BAD BOY TRACTORS

40 SERIES TRACTOR

4035CH, 4035H, 4025H
SERVICE MANUAL

Before ordering parts please check for the latest Parts Manual update on the Tractor tab of the Bad Boy Mowers Dealer Zone.

Revised: 3/5/21

PREFACE

This manual is to provide servicing personnel with extensive information on the structure, service procedure, removal and installation procedure, disassembly, troubleshooting and more for the **4025H/4035H/4035CH TRACTOR** with high-end technology to ensure precise and rapid service.

Most accidents are resulted from negligence in safety precautions and directions, so it is very necessary to follow such precautions and directions to avoid any safety accident beforehand. Service technicians should provide quality service to prevent any safety accident and enhance customer satisfaction so they should fully understand the service procedure, methods, inspection points and safety precautions for accurate service.

To ensure optimum condition of your tractor, it is highly recommended to use only **BBT** genuine parts which are manufactured under strict quality assurance policy for premium quality, durability and reliability. **BBT** is always committed to provide best quality products through extensive research, study and development.

Information in this manual is subject to change without notice for improvement of the product.

Please keep this manual in a safe place. If there is any typo, incorrect information or question about this manual, feel free to contact **BBT**.

(Oct. 2020)

BAD BOY TRACTORS Co. Ltd.

※ Remark

- **This manual does not contain all accidents and preventive measures that can occur during service. Make sure to have this tractor serviced only by professional technicians with care.**
- **Use only genuine parts, including engine oil and transmission fluid, specified in this manual. Otherwise, it can affect the tractor's performance seriously.**
- **Never attempt to duplicate contents and figures in this manual without prior approval by BBT.**

MEANINGS OF SAFETY SYMBOLS

Precautions and instructions described in this manual and safety decals, such as DANGER, WARNING and CAUTION decals, are important for you and your machine's safety. If these instructions are not followed, you and the vehicle can be severely injured and damaged. Read such precautions and instructions carefully for your safety.

If any DANGER, WARNING or CAUTION decal is damaged or missing, order it from your dealer and have it attached to the original position.

Important safety instructions are described with various symbols throughout this manual. Make sure to follow such instructions. Their design and meanings are as follows:

DANGER	**This symbol indicates potentially hazardous situation which, if not observed, may result in death or moderate injury.**
WARNING	**This symbol indicates the most serious hazardous situation which, if not observed, may result in death or serious injury.**
CAUTION	**This symbol indicates potentially hazardous situation which, if not observed, may result in minor or moderate injury. Also, this can be used as a warning for an unstable action.**
IMPORTANT	**This symbol indicates important procedures or information to perform work with more ease and skills.**
Notes	**This symbol indicates information useful to users.**

HOW TO USE THIS MANUAL

1. Target readers

This manual is intended for technicians with mid to high level of service knowledge and skills for **BAD BOY TRACTORS**. Make sure to understand this manual fully for rapid and accurate inspection and service.

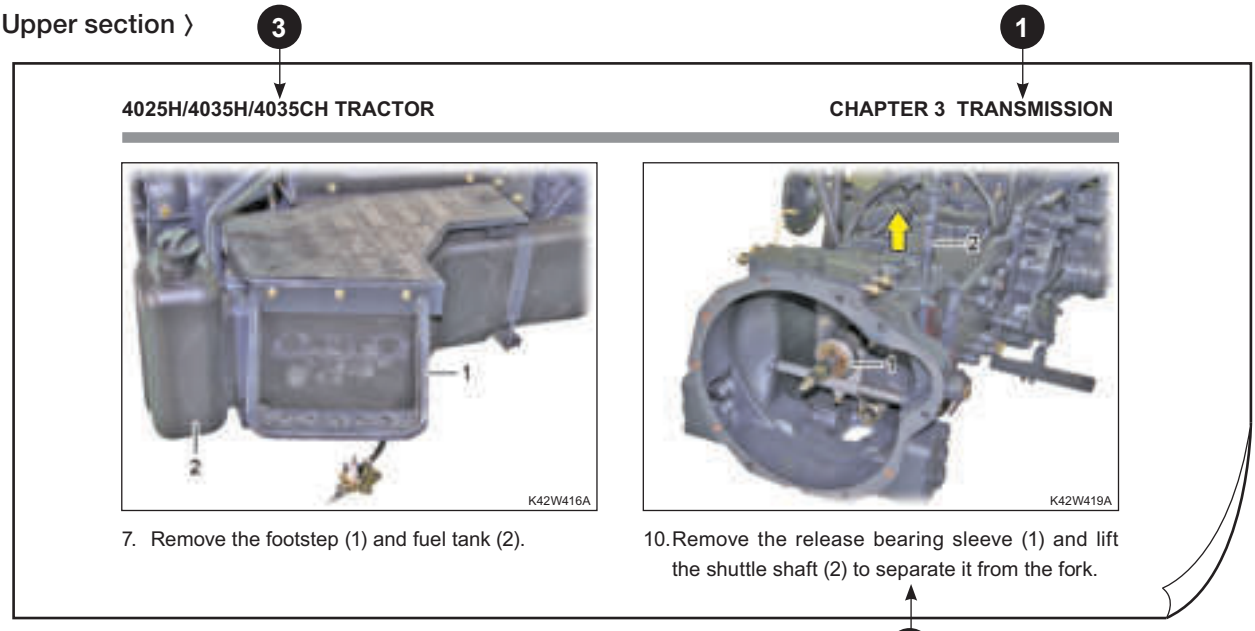
2. Order of contents

This manual is a single book for the **4025H/4035H/4035CH TRACTOR** and contains several useful chapters such as General Information, Engine, Clutch, Transmission, Front Axle, Hydraulic System, Electric System. Information and diagrams in this manual are described based on the standard model so they may be different from your vehicle due to different specifications by models. However, the same instructions should be followed for service.

3. Body structure of this manual

This manual is structured as follows:

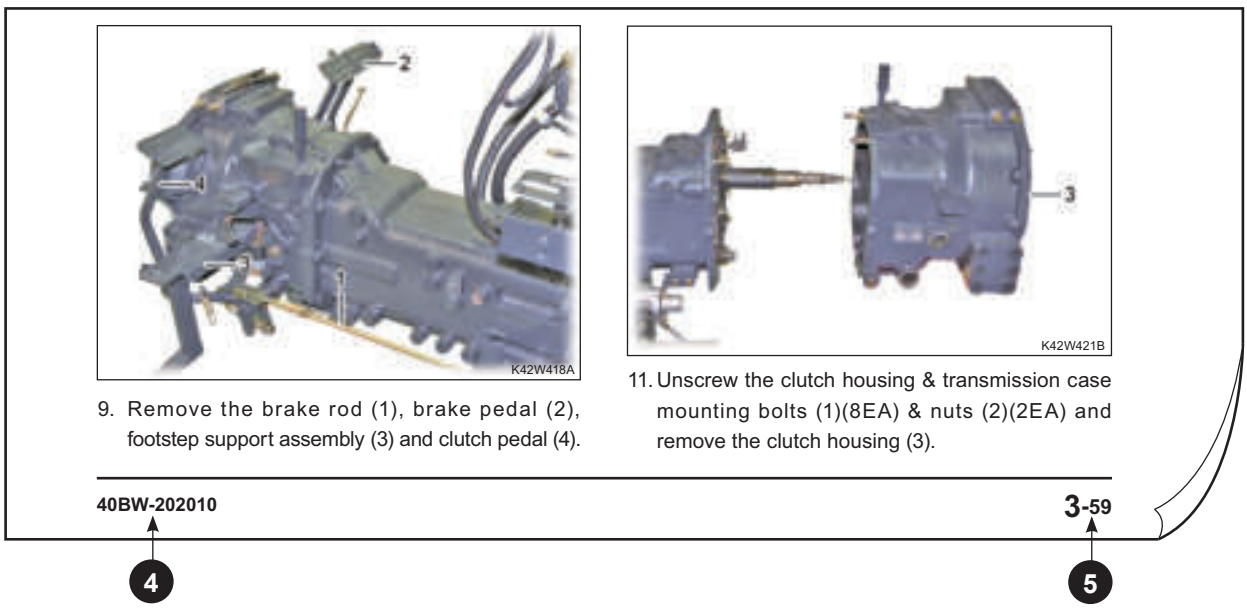
〈 Upper section 〉



7. Remove the footstep (1) and fuel tank (2).

10. Remove the release bearing sleeve (1) and lift the shuttle shaft (2) to separate it from the fork.

〈 Lower section 〉



9. Remove the brake rod (1), brake pedal (2), footstep support assembly (3) and clutch pedal (4).

11. Unscrew the clutch housing & transmission case mounting bolts (1)(8EA) & nuts (2)(2EA) and remove the clutch housing (3).

HOW TO USE THIS MANUAL

① **Chapter**

This indicates the current chapter.

② **Body**

Generally, figures and diagrams are placed in the upper section of a page while information and description are set in the lower section. However, a large table or diagram may take a whole page. Each figure is assigned with a figure number and a large figure may be set in a A3-size page like a circuit diagram.

③ **Model name**

This indicates the corresponding model.

④ **Publication classification**

This indicates the publication category and date of this manual.

⑤ **Page number**

Each page is given with the corresponding number:

Example: 3-59

4. Other information

The component names used in this manual are set to reflect their functions so they may not be consistent with the ones in other materials, such as the part list and user's manual, labels and decals.

Also, as the figures and diagrams in this manual are based on the product at the time of its publication, so they may differ from your actual product. The specification and other information in this manual are subject to change without notice for design change or improvement of the product.

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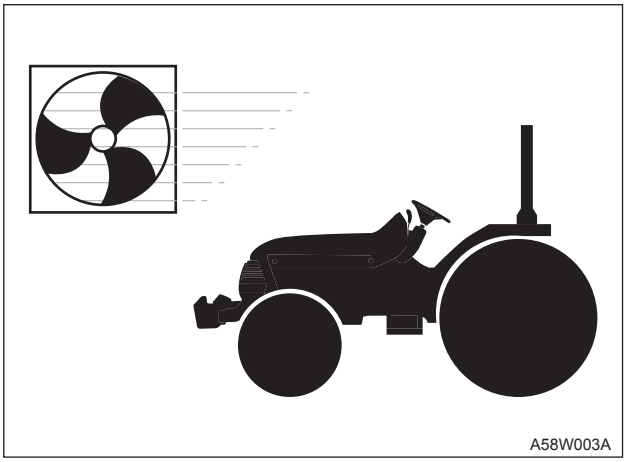
1. GENERAL INFORMATION FOR SERVICE

1.1 FOR SAFE OPERATION

1.1.1 WORK PLACE


A58W003A

⚠ DANGER

Sufficient ventilation:

- **When grinding or sanding a painted surface or working near the exhaust gas pipe, the work area should be sufficiently ventilated to avoid inhalation of hazardous gas and particles. [Otherwise] the battery can explode, resulting in a burn.**

[Otherwise] You can inhale toxic gas, leading to an injury.

⚠ CAUTION

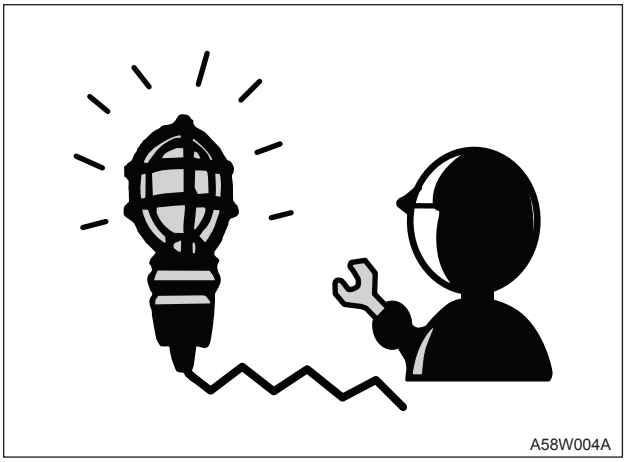
Sufficient working area:

- **To prevent an injury, secure a sufficient working area for service.**

  [Otherwise] it can lead to rollover.

⚠ CAUTION

- **Have your work place neat and clean.**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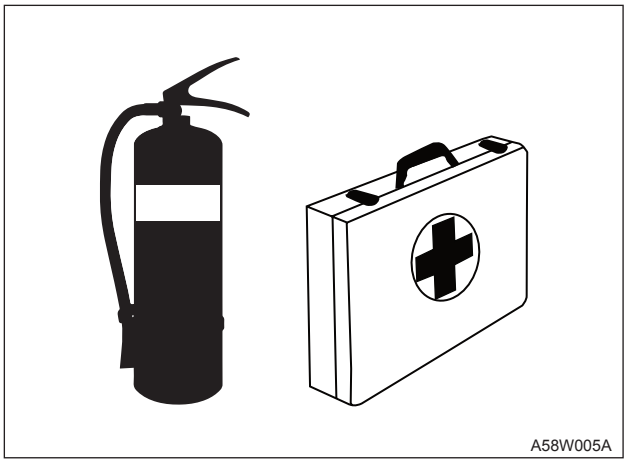
⚠ CAUTION

- **The work place should be properly illuminated.**

When working in or under the machine, make sure to have a protected lighting equipment.

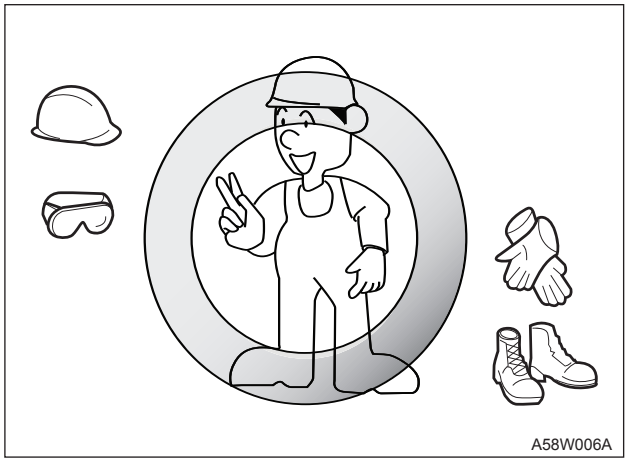

A58W005A

⚠ CAUTION

- **Have a fire extinguishing system ready in your work place.**

Have a fire extinguisher in your work place.

1.1.2 WORKING CLOTHES AND OTHER SAFETY GEARS

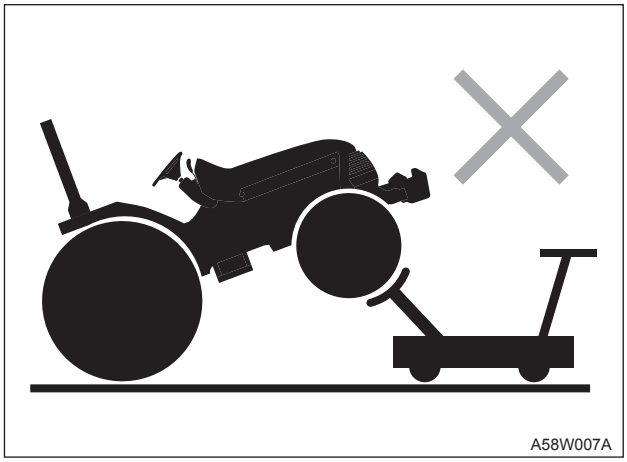


⚠ CAUTION

- **Wear proper working clothes to ensure your safety.**

Make sure to wear working clothes, safety hat, safety gloves, safety goggles and other safety gears for your safety.

1.1.3 TOOL

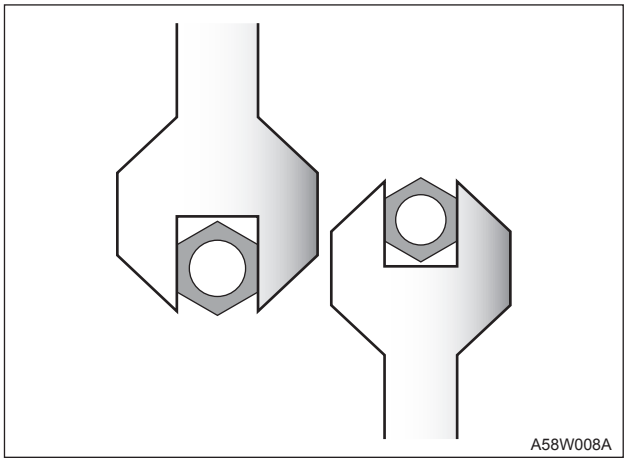


⚠ DANGER

- **Have a proper support and lifting equipment ready always.**

Never work on the tractor only with a wood support or other type of block or jack.

Do not use any lift or crane with insufficient rated load capacity.



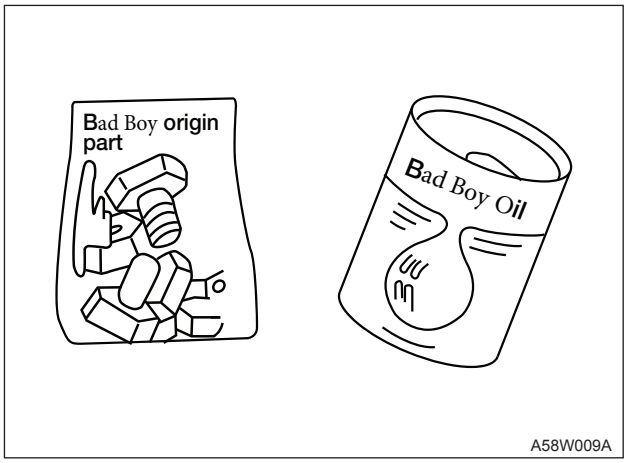
⚠ WARNING

- **Use a proper tool.**

Use the specified tools for disassembly and assembly.

[If working on the machine without sufficient knowledge or skills], it can lead to an injury or damage to equipments and parts.

1.1.4 STANDARD PARTS, LUBRICANT, GREASE AND OIL



A58W009A

⚠ CAUTION

Use only the specified standard parts.

[Otherwise] It can shorten the service life and cause an unexpected problem to the vehicle.

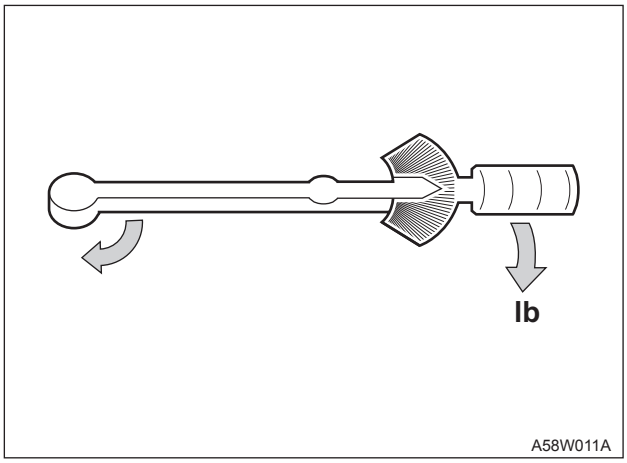
1.1.5 FINISHING UP AND CHECKING

A58W010A

⚠ CAUTION

- **Before delivering the machine to your customer, make sure to inspect it according to the inspection list.**

1.1.6 TORQUE PART



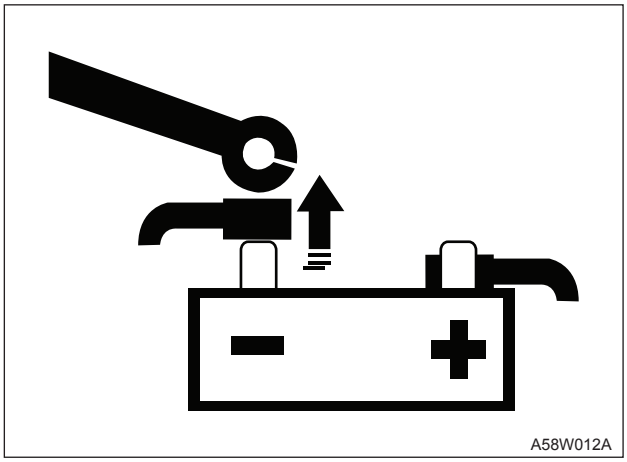
A58W011A

⚠ WARNING

Follow the torque specified in this manual.

[Otherwise] It can cause a serious accident.

1.1.7 ELECTRIC SYSTEM


A58W012A

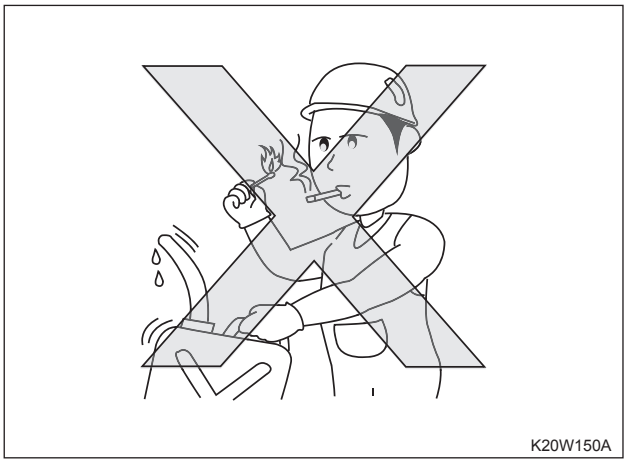
⚠ WARNING

Shorted line:

- **To prevent the battery from discharging, disconnect the negative battery cable during inspecting the electric system.**

[Otherwise] It can cause a serious accident.

1.1.8 SAFETY DURING SERVICE



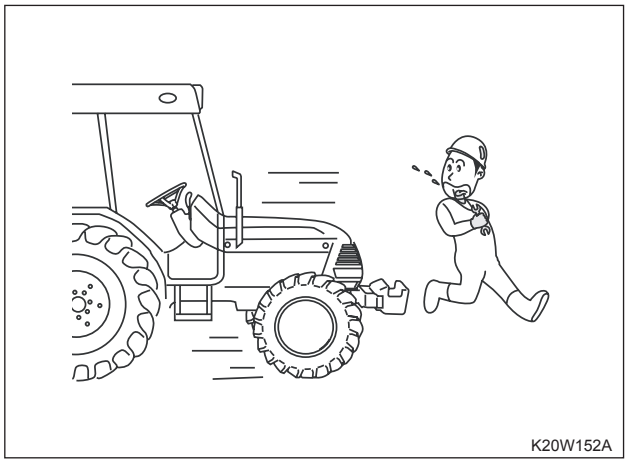
K20W150A

⚠ WARNING

Keep flammables away during fueling

- **Keep flammables, such as a cigarette, match and lighter, away from the vehicle during fueling.**

[Otherwise] it can cause a fire, leading to a burn.



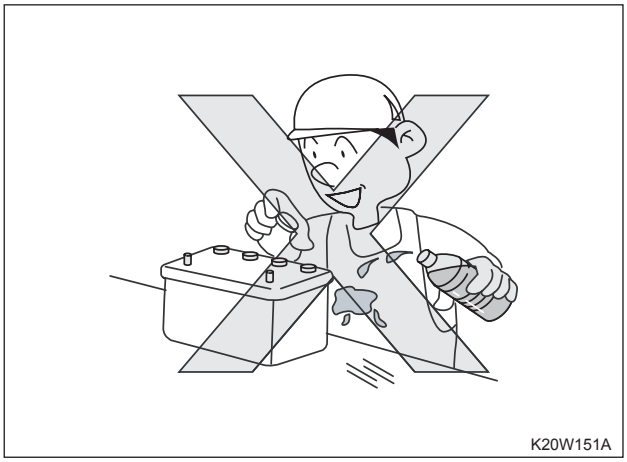
K20W152A

⚠ CAUTION

Stop the engine during inspection and service

- **Make sure to stop the engine during inspection, service, repair or cleaning.**

[Otherwise] it can lead to an injury or accident.



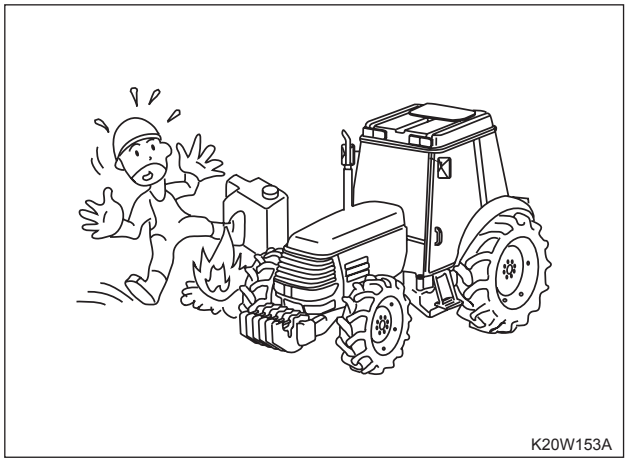
K20W151A

⚠ DANGER

Do not allow the battery fluid to contact your skin.

- **If battery fluid is on your skin or clothing, rinse it with water immediately.**

[Otherwise] you can get burnt or clothing can be damaged.



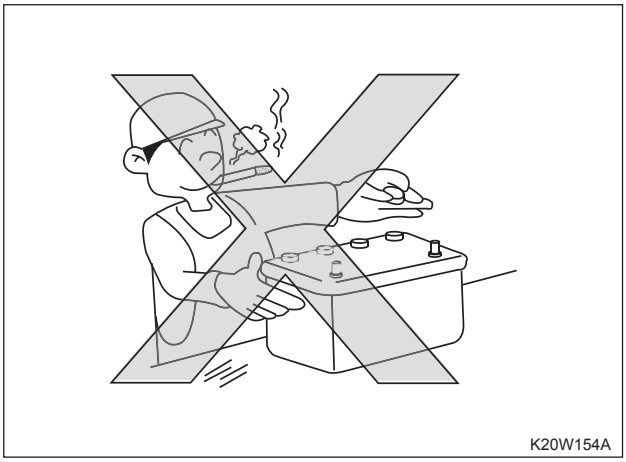
K20W153A

⚠ DANGER

Add fuel or oil only after the engine is sufficiently cooled down.

- **Never add fuel or oil while the engine is running or hot.**

[Otherwise] Hot fuel or oil can cause a fire.


K20W154A

DANGER

Keep flammables away during battery inspection

- **Keep flammables away from the vehicle while checking and charging the battery.**

[Otherwise] the battery can explode, resulting in a burn.


K20W155A

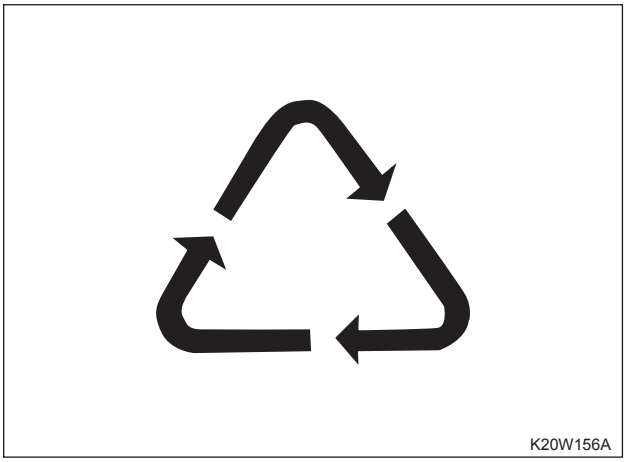
CAUTION

Follow the correct procedures for battery connection and disconnection.

- **When connecting the battery, connect its positive cable first. When disconnecting it, disconnect its negative cable first.**

[Otherwise] it can cause a short circuit, leading to burn, fire or electric shock injury.

1.1.9 WASTE DISPOSAL


K20W156A

WARNING

If waste is not disposed properly, it can pollute the environment and destroy the ecosystem. Make sure to dispose waste according to the applicable law.

- **When draining fuel or oil, store it in a proper container and put a label on it to prevent anyone from accidentally drinking it.**
- **When fueling or draining oil, be careful not to spill it around to prevent soil or water pollution.**
- **There are various types of hazard waste produced from the tractor, including fuel, coolant, brake fluid, oil, filter, battery and etc.**
- **Have harmful waste disposed by a specialized refuse disposal company according to the applicable law and regulations.**

2. LOCATION OF DECALS

To ensure safe work, check the location of the safety decals and always keep the safety precautions.

Keep the safety decals intact. If any decals is damaged or missing, attach a new decal.

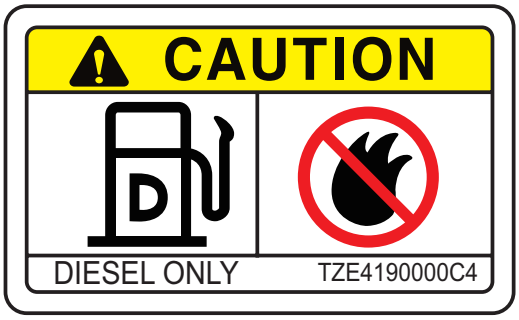
ROPS MODEL

(1) No.: TA00036924A

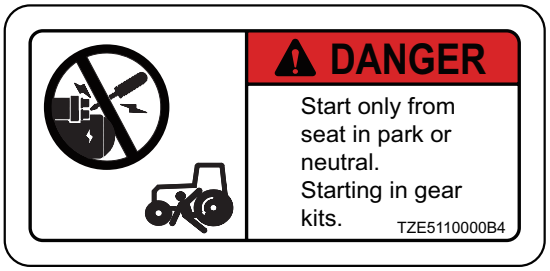
(2) No.: TZE5130000C4

(3) No.: TZE5180000C4

(5) No.: TZE4190000C4



(6) No.: TZE5110000B4



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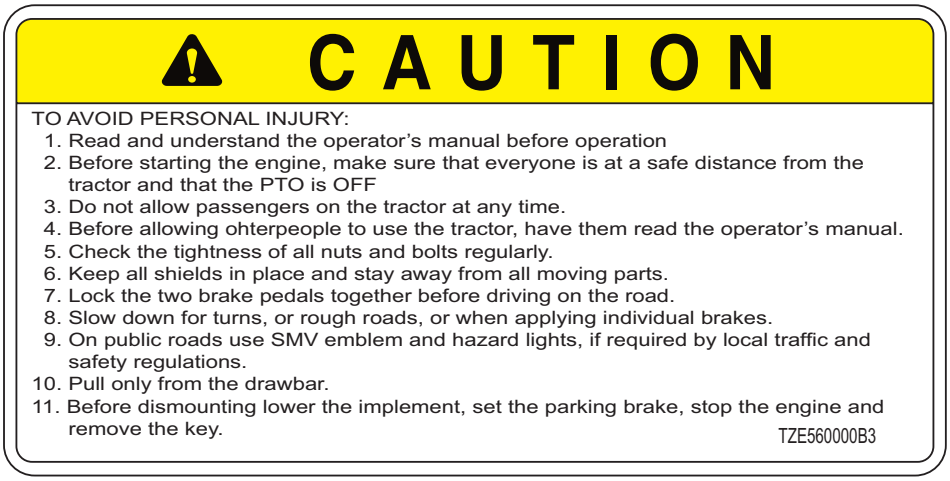
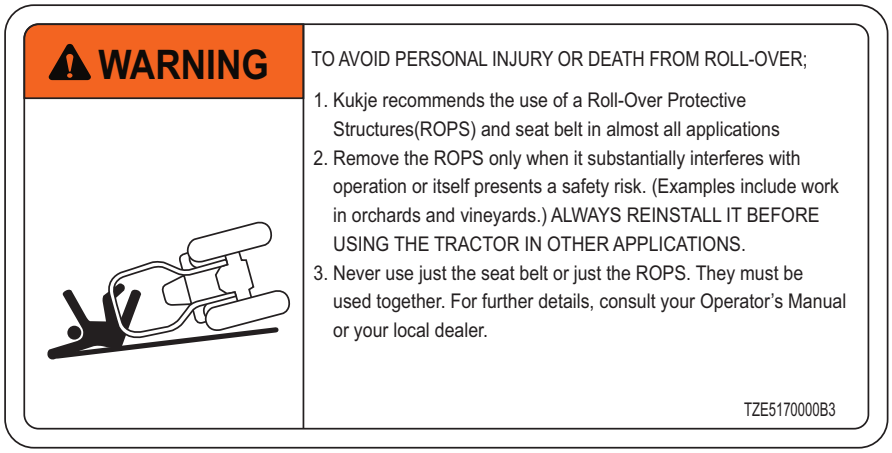
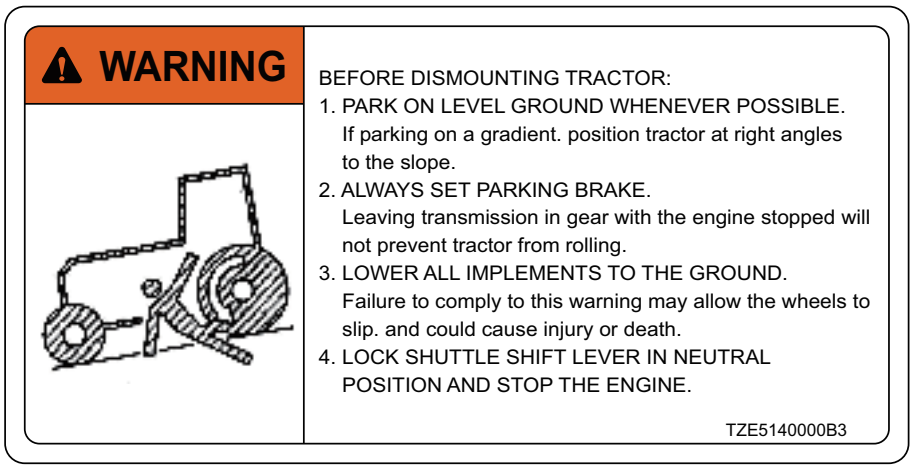


(8) No.: TZE5170000B3

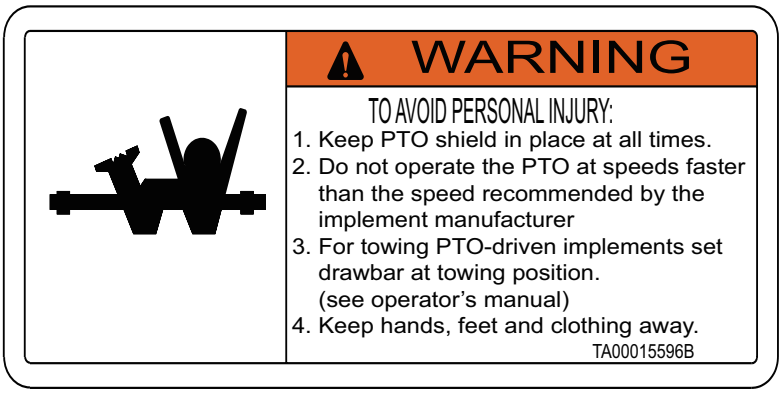


(9) No.: TZE5140000B3



(10) No.: TZE5120000B4

(11) No.: TA00015596B



(13) No.: TZE5770000B3

CAUTION

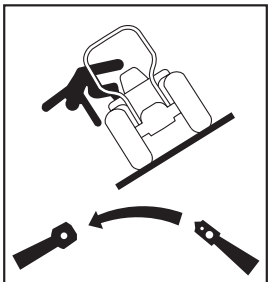
TO AVOID PERSONAL INJURY(OPERATING ON SLOPES)

1. If descending a slope, never disengage the clutch or shift levers to neutral.
   Doing so could cause the tractor to speed up out of control.
2. Slow down for slopes, especially when transporting heavy, rear mounted equipment.
3. Before descending a slope, shift to a gear low enough to control speed without using brakes.

TZE5770000B3

(14) No.: NTE5150000C4

WARNING



Use seat belt

NTE5150000C4

(15) No.: NTE5210000C4

WARNING

DEATH OR INJURY MAY RESULT IF THE TRACTOR ROLLS OVER WITH THE ROPS IN THE FOLDED DOWN POSITION.

OPERATE THIS TRACTOR WITH THE ROPS FOLDED DOWN ONLY WHEN NECESSARY.

NTE5210000C4

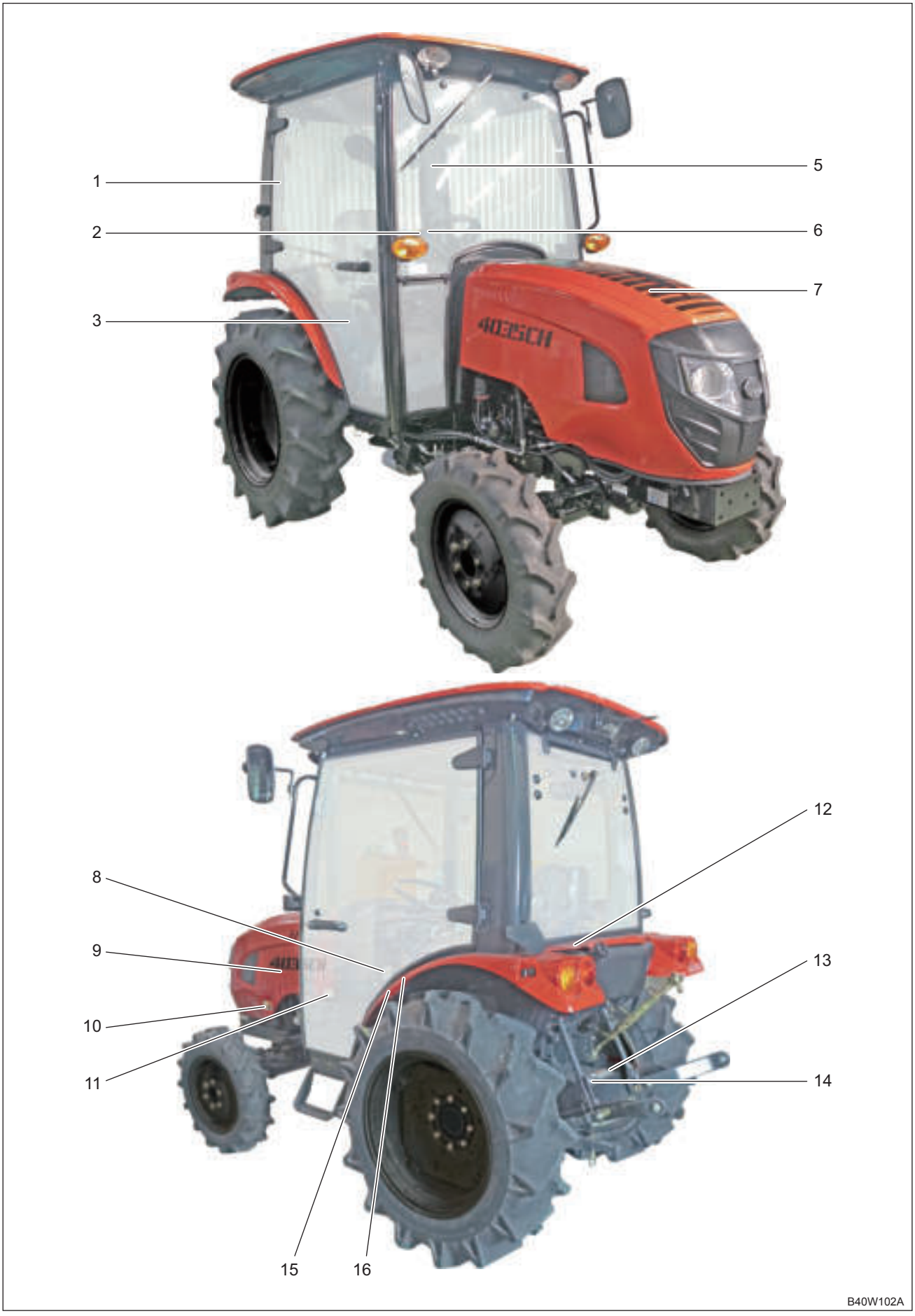
(16) No.: NTE5220000C4

WARNING

This structure's protective capability may be impaired by structural damage, overturn, or alteration.
If any of these conditions occur, the structure must be replaced.

NTE5220000C4

CABIN MODEL



(1) No.: TA00028501A

CAUTION

○ Work in ventilated area.
Do not work long hours air conditioner, because it make exhaust air. if you don't have an air cleaner, open the door and get outside air into the area.

WARNING

Before operating this machine please read the operators manual so that you fully understand how to operate this machine. Always check the oil, coolant, and fuel levels before operating this unit.

Starting
1. Do not use a screwdriver or any other tool to jump the starter as a means of cranking this unit.
2. The operator should only start this unit from the operators station. Starting this unit anywhere other than the operator's platform can cause serious injury.
3. When starting this unit it is critical to ensure that main shift lever, range shift lever, and pto shift lever are all in the neutral position.
4. While operating this unit always ensure that safety devices are being used correctly. For example always wear your seat belt and ensure that the pto cover is installed.
5. Never start this unit while others are close by. Only crank and operate this unit once others are at a safe distance. This includes starting, operating implements, operating a loader, or using a backhoe.
6. After starting this unit allow the tractor to idle five minutes with the pto lever and the shift lever in the neutral position.
7. In cold weather allow the glow plugs to cycle through one time before trying to start this unit.

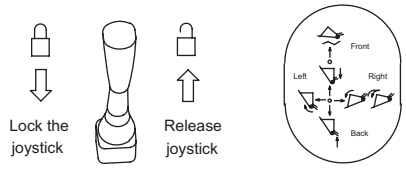
Driving
1. When turning on a slope or uneven surface please reduce your speed.
2. When traveling downhill please shift into low range before you begin moving.
3. Do not operate this unit in narrow or unsafe places; the potential for roll over could exist in these conditions.
4. When climbing a steep slope, always do so in reverse.
5. While driving the tractor make sure that the two brake pedals are latched together, and do not engage differential lock while moving.
6. The operator should be the only person on the tractor. Carrying passengers on the tractor or implement can cause serious injury.
7. Do not step on, or stand on pto cover at anytime. 8. Do not suddenly stop, turn, or jump the clutch on this unit at anytime. 9. While operating on a public road, always abide by the law.

Operating
1. Use caution in wet conditions, turning suddenly can cause the tractor to become stuck.
2. When operating this unit, always maintain a safe working distance from others.

Parking
1. When parking the tractor make sure all implements or attachments are on the ground before turning of the engine. This includes the front end loader.
2. When parking on a slope always apply the parking break and chock the tires.

Servicing
1. Before servicing this machine always turn the engine off first.
2. When checking electrical components always disconnect the negative terminal of the battery.
3. For information regarding service issues or service help please contact you local dealer.
4. Always allow time for the radiator coolant to cool and relieve pressure before removing the radiator cap.

WARNING



○ When the joystick is not being used, always put it in the locked position.

TA00028501A

(2) No.: NTE5220000C4

WARNING

This structure's protective capability may be impaired by structural damage, overturn, or alteration.
If any of these conditions occur, the structure must be replaced.

NTE5220000C4

(3) No.: TZE5770000B3

C A U T I O N

TO AVOID PERSONAL INJURY(OPERATING ON SLOPES)
1. If descending a slope, never disengage the clutch or shift levers to neutral.
Doing so could cause the tractor to speed up out of control.
2. Slow down for slopes, especially when transporting heavy, rear mounted equipment.
3. Before descending a slope, shift to a gear low enough to control speed without using brakes.

TZE5770000B3

(5) No.: TA00028504A

WARNING

Engine Oil

Before using this machine please check the engine oil level.
If low please add oil before operating this unit.
Do not mix oils. Only use oil from one manufacture at a time.

Coolant

Before using this machine please check the coolant level in the sub tank.
If the Coolant level is below the bottom line, please add additional coolant.
Only add coolant to the sub tank, do not pour directly into the radiator.
During the winter time always use anti-freeze coolant.

Fuel Filter

If water is present in the fuel bowl, drain the water immediately.Clean filter element every one hundred hours.If any defect or damage is present, please replace the filter.

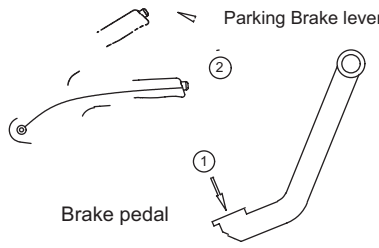
Air Cleaner

Before using this machine, please check the air filter and clean if necessary. Replace air filter every one-hundred to two-hundred hours.

Air Breather

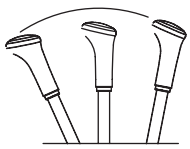
Follow instructions listed in the operator manual.

Using the Parking Brake



- When engaging or disengaging the parking brake please press the brake pedal fully before moving the parking brake lever.

WARNING



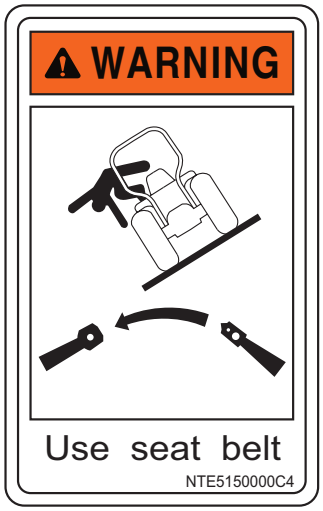
- Suddenly engaging or disengaging the shifting levers could cause sever damage to this unit and or harm to the operator.

Warning when starting on a slope

- When starting on a slope please ensure that both brake pedals are fully engaged.
  Once you have shifted the unit it gear, slowly release the brakes as the tractor begins to move in the forward position

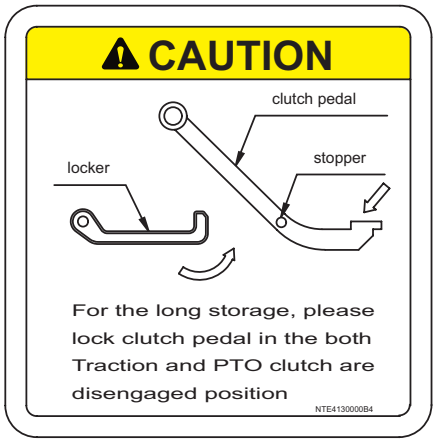
TA00028504A

(6) No.: NTE5150000C4



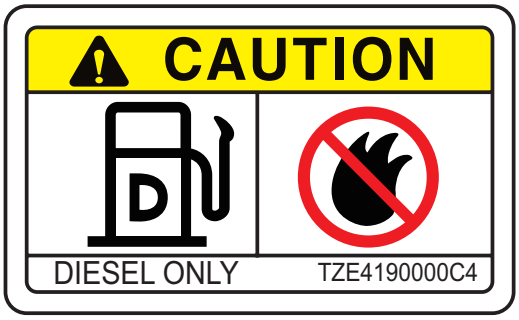
(7) No.: TZE5180000C4

(8) No.: NTE4130000B4

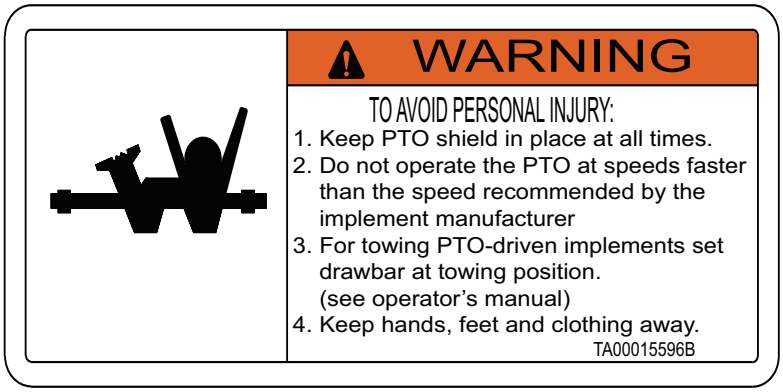


(9) No.: TZE5130000C4

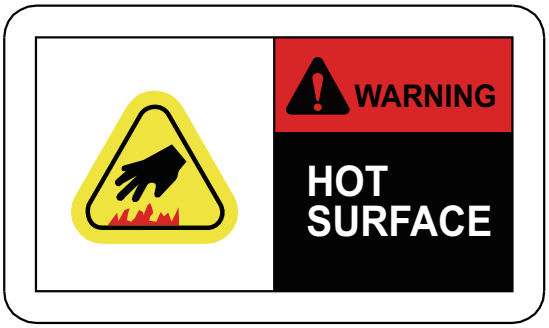
(12) No.: TZE4190000C4



(13) No.: TA00015596B

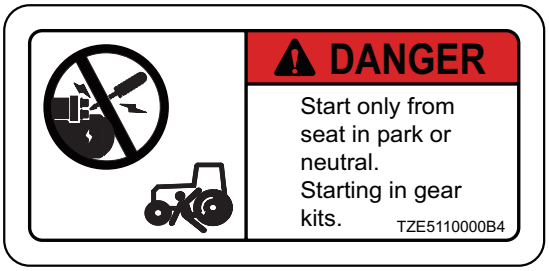


(10) No.: TA00036924A



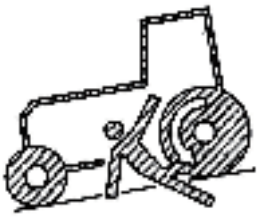
(14) No.: TZE5120000B4

(11) No.: TZE5110000B4



(15) No.: TZE5140000B3

⚠ WARNING



BEFORE DISMOUNTING TRACTOR:
1. PARK ON LEVEL GROUND WHENEVER POSSIBLE.
   If parking on a gradient. position tractor at right angles to the slope.
2. ALWAYS SET PARKING BRAKE.
   Leaving transmission in gear with the engine stopped will not prevent tractor from rolling.
3. LOWER ALL IMPLEMENTS TO THE GROUND.
   Failure to comply to this warning may allow the wheels to slip. and could cause injury or death.
4. LOCK SHUTTLE SHIFT LEVER IN NEUTRAL POSITION AND STOP THE ENGINE.

TZE5140000B3

(16.) No.: TZE5160000B3

⚠ C A U T I O N

TO AVOID PERSONAL INJURY:
1. Read and understand the operator's manual before operation
2. Before starting the engine, make sure that everyone is at a safe distance from the tractor and that the PTO is OFF
3. Do not allow passengers on the tractor at any time.
4. Before allowing ohterpeople to use the tractor, have them read the operator's manual.
5. Check the tightness of all nuts and bolts regularly.
6. Keep all shields in place and stay away from all moving parts.
7. Lock the two brake pedals together before driving on the road.
8. Slow down for turns, or rough roads, or when applying individual brakes.
9. On public roads use SMV emblem and hazard lights, if required by local traffic and safety regulations.
10. Pull only from the drawbar.
11. Before dismounting lower the implement, set the parking brake, stop the engine and remove the key.

TZE560000B3

3. GENERAL INFORMATION FOR MAINTENANCE

3.1 TIGHTENING TORQUE

3.1.1 HEX. BOLT

Unit: N.m (kgf.m) [lbf.ft]

ITEM	NO GRADE OR 4 T	7T	9 T	8.8 T	10.9 T	12.9 T
M6	8.8 (0.9) [6.4]	11 (1.1) [8.1]	-	9 (0.9) [5]	13 (1.3) [10]	14 (1.4) [9]
M8	20 (2.0) [14.7]	25 (2.6) [18.4]	14 (1.4) [10.3]	23 (2.3) [17]	33 (3.3) [25]	40 (2.9) [29]
M10	42 (4.3) [30.9]	52 (5.3) [38.3]	28 (2.9) [20.6]	45 (4.5) [33]	65 (6.5) [50]	70 (7.0) [50]
M12	68 (6.9) [50.1]	84 (8.6) [61.9]	44 (4.5) [32.4]	80 (8.0) [60]	115 (11.5) [85]	125 (12.5) [95]
M14	120 (12) [88.5]	140 (14) [103.2]	-	125 (12.5) [90]	180 (18.0) [133]	195 (19.5) [145]
M16	180 (18) [132.2]	220 (22) [162.2]	-	195 (19.5) [140]	280 (28.0) [200]	290 (29.0) [210]
M18	260 (27) [191.7]	290 (30) [213.9]	-	280 (28.0) [200]	390 (39.0) [285]	400 (40.0) [290]
M20	360 (27) [265.5]	400 (41) [295.0]	-	400 (40.0) [290]	550 (55.0) [400]	-

3.1.2 STUD BOLT

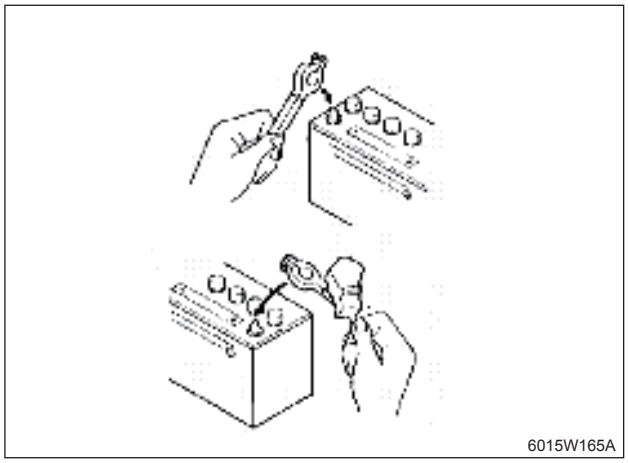
ITEM	BASE			TOLERANCE		
	N.m	kgf.m	lbf.ft	N.m	kgf.m	lbf.ft
M8	11.8 ~ 15.6	1.2 ~ 1.6	8.68 ~ 11.5	8.82 ~ 11.8	0.90 ~ 1.2	6.51 ~ 8.67
M10	24.6 ~ 31.3	2.5 ~ 3.2	18.1 ~ 23.1	19.7 ~ 25.4	2.0 ~ 2.6	14.5 ~ 18.8
M12	29.5 ~ 49.0	3.0 ~ 5.0	21.7 ~ 36.1	31.4	3.2	23.1

3.2 OIL, GREASE, FUEL AND COOLANT SPECIFICATIONS

ITEM	CAPACITY	SPECIFICATION	REMARKS
Fuel	27 ℓ (7.13 u.s. gal)	Diesel fuel (KS 2)	Summer: S, Winter: W
Engine oil	4.3 ℓ (1.14 u.s. gal)	SAE15W-40	Final Tier4 : Grade CJ or higher
Grease	Small amount	High load No. 2 of KSM 2130	Multi-purpose
Coolant	5.0 ℓ (1.32 u.s. gal)	**BBT** genuine anti-freeze	No. 2 of KSM 2142, permanent use
Transmission fluid and steering oil	37 ℓ (9.77 u.s. gal)	TF500	Texaco TDH oil, 1893 Chevron tractor hydraulic fluid
Front axle oil	6.4 ℓ (1.69 u.s. gal)	SAE 80W90	Gear oil

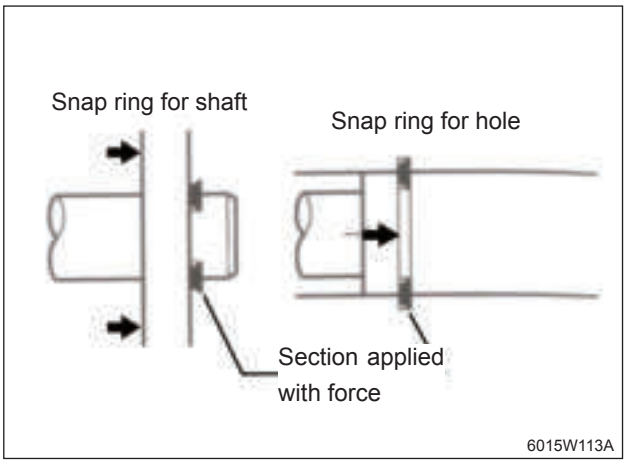
※ If the ambient temperature is below 50°F (10°C), use diesel fuel for winter season.

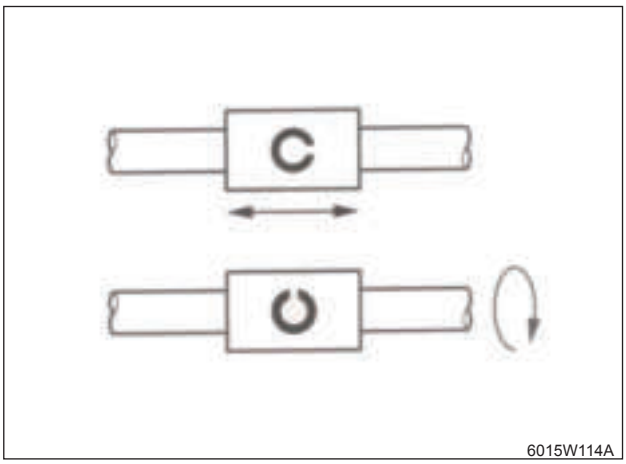
3.3 ELECTRIC DEVICE SERVICE



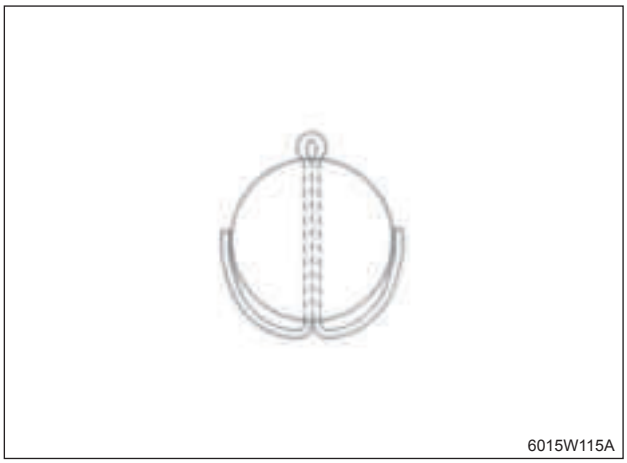
1. When disassembling or repairing any part applied with voltage, disconnect the negative battery cable first.
2. When disconnecting the battery cables, disconnect the negative cable first. When connecting them, connect the positive cable first.
3. Apply grease to the battery terminals and cover them securely after connecting the battery cables.
4. When charging the battery, it produces hydrogen gas and chlorine. Therefore, disconnect the battery and move it to an isolated well-ventilated area with no flammables and flame before charging.

3.4 USING STANDARD PART AND ADHESIVE

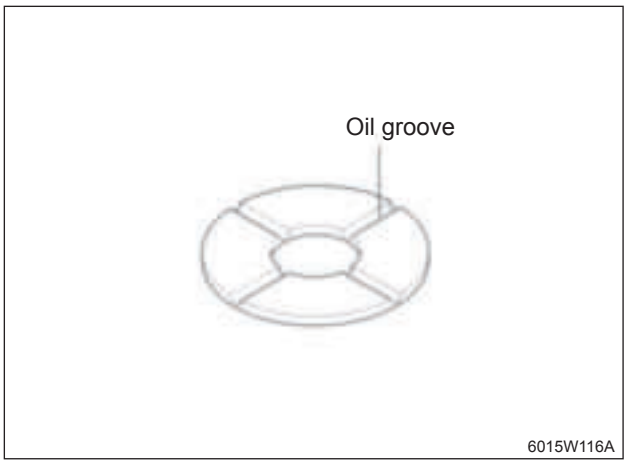




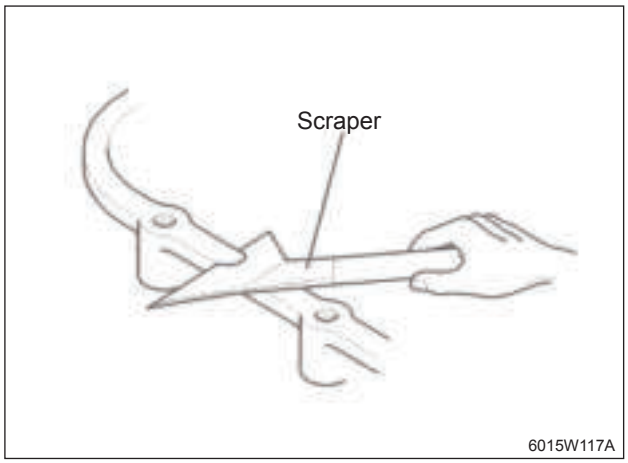
1. When replacing a worn or damaged part, use a new part that meets the international standard.
2. When replacing a packing or O-ring, fit a new one. Before installation, apply grease to the O-ring or oil seal ring.
3. When assembling a snap ring on a shaft or in a hole, ensure its sharply angled side to point the direction of force as shown in the first figure.
4. When installing a spring pin, insert its split portion in the direction to be forced as described in the second figure above.



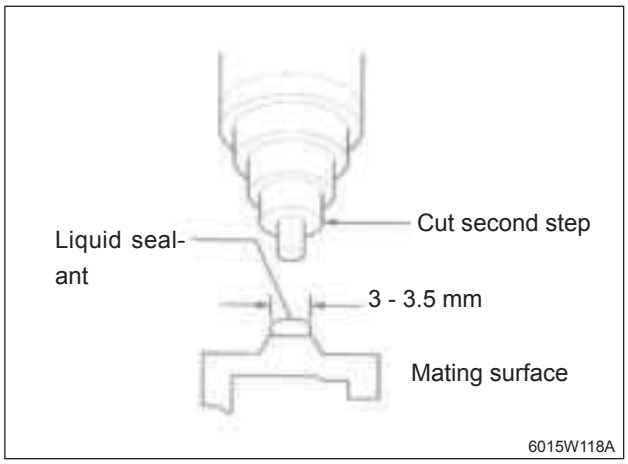
5. Replace the split pin with a new one and fix it firmly.



6. When the oil grooves are engaged with the thrust washer, be careful with assembly.



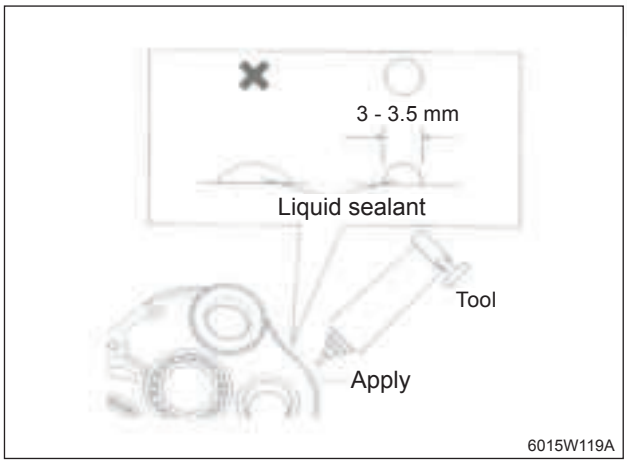
7. Use a liquid sealant removal scraper (flat) to remove any sealant left on the case. Make sure not to make any scratch bigger than 0.3 mm (0.012 in). If the surface is scratched, grind it with an oil grinder.



⚠ CAUTION

Do not use kerosene, heavy oil or diesel oil.

- **Before applying sealant: Use a proper cleaner to remove any oil and stain left on the surface. Never use gasoline.**
- **Cut the second step of the nozzle so that it can drop beads 3 to 3.5 mm wide.**
- **Fit the tube to the tool and use this tool to apply liquid sealant onto the mating surface.**



⚠ CAUTION

Spread liquid sealant. Otherwise, it can leak.

- **Apply sealant to the inner side of the attached surface.**
- **Assemble within 15 minutes after applying liquid sealant.**
- **After assembly, tighten the bolts in a diagonal order.**
- **When oiling the part, run the machine 30 minutes after oiling it.**

4. INSPECTION AND CORRESPONDING ACTION

⚠ CAUTION

- **To inspect or service the tractor, stop the engine on level ground, apply the parking brake and chock the wheels in advance.**

4.1 DAILY INSPECTION

To prevent any future problem, it is important to be aware of the condition of the tractor. Therefore, check the followings before starting the engine:

4.1.1 CHECKING WORK PLACE

- Check that the work place hasn't had any problem.

4.1.2 CHECKING CONDITION AROUND TRACTOR

- Check the tires for inflation pressure, wear and damage.
- Check for leakage.
- Check the engine oil level.
- Check the transmission fluid level.
- Check the coolant level.
- Check the condition of the seat belt.
- Check the radiator screen and grill.
- Check the bolts and nuts on the tires are firmly tightened.
- Check the license plate and SMV emblem for damage. When necessary, clean or replace them.
- Follow all the instructions in the Danger, Warning and Caution decals.
- Clean the area around the exhaust manifold and engine muffler.

4.1.3 CHECKING WHEN SEATING ON DRIVER'S SEAT

- Check the brake and clutch pedals.
- Check the parking brake.
- Check the steering wheel.

4.1.4 CHECKING WHEN TURNING IGNITION SWITCH

- Check the function of the lamps and indicators on the instrument cluster.
- Check the head lamps, tail lamps and hazard warning flasher. When necessary, clean them.
- Check the performance of the instrument cluster and gauges.

4.1.5 CHECKING WHEN STARTING ENGINE

- Check if the lamp on the easy checker is not turned off.
- Check the color of exhaust gas.
- Check that the brake operates properly.

5. GENERAL INFORMATION FOR SERVICE

5.1. MACHINE HISTORY AND INFORMATION

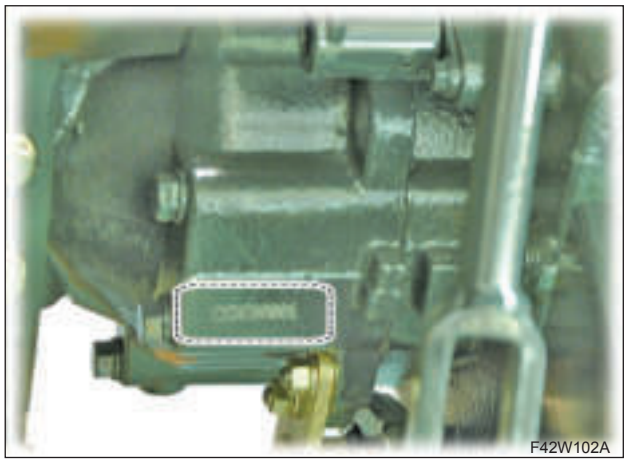
If you have any question or want to ask for service, check the operating hours, serial number, engine number and engine model of the tractor.

5.1.1 SERIAL NUMBER

Example : CSDE00001

It is specified on the serial number decal which is attached on the front right side of the front axle bracket.

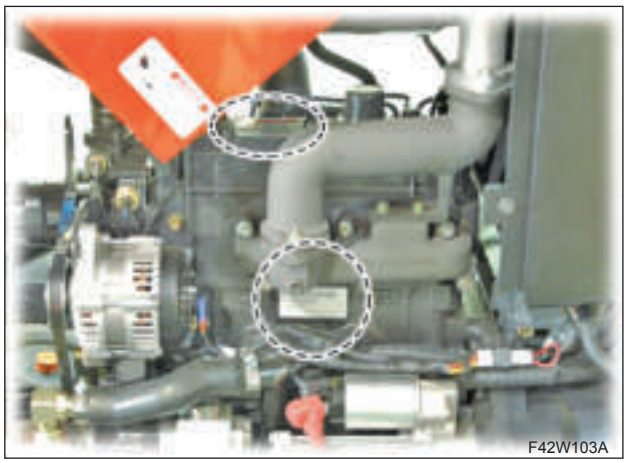
5.1.2 TRANSMISSION SERIAL NUMBER



Example : CSDE00001

It is stamped on the left side surface of the rear axle case.

5.1.3 ENGINE NUMBER



Example : TANE0002

The engine number is stamped on the cylinder block and is specified on the decal which is attached to the cylinder block on the left side of the engine. Also, the decal indicating the engine model and standards is attached on the top of the engine cylinder head cover.

5.1.4 HOURMETER

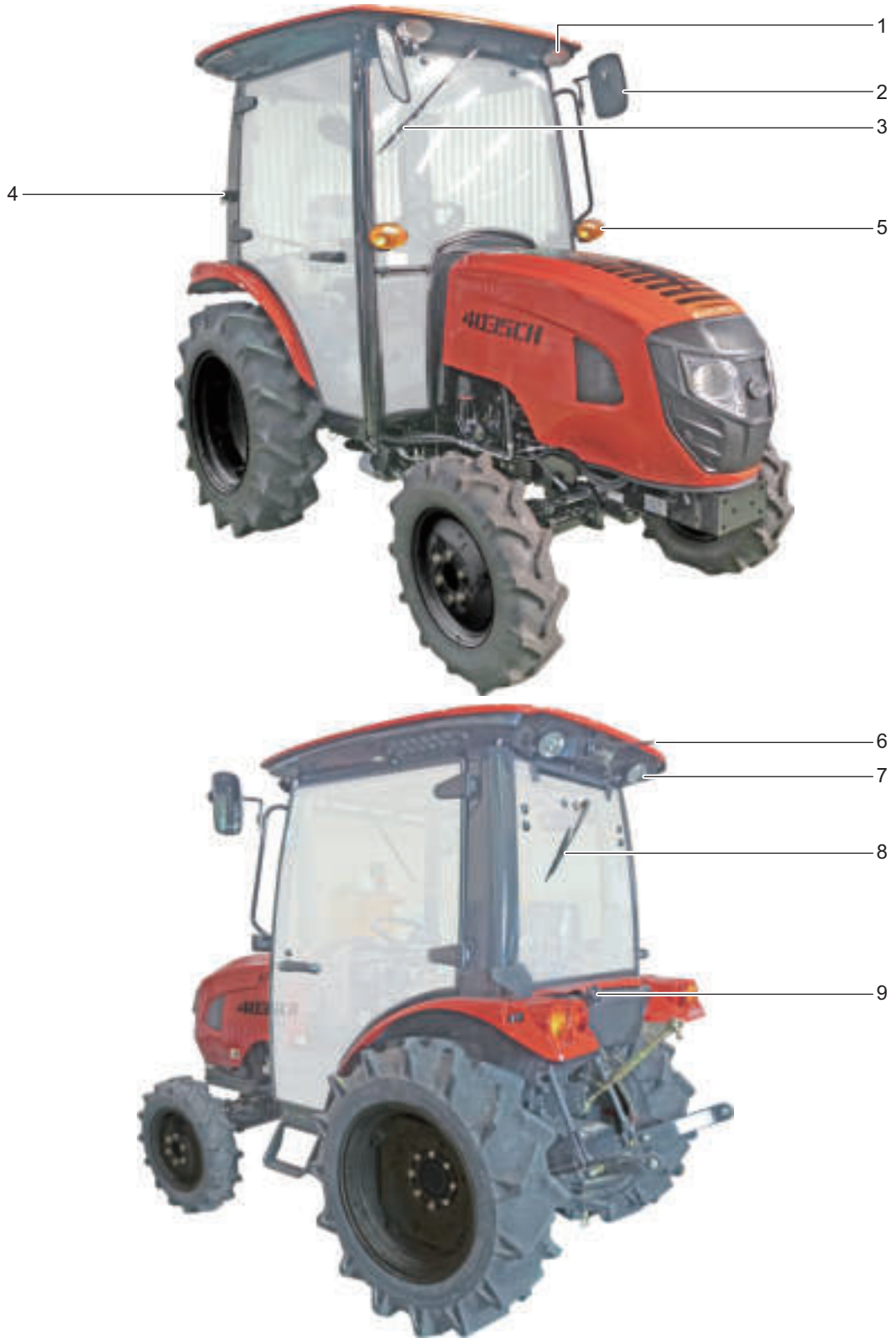
6. COMPONENTS OF TRACTOR

6.1 FRONT AND REAR EXTERIOR VIEW

ROPS MODEL

(1) Head lamp
(2) Steering wheel
(3) Side step
(4) Turn signal lamp
(5) ROPS assembly
(6) Combination lamp
(7) Top link
(8) Draw bar hitch assembly
(9) Lower link

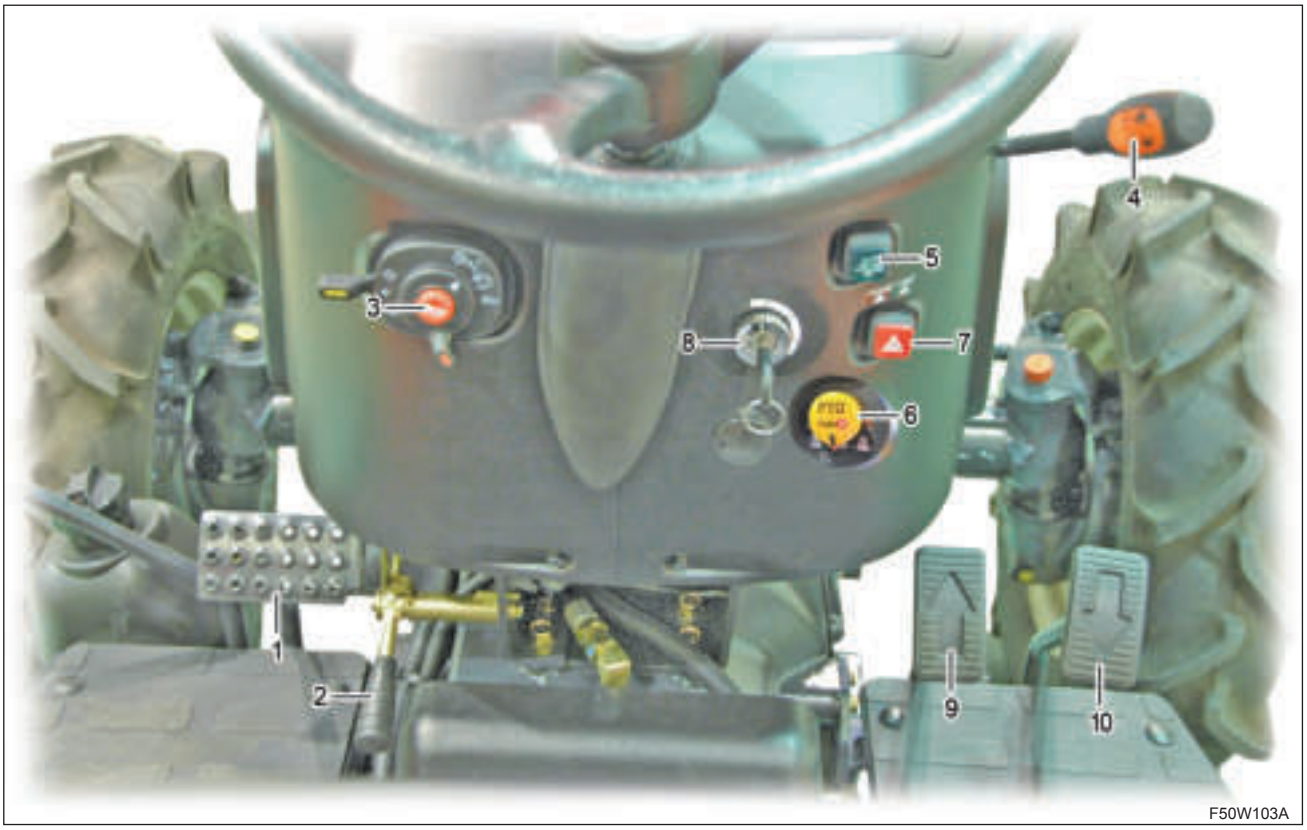
CABIN MODEL



(1) Work lamp (FR)
(2) Rear view mirror
(3) Wiper (FR)
(4) Washer fluid filler
(5) Turn signal lamp
(6) Antenna
(7) Work lamp (RR)
(8) Wiper (RR)
(9) Fuel inlet cap

6.2 INTERIOR VIEW

ROPS MODEL

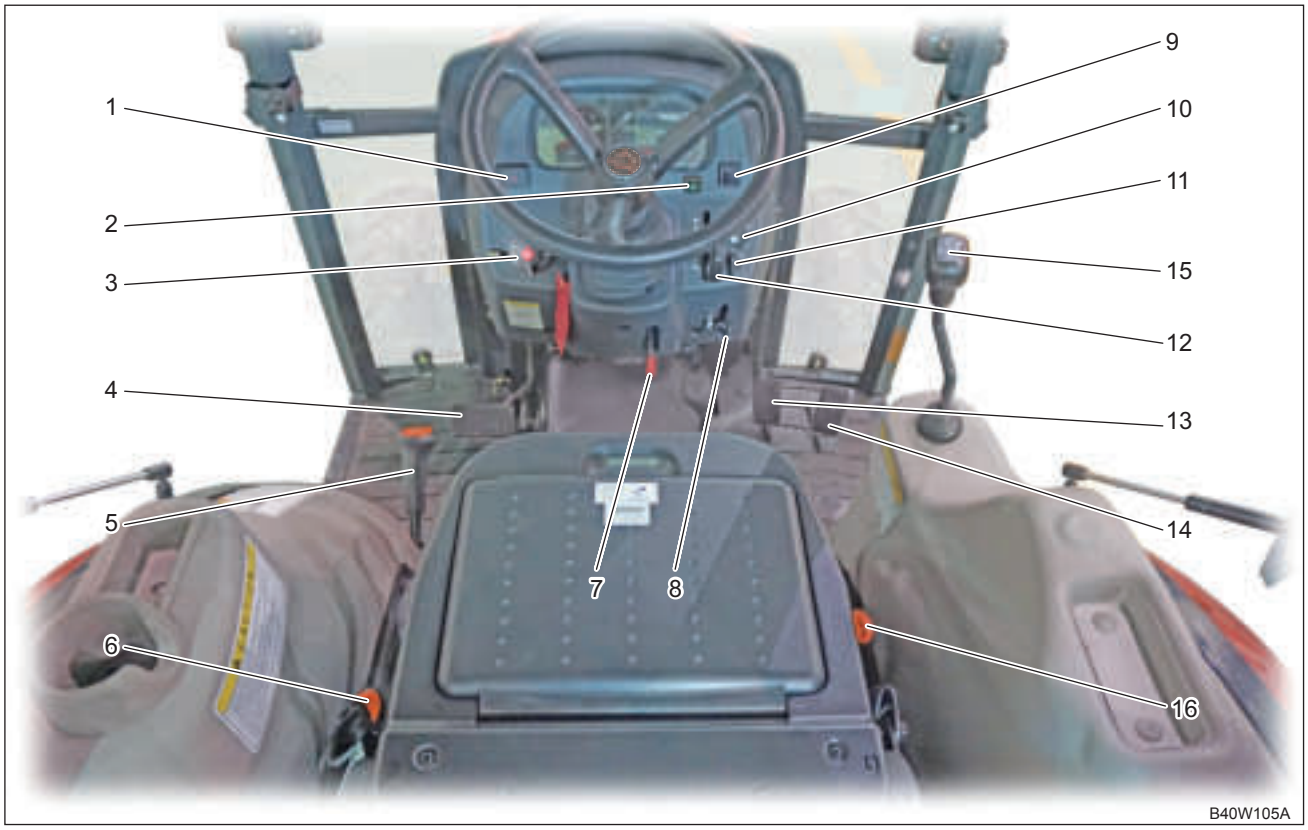


F50W103A

B40W111A

(1) Brake pedal
(2) Parking brake lever
(3) Turn signal light switch
(4) Accelerator lever
(5) Cruise switch
(6) PTO ON/OFF switch
(7) Hazard switch
(8) Key switch
(9) HST pedal (Forward)
(10) HST pedal (Reverse)
(11) Position control lever
(12) Stop valve knob
(13) 4WD lever
(14) Range gear shift lever
(15) Seat adjust lever
(16) PTO gear shift lever
(17) Differential lock pedal

CABIN MODEL

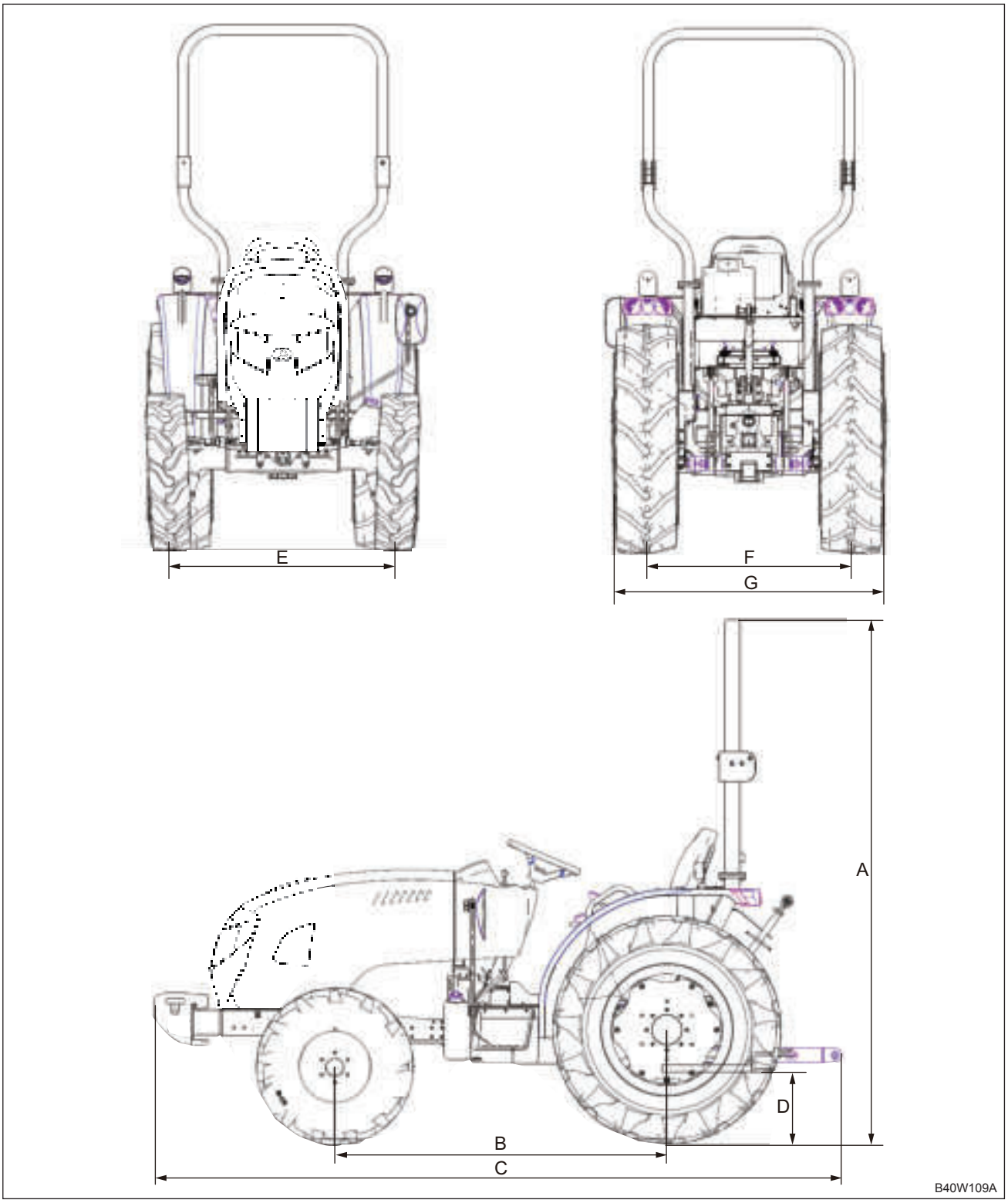


(1) Hazard switch
(2) Cruise switch
(3) Combination switch
(4) Brake pedal
(5) Range gear shift lever
(6) PTO gear shift lever
(7) Tilt lever
(8) Parking brake lever
(9) PTO switch
(10) Key switch
(11) PTO select switch
(12) Accelerator lever
(13) HST pedal (Forward)
(14) HST pedal (Reverse)
(15) Joystick lever
(16) Position control lever
(17) Differential lock pedal
(18) Stop valve knob
(19) 4WD lever

7. TRACTOR SPECIFICATIONS

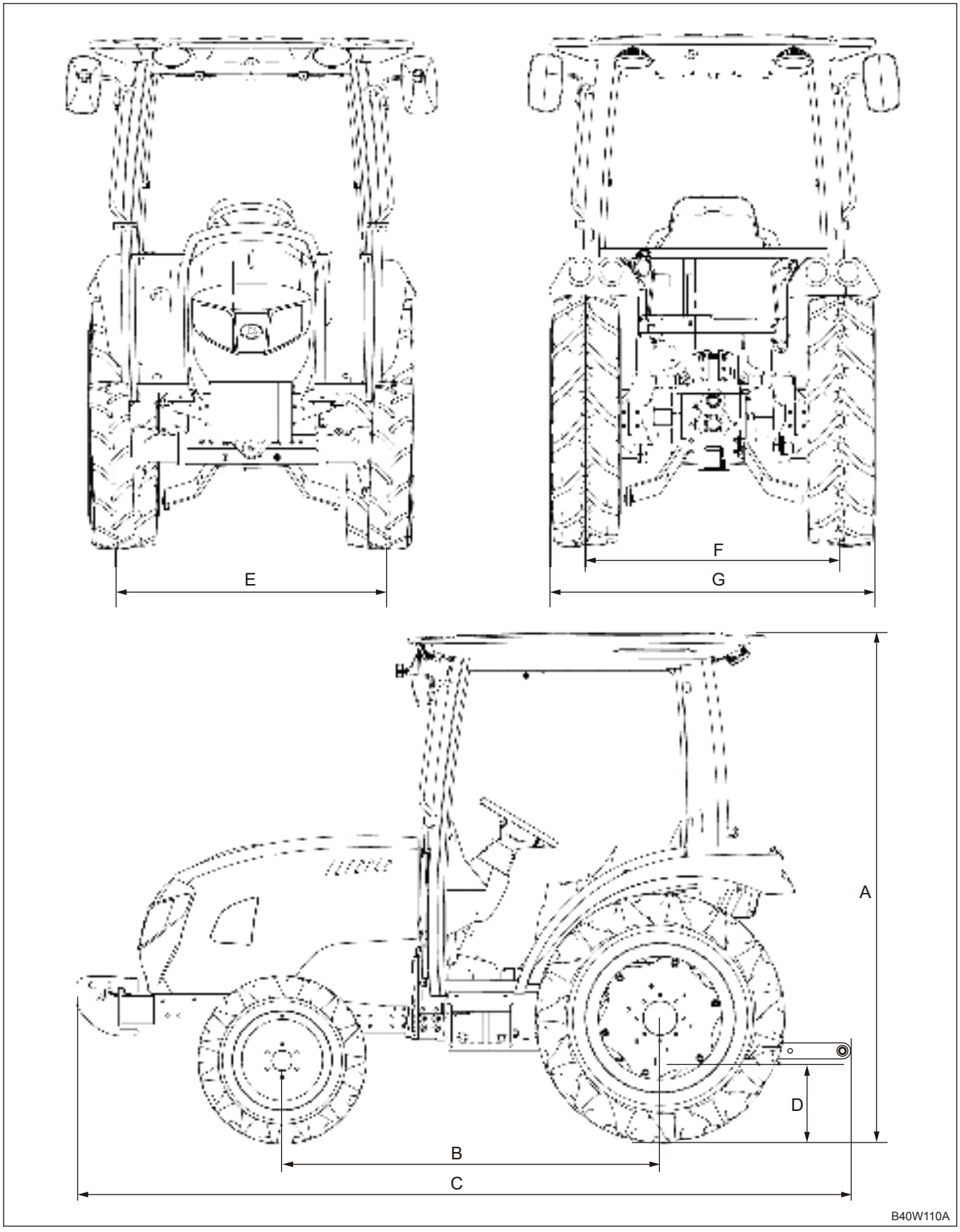
7.1 EXTERIOR DIMENSIONS

ROPS MODEL



DIMENSION						mm (in.)
A	B	C	D	E	F	G
2,643 (104.06)	1,671 (65.79)	3,426 (134.88)	335 (13.19)	1,201 (47.28)	1,165 (45.87)	1,451 (57.13)

CABIN MODEL



DIMENSION mm (in.)

A	B	C	D	E	F	G
2,258 (88.9)	1,671 (65.79)	3,426 (134.88)	343 (13.50)	1,203 (47.36)	1,130 (44.49)	1,413 (55.63)

7.2 MAJOR SPECIFICATIONS

MAJOR ITEMS				4025H	4035H	4035H
ENGINE	Model			A1700N6	A1700N5	A1700N4
	Type			Vertical, water cooled 4-cycle, diesel engine		
	Emission regulation			Final Tier4		
	Number of cylinders			3		
	Bore and stroke		mm (in.)	88 X 94 (3.46 X 3.70)		
	Total displacement		cc (in^3)	1,714 (104.59)		
	Rated speed		rpm	2,100	2,600	
	Power at rated engine rpm		kW (HP)	18.3(24.5)	22(30)	25.7(35)
	Intake type			Naturally		
	Battery		V	12		
	Fuel			Diesel		
Capacity	Fuel tank		ℓ (u.s. gal)	27 (7.13)		
	Engine crankcase		ℓ (u.s. gal)	4.3 (1.14)		
	Coolant		ℓ (u.s. gal)	5.0 (1.32)		
	Transmission case		ℓ (u.s. gal)	37(9.77)		
	Front axle		ℓ (u.s. gal)	6.4 (1.69)		
Dimension	Overall length (with F/weight)		mm (in.)	3,426 (134.88)		
	Overall width		mm (in.)	ROPS MODEL : 1,451 (57.13) CABIN MODEL : 1,413 (55.63)		
	Overall height		mm (in.)	2,643 (104.06)	ROPS MODEL : 2,643 (104.06) CABIN MODEL : 2,258 (88.9)	
	Wheel base		mm (in.)	1,671 (65.79)		
	Min. ground clearance		mm (in.)	ROPS MODEL : 335 (13.19) CABIN MODEL : 343 (13.50)		
	Tread	Front	mm (in.)	ROPS MODEL : 1,201 (47.28) CABIN MODEL : 1,203 (47.36)		
		Rear	mm (in.)	ROPS MODEL : 1,165 (45.87) CABIN MODEL : 1,130 (44.49)		

MAJOR ITEMS				4025H	4035H	4035H
Transmission	Tire size	Front wheel		8.0-16 6PR	ROPS MODEL : 8.0-16 6PR CABIN MODEL : 7.0-16 6PR	
		Rear wheel		12.4-24 6PR	ROPS MODEL : 12.4-24 6PR CABIN MODEL : 11.2-24 6PR	
	Steering system			Fully hydraulic		
	Transmission system			HST		
	Brake system	Driving		Wet disc type		
		Parking		Foot brake lever type		
Hydraulic oil	Hydraulic lift control			Position control type		
	Pump flow capacity		LPM	52		
	3-point hitch			CAT.1		
	Max. lift force (at lifting point)		kg	1,600		
PTO	PTO (hydraulic)			Ø 35 mm - 6 splines		
	Revolution (rpm)		1st	533	560	
Draft system				Pin mounting type		
Driving speed	Forward	ROPS MODEL	km/h (MPH)	0 ~ 30.7 (0 ~ 19.07)		
		CABIN MODEL	km/h (MPH)	0 ~ 29.3 (0 ~ 18.18)		
	Reverse	ROPS MODEL	km/h (MPH)	0 ~ 30.7 (0 ~ 19.07)		
		CABIN MODEL	km/h (MPH)	0 ~ 29.3 (0 ~ 18.18)		
Weight (with F/W) kg(lbs.)				1,586 (3,497)	ROPS MODEL : 1,586 (3,497) CABIN MODEL : 1,691 (3,728)	

※ 1. Rated engine speed: 2,600 rpm, 4025H : 2,100 rpm

2. Tire dynamic load radius (only for pneumatic tire): 540 (12.4 - 24), 515 (11.2 - 24)

3. Notes: The specifications are subject to change without notice.

7.3 DRIVING SPEED

SHIFT POSITION		SPEED (FORWARD AND REVERSE)	
MODEL	RANGE SHIFT	km/h	MPH
CABIN MODEL [11.2-24]	A	0 ~ 4.5	0 ~ 2.80
	B	0 ~ 12.2	0 ~ 7.58
	C	0 ~ 23.3	0 ~ 14.48
ROPS MODEL [12.4-24]	A	0 ~ 4.7	0 ~ 2.92
	B	0 ~ 12.8	0 ~ 7.95
	C	0 ~ 24.4	0 ~ 15.16

8. PERIODIC INSPECTION

8.1 PERIODIC MAINTENANCE SCHEDULE TABLE

NO.	ITEMS \ RUNNING HOURS		OPERATING HOUR (HOUR OR YEAR)															
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	1YR	2YR
1	Engine oil	R	⦿				●					●						
2	Engine oil filter	R	⦿				●					●						
3	Transmission fluid	R	⦿						●						●			
4	Transmission fluid filter HST filter	R	⦿						●						●			
5	Front axle fluid	R	⦿						●						●			
6	Radiator cleaning	CL	At the time the coolant is replaced															
7	Fuel oil filter and element	C		●		●		●		●		●		●		●		
		R					●					●						
8	Coolant	R	Check before every work (Replace every year)															
9	Air cleaner element	CL	●	●	●	●	●	●	●	●	●		●	●	●	●		
		R										R						
10	Fan and radiator cleaning	CL	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
11	Battery solution	R	Replace every two years															
12	Battery (specific gravity)	C		●		●		●		●		●		●		●		
13	Fuel pipe and connection	C	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
		R																●
14	Steering wheel hose	C	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
		R																●
15	Radiator hose	C				●				●				●				
		R																●
16	Hydraulic fluid hose	C		●		●		●		●		●		●		●		
		R															●	
17	Fuel hose	C		●		●		●		●		●		●		●		
		R															●	
18	Electric cables	C	●	●	●	●	●	●	●	●	●	●	●	●	●	●		

NO.	RUNNING HOURS / ITEMS		OPERATING HOUR (HOUR OR YEAR)															
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	1YR	2YR
19	Greasing	C	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
20	Tightening handles	C		●		●		●		●		●		●				
21	Tightening bolts&Nuts	C	●	●		●		●		●		●		●		●		
22	Cooling fan belt	A	●	●		●		●		●		●		●		●		
23	Brake	A		●		●		●		●		●		●		●		
24	Engine breed pipe	C	●	●		●		●		●		●		●		●		
25	Engine crankcase cleaning	CL						●						●				
26	Intake/exhaust valves	C												●				
27	Fuel injection valve	C												●				
28	Generator motor	C	●	●				●				●						
29	Hydraulic system	C	●	●				●				●						

※ The jobs indicated by ◉ must be done after the first 50 hours of operation

※ Meanings of symbols=R:Replace C:Check A:Adjust CL:Clean

※ Inspection should be done every 50 hours. If the tractor is not used much, inspect every year.

※ Replace parts every two years regardless of running hours.

8.2 INSPECTION DESCRIPTION

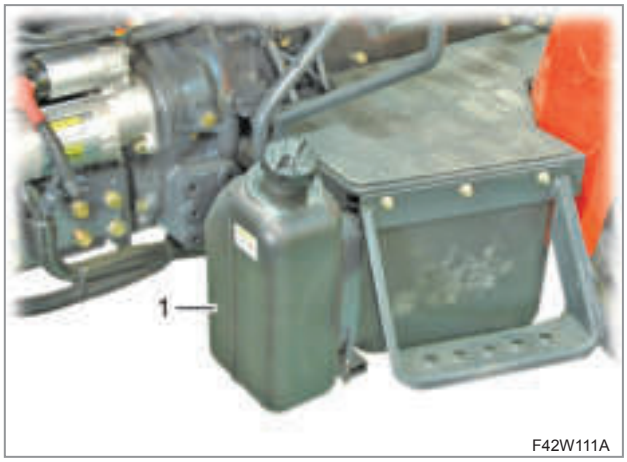
⚠ CAUTION

- **Before working on this machine, lower any attachment or implement on the ground and apply the parking brake (1).**

8.2.1 FUELING INTO FUEL TANK

⚠ CAUTION

- **When fueling, be careful not to spill fuel and watch out for any smoke or flame around. Make sure to fuel only with the engine stopped.**



1. Check the fuel level through the instrument cluster with the engine running.
2. When the pointer on the fuel gauge is on the first quarter zone, add fuel to the fuel tank (1).

FUEL TANK CAPACITY	27 ℓ (7.13 u.s.gal.)

⚠ CAUTION

- **Make sure that no dust enters the fuel filler hole.**
- **If the fuel tank becomes empty, air may enter the fuel system, causing an engine starting problem. Add fuel to the tank before it becomes empty.**
- **When fueling, be careful not to spill it. If spilled, wipe it out thoroughly.**
- **After daily work, top up the fuel tank to prevent any foreign material from entering the tank.**

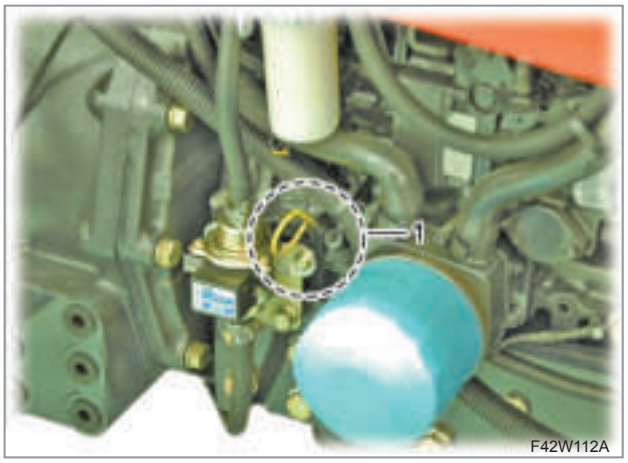
8.2.2 CHECKING ENGINE OIL

⚠ WARNING

- **Never mix different types of oil, but use the only engine oil specified by BBT. (SAE 15W-40, Final Tier4: grade CJ or higher)**
- **Never attempt the start the engine without sufficient engine oil.**

⚠ CAUTION

- **Make sure to stop the engine before checking the engine oil level.**



1. Make sure that the machine is parked on level ground.
2. Remove any dust around the dipstick inlet.
3. Pull out the dipstick (1), wipe its mark, insert it and pull it out again to check the oil level and oil condition.
4. The oil level should be between the min. and max. lines and the oil color should not be too dark or too light.
5. If not normal, add engine oil up to the max. line on the dipstick. (Refer to 8.2.8 Changing engine oil in this chapter.)

8.2.3 CHECKING COOLANT AMOUNT

⚠ CAUTION

- **Hot coolant or steam from the pressurized cooling system can be surged leading to a serious scald. Make sure to stop the engine before checking the coolant level. Remove the filler cap only when it is cooled down enough to touch by a hand. At this moment, release residual pressure in the system and then unscrew the cap slowly to remove it.**

1. Check the coolant level in the reservoir (1).
2. The coolant level should be between the lower and upper limits while the engine is running.
3. If the coolant level is below the min. level, add coolant up to the max. limit into the reservoir.

RESERVOIR CAPACITY	0.45 ℓ (0.12 u.s.gal.)

8.2.4 CHECKING LAMPS

1. Check the head lamps, turn signal lamps and brake lamps.
2. If any lamp is malfunctioning or damaged, replace it with a new one.

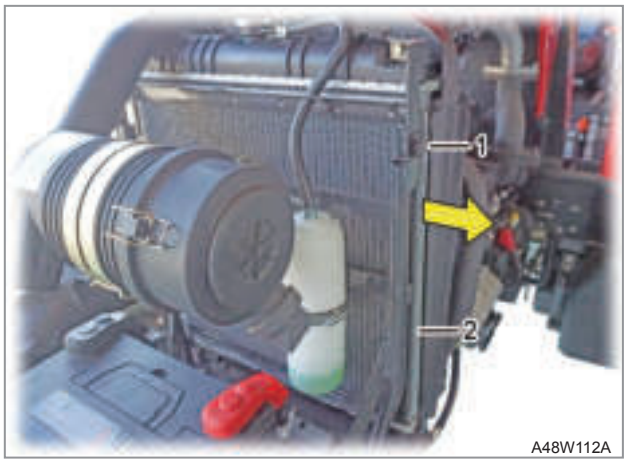
8.2.5 CHECKING SEAT BELT

1. Inspect the seat belt (1) and its anchor at least every year. Check the belt for looseness of its anchor, cut, excessive wear or abnormal wear. If a damage is found, replace the seat belt with a new genuine **BBT** seat belt.

8.2.6 CLEANING RADIATOR DUST GRILL

⚠ CAUTION

- **Check and clean the dust grill after stopping the engine.**



1. Check the front of the hood or side grill for dust, and clean them accordingly.
2. Open the hood and unscrew the fix bolt (1), and then pull out the dust grill (2) to sideway to remove. Then, remove dust from the dust grill.

⚠ CAUTION

- **Clean the grill and dust grill to prevent the engine from overheating and let sufficient air flow into the air cleaner.**

8.2.7 CHECKING INSTRUMENT CLUSTER SIGNALS

ROPS MODEL

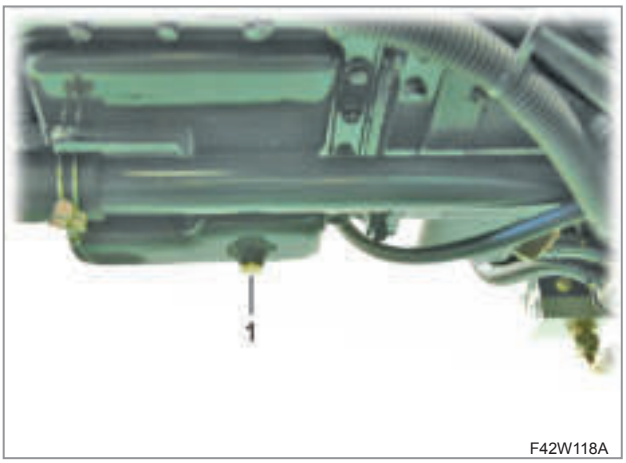
CABIN MODEL

1. Turn the ignition switch to the START position.
2. Check that the gauges and signals are working properly.
3. If not, check the corresponding lamp and electric circuit.
4. If necessary, replace the part with a new one.

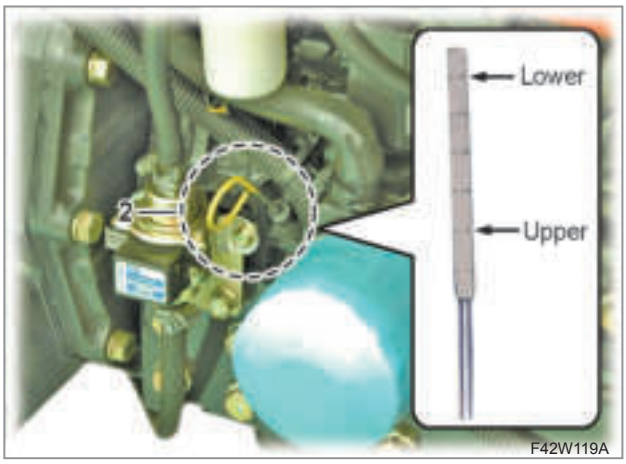
8.2.8 CHANGING ENGINE OIL

⚠ CAUTION

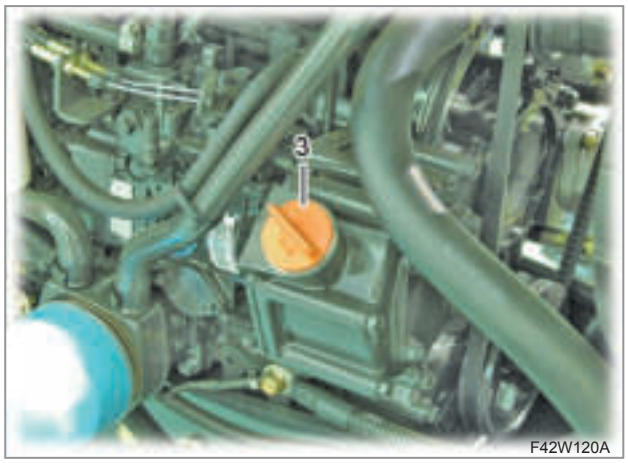
- **Make sure to stop the engine before changing engine oil.**
- **Make sure that the engine is sufficiently cooled down enough to touch by a hand.**



1. Remove the drain plug (1) to drain engine oil.
2. Fit the drain plug and tighten it to 50 N.m (37 lb.ft).
3. Add clean oil with proper viscosity to the crankcase.



4. Wait for 15 minutes and check the oil level. The oil level should be up to the upper limit on the dipstick (2).



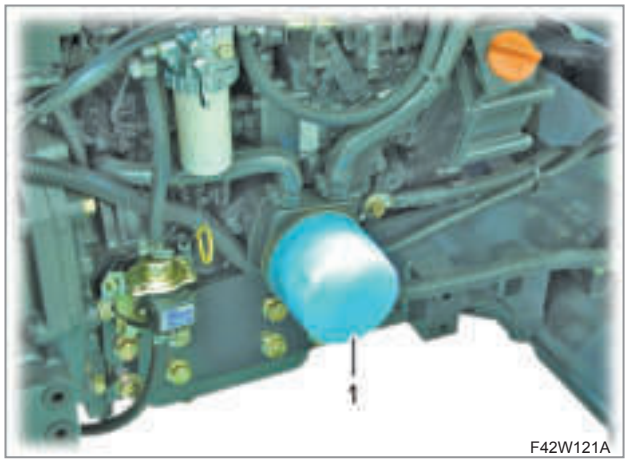
5. Run the engine for a while and check the oil filler hole (3) and drain plug for oil leakage.

SPECIFIED AMOUNT OF ENGINE OIL	4.3ℓ (1.14 u.s.gal.)
LUBRICANTS	Grade CJ or higher

8.2.9 REPLACING ENGINE OIL FILTER

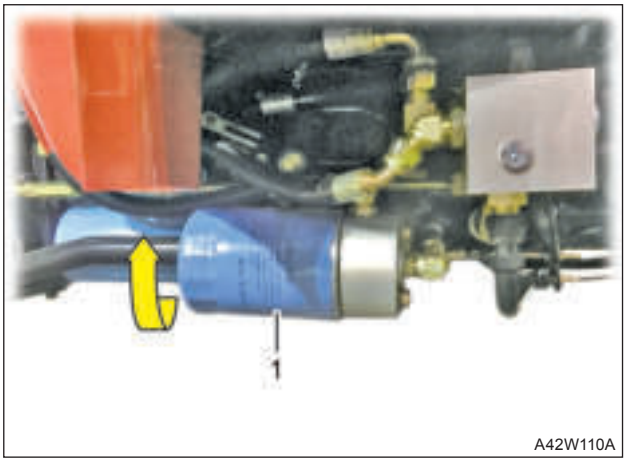
⚠ CAUTION

- **Be sure to use the only BBT genuine oil filter not to damage the engine. Replace the oil filter only after the engine is stopped and cooled down.**



1. Unscrew the filter element (1) and clean its mounting surface.
2. Replace the O-ring on the surface which is to be against a new filter.
3. Apply a thin film of clean oil around the seal ring of a new filter.
4. Fit the new filter and tighten it by hand.
5. Start the engine and check the filter base for oil leakage.
6. Stop the engine and check the oil level. If the level is too low, add more oil.

8.2.10 REPLACING HST FILTER

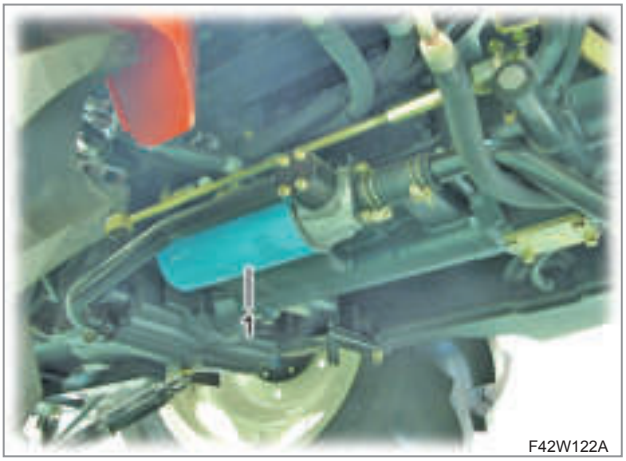


1. Turn the filter element (1) counterclockwise to remove.
2. Apply a clean oil around the seal ring of element of a new filter and tighten it.
3. Start the engine and check oil leakage after operate forward and reverse.

8.2.11 REPLACING TRANSMISSION/ HYDRAULIC FILTER

⚠ CAUTION

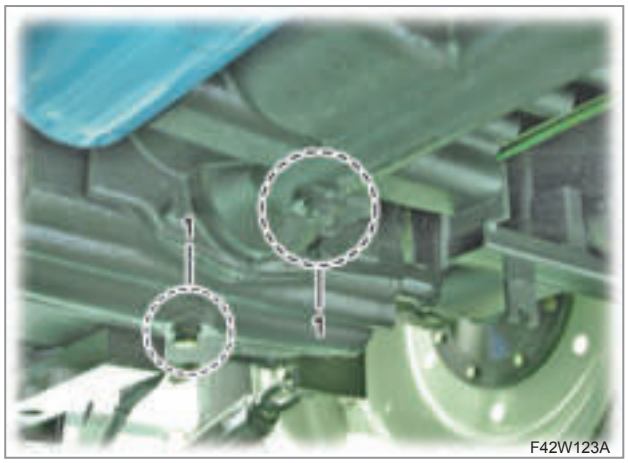
- **Replace the transmission fluid filter only after the engine is stopped and cooled down.**
- **Be sure to use the BBT genuine oil filter to keep the transmission intact.**



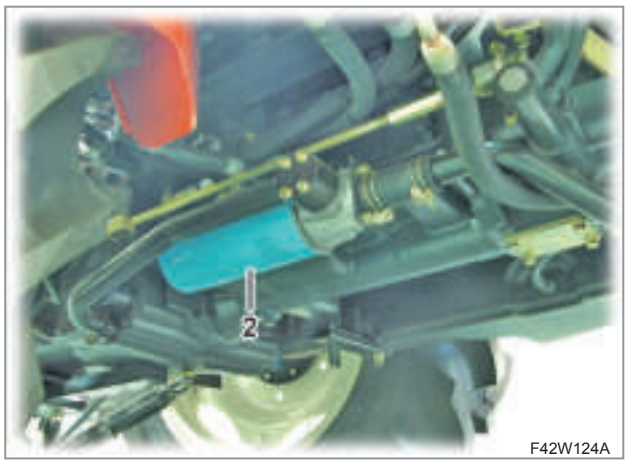
1. Remove the filter element (1) by unscrewing it.
2. Apply clean oil onto the seal ring of a new filter element and tighten this filter element.
3. Start the engine and check the filter base for fuel leakage.
4. Stop the engine and check the oil level. If the level is too low, add more oil.

8.2.12 CHANGING TRANSMISSION FLUID/HYDRAULIC OIL

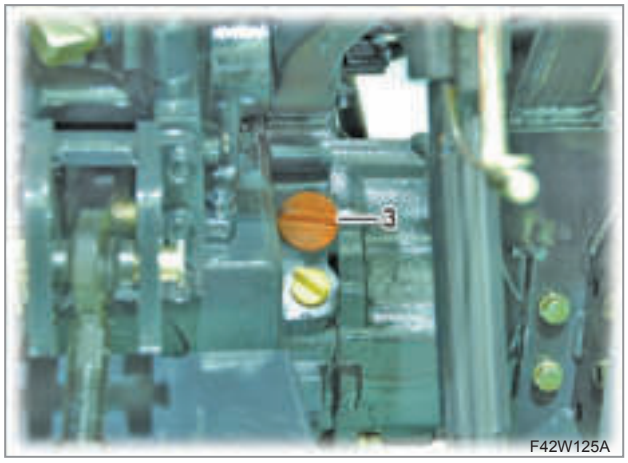
1. Start the engine and activate several hydraulic functions to increase oil temperature.
2. Park the tractor on level ground and lower the implement onto the ground.
3. Stop the engine, remove the ignition key and apply the parking brake. (Set the transmission into the neutral state.)



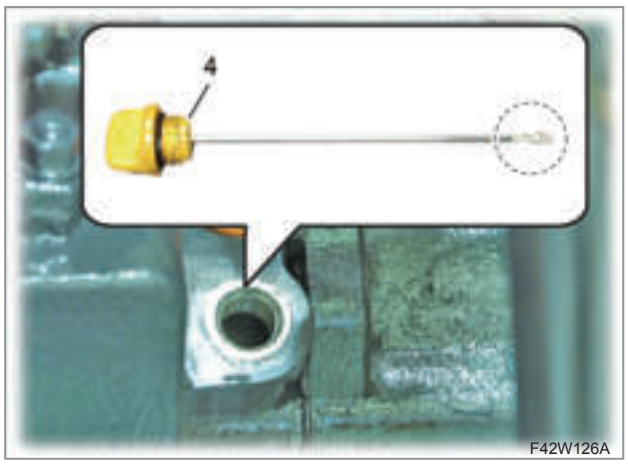
4. Remove the drain plug (1).



5. Replace the transmission fluid/hydraulic oil filter element (2).
6. Before adding clean oil, replace the seal and tighten the drain plug to 5 kg.m (36 lb.ft).



7. Add transmission fluid/hydraulic oil into the transmission case through its filler hole (3).
8. Run the engine for a moment to activate the hydraulic pressure function. Stop the engine.



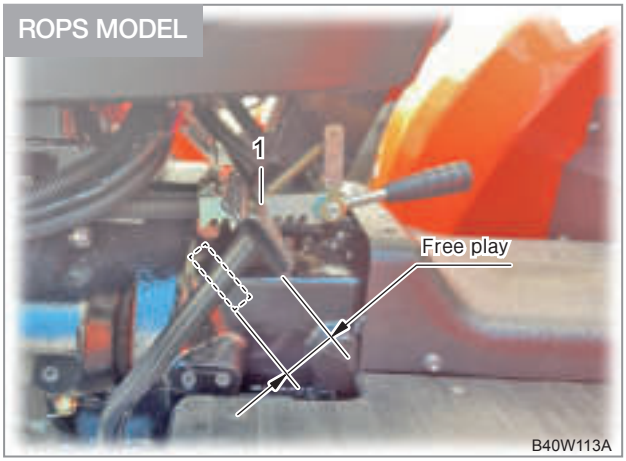
9. Wait for 10 to 15 minutes before checking the oil level. The oil level should be on the mark on the dipstick (4). If not, add oil up to the specified upper limit.

TRANSMISSION FLUID/ HYDRAULIC OIL AMOUNT	37 ℓ (9.77 u.s.gal.)

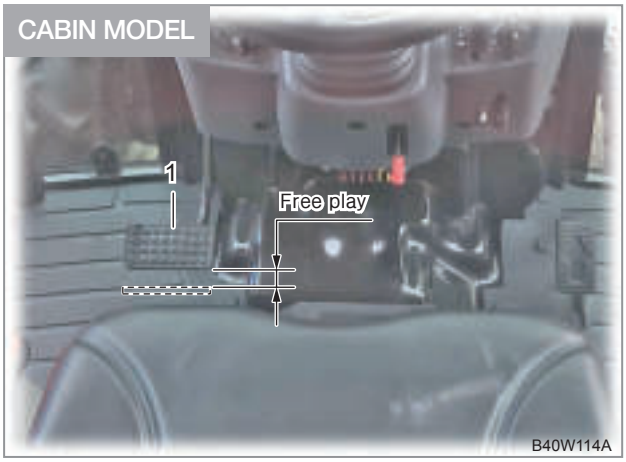
8.2.13 ADJUSTING BRAKE PEDAL

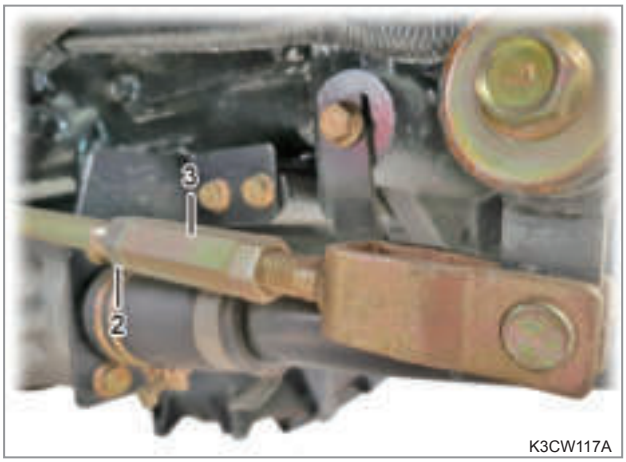
1. Release the parking brake.

ROPS MODEL



CABIN MODEL





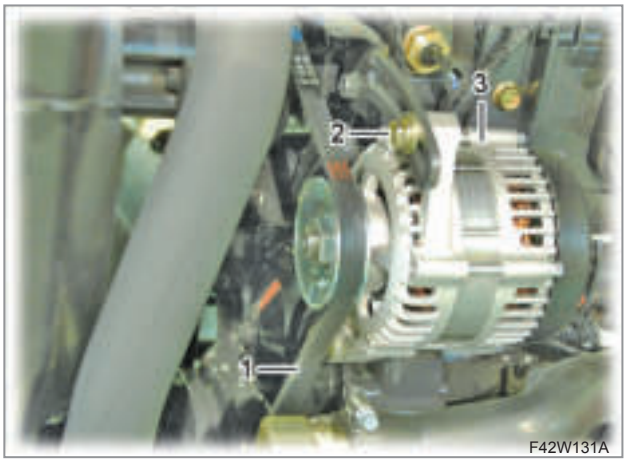
2. Depress the brake pedal (1) slightly and then release it.
3. Check the free play of the pedal when releasing it.
4. Unscrew the lock nut (2) of the brake rod under the floor and turn the turn buckle (3) to adjust the free play.
5. Adjust both pedals to the same amount of free play.
6. Tighten the lock nut.

BRAKE PEDAL FREE PLAY	5 - 10 mm (0.19 - 0.39 in)

8.2.14 ADJUSTING FAN BELT TENSION

⚠ CAUTION

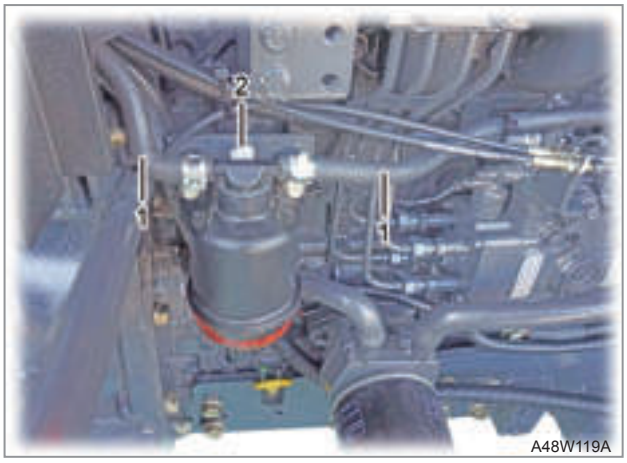
- **Stop the engine before adjusting the tension of the fan belt.**
- **When adjusting the fan belt tension, be careful not to hurt your hands and damage the alternator.**



1. Stop the engine, remove the ignition key and apply the parking brake.
2. Check the tension of the fan belt (1).
3. Loosen the tension adjusting bolt (2).
4. Place a stick or pipe between the alternator (3) and cylinder block.
5. Push the alternator outwards to adjust the fan belt tension.
6. Tighten the adjusting bolt.

BELT DEFLECTION [Pressing with force of 10 kg (22 lb)]		10-15 mm (0.39-0.59 in)
TORQUE VALUE	Mounting bolt	26 Nm(19 lb.ft)
	Adjusting bolt	52 Nm(38 lb.ft)

8.2.15 CHECKING FUEL LINE



1. Check the fuel line (1) and clamp for leakage.
2. If any abnormal condition is found, replace the corresponding part with a new one.

⚠ CAUTION

If replacing the fuel line, make sure to bleed the fuel system.

▶ BLEEDING FUEL LINE

- **Turn the bleeding knob (2) of the fuel filter counterclockwise.**
- **Turn the ignition switch to crank the engine. Then, check if fuel flows through the bleeding knob.**
- **If fuel without bubbles flows out, stop cranking the engine and tighten the bleeding knob completely.**
- **If the engine is still hard to be started, loosen one to two nozzle holders and crank the engine to bleed the system.**

8.2.16 CLEANING AIR CLEANER ELEMENT

1. Open the air cleaner cover (1) and pull out the air cleaner element.

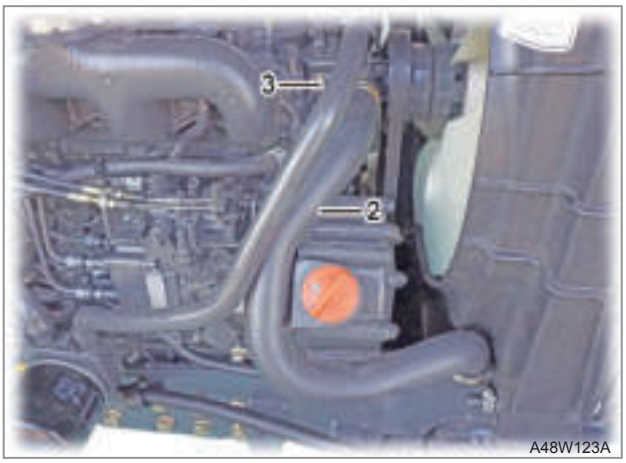
2. Remove the element (2) and dust it off. If dust is still attached to the element, insert a nozzle into it and blow dust out from inside with compressed air (up to 600 kPa, 6 bar, 90 psi).
3. Replace the part every year or every 6th cleaning schedule whichever comes first.

8.2.17 BATTERY

⚠ CAUTION

- **Keep any spark or flame away from the battery. It can cause explosion with its gas.**
- **To avoid a spark, disconnect the negative (ground) battery cable (1) first. When connecting the battery, connect the positive cable first.**
- **Never charge the battery with its positive and negative poles touching a metallic object. Use a voltmeter or hydrometer.**
- **If the battery is frozen, it can explode. Heat the battery to 16°C (60°F) before charging it.**
- **The battery cannot be charged when the engine speed is below 1,000 RPM. (It can be charged with the engine running at 1,500 RPM or higher speed.)**

8.2.18 CHECKING RADIATOR AND INTAKE HOSES



1. Check the condition of the air intake hose (1) and radiator hose (2) every six months or 200 hours of use whichever comes first.
2. Check the hose and tighten the clamp (3).
3. A leaking or damaged hose can be a major cause of dust in the engine.
4. If the hose is worn or damaged, replace it with a new one.
5. It is recommended to replace the radiator hose every two years.

8.2.19 APPLYING GREASE

1. Apply grease every 50 hours of use.
2. Check the target positions and apply a proper amount of grease on them before beginning your work. Make sure to apply grease on them especially after working in a wet field.

- Grease applied components
  - Front/Back of front axle bracket (1)
  - Left/Right of front axle (2)
  - Left/Right of brake rod (3)
  - Lift link and more (4)

8.2.20 ADDING ANTI-FREEZE

⚠ CAUTION

- **Never remove the cap when the coolant temperature is over the boiling point. To release pressure, unscrew the radiator cap (1) slightly. Then, unscrew it completely.**
- **Never pour cold water or coolant onto the hot engine. Always use warm liquid until the engine is sufficiently cooled down.**

1. If the tractor is equipped with a cabin, turn the heater control dial to the right end.
2. To release pressure, unscrew the radiator cap (1) slightly. Then, unscrew it completely.
3. To collect coolant, place a container under the drain hole.

4. Remove the radiator drain cap (2) completely.
5. After coolant is completely removed from the radiator, fit the plug and add clean water to the system.
6. Run the engine until its temperature reaches its operating temperature.

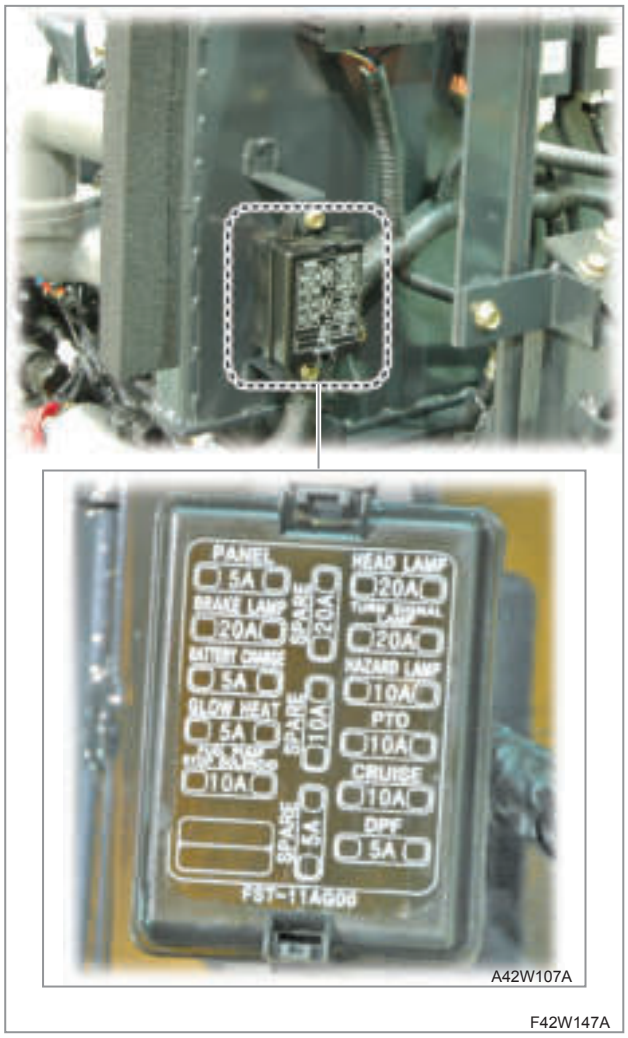
7. Stop the engine and add clean water to the system.
8. Run the engine until its temperature reaches its operating temperature. Then, stop the engine.
9. Then, add the specified anti-freeze to the system.
10. Add the anti-freeze to the “FULL” limit mark.
11. Start the engine and run it for 15 minutes.
12. Stop the engine and add the anti-freeze up to the "FULL" mark.
13. Tighten the radiator cap.

Note: For efficient cooling, the dust grill of the radiator should always be kept clean. Remove any dust or oil from it and spread any bent cooling fin straight.

RESERVOIR CAPACITY	0.45 ℓ (0.12 u.s.gal.)

8.2.21 FUSE AND RELAY

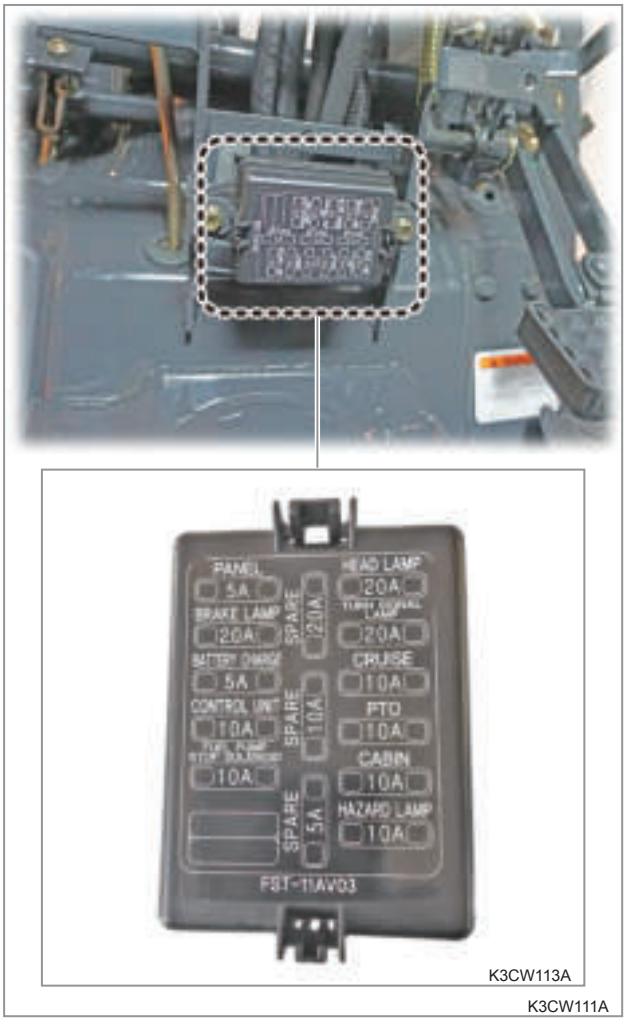
ROPS MODEL



ITEM	SPECIFICATION	DESCRIPTION
Fuse 1	5 A	Panel
Fuse 2	20 A	Brake lamp
Fuse 3	5 A	Battery charge
Fuse 4	5 A	Glow/Heat
Fuse 5	5 A	Fuel pump, Stop solenoid
Fuse 6	20 A	Spare
Fuse 7	10 A	Spare
Fuse 8	5 A	Spare
Fuse 9	20 A	Head lamp
Fuse 10	20 A	Turn signal lamp
Fuse 11	10 A	Hazard lamp
Fuse 12	10 A	PTO
Fuse 13	10 A	Cruise
Fuse 14	5 A	DPF

1. A fuse is to protect circuits from electric overload.
2. The relay control current is high load current which flows through a circuit.
3. To prevent damage to the electric system, never use a fuse with higher capacity than the one already installed.

CABIN MODEL



1. A fuse is to protect circuits from electric overload.
2. The relay control current is high load current which flows through a circuit.
3. To prevent damage to the electric system, never use a fuse with higher capacity than the one already installed.

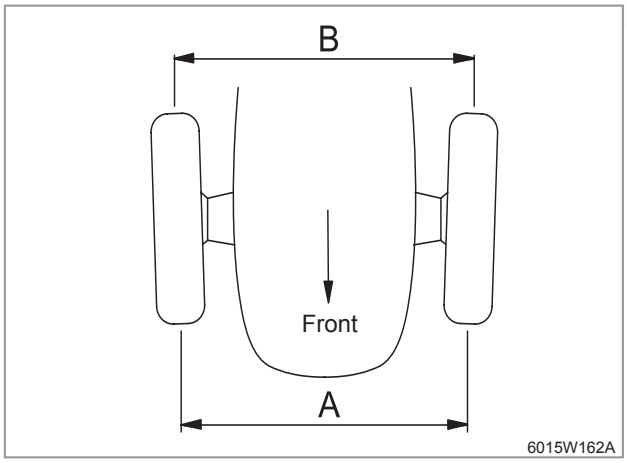
ITEM	SPECIFICATION	DESCRIPTION
Fuse 1	5 A	Panel
Fuse 2	20 A	Brake lamp
Fuse 3	5 A	Battery charge
Fuse 4	10 A	Control unit
		DPF
Fuse 5	10 A	Fuel pump, Stop solenoid
Fuse 6	20 A	Spare
Fuse 7	10 A	Spare
Fuse 8	5 A	Spare
Fuse 9	20 A	Head lamp
Fuse 10	20 A	Turn signal lamp
Fuse 11	10 A	Cruise
Fuse 12	10 A	PTO
Fuse 13	10 A	Cabin
Fuse 14	10 A	Hazard lamp

8.2.22 TIRE INFLATION PRESSURE

1. Performance and expectancy of life of tires depend on maintaining tire's inflation pressure properly.
2. If tire inflation pressure is insufficient, it can cause premature wear. If it is excessive, it can reduce traction and increase wheel slip.
3. The specified tire pressure is different not only by working environment and load, but also by tractor models. Make sure to follow the specified standard inflation pressure set in this manual.

STANDARD	Front wheel	2.0 kg/cm^2 (28.44 psi)
	Rear wheel	1.3 kg/cm^2 (18.49 psi)
WITH LOADER	Front wheel	3.0 kg/cm^2 (42.67 psi)
	Rear wheel	2.0 kg/cm^2 (28.44 psi)

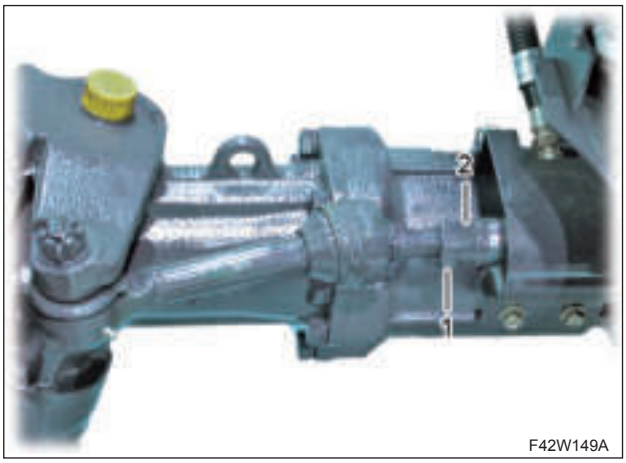
8.2.23 CHECKING TOE-IN



(A) Front distance (B) Rear distance

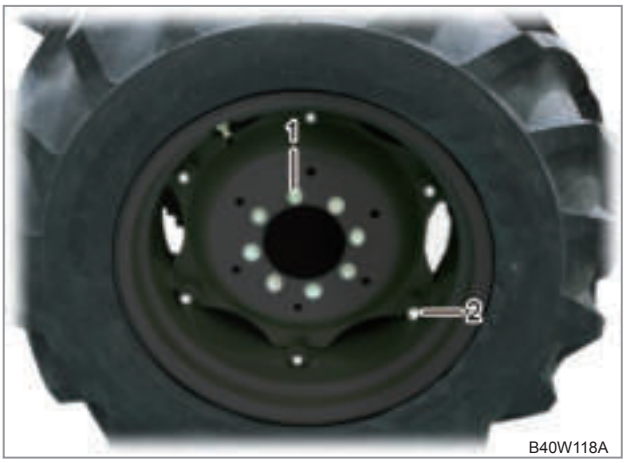
1. Park the machine on level ground.
2. Measure the front distance (A).
3. Measure the rear distance (B).
4. The difference (B- A) between the front distance (A) and rear distance (B) should be over 4 - 8 mm (0.157 - 0.314 in.).

8.2.24 ADJUSTING FRONT WHEEL TOE-IN



1. Unscrew the mounting nut (1) on the tie rod.
2. Turn the rod (2) inwards or outwards. (Two rods should be same in length.)
3. Adjust the toe-in and tighten the mounting nut (1).

8.2.25 TIGHTENING WHEEL BOLT



Tighten all the bolts on the wheel after initial 4 and 8 hours of operation. Then, check tightness of the bolts every 100 hours of use.

ITEM		TORQUE VALUE
Front wheel	Hub bolt	18 - 20 kg.m (130 - 144 lb.ft) (176 ~ 196 N.m)
	Rim disc mounting bolt	22 - 24 kg.m (158 - 173 lb.ft) (216 ~ 235 N.m)
Rear wheel	Hub bolt (1)	17 - 21 kg.m (122 - 151 lb.ft) (167 ~ 206 N.m)
	Rim disc mounting bolt (2)	17 - 21 kg.m (122 - 151 lb.ft) (167 ~ 206 N.m)

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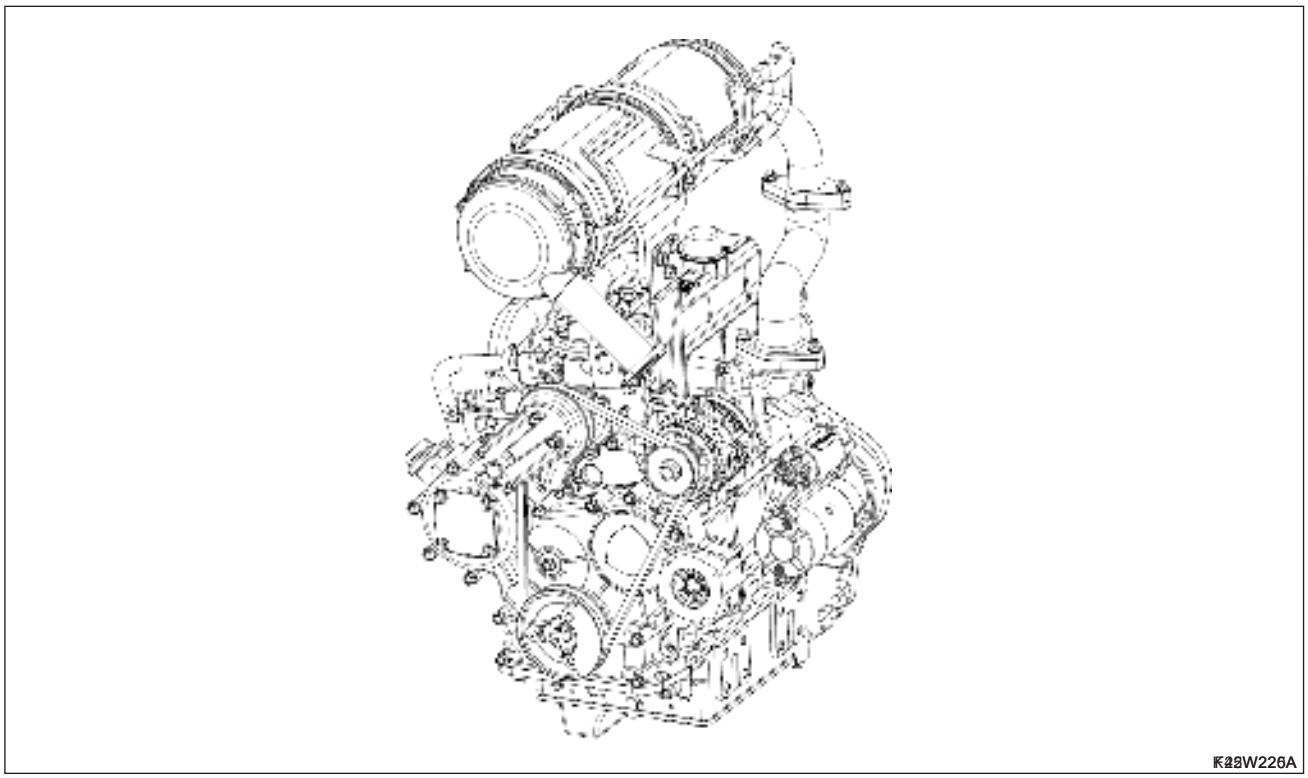
1. EXTERIOR AND NAMES OF PARTS

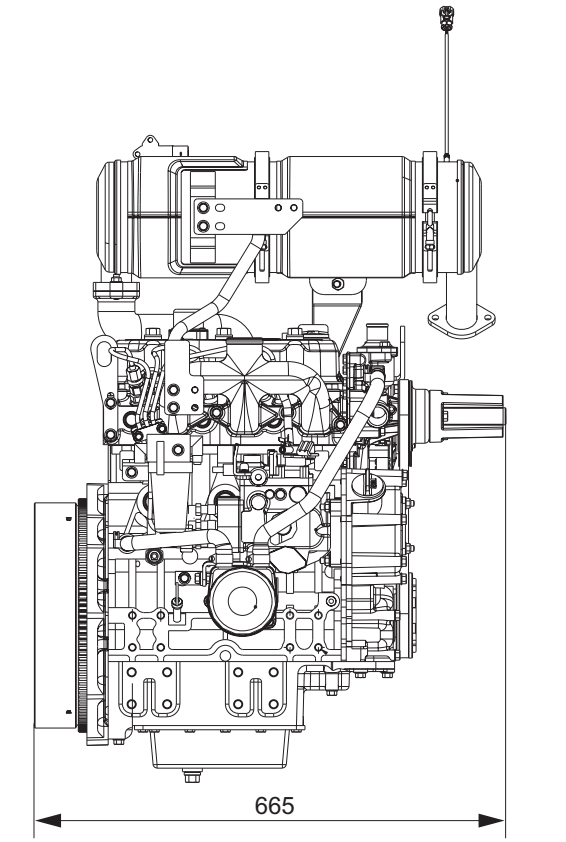
1.1 SPECIFICATION

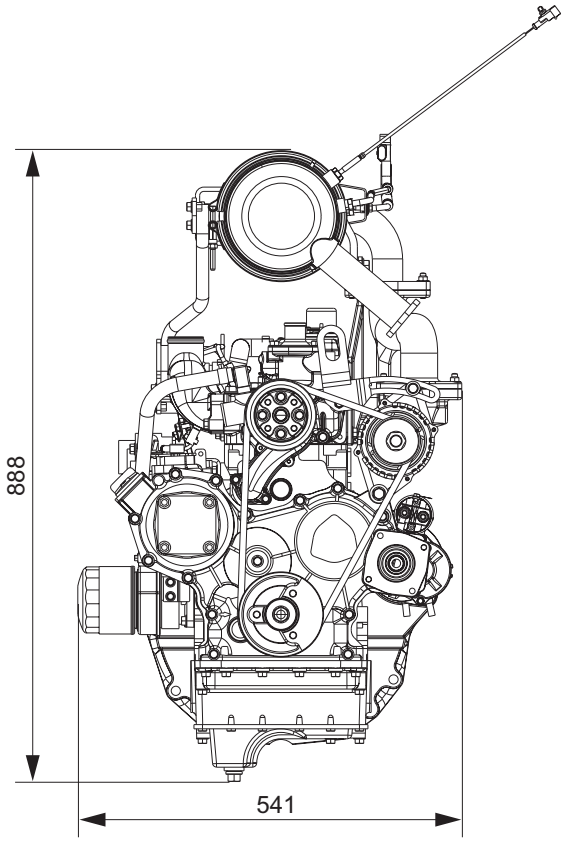


		A1700N6	A1700N5	A1700N4
Type		Vertical Water-Cooled 4 Cycle Diesel Engine		
Emission Regulation		EPA Final Tier4 (Power Category - 19≤kW<37, **A1700N6** : 8≤kW<19)		
No. of Cylinders		3		
Bore × Stroke	mm	88×94		
Displacement	cc	1,714		
Combustion System		IDI (Indirect Injection)		
Intake System		Natural Aspirated		
Horse Power	kW(HP)	18.3(24.5)	22(30)	25.7(35)
Compression Ratio		21.3 : 1		
Direction of Rotation		CCW from Flywheel Side		
Cooling System		Pressurized Radiator		
Lubricant Capacity	ℓ	4.3		
Starter	V-kW	12 - 2.2		
Alternator	V-A	12 – 50		
Dimension(L×W×H)	mm	690×527×911		

※ Specifications could be changed without notice for performance improvement

1.2 ENGINE DIMENSIONS





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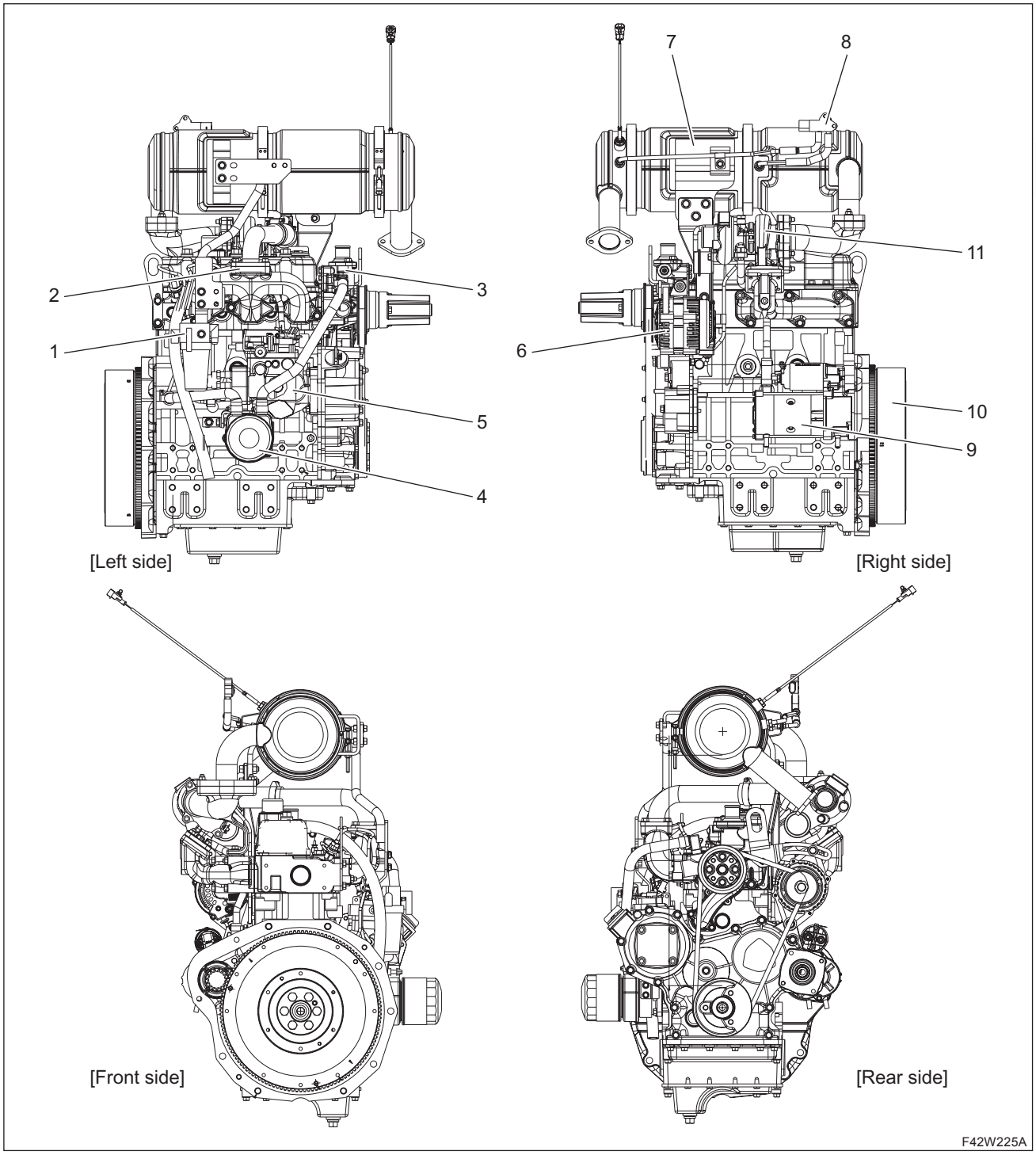
1.3 NAME OF EACH PART



(1) Fuel filter
(2) Intake manifold
(3) Water pump
(4) Oil filter
(5) Fuel injection pump
(6) Alternator
(7) After-treatment device
(8) DP sensor
(9) Starter motor
(10) Flywheel
(11) Turbo charger

* The pictures show the locations of the major external engine components, the filters, and other service and maintenance points. Some external components will be at different locations for different engine models.

NOTE
• **The pictures are only a reference to show a typical engine.**

1.4 EMISSIONS REGULATIONS

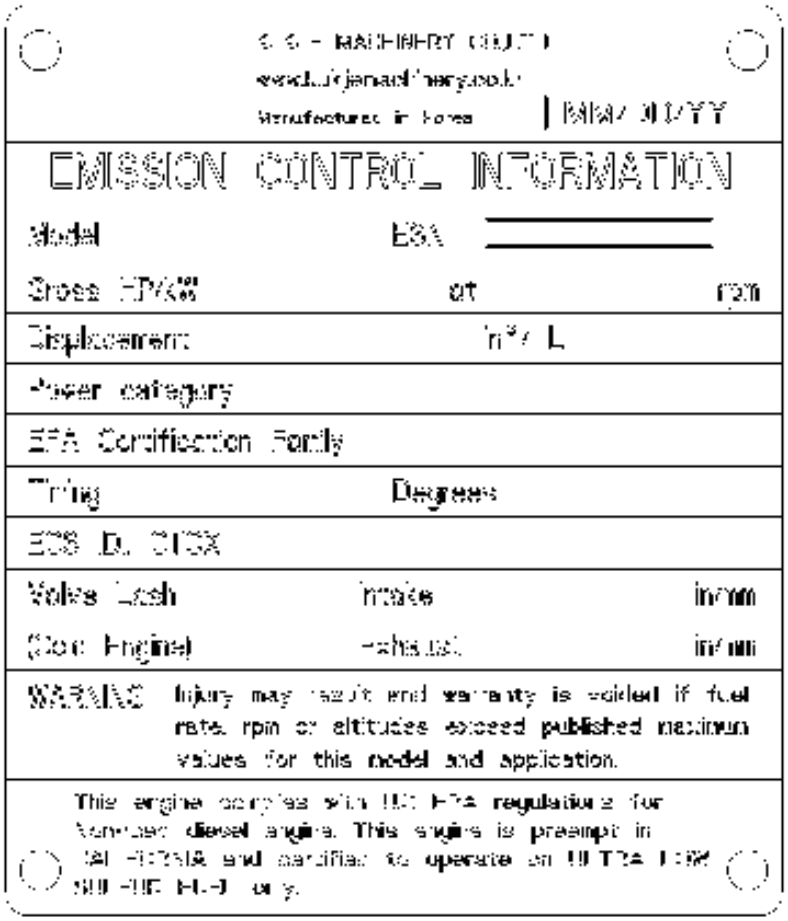
Each country conducts the emissions regulations on non-road diesel engine to prevent environmental contamination. The regulations values and enforcement time are different by each power category.

1.4.1 EMISSIONS REGULATIONS VALUE

Unit: [g/kW-hr]

NATION	EMISSIONS REGULATIONS	OUTPUT (KW)	NOx + THC (NOx + NMHC)	CO	PM
US	Final Tier-4	8 ~ 19	7.5	6.6	0.40
	Final Tier-4	19 ~ 56	(4.7)	5.0	0.03

1.4.2 THE EMISSIONS CERTIFICATE DECAL AND ATTACHED LOCATION



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The engine which is exported to the abroad area attach the following decal in head cover.

1.4.3 WARRANTY CONDITION OF EMISSION REGULATIONS VALUE

In the maintenance of engine, make sure the warranty conditions are observed and at the same time maintenance considers degradation as time goes by next maintenance.

The case of EPA certificate engine should observe as following conditions in order to keep emission regulations.

NOTE

- **CONDITIONS ARE AS FOLLOWS**

  1) Intake air temperature: -20°C ~ 40°C

  2) Humidity: under 80%

  3) Intake air negative pressure

  Unit: [kPa (mmAq)]

ENGINE NAME	INITIAL VALUE	ALLOWANCE VALUE
A1700	≤ 2.45(250)	≤ 6.23 (635)

  4) Exhaust back pressure

  Unit: [kPa (mmAq)]

ENGINE NAME	INITIAL VALUE	ALLOWANCE VALUE
A1700	≤ 6.37 (650)	≤ 7.65 (780)

- **FUEL AND LUBRICATING OIL ARE AS FOLLOWS**

  1) Fuel: Ultra low sulfur diesel fuel.

  2) Lubricating oil: SAE 15W-40 or over CJ-4 level.

- **THE SEAL OF FUEL INJECTION QUANTITY AND ROTATION RESTRICTION DO NOT RELEASE**

  EPA certificate engine attach seal cap in injection quantity control device and removing the seal cap to change the injection quantity by final buyer is illegal. If the fuel adjusting devices need to re-adjust, make sure that emission and engine performance are the same level as the certificate values.

- **MAKE SURE TO MAINTAIN**

  Based on listed regular checklist in this manual do a repair check and record a check result/

- **THE MAINTENANCE PERIOD AND WARRANTY PERIOD OF RATED EXHAUST EMISSION COMPONENTS**

  The rated exhaust emission components in the table below should be conducted in the maintenance period. Also warranty period should be conducted conditions that based on the “maintenance checklist” in this document. And set a period to side of the first to reach one of the operation time and using number of year below table.

ITEM	MAINTENANCE PERIOD	
Related parts / Power category	Clean the Injector	Clean/Repair/Adjust - the Injector, Injection pump, others
19 ≤ kW < 37	per 1,500hr	per 3,000hr

2. MAIN FUNCTION AND PERIODIC CHECK

2.1 PERIODIC CHECKLIST

Periodic checks and maintenance are very important for keeping the engine in optimum condition. The check contents and times are indicated in below table. So be sure to observe.

PART	ITEM		DAILY	Every 50hrs	Every 250hrs	Every 500hrs	1000hrs or 1 years	2000hrs or 2 years
Fuel System	Check the fuel level and refill		○					
	Clean the fuel tank			○				
	Check the fuel filter and hose related coolant		○					
	Replace the fuel filter element.				◎			
	Fuel injection valve	Pressure check adjustment					●	
	Fuel injection pump	Adjust injection timing						●
Lubricating system	Check the lubricating oil level		○					
	Replace the lubricating oil			◎ (1st time)	◎			
	Replace the lubricating oil filter			◎ (1st time)	◎			
Coolant system	Check the coolant level		○					
	Check the clogging of the radiator		○		○			
	Replace the coolant					◎		
	Adjust the fan belt tension			○ (1st time)	○			
Intake air system	Clean the air cleaner,				○	◎		
	Replace the element.							
Engine body	Re-tighten the bolts							● (Re-tighten)
	Adjust the in/exhaust valve clearance.						●	
Electrical equipment	Check the warning lamps.		○					
	Check the battery liquid level.			○				

※ ○: Customer check / ◎: Part exchange / ●: Check in place to specified location

2.2 CHECK THE MAIN FUNCTION

- Checking the main function is the best way for performance guarantee and long life of engine.

  Please note the following information to the engine to maintain.

2.2.1 VISUAL CHECK

- Visual check of around the engine: confirm the fuel, lubricating oil, coolant system, fuel and water leakage.

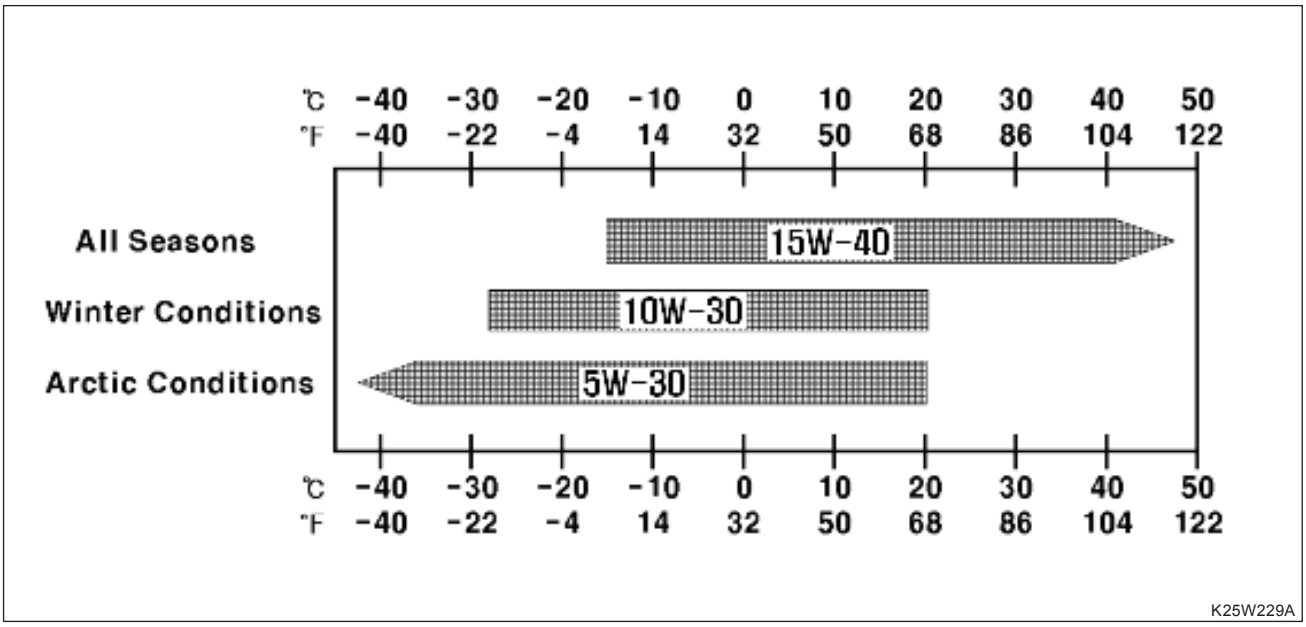
  Check the hose of the each part, V-belt, and the tightening status of clamp.

  Check the damage of components or loosening the bolt &nut.
- If you have trouble when a visual check, please refer to this manual for repairing it.

2.2.2 LUBRICATING OIL

- Diesel engines operate under differed conditions than gasoline engines, so proper oil should be used.
- If defective oil is used or lubricating oil is not changed regularly, accelerated wear of moving components and engine life may be seriously shortened.
- Oil viscosity grade use the class SAE 15W-40 , above API CJ-4 level (Final Tier4).

  * Please refer to next graphic and use the proper oil.

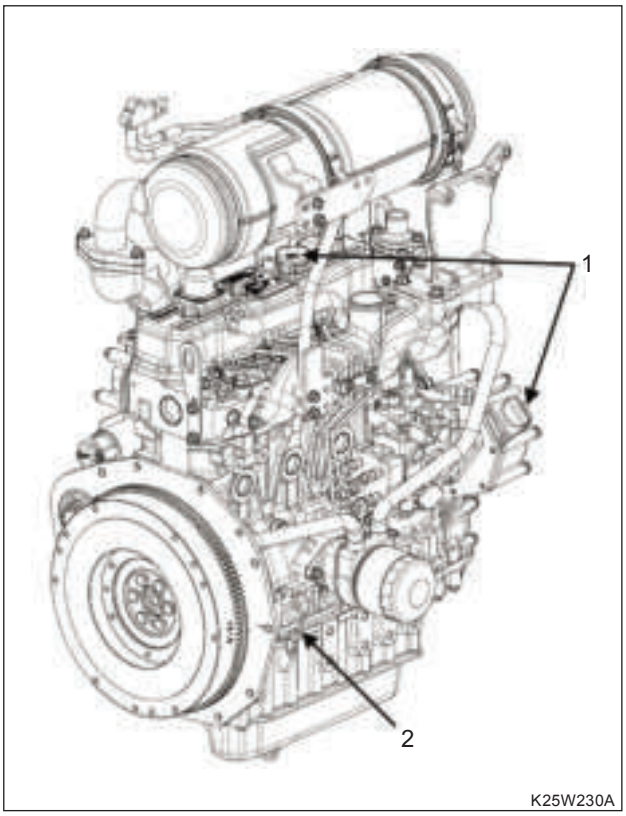


- Before engine operating, check the lubricating oil level whether it is set at the right level between the L(low) mark and the H(high) mark. If necessary, add lubricating oil. If the oil is contaminated or viscosity is low, it should be changed.

  1) While checking the lubricating oil, keep the engine horizontal.

  2) Wait for about 15 minutes after shutting off the engine to check the oil level.

  3) Check the oil level 5~6 minutes later after refilling the lubricating oil.

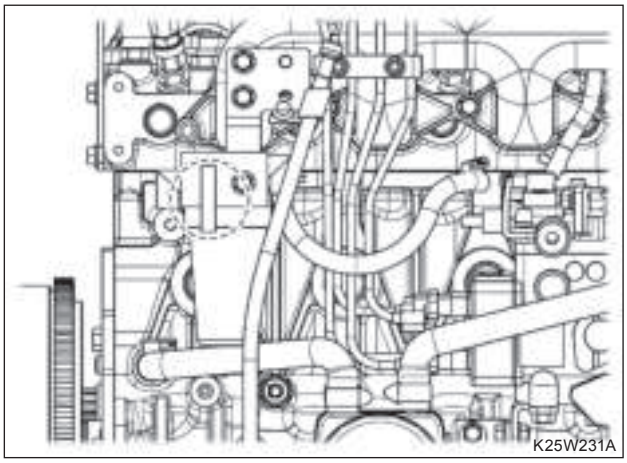


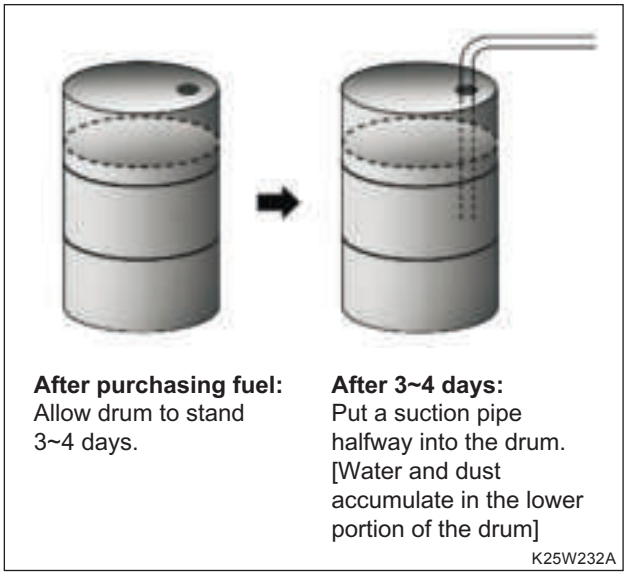
(1) Lubricating oil (2) Dip stick

- Lubricating oil and element replacement for 1st time is after operating engine for 50hrs. And then 2nd time and thereafter is every 250 hr.

2.2.3 FUEL

- The characteristics of diesel engine fuel (Cetane, specific gravity, viscosity, etc) has a effect on engine start, power out, fuel consumption, the functionality of a chain of fuel, knock, emission, etc. Use the fuel that has Cetane value 40-48 and use a lower viscosity at low temperature.





- The contaminated fuel can be a cause of starting failure and the engine will emit bluish white exhaust.
- The fuel that contains water and dust can cause a serious failure, so always use clean fuel.

  1) The case which store the fuel in the house, stand the drum for several days to precipitate the water and dust to the bottom and then use the fuel at the top.

  2) Before operating the engine, open the drain cock at the bottom of the fuel tank and remove the sediments.

- Replace the fuel filter: every 250hrs.

  If water or dust deposits are in fuel, replace the fuel filter.

(1) Bleed air screw

- Bleed air: The fuel system runs from the fuel tank through the fuel filter, fuel injection pump and high pressure piping, to the injector. Fuel is not injected if there is air in the fuel system. Bleed the air according to the following steps.

  1) Loosen the air bleeding screw at top of the fuel filter until foamy. And then put a cloth near the air bleeding screw for prevent overflow fuel.

  2) If fuel doesn't include bubbles, tighten the air bleeding screw.

⚠ WARNING

- **Do not lay flammable materials in engine around.**

2.2.4 COOLANT

- The coolant must use the soft water (such as tap water, etc). Hard water such as well water causes scale deposits on the coolant system. This reduces the cooling efficiency and raises the coolant temperature too high, causing seizures between the piston and the liner. Use an anticorrosive to prevent rot at summer season and use a coolant to prevent freezing at winter season.
- The anti-freezing liquid to dilute to 40~60% based on the quantity of coolant according to vehicle type.

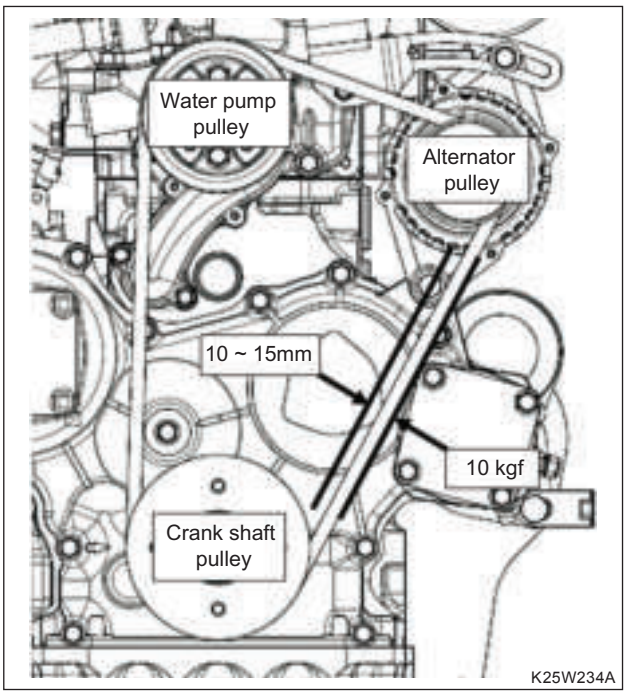
COOLANT (VOLUME %)	30	40	50	60	70
WATER	70	60	50	40	30
FREEZING POINT (°C)	-16	-25	-35	-50	-48

- Replace the coolant: Every 500hrs or every 2years.

  Contaminated coolant reduces cooling efficiency so the temperature could be raised too high. This might cause the engine seizure.

- Before operating the engine, always check the amount of coolant in the sub-tank. In addition, check the amount of coolant in the radiator at least once a week. If the coolant is not enough, engine temperature will be raised high. This could be a cause of engine seizure.

2.2.5 V-BELT.



- Too much of fan belt tension accelerates wear of the belt, in contrast, too little of belt tension leaves the pulley idle, overheats the engine, and no-load is generated. Adjust the belt tension as follows.
- The belt tension is 8~12mm in the case of new part. The case which uses the belt, adjust tension to 10~15mm.
- Correct adjustment exists when the belt can be pushed inward about 10~15mm with 10kgf (22lb) thumb pressure exerted midway between the pulleys. Check if there is oil, grease, any damage in the belt.
- Replace the belt if it is cracked or frayed.
- Replace the belt if tegument is worn out or some pieces are detached.

2.2.6 EVERY 50HRS CHECK

1. Replace the lubricating oil and oil filter: Replace the lubricating oil and oil filter at the first 50hrs.
2. Check the tension of the V-belt.

2.2.7 CHECK EVERY 250HRS

1. Replace the lubricating oil and oil filter: Replace the lubricating oil and oil filter every 250 hrs after replacing it at first 50 hrs.
2. Check & clean the radiator fan.
3. Clean the air cleaner.
4. Check the tension of the V belt.
5. Replace the fuel filter: Replace the fuel filter every 250 hrs.

2.2.8 CHECK EVERY 500HRS

1. Replace the air cleaner elements.

2.2.9 CHECK EVERY 1,000HRS

1. Check & correct the injection pressure of injector and the spray condition (see section 5.2.)
2. Correcting the valve clearance (see section 4.3.23)

2.2.10 CHECK EVERY 2,000HRS

1. Cleaning & maintenance of the coolant path: Parts related coolant path such as radiator, water pump, cylinder block and head, oil cooler etc. causes cooling efficiency decrease by long-term use. Therefore cleaning & maintenance is required.
2. Check & replace the fuel pipe and coolant pipe: Check the hose used in the fuel pipe or coolant pipe etc, and the deteriorated or defected parts replace. Although replacement timing is not reached, hose replace once every 2 years.
3. Rapping of intake/exhaust valve: Do maintenance to ensure the leak tightness of the cylinder head.
4. Correct the injection timing and check & correct the injection pump: see section 4.3.11.

3. DEFECT DIAGNOSIS AND MANAGEMENT

	TROUBLE	CAUSE	REPAIRING
Engine difficult to start	Starter switch but does not pinion.	1) Lack of battery capacity	1) If discharged, charge or replace. 2) If lack of the capacity because of the cold weather, raise slowly the temperature, or charge or replace.
		2) Connection of battery cable is loosen, broken, or corroded. (excessive resistance)	Correction
		3) Failure of spline which gets in gear pinion of the armature shaft.	Correct the spline.
		4) Failure of the magnetic switch plunger. Or coil disconnection and short.	Correction or replace
		5) Key-switch circuit is malfunctioning	Correction or replace
		6) Starter brush failure.	Disassembly and clear, replace, broken components.
	Pinion engages with ring gear but does not rotate starter.	1) Lack of battery capacity.	Same the 1-1)
		2) Disconnection of cable that connect the battery and magnetic switch. Or tightening failure of the connecting wire that connect magnetic switch and terminal of motor.	Correction
		3) Gearing failure of pinion and ring gear.	Correct or replace the pinion
		4) Starter failure.	Correction or replace
		5) Tightening failure of batteries code connection area.	Re-tighten.
	Pinion does not engage with ring gear and does rotate.	1) Starter installation failure.	Re-installation.
		2) Failure of plunger & dimensions adjustment	Correction
		3) Pinion sleeve spring failure.	Replace
	The pinion engages with the ring gear and starter is rotated. But engine does not rotate.	1) Overrunning clutch failure.	Replace
		2) Engine internal failure.	Repair
	Engine starts but will not keep running	1) There is no fuel in the fuel tank.	Fill the supply tank.
		2) Air inhalation in the fuel system	Bleed air
		3) Fuel element clogging.	Clean or replace
		4) Air inhalation in injection pump.	Bleed air
		5) The electricity does not flow in the fuel cut solenoid valve of injection pump.	Confirm the presence of electricity when key-switch is “ON”. If necessary, check the fuse or wire.
		6) Loose or failure of fuel cut solenoid valve in injection pump.	Re-tighten the solenoid valve, check the operation sound when turn On, Off the key-switch. Replace the failed solenoid.
		7) Injection pump failure	Correction or replace

TROUBLE		CAUSE	REPAIRING
Engine difficult to start	Engine starts but will not keep running	8) Connection area of high pressure pipe is loose.	Re-tighten
		9) Injection pump sticking.	Correction or replace.
		10) Spray failure of Injection valve.	Correction or replace
		11) Inappropriate injection pressure.	Correction
		12) Glow plugs failure.	Correction or replace.
		13) Compress pressure failure. - Closing of valve failure - Cylinder gasket packing failure - The piston, piston ring, cylinder wear	Check the valve and valve seat - Correction - Replace - Replace
	Start the engine, but it will stop soon	1) Fuel pipe clogged or filter polluted.	Cleaning
		2) Air inhalation in fuel.	Bleed air
		3) Clogging of the air hole in the fuel tank cap.	Correction
Idle condition failure		1) Maladjustment of the accelerator lever.	Correct acceleration lever and cable
		2) Air inhalation in injection pump.	Bleed air
		3) Injector failure	Correction or replace
		4) Injection timing failure	Correction
		5) Injection pump failure.	Correction or replace
Engine power output low		1) Improper valve clearance	Correction
		2) Adhesion failure of the valve.	Check the valve and valve sheet
		3) Cylinder head gasket gas leak.	Replace the gasket.
		4) Wearing to piston, sticking and breakage.	Replace the piston ring
		5) Air intake quantity shortage.	Clean the element in air cleaner.
		6) Injection timing failure	Correction
		7) Fuel injection quantity shortage.	Correct the pump flow rate.
		8) Injection pressure failure or sticking	Adjust or replace the injector
		9) Clogging the fuel pipe system.	Correction
		10) Air inhalation in fuel.	Bleed air
		11) Water inhalation in fuel.	Replace the fuel
		12) Freezing and solidity wax status of fuel line.	After putting in warm garage until disappear the freezing or wax, operate the air bleeding.
		13) Injection pump failure	Replace the injection pump

TROUBLE		CAUSE	REPAIRING
Engine overheat		1) Coolant shortage or fur forms	Refill or clean up
		2) Fan is loose, damage, or not balanced	Correction or replace
		3) Water pump performance degradation.	Correction or replace
		4) Valve clearance unsuitable	Correction
		5) Resistance increase in exhaust system.	Clean up or Replacement
		6) Clogging the radiator air path.	Clean up
		7) Inappropriate injection timing.	Correct the injection timing
		8) Cylinder head gasket breakage.	Replace the head gasket.
		9) Shortage or failure the lubricating oil.	Refill or Replacement.
Engine noise excessive	Crankshaft metal	1) Oil clearance increase by wearing the metal or crankshaft.	Replace the metal or polishing the crankshaft.
		2) Eccentricity wearing to crankshaft	Polishing or replace the crankshaft.
		3) Seizure of metal	Replace the metal or polishing the crankshaft.
	Connecting rod metal	1) Wearing to crankshaft pin metal.	Replace the metal.
		2) Wearing to crankshaft pin.	Replace the crankshaft.
		3) Bending to connecting rod.	Correction or replace.
		4) Seizure of crankshaft pin metal	Replace the metal or polishing the crankshaft.
		5) Oil supply shortage by clogging the oil line.	Clean the oil line
	Piston, Piston pin and piston ring	1) Piston clearance increase piston by wearing the piston and piston ring.	Replace piston and piston ring
		2) Wearing the piston pin diameter and piston pin	Replace
		3) Wearing to piston	Replace
		4) Piston wear or failure	Replace
		5) Piston ring failure	Replace
	Engine noise excessive	1) Wearing to crankshaft, thrust bearing.	Replace the thrust bearing.
	others	2) Excessive backlash of timing gear.	Replace the timing gear.
		3) Excessive valve clearance.	Correct the Valve clearance.
		4) Wearing to valve part.	Correction or replace
		5) Water pump bearing failure	Replace the pump.

TROUBLE		CAUSE	REPAIRING
Fuel consumption excessive		1) Fuel leak	Check and if necessary, replace all the pipe and re-tighten connection area.
		2) Clogging of the return pipe or hose	- Twisting, crushing of the return line is checked. Defective parts are replaced.
			- If lines were clogged, bleed air after boring the compressed air.
		3) Inappropriate injection timing.	Correction
		4) Check the compression pressure.	Correction or replace
		5) Injection valve failure (spray, pressure, etc)	Correction or replace
		6) Injection pump failure (excessive injection quantity)	Correction or replace
		7) Check the head gasket	Replace
Lubricating oil consumption excessive	Oil up	1) Cylinder and piston excessive clearance	Replace
		2) Wearing to piston ring, ring groove.	Replace the piston ring
		3) Inappropriate piston ring setting inlet location	Correct the location
		4) Clogging of the air breather	Clean up
		5) Excessive refill of lubricating oil.	Correction
	Oil Down	1) Loosing the valve stem and valve guide.	Replace
		2) Cylinder head gasket failure	Replace the gasket
		3) Valve stem seal failure	replace
	Oil leak	1) Connection area loosing in each part.	Tighten
		2) Packing failure in each part.	Replace the packing
		3) Oil seal failure.	Replace the oil seal
Lubricating oil pressure drop		1) Inappropriateness of the fuel quality.	Replace the specified oil.
		2) Pressure-control valve failure.	Replace
		3) Wearing to oil pump.	Replace
		4) Oil pipe failure.	Correction or replace
		5) Wearing to crank metal or crank pin.	Metal replace

TROUBLE		CAUSE	REPAIRING
Engine knocking		1) Mismatch the injection timing.	Correction
		2) Injection pressure failure	Correction
		3) Failure of the injection function.	Disassembly& Correction
		4) Shortage of the intake air	Clean the air cleaner
		5) Lubricating oil enter into the combustion chamber. - Oil up - Oil down - Oil viscosity is low.	 - Correction - Correction - Replace the appropriate oil.
		6) Engine temperature is low.	Warm-up.
Smoke excessive	White exhaust smoke	1) Injection timing is late.	Correction
		2) Compression pressure is low.	Correction
		3) Water inhalation in fuel.	Replace
		4) Air intake quantity shortage	Correction
		5) Lubricating oil enter into the combustion chamber.	Correction
	Black exhaust smoke	1) Injection timing is too late.	Correction
		2) Becoming overload.	Correct the appropriate load.
		3) Injection quantity is too many.	Injection limit spring failure.
		4) Injection unevenness	Correction
		5) Spray failure of the injection valve.	Correction or replace
		6) Intake air shortage	Clean the Air-cleaner

4. DPF SYSTEM

This section explains how to operate the DPF systems and help maintenance methods according to warning alarm levels. This data logger enables comprehensive monitoring of the DPF conditions to need DPF cleaning, check the cause of trouble – shooting to keep running the DPF system in good condition.

To operate correctly and efficiently, please kindly keep in mind this instructions and comments stated below;

1. Please be sure to follow and refer to the diagram in this manual when installing.
2. Please be sure to act in manual when alarm on or off and check system conditions by fault diagnosis device.
3. If you are aware of DPF system fault, Please send us data which is downloaded from “DPF Data Logger” in E-mail for analysis.

4.1 INTRODUCTION

The logger named “DPF Data Logger” is one of devices which record several data sources of Diesel Particle Filter (“DPF”). (DPF is used to collect particulate matter (“SOOT”) from diesel engine exhaust gas. It has a structure for filtering “SOOT” and passing gas through Wall Flow Substrate.) In case of accumulating SOOTs continuously, engine back-pressure becomes higher and then come into critical situation. To avoid this situation, the lamp will be running to know you what remove SOOT from DPF. Thus DPF Data Logger is available for logging temperature and pressure of DPF and running lamp in each critical situation.

4.2 DPF DATA LOGGER

4.2.1 INSTALLATION

It can be operated the date in initial installation through CAN communication scanner and can be analyzed data which is downloaded through USB device

4.2.2 SIGNAL LAMP

The lamp is used to alarm user when DPF should be cleaned or there is a problem with temperature / pressure sensor. When the lamp is turned on, user can detect the status using scanner.

4.2.3 SCANNER (FAULT DIAGNOSIS DEVICE)

It can be checking the DPF condition and any problems with sensors through CAN communication.

4.2.4 LOGGING DATA

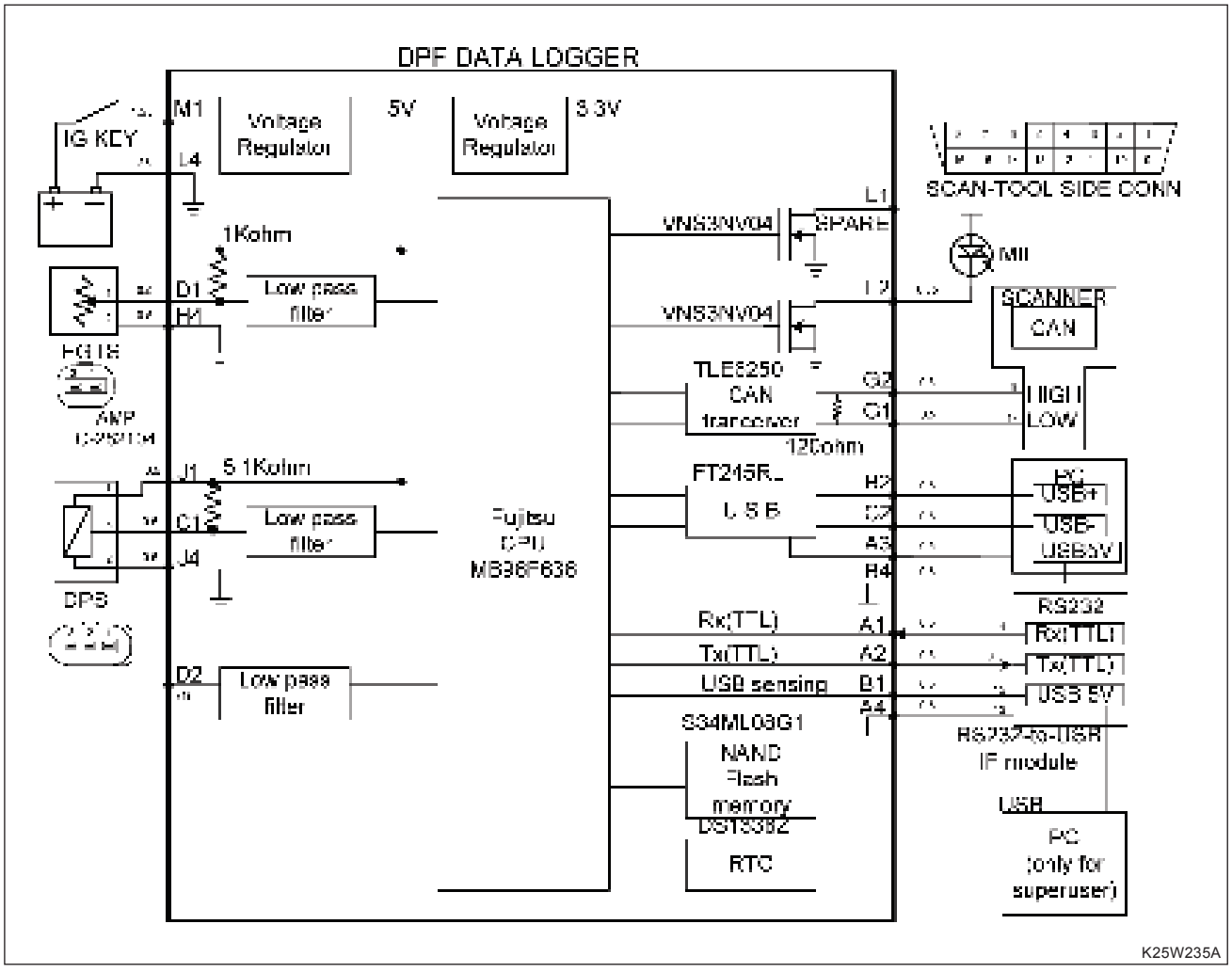
Data stored in DPF data logger can be downloaded through USB communication. There are two of methods. One is to download data from customer’s car to PC through OBD2 connecter (Low speed download mode), another is to download data directly from logger after separating DPF data logger from customer’s car by a staff of service department (High speed download mode). If you need to analyze the data, please send us the data via e-mail (ktm@endss.com).

4.3 FEATURES (INPUT / OUTPUT)

4.3.1 DATA LOGGER SPECIFICATION

ITEM	SPEC
Input Current Range	Maximum 200mA (Using Ignition key battery)
Input Voltage Range	7V ~ 18V
Leakage current	0mA
DPS sensor power supply	Maximum 50mA, 5V±0.2V
DPS Sensor	0 ~ 5V
EGTS Sensor	1 Kohm pull-up in logger
CAN Communication	CAN low, high to communicate with scanner, 250Kbps for DPF status check
RS232 communication	Communication to download data stored in “DPF data logger” or to reprogram and check DPF condition
LED Lamp	Warn the DPF conditions (working 1 Amp)

4.3.2 HARDWARE BLOCK DIAGRAM OF DPF DATA LOGGER



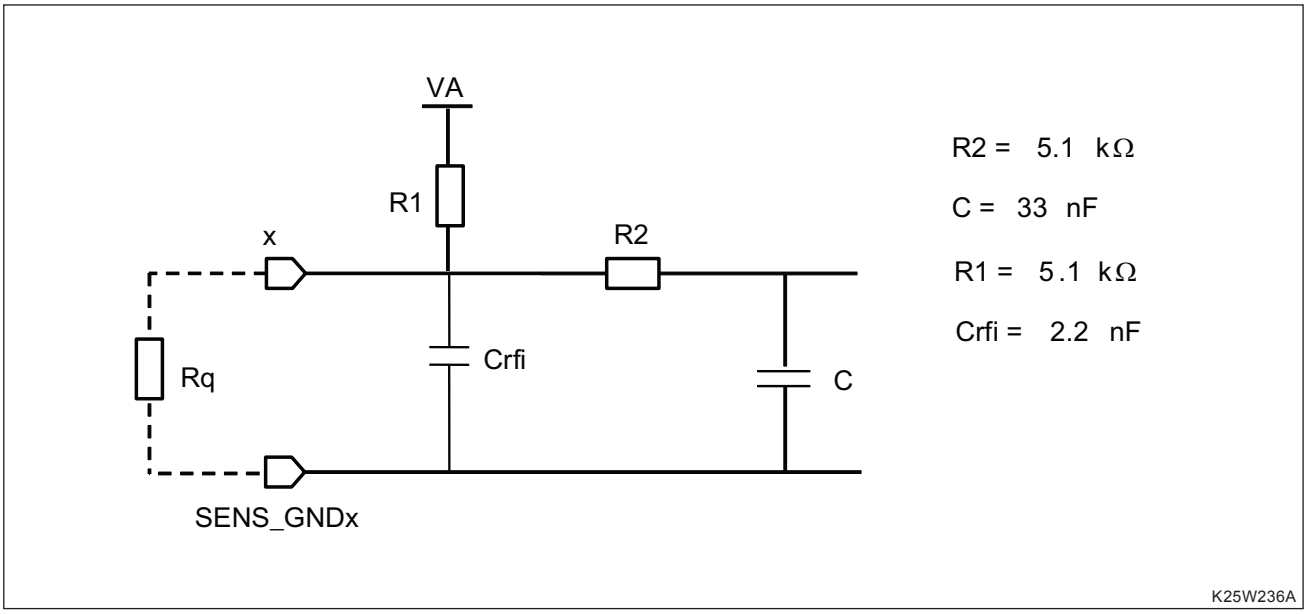
4.4 ELECTRIC SPECIFICATION

4.4.1 DPS SENSOR

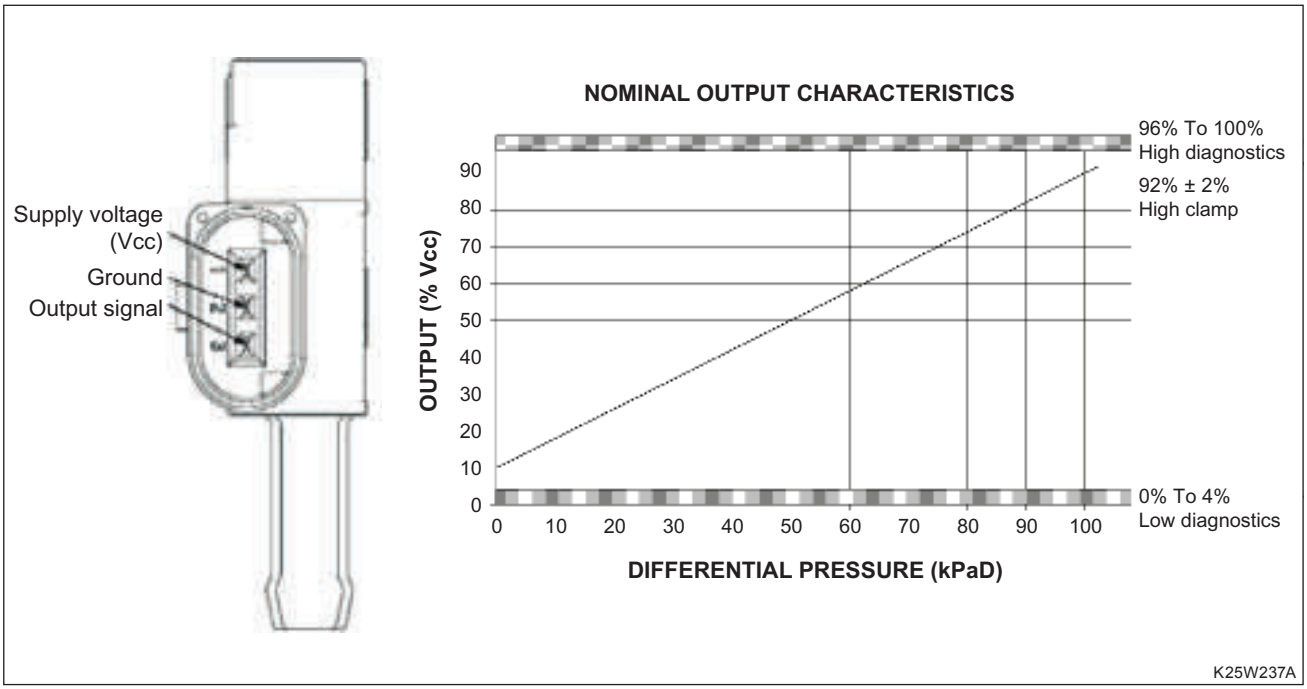
INTRODUCTION

Check the pressure difference between DPF inlet and outlet to measure the collected SOOT.

CIRCUIT



TABLE

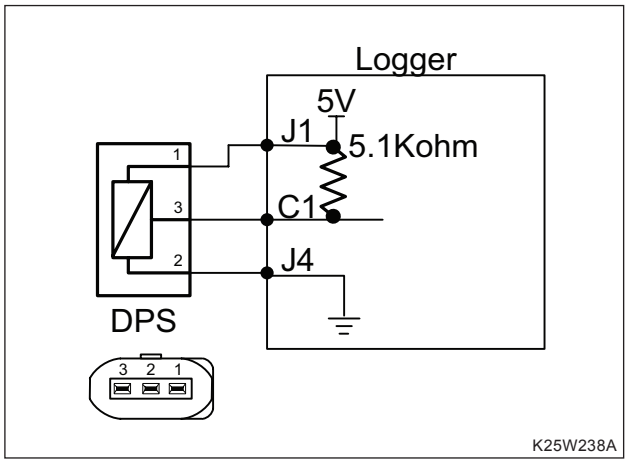


DIAGNOSTICS

The following sensor diagnostics are when the sensor is properly connected with a 5kohm pull-up load to Vcc.

FAULT PIN OUTPUT
Open 1 > 96%Vcc
Open 2 > 96%Vcc
Open 3 > 96%Vcc
Short 1-2 < 4%Vcc
Short 1-3 > 96%Vcc
Short 2-3 < 4%Vcc

PART CHECK



1) SCANNER

1] (DIAGNOSTIC) - 4] Engine - 1] DPF Logger - 1] Self check - 8] Differential pressure voltage - 9] Differential pressure

2) Check the voltage 0.5± 0.2V under atmosphere (Voltage of atmospheric pressure = 5V*10%)

3) How to check:

1. Turn off ignition switch.
2. Separate pressure sensor from connector.
3. Separate hose from pressure sensor.
4. Loosen bolts and separate pressure sensor from car

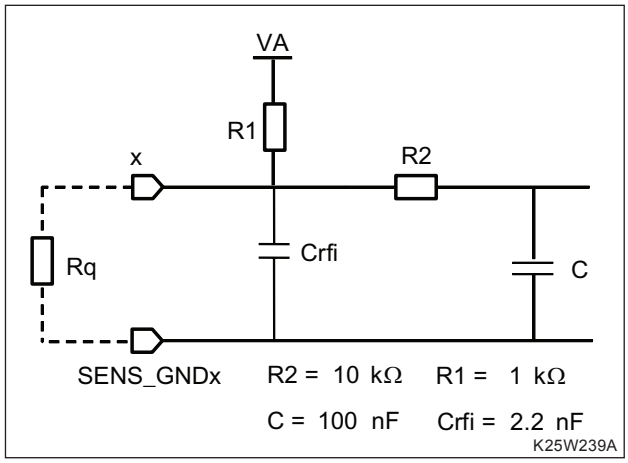
4) DPS sensor installation torque: 1.0 ~ 1.2 kgf•m

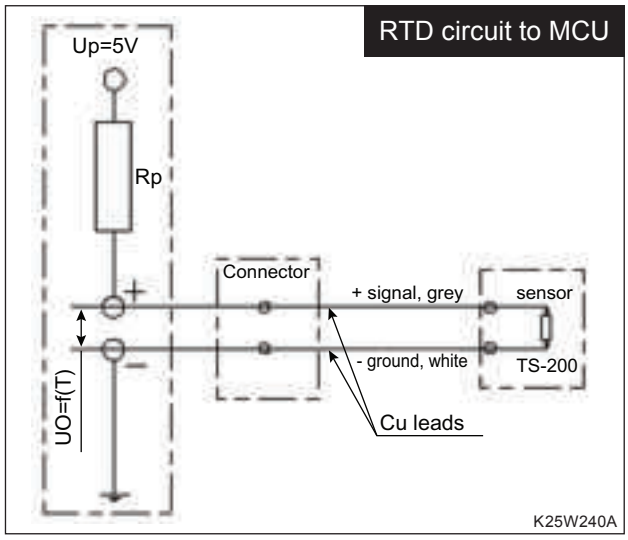
4.4.2 EGTS SENSOR (EXHAUST GAS TEMPERATURE SENSOR)

INTRODUCTION

Check the temperature of the exhaust gas from DPF and data logger records the temperature of the exhaust gas in Logger.

CIRCUIT





- Voltages
  - Power supply: Up = +5V ± 0.1%
  - Output voltage: UO = See table
- Resistances
  - Pull up resistance: Rp = 1000 Ω ± 0.1%
  - Lead resistance: R1 = 005 Ω (MI-cable + Cu-leads)
  - TS-200 0°C: RO = 200
  - Total TS-200 resistance: Rs = See table

TABLE

$Rs = R1 + R0 (1 + \alpha T + \beta T^2)$

$\alpha = 3.8285\ 10^{-3}$

$\beta = 3.8285\ 10^{-3}$

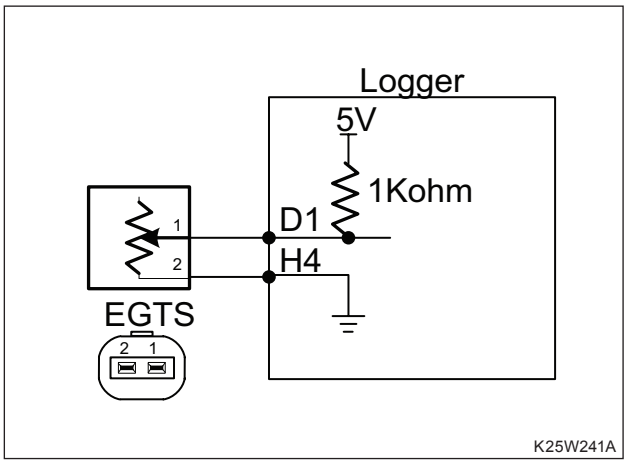
T (°C)	Rs (Ω)	UO (V)
-40	169.7	0.725
-20	185.1	0.781
0	200.5	0.835
25	219.6	0.900
50	238.5	0.963
100	275.9	1.081
150	312.7	1.191
200	349.0	1.293
250	384.6	1.389
300	419.7	1.478
350	454.2	1.562
400	488.1	1.640
450	521.4	1.713
500	554.1	1.783
600	617.8	1.909
700	679.2	2.022
800	738.2	2.123
850	766.8	2.170

DIAGNOSTICS

The following sensor diagnostics are when the sensor is properly connected with a 1kohm pull-up load to Up.

FAULT PIN OUTPUT
Open (Signal of Sensor) > 95%Vcc
Open (Ground of Sensor) > 95%Vcc
Open (Signal and Ground) > 95%Vcc
Short (Signal to Ground) < 5%Vcc

PART CHECK



1) SCANNER

1] (DIAGNOSTIC) - 4] Engine - 1] DPF Logger - 1] Self check - 10] Exhaust gas Temperature. Voltage - 11] Exhaust gas Temperature.Voltage

2) How to check:

1. Turn off ignition switch
2. Separate EGTS sensor from connector
3. Measure resistance at normal temperature by multi-meter
4. Check the resistance value as 220 ± 20Ω at room temperature(25°C)

3) Note: Different resistance values in different temperatures after driving need checking to the resistance value in reference to original value.

4) EGTS sensor installation torque: 4.0 ~ 5.0 kgf•m

⚠ CAUTION

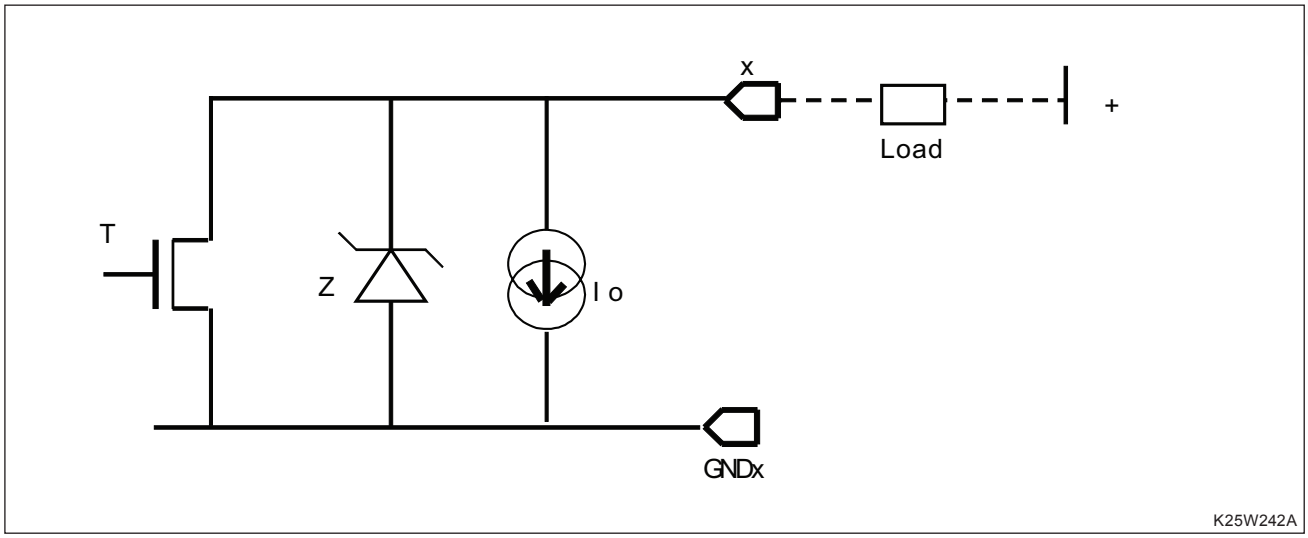
- **Don't separate only sensor from main board to avoid gas leak out of tail pipe**
- **Check sensor when it is dropped in use.**

4.4.3 DPF CHECK LED LAMP

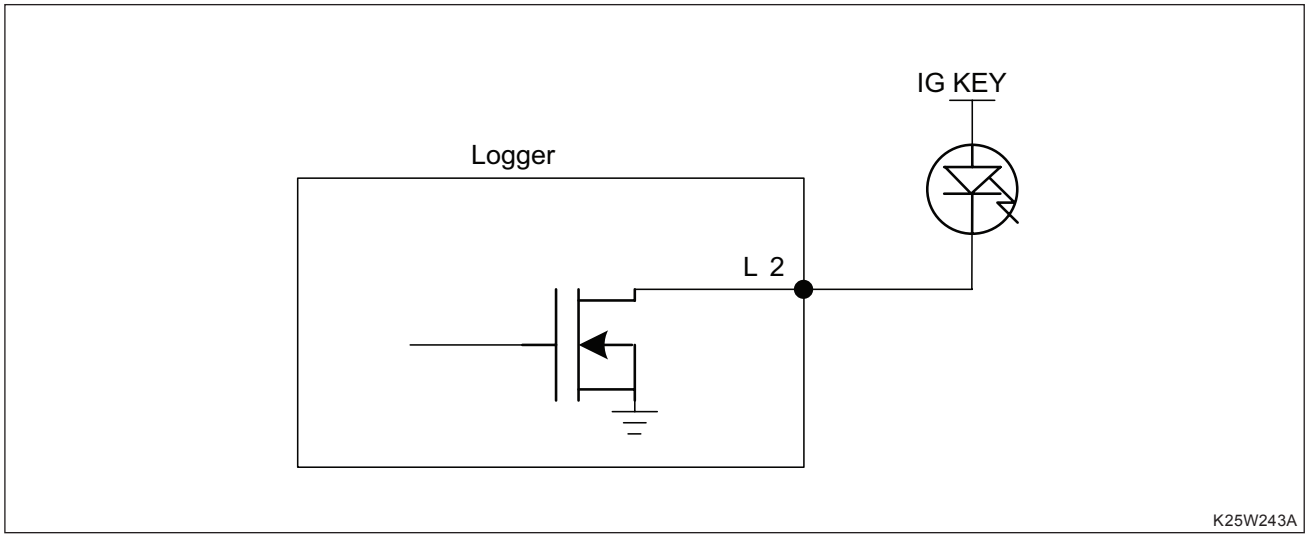
INTRODUCTION

Check lamp to show the DPF conditions.

CIRCUIT



WIRING



DPF LAMP ON/OFF

- If IGNITION KEY ON: Lamp ON for 1 sec

DANGER LEVEL	CONDITION	LAMP DISPLAY
EMERGENCY	1. △P > setting values(Pressure, time) It means DPF is clogged with Particular. 2. EGTS > setting value(Temp. time) It means that DPF almost melt.	Continuous
CAUTION	Sensor malfunction	Every 0.5sec.
CHECK	Working time > setting value(working time) (*possible erasing lamp with scanner)	Every 2.0sec.

*) Setting1: emergency differential pressure setting: only super-user can set using scanner

SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 2] Change setting - 1] DPS Warning Pressure – F1(Increase) or F5(Decrease)

*) Setting2: emergency pressure time setting: only super-user can set using scanner

SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 2] Change setting - 2] DPS Warning Time – F1(Increase) or F5(Decrease)

*) Setting3: emergency exhaust temperature setting: only super-user can set using scanner

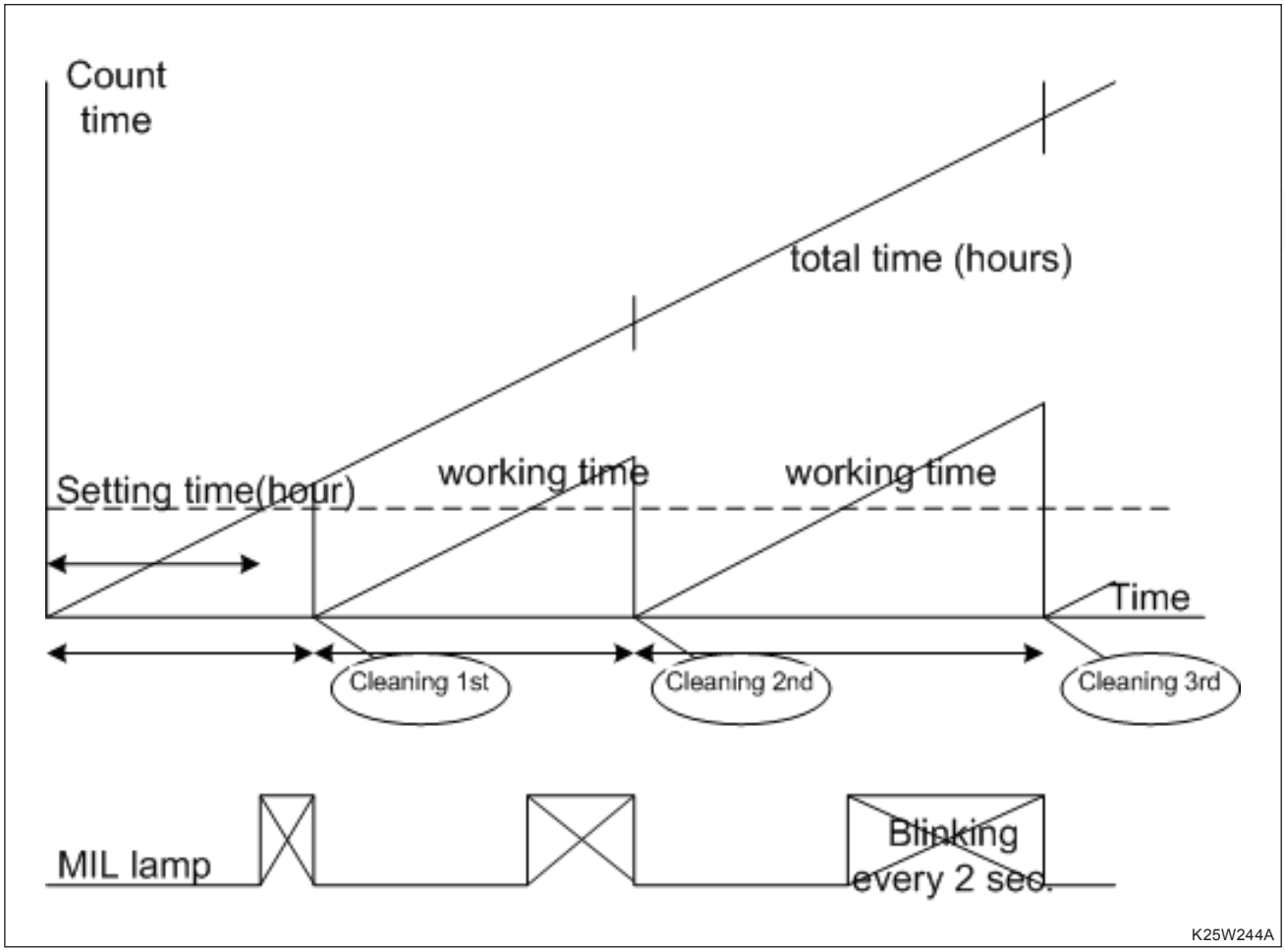
SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 2] Change setting - 3] EGTS Warning Temperature- F1(Increase) or F5(Decrease)

*) Setting4: emergency temperature time setting: only super-user can set using scanner

SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 2] Change setting - 4] EGTS Warning Time – F1(Increase) or F5(Decrease)

*) Setting5: DPF Cleaning Count :

SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 2] Change setting - 5] Reset DPF Cleaning Count – F1(Increase)



*) DPF Cleaning: DPF check lamp blinking in every 2 seconds indicates that engine operation hour exceeds setting value to make alarm for DPF cleaning maintenance. DPF check lamp will turn off if “Cleaning” is selected via scanner after DPF cleaning.

ACTION WHEN LAMP TURNS ON

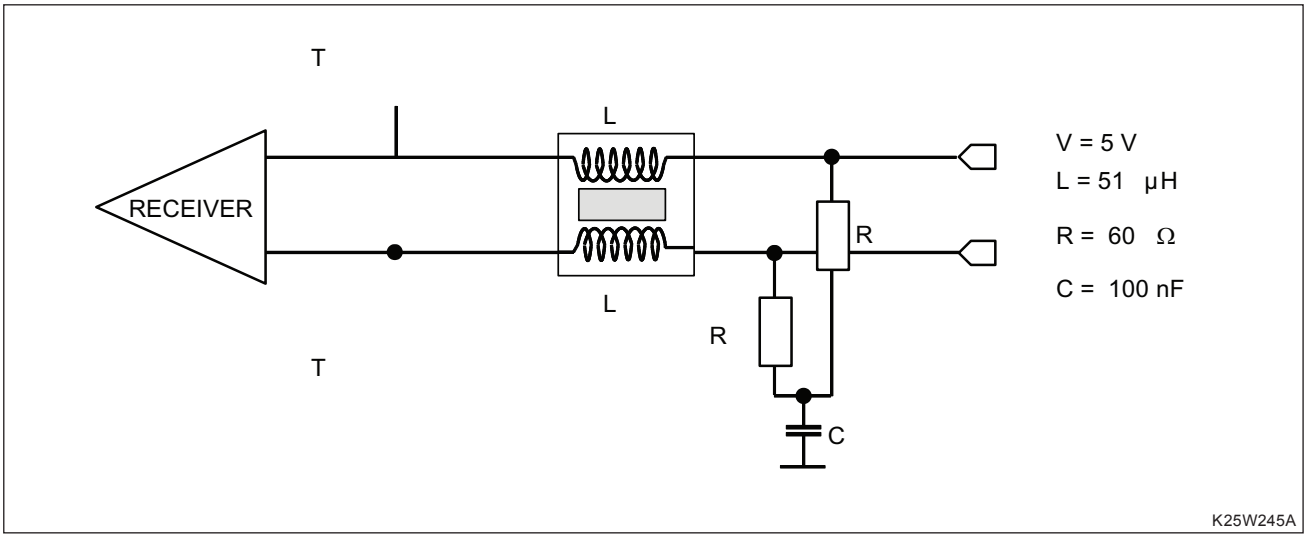
DANGER LEVEL	TEMPORARY ACTION	LAMP DISPLAY
EMERGENCY	1. Stop tractor and engine if lamp light blinks while driving 2. Call customer service 3. Caution ! : DPF could be damaged seriously if you keep driving even though lamp blinks	Continuous
CAUTION	1. Go to service shop for a inspection when lamp blinking 2. Check sensor in service shop	Every 0.5 sec.
CHECK	1. Go to service shop for a inspection when lamp blinking 2. Carry out a cleaning of DPF	Every 2.0 sec.

4.4.4 CAN COMMUNICATION

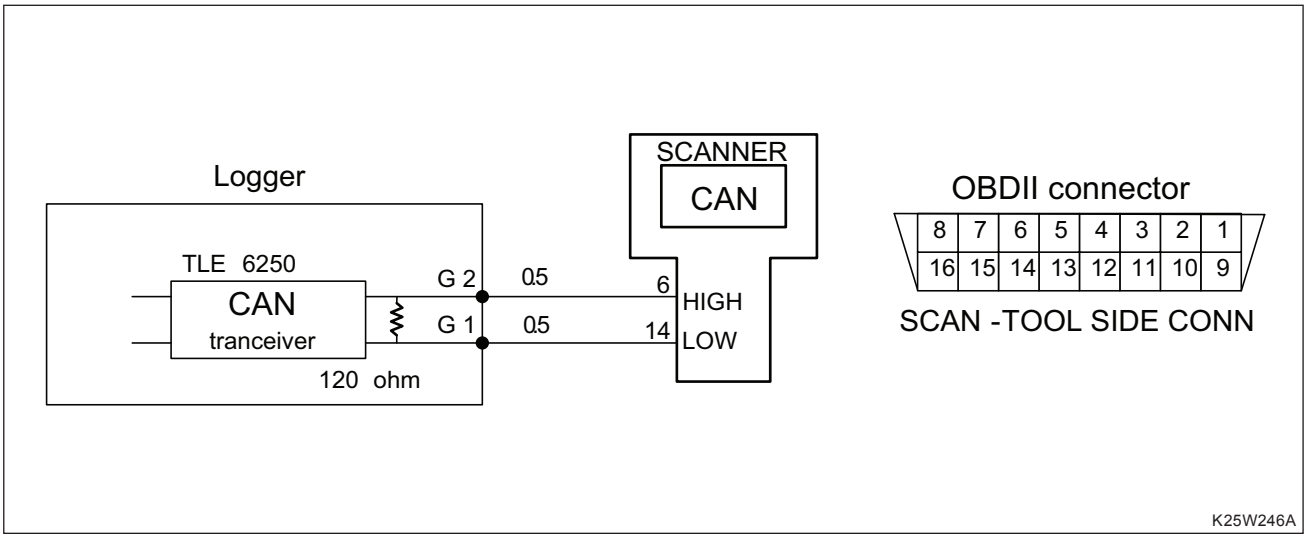
INTRODUCTION

A circuit connecting to scanner, which helps check a condition of DPF and repair.

CIRCUIT



WIRING



SCANNER CHECK

1) Connect scanner tool to OBDII terminal in IG key off or on

2) Ignition key on

3) Press a power button on scanner

4) SCANNER – 1] DIAGNOSTIC - 4] Engine - 1] DPF Logger - 1] Auto check

5) It indicates an error between Logger and CAN communication when displaying “00” value on data list

6) Call customer service department for inspection of scanner if communication is not running

4.4.5 PC RS232 COMMUNICATION (LOW SPEED DATA DOWNLOAD AND REPROGRAM)

INTRODUCTION

A circuit connecting to scanner, which helps check a condition of DPF and repair.

1) Using 4 pins connecter between RS232 connecter and Data logger connector

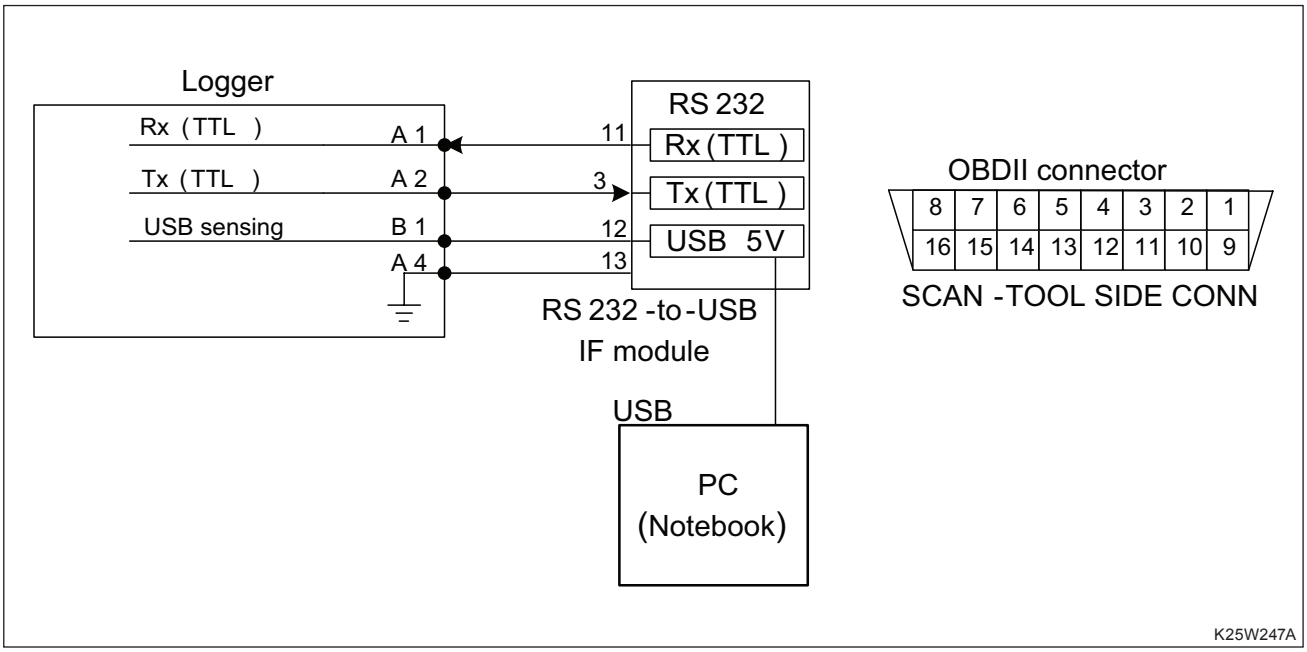
2) 4pin connector (RS232_RX, RS232_TX, RS232_GND, USB1_CONNECT)

3) Logger reprogram : Connect RS232-to-USB Interface module to PC and start to download HEX file when turn IG_KEY ON while running reprogram execution file provided

4) USB1_CONNECT : Signal to detect connecting RS232-to-USB I/F module from external

5) Data Download from Logger : Select downloading times to setting key among 2 second/10 second/ 60 second because it needs about 19 hours to download at a speed of 115200BR (115200,8,N,1)

WIRING



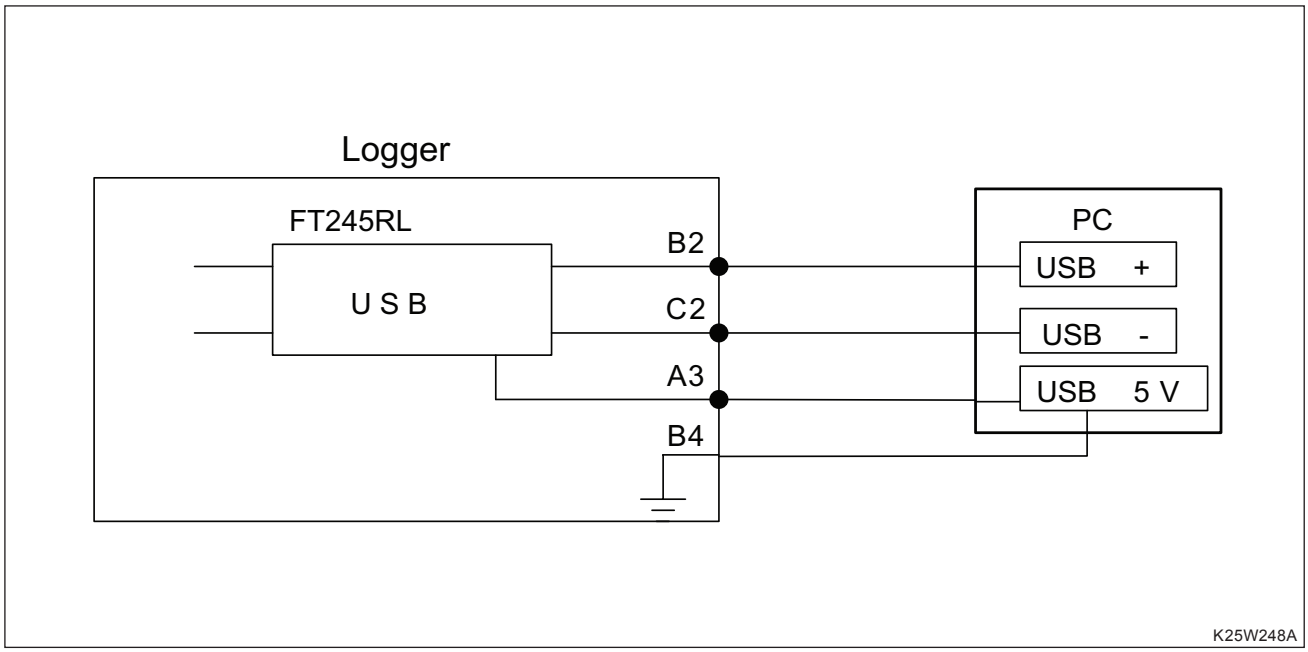
4.4.6 PC USB2 COMMUNICATIONS (HIGH SPEED DATA DOWNLOAD)

INTRODUCTION

High speed downloading tool for DPF engineer only

1) Maximum length of USB connector should not exceed 200 mm and it has 6 pin connector only
2) Need 4 pin connecter ((USB2 power supply, USB2 ground, USB2_POSI, USB2_NEG) for high speed download in option and it does not connect to wire-harness.
3) Communication speed: 1GB data will take 200 seconds to download with a speed of 12megaBR (Using extra logger connecter)

WIRING



4.4.7 RTC(REAL TIME CHECK) POWER SUPPLY (WARRANTY FOR 5 YEARS)

RTC power supply (Warranty for 5 years)

RTC IC is used to memorize present time without electric power. The present time is recorded one time when IG key ON.

