MTL16

MUSTANG
TRACK LOADER

SERVICE MANUAL

PART #908312

Revision C - 06/11

Mustang Manufacturing Company, Inc.

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I . GENERAL
II . SPECIFICATIONS
III. MACHINE CONFIGURATION
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V . TROUBLESHOOTING
VI. ENGINE

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SAFETY PRECAUTIONS

SAFETY ALERT SYMBOL

This symbol means Attention! Be Alert! Your Safety Is Involved.
The message that follows the symbol contains important information about safety.
Read and understand the message to avoid personal injury or death.

■ SIGNAL WORDS

Safety messages appearing in this manual and on machine decals are identified by the words "DANGER", "WARNING" and "CAUTION". These signal words mean the following:

⚠ DANGER	⚠ WARNING	⚠ CAUTION
The word "DANGER" indicates an imminently hazardous situation which, if not avoided, can result in serious injury or death.	The word "WARNING" indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.	The word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT: The word "IMPORTANT" is used to alert against operators and maintenance personnel about situations which can result in possible damage to the machine and its components.

This manual is intended for trained and qualified personnel only. Warnings or cautions described in this manual do not necessarily cover all safety measures. For maintenance work, each person must take adequate safety precautions against possible hazards present in the respective working environment.

Observe all safety rules

- Operation, inspection and maintenance of this machine must be performed only by a trained and qualified person.
- All rules, regulations, precautions and safety procedures must be understood and followed when performing operation, inspection and maintenance of this machine.
- Do not perform any operation, inspection and maintenance of this machine when under the adverse influence of alcohol, drugs, medication, fatigue, or insufficient sleep.

Wear appropriate clothing and personal protective equipment

- Do not wear loose clothing or any accessory that can catch on controls or in moving parts.
- Do not wear oily or fuel stained clothing that can catch fire.

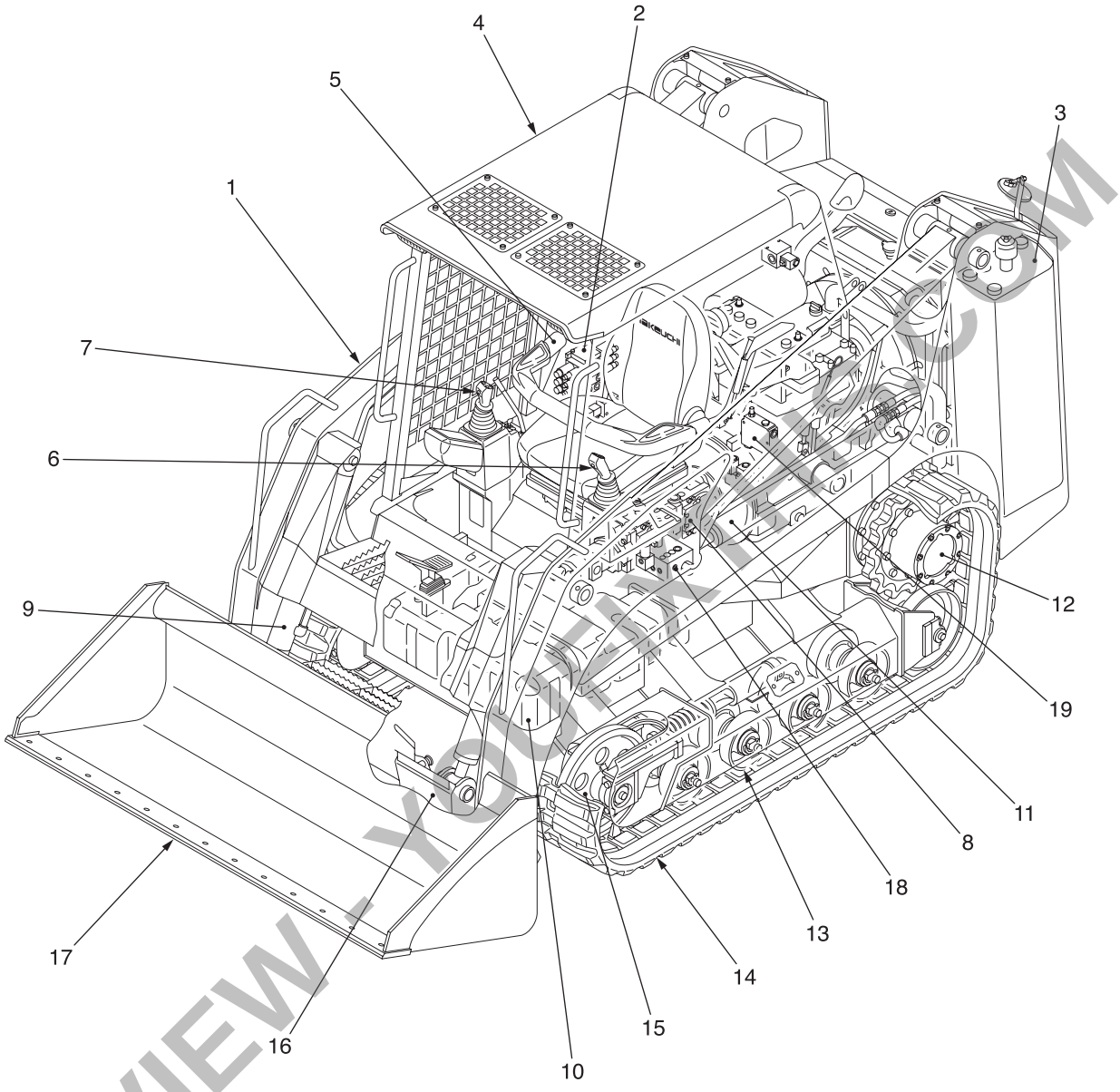

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- Wear a hard hat, safety shoes, safety glasses, filter mask, heavy gloves, ear protection and other protective equipment as required by job conditions. Wear required appropriate equipment such as safety glasses and filter mask when using grinders, hammers or compressed air, as metal fragments or other objects can fly and cause serious injury.
- Use hearing protection when operating the machine. Loud prolonged noise can cause hearing impairments, even the total loss of hearing.

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NAMES OF COMPONENTS



1. Lift Arm
2. Control Valve
3. Hydraulic Tank
4. Canopy
5. Safety Bar
6. Pilot Valve (L. H.)
7. Pilot Valve (R. H.)
8. HST Pump
9. Bucket Cylinder
10. Fuel Tank
11. Arm Cylinder
12. Travel Motor
13. Track Roller
14. Crawler Belt
15. Idler
16. Quick Attachment
17. Bucket
18. Control Valve (Sub)
19. Self -Level Valve

