

# **SW884/994**

# **SHOP MANUAL**

**SAKAI®**

3498-6568B-1





# Introduction

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

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

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

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



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# **SAFETY**

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# 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.

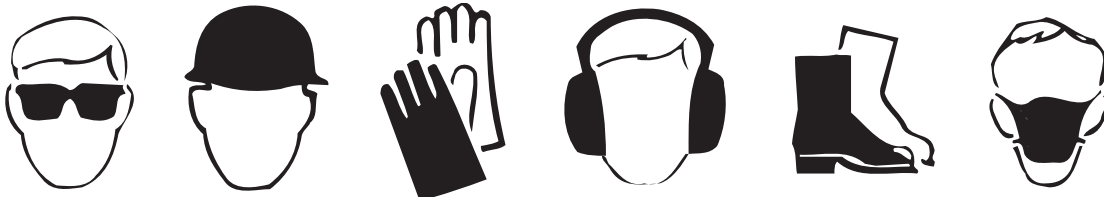
- The machine is designed specifically for the compaction of asphalt or soil road construction materials. Use of the machine for other purposes such as towing other equipment is considered contrary to the designated use. The manufacturer cannot be responsible or held liable for any damage resulting from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

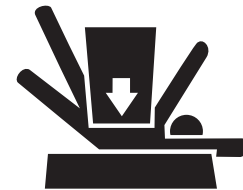
- Always make sure that there are no obstructions or persons in your line of travel before starting the compactor in motion.
- Never climb on and off the machine while it is in motion.
- Always remain seated with the seat belt fastened when traveling, compacting or loading or unloading the machine.
- 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.



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# **SPECIFICATIONS**

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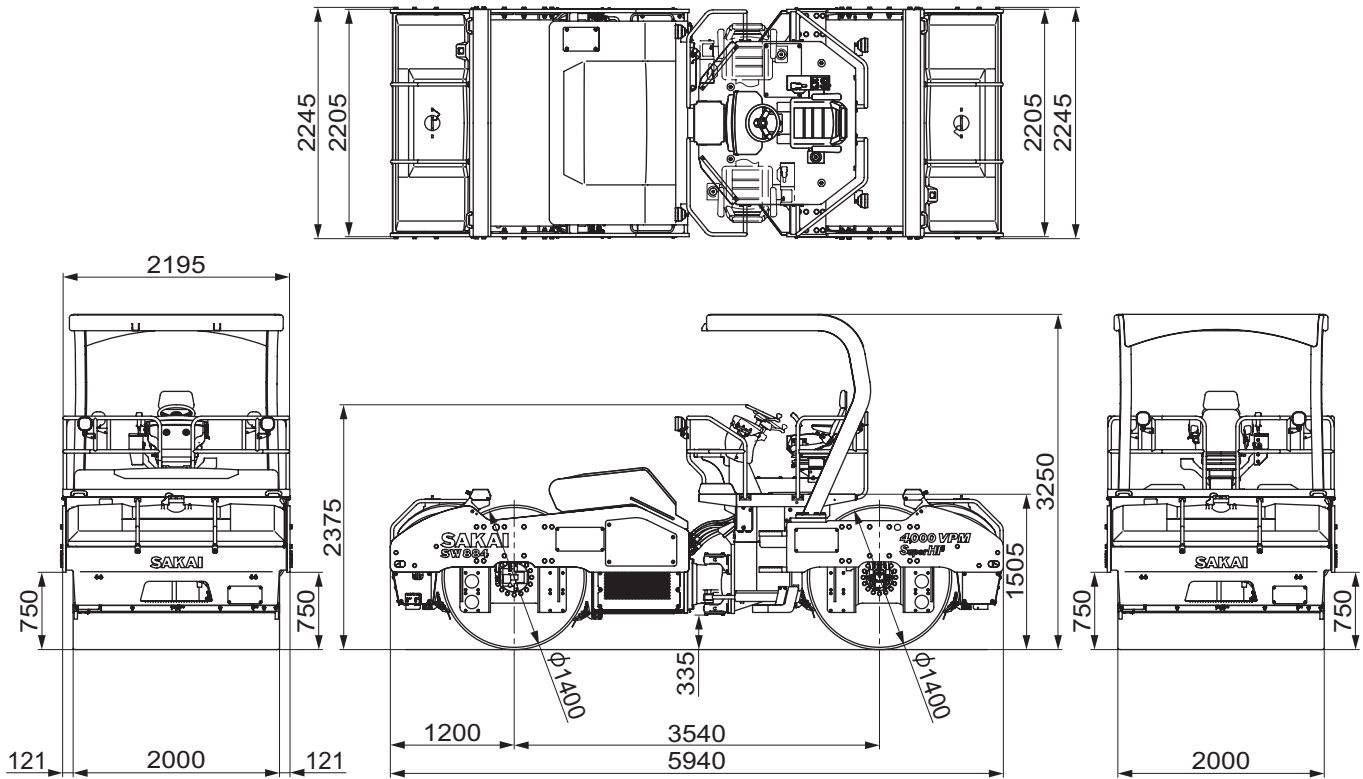






# 1. SPECIFICATION DATA

## 1-1. SW884

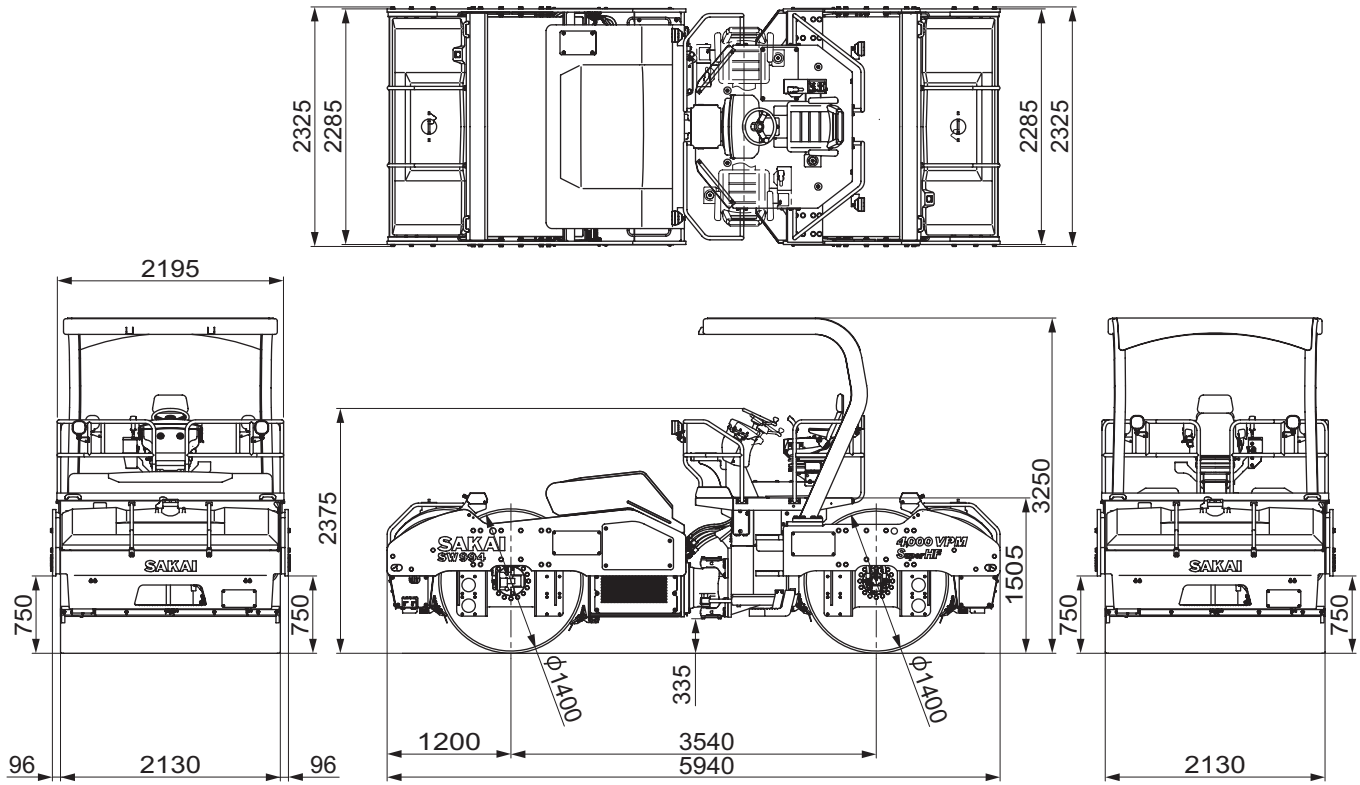


0568-99025-0-11997-0

Model & Type		Model		SAKAI SW884 with ROPS		
		Type		VIBRATORY TANDEM ROLLER		
Weight	Operating weight	without ballast	12,890 kg	( 28,415 lbs. )		
		with ballast	N/A kg	( N/A lbs. )		
	Maximum weight		13,610 kg	( 30,005 lbs. )		
	Shipping weight	with ROPS	12,110 kg	( 26,695 lbs. )		
		without ROPS	11,560 kg	( 25,485 lbs. )		
	Load on front axle		6,350 kg	( 14,000 lbs. )		
Load on rear axle		6,540 kg	( 14,420 lbs. )			
Dimensions	Overall length		5,940 mm	( 234 in. )		
	Overall width		2,245 mm	( 88 in. )		
	Overall height	with ROPS		3,250 mm	( 128 in. )	
		without ROPS		2,375 mm	( 94 in. )	
	Wheelbase		3,540 mm	( 139 in. )		
	Compaction width		2,000 mm	( 79 in. )		
	Front drum	width × dia. × thickness		2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.)		
	Rear drum	width × dia. × thickness		2,000 mm × 1,400 mm × 22 mm (79 in. × 55 in. × 0.9 in.)		
	Ground clearance			335 mm	( 13.1 in. )	
	Kerb clearance	Left		750 mm	( 29.6 in. )	
		Right		750 mm	( 29.6 in. )	
	Side clearance	Left		121 mm	( 4.8 in. )	
Right			121 mm	( 4.8 in. )		
Leveling blade width			N/A mm	( N/A in. )		

Performance	Vibrator system	Front	Centrifugal force	Low amplitude	4,000 vpm	160 kN	( 35,970 lbf. )
					3,000 vpm	90 kN	( 20,230 lbf. )
				2,500 vpm	63 kN	( 14,160 lbf. )	
				High amplitude	3,000 vpm	177 kN	( 39,790 lbf. )
			2,500 vpm		123 kN	( 27,650 lbf. )	
			Frequency	Low amplitude	66.7 Hz	( 4,000 vpm )	
					50.0 Hz	( 3,000 vpm )	
		High amplitude		41.7 Hz	( 2,500 vpm )		
				50.0 Hz	( 3,000 vpm )		
		Amplitude	Low amplitude	0.33 mm	( 0.013 in. )		
			High amplitude	0.64 mm	( 0.025 in. )		
		Rear	Centrifugal force	Low amplitude	4,000 vpm	160 kN	( 35,970 lbf. )
					3,000 vpm	90 kN	( 20,230 lbf. )
				2,500 vpm	63 kN	( 14,160 lbf. )	
	High amplitude			3,000 vpm	177 kN	( 39,790 lbf. )	
			2,500 vpm	123 kN	( 27,650 lbf. )		
	Frequency		Low amplitude	66.7 Hz	( 4,000 vpm )		
				50.0 Hz	( 3,000 vpm )		
			High amplitude	41.7 Hz	( 2,500 vpm )		
				50.0 Hz	( 3,000 vpm )		
	Amplitude		Low amplitude	0.33 mm	( 0.013 in. )		
			High amplitude	0.64 mm	( 0.025 in. )		
	Linear pressure		Static linear pressure	Front drum		311 N/cm	( 178 lbf./in. )
				Rear drum		321 N/cm	( 183 lbf./in. )
			Dynamic linear pressure	Front drum	Low amplitude	4,000 vpm	1,111 N/cm
		3,000 vpm				761 N/cm	( 435 lbf./in. )
		2,500 vpm			626 N/cm	( 358 lbf./in. )	
		High amplitude		3,000 vpm	1,196 N/cm	( 683 lbf./in. )	
				2,500 vpm	926 N/cm	( 529 lbf./in. )	
				Rear drum	Low amplitude	4,000 vpm	1,121 N/cm
		3,000 vpm	771 N/cm			( 440 lbf./in. )	
		2,500 vpm	636 N/cm		( 363 lbf./in. )		
	High amplitude	3,000 vpm	1,206 N/cm		( 688 lbf./in. )		
2,500 vpm		936 N/cm	( 534 lbf./in. )				
Speed	Number of speed shift			2 speed			
	Speed range	1st	4,000 vpm	0 to 7.2 km/h	( 0 to 4.5 mph )		
			3,000 vpm	0 to 5.5 km/h	( 0 to 3.4 mph )		
			2,500 vpm	0 to 4.5 km/h	( 0 to 2.8 mph )		
		2nd	0 to 11.0 km/h ( 0 to 6.8 mph )				
Gradeability		without vibration		29 %	( 16 ° )		
Turning radius	Machine clearance radius inside			4.2 m	( 166 in. )		
	Machine clearance radius outside			6.4 m	( 252 in. )		
	Turning radius inside compacted surface			4.3 m	( 170 in. )		
	Turning radius outside compacted surface			6.3 m	( 249 in. )		
Steering / Oscillating angle			± 36.7 ° / ± 6.5 °				

1-2. SW994

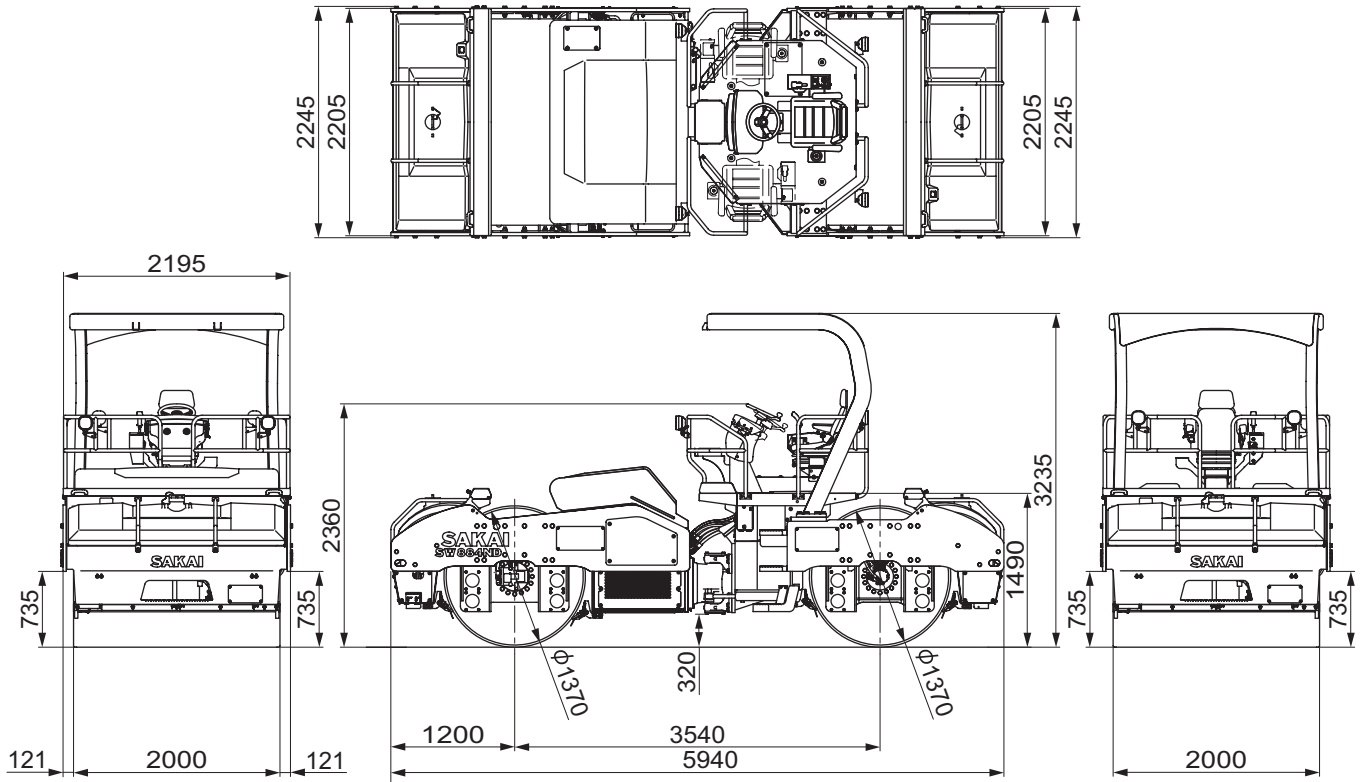


0569-99009-0-10916-0

Model & Type		SAKAI SW994 with ROPS		
Type		VIBRATORY TANDEM ROLLER		
Weight	Operating weight	without ballast	13,270 kg ( 29,255 lbs. )	
		with ballast	N/A kg ( N/A lbs. )	
	Maximum weight		14,000 kg ( 30,865 lbs. )	
	Shipping weight	with ROPS	12,500 kg ( 27,555 lbs. )	
		without ROPS	11,950 kg ( 26,345 lbs. )	
	Load on front axle		6,530 kg ( 14,395 lbs. )	
Load on rear axle		6,740 kg ( 14,860 lbs. )		
Dimensions	Overall length		5,940 mm ( 234 in. )	
	Overall width		2,325 mm ( 92 in. )	
	Overall height	with ROPS		3,250 mm ( 128 in. )
		without ROPS		2,375 mm ( 94 in. )
	Wheelbase		3,540 mm ( 139 in. )	
	Compaction width		2,130 mm ( 84 in. )	
	Front drum	width × dia. × thickness		2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Rear drum	width × dia. × thickness		2,130 mm × 1,400 mm × 22 mm (84 in. × 55 in. × 0.9 in.)
	Ground clearance			335 mm ( 13.1 in. )
	Kerb clearance	Left		750 mm ( 29.6 in. )
		Right		750 mm ( 29.6 in. )
	Side clearance	Left		96 mm ( 3.8 in. )
		Right		96 mm ( 3.8 in. )
	Leveling blade width			N/A mm ( N/A in. )

Performance	Vibrator system	Front	Centrifugal force	Low amplitude	4,000 vpm	173 kN	( 38,890 lbf. )
					3,000 vpm	98 kN	( 22,030 lbf. )
				2,500 vpm	68 kN	( 15,285 lbf. )	
				High amplitude	3,000 vpm	185 kN	( 41,590 lbf. )
			2,500 vpm		128 kN	( 28,775 lbf. )	
			Frequency	Low amplitude	66.7 Hz	( 4,000 vpm )	
					50.0 Hz	( 3,000 vpm )	
				High amplitude	41.7 Hz	( 2,500 vpm )	
		50.0 Hz			( 3,000 vpm )		
		Amplitude	Low amplitude	0.34 mm	( 0.013 in. )		
			High amplitude	0.65 mm	( 0.026 in. )		
		Rear	Centrifugal force	Low amplitude	4,000 vpm	173 kN	( 38,890 lbf. )
					3,000 vpm	98 kN	( 22,030 lbf. )
				2,500 vpm	68 kN	( 15,285 lbf. )	
				High amplitude	3,000 vpm	185 kN	( 41,590 lbf. )
			2,500 vpm		128 kN	( 28,775 lbf. )	
	Frequency		Low amplitude	66.7 Hz	( 4,000 vpm )		
				50.0 Hz	( 3,000 vpm )		
			High amplitude	41.7 Hz	( 2,500 vpm )		
		50.0 Hz		( 3,000 vpm )			
	Amplitude	Low amplitude	0.34 mm	( 0.013 in. )			
		High amplitude	0.65 mm	( 0.026 in. )			
	Linear pressure	Static linear pressure	Front drum		301 N/cm	( 172 lbf./in. )	
			Rear drum		310 N/cm	( 177 lbf./in. )	
		Dynamic linear pressure	Front drum	Low amplitude	4,000 vpm	1,113 N/cm	( 635 lbf./in. )
					3,000 vpm	761 N/cm	( 434 lbf./in. )
				High amplitude	2,500 vpm	620 N/cm	( 354 lbf./in. )
					3,000 vpm	1,169 N/cm	( 668 lbf./in. )
			Rear drum	Low amplitude	2,500 vpm	902 N/cm	( 515 lbf./in. )
					4,000 vpm	1,123 N/cm	( 641 lbf./in. )
				High amplitude	3,000 vpm	770 N/cm	( 440 lbf./in. )
					2,500 vpm	630 N/cm	( 359 lbf./in. )
High amplitude		3,000 vpm	1,179 N/cm	( 673 lbf./in. )			
		2,500 vpm	911 N/cm	( 520 lbf./in. )			
Speed	Number of speed shift			2 speed			
	Speed range	1st	4,000 vpm	0 to 7.2 km/h	( 0 to 4.5 mph )		
			3,000 vpm	0 to 5.5 km/h	( 0 to 3.4 mph )		
			2,500 vpm	0 to 4.5 km/h	( 0 to 2.8 mph )		
2nd		0 to 11.0 km/h ( 0 to 6.8 mph )					
Gradeability		without vibration		28 %	( 15 ° )		
Turning radius	Machine clearance radius inside			4.2 m	( 166 in. )		
	Machine clearance radius outside			6.5 m	( 256 in. )		
	Turning radius inside compacted surface			4.3 m	( 170 in. )		
	Turning radius outside compacted surface			6.4 m	( 252 in. )		
Steering / Oscillating angle			± 36.7 ° / ± 6.5 °				

1-3. SW884ND

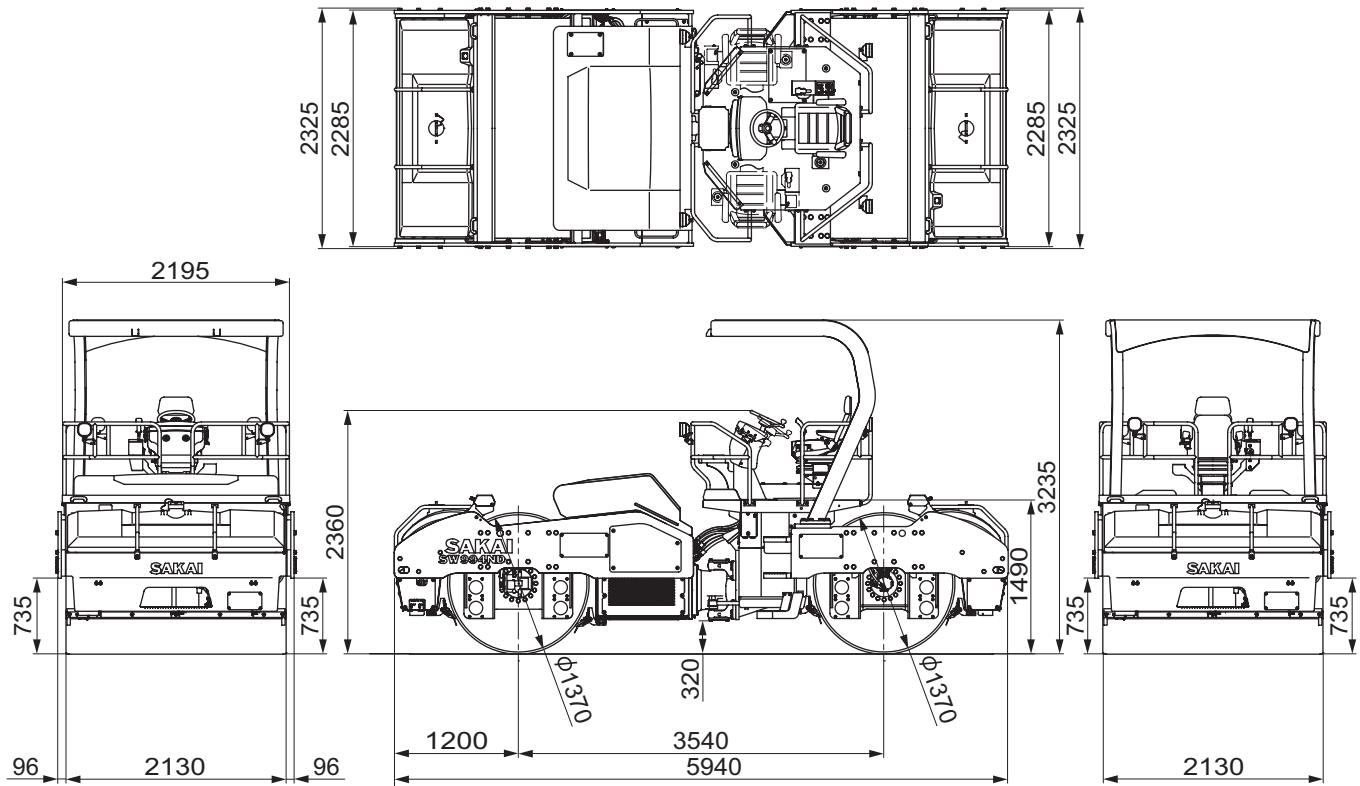


0568-99031-0-12142-0

Model & Type	Model		SAKAI SW884ND with ROPS	
	Type		VIBRATORY TANDEM ROLLER	
Weight	Operating weight	without ballast	13,230 kg	( 29,165 lbs. )
		with ballast	N/A kg	( N/A lbs. )
	Maximum weight		13,950 kg	( 30,755 lbs. )
	Shipping weight	with ROPS	12,450 kg	( 27,445 lbs. )
		without ROPS	11,900 kg	( 26,235 lbs. )
	Load on front axle		6,520 kg	( 14,375 lbs. )
Load on rear axle		6,710 kg	( 14,795 lbs. )	
Dimensions	Overall length		5,940 mm	( 234 in. )
	Overall width		2,245 mm	( 88 in. )
	Overall height	with ROPS	3,235 mm	( 127 in. )
		without ROPS	2,360 mm	( 93 in. )
	Wheelbase		3,540 mm	( 139 in. )
	Compaction width		2,000 mm	( 79 in. )
	Front drum	width × dia. × thickness	2,000 mm × 1,370 mm × 21 mm (79 in. × 54 in. × 0.8 in.)	
	Rear drum	width × dia. × thickness	2,000 mm × 1,370 mm × 21 mm (79 in. × 54 in. × 0.8 in.)	
	Ground clearance		320 mm	( 12.5 in. )
	Kerb clearance	Left	735 mm	( 29.0 in. )
		Right	735 mm	( 29.0 in. )
	Side clearance	Left	121 mm	( 4.8 in. )
		Right	121 mm	( 4.8 in. )
	Leveling blade width		N/A mm	( N/A in. )

Performance	Vibrator system	Front	Centrifugal force	Vibration		158 kN	( 35,585 lbf. )
				Oscillation		172 kN	( 38,600 lbf. )
			Frequency	Vibration		50.0 Hz	( 3,000 vpm )
				Oscillation		46.7 Hz	( 2,800 vpm )
			Amplitude	Vibration		0.55 mm	( 0.022 in. )
				Oscillation		0.60 mm	( 0.024 in. )
		Rear	Centrifugal force	Vibration		158 kN	( 35,585 lbf. )
				Oscillation		172 kN	( 38,600 lbf. )
			Frequency	Vibration		50.0 Hz	( 3,000 vpm )
				Oscillation		46.7 Hz	( 2,800 vpm )
	Amplitude	Vibration		0.55 mm	( 0.022 in. )		
		Oscillation		0.60 mm	( 0.024 in. )		
	Linear pressure	Static linear pressure	Front drum	Operating weight		320 N/cm	( 183 lbf./in. )
			Rear drum	Operating weight		329 N/cm	( 188 lbf./in. )
		Dynamic linear pressure	Front drum	Operating weight	Vibration	1,111 N/cm	( 635 lbf./in. )
			Rear drum	Operating weight	Vibration	1,121 N/cm	( 640 lbf./in. )
	Speed	Number of speed shift			2 speed		
		Speed range	1st	Vibration	0 to 5.5 km/h	( 0 to 3.4 mph )	
				Oscillation	0 to 6.4 km/h	( 0 to 4.0 mph )	
	2nd		0 to 11.0 km/h ( 0 to 6.8 mph )				
Gradeability			without vibration		28 %	( 15 ° )	
Turning radius	Machine clearance radius inside				4.2 m	( 166 in. )	
	Machine clearance radius outside				6.4 m	( 252 in. )	
	Turning radius inside compacted surface				4.3 m	( 170 in. )	
	Turning radius outside compacted surface				6.3 m	( 249 in. )	
Steering / Oscillating angle						± 36.7 ° / ± 6.5 °	

1-4. SW994ND



0569-99010-0-10943-0

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



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

## SPECIFICATIONS

### 1-5. Common Specifications

Engine	Name		CUMMINS QSF3.8 (Diesel, EPA-Tier 4)	
	Model		4-cycle, Water-cooled, 4-cylinder in-line, overhead valve, direct injection type, with turbo charger	
	Bore × Stroke		102 mm × 115 mm (4.02 in. × 4.53 in.)	
	Displacement		3.800 L ( 229.0 cu.in )	
	Performance	Rated speed		2,200 min <sup>-1</sup>
		Rated output		97.0 kW ( 130 HP )
		Max. torque		488 N·m ( 360 lbf·ft ) ----- at 1,600 min <sup>-1</sup>
		Fuel consumption rate		234 g/kW·h ( 0.385 lb/HP·h ) ----- at 2,200 min <sup>-1</sup>
		Fuel consumption		27 L/h with full load ( 7.1 gal with full load )
	Fuel system	Fuel		Diesel (ASTM D975-2D)
		Fuel injection pump		Inline injection pump
		Fuel injection time regulator		All speed governor
	Lubrication system	Lubrication type		Full forced pressure feed
		Oil filter type		Full flow
		Oil cooler type		Integrated water cooled
	Air intake system	Air cleaner type		Dry
	Cooling system	Cooling type		Pressurized water forced circulation
		Cooling fan type		Inhale
	Electrical system	Alternator		12 V 135 A
		Starter		12 V 4.8 kW
Battery		12 V (CCA1000) × 1 pcs. (12 V)		
Dry weight		348 kg (767 lbs.)		
Drive system	Transmission	Type	Hydrostatic	
		Speed	2 speed shifts	
	Reverser		Switching the direction of flow delivered from the variable pump	
	Differential type	Front	N/A	
		Rear	N/A	
Final drive	Front	Planetary gear		
	Rear	Planetary gear		
Vibration system	Power transmission type		Hydraulic	
	Vibrator type		Double eccentric shafts	
Brake system	Service brake		Dynamic brake through hydrostatic drive system (F-N-R lever)	
	Secondary brake (Emergency brake)		Hydrostatic + Spring applied hydraulically released type (Brake pedal)	
	Parking brake		Spring applied hydraulically released type (Panel button)	
Steering system	Power transmission type		Hydraulic	
	Steering type		Articulated	
Drum and tyres	Use	Front	Steel drum / Vibrate and drive / 1pc.	
		Rear	Steel drum / Vibrate and drive / 1pc.	
	Suspension type	Front	Rubber isolation	
		Rear	Rubber isolation	
Sprinkler system	Water spray type		Pressurized	
	Liquid spray type		N/A	

## 2. TABLE OF STANDARD VALUES


### 2-1. Engine

Item		Standard value	Remarks
Engine model		CUMMINS QSF 3.8	
Rated output		97/2,200 kW/ min <sup>-1</sup> ( 130/2,200 HP/ min <sup>-1</sup> )	
Max. rpm under no load		2,200 rpm	
Min. rpm under no load		900 rpm	
Cylinder head tightening torque	1st	90 N·m ( 66 lbf·ft )	
	2nd	90 N·m ( 66 lbf·ft )	
	3rd	Tighten additional 90°	
Intake manifold tightening torque		24 N·m ( 18 lbf·ft )	
Exhaust manifold tightening torque		43 N·m ( 32 lbf·ft )	
Valve clearance (intake)		0.254 mm ( 0.01 in. )	
Valve clearance (exhaust)		0.508 mm ( 0.02 in. )	
Crankcase blowby		101.6 mm of H <sub>2</sub> O ( 4.0 in. of H <sub>2</sub> O )	Use mano meter

### 2-2. Propulsion

Item			Standard value	Remarks	
Travel speed (Forward/ reverse)	SW884/994	1st	4,000 vpm	0 to 7.2 km/h ( 0 to 4.5 mph )	
			3,000 vpm	0 to 5.5 km/h ( 0 to 3.4 mph )	
			2,500 vpm	0 to 4.5 km/h ( 0 to 2.8 mph )	
	SW884ND/994ND	2nd		0 to 11.0 km/h ( 0 to 6.8 mph )	
			1st	Vibration	0 to 5.5 km/h ( 0 to 3.4 mph )
				Oscillation	0 to 6.4 km/h ( 0 to 4.0 mph )
2nd		0 to 11.0 km/h ( 0 to 6.8 mph )			

### 2-3. Hydraulic System

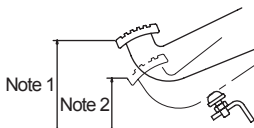
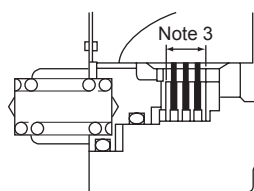
Item		Standard value	Remarks		
Propulsion	High pressure relief valve setting		40.2 ± 1.0 MPa ( 5,829 ± 145 psi )		
	Cut off valve setting		37.3 ± 1.0 MPa ( 5,409 ± 29 psi )		
	Charge relief valve setting	Pump	2.5 ± 0.2 MPa ( 362 ± 29 psi )		
		Motor (F)	2.5 ± 0.2 MPa ( 362 ± 29 psi )		
	Case pressure	Pump	0.4 MPa ( 58.0 psi )	or less	
		Motor	0.3 MPa ( 43.5 psi )	or less	
	Brake release pressure		1.5 MPa ( 218 psi )		
	Motor drainage	SW884/994	10.7 L/min ( 2.8 gal./min )		
SW884ND/994ND		10.9 L/min ( 2.9 gal./min )			
Vibration	High pressure relief valve setting		31.5 ± 1.0 MPa ( 4,567 ± 145 psi )		
	Charge relief valve setting	Pump (R)		2.5 ± 0.2 MPa ( 362 ± 29 psi )	
		Pump (F),(R)		0.4 MPa ( 58.0 psi )	
	Case pressure	Motor	SW884/994	0.15 MPa ( 21.8 psi )	or less
			SW884ND/994ND	0.17 MPa ( 24.7 psi )	or less
	Motor drainage	SW884/994	6.4 L/min ( 1.7 gal./min )		
SW884ND/994ND		10.5 L/min ( 2.8 gal./min )			
Steering oil pressure		17.5 ± 1.0 MPa ( 2,538 ± 145 psi )	(orbitroll relief pressure + charge relief pressure)		

## SPECIFICATIONS

### 2-4. Steering

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

### 2-5. Brakes

Item	Standard value	Remarks
Clearance between brake pedal and floorboard (as released)	132 mm (5.2 in.) Note 1: See dimensions	 SW880-02001
Clearance between brake pedal and floorboard (when pressed down)	75 mm (3.0 in.) Note 2: See dimensions	
Propulsion motor inner brake wear limit Thickness of disc assembly (7 discs)	18.5 to 19.1 mm (0.73 to 0.75 in.) Note 3: See dimensions Allowable when thickness is within this range. Replace all 7 discs when thickness becomes 18.5 or less.	 SW880-02002

### 2-6. Capacities

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

### 3. FUEL AND LUBRICANTS SPECIFICATION

#### 3-1. Rating

Lubricant	Service classification	Ambient temp. and applicable viscosity rating			Applicable Standards
		-15 to 30°C (5 to 86°F) Cold	0 to 40°C (32 to 104°F) Moderate	15 to 55°C (59 to 131°F) Tropical	
Engine oil	API grade CJ-4	SAE5W-40	SAE5W-40	SAE5W-40	MIL-L-2104B
Gear oil	API grade GL5	SAE80W-90	SAE90	SAE140	MIL-L-2105
Hydraulic oil	Anti wear	ISO-VG32 Over VI 140	ISO-VG46 Over VI 140	ISO-VG68 Over VI 110	ISO-3448
Grease	Lithium type extreme pressure				NLGI-2
Fuel	Diesel oil				ASTM D975-2D
DEF	ISO22241-1 or AUS32				

#### 3-2. Recommended Lubricants

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

# 4. TIGHTENING TORQUE CHART

N·m	(lbf·ft)
-----	----------

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

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# **ENGINE AND CONTROLS**

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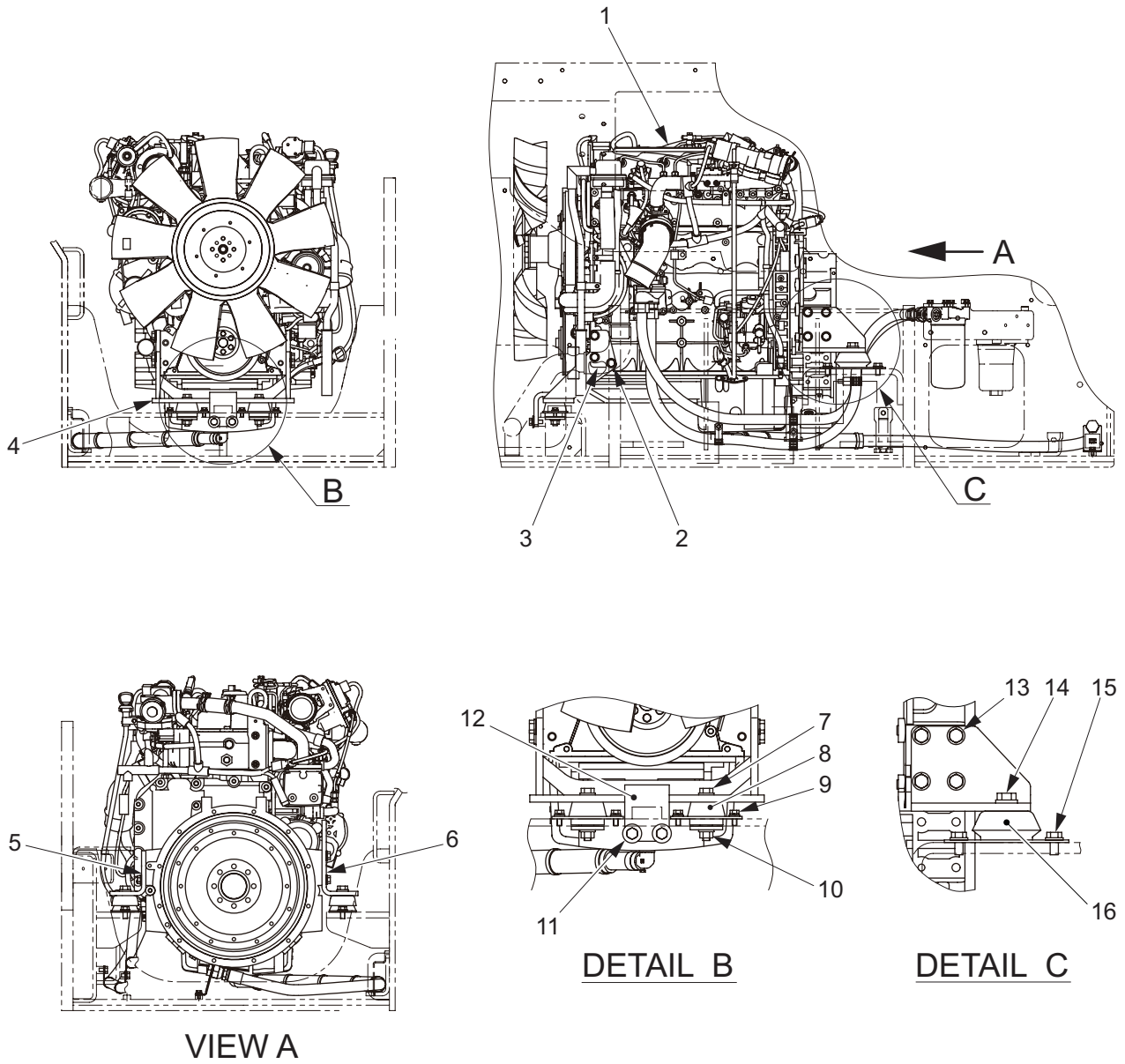
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# 1. ENGINE

## 1-1. Engine Mount



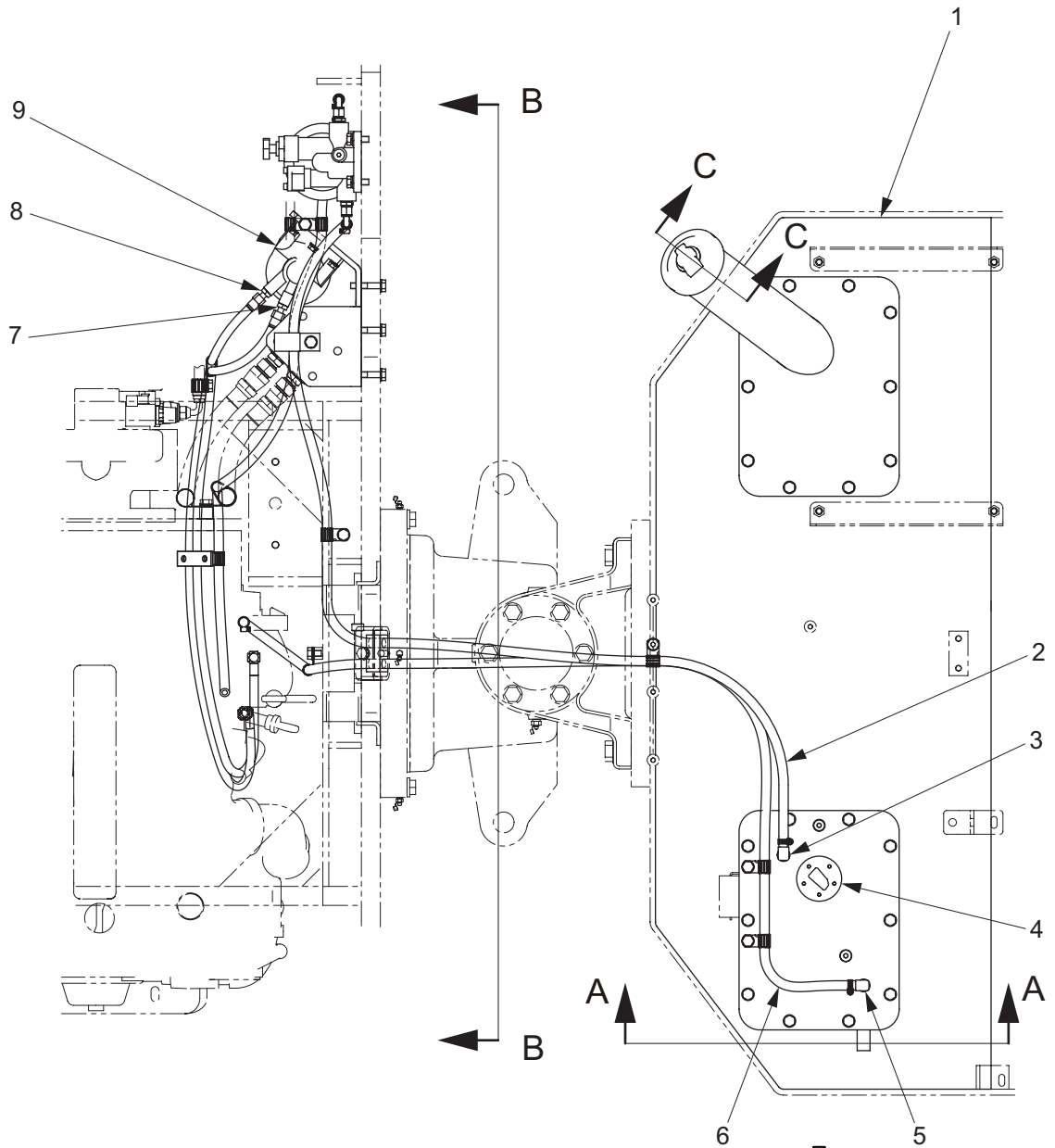
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- |                   |                    |                    |
|-------------------|--------------------|--------------------|
| (1) Engine        | (7) Bolt : M12×80  | (12) Bracket       |
| (2) Bolt : M12×35 | (8) Damper         | (13) Bolt :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