4.5 NOTE

4.5.1 RUNNING TEMPERATURE RANGE

- -40°C ~ 105°C

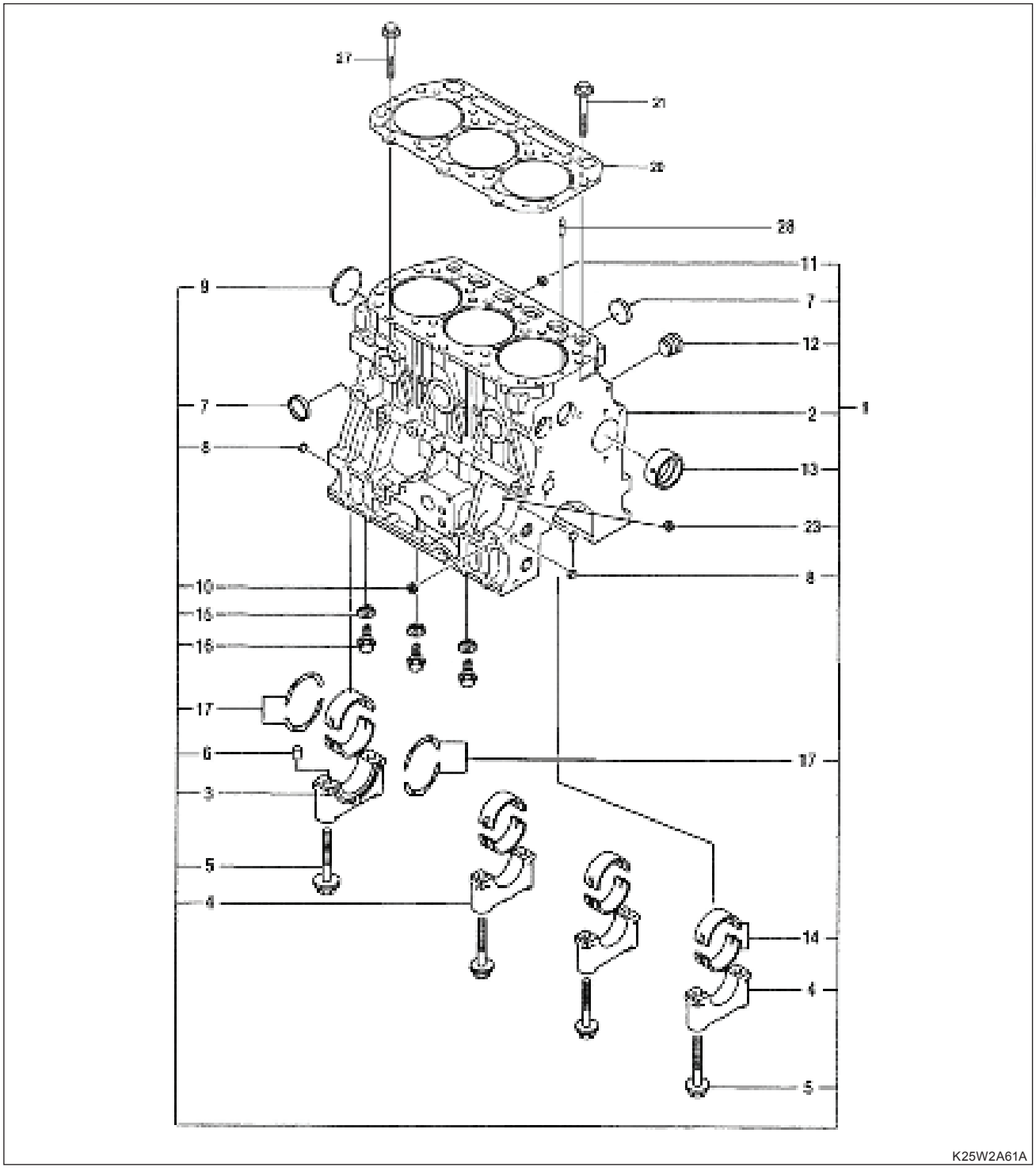
4.5.2 CASE: WATER-PROOF CASE

4.6 WARRANTY

4.6.1 WE GUARANTEE DPF DATA LOGGER FOR 5 YEARS AFTER SHIPMENT

5. SECTIONAL VIEW FOR MAJOR COMPONENTS

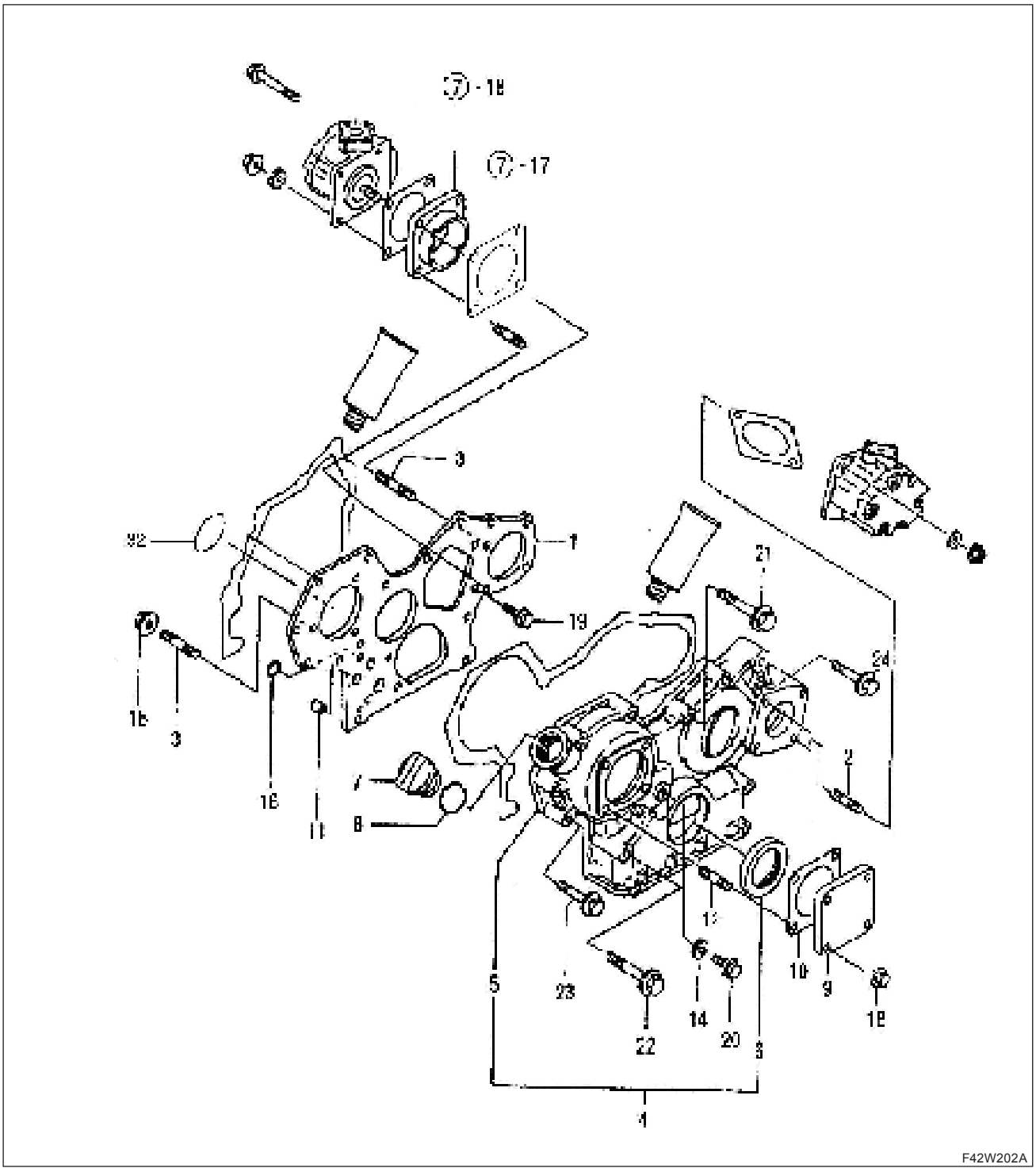
5.1 CYLINDER BLOCK



COMPONENTS

(1) Block ass'y, cylinder
(2) Block, cylinder
(3) Bearing cap 1
(4) Bearing cap 2
(5) Bolt, bearing cap
(6) Spring pin
(7) Plug 30
(8) Plug 12
(9) Plug 50
(10) Plug pt 1/4
(11) Plug, pt 3/8
(12) Plug(block heater)
(13) Bush(cam shaft)
(14) Bearing ass'y, main(std)
(15) Packing
(16) Bolt 8 ×12
(17) Bearing ass'y, thrust
(20) Gasket, head
(21) Bolt(head, cylinder)
(23) Plug pt 1/8
(27) Bolt(head, cylinder)
(28) Pin(oil)

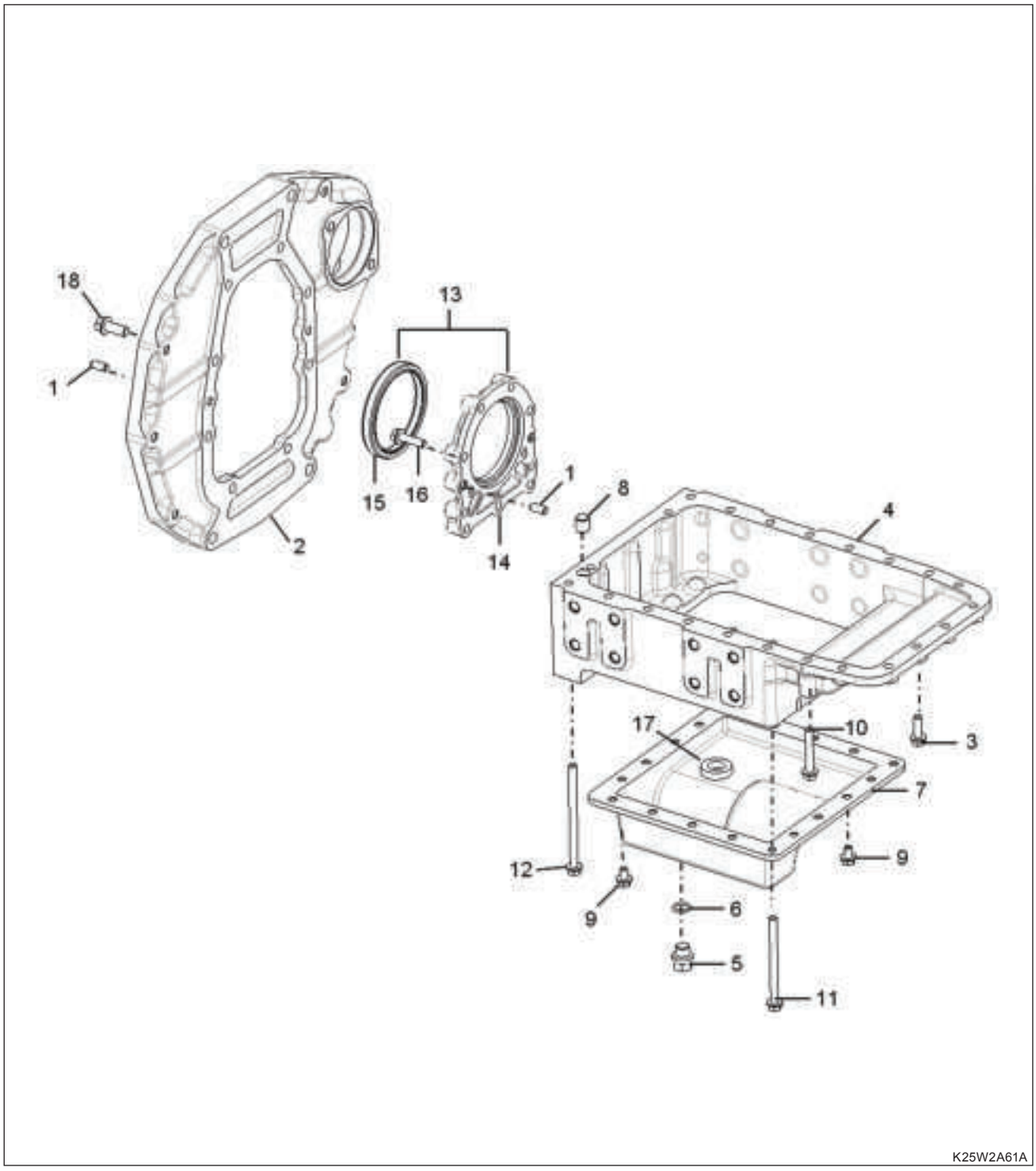
5.2 GEAR CASE



COMPONENTS

(1) Flange, gear case
(2) Stud bolt, M8 X L22
(3) Stud bolt, M8 X L20
(4) Gear case ass'y
(5) Gear case
(6) Oil seal
(7) Lub-oil filler cap
(8) O-ring
(9) Cover
(10) Packing
(11) Knock pin
(12) Stud bolt
(14) Copper packing, Ø8
(16) O-ring
(18) Flange nut, M8
(19) Bolt, M8 X L16
(20) Flange bolt, M8 × L22
(21) Flange bolt, M8 × L60
(22) Flange bolt, M8 × L90
(23) Flange bolt, M8 × L85
(24) Flange bolt, M8 × L50
(32) O-ring

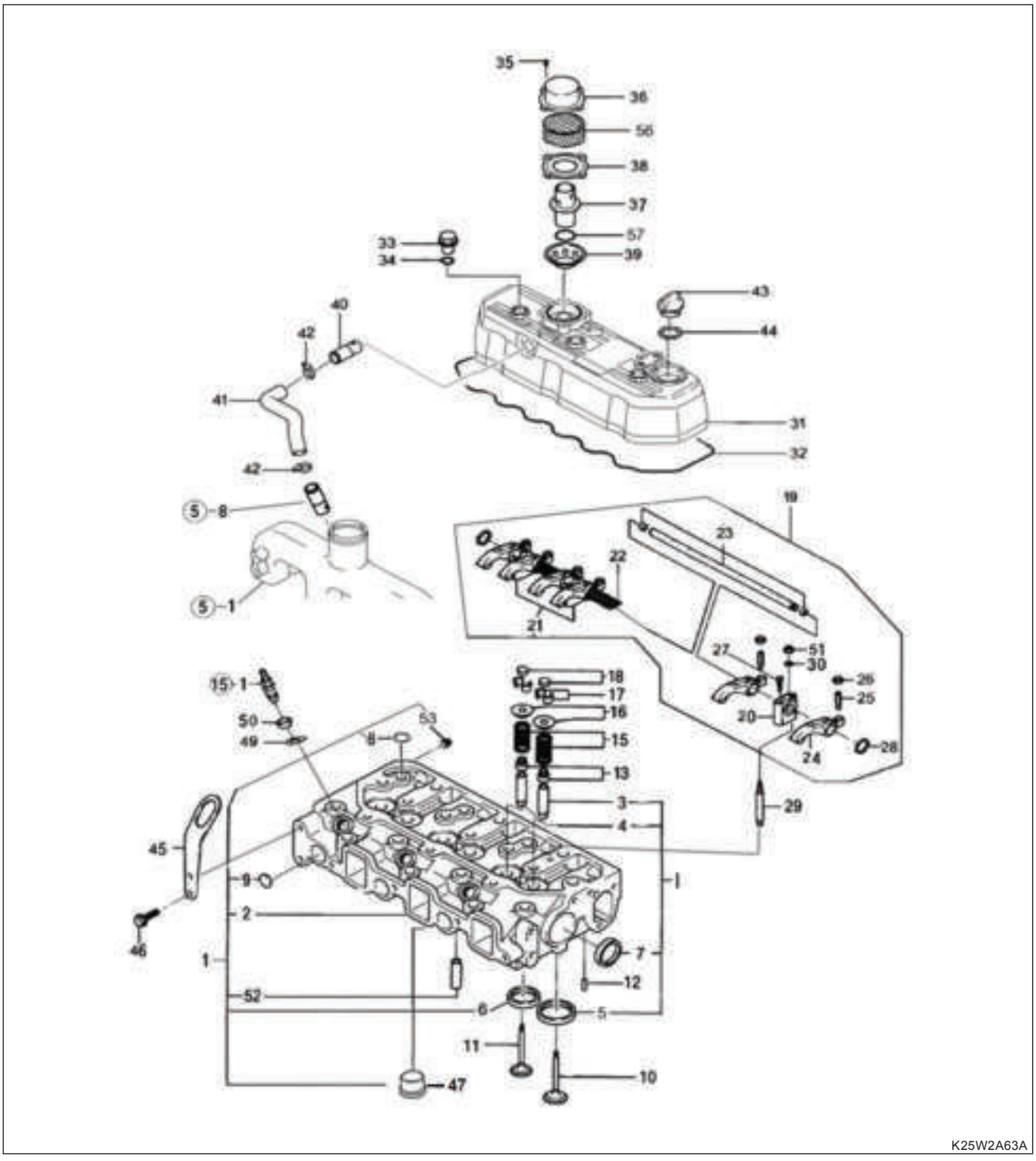
5.3 FLYWHEEL HOUSING AND OIL PAN



COMPONENTS

(1) Parallel pin
(2) Flange mounting
(3) Flange bolt, M8 X L25
(4) Oil pan
(5) Lub-oil drain plug, M14
(6) O-ring
(7) Lower cover
(8) Knock pin
(9) Flange bolt, M8×L12
(10) Flange bolt, M8×L50
(11) Flange bolt, M8×L100
(12) Flange bolt, M8×L120
(13) Oil seal housing ass'y
(14) Oil seal housing
(15) Oil seal
(16) Flange bolt, M8×L30
(17) Magnet
(18) Flange bolt, M10×L25

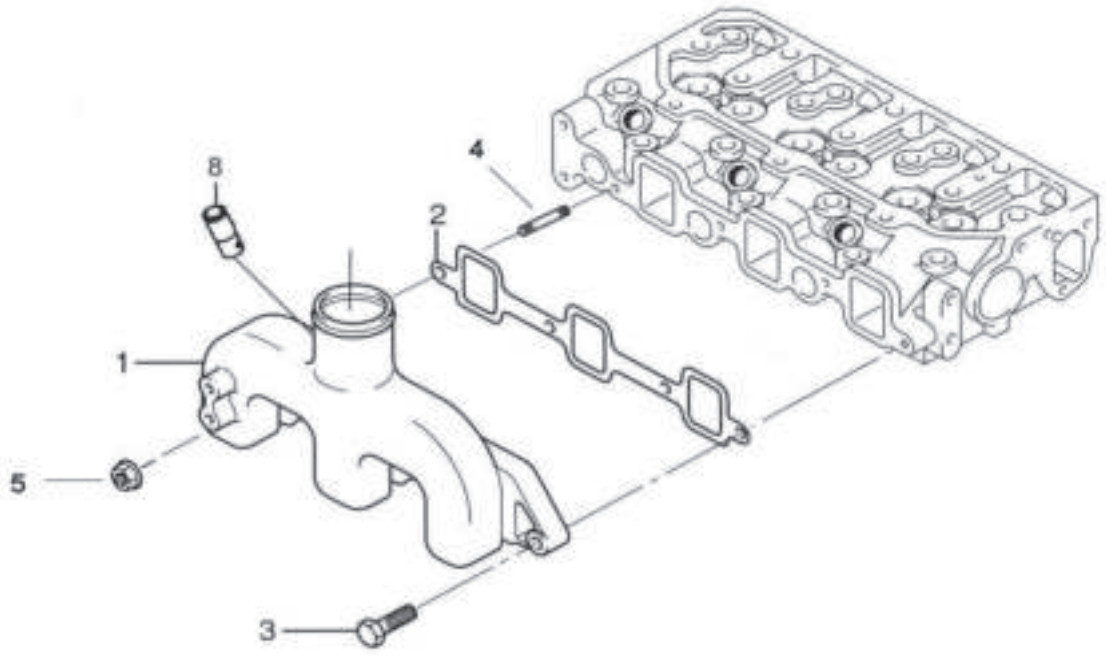
5.4 CYLINDER HEAD AND HEAD COVER



COMPONENTS

(1) Head ass'y, cylinder
(2) Head, cylinder
(3) Guide, suc valve
(4) Guide, exh valve
(5) Seat, suc valve
(6) Seat, exh valve
(7) Plug 40
(8) Plug 22
(9) Plug 22
(10) Valve, suction
(11) Valve, exhaust
(12) Pin, parallel 4×10
(13) Seal,valve shaft
(15) Spring, valve
(16) Retainer, valve spring
(17) Cotter, valve spring
(18) Cap, valve
(19) Shaft ass'y, rocker arm
(20) Support (A)
(21) Support (B)
(22) Spring(rocker arm)
(23) Shaft, rocker arm
(24) Rocker arm
(25) Screw, valve
(26) Nut, adjusting
(27) Screw, stop 8×10
(28) Circlip
(29) Bolt, stud
(30) Washer 12
(31) Cover, head
(32) Packing, head cover
(33) Cap, hood
(34) O-ring (P)
(35) Screw 4×10
(36) Cover, breather
(37) Valve, pressure relief
(38) Gasket, breather
(39) Plate, breather adjusting
(40) Tube, breather
(41) Hose, plain
(42) Clip, hose 20
(43) Oil filler
(44) O-ring (P)
(45) Lift
(46) Bolt, flange 8 x 16
(47) Pre chamber
(49) Seal,injector
(50) Spacer, nozzle
(51) Nut m12
(53) Plug pt 1/8
(56) Baffle
(57) O-ring

5.5 INTAKE MANIFOLD

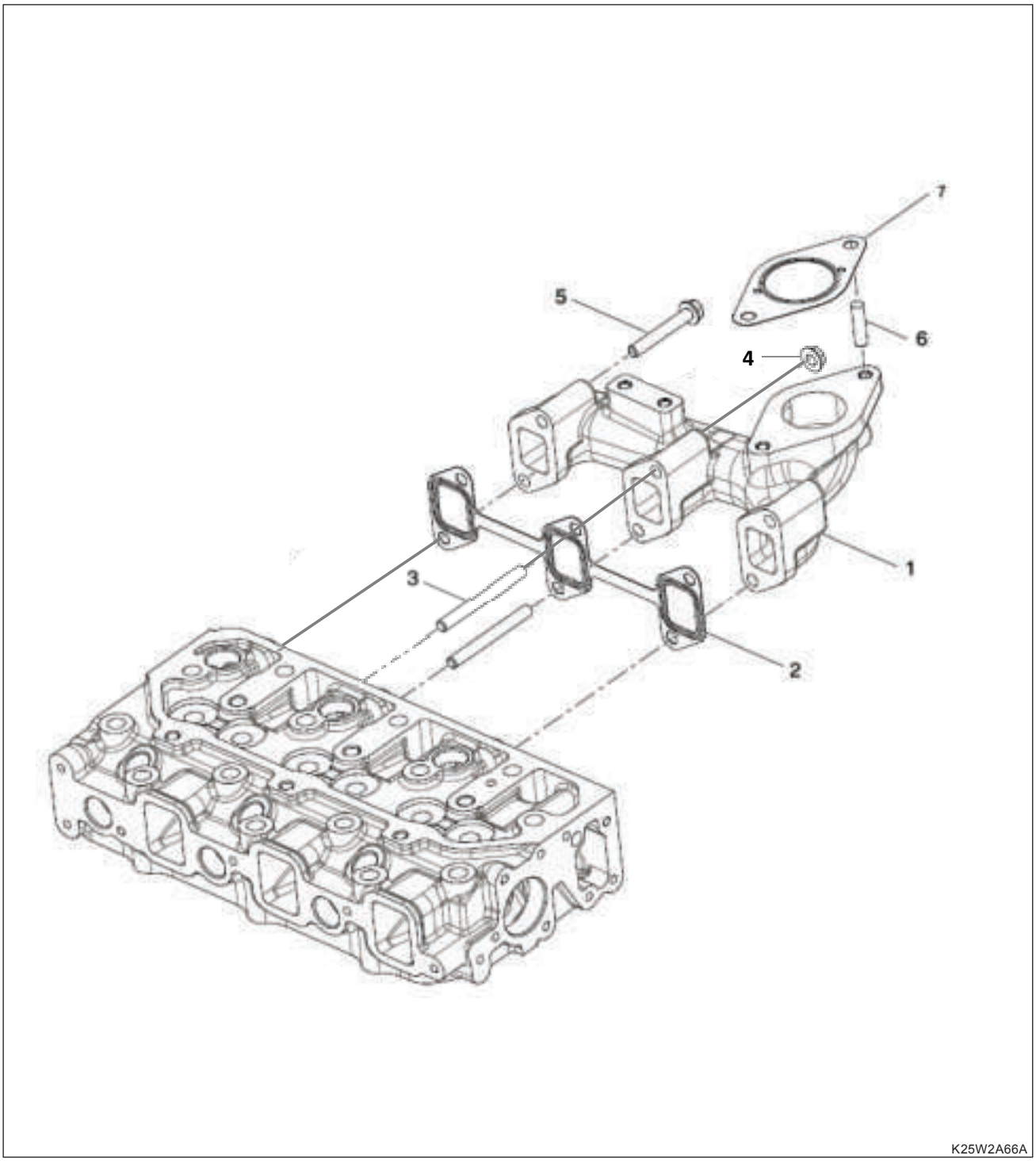


K25W2A64A

COMPONENTS

(1) Manifold, int.
(2) Packing(manifold, int)
(3) Bolt, flange 8 x 30
(4) Bolt, stud 8 x 35
(5) Nut, hexagon flange
(8) Tube, breather

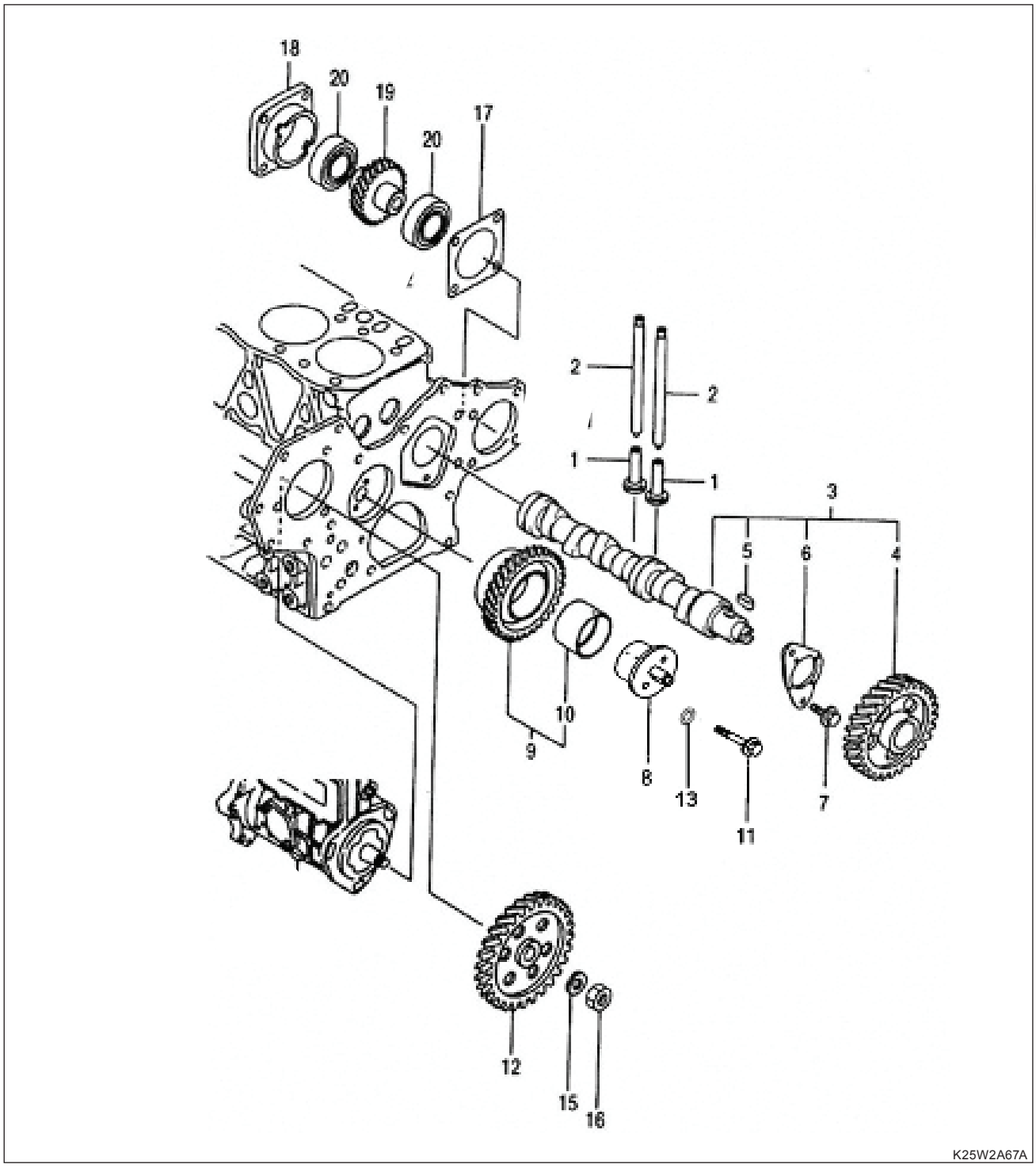
5.6 EXHAUST MANIFOLD



COMPONENTS

(1) Manifold, exhaust
(2) Gasket, exh. Manifold
(3) Bolt, stud
(4) Nut, flange 8
(5) Bolt, flange 8 x 80
(6) Bolt, stud 8 x 22
(7) Gasket(silencer)

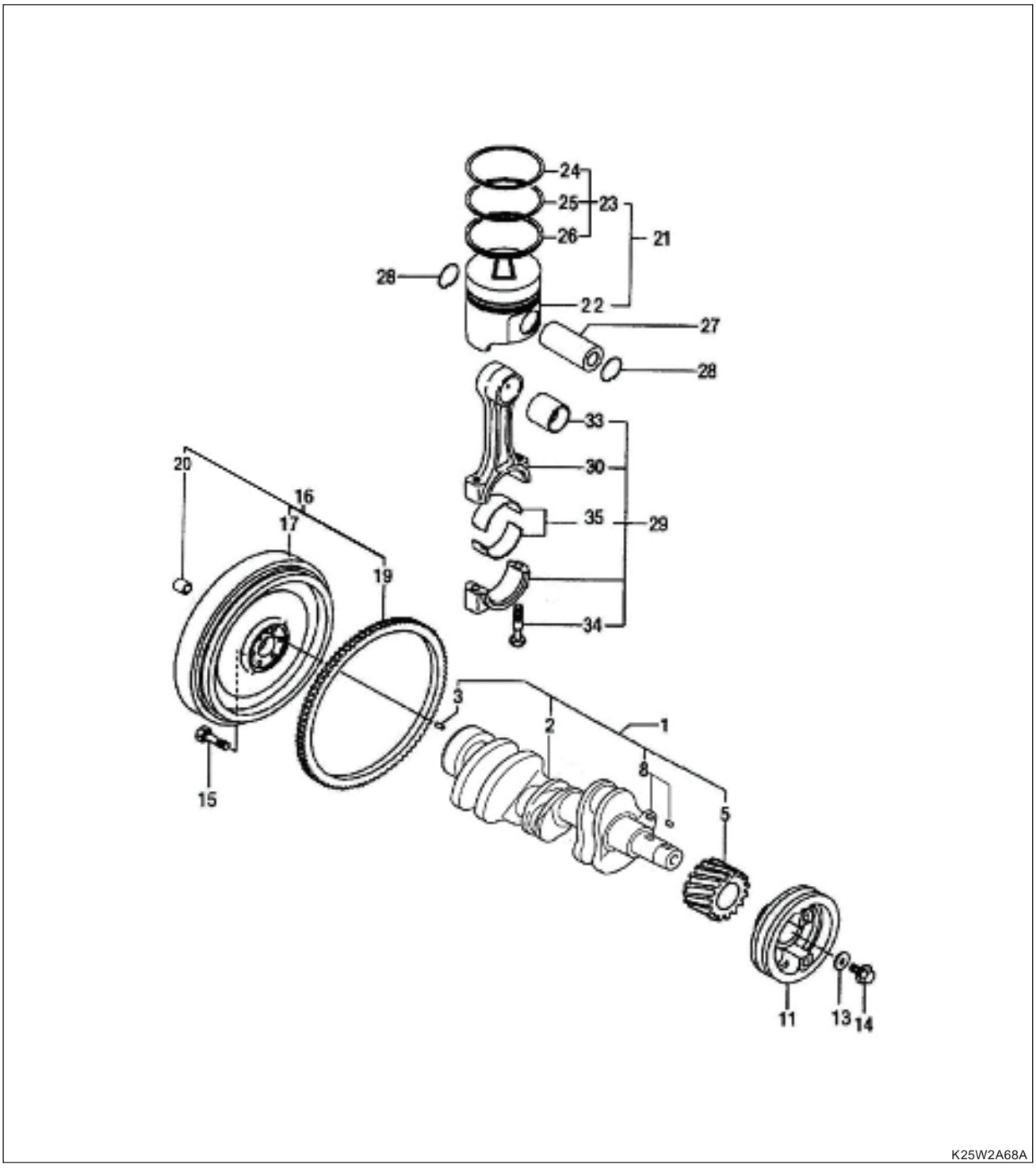
5.7 CAMSHAFT AND DRIVE GEAR



COMPONENTS

(1) Tappet
(2) Push rod
(3) Camshaft assembly
(4) Camshaft gear
(5) Sliding key
(6) Thrust bearing (camshaft)
(7) Hex. flange bolt
(8) Idle gear shaft
(9) Idle gear assembly
(10) Bushing (idle gear)
(11) Bolt (idle shaft)
(12) Fuel injection pump gear
(15) Spring washer
(16) Hex. nut
(17) Packing
(18) Hydraulic pump gear cover
(19) Hydraulic pump drive gear assembly
(20) Ball bearing (with deep groove)

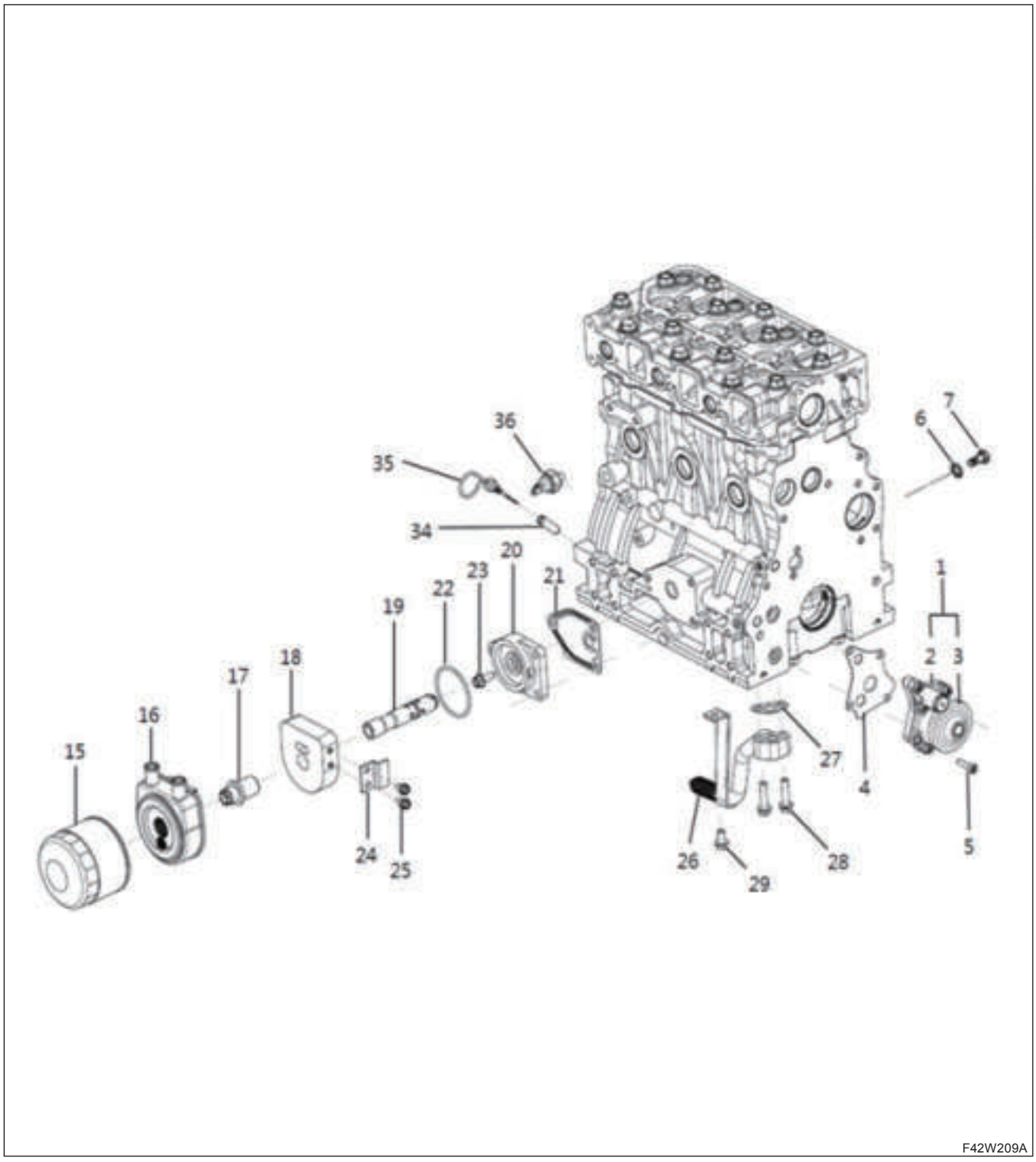
5.8 CRANKSHAFT AND PISTON



COMPONENTS

(1) Crank shaft ass'y
(2) Crank shaft
(3) Pin, parallel 8 × 16
(5) Gear, crank
(8) Key 7 × 14
(11) V-pulley(crank shaft)
(13) Washer(V-pulley) 8
(14) Bolt(V-pulley)
(15) Bolt, fly wheel
(16) Fly wheel ass'y (single 3cyl)
(17) Fly wheel (single 3cyl)
(19) Gear, ring
(20) Bearing, ball 6302
(21) Piston ass'y
(22) Piston
(23) Piston ring ass'y
(24) Piston ring (1st)
(25) Piston ring (2nd)
(26) Piston ring (oil)
(27) Pin, piston
(28) Ring, retainer
(29) Connecting rod ass'y
(30) Connecting rod
(33) Bush(piston pin)
(34) Bolt(connecting rod)
(35) Bearing, crank pin

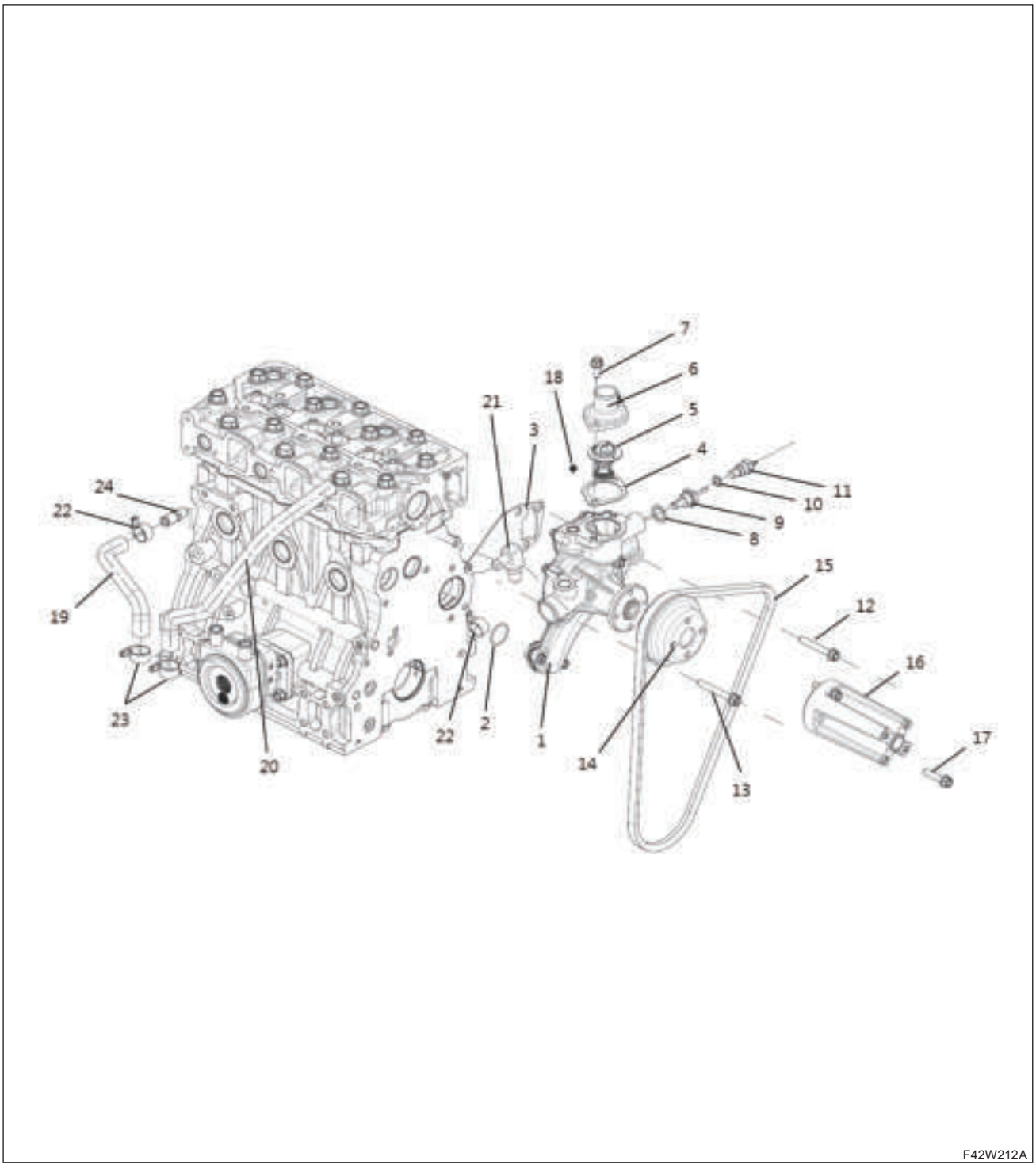
5.9 LUBRICATION SYSTEM



COMPONENTS

(1) Lub-oil pump ass'y
(2) Lub-oil pump
(3) Oil pump gear
(4) Packing, oil pump
(5) Bolt, M6 x L25
(6) Washer,sealing
(7) Screw,hexagon head cap
(15) Oil filter
(16) Oil cooler
(17) Bolt, oil cooler
(18) Space, oil cooler
(19) Oil pressure control valve
(20) Bracket, oil filter
(21) Packing, oil filter
(22) O-ring
(23) Flange bolt, M8 x L20
(24) Bracket, oil cooler
(25) Flange bolt, M6 × L12
(26) Oil suction pipe
(27) Packing, oil suction pipe
(28) Flange bolt, M8 x L35
(29) Flange bolt, M8 x L16
(34) Guide, dipstick
(36) Dipstick
(37) Oil pressure switch

5.10 COOLING SYSTEM

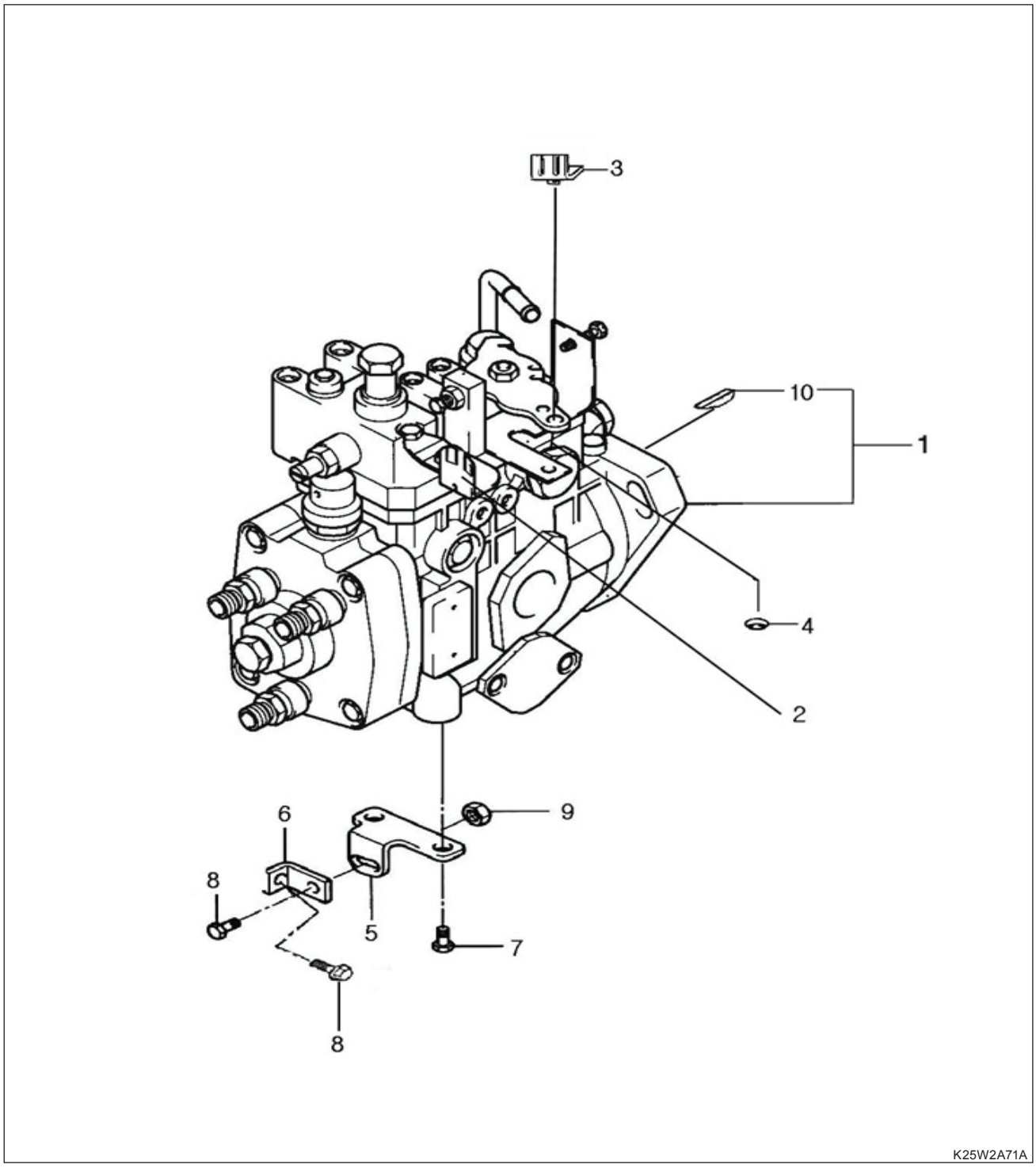


F42W212A

COMPONENTS

(1) Water pump ass'y
(2) O-ring
(3) Packing, water pump
(4) Packing, cover
(5) Thermostat
(6) Cover, thermostat
(7) Flange bolt, M8 × L18
(8) Copper packing, Ø16
(9) Sensor, glow plug
(10) Copper packing, Ø10
(11) Coolant temp. Sensor
(12) Flange bolt, M8 × L60
(13) Flange bolt, M8 × L55
(14) V-pulley
(15) V-belt
(16) Spacer, cooling fan
(17) Flange bolt, M8 × L35
(18) Taper plug, pt 3/8
(19) Cooling hose A
(20) Cooling hose B
(21) 90˚ Elbow
(22) Hose clamp, Ø25
(23) Hose clamp, Ø22
(24) Joint, pt 1/4

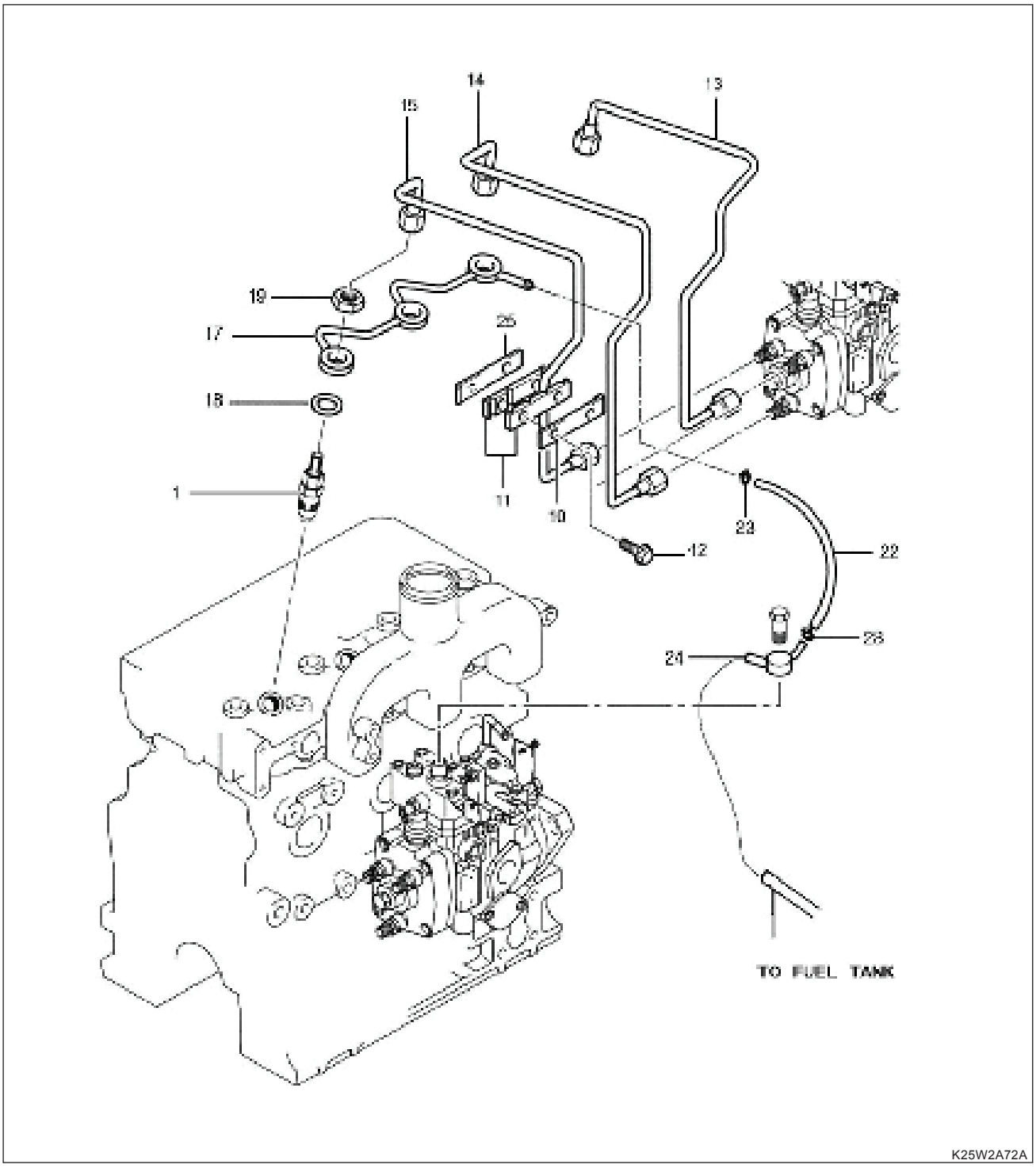
5.11 FUEL INJECTION PUMP



COMPONENTS

(1) Fuel injection pump ass'y
(2) Support
(3) Hook
(4) E-type retaining-ring
(5) Bracket,pump (A)
(6) Bracket,pump (B)
(7) Screw, hexagon head cap
(8) Bolt, flange 8 x 16
(9) Nut, flange
(10) Key,woodruff

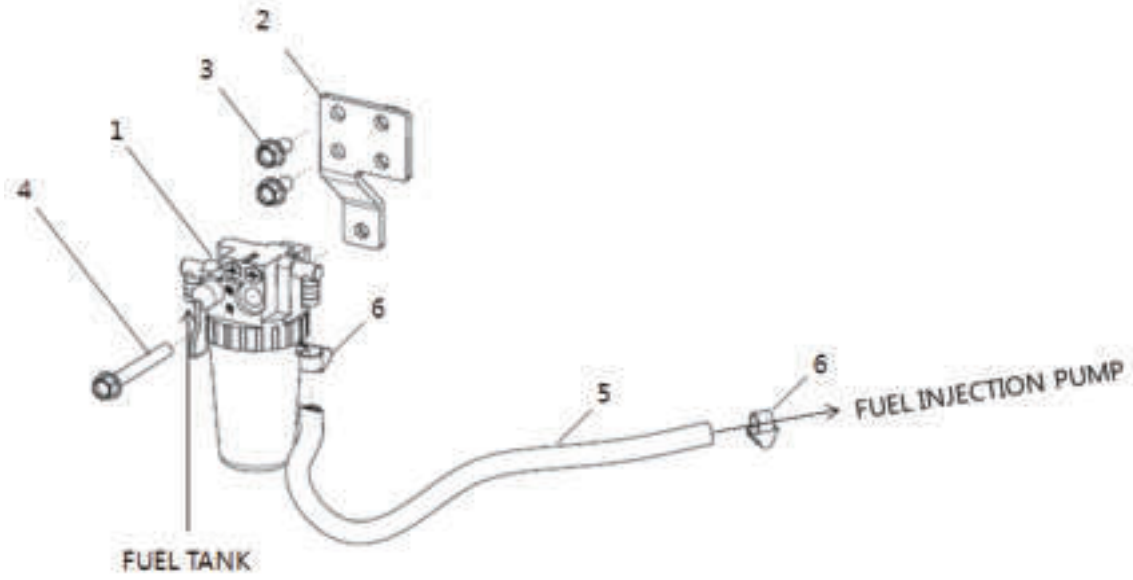
5.12 FUEL INJECTION SYSTEM AND VALVE



COMPONENTS

(1) Fuel injection valve assembly
(10) Bracket (fuel pipe)
(11) Bracket rubber (fuel pipe)
(12) Bracket plate
(13) Fuel pipe assembly (A)
(14) Fuel pipe assembly (B)
(15) Fuel pipe assembly (C)
(16) Fuel pipe assembly (D)
(17) Return pipe assembly
(18) Packing (joint)
(19) Hex. mounting nut
(22) Return hose
(23) Hose clip
(24) Joint
(25) Hex. flange nut

5.13 FUEL SYSTEM

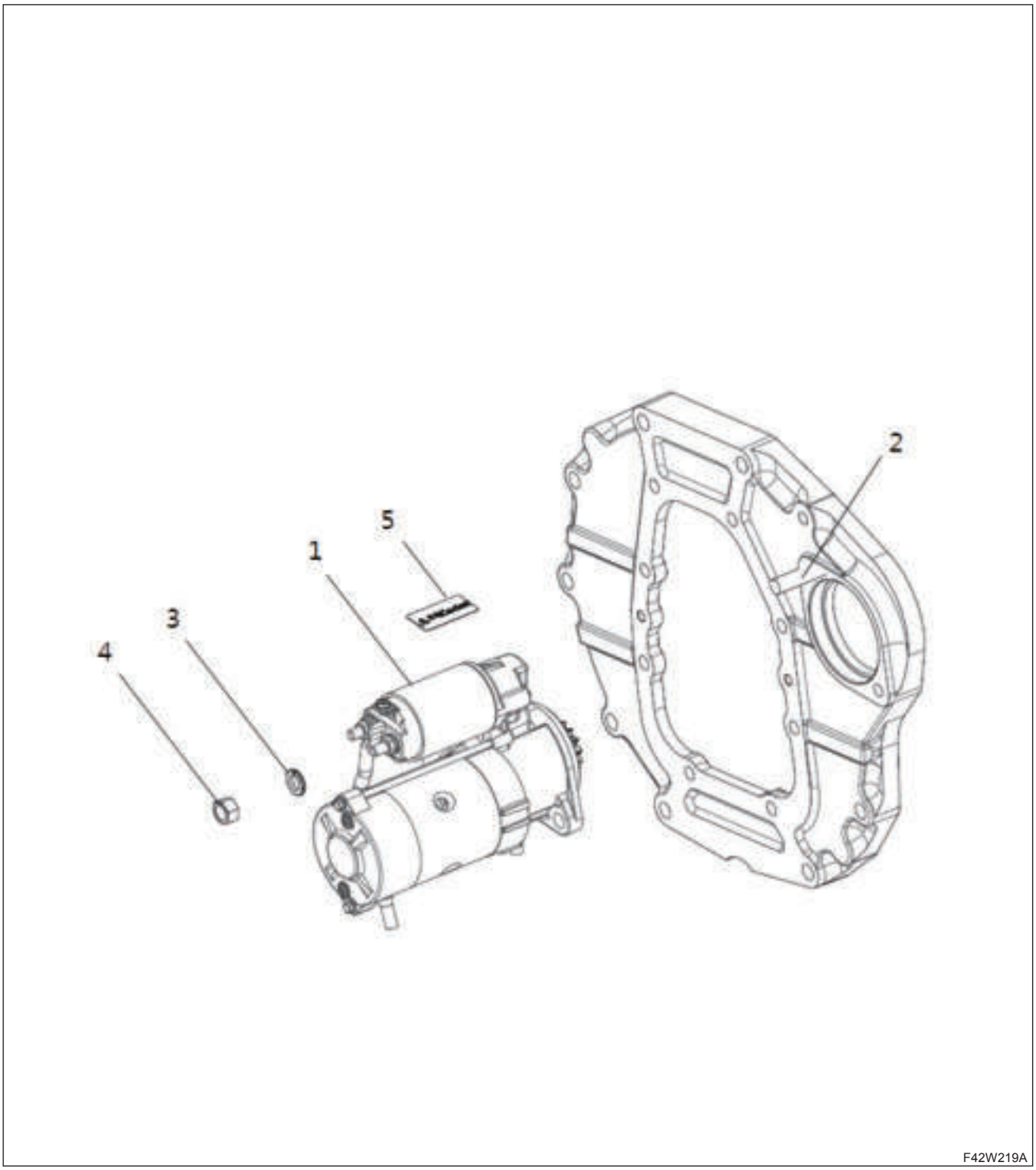


F42W213A

COMPONENTS

(1) Fuel filter ass'y
(2) Bracket, fuel filter
(3) Bolt, flange
(4) Bolt, flange
(5) Hose, fuel ass'y
(6) Hose clip

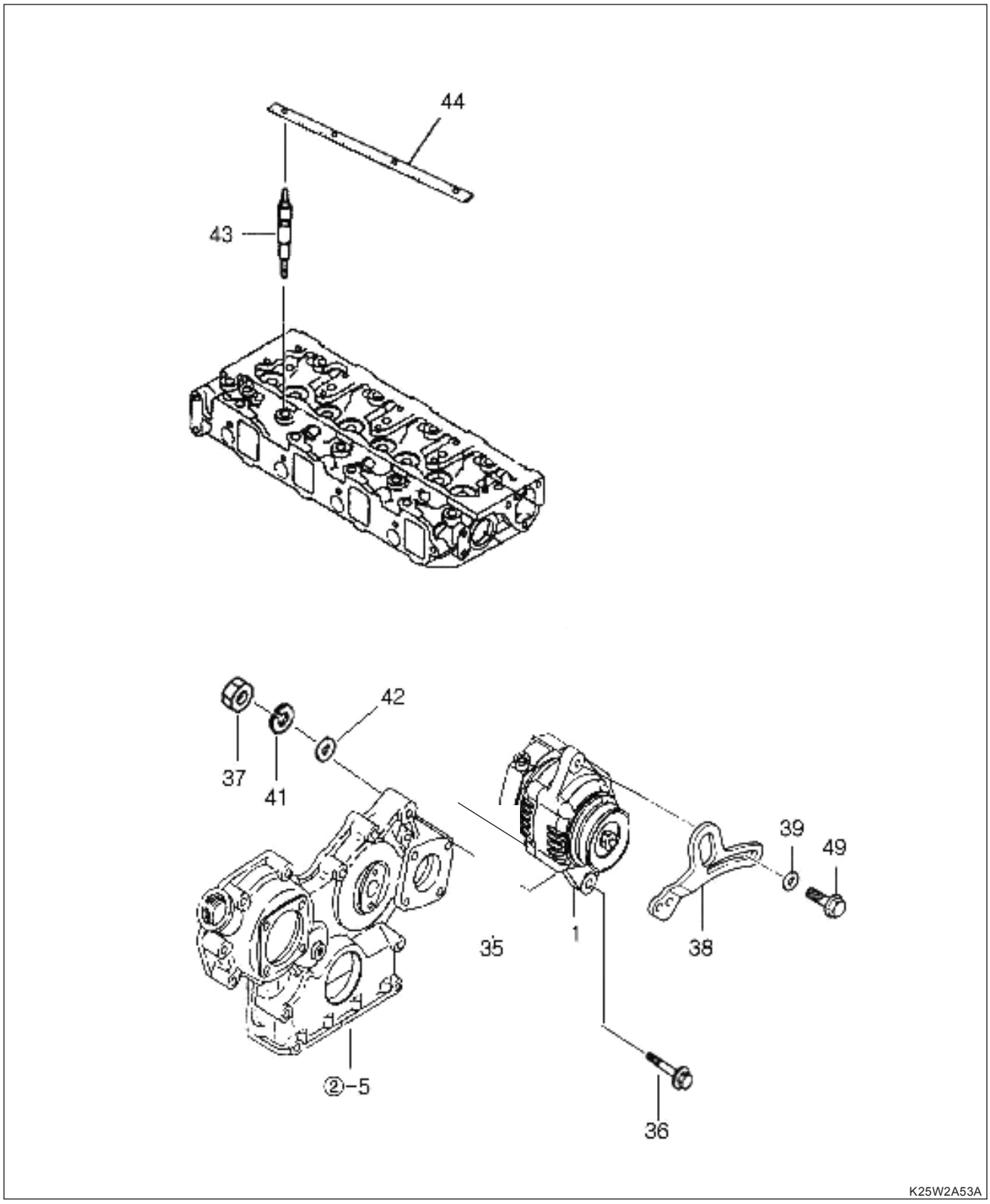
5.14 START MOTOR



COMPONENTS

(1) Starter
(2) Stud bolt, M12 x L30
(3) Spring washer
(4) Nut, M12
(5) Caution plate

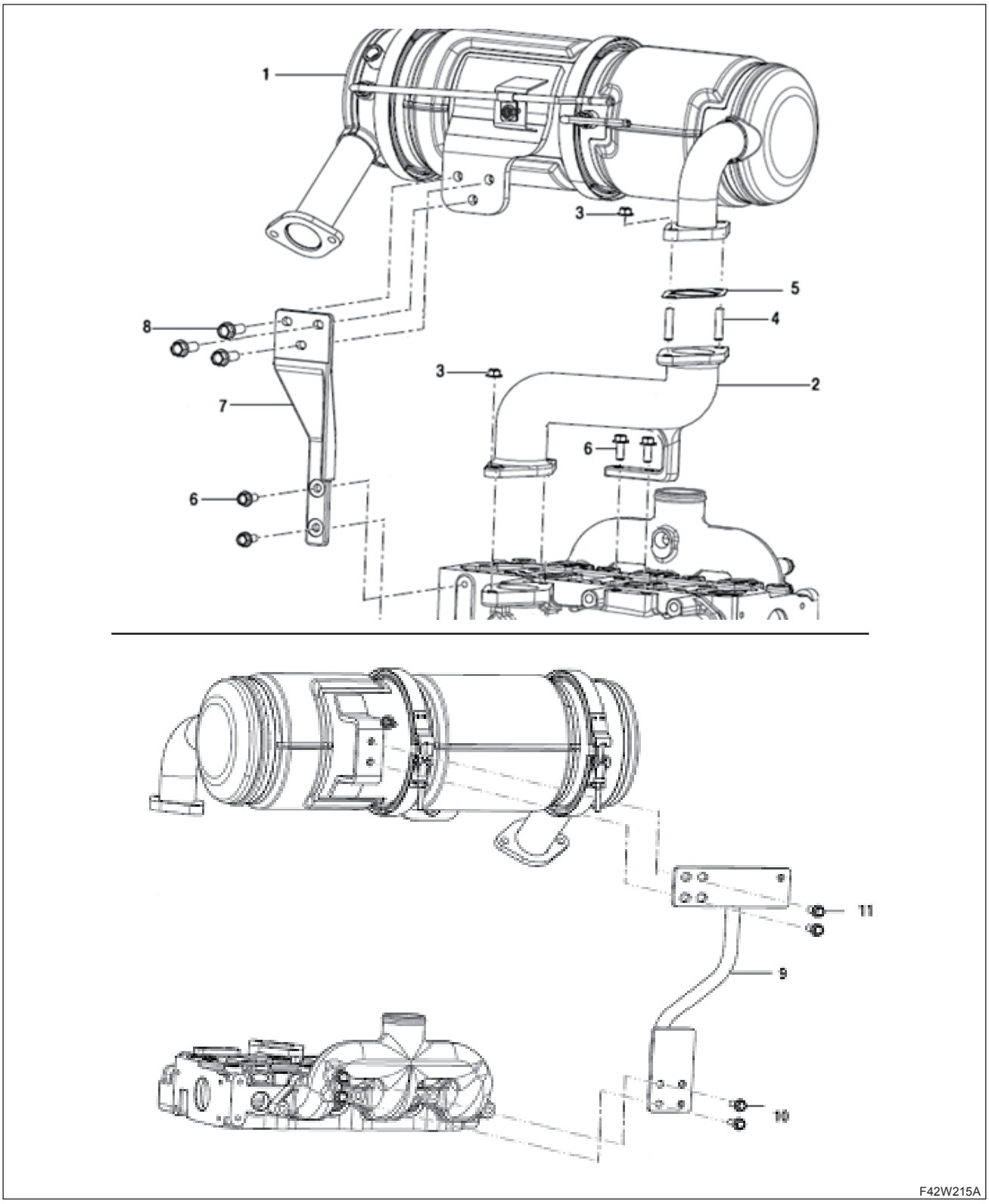
5.15 ALTERNATOR AND ELECTRIC SYSTEM



COMPONENTS

(1) Alternator(12V-45A)
(1) Alternator(12V-70A)
(36) Bolt 10
(36) Bolt 8
(37) Nut 10
(37) Nut 8
(38) Bracket
(39) Washer
(41) Washer, lock
(42) Washer
(42) Washer
(43) Plug, thermostat
(44) Connector
(49) Bolt 8×30

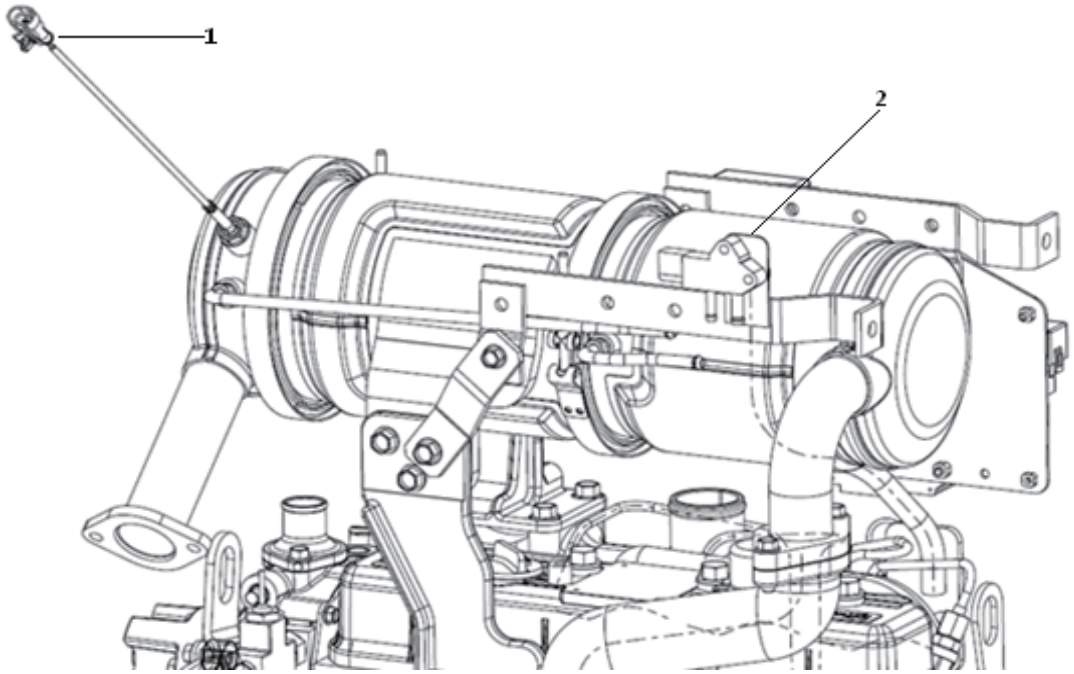
5.16 DPF APPLICATION SYSTEM



COMPONENTS

(1) DPF
(2) DPF support(A)
(3) Nut, flange 8
(4) Stud bolt
(5) Gasket
(6) Bolt, flange
(7) DPF support(B)
(8) Bolt, flange
(9) DPF bracket
(10) Bolt, flange
(11) Bolt, flange

5.17 DPF'S SENSOR OPTION



F42W217A

COMPONENTS

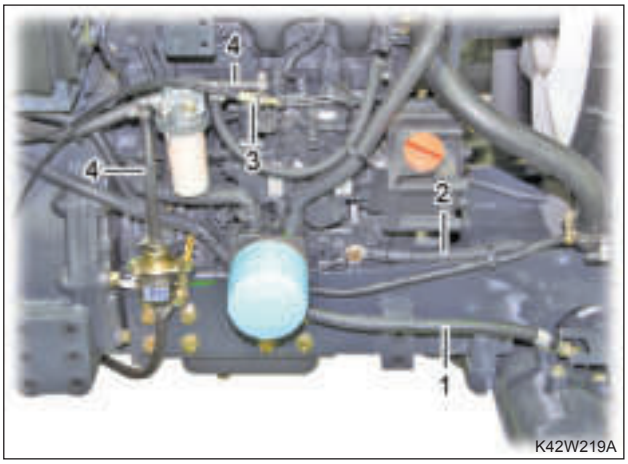
(1) Temperature sensor
(2) DPF diff, pressure sensor
(3) Hose A, diff. Pressure sensor
(4) Hose B, diff. Pressure sensor

6. DISASSEMBLY AND SERVICE

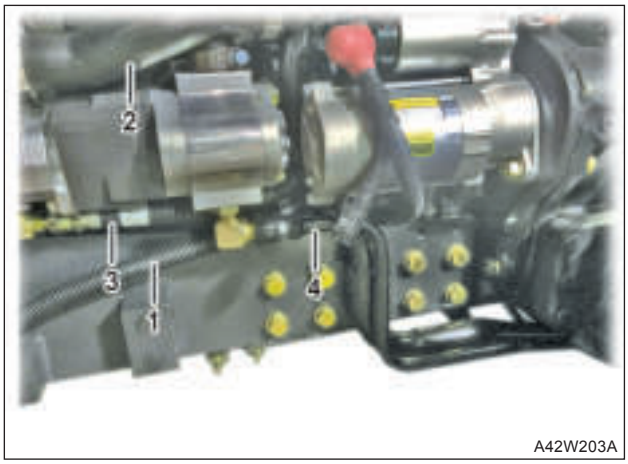
6.1 ENGINE REMOVAL

ROPS MODEL

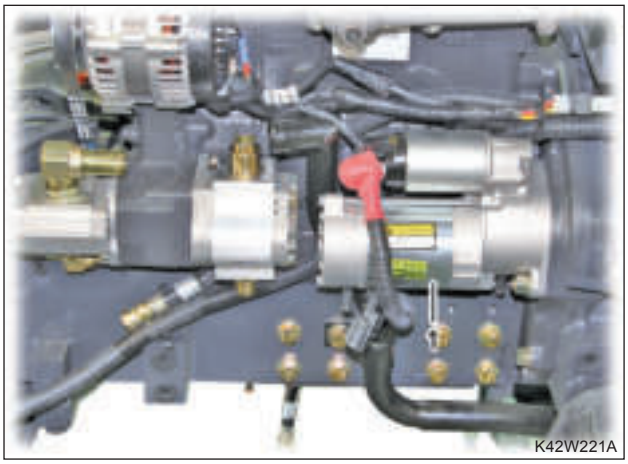
1. Open the hood to disconnect the head lamp wiring connector (1), gas cylinder (2). Then, unscrew the hood mounting bolts (3) to remove the hood.



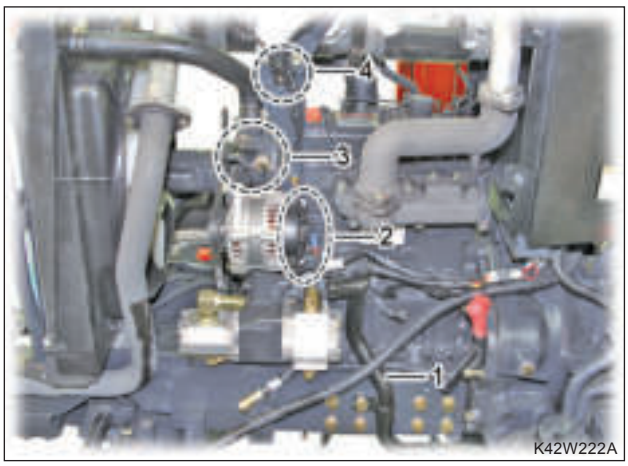
2. Disconnect the steering cylinder hose (1), ground wire (2), accelerator cable (3) and fuel hose (4) from right side of the engine.



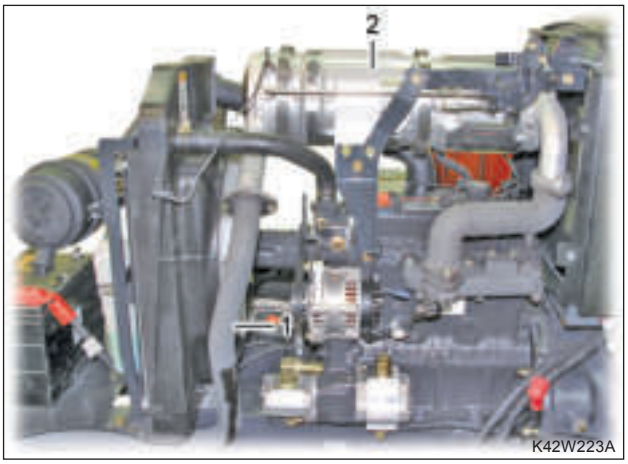
3. Disconnect the steering cylinder hose (1), hydraulic pump suction hose (2), steering unit hose (3) and hydraulic pipe (4) from left side of the engine.



4. Remove the start motor (1).

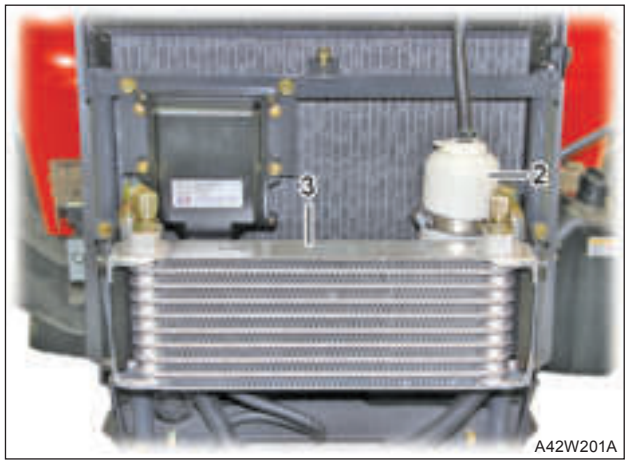


5. Disconnect the hydraulic suction pipe(1), generator wiring connector (2), coolant temperature sensor connector (3) and DPF wiring connector (4).

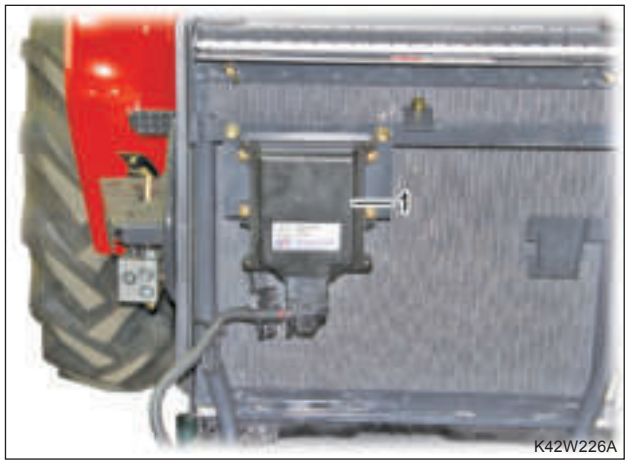


6. Remove the exhaust pipe (1) and DPF assembly (2) [Tier-4 engine only].

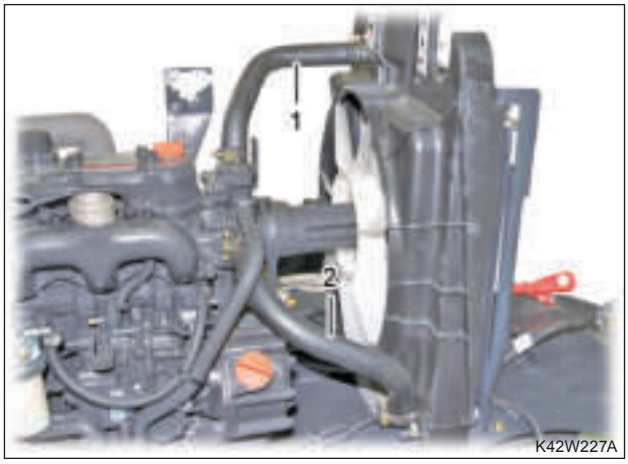
7. Remove the battery (1).



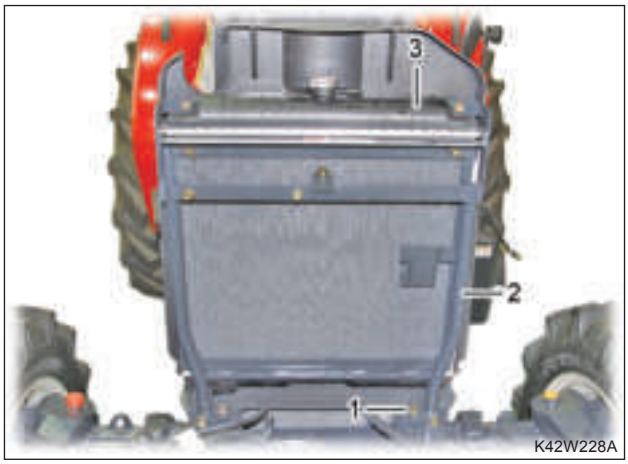
8. Remove the air cleaner (1) and reservoir tank (2). Remove the oil cooler(3).



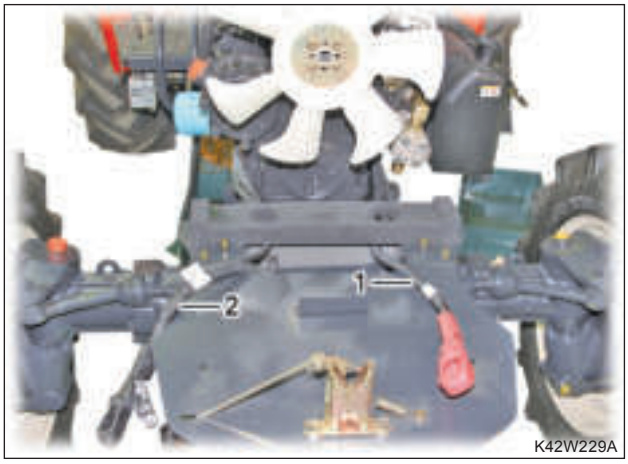
9. Remove the ECU (1).

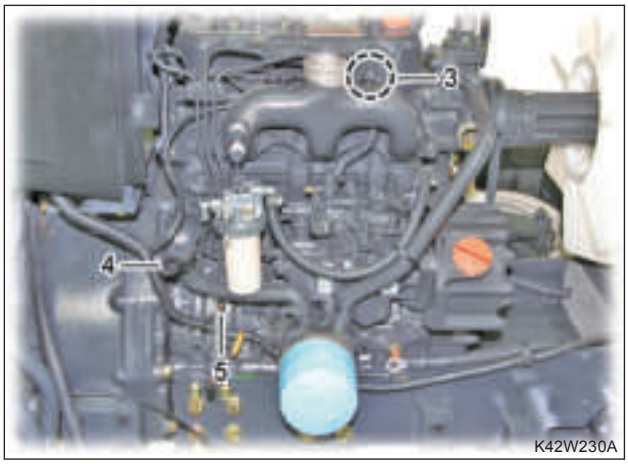


10. Disconnect the radiator hose (Upper: 1, Lower: 2).

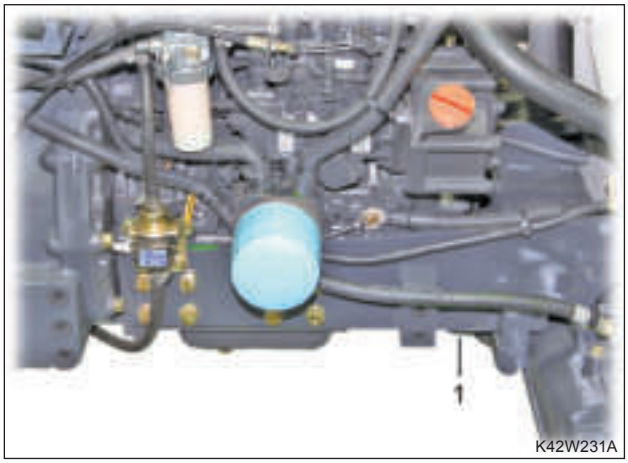


11. Unscrew the radiator support mounting bolts (1)(4EA) to remove the radiator support (2) and radiator (3).

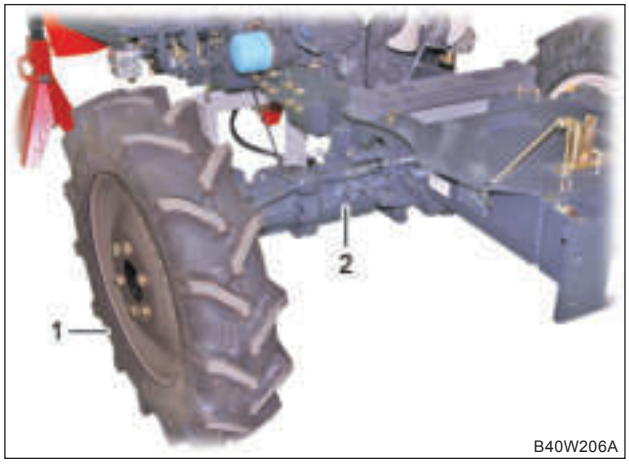




12. Disconnect the positive (+) battery line (1) and negative (-) battery line (2). Then, disconnect glow plug wiring (3), fuel solenoid connector(4) and oil pressure switch connector (5) and organize the engine wiring into the instrument panel.



13. Remove the propeller shaft (1). (Refer to "Propeller shaft disassembly and assembly" in chapter 5)



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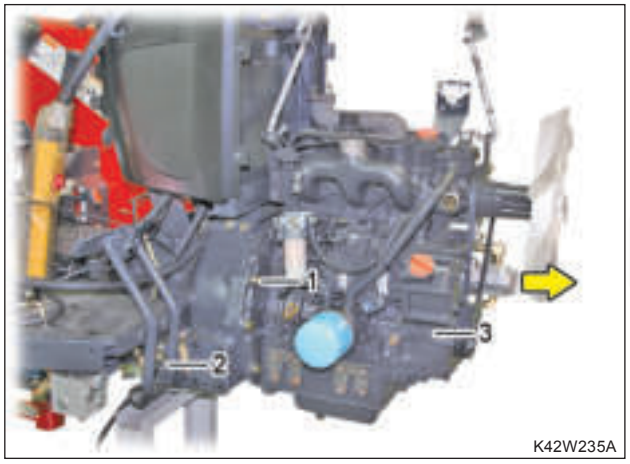
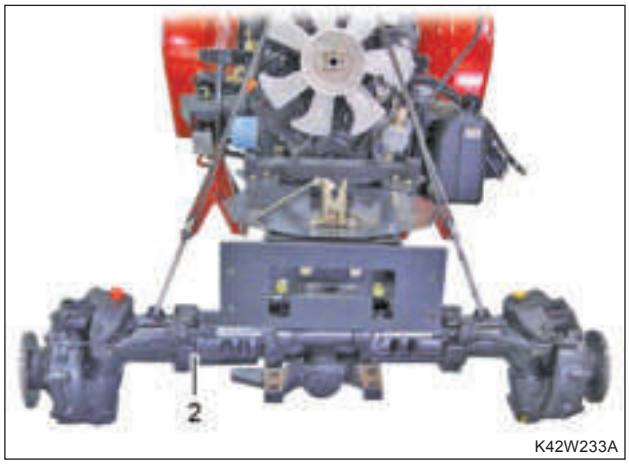
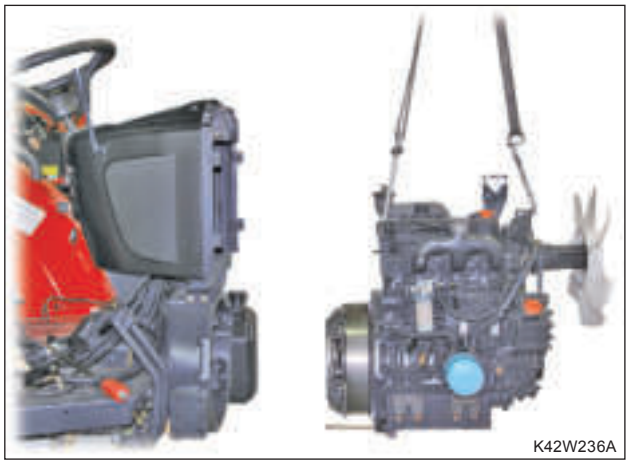


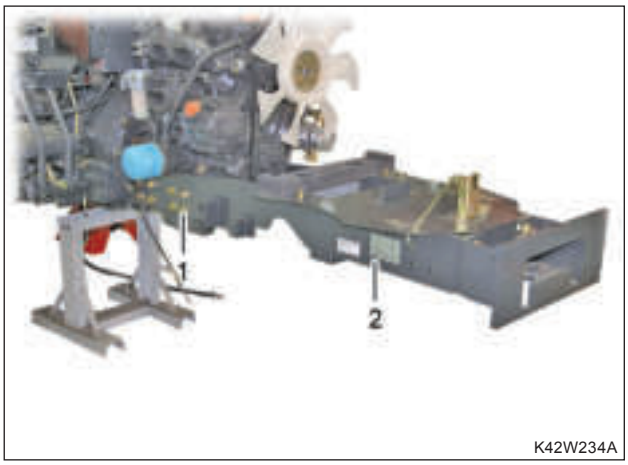
K42W235A



K42W233A

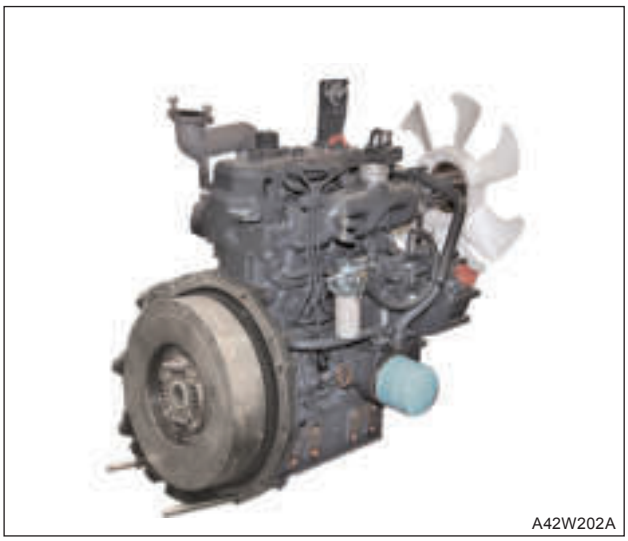

K42W236A

14. Remove the front wheel (1) and front axle (2). (Refer to "Disassembly and assembly" in chapter 5).



K42W234A

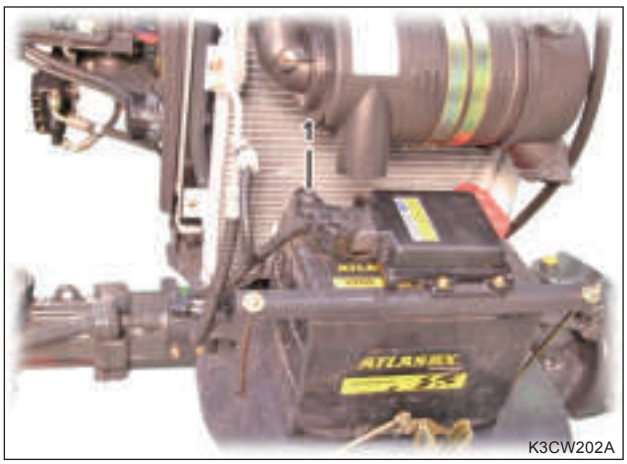
15. Unscrew the bracket assembly mounting bolts (1)(16EA) of front axle and remove the front axle bracket assembly (2).


A42W202A

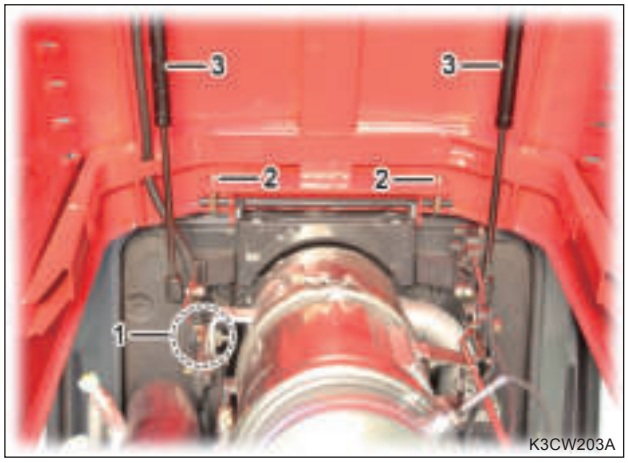
16. Install a engine removal hooks and use a hoist to lift the engine. Then, unscrew the engine and clutch housing mounting bolts (1)(8EA) and nuts (2)(2EA) to remove the engine assembly (3) using a hoist.

CABIN MODEL

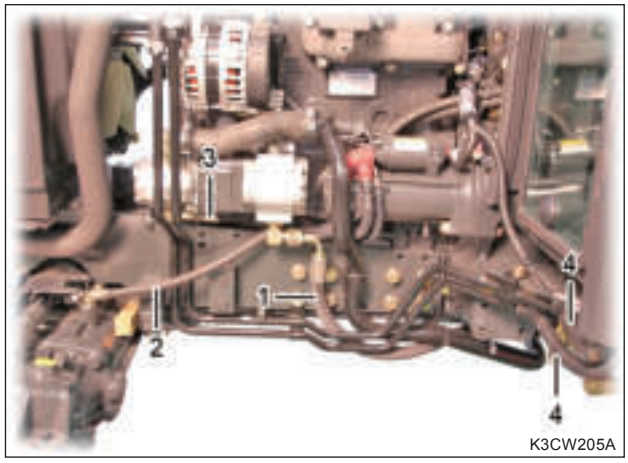

B40W201A


K3CW202A

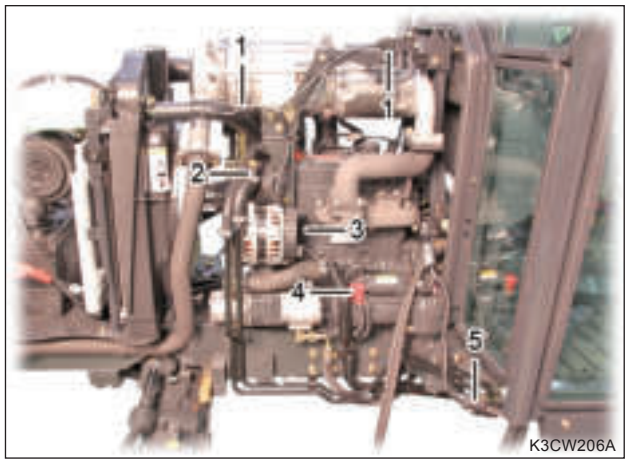
1. Open the hood and disconnect the negative (-) battery cable (1).

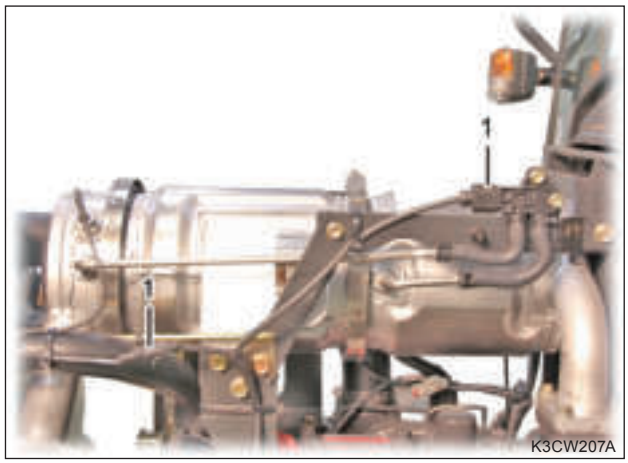


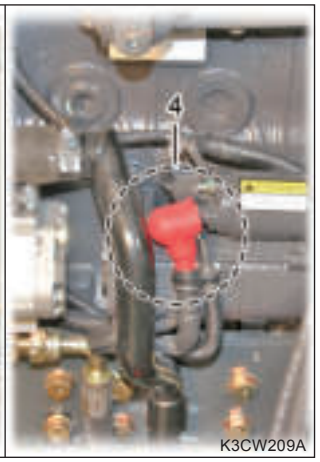
2. Disconnect the head lamp wiring connector (1), unscrew the hood mounting bolts (2) and remove the gas cylinder (3) to remove the hood (4).

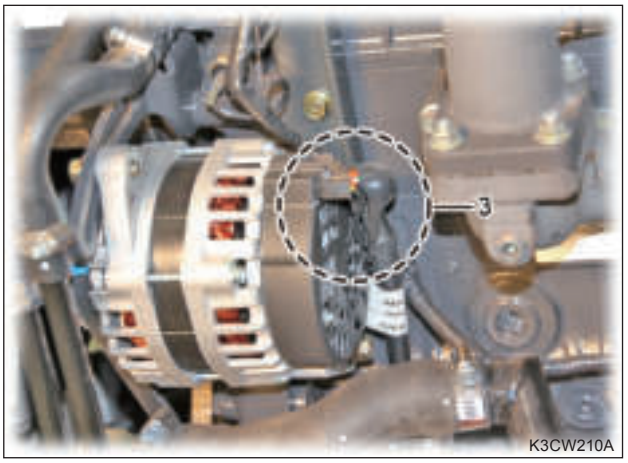


3. Disconnect the hydraulic hose (1), steering hydraulic hose (2), steering unit hose (3) and cabin heater hoses (4) from left side of the engine.

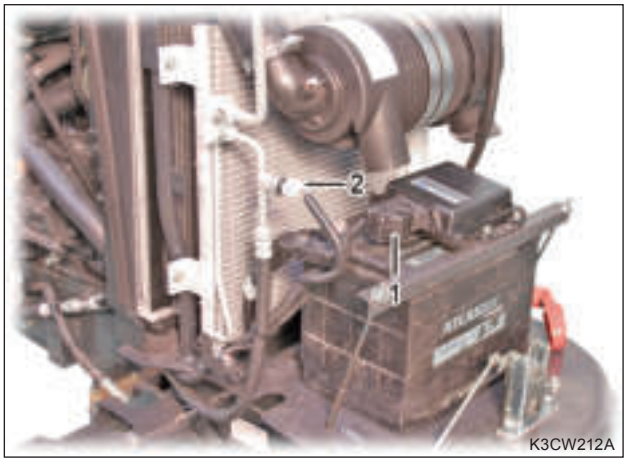




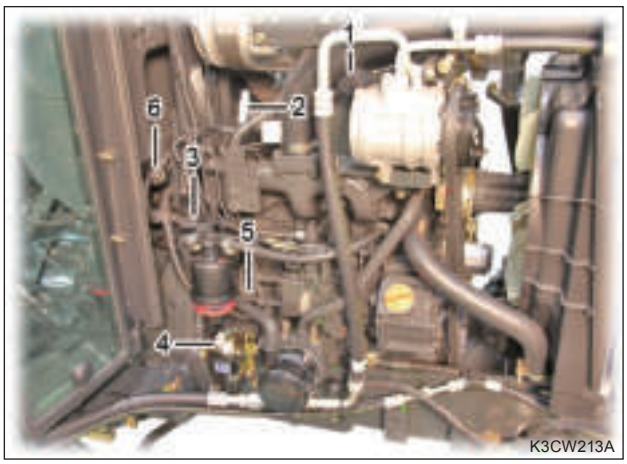




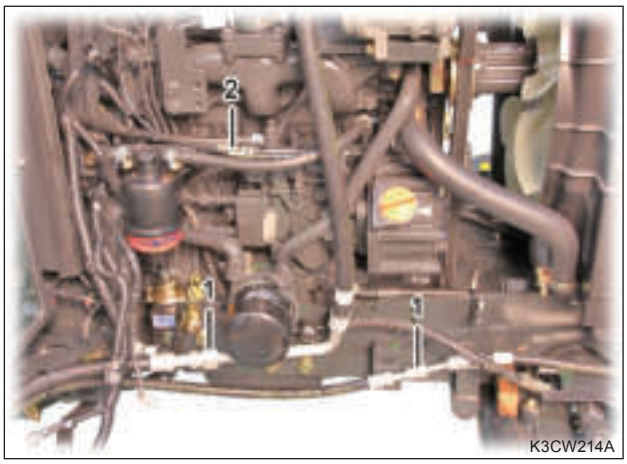
4. Disconnect the connectors of the DPF sensor (1), water temp. sensor (2), alternator (3), starter motor (4) and cabin wiring (5).



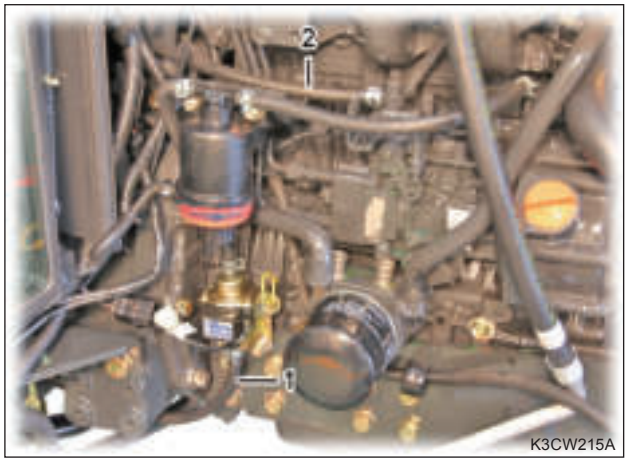
5. Disconnect the ECU connector (1) and A/C condenser pressure sensor connector (2).



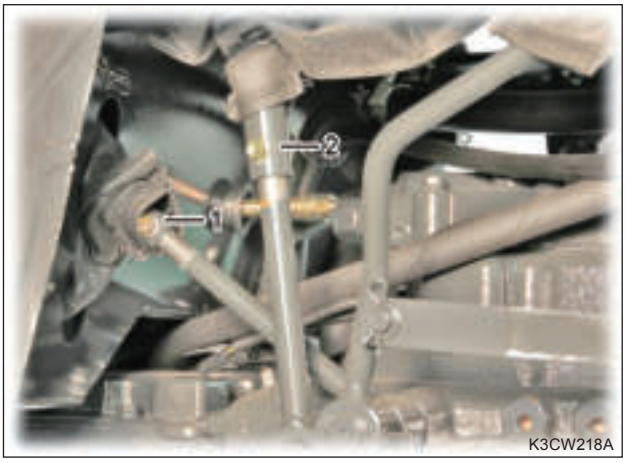
6. Disconnect the connectors of the A/C compressor (1), glow plug (2), stop solenoid (3), fuel pump (4), engine oil pressure switch (5) and cabin wiring (6).



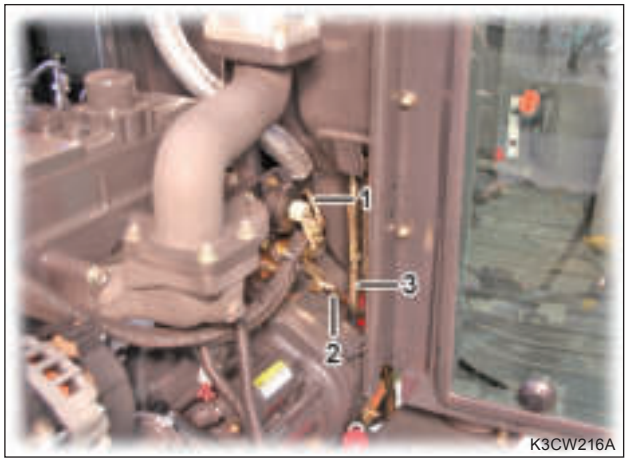
7. Disconnect the A/C refrigerant hose (1) and accelerator cable (2).

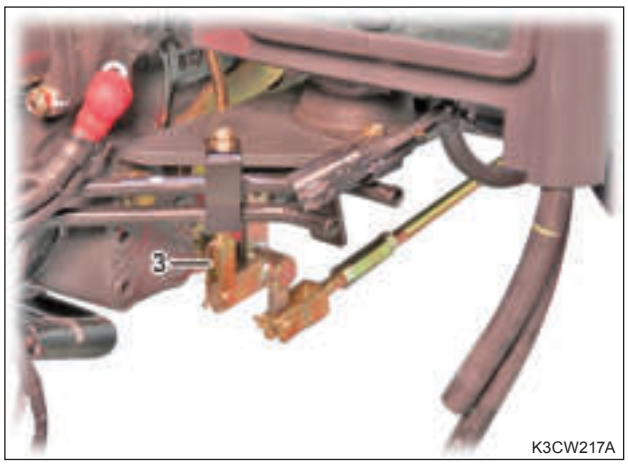


8. Disconnect the fuel supply hose (1) and fuel return hose (2) from the right side of the tractor.

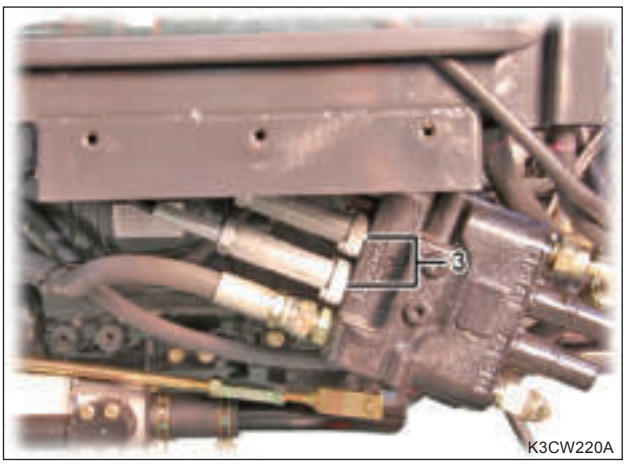


10. Remove the 4WD lever (1) and range shift lever (2) from the lower left section of the cabin.





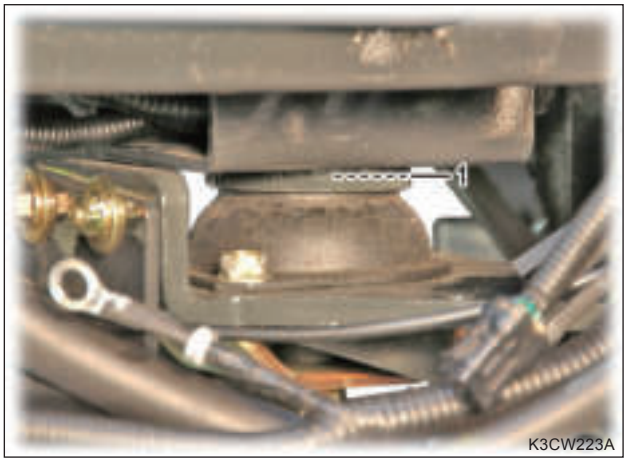
9. Disconnect the F-R shuttle rod (1), clutch rod (2) and brake rod (LH) (3).

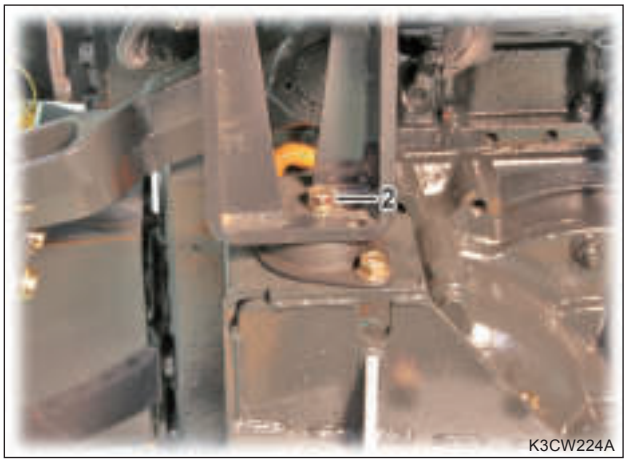


11. Remove the step (RH) (1) and disconnect the brake rod (RH) (2), front SCV cable (3) and steering unit hose (4).

12. Remove the differential connecting lever (1) and hydraulic adjusting shaft (2).

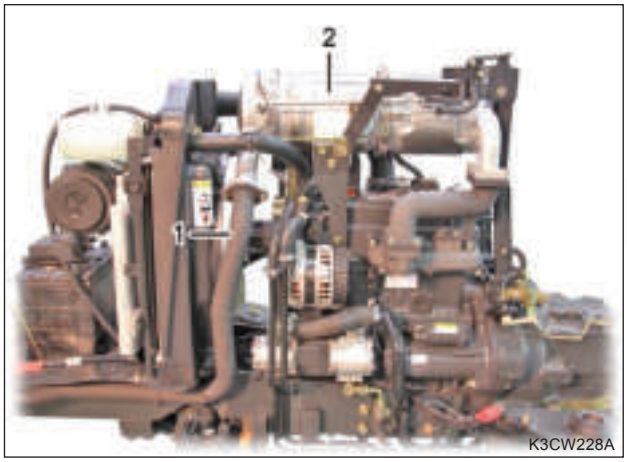
13. Remove the PTO shift grip (1), main shift lever grip (2) and position control lever grip (3) from in the cabin.



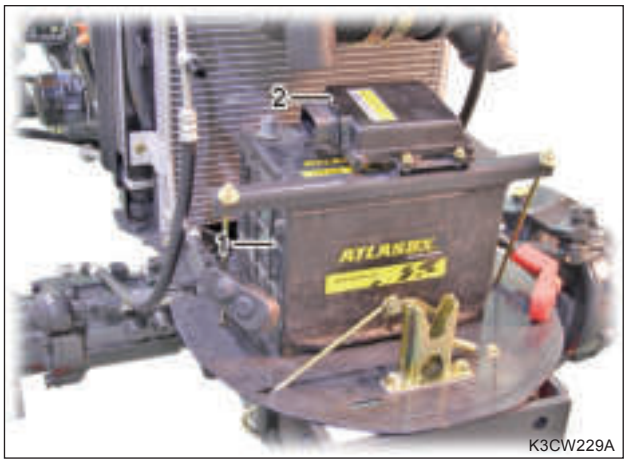


14. Unscrew the mounting bolts (Front : 1, Rear : 2).

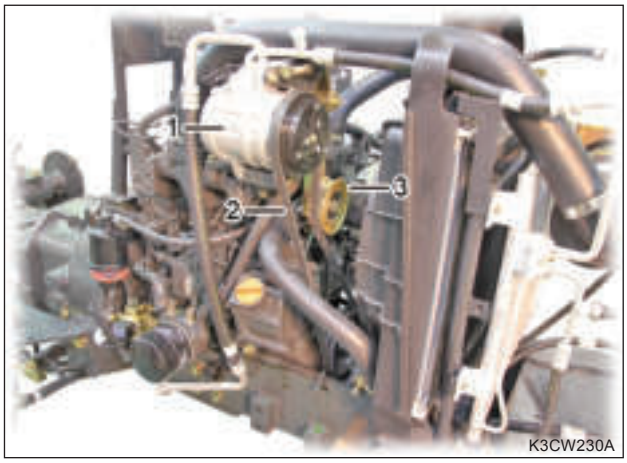
15. Install a cabin removal jig and remove the cabin slowly with a hoist.



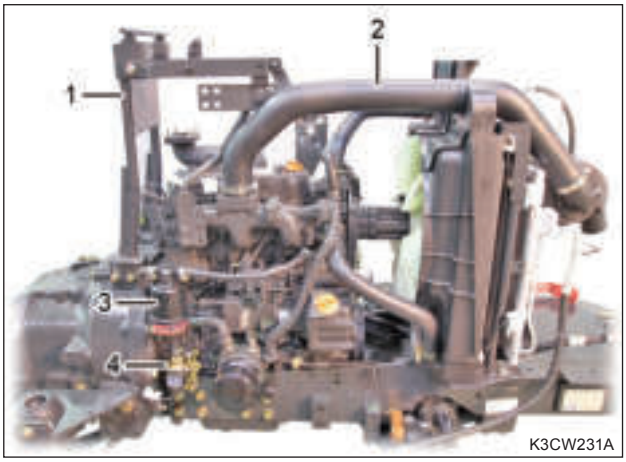
16. Disconnect the exhaust pipe (1) and remove the DPF assembly (2) from the upper section of the engine.



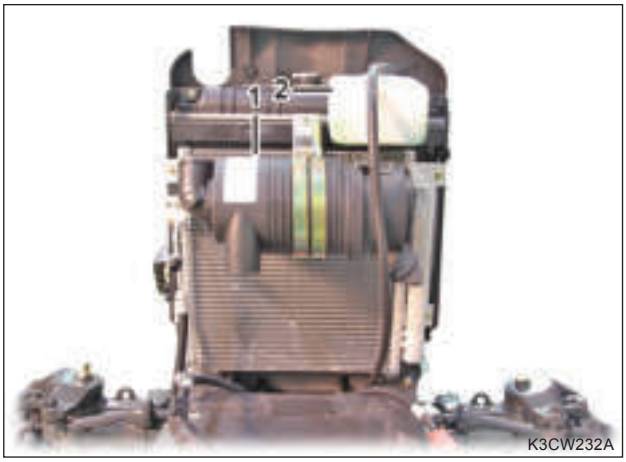
17. Remove the battery (1) and ECU (2).



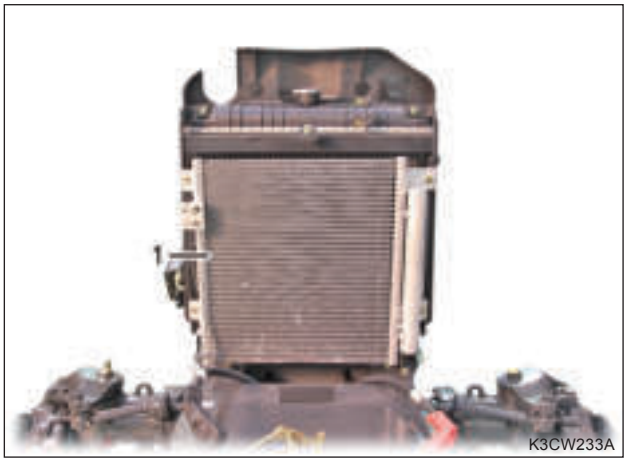
18. Remove the compressor (1), tension belt (2) and tension pulley (3).



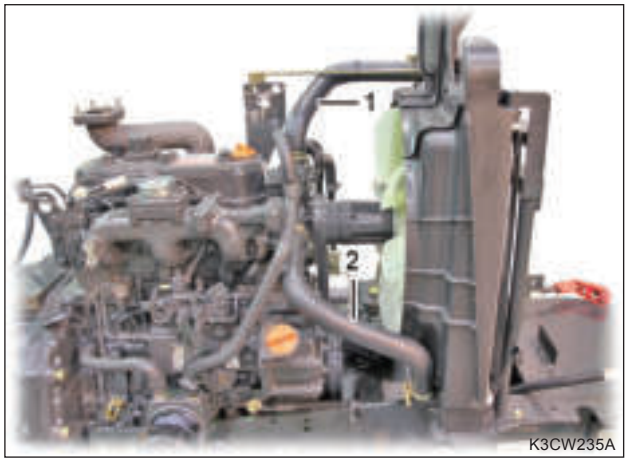
19. Remove the hood support (1), intake hose (2), fuel filter (3) and fuel pump (4).

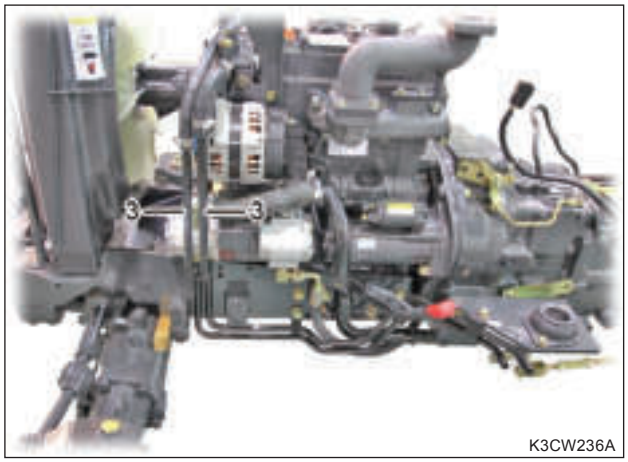


20. Remove the air cleaner (1) and reservoir tank (2).



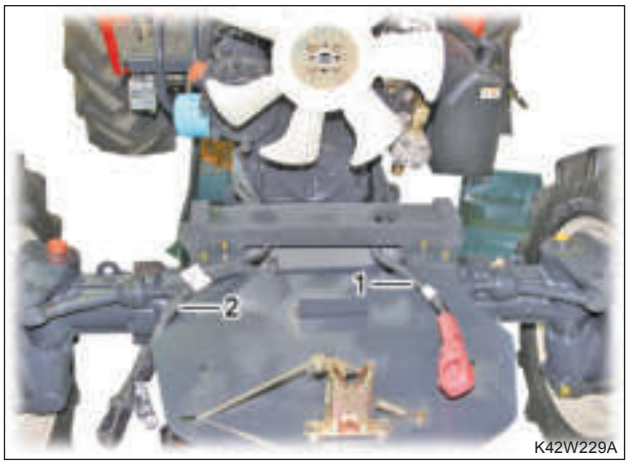
21. Remove the condenser (1).



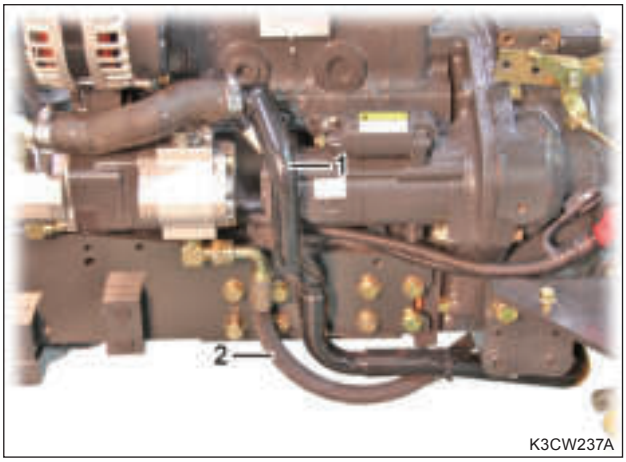


22. Disconnect the radiator hoses (Upper: 1, Lower: 2) and cabin heater pipe (3).

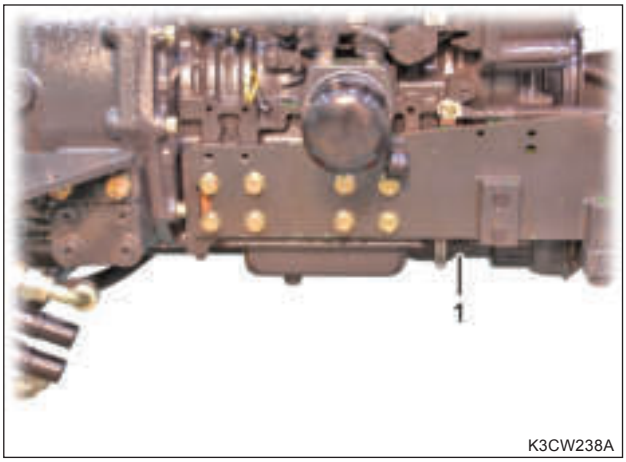
23.Unscrew the radiator support mounting bolts (1) (4EA) to remove the radiator support (2) and radiator (3).



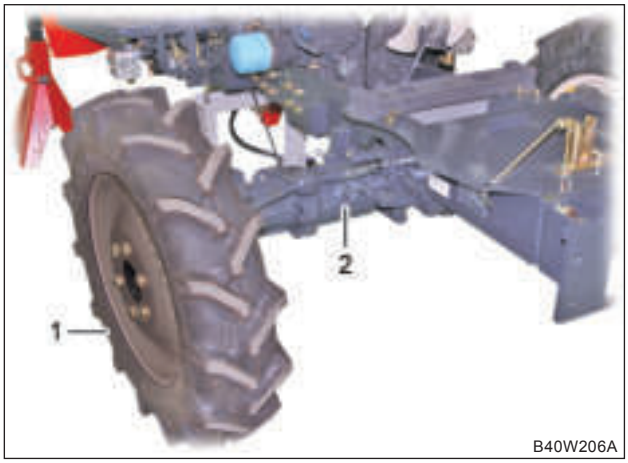
24. Disconnect the positive (+) battery cable (1) and negative (-) battery cable (2).

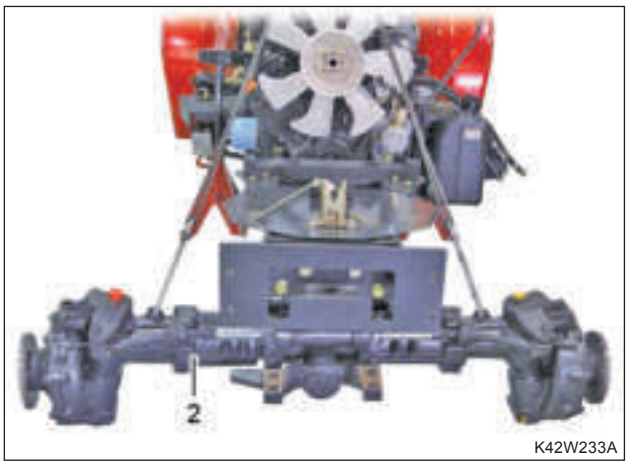


25. Disconnect the suction tube (1) and discharge hose (2) of the hydraulic pump.

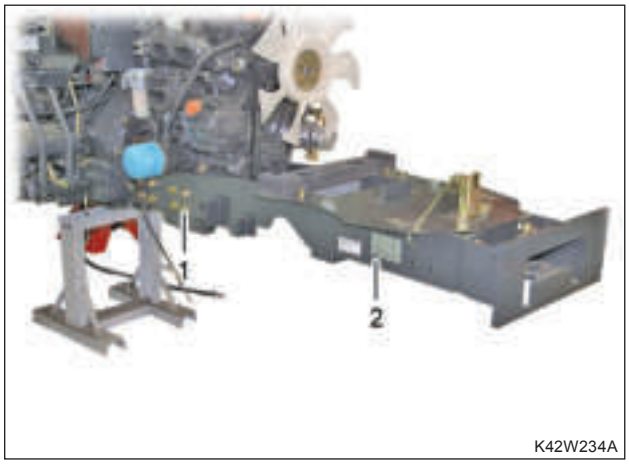


26. Remove the propeller shaft (1). (Refer to "Propeller shaft disassembly and assembly" in chapter 5)

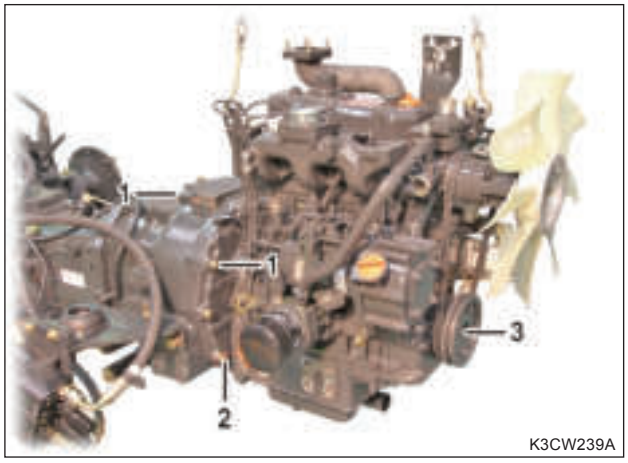




27. Remove the front wheel (1) and front axle (2). (Refer to "Disassembly and assembly" in chapter 5).



28. Unscrew the bracket assembly mounting bolts (1)(16EA) of front axle and remove the front axle bracket assembly (2).



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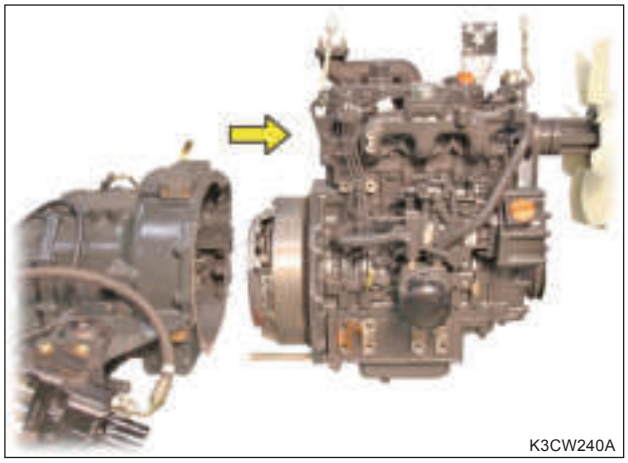
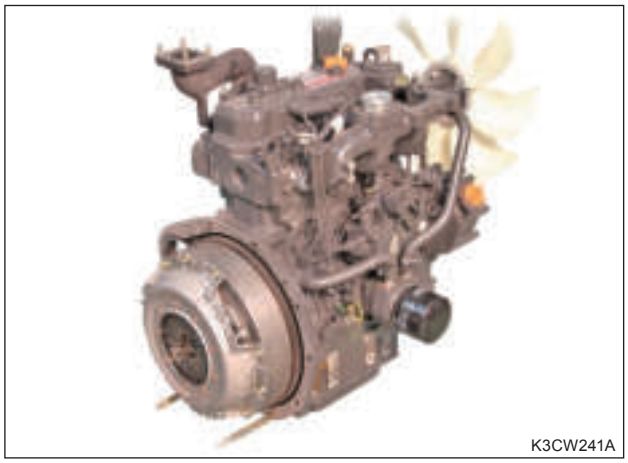

K3CW240A


K3CW241A

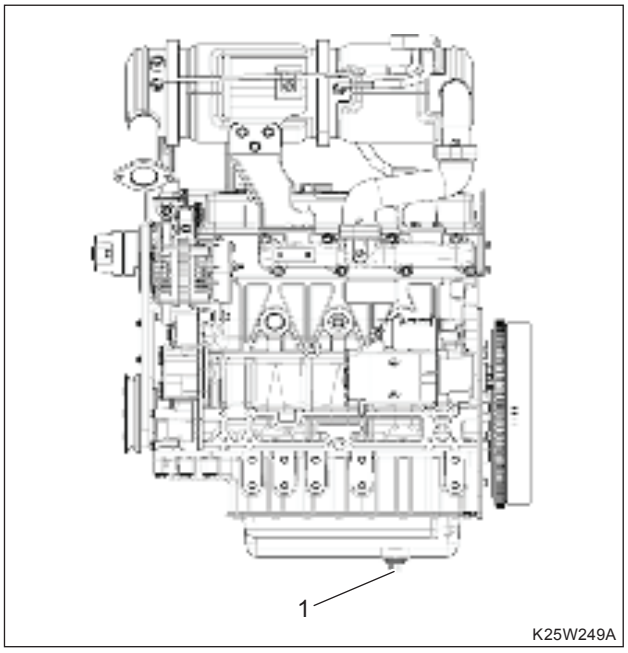
29. Install a engine removal hooks and use a hoist to lift the engine. Then, unscrew the engine and clutch housing mounting bolts (1)(8EA) and nuts (2)(2EA) to remove the engine assembly (3) using a hoist.

6.2 DISASSEMBLY OF ENGINE

6.2.1 GENERAL PRECAUTIONS

1. Select place that must be neatly arranged.
2. Disassemble parts must be carefully handled for prevention of injury or taint. Prepare some vessels for keeping of disassemble parts.
3. Prepare the solvent and compressed air for cleaning of parts.
4. Use the tools that are in good condition and be sure you understand how to use them before performing any job.
5. Disassembly procedure can be complicated. Put display in order to identify the many parts disassembled. Then reassemble the parts in same order as disassemble.

6.2.2 LUBRICATING OIL



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Loosen the drain plug (1) from the bottom of the oil pan and drain the oil to the prepared vessel.

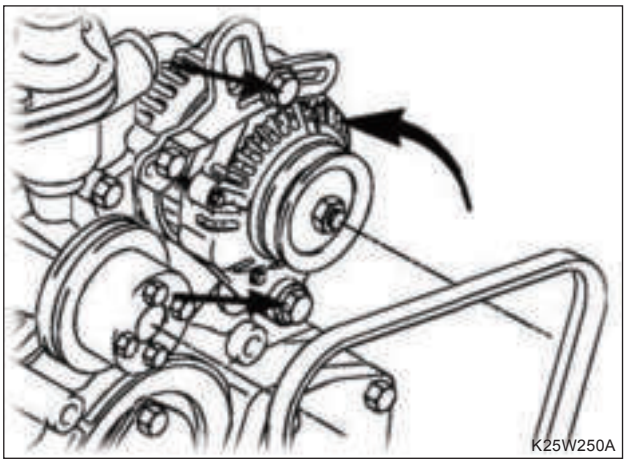
⚠ CAUTION

- **Don't allow hot oil to directly contact skin.**

⚠ WARNING

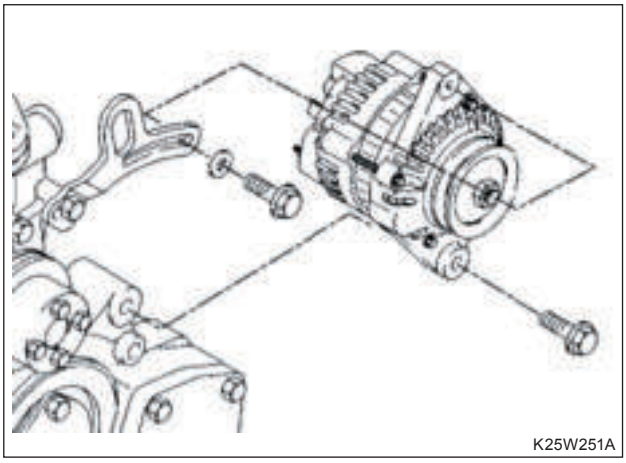
- **Disposal of waste oil must be treated the related regulations.**

6.2.3 V-BELT, V-PULLEY



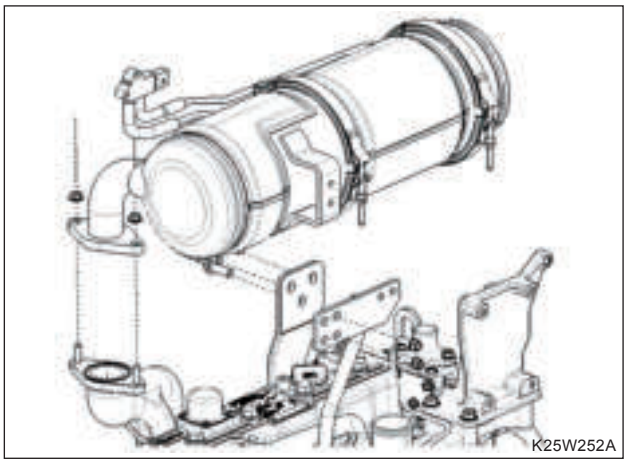
1. Loosen the bolts that hold the V-pulley.
2. Loosen the tension bolt and the bolt that hold the alternator, remove the V-belt after relaxation of belt.
3. Disassemble the V-pulley.

6.2.4 ALTERNATOR



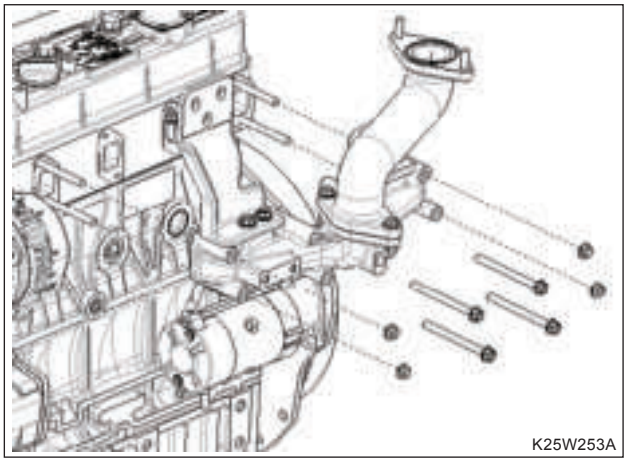
1. Loosen the bolt and washer that hold the upper side of alternator.
2. Loosen the bolt in lower side.
3. Disassemble the alternator.

6.2.5 AFTER-TREATMENT DEVICE (ATD)



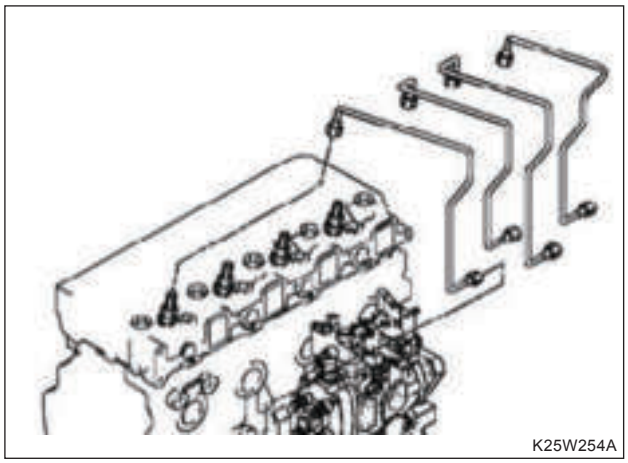
1. Loosen the bolts that hold the ATD.
2. Loosen the nuts that connect the ATD and DPF fixing housing.
3. Disassemble the ATD. (When disassembling the ATD, should be careful because ATD is heavy.)

6.2.6 EXHAUST MANIFOLD



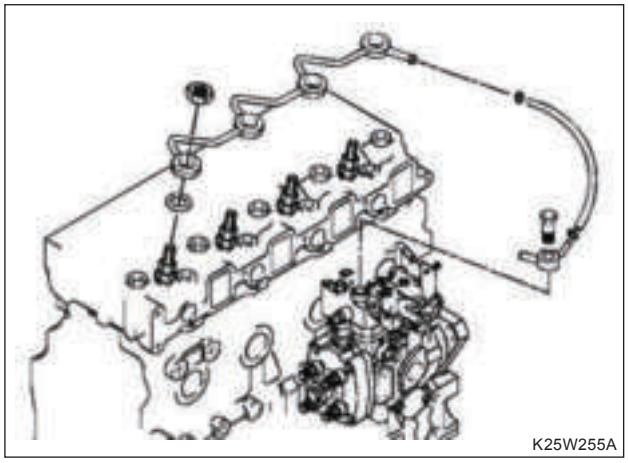
1. Loosen the bolts and nuts that hold the exhaust manifold.
2. Disassemble the exhaust manifold and steel gasket.

6.2.7 FUEL INJECTION PIPES



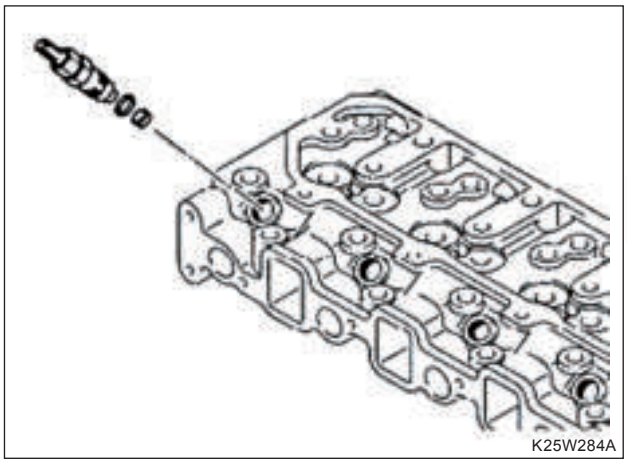
1. Loosen the bolts that hold fuel injection pipes assembly.
2. Loosen the nuts in fuel injection pump side.
3. Loosen the nuts in head cover side.
4. Disassemble the fuel injection pipes.

6.2.8 FUEL DRAIN LINE



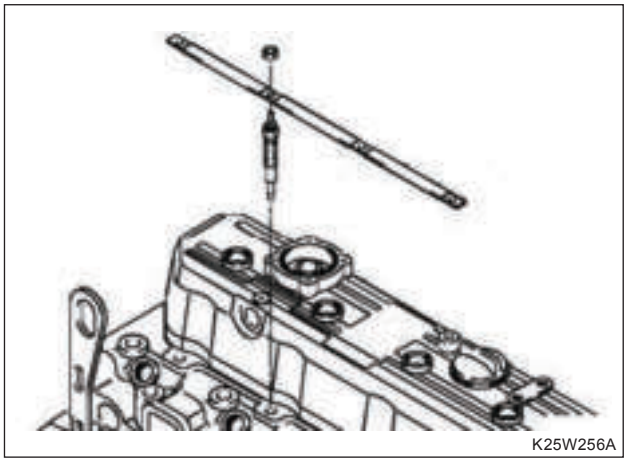
1. Disassemble the fuel drain hose.
2. Loosen the bolts that hold the fuel drain pipe and remove the drain pipe.

6.2.9 FUEL INJECTION VALVE (INJECTOR)



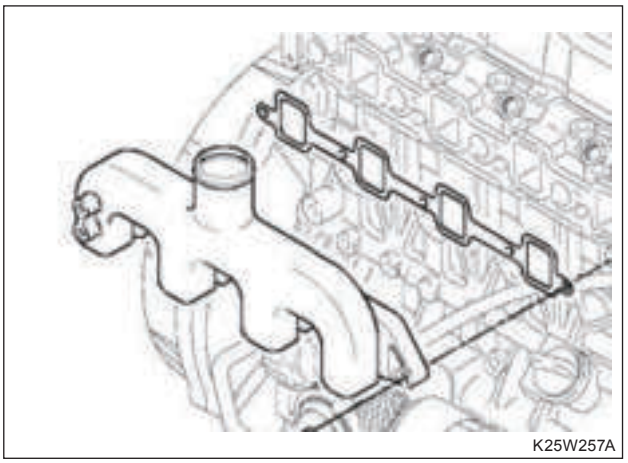
1. Disassemble the injectors.
2. Disassemble the sealing washers and nozzle spaces.
3. Remove cup from the injectors. (Do not re-use the sealing washer and the nozzle space cup).

6.2.10 GLOW PLUG



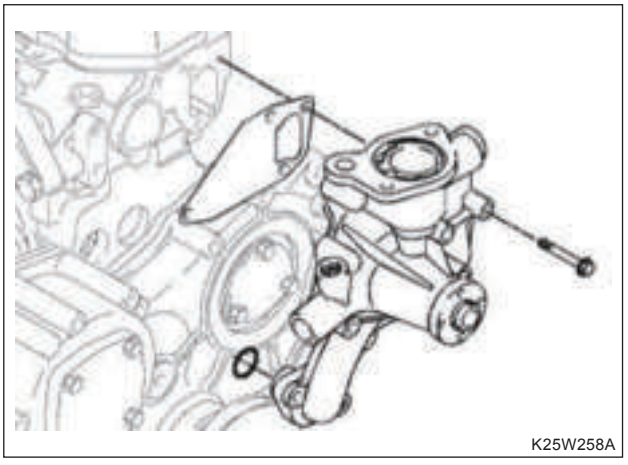
1. Disassemble the wire harness from the connector.
2. Loosen the nuts that hold the connector.
3. Disassemble the glow plugs.

6.2.11 INTAKE MANIFOLD



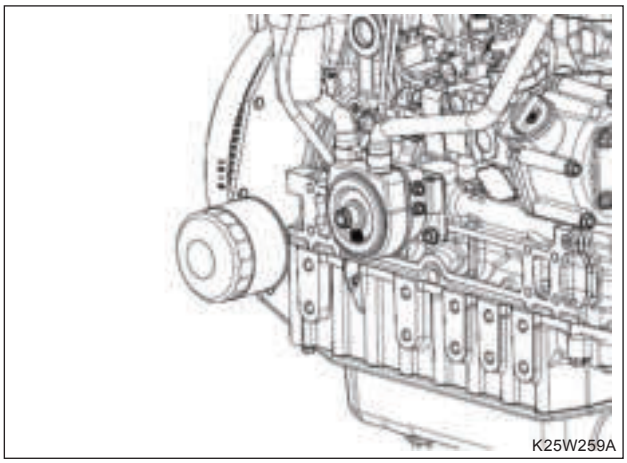
1. Loosen the clamp that holds breather hose connecting Intake manifold and cylinder head.
2. Loosen the bolts and nut that hold the intake manifold.
3. Disassemble the intake manifold.
4. Disassemble the packing.
5. Do not re-use the packing.

6.2.12 WATER PUMP



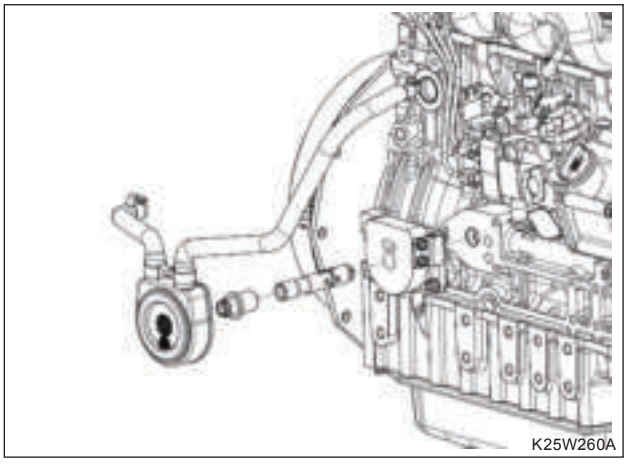
1. Loosen the bolts that hold the V-pulley.
2. Disassemble the V-pulley.
3. Loosen the bolts that hold the water pump.
4. Disassemble the water pump and packing.
5. Do not re-use the packing

6.2.13 OIL FILTER



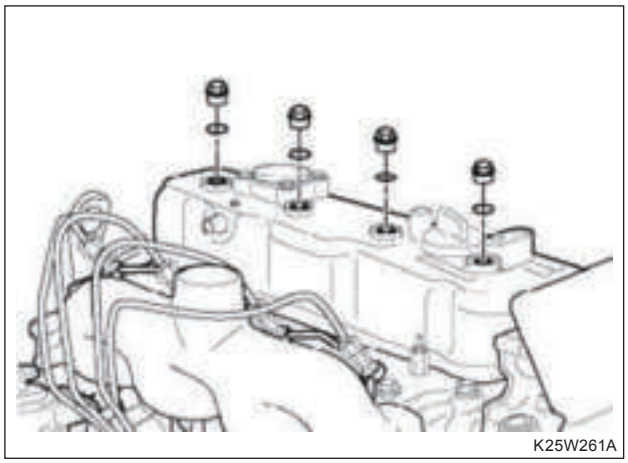
1. Disassemble the oil filter using by tool.

6.2.14 OIL COOLER



1. Loosen the clamps that hold the hoses.
2. Disassemble the hoses.
3. Disassemble the bolt that holds the oil cooler by using tool.
4. Disassemble the oil cooler.
5. Loosen the bolts that hold cooler bracket
6. Disassemble the cooler bracket.

6.2.15 HEAD COVER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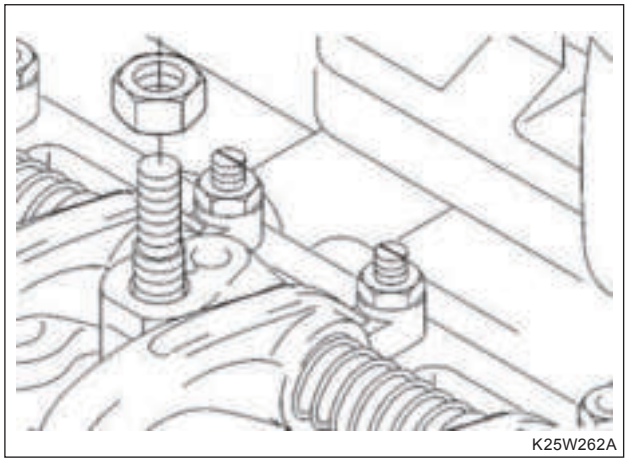
1. Loosen the nuts that hold the head cover.
2. Disassemble the head cover.
3. Disassemble the packing from head cover.
4. Do not re-use the packing.

6.2.16 ROCKER-ARM SHAFT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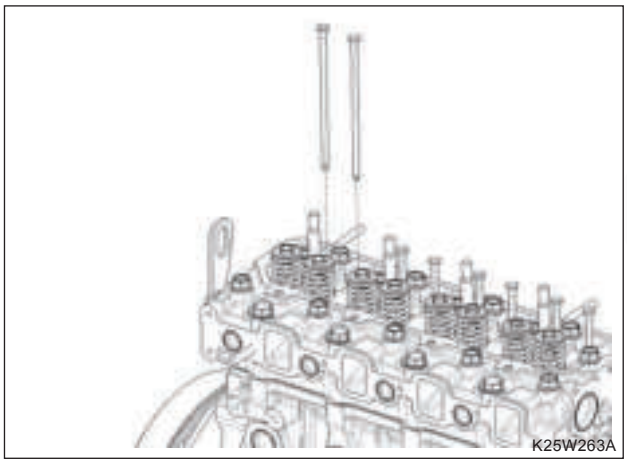
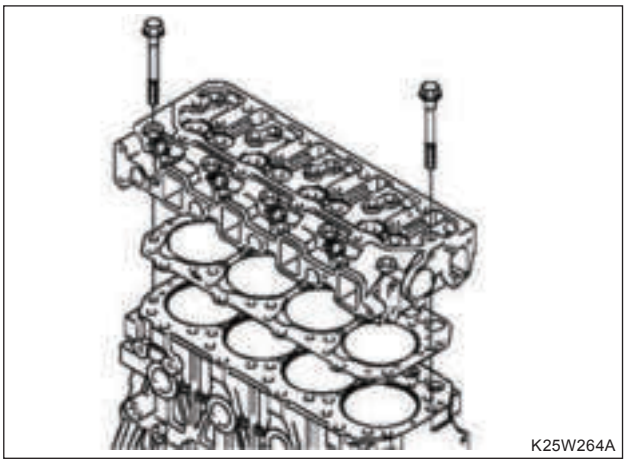
1. Loosen the bolts that hold the rocker arm shaft
2. Disassemble the rocker arm shaft.

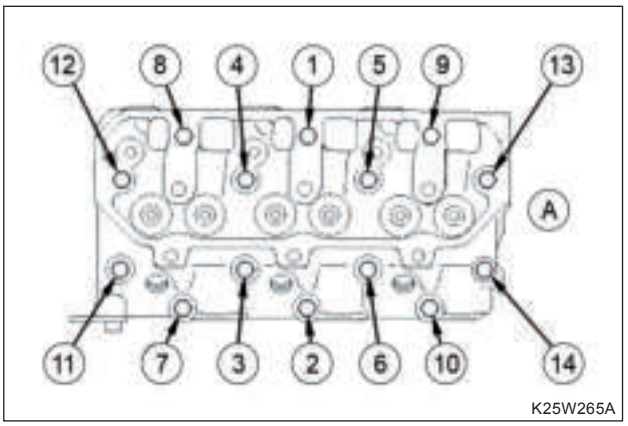
6.2.17 PUSH ROD


K25W263A

Disassemble the push rod. (Arrange the push rod in order from front side after disassemble it.)

6.2.18 CYLINDER HEAD

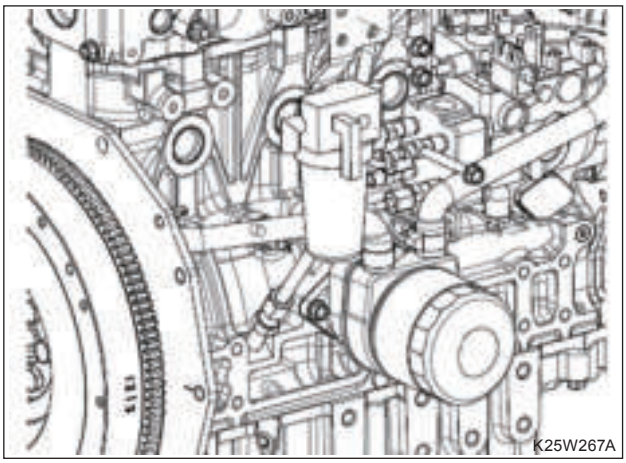




1. Loosen the 14 clamping bolts in order. (Order: Outside(14) → Inside(1))
2. Disassemble the cylinder head assembly.
3. Disassemble the gasket.
4. Do not re-use the gasket.

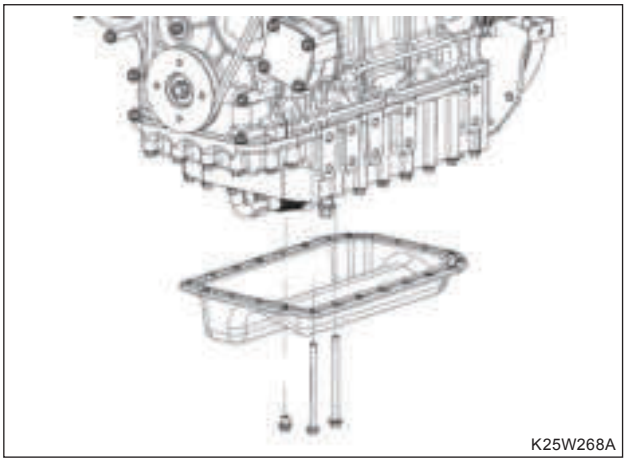
CAUTION
• **Do not cause scratch to the upper plane of cylinder block and the lower plane of the cylinder head.**

6.2.19 FUEL FILTER



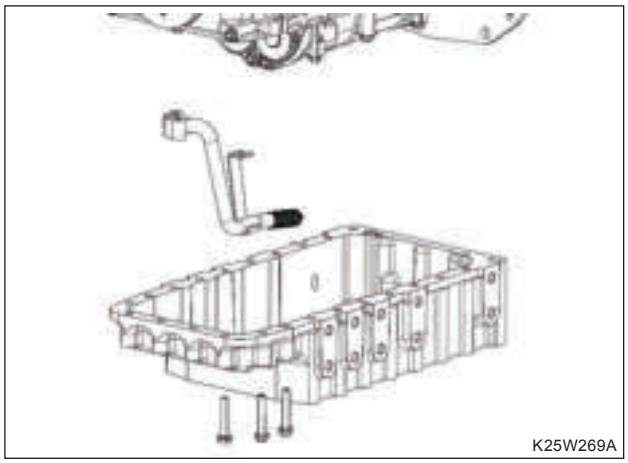
1. Loosen the clamp that holds hose connecting fuel filter pump and fuel injection pump.
2. Loosen the bolts that hold the fuel filter bracket.
3. Disassemble the fuel filter and fuel filter bracket.

6.2.20 OIL PAN



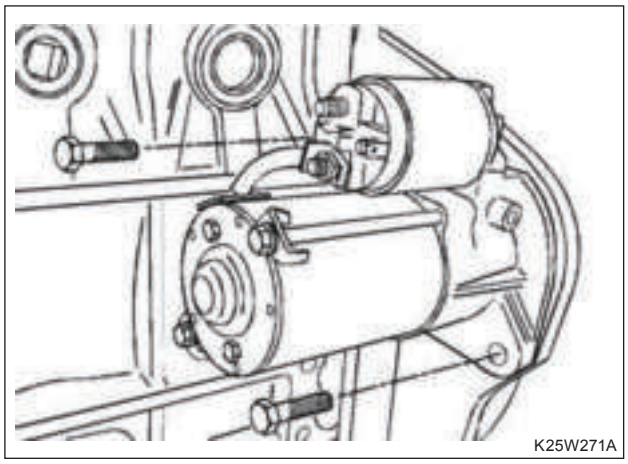
1. Loosen the bolts that hold the oil pan.
2. Disassemble the oil pan.
3. Disassemble the packing of oil suction pipe.
4. Clean the liquid packing on oil pan and adapter.

6.2.21 FRAME AND OIL SUCTION PIPE



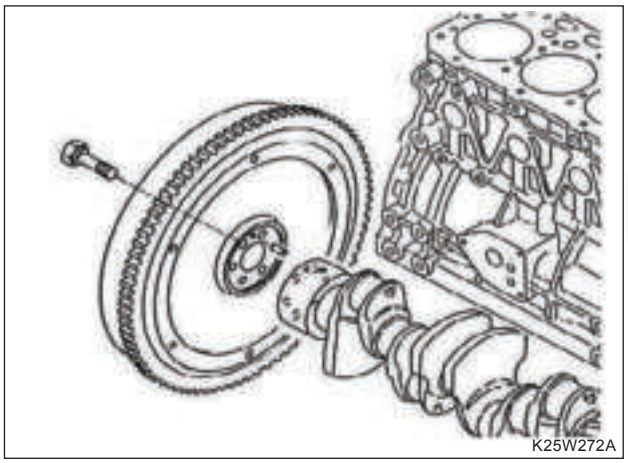
1. Loosen the 20 bolts that hold frame.
2. Disassemble frame.
3. Clean the liquid packing on face of frame
4. Loosen the 2 bolts that hold the oil suction pipe.
5. Disassemble the oil suction pipe.

6.2.22 STARTER



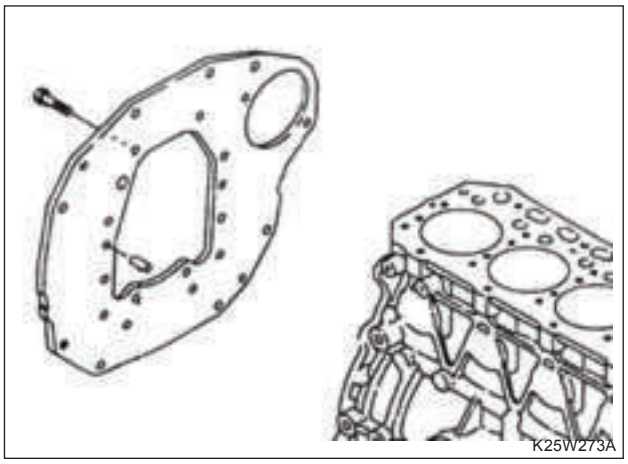
1. Loosen the bolts that hold the starter motor.
2. Disassemble the starter motor.

6.2.23 FLYWHEEL



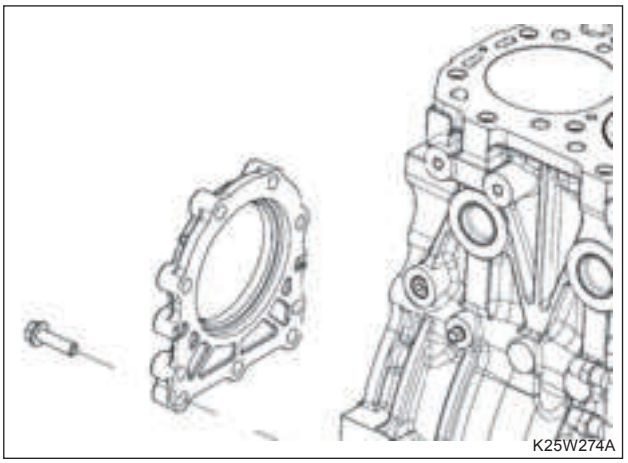
1. Loosen the bolts that hold the flywheel.
2. Disassemble the flywheel.

6.2.24 MOUNTING FLANGE



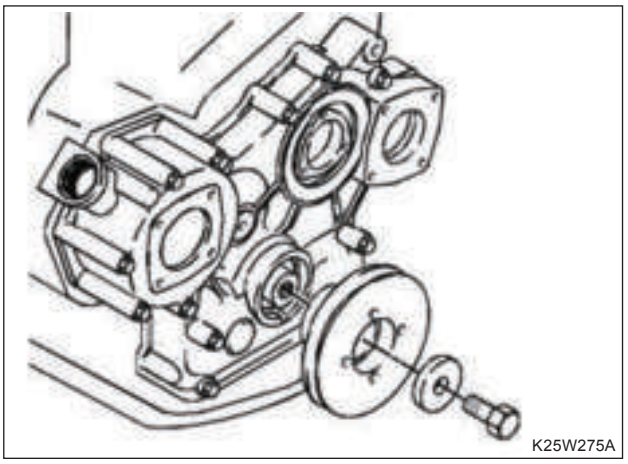
1. Loosen the bolts that hold the mounting flange.
2. Disassemble the mounting flange.

6.2.25 OIL SEAL HOUSING



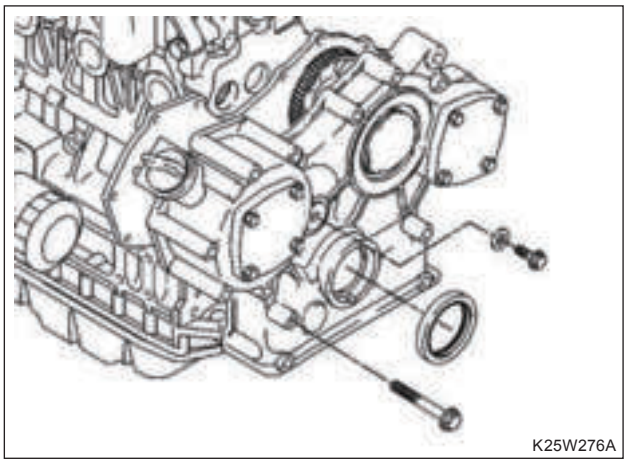
1. Loosen the 9 clamping bolts.
2. Disassemble the oil seal housing.
3. Clean the liquid packing on oil seal housing.

6.2.26 CRANK PULLEY



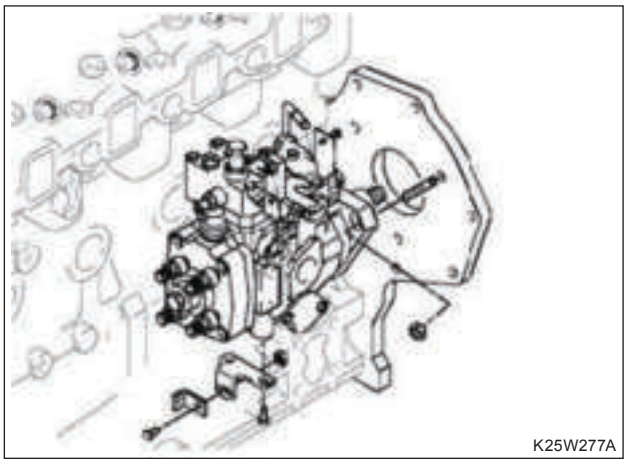
1. Loosen the bolt that holds the crank pulley.
2. Disassemble the crank pulley.

6.2.27 GEAR CASE



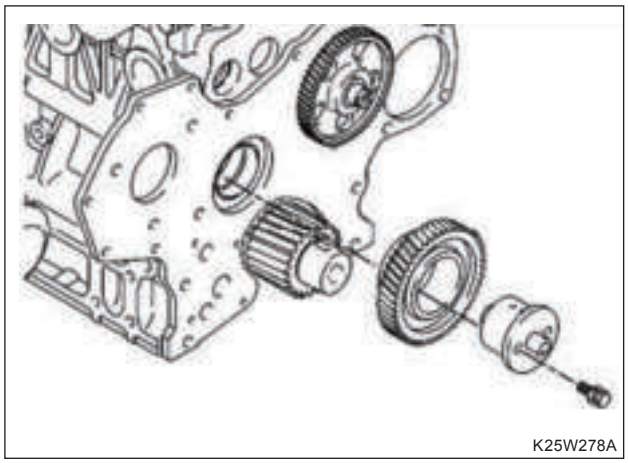
1. Loosen the bolts that hold the gear case.
2. Disassemble the gear case.
3. Clean the liquid packing on gear case flange and gear case.

6.2.28 FUEL INJECTION PUMP



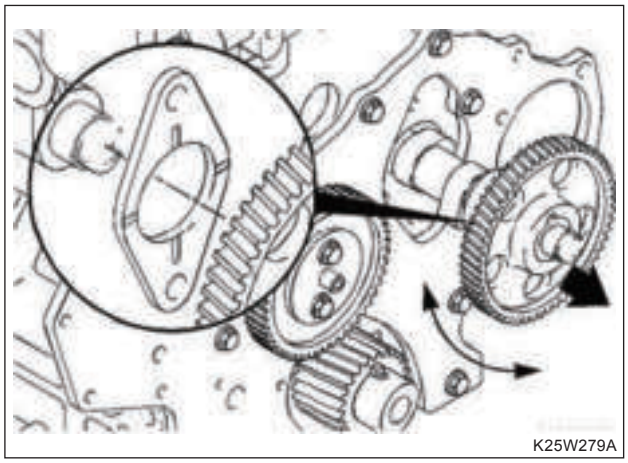
1. Loosen the bolt that holds the fuel injection pump gear.
2. Disassemble the fuel injection pump gear.
3. Loosen the bolts that hold support bracket.
4. Disassemble the support bracket.
5. Loosen the bolts that hold the fuel injection pump.
6. Disassemble the fuel injection pump.

6.2.29 IDLE SHAFT AND IDLE GEAR



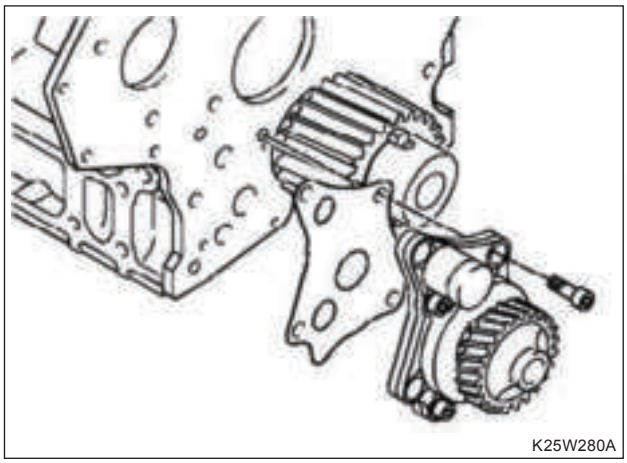
1. Loosen the bolts that hold idle shaft and idle gear.
2. Disassemble the idle shaft and idle gear.

6.2.30 CAM SHAFT ASSEMBLY



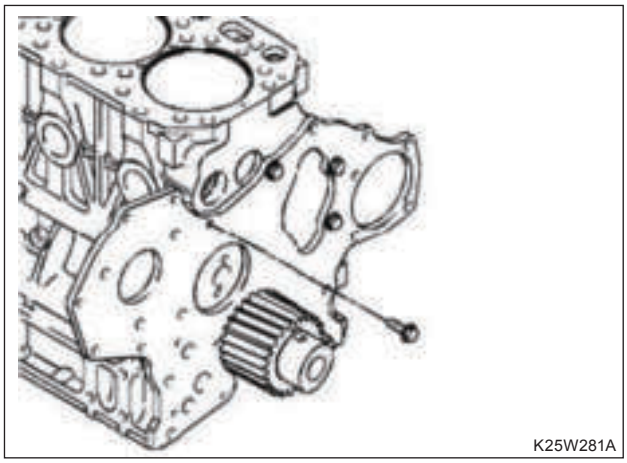
1. Loosen the bolts that hold the cam shaft.
2. Disassemble the cam shaft with turning it.
3. Cam shaft will be damaged if forcibly disassemble.

6.2.31 OIL PUMP



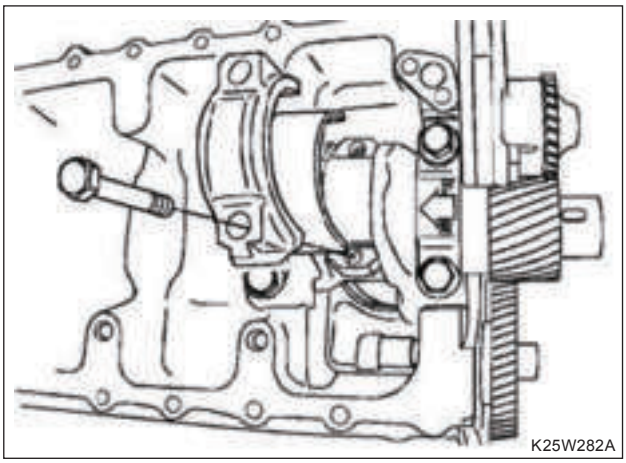
1. Loosen the bolts using by hexagon wrench.
2. Disassemble the oil pump.
3. Do not re-use the O-ring and packing.

6.2.32 GEAR CASE FLANGE



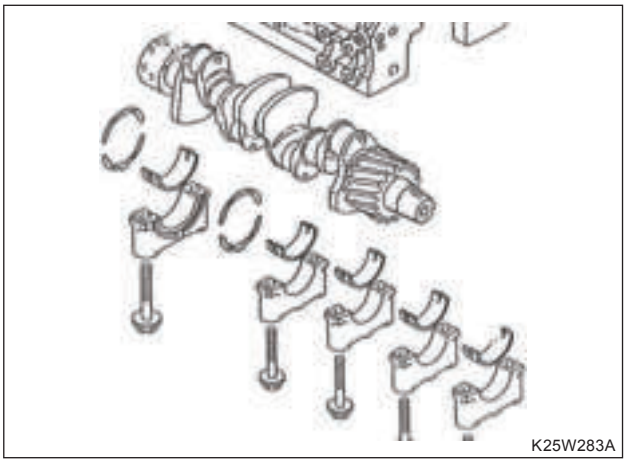
1. Loosen the bolts that hold the gear case flange.
2. Disassemble the gear case flange.

6.2.33 PISTON AND CONNECTING ROD


K25W282A

1. Loosen the bolts that hold small end of connecting rod.
2. Disassemble cap of the small end of connecting rod.
3. Push the piston and connecting rod away from the crankshaft with the handle of a hammer.
4. Disassemble the piston and connecting rod.
5. Disassemble the bearing of pin from the connecting rod.
6. Take note of assembling position since in case of re-use they shall be fitted in the same position.
7. Do not use the bearings.

6.2.34 CRANK SHAFT


K25W283A

1. Loosen the bolts that hold main bearing cap.
2. Disassemble the crank shaft.

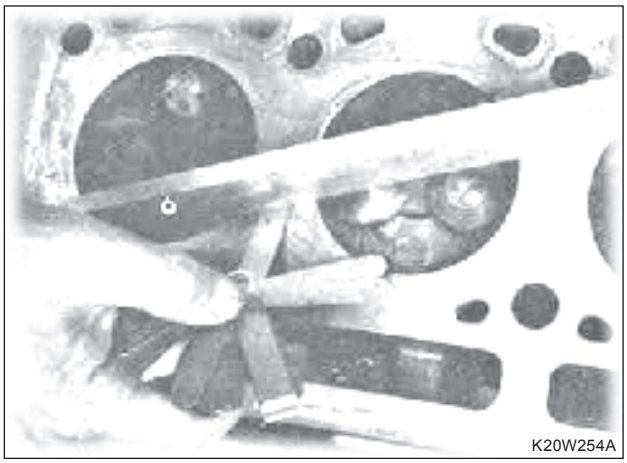
6.3 MAIN PARTS INSPECTION & MAINTENANCE

6.3.1 CYLINDER HEAD

DISASSEMBLY

1. Disassemble the valve cotter, spring, retainer by the valve spring with disassembly tools.
2. Disassemble the intake valve and exhaust valve.
3. Keep those disassembled parts by matching cylinders.

CHECK THE CYLINDER HEAD


K20W254A

1. Before cleaning the cylinder head, check for leak, damage, crack from water, gas, etc.

• Check the cracking in head combustion surface by color check.

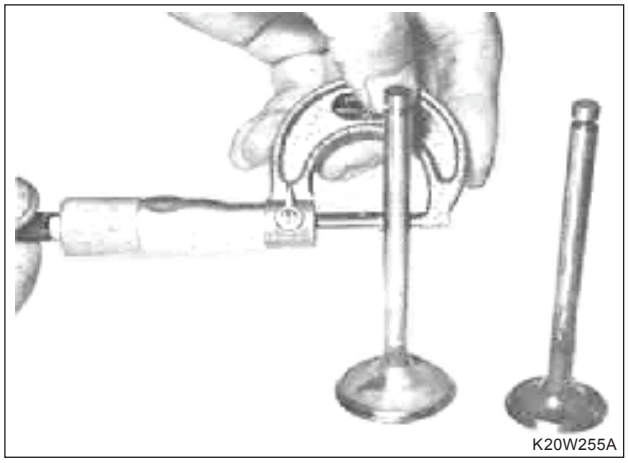
2. Check the invisible crack or damage by water pressure testing or magnetic particle testing.
3. Check the plane degree of the cylinder head's bottom if there is any gas leak from gasket.

• Replace the cylinder head if the check result is out of limit.

SPECIFICATION	Less than 0.05 mm
LIMIT	More than 0.15 mm

INTAKE & EXHAUST VALVE & VALVE GUIDE

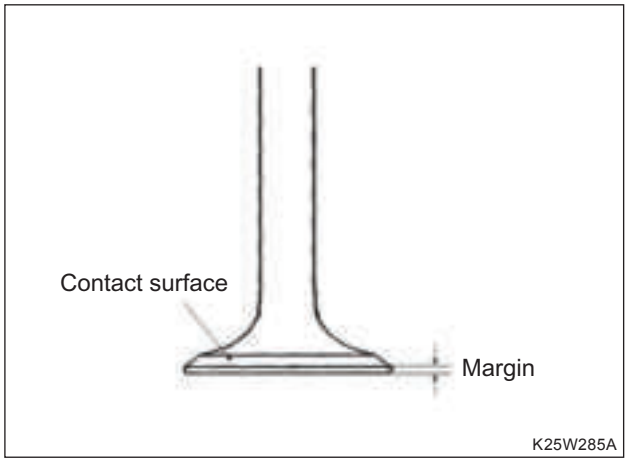
▶ VALVE



- Measure the valve stem outer diameter. If the wear is over the limit, replace the valve.

SPECIFICATION	LIMIT
7.96 ~ 7.97 mm	7.9 mm

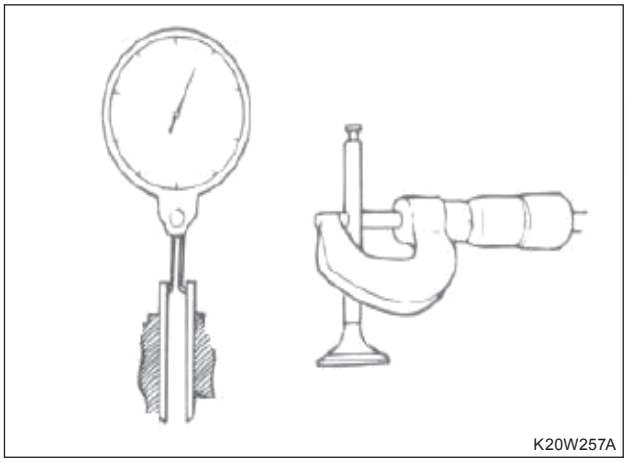
▶ VALVE SHEET CONTACT SURFACE



- Check the valve sheet contact surface and if necessary, modify it with grinding paper. Replace if major damage is found.
- Check the margin(thickness of valve head) and if less than the limit, replace it.

SPECIFICATION	1.2 mm
LIMIT	0.5 mm

▶ VALVE GUIDE



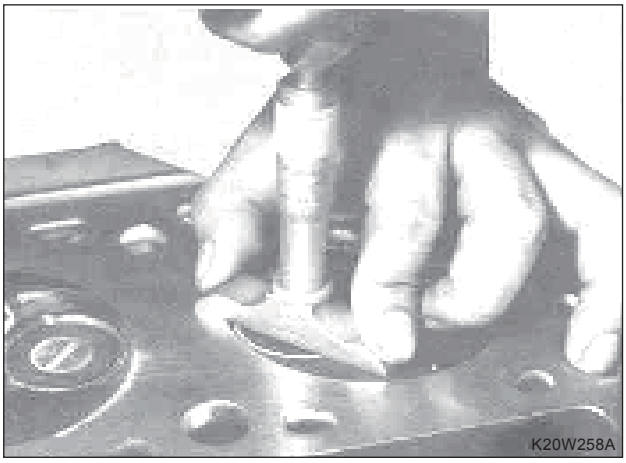
- Measure the distance between the valve guide and valve stem.

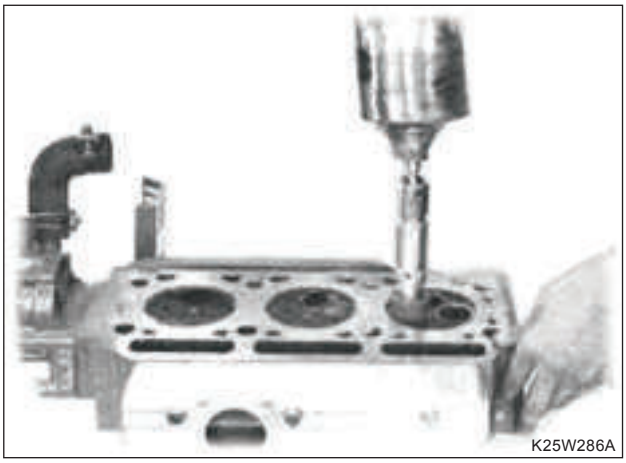
  If the distance is more than limit, replace the valve or valve guide or either parts.

SPECIFICATION	0.04 ~ 0.05 mm
LIMIT	0.2 mm

- Valve guide and the valve sheet should be machined at the same time. (Valve guide must assemble by the press machine.)
- Valve guide Inner diameter: 8.010 ~ 8.025 mm
- Valve guide's projecting quantity from the head surface : 13 mm

▶ VALVE SHEET





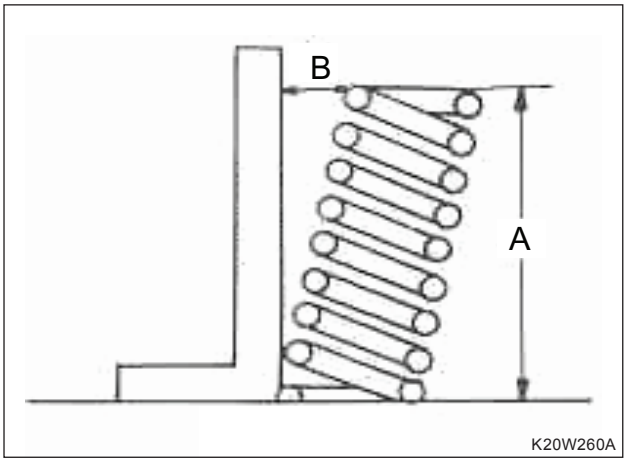
If the valve's difference is more than limit, replace the valve sheet.

SPECIFICATION	0.7 mm
LIMIT	1.0 mm

- Modifying the valve sheet
  - When modifying the valve sheet, if necessary, replace the valve guide.
  - Modify the sheet width and sheet angle according to the specification by special tools or valve grinder.

INTAKE VALVE SEAT ANGLE	EXHAUST VALVE SEAT ANGLE
60°	45°

▶ VALVE SPRING



Squareness, free-length, transformation, etc. of valve spring are direct cause of damage such as valve stem uneven wear, etc. Therefore check certainly it when disassembling.

If the measurement value is over the limit, replace

ITEM	SPECIFICATION	LIMIT
Free length (A)	46 mm	-
Inclination (B)	-	1.2 mm
Spring load	12.2 kg / 39.6 mm	-

▶ CYLINDER HEAD ASSEMBLY

1. Clean the cylinder head.
2. Replace the new valve stem seal and assemble the stem seal to the valve guide by special tool

⚠ CAUTION

- **Stem seal assembling quality affects to oil consumption.**

3. Assemble the valve after putting the oil on valve stem and valve guide.
4. Assemble the valve spring and valve retainer.
5. Assemble the valve cotter by special tool.
6. Beat it slightly by Urethane hammer and check it.

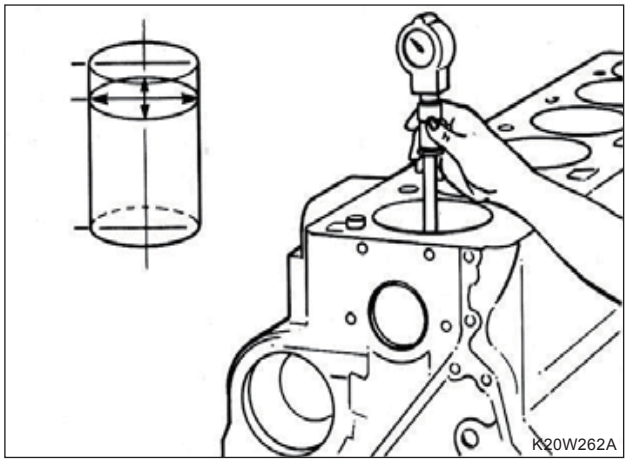
6.3.2 CYLINDER BLOCK

CHECK THE CYLINDER BLOCK

▶ **CHECK THE CRACK AND ETC IN EACH PART**

- If damaged by freezing or rollover, check first by sight before disassembly. If there is defect, execute the color checking.
- Check points: Cylinder head bolts, screws: crack, etc.
- If the damage is serious, replace the cylinder block and if the damage is minor, modify it.
- To test the crack or water leak, execute the water pressure test.
- When replacing the freezing protection plug, put some bonds to the plug's circumference.(Three Bond 1194 or equivalent)

▶ **MEASURING THE CYLINDER INSIDE DIAMETER**



- Measure the cylinder inside diameter and if the measurement value is over limit, replace it.

(mm)

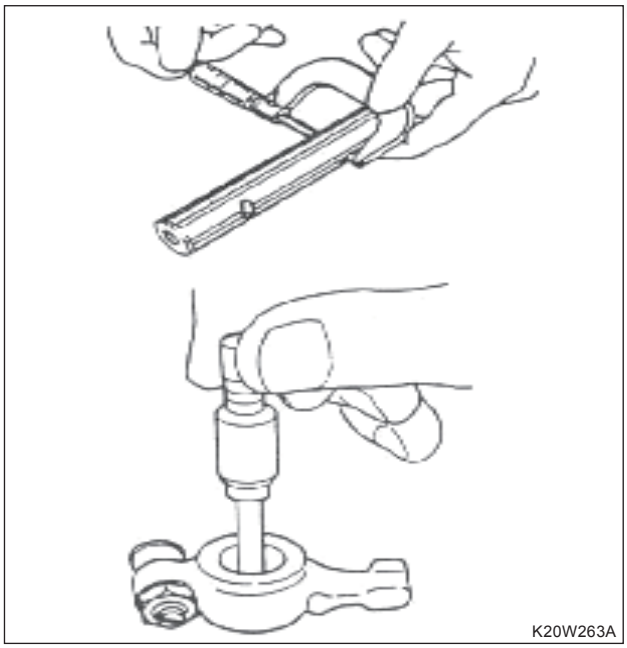
ITEM	SPECIFICATION	LIMIT
Cylinder inside diameter	88.005 ~ 88.025	88.20
Cylinder roundness	0.0~0.01	0.03
Cylinder cylindricity	0.0~0.015	0.03

- Measuring position : Measure the engine front and thrust parts and the upper area 20 mm, Mid area, bottom area. (Average)

6.3.3 VALVE DEVICE

Rocker arm assembly needs to be maintained clearly and exactly because it is related with timing of the valve open & close and the engine performance.

CHECK THE ROCKER ARM



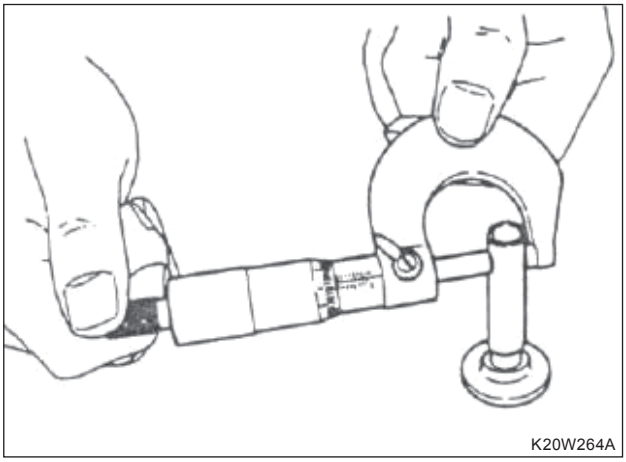
1. Rocker arm shaft outer diameter and rocker arm Inner diameter

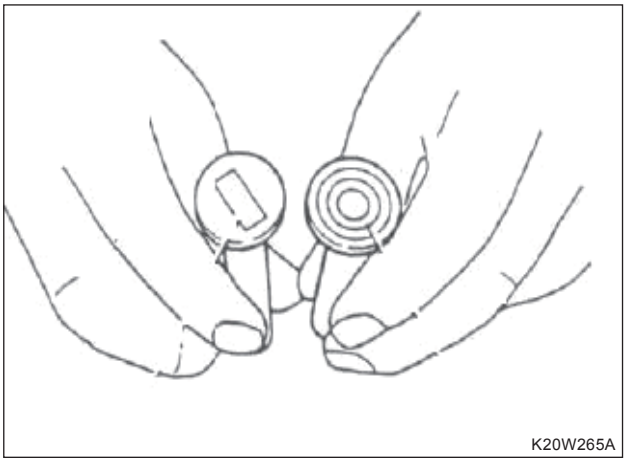
If the measurement of the shaft outer diameter and rocker arm Inner diameter is over the limit, replace it.

(mm)

ITEM	SPECIFICATION	LIMIT
Shaft Outer Diameter	18.959 ~ 18.98	18.95
Rocker arm inside diameter	19.0 ~ 19.021	19.09
clearance	0.02 ~ 0.062	0.14

TAPPET





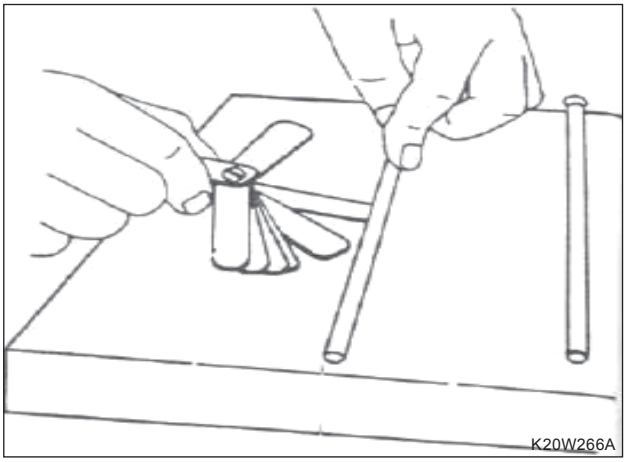
If the measurement of the tappet outer diameter and cylinder block is over the limit, replace it.

(mm)

ITEM	SPECIFICATION	LIMIT
Tappet outer diameter	14.227 ~ 14.249	14.18
Guide inside diameter	14.260 ~ 14.280	14.30
clearance	0.011 ~ 0.056	0.12

- Tappet's contacting condition to camshaft : If uneven wear, disfigurement or damage is serious, replace the tappet.

PUSH ROD



- Put the push rod on the surface plate and measure the bending degree by gap gauge. If it is over the limit, replace it.

(mm)

LIMIT	Below 0.3

6.3.4 PISTON & PISTON RING

CHECK THE PISTON

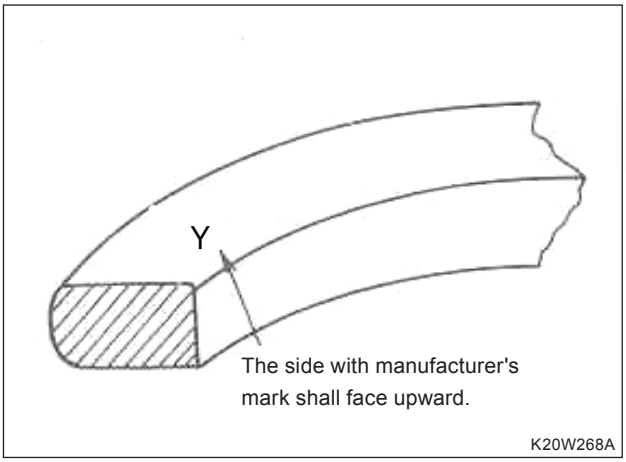
▶ PISTON OUTER DIAMETER

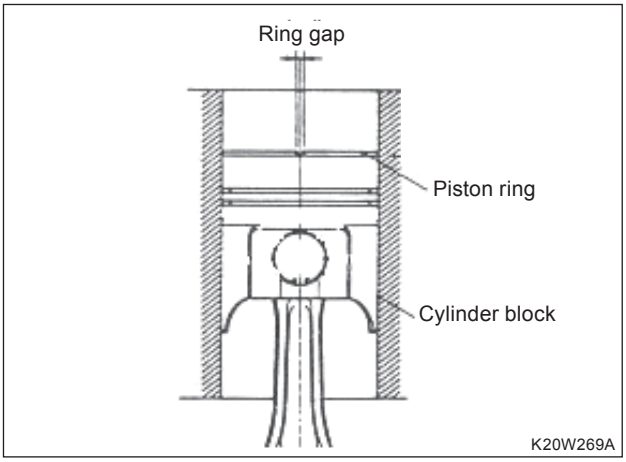
- If the main measurement value is over the limit, replace the pistons
- If there is any damage or scratch on the surface, replace it
- Piston outer diameter

(mm)

ITEM	SPECIFICATION	LIMIT
Piston outer diameter	87.95 ~ 87.97	87.90
Minimum clearance with cylinder	0.060 ~ 0.080	-

▶ PISTON RING

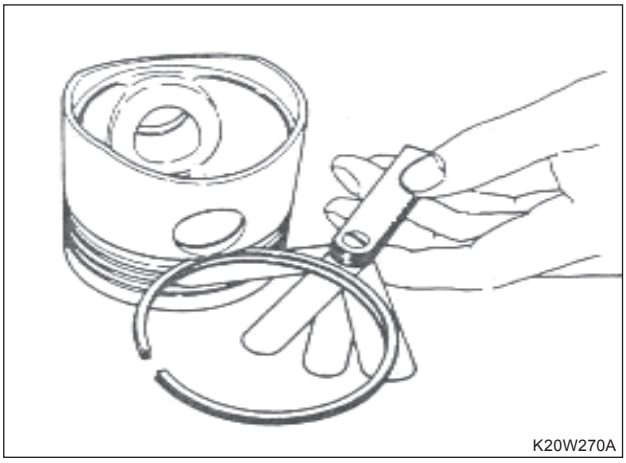




- When replacing the piston ring, make the ring groove clean. Be sure to assemble it with the top of the piston towards the manufacturer's mark on top and make sure it moves well.
- When the piston ring assemble, ring's cut direction shouldn't be in side-pressured area and make it cross each other by 120 degree.
- Measure each main area and replace it if it is over limit.
- Measure the piston ring clearance

(mm)

ITEM	SPECIFICATION	LIMIT
First Ring	0.25~0.40	1.5
Second Ring	0.50~0.70	1.5
Oil Ring	0.20~0.40	1.5

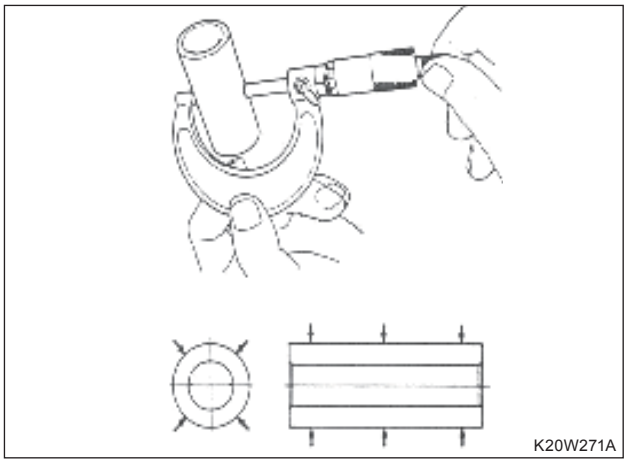


- Measure the clearance between piston ring and ring groove.

(mm)

ITEM	SPECIFICATION	LIMIT
First Ring	0.07 ~ 0.11	-
Second Ring	0.07 ~ 0.11	-
Oil Ring	0.03 ~ 0.07	-

▶ PISTON PIN

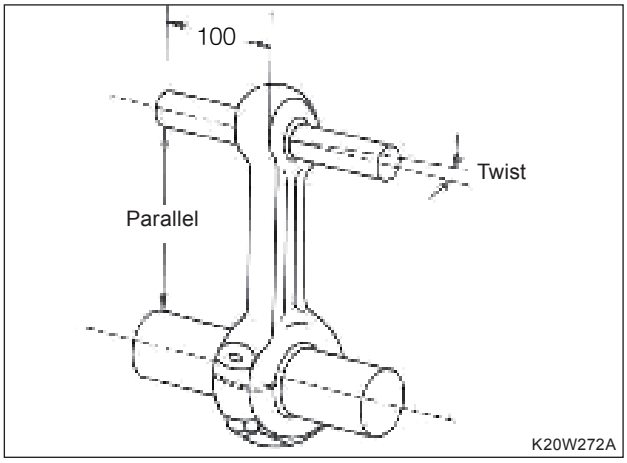


- If it wears or uneven wear is over the limit, replace it.

(mm)

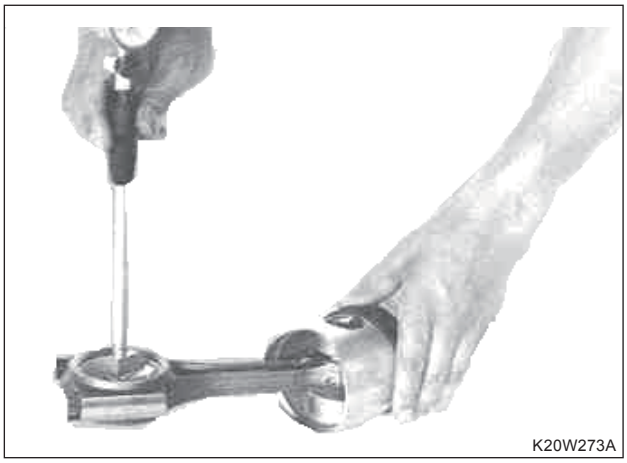
ITEM	SPECIFICATION	LIMIT
Piston pin outer diameter	29.991 ~ 30.0	29.90
pin bush inside diameter	30.0 ~ 30.008	30.02
Clearance	0 ~ 0.017	0.12

▶ CONNECTING ROD



- Measure the parallel and twist degree of big end and small end. If the measurement value is over the limit, replace it.

ITEM	SPECIFICATION	LIMIT
Twist and parallel degree	by 100 mm, 0.05 mm	0.08 mm



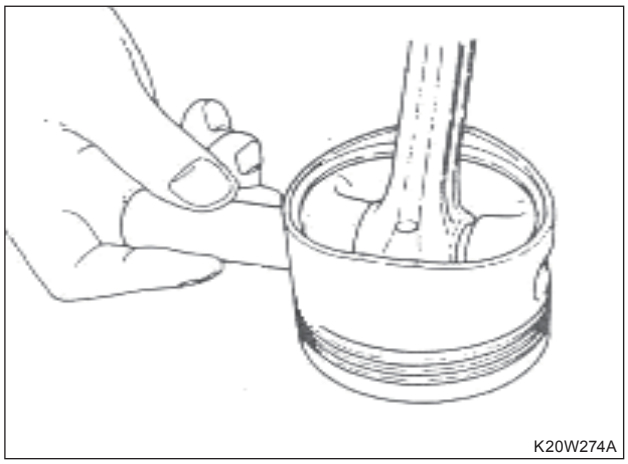
- Check big end of the connecting rod

(mm)

ITEM	SPECIFICATION	LIMIT
Big end inside diameter	53.0 ~ 53.019	-
Metal thickness	1.485~1.500	-
Crank pin outer diameter	49.950 ~ 49.964	49.91
Oil clearance	0.036 ~ 0.095	0.15

- If the measurement value is over the limit, replace the pin bearing. If necessary, replace the connecting rod.

REPLACE THE PISTON

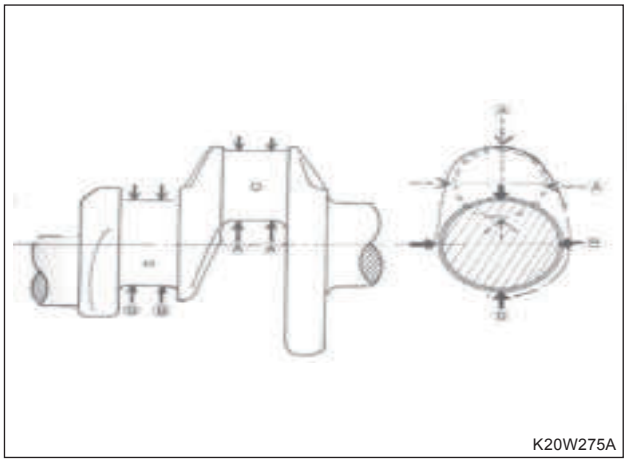

K20W274A

1. Replacing of piston ring and connecting rod should be operated in clean surrounding.
2. Make sure the piston ring is movable easily after assembly.
3. Assemble the piston pin stop ring to the piston.
4. Put some oil to the piston pin and assemble the connecting rod.
5. Assemble the piston pin stop ring.
6. When the piston is needed to be replaced, make sure the piston pin is also replaced.

6.3.5 CRANK SHAFT

CHECK THE CRANKSHAFT

▶ **CHECK THE CRANKSHAFT JOURNAL**

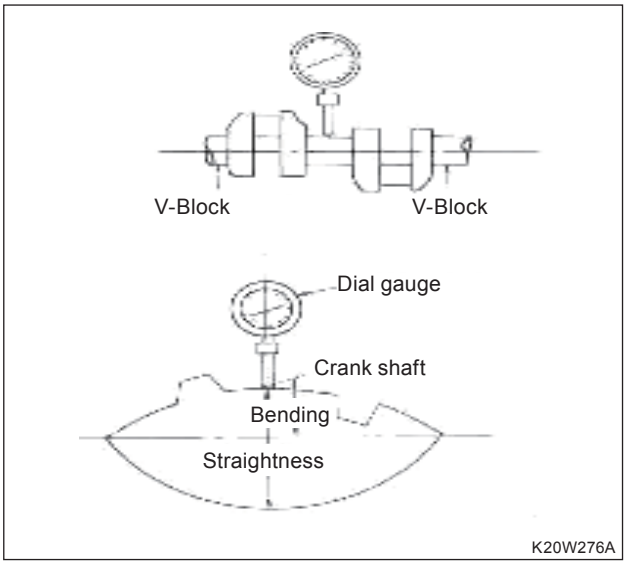

K20W275A

- If there is any crack or damage, replace it.
- Measure every main part, and if it is over the limit, replace the main bearing. If necessary, replace the crankshaft.

(mm)

ITEM	SPECIFICATION	LIMIT
Crank journal outer diameter	53.950 ~ 53.964	53.91
Metal thickness	1.987 ~ 2	-
Oil clearance	0.036 ~ 0.095	0.15

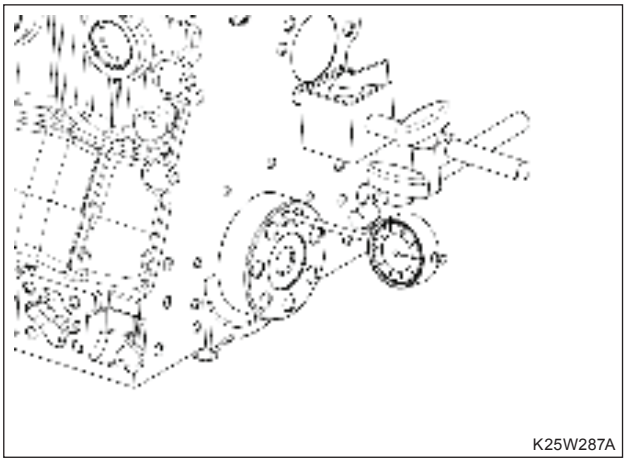
▶ CHECK THE CRANKSHAFT BENDING DEGREE



- Measure the bending degree of crankshaft.
- Fix both journal side of the camshaft to the V-block on the surface plate. Measure the straightness at the center of the rolling crankshaft by the dial gauge. If it is over the limit, replace it.

BENDING DEGREE SPECIFICATION	Below 0.02 mm

▶ CHECK THE CRANKSHAFT SIDE CLEARANCE



- Measure the crankshaft side clearance.
- Install the magnetic base at the end of the crankshaft and put the dial gauge on it. Measure the crankshaft-side side clearance. Replace the thrust bearing or crankshaft if it is over the limit.

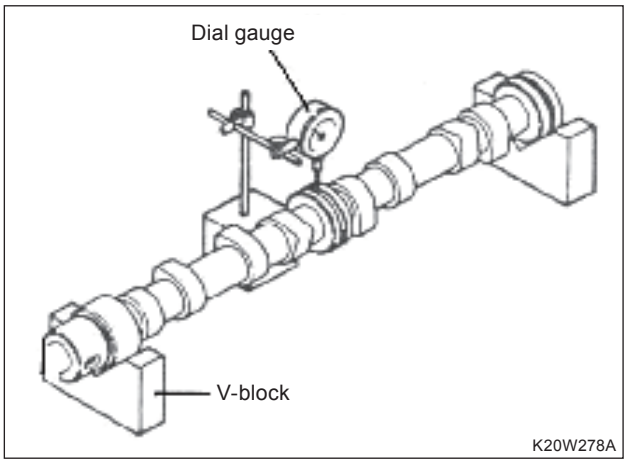
ITEM	SPECIFICATION
Thrust Clearance	0.09 ~ 0.271 mm

6.3.6 CAM SHAFT

CHECK THE CAMSHAFT

▶ CHECK THE CAMSHAFT'S FIGURE

Check the wear on contacting surface between the tappet and the cam. Also, check the cam gear damage.



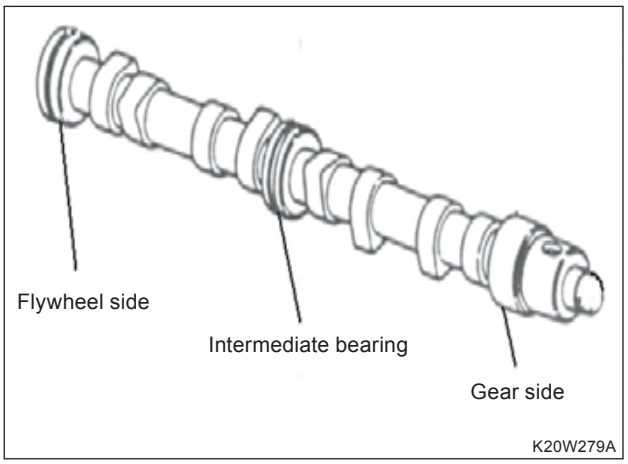
▶ CHECK THE CAMSHAFT BENDING DEGREE

- Measure the camshaft bending degree.
- Fix both journal side of the camshaft to the V block on the surface plate. Check the journal waving by the dial gauge at the center of the rolling camshaft. The bending degree is the half of the journal oscillation.

(mm)

ITEM	SPECIFICATION	LIMIT
Bending degree	Below 0.02	0.05

▶ CHECK THE CAMSHAFT JOURNAL

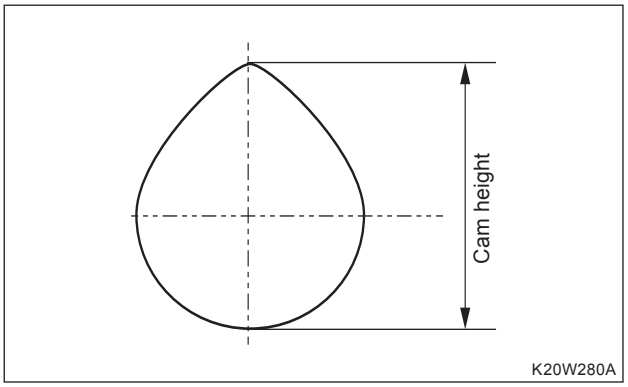


Measure the outer diameter of camshaft by micrometer. The Oil clearance is calculated after measuring the difference between camshaft inner diameter of the cylinder block by cylinder gauge and camshaft outer diameter.

(mm)

ITEM		SPECIFICATION
Gear side	Outer diameter	44.950 ~ 44.964
	Oil clearance	0.066 ~ 0.110
Middle	Outer diameter	44.916 ~ 44.930
	Oil clearance	0.070 ~ 0.130
Fly wheel side	Outer diameter	44.950 ~ 44.964
	Oil clearance	0.066 ~ 0.110

▶ CHECK THE HEIGHT OF INTAKE·EXHAUST CAM



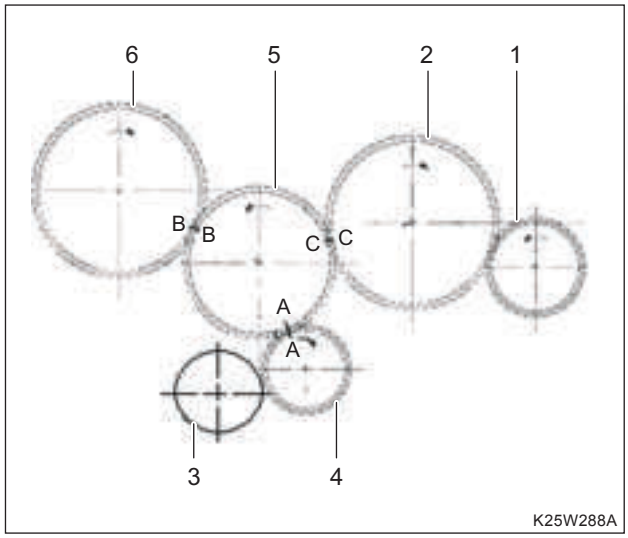
(mm)

ITEM		SPECIFICATION
Cam height	intake	37.98 ~ 38.02
	exhaust	37.98 ~ 38.02

6.3.7 GEARS

CHECK THE GEARS

▶ CHECK THE GEARS



(1) Hydraulic pump drive gear
(2) Camshaft gear
(3) Oil pump gear
(4) Crank gear
(5) Idle gear
(6) Fuel injection pump gear

Check each gear's tooth side and replace them if there is any damage or wear.

▶ CHECK THE GEAR BACKLASH

(mm)

BACK LASH	Crank gear, Camshaft gear, Idle gear, Fuel injection pump gear	0.07 ~ 0.15
	Hydraulic pump drive gear Oil pump gear	0.11 ~ 0.19

6.4 THE ENGINE ASSEMBLY

6.4.1 CAUTION BEFORE ASSEMBLING THE ENGINE

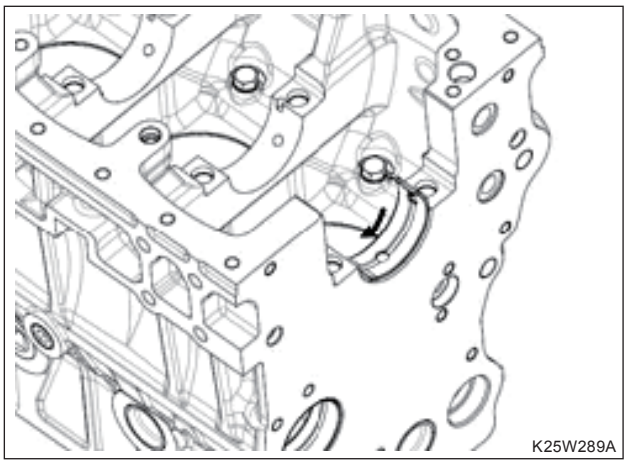
- Carefully clean and arrange disassemble parts.
- Check the tool box and jig.
- Prepare and check the spare parts. (Gasket, o-ring, packing, etc)
- Clean the work place during assemble of the engine.
- Assemble the engine according to work sheet and order in this book.
- Tightening torque of screws, bolts and nuts are worked within the factory specification. And check the drive part.
- Check removed parts and spare parts after assembling.

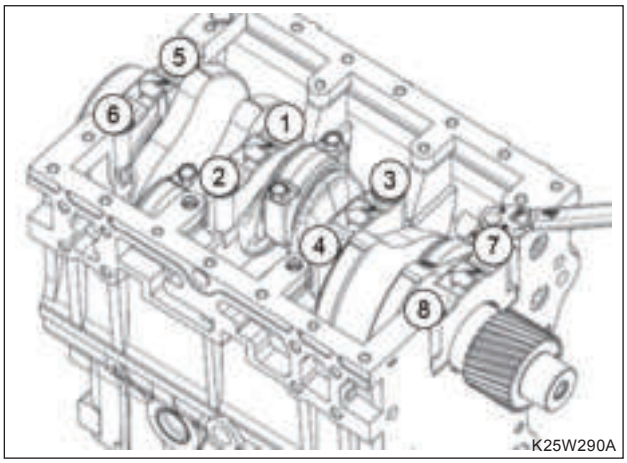
6.4.2 CYLINDER BLOCK

Put down the cylinder block head plate using the support on the work-bench.

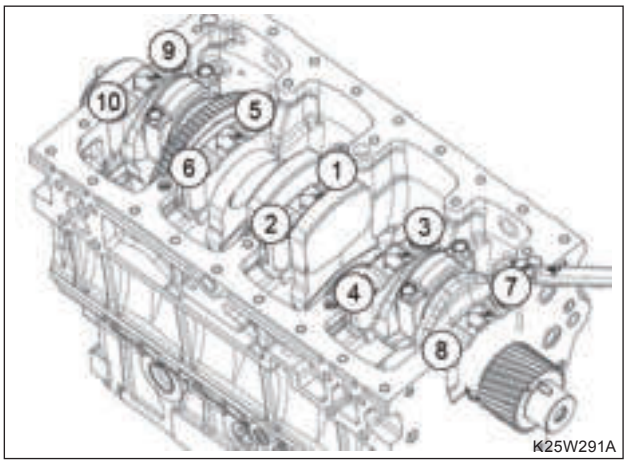
6.4.3 CRANKSHAFT

ASSEMBLY PROCEDURE


K25W289A



K25W290A



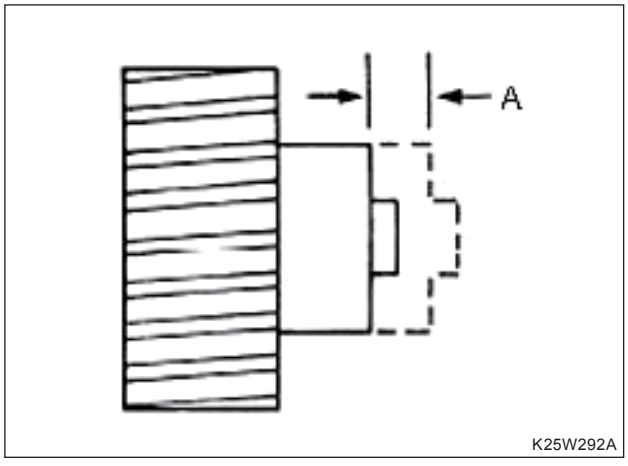
K25W291A

1. Cylinder block and bearing cap assemble with the new main bearing. Oil hole of main bearing assemble into the cylinder block.
2. Apply the lubricating oil on the crankshaft journal.
3. Put down the crankshaft on the cylinder block.

⚠ WARNING

- **Use the hoist or lift for safe work.**
- **Thrust bearing assemble that the oil groove into outside.**
- **Assemble the bearing cap after same direction with the cylinder block number.**
- **Cylinder block number start the gear case flange that is No. 1.**
- **The arrow of bearing cap is the front direction.**
- **Lubricate the lubricating oil on the bolt of main bearing.**
- **Assemble the bearing cap bolt according to the factory specification and follow procedure.**
  A. Assemble the bearing cap bolt tentatively.
  B. Assemble the bearing cap bolt according to assembling procedure. (1→8)
  (Tightening torque : 12.5 kg-m)
- **Check the crankshaft rotation.**

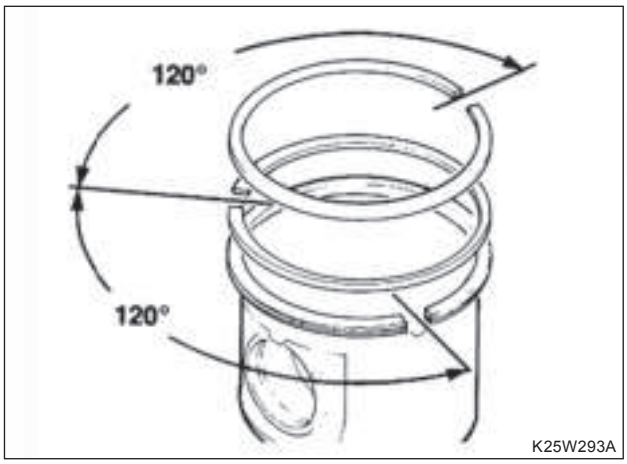
CHECK THE CLEARANCE OF CRANKSHAFT SIDE

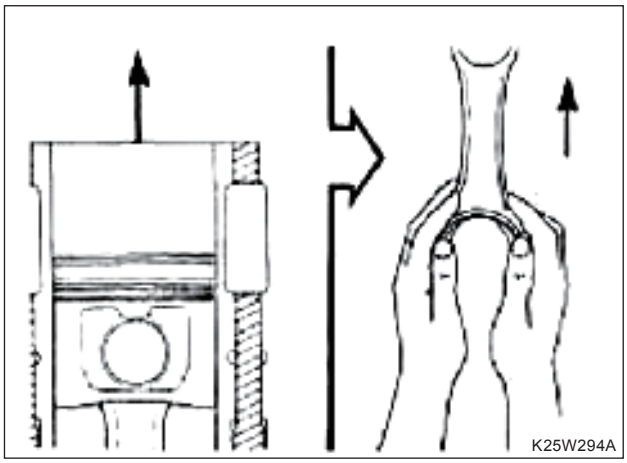


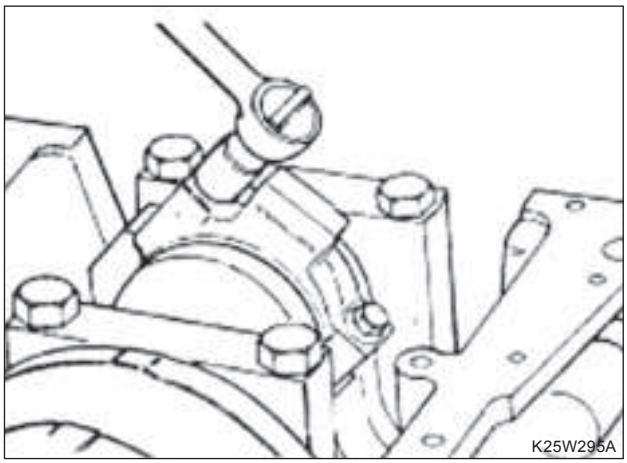
1. Check the clearance of crankshaft side by dial gauge.
2. The clearance of crankshaft side: 0.090 ~ 0.271 mm

6.4.4 PISTON AND CONNECTING ROD

ASSEMBLY PROCEDURE



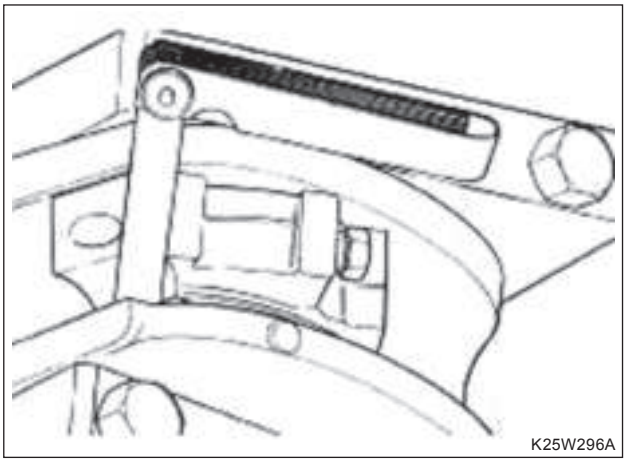




1. Assemble the piston assembly and connecting rod.
2. Apply the lubricating oil on the cylinder block and
3. piston.
4. Each gap of piston ring locate 120 degree.
5. Assemble the crank pin bearing on the connecting rod. (Apply the lubricating oil on the crankshaft pin and crank pin bearing.)

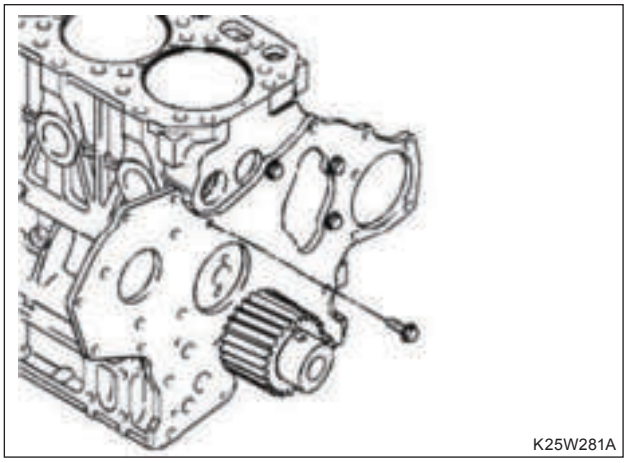
6. Press the piston ring. (With jig)
7. Rotate it and locate the crankshaft pin to TDC.
8. Assemble the piston in cylinder. (Please be sure that piston and ring is not damaged.)
9. After assembly, crankshaft rotate 180° and locate BTDC. And assemble the connecting rod cap with new bearing.
10. Locate same direction between connecting rod big end and serial number of cap.
11. Assemble the cap bolt within the factory specification and follow procedure.
    A. Assemble the bearing cap bolt tentatively.
    B. Assemble the bearing cap bolt according to assembly procedure. (Tightening torque : 7.5 kg-m)
12. Check the crankshaft rotation.