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SPECIFICATIONS OF DEVICE

Serial Number		21300004~	
		21300004~21301932	21301933~
Engine			
Model		Yanmar 4TNE98-TBL	Yanmar 4TNV98-YTBL
Type		4-Cycle, vertical, water-cooled, in-line, 4-cylinder diesel engine	←
Number of Cylinders-Bore × Stroke	mm	4-98 × 110	←
Total Displacement	mL	3318	3319
Compression Ratio		18.0	18.5
Performance			
Rated Output	kW/min^{-1}	50/2450	49.2/2450
Maximum Torque	N·m/min^{-1}	224.6~245.2/1600	236/1470
Maximum No-load R.P.M.	min^{-1}	2650 ±25	←
Minimum No-load R.P.M.	min^{-1}	1150 ±25	←
Specific Fuel Consumption	g/kW·h	245	235
Starter	V–kW	12–3.0	←
Generator	V–kW	12–0.48	←
Battery	V–A·h	12–80	←
HST Pump			
Model		PVM2828	
Type		Variable displacement type double axial piston	
Displacement	cm^3/rev	28.0 + 28.0	
Delivery	L/min	68.6 + 68.6	
Relief Valve Pressure Setting	MPa	34.5	
Charge Relief Valve Pressure Setting	MPa	1.96 ±0.02 (1.9 ±0.07*)	
Gear Pump			
Model		DDG1A27·16F9H7-R916	
Type		Tandem gear	
Displacement	cm^3/rev	27.8 + 16.2	
Delivery	L/min	68.1 + 39.7	
Gear Pump (High Flow)			
Model		SGP1A18F2H9-L321	
Type		Gear	
Displacement	cm^3/rev	18.3	
Delivery	L/min	56.3	
Control Valve			
Model		07886-00000	
Number of Circuits		3	
Main Relief Valve Pressure Setting	MPa@L/min	20.6 @68	
Port Relief Valve Pressure Setting	MPa@L/min	24.5 @68	
Control Valve (High Flow)			
Model		07930-0000A	
Main Relief Valve Pressure Setting	MPa@L/min	20.6 @60	
Control Valve (Sub)			
Model		07903-0000B	
Rated Flow	L/min	41.6	
Relief Valve Pressure Setting	MPa@L/min	3.3 @40	

*: 21300004~21300812

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RECOMMENDED LUBRICANTS

Use different fuels, lubricants and greases according to the temperature, referring to the chart below.

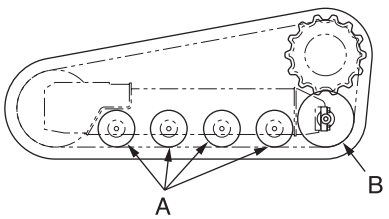
- Change the lubricant earlier than as show in the table if it is extremely dirty or its performance has deteriorated severely.
- Whenever possible, use the same brand of lubricant as before. If changing with a different brand, replace the entire quantity – do not mix different brands.

Part	Type	Type by temperature -22 -4 14 32 50 68 86 104°F -30 -20 -10 0 10 20 30 40°C	Replacement interval	Capacity
Engine oil pan	Diesel engine oil API service CD	SAE 5W-20 SAE 10W-30 SAE 15W-40	After first 50 hrs. Every 250 hrs.	Upper limit: 10.2 L Lower limit: 5.7 L
Hydlaulic tank	Diesel engine oil API service CD	SAE 10W-30	Every 1000 hrs.	Total system: 60 L Tank level: 39L
Fuel tank	Diesel fuel	Use a clean, Quality fuel for performance and optimum engine life. • To prevent fuel flow problems in cold weather, use diesel fuel with a pour point of at least -12°C (10°F) below the lowest expected ambient temperature. • Minimum cetane number is 45. Low temperature or high altitude operation may require the use of fuel with a higher cetane number.		Tank level: 75 L
Engine cooling system	Coolant (water**+Coolant***)	30% coolant mixture 50% coolant mixture	Every 1000 hours	10.9 L
Travel reduction gear	Gear oil API-GL-4	SAE 90	After first 500 hrs.* Every 1000 hrs.	1.1 L (TEIJIN) 1.0 L (DAIKIN)
Track Roller A	Diesel engine oil API service CD	SAE 30	—	180 mL
Track Roller B	Mobil gear SHC 680	——	—	140 mL
Idler	Diesel engine oil API service CD	SAE 30	—	120 mL
Working equipment	Lithium grease EP-2 NLGI No. 2	——	Daily or erery 10 hrs.	As required
Levers		——	When required	

* If the percentage of the traveling time within the total operating time is high, replace the gear oil earlier than the specified time.

** For water, use tap water (soft). Do not use well or river water.

*** When the ambient temperature drops below 0°C, add coolant (antifreeze). Follow the coolant manufacture's instructions to determine the mixture ratio.



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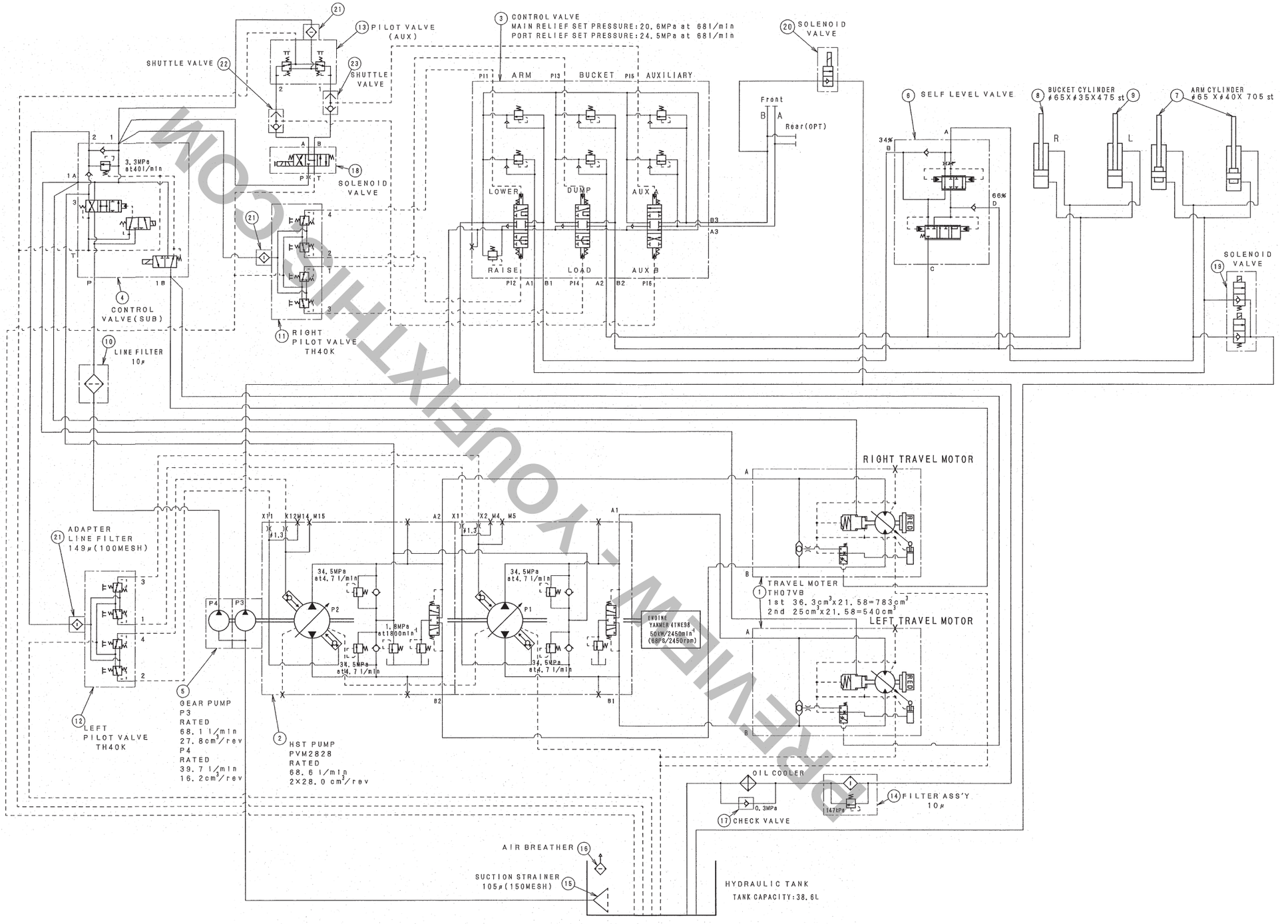
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HYDRAULIC SYSTEM

