

SV410-2

SHOP MANUAL

SAKAI®

3498-6404A-0

Introduction

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

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

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

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

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SAFETY


1. GENERAL SAFETY

1-1. Understanding the Safety Symbols and Words

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

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

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

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

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

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



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



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

1-2. General

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

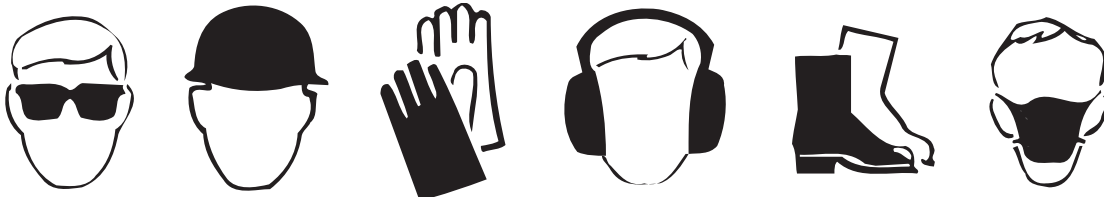
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from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

1-3. Qualifications of Operators and Maintenance Personnel

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

1-4. Safety Practices and Policies

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



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

1-5. Pre Start Inspection

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

1-6. Safety Instructions

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

1-7. Starting

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

1-8. Operating

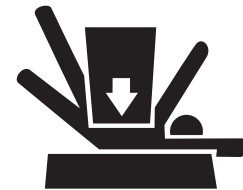
- Always make sure that there are no obstructions or persons in your line of travel before starting the compactor in motion.
- Never climb on and off the machine while it is in motion.
- Always remain seated with the seat belt fastened when traveling, compacting or loading or unloading the machine.
-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

1-9. Stopping

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

1-10. Maintenance

- In any performing any work concerning the operation, adjustment or modification of the machine or it's safety devices or any work related to maintenance, inspection or repair, always follow the start-up and shut-down procedures in the Operator's Manual and the Maintenance Manual.
- Ensure that the maintenance area is safe and secure.
- If the machine is shut down for maintenance or repair work it must be secured against inadvertent starting by removing the starter key and attaching a warning sign to the starter switch.
- The machine must be parked on stable and level ground with the drums or tires blocked to prevent inadvertent movement.
- Immediately after the engine has stopped, the exhaust system, engine, radiator coolant, engine oil, hydraulic fluid and other lubricants and components will be very hot. Fluids can be under pressure, removing the radiator cap or draining oil or changing filters can cause serious burns. Wait until the machine has cooled down.
- Use care when attaching and securing lifting tackle to individual parts and large assemblies being removed or repositioned for repair purposes to avoid the risk of accident. Use lifting devices that are in perfect condition and of sufficient lifting capacity. Never stand under suspended loads.
- Always use the proper tools and workshop equipment in good condition when performing maintenance or repairs on the machine.
- Always use specially designed safety ladders and working platforms when working above floor level. Never use machine parts as a climbing aid.
- Keep all steps, handles, handrails, platforms and ladders free from mud, dirt, grease, ice or snow.
- Clean the machine, especially threaded connections of any traces of oil or fuel before carrying out any maintenance or repairs. Never use aggressive detergents. Use lint free cleaning rags.
- Examine all fuel, lubricant and hydraulic fluid lines and connectors for leaks, loose connections chafe marks or damage after cleaning.
- Repair or replace defective parts immediately.
- Whenever possible, avoid servicing or maintenance when the engine is running unless the drums or tires are adequately blocked, the articulation lock bar is in the locked position and the parking brake is applied.
- Never fill the fuel tank with the engine running, while near an open flame or while smoking. Always clean up any spilled fuel.
- Ensure safe operation, optimum performance of the machine and its warranty by using only genuine SAKAI replacement parts.



SAFETY

- 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.



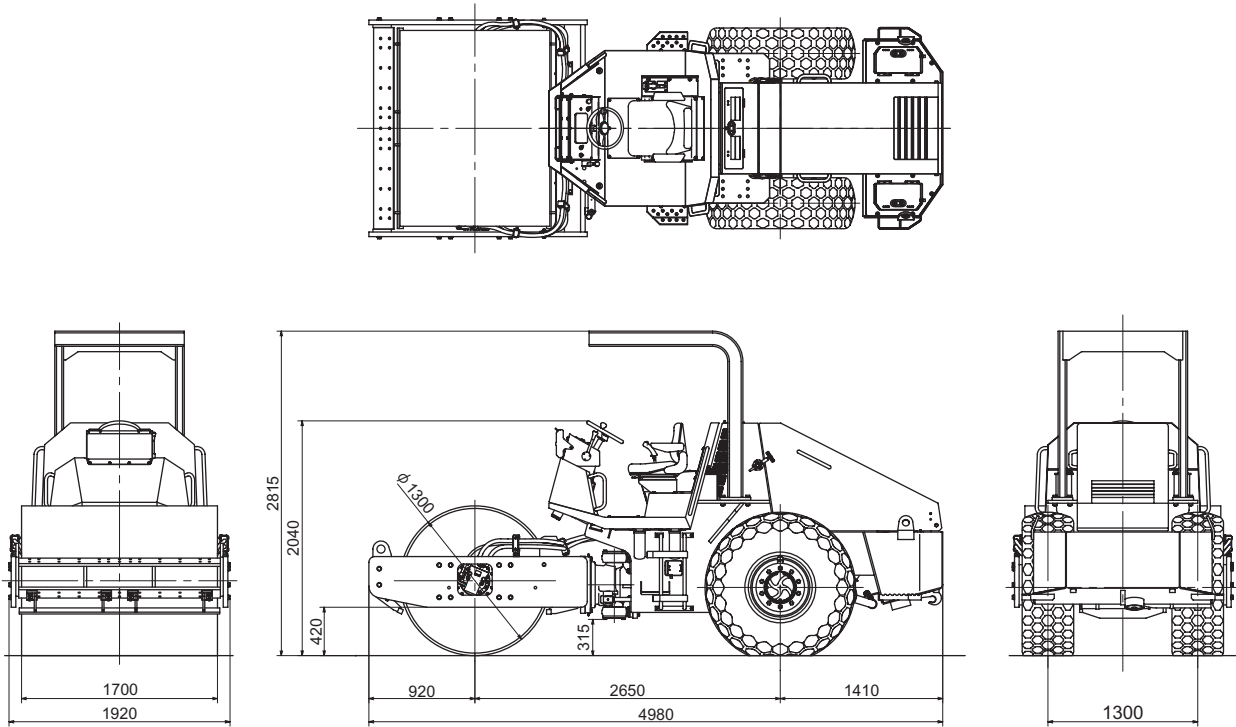
1-11. Transporting the Machine

- 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. SV410D-2



0404-99028-0-11650-A

Model		SV410D-2		
Weight	Operating weight	7,430 kg	(16,380 lbs.)	
	Front axle	3,630 kg	(8,000 lbs.)	
	Rear axle	3,800 kg	(8,380 lbs.)	
Dimensions	Overall length	4,980 mm	(196 in.)	
	Overall width	1,920 mm	(76 in.)	
	Overall height	Steering wheel	2,040 mm	(80 in.)
		ROPS	2,815 mm	(111 in.)
	Wheelbase	2,650 mm	(104 in.)	
	Compaction width	1,700 mm	(67 in.)	
	Minimum height above ground	315 mm	(12.5 in.)	
	Curb clearance	420 mm	(16.5 in.)	
Drive speed	1st	0 to 6 km/h	(0 to 3.7 mph)	
	2nd	0 to 10 km/h	(0 to 6.2 mph)	
	Reverse slope operation	0 to 7 km/h	(0 to 4.3 mph)	
Vibration performance	Frequency	Low amplitude	38 Hz	
		High amplitude	30 Hz	
	Centrifugal force	Low amplitude	93 kN (20,945 lbf.)	
		High amplitude	118 kN (26,445 lbf.)	
	Amplitude	Low amplitude	0.7 mm (0.028 in.)	
High amplitude		1.4 mm (0.055 in.)		
Minimum turning radius		4.9 m	(193 in.)	
Gradability *1		62 %	(32 °)	

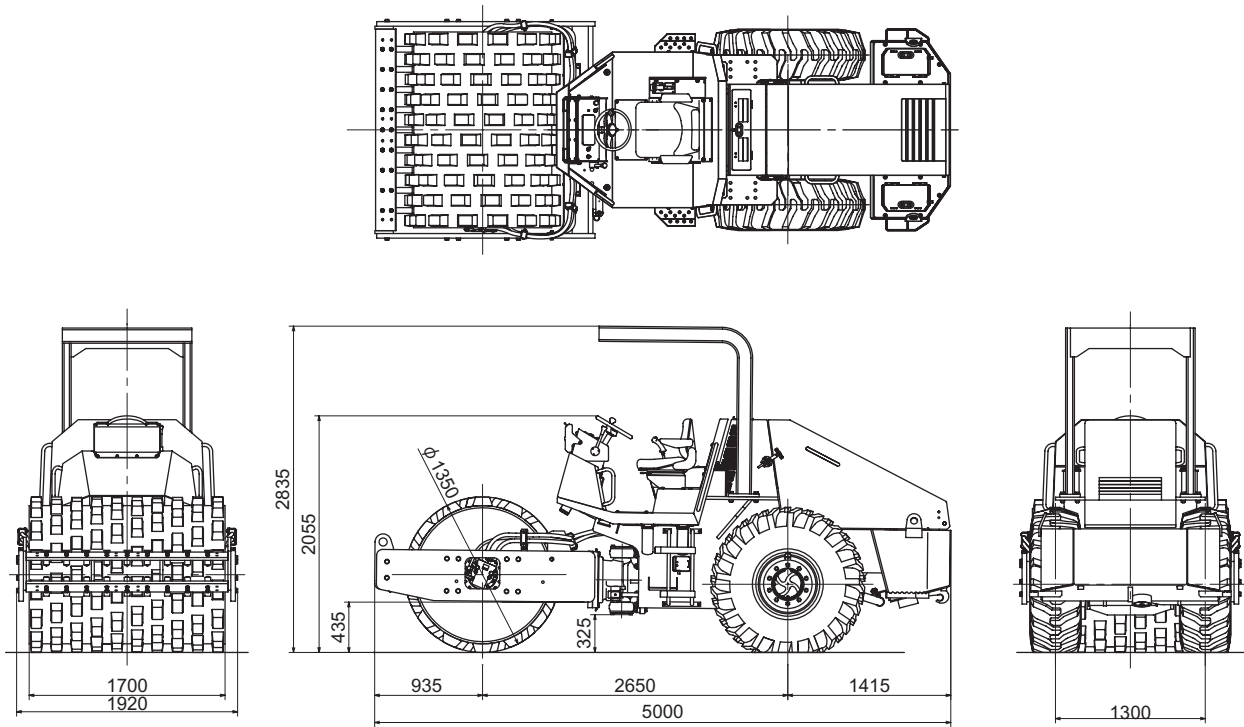
*1: The gradability is the calculated value. It may vary based on the ground surface conditions.

SPECIFICATIONS

Engine	Name		DEUTZ TCD2011L04W Diesel Engine with turbocharger (EPA Tier 3)		
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, vertical mounted, overhead valve, direct injection type		
	Bore × Stroke		96 mm × 125 mm (3.780 in. × 4.921 in.)		
	Displacement		3.619 L (221 cu.in)		
	Performance	Rated speed		2,300 min ⁻¹ (2,300 rpm)	
		Rated output		74.9 kW (100 HP)	
		Max. torque		350 N·m (258 lbf·ft) at 1,600 min ⁻¹	
		Fuel consumption		230 g/kW·h (0.378 lb/HP·h) at rated speed	
	Governor		Mechanical all-speed type		
	Lubrication system		Pressure lubrication by gear pump		
	Oil filter		Full-flow: paper		
	Air cleaner		Dry type		
	Cooling system		Centrifugal pump forced feeding system (pressure type)		
	Cooling fan		Inhaling type		
	Electrical system	Alternator		14 V 55 A	
		Starter		12 V 2.3 kW	
Battery		12 V CCA 620 × 1 pcs. (12 V)			
Dry weight		268 kg (590 lbs.)			
Power line	Transmission	Type	Hydrostatic transmission		
		Speeds	2 speed shifts		
	Reverser		Switching the direction of flow delivered from the variable pump		
	Differential		Auto lock type		
Final drive		Planetary gear			
Vibrating system	Transmission		Hydrostatic transmission		
	Vibrator		Eccentric shaft type		
Braking device	Service brake		Hydrostatic and mechanical type		
	Parking brake		Mechanical type		
Steering system	Steering control type		Hydraulic type (Articulated type)		
	Steering control angle		± 37 °		
	Oscillation angle		± 7 °		
Drum and wheels	Use	Front drum		Vibrate & drive × 1	
		Rear tires		Drive × 2	
	Dimension	Front drum	width × diameter	1,700 mm × 1,300 mm (67 in. × 51 in.)	
		Rear tires	size	16.9-24 6PR	
	Suspension system	Front		Rubber damper type	
Rear		Rigid			
Others	Rops		Steel frame		

SPECIFICATIONS

1-2. SV410T-2



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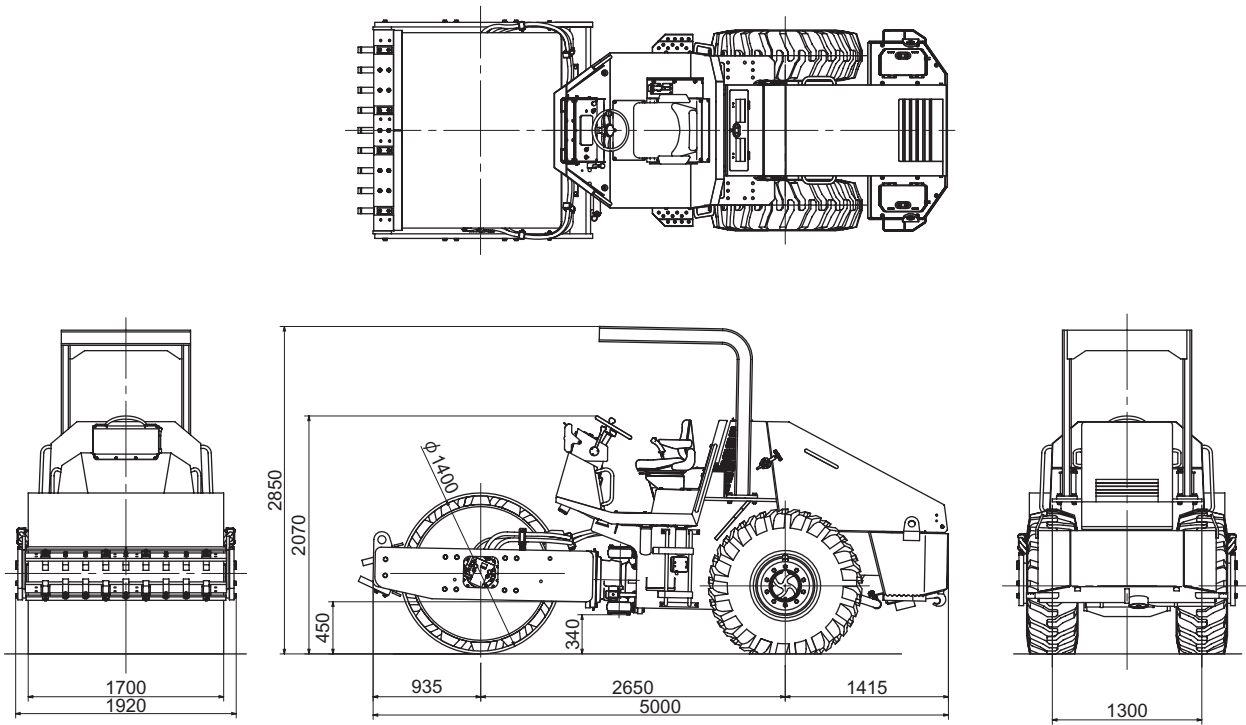
Model		SV410T-2		
Weight	Operating weight	7,650 kg	(16,865 lbs.)	
	Front axle	3,880 kg	(8,555 lbs.)	
	Rear axle	3,770 kg	(8,310 lbs.)	
Dimensions	Overall length	5,000 mm	(197 in.)	
	Overall width	1,920 mm	(76 in.)	
	Overall height	Steering wheel	2,055 mm	(81 in.)
		ROPS	2,835 mm	(112 in.)
	Wheelbase	2,650 mm	(104 in.)	
	Compaction width	1,700 mm	(67 in.)	
	Minimum height above ground	325 mm	(13.0 in.)	
	Curb clearance	435 mm	(17.0 in.)	
Drive speed	1st	0 to 6 km/h	(0 to 3.7 mph)	
	2nd	0 to 10 km/h	(0 to 6.2 mph)	
	Reverse slope operation	0 to 7 km/h	(0 to 4.3 mph)	
Vibration performance	Frequency	Low amplitude	38 Hz	
		High amplitude	30 Hz	
	Centrifugal force	Low amplitude	103 kN (23,150 lbf.)	
		High amplitude	127 kN (28,660 lbf.)	
	Amplitude	Low amplitude	0.7 mm (0.028 in.)	
High amplitude		1.4 mm (0.055 in.)		
Minimum turning radius		4.9 m	(193 in.)	
Gradability *1		62 %	(32 °)	

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

Engine	Name		DEUTZ TCD2011L04W Diesel Engine with turbocharger (EPA Interim Tier 3)		
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, vertical mounted, overhead valve, direct injection type		
	Bore × Stroke		96 mm × 125 mm (3.780 in. × 4.921 in.)		
	Displacement		3.619 L (221 cu.in)		
	Performance	Rated speed		2,300 min ⁻¹ (2,300 rpm)	
		Rated output		74.9 kW (100 HP)	
		Max. torque		350 N·m (258 lbf·ft) at 1,600 min ⁻¹	
		Fuel consumption		230 g/kW·h (0.378 lb/HP·h) at rated speed	
	Governor		Mechanical all-speed type		
	Lubrication system		Pressure lubrication by gear pump		
	Oil filter		Full-flow: paper		
	Air cleaner		Dry type		
	Cooling system		Centrifugal pump forced feeding system (pressure type)		
	Cooling fan		Inhaling type		
	Electrical system	Alternator		14 V 55 A	
Starter		12 V 2.3 kW			
Battery		12 V CCA 620 × 1 pcs. (12 V)			
Dry weight		268 kg (590 lbs.)			
Power line	Transmission	Type	Hydrostatic transmission		
		Speeds	2 speed shifts		
	Reverser		Switching the direction of flow delivered from the variable pump		
	Differential		Auto lock type		
Final drive		Planetary gear			
Vibrating system	Transmission		Hydrostatic transmission		
	Vibrator		Eccentric shaft type		
Braking device	Service brake		Hydrostatic and mechanical type		
	Parking brake		Mechanical type		
Steering system	Steering control type		Hydraulic type (Articulated type)		
	Steering control angle		± 37 °		
	Oscillation angle		± 7 °		
Drum and wheels	Use	Front drum		Vibrate & drive × 1	
		Rear tires		Drive × 2	
	Dimension	Front drum	Pad	width × diameter	1,700 mm × 1,350 mm (67 in. × 53 in.)
				Number of pads	140
		Pad height	75 mm (3.0 in.)		
		Pad area	102 cm ² (16 sq.in.)		
		Rear tires	size	16.9-24 6PR	
Suspension system	Front		Rubber damper type		
	Rear		Rigid		
Others	Rops		Steel frame		

SPECIFICATIONS

1-3. SV410TF-2



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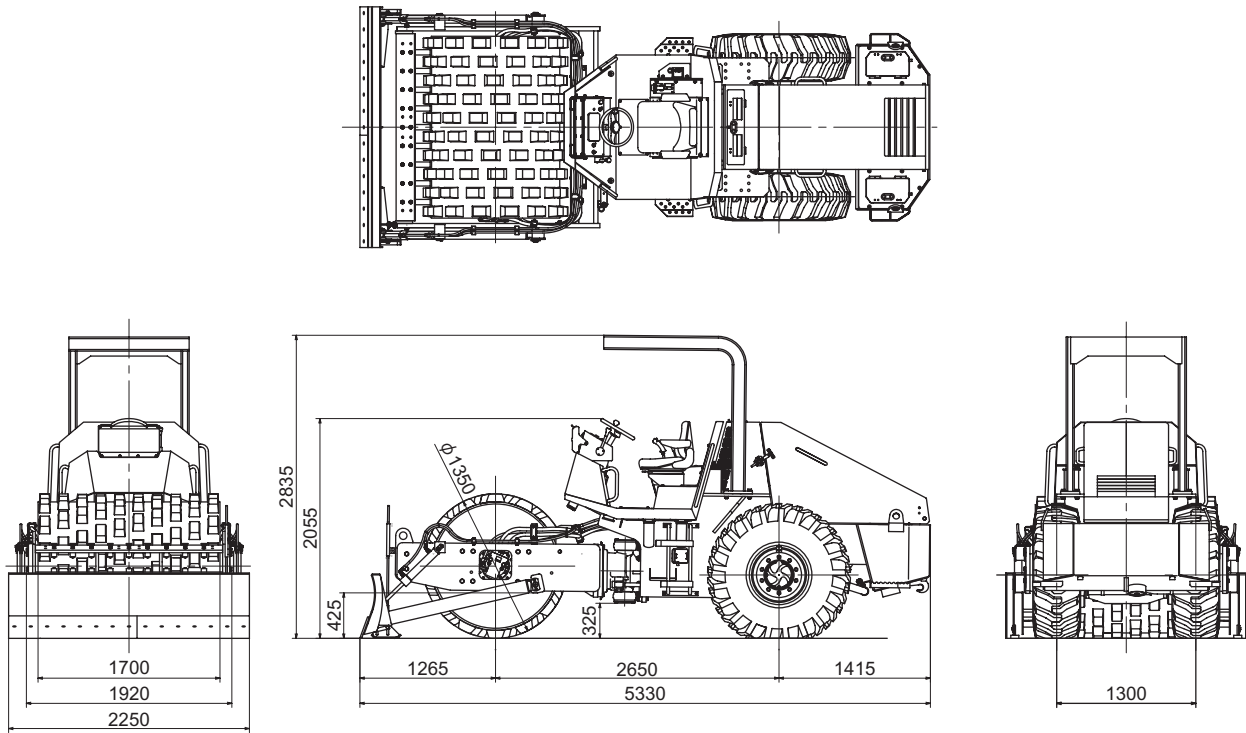
Model		SV410TF-2		
Weight	Operating weight	8,840 kg	(19,490 lbs.)	
	Front axle	5,110 kg	(11,265 lbs.)	
	Rear axle	3,730 kg	(8,225 lbs.)	
Dimensions	Overall length	5,000 mm	(197 in.)	
	Overall width	1,920 mm	(76 in.)	
	Overall height	Steering wheel	2,070 mm	(81 in.)
		ROPS	2,850 mm	(112 in.)
	Wheelbase	2,650 mm	(104 in.)	
	Compaction width	1,700 mm	(67 in.)	
	Minimum height above ground	340 mm	(13.5 in.)	
	Curb clearance	450 mm	(17.5 in.)	
Drive speed	1st	0 to 6 km/h	(0 to 3.7 mph)	
	2nd	0 to 10 km/h	(0 to 6.2 mph)	
	Reverse slope operation	0 to 7 km/h	(0 to 4.3 mph)	
Vibration performance	Frequency	Low amplitude	38 Hz	
		High amplitude	30 Hz	
	Centrifugal force	Low amplitude	103 kN (23,150 lbf.)	
		High amplitude	127 kN (28,660 lbf.)	
	Amplitude	Low amplitude	0.5 mm (0.020 in.)	
High amplitude		0.9 mm (0.035 in.)		
Minimum turning radius		4.9 m	(193 in.)	
Gradability *1		50 %	(26 °)	

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

Engine	Name		DEUTZ TCD2011L04W Diesel Engine with turbocharger (EPA Tier 3)		
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, vertical mounted, overhead valve, direct injection type		
	Bore × Stroke		96 mm × 125 mm (3.780 in. × 4.921 in.)		
	Displacement		3.619L (221 cu.in)		
	Performance	Rated speed		2,300 min ⁻¹ (2,300 rpm)	
		Rated output		74.9 kW (100 HP)	
		Max. torque		350 N·m (258 lbf·ft) at 1,600 min ⁻¹	
		Fuel consumption		230 g/kW·h (0.378 lb/HP·h) at rated speed	
	Governor		Mechanical all-speed type		
	Lubrication system		Pressure lubrication by gear pump		
	Oil filter		Full-flow: paper		
	Air cleaner		Dry type		
	Cooling system		Centrifugal pump forced feeding system (pressure type)		
	Cooling fan		Inhaling type		
	Electrical system	Alternator		14 V 55 A	
		Starter		12 V 2.3 kW	
Battery		12 V CCA 620 × 1 pcs. (12 V)			
Dry weight		268 kg (590 lbs.)			
Power line	Transmission	Type	Hydrostatic transmission		
		Speeds	2 speed shifts		
	Reverser		Switching the direction of flow delivered from the variable pump		
	Differential		Auto lock type		
Final drive		Planetary gear			
Vibrating system	Transmission		Hydrostatic transmission		
	Vibrator		Eccentric shaft type		
Braking device	Service brake		Hydrostatic and mechanical type		
	Parking brake		Mechanical type		
Steering system	Steering control type		Hydraulic type (Articulated type)		
	Steering control angle		± 37 °		
	Oscillation angle		± 7 °		
Drum and wheels	Use	Front drum		Vibrate & drive × 1	
		Rear tires		Drive × 2	
	Dimension	Front drum	Smooth	width × diameter	1,700 mm × 1,400 mm (67 in. × 55 in.)
				width × diameter	1,700 mm × 1,350 mm (67 in. × 53 in.)
		Pad	Number of pads	140	
			Pad height	75 mm (3.0 in.)	
			Pad area	102 cm ² (16 sq.in.)	
	Rear tires	size	16.9-24 6PR		
Suspension system	Front		Rubber damper type		
	Rear		Rigid		
Others	Rops		Steel frame		

SPECIFICATIONS

1-4. SV410TB-2



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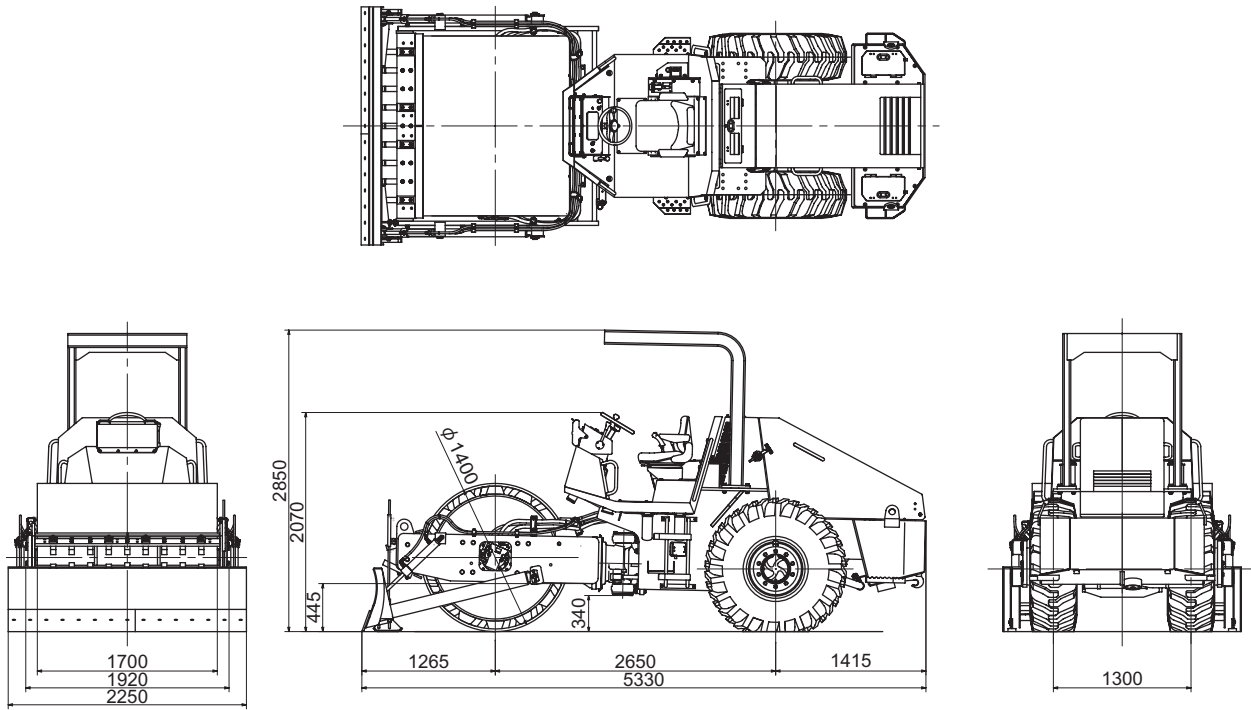
Model		SV410TB-2		
Weight	Operating weight	8,050 kg	(17,745 lbs.)	
	Front axle	4,380 kg	(9,655 lbs.)	
	Rear axle	3,670 kg	(8,090 lbs.)	
Dimensions	Overall length	5,330 mm	(210 in.)	
	Overall width	2,250 mm	(89 in.)	
	Overall height	Steering wheel	2,055 mm	(81 in.)
		ROPS	2,835 mm	(112 in.)
	Wheelbase	2,650 mm	(104 in.)	
	Compaction width	1,700 mm	(67 in.)	
	Minimum height above ground	325 mm	(13.0 in.)	
	Curb clearance	425 mm	(16.5 in.)	
Drive speed	1st	0 to 6 km/h	(0 to 3.7 mph)	
	2nd	0 to 10 km/h	(0 to 6.2 mph)	
	Reverse slope operation	0 to 7 km/h	(0 to 4.3 mph)	
Vibration performance	Frequency	Low amplitude	38 Hz	
		High amplitude	30 Hz	
	Centrifugal force	Low amplitude	103 kN	(23,150 lbf.)
		High amplitude	127 kN	(28,660 lbf.)
	Amplitude	Low amplitude	0.7 mm	(0.028 in.)
High amplitude		1.4 mm	(0.055 in.)	
Minimum turning radius		4.9 m	(193 in.)	
Gradability *1		59 %	(30 °)	

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

Engine	Name		DEUTZ TCD2011L04W Diesel Engine with turbocharger (EPA Tier 3)		
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, vertical mounted, overhead valve, direct injection type		
	Bore × Stroke		96 mm × 125 mm (3.780 in. × 4.921 in.)		
	Displacement		3.619L (221 cu.in)		
	Performance	Rated speed		2,300 min ⁻¹ (2,300 rpm)	
		Rated output		74.9 kW (100 HP)	
		Max. torque		350 N·m (258 lbf-ft) at 1,600 min ⁻¹	
		Fuel consumption		230 g/kW·h (0.378 lb/HP·h) at rated speed	
	Governor		Mechanical all-speed type		
	Lubrication system		Pressure lubrication by gear pump		
	Oil filter		Full-flow: paper		
	Air cleaner		Dry type		
	Cooling system		Centrifugal pump forced feeding system (pressure type)		
	Cooling fan		Inhaling type		
	Electrical system	Alternator		14 V 55 A	
		Starter		12 V 2.3 kW	
Battery		12 V CCA 620 × 1 pcs. (12 V)			
Dry weight		268 kg (590 lbs.)			
Power line	Transmission	Type	Hydrostatic transmission		
		Speeds	2 speed shifts		
	Reverser		Switching the direction of flow delivered from the variable pump		
	Differential		Auto lock type		
Final drive		Planetary gear			
Vibrating system	Transmission		Hydrostatic transmission		
	Vibrator		Eccentric shaft type		
Braking device	Service brake		Hydrostatic and mechanical type		
	Parking brake		Mechanical type		
Steering system	Steering control type		Hydraulic type (Articulated type)		
	Steering control angle		± 37 °		
	Oscillation angle		± 7 °		
Drum and wheels	Use	Front drum		Vibrate & drive × 1	
		Rear tires		Drive × 2	
	Dimension	Front drum	Pad	width × diameter	1,700 mm × 1,350 mm (67 in. × 53 in.)
				Number of pads	140
		Pad height	75 mm (3.0 in.)		
		Pad area	102 cm ² (16 sq.in.)		
		Rear tires	size	16.9-24 6PR	
Suspension system	Front		Rubber damper type		
	Rear		Rigid		
Others	Rops		Steel frame		

SPECIFICATIONS

1-5. SV410FB-2



0404-99039-0-11832-A

Model		SV410FB-2		
Weight	Operating weight	9,250 kg	(20,390 lbs.)	
	Front axle	5,630 kg	(12,410 lbs.)	
	Rear axle	3,620 kg	(7,980 lbs.)	
Dimensions	Overall length	5,330 mm	(210 in.)	
	Overall width	2,250 mm	(89 in.)	
	Overall height	Steering wheel	2,070 mm	(81 in.)
		ROPS	2,850 mm	(112 in.)
	Wheelbase	2,650 mm	(104 in.)	
	Compaction width	1,700 mm	(67 in.)	
	Minimum height above ground	340 mm	(13.5 in.)	
	Curb clearance	445 mm	(17.5 in.)	
Drive speed	1st	0 to 6 km/h	(0 to 3.7 mph)	
	2nd	0 to 10 km/h	(0 to 6.2 mph)	
	Reverse slope operation	0 to 7 km/h	(0 to 4.3 mph)	
Vibration performance	Frequency	Low amplitude	38 Hz	
		High amplitude	30 Hz	
	Centrifugal force	Low amplitude	103 kN	(23,150 lbf.)
		High amplitude	127 kN	(28,660 lbf.)
	Amplitude	Low amplitude	0.5 mm	(0.020 in.)
High amplitude		0.9 mm	(0.035 in.)	
Minimum turning radius		4.9 m	(193 in.)	
Gradability *1		48 %	(25 °)	

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

Engine	Name		DEUTZ TCD2011L04W Diesel Engine with turbocharger (EPA Tier 3)		
	Model		Water-cooled, 4-cycle, 4-cylinder, in-line, vertical mounted, overhead valve, direct injection type		
	Bore × Stroke		96 mm × 125 mm (3.780 in. × 4.921 in.)		
	Displacement		3.619L (221 cu.in)		
	Performance	Rated speed		2,300 min ⁻¹ (2,300 rpm)	
		Rated output		74.9 kW (100 HP)	
		Max. torque		350 N·m (258 lbf·ft) at 1,600 min ⁻¹	
		Fuel consumption		230 g/kW·h (0.378 lb/HP·h) at rated speed	
	Governor		Mechanical all-speed type		
	Lubrication system		Pressure lubrication by gear pump		
	Oil filter		Full-flow: paper		
	Air cleaner		Dry type		
	Cooling system		Centrifugal pump forced feeding system (pressure type)		
	Cooling fan		Inhaling type		
	Electrical system	Alternator		14 V 55 A	
		Starter		12 V 2.3 kW	
Battery		12 V CCA 620 × 1 pcs. (12 V)			
Dry weight		268 kg (590 lbs.)			
Power line	Transmission	Type	Hydrostatic transmission		
		Speeds	2 speed shifts		
	Reverser		Switching the direction of flow delivered from the variable pump		
	Differential		Auto lock type		
Final drive		Planetary gear			
Vibrating system	Transmission		Hydrostatic transmission		
	Vibrator		Eccentric shaft type		
Braking device	Service brake		Hydrostatic and mechanical type		
	Parking brake		Mechanical type		
Steering system	Steering control type		Hydraulic type (Articulated type)		
	Steering control angle		± 37 °		
	Oscillation angle		± 7 °		
Drum and wheels	Use	Front drum		Vibrate & drive × 1	
		Rear tires		Drive × 2	
	Dimension	Front drum	Smooth	width × diameter	1,700 mm × 1,400 mm (67 in. × 55 in.)
				width × diameter	1,700 mm × 1,350 mm (67 in. × 53 in.)
			Pad	Number of pads	140
				Pad height	75 mm (3.0 in.)
		Pad area	102 cm ² (16 sq.in.)		
		Rear tires	size	16.9-24 6PR	
Suspension system	Front		Rubber damper type		
	Rear		Rigid		
Others	Rops		Steel frame		

2. TABLE OF STANDARD VALUES


2-1. Engine

Item	Standard value	Remarks
Engine model	DEUTZ TCD2011L04W Diesel Engine with turbocharger	
Rated output	74.9/2,300 kW/rpm (100/2,300 HP/rpm)	
Max. rpm under no load	2,530 ⁰ ₋₅₀ rpm	
Min. rpm under no load	750 ± 25 rpm	
Cylinder head tightening torque	80 N·m (59 lbf-ft)	
Intake manifold tightening torque	21 N·m (16 lbf-ft)	
Exhaust manifold tightening torque	55 N·m (41 lbf-ft)	
Fan belt tension (deflection volume)	450 ± 50 N (101 ± 11 lbf)	First assembly
	300 ± 20 N (67 ± 4.5 lbf)	Check after 15 min. running under load
Valve clearance (intake)	0.3 mm (0.012 in.)	
Valve clearance (exhaust)	0.5 mm (0.020 in.)	
Compression pressure	2.2 to 2.7 MPa (319 to 392 psi)	
Injection pressure	11.5 MPa (1,668 psi)	

2-2. Propulsion

Item	Standard value	Remarks
Travel speed (Forward/reverse)	1st 0 to 6 km/h (0 to 3.7 mph)	
	2nd 0 to 10 km/h (0 to 6.2 mph)	
	Reverse slope operation 0 to 7 km/h (0 to 4.3 mph)	
Rear wheel/hub nut	785 N·m (579 lbf-ft)	
Tire inflation pressure	137 kPa (20 psi)	

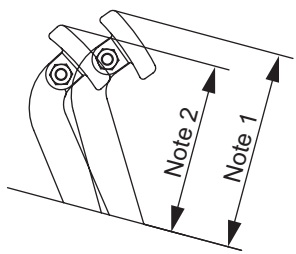
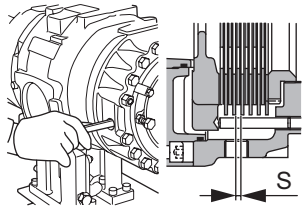
2-3. Hydraulic Systems

Item	Standard value	Remarks		
Propulsion	High pressure relief valve setting	41.8 ± 1.0 MPa (6,061 ± 145 psi)	at 1,800 min ⁻¹	
	Charge relief valve setting	Pump	2.5 ± 0.2 MPa (363 ± 29 psi)	
		Front motor	2.5 ± 0.2 MPa (363 ± 29 psi)	
	Case pressure	Rear motor	2.67 MPa (387 psi)	at 19 L/min
		Pump	0.3 MPa (43.5 psi)	or less
		Front motor	0.3 MPa (43.5 psi)	or less
	Brake release pressure	Rear motor	0.3 MPa (43.5 psi)	or less
		Front motor	—	
		Rear motor	—	
	Motor drainage	Rear axle	1.5 to 3.0 MPa (218 to 435 psi)	
Front motor		5.0 L/min (1.3 gal./min)		
Motor drainage	Rear motor	6.2 L/min (1.6 gal./min)		
	High pressure relief valve setting	25.0 ± 1.0 MPa (3,625 ± 145 psi)		
Vibration	Charge relief valve setting	2.5 ± 0.2 MPa (363 ± 29 psi)		
	Case pressure	Pump	0.3 MPa (43.5 psi)	or less
		Motor	0.17 MPa (24.7 psi)	or less
	Motor drainage	6.3 L/min (1.7 gal./min)		
Steering oil pressure	17.5 ± 1.0 MPa (2,538 ± 145 psi)	(orbitroll relief pressure + charge relief pressure)		

2-4. Steering Devices

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

2-5. Brakes

Item	Standard value	Remarks
Clearance between brake pedal and floorboard (as released)	169 mm (6.7 in.) Note 1: See dimensions.	 <p>SV700-02001</p>
Clearance between brake pedal and floorboard (when pressed down)	145 mm (5.7 in.) Note 2: See dimensions.	
Brake disc wear limit	4.5 mm (0.18 in.) (S)	 <p>SV700-02003</p>

2-6. Capacities

Item	Standard value	Remarks
Engine oil pan	10.5 L (2.8 gal.)	
Fuel tank	180 L (48 gal.)	
Cooling	13 L (3.4 gal.)	
Gear box (front motor)	1.96 L (0.5 gal.)	
Center housing (rear axle)	7.3 L (1.9 gal.)	
Hub reduction gear case (rear left and right)	1.25 L ×2 (0.3 gal. ×2)	
Hydraulic oil tank	50 L (13.2 gal.)	
Vibrator case (front)	21 L (5.5 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 CH-4	SAE15W-40	SAE40	SAE40	MIL-L-2104B
Gear oil	API grade GL4	SAE80W-90	SAE90	SAE140	MIL-L-2105
Hydraulic oil	Wear resistant	ISO-VG32 Over VI 140	ISO-VG46 Over VI 140	ISO-VG68 Over VI 110	ISO-3448
Grease	Lithium type extreme pressure				NLGI-2
Fuel	Diesel oil				ASTM D975-2D

3-2. Recommended Lubricants

Lubricant Oil company	Engine oil API CF-4	Gear oil API GL 4	Hydraulic oil VG 46	Grease (NLGI-II)
CALTEX	N/A	Universal Thuban 90	Rando Oil HD 46	Martifack EP 2
BP	Vanellus C Extra	BP Gear Oil EP 90	BP Energol HLP 46	BP Energrease LS-EP 2
ESSO	N/A	Esso Gear Oil GP 90	Nuto H 46	Beacon EP 2
MOBIL	Delvac MX	Mobil Pegasus Gear oil 90	Nuto Oil 25	Beacon EP 25
SHELL	Rimula X	Shell Spirax 90 EP	Shell Tellus Oil 46	Shell Alvania EP Grease 2
CASTROL	Castrol GTX	Castrol Hypoy 90	Hyspin AWS 46	Spherrol ELP 2

4. TIGHTENING TORQUE CHART

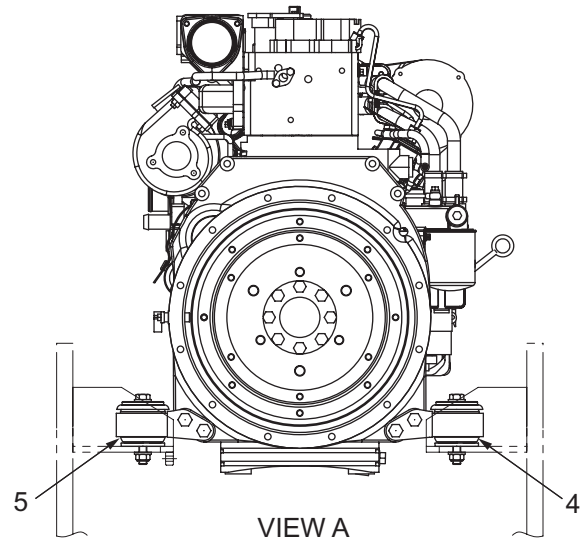
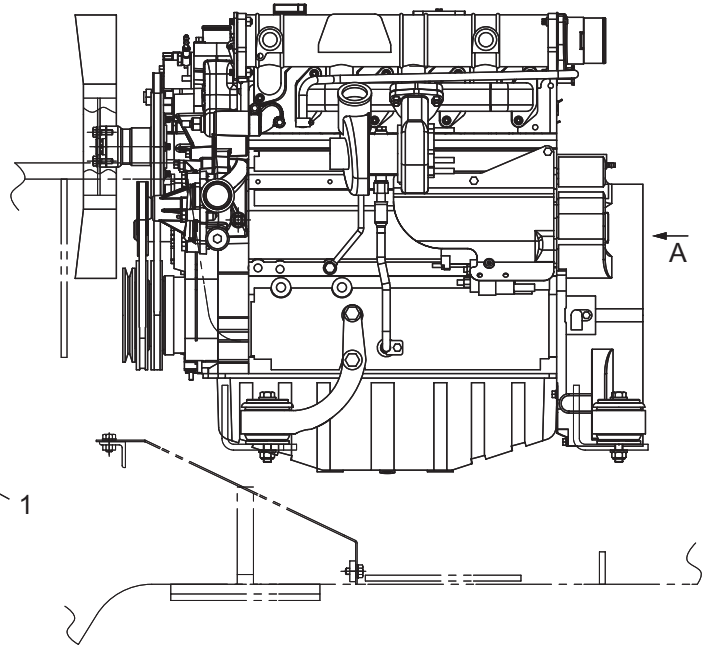
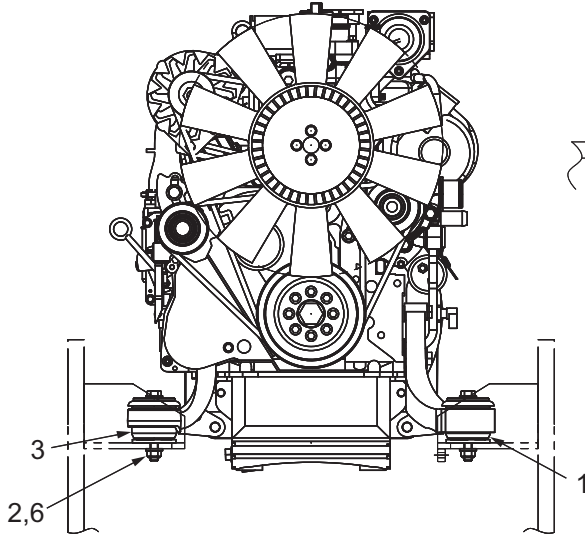
N·m	(lbf·ft)
-----	----------

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

ENGINE AND CONTROLS

1. ENGINE

1-1. Engine Mount



SV400-2-03001

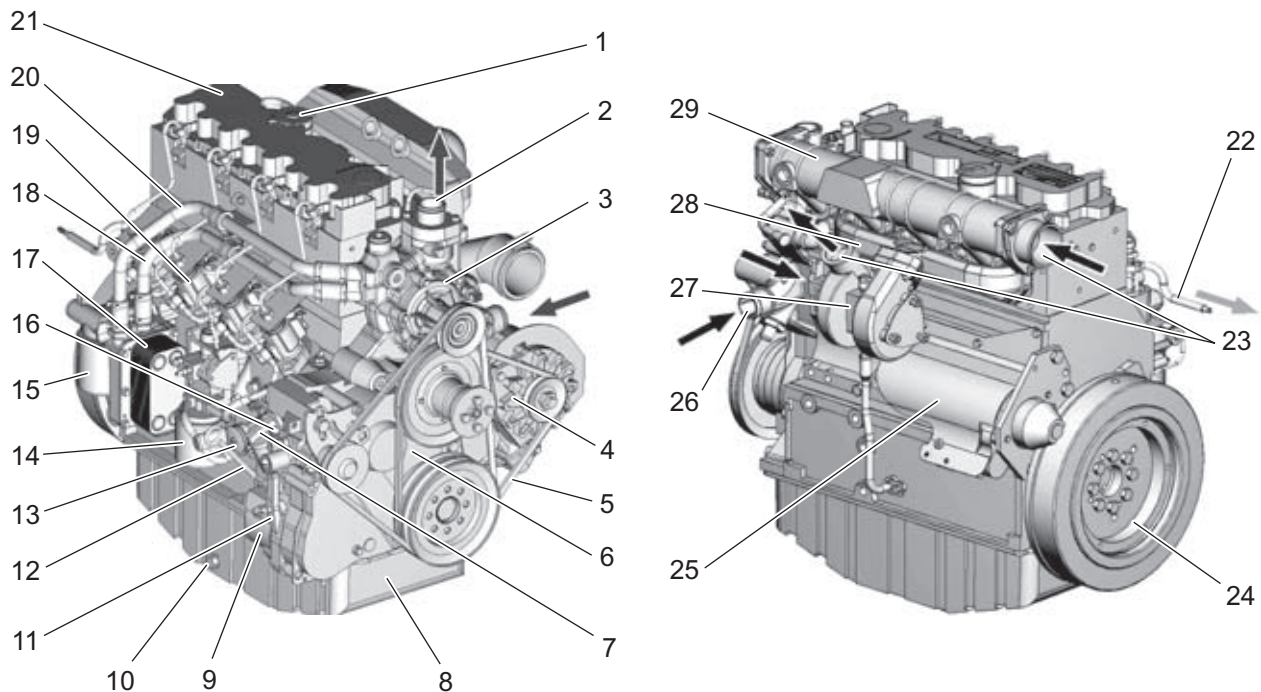
- | | |
|---------------|--------------------|
| (1) Damper | (4) Damper |
| (2) Nut : M12 | (5) Damper |
| (3) Damper | (6) Bolt : M12×100 |



(6) Bolt M12×100 : 108 N·m (80 lbf·ft)

- Engine dry weight : 268 kg (591 lbs.)
- Engine oil quantity : 10.5 L (2.8 gal.)

1-2. Engine Exterior



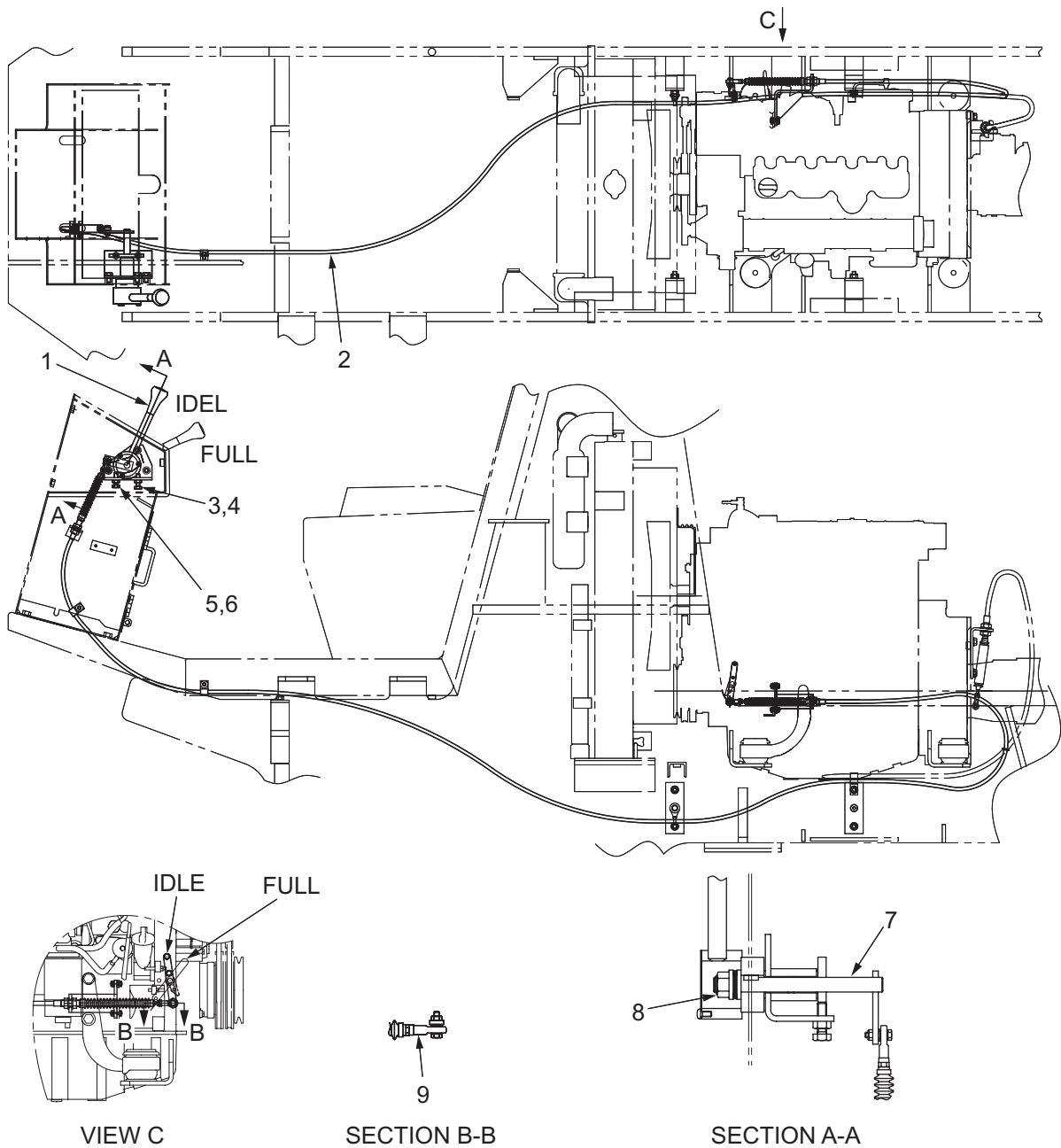
SV400-2-03002

* The actual equipment may differ from that shown above.

- | | |
|--|--|
| (1) Crankcase breather | (16) Shut off lever |
| (2) Coolant outlet from engine to cooler | (17) Lube oil cooler |
| (3) Coolant pump | (18) Coolant inlet from the thermostat housing to the lubricating oil cooler |
| (4) Generator | (19) High pressure pump |
| (5) V-belts | (20) Coolant feed to the cylinder head |
| (6) Gearcase cover | (21) Cylinder head cover |
| (7) Lubricating oil sump | (22) Fuel return line to the tank |
| (8) Lubricating oil filling | (23) Connections charge air cooler |
| (9) Lubricating oil pump | (24) Flywheel |
| (10) Lubricating oil drain plug | (25) Starter cover |
| (11) Adjustment lever | (26) Coolant inlet from cooler |
| (12) Lubricating oil dipstick | (27) Turbocharger |
| (13) Fuel pump with fuel cleaning | (28) Exhaust manifold line |
| (14) Exchangeable fuel filter | (29) Charge air line |
| (15) Lube oil replacement filter | |

2. CONTROL SYSTEM

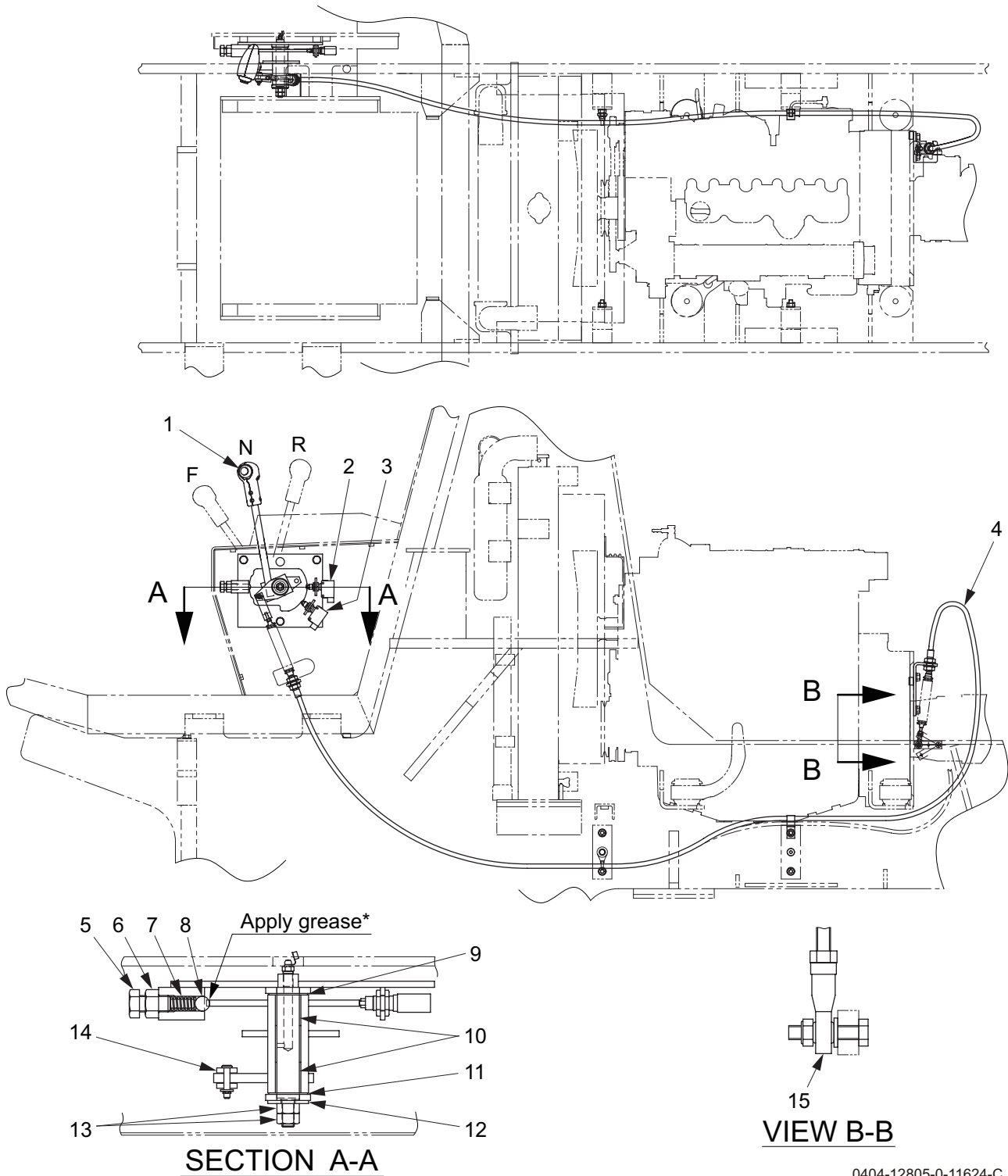
2-1. Throttle Control



SV400-2-03004

- | | |
|---------------------------|--------------|
| (1) Throttle lever | (6) Lock nut |
| (2) Control cable | (7) Shaft |
| (3) Adjusting bolt (Full) | (8) Nut |
| (4) Lock nut | (9) Rod end |
| (5) Adjusting bolt (Idle) | |

2-2. Forward-reverse Control



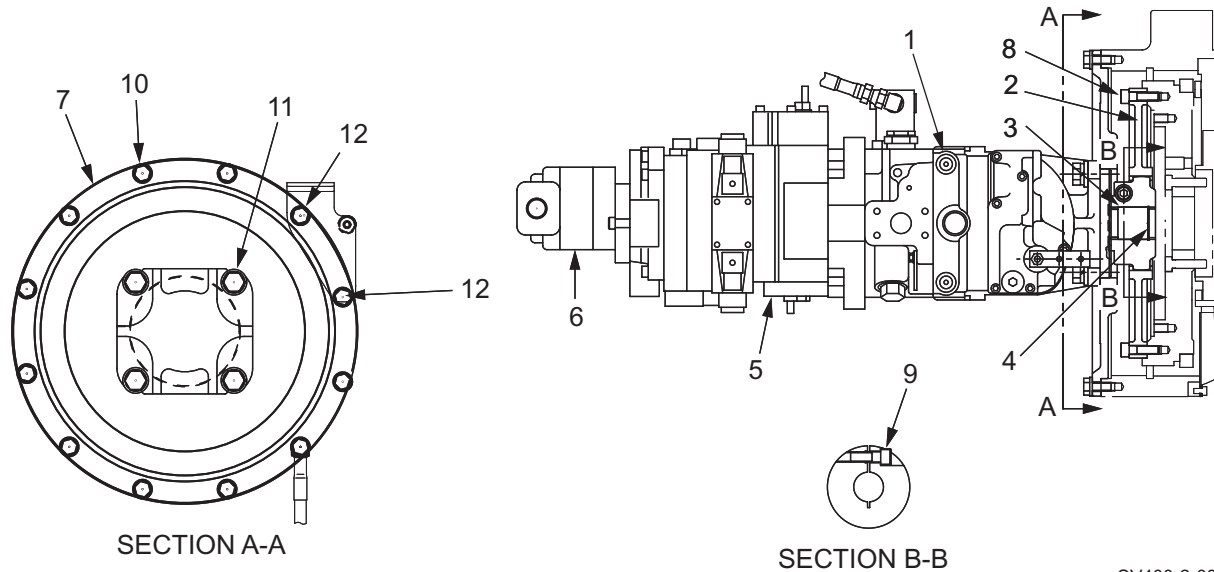
0404-12805-0-11624-C

- | | | |
|--------------------------|----------------------------|------------------------------|
| (1) F-R lever | (6) Nut : M16 | (11) Washer (Apply grease*) |
| (2) F-R lever switch | (7) Spring (Fill grease) | (12) Washer |
| (3) Backup buzzer switch | (8) Steel ball | (13) Nut |
| (4) Control cable | (9) Washer (Apply grease*) | (14) Clevis |
| (5) Bolt : M16× 30 | (10) Bush (Apply grease*) | (15) Rod end (Apply grease*) |

* Lithium-based grease

3. PUMP MOUNT

3-1. Pump Mount



SV400-2-03006

- | | |
|---------------------------------|---------------------------------------|
| (1) Propulsion pump | (7) Housing |
| (2) Flange | (8) Hexagon socket head bolt : M10×35 |
| (3) Hub | (9) Hexagon socket head bolt : M12×35 |
| (4) Snap ring | (10) Bolt : M10×25 |
| (5) Vibrator pump | (11) Bolt : M14×45 |
| (6) Steering pump (charge pump) | (12) Bolt : M10×30 |



- | | | |
|------------------------------|--------|----------------------------|
| (8) Hexagon socket head bolt | M10×35 | : 49 N·m (36.1 lbf·ft) |
| (9) Hexagon socket head bolt | M12×35 | : 86 N·m (63.4 lbf·ft) |
| (10) Bolt | M10×25 | : 59 N·m (43.5 lbf·ft) |
| (11) Bolt | M14×45 | : 167 N·m (123.2 lbf·ft) |
| (12) Bolt | M10×30 | : 59 N·m (43.5 lbf·ft) |


3-2. 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 (1) and hub (3) splines.
- ② Install snap ring (4) of hub (3) to pump (1) and set to the specified dimension.

★ Specified dimension a: 9 mm (0.35 in.)



- ③ Secure hub (3) with bolts (9).

 (9) Bolt M12×35 : 86 N·m (63 lbf·ft)

- ④ Secure flange (2) to engine flywheel with eight bolts (8).

 (8) Bolt M10×35 : 49 N·m (36 lbf·ft)

- ⑤ Secure housing (7) to engine flywheel housing with ten bolts (10), two bolts (12) and washers.

 (10) Bolt M10×25 : 59 N·m (44 lbf·ft)
 (12) Bolt M10×30 : 59 N·m (44 lbf·ft)

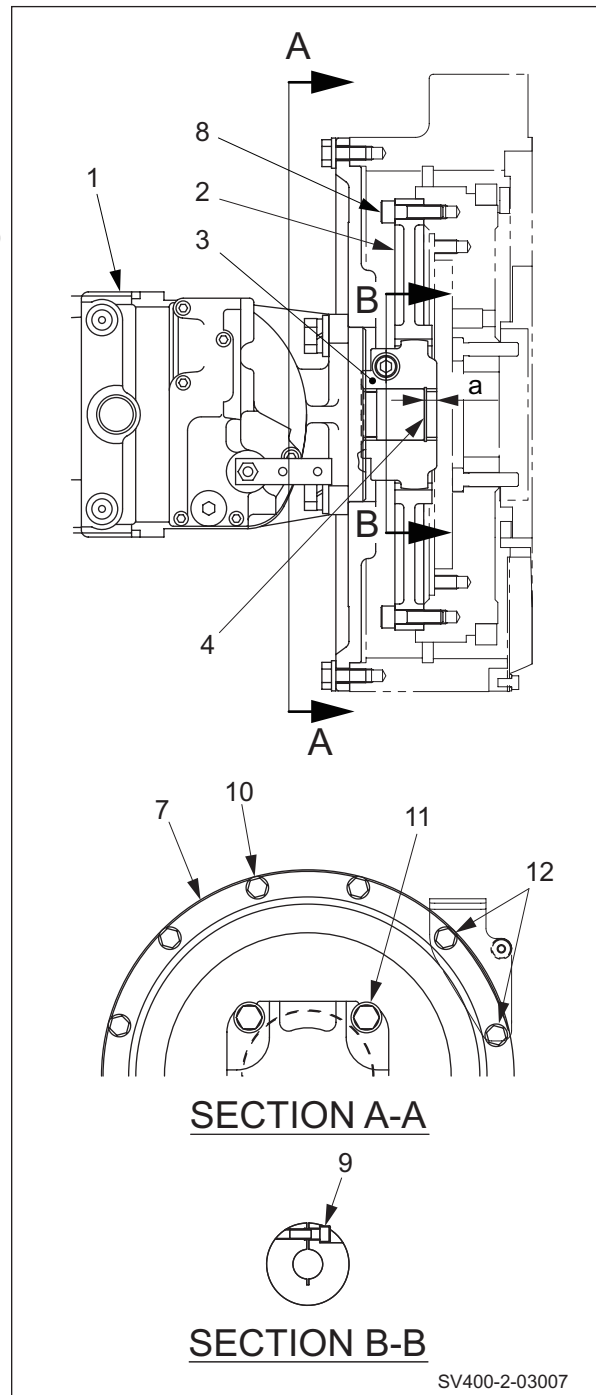
- ⑥ Engage hub (3) with flange (2).

- ⑦ Secure pump (1) to housing (7) with four bolts (11), spring washers and washers.

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

(NOTICE)

- Bolt (8) is treated with thread-locking fluid. Use new thread-locking fluid treated bolt for installation.



SV400-2-03007

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

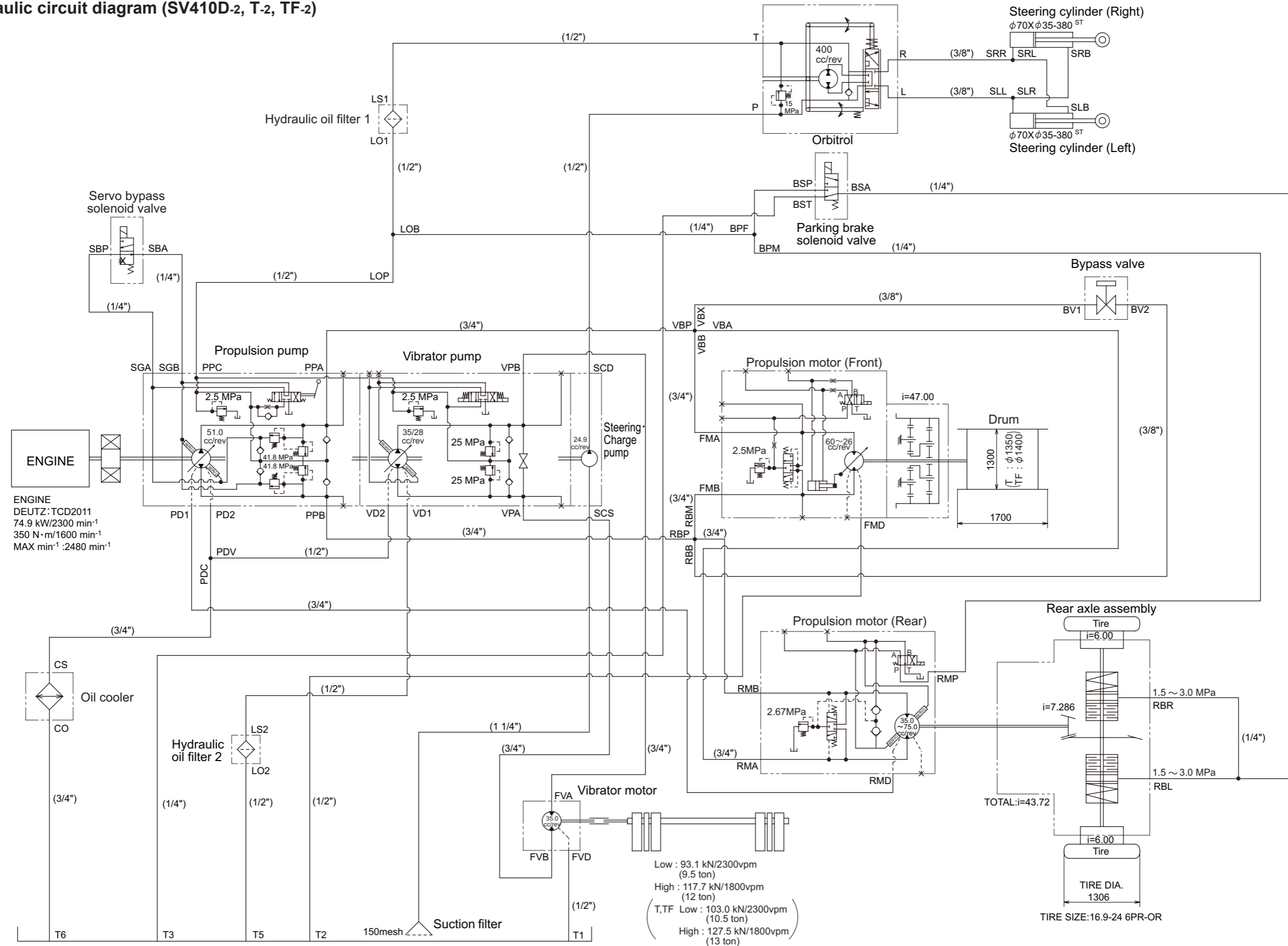
DESCRIPTION	SYMBOL
Check valve	
Manual shut off (On-Off)	
Pressure relief	
Flow control, adjustable	
Valve symbols: The basic valve symbol one or more squares with lines representing flow paths and flow conditions between ports.	
Multiple squares indicate a valve with as many distinct positions there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

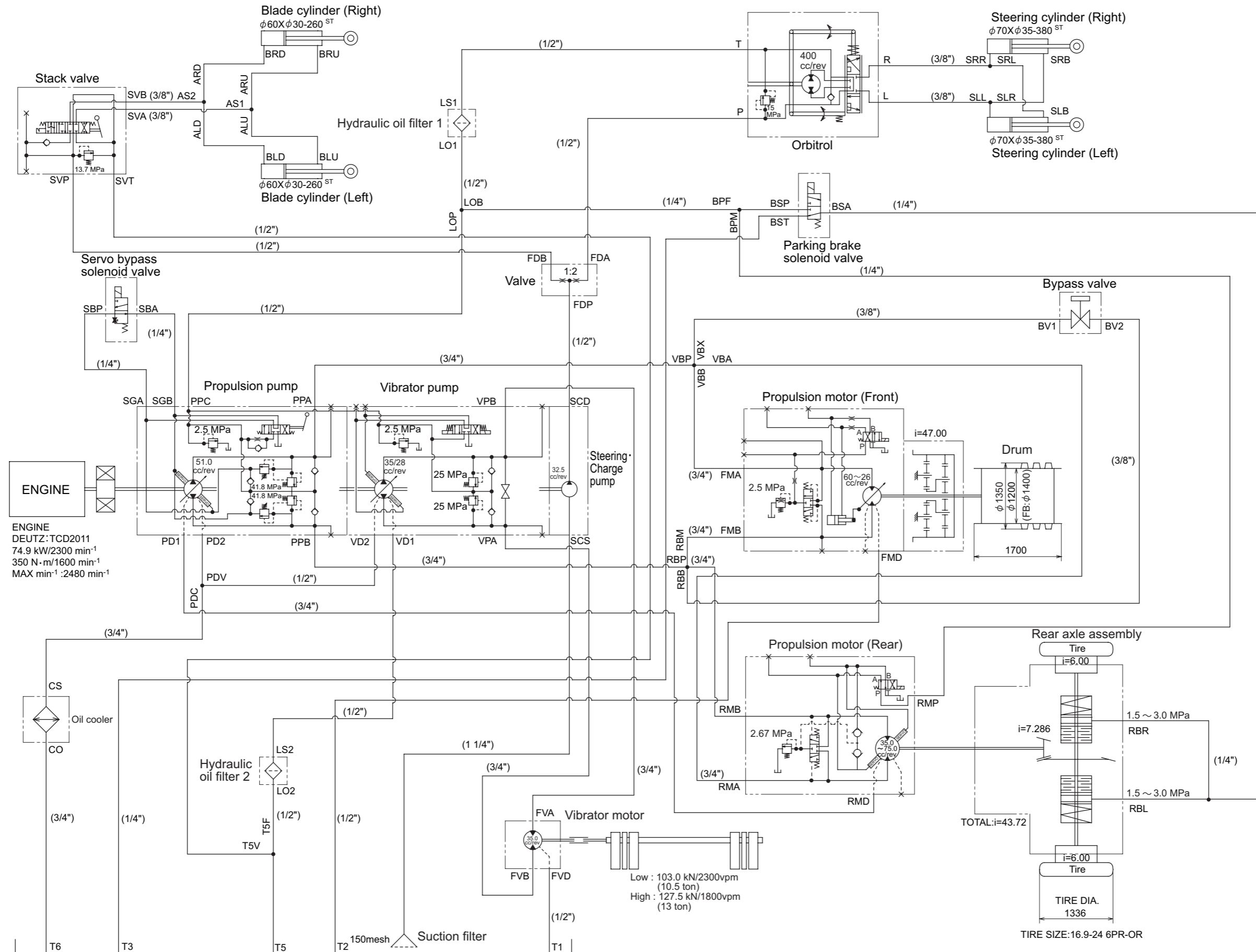
DESCRIPTION	SYMBOL
Spring	
Manual	
Pressure compensated	
Reversing motor	
Pilot pressure: Internal supply	
Remote supply	
Solenoid: Single winding	
Two windings operating in opposite directions.	
Pilot directional valve is actuated by the solenoid.	