CHECK THE CLEARANCE OF CONNECTING ROD SIDE


K25W296A

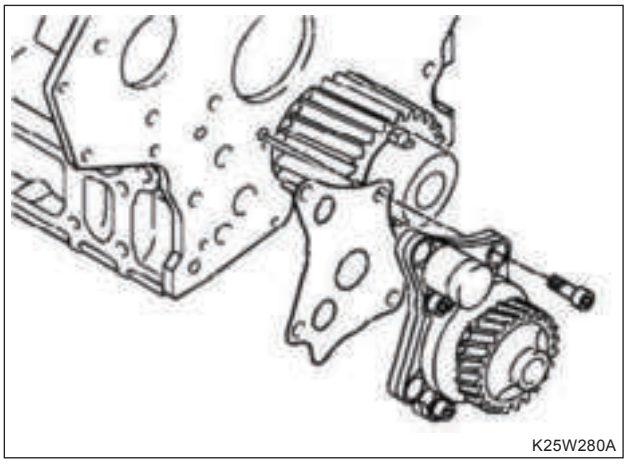
1. Check the clearance of connecting rod and cap. (Use clearance gage.)
2. Side clearance : 0.15 ~ 0.35 mm

6.4.5 GEAR CASE FLANGE


K25W281A

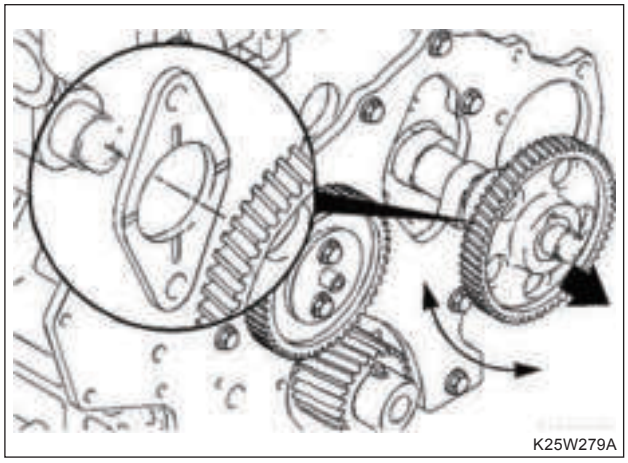
1. Apply the liquid gasket on the gear case flange. (Use Loctite 5060 or similar liquid gasket.)
2. Assemble the gear case flange and bolts to hold the gear case flange. (Tightening torque: 2.7 kg•m)

6.4.6 OIL PUMP


K25W280A

1. Assemble the oil pump with O-ring.
2. Tighten the bolts to hold the oil pump. (Tightening torque: 2.7 kg•m)

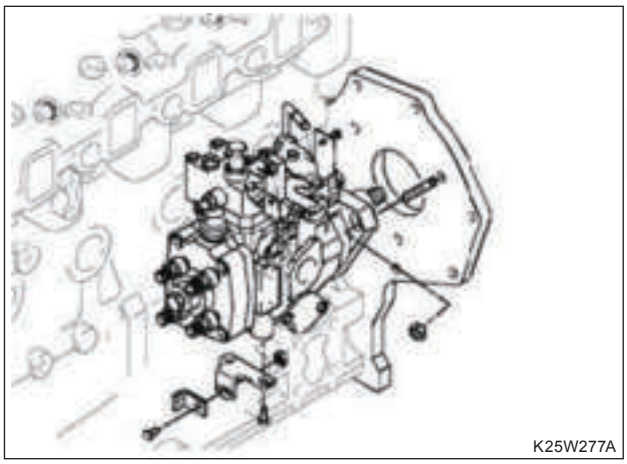
6.4.7 CAMSHAFT



1. Apply the lubricating oil on the journal, cam, thrust bearing.
2. Assemble the camshaft with turning it.
3. Assemble the bolts in cylinder block to hold the cam shaft. (Tightening torque: 2.7 kg•m)
4. Cam shaft will be damaged if forcibly assembled.

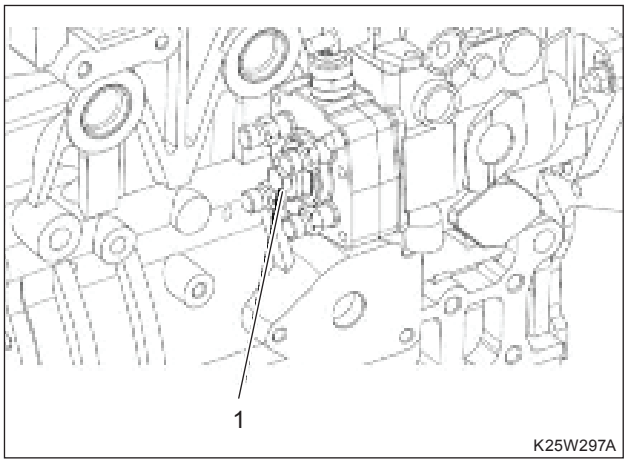
6.4.8 INJECTION PUMP

ASSEMBLY

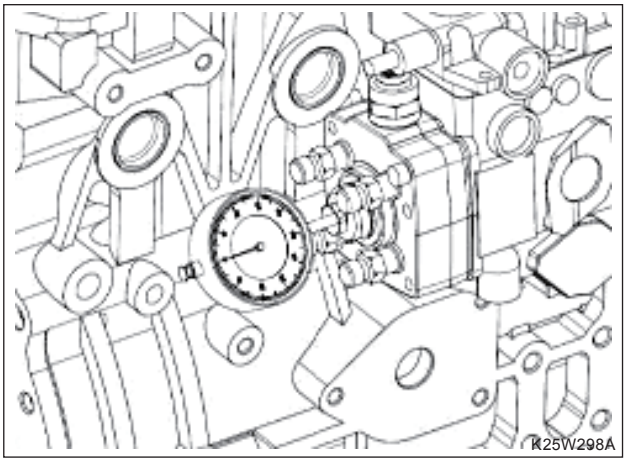


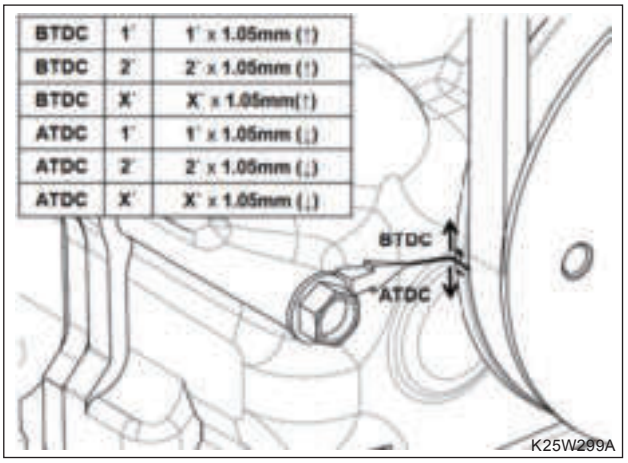
1. Assemble the o-ring in fuel injection pump and in gear case flange. (Assemble the key radius type on the fuel injection pump shaft.)
2. Line up the injection pump gear and 'B' mark of idle gear (See 5.3.9), and then assemble the bolt and spring washer to hold fuel injection pump tentatively.
3. Line up the injection timing of injection pump. (Reference the section (2).)
4. Assemble the nuts to hold the fuel injection pump.
5. Assemble the support bracket.

LINE UP THE INJECTION TIMING



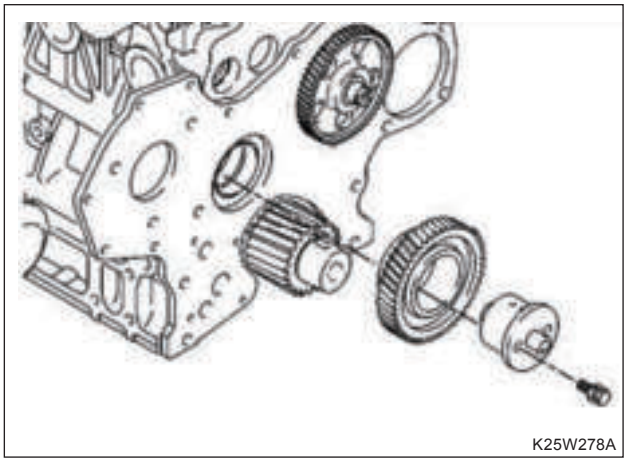
1. Disassemble the timing check plug (1) of fuel injection pump.
2. Assemble the dial gage. (with the jig)

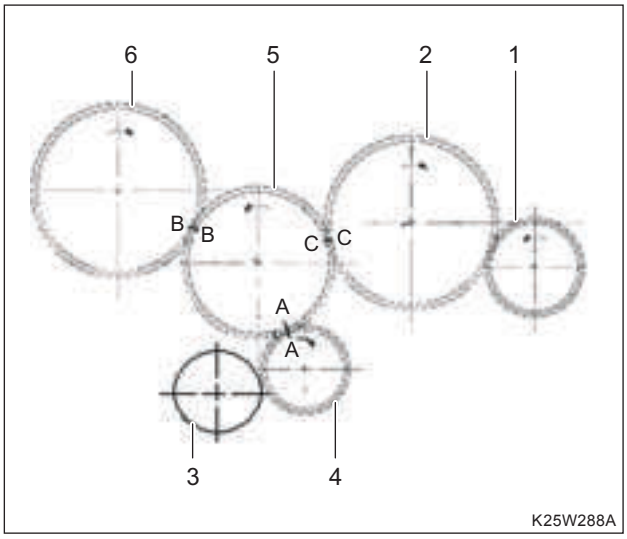




3. Rotate the crank pulley CCW until indicator of dial gage doesn't move by rotating the crank pulley. And then where gauge pin stopped line up zero point of dial gauge by rotating the dial gauge.
4. Rotate the crank pulley CW slowly until line up "→" mark of gear case and "Injection timing" line using by sharp something of crank pulley.
5. The indicator of dial gage line up "0" mark in dial gage by swing the fuel injection pump.
6. Tighten the 3 bolts that hold fuel injection pump.
7. After adjusting injection timing, check the injection timing again.
8. Disassemble the dial gage.
9. Assemble the timing check plug.

6.4.9 IDLE GEAR

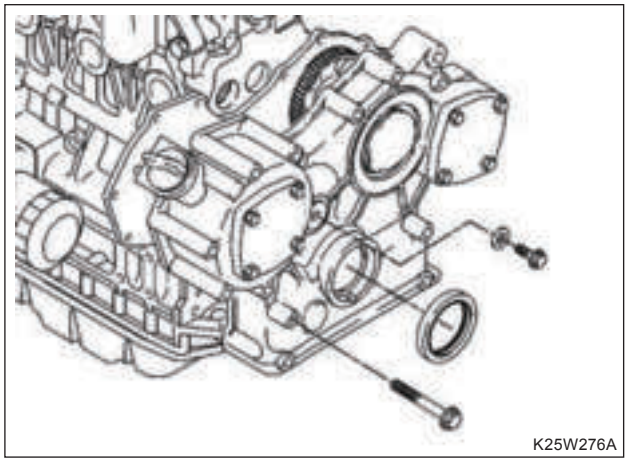




(1) Hydraulic pump drive gear
(2) Camshaft gear
(3) Oil pump gear
(4) Crank gear
(5) Idle gear
(6) Fuel injection pump gear

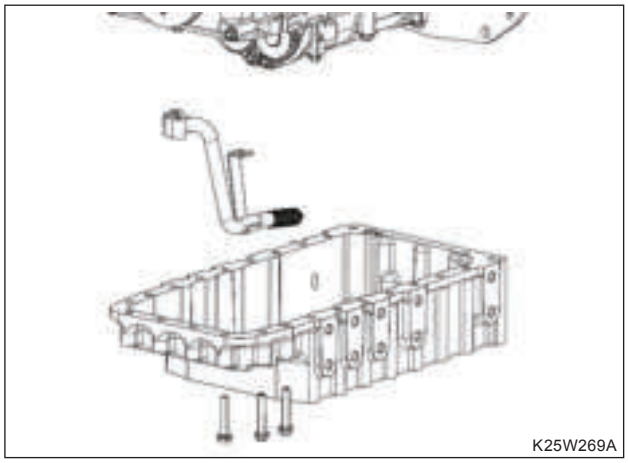
1. Apply the lubricating oil on the bush.
2. Assemble the idle gear. (Check the mark A, B, C.)
3. Assemble the idle gear shaft.
4. Tighten the bolts to hold the shaft of idle gear (Tightening torque : 2.7 kg•m).

6.4.10 GEAR CASE



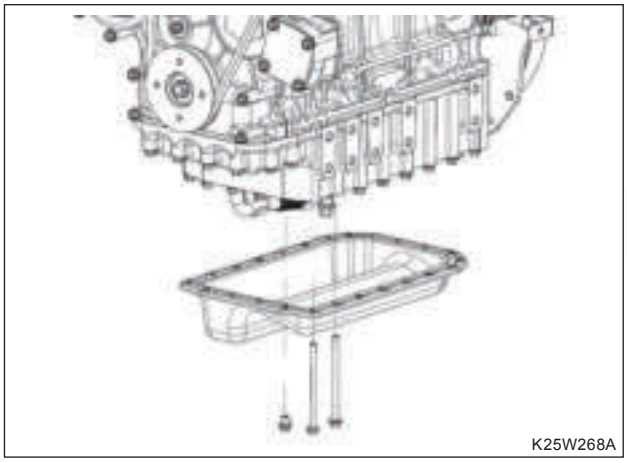
1. Apply the liquid packing on the gear case. (Use Loctite 5060 or similar product.).
2. Assemble the bolts to hold the gear case. (Tightening torque : 2.7 kg•m).

6.4.11 FRAME AND OIL SUCTION PIPE



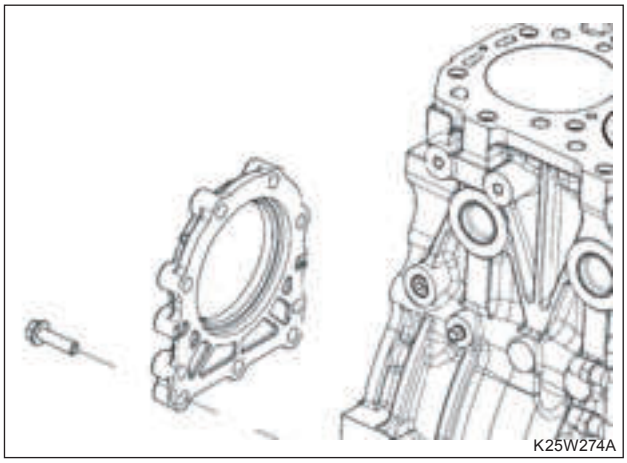
1. Assemble the oil suction pipe with packing.
2. Tighten the bolts to hold oil suction pipe. (Tightening torque: 2.7 kg•m)
3. Apply the liquid packing on the frame. (Use Loctite 5060 or similar product.)
4. Assemble the frame.
5. Assemble the bolts to hold frame. (Tightening torque: 2.7 kg•m)

6.4.12 OIL PAN



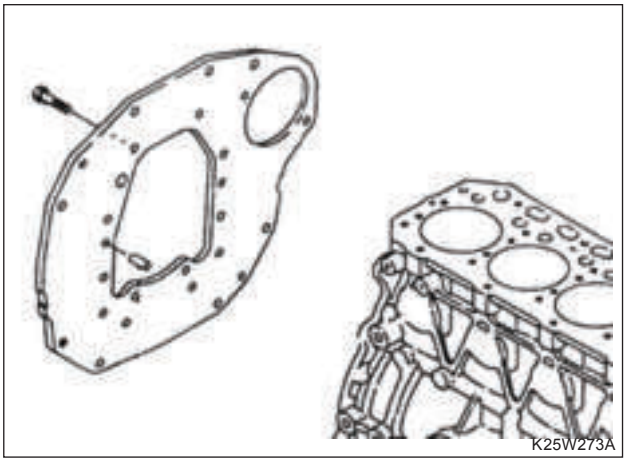
1. Apply the liquid packing on the oil pan. (Use Loctite 5060 or similar product.)
2. Assemble the oil pan.
3. Tighten the bolts to hold oil pan. (Tightening torque: 2.7 kg•m)

6.4.13 OIL SEAL HOUSING



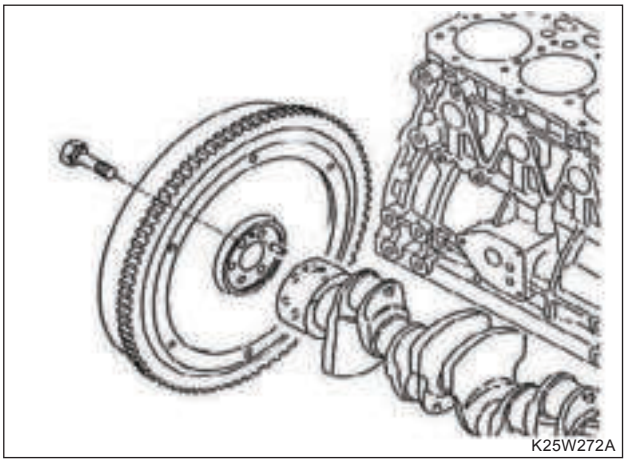
1. Apply the liquid packing on the oil seal housing. (Use Loctite 5060 or similar product.)
2. Assemble the oil seal housing.
3. Tighten the bolts to oil seal housing. (Tightening torque: 2.7 kg•m)

6.4.14 MOUNTING FLANGE



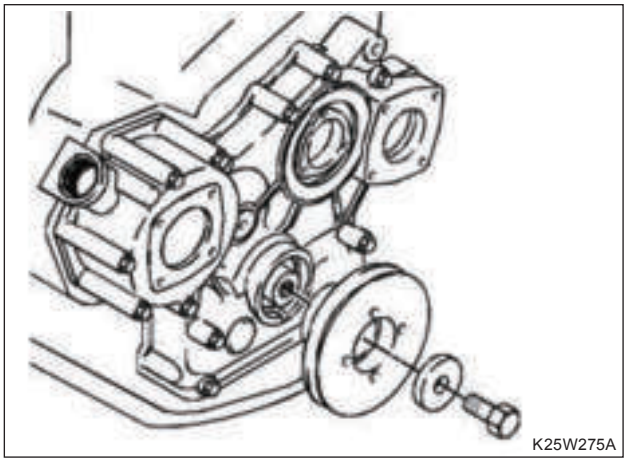
1. Assemble the mounting flange.
2. Tighten the bolts to hold mounting flange. (Tightening torque: 2.7 kg•m)

6.4.15 FLYWHEEL



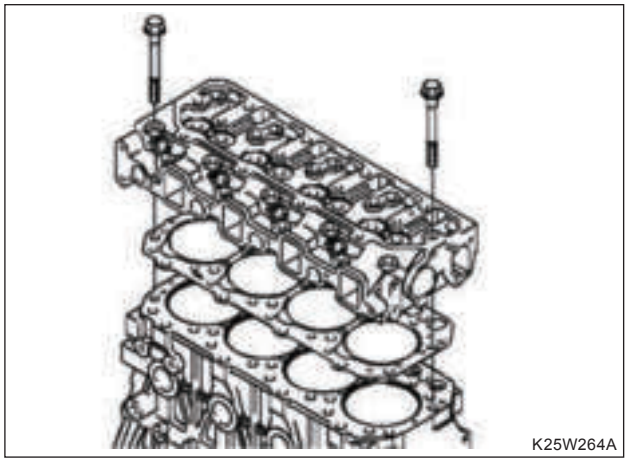
1. Assemble the flywheel.
2. Assemble the flywheel bolt within the factory specification and follow procedure.
   A. Tighten the bolt. (Tightening torque: 3.0 kg•m)
   B. And then tighten the bolt again to hold the flywheel. (Tightening torque: 9.0 kg•m)

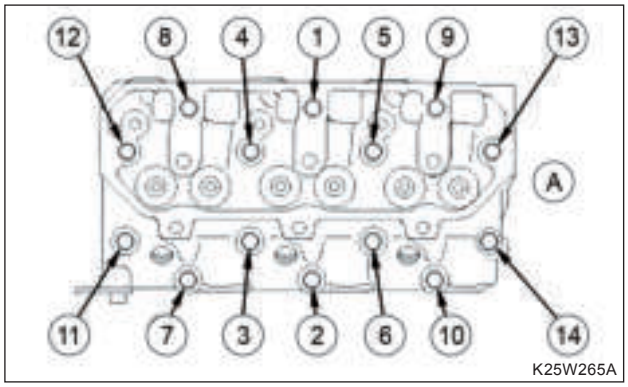
6.4.16 CRANK PULLEY



1. Assemble the crank pulley and washer.
2. Tighten the bolt to crank pulley. (Tightening torque: 11.5 kg•m)

6.4.17 CYLINDER HEAD





1. Assemble the head gasket.
2. Tighten the bolts to the cylinder head in order.

   (Order: Inside(1) → Outside(14))

   A. The bolt lubricates the lubricating oil.

   B. Assemble the cylinder head bolt tentatively.

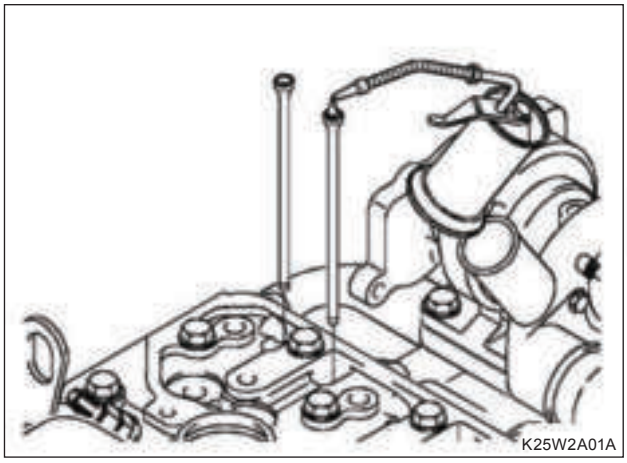
   C. Assemble the bolt according to factory procedure. (Tightening torque: 5.2kg•m)

   D. Disassemble to 360 deg.

   E. Re-tighten the bolt.(Tightening torque : 6.8 kg•m)

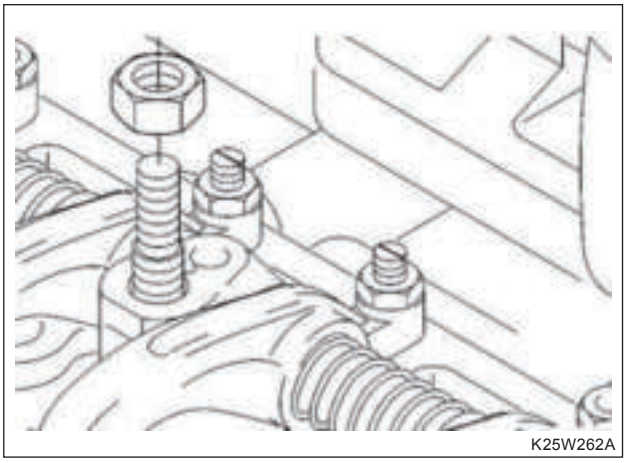
   F. Tightening it into 90 degree by using angle mapper. (Actual tightening torque: 12.0±1.0 kg•m)

6.4.18 PUSH ROD



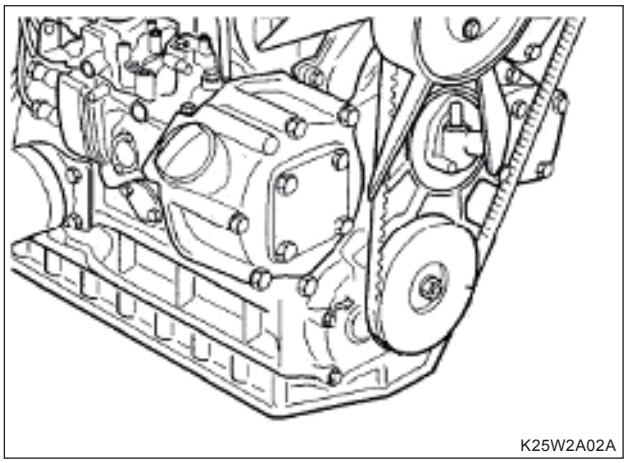
1. Assemble the push rod in socket of tappet in order.
2. Lubricate the lubricating oil on the push rod.

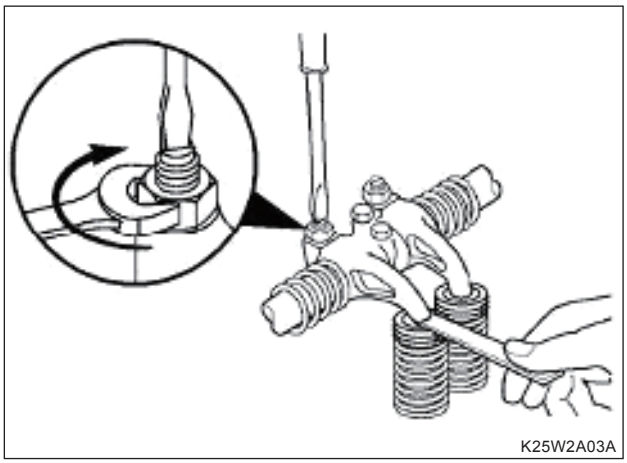
6.4.19 ROCKER ARM ASSEMBLY


K25W262A

1. Apply the lubricating oil to rocker arm shaft and bush. And assemble the bolt to rocker arm shaft.
2. The adjustment bolt of rocker arm should untie.
3. Assemble the bolt. (Tightening torque : 6.0 kg-m)

ADJUSTMENT PROCEDURE OF VALVE CLEARANCE


K25W2A02A

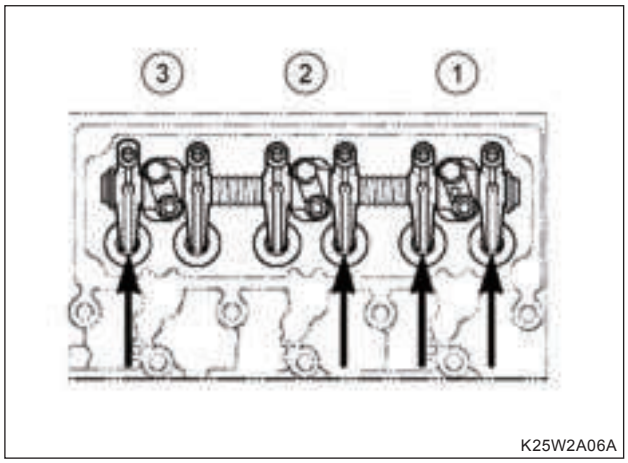

K25W2A03A

1. Rotate the engine until the first cylinder stay on TDC. Line up the mark '→' of crank pulley and the mark '0' of gear case.
2. Install the gauge between rocker arm and valve stem.
3. Adjust the clearance with rotating the adjustment bolt.

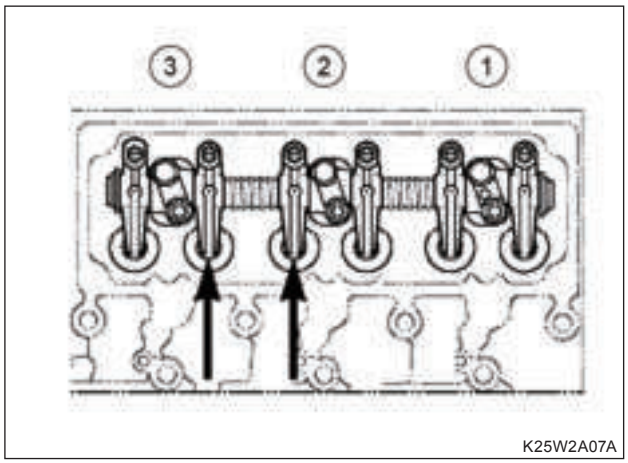
VALVE CLEARANCE (ENGINE COOLED STATUS)	
Intake valve	Exhaust valve
0.3 mm	0.3 mm
NOTE: Lower 60°C [140°F]	

4. Tighten the adjustment bolt.
(Tightening torque: 2.7 kg•m)

ADJUSTMENT PROCEDURE



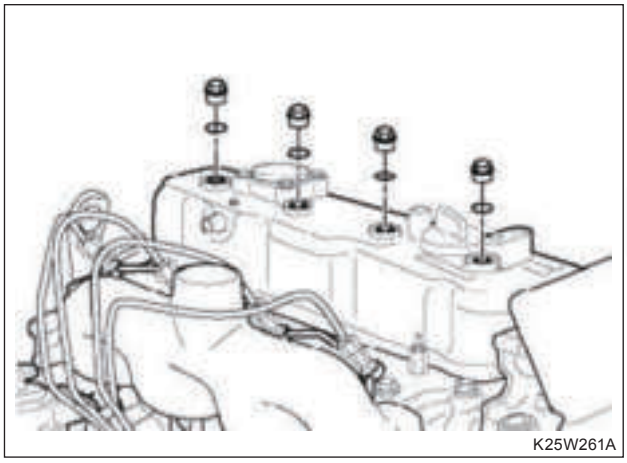
K25W2A06A



K25W2A07A

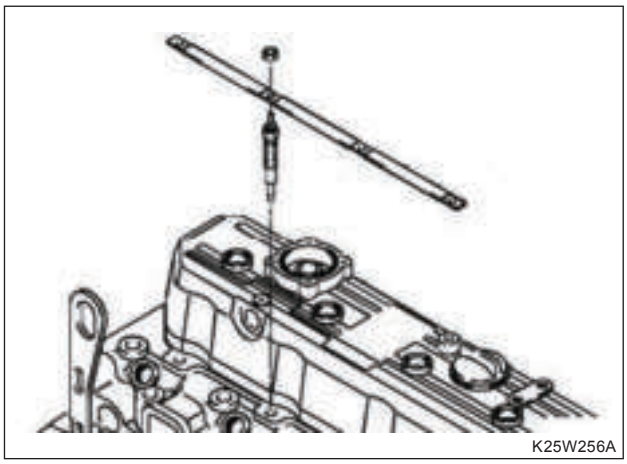
1. Rotate the engine until the first cylinder stay on TDC
2. Adjust the intake valve of cylinder '1' and '2'.
3. Adjust the exhaust valve of cylinder '1' and '3'.
4. Rotate the crankshaft to rotation direction of engine. (360 degree.)
5. Adjust the intake valve of cylinder '3'.
6. Adjust the exhaust valve of cylinder '2''.

6.4.20 CYLINDER HEAD COVER


K25W261A

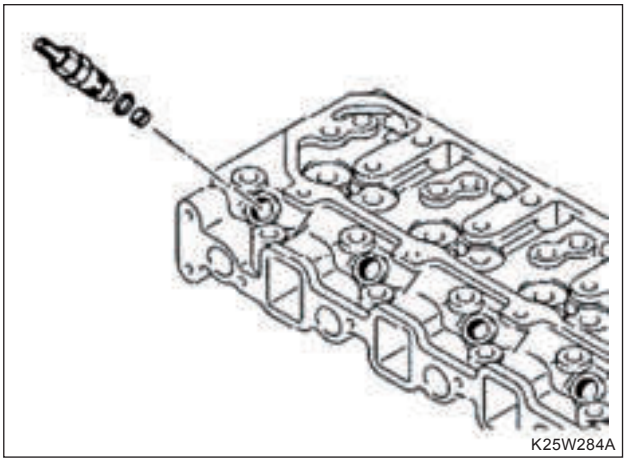
1. Assemble the new gasket and head cover.
2. Tighten the nuts to hold the head cover. (Tightening torque : 2.0 kg-m).

6.4.21 GLOW PLUG


K25W256A

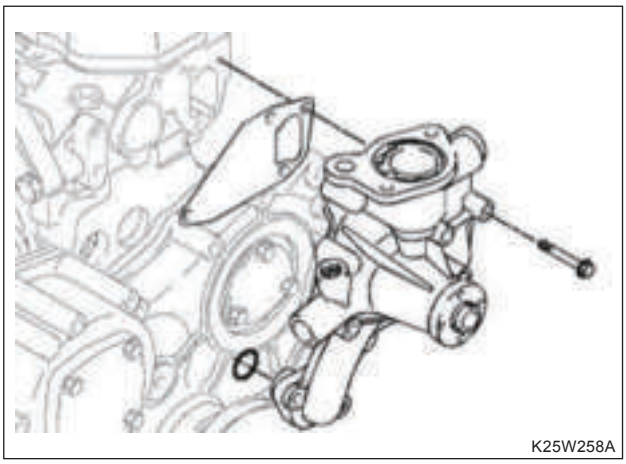
1. Tighten the glow plug.
2. Assemble the connector and tighten the nuts.

6.4.22 INJECTION VALVE (INJECTOR)



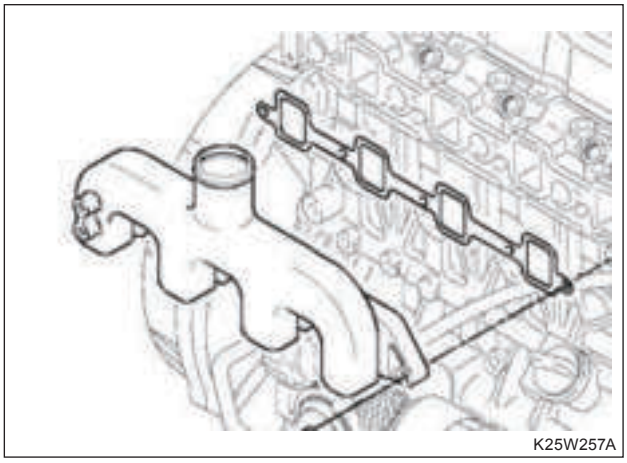
1. Assemble the new nozzle space cup and sealing washer.
2. Assemble and use the flat plate of injector. (Tightening torque : 7.5 kg-m)

6.4.23 WATER PUMP



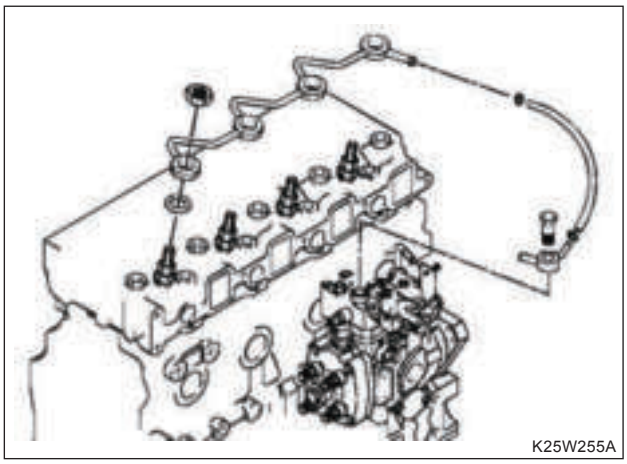
1. Assemble the water pump with new packing.
2. Tighten the bolts to water pump. (Tightening torque: 2.7 kg•m)
3. Assemble the V-pulley.
4. Tighten the bolts to V-pulley. (Tightening torque: 2.7 kg•m)

6.4.24 INTAKE MANIFOLD



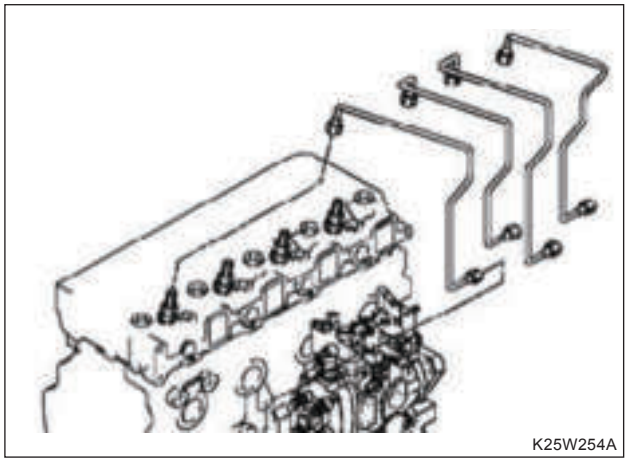
1. Assemble the intake manifold with new packing.
2. Tighten the bolts and nuts to hold the intake manifold. (Tightening torque: 2.7 kg•m)

6.4.25 FUEL DRAIN PIPE



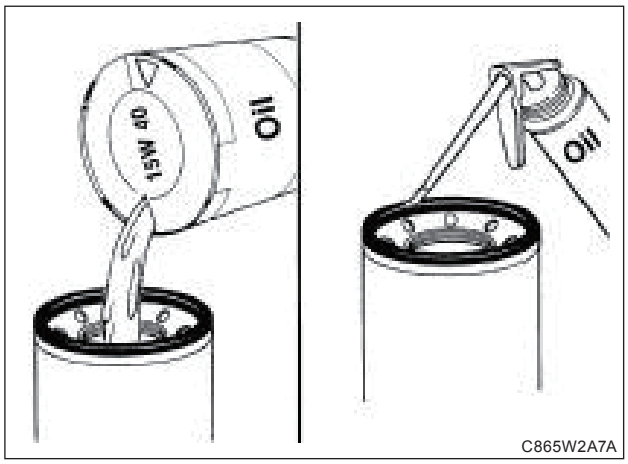
1. Assemble the new packing.
2. Tighten the nuts after install the drain pipe. (Tightening torque : 2.3 kg-m)
3. Assemble the drain hose. (Drain pipe ~ injection pump.)

6.4.26 FUEL SUPPLY PIPE.



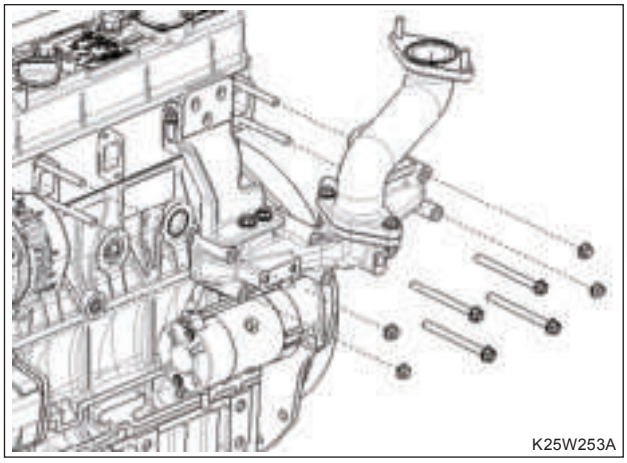
1. Assemble the high pressure pipe.
2. Tighten nuts between fuel injection pump and fuel injection valve. Use two wrenches in order to prevent rotating the relative parts. (Tightening torque : 2.7 kg-m)
3. Assemble the fuel line clamp.

6.4.27 OIL FILTER



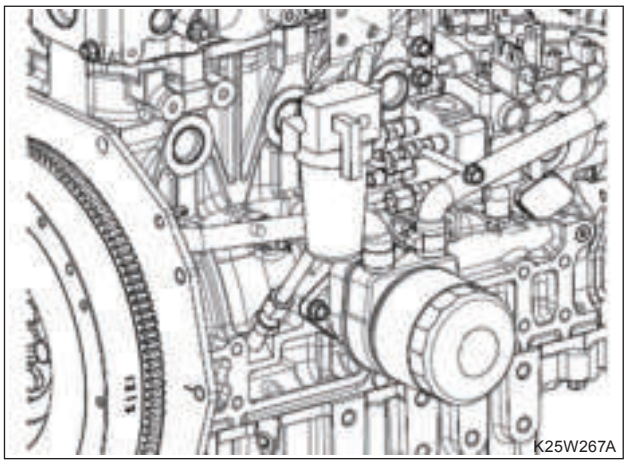
1. Assemble the oil filter using by tool.
2. If it is new part, put the lubricating oil in the oil filter.

6.4.28 EXHAUST MANIFOLD



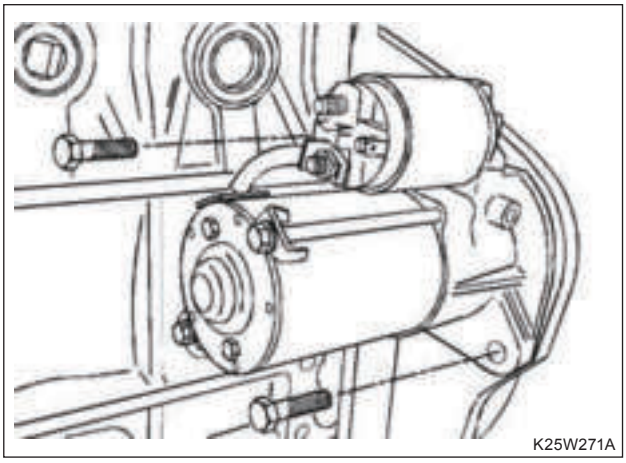
1. Assemble the exhaust manifold with new gasket.
2. Tighten the bolts and nuts to hold exhaust manifold. (Tightening torque: 2.7 kg•m)

6.4.29 FUEL FILTER



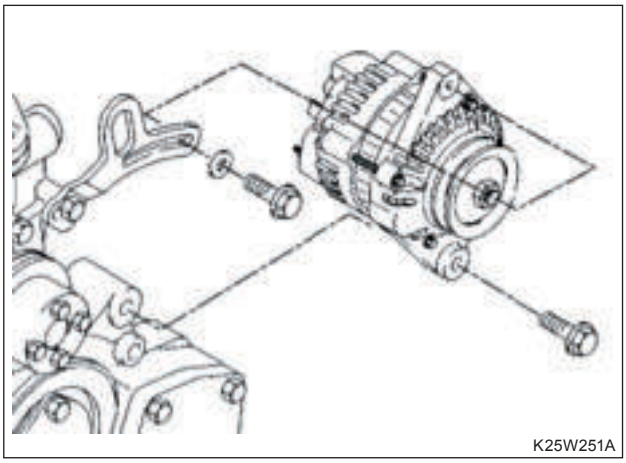
1. Assemble the fuel filter bracket with fuel filter.
2. Tighten the bolts to hold the fuel filter.
3. Connect the fuel filter and fuel inlet of fuel injection pump by using the hose.
4. Tighten the clamps to hold the hose.

6.4.30 STARTER



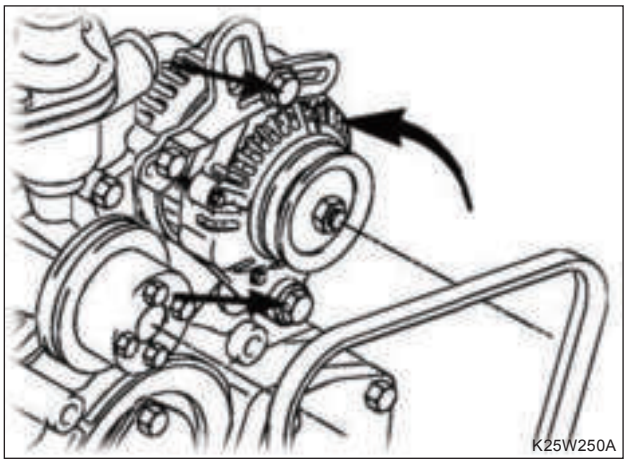
1. Assemble the starter.
2. Tighten the bolts to hold starter.

6.4.31 ALTERNATOR



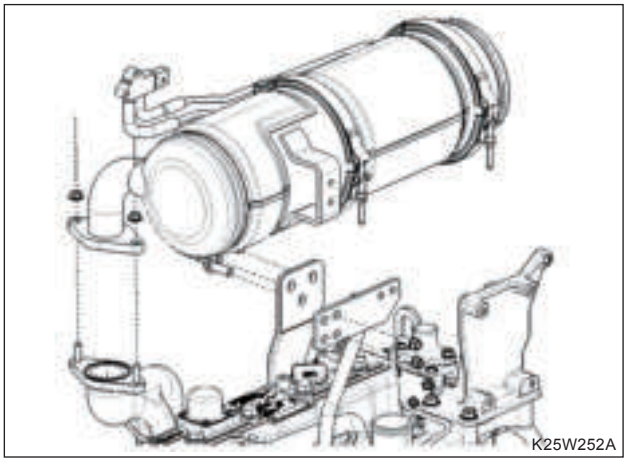
1. Assemble the alternator.
2. Tighten the lower side bolt with washers tentatively.
3. Tighten the clamping bolt and washer that hold the upper side of alternator tentatively.
4. The bolts that hold alternator are re-tightened after adjusting the tension of V-belt.

6.4.32 V-BELT



1. Adjust the tension of alternator after that tighten the adjust bolt and bolts.

6.4.33 AFTER-TREATMENT DEVICE (ATD)



1. Assemble ATD.
2. Tighten the bolts to hold the ATD. (When assembling the ATD, should be careful because ATD is heavy.)

6.4.34 LUBRICATING SYSTEM

1. Supply the lubricating oil. (15W-40 CJ-4 or CG-4)
2. Check the mark of oil level gauge. (mark “F”)

OIL CAPACITY (LITER)	
ENGINE MODEL	LUBRICATING OIL
A1700	4.3

6.5 ENGINE OPERATION

6.5.1 OPERATION ADVANCE PREPARATION WORK

1. Fill the new lubricating oil through the filler port.
2. Connect the coolant hose and fill the coolant.
3. Connect the fuel hose to fuel tank.
4. Execute the air bleeding of the fuel line.

6.5.2 ENGINE OPERATION

Because the friction surface is not used enough in case of the new engine, useful life could be shortened due to overload or over speed in oil film. Therefore must comply with the below.

UNTIL THE FIRST 50HRS

1. The engine operates between 1200rpm~1500rpm in no load until the temperature of the engine becomes normal operation condition.
2. Avoid the overload or continuous high speed operation.
3. Avoid the no load high speed operation.
4. Avoid the sudden acceleration or sudden stop of the engine.
5. Must comply with check and inspection procedure.

6.5.3 RUNNING-IN OPERATION CHECKLIST

Must comply with the following information while the initial running-in operation.

1. Check the lubricating oil level frequently (maintain between the upper limit and lower limit in lubricating oil level)
2. Check the oil pressure warning lamp. If lamp is lit, lubricating oil shortage or lubrication system is problem. Therefore must be check.
3. Check the coolant gauge and confirm that whether or not coolant circulate smoothly.

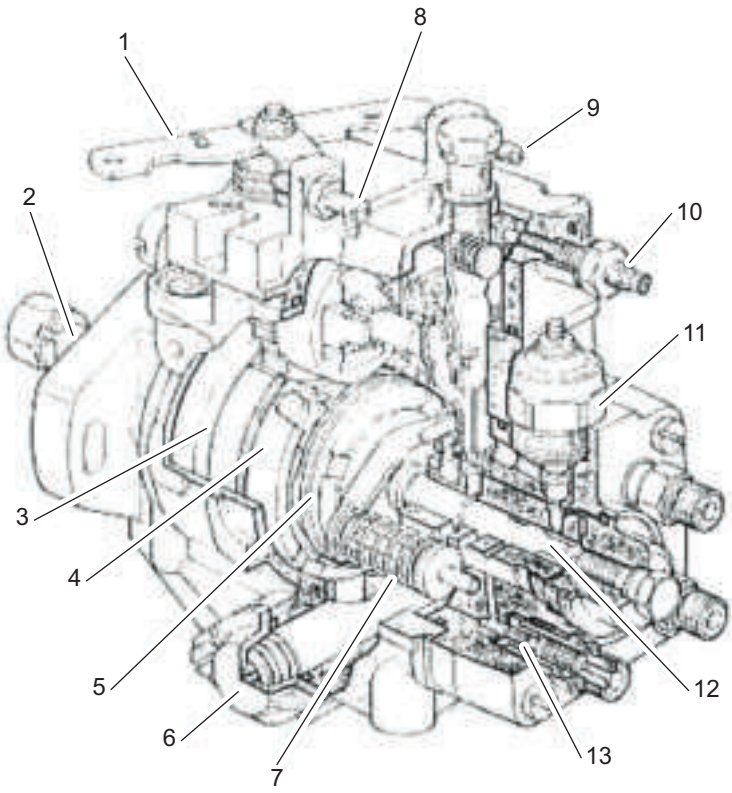
After finishing the running-in operation (50hrs), replace the lubricating oil and oil filter. (Lubricating oil according to the local characteristics used.)

6.6 ENGINE IMPORTANT PARTS MAINTENANCE

6.6.1 FUEL INJECTION PUMP

Injection pump is distributor injection type (VE) mounted on the gear case flange and driven by injection pump gear. The fuel is supplied in each cylinder by one plunger rotation and reciprocating motion. The fuel is sucked from fuel tank by external feed pump and internal feed pump. And then fuel send to injection pump through fuel filter. Low-pressure fuel sucks in pump chamber and is controlled by regulating valve. The fuel enter high pressure chamber through barrel suction port via injection pump head path from pump chamber. High-pressured fuel made by plunger inject through injection valve according to injection timing. Excessive fuel in injection pump returns fuel tank through fuel return hose via over flow valve.

The injection pump is cooled and lubricated by the fuel circulation. Remaining fuel also returns fuel tank through over flow hose after collecting in the injection pump. Water in the fuel reduces pump useful life. Therefore must manage not to enter water, dirt into the fuel system.



(1) Control lever
(2) Drive shaft
(3) Feed pump
(4) Roller holder
(5) Cam disk
(6) Timer
(7) Plunger spring
(8) High speed control bolt
(9) Low speed control bolt
(10) Full-load adjusting screw
(11) Fuel cut solenoid
(12) Plunger
(13) Delivery valve

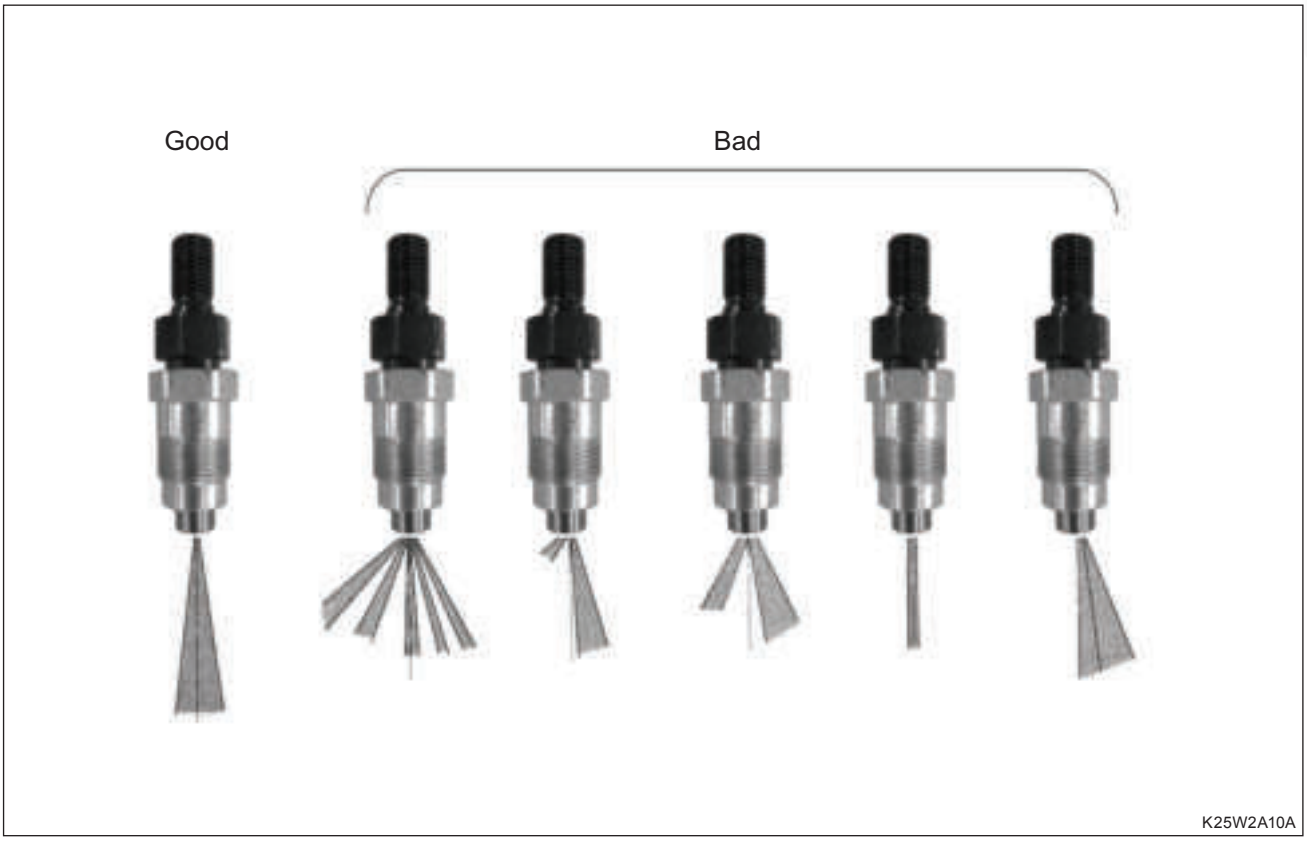
▶ SPECIFICATION

ITEM		SPECIFICATION	REMARK
Type of Fuel filter		Cartridge element type	
Injection pump	Type	VE Type (Distributor Type)	
	Direction of rotation	Right (driving shaft to the right in)	
	Sequence of injection	1-3-2 (3Cyl.)	
	Type of governor	All Speed	
	Fuel cut solenoid	12V / 8Ω	
Injection valve	Type of nozzle	Semi-Throttle Type	
	Type of holder	Screw insertion type	

6.6.2 INJECTOR

Spray shape of the injector is the important element that affects in efficiency. Therefore must properly adjust and maintain.

INJECTOR SPRAY SHAPE CHECK



After injector injection pressure is adjusted to 120±5kg/cm^2, affix it in injector tester and every second 4~ 6 time fabricate the lever. Check the spray condition and if it is abnormal, injector replace or clean.

1. Check whether the spray condition is good.
2. The case which is defective, disassemble the injection valve and replace the injector tube or assembly.
3. After the spray stopped, check whether or not after drop.
4. The case which is defective, disassemble the injection valve and replace the injector tube or assembly.

CHECK AND ADJUSTMENT OF THE INJECTOR

▶ CHECK AND ADJUSTMENT OF THE INJECTION OPENING PRESSURE

1. Mounting on injector in tester.
2. Handle of the tester is operated at 1time per second.
3. Indicator of the manometer is slowly rising and indicator shakes during injection. After looking at starting shaking points of the indicator, check whether opening pressure is standard value.

STANDARD PRESSURE	**OPENING PRESSURE**	Standard value
	ADJUSTING PRESSURE	standard value +5~10 kg/cm^2
LIMIT PRESSURE		Above standard value -10kg/cm^2

4. The case which is defective, disassemble the injector and replace the thickness of the shim. And then injection opening pressure adjusts standard value.

⚠ WARNING

- **Be careful when disassembling the injector not to let dust or debris in.**

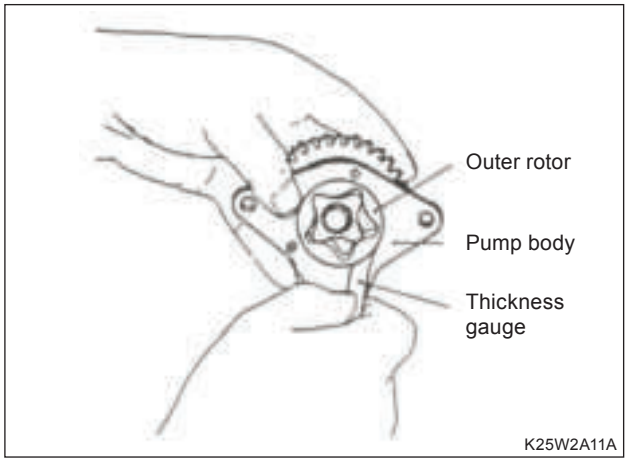
5. If you can't adjust injection pressure despite replace a thickness of the shim, injector replaces the assembly.

6.6.3 OIL PUMP

Oil pump, as trochoid pump, driven by crank shaft gear is compact as well as pressure fluctuation is small. And 3.5kg/cm^2 pressure supply to each part.

When discharging pressure of the oil pump is low, check the flow rate. And the case which does not have defective, the check of oil pump is necessary with the next method.

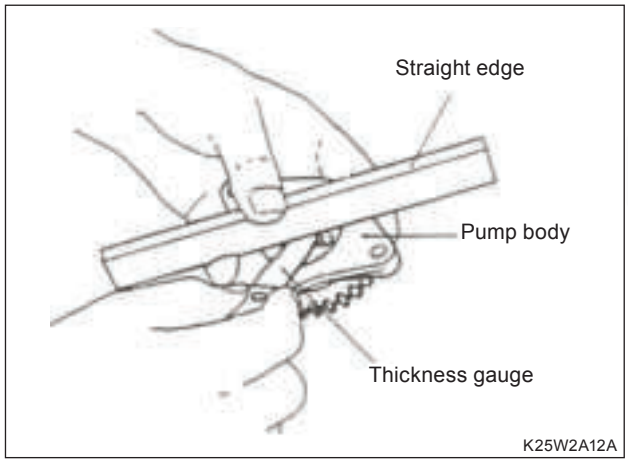
CLEARANCE OF BETWEEN OUT ROTOR AND PUMP BODY



Checking a clearance of between out rotor and pump body by thickness gauge.

ITEM	STANDARD
Clearance (mm)	0.10 ~ 0.16

CLEARANCE OF PUMP BODY, OUTER ROTOR AND INNER ROTOR



Check a clearance of pump body, outer rotor and inner rotor by thickness gauge.

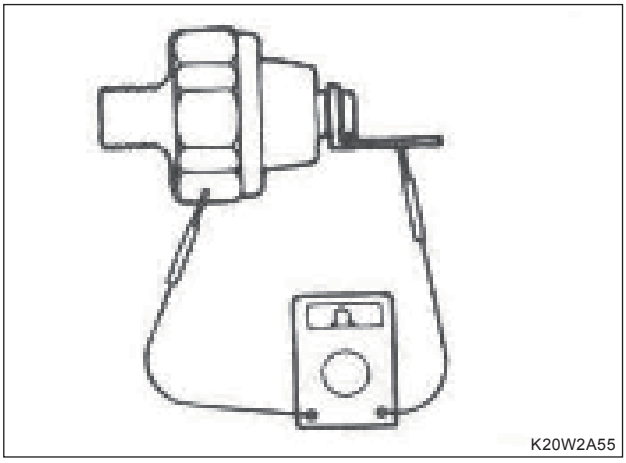
ITEM	STANDARD
Clearance (mm)	0.03 ~ 0.09

CLEARANCE OF BETWEEN INNER ROTOR SHAFT AND OIL PUMP COVER

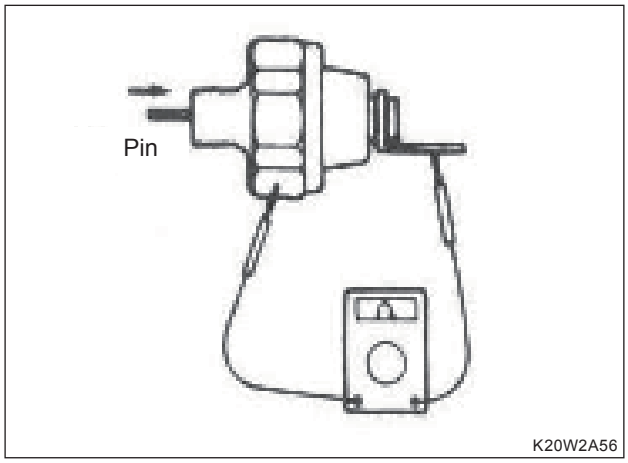
After measuring a rotor shaft outer diameter and oil pump cover inner diameter, calculate the difference between the inner diameter and outer diameter.

ITEM	STANDARD
Clearance (mm)	0.013 ~ 0.043

6.6.4 PRESSURE SWITCH



Connects the tester (Ω) in between the terminal and the body, and check whether or not applying an electric current. If applying an electric current, it is normality and if not applying an electric current, replace the switch.



The thin rod puts in oil hole and slightly presses. At this point, If applying an electric current, it is normality and if not applying an electric current, replace the switch.

When inflicting an air press of 0.5kg/cm^2 in the oil hole, it is normality if not applying an electric current. At this point, check whether or not leak the air and if leaking the air, the case which damages the diaphragm. Therefore replace the switch.

6.6.5 COOLING SYSTEM

This engine is water cooling type. Combustion heat and oil heat are absorbed by coolant and emitting those at the outside. As a result, engine can operate normally the engine.

Coolant supplied by water pump circulates the oil cooler through coolant hose and absorbs the oil heat. And coolant absorbs combustion heat through water jacket of cylinder block and coolant path of cylinder head.

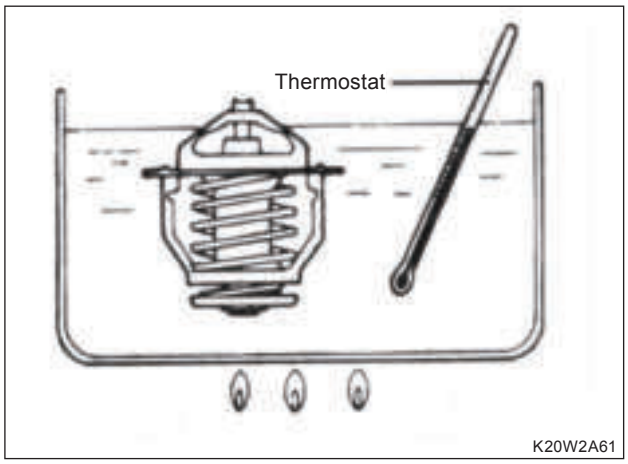
Coolant absorbing the oil heat and combustion heat is sent to thermostat of water pump. If temperature of coolant is lower than valve open temperature of thermostat, re-circulate inside the cylinder. And if temperature of coolant is higher than valve open temperature of thermostat, flow the radiator. After emitting the heat which absorbs from the coolant in radiator, coolant again circulates to water pump.

CHECK THE WATER PUMP

You must check the following with the water pump. If water pump is defective, replace water pump assembly.

1. Leak of water pump. (Check if water flows out from the drain hole on the bottom of the pump body during operation)
2. Damage or crack of water pump body.
3. Damage or crack of impeller.
4. Damage of bearing assembly. (When rotating the pump shaft gently, it should be rotated freely without any interference.)

THERMOSTAT



Thermostat constantly maintain the coolant temperature and is used to improve thermal efficiency by preventing heat loss.

When heating the thermostat in water, check the valve open temperature.

VALVE OPEN TEMP	72.0°C ± 2°C (start open)
	85.0°C ± 2°C (full open)

- Valve expansion lift: Above 8mm

6.6.6 OVERHEAT

If stopping the engine when overheating the engine, stop the circulation of the coolant and overheating can be serious locally. Also if quick freezing, crack will be able to occur in cylinder head, cylinder block etc,.

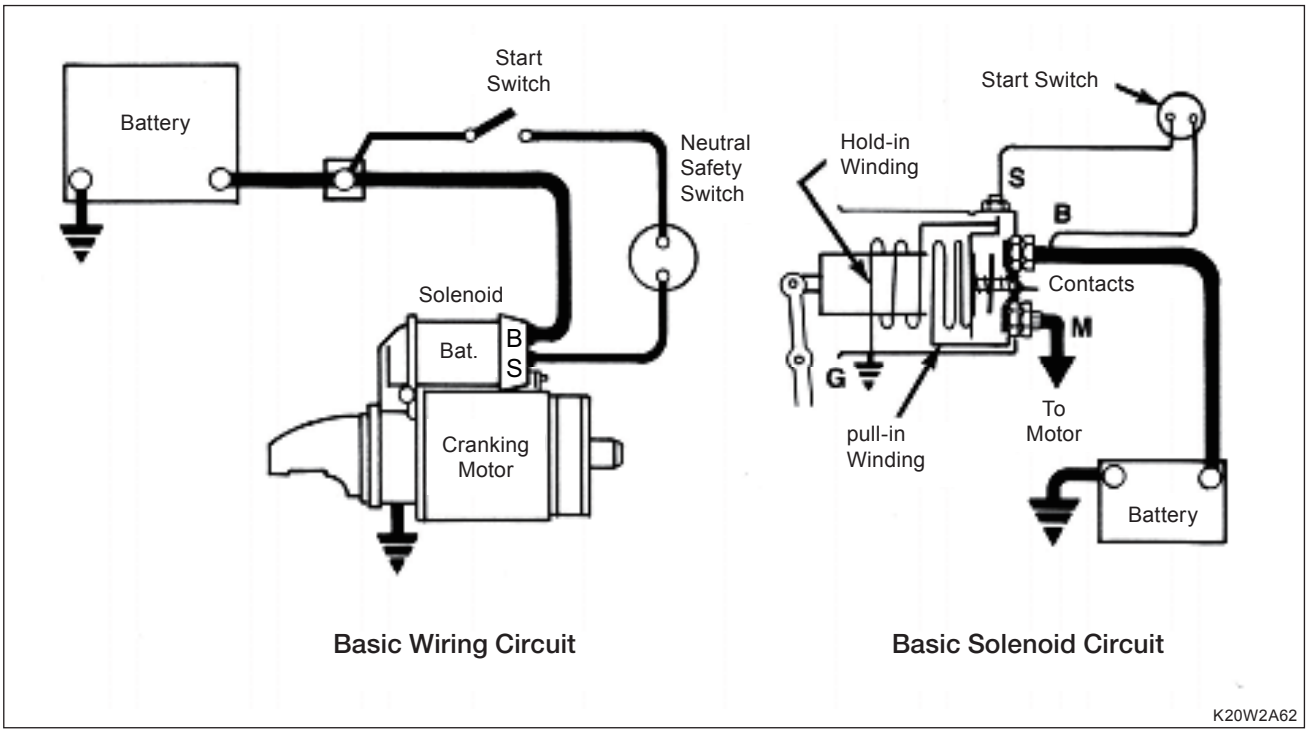
Do not confusion In this case, engine rotates at low speed and coolant temperature does to make fall naturally.

Then after, supplies the coolant and removes the cause.

6.7 ELECTRICAL SYSTEM

6.7.1 STARTER

BASE CIRCUIT DIAGRAM

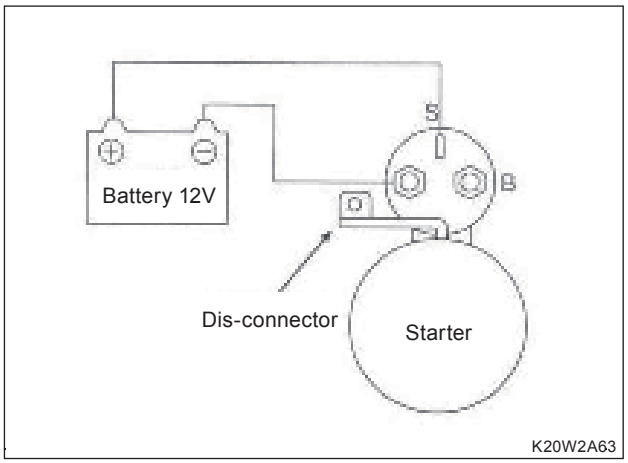


SPECIFICATION

ITEM	SPECIFICATION
Output	12V / 2.2kW
Pinion number of teeth	15
No-load voltage	11.5V

CHECK

▶ **PULL IN COIL TEST OF MAGNETIC SWITCH(SOLENOID)**

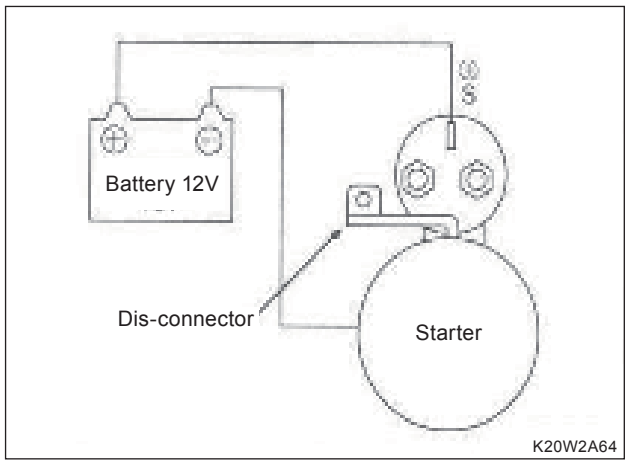


The case which connects battery between S-M terminal, if plunger comes in and the pinion comes out, the pull in winding is normality. If the pinion does not come out, replace the magnetic switch.

⚠ CAUTION

- **When this check doing to, separates connector from M terminal.**
- **Don't connect continuously more than 10 second.**

▶ PULL IN COIL TEST OF MAGNETIC SWITCH(SOLENOID)

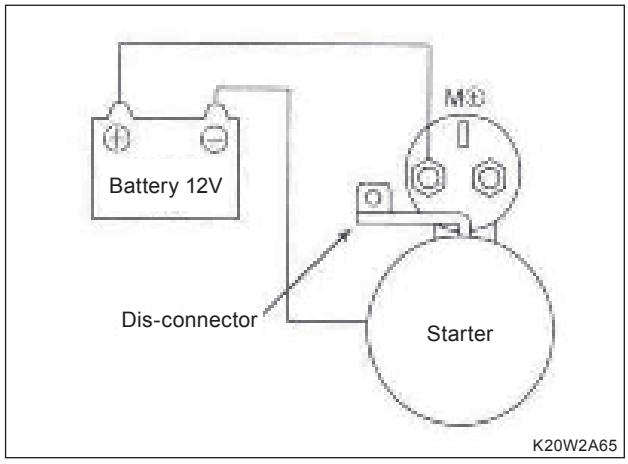


The case which connects battery between S-M terminal, if plunger comes in and the pinion comes out, the pull in winding is normality. If the pinion does not come out, replace the magnetic switch.

⚠ CAUTION

- **Don't connect continuously more than 10 second.**

▶ MAGNETIC SWITCH RETURN TEST

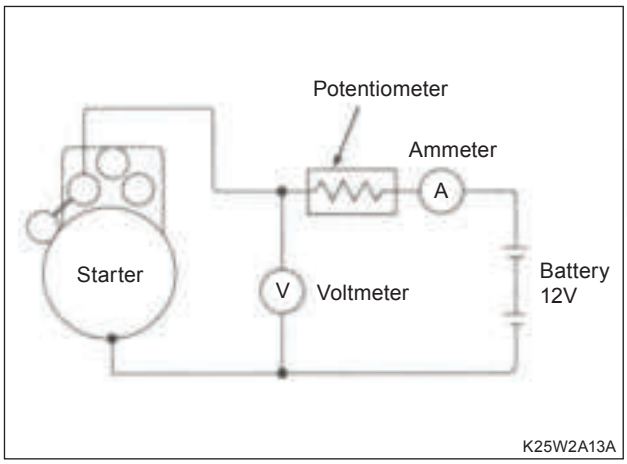


Until stopper pulls out the pinion by manual in the condition which connects between M terminal of magnetic switch and body. If pinion returns immediately when taking off hand, both coils are normality.

⚠ CAUTION

- **Don't connect continuously more than 10 second.**

▶ NO-LOAD TEST

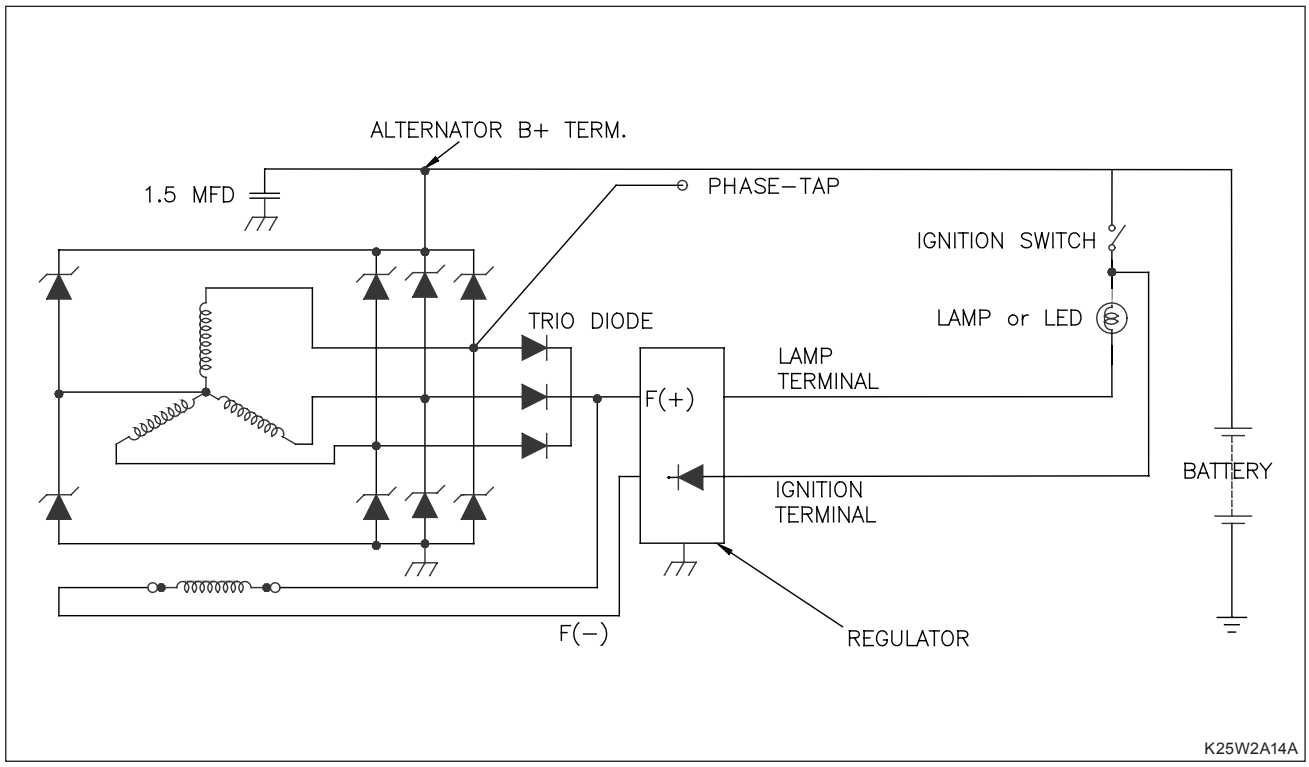


1. Connect the starter motor, battery, voltmeter, ammeter and variable resistance as picture.
2. If rotated when you switch to ON after making the variable resistance with the maximum, starter motor is normality. Rheostat adjusts to 11V in voltmeter. And if current and number of rotation are other case in regulation, presumes the cause of breakdown base on next table and repair it.

ACTUAL STATE	CAUSE
Electric current is large current and number of rotation is low. (Neither torque is much strong)	- Stain of metal, oil contamination - Wear the pole peace of armature core - Short of armature
Electric current is large current and doesn't rotate at all.	- Earth of electronic switch - Earth of armature coil, field coil - Seizure of metal
Electric current does not flow and does not rotate.	- Disconnection of armature coil, field coil - Disconnection of brush, pigtail - Contamination of armature, connection defect between brush and armature by Highmica etc,.
Electric current is small current and number of rotation is low. (Neither the torque is much strong)	- Connection defect of field coil contact part (If shunt coil is disconnected or connection defect, rotation degree is also high)
Electric current is large current and number of rotation is high.	- Short of field coil

6.7.2 ALTERNATOR

BASE CIRCUIT DIAGRAM

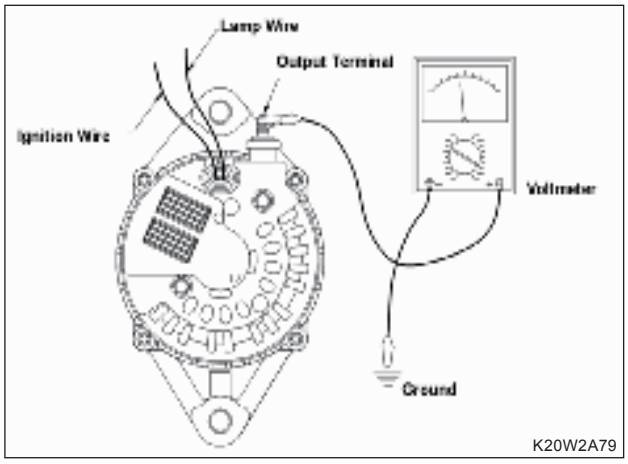


SPECIFICATION

ITEM	CONTENT
TYPE	Rectifier Alternator
CAPACITY	12.0V / 50A
MOTOR VELOCITY	1,000~18,000 rpm
REGULATOR SETTING VOLTAGE	14.7 ± 0.3V
TEMPERATURE COMPENSATE	-7 ± 3mV/°C

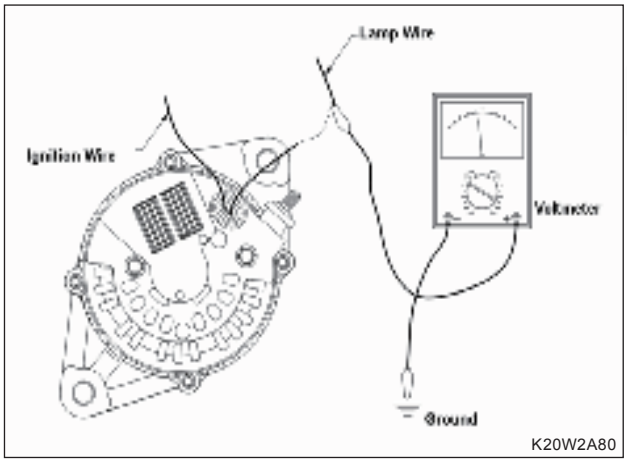
CHECK

▶ ALTERNATOR OUTPUT VOLTAGE TEST ON ENGINE RUNNING CONDITION.



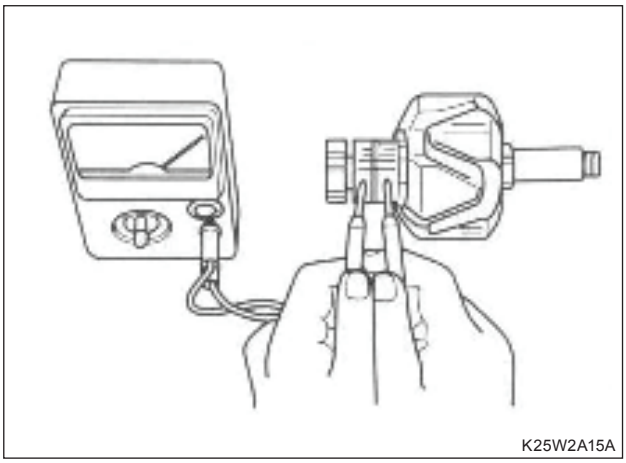
1. Connect positive (+) of voltmeter lead to alternator output Terminal (B+) and negative (-) lead to a ground on alternator.
2. With engine running about 1500 RPM and all accessories turned on, output voltage must be 13.4 ~ 15.7(V).
3. If output is not measured, or if voltage is not constant, check alternator output circuit for loose.
4. If output is still not measured, check brushes and slip rings for wear, dirt or damage.
5. If brushes and slip rings are good, alternator is damaged internally. Disassemble alternator and test components.

▶ IGNITION CIRCUIT TEST AT IGNITION KEY ON CONDITION



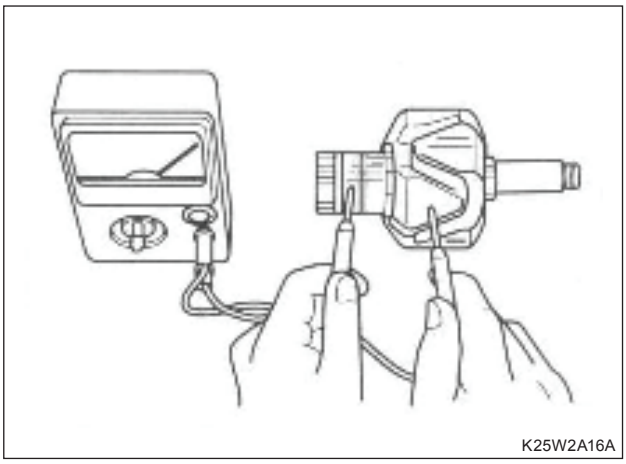
1. Unplug Ignition terminal of regulator connector from voltage regulator
2. Connect positive (+) voltmeter lead to Ignition wire on the wiring harness and negative (-) voltmeter lead to a ground terminal.
3. Voltmeter should indicate battery voltage. If battery voltage is not measured, check Ignition circuit for loose or dirty connection or damaged wiring.

▶ ROTOR


K25W2A15A

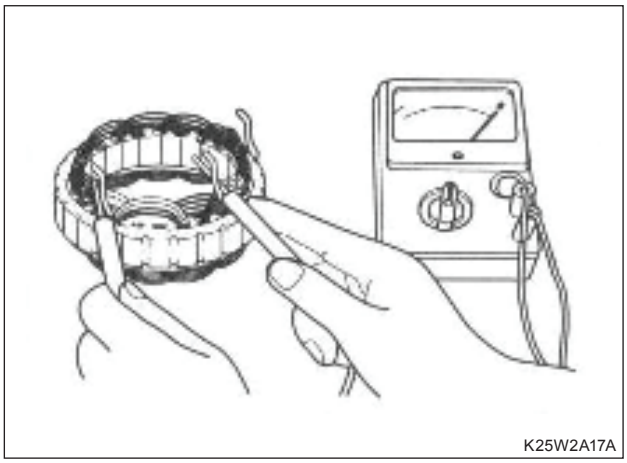
1. Check the conductivity of rotor coil. Confirm that whether or not conductivity between slip rings. Measure the resistance value and if the resistance value is very small, it is short. But if it is not conductivity or short, replace the rotor assembly.

STANDARD	about 27.5Ω / 20°C

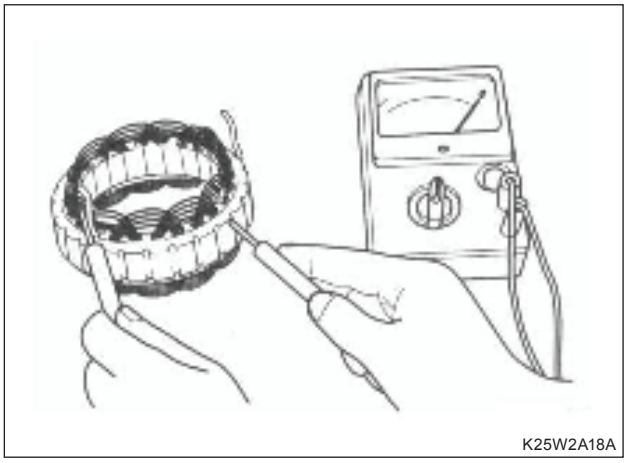

K25W2A16A

2. Check the earth of rotor coil. Confirm that whether or not conductivity between slip ring and earth. If it is electric conduction, replace the rotor assembly.

▶ STATOR


K25W2A17A

1. Check the conductivity of stator. Confirm that whether or not conductivity between coil and lead. If it is not electric conduction, replace the stator assembly.


K25W2A18A

2. Check the earth of coil. Confirm that whether or not conductivity between coil and core. If it is electric conduction, replace the stator assembly.

6.7.3 CAUTION FACT OF ELECTRIC WIRING

ALTERNATOR

- Do not reverse connection the battery.

  If reverse connecting the plus (+) and minus (-) of battery cable, the diode of alternator is damaged and does not become charging. Also the starter coil burn out. Battery must be produced by correcting the length of battery cable or by making the structure which prevents a reverse connection in order for not to become the reverse connection.

- Charging output voltage not use the control purpose.

  The engine number of rotation and output voltage are not constant proportion. Therefore output voltage forbids using the control purpose.

- Use the specified V-belt.
- Do not high-pressure cleaning using the high pressure washing machine.

  If alternator does high-pressure cleaning, charging becomes defect due to insert water in brush.

STARTER

- Use the battery which satisfied specification.

  Starting performance of engine depend on capacity of battery. This battery capacity should be change according to temperature condition and using condition in work machine. Consequently, select the battery which satisfied specification and must use it.

- Total wire resistance of battery cable(+,-) must be less than 2/1000Ω.

  If total wire resistance is out of standard value, it is cause of breakdown and functional loss in starter.

- If wire resistance of starter must be more than standard value.

  Reciprocation wire total resistance between starter and key switch (Or power relay, safety relay: when using) must be less than 5/100Ω.

- Do not high pressure cleaning with high pressure washing machine.

  Waterproof of starter is level which is no problem when pouring the water or rain usually. Consequently, do not high pressure cleaning or be submerged.

CURRENT LIMIT

- Do not use excessive discharged battery (under 8V). Abnormal high voltage is generated when using it. As a result, other electronic sub assembly is damaged. Excessive discharged battery uses after charging.
- Do not separate the battery during the operation. If separating the battery during the operation, malfunction the current limit and not control the output voltage. In this case, electronic sub assembly is damaged by generating the continuous high voltage.

7. MAINTENANCE STANDARD TABLE

7.1 MAIN BOLT TIGHTENING TORQUE

ITEM	SIZE	HEXAGON(mm)	TIGHTENING TORQUE(kgf·cm)	NOTE
Cylinder head bolt	M11×1.5	17	① 800 kgf·cm	(1200 kgf·cm)
			② 360° disassum.	
			③ 520kgf·cm(Long bolt)	
			570kgf·cm(Short bolt)	
			④ ③+ 90°	
Connecting rod bolt	M10×1.25	14	300kgf·cm + 60°	(700 kgf·cm)
Flywheel clamping bolt	M10×1.25	17	300kgf·cm + 60°	(900 kgf·cm)
Metal cap clamping bolt	M12×1.5	17	600kgf·cm + 60°	(1250 kgf·cm)
Crankshaft V-pulley clamping bolt	M14×1.5	19	① 750	
			② 1150±100	
Glow plug	M10×1.25	12	275±25	
Injection valve	M20×1.5	22	750±50	
Valve adjusting screw clamping bolt	M8×1.25		270±30	
Balancer housing clamping bolt	M8×1.25	12	270±30	
Idle gear shaft clamping bolt	M8×1.25	12	270±30	
Nozzle Return pipe Nut	M12×1.5	17	370±50	
Nozzle jet bolt	M8×1.25	13	170±50	
Injection pump gear clamping bolt	M12×1.25	19	900±100	
Alternator bracket nut	M10×1.5	14	530±70	
Oil seal housing clamping bolt	M8×1.25	12	270±30	
Oil suction tube clamping bolt	M8×1.25	12	270±30	
Thermostat cover bolt	M8×1.25	12	270±30	
Rocker arm support hold nut	M12×1.25	19	600±50	
Camshaft thrust bearing bolt	M8×1.25	12	270±30	

7.2 STANDARD BOLT & NUT TIGHTENING TORQUE

SIZE	4T		7T		9T	
	NORMAL THREAD	FINE THREAD	NORMAL THREAD	FINE THREAD	NORMAL THREAD	FINE THREAD
M 5	40 ± 5 kgf·cm 3.92 ± 0.49 N.m 2.89 ± 0.36 lbf.ft	-	60 ± 10 kgf·cm 5.88 ± 0.98 N.m 4.33 ± 0.72 lbf.ft	-	90 ± 10 kgf·cm 8.82 ± 0.98 N.m 6.50 ± 0.72 lbf.ft	-
M 6	60 ± 10 kgf·cm 5.88 ± 0.98 N.m 4.33 ± 0.72 lbf.ft		130 ± 10 kgf·cm 12.74 ± 0.98 N.m 9.39 ± 0.72 lbf.ft		135 ± 10 kgf·cm 13.23 ± 0.98 N.m 9.75 ± 0.72 lbf.ft	
M 8	150 ± 20 kgf·cm 14.70 ± 1.96 N.m 10.83 ± 1.44 lbf.ft		270 ± 30 kgf·cm 26.46 ± 2.94 N.m 19.49 ± 2.16 lbf.ft		330 ± 20 kgf·cm 32.34 ± 1.96 N.m 23.83 ± 1.44 lbf.ft	
M 10	300 ± 50 kgf·cm 29.40 ± 4.90 N.m 21.66 ± 3.61 lbf.ft	240 ± 40 kgf·cm 23.52 ± 3.92 N.m 17.33 ± 2.89 lbf.ft	530 ± 70 kgf·cm 51.94 ± 6.86 N.m 38.27 ± 5.05 lbf.ft	420 ± 60 kgf·cm 41.16 ± 5.88 N.m 30.32 ± 4.33 lbf.ft	690 ± 30 kgf·cm 67.62 ± 2.94 N.m 49.82 ± 2.17 lbf.ft	550 ± 30 kgf·cm 53.90 ± 2.94 N.m 39.71 ± 2.16 lbf.ft
M 12	530 ± 70 kgf·cm 51.94 ± 6.86 N.m 38.27 ± 5.05 lbf.ft	420 ± 60 kgf·cm 41.16 ± 5.88 N.m 30.32 ± 4.33 lbf.ft	900 ± 100 kgf·cm 88.20 ± 9.80 N.m 64.98 ± 7.22 lbf.ft	720 ± 80 kgf·cm 70.56 ± 7.84 N.m 51.98 ± 5.77 lbf.ft	1130 ± 70 kgf·cm 110.74 ± 6.86 N.m 81.59 ± 5.05 lbf.ft	900 ± 60 kgf·cm 88.20 ± 5.88 N.m 64.98 ± 4.33 lbf.ft
M 14	780 ± 70 kgf·cm 76.44 ± 6.86 N.m 56.32 ± 5.05 lbf.ft	620 ± 60 kgf·cm 60.76 ± 5.88 N.m 44.76 ± 4.33 lbf.ft	1350 ± 150 kgf·cm 132.30 ± 14.70 N.m 97.47 ± 10.83 lbf.ft	1080 ± 120 kgf·cm 105.84 ± 11.76 N.m 77.98 ± 8.66 lbf.ft	1850 ± 150 kgf·cm 181.30 ± 14.70 N.m 133.57 ± 10.83 lbf.ft	1480 ± 120 kgf·cm 145.04 ± 11.76 N.m 106.86 ± 8.66 lbf.ft
M 16	1250 ± 150 kgf·cm 122.50 ± 14.70 N.m 90.25 ± 10.83 lbf.ft	1000 ± 120 kgf·cm 98.00 ± 11.76 N.m 72.20 ± 8.66 lbf.ft	1900 ± 200 kgf·cm 186.20 ± 19.60 N.m 137.18 ± 14.44 lbf.ft	1520 ± 160 kgf·cm 148.96 ± 15.68 N.m 109.74 ± 11.55 lbf.ft	2580 ± 220 kgf·cm 252.84 ± 21.56 N.m 186.28 ± 15.88 lbf.ft	2060 ± 220 kgf·cm 201.88 ± 21.56 N.m 148.73 ± 15.88 lbf.ft
M 18	1750 ± 150 kgf·cm 171.50 ± 14.70 N.m 126.35 ± 10.83 lbf.ft	1400 ± 120 kgf·cm 137.20 ± 11.76 N.m 101.08 ± 8.66 lbf.ft	2650 ± 250 kgf·cm 259.70 ± 24.50 N.m 191.33 ± 18.05 lbf.ft	2120 ± 200 kgf·cm 207.76 ± 19.60 N.m 153.06 ± 14.44 lbf.ft	3800 ± 300 kgf·cm 372.40 ± 29.40 N.m 274.36 ± 21.66 lbf.ft	3040 ± 240 kgf·cm 297.92 ± 23.52 N.m 219.49 ± 17.33 lbf.ft
M 20	2450 ± 250 kgf·cm 240.10 ± 24.50 N.m 176.89 ± 18.05 lbf.ft	1960 ± 200 kgf·cm 192.08 ± 19.60 N.m 141.51 ± 14.44 lbf.ft	3700 ± 400 kgf·cm 362.60 ± 39.20 N.m 267.14 ± 28.88 lbf.ft	2960 ± 320 kgf·cm 290.08 ± 31.36 N.m 213.71 ± 23.10 lbf.ft	5400 ± 400 kgf·cm 529.20 ± 39.20 N.m 389.88 ± 28.88 lbf.ft	4320 ± 320 kgf·cm 423.36 ± 31.36 N.m 311.90 ± 23.10 lbf.ft

PT PLUG	SIZE	1/8	1/4	3/8	1/2	3/4
	ALUMINUM	150 ± 20 kgf·cm 14.70 ± 1.96 N.m 10.83 ± 1.44 lbf.ft	200 ± 30 kgf·cm 19.60 ± 2.94 N.m 14.44 ± 2.17 lbf.ft	250 ± 30 kgf·cm 24.50 ± 2.94 N.m 18.05 ± 2.17 lbf.ft	350 ± 50 kgf·cm 34.30 ± 4.90 N.m 25.27 ± 3.61 lbf.ft	460 ± 50 kgf·cm 45.08 ± 4.90 N.m 33.21 ± 3.61 lbf.ft
	CAST	200 ± 20 kgf·cm 19.60 ± 1.96 N.m 14.44 ± 1.44 lbf.ft	250 ± 30 kgf·cm 24.50 ± 2.94 N.m 18.05 ± 2.17 lbf.ft	360 ± 30 kgf·cm 35.28 ± 2.94 N.m 25.99 ± 2.17 lbf.ft	560 ± 50 kgf·cm 54.88 ± 4.90 N.m 40.43 ± 3.61 lbf.ft	770 ± 50 kgf·cm 75.46 ± 4.90 N.m 55.59 ± 3.61 lbf.ft

	M 8	M 12	M 14	M 16
HOLLOW BOLT	150 ± 20 kgf·cm 14.70 ± 1.96 N.m 10.83 ± 1.44 lbf.ft	300 ± 50 kgf·cm 29.40 ± 4.90 N.m 21.66 ± 3.61 lbf.ft	450 ± 50 kgf·cm 44.10 ± 4.90 N.m 32.49 ± 3.61 lbf.ft	550 ± 50 kgf·cm 53.90 ± 4.90 N.m 39.71 ± 3.61 lbf.ft

7.3 SERVICE DATA

7.3.1 CYLINDER HEAD

ITEM			STANDARD	LIMIT	NOTE
Cylinder head combustion surface distortion			below 0.03	0.15	
Valve seat angle	Intake		120°	-	
	Exhaust		90°	-	
Valve seat width	Intake		1.73	2.23	
	Exhaust		2.12	2.62	
Intake valve	Valve stem outer dia.		Ø 7.96 ~ Ø 7.97	Ø 7.9	
	Valve guide inner dia.		Ø 8.010 ~ Ø 8.025	Ø 8.1	
	Oil clearance		0.040 ~ 0.055	0.15	
Exhaust valve	Valve stem outer dia.		Ø 7.96 ~ Ø 7.97	Ø 7.9	
	Valve guide inner dia.		Ø 8.010 ~ Ø 8.025	Ø 8.1	
	Oil clearance		0.040 ~ 0.055	0.15	
Valve guide projection(from head surface)			13	-	
Valve sinking depth	Intake valve		0.7	1	
	Exhaust valve		0.7		
Thickness of valve head	Intake valve		1.2	0.5	
	Exhaust valve		1.2		
Intake valve timing	Open	BTDC	9° ~ 19°	-	
	Close	ABDC	37° ~ 47°		
Exhaust valve timing	Open	BBDC	37° ~ 47°		
	Close	ATDC	9° ~ 19°		
Valve spring	Free length		46.1	-	
	Inclination		-	1.2	
	Tension (when compressed to 1mm length)		1.883	-	
Intake & Exhaust valve clearance			0.15 ~ 0.25	0.25 ~ 0.35	-

7.3.2 CYLINDER BLOCK

ITEM		STANDARD	LIMIT	NOTE
Cylinder bore	L	Ø 88.015 ~ Ø 88.025	Ø 88.20	
	S	Ø 88.005 ~ Ø 88.015		
Cylinder roundness		0 ~ 0.01	0.03	
Cylindricity		0 ~ 0.015	0.03	

7.3.3 VALVE ROCKER ARM

ITEM		STANDARD	LIMIT	NOTE
Intake & Exhaust rocker arm	Rocker arm shaft outer dia.	Ø 15.959 ~ Ø 15.98	Ø 18.95	
	Rocker arm inner dia.	Ø 19.0 ~ Ø 16.021	Ø 19.09	
	Oil clearance	0.020 ~ 0.062	0.14	
Pushrod bending		0.03 or less	0.25 or less	-
Tappet	Tappet stem outer dia.	Ø 14.224~Ø 14.249	Ø 14.18	
	Tappet guide hole inner dia.	Ø 14.260~Ø 14.280	Ø 14.30	
	Oil clearance	0.011 ~ 0.056	0.12	

7.3.4 PISTON

ITEM		STANDARD	LIMIT	NOTE
Piston outer dia.	A	Ø 87.965~Ø 87.975	Ø 87.90	
	C	Ø 87.960~Ø 87.965		
Minimum clearance between piston and cylinder block		0.040 ~ 0.070	-	
Top clearance		0.8	-	
Piston and piston pin	Piston pin outer dia.	Ø 30.0 ~ Ø 29.991	Ø 29.90	
	Piston pin hole inner dia.	Ø 30.0 ~ Ø 30.008	Ø 30.02	
	Oil clearance	0 ~ 0.017	0.12	

7.3.5 PISTON RING

ITEM		STANDARD	LIMIT	NOTE
Top ring	Ring groove width	2.06 ~ 2.08	-	
	Ring width	1.97 ~ 1.99	-	
	Ring and ring groove clearance	0.07 ~ 0.110	-	
	End clearance	0.20 ~ 0.35	1.5	
2nd ring	Ring groove width	2.06 ~ 2.08	-	
	Ring width	1.97 ~ 1.99	-	
	Ring and ring groove clearance	0.07 ~ 0.110	-	
	End clearance	0.45 ~ 0.65	1.5	
Oil ring	Ring groove width	3.02 ~ 3.04	-	
	Ring width	3.97 ~ 3.99	-	
	Ring and ring groove clearance	0.03 ~ 0.07	-	
	End clearance	0.20 ~ 0.40	1.5	

7.3.6 CONNECTING ROD

ITEM		STANDARD	LIMIT	NOTE
Crankpin side	Crank pin pushing inner dia.	Ø 53.0 ~ Ø 53.019	-	
	Crank pin metal thickness	1.487 ~ 1.50	-	
	Crank pin outer dia.	Ø 49.95 ~ Ø 49.964	Ø 49.91	
	Oil clearance	0.038 ~ 0.095	0.15	
Piston pin side	Piston pin bush inner dia.	Ø 30.025 ~ Ø 30.038	Ø 30.10	
	Piston pin outer dia.	Ø 29.991 ~ Ø 30.0	Ø 29.90	
	Oil clearance	0.025 ~ 0.047	0.2	
Twist and parallelism		Ø 0.05/100mm	Ø 0.08	

7.3.7 CAMSHAFT

ITEM		STANDARD	LIMIT	NOTE
Gear side	Camshaft journal outer diameter	Ø 44.950 ~ Ø 44.964	Ø 44.89	
	Oil clearance	0.066 ~ 0.110	-	
Intermediate	Camshaft journal outer diameter	Ø 44.916 ~ Ø 44.930	Ø 44.89	
	Oil clearance	0.070 ~ 0.130	-	
Flywheel side	Camshaft journal outer diameter	Ø 44.950 ~ Ø 44.964	Ø 44.89	
	Oil clearance	0.066 ~ 0.110	-	

7.3.8 CRANKSHAFT

ITEM		STANDARD	LIMIT	NOTE
Crank journal	Crankshaft journal outer dia.	Ø 53.950 ~ Ø 53.964	Ø 53.91	
	Bearing metal thickness	1.987 ~ 2.000	-	
	Oil clearance	0.036 ~ 0.095	0.15	
Bending		0.02 or less	0.02 or less	-

MEMO

CHAPTER 3 TRANSMISSION

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1. OVERVIEW

1.1 SPECIFICATION

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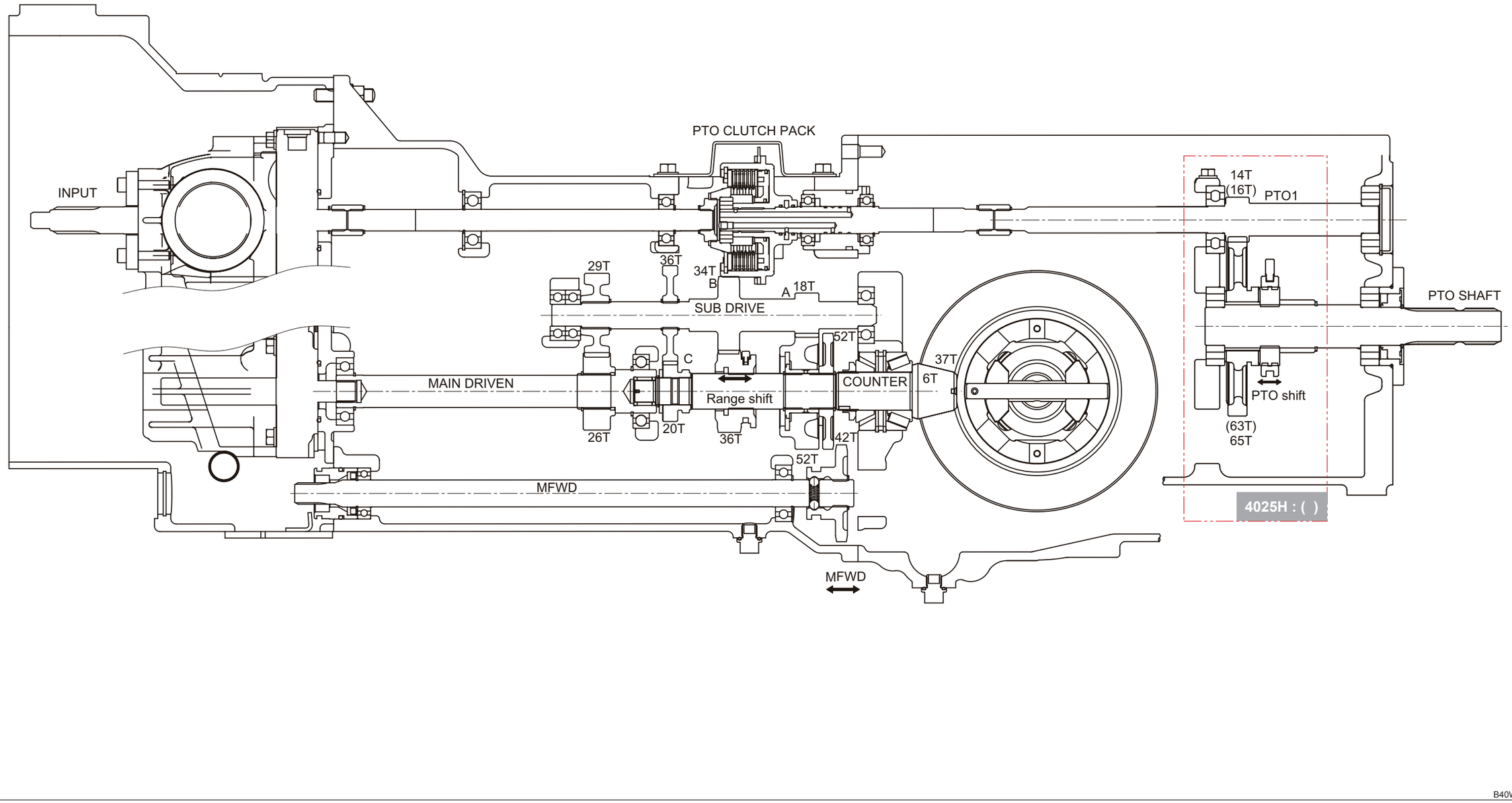
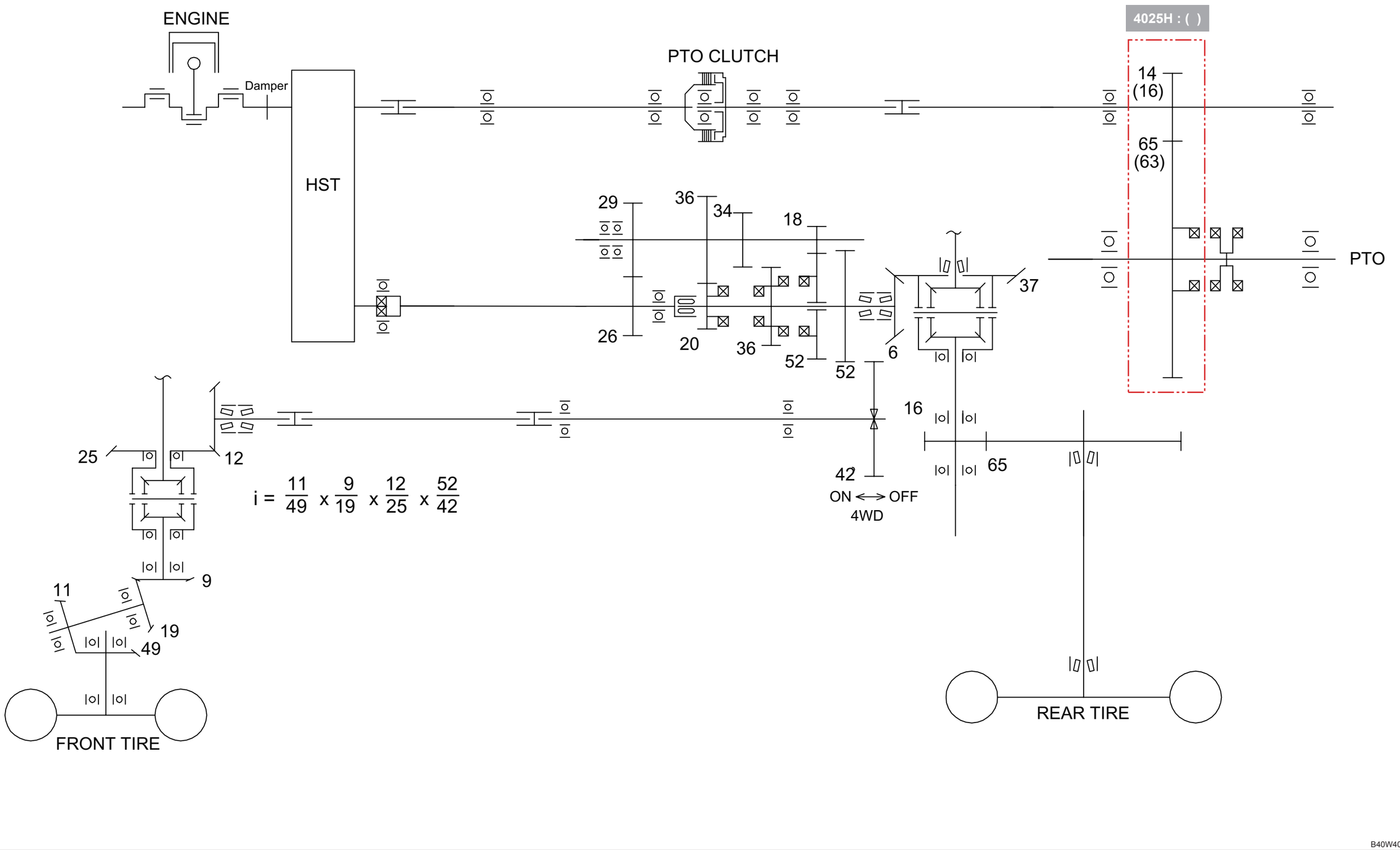
<tr><td rowspan="8">Transmission system</td><td rowspan="5"></td><td>Shuttle type</td><td colspan="5">Hydrostatic</td></tr>
<tr><td>Main shift</td><td colspan="5">HST</td></tr>
<tr><td>Range shift</td><td colspan="5">3 speeds, constant-mesh</td></tr>
<tr><td rowspan="2">Shifting gear and driving speed</td><td rowspan="2">CVT</td><td>7 - 16
11.2 - 24</td><td>CABIN MODEL</td><td colspan="2">Forward driving: 0 - 23.3 km/h (0 - 14.48 MPH)
Reverse driving: 0 - 23.3 km/h (0 - 14.48 MPH)</td></tr>
<tr><td>8 - 16
12.4 - 24</td><td>ROPS MODEL</td><td colspan="2">Forward driving: 0 - 24.4 km/h (0 - 15.16 MPH)
Reverse driving: 0 - 24.4 km/h (0 - 15.16 MPH)</td></tr>
<tr><td colspan="2" rowspan="4">PTO shift</td><td colspan="2">Type</td><td colspan="3">Independent PTO</td></tr>
<tr><td colspan="2">Stage</td><td colspan="3">1</td></tr>
<tr><td colspan="2">Revolution</td><td>1st: 533 rpm
[4025H]</td><td colspan="2">1st: 560 rpm
[4035H/ 4035CH]</td></tr>
<tr><td colspan="2">PTO shaft</td><td colspan="3">Ø 35 mm, 6 splines</td></tr>
<tr><td colspan="2">Rear axle</td><td colspan="5">Reduction ratio: $\frac{6}{37}$ x $\frac{16}{65}$ = 0.03992</td></tr>
<tr><td rowspan="2">Brake</td><td colspan="2">Main brake</td><td colspan="5">Wet multi-plate type</td></tr>
<tr><td colspan="2">Parking brake</td><td colspan="5">Foot brake lever type</td></tr>
<tr><td colspan="3" rowspan="2">Transmission fluid</td><td colspan="2">Capacity</td><td colspan="3">37ℓ (9.77 u.s. gal)</td></tr>
<tr><td colspan="2">Specification</td><td colspan="3">TF 500</td></tr>
</table>

1.2 POWER TRANSFER

1.2.1 TRANSMISSION ASSEMBLY DIAGRAM

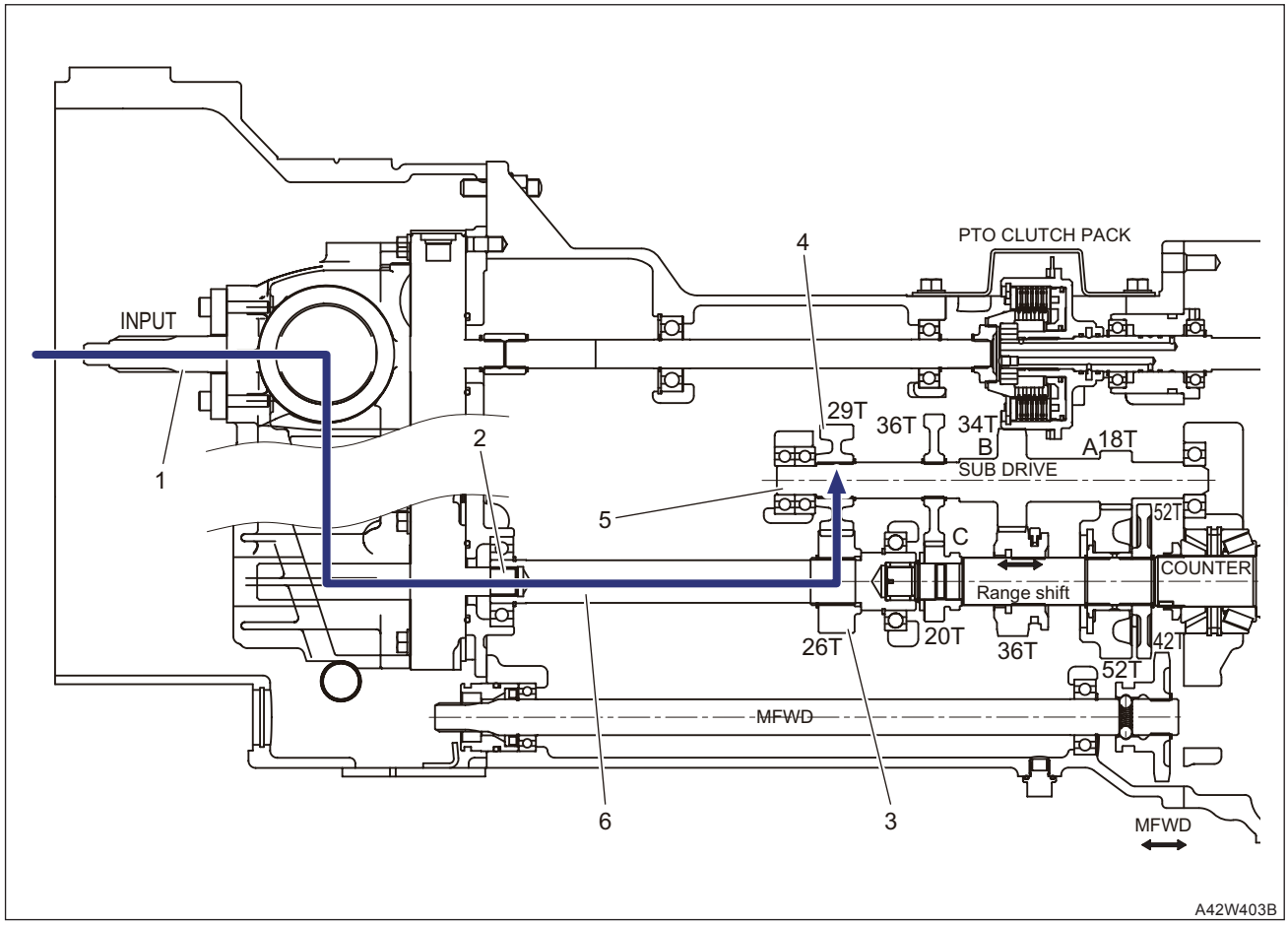


1.2.2 POWER FLOW CHART



2. STRUCTURE AND OPERATING PRINCIPLE

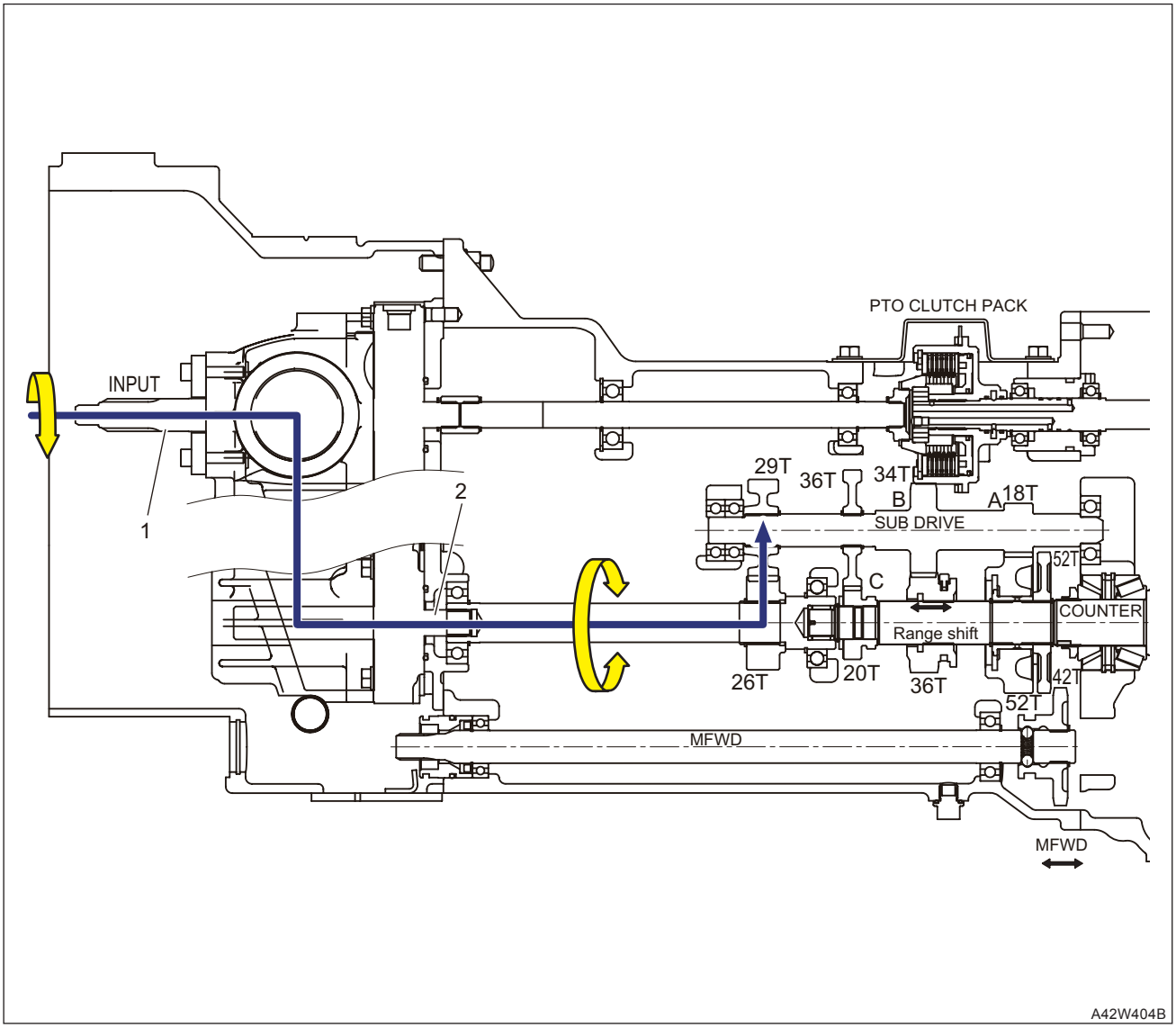
2.1 MAIN SHIFT



The engine torque is transferred to the HST through the HST input shaft (pump shaft) (1). Then, it is converted to hydraulic pressure in the HST to turn the HST motor shaft (2). As the HST motor shaft is connected to the range shift drive shaft (6), rotation of the range shift drive shaft turns the 26T gear (3) which then turns the range shift drive shaft (5) through the engaged 29T gear (4).

Therefore, the amount of depression of the forward driving pedal determines the hydraulic pressure quantity for the HST input shaft (pump shaft), and this change of hydraulic pressure leads to consequential change in HST motor shaft speed, enabling continuous shift operation.

2.2 F-R SHUTTLE SHIFT



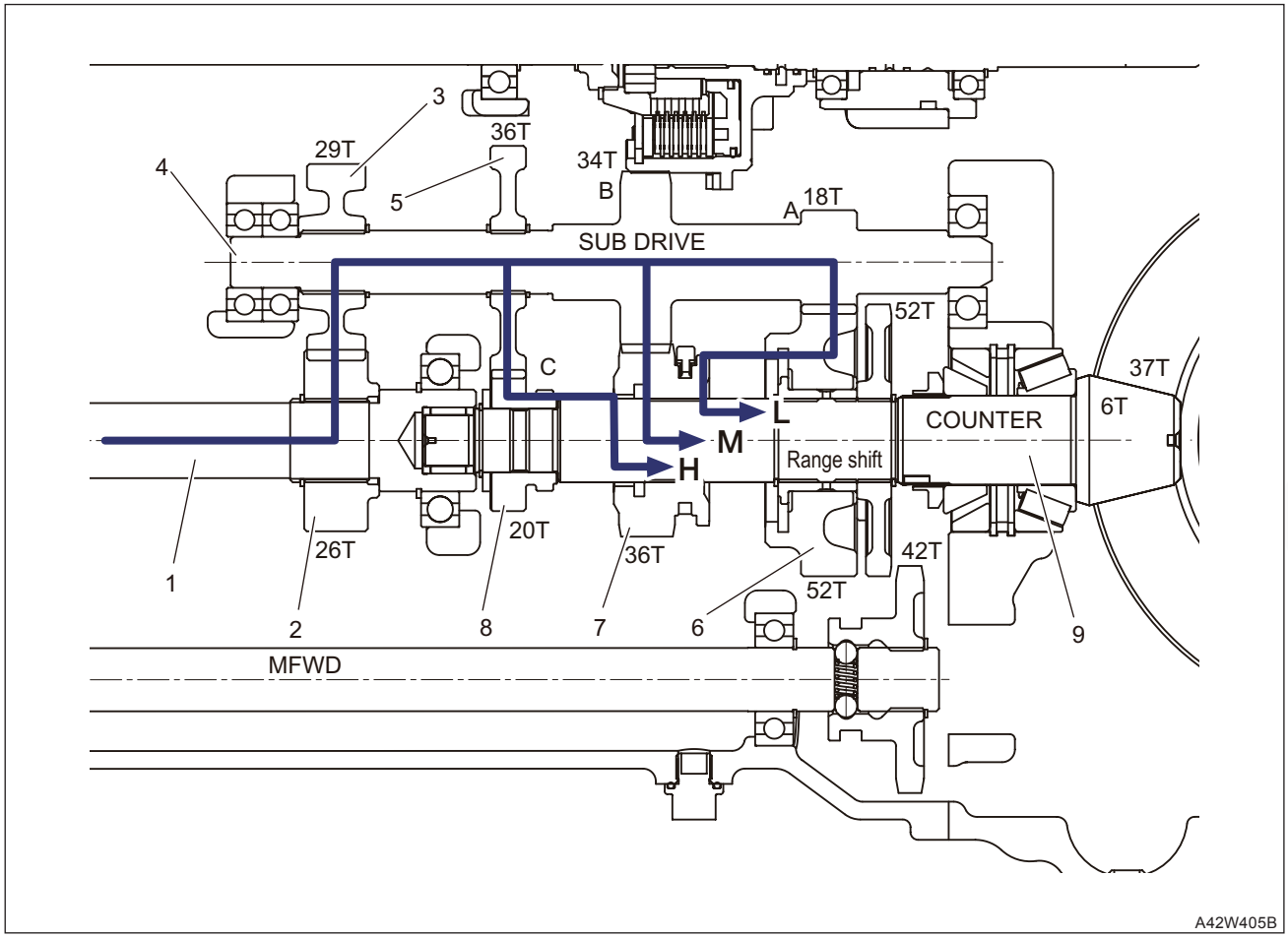
As the HST input shaft (pump shaft) (1) is rotated by the engine torque, the internal piston delivers hydraulic pressure to the HST motor shaft (2).

The HST pump shaft is installed with the swash plate which is tilted between -18° and +18°. The angle of the swash plate is changed according to the depressing condition of the HST pedal.

When the swash plate of the HST pump shaft starts to tilt toward the positive x-axis from 0° (neutral position) gradually, the amount of hydraulic oil delivered to the HST motor shaft is increased, resulting in increase of the vehicle speed. When the swash plate moves toward the negative x-axis from 0°, the delivery direction of hydraulic oil is reversed, resulting in reverse rotation of the HST motor shaft.

Therefore, the rotating direction of the HST motor shaft is switched between forward direction and reverse direction according to the selected direction (forward/reverse driving) of the HST pedal, and this direction control is applied to gears in the transmission to drive the vehicle forward or backward.

2.3 RANGE SHIFT



The torque delivered to the range shift drive shaft (1) turns the range shift drive gear shaft (4) through the 26T gear (2) and 29T gear (3). The 29T gear is rotated continuously. Also, the 20T gear (8) and 52T gear (6) are rotated as well as they are engaged with the 34T gear and 18T gear of the range shift drive gear shaft and 36T gear (5).

On the other hand, the range shift drive shaft and countershaft (9) idle from each other due to their internal needle bearings. Therefore, the 20T gear (8) and 52T gear (6) are rotated, sliding.

When the range shift driven 2nd gear (7) is pushed to the rightmost position for low speed (L) shift operation, the spline in the 52T gear is engaged with the spline on the range shift driven 2nd gear. Then, the torque reduced by engagement of the 52T gear and 18T gear of the range shift drive gear shaft is delivered to the countershaft through the range shift driven 2nd gear which is fixed to the countershaft with splines.

For mid speed (M) shift operation, the torque is transferred to the countershaft after it is reduced by engagement of the 34T gear of the range shift drive gear shaft with the 36T range shift driven 2nd gear (7).

When the range shift driven 2nd gear (7) is moved to the leftmost position for high speed (H) shift operation, it is engaged with the 20T gear (8). Then, the torque at the specified speed ratio with engagement of the 20T gear (8) with the 36T gear (5) of the range shift drive gear shaft is delivered to the final countershaft through the range shift driven 2nd gear.

POWER TRANSFER

▶ LOW SPEED (L)

Range shift drive shaft (1) → 26T gear (2) → 29T gear (3) → Range shift drive gear shaft (4) → 18T gear → 52T gear (6) → 36T range shift driven gear 2nd (7) → Counter shaft (9)

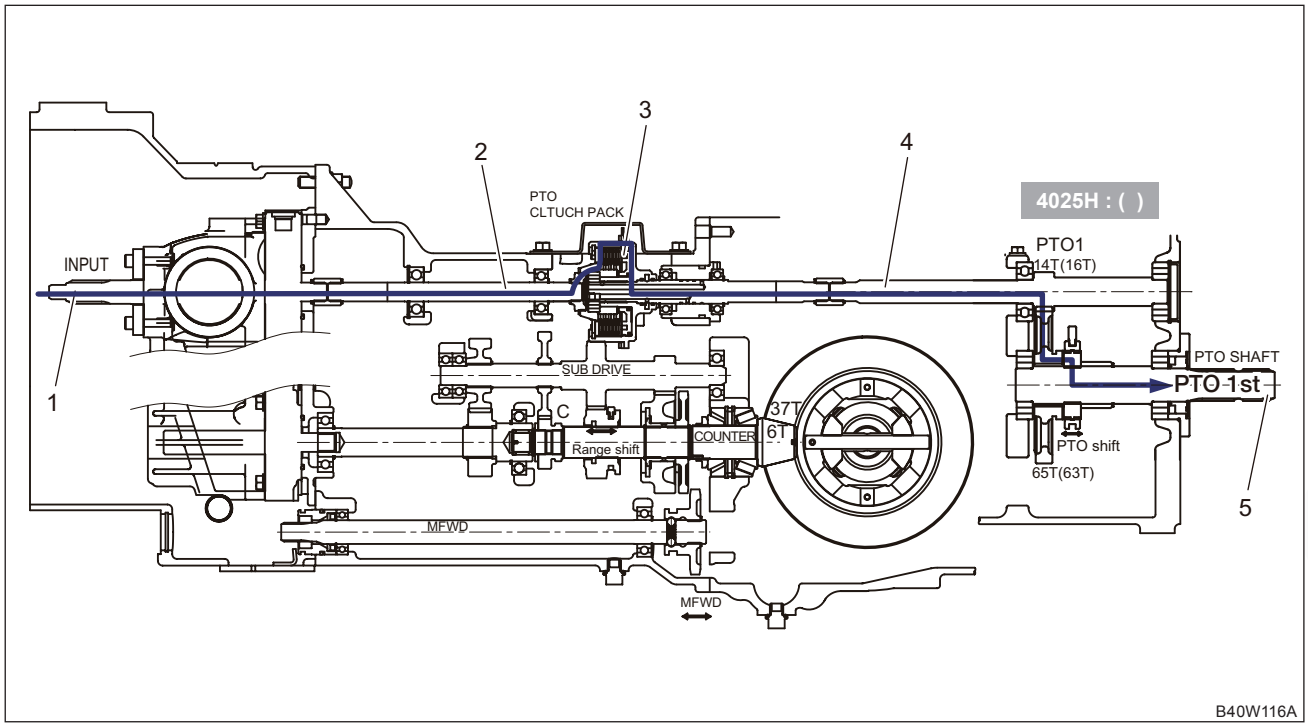
▶ MID SPEED (M)

Range shift drive shaft (1) → 26T gear (2) → 29T gear (3) → Range shift drive gear shaft (4) → 34T gear → 36T range shift driven gear 2nd (7) → Counter shaft (9)

▶ HIGH SPEED (H)

Range shift drive shaft (1) → 26T gear (2) → 29T gear (3) → Range shift drive gear shaft (4) → 36T gear (5) → 20T gear (8) → 36T range shift driven gear 2nd (7) → Counter shaft (9)

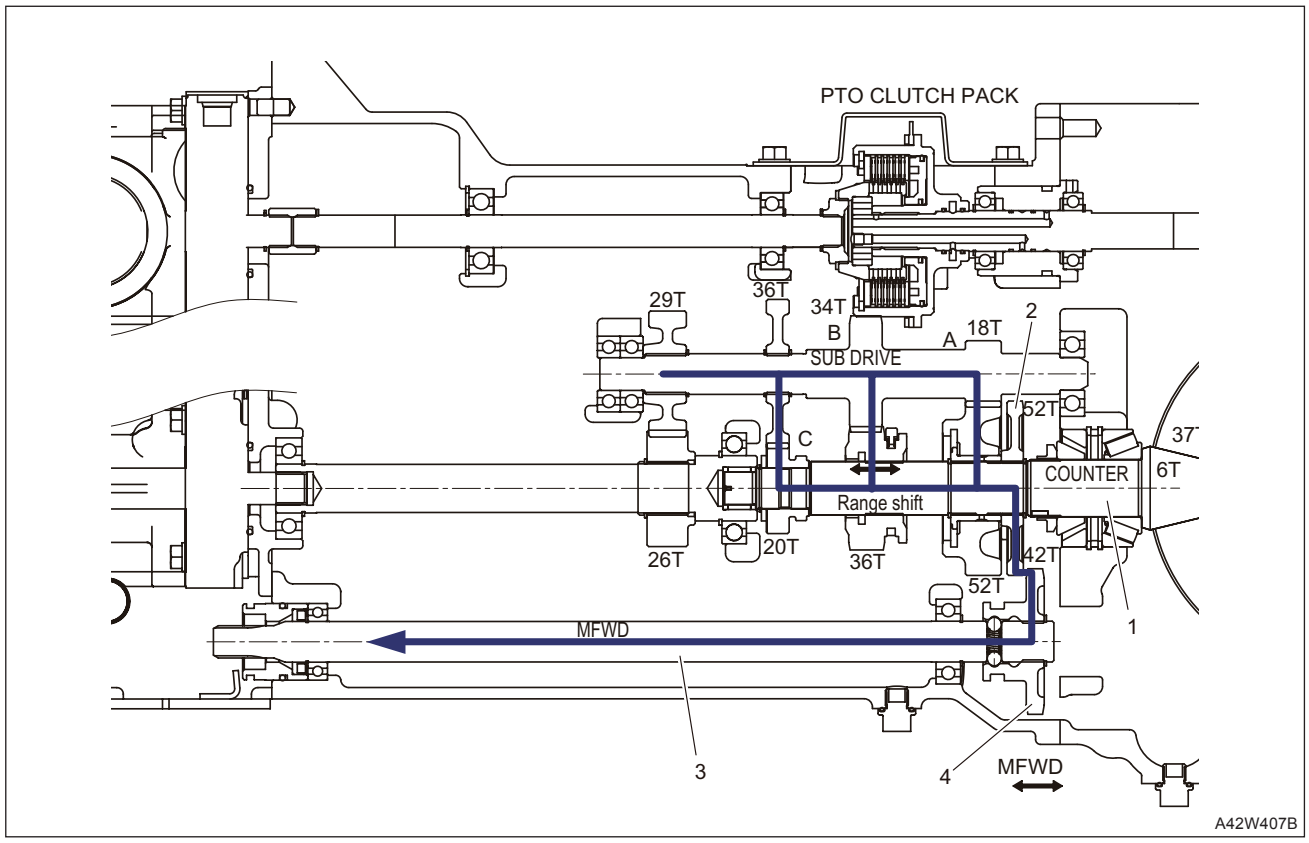
2.4 PTO SHIFT



As the HST input shaft (pump shaft) (1) is rotated by the engine torque and it is directly connected to the PTO shaft (2) with the joint, this forms the driveline system for PTO operation.

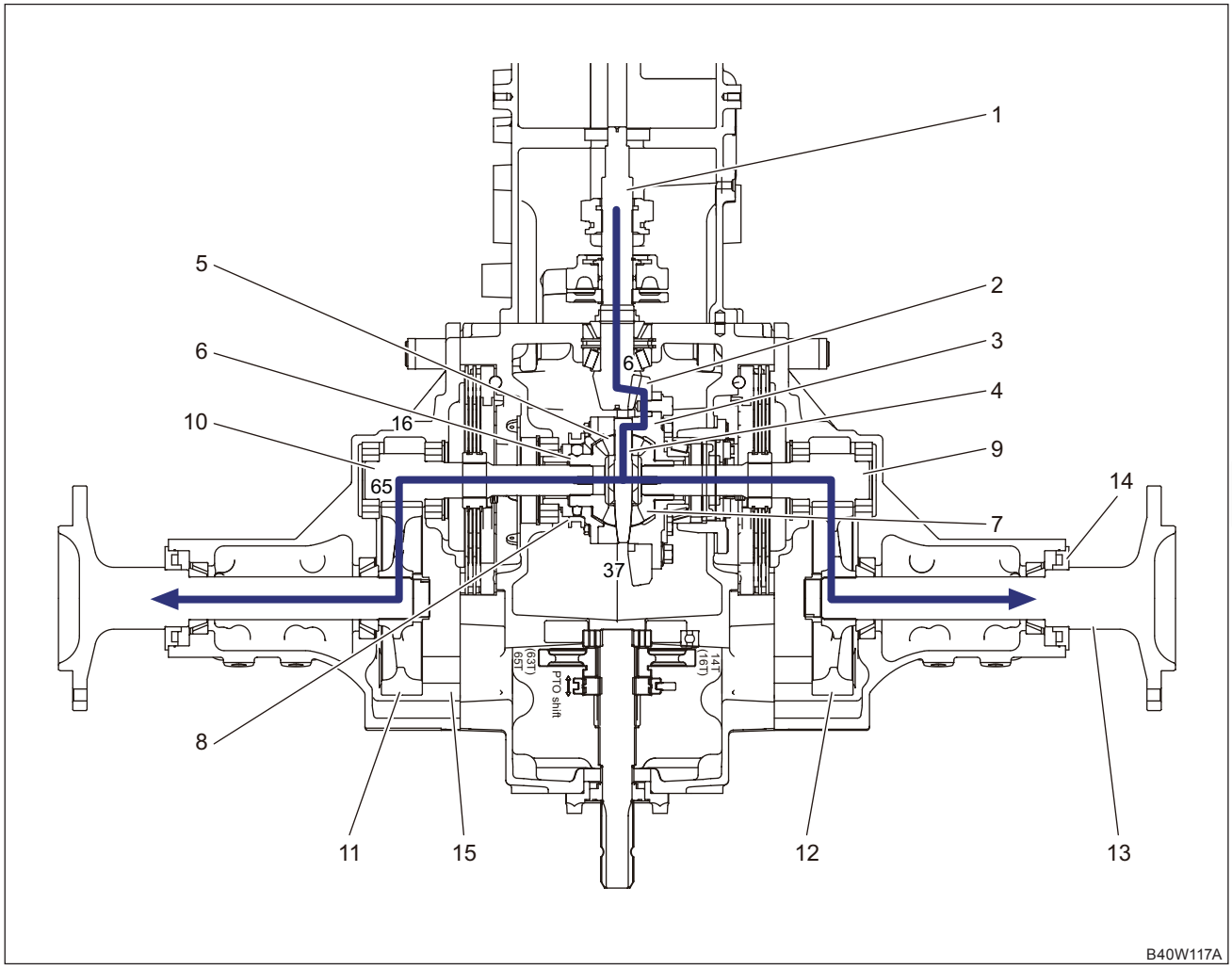
As the PTO clutch (3) is engaged, the 65T and 60T gears of the PTO shaft (5), which are engaged with the 14T and 18T gears of the PTO drive gear shaft (4), are rotated. As the PTO hub is connected by shift operation of the PTO lever, PTO torque of the 1st is delivered to the PTO shaft.

2.5 4WD



When the countershaft (1) rotates for range shift operation, the 52T gear, which is the 4WD drive gear (2) of the countershaft, rotates constantly. Therefore, when the 4WD driven gear (4) of the 4WD drive shaft (3) is moved to the left to be engaged with the 4WD drive gear, the 4WD drive and driven gears are engaged and rotated together. Then, the rotating power reduced at the reduction ratio by the 52T gear and 42T gear is delivered to the 4WD drive shaft to turn the front axle through the propeller shaft.

2.6 REAR AXLE



(1) Counter shaft
(2) Ring gear
(3) Differential case
(4) Pinion shaft
(5) Differential pinion
(6) Differential side gear (B)
(7) Differential side gear (A)
(8) Differential thrust assembly
(9) Final pinion (R)
(10) Final pinion (L)
(11) Rear axle gear (LH)
(12) Rear axle gear (RH)
(13) Rear axle
(14) Oil seal
(15) Rear axle housing

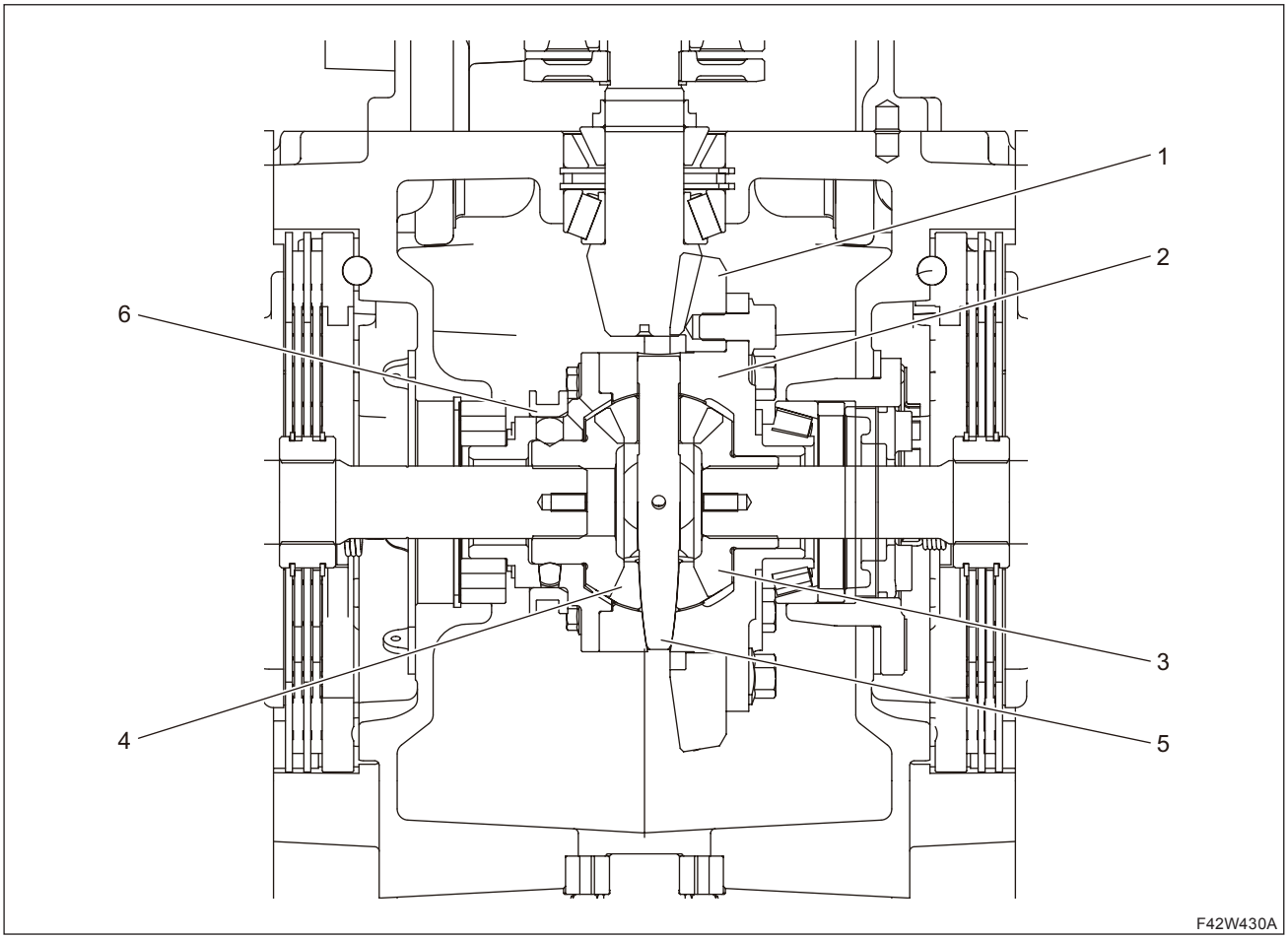
2.6.1 POWER TRANSFER

When rotating force arrives at the counter shaft (1), it rotates the differential case (3) through the ring gear (2). As the differential rotates, the differential pinion (5) and differential side gear (7) inside the differential case to deliver the rotating force to the final pinion (9).

Then, the speed of the rotating force at the final pinion is reduced through engagement of the 16 gear of the final pinion with the 65 rear axle gear (11), and it is finally transmitted to the rear axle (13), which is connected with splines, in order to rotate the rear wheels.

3. OPERATION AND ADJUSTMENT

3.1 DIFFERENTIAL SYSTEM



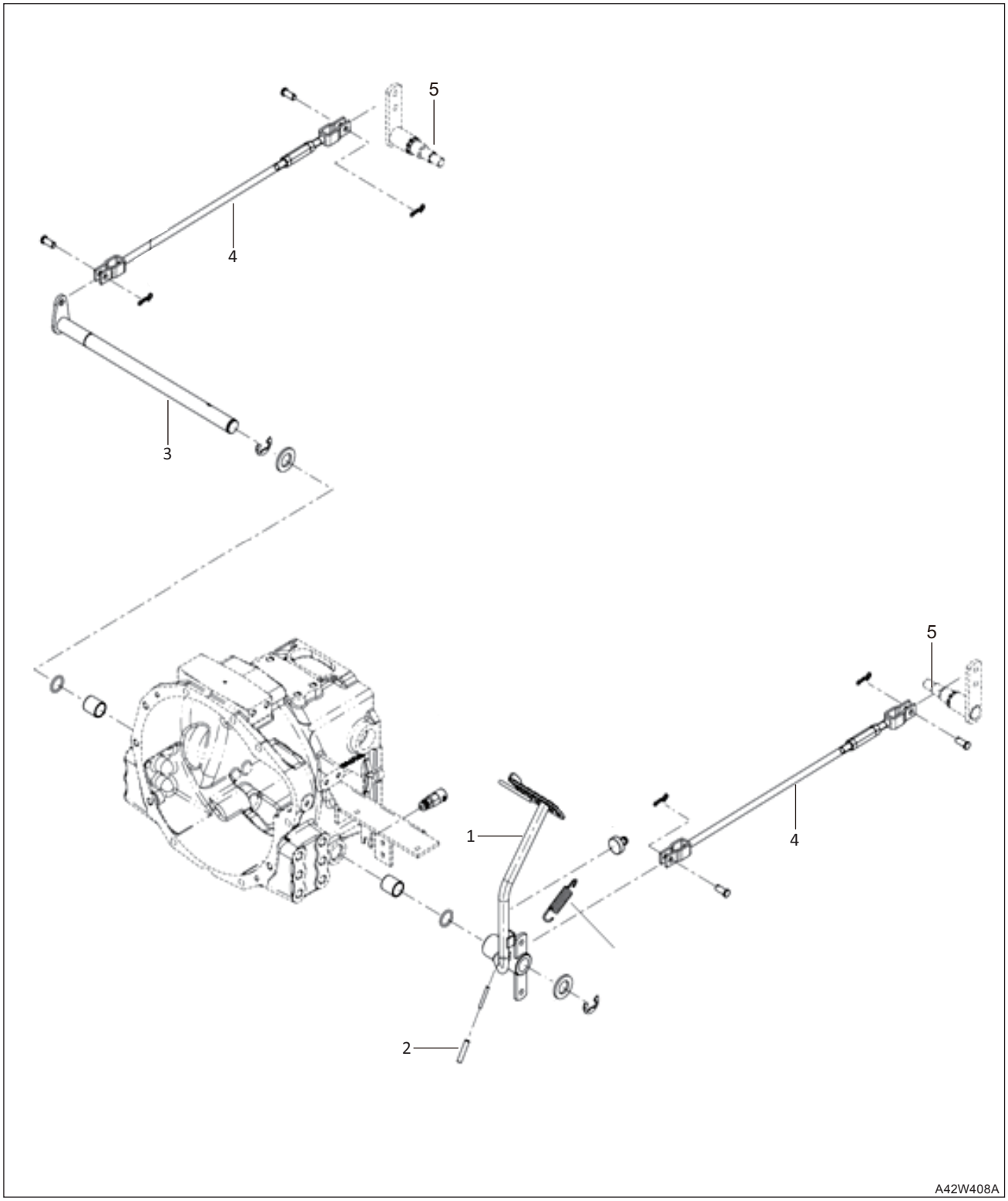
The differential system is to rotate the left wheel and right wheel at different speeds for smooth turning. When turning, this system rotates the inner wheel in the turning direction slower and the outer wheel faster to turn the vehicle in the desired direction.

Also, when a wheel gets stuck in mud, it is hard to escape the pit since the wheel in mud with no friction rotates at faster speed and the wheel on road with friction does not rotate due to the differential system. To prevent this situation, the vehicle is equipped with the differential lock. The differential lock moves the differential lock slide to fix the differential case and differential side gear together with the pin, resulting in rotation of the side gear on the other side as well. Therefore, the wheels on both sides are rotated at the same speed to escape the pit.

The differential system consists of the ring gear (1), differential case (2), differential side gear (3), differential pinion (4), differential pinion shaft (5) and differential lock slide (6).

3.2 BRAKE

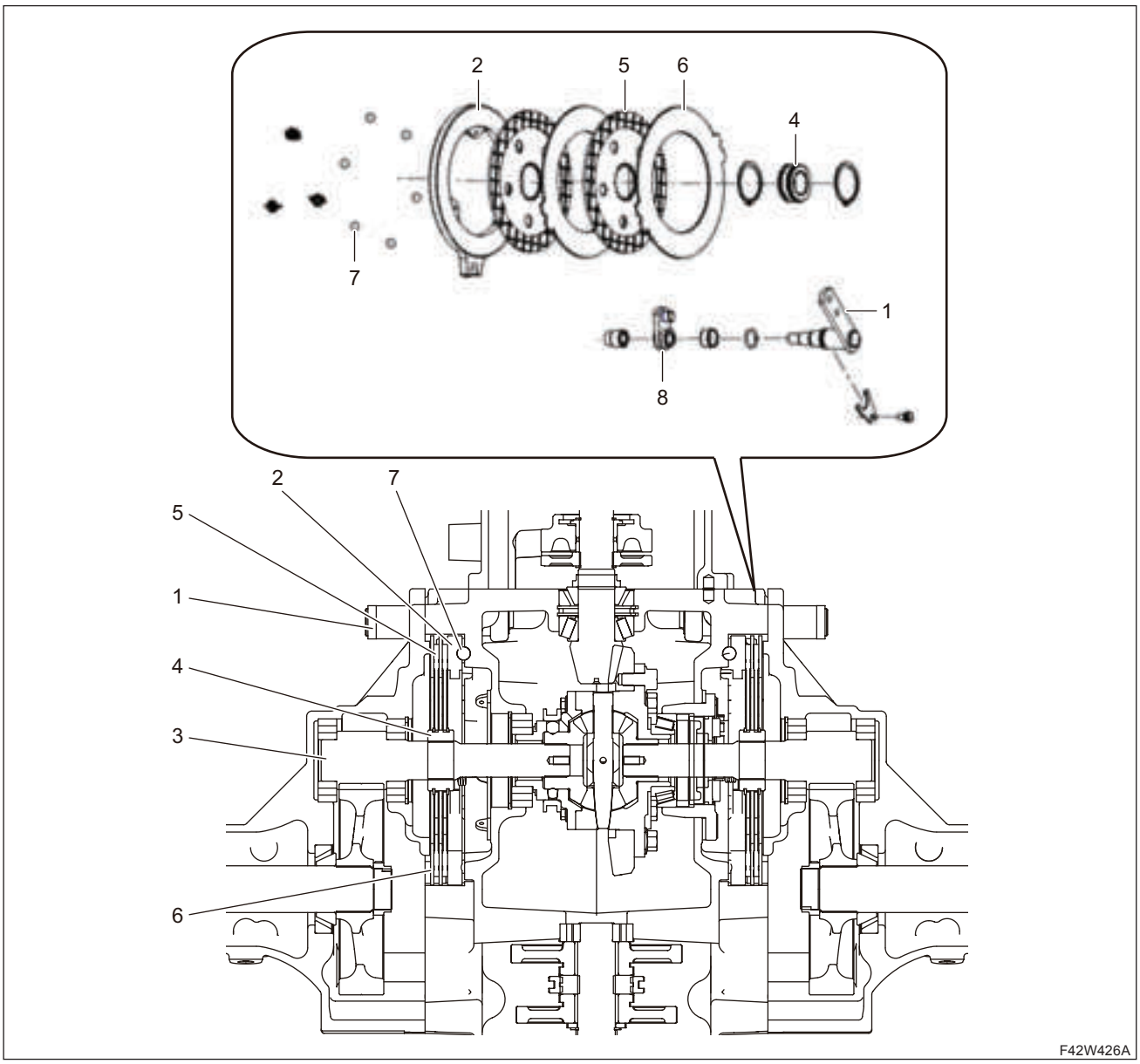
3.2.1 OVERVIEW



When the brake pedal (1) is depressed, the brake shaft (3), which is fixed with the brake pedal boss and spring pin (2), starts to rotate. Then, as the brake shaft is connected to the brake rod (4) with the snap pin, the shaft pulls the rod which then turns the brake activating brake lever (5) to operate the internal brake.

As this brake is a wet multi-plate type, it is soaked in oil for superior lubrication, cooling and durability.

3.2.2 OPERATING PRINCIPLE OF BRAKE



(1) Brake lever
(2) Cam plate
(3) Final pinion
(4) Boss
(5) Disc
(6) Pressure plate
(7) Steel ball
(8) Brake inside arm

When the brake lever (1) is pulled by transferred power, the brake inside arm (8) fixed by the splined boss is rotated as well. Also, as the protruded parts on the brake inside arm are fit to the grooves of the cam plates (LH/RH) (2), the cam plates are rotated as well.

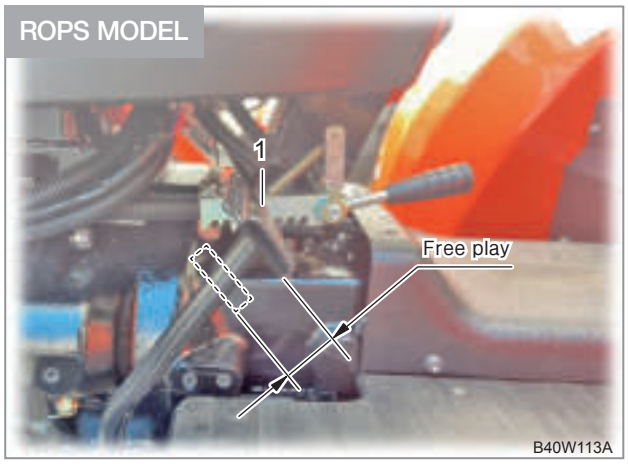
On the other side, the final pinion (3) is fixed to the differential side gear with splines, rotating together, and its other side is connected to the boss (4) with splines. This boss is fixed to 2 discs (5) with splines as one unit. Also, the pressure plates (6) are installed in between the friction discs and these pressure plates are fixed to the rear axle housing.

Therefore, when the brake pedal is depressed, the brake lever is moved to rotate the cam plate. Then, the steel ball (7) installed in the groove on the slant of the cam plate pushes the cam plate inward, producing driving force. This driving force compresses the friction discs and plates. As the pressure plates are fixed by the rear axle housing, they stop rotating.

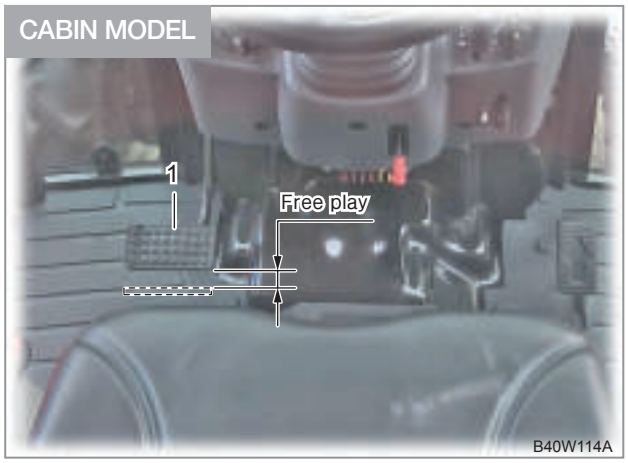
As a result, the final pinion fixed to the boss stops rotating as well, leading to stop of the vehicle.

3.2.3 BRAKE PEDAL FREE PLAY ADJUSTMENT

ROPS MODEL

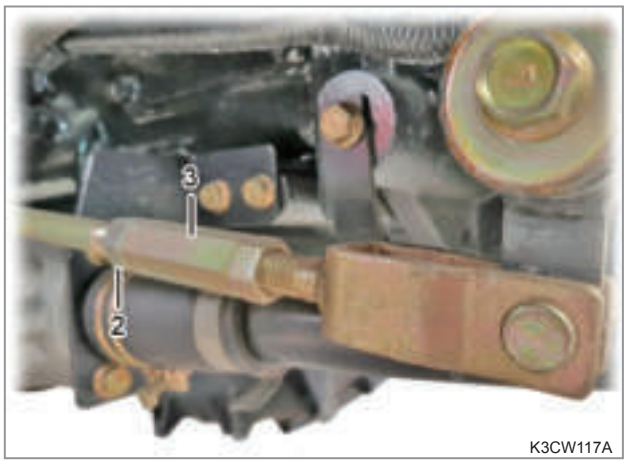


CABIN MODEL



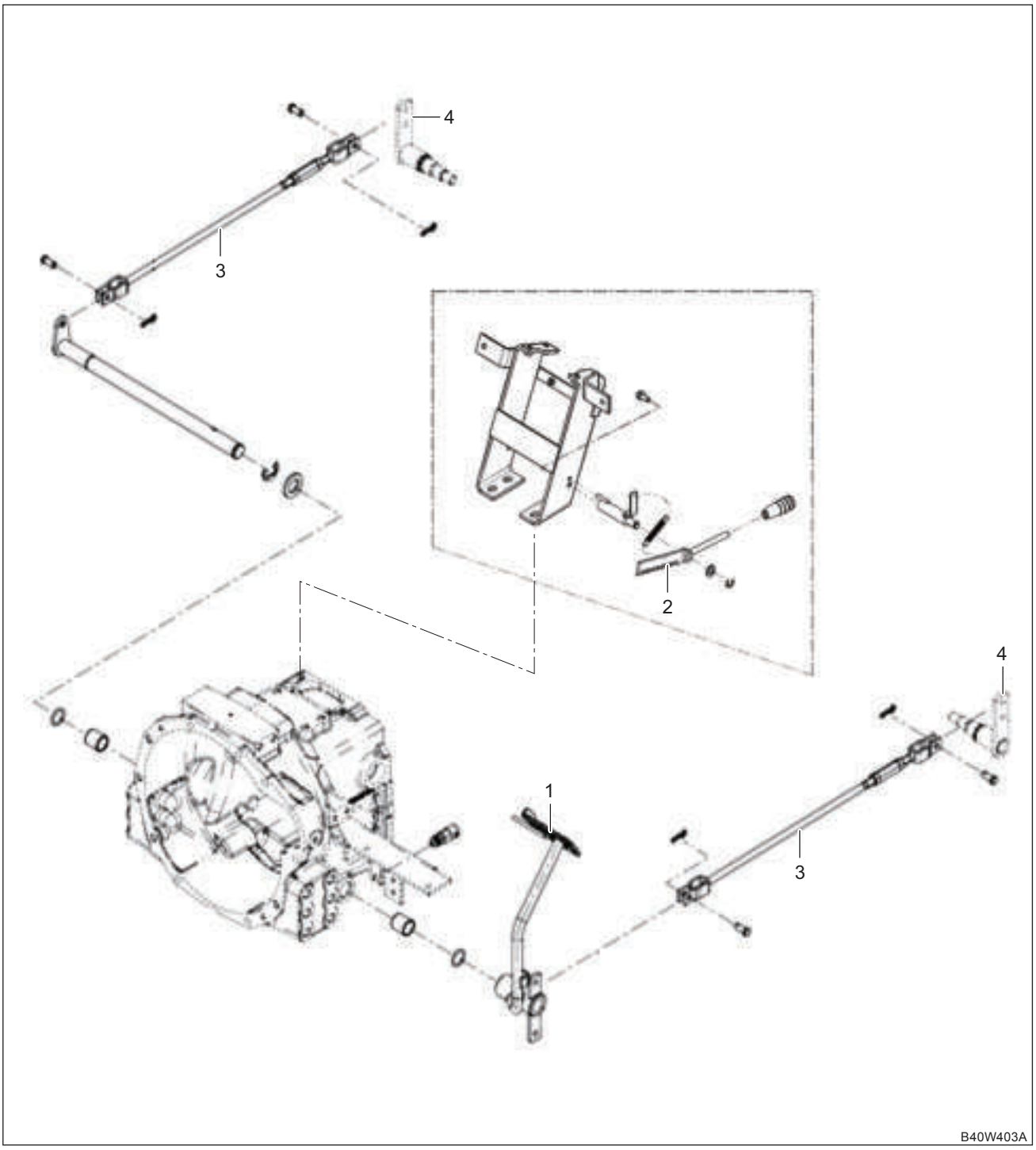
1. Depress the brake pedal (1) slightly. Then, release it.
2. Measure its free play.

ITEM	STANDARD
Brake pedal free play	5 - 10 mm (0.19 - 0.39 in)
* The free play for both pedals should be identical.	



3. If the free play is out of the standard, unscrew the mounting nuts (2) of the brake rods (LH/RH) on the brake shaft section and use the turnbuckle (3) to adjust the free play. After adjusting the free play of the both sides, tighten the mounting nuts.

3.3 PARKING BRAKE OPERATION



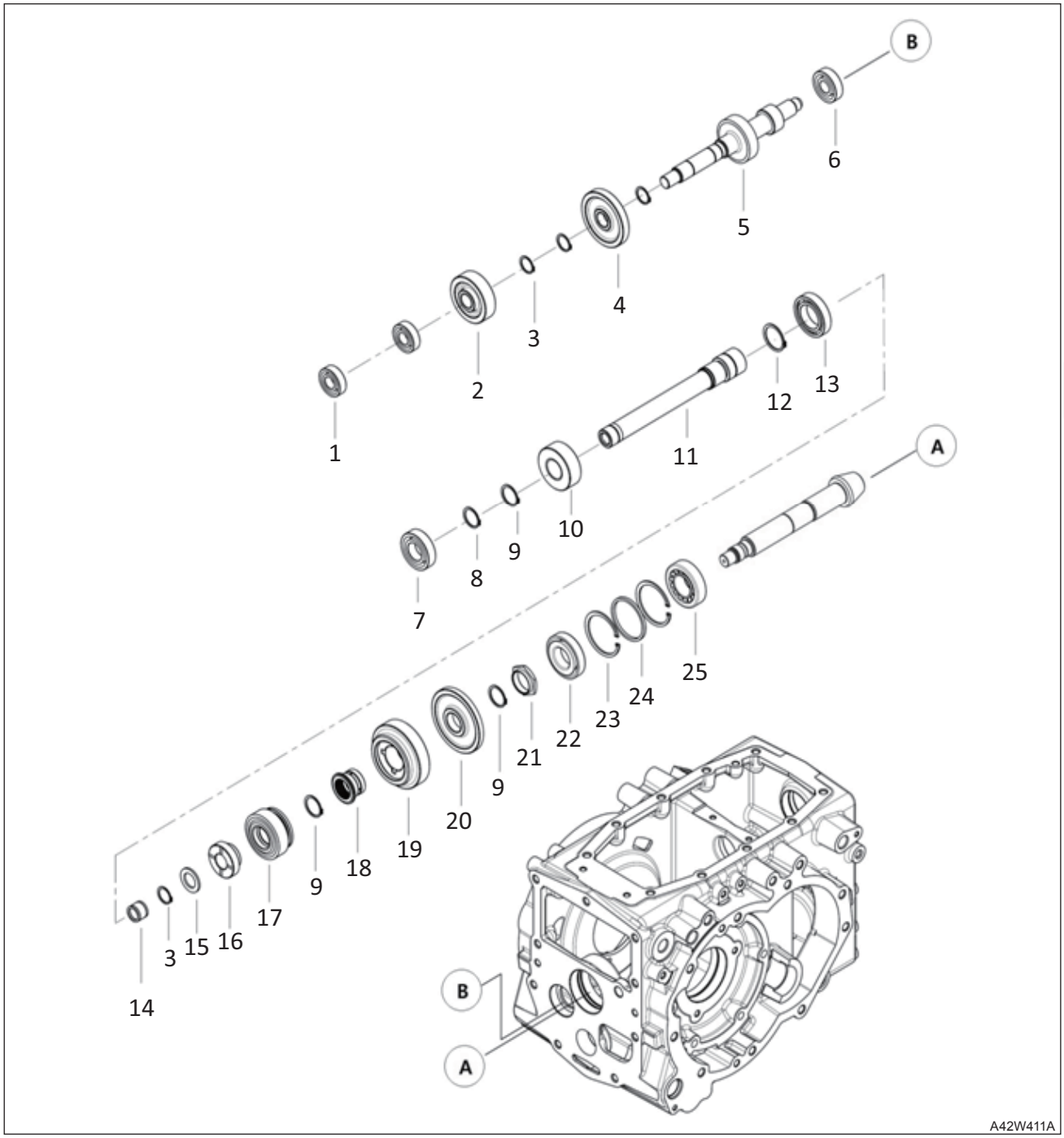
(1) Brake pedal
(2) Parking brake lever
(3) Brake rod
(4) Brake lever

With the brake pedal (1) depressed firmly, pull the parking brake lever (2) to engage the gear tooth with the fixing plate of the brake pedal.

As the brake pedal is operated, the brake rod (3), which is connected to the brake shaft and brake pedal, is pulled to activate the brake lever (4) in order to apply braking force for the left/right brakes.

4. SECTIONAL VIEW FOR MAJOR COMPONENTS

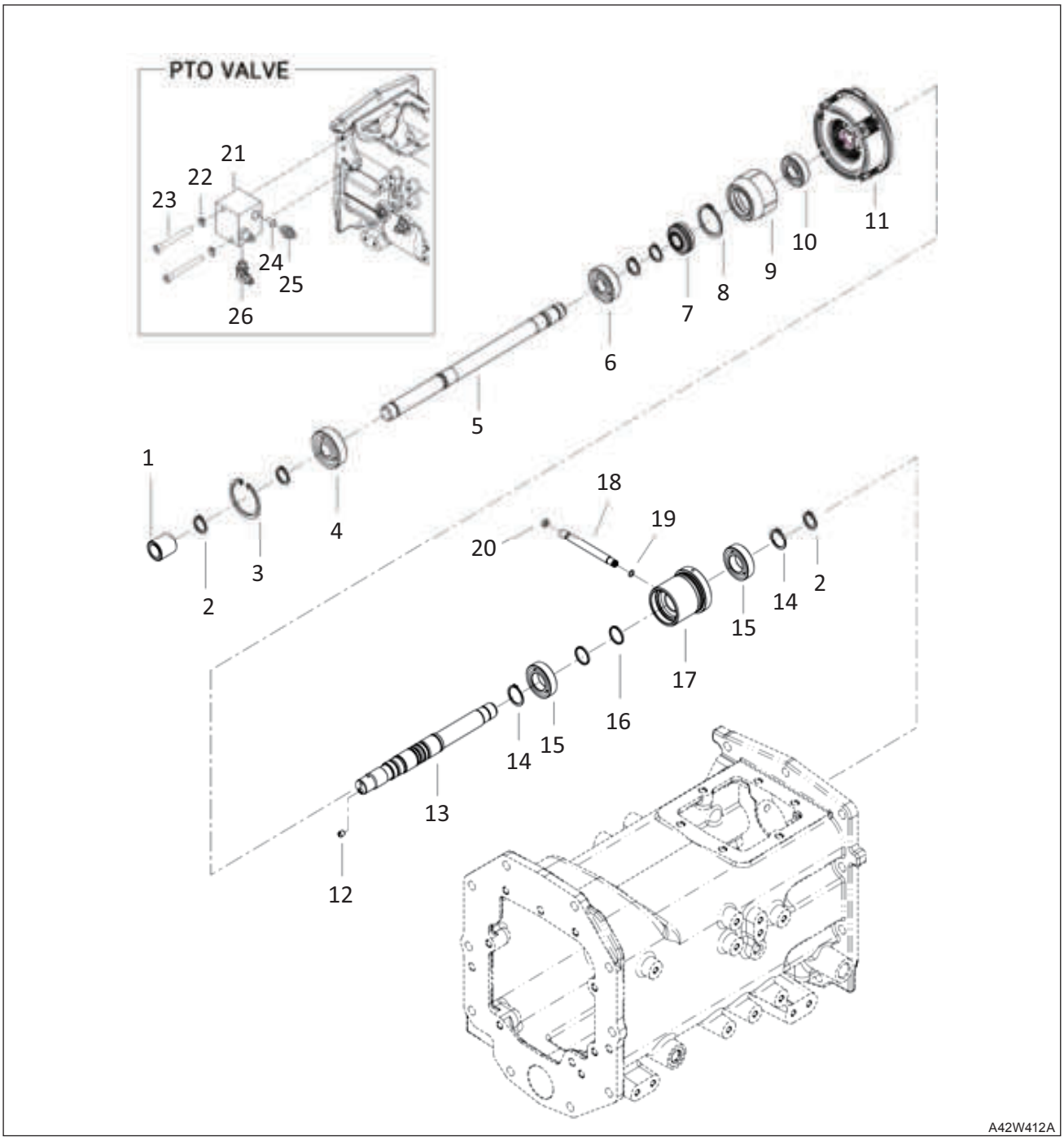
4.1 RANGE SHIFT GEAR



COMPONENTS

(1) Ball bearing
(2) Range drive gear
(3) Snap ring
(4) Gear, range C
(5) Range drive shaft
(6) Ball bearing
(7) Ball bearing
(8) Snap ring
(9) Snap ring
(10) Range drive gear
(11) Range shaft
(12) Snap ring
(13) Ball bearing
(14) Needle bearing
(15) Collar
(16) Gear, range C drive
(17) Range shift drive gear 2nd
(18) Sleeve
(19) Range shift drive gear 1nd
(20) Four wheel drive gear
(21) Stop nut
(22) Taper roller bearing
(23) Snap ring
(24) Spacer
(25) Taper roller bearing(32207C)

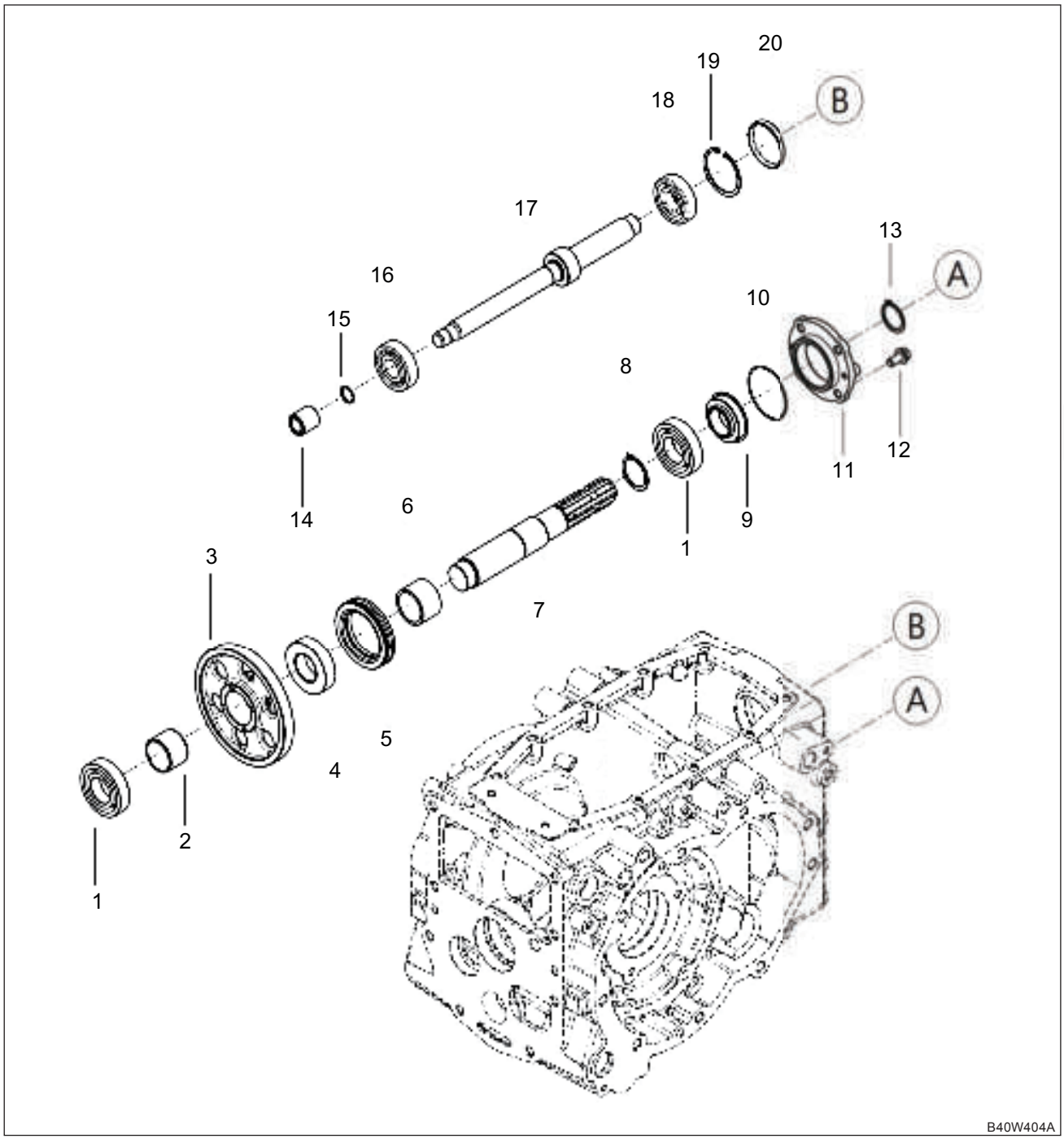
4.2 MAIN P.T.O SHAFT



COMPONENTS

(1) Joint
(2) Snap ring
(3) Snap ring
(4) Ball bearing
(5) Main PTO shaft
(6) Ball bearing
(7) Joint
(8) Snap ring
(9) Clutch hub
(10) Ball bearing
(11) PTO clutch ass'y
(12) Stop screw
(13) PTO clutch shaft
(14) Snap ring
(15) Ball bearing
(16) Seal ring
(17) Sleeve
(18) Clutch input pipe
(19) O-ring
(20) O-ring
(21) PTO valve
(22) Spring washer
(23) Hexagon socket bolt
(24) O-ring
(25) Connecter
(26) Elbow

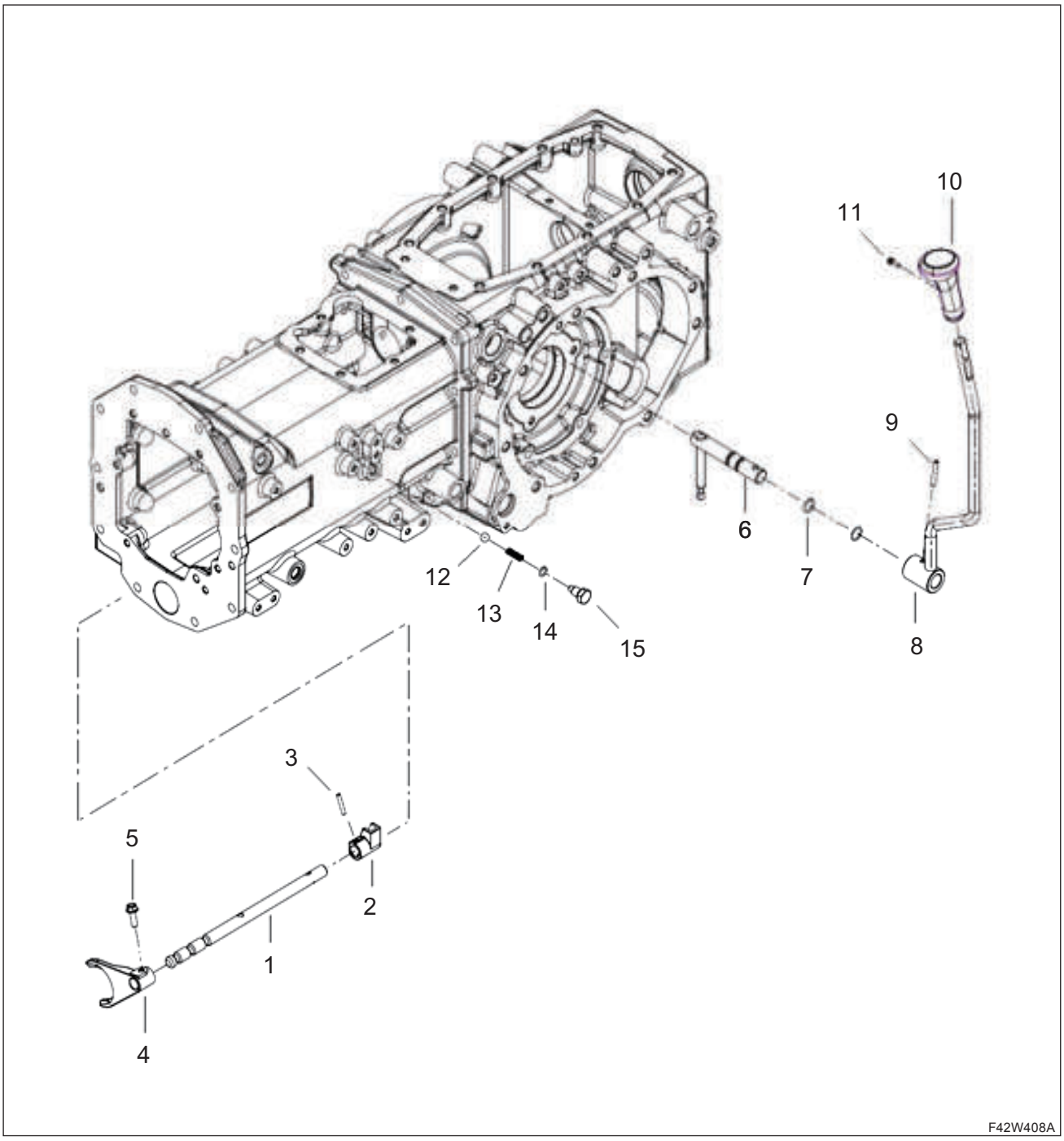
4.3 PTO DRIVE SHAFT



COMPONENTS

(1) Ball bearing
(2) Bush
(3) Gear, PTO1
(3) Gear, PTO1
(4) Hub, PTO
(5) Sleeve, PTO
(6) Spacer
(7) Shaft, PTO drive
(8) Snap ring
(9) Oil seal
(10) O-ring
(11) Cover, PTO
(12) Hex flange bolt
(13) Snap ring
(14) Joint
(15) Snap ring
(16) Ball bearing
(17) Shaft, PTO drive
(17) Shaft, PTO drive
(18) Ball bearing
(19) Snap ring
(20) Seal cap

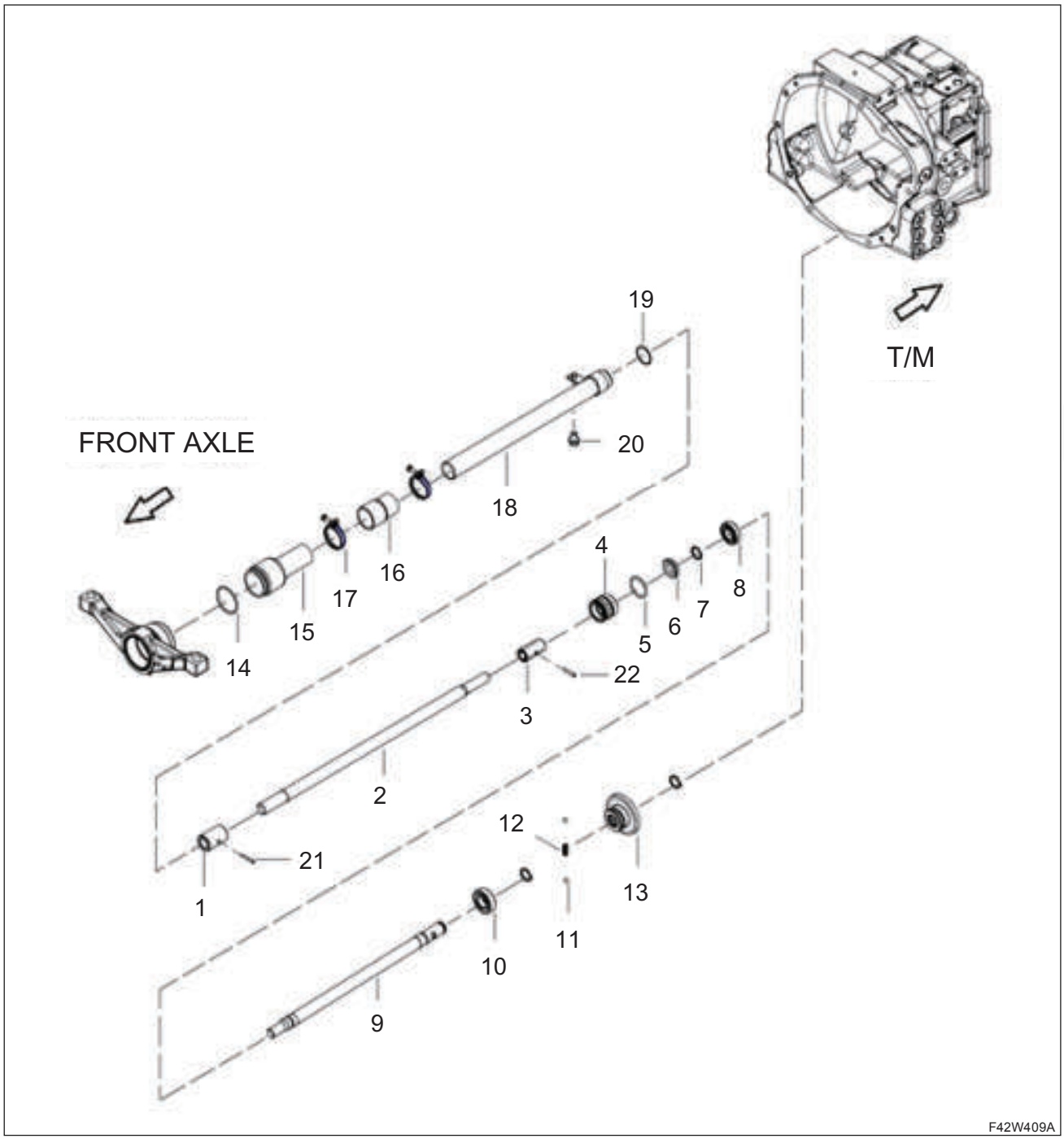
4.4 LEVER ASS'Y, RANGE SHIFT



COMPONENTS

(1) Range shift fork shaft
(2) Range shifter
(3) Spring pin
(4) Range shift fork
(5) Hex bolt w/washer
(6) Shaft, range shift
(7) O-ring
(8) Range shift lever
(9) Spring pin
(10) Range shift knob(K3)
(11) Screw
(12) Steel ball
(13) Spring
(14) O-ring
(15) Bolt

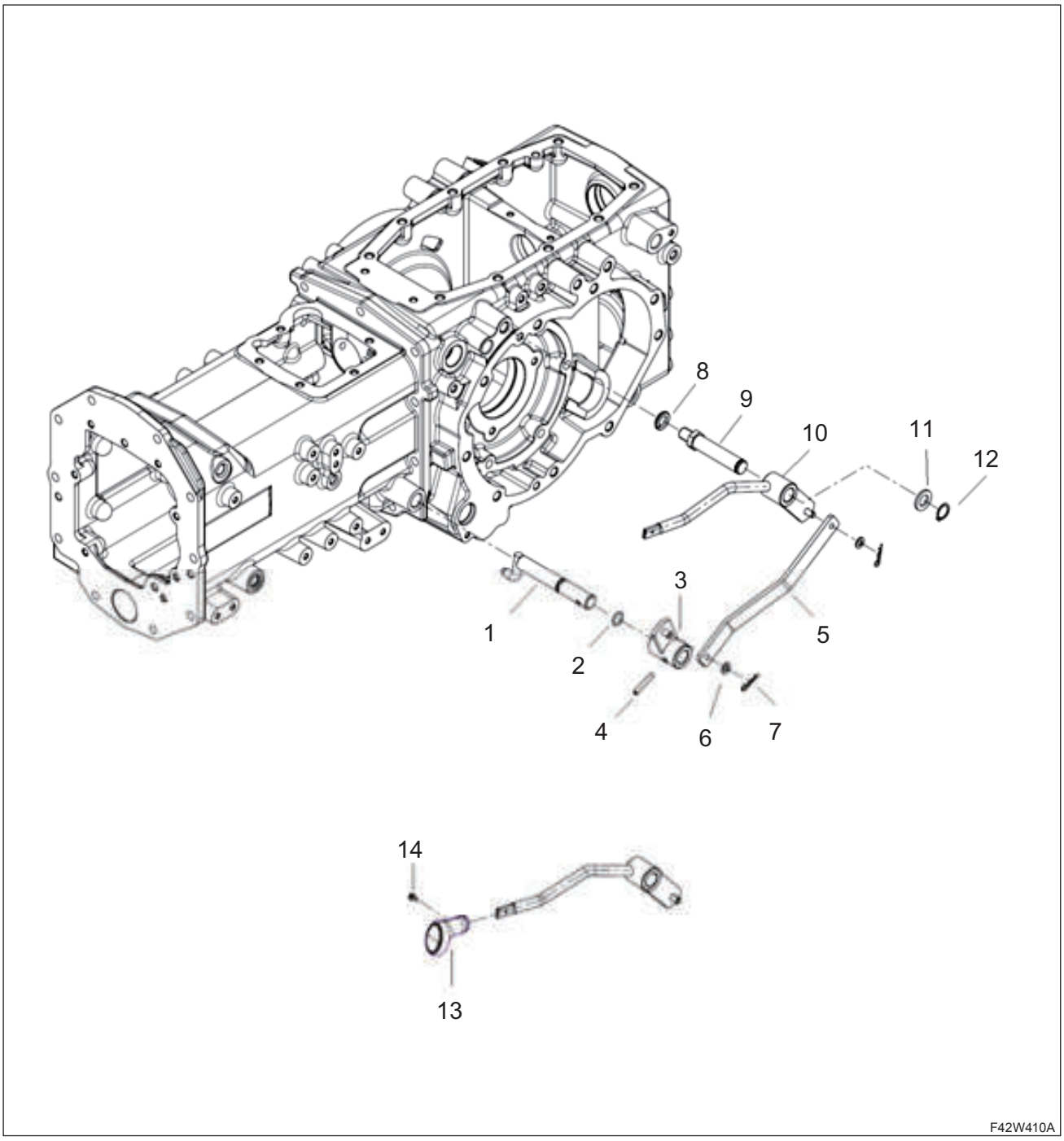
4.5 FRONT DRIVE SHAFT



COMPONENTS

(1) Couple ring R
(2) Propeller shaft
(3) 4nd drive joint
(4) Oil seal housing
(5) O-ring
(6) Oil seal
(7) Snap ring
(8) Ball bearing
(9) 4dn drive shaft
(10) Ball bearing
(11) Steel ball
(12) Spring
(13) 4dn driven gear
(14) Stop O-ring
(15) Shaft cover(front)
(16) Shaft cover boots
(17) Hose band
(18) Shaft cover(back)
(19) Stop O-ring
(20) Hex flange bolt
(21) Spring pin
(22) Spring pin

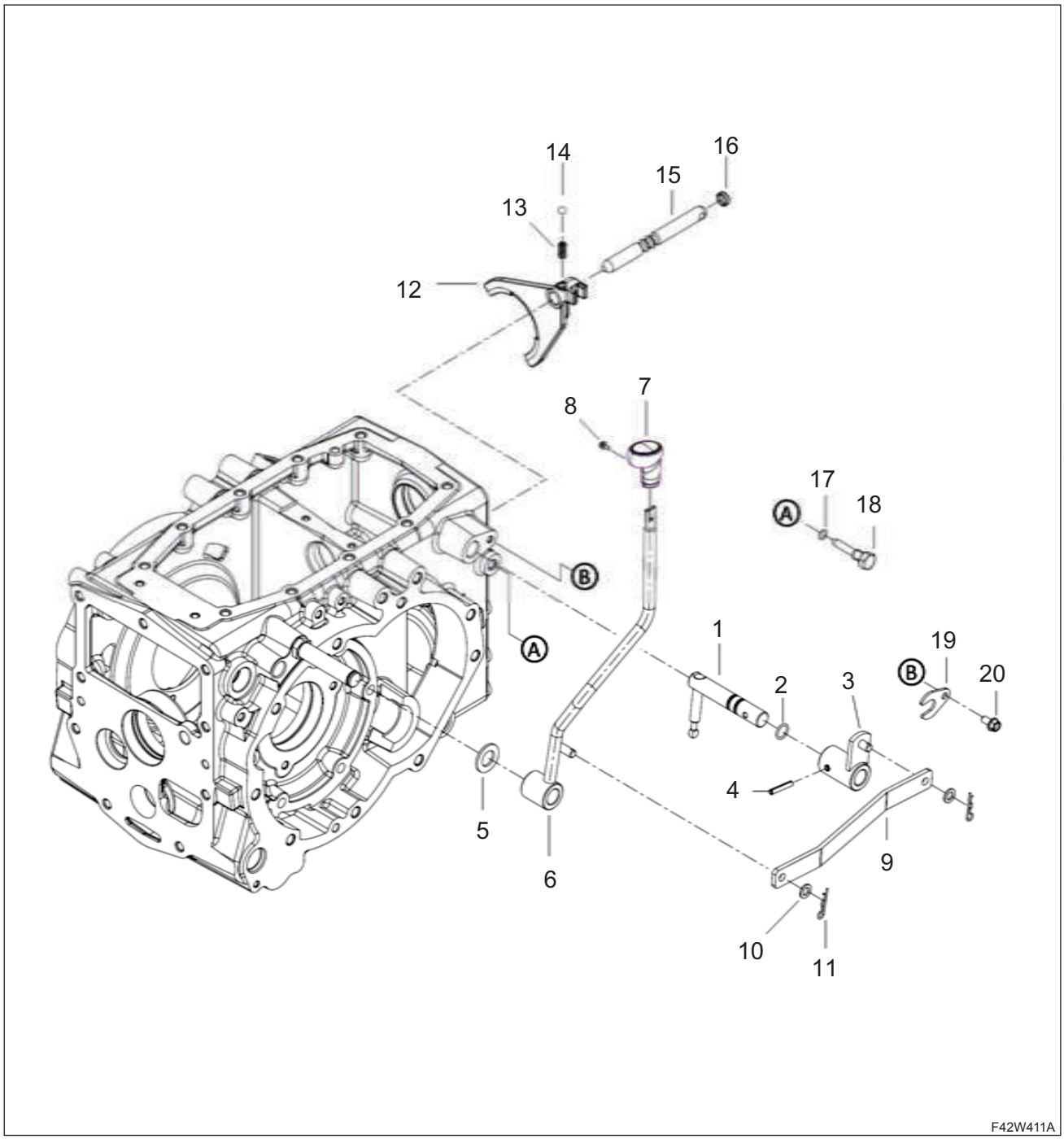
4.6 4WD LEVER



COMPONENTS

(1) 4nd lever
(2) O-ring
(3) Front wheel shift arm
(4) Spring pin
(5) 4nd lever link
(6) Washer
(7) Snap pin
(8) Spring washer
(9) PTO lever shaft
(10) 4nd lever
(11) Washer
(12) Snap ring
(13) Front wheel drive knob ass'y
(14) Screw

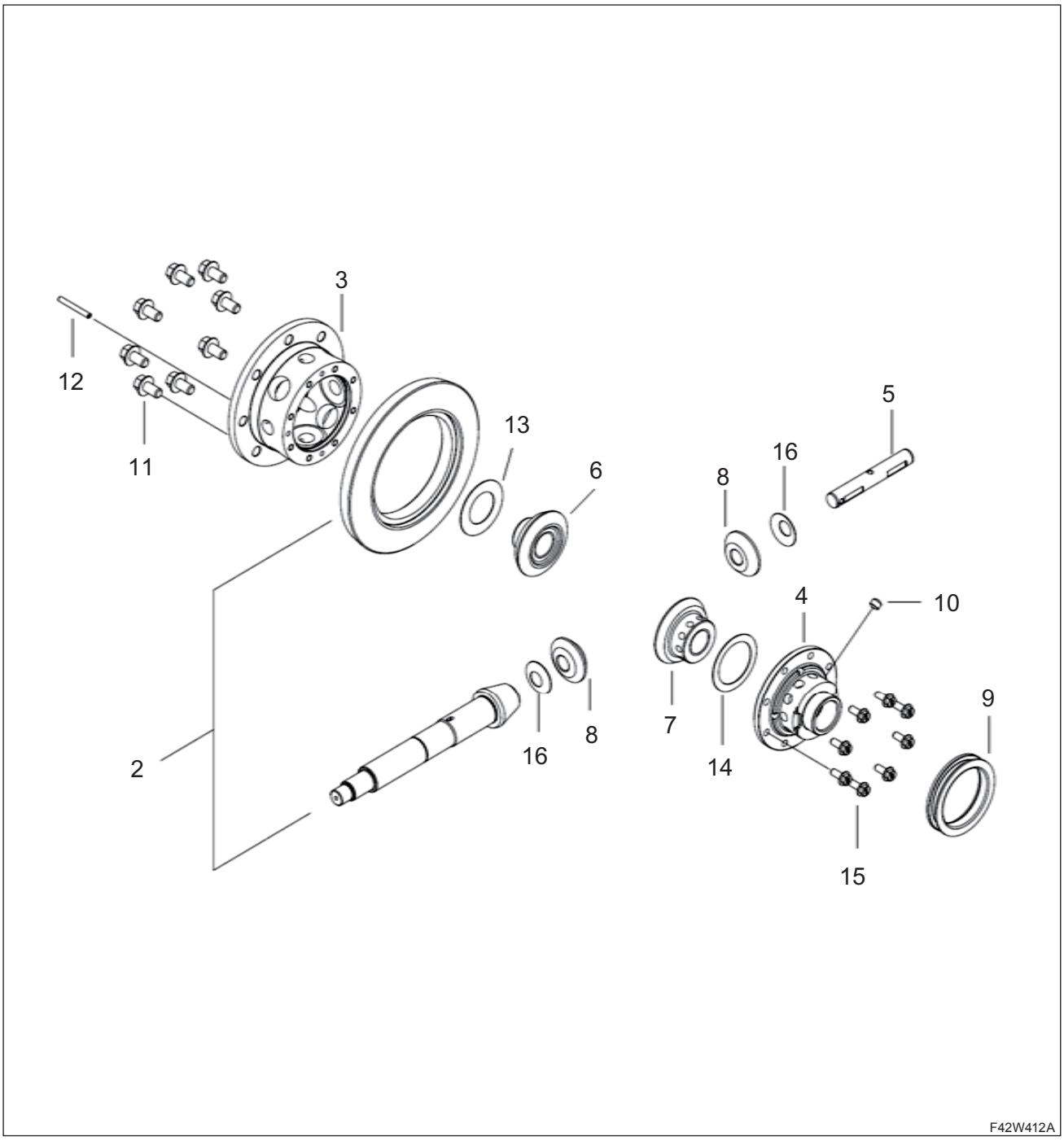
4.7 FORK & LEVER, PTO



COMPONENTS

(1) Shaft, PTO change
(2) O-ring
(3) Change arm, PTO
(4) Spring pin
(5) Washer
(6) PTO change lever
(7) PTO knob ass'y
(8) Screw
(9) PTO lever link
(10) Washer
(11) Snap pin
(12) PTO fork
(13) Spring
(14) Steel ball
(15) PTO fork shaft
(16) Seal cap
(17) O-ring
(18) Stop bolt
(19) Plate
(20) Hex flange bolt

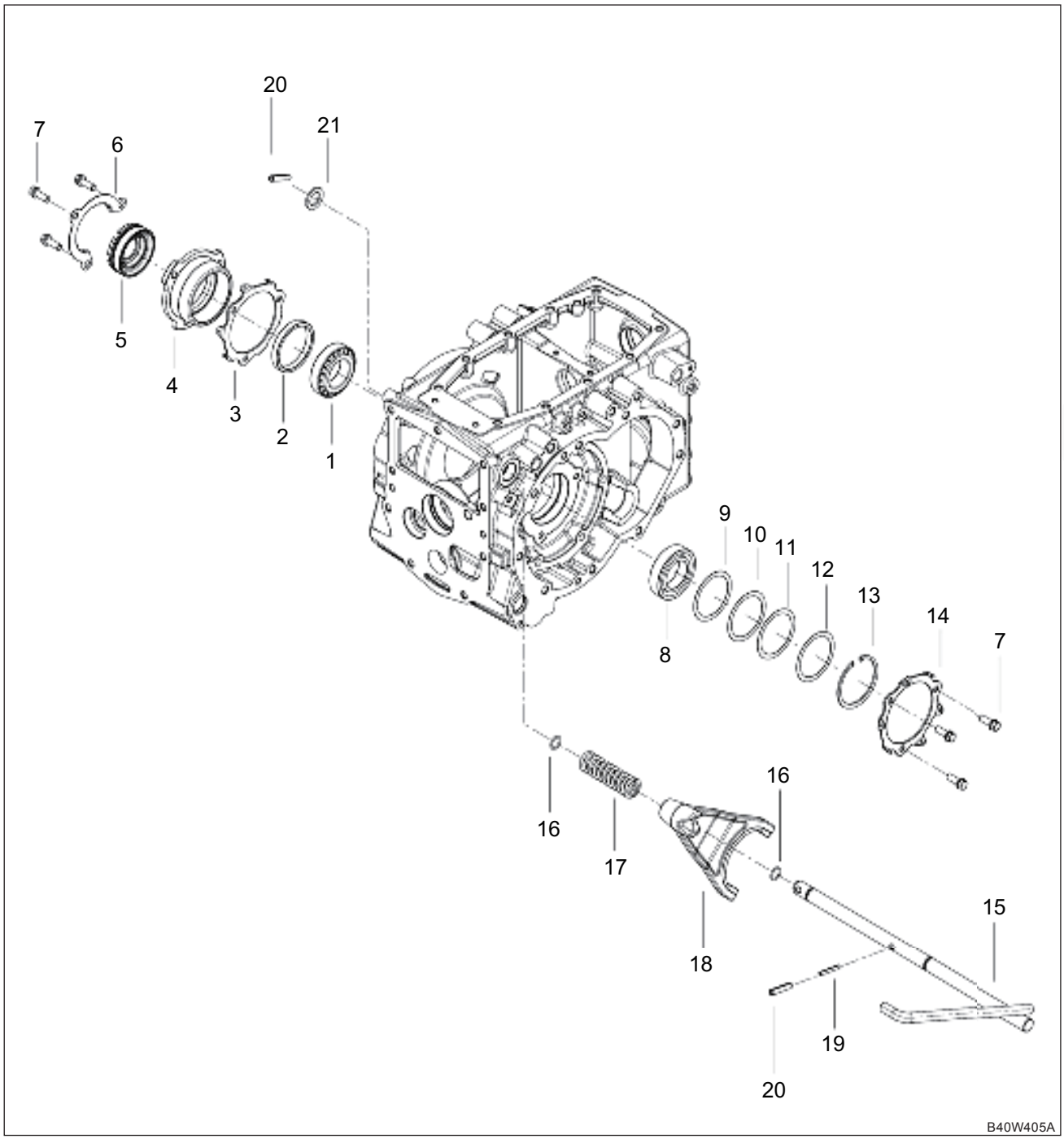
4.8 RING GEAR & DIFF.GEAR ASS'Y



COMPONENTS

(1) Differential ass'y
(2) Ring gear ass'y
(3) Differential case(right)
(4) Differential case(left)
(5) Differential shaft
(6) Differential side gear r
(7) Differential side gear l
(8) Pinion, differential
(9) Differential stop slider
(10) Roller
(11) Bolt
(12) Spring pin
(13) Thrust washer
(14) Washer
(15) Bolt
(16) Thrust washer

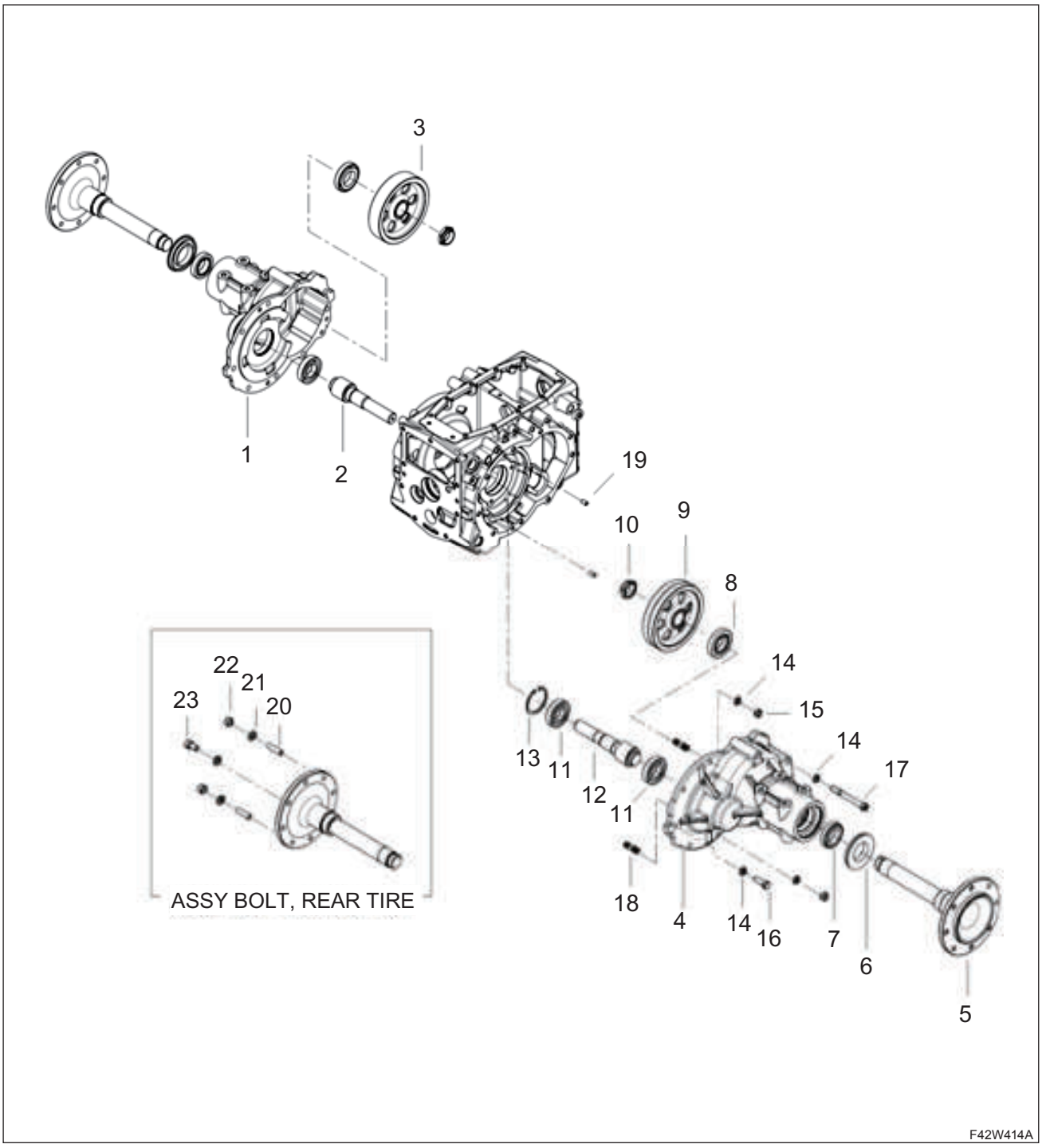
4.9 DIFFERENTIAL



COMPONENTS

(1) Taper roller bearing
(2) Spacer
(3) Spring holder
(4) Bearing support
(5) Screw
(6) Stop plate
(7) Washer ass'y hex bolt
(8) Ball bearing
(9) Shim
(10) Shim
(11) Shim
(12) Shim
(13) Snap ring
(14) Spring holder
(15) Differential pedal
(16) O-ring
(17) Differential spring
(18) Differential fork
(19) Spring pin
(20) Spring pin
(21) Plain washer

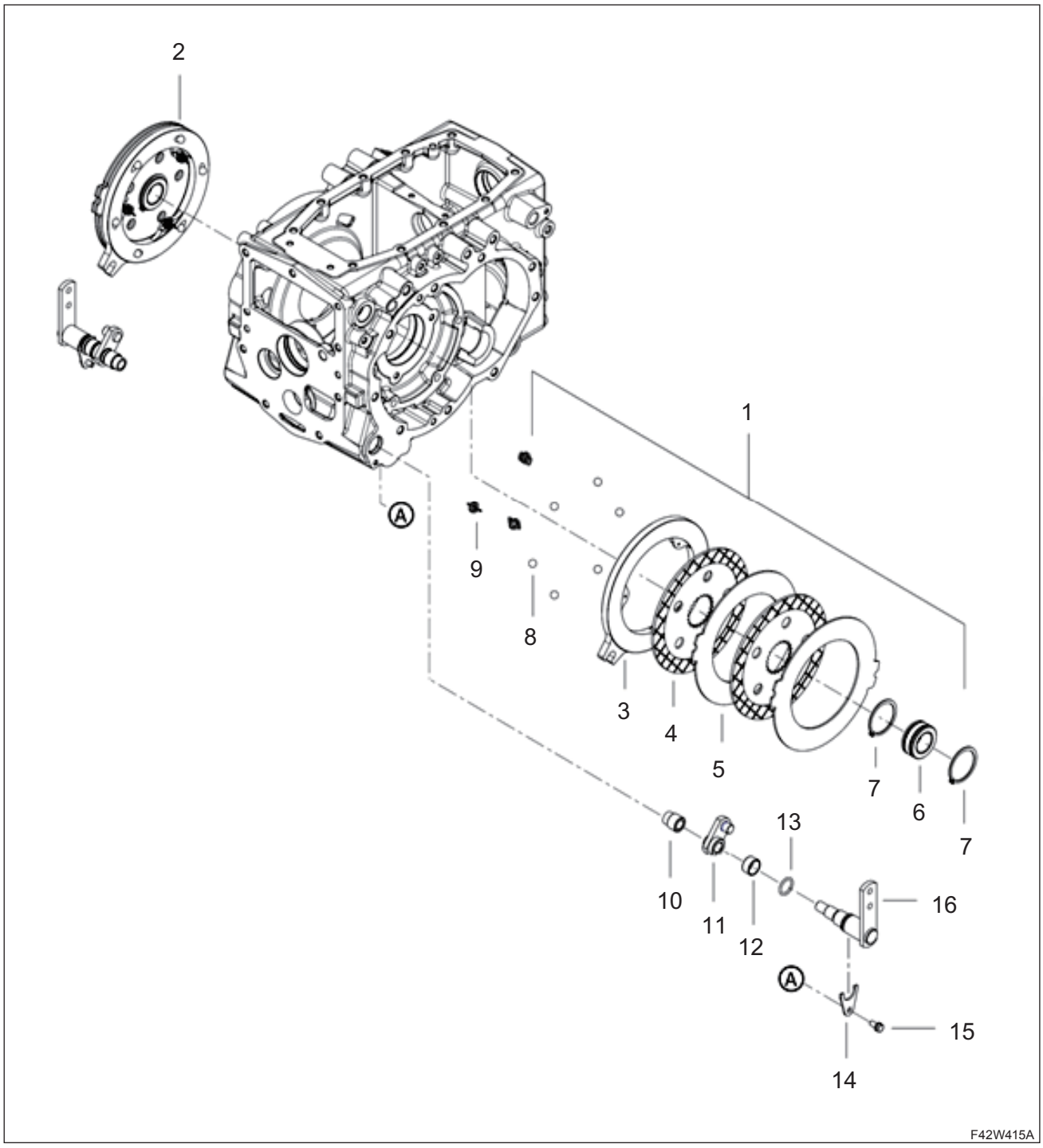
4.10 DRIVING PART, REAR AXLE



COMPONENTS

(1) Housing, rear axle(right)
(2) Final pinion (right)
(3) Final gear (right)
(4) Housing, rear axle(left)
(5) Rear axle
(6) Oil seal
(7) Taper roller bearing
(8) Taper roller bearing
(9) Final gear (left)
(10) Rock nut
(11) Ball bearing
(12) Final pinion (left)
(13) Snap ring
(14) Spring washer
(15) Hex nut
(16) Bolt
(17) Bolt
(18) Stud bolt
(19) Pin
(20) Stud bolt
(21) Washer
(22) Hex nut
(23) Bolt

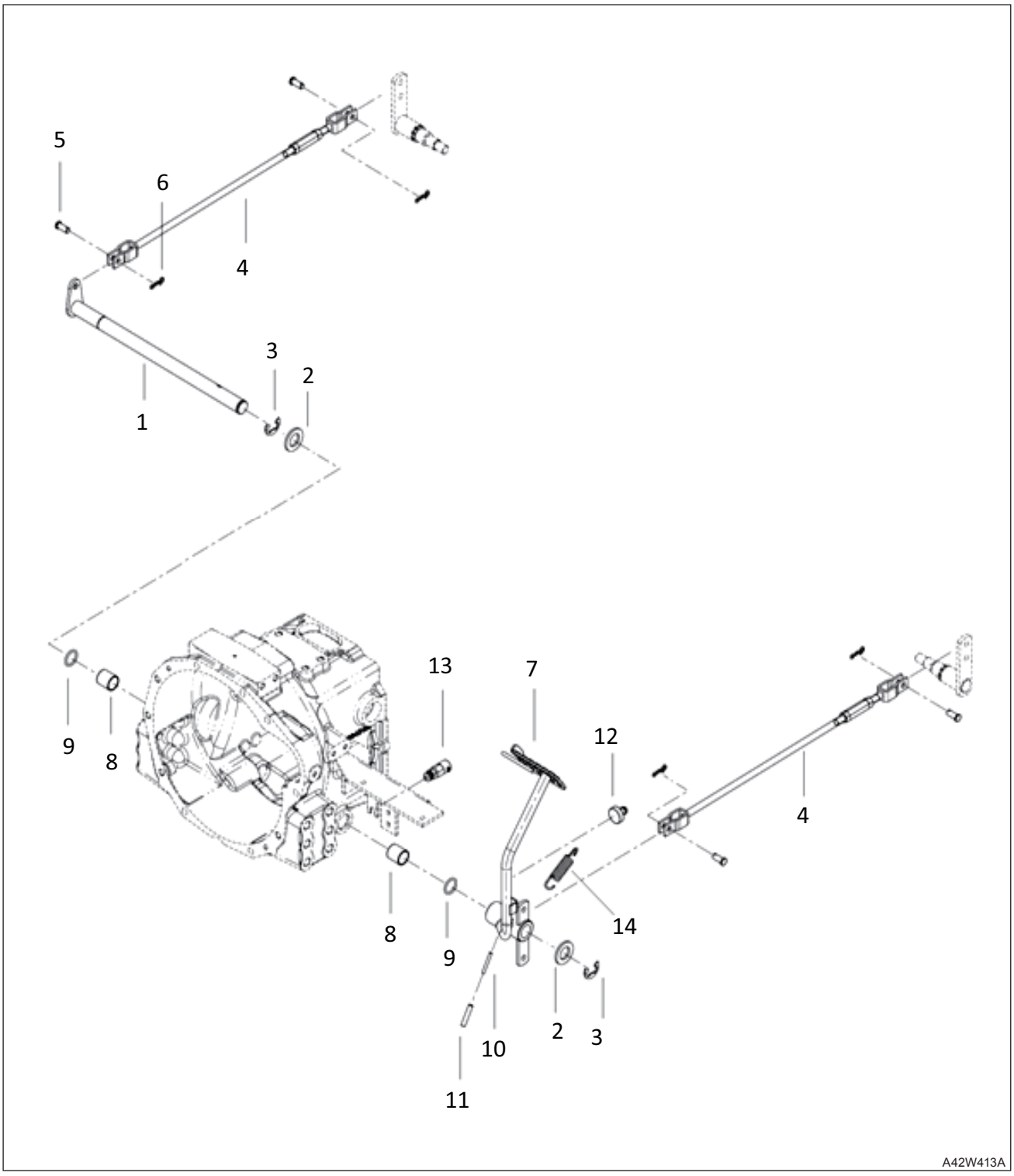
4.11 BRAKE



COMPONENTS

(1) Brake ass'y (left)
(2) Brake ass'y (right)
(3) Cam plate (left)
(3) Cam plate (right)
(4) Disk
(5) Pressure plate
(6) Boss
(7) Snap ring
(8) Steel ball
(9) Spring
(10) Brake lever bush
(11) Brake inside arm
(12) Dry bush
(13) O-ring
(14) Plate
(15) Hex bolt w/washer
(16) Brake lever

4.12 BRAKE PEDAL



COMPONENTS

(1) Brake shaft ass'y
(2) Washer
(3) Snap ring
(4) Brake rod ass'y
(5) Pin
(6) Snap pin
(7) Brake pedal
(8) Dry bush
(9) O-ring
(10) Spring pin
(11) Spring pin
(12) Rubber stopper
(13) Stop lamp switch
(14) Return spring

5. DISASSEMBLY AND SERVICE

ROPS MODEL

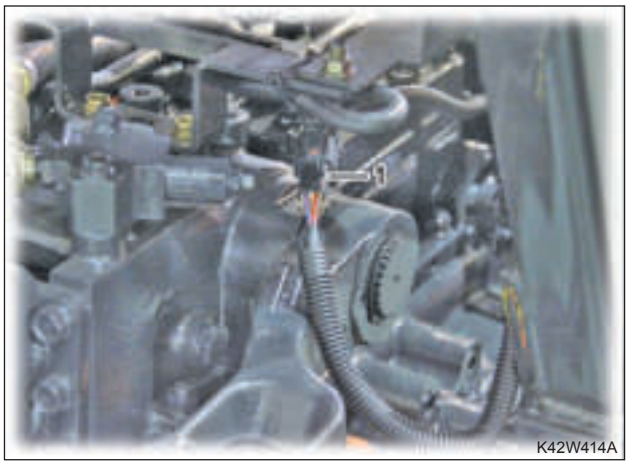
5.1 CLUTCH HOUSING REMOVAL

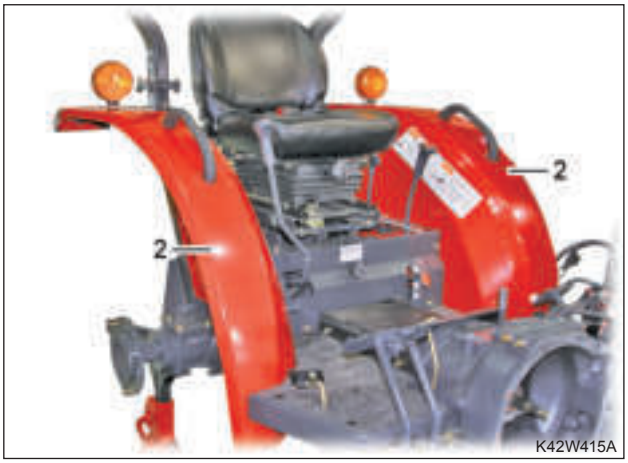
1. Remove the engine assembly.

2. Remove the dashboard (R, L)(1) and instrument panel cover (2).

3. Remove the bonnet hinge assembly (1).

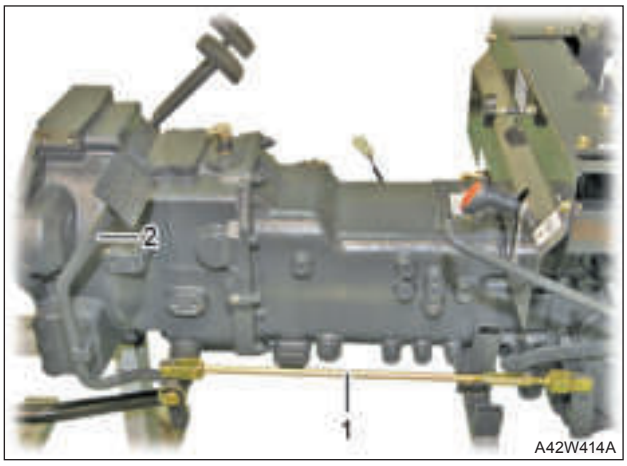
4. Remove the steering column assembly (1).





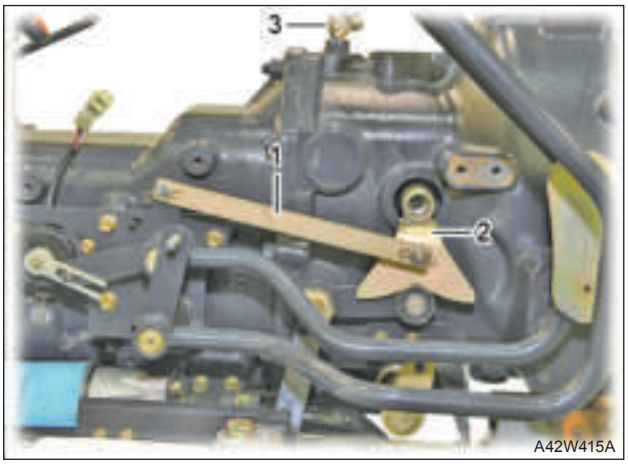
5. Disconnect the combination lamp wiring connector (1) and remove the fender assembly (2)(LH, RH).

6. Remove the footstep (1) and fuel tank (2).

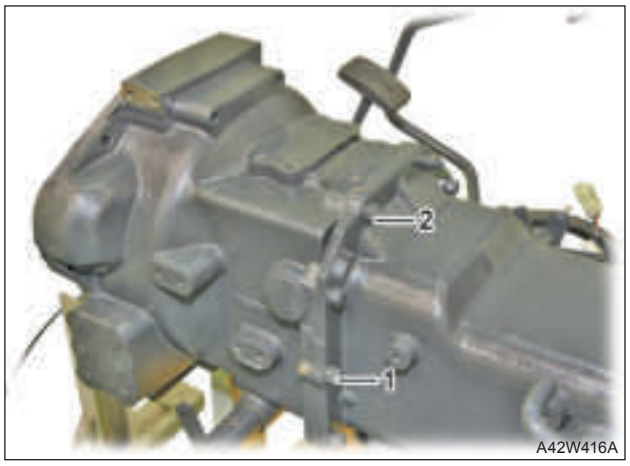


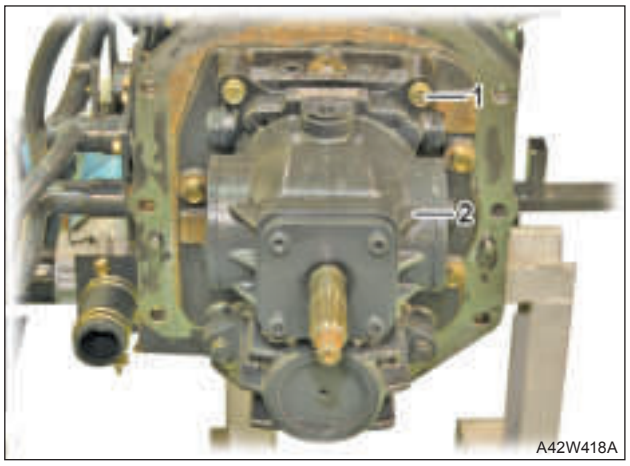
8. Remove the brake rod (1), brake pedal (2).