HYDRAULIC CIRCUIT DIAGRAM

Standard
Serial No. 21300004~21301932
Travel Motor (TEIJIN)



TL 130 HYDRAULIC CIRCUIT DIAGRAM

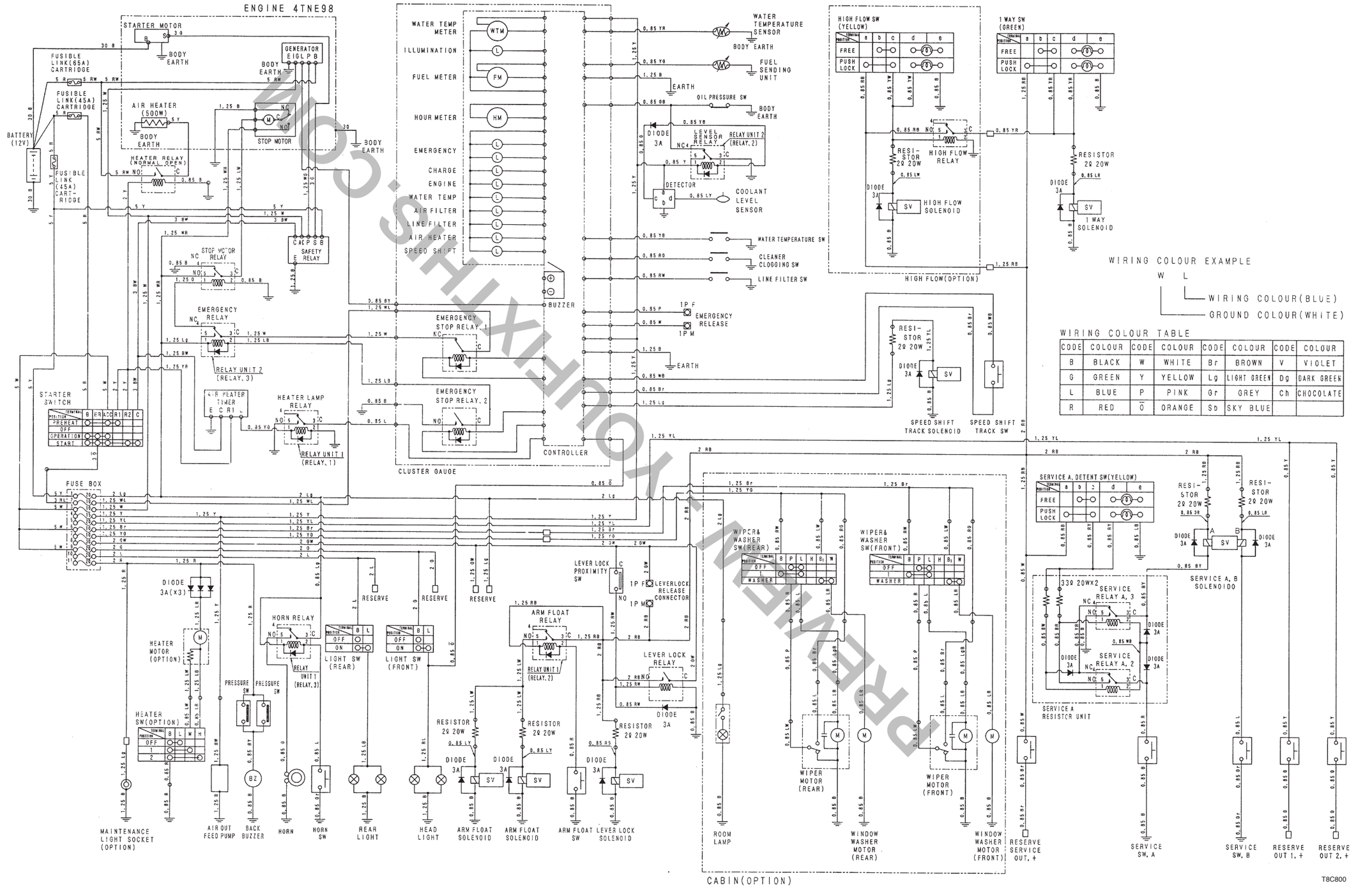
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ELECTRICAL SYSTEM

ELECTRICAL WIRING DIAGRAM

Serial No. 21300004~21301932



WIRING COLOUR EXAMPLE

W L
- WIRING COLOUR(BLUE)
- GROUND COLOUR(WHITE)

WIRING COLOUR TABLE

CODE	COLOUR	CODE	COLOUR	CODE	COLOUR	CODE	COLOUR
B	BLACK	W	WHITE	Br	BROWN	V	VIOLET
G	GREEN	Y	YELLOW	Lg	LIGHT GREEN	Dg	DARK GREEN
L	BLUE	P	PINK	Gr	GREY	Ch	CHOCOLATE
R	RED	O	ORANGE	Sb	SKY BLUE		

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Figure 7-9 Preventive Maintenance Schedule.

PREVENTIVE MAINTENANCE SCHEDULE FOR AIR CONDITIONING SYSTEMS

NOTE: Typical Maintenance Schedule: 3 months or 15,000 miles, 6 Months or 30,000 miles, 12 Months or 60,000 miles

Installation Date: _____ Mileage: _____

Last Maintenance Check: _____ Mileage: _____

Checked by _____ Mileage: _____

COMPONENT	MAINTENANCE INTERVAL (months) 3*	6*	12*	DONE
1. COMPRESSOR				
Check noise level	•			❑
Check clutch pulley	•			❑
Check oil level	•			❑
Run system 5 minutes	•			❑
Check belts for tension (120 lb max.)	•			❑
Inspect shaft seal (leakage)		•		❑
Check mounting bracket (tighten bolts)		•		❑
Check alignment to clutch w/crankshaft drive pulley		•		❑
Perform manifold gauge check			•	❑
Verify clutch is engaging			•	❑
CONDENSER				
2. Clean dirt/bugs/leaves from coils (w/compressed air)	•			❑
Check inlet/outlet for obstructions/damage	•			❑
RECEIVER-DRIER				
3. Check inlet line from condenser (hot to touch)	•			❑
Check sight glass (streaks or cloudiness)	•			❑
Replace if system is opened			•	❑

COMPONENT	MAINTENANCE INTERVAL (months) 3*	6*	12*	DONE
4. EXPANSION VALVE				
Inspect capillary tube (leakage/damage/looseness)			•	❑
5. EVAPORATOR				
Clean dirt/bugs/leaves form fins/tubes (w/compressed air)			•	❑
Check solder joints on inlet/outlet tubes (leakage)			•	❑
Inspect condensate drain (R-12 or oil leak)			•	❑
6. OTHER COMPONENTS				
Check discharge lines (hot to touch)	•			❑
Check suction lines (cold to touch)	•			❑
Inspect fittings/clamps/hoses		•		❑
Check thermostatic switch (proper operation)			•	❑
Outlets in cab (temperature check; 40 to 50°F)		•		❑
Check fan clutch (proper operation)		•		❑
Inspect all wiring connections		•		❑
Operate manual controls through full functions	•			❑

The following require monthly maintenance:

*Compressor – run system at least 5 minutes (40 degrees Fahrenheit minimum outside temp.) in order to circulate oil and lubricate components.

