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TOYOTA

REPAIR MANUAL

7FGF 15, 18, 20, 25, 30
7FDF 15, 18, 20, 25, 30
7FGJF 35
7FDJF 35

Pub. No. CE026-1

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FOREWORD

This manual covers the service procedures of the TOYOTA FORKLIFT 7FGF/7FDF15 ~ 30 series. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

This manual deals with the above models as of June 1999. Please understand that disagreement can take place between the descriptions in the manual and actual vehicles due to change in design and specifications. Any change or modifications thereafter will be informed by Toyota Industrial Equipment Parts & Service News.

For the service procedures of the mounted engine, read the repair manuals listed below as reference together with this manual.

(Reference)

Repair manuals related to this manual are as follows:

TOYOTA INDUSTRIAL EQUIPMENT 4Y ENGINE
REPAIR MANUAL (No. CE602-2)

TOYOTA INDUSTRIAL EQUIPMENT 1DZ-II ENGINE
REPAIR MANUAL (No. CE618-2)

TOYOTA INDUSTRIAL EQUIPMENT 2Z ENGINE
REPAIR MANUAL (No. CE625-3)

TOYOTA INDUSTRIAL EQUIPMENT 7FGF/7FDF15-30
REPAIR MANUAL SUPPLEMENT (No. CE033)

TOYOTA Material Handling Company
A Division of TOYOTA INDUSTRIES CORPORATION

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GENERAL

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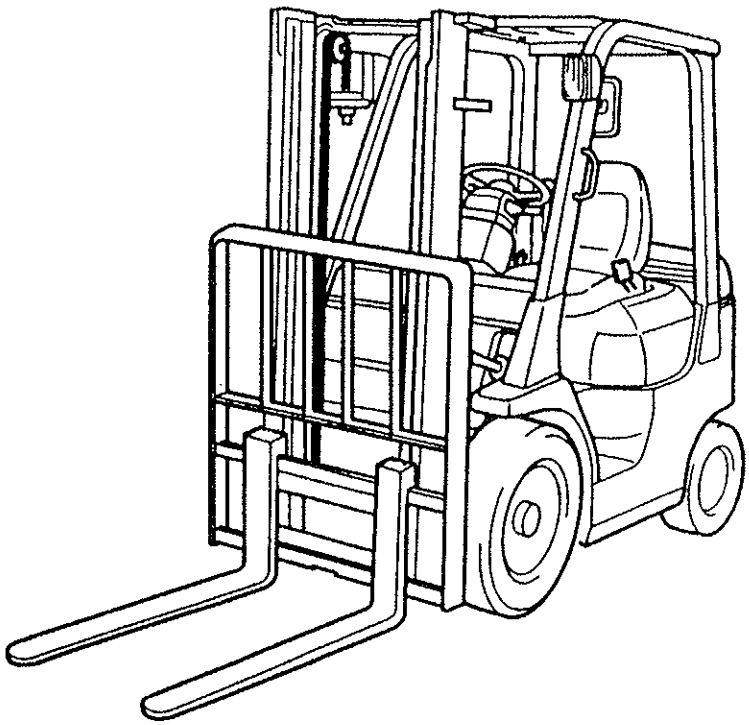
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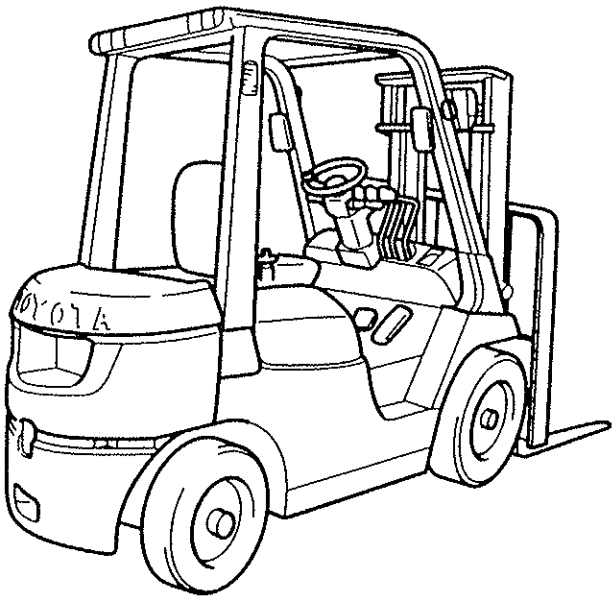
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EXTERIOR VIEWS





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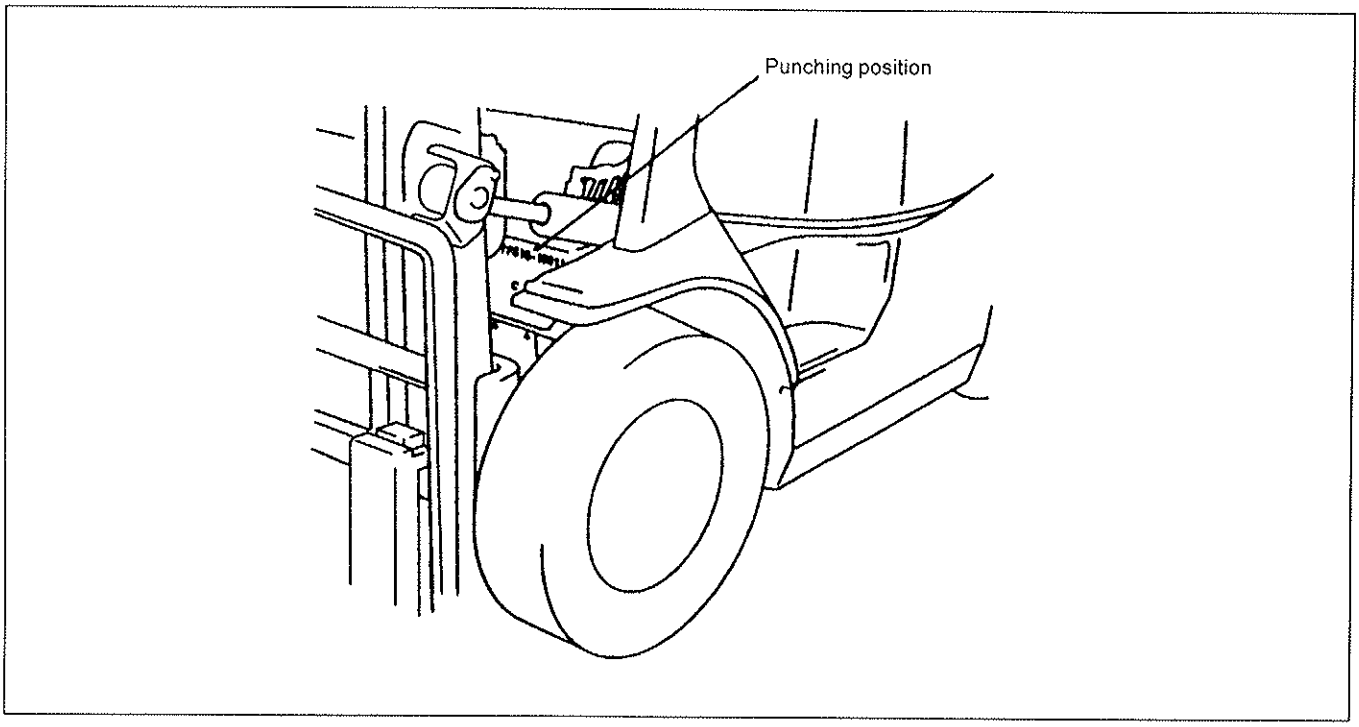
VEHICLE MODEL

Classification		Vehicle Model	Transmission Type	Engine	
Series	Model				
1 ton series	1.5 ton model	42-7FGF15	T/C	4Y	Gasoline
		02-7FDF15	T/C	1DZ-II	Diesel
	1.75 ton model	42-7FGF18	T/C	4Y	Gasoline
		02-7FDF18	T/C	1DZ-II	Diesel
2 ton series	2.0 ton model	42-7FGF20	T/C	4Y	Gasoline
		62-7FDF20	T/C	1DZ-II	Diesel
		02-7FDF20	T/C	2Z	
	2.5 ton model	42-7FGF25	T/C	4Y	Gasoline
		62-7FDF25	T/C	1DZ-II	Diesel
		02-7FDF25	T/C	2Z	
3 ton series	3.0 ton model	02-7FGF30	T/C	4Y	Gasoline
		62-7FDF30	T/C	1DZ-II	Diesel
		02-7FDF30	T/C	2Z	
J3.5 ton series	J3.5 ton model	02-7FGJF35	T/C	4Y	Gasoline
		02-7FDJF35	T/C	2Z	Diesel

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FRAME NUMBER

Frame No. Punching Position



Series	Engine	Vehicle model	Punching format
1 ton series	4Y	42-7FGF15	407FGF18©10011
		42-7FGF18	
	1DZ-II	02-7FDF15	7FDF18©10011
		02-7FDF18	
2 ton series	4Y	42-7FGF20	407FGF25©10011
		42-7FGF25	
	2Z	02-7FDF20	7FDF25©10011
		02-7FDF25	
	1DZ-II	62-7FDF20	607FDF25©10011
		62-7FDF25	
3 ton, J3.5 ton series	4Y	02-7FGF30	7FGJF35©10011
		02-7FGJF35	
	2Z	02-7FDF30	7FDJF35©10011
		02-7FDJF35	
	1DZ-II	62-7FDF30	607FDF30©10011

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HOW TO USE THIS MANUAL

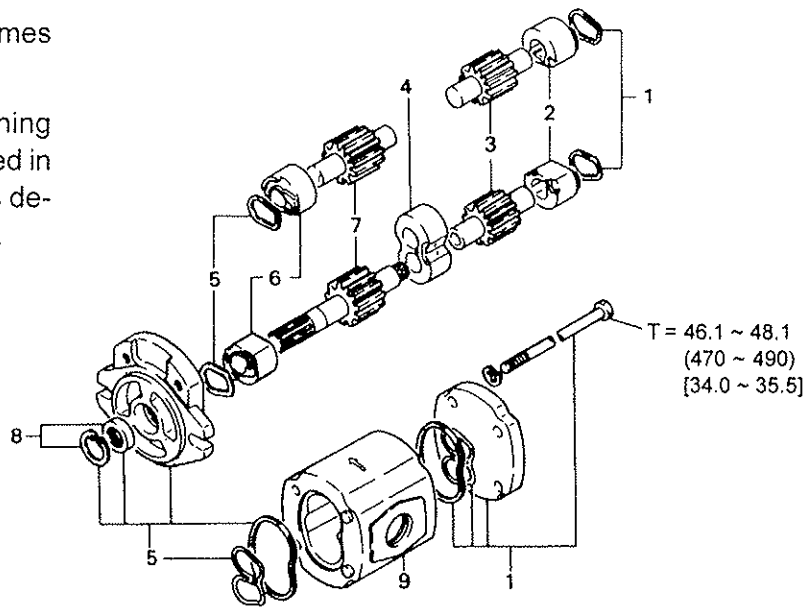
EXPLANATION METHOD

1. Operation procedure
   (1) The operation procedure is described in either pattern A or pattern B below.
   Pattern A: Explanation of each operation step with illustration.
   Pattern B: Explanation of operation procedure by indicating step numbers in one illustration, followed by explanation of cautions and notes summarized as point operations.

Example of description in pattern B

DISASSEMBLY·INSPECTION·REASSEMBLY Tightening torque unit T = N·m (kgf-cm) [ft-lbf]

- Step Nos. are partially sometimes omitted in illustrations.
- When a part requiring tightening torque instruction is not indicated in the illustration, the part name is described in the illustration frame.



Disassembly Procedure

1 Remove the cover. **[Point 1]**

2 Remove the bushing **[Point 2]** ← Operation explained later

3 Remove the gear.

Point Operations Explanation of key point for operation with an illustration

[Point 1]
Disassembly: Put a match mark when removing the pump cover.

[Point 2]
Inspection: Measure the bush inside diameter.

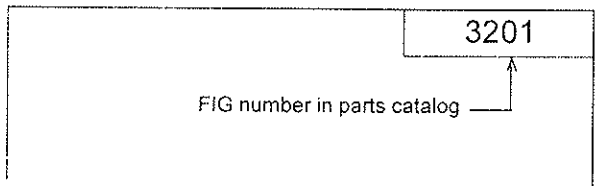
Limit: 19.12 mm (0.7528 in)

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2. How to read components figures

(1) The components figure uses the illustration in the parts catalog for the vehicle model. Please refer to the catalog for checking the part name.
The number at the right shoulder of each components figure indicates the Fig. number in the parts catalog.

(Example)



3. Matters omitted in this manual

(1) This manual omits description of the following jobs, but perform them in actual operation:
① Cleaning and washing of removed parts as required
② Visual inspection (partially described)

TERMINOLOGY

Caution:
Important matters of which negligence may cause accidents. Be sure to observe them.

Note:
Important items of which negligence may cause accidents, or matters in operation procedure requiring special attention.

Standard: Values showing allowable range in inspection and adjustment.
Limit: Maximum or minimum allowable value in inspection or adjustment.

ABBREVIATIONS

Abbreviation (code)	Meaning	Abbreviation (code)	Meaning
ASSY	Assembly	SAS	System of active stability
LH	Left hand	SST	Special service tool
LLC	Long life coolant	STD	Standard
M/T	Manual transmission	T =	Tightening torque
NMR	No-load maximum speed	T/C	Torque converter & transmission
OPT	Option	○○T	Number of teeth (○ ○)
O/S	Oversize	U/S	Undersize
PS	Power steering	W/	With
RH	Right hand	L/	Less
SAE	Society of Automotive Engineers (USA)		

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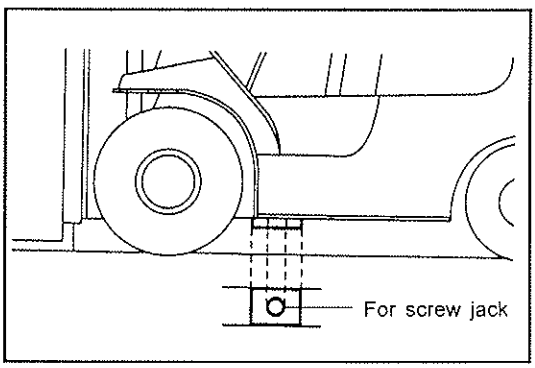
OPERATIONAL TIPS

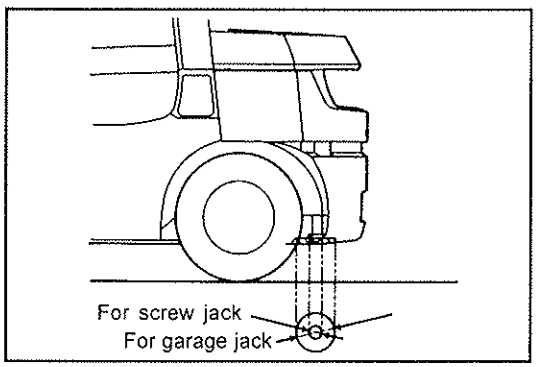
1. Safe operation
   (1) After jacking up, always support with wooden blocks or rigid stands.
   (2) When hoisting the vehicle or its heavy component, use wire rope(s) with a sufficient reserve in load capacity.
   (3) Always disconnect the battery terminal before the inspection or servicing of electrical parts.

2. Tactful operation
   (1) Prepare the mechanic tools, necessary measuring instruments (circuit tester, megger, oil pressure gauge, etc.) and SSTs before starting operation.
   (2) Before disconnecting wiring, always check the cable color and wiring state.
   (3) When overhauling functional parts, complicated portions or related mechanisms, arrange the parts neatly to prevent confusion.
   (4) When disassembling and inspecting such a precision part as the control valve, use clean tools and operate in a clean location.
   (5) Follow the described procedures for disassembly, inspection and reassembly.
   (6) Replace, gaskets, packings and O-rings with new ones each time they are disassembled.
   (7) Use genuine Toyota parts for replacement.
   (8) Use specified bolts and nuts. Observe the specified tightening torque at the time of reassembly. Tighten to the center of the specified tightening torque range.
   If no tightening torque is specified, tighten the bolt or nut according to the standard tightening torque table.

3. Grasping the trouble state
   When a trouble occurs, do not attempt immediate disassembly or replacement but first check if the trouble requires disassembly or replacement for remedying.

4. Disposal of waste fluid, etc.
   When draining waste fluid from the vehicle, receive it in a container.
   If any oil, fuel, coolant, oil filter, battery or other harmful substance is directly discharged or scrapped without permission, it will either adversely affect human health or destroy the environment. Always sort waste fluids, etc. and treat them properly by requesting disposal by specialized companies.



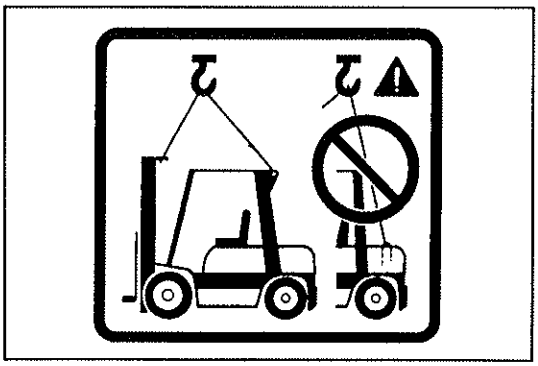


5. Jack up points
   Jack up points are provided in the front and rear portions of the vehicle. Always apply jacks at the jack up points.

   Front side:
   A circular groove to accept a screw jack is provided under the front side of the frame.
   When a garage jack is used, jack up at the bottom surface of the frame.

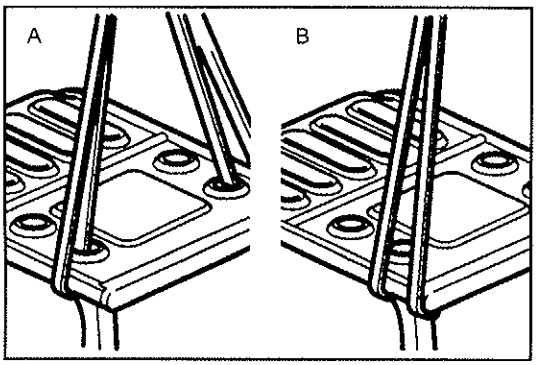
   Rear side:
   A circular groove to accept a screw or garage jack is provided at the bottom surface of the counterweight.

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HOISTING THE VEHICLE

When hoisting the vehicle, sling with wire rope(s) at the mast hook holes and the rear side of the head guard.



Slinging at the head guard is done in two ways.

Method A:
Sling after removing the head guard seat.

Method B:
Carefully sling so as not to damage rear combination lamps.

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CIRCUIT TESTER

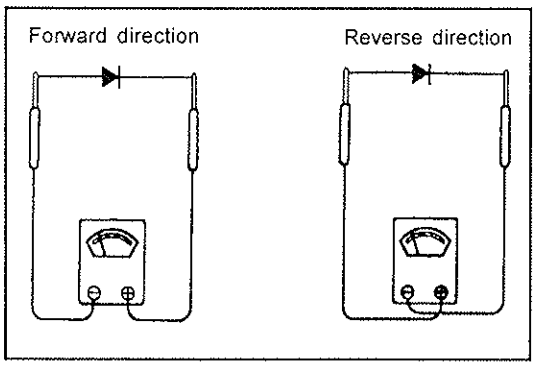
Circuit testers are available in both the analog and digital types. They should be used selectively according to the purpose of measurement.

Analog type: This type is convenient for observing movement during operation, but the measured value should only be used for reference or rough judgement.

Digital type: Fairly accurate reading is possible, but it is difficult to observe the variation or movement.

1. Difference in measurement results with the digital type and analog type
   * The result may be different between measurements with the analog type and digital type. Always use a circuit tester according to its operation manual. Cautions when the polarities are different between the analog type and digital type are described below.

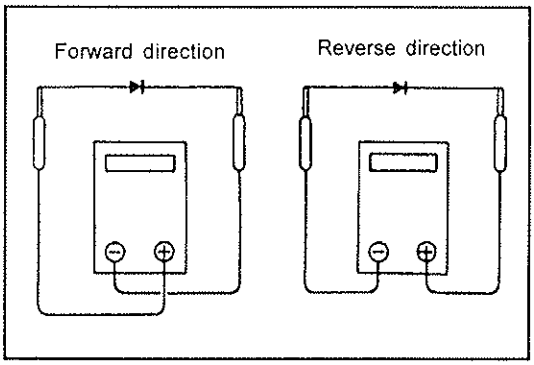
(1) Analog circuit tester



Measurement result example
Tester range: kΩ range

	Analog type
Forward	Continuity exists
	11 kΩ
Reverse	No continuity
	∞

(2) Digital circuit tester

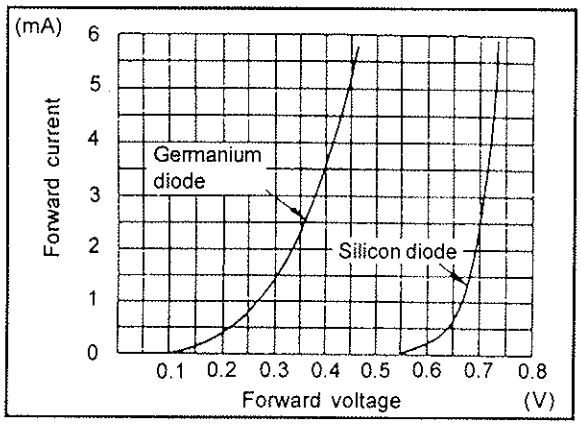


Measurement result example
Tester range: MΩ range

	Digital type
Forward	No continuity
	1
Reverse	Continuity exists
	2 MΩ

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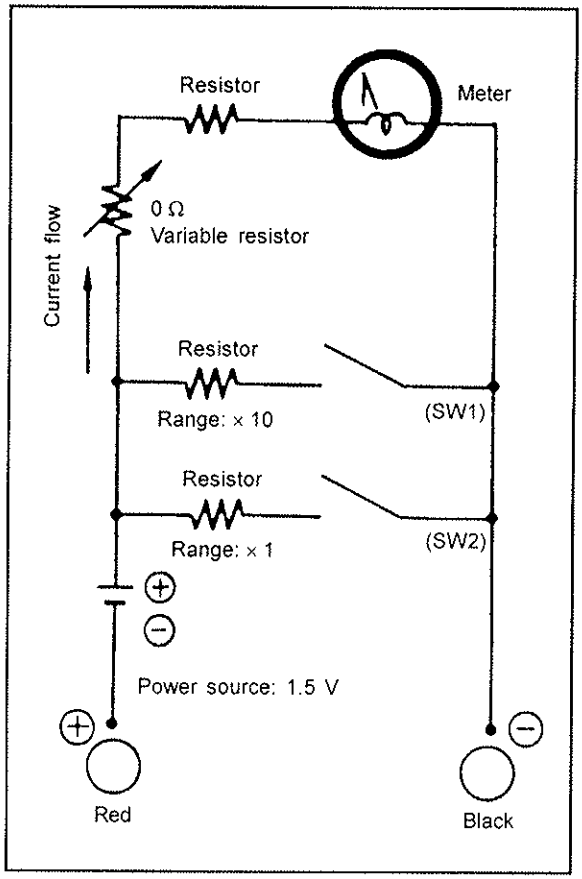
2. Difference in result of measurement with circuit tester
The circuit tester power supply voltage depends on the tester type. 1.5 V, 3.0 V or 6.0 V is used.
The resistance of a semiconductor such as a diode varies with the circuit tester power supply voltage.
The diode characteristics are shown in the figure below.



The resistance values of the same semiconductor measured with two types of circuit testers having different power supply voltages are different.

This manual describes the results of measurement with a circuit tester whose power supply voltage is 3.0 V.

3. Difference in measurement result by measurement range (analog type)
In the analog type circuit tester, changing the measurement range switches over the internal circuit to vary the circuit resistance. Even when the same diode is measured, the measurement result varies with the measurement range.



Always use the range described in the repair manual for measurement.

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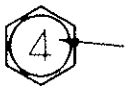
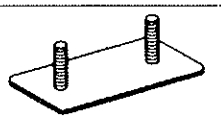
STANDARD BOLT & NUT TIGHTENING TORQUE

Standard bolt and tightening torques are not indicated.
Judge the standard tightening torque as shown below.

1. Find out the type of the bolt from the list below and then find the bolt tightening torque from the table.
2. The nut tightening torque can be judged from the mating bolt type.