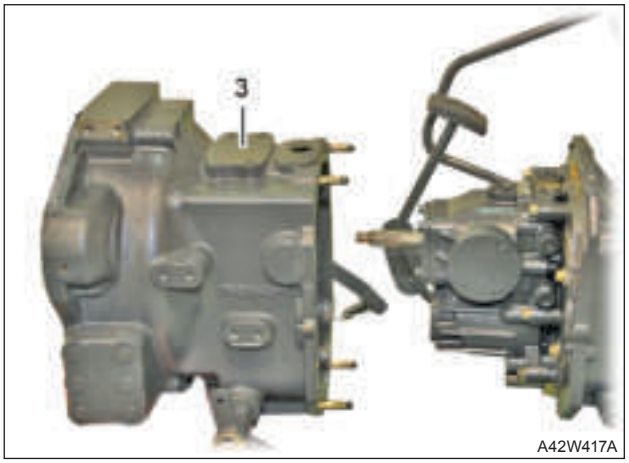
7. Remove the transmission case cover (1), floor mat (2)(LH, RH), dust cover assembly (3).

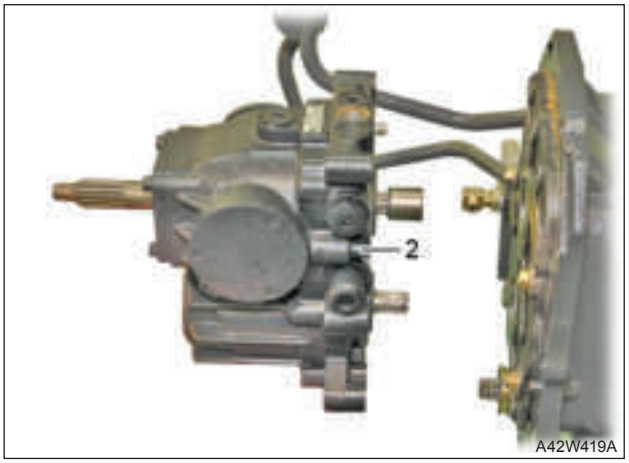


9. Remove the HST arm connecting plate (1), HST arm (2) and elbow (3).

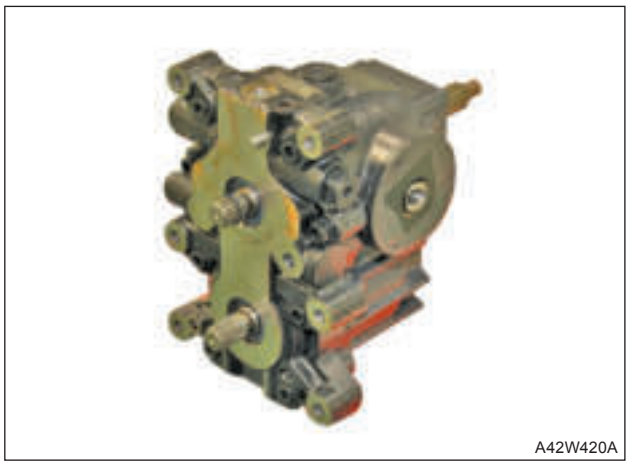








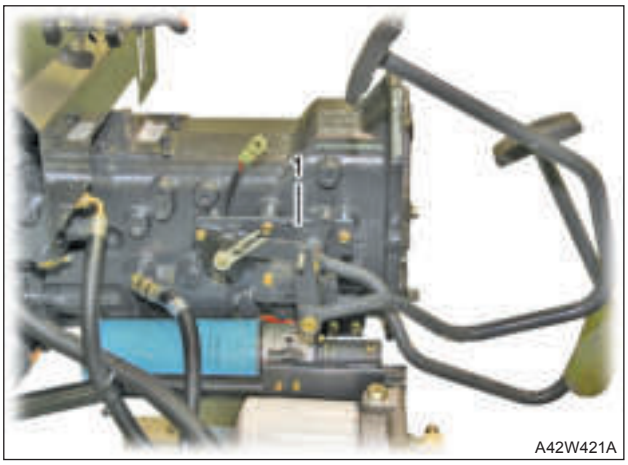
10. Unscrew the clutch housing & transmission case mounting bolts (1)(6EA) & nuts (2)(4EA) and remove the clutch housing (3).



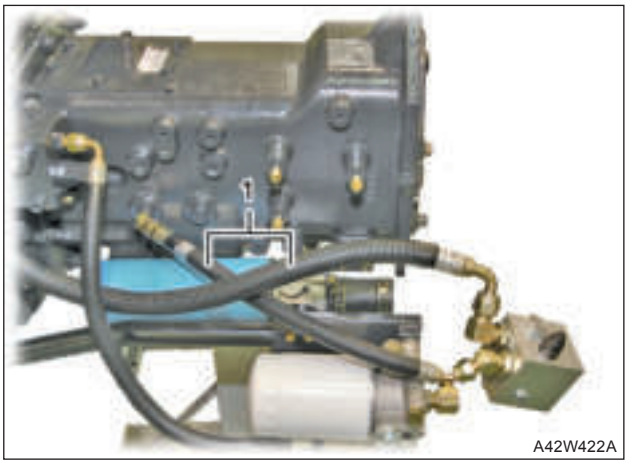
11. Unscrew the HST mounting bolts (1)(6EA) and remove the HST (2) from the transmission case.

5.2 TRANSMISSION CASE ASSEMBLY DISASSEMBLY

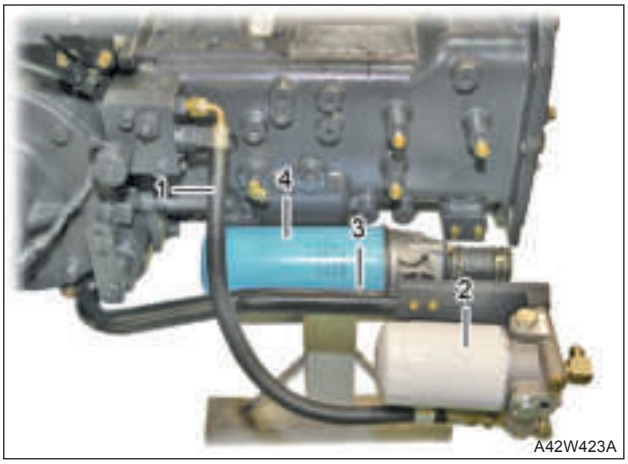
1. Remove the clutch housing assembly.
2. Remove the HST assembly.



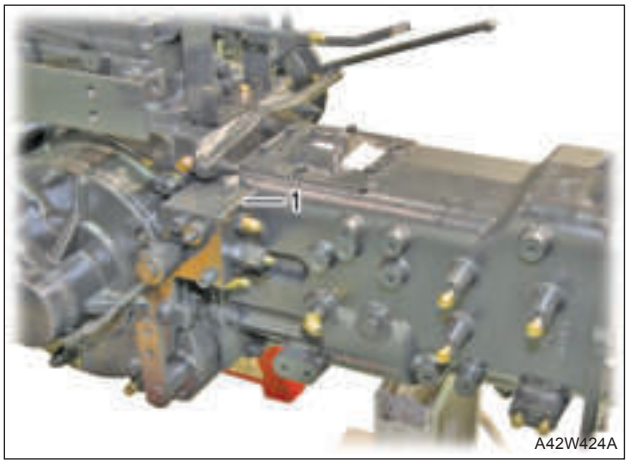
3. Remove the HST pedal pedal assembly (1).

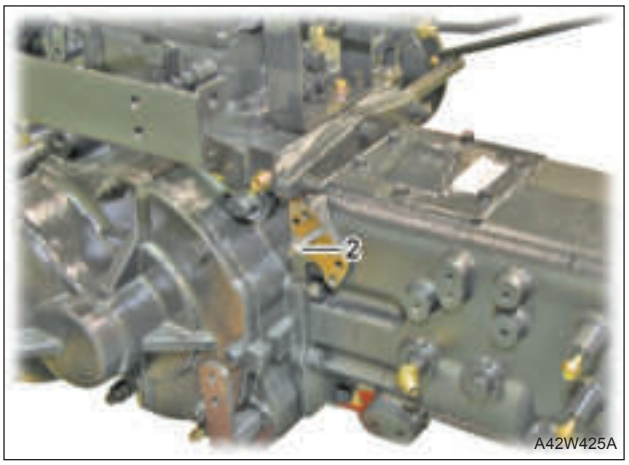


4. Remove the high pressure hose (1) of front outlet valve.

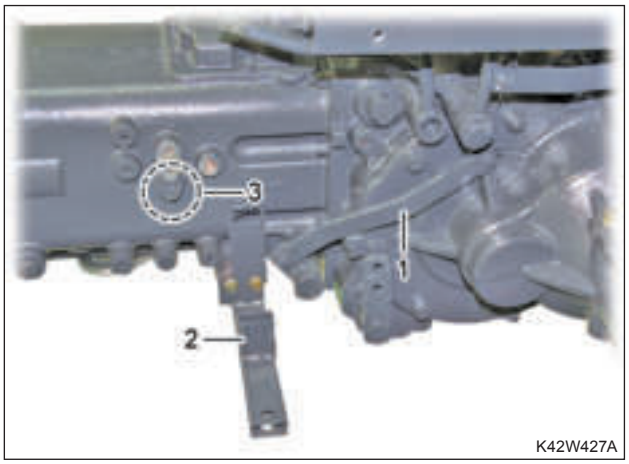


5. Remove the PTO valve hydraulic hose (1), HST filter (2), hydraulic oil suction pipe (3) and hydraulic filter (4).

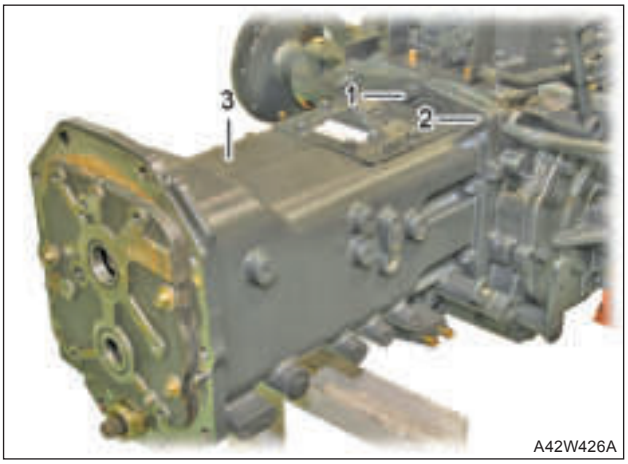




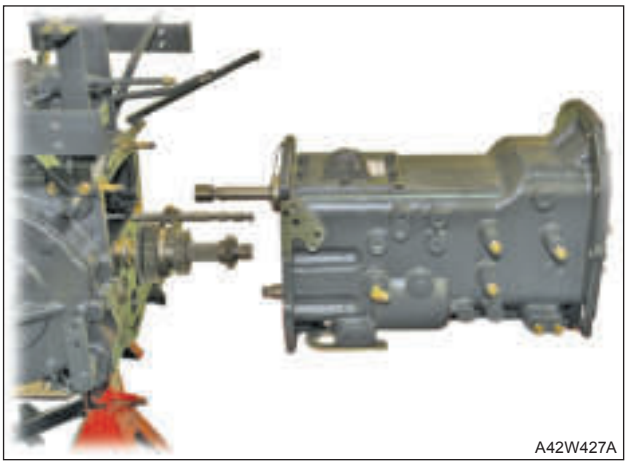
6. Remove the PTO valve(1) and disconnect the PTO clutch input pipe (2).



7. Remove the 4WD lever link (1) and fuel tank rear supporter (2). Then, unscrew the plug (3) to remove the spring and steel ball from in the hole.



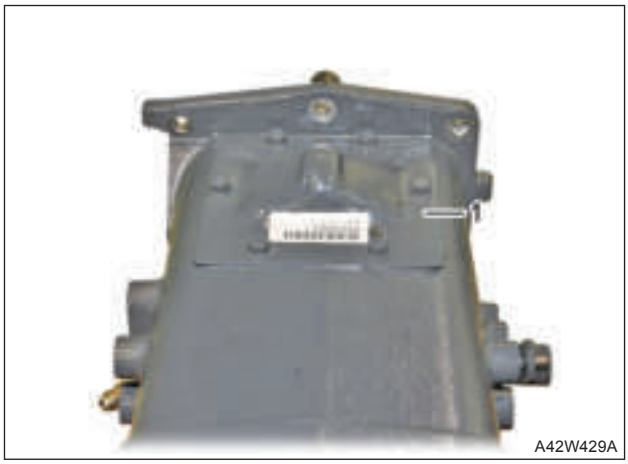
A42W426A


A42W427A


A42W428A

8. Unscrew the rear axle case & transmission case mounting bolts (1)(7EA) & nuts (2)(2EA) to remove the transmission case assembly (3).

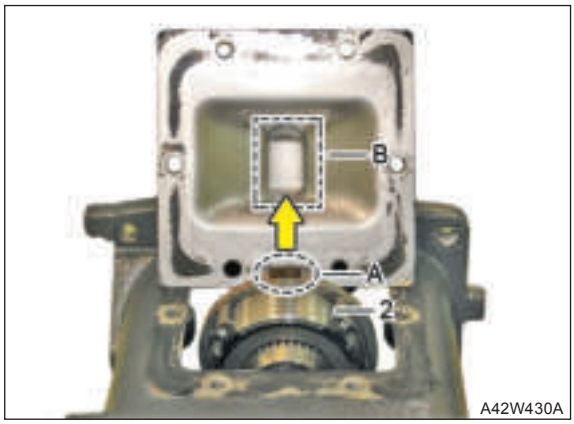
5.3 TRANSMISSION CASE ASSEMBLY COMPONENTS DISASSEMBLY



A42W429A

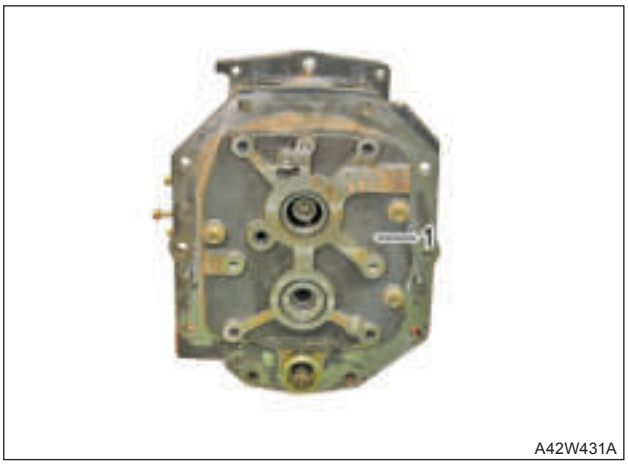
1. Remove the PTO clutch cover (1).

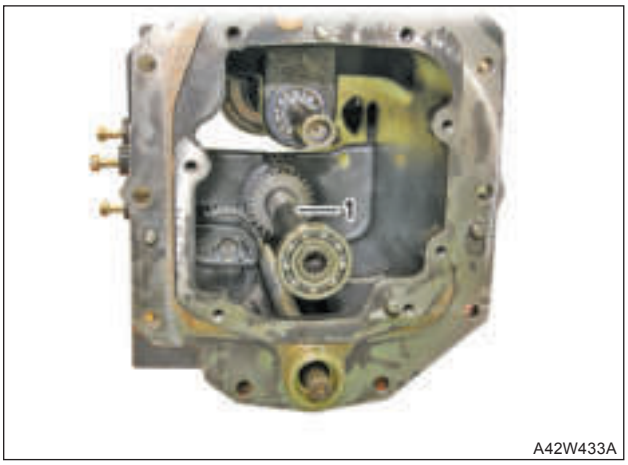
Notes

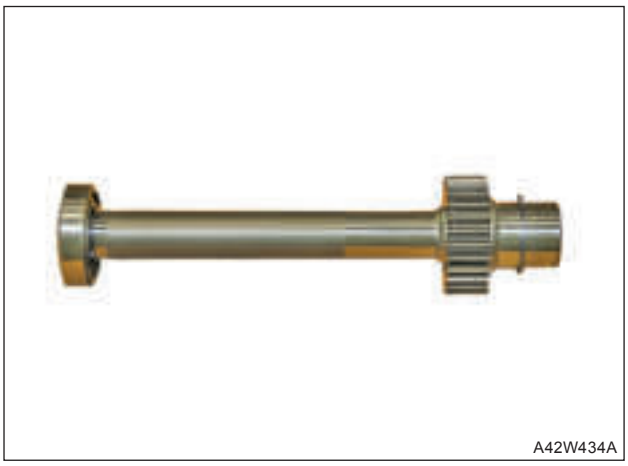


A42W430A

- **When installing the PTO clutch cover, set the brake plate protrusion (A) of the PTO clutch pack into the groove of the case.**
- **The brake plate (2) of the PTO clutch pack is set apart from the PTO clutch and fixed into the groove while the rear PTO is in operation. Only the PTO clutch pack body is rotated in this state. When the rear PTO is turned off in this state, the PTO clutch pack stops rotating as well. However, it may be rotated further by inertia of the rotating rear implement. To prevent such rotation by inertia, the PTO clutch is equipped with the brake plate. The brake plate is combined with the PTO clutch pack by compression of the piston returned by the internal spring when the PTO clutch is disengaged.**

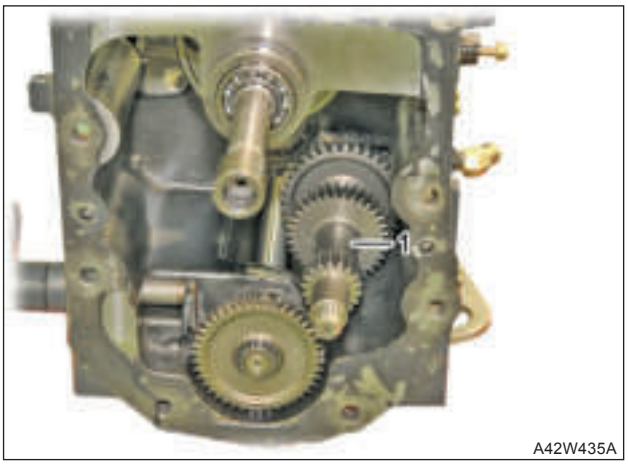




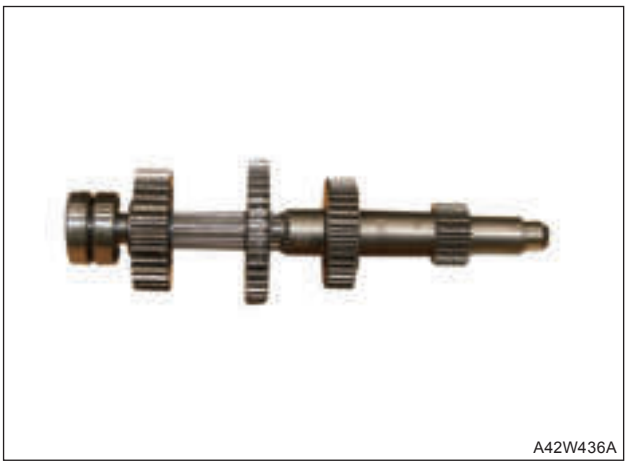


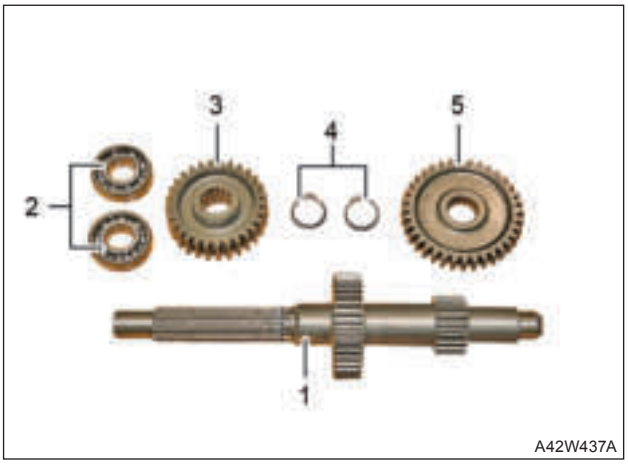
2. Remove the plate (1).

3. Remove the range shift drive shaft (1).



A42W435A

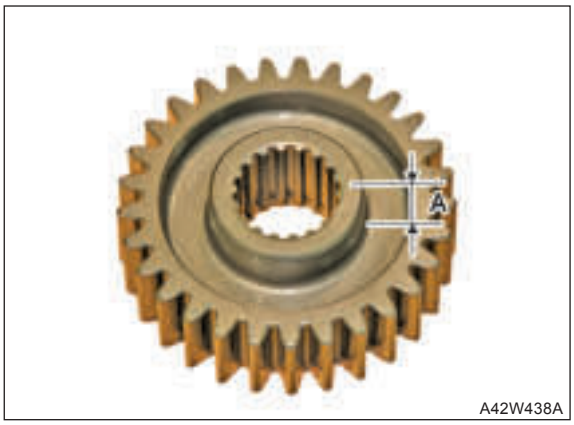

A42W436A



A42W437A

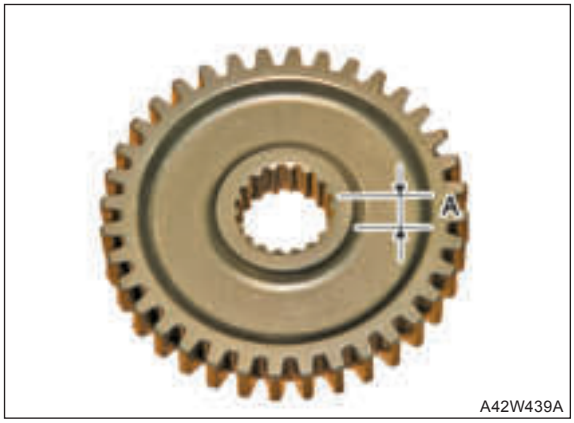
4. Remove the range shift drive gear shaft (1), ball bearing (2), range shift drive gear [29T] (3), snap ring (4) and range shift (C) drive gear [36T] (5) from the range shift drive gear shaft in order.

Notes



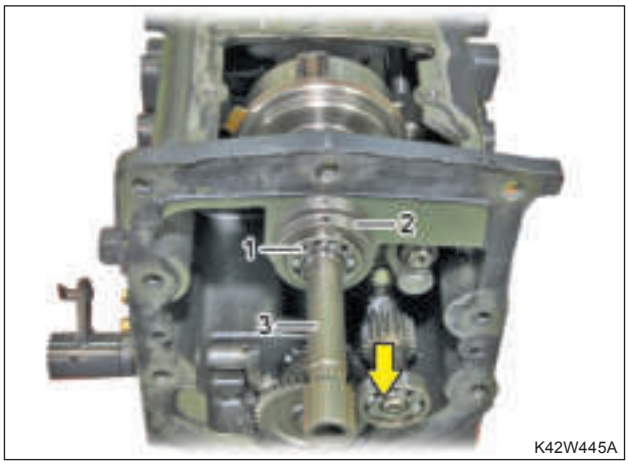
A42W438A

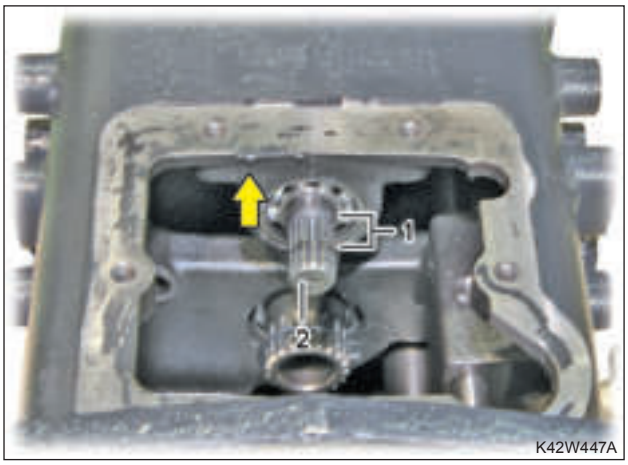
1. During the range shift drive gear installation, make sure that the higher part of boss (A) section toward ball bearing side.

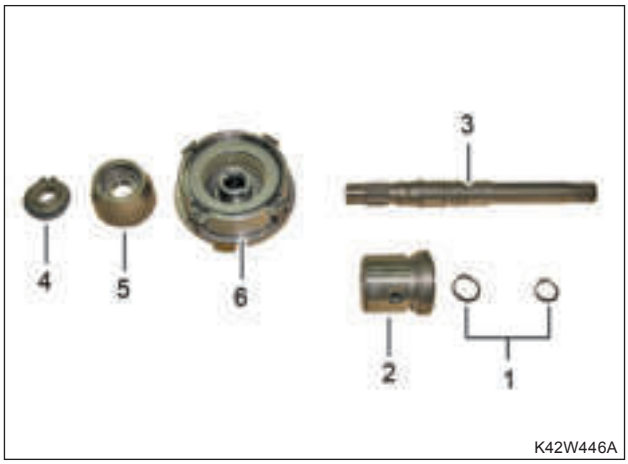


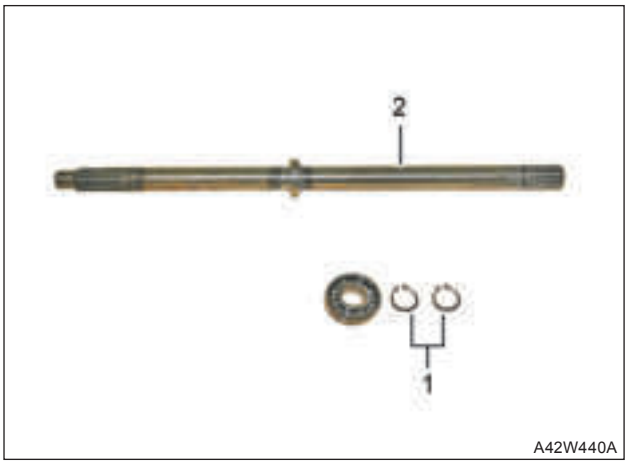
A42W439A

2. During the range shift C drive gear installation, make sure that the lower part of boss (A) section toward ball bearing side.







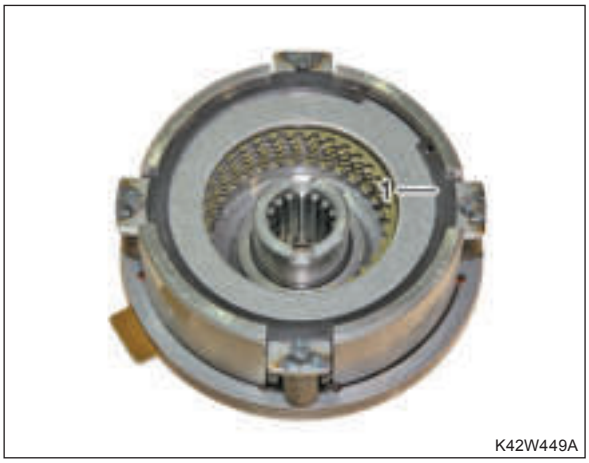


5. Remove the PTO clutch shaft snap ring (1) and sleeve (2). Then, remove the PTO clutch shaft (3), joint (4), clutch hub (5) PTO clutch assembly (6) simultaneously.

6. Remove the main PTO shaft snap ring (1)(2EA) and main PTO shaft (2).

Notes

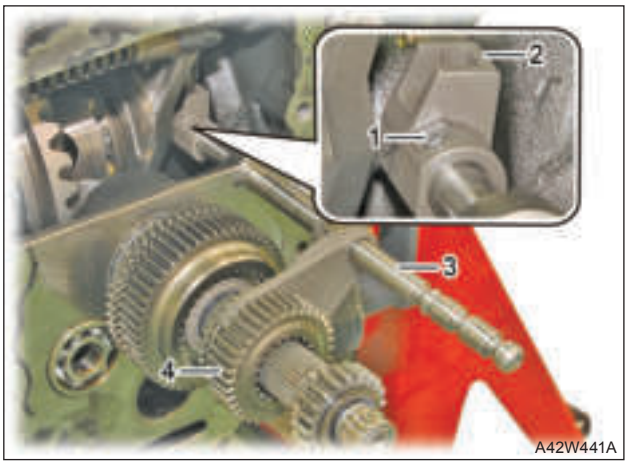
▶ **PTO CLUTCH PACK COMPONENTS DISASSEMBLY**



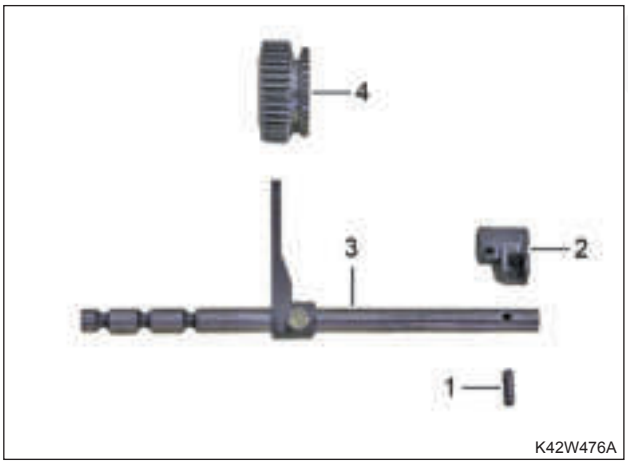
K42W449A


K20W4A05

- **Pull out the stop ring (1) and remove the spring, pressure plate, plate, disc, brake, piston, case.**

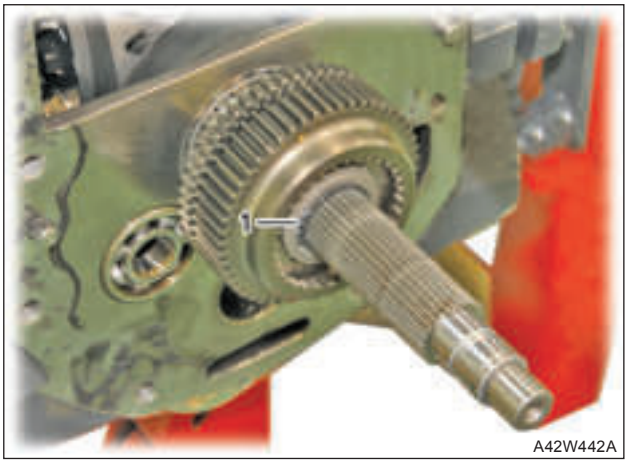


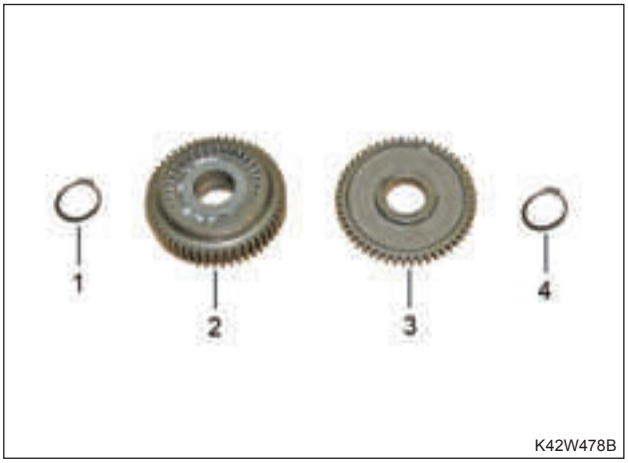
A42W441A



K42W476A

7. Pull out the spring pin (1) and remove the range shift shifter (2). Then, remove the range shift fork shaft (3) and range shift driven gear 2nd (4) simultaneously.

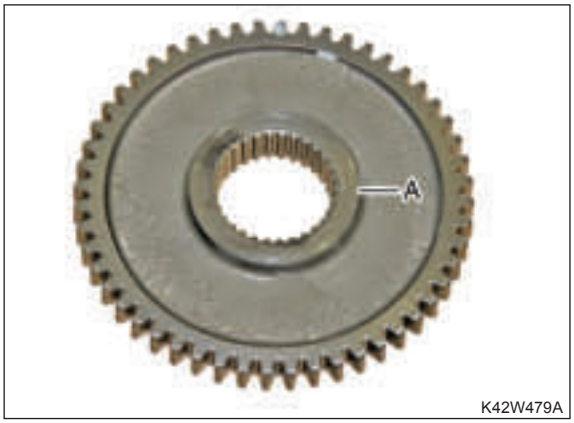




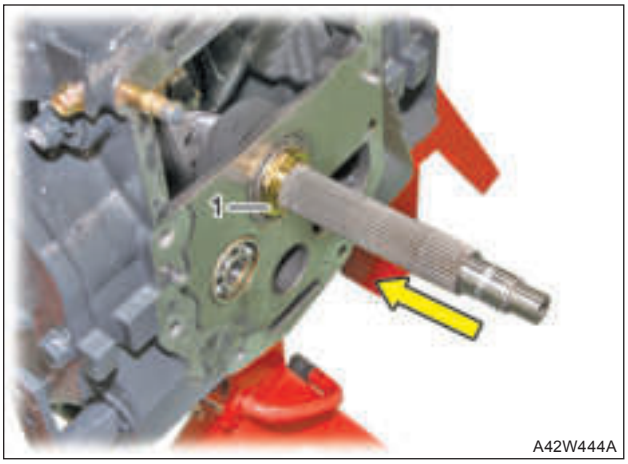
8. Pull out the snap ring (1) and remove the range shift drive gear 1st (2), 4WD gear (3) and snap ring (4).

9. Remove the needle bearing (1), snap ring (2), spacer (3), range shift C drive gear (4), range shift drive gear 2nd (5), snap ring (6), range shift drive gear 1st (7), 4WD gear (8) and snap ring (9) from the counter shaft in order.

Notes



- **When installing the 4WD gear, its higher boss (A) should face the range shift drive gear 1st.**

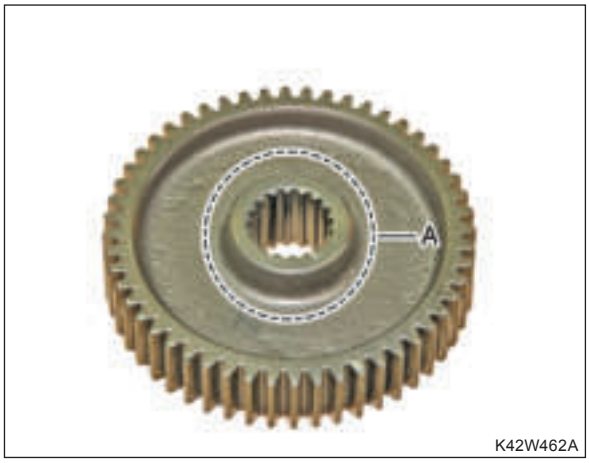


10. Unfold the caulking part of the counter shaft mounting nuts (1) to unscrew the mounting nuts. Then, remove the counter shaft in the rear axle case by tapping outside direction. (Remove the differential system assembly first)

Mounting nut
tightening torque .....78.4 ~ 98 N.m
8 ~ 10 kgf.m
57.6 ~ 72 lb.ft

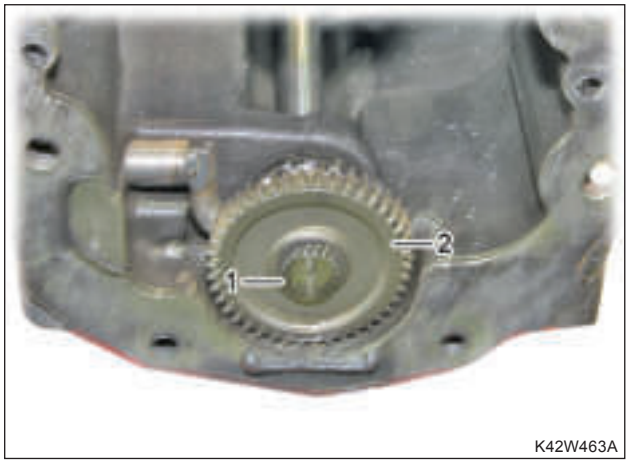
Notes

▶ **MAIN SHIFT DRIVE SHAFT DISASSEMBLY**

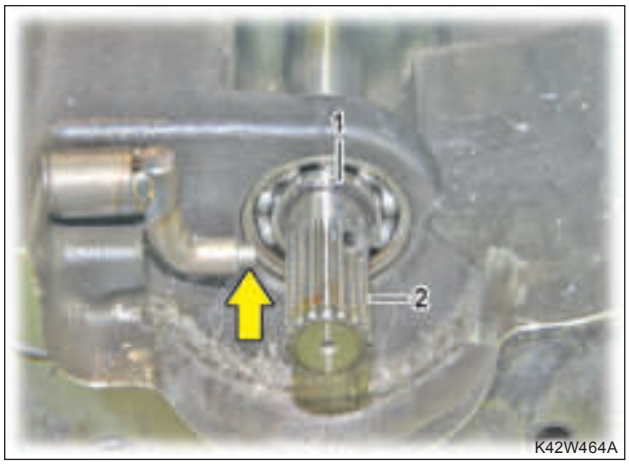


- **When installing the range shift drive gear, its long boss (A) should face the clutch housing.**

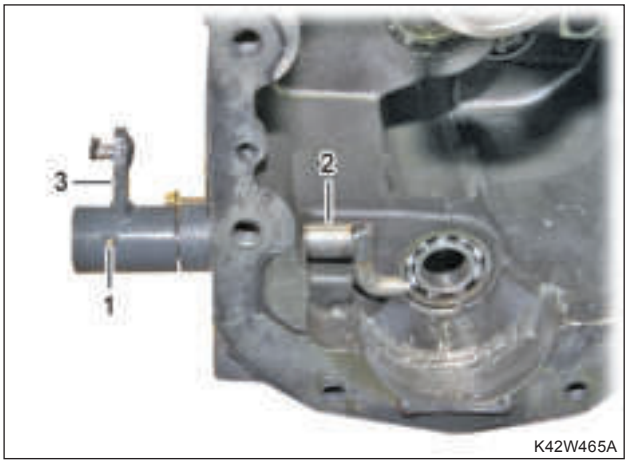
5.3.1 4WD SHAFT DISASSEMBLY

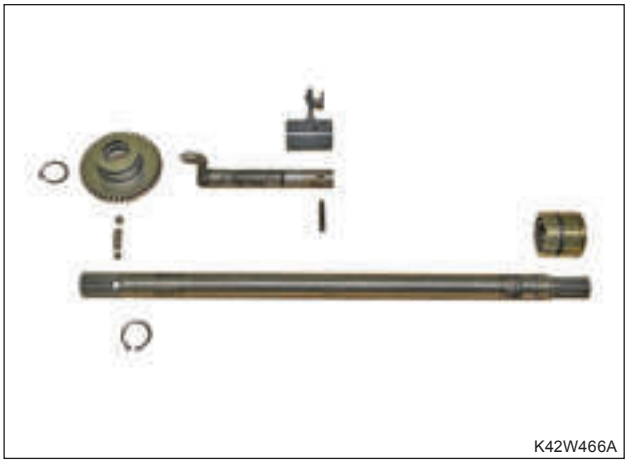


1. Pull out snap ring (1) and remove the 4WD gear (2).



2. Pull out snap ring (1) and remove the 4WD shaft (2), oil seal housing in the clutch housing side direction.

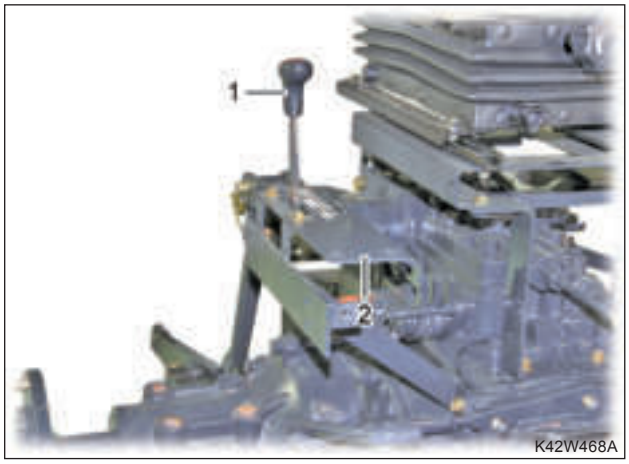




3. Remove the spring pin (1) from the outside of the transmission case, 4WD lever (2) and front wheel shift arm (3).

5.4 REAR AXLE CASE DISASSEMBLY

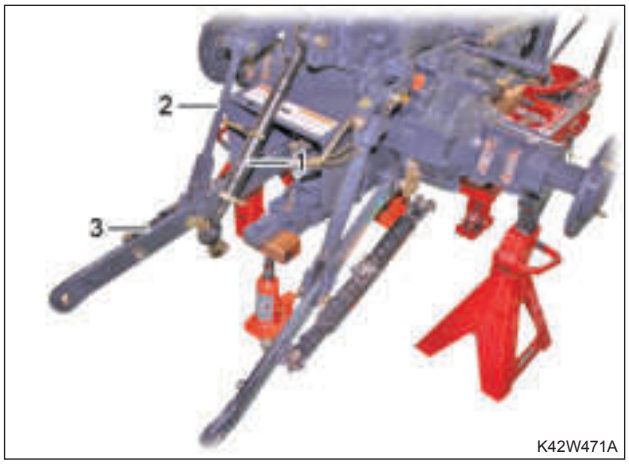
1. Remove the ROPS (1).



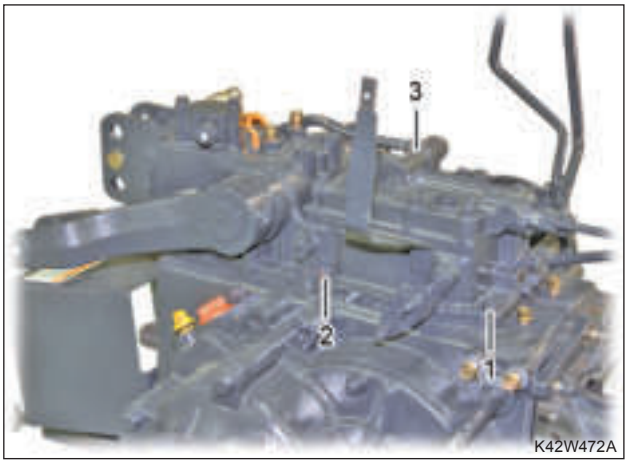
2. Remove the position control knob (1) and lever cover (2).

3. Remove the range shift lever knob (1), PTO lever knob (2) and lever cover (3).

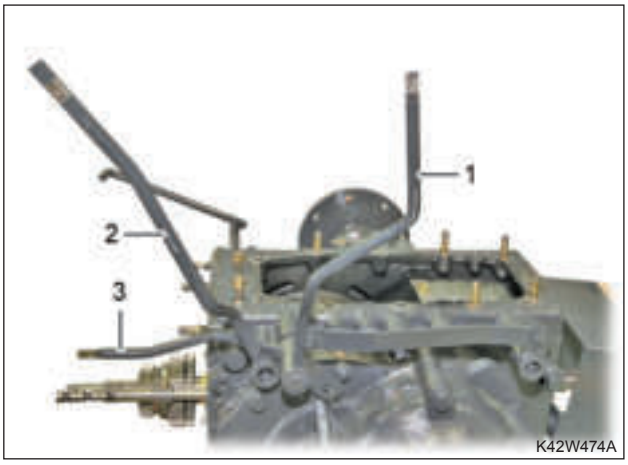
4. Unscrew the seat bracket mounting bolts (1)(4EA) and remove the seat bracket (2) and seat (3) simultaneously.



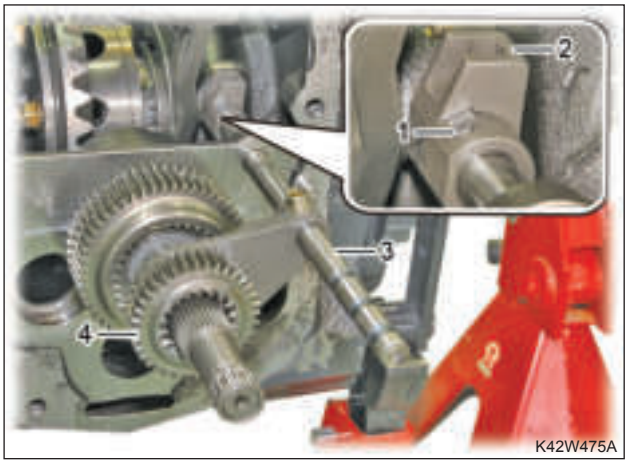
5. Remove the top link (1), lift link assembly (2) and lower link (3).

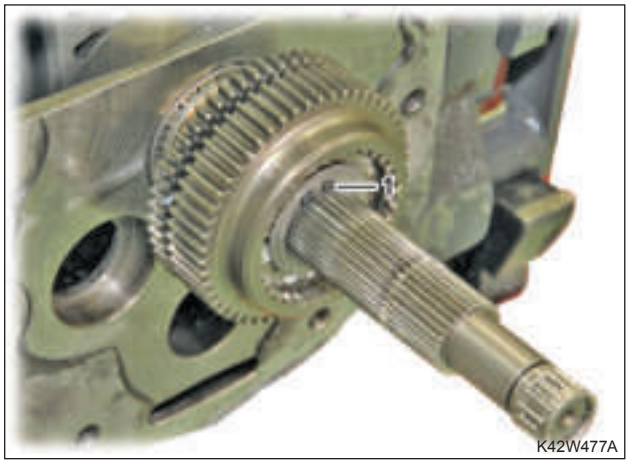


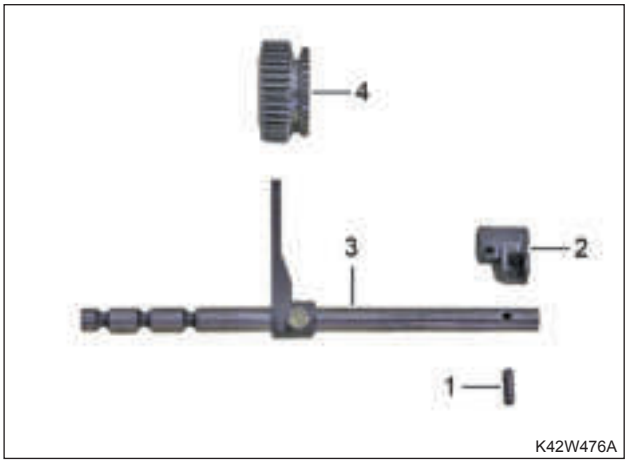
6. Unscrew the hydraulic cylinder case mounting bolts (1)(5EA), nuts (2)(5EA) to remove the hydraulic cylinder case (3).

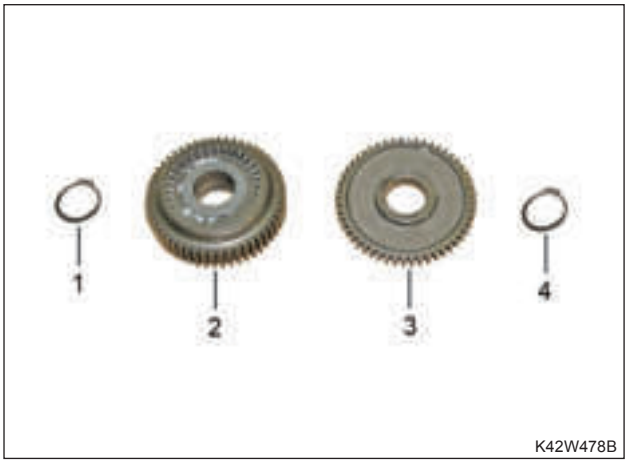


7. Remove the PTO shift lever (1), range shift lever (2) and 4WD lever (3).





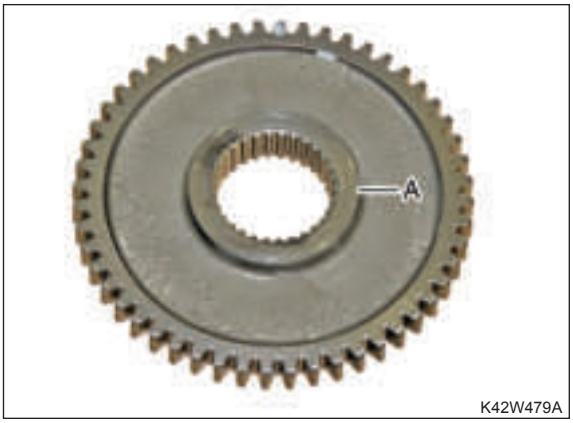




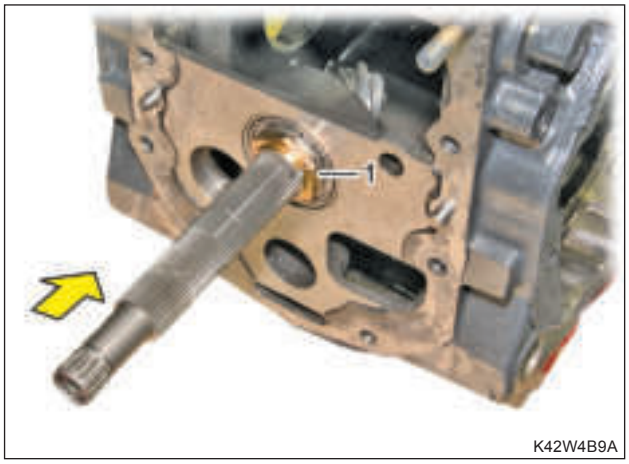
8. Pull out the spring pin (1) and remove the range shift shifter (2). Then, remove the range shift fork shaft (3) and range shift drive gear 2nd (4) simultaneously.

9. Pull out the snap ring (1) and remove the range shift drive gear 1st (2), 4WD gear (3) and snap ring (4).

Notes



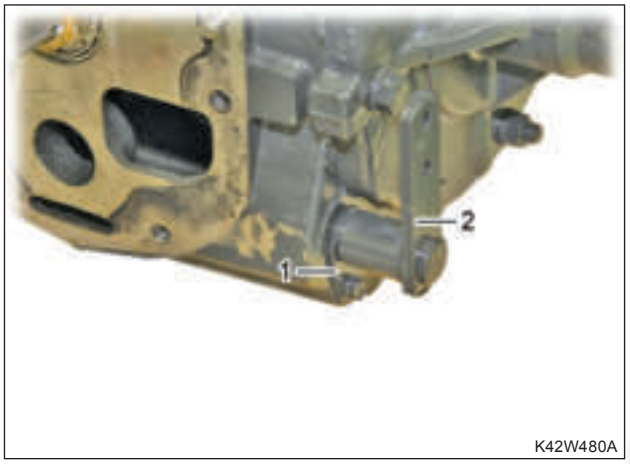
- **When installing the 4WD gear, its higher boss (A) should face the range shift drive gear 1st.**



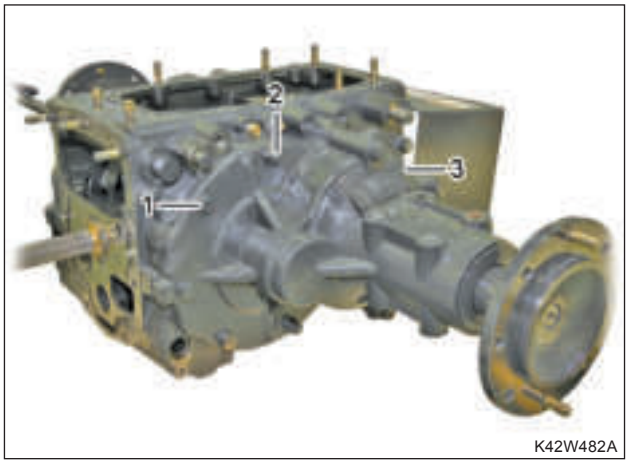
10. Unfold the caulking part of the counter shaft mounting nuts (1) to unscrew the mounting nuts. Then, remove the counter shaft in the rear axle case by tapping outside direction. (Remove the differential system assembly first)

Mounting nut
tightening torque .....78.4 ~ 98 N.m
8 ~ 10 kgf.m
57.6 ~ 72 lb.ft

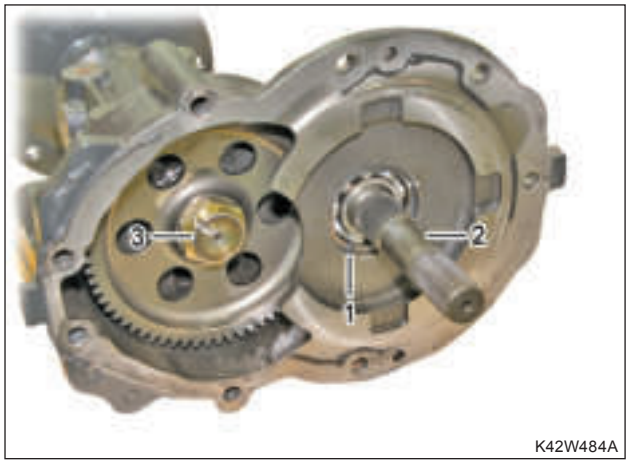
5.4.1 REAR AXLE DRIVE SECTION DISASSEMBLY



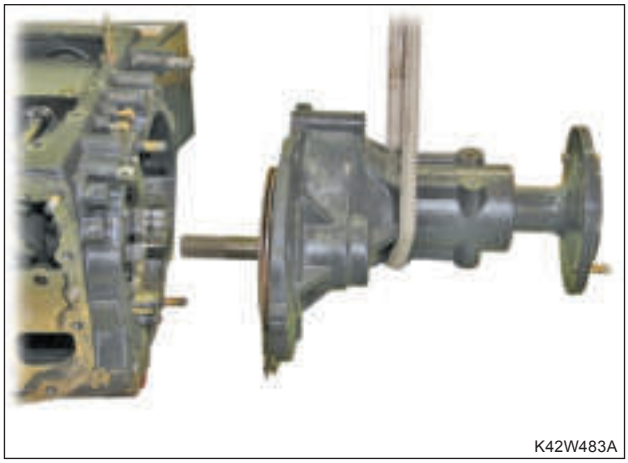
1. Remove the brake lever plate (1) and brake lever (2).

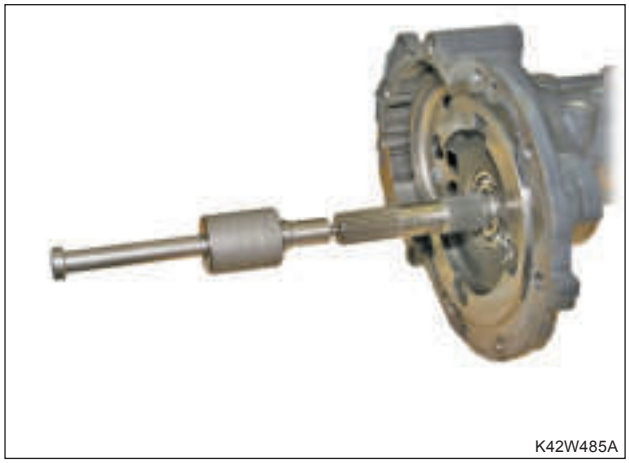


K42W482A

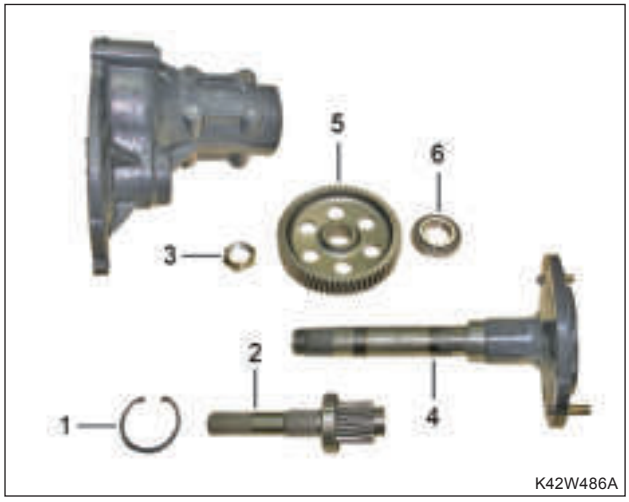


K42W484A


K42W483A


K42W485A

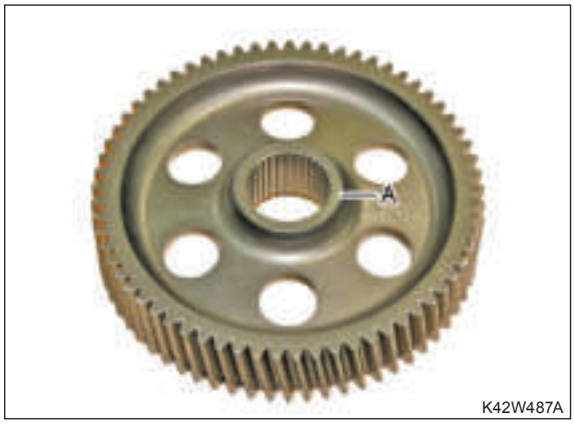
2. Unscrew the rear axle housing mounting bolts (1)(7EA) and nuts (2)(2EA) to remove the rear axle housing assembly (3).



K42W486A

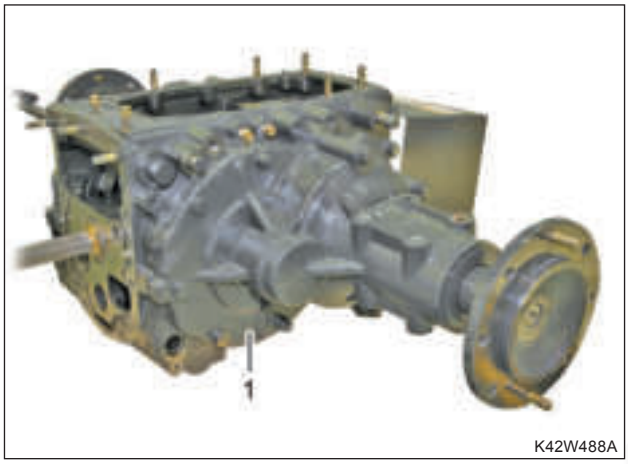
3. Pull out the snap ring (1) of the rear axle housing final pinion to remove the final pinion (2). Unscrew the lock nut (3) and remove the rear axle (4), final gear (5) and taper roller bearing (6).

Notes

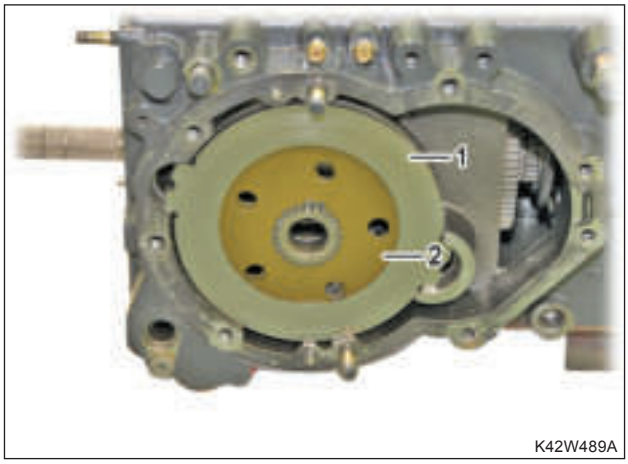


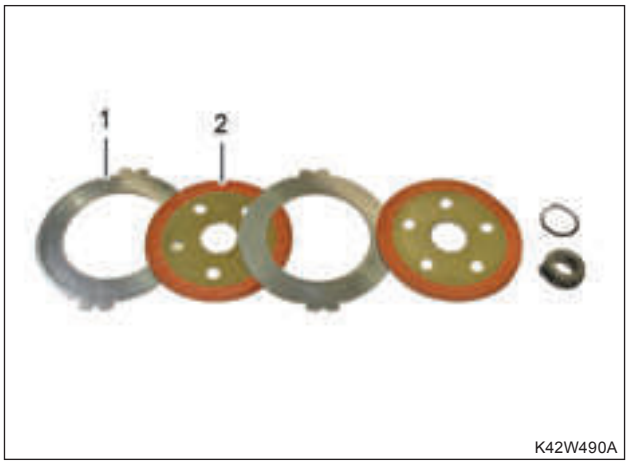
- **When installing the final gear, its higher boss (A) should be toward the inside.**

5.4.2 BRAKE ASSEMBLY DISASSEMBLY

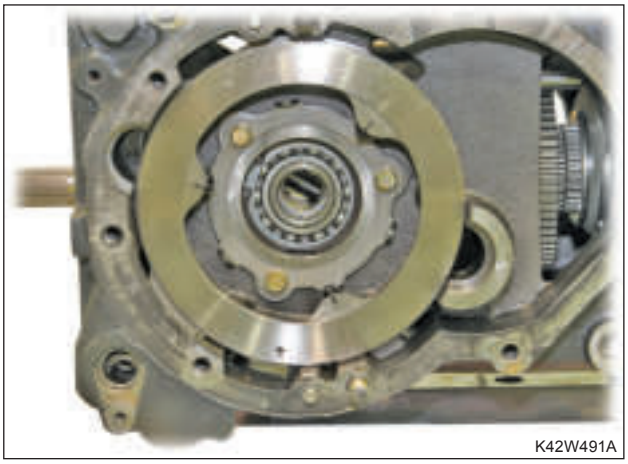


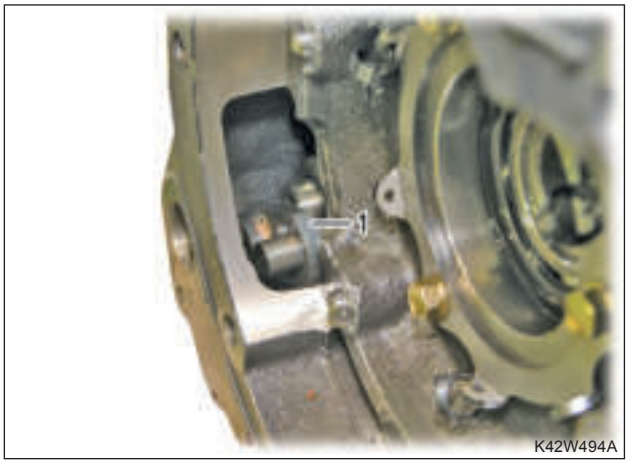
1. Remove the rear axle housing assembly (1).



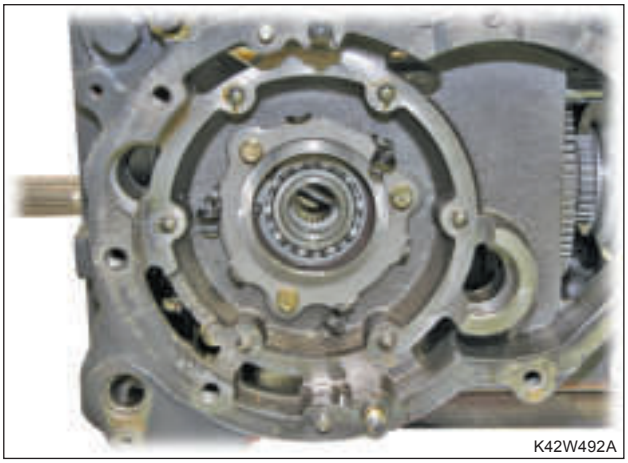


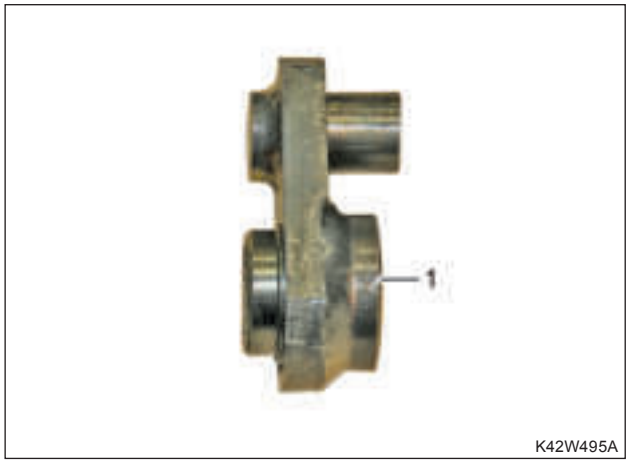
2. Remove the pressure plate (1) and disc (2).


K42W491A

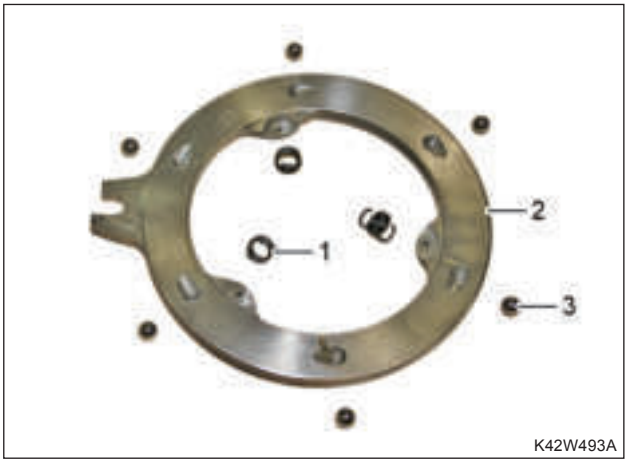


K42W494A

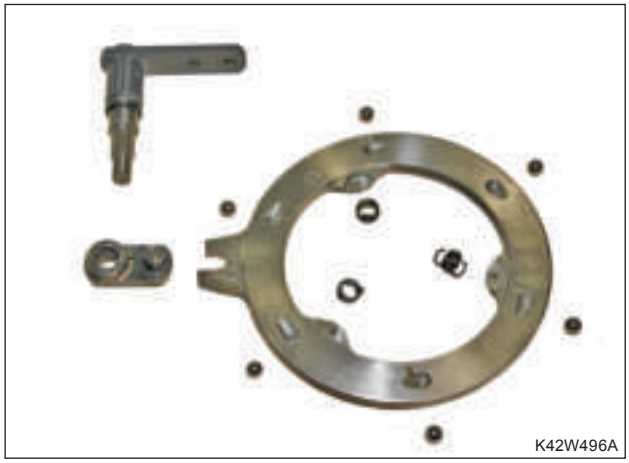

K42W492A



K42W495A



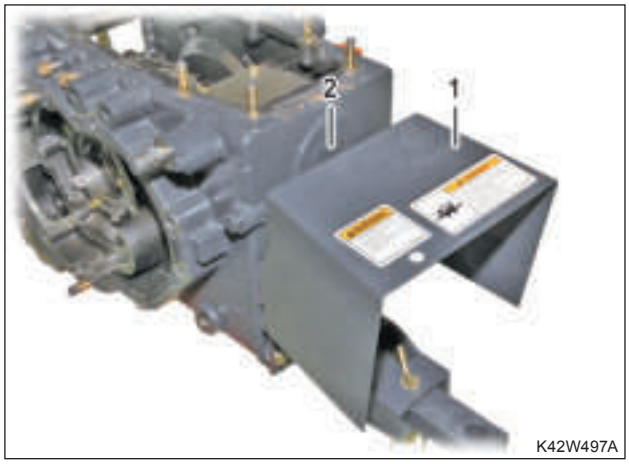
K42W493A


K42W496A

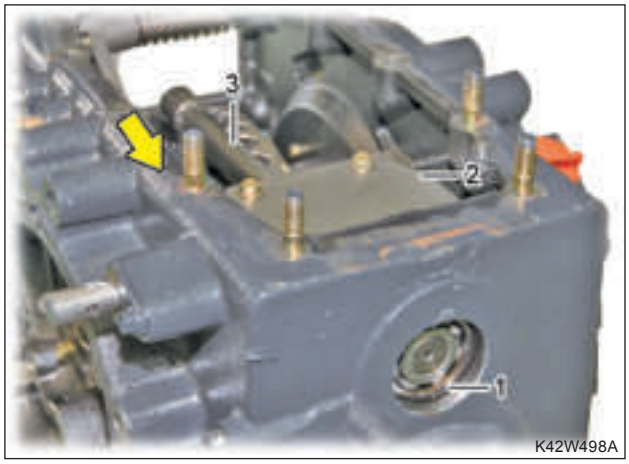
3. Remove the spring (1), cam plate (2) and steel ball (3).

4. Remove the inner arm (1) in the rear axle case.

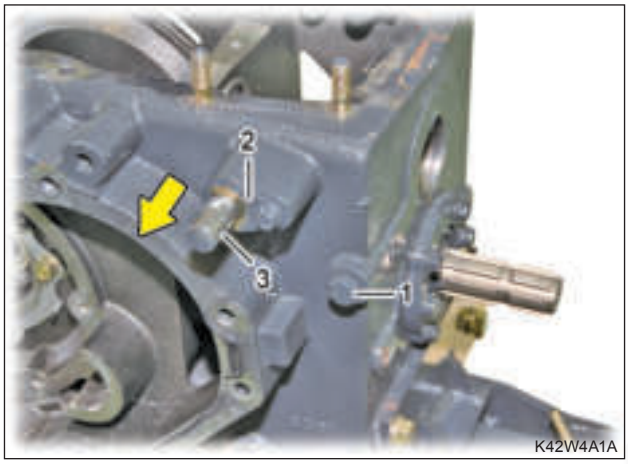
5.4.3 PTO SHIFT GEAR DISASSEMBLY



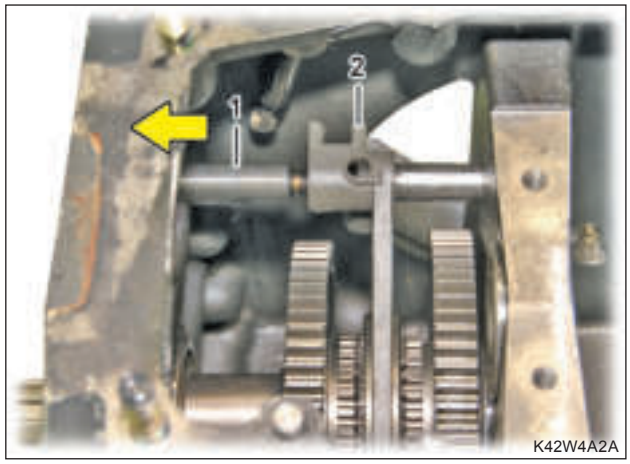
1. Remove the PTO cover (1) and seal cap (2).

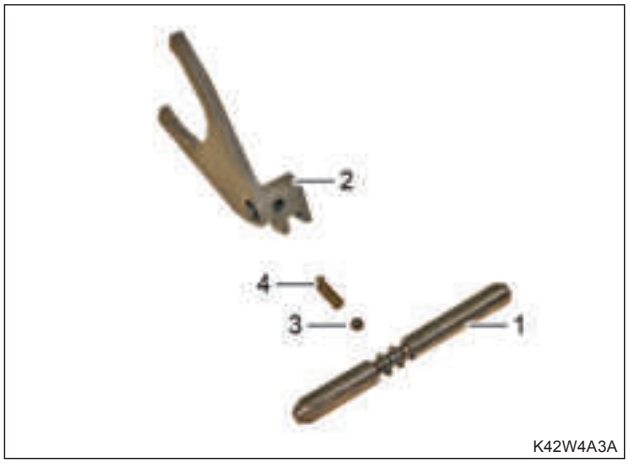


2. Pull out the snap ring (1) and remove the plate (2) and PTO drive gear shaft (3).

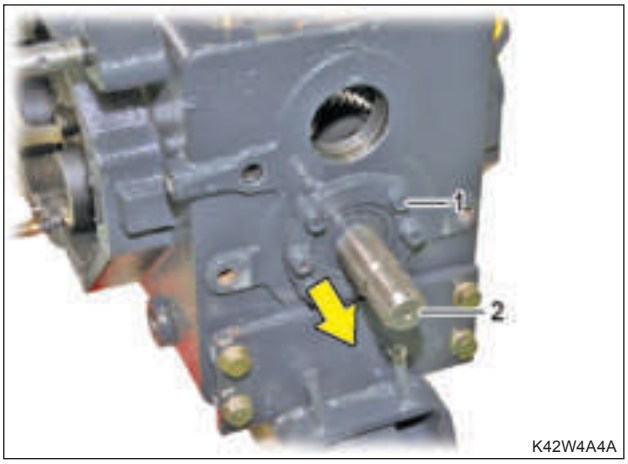


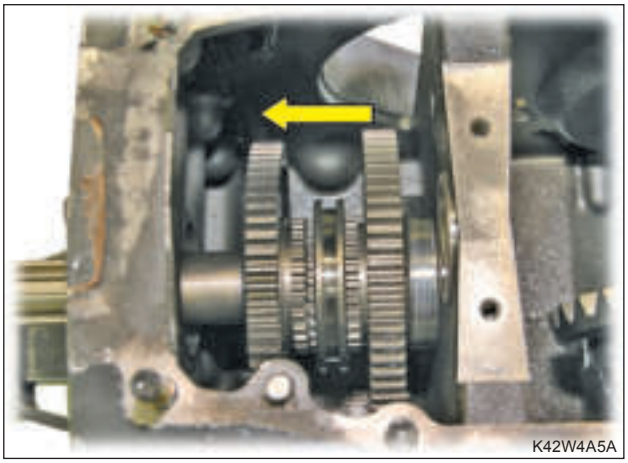
3. Unscrew the PTO fork shaft mounting bolt (1) and remove the PTO shift shaft mounting plate (2). Then, pull out the PTO shift shaft (3) to remove it from the PTO fork groove.

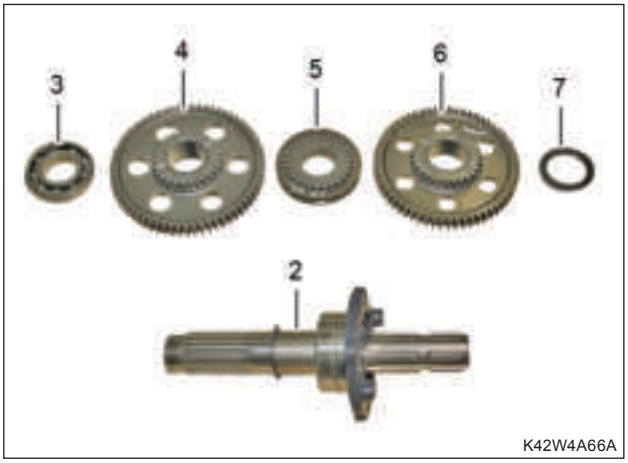




4. Pull out the PTO fork shaft (1) and remove the PTO fork (2), steel ball (3) and spring (4).



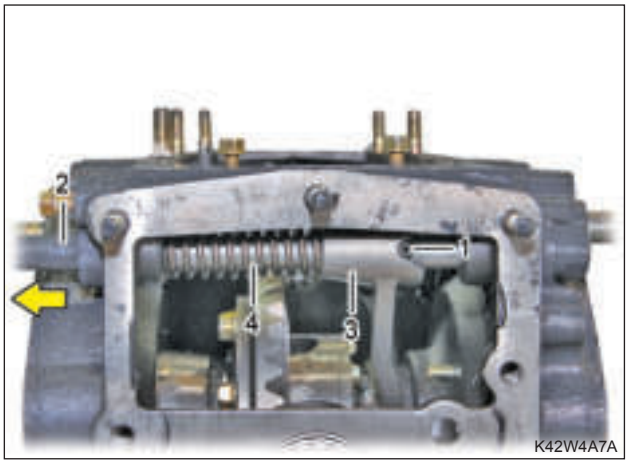


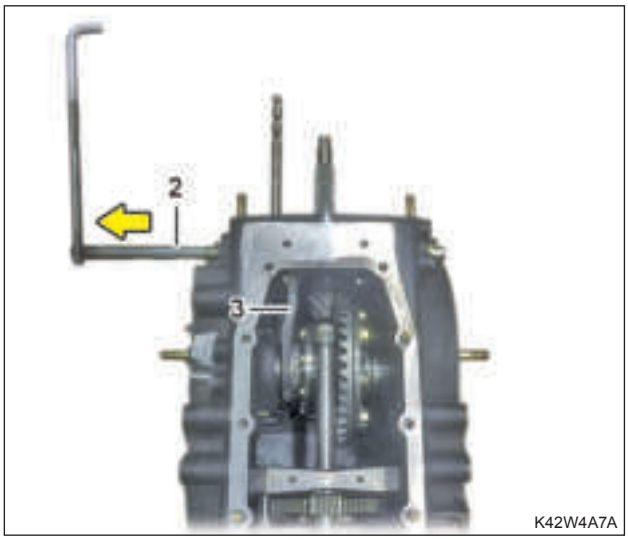


5. Unscrew the PTO shaft cover bolts (1) to remove the PTO shaft (2), ball bearing (3), PTO drive gear 1st (4), PTO hub sleeve (5), PTO drive gear 2nd (6) and washer (7).

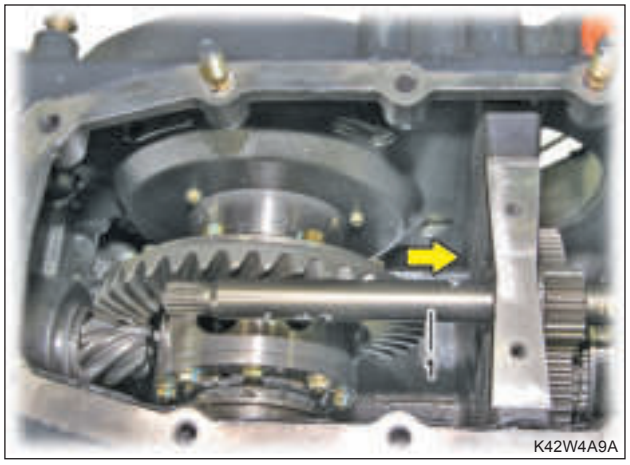
5.4.4 DIFFERENTIAL SYSTEM DISASSEMBLY

1. Remove the rear axle case from the transmission. Then, remove the rear axle housing and hydraulic cylinder case.

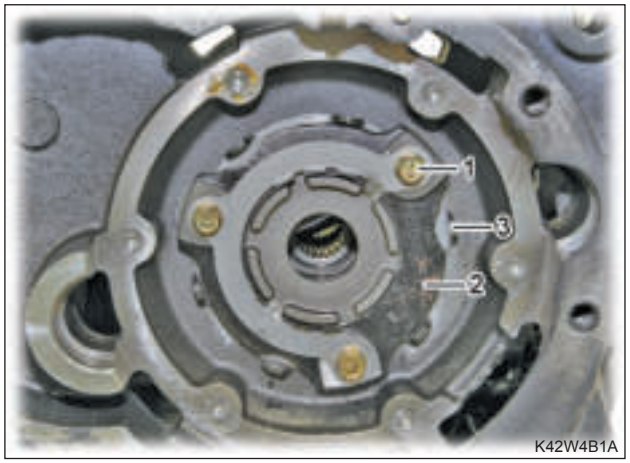


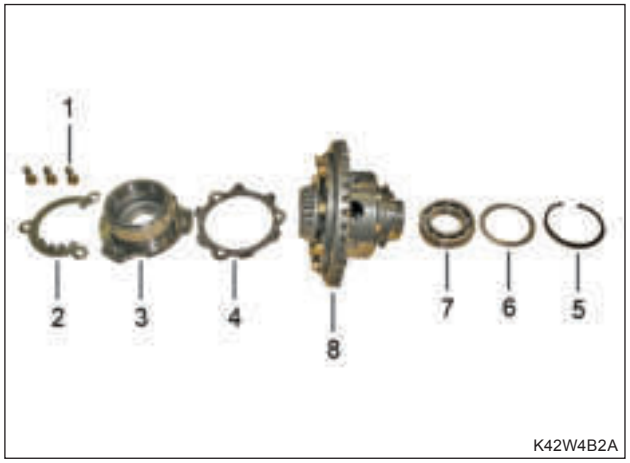


2. Pull out the differential lock pedal spring pin (1) and remove the differential lock pedal (2) in the arrow direction. Then, remove the differential fork (3) and differential spring (4).



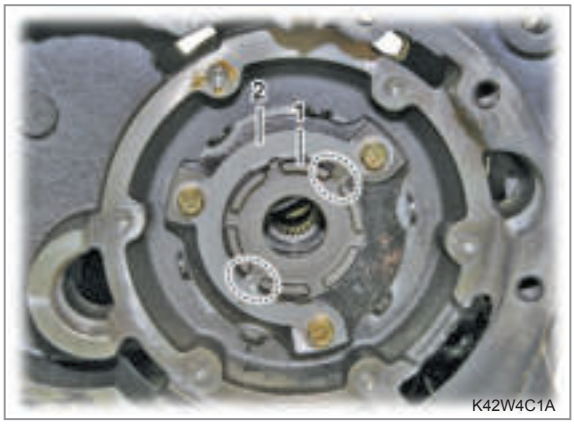
3. Remove the PTO drive gear shaft (1).





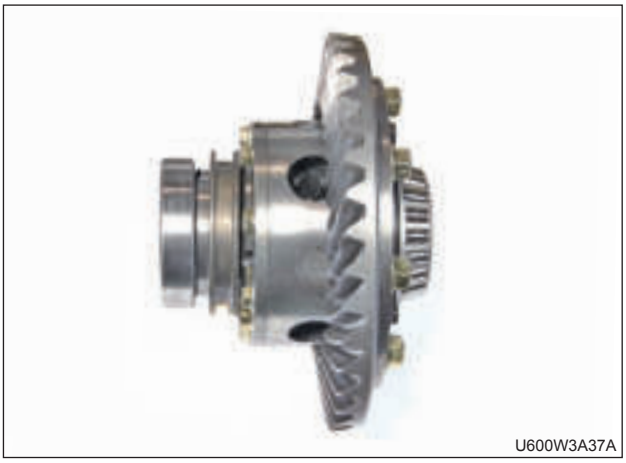
4. Unscrew the bolts (1) and remove the mounting plate (2), bearing support (3) and spring holder (4). Pull out the snap ring (5) on the opposite side and remove the shim (6), ball bearing (7) and differential system assembly (8).

IMPORTANT



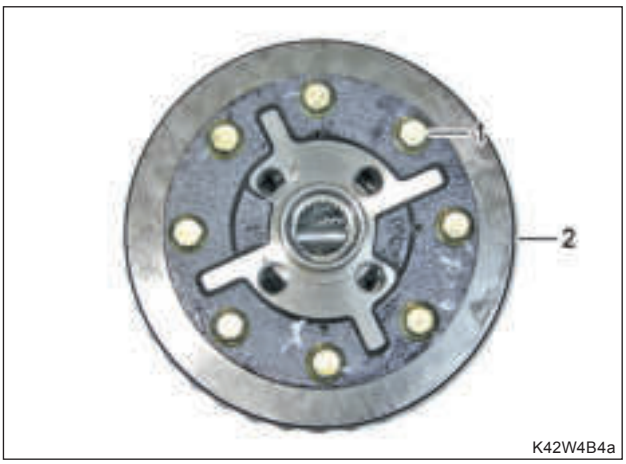
- **When installing the screw (1) to the bearing support, tighten it to the specified torque and caulk the mounting plate (2) to the screw groove to fix the screw firmly.**
  Tightening torque .....78.4 ~ 98 N.m
  8 ~ 10 kgf.m
  57.6 ~ 72 lb.ft

5.4.5 DIFFERENTIAL SYSTEM COMPONENTS DISASSEMBLY


U600W3A37A

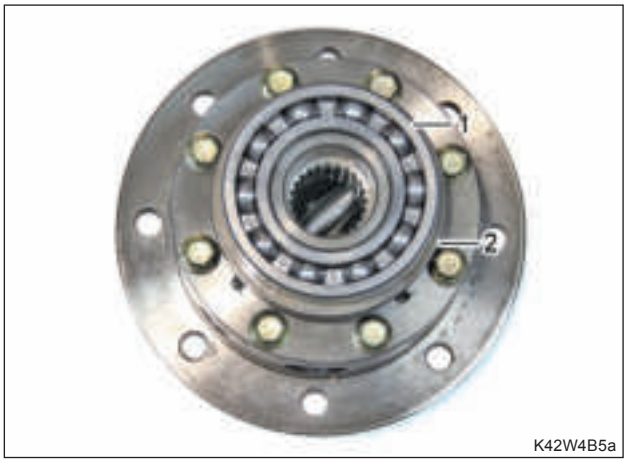
K42W4B3a

1. Invert the rear differential system assembly to remove the taper roller (1).



K42W4B4a

2. Unscrew the differential system case 1 mounting bolts (1) and remove the ring gear (2).



K42W4B5a

3. Remove the ball bearing(1) and differential lock hub (2).

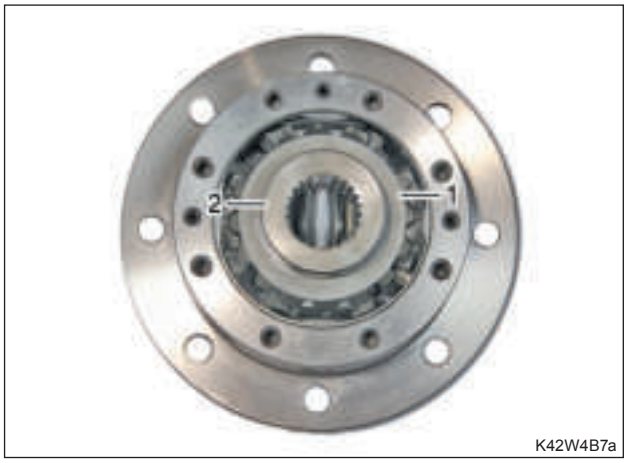
Notes


U600W3A41A

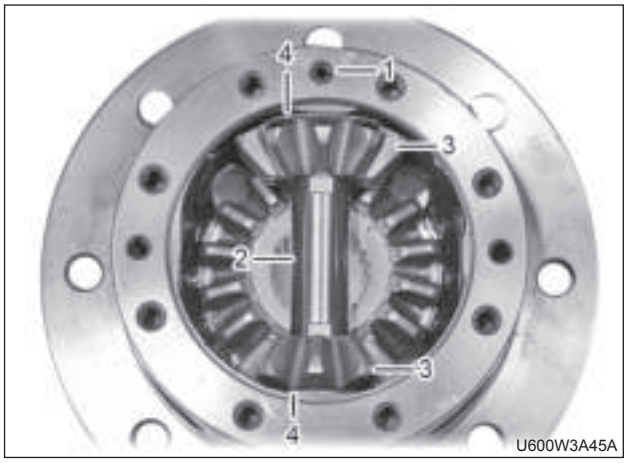
- When installing the final gear, its higher boss (A) should toward the inside.

K42W4B6a

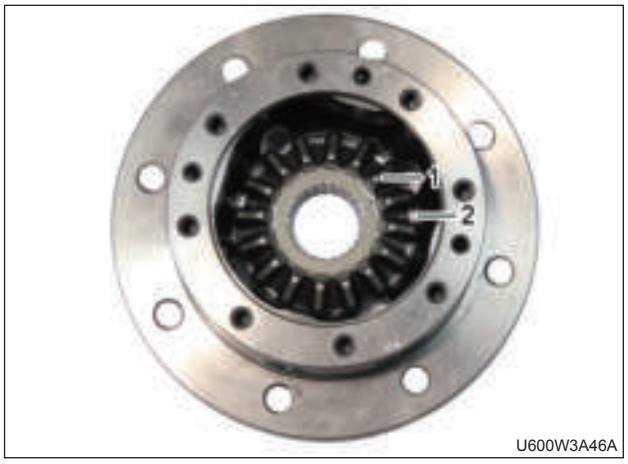
4. Unscrew the differential system case 2 mounting bolts(1) and remove differential system case 2 (2).



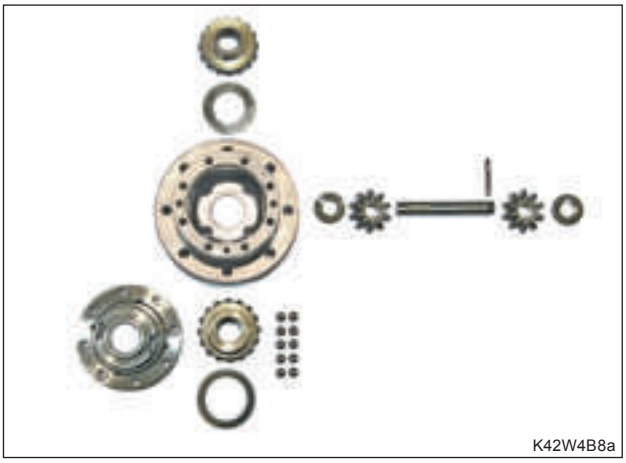
5. Remove the washer (1) and side gear (2).



6. Pull out the differential shaft 2 mounting spring pin (1) and differential shaft 2 (2) to remove the pinion drive gear (3) and thrust washer (4).

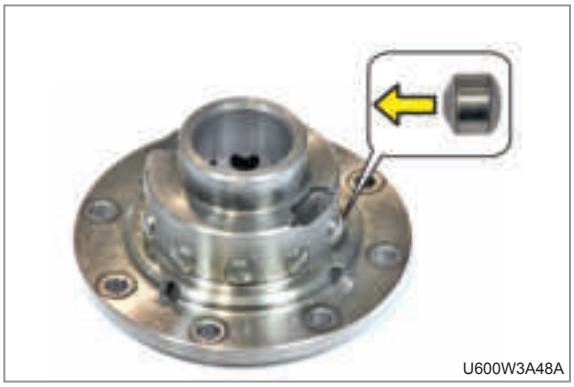


7. Remove the side gear (1) and washer (2).



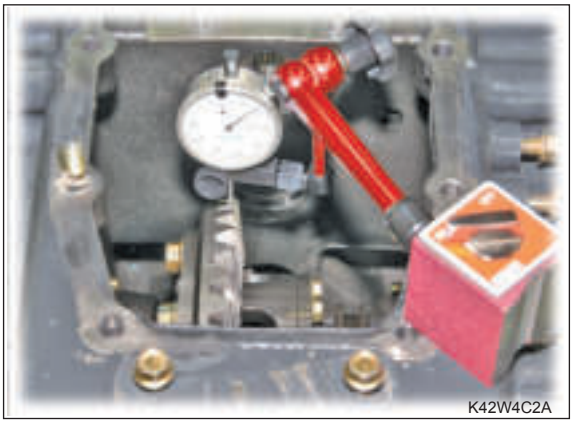
8. Install in the reverse order of removal.

IMPORTANT



- **When installing the roller to the differential case, the flat end of the roller should face the groove of the side gear.**

Notes

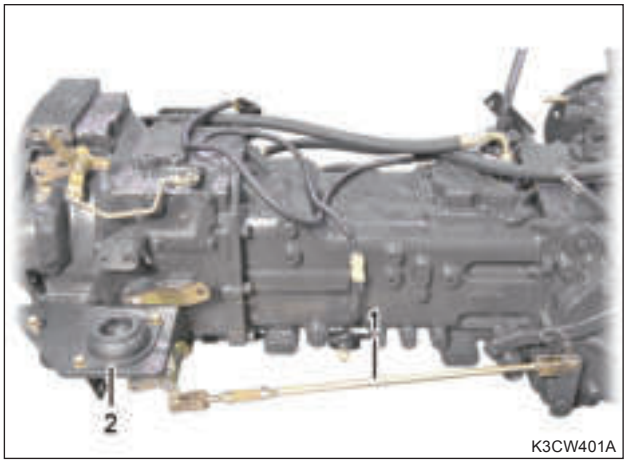


- **Check the backlash of the ring gear using a dial gauge.**
  Specified value.....0.15 ~ 0.25 mm
  (0.0059 ~ 0.0098 in.)
- **After adjustment of backlash, there should be no lateral free play of the differential assembly. To adjust the backlash, use shims between the ball bearing and snap ring.**

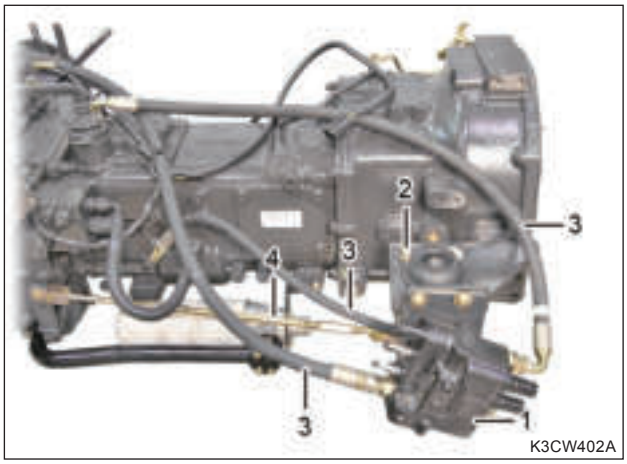
CABIN MODEL

5.5 CLUTCH HOUSING REMOVAL

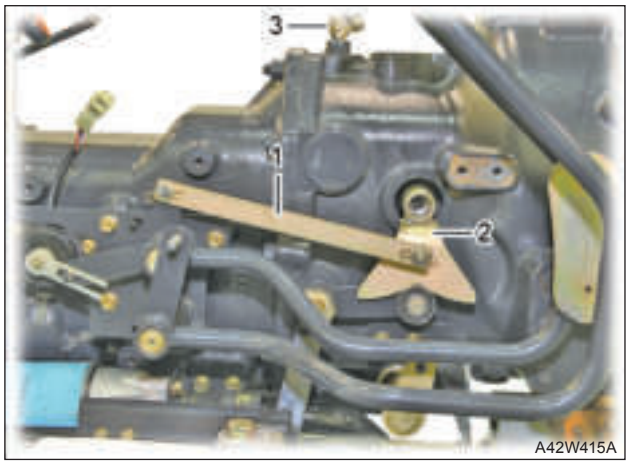
1. Remove the cabin.
2. Remove the engine assembly.



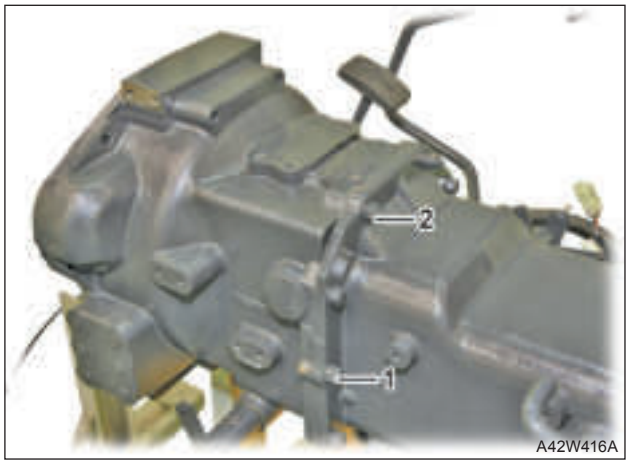
3. Remove the brake rod (1) and cabin support assembly (2).

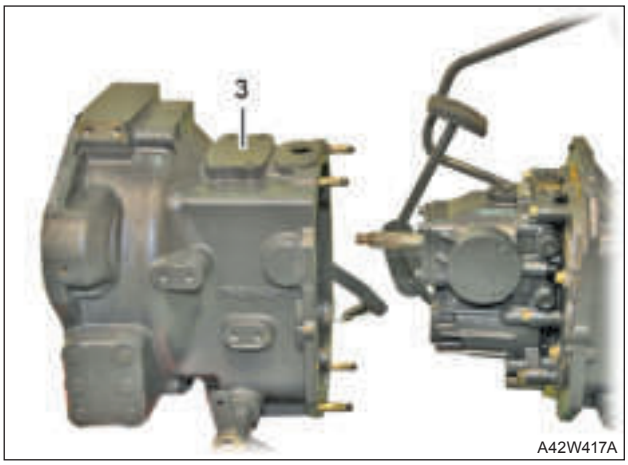


4. Remove the loader valve (1) and cabin support (2) and disconnect the hydraulic hose (3) and brake rod (4).

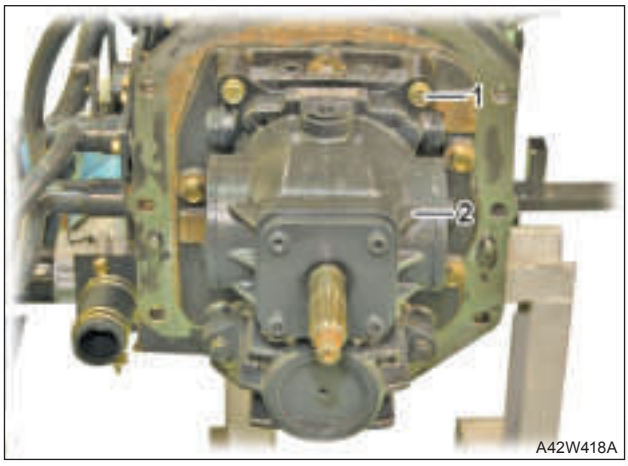


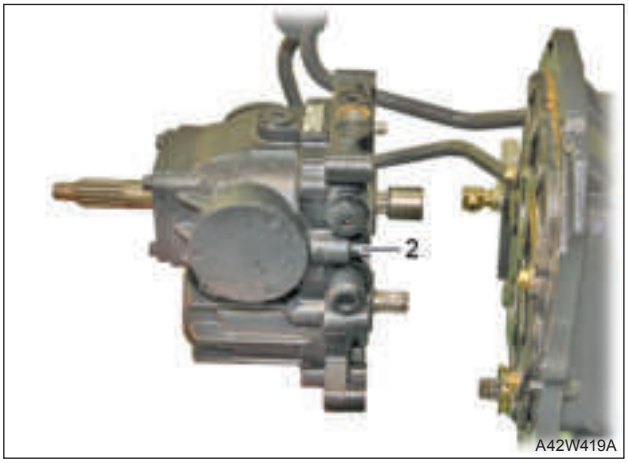
5. Remove the HST arm connecting plate (1), HST arm (2) and elbow (3).

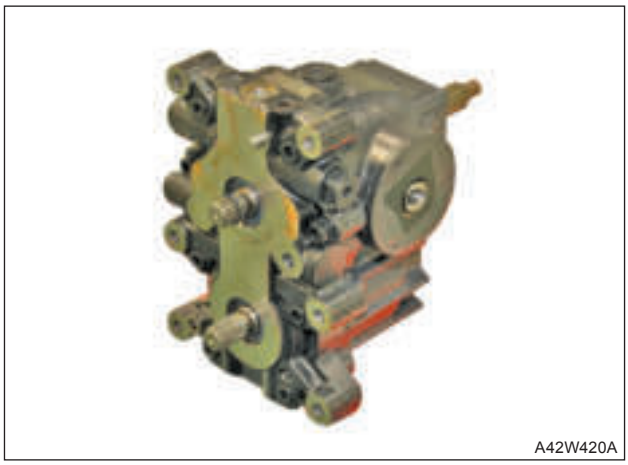




6. Unscrew the clutch housing & transmission case mounting bolts (1)(6EA) & nuts (2)(4EA) and remove the clutch housing (3).



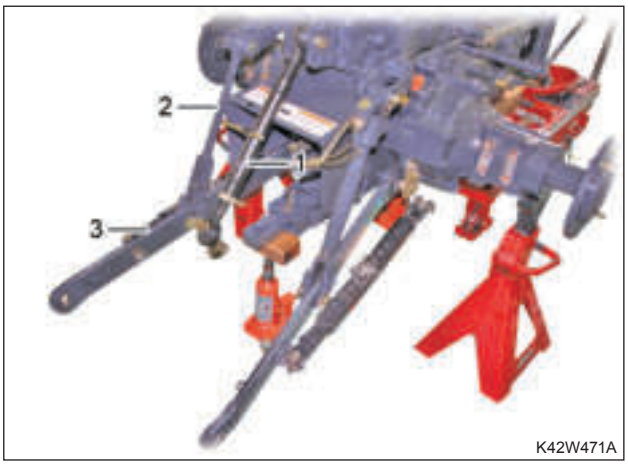




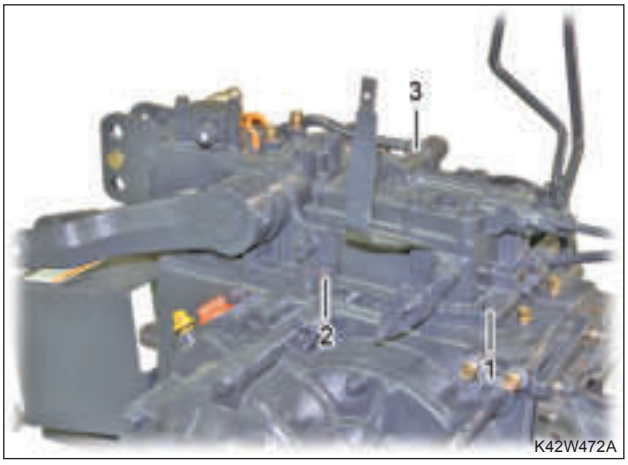
7. Unscrew the HST mounting bolts (1)(6EA) and remove the HST (2) from the transmission case.

5.6 REAR AXLE CASE DISASSEMBLY

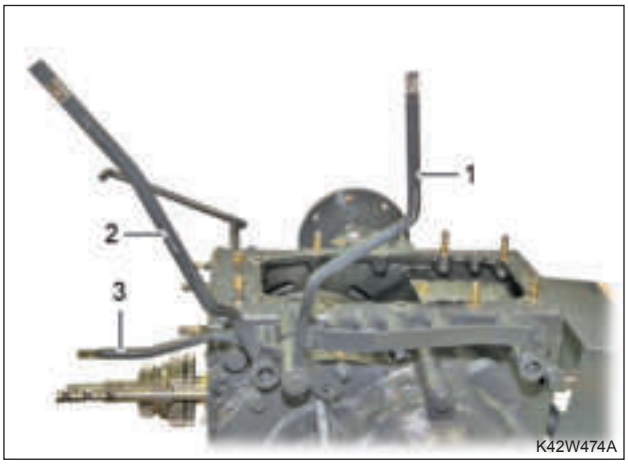
1. Remove the cabin assembly.



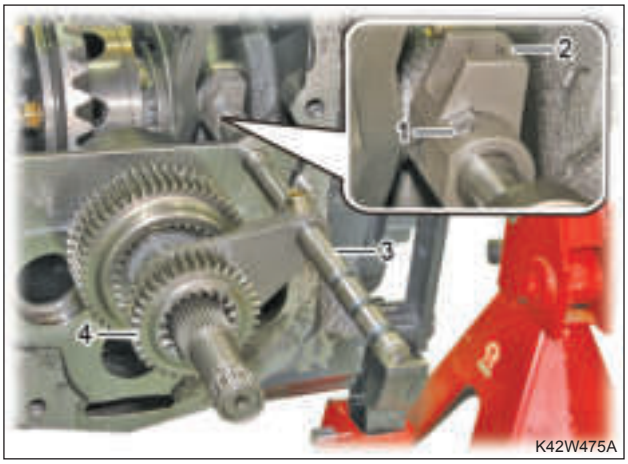
2. Remove the top link (1), lift link assembly (2) and lower link (3).

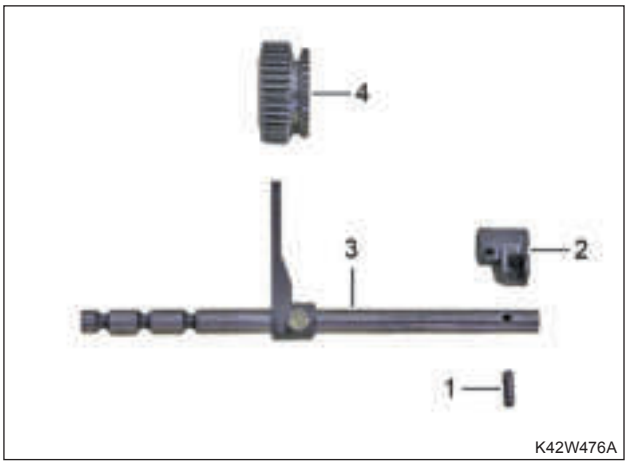


3. Unscrew the hydraulic cylinder case mounting bolts (1)(5EA), nuts (2)(5EA) to remove the hydraulic cylinder case (3).

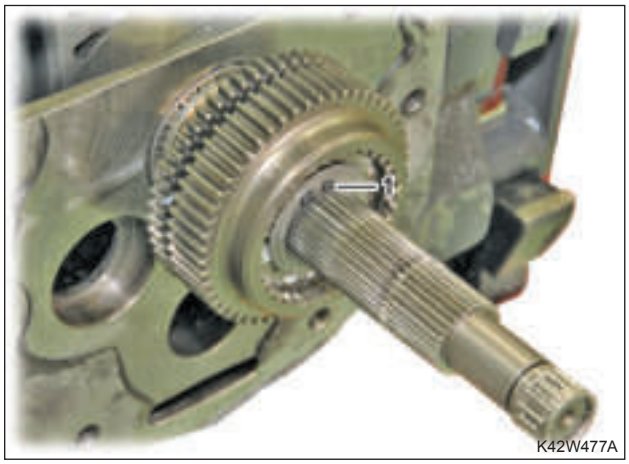


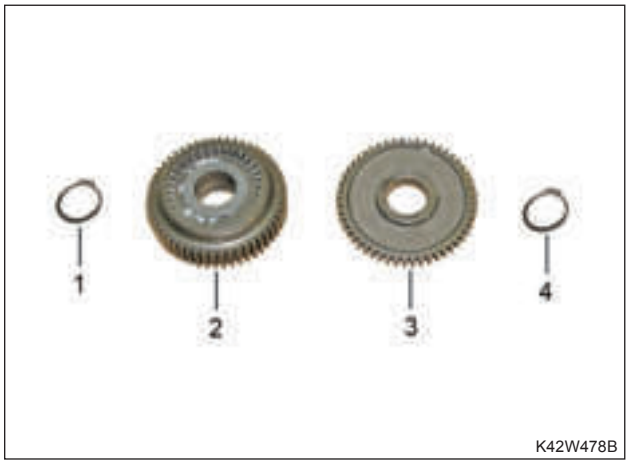
4. Remove the PTO shift lever (1), range shift lever (2) and 4WD lever (3).





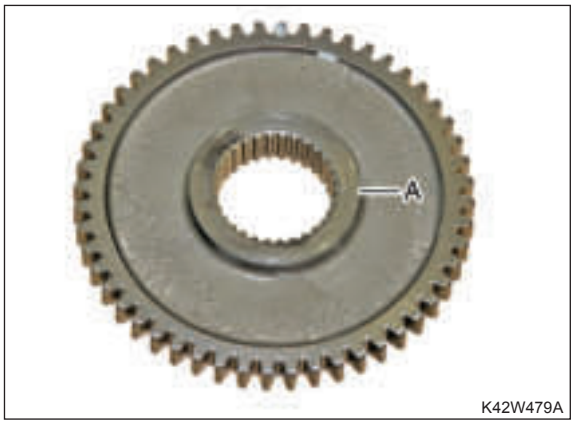
5. Pull out the spring pin (1) and remove the range shift shifter (2). Then, remove the range shift fork shaft (3) and range shift drive gear 2nd (4) simultaneously.



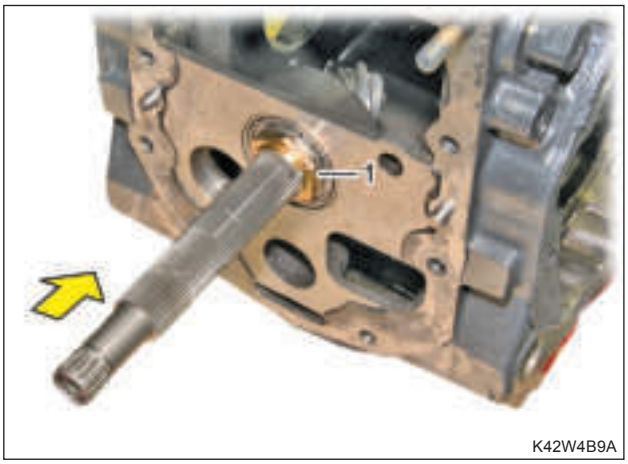


6. Pull out the snap ring (1) and remove the range shift drive gear 1st (2), 4WD gear (3) and snap ring (4).

Notes



- **When installing the 4WD gear, its higher boss (A) should face the range shift driven gear 1st.**



7. Unfold the caulking part of the counter shaft mounting nuts (1) to unscrew the mounting nuts. Then, remove the counter shaft in the rear axle case by tapping outside direction. (Remove the differential system assembly first)

Mounting nut
tightening torque .....78.4 ~ 98 N.m
8 ~ 10 kgf.m
57.6 ~ 72 lb.ft

MEMO

CHAPTER 4 FRONT AXLE

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1. OVERVIEW

1.1 SPECIFICATIONS

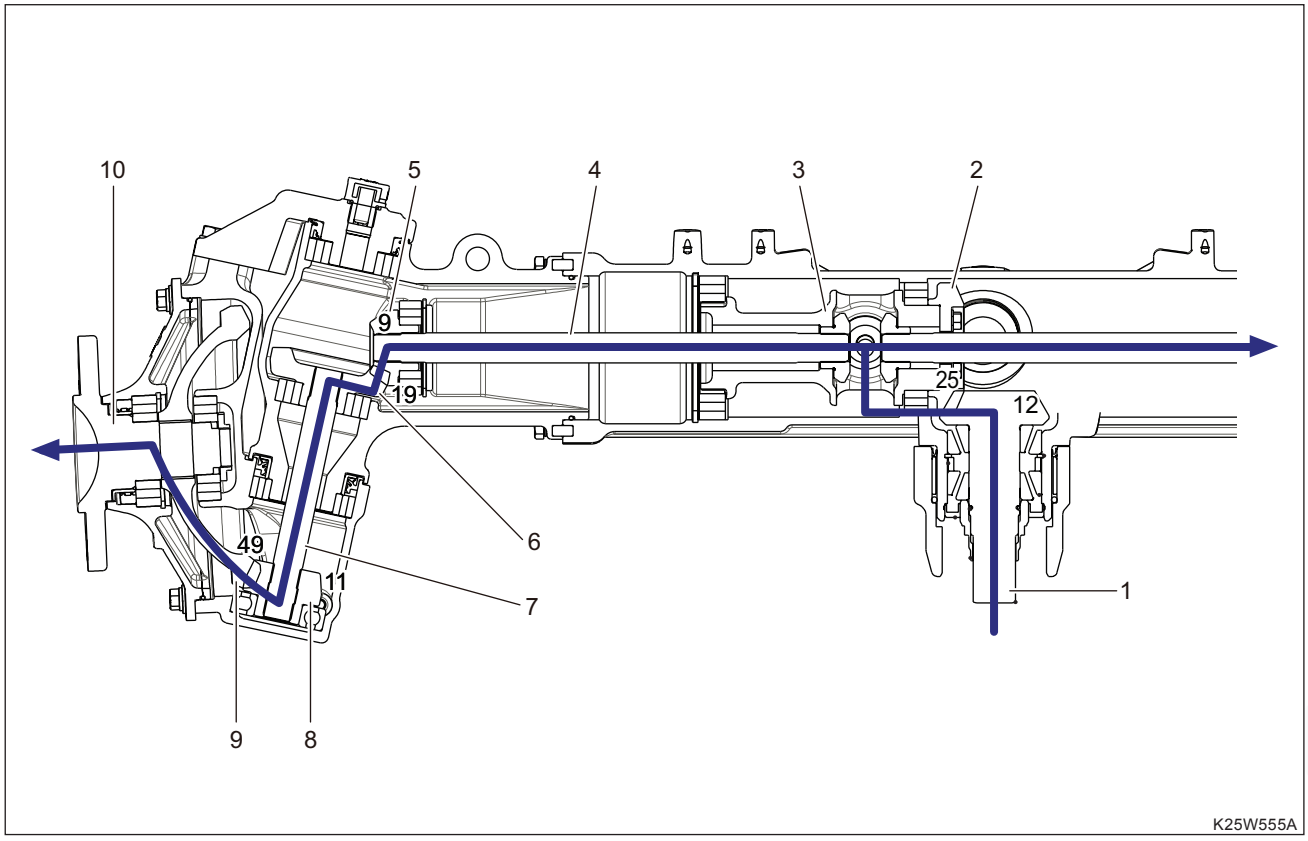
1. Tread ..... 7 - 16: Standard - 1,203 mm (47.362 in)
   8 - 16: Standard - 1,201 mm (47.283 in)
2. Tire size ..... 7 - 16 6PR / 8 - 16 6PR
3. Front wheel alignment..... Toe-in: 4 - 8 mm (0.157 - 0.315 in.)
4. Oil ..... Standard: TF500, SAE 80W90
   Capacity: 6.4 ℓ (1.69 u.s.gal)
5. Differential system ..... Pinion and ring gear backlash: 0.15 - 0.2 mm (0.0059 - 0.0079 in.)
6. Front gear case..... Front final gear and final pinion backlash: 0.15 - 0.3 mm (0.0059 - 0.0118 in)

   Pinion drive torque: 0.032 - 0.16 kgf.m
   0.314 - 1.568 N.m
   0.230 - 1.152 lbf.ft

1.2 TIGHTENING TORQUE FOR MAJOR COMPONENTS

MAJOR COMPONENTS		TORQUE VALUE
Knuckle arm and tie-rod end	Slotted nut	137.2 N.m 14.0 kgf.m 100.8 lbf.ft
Front axle case and front gear case	Hex. bolt	112.7±9.8 N.m 11.5±1 kgf.m 82.8±7.2 lbf.ft
	Washer mounting hex. bolt	88.2±9.8 N.m 9.0±1 kgf.m 64.8±7.2 lbf.ft
Front bearing case	Washer mounting hex. bolt	51.9±2.9 N.m 5.3±0.3 kgf.m 38.2±2.2 lbf.ft
Pinion bearing retainer	Hex. socket cap bolt	32.3 N.m 3.3 kgf.m 23.8 lbf.ft

1.3 POWER TRANSFER



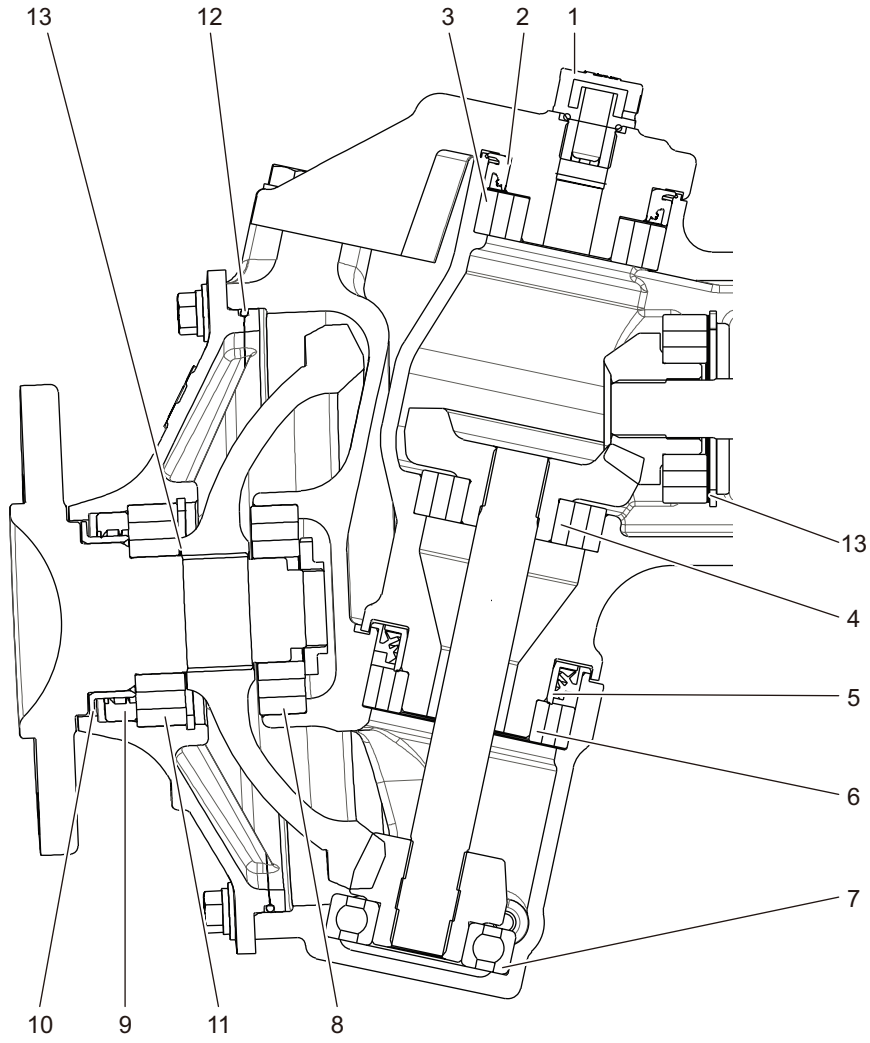
(1) Drive pinion
(2) Ring gear
(3) Differential case
(4) Front 1st shaft
(5) 9 bevel gear
(6) 19 bevel gear
(7) Front 2nd shaft
(8) 11 bevel gear
(9) 49 front final gear
(10) Front spindle

When the 4WD mode is selected, rotating force from the 4WD shaft of the transmission is passed through the propeller shaft and is delivered to the front axle section through the drive pinion (1) of the front axle case.

The 12 gear of the drive pinion is engaged with the 25 ring gear (2) of the front differential, rotating together at the reduced speed, and the differential case (3) integrated with the ring gear is rotated as well. Then, as the differential pinion shaft is rotated together, the differential pinion gear and differential side gear are engaged with each other, rotating together. Therefore, this rotating force is transmitted to the front 1st shaft (4) since it is fixed to the differential side gear with splines.

After the rotating force is passed through the front 1st shaft, it is delivered to the front gear case through the 9 bevel gear (5) and 19 bevel gear (6). Then, it is passed to the 49 front final gear (9) through the front 2nd shaft (7) and 11 bevel gear (8). Finally, this force is delivered to the front wheels installed to the 49 front final gear to turn the wheels.

1.4 KNUCKLE SECTION



(1) Oil cap assembly
(2) Oil seal
(3) Ball bearing
(4) Ball bearing
(5) Oil seal
(6) Ball bearing
(7) Ball bearing
(8) Ball bearing
(9) Oil seal
(10) Sleeve
(11) Ball bearing
(12) O-ring
(13) Shim

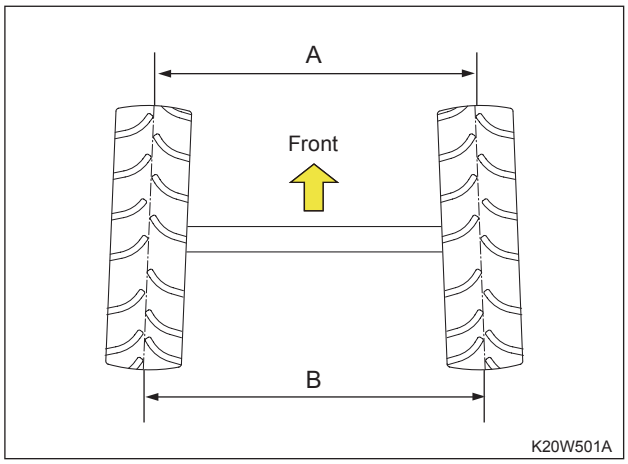
The knuckle section is a part to perform driving and steering functions in the front axle section, and it (knuckle arm + front gearbox) revolves around the fixed king pin section (front gear case).

Four vertically set ball bearings and three laterally set ball bearings withstand vertical and lateral load applied to the front axle. Also, the rotating parts of the front spindle and front gear box are equipped with special oil seals to ensure superior sealing performance even in a wet condition.

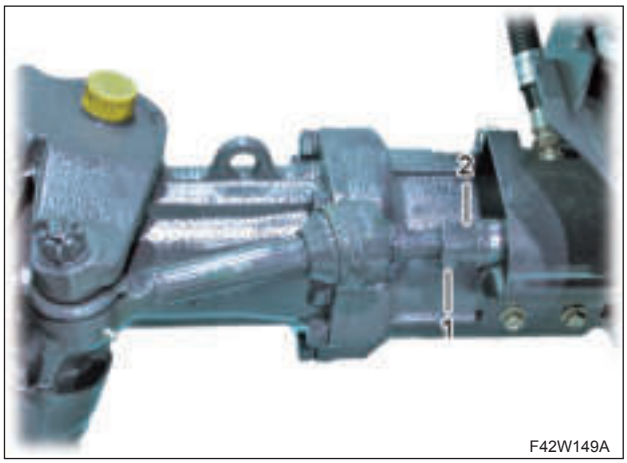
2. INSPECTION AND ADJUSTMENT

2.1 TOE-IN

1. Park the tractor on firm level ground and turn the steering wheel to set both front wheels in the straight ahead position. Then, stop the engine.



2. Measure the distance between the centers of the tires at the center of the hub of the front axle as shown in the figure.
3. Measure the rear width between the front tires with the same method.
4. Subtract the front width (A) from the rear width (B). The value should be 4 - 8 mm (0.157 - 0.315 in.).



5. If the result is out of the specification, unscrew the tie-rod end mounting nut (1) from the knuckle arm and turn the rod (2) to adjust the distance between the centers.

Notes

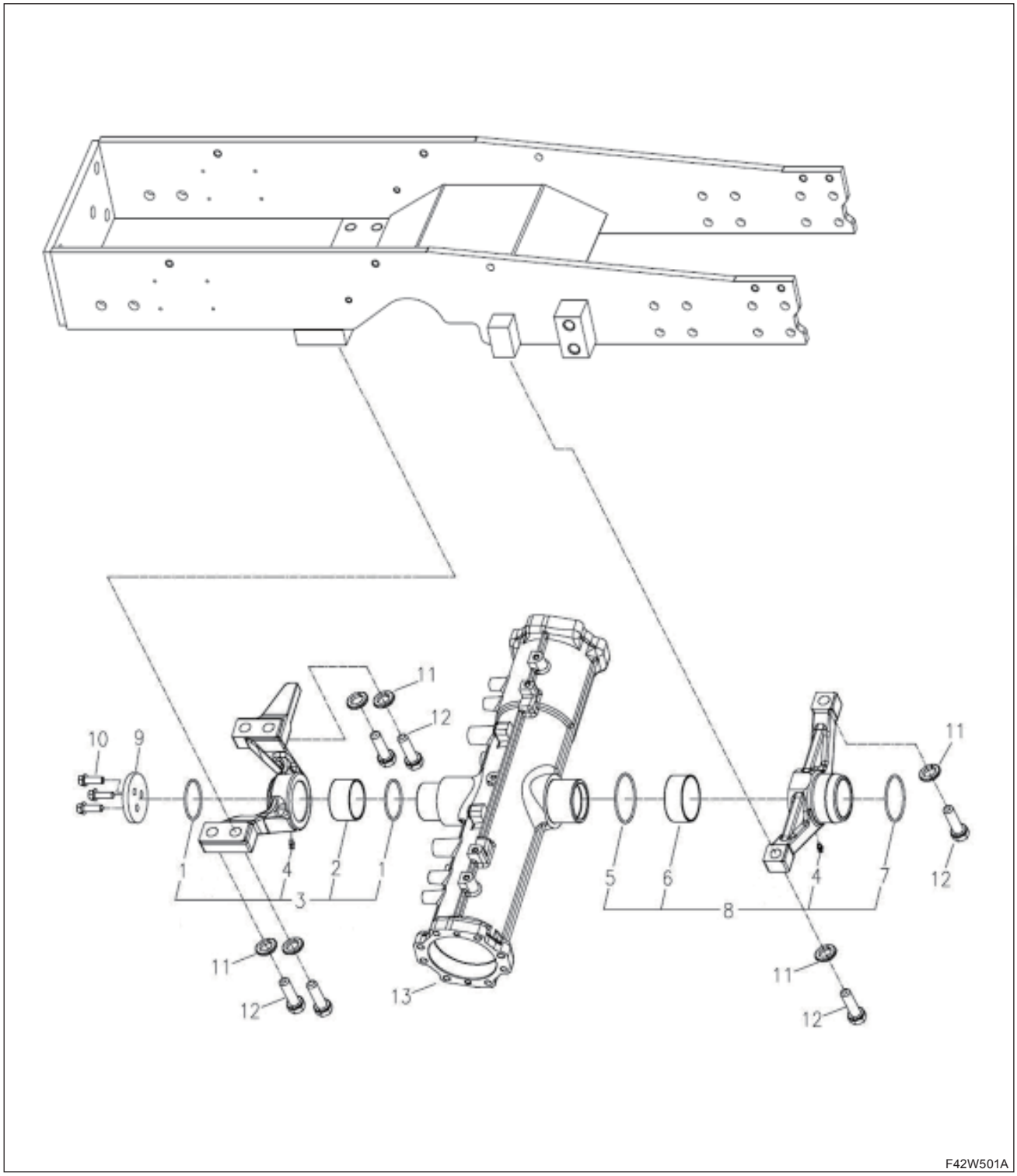
Front tire inflation pressure	With loader	3.0 kgf/cm^2 42.66 psi
	Standard	2.0 kgf/cm^2 28.44 psi

3. TROUBLESHOOTING

PROBLEMS	CAUSE OR SYMPTOM	SOLUTION
The front wheels rattle.	• Poorly adjusted toe-in • Abnormal tire inflation pressure	• Adjust the toe-in (4 - 8 mm). • Inflate the tire to the proper pressure level (2.0 kgf/cm^2).
The front tires are worn excessively.	• Poorly adjusted toe-in • Excessive inflation pressure	• Adjust the toe-in. • Adjust the tire pressure to the proper level.
It is hard to steer the vehicle.	• Poorly adjusted toe-in • Damaged tie rod • Defective steering cylinder connection and PST valve	• Adjust the toe-in. • Replace the tie rod. • Check and repair the hydraulic line.
Noise is generated from the front axle.	• Damaged internal gear • Insufficient front axle oil • Improper backlash	• Disassemble, inspect and repair • Add fluid. • Adjust the backlash.

4. SECTIONAL VIEW FOR MAJOR COMPONENTS

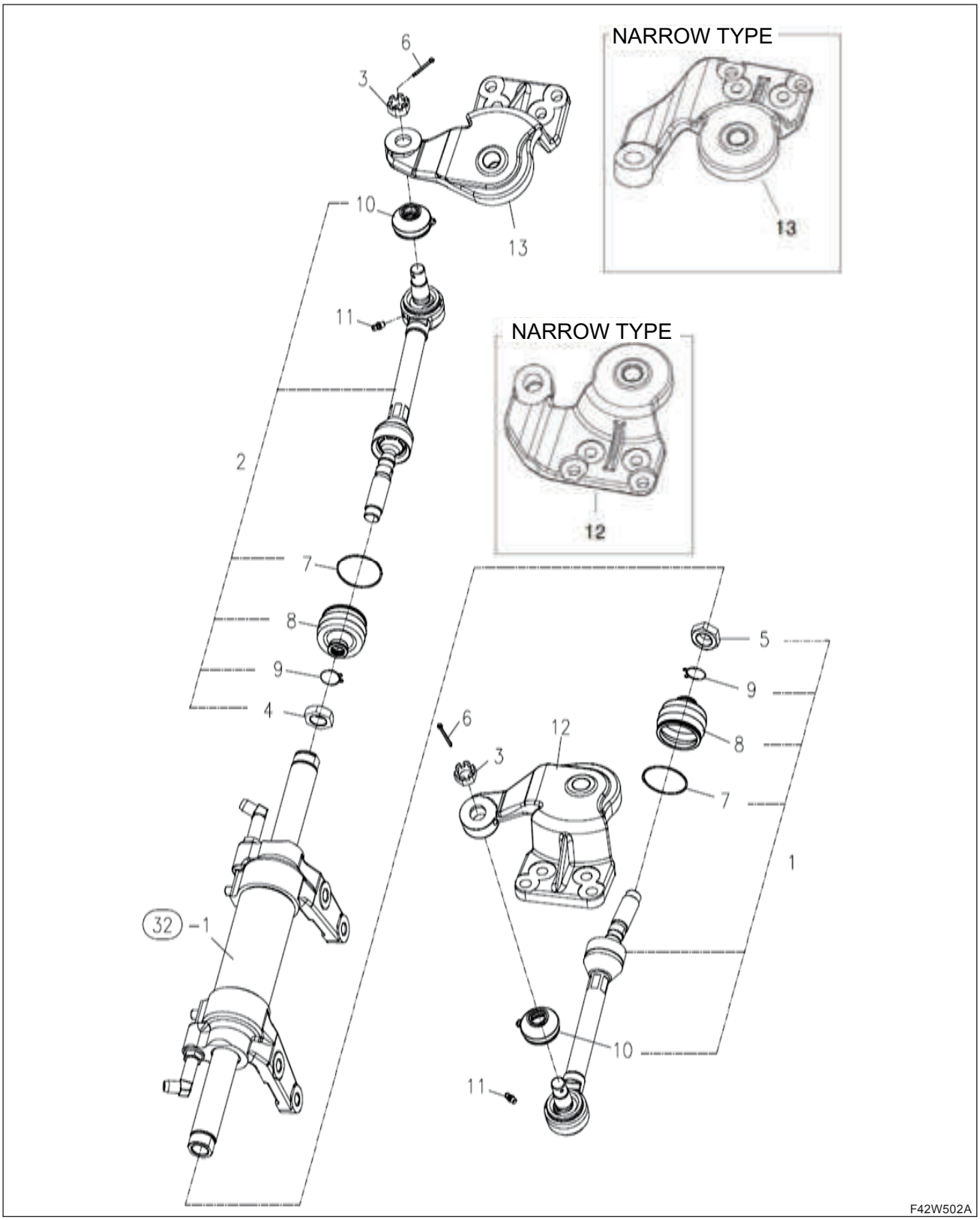
4.1 CENTER PIN SUPPORT



COMPONENTS

(1) O-ring
(2) Bush
(3) Front Axle Support Ass'y
(4) Nipple,grease
(5) O-ring
(6) Bush
(7) O-ring
(8) Rear Axle Support Ass'y
(9) Plate
(10) Hex Flange Bolt
(11) Spring Washer
(12) Hex Bolt
(13) Case

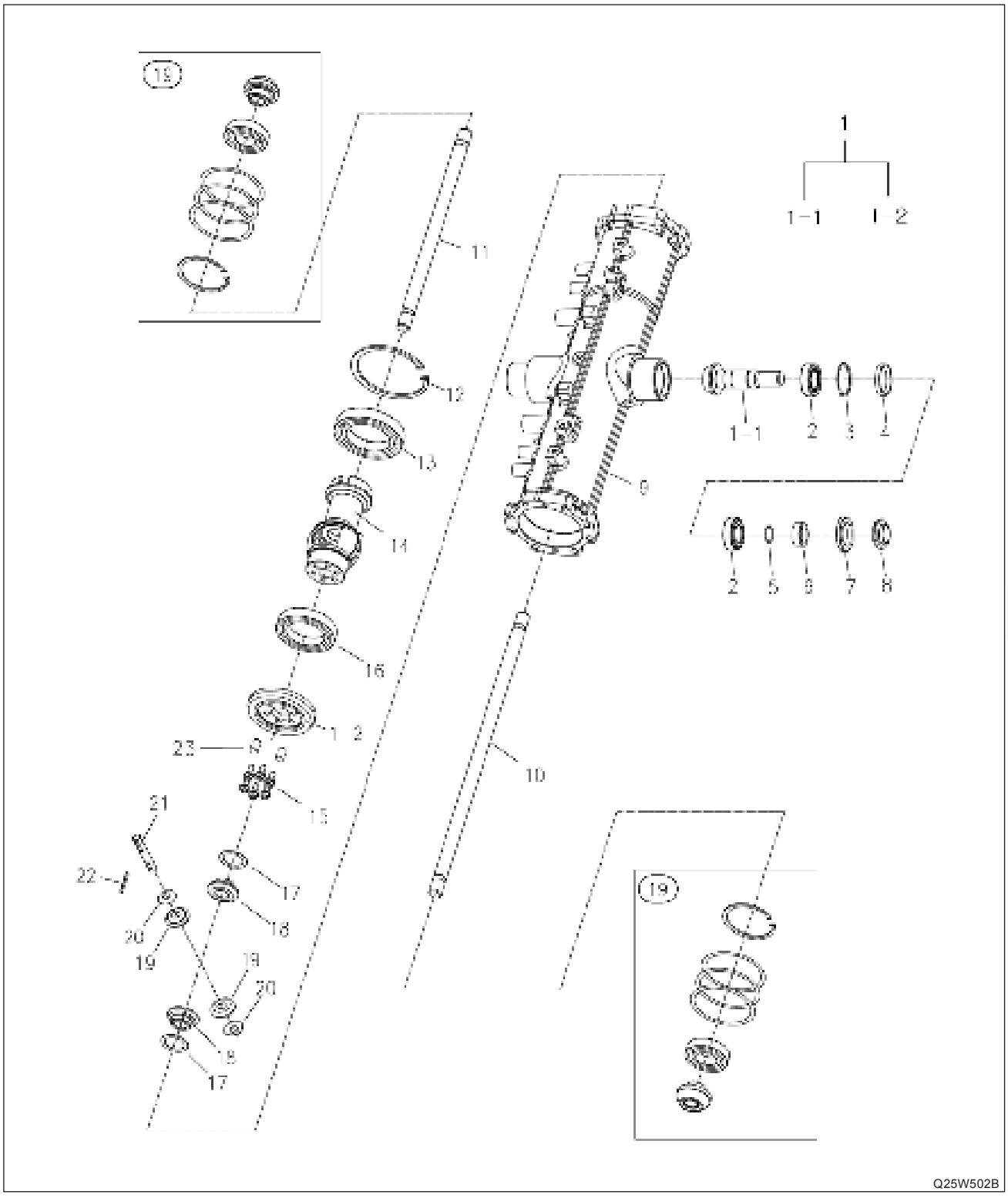
4.2 TIE ROD



COMPONENTS

(1) Tie rod ass'y, L
(2) Tie rod ass'y, R
(3) Nut
(4) Nut
(5) Nut
(6) Cotter pin
(7) Ring
(8) Cover
(9) Clip
(10) Cover
(11) Grease nipple
(12) Knuckle arm(L)
(13) Knuckle arm(R)

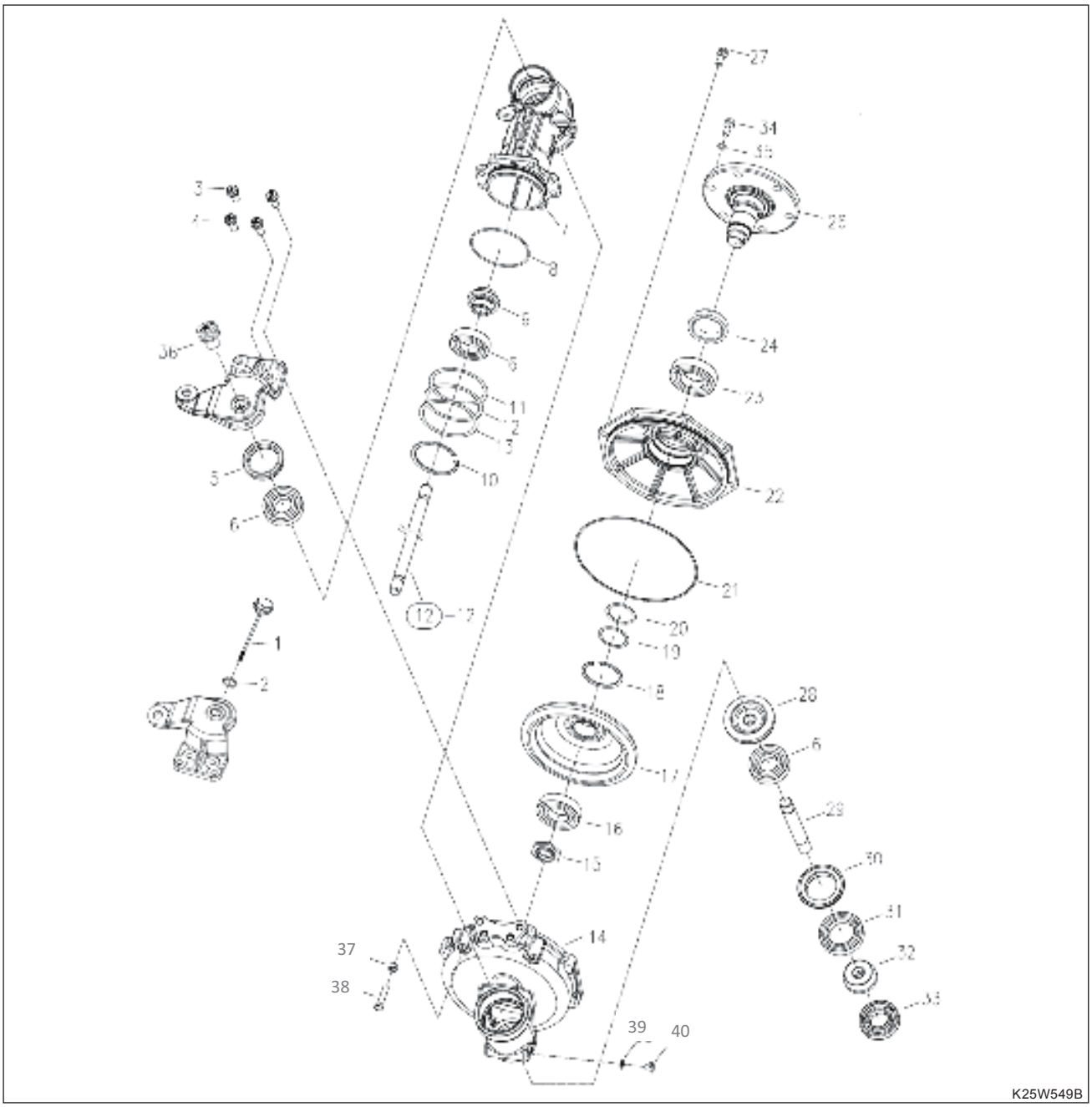
4.3 RING GEAR AND DIFFERENTIAL GEAR



COMPONENTS

(1) Ring gear ass'y
(1-1) Drive pinion
(1-2) Ring gear
(2) Roller bearing
(3) Snap ring
(4) Collar
(5) O-ring
(6) Bush
(7) Oil seal
(8) Nut
(9) Case
(10) Front first shaft
(11) Front first shaft
(12) Snap ring
(13) Ball bearing
(14) Differential case
(15) Hex flange bolt
(16) Ball bearing
(17) Liner
(18) Differential gear 14
(19) Differential gear 10
(20) Liner
(21) Shaft, differential pinion
(22) Spring pin
(23) Pin

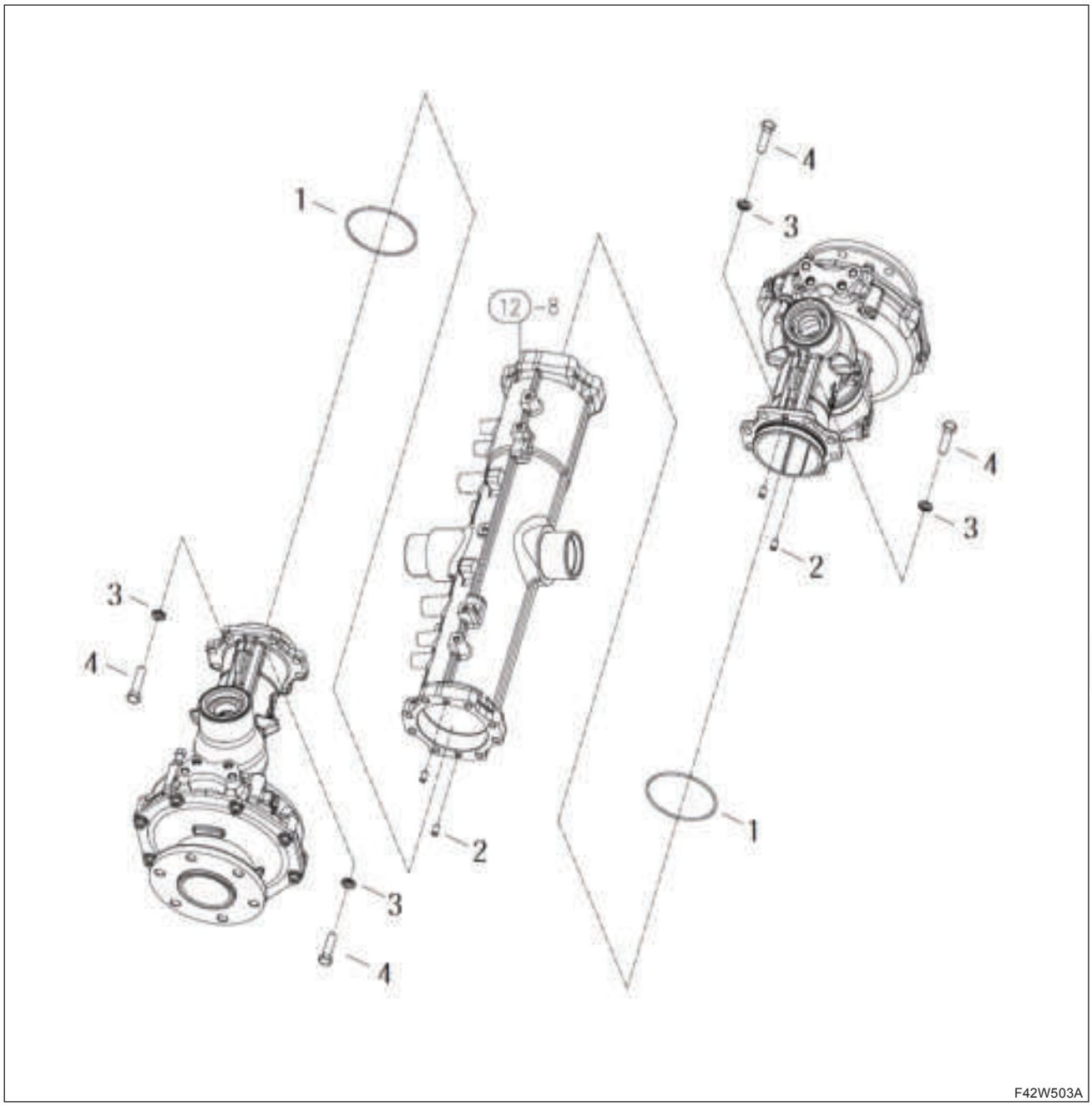
4.4 4WD GEAR CASE



COMPONENTS

(1) Oil level
(2) O-ring
(3) Bolt w/washer
(4) Reamer bolt
(5) Oil seal
(6) Ball bearing
(7) Housing front gear
(8) O-ring
(9) Front first pinion
(10) Snap ring
(11) Shim 0.2T
(12) Shim 0.3T
(13) Shim 0.5T
(14) Housing front gear
(15) Lock nut
(16) Ball bearing
(17) Gear bevel 49T
(18) Snap ring
(19) Shim 0.2T
(20) Shim 0.5T
(21) O-ring
(22) Housing front bearing
(23) Ball bearing
(24) Oil seal
(26) Front spindle
(27) Bolt w/washer
(28) Gear, front second shaft
(29) Front second shaft
(30) Seal
(31) Ball bearing
(32) Gear bevel 11T
(33) Bearing
(34) Bolt(m14x1.5P)
(35) Spring, washer
(36) Cap, oil
(37) Hex net
(38) Hex bolt
(39) Seal washer
(40) Plug m10

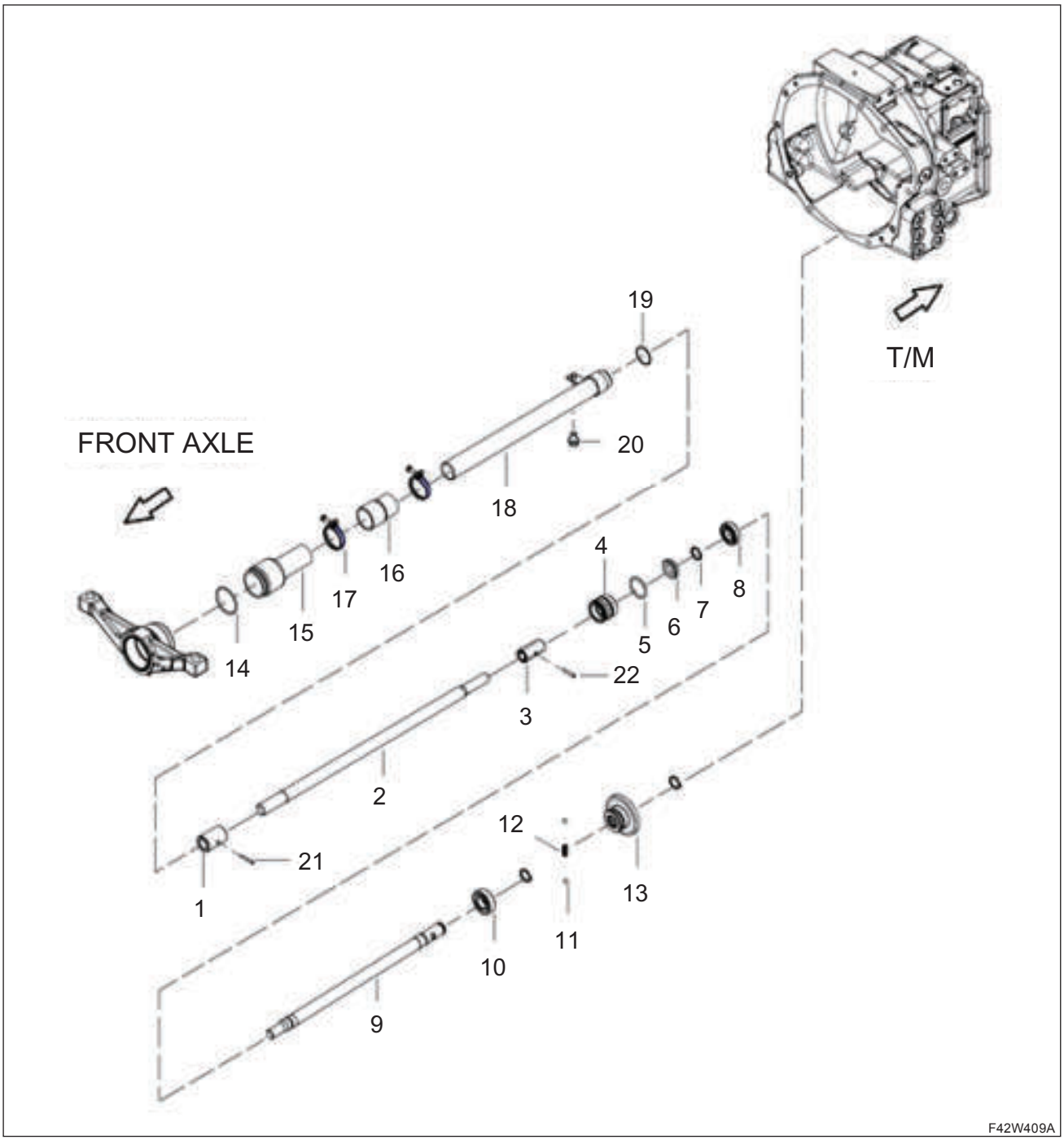
4.5 SPACER



COMPONENTS

(1) O-ring
(2) Pin
(3) Spring Washer
(4) Bolt

4.6 FRONT DRIVE SHAFT



COMPONENTS

(1) Couple ring R
(2) Propeller shaft
(3) 4th drive joint
(4) Oil seal housing
(5) O-ring
(6) Oil seal
(7) Snap ring
(8) Ball bearing
(9) 4th drive shaft
(10) Ball bearing
(11) Steel ball
(12) Spring
(13) 4th driven gear
(14) Stop O-ring
(15) Shaft cover(front)
(16) Shaft cover boots
(17) Hose band
(18) Shaft cover(back)
(19) Stop O-ring
(20) Hex flange bolt
(21) Spring pin
(22) Spring pin

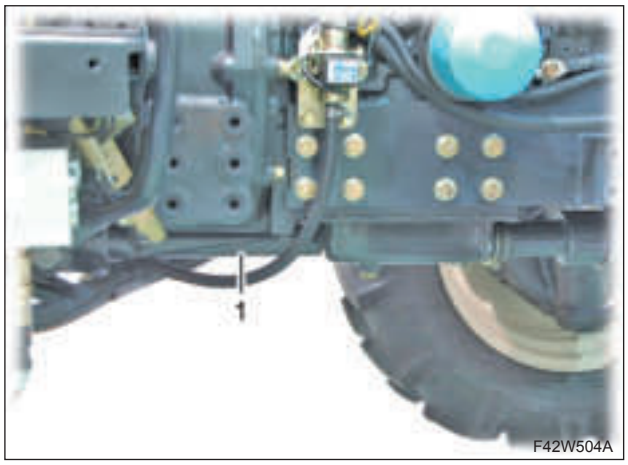
5. DISASSEMBLY AND SERVICE

5.1 FRONT AXLE CASE ASSEMBLY REMOVAL

1. Park the tractor on firm level ground.

2. Unscrew the drain plug (1) on the bottom of the front axle case to drain oil from the front axle case.

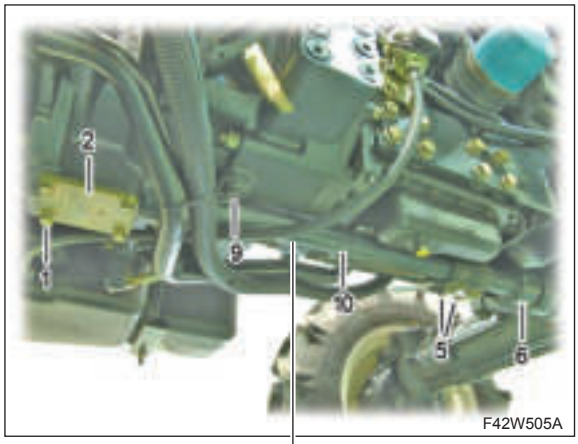
OIL CAPACITY FOR FRONT AXLE	6.4ℓ (1.69 u.s.gal)

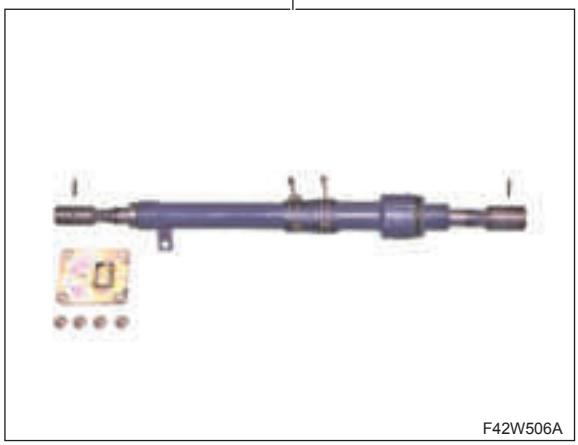


3. Remove the propeller shaft (1).

Notes

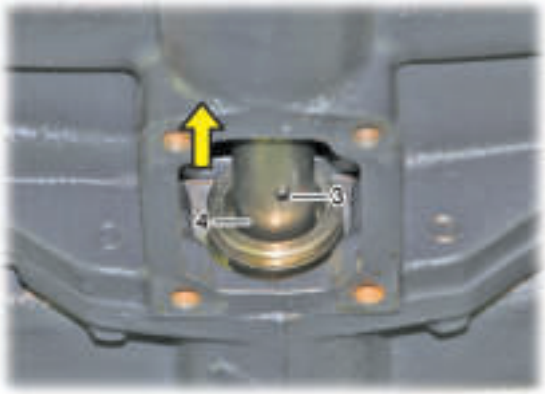
▶ **PROPELLER SHAFT DISASSEMBLY AND ASSEMBLY**





Notes

▶ **PROPELLER SHAFT DISASSEMBLY AND ASSEMBLY**



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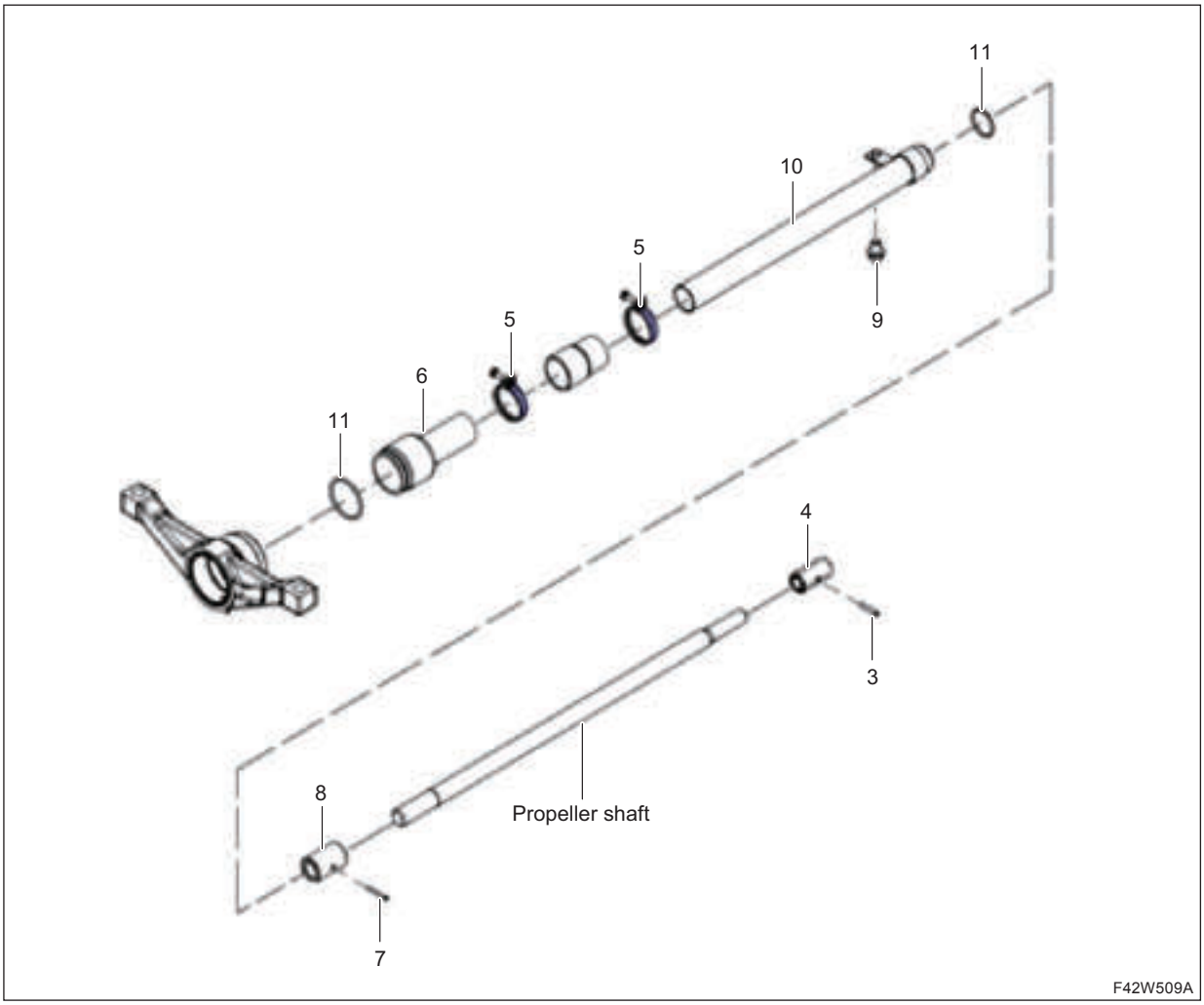
Notes

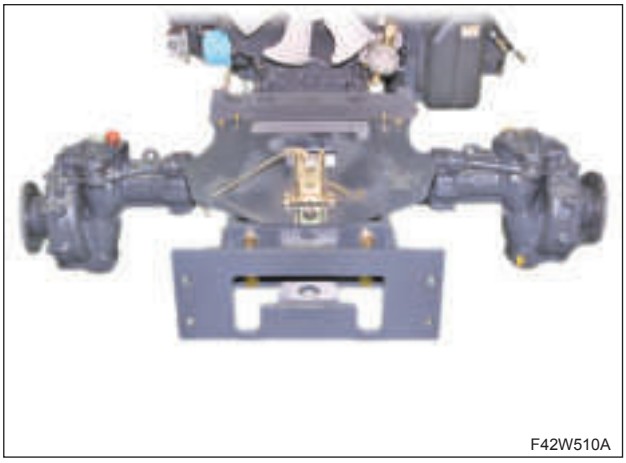
▶ **PROPELLER SHAFT DISASSEMBLY AND ASSEMBLY**



1. Unscrew the cover mounting bolts (1) and remove the cover (2). Then, remove the coupling pin (3) and pull out the coupling (4) in the arrow direction (front side of vehicle) to remove the 4WD shaft.
2. After loosening the shaft cover booth band (5) and pull out the shaft cover (FRT)(6) in the front bracket.
3. Pull out the coupling pin (7) and remove the coupling (8) from the bevel pinion.
4. Unscrew the mounting bolts (9) of the shaft cover (RR) and pull out the shaft cover (RR)(10) to remove the propeller shaft assembly.

⚠ CAUTION

- **Check the O-rings (11) (2 EA) in the propeller shaft. If any one is faulty, replace it with a new one.**
- **Apply grease to the surface of a new O-ring and be careful not to miss any O-ring.**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4. Place a stand under the engine oil pan. With the front of the tractor lifted slightly, remove the front tires.

⚠ CAUTION

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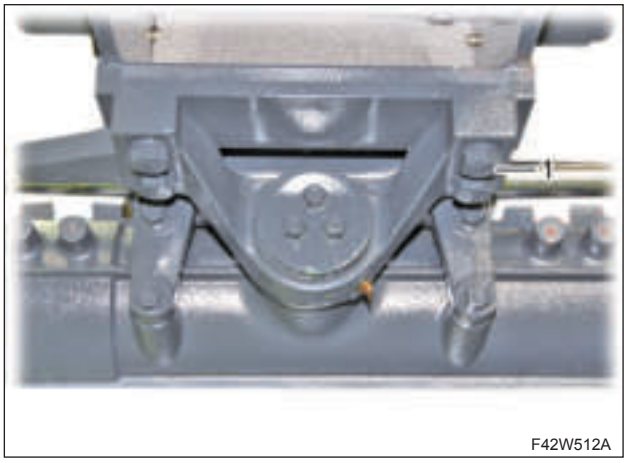
- **After removing one tire, the center of gravity of the front axle case is shifted so the body starts to lean. Therefore, fit a wooden wedge block (A) between the front axle case and front axle bracket before removing the front tires.**



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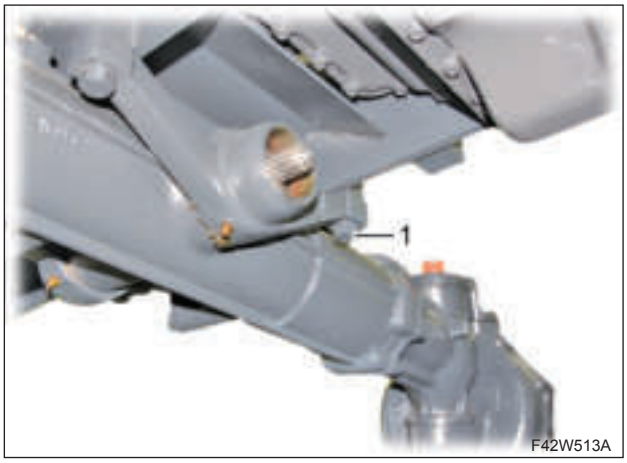

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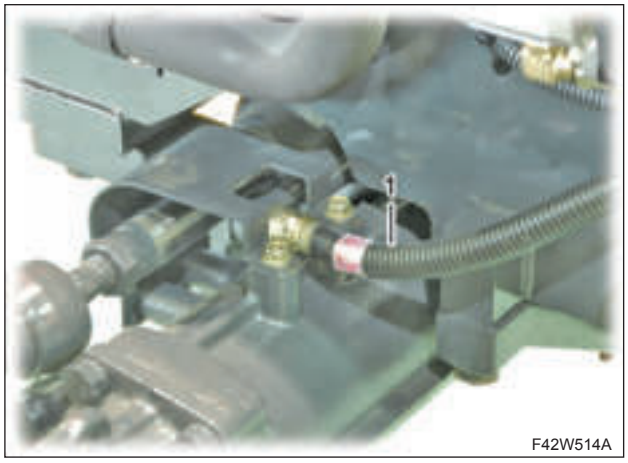
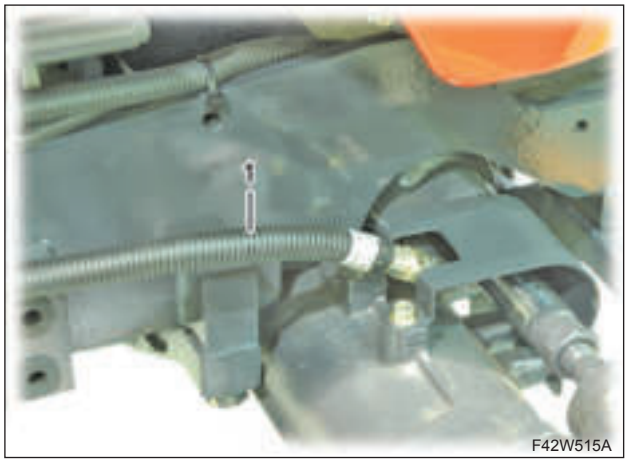
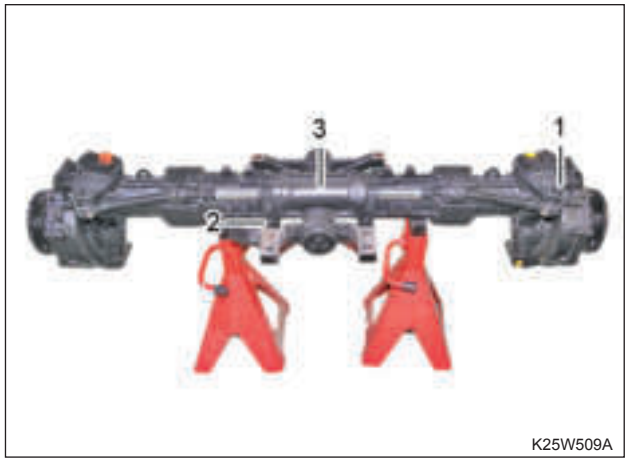
5. Support the front axle case with a portable hydraulic jack or hoist. Then, unscrew the mounting bolts (1) of the front and rear supports to separate the supports from their front axle bracket.

ITEM	TORQUE VALUE
Mounting bolt	392 N.m 40 kgf.m 288 lbf.ft



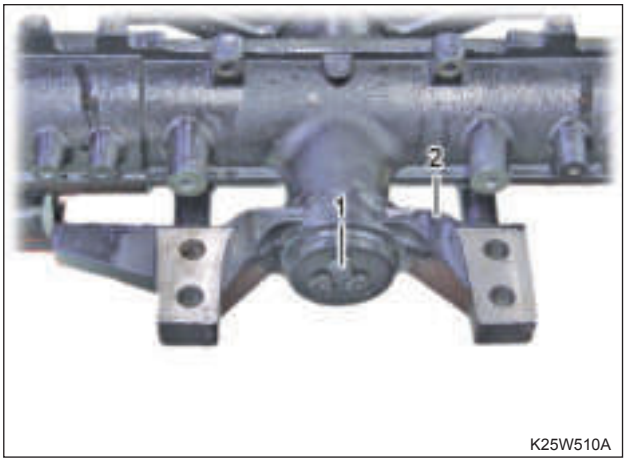


6. Disconnect each PST cylinder hydraulic hose (1). Then, remove the front axle case assembly.



7. Unscrew the slotted nut (1) of the tie rod end from the front axle case assembly and unscrew the PST cylinder mounting bolt (2) to separate the PST cylinder (3). When re-installing the PST cylinder, apply Loctite to the threads of its mounting bolt.

ITEM	TORQUE VALUE
PST cylinder mounting bolt	88.2 N.m 9.0 kgf.m 64.8 lbf.ft
Slotted nut	264.6 N.m 27 kgf.m 194.4 lbf.ft



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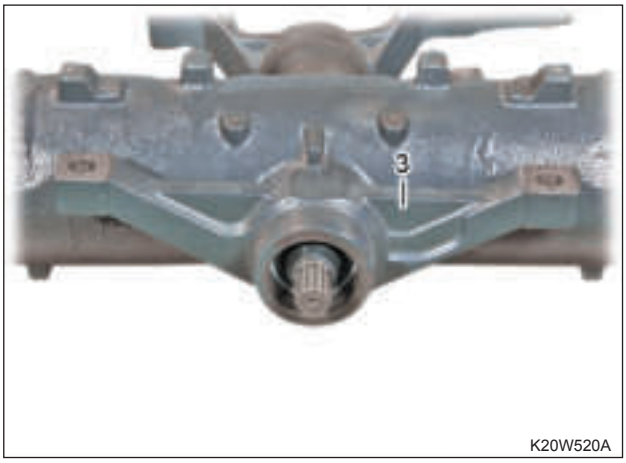

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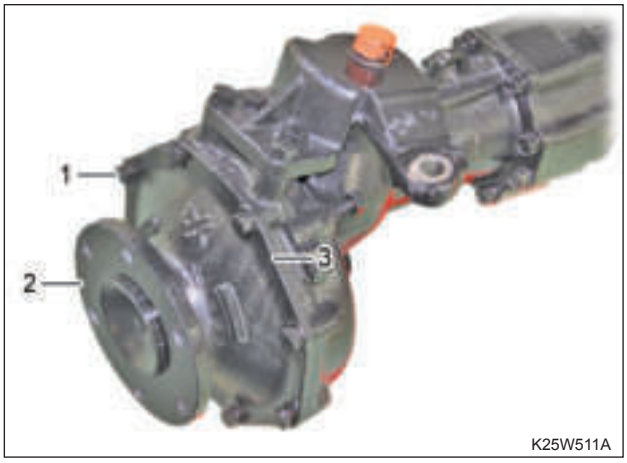
8. Remove the support (front) thrust plate (1) from the front axle case assembly. Then, pull out the support (front) (2) and support (rear) (3) to remove them.

5.2 FRONT AXLE CASE COMPONENT DISASSEMBLY

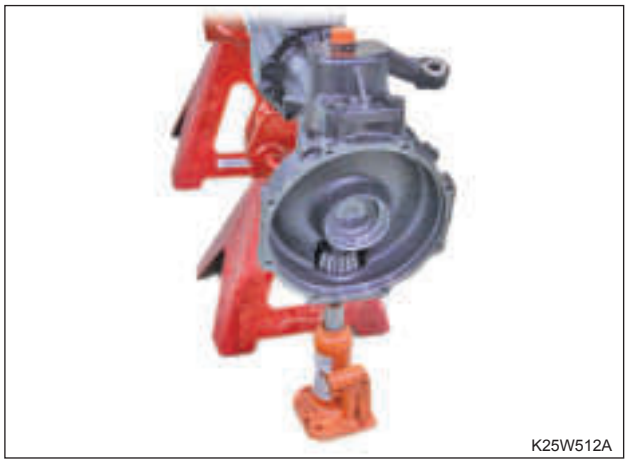
5.2.1 FRONT GEAR CASE

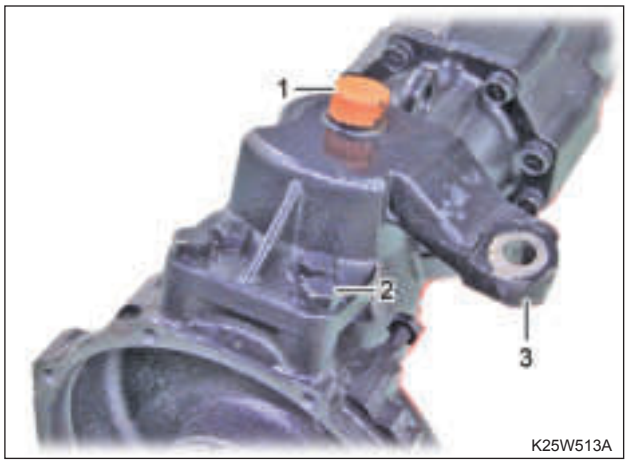


K25W511A

1. Unscrew the front bearing case mounting bolts (1) and remove the front spindle (2) and front bearing case (3) assembly together.

ITEM	TORQUE VALUE
Mounting bolt	51.9±6.9 N.m 5.3±0.7 kgf.m 38.2±5.0 lbf.ft


K25W512A



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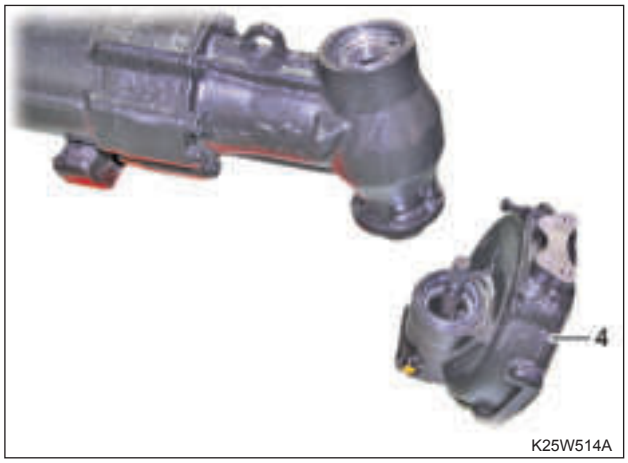
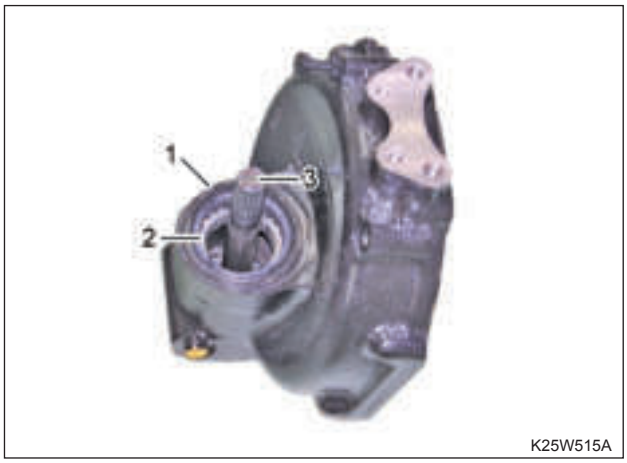


K25W514A

2. Place a jack under the front gearbox and unscrew the filler plug (1) and knuckle arm mounting bolts (2).
3. Lift up the knuckle arm (3) to remove it. Then, pull down the front gearbox (4) to separate it.

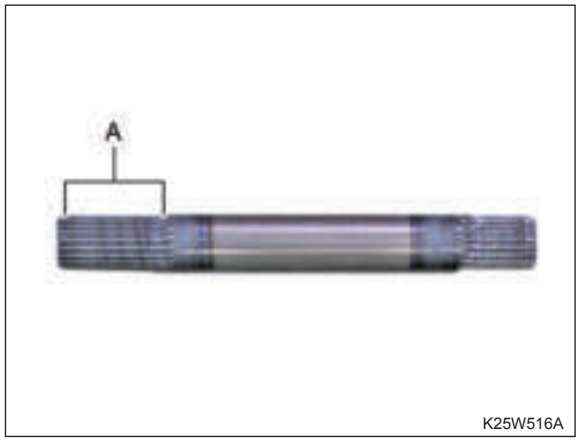
ITEM	TORQUE VALUE
Mounting bolt	88.2 N.m 9.0 kgf.m 64.8 lbf.ft



K25W515A

4. Remove the bearing seal (1), ball bearing (2) and front 2nd shaft (3) from the front gearbox by lifting them up.

Notes

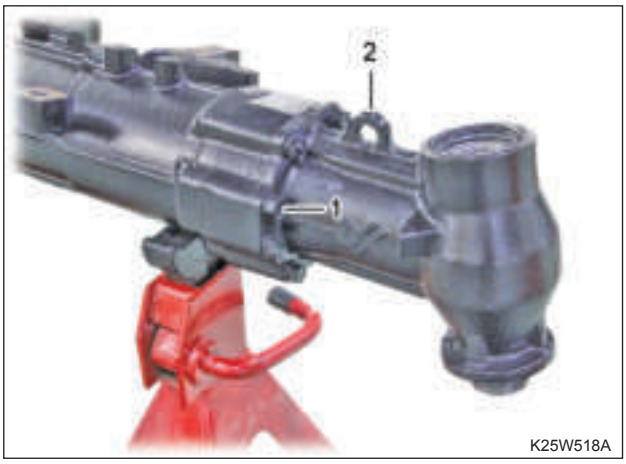


K25W516A

- **During the front 2nd shaft installation, make sure that the long side section (A) of the spline is toward the bevel gear 11T.**

K25W517A

5. Lift up the bevel gear (1) from the front gearbox to remove it.



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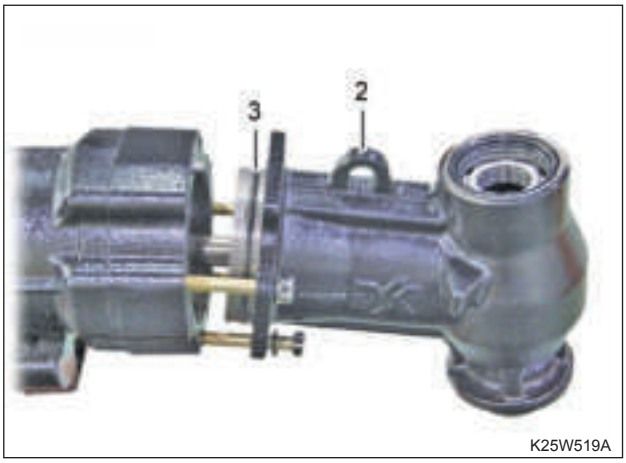


K25W519A

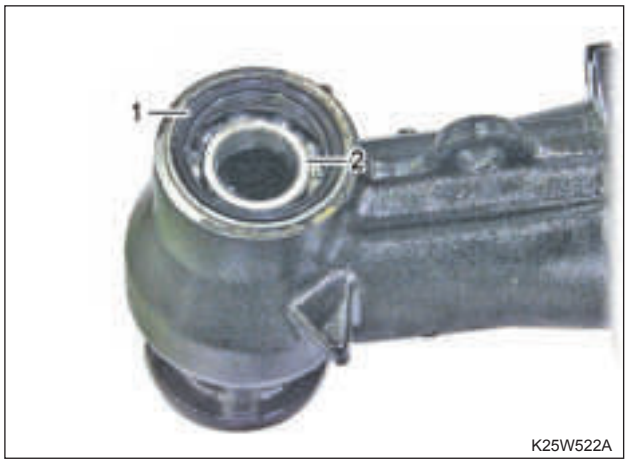
K25W521A

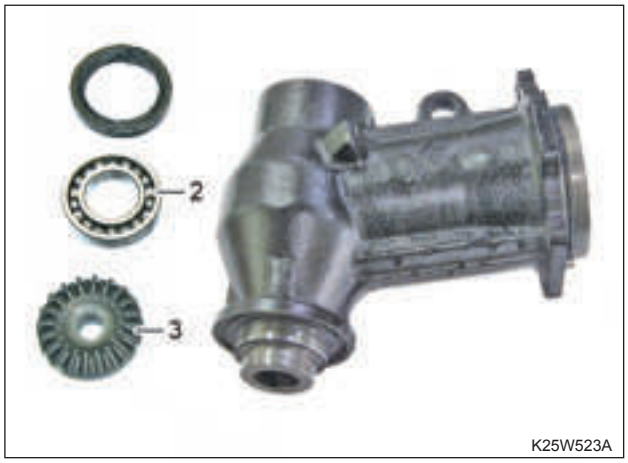
6. Unscrew the front axle case support bolts (1) to separate the front gear case assembly (2).

Notes
• **Apply grease to the O-ring (3) of the front axle case when re-installing it.**

ITEM	TORQUE VALUE
Support bolt (1)	88.2 N.m 9.0 kgf.m 64.8 lbf.ft

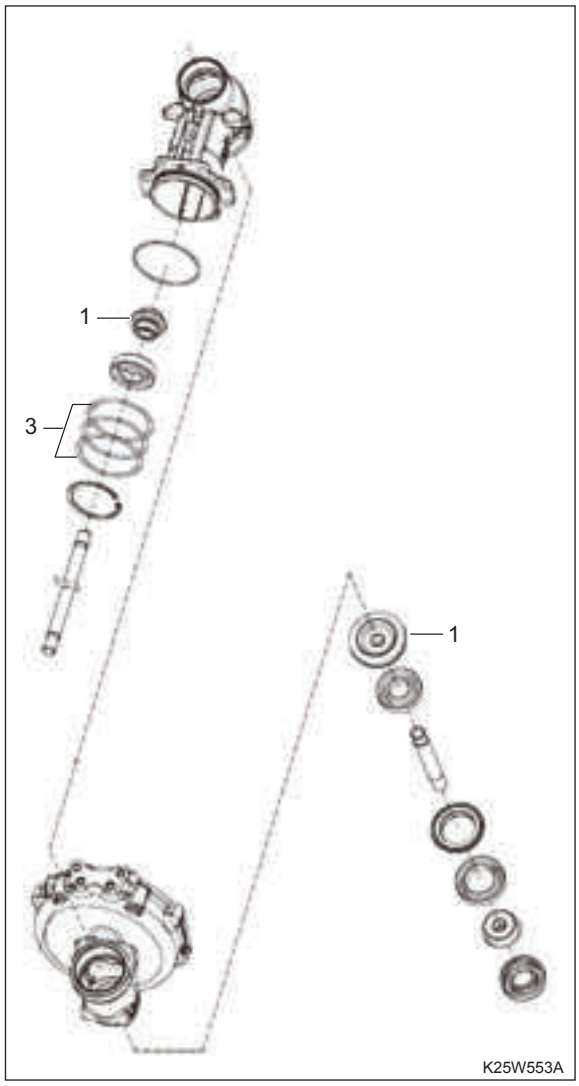
7. Pull out the snap ring (1) for hole and remove the shim (2) and front 1st shaft pinion (3). At this moment, check the amount of the shims between the snap ring and bearing so that the same amount of the shims can be fitted during assembly.



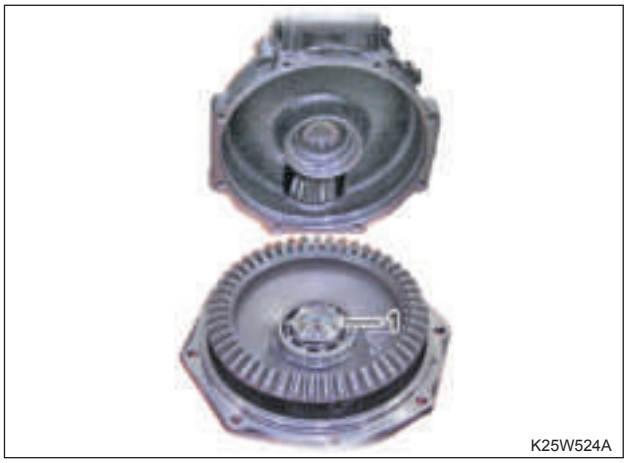


8. Remove the oil seal (1) from the front gear case. Then, remove the deep-groove ball bearing (2) and front 2nd shaft gear (3).

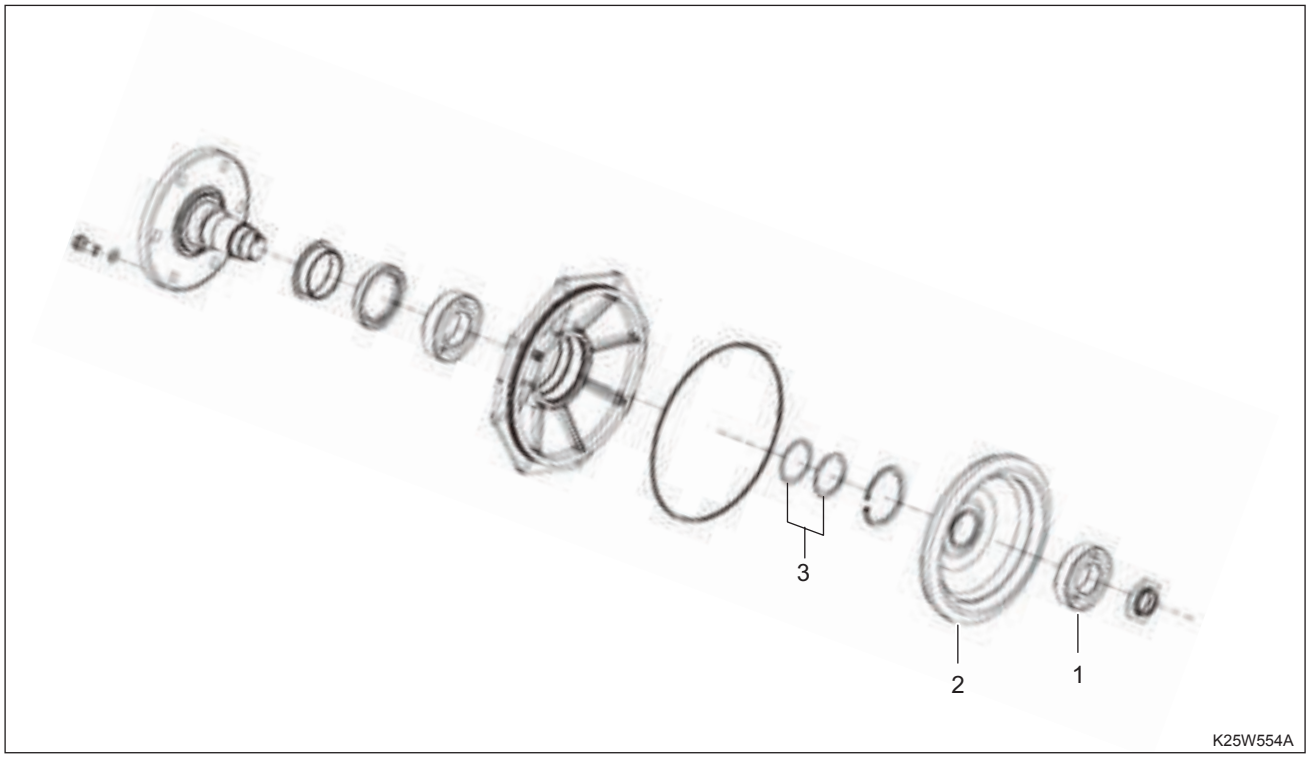
Notes

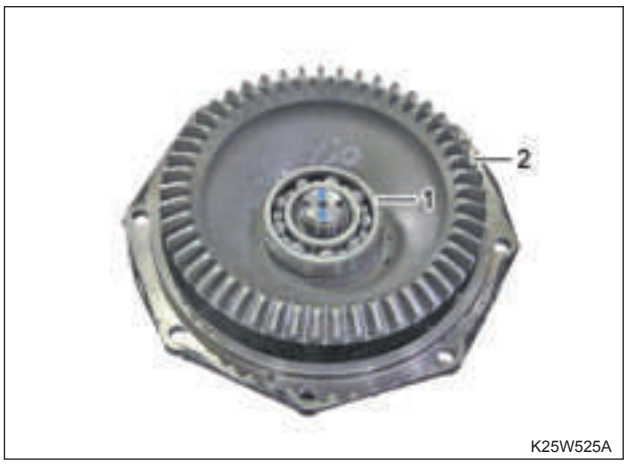


- **Adjust the backlash between the front 1st shaft pinion (1) and front 2nd shaft gear (2) to 0.15 - 0.3 mm (0.006 - 0.012 in.) using 0.2T, 0.3T and 0.5T shims (3).**

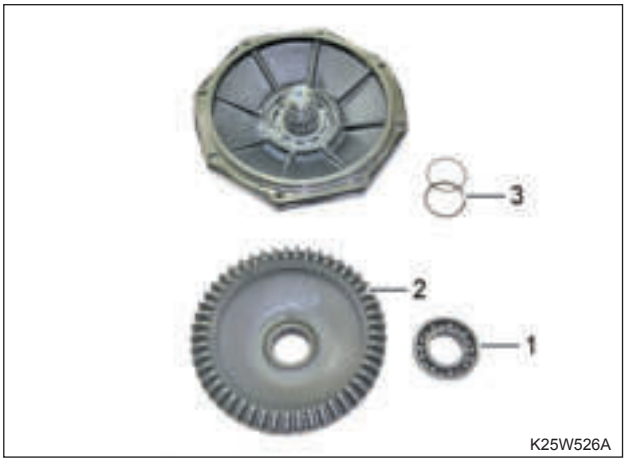


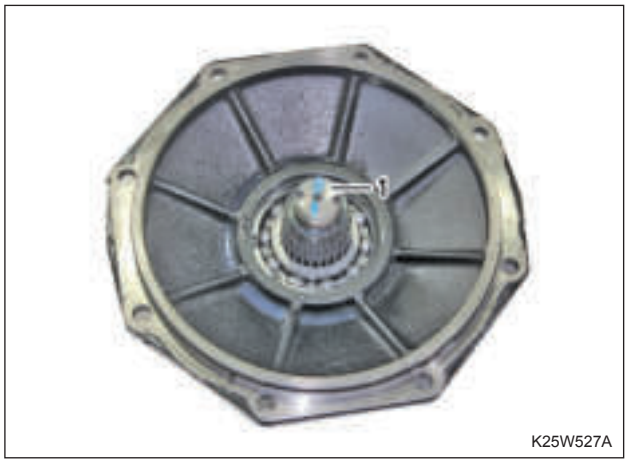
9. Unscrew the front spindle mounting lock nut (1) from the front bearing case assembly.

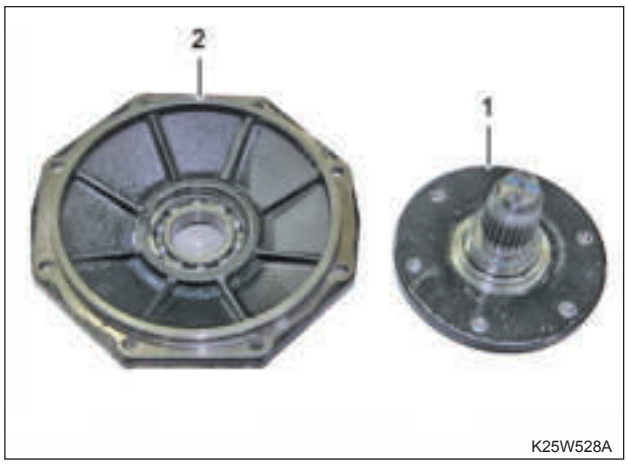




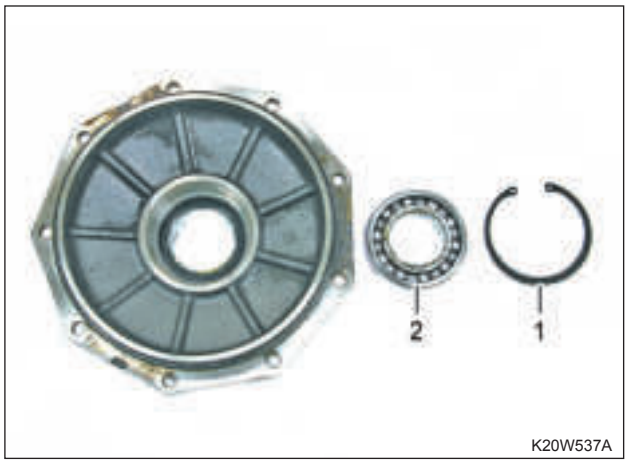
10. Remove the bearing (1) and front final gear (2). Then, remove the adjust shim (3).







11. Separate the front spindle (1) and front bearing case (2) from each other.



12. Pull out the snap ring for hole (1) from the front bearing case and remove the deep-groove ball bearing (2).

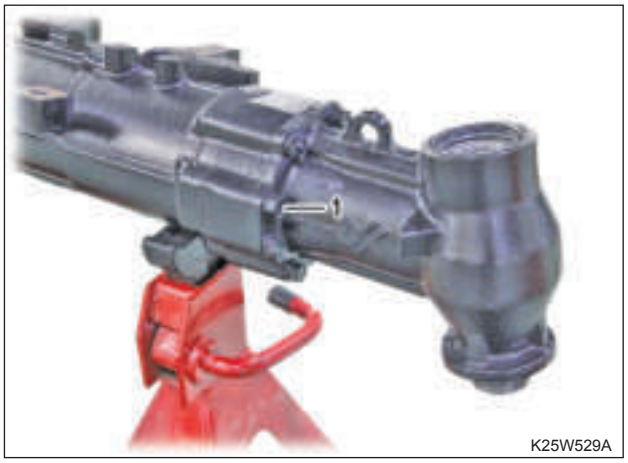
FRONT SPINDLE INSTALLATION

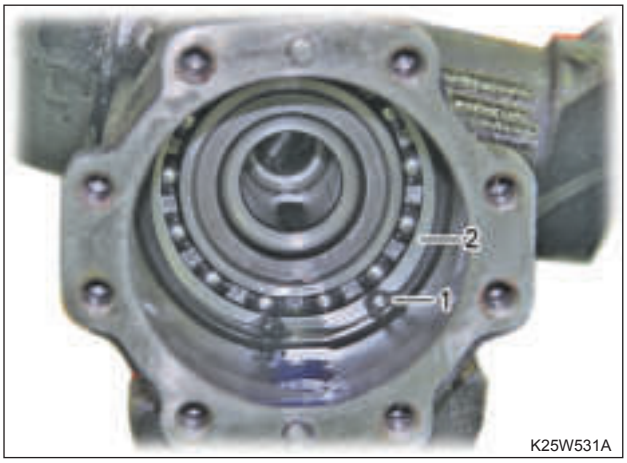
1. Insert the front final gear into the front spindle, install the washer, lock washer and mounting bolt and tighten the bolt to the specified torque. Then, bend the lock washer to press it against the bolt head.

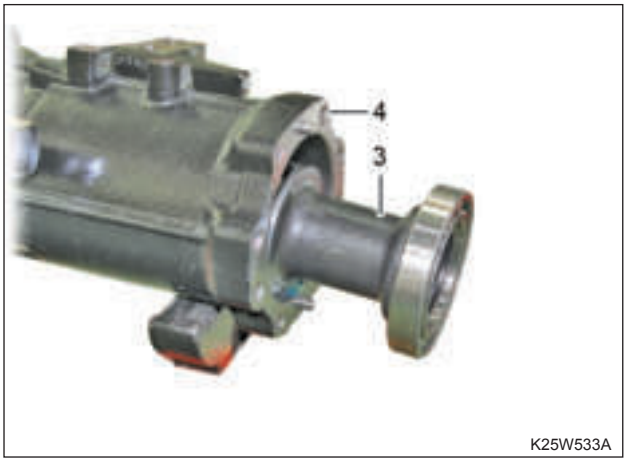
ITEM	TORQUE VALUE
Mounting bolt	51.9 N.m 5.3 kgf.m 38.2 lbf.ft

2. Apply grease to the O-ring of the front bearing case and fit it to the front gearbox.

5.2.2 FRONT DIFFERENTIAL





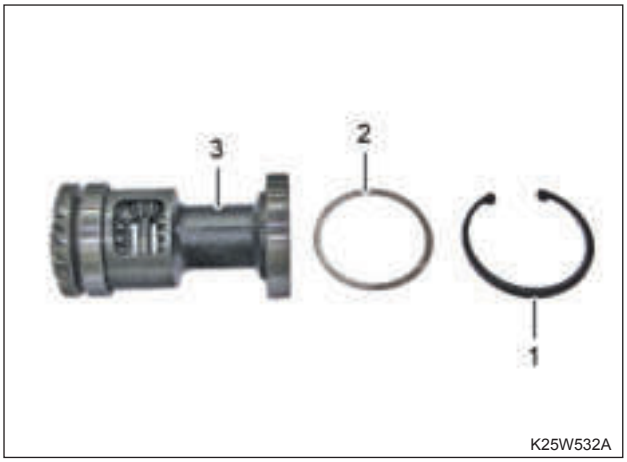


1. Unscrew the front gear case mounting bolts (1) to remove the front gear case (2), spacer (3) and front 1st shaft (4) together.

ITEM	TORQUE VALUE
Mounting bolt	88.2 N.m 9.0 kgf.m 64.8 lbf.ft

Notes

- **Apply grease to the O-ring (5) of the front axle case when re-installing it.**

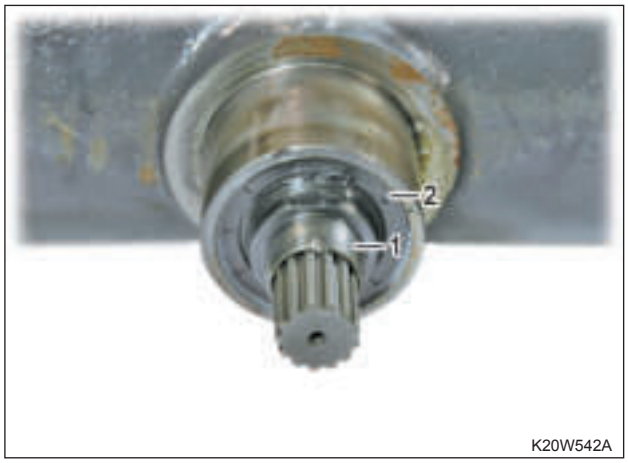


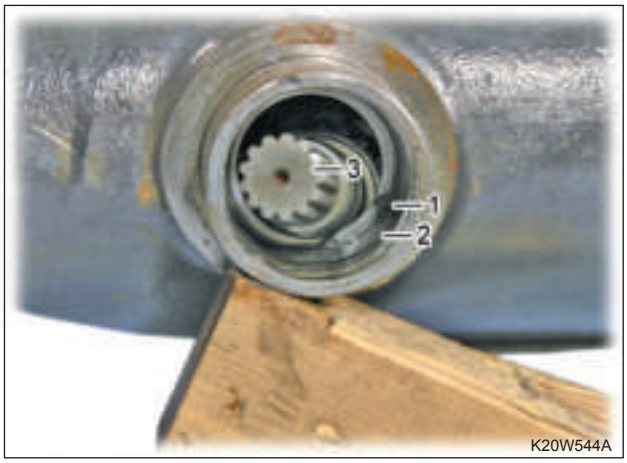
2. Pull out the snap ring (1) and adjusting shim (2) to remove the differential case assembly (3) from the front axle case (4).

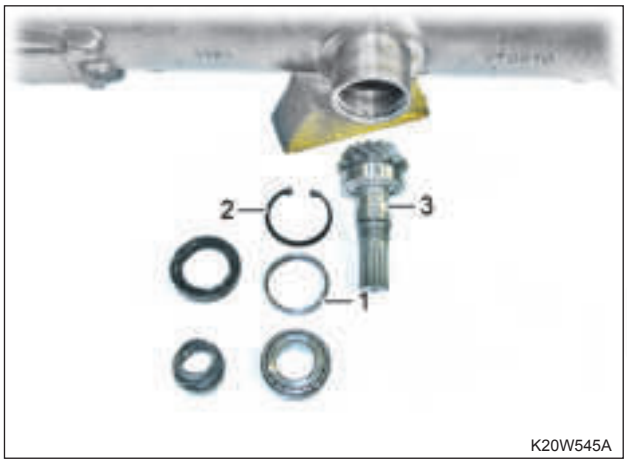
ITEM	TORQUE VALUE
Mounting bolt	29.4 N.m 3.0 kgf.m 21.6 lbf.ft

Notes

- **Apply Loctite to the threads of the bearing retainer mounting bolt during re-installation.**



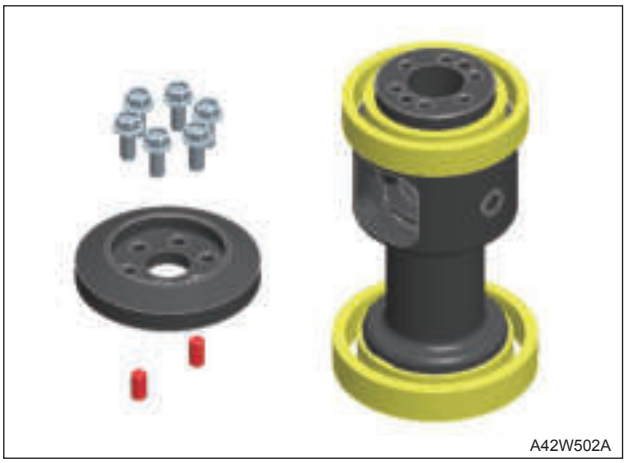




3. Unscrew the seal collar (1) from the drive pinion, pull out the oil seal (2) and remove the taper roller bearing (3).

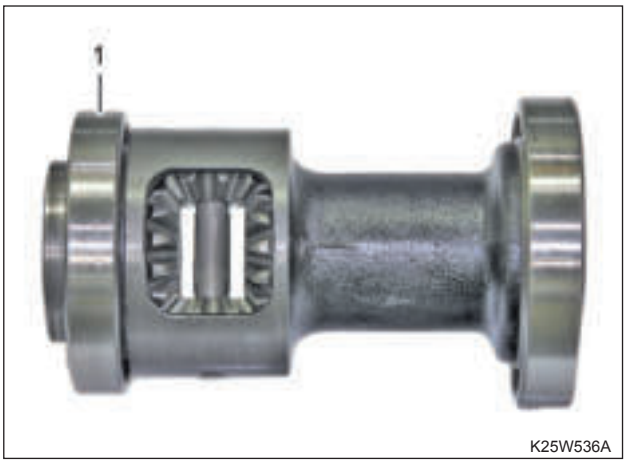
4. Pull out the collar (1) and snap ring (2). Then, remove the drive pinion (3) by pushing into the front axle case hole.

5.2.3 FRONT DIFFERENTIAL ASSEMBLY DISASSEMBLY

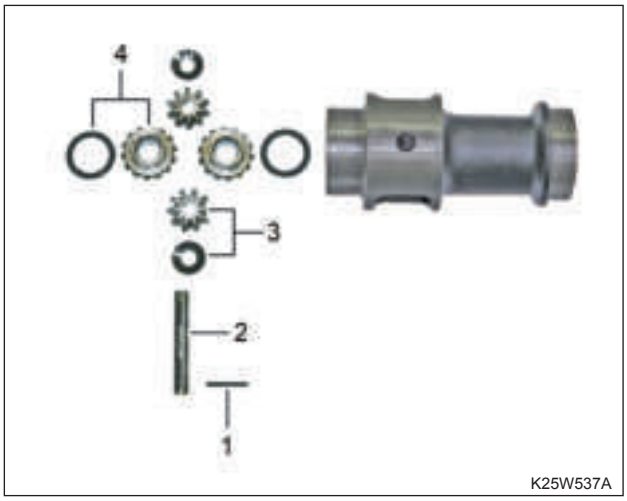


1. Unscrew the ring gear mounting bolts (1) from the front differential assembly to separate the ring gear (2) and differential case (3).

ITEM	TORQUE VALUE
Mounting bolt M8(10.9T)	34.3 N.m 3.5 kgf.m 25.2 lbf.ft



2. Remove the ball bearings (1) from both sides of the differential case assembly.



3. Pull out the spring pin (1) from the knock pin hole of the differential case. Then, remove the differential pinion shaft (2) and differential pinion gear 10 (3) together. And then, remove the differential side gear and liner (4).
4. Assemble in the reverse order of disassembly.

CHAPTER 5 HYDRAULIC SYSTEM

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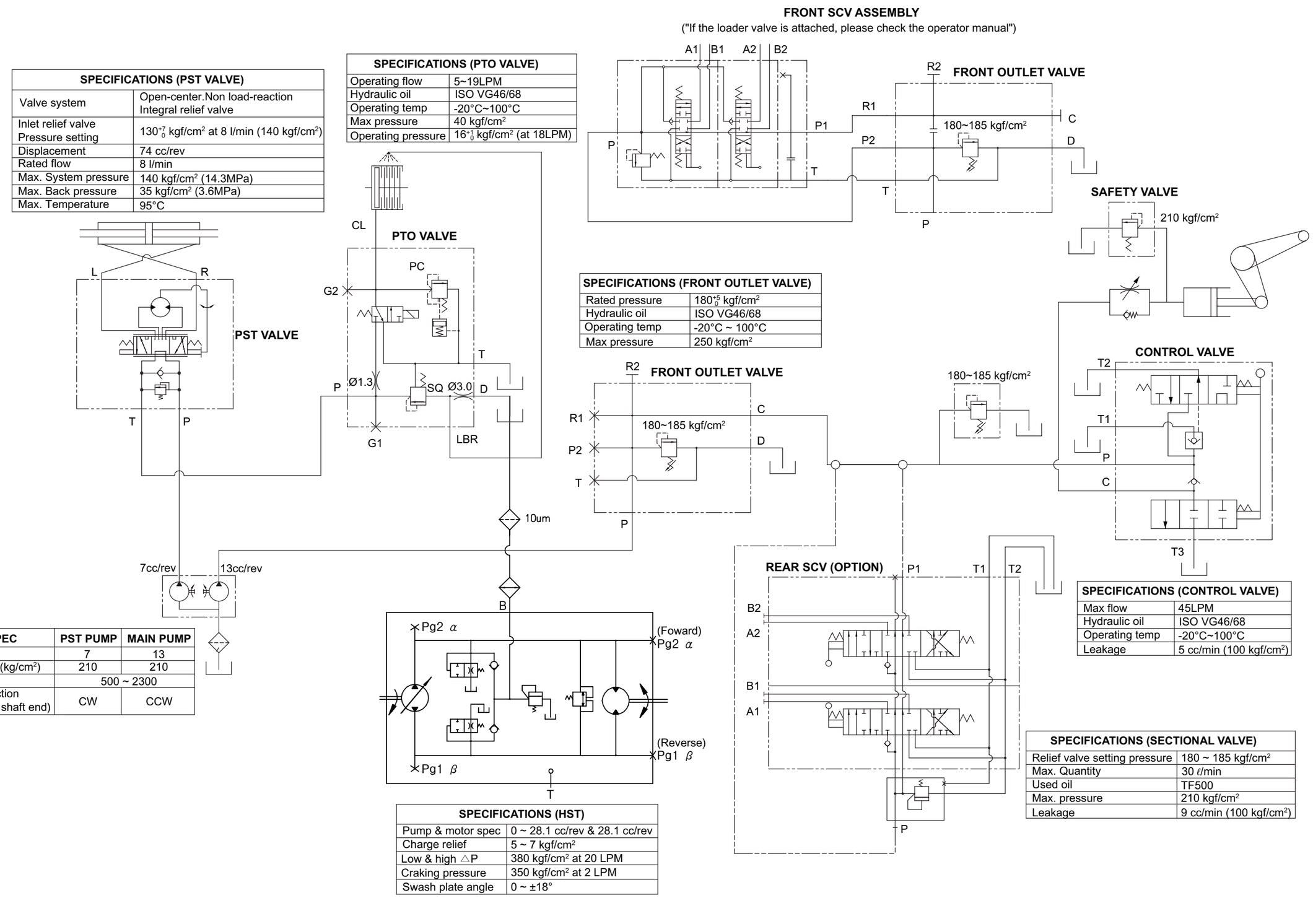
1. CIRCUIT DIAGRAM FOR HYDRAULIC SYSTEM

ROPS MODEL



SPECIFICATIONS (PST VALVE)	
Valve system	Open-center.Non load-reaction Integral relief valve
Inlet relief valve Pressure setting	130^{+7}_{0} kgf/cm² at 8 l/min (140 kgf/cm²)
Displacement	74 cc/rev
Rated flow	8 l/min
Max. System pressure	140 kgf/cm² (14.3MPa)
Max. Back pressure	35 kgf/cm² (3.6MPa)
Max. Temperature	95°C

SPECIFICATIONS (PTO VALVE)	
Operating flow	5~19LPM
Hydraulic oil	ISO VG46/68
Operating temp	-20°C~100°C
Max pressure	40 kgf/cm²
Operating pressure	16^{+1}_{0} kgf/cm² (at 18LPM)

SPECIFICATIONS (FRONT OUTLET VALVE)	
Rated pressure	180^{+5}_{0} kgf/cm²
Hydraulic oil	ISO VG46/68
Operating temp	-20°C ~ 100°C
Max pressure	250 kgf/cm²

SPECIFICATIONS (CONTROL VALVE)	
Max flow	45LPM
Hydraulic oil	ISO VG46/68
Operating temp	-20°C~100°C
Leakage	5 cc/min (100 kgf/cm²)

PUMP SPEC	PST PUMP	MAIN PUMP
Flow(cc/rev)	7	13
Max pressure(kg/cm²)	210	210
RPM	500 ~ 2300	
Rotation direction (Viewed from shaft end)	CW	CCW

SPECIFICATIONS (HST)	
Pump & motor spec	0 ~ 28.1 cc/rev & 28.1 cc/rev
Charge relief	5 ~ 7 kgf/cm²
Low & high △P	380 kgf/cm² at 20 LPM
Craking pressure	350 kgf/cm² at 2 LPM
Swash plate angle	0 ~ ±18°

SPECIFICATIONS (SECTIONAL VALVE)	
Relief valve setting pressure	180 ~ 185 kgf/cm²
Max. Quantity	30 ℓ/min
Used oil	TF500
Max. pressure	210 kgf/cm²
Leakage	9 cc/min (100 kgf/cm²)

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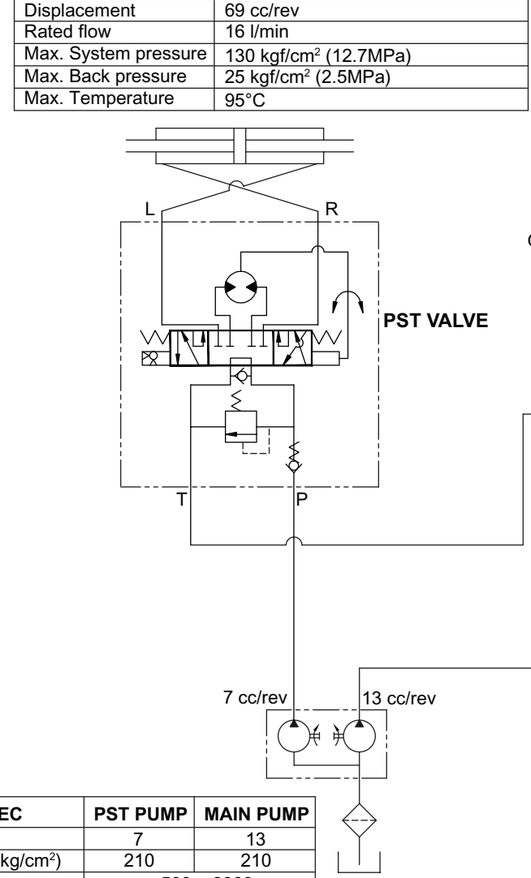
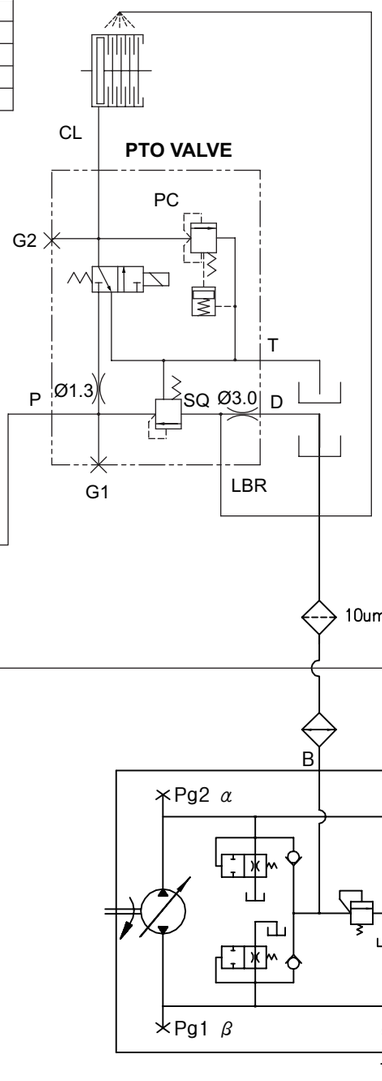
CABIN MODEL

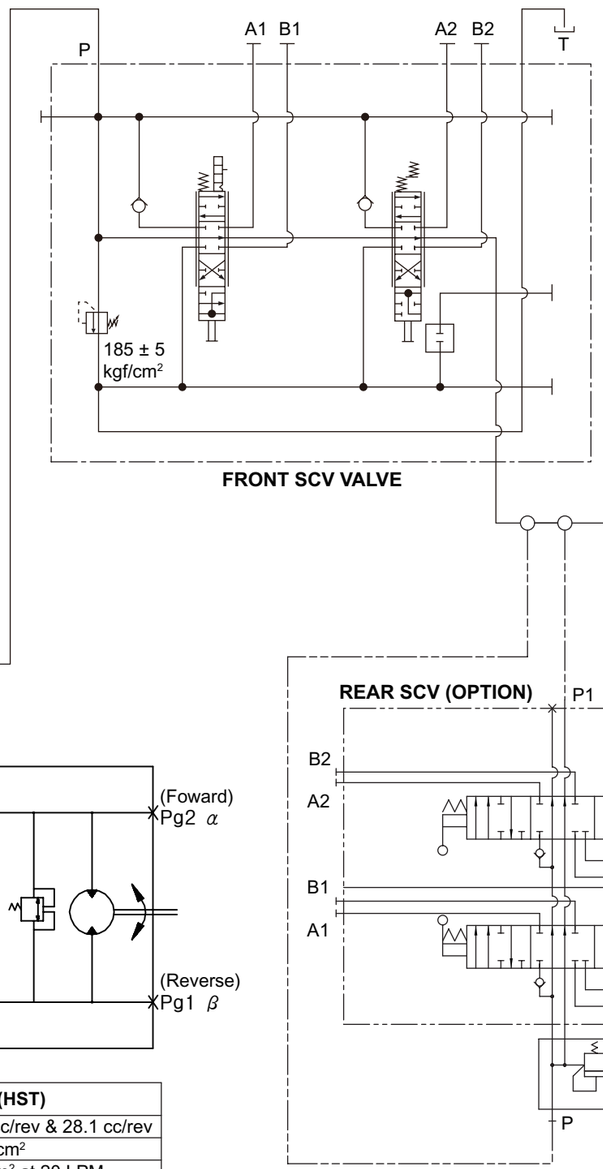
SPECIFICATIONS (PST VALVE)	
Valve system	Open-center.Non load-reaction Integral relief valve
Inlet relief valve Pressure setting	130 kgf/cm² at 16 l/min
Displacement	69 cc/rev
Rated flow	16 l/min
Max. System pressure	130 kgf/cm² (12.7MPa)
Max. Back pressure	25 kgf/cm² (2.5MPa)
Max. Temperature	95°C

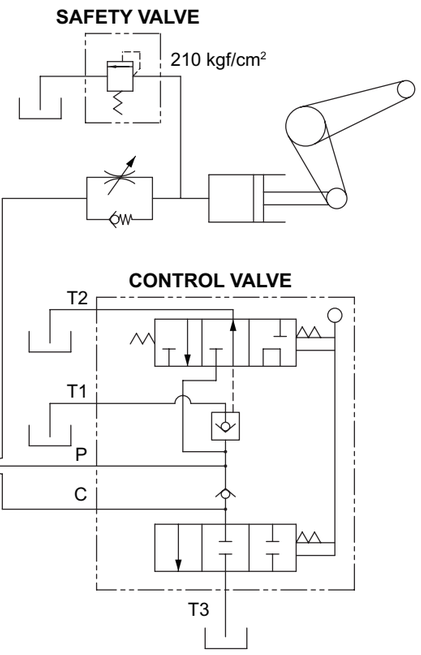
SPECIFICATIONS (PTO VALVE)	
Operating flow	5~19LPM
Hydraulic oil	ISO VG46/68
Operating temp	-20°C~100°C
Max pressure	40 kgf/cm²
Operating pressure	16^{+1}_{0} kgf/cm² (at 18LPM)

SPECIFICATIONS (FRONT SCV)	
Rated pressure	180 ± 5 kgf/cm² (at 30LPM)
Hydraulic oil	ISO VG46/68
Operating temp	-20°C ~ 80°C
Max pressure	250 kgf/cm²









PUMP SPEC	PST PUMP	MAIN PUMP
Flow(cc/rev)	7	13
Max pressure(kg/cm²)	210	210
RPM	500 ~ 2300	
Rotation direction (Viewed from shaft end)	CW	CCW

SPECIFICATIONS (HST)	
Pump & motor spec	0 ~ 28.1 cc/rev & 28.1 cc/rev
Charge relief	5 ~ 7 kgf/cm²
Low & high △P	380 kgf/cm² at 20 LPM
Craking pressure	350 kgf/cm² at 2 LPM
Swash plate angle	0 ~ ±18°

SPECIFICATIONS (CONTROL VALVE)	
Max flow	45LPM
Hydraulic oil	ISO VG46/68
Operating temp	-20°C~100°C
Leakage	5cc/min (100kgf/cm²)

SPECIFICATIONS (SECTIONAL VALVE)	
Relief valve setting pressure	180 ~ 185 kgf/cm²
Max. Quantity	30 ℓ/min
Used oil	TF500
Max. pressure	210 kgf/cm²
Leakage	9 cc/min (100 kgf/cm²)

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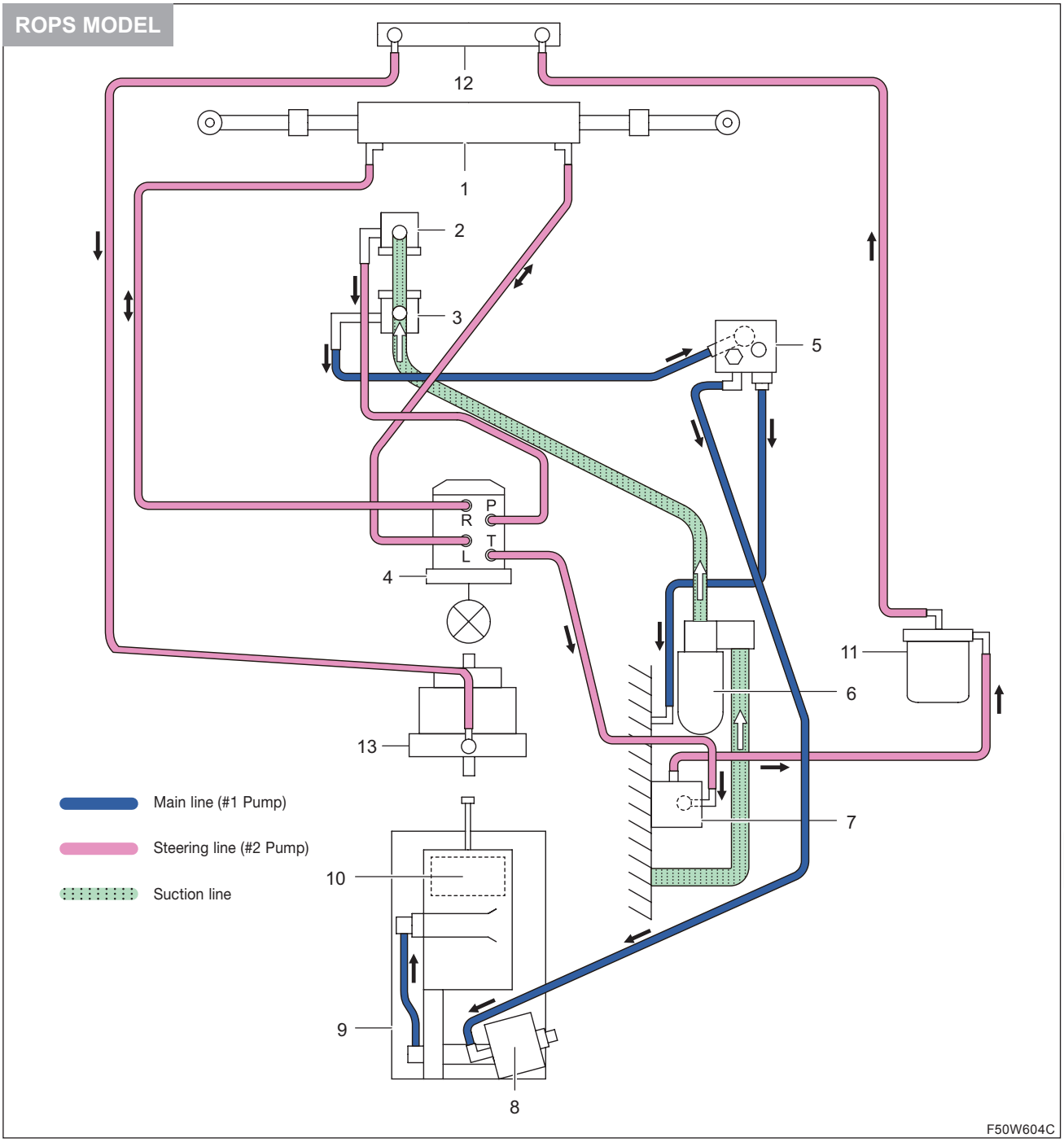
2. DIAGRAM FOR HYDRAULIC SYSTEM

ROPS MODEL



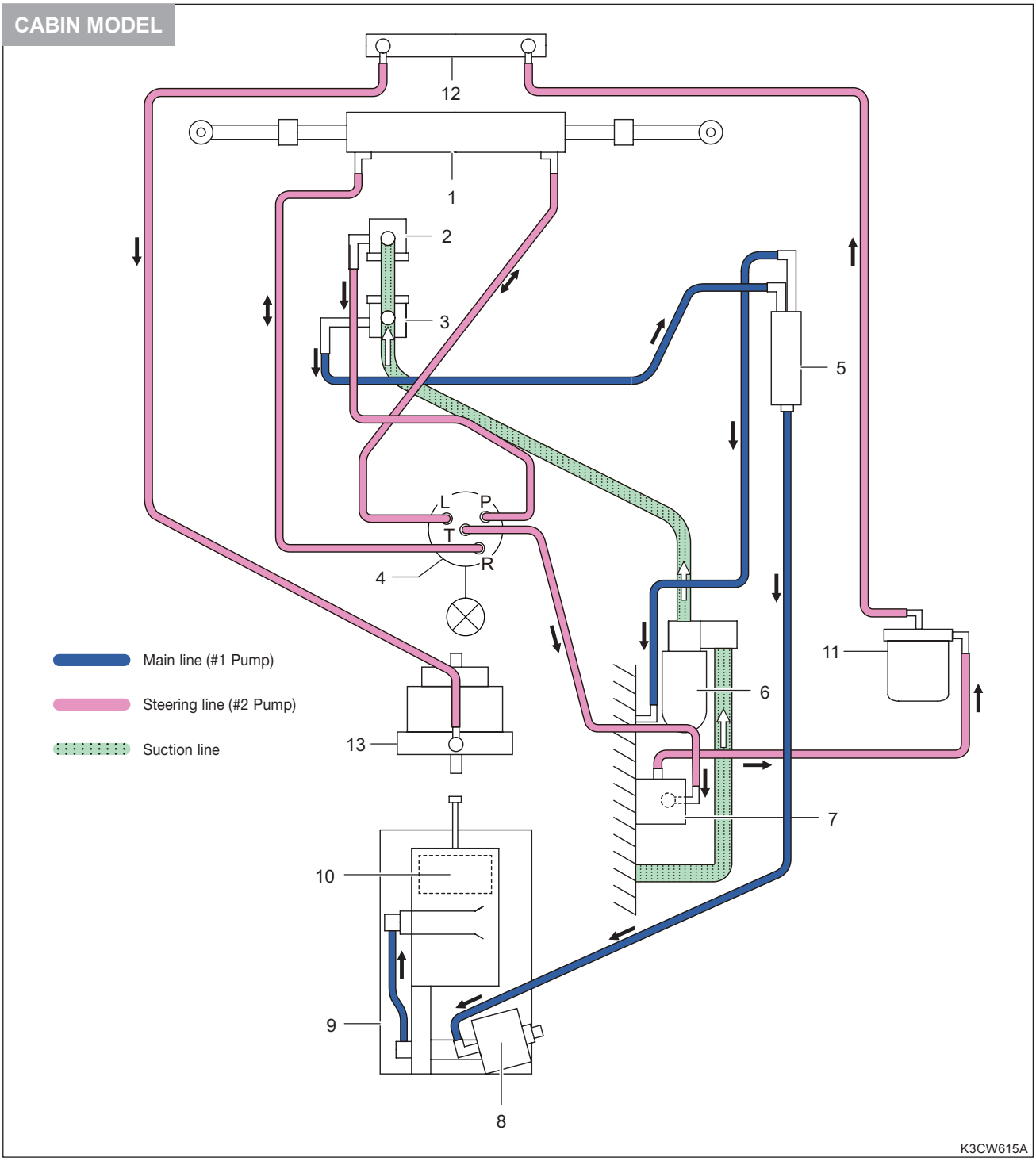
(1) PST cylinder
(2) Hydraulic pump (7cc)
(3) Hydraulic pump (13cc)
(4) PST valve
(5) Front outlet valve
(6) Hydraulic filter
(7) PTO valve
(8) Rear relief valve
(9) Hydraulic cylinder case
(10) Control valve
(11) HST filter
(12) Oil cooler
(13) HST

The hydraulic system can be divided into two parts; 3-point link section and steering section. Firstly, the 3-point link section receives hydraulic oil from the primary gear pump (13.0 cc/rev.) and supplies this oil to the position control valve for rear implement operation.