Maintenance notes: _____

_____

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OVERALL MACHINE

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All systems working, but with insufficient power. 7

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The travel system is operating at an unusually high temperature. 14

Machine will not travel in second speed. 16

LIFT ARMS

Lift Arm cylinders fail to move. 18

Movement of the lift arm cylinders is slow or lacks power. 20

Slowly pulling the control lever of the lift arms causes the lift arms to drop momentarily. 22

The amount of lift arms natural drop is great. 23

BUCKET

Bucket cylinders fail to move. 24

Movement of the bucket cylinders is slow or lacks power. 26

The amount of bucket natural drop is great. 28

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13.2 Tightening torques for standard bolts and nuts

Item	Nominal thread diameter × pitch	Tightening torque N•m (kgf•m)	Remarks
Hexagon bolt (7T) and nut	M6 × 1	9.8 to 11.8 (1.0 to 1.2)	Use 80 % of the value at left when the tightening part is aluminum. Use 60 % of the value at left for 4T bolts and lock nuts.
	M8 × 1.25	22.6 to 28.4 (2.3 to 2.9)	
	M10 × 1.5	44.1 to 53.9 (4.5 to 5.5)	
	M12 × 1.75	78.4 to 98.0 (8.0 to 10)	
	M14 × 1.5	127.5 to 147.1 (13 to 15)	
	M16 × 1.5	215.7 to 235.4 (22 to 24)	
PT plug	1/8	9.8 (1.0)	-
	1/4	19.6 (2.0)	
	3/8	29.4 (3.0)	
	1/2	58.8 (6.0)	
Pipe joint bolt	M8	12.7 to 16.7 (1.3 to 1.7)	-
	M10	19.6 to 25.4 (2.0 to 2.6)	
	M12	24.5 to 34.3 (2.5 to 3.5)	
	M14	39.2 to 49.0 (4.0 to 5.0)	
	M16	49.0 to 58.8 (5.0 to 6.0)	

Note) Lubricating oil is not applied to threaded portion and seat surface.

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FOREWORD

This manual is intended for persons who engage in maintenance operations, and explains procedures for disassembly and reassembly of the machine, check and maintenance procedures, maintenance reference values, troubleshooting and outline specifications, etc. Please use this manual as a reference in service activities to improve maintenance techniques.
Further, please be advised that items contained in this manual are subject to change without notice due to design modifications, etc.

MACHINE FRONT AND REAR, LEFT AND RIGHT

The end where the bucket is mounted is the front and the end with the travel motors is the rear. Also the right and left sides of the operator when he is seated in the driver's seat are the right and left sides of the machine.

MACHINE SERIAL NUMBER

The machine serial number is stamped on the identification plate. When sending reports and inquiries, and when ordering parts, etc., be sure to include this number.

MANUAL CONTROL

Information on those to whom this manual is distributed is recorded in the ledger in the section in charge at this company, so please decide on a person to be in charge of it and control it. When there are updates or additions, etc., we will notify the person in charge.

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DISASSEMBLY AND ASSEMBLY

Removing the Engine

1. Disconnect the negative battery cable from the battery.

2. Remove the canopy.
   ☞ "Removing the Canopy"

3. Remove the floor frame.
   ☞ "Removing the Floor Frame"

4. Disconnect the electrical wiring from the air cleaner. Next, remove the bracket (1) together with the air cleaner.

5. Remove the radiator.
   ☞ "Removing the Radiator"

6. Disconnect the coolant drain hose (2).

7. Remove the hydraulic pump.
   ☞ "Removing the Hydraulic Pump"

8. Remove the valves (3) and the filter (4).

9. Remove the fuel inlet pipe (5).

10. Disconnect the fuel hoses (6).

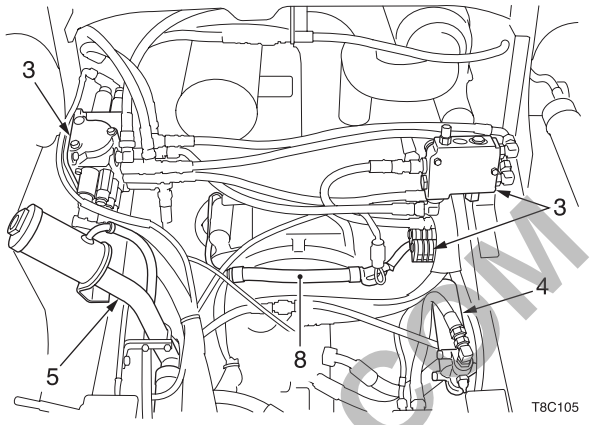
11. Disconnect the battery cable (7) and all the connections on the engine side of the electric wirings (8).
    - Attach identification labels to individual wirings.
    - Disconnect the wirings from the clamp and the band.

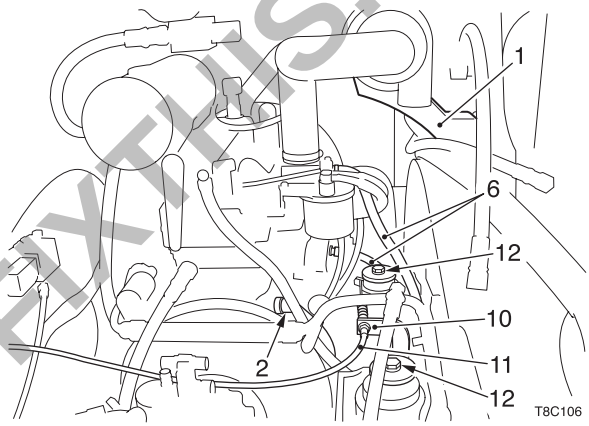
12. Disconnect the engine ground cable (9).

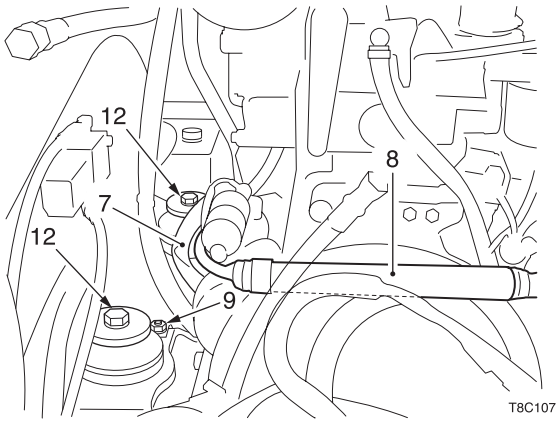
13. Remove the bracket (10) and accelerator wire (11) from the engine.

14. Remove the bolts (12) and then the cushion rubbers.
    ⊂⊃ Bolt: 256N·m; Apply thread-locking compound.

15. Suspend the engine temporarily, and remove the engine.
    ⏏ Engine : 250 kg (21300004~21301932)
    : 255 kg (21301933~)







Installing the Engine

Follow the same procedure as for removal in the reverse order.

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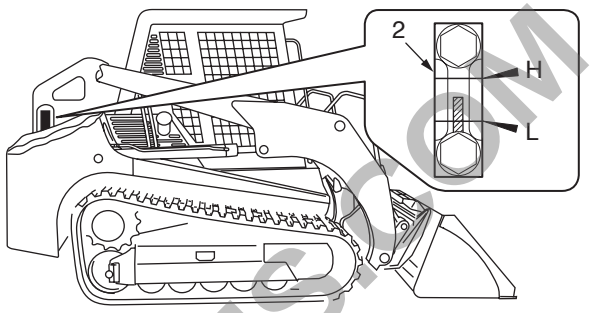
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Filling with Hydraulic Oil

The oil level changes according to the oil temperature. Inspect the oil level in the hydraulic oil level inspection posture shown in the diagram.