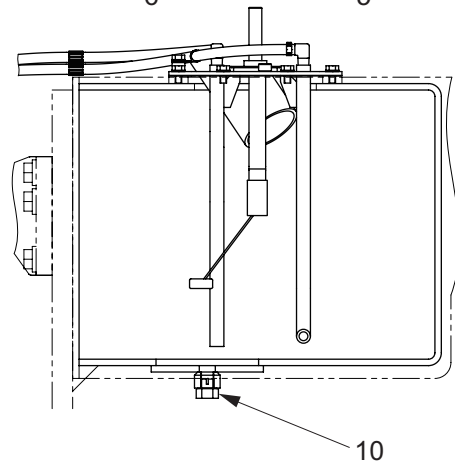


- |   |   |
|---|---|
| (2) Bolt M12×35 : 108 N·m ( 80 lbf·ft ) | (13) Bolt M12×35 : 108 N·m ( 80 lbf·ft )  |
| (9) Bolt M 8×20 : 31 N·m ( 23 lbf·ft )  | (14) Bolt M16×50 : 265 N·m ( 195 lbf·ft ) |
| (10) Nut M12 : 108 N·m ( 80 lbf·ft )    | (15) Bolt M12×25 : 108 N·m ( 80 lbf·ft )  |

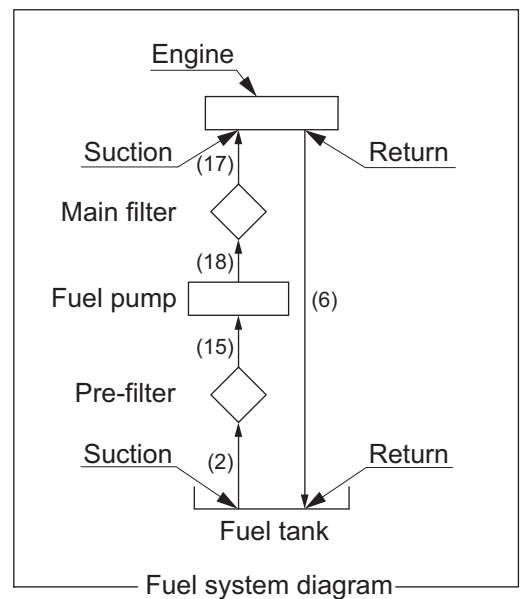
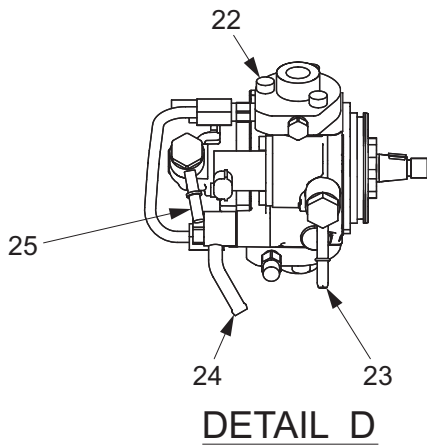
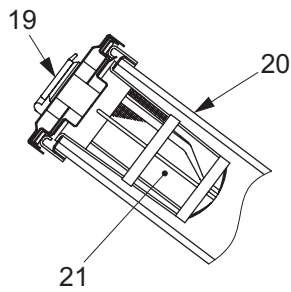
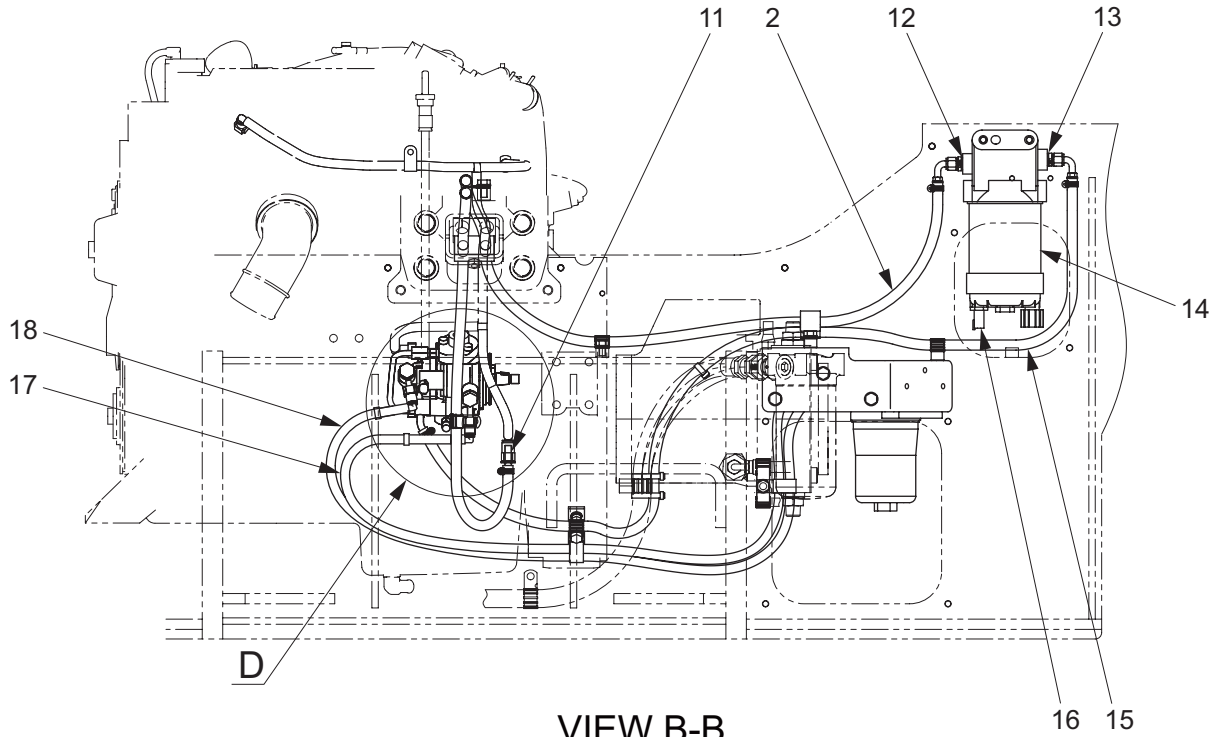
## 2. FUEL SYSTEM



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



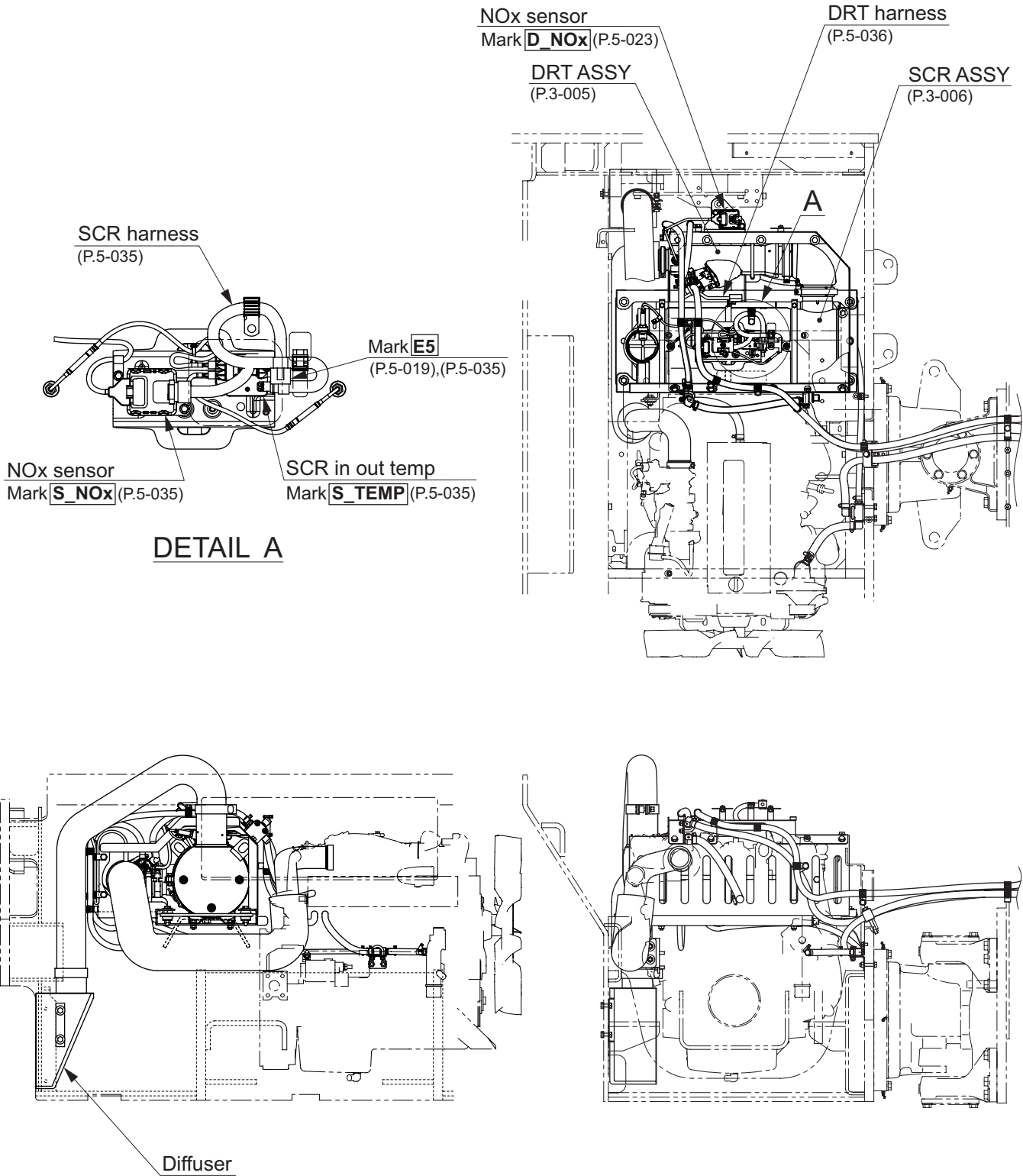
**SECTION A-A**



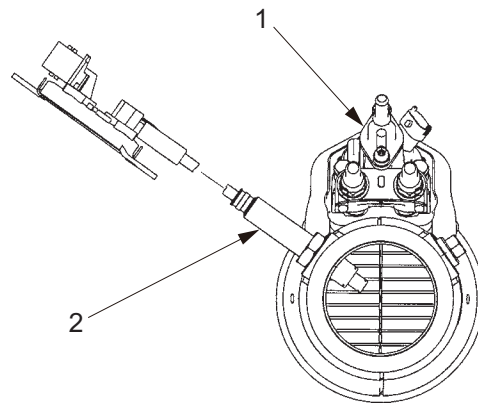
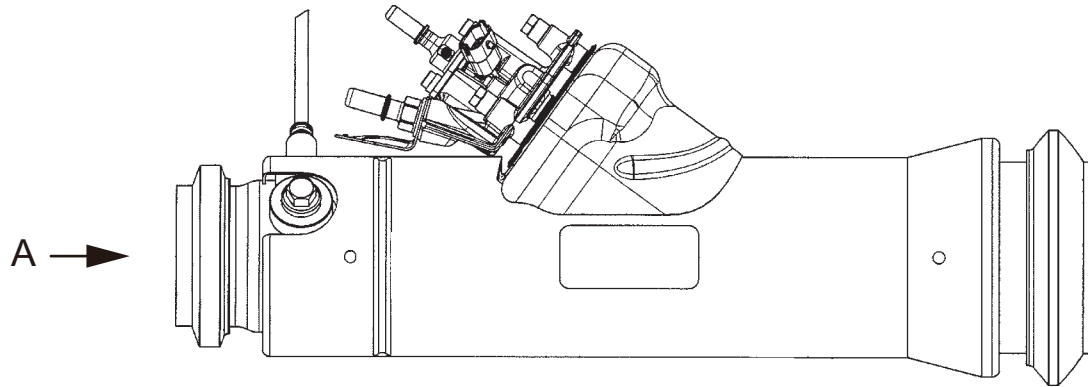
• Arrow “→” symbols show the hose connection and the direction of the flow of the fuel.

### 3. EXHAUST SYSTEM

#### 3-1. Exhaust System



## 3-1-1. DRT ASSY

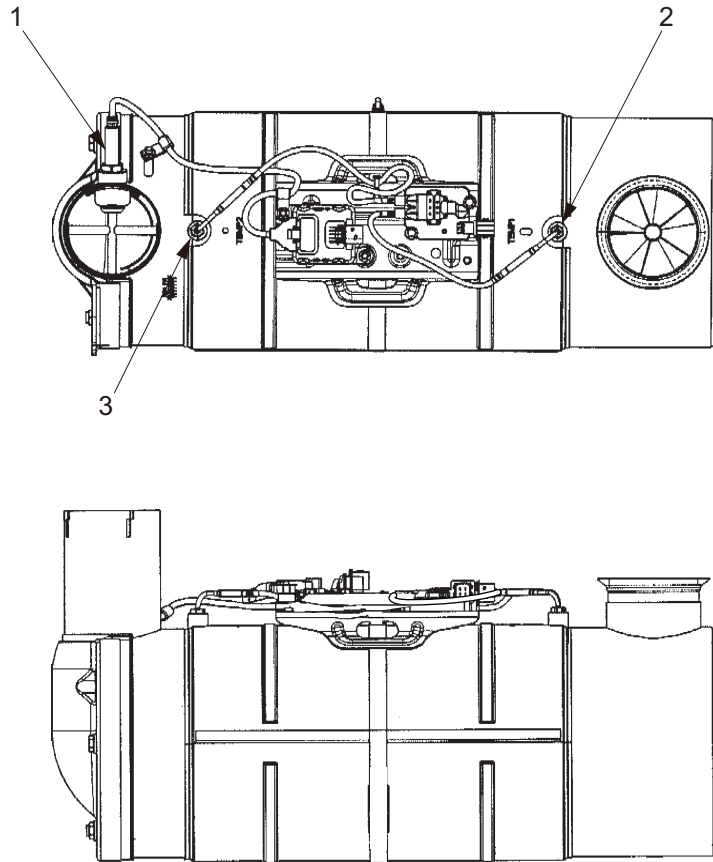


VIEW A

SW884-03003

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

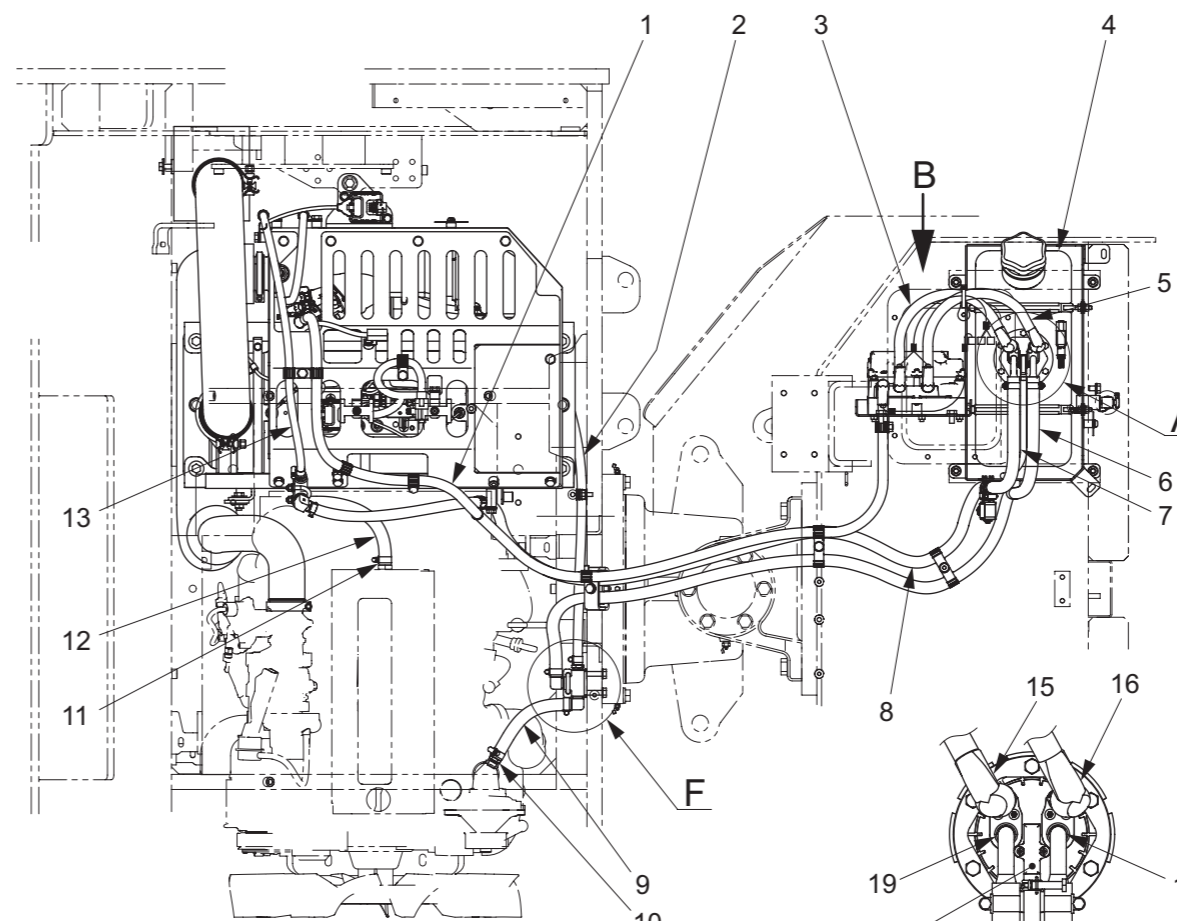
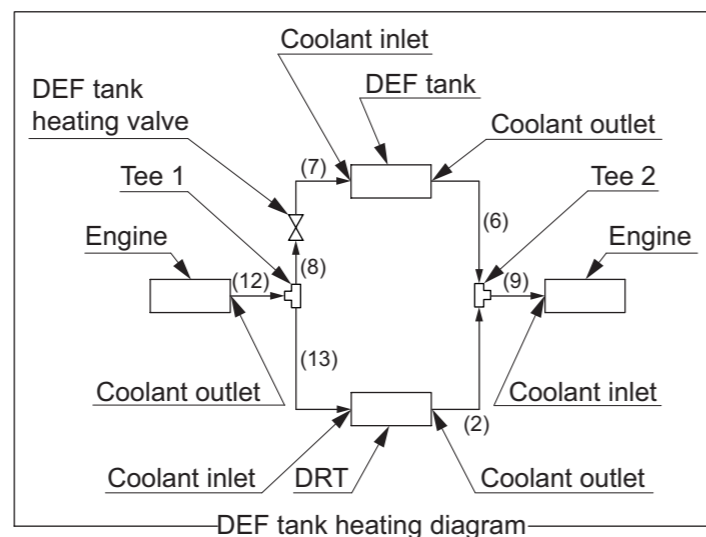
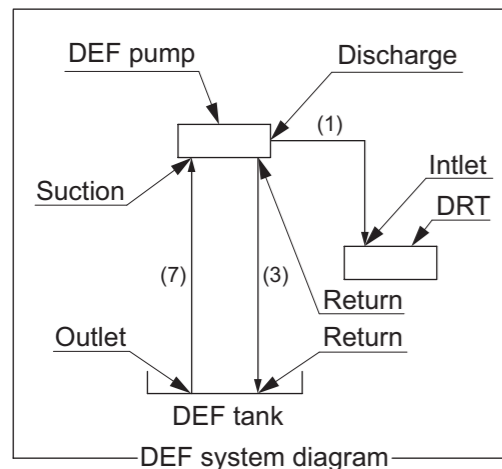
3-1-2. SCR ASSY



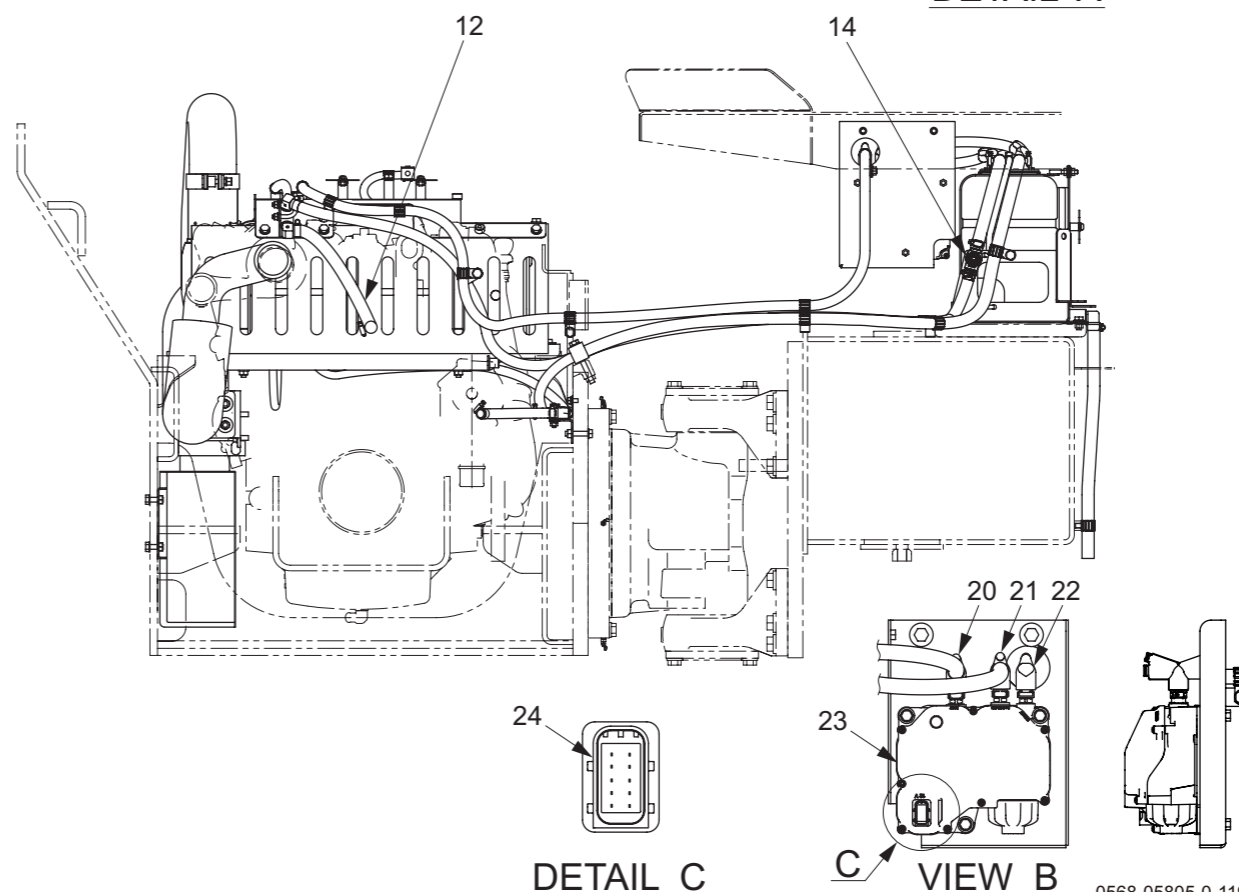
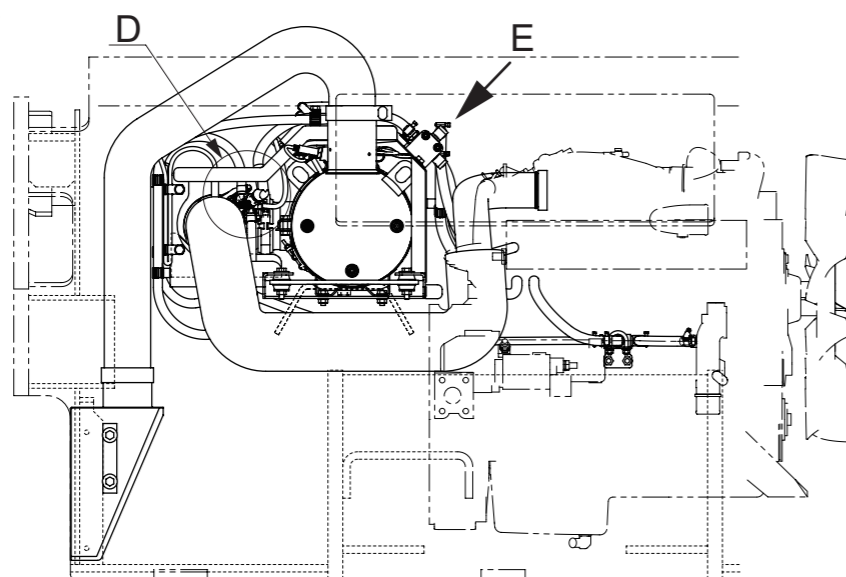
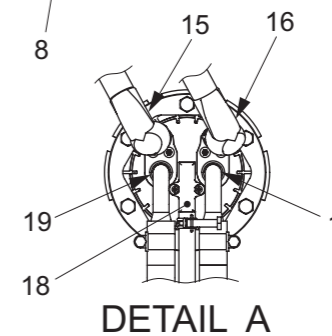
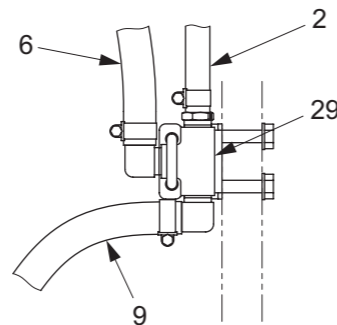
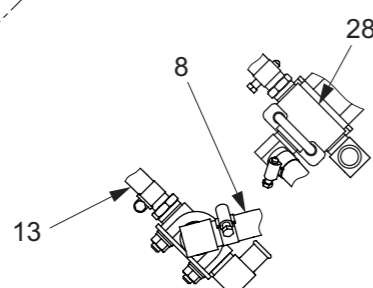
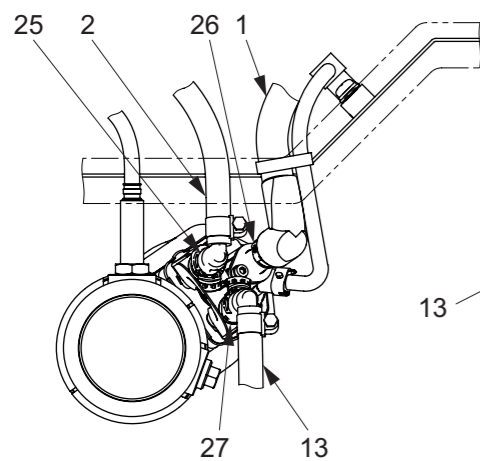
SW884-03004

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

### 3-2. Urea Piping



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



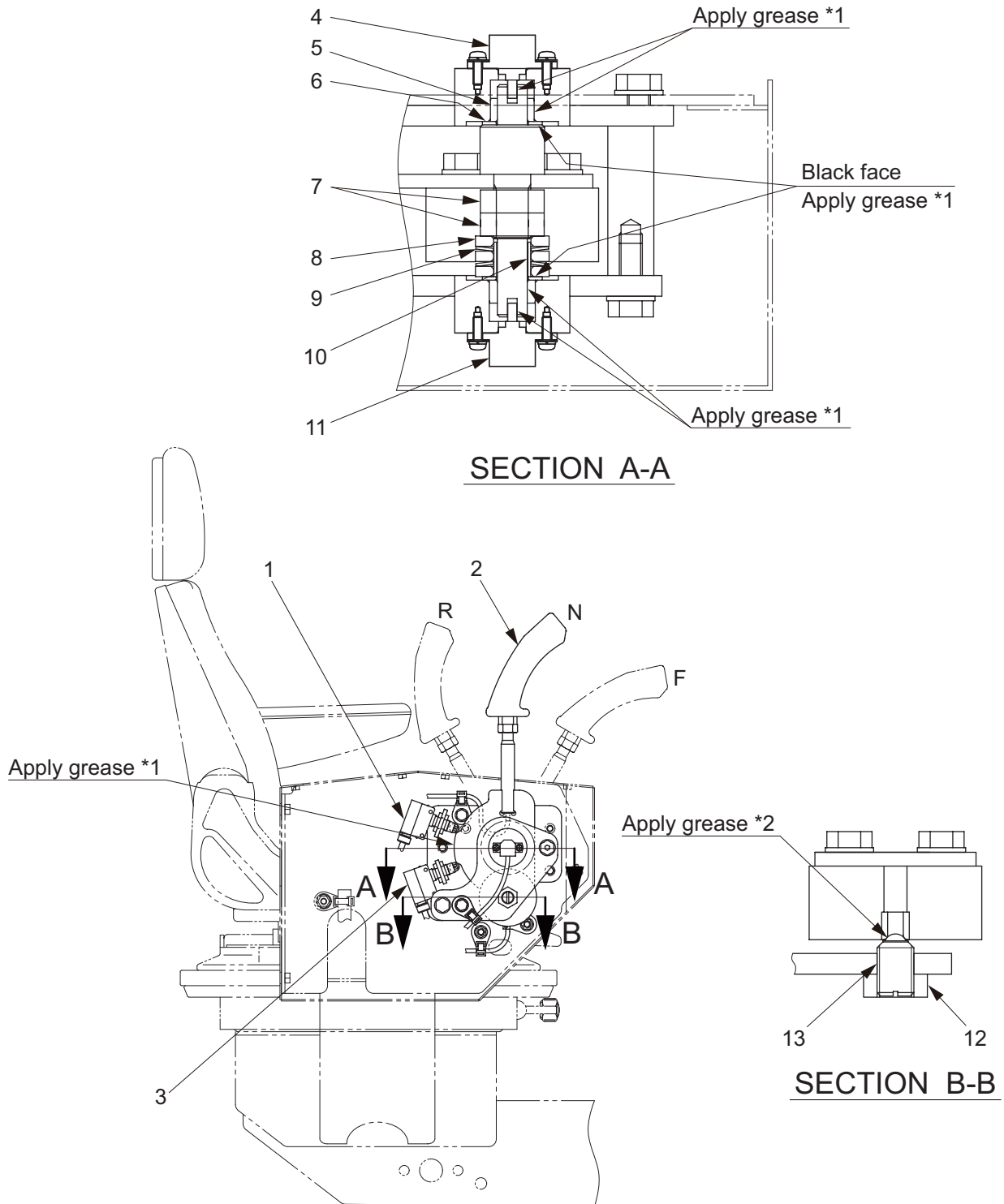
• Arrow "⇒" symbols show the hose connection and the direction of the flow of the DEF.  
 • Arrow "→" symbols show the hose connection and the direction of the flow of the coolant.





# 4. CONTROL SYSTEM

## 4-1. Forward-reverse Control



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

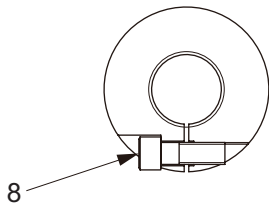
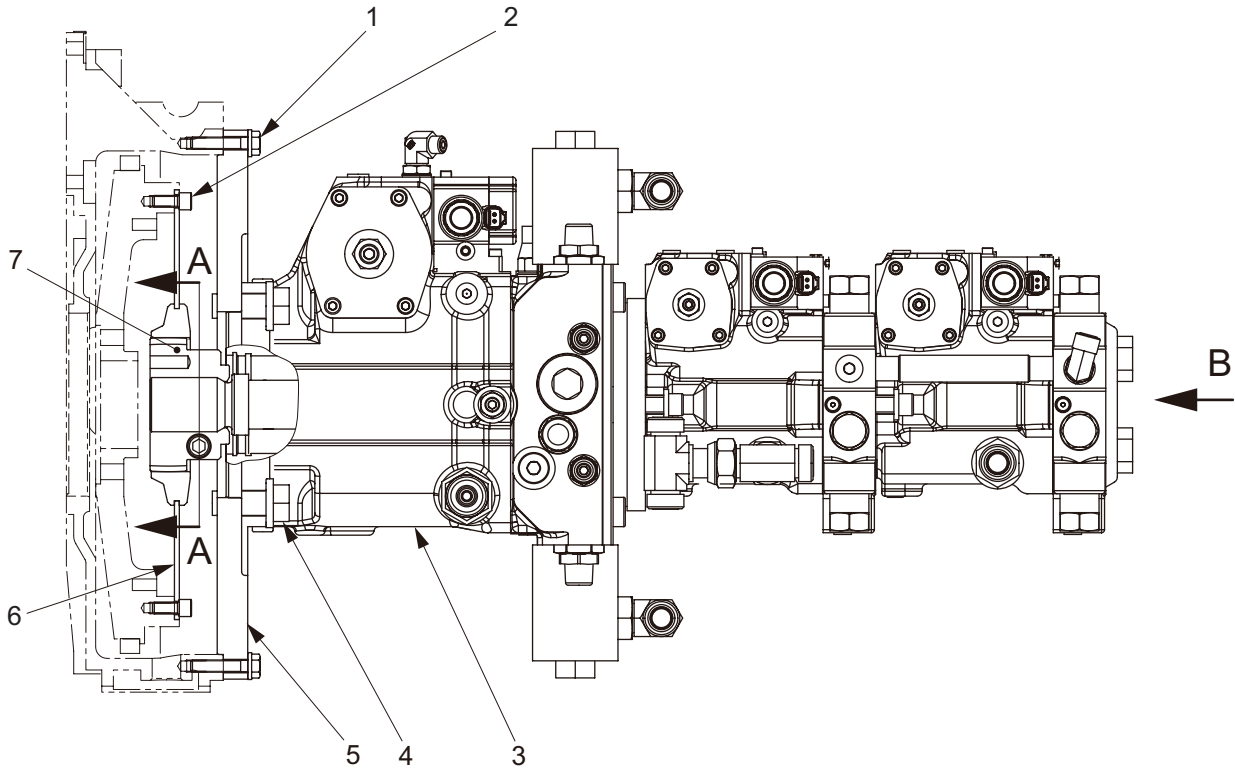
\*1 : Lithium-based grease

\*2 : Molybdenum-based grease

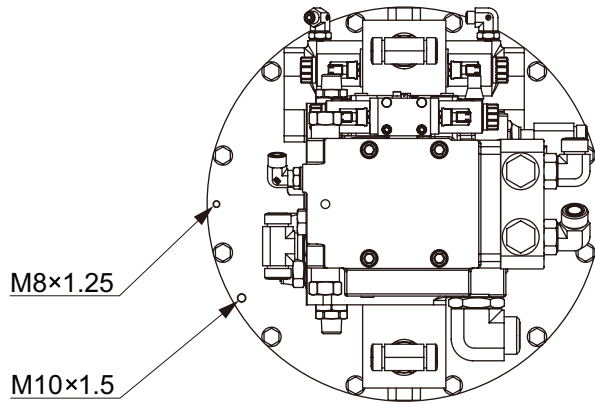
0568-12805-0-11265-C

# 5. PUMP MOUNT

## 5-1. Pump Mount



SECTION A-A



VIEW B

0568-36812-0-11986-B

- (1) Bolt : M10×50
- (2) Bolt : 3/8-16UNC×22
- (3) Pump
- (4) Bolt : M20×50

- (5) Housing
- (6) Flange
- (7) Hub
- (8) Bolt : M12×35



- (1) Bolt M10×50 : 60 N·m ( 44 lbf-ft )
- (2) Bolt 3/8-16UNC×22 : 69 N·m ( 51 lbf-ft )

- (4) Bolt M20×50 : 539 N·m ( 398 lbf-ft )
- (8) Bolt M12×35 : 86 N·m ( 63 lbf-ft )

### 5-1-1. Installation of pump

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

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



(8) Bolt M12×35 : 86 N·m (63 lbf·ft)

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



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

#### (NOTICE)

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

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



(1) Bolt M10×50 : 60 N·m (44 lbf·ft)

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



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



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# **HYDRAULIC SYSTEMS**

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# 1. SYSTEM CIRCUIT DIAGRAM

## 1-1. Graphic Symbols for Hydraulic Circuits

### Basic Symbols



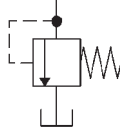

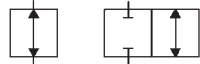
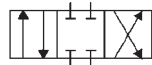

DESCRIPTION	SYMBOL
Lines:	
Main working	
Pilot control	
Drain or bleed	
Lines, joining	
Not connected	
Component outline	
Arrow indicates direction of flow.	
Line with fixed restriction (orifice).	
Test port, pressure measurement.	
Temperature measurement gauge	
Pressure measurement gauge	
Reservoir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

### Pump, Motors and Cylinders


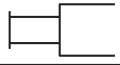

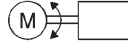
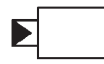

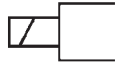
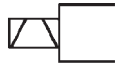

DESCRIPTION	SYMBOL
Hydraulic pumps:	
Fixed displacement	
Unidirectional	
Bidirectional	
Variable displacement	
Unidirectional	
Bidirectional	
Variable displacement pressure compensated Unidirectional	
Hydraulic Motor:	
Unidirectional	
Bidirectional	
Double acting hydraulic cylinder	
Differential cylinder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