Secondly, the steering section receives hydraulic oil from the secondary gear pump (7.0 cc/rev.) and supplies this oil to the PST unit for power steering.

Hydraulic oil supplied from the secondary gear pump is used to operate the PST valve and PTO valve. Then, it is carried from the PTO valve into the HST filter to be filtered. After filtered, it is led into the oil cooler to be cooled down to a sufficient level before it is delivered to the HST for HST operation.

CABIN MODEL



(1) PST cylinder
(2) Hydraulic pump (7cc)
(3) Hydraulic pump (13cc)
(4) PST valve
(5) Loader valve (Front SCV)
(6) Hydraulic filter
(7) PTO valve
(8) Rear relief valve
(9) Hydraulic cylinder case
(10) Control valve
(11) HST filter
(12) Oil cooler
(13) HST

The hydraulic system can be divided into two parts; 3-point link section and steering section. Firstly, the 3-point link section receives hydraulic oil from the primary gear pump (13.0 cc/rev.) and supplies this oil to the position control valve for rear implement operation.

Secondly, the steering section receives hydraulic oil from the secondary gear pump (7.0 cc/rev.) and supplies this oil to the PST unit for power steering.

Hydraulic oil supplied from the secondary gear pump is used to operate the PST valve and PTO valve. Then, it is carried from the PTO valve into the HST filter to be filtered. After filtered, it is led into the oil cooler to be cooled down to a sufficient level before it is delivered to the HST for HST operation.

3. MAJOR COMPONENT SPECIFICATIONS

3.1 PST VALVE

TYPE	OPEN CENTER, NON-LOAD REACTION TYPE INTEGRAL RELIEF VALVE
Relief valve setting pressure	130 kgf/cm^2 at 16 ℓ/min
Capacity	69 cc/rev
Rated flow	16 ℓ/min
Max. impact pressure	130 kgf/cm^2
Max. temperature	95 ℃ (203 °F)
Input torque	0.14 ~ 0.18 kgf·m
Max. back pressure	25 kgf/cm^2 ("T" Port)
Filter	Nominal 10 μm

3.2 HYDRAULIC PUMP

	PRIMARY PUMP	SECONDARY PUMP
Theoretical discharge volume	13.0 cc/rev	7.0 cc/rev
Maximum pressure	210 kgf/cm^2	210 kgf/cm^2
Revolving speed	500 ~ 2,500 rpm	500 ~ 3,000 rpm
Turning direction (when seeing from end of shaft)	Counterclockwise	Clockwise

3.3 CONTROL VALVE

Max. flow	45 ℓ/min.
Operating pressure	180 kgf/cm^2

3.4 FRONT OUTLET VALVE

Relief valve setting pressure	180 ~ 185 kgf/cm^2
Max pressure	250 kgf/cm^2

3.5 REAR SCV [OPTIONAL]

Relief valve setting pressure	180 ~ 185 kgf/cm^2
Nominal flow	30 ℓ/min.
Max. pressure	210 kgf/cm^2

3.6 PTO VALVE

Sequence valve setting pressure	16.0 kgf/cm^2
Operating flow	5 ~ 19 ℓ/min.
Max pressure	40 kgf/cm^2

3.7 HST

Displacement	Pump	0 ~ 28.1 cc/rev
	Motor	28.1 cc/rev
Pump swash plate angle		0 ~ ± 18°
Power input rotate direction		C.W (View on shaft end)
Charge relief set pressure		5~7 kgf/cm^2
Filter		10 μm
Neutral valve (orifice)		Ø0.8

3.8 FRONT SCV [LOADER VALVE]

Relief valve setting pressure	180 ~ 185 kgf/cm^2
Nominal flow	45 ℓ/min.
Operating pressure	250 bar

3.9 OIL COOLER

Air flow	5 m/sec
Flow	20 LPM
Heat rejection rate	Min. 4,400 kcal/h

3.10 PST CYLINDER

Type	Double-rod double acting type
Rod O.D.	Ø 30 mm
Cylinder I.D.	Ø 55 mm
Stroke	184.4 mm
Relief setting pressure	130 kgf/cm^2

3.11 HYDRAULIC FILTER

Filtering area	4,972 cm^2
Max. fineness	110 ± 8 μ

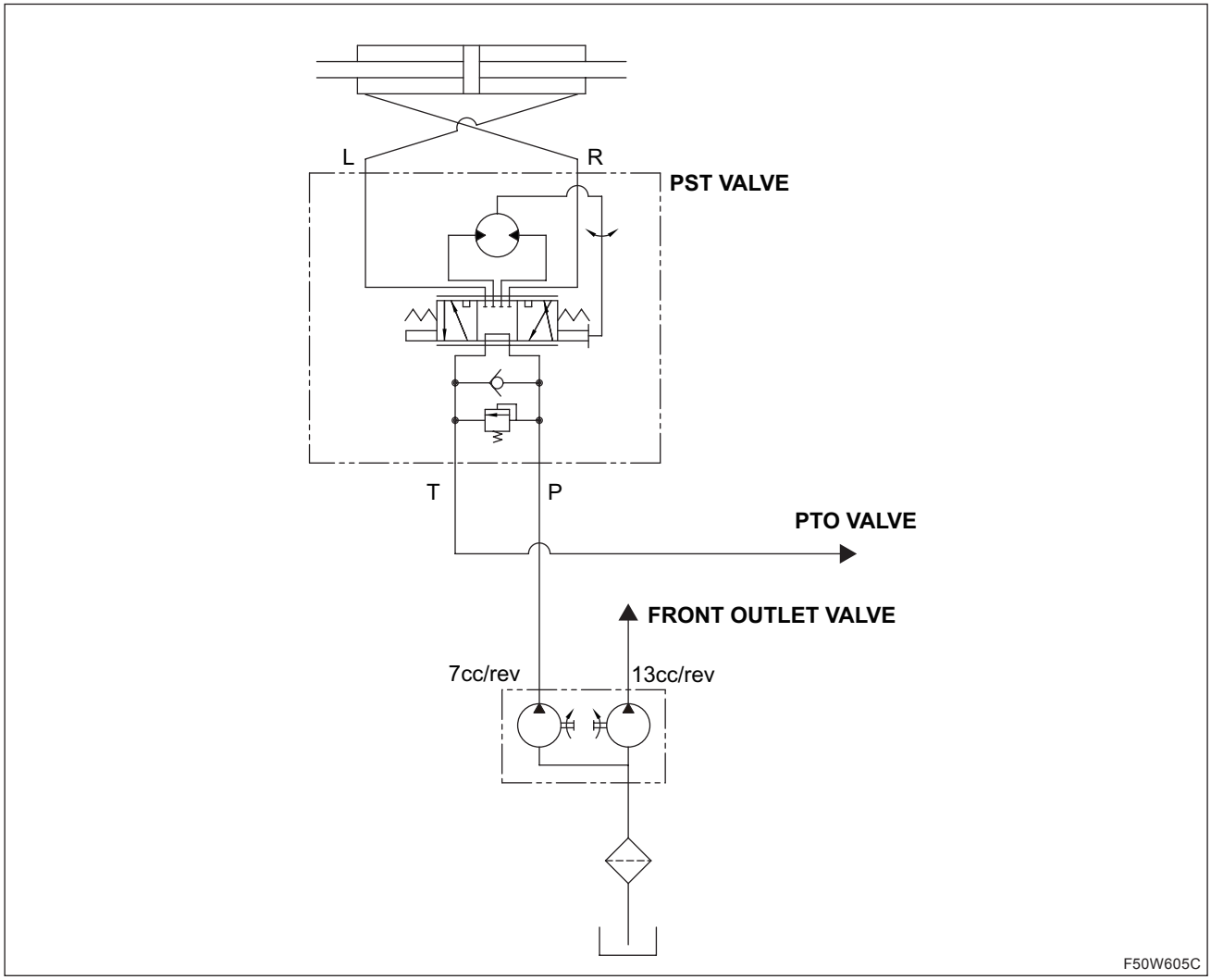
3.12 HST FILTER

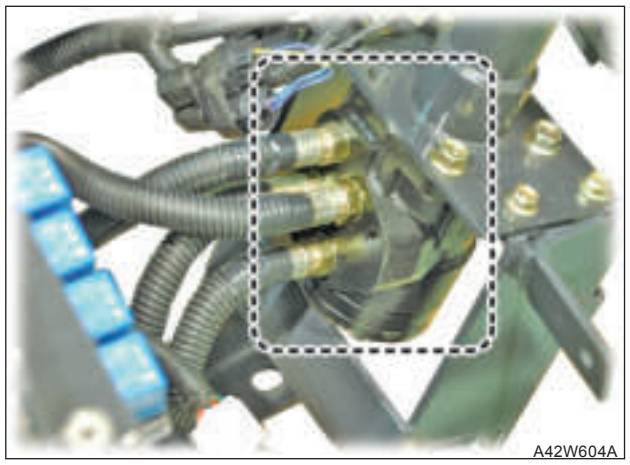
Filtering area	2,677 cm^2
Rated flow	30 LPM
Fineness	20 μ

4. STRUCTURE AND OPERATION

4.1 STEERING VALVE

4.1.1 OVERVIEW





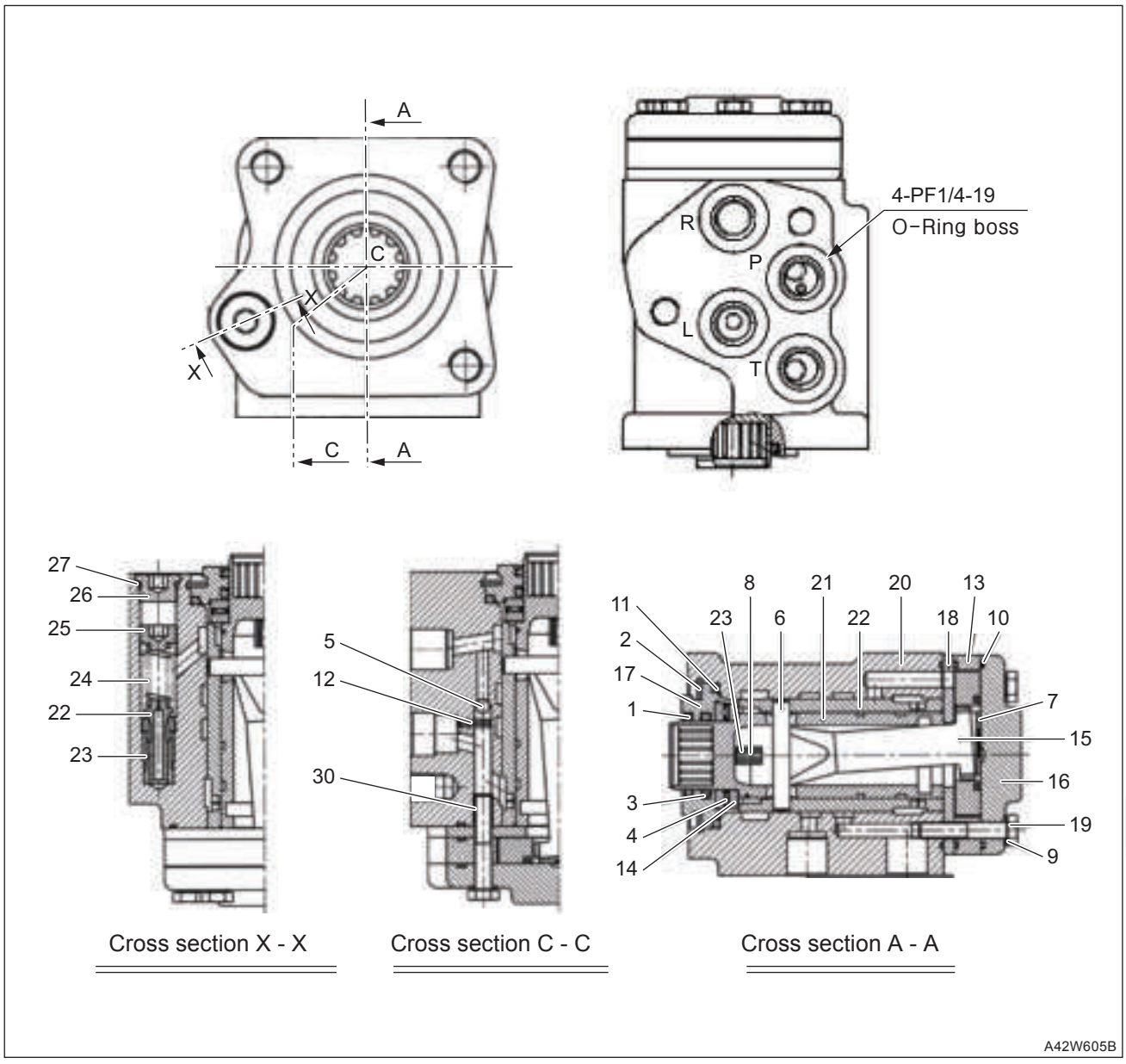
Hydraulic oil from the hydraulic pump (secondary) is supplied to the steering valve which is installed under the steering wheel.

When the engine is started, oil is supplied to the left or right of the PST cylinder according to the turning direction of the steering wheel. Then, the corresponding PST cylinder is extended or retracted to turn the vehicle to the desired direction.

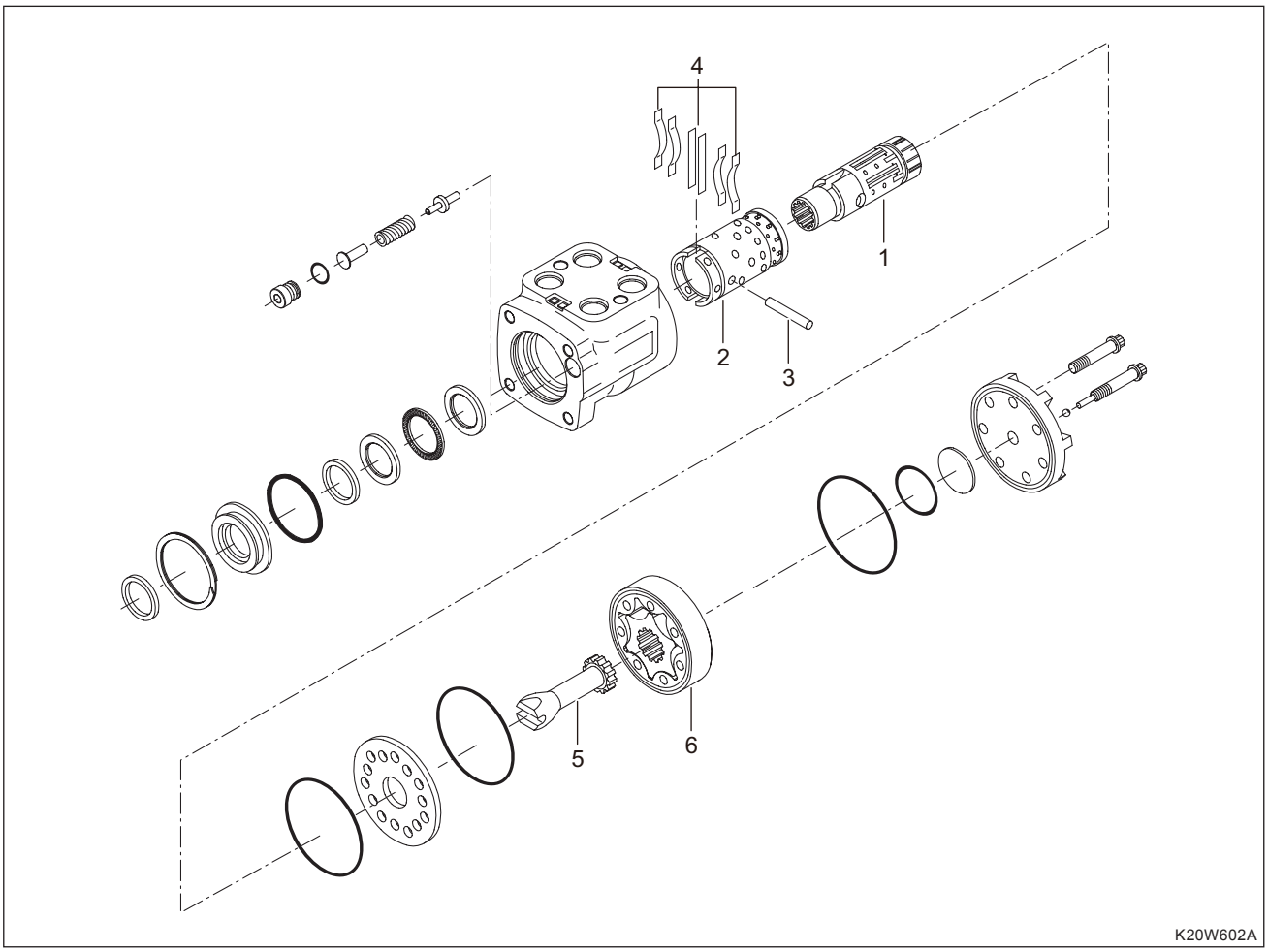
Then, oil used from the PST cylinder is returned to the tank through the steering valve, return hose and PTO valve and it is recirculated by the pump to be used again.

This steering valve is a non-load reaction type which means that the steering wheel is not returned automatically once it is turned to one side.

4.1.2 INTERNAL STRUCTURE AND OPERATING PRINCIPLE



(1) Dust seal
(2) Retaining ring
(3) Quad ring
(4) Thrust bearing
(5) Ball
(6) Pin
(7) Spacer
(8) Center spring
(9) Washer
(10) O-ring
(11) O-ring
(12) Spring pin
(13) Gerotor set
(14) Bearing race
(15) Drive
(16) End cap
(17) Gland bushing
(18) Plate
(19) Cap screw
(20) Housing
(21) Spool
(22) Sleeve
(23) Plate spring
(24) Spool
(25) Bushing
(26) Spring
(27) Control screw
(28) Plug
(29) O-ring
(30) Heli coil



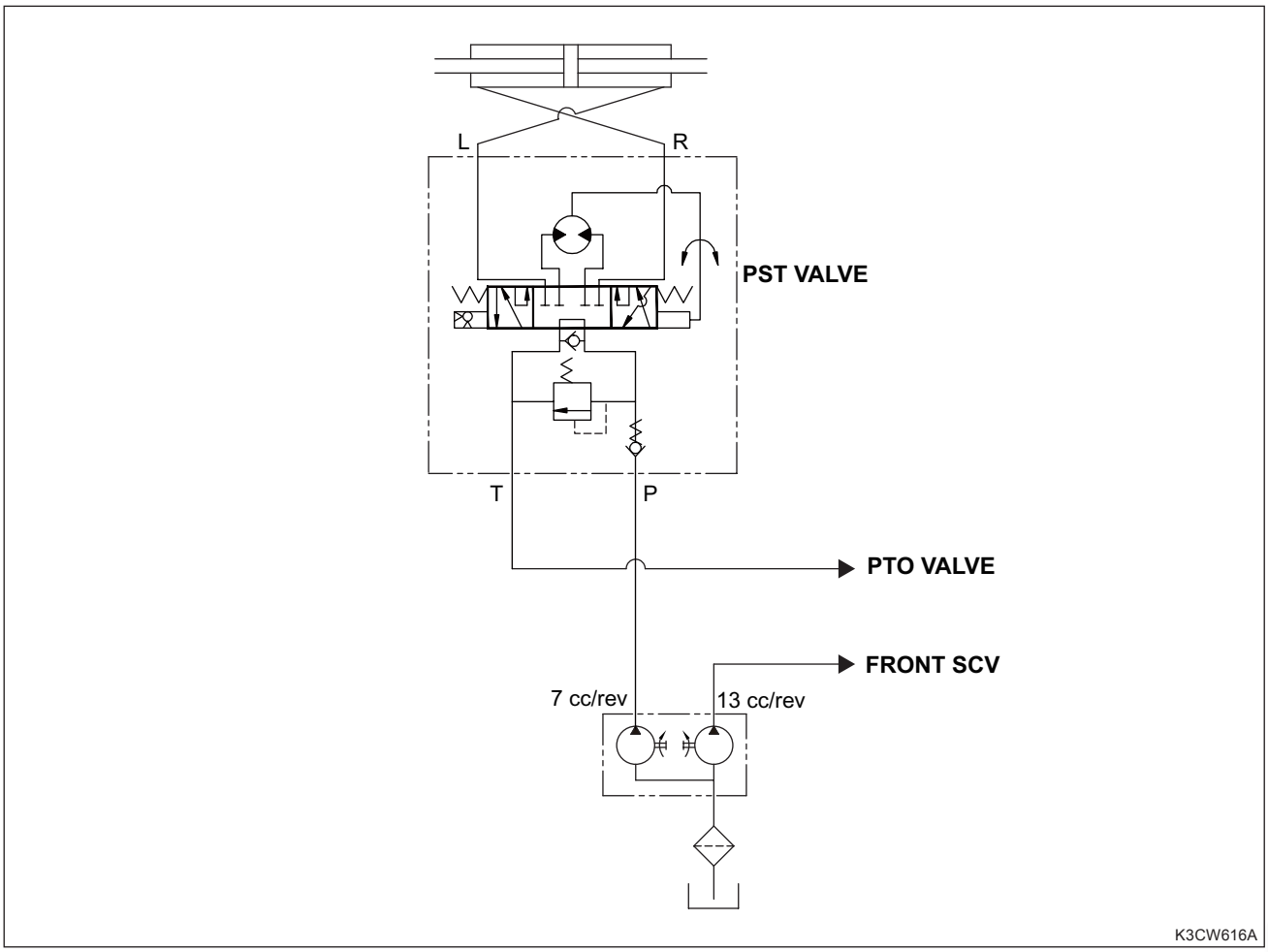
(1) Spool
(2) Sleeve
(3) Pin
(4) Leaf spring
(5) Drive shaft
(6) Gerotor (inner rotor)

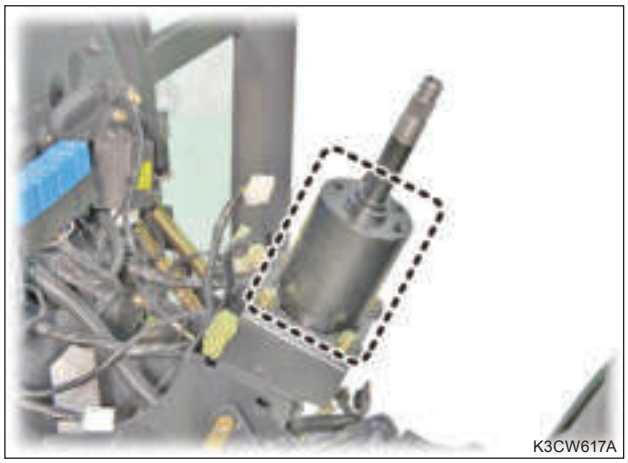
The steering wheel is engaged with the steering valve spool with splines. Therefore, when the steering wheel is turned, the spool is turned as well. The spool (1) is covered with the sleeve (2) and these are fixed by the pin (3). Therefore, when the spool is turned by the steering wheel, this pin is rotated as well to turn the sleeve. The inside diameter of the pin hole of the sleeve is matched to the outside diameter of the pin, so the pin fits to the hole tightly. However, the pin hole of the spool is larger than the pin. Therefore, when the spool is rotated, the sleeve cannot be rotated with the spool immediately, but it is rotated approx. 10 degrees (the amount of free play of the spool pin hole) behind the spool. For example, when the steering wheel is being turned clockwise, the sleeve is turned approx. 10 degrees behind the spool, so the holes for the right turn among the holes of the sleeve and spool are aligned to supply hydraulic oil to the steering cylinder for right turn. When the steering wheel is stopped, the spool is stopped simultaneously but the sleeve turns 10 degrees further before stopping. This is because the leaf spring binds the spool and sleeve and it exerts a force to return the relative positions of the spool and sleeve to the neutral positions. Since force of this spring is not so strong, so it does not have any effect when the steering wheel is being turned. However, when the steering wheel is stopped, it returns the spool and sleeve to the neutral position. Then, the neutral holes among the several holes of the spool and sleeve are aligned, so the steering cylinder does not move, keeping its original position.

On the other side, when the steering wheel is turned, the spool rotates and turns the sleeve through the pin, but it turns the drive shaft (5) as well. Then, this drive shaft turns the inner rotor (6) of the Gerotor pump under the steering valve. This Gerotor pump is to enable steering even when the engine is stopped. When the steering wheel is turned, the rotor in the Gerotor is rotated to produce and supply hydraulic oil to the steering cylinder.

CABIN MODEL

4.1.1 OVERVIEW





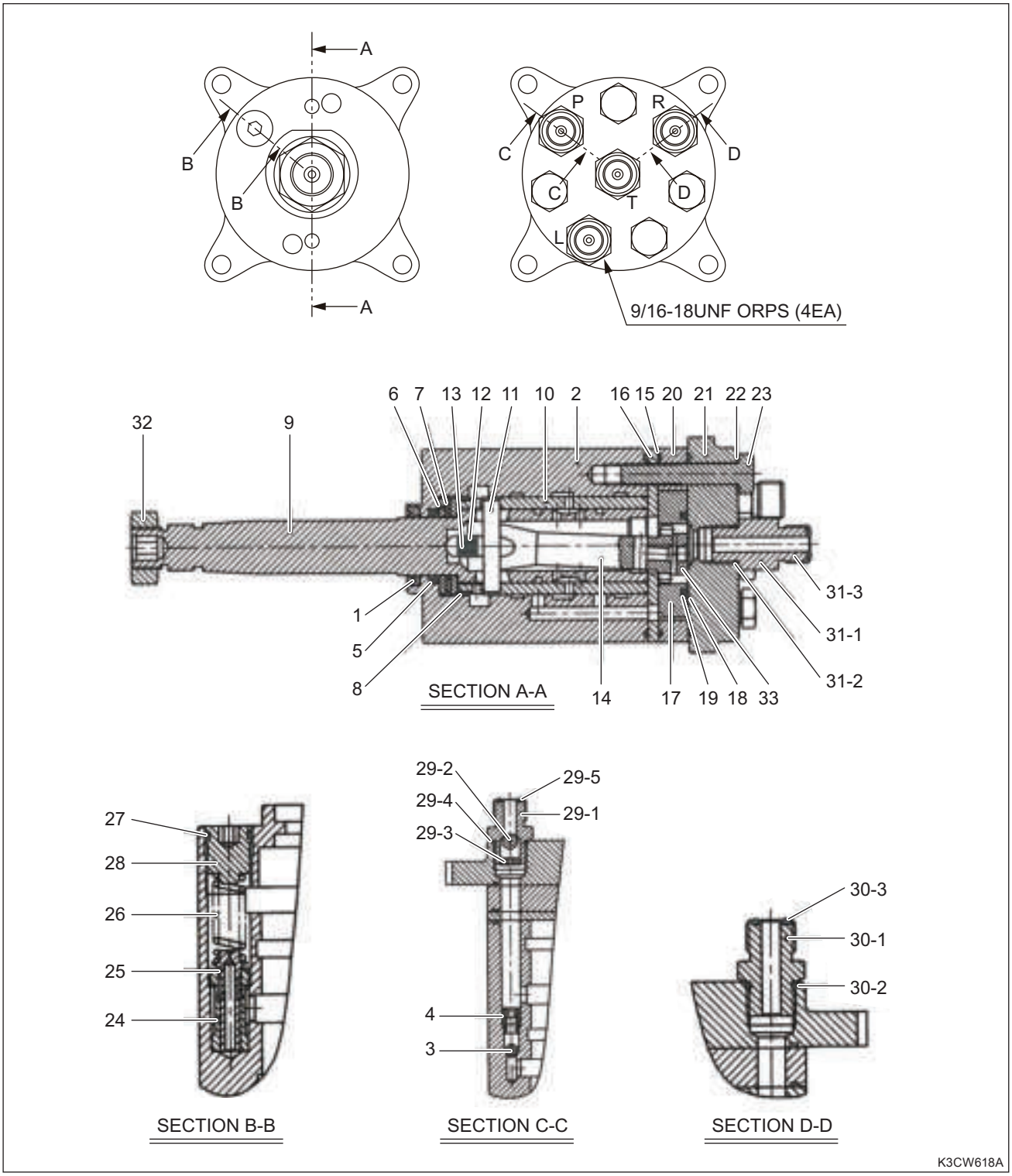
Hydraulic oil from the hydraulic pump (secondary) is supplied to the steering unit which is installed under the steering wheel.

When the engine is started, oil is supplied to the left or right of the PST cylinder according to the turning direction of the steering wheel. Then, the corresponding PST cylinder is extended or retracted to turn the vehicle to the desired direction.

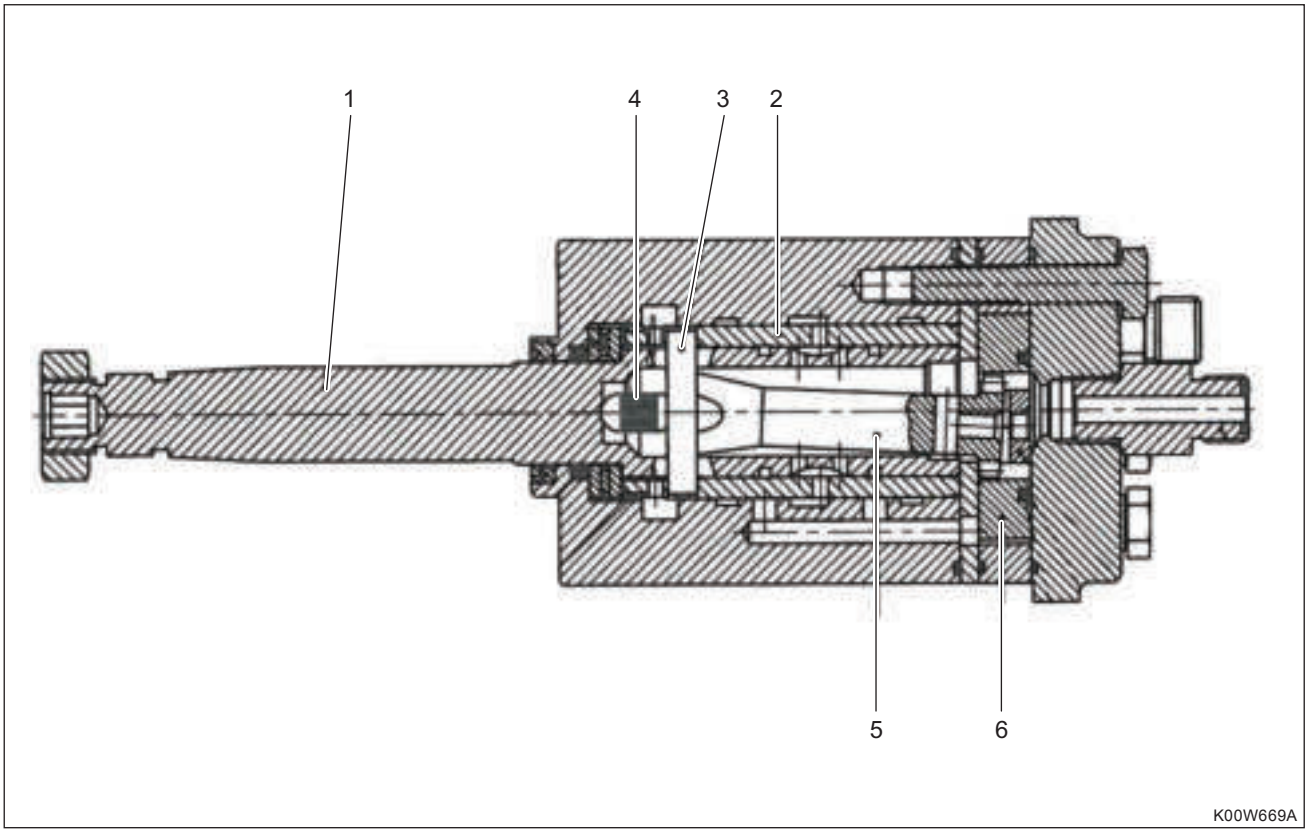
Then, oil used from the PST cylinder is returned to the tank through the steering unit, return hose and HST and it is recirculated by the pump to be used again.

This steering unit is a non-load reaction type which means that the steering wheel is not returned automatically once it is turned to one side.

4.1.2 INTERNAL STRUCTURE AND OPERATING PRINCIPLE



(1) Dust seal
(2) Housing
(3) Ball
(4) Thread pin
(5) Cap seal
(6) Bearing race
(7) Thrust bearing
(8) Ring-sleeve
(9) Spool
(10) Sleeve
(11) Pin
(12) Centering spring
(13) Plate spring
(14) Drive
(15) O-ring
(16) Plate
(17) Inner rotor
(18) Slide ring
(19) O-ring
(20) Outer rotor
(21) End plate
(22) Washer
(23) Cap screw
(24) Relief bushing
(25) Relief spool
(26) Spring
(27) O-ring
(28) Control screw
(29) Port check valve
(29-1) Body check
(29-2) Ball
(29-3) Retainer
(29-4) O-ring
(29-5) O-ring
(30) Port connector
(30-1) Body-port
(30-2) O-ring
(30-3) O-ring
(31) T-port connector
(31-1) Body T-port
(31-2) O-ring
(31-3) O-ring
(32) Nut
(33) Spacer



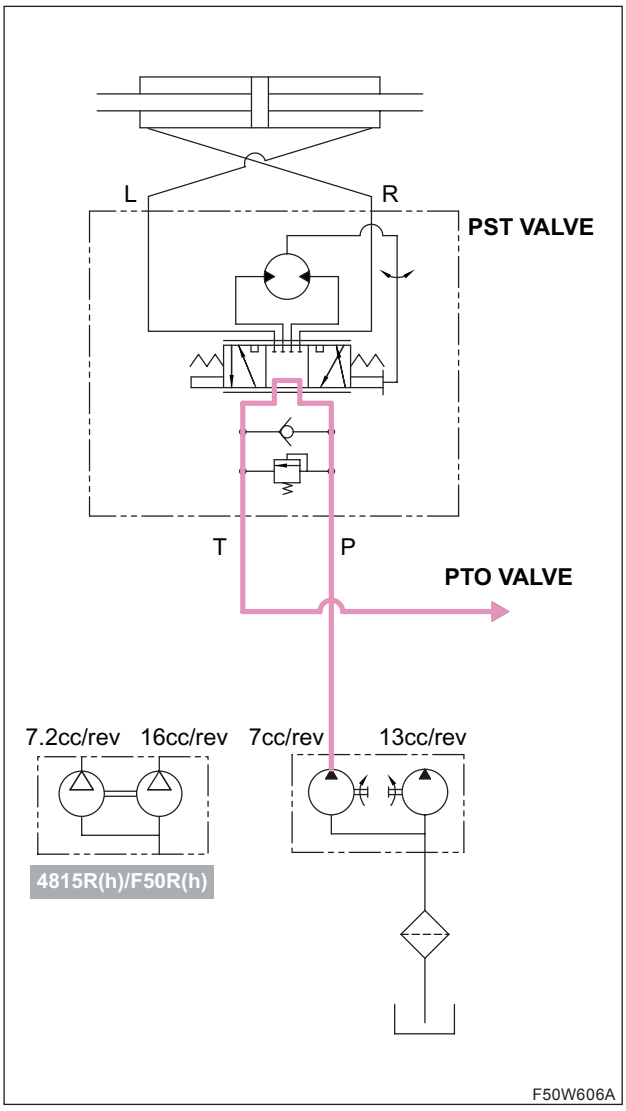
(1) Spool
(2) Sleeve
(3) Pin
(4) Plate spring
(5) Drive shaft
(6) Gerotor (inner rotor)

The steering wheel is engaged with the steering unit spool (1) with splines. Therefore, when the steering wheel is turned, the spool is turned as well. The spool (1) is covered with the sleeve (2) and these are fixed by the pin (3). Therefore, when the spool is turned by the steering wheel, this pin is rotated as well to turn the sleeve. The inside diameter of the pin hole of the sleeve is matched to the outside diameter of the pin, so the pin fits to the hole tightly. However, the pin hole of the spool is larger than the pin. Therefore, when the spool is rotated, the sleeve cannot be rotated with the spool immediately, but it is rotated approx. 10 degrees (the amount of free play of the spool pin hole) behind the spool. For example, when the steering wheel is being turned clockwise, the sleeve is turned approx. 10 degrees behind the spool, so the holes for the right turn among the holes of the sleeve and spool are aligned to supply hydraulic oil to the steering cylinder for right turn. When the steering wheel is stopped, the spool is stopped simultaneously but the sleeve turns 10 degrees further before stopping. This is because the plate spring (4) binds the spool and sleeve and it exerts a force to return the relative positions of the spool and sleeve to the neutral positions. Since force of this spring is not so strong, so it does not have any effect when the steering wheel is being turned. However, when the steering wheel is stopped, it returns the spool and sleeve to the neutral position. Then, the neutral holes among the several holes of the spool and sleeve are aligned, so the steering cylinder does not move, keeping its original position.

On the other side, when the steering wheel is turned, the spool rotates and turns the sleeve through the pin, but it turns the drive shaft (5) as well. Then, this drive shaft turns the inner rotor (6) of the Gerotor pump under the steering unit. This Gerotor pump is to enable steering even when the engine is stopped. When the steering wheel is turned, the rotor in the Gerotor is rotated to produce and supply hydraulic oil to the steering cylinder.

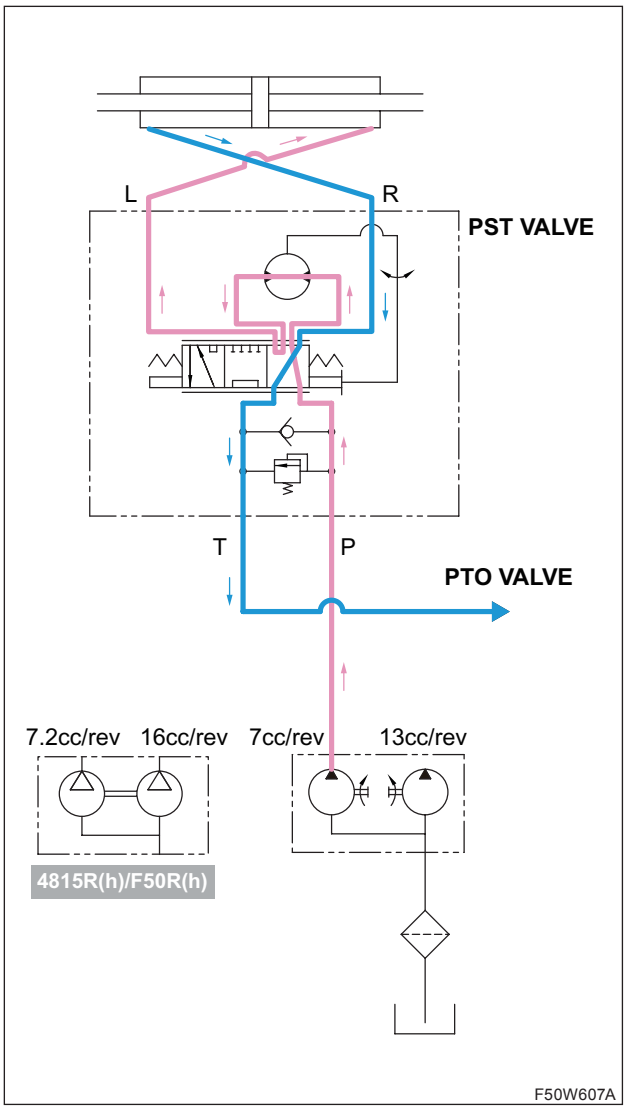
4.1.3 EXAMPLES OF STEERING WHEEL OPERATION

NEUTRAL



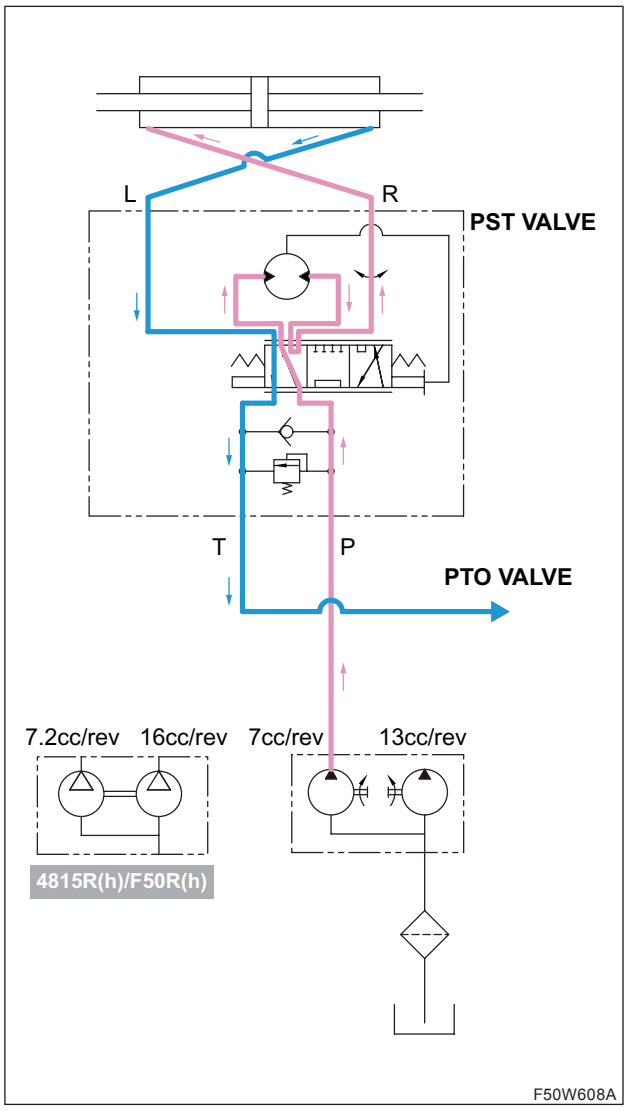
Hydraulic oil delivered from the secondary gear pump is sent to the PST valve through the port P. When the steering wheel is stopped, only the neutral holes of the spool and sleeve of the PST valve are aligned, so hydraulic oil at the port P is returned through the port T and is supplied to the PTO valve side.

LEFT TURN



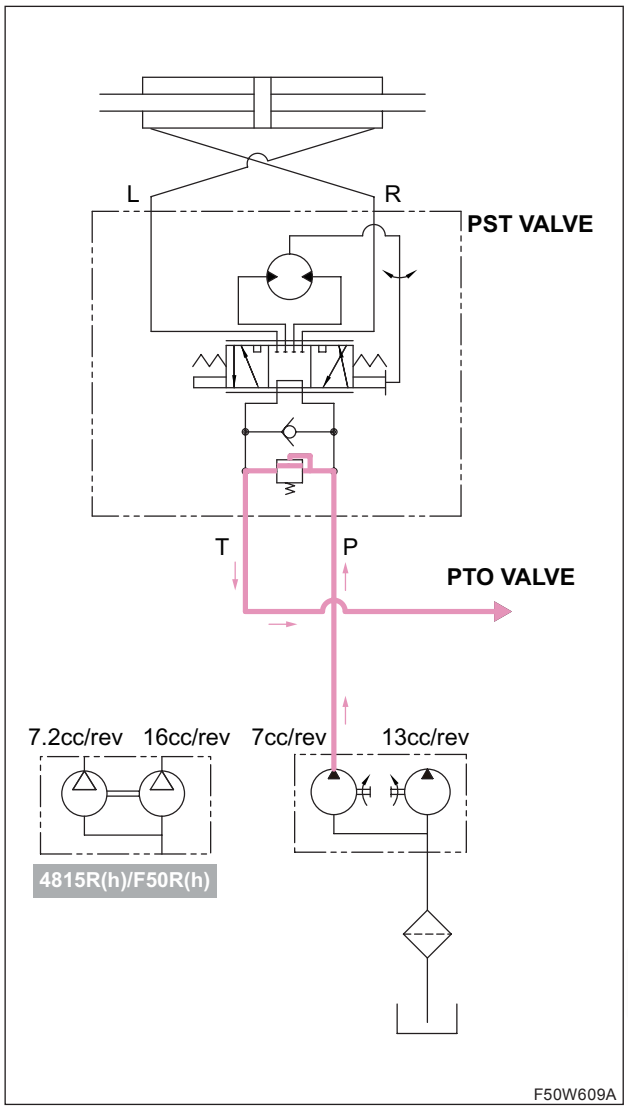
When the steering wheel is turned counterclockwise, the sleeve is turned counterclockwise approx. 10 degrees behind the spool, so the oil holes of the spool and sleeve for the left turn operation are aligned. Therefore, hydraulic oil at the port P is passed through the spool, sleeve and Gerotor and is supplied to the right port of the PST cylinder through the port L. On the other hand, hydraulic oil at the left port of the PST cylinder is flowed through the port R, returned through the return holes of the spool and sleeve for left turn and port T, and delivered to the PTO valve. Therefore, the PTO valve receives the same amount of hydraulic oil whether the steering wheel is turned or not.

RIGHT TURN



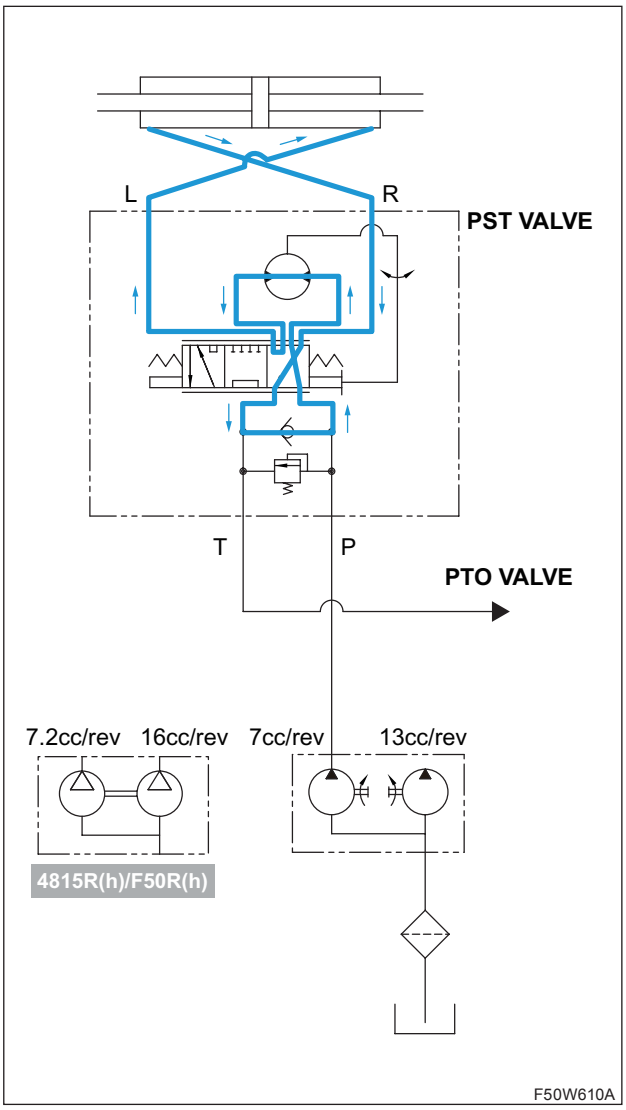
When the steering wheel is turned clockwise, the sleeve is turned clockwise approx. 10 degrees behind the spool, so the oil holes of the spool and sleeve for the right turn operation are aligned. Therefore, hydraulic oil at the port P is passed through the spool, sleeve and Gerotor and is supplied to the left port of the PST cylinder through the port R. On the other hand, hydraulic oil at the right port of the PST cylinder is flowed through the port L, returned through the return holes of the spool and sleeve for right turn and port T, and delivered to the PTO valve.

OPENING RELIEF VALVE



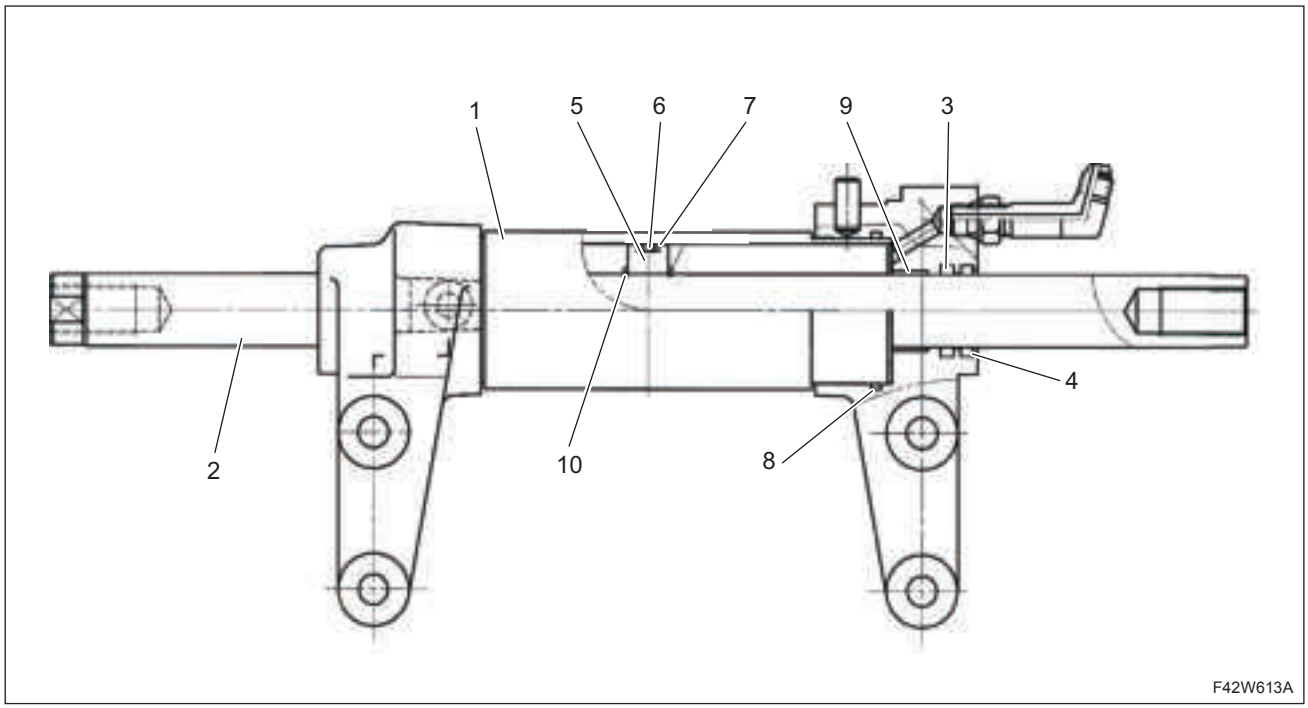
When the PST cylinder is moved to the left or right end and there is no more space to move further, pressure of hydraulic oil flowed through the port P increases over the relief valve setting pressure, 130~137 kgf/cm^2, resulting in opening of the relief valve. Then, hydraulic oil flowed through the port P is passed through the relief valve, returned through the port T, and delivered to the PTO valve.

MANUAL STEERING (LEFT TURN)



When the steering wheel is turned with the engine stopped, the spool, sleeve and Gerotor pump are rotated as described previously. For example, when the steering wheel is manually turned counterclockwise, hydraulic oil at the left side of the PST cylinder is sucked through the port R and is flowed to the Gerotor through the sleeve and spool. Then, after hydraulic oil is pressurized in the Gerotor, it is flowed into the left side of the check valve through the spool and sleeve and leaves the right side of the valve. Finally, it passes through the spool, sleeve and port L and flows into the right port of the PST cylinder to complete the manual left turn operation. For right turn, hydraulic oil is sucked through the port L from the right port of the PST cylinder and is flowed into the left port of the PST cylinder through the port R to complete the manual right turn operation.

4.2 PST CYLINDER

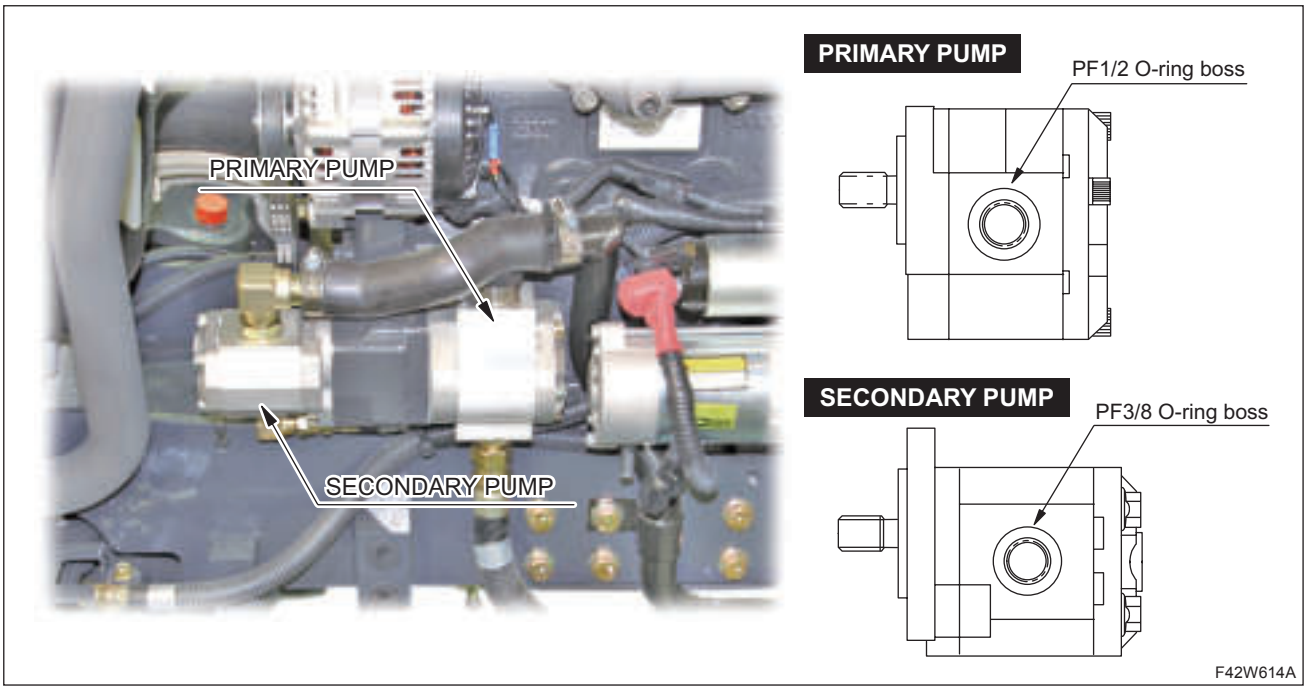


(1) Cylinder tube (3) U-packing (5) Piston (7) X-ring (9) Bushing
(2) Piston rod (4) Dust seal (6) Backup ring (8) O-ring (10) Stop ring (type C)

The PST cylinder is a double-rod double acting type cylinder which performs double rod operation for steering without a need of a separate tie rod.

ITEM	SPECIFICATIONS
Type	Double-rod double acting piston
Rod O.D. (mm)	Ø 30
Cylinder I.D. (mm)	Ø 55
Cylinder O.D. (mm)	Ø 65
Stroke (mm)	184.4
Weight	7.8 kg
Relief setting pressure	130 kgf/cm^2

4.3 HYDRAULIC PUMP



The hydraulic pump is a gear type and consists of the primary pump as the main pump (13 cc/rev) and secondary pump as the steering pump (7.0 cc/rev). The drive shaft set between these two pumps receives engine power directly through the drive gear of the engine crankcase.

- Pump capacity (at rated engine RPM)

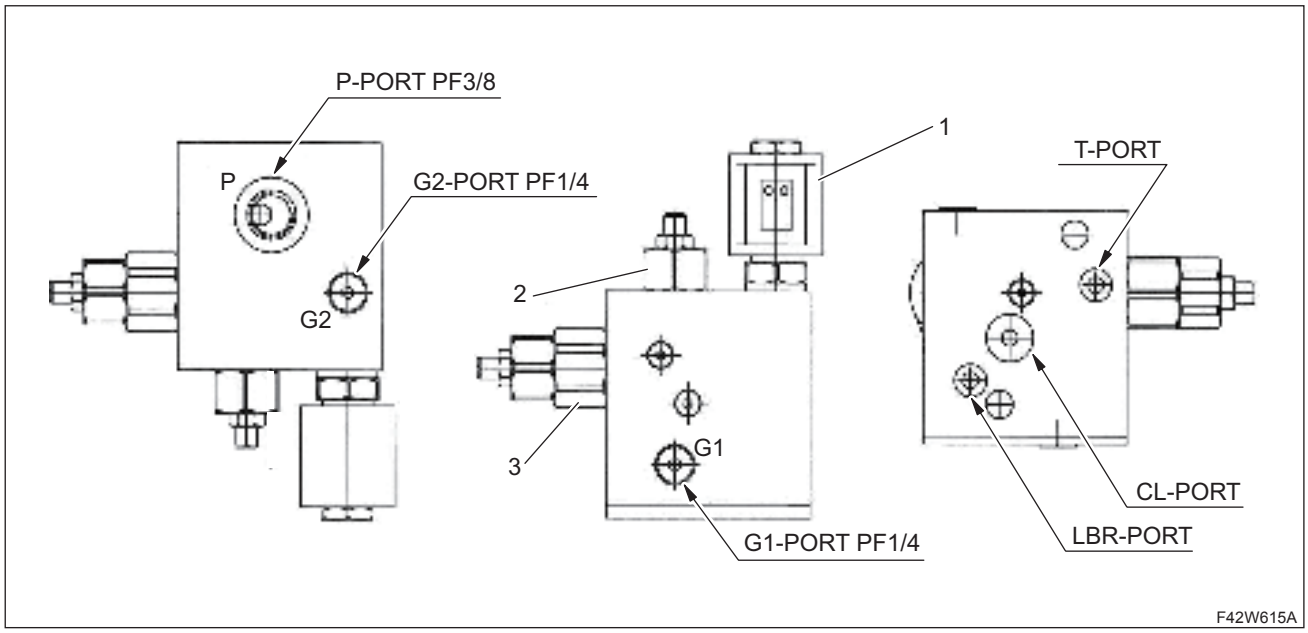
  Primary pump: 13 cc/rev. X 2,600 rpm = 33.8 lpm

  Secondary pump: 7.0 cc/rev. X 2,600 rpm = 18.2 lpm

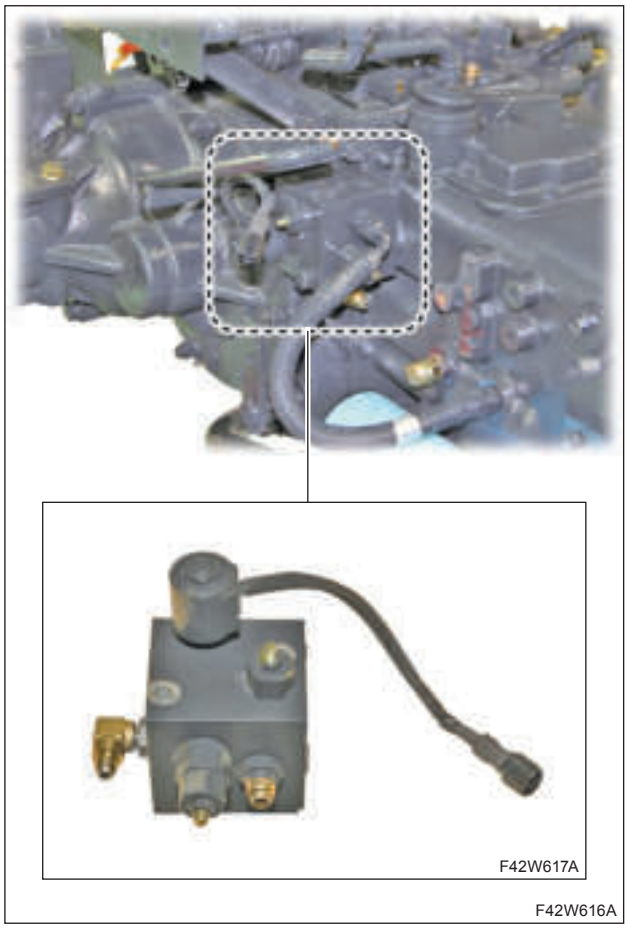
▶ PUMP SPECIFICATIONS

ITEM	MAIN PUMP (PRIMARY PUMP)	STEERING PUMP (SECONDARY PUMP)
Theoretical discharge volume	13 cc/rev	7.0 cc/rev
Maximum pressure	210 kgf/cm^2	←
Rotating direction	Counterclockwise	Clockwise
Operating oil	TF 500	←
Usable oil temperature range	-20 ~ 100 ℃	←
Relief setting pressure	160 ±5 kgf/cm^2	←
Max. usable turning peed	2,340 rpm	←
Min. usable turning peed	970 rpm	←
Pressure on suction side	-0.2 - 1.0 kgf/cm^2	←

4.4 PTO VALVE



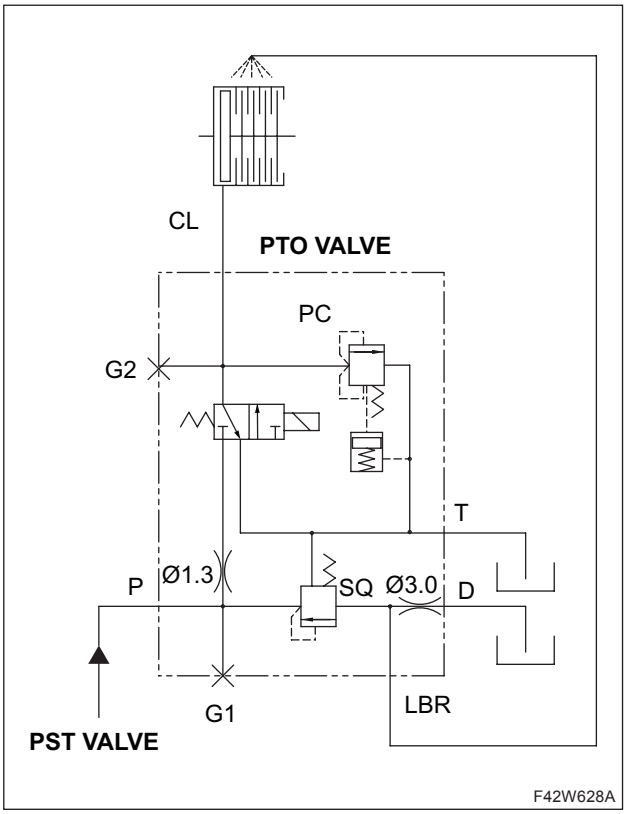
(1) Solenoid valve (2) Sequence valve (3) DRV valve



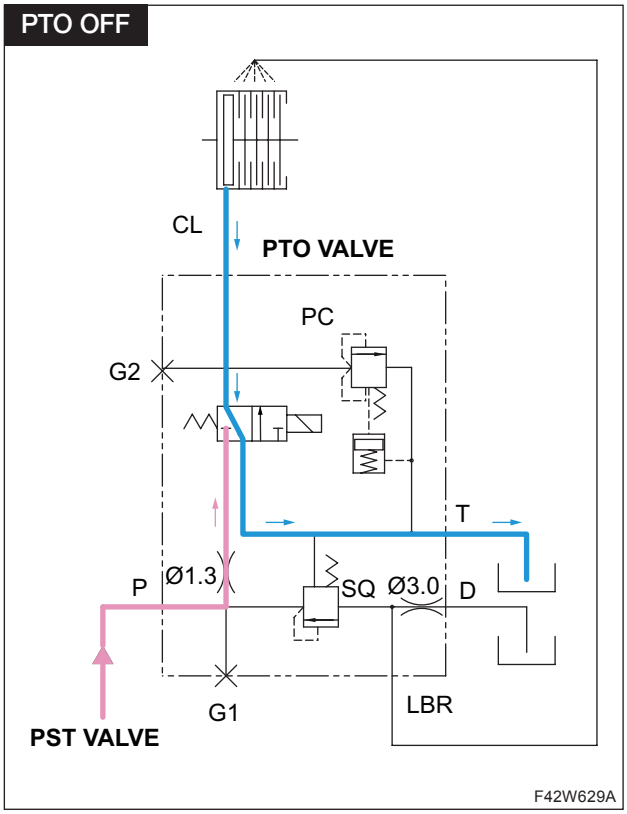
The PTO valve is installed to the rear right side of the transmission case. It receives oil from the PST valve to lubricate and operate the PTO clutch and it is turned ON and OFF by the PTO switch.

▶ PUMP SPECIFICATIONS

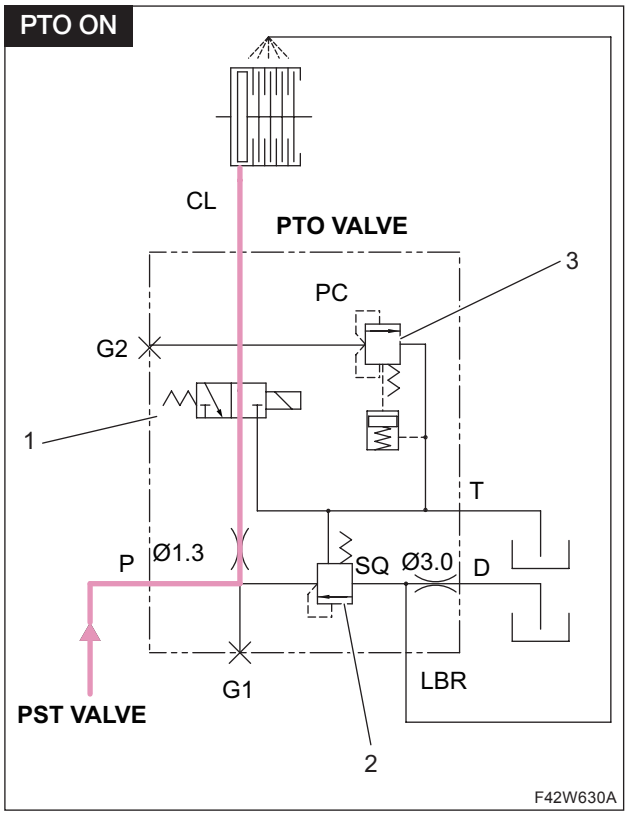
ITEM	SPECIFICATION
Operating flow	5 - 19 ℓ/min.
Operating pressure	Max. 40 kgf/cm^2
Sequence valve setting pressure	16.0 kgf/cm^2
Operating temperature range	-20°C ~ 100°C



The port T of the PST valve discharges hydraulic oil continuously regardless of movement of the steering wheel and all of this oil is flowed to the port P of the PTO valve. The PTO valve consists of the sequence valve, which is opened at 16 kgf/cm^2, DRV valve and electrically operated ON/OFF solenoid valve.



The electric solenoid spool is turned ON and OFF by the driver's operation of the PTO switch. When the main spool is OFF, The flow P sent from the PST valve is led to the main spool through the Ø1.3 orifice and is trapped while oil discharged from the PTO clutch passes through the main spool to be returned to the tank.

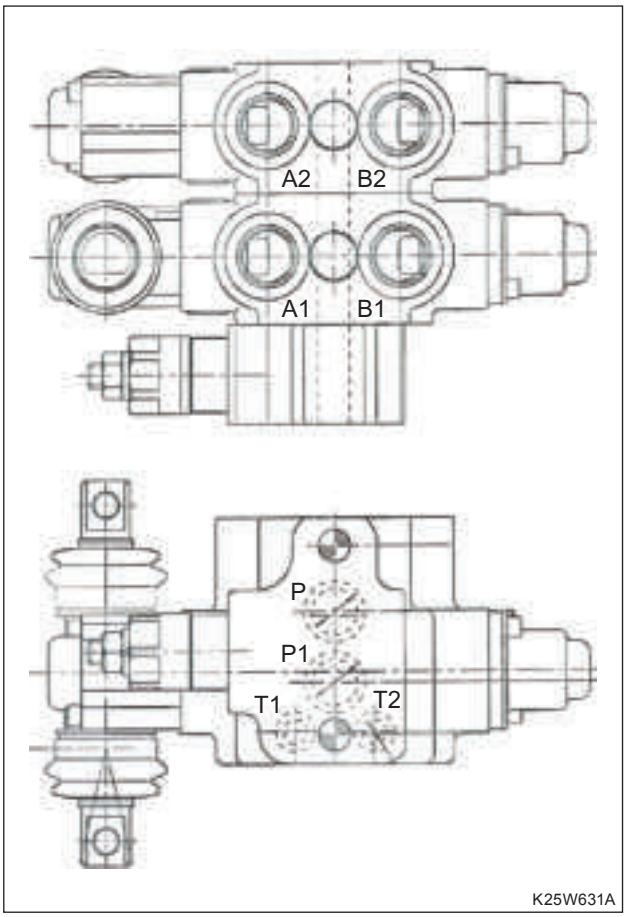


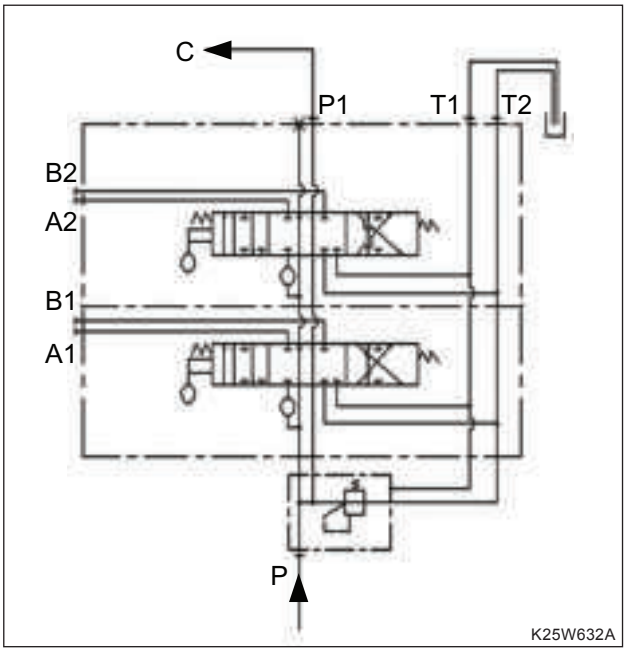
When the PTO switch is set the ON position by the driver, the magnet of the electric solenoid is activated to pull the spool in the left direction as shown in the circuit diagram. Then, hydraulic oil is passed through the solenoid spool (1) and is supplied to the piston of the PTO clutch through the port CL. There is a Ø1.3 mm orifice before the solenoid spool. Therefore, at the initial valve opening state, more hydraulic oil is applied to the sequence valve (2) than the PTO piston so that the amount of opening of the sequence valve is large for smooth initial engagement of the PTO clutch and reduction of shock. After a certain period of time, hydraulic oil of 16 kgf/cm^2 is delivered to the piston to achieve the maximum level of the delivered torque of the PTO clutch.

The DRV valve (3) is connected in the middle of the port PC line in which pressure is applied for the piston when the PTO is activated. This valve delays engagement of the PTO clutch to reduce engagement shock. It discharges hydraulic oil from the port CL to delay the PTO engagement initially right after the PTO engagement is activated. Then, after several seconds, this valve is closed to achieve the maximum level of torque that the PTO clutch delivers.

4.5 REAR SCV [OPTIONAL]

The rear SCV is installed to the rear section of the tractor and receives hydraulic oil at a high pressure through the carryover operation.





The rear SCV is a rear auxiliary hydraulic valve and is equipped with two double acting spools for use of an implement with two kinds of double acting cylinders. Its inlet is equipped with the relief valve of 180 ~ 185 kgf/cm^2 to protect the circuit. Its two spools are simple return type double acting valves.

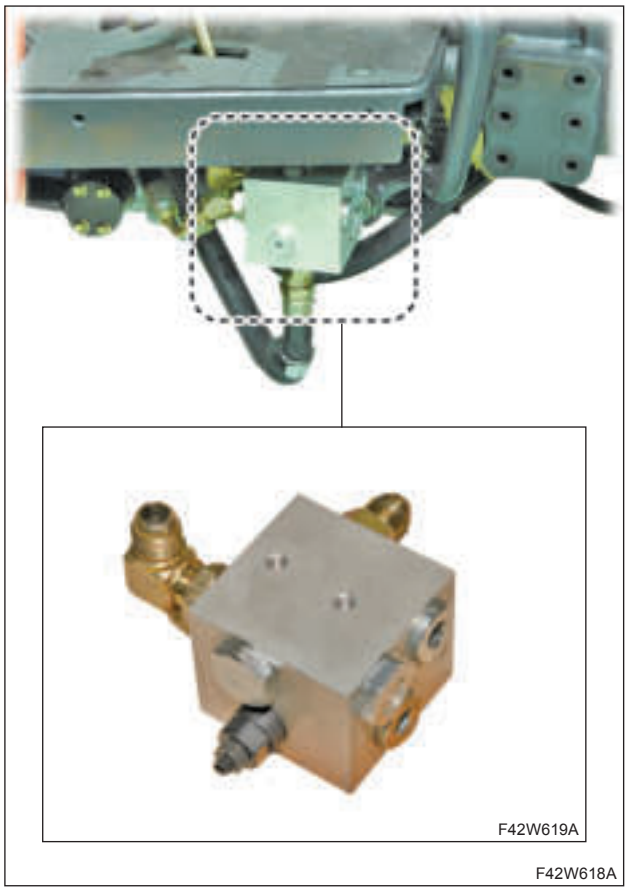
The spools of the rear SCV are double acting valves, but they also can be used for implements equipped with single acting cylinders. As shown in the circuit diagram above, when hydraulic oil is applied to the port connected to the single acting cylinder, this single acting cylinder is extended. When hydraulic oil is applied to the opposite direction, hydraulic oil is trapped so the relief valve of 180 ~ 185 kgf/cm^2 is opened to protect the circuit. However, the port connected to the single acting cylinder is opened as well simultaneously. Therefore, this single acting cylinder is retracted by weight of the implement or crops and oil in the cylinder is drained and returned to the transmission.

It is okay to use the double acting valve for operation of a single acting cylinder as described. However, if a single acting cylinder is used for an extended period of time, the relief valve is operated continuously, causing several problems, including rise of transmission fluid temperature and fatigue of the gear pump.

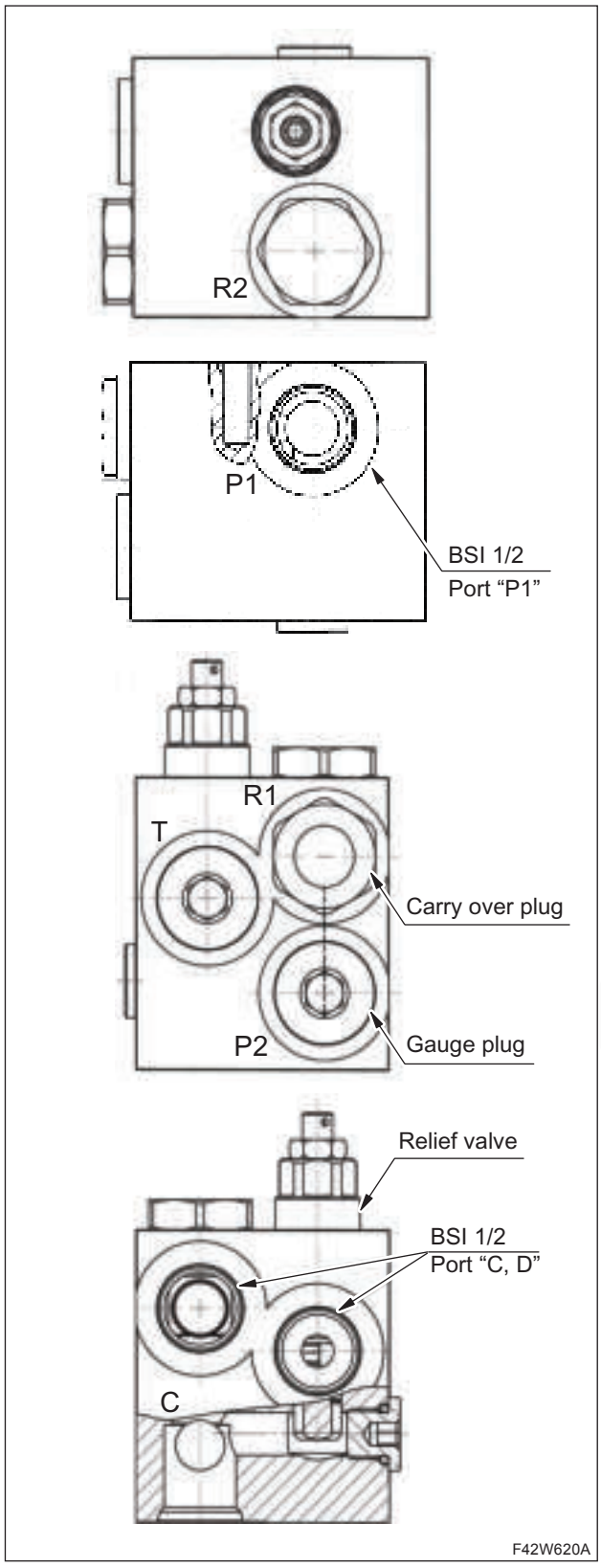
▶ VALVE SPECIFICATIONS

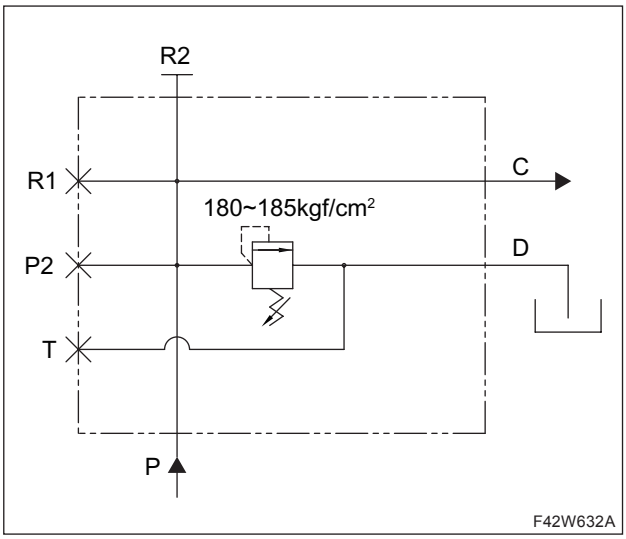
ITEM	SPECIFICATION
Max. flow	30 ℓ/min.
Max. operating pressure	210 kgf/cm^2
Relief valve setting pressure	180 ~ 185 kgf/cm^2
Operating oil	TF500

4.6 FRONT OUTLET VALVE ASSEMBLY



The front outlet valve assembly is installed under the front section of the step on the right side. It is connected to the main gear pump (primary pump) to receive hydraulic oil at a high pressure from the gear pump before any other components mainly for operation of an external implement, such as a loader.





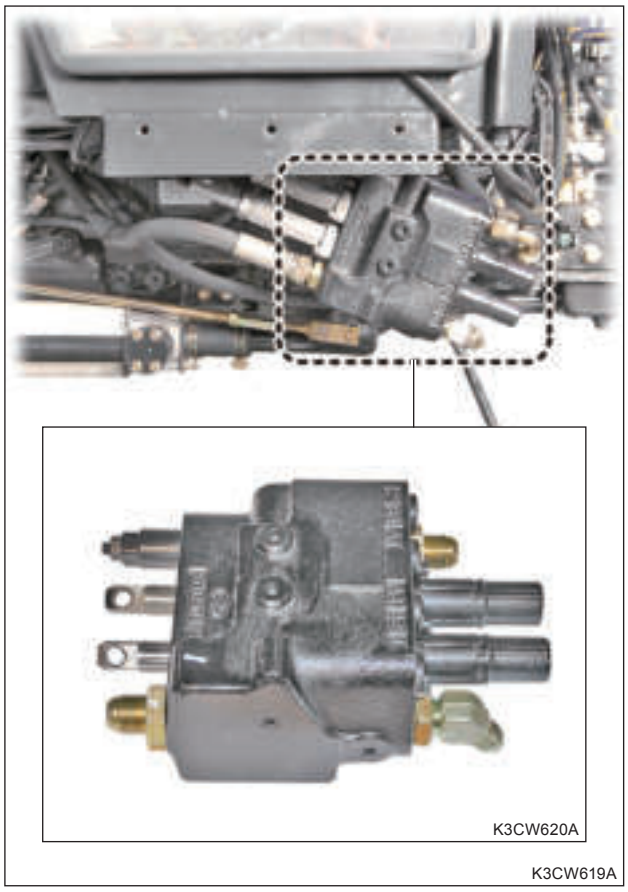
The front outlet valve assembly is an open center type. When this valve (i.e. loader) is not in use, hydraulic oil from the hydraulic pump is passed through this valve and is supplied to the rear SCV valve after it. Passing hydraulic oil to the next device for its use from the valve is called Carryover, and this is done through the port C, carryover port.

Also, the front outlet valve assembly is equipped with the relief valve (main 180 ~ 185 bar). This valve is opened to protect the hydraulic circuit when excessive pressure is applied in the hydraulic circuit by external shock during rear implement or lift operation.

▶ VALVE SPECIFICATIONS

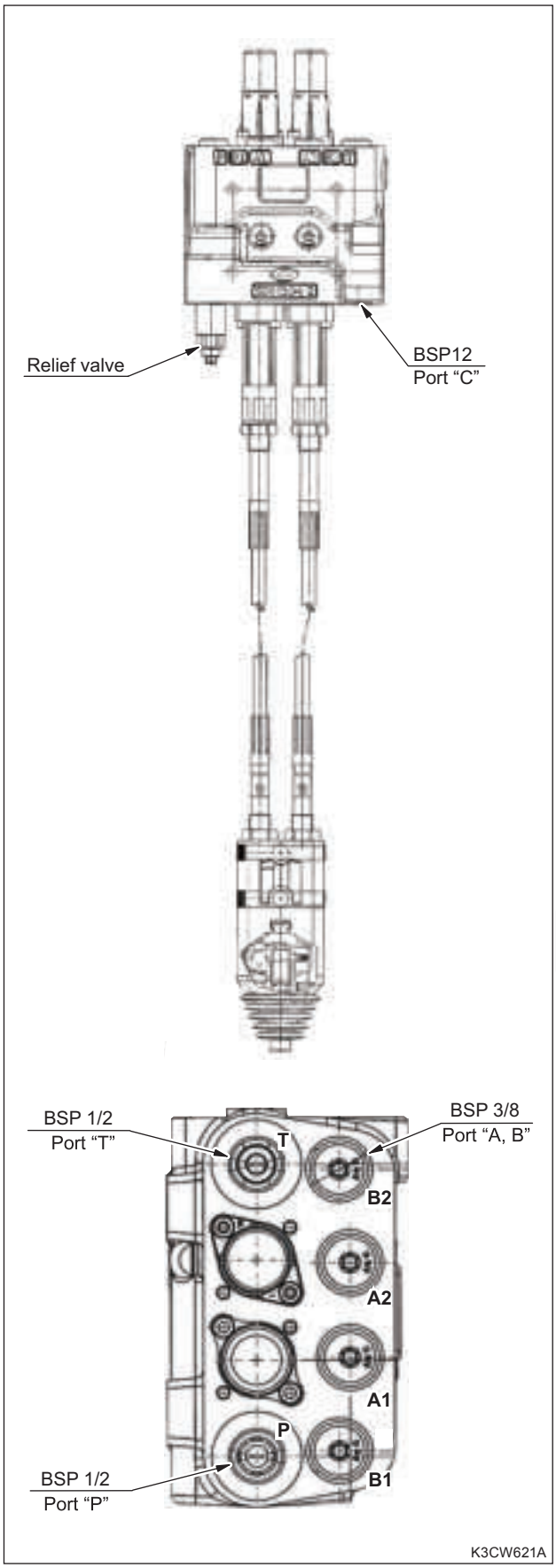
ITEM	SPECIFICATION
Relief valve setting pressure	180 ~ 185 kgf/cm^2
Operating oil	TF500

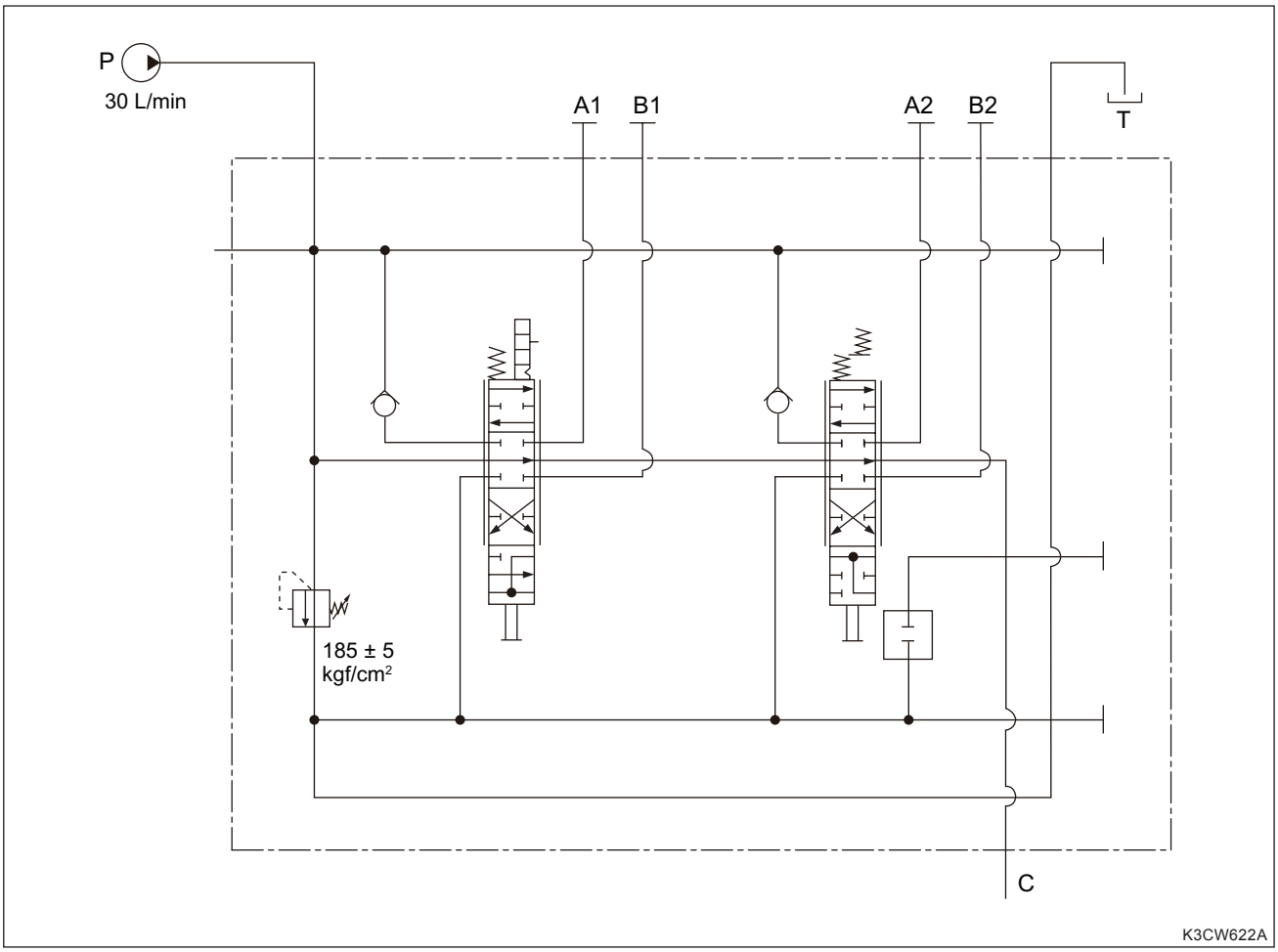
4.7 FRONT SCV (LOADER VALVE)



The front SCV (loader valve) assembly is installed under the front section of the step on the right side.

It is connected to the main gear pump (primary pump) to receive hydraulic oil at a high pressure from the gear pump before any other components mainly for operation of a loader.





When the joystick lever is not in use, hydraulic oil from the pump is passed through the port C and is supplied to the rear SCV assembly or control valve.

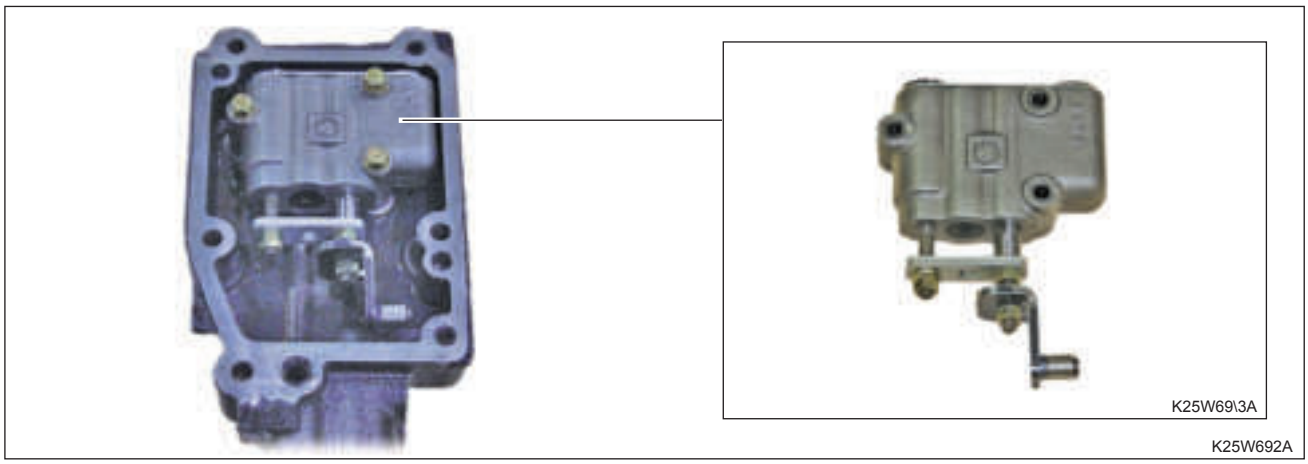
The hydraulic oil delivered from P flows into the boom or bucket of the front loader through the ports A1, B1 or A2, B2 as the spool moves by operating the joystick lever. As a result, the system operates such as boom up, boom down, bucket dump and bucket rollback.

▶ VALVE SPECIFICATIONS

ITEM	SPECIFICATION
Relief valve setting pressure	180 ~ 185 kgf/cm^2
Max. flow	60 ℓ/min.
Nominal pressure	250 bar

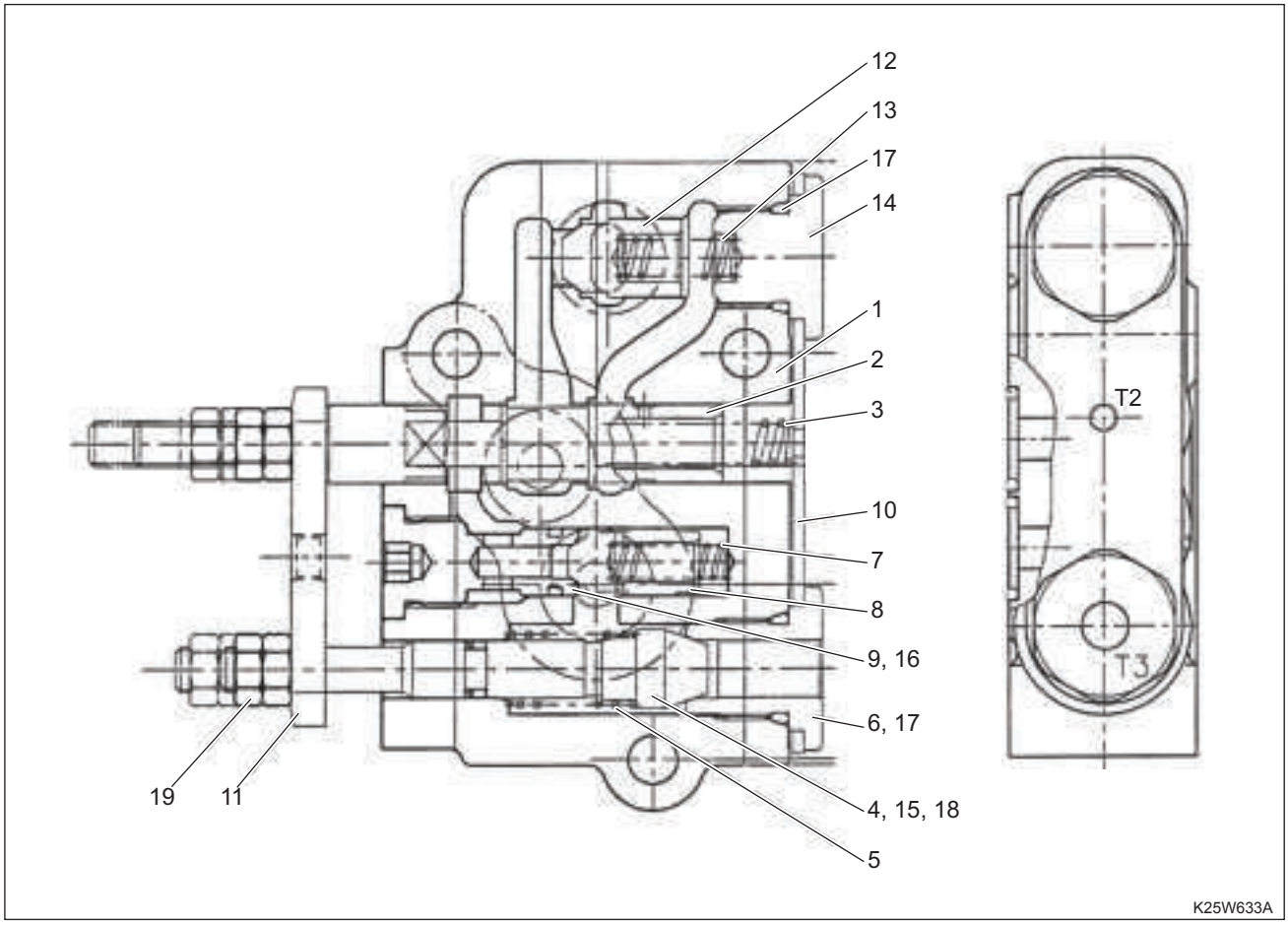
4.8 CONTROL VALVE

▶ OVERVIEW



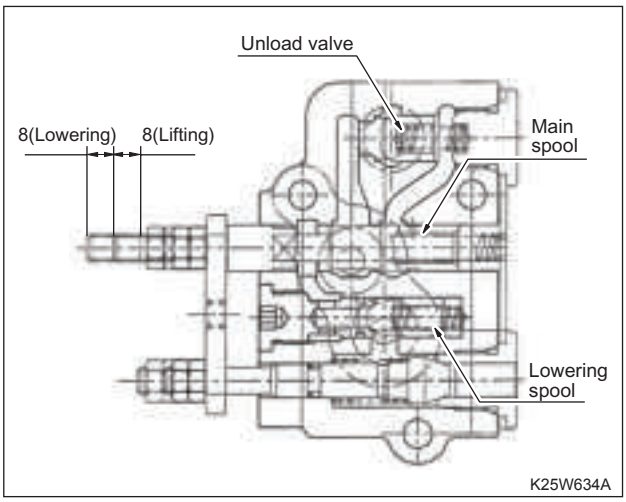
The control valve is installed in the hydraulic cylinder cover and it receives oil at a high pressure from the front outlet valve (front SCV) or the rear SCV (if equipped) through carryover operation. The internal spool is operated according to the position of the control lever to lift or lower the lift arm or set it in the neutral status.

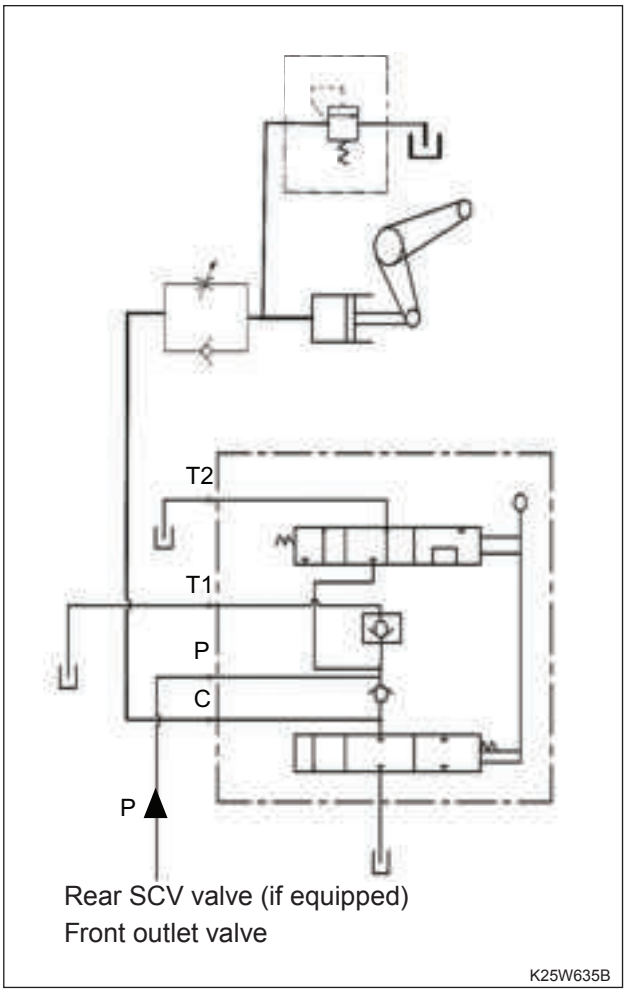
▶ COMPONENTS



(1) Body
(2) Main spool
(3) Main spring
(4) M.Check poppet
(5) M.Check spring
(6) M.Check plug
(7) L.Check spring
(8) L.Check
(9) L.Check seat
(10) Plate-A
(11) Plate-B
(12) U.L. Check
(13) U.L. Spring
(14) U.L. Plug
(15) O-ring
(16) O-ring
(17) O-ring
(18) Backup ring
(19) Nut

▶ OPERATING PRINCIPLE





This valve is operated by connecting the link in the lift cylinder mechanically to the position lever that the driver operates. The main spool of the control valve is pushed in or out according to the position of the lever in order to lift or lower the lift arm.

For example, if the position ordered by the position control lever is higher than the current position of the lower link, the main spool of the valve is pushed in by the link structure set in the hydraulic cylinder case. Then, hydraulic oil is supplied to the cylinder to lift the lift arm and lower link.

On the contrary, if the position ordered by the position control lever is lower than the current position of the lower link, the main spool of the control valve is pushed out by the link structure set in the hydraulic cylinder case. Then, the lowering spool is operated to drain hydraulic oil in the lift cylinder in order to lower the lower link.

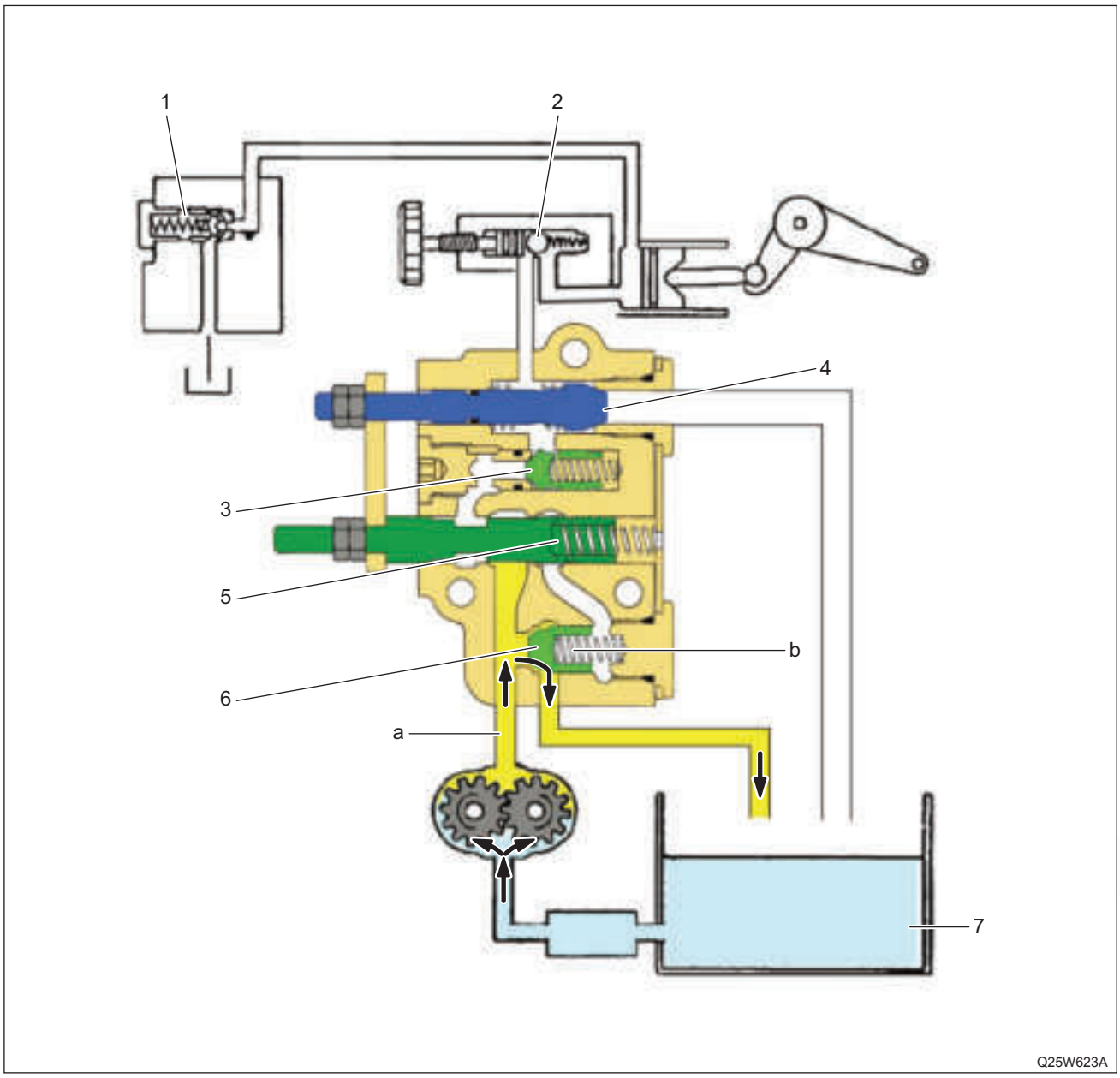
When the position ordered by the position control lever is matched to the actual position of the lower link after lifting or lowering operation, the spool of the control valve is kept in the neutral position by the link structure set in the hydraulic cylinder case. Therefore, the lower link is maintained in the current position.

▶ VALVE SPECIFICATIONS

ITEM	SPECIFICATION
Max. flow	45 ℓ/min.
Operating oil	TF500
Operating pressure	180 kgf/cm^2

4.8.1 OPERATION AND OIL FLOW

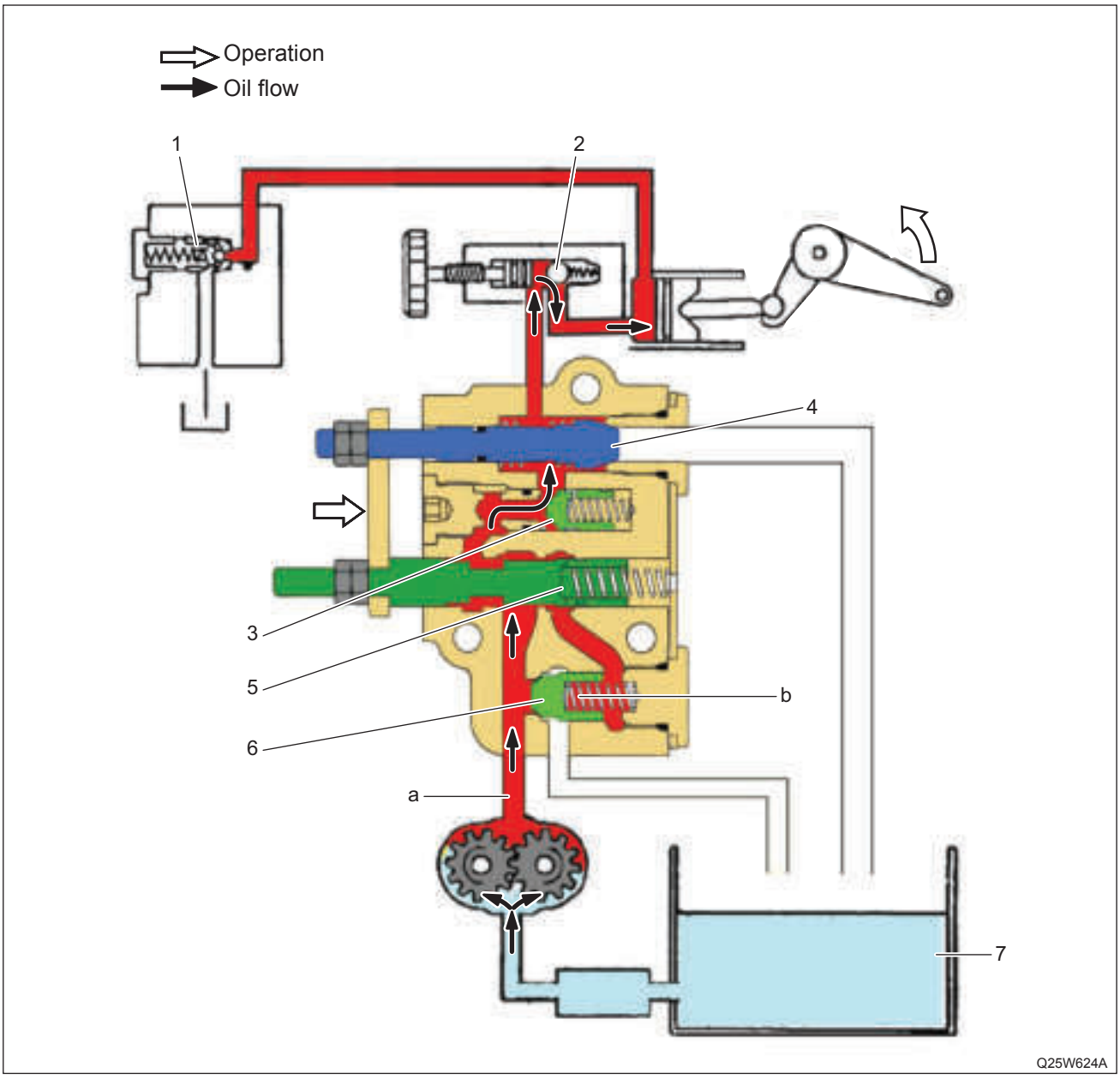
▶ **NEUTRAL**



(1) Safety valve
(2) Slow return valve
(3) Load check valve
(4) Mechanical valve
(5) Main spool
(6) Unload valve
(7) Oil tank

The pressure (b) applied to the back of the unload valve spring is removed. (it opens the spool and is sucked into tank.) As the unload valve is opened by the pressure (a), the oil in the pump is returned to the tank and the pressure drops. The load check valve and mechanical check valve are kept closed.

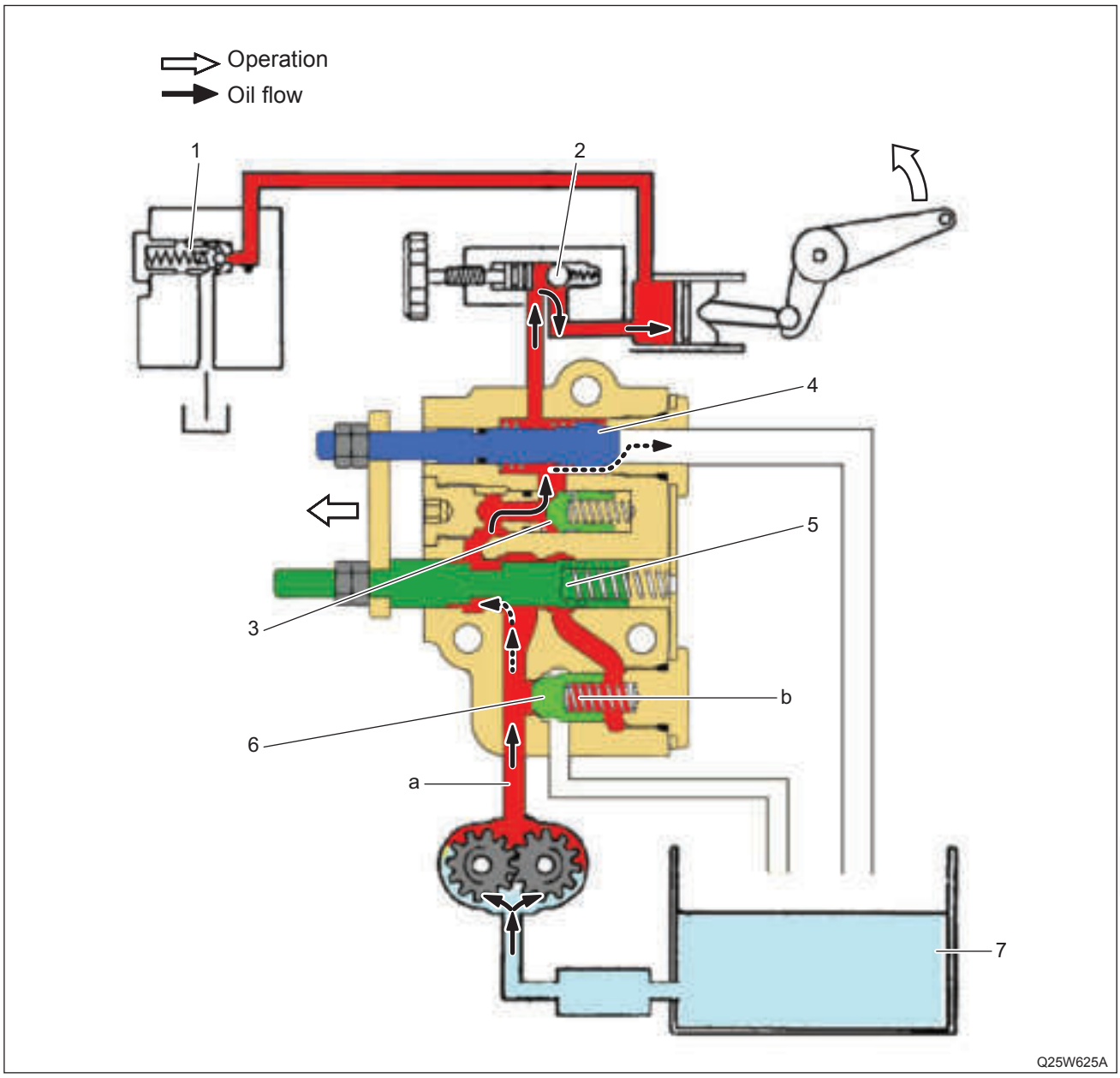
▶ LIFTING (RAPID LIFTING)



(1) Safety valve
(2) Slow return valve
(3) Load check valve
(4) Mechanical valve
(5) Main spool
(6) Unload valve
(7) Oil tank

The unload valve is applied with the pilot pressure (a) and (b) so it is closed by the spring force. As the pressure in the pump rises, oil flows through the flow passage in the spool and opens the load check valve to flow into the cylinder (rapid lifting). The mechanical check valve is kept closed.

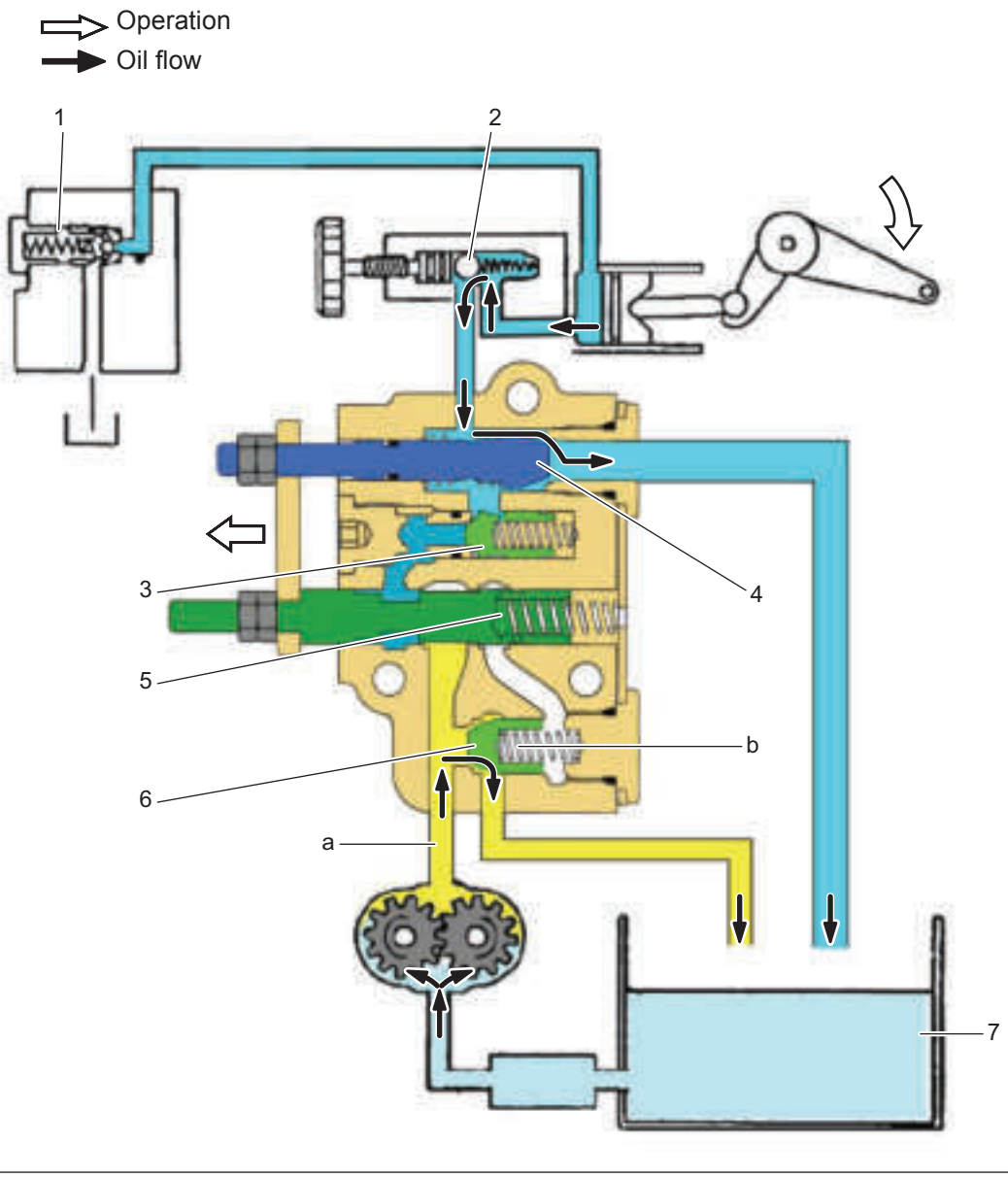
▶ LIFTING (LOW-SPEED LIFTING)



(1) Safety valve
(2) Slow return valve
(3) Load check valve
(4) Mechanical valve
(5) Main spool
(6) Unload valve
(7) Oil tank

As the hydraulic lift is lifted, the feedback link is moved to push the main spool closer to the neutral position. Then, the mechanical valve open slightly and the oil flow of main spool to return oil back to the tank. But the majority of oil is led into the cylinder to reduce shock occurred by lifting operation.

▶ LOWERING

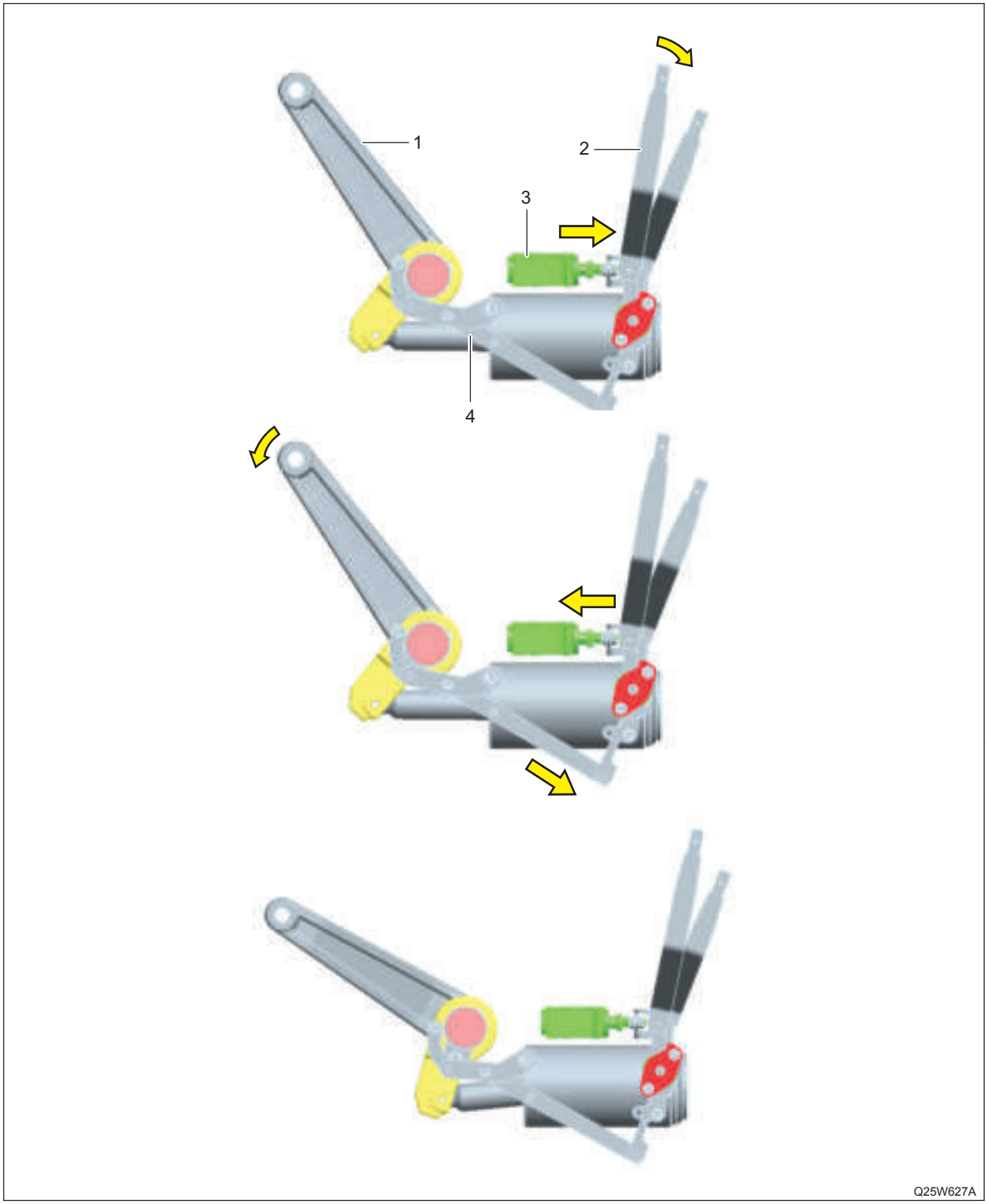


(1) Safety valve
(2) Slow return valve
(3) Load check valve
(4) Mechanical valve
(5) Main spool
(6) Unload valve
(7) Oil tank

Oil in the hydraulic pump opens the unload valve and enters the tank as in the neutral state. As oil in the hydraulic cylinder moves the spool, the mechanical valve, which is directly connected to the main spool with the pin, is opened to return the oil back to the tank.

4.8.2 CONTROL LEVER OPERATION

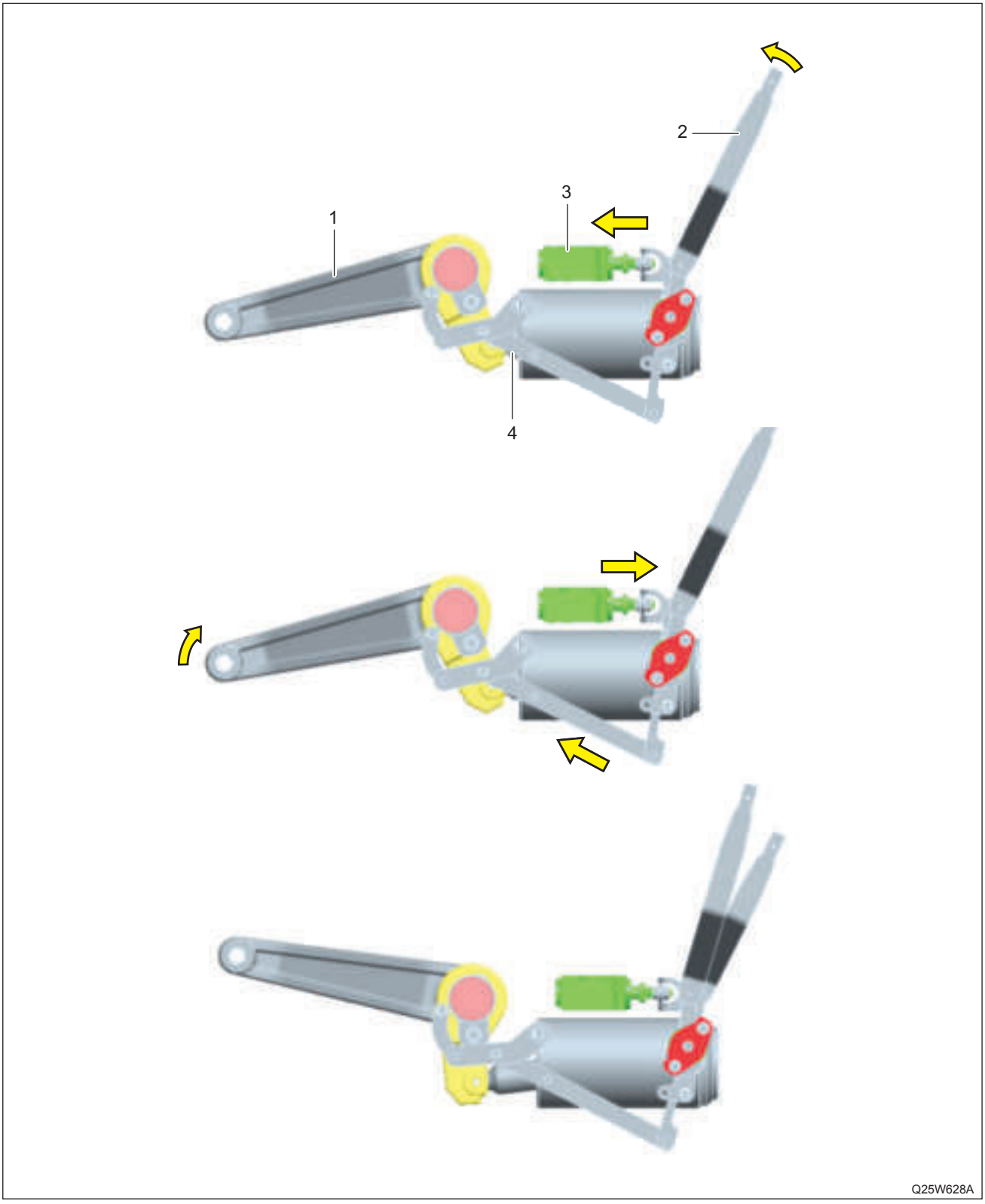
▶ **LOWERING**



(1) Lift arm (2) Control lever (3) Control valve (4) Feedback rod

When setting the control lever to the Lowering position, pressure applied to the spool is released so the spool is returned to its original position by the spring. Therefore, oil in the cylinder is returned back to the tank, the lift arm is lowered, and the spool is returned to the neutral position by the feedback rod.

▶ LIFTING



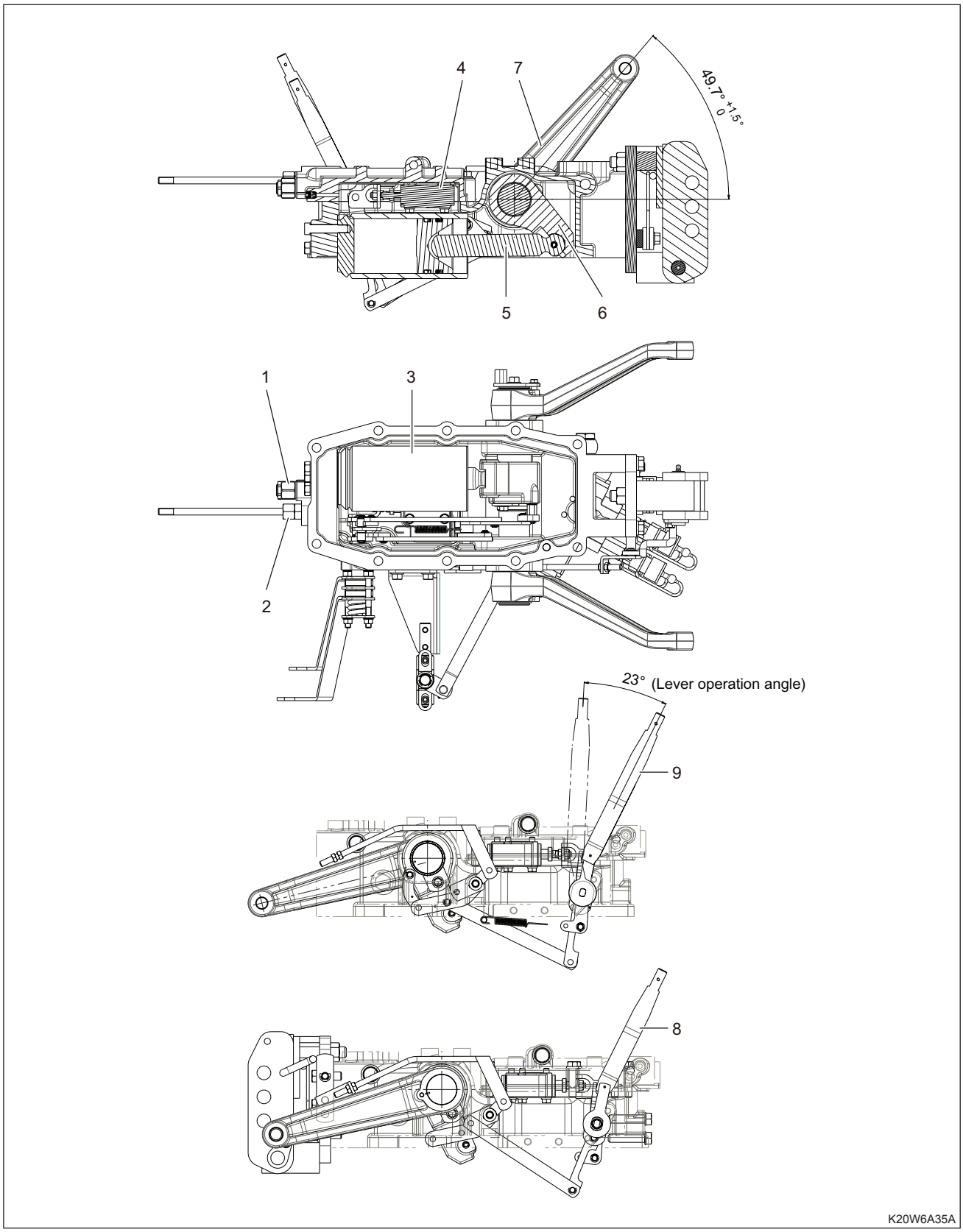
(1) Lift arm (2) Control lever (3) Control valve (4) Feedback rod

When the control lever is set to the Lifting position, the control valve spool behind the hydraulic cylinder case is pressed and oil is flowed into the cylinder. Then, the piston lifts the lift arm. However, as the feedback rod installed to the lift arm is operated to provide a lifting signal in this state, the spool of the control valve is returned to the neutral position even with the control lever still in the lifting position. Therefore, the spool is returned to the neutral position during the lowering operation as well.

4.9 HYDRAULIC CYLINDER CASE ASSEMBLY

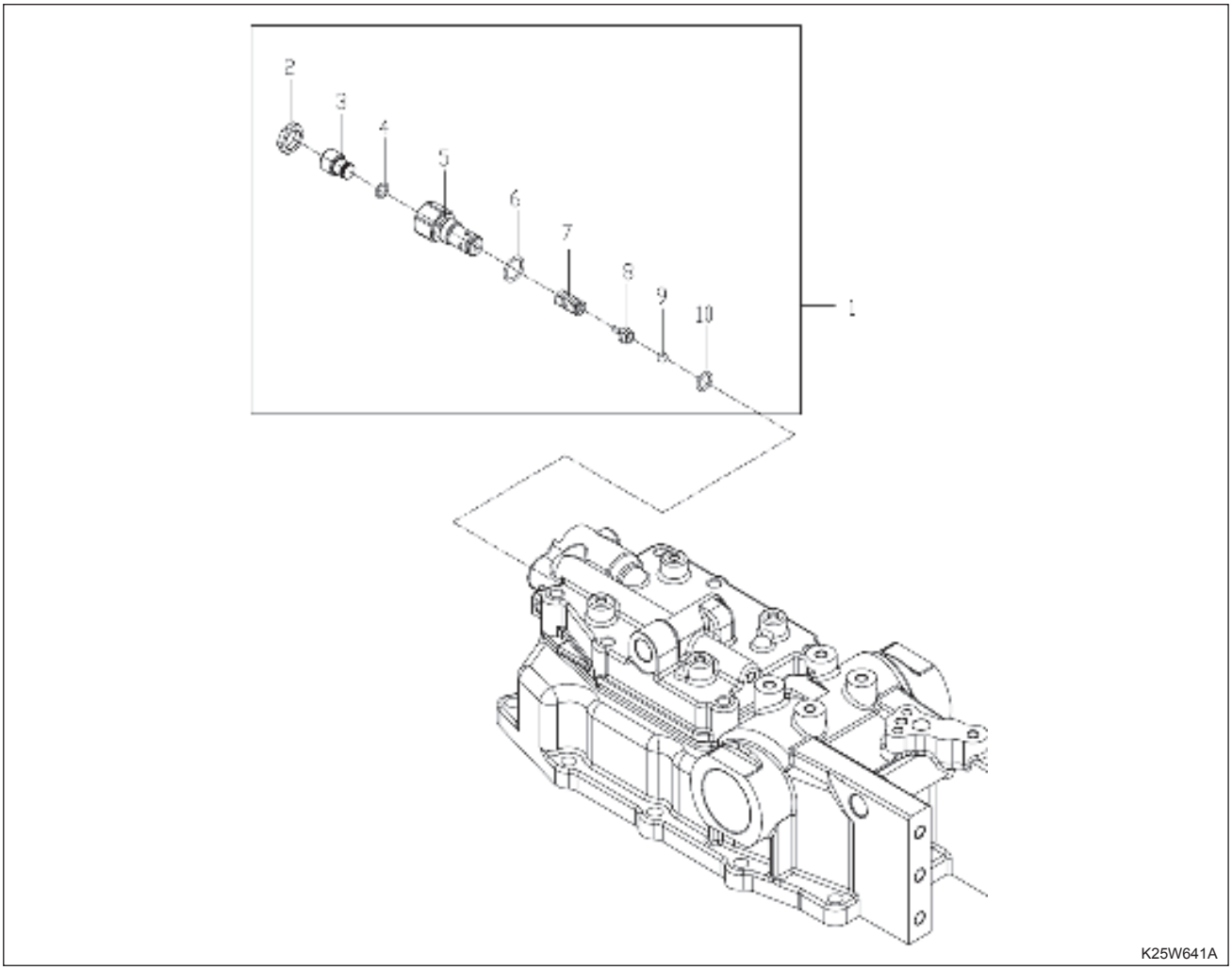
4.9.1 HYDRAULIC CYLINDER CASE

COMPONENTS

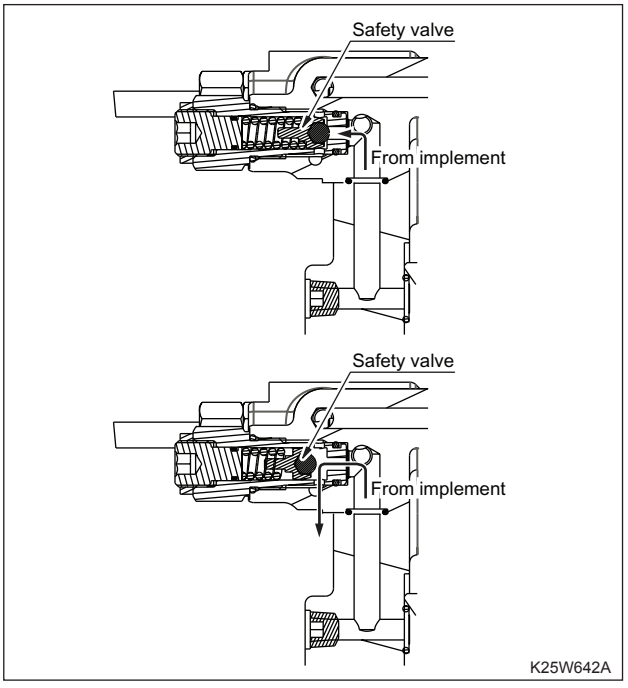


(1) Safety valve
(2) Lowering speed control valve
(3) Cylinder ass'y
(4) Lift/Lowering valve
(5) Piston rod
(6) Lift crank
(7) Lift arm
(8) Draft lever ass'y
(9) Position lever ass'y

4.9.2 SAFETY VALVE



(1) Safety valve ass'y
(2) Nut
(3) Bolt
(4) O-ring
(5) Body, safety valve
(6) O-ring
(7) Spring
(8) Ball guide
(9) Steel ball
(10) O-ring

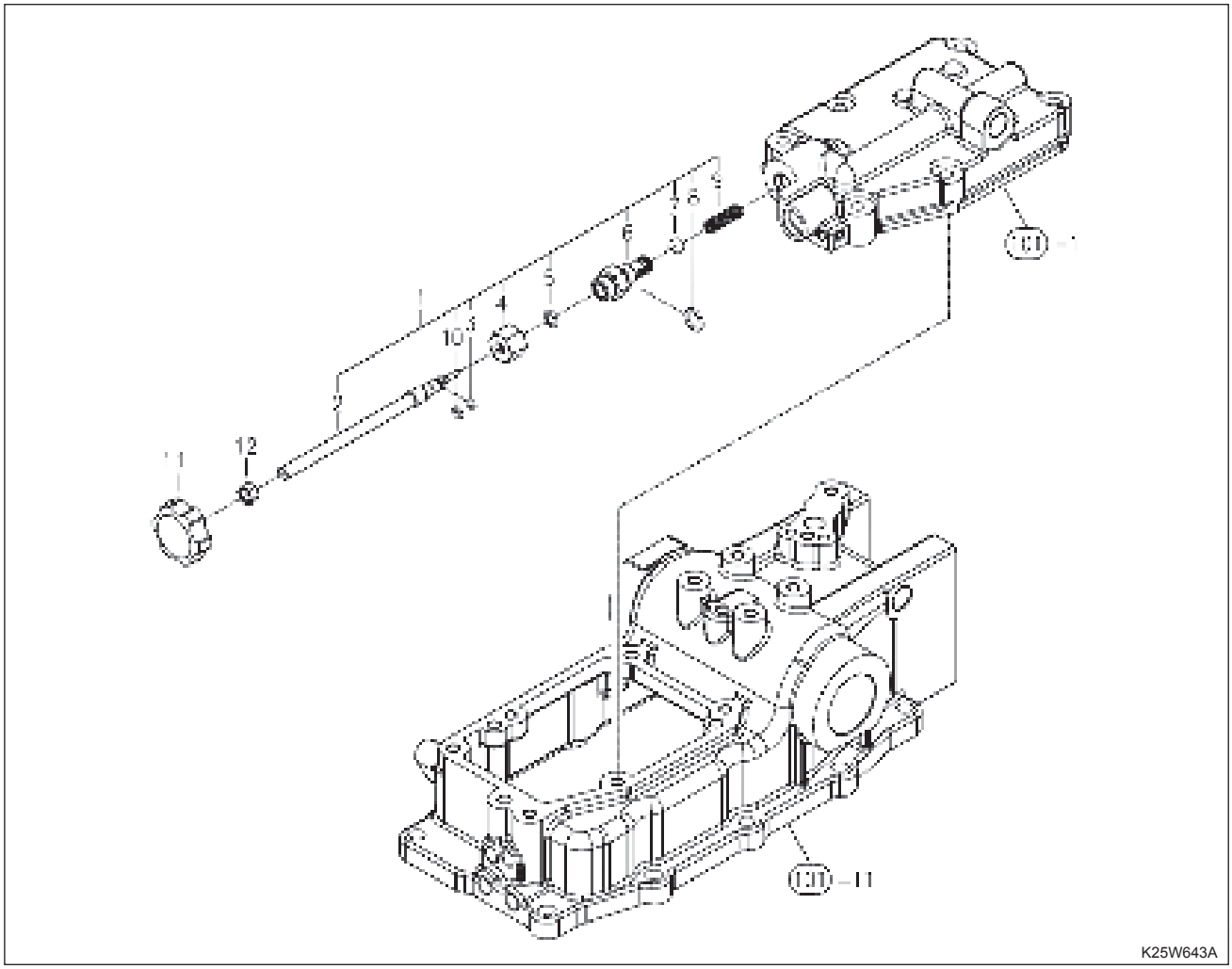


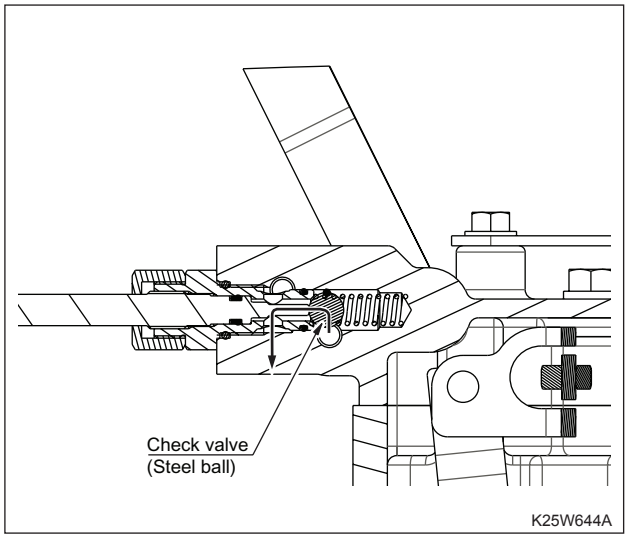
The piston of the hydraulic cylinder case is supplied with hydraulic oil through the lift solenoid valve of the control valve. If the lift arm is overloaded by this oil, pressure in the circuit rises continuously.

In other words, if impact pressure is applied from an external source to an implement and this pressure is over a certain limit, the safety valve is opened to drain oil back to the tank in order to protect the internal circuit of the hydraulic implement.

RELIEF VALVE SETTING PRESSURE	210 ± 10 kgf/cm^2

4.9.3 STOP VALVE (ALSO AS SLOW RETURN VALVE)

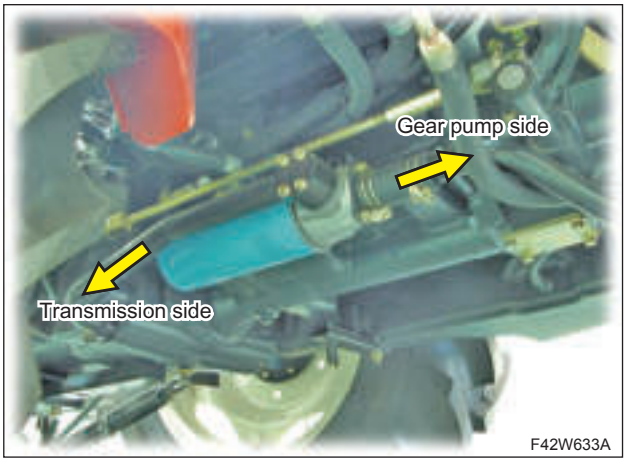




Stop valve is used to stop lowering or adjust the lowering speed of the hydraulic lift. When turning the handle counterclockwise, the lowering speed of the lift arm increases. Turning it clockwise slows down the lowering speed. Also, when turning it clockwise to its end, the oil flow passage is blocked so the lift arm is stopped at the current position.

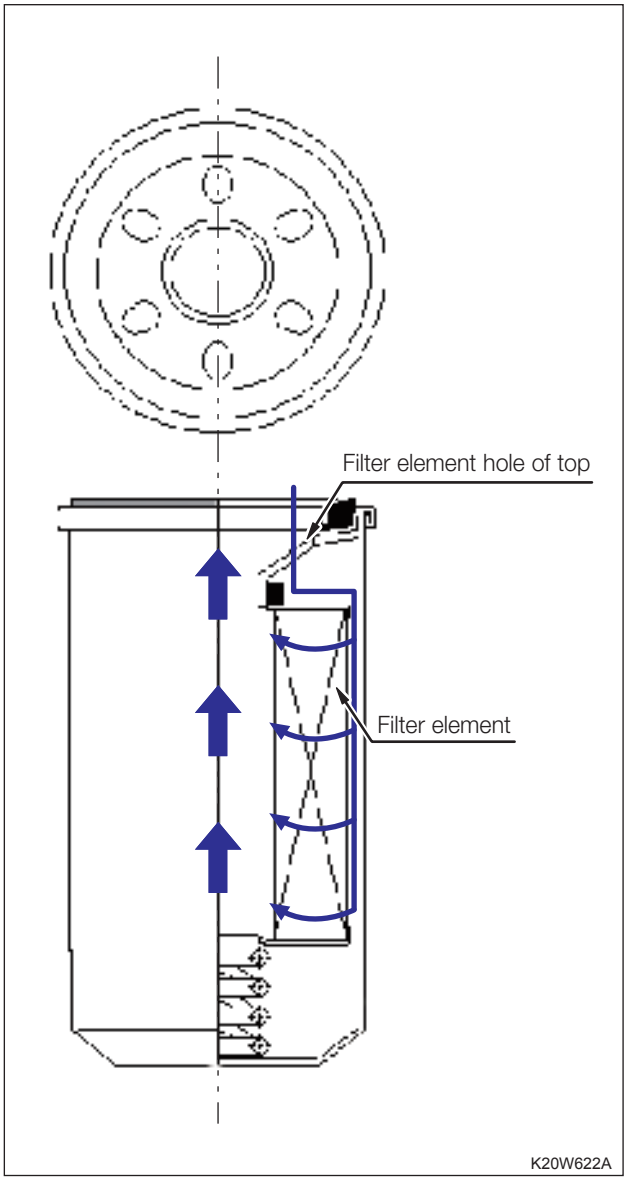
4.10 HYDRAULIC FILTER AND STRAINER

4.10.1 HYDRAULIC FILTER



The hydraulic filter is installed under the transmission to filter oil in the oil tank (transmission) before this oil is delivered to the gear pump.

Hydraulic oil is flown through the hole on the top of the oil filter cartridge and is passed from the outside to the inside of the filter. Then, it is flowed in through the hole in the middle of the cartridge.

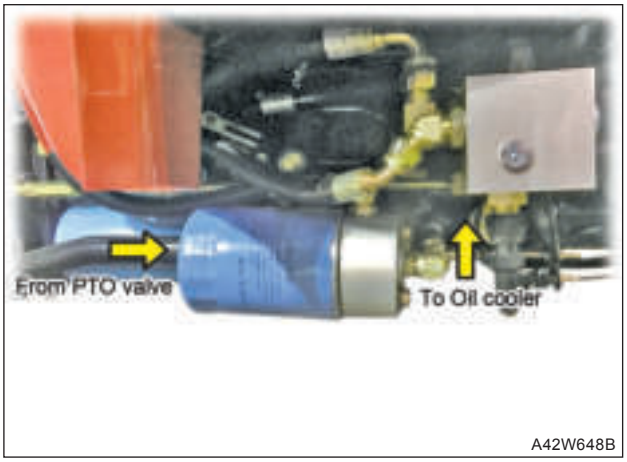


▶ **FILTER ELEMENT SPECIFICATIONS**

Filtering area	4,972 cm^2
Number of folds	55
Folding width	195 × 17 × 55 folds
Bursting strength	4.5 bar
Max. fineness	110 ± 8 μ
Min. fineness	92 ± 8 μ

Notes
• **Hydraulic filter replacement: after initial 50 hours, and then every 300 hours of use**

4.10.2 HST FILTER



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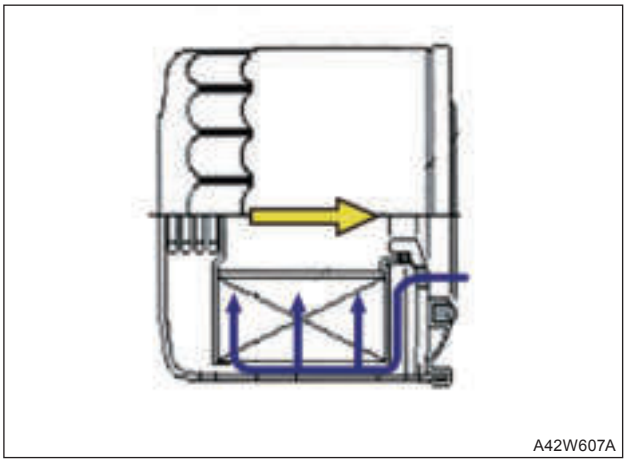
The HST filter is installed below the right floor. As oil delivered from the PTO valve side passes through the HST filter, it is filtered before it returns into the oil cooler for cooling and flows into the HST.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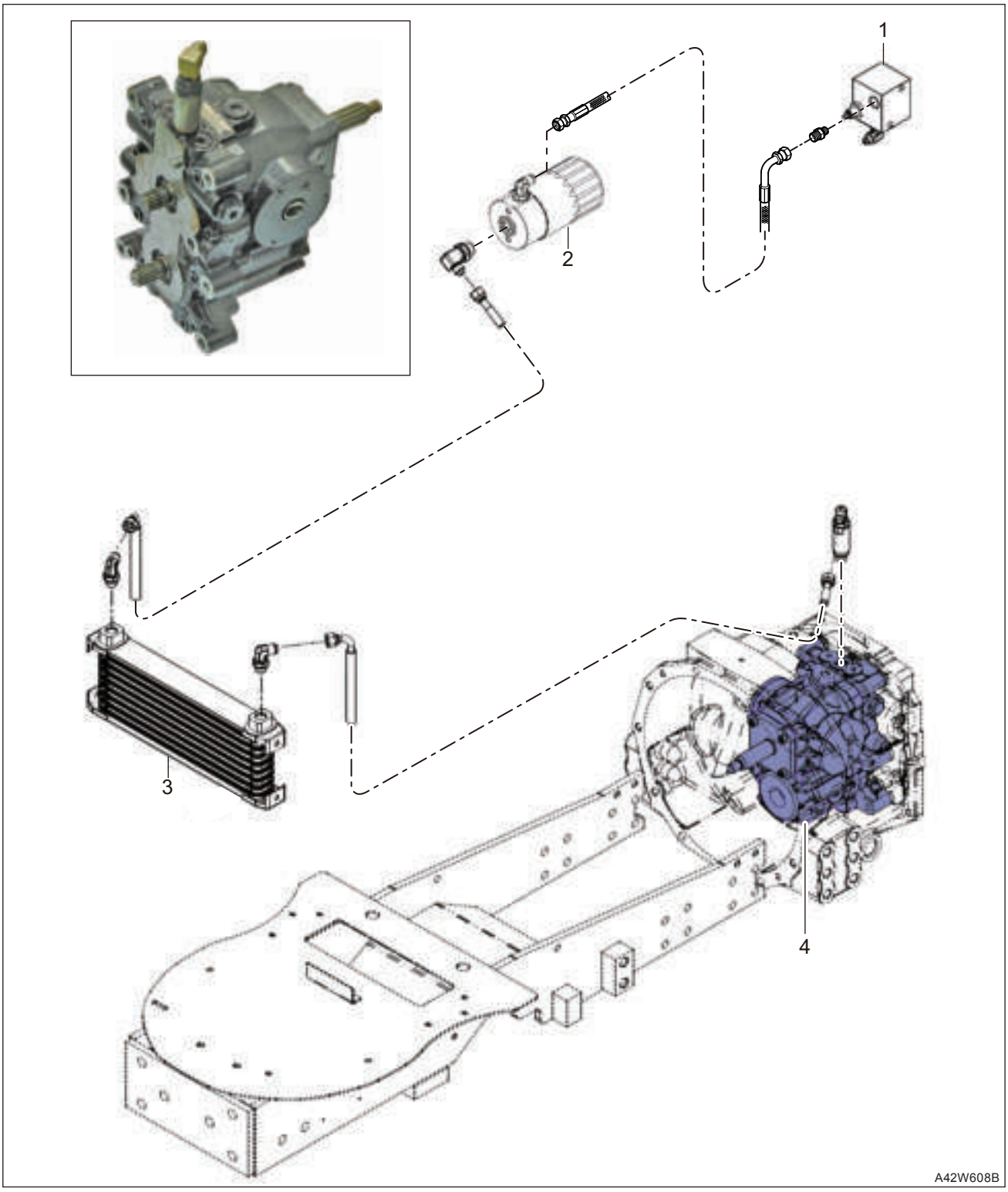
▶ SPECIFICATIONS

Filtering area	2,677 cm^2
Number of folds	75
Folding width	105 × 17 × 75 folds
Rated flow	30 ℓ /min
Bursting strength	17 kgf/cm^2
Fineness	20 μ

Notes
• **Replace after initial 50 hours, and then every 300 hours of use**

4.11 HST(HYDROSTATIC TRANSMISSION)

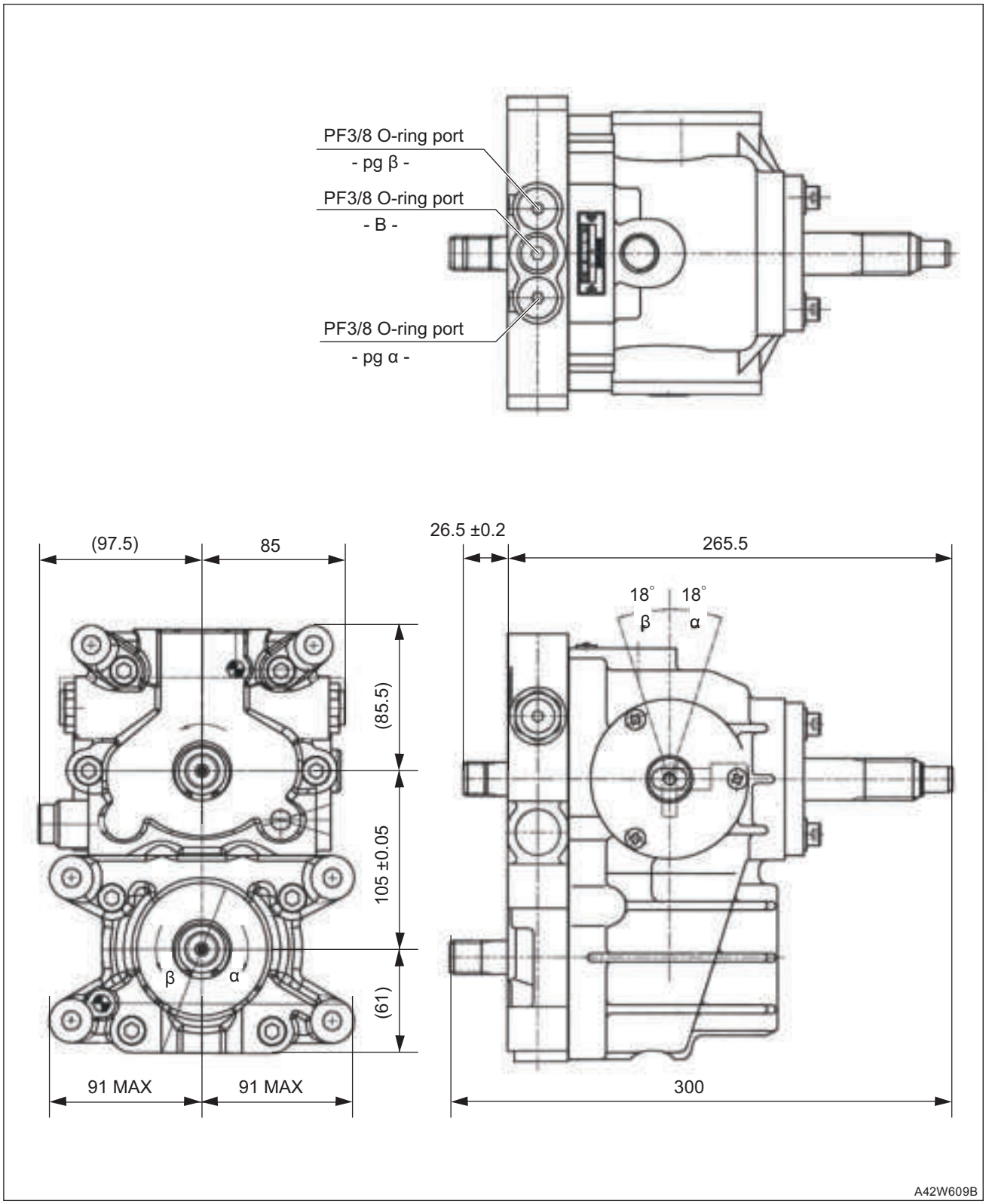
4.11.1 HST PASSAGE COMPOSITION



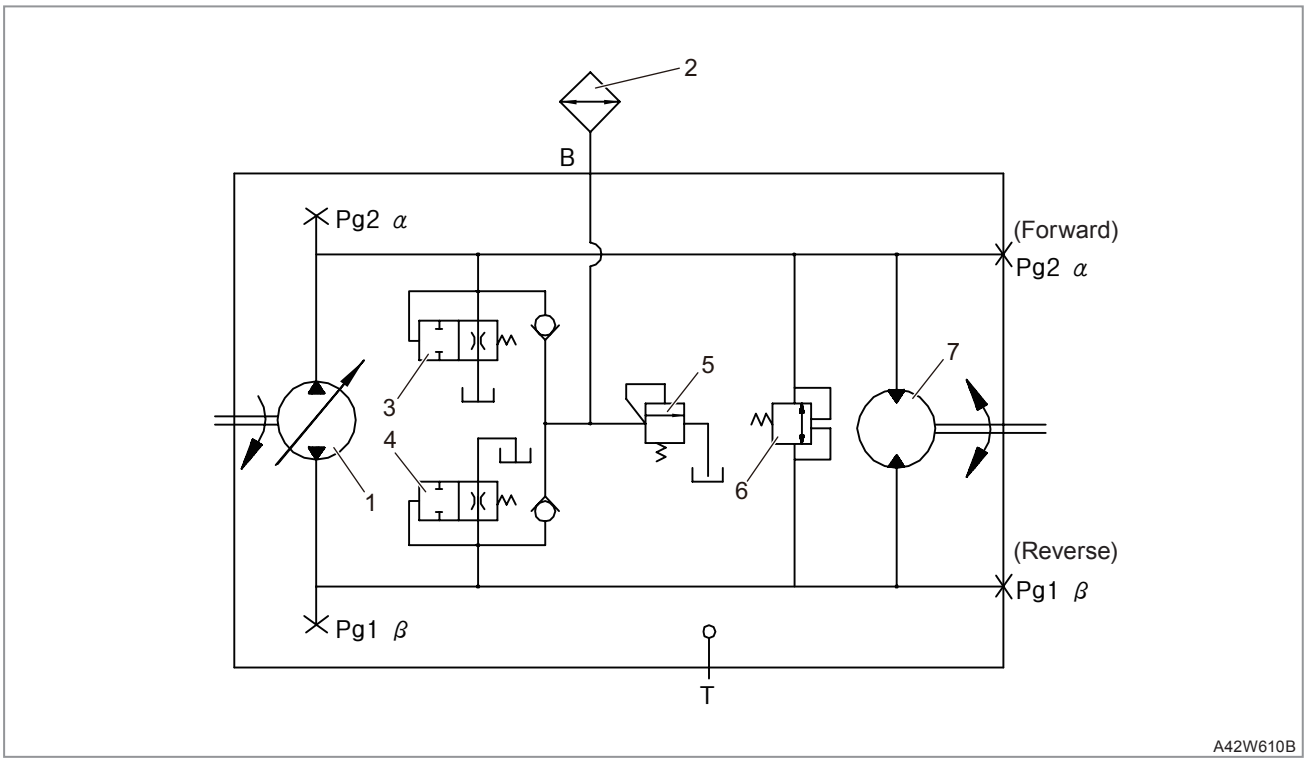
(1) PTO valve (2) HST filter (3) Oil cooler (4) HST

The HST (Hydro-Static Transmission) consists of the variable capacity pump, fixed capacity motor, check valve, high-pressure relief valve, etc. and it is installed to the transmission to supply turning force to the transmission. The input shaft of the HST is connected to the spring damper which is installed to the flywheel of the engine with the spline. to receive turning force from the engine. Its HST pump is driven by receiving this turning force through the input shaft of the HST, and hydraulic oil led into the HST is sent to the hydraulic motor to supply new rotating force to the transmission. As the HST pump can adjust hydraulic flow variably, it can adjust the speed of the HST motor variably and the rotating direction of the motor through the internal swash plate for forward and reverse driving.

4.11.2 EXTERIOR DIMENSION

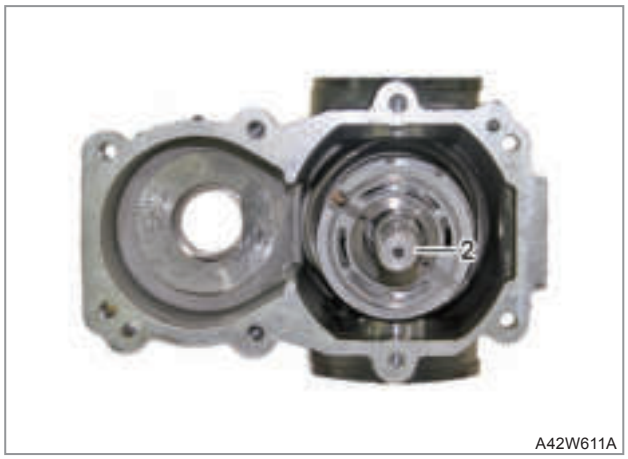


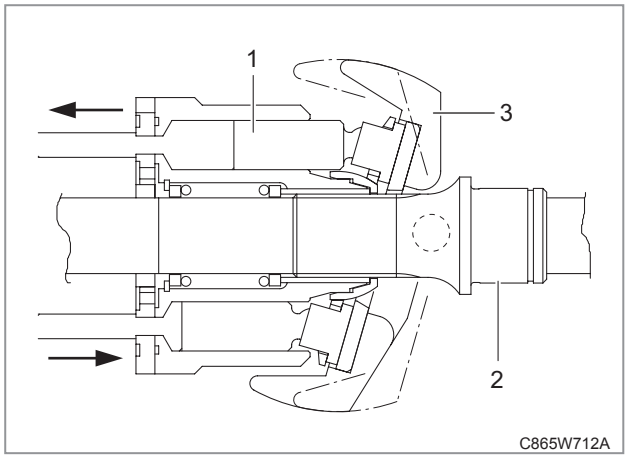
4.11.3 CIRCUIT DIAGRAM



(1) HST pump
(2) Oil cooler
(3) Neutral valve
(4) Neutral valve
(5) Charge relief valve
(6) Main relief valve
(7) HST motor

4.11.4 HST PUMP





(1) Piston (3) Swash plate
(2) Shaft

The pump in the HST is equipped with several pistons (1) to control hydraulic flow with reciprocating motion. Also, it uses its swash plate (3) to hydraulic flow and flow direction. The piston attached to its cylinder is in contact with the inclined surface of the swash plate, sliding on this surface in reciprocating motion in the cylinder.

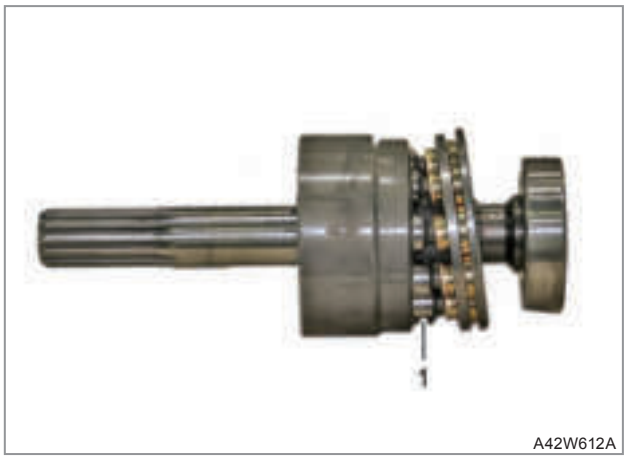
Therefore, Every time the shaft (2) rotates once, the pistons reciprocate once as well. The pistons on one side in the cylinder suck oil while the pistons on the other side in the cylinder discharge oil, forming one cycle.

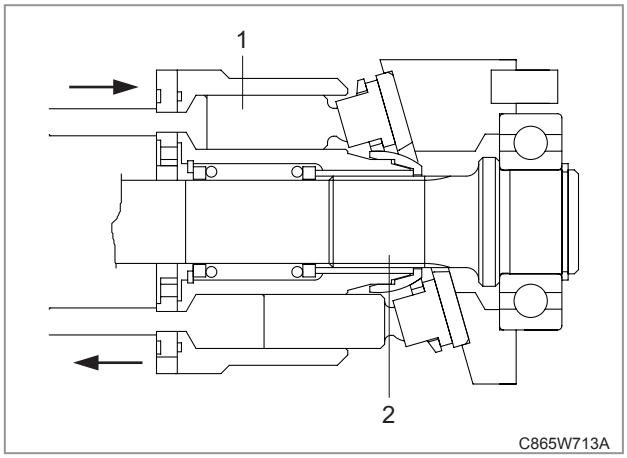
Therefore, the cylinder is divided into the high-pressure side and low-pressure side. When, the inclined side of the swash plate is changed, these sides are switched.

This is where the direction of flow changes when the HST pedal is depressed in "forward" or "reverse". Then, the rotating direction of the motor shaft in the HST is changed to enable forward or reverse driving.

The inclination of the swash plate in the pump is adjusted within the range of -18° - +18°, and its angle determines the driving direction and vehicle speed.

4.11.5 HST MOTOR





(1) Piston (2) Shaft

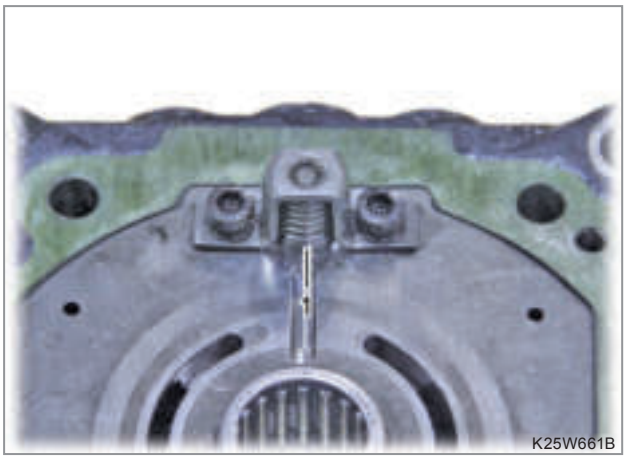
The motor in the HST has a shape similar to the pump, but it is equipped with the fixed swash plate, making it a fixed capacity type.

After hydraulic oil is compressed in the pump, it is led into the motor to drive it. The piston in the motor has a structure similar to a pump, but the swash plate of the motor is fixed at the angle of 18°. Therefore, when each piston receives high-pressure oil, it is extended to push out the swash plate. However, as the swash plate is fixed, this force is blocked by the swash plate and rotates the cylinder assembly instead.

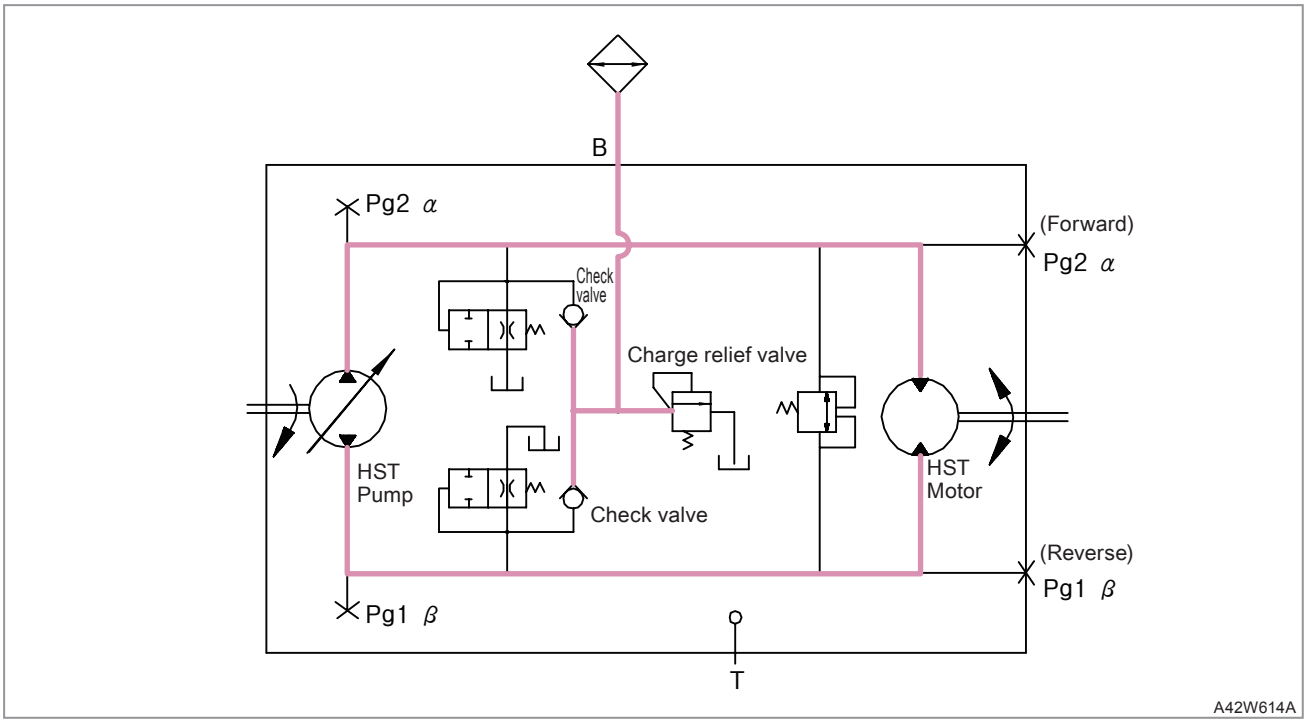
Therefore, one half of the cylinder space expands while the other half of the cylinder space contacts. Oil discharged in this state is returned to the suction line toward the pump, completing one cycle.

The speed of the motor is determined by the amount of oil flow of the pump, and the rotating direction of the motor is determined by the direction of oil flow.

4.11.6 CHARGE RELIEF VALVE



(1) Charge relief valve

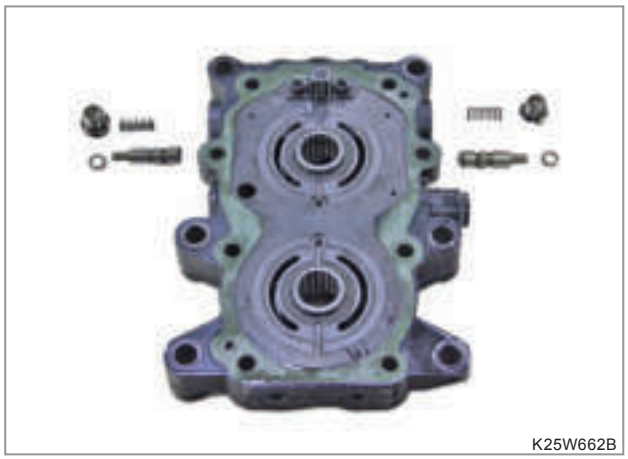


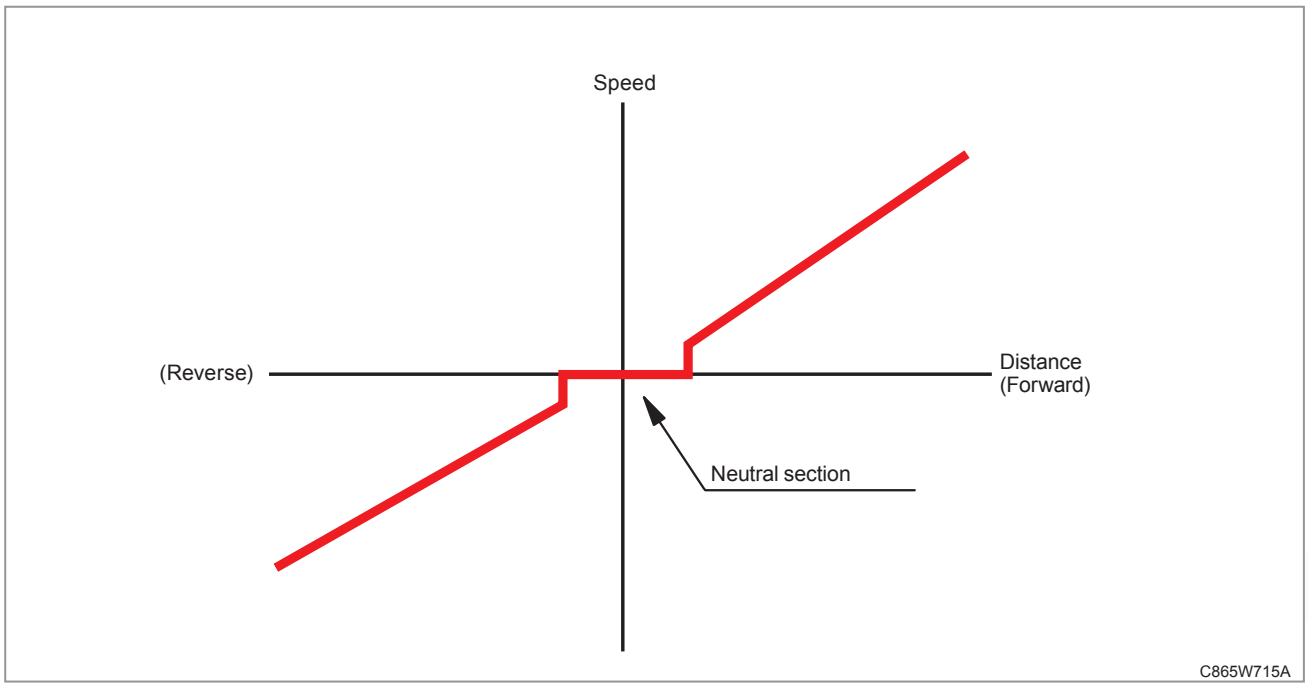
Most of oil is circulated in between the pump and motor in the HST. There is no separate charge pump. Instead, the gear pump of the vehicle body supplies hydraulic oil through the passage.

Most of oil is circulated through the circuit, but oil leakage occurs in the process. Therefore, this amount of oil loss should be supplemented in the circuit continuously. For this, the pump for charge continuously supplies oil to the low-pressure side circuit in which oil is returned from the motor. The setting pressure of the charge relief valve is 5 ~ 7 kgf/cm^2. When pressure rises due to surplus oil or load in the high-pressure side, the charge relief valve opens to send oil to the oil tank.

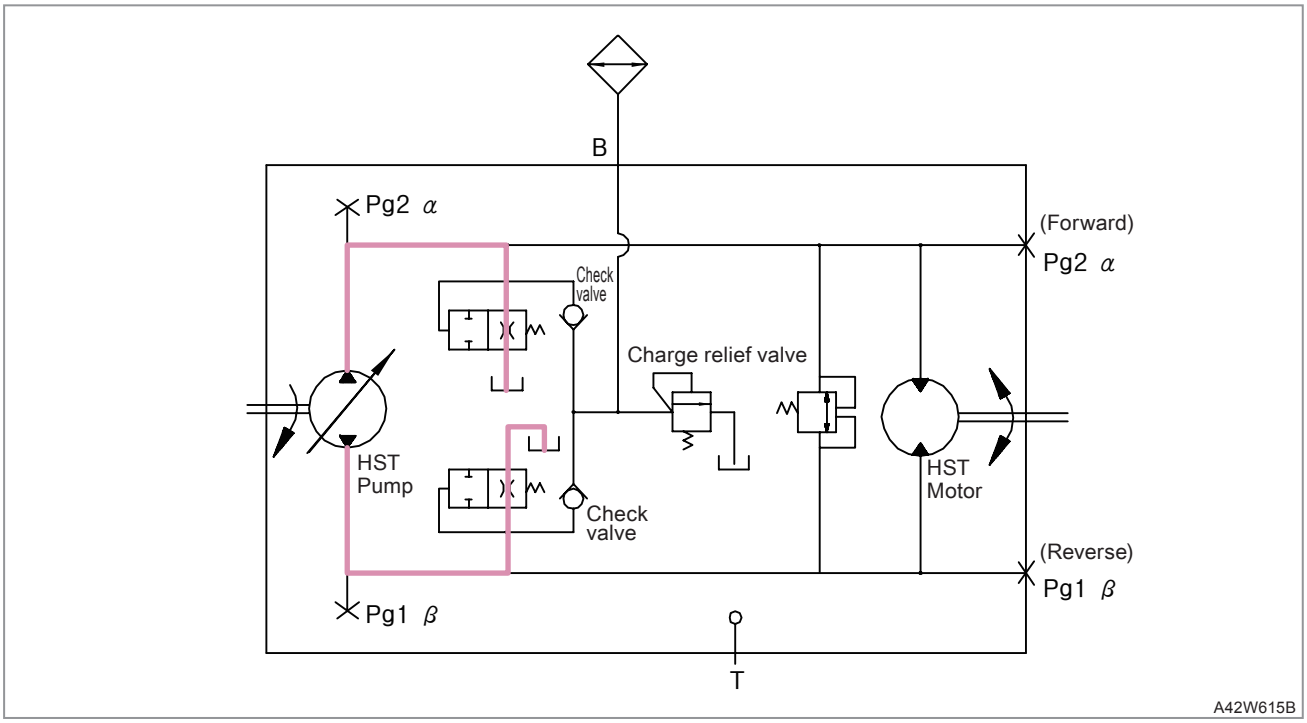
During forward or reverse driving, high pressure is formed in the compression side of the pump while low pressure is formed in the suction side, leading to oil loss in the low pressure side. If this leads to pressure drop, the charge relief valve is closed and oil is supplemented through the check valve.

4.11.7 NEUTRAL VALVE





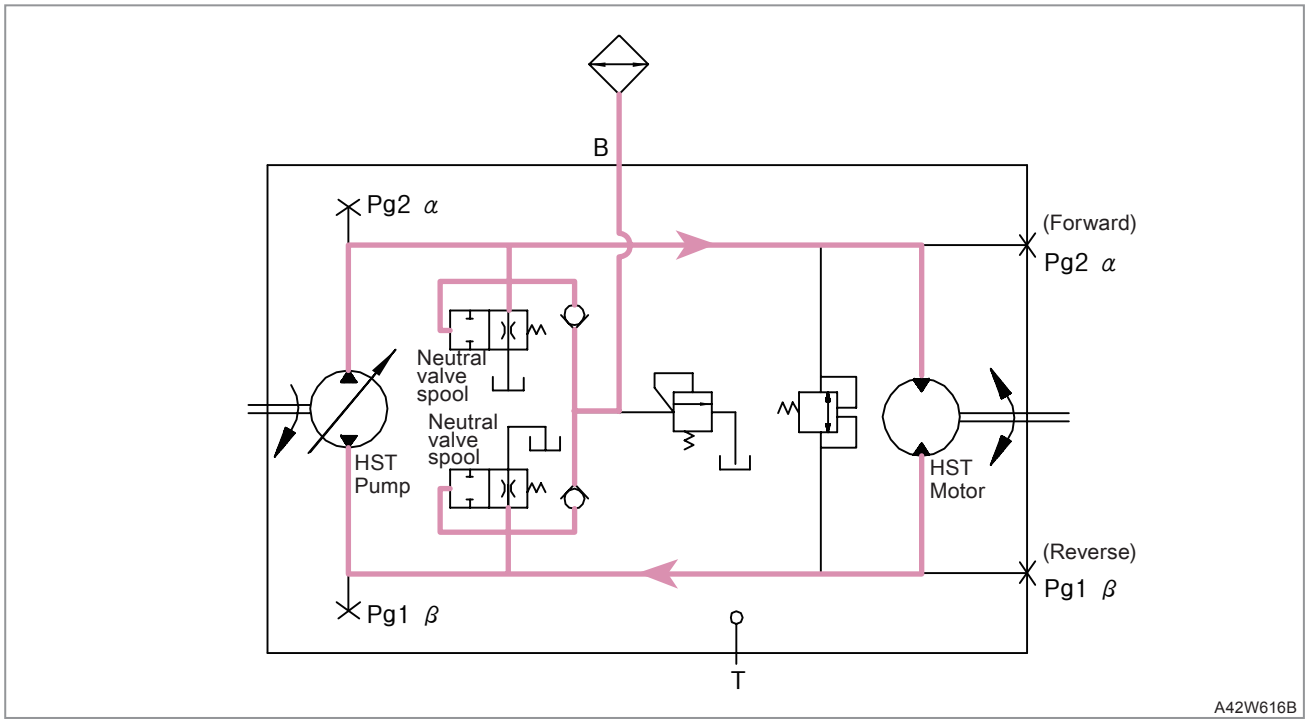
NEUTRAL



In the HST pump operation process, it is almost impossible to set the swash plate at 0° exactly to keep the neutral state (no oil flow). Also, it is impossible for the driver to set the angle of the swash plate to 0° for the neutral setting. To solve this problem, the neutral valve is installed to obtain the minimum range to keep the neutral state.

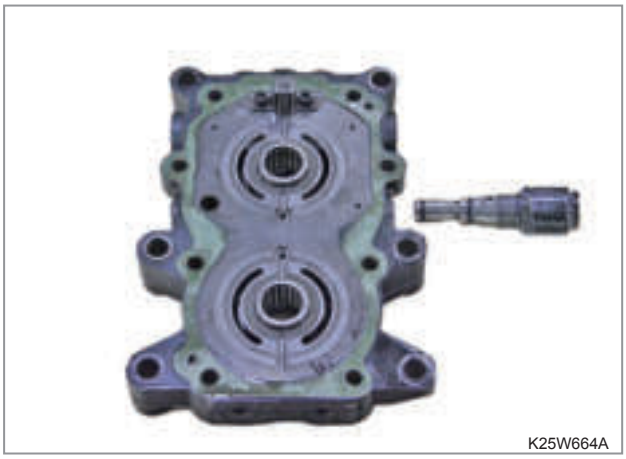
When the angle of the swash plate is close to, but not exactly 0°, a small amount of oil is discharged to the motor. In this case, the neutral valve drains this oil through its orifice to prevent internal pressure rise before it reaches the motor. This also prevents minute operation of the hydraulic motor.

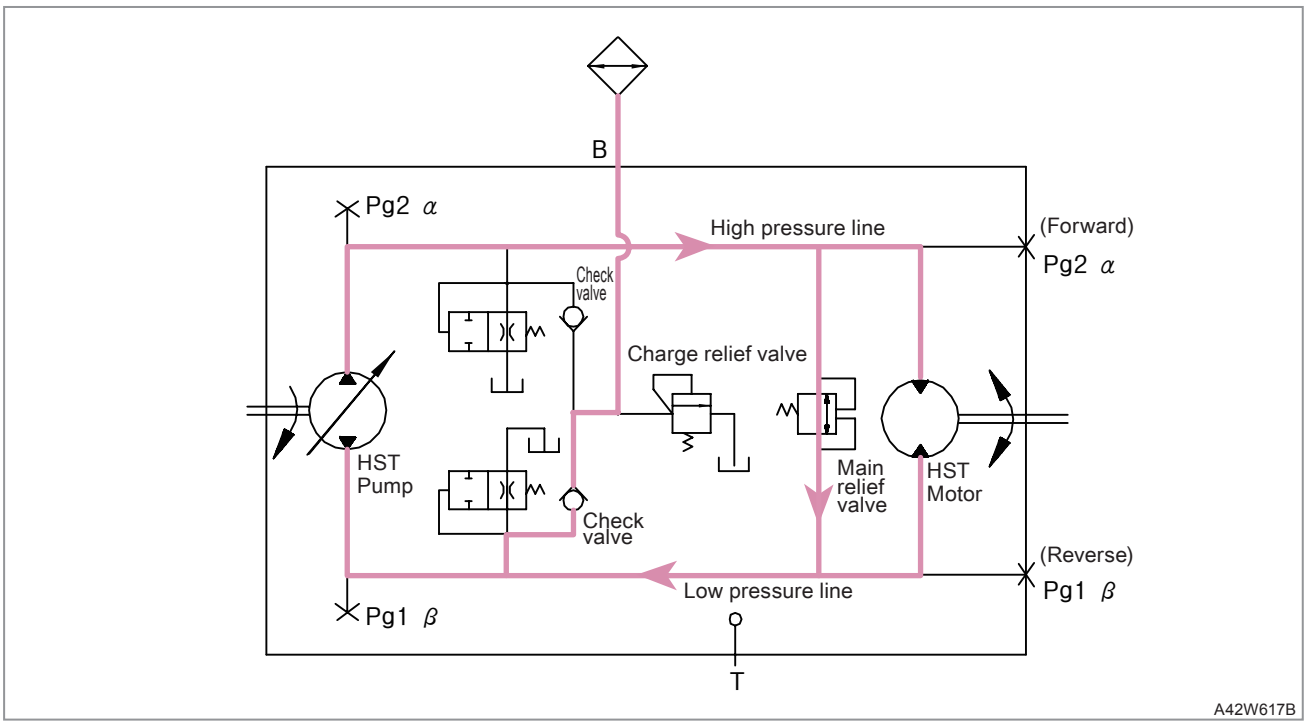
FORWARD/REVERSE DRIVING



When operating the forward/reverse pedal for forward or reverse driving, the angle of the swash plate is increased so oil flow toward the pump is also increased. As a result, hydraulic pressure rises gradually and eventually exceeds the setting pressure of the return spring of the neutral valve. Then, the spool of the neutral valve is moved to close the orifice, leading oil to the motor through the internal circuit.

4.11.8 MAIN RELIEF VALVE





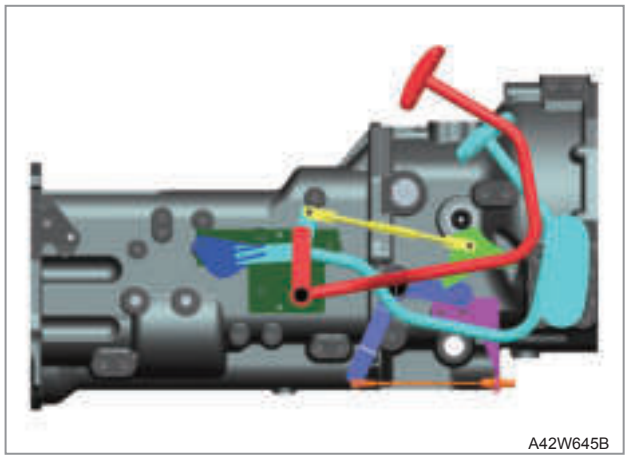
The setting pressure of the main relief valve is 380 kgf/cm^2 (37.2 MPa) to protect the internal circuit in case of HST overload.

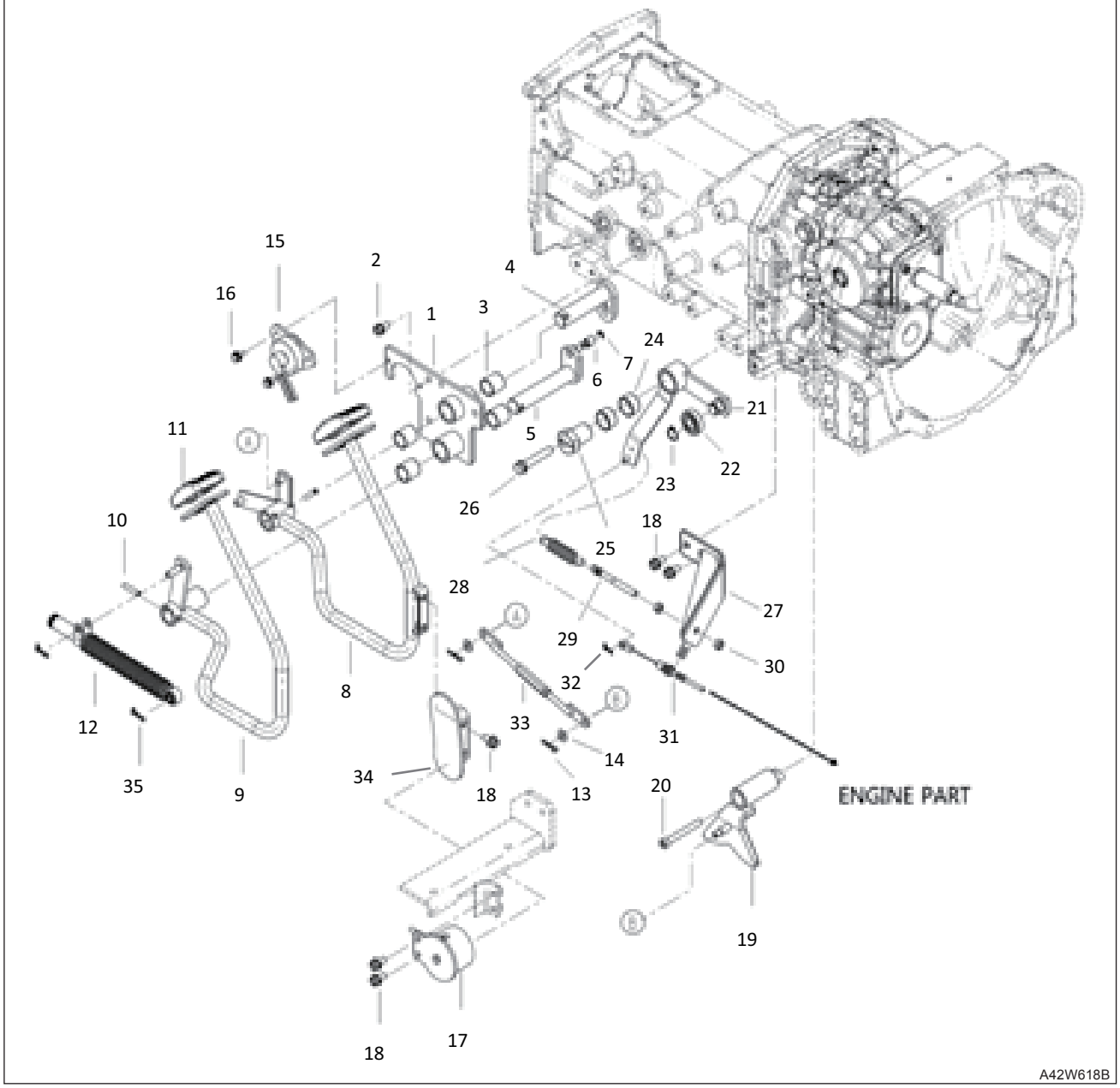
When the main relief valve is activated during forward or reverse driving, oil in the high-pressure side circuit is delivered to the low-pressure side circuit to prevent damage of the internal circuit due to load.

On the other hand, oil supplied by the charge pump is sent to the low-pressure circuit through the check valve on the neutral valve side.

4.11.9 HST PEDAL AND LINK COMPONENTS

ROPS MODEL





(1) Bracket ass'y, pedal
(2) Hex flange bolt
(3) Bush
(4) Shaft ass'y, front
(5) Shaft ass'y, rear
(6) Roller
(7) Snap ring
(8) Pedal ass'y, front
(9) Pedal ass'y, rear
(10) Spring pin
(11) Pedal cover
(12) Damper
(13) Snap pin
(14) Plain washer
(15) Switch(fr)
(16) Bolt w/washer
(17) Cruise magnet
(18) Hex flange bolt
(19) Joint
(20) Hexagon socket bolt
(21) Arm ass'y
(22) Ball bearing
(23) Snap ring
(24) Bush
(25) Shaft
(26) Bolt w/washer
(27) Holder ass'y, spring
(28) Spring
(29) Bolt
(30) Hex nut
(31) Wire
(32) Snap pin
(33) Rod ass'y
(34) Bracket ass'y, cruise
(35) Snap pin

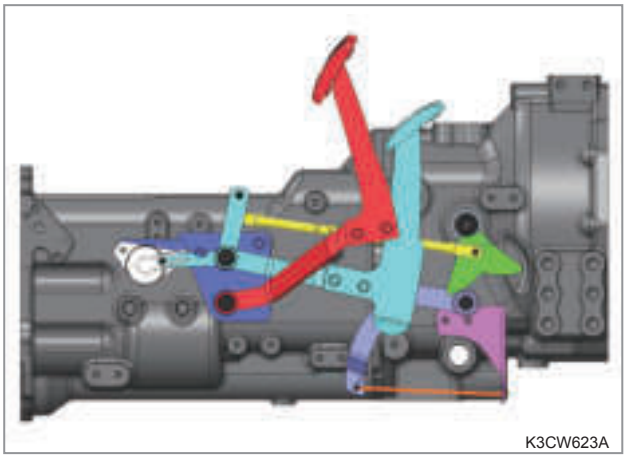
The forward and reverse driving pedals are installed at different hinge point shafts (4 & 5) and they are interlinked.

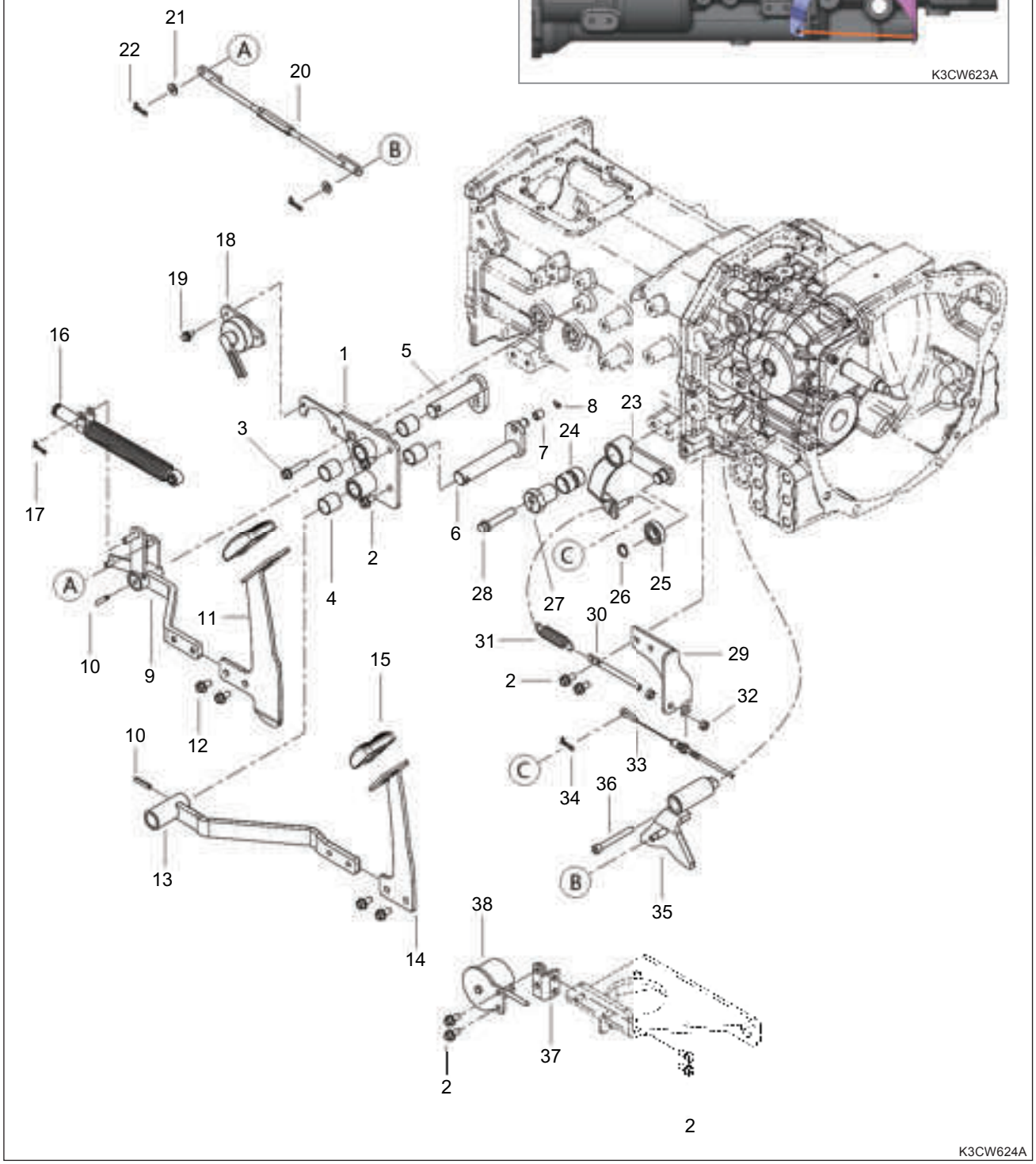
Therefore, when the forward driving pedal is depressed, the reverse driving pedal is lifted and vice versa. There is the rod (33) between the forward driving pedal and connecting joint (19). The connecting joint is rotated for the amount of movement of the pedal in the reverse direction for the forward/backward driving.

The connecting joint is connected to the swash plate of the HST. While it is turned clockwise or counterclockwise, it determines the driving direction (forward/reverse) and driving speed. Also, the connecting joint is engaged with the neutral control bracket (21). This neutral control bracket has the ball bearing (22) which slides along the curve of the connecting joint according to the rotating direction of the joint, moving the neutral control bracket accordingly. Then, its motion in the same direction for the connecting joint pulls or release the HST accelerator cable (31), which is connected to the neutral control bracket, to determine the engine speed.

Also, the safe start neutral switch (15) is connected to the rear bracket of the forward driving pedal to detect the neutral position. The cruise control bracket (34) is attached with the electromagnet (17) which fixes the forward driving pedal at the specified position in the cruise control mode to maintain the constant driving speed.

CABIN MODEL

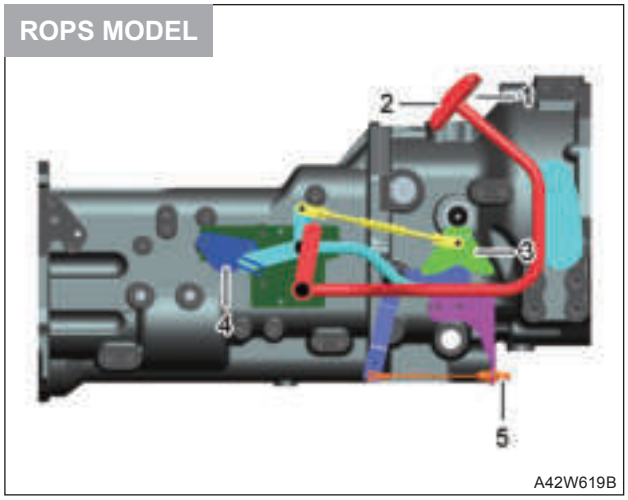

K3CW623A


21
22
A
20
B
18
19
16
1
5
3
8
23
24
7
17
6
2
4
C
28
27
26
25
11
30
31
29
10
9
15
2
32
10
12
C
33
34
36
13
B
35
38
14
37
2
2
K3CW624A

(1) Bracket ass'y, pedal
(2) Hex flange bolt
(3) Hex flange bolt
(4) Bush
(5) Shaft ass'y, front
(6) Shaft ass'y, rear
(7) Roller
(8) Snap ring
(9) Pedal ass'y, front
(10) Spring pin
(11) Pedal ass'y, front
(12) Hex flange bolt
(13) Pedal ass'y, rear
(14) Pedal ass'y, rear
(15) Pedal cover
(16) Damper
(17) Snap pin
(18) Switch(FR)
(19) Bolt w/washer
(20) Rod ass'y
(21) Plain washer
(22) Snap pin
(23) Arm ass'y
(24) Bush
(25) Ball bearing
(26) Snap ring
(27) Shaft
(28) Bolt w/washer
(29) Holder ass'y, spring
(30) Bolt
(31) Spring
(32) Hex nut
(33) Wire
(34) Snap pin
(35) Joint
(36) Hexagon socket bolt
(37) Bracket ass'y, cruise
(38) Cruise magnet

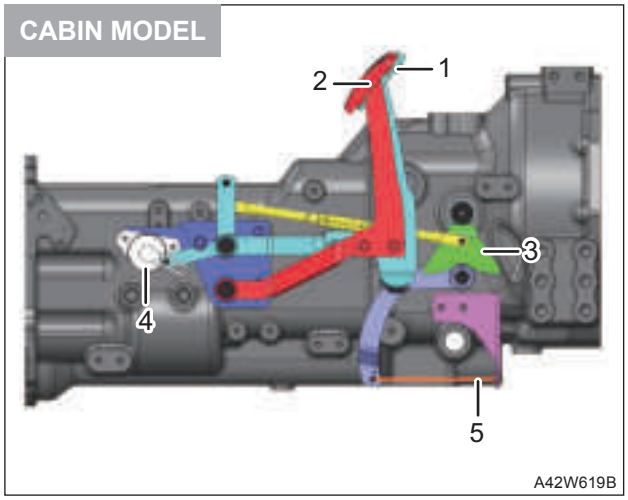
NEUTRAL

ROPS MODEL



A42W619B

CABIN MODEL

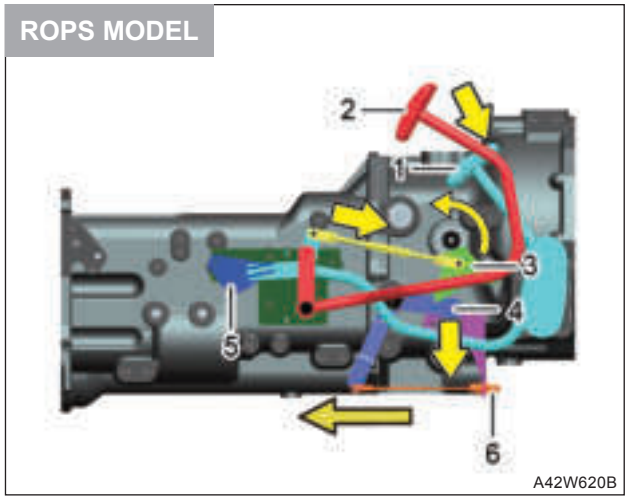


A42W619B

- Align the forward pedal (1) and reverse pedal (2).
- Maintaining the connecting joint (3) in the neutral state
- Detecting the neutral condition of the safe start neutral switch (4)
- Maintaining the idle state of the HST accelerator cable (5)

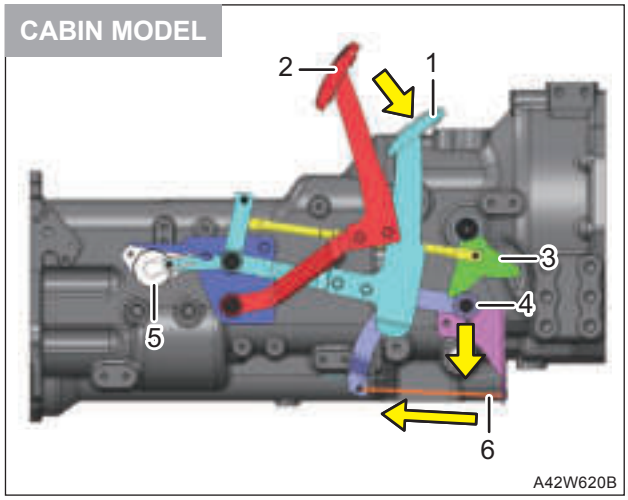
FORWARD DRIVING

ROPS MODEL



A42W620B

CABIN MODEL

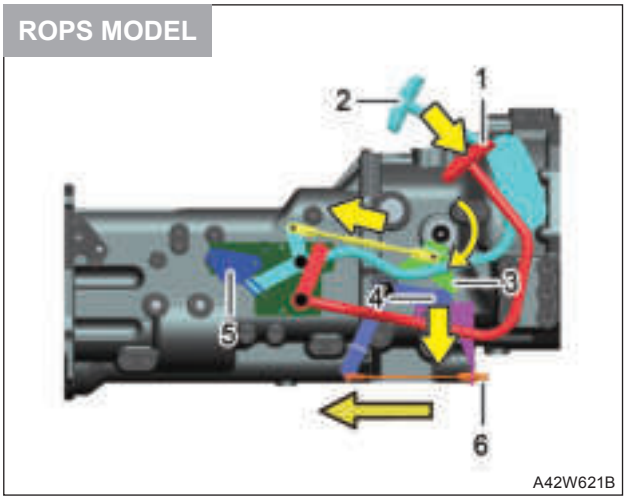


A42W620B

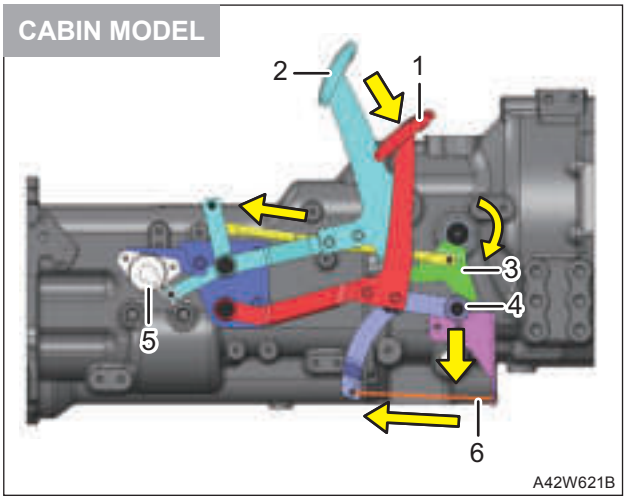
- Lowering the forward driving pedal (1) and lifting the reverse driving pedal (2)
- Turning the connecting joint (3) clockwise
  - Changing the angle of the HST swash plate (0 - +18˚)
- Turning and lowering the neutral control bracket (4) clockwise
- Detecting the forward condition of the safe start neutral switch (4)
- Pulling the HST accelerator cable (6) - Increase of the engine speed

REVERSE DRIVING

ROPS MODEL

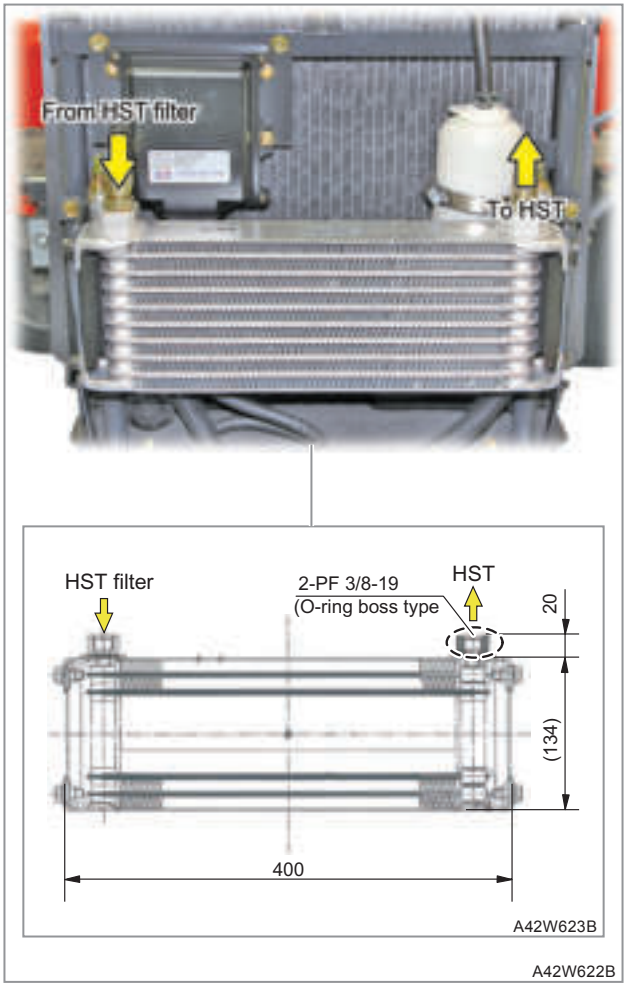


CABIN MODEL



- Lowering the reverse driving pedal (1) and lifting the forward driving pedal (2)
- Turning the connecting joint (3) counterclockwise - Changing the angle of the HST swash plate (0 - +18˚)
- Turning and lowering the neutral control bracket (4) clockwise
- Detecting the reverse condition of the safe start neutral switch (5)
- Pulling the HST accelerator cable (6) - Increase of the engine speed

4.12 OIL COOLER

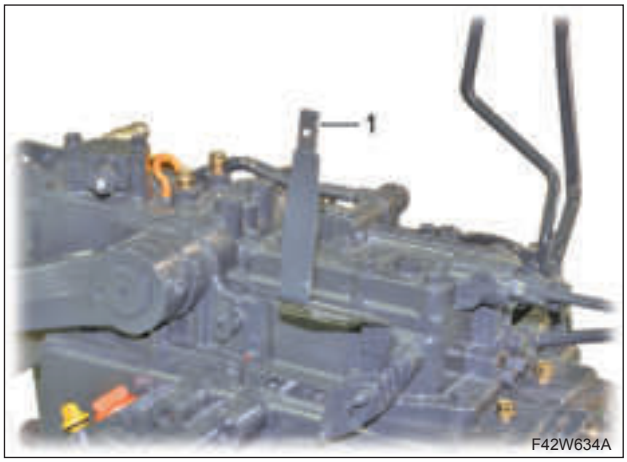


The oil cooler is installed to the face of the radiator in the engine compartment. Oil is heated while passing through the steering system and PTO valve. This hot oil flows through the oil cooler which lowers the oil temperature to a proper level enough for the HST operation.