BOLT STRENGTH TYPE IDENTIFICATION METHOD

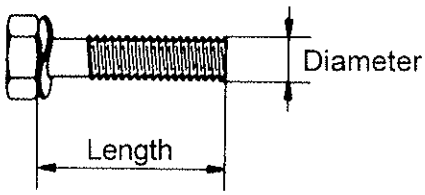
IDENTIFICATION BY BOLT SHAPE

	Shape and class	Class
Hexagon head bolt	 Bolt head No.	4 = 4T 5 = 5T 6 = 6T 7 = 7T 8 = 8T
	 No mark	4T
Hexagon flange bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T
Welded bolt		4T
Stud bolt	 No mark	4T
	 Grooved	6T

IDENTIFICATION BY PART NO.

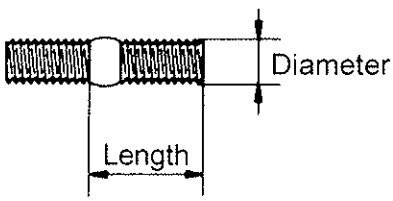
Hexagon head bolt

Parts No.
91611-40625
- Length (mm)
- Diameter (mm)
- Class



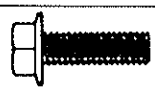
Stud bolt

Part No.
92132-40614
- Length (mm)
- Diameter (mm)
- Class

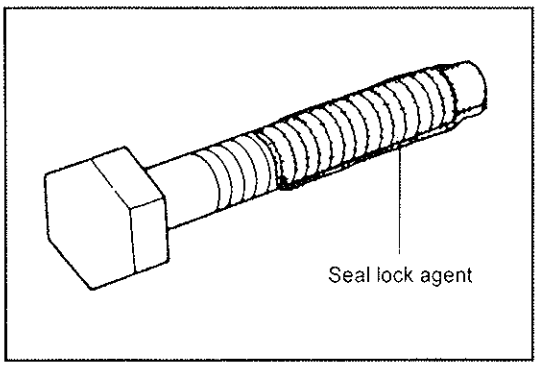


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TIGHTENING TORQUE TABLE

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt 			Hexagon flange bolt 		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1.0	5.4	55	48 in-lbf	5.9	60	52 in-lbf
	8	1.25	13	130	9	14	145	10
	10	1.25	25	260	19	28	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	75	760	55	83	850	61
	16	1.5	113	1150	83	—	—	—
5T	6	1.0	6.4	65	56 in-lbf	7.5	75	65 in-lbf
	8	1.25	16	160	12	18	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1050	76
	16	1.5	137	1400	101	157	1600	116
6T	6	1.0	7.8	80	69 in-lbf	8.8	90	78 in-lbf
	8	1.25	19	195	14	21	215	16
	10	1.25	38	400	29	43	440	32
	12	1.25	72	730	53	79	810	59
	14	1.5	110	1100	80	123	1250	90
	16	1.5	170	1750	127	191	1950	141
7T	6	1.0	11	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	103	1050	76
	14	1.5	147	1500	108	167	1700	123
	16	1.5	226	2300	166	—	—	—
8T	6	1.0	12	125	9	14	145	9
	8	1.25	29	300	22	32	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	108	1100	80	123	1250	90
	14	1.5	172	1750	127	196	2000	145
	16	1.5	265	2700	195	299	3050	221

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PRECOAT BOLTS

(Bolts with seal lock agent coating on threads)

1. Do not use the precoat bolt as it is in either of the following cases:
   (a) After it is removed.
   (b) When the precoat bolt is moved (loosened or tightened) by tightness check, etc.

   Note:
   For torque check, use the lower limit of the allowable tightening torque range. If the bolt moves, retighten it according to the steps below.

2. Method for reuse of precoat bolts
   (1) Wash the bolt and threaded hole. (The threaded hole must be washed even for replacement of the bolt.)
   (2) Perfectly dry the washed parts by air blowing.
   (3) Coat the specified seal lock agent to the threaded portion of the bolt.

HIGH PRESSURE HOSE FITTING TIGHTENING TORQUE

1. When connecting a high pressure hose, wipe the hose fitting and mating nipple contact surfaces with clean cloth to remove foreign matters and dirt. Also check no dent or other damage on the contact surfaces before installation.

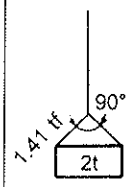
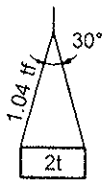
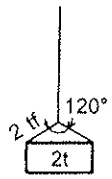
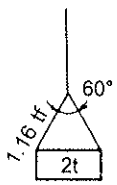
2. When connecting a high pressure hose, hold the hose to align the fitting with the nipple and tighten the fitting.

3. The maximum tightening torque must not exceed twice the standard tightening torque.

Nominal diameter of screw	Standard tightening torque N•m (kgf-cm) [ft-lbf]		Hose inside diameter mm (in)
	Standard	Tightening range	
7/16 — 20UNF	25 (250) [18.1]	24 ~ 26 (240 ~ 270) [17.4 ~ 19.5]	6 (0.24)
9/16 — 18UNF	49 (500) [36.2]	47 ~ 52 (480 ~ 530) [34.7 ~ 38.3]	9 (0.35)
3/4 — 16UNF	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47)
7/8 — 14UNF	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47), 15 (0.59)
1•1/16 — 12UNF	118 (1200) [86.8]	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.4]	19 (0.75)
1•5/16 — 12UNF	137 (1400) [101.3]	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.4]	25 (0.98)
PF1/4	25 (250) [18.1]	24 ~ 26 (240 ~ 270) [17.4 ~ 19.5]	6 (0.24)
PF3/8	49 (500) [36.2]	47 ~ 52 (480 ~ 530) [34.7 ~ 38.3]	9 (0.35)
PF1/2	59 (600) [43.4]	56 ~ 62 (570 ~ 630) [41.2 ~ 45.6]	12 (0.47)
PF3/4	118 (1200) [86.8]	112 ~ 123 (1140 ~ 1250) [82.5 ~ 90.4]	19 (0.75)
PF1	137 (1400) [101.3]	130 ~ 144 (1330 ~ 1470) [96.2 ~ 106.4]	25 (0.98)

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WIRE ROPE SUSPENSION ANGLE LIST

Lifting angle	Tension	Compres-sion	Suspension method	Lifting angle	Tension	Compres-sion	Suspension method
0°	1.00 time	0 time		90°	1.41 time	1.00 time	
30°	1.04 time	0.27 time		120°	2.00 time	1.73 time	
60°	1.16 time	0.58 time					

SAFE LOAD FOR EACH WIRE ROPE SUSPENSION ANGLE

Unit: N (tf) [lbf]

Rope diameter	Cutting load	Single-rope suspension	Two-rope suspension				Four-rope suspension			
		0°	0°	30°	60°	90°	0°	30°	60°	90°
6mm (0.24 in)	21380 (2.18) [4807]	3040 (0.31) [683.6]	6080 (0.62) [1367]	5880 (0.6) [1323]	5200 (0.53) [1169]	4310 (0.44) [970]	12160 (1.24) [2734]	11770 (1.2) [2646]	10400 (1.06) [2337]	8630 (0.88) [1940]
8 mm (0.32 in)	31480 (3.21) [7078]	4410 (0.45) [992.3]	8830 (0.9) [1985]	8530 (0.87) [1918]	7650 (0.78) [1720]	6280 (0.64) [1411]	17650 (1.8) [3969]	17060 (1.74) [3937]	15300 (1.56] [3440]	12550 (1.28) [2322]
10 mm (0.4 in)	49230 (5.02) [11.69]	6960 (0.71) [1565.6]	14020 (1.43) [3153]	13440 (1.37) [3021]	11770 (1.2) [2646]	9810 (1.0) [2205]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	19610 (2.0) [4410]
12.5 mm (0.5 in)	76880 (7.84) [17387]	10980 (1.12) [2469.5]	21570 (2.2) [4851]	21280 (2.1) [4631]	18630 (1.9) [4190]	14710 (1.5) [3308]	43150 (4.4) [9702]	41190 (4.2) [9261]	37270 (3.8) [8379]	29420 (3.0) [6615]
14 mm (0.56 in)	96400 (9.83) [21675]	13730 (1.4) [3087]	27460 (2.8) [6174]	26480 (2.7) [5954]	23540 (2.4) [5292]	18630 (1.9) [4190]	54920 (5.6) [12348]	52960 (5.4) [11907]	47070 (4.8) [10584]	37270 (3.8) [8379]

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COMPONENTS WEIGHT

Component		Weight kg (lb)
Engine	4Y	134 (295)
	1DZ-II	176 (388)
	2Z	240 (529)
Transmission	T/C	~ 2003.10: 124 (273) 2003.10 ~: 73 (161)
Counter weight	1.5 ton model	Approx. 745 (1640)
	1.75 ton model	Approx. 880 (1940)
	2.0 ton model	Approx. 1150 (2540)
	2.5 ton model	Approx. 1480 (3260)
	3.0 ton model	Approx. 1800 (3970)
	J3.5 ton model	Approx. 2130 (4700)
V mast ASSY L/backrest and fork (with lift cylinder, max. lifting height: 3000 mm (118 in))	1 ton series	Approx. 410 (900)
	2 ton series	Approx. 505 (1110)
	3 ton series	Approx. 570 (1260)
	J3.5 ton series	Approx. 680 (1500)

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RECOMMENDED LUBRICANT QUANTITY & TYPES

Description		Application	Quantity ℓ (US gal)	Classification	Type
Engine	Gasoline	4Y	4.0 (1.06)	API SH, SJ	Motor oil SAE30 (SAE20 in cold area) SAE20W-40 (SAE10W-30 in cold area)
	Diesel	1DZ-II	7.9 (2.09)	API CE, CF	Diesel engine oil SAE30 (SAE20 in cold area) SAE10W-30
		2Z	9.0 (2.38)		
Transmission		T/C	9.0 (2.38)	ATF	GM Dexron® II
Differential		1 ton series	6.3 (1.66)	API GL-5	Hypoid gear oil SAE85W-90
		2 ton series	6.6 (1.74)		
		3 ton series, J3.5 ton series	7.7 (2.03)		
Hydraulic oil		Attached Table 1 Hydraulic oil volume		ISO VG32	Hydraulic oil
Fuel tank		1 ton series	45 (11.9)	—	—
		Other series	65 (17.2)		
Brake line		All models	Proper quantity Reservoir Tank 0.2 (0.05)	—	SAE J-1703 DOT-3
Chassis parts		All models	Proper quantity	—	• MP grease • Molybdenum disulfide grease
Coolant (excluding reservoir tank)		Attached Table 2 Coolant volume		LLC	• LLC 30-50% mixture (for winter or all-season) • Coolant with rust-inhibitor (for spring, summer and autumn)
Coolant (Reservoir Tank)		All models	0.6 (0.16) (at Full level)	↑	↑

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Attached Table 1 Hydraulic oil volume [V mast, max. lifting height 3000 mm (118 in)] Unit: ℓ (US gal)

Model	1 ton series	2 ton series	3 ton series	J3.5 ton series
4Y engine models	28 (7.4)	35 (9.2)	36 (9.5)	36 (9.5)
1DZ-II engine models	28 (7.4)	35 (9.2)	36 (9.5)	
2Z engine models		40 (10.6)	41 (10.8)	41 (10.8)

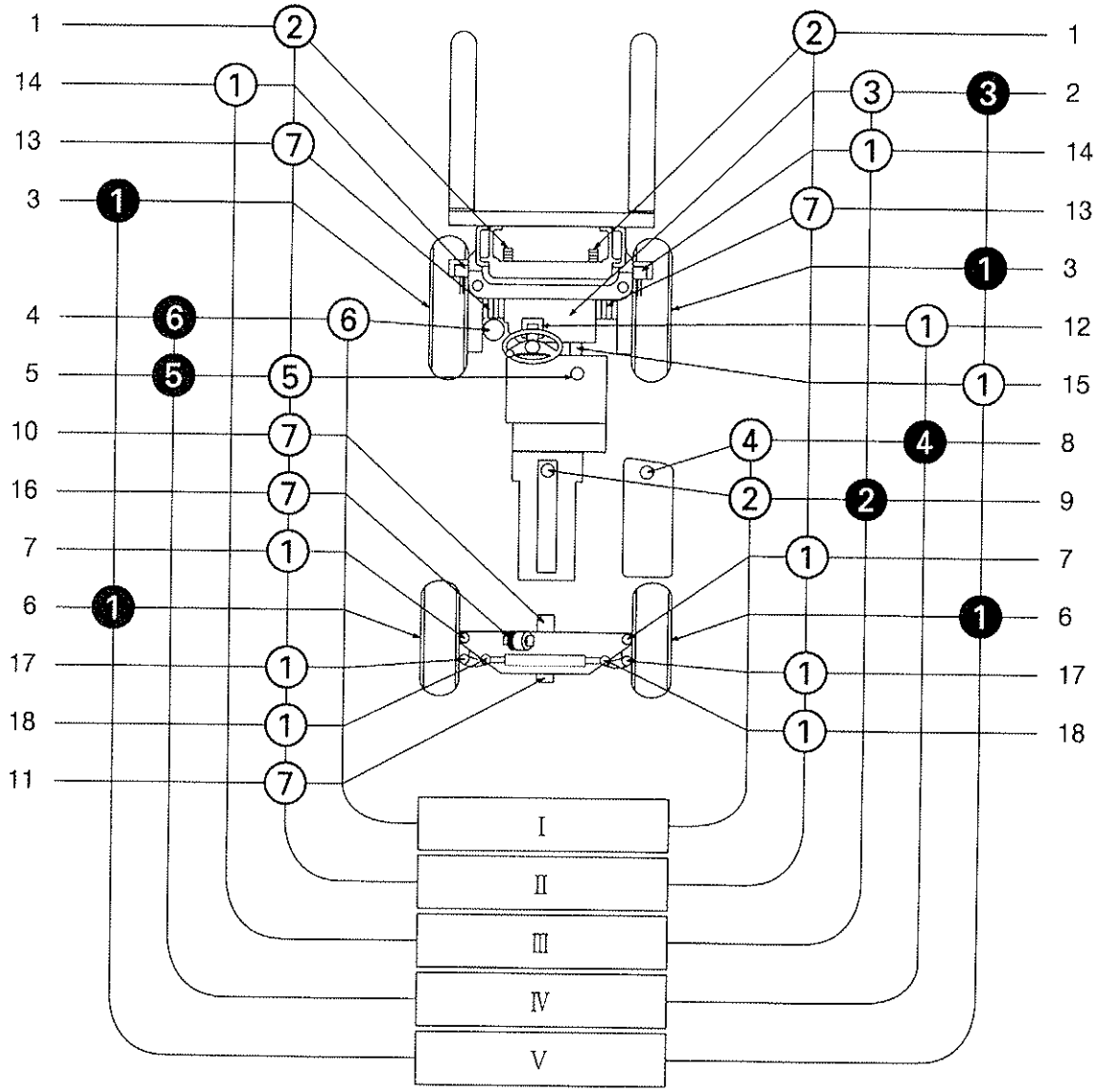
Note:
Since the hydraulic oil volume varies with the mast specification, be sure to check finally with the level gauge.

Attached Table 2 Coolant volume Unit: ℓ (US gal)

Engine	1 ton series	2 ton series	3 ton series	J3.5 ton series
4Y	7.4 (1.95)	9.3 (2.46)	9.5 (2.51)	9.5 (2.51)
1DZ-II	5.9 (1.56)	8.3 (2.19)	8.2 (2.16)	
2Z		9.0 (2.37)	8.8 (2.32)	8.8 (2.32)

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LUBRICATION CHART



○ Inspection
● Replacement
① MP grease
② Engine oil
③ Hypoid gear oil
④ Hydraulic oil
⑤ Automatic transmission fluid
⑥ Brake fluid
⑦ Molybdenum disulfide grease

I. Inspect every 8 hours (daily)
II. Inspect every 40 hours (weekly)
III. Inspect every 250 hours (6 weeks)
IV. Inspect every 1000 hours (6 monthly)
V. Inspect every 2000 hours (annual)

1 Chain
2 Differential
3 Front wheel bearing
4 Brake master cylinder
5 Torque converter case
6 Rear wheel bearing
7 Steering knuckle king pin
8 Oil tank
9 Engine crank case
10 Rear axle beam front pin
11 Rear axle beam rear pin
12 Tilt steering locking mechanism
13 Mast support bushing
14 Tilt cylinder front pin
15 Propeller shaft
16 Swing lock cylinder lower pin
17 Tie rod end pin
18 Rear axle cylinder end pin

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PERIODIC MAINTENANCE

INSPECTION METHOD

I : Inspection. Repair or replacement if required.
M : Measurement. Repair or adjustment if required.
T : Retightening C : Cleaning L : Lubrication
* : For new vehicle *1 : Flaw detector

Item \ Inspection Period		Every 6 weeks	Every 3 months	Every 6 months	Every 12 months
		Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
ENGINE					
Main body	Proper starting and abnormal noise	I	←	←	←
	Rotating condition at idling	M	←	←	←
	Rotating condition during acceleration	M	←	←	←
	Exhaust gas condition	I	←	←	←
	Air cleaner element	C	←	←	←
	Valve clearance	M*			M
	Compression				M
	Cylinder head bolt loosening				T
	Muffler rubber mount				I
PCV system	Clogging and damage in PCV valve and piping	I	←	←	←
Governor	No-load maximum rpm	M	←	←	←
Lubrication system	Oil leak	I	←	←	←
	Oil level	I	←	←	←
	Clogging and dirt of oil filter	I	←	←	←
Fuel system	Fuel leak	I	←	←	←
	Operation of carburetor link mechanism	I	←	←	←
	Dirt and clogging of fuel filter and element	I	←	←	←
	Injection timing			M	←
	Injection nozzle injection pressure and spray status				M
	Draining of sedimenter			I	←
Cooling system	Coolant level in radiator and leak	I	←	←	←
	Rubber hose degradation	I	←	←	←
	Radiator cap condition	I	←	←	←
	Fan belt tension, looseness and damage	I	←	←	←
	Radiator rubber mount				I

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Item \ Inspection Period		Every 6 weeks / Every 250 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
POWER TRANSMISSION SYSTEM					
Differential	Leak	I	←	←	←
	Oil level	I	←	←	←
	Bolt loosening				T
Torque converter & transmission	Leak	I	←	←	←
	Fluid level	I	←	←	←
	Operating mechanism function and looseness	I	←	←	←
	Control valve and clutch functions	I	←	←	←
	Inching valve function	I	←	←	←
	Stall and hydraulic pressure measurement			M	←
Propeller shaft and axle shaft	Loose joint		T	←	←
	Looseness at spline connections				I
	Looseness of universal joint				I
	Twisting and cracks of axle shaft				I
DRIVE SYSTEM					
Wheels	Tire inflation pressure	M	←	←	←
	Tire cuts, damage and uneven wearing	I	←	←	←
	Loose rim and hub nuts	T	←	←	←
	Tire groove depth	M	←	←	←
	Metal chips, pebbles and other foreign matter trapped in tire grooves	I	←	←	←
	Rim, side bearing and disc wheel damage	I	←	←	←
	Abnormal sound and looseness of front wheel bearing	I	←	←	←
	Abnormal sound and looseness of rear wheel bearing	I	←	←	←

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Item \ Inspection Period		Every 6 weeks / Every 250 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Front axle	Cracks, damage and deformation of housing				I
Rear axle	Cracks, damage and deformation of beam				I
	Looseness of axle beam in vehicle longitudinal direction	M*			M
STEERING SYSTEM					
Steering wheel	Play and looseness	I	←	←	←
	Function	I	←	←	←
Steering valve	Oil leak	I	←	←	←
	Looseness of mounting	T	←	←	←
Power Steering	Oil leak	I	←	←	←
	Mounting and linkage looseness	I	←	←	←
	Damage of power steering hose				I
Knuckle	King pin looseness	I	←	←	←
	Cranks and deformation				I
BRAKING SYSTEM					
Brake pedal	Play and reserve	M	←	←	←
	Braking effect	I	←	←	←
Parking brake	Operating force	I	←	←	←
	Braking effect	I	←	←	←
	Rod and cable looseness and damage	I	←	←	←
Brake pipe	Leak, damage and mounting condition	I	←	←	←
Reservoir tank	Leak and fluid level	I	←	←	←
Master cylinder and wheel cylinder	Function, wear, damage, leak and mounting looseness				I

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Item	Inspection Period	Every 6 weeks / Every 250 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Brake drum and brake shoe	Clearance between drum and lining	M	←	←	←
	Wear of shoe sliding portion and lining				I
	Drum wear and damage				I
	Shoe operating condition				I
	Anchor pin rusting				I
	Return spring fatigue				M
	Automatic adjuster function				I
Backing plate	Deformation, cracks and damage				I
	Loose mounting				T
MATERIAL HANDLING SYSTEM					
Forks	Abnormality of fork and stopper pin	I	←	←	←
	Misalignment between left and right fork fingers	I	←	←	←
	Cracks at fork root and welded part				I*1
Mast and lift bracket	Deformation and damage of each part and crack at welded part	I	←	←	←
	Mast and lift bracket looseness	I	←	←	←
	Wear and damage of mast support bushing				I
	Wear, damage and rotating condition of rollers	I	←	←	←
	Wear and damage of roller pins				I
	Wear and damage of mast trip	I	←	←	←
Chain and chain wheel	Tension, deformation and damage of chain	I	←	←	←
	Chain lubrication	I	←	←	←
	Abnormality of chain anchor bolt	I	←	←	←
	Wear, damage and rotating condition of chain wheel	I	←	←	←
Various attachments	Abnormality and mounting condition of each part	I	←	←	←
HYDRAULIC SYSTEM					
Cylinder	Loosening and damage of cylinder mounting	T	←	←	←
	Deformation and damage of rod, rod screw and rod end	I	←	←	←
	Cylinder operation	I	←	←	←
	Natural drop and natural forward tilt (hydraulic drift)	M	←	←	←

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Item \ Inspection Period		Every 6 weeks	Every 3 months	Every 6 months	Every 12 months
		Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Cylinder	Oil leak and damage	I	←	←	←
	Wear and damage of pin and pin support	I	←	←	←
	Lifting speed	M	←	←	←
	Uneven movement	I	←	←	←
Oil pump	Oil leak and abnormal sound	I	←	←	←
Hydraulic oil tank	Oil level and contamination	I	←	←	←
	Tank and oil strainer			C	←
	Oil leak	I	←	←	←
Control lever	Loose linkage	I	←	←	←
	Operation	I	←	←	←
Oil control valve	Oil leak	I	←	←	←
	Relief pressure measurement				M
	Relief valve and tilt lock valve functions	I	←	←	←
Hydraulic piping	Oil leak	I	←	←	←
	Deformation and damage	I	←	←	←
	Loose joint	T	←	←	←
ELECTRICAL SYSTEM					
Ignition timing	Cracks on distributor cap	I	←	←	←
	Spark plug burning and gap	I	←	←	←
	Distributor side terminal burning	I	←	←	←
	Distributor cap center piece wear and damage	I	←	←	←
	Plug cord internal discontinuity				I
	Ignition timing			M	←
Starting motor	Pinion gear meshing status	I	←	←	←
Charger	Charging function	I	←	←	←
Battery	Battery fluid level	I	←	←	←
	Battery fluid specific gravity			M	←
Electrical wiring	Damage of wiring harness	I	←	←	←
	Fuses	I	←	←	←

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Item \ Inspection Period		Every 6 weeks	Every 3 months	Every 6 months	Every 12 months
		Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Preheater	Open-circuit in glow plug			I	←
	Open-circuit in intake heater			I	←
Engine stopping system	Diesel engine key stop device function	I	←	←	←
DPF Muffler	Filter			I	←
	Inline filter (for back pressure sensor)		I	←	←
	DPF Valve				C
SAFETY DEVICES, ETC.					
Head guard	Cracks at welded portion	I	←	←	←
	Deformation and damage	I	←	←	←
Back-rest	Loosening of mounting	T	←	←	←
	Deformation, crack and damage	I	←	←	←
Lighting system	Function and mounting condition	I	←	←	←
Horn	Function and mounting condition	I	←	←	←
Direction indicator	Function and mounting condition	I	←	←	←
Instruments	Functions	I	←	←	←
Backup buzzer	Function and mounting condition	I	←	←	←
Rear-view mirror	Dirt, damage	I	←	←	←
	Rear reflection status	I	←	←	←
Seat	Loosening and damage of mounting	I	←	←	←
	Seatbelt damage and function	I	←	←	←
Body	Damage and cracks of frame, cross members, etc.				I
	Bolt looseness				T
SAS	Functions	I	←	←	←
	Loosening and damage at sensor mounting portion	I	←	←	←
	Damage, deformation, oil leakage and loosening of the mounting of functional parts	I	←	←	←
	Loosening and damage of wire harnesses	I	←	←	←
	Lock cylinder accumulator performance				I
	Rusting and corrosion of load sensor				I
Others	Grease up	L	←	←	←

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PERIODIC REPLACEMENT OF PARTS AND LUBRICANTS

● : Replacement

Item \ Interval	Every 6 weeks	Every 3 months	Every 6 months	Every 12 months
	Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Engine oil	●	←	←	←
Engine oil filter	● *1	●	←	←
Engine coolant (every 2 years for LLC)		●	←	←
Fuel filter			●	←
Torque converter oil			●	←
Torque converter oil filter			●	←
Differential oil				●
Hydraulic oil			●	←
Hydraulic oil filter	● *1		●	←
Wheel bearing grease				●
Spark plugs			●	←
Air cleaner element				●
Cups and seals for brake master and wheel cylinders				●
Brake fluid			●	←
Power steering hoses				● *2
Power steering rubbers parts				● *2
Hydraulic hoses				● *2
Brake fluid reservoir tank hose				● *2
Fuel hoses				● *2
Torque converter rubber hoses				● *2
Chains				● *3
DPF Muffler filter (OPT)				● *3
DPF Muffler back pressure sensor inline filter (OPT)			●	←
DPF Air cleaner (OPT)				● *2
SAS Swing lock cylinder				● *5
Catalytic muffler (OPT)				●

*1: for new vehicle *2: Every 2 years *3: Every 3 years *5: Every 10000 hours

Replacement shall be made upon arrival of the operation hours or months, whichever is earlier.