### Valves

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

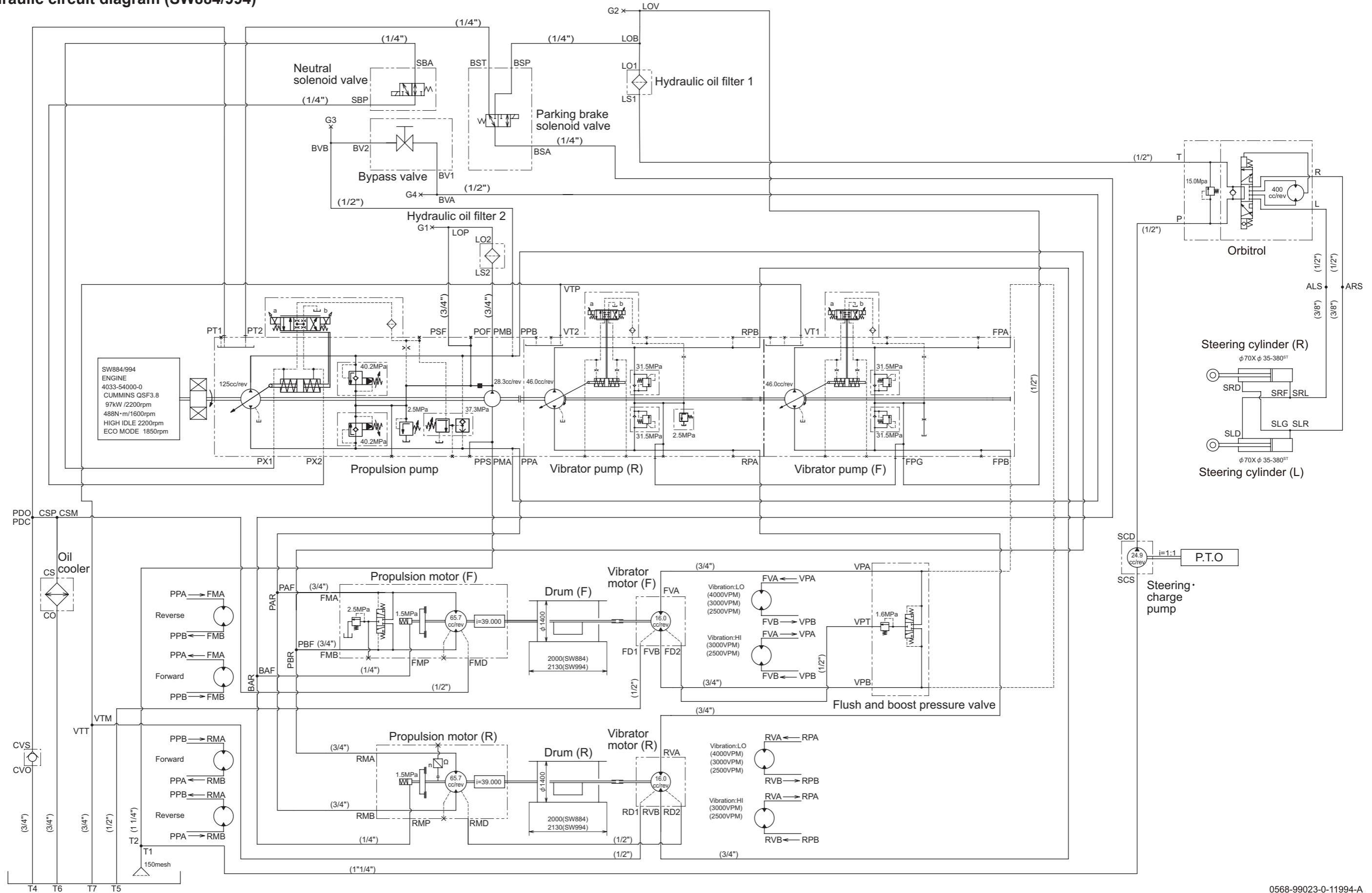
### Methods of Operation

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



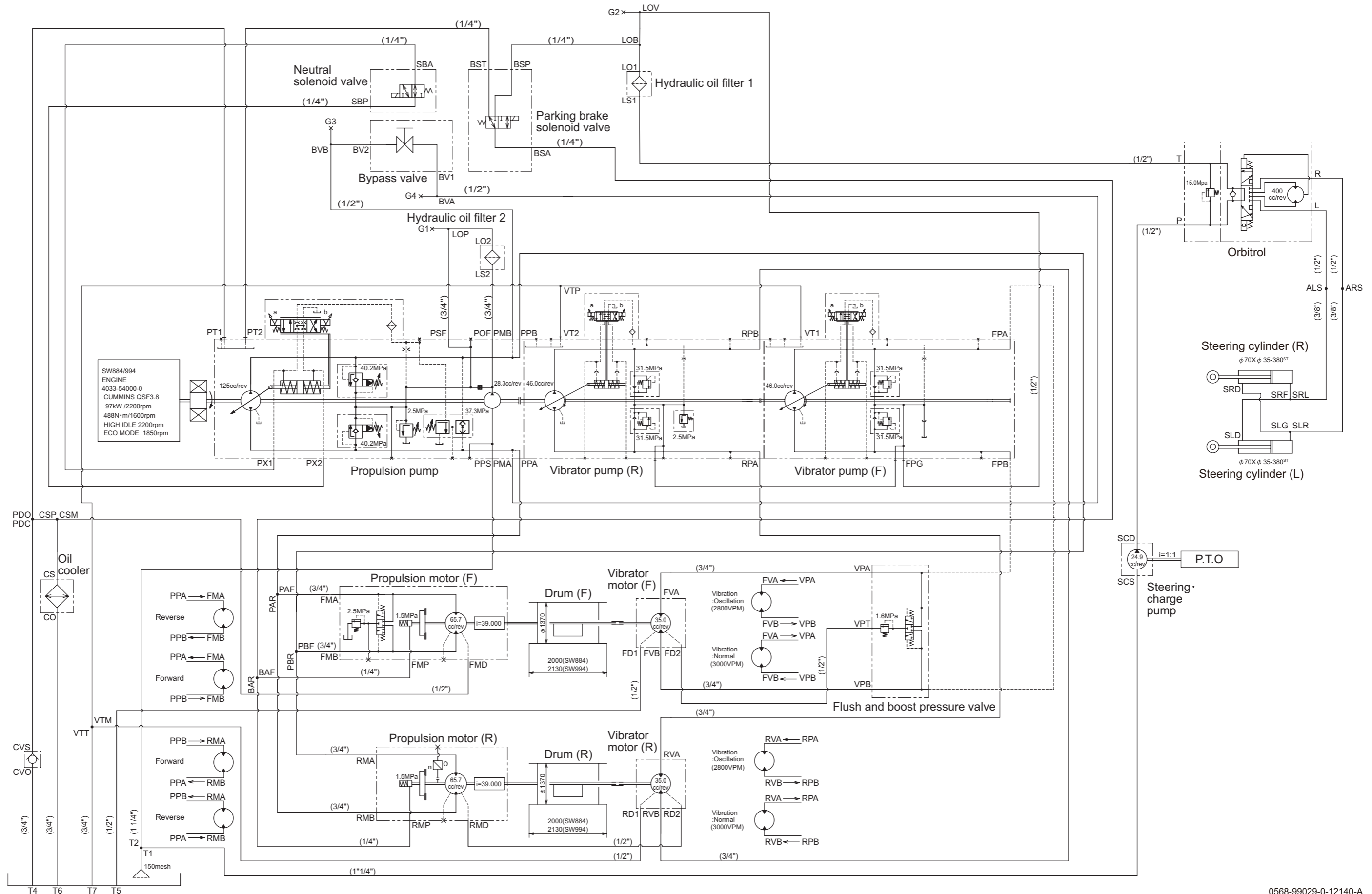
1-2. Hydraulic Circuit Diagram

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





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

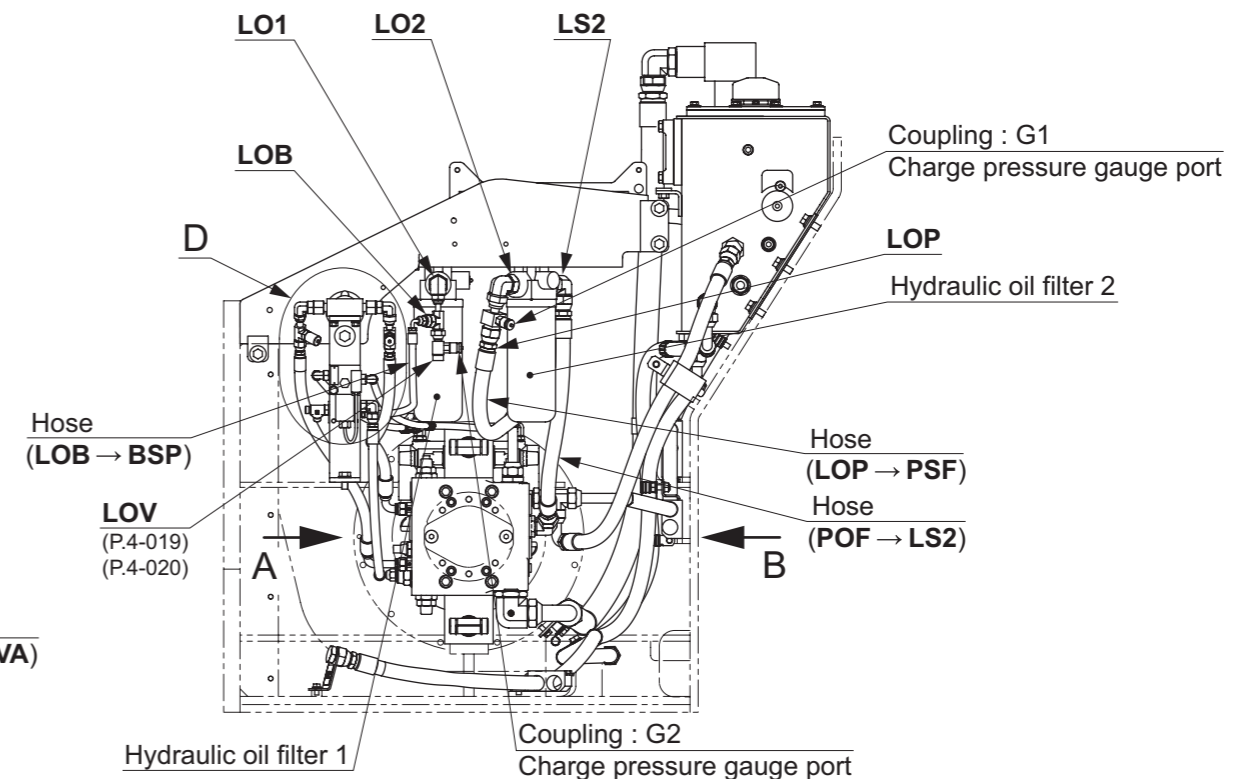
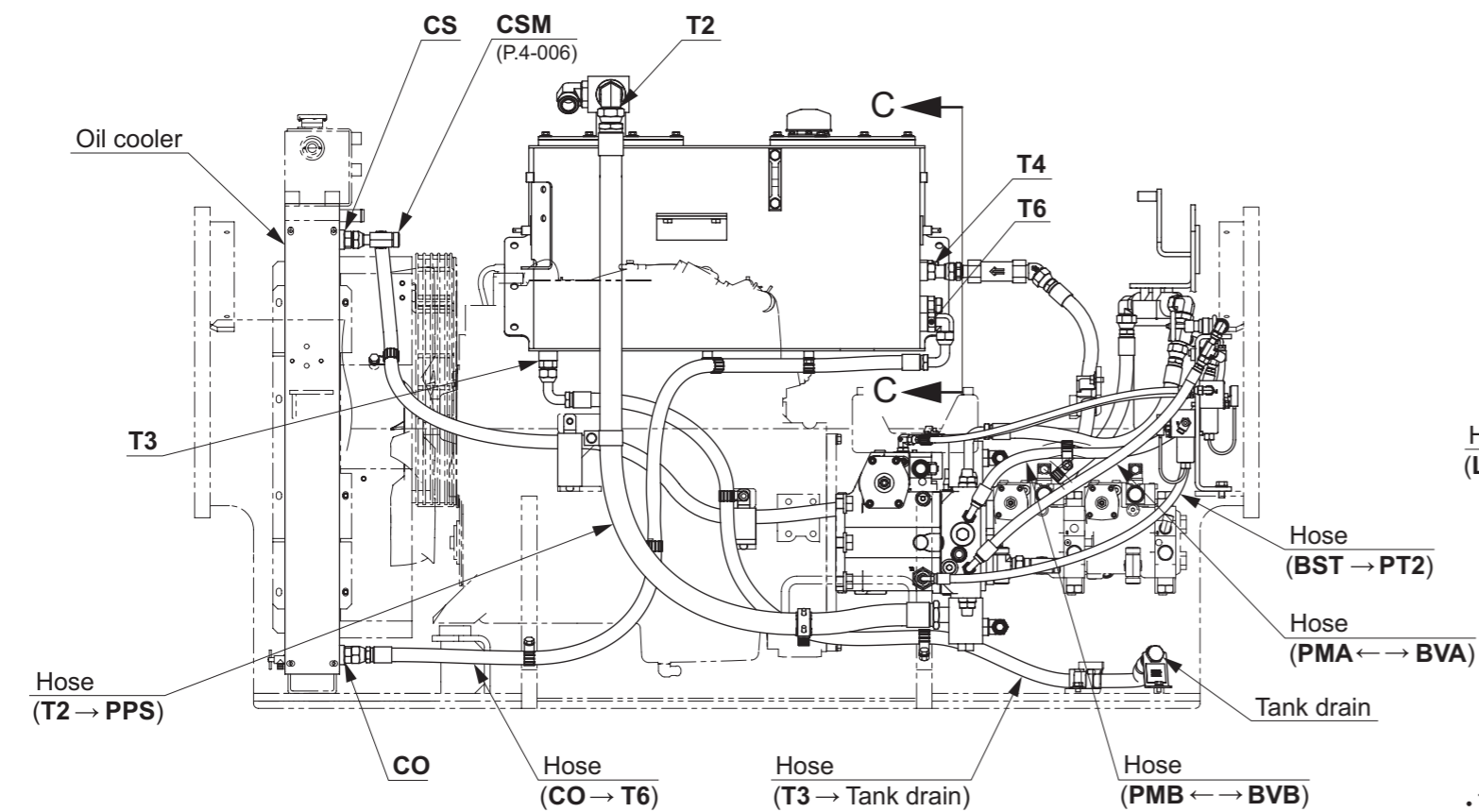
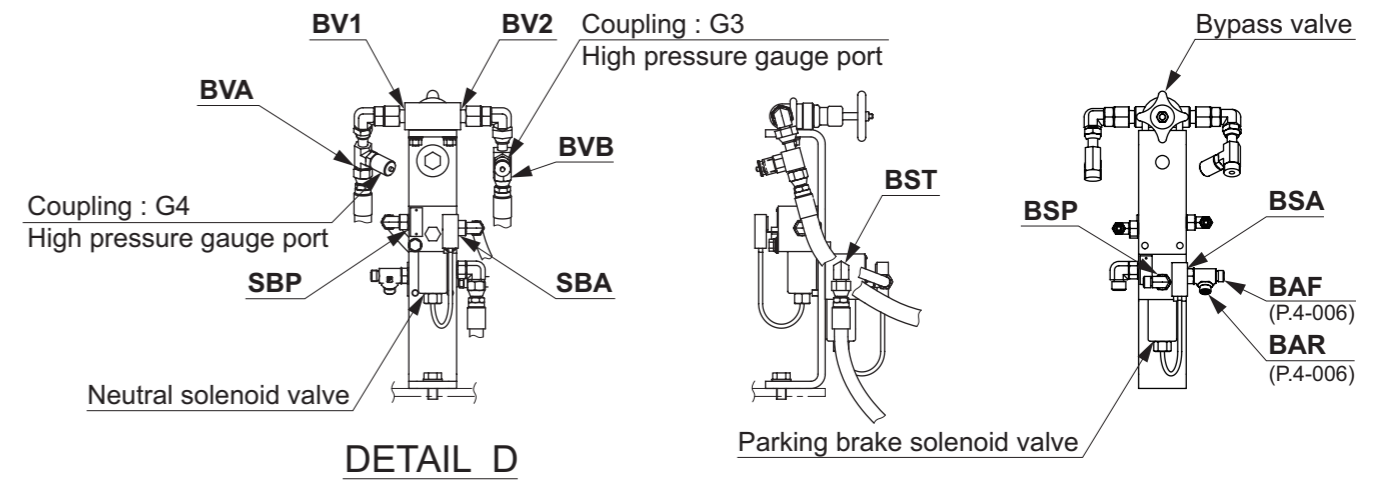
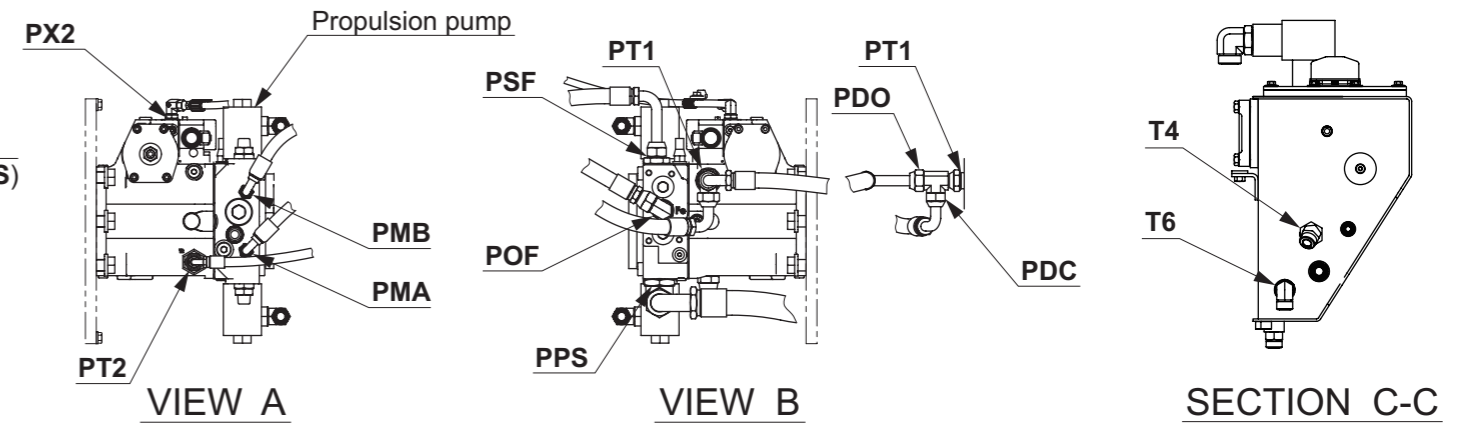
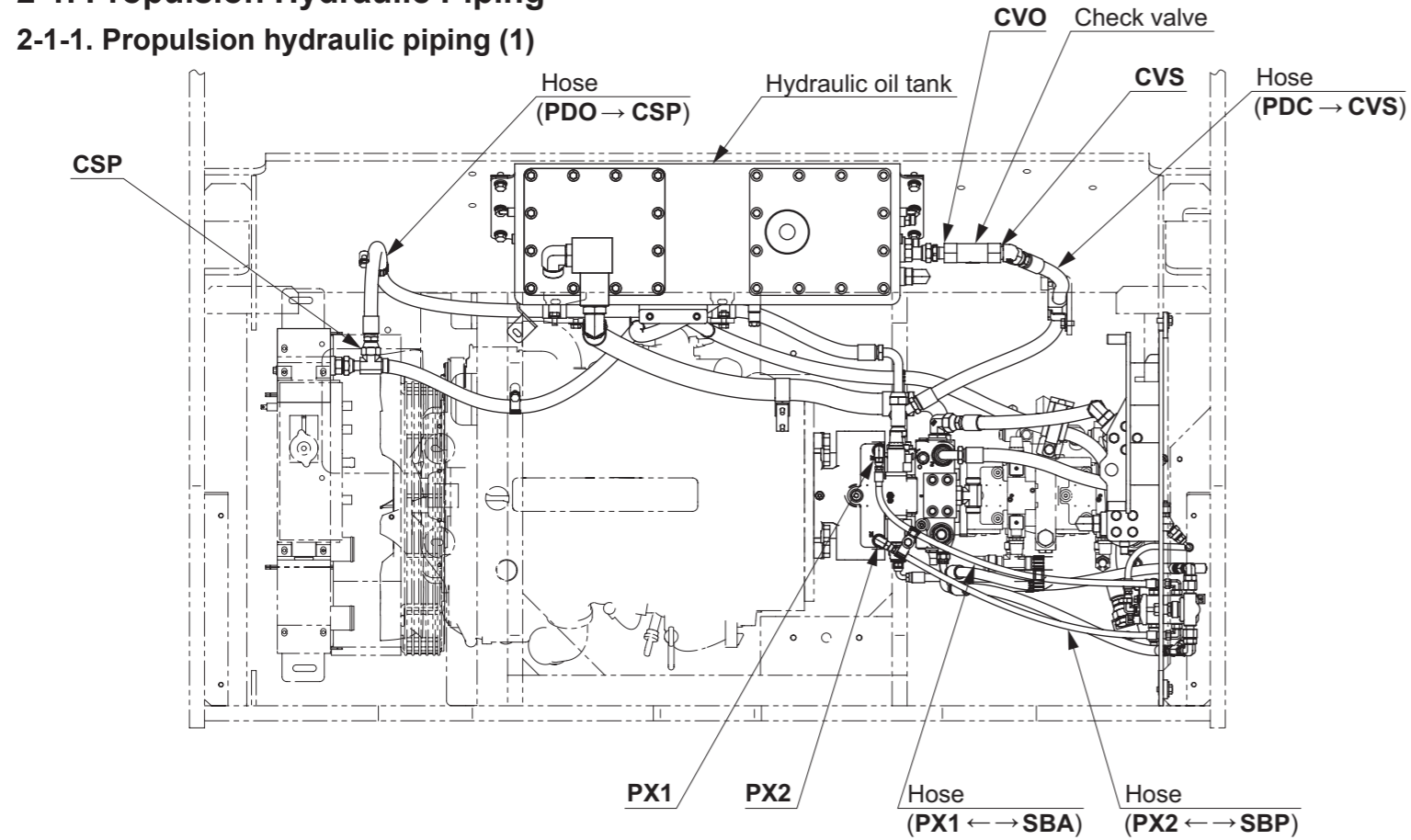




## 2. PROPULSION HYDRAULIC SYSTEM

### 2-1. Propulsion Hydraulic Piping

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

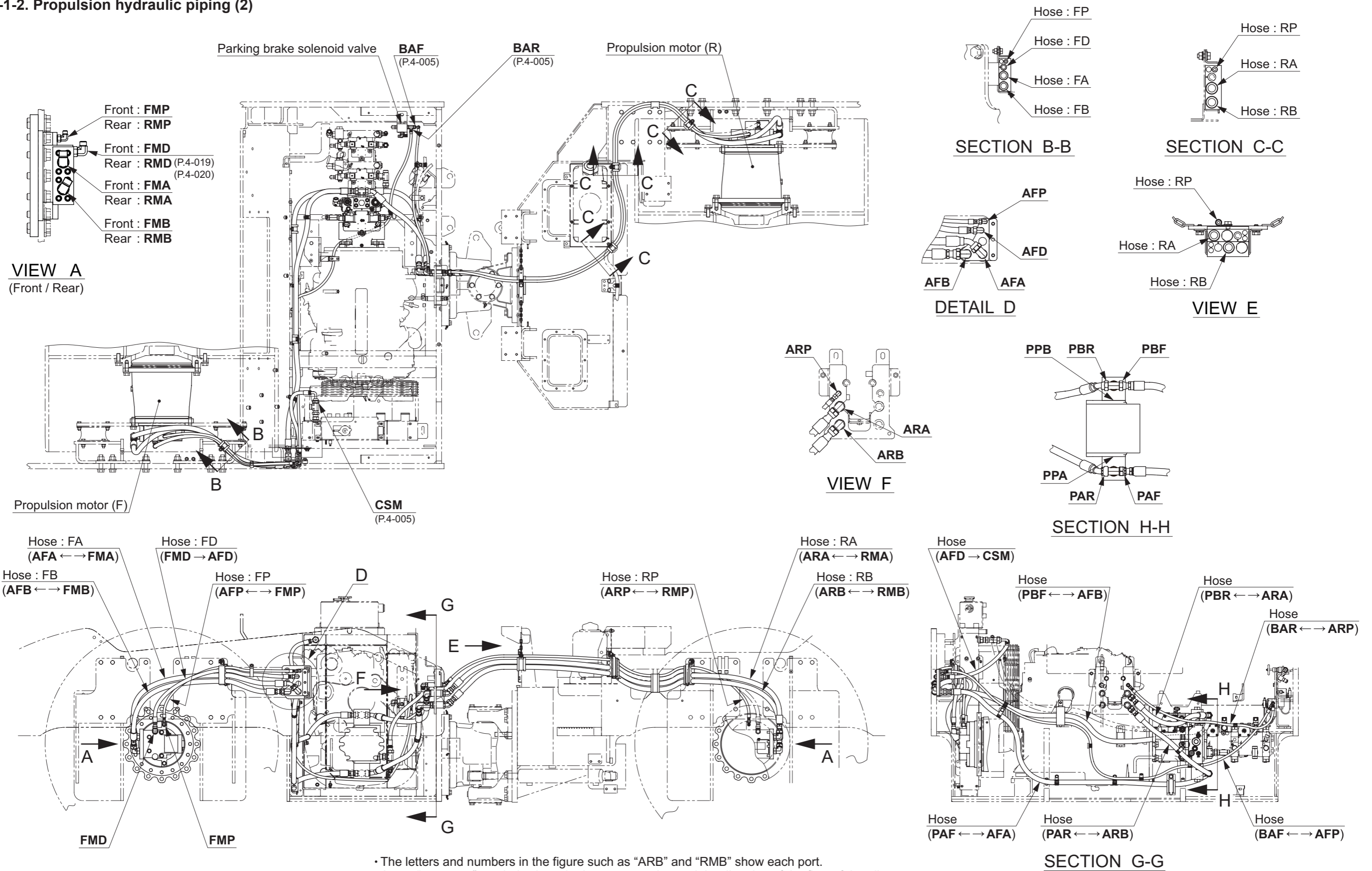


• The letters and numbers in the figure such as "PMA" and "BVA" show each port.  
 • Arrow "↔"; "→" symbols show the hose connection and the direction of the flow of the oil.





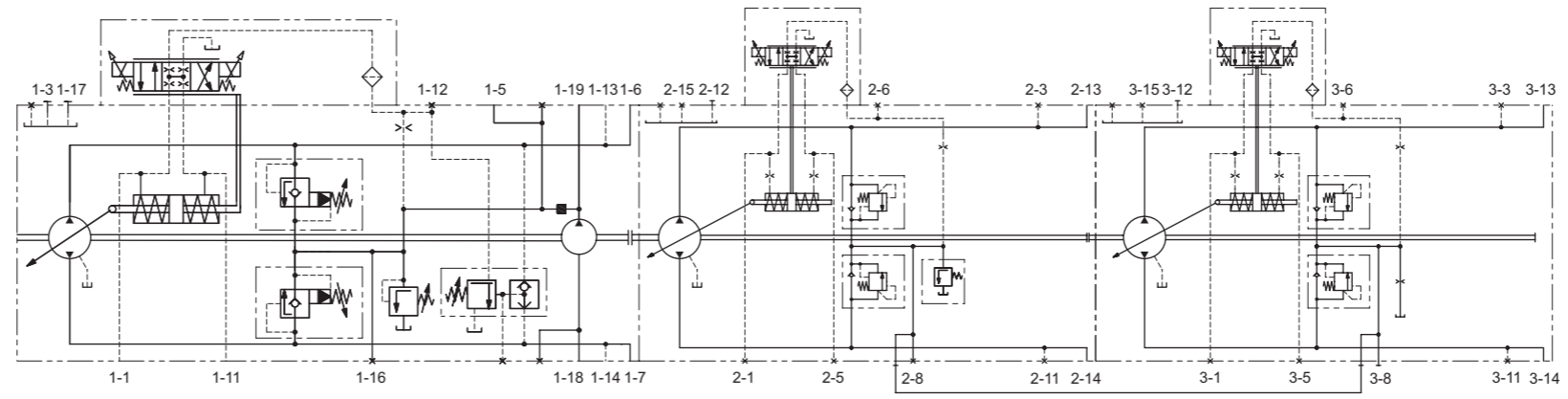
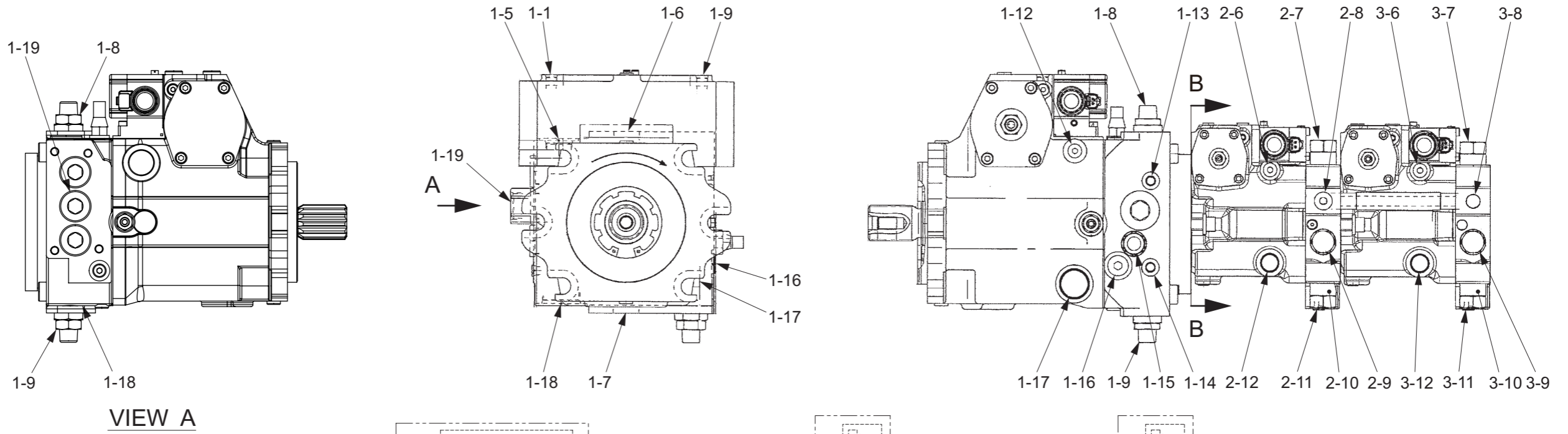
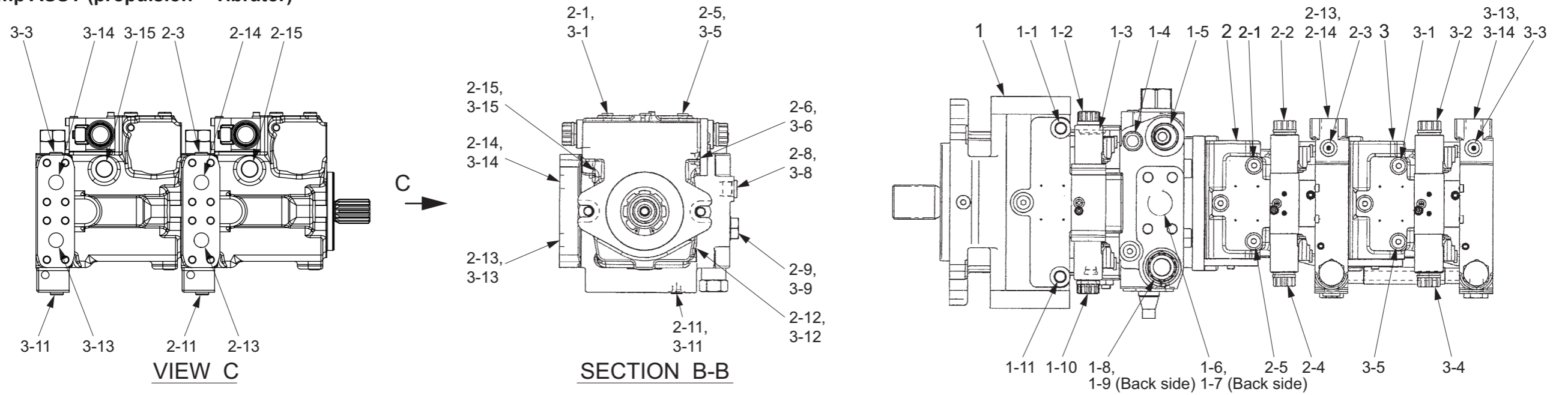
2-1-2. Propulsion hydraulic piping (2)



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

2-2. Hydraulic Component Specifications

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



Pump circuit diagram

(1) Propulsion pump

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

Specifications

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

(2) Vibrator pump (R)

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

Specifications

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

(3) Vibrator pump (F)

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

Specifications

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

ASSY Specifications

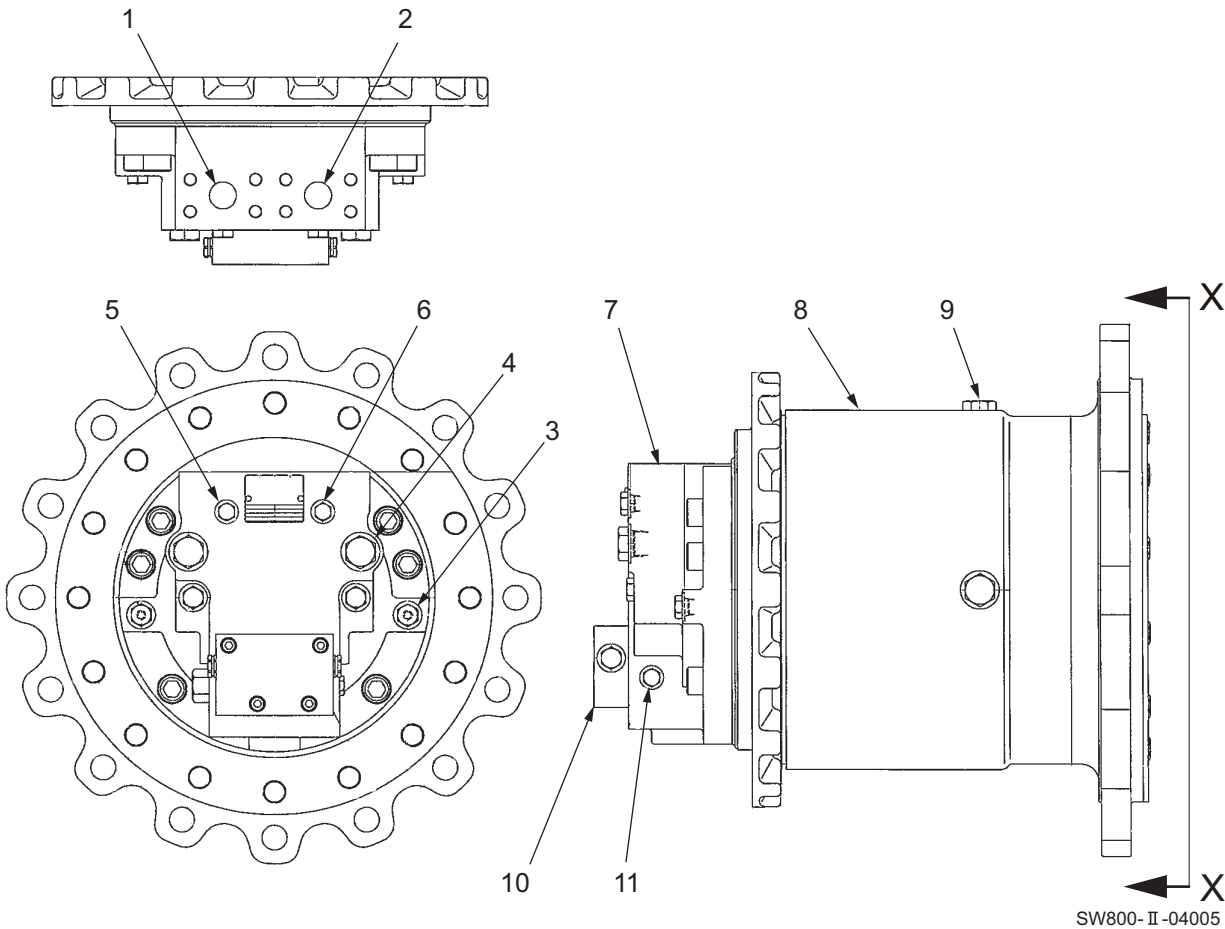
- Allowable pump case pressure : 0.4 MPa ( 58 psi ) or less
- Weight : 145 kg ( 320 lbs. )

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



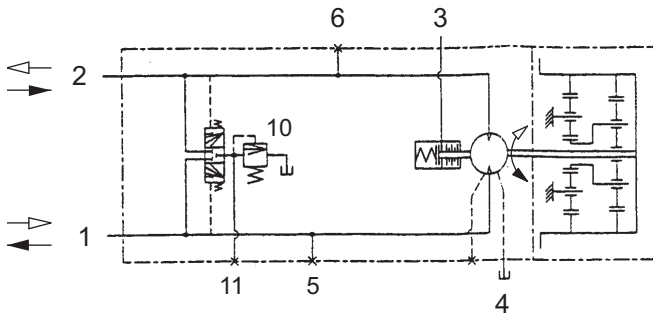


2-2-2. Propulsion hydraulic motor (F)



SW800-II-04005

- |   |                    |  |
|---|--------------------|--|
| (1) Port B (Forward)                      | [FMB] : SAE 1"     | (7) Motor                                    |
| (2) Port A (Reverse)                      | [FMA] : SAE 1"     | (8) Reduction gear                           |
| (3) Parking brake pilot port              | [FMP] : 9/16-18UNF | (9) Filler cap : 7/8-14UNF                   |
| (4) Drain port                            | [FMD] : 7/8-14UNF  | (10) Shuttle valve                           |
| (5) High pressure gauge port (For Port B) | : 9/16-18UNF       | (11) Charge pressure gauge port : 7/16-20UNF |
| (6) High pressure gauge port (For Port A) | : 9/16-18UNF       |  |



Motor circuit diagram

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

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

SW880-1-04002

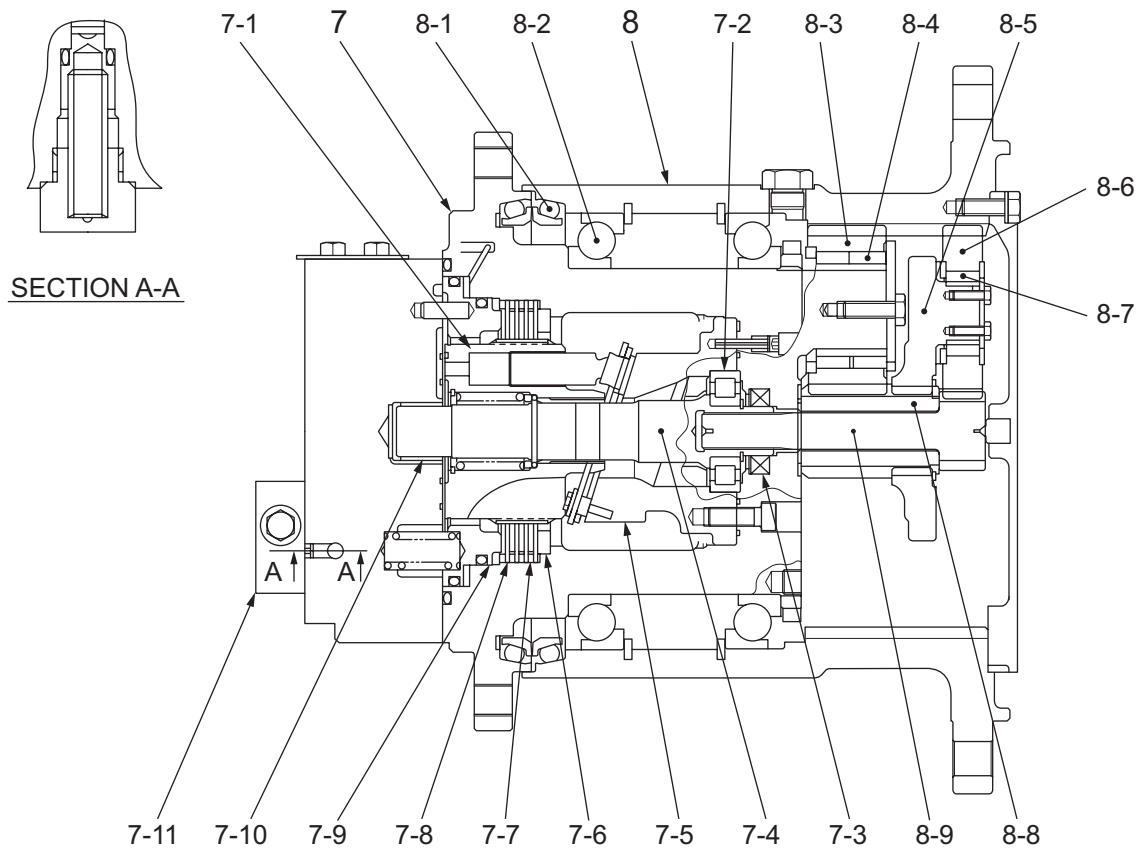
Motor specifications

- Displacement : 65.7 cm<sup>3</sup>/rev ( 4.0 cu.in./rev )
- Maximum working pressure : 41.8 MPa ( 6,063 psi )
- Brake release pressure : 1.5 MPa ( 218 psi )
- Allowable motor case pressure : 0.3 MPa ( 43.5 psi )

Reduction gear specifications

- Reduction ratio : 1/39.000
- Propulsion hydraulic motor weight : 191 kg ( 421 lbs. )

1) Internal structure of propulsion hydraulic motor (F)



SW800- II -04006

(7) Motor

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

(8) Reduction gear

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

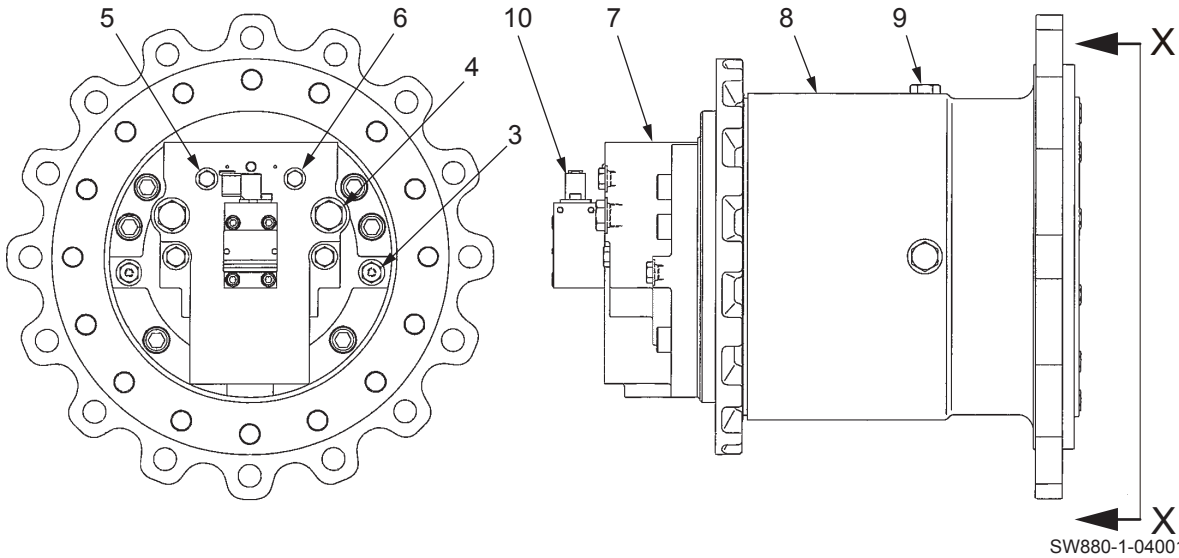
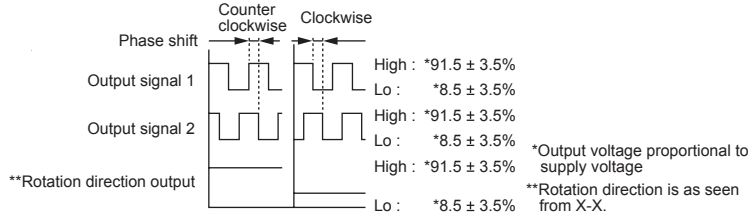
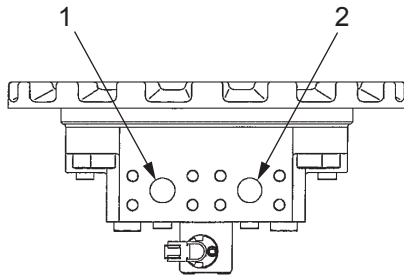


2-2-3. Propulsion hydraulic motor (R)

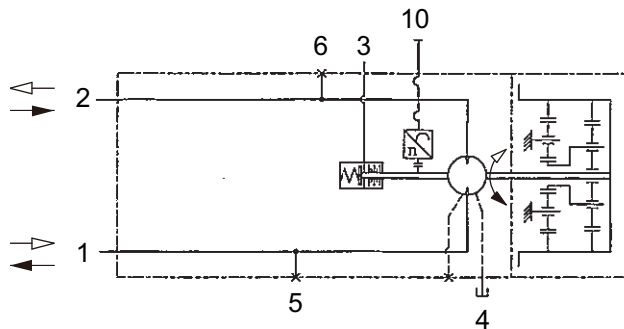
Speed sensor specifications

• Supply power voltage	5V ±0.25V
• Maximum required current	25 mA
• Output signal	21 pulses/rev.
• Connector	DEUTSCH DTM-Series 6-Pin DTM 04-6P

Sensor pin I/O	
1	Output signal 2
2	Revolving direction output
3	Output signal 1
4	Supply power voltage
5	0 V (GND)
6	-



- |   |                    |                               |
|---|--------------------|-------------------------------|
| (1) Port B (Forward)                      | [RMB] : SAE 1"     | (7) Motor                     |
| (2) Port A (Reverse)                      | [RMA] : SAE 1"     | (8) Reduction gear            |
| (3) Parking brake pilot port              | [RMP] : 9/16-18UNF | (9) Filler cap                |
| (4) Drain port                            | [RMD] : 7/8-14UNF  | (10) Speed sensor : 7/8-14UNF |
| (5) High pressure gauge port (For Port B) | : 9/16-18UNF       |                               |
| (6) High pressure gauge port (For Port A) | : 9/16-18UNF       |                               |



Motor circuit diagram

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

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

SW880-1-04003

Motor specifications

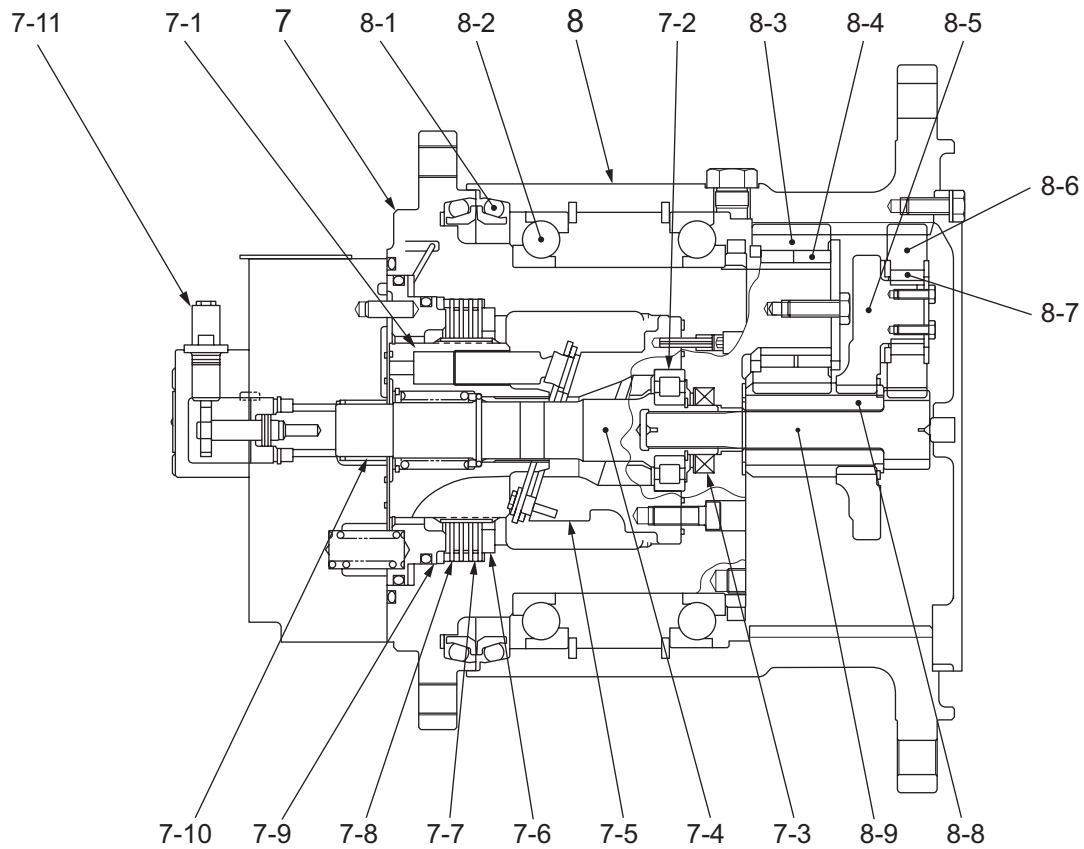
- Displacement : 65.7 cm<sup>3</sup>/rev ( 4.0 cu.in./rev )
- Maximum working pressure : 41.8 MPa ( 6,063 psi )
- Brake release pressure : 1.5 MPa ( 218 psi )
- Allowable motor case pressure : 0.3 MPa ( 43.5 psi )

Reduction gear specifications

- Reduction ratio : 1/39.000
- Propulsion hydraulic motor weight : 192 kg ( 423 lbs. )



1) Internal structure of propulsion hydraulic motor (R)