SPECIFICATIONS

Temperature of oil-intake	90 °C
Heat rejection rate	Min 4,400 kcal/h
Core type	DRAWN CUP type

4.13 POSITION CONTROL

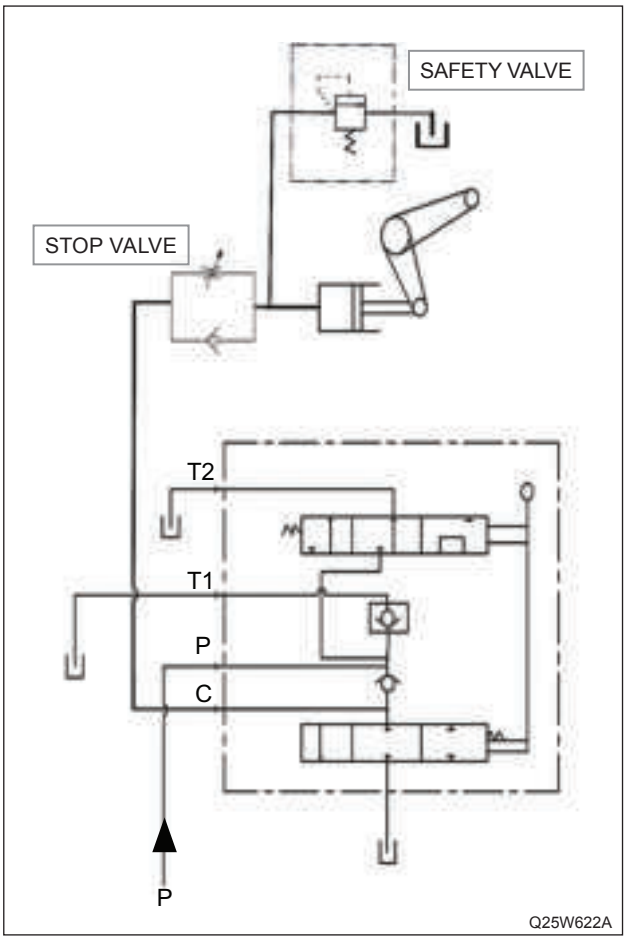


(1) Position control lever

The position control lever (1) is used to control the position of the 3-point hitch. The control valve and feedback link mechanism are used to lift and lower an implement.

The position of the implement can be set by the position control lever. When it is pushed forward, the lift arm is lowered. Pulling it lifts the lift arm.

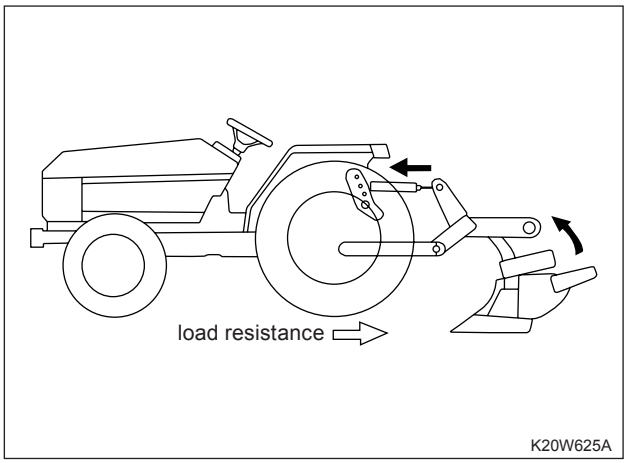
When the position control lever is moved, its link moves the control valve spool in the hydraulic cylinder case to the lifting or lowering position. As soon as the lever stops moving, the spool is returned to its neutral position to stop the 3-point hitch.

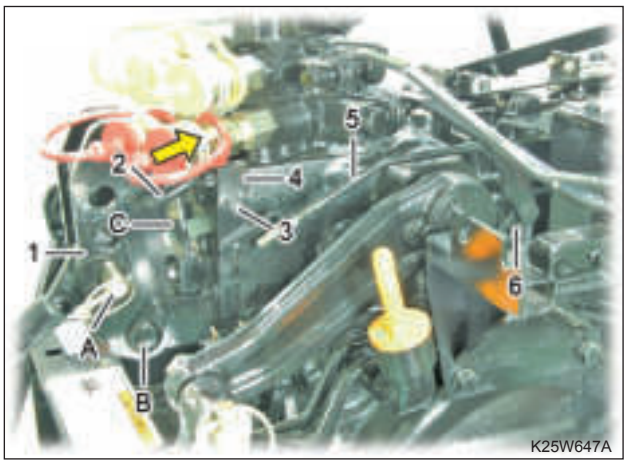


Oil from the pump pushes the piston through the control valve to lift the lift arm. When the lift arm is lowered by weight of the implement, oil in the piston is flown out through control valve and is returned to the transmission case.

The lowering speed of the implement can be adjusted with the stop valve on the front of the hydraulic cylinder case. Turning the stop valve counterclockwise increases the lowering speed while turning it clockwise decreases the lowering speed. When turning the valve clockwise, it is locked so the lift arm stops lowering.

4.14 DRAFT CONTROL





The draft control is a device that controls load by vertical movement of the lift arm (implement) against load resistance of an implement during draft work with an implement, such as a plow and cultivator.

When an implement is loaded, load is applied to the top link connection (A) through the top link.

When the top link connection is applied with load, it pushes the top link hinge at the point B. Then, the bracket (2) is pushed forward to push the connecting link DF (4). Therefore, the lower section of the link DF is pulled at the shaft (3) so the draft rod (5) connected to this lower section is pulled as well. As a result, the draft arm (6) connected to the draft rod is turned and the link in the hydraulic cylinder case is operated to operate the control valve. Finally, hydraulic oil pushes the piston in the hydraulic cylinder to lift the lift arm. Then, the implement is lifted to lessen applied load.

When draft load is lowered, the implement is lowered by its weight and oil in the cylinder is pushed out by the piston.

To perform draft control, remove the connecting plate (C). Make sure to install it after work.

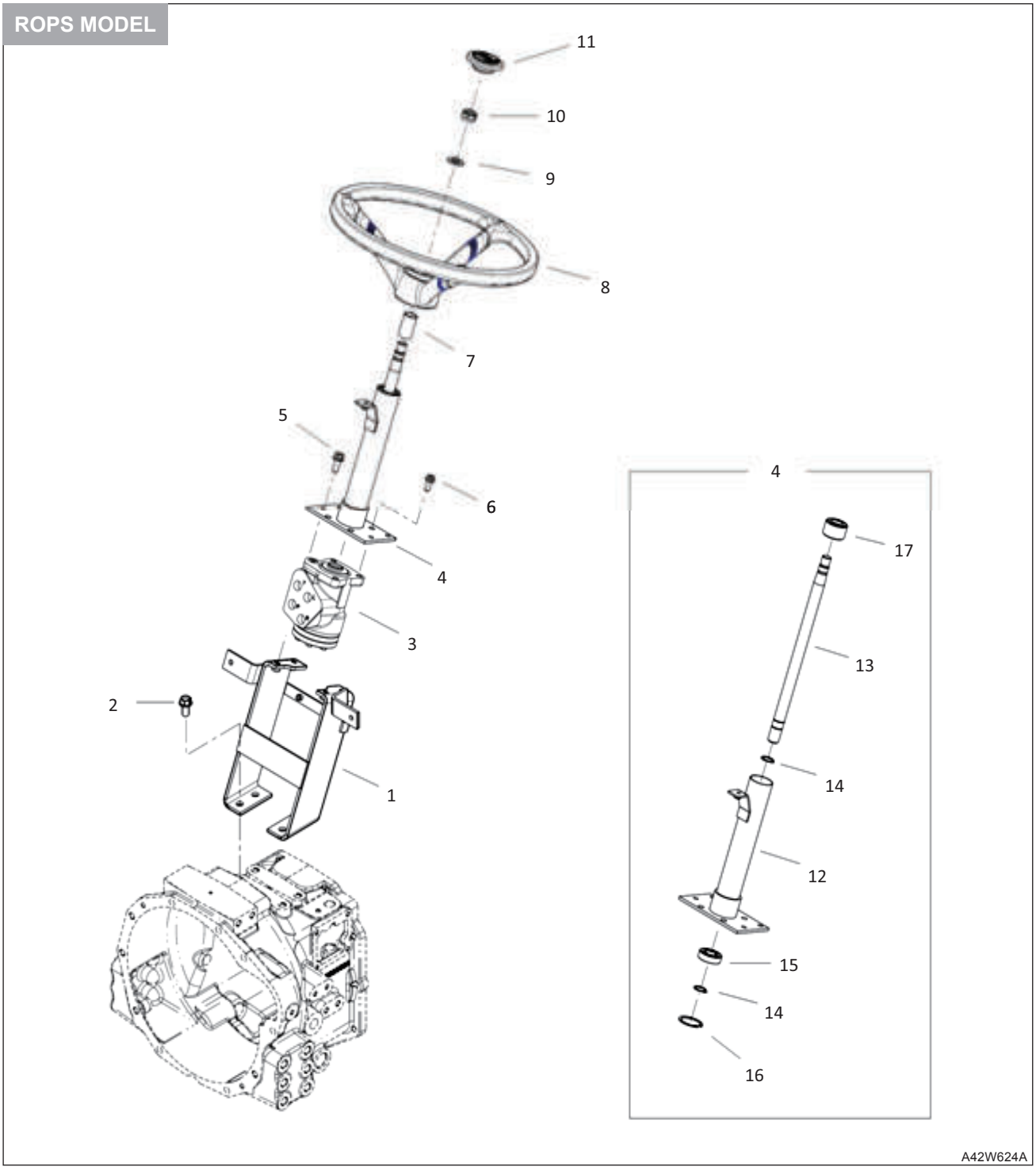
5. TROUBLESHOOTING

PROBLEMS	CAUSE OR SYMPTOM	SOLUTION
The 3-point hitch cannot be lifted.	• Improperly installed control valve	• Remove and re-install it.
	• Damaged control valve	• Replace it with a new one.
	• Foreign material stuck in control valve or spool stuck	• Remove, clean and repair it.
	• Insufficient transmission fluid	• Add transmission fluid.
	• Clogged oil filter	• Clean or replace it.
	• Damaged hydraulic pump	• Repair or replace it.
	• Damaged cylinder piston ring of hydraulic cylinder case	• Check the backup ring and O-ring and replace it as necessary.
The 3-point hitch cannot be lowered.	• Damaged stop valve	• Check and repair the stop valve.
	• Foreign material stuck in control valve	• Remove and clean the control valve.
Impossible to drive forward or backward	• Damaged power train	• Check and adjust the power train
	• Clogged HST internal circuit	• Check the check valve, relief valve, etc. and clean them accordingly.
	• Incorrectly set neutral position of HST pedal	• Set the HST neutral range correctly
	• Insufficient hydraulic oil amount	• Add oil
	• Clogged HST filter	• Clean or replace
	• Faulty HST	• Replace the HST
Excessively heated oil	• Insufficient oil in transmission	• Add oil
	• Low setting pressure of relief valve	• Set the setting pressure properly or replace the relief valve
	• Low discharge pressure of gear pump	• Check and repair the pipe • Clean the filter • Clean or replace the valve seat
	• Clogged oil cooler	• Clean
Impossible to stop with lever in HST pedal neutral position	• Incorrectly set neutral position of HST	• Adjust the neutral position correctly
	• Faulty neutral valve	• Clean and remove foreign materials

6. SECTIONAL VIEW FOR MAJOR COMPONENTS

6.1 STEERING COLUMN

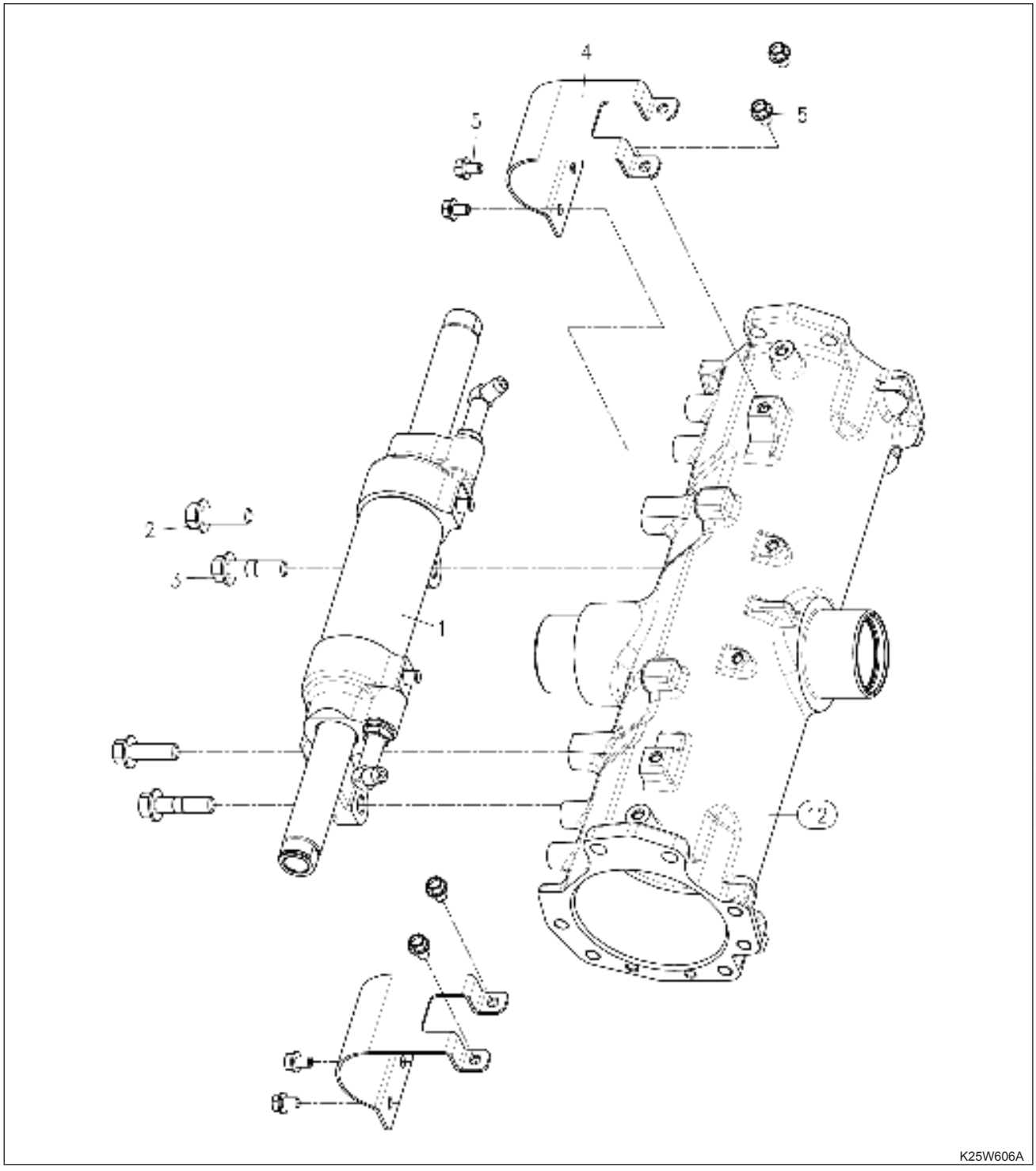
ROPS MODEL



COMPONENTS

(1) Support, steering
(2) Hex flange bolt
(3) PST valve ass'y
(4) Column, steering
(5) Hex flange bolt
(6) Hex flange bolt
(7) Cover(shaft)
(8) Steering wheel ass'y
(9) Plain washer
(10) U-nut
(11) Steering cap
(12) Pipe ass'y, steering
(13) Shaft, steering
(14) Snap ring
(15) Ball bearing
(16) Snap ring
(17) Column bush

6.2 P.S.T CYLINDER

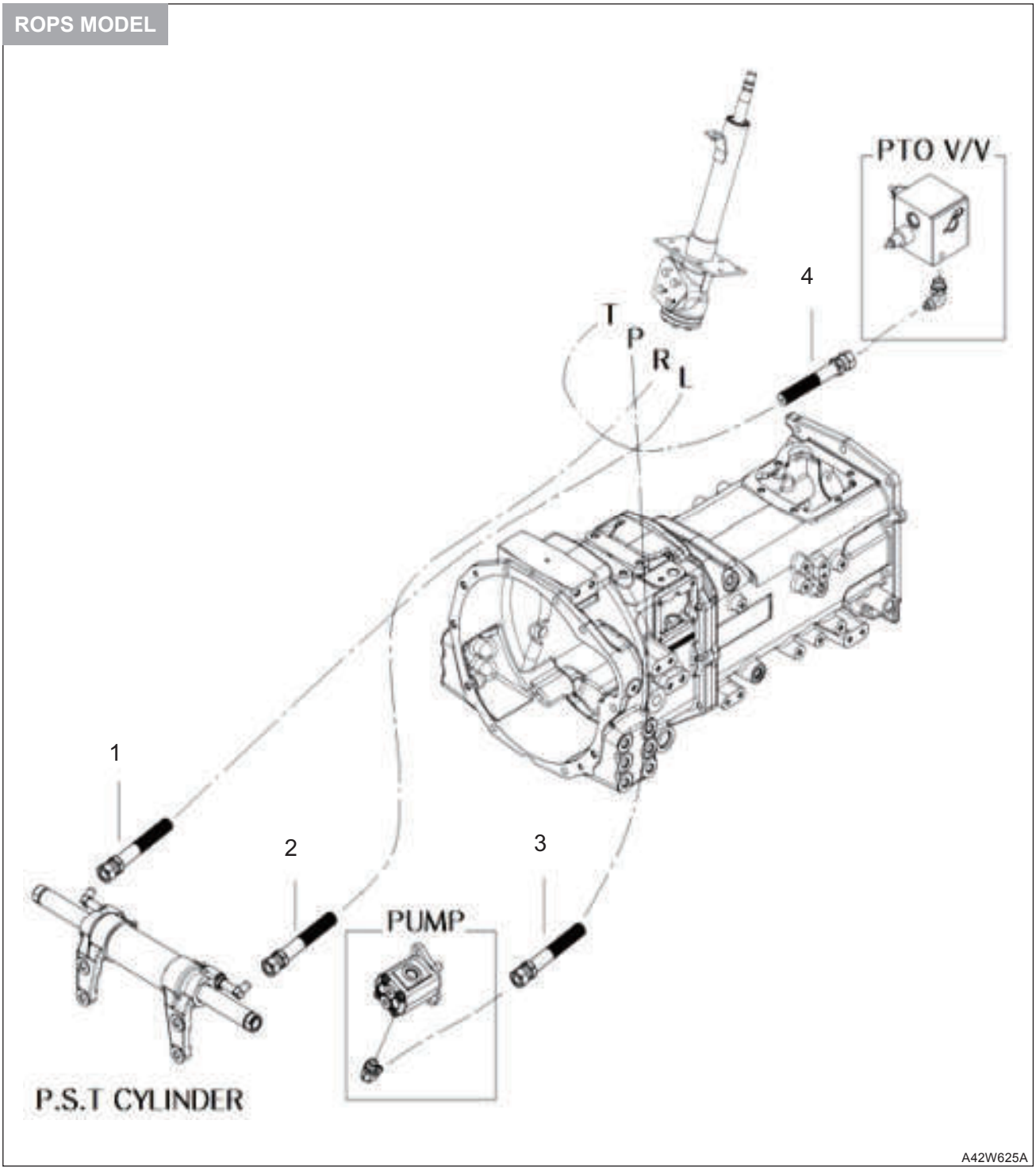


COMPONENTS

(1) P.S.T cylinder ass'y
(2) Hex flange bolt
(3) Hex flange bolt
(4) Cover, P.S.T cylinder
(5) Hex flange bolt

6.3 P.S.T PIPE

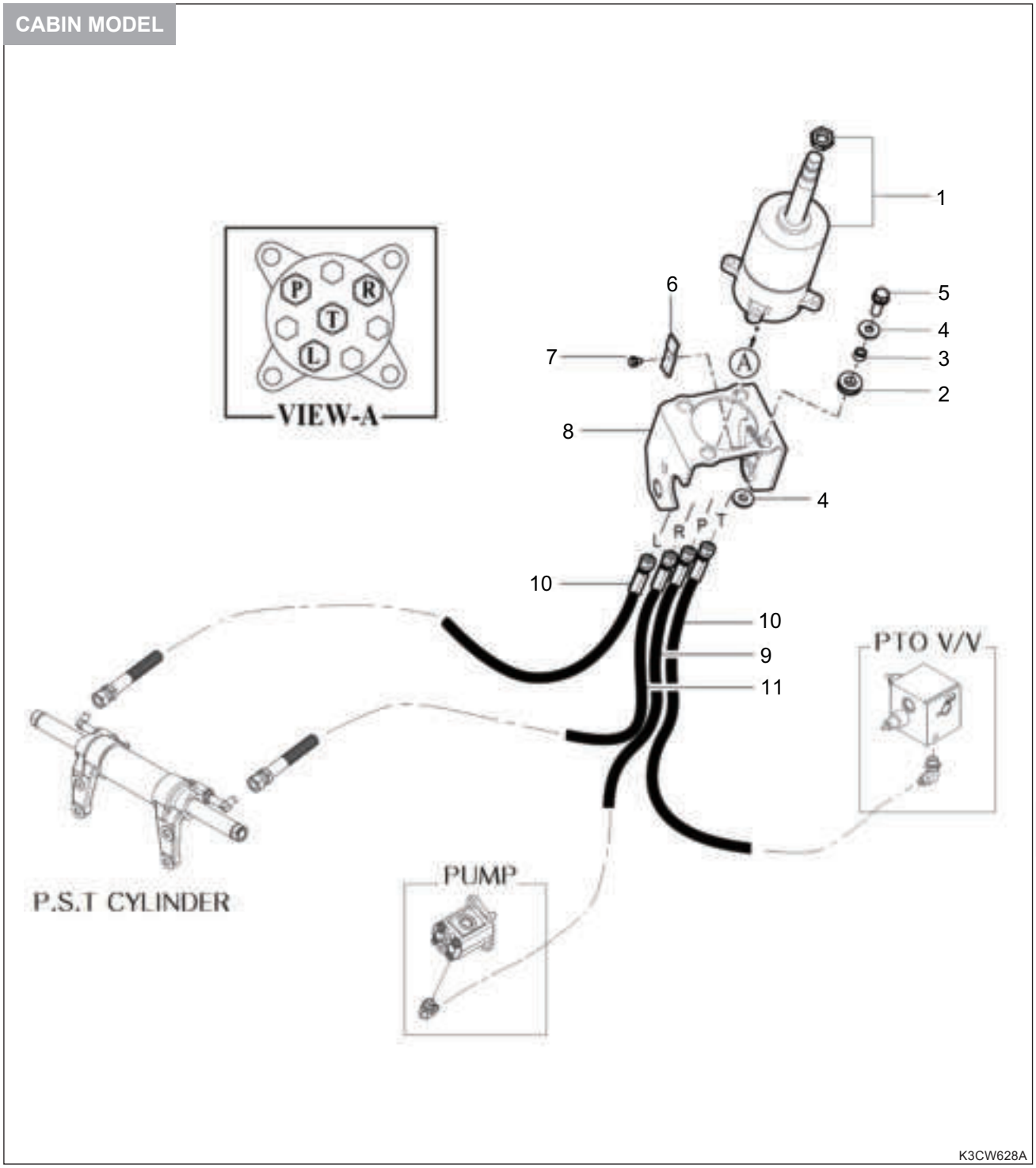
ROPS MODEL



COMPONENTS

(1) Hose
(2) Hose
(3) Hose
(4) Hose

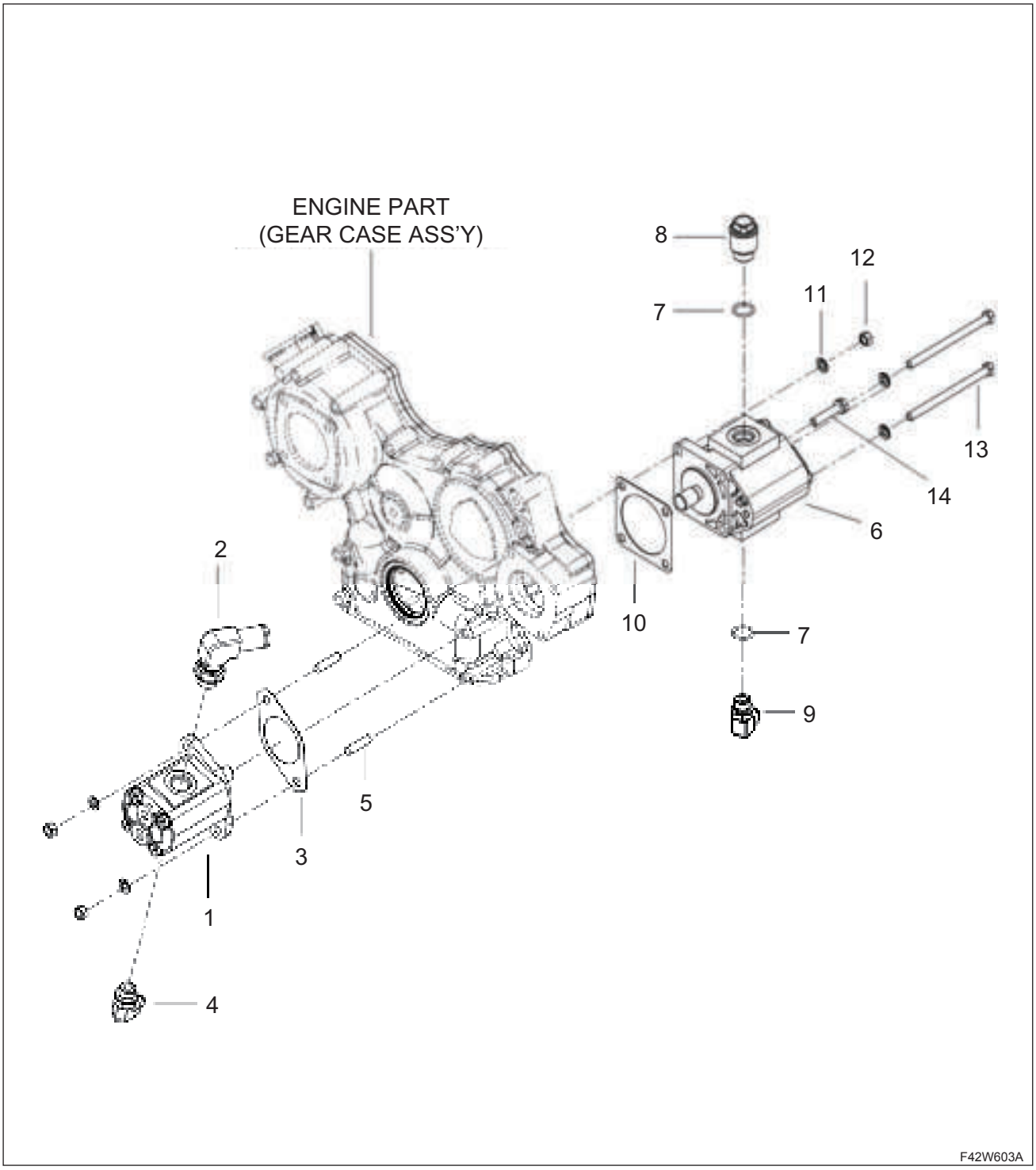
CABIN MODEL



COMPONENTS

(1) Valve unit,steering
(2) Grommet
(3) Collar (08x12x7.3)
(4) Washer (9x22x2)
(5) Washer ass'y hex bolt
(6) Plate, guide
(7) Washer ass'y hex bolt
(8) Bracket comp, steering
(9) Hose ass'y (P)
(10) Hose ass'y (L, R, P)
(11) Hose ass'y (R)

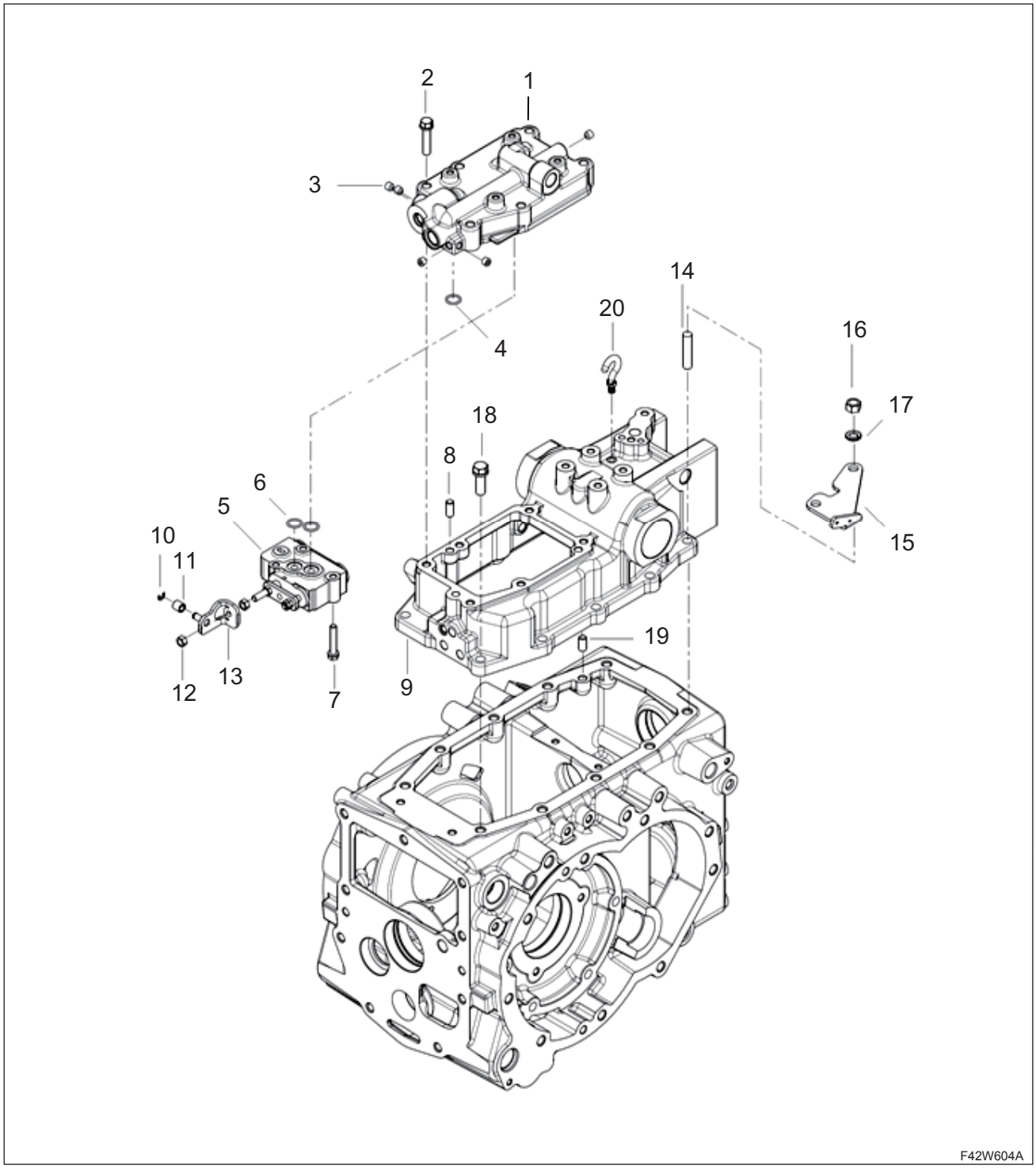
6.4 HYD PUMP



COMPONENTS

(1) Hyd pump
(2) Elbow
(3) Packing
(4) Elbow
(5) Stud bolt
(6) Hyd pump
(7) O-ring
(8) Joint
(9) Elbow
(10) Packing
(11) Spring washer
(12) Hex nut
(13) Hex bolt
(14) Bolt w/washer

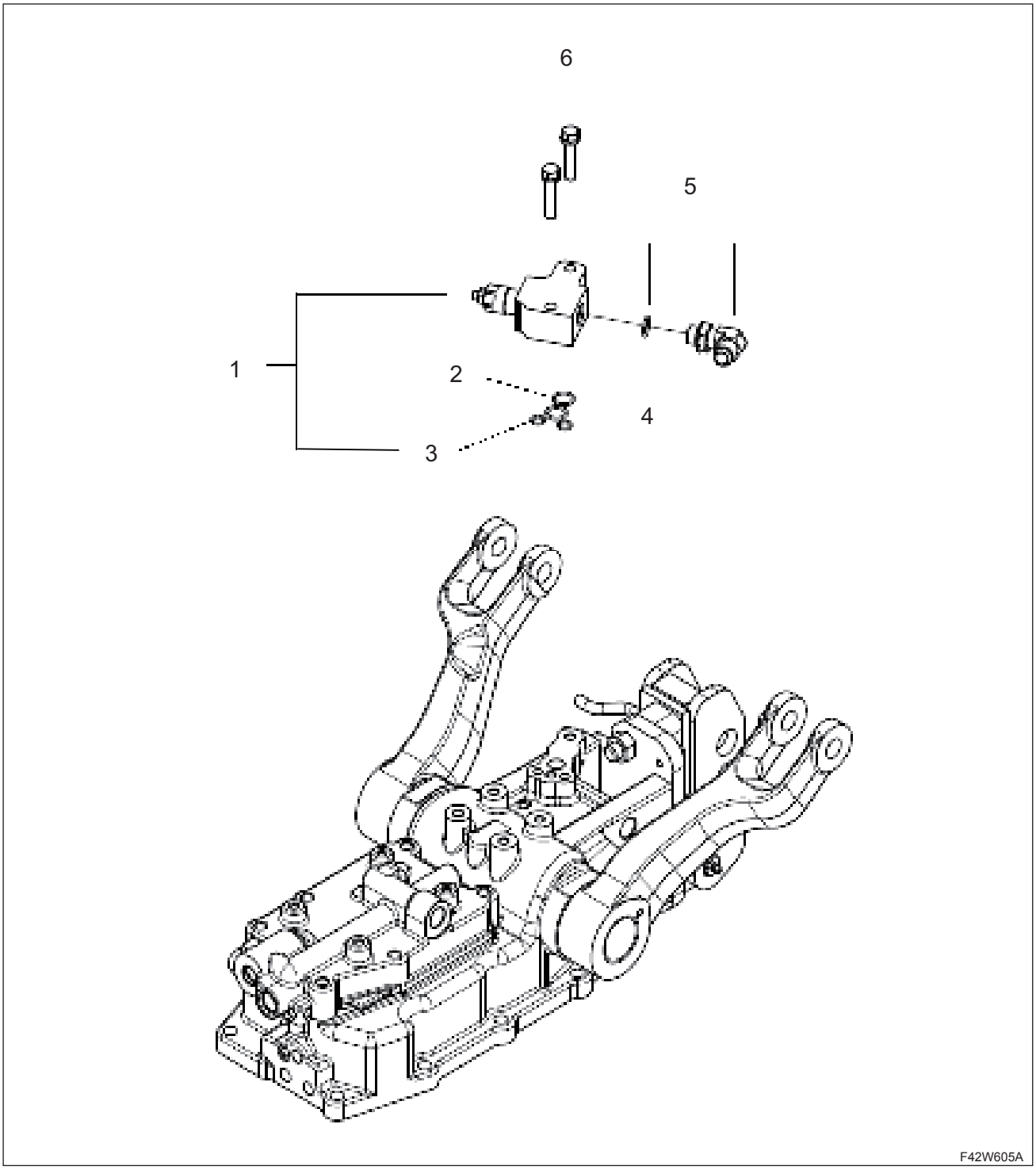
6.5 CASE, HYD CYLINDER



COMPONENTS

(2) Bolt w/washer
(3) Plug
(4) O-ring
(5) Control, valve ass'y
(6) O-ring
(7) Bolt w/washer
(8) Pin
(9) Case, hyd cylinder
(10) Snap ring
(11) Roller
(12) Hex nut
(13) Clevis ass'y
(14) Stud bolt
(15) Bracket, switch
(16) Spring washer
(17) Hex nut
(18) Bolt w/washer
(19) Pin
(20) Air breather

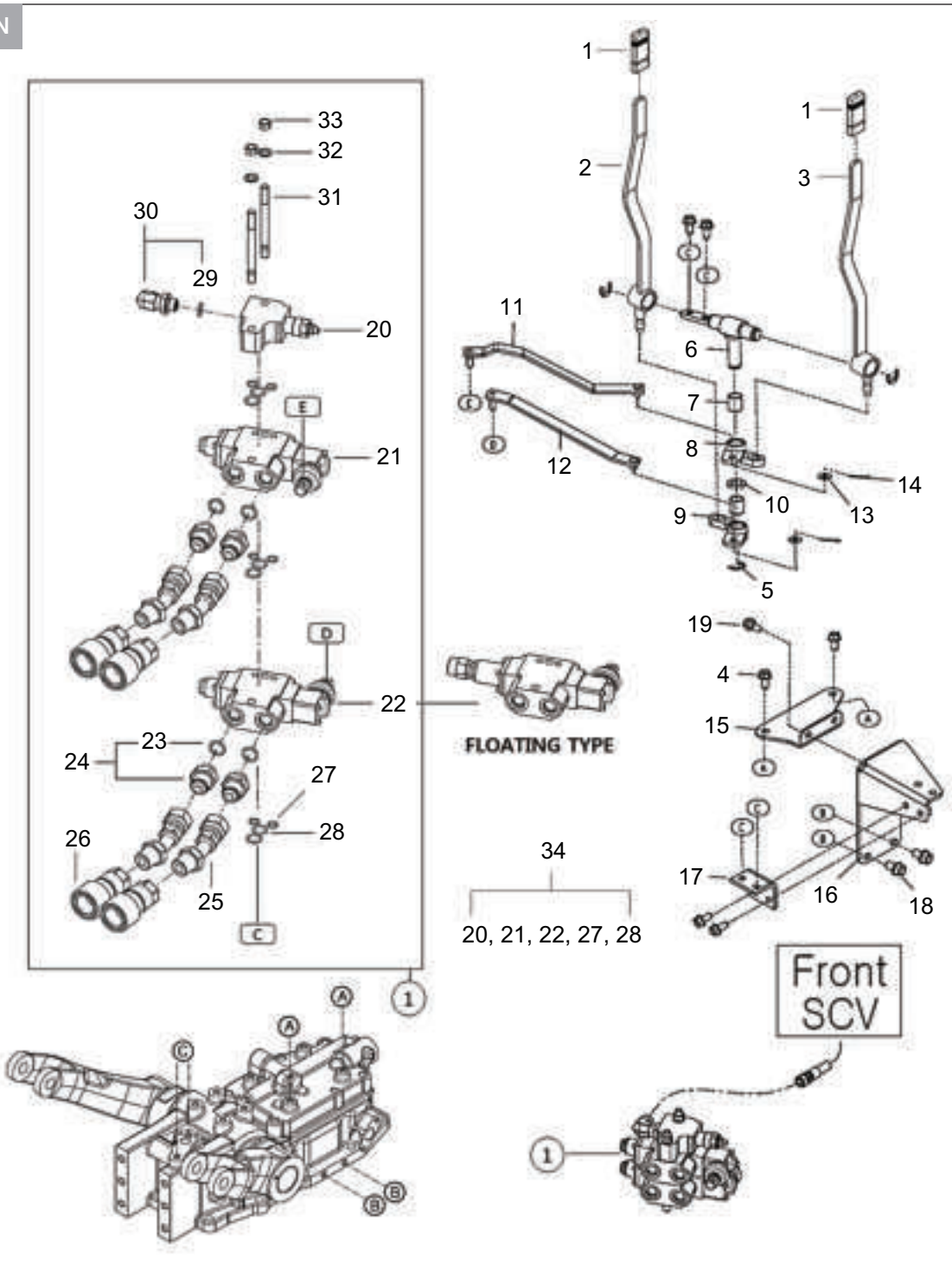
6.6 RELIEF VALVE



COMPONENTS

(1) Valve, relief
(2) O-ring
(3) O-ring
(4) O-ring
(5) Elbow
(6) Washer ass'y hex bolt

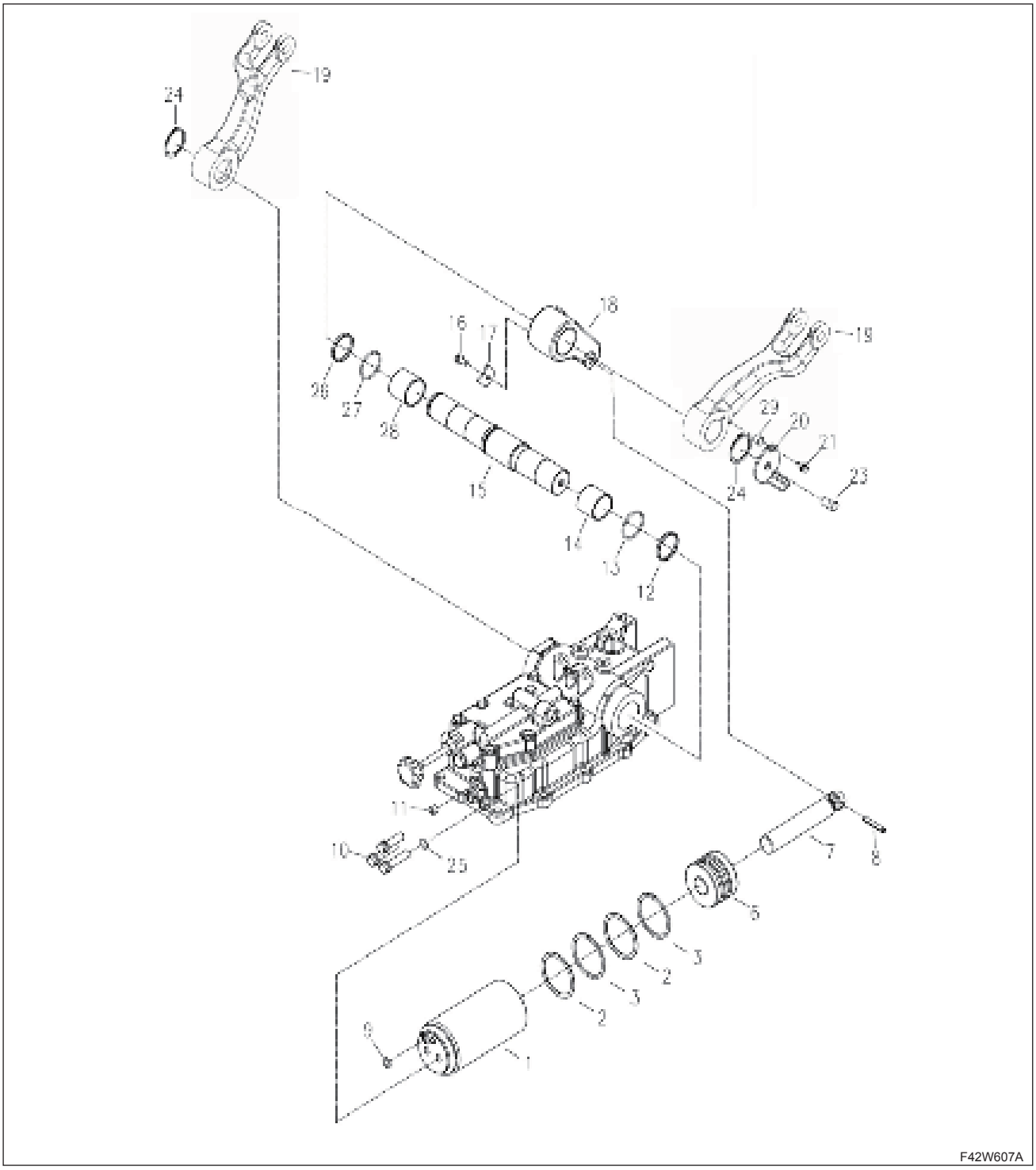
OPTION



COMPONENTS

(1) Knob
(2) Lever A ass'y
(3) Lever B ass'y
(4) Hex flange bolt
(5) Snap ring (E)
(6) Shaft ass'y
(7) Bush
(8) Boss A ass'y
(9) Boss B ass'y
(10) Plate
(11) Link (2) ass'y
(12) Link (1) ass'y
(13) Plain washer
(14) Cotter pin
(15) Bracket ass'y
(16) Bracket, SCV lever
(17) Bracket
(18) Hex flange bolt
(19) Hex flange bolt
(20) Cover relief
(21) SCV PTO 2nd
(22) SCV PTO 3rd
(22) SCV (floating)
(23) O-ring
(24) Adaptor
(25) Pipe
(26) Joint arm (1/2)
(27) O-ring
(28) O-ring
(29) O-ring
(30) Elbow
(31) Stud bolt
(32) Spring washer
(33) Hex nut
(34) 4-Port ass'y

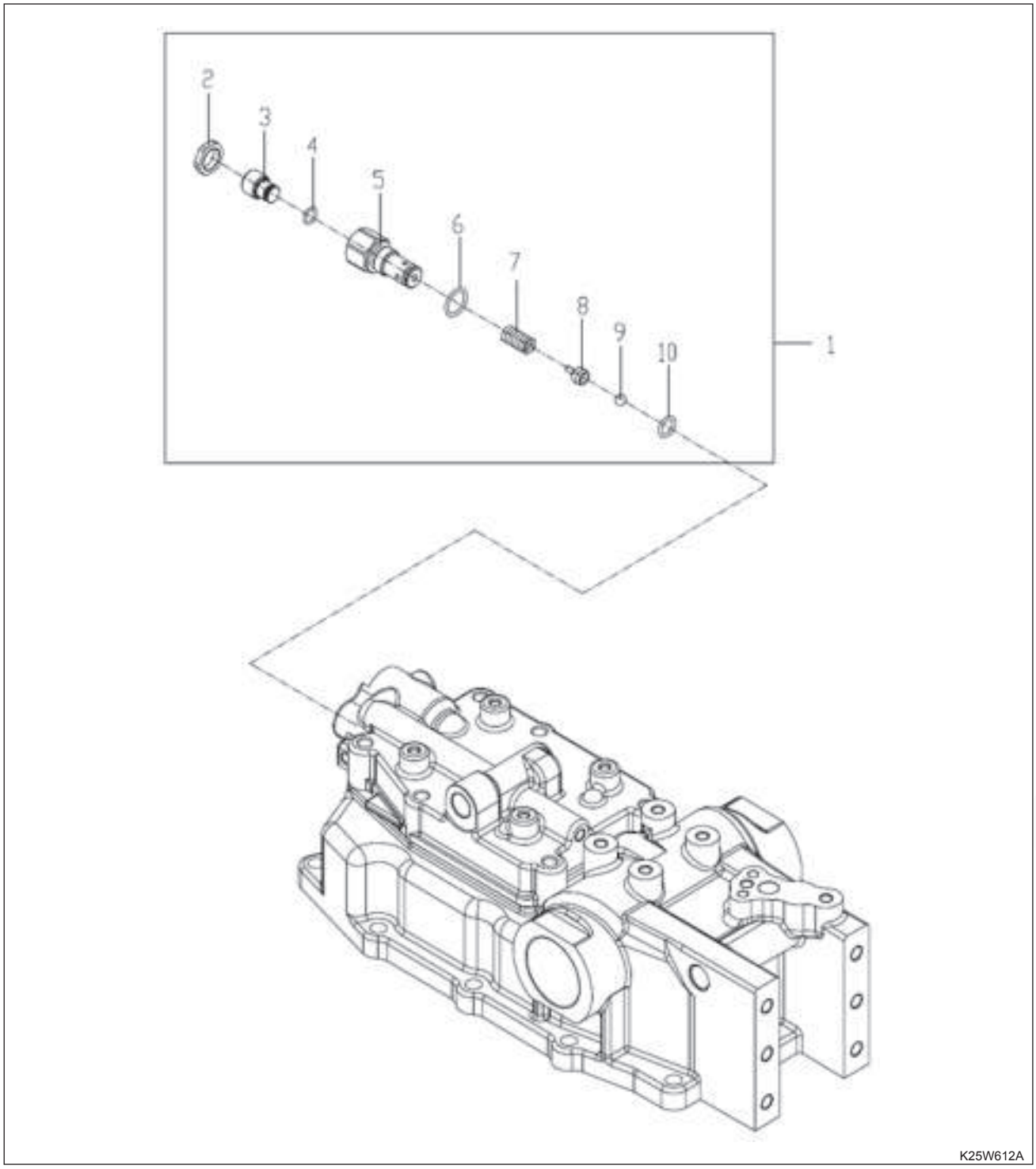
6.7 PISTON ASS'Y



COMPONENTS

(1) Piston ass'y
(2) O-ring
(3) Ring
(6) Piston
(7) Rod, piston
(8) Spring pin
(9) O-ring
(10) Hex bolt
(11) Plug
(12) Ring, backup
(13) O-ring
(14) Bush
(15) Shaft, lift link
(16) Hex flange bolt
(17) Plate
(18) Crank, lift
(19) Arm, lift
(20) Cam ass'y
(21) Hex flange bolt
(23) Hex flange bolt
(24) Snap ring(C-type)
(25) Bonded seal
(26) Ring, backup
(27) O-ring
(28) Bush
(29) Collar

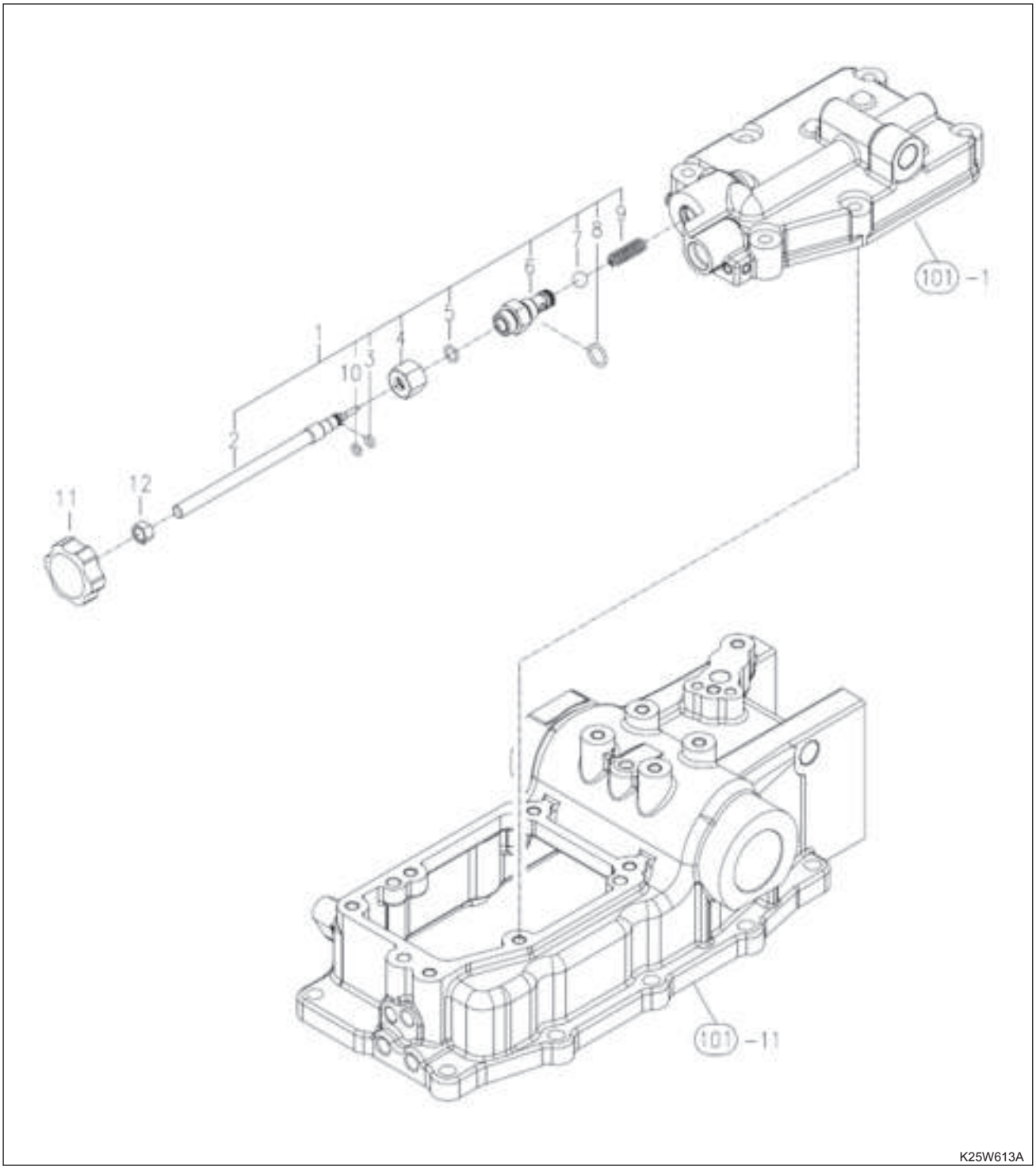
6.8 SAFETY VALVE



COMPONENTS

(1) Safety valve ass'y
(2) Nut
(3) Bolt
(4) O-ring
(5) Body, safety valve
(6) O-ring
(7) Spring
(8) Ball guide
(9) Steel ball
(10) O-ring

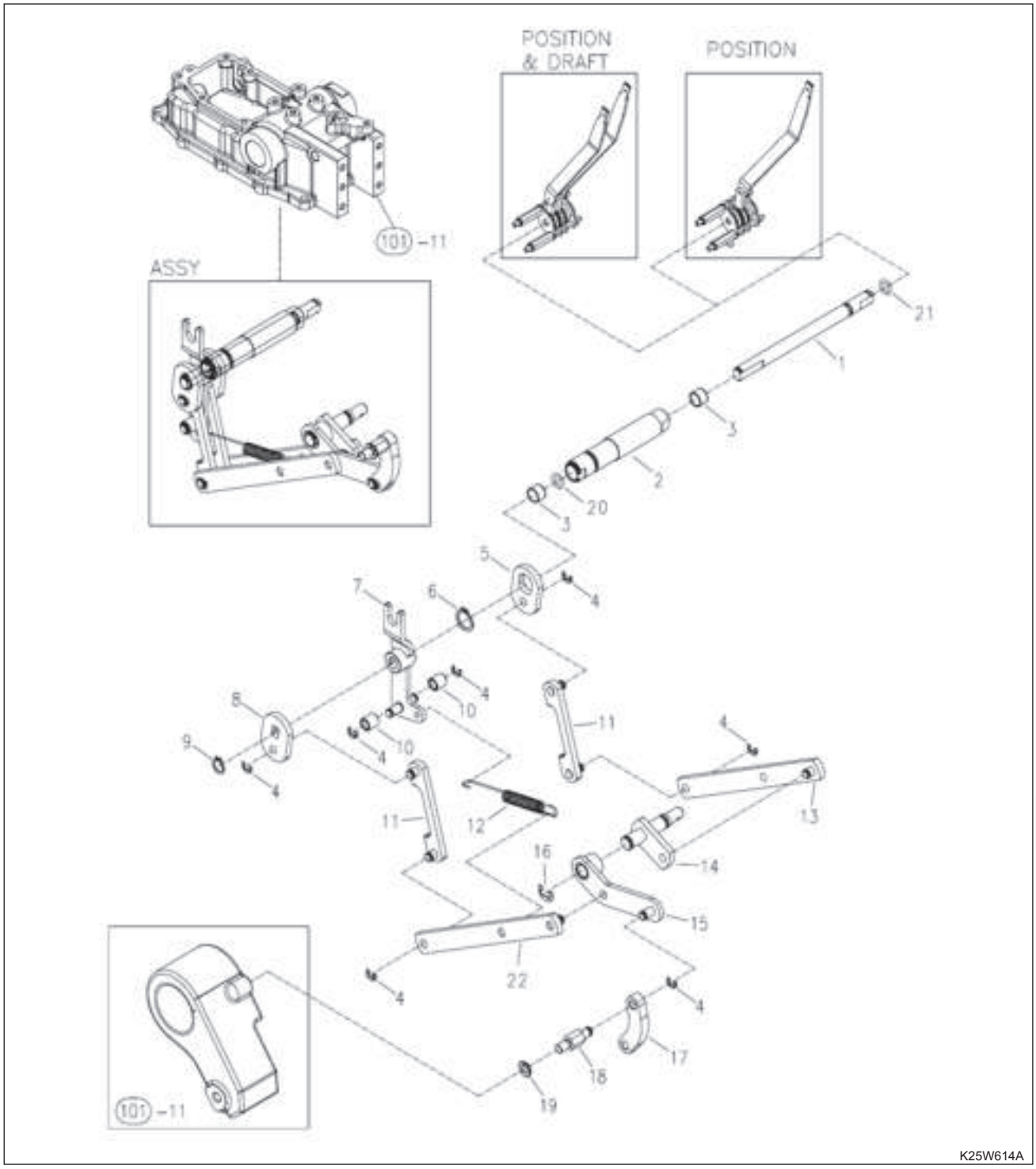
6.9 STOP VALVE



COMPONENTS

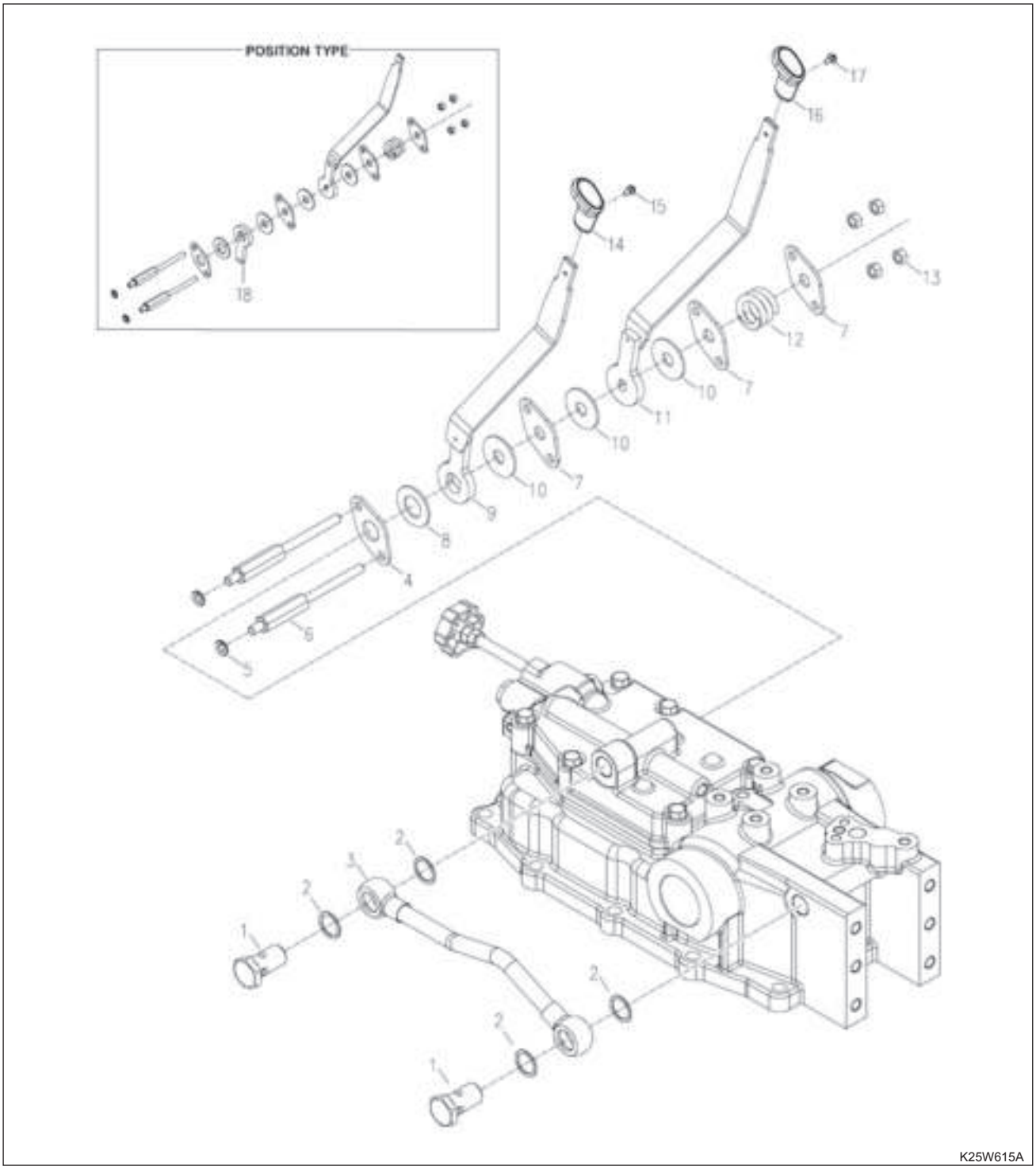
(1) Stop V/V
(2) Stop bolt
(3) O-ring
(4) Nut
(5) O-ring
(6) Body, stop V/V
(7) Steel ball
(8) O-ring
(9) Spring
(10) Ring, backup
(11) Knob
(12) Hex nut

6.10 HYD CONTROL POSITION TYPE



COMPONENTS

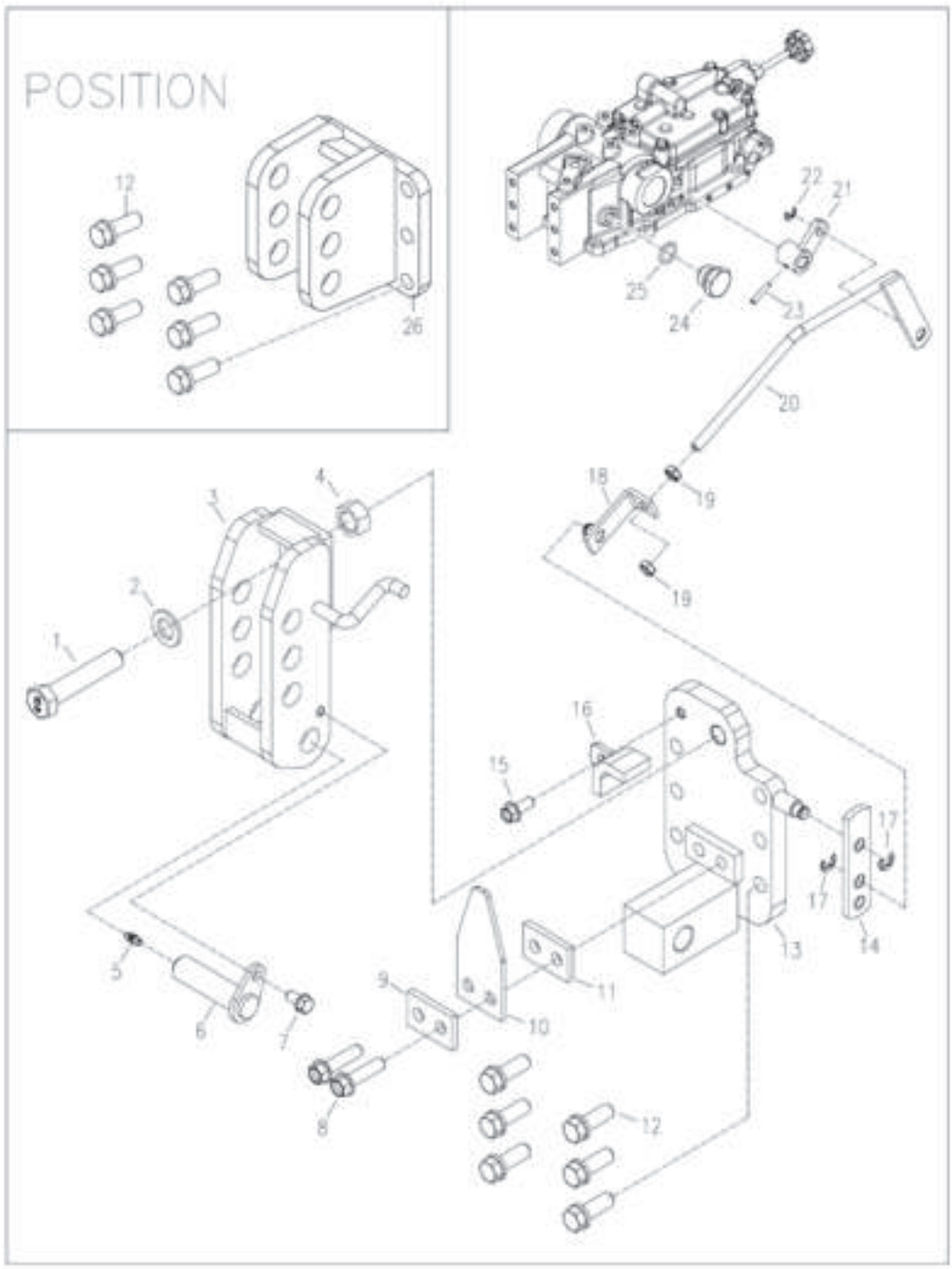
(1) Shaft,position lever
(2) D-control shaft
(3) Bush
(4) Snap ring(E)
(5) Plate
(6) Snap ring
(7) Link ass'y
(8) Plate
(9) Snap ring
(10) Roller
(11) Link B ass'y
(12) Spring
(13) Link
(14) Link ass'y(in)
(15) Link, feed back
(16) Snap ring(E)
(17) Link
(18) Pin, feed back
(19) Spring washer
(20) O-ring
(21) O-ring
(22) Link, position



COMPONENTS

(1) Connector
(2) Bonded seal
(3) Bracket
(4) Bracket
(6) Bolt
(7) Bracket A
(8) Plate, friction
(9) Lever, D-control
(10) Plate A
(11) Lever, P-control
(12) Spring
(13) Hex nut
(14) Knob ass'y, draft control
(15) Screw
(16) Knob ass'y, position control
(17) Screw
(18) Arm,lever

6.11 DRAFT CONTROL



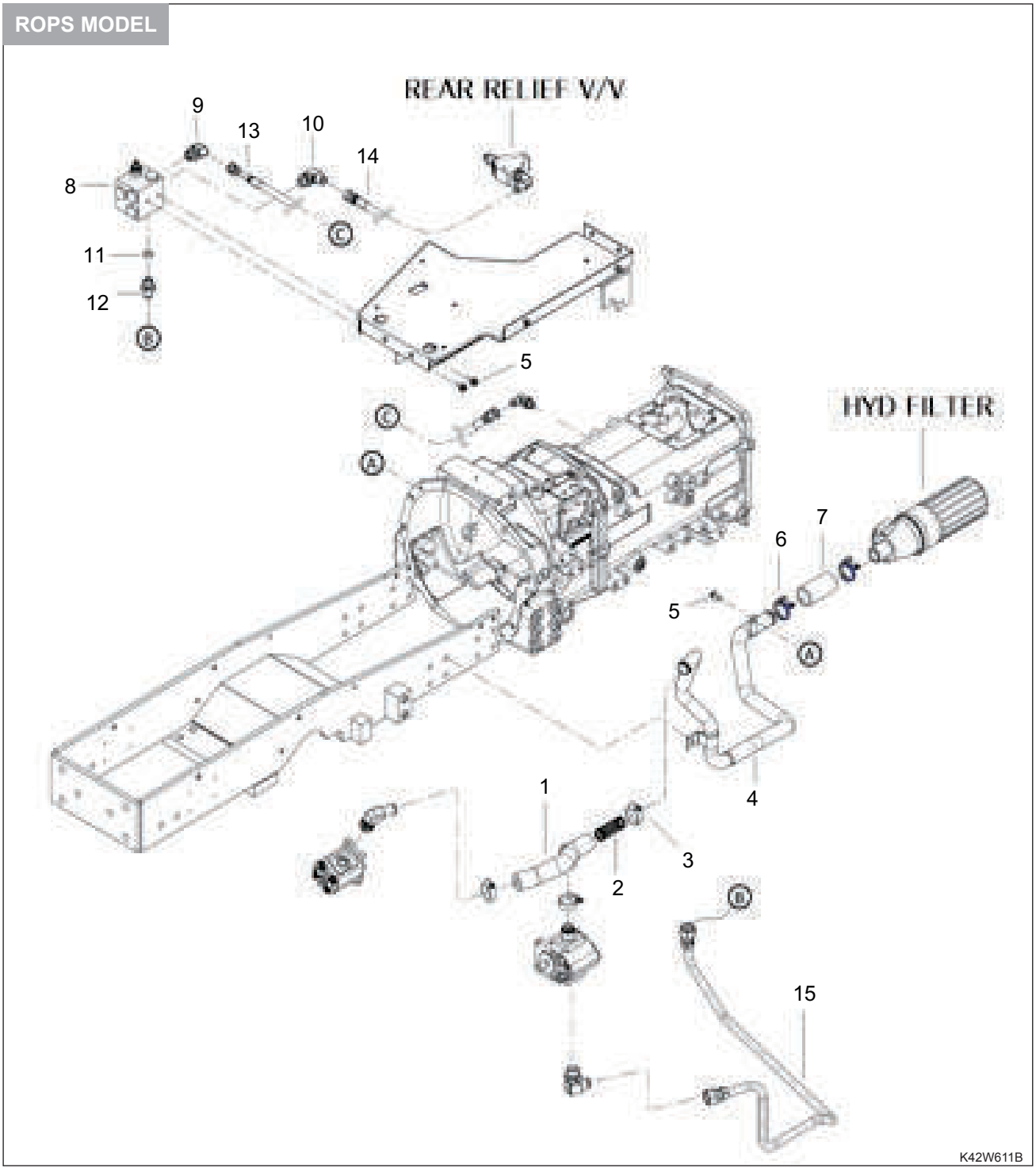
K25W616A

COMPONENTS

(1) Hex bolt
(2) Washer
(3) Hinge D, top link
(4) Hex nut
(5) Nipple
(6) Pin, hinge
(7) Bolt w/washer
(8) Hex flange bolt
(9) Plate
(10) Plate, hinge
(11) Plate
(12) Bolt w/washer
(13) Support D, hinge
(14) Plate
(15) Hex flange bolt
(16) Plate ass'y
(17) Snap ring(E)
(18) Plate ass'y
(19) Hex fix nut
(20) Rod
(21) Link ass'y(out)
(22) Snap ring(E)
(23) Spring pin
(24) Body
(25) O-ring
(26) Hinge, top link

6.12 HYD PIPING

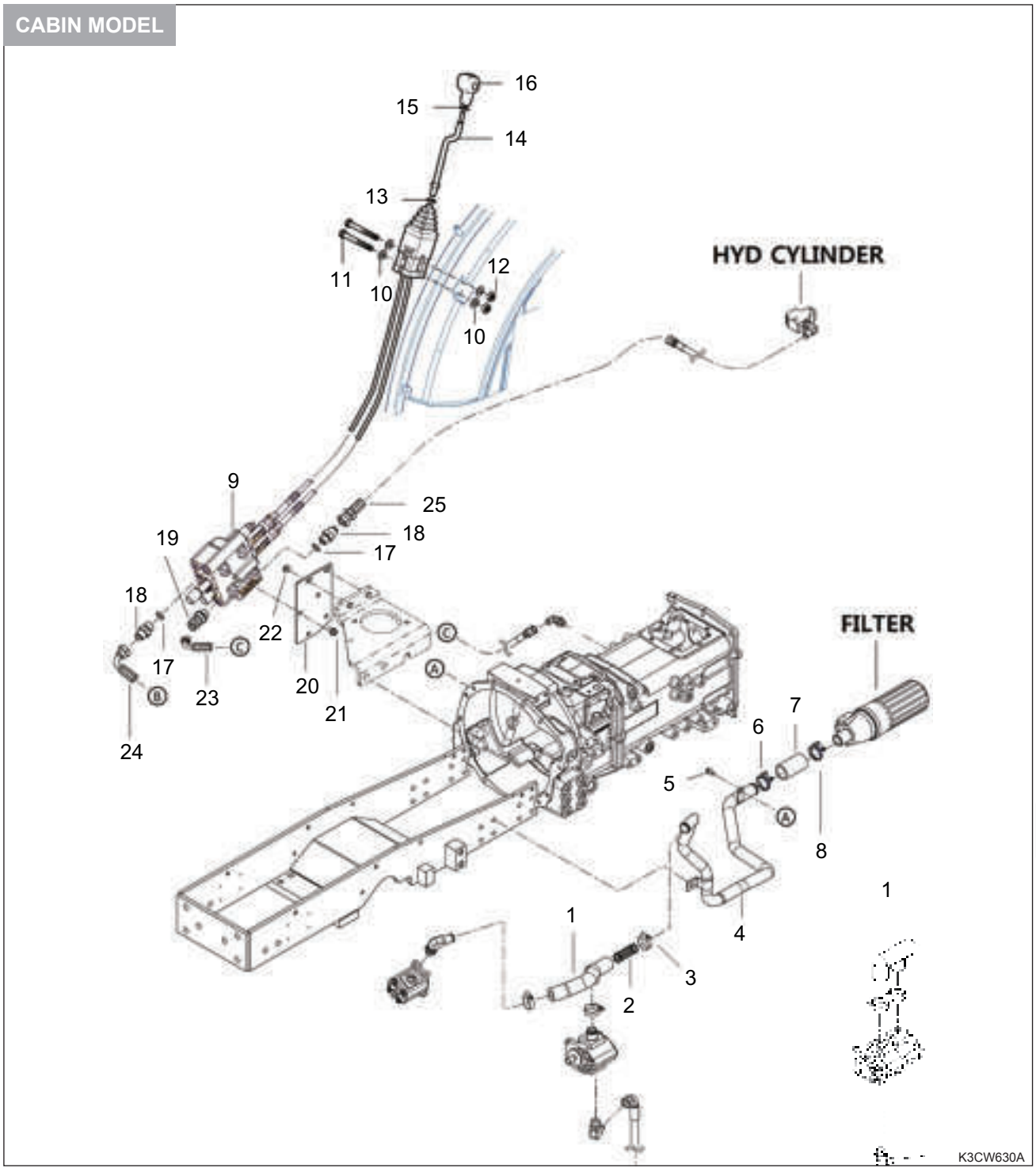
ROPS MODEL



COMPONENTS

(1) Rubber hose
(2) Spring A
(3) Hose clamp
(4) Pipe ass'y , lower pressure
(5) Hex flange bolt
(6) Hose band
(7) Lower pressure hose
(8) Front out valve
(9) Elbow
(10) Elbow
(11) O-ring
(12) Nipple
(13) Hose
(14) Higher hose
(15) Pipe ass'y , higher pressure

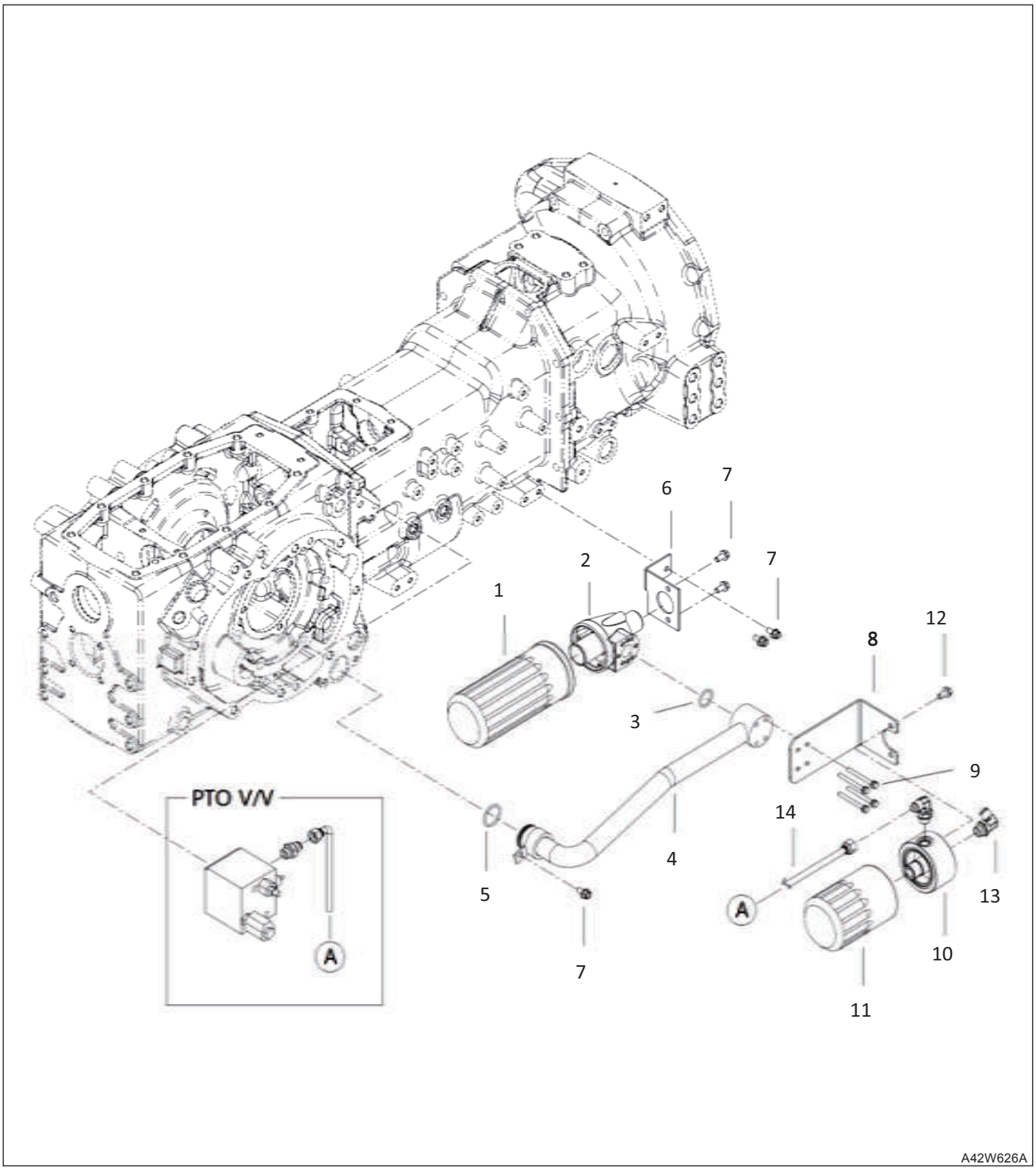
CABIN MODEL



COMPONENTS

(1) Rubber hose
(1) Pipe , lower pressure
(2) Spring A
(3) Hose clamp
(4) Pipe ass'y, lower pressure
(4) Pipe ass'y, lower pressure
(5) Hex flange bolt
(6) Hose band
(7) Lower pressure hose
(8) Hose band
(9) Loader valve ass'y
(10) Plain washer
(11) Bolt w/washer
(12) Hex nut
(13) Hex nut(fine)
(14) Lever comp, joystick
(15) Hex nut(fine)
(16) Grip comp, joystick
(17) O-ring
(18) Nipple
(19) Elbow
(20) Bracket, valve
(21) Hex flange bolt
(22) Hex flange nut
(23) Hyd hose
(24) Hyd hose
(24) Hyd hose
(25) Hyd hose

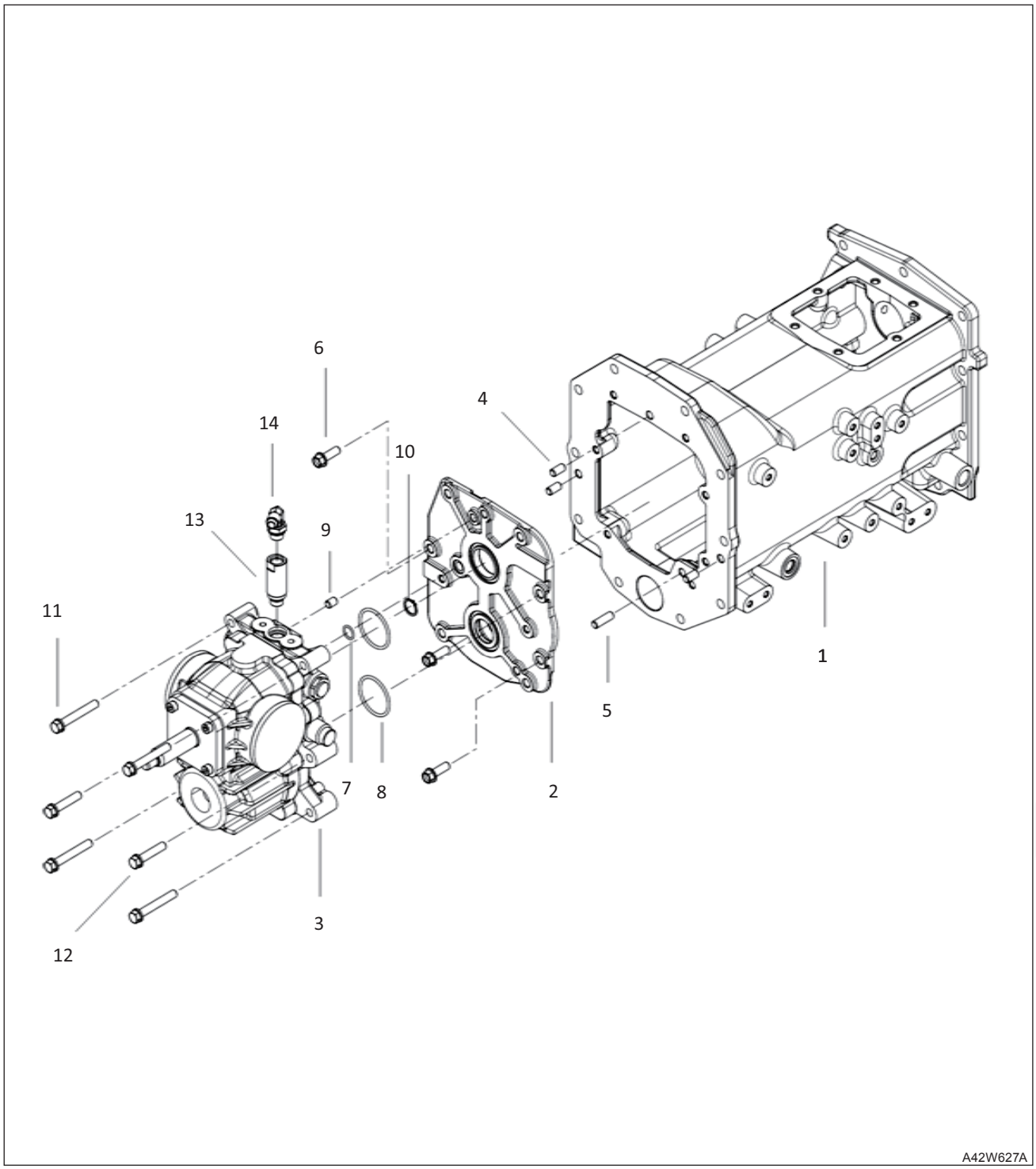
6.13 HYD FILTER



COMPONENTS

(1) Filter
(2) Filter cover
(3) O-ring
(4) Lower pressure pipe(filter)
(5) O-ring
(6) Filter cover bracket
(7) Hex flange bolt
(8) Bracket
(9) Bolt w/washer
(10) Filter cover
(11) Filter
(12) Hex flange bolt
(13) Elbow
(14) Hose

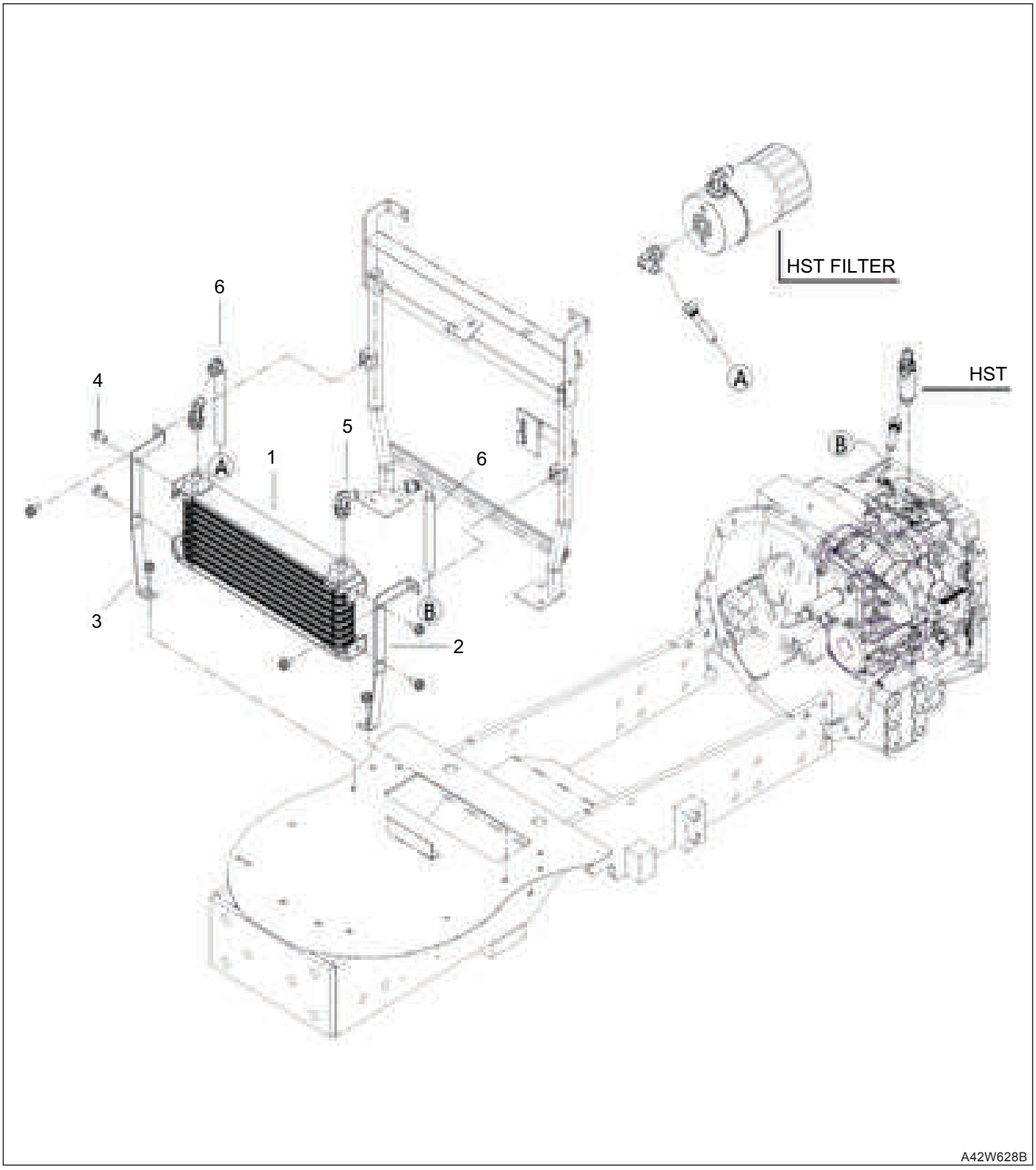
6.14 HST PUMP



COMPONENTS

(1) Transmission case
(2) Plate
(3) HST (28cc)
(4) Parallel pin
(5) Parallel pin
(6) Hex flange bolt
(7) O-ring
(8) O-ring
(9) Parallel pin
(10) Snap ring
(11) Hex bolt w/washer
(12) Hex bolt w/washer
(13) Adaptor(3/8)
(14) Elbow

6.15 OIL COOLER



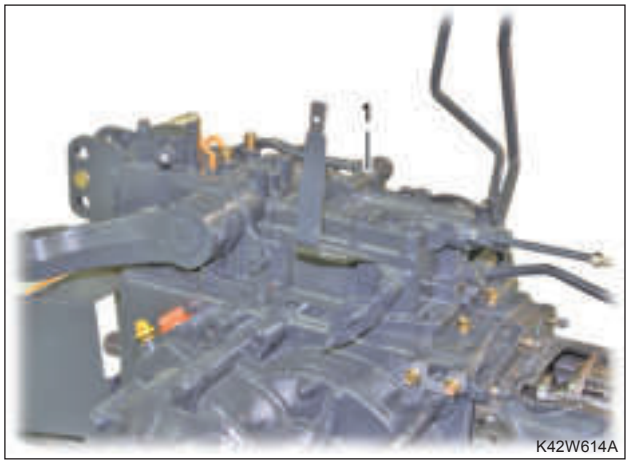
COMPONENTS

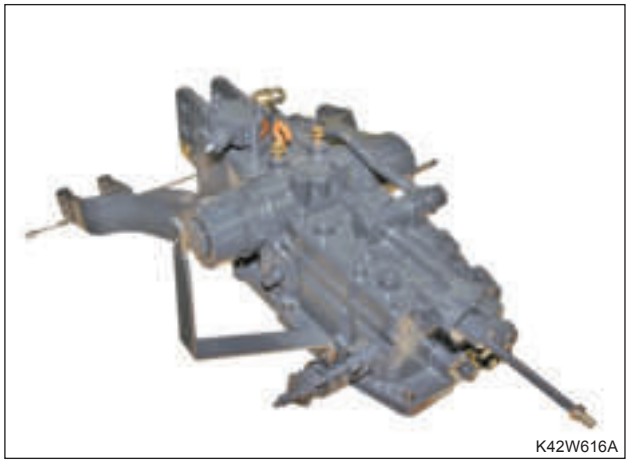
(1) Oil cooler
(2) Bracket, oil cooler(l)
(3) Bracket, oil cooler®
(4) Hex flange bolt
(5) Elbow
(6) Hose

7. DISASSEMBLY AND SERVICE

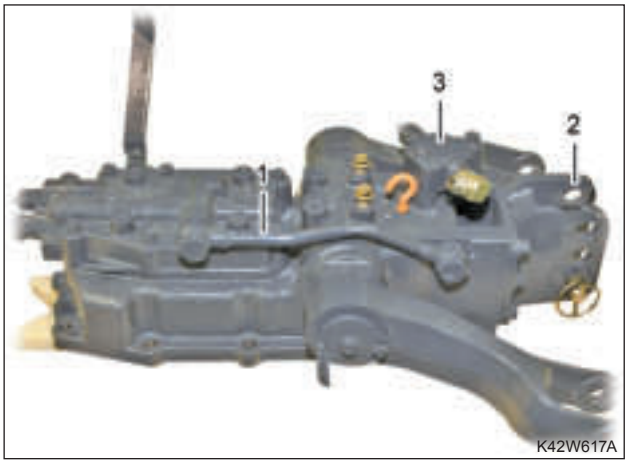
7.1 HYDRAULIC CYLINDER CASE ASSEMBLY DISASSEMBLY AND ASSEMBLY

1. Remove the fender and plate of under the seat.

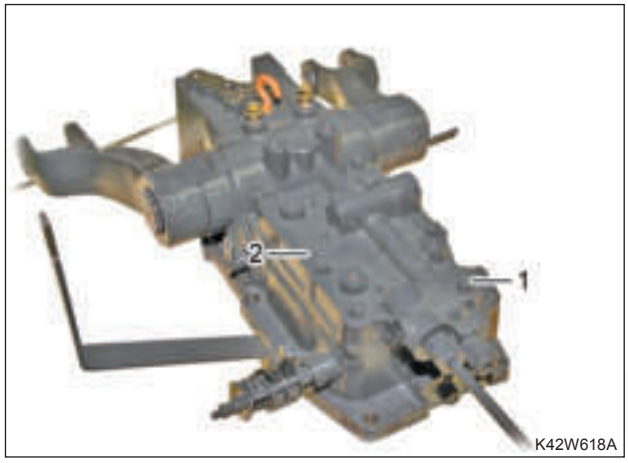


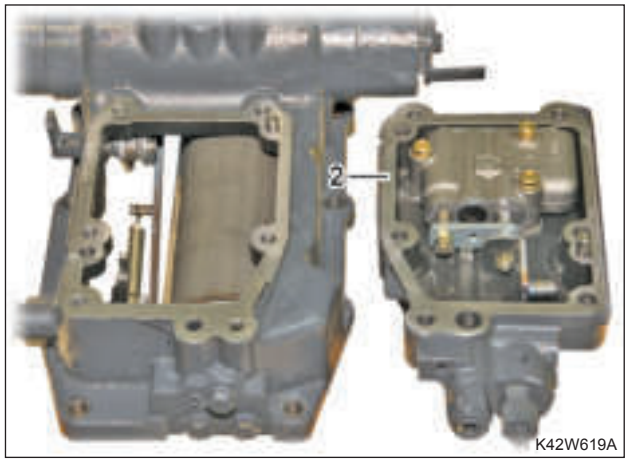


2. Remove the hydraulic cylinder case assembly (1).

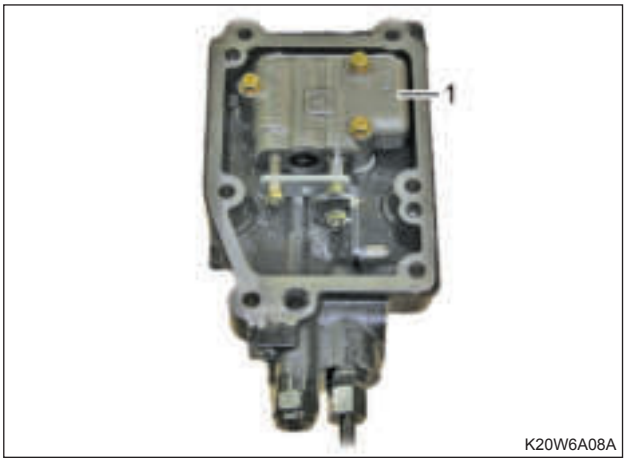


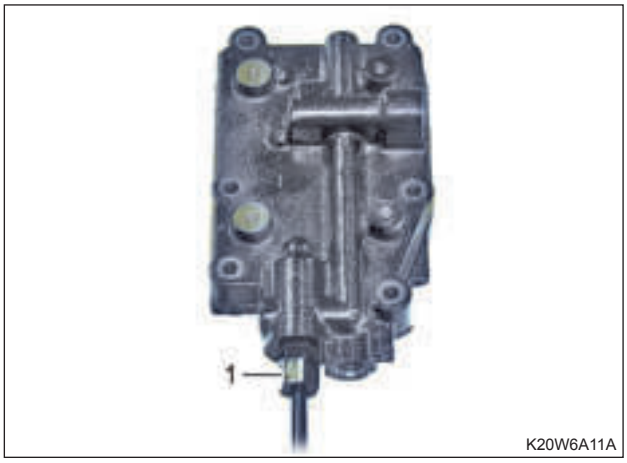
3. Disconnect the hydraulic pipe (1) and remove the top link bracket assembly (2) and rear relief valve (3).

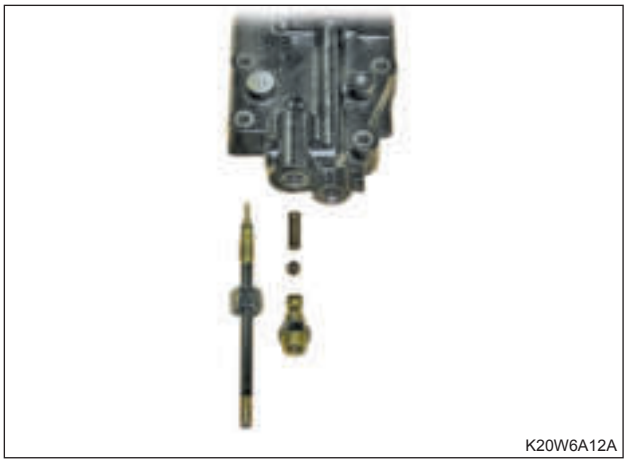




4. Unscrew the hydraulic cylinder cover mounting bolts (1) to remove the hydraulic cylinder cover (2).

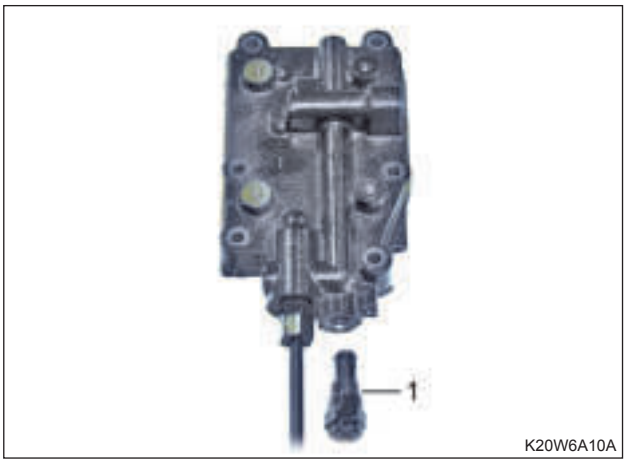




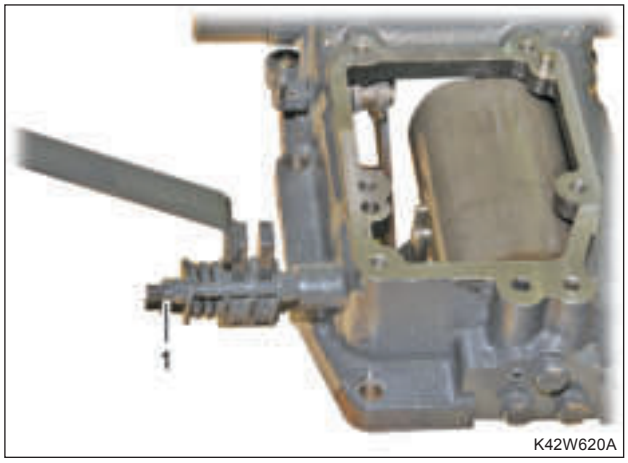


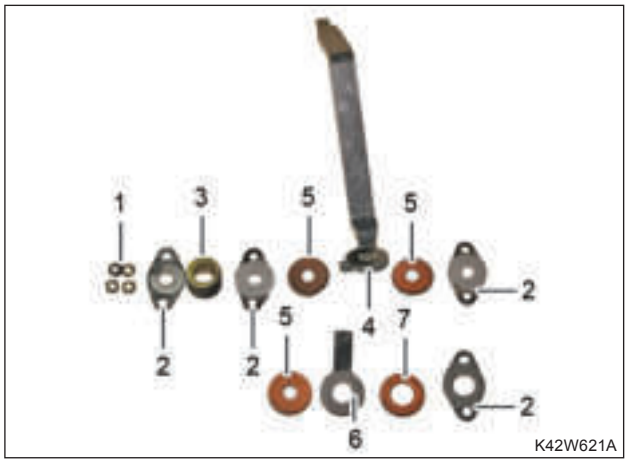
5. Remove the control valve (1) from the hydraulic cylinder cover.

7. Remove the lowering speed control valve assembly (1).

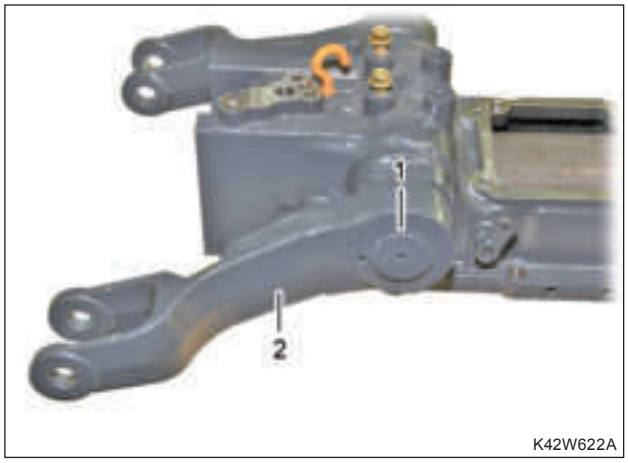


6. Remove the safety valve (1) from the hydraulic cylinder cover.

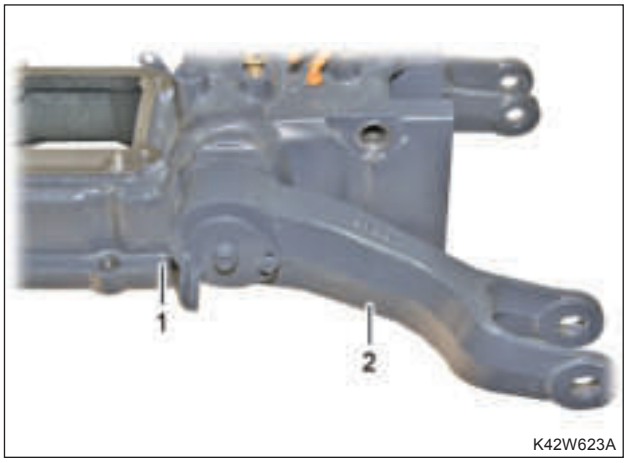


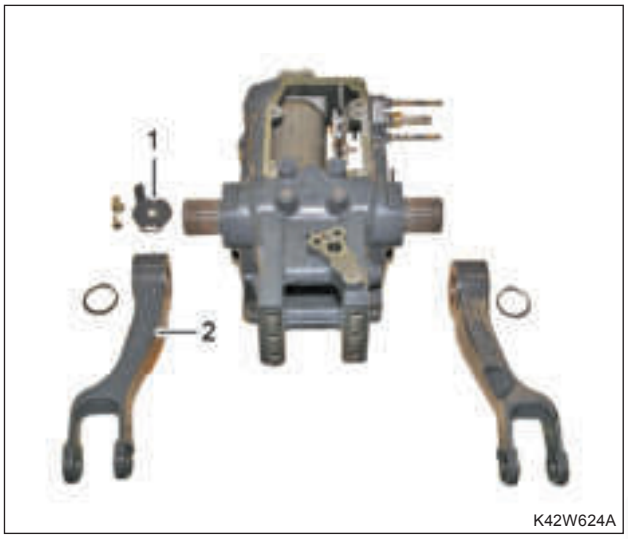


8. Unscrew the lever retaining nut (1). Then, remove the bracket A (2), spring (3), bracket A (2), plate (5), P lever (4), plate (5), bracket A (2), plate (5), D lever (6), friction plate (7) and bracket (2) in order.

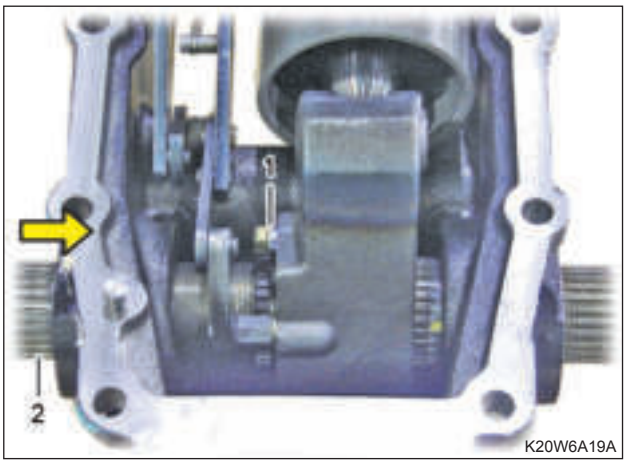


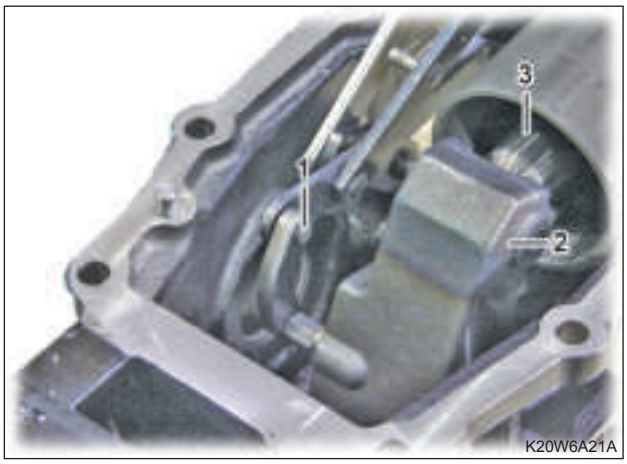
9. Pull out the snap ring (1) from the right side. Then, disconnect the lift arm (2).

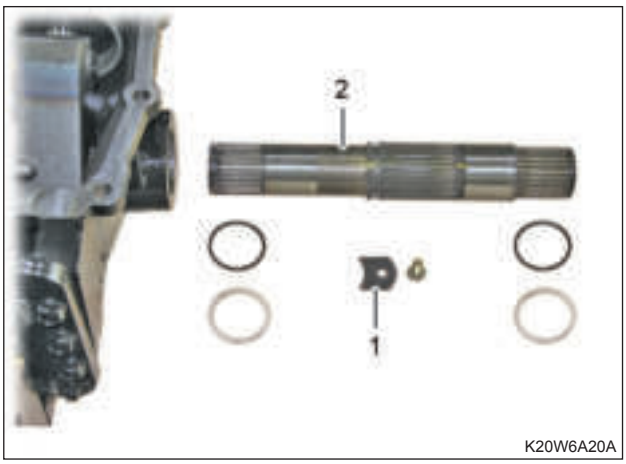


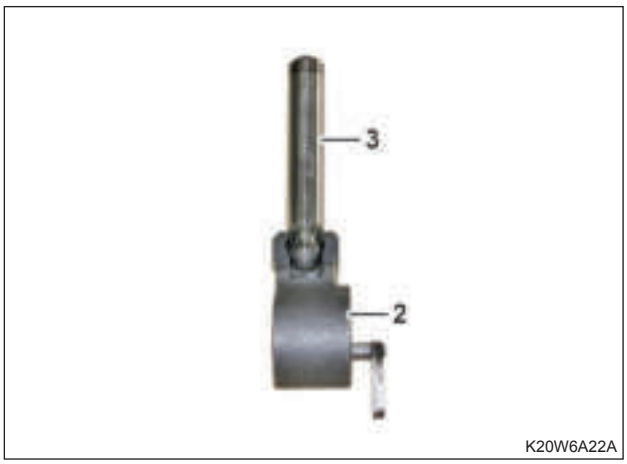


10. Remove the cam assembly (1) from the left side and pull out the snap ring. Then, disconnect the lift arm (2).





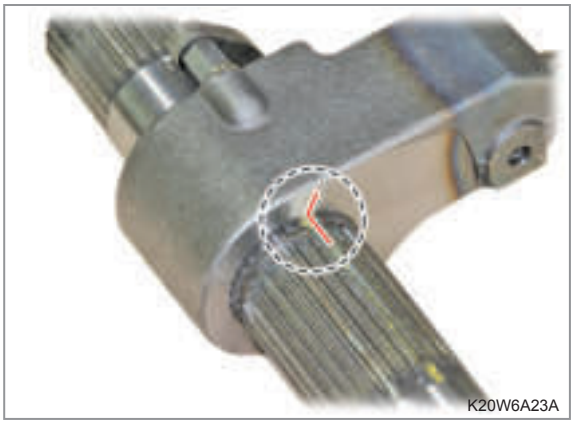




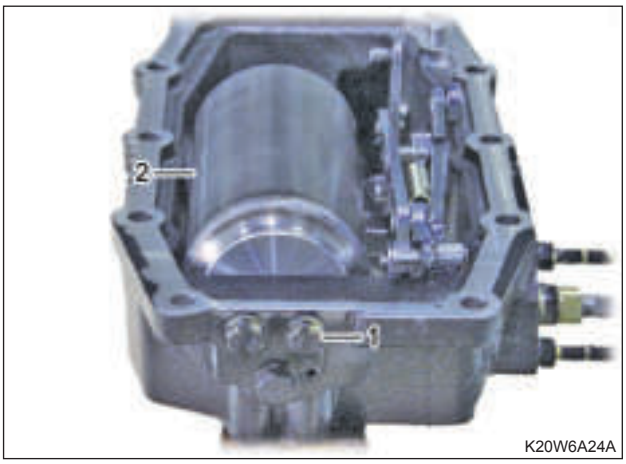
11. Unscrew the plate (1) and pull out the lift link shaft (2) to the right.

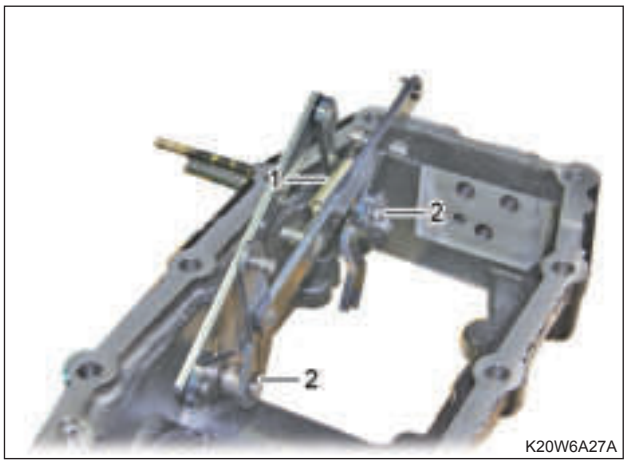
12. Pull out the E-type snap ring (1) for the lift crank link. Then, remove the lift crank (2) and piston rod (3) together.

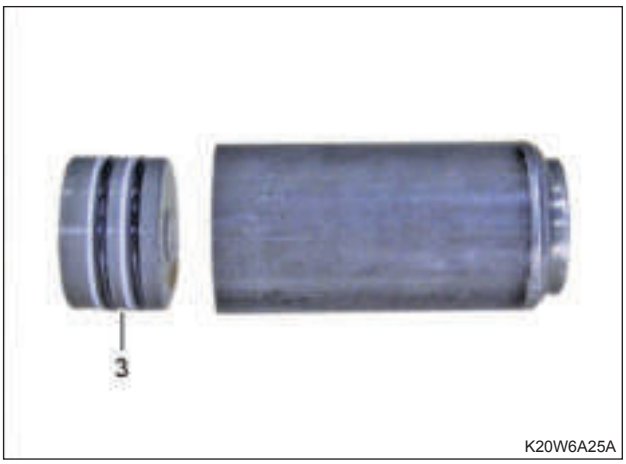
IMPORTANT

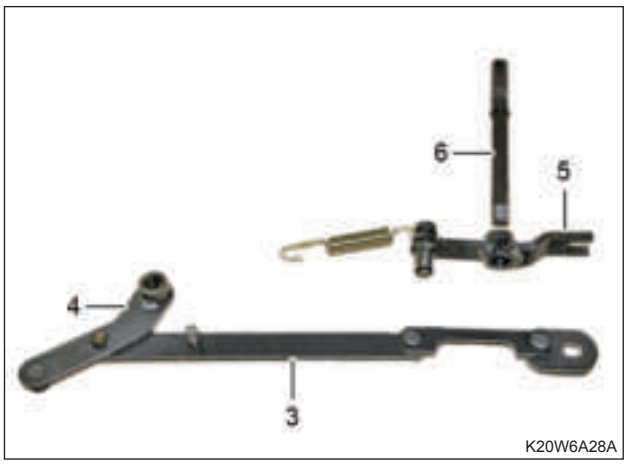


- **Insert the lift link shaft from the right to the left side, aligning the matching mark on the lift link shaft with the matching mark on the lift crank.**



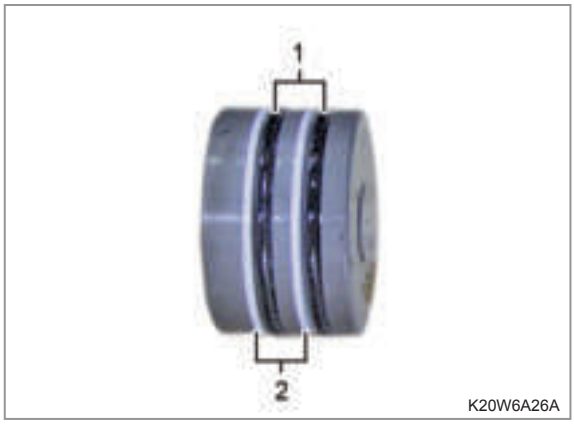






13. Unscrew the hex. bolt (1) and remove the piston assembly (2) to separate the piston (3) from the piston assembly.

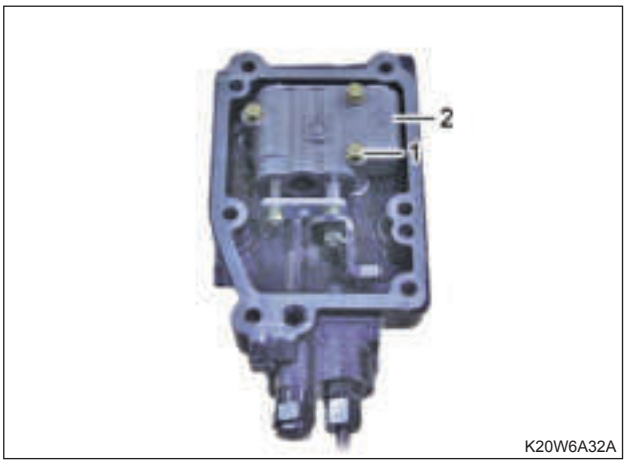
Notes

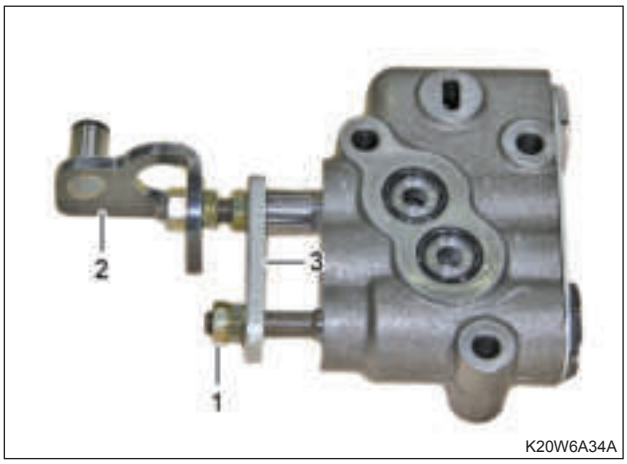


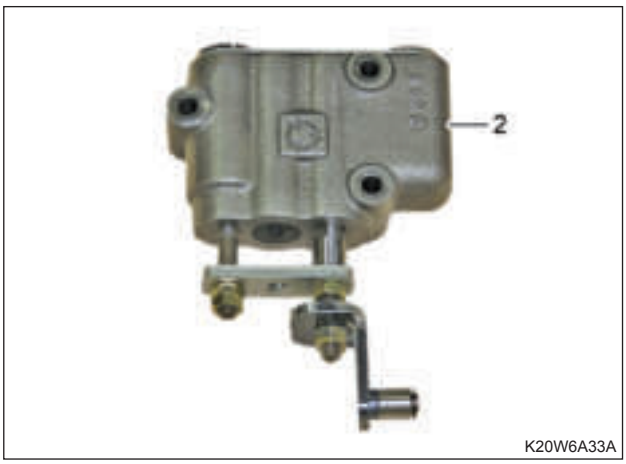
- **Check how much the O-ring (1) and backup ring (2) for the piston are worn, and replace any defective or excessively worn one with a new one.**

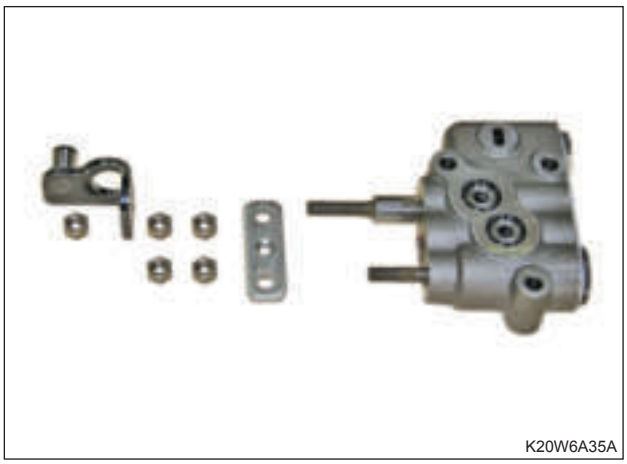
14. Remove the spring (1) and pull out the E-snap ring (2). Then, remove the position link (3), position feedback link (4), connecting link (5) and position lever shaft (6).
15. Assemble in the reverse order of disassembly.

7.2 CONTROL VALVE DISASSEMBLY



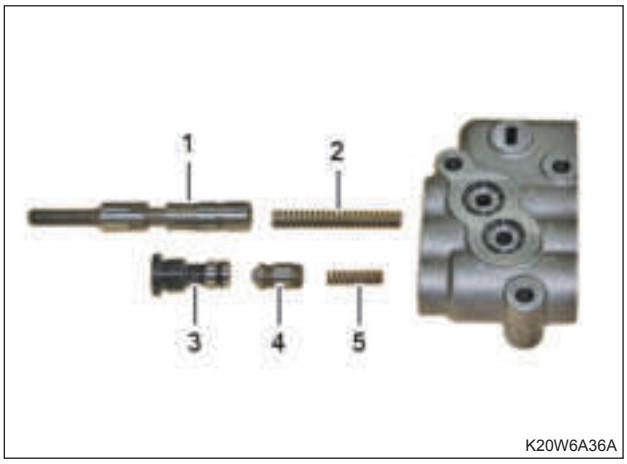




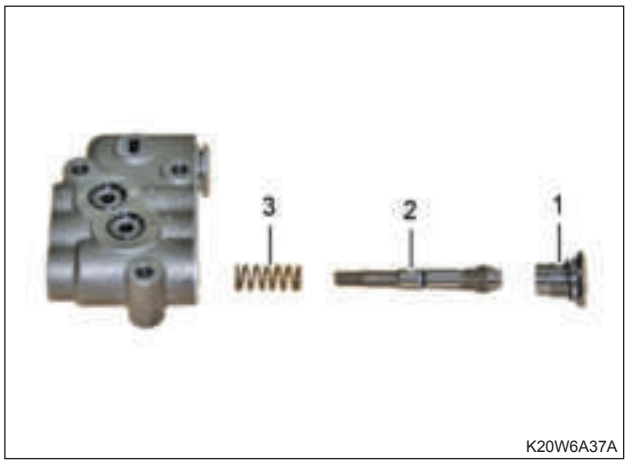


1. Unscrew the control valve mounting bolts (1) from the hydraulic cylinder cover to remove the control valve (2).

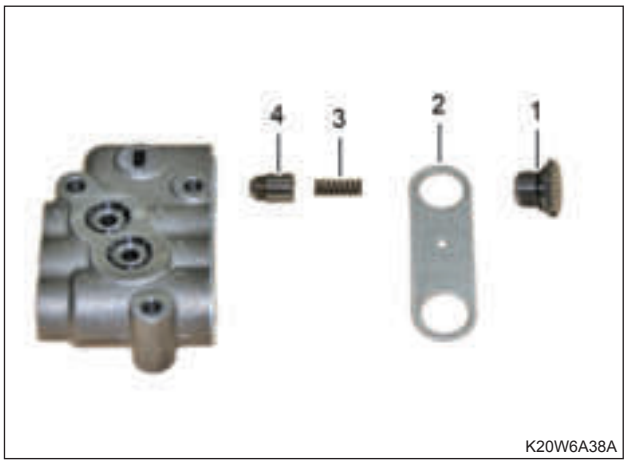
2. Unscrew the hex. nut (1) from the control valve to separate the clevis assembly (2) and plate (3).



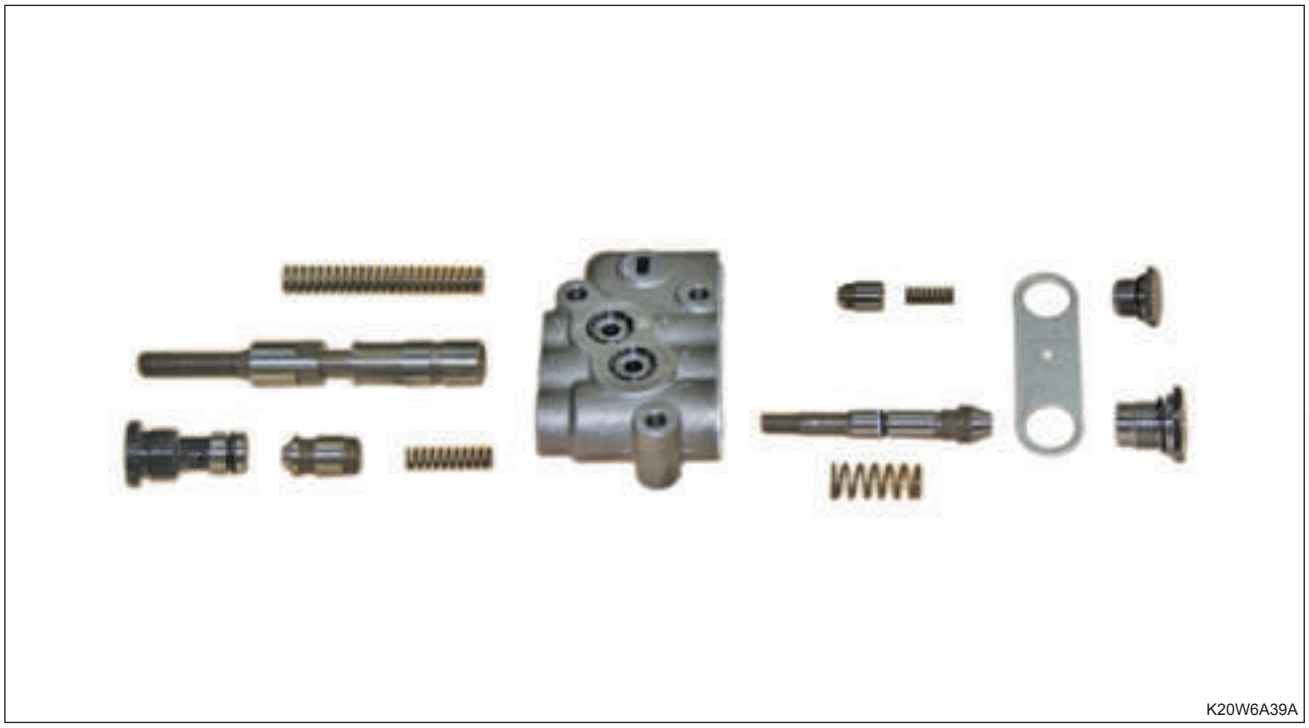
3. Remove the main spool (1), main spring (2), load check (3), load check seat (4) and load check spring (5) from the control valve.



4. Unscrew the main check plug (1) and remove the main check poppet (2) and main check spring (3).



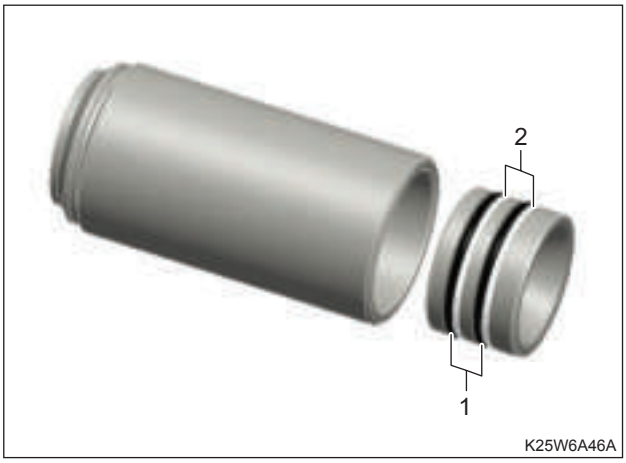
5. Unscrew the unload plug (1) and remove the plate (2), unload spring (3) and unload check (4).



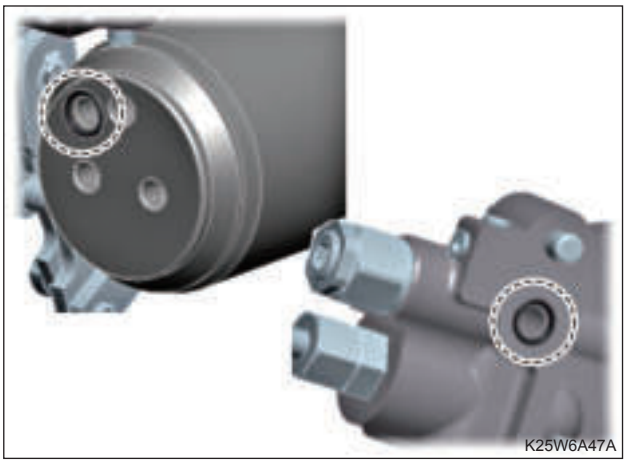
6. Assemble in the reverse order of disassembly.

HYDRAULIC CYLINDER INSTALLATION STANDARD

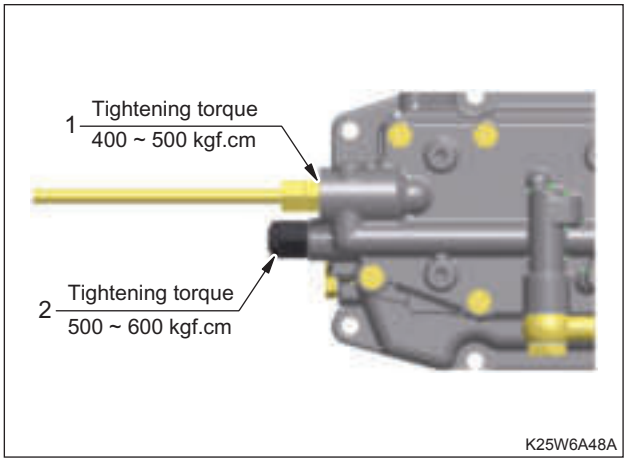
1. Keep all hydraulic components clean and remove any foreign material and dust from them before their installation.



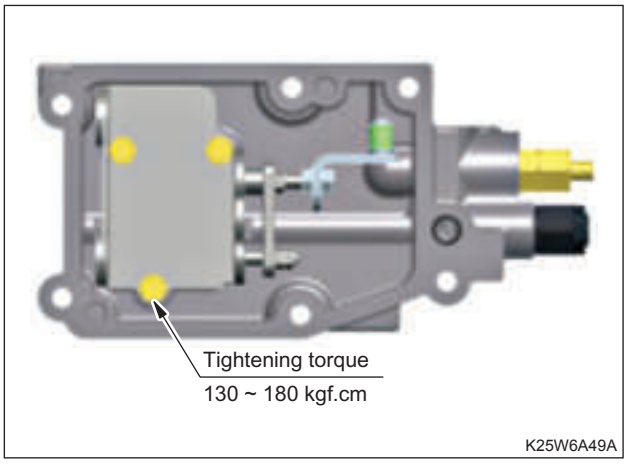
2. When installing the O-ring (1) and backup ring (2) to the piston, install them in the correct direction. (Apply transmission fluid to them before installation.)

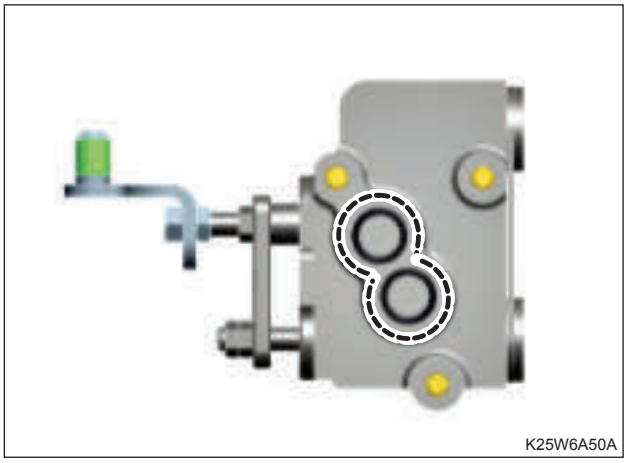


3. Check if the O-rings for the hydraulic cylinder and hydraulic cylinder cover are missing or damaged. Apply grease on them before their installation.

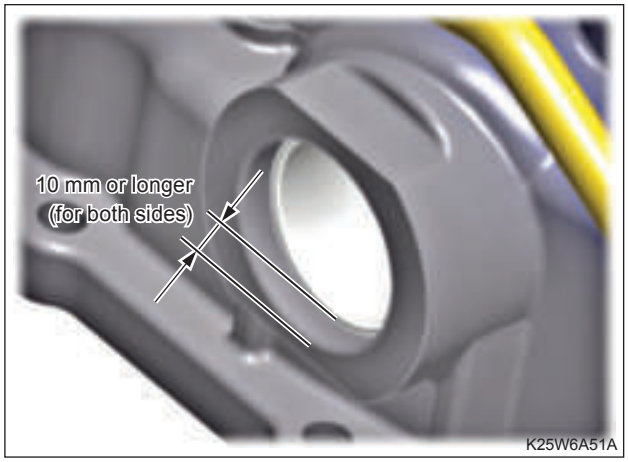


4. When installing the safety valve (1) and lowering speed control valve (2), check if their O-rings are missing or damaged. Also, apply grease on them before installation.

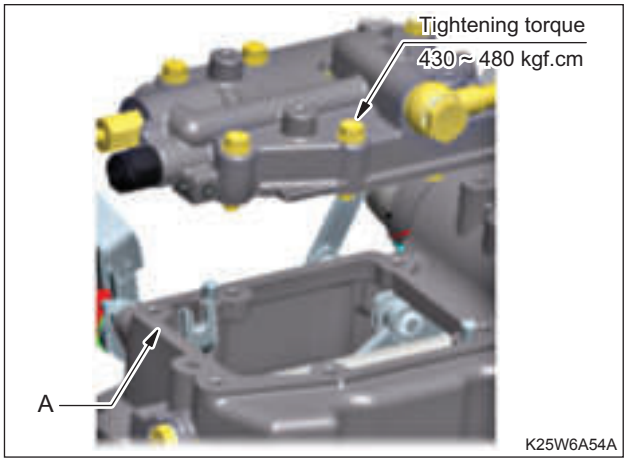




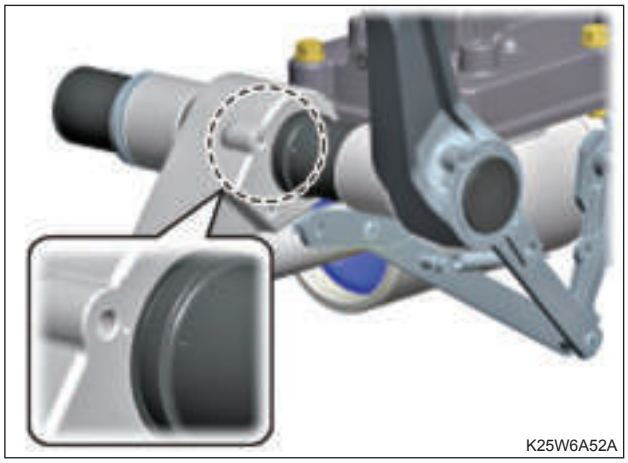
5. When installing the lifting/lowering control valve, check if its O-ring is missing or damaged. Also, apply grease on it before installation. Also, tighten the mounting bolt to the specified torque.



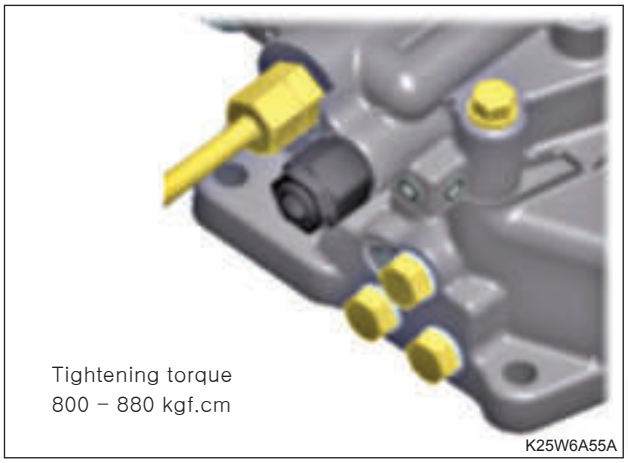
6. When pressing in the hydraulic cylinder case bushing, select the correct size and use a pressing jig.



9. When installing the hydraulic cylinder cover, apply liquid gasket (A) on it in advance.

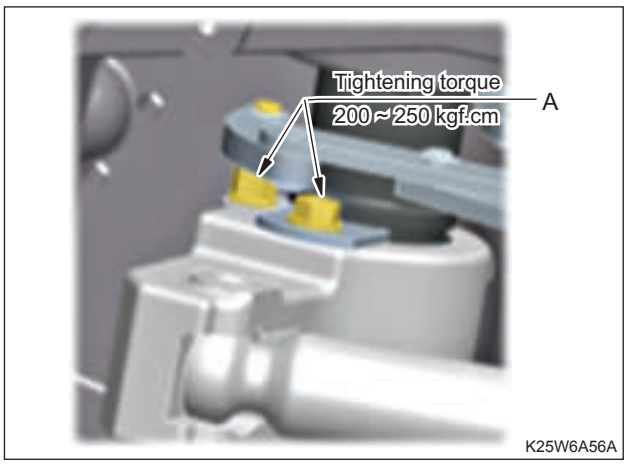


7. When installing the lift crank shaft and crank, align their matching marks.

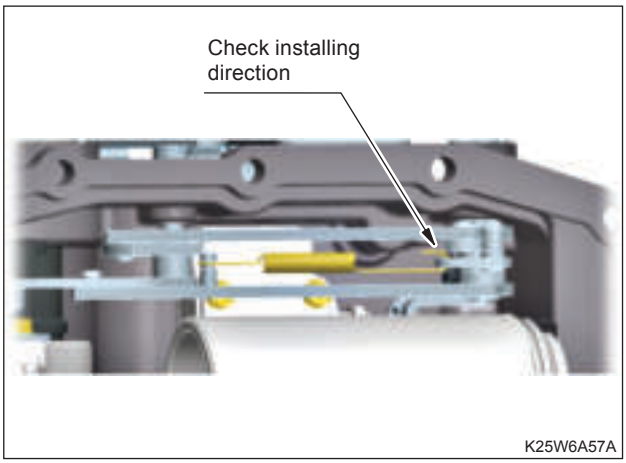


10. When installing the hydraulic cylinder, apply LOCTITE on it and follow the specified tightening torque.

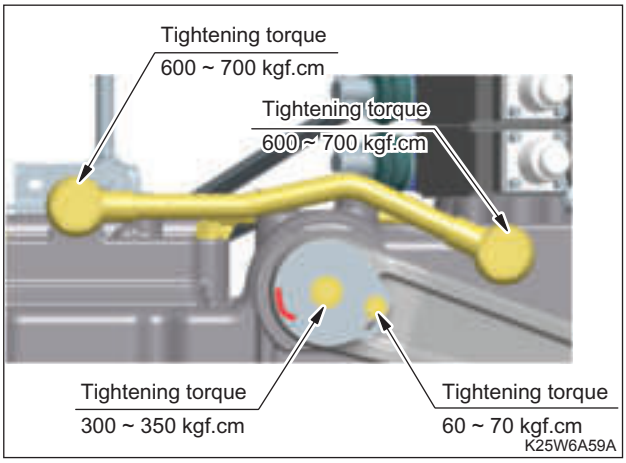
8. When installing the lift crank shaft and lift arm, align their matching marks.



11. When installing the link, apply LOCTITE (A) on it and follow the specified tightening torque.

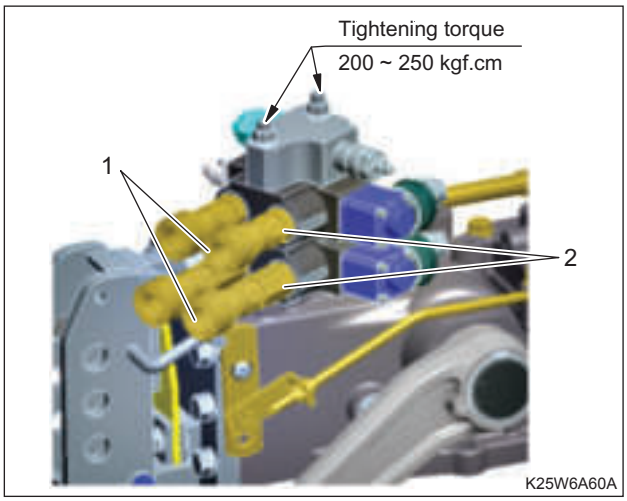


12. When installing the return spring, set its longer section to the front.



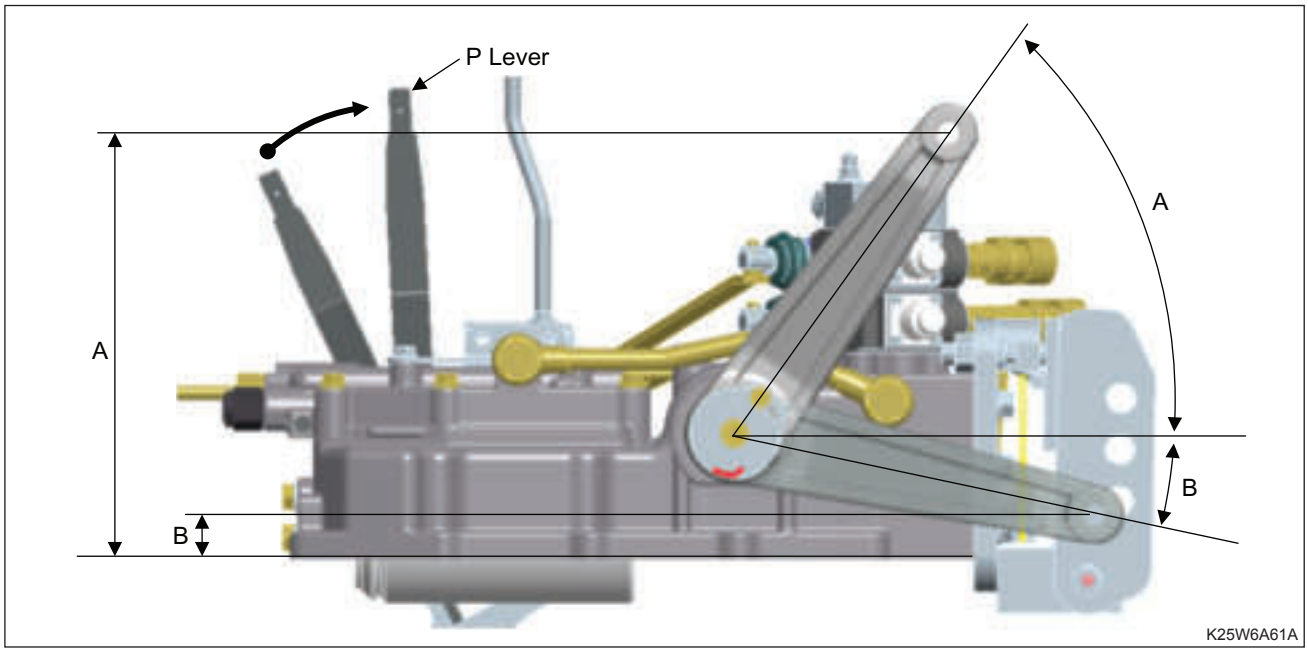
13. Tighten the high-pressure pipe to the specified torque and install the cam correctly according to the specification specified in the figure. (When installing the cam assembly, turn it counterclockwise for 5 mm from the end of the long hole.)

OPTIONAL



14. When installing the rear SCV, make sure that its O-ring is not missing or damaged.
15. When installing the SCV, tighten its nut to the specified torque (200 - 250 kgf.cm).
16. When installing the quick coupler (1) and joint (2), wrap them with seal tape.

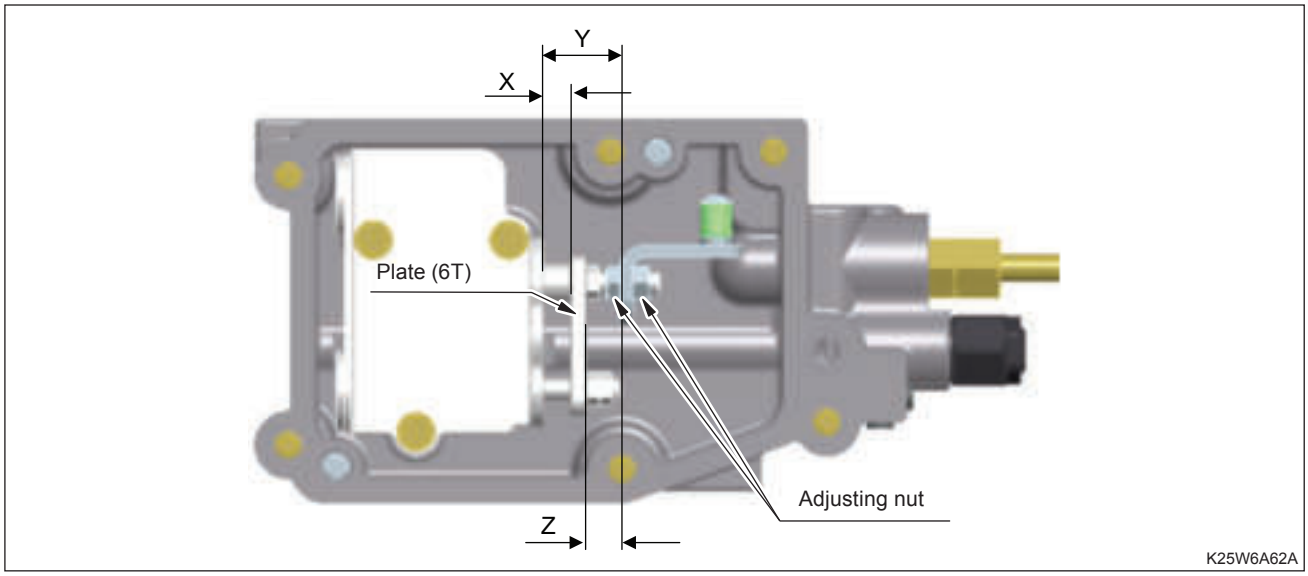
▶ CONTROL VALVE SETTING BY DIFFERENT LIFT ARM ANGLES



1. P lever pulled to the max. lifting position

A (LIFTING ANGLE)	A (LIFTING HEIGHT)	B (LOWERING ANGLE)	B (LOWERING HEIGHT)
47.5°~49°	269~273.5	16.3°~17.3°	14.8~10.3

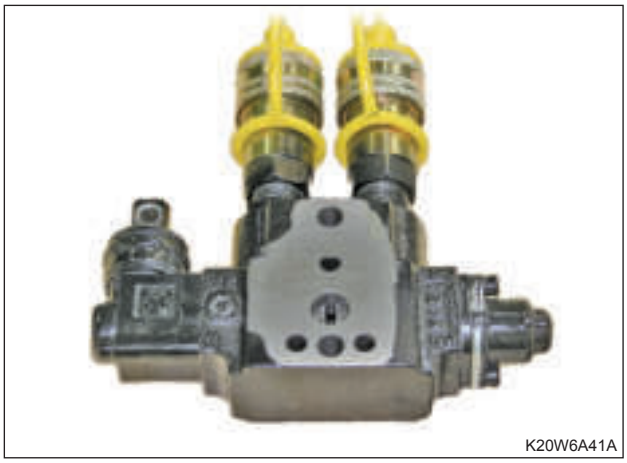
2. If the lifting angle or lowering angle is out of the specified range, adjust it with the clevis adjusting nut. (Initial setting value: Y 29 mm or Z 13 mm with X 10 mm) (Repeat adjustment 2 to 3 times for precise setting.)

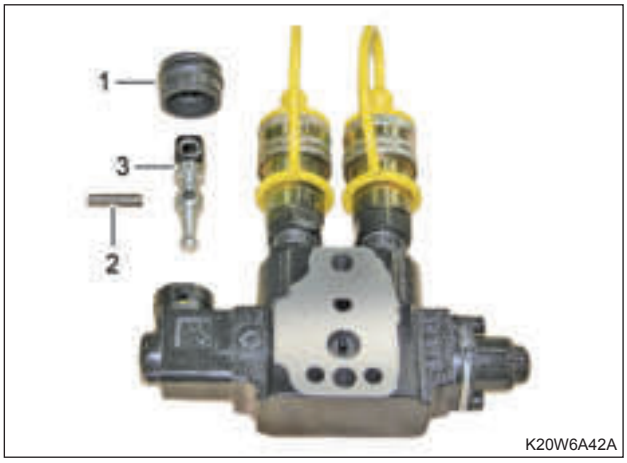


3. Apply LOCTITE to the adjusting nut before its installation.
   - Excessive lifting height: decrease the length Y and Z
   - Insufficient lifting height: increase the length Y and Z

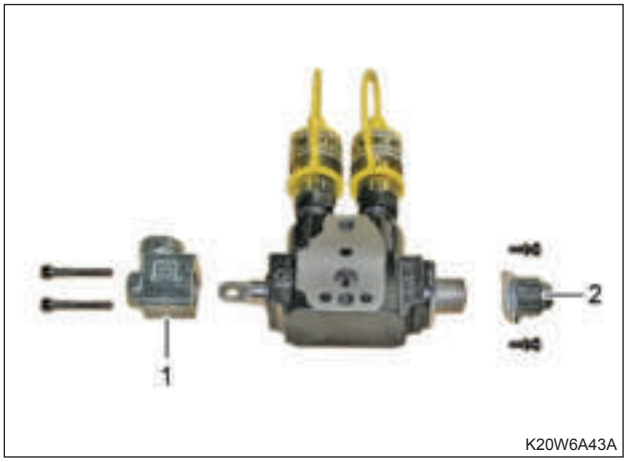
7.3 REAR SCV DISASSEMBLY [OPTIONAL]

1. Disconnect all the hydraulic pipes (1) to the rear SCV from the back of the tractor and unscrew the mounting nuts (2), and disconnect the connecting bracket (3) to remove the rear SCV assembly.

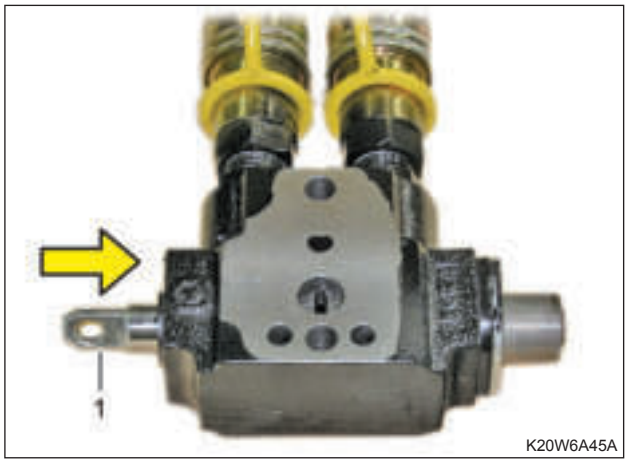


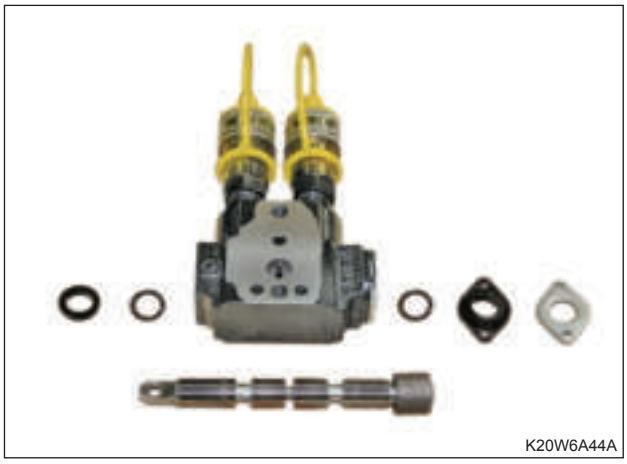


2. Remove the rubber bellows (1) and pull out the retaining pin (2). Then, remove the arm (3).

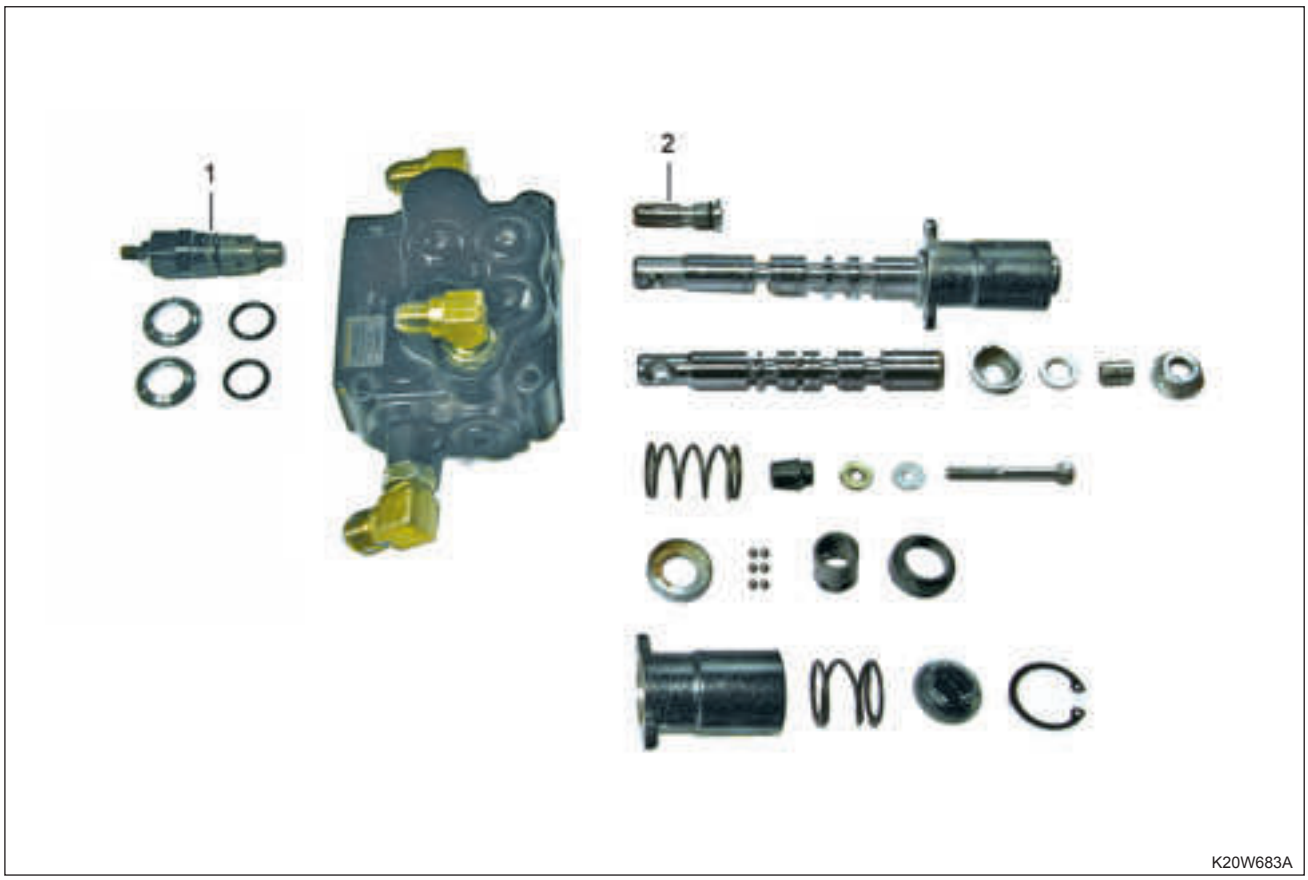


3. Remove the covers (1 & 2).



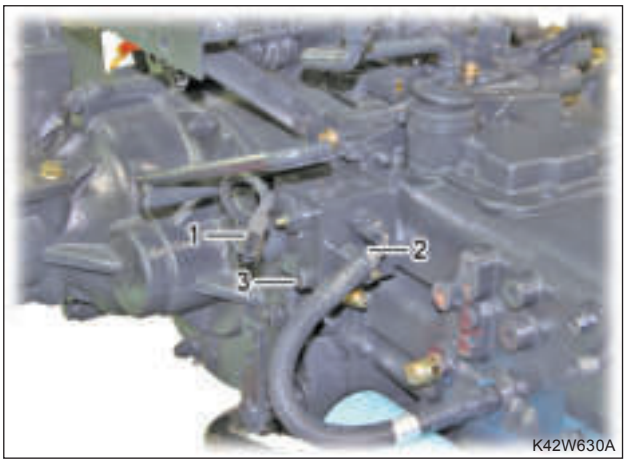


4. Pull out the spool (1) in the arrow direction.

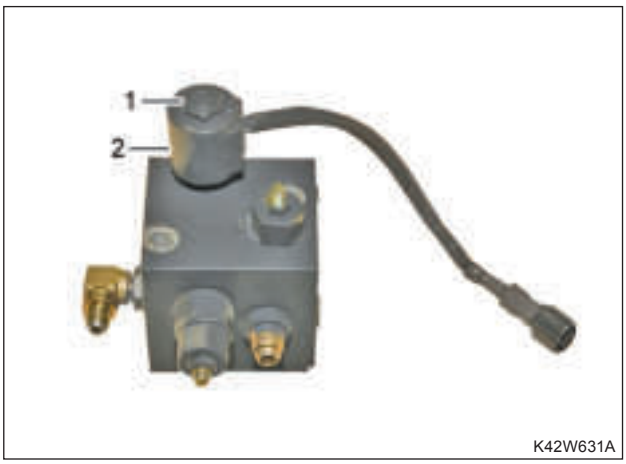


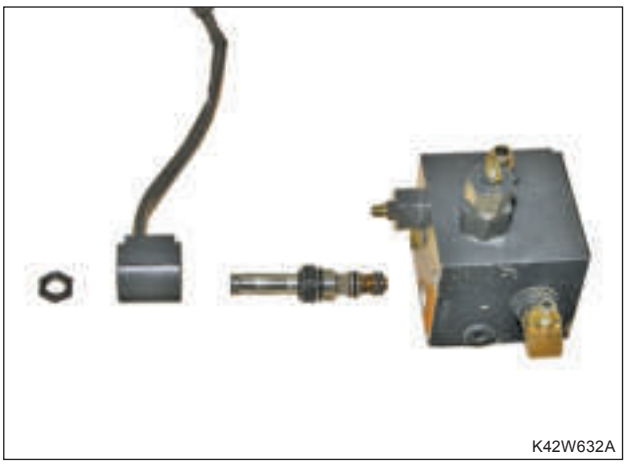
4. Unscrew the relief valve (1) from the other side to remove it. Then, pull the spool (2) to remove it.

7.4 PTO VALVE DISASSEMBLY

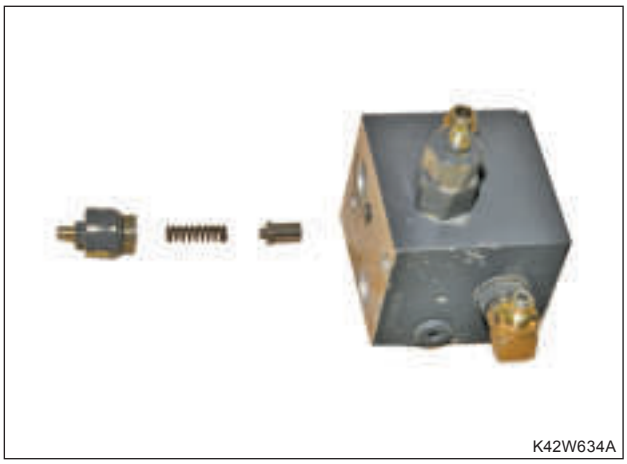


1. Disconnect the PTO valve wiring (1) connector and hydraulic pipe (2) and unscrew the mounting bolts (3) to remove the PTO valve assembly.



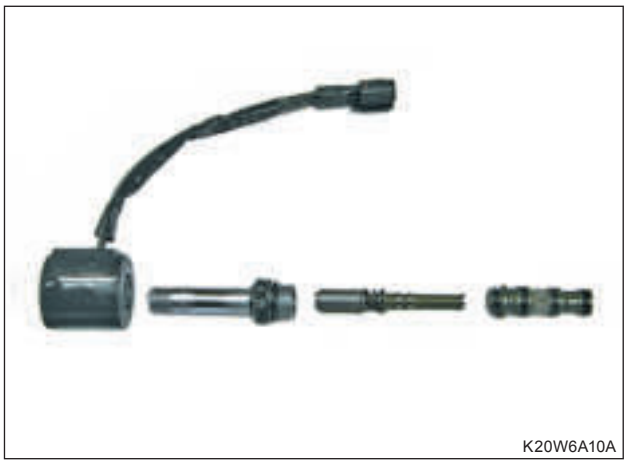


2. Unscrew the mounting nuts (1) from the PTO valve assembly to remove the solenoid valve (2).



3. Remove the sequence valve (1).

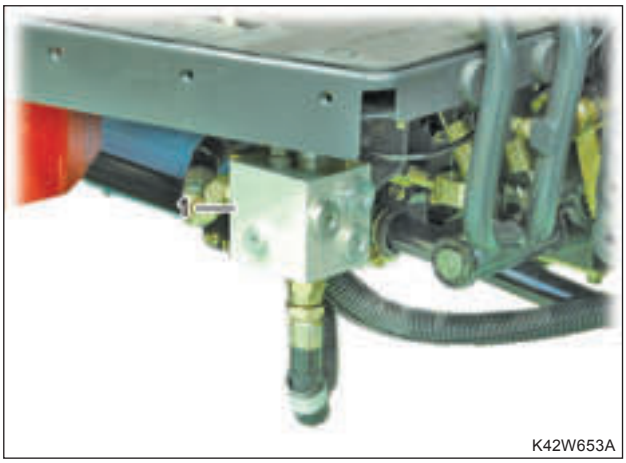
4. Remove the DRV valve (1).



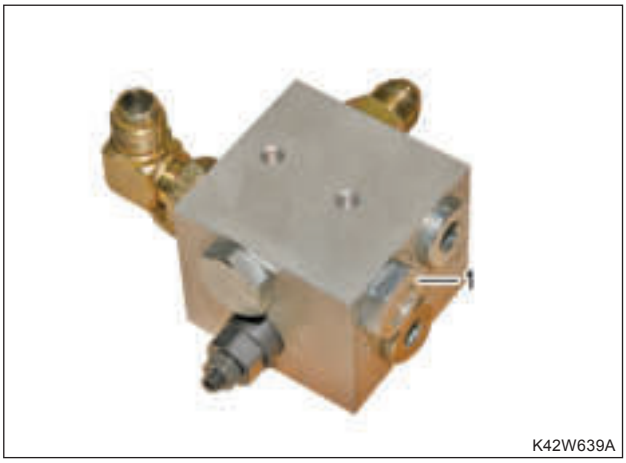
5. Remove the magnet housing (1) of the PTO solenoid. Remove the internal valve and spool as well.

6. Assemble in the reverse order of disassembly.

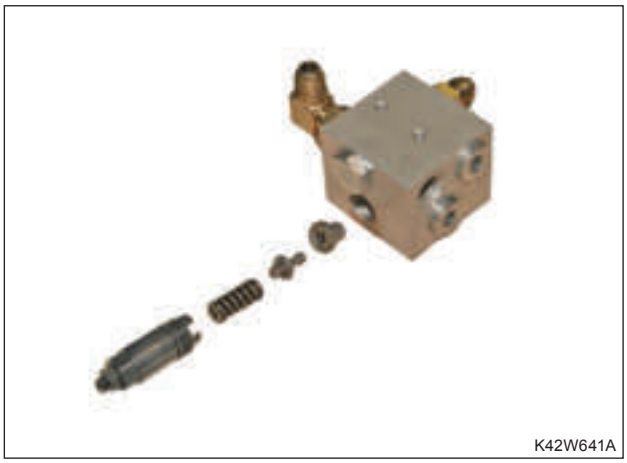
7.5 FRONT OUTLET VALVE DISASSEMBLY



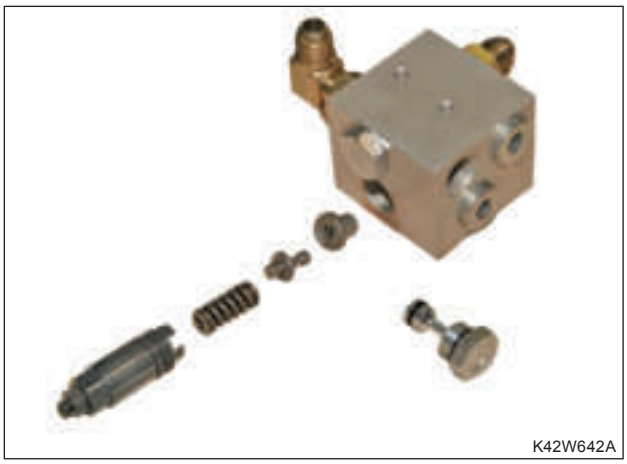
1. Disconnect the hydraulic hose from the front outlet valve and unscrew the bracket mounting bolts to remove the front outlet valve (1) assembly.



2. Remove the carry over plug (1).

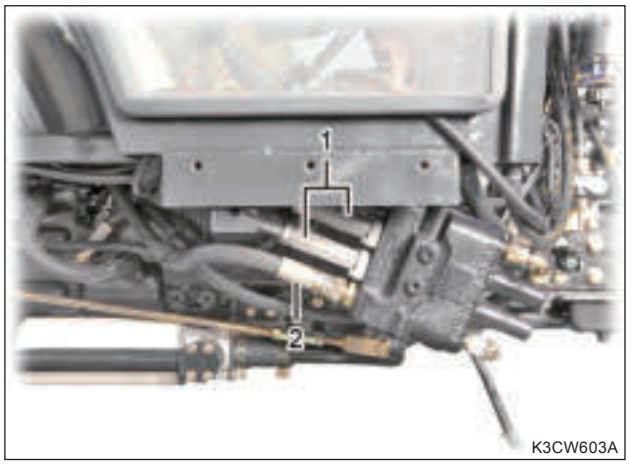


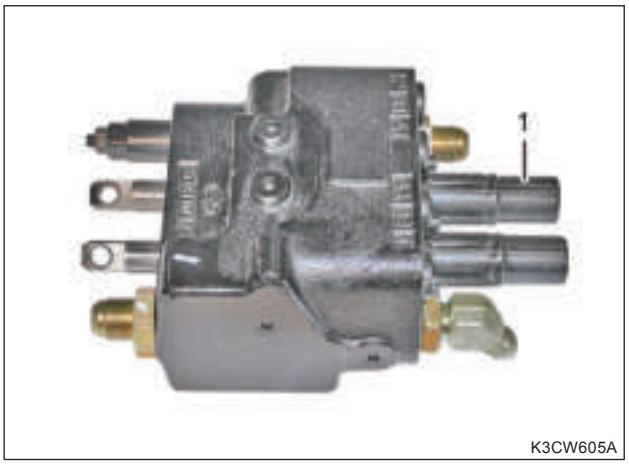
3. Remove the relief valve.

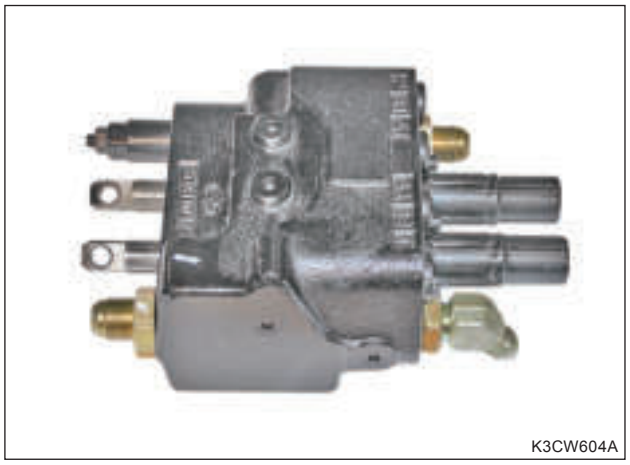


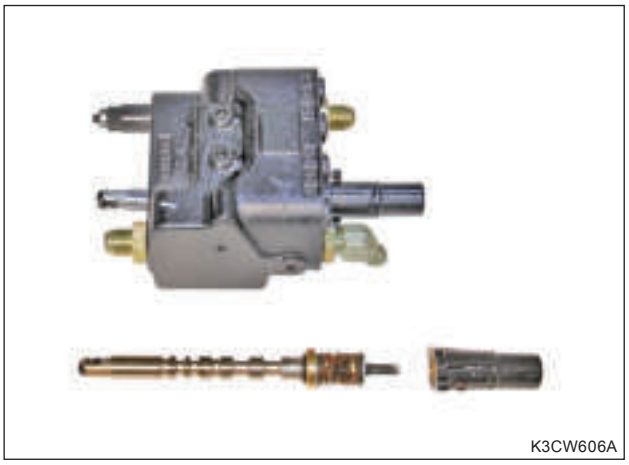
4. Assemble in the reverse order of disassembly.

7.6 FRONT SCV ASSEMBLY (LOADER VALVE) DISASSEMBLY



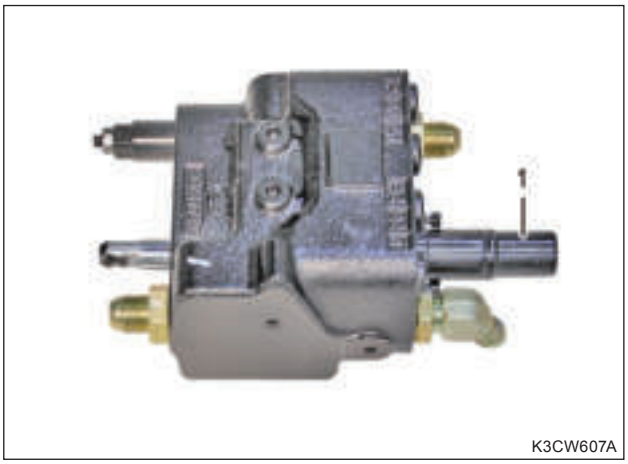


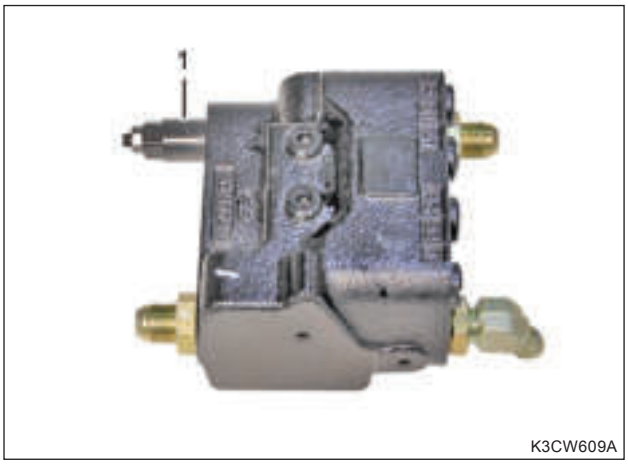


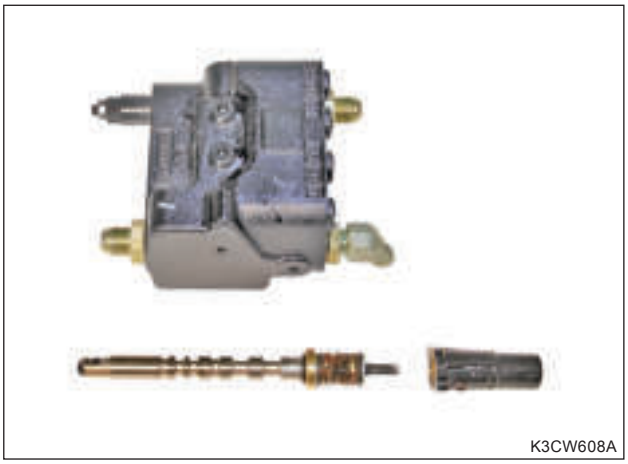


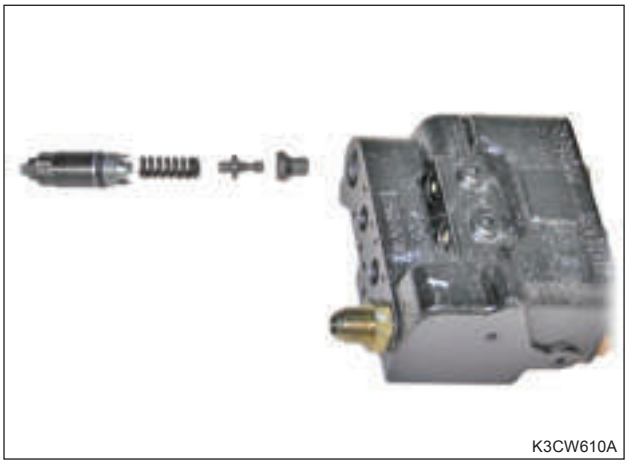
1. Disconnect the loader cable (1) and hydraulic pipe (2). Then, unscrew the mounting bolts to remove the loader valve assembly.

2. Remove the bucket valve (1) from the loader valve assembly.



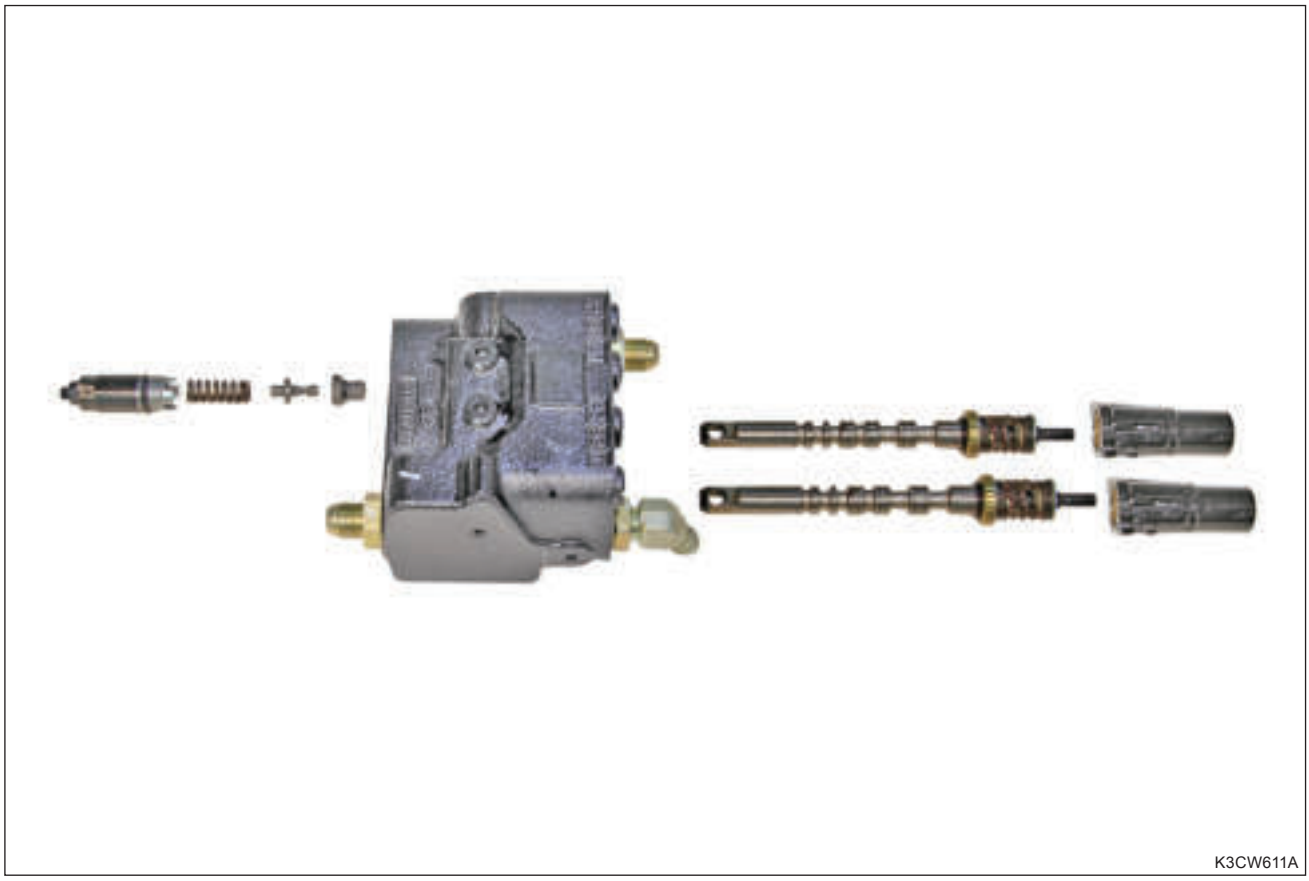






3. Remove the boom valve (1) from the loader valve assembly.

4. Remove the relief valve (1) from the loader valve assembly.



5. Assemble in the reverse order of disassembly.

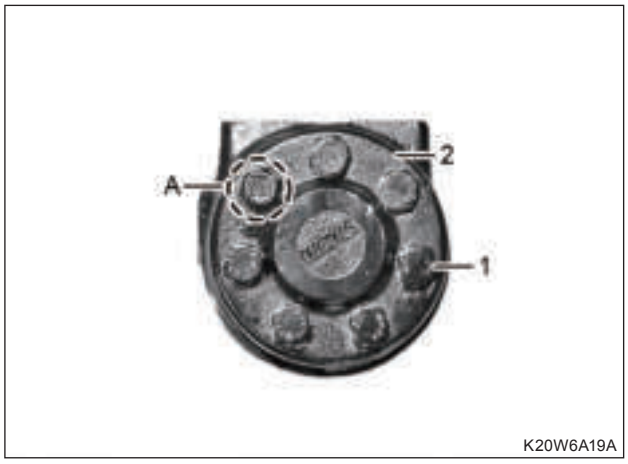
7.7 STEERING VALVE (UNIT) DISASSEMBLY

ROPS MODEL

1. Remove the upper dashboard part (1) and column cover (2).

2. Unscrew the steering valve assembly mounting bolts (1) under the steering wheel and push down the steering valve assembly to remove it.

3. Disconnect the hydraulic hoses (1) from the steering valve assembly.

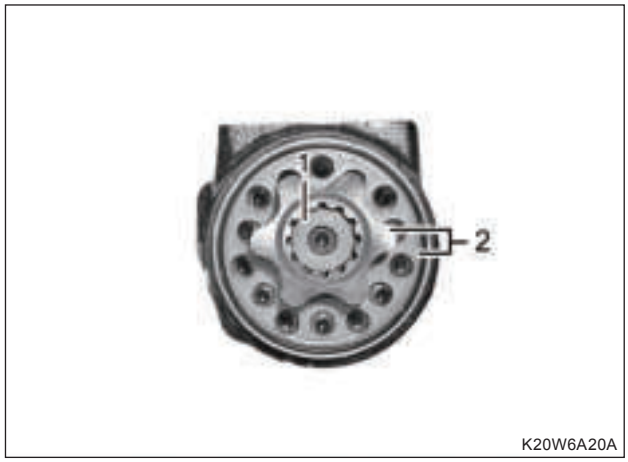


K20W6A19A

4. Unscrew the end cap mounting bolts (1) from the steering valve assembly to remove the end cap (2).

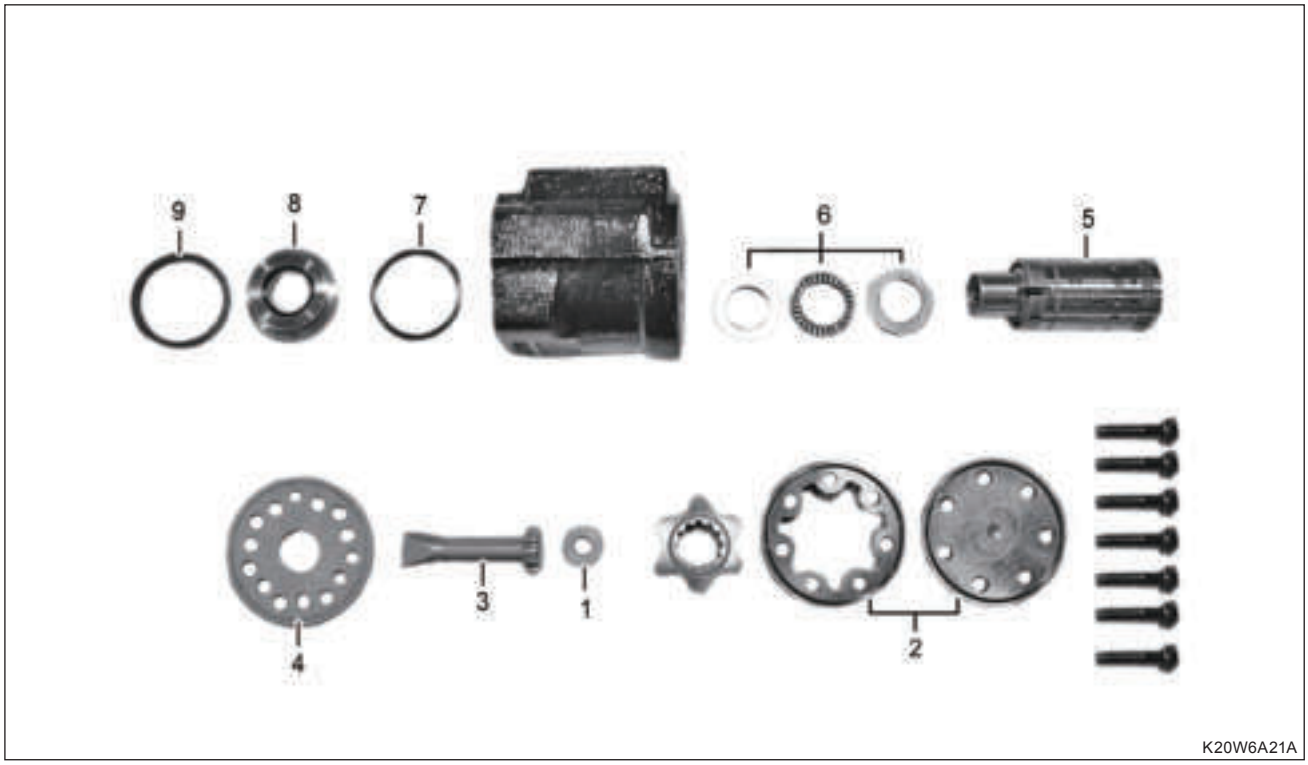
IMPORTANT

- **The bolt A among the end cap mounting bolts is longer than the other ones. Make sure to install it correctly.**



K20W6A20A

5. Remove the spacer (1) and gerotor set (2) in order.



K20W6A21A

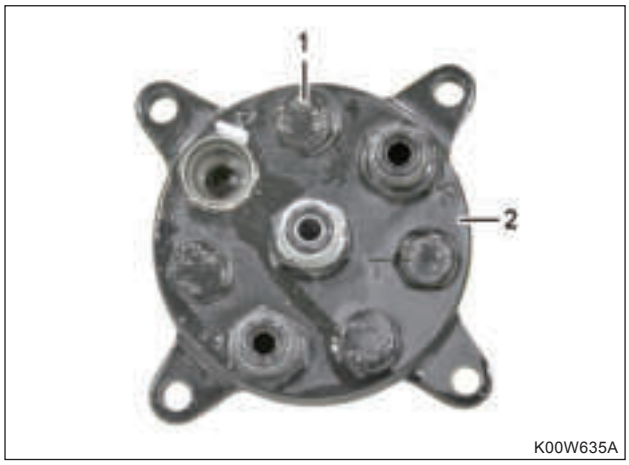
6. Pull out the drive (3) and remove the plate (4), spool and sleeve assembly (5), thrust bearing (6), O-ring (7), grand bushing (8) and retaining ring (9) in order.

CABIN MODEL

1. Remove the steering wheel (1), upper dashboard (2) and lower dashboard (3).

2. PST unit assembly mounting bolts and nuts (1) to remove the PST unit assembly (2) by lifting it up.

3. Disconnect the PST hydraulic hoses (1) from the PST unit assembly.



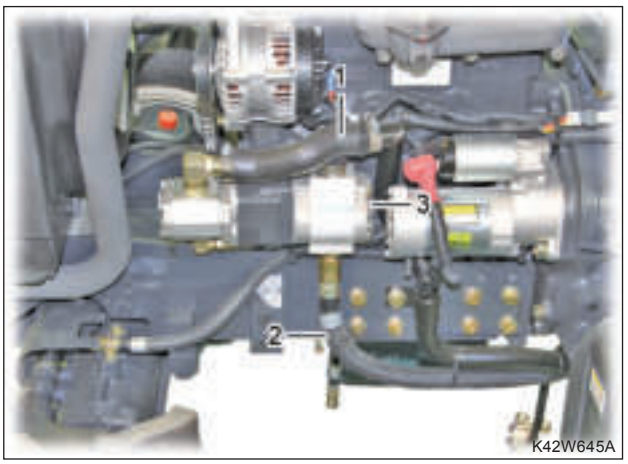
4. Unscrew the mounting bolts (1) from the PST unit end plate to remove the end plate (2).

5. Remove the spacer (1), inner rotor (2) and outer rotor (3).

6. Remove the drive (1), plate (2), sleeve assembly (3) in order from the housing (4).

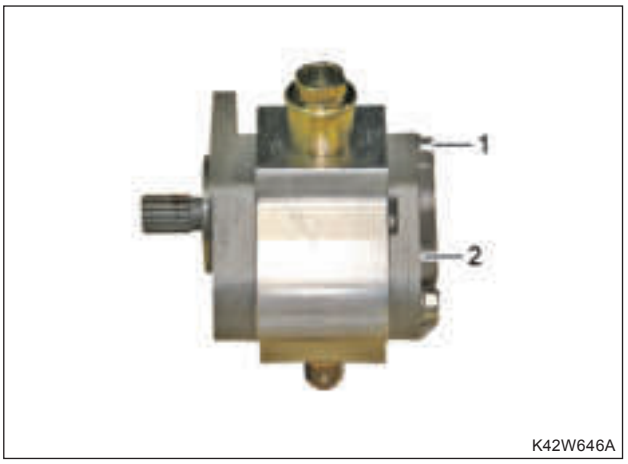
7.8 HYDRAULIC PUMP DISASSEMBLY

13 cc

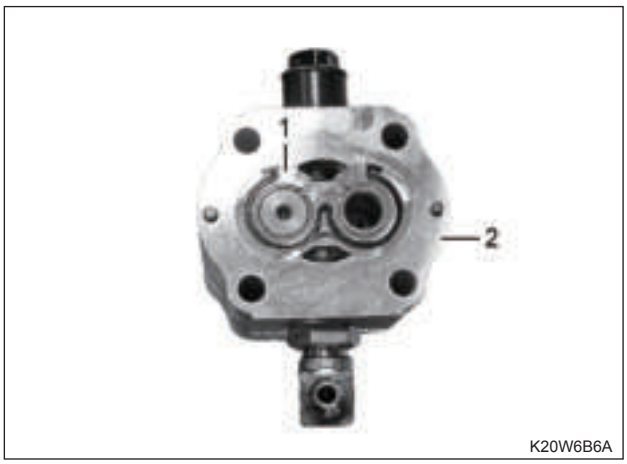


1. Disconnect the hydraulic pipe (1) and hydraulic hose (2) from the hydraulic pump on the left side of the engine. Then, unscrew the mounting bolt (3) to remove the hydraulic pump assembly.

ITEM	TORQUE VALUE
Mounting bolt	21.56 ± 2.94 N.m 2.2 ± 0.3 kgf.m 15.84 ± 2.16 lbf.ft



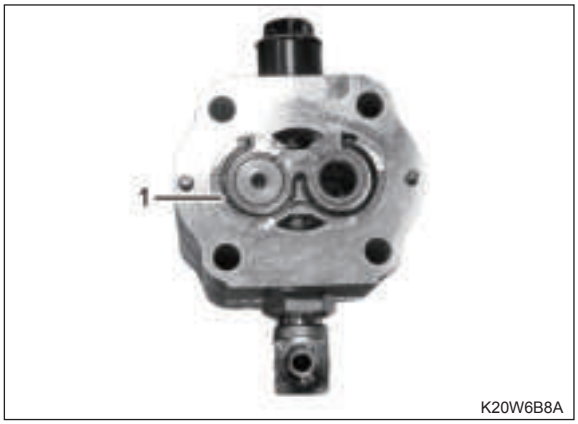
2. Unscrew the housing mounting bolts (1) and remove the rear cover (2).



3. Separate the shaft holding block (1) and each housing (2) from the cabin.

4. Remove the drive gear (3), driven gear (4) and front cover (5).

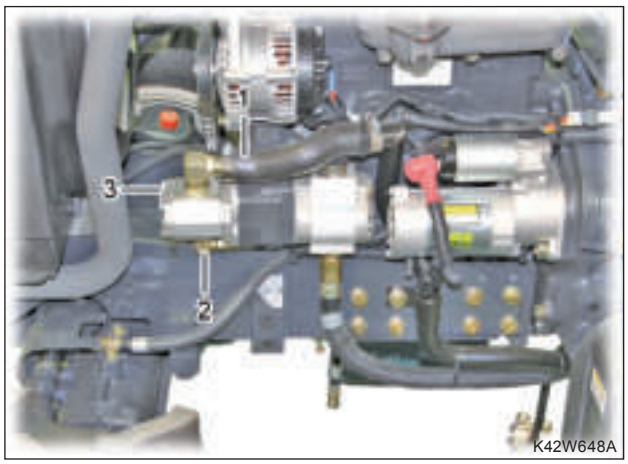
IMPORTANT



- **The seal (1) of the shaft holding block should face the housing when assembling it.**

5. Assemble in the reverse order of disassembly.

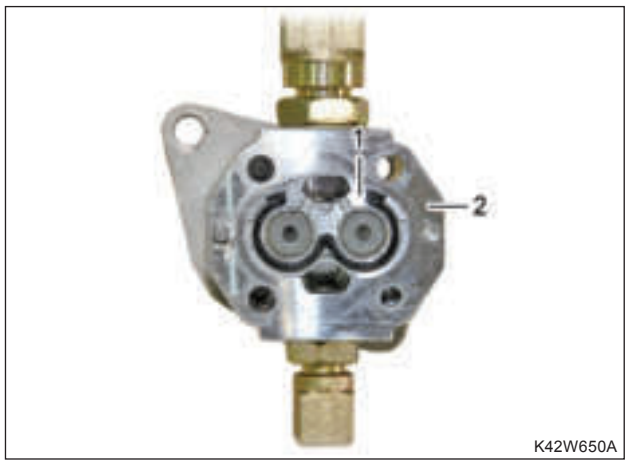
7 cc



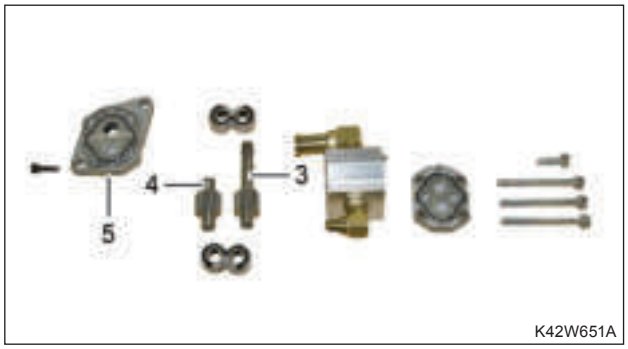
1. Disconnect the hydraulic pipe (1) and hydraulic hose (2) from the hydraulic pump on the left side of the engine. Then, unscrew the mounting bolt (3) to remove the hydraulic pump assembly.

ITEM	TORQUE VALUE
Mounting bolt	21.56 ± 2.94 N.m 2.2 ± 0.3 kgf.m 15.84 ± 2.16 lbf.ft

2. Unscrew the housing mounting bolts (1) and remove the rear cover (2).

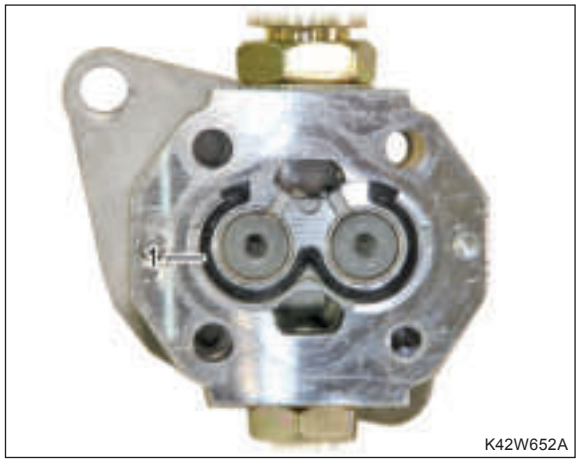


3. Separate the shaft holding block (1) from the housing (2).



4. Remove the drive gear (3), driven gear (4) and front cover (5).

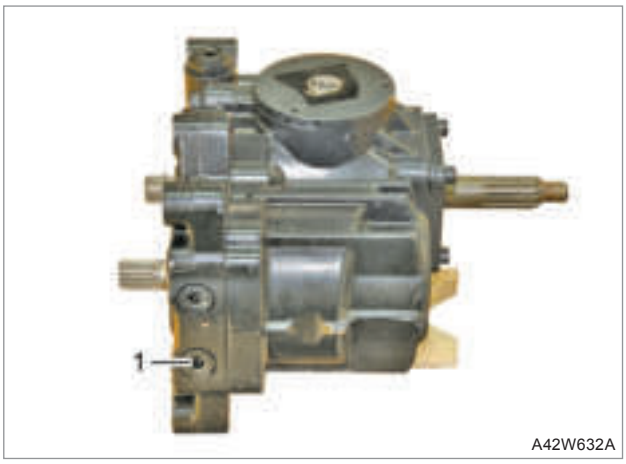
IMPORTANT



- **The seal (1) of the shaft holding block should face the housing when assembling it.**
- **And open section of the seal should face the suction side of the housing.**

5. Assemble in the reverse order of disassembly.

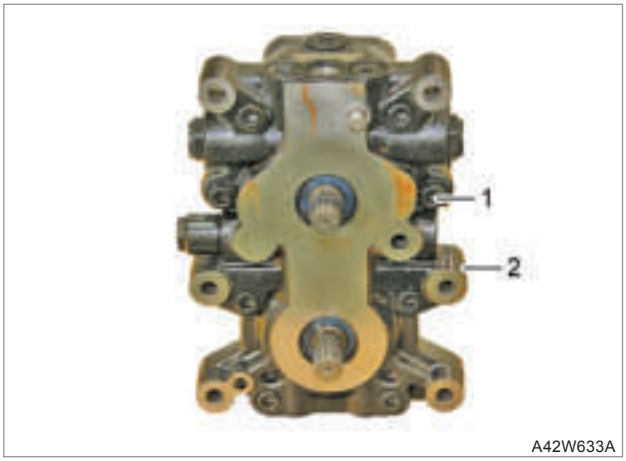
7.9 HST

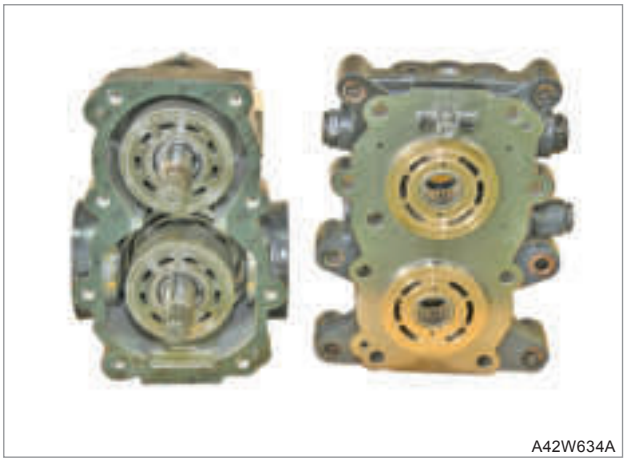


1. Unscrew the drain plug (1) from the bottom of the HST front cover to drain oil.

8-mm L-shape wrench

FRONT COVER DISASSEMBLY

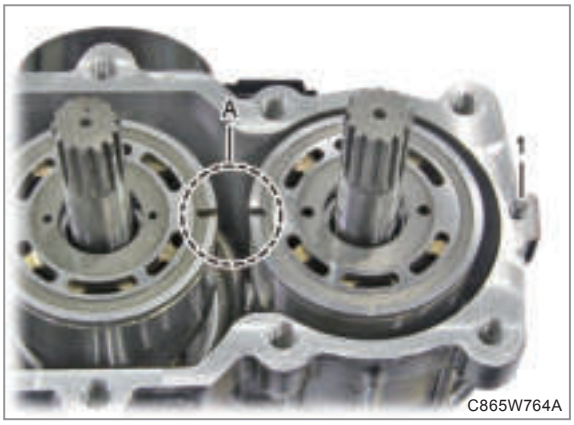




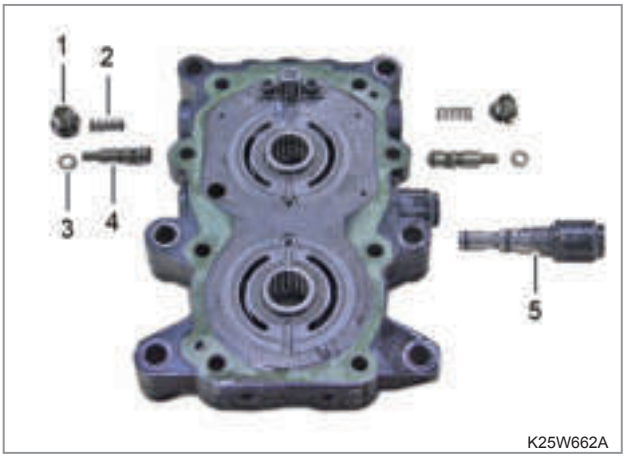
2. Unscrew eight HST front cover mounting bolts (1) to remove the front cover (2).

M12 BOLT	8 EA
10-mm L-shape wrench	

Notes

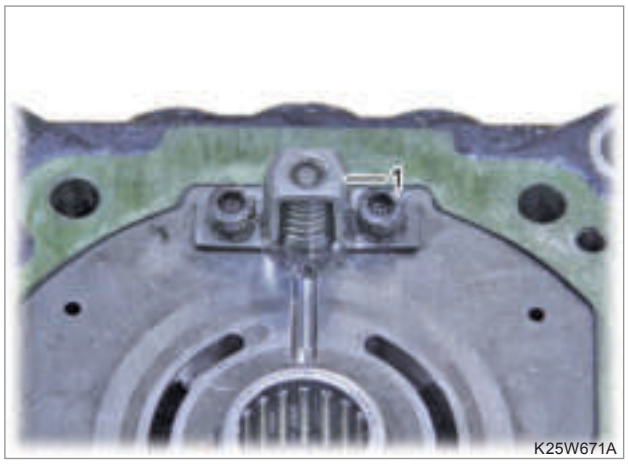


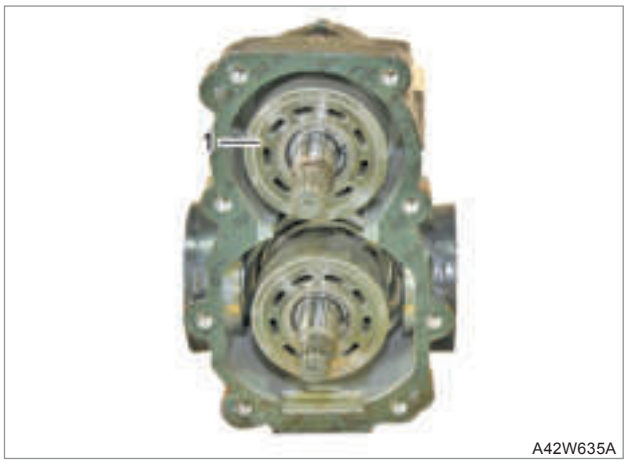
- **Align the grooves (A) of the valve plate with the knock pin (1) of the HST case during assembly.**



3. Remove the plug (1), spring (2), spring seat (3) and spool (4) from the upper section of the front cover. Then, remove the main relief valve (5).

10-mm L-shape wrench
8-mm L-shape wrench





4. Unscrew the spring holder (1) from the inner upper section of the front cover. Then, remove the spring (2) and check valve (3).

M6 BOLT	5 EA
5-mm L-shape wrench	

5. Remove the valve plate (1) on the motor side. Then, separate the cylinder block (2) and piston assembly (3).

Notes

- **Set the valve plate grooves (A) on the motor side toward the cylinder block during assembly (groove in section A: two (both directions)**


C865W771A

- Valve plate

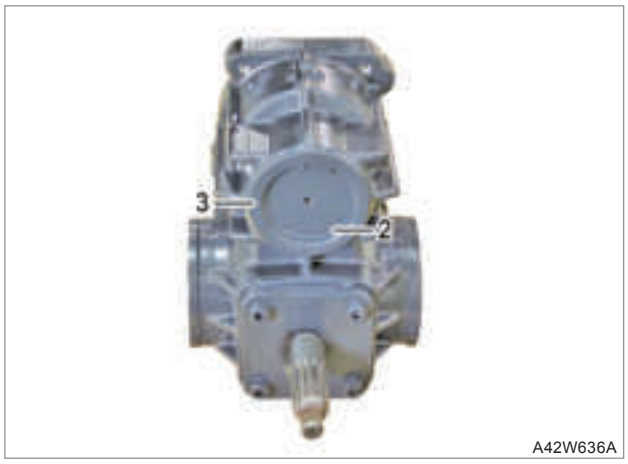

C865W774A

- Piston assembly

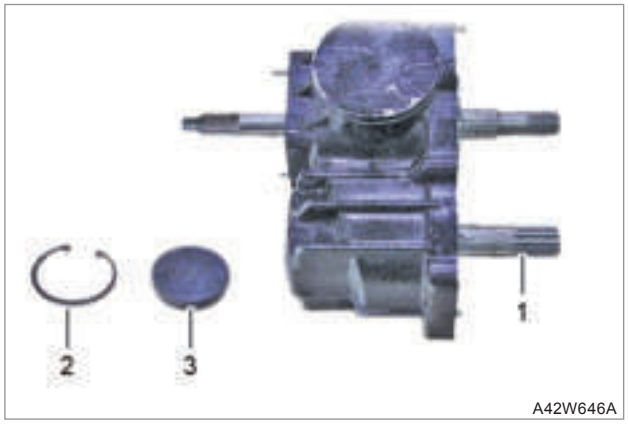

C865W772A


C865W773A

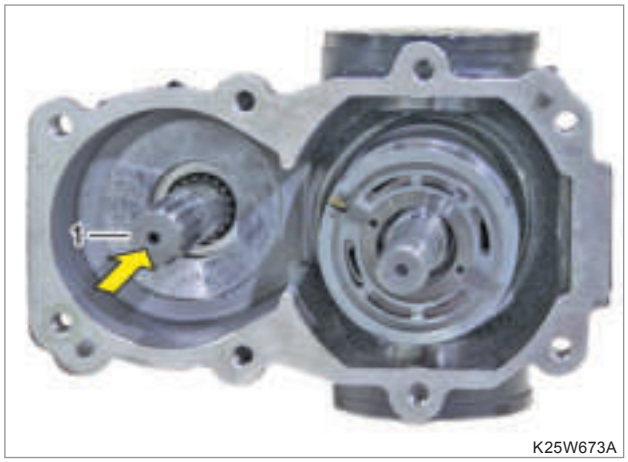
- Cylinder block



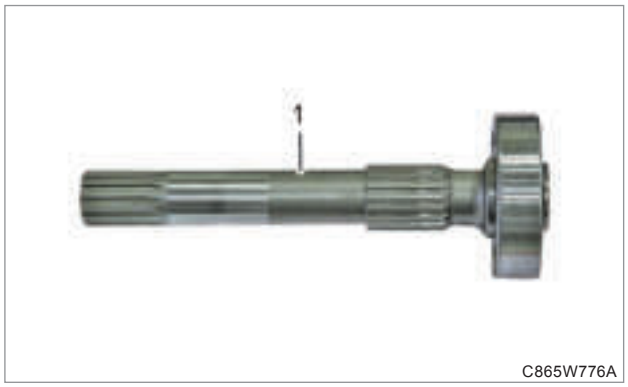
A42W636A



A42W646A

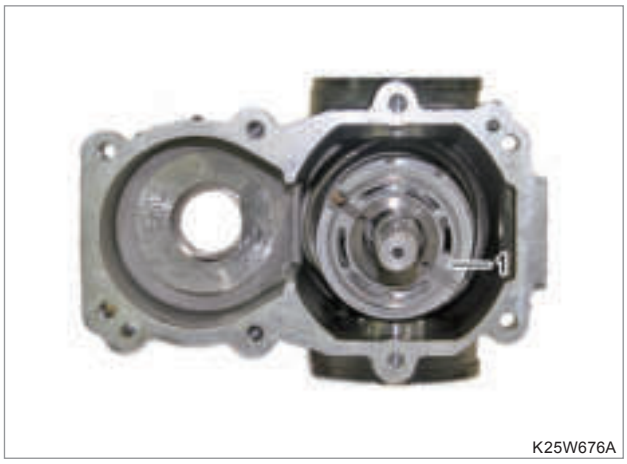


K25W673A

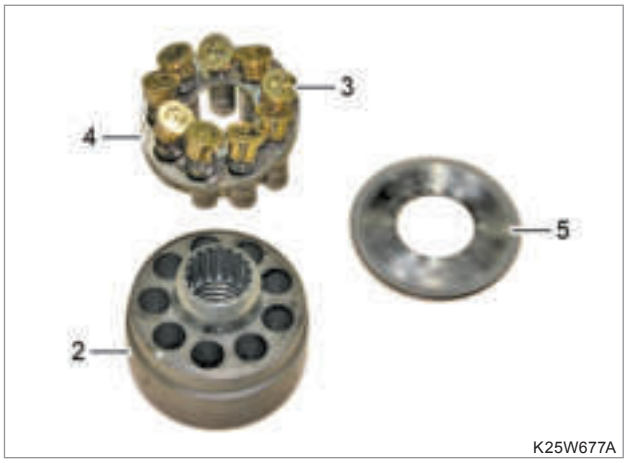


C865W776A

6. Pull out the snap ring (2) from rear of motor shaft and remove the cover (3) and motor shaft(1) by tapping snap ring direction.



K25W676A



K25W677A

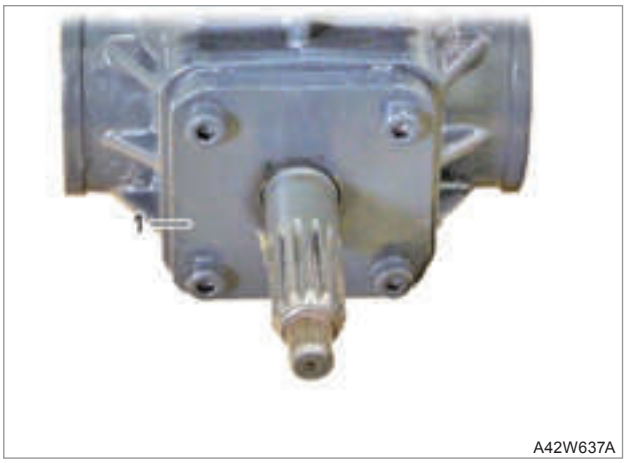
7. Remove the valve plate (1) on the pump side. Then, remove the cylinder block (2), piston (3), set plate (4) and shoe plate (5) after separating the cylinder block and piston assembly.

Notes

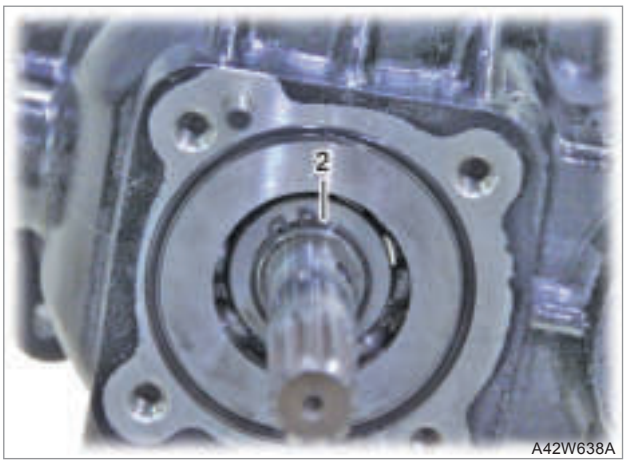
C865W779A

- **Set the valve plate grooves (A) on the pump side toward the cylinder block during assembly (groove in section A: one (rotating direction))**

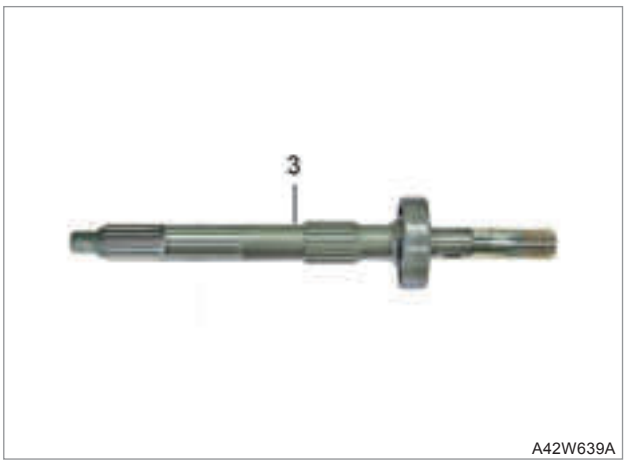
PUMP SHAFT DISASSEMBLY



A42W637A



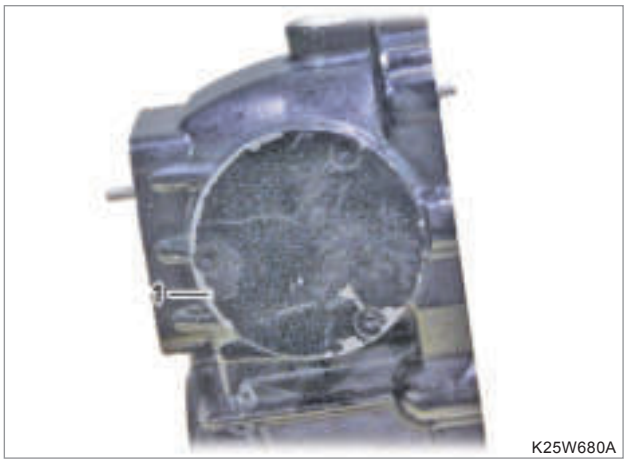
A42W638A



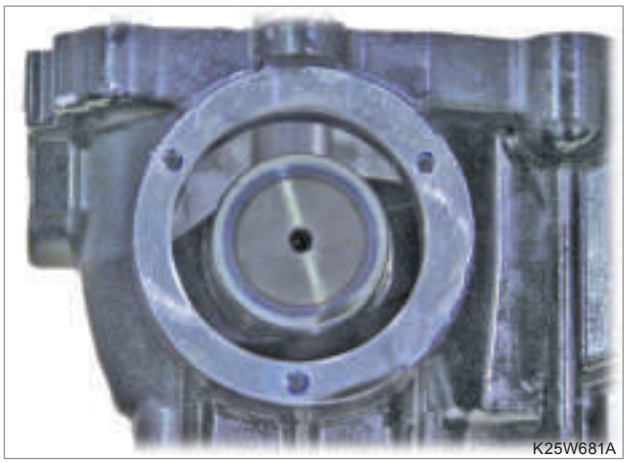
A42W639A

8. Remove the pump shaft cover(1). And pull out the snap ring (2) from the inside and disconnect the pump shaft (3).

SWASH PLATE DISASSEMBLY

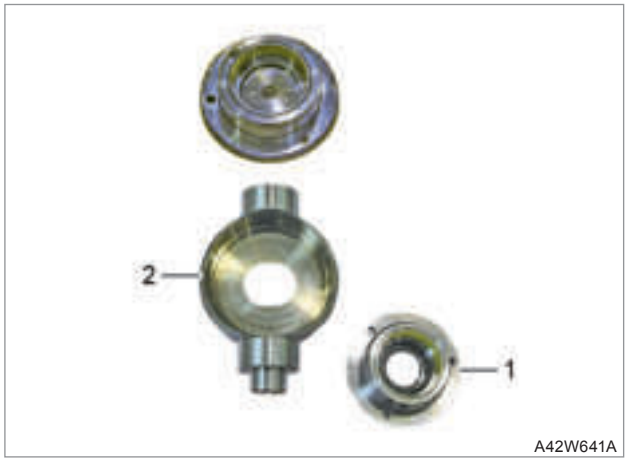


K25W680A


K25W681A

9. Remove the cover (1).

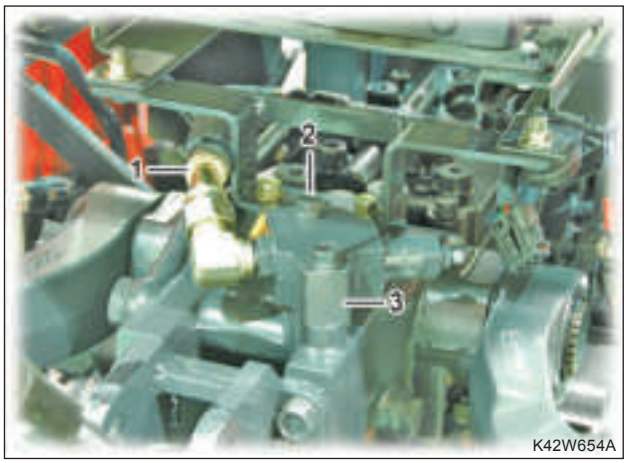
M6 BOLT	3 EA
5-mm L-shape wrench	



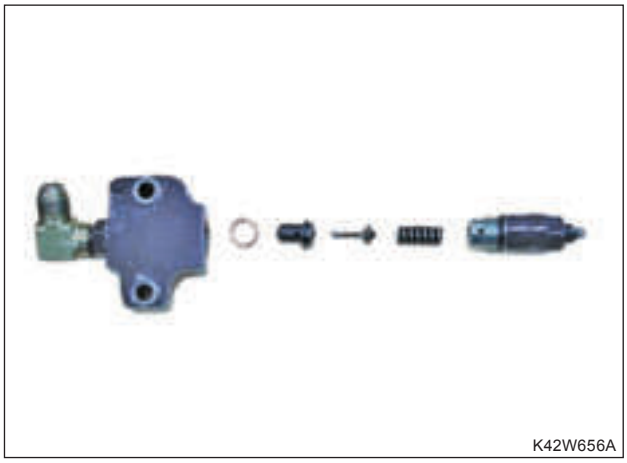
10. Remove the swash cover (1) to remove the swash plate (2).

M6 BOLT	3 EA
4-mm L-shape wrench	

7.10 RELIEF VALVE BLOCK DISASSEMBLY

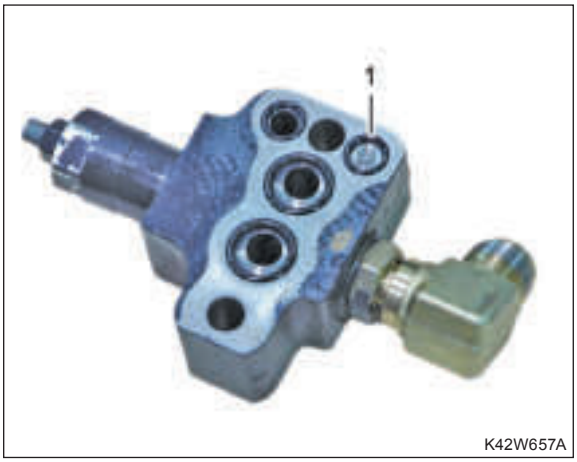


1. Disconnect the hydraulic hose (1) of the relief valve block from the back of the tractor and unscrew the mounting bolts (2) to remove the relief valve (3).



2. Remove the relief valve.

⚠ CAUTION



K42W657A

- **Make sure that the O-ring is correctly installed and apply grease on the mating surface of O-ring when the reinstalling.**

8. INSPECTION, ADJUSTMENT AND TEST

1. When testing oil flow or pressure for the hydraulic kit, warm up the engine to obtain proper oil temperature.

⚠ CAUTION

- **Do not place the SCV lever or joystick lever into the extending or retracting position for an extended period of time. Hydraulic oil can be overheated.**
- **Overheated hydraulic oil can damage the hydraulic kit or cause an injury.**

Notes

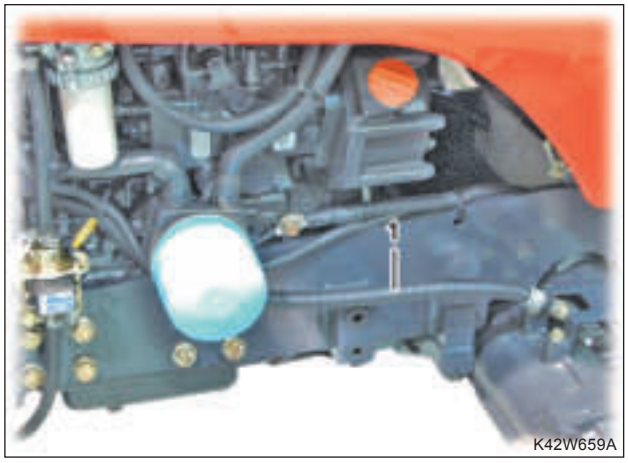
▶ OIL WARMING-UP PROCEDURE


K42W658A

1. **Lower the 3-point hitch completely.**
2. **Idle the engine at a low speed.**
3. **Pull the SCV lever (If equipped) backwards to set the system in the relief status.**
4. **Pull the lever backwards until the suction line becomes too hot to touch.**
   - **The oil temperature at this point should be approx. 38 - 43℃ (100 - 110℉).**

8.1 PST VALVE

8.1.1 RELIEF VALVE PRESSURE TEST

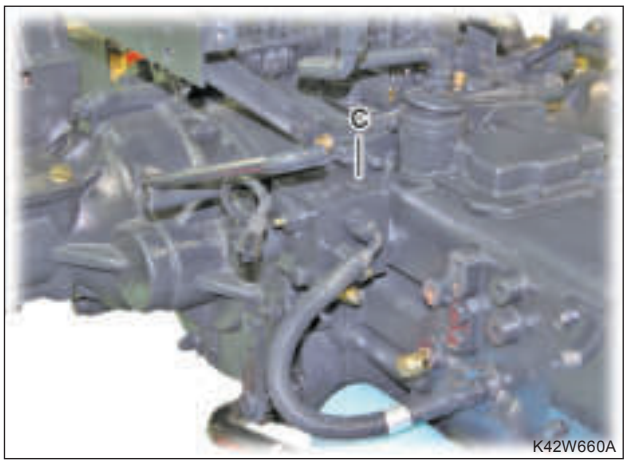


1. Remove the hydraulic hose (1) from the right side of the steering cylinder.
2. Connect a hydraulic pressure gauge, hose and adapter between the steering cylinder port and hydraulic hose.
3. Start the engine and idle it at a high speed.
4. Turn the steering wheel to its left end position. Check the needle on the gauge when the relief valve is operated.

- Relief setting pressure:
  130 kgf/cm^2 [12.74 MPa / 1,849 psi]
- If the measurement is out of the standard, adjust the relief valve or replace the PST valve.

8.2 PTO VALVE

8.2.1 SEQUENCE VALVE PRESSURE TEST



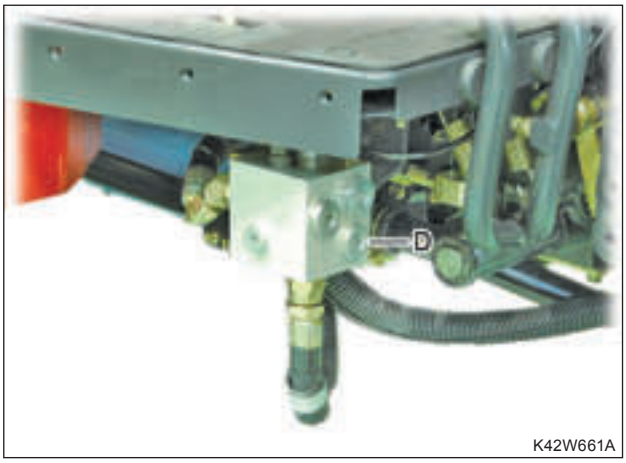
1. Unscrew the port G1 plug (PF1/4)(C) of the PTO valve and connect an adapter, hydraulic pressure gauge and hydraulic hose.
2. Start the engine and run it at 2,600 rpm.
3. Check the pressure when it starts to drop while it is rising.
4. Read the pressure value on the hydraulic pressure gauge.