Hydraulic oil level inspection posture

1. Start the engine and run it at low speed.
2. Fully retract the lift arm and bucket cylinders and ground the bucket cutting edge.
3. Stop the engine.
4. Inspect the oil level using the sight gauge (2).
   - When the oil temperature is about 20°C: The level should be halfway between the upper limit (H) and lower limit (L). If it is below the lower limit (L), replenish.
   - When the oil temperature is about 50 to 80°C: The level should be near the upper limit (H).



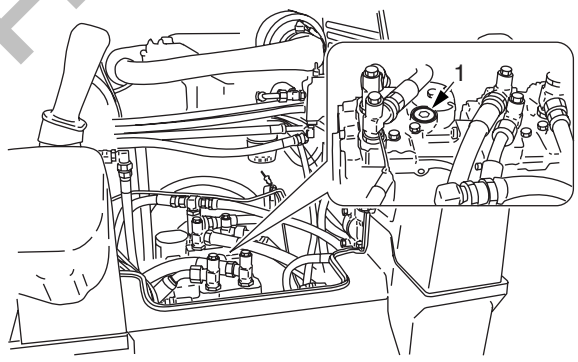
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Bleeding the air

After replacing the hydraulic oil, bleed the air from the hydraulic circuit and hydraulic devices. Failure to do so may damage the hydraulic devices.

Hydraulic pump

1. Tilt up the canopy.
2. Remove the plug (1) from the hydraulic pump.
3. Once hydraulic oil overflows from the plug hole, connect the plug (1).



T7G024A

Cylinders

1. Start the engine and run it at low idle for 10 minutes.
2. Set the engine to a low idle, then extend and contract all the cylinders 4 or 5 times, without going to the stroke end.
3. Run the engine at high speed, then extend and contract all the cylinders 4 or 5 times, without going to the stroke end.
4. Set the engine back to a low idle, then extend and contract all the cylinders 4 or 5 times to the stroke ends.

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If you find particles of desiccant in the compressor, remove and replace it and the receiver-drier. Before doing so, back flush other system components (except the expansion valve) using a flushing kit. If there are stem type valves and you isolate the compressor, the rest of the system must be purged of refrigerant before you can disconnect and flush system components (*Chapter 9* describes the flushing procedure). After flushing, reassemble the components. Always check the oil level in the compressor, even if you install a new or rebuilt unit. Tighten all connections and evacuate the system. Recharge the air conditioner with refrigerant and check system operation and performance.

Note: Rotary compressors have a limited oil reservoir. Extra oil must be added for all truck installations

Condenser Malfunction or System Overcharge

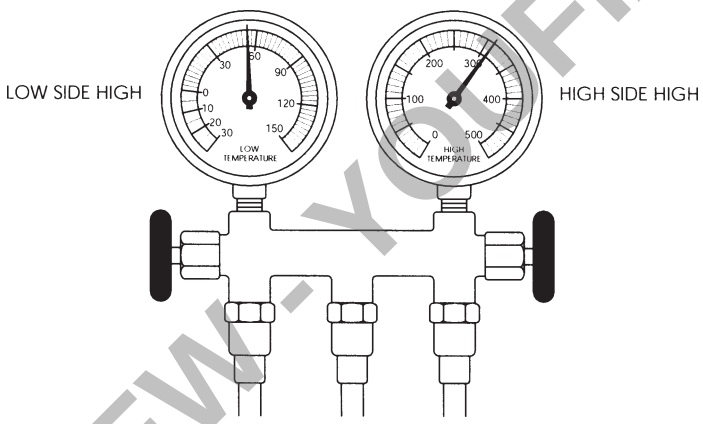


Figure 8-13
Gauge reading, condenser malfunction or system overcharge.

Tip: The air from vents in the cab may be warm. In R-12 systems there can be bubbles in the sight glass. The high pressure hoses and lines will be very hot. Don't forget to check the engine cooling system components—fan and drive belt, fan clutch operation, and the radiator shutter.

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DISASSEMBLY AND ASSEMBLY

General Cautions

- Since all parts in control valves are precision machined, carry out disassembly and assembly operations in a clean place.
- Before disassembly, clean the outside surfaces around the valves.
- Clean each of the disassembled parts and apply clean hydraulic oil to them.
- Apply hydraulic oil to sliding surfaces and apply a thin coating of grease to seals when assembling them.

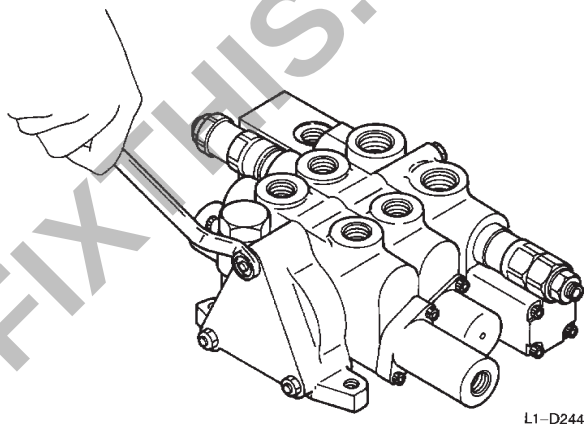
Following is an explanation of the control valve disassembly procedure.
Follow the procedure used to disassemble the control valve in reverse order when reassembling it.

- Before disassembly, number each section and spool.

Disassembly

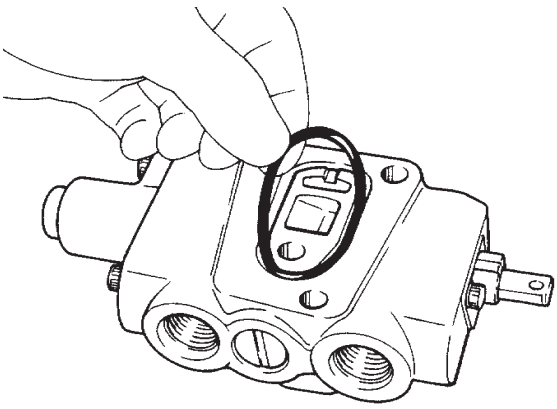
Valve Assembly

1. Loosen the nuts and remove the tie rods, then remove the sections.
   ⊂⊃ Nut: 39.23 ±3.92 N·m



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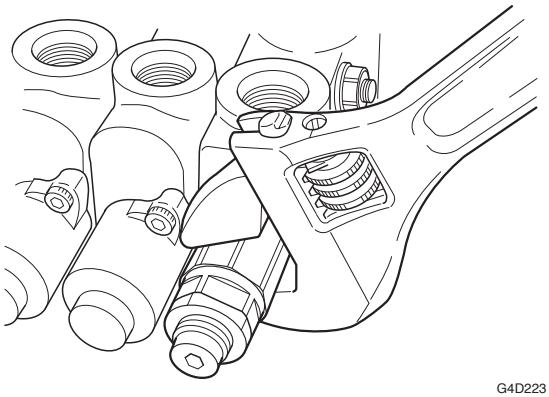
2. Remove the O-ring.
   - The mating surfaces are metal seals, so be careful not to scratch, bruise or otherwise damage them.



Y1–D226

3. Remove the main relief valves and the port relief valves, then remove the O-rings from the relief valves.
   - Do not disassemble the relief valves unless it is necessary.
   - When using a spanner or adjustable wrench, be sure to attach it in the place shown in the figure at right.