SW880-04004

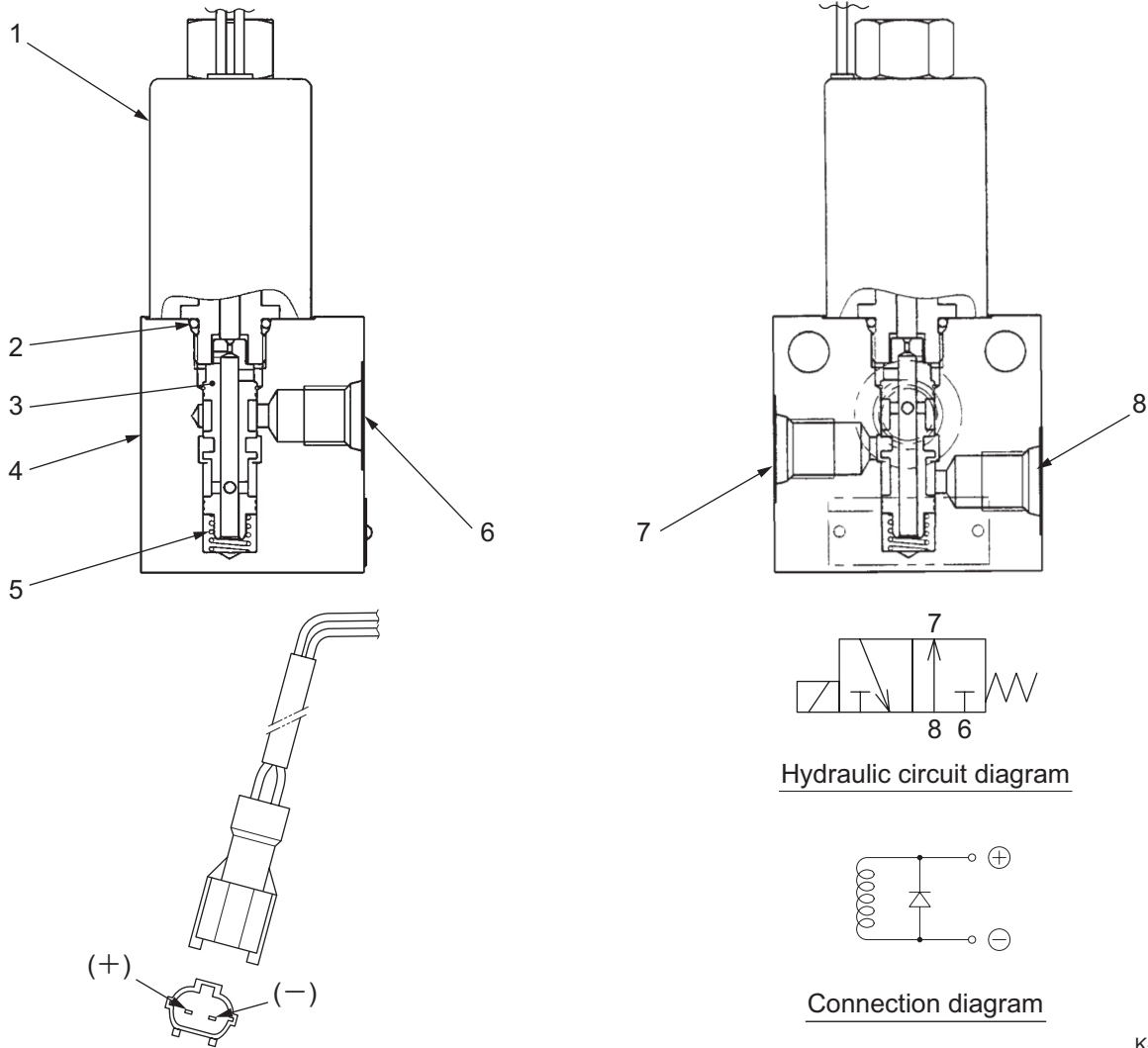
(7) Motor

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

(8) Reduction gear

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

2-2-4. Neutral solenoid valve



Hydraulic circuit diagram

Connection diagram

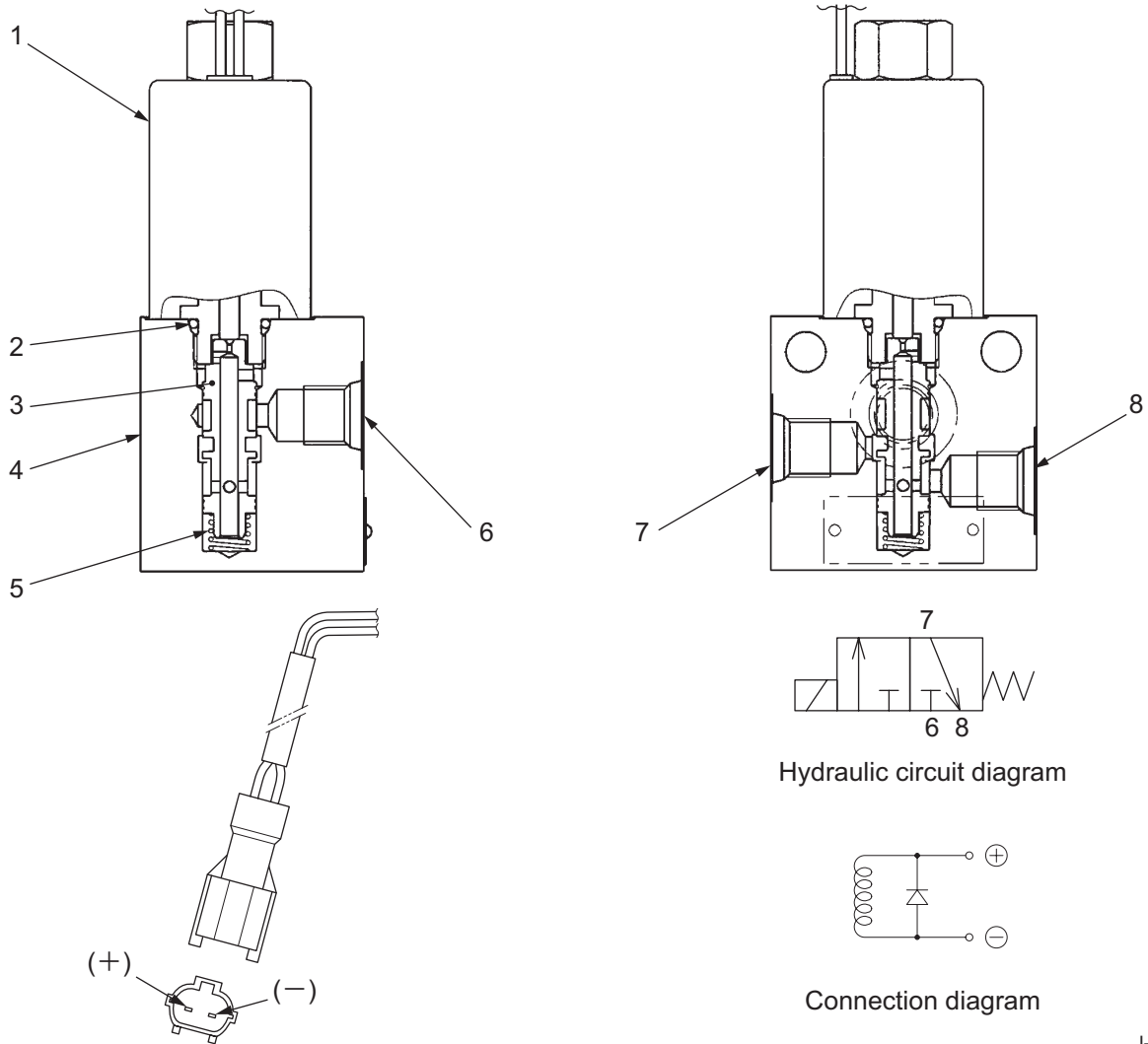
K-40146

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

Specifications

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

2-2-5. Parking brake solenoid valve



- (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

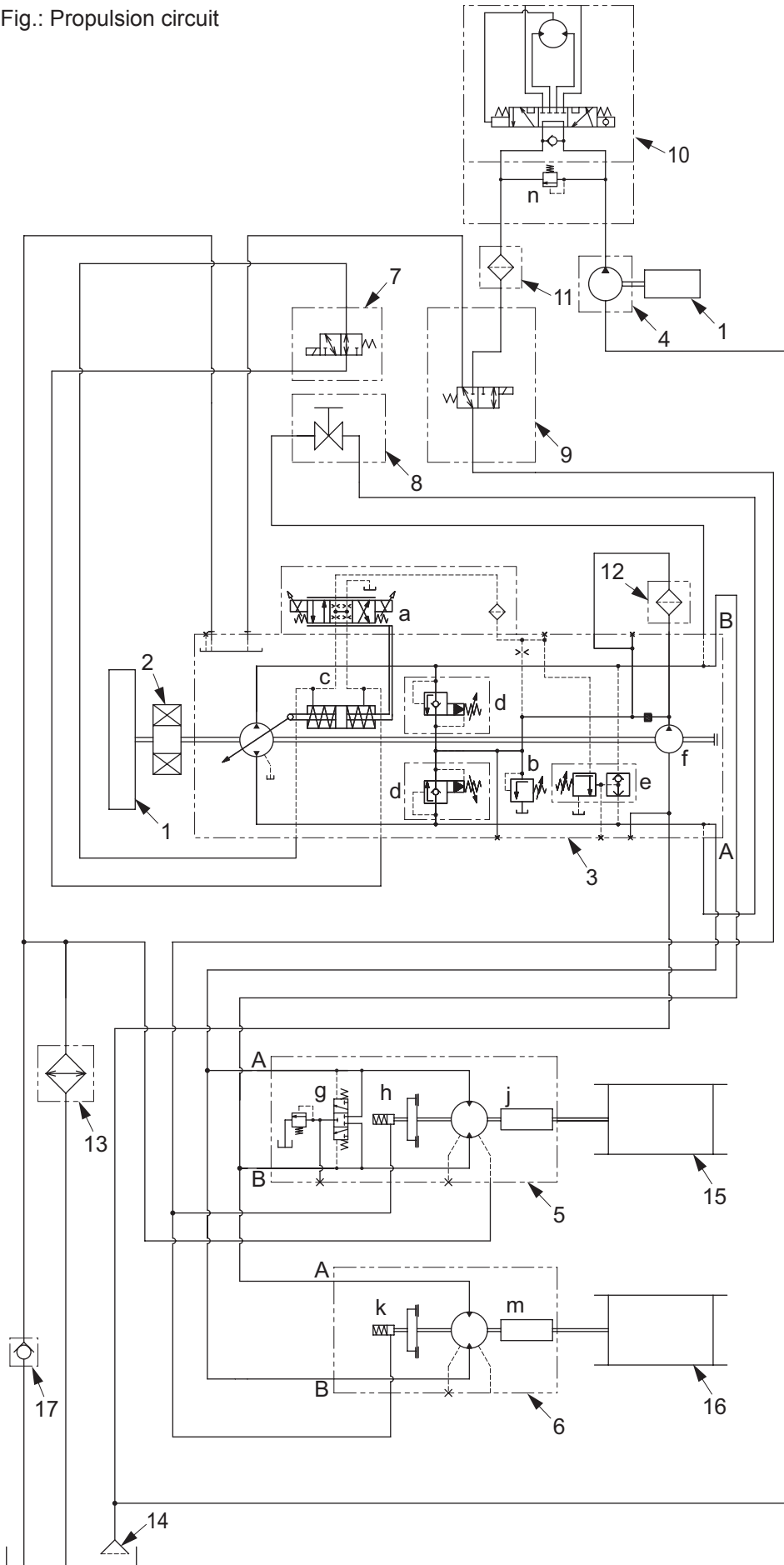
Specifications

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

J-40146

# HYDRAULIC SYSTEM

Fig.: Propulsion circuit



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

## 2-3. Description and Operation of Propulsion System

### Description

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

### Basic function of propulsion pump and motor

#### Propulsion pump:

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

#### Propulsion motor:

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

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

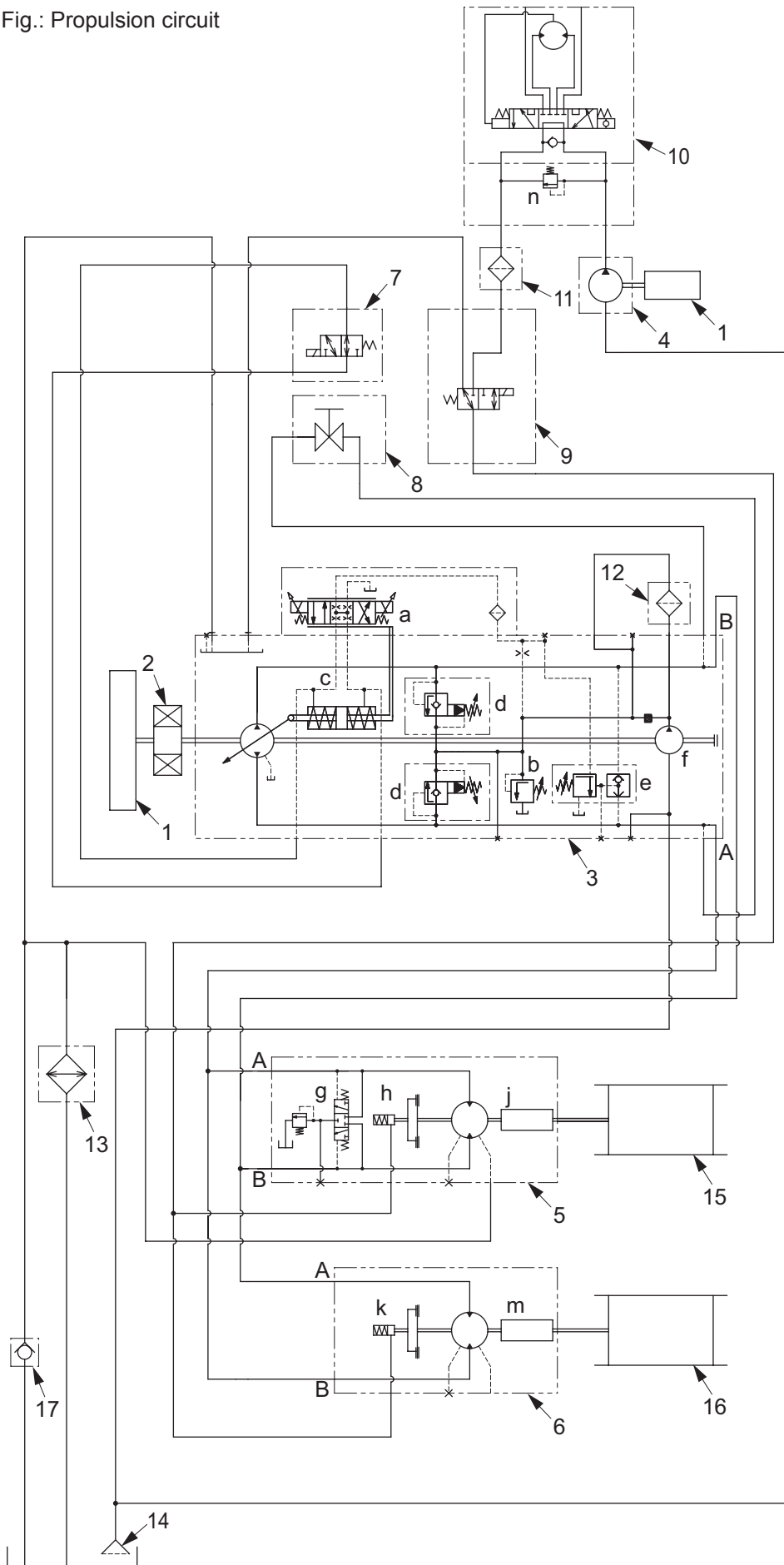
- Assemblies such as pump ASSY and motor ASSY are indicated by numbers such as “1” and “2”, while component parts of assemblies are shown by small letters such as “a” and “b”.
- The parking brake is supposed to have been released.
  
- Operation of the F-R lever forward puts pump control valve (a) into function. Servo piston (c) tilts the pump swashplate in the forward travel direction.
- Propulsion pump (3) discharges oil from its port B. Then the oil flow branches into two lines; one line connecting to port B in propulsion motor (5) and one line to port A in propulsion motor (6).
- The oil fed into the ports of the motors drives the motors, flowing out from the opposite side ports (port A in propulsion motor (5) and port B in propulsion motor (6)) and joins again to flow into port A in propulsion pump (3). At the same time, part of oil is drained to hydraulic oil tank via shuttle valve (g) and the motor casing.

### (NOTE)

- **Because the propulsion circuit is a closed circuit, the relationship between the suction port and discharge port is reversed when the travel direction is reversed. (The direction of oil flow reversed.)**
  
- The power from propulsion motor (5), (6) is delivered to drums (15), (16) through reduction mechanism in reduction gear (j), (m).

# HYDRAULIC SYSTEM

Fig.: Propulsion circuit



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

## Two-step Speed selection (High-Low)

### From Low to High:

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

### To release parking brake

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

### Circuit protection against high pressure

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

### Charge circuit

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

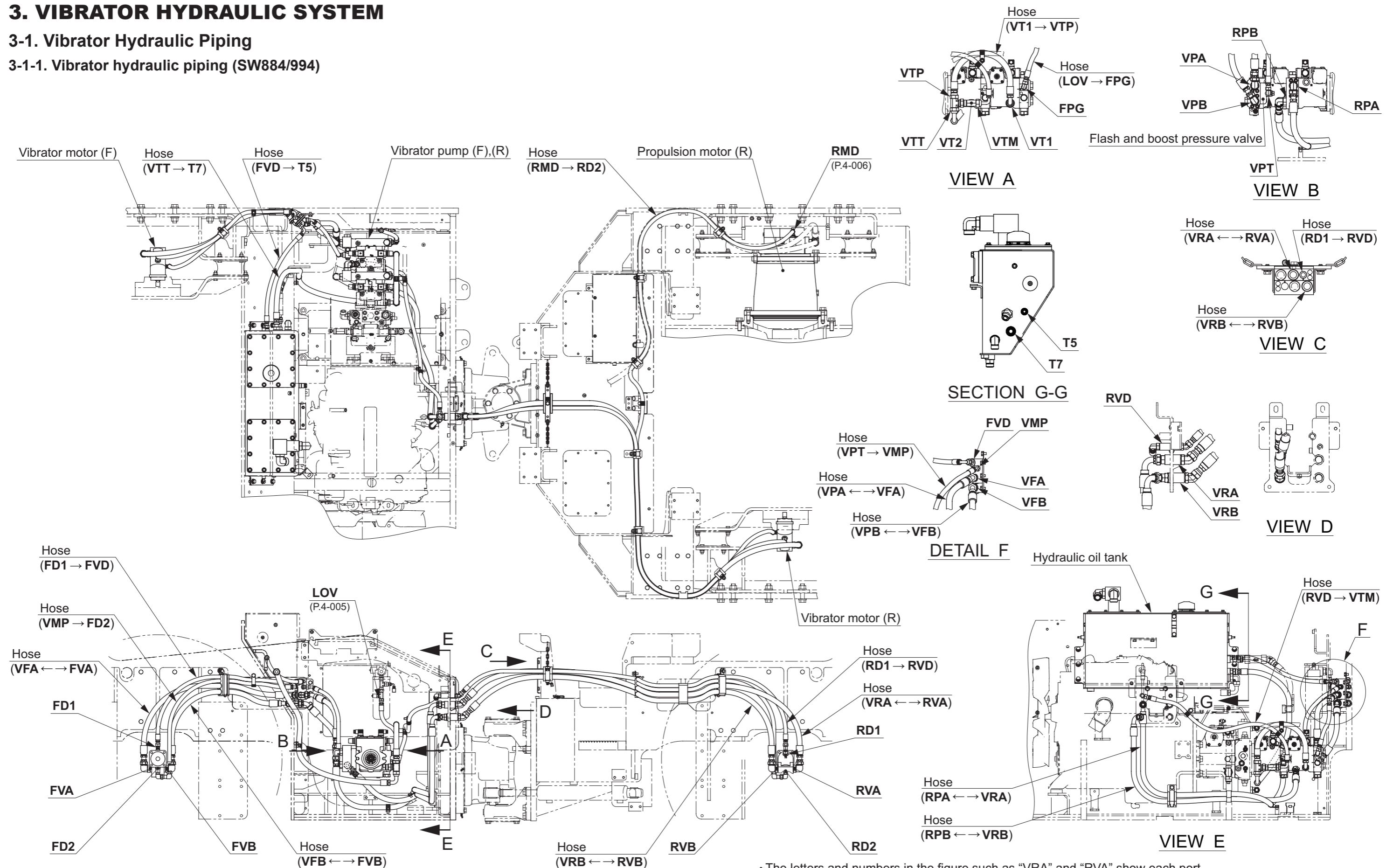




### 3. VIBRATOR HYDRAULIC SYSTEM

#### 3-1. Vibrator Hydraulic Piping

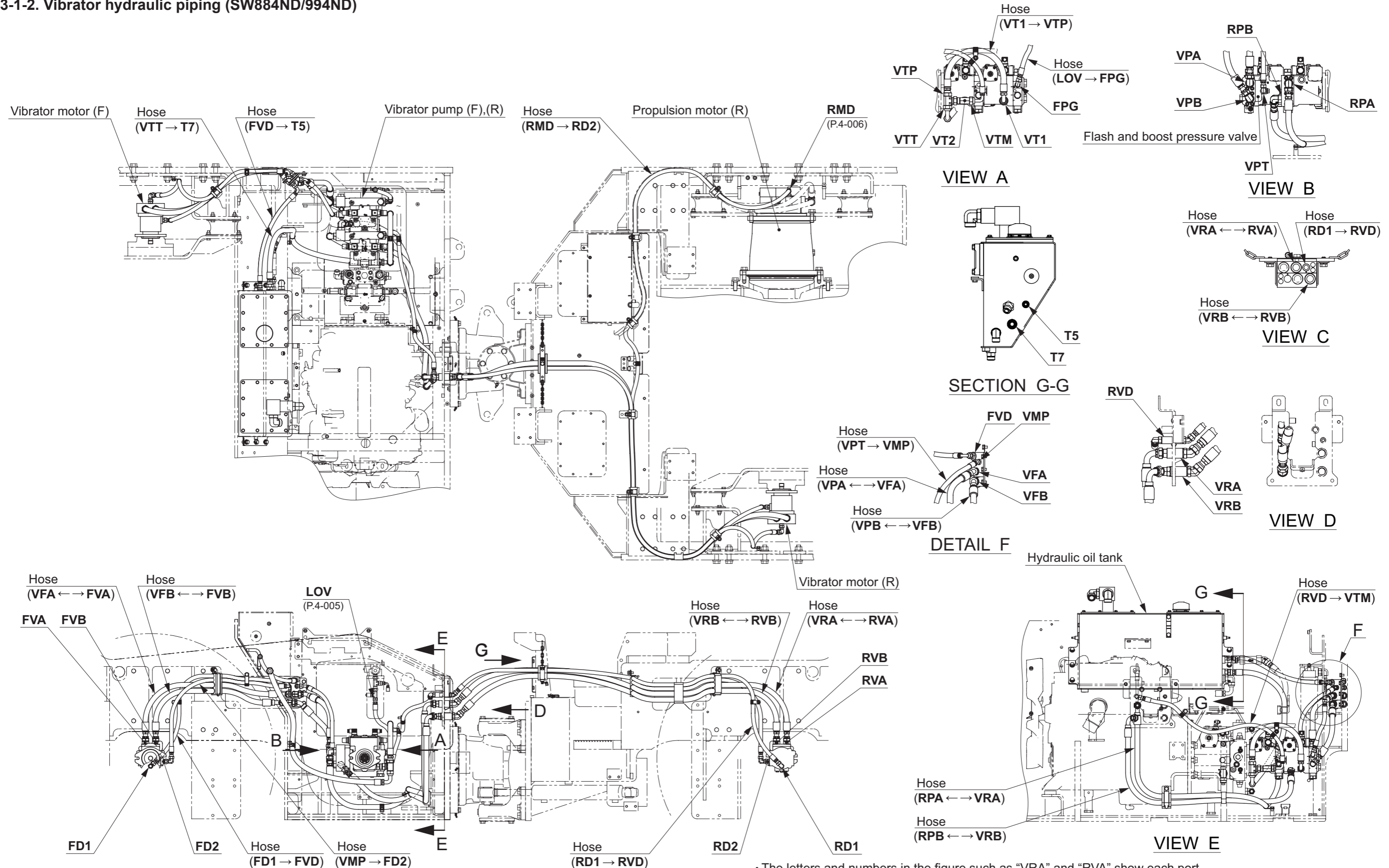
##### 3-1-1. Vibrator hydraulic piping (SW884/994)



• The letters and numbers in the figure such as “VRA” and “RVA” show each port.  
• Arrow “ $\longleftrightarrow$ ”; “ $\rightarrow$ ” symbols show the hose connection and the direction of the flow of the oil.



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

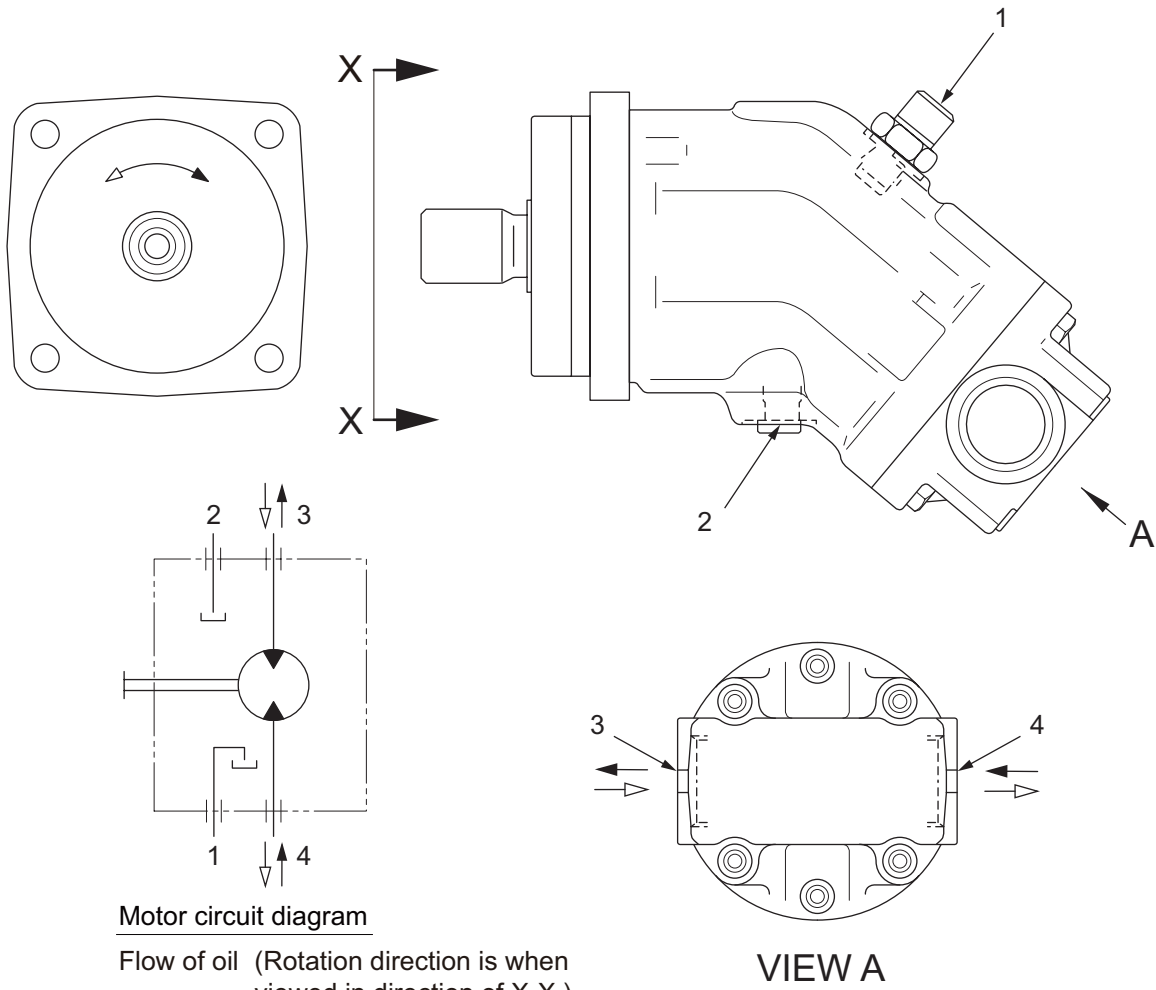


• The letters and numbers in the figure such as "VRA" and "RVA" show each port.  
 • Arrow "↔"; "→" symbols show the hose connection and the direction of the flow of the oil.



### 3-2. Hydraulic Component Specifications

#### 3-2-1. Vibrator hydraulic motor (SW884/994)



Motor circuit diagram

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

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

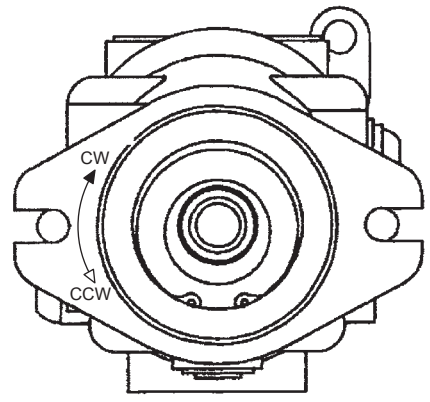
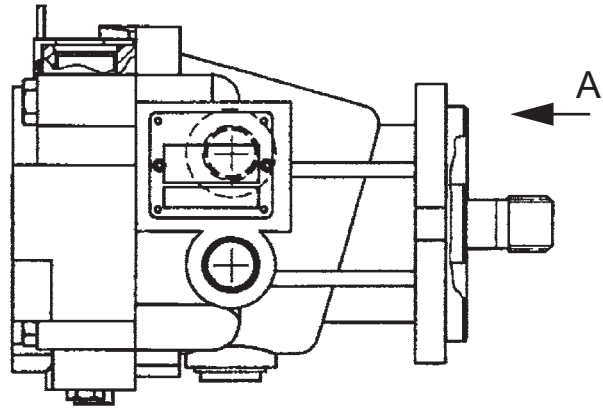
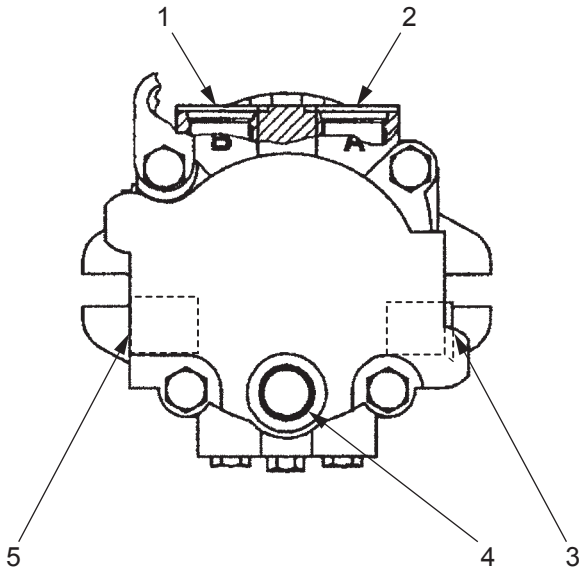
SW800-04015

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

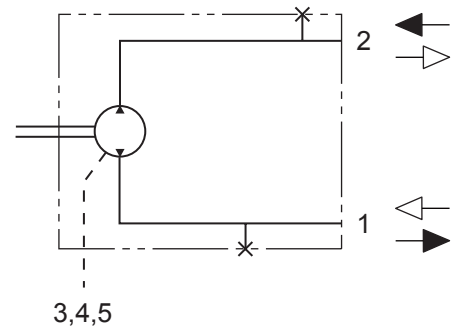
**Specifications**

- |                                 |   |                         |   |                 |   |
|---------------------------------|---|-------------------------|---|-----------------|---|
| • Displacement                  | : | 16 cm <sup>3</sup> /rev | ( | 0.98 cu.in./rev | ) |
| • Working pressure              | : | 22.5 MPa                | ( | 3,263 psi       | ) |
| • Allowable motor case pressure | : | 0.15 MPa                | ( | 21.6 psi        | ) |
| • Weight                        | : | 5.4 kg                  | ( | 11.9 lbs.       | ) |

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



VIEW A



Motor circuit diagram

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

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

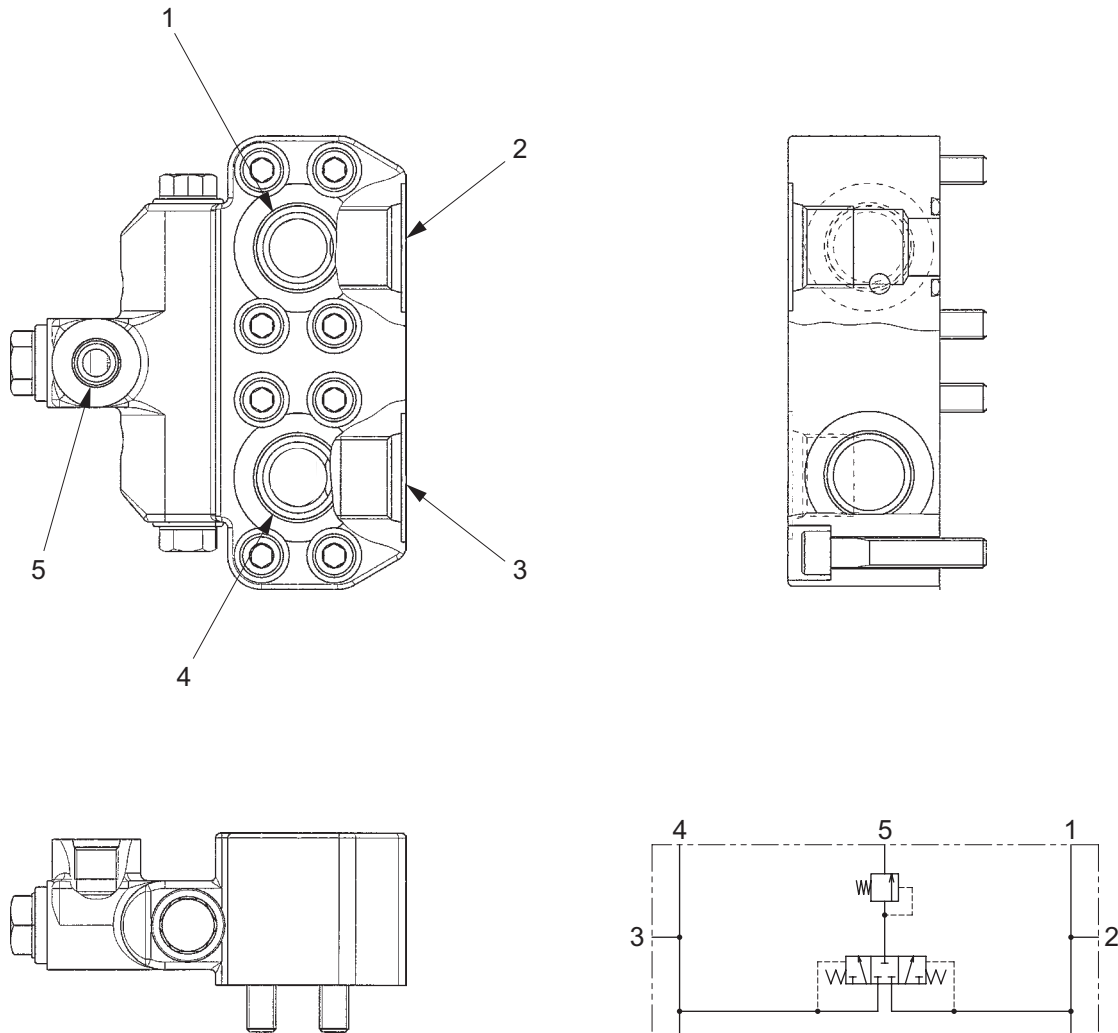
SV400-2-04012

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

Specifications

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

3-2-3. Flush and boost pressure valve



Hydraulic circuit diagram

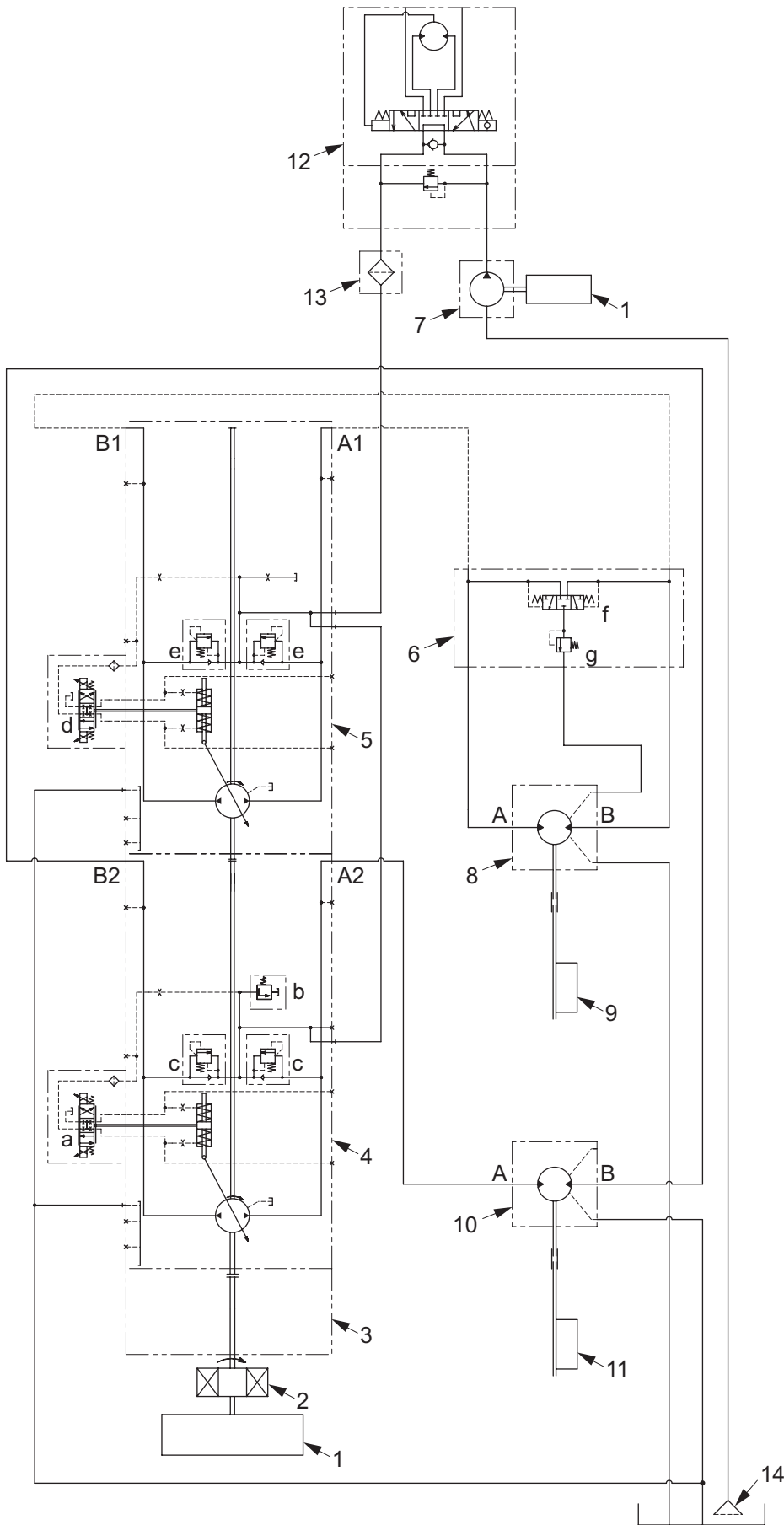
SW884-04005

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

Specifications

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

Fig.: Vibrator circuit



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



### 3-3. Description and Operation of Vibrator System

#### Description

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

#### Basic function of vibrator pump and motor

##### Vibrator pump:

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

##### Vibrator motor:

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

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

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

#### (NOTE)

- **Because the vibrator system also uses a closed circuit (HST) like the propulsion circuit, every time the amplitude selection is changed from low amplitude to high or vice versa, the function of the pump inlet and outlet is reversed with each other.**
- **ND type switches oscillation and normal.**
- When the front drum is selected by the vibratory drum select switch, proportional solenoid valve (d) operates, only the vibrator pump (F) (5) discharges oil, the vibrator motor (F) (8) operates, and the vibrator (F) (9) rotates.
- When the rear drum is selected by the vibratory drum select switch, proportional solenoid valve (a) operates, only the vibrator pump (R) (4) discharges oil, the vibrator motor (R) (10) operates, and the vibrator (R) (11) rotates.
- When both drums are selected by the vibratory drum select switch, proportional solenoid valves (a), (d) operates, both vibrator pumps discharges oil, both vibrator motors operates, and both vibrators rotates.