- Sequence valve setting pressure:
  16 kgf/cm^2 (1.57 MPa / 227.5 psi)

5. If the pressure cannot reach the specified value, adjust the sequence valve or replace the PTO valve.

8.3 FRONT OUTLET VALVE

8.3.1 RELIEF VALVE PRESSURE TEST



1. Unscrew the plug for relief valve pressure checking (PF1/4)(D) of the front outlet valve and connect an adapter, hydraulic pressure gauge and hydraulic hose.
2. Start the engine and run it at 2,600 rpm.
3. With the 3-point link fixed to the structure or certain load applied to the structure, pull the position control lever backward and observe that the pressure gradually rises. Then, check the pressure value when it starts to drop.
4. Check the pressure value when the relief valve operating sound is heard with the rear SCV valve pulled (if equipped).

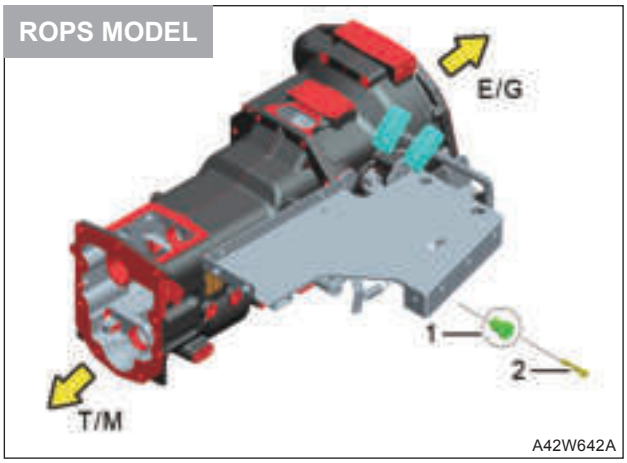
- Relief setting pressure:
  180 ~ 185 kgf/cm^2 (17.64 ~ 18.13 MPa / 2,560 ~ 2,631 psi)

5. If the pressure cannot reach the specified value, adjust the relief valve or replace the front outlet valve.

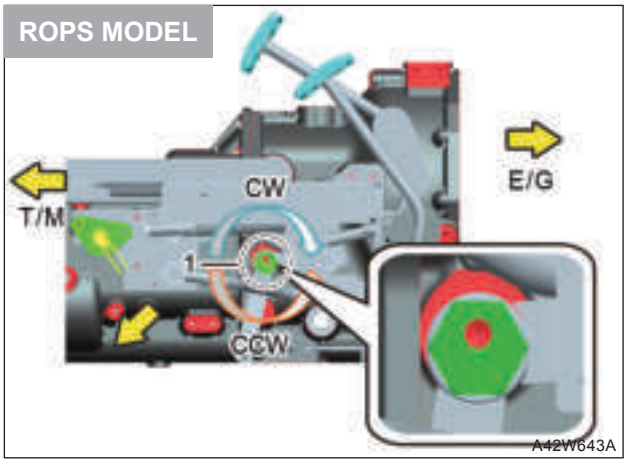
8.4 HST NEUTRAL SETTING

1. Lift the vehicle off the ground so that the wheels idle above the ground.
2. Set the engine to idle speed.
3. Set the range shift lever to the low position.
4. Check if the wheels rotate forward or backward with the HST pedal released.

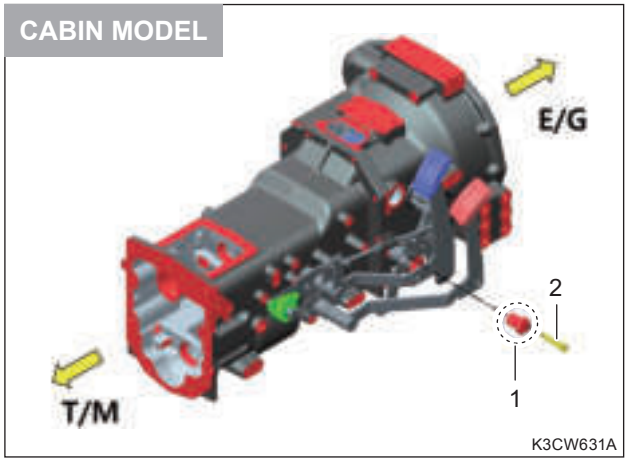
ROPS MODEL



ROPS MODEL

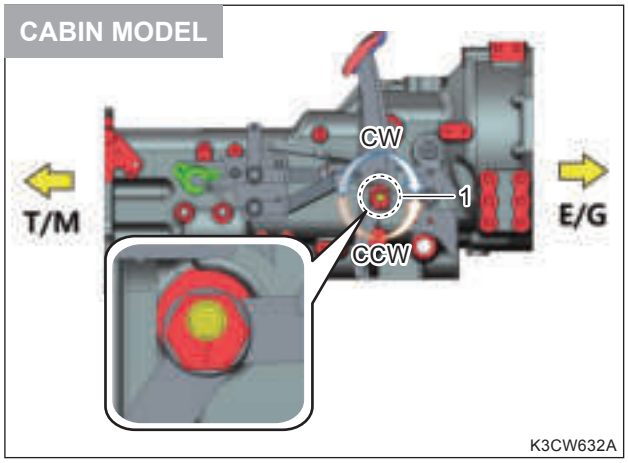


CABIN MODEL



K3CW631A

CABIN MODEL



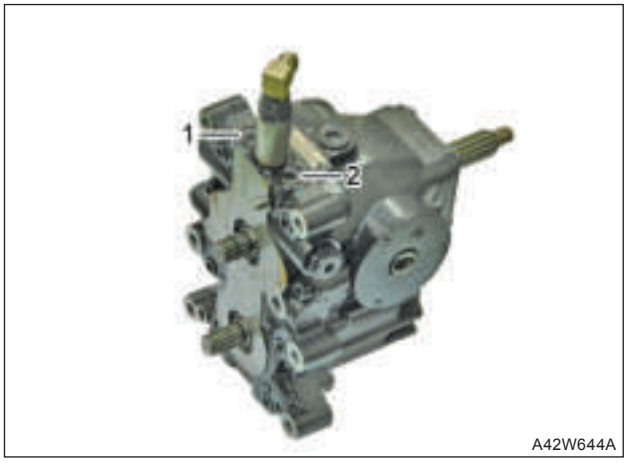
K3CW632A

5. If the wheels rotate in the forward direction with the HST pedal released, unscrew the mounting bolt (2) and turn the shaft (1) counterclockwise slowly as shown in the figure. Tighten the mounting bolt to the position where the wheels stop rotating.
6. If the wheels rotate in the backward direction, turn the shaft (1) clockwise to find the position where the wheels stop rotating. Then, fix the shaft to that position by tightening the mounting bolt (2).

Notes

- **Adjust the forward/reverse driving condition with the mounting bolt (2) fit loosely.**
- **Adjust the shaft (1) using a 32-mm spanner.**
- **In the neutral state, the mounting bolt (2) forms an "I" shape.**

8.5 HST MAIN RELIEF VALVE PRESSURE TEST



A42W644A

(1) Pressure measuring port of high pressure relief valve (forward driving) (PT 3/8)
(2) Pressure measuring port of high pressure relief valve (reverse driving) (PT 3/8)

1. Remove the plug (1) from the pressure measuring port of the HST high pressure relief valve and set the pressure gauge (500 kgf/cm^2 or higher).
2. Start the engine and place the range shift lever in the 3rd gear shift position. Then, depress the brake pedal fully and depress the shuttle shift pedal repeatedly to increase the oil temperature.
3. Set the engine speed to 2,600 RPM and depressing the forward pedal fully. Then, measure the pressure of the high pressure relief valve (for forward driving).
4. If the measurement is out of the standard (380 kgf/cm^2), check the high-pressure relief valve and HST body.
5. Perform the same measurement for the reverse driving side.

⚠ WARNING

- **If the tractor moves with the brake pedal depressed, it can cause an accident. Stop the test immediately and resume the test after the service.**
- **Never let anyone other than the driver get near the front and rear side of the tractor. Any observer can be hit by a tractor during the test and he/she can seriously get injured.**

MEMO

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1. MAJOR ELECTRIC SYSTEM SPECIFICATIONS

ITEM	STANDARD
Battery	12 V 90 Ah
Alternator	12 V 50 Ah
Starter	12 V 2.2 kW
Preheat relay	DC 12 V, 70 A
PTO engagement switch	Rated current: 14 V 15 A
Safety switch	12 V 10 A
Preheat controller	Voltage range: DC 8 - 16 V
Flasher unit	Voltage range: DC 10 - 16 V
Direct signal lamp (front)	12 V 21 W/5 W
Combination lamp (rear)	12 V 27 W, 12 V 8 W, 12 V 21 W/5 W
Head lamp	HS1 12V 35W/35W
Horn	12 V , 350 ± 2 Hz, 110 ± 5 dB
Fusible link	60 A X 2 EA
Cruise controller	DC 12V 1A
Safety start neutral switch	DC 13V

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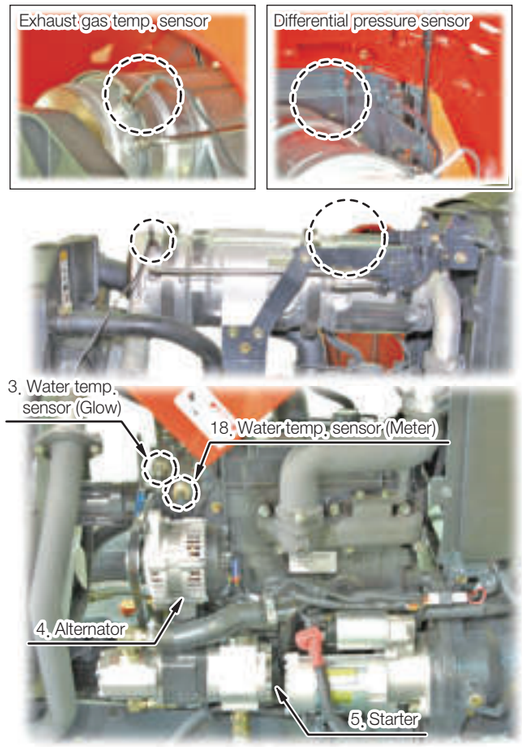
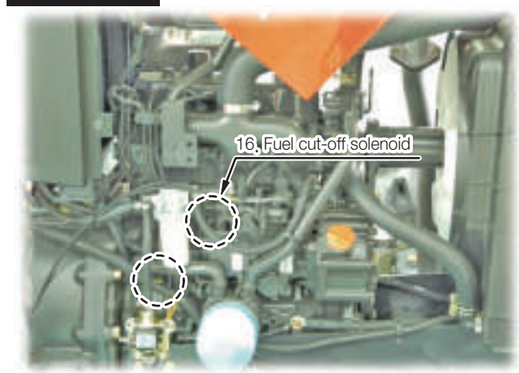
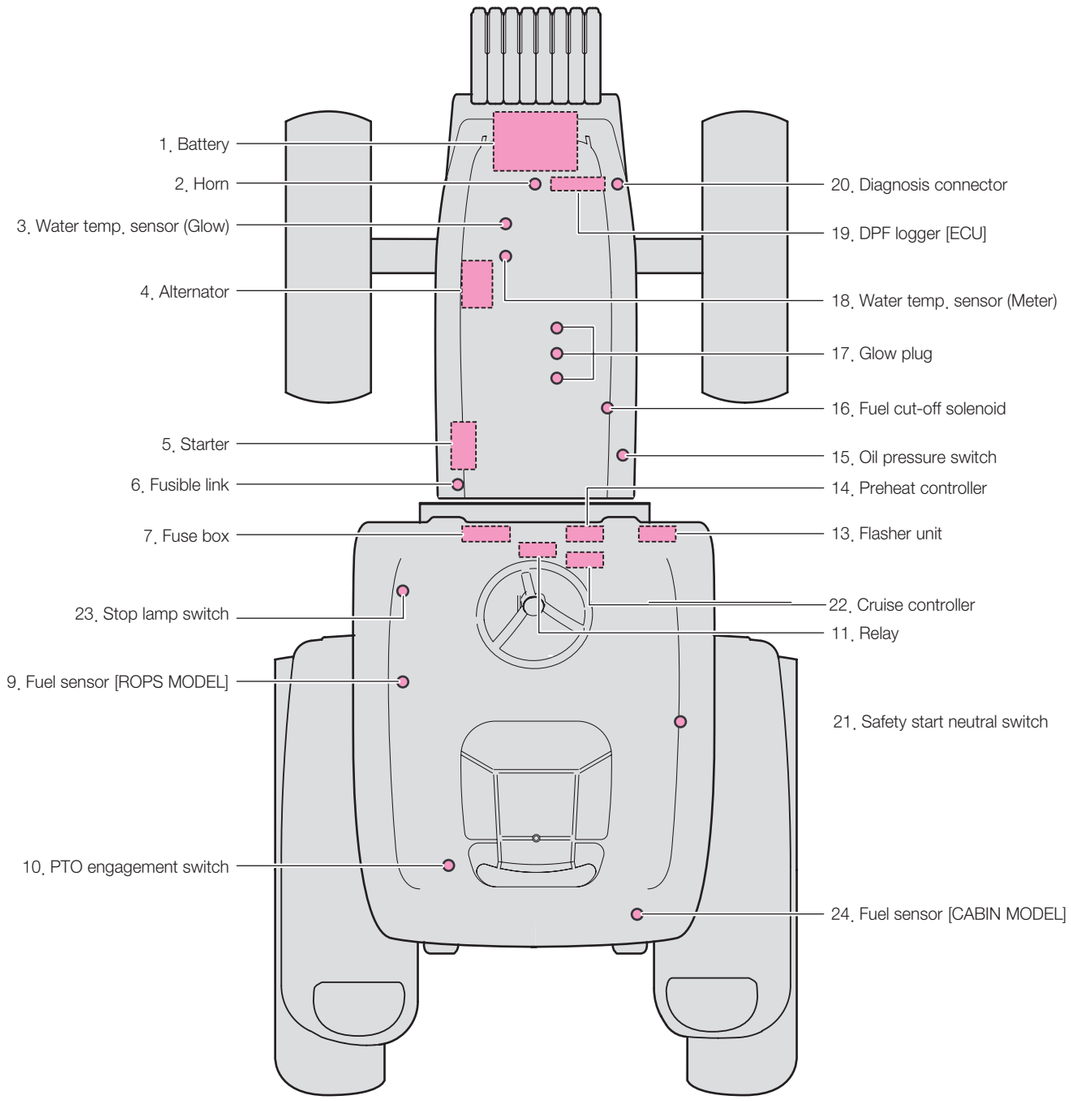
2. MAJOR ELECTRIC COMPONENT LAYOUT DIAGRAM

ENGINE (LH)

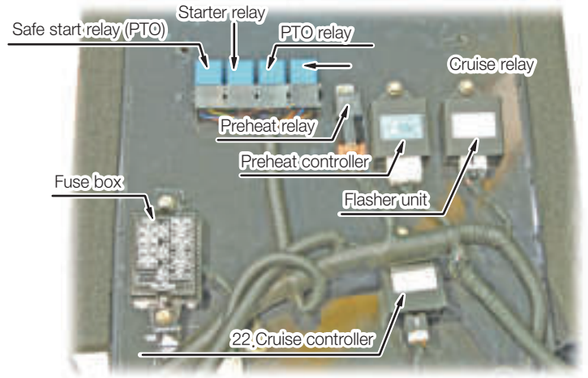


ENGINE (RH)

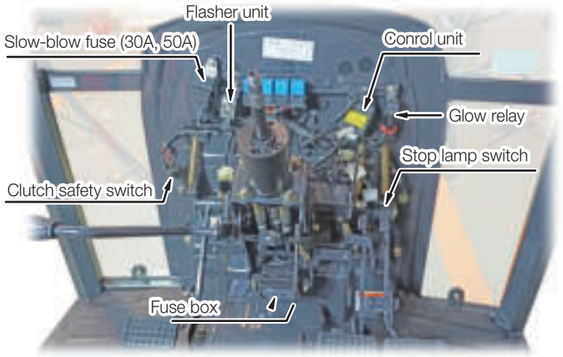


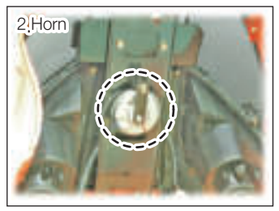


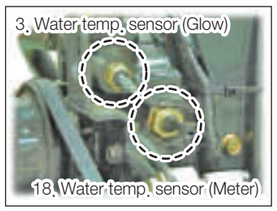
BONNET HINGE ASSEMBLY ROPS MODEL

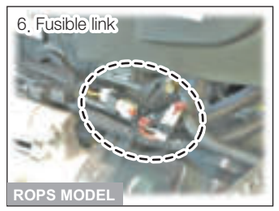


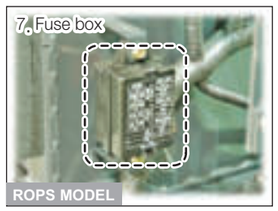
BONNET HINGE ASSEMBLY CABIN MODEL

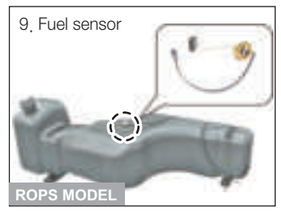


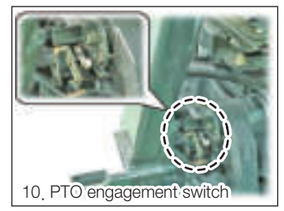


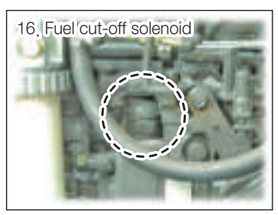


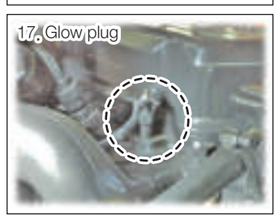


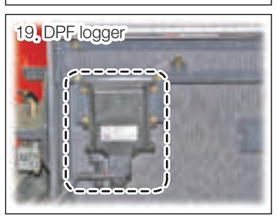


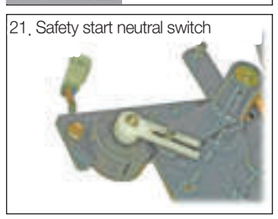


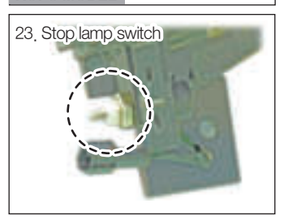


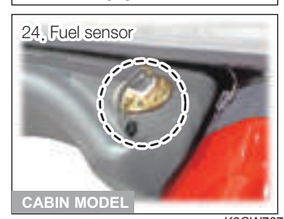












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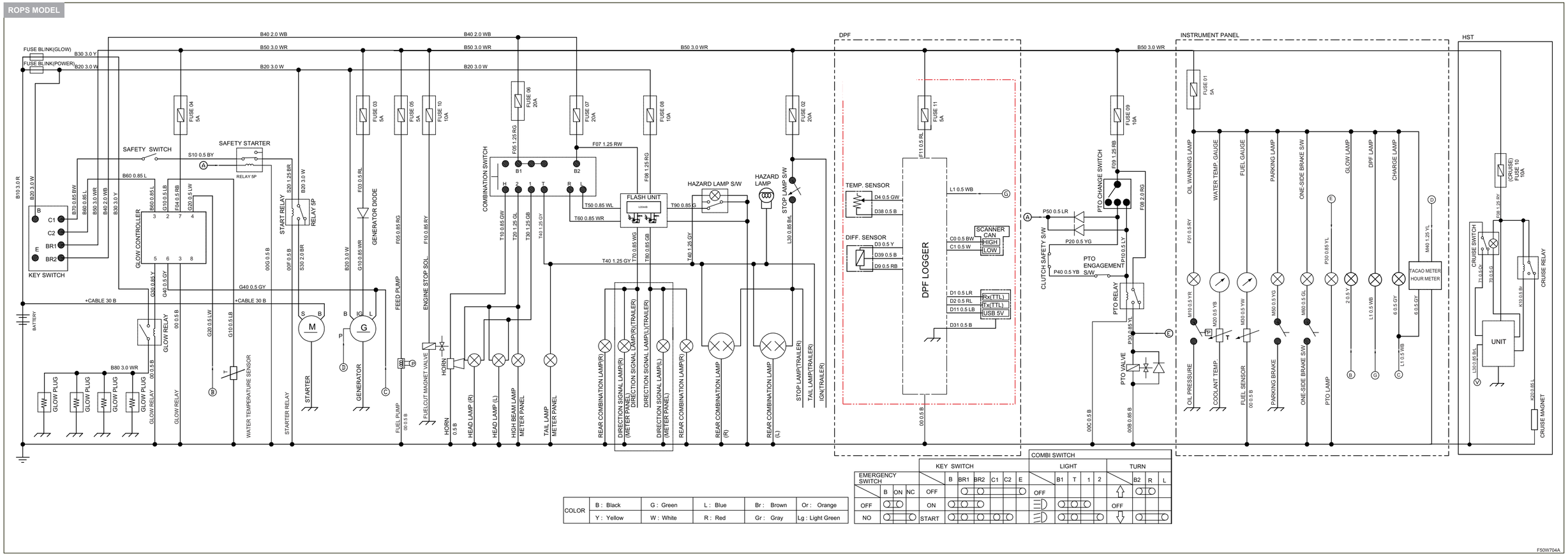
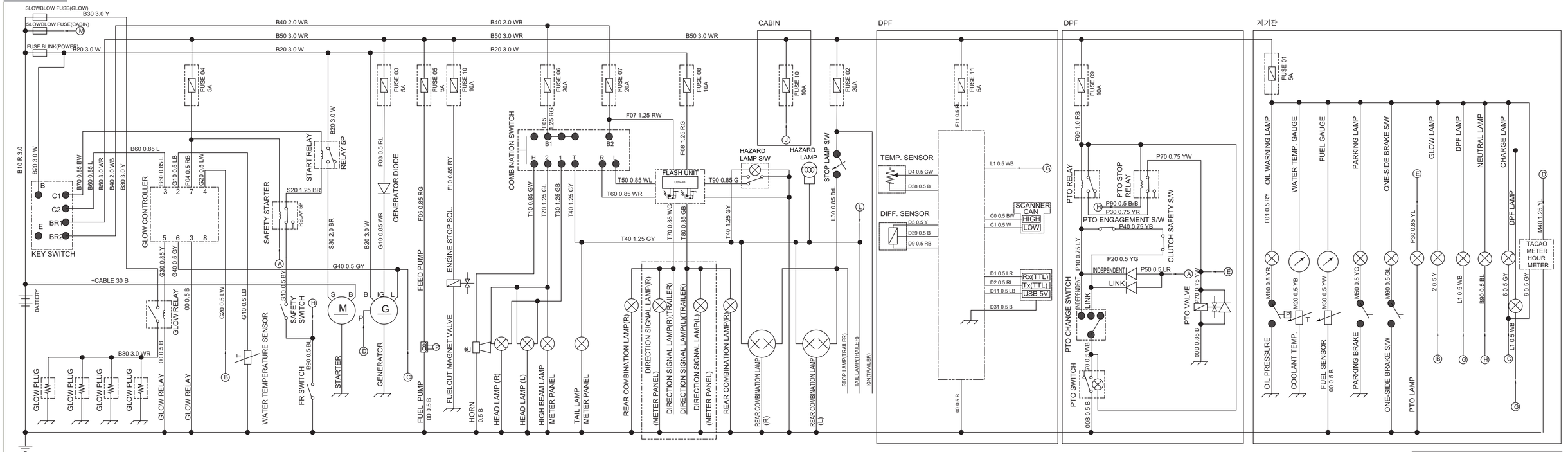
3. ELECTRIC WIRING DIAGRAM

ROPS MODEL



CABIN MODEL



COLOR	B : Black	G : Green	L : Blue	Br : Brown	Or : Orange
	Y : Yellow	W : White	R : Red	Gr : Gray	Lg : Light Green

EMERGENCY SWITCH				KEY SWITCH							COMB SWITCH								
											LIGHT						TURN		
	B	ON	NC		B	BR1	BR2	C1	C2	E		B1	T	1	2		B2	R	L
				OFF	○	○				○									
OFF	○			ON	○	○						◐	○	○					
NO			○	START	○	○		○	○			◐	○	○	○				

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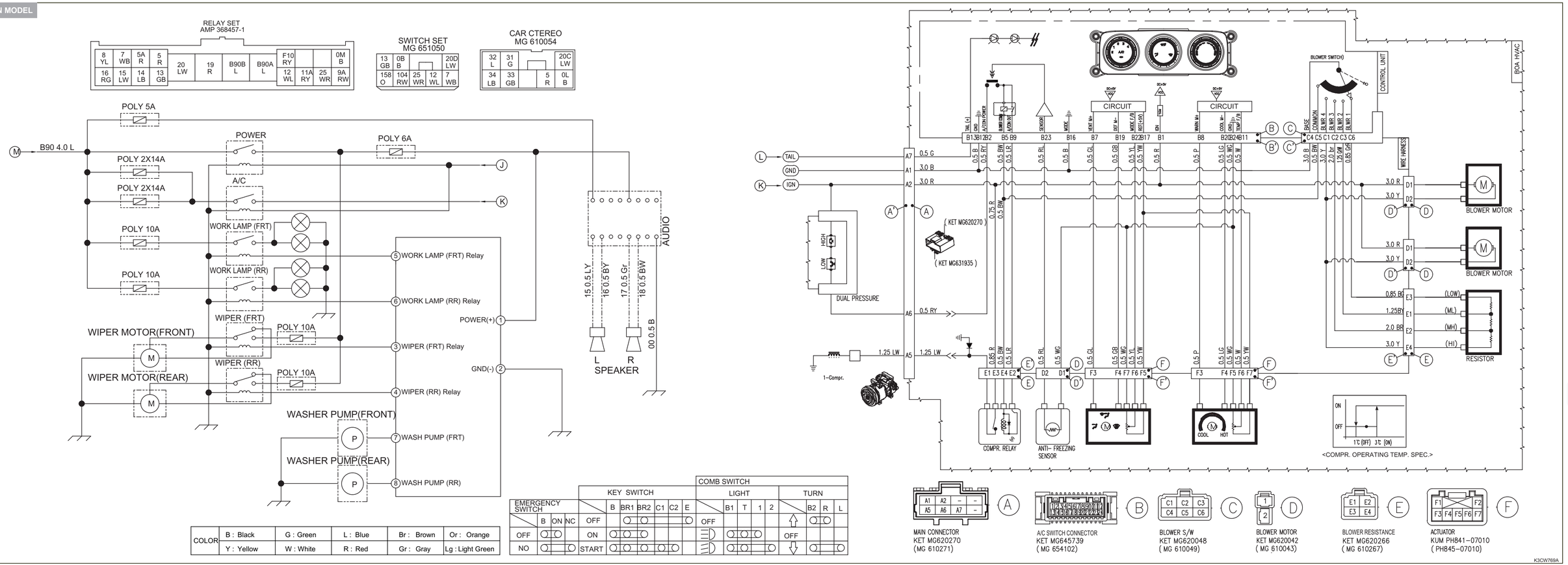
CABIN MODEL



COLOR					
	B : Black	G : Green	L : Blue	Br : Brown	Or : Orange
	Y : Yellow	W : White	R : Red	Gr : Gray	Lg : Light Green

EMERGENCY SWITCH				KEY SWITCH						COMB SWITCH								
					B	BR1	BR2	C1	C2	E	LIGHT					TURN		
	B	ON	NC	OFF								B1	T	1	2		B2	R	L
OFF				ON							OFF					OFF			
NO				START															

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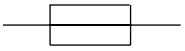
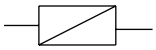
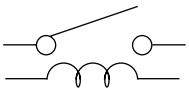
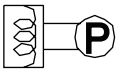
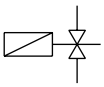
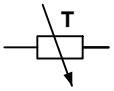
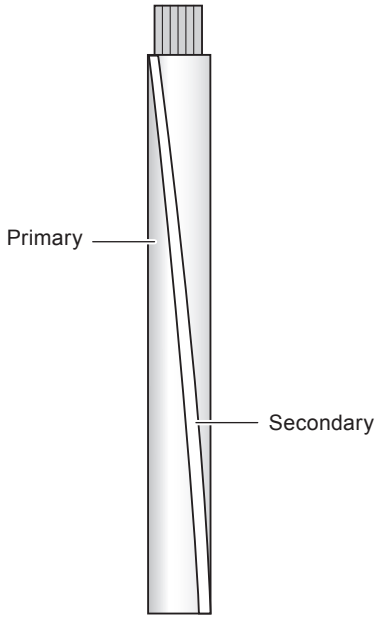
3.1 SYMBOLS AND WIRING COLOR DEFINITION IN ELECTRIC CIRCUIT

3.1.1 SYMBOL

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	Battery		Diode
	Fusible link		Gauge
	Fuse		Lamp
	Relay		Feed pump
	Switch		Fuel cut-off solenoid
	Starter		Horn
	Alternator		Beacon
	Glow plug		Water temp. sensor

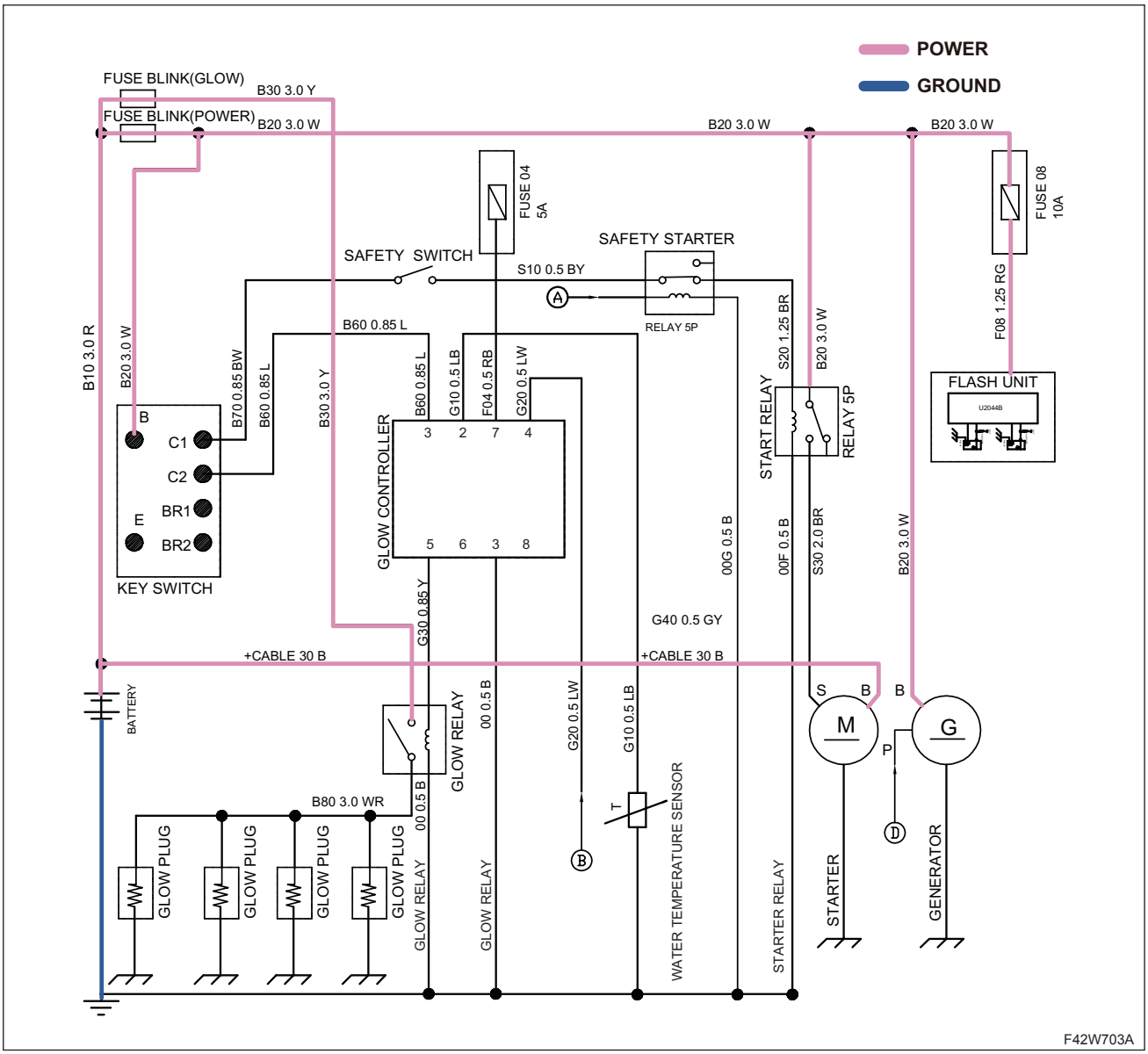
3.1.2 COLOR DEFINITION



SYMBOL	COLOR
B	Black
Y	Yellow
G	Green
W	White
L	Blue
R	Red
Br	Brown
Gr	Gray
Or	Orange
Lg	Light green
BW	Black (primary) + White (secondary)
YG	Yellow (primary) + Green (secondary)

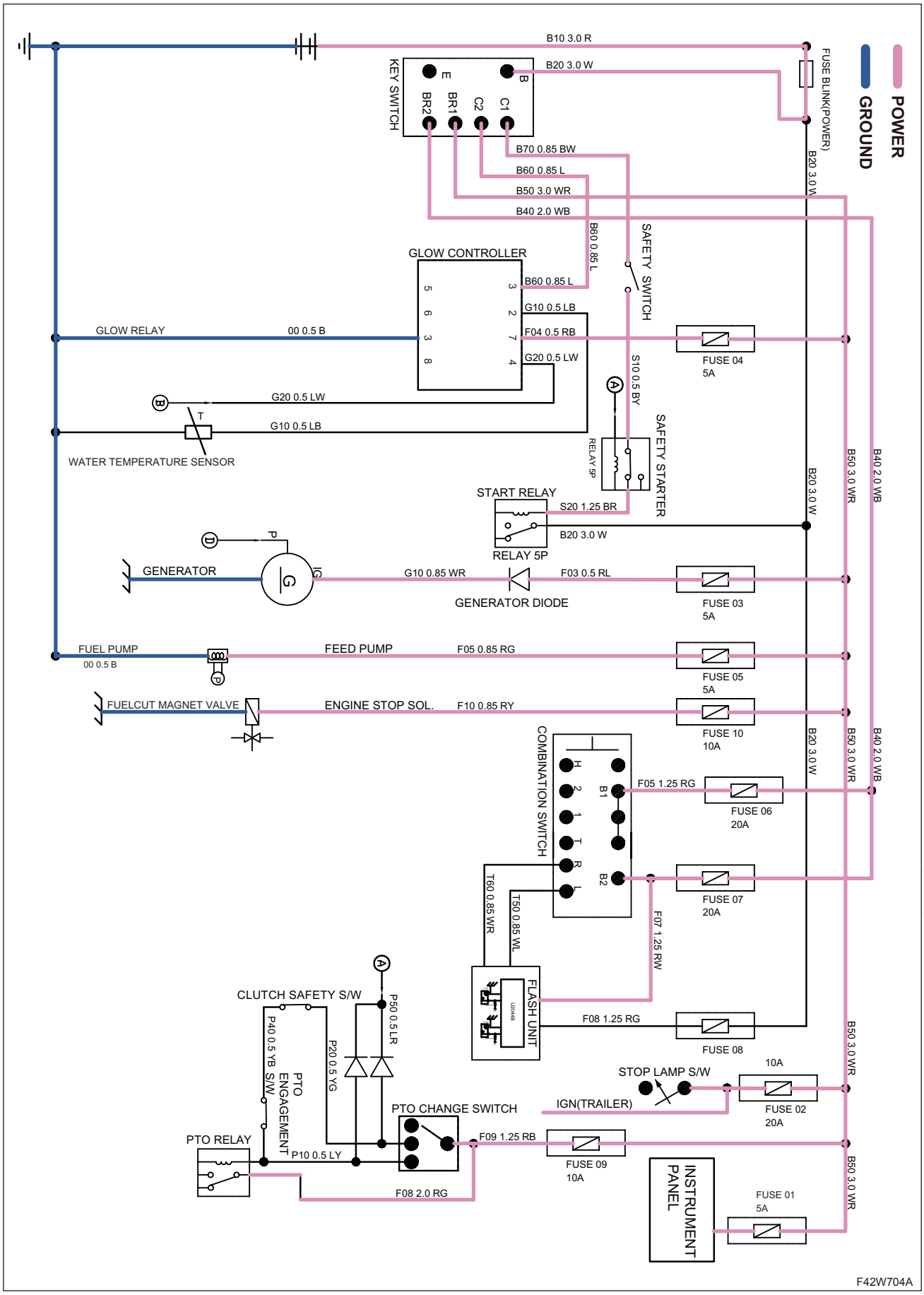
4. CIRCUIT CONFIGURATION BY MAJOR FUNCTION

4.1 BATTERY AND FUSIBLE LINK



There are two fusible links at the end of the wiring 3.0R above the battery in the left section of the circuit diagram. The fusible link on the wiring 3.0Y is to supply main power to the glow relay. When the glow relay is energized, power is supplied to the glow plug to operate it. The fusible link on the wiring 3.0W is related to all other electric devices except main power for preheating operation. It supplies power to the start relay, generator, flasher unit.

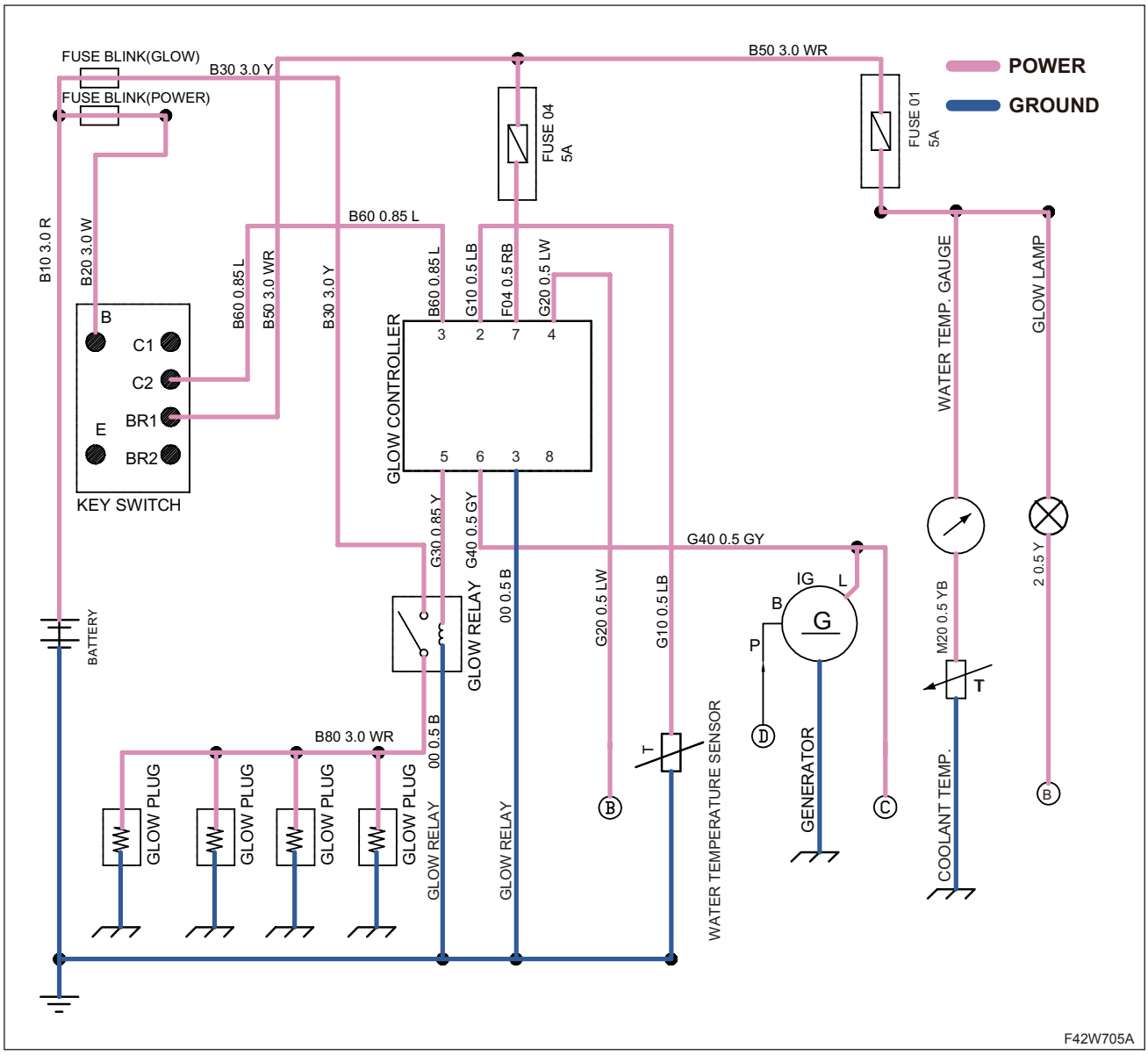
4.2 IGNITION SWITCH ON



The ignition switch is located in the upper left section of the circuit diagram. This switch receives battery power through the wiring 3.0W.

1) ACC: When the ignition switch is turned to the 1st stage, ignition switch ON power is supplied through the terminal BR2 and wiring 2.0WB. When following the wiring 2.0WB from the terminal BR2 in the circuit diagram, this wiring is passed through two 20 A fuses and is connected to the combination switch for input power. Power supplied through the first fuse (No. 06) is delivered to various lamps through the combination switch. Power supplied through the second fuse (No. 07, 20 A) is delivered to the flasher unit, turn signal lamps and hazard warning switch through the turn signal lamp switch.
2) ON: When the ignition switch is turned to the 2nd stage, ignition switch ON power is supplied through the terminal BR1 and wiring 3.0WR. Firstly, an ignition switch ON signal is delivered to the glow controller through the 5 A fuse and wiring 0.5RB. The glow controller starts to control preheat operation as soon as it receives this signal. Secondly, this power is delivered to the terminal IG of the generator through the 5 A fuse and wiring 0.5RL, passing through the diode. Thirdly, it is connected to the fuel feed pump through the 5 A fuse and wiring 0.85RG to run the fuel feed pump with the ignition switch ON. Fourthly, it is connected to the fuel cut-off solenoid through the 10 A fuse and wiring 0.85RY to supply and cut off fuel depending on the position of the ignition switch (ON/OFF). Fifthly, it is delivered to the brake lamp switch through the 20 A fuse. Sixthly, it is supplied to the PTO selection switch through the 10 A fuse and wiring 1.25RB. Seventhly, it is connected to the instrument cluster through the 5 A fuse as main power for the instrument cluster.
3) Manual preheating: When the ignition switch is held in between the ON and START positions, the manual preheating signal is supplied to the glow controller from the terminal C2 through the wiring 0.85L to activate manual preheating.
4) START: When the ignition switch is turned to the START position, an engine start signal is supplied from the terminal C1 through the wiring 0.85BW. This start signal is passed through the safety switch and is delivered to the safety start relay. When the safety start relay receives a PTO engagement signal from (A), the 5P relay is energized so the relay main power is disconnected. Therefore, the engine cannot be started when the PTO switch is set in the ON position. When the safety switch is connected and the PTO switch is in the OFF position, power is supplied to the coil of the start relay so main power of the start relay is directly supplied to the start motor for cranking.

4.3 PREHEAT



The circuit related to the preheat operation is located in the left section of the above circuit diagram.

As soon as the ignition switch is turned to the ON position, preheating operation is started and the preheat indicator on the instrument cluster is turned ON. When the ignition switch is returned to the ON position from the START position, after-heating operation is started. However, if the engine is not started so the generator is not operated properly, after-heating operation is not performed.

-. It receives the manual preheating signal from the ignition switch through the wiring 0.85L.

-. It receives the coolant temperature signal through the wiring 0.5LB.

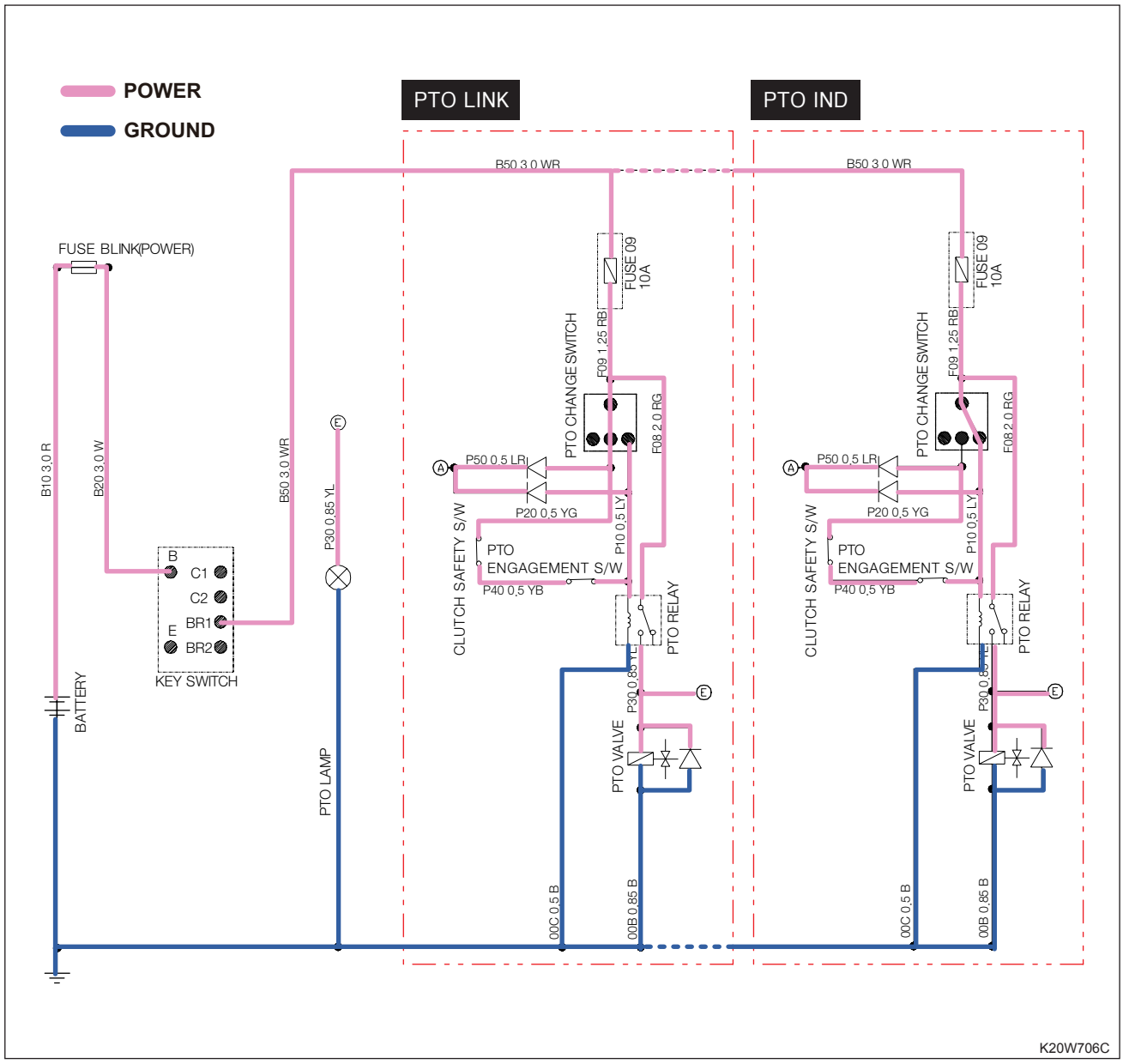
-. It receives the ignition switch ON signal through the wiring 0.5RB.

-. It sends power to the preheat indicator on the instrument cluster through the wiring 0.5LW and instrument cluster wiring (B).

-. The wiring 0.85Y is a output wiring for the glow relay coil signal. When the glow relay coil is energized by this signal output, main power is directly supplied from the battery through the fusible link for preheating and wiring 3.0Y to the glow plugs installed to each cylinder in the engine.

-. The wiring 0.5GY is connected to the terminal L which is a direct current output terminal of the generator. This is to enable after-heating operation only when the generator is normally running.

4.4 PTO OPERATION



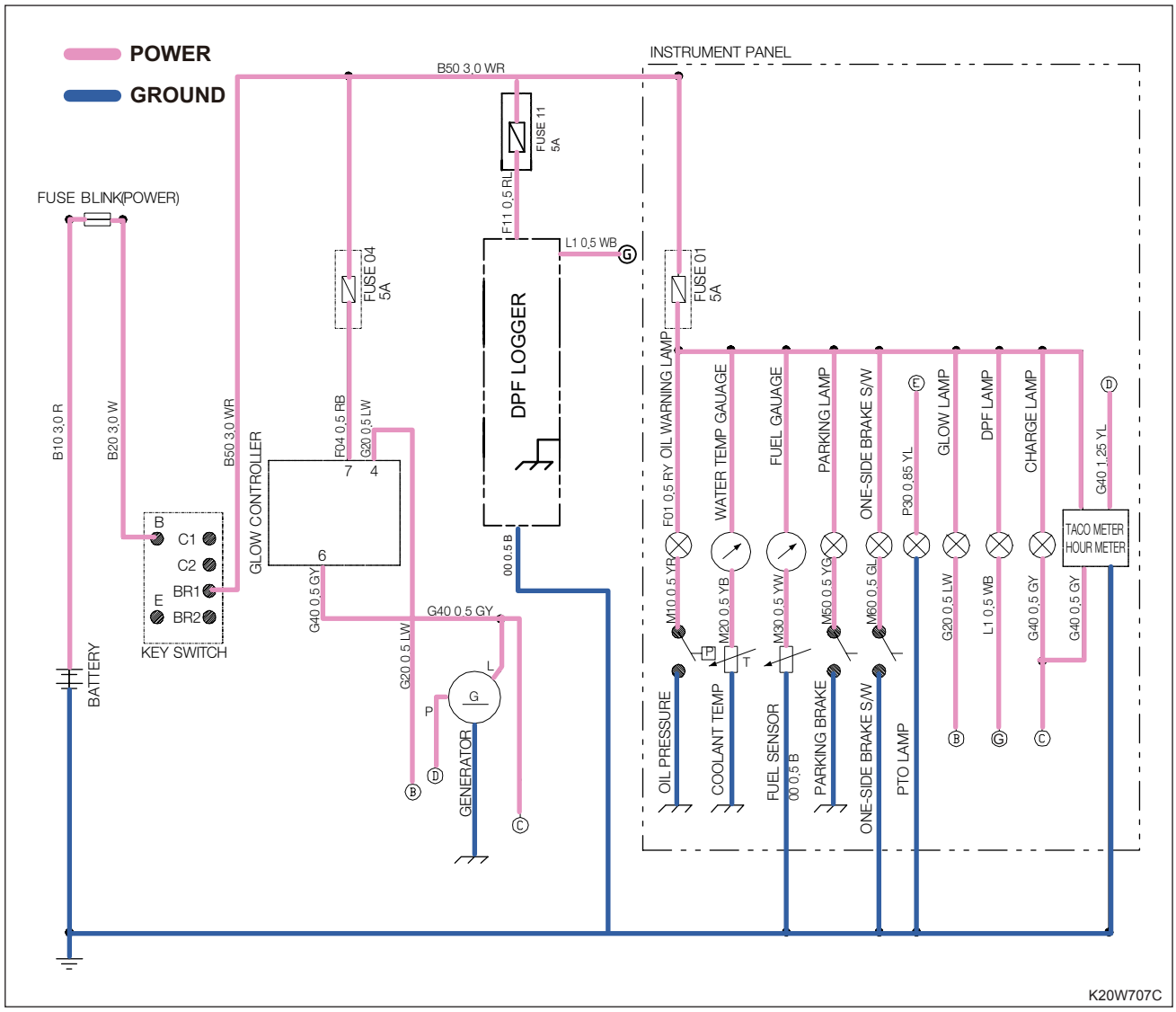
1) LINK: This is activated when the PTO switch is set in the LINK position. As power is supplied to the PTO switch through the wiring 1.25RB, it is sent out through the wiring 0.5YG. This signal is sent to the PTO safety start relay through the wiring 0.5LR and diode first to prevent the engine from starting when the PTO switch is set in the ON position. The wiring 0.5YG is connected to the clutch safety switch. This switch is installed to the driving clutch pedal to stop PTO when the clutch pedal is depressed. Therefore, when the PTO switch is set to the Manual position, depressing the driving clutch pedal stops the PTO.

   The wiring 0.5YB is passed through another switch before it is connected to the PTO relay. This is the PTO engagement switch which is installed to the 3-point hitch lift arm lever. When setting the 3-point hitch to the lifting position, the PTO engagement switch becomes open to stop the PTO.

2) IND: This is activated when the PTO selection switch is set in the IND position. As power is supplied to the PTO switch through the wiring 1.25RB, it is sent out through the wiring 0.5LY. This signal is sent to the PTO safety start relay through the wiring 0.5LR and diode first to prevent the engine from starting when the PTO switch is set in the ON position. Then, it is directly supplied to the PTO relay to operate the PTO regardless of the operation of the driving clutch or 3-point hitch lift arm lever.

3) PTO relay and PTO indicator: The PTO relay coil power is supplied through the wiring 0.5YG or 0.5LY depending on the position of the PTO selection switch. The main power of the PTO relay is connected to the ignition switch ON power passed through the 10 A fuse. The main power of the PTO relay is sent through the wiring 0.85YL. It is sent to the instrument cluster through the connecting wiring (E) to inform the driver with the PTO operation status before it reaches the PTO valve. Therefore, the PTO indicator on the instrument cluster can be turned on properly even when the PTO is not operated due to malfunction of the PTO valve. Also, when the PTO selection switch is set in the LINK position, the PTO indicator on the instrument cluster goes off even though the PTO is turned off only temporarily by operation of the driving clutch pedal or lift arm lever. Make sure to maintain high standards of safety in this condition.

4.5 INSTRUMENT CLUSTER AND SENSORS



The instrument cluster receives its main power through the 5 A fuse when the ignition switch is set to the ON position.

1) Oil pressure warning: The oil pressure warning lamp switch is connected to the ground side of the wiring 0.5RY. It is turned on by controlling electricity supplied to its negative terminal.

2) Coolant temperature gauge: The coolant temperature sensor is connected to the coolant temperature gauge through the wiring 0.5YB. The gauge is operated by controlling the electricity supplied to its negative terminal.

3) Fuel gauge: The fuel gauge is connected to the fuel sensor through the wiring 0.5YW. The fuel gauge on the instrument cluster is operated by controlling electricity supplied to its negative terminal.

4) Parking indicator (optional): The parking indicator is connected to the parking switch through the wiring 0.5YG. The parking indicator on the instrument cluster is operated by controlling electricity supplied to its negative terminal.

5) One-side brake warning lamp (optional): The one-side brake warning lamp is connected to the one-side brake switch through the wiring 0.5GL. This lamp on the instrument cluster is operated by controlling electricity supplied to its negative terminal.

6) PTO indicator (optional): The PTO indicator on the instrument cluster is supplied with '+' power through the connecting wiring (E) and wiring 0.85YL (main power output line of the PTO relay) for its illumination.

7) Preheat indicator: The preheat indicator on the instrument cluster is connected to the wiring 0.5LW (preheat indicator output line of the preheat controller) through the connecting wiring (B). The preheat controller controls electricity supplied to the negative terminal of the indicator to turn it on.

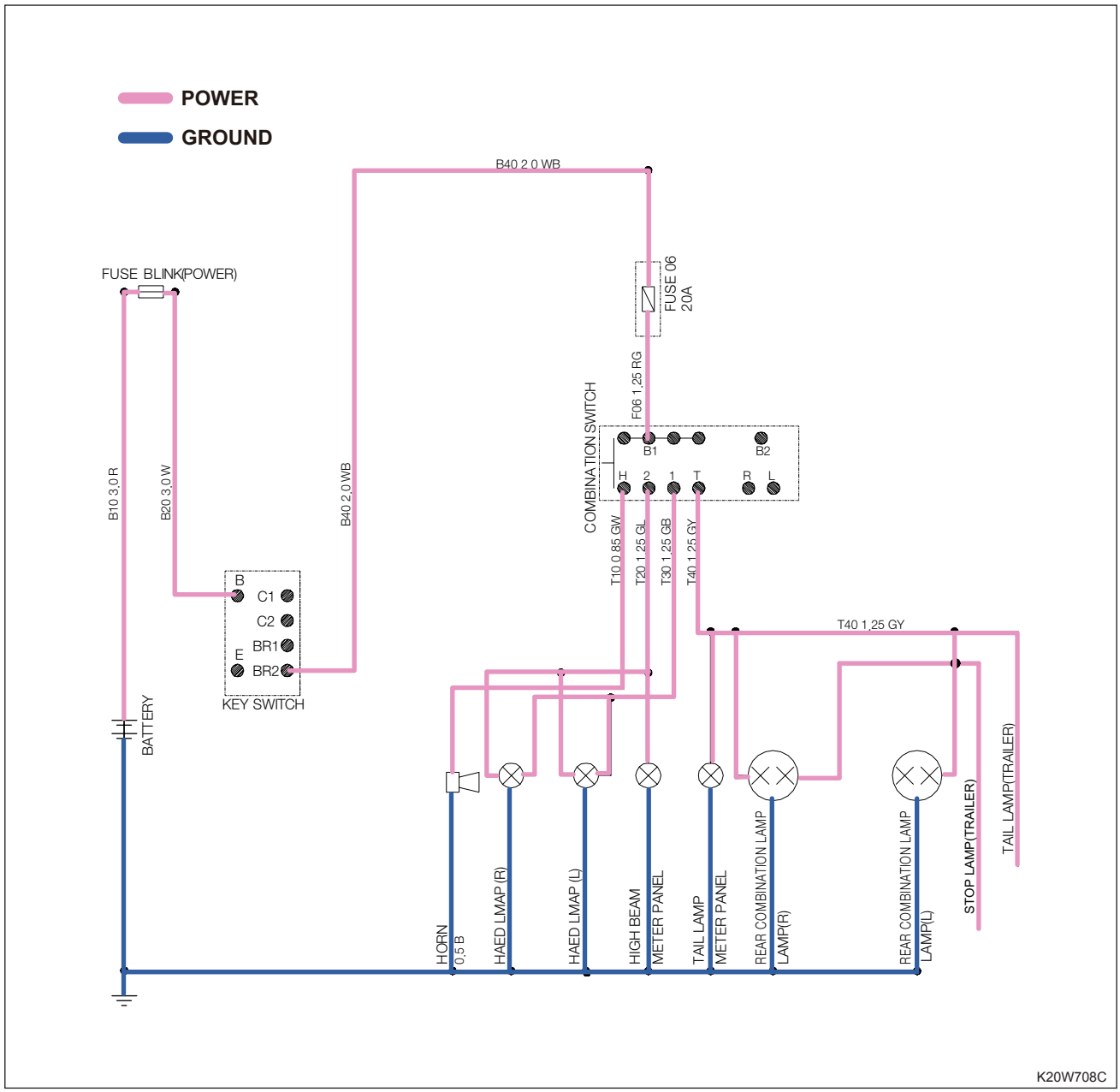
8) Charge warning lamp: The charge warning lamp is connected to the output terminal L of the generator through the connecting wiring (C). Therefore, when the generator is not in operation, the ignition switch ON power at the input terminal of the instrument cluster is sent to the ground side through the generator to turn on the charge warning lamp. When the generator is activated to start charging, charging power is sent from the terminal L of the generator. Then, both terminals of the lamp are applied with positive power, making no potential difference. Therefore, the charge warning lamp is turned off when the generator charges normally.

9) Tachometer: The hourmeter and tachometer have two input terminals and two output terminals. One input terminal is supplied with ignition ON power (the instrument cluster input power). The other input terminal is connected to the terminal P (alternating current wave terminal) of the generator through the connecting wiring (D) to receive alternating current wave power from the generator. This alternating current wave is converted to the RPM to be displayed on the tachometer on the instrument cluster.

10) Hourmeter: One of the output terminal of the hourmeter is a ground terminal while the other output terminal is connected to the terminal L (the direct current output terminal) of the generator through the connecting wiring (C) and wiring 0.5GY. Therefore, the hourmeter is operated as long as the generator is in proper operation.

11) DPF lamp: The DPF lamp is connected to the wiring 0.5WB (DPF lamp output line of the DPF LOGGER) through the connecting wiring (G). Therefore, the DPF lamp is turn on when the DPF operating signal is sent to the instrument cluster by the DPF LOGGER.

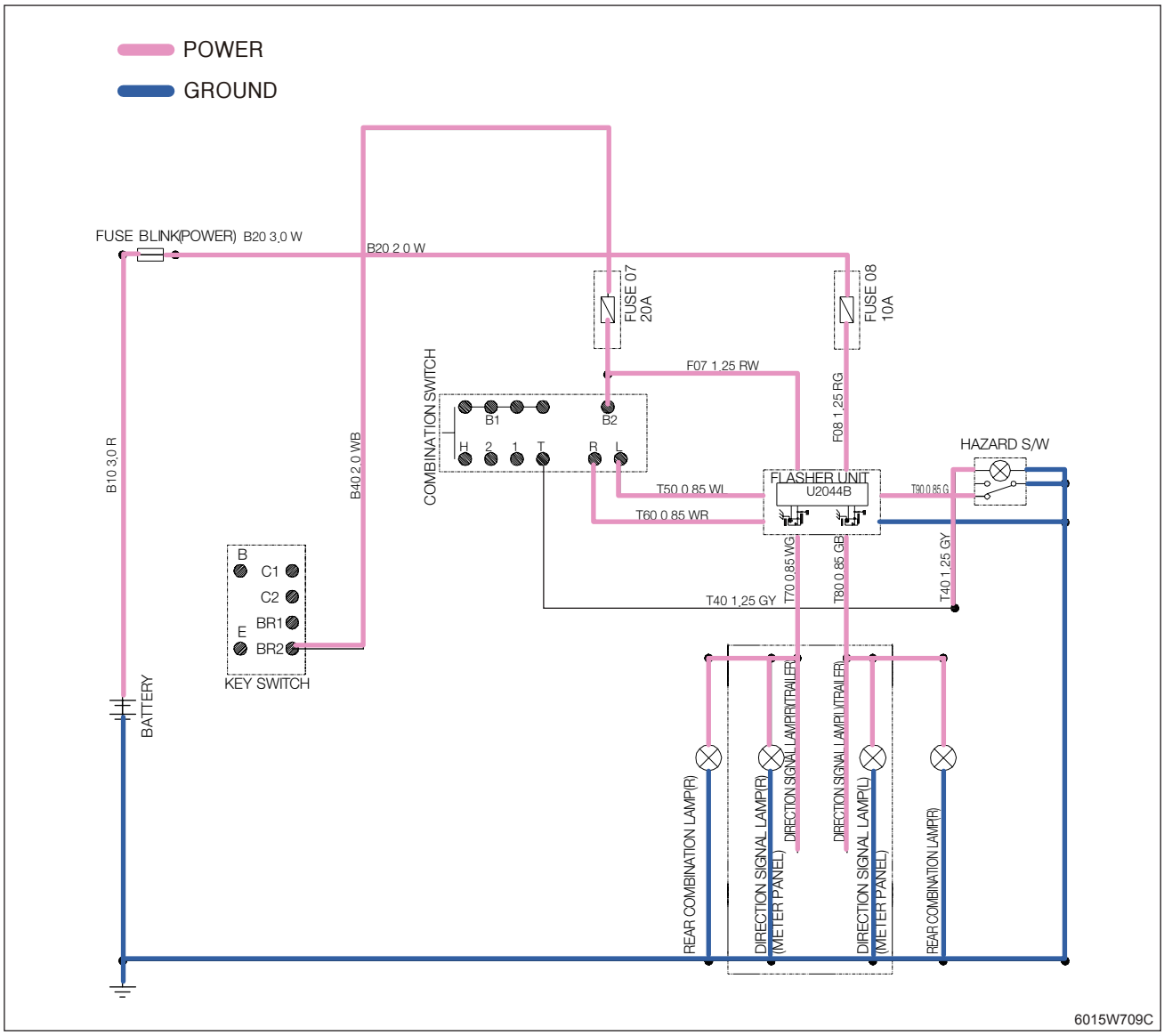
4.6 COMBINATION SWITCH AND HEAD LAMP



The combination switch receives power from the terminal ACC of the ignition switch through the wiring 1.25RG and 20 A fuse.

1) Horn: The terminal H, which is located in the left end position among the terminals of the combination switch, is connected to the horn through the wiring 0.85GW to activate the horn when the horn switch is pressed.
2) High beam: The terminal No. 2 of the combination switch is connected to the head lamp high beam through the wiring 1.25GL. It is also connected to the high beam indicator on the instrument cluster.
3) Low beam: The terminal No. 1 of the combination switch is connected to the head lamp low beam through the wiring 1.25GB. As shown in the circuit diagram, the high beam and low beam bulbs are integrated into one unit which receives power for both beams.
4) Position/Tail lamp: The terminal T of the combination switch is for the position lamp or tail lamp. It is connected to the front/rear combination lamp and instrument cluster illumination lamp through the wiring 1.25GY.

4.7 TURN SIGNAL LAMP SWITCH, HAZARD WARNING FLASHER AND FLASHER UNIT



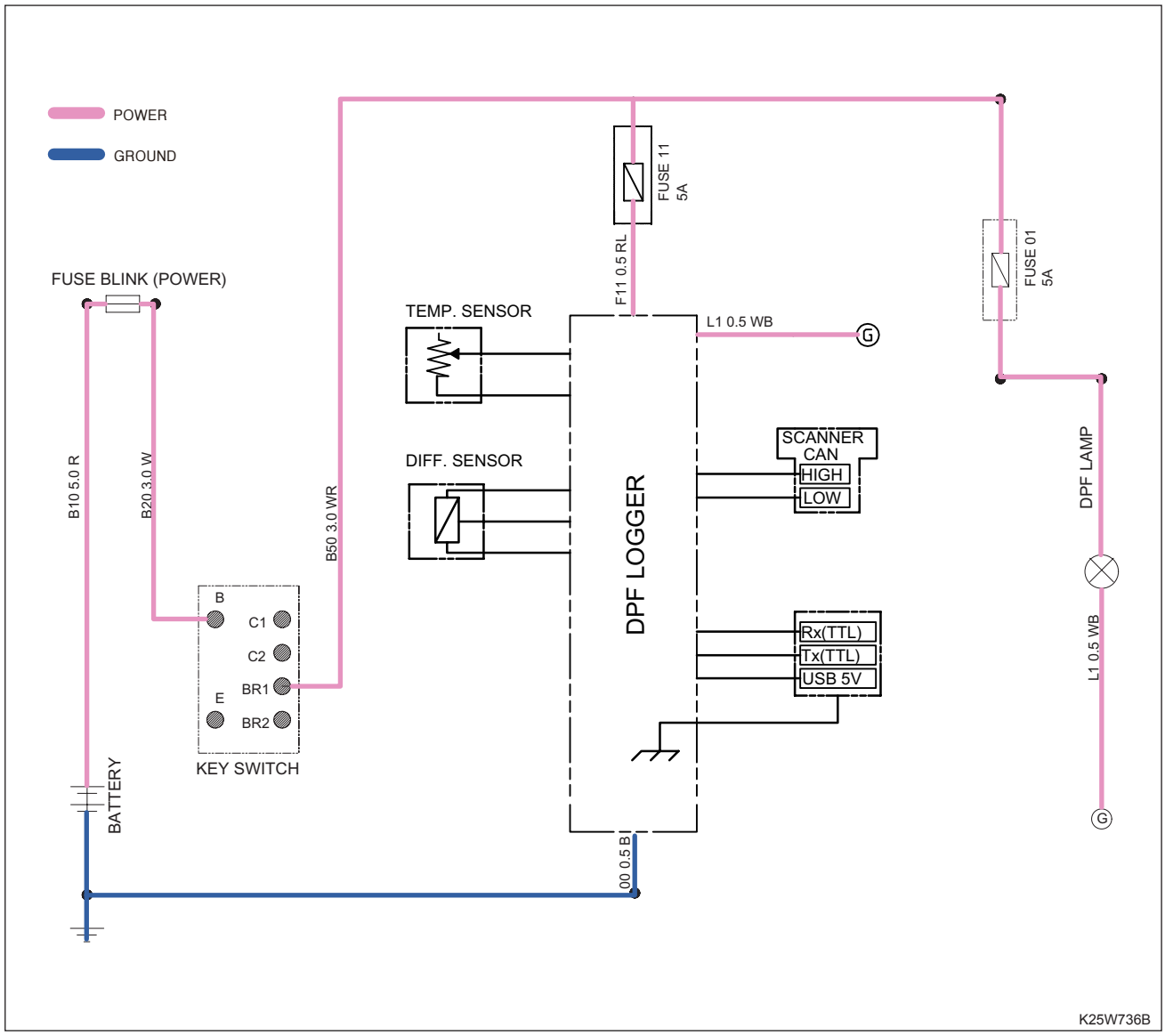
The turn signal lamp switch of the combination switch receives power from the terminal ACC of the ignition switch through a separate 20 A fuse.

1) Right turn: When setting the turn signal lamp switch to the right turn position, power is supplied to the flasher unit from the terminal R through the wiring 0.85WR. Then the flasher unit changes continuous power to intermittent power supplied to the front combination lamp, rear combination lamp and right turn signal indicator on the instrument cluster to make each lamp flicker.

2) Left turn: When setting the turn signal lamp switch to the left turn position, power is supplied to the flasher unit from the terminal L through the wiring 0.85WL. Then the flasher unit changes continuous power to intermittent power supplied to the front combination lamp, rear combination lamp and left turn signal indicator on the instrument cluster to make each lamp flicker.

The flasher unit has two input power wirings. One is the wiring 1.25RW which receives power from the terminal ACC of the ignition switch. It branches off after the turn signal lamp fuse (20 A) and is connected to the flasher unit. The power from the terminal ACC is used for the turn signal lamp when the flasher unit receives a turn signal lamp signal from the turn signal lamp switch. The other input wiring is the wiring 2.0W which supplies power directly from the battery through the 10 A fuse. This power is used for the turn signal lamps on both sides when the hazard warning flasher switch is activated. This power is also used by the fusible link for the ignition switch. Also, power for the hazard warning flasher is supplied to the hazard warning flasher of the trailer as well.

4.8 DPF LOGGER



When the ignition switch is turned to the ON position, power flows through the wiring 3.0WR to be delivered to the DPF logger through the fuse No. 11 (5 A).

If a faulty condition is detected by the differential pressure sensor of the DPF, the corresponding signal is delivered to the instrument cluster through Ⓖ to turn on the DPF warning lamp.

5. SERVICE TIPS AND COMPONENTS OF ELECTRIC SYSTEM

5.1 SERVICE TIPS

5.1.1 BATTERY

1. Stop the engine and remove the ignition key.
2. Open the hood and disconnect the negative battery cable (1) first and then the positive battery cable (2).
3. Unscrew the bolt from the battery mounting to remove the battery.
4. Replace the battery with a new one if necessary.
5. When re-installing the battery, connect the positive cable first and then the negative cable firmly.

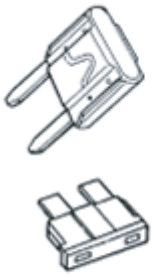
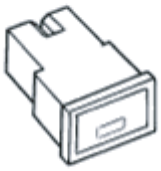
Notes

- **Loose battery terminal can cause a spark or poor charging performance.**
- **If the cable terminal is contaminated, clean it thoroughly and apply grease on it.**

⚠ CAUTION

- **Keep flames or sparks away from the battery. It can explode due to gas production during its operation.**
- **As the battery discharges naturally, charge it every month (for 8 to 10 hours at 7 A).**
- **Make sure to use the battery with the specified capacity.**
- **Be sure to attach the rubber boots to the battery positive terminal and booster terminal.**

5.1.2 FUSE

FUSE	 6015W702A
FUSIBLE LINK	 6015W703A
SLOW-BLOW FUSE	 6015W704A

If any electric part is malfunctioning, check the fuse first.

1. Make sure to use the fuse with the specified capacity.
2. Check if any fusible link is open.

Notes

- **When continuity is detected by touching both terminals with a tester, it is normal. If continuity is not detected, replace the part with a new one.**

3. Check that the slow-blow fuse is bolted into the slow-blow fuse box to the specified torque firmly.

⚠ CAUTION

- **Do not replace the fuse with other metal wires or aluminum foil. It can lead to electric shock and fire.**
- **If the nut of the slow-blow fuse is not tightened firmly, it can cause a fire. Make sure to tighten it firmly.**

5.1.3 ELECTRIC WIRING

1. If any electric part is malfunctioning, check its electric wiring.
2. Check if the electric wiring is in contact with another part, it is peeled off or its contact is loose.

   If it is peeled off, wind insulating tape around it.
3. If water enters the contact area, it can cause malfunction. Wipe out any moisture and dry it sufficiently.
4. Try to disconnect and re-connect any related connectors. Check if a terminal is misaligned or improperly engaged.
5. Inspect it regularly with the engine running after every 50 hours of use or after every season even though there is no apparent sign of damage.

⚠ WARNING

- **Never attempt to modify electric wirings of the machine. It can cause a fire.**

Notes

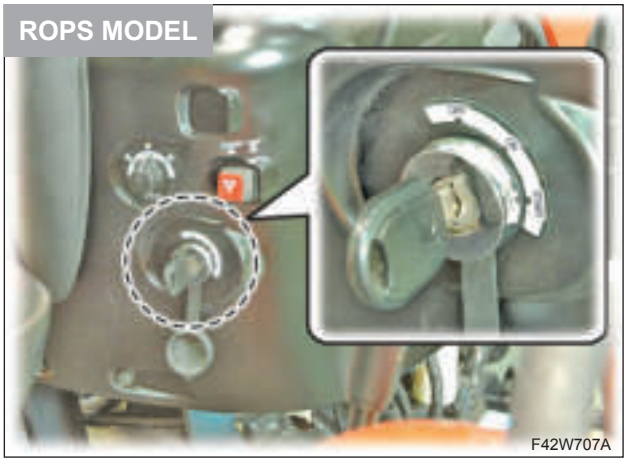
▶ **INSPECTION ORDER FOR ELECTRIC SYSTEM AND CIRCUIT FAILURE**

- **Battery → Fusible link → Fuse → Ignition relay → Switch → Load**

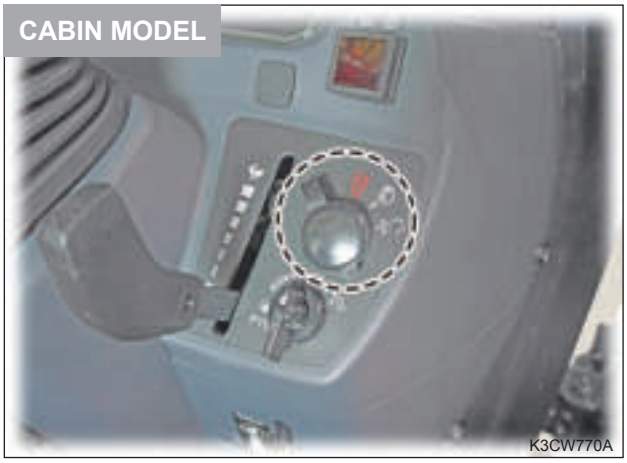
5.2 COMPONENTS

5.2.1 IGNITION SWITCH

ROPS MODEL



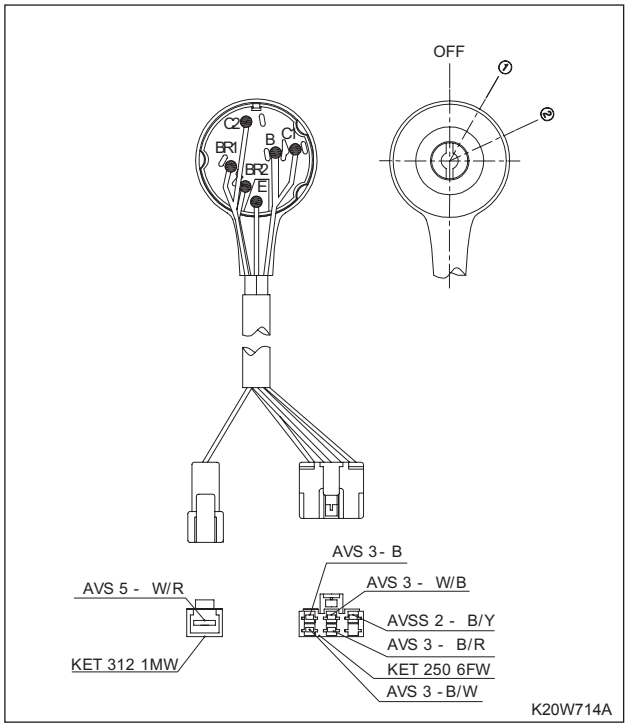
CABIN MODEL



The ignition switch is installed on the dashboard from the right side of the steering wheel. When turning the ignition switch clockwise to the first position, "ON" is selected. When turning it to its end, the engine is started.

When releasing the switch as soon as the engine is started, the switch is automatically returned to the ON position.

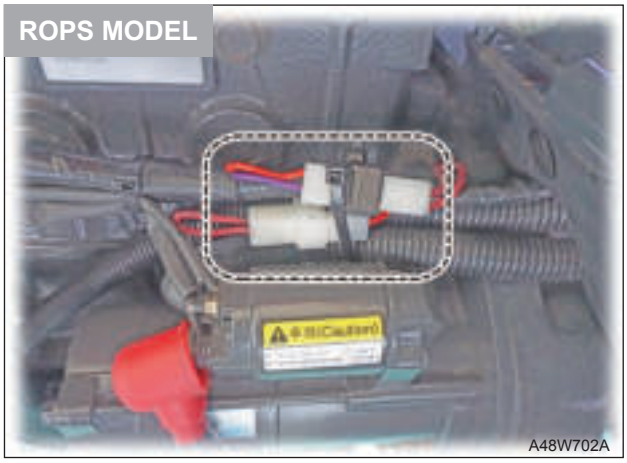
▶ **CONNECTOR AND WIRING DIAGRAM**



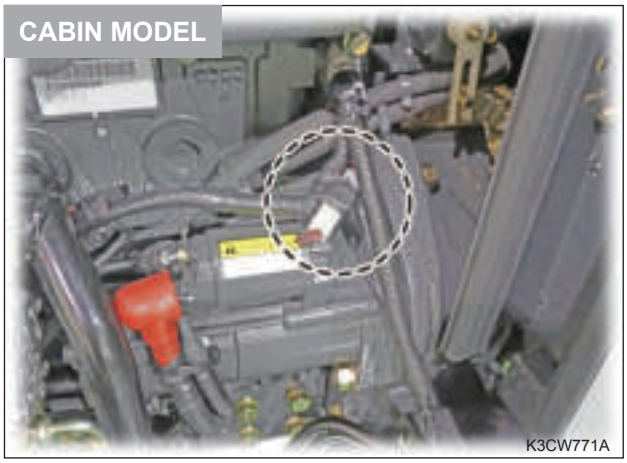
ITEM		TERMINAL SYMBOL				
		B	BR1 BR2	C1	C2	E
SWITCHING POSITION	OFF		●			●
	①	●	●			
	②	●	●	●	●	

5.2.2 FUSIBLE LINK / SLOW-BLOW FUSE

ROPS MODEL



CABIN MODEL

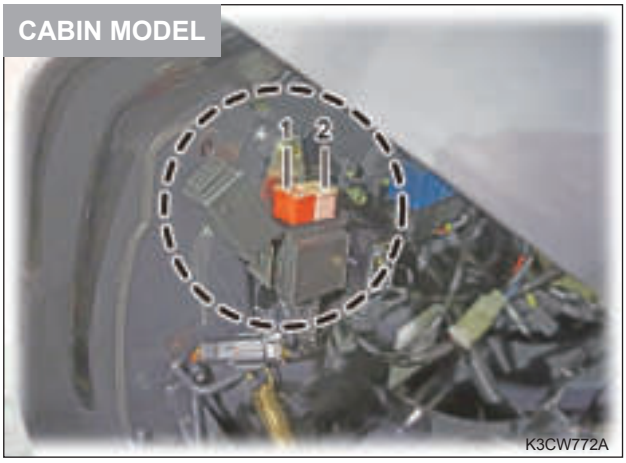


The fusible link is installed on the top of the starter in the left section of the engine compartment. If malfunction occurs in any electric system but the battery is intact, check the condition of the fusible link first.

There are two 60 A fusible links [ROPS MODEL]. One is for main power and the other one is for preheating.

There is one 60 A fusible link [CABIN MODEL] which is for preheating.

CABIN MODEL

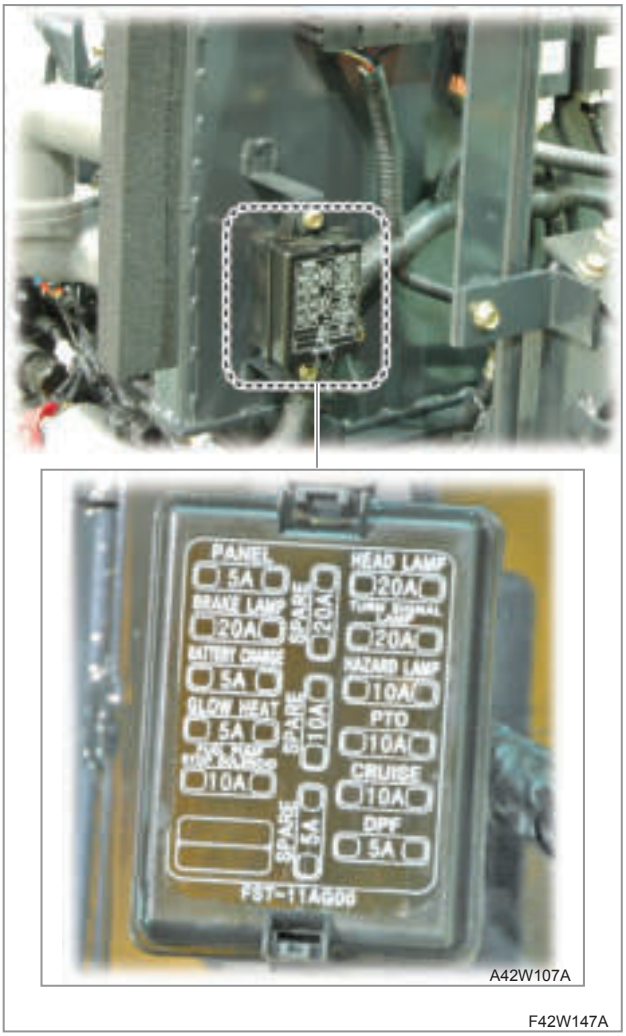


(1) 30A : For Power (2) 50A : For Cabin

The slow-blow fuses (30A, 50A) are installed on the upper left section of the hood hinge in the instrument panel cover.

5.2.3 FUSE BOX

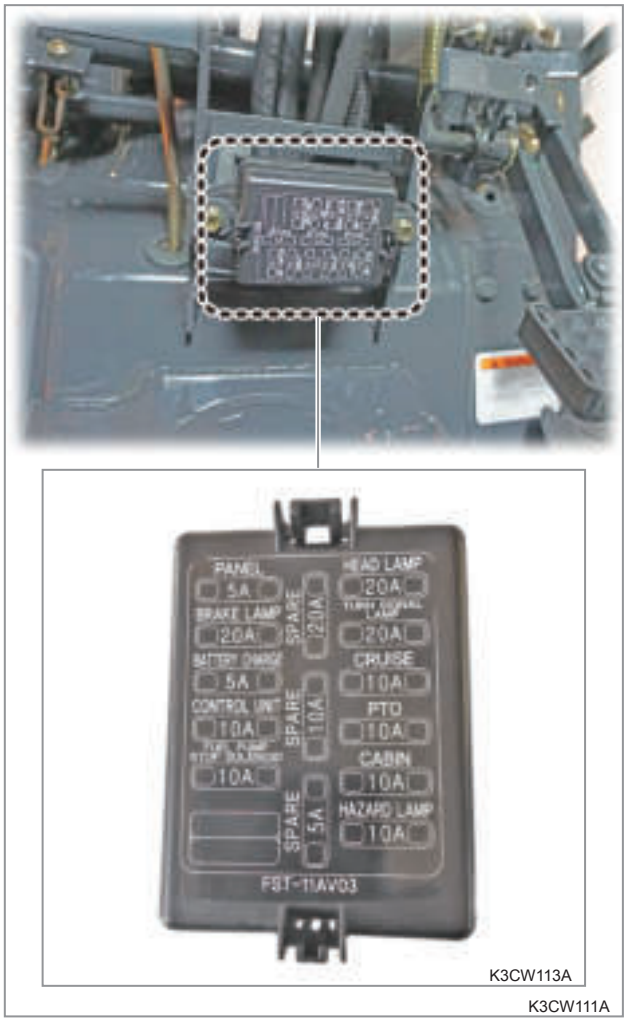
ROPS MODEL



1. A fuse is to protect circuits from electric overload.
2. The relay control current is high load current which flows through a circuit.
3. To prevent damage to the electric system, never use a fuse with higher capacity than the one already installed.

ITEM	SPECIFICATION	DESCRIPTION
Fuse 1	5 A	Panel
Fuse 2	20 A	Brake lamp
Fuse 3	5 A	Battery charge
Fuse 4	5 A	Glow/Heat
Fuse 5	5 A	Fuel pump, Stop solenoid
Fuse 6	20 A	Spare
Fuse 7	10 A	Spare
Fuse 8	5 A	Spare
Fuse 9	20 A	Head lamp
Fuse 10	20 A	Turn signal lamp
Fuse 11	10 A	Hazard lamp
Fuse 12	10 A	PTO
Fuse 13	10 A	Cruise
Fuse 14	5 A	DPF

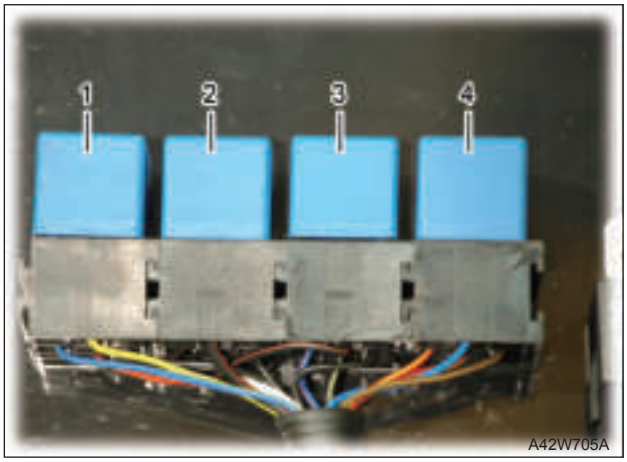
CABIN MODEL



1. A fuse is to protect circuits from electric overload.
2. The relay control current is high load current which flows through a circuit.
3. To prevent damage to the electric system, never use a fuse with higher capacity than the one already installed.

ITEM	SPECIFICATION	DESCRIPTION
Fuse 1	5 A	Panel
Fuse 2	20 A	Brake lamp
Fuse 3	5 A	Battery charge
Fuse 4	10 A	Control unit
		DPF [Cabin model]
Fuse 5	10 A	Fuel pump, Stop solenoid
Fuse 6	20 A	Spare
Fuse 7	10 A	Spare
Fuse 8	5 A	Spare
Fuse 9	20 A	Head lamp
Fuse 10	20 A	Turn signal lamp
Fuse 11	10 A	Cruise
Fuse 12	10 A	PTO
Fuse 13	10 A	Cabin
Fuse 14	10 A	Hazard lamp

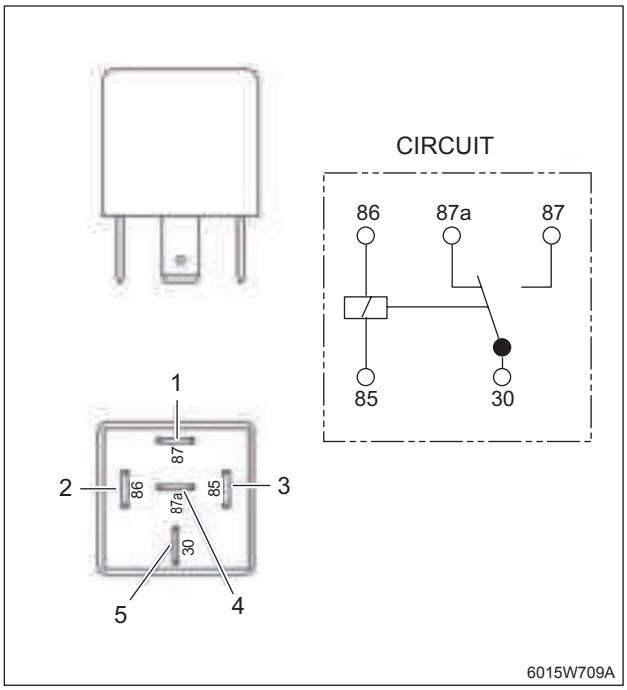
5.2.4 RELAY 5P



(1) Safety start relay (PTO)
(2) Starter relay
(3) PTO relay
(4) Cruise relay

The relay 5P is installed on the upper left section of the hood hinge assembly (dash panel) to supply power to functions for each operating device.

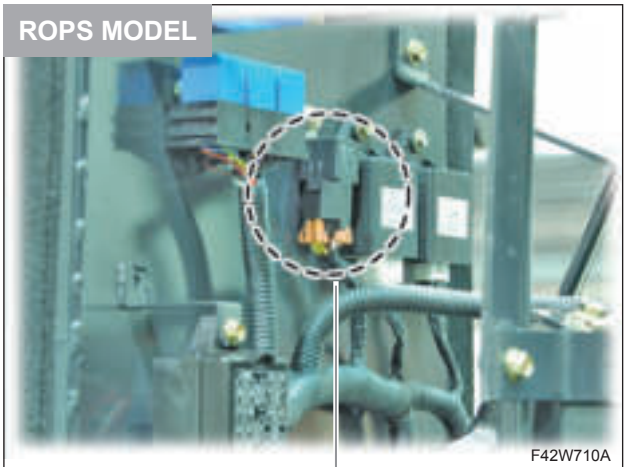
▶ **CONNECTOR AND TEST**



ITEM	TESTING LOCATION		RESULT
	⊕ TERMINAL	⊖ TERMINAL	
Resis-tance	②	③	Approx. 87 Ω
Resis-tance	①	④	0Ω present
Conti-nuity	①	⑤	∞Ω not present

5.2.5 PREHEAT RELAY

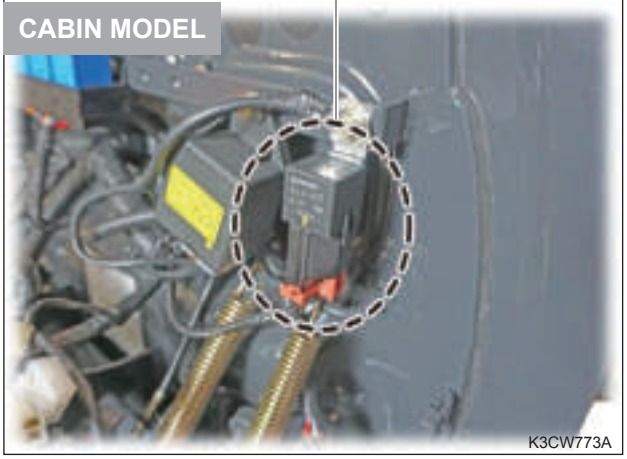
ROPS MODEL



F42W710A

K20W783A

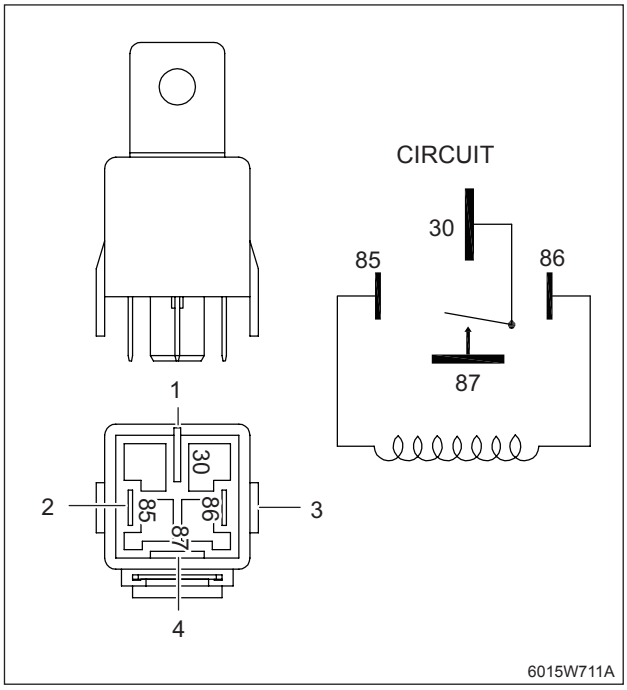
CABIN MODEL



K3CW773A

The preheat relay is installed on the upper middle/ right section of the hood hinge assembly (dash panel) to supply power to the glow plug.

▶ CONNECTOR AND TEST



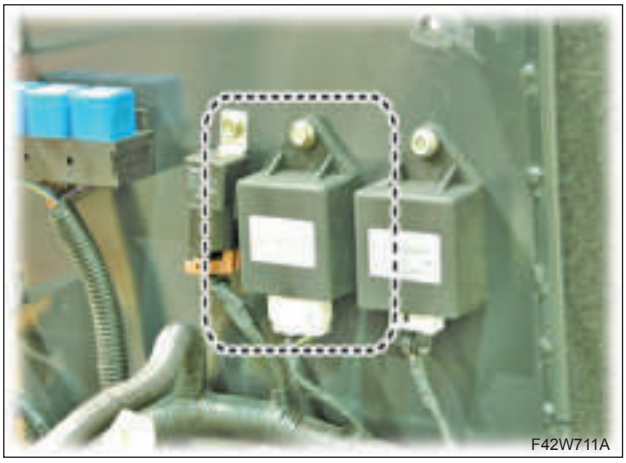
6015W711A

TERMINAL NO.	RESISTANCE (Ω)
① and ②	∞
③ and ④	∞
② and ③	Some Ω (continuity present)

Applying (+) to ③ and (-) to ②

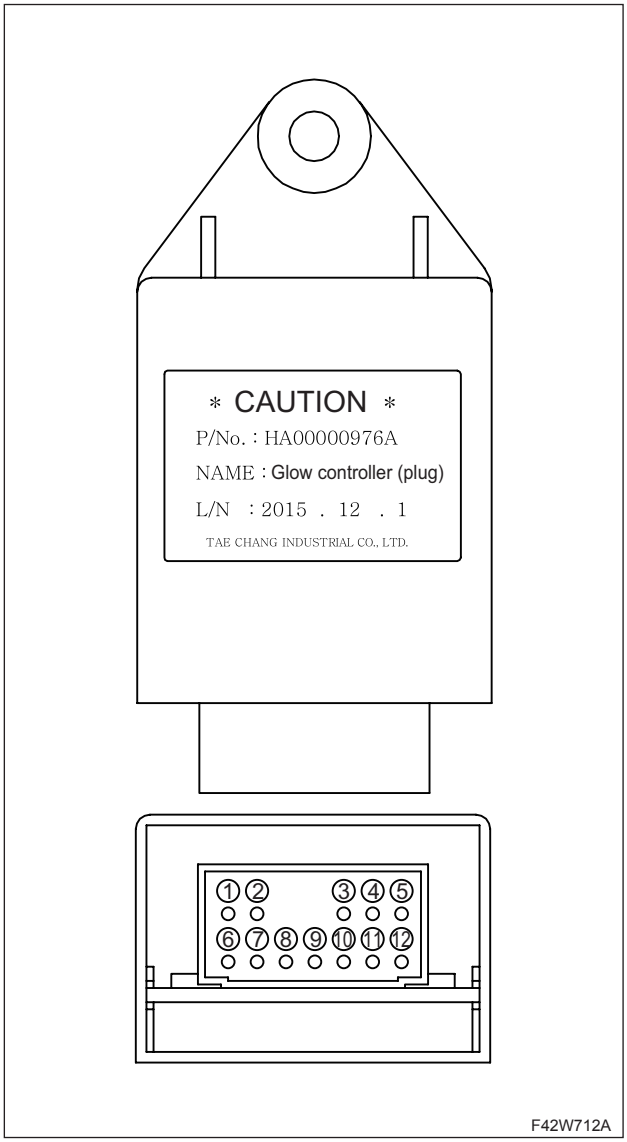
TERMINAL NO.	RESISTANCE (Ω)
① and ④	0

5.2.6 PREHEAT CONTROLLER [ROPS MODEL]

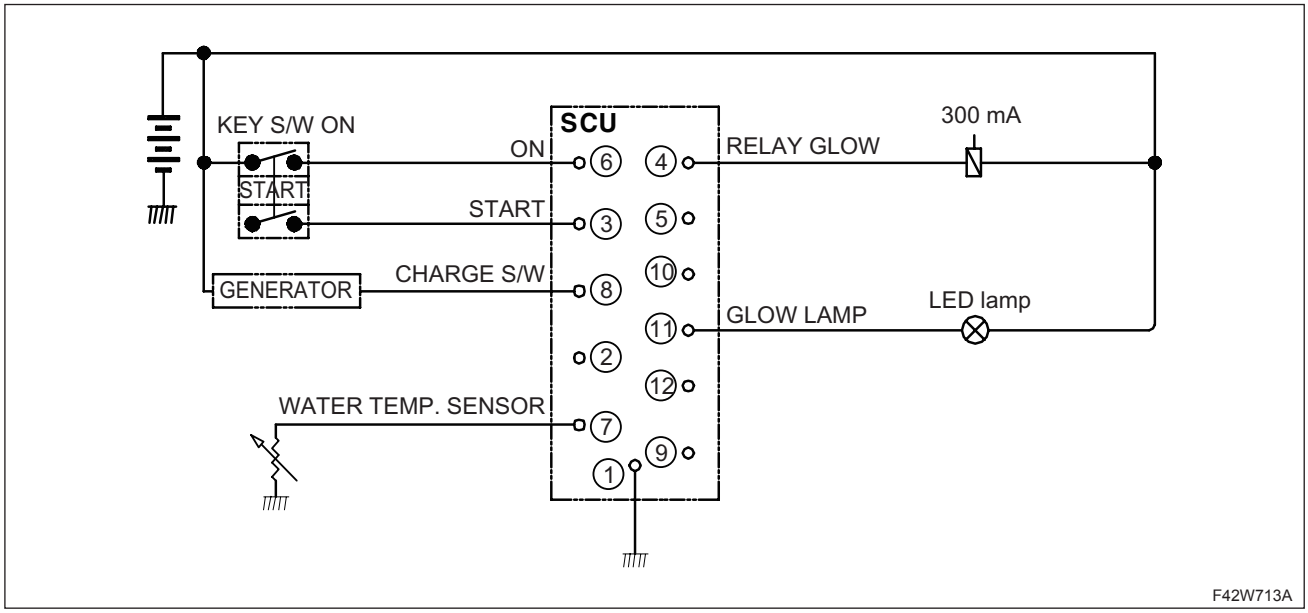


The preheat controller is installed on the upper right section of the hood hinge assembly (dash panel). It receives a signal from the coolant temperature sensor to adjust the preheating time, turns on the preheat indicator on the instrument cluster, and detects a signal from the generator to turn off the charge warning lamp.

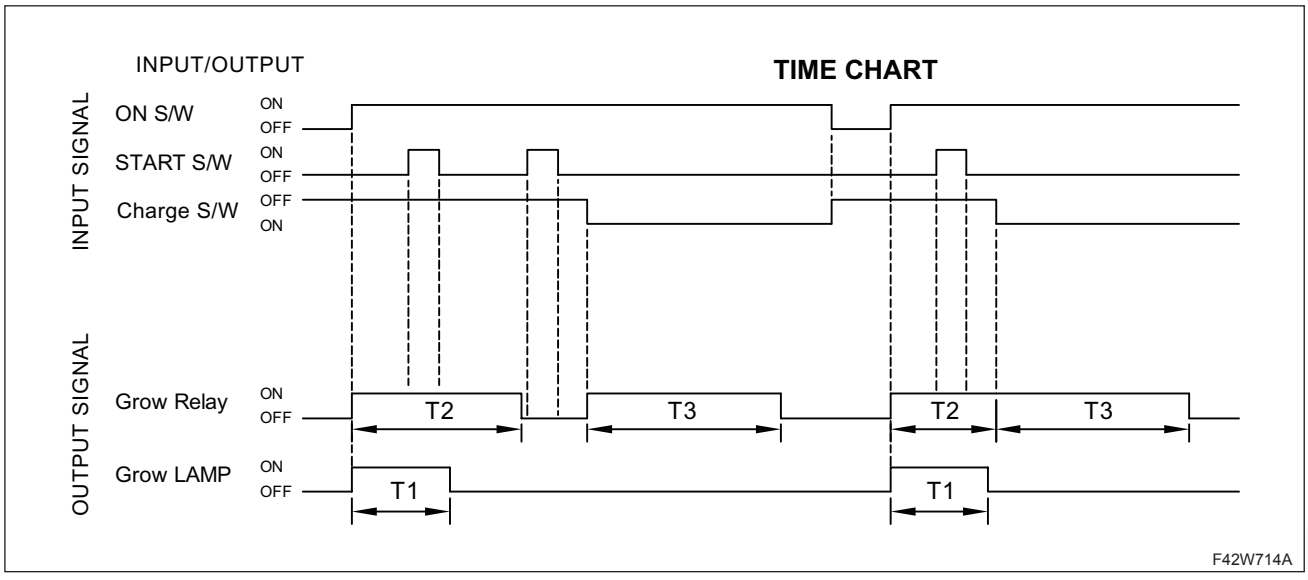
▶ CONNECTOR AND CIRCUIT DIAGRAM



▶ CONTACT DIAGRAM



▶ OPERATING SEQUENCE AND CHARACTERISTICS



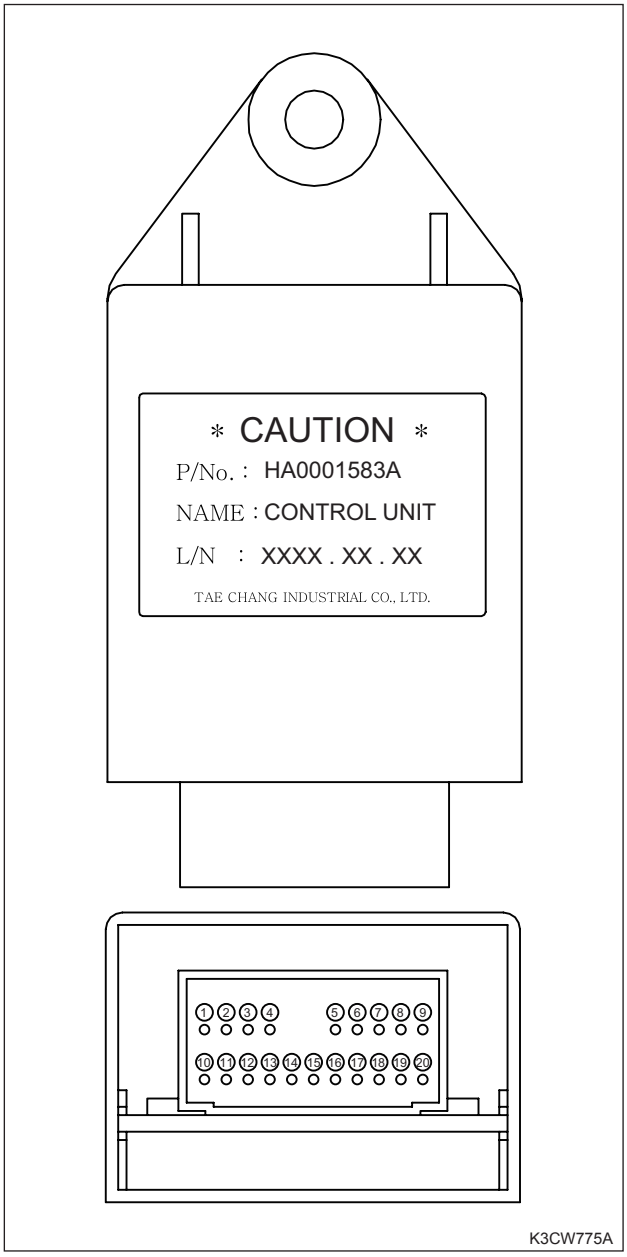
ITEM	WATER TEMP. SENSOR RESISTANCE (KΩ)	TIME (SEC.)	REMARKS
T1: Indicator ON time (sec.)	19.5 (-30℃)	14.0 ± 3.5	-
	9.6 (-15℃)	10.0 ± 3.0	
	1.2 (+40℃)	4.0 ± 1.5	
T2: Preheating time (sec.)	4.5 (+5℃)	30.0 ± 8.0	Relay (37 Ω)
	2.8 (+40℃)	5.0 ± 1.3	
T3: After-heating time (sec.)	1.2 (+40℃)	120 ± 30	
	0.6 (+60℃)	5.0 ± 1.3	

5.2.7 CONTROL UNIT [CABIN MODEL]

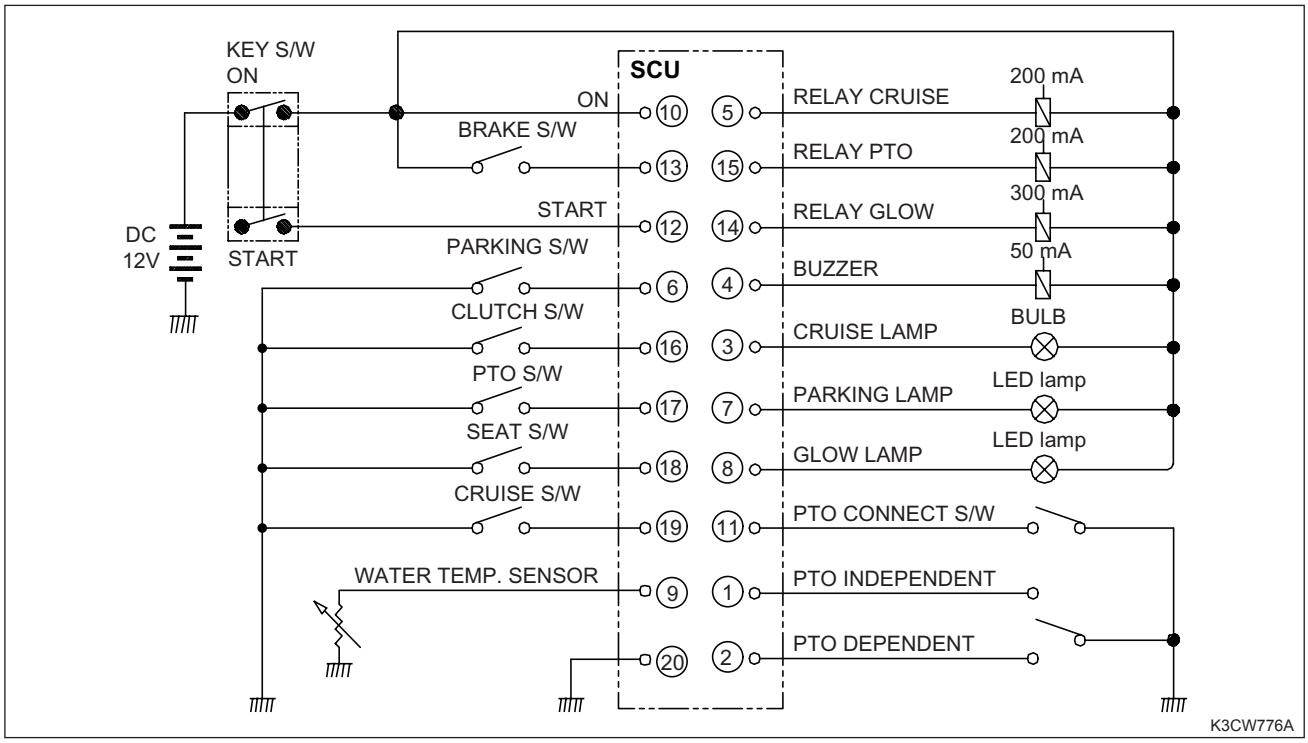
The control unit is installed on the upper right section of the dash panel.

The control unit controls the pre-heating & post-heating, PTO power shutdown when the driver leaves the seat and warning alarm operation when the parking brake is not applied.

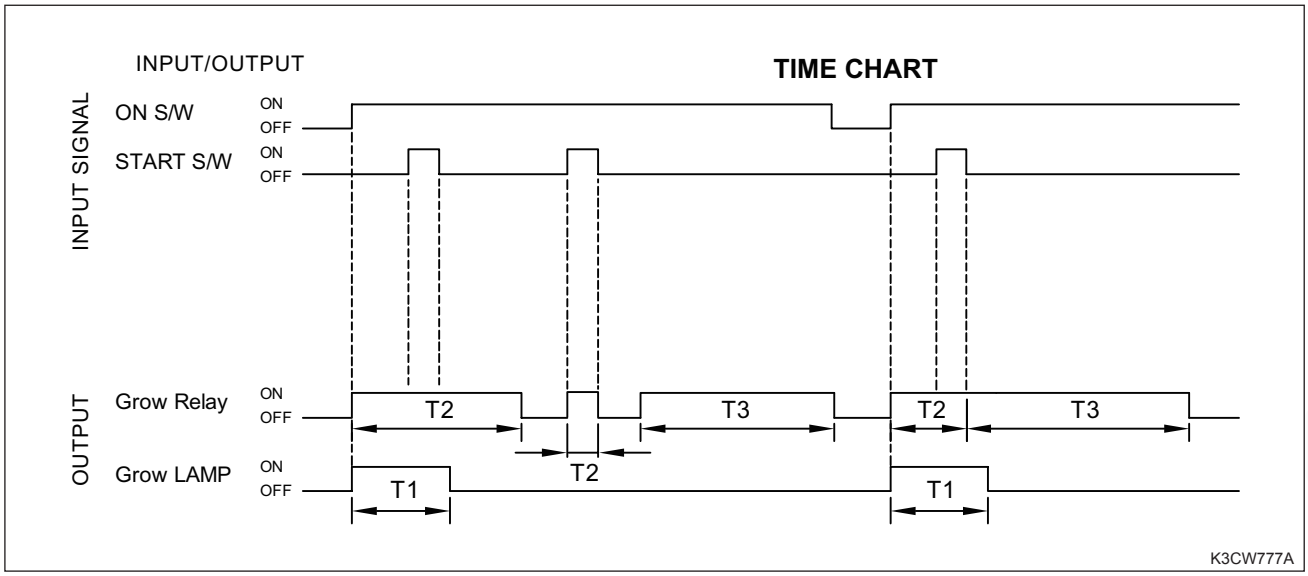
▶ CONNECTOR AND CIRCUIT DIAGRAM



▶ CONTACT DIAGRAM



▶ OPERATING SEQUENCE AND CHARACTERISTICS



ITEM	WATER TEMP. SENSOR RESISTANCE (KΩ)	TIME (SEC.)	REMARKS
T1: Indicator ON time (sec.)	Over 21 (-30℃)	14.0 ± 3.5	-
	9.5 (-15℃)	10.0 ± 3.0	
	0.8 (+40℃)	4.0 ± 1.5	
T2: Preheating time (sec.)	Over 2.8 (+10℃)	30.0 ± 8.0	Relay (37 Ω)
	1.8 (+20℃)	5.0 ± 1.3	
T3: After-heating time (sec.)	0.8 (+40℃)	120 ± 30	
	0.4 (+60℃)	5.0 ± 1.3	

5.2.8 FLASHER UNIT

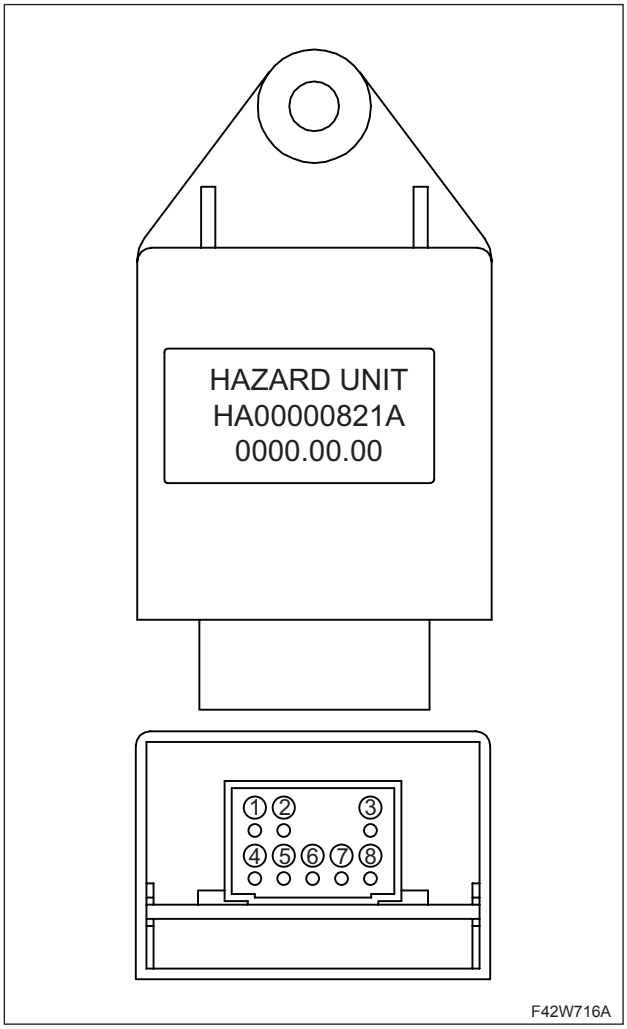
ROPS MODEL


F42W715A

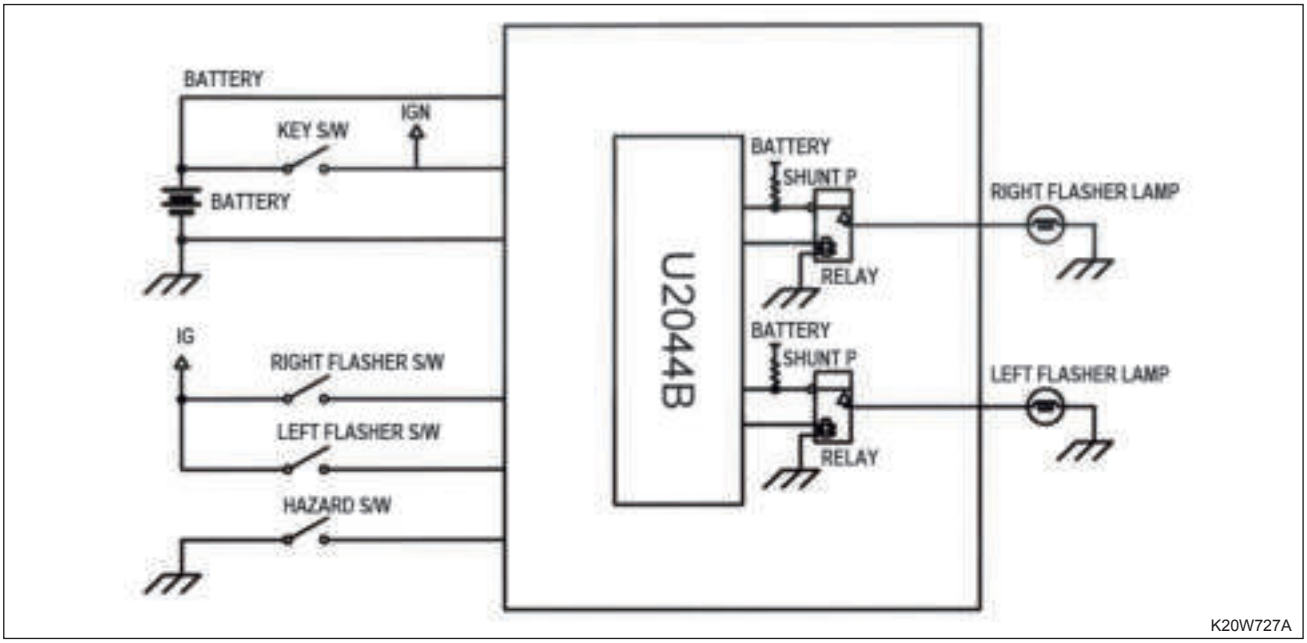
The flasher unit is installed beside of the preheat controller on the upper right section of the hood hinge assembly . It makes the turn signal lamps blink when the flasher switch is operated.

NO.	PIN NAME
1	RIGHT FLASHER LAMP
2	LEFT FLASHER S/W
3	RIGHT FLASHER S/W
4	BATTERY
5	LEFT FLASHER LAMP
6	IG (+)
7	HAZARD S/W
8	GND

▶ **CONNECTOR AND CIRCUIT DIAGRAM**



F42W716A

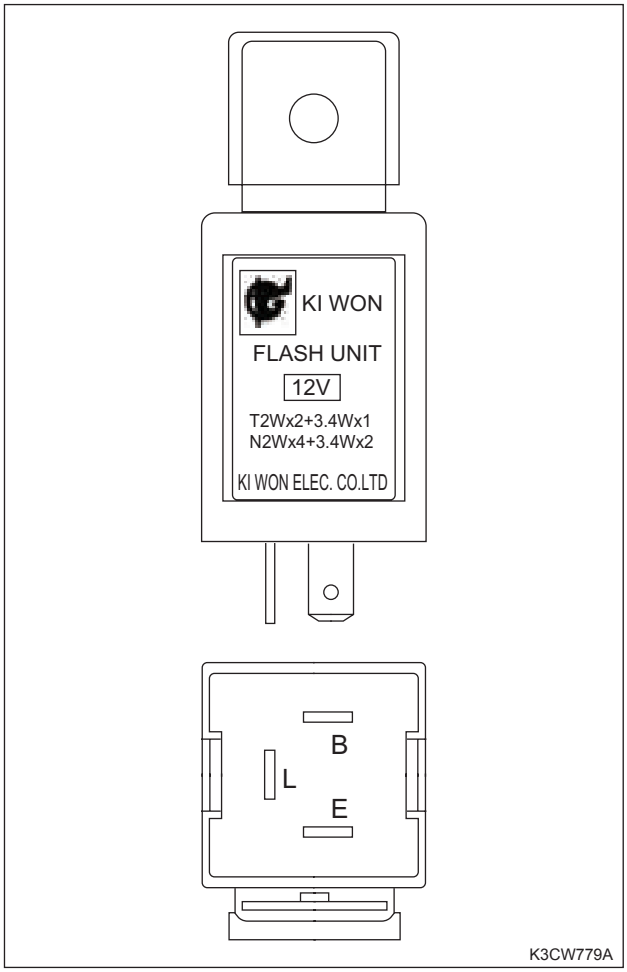


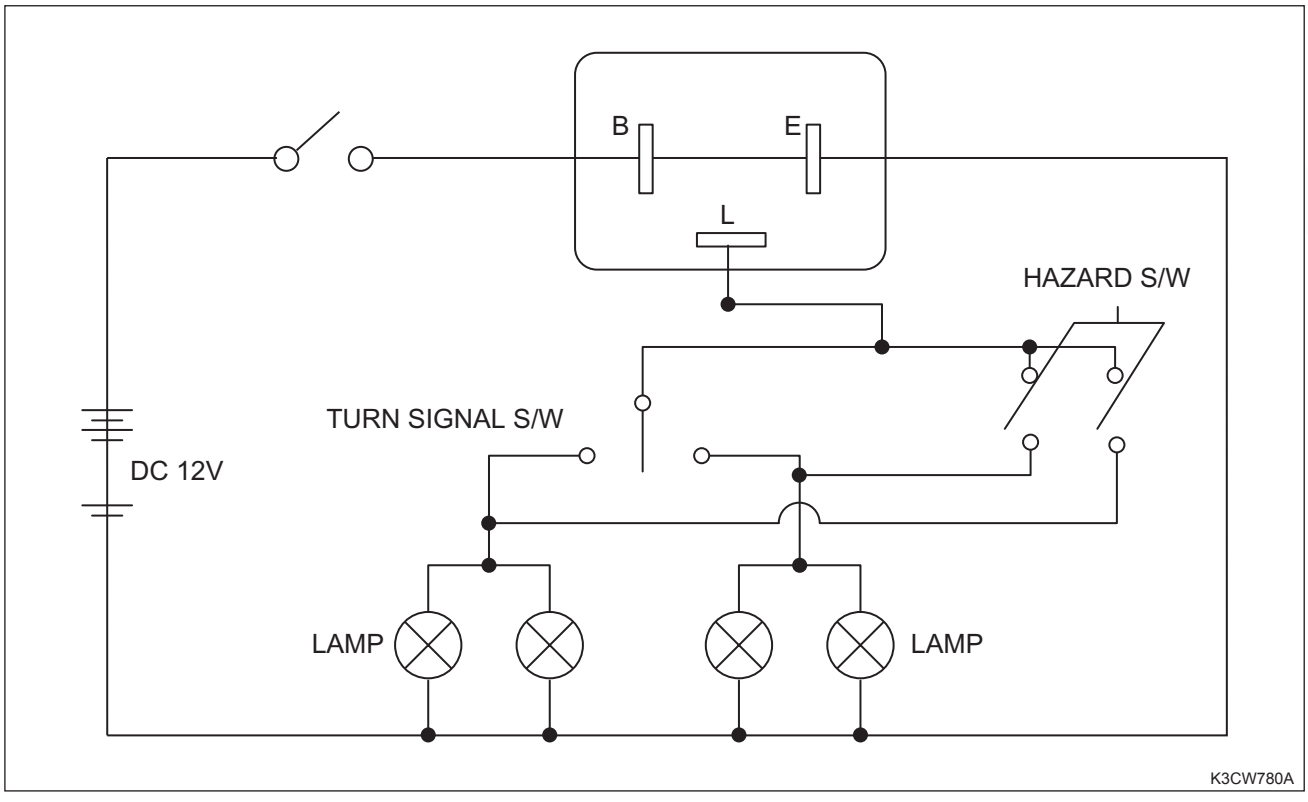
K20W727A

CABIN MODEL

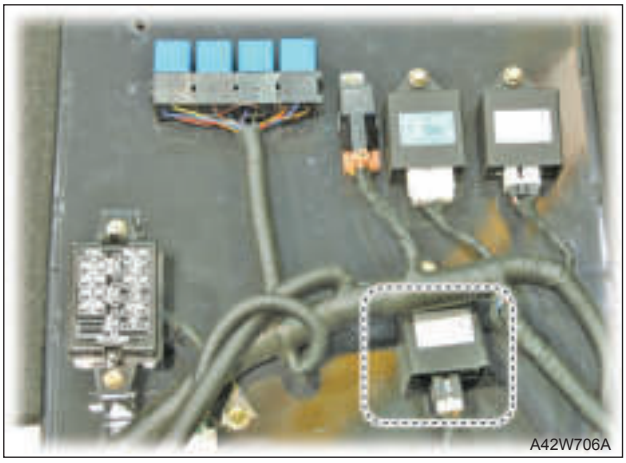
The flasher unit is installed on the upper left side of the dash panel.

▶ CONNECTOR AND CIRCUIT DIAGRAM



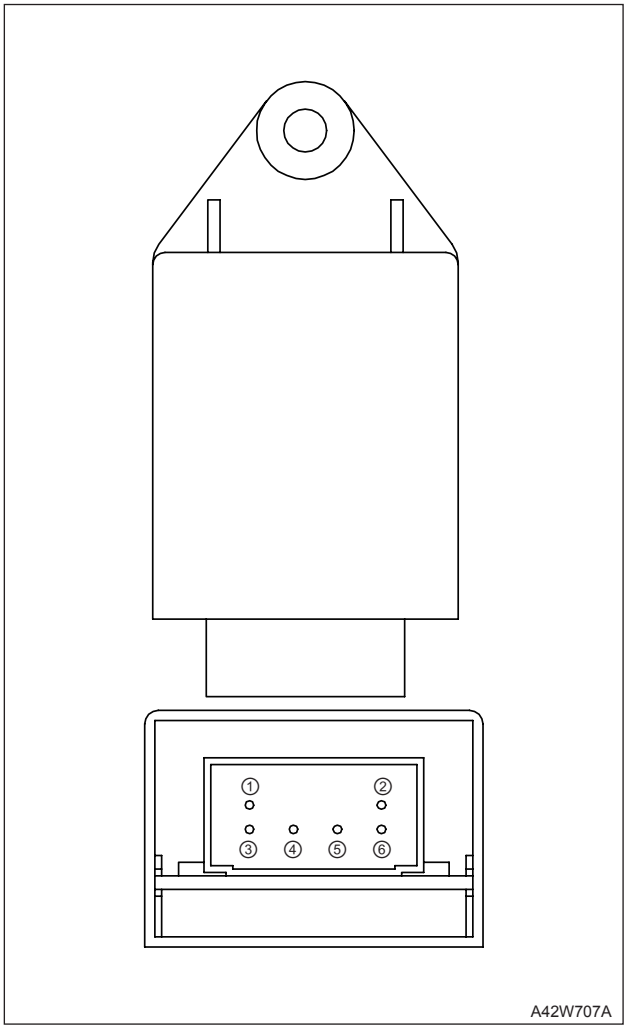


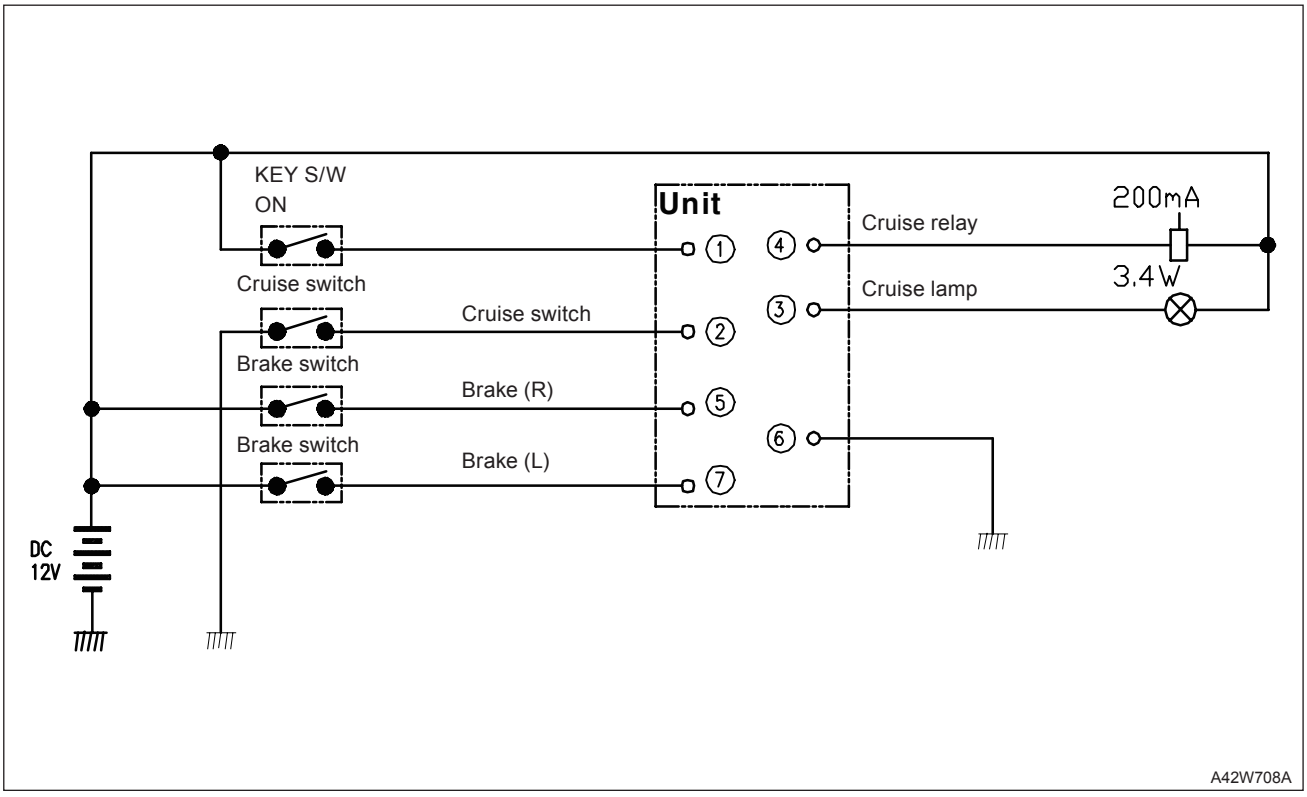
5.2.9 CRUISE CONTROLLER



The cruise controller is installed on the right lower section of the hood hinge (dash panel) to control the cruise control relay and cruise control lamp for the cruise control operation.

▶ CONNECTOR AND CIRCUIT DIAGRAM





5.2.10 PTO SWITCH

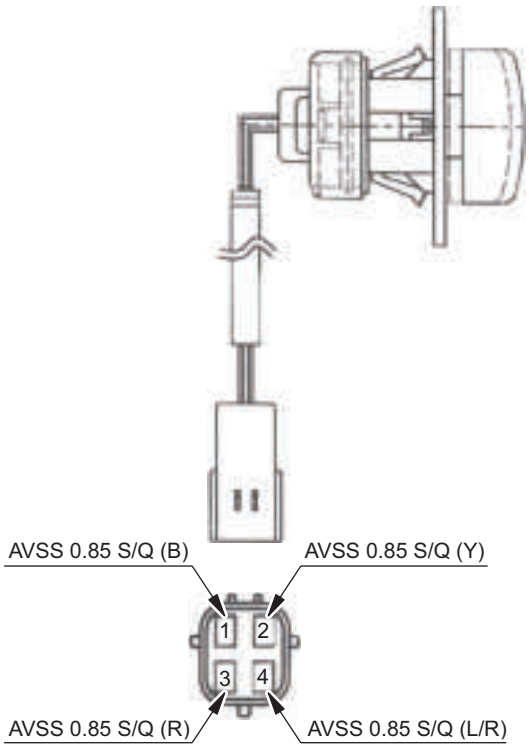
ROPS MODEL

The PTO switch detects the continuity in the ON-OFF position.

CABIN MODEL

The PTO switch is installed on the right upper side of the dash panel.

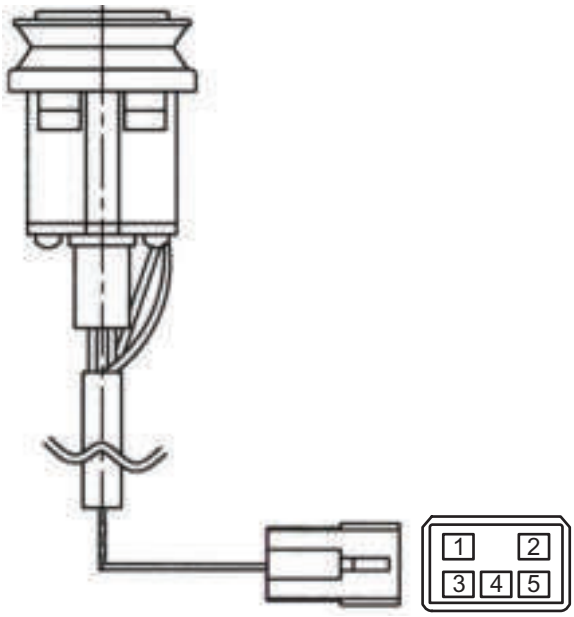
▶ CONNECTOR AND CIRCUIT DIAGRAM



Color / Position	B	Y	R	L/R
STOP OFF	●		●	
LEFT ON	●			●
RIGHT ON	●	●		

L10W6A06A

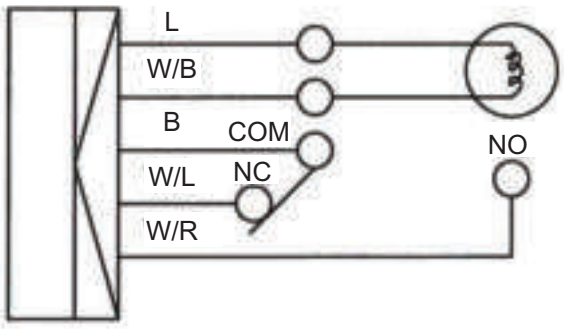
▶ CONNECTOR



No.	Wire Spec.
1	AVSS 0.5S/Q (W/B)
2	AVSS 0.5S/Q (L)
3	AVSS 0.5S/Q (W/L)
4	AVSS 0.5S/Q (B)
5	AVSS 0.5S/Q (W/R)

K3CW783A

▶ CIRCUIT DIAGRAM



	W/R	W/L	B	L	W/B
FREE		○	○	○ ○ ○	○
ON	○		○	○ ○ ○	○

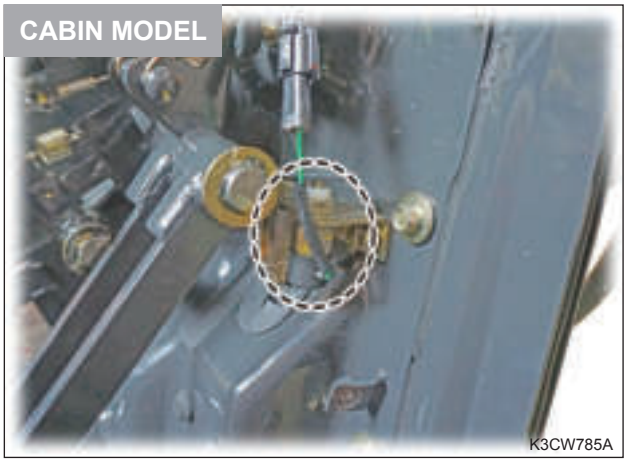
F50W705A

5.2.11 STOP LAMP SWITCH

A42W709A

The stop lamp switch is installed under the left foot rest.

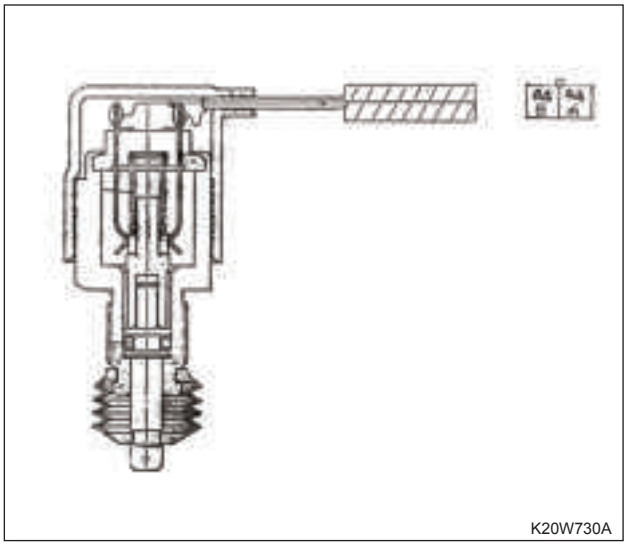
CABIN MODEL



K3CW785A

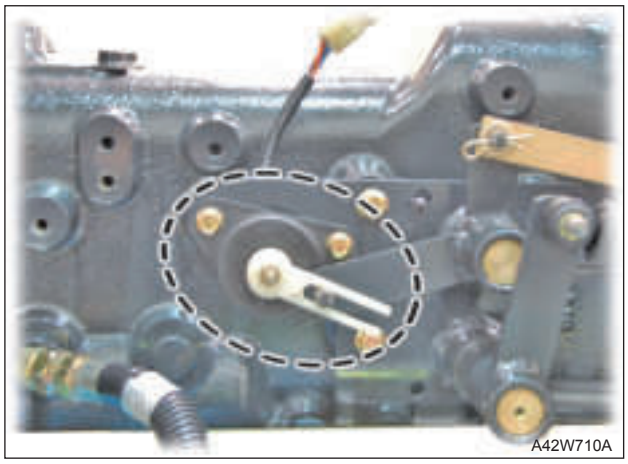
The stop lamp switch is installed on the right side of the dash panel.

▶ CONNECTOR



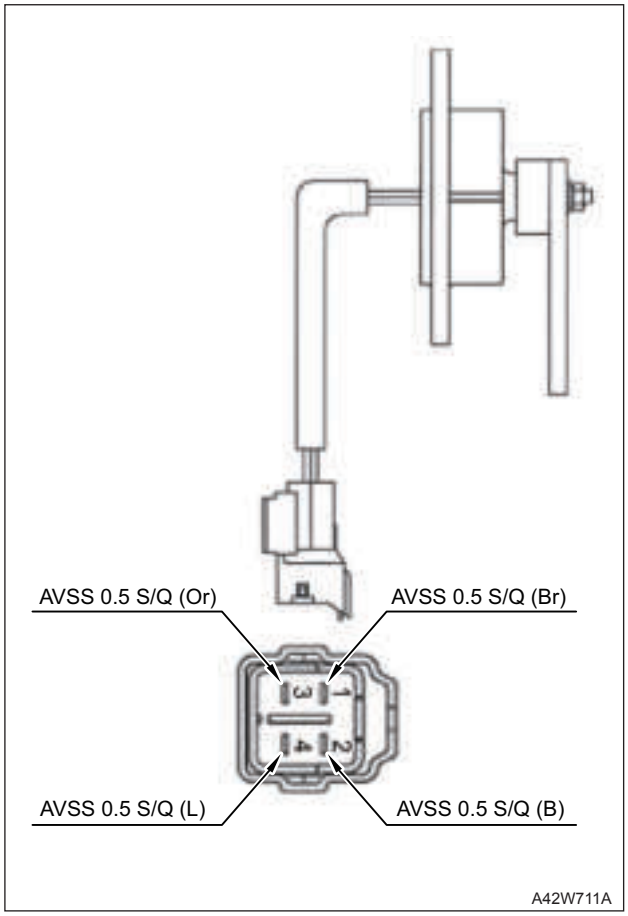
K20W730A

5.2.12 SAFETY START NEUTRAL SWITCH

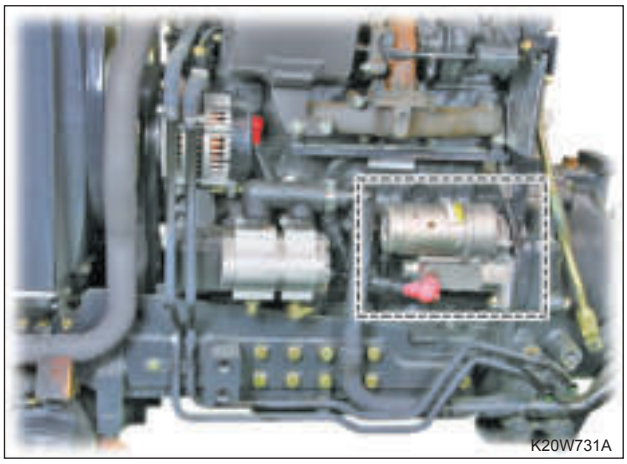


The safety start neutral switch is installed on the rear section of forward pedal. This switch detects the pedal position and to prevent the engine from starting when the switch is not neutral.

▶ CONNECTOR



5.2.13 STARTER



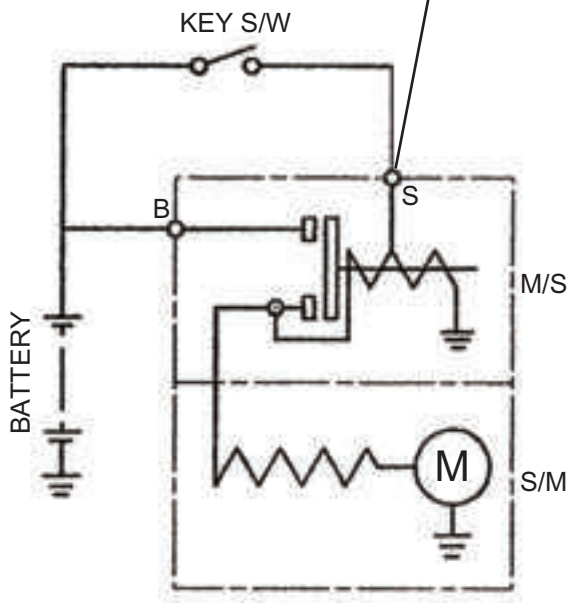
The starter is installed to the rear left section of the engine.

▶ SPECIFICATION

NOMINAL POWER	2.2 kw
VOLTAGE	12 V
RATED TIME	30 sec.
ROTATION	Clockwise (when seeing from pinion side)
WEIGHT	Approx. 5.2 kg

▶ CIRCUIT DIAGRAM

MAGNET SWITCH SPEC.	
RUSH CURRENT	60A or less (11V 20°C)
HOLDING CURRENT	15A or less (11V 20°C)

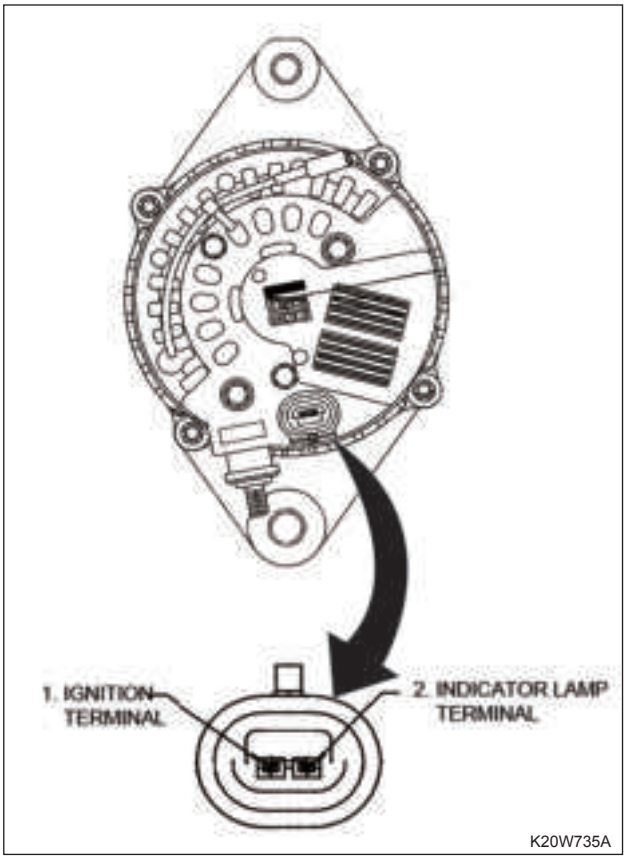


5.2.14 ALTERNATOR

The alternator is installed in the left front section of the engine and it is integrated with the IC regulator.

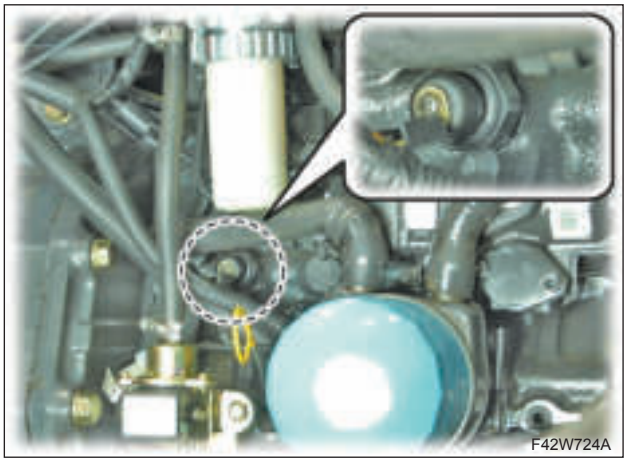
It supplies power to components with high electric load and charges the battery.

▶ CONNECTOR TEST



ITEM	CONNECTION		STATUS	RESULT
	+	−		
CONNECTOR DC POWER	1	Ground (Chassis)	Ignition switch ON	Approx. 12 V
	2	Ground (Chassis)		

5.2.15 ENGINE OIL PRESSURE SWITCH



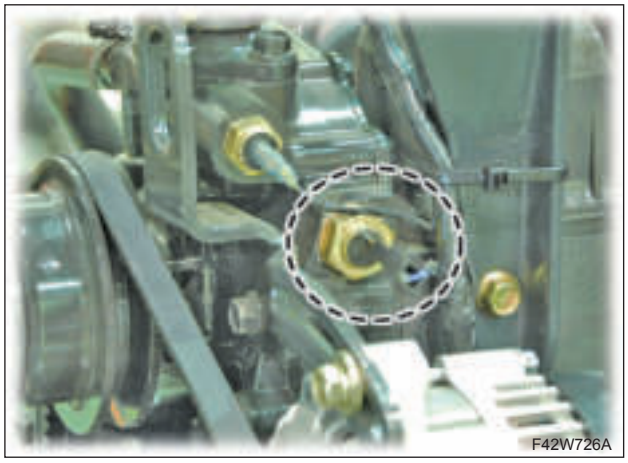
The engine oil pressure switch is installed to the cylinder block on the right side of the engine. When pressure is built in the engine, the contact of the oil pressure switch is connected to send a signal to the instrument cluster assembly.

When the pressure in the engine drops below 0.5 ± 0.1 kgf/cm^2, the engine oil pressure warning lamp on the instrument cluster comes on.

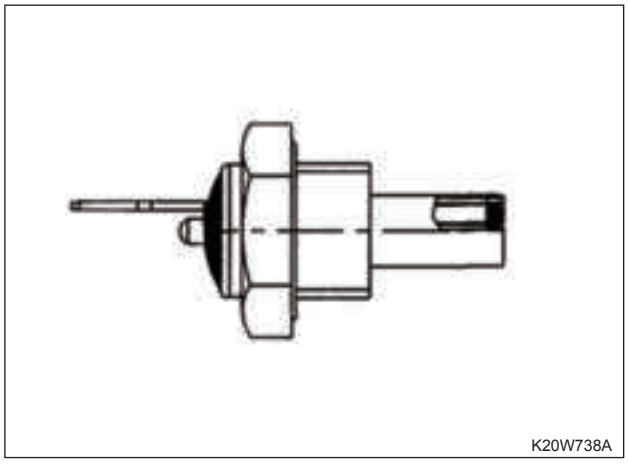
▶ CONNECTOR TEST

ITEM	CONNECTION		STATUS	RESULT
	+	—		
Resis-tance	A	Ground (Chassis)	Engine stopped	0 Ω
			Engine running	∞ Ω
DC power	B		Oil pressure warning lamp ┌ON┘ Ignition switch ┌ON┘	12 V

5.2.16 COOLANT TEMPERATURE SENSOR (PREHEATING)



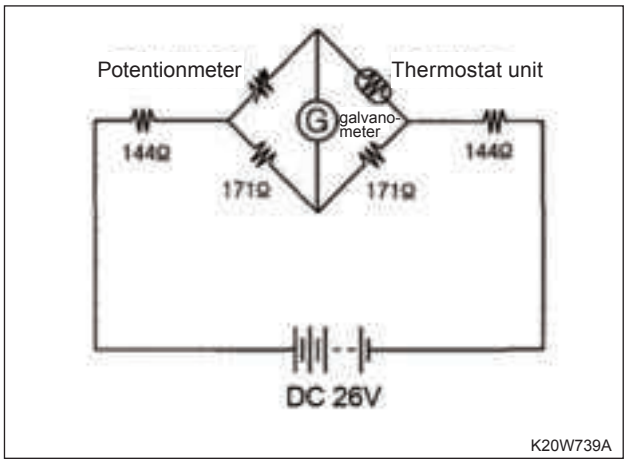
The coolant temperature sensor (preheating) is installed to the coolant flange behind the cooling fan. It sends various resistance values according to the coolant temperature to the instrument cluster to display the coolant temperature on the coolant gauge.



▶ RESISTANCE BY COOLANT TEMPERATURE

TEMPERATURE (℃)	-30	-15	10	20	40
RESISTANCE DIFFERENCE (Ω)	19.5	9.6	3.4	2.4	1.2

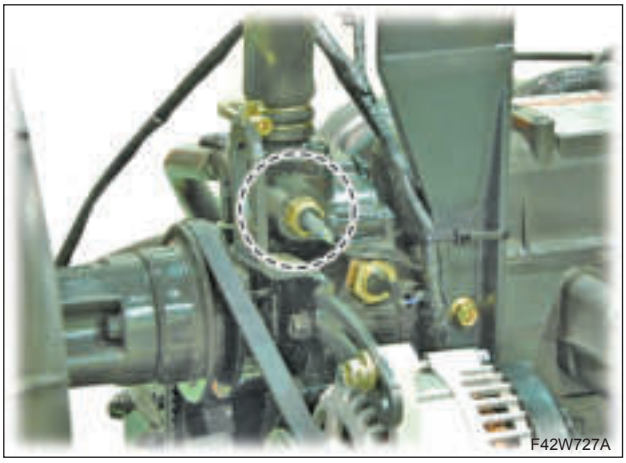
▶ MEASURING CIRCUIT



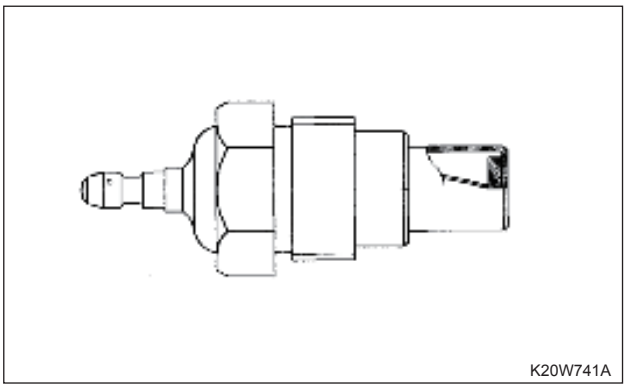
▶ SENSOR TEST

ITEM	CONNECTION		STATUS	RESULT
	+	—		
Resis-tance	1	Ground (Chassis)	–	Resistance changed by coolant temperature
DC power	2	Ground (Chassis)	Ignition switch 「ON」	Approx. 12 V

5.2.17 COOLANT TEMPERATURE SENSOR (METER)



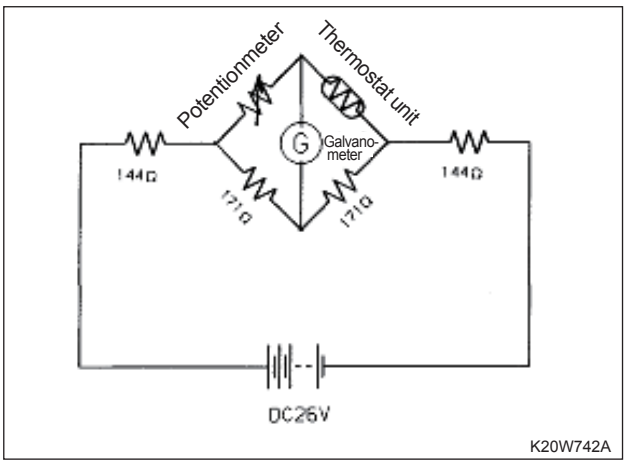
The coolant temperature sensor (meter) is installed to the outlet of the heater hose in front of the coolant flange to supply information to the preheat controller in order to determine the preheat indicator ON time and preheat relay connection time.



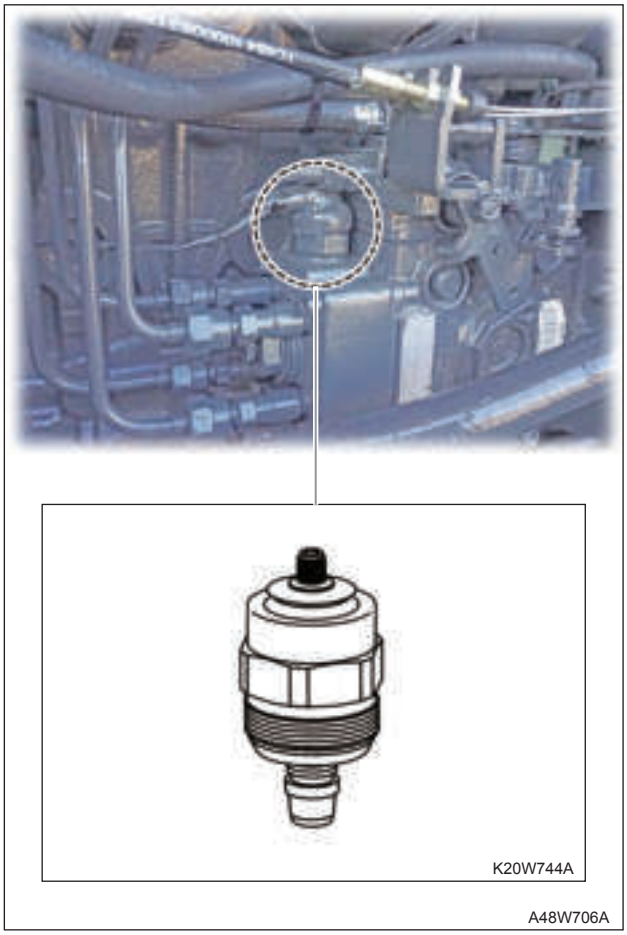
▶ RESISTANCE BY COOLANT TEMPERATURE

TEMPERATURE (°C)	(35)	(50)	80	(100)	(105)	115	(120)	(140)
RESISTANCE (KΩ)	(670)	(350)	118±6	(63.5)	(54.5)	42±2.5	(36.2)	(22)

▶ MEASURING CIRCUIT



5.2.18 FUEL CUT-OFF SOLENOID



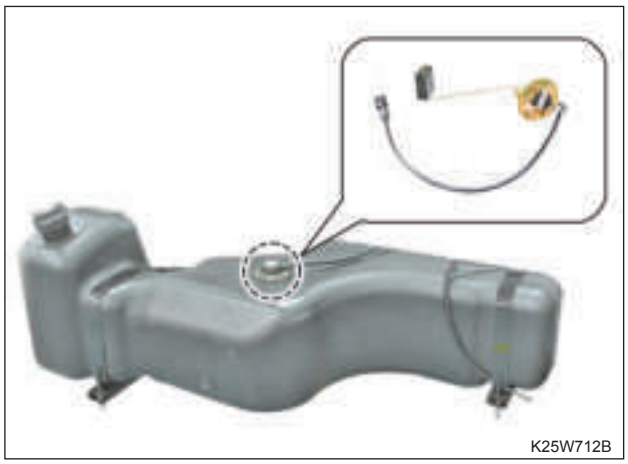
The fuel cut-off solenoid is installed behind the injection pump in the right section of the engine to allow or block fuel entering the engine depending on the position (ON/OFF) of the ignition switch.

▶ SPECIFICATION

RATED VOLTAGE	12 V
POWER CONSUMPTION	16 W
START VOLTAGE	6.5 V
HOLDING VOLTAGE	2.5 V
OPENING VOLTAGE	0.5 V

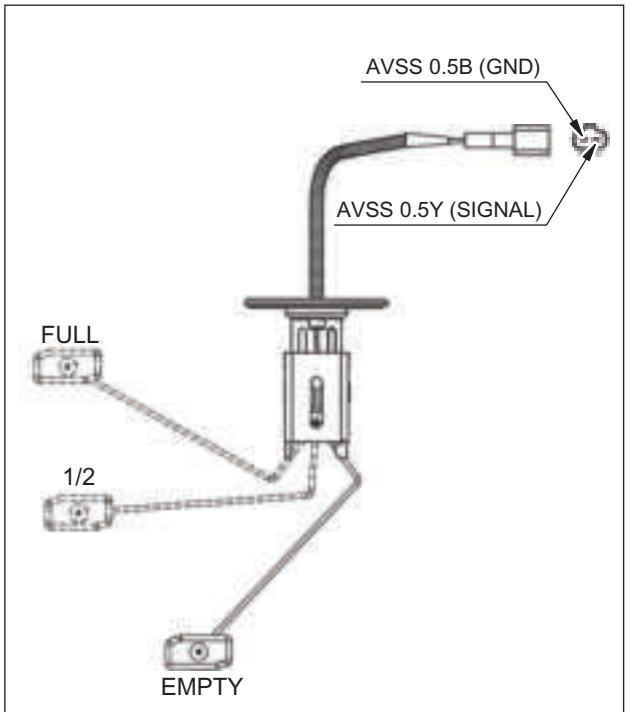
5.2.19 FUEL SENSOR

ROPS MODEL



The fuel sensor is installed to the top of the left fuel tank and consists of the float and variable resistor. The float detects the fuel level and the sensor sends the corresponding resistance value to the fuel gauge on the instrument cluster to display the fuel level.

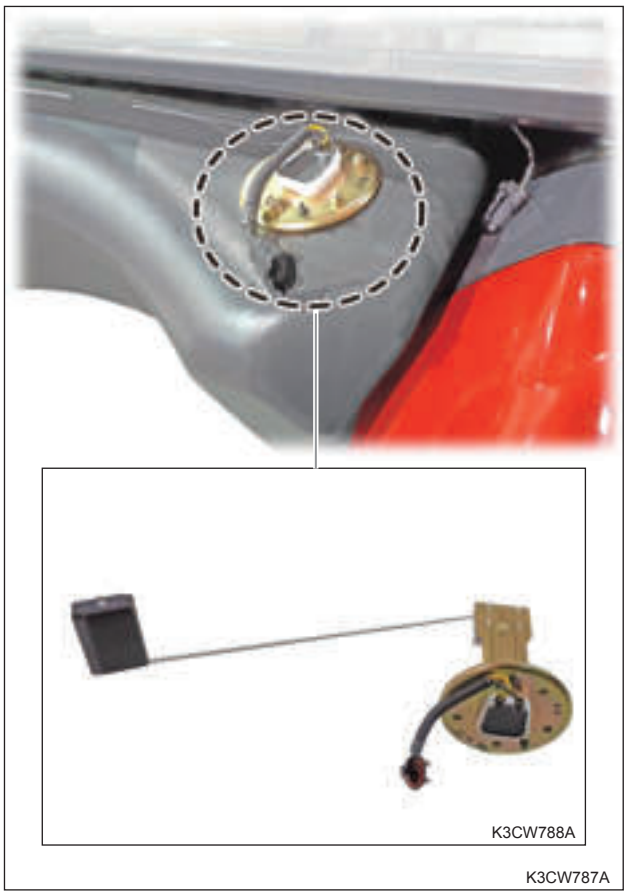
▶ **RESISTANCE BY FLOAT POSITION**



FLOAT POSITION	F	1/2	E
RESISTANCE (Ω)	3	(32.5)	110
TOLERANCE (Ω)	±2	-	±7

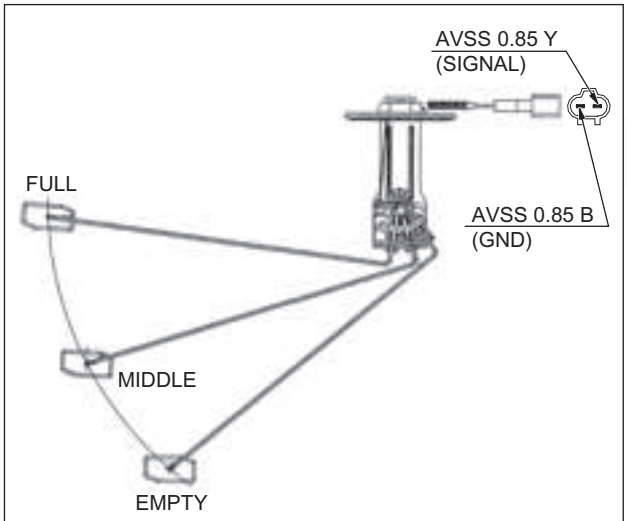
F42W725A

CABIN MODEL



The fuel sensor is installed to the top of fuel tank on the cabin rear section.

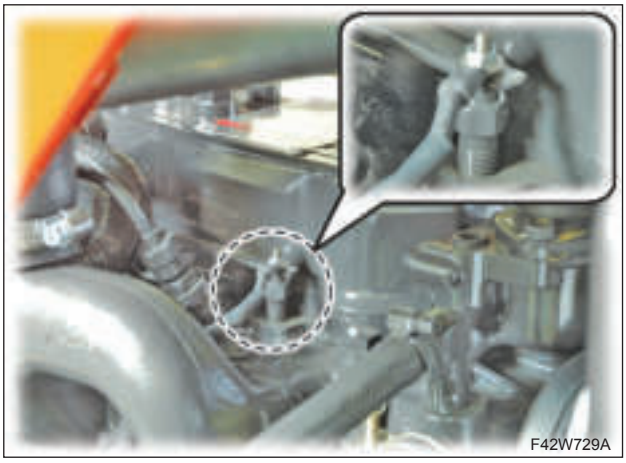
▶ **RESISTANCE BY FLOAT POSITION**



FLOAT POSITION	F	1/2	E
RESISTANCE (Ω)	3	(32.5)	110
TOLERANCE (Ω)	±2	-	±2

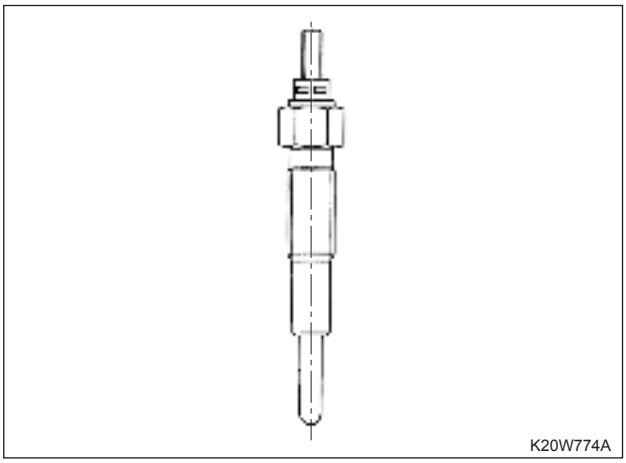
K3CW789A

5.2.20 GLOW PLUG

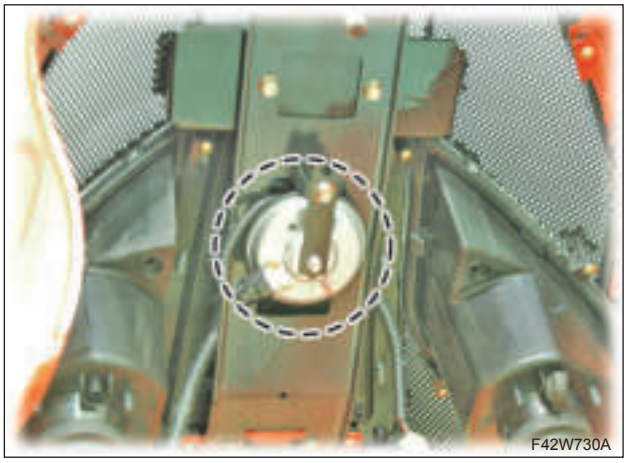


The glow plug is installed to the engine cylinder head to heat the intake air in the pre-combustion chamber in order to facilitate engine starting. The current of the glow plug should be 10 A within 5 seconds after it is applied with DC 11 V and its temperature should rise to 800° in approx. 4.5 seconds.

▶ FEATURE

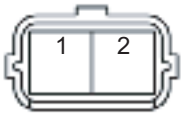
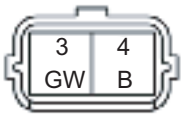


5.2.21 HORN



The horn (1) is installed between the left and right head lamps on the front of the hood.

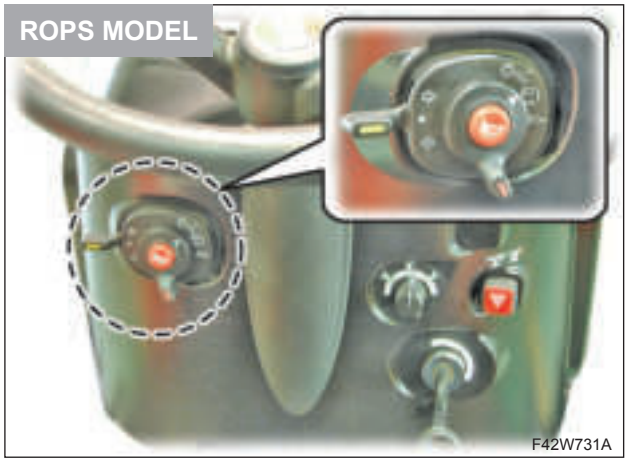
▶ CONNECTOR TEST

Connector A	 6015W7F3A
Connector B	 Q25W803A

ITEM	CONNECTION		STATUS	RESULT
	+	—		
Resistance	2	1	-	Approx. 4.7 Ω
	3	Ground (Chassis)	Ignition switch 「ON」 Horn operated	Approx. 4.7 Ω
	4		-	-

5.2.22 COMBINATION SWITCH

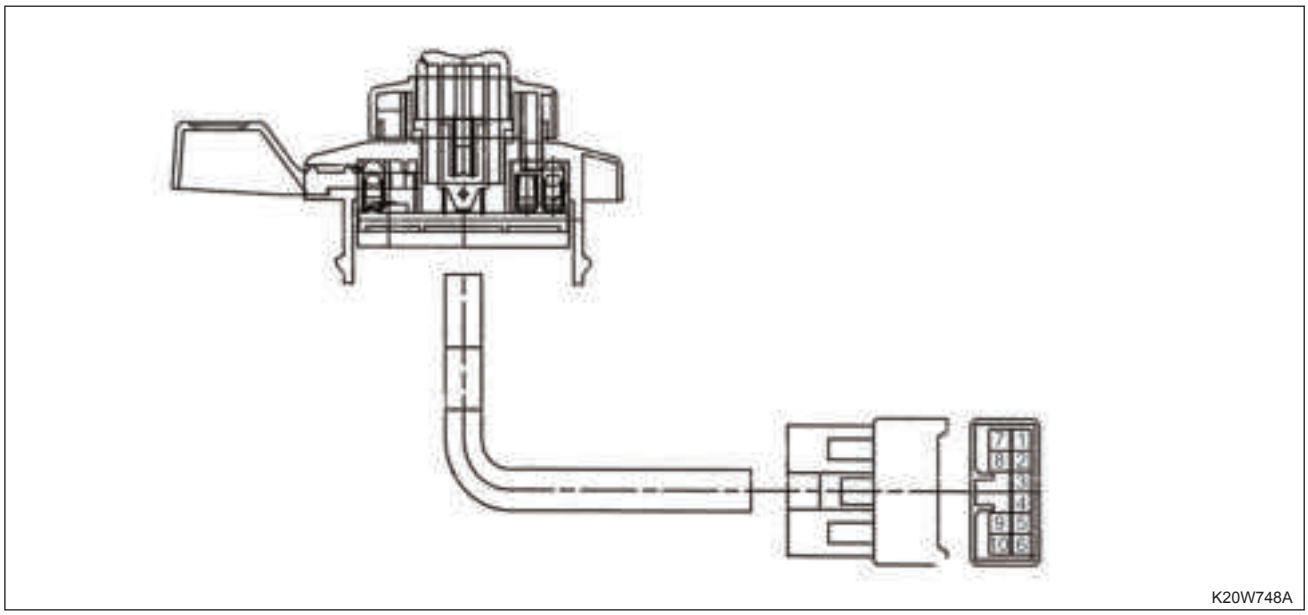
ROPS MODEL



CABIN MODEL

The combination switch is installed to the left side of the dashboard for operation of the head lamp high/low beam, turn signal lamps and horn.

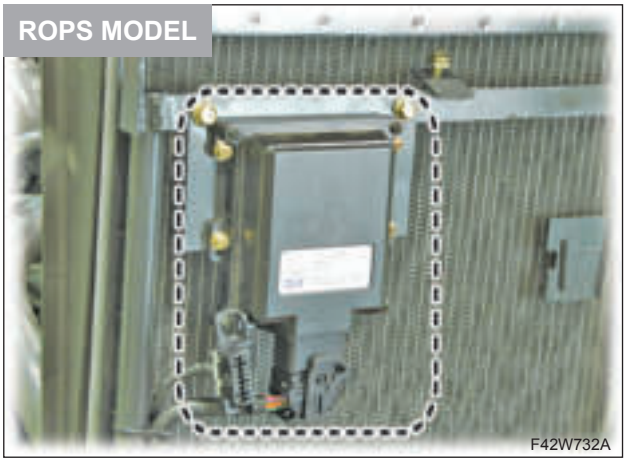
▶ CONNECTOR AND WIRING DIAGRAM



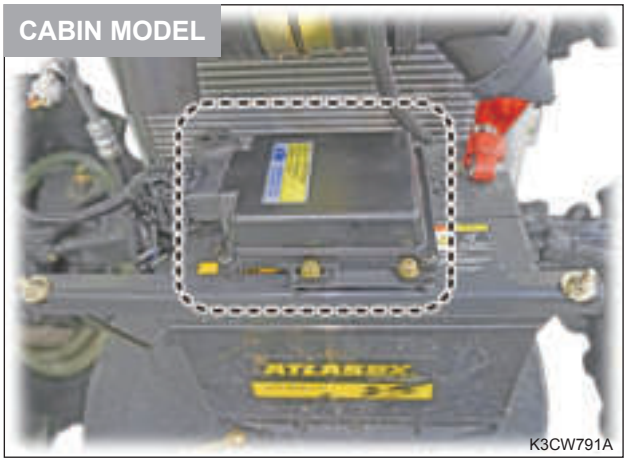
HEAD LAMP					TURN SIGNAL LAMP				HORN		
ITEM	B1	T	1	2	ITEM	B2	R	L	ITEM	B3	H
WIRING COLOR	RY	Y	Or	Br	WIRING COLOR	G	RW	GW	WIRING COLOR	8	LW
CIRCUIT NO.	9	5	4	10	CIRCUIT NO.	8	3	2	CIRCUIT NO.	7	1
○					⇨	○—○			FREE		
≡○	○—○	○—○	○		OFF				PUSH	○	○
≡○	○—○	○—○		○	⇦	○		○			

5.2.23 DPF LOGGER

ROPS MODEL

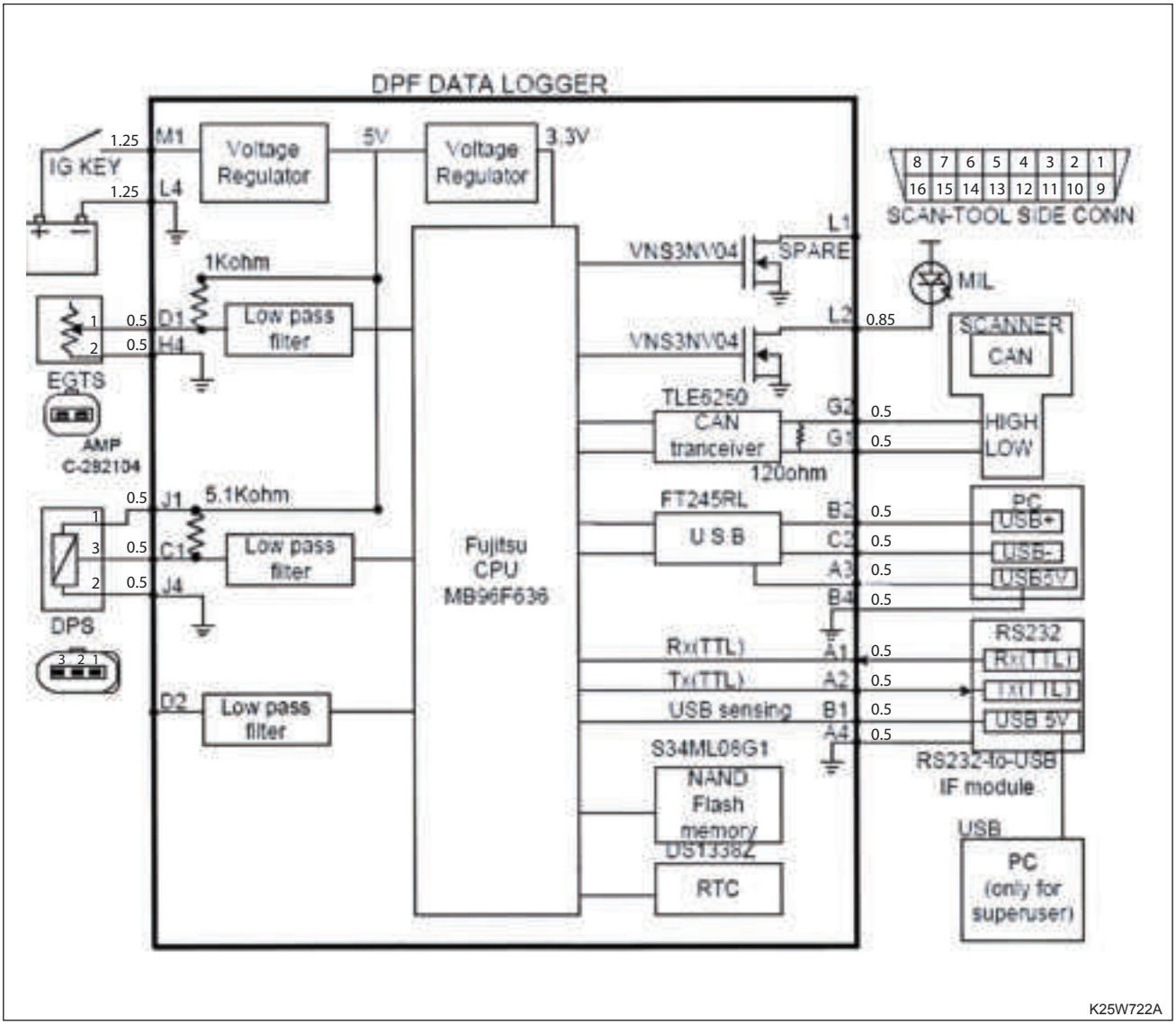


CABIN MODEL

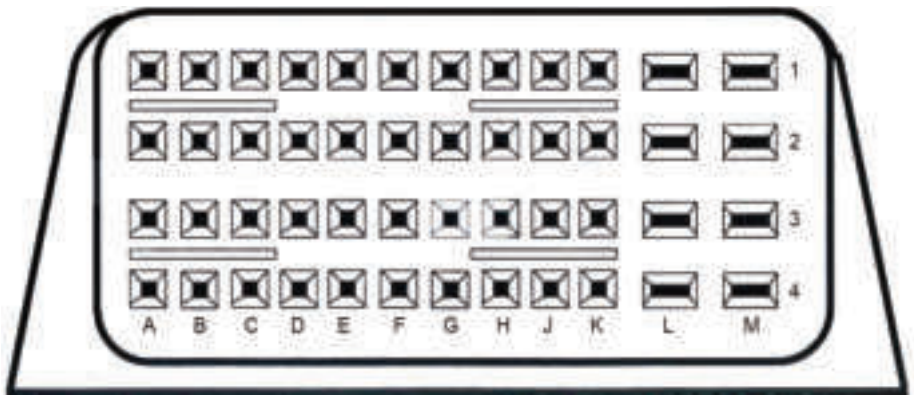


The DPF logger is installed front upper side of the radiator (battery) in the front section of the engine compartment, and it receives information from various engine sensors to maintain the optimum engine combustion condition for emission control.

▶ **CONNECTOR AND CIRCUIT DIAGRAM**



K25W722A



K25W723A

NO	WIRE	DESIGNATION	ASSOCIATED FUNCTION
ANALOG INPUTS			
C1	-	DPS	Differential Pressure sensor
J1	-	DPS_5V	Power of DPS (5Volt)
J4	-	DPS_GND	Ground of DPS
D1	-	EGTS	Exhaust Gas Temperature Sensor
H4	-	EGTS_GND	Ground of EGTS
SWITCH INPUTS			
H1	-	(REPROGRAM)	Reserved (Logger reprogram switch)
DRIVER OUTPUTS			
L2	-	DPF_LAMP	Check lamp of DPF (LED type)
L1	-	(BUZZER)	SPARE (CAUTION BUZZER)
CAN COMM (For diagnosis scanner)			
G2	-	CAN_HIGH	CAN high to SCANNER
Gl	-	CAN_LOW	CAN low to SCANNER
G4	-	CAN_GND	Ground of CAN communication
PC RS232 COMM. (For industrial data download or Reprogram)			
A2	-	TX_TIL	TX 232 TTL communication from logger 0 USB
A1	-	RX_TIL	RX 232 TIL communication from USB to logger
B1	-	USB1_SENSING	Signal of USB1 connection
A4	-	RS232_GND	Ground of RS232 communication
PC USB COMM. (For superuser high speed data download)			
B2	-	USB2_POS	USB2 positive of notebook (max. 200mm wire)
C2	-	USB2_NEG	USB2 negative of notebook (max. 200mm wire)
A3	-	USB2_VCC	Power of USB2 communication(max. 200mm wire)
B4	-	USB2_GND	Ground of USB2 communication(max. 200mm wire)
POWER			
M	-	IG_KEY	Power of data logger
L4	-	GND	Ground of data logger

5.2.24 DIFFERENTIAL PRESSURE SENSOR

The differential pressure sensor is installed to the side of the DPF in the engine compartment.

Exhaust gas discharged from the engine exhaust valve passes through the inlet of the DPF and escapes the outlet of the DPF to be discharged to the atmosphere.

In this process, the pressure difference between the inlet and outlet is measured by the differential pressure sensor, and this information is delivered to the DPF logger to control the combustion process.

If a large amount of PMs is accumulated so the pressure difference between the inlet and outlet is over the limit, post injection is performed into the cylinders to burn PMs in order to keep the proper pressure level in the DPF.

5.2.25 EXHAUST GAS TEMPERATURE SENSOR

The exhaust gas temperature sensor is installed to the rear section of the DPF.

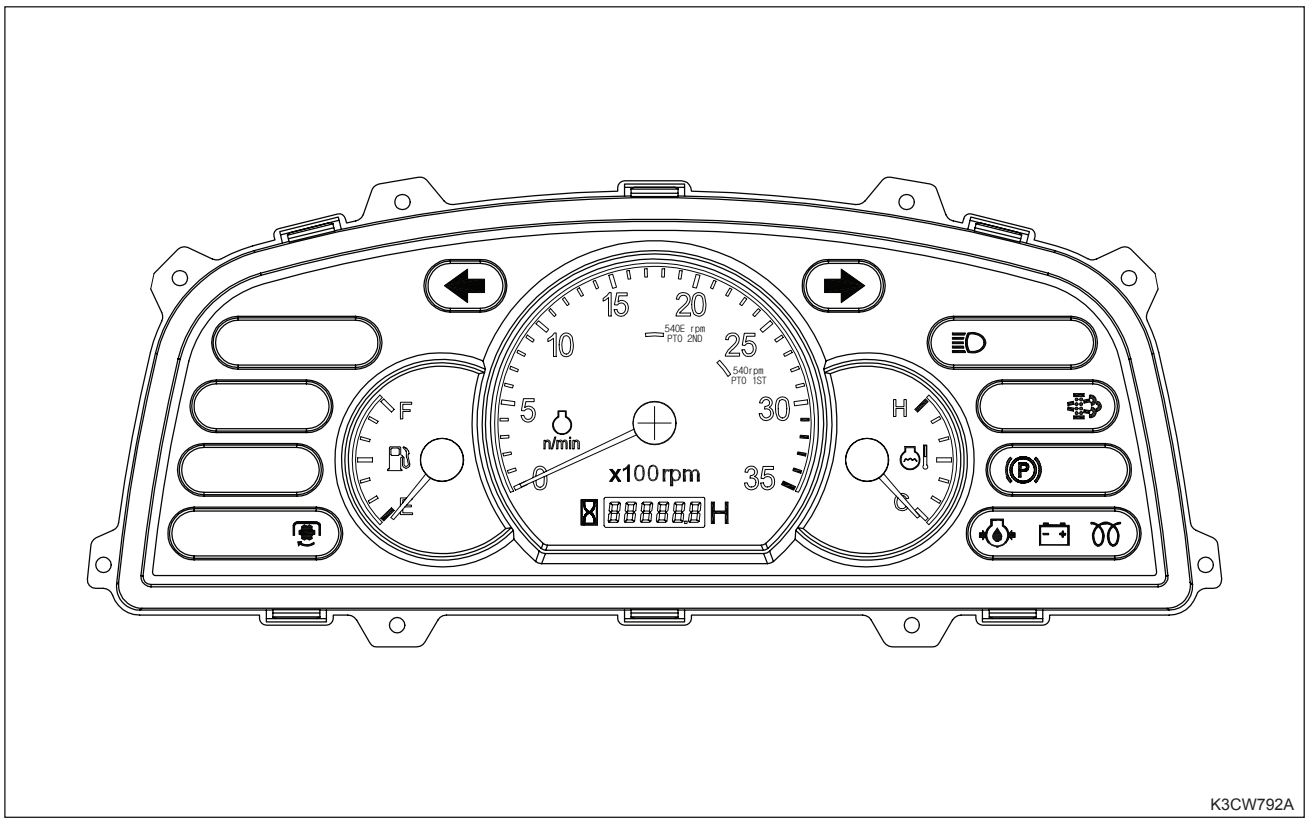
This sensor measures the temperature of the exhaust gas and supplies this information to the DPF logger to maintain a proper level of exhaust gas temperature.

For example, if the temperature of the exhaust gas passing through the DPF is below a certain level, the fuel injection amount is increased by the DPF logger to increase the regeneration temperature. If the temperature of the exhaust gas is over a certain level, the fuel injection amount is decreased to maintain a proper level of temperature.

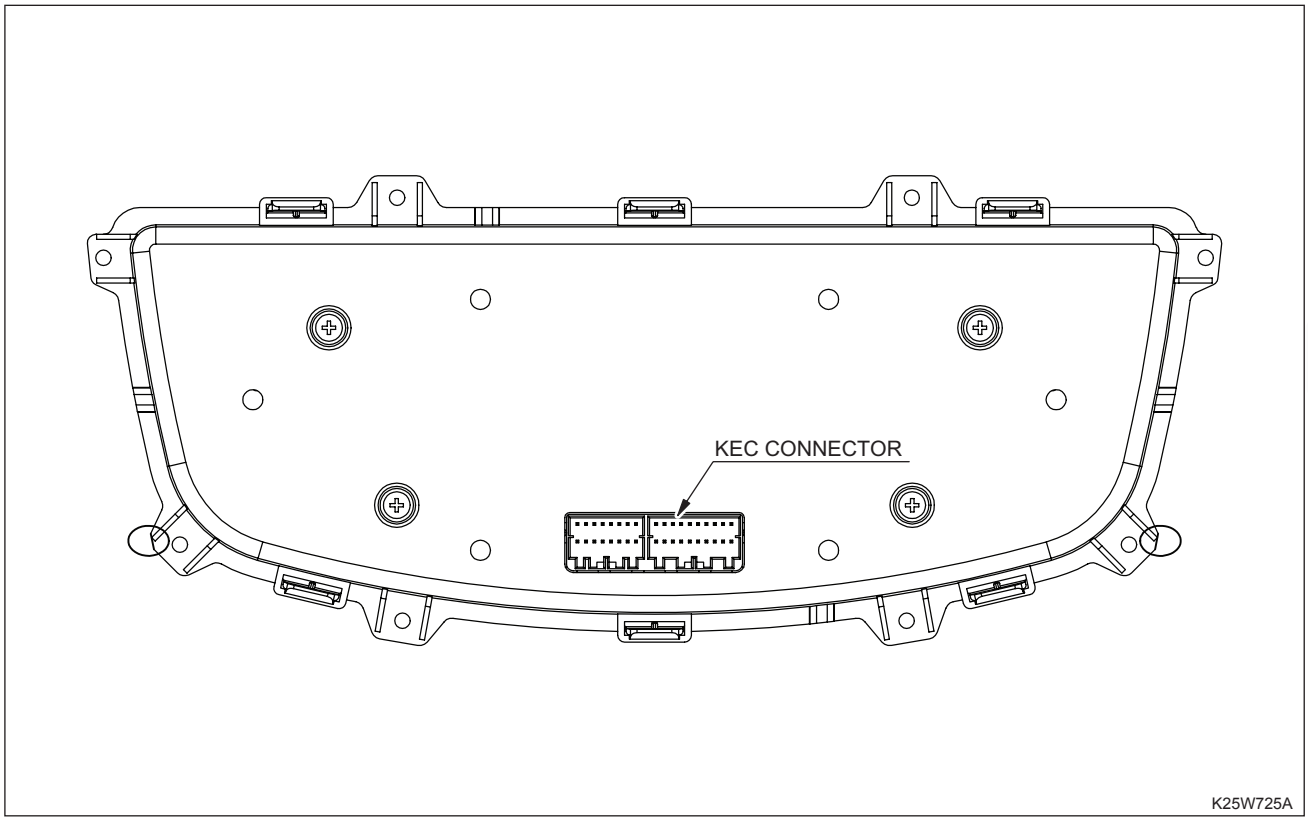
5.2.26 INSTRUMENT CLUSTER

ROPS MODEL

▶ CONFIGURATION AND PERFORMANCE SPECIFICATIONS

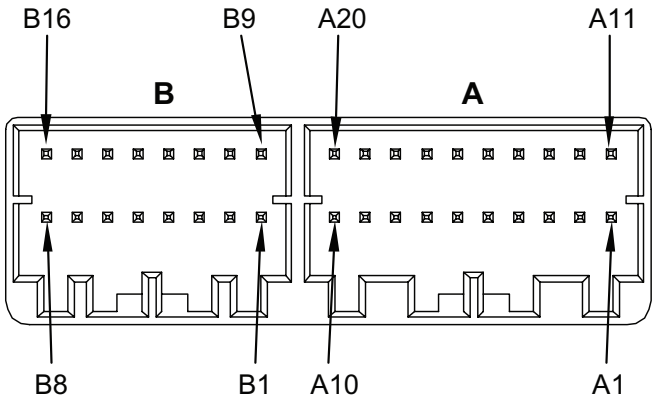


K3CW792A



K25W725A

▶ CONNECTOR

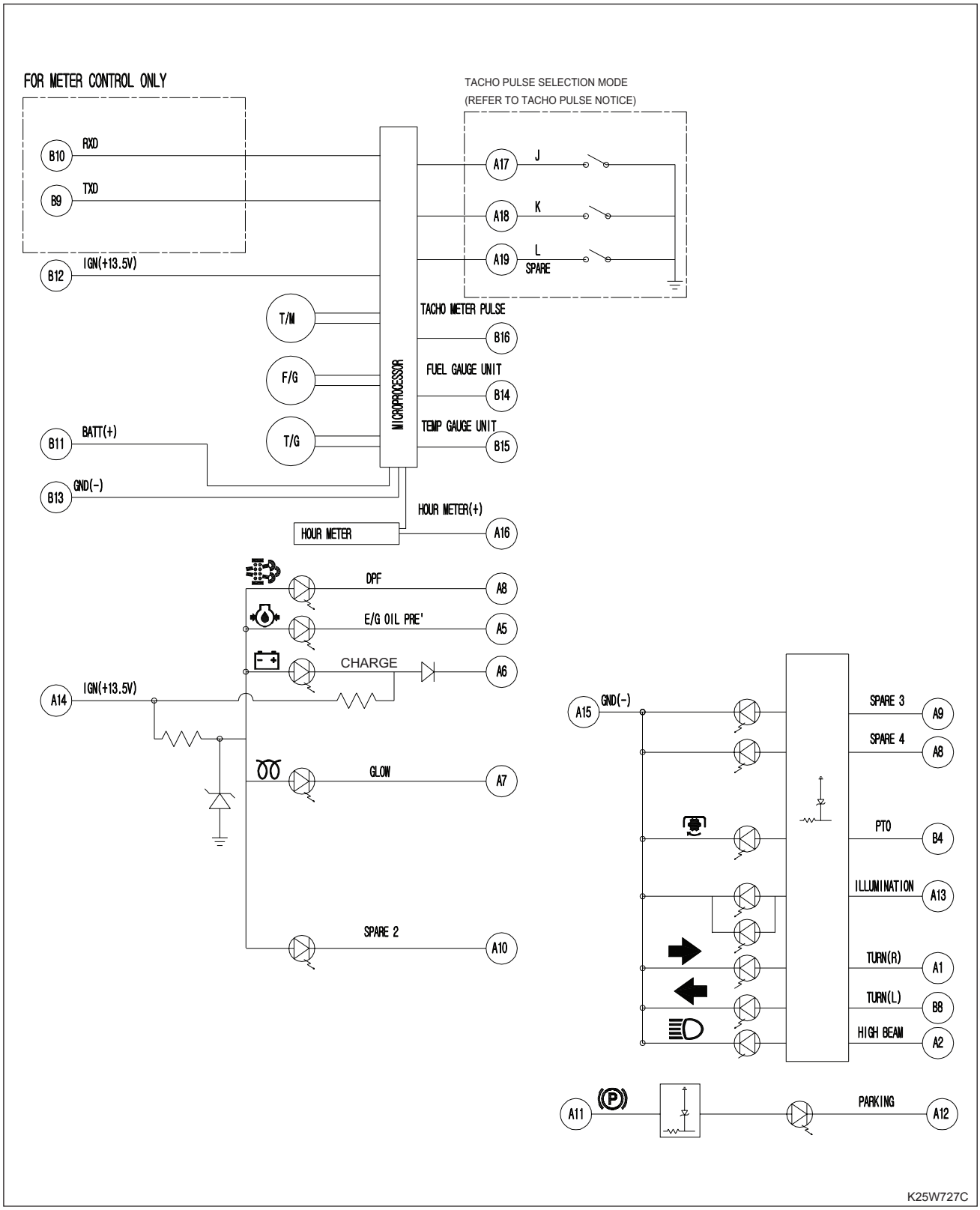


K25W726A

	PIN NO.	NAME	REMARKS
A	A1	TURN (R)	+
	A2	HIGH BEAM	+
	A3	BRAKE RELEASE	-
	A4	WATER SEPARATOR	-
	A5	E/G oil PRESSURE	-
	A6	CHARGE	-
	A7	GLOW	-
	A8	DPF	
	A9	SPARE 3	-
	A10	SPARE 2	
	A11	PARKING(+)	+
	A12	PARKING(-)	-
	A13	ILLUMINATION	+
	A14	IGN(+13.5V)	+
	A15	GND(-)	-
	A16	HOUR METER(+)	+
	A17	J	-
	A18	K	-
	A19	L(SPARE)	-
	A20		

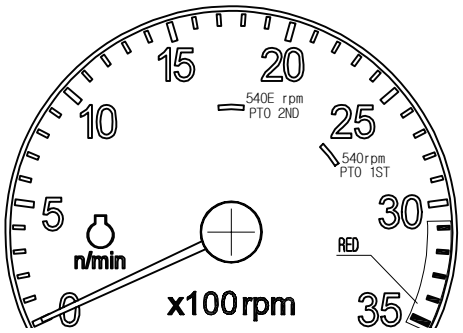
	PIN NO.	NAME	REMARKS
B	B1	SPARE 1	
	B2	Q/T	+
	B3	4WD	+
	B4	PTO	+
	B5	LIFT	-
	B6	HIGH SPEED	-
	B7	NEUTRAL	-
	B8	TURN(L)	+
	B9	TXD	
	B10	RXD	
	B11	BATT(+ REGULAR POWER)	+
	B12	IGN(+13.5V)	+
	B13	GND(-)	-
	B14	FUEL GAUGE UNIT	
	B15	TEMP GAUGE UNIT	
	B16	TACHO METER PULSE	

▶ CIRCUIT

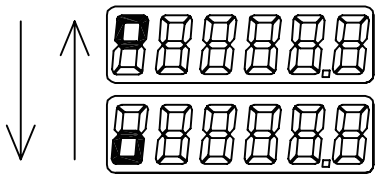

FOR METER CONTROL ONLY
TACHO PULSE SELECTION MODE
(REFER TO TACHO PULSE NOTICE)
B10
RXD
B9
TXD
B12
IGN(+13.5V)
A17
J
A18
K
A19
L
SPARE
T/M
F/G
T/G
MICROPROCESSOR
TACHO METER PULSE
B16
FUEL GAUGE UNIT
B14
TEMP GAUGE UNIT
B15
B11
BATT(+)
B13
GND(-)
HOUR METER(+)
HOUR METER
A16
DPF
A8
E/G OIL PRE'
A5
CHARGE
A6
A14
IGN(+13.5V)
GLOW
A7
SPARE 2
A10
A15
GND(-)
SPARE 3
A9
SPARE 4
A8
PTO
B4
ILLUMINATION
A13
TURN(R)
A1
TURN(L)
B8
HIGH BEAM
A2
A11
PARKING
A12
K25W727C

▶ PERFORMANCE SPECIFICATIONS

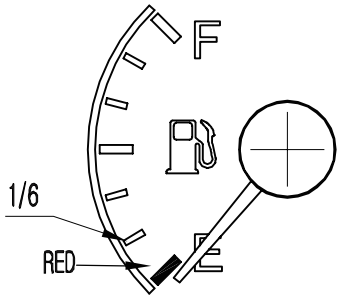
1. Tachometer

PTO RPM		PTO 540 rpm → 2,600 rpm				
Operating range		0 - 3,500 rpm				
Indicator characteristics	Position (rpm)	1,000	2,000	2,500	2,860	3,000
	Tolerance (rpm)	± 50	(± 100)	(± 100)	± 50	± 50
A - Frequency (Hz)		163.4	326.8	408.5	467.3	490.2
B - Frequency (Hz)		179	358	447.6	512	537.1
Zone						

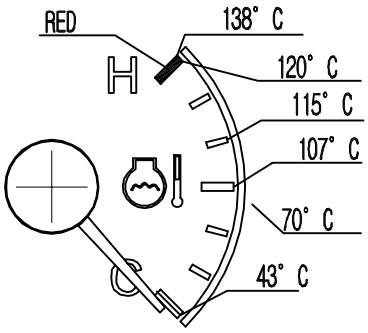
2. Hourmeter

Type	LCD type
Rated voltage	DC 12V
Max. displaying time	9999.9 hours
Time accuracy	± 5 sec./24 hr.(for continuous operation)
Display	

3. Fuel gauge

Type		STEPPER MOTOR			
Operational voltage		DC 12 V			
Indicator characteristics	Position	E	1/6	1/2	F
	Resistance (Ω)	95	(42.5)	18	7
	Tolerance (°)	± 3.5	-	± 3.5	± 3.5
Zone					

4. Temp. gauge

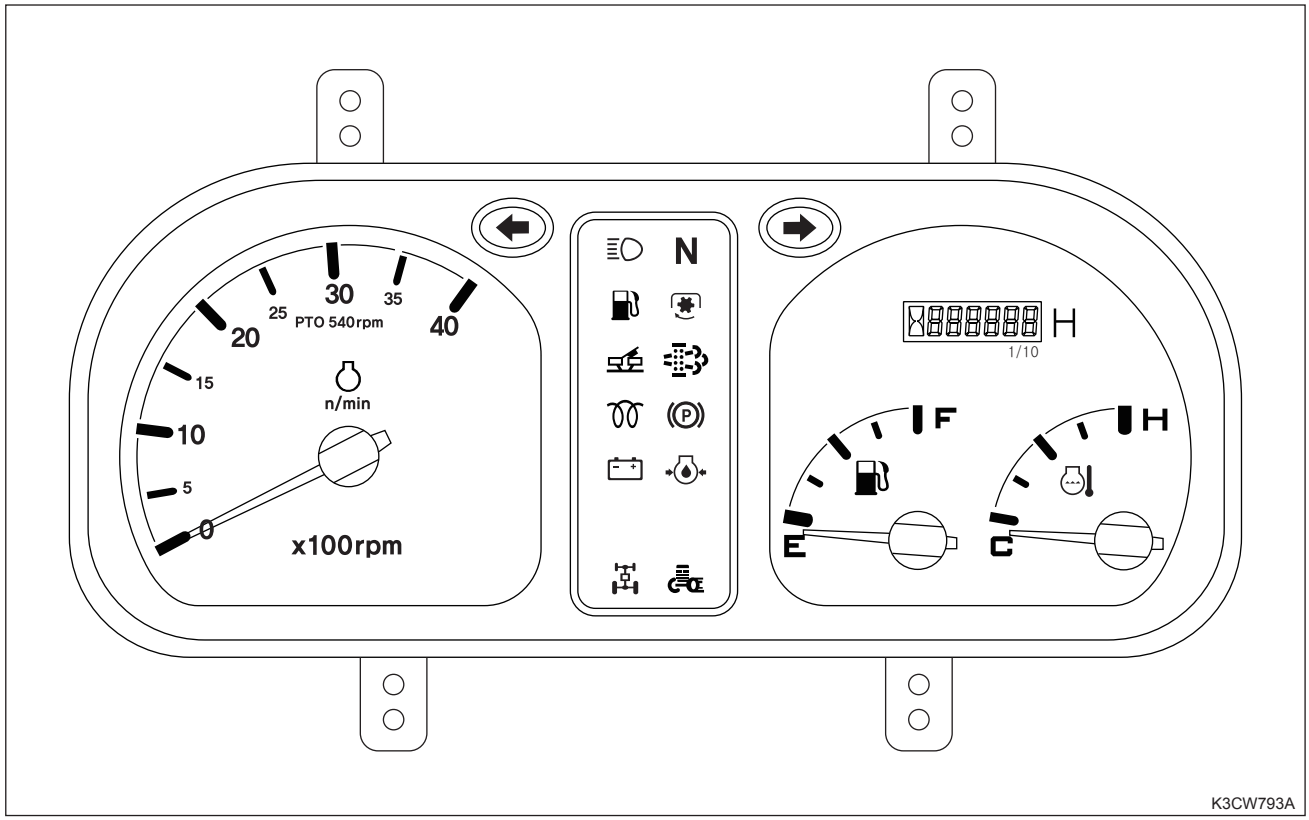
Type		STEPPER MOTOR					
Operational voltage		DC 12 V					
Indicator characteristics	Position	43	70	107	115	120	138
	Resistance (Ω)	240.5	103.2	38	34.1	30.5	21.2
	Tolerance (°)	(± 3.5)	(± 3.5)	± 3.5	(± 3.5)	± 3.5	(± 3.5)
Zone							

5. Indicator

SYMBOL									
NAME	Turn(L)	Turn(R)	Upper beam	E/G oil	Parking	Charge	DPF	Preheat	PTO
COLOR	Green	Green	Blue	Red	Red	Red	Yellow	Red	Yellow
LAMP	LED								

CABIN MODEL

▶ CONFIGURATION AND PERFORMANCE SPECIFICATIONS



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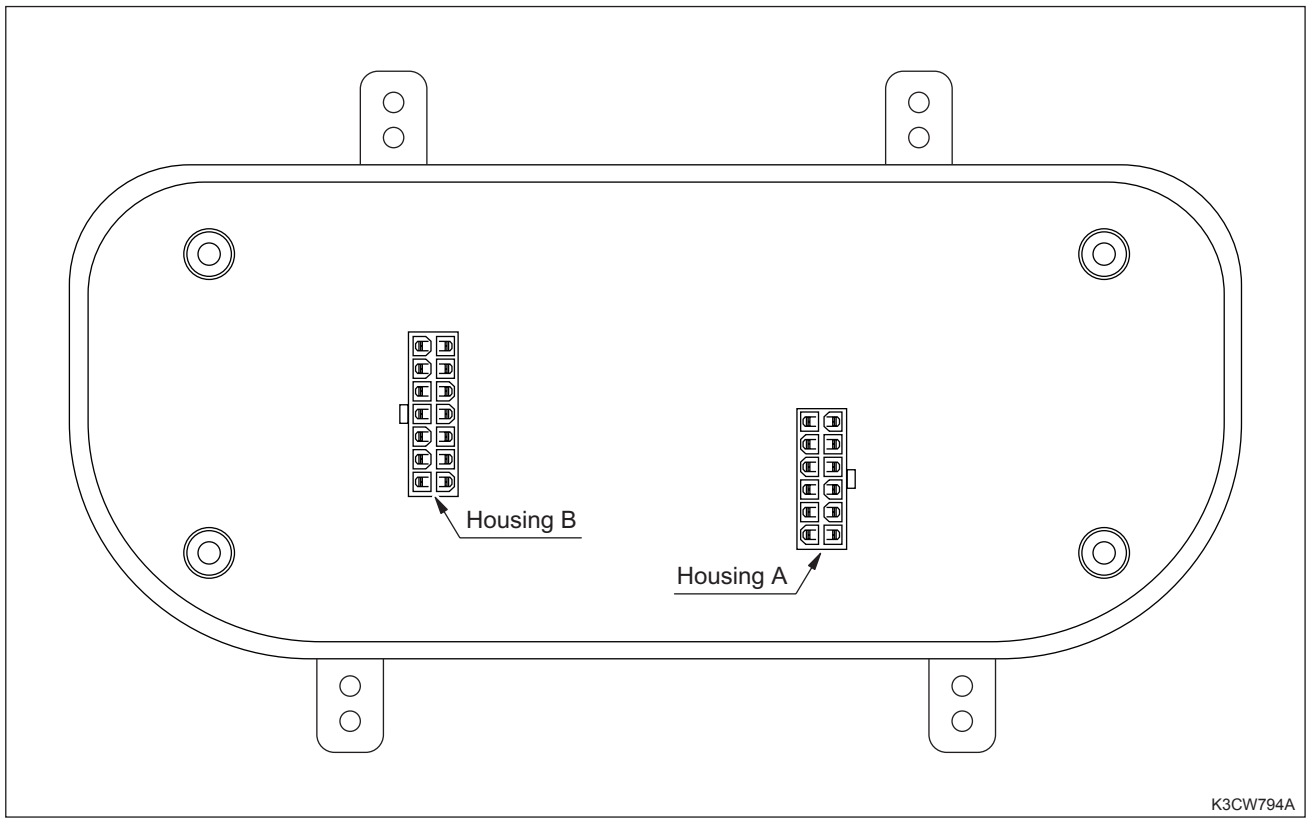
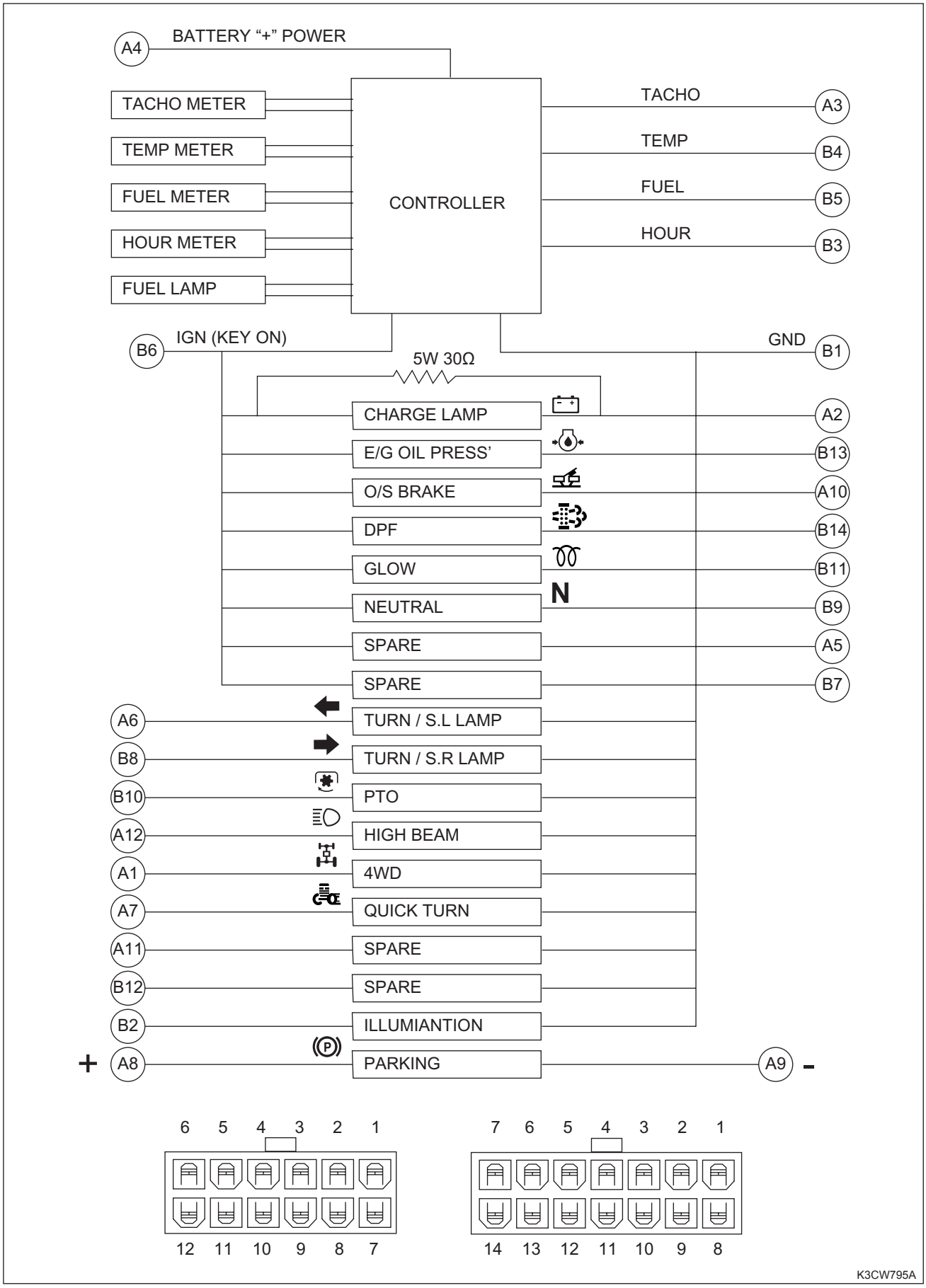


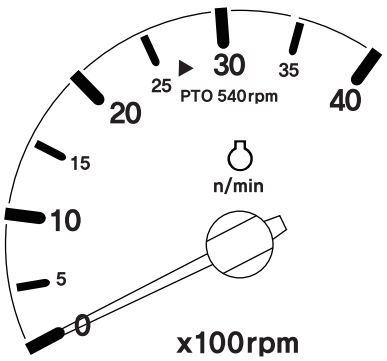
K3CW794A

▶ CIRCUIT & CONNECTOR

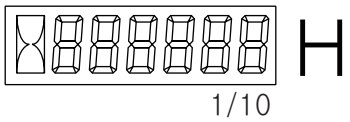


▶ PERFORMANCE SPECIFICATIONS

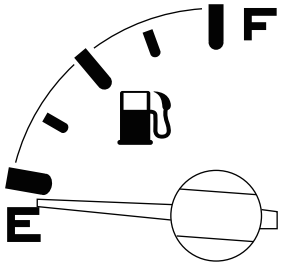
1. Tachometer

Type		STEPPING MOTOR TYPE + ECU CONTROL			
Rated voltage		DC 12V			
RPM detector		E/G 2,700 rpm → 498 Hz			
PTO rpm		PTO 540 rpm → 2,651 rpm			
Operating range		0 ~ 4,000 rpm			
Indicator characteristics	Position (rpm)	1,000	2,000	2,500	3,000
	Tolerance (rpm)	+ 50 -150	(± 100)	± 100	± 250 0
Zone					

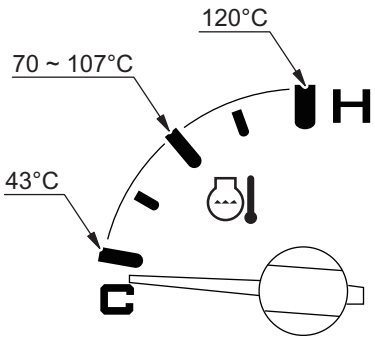
2. Hourmeter

Type	QUARTZ (LCD type)
Rated voltage	FREE VOLTAGE (12V)
Operating voltage range	DC 10V ~ 15V
Operating temp. range	-20°C ~ +80°C
Max. displaying time	99999.9 hours
Time accuracy	± 5 sec./24 hr.(for continuous operation)
Display	

3. Fuel gauge

Type		STEPPING MOTOR TYPE + ECU CONTROL / LEFT -- RIGHT		
Rated voltage		DC 12V		
Indicator characteristics	Position	E	1/2	F
	Resistance (Ω)	95	(32.5)	7
	Tolerance (°)	± 3.75	-	± 3.75
Zone				

4. Temp. gauge

Type		STEPPING MOTOR TYPE + ECU CONTROL / LEFT -- RIGHT		
Rated voltage		DC 12V		
Indicator characteristics	Temperature (°C)	43	(70 ~ 107)	120
	Resistance (Ω)	240.5	(103.2 ~ 38)	30.5
	Tolerance (°)	± 3.75	(± 3.75)	± 3.75
Zone				

5. Indicator

SYMBOL							
NAME	Turn(L)	Turn(R)	Upper beam	Neutral	Low oil	PTO	O/S brake
COLOR	Green	Green	Blue	Green	Red	Red	Red
SYMBOL							
NAME	DPF	Preheat	Parking	Charge	E/G oil	4WD	Quick turn
COLOR	Yellow	Red	Red	Red	Red	Yellow	Yellow
LAMP	LED						

5.3 LAMP BULB REPLACEMENT

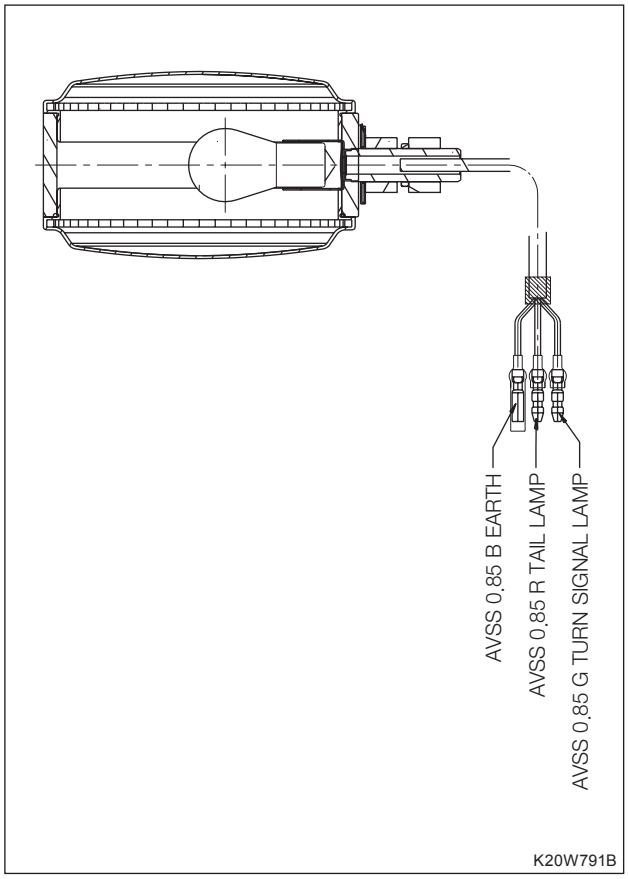
5.3.1 HEAD LAMP

1. Pull the cap (1) out to disconnect it.

3. Bulb specification: HS1 12 V 35 W/35 W

2. Loosen the screw (2) and release the spring holder (3). Then, remove the socket with bulb.

5.3.2 FRONT TURN SIGNAL LAMP [ROPS MODEL]



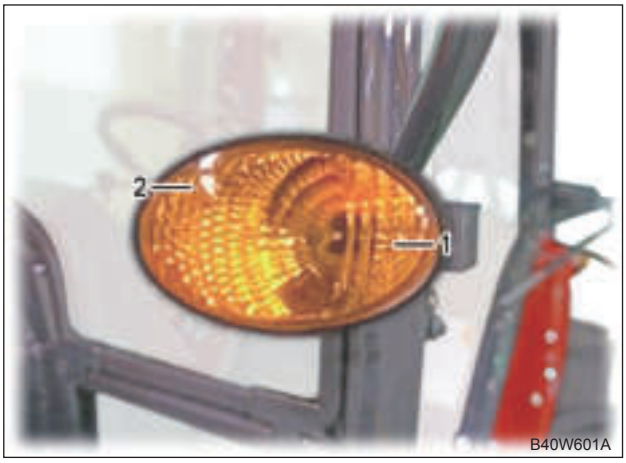
1. Unscrew the front and rear lens mounting screws (1).

2. Remove the bulb (2) by pressing and turning it clockwise.

2. Replace it with a new one.

   Bulb specification: 12 V 21 W/5 W

5.3.3 REAR COMBINATION LAMP [CABIN MODEL]



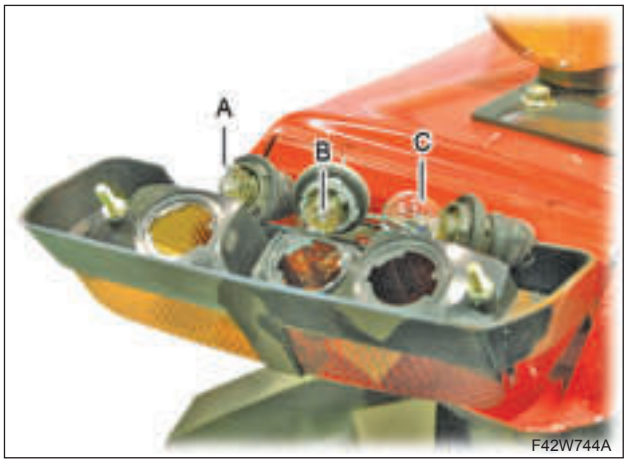
1. Unscrew the lens mounting screws (1) of the front combination lamp and pull the lens (2) to remove it.

2. Remove the bulb (1), (2) by pressing and turning it.

3. Replace the bulb with a new one.

   Bulb specification: Right - 12 V 27 W
   Left - 12 V 8 W

5.3.4 REAR COMBINATION LAMP [ROPS MODEL]



1. Unscrew the mounting nuts (1) of the rear combination lamp in the fender.
2. Press the each socket assembly (2) and turn it counterclockwise to remove.