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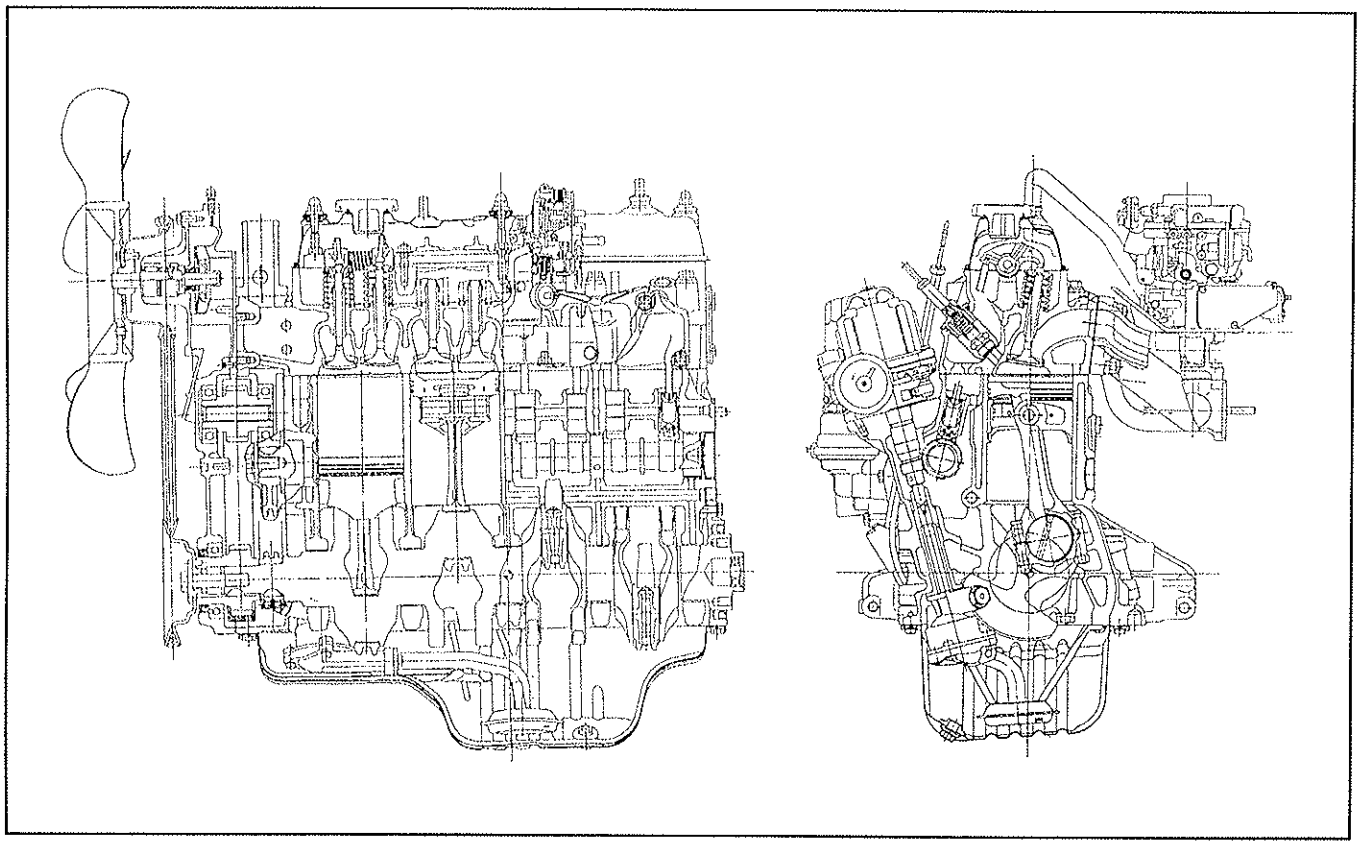
ENGINE

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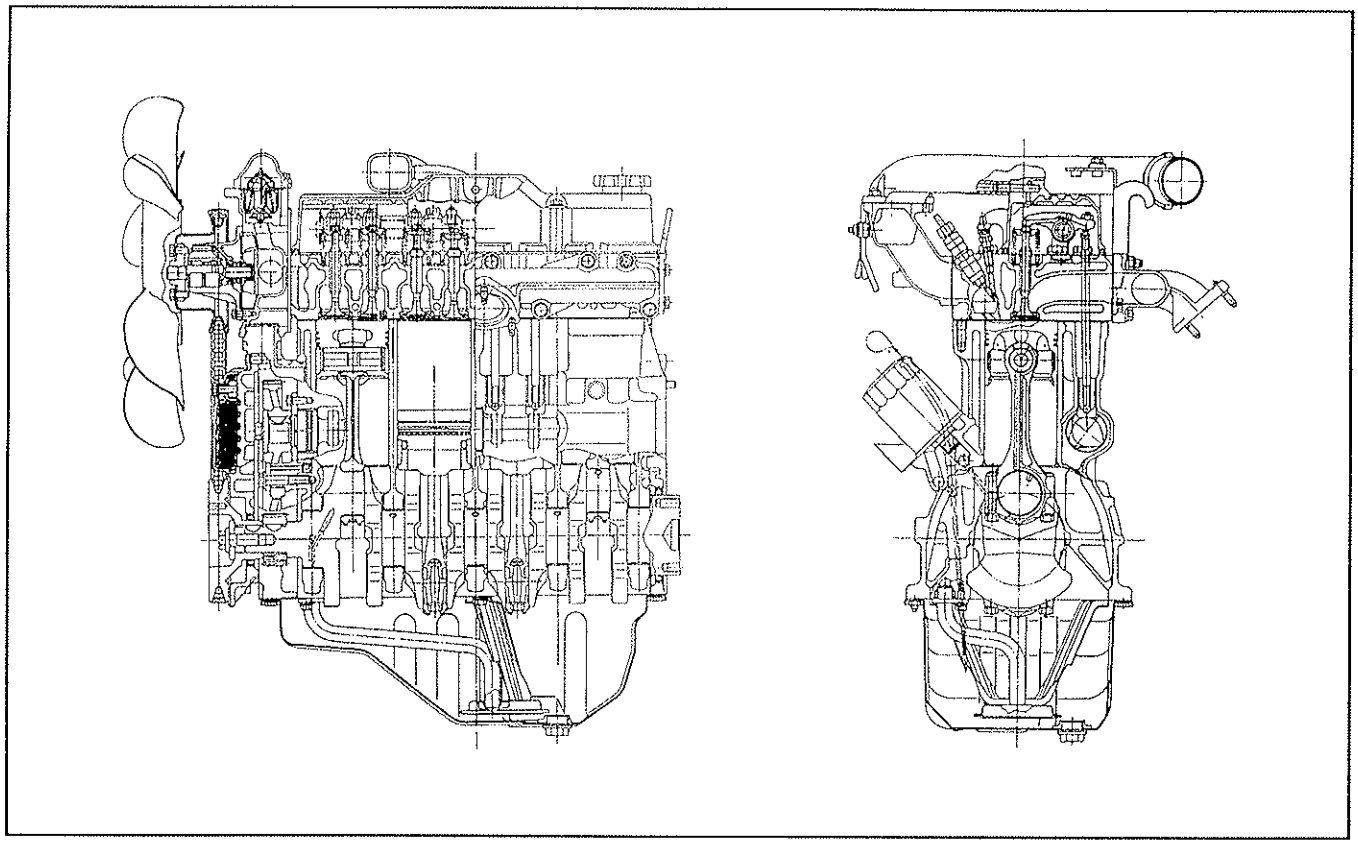
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ENGINE SECTIONAL VIEWS

4Y Engine

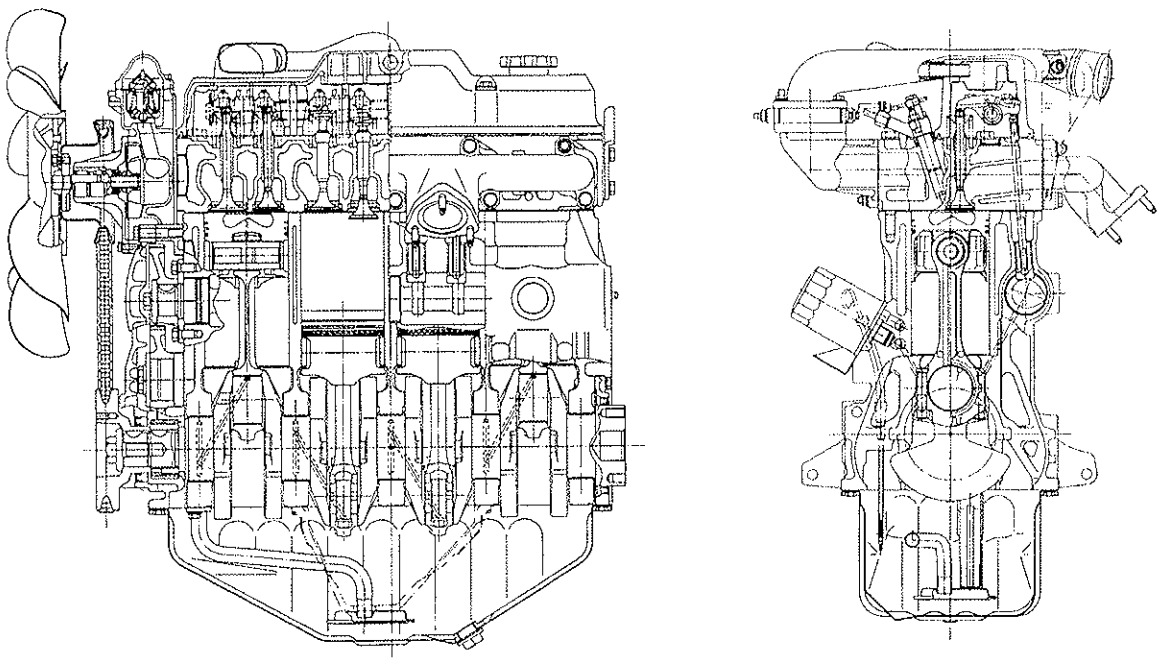


1DZ-II Engine



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2Z Engine



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MAJOR SPECIFICATIONS

Gasoline Engines

Item \ Engine	4Y (1·2 ton series)	4Y (3·J3.5 ton series)
Engine type	Gasoline 4-cycle	←
Number of cylinders and arrangement	Inline 4 cylinders longitudinal	←
Combustion chamber type	Wedge type	←
Valve mechanism	OHV·chain-driven	←
Bore × stroke mm (in)	91.0 × 86.0 (3.583 × 3.386)	←
Total displacement cm^3 (in^3)	2237 (136.51)	←
Compression ratio	8.8	←
Maximum power kW (PS)/rpm	Gasoline :40 (54)/2400 Gasoline/LPG :35 (48)/2400 LPG :37 (50)/2400	Gasoline :43 (58)/2600 Gasoline/LPG :38 (52)/2600 LPG :40 (54)/2600
Maximum torque N·m (kgf-m)/rpm	Gasoline :162 (16.5)/1800 Gasoline/LPG :147 (15.0)/1600 LPG :157 (16.0)/1800	←
Minimum specific fuel consumption g/kW-h (g/PS-h)/rpm	Gasoline :272 (200)/2300 Gasoline/LPG :258 (190)/2400 LPG :252 (185)/2400	←
Service weight kg (lb)	134 (295)	←
No-load maximum rpm rpm	2600	2800

Diesel Engines

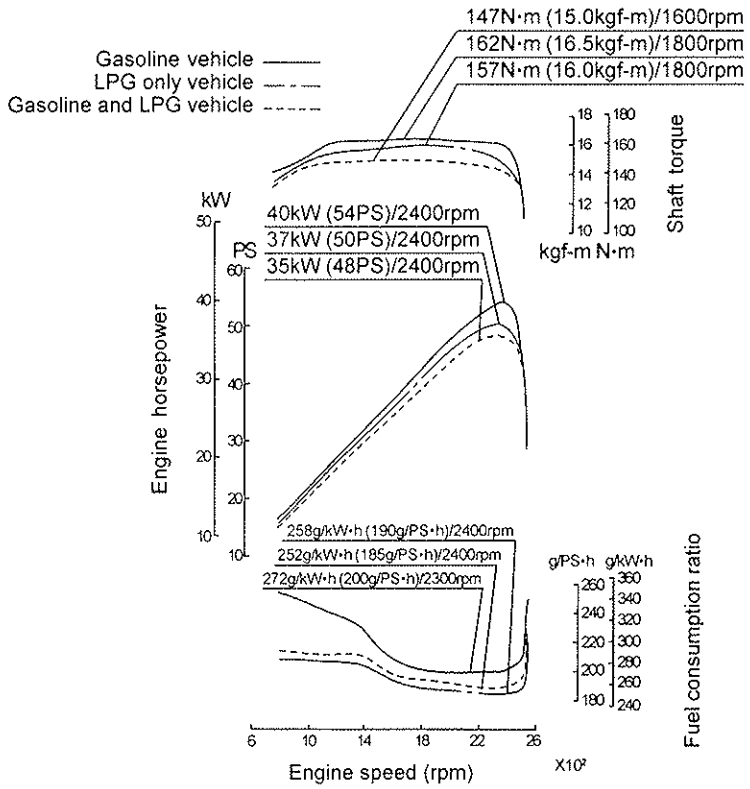
Item \ Engine	1DZ-II (1 ton series)	1DZ-II (2·3 ton series)	2Z
Engine type	Diesel 4-cycle	←	←
Number of cylinders and arrangement	Inline 4 cylinders longitudinal	←	←
Combustion chamber type	Whirl chamber type	←	Direct injection type
Valve mechanism	OHV·gear-driven	←	←
Bore × stroke mm (in)	86.0 × 107.0 (3.386 × 4.213)	←	98.0 × 115.0 (3.858 × 4.528)
Total displacement cm^3 (in^3)	2486 (151.71)	←	3469 (211.69)
Compression ratio	21.5	←	18.6
Maximum power kW (PS)/rpm	40 (55)/2400	44 (60)/2600	49 (66)/2200
Maximum torque N·m (kgf-m)/rpm	167 (17.0)/1600	←	216 (22.0)/1600
Minimum specific fuel consumption g/kW-h (g/PS-h)/rpm	252 (185)/1400	←	209 (154)/1600
Service weight kg (lb)	162 (357)	←	212 (467)
No-load maximum rpm rpm	2600	2800	2400

Note:
For 2·3 ton series 1DZ-II models equipped with vehicle speed control system (OPT), the spec. figures and performance curve are same with those of 1 ton series 1DZ-II models.

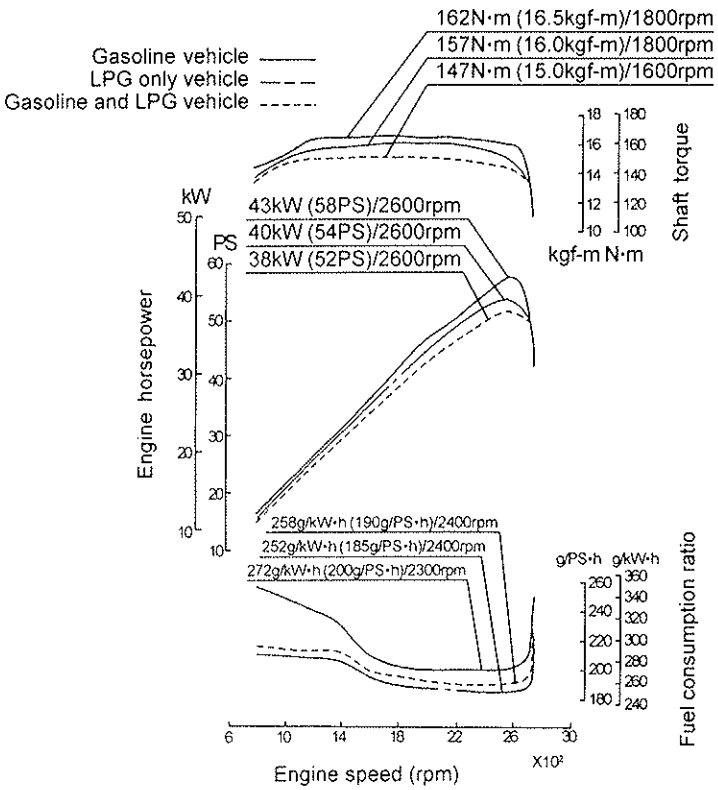
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ENGINE PERFORMANCE CURVES

4Y Engine (1·2 ton Series)

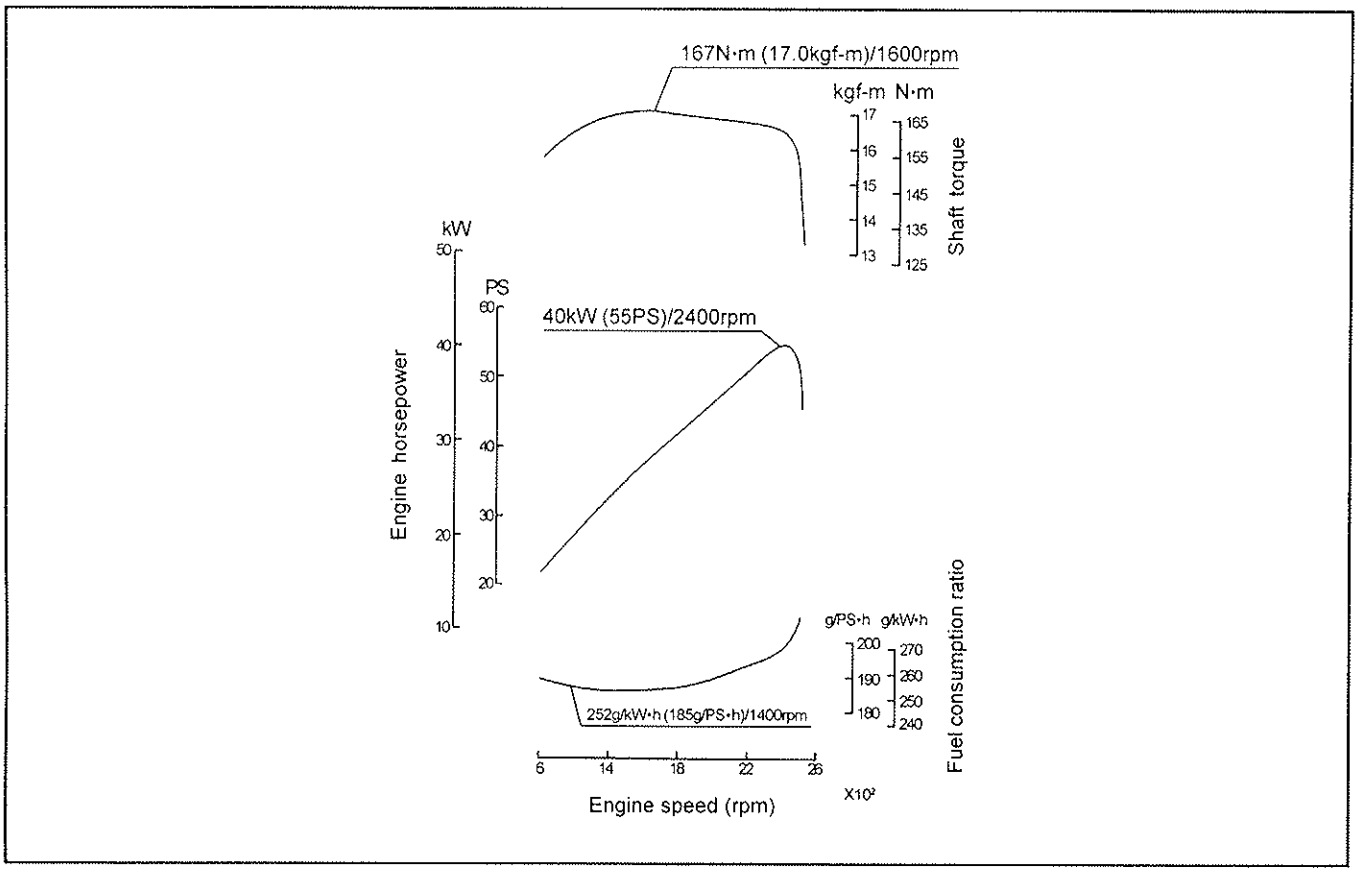


4Y Engine (3·J3.5 ton Series)

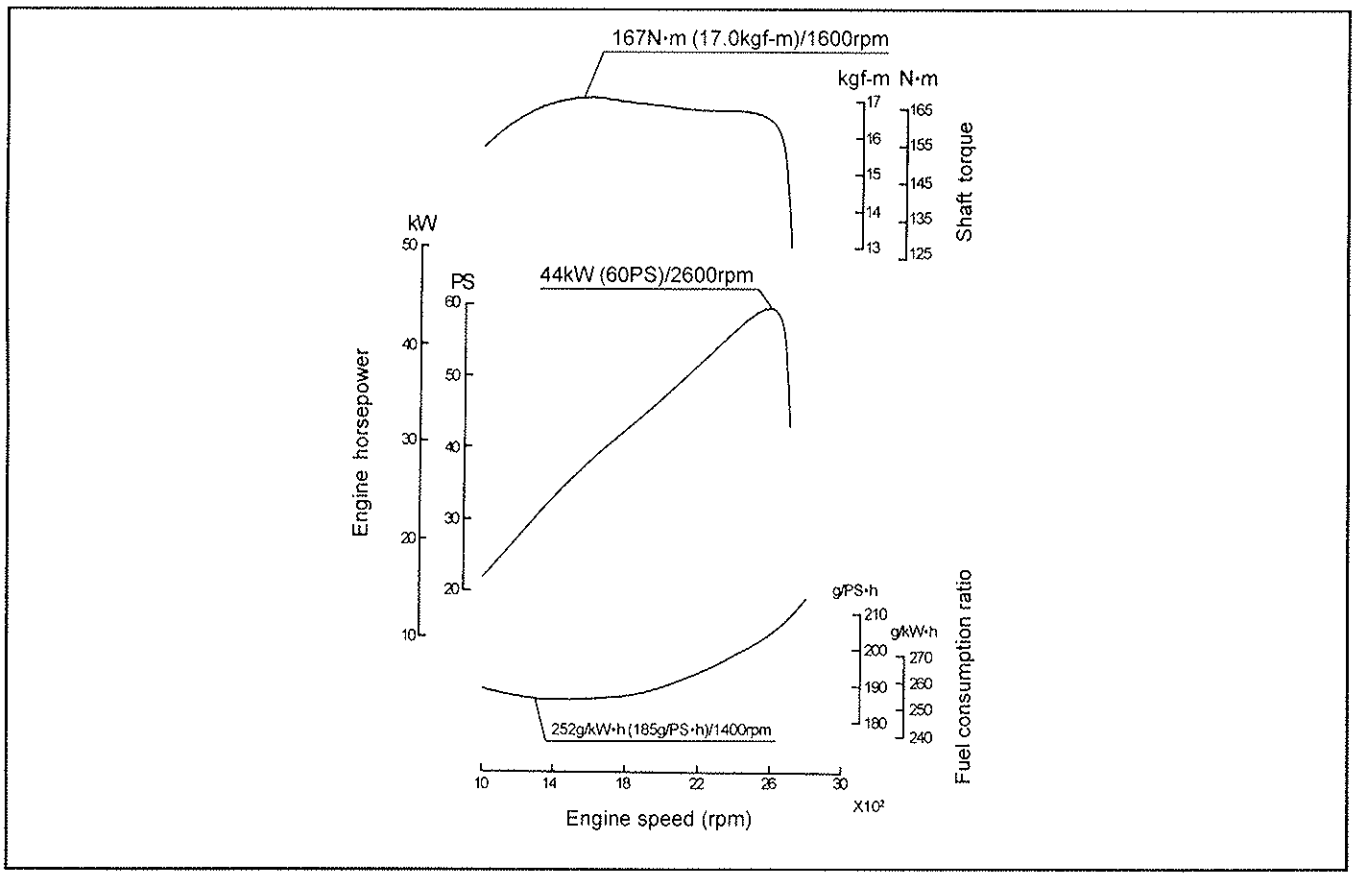


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1DZ-II Engine (1 ton Series)