#### Circuit protection against high pressure

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

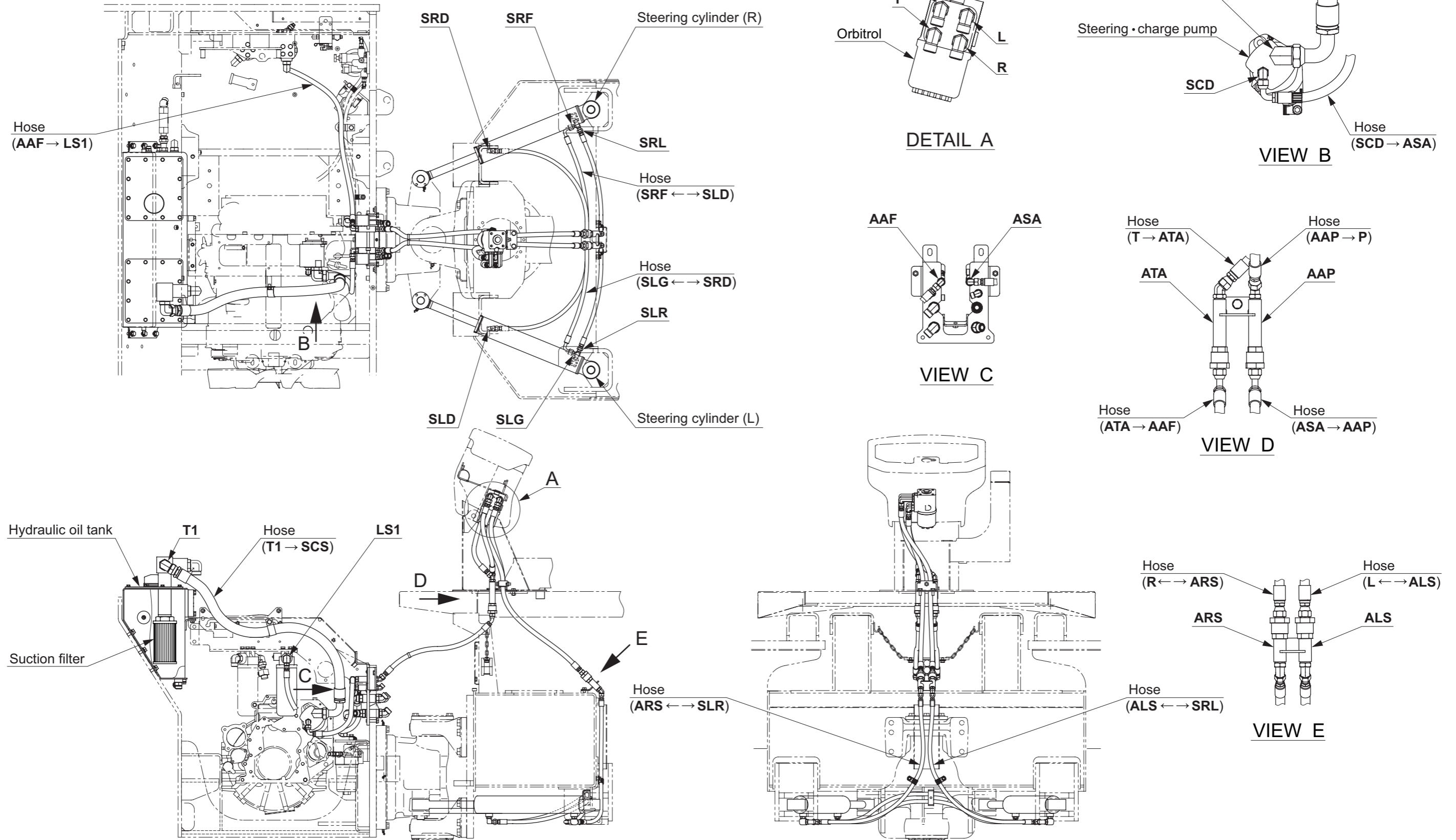
#### Charge circuit

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



# 4. STEERING SYSTEM

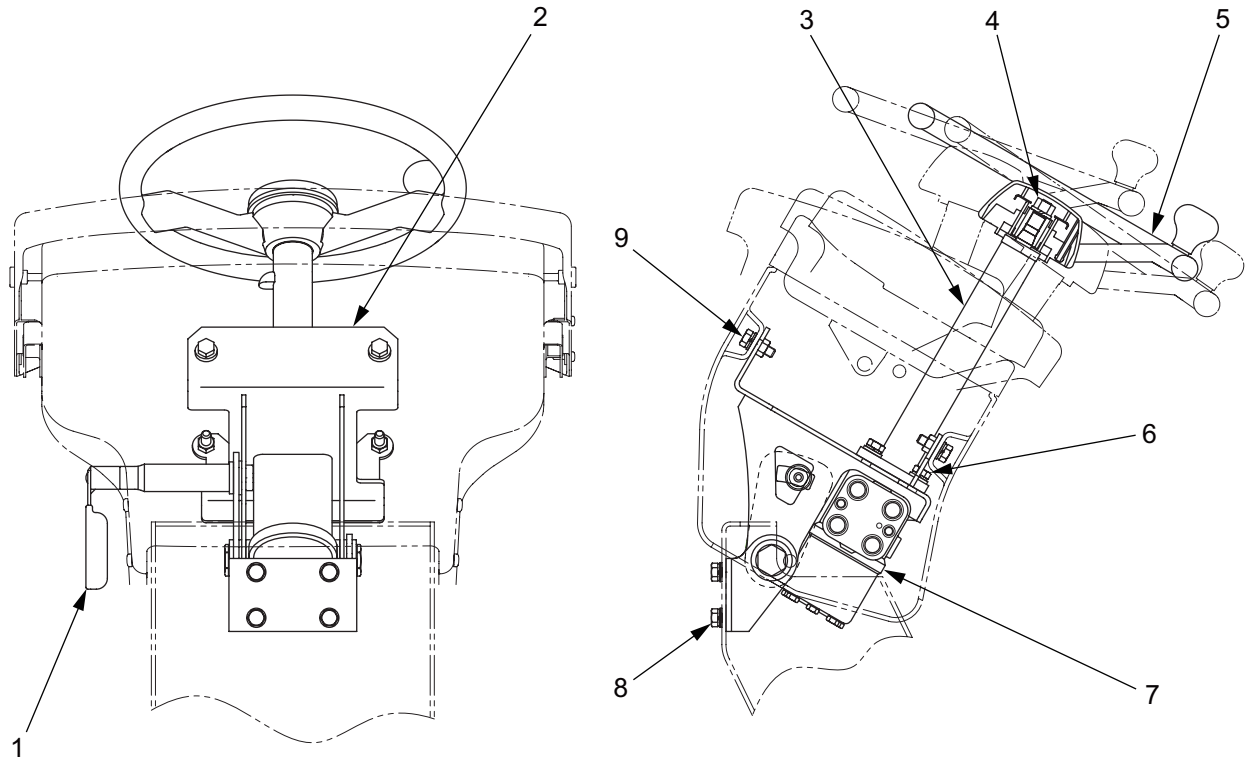
## 4-1. Steering Hydraulic Piping



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



## 4-2. Steering Wheel



0431-32801-0-10036-C

- |                      |              |          |
|----------------------|--------------|----------|
| (1) Tilt lock handle | (6) Bolt     | : M10×35 |
| (2) Tilt ASSY        | (7) Orbitrol |          |
| (3) Column shaft     | (8) Bolt     | : M10×25 |
| (4) Nut : M12 P=1.25 | (9) Bolt     | : M10×25 |
| (5) Steering wheel   |              |          |

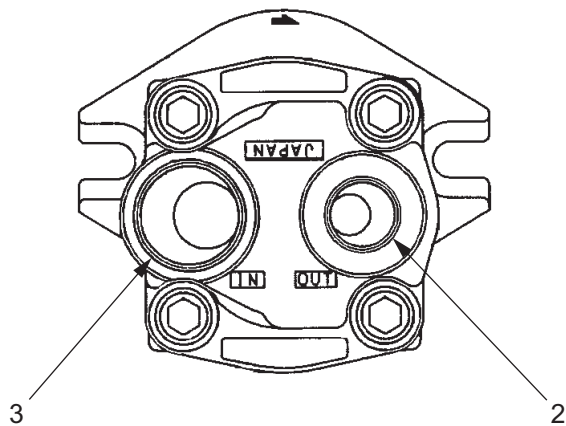
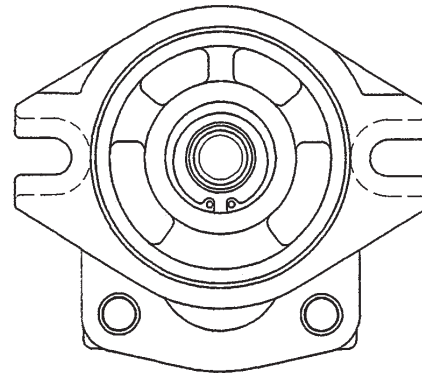
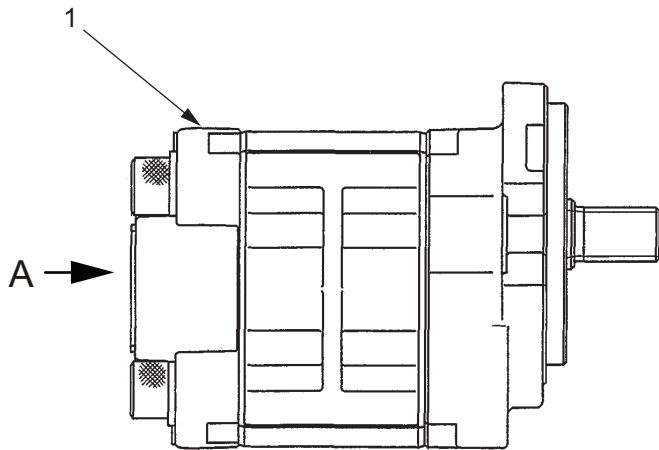


- |                    |   |                      |
|--------------------|---|----------------------|
| (4) Nut M12 P=1.25 | : | 64 N·m ( 47 lbf-ft ) |
| (6) Bolt M10×35    | : | 49 N·m ( 36 lbf-ft ) |
| (8) Bolt M10×25    | : | 49 N·m ( 36 lbf-ft ) |
| (9) Bolt M10×25    | : | 49 N·m ( 36 lbf-ft ) |

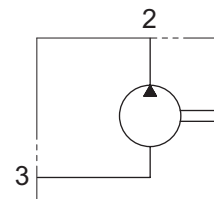
- Steering wheel ASSY weight : 18 kg ( 40 lbs. )

### 4-3. Hydraulic Component Specifications

#### 4-3-1. Steering • charge pump



VIEW A



Hydraulic circuit diagram

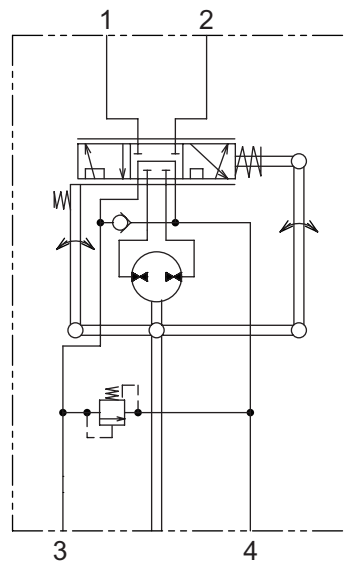
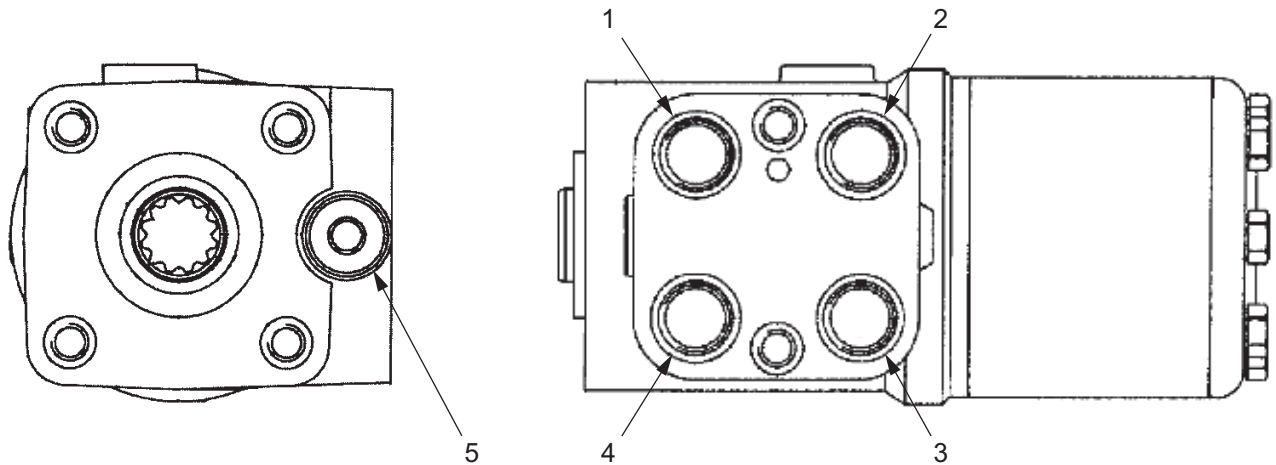
- (1) Pump
- (2) Outlet port **[SCD]** : 7/ 8-14UNF
- (3) Inlet port **[SCS]** : 1 5/16-12UN

**Specifications**

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

SV540-04004

4-3-2. Orbitrol



Hydraulic circuit diagram

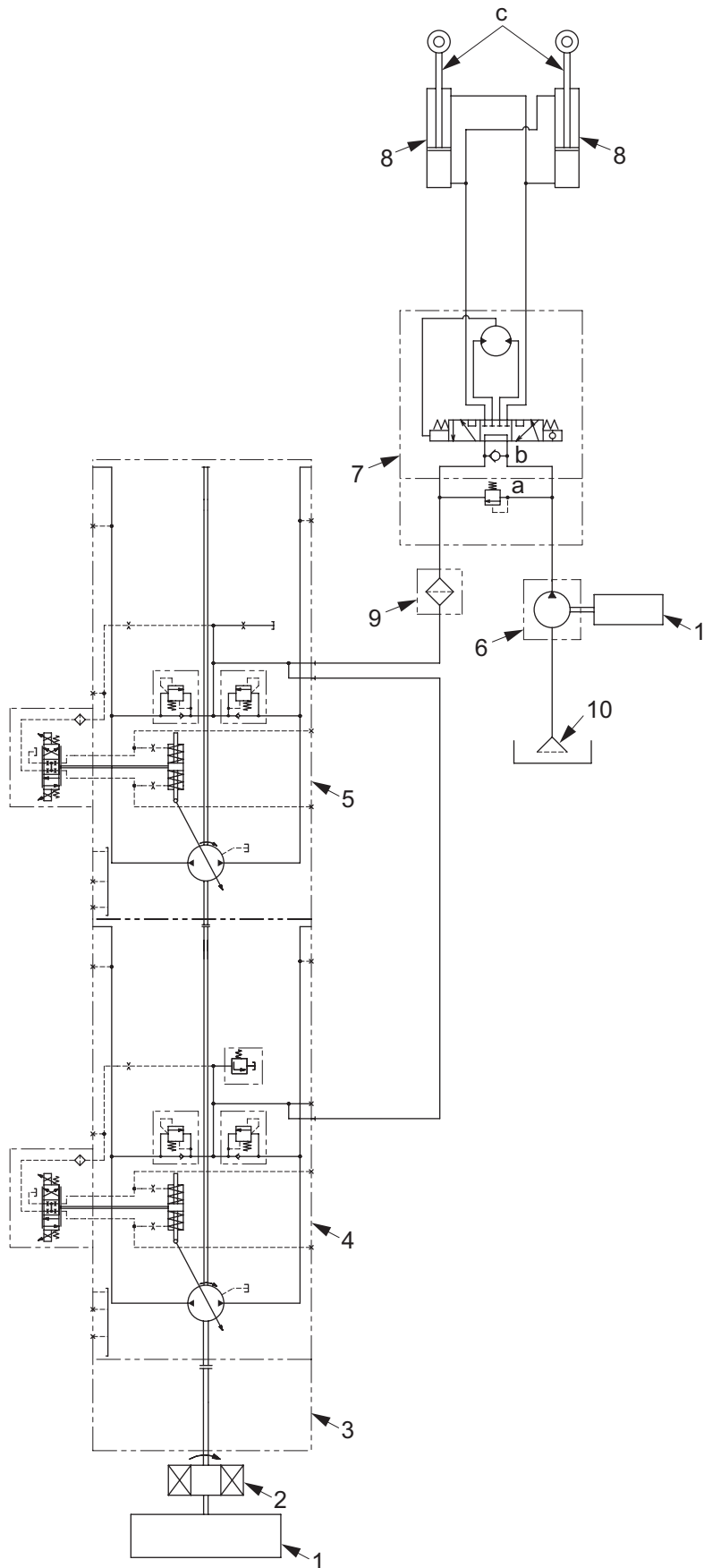
ORB-SD-04150

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

Specifications

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

Fig.: Steering circuit



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



## 4-4. Description and Operation of Steering System

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

#### Description

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

#### Operation

- The oil discharged from steering • charge pump (6) enters Orbitrol (7), and a certain quantity of oil that matches the handle turning direction and speed is supplied to steering cylinders (8).
- The oil that enters the steering cylinder shifts piston rod (c) to operate it, while the oil pushed out of the port on the opposite side returns to Orbitrol (7), flowing into the charge circuit of vibrator pump (4), (5) through hydraulic oil filter 1 (9).
- For the “Charge circuit”, refer to page 4-026.
- Relief valve (a) built in Orbitrol (7) opens to relieve the pressure if the system pressure exceeds the setting of the valve, thus protecting the circuit.

### 4-4-2. Structure and operation of Orbitrol

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

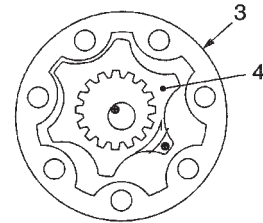
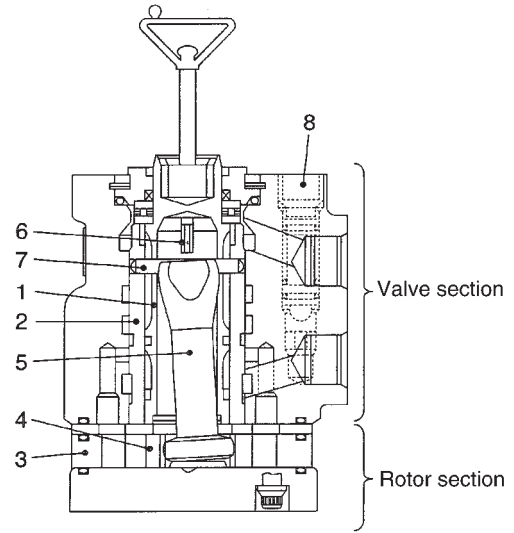
#### Structure

##### Valve section:

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

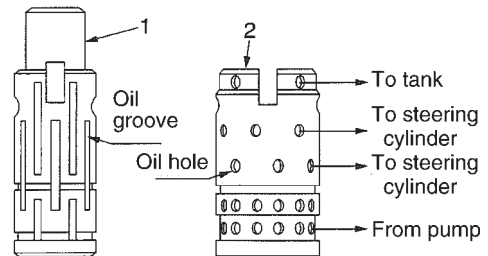
##### Rotor section:

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



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

SV414-04006



SV414-04007

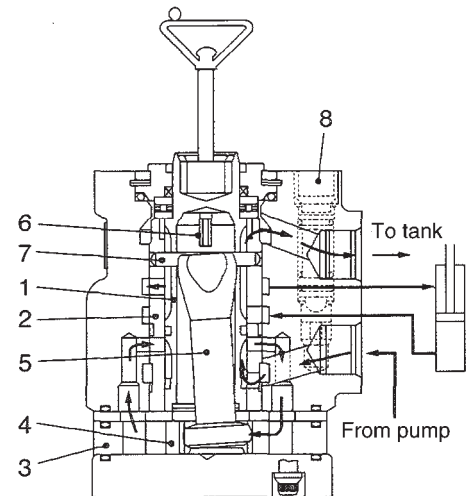
## Operation

### Neutral (when the steering wheel is not operated):

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

### Swing (when the steering wheel is operated):

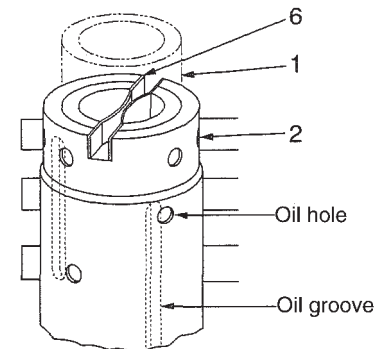
- All the ports of the valve section are closed when Orbitrol is in the neutral position. The oil in the rotor has been sealed up, and rotor (4) is fixed. Sleeve (2) is coupled with rotor (4) via cross pin (7) and drive shaft (5), and it is fixed also.
- When the steering wheel is operated, the turning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



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

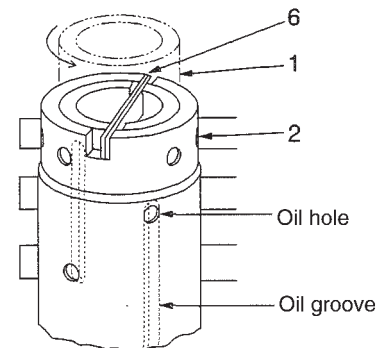
SV414-04009

### Neutral



SV414-04008

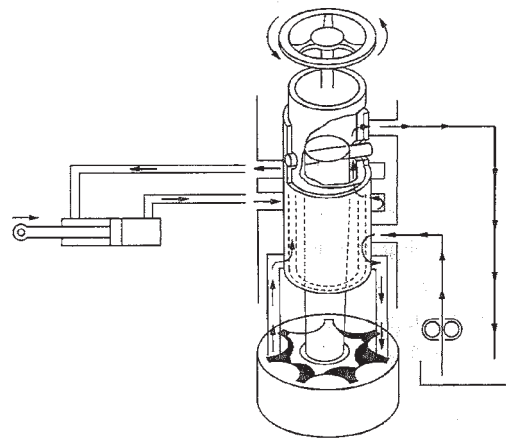
### Swing



SV414-04010

### Operation of feedback mechanism:

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



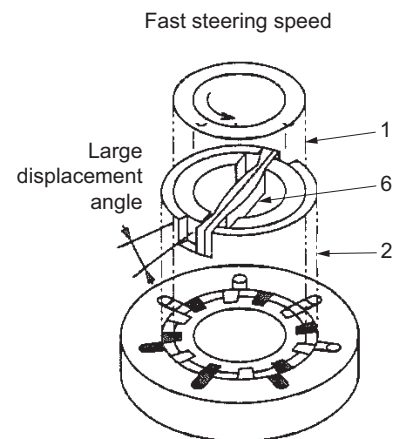
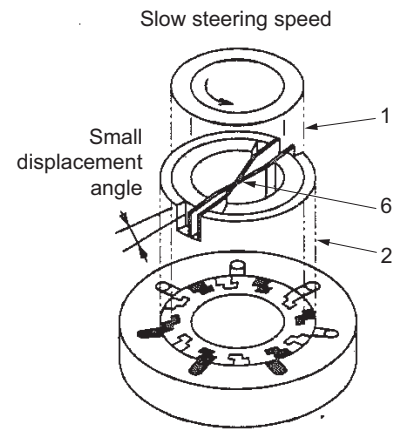
SV414-04011

**Steering speed and flow control:**

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

**Hydraulic pump flow and operating force:**

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



1. Spool
2. Sleeve
6. Centering spring

SV414-04012



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# **ELECTRICAL SYSTEM**

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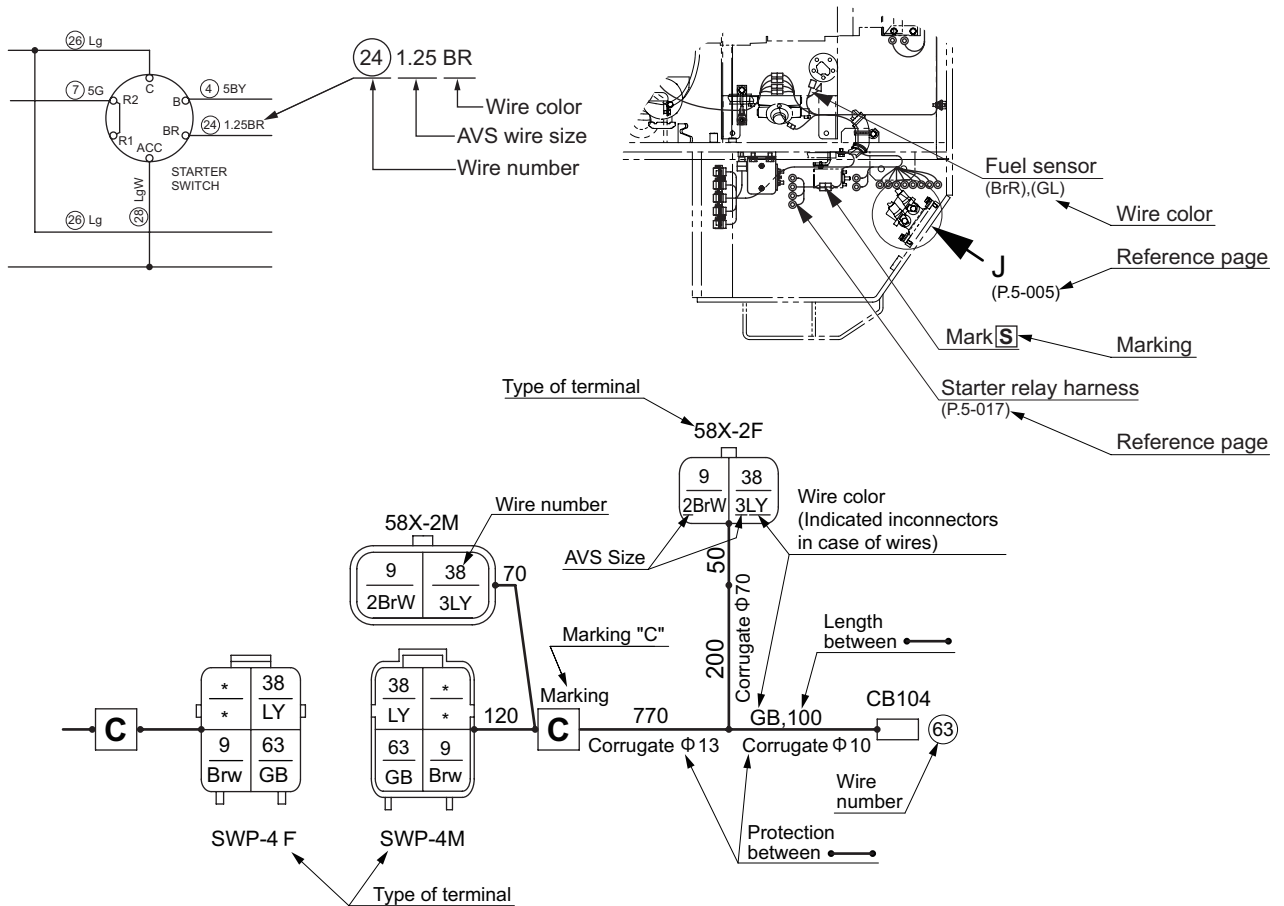




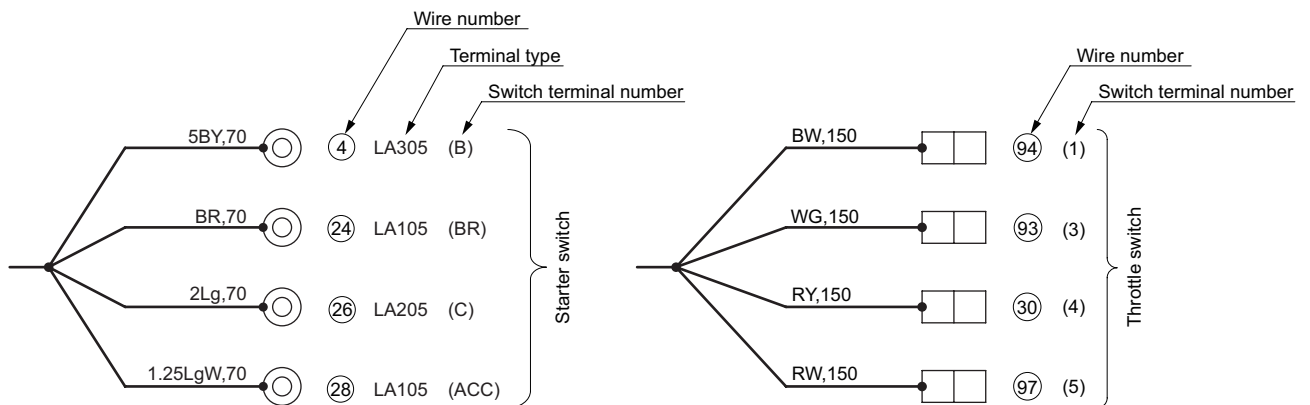
# 1. PRECAUTIONS FOR WORK

## 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

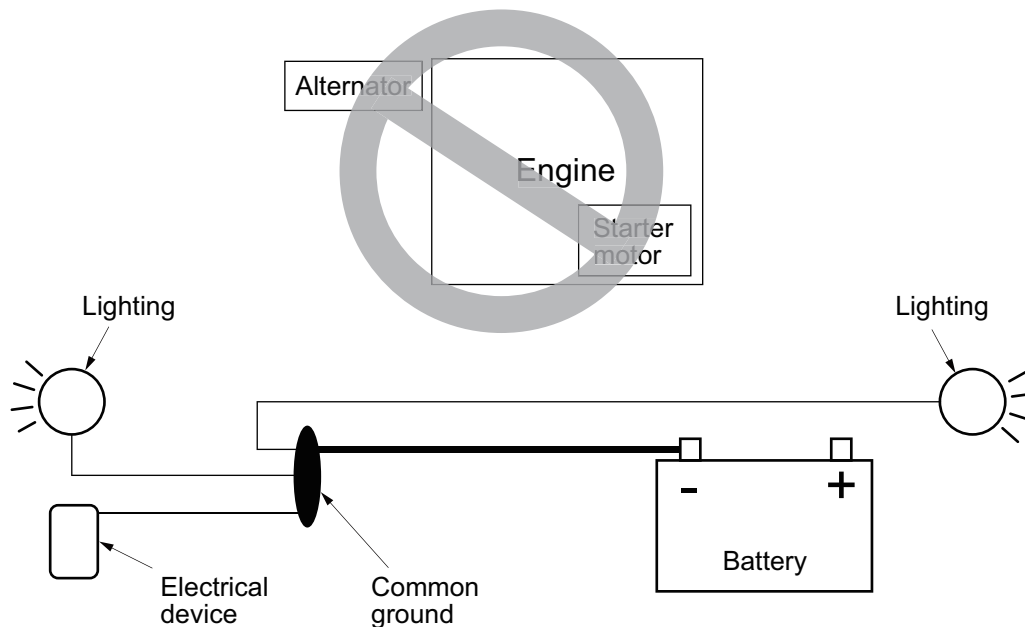
- Wire color code chart

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 (Gr)	Gray	GyR	Gray/Red stripe
Y	Yellow	YR	Yellow/Red stripe	YB	Yellow/Black stripe	YG	Yellow/Green stripe	YL	Yellow/Blue stripe	YW	Yellow/White stripe					GyL	Gray/Blue stripe
Br	Brown	BrW	Brown/White stripe	BrR	Brown/Red stripe	BrY	Brown/Yellow stripe	BrB	Brown/Black stripe	BrG	Brown/Green stripe	BrL	Brown/Blue stripe	Sb	Sky blue		
L	Blue	LW	Blue/White stripe	LR	Blue/Red stripe	LY	Blue/Yellow stripe	LB	Blue/Black stripe	LG	Blue/Green stripe			P	Pink	PB	Pink/Black stripe
Lg	Light green	LgR	Light green/Red stripe	LgY	Light green/Yellow stripe	LgB	Light green/Black stripe	LgW	Light green/White stripe	LgL	Light green/Blue stripe			Pu	Purple		

## 1-2. Electrical Equipment Installation

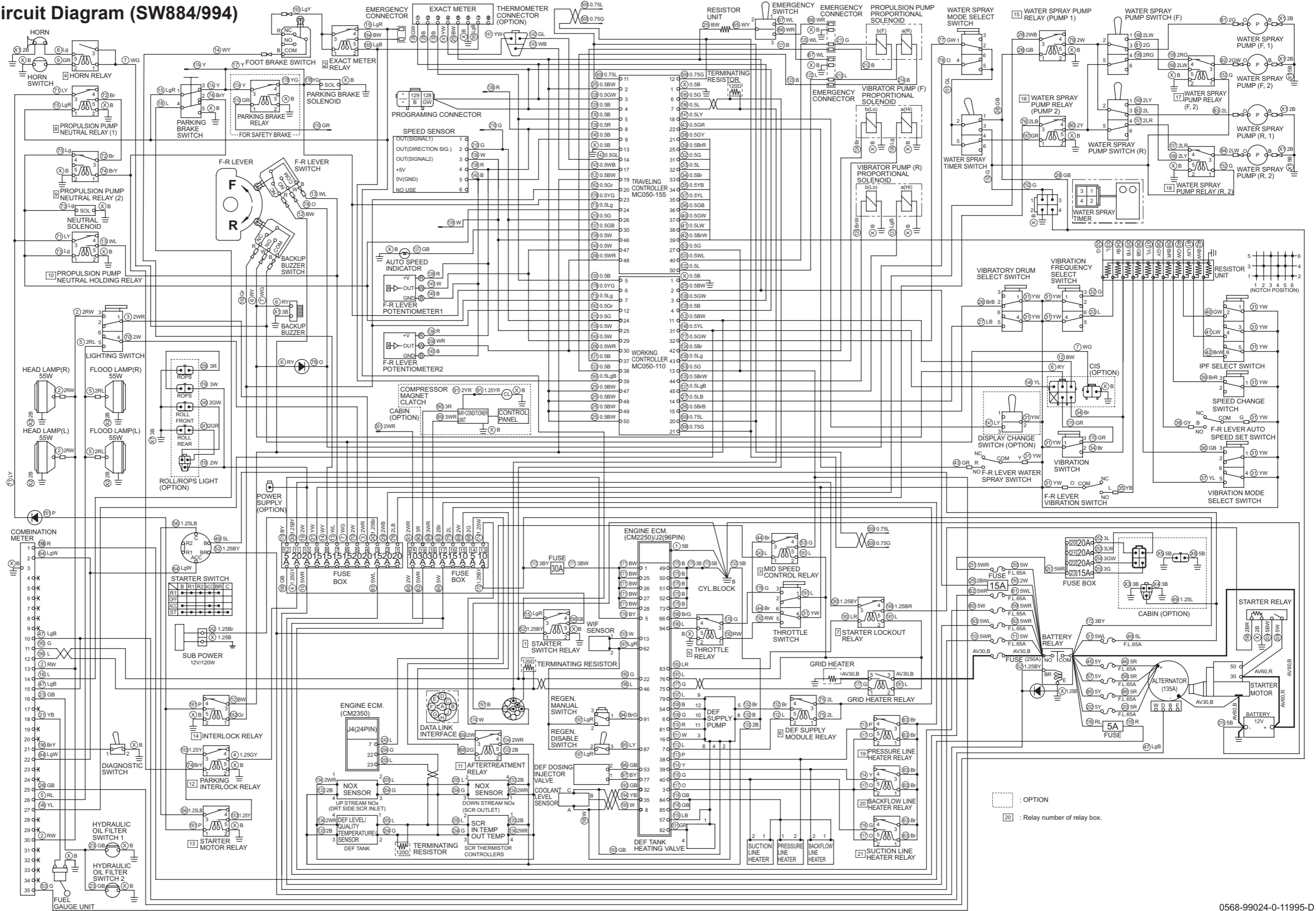
When wiring electrical components to this machine (for example, additional lighting or electrical devices), connect all grounds to a common ground location and then return to the negative side of the battery. Do not wire to the engine block, starter or alternator terminals. Reference picture is below.

**Attention! Do NOT wire to engine, alternator or starter motor.**



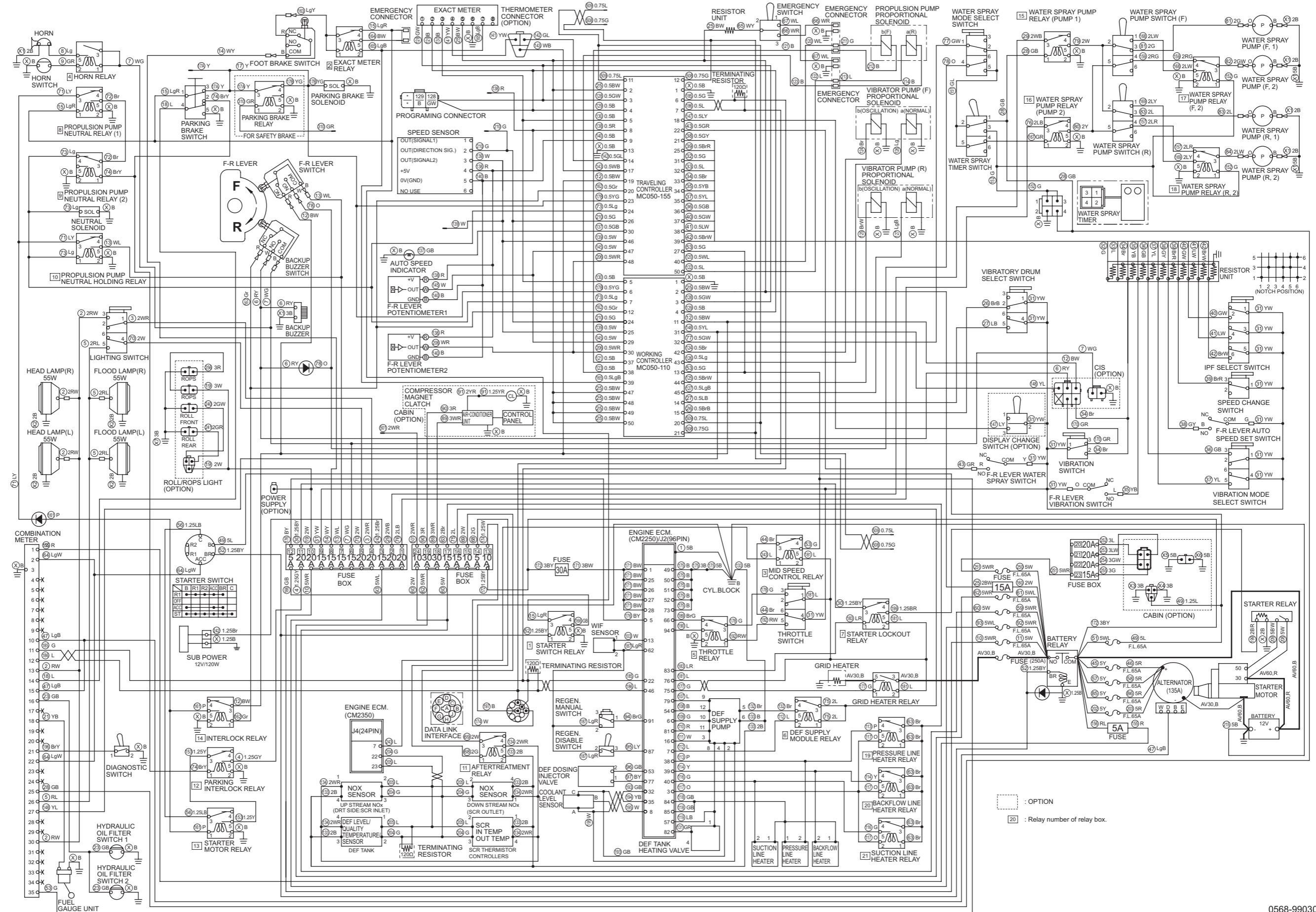
# 2. SYSTEM CIRCUIT DIAGRAM

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





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

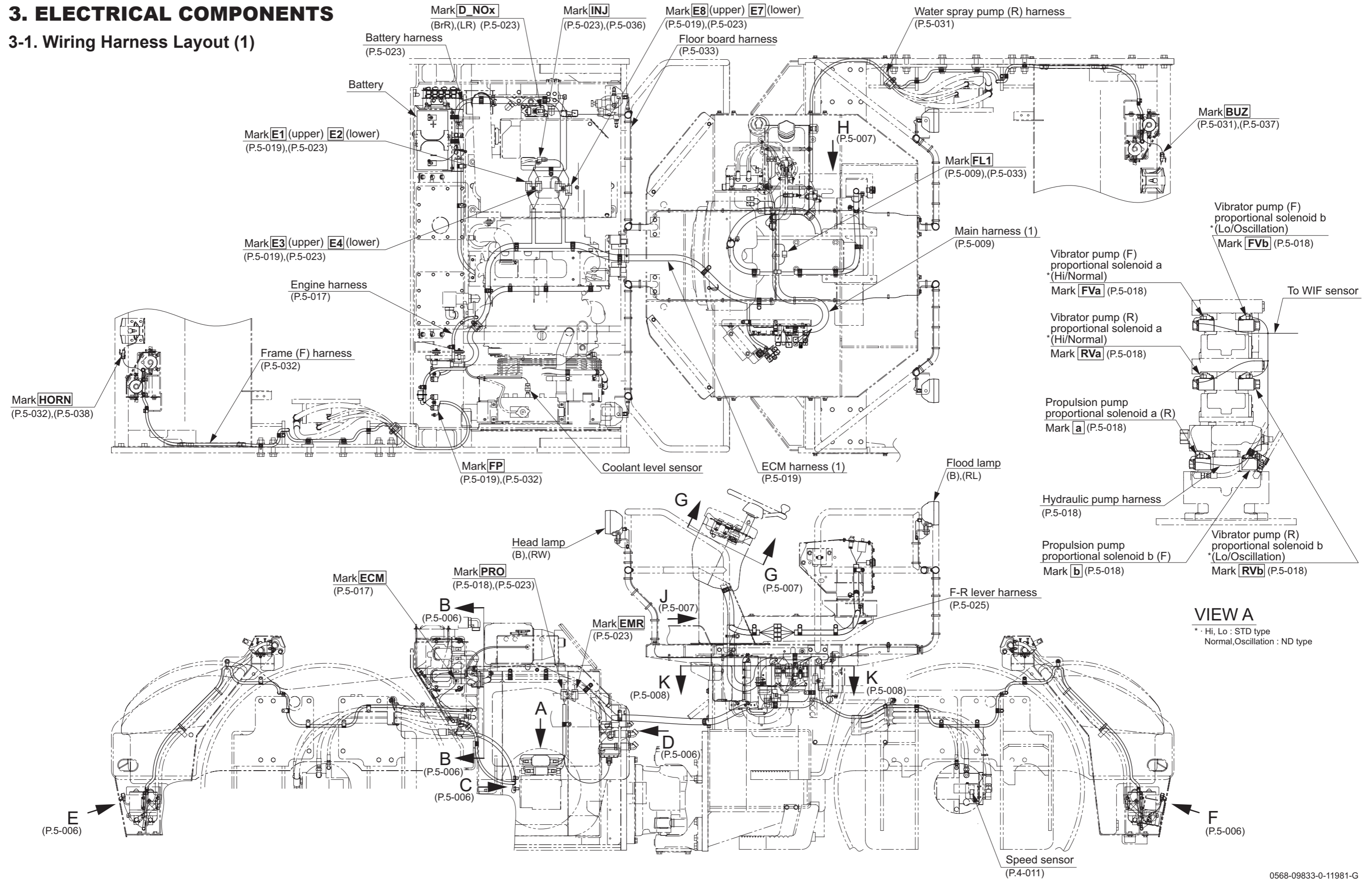






### 3. ELECTRICAL COMPONENTS

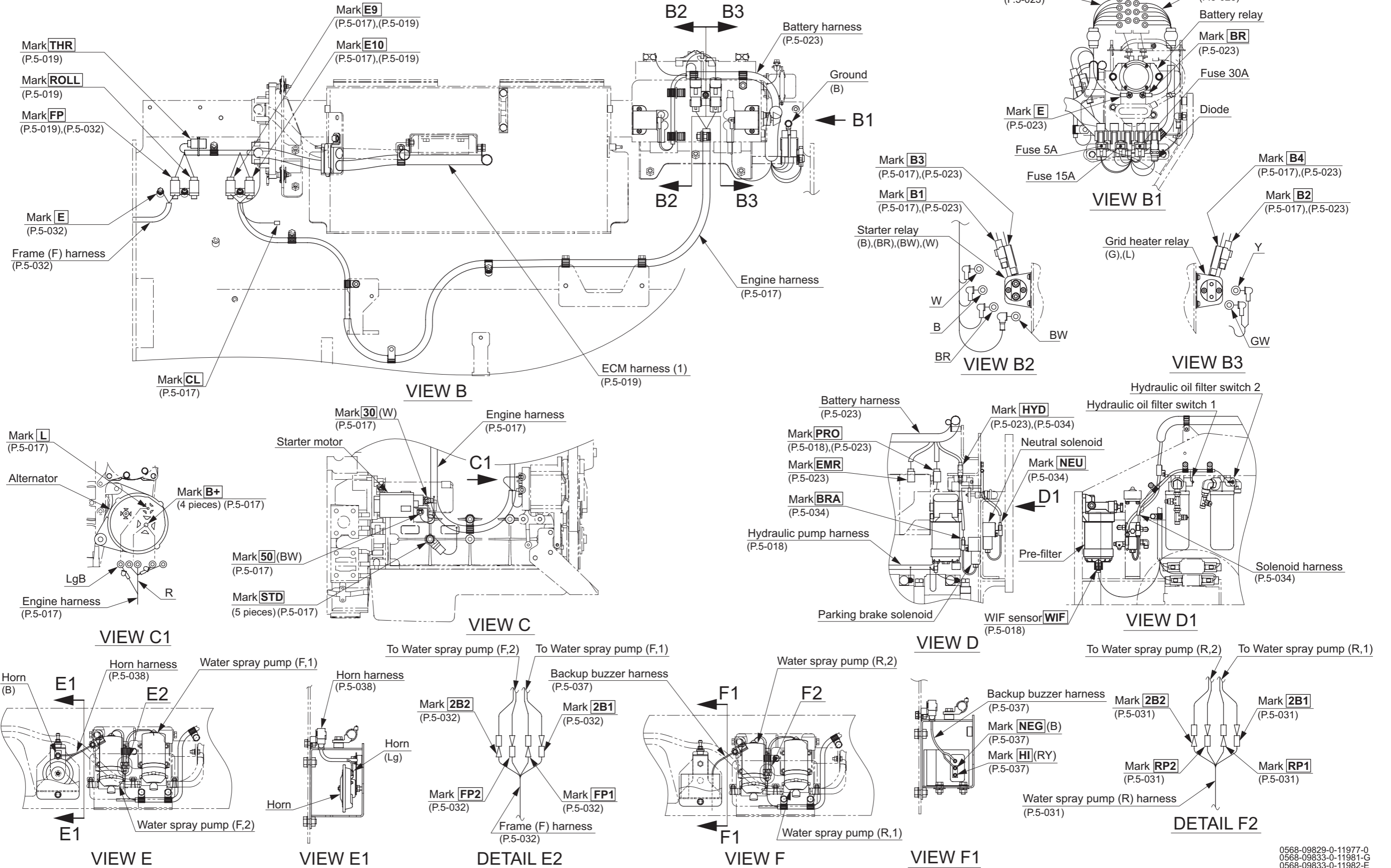
#### 3-1. Wiring Harness Layout (1)





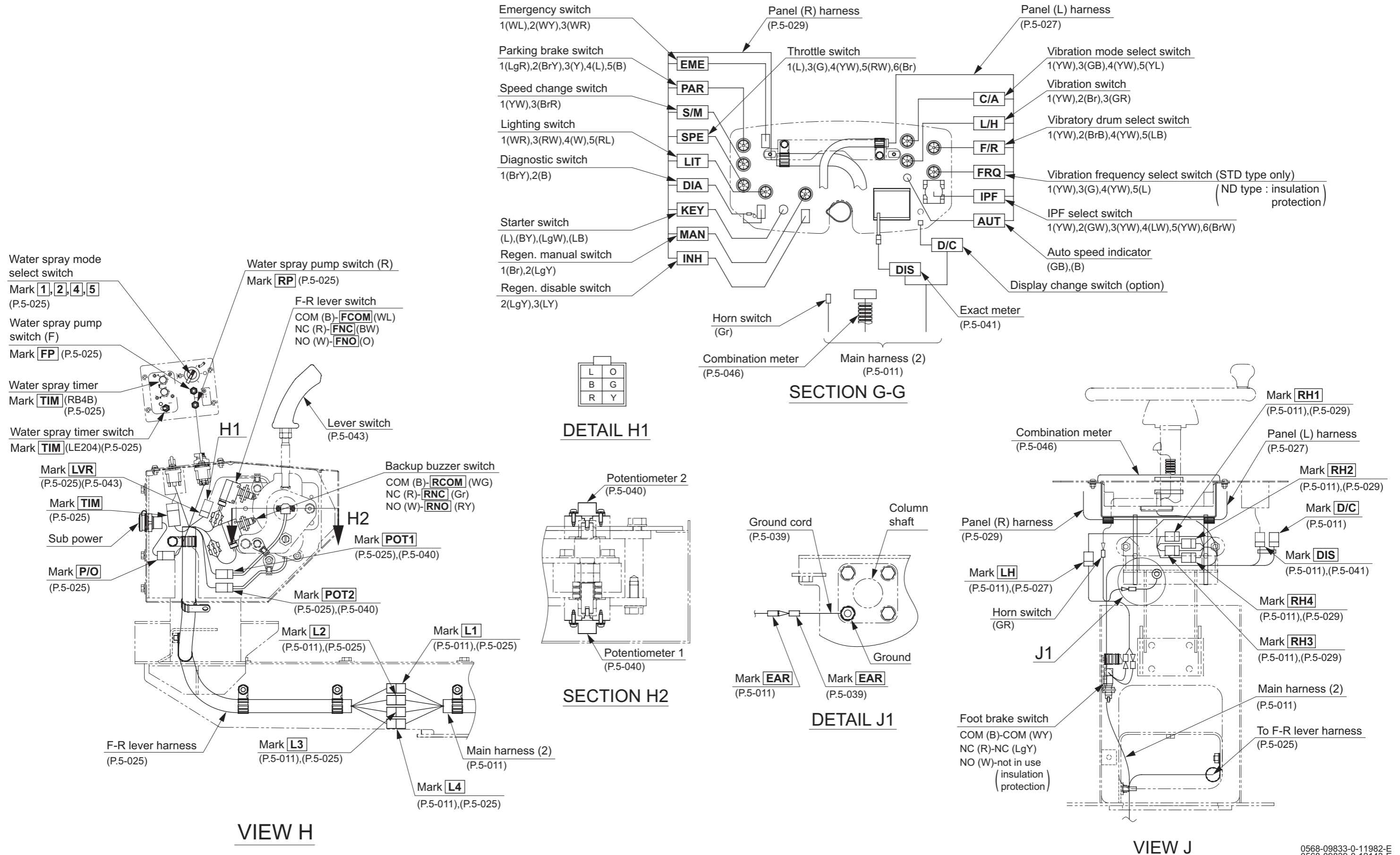


3-2. Wiring Harness Layout (2)