   ⊂⊃ Main relief valve: 58.84 ±5.88 N·m
   ⊂⊃ Port relief valve: 39.23 ±3.92 N·m



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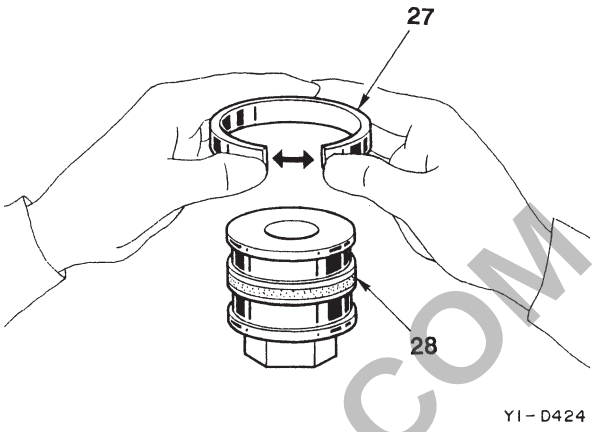
- Replace all seals with new ones each time the valves are disassembled.
- Spools and section bodies are specially selected for a precise fit. Therefore, if any damage is found in either of these parts, replace the section assembly as a unit.
- Be sure to number each section and spool to avoid mistakes during assembly.

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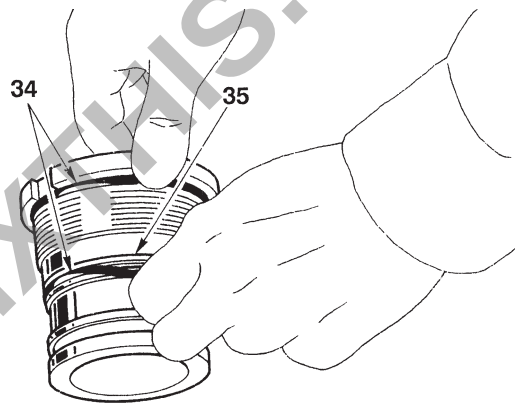
Piston

1. Remove the wear ring (27), then remove the piston packing (28).
   - Spread the wear ring at the cut portion the minimum amount necessary for it to be removed. Remove it in the direction of the shaft.
   - Either cut the piston packing off or use a flat bladed screwdriver, etc. to take it off.

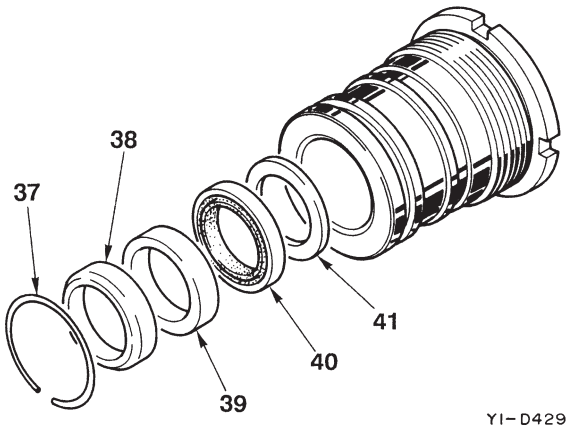


Rod Cover

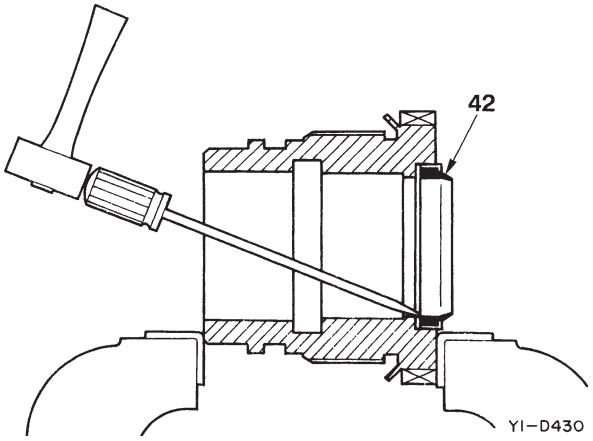
1. Remove the O-ring (34) from the outer diameter of the rod cover, then remove the backup ring (35).



2. Remove the rod packing.
   a. Remove the stopper (37).
   b. Remove the spacer (38).
   c. Remove the cushion seal (39).
   d. Remove the rod packing (40).
   e. Remove the backup ring (41).



3. Remove the dust seal (42).
   - Tap alternately on several points around the circumference on the inside of the metal ring, pushing it out a little at a time to remove it.



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CAUTIONS IN TROUBLESHOOTING AND REPAIRS

(1) Do not begin disassembling the equipment immediately just because it has broken down. Conduct a thorough preliminary check before attempting disassembly.
   a. Ask the user the following questions.
      • What were the conditions when the machine broke down?
      • Did anything abnormal happen before breakdown occurred?
      • Are there any other places which were functioning poorly other than the part that broke down?
      • Are there any parts which have been repaired previous to the breakdown? What were they?
      • Has the same thing happened before?
   b. Run the machine yourself and confirm the breakdown conditions.
      • Judge whether the machine is really broken down or not following the judgment standards.
        The judgment on whether the machine has broken down may differ between individuals.

IMPORTANT: When running the machine, it is possible that moving the machine could make the breakdown worse than it already is, so do not forget to ask the user if there is anything to prevent your operating the machine.

   c. Based on the information that you have gathered from the user and the information obtained from running the machine yourself, judge the cause of the trouble. Also keep in mind that it is difficult to reproduce the conditions of the breakdown again once the machine has been disassembled, and early disassembly may make it impossible to determine the true cause of the trouble. Therefore be sure to find the true cause of the trouble before attempting disassembly.

(2) When it is thought that the trouble has more than one cause, begin investigating from the simplest cause.

(3) Think over why the trouble could have occurred and try to correct the root cause of that problem.

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2. TROUBLESHOOTING

2.1 Quick Reference Table for Troubleshooting

The following table summarizes the general trouble symptoms and their causes. If any trouble symptom occurs, take corrective action before it develops into a serious problem so as not to shorten the engine service life.