3. Replace the bulb with a new one.

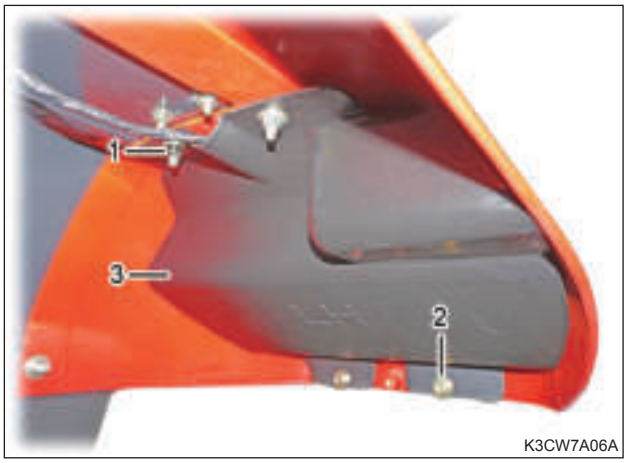
   Bulb specification:

   Ⓐ Left - 12 V 27 W (turn signal lamp)

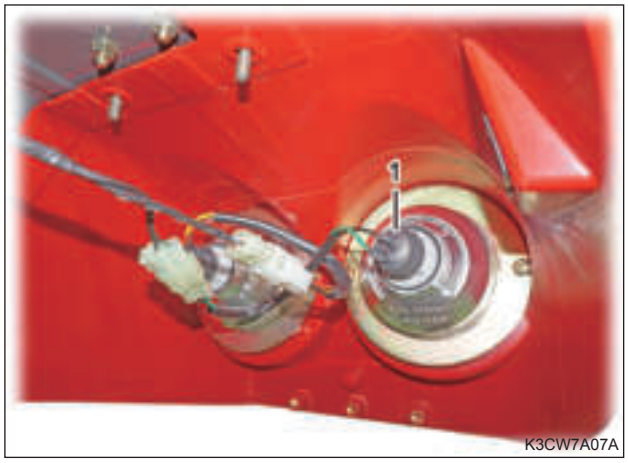
   Ⓑ Middle - 12 V 8 W (Backup/Work lamp)

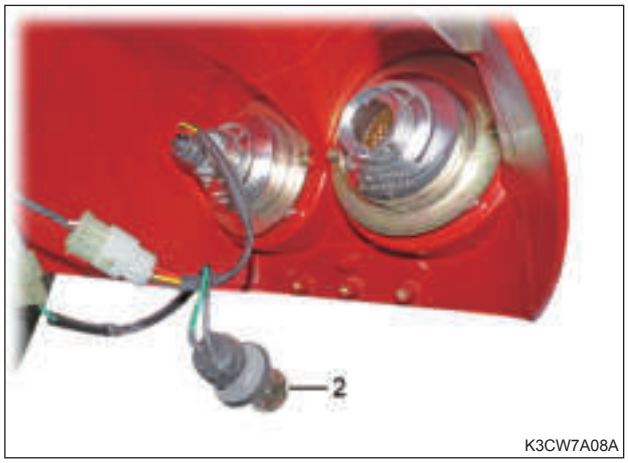
   Ⓒ Right - 12 V 21 W/5 W (brake/tail lamp)

5.3.4 REAR COMBINATION LAMP [CABIN MODEL]



1. Unscrew the lamp cover mounting nuts (1) and bolts (2) to remove the lamp cover (3).

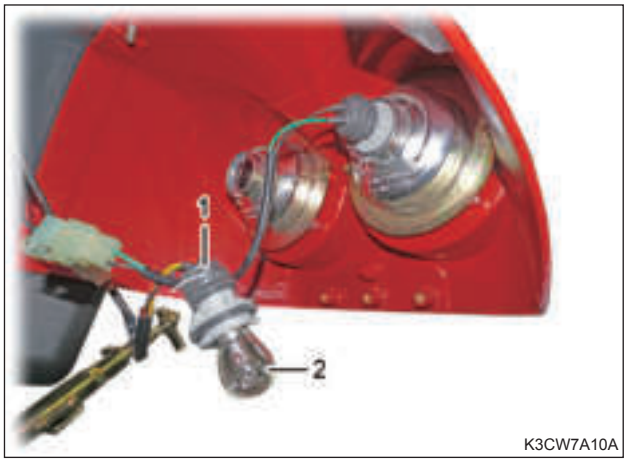




2. Unscrew the grommet assembly (1) counter-clockwise to remove it and remove the bulb (2).

3. Replace the bulb with a new one.

   Bulb specification: 12 V 21 W



4. Unscrew the grommet assembly (1) and remove the bulb (2).

5. Replace the bulb with a new one.

   Bulb specification: 12 V 21 W / 5 W

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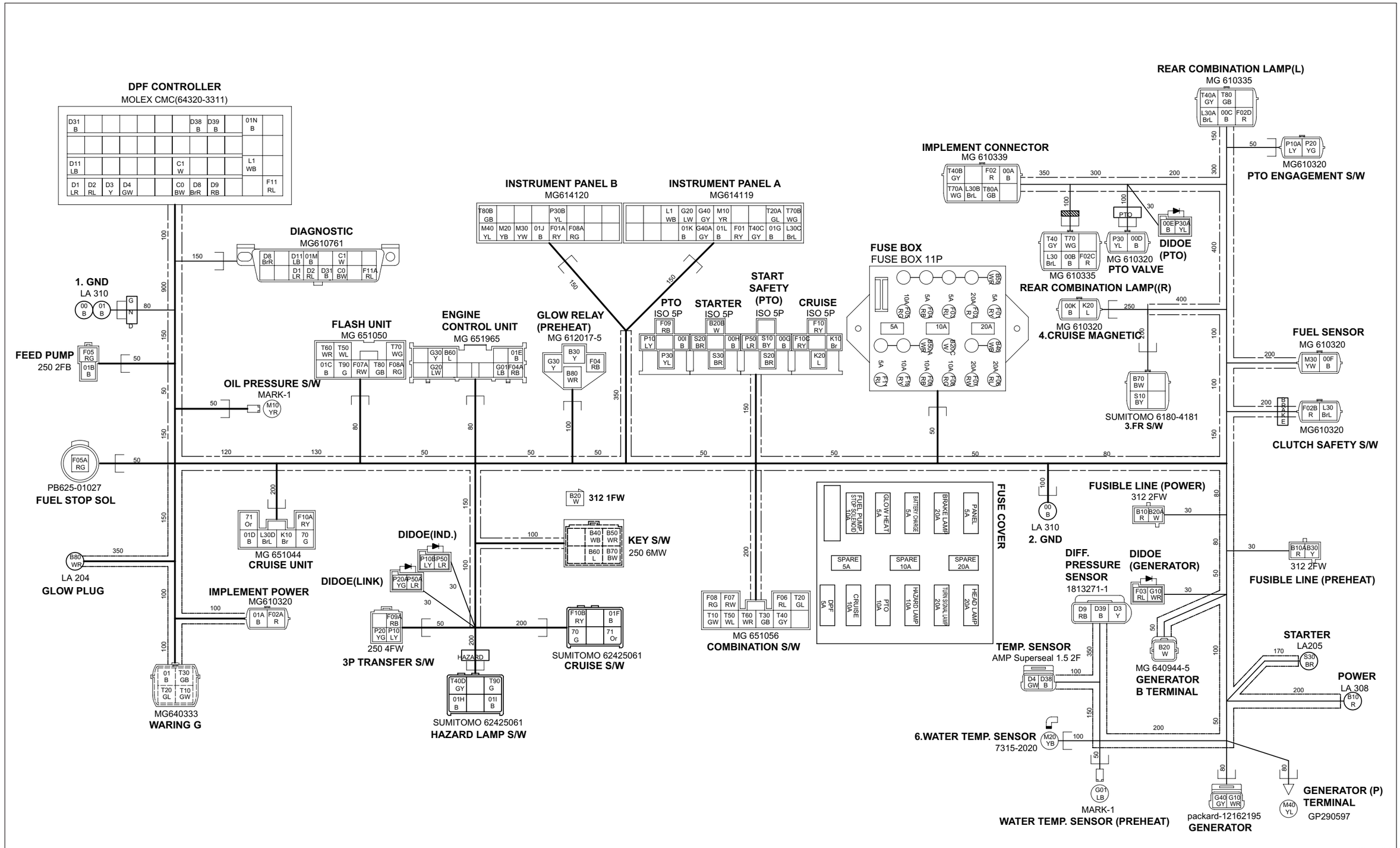
5.4 WIRING DIAGRAM

ROPS MODEL

5.4.1 MAIN WIRING DIAGRAM



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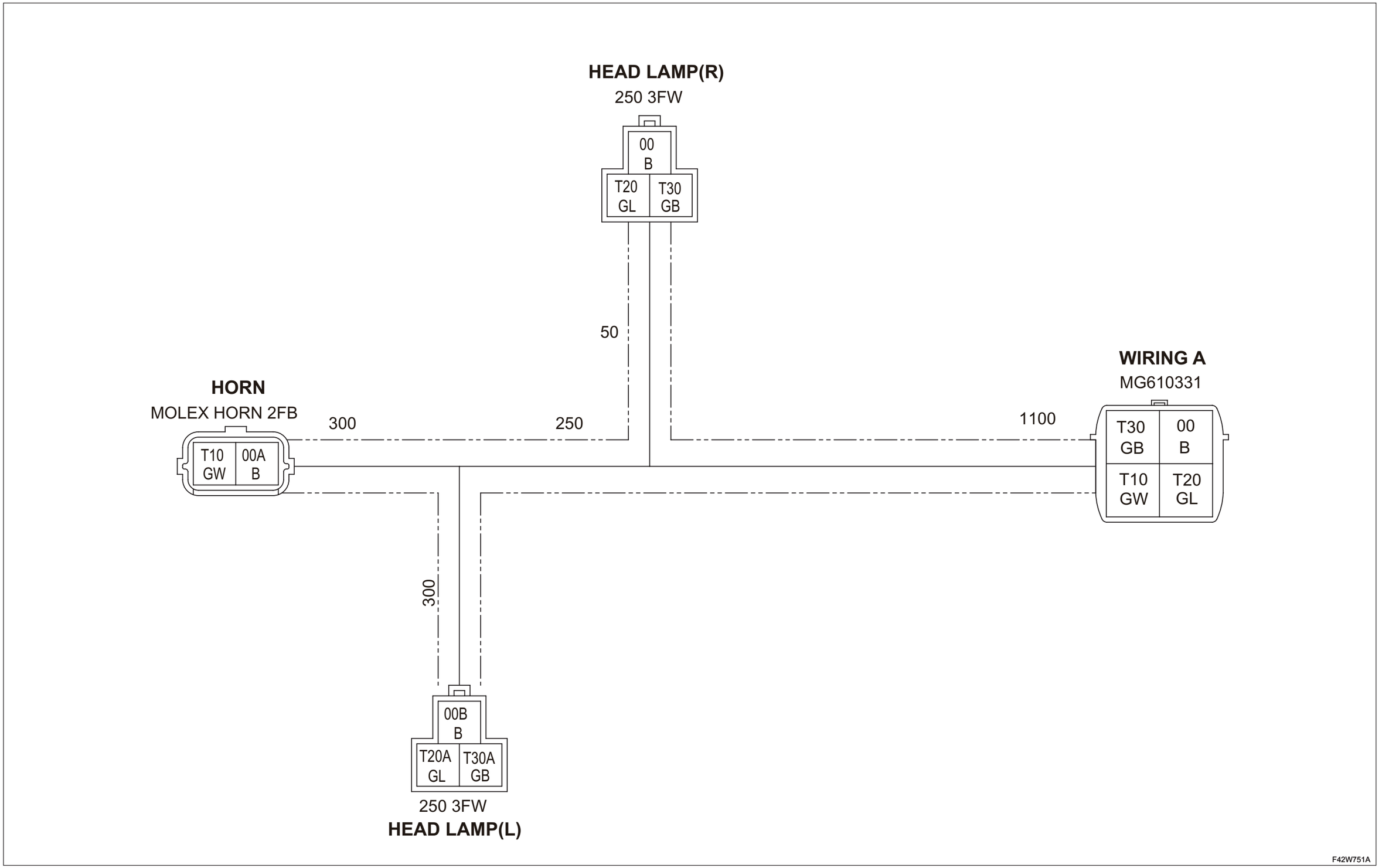
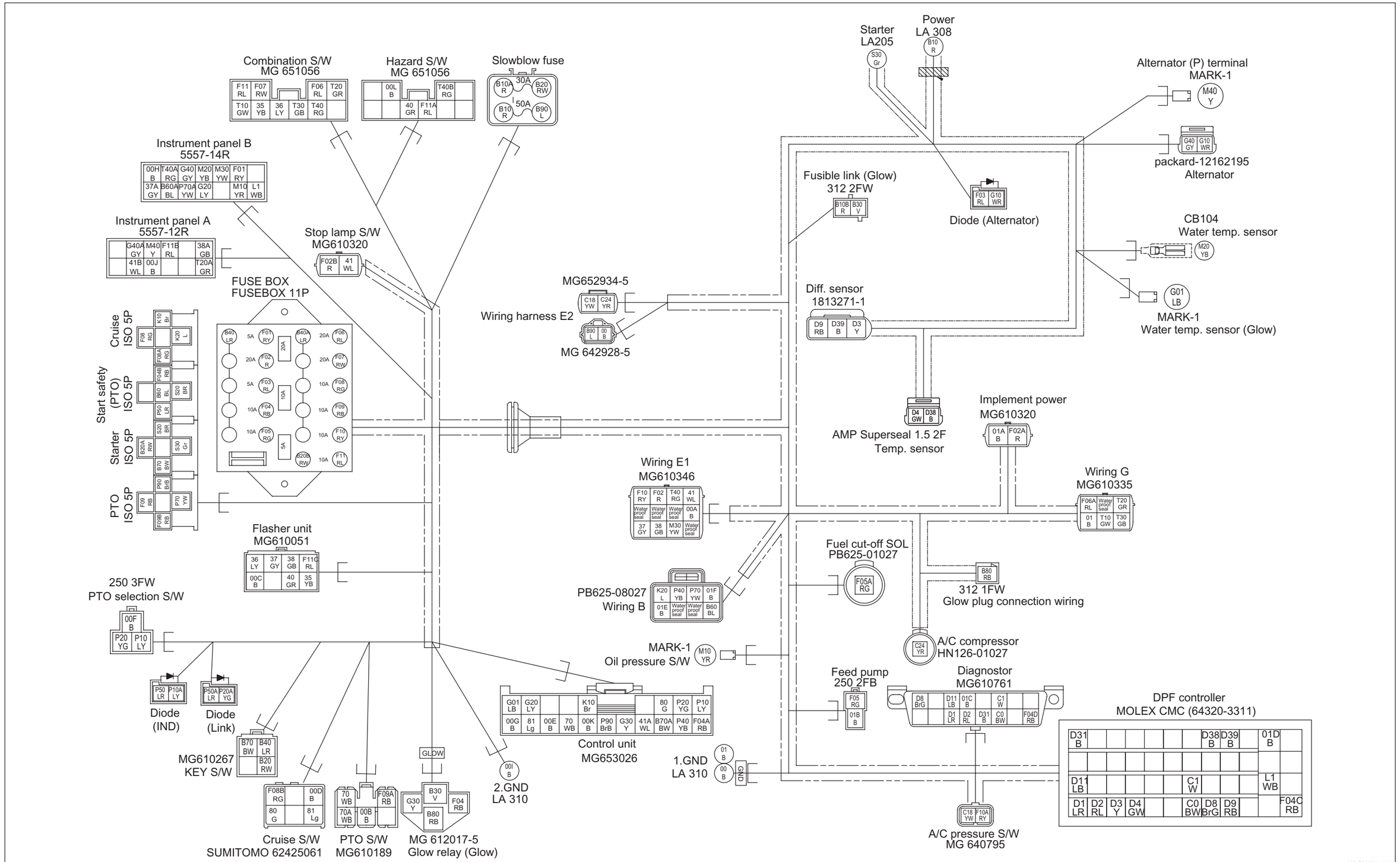
5.4.2 BONNET WIRING DIAGRAM (WIRING G)



CABIN MODEL

5.4.3 MAIN WIRING DIAGRAM (WIRING A)

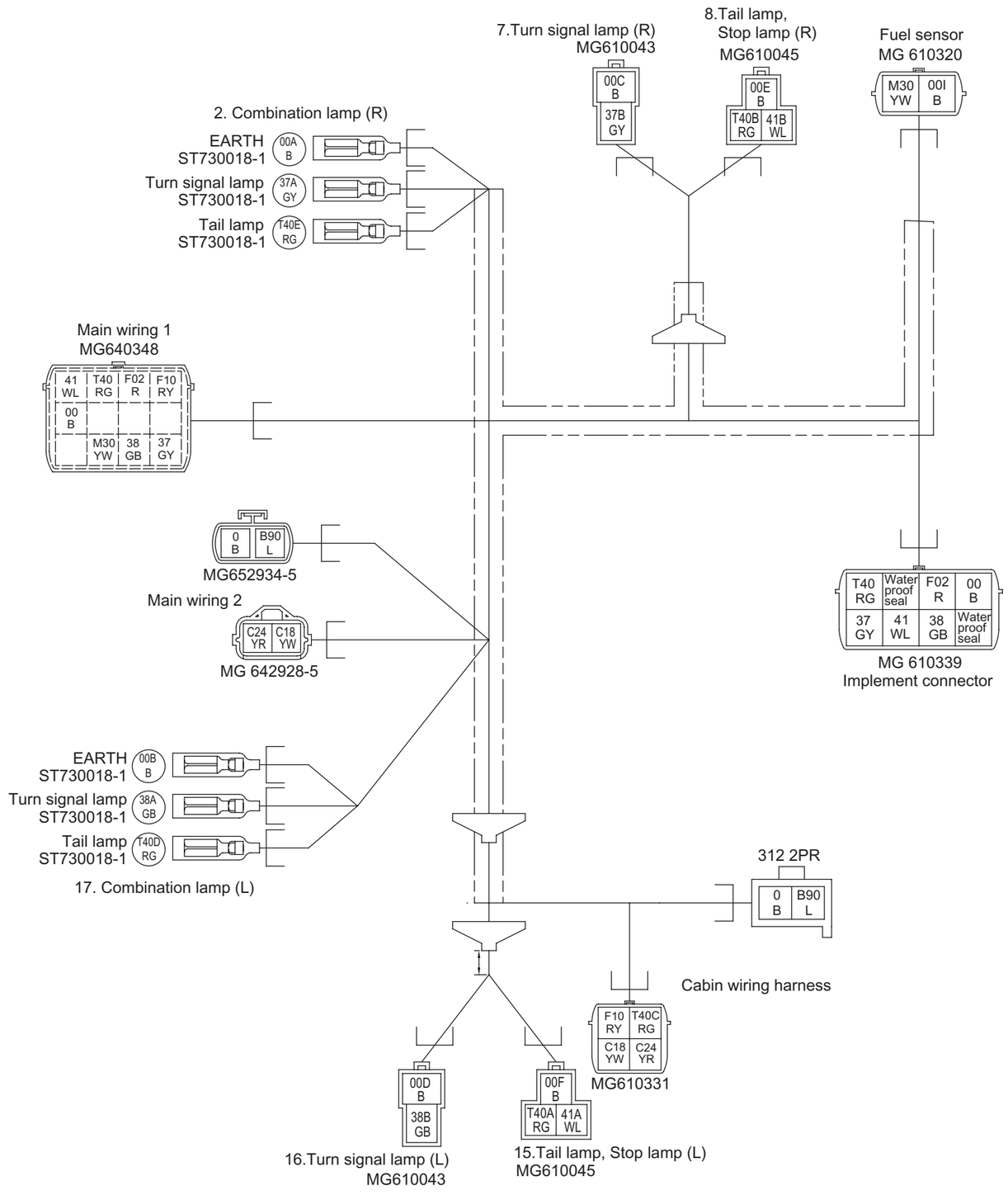


NO	COLOR	FROM	TO	FROM	TO
1	R	B10	B10	Power	Slowblow fuse
2	R		B10A	Joint from B10	Slowblow fuse
3	R		B10B	Joint from B10	Fusible link (Glow)
4	RW	B20	B20	Slowblow fuse	KEY switch
5	RW		B20A	Joint from B20	Relay (Starter)
6	RW		B20B	Joint from B20	Fuse box
7	V	B30	B30	Fusible link (Glow)	Glow relay (Glow)
8	LR	B40	B40	KEY switch	Fuse box
9	LR		B40A	Joint from B40	Fuse box
10	BL	B60	B60	Wiring harness B	Relay (Safety start)
11	BL		B60A	Joint from B60	Instrument panel B
12	BW	B70	B70	KEY switch	Relay (Starter)
13	BW		B70A	Joint from B70	Control unit
14	RB	B80	B80	Glow plug connection wiring	Glow relay (Glow)
15	L	B90	B90	Slowblow fuse	Wiring harness E2
16	BW	C0	C0	Diagnostor	DPF controller
17	W	C1	C1	Diagnostor	DPF controller
18	LR	D1	D1	Diagnostor	DPF controller
19	RL	D2	D2	Diagnostor	DPF controller
20	Y	D3	D3	Diff-pressure sensor	DPF controller
21	GW	D4	D4	Temp. sensor	DPF controller
22	BrG	D8	D8	Diagnostor	DPF controller
23	RB	D9	D9	Diff-pressure sensor	DPF controller
24	LB	D11	D11	Diagnostor	DPF controller
25	B	D31	D31	Diagnostor	DPF controller
26	B	D38	D38	Temp. sensor	DPF controller
27	B	D39	D39	Diff-pressure sensor	DPF controller
28	RY	F01	F01	Fuse box	Instrument panel B
29					
30	R	F02	F02	Fuse box	Wiring harness E1
31	R		F02A	Joint from F02	Implement power
32	R		F02B	Joint from F02	Stop lamp switch
33	RL	F03	F03	Fuse box	Diode (Alternator)

NO	COLOR	FROM	TO	FROM	TO
34	RB	F04	F04	Fuse box	Glow relay (Glow)
35	RB		F04A	Joint from F04	Control unit
36	RB		F04B	Joint from F04	Relay (Safety start)
37	RB		F04C	Joint from F04	DPF controller
38	RB		F04D	Joint from F04	Diagnostor
39					
40	RG	F05	F05	Fuse box	Feed pump
41	RG		F05A	Joint from F05	Fuel cut-off SOL
42	RL	F06	F06	Fuse box	Combination switch
43	RL		F06A	Joint from F06	Wiring harness G
44	RW	F07	F07	Fuse box	Combination switch
45	RG	F08	F08	Fuse box	Cruise relay
46	RG		F08A	Joint from F08	Cruise relay
47	RG		F08B	Joint from F08	Cruise switch
48	RB	F09	F09	Fuse box	Relay (PTO)
49	RB		F09A	Joint from F09	PTO switch
50	RB		F09B	Joint from F09	Relay (PTO)
51	RY	F10	F10	Fuse box	Wiring harness E1
52	RY		F10A	Joint from F10	A/C pressure switch
53	RL	F11	F11	Fuse box	Combination switch
54	RL		F11A	Joint from F11	Hazard warning lamp switch
55	RL		F11B	Joint from F11	Instrument panel A
56	RL		F11C	Joint from F11	Flasher unit
57	LB	G01	G01	Water temp sensor (Glow)	Control unit
58	WR	G10	G10	Alternator	Diode (Alternator)
59	LY	G20	G20	Control unit	Instrument panel B
60	Y	G30	G30	Glow relay (Glow)	Control unit
61	GY	G40	G40	Alternator	Instrument panel B
62	GY		G40A	Joint from G40	Instrument panel A
63	WB	L01	L01	DPF controller	Instrument panel B
64	YR	M10	M10	Oil pressure switch	Instrument panel B
65	YB	M20	M20	Water temp. sensor	Instrument panel B

NO	COLOR	FROM	TO	FROM	TO
66	YW	M30	M30	Wiring harness E1	Instrument panel B
67	Y	M40	M40	Alternator P terminal	Instrument panel A
68					
69	LY	P10	P10	Control unit	PTO selection switch
70	LY		P10A	Joint from P10	Diode (IND)
71					
72	YG	P20	P20	Control unit	PTO selection switch
73	YG		P20A	Joint from P20	Diode (Link)
74	YB	P40	P40	Control unit	Wiring harness B
75	LR	P50	P50	Relay (Safety start)	Diode (IND)
76	LR		P50A	Joint from P50	Diode (Link)
77	LR		P50B	Joint from P50	Control unit
78	YW	P70	P70	Relay (PTO)	Wiring harness B
79	YW		P70A	Joint from P70	Instrument panel B
80	BrB	P90	P90	Relay (PTO)	Control unit
81	BR	S20	S20	Relay (Safety start)	Relay (Start)
82	Gr	S30	S30	Starter	Relay (Start)
83	GW	T10	T10	Combination switch	Wiring harness G
84	GR	T20	T20	Combination switch	Wiring harness G
85	GR		T20A	Joint from T20	Instrument panel A
86	GB	T30	T30	Combination switch	Wiring harness G
87	RG	T40	T40	Combination switch	Wiring harness E1
88	RG		T40A	Joint from T40	Instrument panel B
89	RG		T40B	Joint from T40	Hazard warning lamp switch
90	YB	35	35	Hazard warning lamp switch	Combination switch
91	LY	36	36	Hazard warning lamp switch	Combination switch
92	GY	37	37	Flasher unit	Wiring harness E1
93	GY		37A	Joint from 37	Instrument panel B
94	GB	38	38	Flasher unit	Wiring harness E1
95	GB		38A	Joint from 38	Instrument panel A

5.4.4 FENDER WIRING DIAGRAM (WIRING C)



NO	COLOR	FROM	TO	FROM	TO
1	GY	37	37	Main wiring harness 1	Implement connector
2	GY		37A	Joint from 37	Combination lamp (R)
3	GY		37B	Joint from 37	Turn signal lamp (R)
4	GB	38	38	Main wiring harness 1	Implement connector
5	GB		38A	Joint from 38	Combination lamp (L)
6	GB		38B	Joint from 38	Turn signal lamp (L)
7	WL	41	41	Main wiring harness 1	Implement connector
8	WL		41A	Joint from 41	Tail lamp, Stop lamp (L)
9	WL		41B	Joint from 41	Tail lamp, Stop lamp (R)
10	L	B90	B90	Main wiring harness 2	Cabin wiring harness
11	YW	C18	C18	Main wiring harness 2	Cabin wiring harness
12	YR	C24	C24	Main wiring harness 2	Cabin wiring harness
13	R	F02	F02	Main wiring harness 1	Implement connector
14	RY	F10	F10	Main wiring harness 1	Cabin wiring harness
15	YW	M30	M30	Main wiring harness 1	Fuel sensor
16	RG	T40	T40	Main wiring harness 1	Implement connector
17	RG		T40A	Joint from T40	Tail lamp, Stop lamp (L)
18	RG		T40B	Joint from T40	Tail lamp, Stop lamp (R)
19	RG		T40C	Joint from T40	Cabin wiring harness
20	RG		T40D	Joint from T40	Combination lamp (L)
21	RG		T40E	Joint from T40	Combination lamp (R)
22					
23	B	0	0	Main wiring harness 2	Cabin wiring harness
24	B	00	00	Main wiring harness 1	Implement connector
25	B		00A	Joint from 00	Combination lamp (R)
26	B		00B	Joint from 00	Combination lamp (L)
27	B		00C	Joint from 00	Turn signal lamp (R)
28	B		00D	Joint from 00	Turn signal lamp (L)
29	B		00E	Joint from 00	Tail lamp, Stop lamp (R)
30	B		00F	Joint from 00	Tail lamp, Stop lamp (L)
31	B		00I	Joint from 00	Fuel sensor

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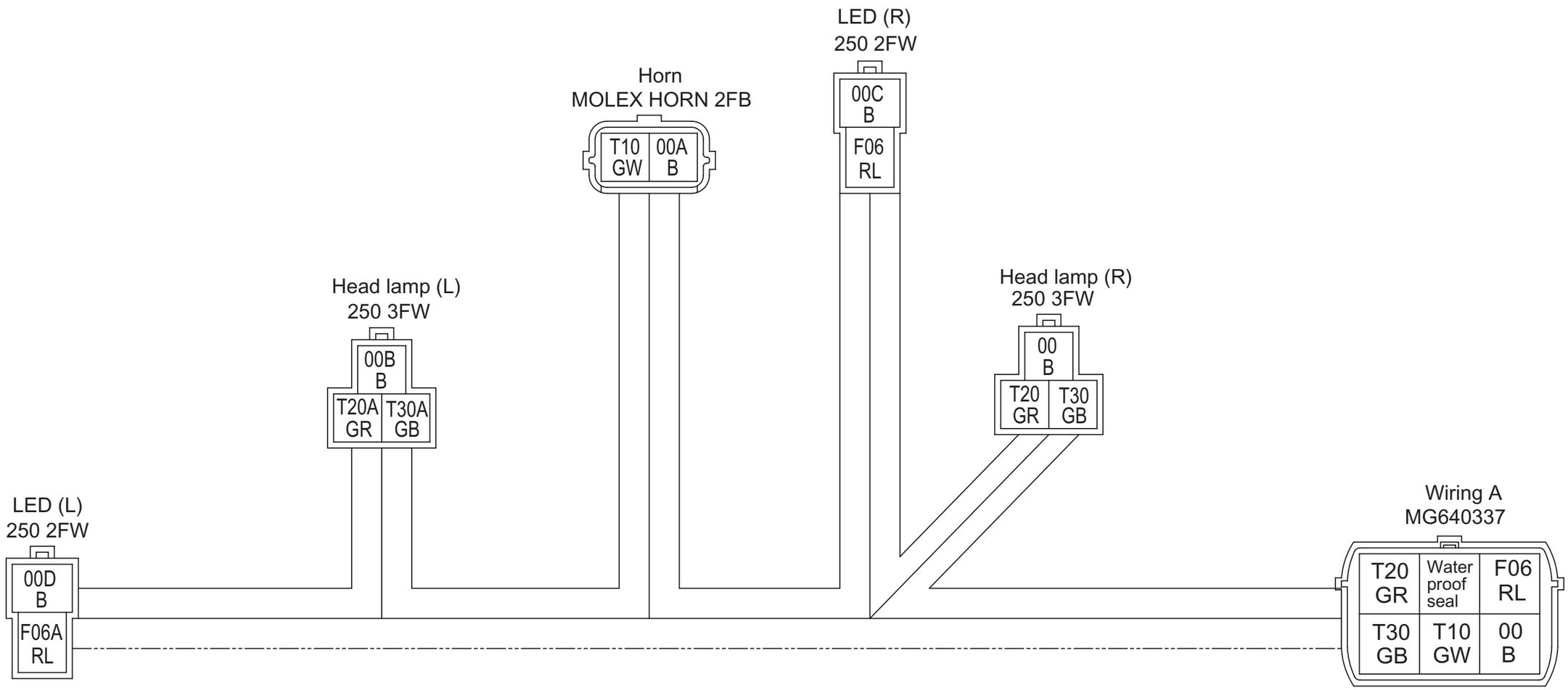
5.4.5 BONNET WIRING DIAGRAM (WIRING G)



NO	COLOR	FROM	TO	FROM	TO
1	RL	F06	F06	Wiring harness A	LED (R)
2	RL		F06A	Joint from F06	LED (L)
3	GW	T10	T10	Wiring harness A	Horn
4	GR	T20	T20	Wiring harness A	Head lamp (R)
5	GR		T20A	Joint from T20	Head lamp (L)
6	GB	T30	T30	Wiring harness A	Head lamp (R)

NO	COLOR	FROM	TO	FROM	TO
7	GB		T30A	Joint from T30	Head lamp (L)
8	B	00	00	Wiring harness A	Head lamp (R)
9	B		00A	Joint from 00	Horn
10	B		00B	Joint from 00	Head lamp (L)
11	B		00C	Joint from 00	LED (R)
12	B		00D	Joint from 00	LED (L)

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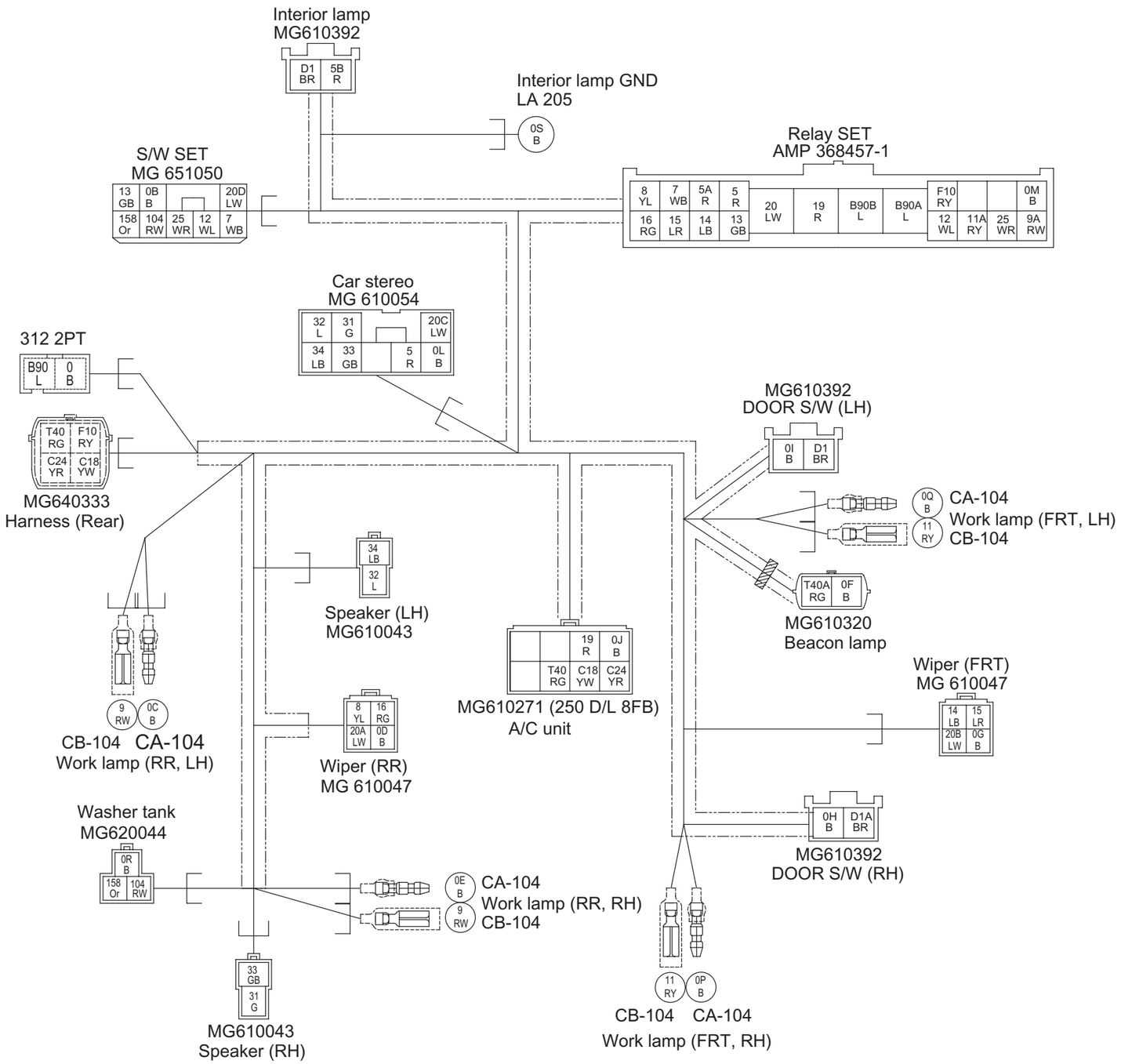
5.4.6 CABIN WIRING DIAGRAM



NO	COLOR	FROM	TO	FROM	TO
1	R	5	5	Audio	Relay SET
2	R		5A	Joint from 5	Relay SET
3	R		5B	Joint from 5	Room lamp
4	WB	7	7	Switch SET	Relay SET
5	YL	8	8	Wiper (RR)	Relay SET
6	RW	9	9	Work lamp (RR, RH)	Work lamp (RR, LH)
7	RW		9A	Joint from 9	Relay SET
8	RY	11	11	Work lamp (FRT, RH)	Work lamp (FRT, LH)
9	RY		11A	Joint from 11	Relay SET
10	WL	12	12	Switch SET	Relay SET
11	GB	13	13	Switch SET	Relay SET
12	LB	14	14	Wiper (FRT)	Relay SET
13	LR	15	15	Wiper (FRT)	Relay SET
14	RG	16	16	Wiper (RR)	Relay SET
15	RY	F10	F10	Harness (RR)	Relay SET
16	R	19	19	Relay SET	A/C unit
17	LW	20		Relay SET	
18	LW		20A	Joint from 20	Wiper (RR)
19	LW		20B	Joint from 20	Wiper (FRT)
20	LW		20C	Joint from 20	Audio
21	LW		20D	Joint from 20	Switch SET
22	WR	25	25	Switch SET	Relay SET
23	RG	T40	T40	Harness (RR)	A/C unit
24	RG		T40A	Joint from T40	Beacon lamp
25	G	31	31	Speaker (RH)	Audio
26	L	32	32	Speaker (LH)	Audio
27	GB	33	33	Speaker (RH)	Audio
28	LB	34	34	Speaker (LH)	Audio
29	RW	104	104	Washer tank	Switch SET
30	Or	158	158	Washer tank	Switch SET
31	L	B90		Harness (RR)	
32	L		B90A	Joint from B90	Relay SET
33	L		B90B	Joint from B90	Relay SET
34	YW	C18	C18	Harness (RR)	A/C unit
35	YR	C24	C24	Harness (RR)	A/C unit
36	BR	D1	D1	Room lamp	DOOR S/W (LH)
37	BR		D1A	Joint from D1	DOOR S/W (RH)
38					
39	B	0		Harness (RR)	
40	B		0B	Joint from 0	Switch SET
41	B		0C	Joint from 0	Work lamp (RR, LH)
42	B		0D	Joint from 0	Wiper (RR)
43	B		0E	Joint from 0	Work lamp (RR, RH)
44	B		0F	Joint from 0	Beacon lamp
45	B		0G	Joint from 0	Wiper (FRT)
46	B		0H	Joint from 0	DOOR S/W (RH)
47	B		0I	Joint from 0	DOOR S/W (LH)
48	B		0J	Joint from 0	A/C unit
49	B		0L	Joint from 0	Audio
50	B		0M	Joint from 0	Relay SET
51	B		0P	Joint from 0	Work lamp (FRT, RH)
52	B		0Q	Joint from 0	Work lamp (FRT, LH)
53	B		0R	Joint from 0	Washer tank
54	B		0S	Joint from 0	Interior lamp GND

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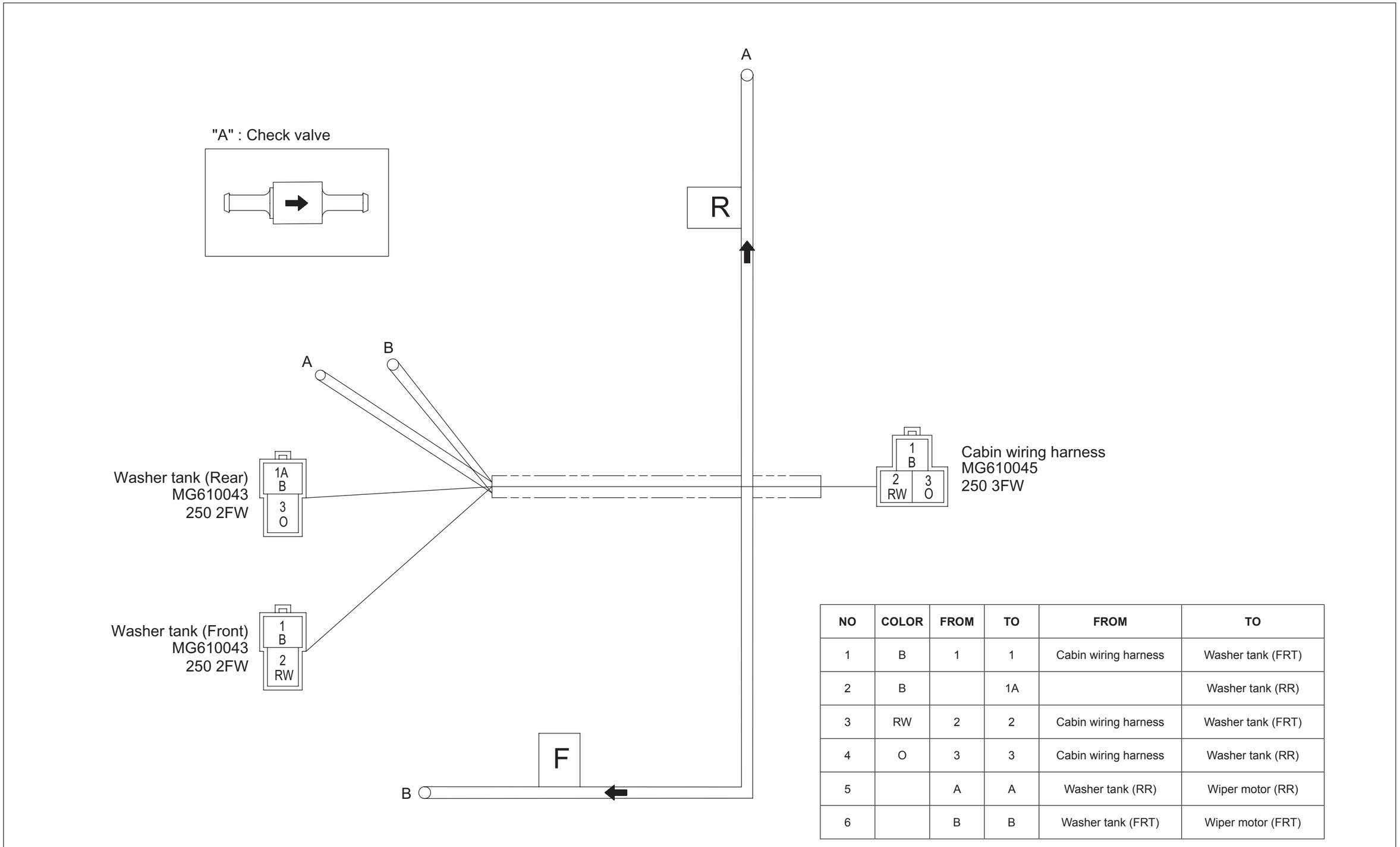
5.4.7 WASHER TANK WIRING DIAGRAM



NO	COLOR	FROM	TO	FROM	TO
1	B	1	1	Cabin wiring harness	Washer tank (FRT)
2	B		1A		Washer tank (RR)
3	RW	2	2	Cabin wiring harness	Washer tank (FRT)
4	O	3	3	Cabin wiring harness	Washer tank (RR)
5		A	A	Washer tank (RR)	Wiper motor (RR)
6		B	B	Washer tank (FRT)	Wiper motor (FRT)

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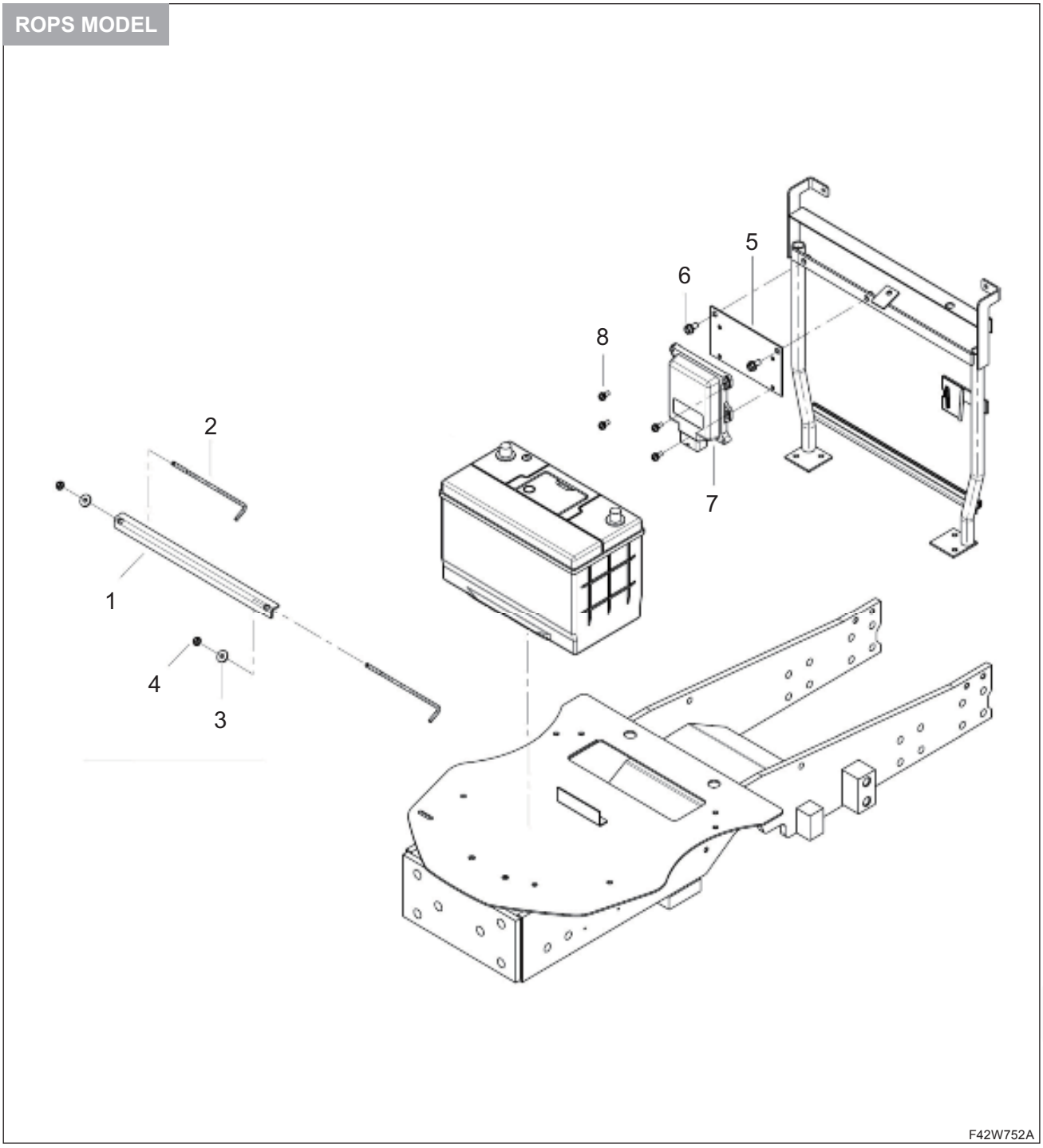
6. SECTIONAL VIEW FOR MAJOR COMPONENTS

6.1 BATTERY

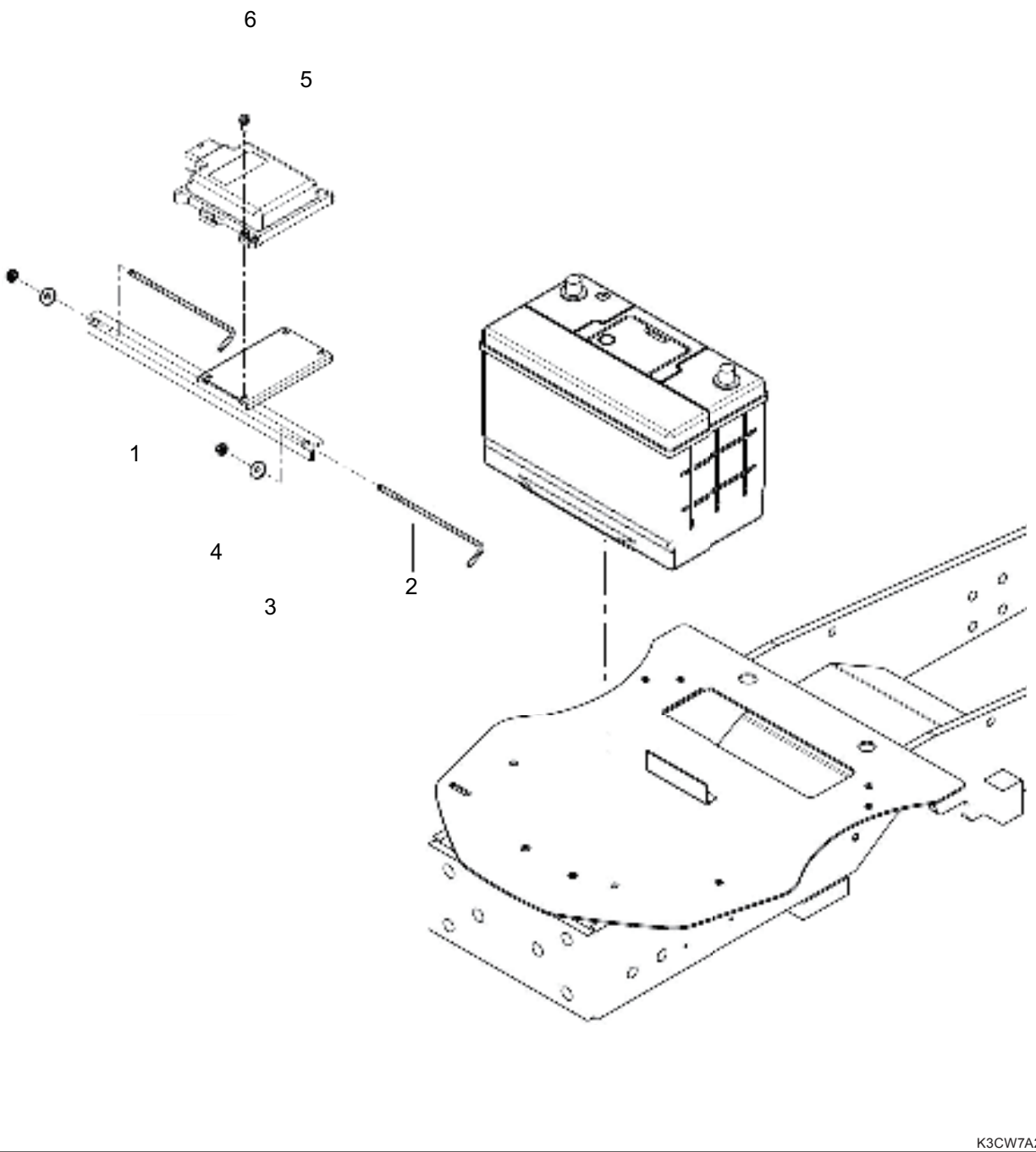
ROPS MODEL



COMPONENTS

(1) Battery stop bracket
(2) Stop rod
(3) Washer
(4) Hex flange nut
(5) Bracket(DPF logger)
(6) Hex flange bolt
(7) DPF logger
(8) Screw

CABIN MODEL

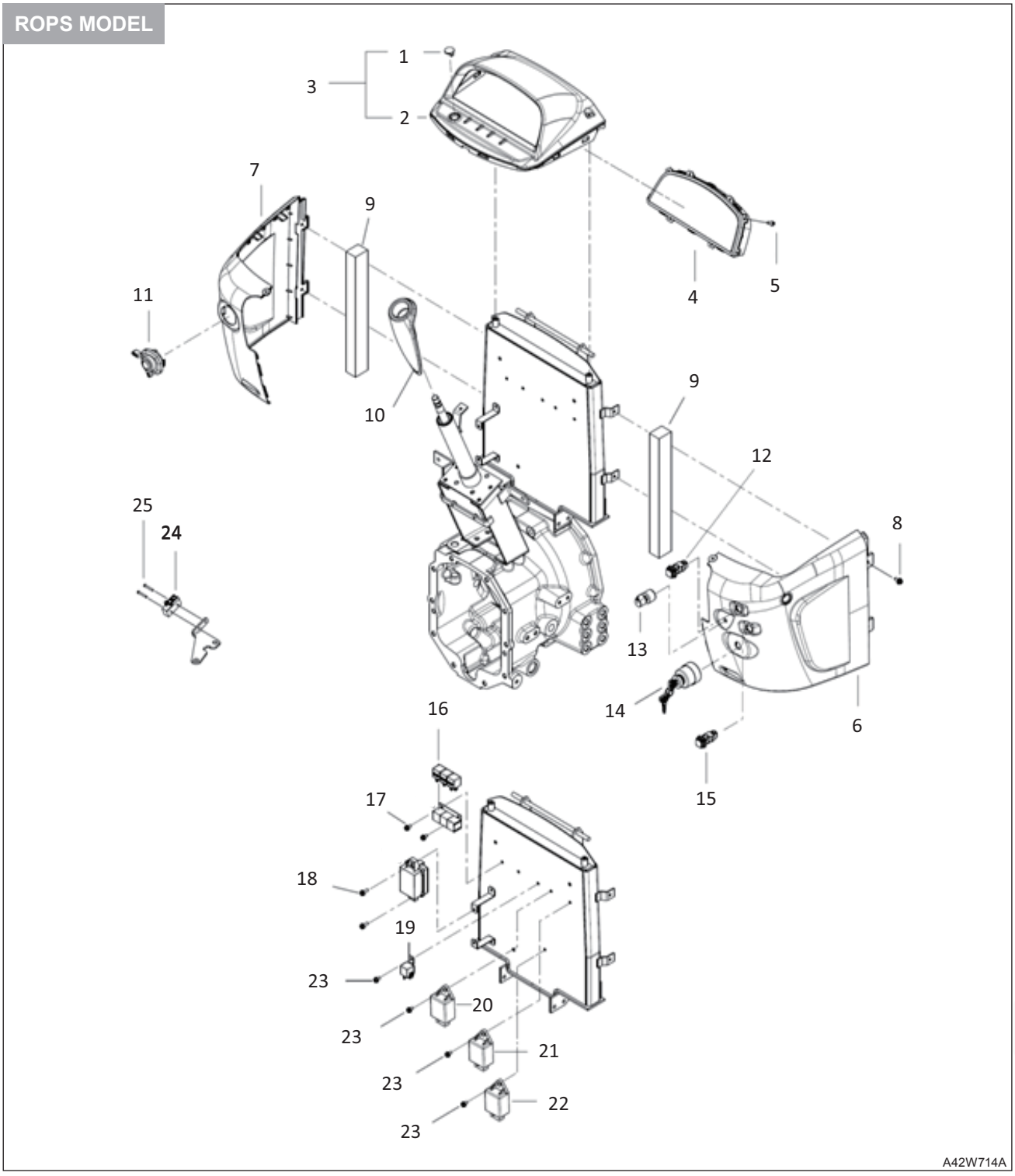


COMPONENTS

(1) Battery stop bracket
(2) Stop rod
(3) Washer
(4) Hex flange nut
(5) DPF logger
(6) Screw

6.2 SWITCH

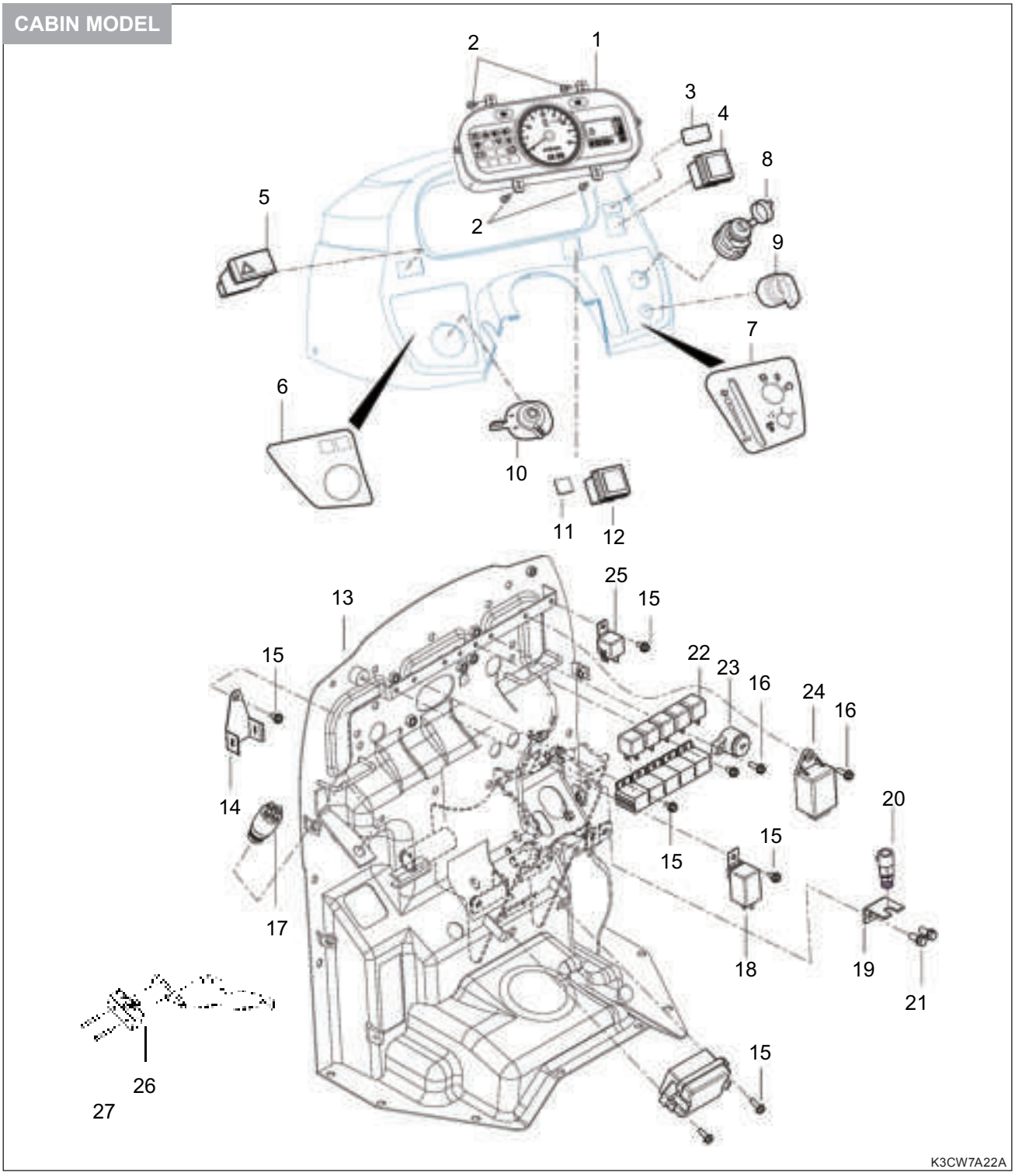
ROPS MODEL



COMPONENTS

(1) Cap
(2) Meter cover
(3) Meter cover ass'y
(4) Meter
(5) Screw
(6) Dashboard R
(7) Dashboard L
(8) Bolt
(9) Urethane
(10) Column cover
(11) Combination switch
(12) Switch, cruise
(13) Front wheel s/w
(14) Start switch ass'y
(15) Emergency switch
(16) Relay
(17) Hex bolt(+)
(18) Hex flange bolt
(19) Glow relay
(20) Controller
(21) Flasher unit
(22) Controller
(23) Hex flange bolt
(24) PTO connect switch
(25) Screw

CABIN MODEL

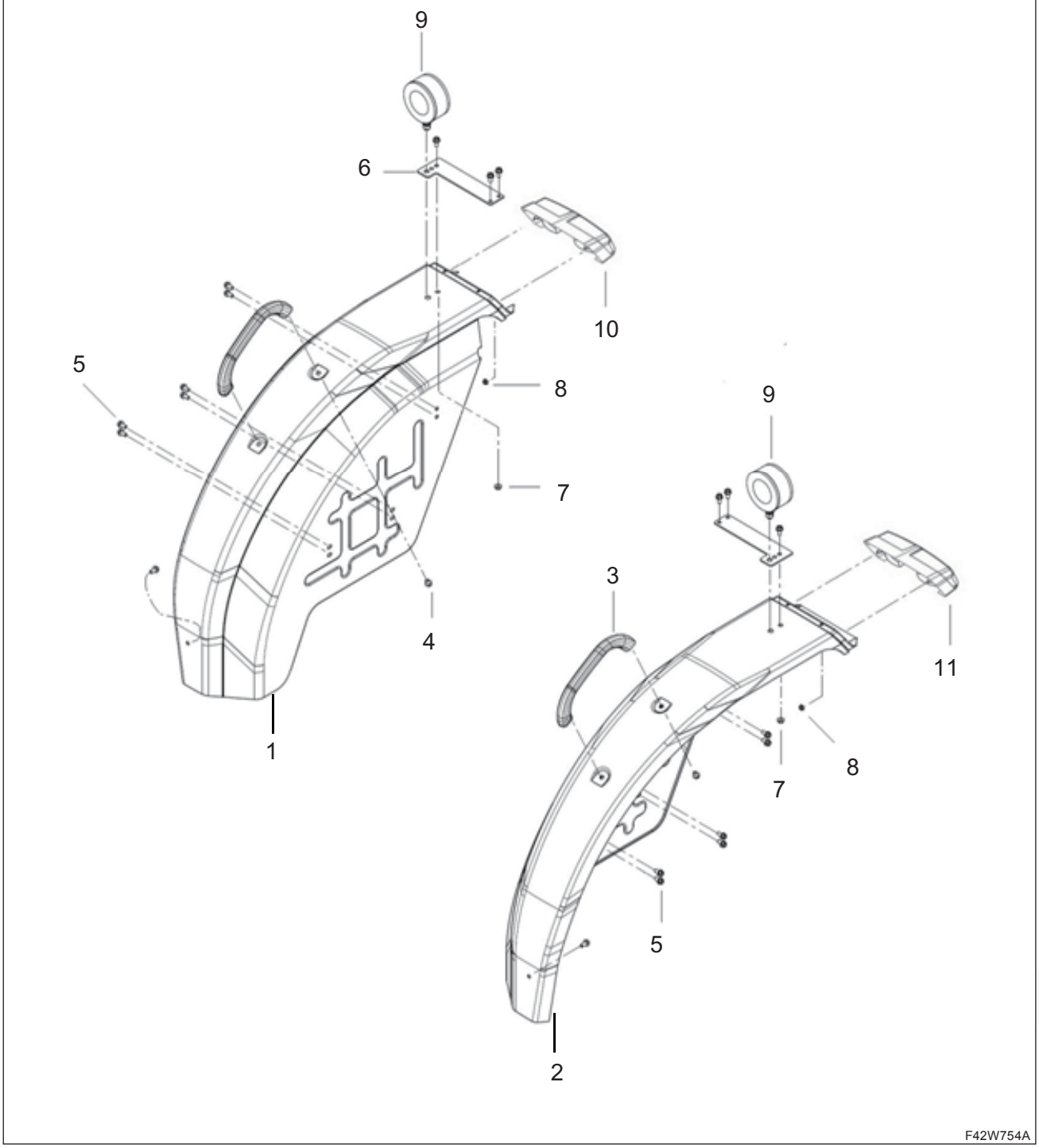


COMPONENTS

(1) Panel ass'y, meter
(2) Screw, C/R pan/SP
(3) Label, PTO
(4) Switch ass'y , alternator
(5) Hazard switch
(6) Label, LH control
(7) Label, RH control
(8) Switch set, rotary
(9) Switch ass'y
(10) Combination switch
(11) Plug
(12) Cruise switch
(13) Dash panel ass'y
(14) Case
(15) Washer ass'y hex bolt
(16) Washer ass'y hex bolt
(17) Safety switch, clutch
(18) Flasher set
(19) Plate
(20) Stop lamp switch
(21) Washer ass'y hex bolt
(22) Relay
(23) Buzzer
(24) Control unit
(25) Glow Relay
(26) PTO connect switch
(27) Screw

6.3 FENDER

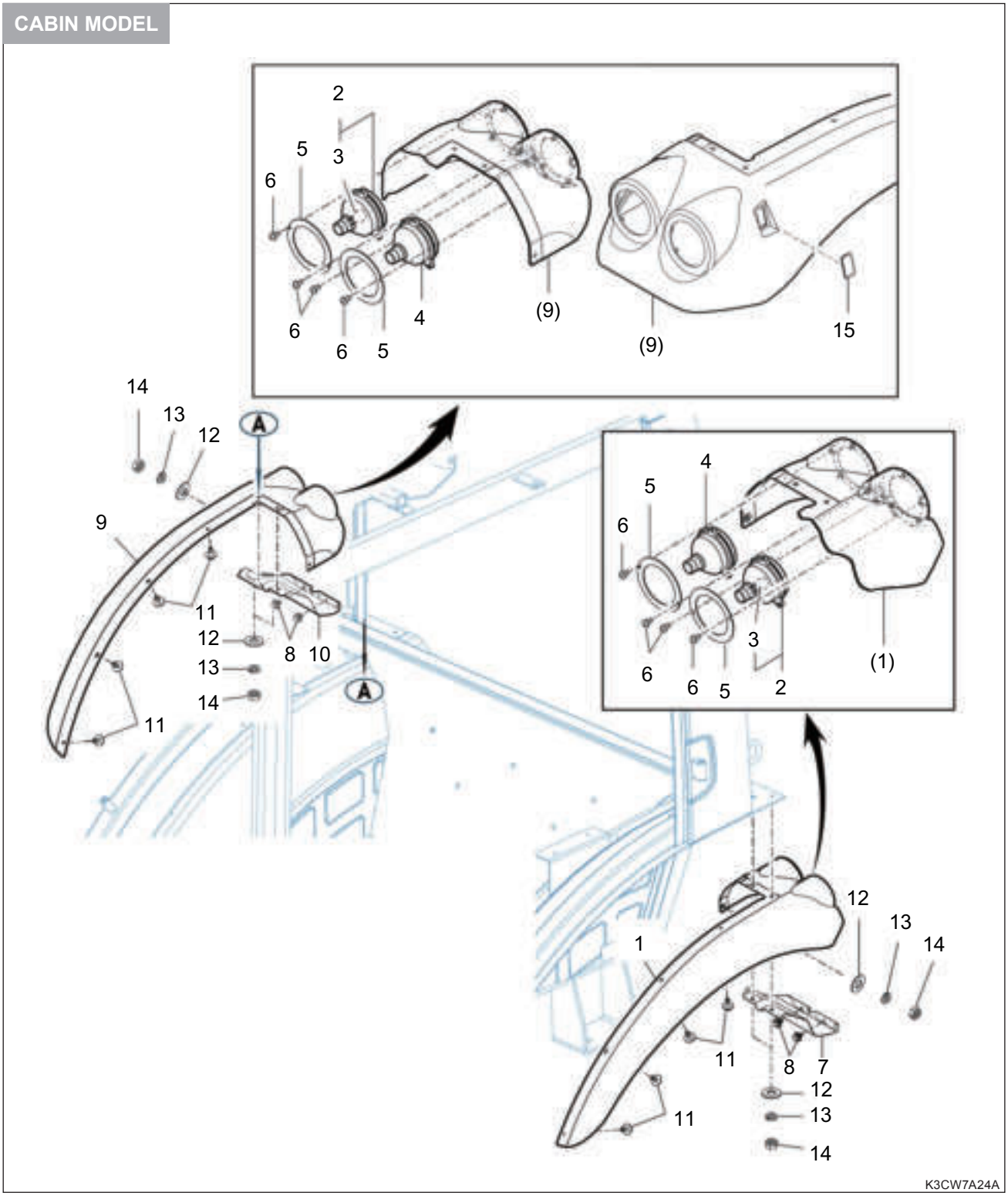
ROPS MODEL



COMPONENTS

(1) Fender R ass'y
(2) Fender L ass'y
(3) Fender grip
(4) Hex flange bolt
(5) Hex flange bolt
(6) Fender support bracket
(7) Hex flange nut
(8) Hex flange nut
(9) Direction lamp ass'y
(10) Combination lamp(R)
(11) Combination lamp(L)

CABIN MODEL

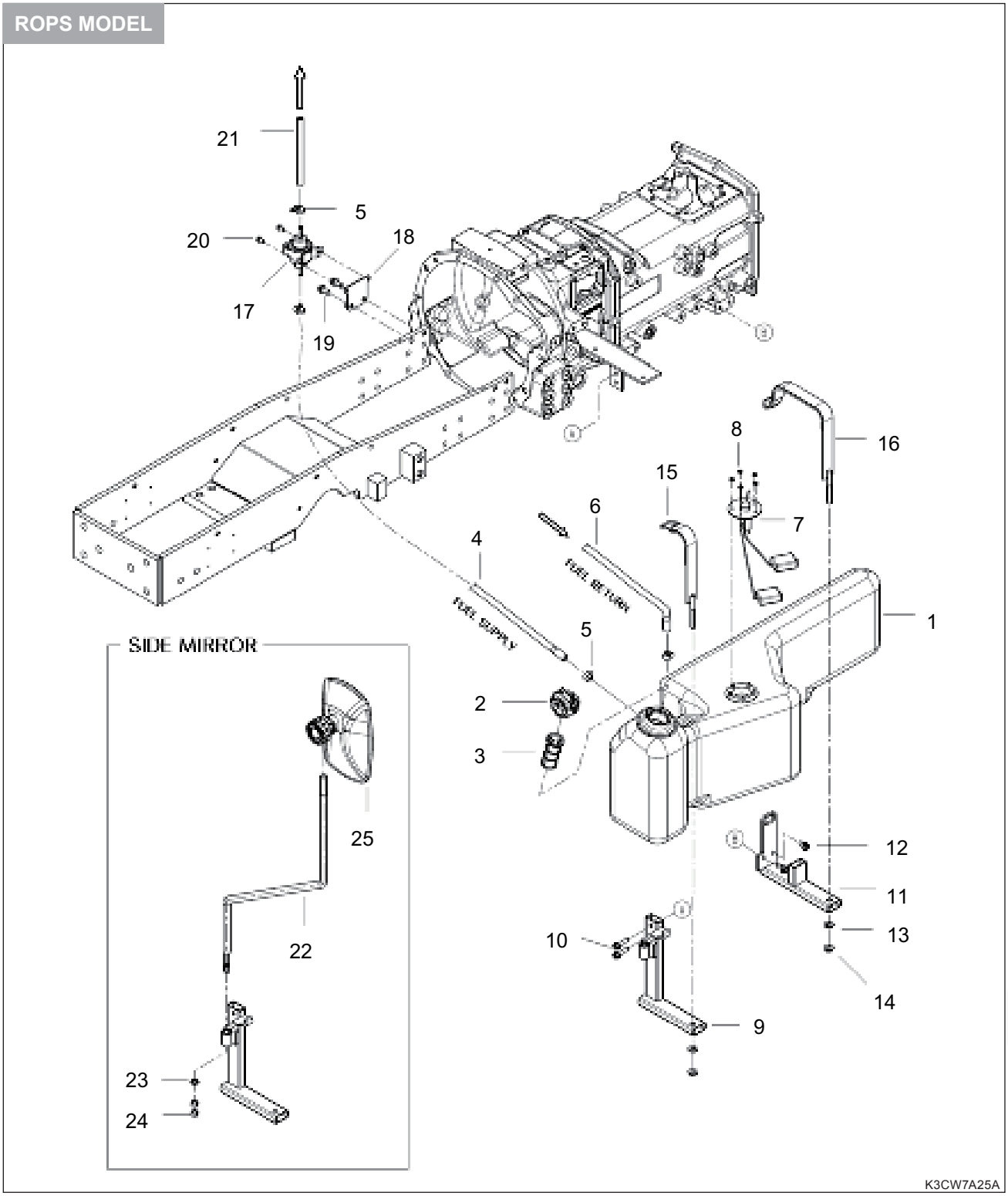


COMPONENTS

(1) Fender comp. LH/sub
(2) Lamp, direction
(3) Bulb, 12V 21W
(4) Lamp, stop
(5) Plate, lamp
(6) Screw
(7) Cover, LH / lamp
(8) Bolt. hex/spl
(9) Fender comp. RH/sub
(10) Cover, RH / lamp
(11) Bolt. hex/spl
(12) Washer
(13) Spring washer
(14) Bolt. hex/spl
(15) Cap, switch

6.4 FUEL TANK

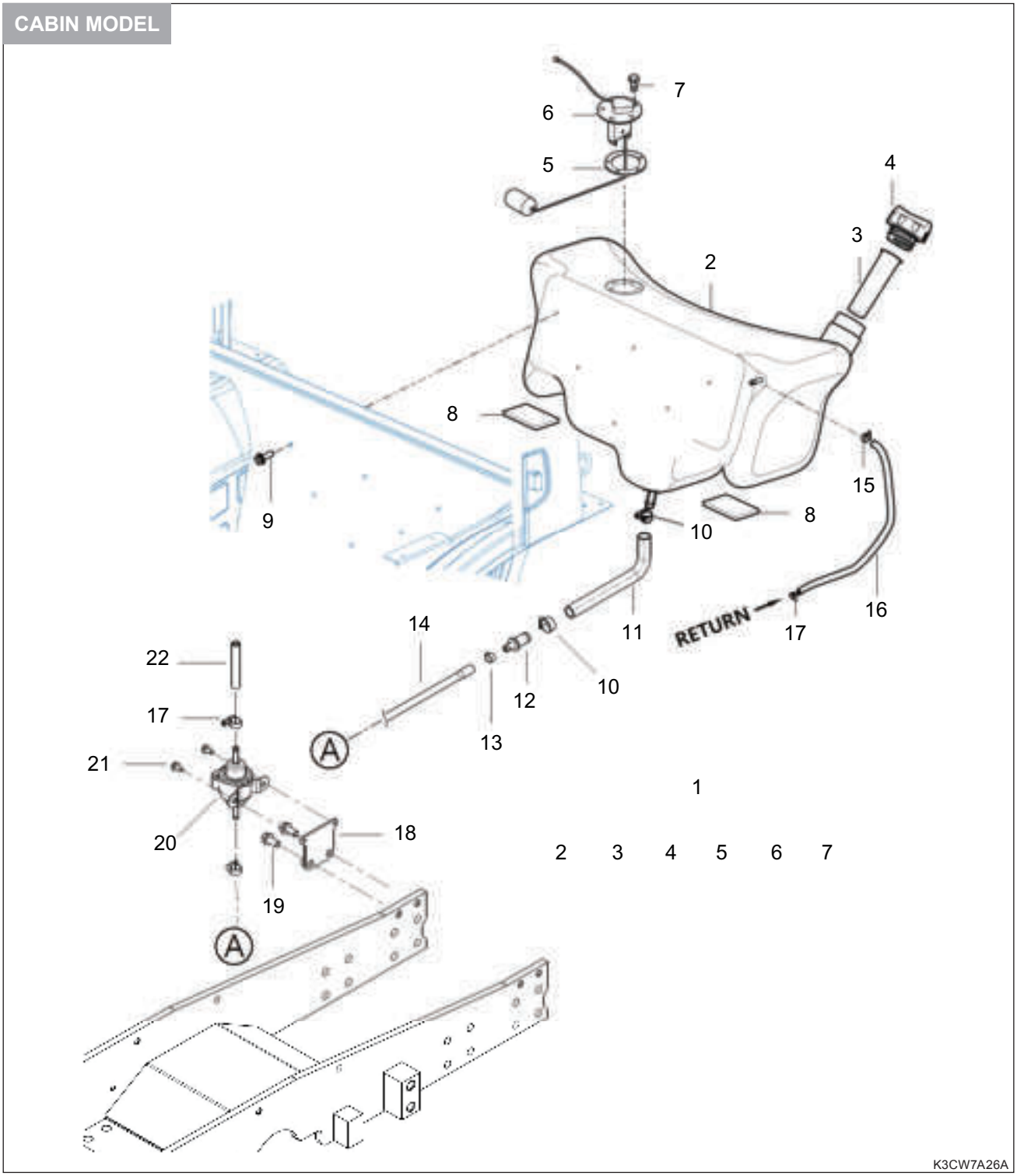
ROPS MODEL



COMPONENTS

(1) Fuel, tank ass'y
(2) Cap, fuel tank ass'y
(3) Strainer, fuel
(4) Hose
(5) Hose clip
(6) Hose
(7) Fuel sensor
(8) Hex nut
(9) Support(F), fuel tank
(10) Hex flange bolt
(11) Support(R), fuel tank
(12) Hex flange bolt
(13) Washer
(14) Hex flange nut
(15) Front band ass'y
(16) Rear band ass'y
(17) Feed pump ass'y
(18) Stay(pump)
(19) Hex flange bolt
(20) Hex flange bolt
(21) Hose
(22) Back mirror stay
(23) Spring washer
(24) Hex nut
(25) Back mirror

CABIN MODEL



COMPONENTS

(1) Fuel tank ass'y
(2) Fuel tank
(3) Strainer, fuel
(4) Cap, fuel tank ass'y
(5) Packing
(6) Fuel sensor
(7) Hex bolt
(8) Rubber, fuel tank
(9) Bolt, hex/sp
(10) Hose clips
(11) Hose, connection
(12) Adapter
(13) Hose clamp
(14) Hose
(15) Hose clips
(16) Hose, drain/2210
(17) Hose clamp
(18) Stay(pump)
(19) Hex flange bolt
(20) Feed pump ass'y
(21) Hex flange bolt
(22) Hose
(22) Hose

7. TROUBLESHOOTING

INSPECTION ITEM / SYMPTOM	Safety switch	Safe start relay	Ignition switch	Starter motor	Battery	Fuse and fusible link	Fuel cut-off solenoid	Preheat controller	Preheat relay	Coolant temperature sensor (preheat)	Alternator	Instrument panel	Light bulb	Fuse	Flasher unit
The engine cannot be started (start motor operated)				●	●		●								
The engine cannot be started (start motor not operated)	●	●	●	●	●	●									
The engine can be started without depressing the clutch pedal.									●						
The engine cannot be stopped.							●								
The preheat indicator does not come on.						●		●	●	●		●			
The preheat indicator does not go off.								●	●						
The charge warning lamp does not come on.						●					●	●			
The charge warning lamp does not go off.											●				
The head lamp does not come on.													●	●	
The turn signal lamp does not come on.													●	●	●
The horn does not sound.														●	

MEMO

CHAPTER 7 CABIN AND HVAC SYSTEM (CABIN MODEL ONLY)

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1. CABIN

1.1 ROOF COMPONENTS

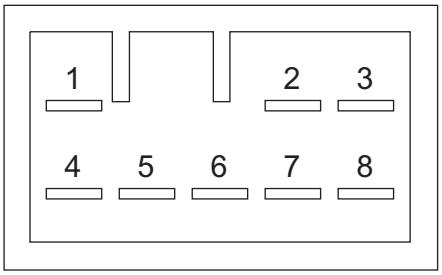
(1) A/C control switch
(2) Speaker
(3) Side vent
(4) Front vent
(5) Rear vent
(6) Audio system
(7) Interior lamp
(8) Work lamp/wiper switch box

1.2 MAJOR COMPONENT INSPECTION

1.2.1 WORK LAMP / WIPER SWITCH BOX

The front and rear wiper operation switches are installed on the middle side of the ceiling in the cabin.

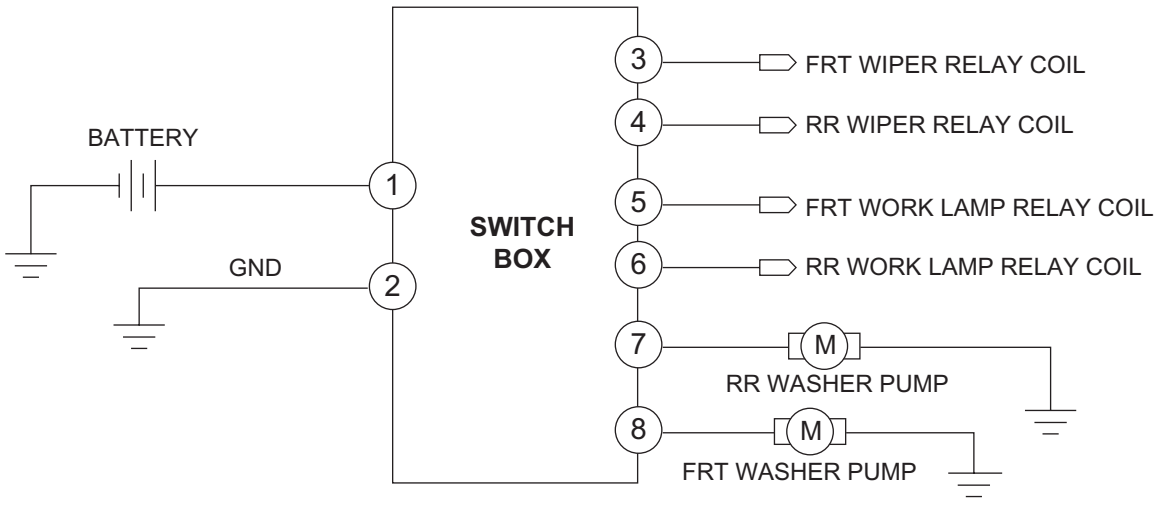
▶ **CONNECTOR**



NO.	DESCRIPTION
1	DC 12V
2	GND
3	FRT WIPER RELAY COIL OUT
4	RR WIPER RELAY COIL OUT
5	FRT WORK LAMP RELAY COIL OUT
6	RR WORK LAMP RELAY COIL OUT
7	RR WASHER PUMP OUT
8	FRT WASHER PUMP OUT

K3CW803A

▶ **CIRCUIT DIAGRAM**



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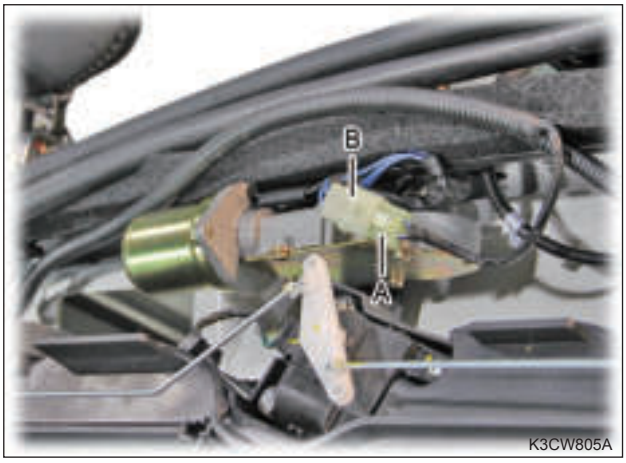
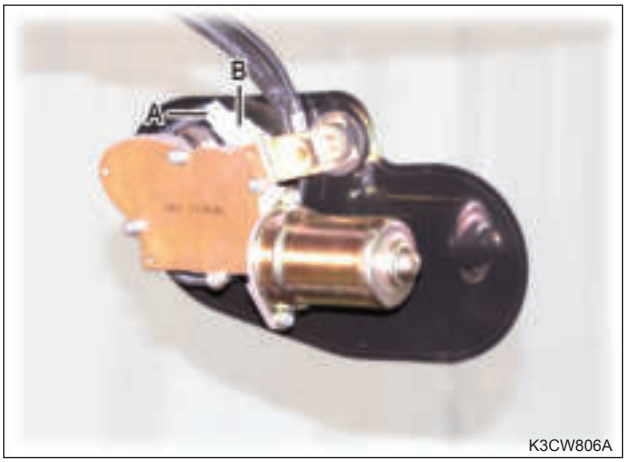
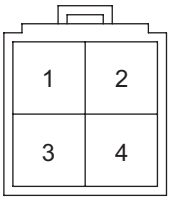
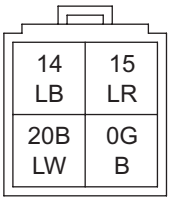
1.2.2 WIPER MOTOR





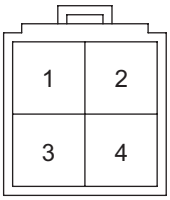
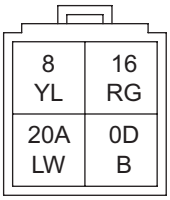
The wiper motors are installed in the front and rear sections of the cabin. The front wiper motor is installed to the front of the frame and can be accessed by opening the cabin roof. The rear wiper motor is installed to the rear glass.

▶ CONNECTOR TEST (FRONT WIPER MOTOR)

CONNECTOR A	 6015W7B3A
CONNECTOR B	 K3CW807A

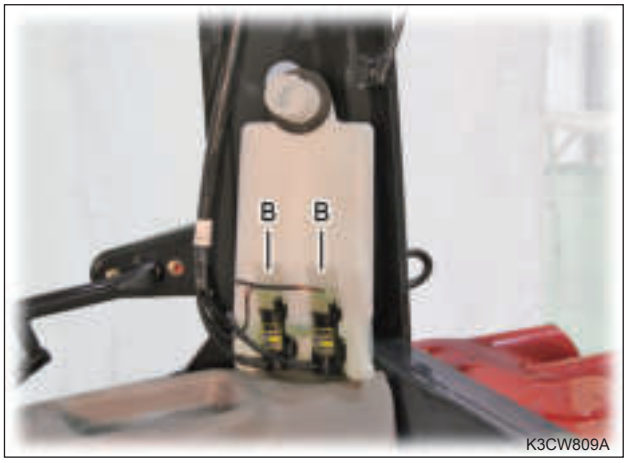
ITEM		CONNECTION +	CONNECTION —	STATUS	RESULT
Connector A	DC power	1	3	–	0 Ω
		2	3		
		4	3		
Connector B	DC power	20B	0G	Ignition switch ┌ON┘	12 V
	Resistance	15	0G	Ignition switch ┌ON┘ Wiper switch ┌ON┘	0 Ω
		14	0G	Ignition switch ┌ON┘ Wiper switch Pressed	
		0G	Ground (Chassis)	-	

▶ **CONNECTOR TEST (REAR WIPER MOTOR)**

CONNECTOR A	 6015W7B3A
CONNECTOR B	 K3CW808A

ITEM		CONNECTION +	CONNECTION —	STATUS	RESULT
Connector A	DC power	1	3	–	0 Ω
		2	3		
		4	3		
Connector B	DC power	20A	0D	Ignition switch 「ON」	12 V
	Resistance	8	0D	Ignition switch 「ON」 Wiper switch 「ON」	
		16	0D	Ignition switch 「ON」 Wiper switch Pressed	
		0D	Ground (Chassis)	-	0 Ω

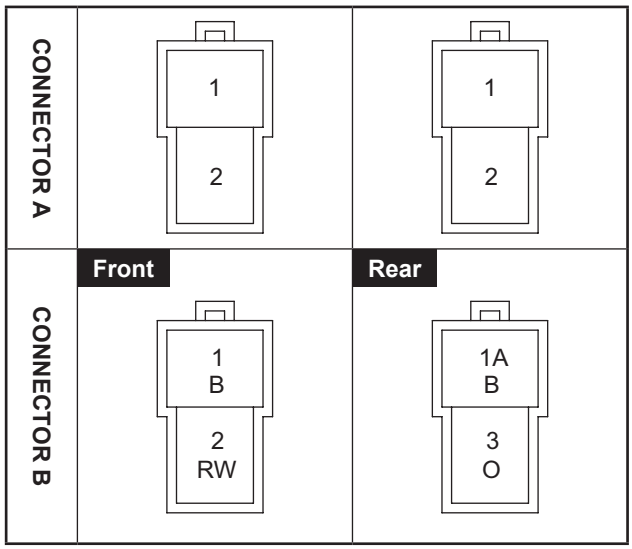
1.2.3 WASHER PUMP



K3CW809A

The washer pump is attached to the washer fluid tank in the rear right pillar section of the outer cabin.

▶ **CONNECTOR TEST**

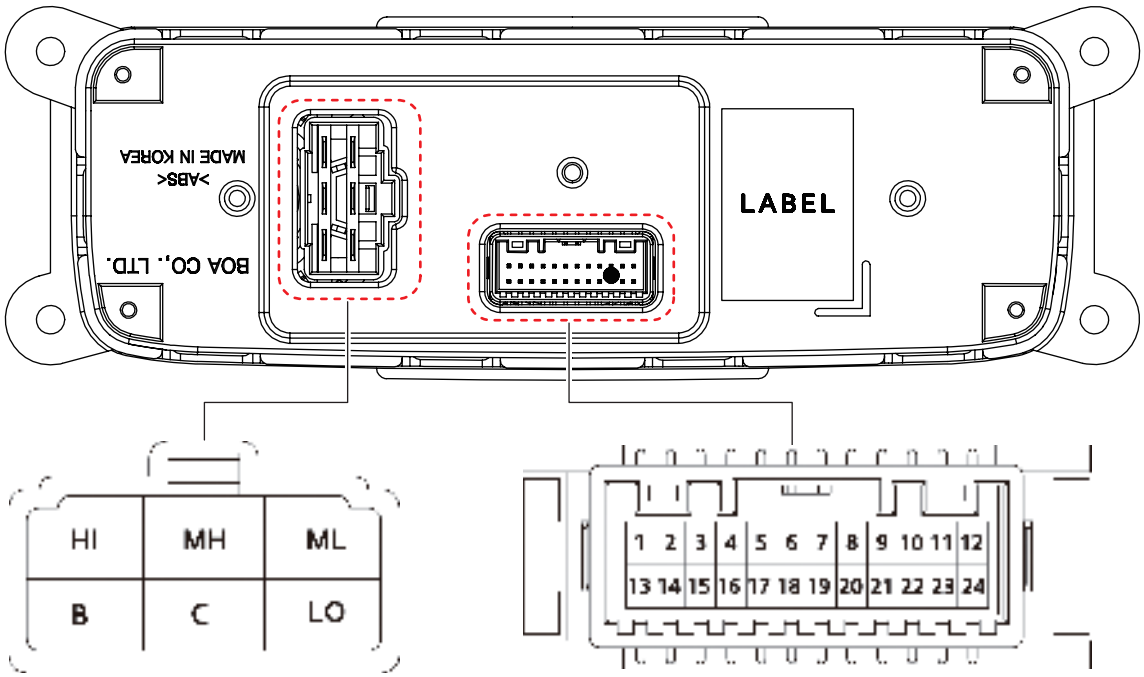


ITEM		CONNECTION +	CONNECTION —	STATUS	RESULT
Connector A	Resis-tance	2	1	–	Little Ω
Connector B	DC power	2	1	Ignition switch 「ON」 Wiper switch Pressed	12 V
		3	1A		

1.2.4 A/C CONTROLLER SWITCH

The A/C controller switch box is installed on the middle right side of the ceiling in the cabin.

▶ **CONNECTOR**



NO.	NAME
HI	HIGH
MH	MHIGH
ML	BLOW
B	BASE
C	COMMON
LO	LOW

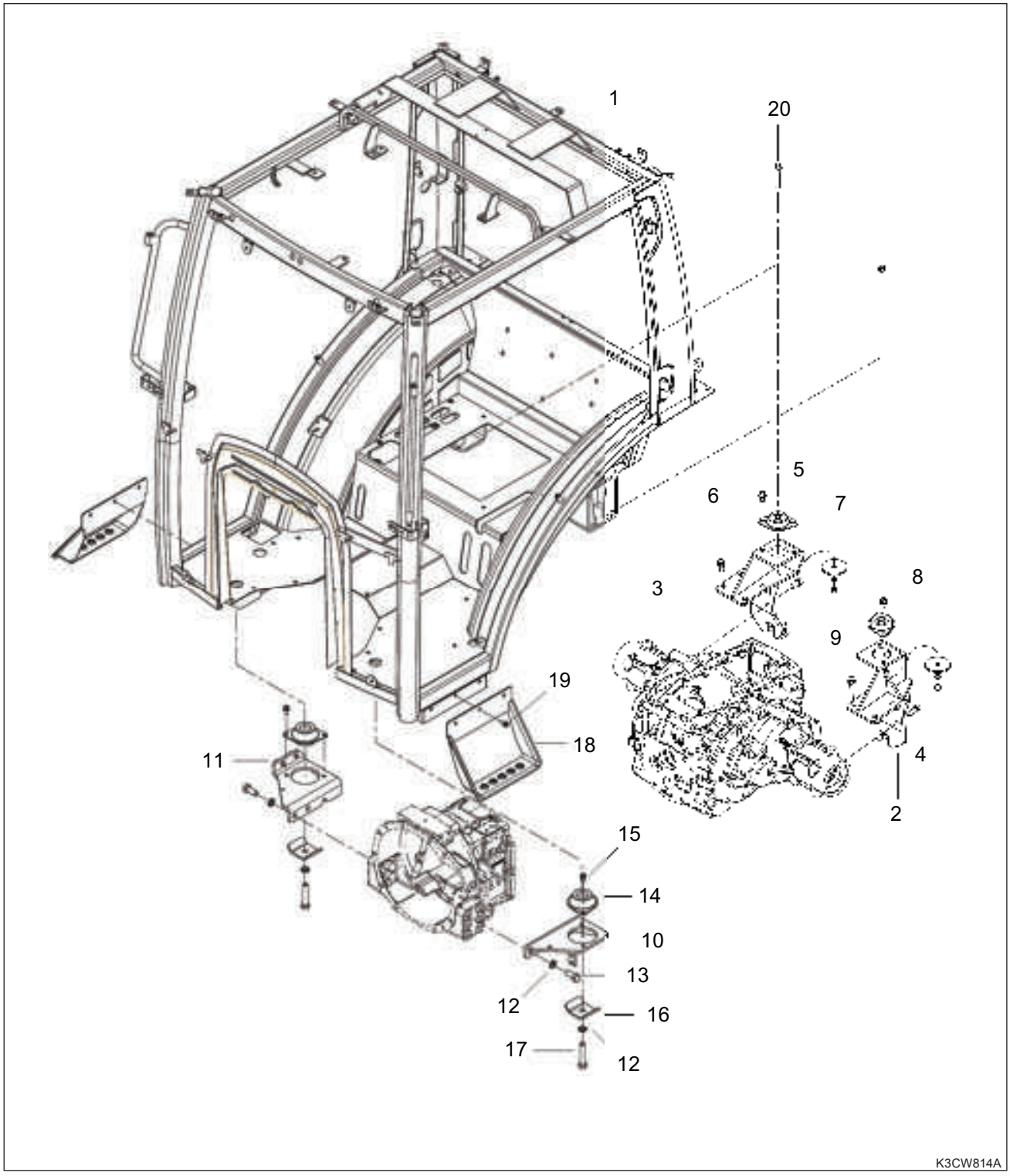
NO.	NAME
1	IGN
2	A/CON POWER
3	-
4	-
5	(-) BLOWER COMMON Sig.
6	INTAKE REC (M+)
7	MODE VENT (M+)
8	TEMP WARM (M+)
9	COMPR ON
10	INTAKE PBR
11	TEMP PBR
12	GND

NO.	NAME
13	TAIL +
14	-
15	-
16	MODE SELECT
17	REF
18	INTAKE REC (M-)
19	MODE VENT (M-)
20	TEMP COOL (M-)
21	COMPR ON
22	MODE PBR
23	DUCT SENSOR
24	GND

B25W817A

1.3 SECTIONAL VIEW FOR MAJOR COMPONENTS

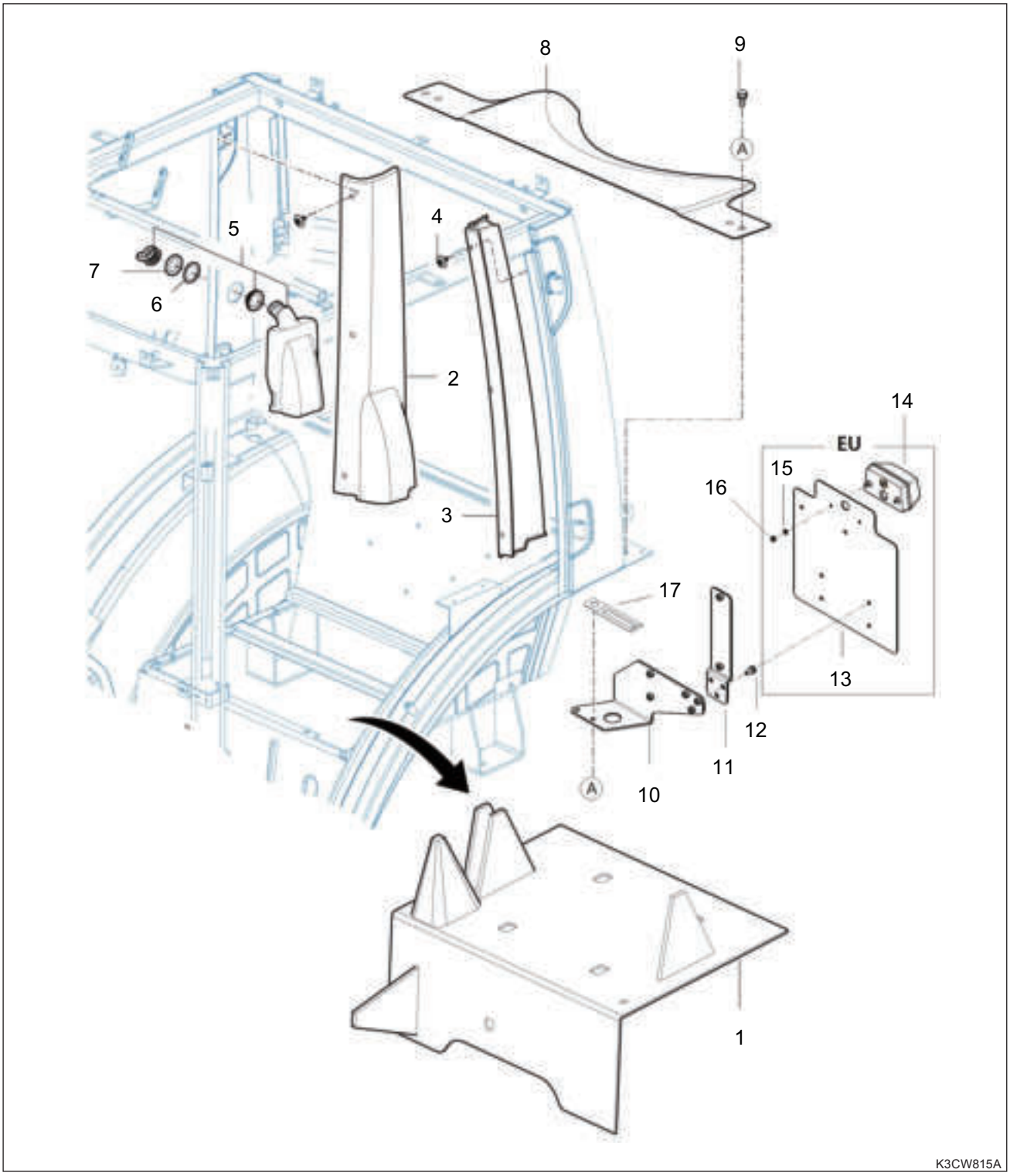
1.3.1 CABIN FRAME ASS'Y



COMPONENTS

(1) Cabin frame ass'y
(2) Mounting bracket, R(LH)
(3) Mounting bracket, R(RH)
(4) Bolt, hex/spl
(5) Insulator
(6) Hex flange bolt
(7) Washer R
(8) Spring wahser
(9) Hex nut
(10) Mounting bracket, F(LH)
(11) Mounting bracket, F(RH)
(12) Spring wahser
(13) Hex bolt
(14) Insulator comp. Mounting
(15) Hex flange bolt
(16) Washer F
(17) Hex bolt
(18) Support foot rest ass'y
(19) Hex flange bolt
(20) Bolt, hex/spl
(21) Trailer socket
(22) (+) Screw

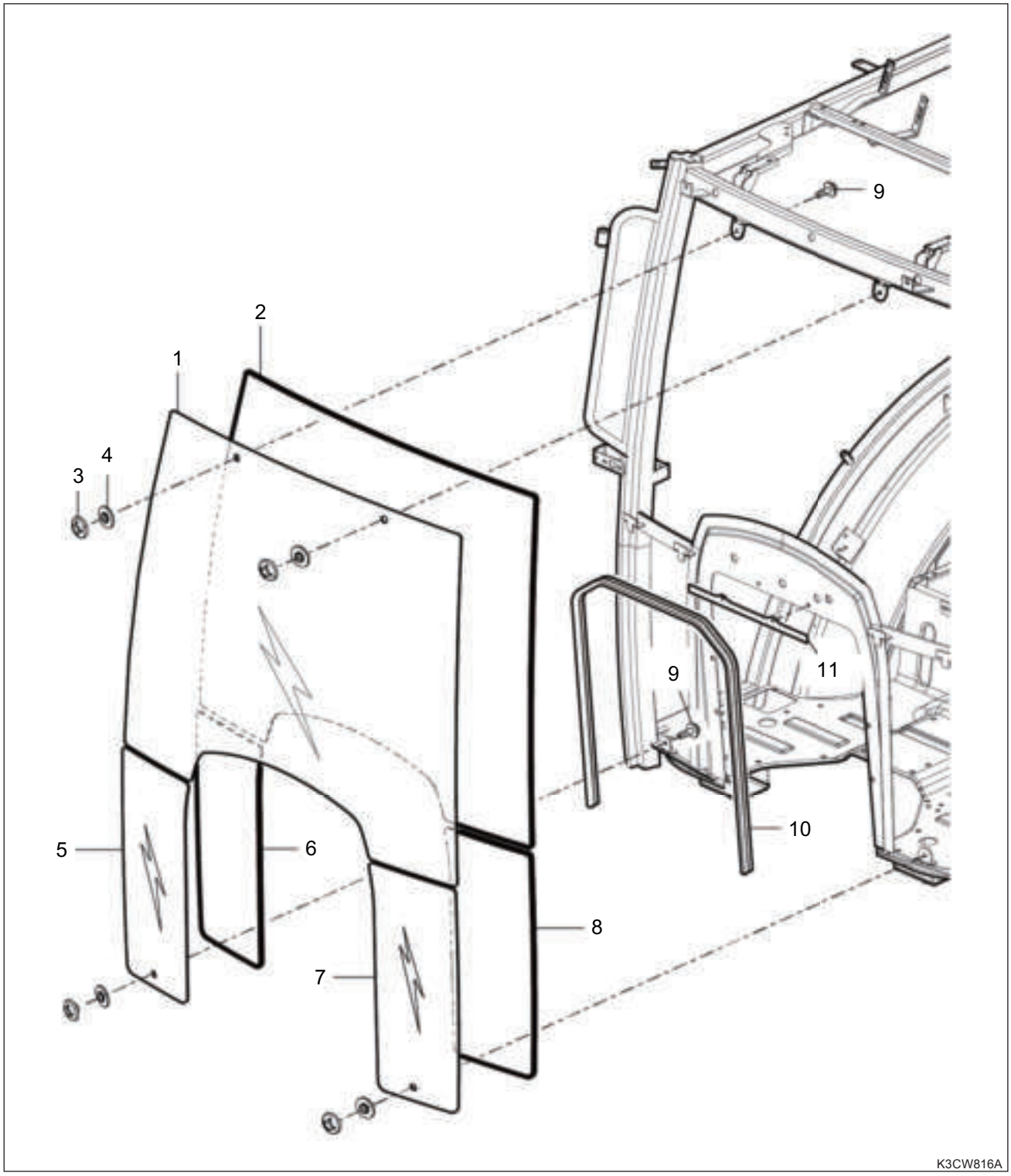
1.3.2 PILLAR COVER ASS'Y



COMPONENTS

(1) Seal, seat
(2) Cover, B pillar/RH
(3) Cover, B pillar/LH
(4) Rivet set, ivory
(5) Washer tank ass'y, 2 motor
(6) Rubber, cap fix
(7) Nut, washer tank
(8) Cover, fuel tank
(9) Washer ass'y hex bolt
(10) Bracket, number plate
(11) Bracket
(12) Hex flange bolt
(13) Bracket, number plate
(14) Lamp, number plate
(15) Spring washer
(16) Hex nut
(17) Clamp

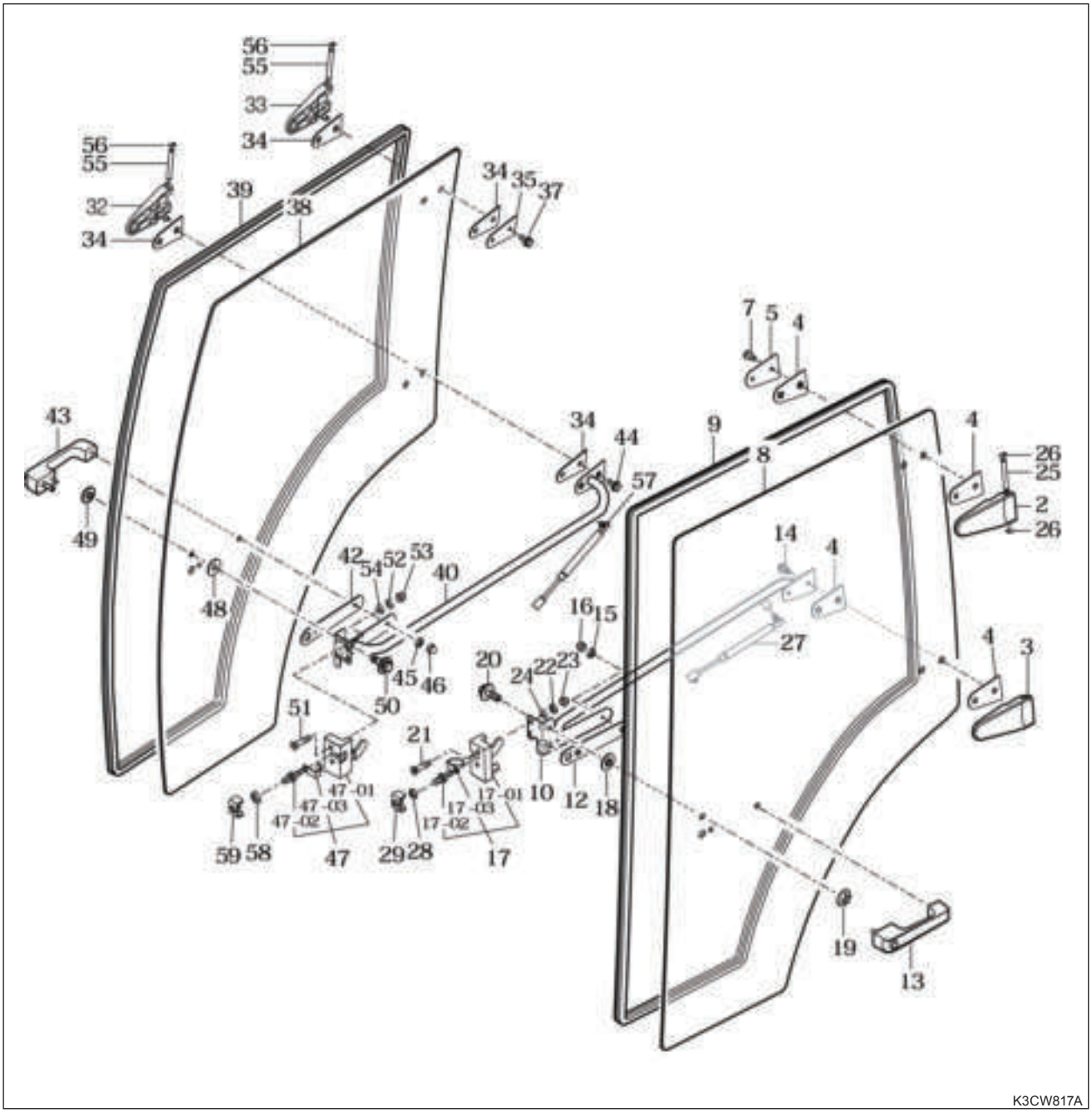
1.3.3 FRONT WINDOW ASS'Y



COMPONENTS

(1) Glass, FR/UPR
(2) Insulator, glass/UPR
(3) Nut comp, glass
(4) Grommet, 13x17x02
(5) Glass, FR/LOW/RH
(6) Insulator, FR/LOW
(7) Glass, FR/LOW/LH
(8) Insulator, FR/LOW
(9) Washer ass'y hex bolt
(10) Insulator, frame dash
(11) Plate, fix insulator

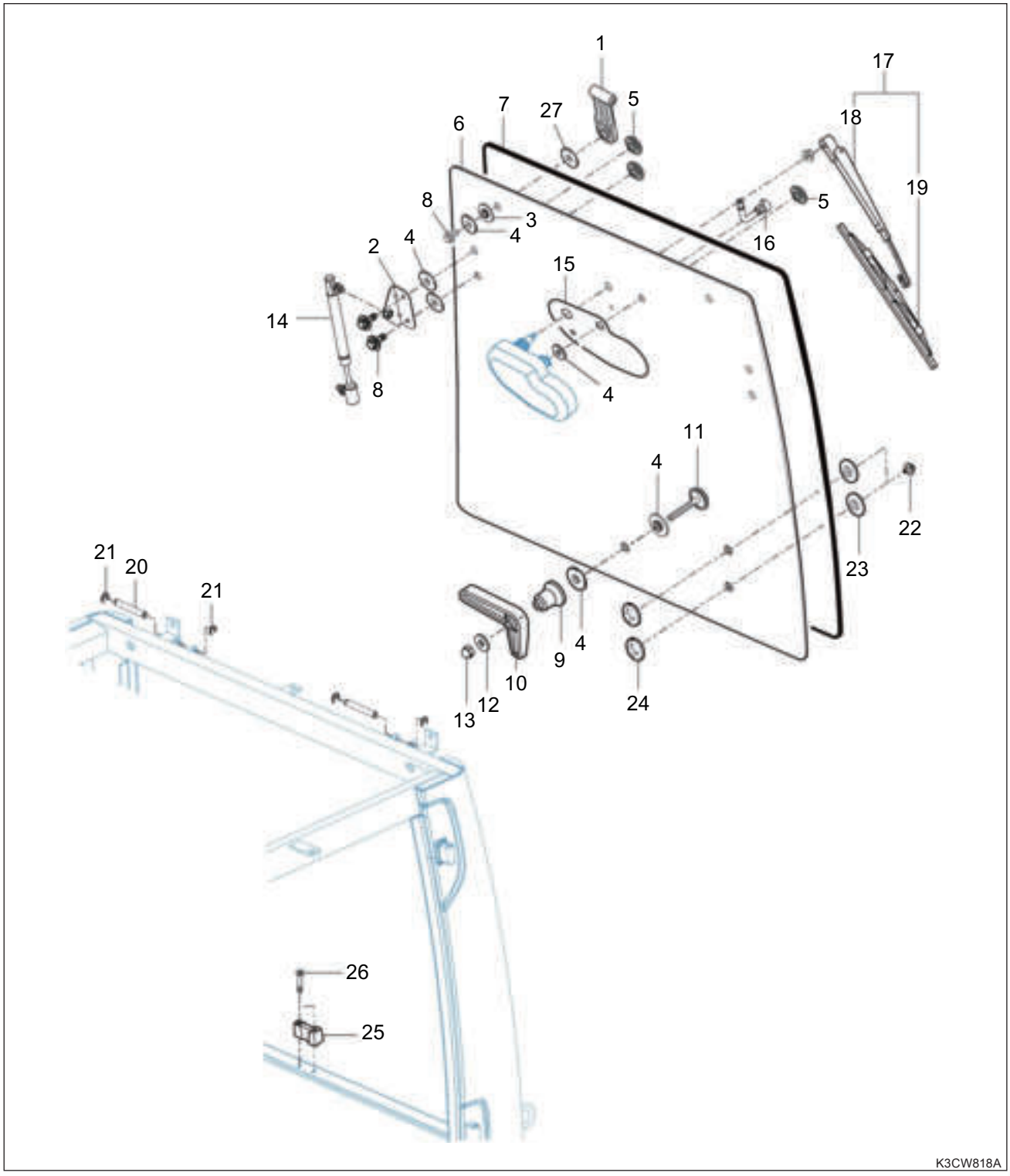
1.3.4 DOOR ASS'Y



COMPONENTS

(2) Hinge comp, UPR/LH/door
(3) Hinge comp, UPR/RH/door
(4) Gasket, door hinge
(5) Plate, door hinge
(7) Bolt, hex/sp
(8) Glass, LH/door
(9) Insulator/door
(10) Guide comp,LH/door
(12) Gasket,door grip
(13) Grip ass'y, lock/handle
(14) Bolt, hex/sp
(15) Spring washer
(16) Nut, cap
(17) Lock set, LH/door
(17-1) Lock ass'y, LH/door
(17-2) Striker
(17-3) Guard
(18) Grommet, 13x17x02
(19) Nut comp, glass
(20) Bolt, hex/spl
(21) Screw, c/r flat
(22) Spring washer
(23) Nut, cap
(24) Plain washer
(25) Pin, hinge door
(26) Snap ring(e type)
(27) Damper ass'y, side/door
(28) Spring washer
(29) Bracket comp, door lock
(32) Hinge comp, UPR/LH/door
(33) Hinge comp, UPR/RH/door
(34) Gasket, door hinge
(35) Plate, door hinge
(37) Bolt, hex/sp
(38) Glass, RH/door
(39) Insulator, door
(40) Guide comp,RH/door
(42) Gasket,door grip
(43) Grip ass'y, lock
(44) Bolt, hex/sp
(45) Spring washer
(46) Nut, cap
(47) Lock set, RH/door
(47-1) Lock ass'y, RH/door
(47-2) Striker
(47-3) Guard
(48) Grommet, 13x17x02
(49) Nut comp, glass
(50) Bolt, hex/spl
(51) Screw, c/r flat
(52) Spring washer
(53) Nut,cap
(54) Plain washer
(55) Pin, hinge door
(56) Snap ring(e type)
(57) Damper ass'y, side/door
(58) Spring washer
(59) Bracket comp, door lock

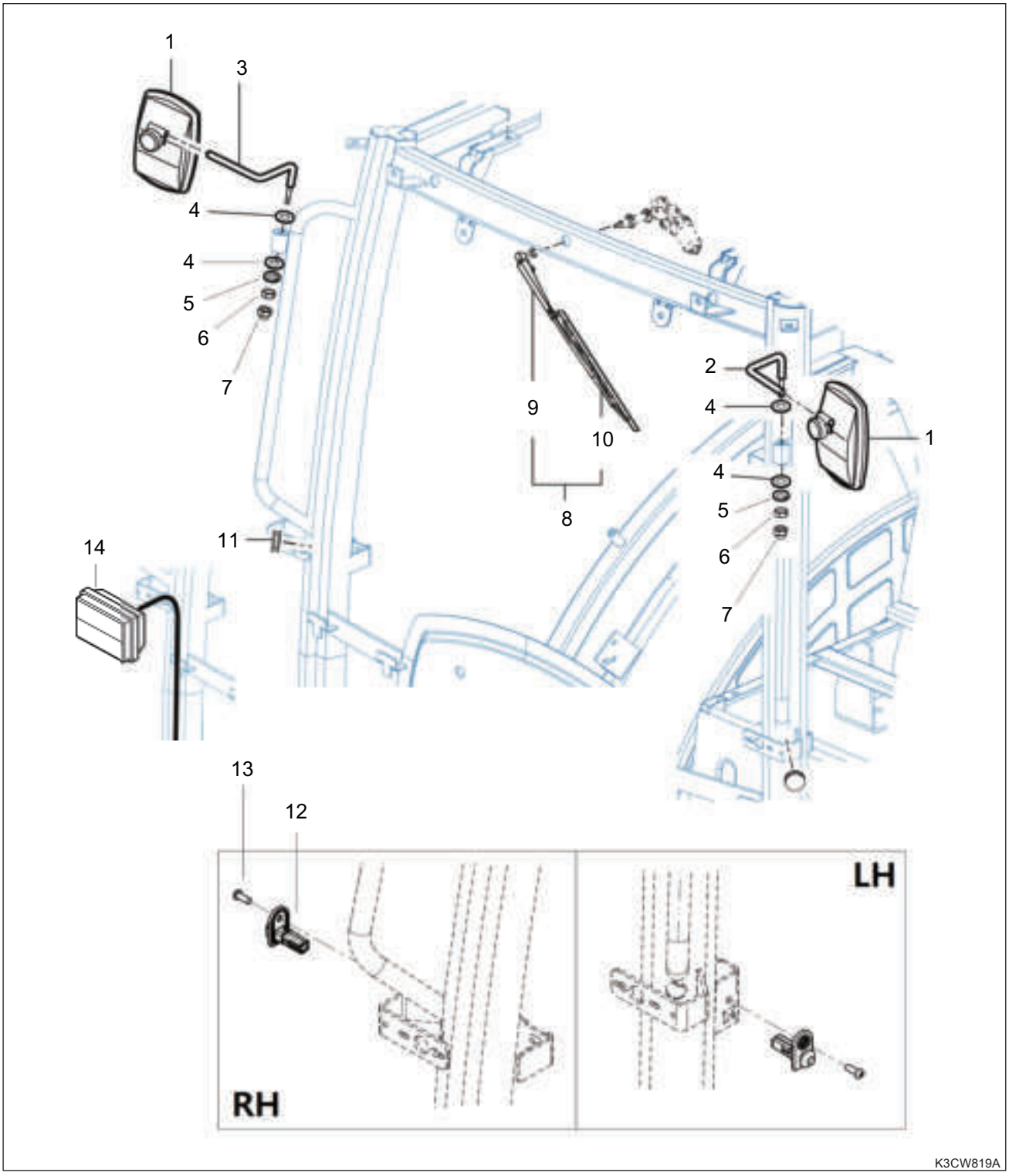
1.3.5 REAR WINDOWS ASS'Y



COMPONENTS

(1) Hinge, rear glass/M6
(2) Bracket comp, RR/damper
(3) Washer, 7x36x3
(4) Grommet, 13x17x02
(5) Nut comp, glass
(6) Glass, rear
(7) Insulator, RR/glass
(8) Bolt, hex/spl
(9) Space, handle/rear
(10) Handle, glass/rear
(11) Bolt comp, glass/M8L
(12) Washer(08x22x02)
(13) Nut, cap
(14) Damper ass'y, RR
(15) Label, cover
(16) Nozzle set
(17) Wiper & blade ass'y, RR
(18) Arm
(19) Blade, 12
(20) Pin, RR/hinge
(21) Snap ring(E type)
(22) Bolt, hex/spl
(23) Grommet, 13x17x02
(24) Nut comp, glass
(25) Stopper, RR/lock
(26) Screw, C/R pan
(27) Spacer

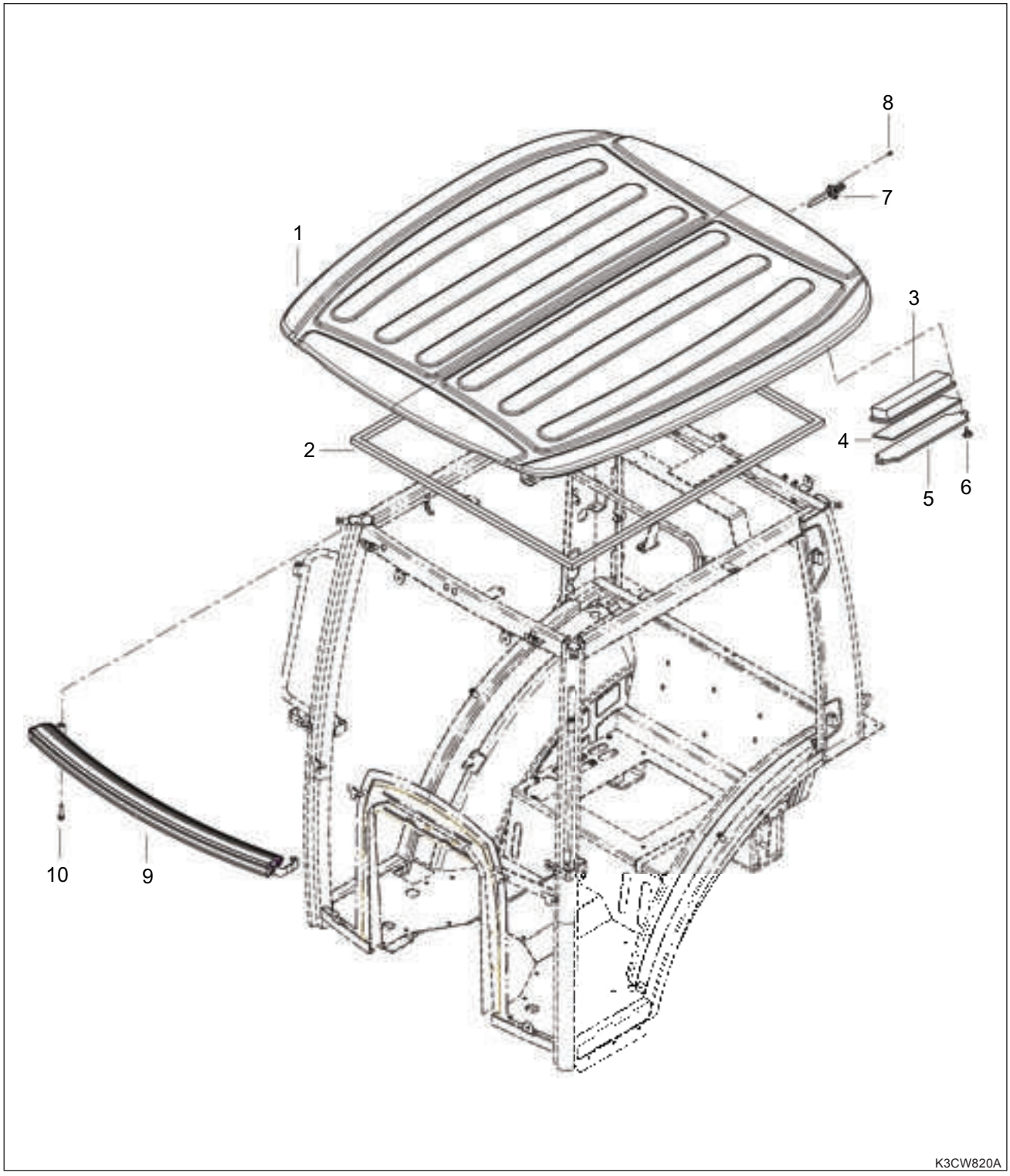
1.3.6 SIDE MIRROR ASS'Y



COMPONENTS

(1) Mirror ass'y
(2) Stay, LH mirror
(3) Stay, RH mirror
(4) Plain washer
(5) Spring washer
(6) Hex nut
(7) Hex bolt, cap
(8) Wiper arm&blade ass'y
(9) Arm, wiper
(10) Blade ass'y
(11) Cap, rubber 20
(12) Switch, door
(13) Screw
(14) Lamp ass'y, combination

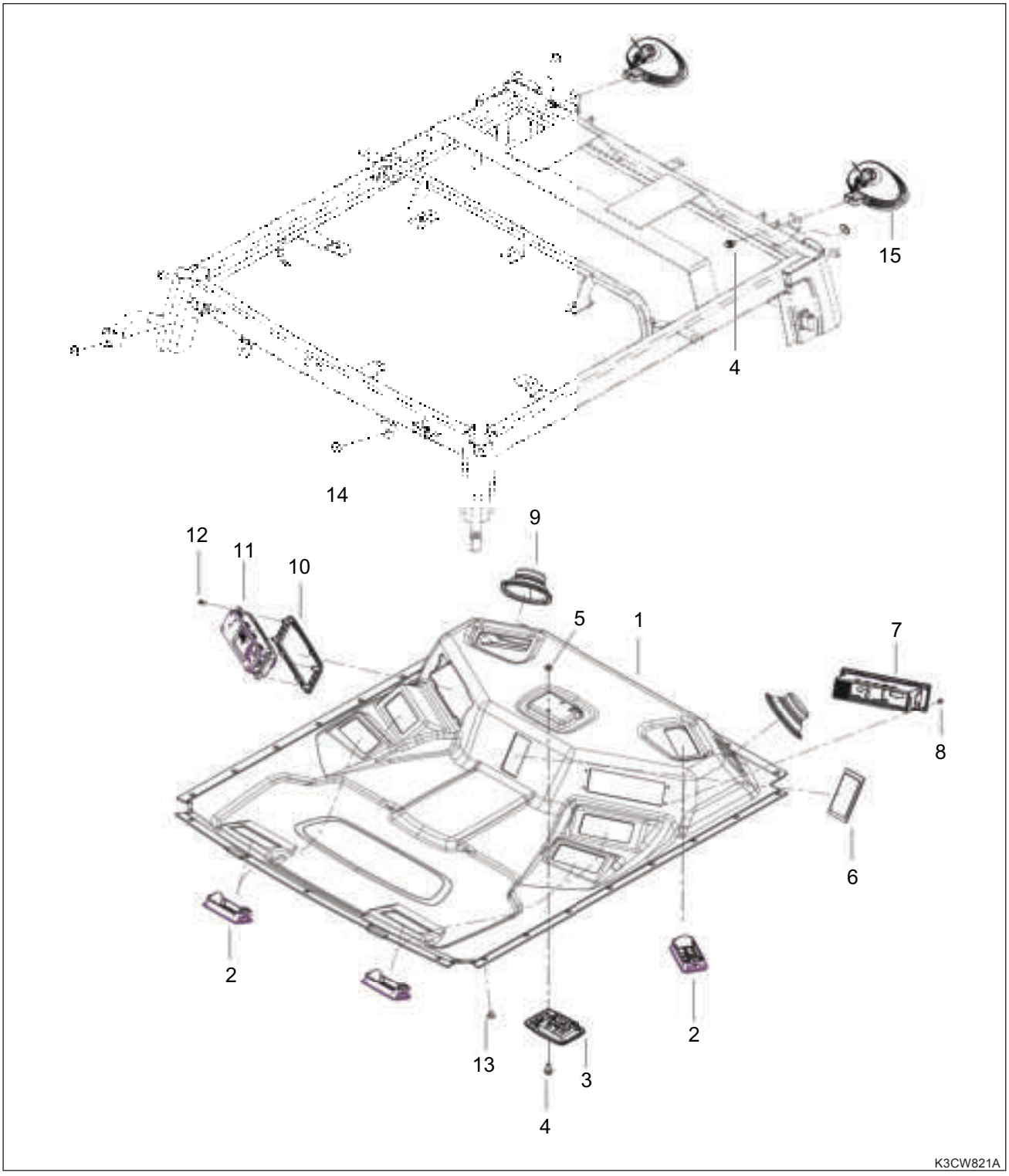
1.3.7 ROOF ASS'Y



COMPONENTS

(1) Roof ass'y
(2) Insulator, roof
(3) Filter, air/main
(4) Filter, aircon/mesh
(5) Cover, air filter
(6) Bolt, grip(M6)
(7) Antenna
(8) Screw
(9) LED bar
(10) Bolt, hex/spl

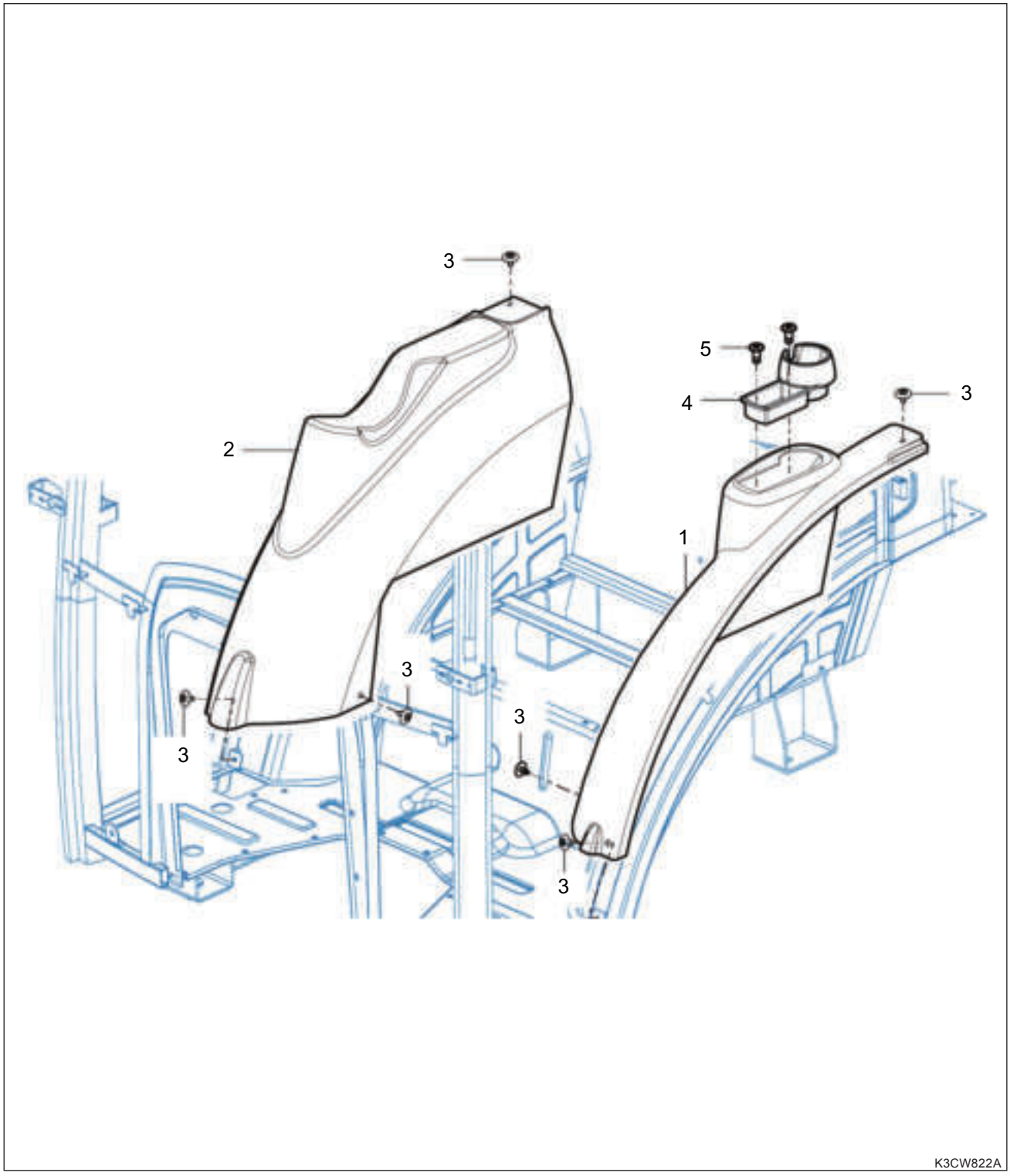
1.3.8 CEILING ASS'Y



COMPONENTS

(1) Ceiling
(2) Grill cover ass'y, air con
(3) Lamp, indoor
(4) Washer ass'y hex bolt
(5) Hex nut
(6) Switch ass'y, wiper/lamp
(7) Audio
(8) Screw
(9) Speaker ass'y
(10) Cover, A/C
(11) Air conditioner controller
(12) Tapping screw
(13) Rivet set
(14) Cap, rubber 20
(15) Lamp ass'y, working

1.3.9 FENDER COVER



COMPONENTS

(1) Cover, LH/fender
(2) Cover, RH/fender
(3) Rivet set
(4) Holder, cup
(5) Washer ass'y hex bolt

1.4 COMPONENT DISASSEMBLY AND ASSEMBLY

1.4.1 CABIN REMOVAL

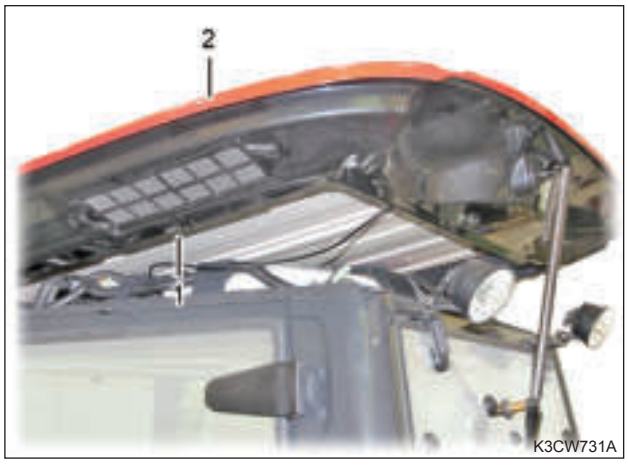
1. Park the tractor on safe and level ground, stop the engine and apply the parking brake.
2. Open the hood and disconnect the negative battery cable.
3. Drain the cooling system.

> **⚠ CAUTION**
>
> - **When handling the heater hose to drain coolant, be careful not to get burnt.**

4. Disconnect various devices from the cabin. Then, remove the cabin.
5. For detailed instructions for cabin removal, refer to the instructions for engine removal in Chapter 2.

1.4.2 ROOF REMOVAL

1. Unscrew the cabin roof mounting nuts (Front: 2 EA, Rear: 3 EA, Left/Right: 1 / 1 EA).



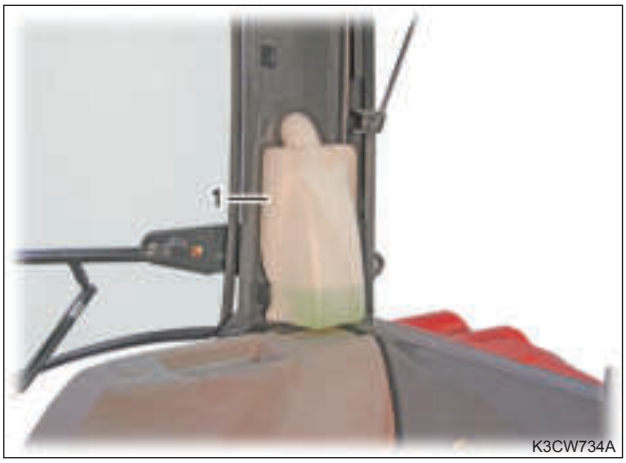
2. Disconnect the antenna connector (1) and remove the roof (2) by lifting it.

1.4.3 SEAT REMOVAL

1. Remove the seat (1) and seat support (2).

1.4.4 FENDER COVER (RH) REMOVAL

1. Remove the pillar cover (RH)(1).



2. Remove the washer tank (1).

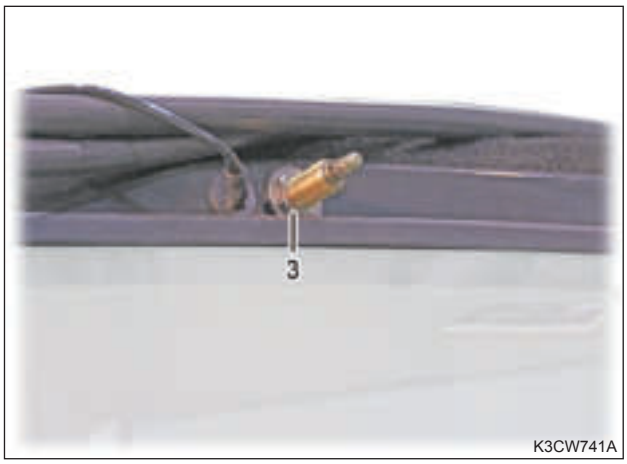
3. Remove the fender cover bracket (1) and joystick grip (2). Then, remove the fender cover (RH)(3).

1.4.5 FENDER COVER (LH) REMOVAL

1. Remove the pillar cover (LH)(1).

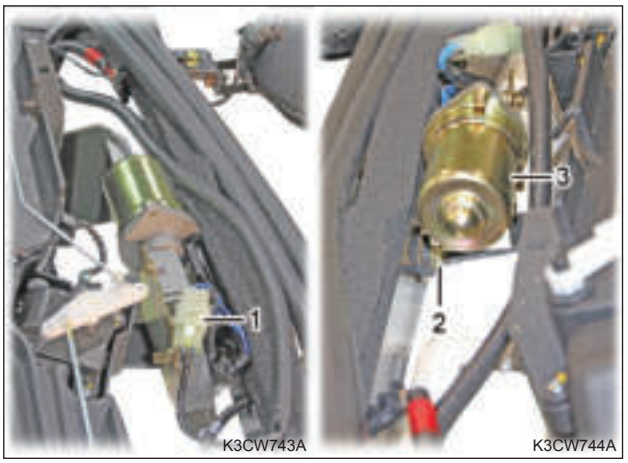
2. Remove the fender cover bracket (1) and fender cover (LH)(2).

1.4.6 FRONT WIPER MOTOR DISASSEMBLY



1. Open the wiper arm cap (1) from the front of the cabin and unscrew the mounting nut to remove the wiper arm (2). Then, unscrew the wiper motor mounting nut (3).

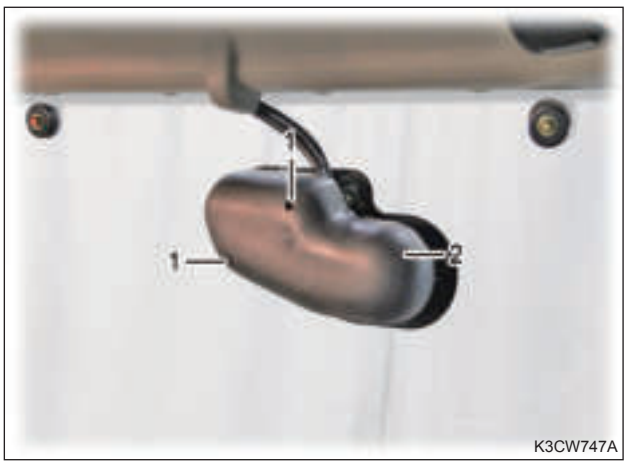
2. Unscrew the cabin roof mounting bolts (1)(7EA) to remove the roof.



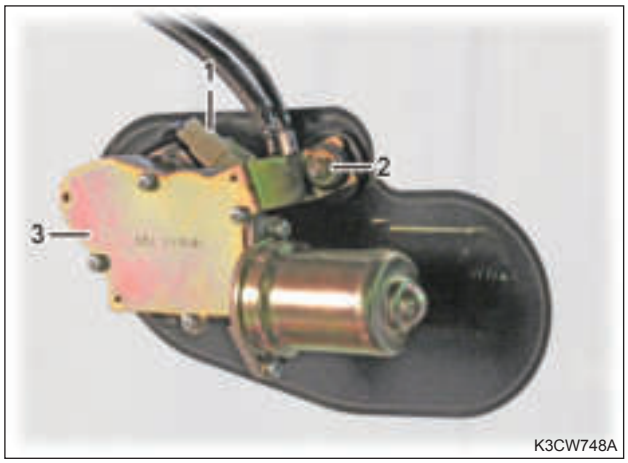
3. Disconnect the front wiper motor connector (1) in the cabin and unscrew the wiper motor mounting bolts (2) to remove the front wiper motor (3).

1.4.7 REAR WIPER MOTOR DISASSEMBLY

1. Open the wiper arm cap (1) and unscrew the mounting nut from the inside to remove the wiper arm (2).



2. Unscrew the rear wiper motor cover mounting bolts (1) to remove the cover (2) in the cabin.



3. Disconnect the rear wiper motor connector (1) and unscrew the motor mounting bolt (2) to remove the rear wiper motor (3).

1.4.8 OTHER COMPONENT REMOVAL

A/C CONTROL SWITCH

1. Pull out the whole A/C control switch box. Then, disconnect the connector (2) and remove the A/C control switch box.

CAR STEREO

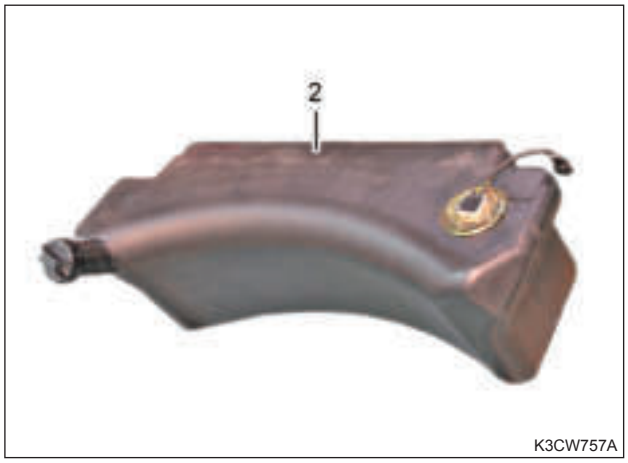
1. Remove the car stereo cover (1) and unscrew the mounting screws (2)(4EA).

2. Disconnect the wiring connector (1) to remove the car stereo (2).

FUEL TANK

1. Remove the fuel tank cover (1).

2. Disconnect the fuel sender connector (1).



3. Unscrew the fuel tank mounting bolts (1) to remove the fuel tank (2) from the back of the cabin.

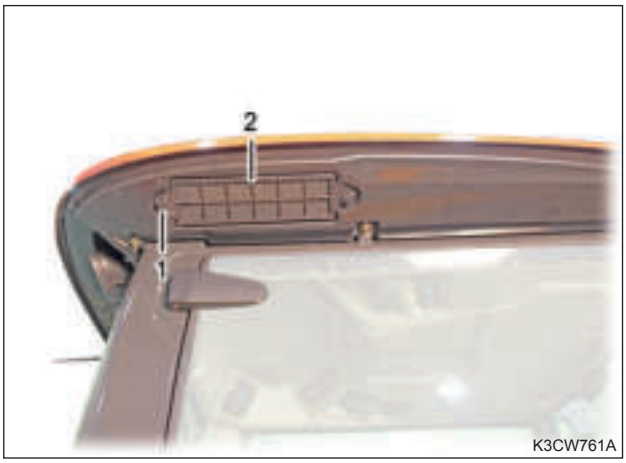
INTERIOR LAMP

1. Separate the interior lamp by pushing its side edge with a flat tool, such as a flat-bladed screwdriver, and pulling it out.

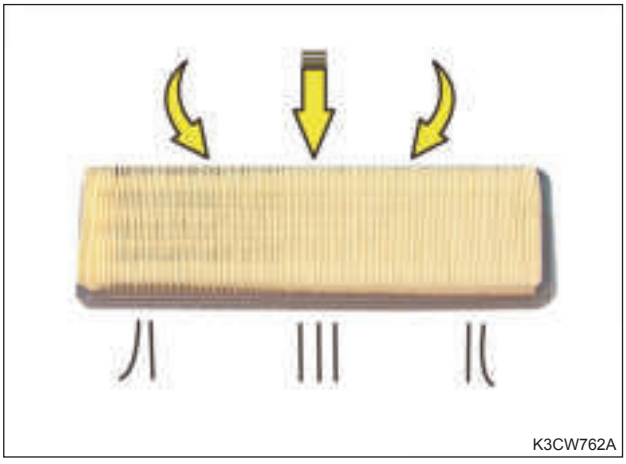
2. Unscrew the interior lamp mounting bolts (1) to remove the interior lamp cover.

3. Disconnect the wiring connector (1) and remove the interior lamp assembly (2). If necessary, replace the bulb (3) with a new one.

AIR FILTER

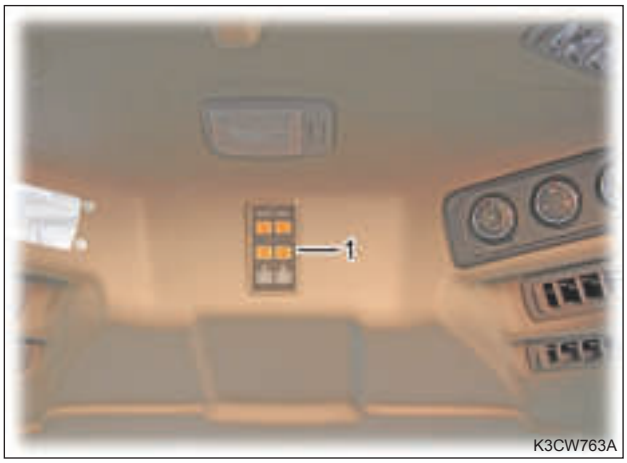


1. Unscrew the mounting screws (1) for the air filter assembly from the left and right side of the cabin roof to remove the filter assembly (2).



2. Clean the filter by blowing compressed air from the inside toward the outside of the cabin.

WIPER SWITCH



1. Pull out the wiper switch assembly from the ceiling and disconnect the wiring connector (2) from the wiper switch (1) to remove the wiper switch assembly.

1.5 TROUBLESHOOTING

SYMPTOM / INSPECTION ITEM	A/C CANNOT BE OPERATED.	COMPRESSOR CANNOT BE OPERATED.	THE A/C IS OPERATED ONLY IN THE 4TH STAGE, NOT IN THE 1ST, 2ND AND 3RD STAGES.	WIPER MOTOR CANNOT BE OPERATED. (WITH IGNITION SWITCH ON, WIPER SWITCH ON)	WIPER MOTOR CANNOT BE OPERATED. (WITH WASHER PUMP OPERATED)	WIPER MOTOR CANNOT BE OPERATED. (WITH WASHER MOTOR OPERATED)
A/C Controller	●		●			
Evaporator	●		●			
Condenser (Receiver Drier)		●				
A/C Compressor		●				
Fuse F13 [10 A]	●					
Fuse F13 [10 A]		●				
A/C Relay		●				
Compressor Relay		●				
Heater switch		●				
Wiper motor [front]				●	●	
Wiper motor [rear]				●	●	
Washer pump [front]						●
Washer pump [rear]						●
Wiper switch [front]				●	●	●
Wiper switch [rear]				●	●	●
Fuse F13 [10 A]				●		
Fuse F13 [10 A]				●		

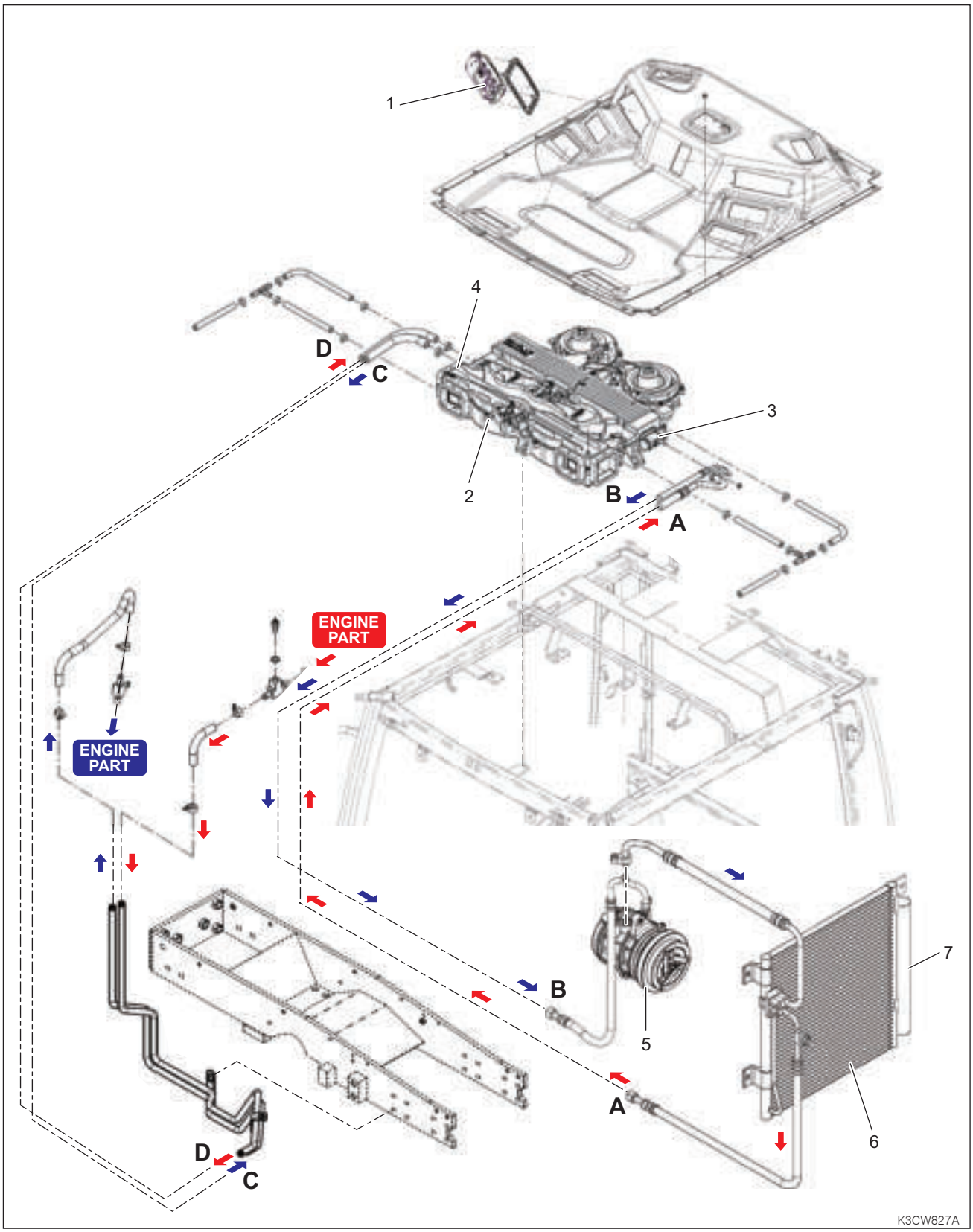
SYMPTOM / INSPECTION ITEM	THE WORK LAMP CANNOT BE TURNED ON. (WITH HEADLAMPS ON) (WITH IGNITION SWITCH ON, LAMP SWITCH ON, WORK LAMP SWITCH ON)	THE WORK LAMP CANNOT BE TURNED ON. (WITH HEADLAMPS OFF) (WITH IGNITION SWITCH ON, LAMP SWITCH ON, WORK LAMP SWITCH ON)	THE WORK LAMP CANNOT BE TURNED ON. (ONLY ONE HEADLAMP ON) (WITH IGNITION SWITCH ON,LAMP SWITCH ON, WORK LAMP SWITCH ON)	THE INTERIOR LAMP CANNOT BE OPERATED. (INTERIOR LAMP SWITCH ON)	THE AUDIO SYSTEM CANNOT BE OPERATED. (IGNITION SWITCH ON)	DATA CANNOT BE STORED IN THE AUDIO SYSTEM MEMORY AND THE INTERIOR LAMP CANNOT BE TURNED ON.(IGNITION SWITCH ON)	THE AUDIO SYSTEM CANNOT BE OPERATED AND NOTHING SOUNDS. (IGNITION SWITCH ON)
Cabin work lamp [front]	●		●				
Cabin work lamp [rear]	●						
Work lamp switch [front]							
Work lamp switch [rear]							
Work lamp relay [front]	●						
Work lamp relay [rear]	●						
Combination switch		●					
Interior lamp				●			
Audio system					●		●
Speaker							●
Cigarette lighter socket							
Fuse F13 [10 A]					●		

2. HVAC SYSTEM

2.1 SPECIFICATIONS

ITEM		SPECIFICATIONS	REMARKS
A/C	Cooling capacity	3,120 - 5% kcal/h	
	Air flow	400 m^3/h (at 12 V)	
	Refrigerant	R-134a	
	Refrigerant capacity	700 g (1.54 lbs)	
Heater	Heating capacity	4,800 - 5% kcal/h	
	Air flow	400 m^3/h (at 12 V)	
Compressor	Displacement	80 cc/rev	
	Lubricant	PAG oil, 100 ± 10 cm^3	
	Number of bores	10	

2.2 HVAC SYSTEM FLOW DIAGRAM

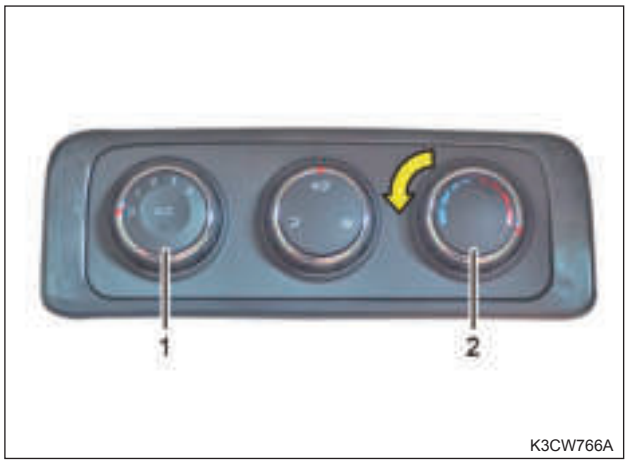


(1) A/C control switch
(2) Evaporator
(3) Expansion valve
(4) Heater block valve
(Line A) A/C hose (high pressure)
(Line B) A/C hose (low pressure)
(Line C) heater hose (low temperature)
(Line D) heater hose (high temperature)
(5) Compressor
(6) Condenser
(7) Receive drier

2.3 HVAC SYSTEM INSPECTION

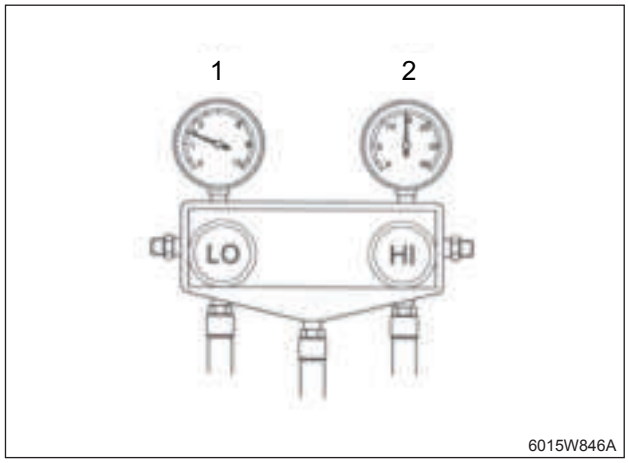
2.3.1 REFRIGERANT GAUGE TEST

1. Stop the engine, remove the ignition key and apply the parking brake.
2. Place all the shift levers in the neutral or disengagement position.
3. Open the hood.
4. Close the manifold gauge valve and install the gauge to the service valve of the A/C hose.
5. To bleed the low-pressure valve, open the valve slightly and then close it. Perform the same procedure for the high-pressure valve.
6. Start the engine and run the engine at 1,500 RPM.



7. Press the A/C switch (1) on the A/C control switch assembly, turn the dial to the max. speed (4th) position and turn the temperature control dial (2) to the cooling position.

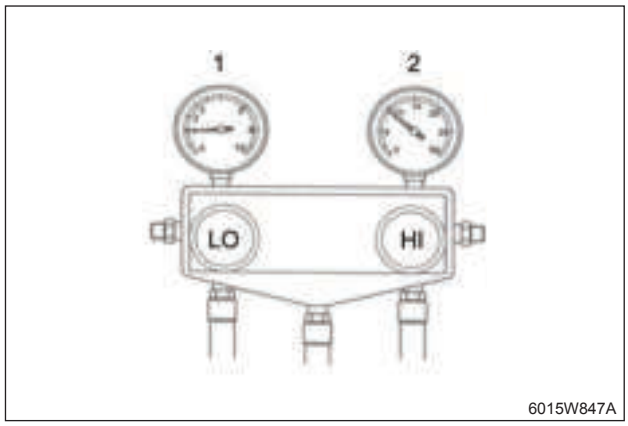
NORMAL STATE



(1) Low pressure (red) (2) High pressure (blue)

Specifi-cations	Low pressure (1)	1.5 - 2.0 kg/cm^2 [21.3 - 28.4 psi]
	High pressure (2)	14.5 - 15 kg/cm^2 [206 - 213 psi]

INSUFFICIENT REFRIGERANT



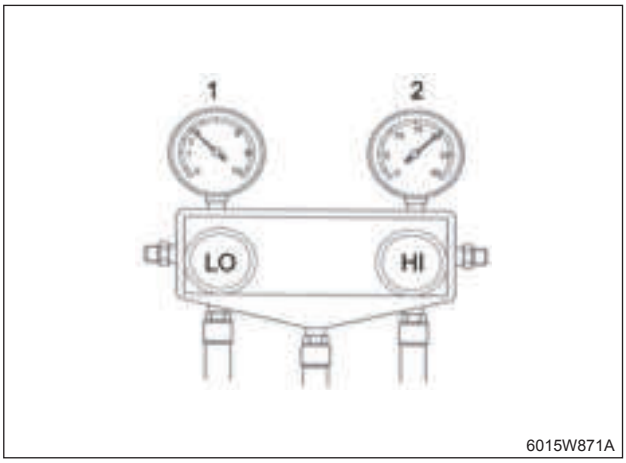
(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool.
2. Problem: Low pressure is detected from both gauges (both high and low pressure sides).

Specifica-tions	Low pressure (1)	0.8 kg/cm^2 [11.37 psi]
	High pressure (2)	8 - 9 kg/cm^2 [113.7 - 128 psi]

3. Cause: Refrigerant leak
4. Solution: Inspect the entire system for leakage with an electronic leakage detector.

EXCESSIVE REFRIGERANT, UNABLE TO OPERATE PROPERLY



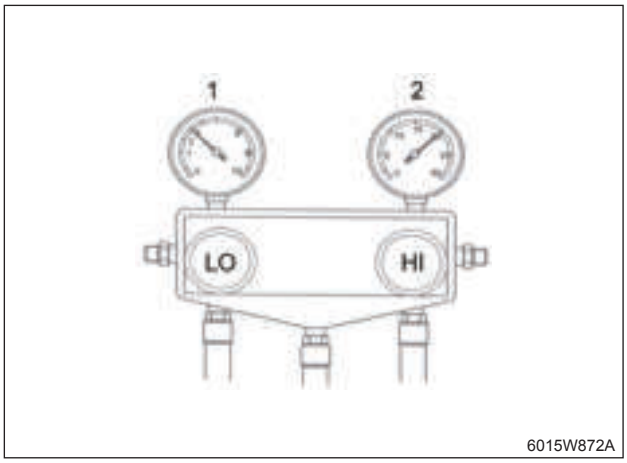
(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool.
2. Problem: High pressure is detected at both gauges (high and low pressure gauges).

Specifications	Low pressure (1)	Below 2.5 kg/cm^2 [35.5 psi]
	High pressure (2)	20 kg/cm^2 [284.4 psi]

3. Cause: Excessive refrigerant causes high pressure in the system. The condenser cannot perform its cooling function properly.
   The compressor belt is loose.
4. Solution: Clean the condenser, adjust the drive belt tension or check the motor operation.
   Check the amount of refrigerant.

AIR IN A/C SYSTEM



(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool.
2. Problem: High pressure is detected at both gauges (high and low pressure gauges).

Specifications	Low pressure (1)	Below 2.5 kg/cm^2 [35.5 psi]
	High pressure (2)	23 kg/cm^2 [327.1 psi]

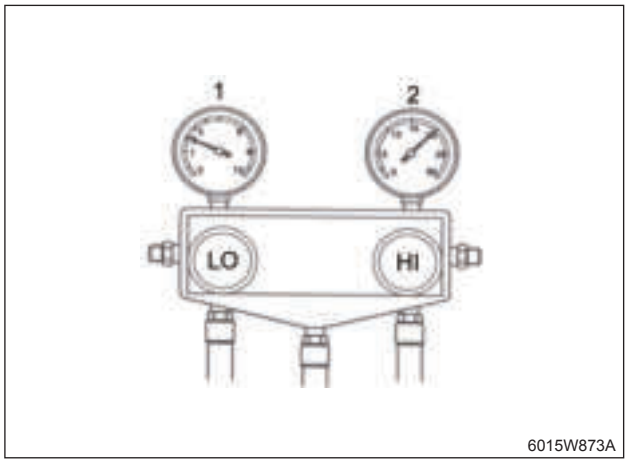
The low-pressure pipe is not cooled down.

3. Cause: The A/C system is not bled properly. (This is shown through the gauge.)
4. Solution: Check the gauge while charging with refrigerant. Check if the refrigerant is contaminated.

Notes

- **If driving the tractor for an extended period of time with air filled in the A/C system, the receiver drier (condenser) may need to be replaced.**

DEFECTIVE EXPANSION VALVE



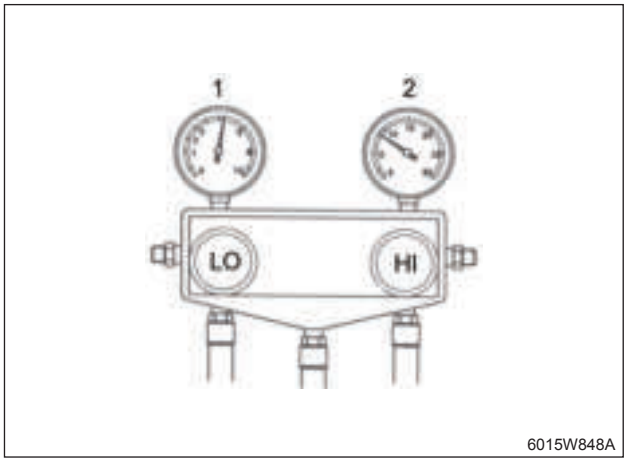
(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool.
2. Problem: High pressure is detected at both gauges (high and low pressure gauges).

Specifications	Low pressure (1)	Below 2.5 kg/cm^2 [35.5 psi]
	High pressure (2)	19 - 20 kg/cm^2 [270 - 284 psi]

3. Cause: Defective expansion valve
4. Solution: Replace the expansion valve with a new one.

ABNORMAL COMPRESSION



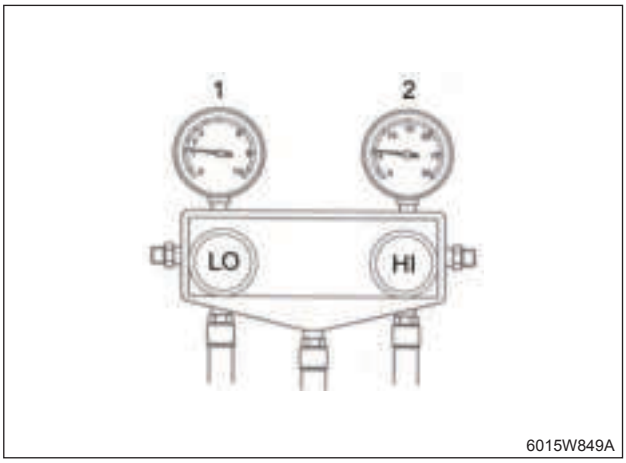
(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool.
2. Problem: High pressure is detected at the low-pressure gauge while low pressure is detected at the high-pressure gauge.

Specifications	Low pressure (1)	4 - 6 kg/cm^2 [56 - 85.3 psi]
	High pressure (2)	7 - 10 kg/cm^2 [99.5 - 142 psi]

3. Cause: Defective compressor gasket or suction valve
4. Solution: Repair or replace the compressor.

WATER IN SYSTEM



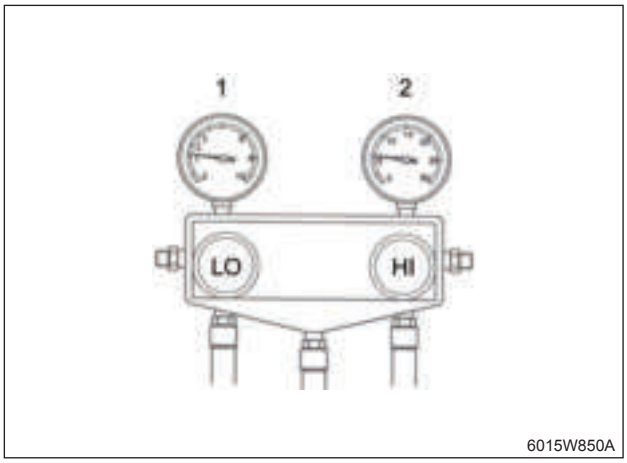
(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Blowing air is not cool continuously.
2. Problem: The low-pressure gauge is shaking.

Specifi-cations	Low pressure (1)	0.5 - 1.5 kg/cm^2 [7.1 - 21.3 psi]
	High pressure (2)	7 - 15 kg/cm^2 [99.5 - 213.3 psi]

3. Cause: Water cooled down through the cooling cycle is trapped in the A/C system and the system operates normally only when ice melts.
4. Solution: Replace the receiver drier (condenser), vacuum the system 2 to 3 times and change refrigerant.

ABNORMAL REFRIGERANT CIRCULATION



(1) Low pressure (red) (2) High pressure (blue)

1. Symptom: Air is not cool (cool only intermittently).
2. Problem: The low-pressure gauge is compressed and the high-pressure gauge indicates 5 - 6 kg/cm^2 [71.7- 85.3 psi].

   Water is condensed on the connection of the receiver drier or expansion valve.

Specifica-tions	Low pressure (1)	0.76 kg/cm^2 [10.8 psi]
	High pressure (2)	6 kg/cm^2 [85.3 psi]

3. Cause: The A/C system is blocked by ice or water. The receiver drier is faulty.
4. Solution: If blocked by ice, vacuum the system. If blocked by water, remove water with air with the expansion valve removed. If necessary, replace the receiver drier.

2.3.2 REFRIGERANT MAINTENANCE

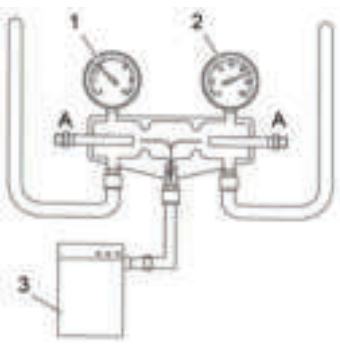
REFRIGERANT CIRCULATION

Notes

- **If the compressor can be operated, operate the HVAC system for 10 minutes with the engine running at 2,000 rpm. Set the temperature control dial to the lowest temperature position and the blower dial to the max. (4th) speed position. Then, refrigerant is circulated in the system and refrigerant in the compressor is indicated.**

Stop the engine and perform the following procedures to circulate the A/C refrigerant.

▶ **DRAIN**

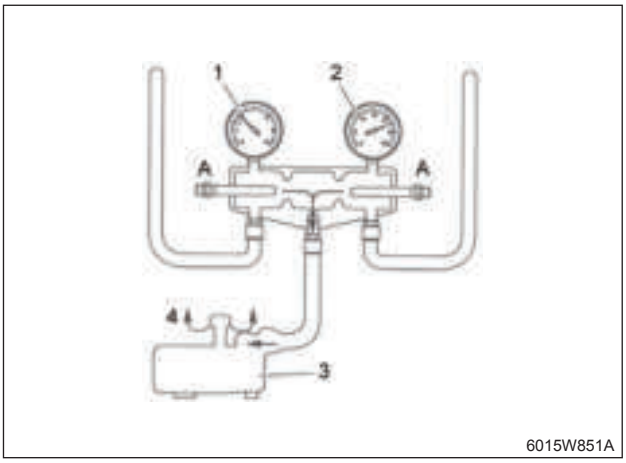


6015W874A

(1) Low-pressure line (red)
(2) High-pressure line (blue)
(3) Drain tank

- Connect the low-pressure hose (red) (1) from the charging station to the suction fitting of the compressor. Then, connect the high-pressure hose (blue) (2) to the drain fitting of the compressor.
- Open the high-pressure valve to drain refrigerant.
- When the high-pressure gauge indicates approx. 3.5 kg/cm^2 [50 psi], open the low-pressure valve.
- When all refrigerant is drained, both gauges indicate 0 kg/cm^2 [0 psi].
- Drain refrigerant from the system, following the instructions of the manufacturer. To prevent any foreign material from entering the A/C system, fit a cap over the fitting.

▶ **VACUUM**

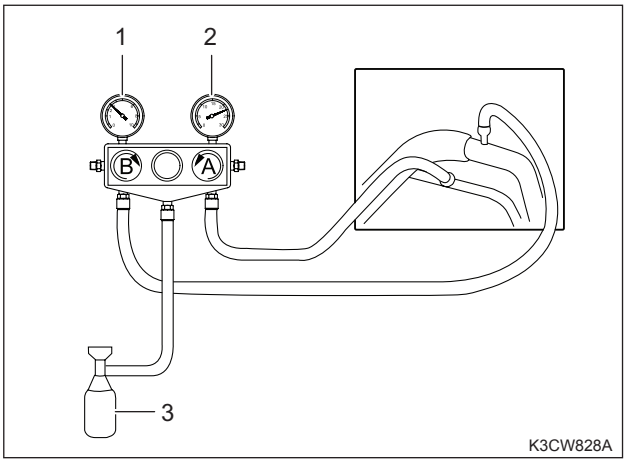


6015W851A

(1) Low-pressure valve gauge
(2) High-pressure valve gauge
(3) Vacuum pump
(A) Valve

- Connect the manifold gauges (low-pressure (red) (1) and high-pressure (blue) (2)) to the service valves.
- Connect the middle manifold hose (green) to the vacuum pump (3).
- Run the vacuum pump (3) and open both valves (low-pressure and high-pressure).
- Run the vacuum pump for 15 to 20 minutes until the gauge indicates 750 mmHg (0 kg/cm^2)[0 psi].
- Close both valves, stop the vacuum pump and observe the low-pressure gauge for 5 minutes.
- If the pointer on the low-pressure gauge moves, it means that refrigerant leaks from the A/C system. Repair the leaking part and vacuum the system again according to the above procedures.
- If the pointer on the low-pressure gauge does not move, remove the vacuum pump.

▶ CHARGING



(1) Low-pressure valve gauge
(2) High-pressure valve gauge
(3) Refrigerant tank

⚠ CAUTION

- **Vacuum the system before adding refrigerant.**

- Connect the manifold gauge to the service valve of the A/C hose pipe.
- Insert the middle hose of the manifold into the refrigerant tank.
- Open the high-pressure valve to add refrigerant (700 g)[1.54 lb].
- Close the high-pressure valve. Then, run the air compressor with the engine running.

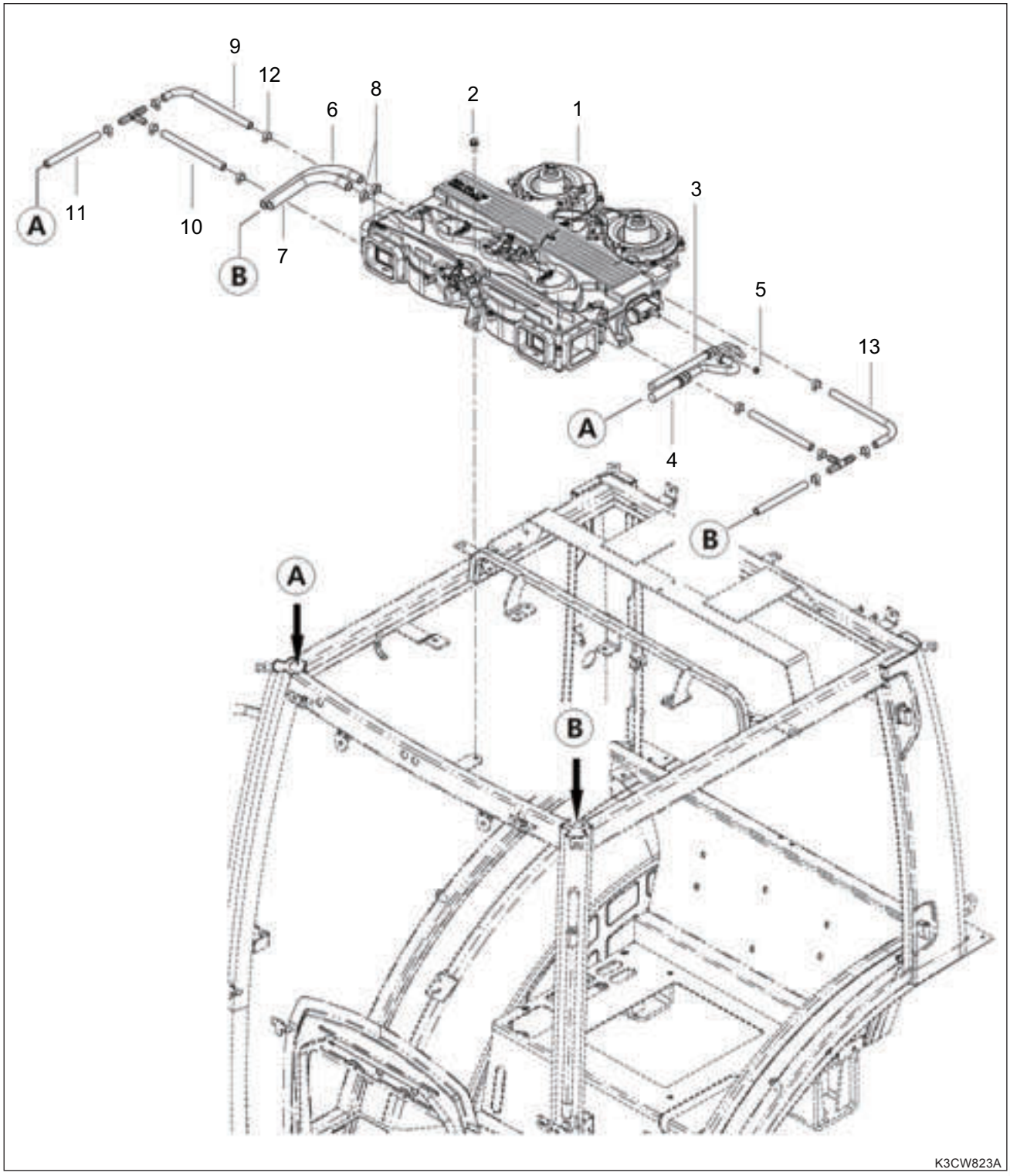
⚠ CAUTION

- **Do not open the high-pressure valve while the air compressor is running. Pressure can be applied to refrigerant.**

- Open the low-pressure valve slightly to add a proper amount of refrigerant.
- Close the low-pressure valve when a sufficient amount is added.
- Stop the engine and disconnect all manifold gauge devices.

2.4 SECTIONAL VIEW FOR MAJOR COMPONENTS

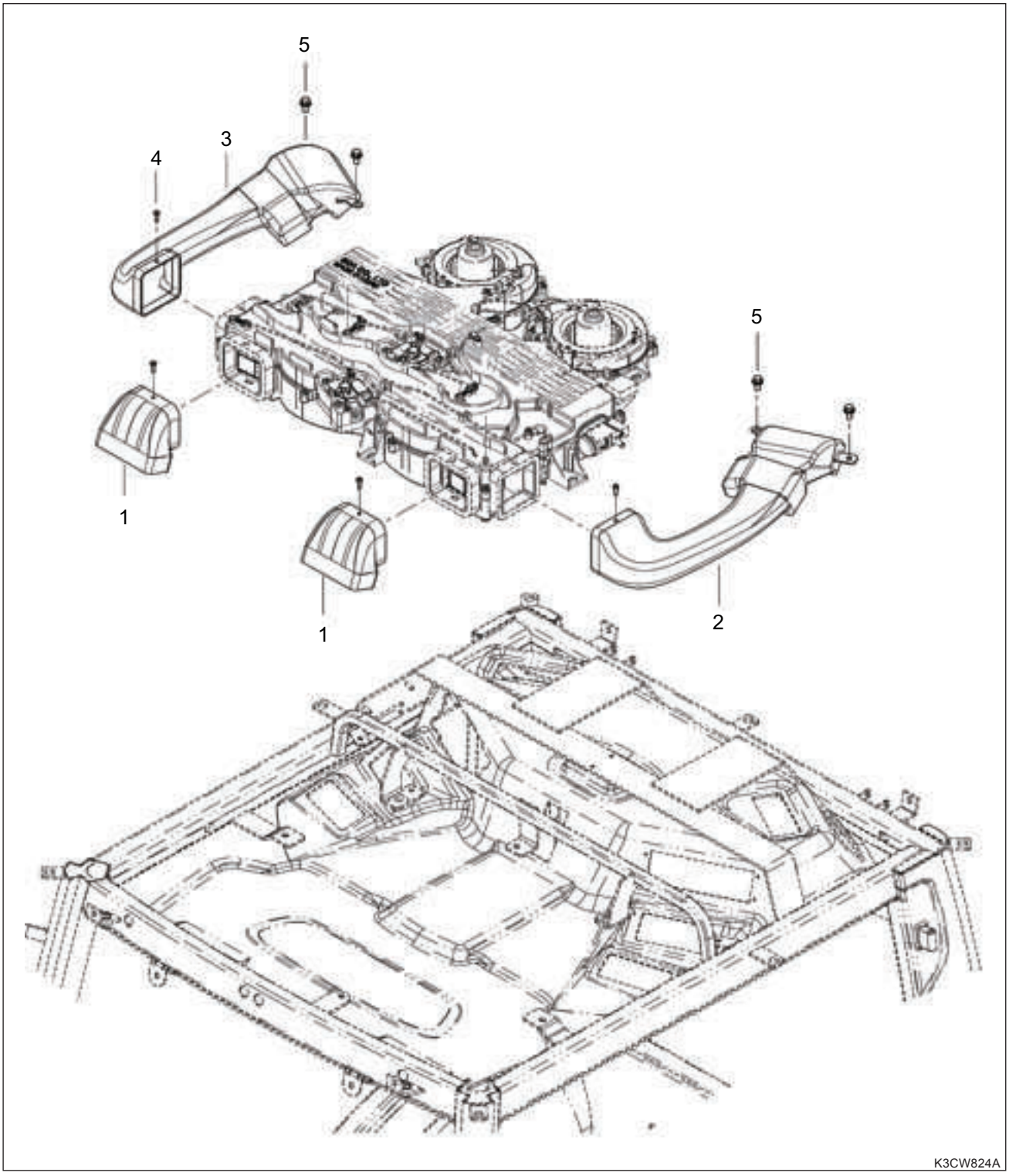
2.4.1 A/C ASS'Y, CABIN



COMPONENTS

(1) HVAC
(2) Washer ass'y hex bolt
(3) Hose, high pressure
(4) Hose, low pressure
(5) Hex flange nut
(6) Hose A, heater
(7) Hose B, heater
(8) Hose clamp
(9) Hose, drain
(10) Hose, drain
(11) Hose, drain
(12) Hose clamp
(13) Hose, drain

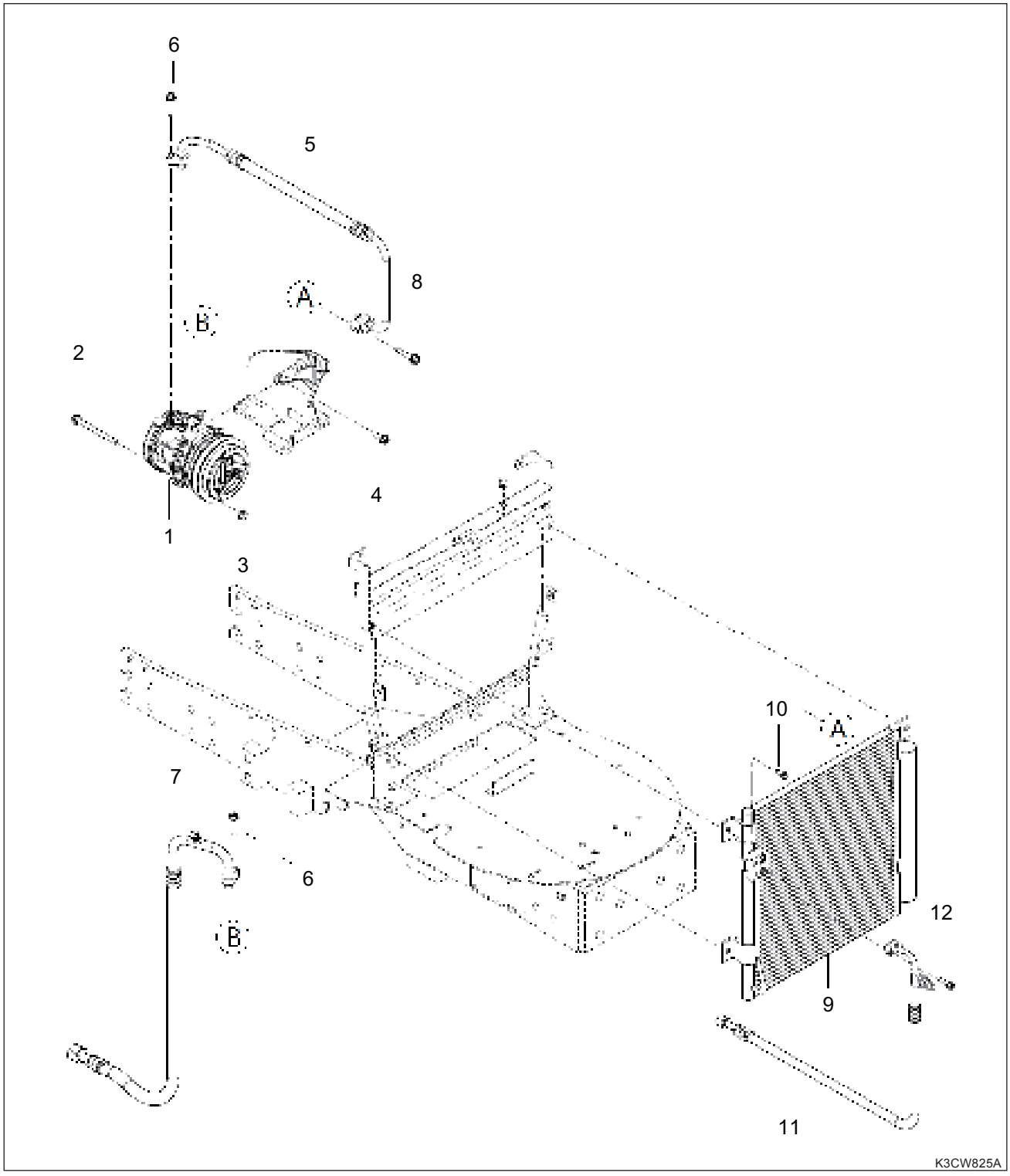
2.4.2 A/C DUCT ASS'Y



COMPONENTS

(1) Duct, front
(2) Duct, left
(3) Duct, right
(4) Tapping screw
(5) Washer ass'y hex bolt

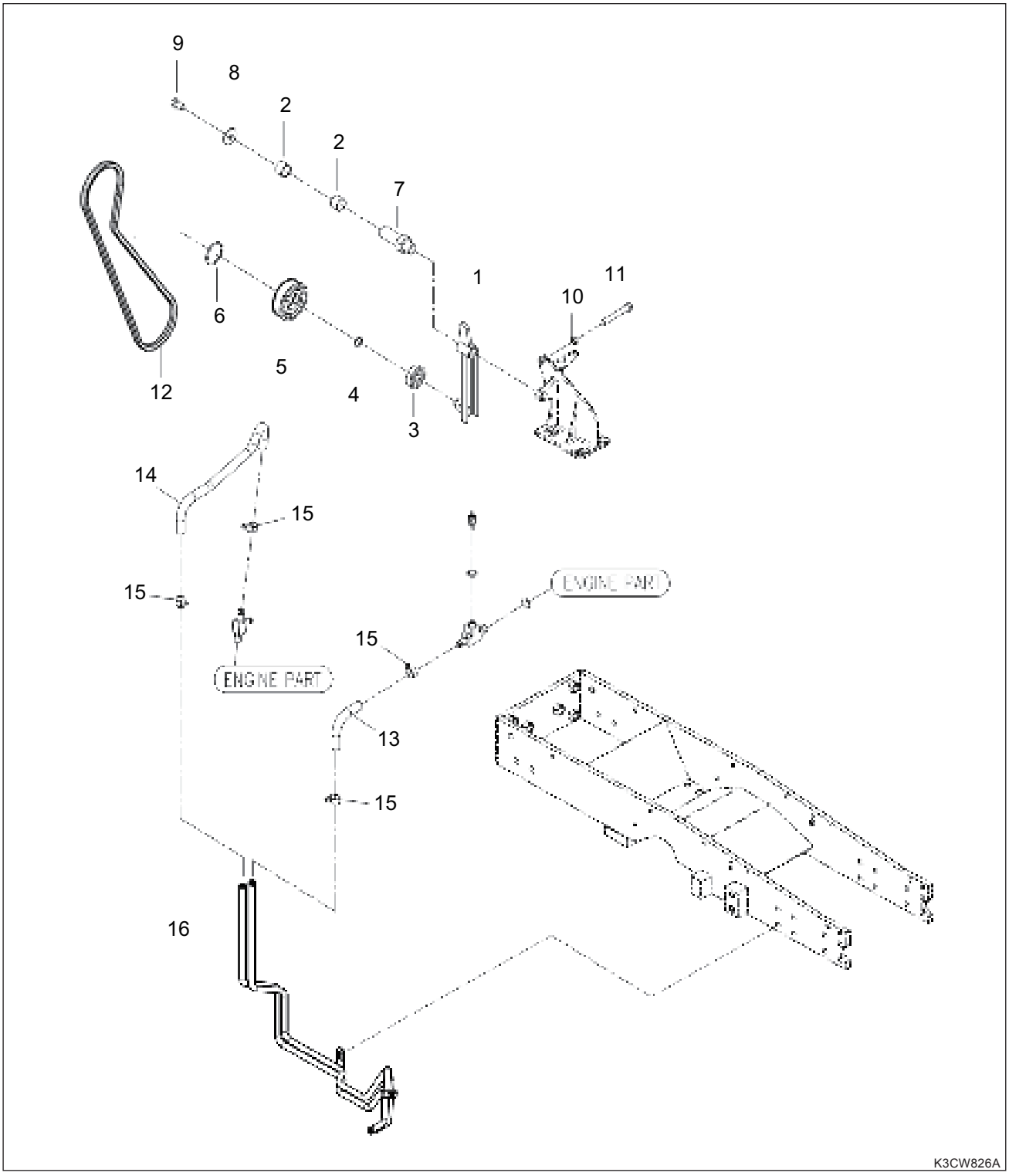
2.4.3 ENGINE SUB ASSEMBLY (1)



COMPONENTS

(1) Compressor
(2) Hex flange bolt
(3) Hex flange nut
(4) Hex flange bolt
(5) Condenser hose, DIS
(5) Condenser hose, DIS
(6) Hex flange bolt
(7) Compressor hose, SUC
(7) Compressor hose, SUC
(8) Hex flange bolt
(9) Condenser
(10) Washer ass'y hex bolt
(11) Condenser hose, LIQ
(12) Hex flange bolt

2.4.4 ENGINE SUB ASSEMBLY (2)



COMPONENTS

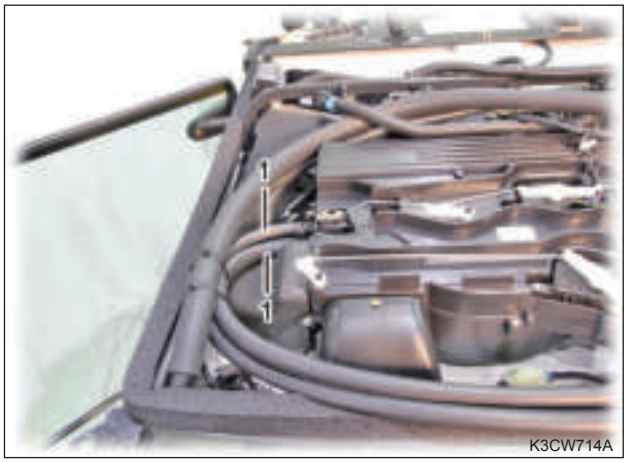
(1) Tension arm
(2) Dry bush
(3) Ball bearing
(4) Snap ring
(5) A/C tension pulley
(6) Snap ring
(7) Tension shaft
(8) Plain washer
(9) Hex bolt, w/washer
(10) Hex nut, fix
(11) Bolt, stopper
(12) V-belt
(12) V-belt
(13) Heater hose, A
(13) Heater hose, A
(14) Heater hose, B
(15) Hose clip
(16) Heater pipe ass'y

2.5 COMPONENT DISASSEMBLY AND ASSEMBLY

2.5.1 AIR CONDITIONER (HVAC) DISASSEMBLY

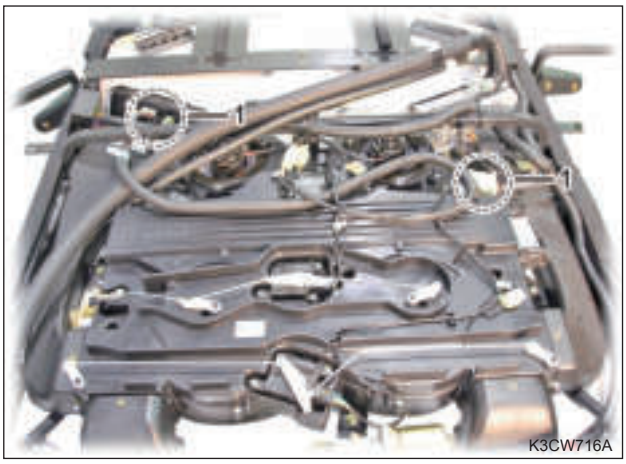
1. Unscrew the cabin roof mounting nuts (Front: 2 EA, Rear: 3 EA, Left/Right: 1 / 1 EA).

2. Lift up the back of the roof to disconnect the antenna connector (1) and remove the roof (2).

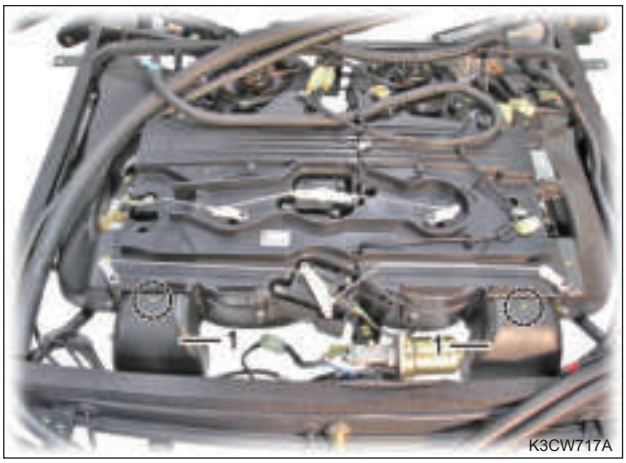


3. Disconnect the heater hose (1).

4. Disconnect the A/C hose (1).



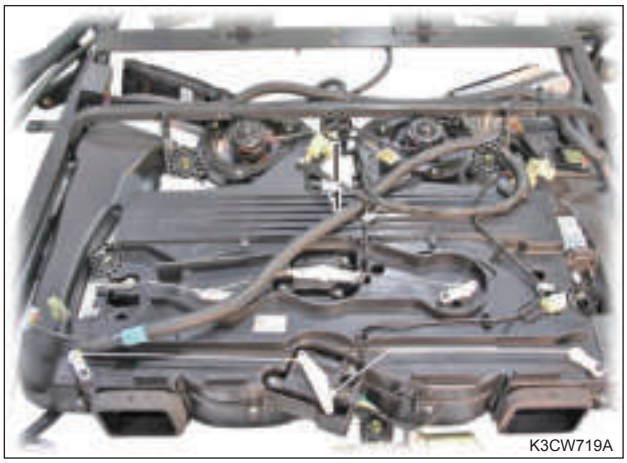
5. Disconnect the cabin wiring harness connector (1).

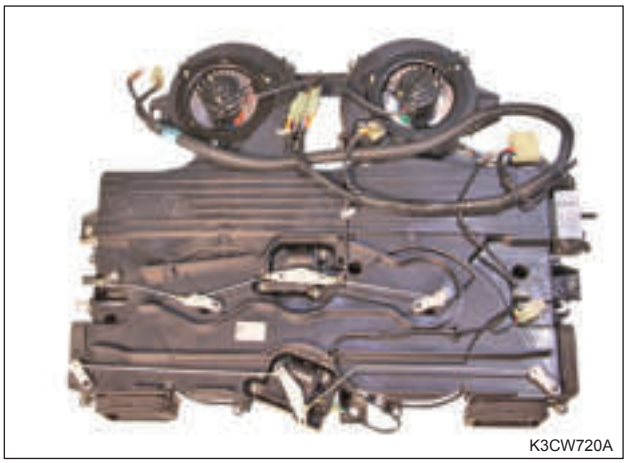


6. Remove the front ducts (1). (1 screw for each duct)

7. Remove the left and right ducts (1). (1 screws and 2 bolts for each duct)

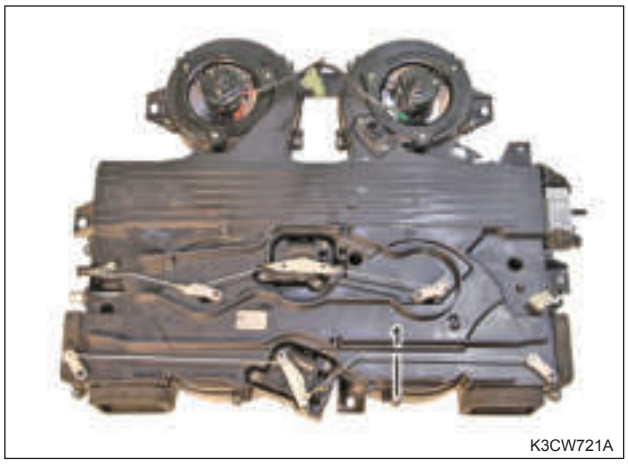
8. Remove the air vents (1) from the cabin ceiling.



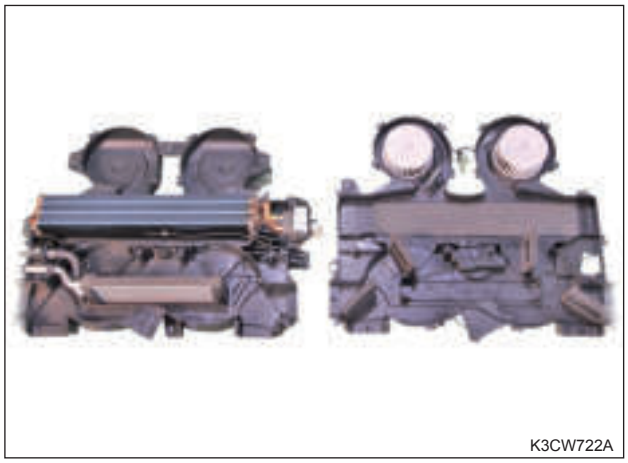


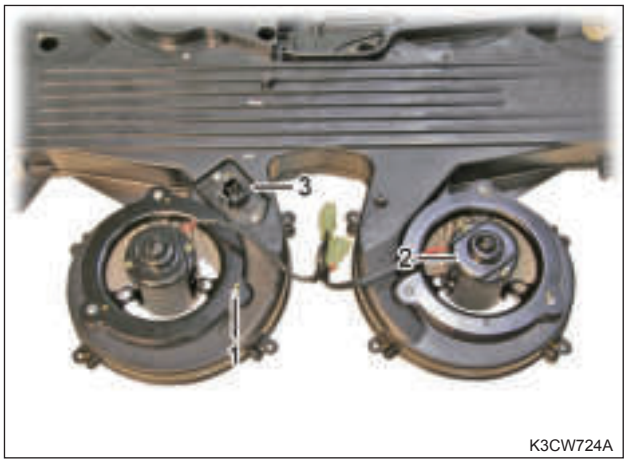
9. Unscrew the A/C (HVAC) mounting nuts (1) (Front : 3EA, Rear : 3EA) to remove the A/C (HVAC) assembly.

2.5.2 HVAC ASSEMBLY COMPONENTS DISASSEMBLY


K3CW721A

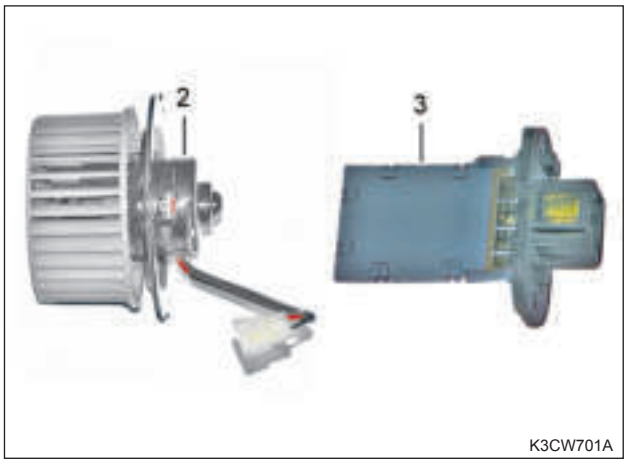

K3CW723A


K3CW722A



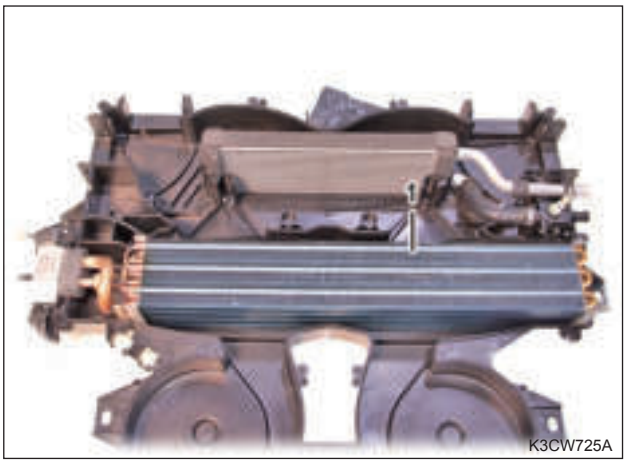
K3CW724A

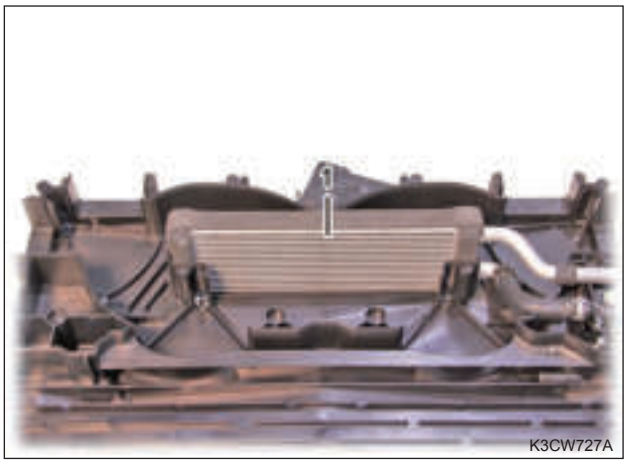
1. Unscrew the A/C (HVAC) assembly cover mounting screw (1)(22EA) to separate the upper and lower covers.

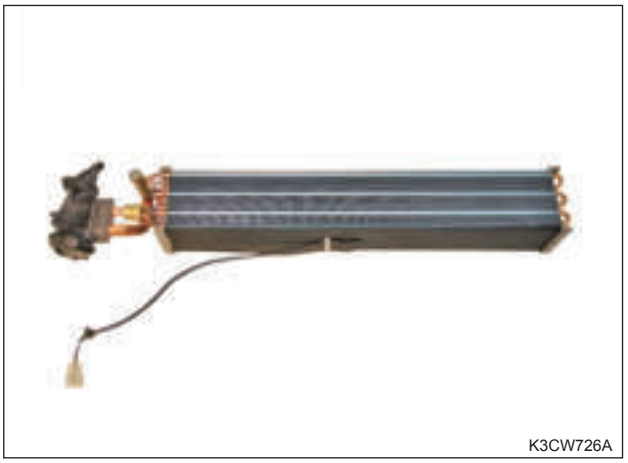


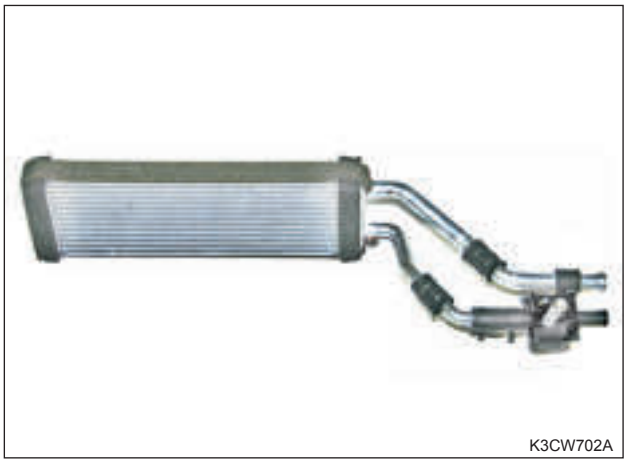
K3CW701A

2. Place the blower fan upside down and unscrew the blower fan motor mounting screws (1) to remove the motor (2). If necessary, remove the resistor (3).







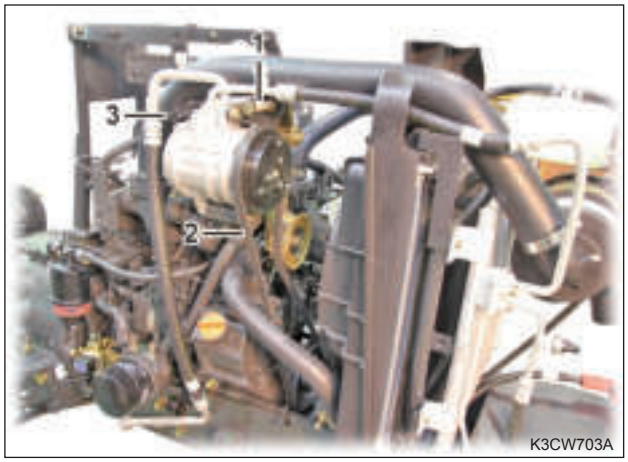


3. Remove the evaporator (1) from its cover.

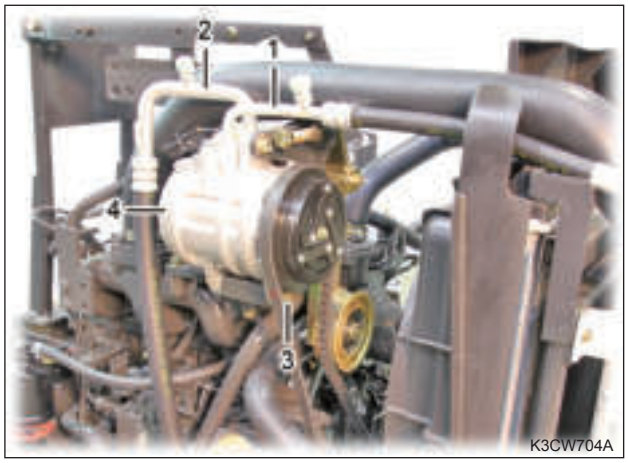
4. Remove the heater (1) from the evaporator cover.

2.5.3 COMPRESSOR DISASSEMBLY

1. Open the hood.
2. Disconnect the negative (-) battery cable and drain refrigerant.



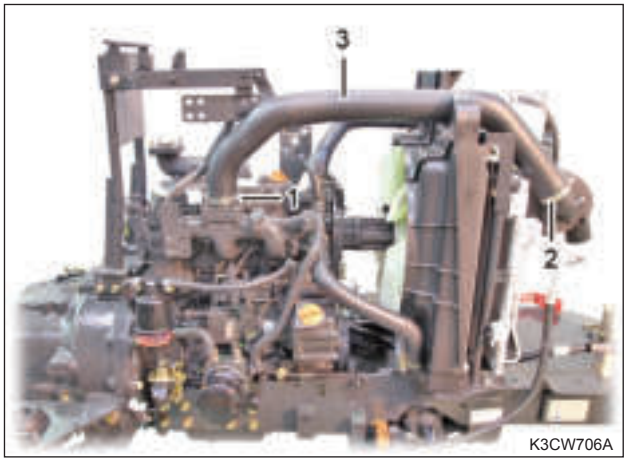
3. Loosen the tension of the A/C belt with its tension bolt (1). Then, remove the belt (2) and disconnect the wiring connector (3).



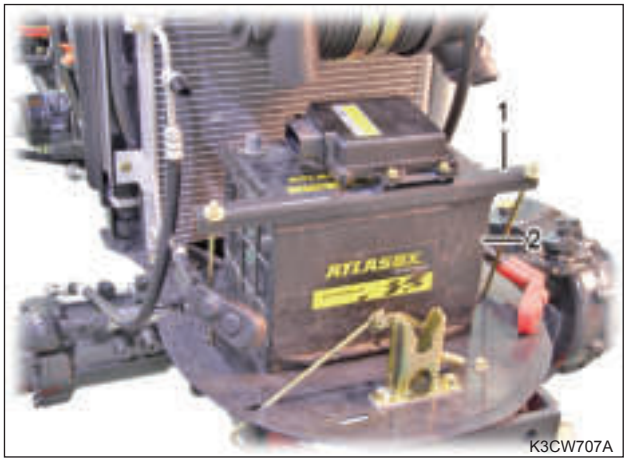
4. Disconnect the high-pressure pipe (1) and low-pressure pipe (2) from the compressor.
5. Unscrew the bracket mounting bolts (3) to remove the compressor (4).

2.5.4 CONDENSER DISASSEMBLY

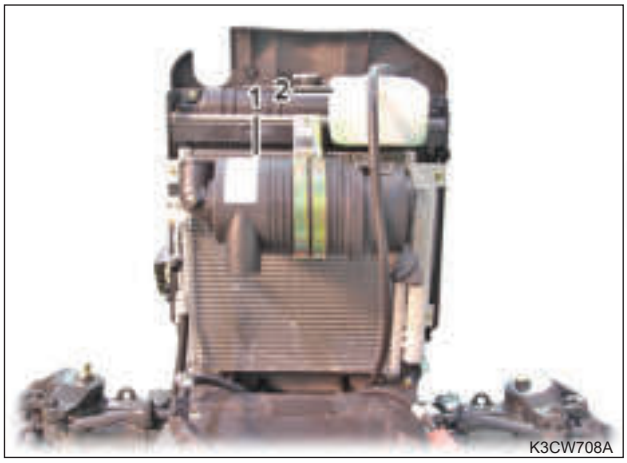
1. Open the hood.
2. Disconnect the negative (-) battery cable and drain refrigerant.



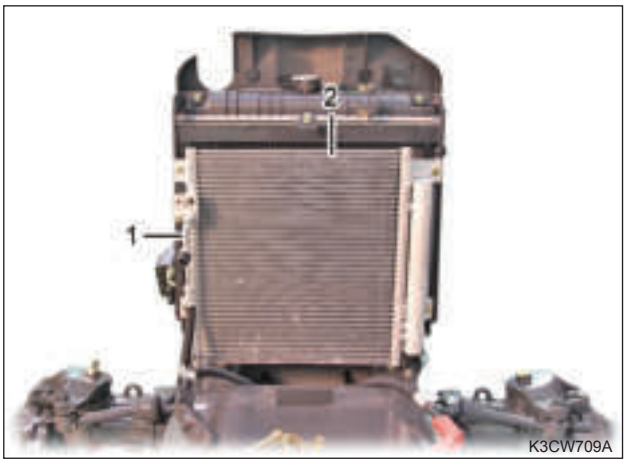
3. Remove the intake pipe mounting hose clip (1) and air cleaner mounting band (2) to remove the intake pipe (3).



4. Remove the battery mounting bracket (1). Then, detach the positive (+) battery cable to remove the battery (2).



5. Remove the air cleaner (1) and reservoir tank (2).



6. Disconnect the high-pressure pipe (1) from the condenser to remove the condenser (2).

⚠ CAUTION

- **When cleaning the condenser, use compressed air or rinse it with water. Keep the pressure of compressed air below 210 kPa (2 kgf/cm^2, 90 psi) and wear protective goggles and gear to prevent an injury by debris.**

Notes

- **When inspecting the condenser for leakage, check if the fin is bent or cracked or the shim is damaged.**
- **Mix detergent and water at a 50:50 ratio and spray this solution around the condenser. Then, plug the outlet and apply pressure of 689 kPa (7 kgf/cm^2, 100 psi) to the suction tube to check for leakage.**
- **If necessary, repair or replace it with a new one.**

2.6 TROUBLESHOOTING

2.6.1 GENERAL INFORMATION

CAUSE OF PROBLEM	SYMPTOM	SOLUTION
The A/C belt is loose, causing abnormal noise.	When the A/C belt is loose or old, it produces a high-pitched creaking sound.	When the A/C belt is loose or old, adjust its tension after replacement.
The compressor produces a noise.	Abnormal sound is heard from the compressor or around it.	Check the bolts of the compressor and bracket. If loose, tighten them firmly.
Abnormal noise is heard from the condenser.	Abnormal noise is produced from the condenser due to broken suction valve.	Replace the suction valve.
Foreign materials are in the condenser.	Soil is in the condenser, reducing its efficiently greatly and affecting the A/C performance.	Rinse the condenser thoroughly to remove soil. Be careful not to damage the fins.
The pipe connection or compressor is contaminated with oil.	Foreign materials are in the A/C system	Check the contaminated area and inspect the compressor gasket, O-ring and shaft seal for a gas leak. If necessary, replace the corresponding part.
Abnormal noise is heard from the motor ventilation duct.	The ventilation duct motor is malfunctioning. Foreign materials are caught in the ventilation duct motor or its mounting bolt is loose.	Replace the ventilation duct motor. Remove foreign materials or tighten the mounting bolt firmly.

2.6.2 COOLING PROBLEM

▶ **THE FAN MOTOR DOES NOT RUN.**

CAUSE OF PROBLEM	INSPECTION	SOLUTION
Blown fuse	Check the A/C fuse.	If the fuse is blown, replace it with a new one.
Open circuit	Check the wiring connector of the fan motor.	Connect the wiring again.
Defective fan motor	Connect a tester to both terminals of the motor and check for continuity. If there is continuity, it is normal.	If there is no continuity, replace the fan motor.
Damaged resistor	Check for continuity between resistors. If there is continuity, it is normal.	If there is no continuity, replace the resistor.
Damaged blower dial	Test the blower dial by turning it.	If the blower does not operate at any stage, replace the blower dial.

▶ THE COMPRESSOR ROTATES BUT COOL AIR IS NOT SUPPLIED

PROBLEMS		CAUSE OR SYMPTOM	SOLUTION
Excessive or insufficient refrigerant		Run the A/C for 5 to 10 minutes. Then, touch the high-pressure and low-pressure pipes and check the refrigerant amount.	
Insufficient refrigerant		There is only slight temperature difference between the high-pressure pipe and low-pressure pipe.	Repair the leaking area and add refrigerant.
Excessive refrigerant		There is no air bubble even though pressure in the high-pressure pipe is high and the condenser is cooled by water.	Drain refrigerant until air bubbles are visible.
The refrigerant pressure is indicated high at the low-pressure side.	Defective thermostat	The magnetic clutch is disengaged before blowing air is sufficiently cooled down.	Adjust or replace
	Leaking compressor gasket or damaged valve	The pressure at the high-pressure gauge is balanced as soon as the magnetic clutch is OFF.	Repair or replace the compressor.
	Defective expansion valve connection	Water is condensed on the connection of the compressor and its temperature is below the temperature of the outlet port or evaporator pipe.	Tighten the pipe connection.
	Excessively open expansion valve	The main pressure is not changed regardless of whether the thermal case is installed or removed.	Replace
	Clogged compressor suction filter	The low-pressure hose is not cooled down, but the compressor connection is.	Clean the filter.
The refrigerant pressure is indicated low at the low-pressure side.	Insufficient refrigerant	Refer to "Insufficient refrigerant."	Add refrigerant.
	Clogged receiver drier	There is a great temperature difference from the tank outlet port and water is condensed on the tank.	Replace the receiver drier (condenser).
	Clogged expansion valve	The inlet port of the expansion valve is cooled down and water is condensed on it.	Replace the expansion valve.
	Leaking expansion valve	The outlet port of the expansion valve is not cooled down and the low-pressure gauge becomes in a vacuum state.	Replace the expansion valve.
	Clogged pipe	The pressure on the low-pressure side is decreased when the pipe is clogged.	Clean or replace the pipe.
	Defective thermostat switch	Vapor is frozen.	Add a sufficient amount of refrigerant.
The refrigerant pressure is indicated high at the high-pressure side.	Blocked condenser	The condenser is contaminated or clogged and the cooling fan rotates abnormally.	Clean, repair or replace
	Excessive refrigerant	Blown fuse, open wiring or poor contact	Adjust the amount of refrigerant.
	Air in A/C system	Refer to "Excessive refrigerant."	Bleed the system and add a proper amount of refrigerant.
The refrigerant pressure is indicated low at the high-pressure side.	Insufficient refrigerant	Refer to "Insufficient refrigerant."	Add refrigerant.

▶ THE FAN MOTOR OPERATES PROPERLY BUT AIR BLOWS POORLY

CAUSE OF PROBLEM	INSPECTION	SOLUTION
The inlet of the evaporator is blocked.	Check the evaporator for contamination.	Remove any blocking material.
Air leaks.	Check the seal of the A/C case.	Adjust
The thermostat switch is malfunctioning.	Perform the circuit test to check if the evaporator is frozen.	Replace

▶ THE COMPRESSOR DOES NOT ROTATE OR HARD TO ROTATE

CAUSE OF PROBLEM	SYMPTOM	SOLUTION
Loose drive belt	The belt shakes excessively.	Adjust the belt tension.
Internal failure of compressor	The belt slips.	Repair or replace
Voltage drop	The compressor clutch slips when the compressor is running.	Charge the battery.
Layer short	The compressor clutch slips when the compressor is running.	Replace the magnetic clutch.
Oil on clutch surface	The compressor clutch slips when the compressor is running.	Replace the clutch or clean its surface.
Excessive clearance on clutch plate	The clutch plate is adsorbed when pressed with a hand.	Adjust the clearance or replace it.
Open circuit	The compressor clutch cannot be engaged and current flow is detected between the compressor connectors.	Replace the compressor.
Damaged wiring or poor ground	The compressor clutch cannot be engaged.	Repair

2.6.3 HEATING PROBLEM

▶ THE FAN MOTOR OPERATES PROPERLY BUT AIR BLOWS POORLY

CAUSE OF PROBLEM	INSPECTION	SOLUTION
Clogged air duct	Check the duct for damage or deflection.	Correct
Air leak from duct	Check the duct connection. Check the duct seal or condition.	Correct

▶ WATER LEAK

CAUSE OF PROBLEM	INSPECTION	SOLUTION
Damaged seal	Check the heater core, core connection, hose and heater pipe for leakage.	Correct or replace
Loose connection	Check the heater core, core connection, hose and heater pipe for leakage.	Correct or replace
Punctured core	Check the heater core.	Replace

▶ AIR BLOWS PROPERLY BUT IT IS NOT HEATED PROPERLY

CAUSE OF PROBLEM	INSPECTION	SOLUTION
Low refrigerant temperature	Check the refrigerant temperature.	Replace the thermostat.
Insufficient refrigerant	Check refrigerant amount	Add coolant
Insufficient coolant	Check if the coolant pipe is clogged.	Bleed and correct
Air not blown to heater core	Check the air mix door and seal.	Adjust or replace the control cable or replace the seal.

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