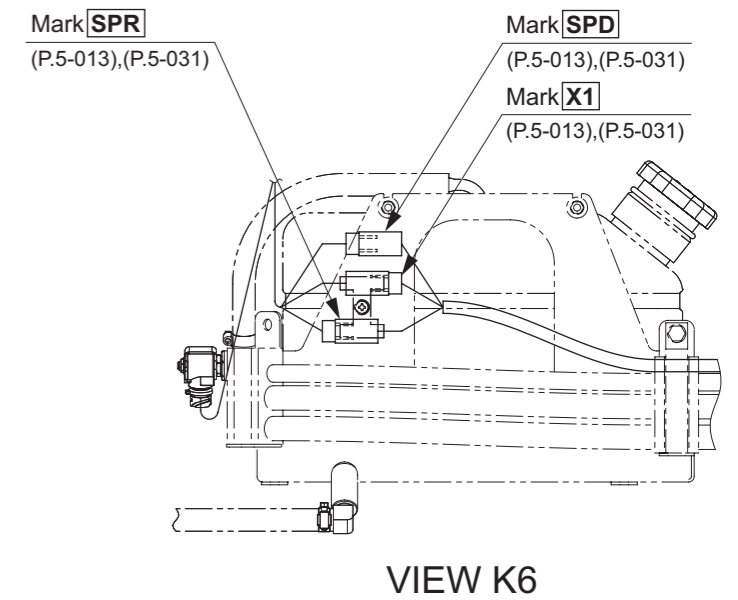
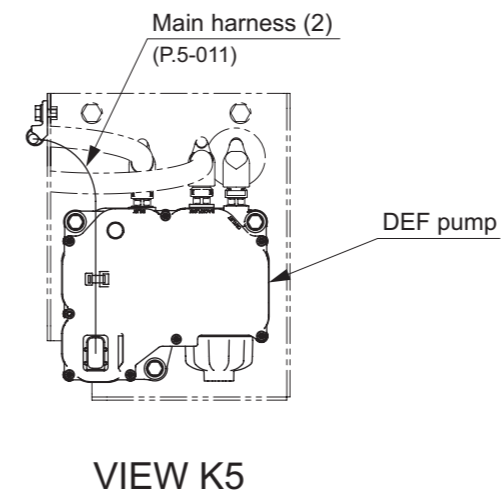
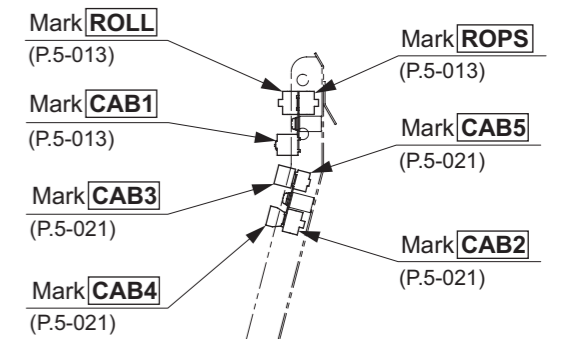
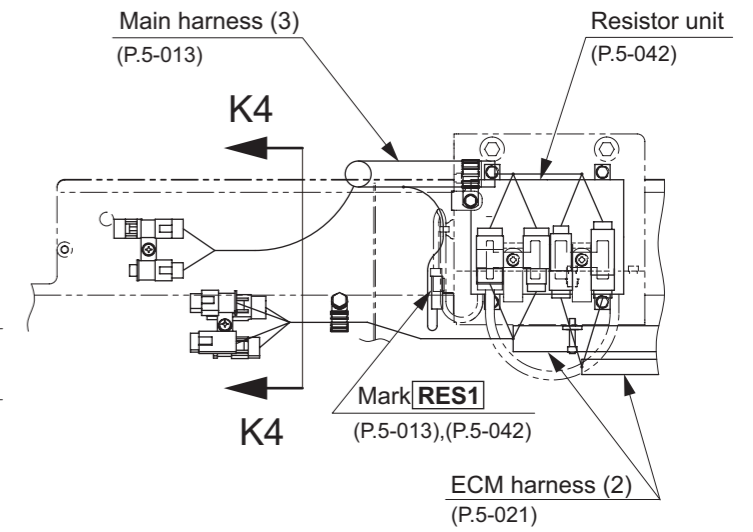
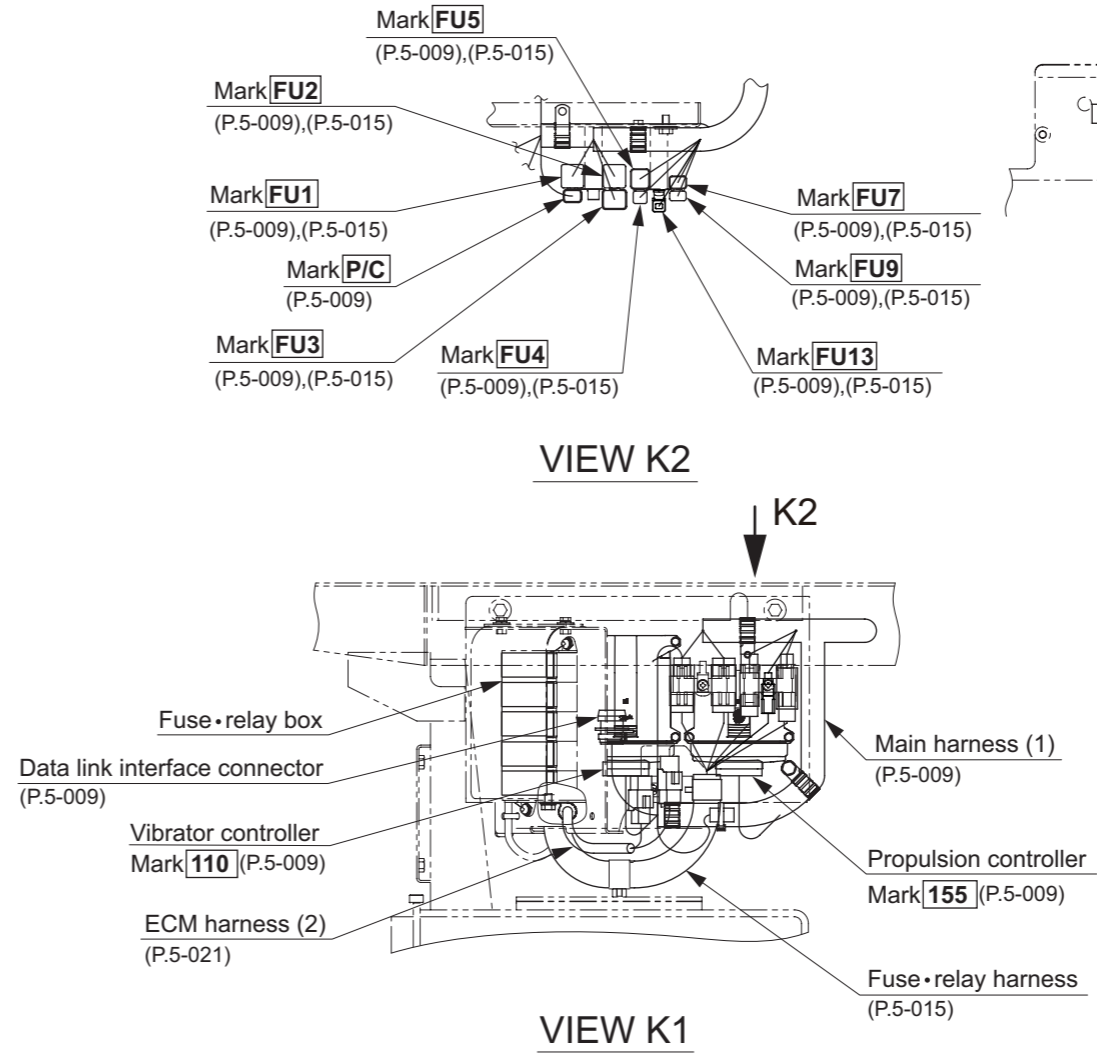
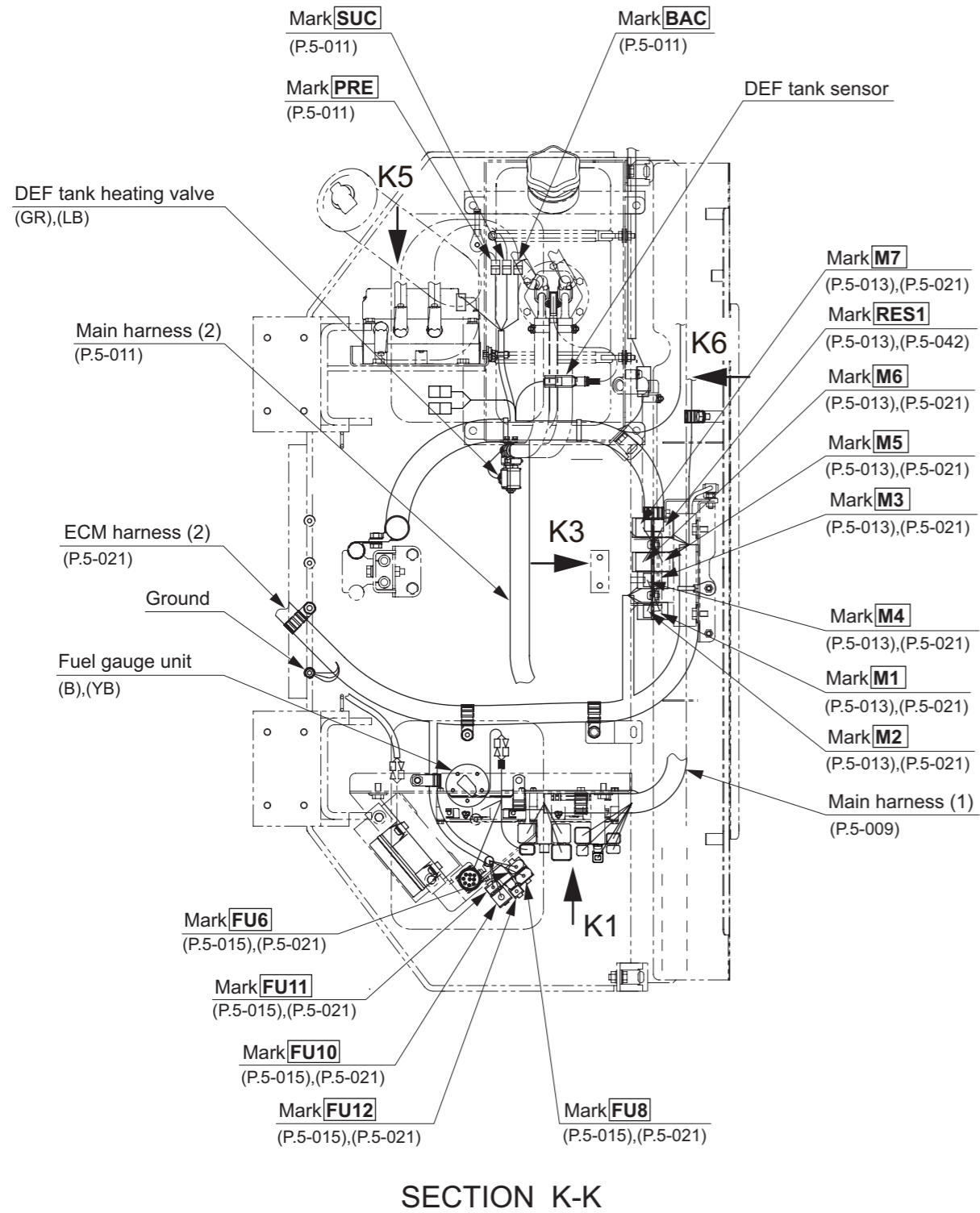


3-3. Wiring Harness Layout (3)





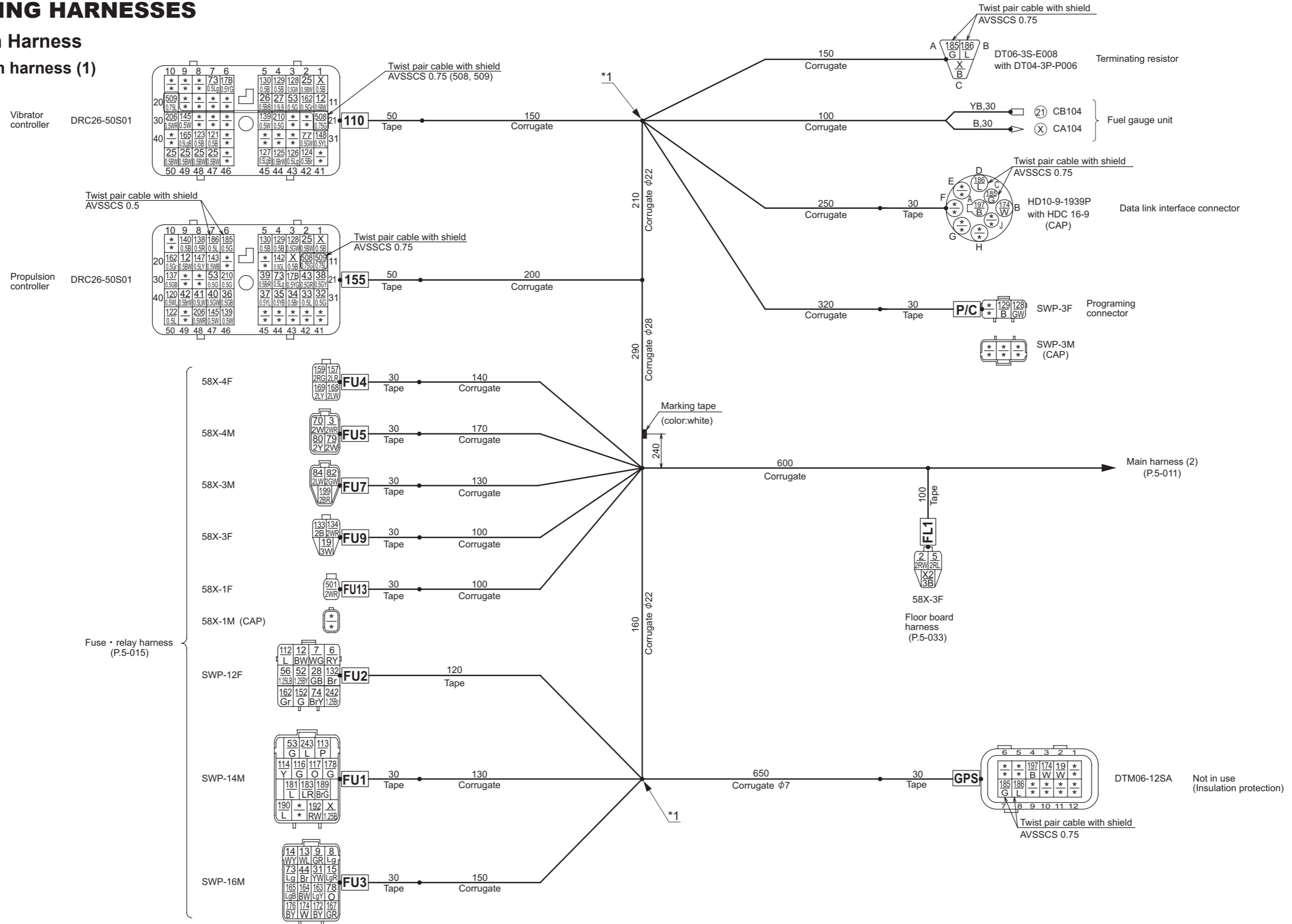
3-4. Wiring Harness Layout (4)



# 4. WIRING HARNESSSES

## 4-1. Main Harness

### 4-1-1. Main harness (1)



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

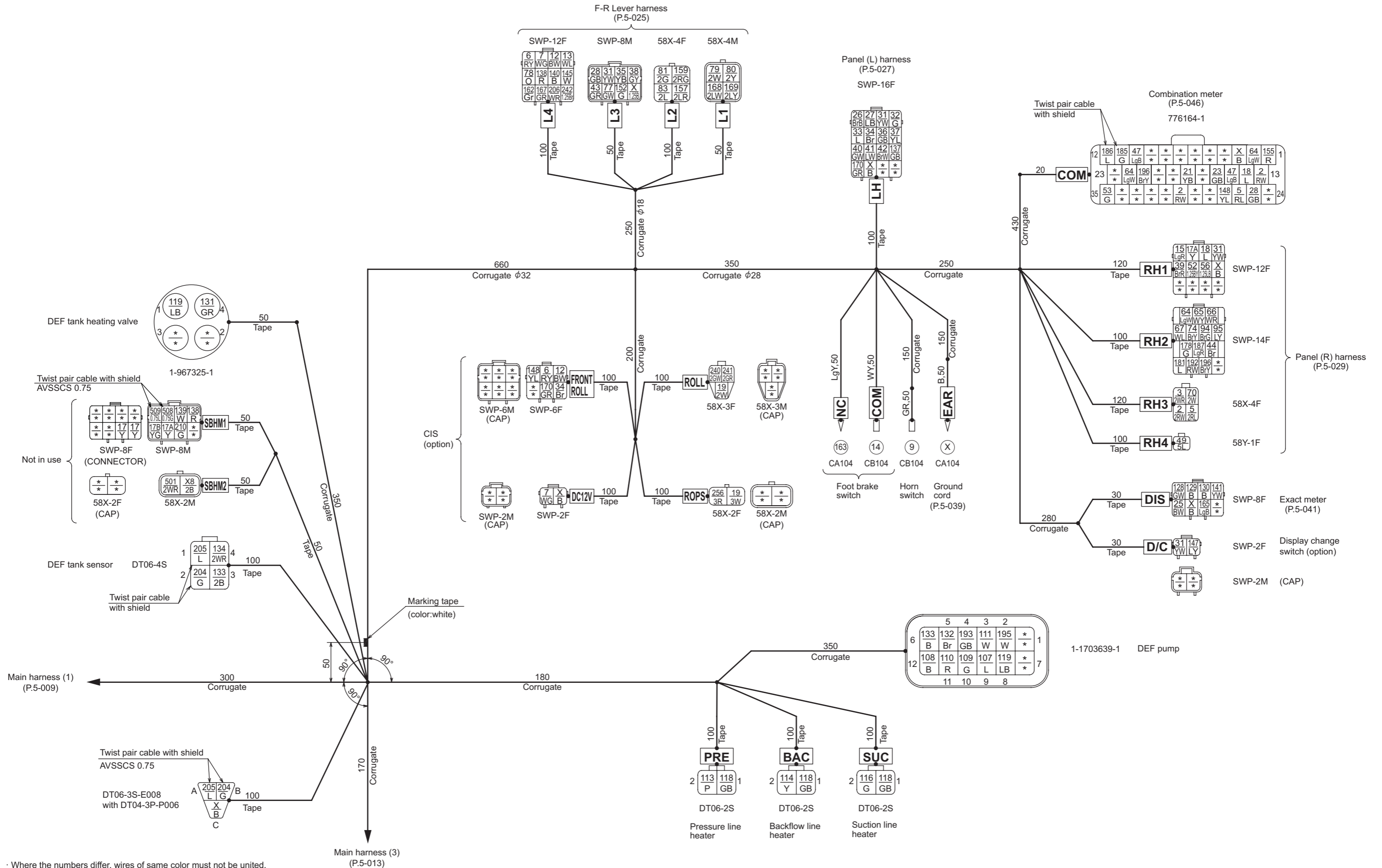


No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			Main Harness (1)	(2)	(3)
ⓧ	B, 0.5B, 1.25B, 3B	15	110-1, 155-1, 13, FU1, Fuel gauge unit, Terminating resistor-C	6	7 2
ⓧ2	3B	3	FL1	1	2
②	RW, 2RW	5	FL1	1	3 1
③	2WR	2	FU5	1	1
⑤	RL, 2RL	4	FL1	1	2 1
⑥	RY	4	FU2	1	2 1
⑦	WG	3	FU2	1	2
⑧	Lg	2	FU3	1	1
⑨	GR	2	FU3	1	1
⑫	BW, 0.5BW	5	110-11, 155-19, FU2	3	2
⑬	WL	2	FU3	1	1
⑭	WY	2	FU3	1	1
⑮	LgR	3	FU3	1	1 1
⑰B	0.5YG	4	110-6, 155-23	2	1 1
⑲	W, 2W, 3W	4	FU9, GPS-2 (not in use)	2	2
⑳	YB	2	Fuel gauge unit	1	1
㉕	BW, 0.5BW, 2BW	9	110-2, 47, 48, 49, 50, 155-2	6	1 2
㉖	BrB, 0.5BrB	2	110-15	1	1
㉗	LB, 0.5LB	2	110-14	1	1
㉘	GB	3	FU2	1	2
㉙	YW	5	FU3	1	4
㉚	G, 0.5G	3	155-31	1	1 1
㉛	L, 0.5L	3	155-32	1	1 1
㉜	Br, 0.5Br	4	155-33	1	2 1
㉝	YB, 0.5YB	3	155-34	1	1 1
㉞	GB, 0.5GB	3	155-36	1	1 1
㉟	YL, 0.5YL	3	155-35	1	1 1
㊱	GY, 0.5GY	3	155-21	1	1 1
㊲	BrR, 0.5BrR	3	155-25	1	1 1
㊳	GW, 0.5GW	3	155-37	1	1 1
㊴	LW, 0.5LW	3	155-38	1	1 1
㊵	BrW, 0.5BrW	3	155-39	1	1 1
㊶	GR, 0.5GR	2	155-22	1	1
㊷	Br	2	FU3	1	1
㊸	1.25BY	3	FU2	1	1 1
㊹	G, 0.5G	4	110-13, 155-27, FU1	3	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			Main Harness (1)	(2)	(3)
⑤⑥	1.25LB	2	FU2	1	1
⑦⑩	2W	2	FU5	1	1
⑦③	Lg, 0.5Lg	4	110-7, 155-24, FU3	3	1
⑦④	BrY	2	FU2	1	1
⑦⑦	GW, 0.5GW	2	110-32	1	1
⑦⑧	O	2	FU3	1	1
⑦⑨	2W	2	FU5	1	1
⑧⑩	2Y	2	FU5	1	1
⑧②	2GW	2	FU7	1	1
⑧④	2LW	2	FU7	1	1
⑪⑫	L	2	FU2	1	1
⑪⑬	P	3	FU1	1	1 1
⑪⑭	Y	3	FU1	1	1 1
⑪⑮	G	3	FU1	1	1 1
⑪⑰	O	2	FU1	1	1
⑫⑩	WL, 0.5WL	2	155-40	1	1
⑫⑪	B, 0.5B	2	110-37	1	1
⑫⑫	L, 0.5L	2	155-50	1	1
⑫⑬	B, 0.5B	2	110-38	1	1
⑫⑭	Br, 0.5Br	2	110-42	1	1
⑫⑮	BrW, 0.5BrW	2	110-44	1	1
⑫⑯	Lg, 0.5Lg	2	110-43	1	1
⑫⑰	LgB, 0.5LgB	2	110-45	1	1
⑫⑱	GW, 0.5GW	4	110-3, 155-3, P/C	3	1
⑫⑲	B, 0.5B	4	110-4, 155-4, P/C	3	1
⑬⑩	B, 0.5B	3	110-5, 155-5	2	1
⑬⑫	Br	2	FU2	1	1
⑬⑬	B, 2B	4	FU9	1	2 1
⑬⑭	2WR	3	FU9	1	1 1
⑬⑰	GB, 0.5GB	2	155-30	1	1
⑬⑱	R, 0.5R	4	155-8	1	2 1
⑬⑲	W, 0.5W	4	110-25, 155-46	2	1 1
⑬⑳	B, 0.5B	3	155-9	1	1 1
⑬㉑	GL, 0.5GL	2	155-14	1	1
⑬㉒	WB, 0.5WB	2	155-17	1	1
⑬㉓	W, 0.5W	3	110-29, 155-47	2	1
⑬㉔	LY, 0.5LY	2	155-18	1	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			Main Harness (1)	(2)	(3)
⑭⑧	YL, 0.5YL	3	110-31	1	2
⑭⑩	G	2	FU2	1	1
⑭⑰	2LR	2	FU4	1	1
⑭⑱	2RG	2	FU4	1	1
⑭⑲	Gr, 0.5Gr	4	110-12, 155-20, FU2	3	1
⑭⑳	LgY	2	FU3	1	1
⑭㉑	BW	2	FU3	1	1
⑭㉒	LgB, 0.5LgB	3	110-39, FU3	2	1
⑭㉓	GR	2	FU3	1	1
⑭㉔	2LW	2	FU4	1	1
⑭㉕	2LY	2	FU4	1	1
⑭㉖	BY, 1.25BY	2	FU3	1	1
⑭㉗	W	3	FU3, Data link interface connector-B, GPS-3 (not in use)	3	
⑭㉘	BY	2	FU3	1	1
⑭㉙	G	2	RH2	1	1
⑭㉚	L	3	FU1	1	1 1
⑭㉛	LR	2	FU1	1	1
⑭㉜	G, 0.5G	6	155-6, Data link interface connector-C, Terminating resistor-A, GPS-7 (not in use)	4	1 1
⑭㉝	L, 0.5L	6	155-7, Data link interface connector-D, Terminating resistor-B, GPS-8 (not in use)	4	1 1
⑭㉞	BrG	2	FU1	1	1
⑭㉟	L	2	FU1	1	1
⑭㊱	RW	2	FU1	1	1
⑭㊲	B	3	Data link interface connector-A, GPS-4 (not in use)	2	1
⑭㊳	2BR	2	FU7	1	1
⑭㊴	WR, 0.5WR	3	110-30, 155-48	2	1
⑭㊵	G, 0.5G	4	110-24, 155-26	2	1 1
⑭㊶	1.25Br	2	FU2	1	1
⑭㊷	L	2	FU1	1	1
⑭㊸	2WR	2	FU13	1	1
⑭㊹	0.75G	3	110-21, 155-12	2	1
⑭㊺	0.75L	3	110-20, 155-11	2	1

4-1-2. Main harness (2)



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

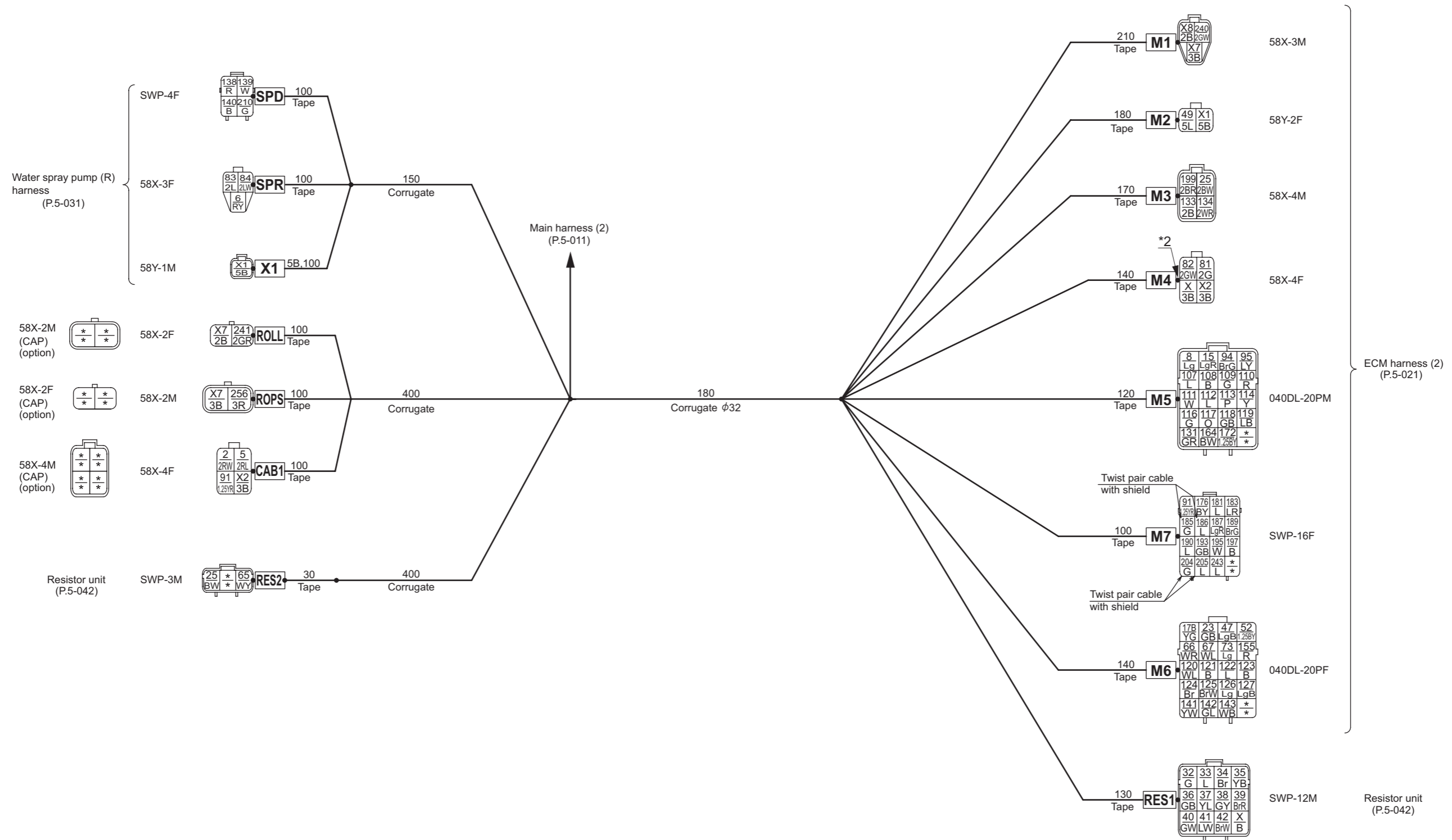


No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	Main Harness (2)	(3)
ⓧ	B, 1.25B	16	6	COM-3, EAR, DIS, L3, LH, RH1, Terminating resistor-C, DC12V (option)	8 2
ⓧ8	2B	2		SBHM2 (not in use)	1 1
②	RW, 2RW	5	1	COM-13, 20, RH3	3 1
③	2WR	2	1	RH3	1
⑤	RL, 2RL	4	1	COM-27, RH3	2 1
⑥	RY	4	1	L4, FRONT ROLL (option)	2 1
⑦	WG	3	1	L4, DC12V (option)	2
⑨	GR	2	1	Horn switch	1
⑫	BW	5	3	L4, FRONT ROLL (option)	2
⑬	WL	2	1	L4	1
⑭	WY	2	1	COM	1
⑮	LgR	3	1	RH1	1 1
⑰	Y	2		Connector × 2 (not in use)	2
⑰A	Y	2		RH1, SBHM1 (not in use)	2
⑰B	YG	4	2	SBHM1 (not in use)	1 1
⑱	L	2		COM-14, RH1	2
⑲	2W, 3W	4	2	ROPS (option), ROLL (option)	2
⑳	YB	2	1	COM-18	1
㉓	GB	2		COM-16	1 1
㉕	BW	9	6	DIS	1 2
㉖	BrB	2	1	LH	1
㉗	LB	2	1	LH	1
㉘	GB	3	1	COM-25, L3	2
㉚	YW	5	1	L3, LH, RH1, D/C (option)	4
㉛	G	3	1	LH	1 1
㉜	L	3	1	LH	1 1
㉝	Br	4	1	LH, FRONT ROLL (option)	2 1
㉞	YB	3	1	L3	1 1
㉟	GB	3	1	LH	1 1
㊱	YL	3	1	LH	1 1
㊲	GY	3	1	L3	1 1
㊳	BrR	3	1	RH1	1 1
㊴	GW	3	1	LH	1 1
㊵	LW	3	1	LH	1 1
㊶	BrW	3	1	LH	1 1
㊷	GR	2	1	L3	1
㊸	Br	2	1	RH2	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	Main Harness (2)	(3)
④7	LgB	3		COM-10, 15	2 1
④9	5L	2		RH4	1 1
⑤2	1.25BY	3	1	RH1	1 1
⑤3	G	4	3	COM-35	1
⑤6	1.25LB	2	1	RH1	1
⑥4	LgW	3		COM-2, 22, RH2	3
⑥5	WY	2		RH2	1 1
⑥6	WR	2		RH2	1 1
⑥7	WL	2		RH2	1 1
⑦0	2W	2	1	RH3	1
⑦4	BrY	2	1	RH2	1
⑦7	GW	2	1	L3	1
⑦8	O	2	1	L4	1
⑦9	2W	2	1	L1	1
⑧0	2Y	2	1	L1	1
⑧1	2G	2		L2	1 1
⑧3	2L	2		L2	1 1
⑨4	BrG	2		RH2	1 1
⑨5	LY	2		RH2	1 1
⑩7	L	2		DEF supply pump-9	1 1
⑩8	B	2		DEF supply pump-12	1 1
⑩9	G	2		DEF supply pump-10	1 1
⑪0	R	2		DEF supply pump-11	1 1
⑪1	W	2		DEF supply pump-3	1 1
⑪3	P	3	1	PRE	1 1
⑪4	Y	3	1	BAC	1 1
⑪6	G	3	1	SUC	1 1
⑪8	GB	4		BAC, PRE, SUC	3 1
⑪9	LB	3		DEF supply pump-8, DEF tank heating valve-1	2 1
⑫8	GW	4	3	DIS	1
⑫9	B	4	3	DIS	1
⑬0	B	3	2	DIS	1
⑬1	GR	2		DEF tank heating valve-4	2
⑬2	Br	2	1	DEF supply pump-5	1
⑬3	B, 2B	4	1	DEF supply pump-6, DEF tank sensor-3	2 1
⑬4	2WR	3	1	DEF tank sensor-4	1 1
⑬7	GB	2	1	LH	1
⑬8	R	4	1	L4, SBHM1 (not in use)	2 1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	Main Harness (2)	(3)
⑬9	W	4	2	SBHM1 (not in use)	1 1
⑭0	B	3	1	L4	1 1
⑭1	YW	2		DIS	1 1
⑭5	W	3	2	L4	1
⑭7	LY	2	1	D/C (option)	1
⑭8	YL	3	1	COM-27, FRONT ROLL (option)	2
⑮2	G	2	1	L3	1
⑮5	R	2		COM-1	1 1
⑮7	2LR	2	1	L2	1
⑮9	2RG	2	1	L2	1
⑰2	Gr	4	3	L4	1
⑰3	LgY	2	1	NC	1
⑰5	LgB	3	2	DIS	1
⑰7	GR	2	1	L4	1
⑰8	2LW	2	1	L1	1
⑰9	2LY	2	1	L1	1
⑱0	GR	2		LH, FRONT ROLL (option)	2
⑱8	G	2	1	RH2	1
⑱1	L	3	1	RH2	1 1
⑱5	G	6	4	COM-11	1 1
⑱6	L	6	4	COM-12	1 1
⑱7	LgR	2		RH2	1 1
⑱9	RW	2	1	RH2	1
⑲3	GB	2		DEF supply pump-4	1 1
⑲5	W	2		DEF supply pump-2	1 1
⑲6	BrY	2		COM-21, RH2	2
⑳4	G	3		DEF tank sensor-2, Terminating resistor-B	2 1
⑳5	L	3		DEF tank sensor-1, Terminating resistor-A	2 1
⑳6	WR	3	2	L4	1
㉑0	G	4	2	SBHM1 (not in use)	1 1
㉑4	2GW	2		ROLL (option)	1 1
㉑1	2GR	2		ROLL (option)	1 1
㉑2	1.25Br	2	1	L4	1
㉕6	3R	2		ROPS (option)	1 1
㉙1	2WR	2	1	SBHM2 (not in use)	1
㉙8	0.75G	3	2	SBHM1 (not in use)	1
㉙9	0.75L	3	2	SBHM1 (not in use)	1

4-1-3. Main harness (3)



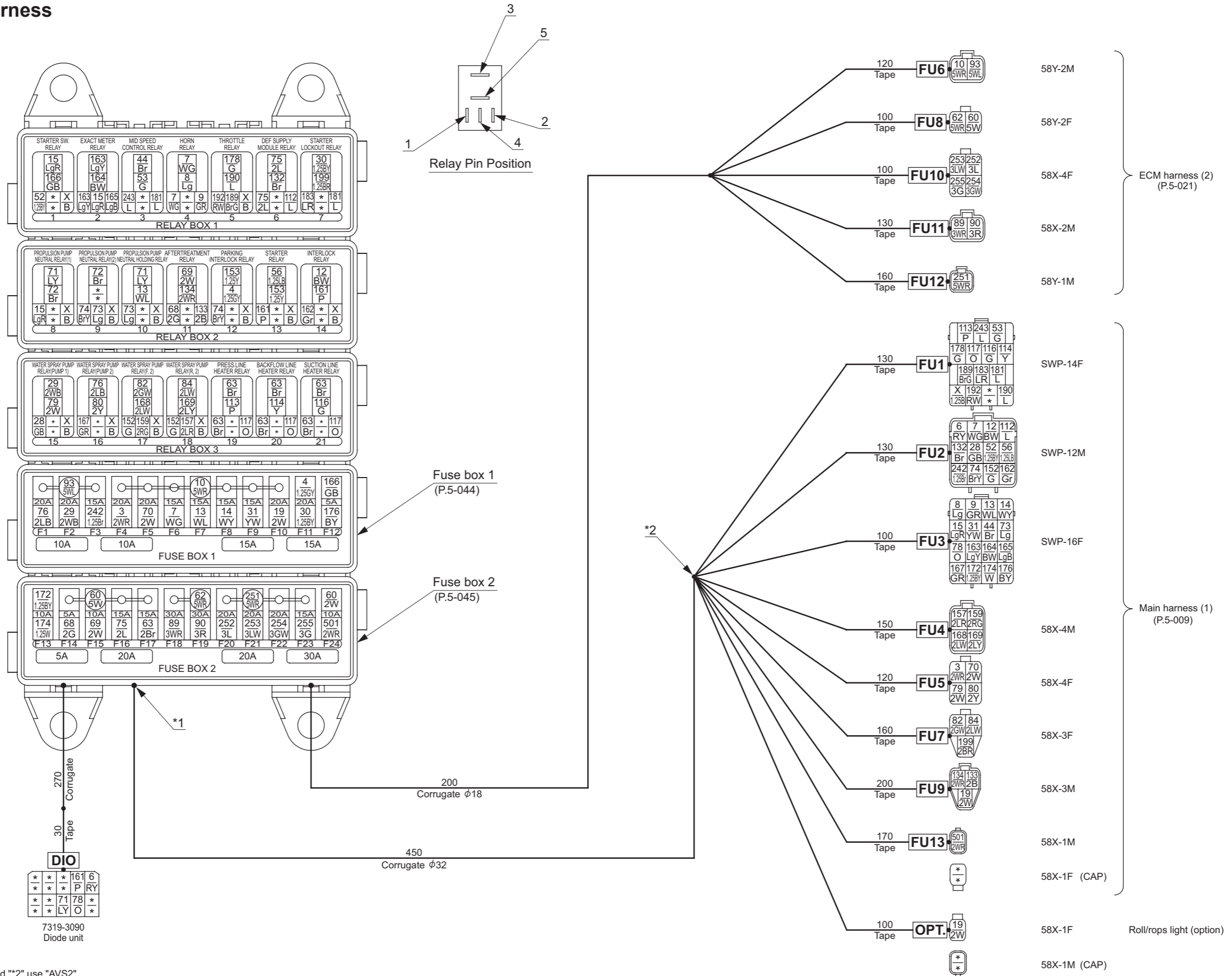
· The ground wire "X" between "M1" (main harness (1)) and "M2" (main harness (3)) use "AVS3".  
 · Where the numbers differ, wires of same color must not be united.