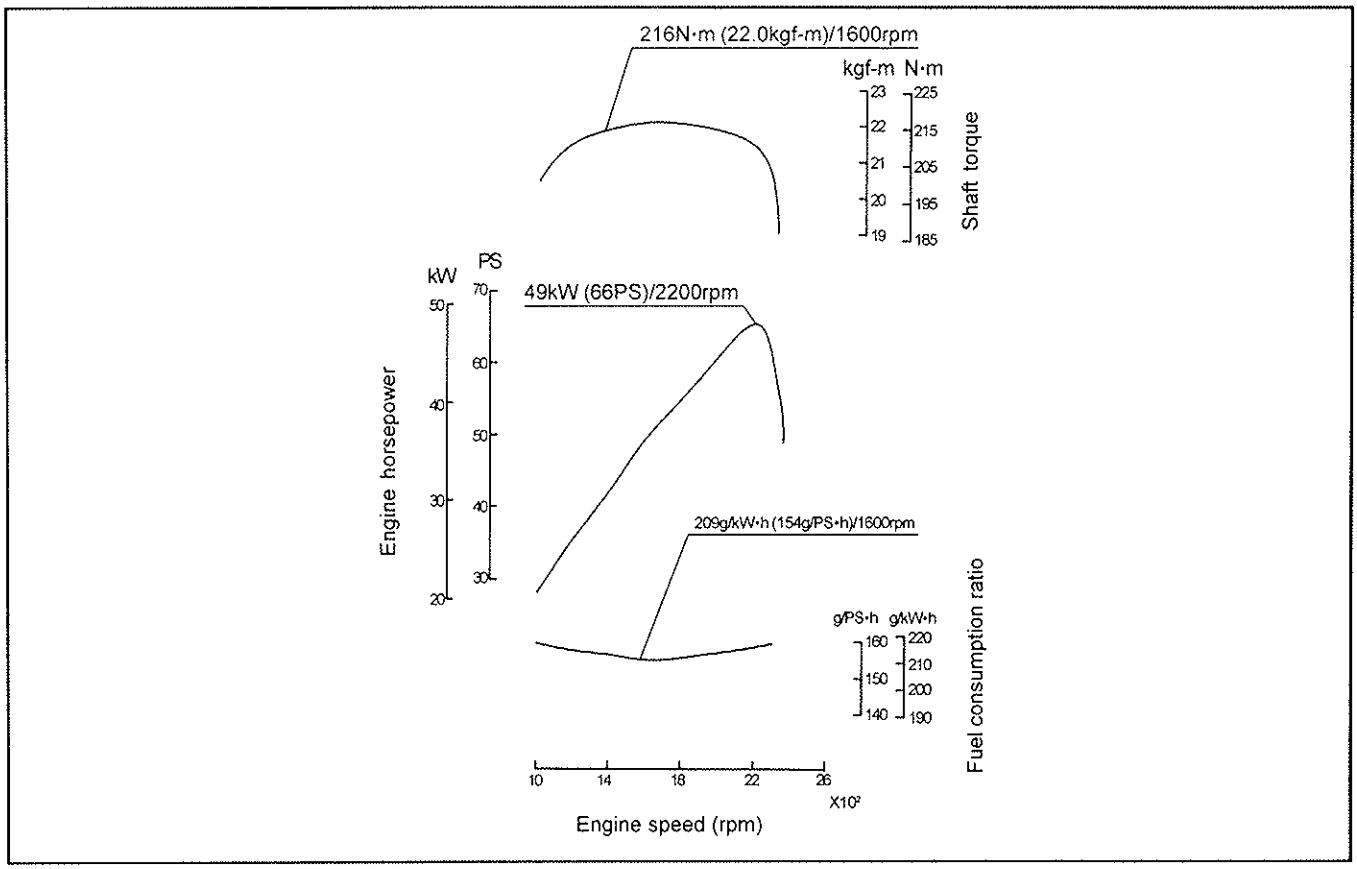


1DZ-II Engine (2·3 ton Series)



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2Z Engine

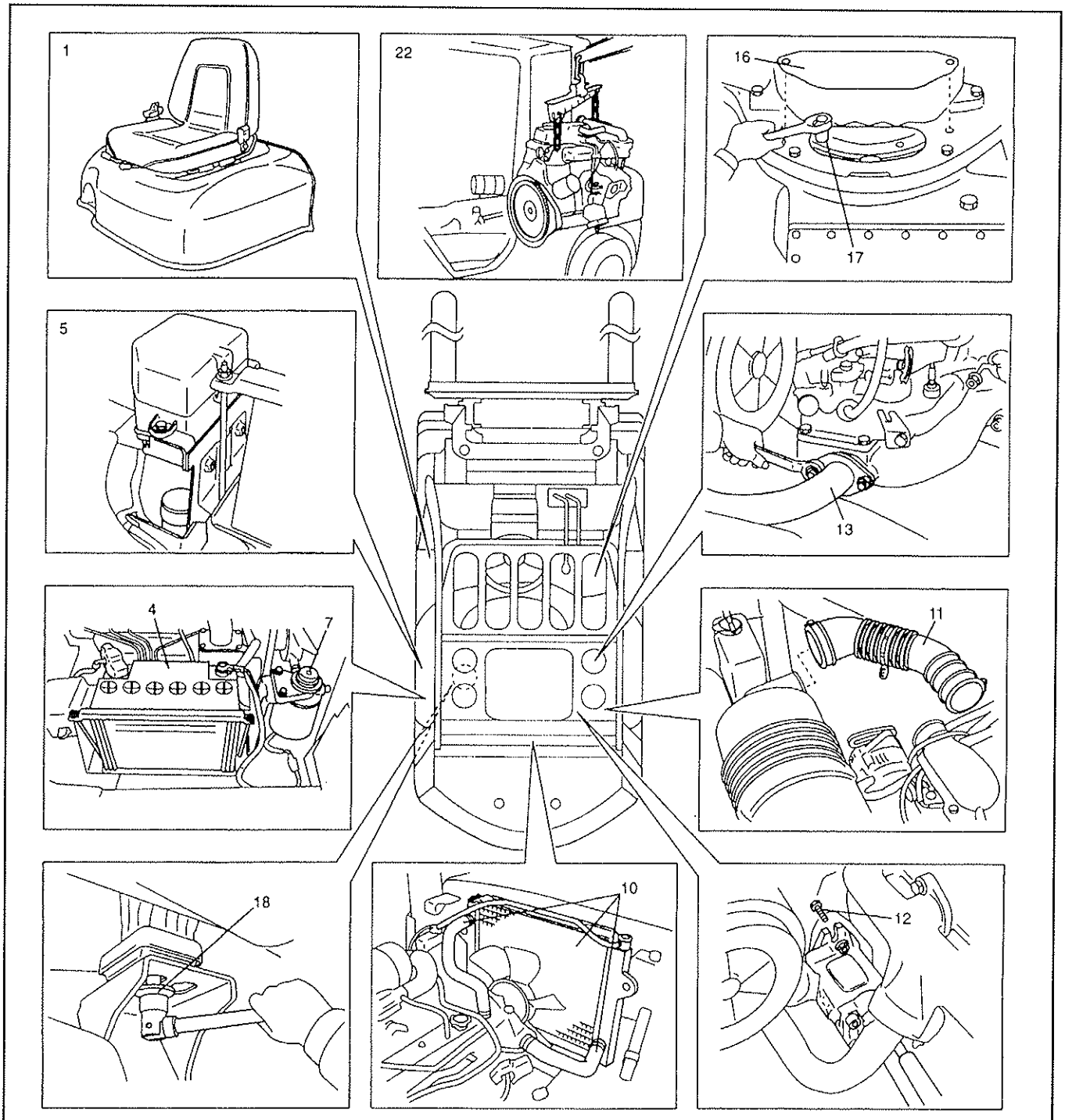


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ENGINE ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Engine mounting nut	T = 53.9 ~ 99.0 (550 ~ 1010) [39.8 ~ 73.1]
End plate set bolt	T = 49.0 ~ 78.5 (500 ~ 800) [36.2 ~ 57.9]
Drive plate set bolt (for connecting engine crankshaft)	4Y: T = 56.9 ~ 64.7 (580 ~ 660) [42.0 ~ 47.7] 1DZ-II·2Z: T = 76.5 ~ 93.2 (780 ~ 950) [56.4 ~ 68.7]
Drive plate set bolt (for connecting torque converter)	T = 14.7 ~ 21.6 (150 ~ 220) [10.9 ~ 15.9]
Torque converter housing set bolt	T = 29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]

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Removal Procedure

1 Remove the engine hood. (See p. 9-5.)

2 Remove the toe board.

3 Drain coolant.

4 Remove the battery and battery tray.

5 Remove the relay block and electrical parts plate set bolts to free them.

6 Disconnect the accelerator wire and fuel hose. **[Point 1]**

7 Diesel Vehicle:
Remove the sedimenter bracket set bolt to free the bracket.

8 Disconnect connectors and wiring harness clamps around the engine.

9 Disconnect the torque converter cooler hose. **[Point 2]**

10 Remove the radiator.

11 Disconnect the air cleaner hose.

12 Remove the oil pump set bolts to free the pump.

13 Disconnect the exhaust pipe.

14 Disconnect the wiring from the starting motor.

15 Remove the under cover.

16 Remove the cover plate.

17 Remove 6 drive plate set bolts.

18 Remove the engine ASSY mounting nuts.

19 Slightly hoist the engine. **[Point 3]**

20 Support the torque converter housing with wooden blocks.

21 Separate the torque converter housing and engine. **[Point 4]**

22 Remove the engine ASSY with drive plate and torque converter end plate.

23 Remove the drive plate.

24 Remove the torque converter end plate.

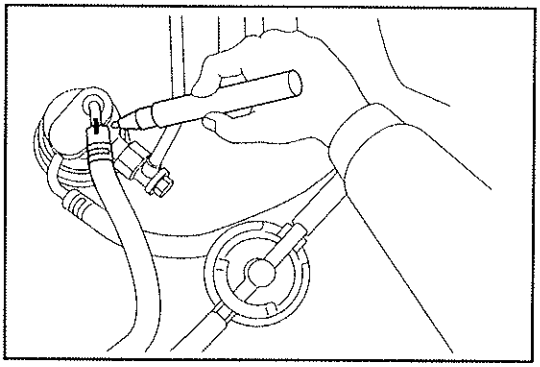
25 Remove the starting motor.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

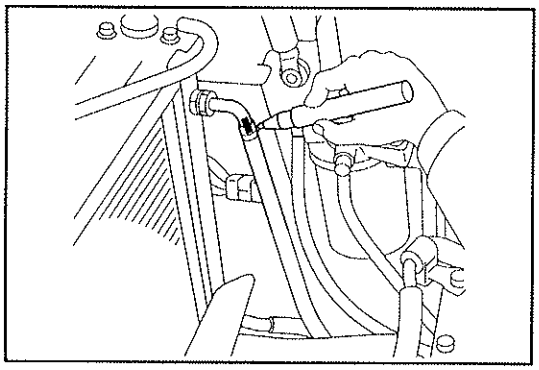
Note:
- **Apply sealant (08833-76002-71 (08833-00080)) before tightening the drive plate set bolt (for connecting engine crankshaft).**
- **Bleed air from the fuel system after installation of the engine ASSY. (For diesel vehicle) (See p. 1-11.)**

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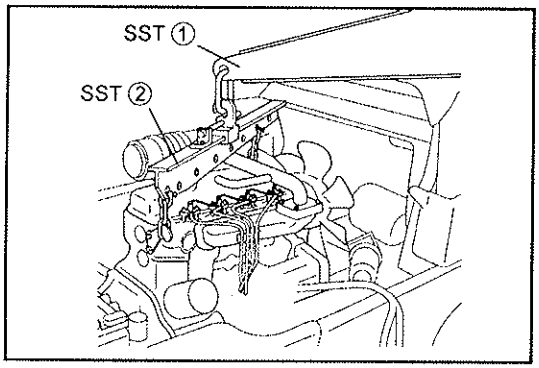


Point Operations

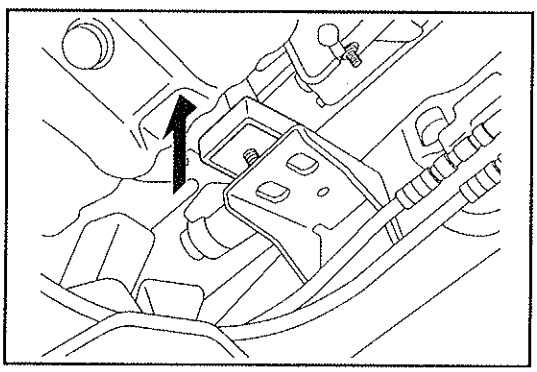
[Point 1]
Removal:
Put a match marks on the fuel hose and the coupler.



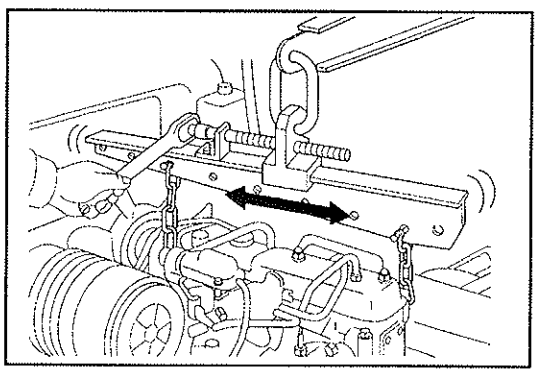
[Point 2]
Removal:
Put a match mark on the radiator and torque converter cooler hose.



[Point 3]
Removal·Installation:
SST 09010-20111-71 --- ①
09010-23320-71 ---②

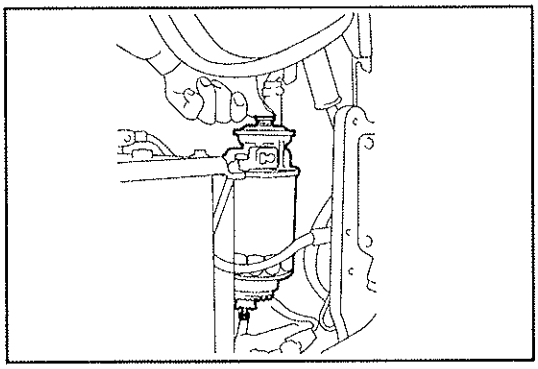


Removal:
Tentatively hoist up until the mounting bolt completely comes out from the hole in the frame.



[Point 4]
Removal:
Use a straight-edge screwdriver for separation. If the fitting is too tight, change the SST hook position and adjust the engine angle for easier separation.

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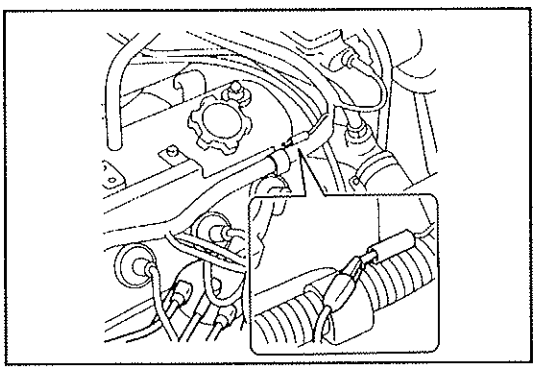


AIR BLEEDING FROM FUEL SYSTEM (DIESEL VEHICLE)

1. Operate the hand pump of the fuel filter until the pump operating force becomes heavy.

ENGINE SPEED INSPECTION AND ADJUSTMENT

Note:
Warm up the engine, set the vehicle to the following conditions, and conduct inspection and adjustment.
Coolant temperature: 80°C (176°F) or more, engine oil: 70°C (158°F) or more, operating oil temperature: 50°C (122°F) or more, auto choke in release state (4Y engine)

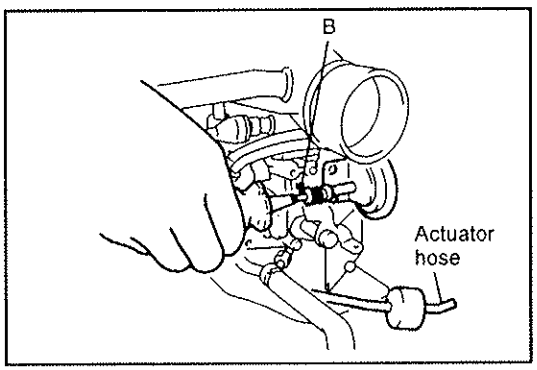


4Y ENGINE

Idling speed and idle up speed inspection and adjustment

<Gasoline Vehicle>

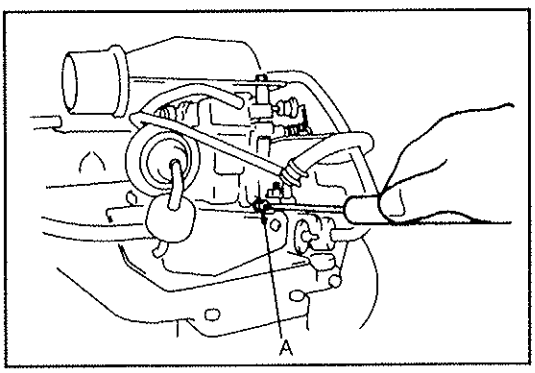
1. Install the engine speedometer.



2. Disconnect the idle up actuator and inspect the idle up speed.

   Standard: 1000 ± 30 rpm

3. If the measured value is out of the specified range, adjust by turning adjusting screw B.
4. Connect the idle up actuator.

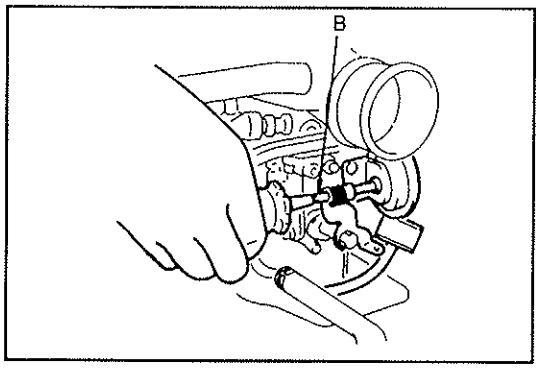


5. Check the idling speed.

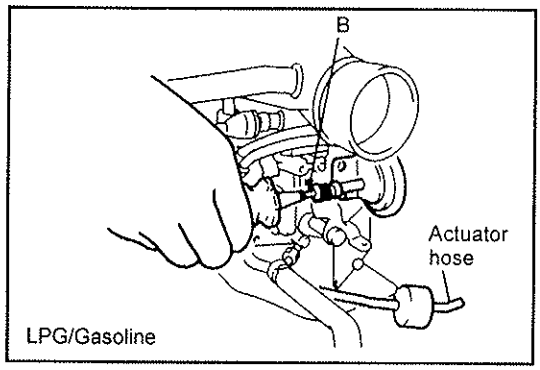
   Standard: 750 $^{+50}_{-0}$ rpm

6. If the measured value is out of the specified range, adjust by adjusting screw A.
7. If the speed is still higher after adjustment in 3 above, adjust using the following procedure:

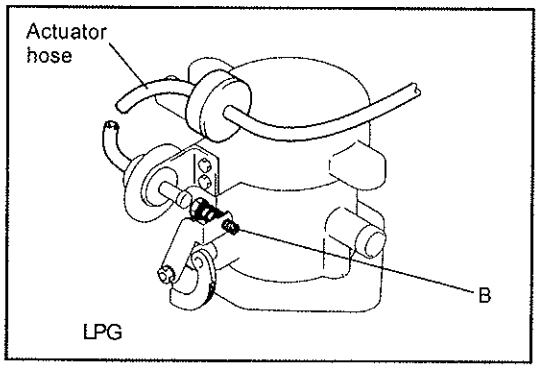
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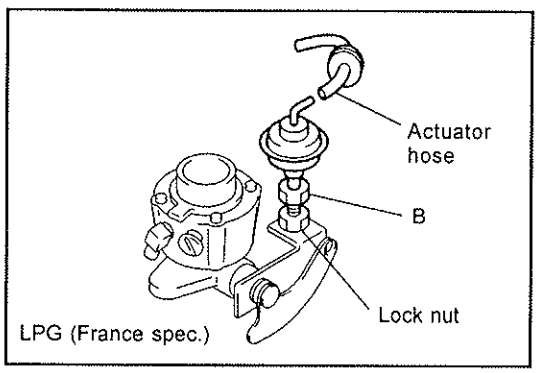
(1) If the auto choke cam is contacting although the coolant temperature is as specified above, replace the auto choke.
(2) If the idle up actuator rod and adjusting screw B are in contact with each other, turn adjusting screw B counterclockwise.



<LPG/Gasoline or LPG>
1. Install the engine speedometer.
2. Disconnect the idle up actuator and inspect the idle up speed.
Standard:
LPG/Gasoline: 1000 ± 30 rpm



LPG: 1400 ± 30 rpm

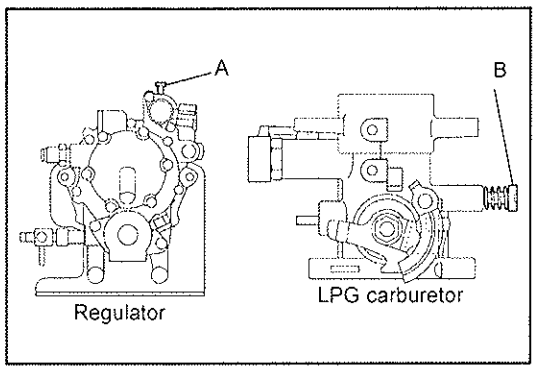


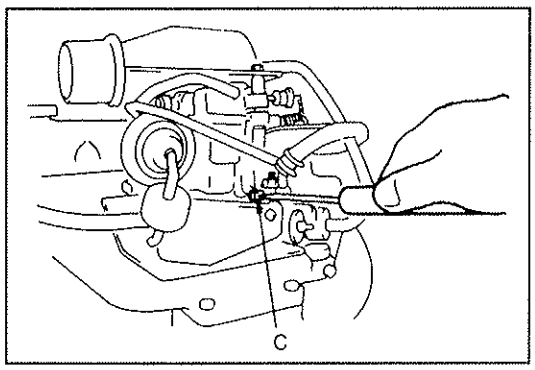
LPG (France spec.): 1400 ± 30 rpm

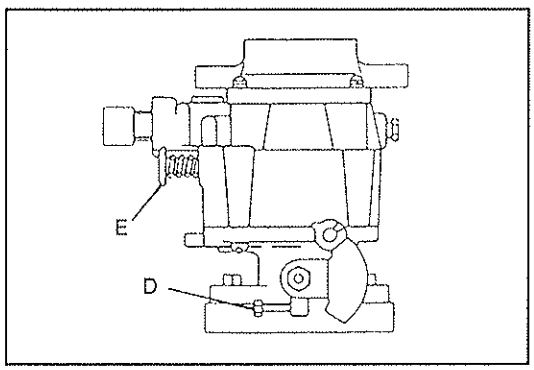
3. If the measured value is out of the specified range, adjust by turning adjusting screw B. Loosen the lock nut before adjustment in case of the LPG engine vehicle (France spec.).
4. Connect the idle up actuator.
5. Check the idling speed.