	Trouble symptom / Cause	Starting failure: Engine does not start.	Starting failure: Engine starts but stops soon. Exhaust smoke: None	Starting failure: Engine starts but stops soon. Exhaust smoke: Little	Starting failure: Engine starts but stops soon. Exhaust smoke: Much	Insufficient engine output: Exhaust color: Ordinary	Insufficient engine output: Exhaust color: White	Insufficient engine output: Exhaust color: Black	Poor exhaust color: During work: White	Poor exhaust color: During work: Black	High knocking sound during combustion	Abnormal engine sound	Uneven combustion sound	Hunting: During idling	Hunting: During work	Large engine vibration	Difficulty in returning to low speed	Excessive fuel consumption	Lubricating oil: Excessive consumption	Lubricating oil: Dilution by fuel oil	Lubricating oil: Mixture with water	Lubricating oil: Low L.O. pressure	Much blow-by gas	Cooling water: Overheat	Cooling water: Low water temperature	Air intake: Pressure drop	Air intake: Pressure rise	Exhaust temperature rise		Corrective action
Engine system	Improper clearance of intake/exhaust valve	○	○			○						○															○			Adjust the valve clearance. (See 3.5 in Chapter 3.)
	Compression leakage from valve seat					○		○		○		○					○					○					○			Lap the valve seat. (See 4.2(6) in Chapter 4.)
	Seizure of intake/exhaust valve	○			○	○		○		○		○		○	○				○			○				○				Correct or replace.
	Blowout from cylinder head gasket					○															○									Replace the gasket. (See 4.2(2) – ⑮ in Chapter 4.)
	Seized or broken piston ring	○			○		○		○			○		○	○			○	○			○	○					○		Replace the piston ring. (See 4.4(2) – ⑤, ⑩ in Chapter 4.)
	Worn piston ring, piston or cylinder	○			○		○		○			○						○	○			○								Perform honing and use oversize parts. See 4.4(5)-(5.1), (5.4) and (6) in Chapter 4.
	Seized crankpin metal or bearing	○	○									○		○	○	○						○								Repair or replace.
	Improper arrangement of piston ring joints		○				○											○				○								Correct the ring joint positions. (See 4.4 (4)-6 in Chapter 4.)
	Reverse assembly of piston rings						○		○									○				○								Reassemble correctly. (See 4.4 (4)-6 in Chapter 4.)
	Worn crankpin and journal bearing					○						○		○	○	○					○									Measure and replace. (See 4.4 (5)-(5.2) - ③ in Chapter 4.)
	Loosened connecting rod bolt											○				○					○									Tighten to the specified torque. (See 4.4 (4)-2 in Chapter 4.)
	Foreign matter trapped in combustion chamber	○										○						○				○								Disassemble and repair.
	Excessive gear backlash											○																		Adjust gear meshing. (See 4.3 (4)-2 in Chapter 4.)
	Worn intake/exhaust valve guide						○											○				○								Measure and replace. (See 4.2 (5)-(5.2) and (7) in Chapter 4.)
	Defective governor		○										○	○	○	○														Make adjustment. (See 3.8 in Chapter 3.)
	Improper open/close timing of intake/ exhaust valves	○					○	○	○	○		○																		Adjust the valve clearance. (See 3.5 in Chapter 3.)
Turbocharger	Fouled blower							○		○																				Wash the blower.
	Waste gate malfunction							○		○																				Disassemble and inspect.
	Worn floating bearing						○		○																					Disassemble and inspect.

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5. LUBRICATION SYSTEM ..... 5-1~5-2

5.1 LUBRICATION SYSTEM DIAGRAM 5-1

5.2 TROCHOID PUMP COMPONENTS 5-1

5.3 DISASSEMBLY 5-2

5.4 SERVICING POINTS 5-2

5.5 PARTS INSPECTION AND MEASUREMENT 5-2

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(3) Pinion projection length

Connect the positive (+) lead from the battery to terminal S and negative (–) lead to terminal M. Turn the switch ON and measure the pinion moving distance ℓ in the thrust direction.
Perform this test within 10 seconds.

	Standard
ℓ	0.3 ~ 1.5 mm

Note: *Before measuring the dimension, pull the pinion out lightly in the direction of the arrow.*

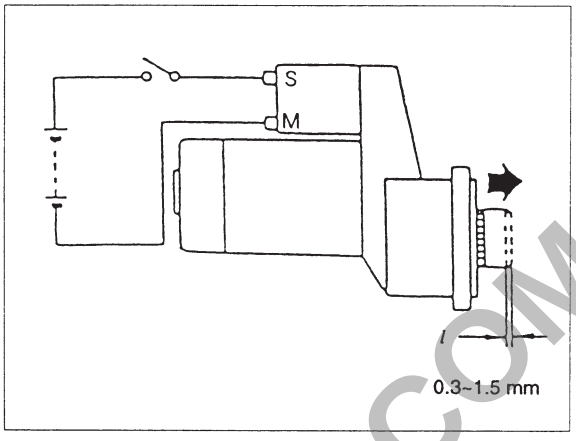


Fig. 29

If the measured ℓ dimension is outside the standard range, either insert or remove the dust cover (adjusting shim 0.5 mm, 0.8 mm) for adjustment.

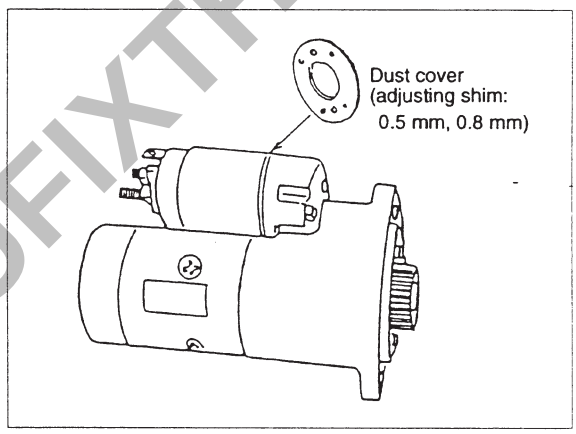


Fig. 30

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Safety Precautions

(1) SERVICE AREA

⚠ WARNING



•Sufficient Ventilation

Inhalation of exhaust fumes and dust particles may be hazardous to ones health. Running engines welding, sanding, painting, and polishing tasks should be only done in well ventilated areas.

⚠ CAUTION

•Safe / Adequate Work Area

The service area should be clean, spacious, level and free from holes in the floor, to prevent “slip” or “trip and fall” type accidents.

⚠ CAUTION



•Bright, Safely Illuminated Area

The work area should be well lit or illuminated in a safe manner. For work in enclosed or dark areas, a “drop cord” should be utilized. The drop cord must have a wire cage to prevent bulb breakage and possible ignition of flammable substances.

⚠ CAUTION



•Safety Equipment

Fire extinguisher(s), first aid kit and eye wash / shower station should be close at hand (or easily accessible) in case of an emergency.

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The cylinder to be adjusted first does not have to be the No.1 cylinder. Select and adjust the cylinder where the piston is the nearest to the top dead center after turning, and make adjustment for other cylinders in the order of ignition by turning the crankshaft 240° each time.

The adjustment method of reducing the flywheel turning numbers (for reference):

For 3 cylinder engines

Set No.1 cylinder to the compression T.D.C.and adjust the clearance of the ● mark of the below table. Next, turn the flywheel once (the suction / exhaust valve of No.1 cylinder is in the position of the overlap T.D.C. at this time), and adjust the clearance of the ○ mark.

Ignition order of 3 cylinder engines: 1→3→2

Cylinder No.	1		2		3		
Valve	Suction	Exhaust	Suction	Exhaust	Suction	Exhaust	
No.1 compression T.D.C	●	●	●			●	The first time
No.1 overlap T.D.C				○	○		The second time

For 4 cylinder engines

Set No.1 cylinder to the compression T.D.C. and adjust the clearance of the ● mark of the bottom table. Next, turn the flywheel once, and adjust the clearance of the ○ mark.

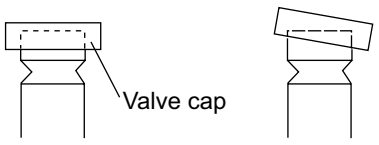
Ignition order of 4 cylinder engines: 1→3→4→2

Cylinder No.	1		2		3		4		
Valve	Suction	Exhaust	Suction	Exhaust	Suction	Exhaust	Suction	Exhaust	
No.1 compression T.D.C	●	●	●			●			The first time
No.4 compression T.D.C				○	○		○	○	The second time

(b)Valve clearance inspection and adjustment

1) Loosen adjusting bolts

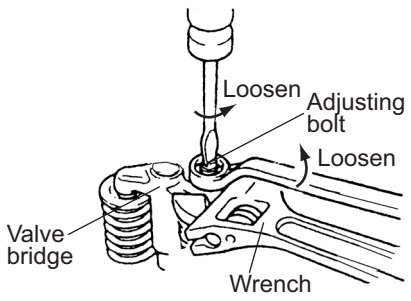
In case of 2-valve cylinder head loosen the lock nut and adjusting screw, and check the valve for any inclination of valve cap, entrance of dirt or wear.