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
ⓧ	B, 3B	15	6	7	M4, RES1	2
ⓧ1	5B	2			M2, X1	2
ⓧ2	3B	3	1		M4, CAB1 (option)	2
ⓧ7	2B, 3B	3			M1, ROLL (option), ROPS (option)	3
ⓧ8	2B	2		1	M1	1
②	2RW	5	1	3	CAB1 (option)	1
⑤	2RL	4	1	2	CAB1 (option)	1
⑥	RY	4	1	2	SPR	1
⑧	Lg	2	1		M5	1
⑮	LgR	3	1	1	M5	1
⑰B	YG	4	2	1	M6	1
⑳	GB	2		1	M6	1
㉕	BW, 2BW	9	6	1	M3, RES2	2
㉓	G	3	1	1	RES1	1
㉔	L	3	1	1	RES1	1
㉕	Br	4	1	2	RES1	1
㉖	YB	3	1	1	RES1	1
㉗	GB	3	1	1	RES1	1
㉘	YL	3	1	1	RES1	1
㉙	GY	3	1	1	RES1	1
㉚	BrR	3	1	1	RES1	1
㉛	GW	3	1	1	RES1	1
㉜	LW	3	1	1	RES1	1
㉝	BrW	3	1	1	RES1	1
㉞	LgB	3		2	M6	1
㉟	5L	2		1	M2	1
㊱	1.25BY	3	1	1	M6	1
㊲	WY	2		1	RES2	1
㊳	WR	2		1	M6	1
㊴	WL	2		1	M6	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
⑦3	Lg	4	3		M6	1
⑧1	2G	2		1	M4	1
⑧2	2GW	2	1		M4	1
⑧3	2L	2		1	SPR	1
⑧4	2LW	2	1		SPR	1
⑨1	1.25YR	2			M7, CAB1 (option)	2
⑨4	BrG	2		1	M5	1
⑨5	LY	2		1	M5	1
⑩7	L	2		1	M5	1
⑩8	B	2		1	M5	1
⑩9	G	2		1	M5	1
⑪0	R	2		1	M5	1
⑪1	W	2		1	M5	1
⑪2	L	2	1		M5	1
⑪3	P	3	1	1	M5	1
⑪4	Y	3	1	1	M5	1
⑪6	G	3	1	1	M5	1
⑪7	O	2	1		M5	1
⑪8	GB	4		3	M5	1
⑪9	LB	3		2	M5	1
⑫0	WL	2	1		M6	1
⑫1	B	2	1		M6	1
⑫2	L	2	1		M6	1
⑫3	B	2	1		M6	1
⑫4	Br	2	1		M6	1
⑫5	BrW	2	1		M6	1
⑫6	Lg	2	1		M6	1
⑫7	LgB	2	1		M6	1
⑬1	GR	2		1	M5	1
⑬3	2B	4	1	2	M3	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS			
			(1)	(2)	Main Harness (3)	
⑬4	2WR	3	1	1	M3	1
⑬8	R	4	1	2	SPD	1
⑬9	W	4	2	1	SPD	1
⑭0	B	3	1	1	SPD	1
⑭1	YW	2		1	M6	1
⑭2	GL	2	1		M6	1
⑭3	WB	2	1		M6	1
⑮5	R	2		1	M6	1
⑮6	BW	2	1		M5	1
⑰2	1.25BY	2	1		M5	1
⑰6	BY	2	1		M7	1
⑱1	L	3	1	1	M7	1
⑱3	LR	2	1		M7	1
⑱5	G	6	4	1	M7	1
⑱6	L	6	4	1	M7	1
⑱7	LgR	2		1	M7	1
⑱9	BrG	2	1		M7	1
⑲0	L	2	1		M7	1
⑲3	GB	2		1	M7	1
⑲5	W	2		1	M7	1
⑲7	B	3	2		M7	1
⑲9	2BR	2	1		M3	1
⑳4	G	3		2	M7	1
⑳5	L	3		2	M7	1
㉑0	G	4	2	1	SPD	1
㉑4	2GW	2		1	M1	1
㉑1	2GR	2		1	ROLL (option)	1
㉑3	L	2	1		M7	1
㉑6	3R	2		1	ROPS (option)	1

4-2. Fuse · Relay Harness



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

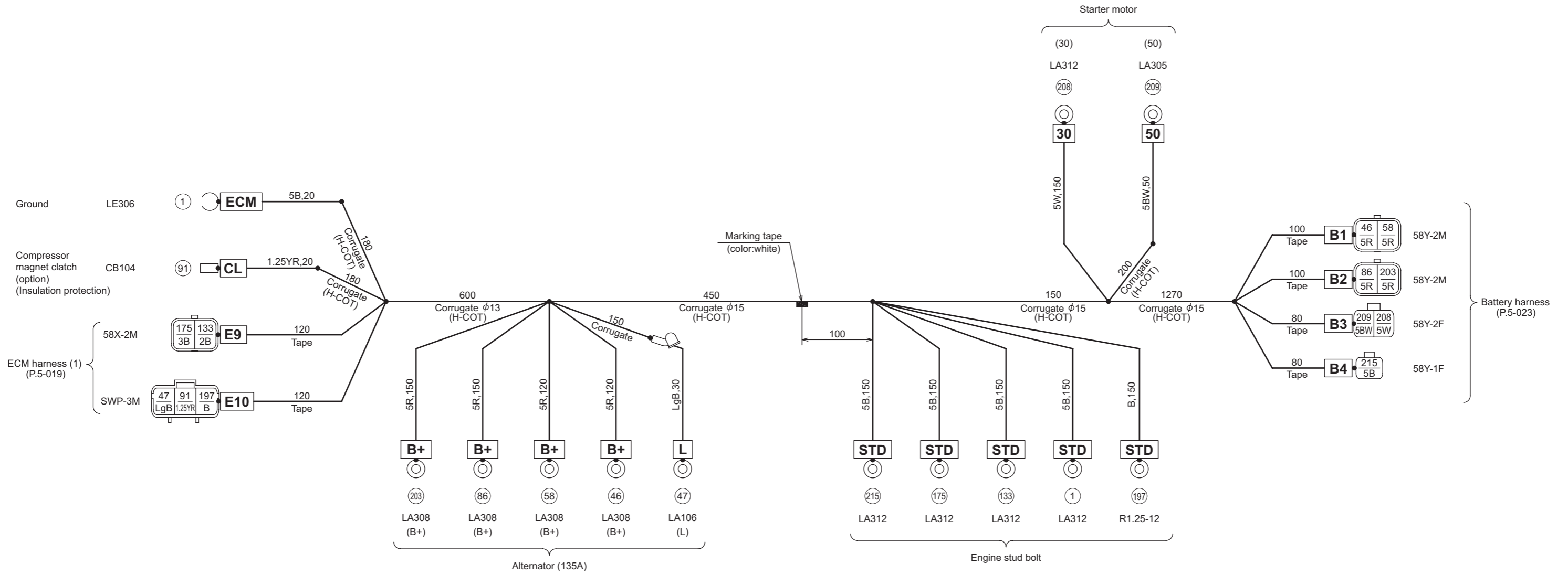
No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B, 1.25B	13	<b>FU1</b> , Relay box 1-1-2, 1-5-2, 2-8-2, 2-9-2, 2-10-2, 2-12-2, 2-13-2, 2-14-2, 3-15-2, 3-16-2, 3-17-2, 3-18-2
③	2WR	2	<b>FU5</b> , Fuse box 1-F4
④	1.25GY	2	Fuse box 1-F11, Relay box 2-12-5
⑥	RY	2	<b>DIO</b> , <b>FU2</b>
⑦	WG	4	<b>FU2</b> , Fuse box 1-F6, Relay box 1-4-1, 3
⑧	Lg	2	<b>FU3</b> , Relay box 1-4-5
⑨	GR	2	<b>FU3</b> , Relay box 1-4-2
⑩	5WR	2	<b>FU6</b> , Fuse box 1-F7
⑫	BW	2	<b>FU2</b> , Relay box 2-14-3
⑬	WL	3	<b>FU3</b> , Fuse box 1-F7, Relay box 2-10-5
⑭	WY	2	<b>FU3</b> , Fuse box 1-F8
⑮	LgR	4	<b>FU3</b> , Relay box 1-1-3, 1-2-4, 2-8-1
⑲	2W	3	<b>FU9</b> , Fuse box 1-F10, <b>OPT.</b> (option)
⑳	GB	2	<b>FU2</b> , Relay box 3-15-1
㉑	2WB	2	Fuse box 1-F2, Relay box 3-15-3
㉒	1.25BY	2	Fuse box 1-F11, Relay box 1-7-3
㉓	YW	2	<b>FU3</b> , Fuse box 1-F9
㉔	Br	2	<b>FU3</b> , Relay box 1-3-3
㉕	1.25BY	2	<b>FU2</b> , Relay box 1-1-1
㉖	G	2	<b>FU1</b> , Relay box 1-3-5
㉗	1.25LB	2	<b>FU2</b> , Relay box 2-13-3
㉘	2W, 5W	3	<b>FU8</b> , Fuse box 2-F15, F24
㉙	5WR	2	<b>FU8</b> , Fuse box 2-F19
㉚	Br, 2Br	7	Fuse box 2-F17, Relay box 3-19-1, 3, 3-20-1, 3, 3-21-1, 3
㉛	2G	2	Fuse box 2-F14, Relay box 2-11-1

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑥⑨	2W	2	Fuse box 2-F15, Relay box 2-11-3
⑦⑩	2W	2	<b>FU5</b> , Fuse box 1-F5
⑦①	LY	3	<b>DIO</b> , Relay box 2-8-3, 2-10-3
⑦②	Br	2	Relay box 2-8-5, 2-9-3
⑦③	Lg	3	<b>FU3</b> , Relay box 2-9-4, 2-10-1
⑦④	BrY	3	<b>FU2</b> , Relay box 2-9-1, 2-12-1
⑦⑤	2L	3	Fuse box 2-F16, Relay box 1-6-1, 3
⑦⑥	2LB	2	Fuse box 1-F1, Relay box 3-16-3
⑦⑧	O	2	<b>DIO</b> , <b>FU3</b>
⑦⑨	2W	2	<b>FU5</b> , Relay box 3-15-5
⑧⑩	2Y	2	<b>FU5</b> , Relay box 3-16-5
⑧②	2GW	2	<b>FU7</b> , Relay box 3-17-3
⑧④	2LW	2	<b>FU7</b> , Relay box 3-18-3
⑧⑨	3WR	2	<b>FU11</b> , Fuse box 2-F18
⑨⑩	3R	2	<b>FU11</b> , Fuse box 2-F19
⑨③	5WL	2	<b>FU6</b> , Fuse box 1-F2
⑪②	L	2	<b>FU2</b> , Relay box 1-6-2
⑪③	P	2	<b>FU1</b> , Relay box 3-19-5
⑪④	Y	2	<b>FU1</b> , Relay box 3-20-5
⑪⑥	G	2	<b>FU1</b> , Relay box 3-21-5
⑪⑦	O	4	<b>FU1</b> , Relay box 3-19-2, 3-20-2, 3-21-2
⑬②	Br	2	<b>FU2</b> , Relay box 1-6-5
⑬③	2B	2	<b>FU9</b> , Relay box 2-11-2
⑬④	2WR	2	<b>FU9</b> , Relay box 2-11-5
⑮②	G	3	<b>FU2</b> , Relay box 3-17-1, 3-18-1
⑮③	1.25Y	2	Relay box 2-12-3, 2-13-5
⑮⑦	2LR	2	<b>FU4</b> , Relay box 3-18-4

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑮⑨	2RG	2	<b>FU4</b> , Relay box 3-17-4
⑮①	P	3	<b>DIO</b> , Relay box 2-13-1, 2-14-5
⑮②	Gr	2	<b>FU2</b> , Relay box 2-14-1
⑮③	LgY	3	<b>FU3</b> , Relay box 1-2-1, 3
⑮④	BW	2	<b>FU3</b> , Relay box 1-2-5
⑮⑤	LgB	2	<b>FU3</b> , Relay box 1-2-2
⑮⑥	GB	2	Fuse box 1-F12, Relay box 1-1-5
⑮⑦	GR	2	<b>FU3</b> , Relay box 3-16-1
⑮⑧	2LW	2	<b>FU4</b> , Relay box 3-17-5
⑮⑨	2LY	2	<b>FU4</b> , Relay box 3-18-5
⑮⑰	1.25BY	2	<b>FU3</b> , Fuse box 2-F13
⑮⑱	W, 1.25W	2	<b>FU3</b> , Fuse box 2-F13
⑮⑲	BY	2	<b>FU3</b> , Fuse box 1-F12
⑮⑳	G	2	<b>FU1</b> , Relay box 1-5-3
⑮㉑	L	3	<b>FU1</b> , Relay box 1-3-2, 1-7-2
⑮㉒	LR	2	<b>FU1</b> , Relay box 1-7-1
⑮㉓	BrG	2	<b>FU1</b> , Relay box 1-5-4
⑮㉔	L	2	<b>FU1</b> , Relay box 1-5-5
⑮㉕	RW	2	<b>FU1</b> , Relay box 1-5-1
⑮㉖	1.25BR, 2BR	2	<b>FU7</b> , Relay box 1-7-5
⑲②	1.25Br	2	<b>FU2</b> , Fuse box 1-F3
⑲③	L	2	<b>FU1</b> , Relay box 1-3-1
⑲⑤	5WR	2	<b>FU12</b> , Fuse box 2-F21
⑲⑥	3L	2	<b>FU10</b> , Fuse box 2-F20
⑲⑦	3LW	2	<b>FU10</b> , Fuse box 2-F21
⑲⑧	3GW	2	<b>FU10</b> , Fuse box 2-F22
⑲⑨	3G	2	<b>FU10</b> , Fuse box 2-F23
⑳①	2WR	2	<b>FU13</b> , Fuse box 2-F24



4-3. Engine Harness



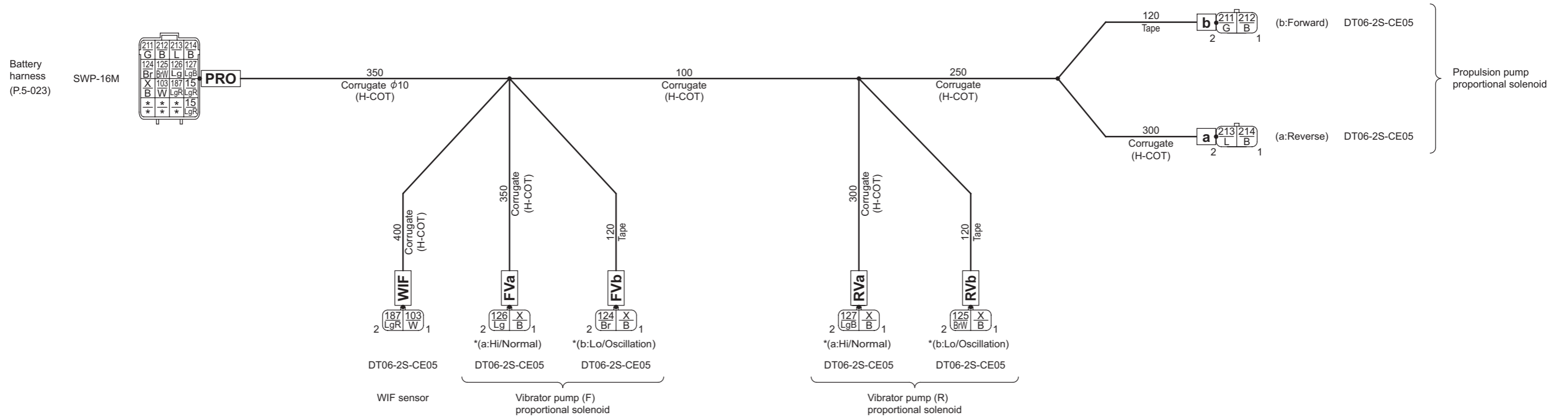
· Where the numbers differ, wires of same color must not be united.  
 · Make use of heat resistance wire "AEX" equivalency product.

1568-09297-2-12261-C

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
①	5B	2	ECM, STD
④⑥	5R	2	B1, B+
④⑦	LgB	2	E10, L
⑤⑧	5R	2	B1, B+
⑧⑥	5R	2	B2, B+
⑨①	1.25YR	2	CL, E10
⑬③	2B, 5B	2	E9, STD

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑬⑤	3B, 5B	2	E9, STD
⑬⑦	B	2	E10, STD
⑬③	5R	2	B2, B+
⑬⑧	5W	2	30, B3
⑬⑨	5BW	2	50, B3
⑬⑮	5B	2	B4, STD

### 4-4. Hydraulic Pump Harness



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

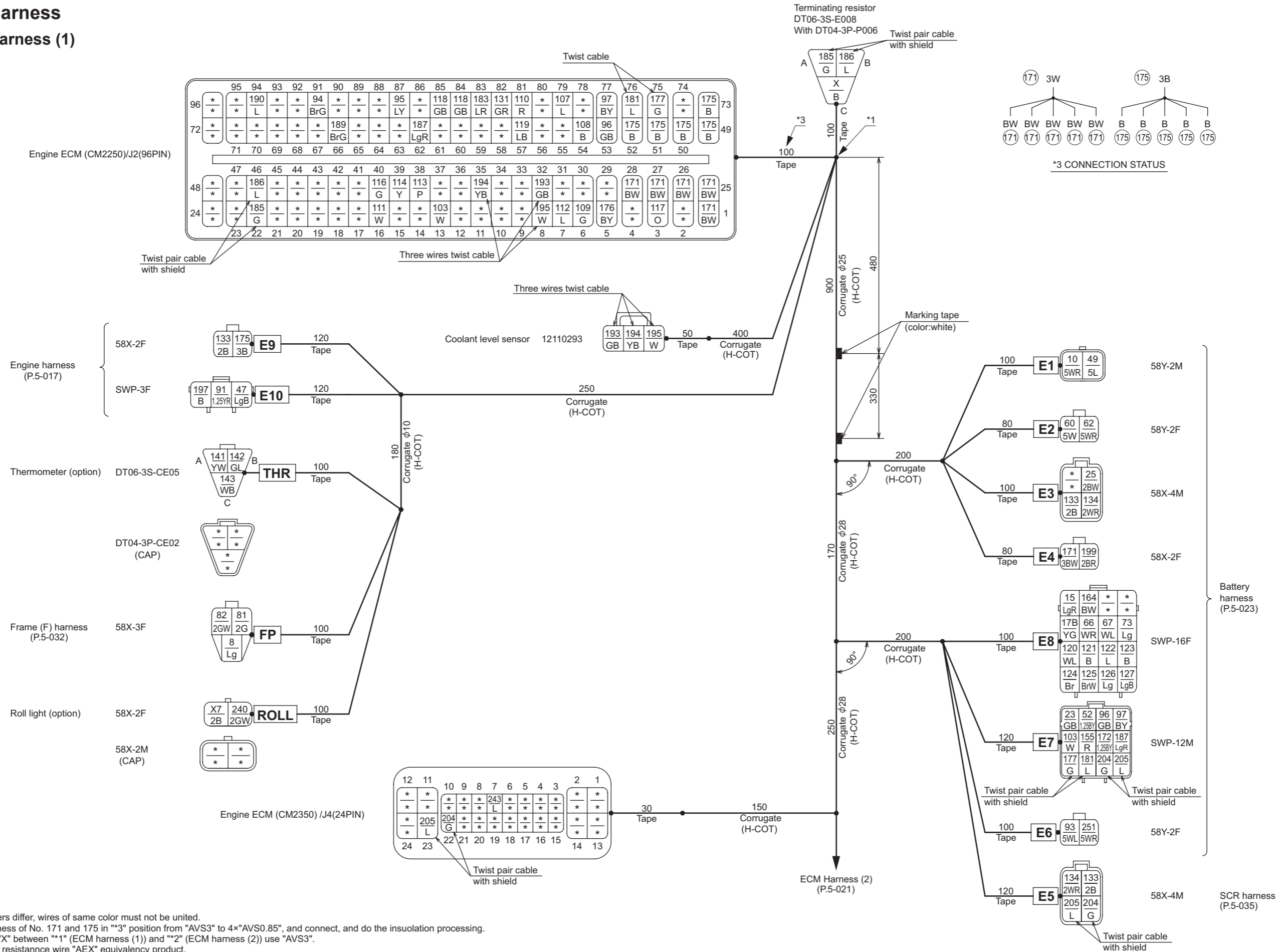
1568-09292-0-22244-A

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

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

### 4-5. ECM Harness

#### 4-5-1. ECM harness (1)



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

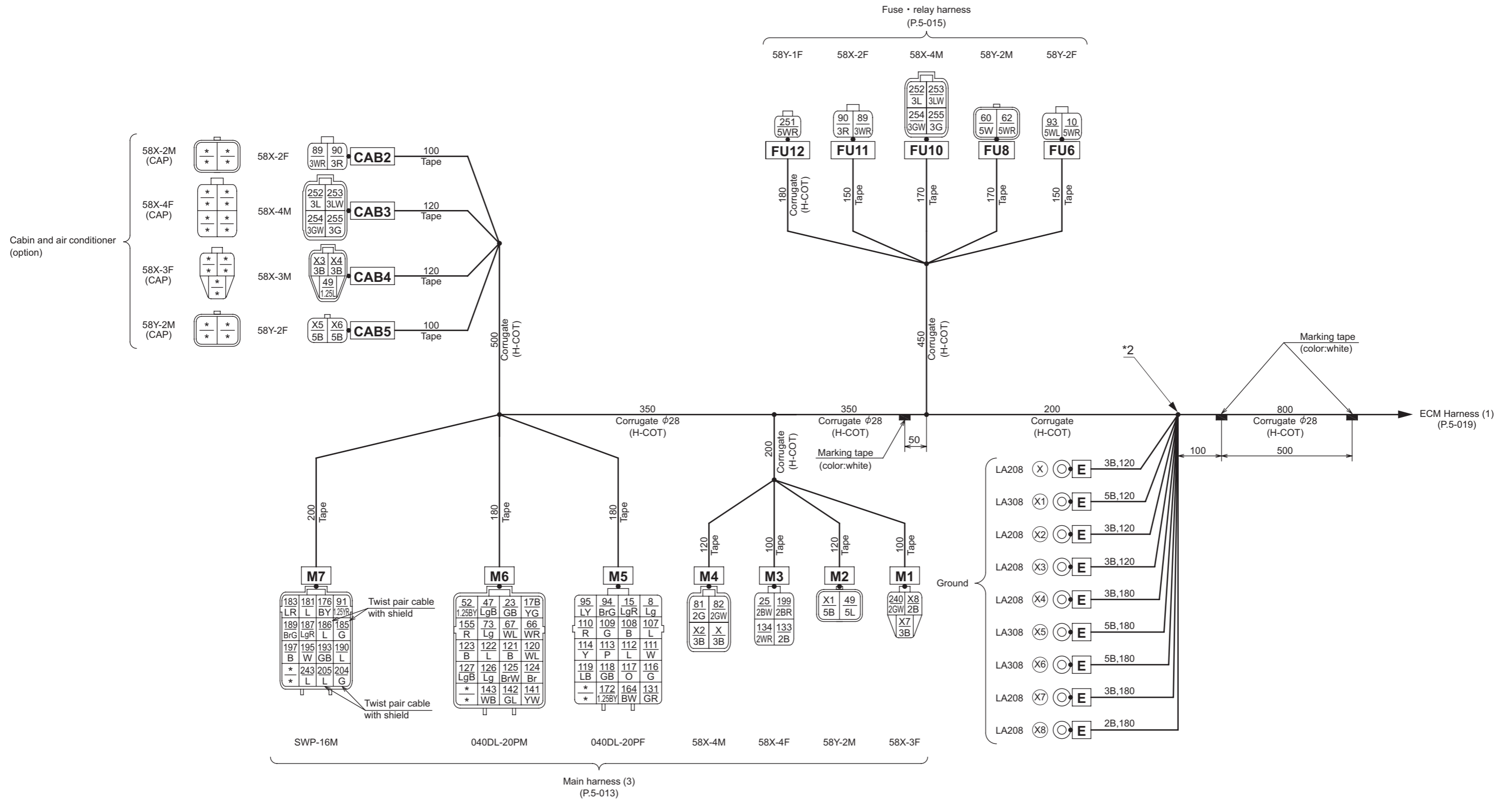


No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
(X)	B, 3B	3	Terminating resistor-C	1	2
(X7)	2B, 3B	3	<b>ROLL</b> (option)	1	2
(8)	Lg	2	<b>FP</b>	1	1
(10)	5WR	2	<b>E1</b>	1	1
(15)	LgR	2	<b>E8</b>	1	1
(17B)	YG	2	<b>E8</b>	1	1
(23)	GB	2	<b>E7</b>	1	1
(25)	2BW	2	<b>E3</b>	1	1
(47)	LgB	2	<b>E10</b>	1	1
(49)	1.25L, 5L	3	<b>E1</b>	1	1
(52)	1.25BY	2	<b>E7</b>	1	1
(60)	5W	2	<b>E2</b>	1	1
(62)	5WR	2	<b>E2</b>	1	1
(66)	WR	2	<b>E8</b>	1	1
(67)	WL	2	<b>E8</b>	1	1
(73)	Lg	2	<b>E8</b>	1	1
(81)	2G	2	<b>FP</b>	1	1
(82)	2GW	2	<b>FP</b>	1	1
(91)	1.25YR	2	<b>E10</b>	1	1
(93)	5WL	2	<b>E6</b>	1	1
(94)	BrG	2	Engine ECM (96pin)-91	1	1
(95)	LY	2	Engine ECM (96pin)-87	1	1
(96)	GB	2	<b>E7</b> , Engine ECM (96pin)-53	2	
(97)	BY	2	<b>E7</b> , Engine ECM (96pin)-77	2	
(103)	W	2	<b>E7</b> , Engine ECM (96pin)-13	2	
(107)	L	2	Engine ECM (96pin)-79	1	1
(108)	B	2	Engine ECM (96pin)-54	1	1

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
(109)	G	2	Engine ECM (96pin)-6	1	1
(110)	R	2	Engine ECM (96pin)-81	1	1
(111)	W	2	Engine ECM (96pin)-16	1	1
(112)	L	2	Engine ECM (96pin)-7	1	1
(113)	P	2	Engine ECM (96pin)-38	1	1
(114)	Y	2	Engine ECM (96pin)-39	1	1
(116)	G	2	Engine ECM (96pin)-40	1	1
(117)	O	2	Engine ECM (96pin)-3	1	1
(118)	GB	3	Engine ECM (96pin)-84, 85	2	1
(119)	LB	2	Engine ECM (96pin)-57	1	1
(120)	WL	2	<b>E8</b>	1	1
(121)	B	2	<b>E8</b>	1	1
(122)	L	2	<b>E8</b>	1	1
(123)	B	2	<b>E8</b>	1	1
(124)	Br	2	<b>E8</b>	1	1
(125)	BrW	2	<b>E8</b>	1	1
(126)	Lg	2	<b>E8</b>	1	1
(127)	LgB	2	<b>E8</b>	1	1
(131)	GR	2	Engine ECM (96pin)-82	1	1
(133)	2B	4	<b>E3</b> , <b>E5</b> , <b>E9</b>	3	1
(134)	2WR	3	<b>E3</b> , <b>E5</b>	2	1
(141)	YW	2	<b>THR</b> -A (option)	1	1
(142)	GL	2	<b>THR</b> -B (option)	1	1
(143)	WB	2	<b>THR</b> -C (option)	1	1
(155)	R	2	<b>E7</b>	1	1
(164)	BW	2	<b>E8</b>	1	1
(171)	BW, 3BW	6	<b>E4</b> , Engine ECM (96pin)-1, 25, 26, 27, 28	6	

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			ECM Harness (1)		(2)
(172)	1.25BY	2	<b>E7</b>	1	1
(175)	B, 3B	6	<b>E9</b> , Engine ECM (96pin)-49, 50, 51, 52, 73	6	
(176)	BY	2	Engine ECM (96pin)-5	1	1
(177)	G	2	<b>E7</b> , Engine ECM (96pin)-75	2	
(181)	L	3	<b>E7</b> , Engine ECM (96pin)-76	2	1
(183)	LR	2	Engine ECM (96pin)-83	1	1
(185)	G	3	Engine ECM (96pin)-22, Terminating resistor-A	2	1
(186)	L	3	Engine ECM (96pin)-46, Terminating resistor-B	2	1
(187)	LgR	3	<b>E7</b> , Engine ECM (96pin)-62	2	1
(189)	BrG	2	Engine ECM (96pin)-66	1	1
(190)	L	2	Engine ECM (96pin)-94	1	1
(193)	GB	3	Coolant level sensor, Engine ECM (96pin)-32	2	1
(194)	YB	2	Coolant level sensor, Engine ECM (96pin)-35	2	
(195)	W	3	Coolant level sensor, Engine ECM (96pin)-8	2	1
(197)	B	2	<b>E10</b>	1	1
(199)	2BR	2	<b>E4</b>	1	1
(204)	G	4	<b>E5</b> , <b>E7</b> , Engine ECM J4 (24pin)-22	3	1
(205)	L	4	<b>E5</b> , <b>E7</b> , Engine ECM J4 (24pin)-23	3	1
(240)	2GW	2	<b>ROLL</b> (option)	1	1
(243)	L	2	Engine ECM J4 (24pin)-7	1	1
(251)	5WR	2	<b>E6</b>	1	1

4-5-2. ECM harness (2)



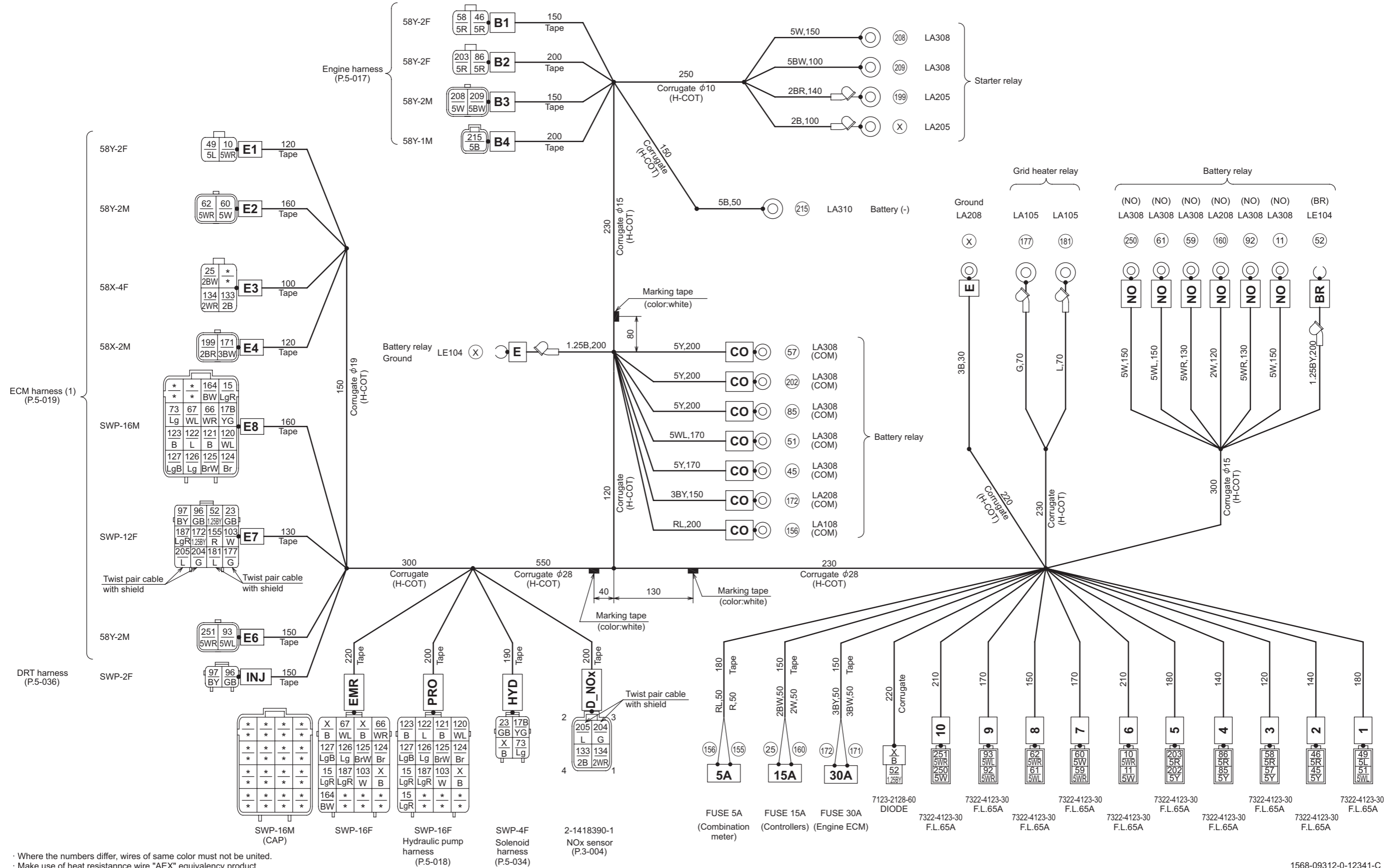
· Where the numbers differ, wires of same color must not be united.  
 · The ground wire "X" between \*\*1" (ECM harness (1)) and \*\*2" (ECM harness (2)) use "AVS3".  
 · Make use of heat resistance wire "AEX" equivalency product.

No.	SIZE, COLOR	CONTACT POINTS TOTAL	CONNECTION and NUMBER OF CONTACT POINTS		
			(1)	ECM Harness (2)	
ⓧ	B, 3B	3	1	E, M4	2
ⓧ1	5B	2		E, M2	2
ⓧ2	3B	2		E, M4	2
ⓧ3	3B	2		E, CAB4 (option)	2
ⓧ4	3B, 5B	2		E, CAB4 (option)	2
ⓧ5	5B	2		E, CAB5 (option)	2
ⓧ6	5B	2		E, CAB5 (option)	2
ⓧ7	2B, 3B	3	1	E, M1	2
ⓧ8	2B	2		E, M1	2
⑧	Lg	2	1	M5	1
⑩	5WR	2	1	FU6	1
⑮	LgR	2	1	M5	1
⑰B	YG	2	1	M6	1
⑳3	GB	2	1	M6	1
㉔5	2BW	2	1	M3	1
④7	LgB	2	1	M6	1
④9	1.25L, 5L	3	1	M2, CAB4 (option)	1
⑤2	1.25BY	2	1	M6	1
⑥0	5W	2	1	FU8	1
⑥2	5WR	2	1	FU8	1
⑥6	WR	2	1	M6	1
⑥7	WL	2	1	M6	1
⑦3	Lg	2	1	M6	1
⑧1	2G	2	1	M4	1
⑧2	2GW	2	1	M4	1
⑧9	3WR	2		FU11, CAB2 (option)	2
⑨0	3R	2		FU11, CAB2 (option)	2
⑨1	1.25YR	2	1	M7	1

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

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

4-6. Battery Harness



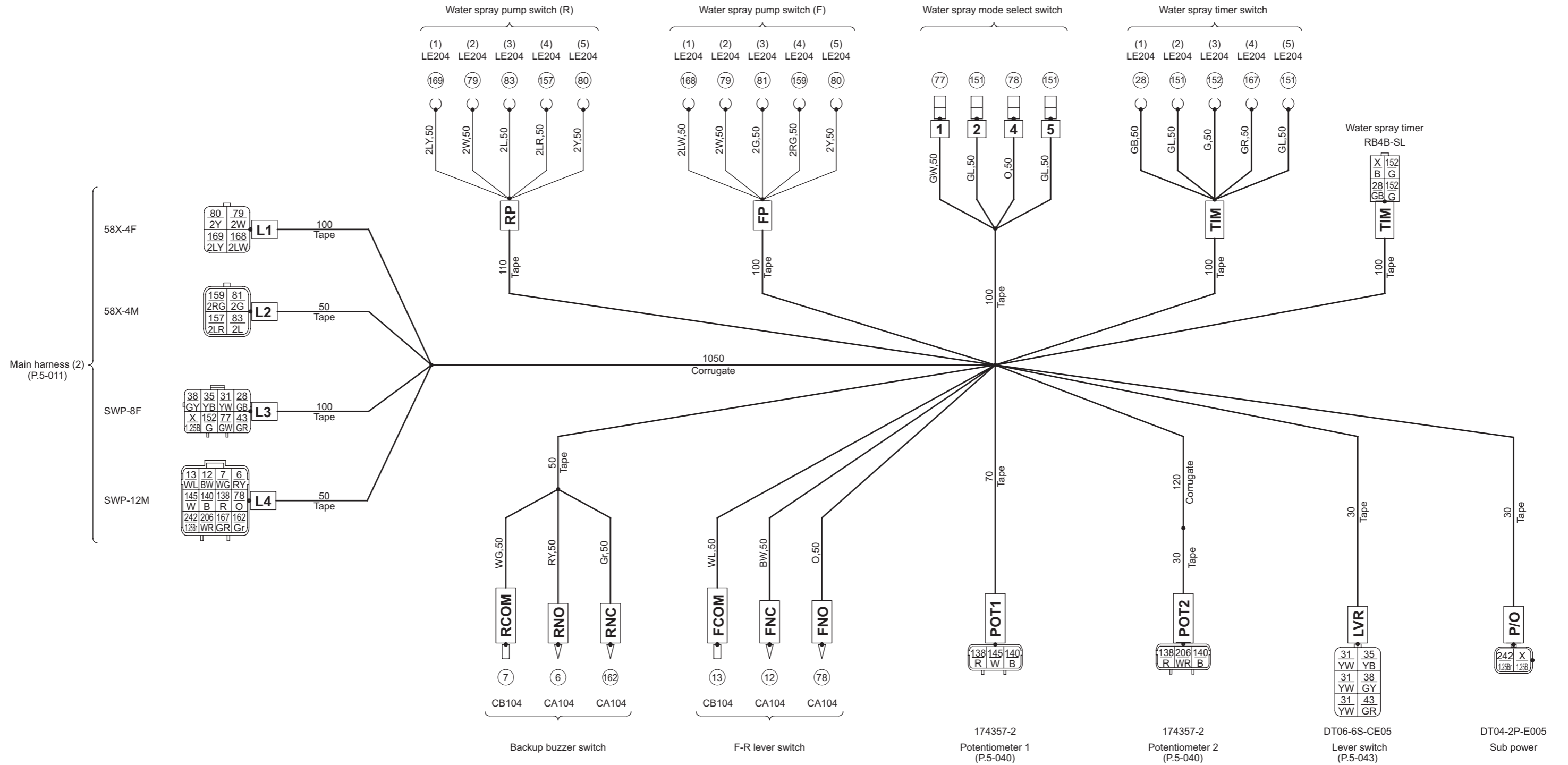
· Where the numbers differ, wires of same color must not be united.  
· Make use of heat resistance wire "AEX" equivalency product.

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(X)	B, 1.25B, 2B, 3B	9	E × 2, EMR × 3, HYD, PRO, Diode, Starter relay
(10)	5WR	2	6, E1
(11)	5W	2	6, NO
(15)	LgR	4	E8, EMR, PRO × 2
(17B)	YG	2	E8, HYD
(23)	GB	2	E7, HYD
(25)	2BW	2	E3, Fuse 15A
(45)	5Y	2	2, CO
(46)	5R	2	2, B1
(49)	5L	2	1, E1
(51)	5WL	2	1, CO
(52)	1.25BY	3	BR, E7, Diode
(57)	5Y	2	3, CO
(58)	5R	2	3, B1
(59)	5WR	2	7, NO
(60)	5W	2	7, E2
(61)	5WL	2	8, NO
(62)	5WR	2	8, E2
(66)	WR	2	E8, EMR

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

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

4-7. F-R Lever Harness



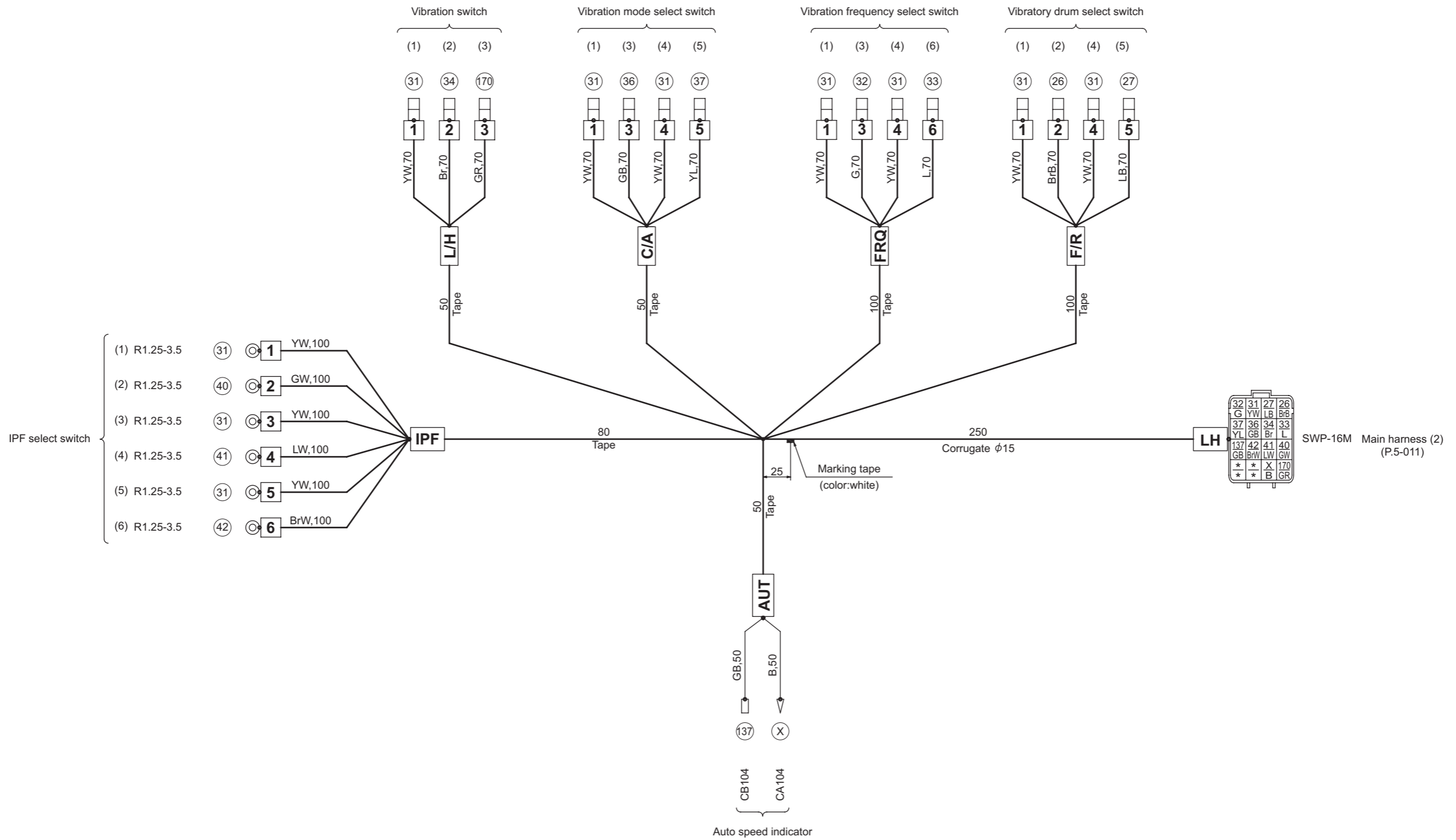
· Where the numbers differ, wires of same color must not be united.

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B, 1.25B	3	L3, P/O, TIM
⑥	RY	2	L4, RNO
⑦	WG	2	L4, RCOM
⑫	BW	2	FNC, L4
⑬	WL	2	FCOM, L4
⑳	GB	3	L3, TIM (LE204), TIM (RB4B)
㉑	YW	4	L3, LVR × 3
㉓	YB	2	L3, LVR
㉖	GY	2	L3, LVR
㉘	GR	2	L3, LVR
㉚	GW	2	1, L3
㉛	O	3	4, FNO, L4
㉜	2W	3	FP, L1, RP
㉝	2Y	3	FP, L1, RP
㉞	2G	2	FP, L2

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑧③	2L	2	L2, RP
⑬⑧	R	3	L4, POT1, POT2
⑭④	B	3	L4, POT1, POT2
⑭⑤	W	2	L4, POT1
⑮①	GL	4	2, 5, TIM (LE204) × 2
⑮②	G	4	L3, TIM (LE204), TIM (RB4B) × 2
⑮⑦	2LR	2	L2, RP
⑮⑨	2RG	2	FP, L2
⑰②	Gr	2	L4, RNC
⑰⑦	GR	2	L4, TIM
⑰⑧	2LW	2	FP, L1
⑰⑨	2LY	2	L1, RP
⑳⑥	WR	2	L4, POT2
㉒②	1.25Br	2	L4, P/O



4-8. Panel (L) Harness



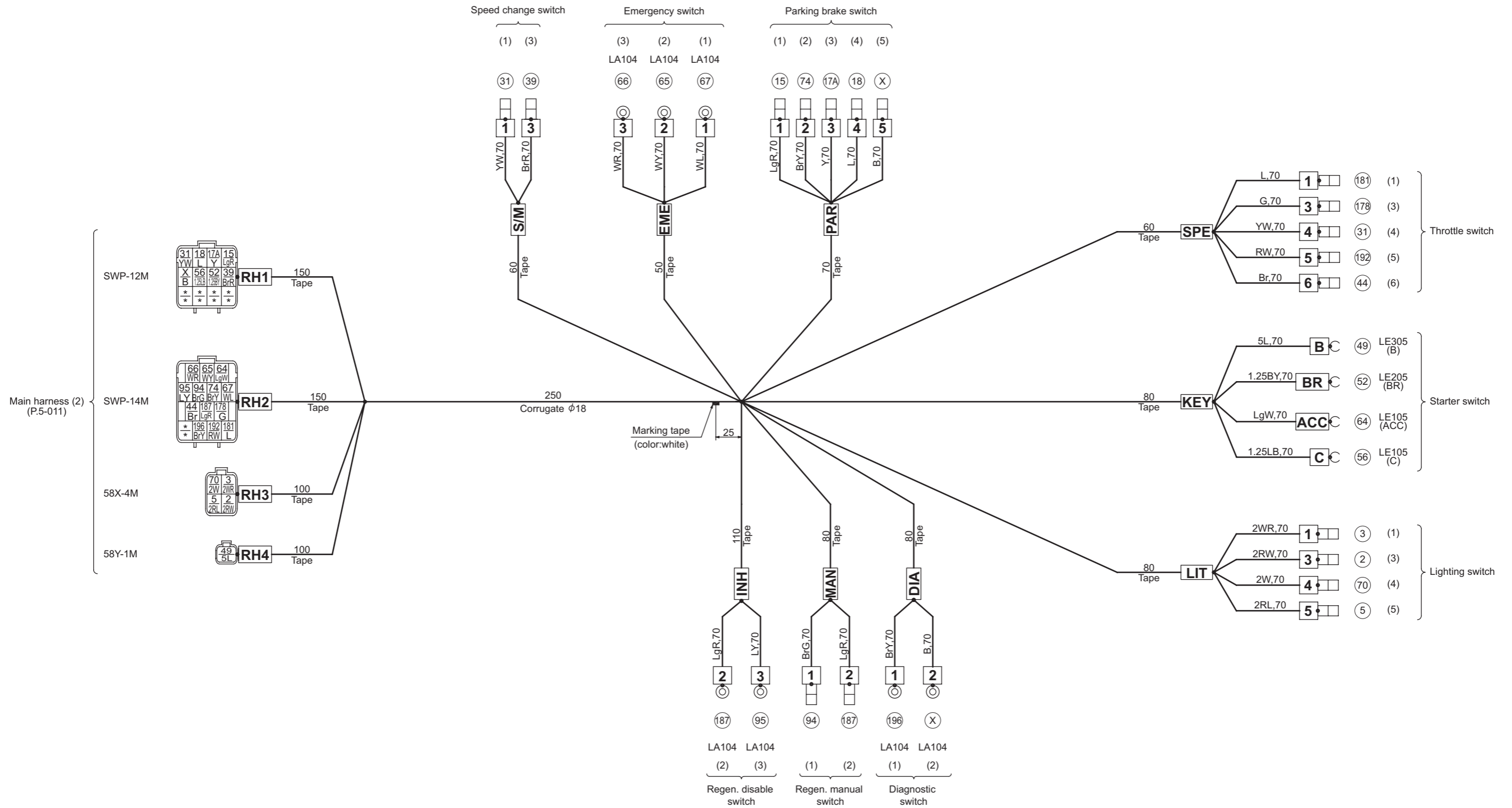
· Where the numbers differ, wires of same color must not be united.