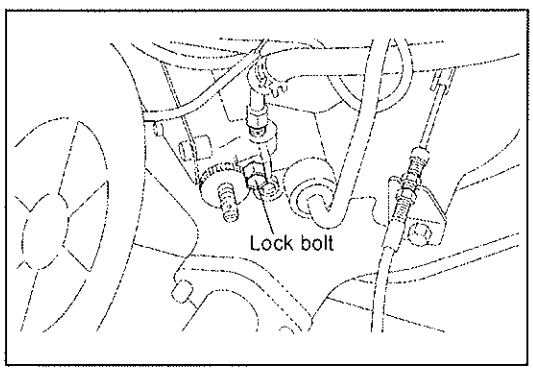
Standard:
LPG/Gasoline: 750 $^{+50}_{-0}$ rpm
LPG: 800 $^{+50}_{-0}$ rpm
LPG (France spec.) : 750 $^{+50}_{-0}$ rpm

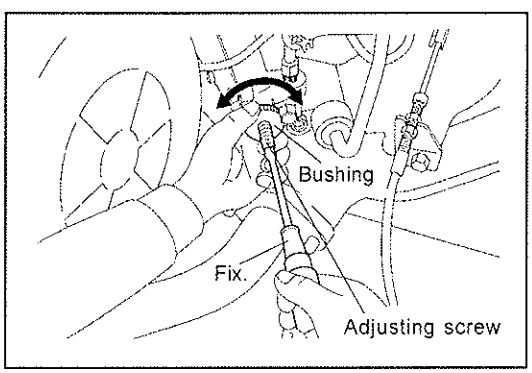
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6. If the measured value is out of the specified range, make adjustment according to the following procedure:
   (1) Make adjustment by turning the adjusting screw B (LPG vehicle) or C (LPG/gasoline vehicle).
   (If less than the standard, turn the adjusting screw A counterclockwise beforehand.)
   (2) Slowly turn the adjusting screw A clockwise or counterclockwise until the maximum speed is obtained.
   (3) Determine the positions of adjusting screws B and C by repeating steps (1) and (2) until the value obtained in step (2) satisfies the standard.
   (4) Slowly turn the adjusting screw A clockwise from (3) to the position where the speed begins to drop, and then turn it 45 degrees counterclockwise.

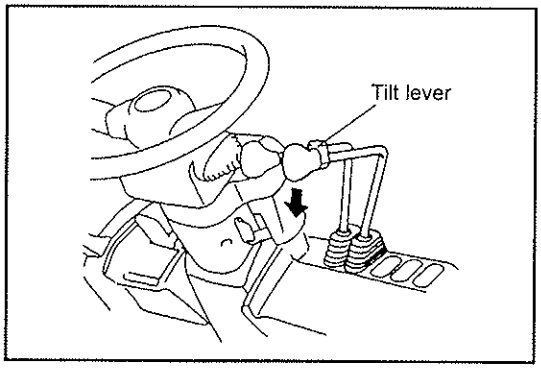
LPG (France spec.)
   (1) Make adjustment by turning the adjusting screw D (LPG vehicle).
   (If less than the standard, turn the adjusting screw E clockwise beforehand.)
   (2) Determine the position of adjusting screw D by repeating step (1) until the value obtained in step (1) satisfies the standard.
   (3) Slowly turn the adjusting screw E counter-clockwise from (2) to the position where the speed begins to drop, and then turn it 45 degrees clockwise.

No-load Maximum Speed Inspection·Adjustment
<Gasoline, LPG or LPG/Gasoline Vehicle>
1. Install the engine speedometer.
2. Inspect and adjust the no-load static maximum speed.
   (1) Measure the speed when the accelerator pedal is fully depressed.

   Standard:
   4Y engine:
   1·2 ton series: ..... 2600 ± 50 rpm
   3·J3.5 ton series: ..... 2800 ± 50 rpm

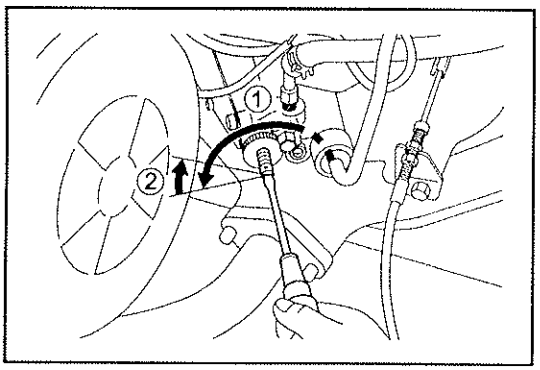
   (2) If the measured value does not satisfy the standard, make adjustment as follows:
   ① Remove the seal and loosen the lock bolt.
   ② Fully depress the accelerator pedal.
   ③ Turn the bushing for adjustment, while holding the adjusting screw of the air governor immovable with a straight-edge screwdriver.

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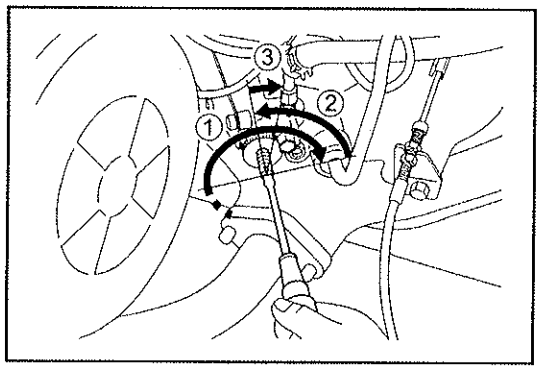


3. Check and adjust relief down.
   (1) Operate the tilt lever fully backward with the engine running at the maximum speed, and measure the decrease in speed (relief down) upon full relief.

   Standard: Within 300 rpm

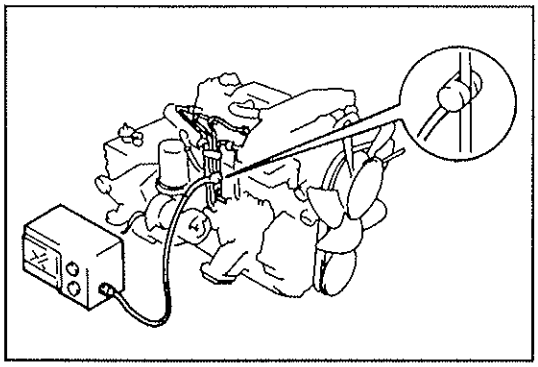


   (2) If the measured value is out of the standard range, make adjustment according to the following procedure:
      ① Turn the adjusting screw counterclockwise to decrease relief down.
      ② Return the screw by 1/10 of a turn to eliminate twisting of the spring in the air governor.
      ③ Adjust the no-load maximum speed.
      ④ Repeat steps ①, ② and ③ until the measured value satisfies the standard.



4. Check and adjust hunting.
   (1) Check for hunting upon tilt relief at the no-load maximum speed.
   (2) If hunting occurs a few times or more, make adjustment according to the following procedure:
      ① Turn the adjusting screw clockwise by 1/2 of a turn or more.
      ② Return the screw counterclockwise by 1/4 of a turn.
      ③ Finally, turn it by 1/10 of a turn to eliminate twisting of the spring in the air governor.
      ④ Adjust the no-load maximum speed.
      ⑤ Repeat steps ① through ④ until hunting occurs no more.
5. Repeat adjustments in steps 2 to 4 until respective standards are satisfied.
6. Seal the lock bolt.

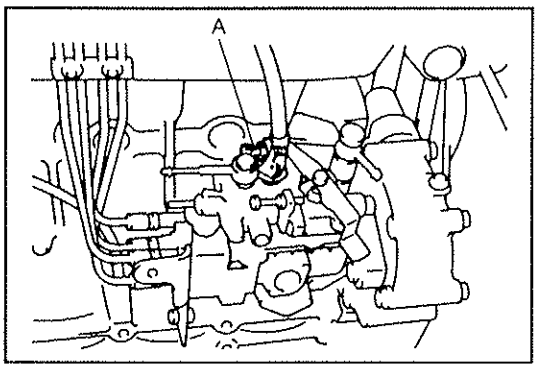
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1DZ-II·2Z ENGINE

Idle Speed Inspection·Adjustment

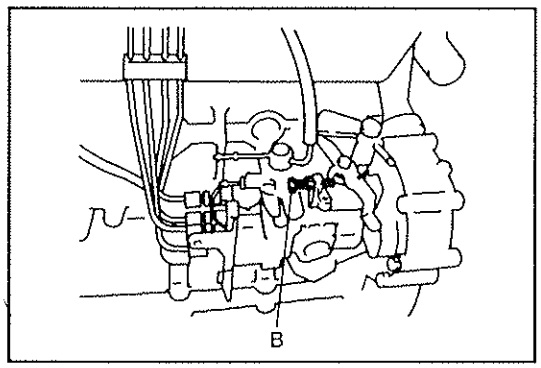
1. Install the engine speedometer.



2. Check the idle speed.

   Standard: 750 ± 25 rpm

3. If the measured value is out of the standard, loosen the lock nut and make adjustment by turning adjusting screw A.



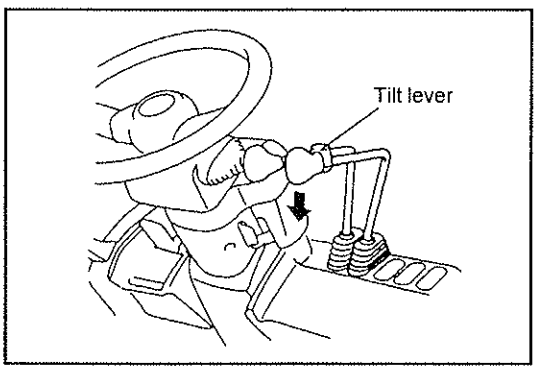
No-load Maximum Speed Inspection·Adjustment

1. Install the engine speedometer.
2. Inspect and adjust the no-load maximum speed.
   (1) Measure the speed when the accelerator pedal is fully depressed.

   Standard:
   1DZ-II engine:
   1 ton series: ..... 2600 ± 50 rpm
   Vehicle speed control system spec.: ..... 2600 ± 50 rpm
   2·3 ton series: ..... 2800 ± 50 rpm
   2Z engine: ..... 2400 ± 50 rpm

   (2) If the measured value does not satisfy the standard , make adjustment as follows:
   ① Remove the seal and loosen the lock nut.
   ② Make adjustment by turning adjusting screw B.
3. Check and adjust relief down.
   (1) Operate the tilt lever fully backward with the engine running at the maximum speed and measure the decrease in speed (relief down) upon full relief.

   Standard: Within 200 rpm



4. Seal the adjusting screws after the end of adjustment.

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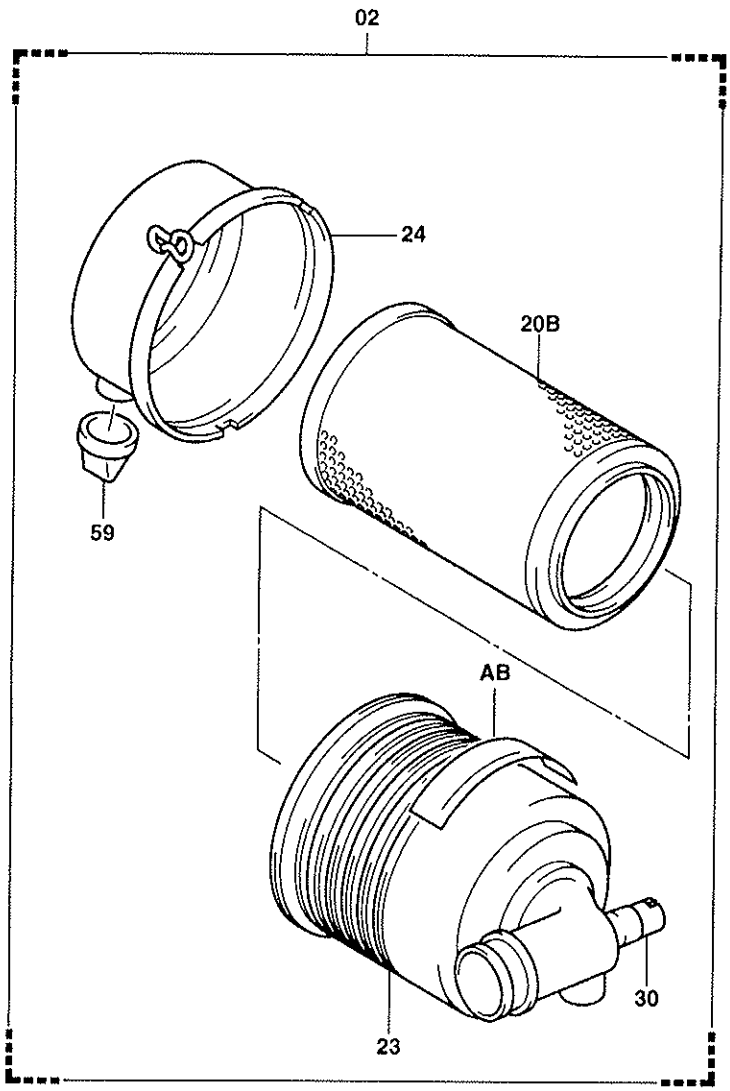
AIR CLEANER

SPECIFICATIONS

	Single (STD)	Double (OPT)
Type	Cyclone type	←
Size	7-inch	←
Intake type	Fresh air introduction type	←
Filtering area cm² (in²)	14600 (2263)	Outer: 18600 (2883)
		Inner: 510 (79.1)
Others	With evacuator valve	←

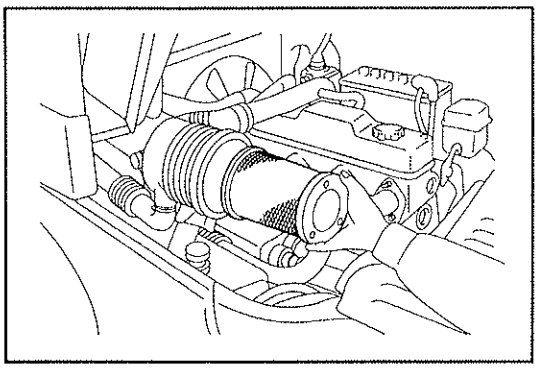
COMPONENTS

1703



1703-419A

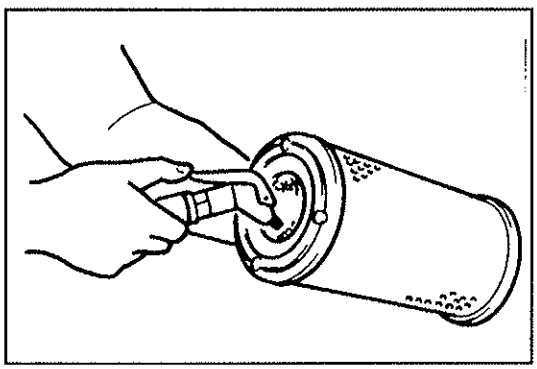
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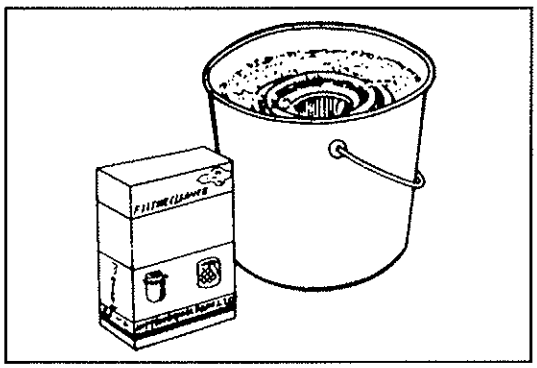
AIR CLEANER CLEANING·INSPECTION

1. Open the engine hood.
2. Remove the element.

Note:
In case of the double element type (OPT), do not remove the inner element for other than replacement.

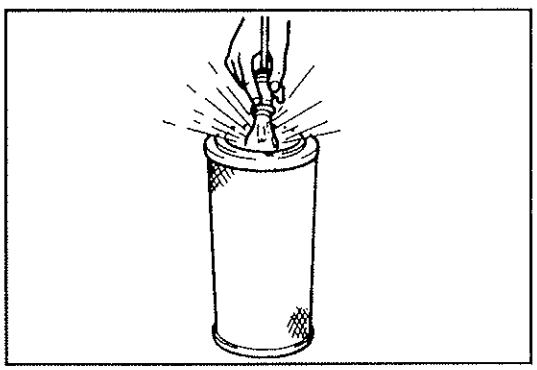


3. Clean the element.
   (1) For ordinary cleaning, blow with compressed air [690 kPa (7kgf/cm²) [100 psi] or less] vertically along the pleats from the inside of the element.
   If heavily contaminated, washing is possible.
   (2) Element washing method
   Dissolve neutral detergent in tepid water (approx. 40°C (104°F)) and immerse the element in it for about 30 minutes. Then, rinse the element well with clear water. [Water pressure: 275 kPa (2.8 kgf/cm²) [40 psi] or less]
   After washing, naturally dry the element or dry the element with a dryer (cold air).

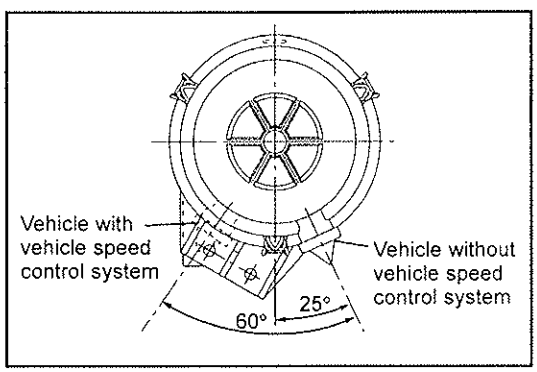


Note:
- **Do not damage the element during washing.**
- **Never use compressed air or hot air for drying.**

4. Clean the evacuator valve (dust discharge valve).
   (1) Hold the tip end of the evacuator valve and discharge dust and dirt from the inside of the valve.

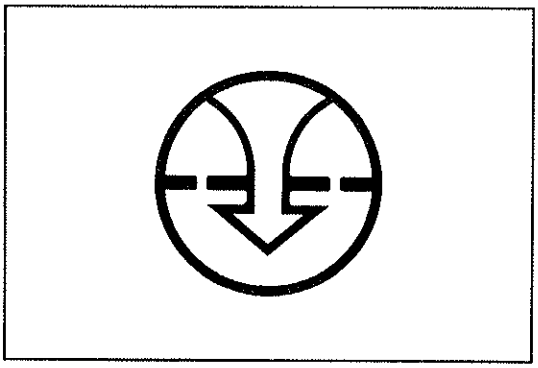


5. Inspect the element.
   (1) After cleaning, place an electric bulb in the element to inspect any damage in the element. If any pinhole, tear or damage is found, replace it with a new element.
6. Element replacement
   Replace the element after it is washed six times or generally at intervals of 12 months.



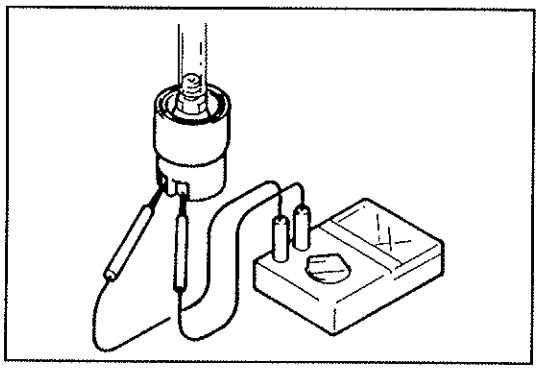
7. Install the element.
   (1) Install the evacuator valve in the illustrated direction.

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CLOGGING WARNING SYSTEM INSPECTION

1. Warning lamp inspection
   (1) See that the air cleaner warning lamp comes on when the ignition switch is turned ON and goes out when the engine starts.



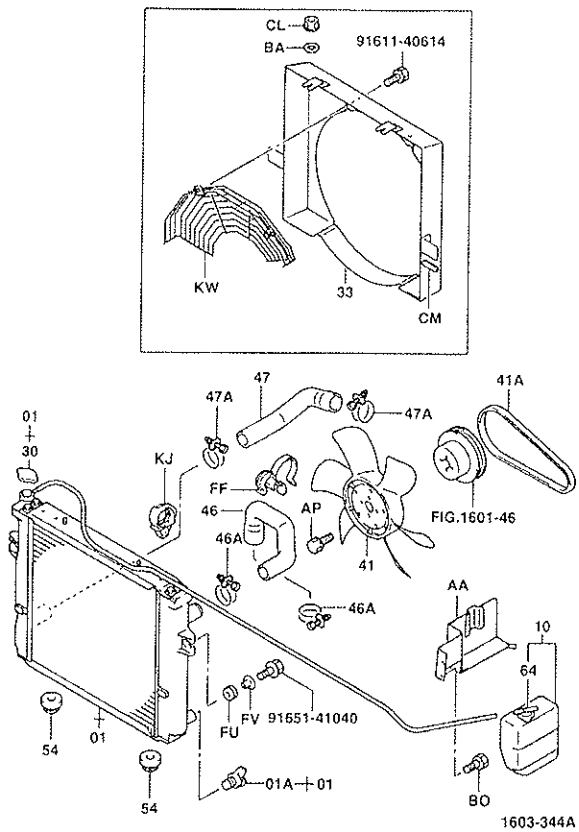
2. Individual inspection
   (1) Use a mity vac to apply a negative pressure to the vacuum switch, and inspect conduction.

   Standard
   Gasoline models:
   2942 ± 294 Pa (300 ± 30 mm H_2O)
   (22.1 ± 2.2 mmHg) [11.81 ± 1.18 in H_2O]
   [0.870 ± 0.087 in Hg]: Conduction
   Diesel models:
   7473 ± 569 Pa (762 ± 58 mm H_2O)
   (56.0 ± 4.3 mmHg) [30.00 ± 2.28 in H_2O]
   [2.205 ± 0.169 in Hg]: Conduction

RADIATOR

COMPONENTS

1603



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SPECIFICATIONS

Type		Crossflow
Fin type		Corrugated fin
Coolant capacity (in radiator)		See the table below
Cap opening pressure	kPa (kgf/cm²) [psi]	88 ± 14.7 (0.9 ± 0.15) [13 ± 2.1]
Others		Built in torque converter cooler (torque converter model)

COOLANT CAPACITY AND ANTIFREEZE TABLE

Unit: ℓ (US gal)

		Radiator capacity	Total amount of coolant	LLC mixing ratio at 30% (to - 15°C (5°F))	LLC mixing ratio at 50% (to - 35°C (-31°F))	Antirust mixing at 5%
1 ton series	4Y	2.5 (0.66)	7.4 (1.95)	2.2 (0.58)	3.7 (0.98)	0.4 (0.11)
	1DZ-II	2.5 (0.66)	5.9 (1.56)	1.8 (0.48)	3.0 (0.79)	0.3 (0.08)
2 ton series	4Y	3.7 (0.98)	9.3 (2.46)	2.8 (0.74)	4.7 (1.24)	0.5 (0.13)
	1DZ-II	3.7 (0.98)	8.3 (2.19)	2.5 (0.66)	4.2 (1.11)	0.4 (0.11)
	2Z	3.7 (0.98)	9.0 (2.37)	2.7 (0.71)	4.5 (1.19)	0.5 (0.13)
3 ton series	4Y	3.7 (0.98)	9.5 (2.51)	2.9 (0.77)	4.8 (1.27)	0.5 (0.13)
	1DZ-II	3.7 (0.98)	8.2 (2.16)	2.5 (0.66)	4.1 (1.08)	0.4 (0.11)
	2Z	3.7 (0.98)	8.8 (2.32)	2.6 (0.69)	4.4 (1.16)	0.4 (0.11)
J3.5 ton series	4Y	3.7 (0.98)	9.5 (2.51)	2.9 (0.77)	4.8 (1.27)	0.5 (0.13)
	2Z	3.7 (0.98)	8.8 (2.32)	2.6 (0.69)	4.4 (1.16)	0.4 (0.11)

Note:

- **The total amount of coolant does not include the capacity of the reservoir tank.**
- **Reservoir tank capacity: 0.6ℓ (0.16 US gal) (at FULL mark position)**

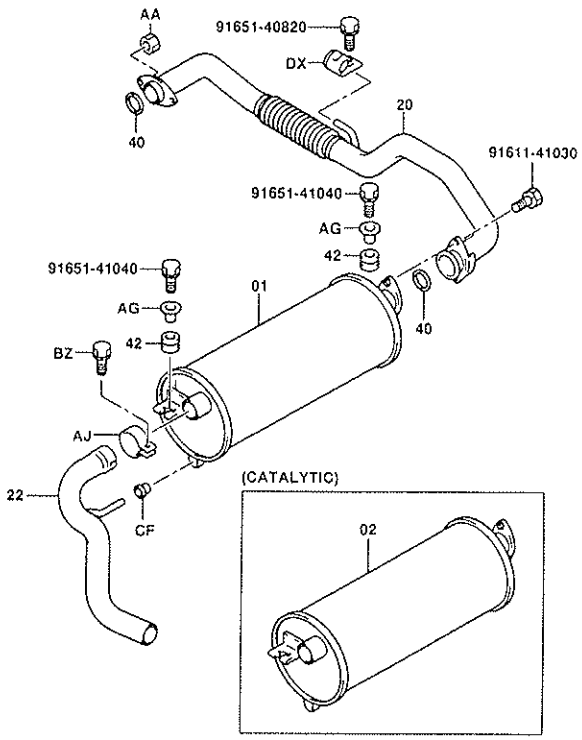
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MUFFLER & EXHAUST PIPE