1-2. Hydraulic Circuit Diagram

1-2-1. Hydraulic circuit diagram (SV410D-2, T-2, TF-2)



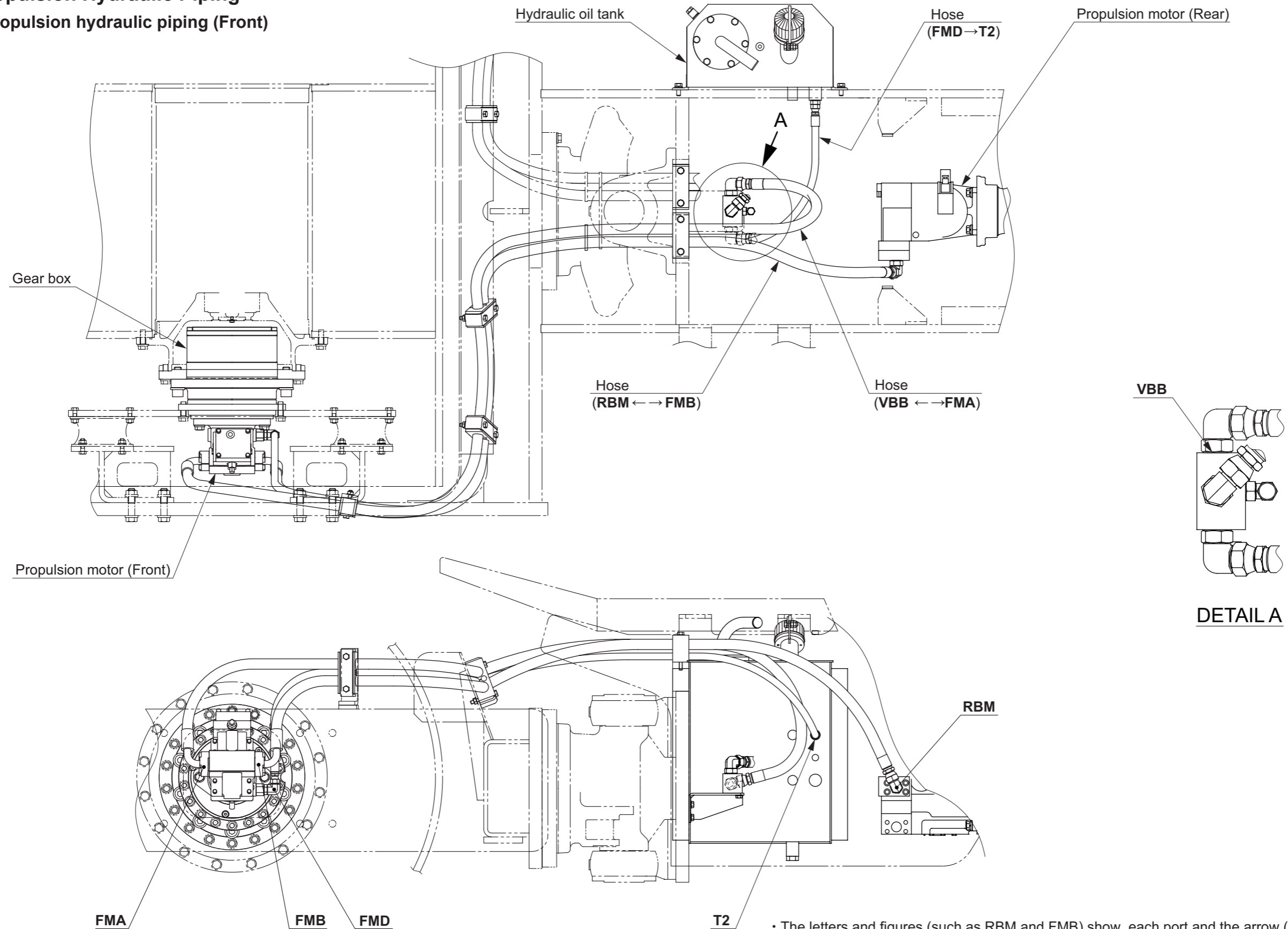
1-2-2. Hydraulic circuit diagram (SV410TB-2, FB-2)



2. PROPULSION HYDRAULIC SYSTEM

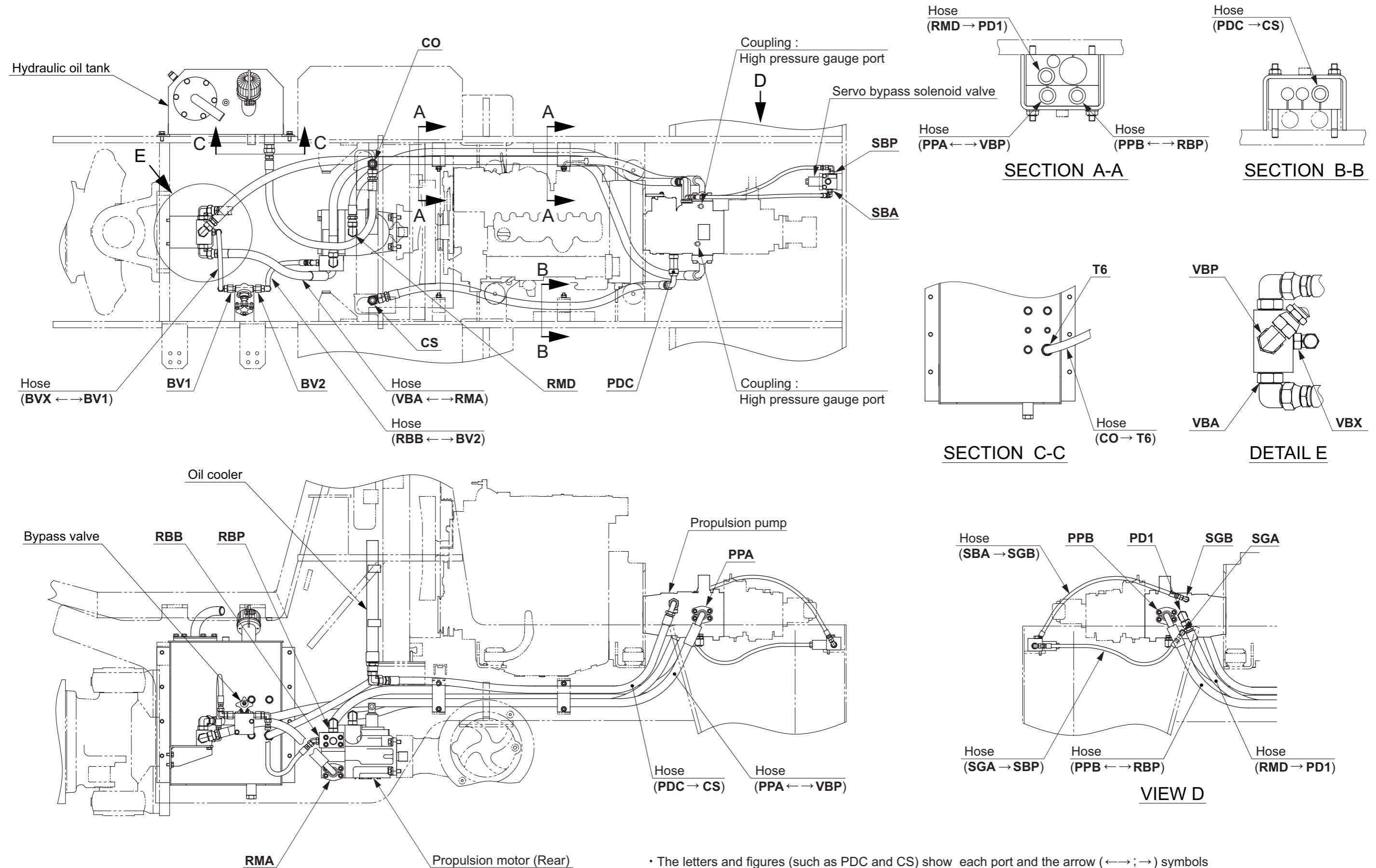
2-1. Propulsion Hydraulic Piping

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



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

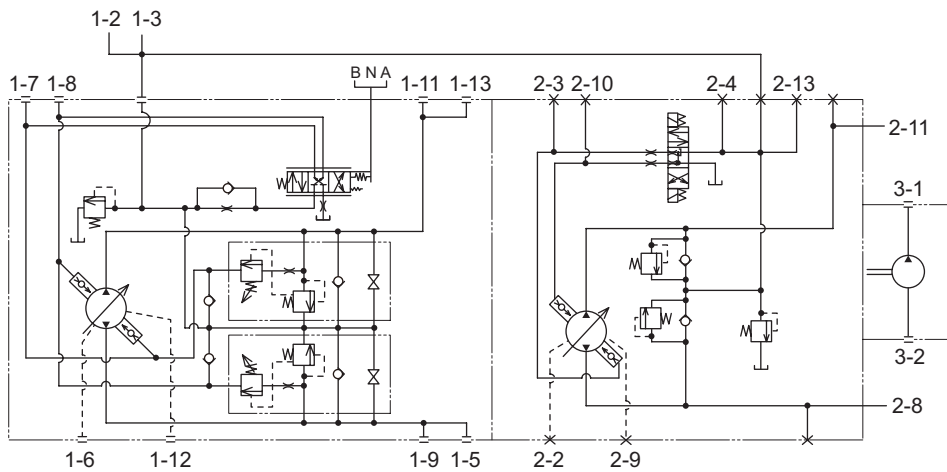
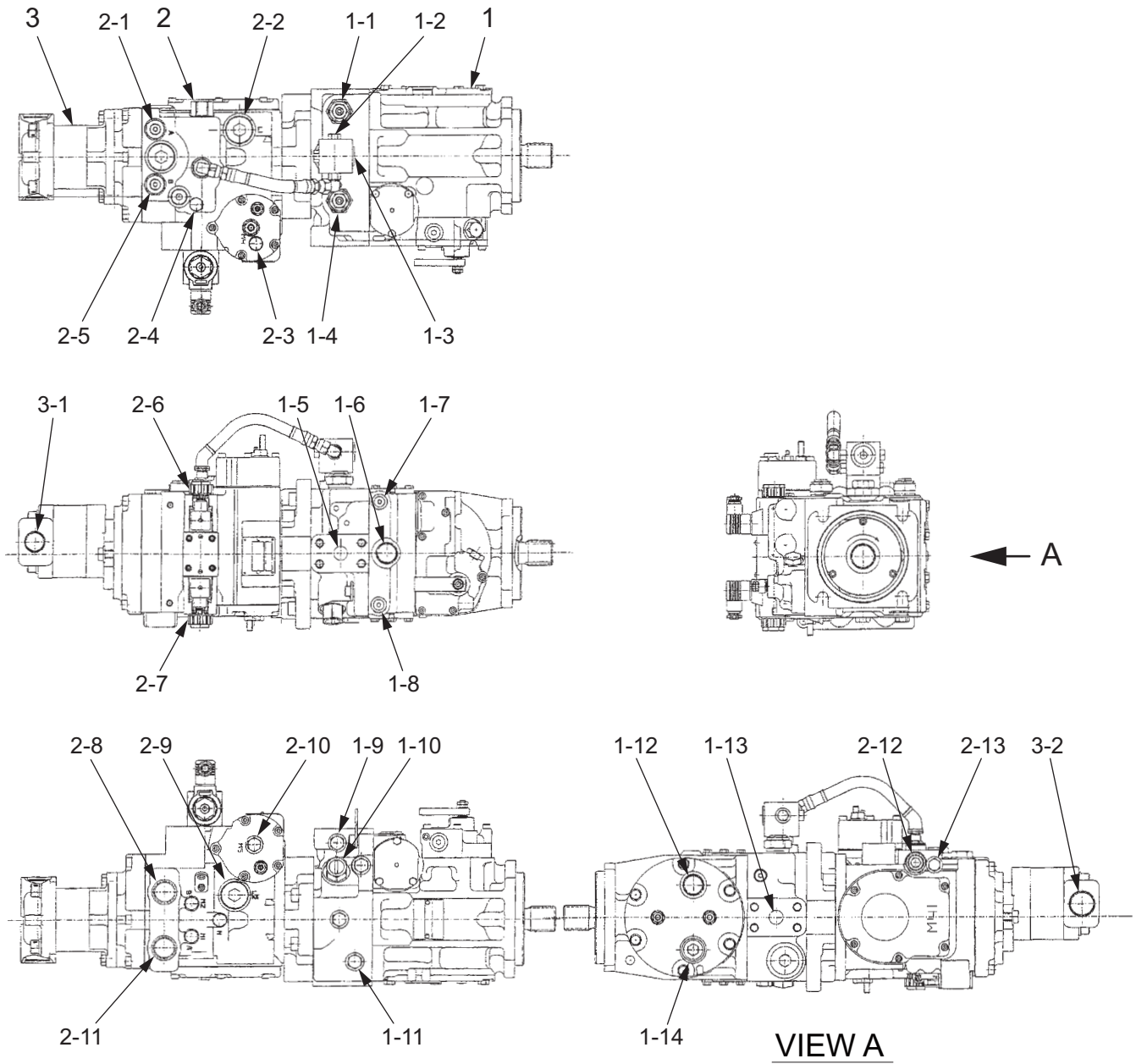
2-1-2. Propulsion hydraulic piping (Rear)



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

2-2. Hydraulic Component Specifications

2-2-1. Hydraulic pump assembly (propulsion + vibrator • steering) (SV410D-2, T-2, TF-2)



Pump circuit diagram

(1) Propulsion pump

(1-1) Multifunction valve (For port A1)	
(1-2) Charge pressure gauge port	: 7/16-20UNF
(1-3) Charge supply port	[PPC] : 7/ 8-14UNF
(1-4) Multifunction valve (For port B1)	
(1-5) Port B1 (Forward)	[PPB] : SAE 1"
(1-6) Drain port	[PD1] : 1 1/16-12UN
(1-7) Servo pressure gauge port	[SGA] : 7/16-20UNF
(1-8) Servo pressure gauge port	[SGB] : 7/16-20UNF
(1-9) High pressure gauge port (For port B1)	: 9/16-18UNF
(1-10) Charge relief valve	
(1-11) High pressure gauge port (For port A1)	: 9/16-18UNF
(1-12) Drain port	[PD2] : 1 1/16-12UN
(1-13) Port A1 (Reverse)	[PPA] : SAE 1"
(1-14) Drain port	: 1 1/16-12UN

Specifications

- Displacement : 51 cm³/rev (3.1 cu.in./rev)
- High pressure relief valve pressure setting : 41.8 MPa (6,061 psi)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)

(2) Vibrator pump

(2-1) High pressure relief valve (For port A2)	
(2-2) Drain port	[VD1] : 1 5/16-12UN
(2-3) Servo pressure gauge port	: 9/16-18UNF
(2-4) Charge pressure gauge port	: 9/16-18UNF
(2-5) High pressure relief valve (For port B2)	
(2-6) Solenoid valve b (Low amplitude)	
(2-7) Solenoid valve a (High amplitude)	
(2-8) Port B2	[VPB] : 1 1/16-12UN
(2-9) Drain port	[VD2] : 1 5/16-12UN
(2-10) Servo pressure gauge port	: 9/16-18UNF
(2-11) Port A2	[VPA] : 1 1/16-12UN
(2-12) Charge relief valve	
(2-13) Charge pressure gauge port	: 1/ 2-20UNF

Specifications

- Displacement (Low amplitude) : 35.0 cm³/rev (2.1 cu.in./rev)
- Displacement (High amplitude) : 28.0 cm³/rev (1.7 cu.in./rev)
- High pressure relief valve pressure setting : 25.0 MPa (3,625 psi)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)

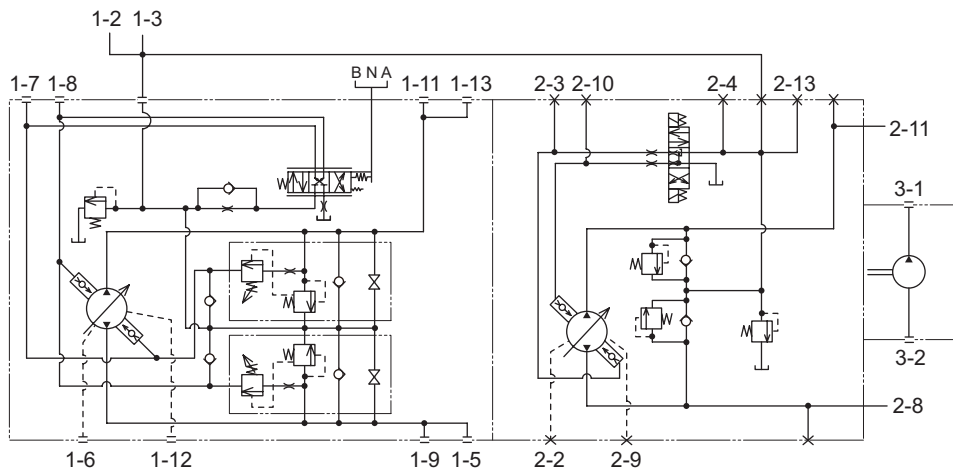
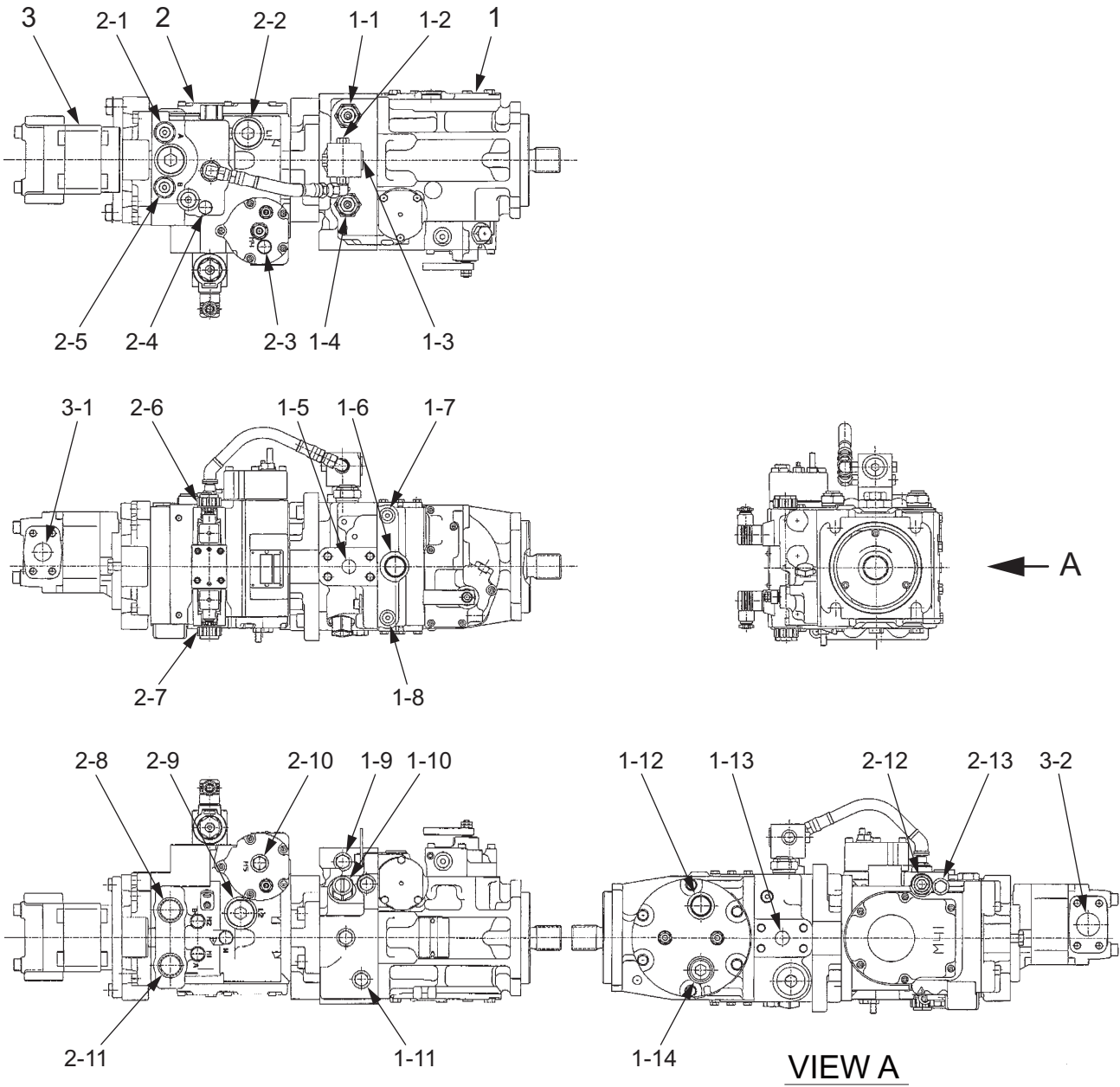
(3) Steering pump

(3-1) Discharge port	[SCD] : 1 1/16-12UN
(3-2) Suction port	[SCS] : 1 5/16-12UN

Specifications

- Displacement : 24.9 cm³/rev (1.5 cu.in./rev)
- Allowable pump case pressure : 0.3 MPa (43.5 psi) or less
- Pump assembly weight : 95 kg (209 lbs.)

2-2-2. Hydraulic pump assembly (propulsion + vibrator • steering) (SV410TB-2, TF-2)



Pump circuit diagram

SV410-2-04007

(1) Propulsion pump

(1-1) Multifunction valve (For port A1)	
(1-2) Charge pressure gauge port	: 7/16-20UNF
(1-3) Charge supply port	[PPC] : 7/ 8-14UNF
(1-4) Multifunction valve (For port B1)	
(1-5) Port B1 (Forward)	[PPB] : SAE 1"
(1-6) Drain port	[PD1] : 1 1/16-12UN
(1-7) Servo pressure gauge port	[SGA] : 7/16-20UNF
(1-8) Servo pressure gauge port	[SGB] : 7/16-20UNF
(1-9) High pressure gauge port (For port B1)	: 9/16-18UNF
(1-10) Charge relief valve	
(1-11) High pressure gauge port (For port A1)	: 9/16-18UNF
(1-12) Drain port	[PD2] : 1 1/16-12UN
(1-13) Port A1 (Reverse)	[PPA] : SAE 1"
(1-14) Drain port	: 1 1/16-12UN

Specifications

- Displacement : 51 cm³/rev (3.1 cu.in./rev)
- High pressure relief valve pressure setting : 41.8 MPa (6,061 psi)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)

(2) Vibrator pump

(2-1) High pressure relief valve (For port A2)	
(2-2) Drain port	[VD1] : 1 5/16-12UN
(2-3) Servo pressure gauge port	: 9/16-18UNF
(2-4) Charge pressure gauge port	: 9/16-18UNF
(2-5) High pressure relief valve (For port B2)	
(2-6) Solenoid valve b (Low amplitude)	
(2-7) Solenoid valve a (High amplitude)	
(2-8) Port B2	[VPB] : 1 1/16-12UN
(2-9) Drain port	[VD2] : 1 5/16-12UN
(2-10) Servo pressure gauge port	: 9/16-18UNF
(2-11) Port A2	[VPA] : 1 1/16-12UN
(2-12) Charge relief valve	
(2-13) Charge pressure gauge port	: 1/ 2-20UNF

Specifications

- Displacement (Low amplitude) : 35.0 cm³/rev (2.1 cu.in./rev)
- Displacement (High amplitude) : 28.0 cm³/rev (1.7 cu.in./rev)
- High pressure relief valve pressure setting : 25.0 MPa (3,625 psi)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)

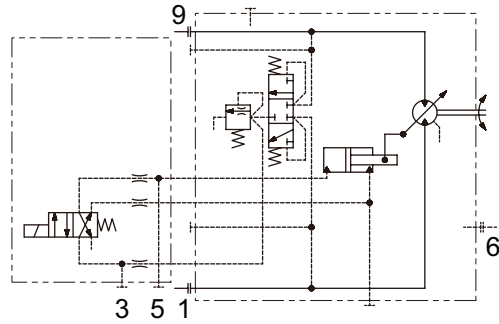
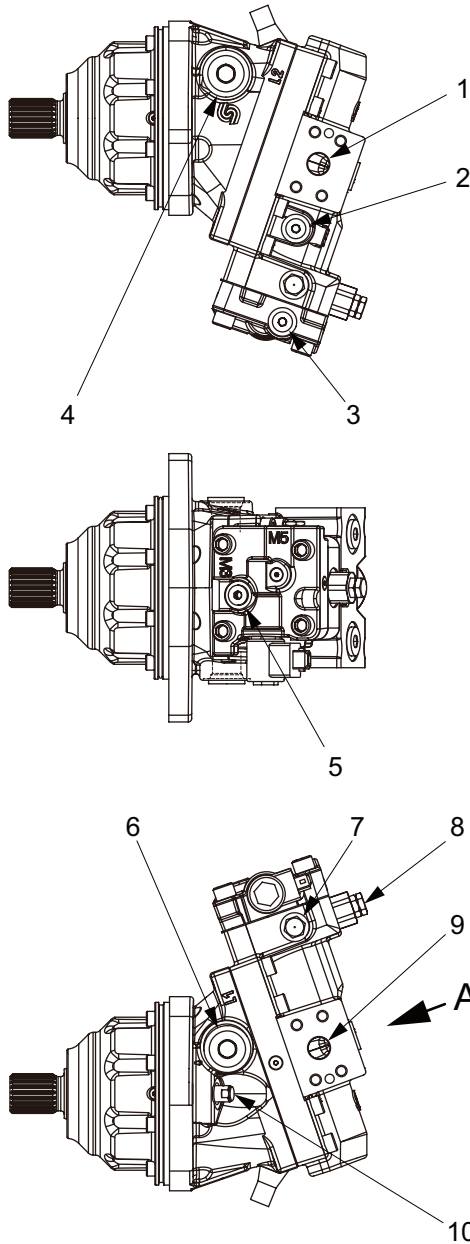
(3) Steering pump

(3-1) Discharge port	[SCD] : Φ 25
(3-2) Suction port	[SCS] : Φ 32

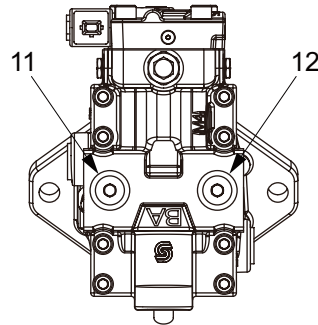
Specifications

- Displacement : 32.5 cm³/rev (2.0 cu.in./rev)
- Allowable pump case pressure : 0.3 MPa (43.5 psi) or less
- Pump assembly weight : 95 kg (209 lbs.)

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



Motor circuit diagram



VIEW A

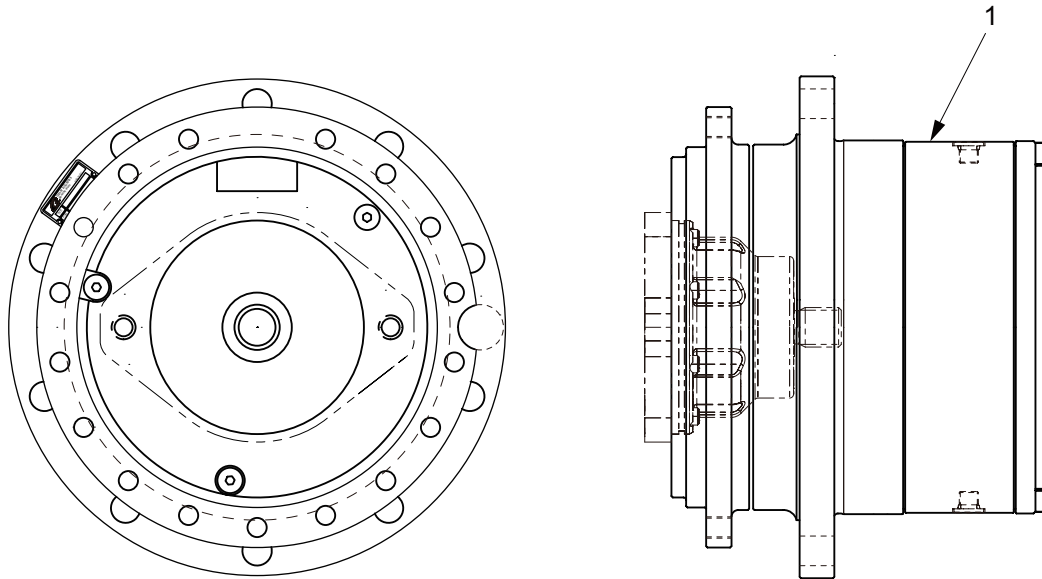
SV410-2-04001

- | | | |
|--------------------------------------|----------------------------|--|
| (1) Port B (Forward) | [FMB] : SAE 3/4" | (7) Loop flushing shuttle valve |
| (2) Servo pressure gauge port (max.) | : 9/16-18UNF | (8) Charge pressure relief valve |
| (3) Control pressure gauge port | : 9/16-18UNF | (9) Port A (Reverse) [FMA] : SAE 3/4" |
| (4) Drain port | [FMD] : 1 1/16-12UN | (10) Speed pickup |
| (5) Servo pressure gauge port (min.) | : 9/16-18UNF | (11) Gauge port (For Port A) : 7/8-14UNF |
| (6) Drain port | : 1 1/16-12UN | (12) Gauge port (For Port B) : 7/8-14UNF |

Motor specifications

- Displacement (max.) : 60.0 cm³/rev (3.66 cu.in./rev)
- (min.) : 26.0 cm³/rev (1.59 cu.in./rev)
- Charge relief valve pressure setting : 2.5 MPa (363 psi)
- Allowable motor case pressure : 0.3 MPa (43.5 psi) or less
- Weight : 28 kg (62 lbs.)

2-2-4. Gear box



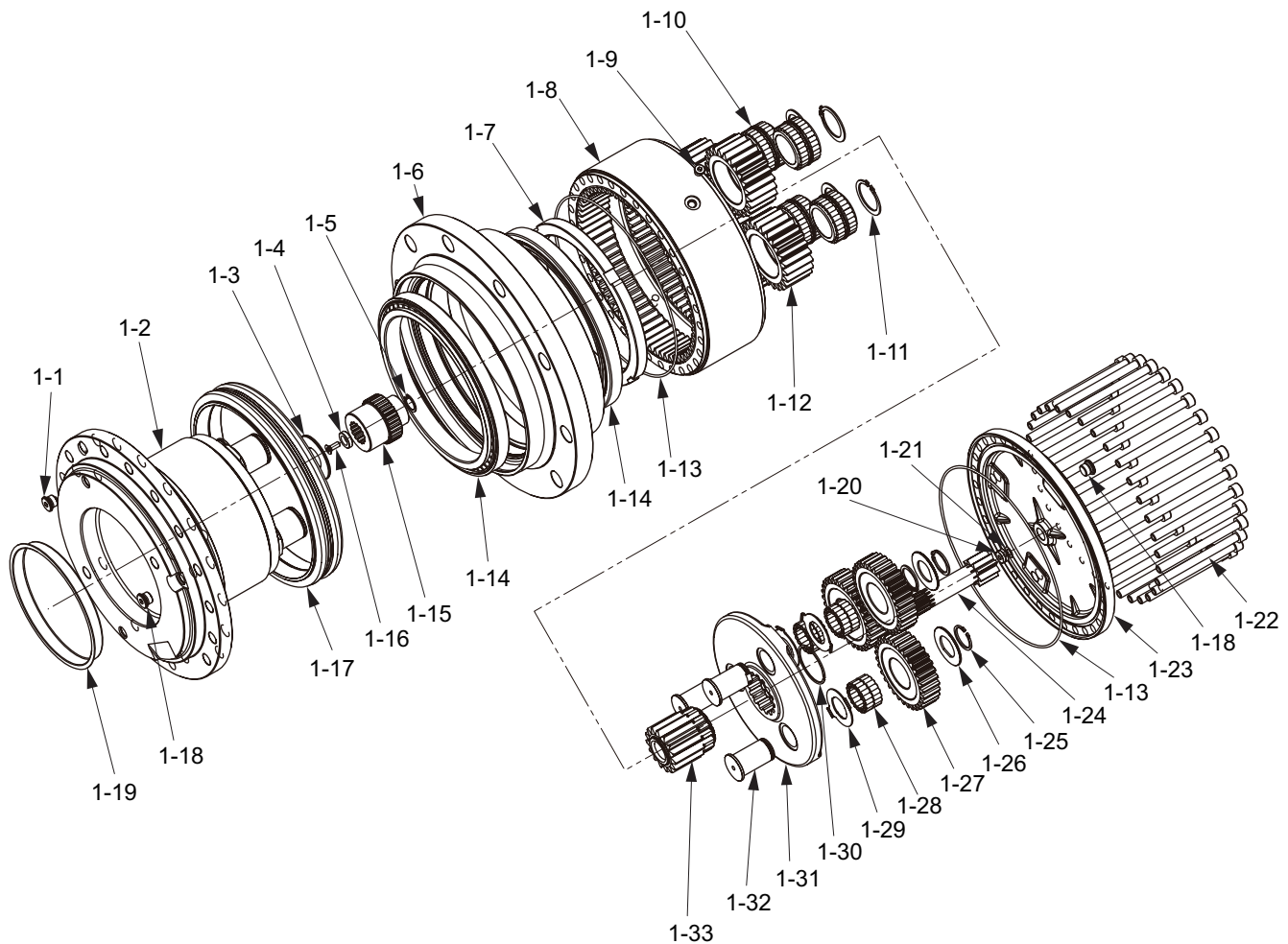
SV410-2-04002

(1) Gear box

Specifications

- Reduction ratio : 1/47.00
- Weight : 90 kg (198 lbs.)

1) Structure of gear box

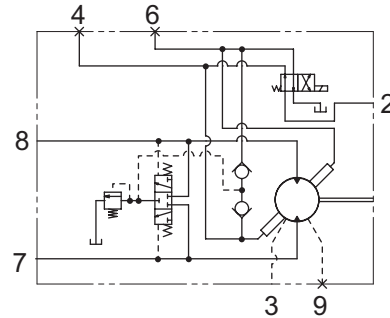
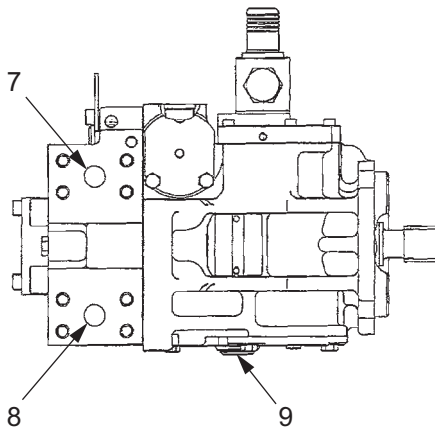
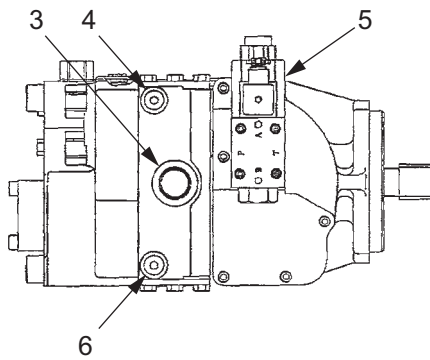
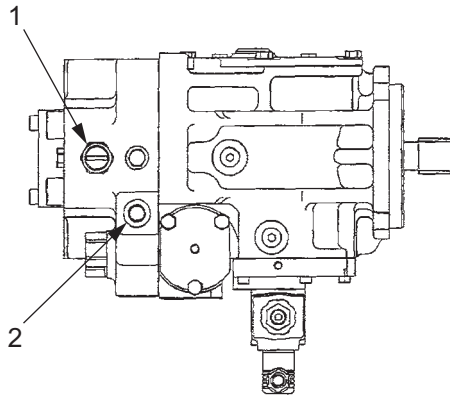


SV410-2-04003

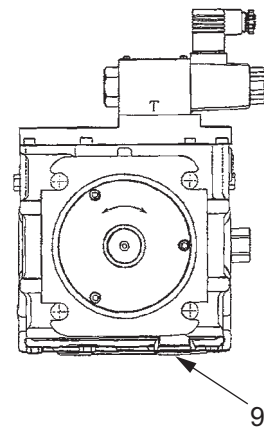
(1) Gear box

(1-1) Plug	: 9/16-18UNF	(1-18) Plug	: 9/16-18UNF
(1-2) Hub		(1-19) Cover	
(1-3) Spacer		(1-20) Pad	
(1-4) Plate		(1-21) Shim	
(1-5) Snap ring		(1-22) Bolt	: M10×120
(1-6) Housing		(1-23) Cover	
(1-7) Bearing nut	: M190	(1-24) Sun gear	
(1-8) Ring gear		(1-25) Snap ring	
(1-9) Plug		(1-26) Bearing washer	
(1-10) Needle bearing		(1-27) Planetary gear	
(1-11) Snap ring		(1-28) Needle	
(1-12) Planetary gear		(1-29) Bearing washer	
(1-13) O-ring		(1-30) Snap ring	
(1-14) Taper bearing		(1-31) Carrier	
(1-15) Coupling		(1-32) Gear pin	
(1-16) Bolt	: M6×16	(1-33) Sun gear	
(1-17) Floating seal kit			

2-2-5. Propulsion hydraulic motor (Rear)



Motor circuit diagram



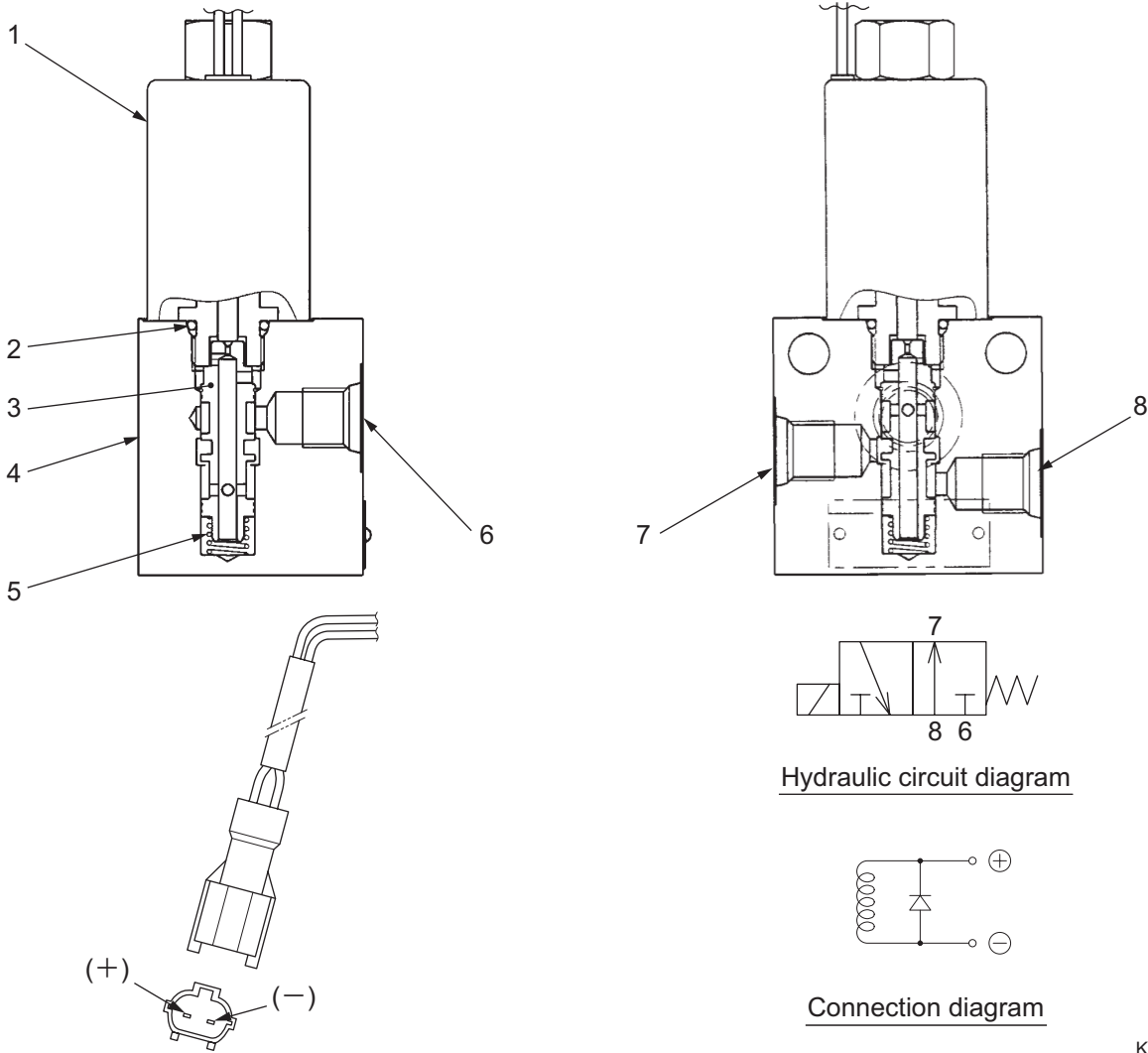
SV505- I -04003

- | | | | |
|----------------------------------|----------------------------|-------------------------------|-----------------------|
| (1) Charge pressure 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 | | | |

Motor specifications

- Displacement (max.) : 75 cm³/rev (4.58 cu.in./rev)
- (min.) : 35 cm³/rev (2.14 cu.in./rev)
- Charge 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.)

2-2-6. Servo bypass solenoid valve



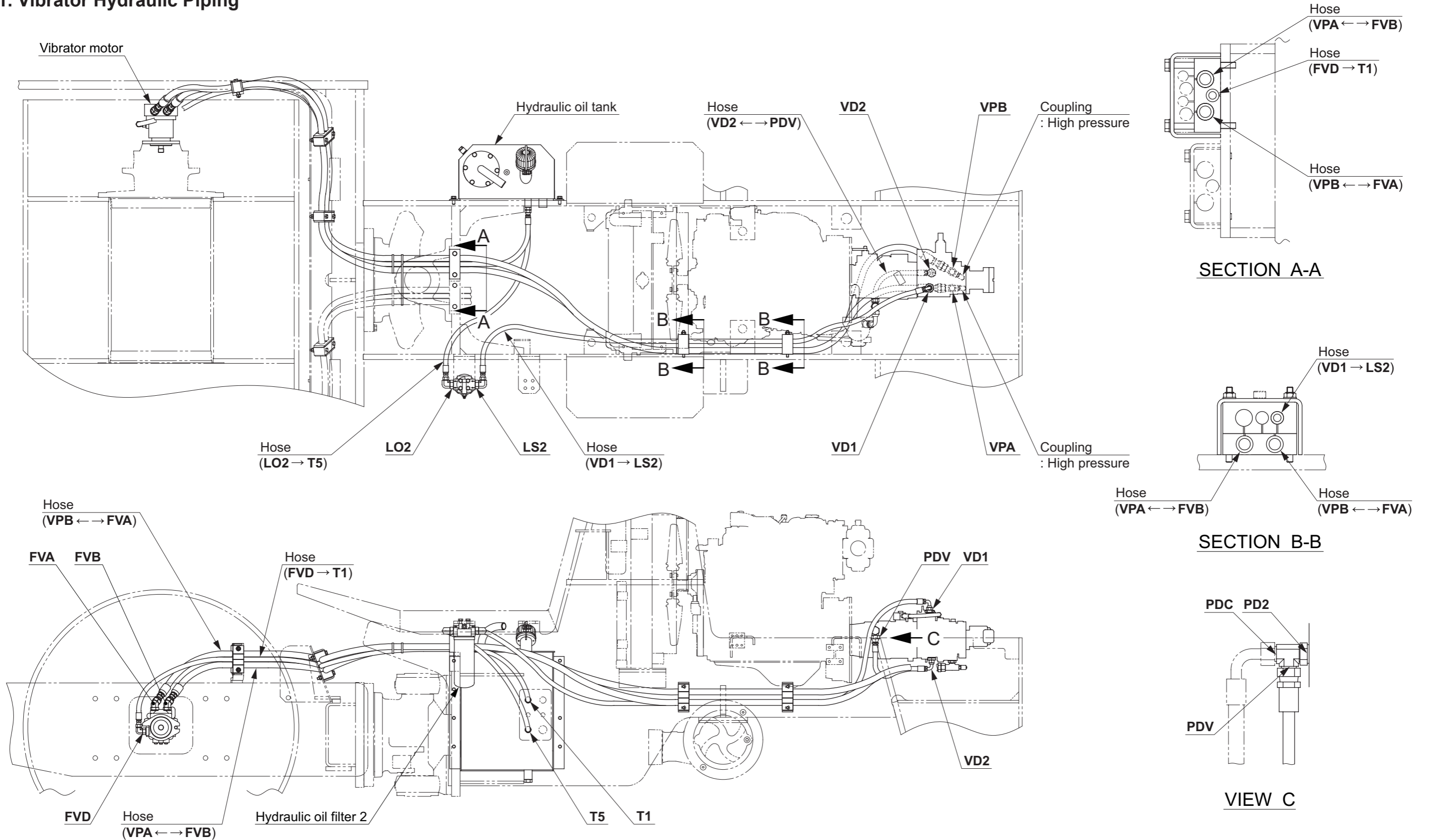
- (1) Solenoid
- (2) O-ring (1B P14)
- (3) Spool (K)
- (4) Body
- (5) Spring
- (6) Port T : 9/16-18UNF-2B
- (7) Port A **[SBA]** : 9/16-18UNF-2B
- (8) Port P **[SBP]** : 9/16-18UNF-2B

Specifications

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

3. VIBRATOR HYDRAULIC SYSTEM

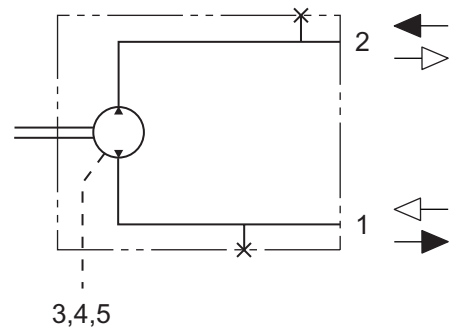
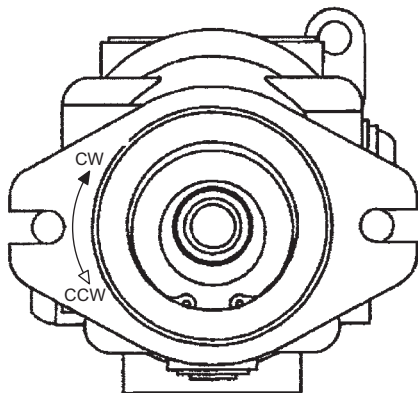
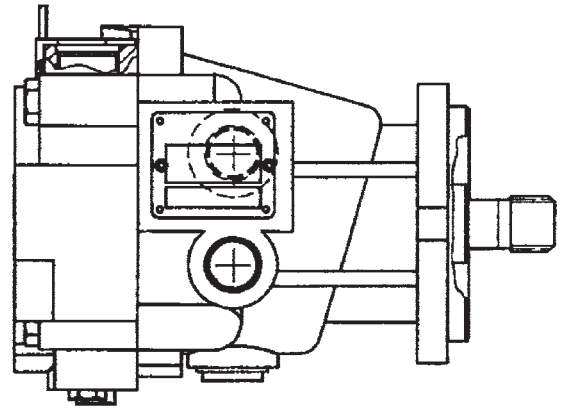
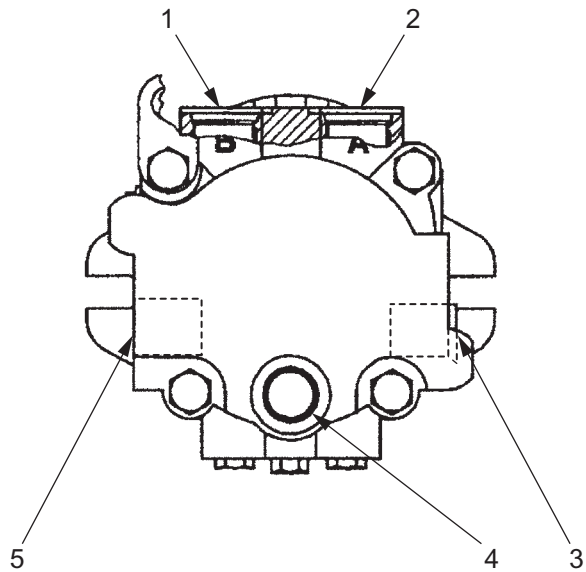
3-1. Vibrator Hydraulic Piping



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

3-2. Hydraulic Component Specification

3-2-1. Vibrator hydraulic motor



Hydraulic circuit diagram

Flow of oil

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

SV400-2-04012

- (1) Port B [FVB] : 1 1/16-12UN
- (2) Port A [FVA] : 1 1/16-12UN
- (3) Drain port [FVD] : 7/ 8-14UNF
- (4) Drain port : 7/ 8-14UNF
- (5) Drain port : 7/ 8-14UNF

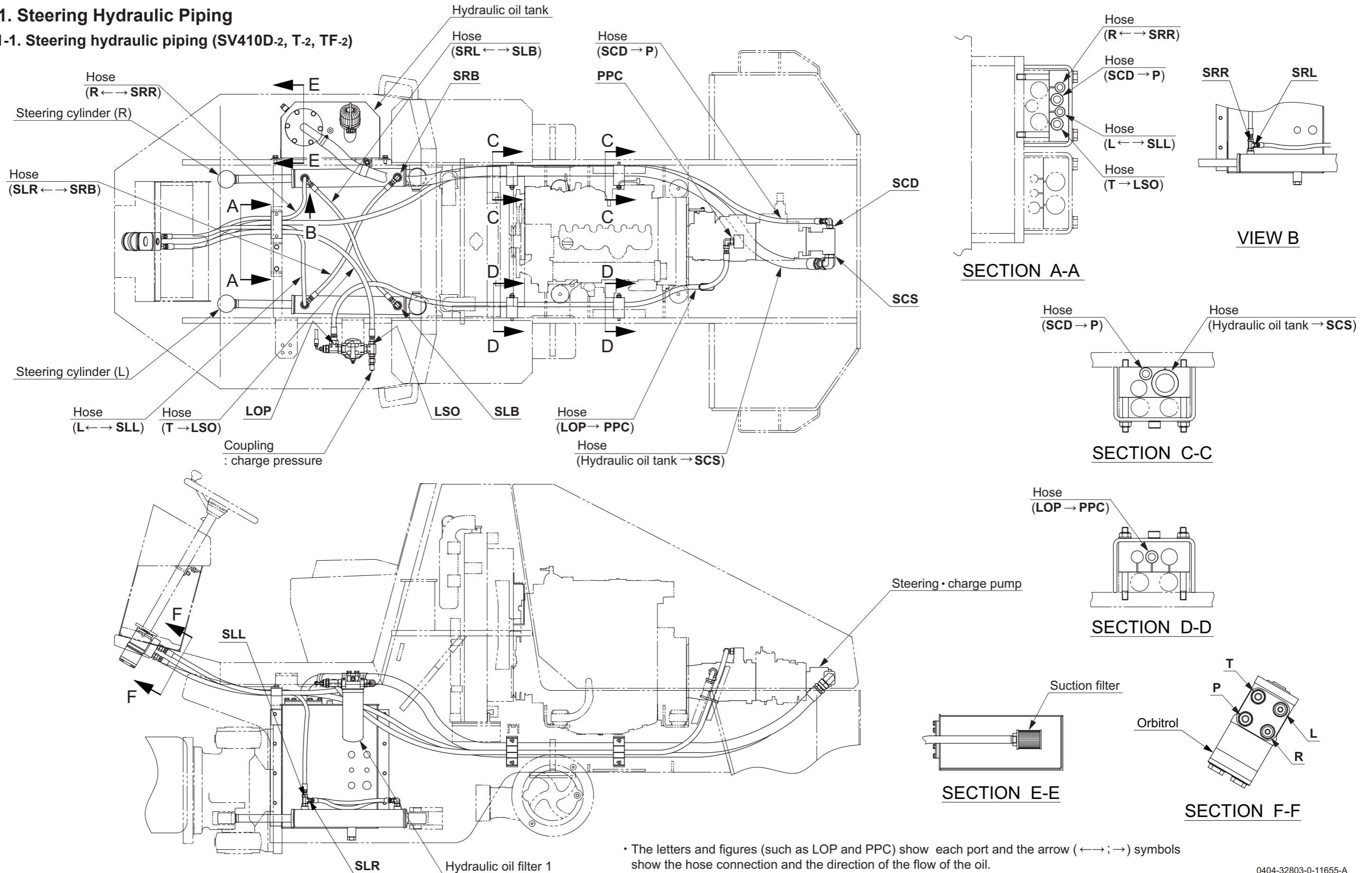
Specifications

- Displacement : 35.0 cm³/rev (2.1 cu.in.)
- Working pressure : 34.5 MPa (5,003 psi)
- Allowable motor case pressure : 0.17 MPa (24.7 psi)
- Weight : 11 kg (24.3 lbs.)

4. STEERING SYSTEM

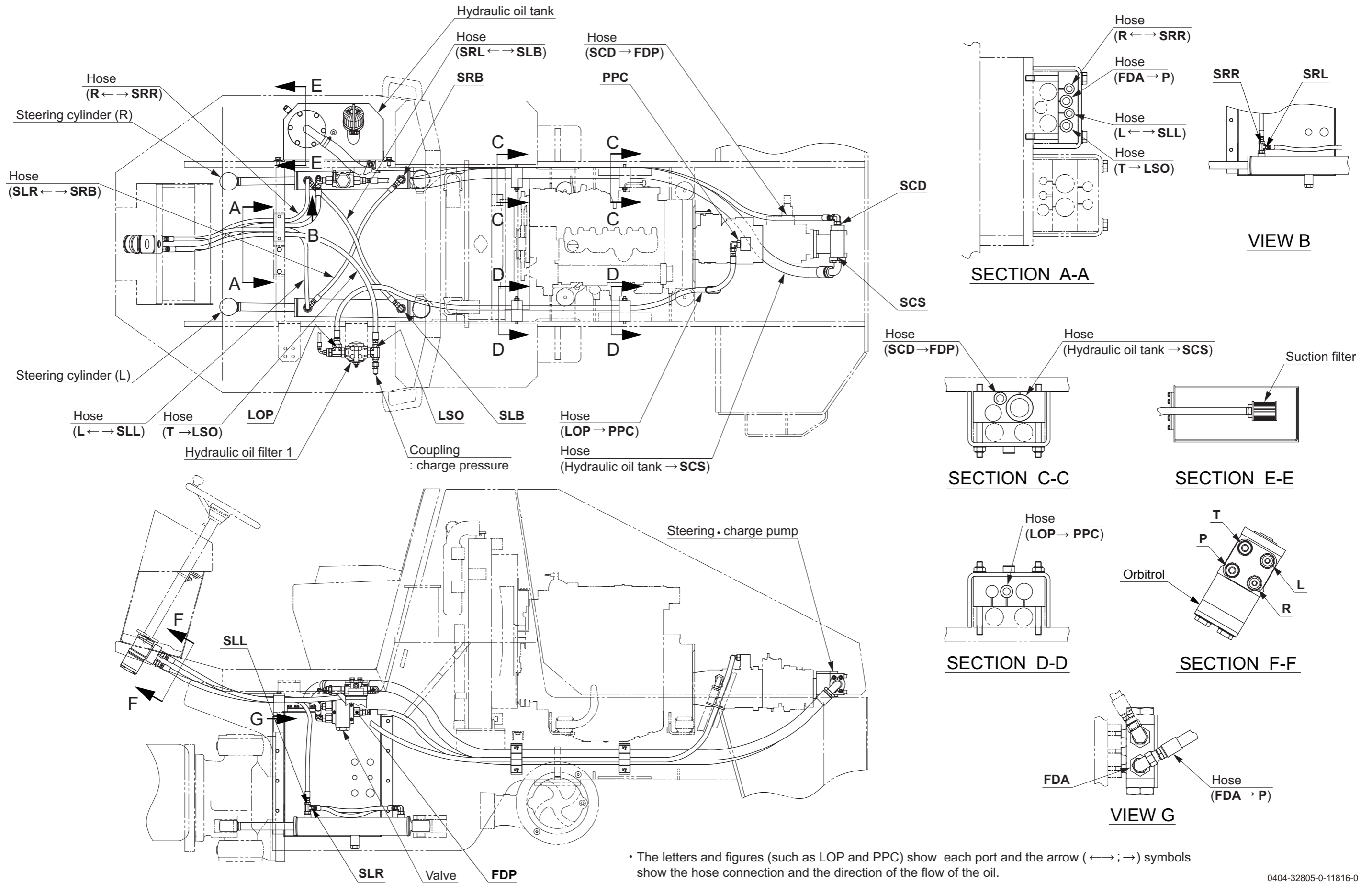
4-1. Steering Hydraulic Piping

4-1-1. Steering hydraulic piping (SV410D-2, T-2, TF-2)



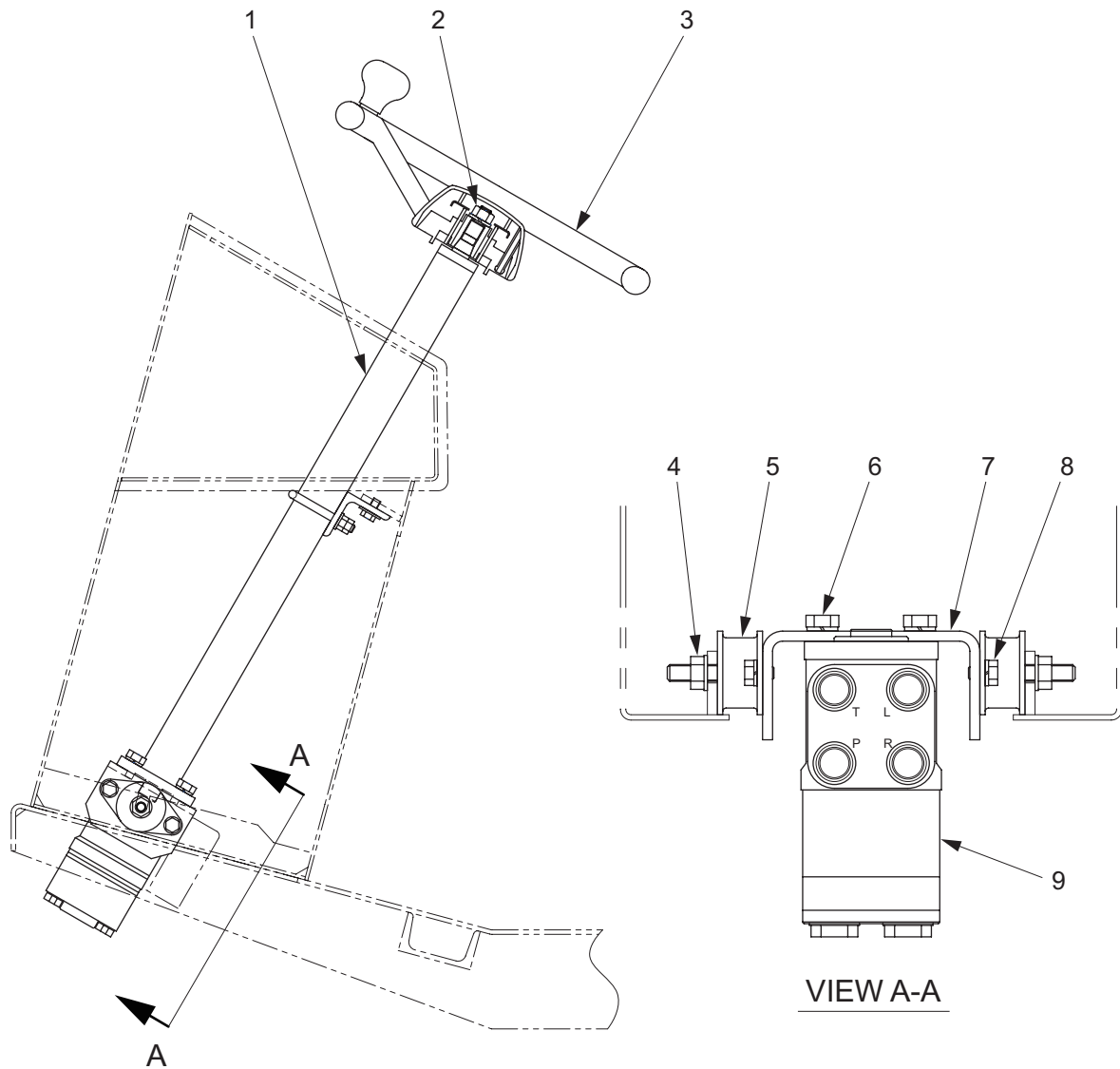
• The letters and figures (such as LOP and PPC) show each port and the arrow (↔; →) symbols show the hose connection and the direction of the flow of the oil.

4-1-2. Steering hydraulic piping (SV410TB-2, FB-2)



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

4-2. Steering Wheel



0404-32804-021754-A

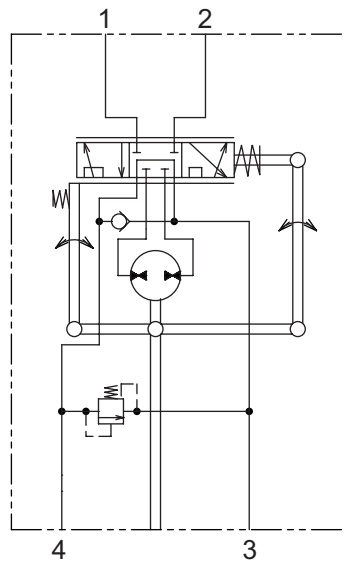
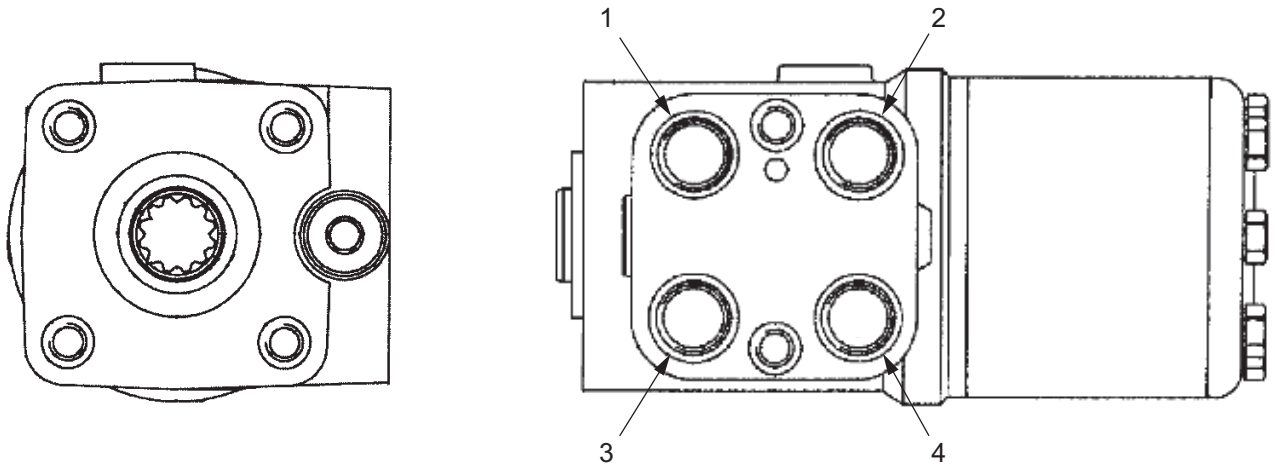
- | | | | |
|--------------------|--------------|--------------|----------|
| (1) Column shaft | | (6) Bolt | : M10×30 |
| (2) Nut | : M12 P=1.25 | (7) Bracket | |
| (3) Steering wheel | | (8) Bolt | : M 8×12 |
| (4) Nut | : M10 | (9) Orbitrol | |
| (5) Damper | | | |



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

4-3. Hydraulic Component Specifications

4-3-1. Orbitrol



Hydraulic circuit diagram

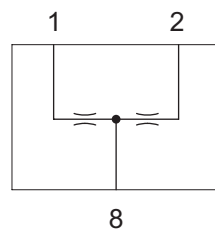
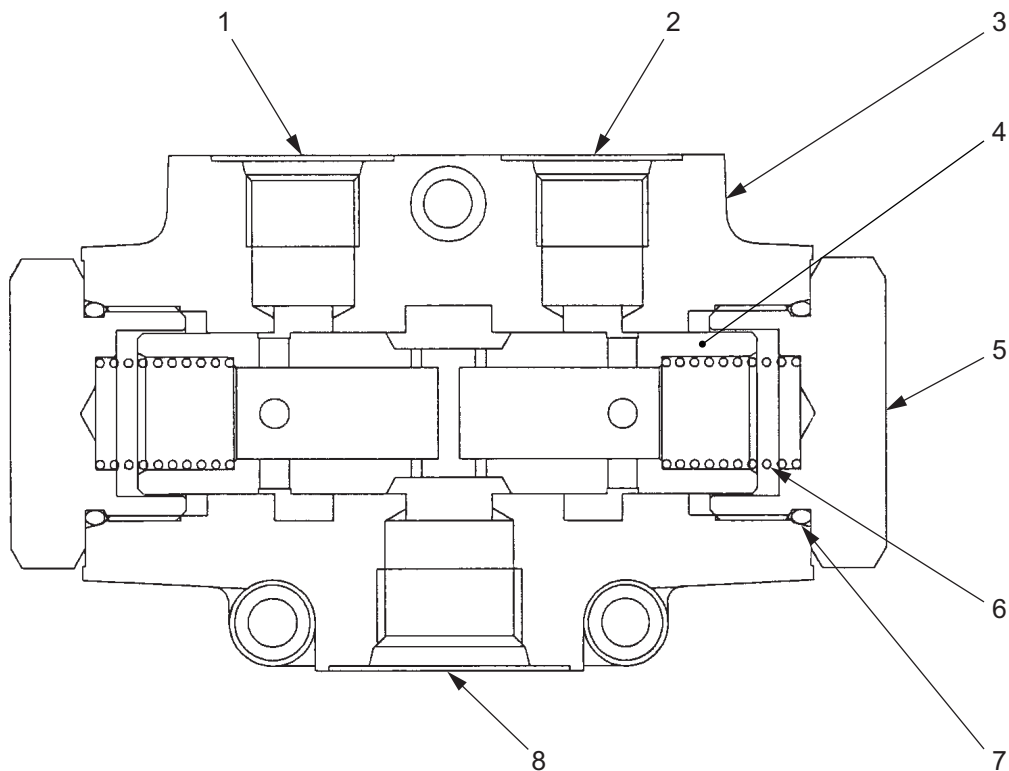
SV510-III-04010

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

Specifications

- Displacement : 400 cm³/rev (24.4 cu.in./rev)
- Relief valve pressure setting : 15.0 MPa (2,175 psi)
- Weight : 7 kg (15 lbs.)