No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(X)	B	2	AUT, LH
(26)	BrB	2	F/R-2, LH
(27)	LB	2	F/R-5, LH
(31)	YW	11	C/A-1, -4, F/R-1, -4, FRQ-1, -4, IPF-1, -3, -5, LH, L/H-1
(32)	G	2	FRQ-3, LH
(33)	L	2	FRQ-6, LH
(34)	Br	2	L/H-2, LH

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
(36)	GB	2	C/A-3, LH
(37)	YL	2	C/A-5, LH
(40)	GW	2	IPF-2, LH
(41)	LW	2	IPF-4, LH
(42)	BrW	2	IPF-6, LH
(137)	GB	2	AUT, LH
(170)	GR	2	LH, L/H-3

4-9. Panel (R) Harness

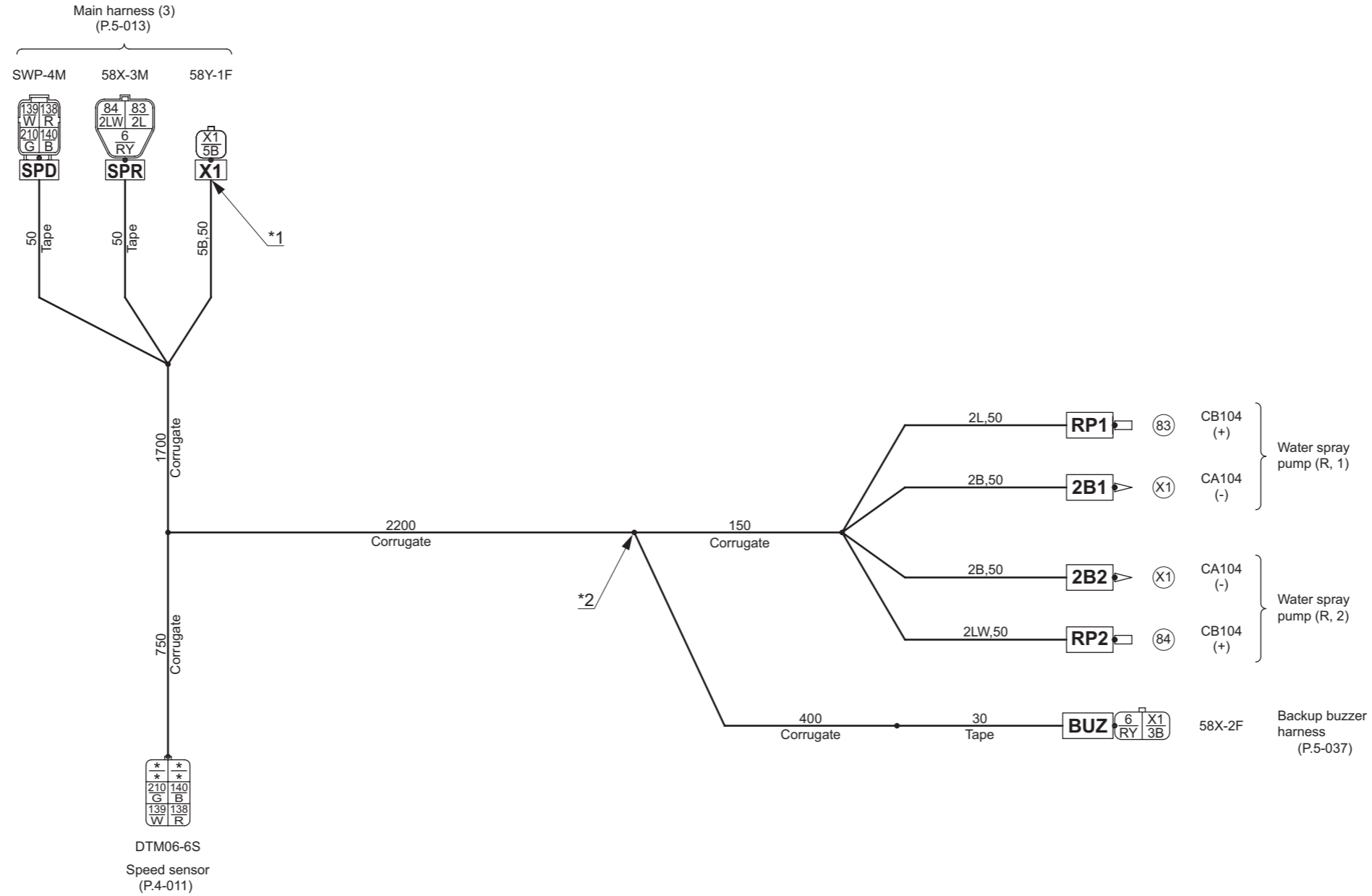


· Where the numbers differ, wires of same color must not be united.

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B	3	DIA-2, PAR-5, RH1
②	2RW	2	LIT-3, RH3
③	2WR	2	LIT-1, RH3
⑤	2RL	2	LIT-5, RH3
⑮	LgR	2	PAR-1, RH1
⑰A	Y	2	PAR-3, RH1
⑱	L	2	PAR-4, RH1
⑳	YW	3	RH1, S/M-1, SPE-4
㉑	BrR	2	RH1, S/M-3
㉒	Br	2	RH2, SPE-6
㉓	5L	2	KEY-B, RH4
㉔	1.25BY	2	KEY-BR, RH1
㉕	1.25LB	2	KEY-C, RH1

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑥4	LgW	2	KEY-ACC, RH2
⑥5	WY	2	EME-2, RH2
⑥6	WR	2	EME-3, RH2
⑥7	WL	2	EME-1, RH2
⑦0	2W	2	LIT-4, RH3
⑦4	BrY	2	PAR-2, RH2
⑨4	BrG	2	MAN-1, RH2
⑨5	LY	2	INH-3, RH2
⑰8	G	2	RH2, SPE-3
⑱1	L	2	RH2, SPE-1
⑱7	LgR	3	INH-2, MAN-2, RH2
⑱2	RW	2	RH2, SPE-5
⑱6	BrY	2	DIA-1, RH2

4-10. Water Spray Pump (R) Harness



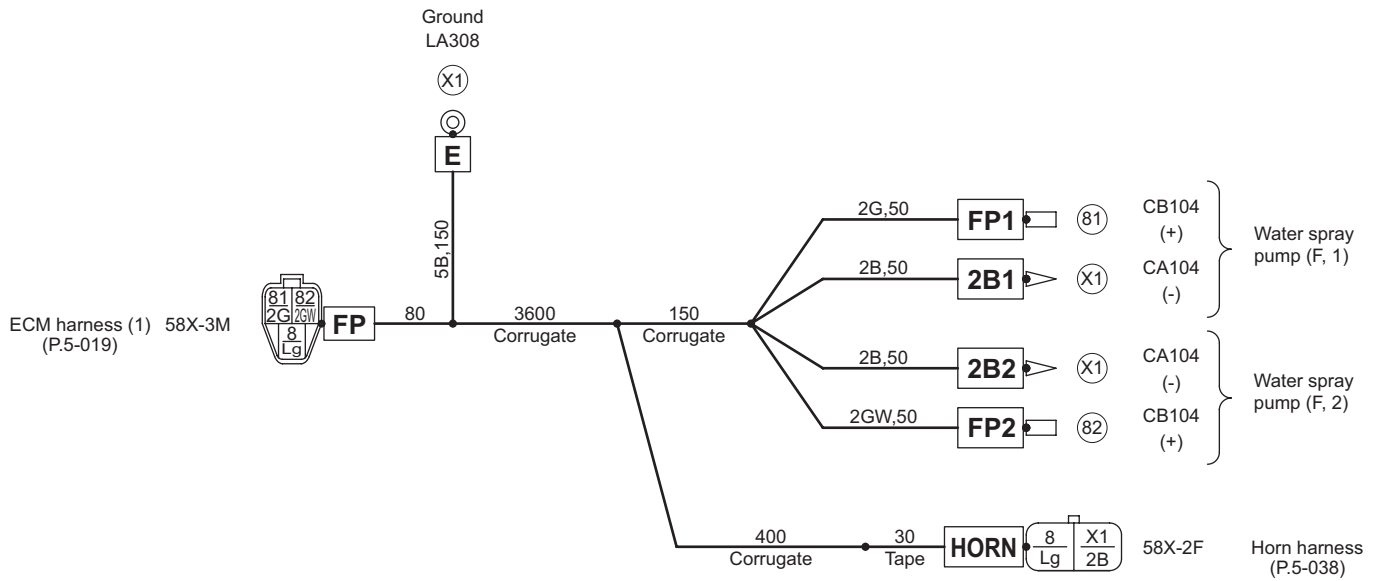
The ground wire "X1" between "\*1" and "\*2" use "AVS5".

1568-09304-0-22298-0

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

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

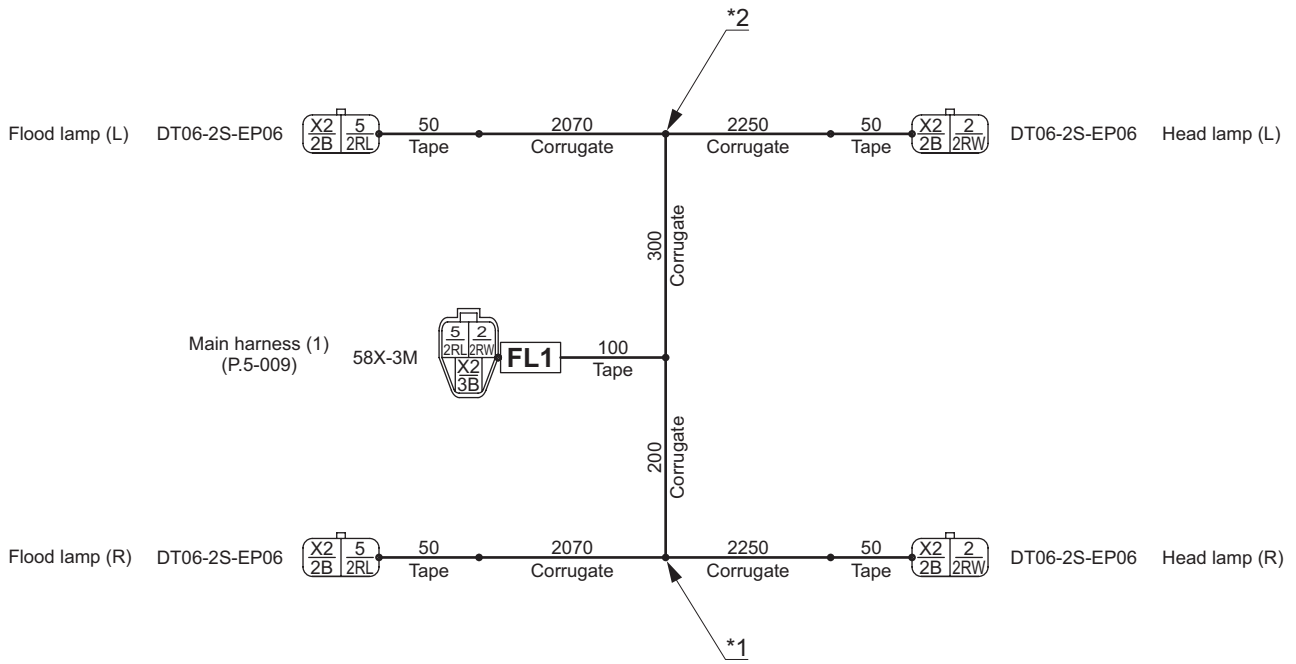
### 4-11. Frame (F) Harness



1568-09285-1-22235-A

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

### 4-12. Floor Board Harness

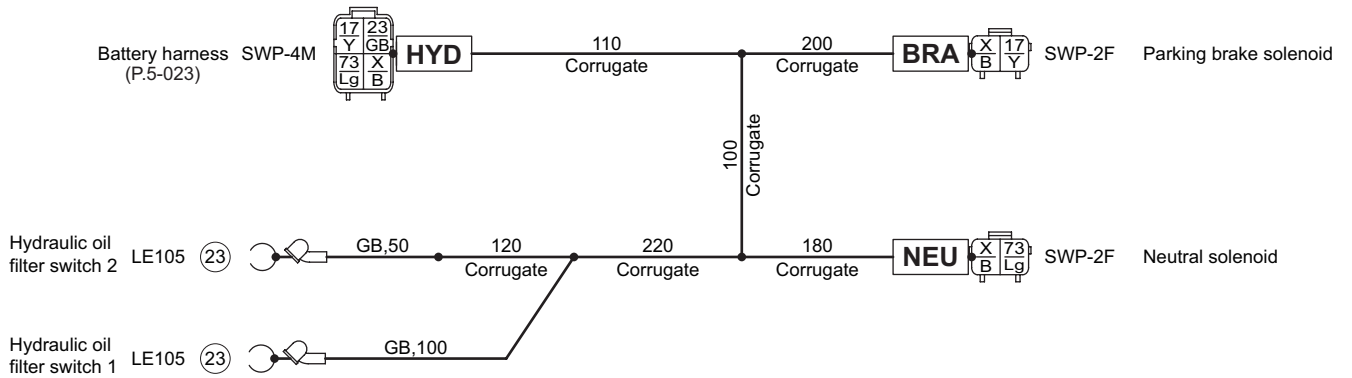


· The ground wire "X2" between "\*\*1" and "\*\*2" use "AVS3".

1568-09274-0-22057-0

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

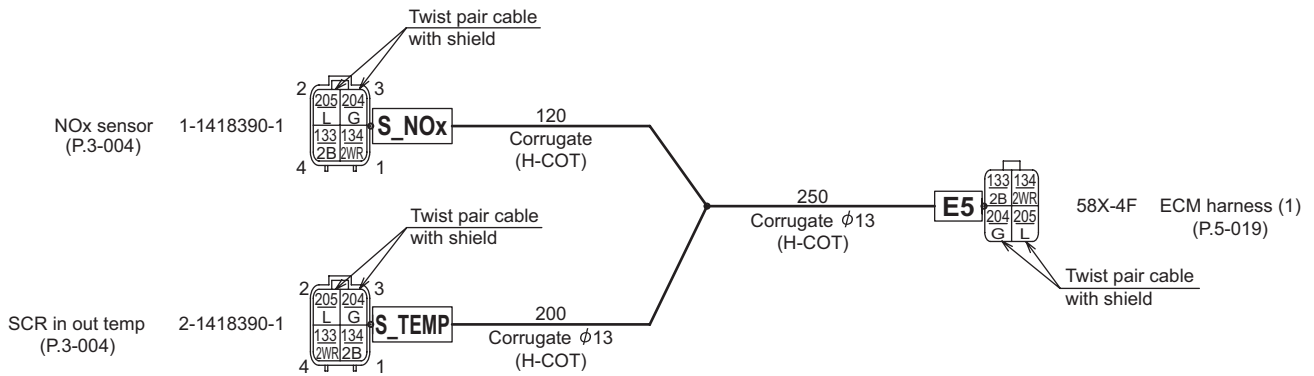
### 4-13. Solenoid Harness



1568-09286-1-32236-0

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

4-14. SCR Harness



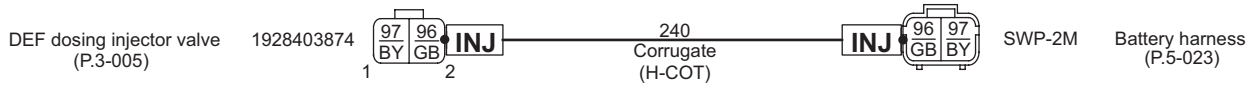
· Make use of heat resistance wire "AEX" equivalency product.

1568-09294-1-32246-B

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑬33	2B	3	S_NOx -4, S_TEMP -4, E5
⑬34	2WR	3	S_NOx -1, S_TEMP -1, E5
⑬04	G	3	S_NOx -3, S_TEMP -3, E5
⑬05	L	3	S_NOx -2, S_TEMP -2, E5



## 4-15. DRT Harness

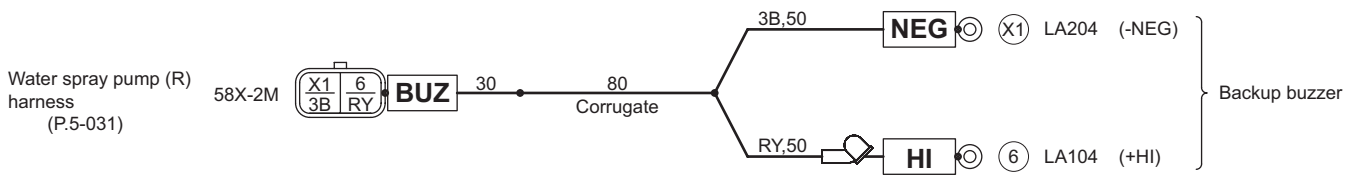


· Make use of heat resistance wire "AEX" equivalency product.

1568-09293-0-32245-A

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
⑨6	GB	2	INJ -2, INJ (SWP)
⑨7	BY	2	INJ -1, INJ (SWP)

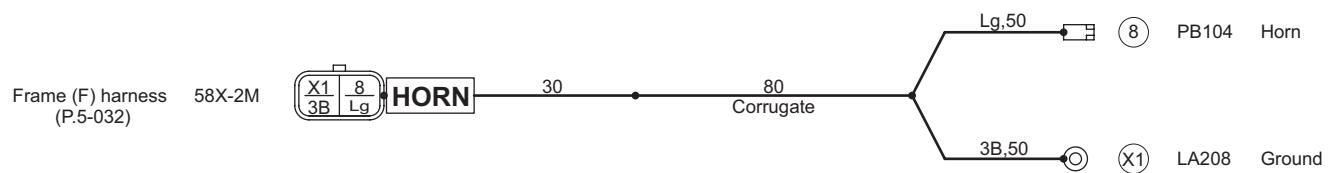
### 4-16. Backup Buzzer Harness



1568-09272-0-32053-0

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

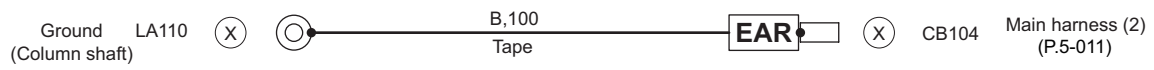
## 4-17. Horn Harness



1568-09271-0-32052-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ1	3B	2	<b>HORN</b> , Ground
Ⓢ	Lg	2	<b>HORN</b> , Horn

4-18. Ground Cord

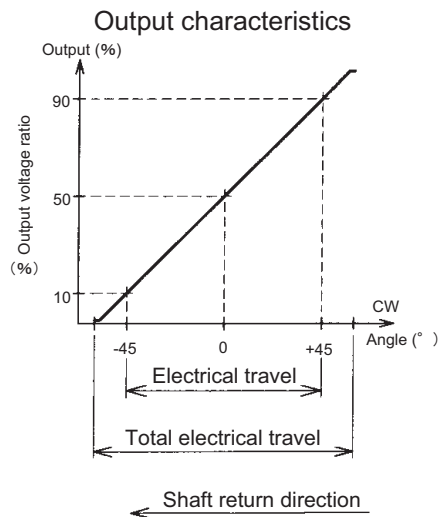
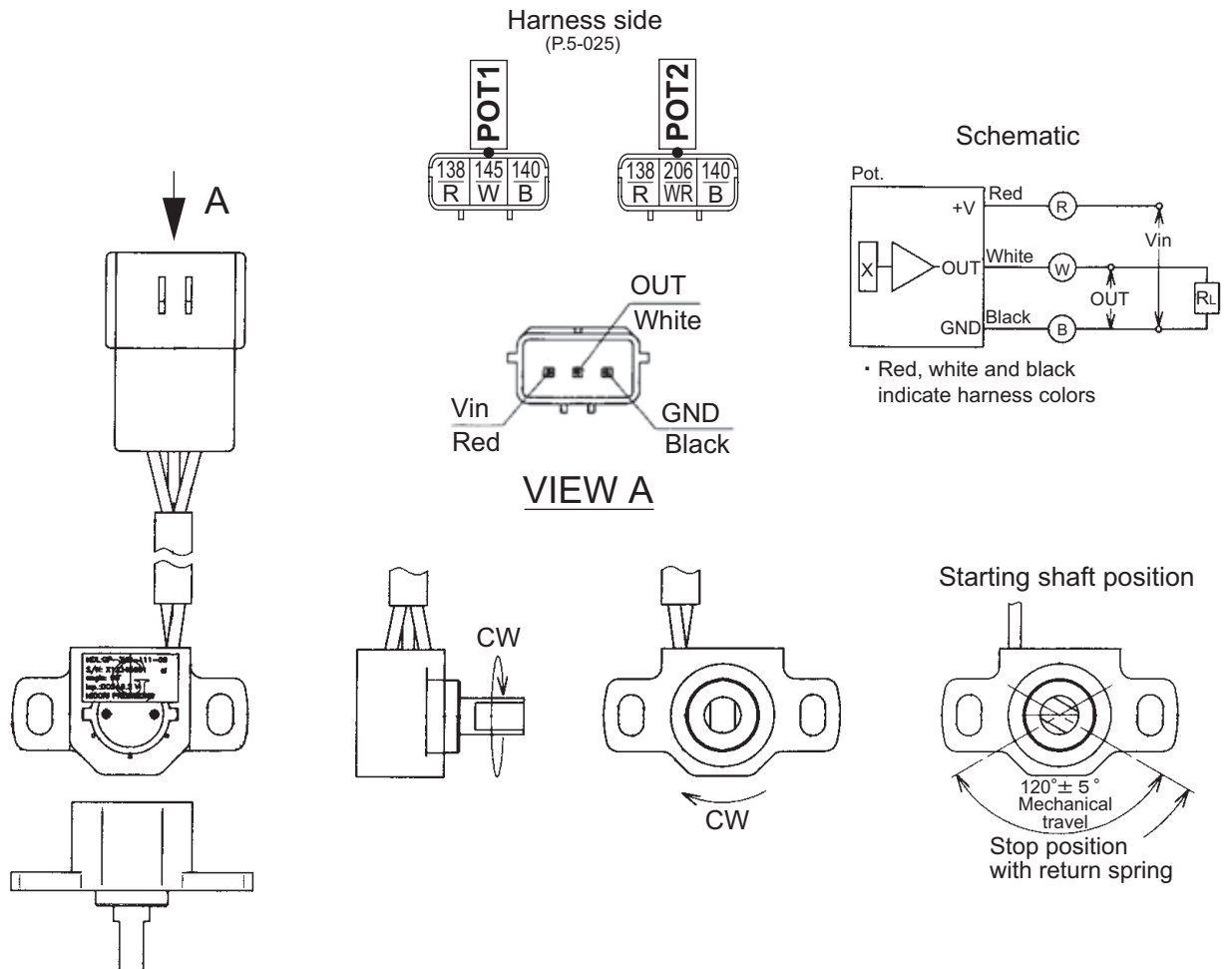


1568-09380-0-42962-0

No.	SIZE, COLOR	CONTACT POINTS	CONNECTION
ⓧ	B	2	Ground, <b>EAR</b>

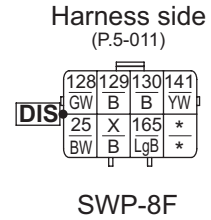
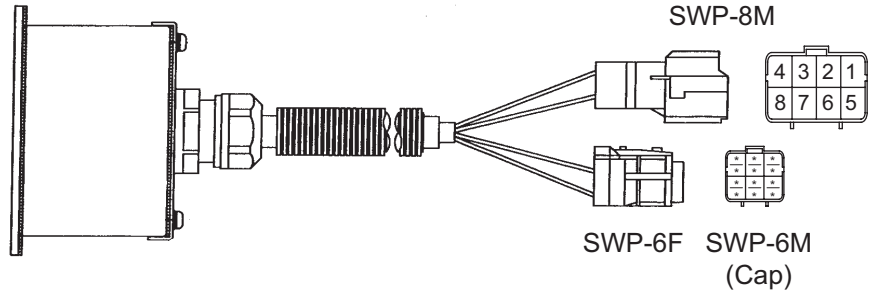
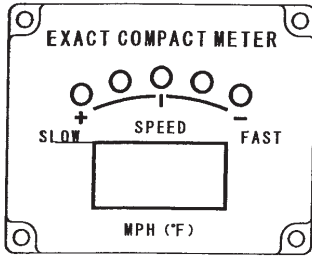
# 5. ELECTRICAL COMPONENT SPECIFICATIONS

## 5-1. Potentiometer



SW880-1-05018

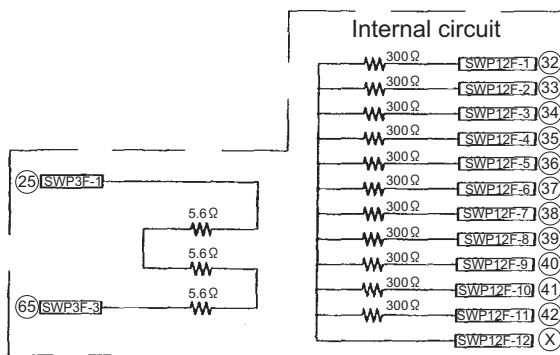
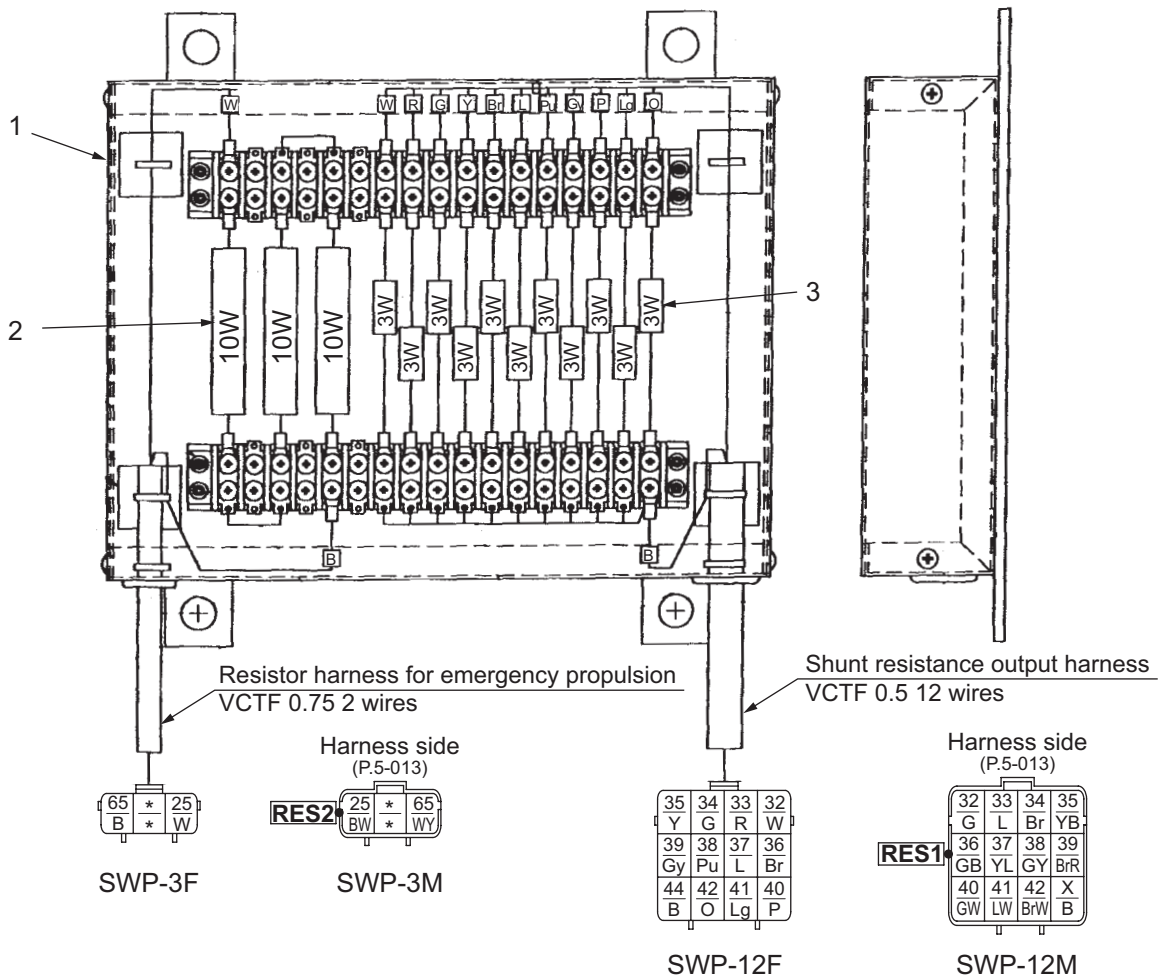
## 5-2. Exact Meter



SW884-05003

Pin NO.	Wire NO.	Function
1	(128)	CAN +
2	(129)	CAN -
3	(130)	CAN GND
4	(141)	+12 V OUT
5	(25)	+12 V
6	(X)	GND
7	(165)	Exact meter relay
8	—	—

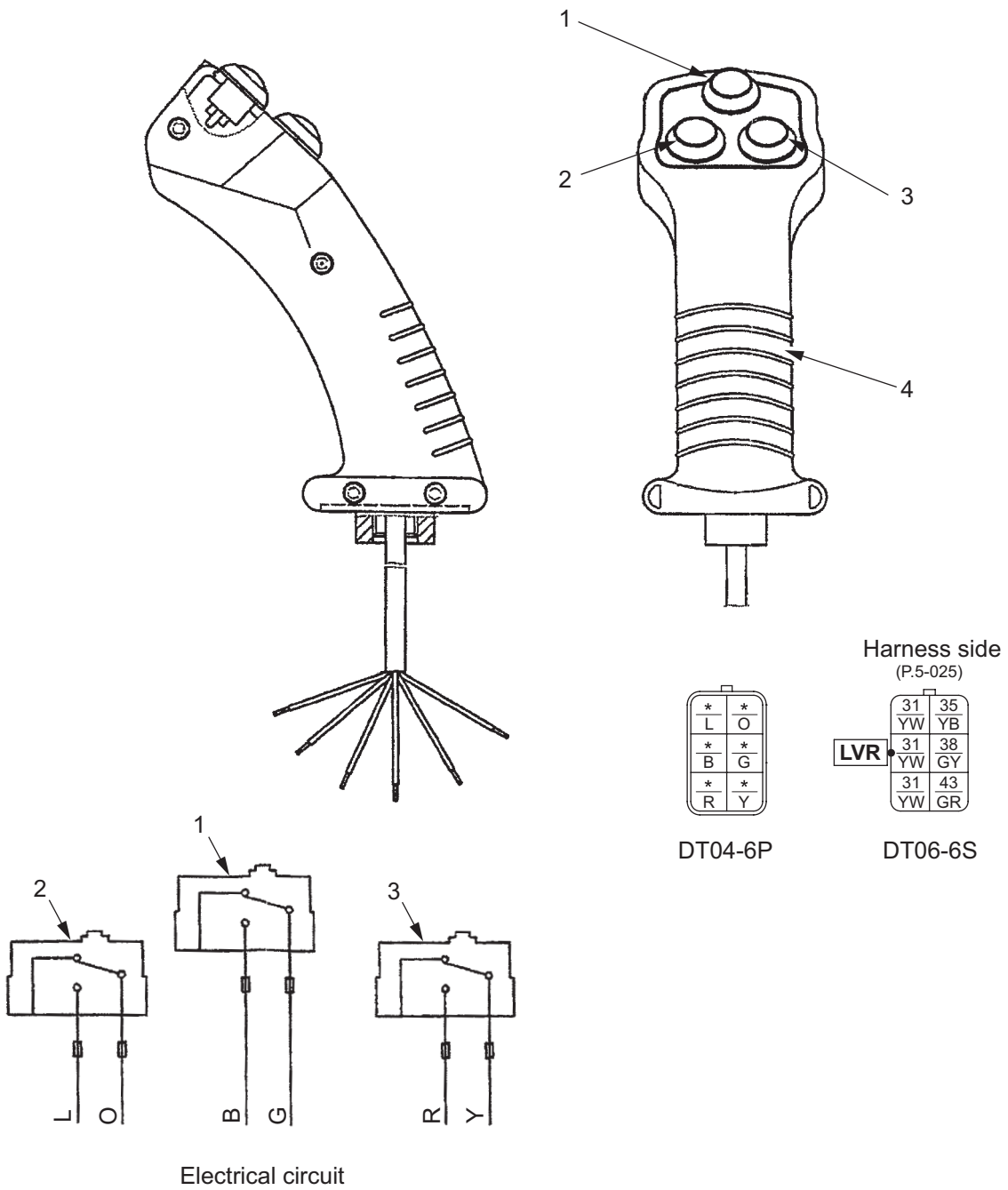
### 5-3. Resistor Unit



SW884-05004

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

5-4. Lever Switch

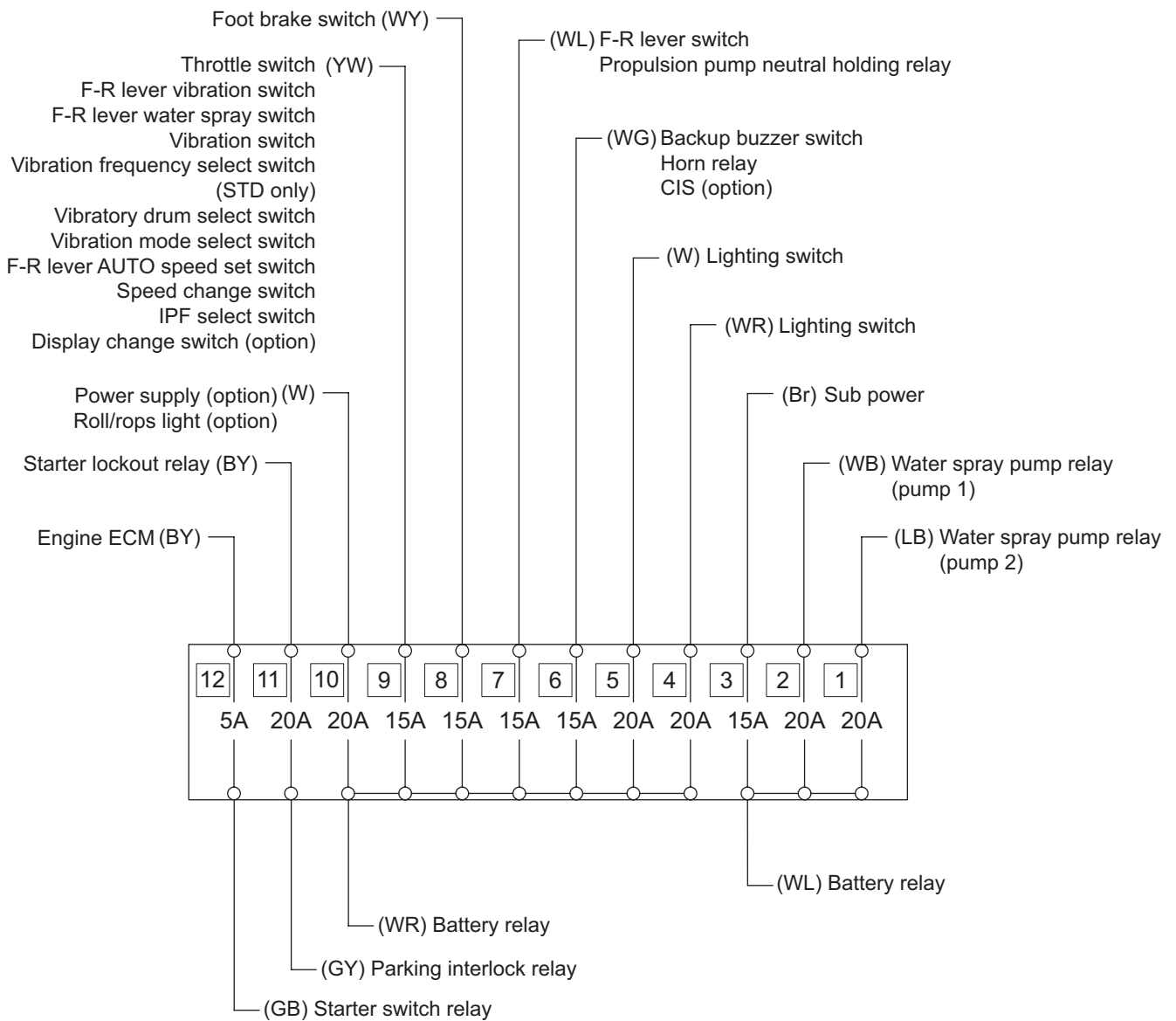


- (1) F-R lever auto speed set switch (White)
- (2) F-R lever vibration switch (Green)
- (3) F-R lever water spray switch (Blue)
- (4) Handle

SW880-1-05019



### 5-5. Fuse Box (1)



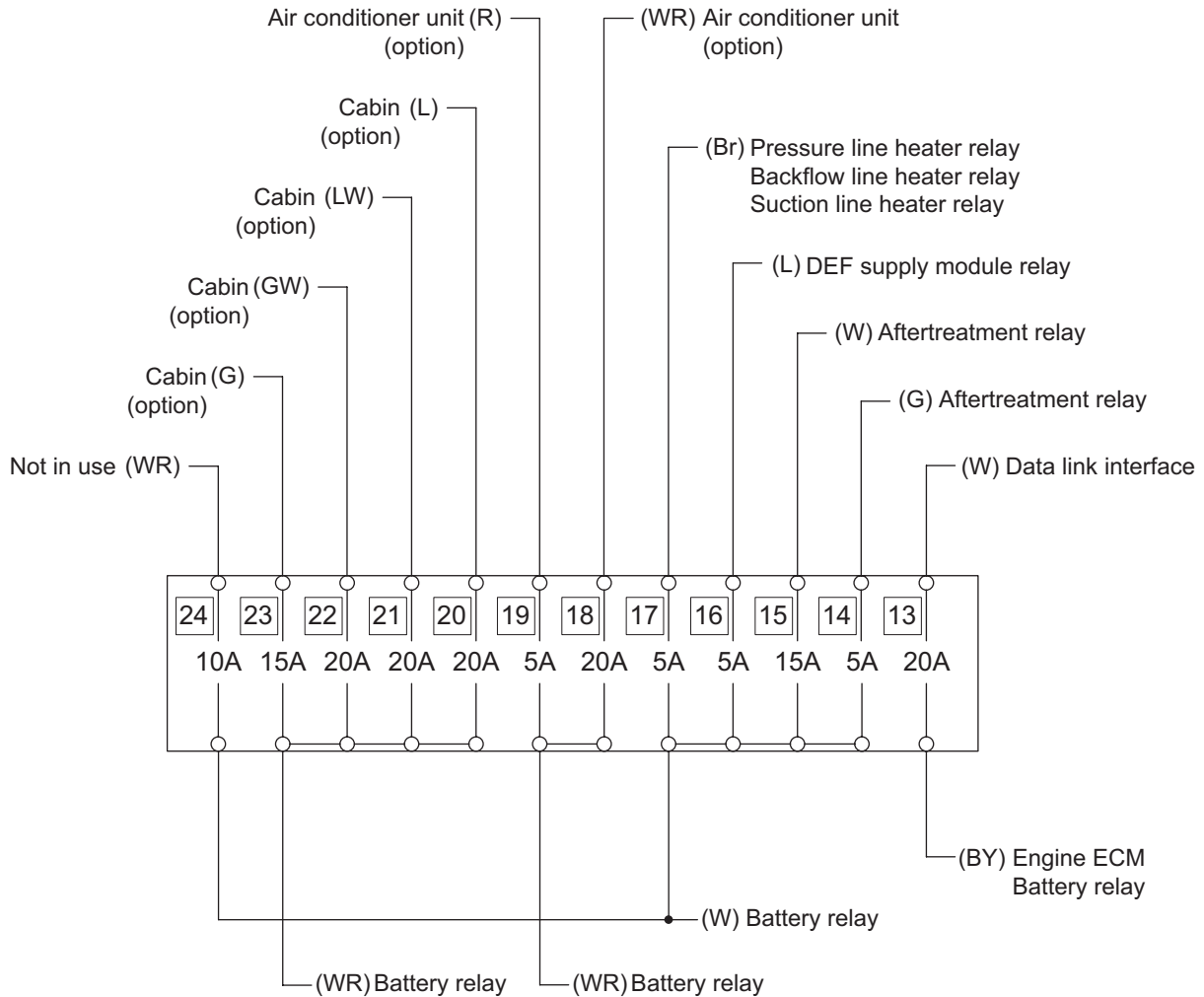
· For the relay box, refer to "4-2. Fuse · Relay Harness" (P.5-015).

SW884-05001

**Harness color codes**

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

5-6. Fuse Box (2)



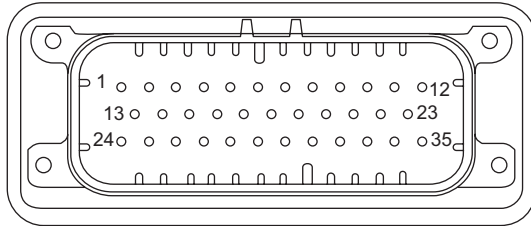
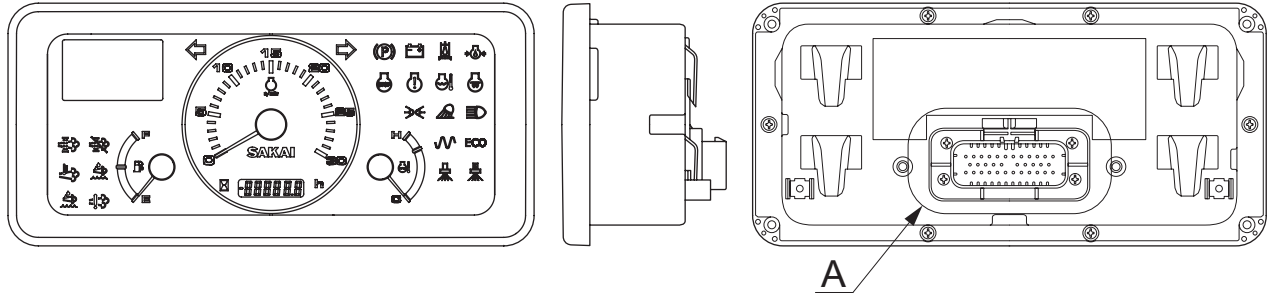
· For the relay box, refer to "4-2. Fuse · Relay Harness" (P.5-015).

SW884-05006

Harness color codes

- |            |                          |
|------------|--------------------------|
| W : White  | BY : Black/Yellow stripe |
| R : Red    | WR : White/Red stripe    |
| G : Green  | GW : Green/White stripe  |
| Br : Brown | LW : Blue/White stripe   |
| L : Blue   |                          |

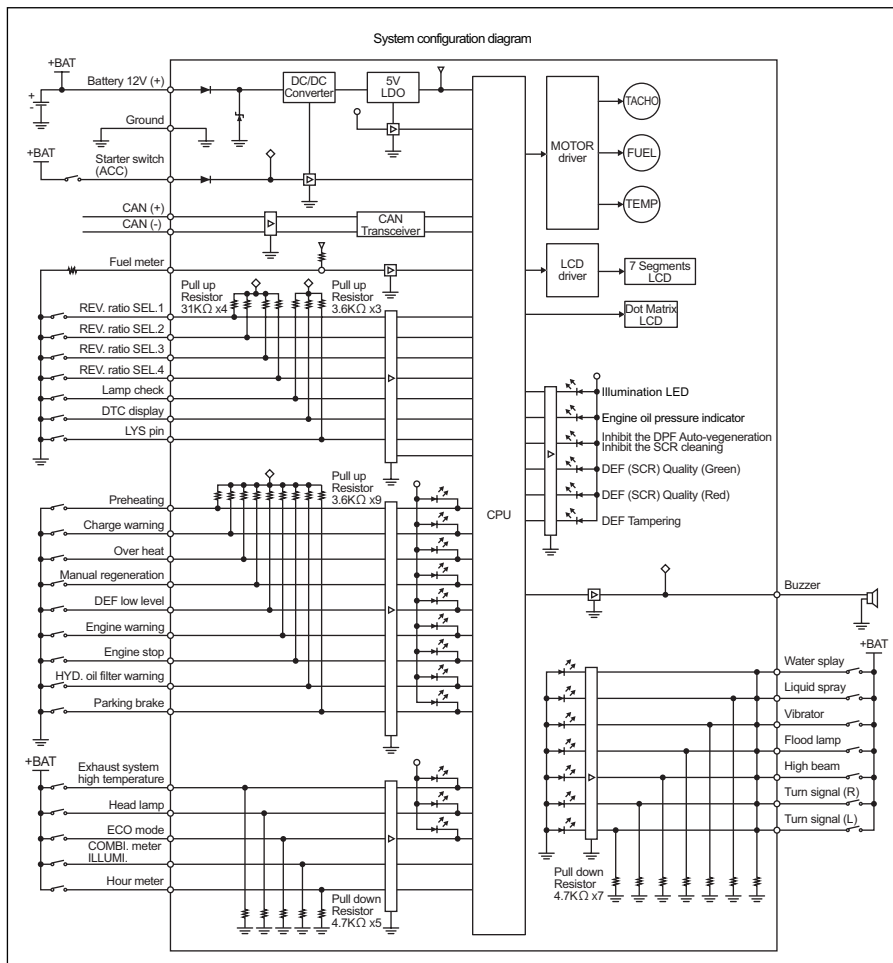
### 5-7. Combination Meter



12	186	185	47	*	*	*	*	*	*	X	64	155
	L	G	LgB	*	*	*	*	*	*	B	LgW	R
23	*	64	196	*	*	21	*	23	47	18	2	13
	*	LgW	BrY	*	*	YB	*	GB	LgB	L	RW	*
35	53	*	*	*	*	2	*	*	148	5	28	*
	G	*	*	*	*	RW	*	*	YL	RL	GB	*

Harness side  
(P.5-011)

### DETAIL A



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