COMPONENTS

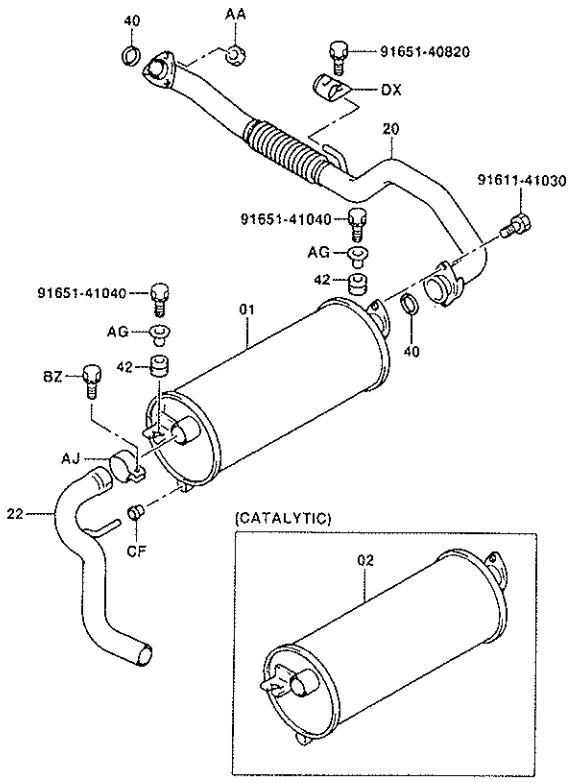
1702

Gasoline model



1702-357

Diesel model

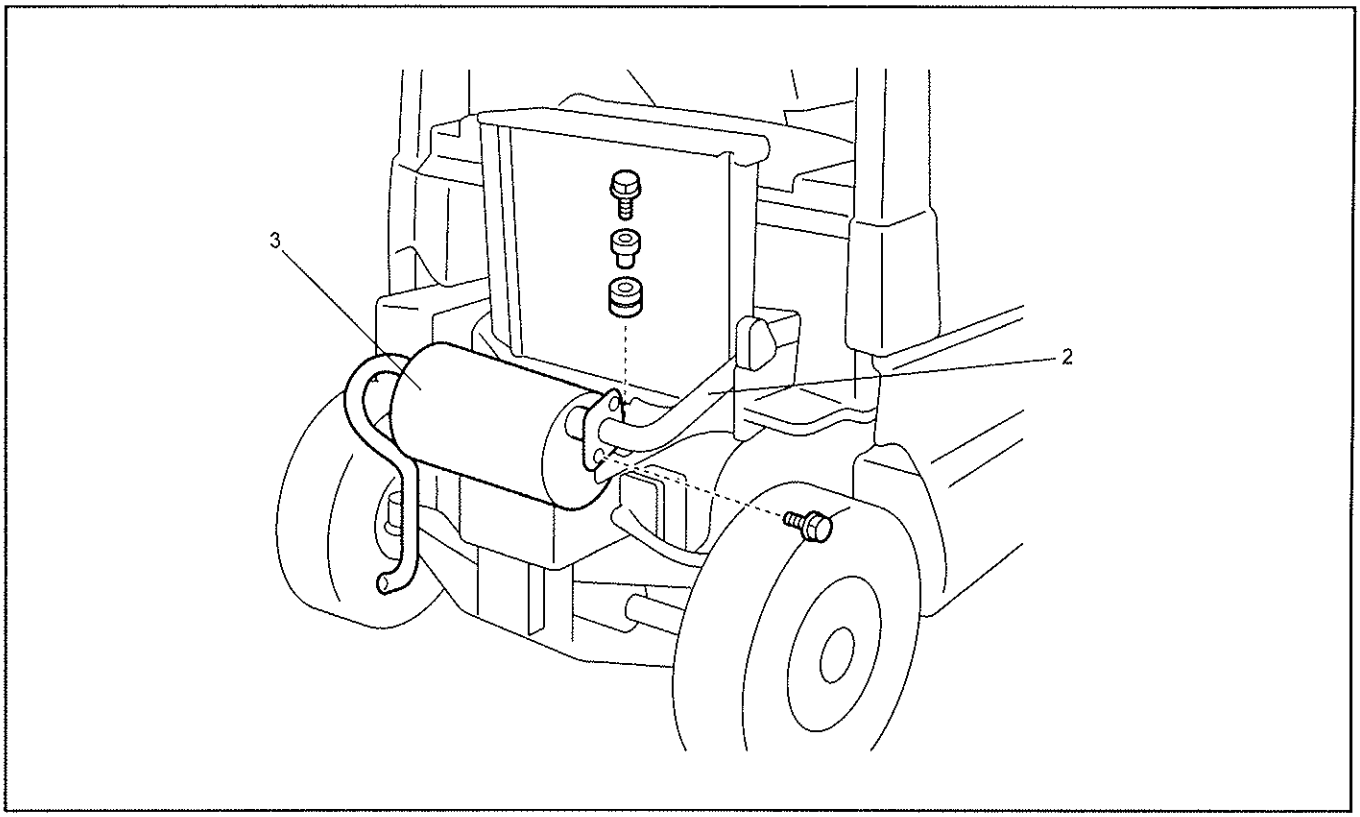


1702-356

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REMOVAL·INSTALLATION

Note:
The muffler can be removed by either of the two methods shown below.
① Remove the muffler after removing the counterweight.
② Remove the muffler after removing the radiator W/counterweight.
Here, method ① is explained.



Removal Procedure

1 Remove the counterweight. (See p. 9-6.)

2 Disconnect the exhaust pipe.

3 Remove the muffler W/tail pipe.

4 Disconnect the tail pipe from the muffler.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

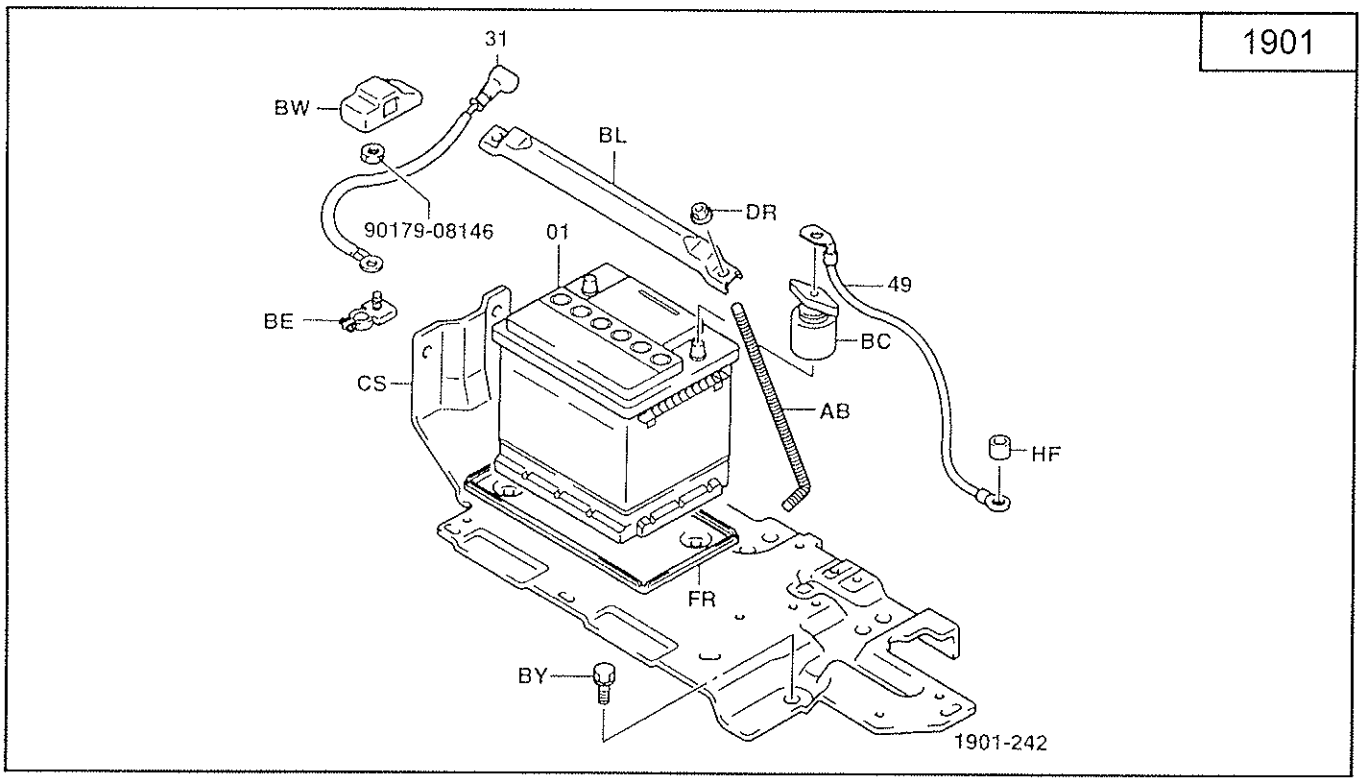
CATALYTIC MUFFLER MAINTENANCE

Replace the muffler ASSY every year (2000 hours) on either the gasoline or diesel engine vehicle.

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BATTERY

COMPONENTS



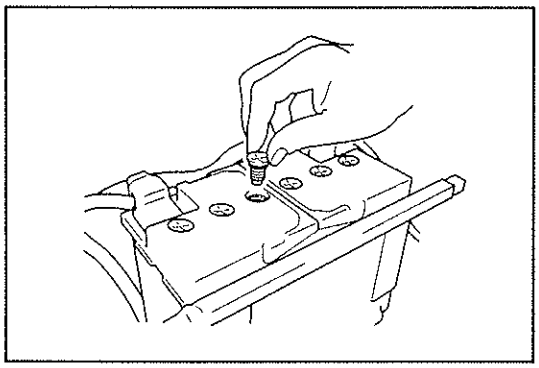
SPECIFICATIONS

Battery type list (The battery is selected according to the equipped engine.)

Engine / Specification	4Y	1DZ-II	2Z	2Z (Two parallel 12-V batteries)
STD	VALTA B100D	VALTA B308D	VALTA B308D	VALTA B208D x 2
OPT (High capacity battery)	VALTA B208D			

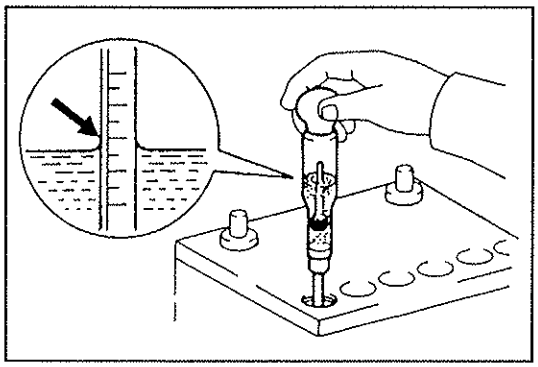
Item / Battery type		VALTA B100D	VALTA B208D	VALTA B308D
Voltage	V	12	←	←
20-hour rate capacity	Ah	36	60	75
Specific gravity of battery fluid in use (at 20°C (68°F))		1.280	←	←
Battery weight	kg (lb)	10.6 (23.4)	15.3 (33.7)	19.3 (42.6)

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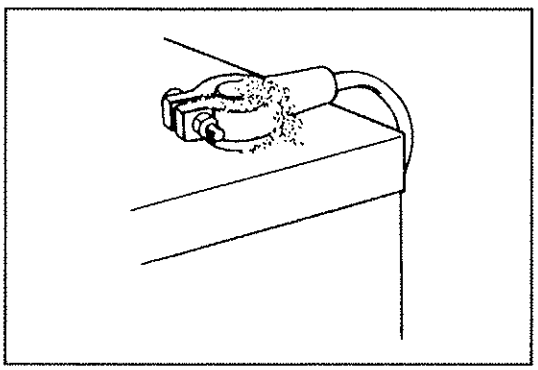
INSPECTION

1. Inspect the battery fluid level.
   (1) Inspect the battery fluid level and fill a distilled water if insufficient. Do not overfill above the upper fluid limit.



2. Inspect the specific gravity of the battery fluid.
   (1) Use a hydrometer and measure the specific gravity of the battery fluid.

   Standard: 1.280 (at 20°C (68°F))
   Calculating equation
   S20 = St + 0.0007 (t-20)
   S20: Specific gravity converted to 20°C (68°F)
   St: Measured specific gravity at t°C
   t: Fluid temperature at the time of measurement



3. Inspect the battery terminals.
   (1) If battery terminals are contaminated to white, clean then and apply a thin coat of MP grease on terminals.

4. Install the battery terminals and the harness connecting portion for loosening.
   (1) Retighten the battery terminals and the harness connecting portion.

Battery Removal

1. Disconnect battery terminals.

Note:
Disconnect the negative terminal first.

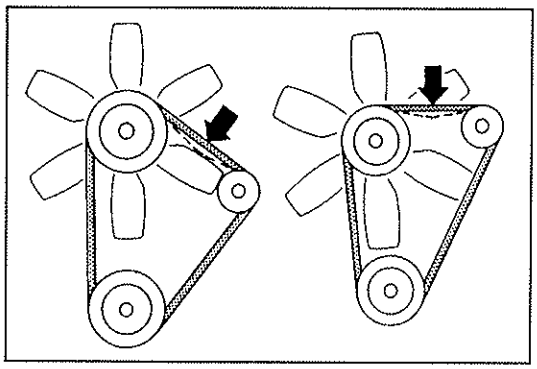
2. Remove the battery stopper.

3. Remove the battery.

Battery Installation

Reverse the removal procedure.

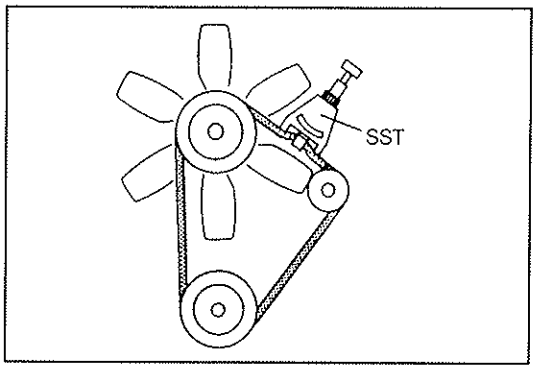
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V-BELT TENSION INSPECTION· ADJUSTMENT

1. Inspect the V belt tension.

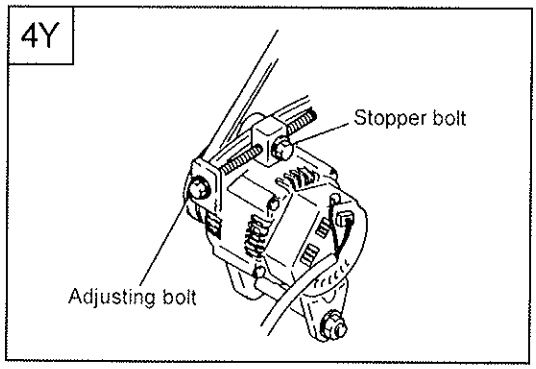
Standard [Deflection when pushed with a force of 98N (10 kgf) [22 lbf]]
8~13 mm (0.31~0.51 in)



Standard [When the tension gauge (SST) is used]

SST 09216-76002-71
(SST 09216-00021)

4Y	**294~490 N (30~50 kgf) [66~110 lbf]**
1DZ-II·2Z	**324~559 N (33~57 kgf) [73~126 lbf]**



2. Adjust the V belt tension.

1DZ-II·2Z:
Use a lever rod and move the alternator for adjustment.

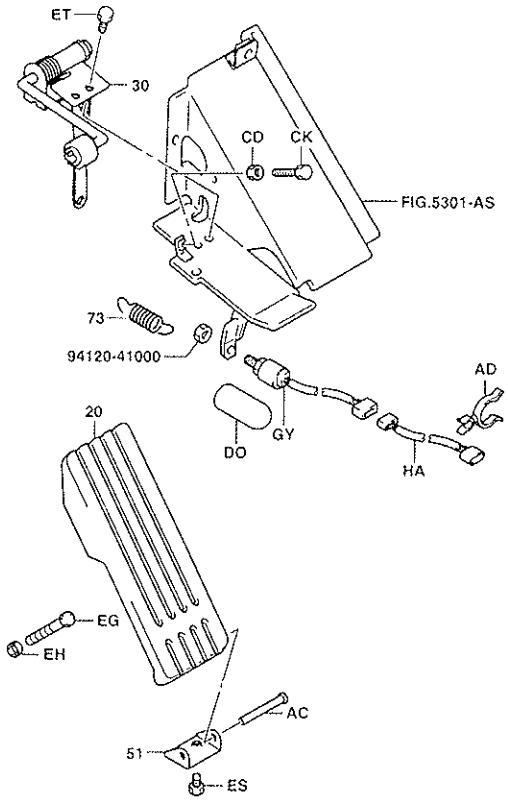
4Y:
Make adjustment by turning the adjusting bolt.

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ACCELERATOR PEDAL

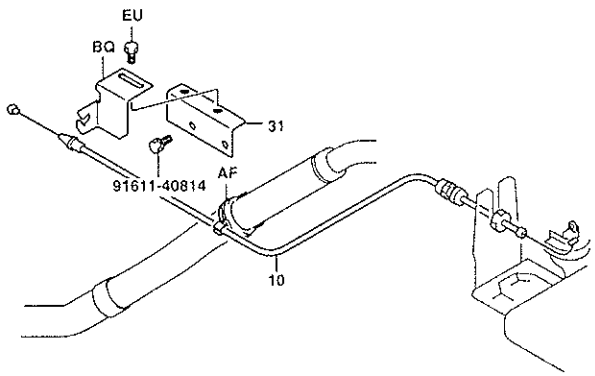
COMPONENTS

2601



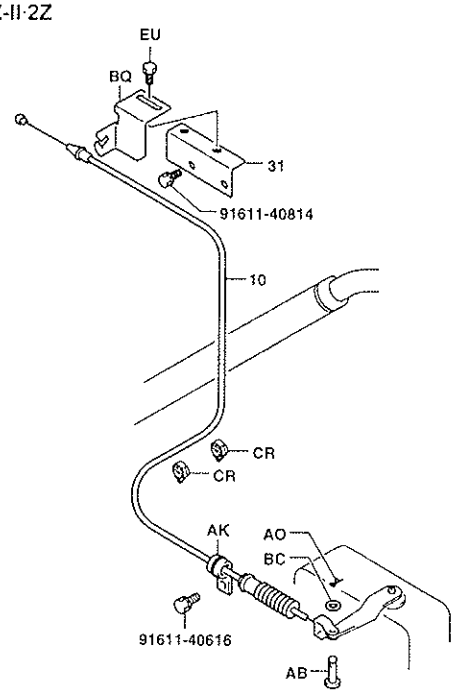
2601-201

4Y



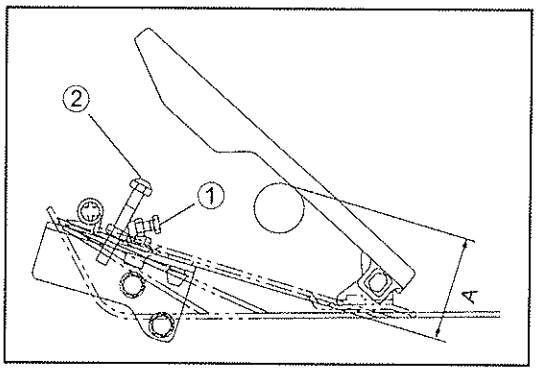
2601-203

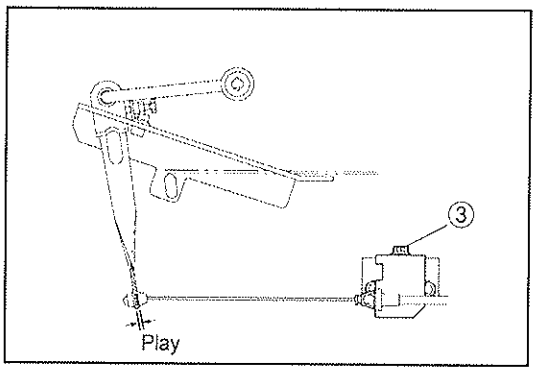
1DZ-II·2Z

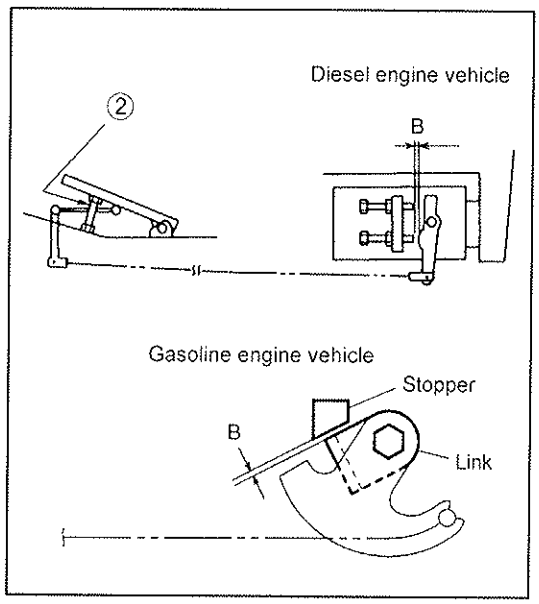


2601-202

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INSPECTION·ADJUSTMENT

Note:
Adjust the accelerator pedal switch after inspecting and adjusting the accelerator pedal height.

1. Check the accelerator pedal height A (from the accelerator bracket to the top face of roller).

   Standard (Reference):

   Gasoline engine vehicle:
   STD pedal A = 68 mm (2.68 in)
   D2 pedal A = 68 mm (2.68 in)

   Diesel engine vehicle:
   STD pedal A = 71 mm (2.80 in)
   D2 pedal A = 68 mm (2.68 in)

2. If the measured value does not satisfy the standard, make adjustment by turning the accelerator link stopper bolt ①.

3. Inspect and adjust the accelerator wire play.

   Standard: 5 ~ 7 mm (0.20 ~ 0.28 in)

   If the standard is not satisfied, make adjustment at accelerator wire bracket ③.

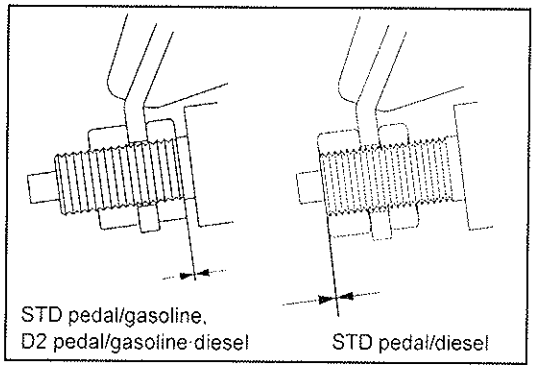
4. Adjust the stopper bolt ② so that the accelerator pedal comes into contact with stopper bolt ② at the following position:
   Position where clearance B between the injection pump lever (or carburetor throttle link) and maximum speed adjusting screw (or stopper) is as shown below:

   Diesel engine vehicle:
   B = 0 ~ 0.5 mm (0 ~ 0.020 in)
   Gasoline engine vehicle:
   B = 0 ~ 2.0 mm (0 ~ 0.079 in)

   0 mm (0 in) clearance here means that the accelerator pedal comes into contact with the stopper bolt at the same time with establishment of the contact between the lever (or carburetor throttle link) and adjusting screw (or stopper).

ACCELERATOR PEDAL SWITCH INSPECTION AND ADJUSTMENT

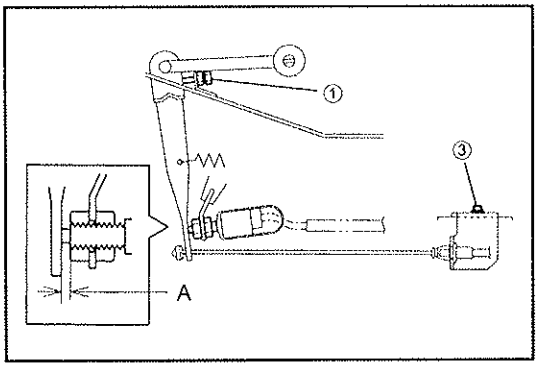
Note:
Adjust the accelerator pedal switch after inspecting and adjusting the accelerator pedal height.