4-3-2. Valve (SV410TB-2, FB-2)



Hydraulic circuit diagram

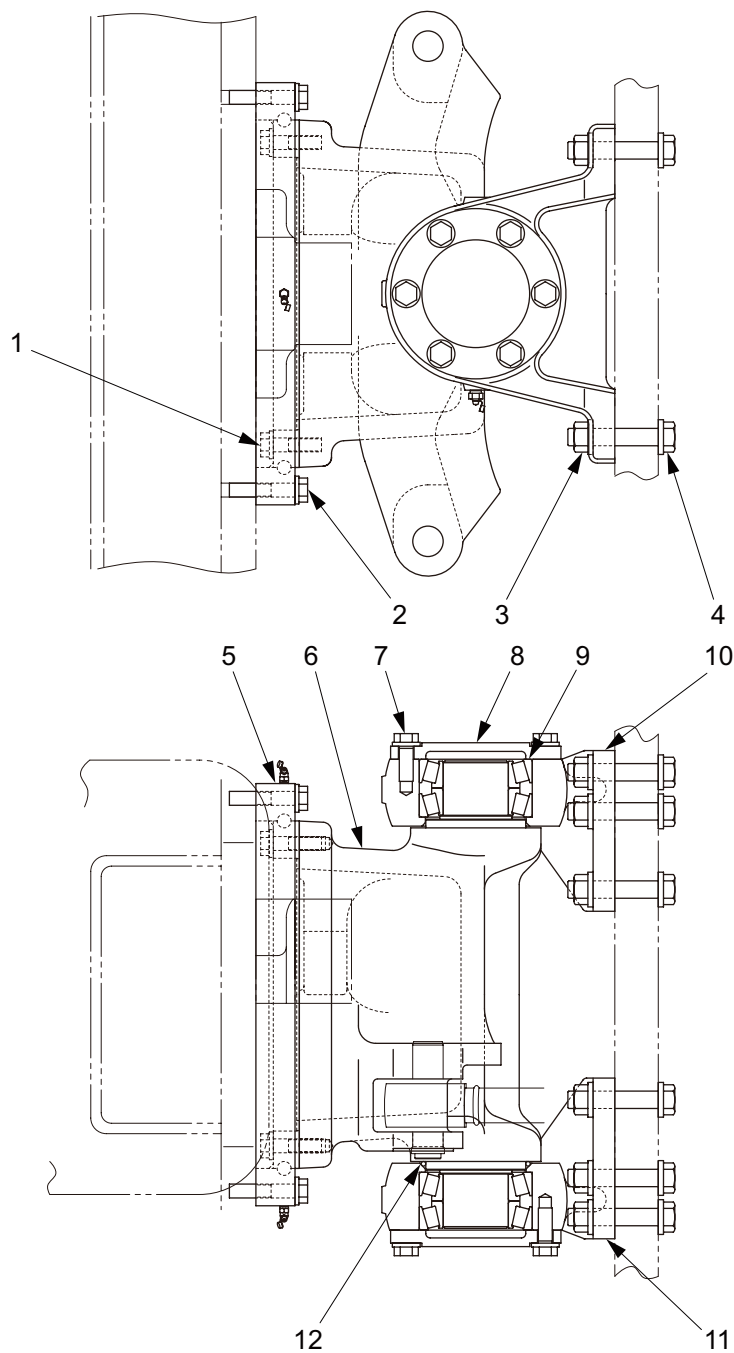
SV412-04003

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

Specifications

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

4-4. Frame (Center Pin)



0402-61802-0-10059-G

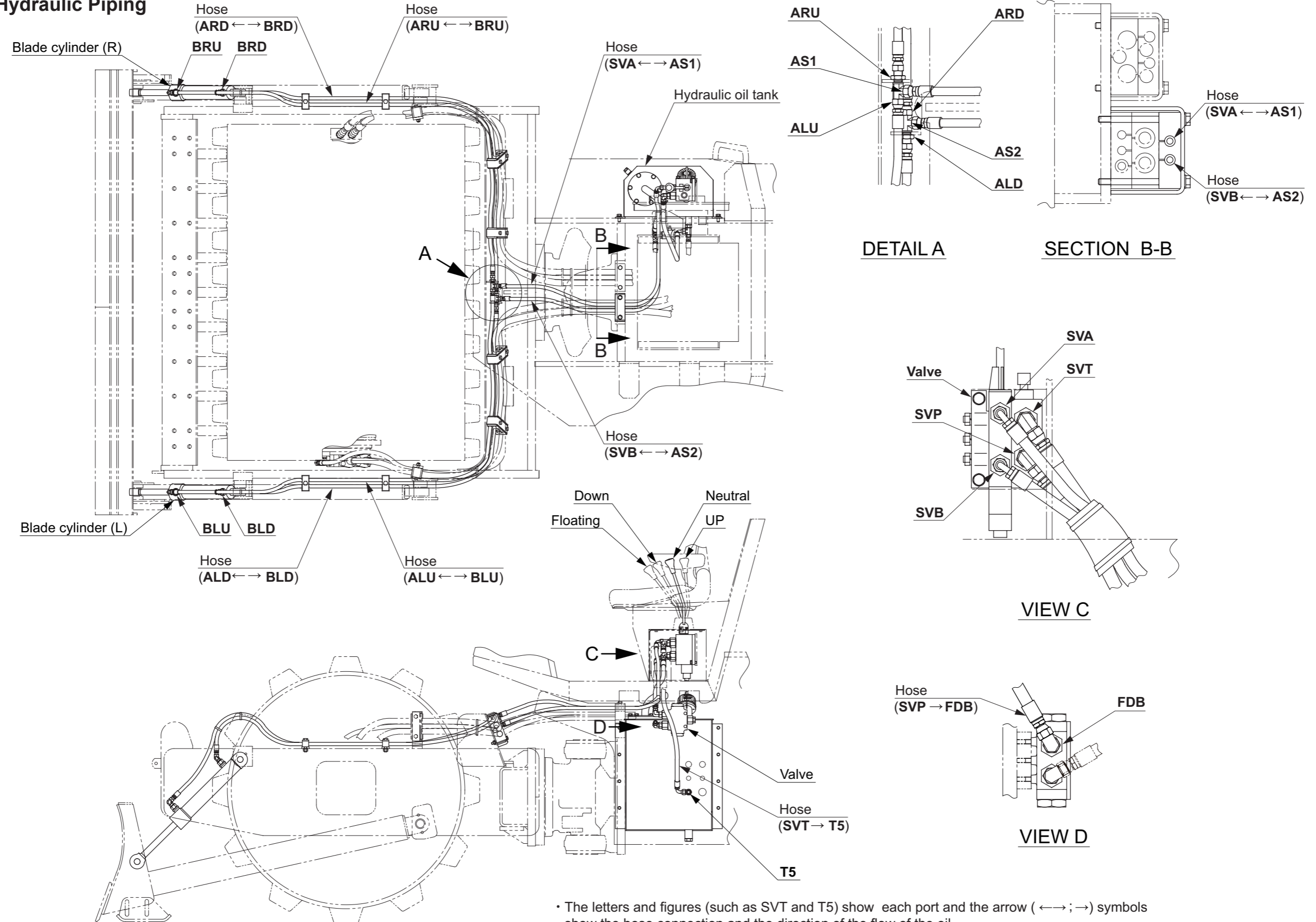
- | | | |
|--------------------|-------------------|----------------------|
| (1) Bolt : M16×60 | (5) Swing bearing | (9) Roller bearing |
| (2) Bolt : M16×80 | (6) Yoke | (10) Bracket (upper) |
| (3) Nut : M20 | (7) Bolt : M16×45 | (11) Bracket (lower) |
| (4) Bolt : M20×100 | (8) Cover | (12) O-ring |



- | | |
|-----------------|--------------------------|
| (1) Bolt M16×60 | : 265 N·m (195 lbf·ft) |
| (2) Bolt M16×80 | : 265 N·m (195 lbf·ft) |
| (3) Nut M20 | : 539 N·m (398 lbf·ft) |
| (7) Bolt M16×45 | : 265 N·m (195 lbf·ft) |

5. BLADE SYSTEM (SV410TB-2, FB-2)

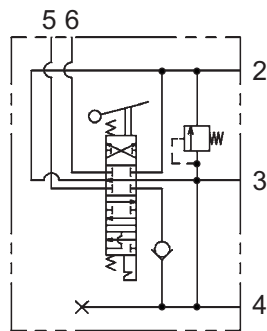
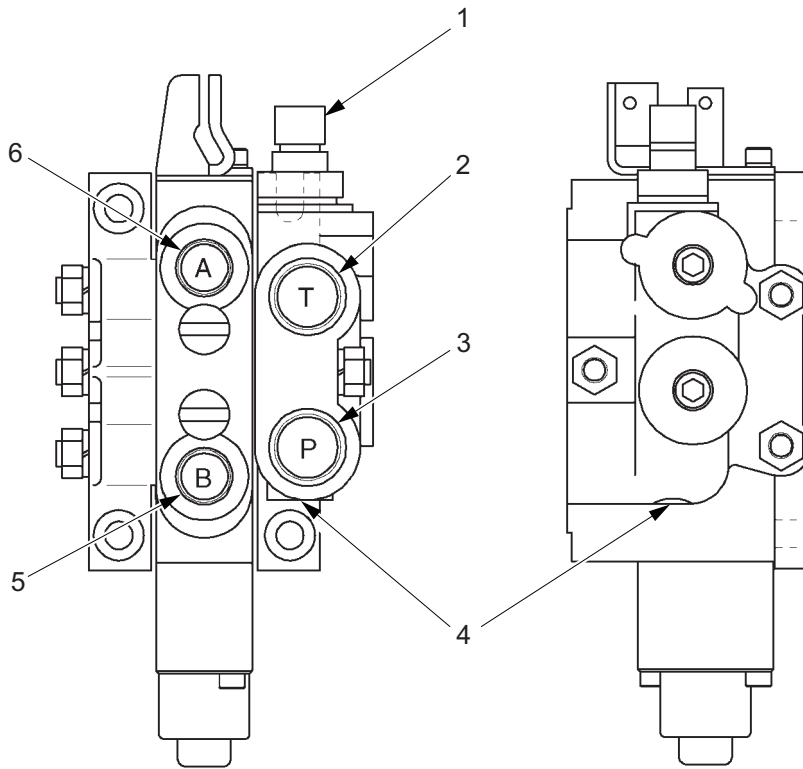
5-1. Blade Hydraulic Piping



• The letters and figures (such as SVT and T5) show each port and the arrow (↔ ; →) symbols show the hose connection and the direction of the flow of the oil.

5-2. Hydraulic Component Specification

5-2-1. Valve



Hydraulic circuit diagram

SV201-1-04010

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

Specifications

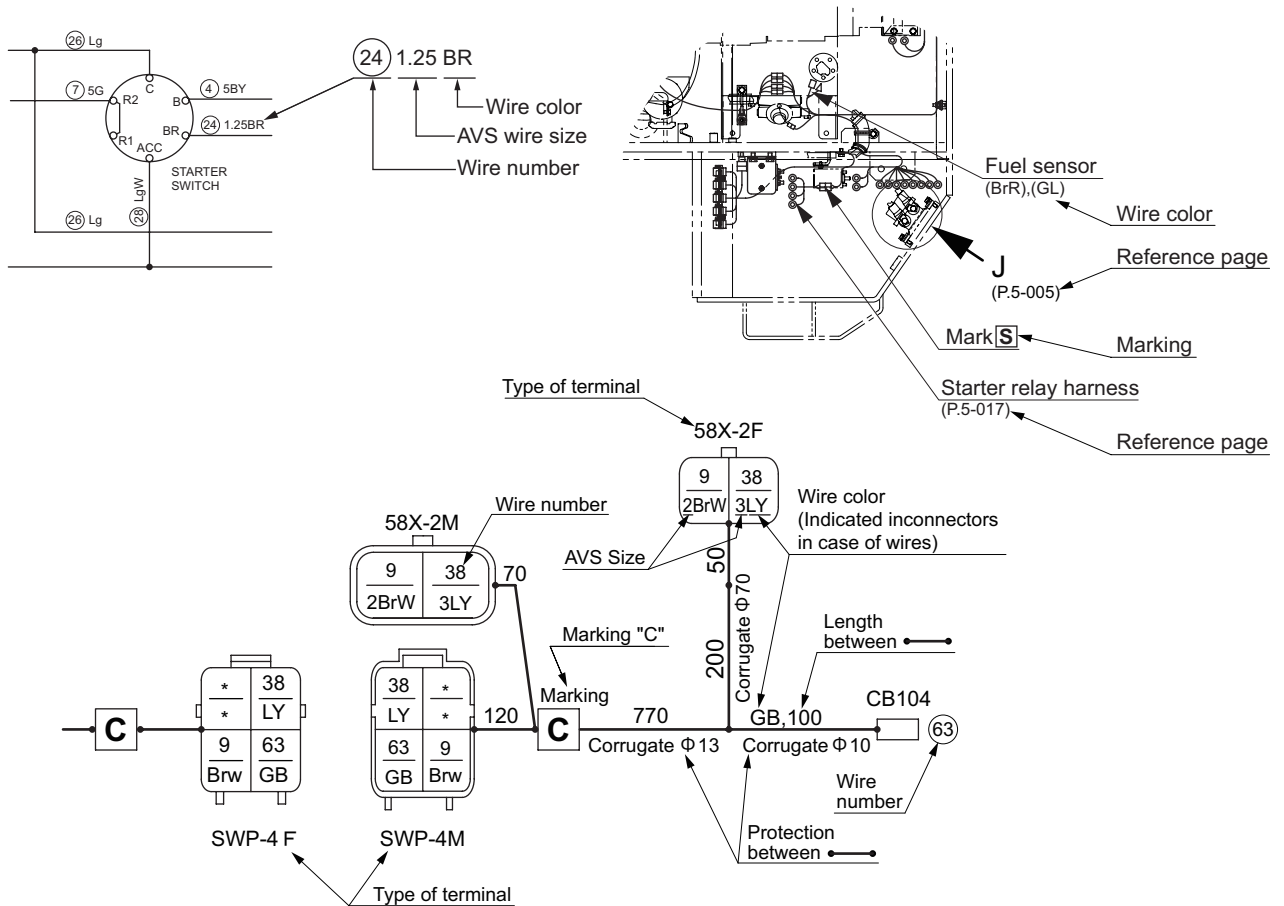
- Rated flow : 70 L/min (18 gal./min)
- Maximum working pressure : 20.6 MPa (2,987 psi)
- Relief valve pressure setting : 13.7 MPa (1,987 psi) at 30 L/min (7.9 gal./min)
- Weight : 7.1 kg (15.7 lbs.)

ELECTRICAL SYSTEM

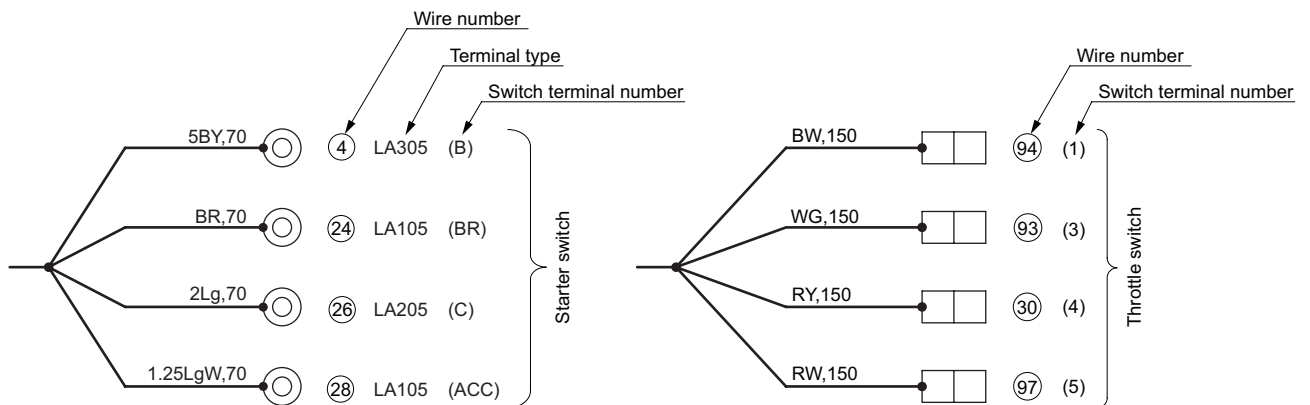
1. PRECAUTIONS FOR WORK

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.



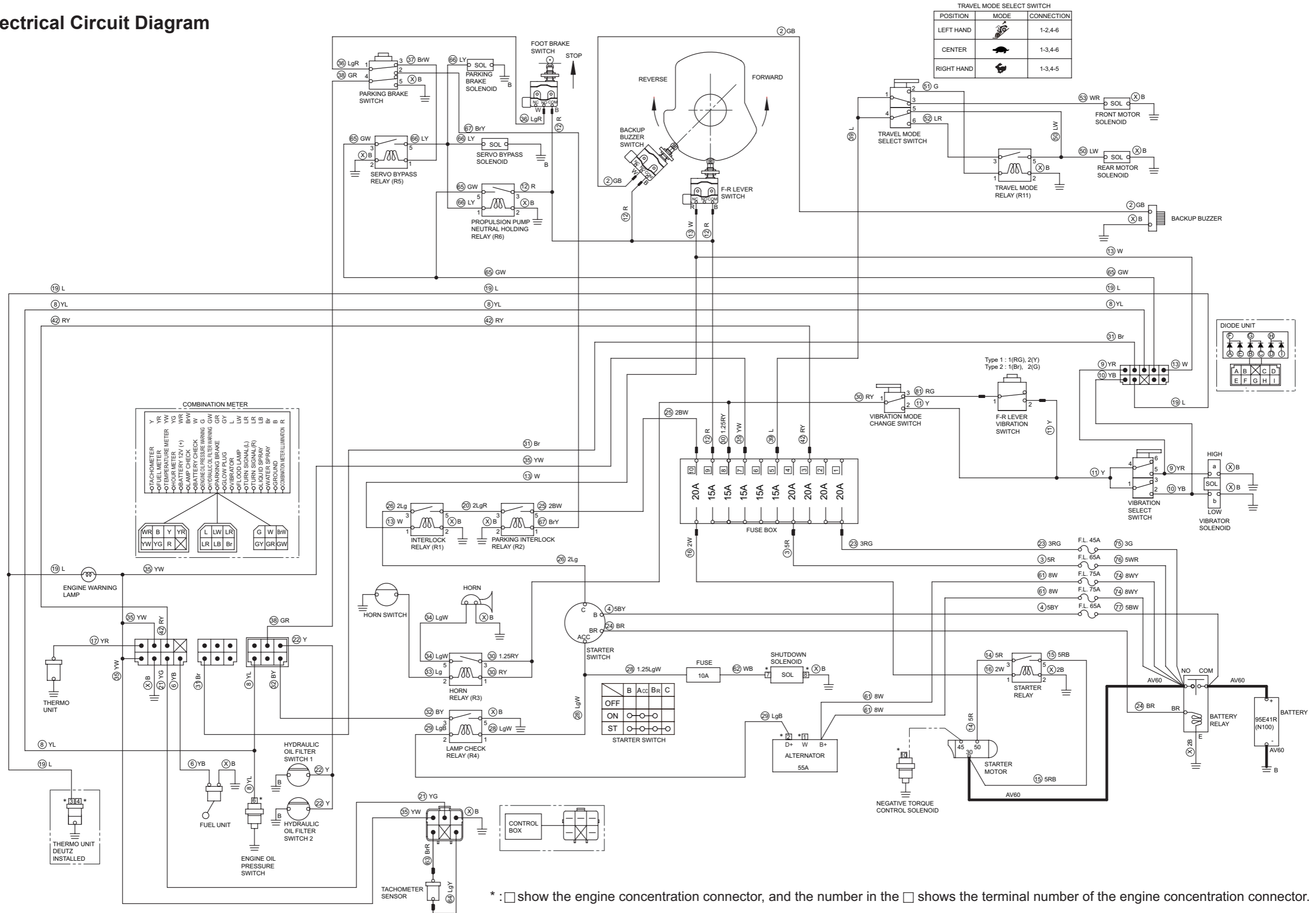
ELECTRICAL SYSTEM

- 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		

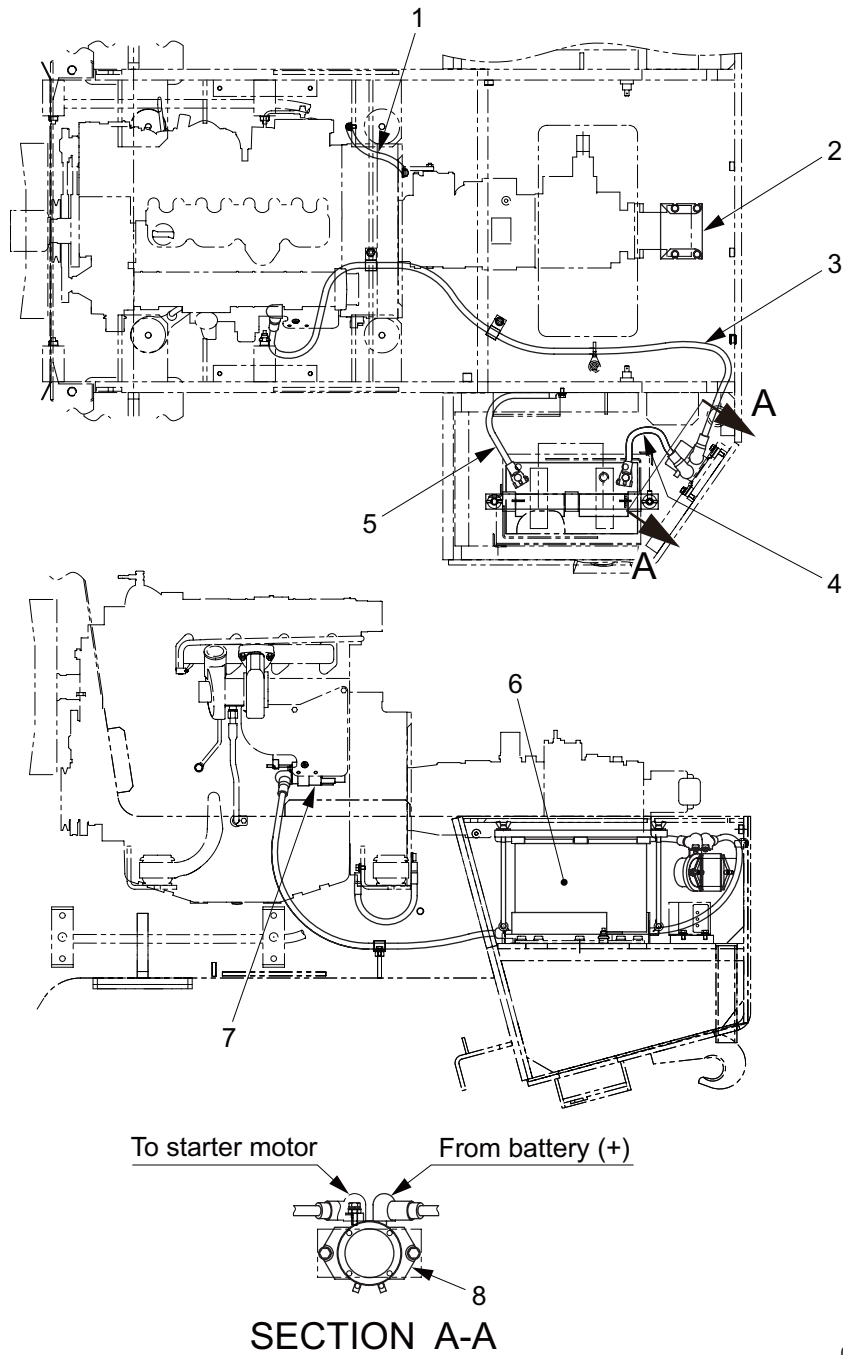
2. SYSTEM CIRCUIT DIAGRAM

2-1. Electrical Circuit Diagram



3. ELECTRICAL COMPONENTS

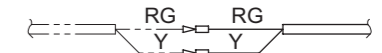
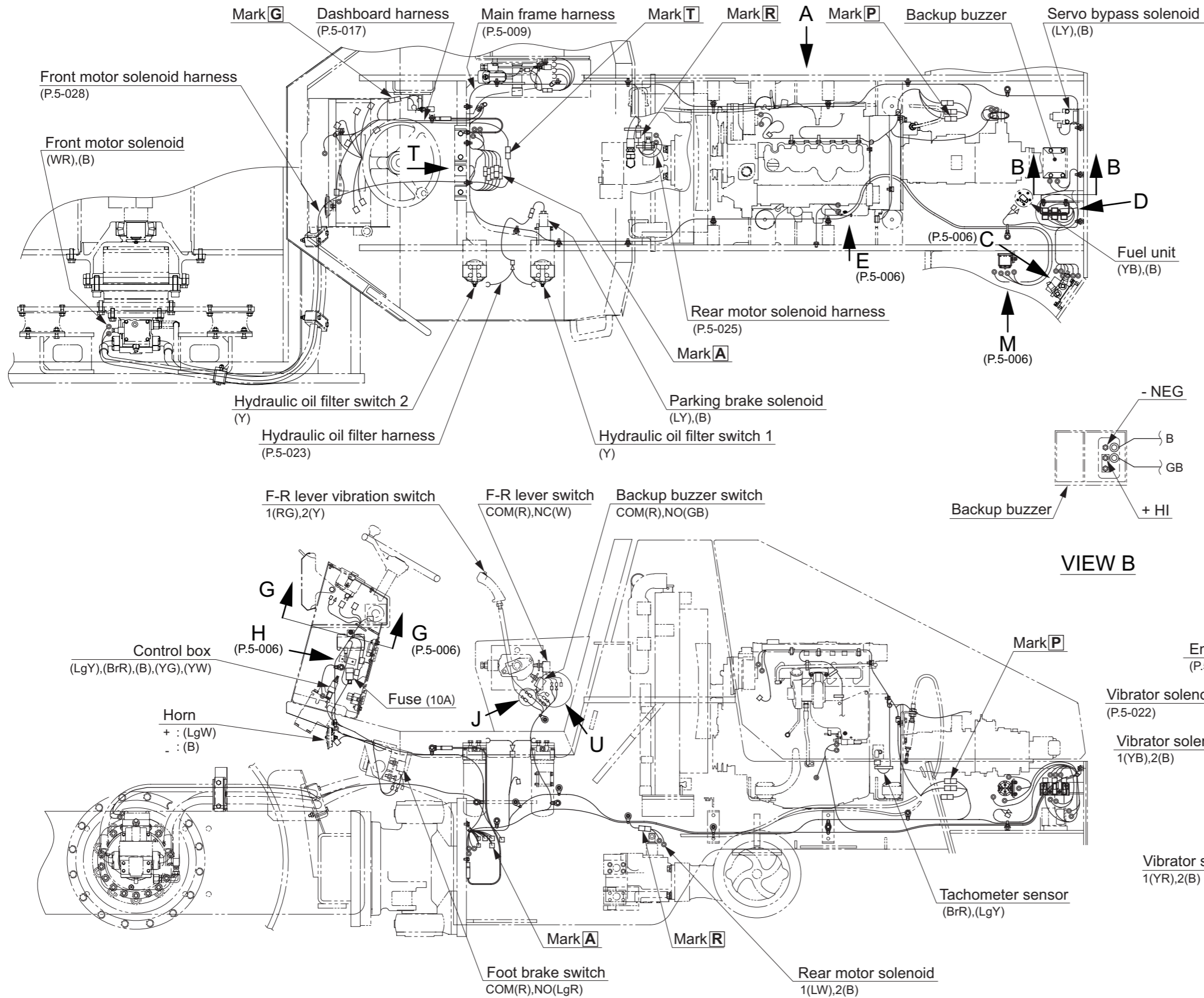
3-1. Battery Layout



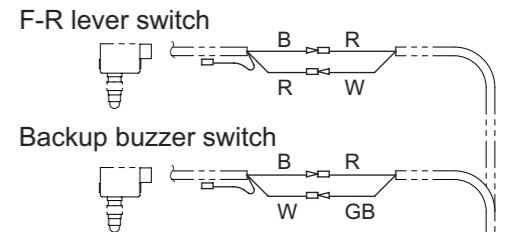
0404-09813-0-11629

- | | |
|---|---------------------------------|
| (1) Cord (Pump housing – Ground) | (5) Cord (Battery (-) – Ground) |
| (2) Backup buzzer | (6) Battery |
| (3) Cord (Battery relay (NO) – Starter motor (terminal 30)) | (7) Starter motor |
| (4) Cord (Battery (+) – Battery relay (COM)) | (8) Battery relay |

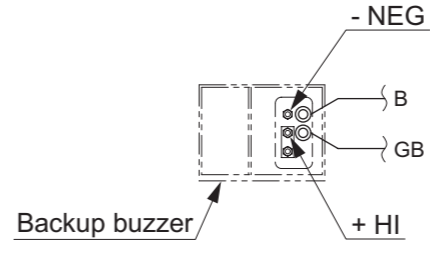
3-2. Wiring Harness Layout – Type 1-(1)



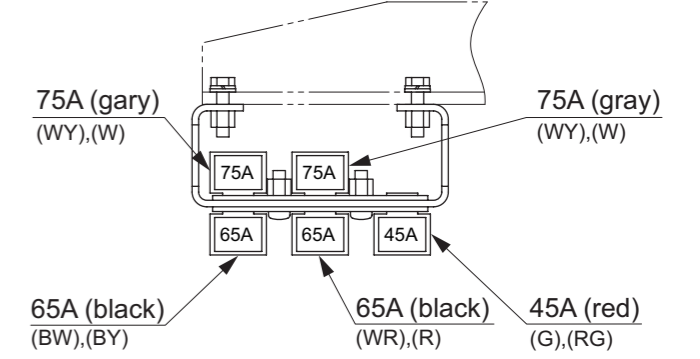
DETAIL J
(F-R lever vibration switch)



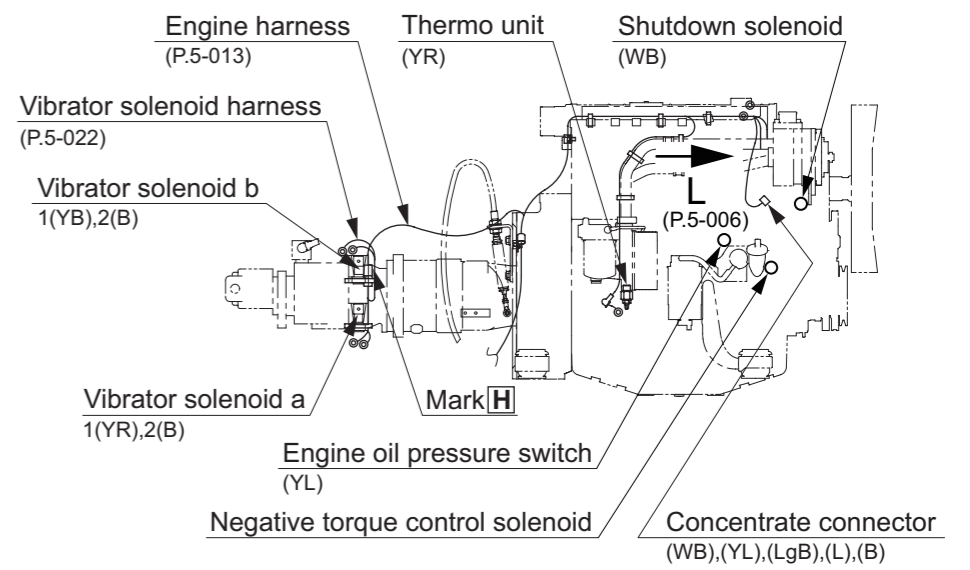
DETAIL U



VIEW B

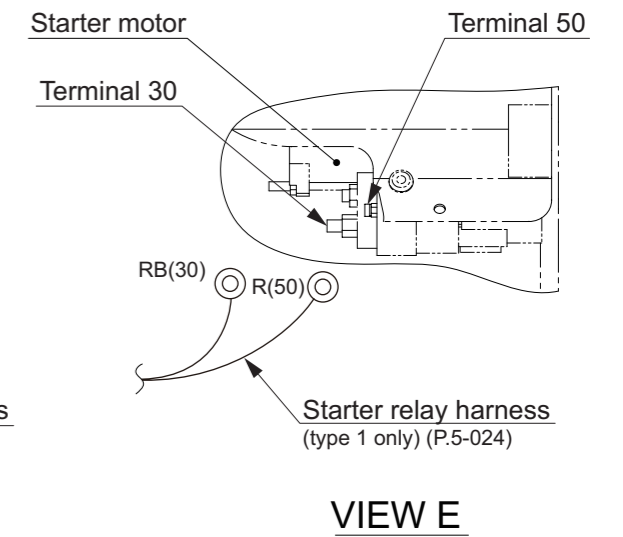
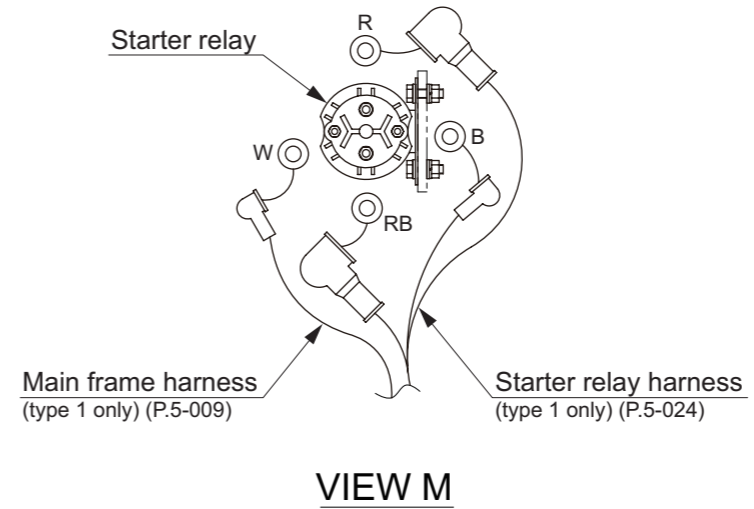
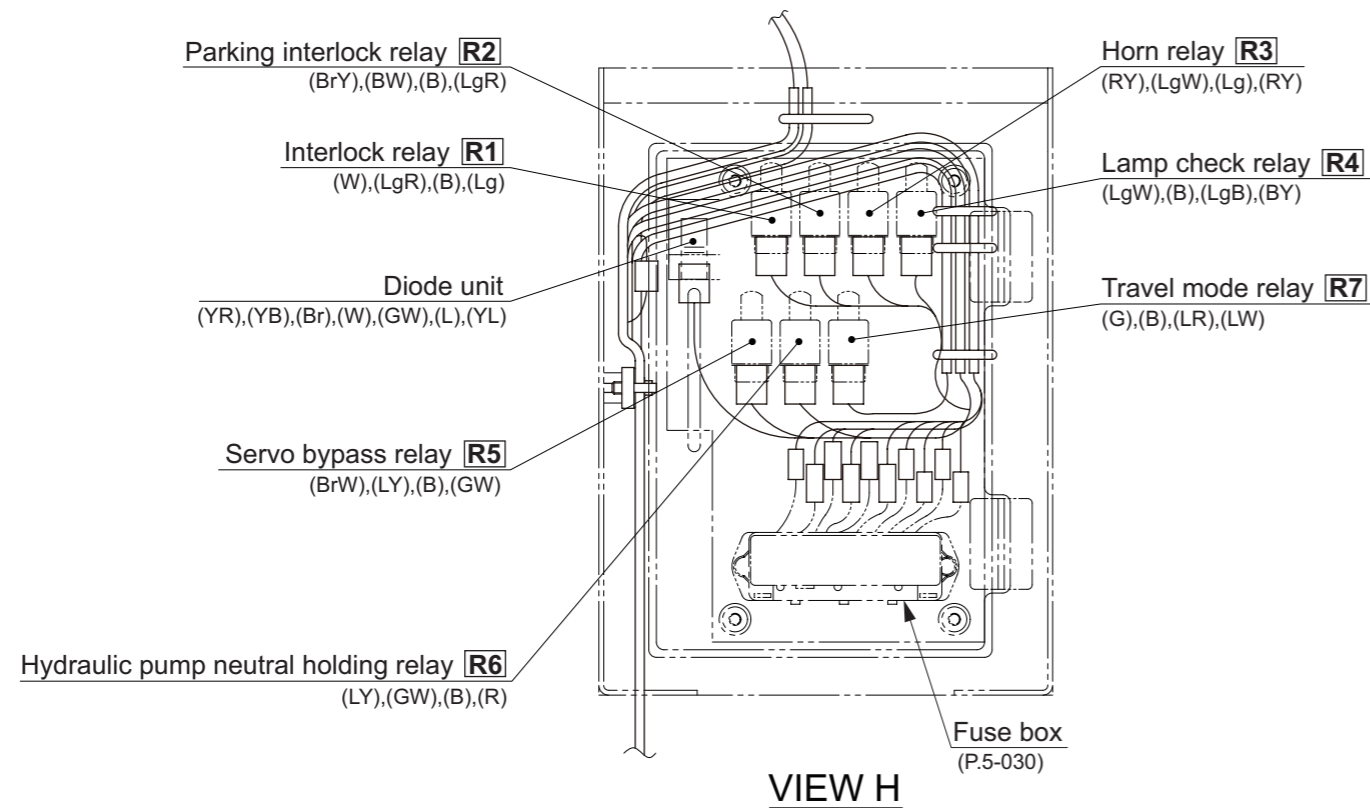
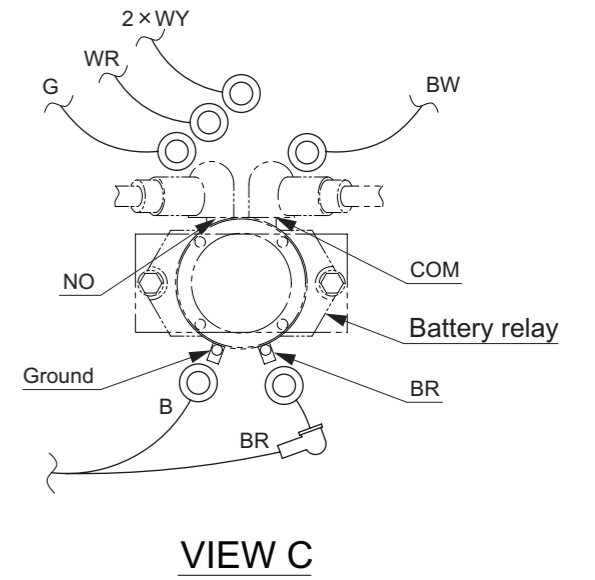
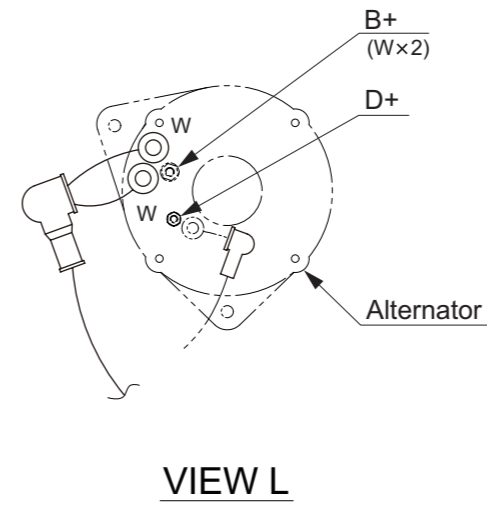
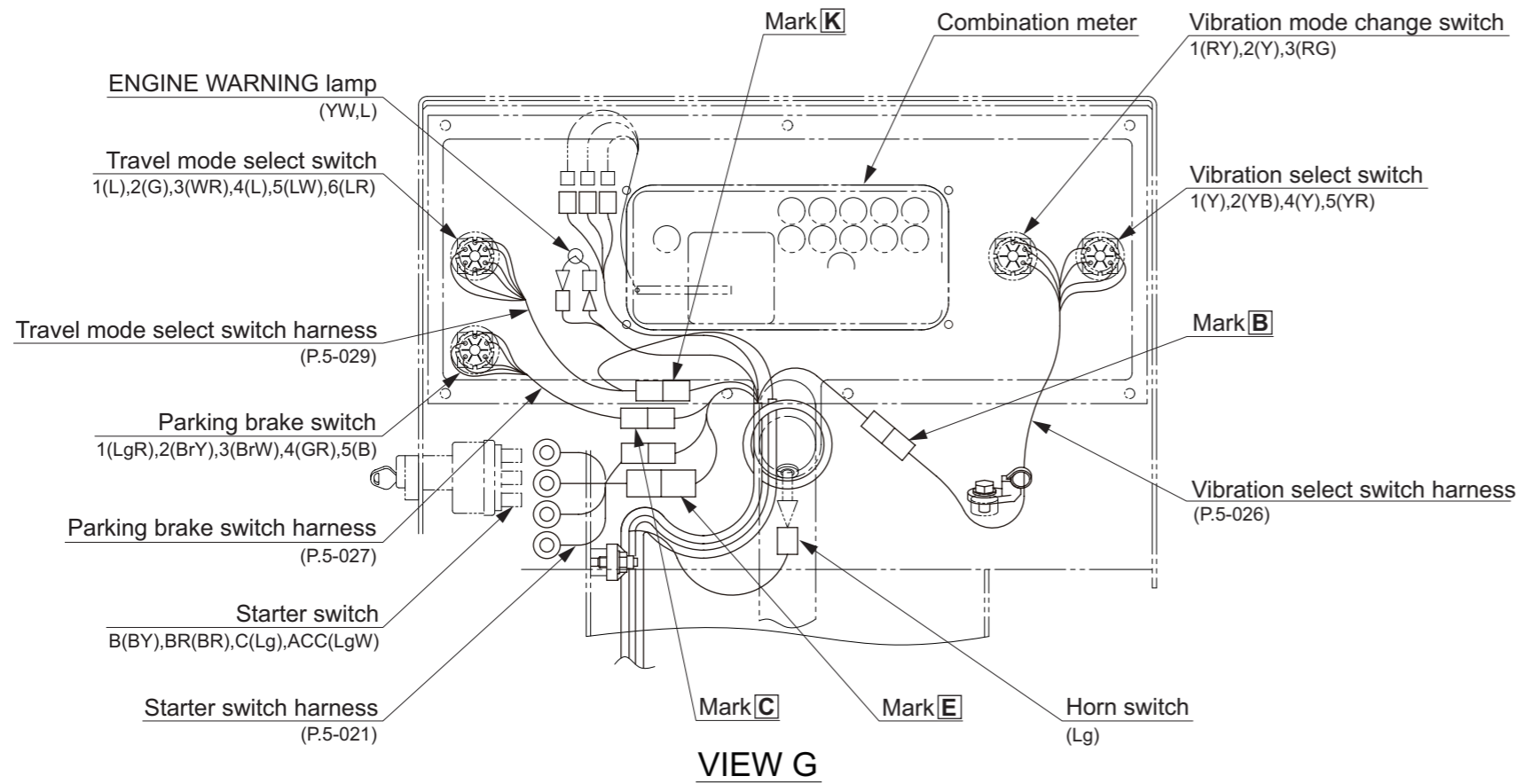


DETAIL D
(Fusible link)

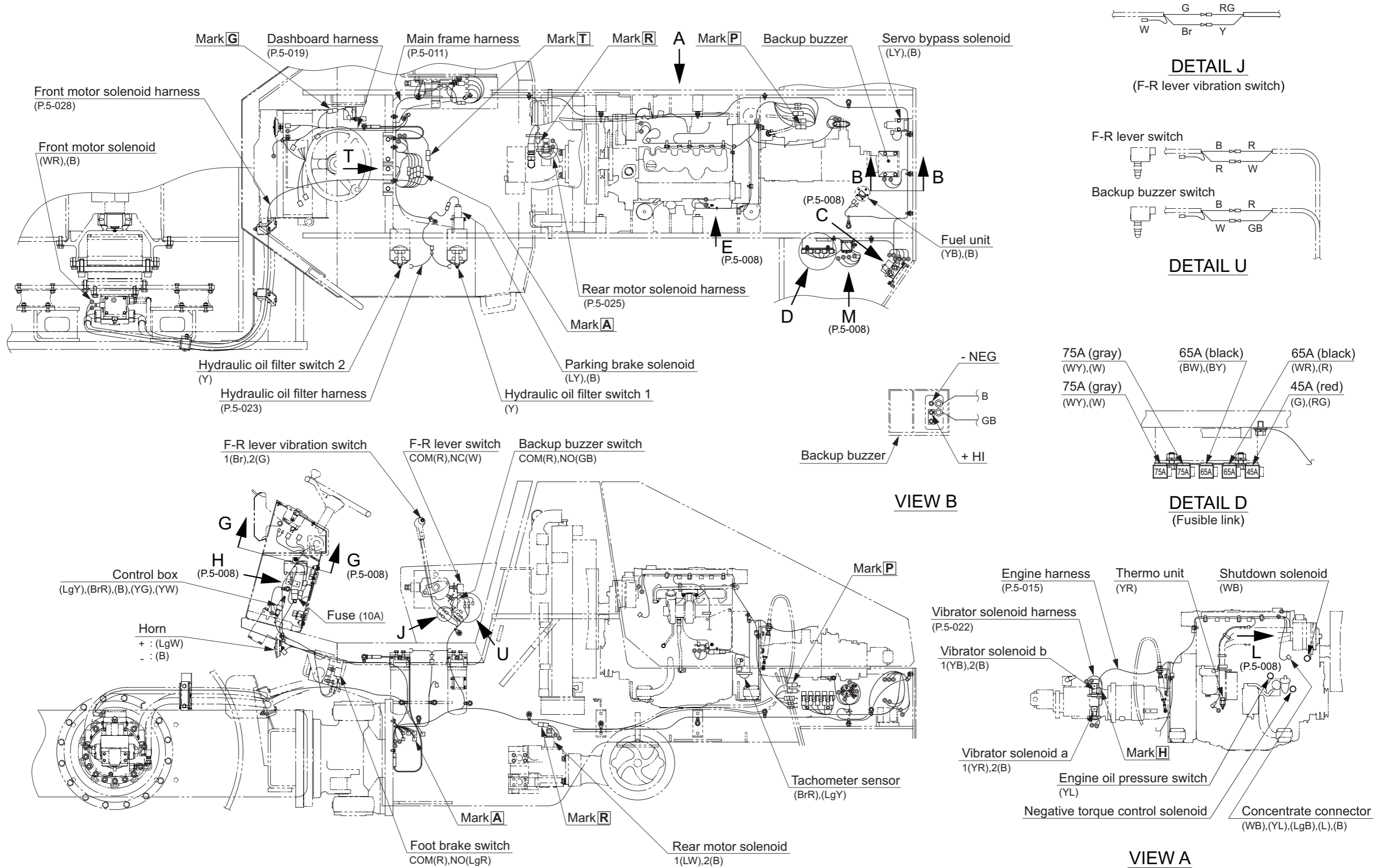


VIEW A

3-3. Wiring Harness Layout – Type 1-(2)



3-4. Wiring Harness Layout – Type 2-(1)



DETAIL J
(F-R lever vibration switch)

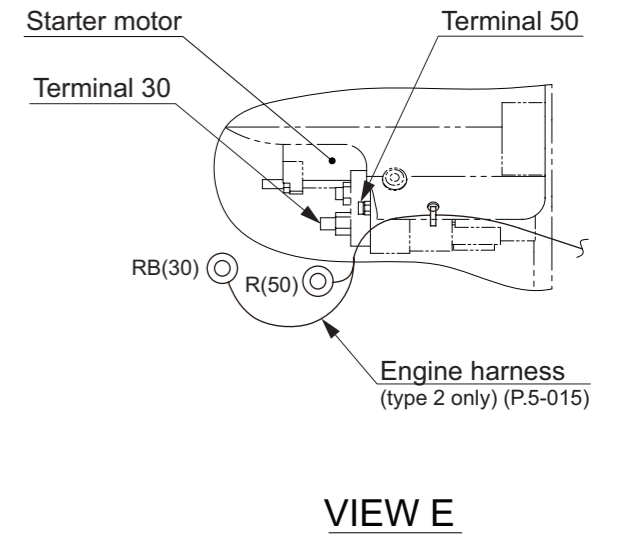
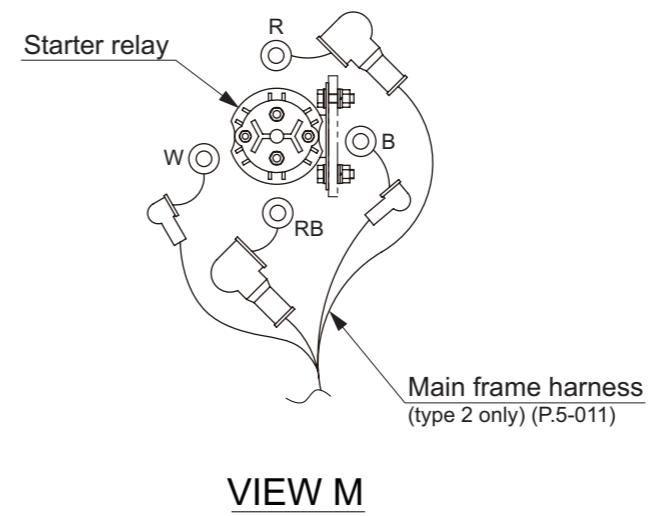
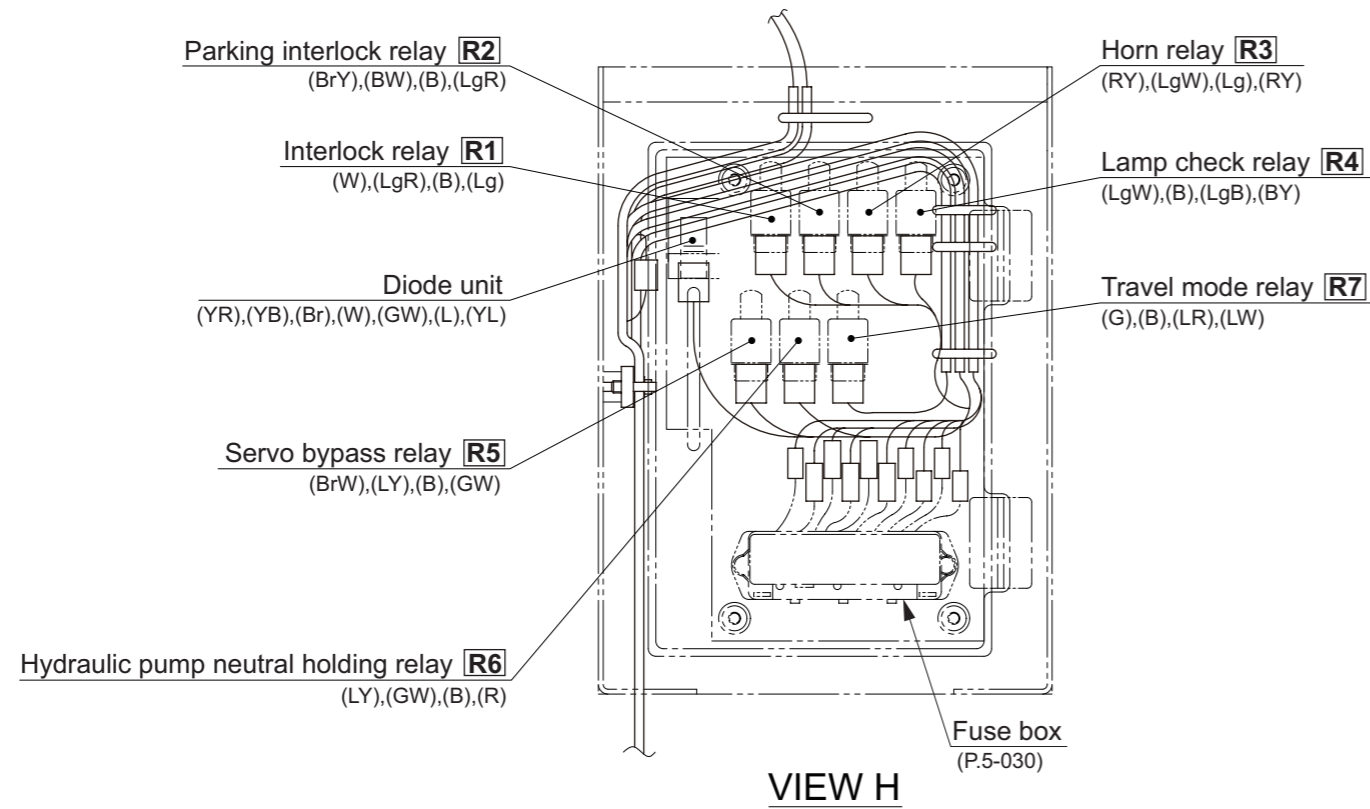
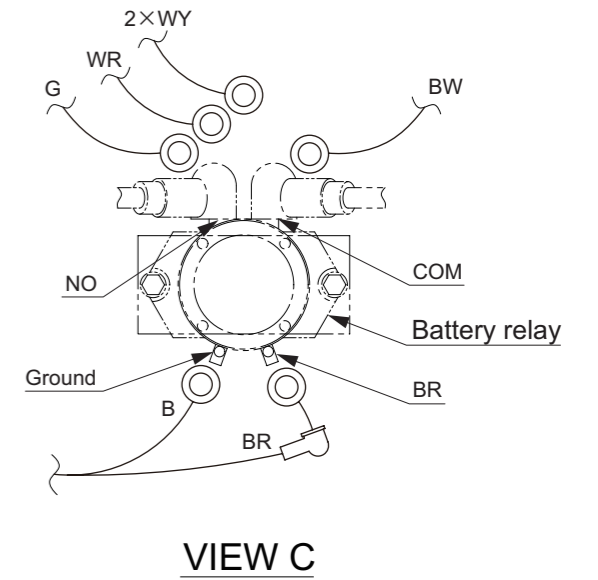
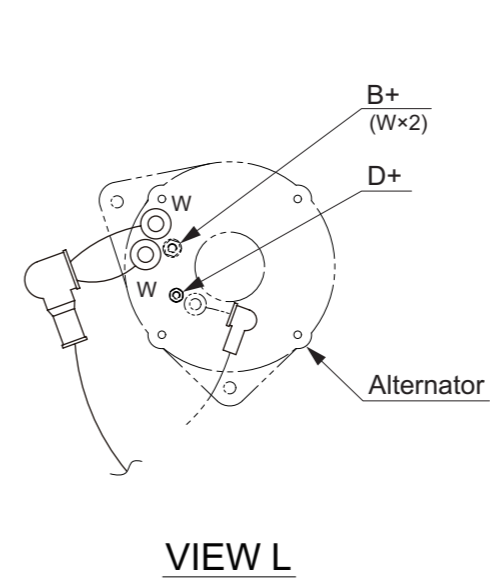
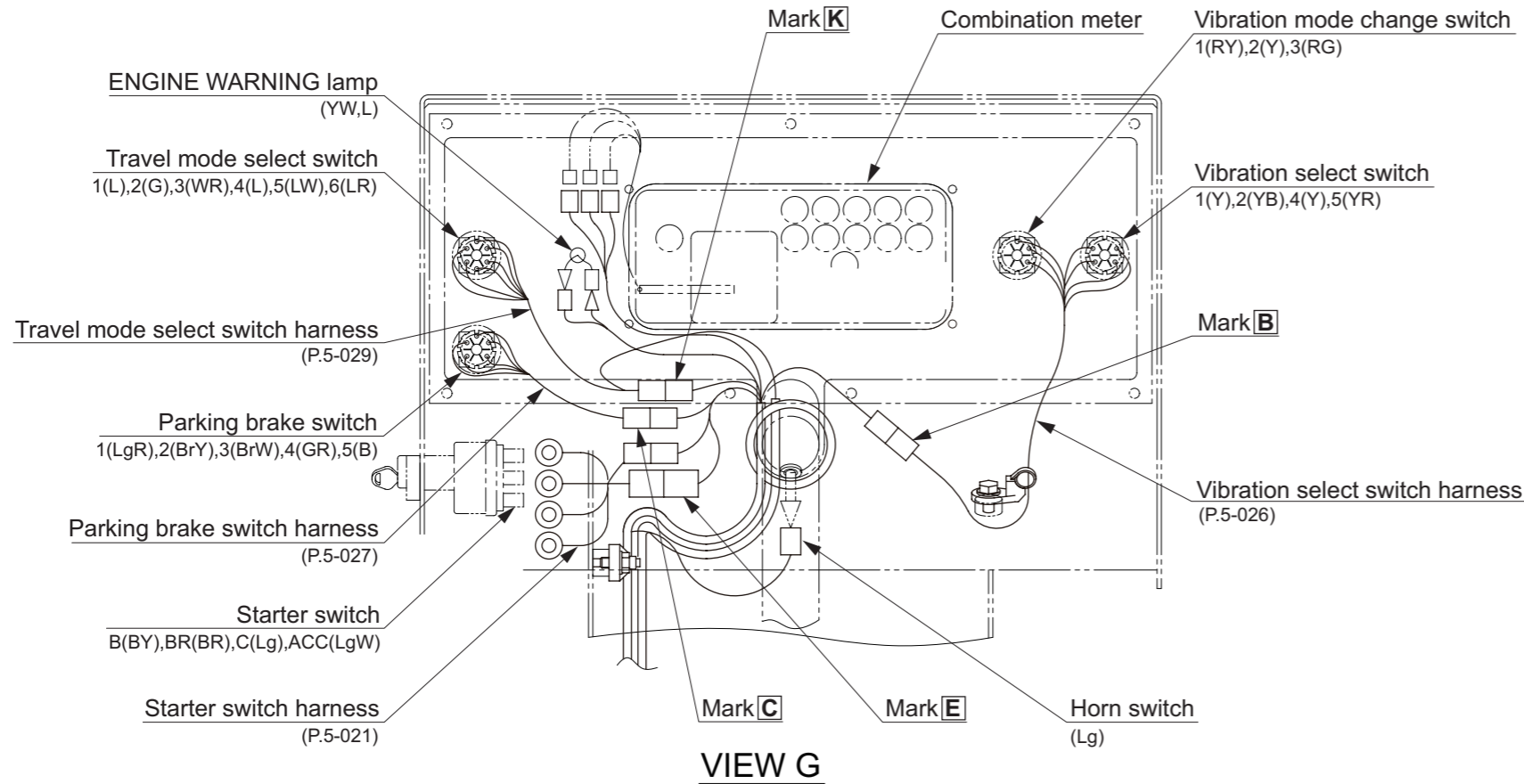
DETAIL U

VIEW B

DETAIL D
(Fusible link)

VIEW A

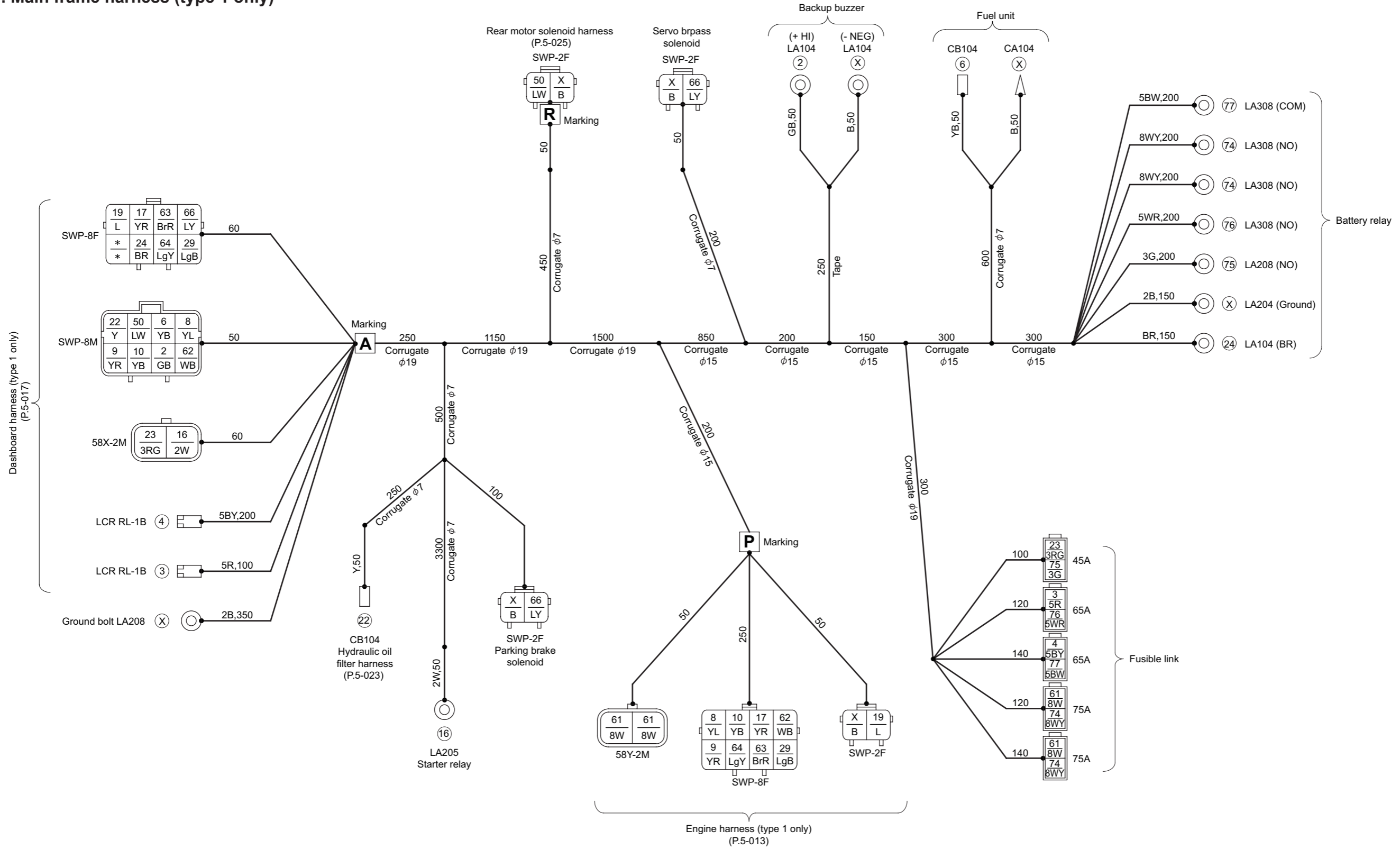
3-5. Wiring Harness Layout – Type 2-(2)



4. WIRING HARNESSSES

4-1. Main Frame Harness

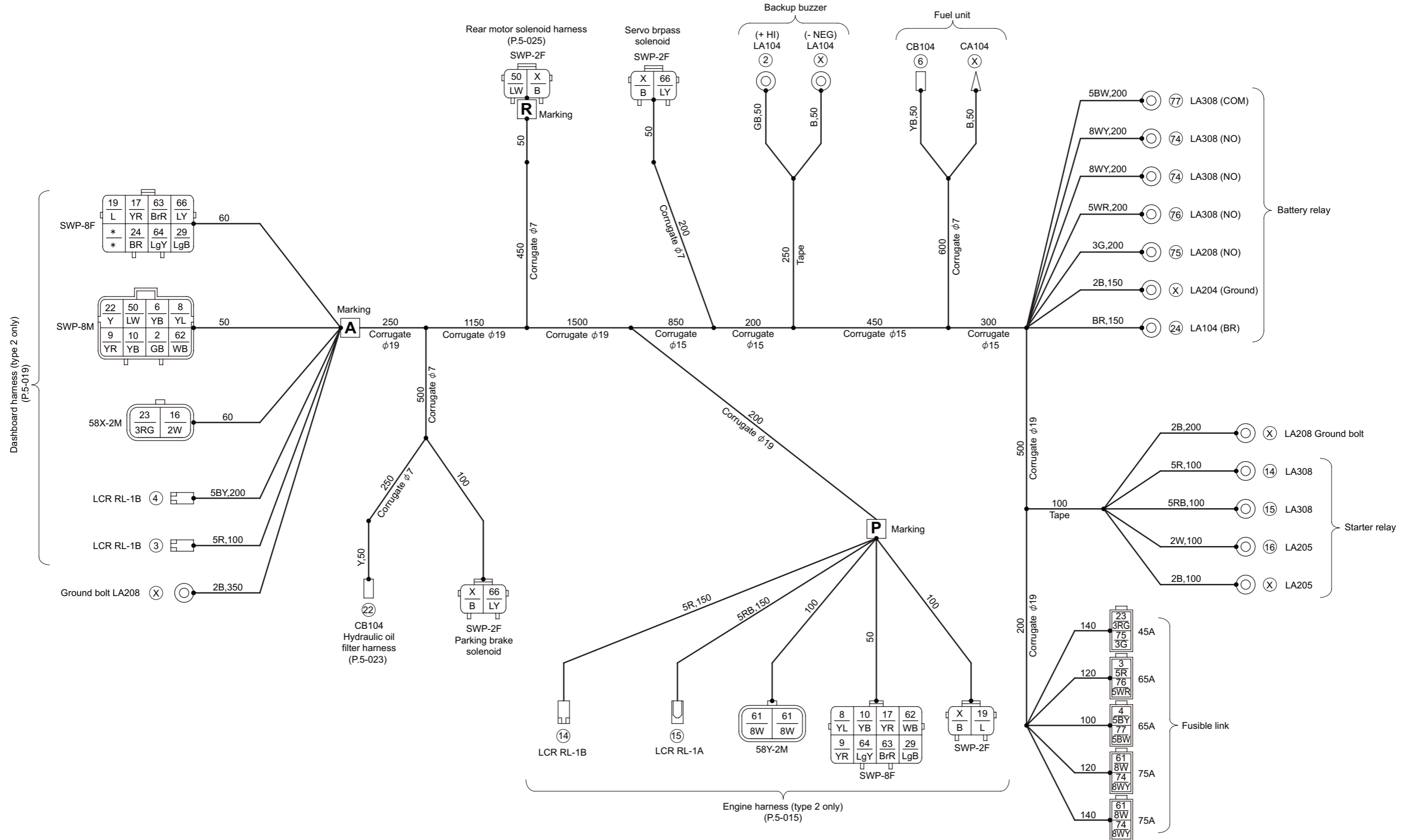
4-1-1. Main frame harness (type 1 only)



NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B, 2B	8	A , P , R , Backup buzzer, Battery relay, Fuel unit, Parking brake solenoid, Servo bypass solenoid
②	GB	2	A , Backup buzzer
③	5R	2	A , Fusible link 75A
④	5BY	2	A , Fusible link 65A
⑥	YB	2	A , Fuel unit
⑧	YL	2	A , P
⑨	YR	2	A , P
⑩	YB	2	A , P
⑯	2W	2	A , Starter relay
⑰	YR	2	A , P
⑲	L	2	A , P
⑳	Y	2	A , Hydraulic oil filter harness

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑳	3RG	2	A , Fusible link 45A
㉑	BR	2	A , Battery relay-BR
㉒	LgB	2	A , P
㉓	LW	2	A , R
㉔	8W	4	P × 2, Fusible link 75A × 2
㉕	WB	2	A , P
㉖	BrR	2	A , P
㉗	LgY	2	A , P
㉘	LY	3	A , Parking brake solenoid, Servo bypass solenoid
㉙	8WY	4	Battery relay-NO × 2, Fusible link 75A × 2
㉚	3G	2	Battery relay-NO, Fusible link 45A
㉛	5WR	2	Battery relay-NO, Fusible link 65A
㉜	5BW	2	Battery relay-COM, Fusible link 65A

4-1-2. Main frame harness (type 2 only)

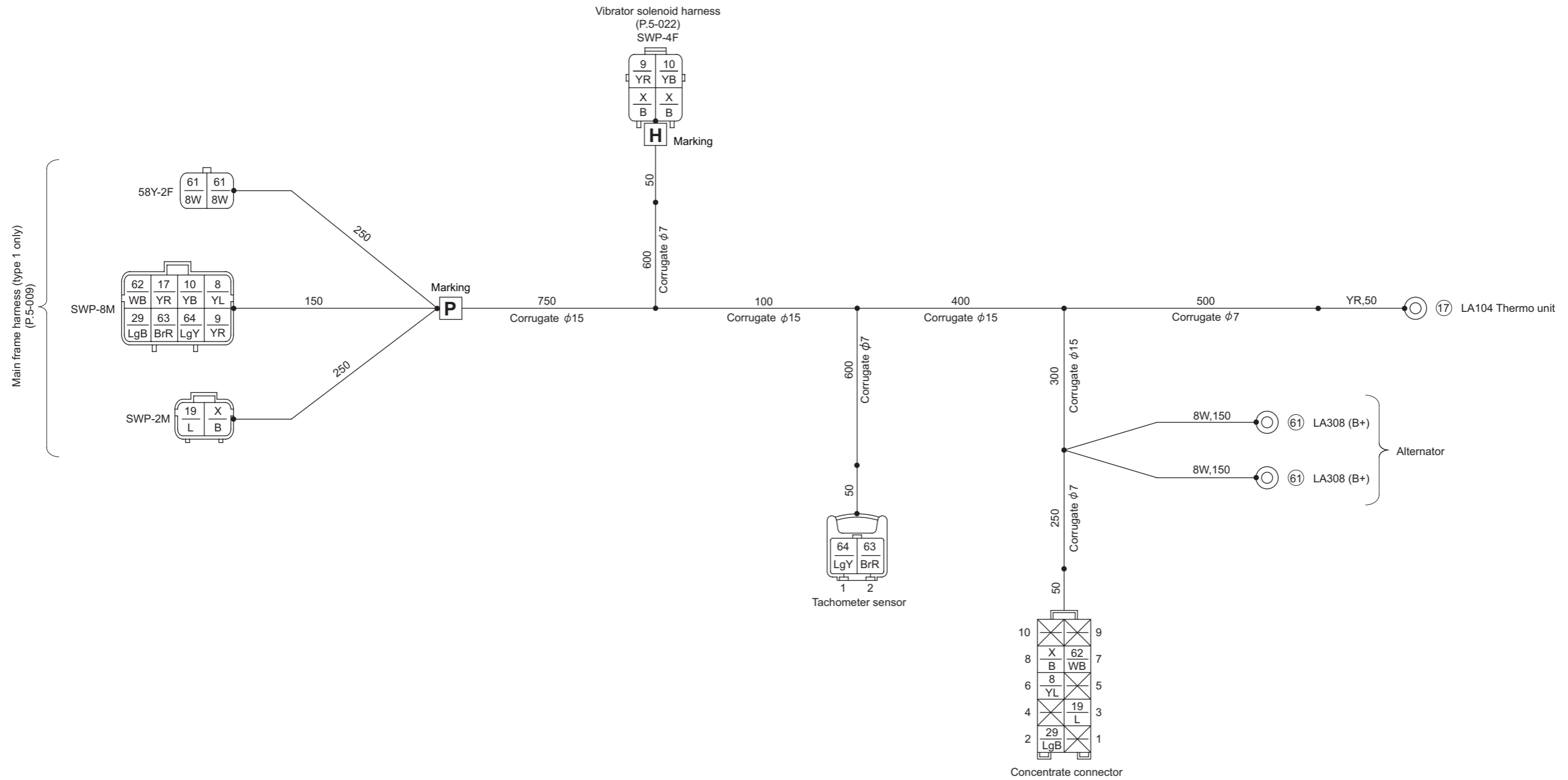


NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B, 2B	10	A , P , R , Backup buzzer, Battery relay, Fuel unit, Parking brake solenoid, Servo bypass solenoid, Starter relay, Ground bolt
②	GB	2	A , Backup buzzer
③	5R	2	A , Fusible link 75A
④	5BY	2	A , Fusible link 65A
⑥	YB	2	A , Fuel unit
⑧	YL	2	A , P
⑨	YR	2	A , P
⑩	YB	2	A , P
⑭	5R	2	P , Starter relay
⑮	5RB	2	P , Starter relay
⑯	2W	2	A , Starter relay
⑰	YR	2	A , P
⑱	L	2	A , P