In case of 4-valve cylinder head loosen the lock nut and adjusting screw of rocker arm. Be careful that excessive tension isn't applied to the valve bridge, and loosen a locknut of valve bridge.

[NOTICE]

When loosening a locknut of a valve bridge, loosen the locknut while fixing the valve bridge with a wrench so that the valve may not lean.



4 Valve cylinder head

(R.1)

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Point6: Piston pin and rings

[Disassemble]

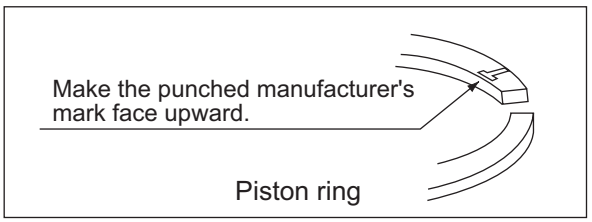
- Using the piston ring replacer (see 4.1.2 in Chapter 4), remove the piston rings.
- Remove the circlip and remove the piston pin by pushing it out.

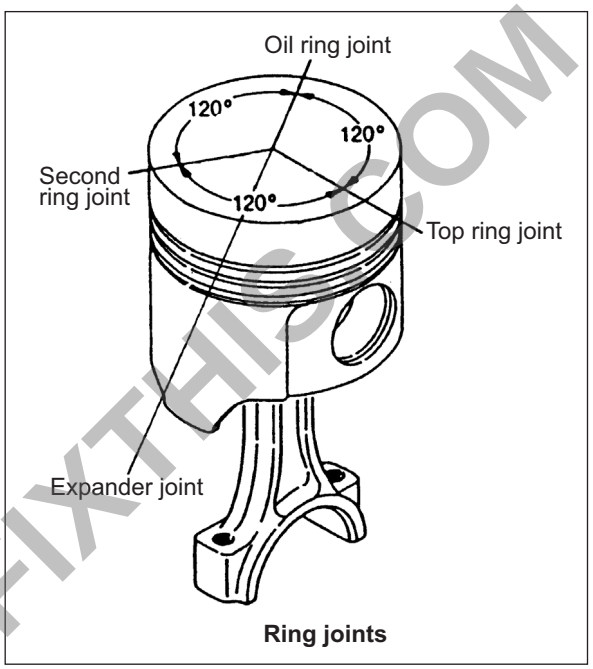
[Reassemble]

- Install each piston ring on the piston, with the punched manufacturer's mark facing upward.

[Reassemble]

- The piston ring joints shall be staggered at by 120° intervals. Do not position the top ring joint vertical to the piston pin. The coil expander joint shall be opposite to the oil ring joint.





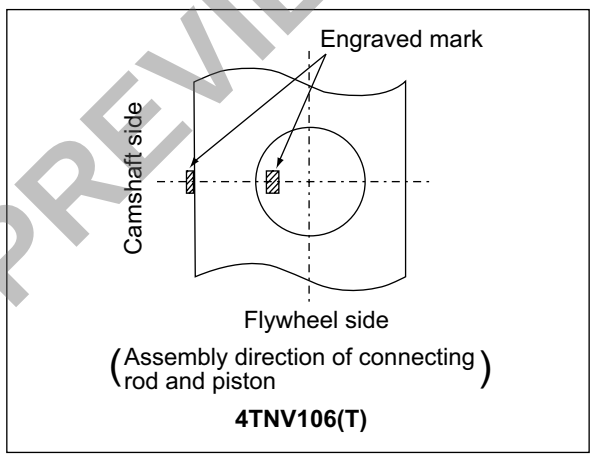
Ring joints

[Reassemble]

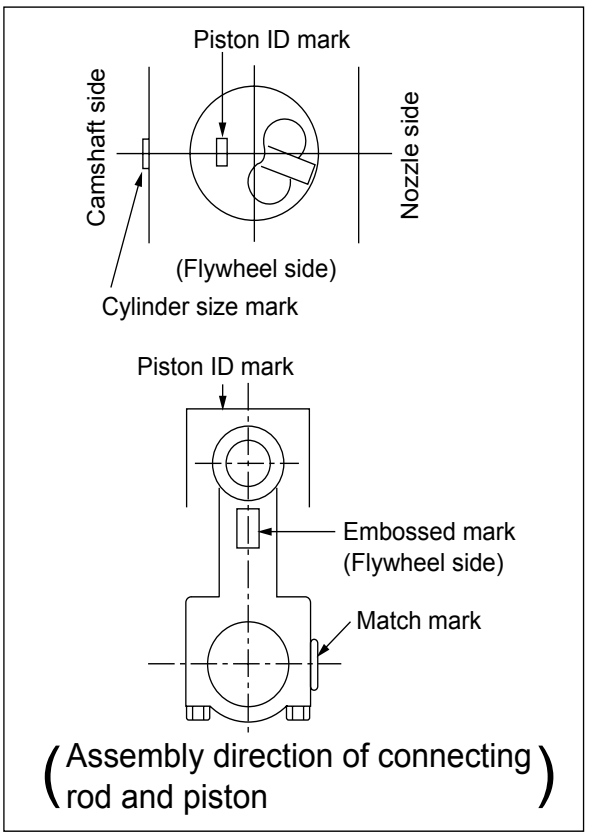
- When installing the piston pin to the rod and piston, the punched match mark on the big end of the connecting rod shall be opposite to the size mark on the piston top.

[Reassemble]

- Install the piston in the cylinder clock with the punched mark on the big end of the rod on the nozzle side. (The embossed mark at the connecting rod I-beam section shall be on the flywheel side.)



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6)Yoke Assy.

7)Armature

Remove the brush holder. The armature and yoke assy can now be removed.

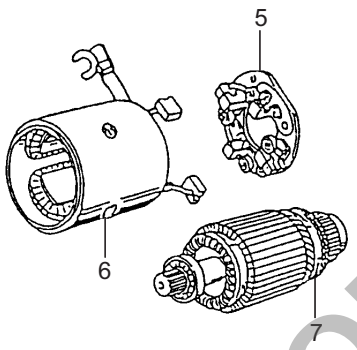


Fig. 4

8)Bolt M6 (2)

9)Magnetic switch

Remove bolt M6 (10 mm), and the magnetic switch can be removed.

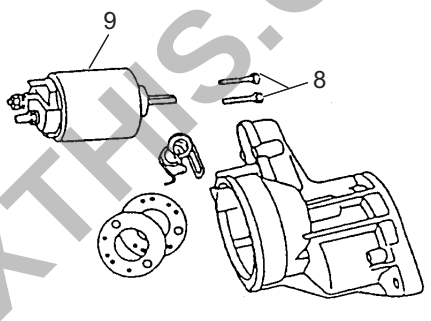


Fig. 5

10)Dust cover

11)Shift lever

Take the dust cover out from the gear case. The shift lever can be removed.

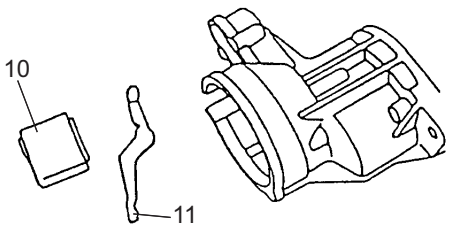


Fig. 6

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