1. Inspect and adjust the accelerator pedal height.

2. Adjust the accelerator pedal switch mounting position.
   STD pedal/gasoline, D2 pedal/gasoline·diesel:
   Install the switch on the bracket so that the nut is flush with the end of the threaded portion of the switch case.
   STD pedal/diesel:
   Install the switch on the bracket so that the switch case end face is flush with the nut end face as illustrated.

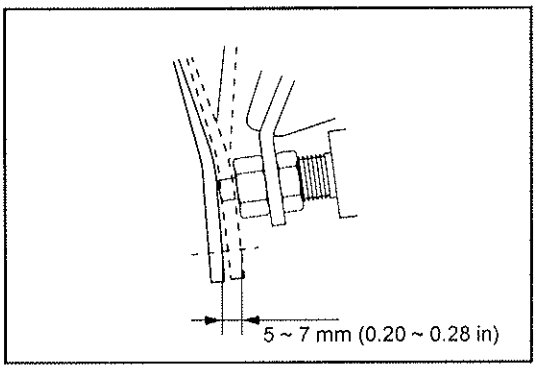
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3. Adjust by turning accelerator link stopper bolt ① to make the clearance (A) between the accelerator pedal link and switch case end face satisfies the standard.

Standard: A = 1 ± 0.5 mm (0.04 ± 0.020 in)

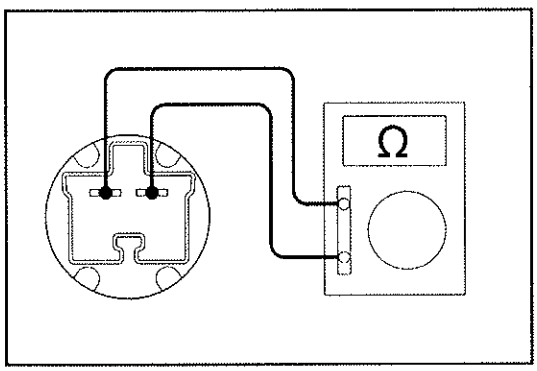
Note:
The accelerator pedal height may be changed as the result of this adjustment.



4. Check to see that the accelerator link departs from the switch shaft end face within the range of the accelerator wire play.

Standard: 5 ~ 7 mm (0.20 ~ 0.28 in)

If the standard is not satisfied, make adjustment at accelerator wire bracket ③.



Accelerator pedal switch inspection

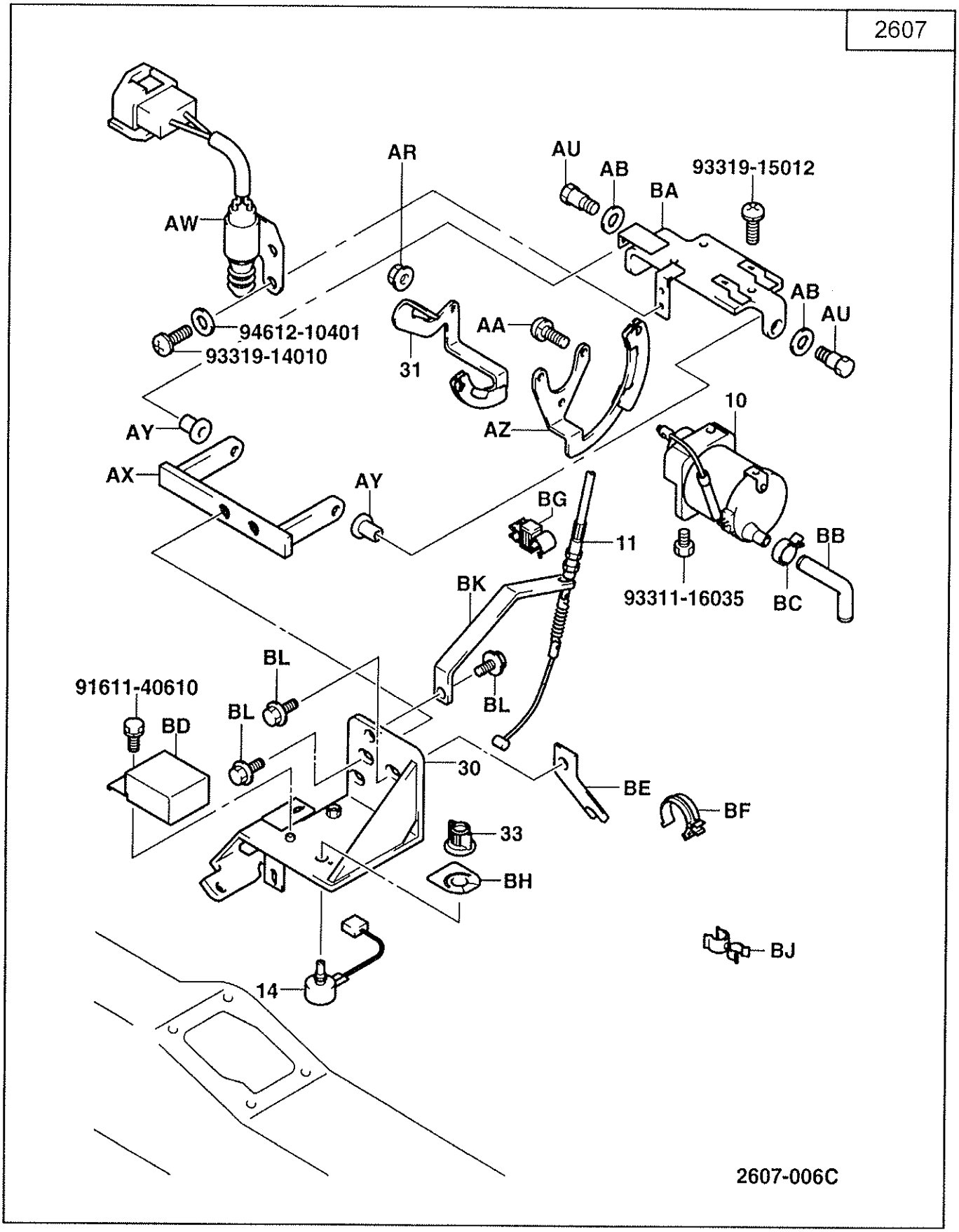
1. Inspect the ON/OFF state of the accelerator pedal switch.

Switch position	Standard
Free	Closed
Pressed	Opend

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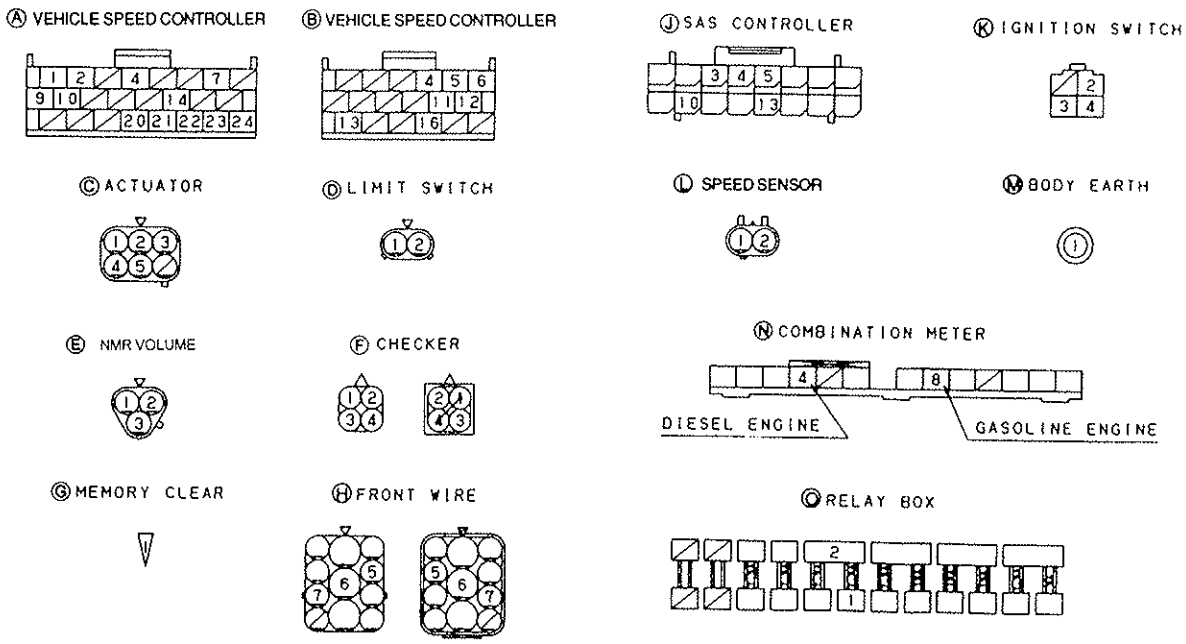
VEHICLE SPEED CONTROL SYSTEM (OPT)

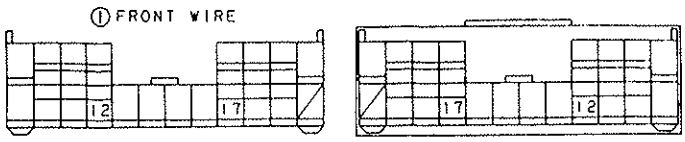
COMPONENTS

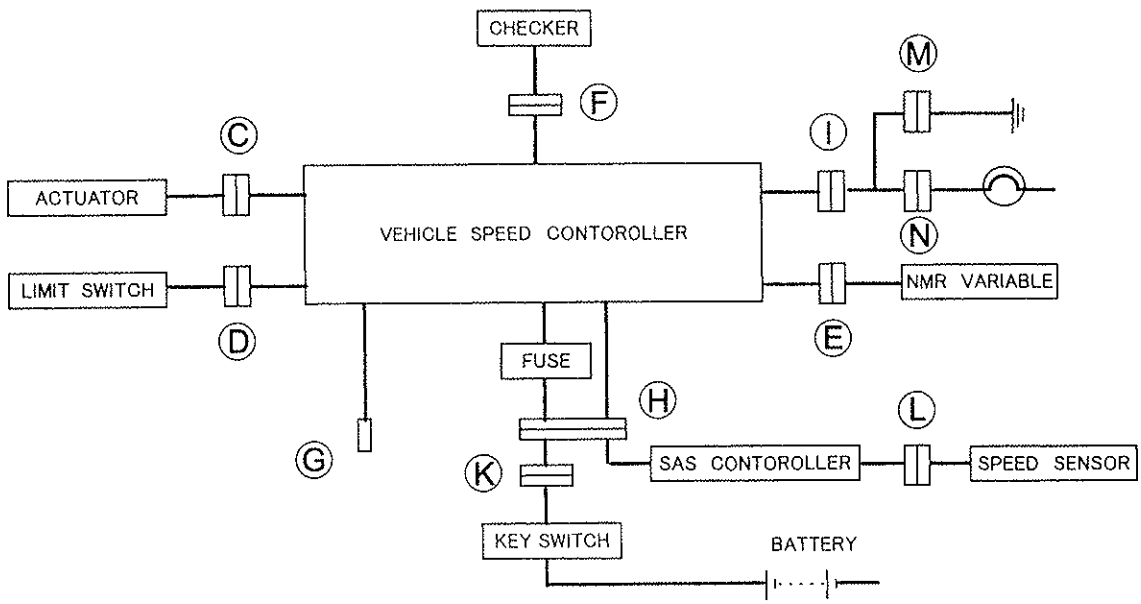


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CONNECTING DIAGRAM

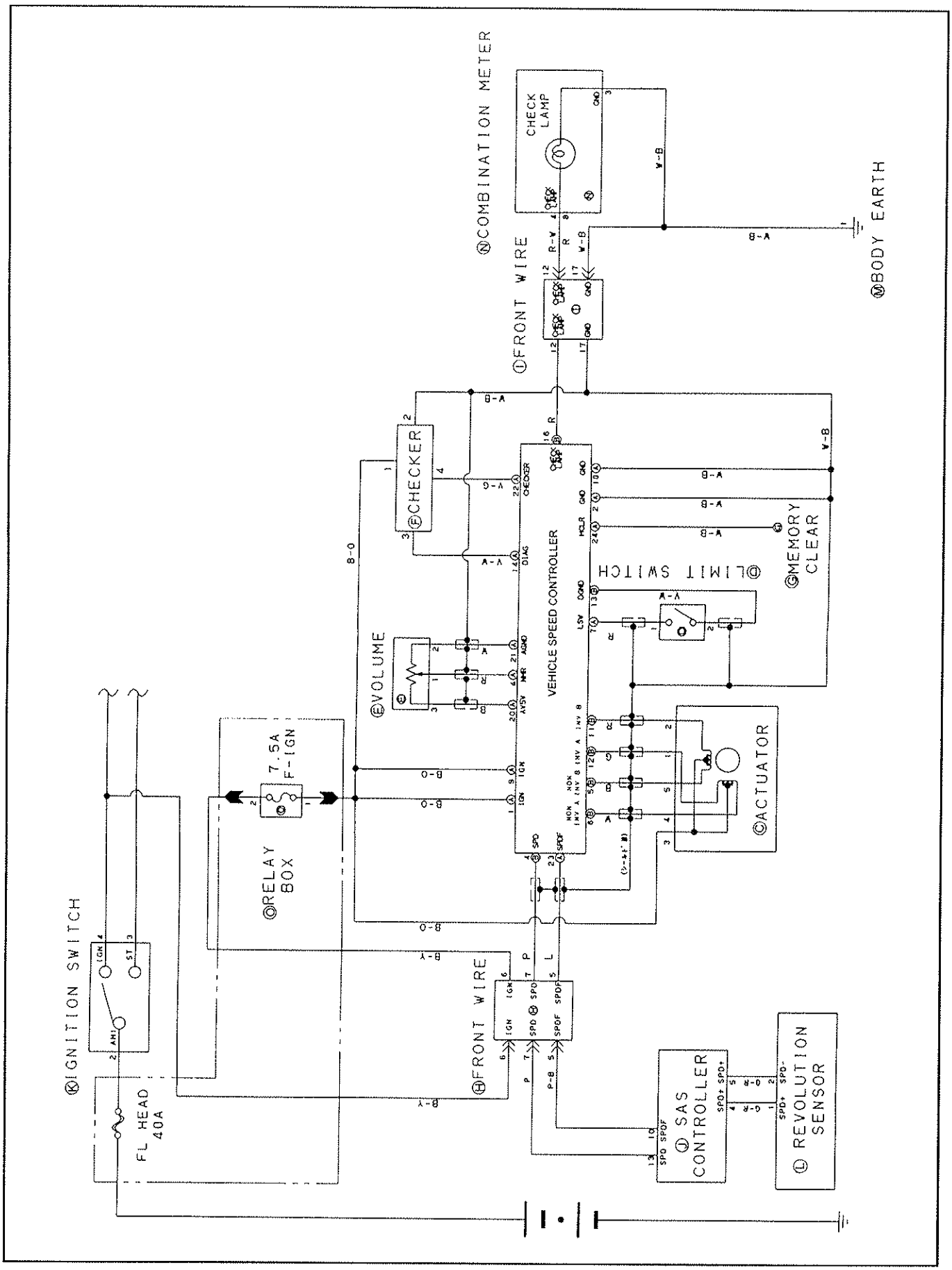






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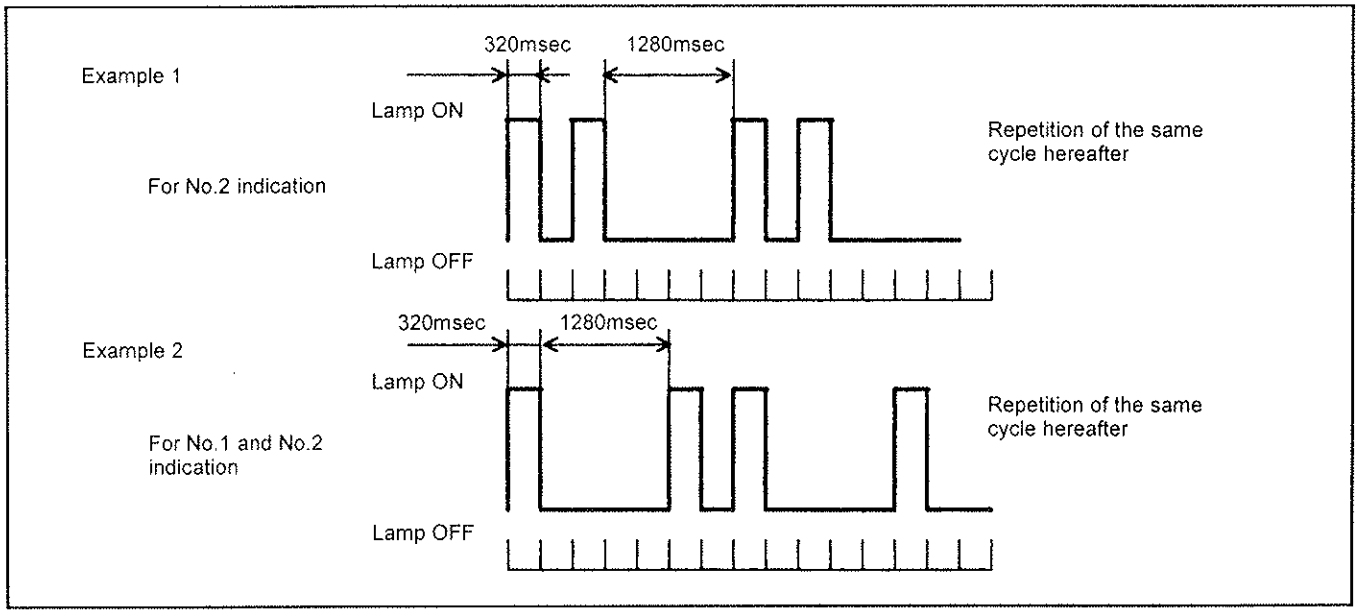
ELECTRICAL CIRCUIT DIAGRAM



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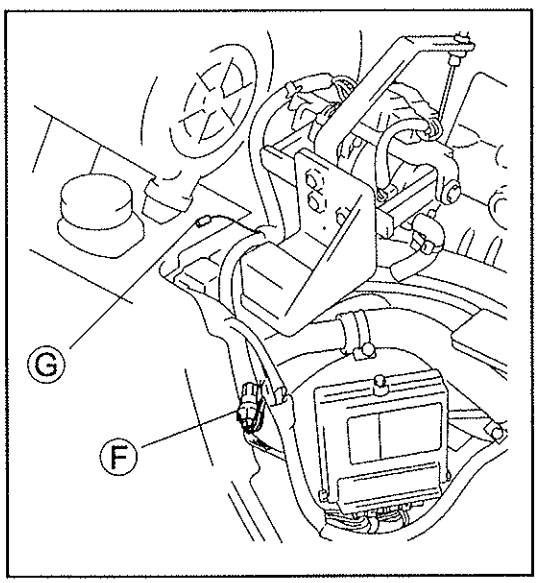
DIAGNOSIS

The diagnosis function, upon detection of a problem by the controller of the vehicle speed control system, informs the operator of the problem and its location by blinking the check lamp on the combination meter. The problem location is indicated by the check lamp blinking count.



Note:

- **The check lamp may blink upon turning the ignition switch ON or while the vehicle is traveling (operating). If the lamp blinks during traveling (operating), promptly stop the vehicle and check the blinking count with the ignition switch ON (engine stops).**
- **Turn the ignition switch OFF and ON again to repeat diagnosis. If any abnormality is detected, the check lamp blinks again.**



Method for Checking Error Codes Indicated in the Past

To display error codes indicated in the past, disconnect diagnosis connector Ⓕ while keeping the key switch at ON. Once the error memory of the controller is reset, however, previous error codes cannot be displayed.

Method for Resetting Error Memory

To reset the error memory, turn the ignition switch OFF and ON with the connector Ⓖ shorted to the ground.

Note:

Reset the error memory as shown above to clear the error memory after the end of repair according to the diagnosis.

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Diagnosis Code List

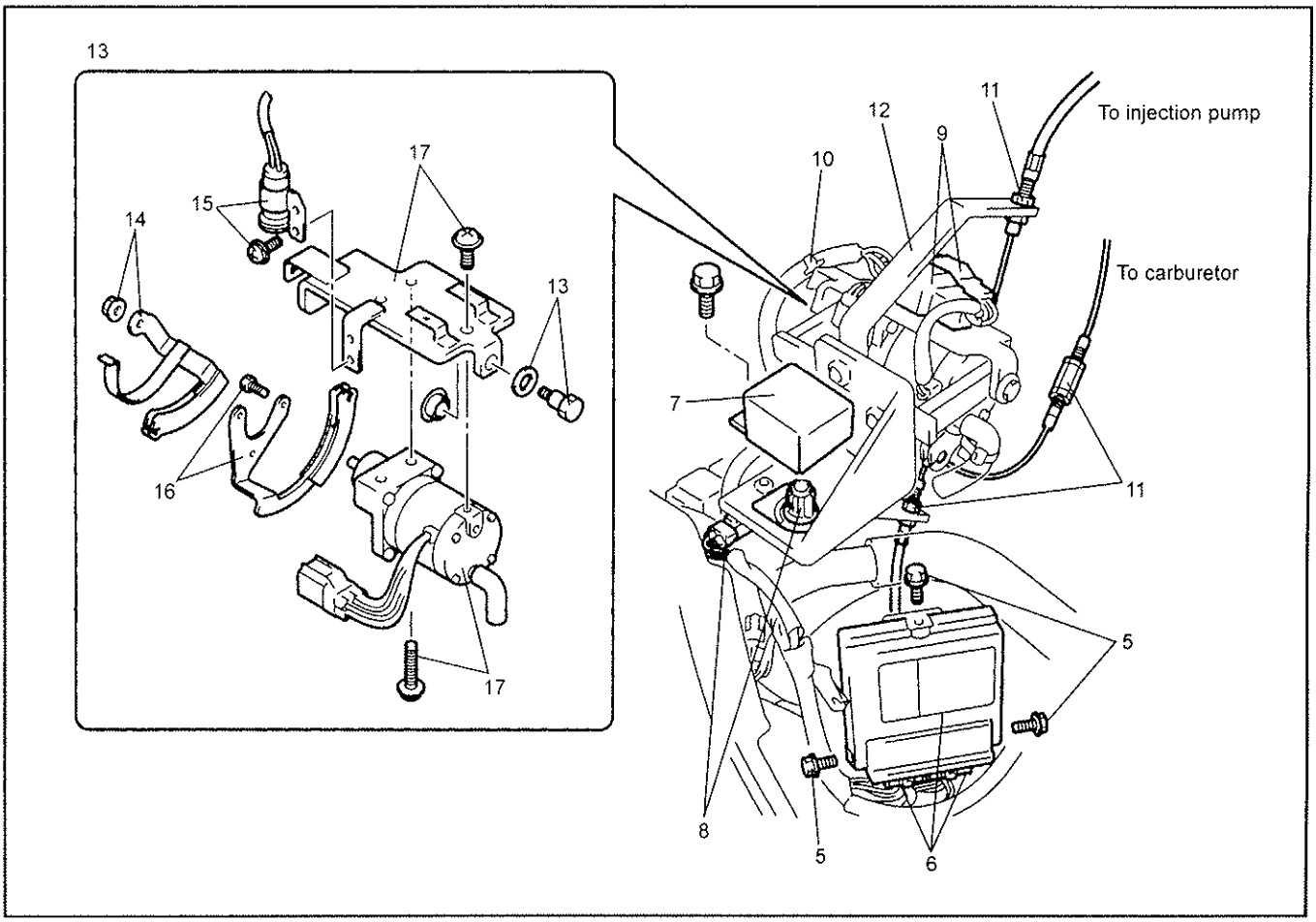
Error code (check lamp blinking count)	Check item	Meaning	Symptom on vehicle	Reference page for trouble-shooting
1	Open circuit of limit switch	Limit switch ON signal is not input although the stepping motor is started as specified.	The stepping motor drive is turned OFF. (Engine idling speed)	1-37
2	Short circuit of limit switch	Limit switch OFF signal is not input although the stepping motor is driven for the specified steps.	The stepping motor drive is turned OFF. (Engine idling speed)	1-37
3	Vehicle speed sensor signal abnormality	Although the SAS controller is not detecting a vehicle speed sensor failure, no vehicle speed signal is input.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-40
4	Vehicle speed fail signal abnormality	Although the SAS controller is detecting a stop or vehicle speed sensor failure, the vehicle speed signal is input.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-41
5	SAS failure	The SAS controller judges a vehicle speed sensor failure.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-42
6	NMR variable resistor failure	An abnormal value is input from the NMR variable resistor. (Open or short circuit)	Fix step motor to the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-43
7	A GND open-circuit	The input value from the NMR variable resistor is abnormal.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-43
8	Over-speed	The speed exceeds the set NMR value.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-45
9	EEP ROM abnormality	Access to the EEP ROM fails.	The stepping motor is fixed at the specified position. (Vehicle speed restriction: 9 km/h (5.6 mph))	1-45

NMR: No-load maximum speed

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REMOVAL·INSTALLATION

Note:
Do not reset the error memory until the end of repair and replacement.