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②②	Y	2	A , Hydraulic oil filter harness
②③	3RG	2	A , Fusible link 45A
②④	BR	2	A , Battery relay-BR
②⑨	LgB	2	A , P
⑤⑩	LW	2	A , R
⑥①	8W	4	P × 2, Fusible link 75A × 2
⑥②	WB	2	A , P
⑥③	BrR	2	A , P
⑥④	LgY	2	A , P
⑥⑥	LY	3	A , Parking brake solenoid, Servo bypass solenoid
⑦④	8WY	4	Battery relay-NO × 2, Fusible link 75A × 2
⑦⑤	3G	2	Battery relay-NO, Fusible link 45A
⑦⑥	5WR	2	Battery relay-NO, Fusible link 65A
⑦⑦	5BW	2	Battery relay-COM, Fusible link 65A

4-2. Engine Harness

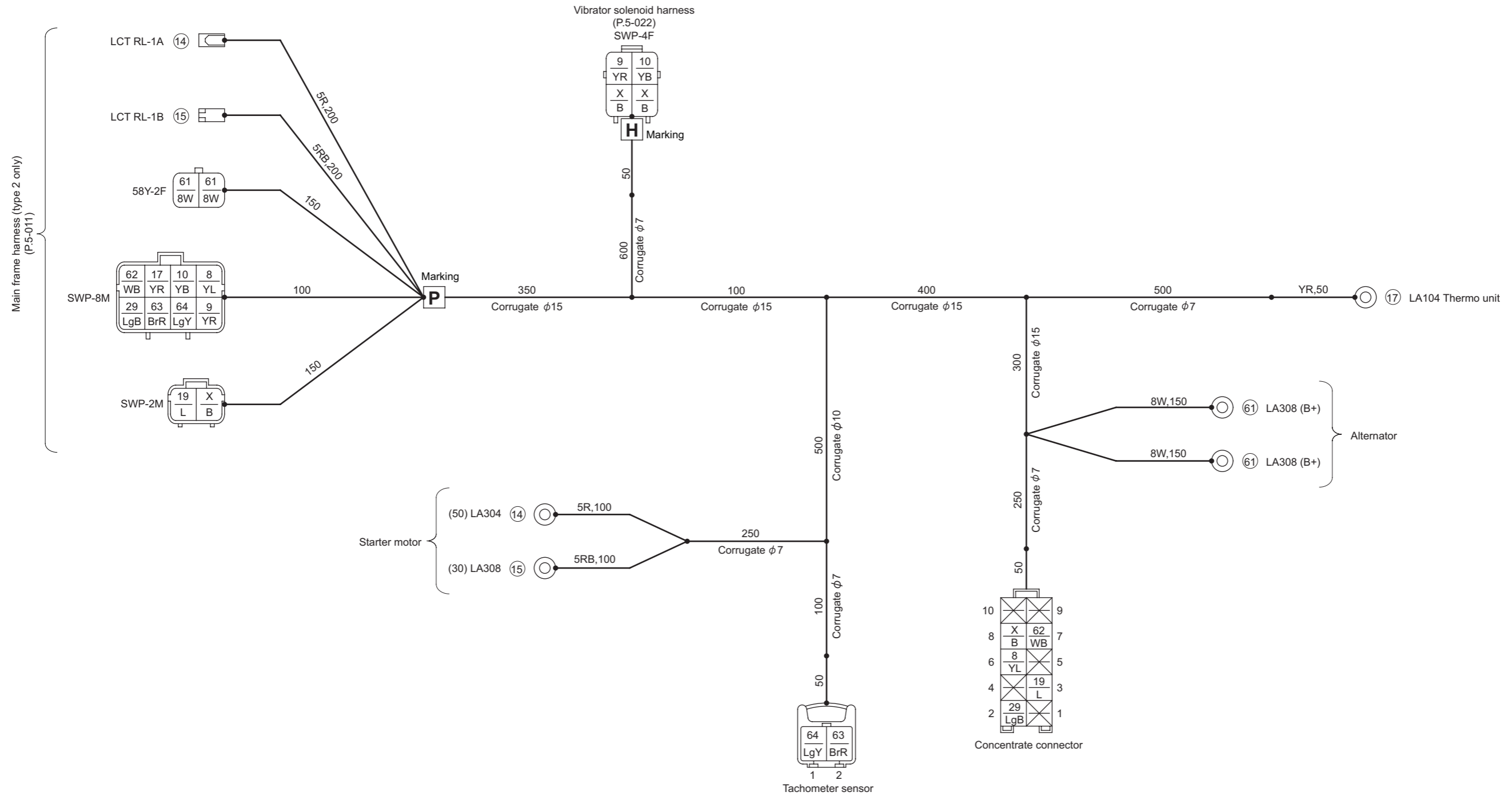
4-2-1. Engine harness (type 1 only)



NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B	4	H × 2, P , Concentrate connector
⑧	YL	2	P , Concentrate connector
⑨	YR	2	P , H
⑩	YB	2	P , H
⑰	YR	2	P , Thermo unit
⑱	L	2	P , Concentrate connector

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑳	LgB	2	P , Concentrate connector
㉑	8W	4	P × 2, Alternator × 2
㉒	WB	2	P , Concentrate connector
㉓	BrR	2	P , Tachometer sensor
㉔	LgY	2	P , Tachometer sensor

4-2-2. Engine harness (type 2 only)

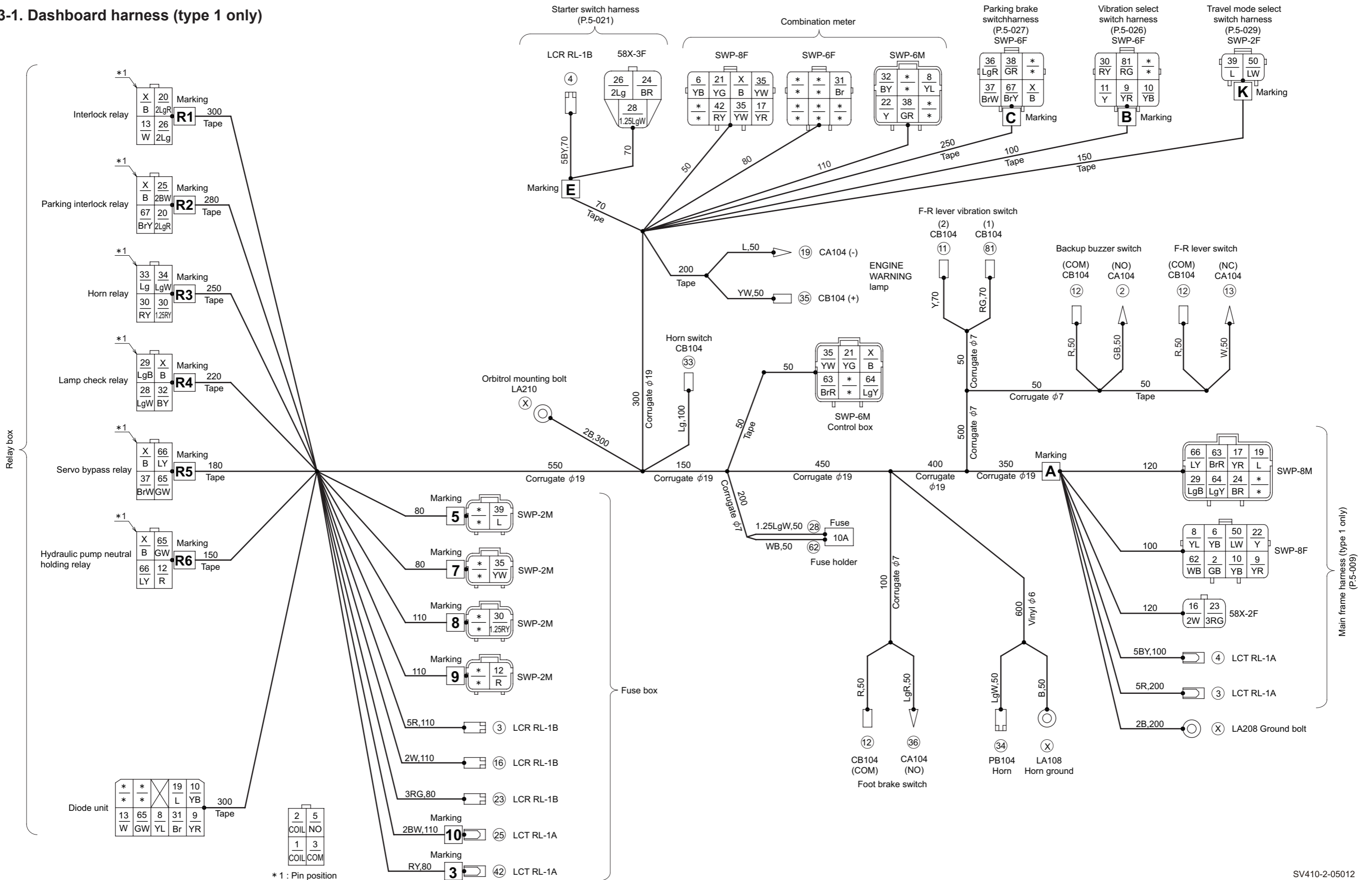


NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B	4	H × 2, P , Concentrate connector
⑧	YL	2	P , Concentrate connector
⑨	YR	2	P , H
⑩	YB	2	P , H
⑭	5R	2	P , Starter motor-(50)
⑮	5RB	2	P , Starter motor-(30)
⑰	YR	2	P , Thermo unit

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑲	L	2	P , Concentrate connector
⑳	LgB	2	P , Concentrate connector
㉑	8W	4	P × 2, Alternator × 2
㉒	WB	2	P , Concentrate connector
㉓	BrR	2	P , Tachometer sensor
㉔	LgY	2	P , Tachometer sensor

4-3. Dashboard Harness

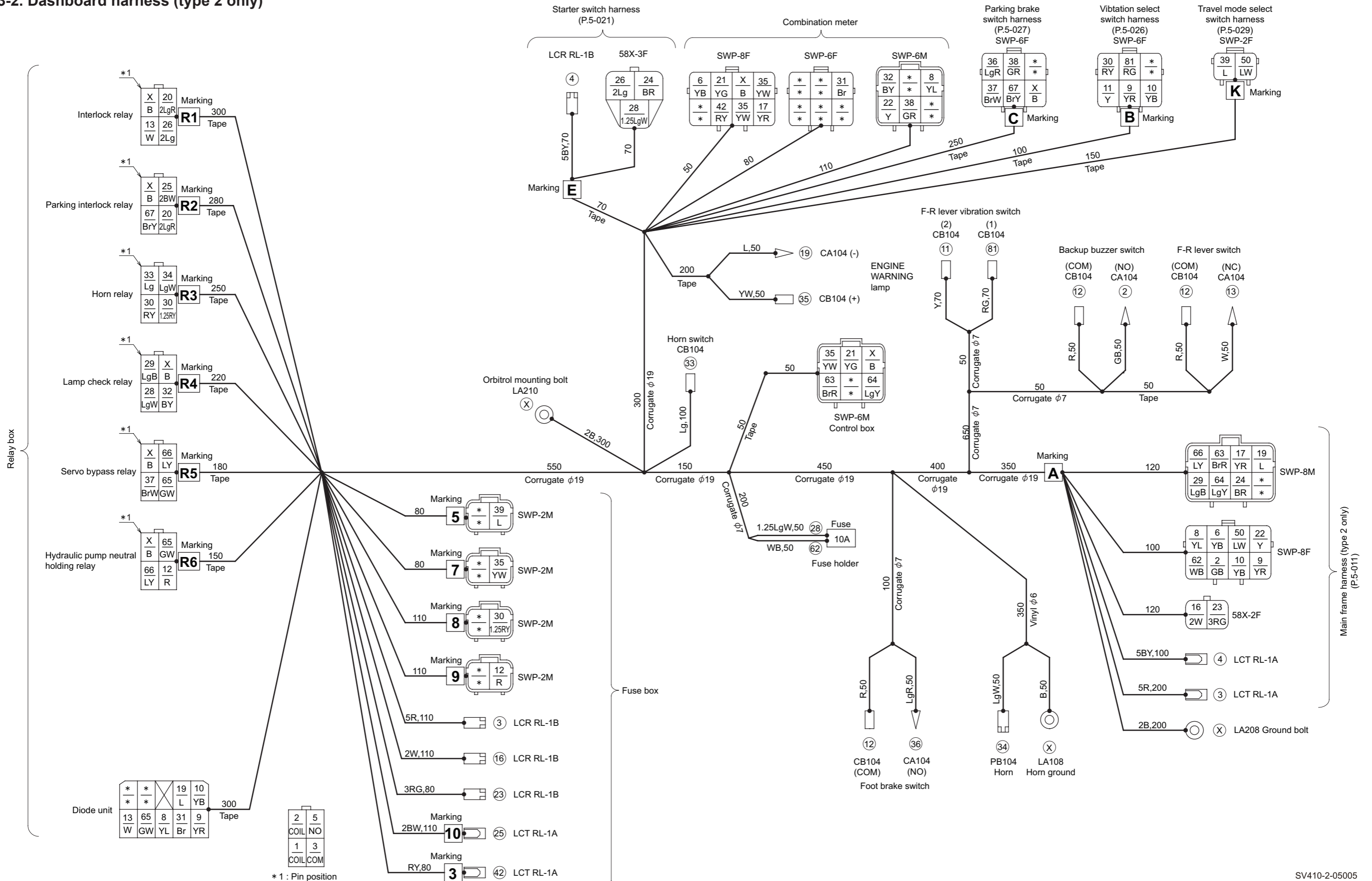
4-3-1. Dashboard harness (type 1 only)



NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⊗	B, 2B	11	C, Relay box-R1, R2, R4, R5, R6, Combination meter, Control box, Ground bolt, Horn ground, Orbitrol mount
②	GB	2	A, Backup buzzer switch-NO
③	5R	2	A, Fuse box
④	5BY	2	A, E
⑥	YB	2	A, Combination meter
⑧	YL	3	A, Combination meter, Diode unit
⑨	YR	3	A, B, Diode unit
⑩	YB	3	A, B, Diode unit
⑪	Y	2	B, F-R lever vibration switch-2
⑫	R	5	Fuse box-9, Relay box-R6, Backup buzzer switch-COM, Foot brake switch-COM, F-R lever switch-COM
⑬	W	3	Relay box-R1, Diode unit, F-R lever switch-NC
⑯	2W, W	2	A, Fuse box
⑰	YR	2	A, Combination meter
⑲	L	3	A, Diode unit, ENGINE WARNING lamp
⑳	LgR	2	Relay box-R1, R2
㉑	YG	2	Combination meter, Control box
㉒	Y	2	A, Combination meter
㉓	3RG	2	A, Fuse box
㉔	BR	2	A, E
㉕	2BW	2	Fuse box-10, Relay box-R2
㉖	2Lg	2	E, Relay box-R1

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑳	1.25LgW, LgW	3	E, Relay box-R4, Fuse 10A
㉙	LgB	2	A, Relay box-R4
㉚	1.25RY, RY	4	B, Fuse box-8, Relay box-R3 × 2
㉛	Br	2	Combination meter, Diode unit
㉜	BY	2	Relay box-R4, Combination meter
㉝	Lg	2	Relay box-R3, Horn switch
㉞	LgW	2	Relay box-R3, Horn
㉟	YW	5	Fuse box-7, Combination meter × 2, Control box, ENGINE WARNING lamp
㊱	LgR	2	C, Foot brake switch-NO
㊲	BrW	2	C, Relay box-R5
㊳	GR	2	C, Combination meter
㊴	L	2	K, Fuse box-5
㊵	RY	2	Fuse box-3, Combination meter
㊶	LW	2	A, K
㊷	WB	2	A, Fuse10A
㊸	BrR	2	A, Control box
㊹	LgY	2	A, Control box
㊺	GW	3	Relay box-R5, R6, Diode unit
㊻	LY	3	A, Relay box-R5, R6
㊼	BrY	2	C, Relay box-R2
㊽	RG	2	B, F-R lever vibration switch-1

4-3-2. Dashboard harness (type 2 only)

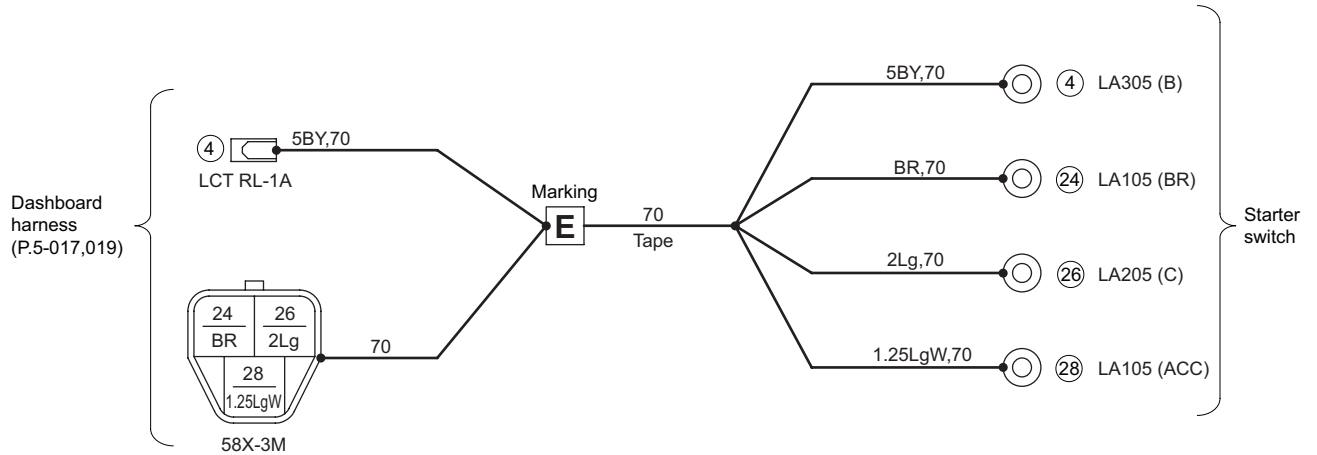


* 1 : Pin position

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B, 2B	11	C , Relay box- R1 , R2 , R4 , R5 , R6 , Combination meter, Control box, Ground bolt, Horn ground, Orbitrol mount
②	GB	2	A , Backup buzzer switch-NO
③	5R	2	A , Fuse box
④	5BY	2	A , E
⑥	YB	2	A , Combination meter
⑧	YL	3	A , Combination meter, Diode unit
⑨	YR	3	A , B , Diode unit
⑩	YB	3	A , B , Diode unit
⑪	Y	2	B , F-R lever vibration switch-2
⑫	R	5	Fuse box- 9 , Relay box- R6 , Backup buzzer switch-COM, Foot brake switch-COM, F-R lever switch-COM
⑬	W	3	Relay box- R1 , Diode unit, F-R lever switch-NC
⑯	2W, W	2	A , Fuse box
⑰	YR	2	A , Combination meter
⑲	L	3	A , Diode unit, ENGINE WARNING lamp
⑳	LgR	2	Relay box- R1 , R2
㉑	YG	2	Combination meter, Control box
㉒	Y	2	A , Combination meter
㉓	3RG	2	A , Fuse box
㉔	BR	2	A , E
㉕	2BW	2	Fuse box- 10 , Relay box- R2
㉖	2Lg	2	E , Relay box- R1

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑳	1.25LgW, LgW	3	E , Relay box- R4 , Fuse 10A
㉑	LgB	2	A , Relay box- R4
⑳	1.25RY, RY	4	B , Fuse box- 8 , Relay box- R3 × 2
㉑	Br	2	Combination meter, Diode unit
㉒	BY	2	Relay box- R4 , Combination meter
㉓	Lg	2	Relay box- R3 , Horn switch
㉔	LgW	2	Relay box- R3 , Horn
㉕	YW	5	Fuse box- 7 , Combination meter × 2, Control box, ENGINE WARNING lamp
㉖	LgR	2	C , Foot brake switch-NO
㉗	BrW	2	C , Relay box- R5
㉘	GR	2	C , Combination meter
㉙	L	2	K , Fuse box- 5
㉚	RY	2	Fuse box- 3 , Combination meter
㉛	LW	2	A , K
㉜	WB	2	A , Fuse10A
㉝	BrR	2	A , Control box
㉞	LgY	2	A , Control box
㉟	GW	3	Relay box- R5 , R6 , Diode unit
㊱	LY	3	A , Relay box- R5 , R6
㊲	BrY	2	C , Relay box- R2
㊳	RG	2	B , F-R lever vibration switch-1

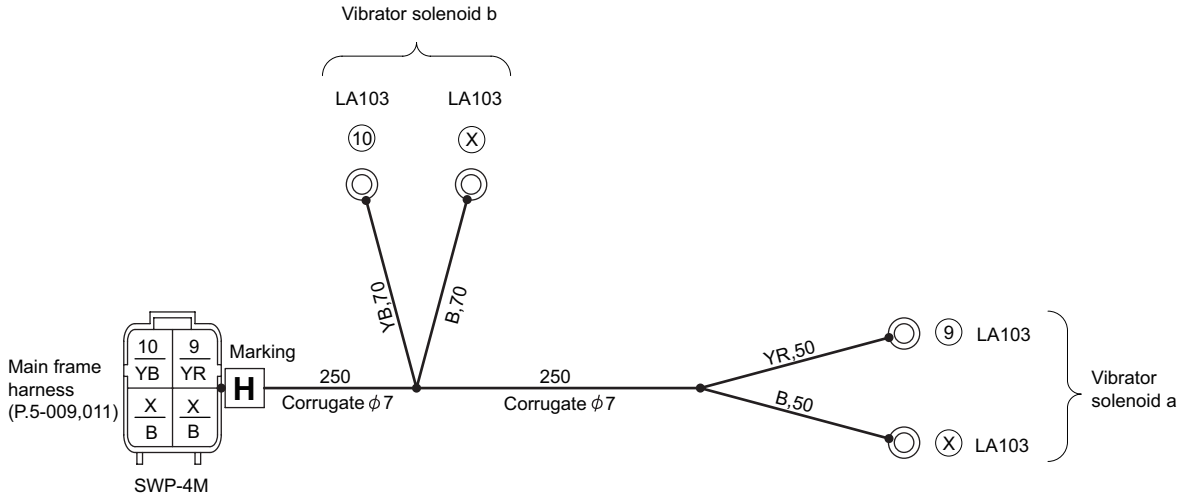
4-4. Starter Switch Harness



SV410-2-05013

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
④	5BY	2	E , Starter switch-B
②④	BR	2	E , Starter switch-BR
②⑥	2Lg	2	E , Starter switch-C
②⑧	2LgW	2	E , Starter switch-ACC

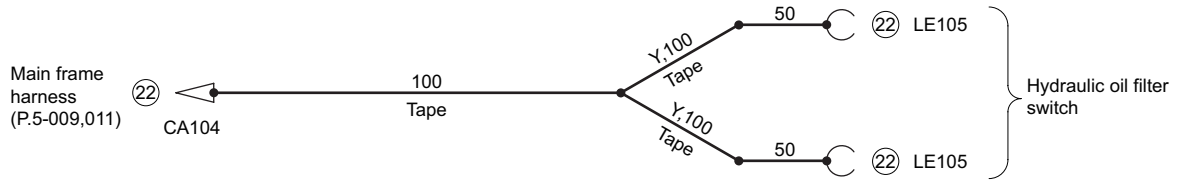
4-5. Vibrator Solenoid Harness



SV410-2-05014

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⊗	B	4	H × 2, Vibrator solenoid-a,b
⑨	YR	2	H , Vibrator solenoid-a
⑩	YB	2	H , Vibrator solenoid-b

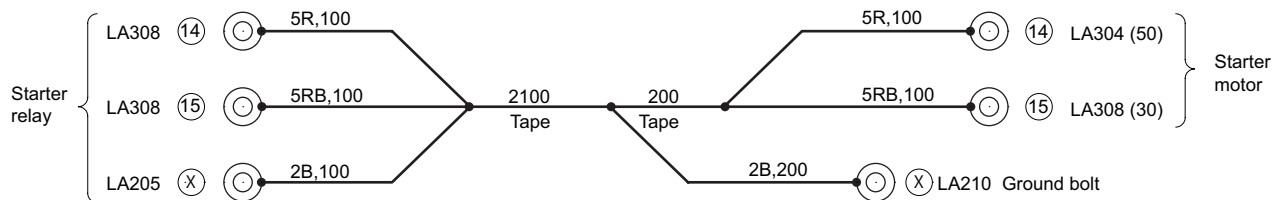
4-6. Hydraulic Oil Filter Harness



SV410-2-05015

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
②②	Y	3	Main frame harness, Hydraulic oil filter switch × 2

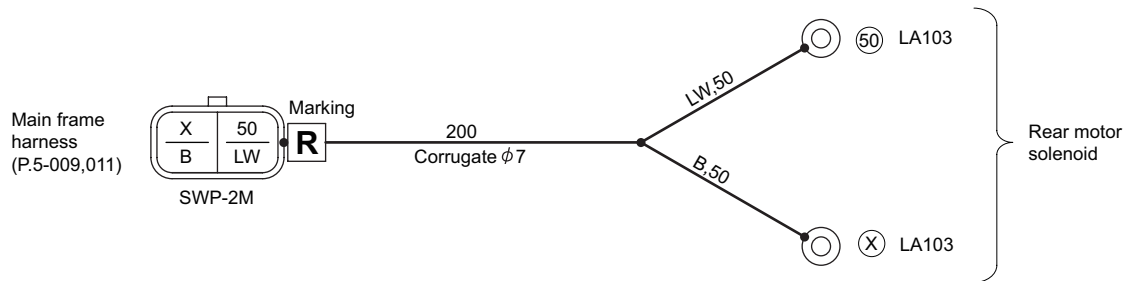
4-7. Starter Relay Harness (Type 1 only)



SV410-2-05016

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(X)	2B	2	Starter relay, Ground bolt
(14)	5R	2	Starter relay, Starter motor-(50)
(15)	5RB	2	Starter relay, Starter motor-(30)

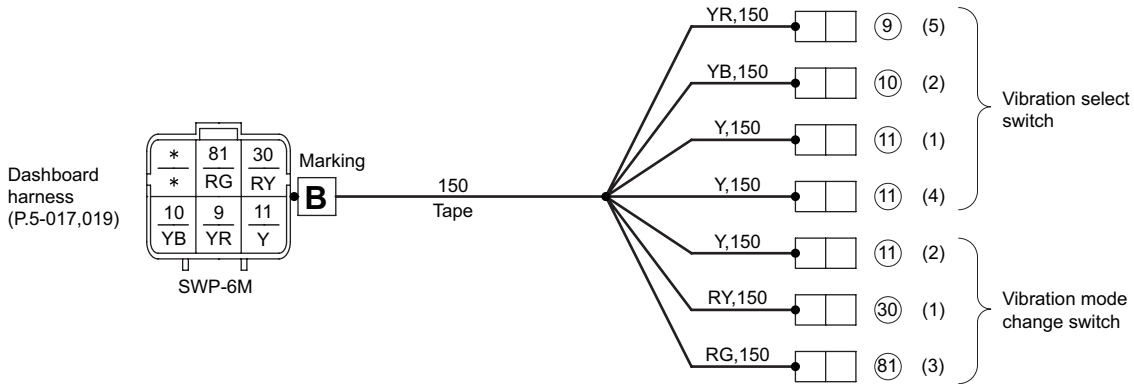
4-8. Rear Motor Solenoid Harness



SV410-2-05008

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⊗	B	2	R , Rear motor solenoid
⊕	LW	2	R , Rear motor solenoid

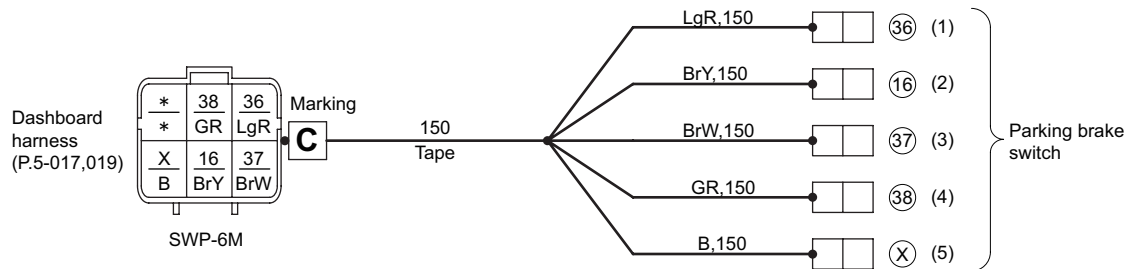
4-9. Vibration Select Switch Harness



SV410-2-05009

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑨	YR	2	B , Vibration select switch-5
⑩	YB	2	B , Vibration select switch-2
⑪	Y	4	B , Vibration select switch-1, 4, Vibration mode change switch-2
③⑩	RY	2	B , Vibration mode change switch-1
⑧①	RG	2	B , Vibration mode change switch-3

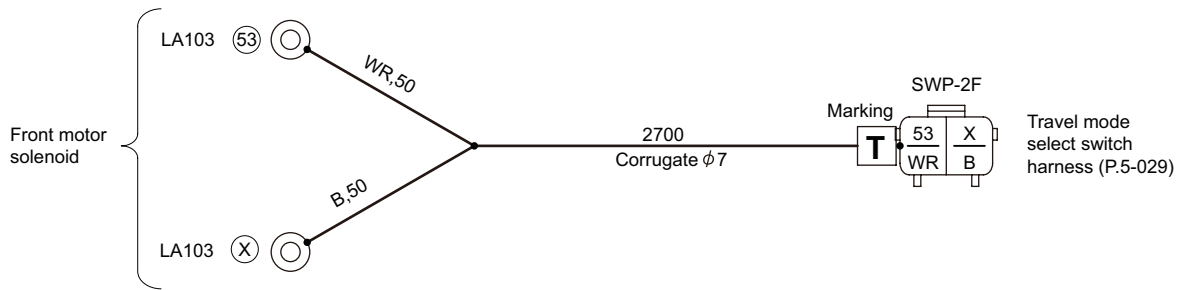
4-10. Parking Brake Switch Harness



SV410-2-05017

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(X)	B	2	C , Parking brake switch-5
(16)	BrY	2	C , Parking brake switch-2
(36)	LgR	2	C , Parking brake switch-1
(37)	BrW	2	C , Parking brake switch-3
(38)	GR	2	C , Parking brake switch-4

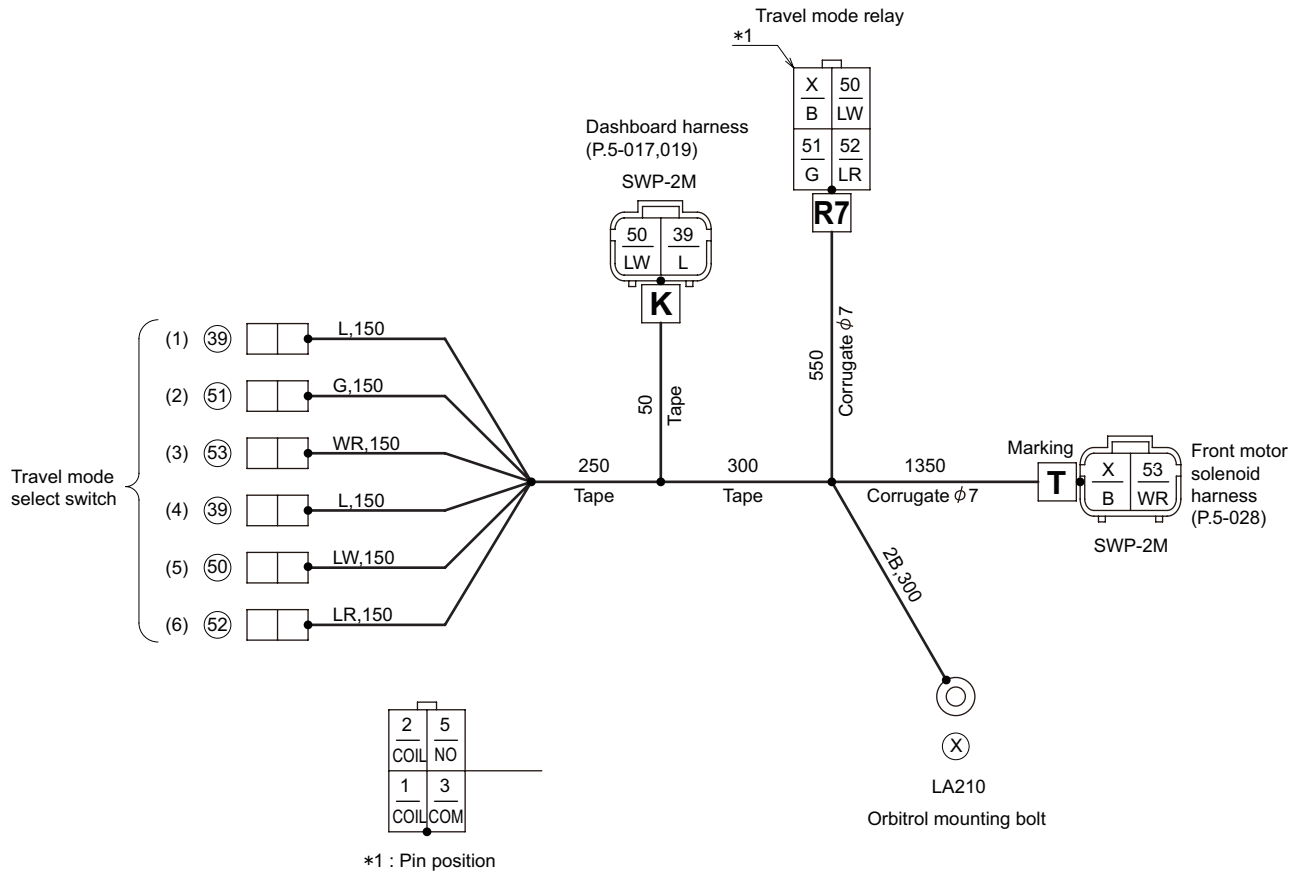
4-11. Front Motor Solenoid Harness



SV410-2-05007

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⊗	B	2	T, Front motor solenoid
⑤③	WR	2	T, Front motor solenoid

4-12. Travel Mode Select Switch Harness

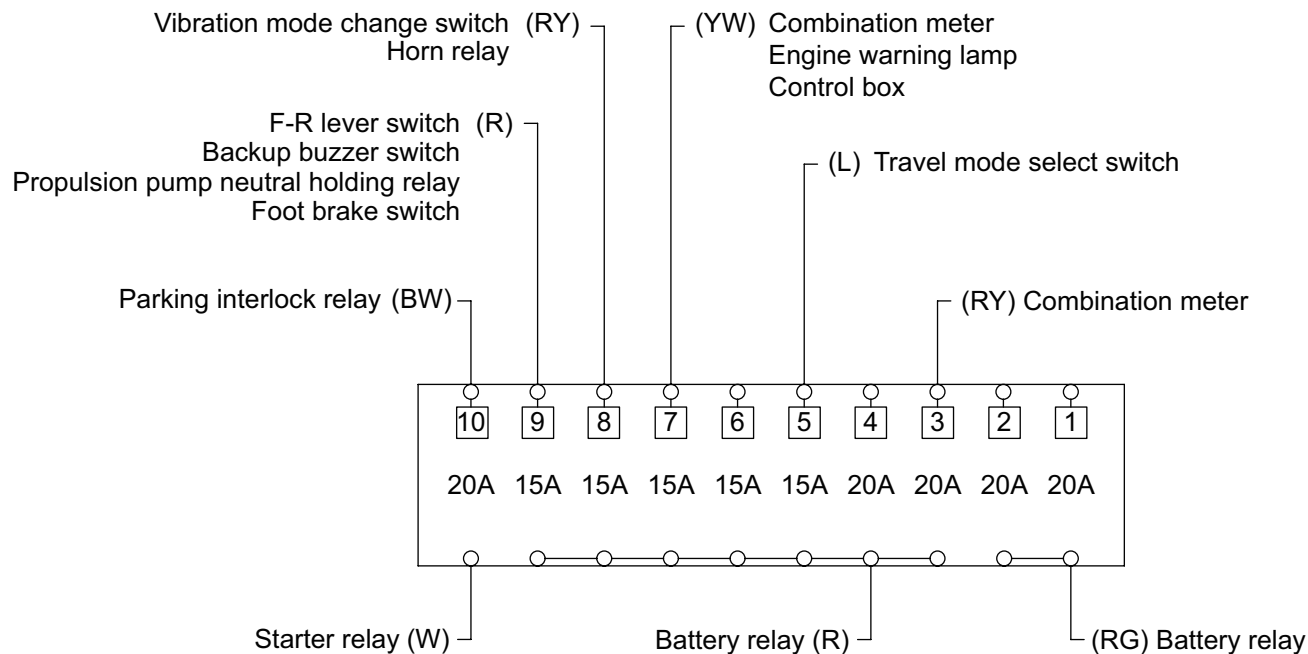


SV410-2-05006

NO.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(X)	B	3	T, R7, Orbitrol mounting bolt
(39)	L	3	K, Travel mode select switch-1,4
(50)	LW	3	K, R7, Travel mode select switch-5
(51)	G	2	R7, Travel mode select switch-2
(52)	LR	2	R7, Travel mode select switch-6
(53)	WR	2	T, Travel mode select switch-3

5. ELECTRICAL COMPONENT SPECIFICATIONS

5-1. Fuse Box



SV410-2-05018

Harness color codes

W : White

R : Red

L : Blue

BW : Black/White stripe

RY : Red/Yellow stripe

RG : Red/Green stripe

YW : Yellow/White stripe

VIBRATORY DRUM • REAR AXLE

1. PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

- When removing, installing, disassembling or reassembling the unit, observe the general precautions described below.
- 1) Precautions for removal work
 - Coolant that contains antifreeze should be treated as a chemical, and must not be drained carelessly on the ground.
 - To prevent dust from getting into disconnected hoses and tubes, cover them with a plug or similar means.
 - When draining oil, use a receptacle with sufficient capacity to receive it.
 - Before proceeding with the work, look for matchmarks that show the installation location. For reassembly, place matchmarks in the required locations to prevent errors. Then remove.
 - When disconnecting wiring connectors, hold the connector components so that unreasonable force is not applied to the wires.
 - Label wires and hoses to ensure correct installation location.
 - Confirm the number and thickness of shims prior to storage.
 - When lifting parts, use lifting equipment of sufficient capacity.
 - When separating parts by using pull bolts, tighten the bolts alternately.
 - Before removing a unit, clean its surrounding area. Then after removal, cover it to prevent dust and other substances from getting in.
 - Before removing piping for hydraulic oil or coolant, or removing related parts, satisfactorily release internal pressure.
 - 2) Precautions for installation work
 - Tighten bolts and nuts (sleeve nuts) to the specified torque (screw tightening torque table).
 - When installing hoses, do not twist them or allow them to interfere with other parts.
 - Replace gaskets, O-rings, split cotter pins, and lock plates with new parts.
 - Properly bend split cotter pins and lock plates.
 - When applying an adhesive, first clean and remove oil/grease from the surfaces properly. Then apply two or three drops to the threaded areas.
 - When applying a liquid gasket, first clean and remove oil/grease from the application surface properly, and confirm that the surface is free of dust and damage. Then apply the product evenly.
 - Clean parts well. Repair scratches, dents, burrs, rust, etc.
 - Apply gear oil to rotating and sliding components.
 - Apply grease to the surfaces of press-fit parts.
 - After installing snap rings, confirm that they are properly seated in the grooves.
 - Connect wiring connectors securely after cleaning off adhering oil, dust and water.
 - Use lifting bolts that are not fatigued or deformed. Screw them in fully.
 - When tightening a split flange, tighten screws alternately to prevent uneven tightening.
 - Before installing hydraulic parts, confirm that they are free of damage and dust, etc.

3) Precautions when work is completed

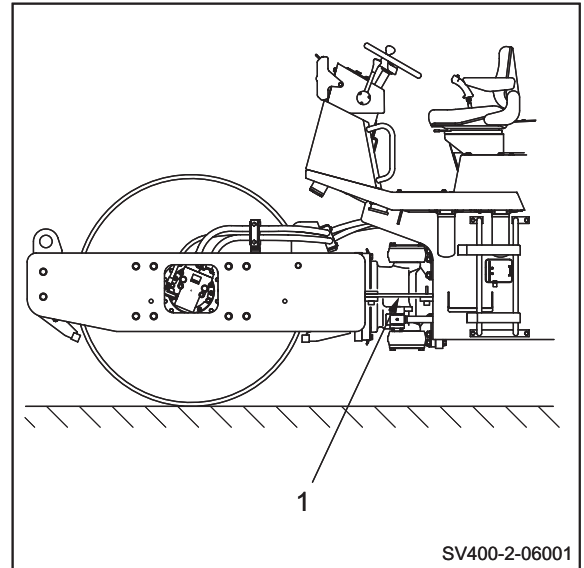
- If coolant has been drained, securely retighten the drain cock and fill with coolant (mixing in long-life coolant) to the specified level. Start the engine and allow the coolant to circulate through the piping. Then add coolant again to the specified level.
- If hydraulic equipment has been removed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

2. VIBRATORY DRUM

2-1. Removal and Installation of Vibratory Drum

2-1-1. Removal of vibratory drum

- 1) Using the steering lock bar (1), connect the front and rear frames. Firmly secure it so that the front and rear frames do not move.



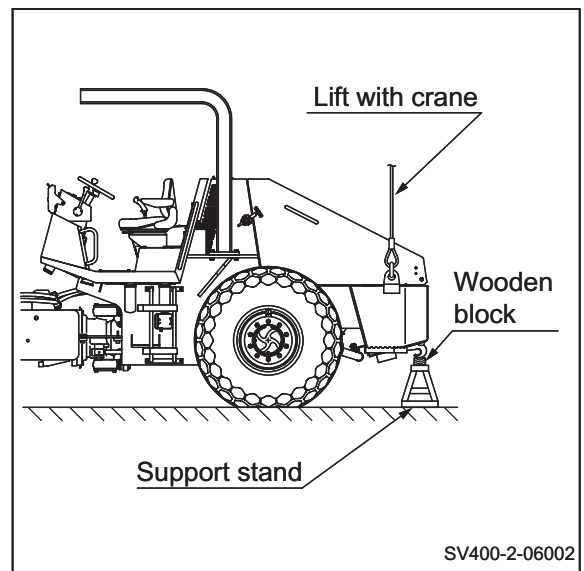
- 2) As shown in the figure on the right, lift the rear frame with a crane. Firmly secure the vehicle body by placing support stands and/or wooden blocks at the rear end of the rear frame.

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



Rear lift weight

SV410D-2	: 3,800 kg (8,377 lbs.)
SV410T-2	: 3,770 kg (8,311 lbs.)
SV410TF-2	: 3,730 kg (8,223 lbs.)
SV410TB-2	: 3,670 kg (8,091 lbs.)
SV410FB-2	: 3,620 kg (7,981 lbs.)



WARNING

When lifting the vehicle, use an appropriate hoist of sufficient strength. Confirm that the surrounding area is safe, and work in a natural, unstrained posture.

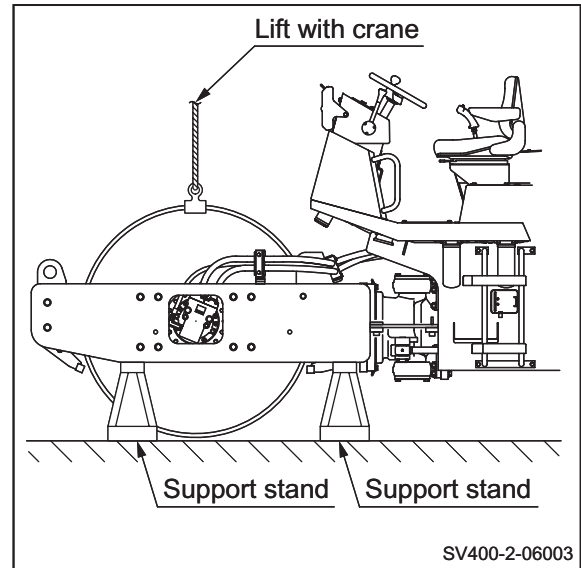
Also, to firmly secure the vehicle body, use a support stand of sufficient strength.

- 3) Lift the front frame with a crane. With the drum slightly above the ground surface, place support stands at the right and left sides of the front frame. Firmly secure the vehicle body.



Front axle weight

- SV410D-2 : 3,630 kg (8,003 lbs.)
- SV410T-2 : 3,880 kg (8,554 lbs.)
- SV410TF-2 : 5,110 kg (11,266 lbs.)
- SV410TB-2 : 4,380 kg (9,656 lbs.)
- SV410FB-2 : 5,630 kg (12,412 lbs.)



- 4) With the crossmember (3) lifted by the crane, loosen the two bolts (2) (both right and left). Then remove the crossmember from the front frame.



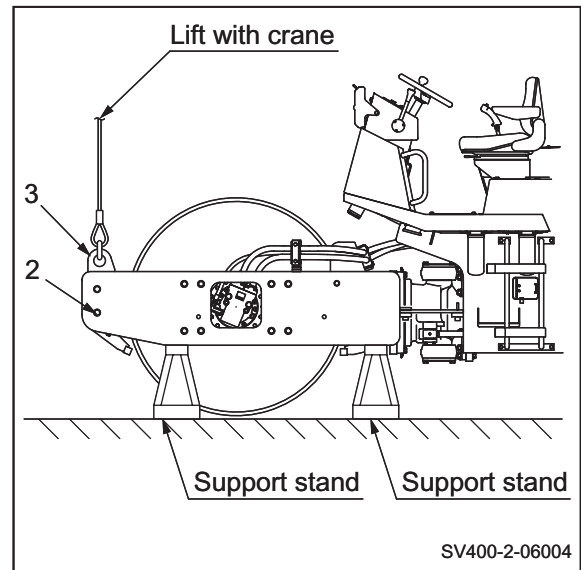
Crossmember

- SV410D-2 : 370 kg (816 lbs.)
- SV410T-2 : 410 kg (903 lbs.)
- SV410TF-2 : 470 kg (1,036 lbs.)
- SV410TB-2 : 410 kg (903 lbs.)
- SV410FB-2 : 470 kg (1,036 lbs.)

- When installing



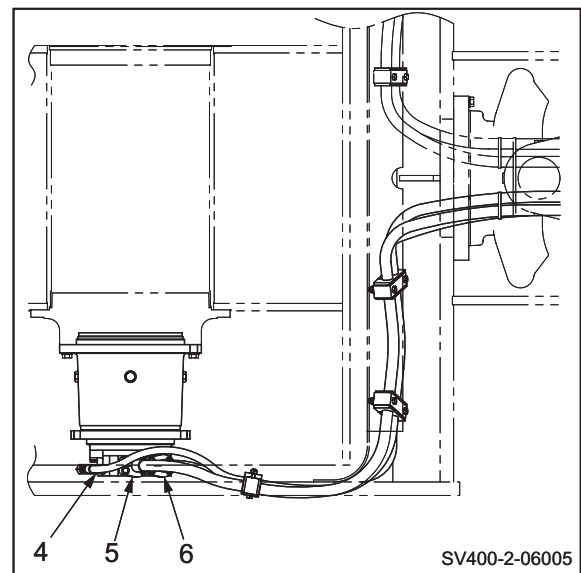
- (2) M20×100: 540 N·m (398 lbf·ft)



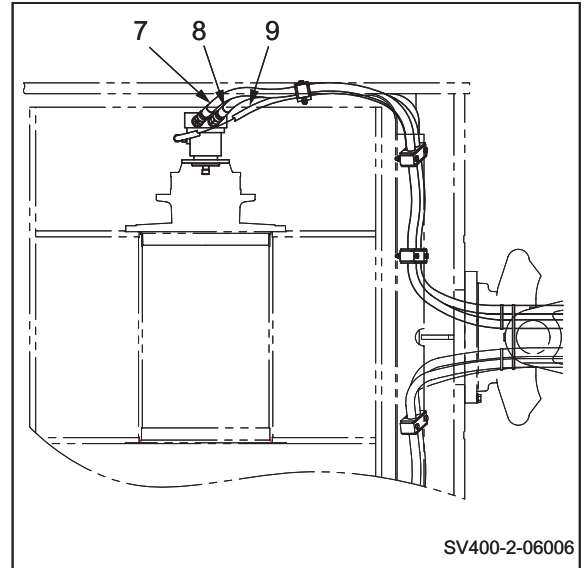
- 5) Disconnecting piping
 - ① Propulsion motor piping
 - Disconnect the hydraulic hoses (4, 5 and 6) that are connected to the propulsion motor.
 - ★ **Either plug both sides of disconnected connections or take other steps to prevent dust from getting inside.**

WARNING

Immediately after the vehicle has stopped, the hydraulic oil will be hot and under builtup pressure. If, under these conditions, you try to disconnect the piping, you may get burned. Therefore, wait until the oil has cooled before engaging in this task.




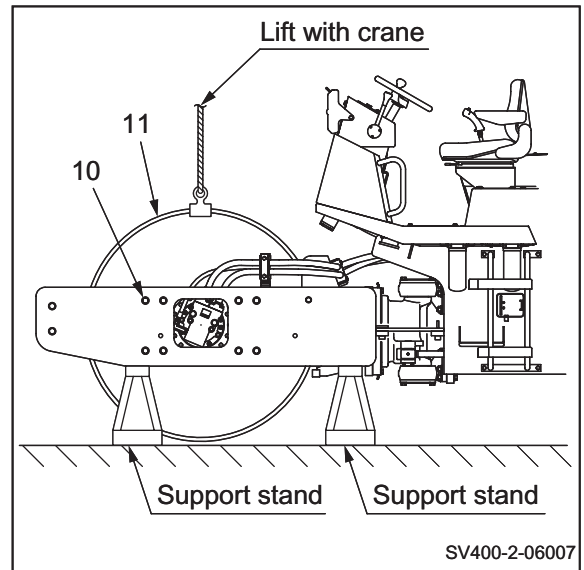
- ② Vibrator motor piping
 Disconnect the hydraulic hoses (7, 8 and 9) that are connected to the vibrator motor.
 ★ **Either plug both sides of disconnected connections or take other steps to prevent dust from getting inside.**



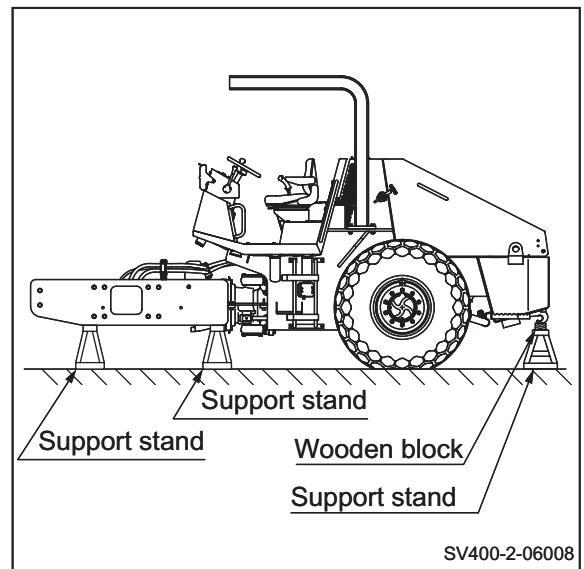
- 6) Lift the drum (11) with a crane. Ensuring that no load is applied to the eight bolts (10), loosen and remove the bolts (10). (Similarly, remove the bolts from the opposite side, too.) Separate the drum assembly and front frame.

- When installing

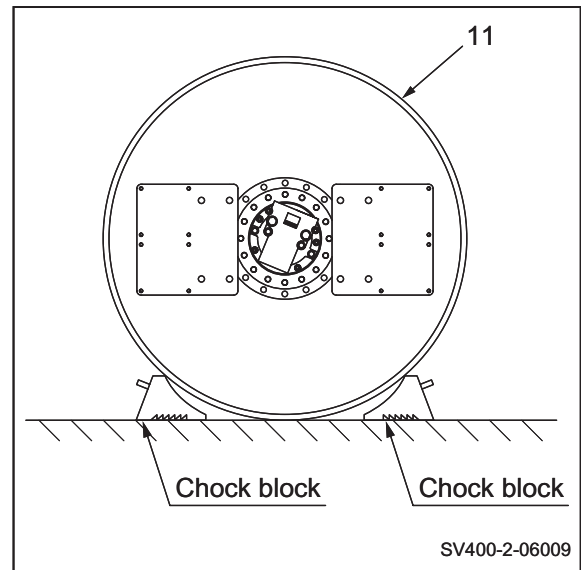
 (10) M20×90: 540 N·m (398 lbf·ft)



- 7) As shown in the figure on the right, use support stands or other means to firmly secure the side of the vehicle body on which the drum was removed. Ensure that the vehicle body does not move.



- 8) Place chock blocks at the front and rear of the removed drum assembly (11) to prevent the drum assembly from moving.



2-1-2. Installation of vibratory drum

- 1) Install the vibratory drum in the reverse order in which it was removed.
 - Tightening torque for bolts in locations requiring particular attention during reinstallation of the vibratory drum:



(10) M20×90: 540 N·m (398 lbf·ft)

(2) M20×100: 540 N·m (398 lbf·ft)

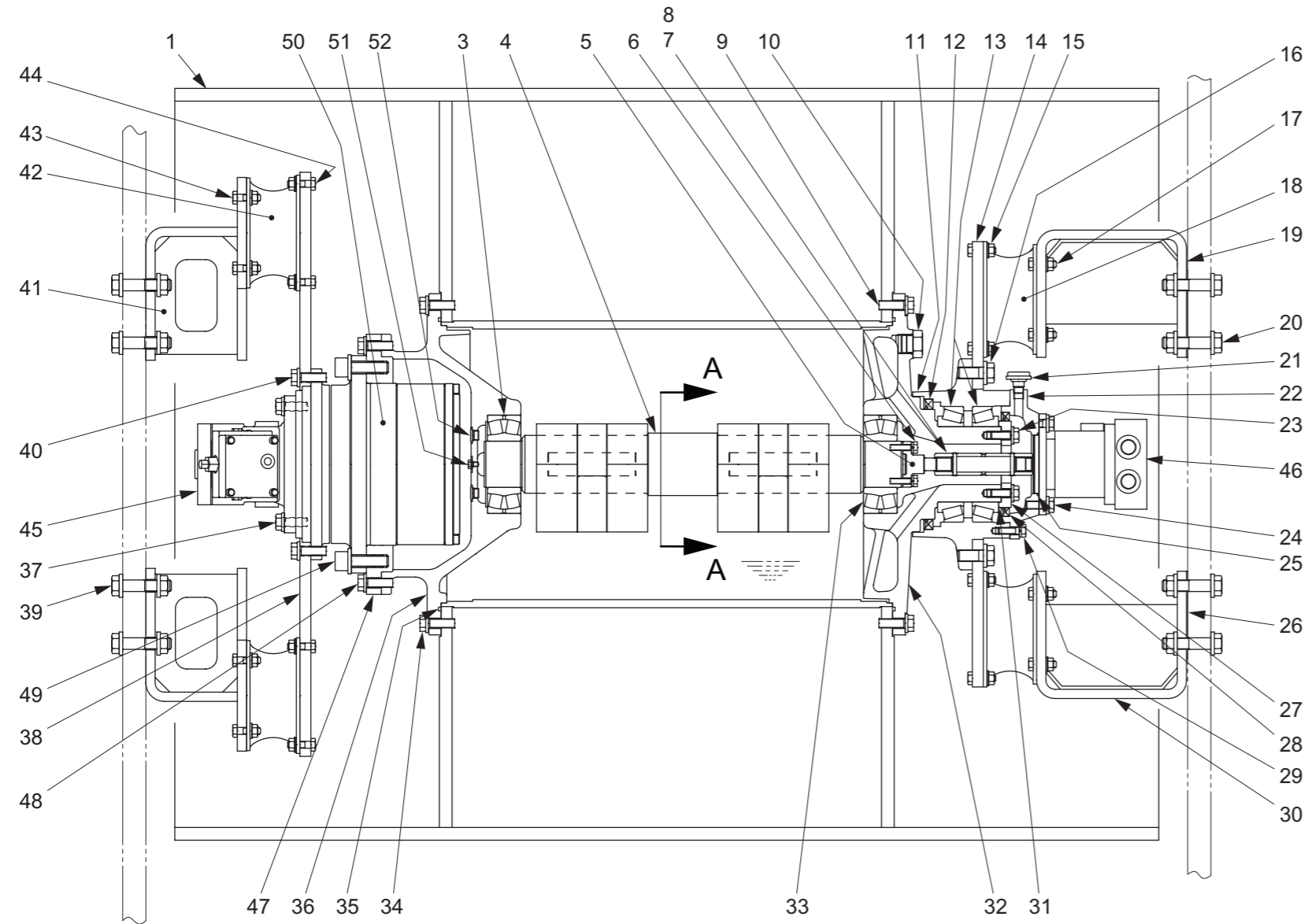
- 2) When installing the vibratory drum, pay particular attention to the items mentioned below.

CAUTION

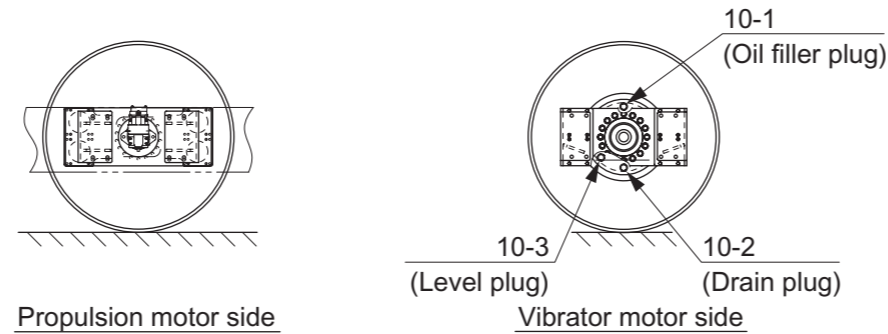
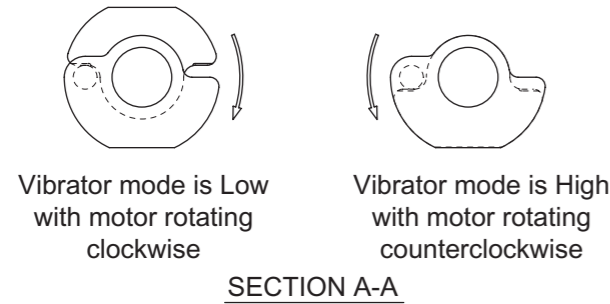
If the engine is run at high speed or the cylinder is operated to full stroke when the engine is started for the first time after work is completed, the piston packing or other items may be damaged by air entering into the cylinder.

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

2-2. Vibratory Drum Assembly



- (1) Drum
- (3) Vibrator bearing
- (4) Eccentric shaft
- (5) Shaft
- (6) Bolt (M10×40)
- (7) Sleeve
- (8) Spring pin
- (9) Bolt (M16×50)
- (10) Plug
- (11) Housing
- (12) Oil seal
- (13) Roller bearing
- (14) Disc
- (15) Bolt (M12×40)
- (16) Bolt (M20×50)
- (17) Bolt (M12×40)
- (18) Damper
- (19) Holder
- (20) Bolt (M20×90)
- (21) Breather
- (22) Cover
- (23) Bolt (M14×40)
- (24) Bolt (M14×40)
- (25) O-ring
- (26) Shim
- (27) Cover
- (28) Oil seal
- (29) Bolt (M12×40)
- (30) Holder
- (31) Shim
- (32) Axle shaft
- (33) Vibrator bearing
- (34) Bolt (M16×50)
- (35) O-ring
- (36) Housing
- (37) Bolt (M16×50)
- (38) Disc
- (39) Bolt (M20×90)
- (40) Bolt (M16×50)
- (41) Holder
- (42) Damper
- (43) Bolt (M12×40)
- (44) Bolt (M12×40)
- (45) Propulsion motor
- (46) Vibrator motor
- (47) Ring
- (48) Bolt (M16×50)
- (49) Bolt (M22×70)
- (50) Gear box
- (51) Bolt (M8×16)
- (52) Plug



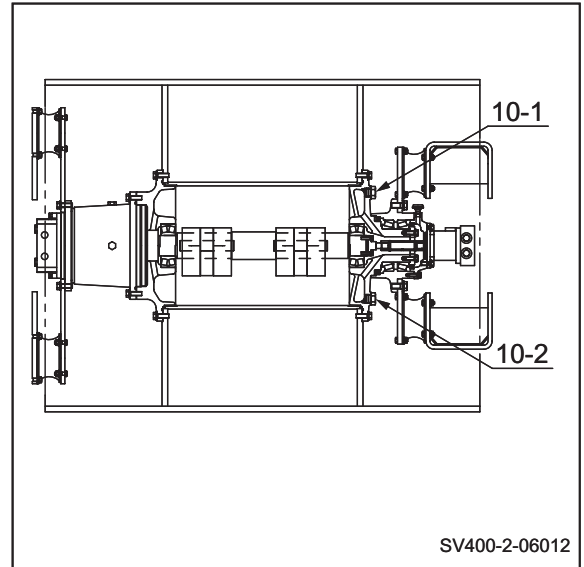
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2-3. Disassembly and Reassembly of Vibratory Drum

- Leader numbers appearing in the vibratory drum disassembly and reassembly procedure illustrations shown below correspond to the numbers indicating the parts of the vibratory drum assembly (page 6-030).

2-3-1. Disassembly of vibratory drum

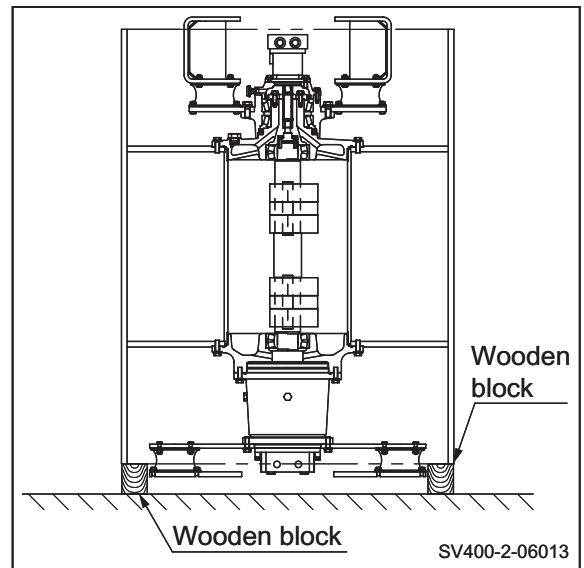
- 1) Remove the plugs (10-1 and 10-2).
 - Drain the gear oil from the vibrator case.
 - Gear oil quantity: 21 L (5.5 gal.)



- 2) Lift the vibratory drum with a crane. As shown in the figure on the right, stand it up with the propulsion motor side facing downward.

⚠ WARNING

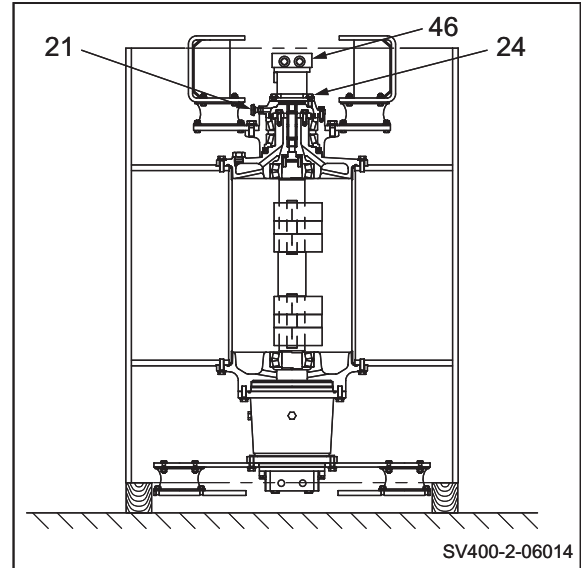
After standing up the drum, place wooden blocks that have sufficient strength underneath. Stabilize the drum so that it is not unsteady.



Vibratory drum assembly

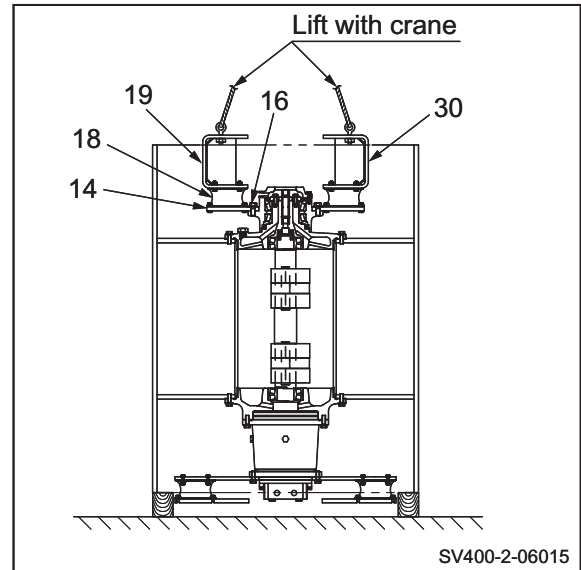
SV410D-2	: 2,665 kg (5,875 lbs.)
SV410T-2	: 2,865 kg (6,316 lbs.)
SV410TF-2	: 4,205 kg (9,270 lbs.)
SV410TB-2	: 2,865 kg (6,316 lbs.)
SV410FB-2	: 4,205 kg (9,270 lbs.)


- 3) Remove the two bolts (24).
 - Remove the vibrator motor (46).
 - Remove the breather (21).



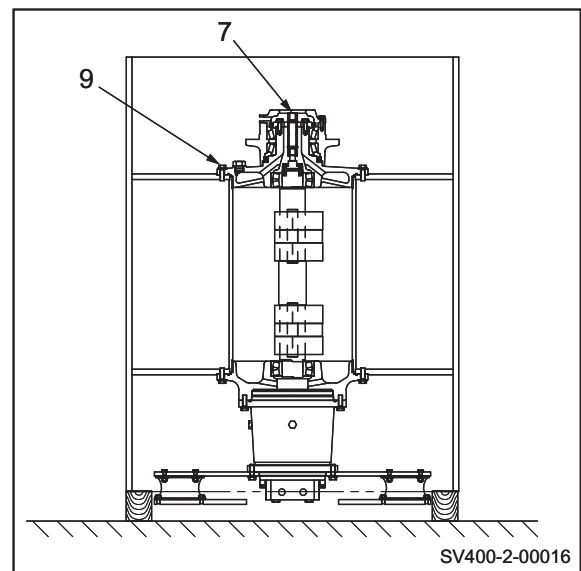
WARNING
 Use aids such as work stepladders when working, and work with a natural, unstrained posture.

- 4) Remove the sixteen bolts (16).
 - Attach the lifting bolts/nuts (M20×2.5) as shown in the figure on the right.
 - Using a crane, lift and remove the holder (19), damper (18) and disc (14) together.



 Total of lifted parts (19, 30, 18 and 14)
 : 135 kg (298 lbs.)

- 5) Remove the sixteen bolts (9).
 - Remove the sleeve (7).

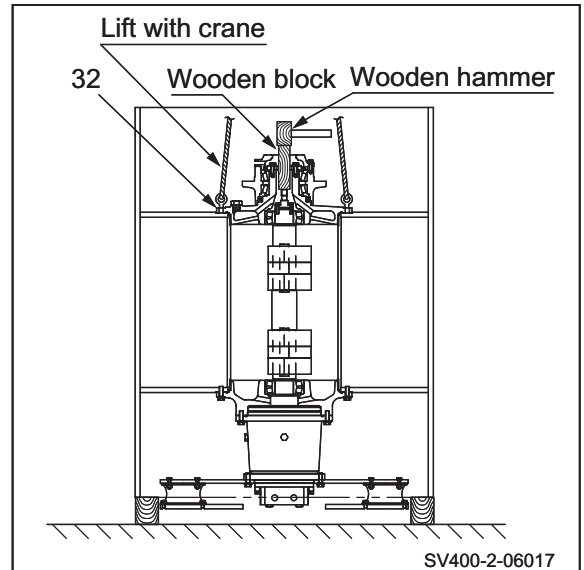


- 6) Attach the lifting bolts (M16×2.0) as shown in the figure on the right.
 - Using a crane, slowly lift and remove the axle shaft (32).
 - ★ At this time, to ensure that the vibrator shaft does not follow along with the axle shaft (32), lift the end of the vibrator shaft while lightly tapping with a wooden hammer through a wood block.


 Axle shaft: 150 kg (331 lbs.)

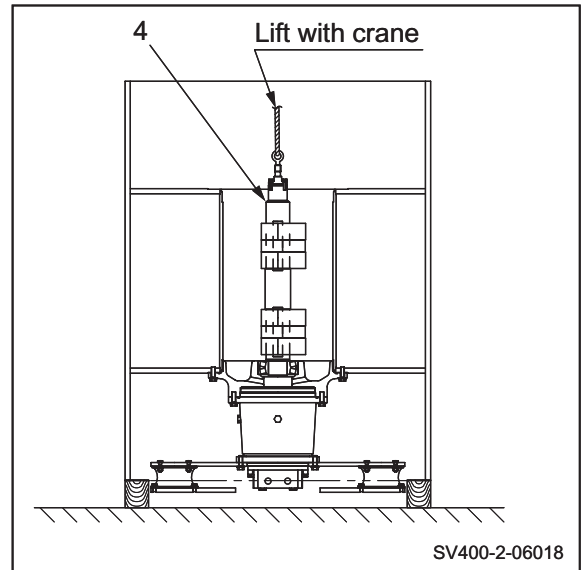
CAUTION

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

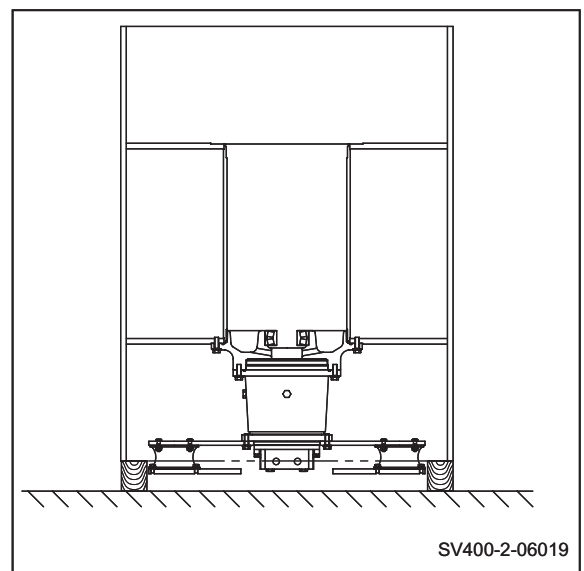


- 7) Attach a lifting bolt (M10×1.5) to the end of the eccentric shaft (4). Then lift with a crane and remove.

 Eccentric shaft: 135 kg (298 lbs.)



- 8) In the figure on the right, the vibrator motor side is up. From the top, the figure shows the condition with the part removed.



9) Lift and invert the drum with a crane. Stand it up with the propulsion motor side upward.

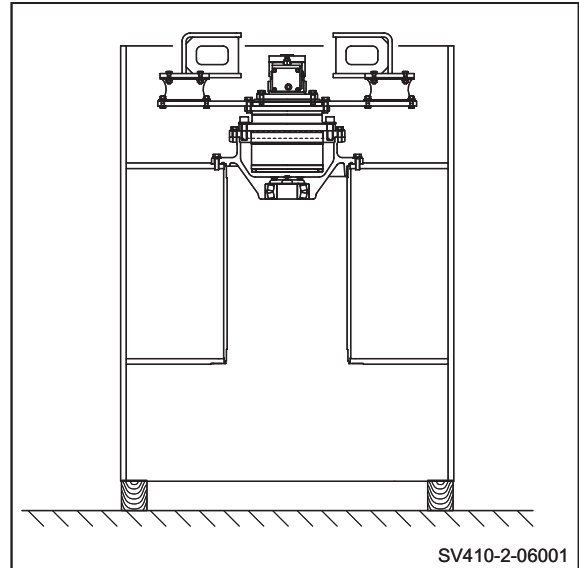


Lifted weight in figure on the right

- SV410D-2 : 2,225 kg (4,905 lbs.)
- SV410T-2 : 2,425 kg (5,346 lbs.)
- SV410TF-2 : 3,765 kg (8,300 lbs.)
- SV410TB-2 : 2,425 kg (5,346 lbs.)
- SV410FB-2 : 3,765 kg (8,300 lbs.)

WARNING

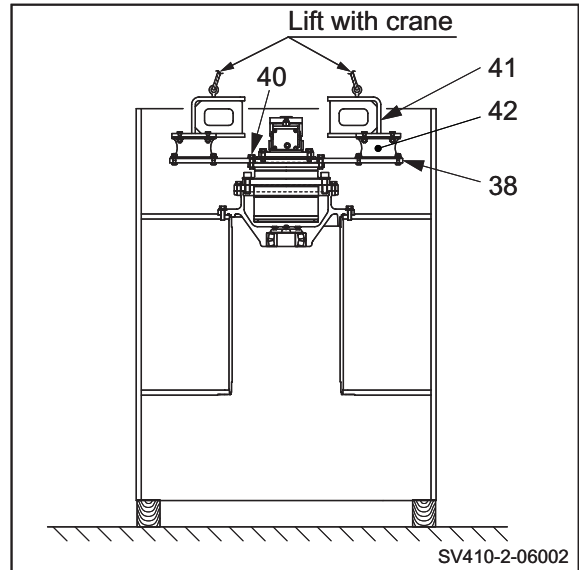
Inverting the drum can be dangerous work. Therefore, be very careful, confirm that the surrounding area is safe and work in a natural, unstrained posture.



10) Remove the seventeen bolts (40).
 • As shown in the figure on the right, attach the lifting bolt/nut (M20×2.5) to the holder (41) and slowly lift. Remove together with the damper (42) and disc (38).



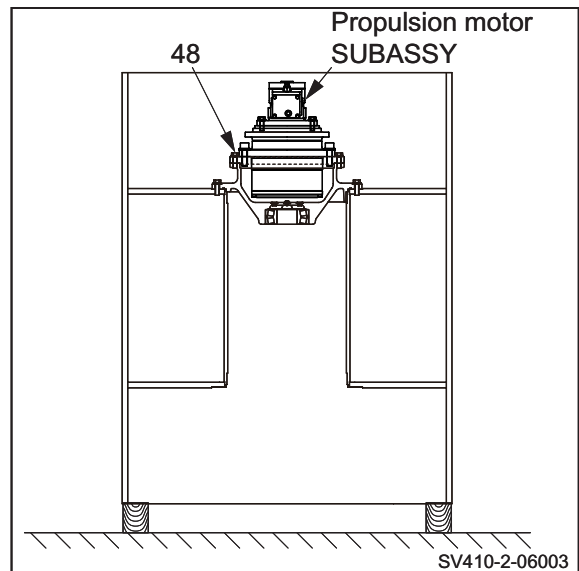
Total of lifted parts (41, 42 and 38)
 : 145 kg (320 lbs.)



11) Remove the eighteen bolts (48).
 • Remove the propulsion motor SUBASSY.

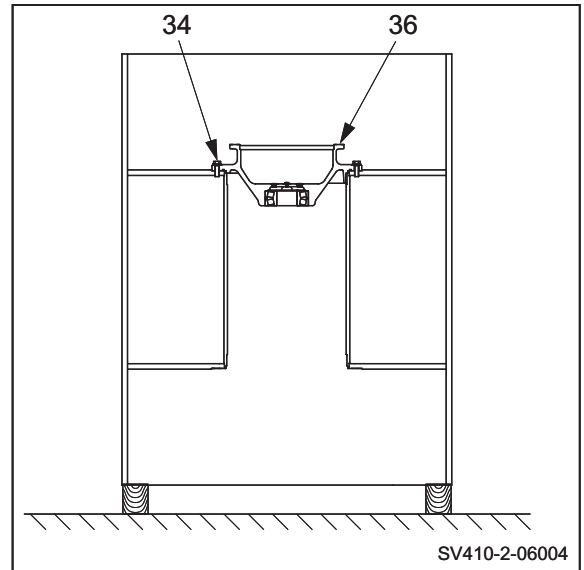


Propulsion motor SUBASSY
 : 145 kg (320 lbs.)

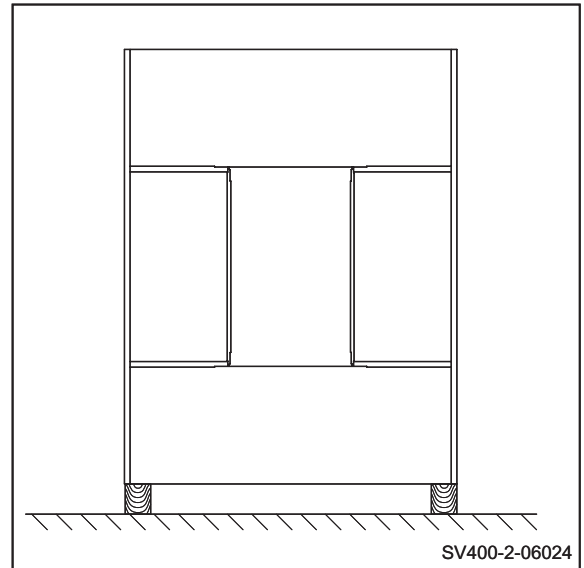


- 12) Remove the sixteen bolts (34).
 • Remove the housing (36).

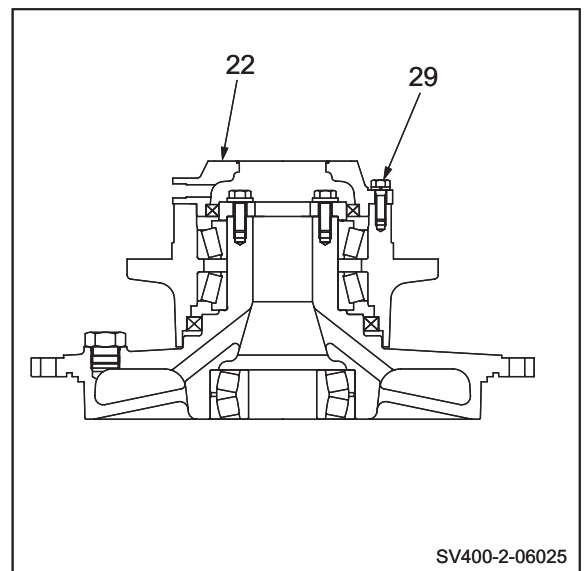
 Axle shaft: 100 kg (220 lbs.)



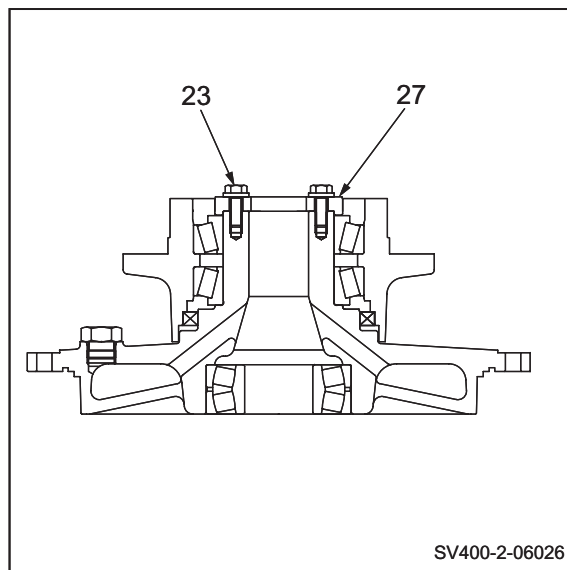
- 13) The figure on the right shows the condition in which all parts have been removed from the vibratory drum assembly.



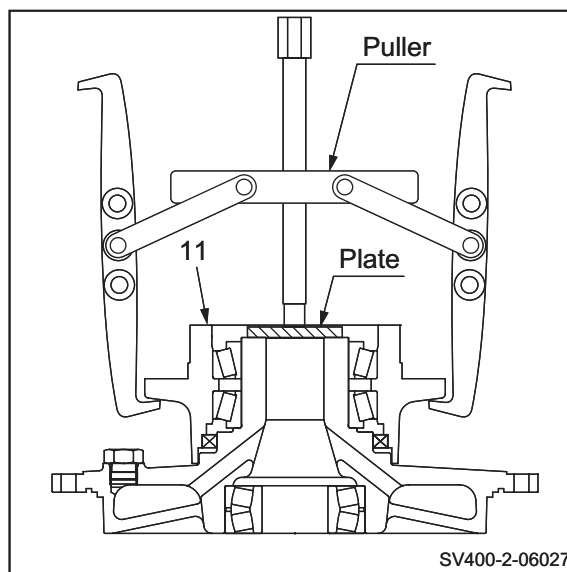
- 14) The figure on the right shows the axle shaft subassembly removed from the vibratory drum.
 • Remove the six bolts (29).
 • Remove the cover (22).



- 15) Remove the eight bolts (23).
• Remove the cover (27).



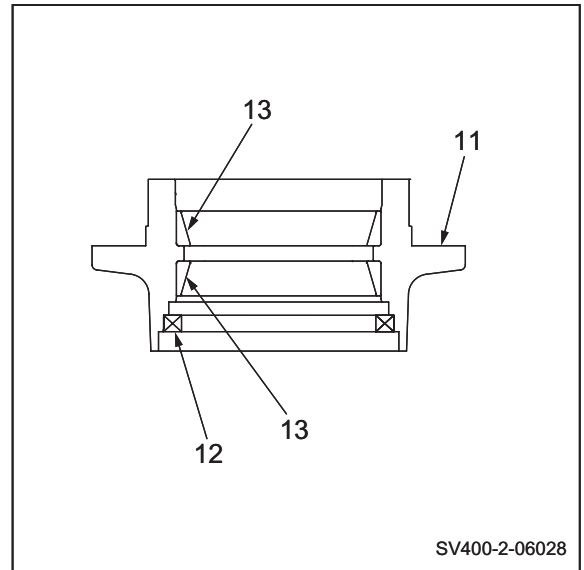
- 16) Place the plate at the end of the axle shaft. With the puller against the housing (11), separate the housing, including the roller bearing, from the axle shaft.



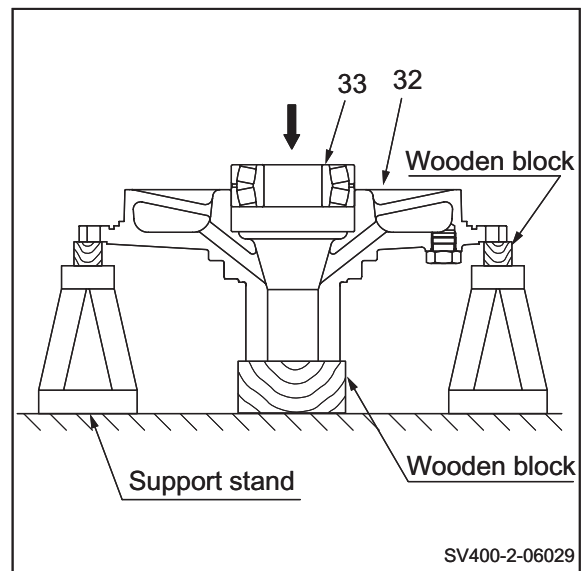
2-3-2. Reassembly of vibratory drum

★ Before reassembling, confirm that each part that was disassembled has been well cleaned and is free of any abnormality.

- 1) Lightly apply gear oil to the press-fitting surface of the roller bearing (13) outer race.
 - Drive the outer race of the roller bearing (13) into the housing (11).
 - Attach the oil seal (12).



- 2) As shown in the figure on the right, firmly secure the axle shaft (32) with support stands and/or wooden blocks.
 - Lightly apply gear oil to the press-fitting surface of the vibrator bearing (33).
 - Drive in the vibrator bearing (33).

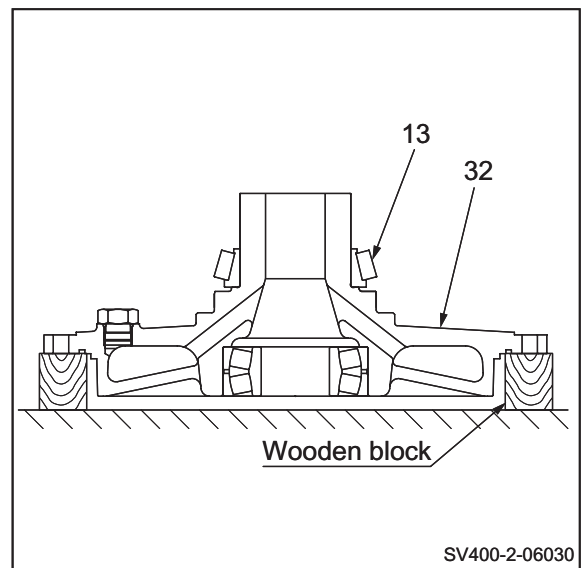


- 3) Using a crane, lift and invert the axle shaft (32) subassembly.



kg Axle shaft subassembly: 90 kg (198 lbs.)

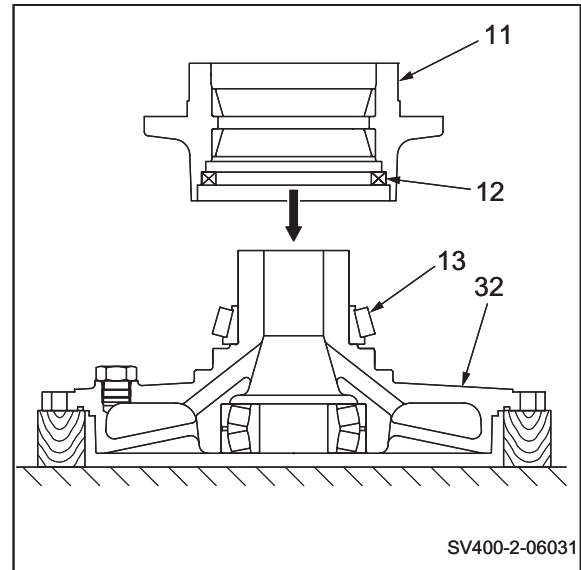
- Lightly apply gear oil to the press-fitting surface of the roller bearing.
- Attach the inner race of the roller bearing (13).



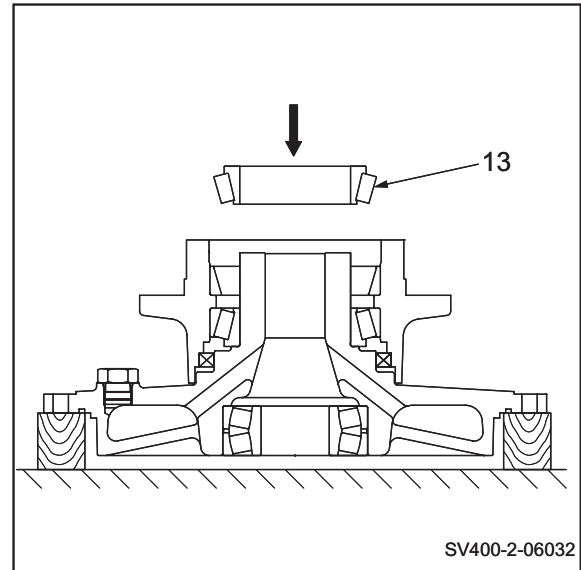
- 4) Apply an ample amount of lithium-based grease to the rolling surfaces of the roller bearing (13).
 - Lightly apply the same grease to the lip surfaces of the oil seal (12).
 - Join the axle shaft (32) subassembly and housing (11).



Housing: 40 kg (88 lbs.)

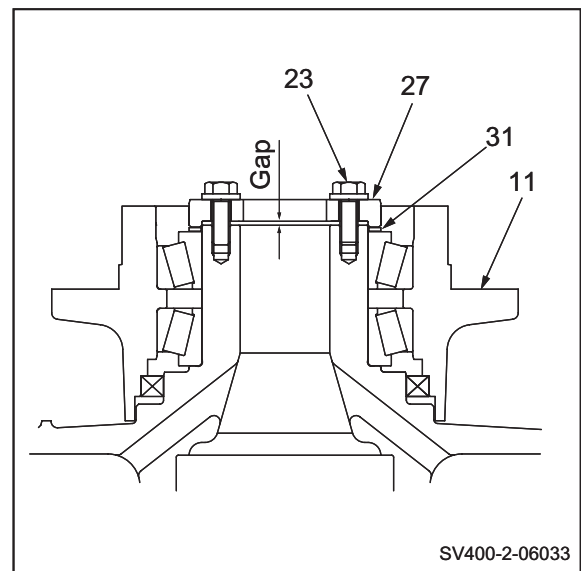


- 5) After applying an ample amount of lithium-based grease to the inner race of the roller bearing (13), drive it in until the inner race's rolling surface makes contact with the outer race.



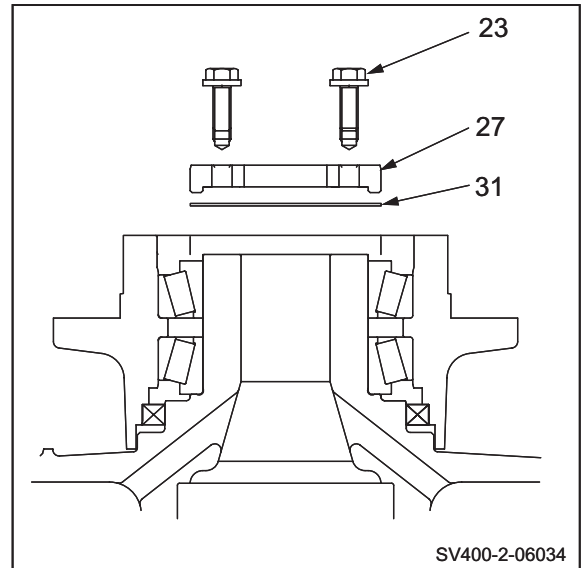
- 6) As shown in the figure on the right, insert shims (31) approximately 1 mm to create a gap between the axle shaft end face and cover (27) interior surface. Then install the cover (27).
 - Install washers to the four bolts (23), and tighten to a tightening torque of 108 N·m (80 lbf·ft).
 - Rotate the housing (11) two or three times. Then tighten the same bolts again to a tightening torque of 108 N·m (80 lbf·ft).
 - Repeat this procedure two or three times until the bolt tightening torque no longer varies.

★ When tightening the bolts (23), alternately tighten by using four of the eight bolts positioned diagonally from each other.



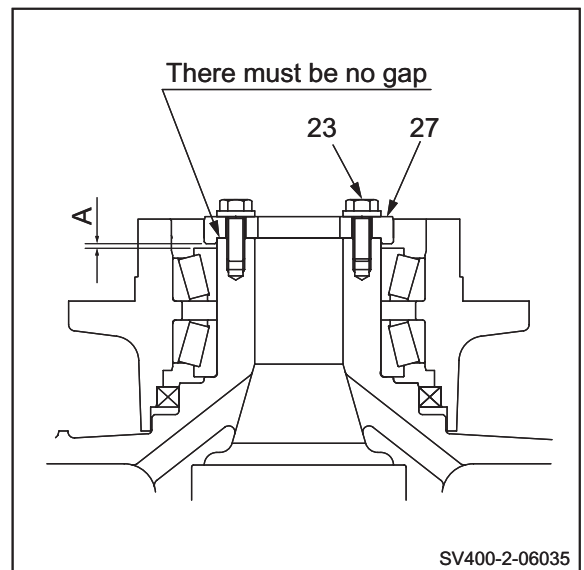
7) Roller bearing preload adjustment

- ① Remove the four bolts (23).
 - Remove the cover (27) and shim (31).



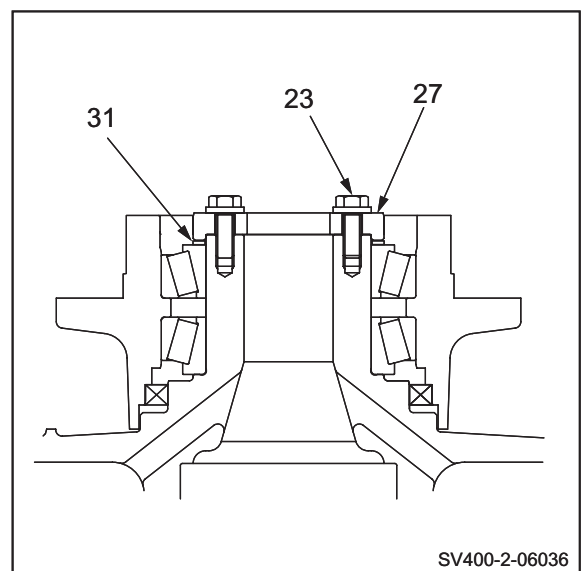
- ② Without inserting shims, install the cover (27). Then install washers to the four bolts (23) and tighten.
 - Using a thickness gauge, measure the gap at dimension A.

★ Preload adjustment shim thickness = $(A+0.1)$ mm




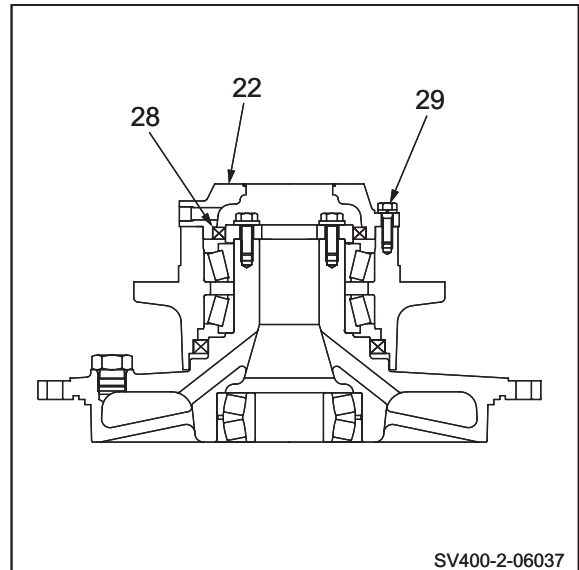
- ③ Remove the bolts (23).
 - Remove the cover (27).
 - Insert the shim (31) whose preload adjustment shim thickness equal to $(A+0.1)$ mm. Then firmly secure the cover (27) again by installing washers to the eight bolts (23).

 (23) M14×40: 170 N·m (125 lbf·ft)




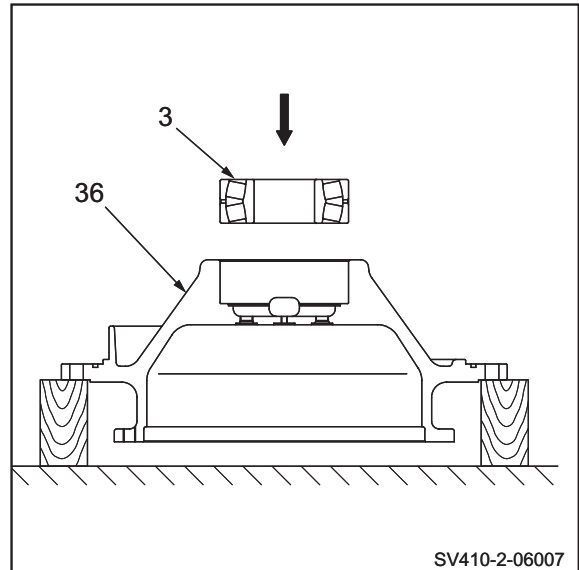
- 8) Install the oil seal (28) to the cover (22).
- Lightly apply grease to the lip surfaces of the oil seal (28).
 - Using the six bolts (29) and spring washers, firmly secure the cover (22) to the housing.

 (29) M12×40: 108 N·m (80 lbf-ft)




- 9) Lightly apply gear oil to the press-fitting surface of the vibrator bearing (3).
- Drive the vibrator bearing (3) into the axle shaft (36).

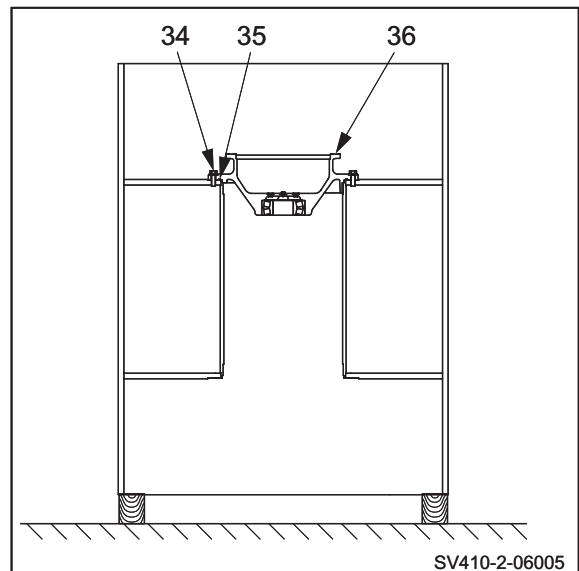
 Axle shaft : 100 kg (220 lbs.)
 Vibrator bearing : 10 kg (22 lbs.)



- 10) Install the O-ring (35) to the housing (36).
- Lightly apply grease to the entire circumference of the O-ring (35).
 - Using the sixteen bolts (34) and washers, firmly secure the housing (36) to the drum.

 (34) M16×50: 270 N·m (199 lbf-ft)

NOTE : When installing, make sure that the O-ring does not protrude from the groove.



WARNING
 Use aids such as work stepladders when working, and work with a natural, unstrained posture.

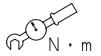
11) Using the eighteen bolts (48) and washers, firmly secure the propulsion motor SUBASSY to the axle shaft.

NOTE: When attaching, make sure that the O-ring does not protrude from the groove.

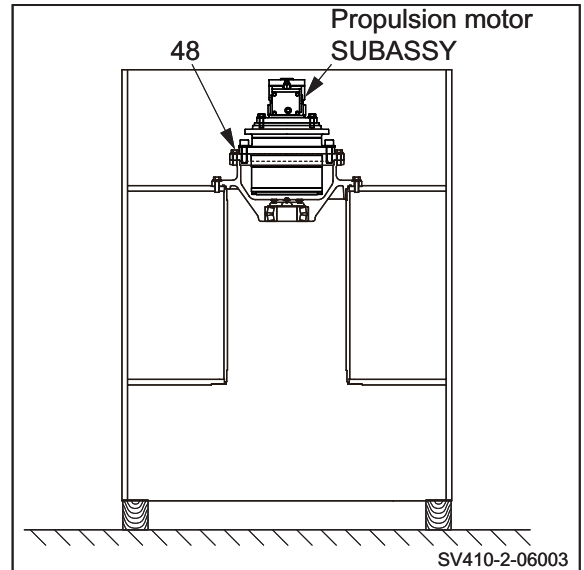


Propulsion motor SUBASSY

: 145 kg (320 lbs.)



(48) M16×50: 270 N·m (199 lbf·ft)



12) Using the seventeen bolts (40) and washers, firmly secure the subassembly of the holder (41), damper (42) and disc (38) to the propulsion motor.

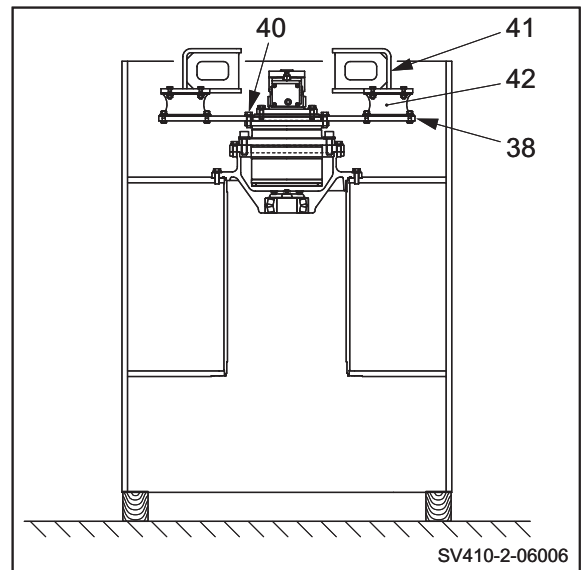


Total of lifted parts (41, 42 and 38)

: 145 kg (320 lbs.)



(40) M16×50: 270 N·m (199 lbf·ft)



13) Lifting with a crane, invert the drum as shown in the figure on the right.



Lifted weight in figure on the right

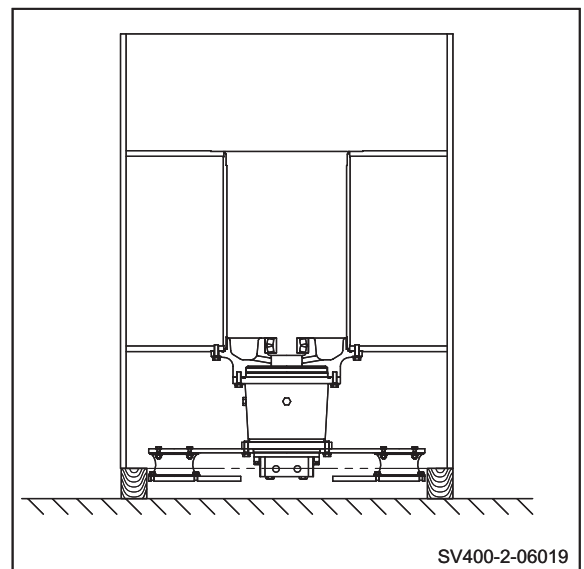
SV410D-2 : 2,225 kg (4,905 lbs.)

SV410T-2 : 2,425 kg (5,346 lbs.)

SV410TF-2 : 3,765 kg (8,300 lbs.)

SV410TB-2 : 2,425 kg (5,346 lbs.)

SV410FB-2 : 3,765 kg (8,300 lbs.)




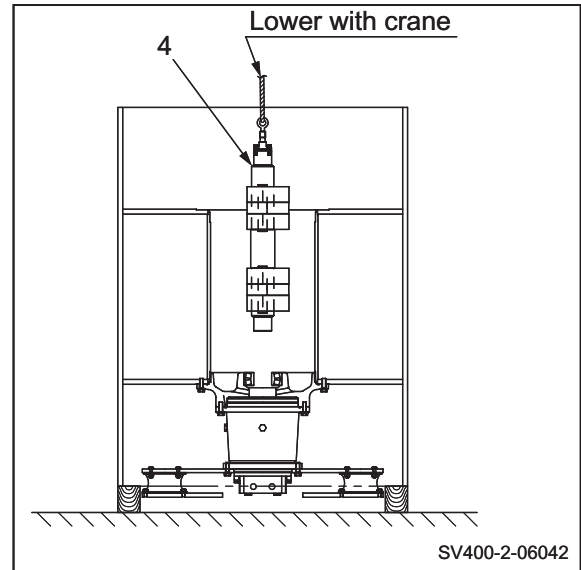
WARNING

Inverting the drum can be dangerous work. Therefore, be very careful, confirm that the surrounding area is safe and work in a natural, unstrained posture.

14) Attach a lifting bolt (M10×1.5) to the end of the vibrator shaft (4). Then lift with a crane, slowly lower and attach.

★ When inserting the vibrator shaft into the vibrator bearing for attachment, be careful not to allow the inner race of the vibrator bearing to lean.


 Vibrator shaft: 135 kg (298 lbs.)

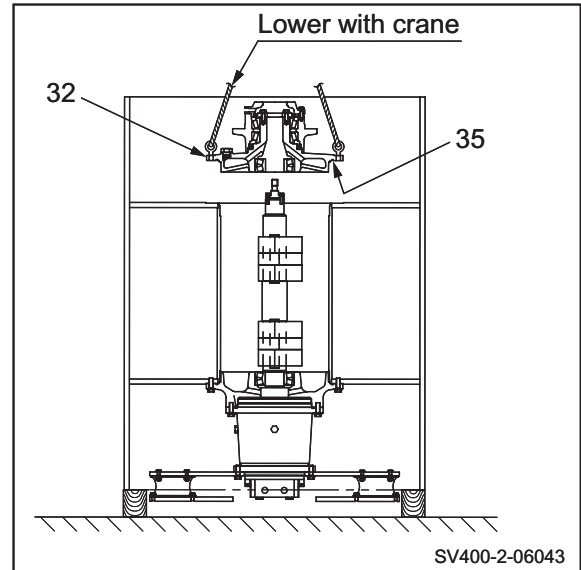


15) Attach the O-ring (35) to the axle shaft (32) subassembly.

- Lightly apply grease to the entire circumference of the O-ring (35).
- Lift and slowly lower the axle shaft (32) subassembly with a crane.


★ When attaching the axle shaft, move the vibrator shaft until the center of the vibrator bearing inner race is aligned with the center of the shaft. Be careful not to allow the vibrator bearing to lean.

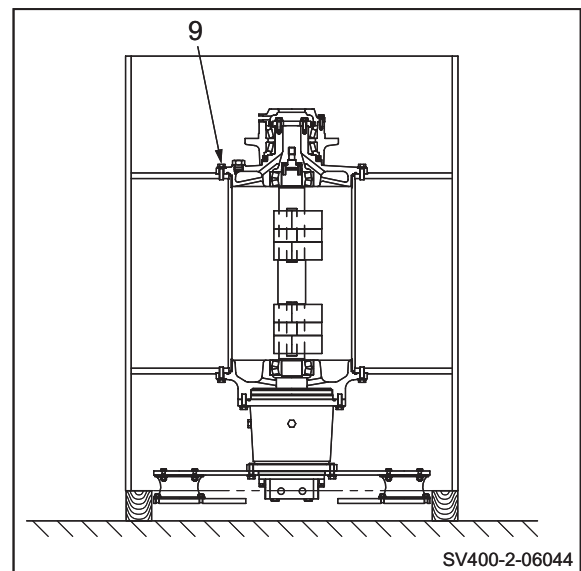
 Axle shaft (32) subassembly : 150 kg (331 lbs.)



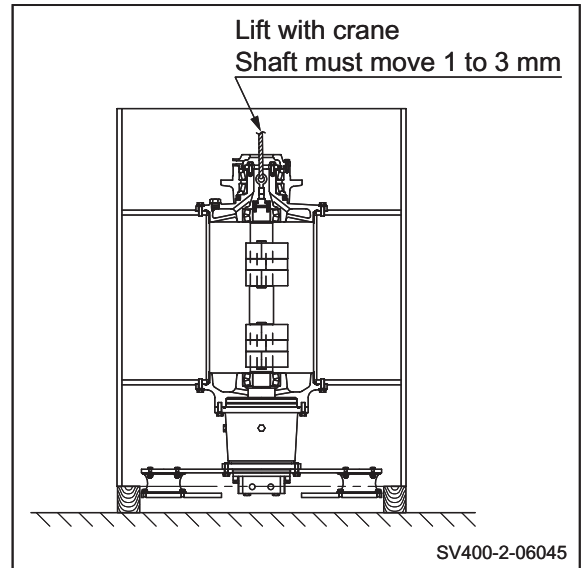
16) Using the sixteen bolts (9) and washers, firmly secure the axle shaft subassembly to the drum.

NOTE: When attaching, make sure that the O-ring does not protrude from the groove.

 (21) M16×50: 270 N·m (199 lbf-ft)



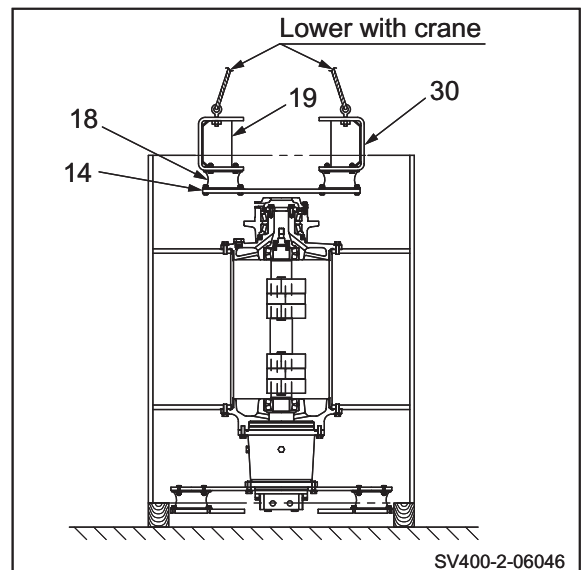
17) Attach a lifting bolt (M10×1.5) to the vibrator shaft end. Then slowly lift with a crane. Confirm that 1 to 3 mm (0.04 to 0.12 in.) of play exists in the axial direction.



18) Using a crane, lift and slowly lower the subassembly of the holder (19 and 30), damper (18) and disc (14).



Total of lifted parts (19, 30, 18 and 14)
: 135 kg (298 lbs.)

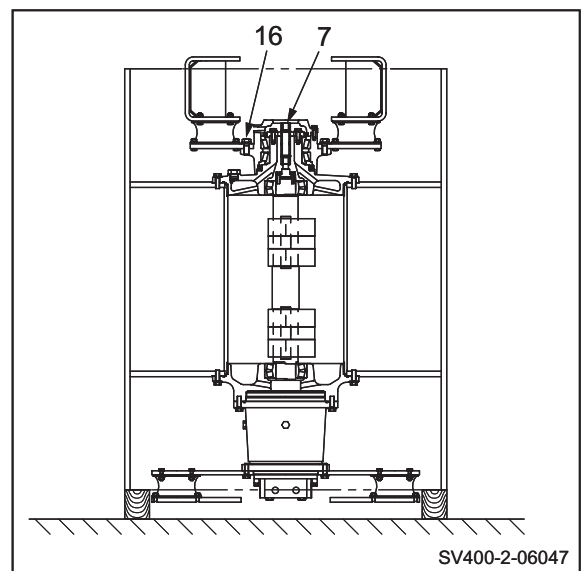


19) Using the sixteen bolts (16) and washers, firmly secure the holder subassembly to the housing.

- Apply a molybdenum-based grease to the spline surface of the sleeve (7), and attach it to the spline shaft at the end of the vibrator shaft.



(16) M20×50: 540 N·m (398 lbf·ft)

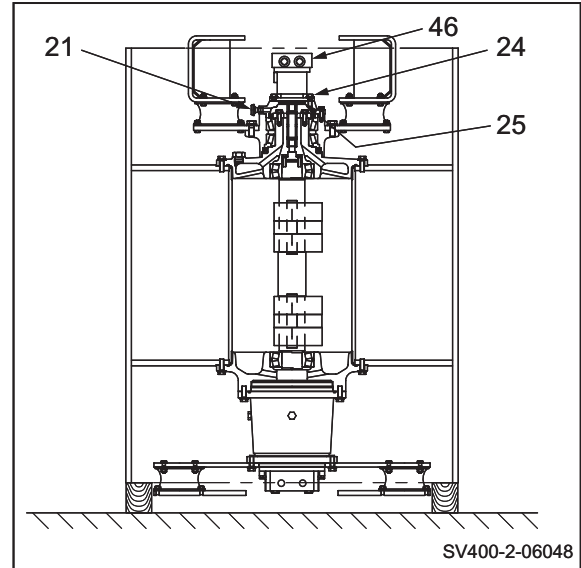


20) Attach the breather (21).

- Attach the O-ring (25) to the vibrator motor (46). Using the two bolts (24) and washers, firmly secure it to the cover.

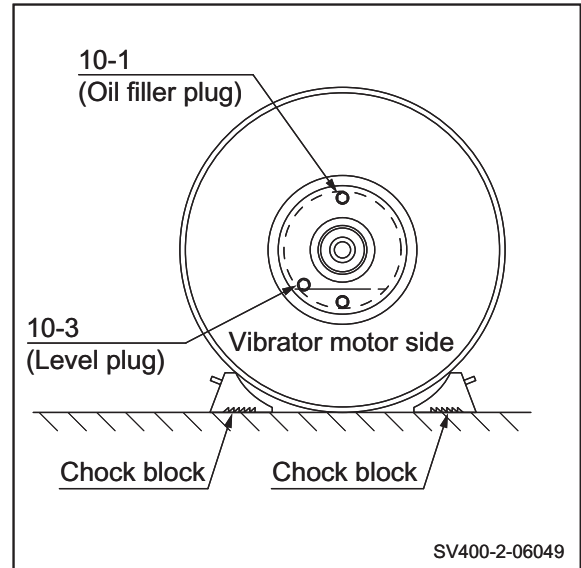
★ Attach by aligning the top side of the vibrator motor (46) and breather (21) with the top side of the propulsion motor.

 (24) M14×40: 170 N·m (125 lbf·ft)



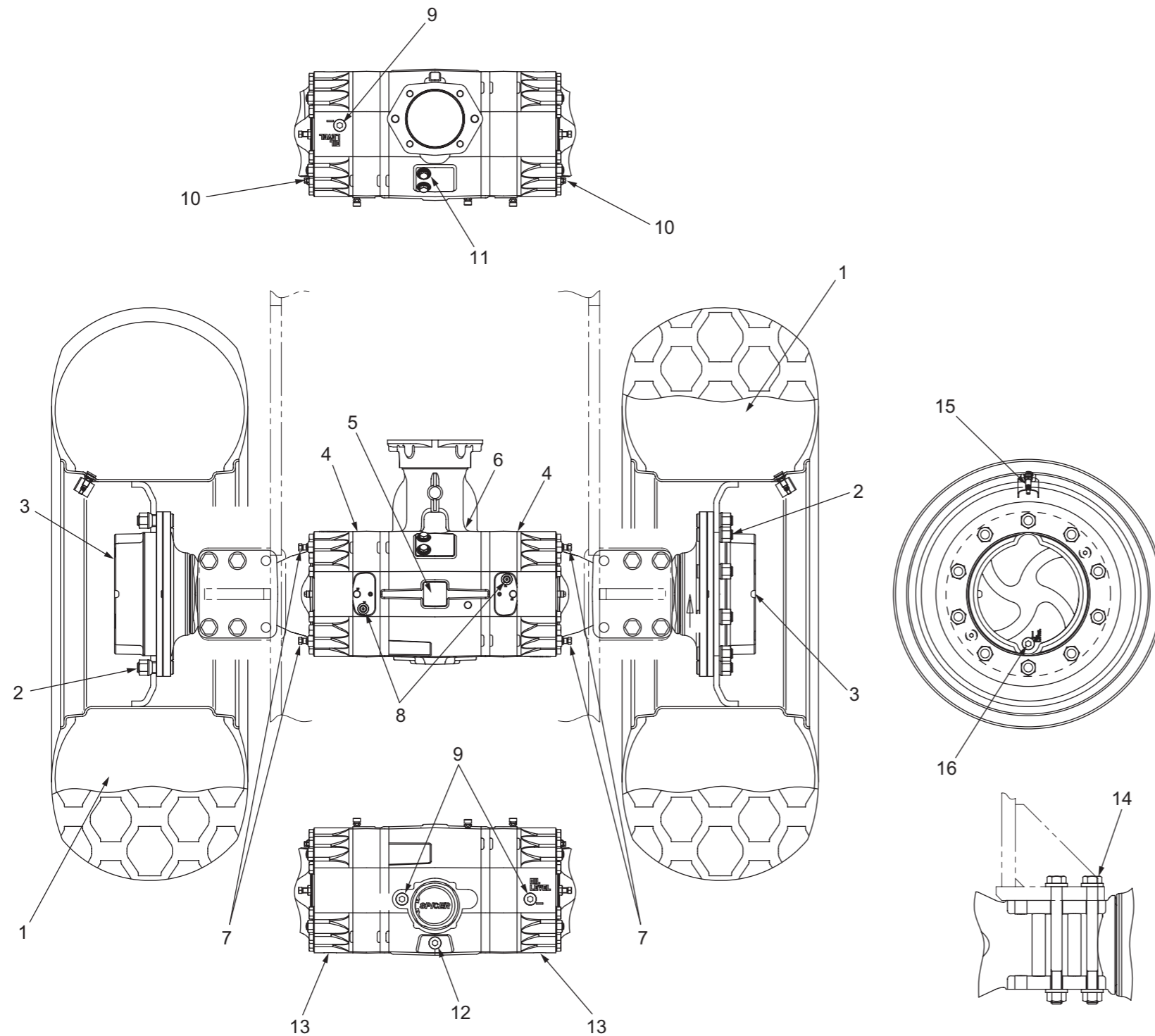
21) Lift the vibratory drum assembly with a crane, and set it sideways at the position of the plug shown in the figure on the right.

- Remove the oil filler plug and level plug.
- From the oil filler plug hole, add approximately 21 L (5.5 gal.) of gear oil until gear oil drips from the level plug hole.
- Attach the oil filler plug and level plug.




3. AXLE

3-1. Rear Axle (SV410D-2)



(1) Tire {Tire inflation pressure: 137.34 kPa (20 psi)}

(2) Nut (M22 p=1.5)

 785 N·m (579 lbf-ft)

(3) Hub reduction gear

(4) Brake

(5) Differential

(6) Center housing

(7) Bolt (for brake release)

(8) Plug (for brake component lubrication)

(9) Plug (for brake and differential component lubrication and level gauge)


(10) Bolt (for brake adjustment)

(11) Plug (for differential component lubrication)

(12) Plug (for differential component drain)

(13) Plug (for brake component drain)

(14) Bolt (M20×220)

 540 N·m (398 lbf-ft)

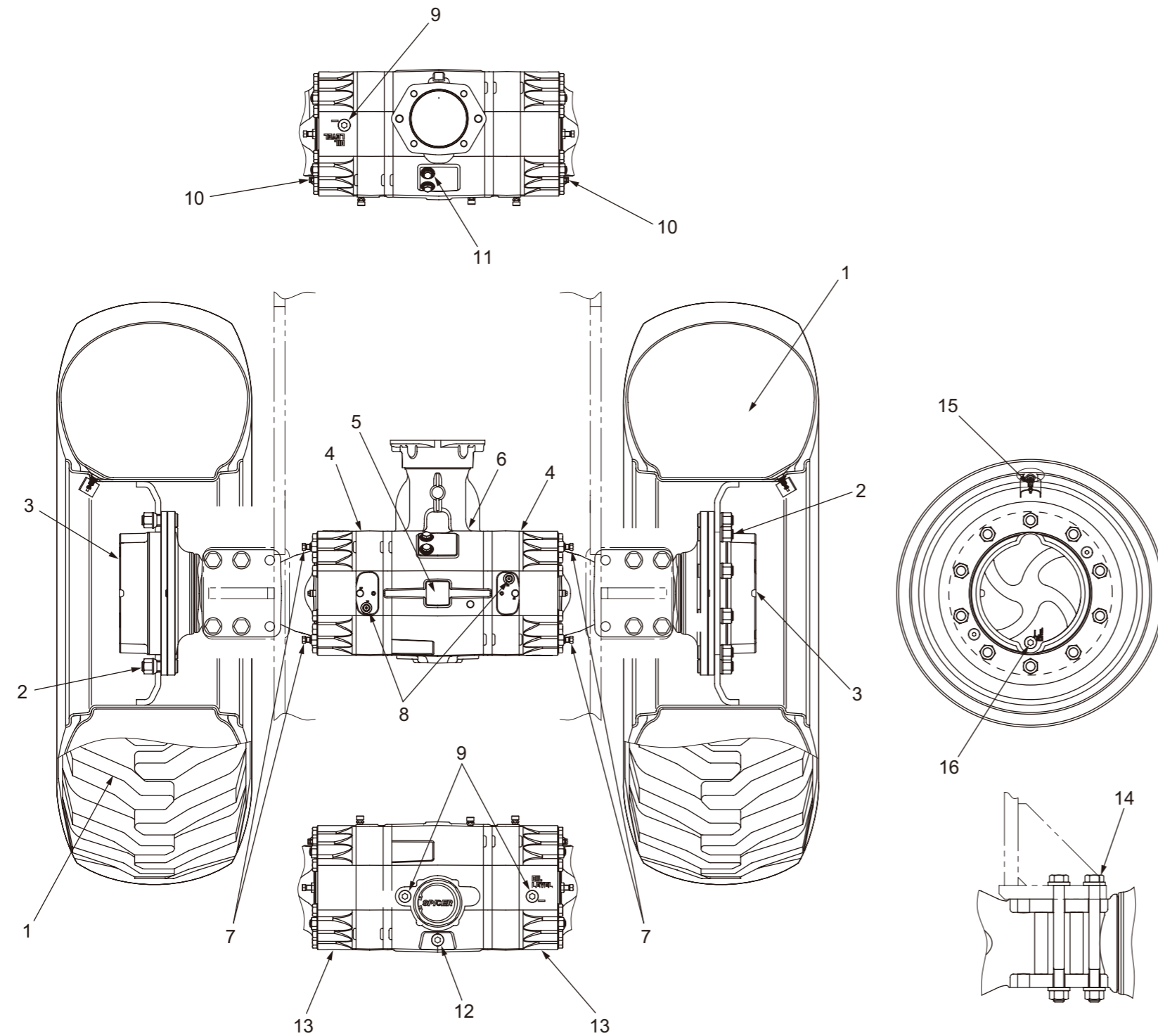
(15) Valve

(16) Plug (for hub reduction gear component lubrication, level gauge and drain)

• Rear axle assembly weight : 630 kg (1,389 lbs.)


• Tire assembly weight : 130 kg (287 lbs.)

3-2. Rear Axle (SV410T-2, TF-2, TB-2, FB-2)



(1) Tire {Tire inflation pressure: 137.34 kPa (20 psi)}

(2) Nut (M22 p=1.5)

 785 N·m (579 lbf-ft)

(3) Hub reduction gear

(4) Brake

(5) Differential

(6) Center housing

(7) Bolt (for brake release)

(8) Plug (for brake component lubrication)

(9) Plug (for brake and differential component lubrication and level gauge)


(10) Bolt (for brake adjustment)

(11) Plug (for differential component lubrication)

(12) Plug (for differential component drain)

(13) Plug (for brake component drain)

(14) Bolt (M20×220)

 540 N·m (398 lbf-ft)

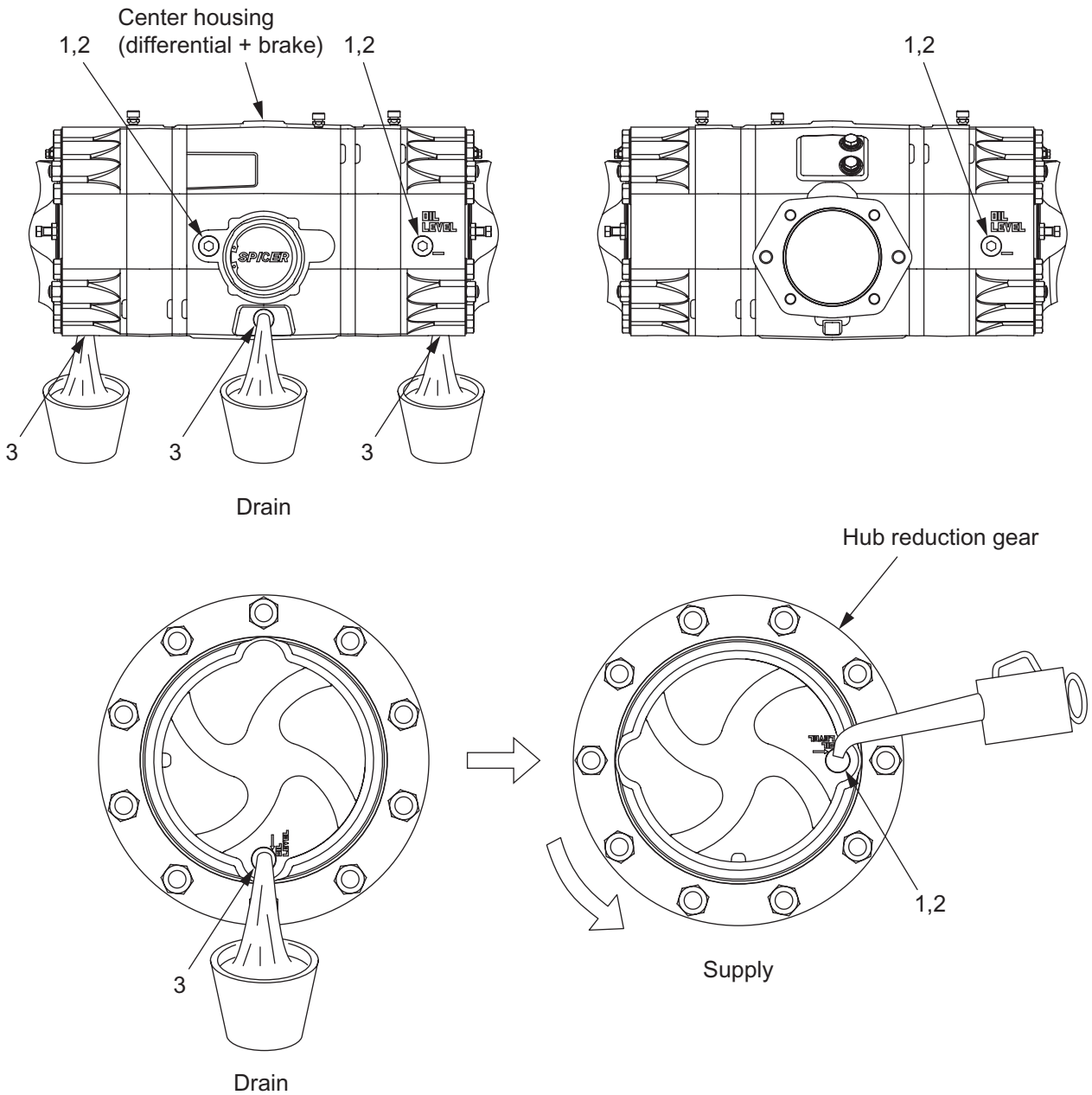
(15) Valve

(16) Plug (for hub reduction gear component lubrication, level gauge and drain)

• Rear axle assembly weight : 660 kg (1,455 lbs.)

• Tire assembly weight : 145 kg (320 lbs.)

3-3. Rear Axle Lubrication



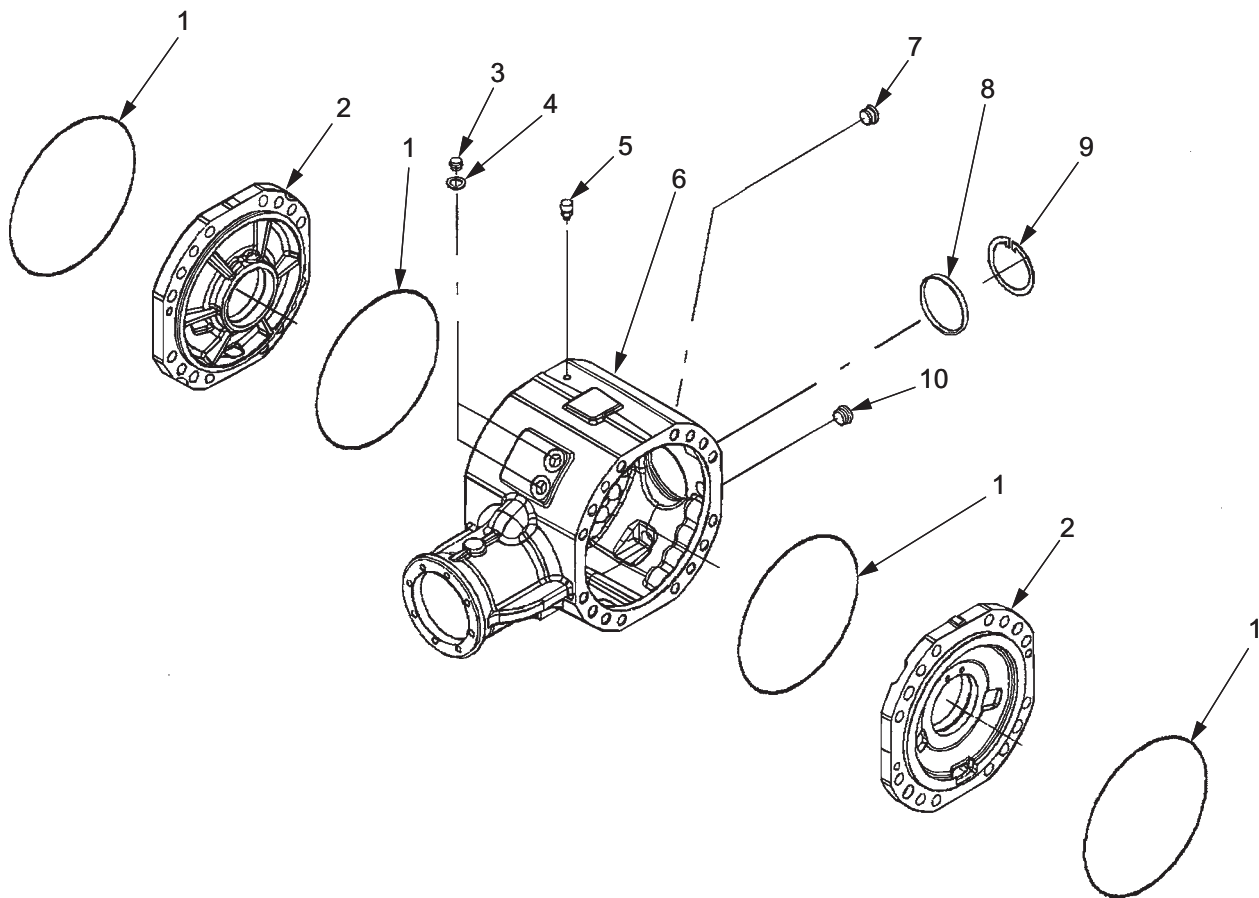
SV201-1-06094

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

- Change oil : Gear oil API-grade GL4 SAE90 (See recommended lubrication.)
- Change oil quantity
 - Center housing : 6.8 L (1.8 gal.)
 - Hub reduction gear : 0.75 L×2 (0.2 gal.×2)

3-4. Rear Axle Structure

3-4-1. Center housing



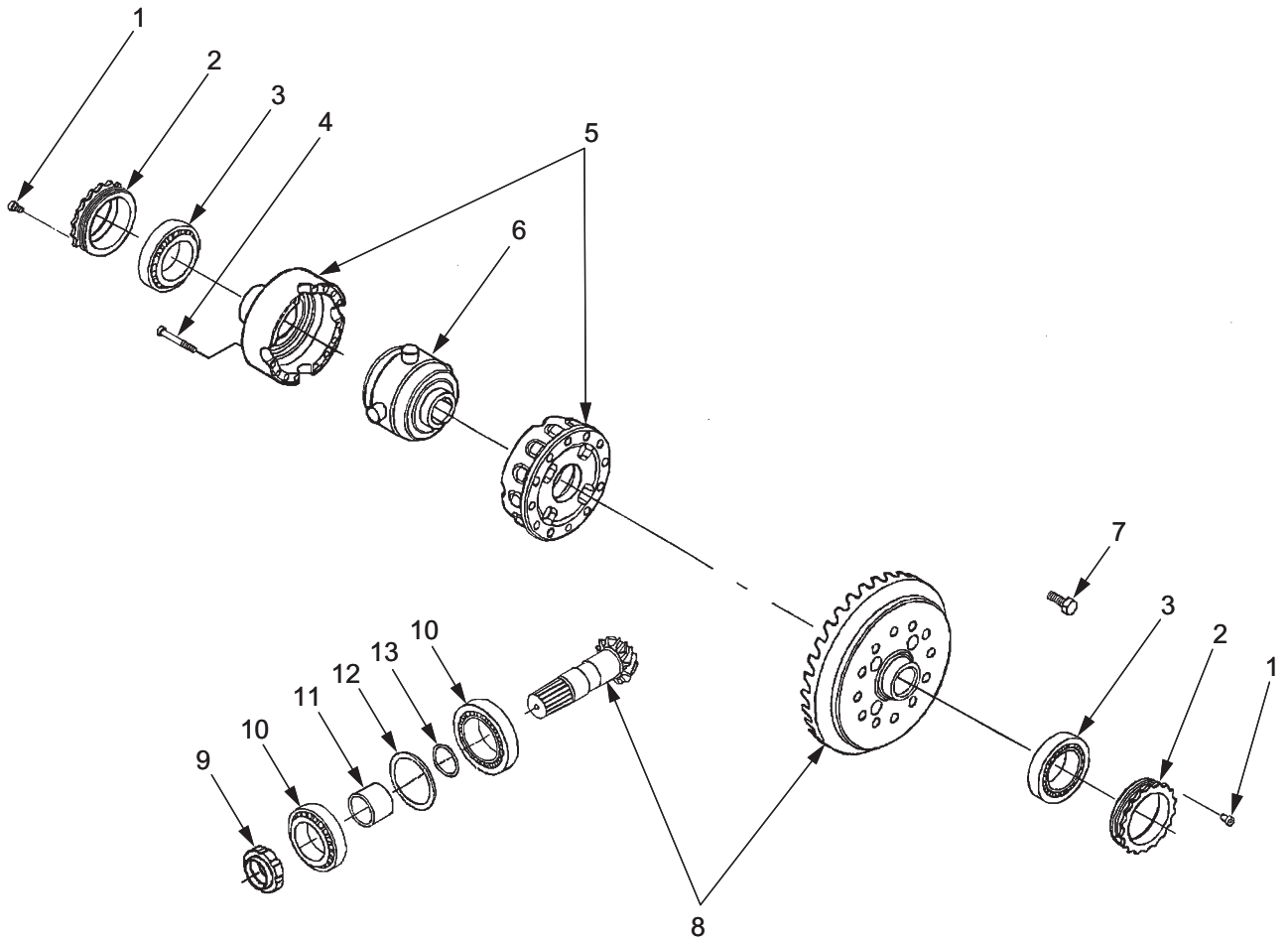
SV201-1-06095

- (1) O-ring
- (2) Cover
- (3) Bolt
- (4) Seal washer

- (5) Vent
- (6) Housing
- (7) Plug
- (8) Plug

- (9) Snap ring
- (10) Magnet plug

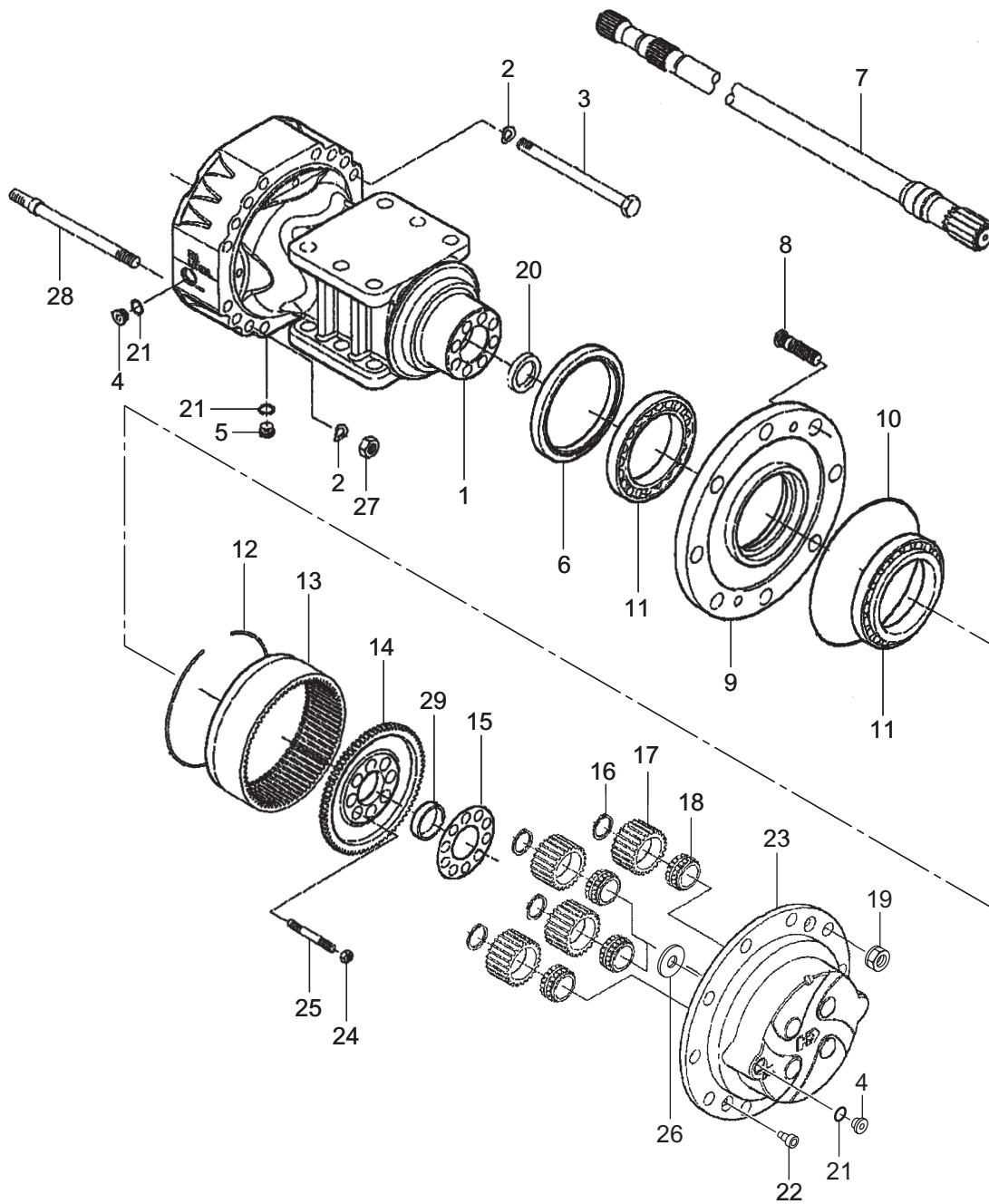
3-4-2. Differential



SV400-2-06053

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

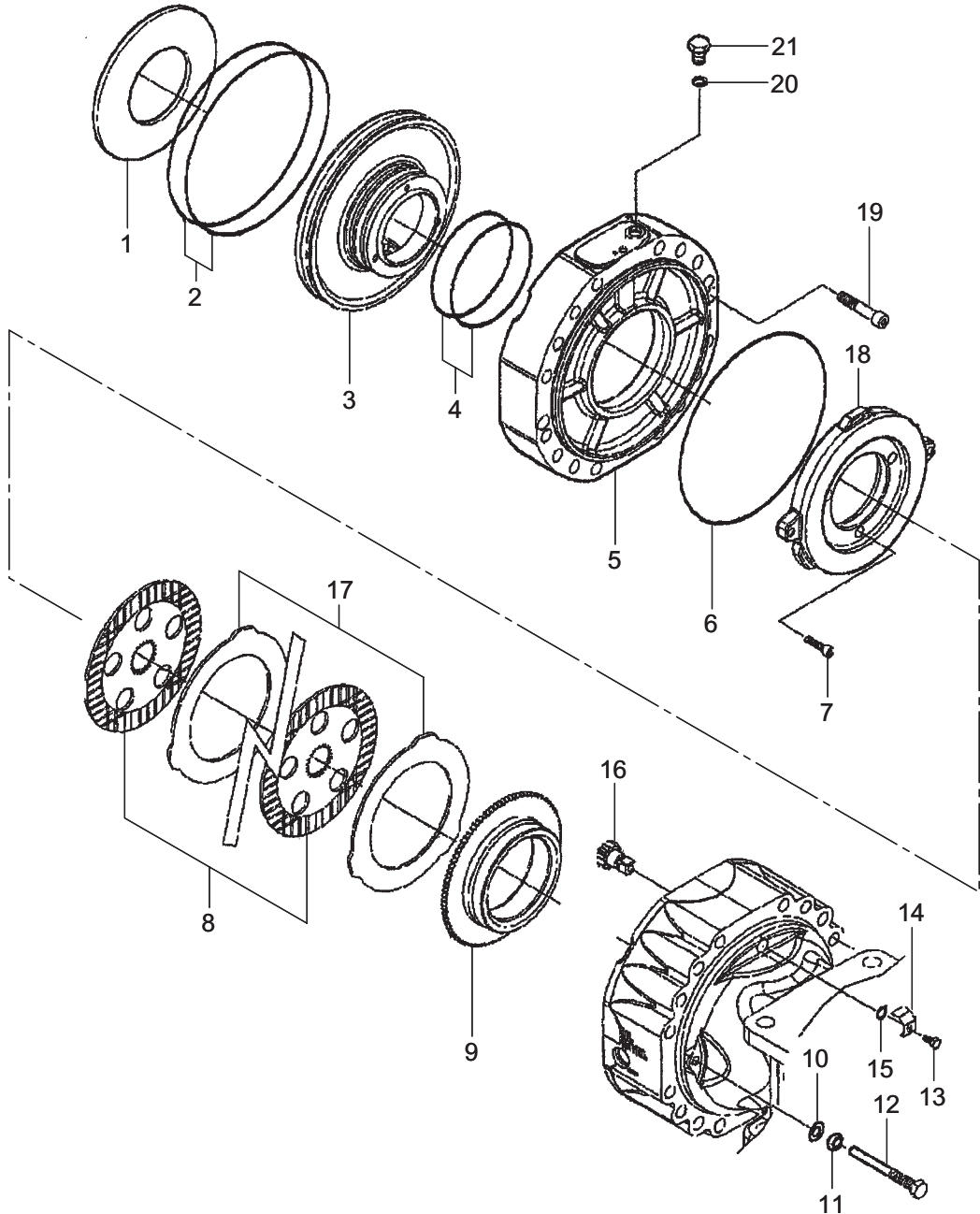
3-4-3. Hub reduction gear



SV400-2-06054

- | | | |
|-------------------|------------------------|-----------------------------|
| (1) Axle case | (11) Bearing | (21) Seal washer |
| (2) Spring washer | (12) Circlip | (22) Countersunk bolt |
| (3) Bolt | (13) Ring gear | (23) Planetary gear carrier |
| (4) Plug | (14) Ring gear support | (24) Nut |
| (5) Plug | (15) Lock plate | (25) Stud bolt |
| (6) Seal | (16) Circlip | (26) Friction washer |
| (7) Axle shaft | (17) Planetary gear | (27) Nut |
| (8) Hub bolt | (18) Bearing | (28) Stud bolt |
| (9) Wheel hub | (19) Hub nut | |
| (10) O-ring | (20) Seal | |

3-4-4. Brake



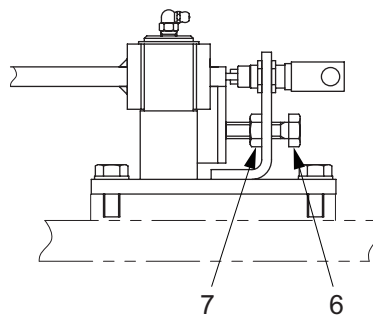
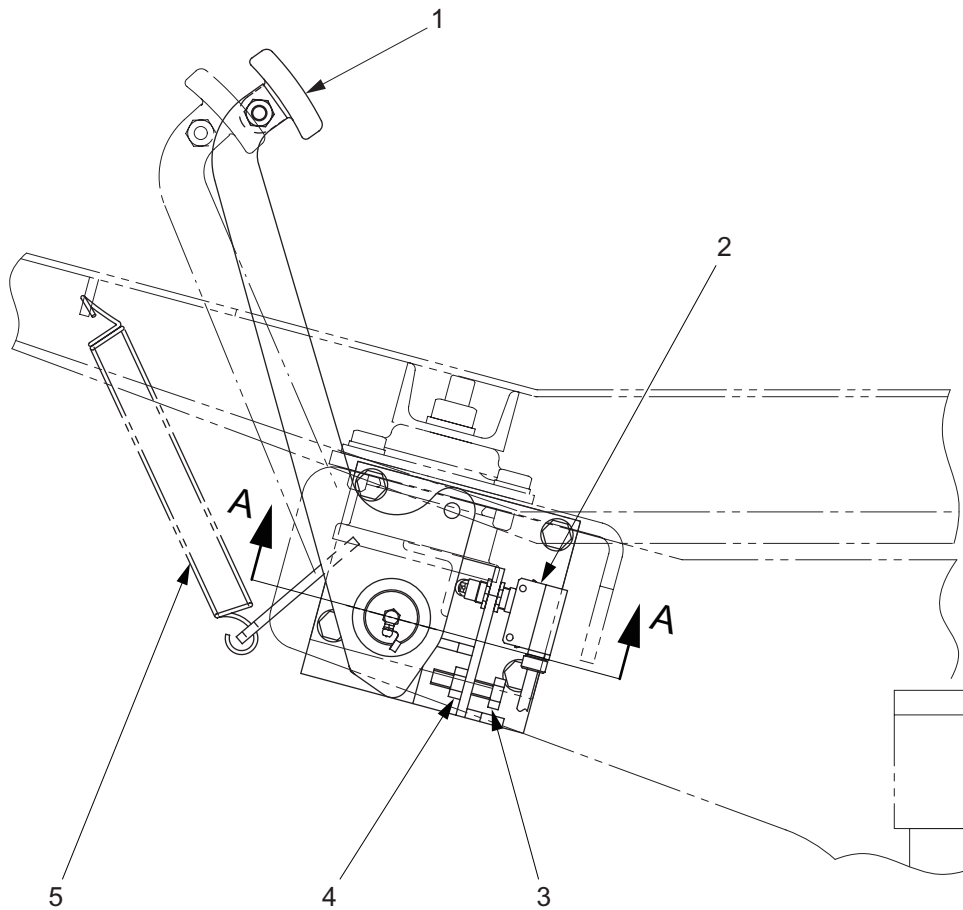
SV412-06001

- (1) Spring
- (2) O-ring
- (3) Piston
- (4) O-ring
- (5) Cover
- (6) O-ring
- (7) Cylinder bolt
- (8) Brake disc
- (9) Ring
- (10) Lock washer
- (11) Nut
- (12) Adjustment bolt
- (13) Hexagon bolt
- (14) Sheet
- (15) O-ring
- (16) Pinion
- (17) Intermediate brake disc
- (18) Disc
- (19) Bolt
- (20) Seal washer
- (21) Bolt

BRAKE

1. BRAKE SYSTEM

1-1. Brake Pedal

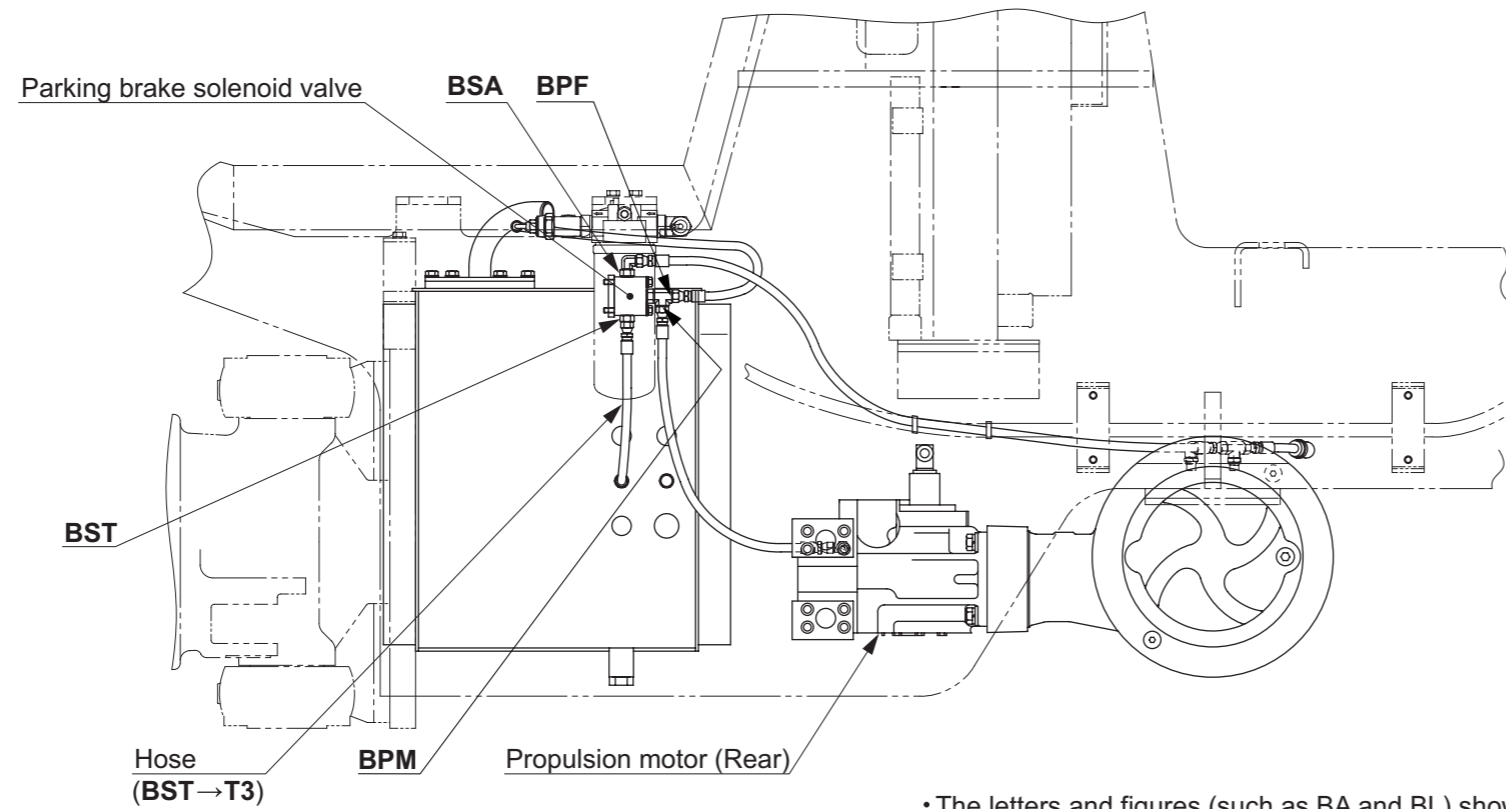
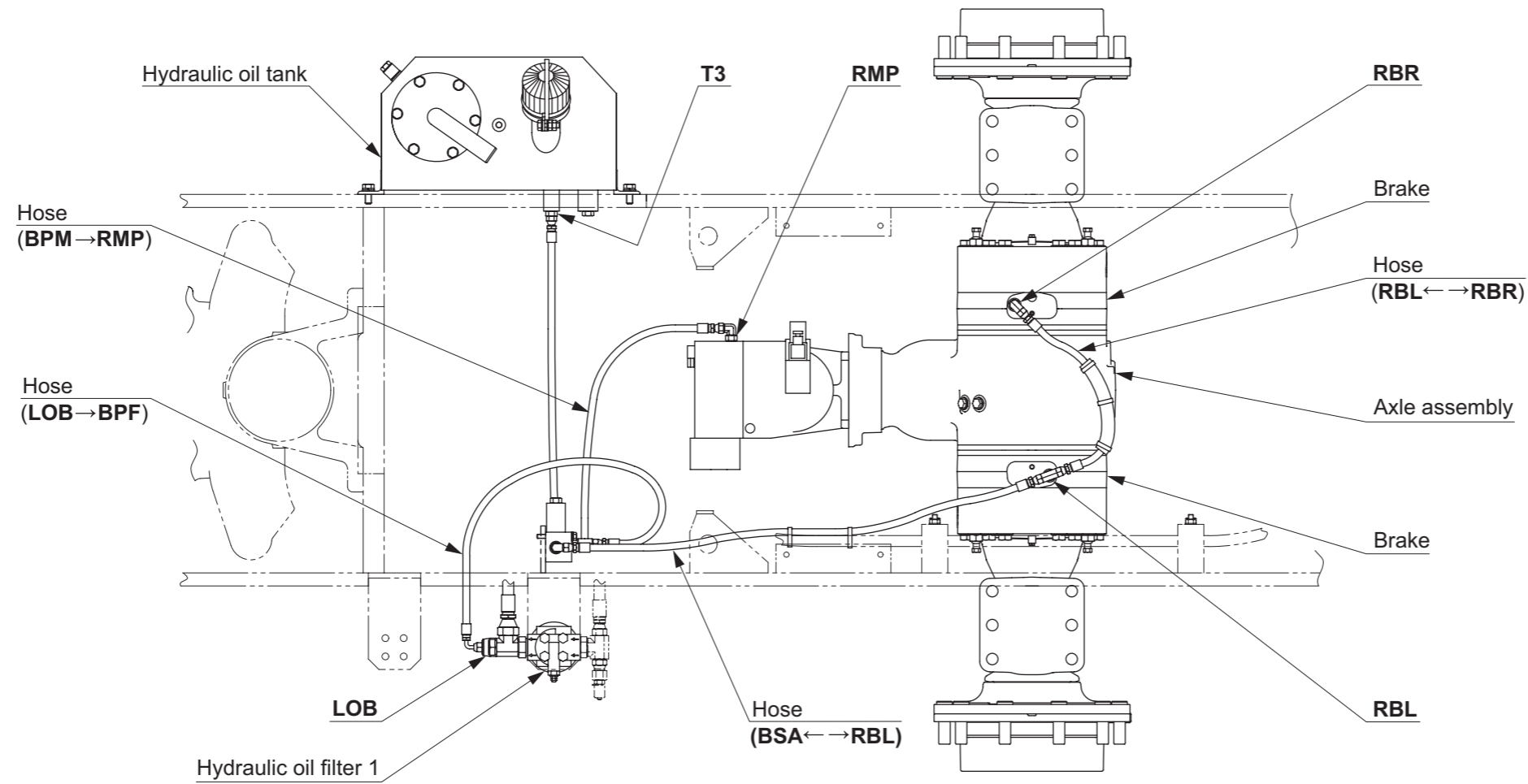


SECTION A-A

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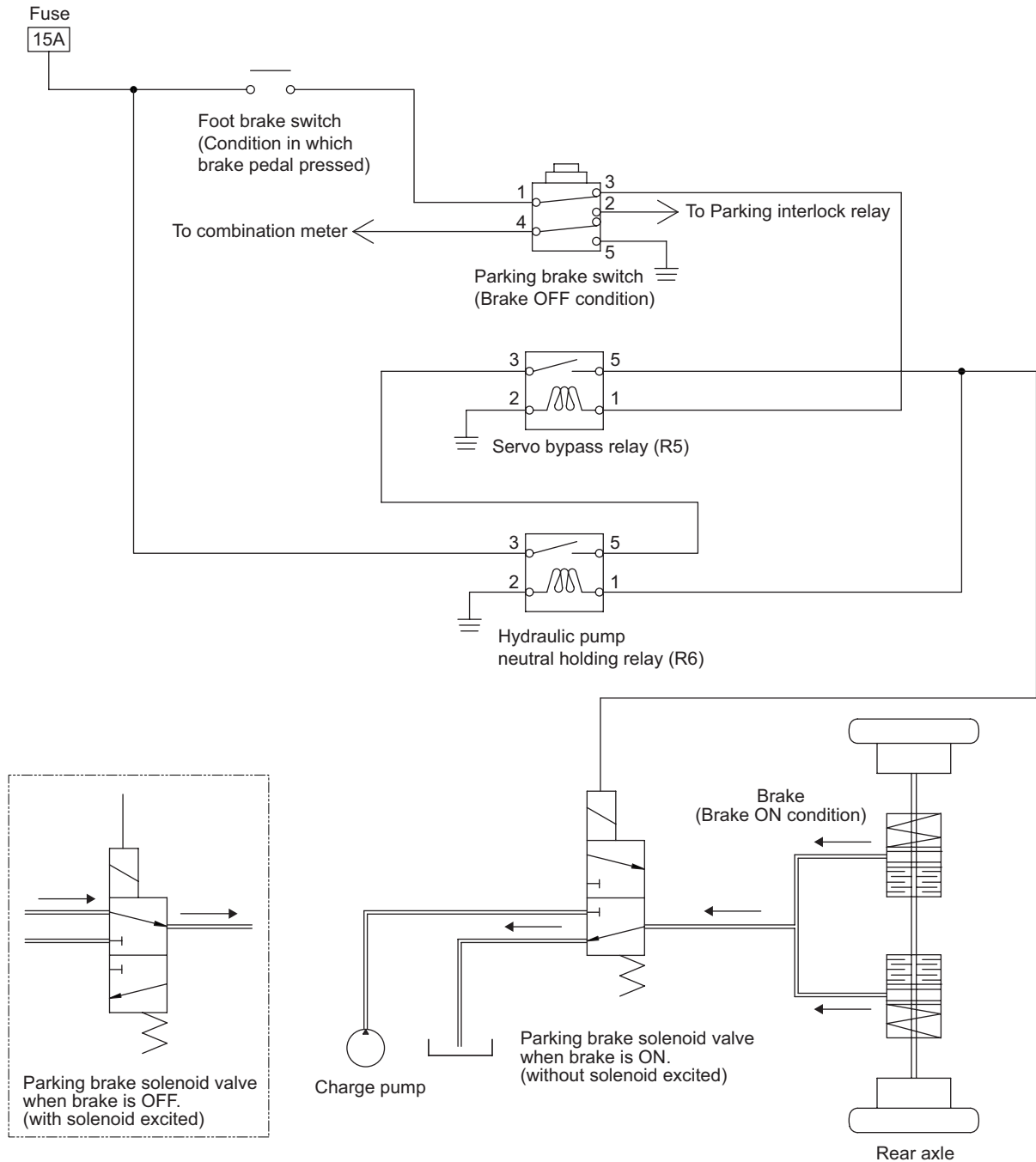
- | | |
|----------------------------|----------------------------|
| (1) Brake pedal | (5) Return spring |
| (2) Foot brake switch | (6) Stopper bolt : M10× 40 |
| (3) Stopper bolt : M10× 40 | (7) Nut : M10 |
| (4) Nut : M10 | |

2. BRAKE HYDRAULIC PIPING



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

3. BRAKE SYSTEM

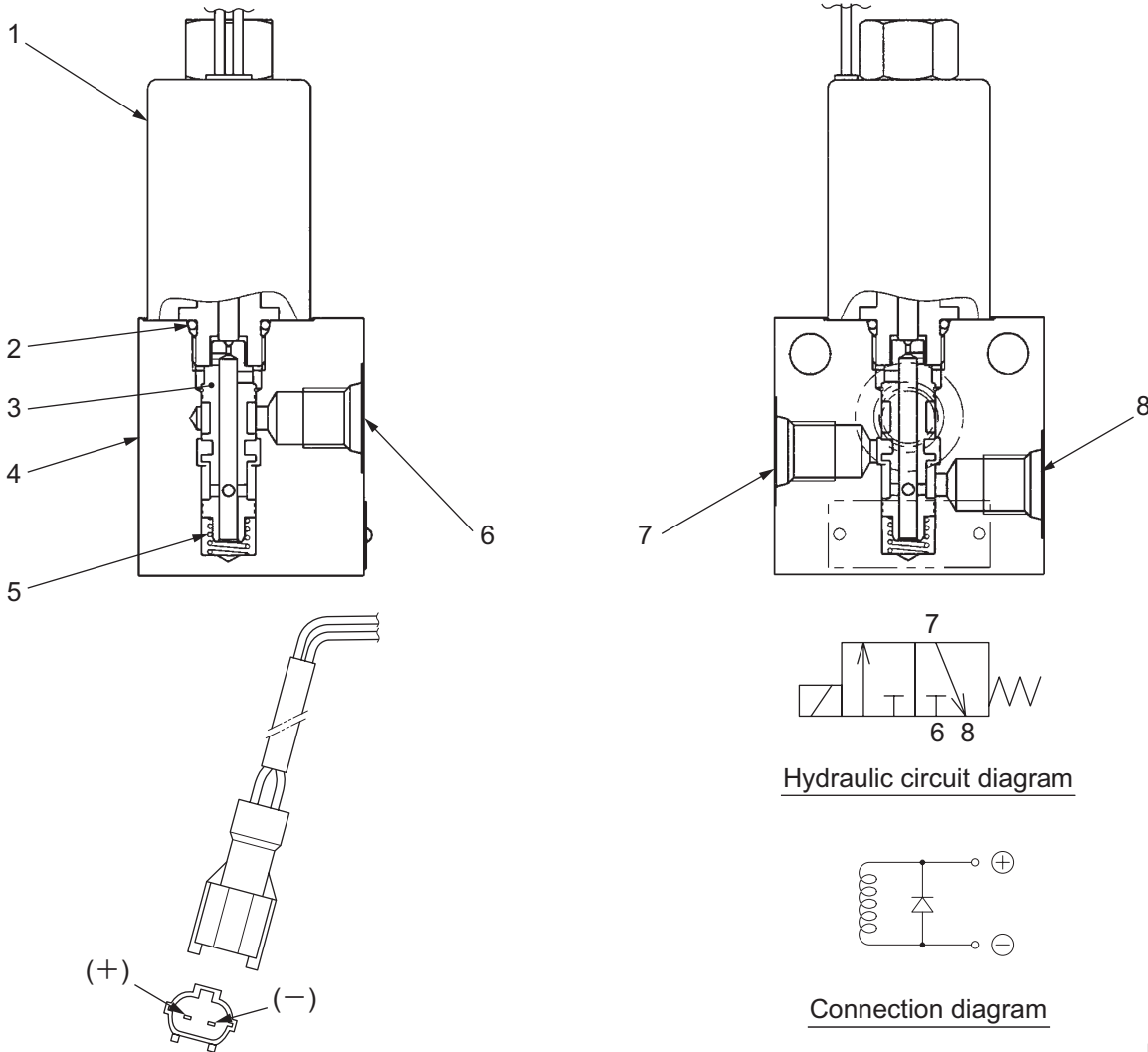


• The arrow (→) symbol shows the direction of the hydraulic oil flow.

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4. HYDRAULIC COMPONENT SPECIFICATION

4-1. Brake Solenoid Valve



- (1) Solenoid
- (2) O-ring (1B P14)
- (3) Spool (J)
- (4) Body
- (5) Spring
- (6) Port P
- (7) Port A
- (8) Port T

[BSP] : 9/16-18UNF-2B
[BSA] : 9/16-18UNF-2B
[BST] : 9/16-18UNF-2B

Specifications

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

INSPECTION AND ADJUSTMENT

1. INSPECTION AND ADJUSTMENT

1-1. Safety Precautions for Inspection and Adjustment

⚠ WARNING

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

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

⚠ CAUTION

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

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

⚠ WARNING

Inadvertent starting the engine may cause a serious accident.

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

⚠ CAUTION

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

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

1-2. Preparation for Inspection and Adjustment

- Prepare the necessary measuring instruments. In addition, particularly when measuring pressure values, make sure to prepare the appropriate hoses, adapters and a plug removal tool for the pressure reading port.
- Make sure that the instruments to be used operate normally.

When handling the instruments, exercise sufficient caution not to drop or apply any impact to them. Doing so may adversely affect the calibration. Another important point is to inspect the instruments regularly. An instrument that does not start from the appropriate zero point may give an inaccurate reading.

1-3. Precautions for Inspection and Adjustment

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

1-4. Warm-up

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

1-5. Inspection and Adjustment of Engine Related Items

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

2. MEASUREMENT AND ADJUSTMENT OF PROPULSION CIRCUIT PRESSURE

2-1. Measurement

⚠ WARNING

Confirm that the parking brake works properly before measurement.

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)

① Remove plugs from couplings (1) and (2) of propulsion pump. Attach pressure gauge with hose (S) and connector (U).

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

② Set propulsion travel mode select switch to “”.

③ Start the engine and set throttle lever to “FULL”.

④ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)

⑤ With propulsion load at maximum, slowly move F-R lever to the side to be measured.

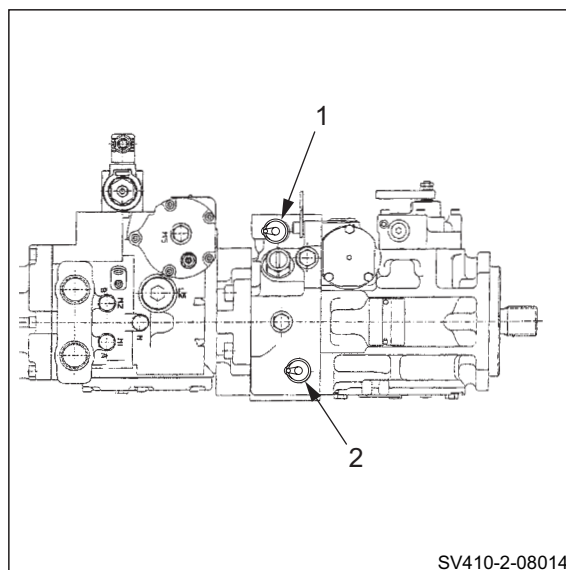
- Then, read pressure indicated by pressure gauge.

⑥ After measuring, promptly return F-R lever to “N”.

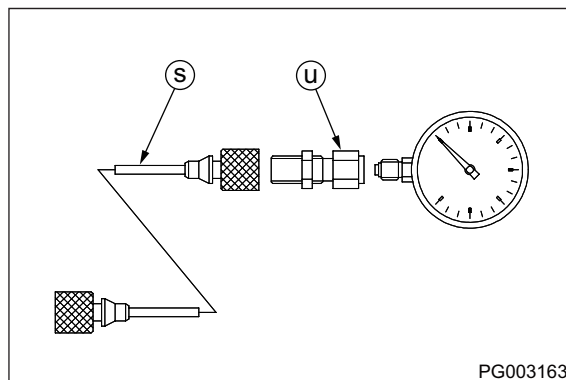
★ Maximum circuit pressure

(high pressure relief valve setting)

: $41.8 \pm 1.0 \text{ MPa}$ ($6,061 \pm 145 \text{ psi}$)



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2-2. Adjustment


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

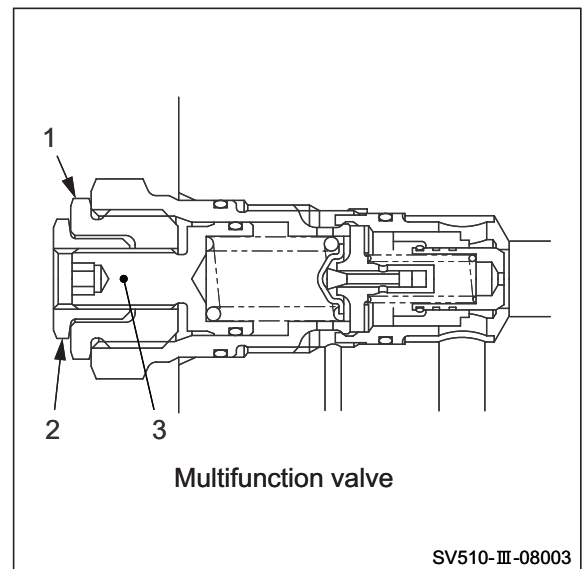
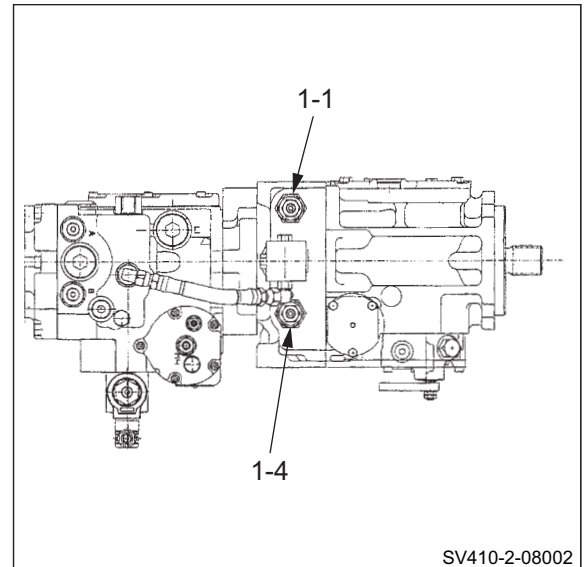
- ① Check nut (2) of multifunction valve (1-1) or (1-4) for evidence of having loosened.
 - Multifunction valve (Forward) : (1-4)
 - Multifunction valve (Reverse) : (1-1)
- ② If there is evidence of nut having loosened, adjust multifunction valve so that pressure becomes within maximum circuit pressure 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.

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



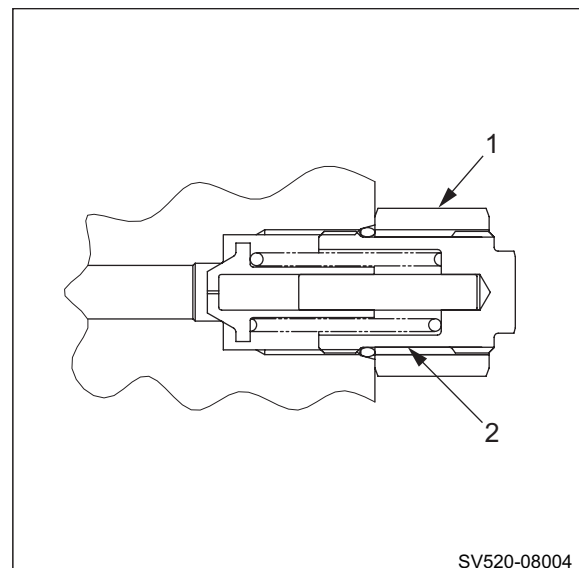
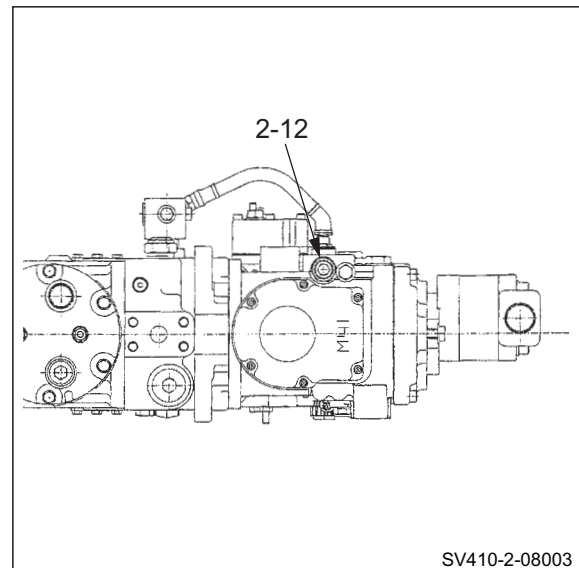
(NOTICE)

- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**
- The numbers “1-1” and “1-4” appearing in above illustrations are consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 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 (2-12) on vibrator pump side.
- ② Tighten adjustment screw (2) by 1/2 complete turns.
 - Adjustment screw turned clockwise : Pressure rise
 - Adjustment screw turned counterclockwise : Pressure drop
 - Pressure change rate : 0.54 MPa/ 1/2 turn (78.3 psi/ 1/2 turn)



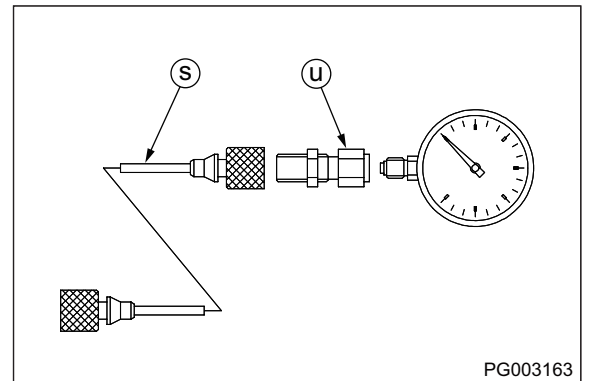
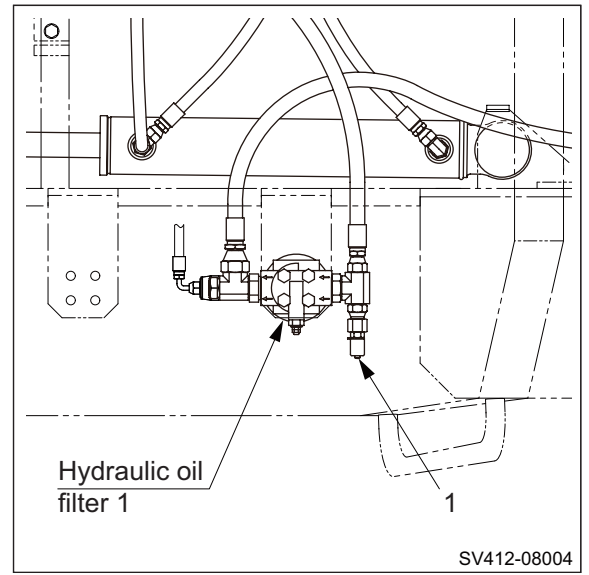
- The number “2-12” appearing in above illustrations is consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-007).

3-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plug from coupling (1) of hydraulic oil filter 1.
Attach pressure gauge with hose (S) and connector (U).
 - Coupling : 9/16-18UNF×M16
 - Adapter for hose (S) : M16 P=2.0
 - Pressure gauge connector (U) : M16×G3/8
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Start the engine and set throttle lever to "FULL".
 - Then, read pressure indicated by pressure gauge.

★ **Standard charge relief valve setting**

: 2.5 ± 0.2 MPa (363 ± 29 psi)



3-2. Adjustment

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

- ① Check nut (2) of charge relief valve (1-10) 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 (3).

Adjustment screw turned clockwise

: Pressure rise

Adjustment screw turned counterclockwise

: Pressure drop

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

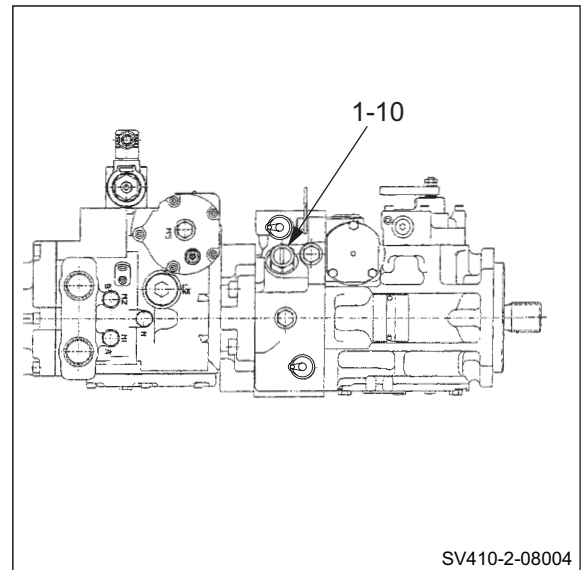
- ③ If there is no evidence of nut having loosened, remove charge relief valve.
- ④ Check removed charge relief valve for trapped dirt and scratches on its seat.
- ⑤ If trapped dirt is present, disassemble and clean charge relief valve.
- ⑥ If a scratch is found on seat, replace charge relief valve.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



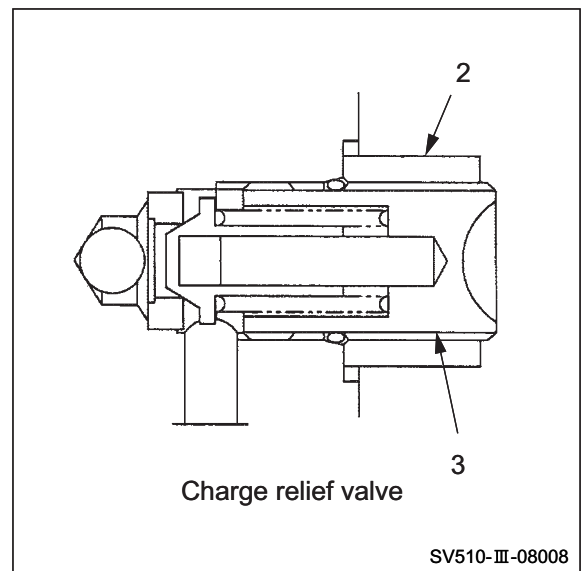
(2) Nut : 52 N·m (38 lbf·ft)

(NOTICE)

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



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- The number “1-10” appearing in above illustrations is consistent with lead line numbers shown in illustration of propulsion pump in “2-2. Hydraulic Component Specifications” (page 4-007).

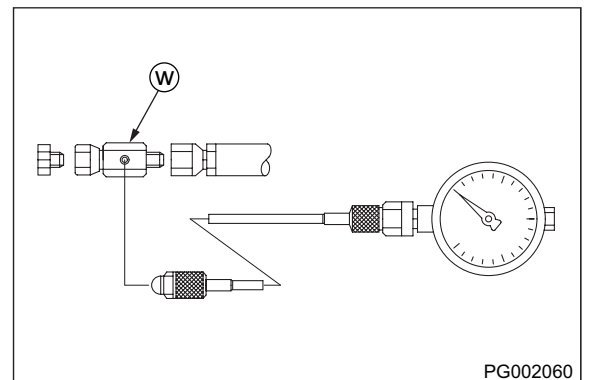
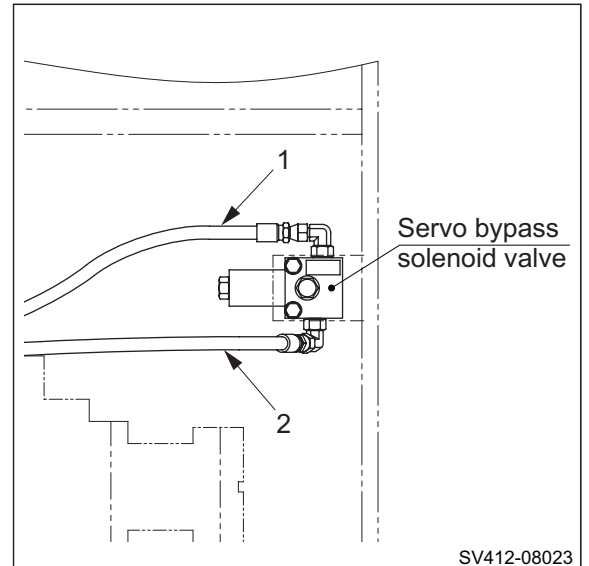
4. MEASUREMENT OF PROPULSION SERVO CIRCUIT PRESSURE

4-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Disconnect the hoses (1) and (2) from servo bypass solenoid valve. Attach pressure gauge through adapter (W).
 - Adapter (W) : 4-4LOHL6G5TP (Parker part number)
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Start the engine and set throttle lever to "FULL".
- ④ Operate F-R lever and then read pressure indicated by pressure gauge.
 - With parking brake "ON", measured pressures of (1) and (2) are the same.
 - With parking brake "OFF", measured pressures of (1) and (2) are different.



★ **Standard charge relief pressure setting**

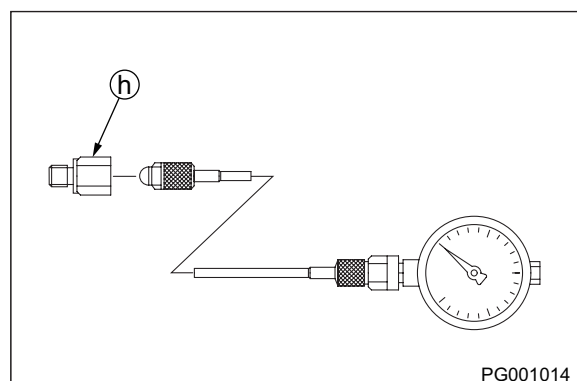
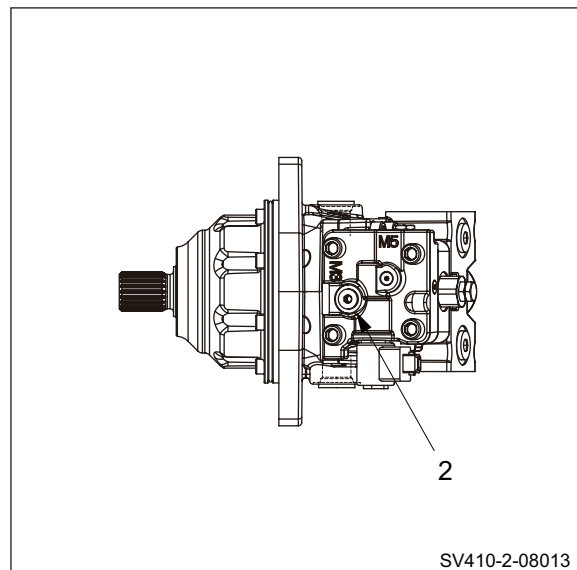
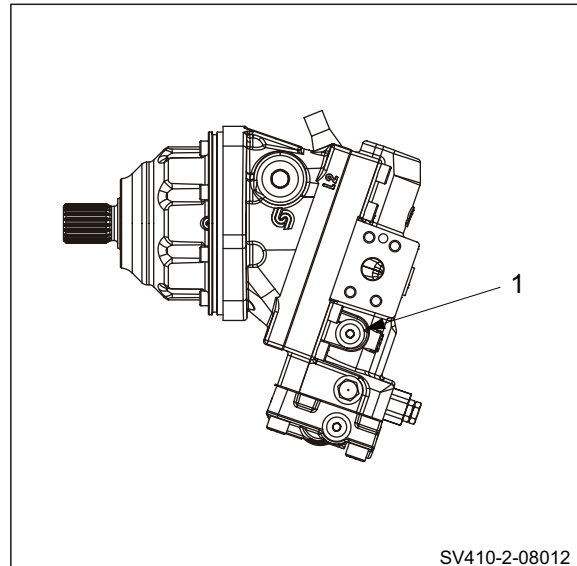
: $2.5 \pm 0.2 \text{ MPa}$ ($363 \pm 29 \text{ psi}$)



5. MEASUREMENT OF MACHINE SPEED CHANGE CIRCUIT PRESSURE

5-1. Measurement of Front Propulsion Motor



- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plugs from front propulsion motor gauge ports (1) and (2). Attach pressure gauge with the adapter (h) .
 - Adapter (h) : 9/16-18UNF
 - Servo pressure gauge port (Low) : (1)
 - Servo pressure gauge port (High) : (2)
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Set propulsion travel mode select switch to “” or “”.
- ④ Start the engine and set throttle lever to “FULL”.
 - Then, read pressure indicated by pressure gauge.



★ Standard charge relief valve setting

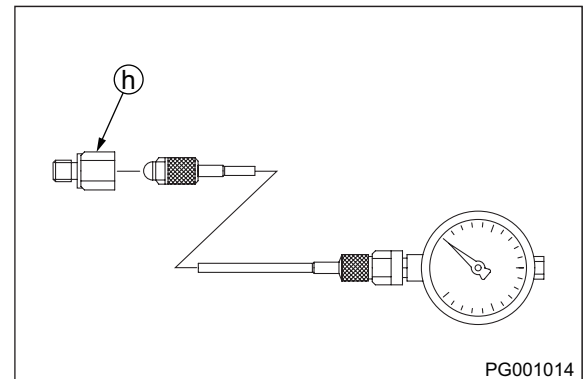
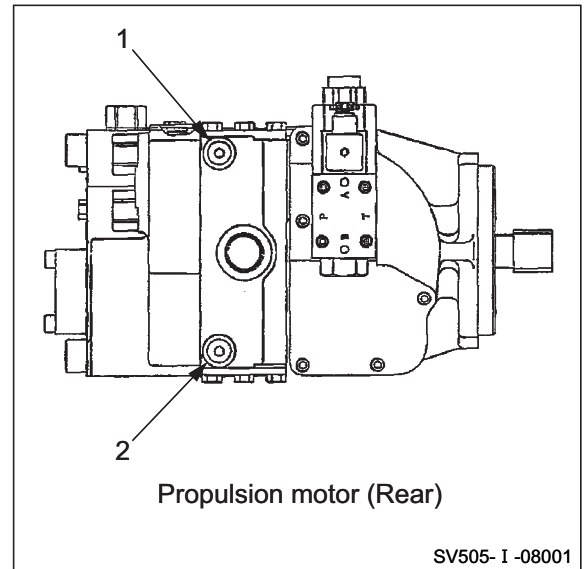
: 2.5 ± 0.2 MPa (363 ± 29 psi)

5-2. Measurement of Rear Propulsion Motor

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plugs from rear propulsion motor gauge ports (1) and (2). Attach pressure gauge with the adapter (h) .
 - Adapter (h) : 9/16-18UNF
 - Servo pressure gauge port (Low) : (1)
 - Servo pressure gauge port (High) : (2)
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Set propulsion travel mode select switch to “” or “”.
- ④ Start the engine and set throttle lever to “FULL”.
 - Then, read pressure indicated by pressure gauge.

★ Standard charge relief valve setting

: $2.67 \pm 0.2 \text{ MPa}$ ($387 \pm 29 \text{ psi}$)



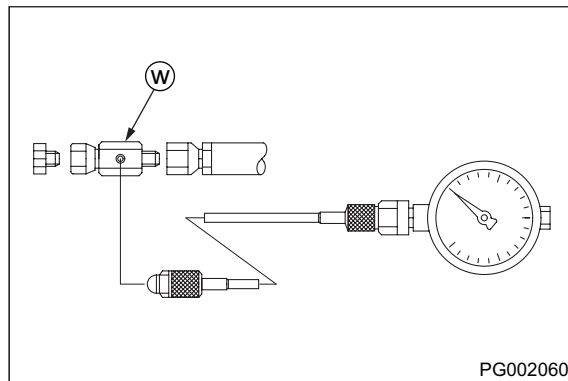
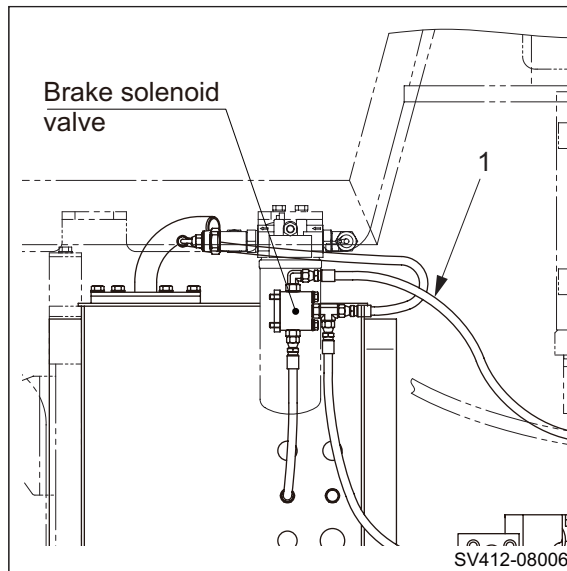
6. MEASUREMENT OF PARKING BRAKE RELEASE PRESSURE

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

6-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Disconnect hose (1) from brake solenoid valve. Attach pressure gauge through adapter (W) .
 - Adapter (W) : 4-4LOHL6G5TP (Parker part number)
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Confirm that F-R lever is "N" properly.
- ③ Apply parking brake by pressing parking brake switch button.
- ④ Start the engine and set throttle lever to "FULL".
- ⑤ Release parking brake by pressing parking brake switch button.
 - Then, read brake release pressure indicated by pressure gauge.

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




7. MEASUREMENT AND INSPECTION OF VIBRATOR CIRCUIT PRESSURE

7-1. Measurement

CAUTION

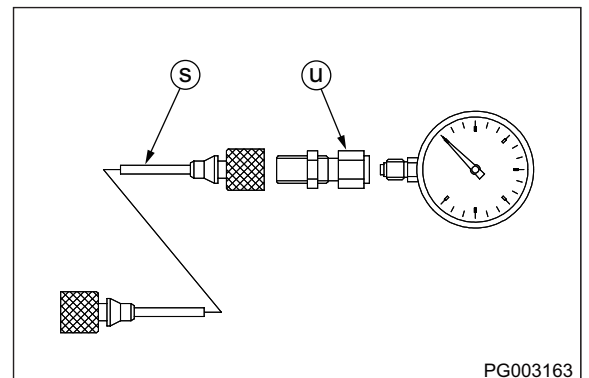
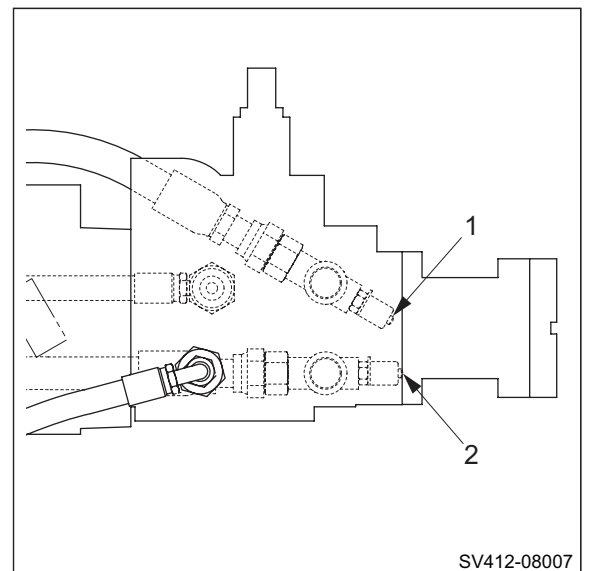
Take care not to operate the vibratory drum for a longer period of time than necessary with the machine stationary. Otherwise, the vibrator bearing could be seized.

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plugs from couplings (1) and (2) of vibrator pump. Attach pressure gauge with hose (S) and connector (U).
 - Coupling : 9/16-18UNF×M16
 - Adapter for hose (S) : M16 P=2.0
 - Pressure gauge connector (U) : M16×G3/8
 - High pressure gauge port : (1)
(Low amplitude)
 - High pressure gauge port : (2)
(High amplitude)
 - Pressure gauge : 0 to 50 MPa
(0 to 7,250 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Set vibration mode change switch to “”.
- ④ Start the engine and set throttle lever to “FULL”.
- ⑤ Press F-R lever vibration switch (ON).
 - Then, read pressure gauge for maximum value of vibrator circuit pressure.
- ⑥ Press F-R lever vibration switch (OFF) as soon as measurement is finished.

★ Maximum circuit pressure

(high pressure relief valve setting)

: $25.0 \pm 1.0 \text{ MPa}$ ($3,625 \pm 145 \text{ psi}$)



7-2. Inspection

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

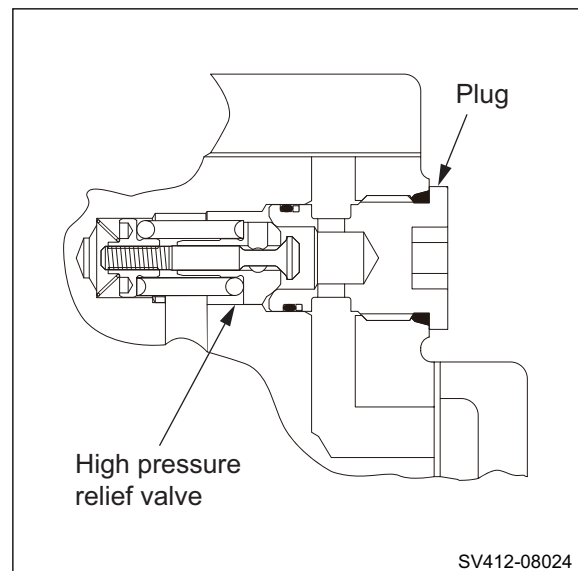
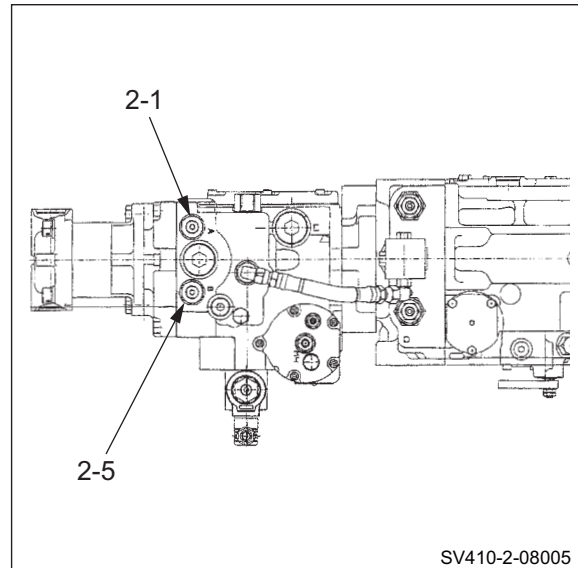
- ① Remove plug and high pressure relief valve (2-1) or (2-5) of vibrator pump.
 - High pressure relief valve (Low amplitude) : (2-5)
 - High pressure relief valve (High amplitude) : (2-1)
- ② Check removed high pressure relief valve for trapped dirt and other abnormalities.
- ③ If trapped dirt is present, 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.



Plug : 40 N·m (30 lbf·ft)

(NOTICE)

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

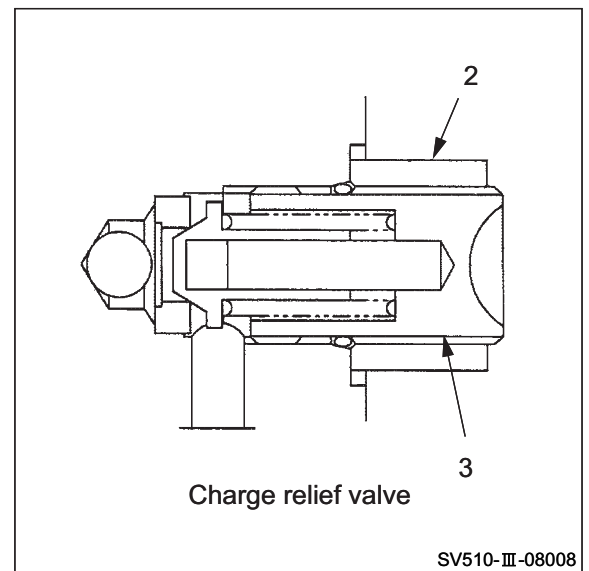
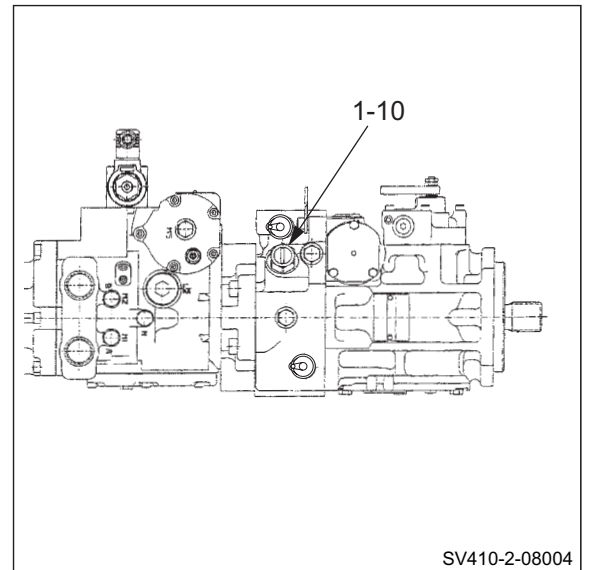


- The numbers “2-1” and “2-5” appearing in above illustrations are consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-007).

8. 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 (2) from charge relief valve (1-10) on propulsion pump side.
- ② Tighten adjustment screw (3) by one complete turns.
 - Adjustment screw turned clockwise
: Pressure rise
 - Adjustment screw turned counterclockwise
: Pressure drop
 - Pressure change rate
: 0.78 MPa/2 turns (113 psi/2 turns)



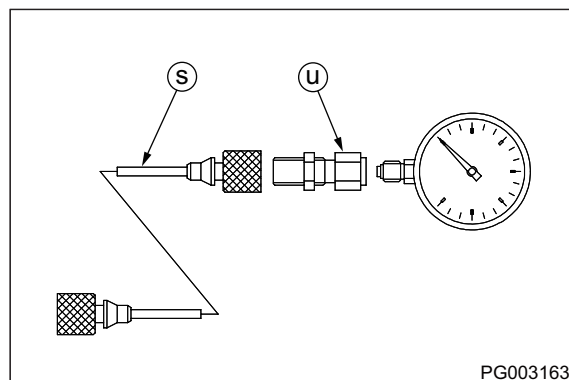
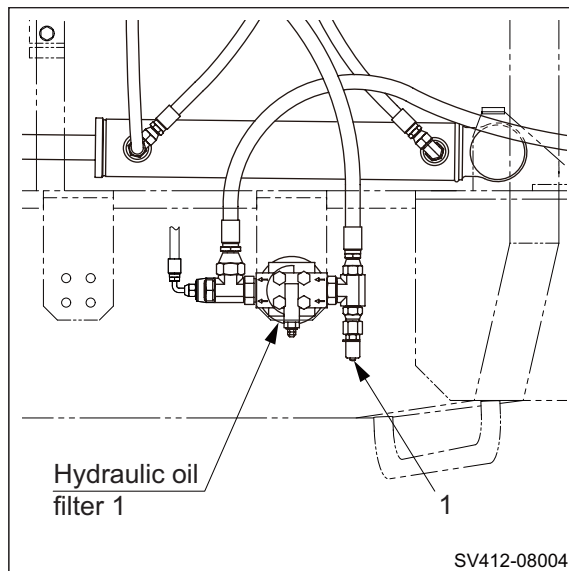
- The number “1-10” appearing in above illustrations is consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-007).

8-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plug from coupling (1) of hydraulic oil filter 1.
Attach pressure gauge with hose (S) and connector (U) .
 - Coupling : 9/16-18UNF×M16
 - Adapter for hose (S) : M16 P=2.0
 - Pressure gauge connector (U) : M16×G3/8
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Start the engine and set throttle lever to "FULL".
 - Then, read pressure indicated by pressure gauge.

★ **Standard charge relief valve setting**

: 2.5 ± 0.2 MPa (363 ± 29 psi)



8-2. 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 (2-12) for evidence of having loosened.
- ② If there is evidence of nut having loosened, adjust charge relief valve so that pressure becomes within standard charge relief valve pressure setting range while watching pressure gauge.
- To adjust pressure, loosen nut and turn adjustment screw (2).

Adjustment screw turned clockwise

: Pressure rise

Adjustment screw turned counterclockwise

: Pressure drop

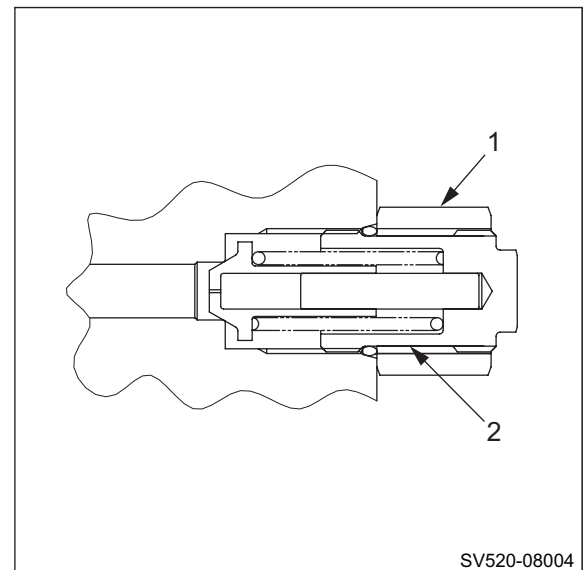
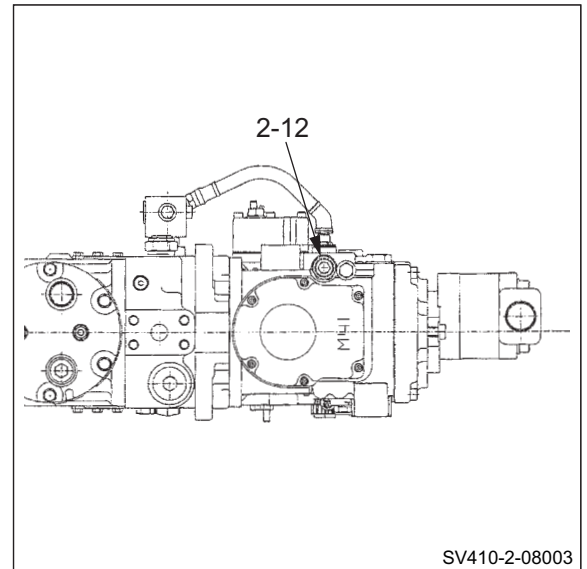
Pressure change rate

: 0.27 MPa/ 1/4 turn (39.2 psi/ 1/4 turn)

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



(1) Nut : 40 N·m (30 lbf-ft)



(NOTICE)

- **Carefully disassemble and reassemble after taking steps to prevent foreign material from getting in.**
- The number “2-12” appearing in above illustrations is consistent with lead line numbers shown in illustration of vibrator pump in “2-2. Hydraulic Component Specifications” (page 4-007).

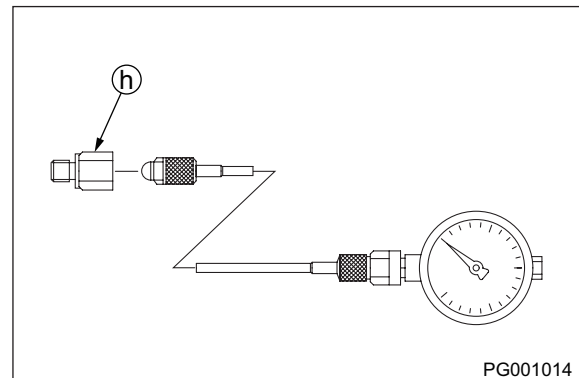
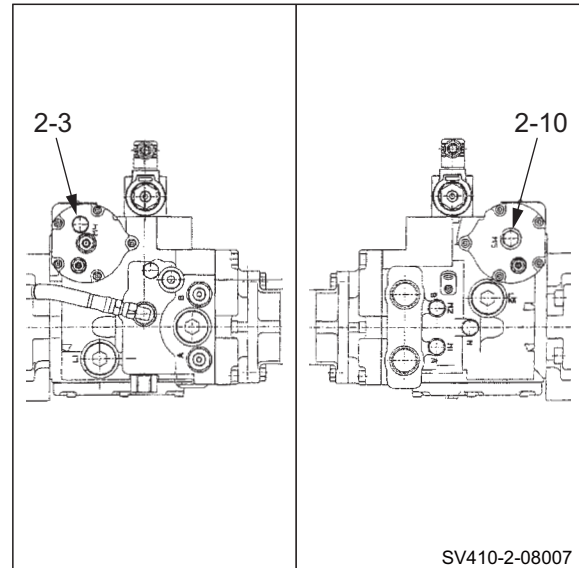
9. MEASUREMENT OF VIBRATOR HIGH/LOW CHANGE CIRCUIT PRESSURE

9-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plugs from servo pressure gauge ports (2-3) and (2-10). Attach pressure gauge with the adapter (h) .
 - Adapter (h) : 9/16-18UNF
 - Servo pressure gauge port (Low) : (2-10)
 - Servo pressure gauge port (High) : (2-3)
 - Pressure gauge : 0 to 5 MPa
(0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Start the engine and set throttle lever to "FULL".
- ④ Set vibration select switch and then read pressure indicated by pressure gauge.
 - With vibration select switch is "○", measured pressures of (2-3) and (2-10) are same.
 - With vibration select switch is "∩" or "∪", measured pressures of (2-3) and (2-10) are different.

★ Standard charge relief valve setting

: $2.5 \pm 0.2 \text{ MPa}$ ($363 \pm 29 \text{ psi}$)



10. MEASUREMENT AND INSPECTION OF STEERING

CIRCUIT PRESSURE

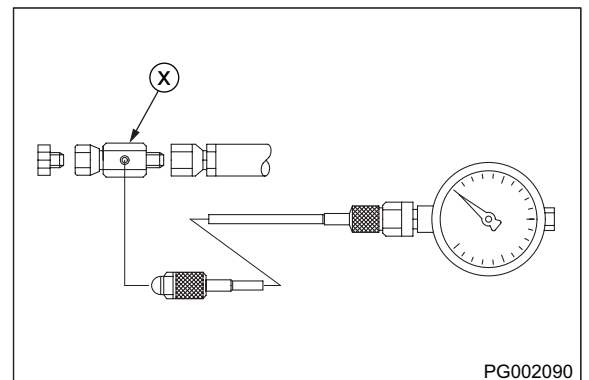
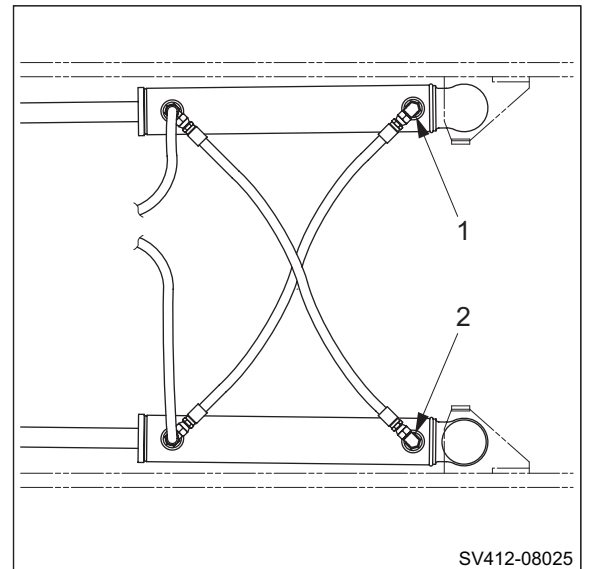
10-1. Measurement

⚠ WARNING

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

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
 - ① Disconnect the hose (1) or (2) from steering cylinder.
 - Attach pressure gauge through adapter (X) .
 - Adapter (X) : 6-4LOHL6G5TP (Parker part number)
 - Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)
 - ② Confirm that F-R lever is "N" properly.
 - ③ Start the engine and set throttle lever to "FULL".
 - ④ Turn steering wheel to operate relief valve.
 - Then, read pressure indicated by pressure gauge.

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

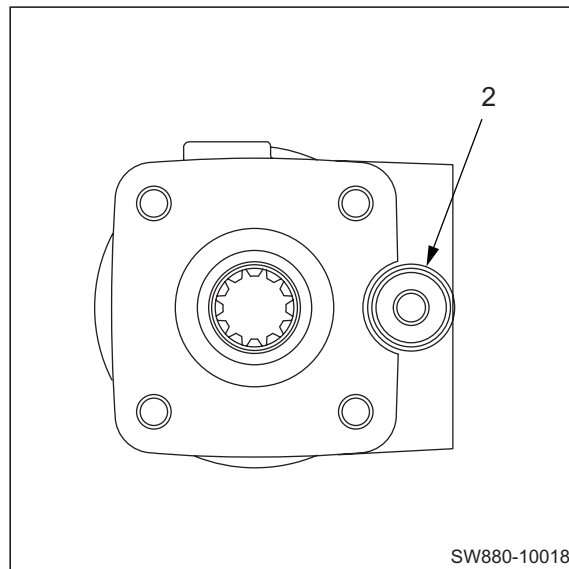


10-2. Inspection

- If measurement results indicate the pressure deviating from standard maximum circuit pressure range, make an inspection in accordance with procedure described below.
 - ① Remove relief valve (2) from orbitrol.
 - ② Check removed relief valve for trapped dirt, scratches on its seat and other abnormalities.
 - ③ If trapped dirt is present, disassemble and clean relief valve.
 - ④ If a scratch or any other abnormality is found on seat, replace relief valve.
 - ⑤ After inspection, measure pressure again and check that pressure reaches standard maximum circuit pressure range.

(NOTICE)

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



11. MEASUREMENT AND INSPECTION OF BLADE CIRCUIT PRESSURE (SV410TB-2, FB-2)

11-1. Measurement

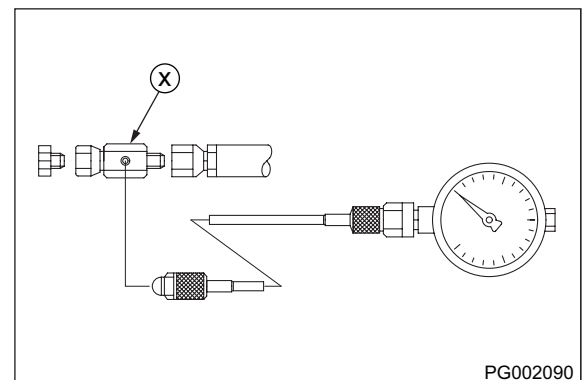
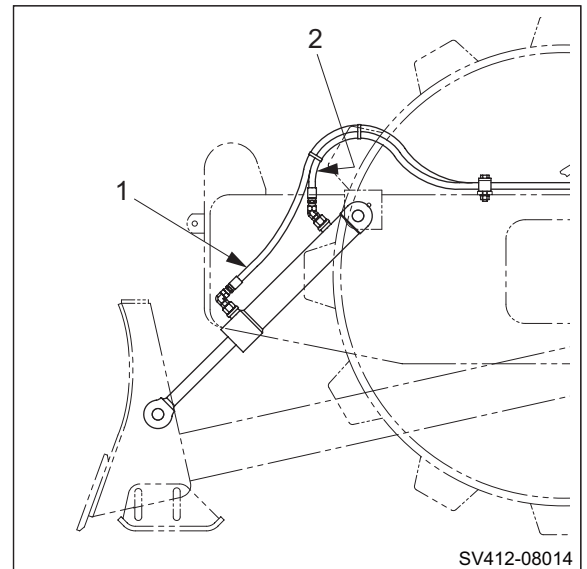
⚠ WARNING

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

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Disconnect hose (1) or (2) from blade cylinder. Attach pressure gauge through the adapter (X) .
 - Adapter (X) : 6-4LOHL6G5TP (Parker part number)
 - Pressure gauge : 0 to 25 MPa (0 to 3,625 psi)
- ② Confirm that F-R lever is "N" properly.
- ③ Set steering wheel to a position where vibratory drum faces straight forward.
- ④ Start the engine and set throttle lever to "FULL".
- ⑤ Move blade control lever to operate relief valve.
 - Then, read pressure indicated by pressure gauge.

★ **Standard maximum circuit pressure (stack valve relief pressure)**

: $13.7 \pm 1.0 \text{ MPa}$ ($1,987 \pm 145 \text{ psi}$)



11-2. Inspection

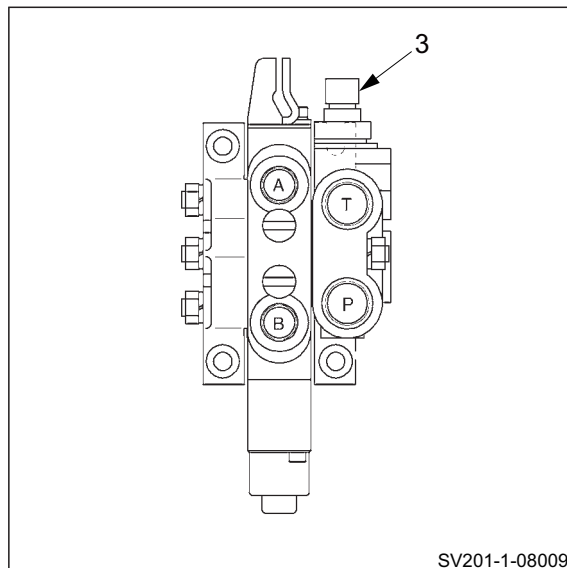
- If measurement results indicate the pressure deviating from standard maximum circuit pressure range, make an inspection in accordance with procedure described below.
 - ① Remove relief valve (3) from stack valve.
 - ② Check removed relief valve for trapped dirt, scratches on its seat and other abnormalities.
 - 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.



(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

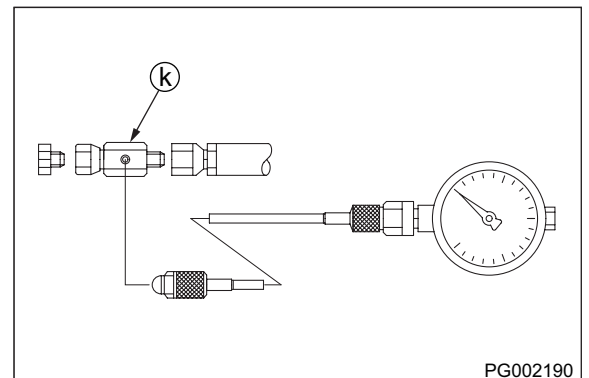
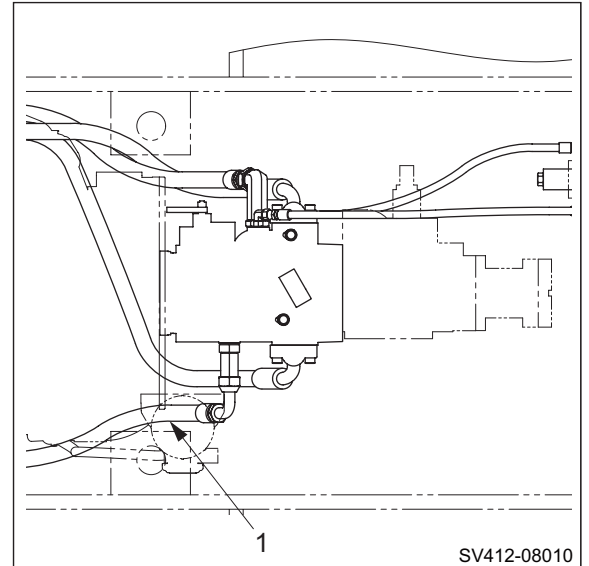
12. MEASUREMENT OF HYDRAULIC PUMP CASE PRESSURE

12-1. Measurement

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Disconnect hose (1) from propulsion pump. Attach pressure gauge through adapter (k) .
 - Adapter (k) : 12-4LOHL6G5TP
(Parker part number)
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Set propulsion travel mode select switch to “”.
- ③ Start the engine and set throttle lever to “FULL”.
- ④ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
- ⑤ With propulsion load at maximum, measure pressure when travel mode select switch is “”, “” and “” and F-R lever is “N”, “F”, and “R”, respectively.





★ Allowable pump case pressure

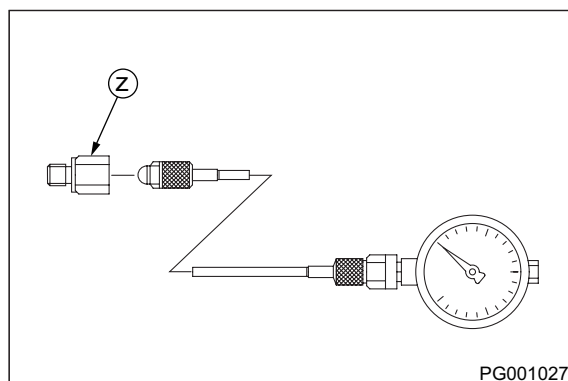
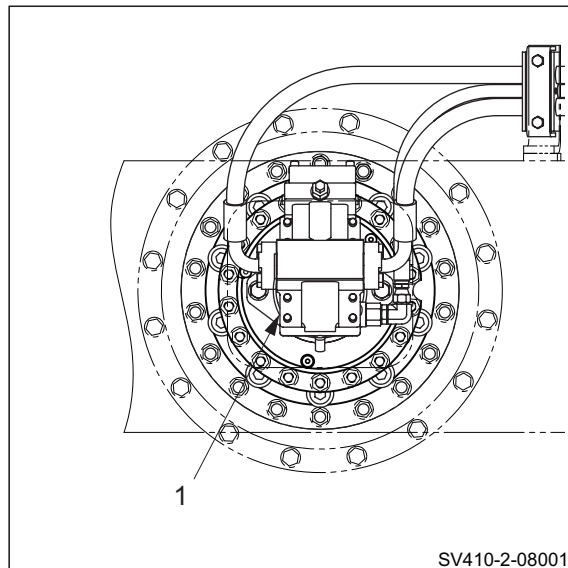
: 0.3 MPa (43.5 psi) or less



13. MEASUREMENT OF PROPULSION MOTOR CASE PRESSURE

13-1. Measurement of Front Propulsion Motor





- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plug from drain port (1). Attach pressure gauge and adapter ② .
 - Adapter ② : 1 1/16-12UN
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Set propulsion travel mode select switch to “”.
- ③ Start the engine and set throttle lever to “FULL”.
- ④ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
- ⑤ With propulsion load at maximum, measure pressure when travel mode select switch is “”, “” and “” and F-R lever is “N”, “F”, and “R”, respectively.

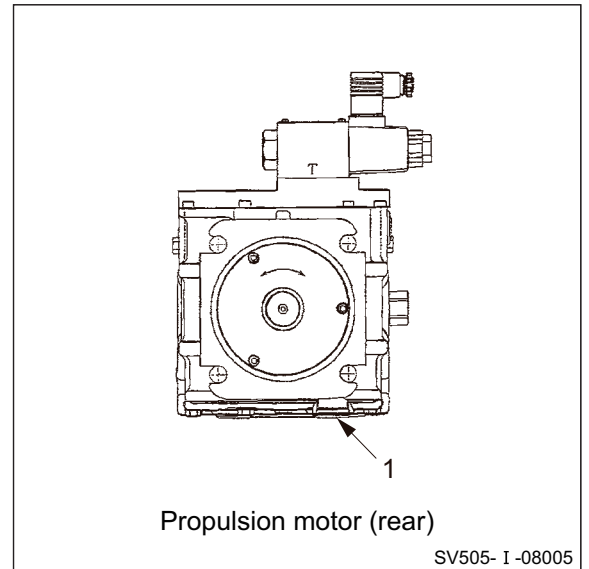


★ Allowable motor case pressure

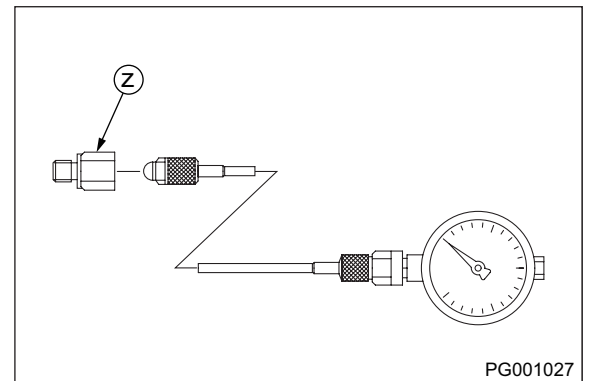
: 0.3 MPa (43.5 psi) or less

13-2. Measurement of Rear Propulsion Motor

- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plug from drain port (1). Attach pressure gauge and adapter (Z) .
 - Adapter (Z) : 1 1/16-12UN
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Set propulsion travel mode select switch to “”.
- ③ Start the engine and set throttle lever to “FULL”.
- ④ Establish a condition in which machine propulsion load becomes maximum.
(Pressure does not build up unless propulsion load is applied.)
- ⑤ With propulsion load at maximum, measure pressure when travel mode select switch is “”, “” and “” and F-R lever is “N”, “F”, and “R”, respectively.



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






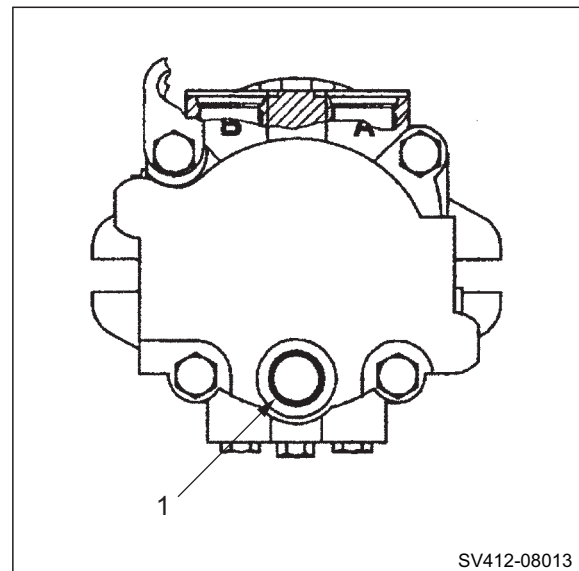
14. MEASUREMENT OF VIBRATOR MOTOR CASE PRESSURE

14-1. 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.

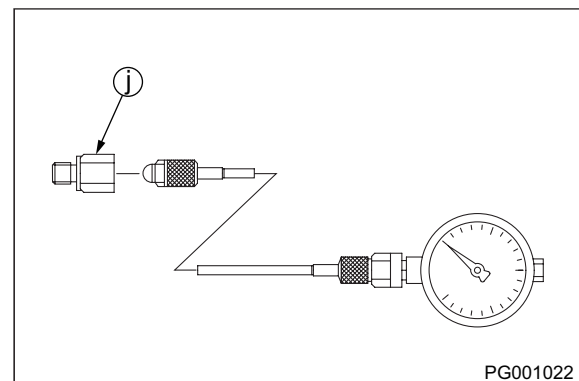
- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 9^{\circ}\text{F}$)
- ① Remove plug from drain port (1). Attach pressure gauge with adapter ① .
 - Adapter ① : 7/8-14UNF
 - Pressure gauge : 0 to 5 MPa (0 to 725 psi)
- ② Apply parking brake by pressing parking brake switch button.
- ③ Set vibration mode change switch to “”.
- ④ Start the engine and set throttle lever to “FULL”.
- ⑤ Press F-R lever vibration switch (ON).
- ⑥ Measure pressure when vibration select switch is in “” and “”, respectively.
- ⑦ Press F-R lever vibration switch (OFF) as soon as measurement is finished.



SV412-08013

★ Allowable motor case pressure

: 0.17 MPa (24.7 psi) or less



PG001022

15. ADJUSTMENT OF THROTTLE LEVER LINKAGE

15-1. Adjustment

- In cases such as maximum no-load rotational speed or minimum no-load rotational speed deviating from standard value, control cable is replaced, or throttle lever does not move smoothly, make an adjustment in accordance with procedure described below.
- Make the adjustment after amply warming up engine.
- Oil temperature during measurement : $50 \pm 5^{\circ}\text{C}$ ($122 \pm 41^{\circ}\text{F}$)

- ① Set throttle lever (1) to "IDLE".
- ② Attach control cable (2) to throttle lever (1).
- ③ Attach control cable (2) to fuel injection pump's control lever.
- ④ Start the engine.
- ⑤ Loosen lock nut (3).
- ⑥ Using stopper bolt (4), adjust so that standard minimum no-load rotational speed is achieved.

★ **Standard minimum no-load rotational speed**
: 750 ± 25 rpm

- ⑦ Using lock nut (3), firmly secure stopper bolt (4).

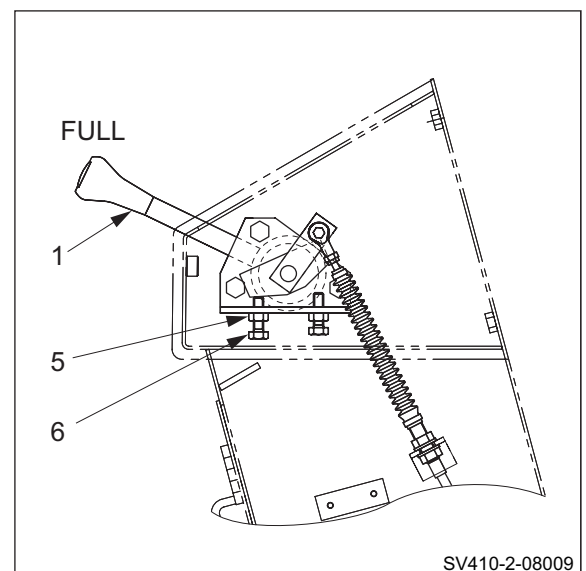
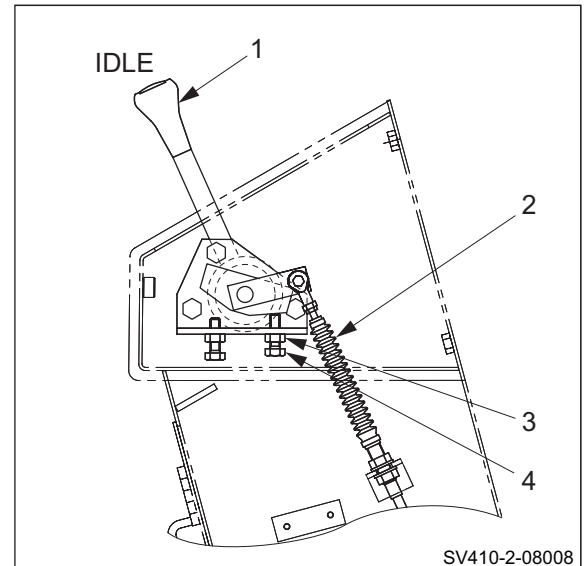
- ⑧ Set throttle lever (1) to "FULL".
- ⑨ Loosen lock nut (5).
- ⑩ Using stopper bolt (6), adjust so that standard maximum no-load rotational speed is achieved.

★ **Standard maximum no-load rotational speed**
: $2,530 \pm 50$ rpm

- ⑪ Using lock nut (5), firmly secure stopper bolt (6).

(NOTICE)

- Refer to shop manual of engine manufacturer if standard value cannot be obtained by above method.



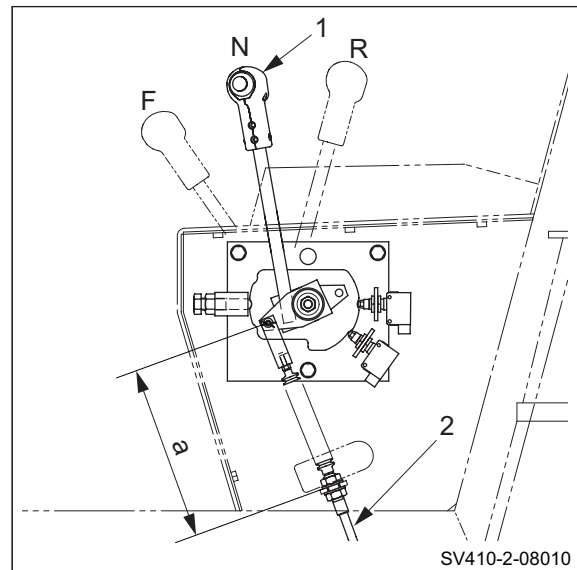
16. ADJUSTMENT OF F-R LEVER LINKAGE

16-1. Adjustment

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

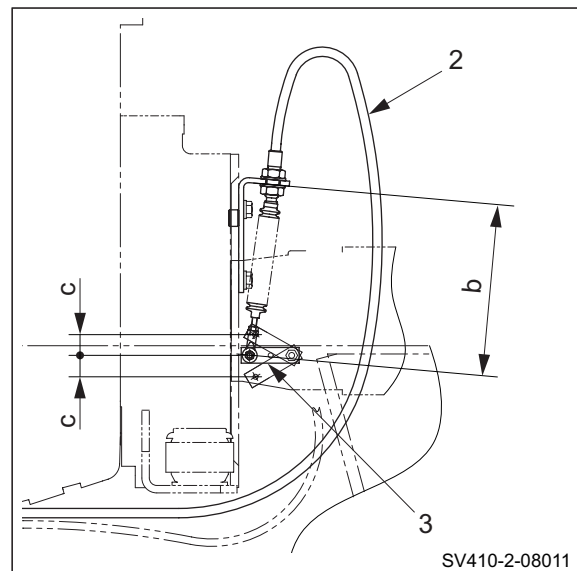
- ① Set F-R lever in “N”.
- ② Attach both ends of control cable (2).

★ Specified dimension a : 239 mm (9.41 in.)



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

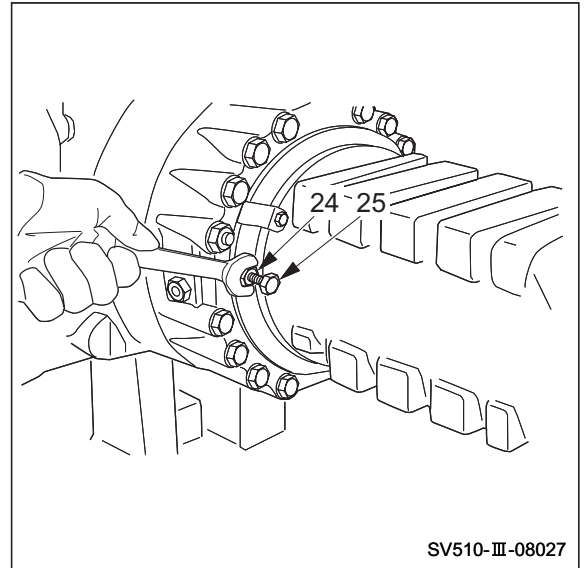
★ Specified dimension b : 208 mm (8.19 in.)
c : 25 mm (1.0 in.)



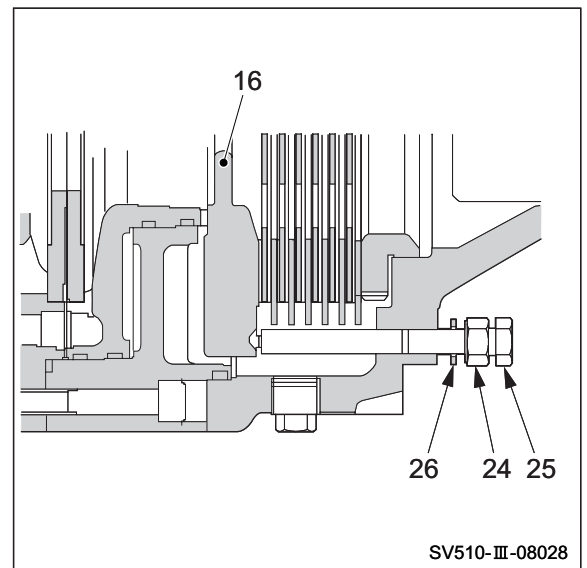
17. BRAKE ADJUSTMENT

17-1. Manually Releasing the Brake

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

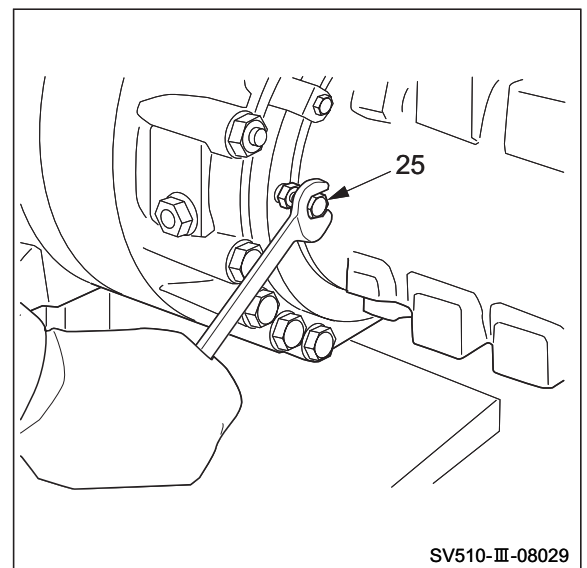


- 2) Tighten bolt (25), and press it into disc (16).
 - Do the same with bolt on the opposite side.



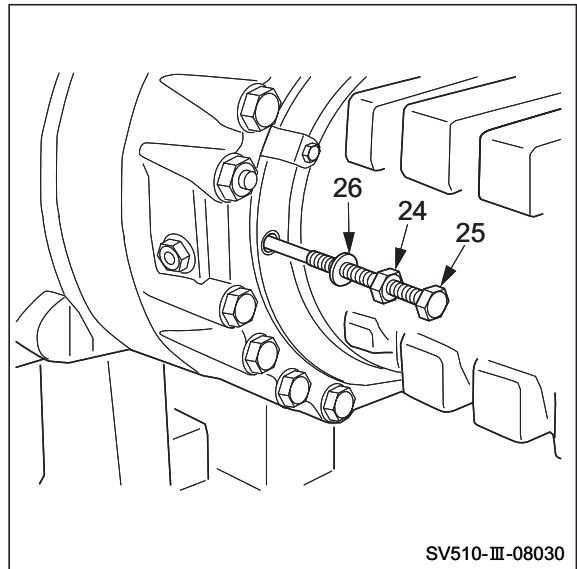
- 3) Alternately tighten bolts (25) 1/4 turn each, and release brake disc.

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



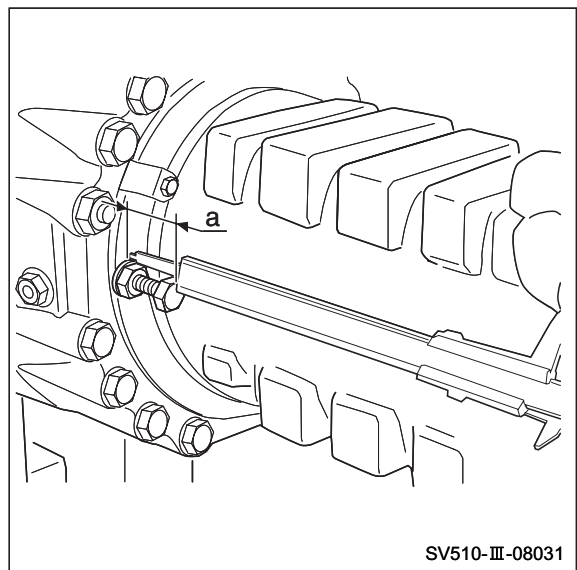
17-2. Adjustment after Manual Release of Brake

- 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).



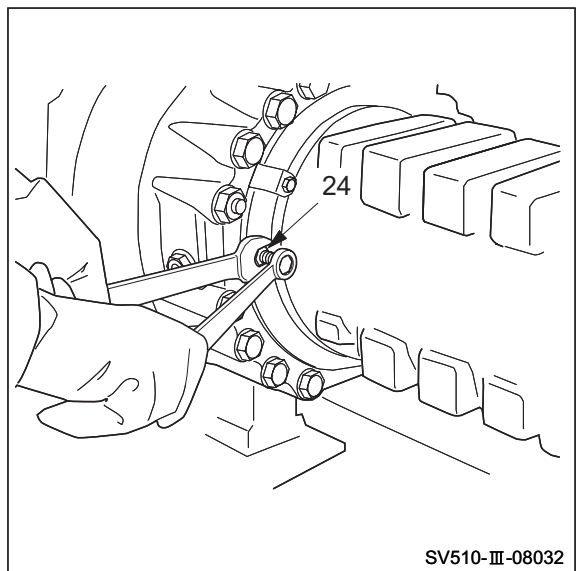
- ⑤ Adjust bolt (25) to the dimensions as shown on the right.
 - Similarly, adjust the bolt on the opposite side.

★ Specified dimension a: $30^{+0.5}_0$ 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.

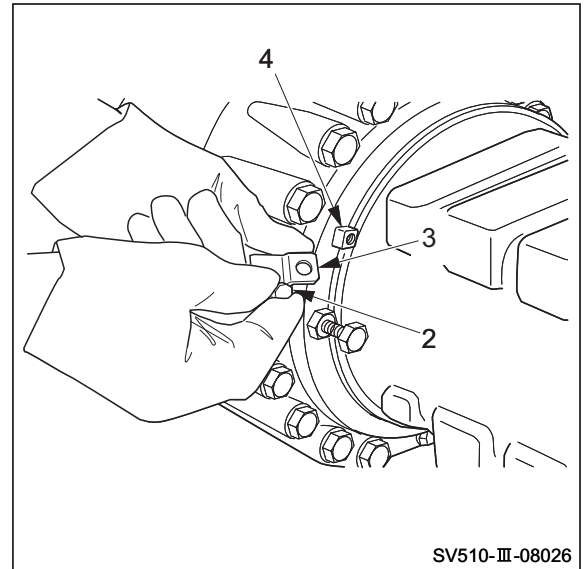


17-3. Brake Clearance Adjustment

- Remove bolt (2) and lock plate (3).
- Rotate adjustment pinion (4) counterclockwise to eliminate all existing clearance between braking discs.



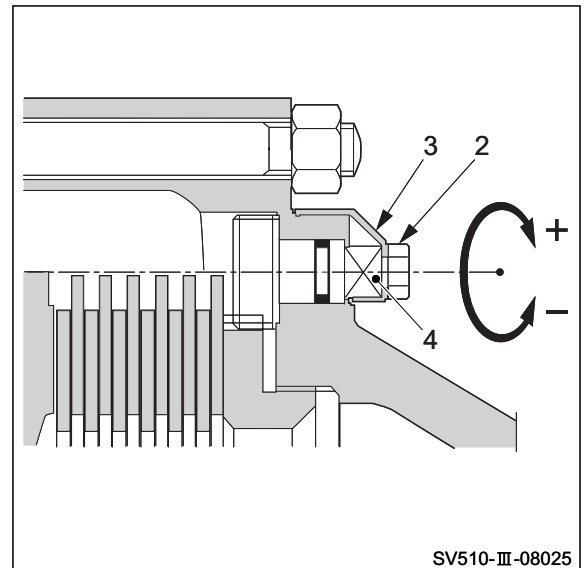
Rotate up to a torque of 8 to 10 N·m (5.9 to 7.4 lbf-ft)



- Rotate pinion (4) clockwise to determine the required clearance of 1 mm (0.04 in.).
 - Clearance change rate : 0.25 mm/turn (0.01 in./turn)
- Install lock plate (3) and lock with bolt (2).



(2) Bolt : 10 to 11 N·m (7.4 to 8.1 lbf-ft)



TROUBLESHOOTING

1. TROUBLESHOOTING

1-1. Safety Precautions for Troubleshooting

WARNING

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

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

CAUTION

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

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

WARNING

Inadvertent starting the engine may cause a serious accident.

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

CAUTION

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

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

1-2. Important Information for Troubleshooting

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

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

1-3. Before Starting

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

The following steps are recommended:

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

1-4. Wire Number and Color Code

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

2. ELECTRICAL SYSTEM TROUBLESHOOTING

2-1. When Performing Electrical System Fault Diagnosis

WARNING

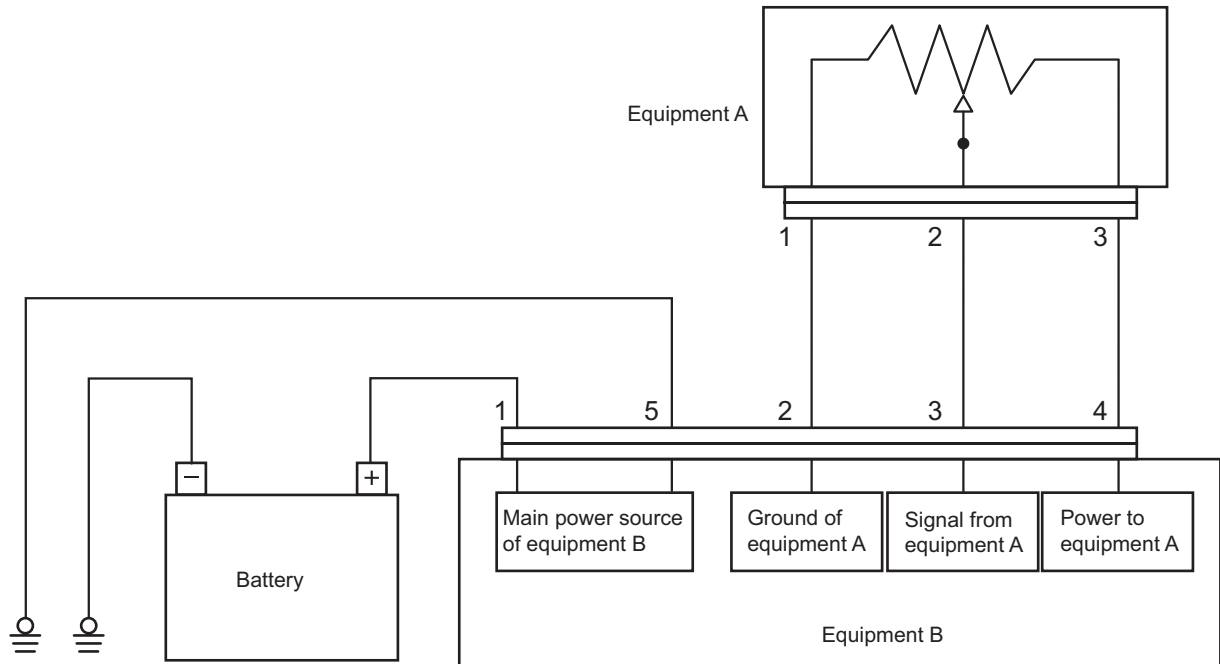
Be very careful because equipment can return to normal during an inspection and suddenly operate properly when a failure occurs due to a faulty contact or other such cause.

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

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

2-1-2. Inspection procedures using a tester

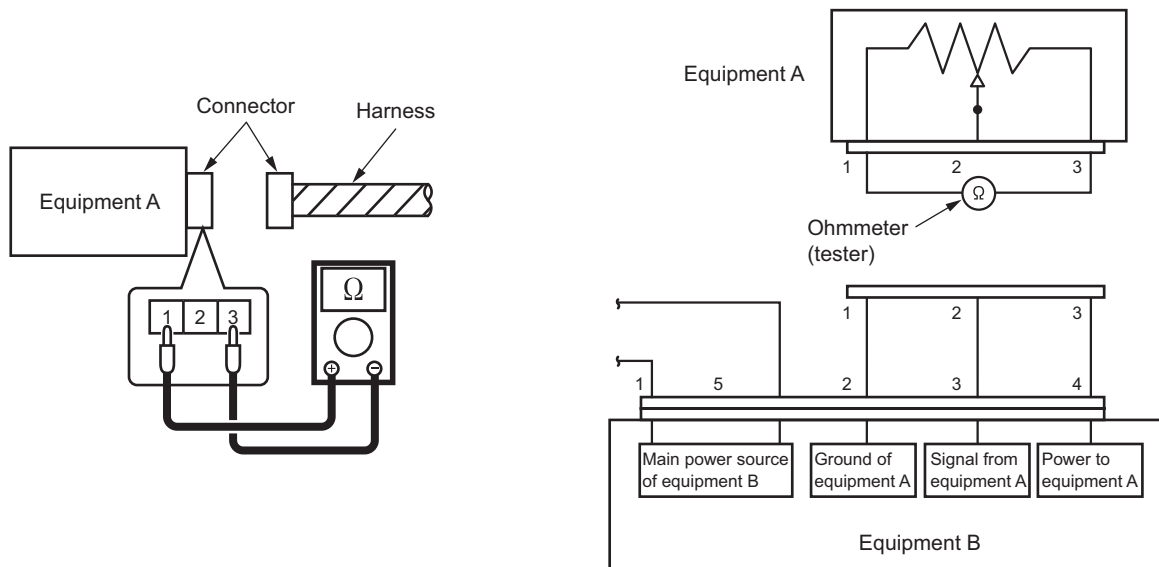
Some of the various inspection procedures are presented here for reference, using a sample circuit below.



GW750-2-10003

1) Measuring resistance using tester

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

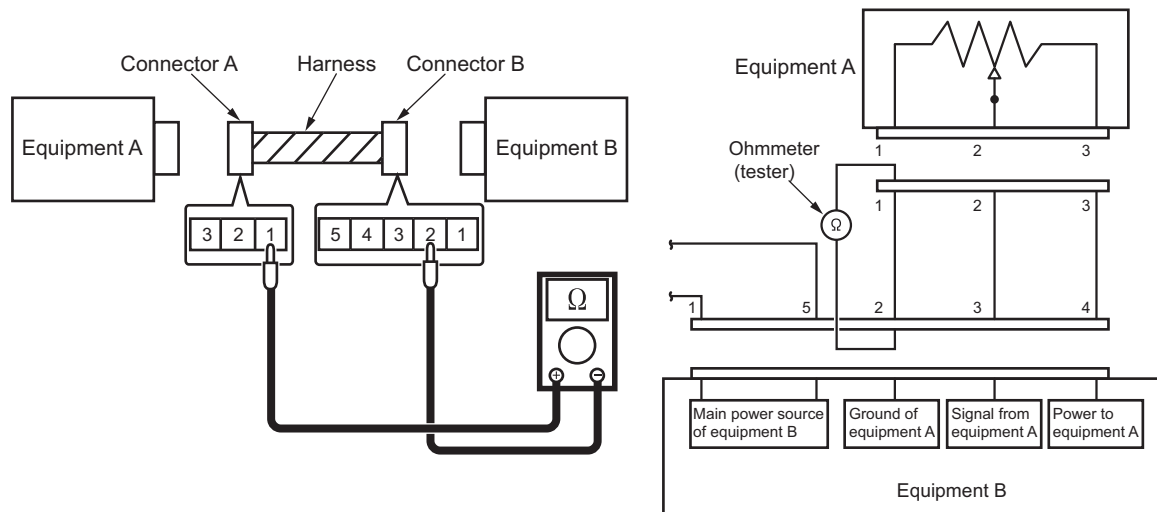


GW750-2-10004

Inspection procedure

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

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



GW750-2-10005

Inspection procedure

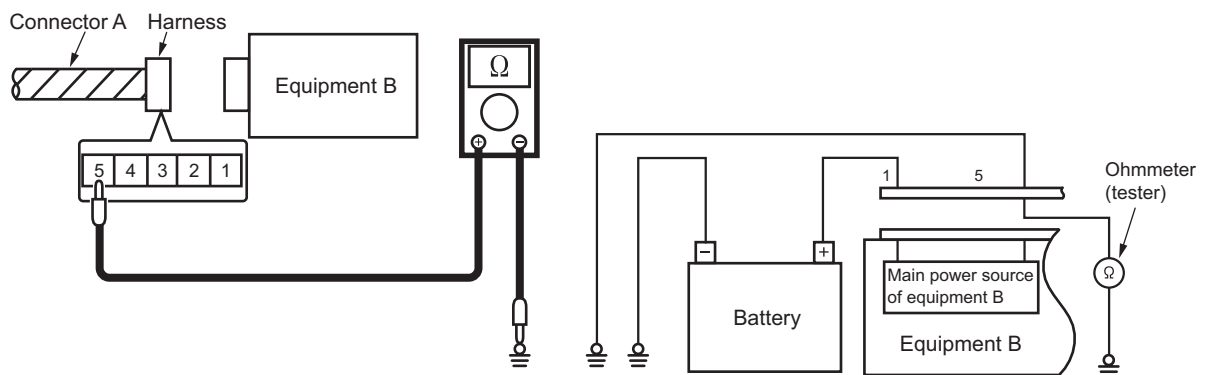
- ① Disconnect the connectors of equipment A and equipment B.
- ② Connect the test probe (+) to connector terminal 1 of equipment A and the test probe (-) to connector terminal 2 of equipment B and measure the resistance. At this time, reversing the connector terminals between the probes (+) and (-) 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)



GW750-2-10006

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.

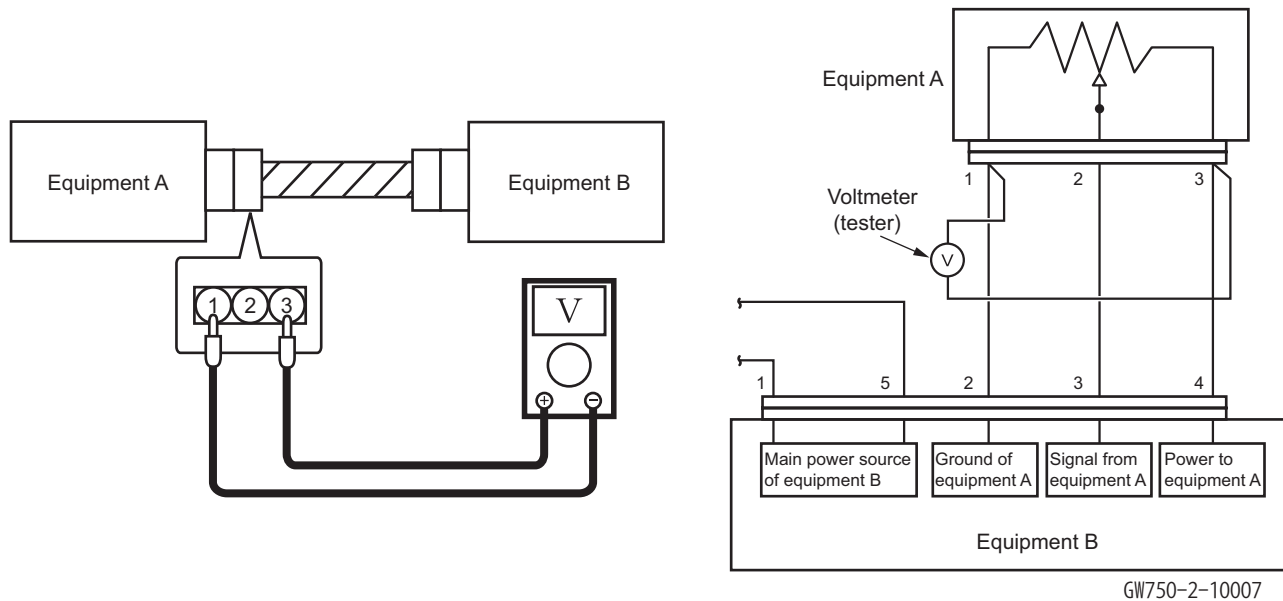
(NOTICE)

- 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.

TROUBLESHOOTING

2) Measuring voltage and current flowing using tester

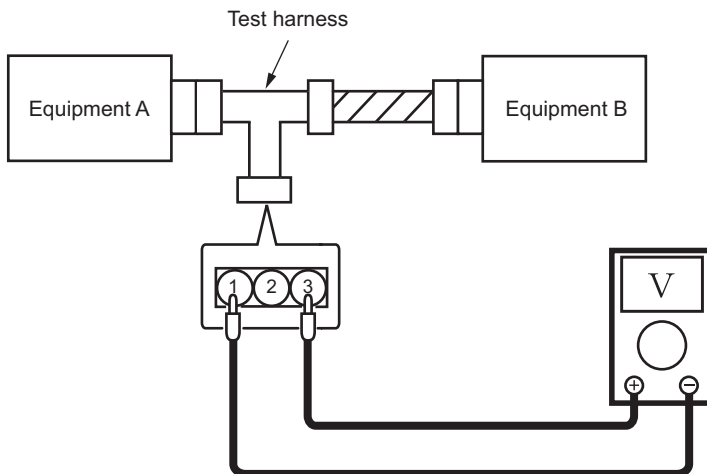
2-1) Measuring voltage of equipment A (measuring voltage between terminals 1 and 3)



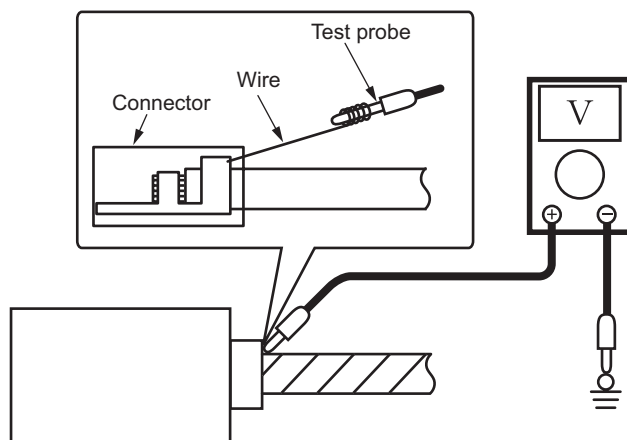
Inspection procedure

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

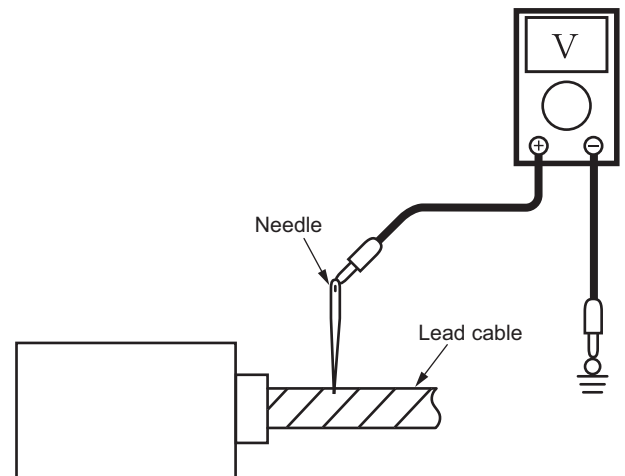
- Measurement using a test harness



- Measurement from the backside of connector



- Measurement on a lead cable



GW750-2-10002

Measurement method

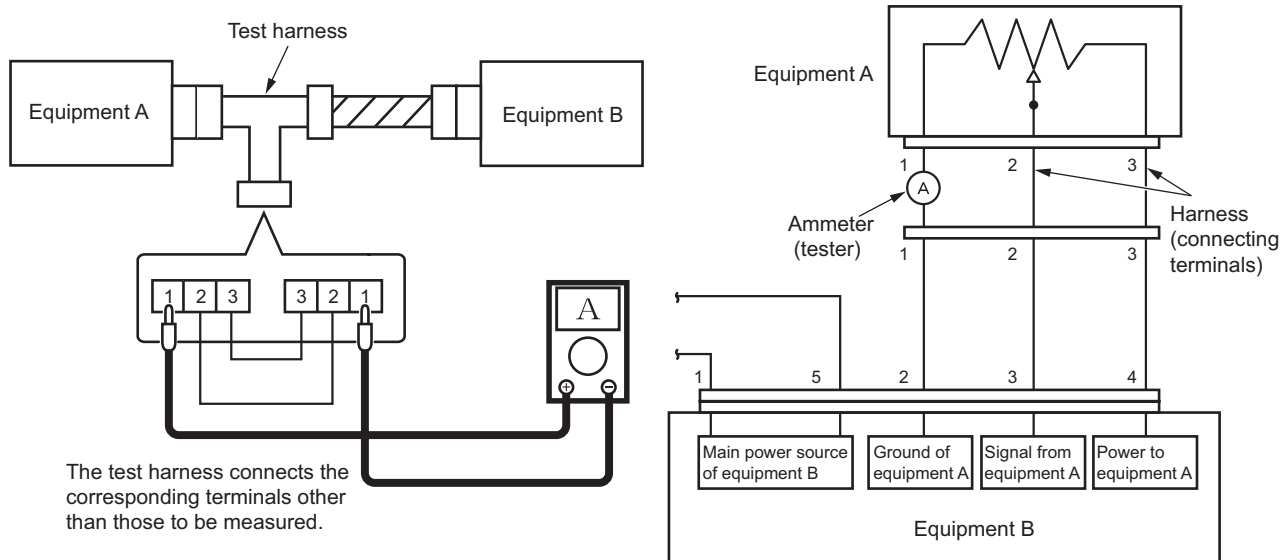
For measurement of voltage, connect the tester probes in parallel to the portion to be measured. Because the voltage can be measured only when the connector is connected in position, contact the tester probes to the terminals without disconnecting the connector. The following methods are available:

- 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)



GW750-2-10008

Inspection procedure

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

Measurement method

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

2-1-3. Inspection of electrical system

Operate the applicable switches and turn the relays ON and OFF. Ultimately, if the solenoid valve operates (makes a sound) and the pump runs, the electrical system is OK.

If there is a failure (fault), narrow the range of the inspection to the six broad steps described below.

1) Ground inspection

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

2) Fuse inspection

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

2-2) If a fuse is blown

Check whether a pump or valve (that is supposed to be protected by a blown fuse) burned, and whether there is a burning odor.

Especially if the pump and valve are not burned, check the harness for signs of burning. If it is burned, replace it.

If a fuse is blown and a relay along the pathway has failed, replace it. And if there is a timer, replace the timer, too. If a switch visually appears to be unsatisfactory (burned, melted, etc.) even though it operates, replace it.

- Simply replacing a fuse may not eliminate the true cause of a problem, and over current may flow again. Also, if over current secondarily causes an electrical path to fail (such as a wiring meltdown inside a solenoid valve), current will not flow. Thus, a fuse may not be blown out, but it also will not operate. If you do not know the location of burning or of an odor, investigate as described follows.

2-3) How to find cause of failure when fuse blown is reproduced

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

3) Connector inspection

- Is a connector disconnected or loose?
- Check that pins are not snapped or corroded.
- If faulty contact is suspected

Turn the starter switch OFF. Then disconnect and check the connectors (including relay and switch sockets).

If the terminal has no luster, faulty contact due to oxidation can be suspected. Therefore, polish the terminal by inserting and removing the connector (relay, switch) repeatedly at least five times. (Luster will return.)

4) Relay inspection (Check ON/OFF operation by sound.)

- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)

Sound heard : A relay failure occurred.

No sound heard : Using a tester, check the harness.

Sound heard : A relay failure occurred.

Still no sound : Using a tester, check the harness.

Continuity : Turn the starter switch OFF temporarily, disconnect the relay and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)

Voltage : With the relay disconnected, turn the starter switch ON and turn the operating switch ON. 24 V (or 12 V) (between vehicle body ground) should not reach the relay coil input terminal. Confirm this. Identify the location (section) to which 24 V (or 12 V) reaches. Then replace the harness or take other action.

5) Solenoid valve inspection (Check ON/OFF operation by sound.)

- Conduct without running the engine. (If you run the engine, you cannot hear the sound of operation.)

Sound heard : The electrical system is normal.

No sound heard : Check with a tester.

Continuity : ① Turn the starter switch OFF temporarily, disconnect the connector and check for continuity between the harness-side grounding terminal (color: black) and vehicle body ground. (If there is none, replace the harness.)

: ② Is the solenoid valve coil burnt?

(Turn the starter switch OFF, disconnect the connector and check the resistance between the solenoid valve terminals.)

Voltage : With the connector disconnected, turn the starter switch ON and check whether 24 V (or 12 V) exists between the harness-side connector and vehicle body ground.

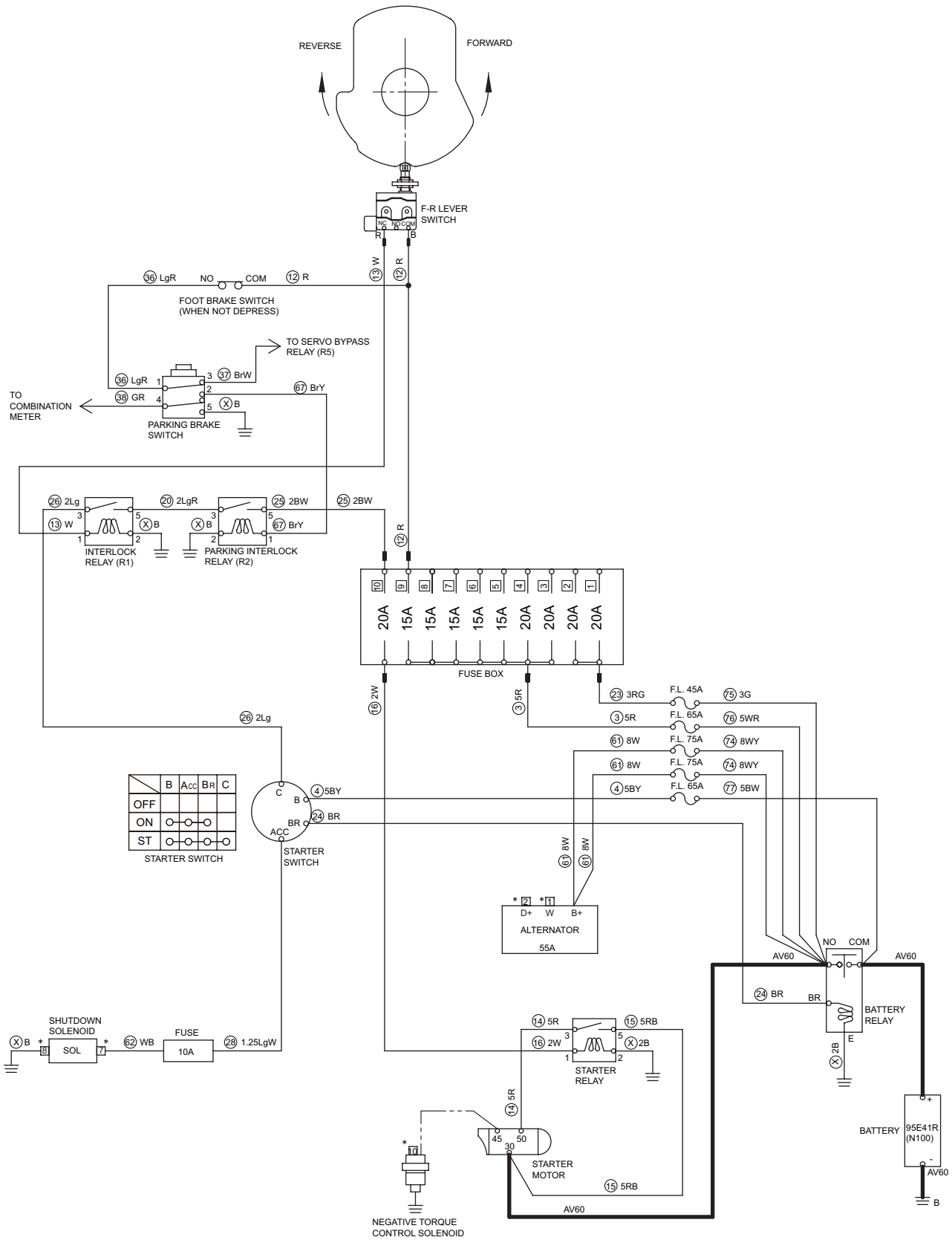
If YES : Replace the valve.

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

6) Harness check

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

Fig.: 2-2-1



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

2-2. 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 must not be lighting. If lamp lights, refer to “workshop manual” of engine manufacturer.

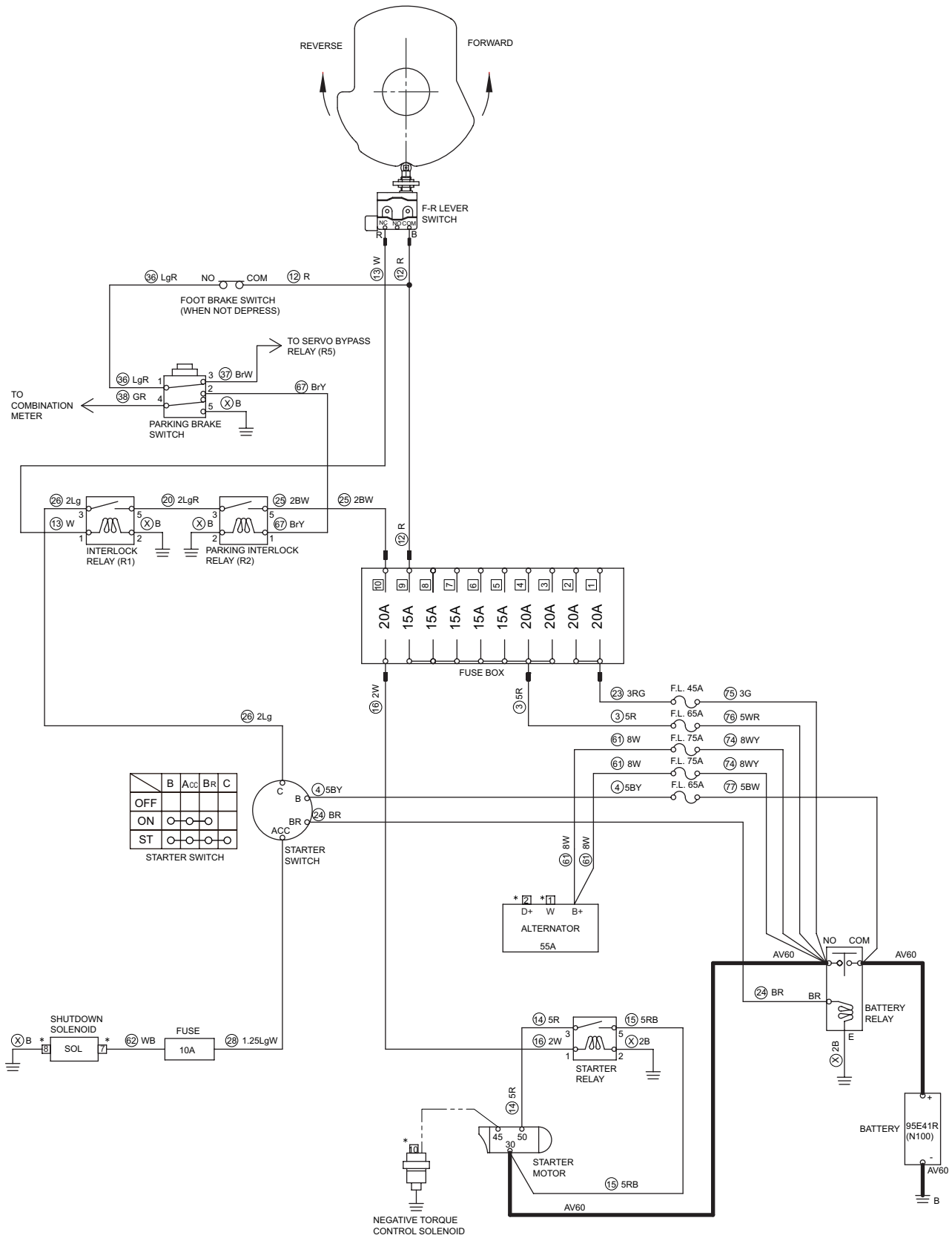
2-2-1. Engine will not start (Starter motor does not run) 1/3

- F-R lever must be “N”.
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
1. Battery	<ul style="list-style-type: none"> • Measure battery voltage or specific gravity. Standard voltage : 12 V or more Standard gravity : 1.26 or more • If value is below standard, battery capacity is insufficient. 	Charge or replace battery.
2. Starter Switch	<ul style="list-style-type: none"> • 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	<p>(1) When starter switch is ON, measure voltage between starter motor terminal 30 and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between starter motor terminal 50 and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If starter motor does not run even though above items (1) and (2) are OK, starter motor is faulty. 	Replace starter motor.
4. Battery Relay	<p>(1) When starter switch is OFF, measure voltage between battery relay primary terminal COM and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between battery relay coil terminal BR inlet wire BR and coil ground terminal E. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between battery relay secondary terminal NO and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, battery relay is faulty. 	Replace battery relay.

Fig.: 2-2-1



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

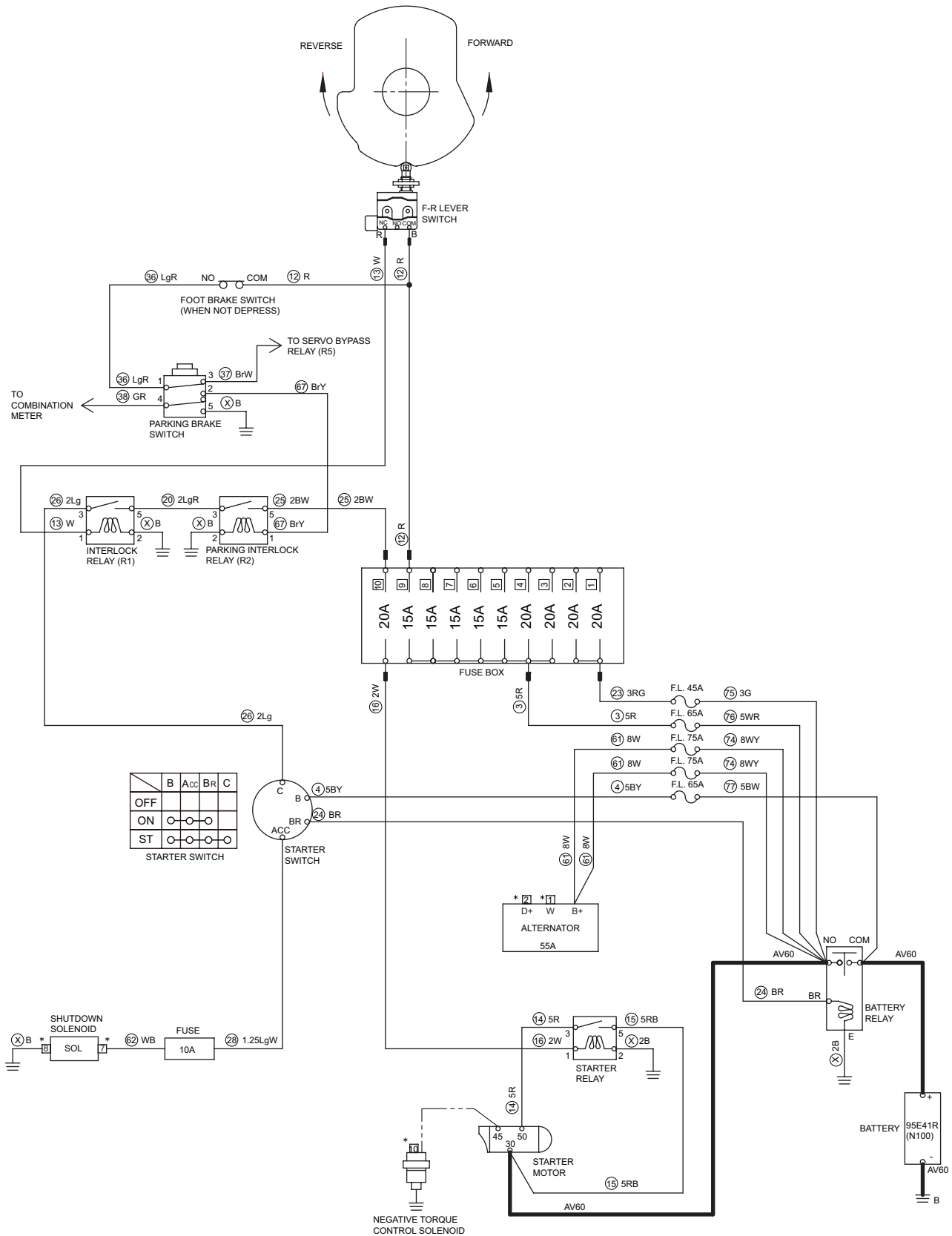
2-2-1. Engine will not start (Starter motor does not run) 2/3

- F-R lever must be "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
5. Starter Relay	<p>(1) When starter switch is START, measure voltage between starter relay terminal 1 inlet wire W and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between starter relay terminal 5 inlet wire RB and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between starter relay terminal 3 outlet wire R and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, starter relay is faulty. 	Replace starter relay.
6. F-R Lever Switch	<p>(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between F-R lever switch terminal NC outlet wire W and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, F-R lever switch is faulty. 	Replace F-R lever switch.
7. Foot Brake Switch	<p>(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, foot brake switch is faulty 	Replace foot brake switch.
8. Parking Brake Switch	<p>(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between parking brake switch terminal 2 outlet wire BrY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, parking brake switch is faulty. 	Replace parking brake switch.

Fig.: 2-2-1



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

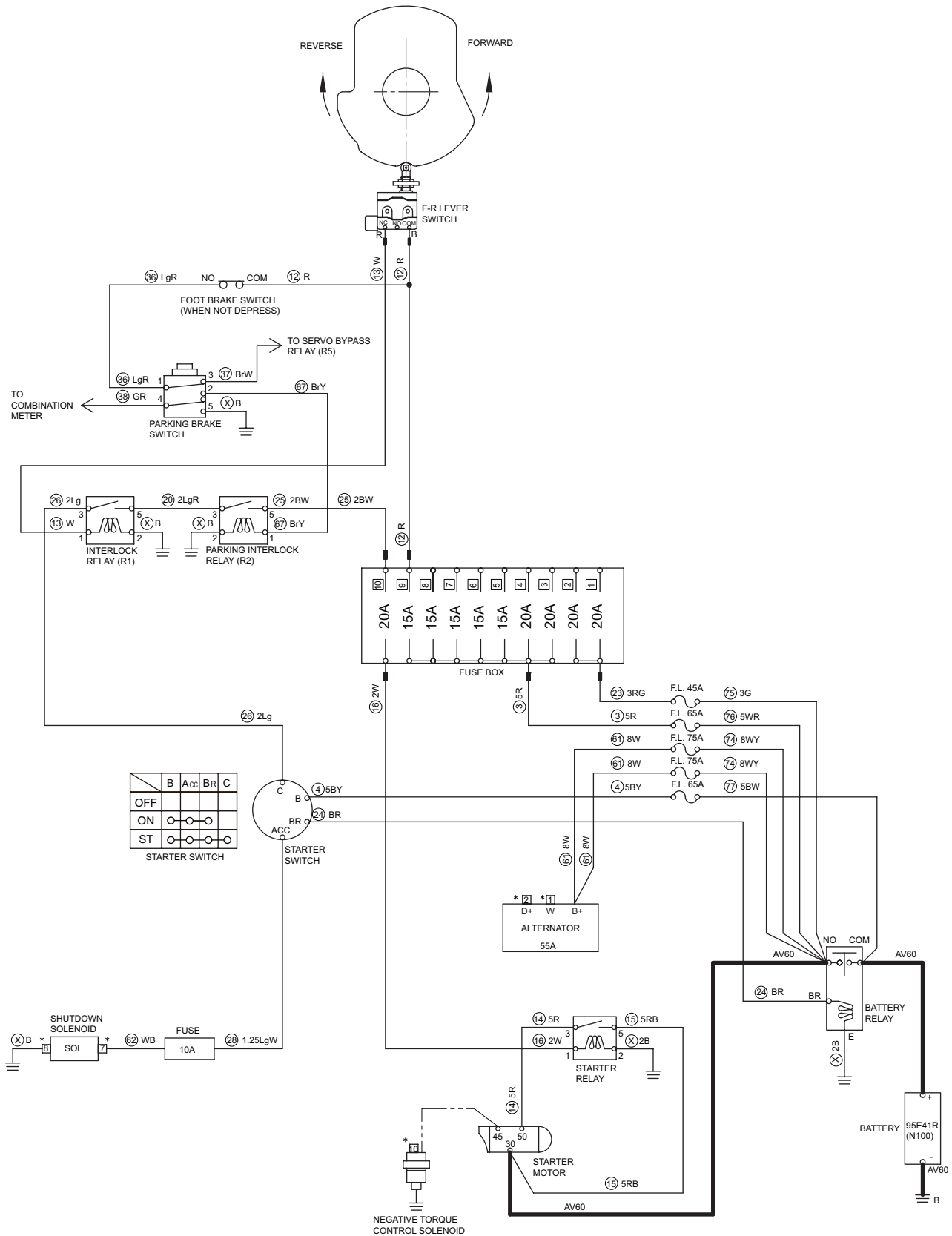
2-2-1. Engine will not start (Starter motor does not run) 3/3

- F-R lever must be "N".
- Parking brake switch must be applied.
- Foot brake switch must be ON (Brake pedal is not depressed).

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
9. Interlock Relay (R1)	<p>(1) When starter switch is ON, measure voltage between interlock relay terminal 1 inlet wire W and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between interlock relay terminal 3 inlet wire Lg and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between interlock relay terminal 5 outlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, interlock relay is faulty. 	Replace interlock relay (R1).
10. Parking Interlock Relay (R2)	<p>(1) When starter switch is ON, measure voltage between parking interlock relay terminal 1 inlet wire BrY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is START, measure voltage between parking interlock relay terminal 3 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is START, measure voltage between parking interlock relay terminal 5 outlet wire BW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, parking interlock relay is faulty. 	Replace parking interlock relay (R2).
11. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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.: 2-2-1



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

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

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

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
1. Shutdown Solenoid	<ul style="list-style-type: none"> • When starter switch is ON, measure voltage between shutdown solenoid terminal 7 inlet wire WB and chassis ground. There is electricity in normal condition. • If electricity flows but engine does not start, shutdown solenoid is faulty. 	Replace shutdown solenoid.
2. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. 	Repair or replace harness.

2-2-3. Engine does not stop running

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
1. Shutdown Solenoid	<ul style="list-style-type: none"> • When starter switch is OFF, measure voltage between shutdown solenoid terminal 7 inlet wire WB and chassis ground. There is no electricity in normal condition. • If electricity does not flows but engine does not stop after started, shutdown solenoid is faulty. 	Replace shutdown solenoid.
2. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty 	Repair or replace harness.

2-2-4. No charging

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
1. Alternator	<ul style="list-style-type: none"> • After starting engine, measure voltage between alternator terminal B+ wire W and chassis ground. Standard voltage : At least intermediate engine speed, 14 V or more • If voltage is lower than standard, alternator is faulty. • If voltage is normal and battery is not charged, battery is faulty. 	Replace alternator or battery.

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

Reference Fig.: 2-2-1

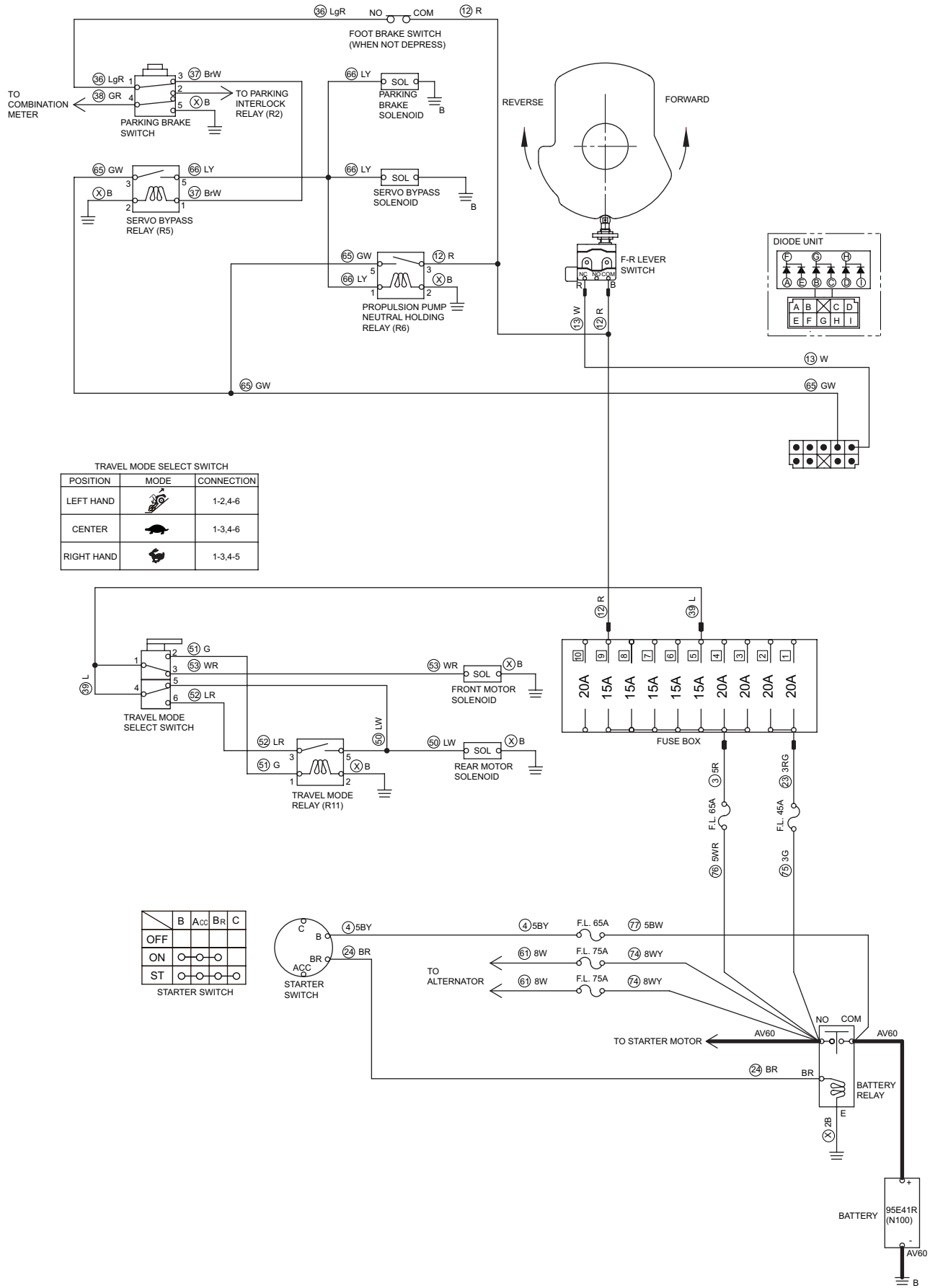
Check point	Check/Cause	Action
1. F-R Lever Switch	<ul style="list-style-type: none"> When starter switch is OFF and F-R lever is “F” or “R”, check continuity between F-R lever switch terminal COM and terminal NC. There is no continuity in normal condition. If there is continuity, F-R lever switch is faulty. 	Replace F-R lever switch.
2. Parking Brake Switch	<ul style="list-style-type: none"> When starter switch is OFF and parking brake switch is released position, check continuity between parking brake switch terminal 1 and 2. There is no continuity in normal condition. If there is continuity, parking brake switch is faulty. 	Replace parking brake switch.

2-2-6. Starting engine is difficult

Reference Fig.: 2-2-1

Check point	Check/Cause	Action
1. Negative Torque Control Solenoid	<ul style="list-style-type: none"> When starter switch is START, measure voltage between negative torque control solenoid terminal 10 inlet wire and chassis ground. There is electricity in normal condition. If electricity flows but starting engine is difficult, negative torque control solenoid is faulty. 	Replace negative torque control solenoid.

Fig.: 2-3-1



2-3. Propulsion

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.

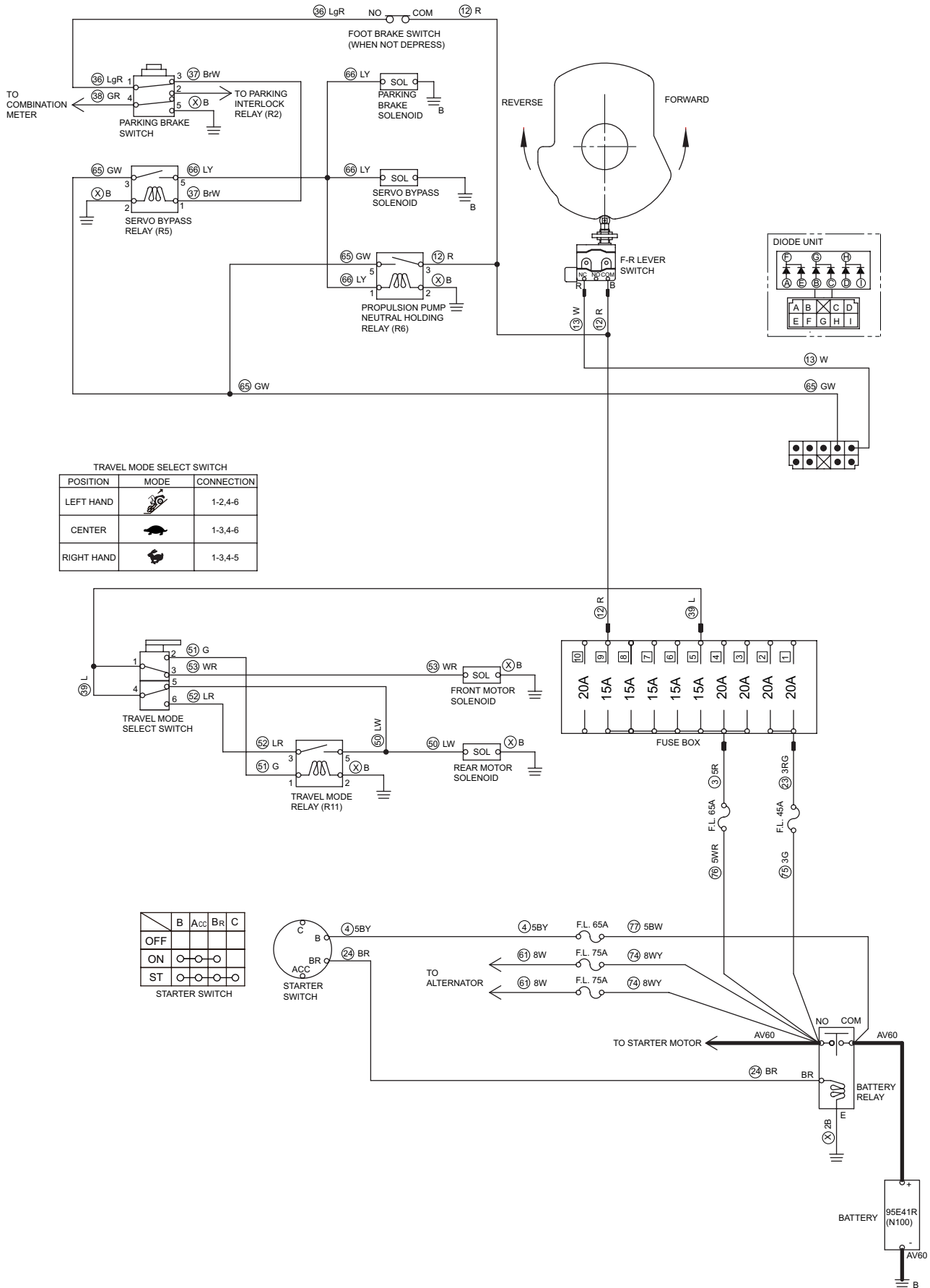
2-3-1. Machine moves neither forward nor backward 1/2

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- F-R lever must not be "N".

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
1. Servo Bypass Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : $12.3 \pm 1.2 \Omega$ • If measured resistance is abnormal, servo bypass solenoid is faulty. 	Replace servo bypass solenoid.
2. Parking Brake Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : $12.3 \pm 1.2 \Omega$ • If measured resistance is abnormal, parking brake solenoid is faulty. 	Replace parking brake solenoid.
3. Servo Bypass Relay (R5)	<p>(1) When starter switch is ON, measure voltage between servo bypass relay terminal 1 inlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between servo bypass terminal 3 inlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between servo bypass relay terminal 5 outlet wire LY and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, servo bypass is faulty. 	Replace servo bypass relay (R5).
4. Propulsion Pump Neutral Holding Relay (R6)	<p>(1) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 1 inlet wire LY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 3 inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between propulsion pump neutral holding relay terminal 5 outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, propulsion pump neutral holding relay is faulty. 	Replace propulsion pump neutral holding relay (R6).

Fig.: 2-3-1



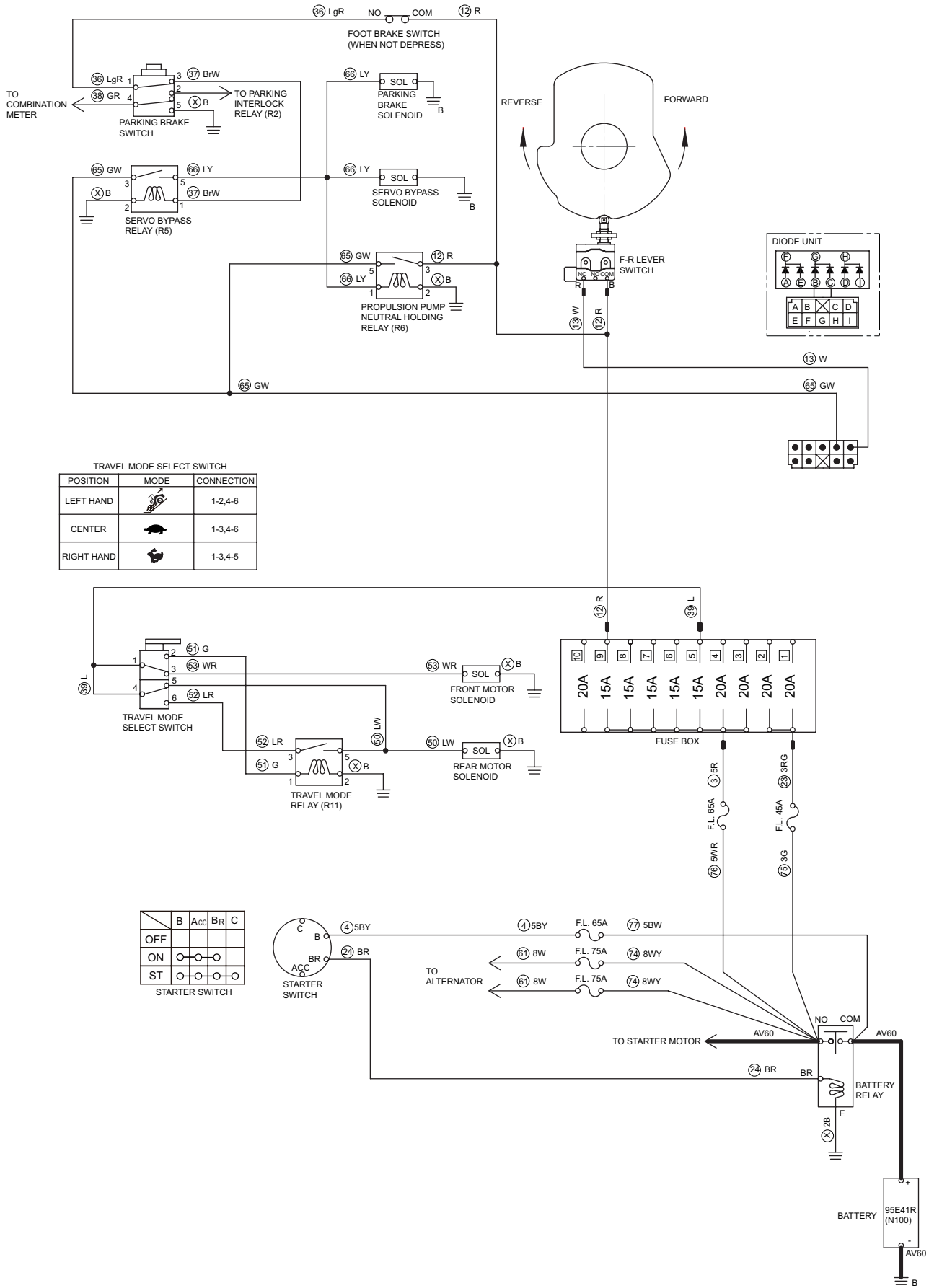
2-3-1. Machine moves neither forward nor backward 2/2

- Parking brake switch must be released.
- Foot brake switch must be ON (Brake pedal is not depressed).
- F-R lever must not be "N".

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
5. Diode Unit	<p>(1) When starter switch is ON and F-R lever is "N", measure voltage between diode unit terminal I inlet wire W and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever is "N", measure voltage between diode unit terminal H outlet wire GW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, diode unit is faulty. 	Replace diode unit.
6. F-R Lever Switch	<p>(1) When starter switch is ON, measure voltage between F-R lever switch terminal COM inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever is "N", measure voltage between F-R lever switch terminal NC outlet wire W and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, F-R lever switch is faulty. 	Replace F-R lever switch.
7. Foot Brake Switch	<p>(1) When starter switch is ON, measure voltage between foot brake switch terminal COM inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between foot brake switch terminal NO outlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, foot brake switch is faulty. 	Replace foot brake switch.
8. Parking Brake Switch	<p>(1) When starter switch is ON, measure voltage between parking brake switch terminal 1 inlet wire LgR and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire BrW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, parking brake switch is faulty. 	Replace parking brake switch.
9. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. 	Repair or replace harness.

Fig.: 2-3-1



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

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

Reference Fig.: 2-3-1




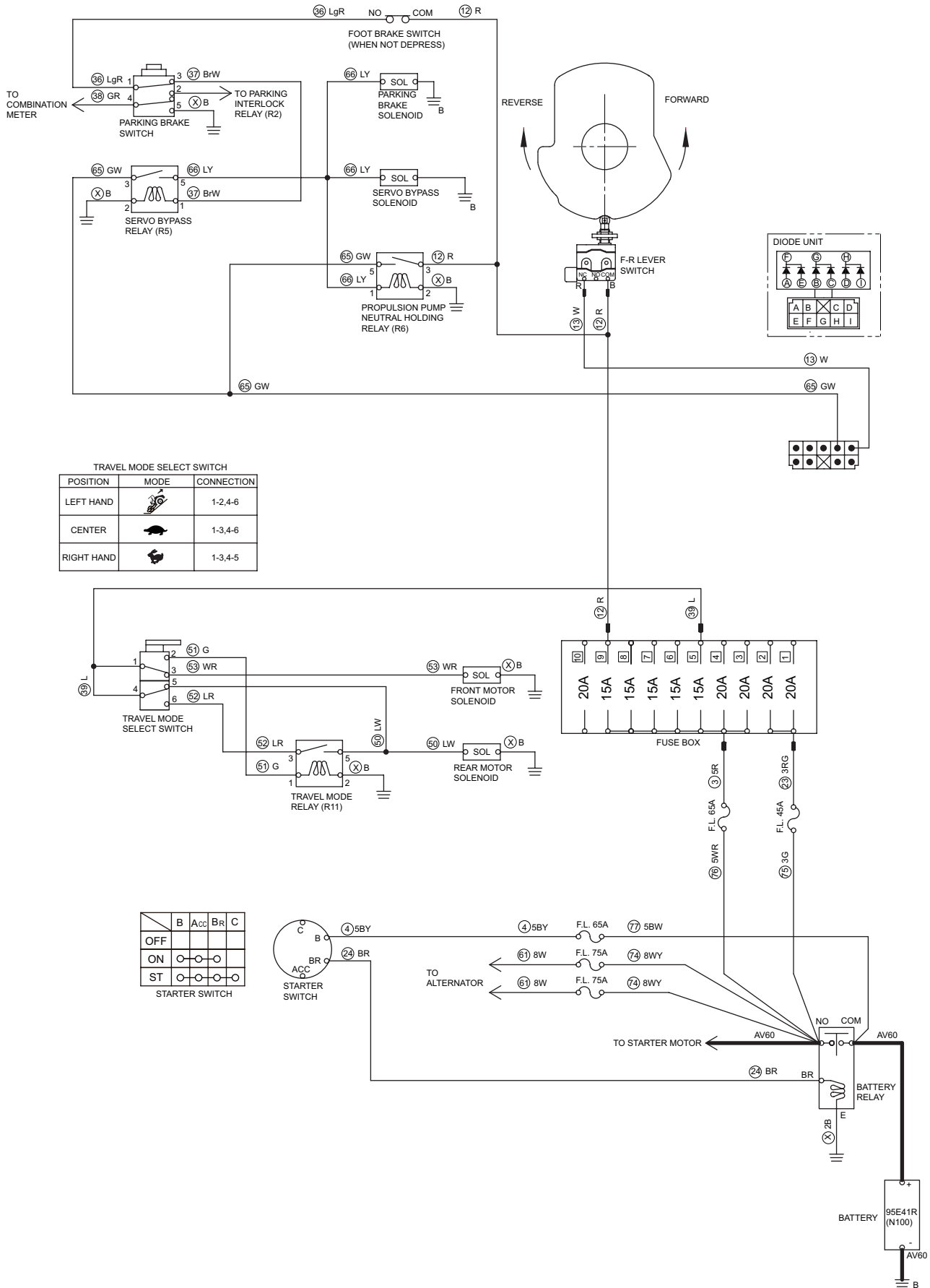
Check point	Check/Cause	Action
1. Front Motor Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : 9.8 Ω • If measured resistance is abnormal, front motor solenoid is faulty. 	Replace front motor solenoid.
2. Rear Motor Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : 5.1 Ω • If measured resistance is abnormal, rear motor solenoid is faulty. 	Replace rear motor solenoid.
3. Travel Mode Relay (R11)	<p>(1) When starter switch is ON and travel mode select switch is "", measure voltage between travel mode relay terminal 1 inlet wire G and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and travel mode select switch is "", measure voltage between travel mode relay terminal 3 inlet wire LR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and travel mode select switch is "", measure voltage between travel mode relay terminal 5 outlet wire LW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and item (3) is NG, travel mode relay is faulty. 	Replace travel mode relay (R11).

Fig.: 2-3-1



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

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

Reference Fig.: 2-3-1




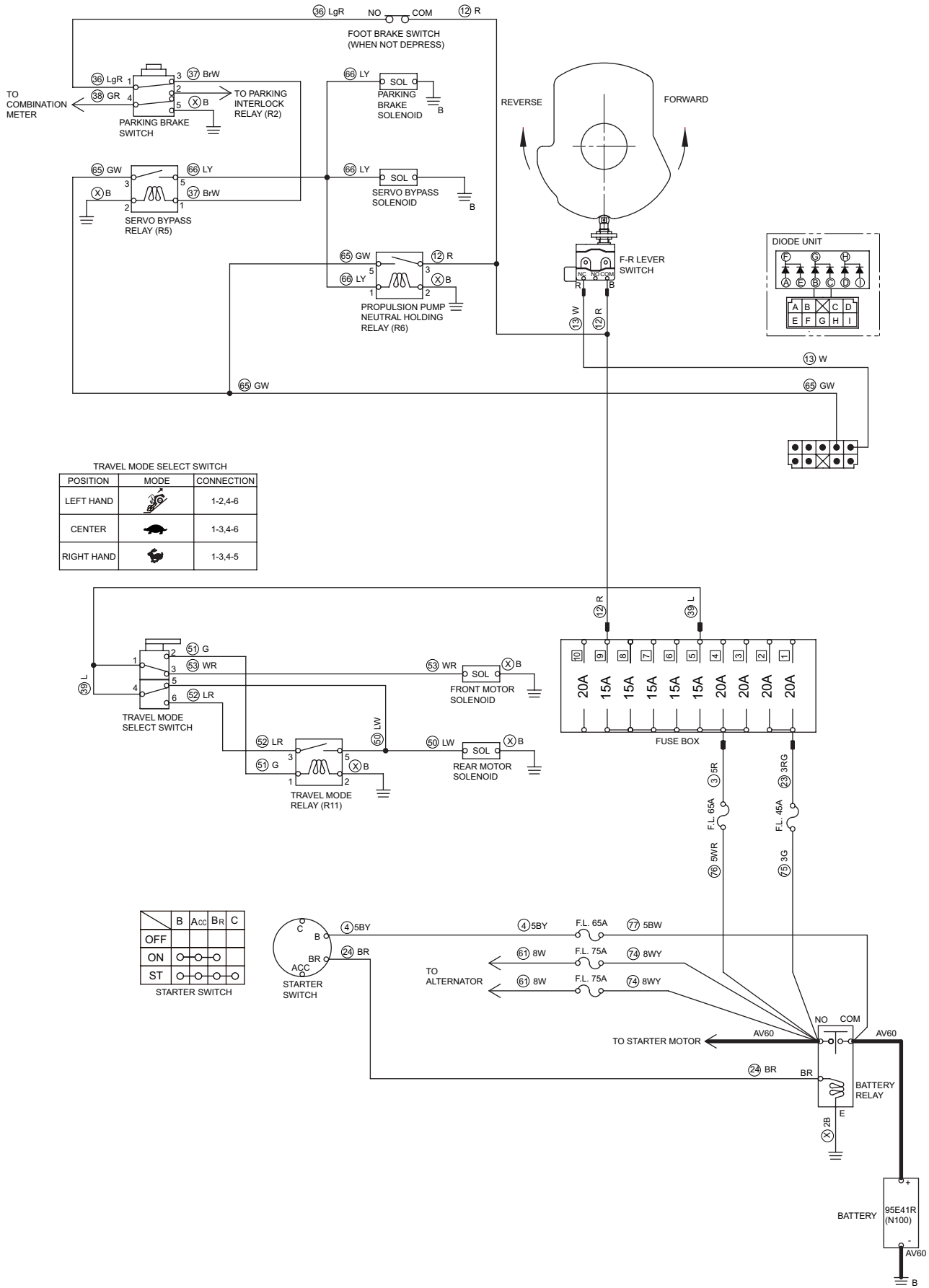
Check point	Check/Cause	Action
4. Travel Mode Select Switch	<p>(1) When starter switch is ON, measure voltage between travel mode select switch terminal 1 inlet wire L, terminal 4 inlet wire L and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and travel mode select switch is “”, measure voltage between travel mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> • Travel mode select switch terminal 2 outlet wire G and chassis ground. • Travel mode select switch terminal 6 outlet wire LR and chassis ground. <p>Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and travel mode select switch is “”, measure voltage between travel mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> • Travel mode select switch terminal 3 outlet wire WR and chassis ground. • Travel mode select switch terminal 6 outlet wire LR and chassis ground. <p>Standard voltage : 12 V or more</p> <p>(4) When starter switch is ON and travel mode select switch is “”, measure voltage between travel mode select switch terminal wires and chassis ground.</p> <ul style="list-style-type: none"> • Travel mode select switch terminal 3 outlet wire WR and chassis ground. • Travel mode select switch terminal 5 outlet wire LW and chassis ground. <p>Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2), (3) or (4) is NG, travel mode select switch is faulty. 	Replace travel mode select switch.
5. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. 	Repair or replace harness.

Fig.: 2-3-1



TRAVEL MODE SELECT SWITCH

POSITION	MODE	CONNECTION
LEFT HAND		1-2,4-6
CENTER		1-3,4-6
RIGHT HAND		1-3,4-5

STARTER SWITCH

	B	ACC	BR	C
OFF				
ON				
ST				

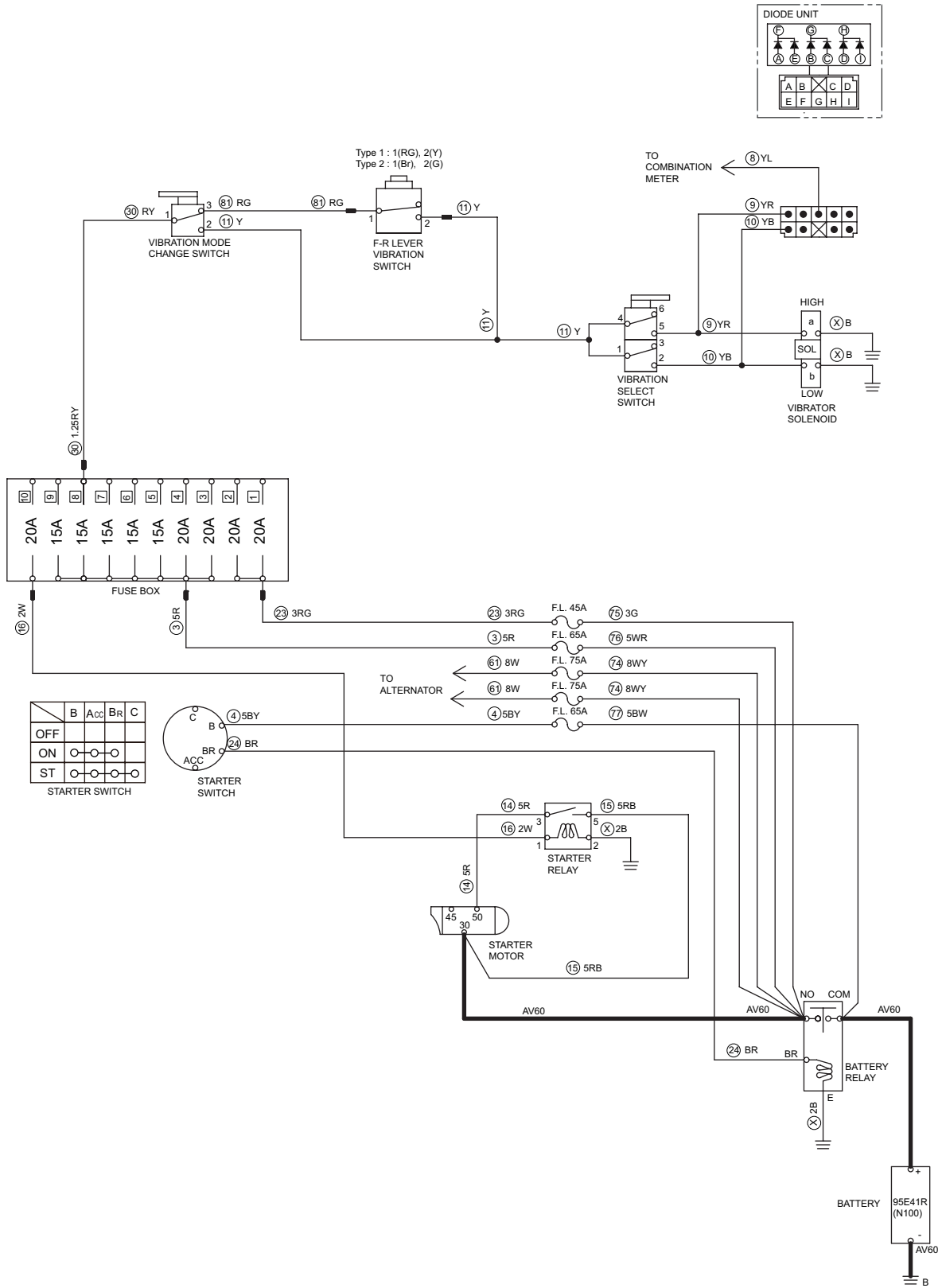
2-3-3. Brake does not work

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

Reference Fig.: 2-3-1

Check point	Check/Cause	Action
1. Parking Brake Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : $12.3 \pm 1.2 \Omega$ • If measured resistance is abnormal, parking brake solenoid is faulty. 	Replace parking brake solenoid.
2. Parking Brake Switch	<ul style="list-style-type: none"> • When starter switch is ON, measure voltage between parking brake switch terminal 3 outlet wire BrW and chassis ground. There is no electricity in normal condition. • If electricity flows, parking brake switch is faulty. 	Replace parking brake switch.
3. Foot Brake Switch	<ul style="list-style-type: none"> • 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 electricity flows, foot brake switch is faulty. 	Replace foot brake switch.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10Ω or less • If resistance is abnormal, harness is faulty. 	Repair or replace harness.

Fig.: 2-4-1



2-4. Vibration

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.

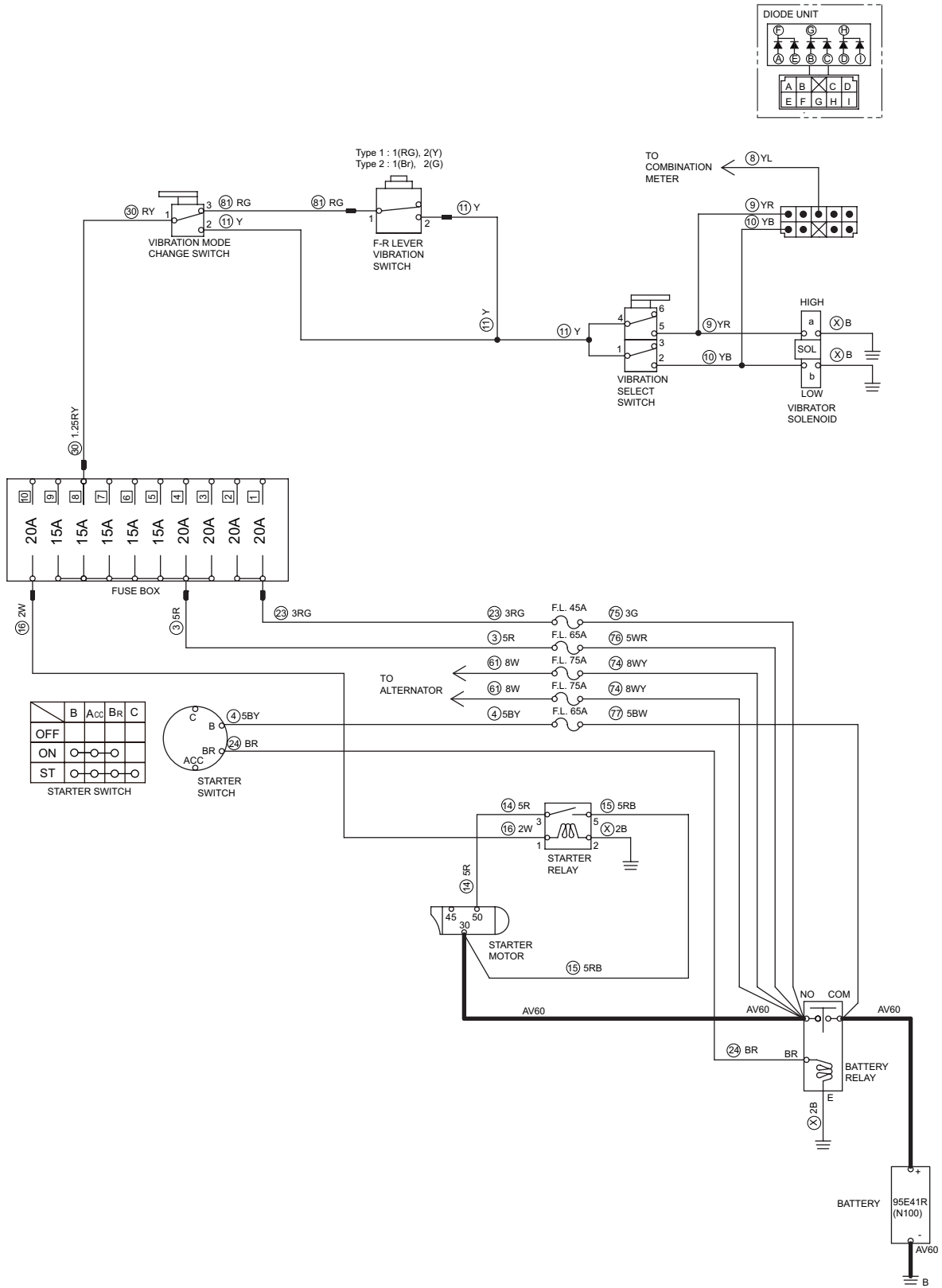
2-4-1. No vibration occurs

- Vibration mode change switch must be "CONT" (continuous mode).
- Vibration select switch must not be "○".

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. Vibrator Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : 5.1 Ω • If resistance is abnormal, vibrator solenoid is faulty. 	Replace vibrator solenoid.
2. Vibration Select Switch	<p>(1) When starter switch is ON, measure voltage between vibration select switch terminal 1 inlet wire Y, terminal 4 inlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration select switch is "∩", measure voltage between vibration select switch terminal 2 outlet wire YB and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration select switch is "∩", measure voltage between vibration select switch terminal 5 outlet wire YR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) or (3) is NG, vibration select switch is faulty. 	Replace vibration select switch.
3. Vibration Mode Change Switch	<p>(1) When starter switch is ON, measure voltage between vibration mode change switch terminal 1 inlet wire RY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between vibration mode change switch terminal 2 outlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, vibration mode change switch is faulty. 	Replace vibration mode change switch.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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



2-4-2. Amplitude does not change (Remains either Low or High)

- Vibration mode change switch must be “CONT” (continuous mode).

Reference Fig.: 2-4-1



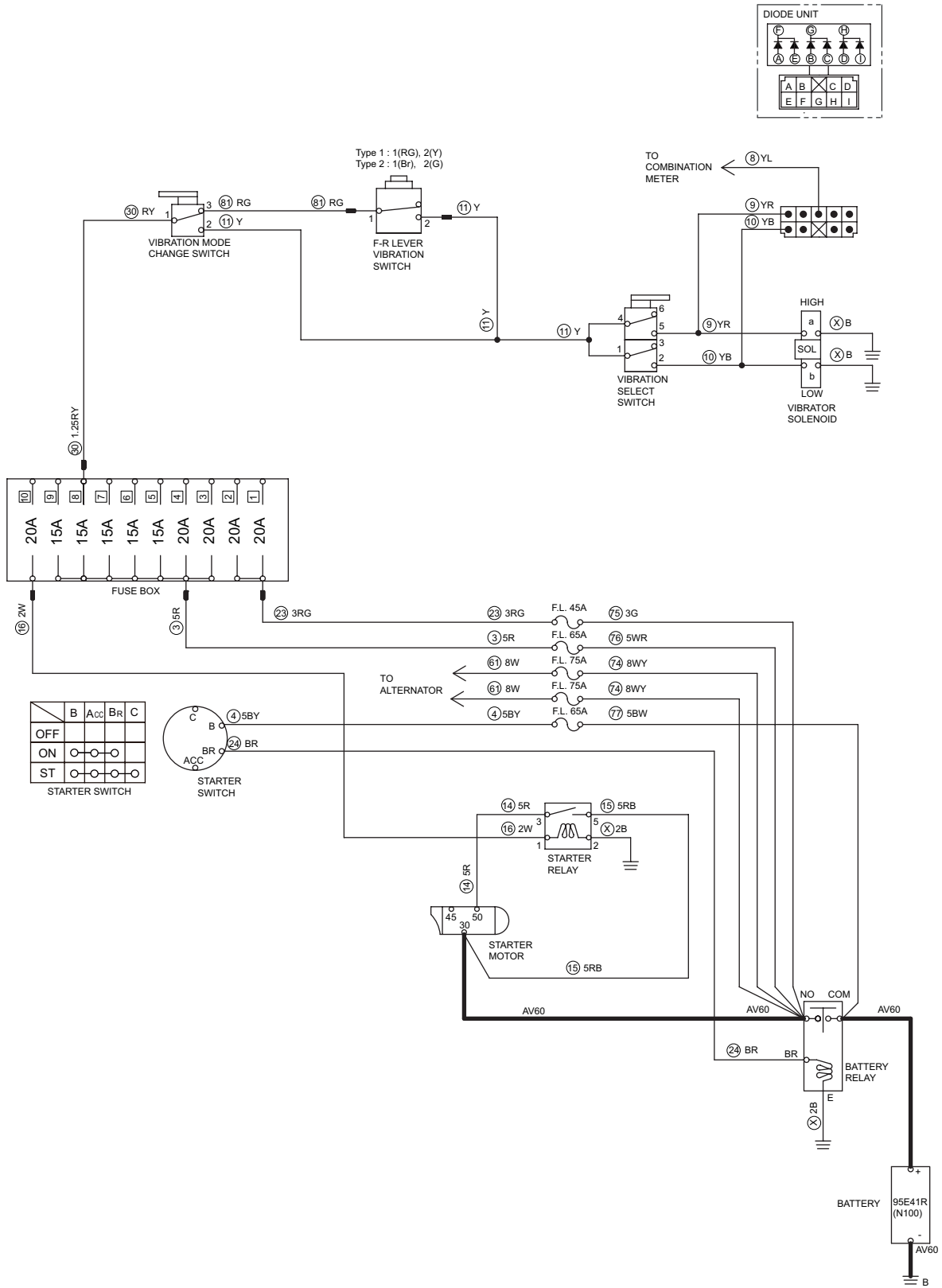


Check point	Check/Cause	Action
1. Vibrator Solenoid	<ul style="list-style-type: none"> • Disconnect harness and measure resistance of coil. Standard resistance : 5.1 Ω • If resistance is abnormal, vibrator solenoid is faulty. 	Replace vibrator solenoid.
2. Vibration Select Switch	<p>(1) When starter switch is ON, measure voltage between vibration select switch terminal 1 inlet wire Y, terminal 4 inlet wire Y and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration select switch is “”, measure voltage between vibration select switch terminal 2 outlet wire YB and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON and vibration select switch is “”, measure voltage between vibration select switch terminal 5 outlet wire YR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) or (3) is NG, vibration select switch is faulty. 	Replace vibration select switch.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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



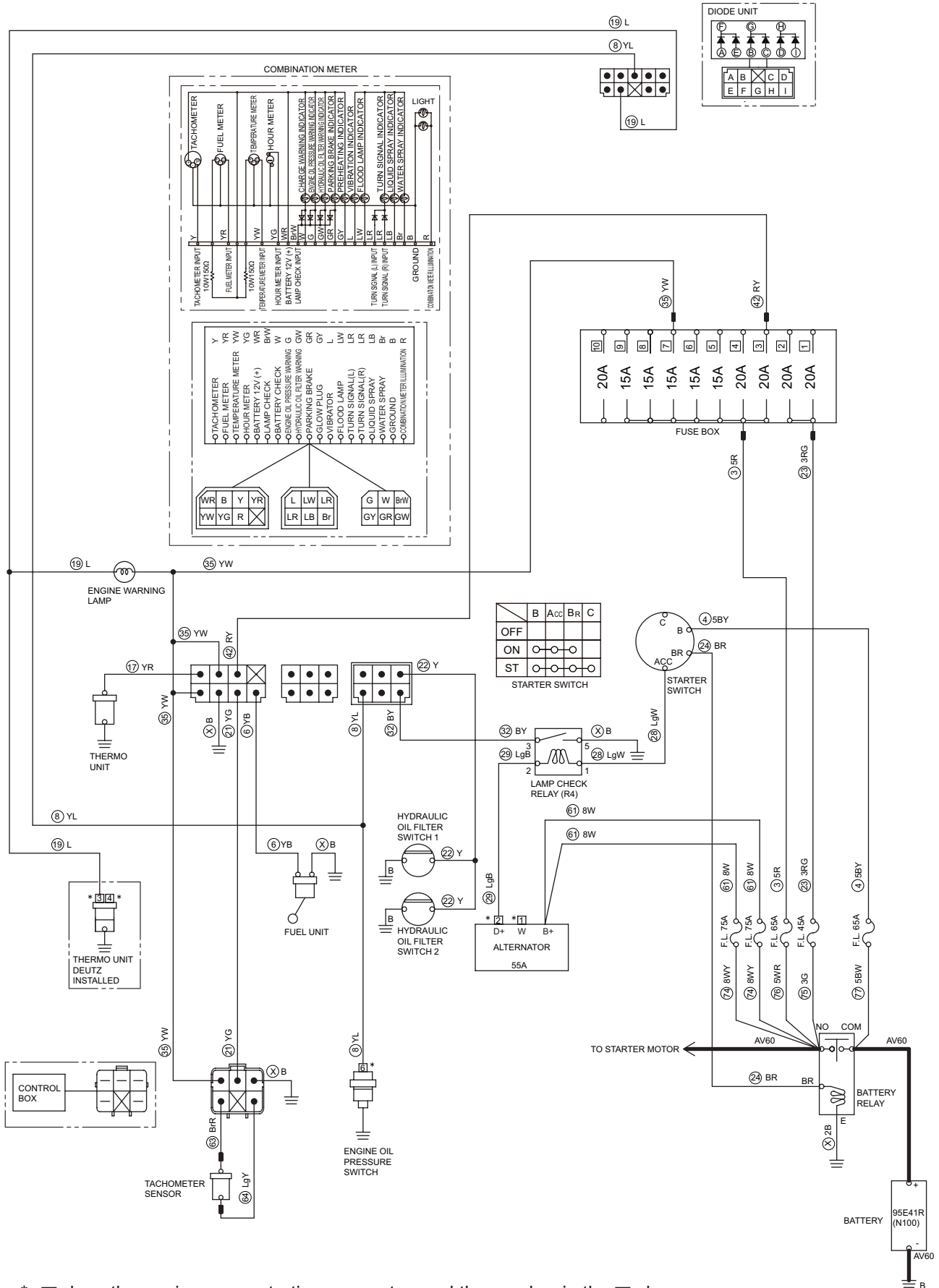
2-4-3. Vibration mode cannot be switched (F-R lever vibration switch does not work)



- Vibration mode change switch to “” (manual mode).
- Vibration select switch must not be “”.

Reference Fig.: 2-4-1

Check point	Check/Cause	Action
1. F-R Lever Vibration Switch	<p>(1) When starter switch is ON, measure voltage between F-R lever vibration switch terminal 1 inlet wire RG and chassis ground. Standard voltage : 12 V or more</p> <p>(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 : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, F-R lever vibration switch is faulty. 	Replace F-R lever vibration switch.
2. Vibration Mode Change Switch	<p>(1) When starter switch is ON, measure voltage between vibration mode change switch terminal 1 inlet wire RY and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between vibration mode change switch terminal 3 outlet wire RG and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, vibration mode change switch is faulty. 	Replace vibration mode change switch.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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



* :  show the engine concentration connector, and the number in the  shows the terminal number of the engine concentration connector.

2-5. 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.

2-5-1. Illumination of combination meter does not turn on

Reference Fig.: 2-5-1

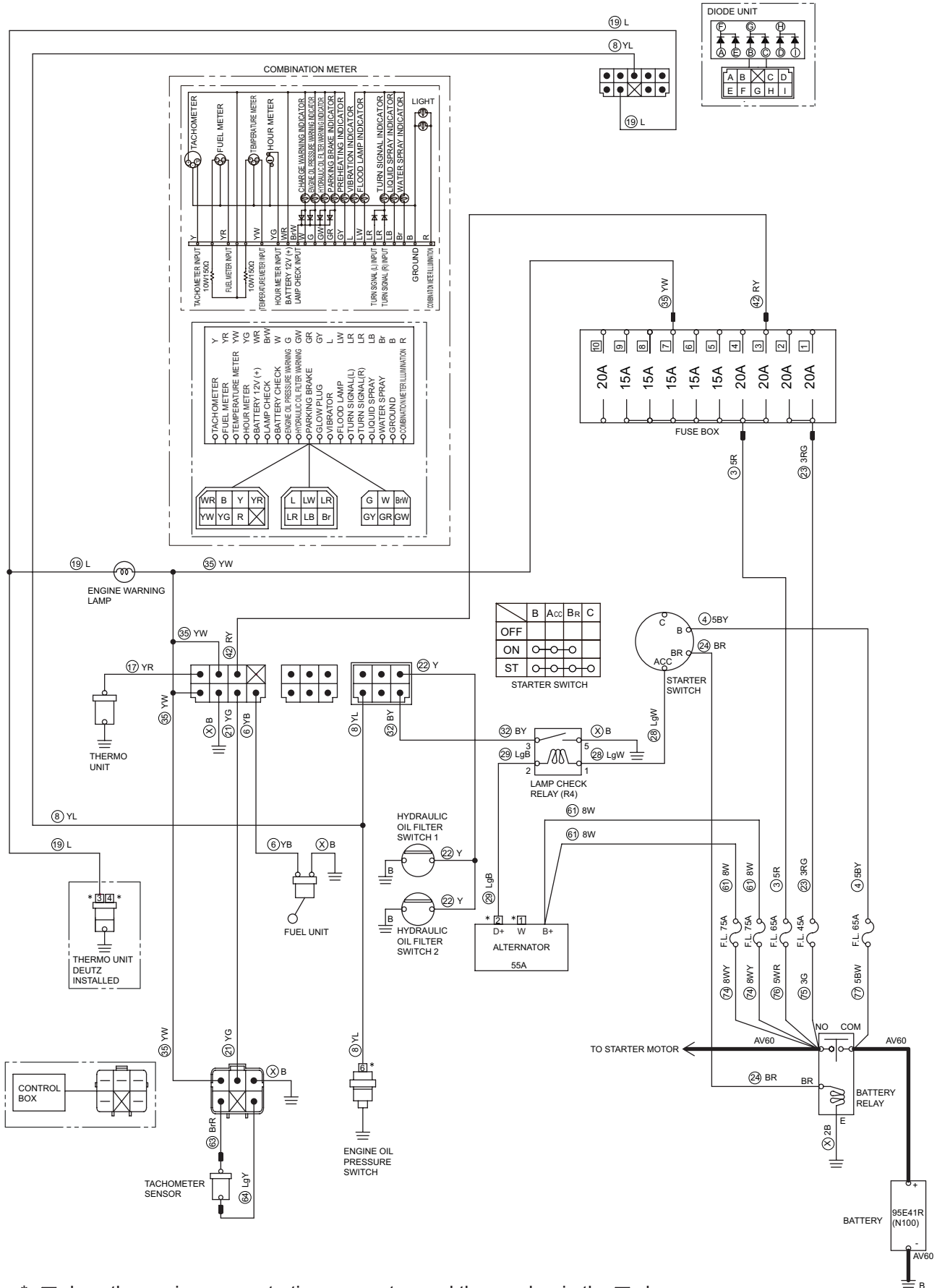
Check point	Check/Cause	Action
1. Bulbs	<ul style="list-style-type: none"> • Check if bulbs have burned out or are poorly contacted. • Bulbs are faulty or poorly connected. 	Replace bulbs.
2. Combination Meter (Combination meter illumination)	<ul style="list-style-type: none"> • When starter switch is ON, measure voltage between combination meter illumination terminal wire No. 42 inlet wire RY and ground terminal wire B. Standard voltage : 12 V or more • If above item is OK and combination meter does not turn on, combination meter is faulty. 	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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. Combination meter warning lamp or indicator lamp is abnormal

Reference Fig. : 2-5-1

Check point	Check/Cause	Action
1. Each Bulb	<ul style="list-style-type: none"> • Check that none of lamp bulbs is burned out or has a contact failure (charge warning lamp, engine oil pressure warning lamp, hydraulic oil filter warning lamp and parking brake indicator lamp). • Bulb is faulty or poorly connected. 	Replace each bulb.
2. Lamp Check Relay (R4)	<p>(1) When starter switch is ON, measure voltage between lamp check relay terminal 2 outlet wire LgB and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between lamp check relay terminal 5 outlet wire B and chassis ground. Standard voltage : 12 V or more</p> <p>(3) After starting engine, measure voltage between lamp check relay terminal wires and chassis ground.</p> <ul style="list-style-type: none"> • Lamp check relay terminal 2 inlet wire LgB and chassis ground • Lamp check relay terminal 5 outlet wire B and chassis ground <p>There is no electricity in normal condition.</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, lamp check relay is faulty. • If above items (1) and (2) are OK and item (3) is NG, alternator is faulty. 	Repair or replace lamp check relay (R4) or alternator.
3. Combination Meter (Lamp check)	<p>(1) When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, check that parking brake indicator lamp, hydraulic oil filter warning lamp, engine oil pressure warning lamp and electrical charge warning lamp illuminate and then go out after starting engine.</p> <ul style="list-style-type: none"> • If above item (1) is OK and the item (2) is NG, combination meter is faulty. <p>(NOTICE)</p> <ul style="list-style-type: none"> • Since engine cannot start unless parking brake switch is applied and F-R lever is "N", parking brake indicator lamp does not go out even after starting engine. 	Replace combination meter.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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



* : show the engine concentration connector, and the number in the shows the terminal number of the engine concentration connector.

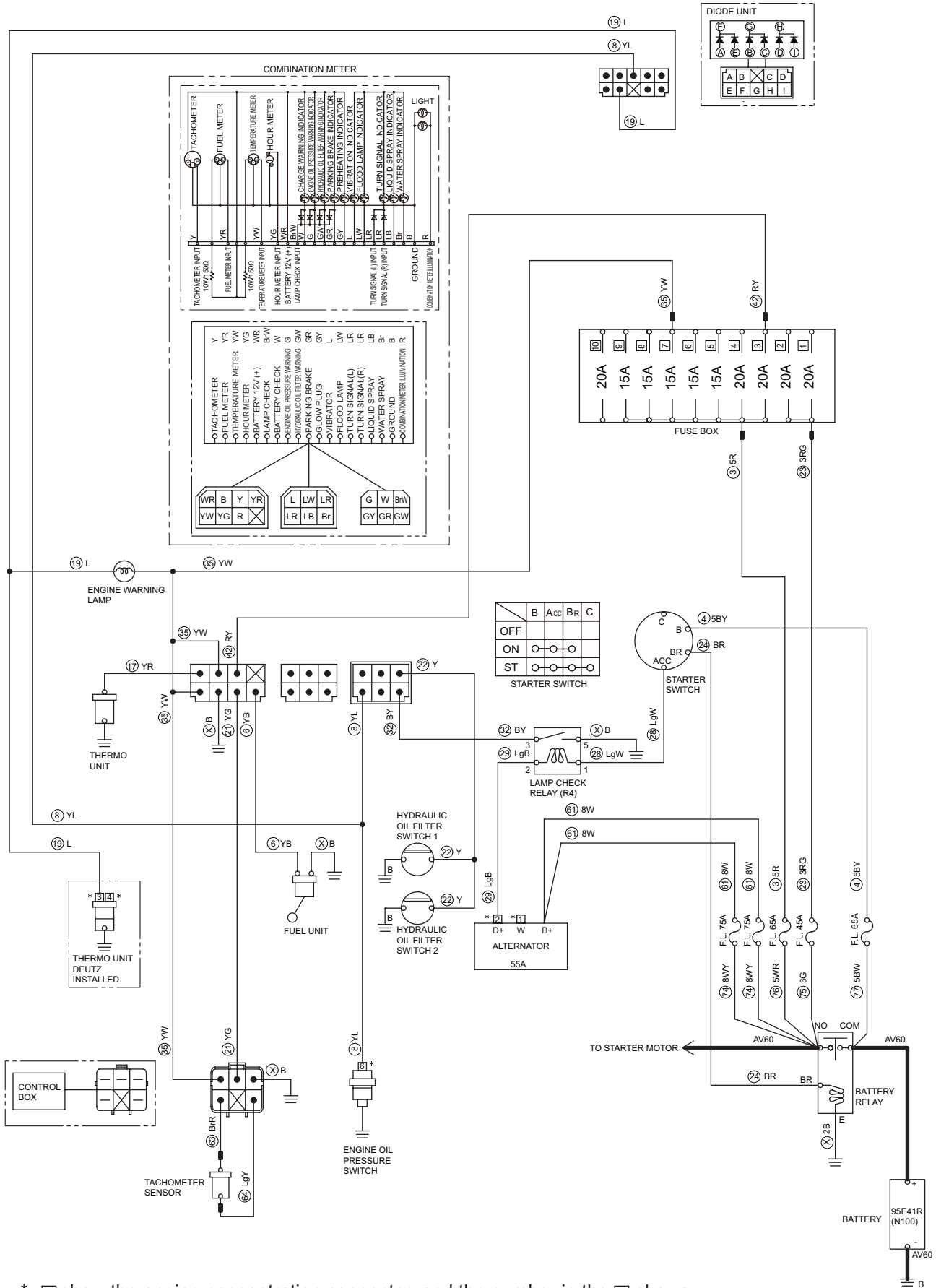
2-5-3. Tachometer reading is abnormal**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Tachometer Sensor	<ul style="list-style-type: none"> Start engine and fix engine speed at 1,000 rpm. Measure pulse between tachometer sensor terminal wire No. 63 outlet wire BrR and ground terminal wire LgY. Standard pulse : 110,011/min. If measured pulse is abnormal, tachometer sensor is faulty. 	Replace tachometer sensor.
2. Control Box	<ul style="list-style-type: none"> Start engine and fix engine speed at 1,000 rpm. Measure pulse between control box terminal wire No. 21 outlet wire YG and ground terminal wire B. Standard pulse : 2,000/min. If measured pulse is abnormal, control box is faulty. 	Replace control box.
3. Combination Meter (Tachometer)	<ul style="list-style-type: none"> When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more If above item is OK and no abnormality found in tachometer sensor or control box, combination meter is faulty. 	Replace combination meter.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less If resistance is abnormal, harness is faulty. 	Repair or replace harness.

2-5-4. Hour meter is abnormal**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Combination Meter (Hour meter)	<ul style="list-style-type: none"> When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more If no abnormality is found, combination meter is faulty. 	Replace combination meter.
2. Harness Connecting Between Terminals	<ul style="list-style-type: none"> 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



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

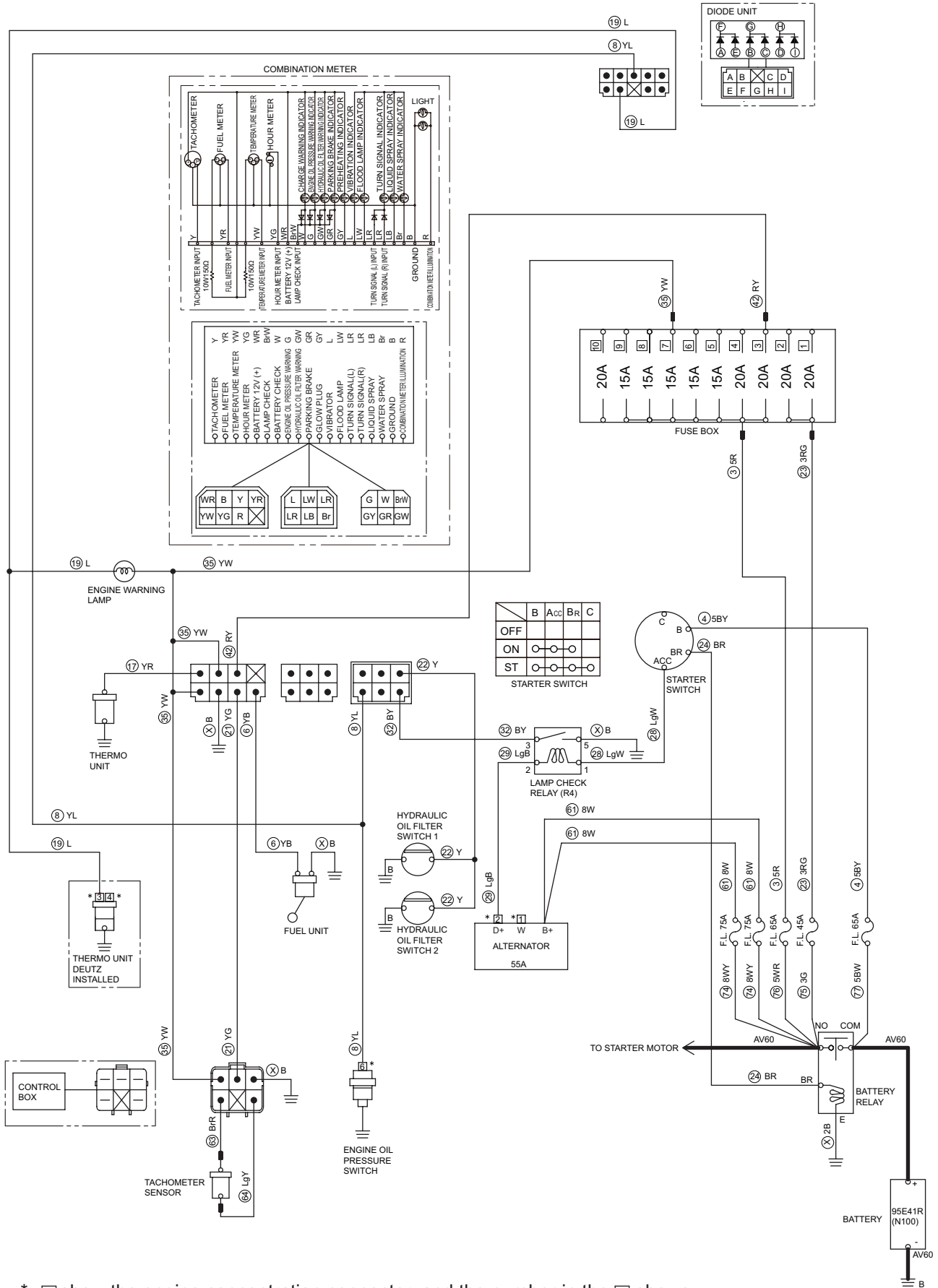
2-5-5. Temperature meter is abnormal**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Thermo Unit	<ul style="list-style-type: none"> Disconnect harness and measure resistance of thermo unit. Standard resistance : 153.9 Ω [(at unit temperature of 50°C (122°F)) 24.9 Ω [(at unit temperature of 103°C (217°F)) If resistance is abnormal, thermo unit is faulty. 	Replace thermo unit.
2. Combination Meter (Temperature meter)	<ul style="list-style-type: none"> When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more If no abnormality is found, combination meter is faulty. 	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less If resistance is abnormal, harness is faulty. 	Repair or replace harness.

2-5-6. Fuel meter is abnormal**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Fuel Unit	<ul style="list-style-type: none"> Disconnect harness and measure resistance of fuel unit. Standard resistance : 10 Ω (with float in "F") 90 Ω (with float in "E") If resistance is abnormal, fuel unit is faulty. 	Replace fuel unit.
2. Combination Meter (Fuel meter)	<ul style="list-style-type: none"> When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more If no abnormality is found, combination meter is faulty. 	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> 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



* : □ show the engine concentration connector, and the number in the □ shows the terminal number of the engine concentration connector.

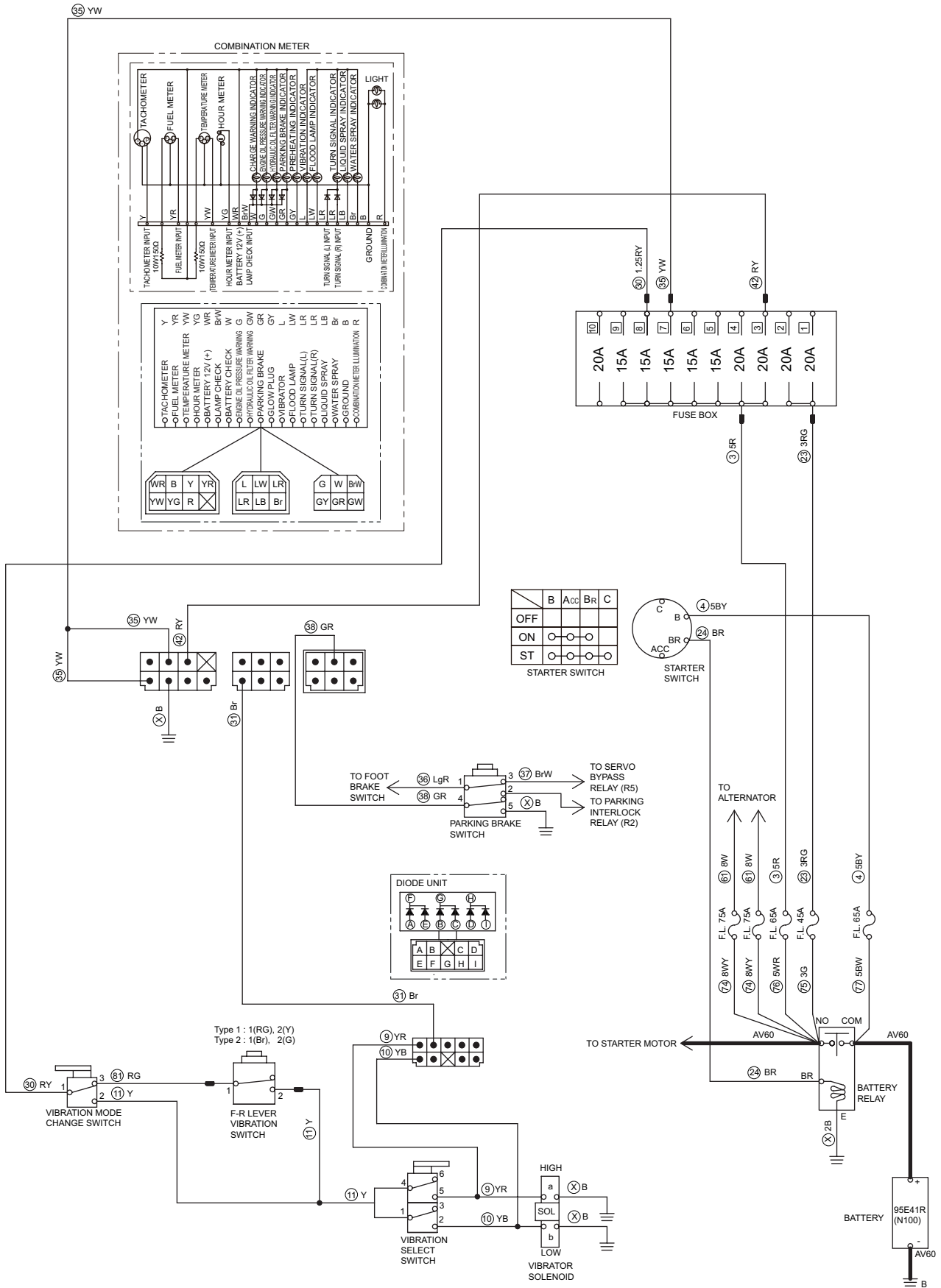
2-5-7. Hydraulic oil filter warning lamp remains ON**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Hydraulic Oil Filter Switch 1 or 2	<ul style="list-style-type: none"> When starter switch is OFF, check continuity between hydraulic oil filter switch 1 or 2 inlet terminal 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.
2. Combination Meter (Hydraulic oil filter warning indicator lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter battery terminal inlet wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between combination meter hydraulic oil filter warning terminal outlet wire Y and chassis ground. There is no electricity in normal condition.</p> <ul style="list-style-type: none"> If above items (1) and (2) are OK and no abnormality is found in hydraulic oil filter switch 1 or 2 but hydraulic oil filter warning lamp remains on after starting engine, combination meter is faulty. 	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less If resistance is abnormal, harness is faulty. 	Repair or replace harness.

2-5-8. Engine oil pressure warning lamp remains ON**Reference Fig.: 2-5-1**

Check point	Check/Cause	Action
1. Engine Oil Pressure Switch	<ul style="list-style-type: none"> Disconnect engine oil pressure switch and check continuity between its terminals. There is continuity in normal condition. If there is continuity, engine oil pressure switch is faulty. 	Replace engine oil pressure switch.
2. Combination Meter (Engine oil pressure warning indicator lamp)	<p>(1) When starter switch is ON, measure voltage between combination meter battery terminal inlet wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, measure voltage between combination meter engine oil pressure warning terminal outlet wire No. 8 wire YL and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> If above items (1) and (2) are OK and no abnormality is found in engine oil pressure switch but engine oil pressure warning lamp remains on after starting engine, combination meter is faulty. 	Replace combination meter.
3. Harness Connecting Between Terminals	<ul style="list-style-type: none"> 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.: 2-5-2



2-5-9. Vibration indicator lamp does not light

- Check that vibrator can be operated.

Reference Fig.: 2-5-2





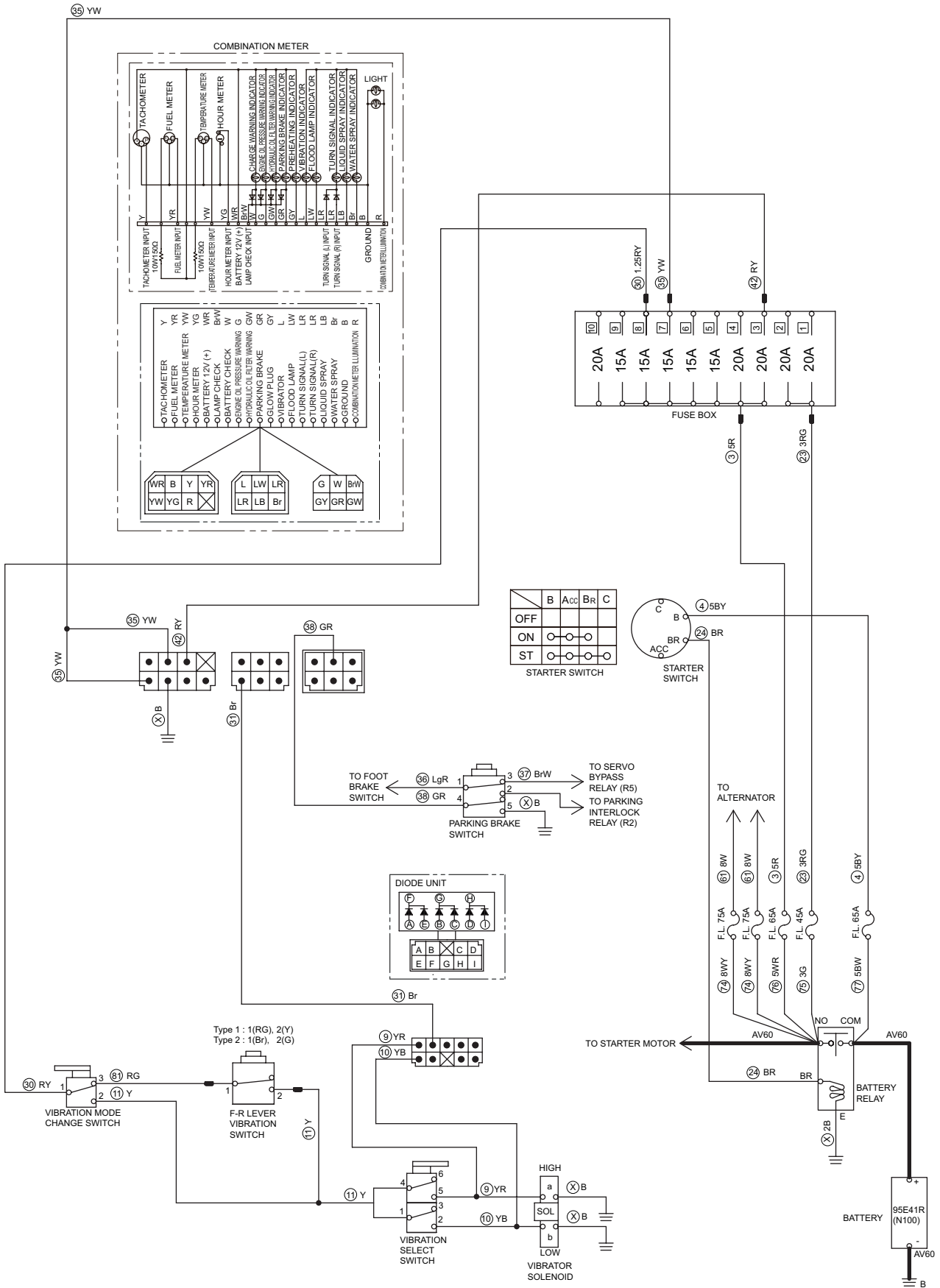
Check point	Check/Cause	Action
1. Bulb	<ul style="list-style-type: none"> • Check if bulb has burned out or is poorly contacted. • Bulb is faulty or poorly connected. 	Replace bulb.
2. Diode Unit	<p>(1) When starter switch is ON and vibration select switch is “”, measure voltage between diode unit terminal A inlet wire YB and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and vibration select switch is “”, measure voltage between diode unit terminal E inlet wire YR and chassis ground. Standard voltage : 12 V or more</p> <p>(3) When starter switch is ON, measure voltage between diode unit terminal F outlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • 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)	<p>(1) When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON, vibration mode change switch is “CONT” and vibration select switch is “” or “”, measure voltage between combination meter vibrator terminal wire No. 31 inlet wire Br and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and vibration indicator lamp does not light, combination meter is faulty. 	Replace combination meter.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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.: 2-5-2

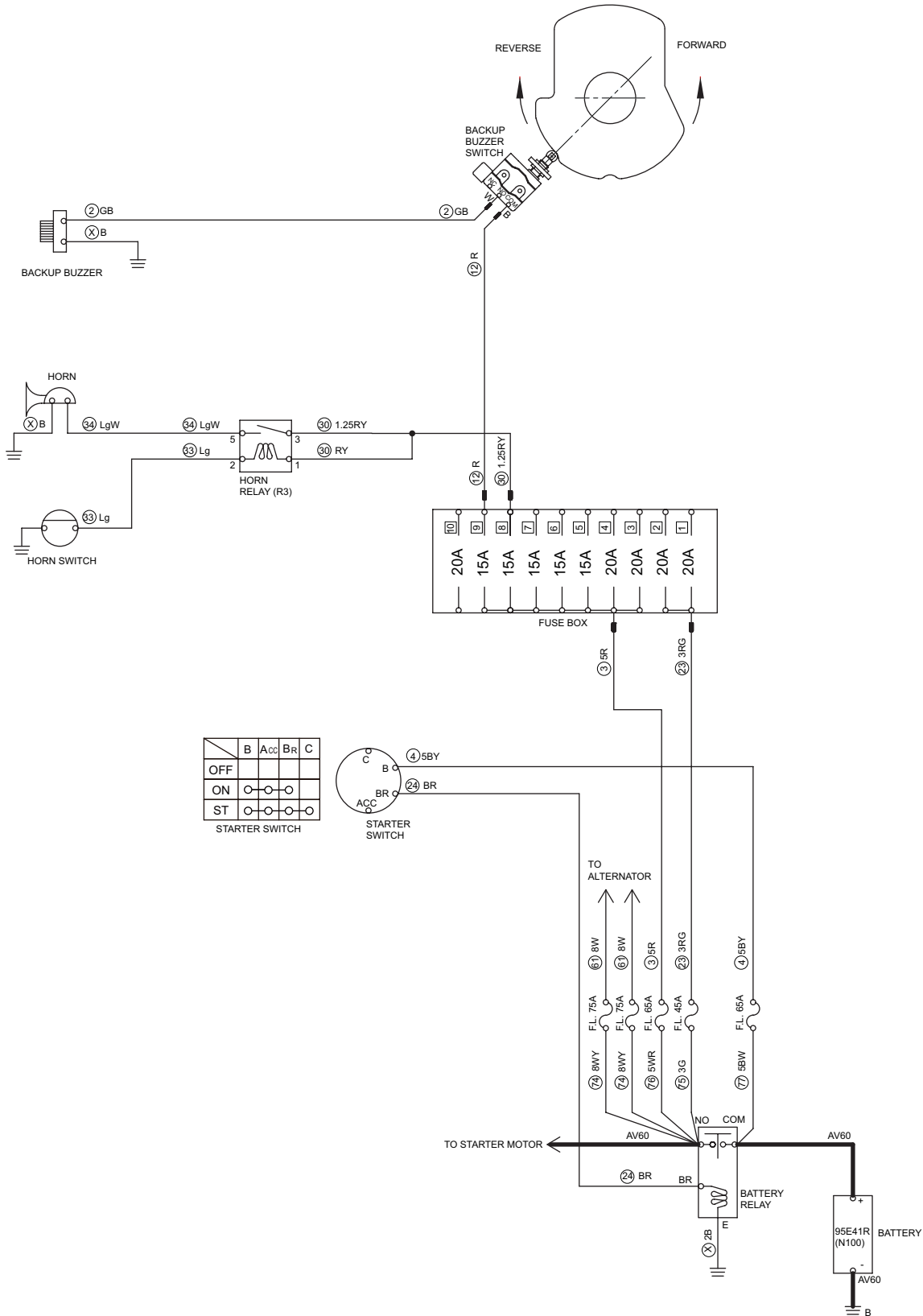


2-5-10. Parking brake indicator lamp does not light

Reference Fig.: 2-5-2

Check point	Check/Cause	Action
1. Bulb	<ul style="list-style-type: none"> • Check if bulb has burned out or is poorly contacted. • Bulb is faulty or poorly connected. 	Replace bulb.
2. Parking Brake Switch	<ul style="list-style-type: none"> • 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)	<p>(1) When starter switch is ON, measure voltage between combination meter battery terminal wire No. 35 inlet wire YW and ground terminal wire B. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and parking brake is applied, measure voltage between combination meter parking brake terminal wire No. 38 outlet wire GR and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above items (1) and (2) are OK and parking brake indicator lamp does not light, combination meter is faulty. 	Replace combination meter.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • 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.: 2-5-3



2-5-11. Horn does not sound

Reference Fig.: 2-5-3

Check point	Check/Cause	Action
1. Horn	<ul style="list-style-type: none"> • 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 (R3)	<p>(1) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 2 outlet wire Lg and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and horn switch is pressed, measure voltage between horn relay terminal 5 outlet wire LgW and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • If above item (1) is OK and item (2) is NG, horn relay is faulty. 	Replace horn relay (R3).
3. Horn Switch	<ul style="list-style-type: none"> • When horn switch is OFF, measure resistance between horn switch terminals. Standard resistance : 100 kΩ or more • If resistance is abnormal, horn switch is faulty. 	Replace horn switch.
4. Harness Connecting Between Terminals	<ul style="list-style-type: none"> • Measure resistance of harness connecting between terminals. Standard resistance : 10 Ω or less • If resistance is abnormal, harness is faulty. 	Repair or replace harness.

2-5-12. Backup buzzer does not sound

Reference Fig.: 2-5-3

Check point	Check/Cause	Action
1. Backup Buzzer	<ul style="list-style-type: none"> • 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	<p>(1) When starter switch is ON, measure voltage between backup buzzer switch terminal COM inlet wire R and chassis ground. Standard voltage : 12 V or more</p> <p>(2) When starter switch is ON and F-R lever is "R", measure voltage between backup buzzer switch terminal NO outlet wire GB and chassis ground. Standard voltage : 12 V or more</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • Parking brake solenoid valve • Rear motor solenoid valve 	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Measure drain quantity from propulsion motor. • If drain quantity is larger than standard value, repair propulsion motor or replace it if necessary.

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

Check point	Cause	Check/Action
9. Propulsion Pump	Discharge flow rate is insufficient due to efficiency degradation of propulsion pump.	<ul style="list-style-type: none"> • 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.
10. Parking Brake Solenoid Valve	Brake remains applied because spool of parking brake solenoid valve does not shift.	Repair parking brake solenoid valve or replace it if necessary.
11. Brake Inlet Pressure	Brake cannot be released because brake inlet pressure is low.	<ul style="list-style-type: none"> • Measure brake release pressure. • If low, repair or replace propulsion motor.
12. Rear Axle	Sticking of disc brakes causes brakes to remain applied.	<ul style="list-style-type: none"> • Replace disc brakes.
13. 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • Parking brake solenoid valve • Rear motor solenoid valve 	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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. Travel mode cannot be switched

Check point	Cause	Check/Action
1. Front Motor Solenoid Valve	Travel mode does not change because spool of front motor solenoid valve does not change.	Repair front motor solenoid valve or replace it if necessary.
2. Rear Motor Solenoid Valve	Travel mode does not change because spool of rear motor solenoid valve does not change.	Repair rear motor solenoid valve 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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. Axle Bearings	Axle bearings supporting front and rear drums are damaged.	Replace axle bearings.
2. Gear Box (front motor)	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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Measure charge pressure. • If low, check and clean 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. <ul style="list-style-type: none"> • Parking brake solenoid valve • Rear motor solenoid valve 	<ul style="list-style-type: none"> • 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 check relief is low.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Measure charge pressure. • If low, check and clean 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. <ul style="list-style-type: none"> • Parking brake solenoid valve • Rear motor solenoid valve 	<ul style="list-style-type: none"> • When solenoid is energized, check if oil flows in return circuit to tank. • If oil is flowing, repair solenoid valve or replace it if necessary.
3. Suction Filter for Steering • Charge Pump	Steering • charge pump flow is reduced due to clogged filler.	Clean suction filter or replace it if necessary.
4. Vibrator Motor	Vibrator motor inlet pressure is low.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.

3-3-4. Vibrator does not stop

Check point	Cause	Check/Action
1. Vibrator Solenoid Valve	Vibrator solenoid valve spool does not return to neutral position.	Repair vibrator solenoid valve or replace it if necessary.
2. Vibrator Pump	Vibrator pump swash plate does not return to neutral position.	Repair 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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 2	Charge circuit pressure increases due to clogged filter.	Clean hydraulic oil filter 2 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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 (SV410TB-2, FB-2)

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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Measure the steering circuit pressure. • If low, replace steering • charge 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Measure the steering circuit pressure. • If low, replace steering • charge pump.

3-5-3. Blade floating operation not possible

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

3-5-4. Blade hydraulic system is overheating

Check point	Cause	Check/Action
1. Oil Level of Hydraulic Oil Tank	Oil level in hydraulic oil tank is low.	Fill tank until correct oil level is obtained.
2. Blade Circuit Setting Pressure	If circuit pressure setting is excessively low, relief valve is open, causing temperature of hydraulic oil in circuit to rise.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.

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