Removal Procedure

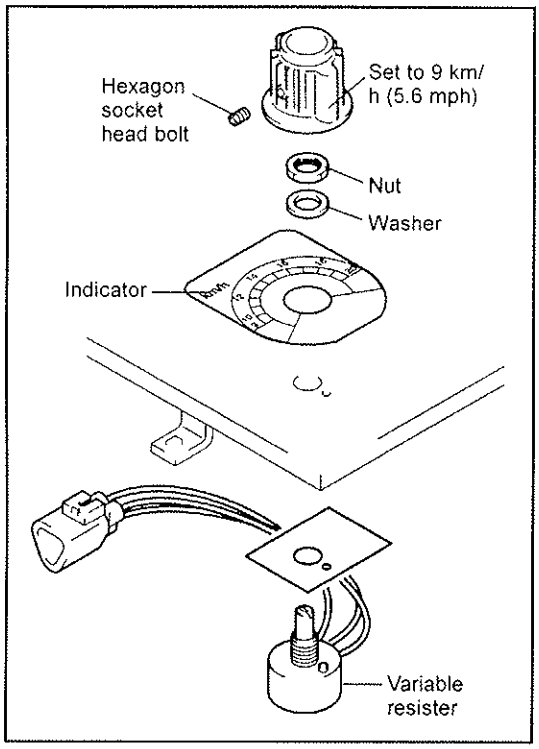
1 Open the engine hood and disconnect the battery negative (-) terminal.
2 Remove the toe board.
3 Remove the step RH.
4 Disconnect the harness clamp from the controller bracket.
5 Remove the vehicle speed controller mounting bolt.
6 Disconnect the connector from the controller, and remove the controller.
7 Remove the cover for the NMR (no-load maximum speed) variable resistor.
8 Disconnect the connector from the NMR variable resistor, and remove the variable resistor. **[Point 1]**
9 Disconnect connectors from the actuator and limit switch.
10 Disconnect the harness clamp from the actuator bracket.
11 Disconnect two accelerator wires.
12 Remove the accelerator wire bracket. (Only for diesel engine vehicle)
13 Remove the support bolt and the actuator W/link ASSY.
14 Remove the wire link on the injection pump (carburetor) side.
15 Remove the limit switch. **[Point 2]**
16 Remove the wire link on the pedal side.
17 Remove the actuator from the actuator bracket. **[Point 3]**

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Installation Procedure

The installation procedure is the reverse of the removal procedure.

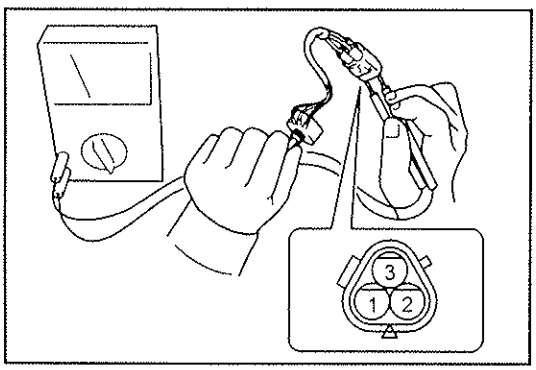
Note:
After installation, adjust the accelerator wire and throttle wire. (See p. 1-36.)
After installation, operate the accelerator pedal to see that links are functioning normally.

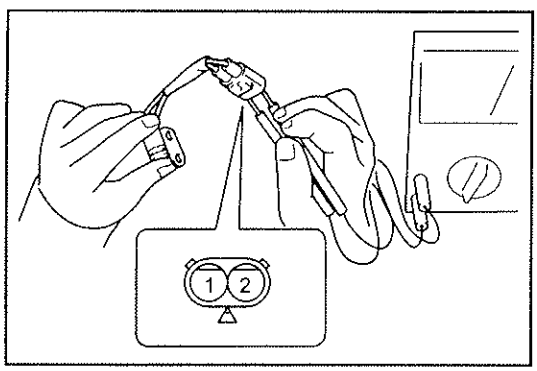


Point Operations

[Point 1]
Removal:
Remove the hexagon socket head bolt from the knob using a 2-mm hexagon wrench.

Installation:
Install the variable resistor as instructed below:
1. Turn the NMR variable resistor fully counterclockwise and install it through the hole in the bracket by tightening the nut.
2. Install the knob through the washer and nut. Align the while line in the knob to 9 km/h (5.6 mph) and tighten the hexagon socket head bolt.





Inspection:
Check resistance of the maximum vehicle speed setting variable resistor.
1. Turn the knob of the variable resistor fully counterclockwise and measure the resistance.

Tester range: Ω × **1k range**
Standard: **Between ① and ②: 0 Ω**
Between ② and ③: 10 ± 1 kΩ
Between ③ and ①: 10 ± 1 kΩ

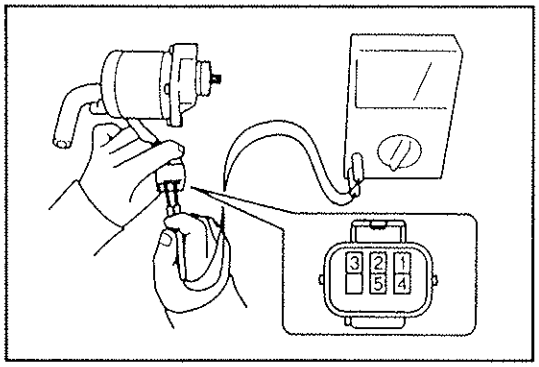
2. Turn the knob of the variable resistor all the way clockwise and measure the resistance.

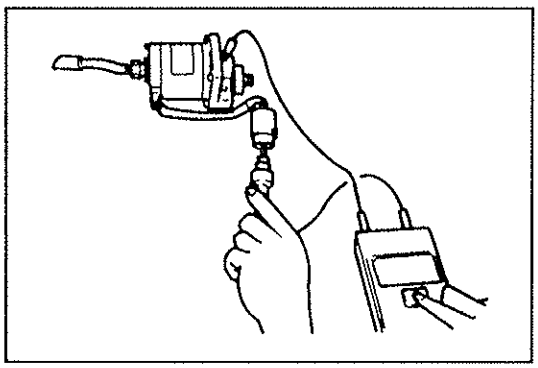
Tester range: Ω × **1k range**
Standard: **Between ① and ②: 10 ± 1 kΩ**
Between ② and ③: 10 ± 1 kΩ
Between ③ and ①: 0 Ω

[Point 2]
Inspection:
Check continuity of the limit switch.

Standard: **Free position: ∞ Ω**
When pressed in by 2.3 (0.091 in) mm or more: 0 Ω

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[Point 3]

Inspection:

Check the actuator.

1. Check that the actuator shaft can be manually turned smoothly without sticking.
2. Check the resistance of the actuator.

Tester range: Ω × **1 range**
Standard: **Between ① and ③: 3.3 Ω**
Between ② and ③: 3.3 Ω
Between ① and ④: 6.6 Ω
Between ② and ⑤: 6.6 Ω

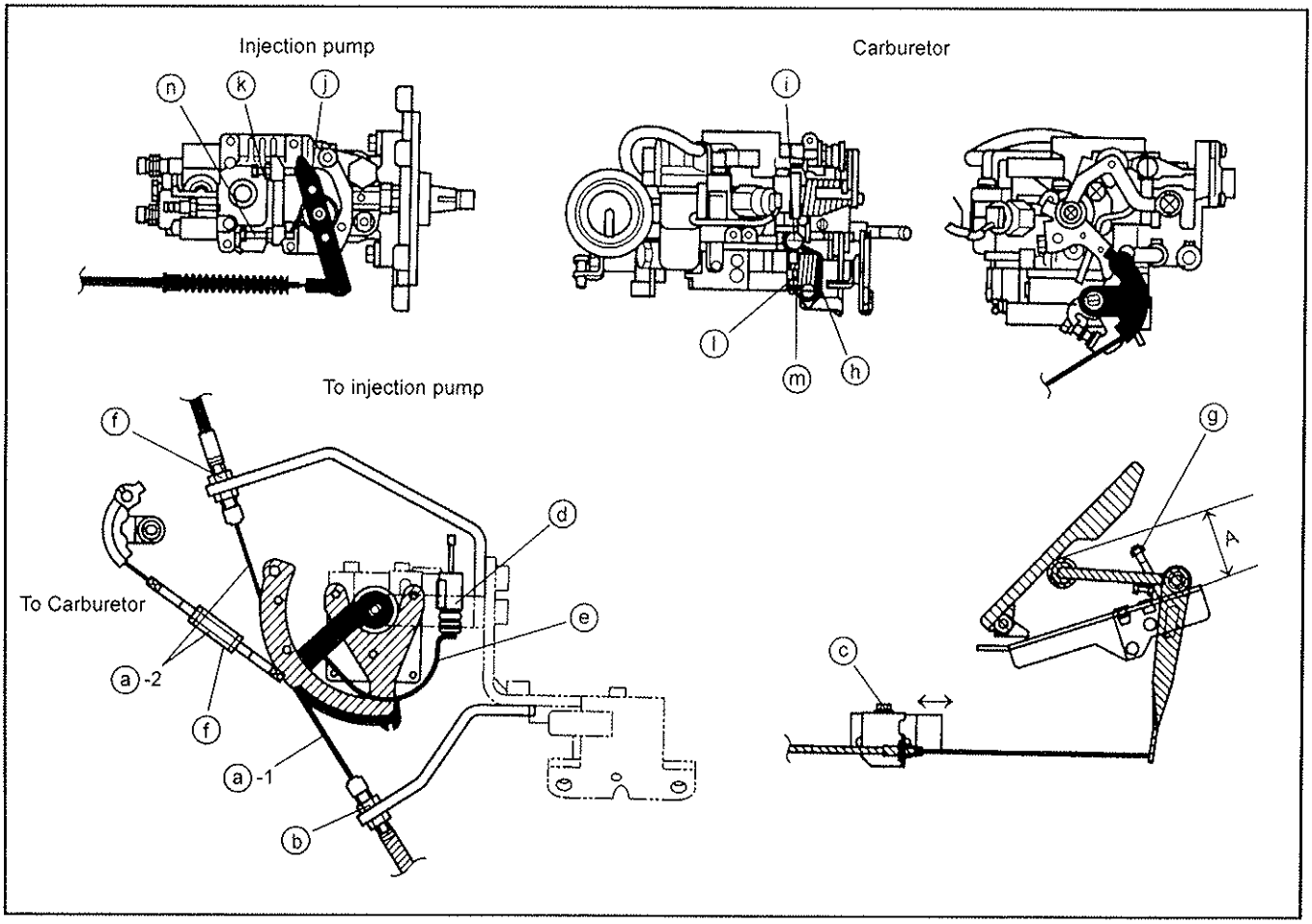
Inspection:

Measure the insulation resistance between each actuator terminal and body.

Tester range: Ω × **1M range**
Standard: **100 MΩ or more**

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ACCELERATION AND THROTTLE WIRE ADJUSTMENT



1. Adjust accelerator link height A.

2. Adjust ⓑ and ⓒ so that deflection of the accelerator wire is 5 mm (0.20 in) when ⓐ-1 portion is pressed. Measure the deflection after setting the actuator bracket horizontally.

3. Gasoline engine vehicle (4Y):
   After warming up the engine, set the ignition key to ON.
   See that the limit switch ⓓ is in contact with the link ⓔ and pressed to ON. Next, while pushing the ⓐ-2 portion with the lever ⓗ is in contact with bolt ⓘ, adjust ⓕ until the deflection of the throttle wire becomes 5 mm (0.20 in).
   Diesel engine vehicle (1DZ-II•2Z):
   See that the limit switch ⓓ is in contact with the link ⓔ when the ignition switch is turned ON. Next, while pushing the ⓐ-2 portion with the throttle lever ⓙ in contact with the idle adjusting screw ⓚ, adjust ⓕ until the throttle wire deflection becomes 5 mm (0.20 in).

4. Gasoline engine vehicle (4Y):
   Turn the ignition switch ON and fully depress the accelerator pedal. Adjust the accelerator pedal stopper bolt ⓖ until the clearance between lever ⓛ and body ⓜ becomes 2 mm (0.079 in).
   Diesel engine vehicle (1DZ-II•2Z):
   Turn the ignition switch ON and fully depress the accelerator pedal. Adjust the accelerator pedal stopper bolt ⓖ until the clearance between throttle lever ⓙ and maximum adjusting screw ⓝ becomes 2 mm (0.079 in).

5. Operate the accelerator pedal 2 or 3 times after the above adjustment to check if links operate smoothly.

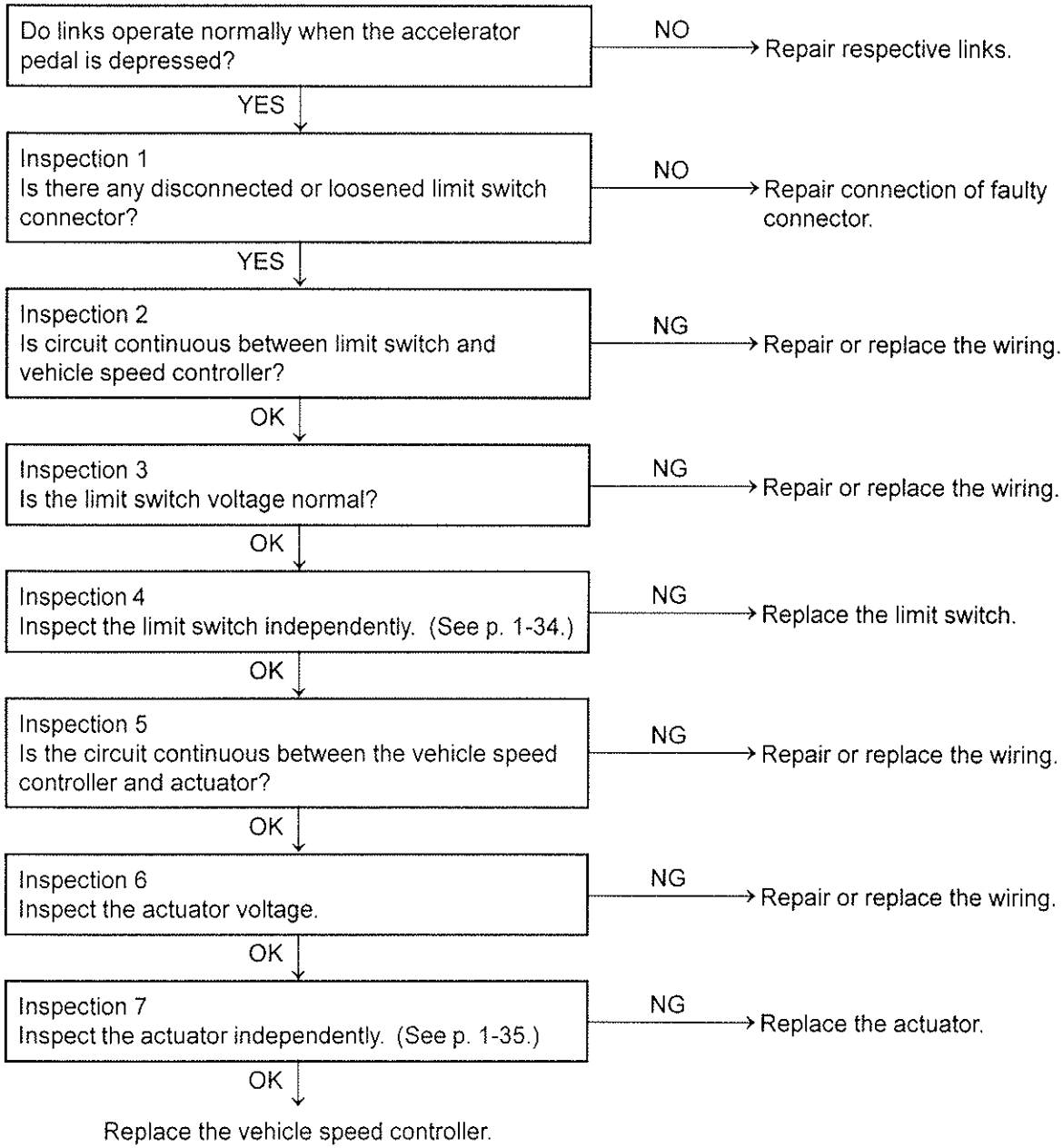
Note:
A are the same as on the standard vehicle. (See p. 1-26.)

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TROUBLESHOOTING

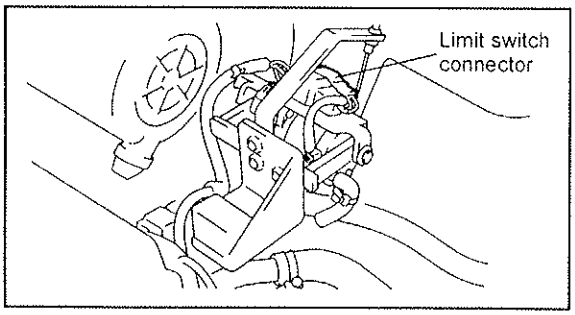
Troubleshooting of Problems with Error Code Display

1. Error codes 1 and 2 (Limit switch open/short circuit)



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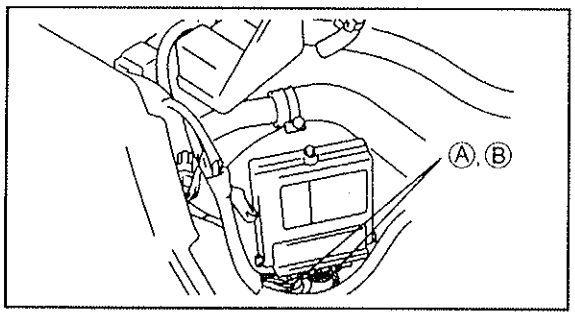
Inspection 1:
Limit switch connector inspection
Check for any disconnected or loose connector.

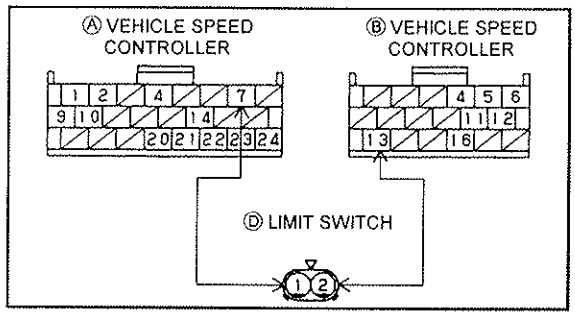


YES → Go to Inspection 2.
NG → Repair connection of the connector.

Inspection 2:
Limit switch harness continuity inspection
Disconnect the limit switch connector and vehicle speed controller connector.

Tester range: Ω × 1	
Measurement terminals	Between vehicle speed controller A-7 and limit switch connector D-1 Between vehicle speed controller B-13 and limit switch connector D-2
Standard	0 Ω

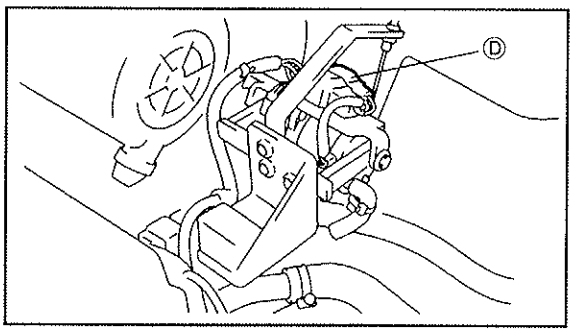


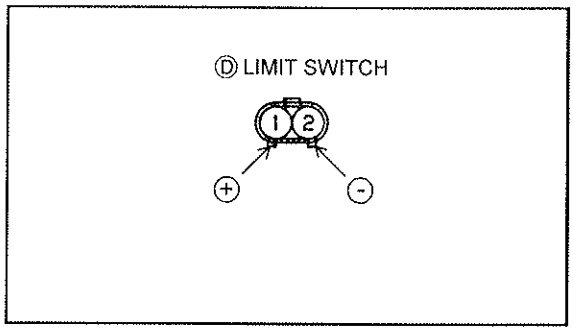


OK → Go to Inspection 3.
NG → Repair or replace the wiring between limit switch and vehicle speed controller.

Inspection 3:
Limit switch harness voltage inspection
Disconnect the limit switch connector and turn the ignition switch to ON.

Tester range: 50 V DC	
Measurement terminals	Between limit switch D-1 ⊕ and limit switch D-2 ⊖
Standard	4.5 ~ 5.2 V





OK → Go to Inspection 4.
NG → Repair or replace the wiring between battery and limit switch.

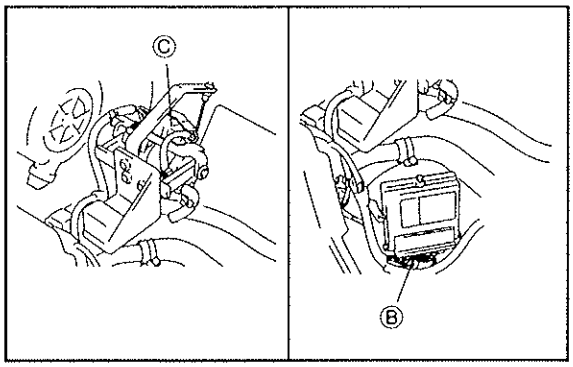
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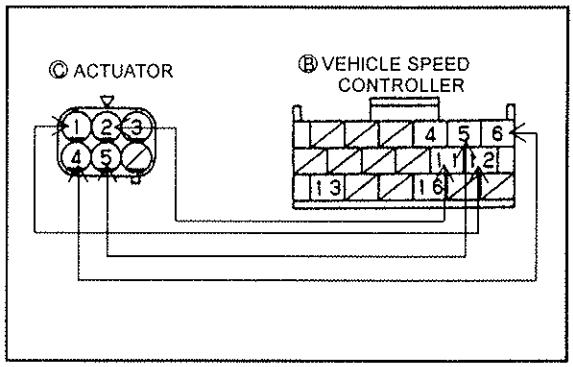
Inspection 4:
Independent limit switch inspection (See p. 1-34.)

OK → Go to Inspection 5.
NG → Replace the limit switch.

Inspection 5:
Actuator harness continuity inspection
Disconnect the actuator connector and the vehicle speed controller connector.

Tester range: Ω × 1	
Measurement terminals	Between vehicle speed controller B-6 and actuator C-4 Between vehicle speed controller B-5 and actuator C-5 Between vehicle speed controller B-12 and actuator C-1 Between vehicle speed controller B-11 and actuator C-2
Standard	0 Ω

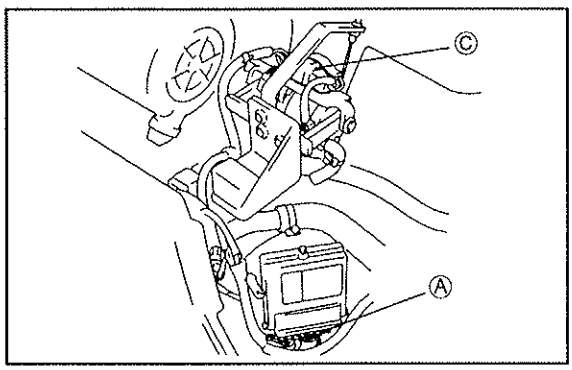


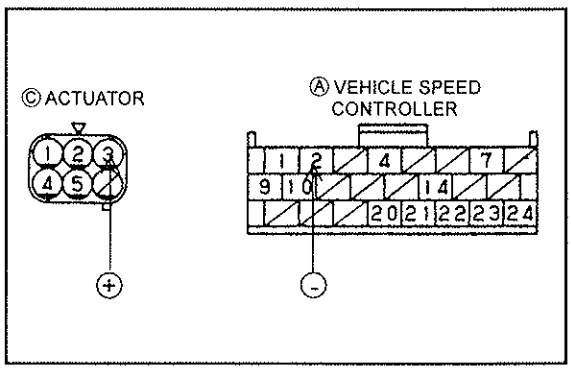


OK → Go to Inspection 6.
NG → Repair or replace the wiring between battery and actuator.

Inspection 6:
Actuator voltage inspection
Turn the ignition switch to ON.

Tester range: 50 V DC	
Measurement terminals	Between actuator C-3 ⊕ and vehicle speed controller A-2 ⊖
Standard	12V (battery voltage)





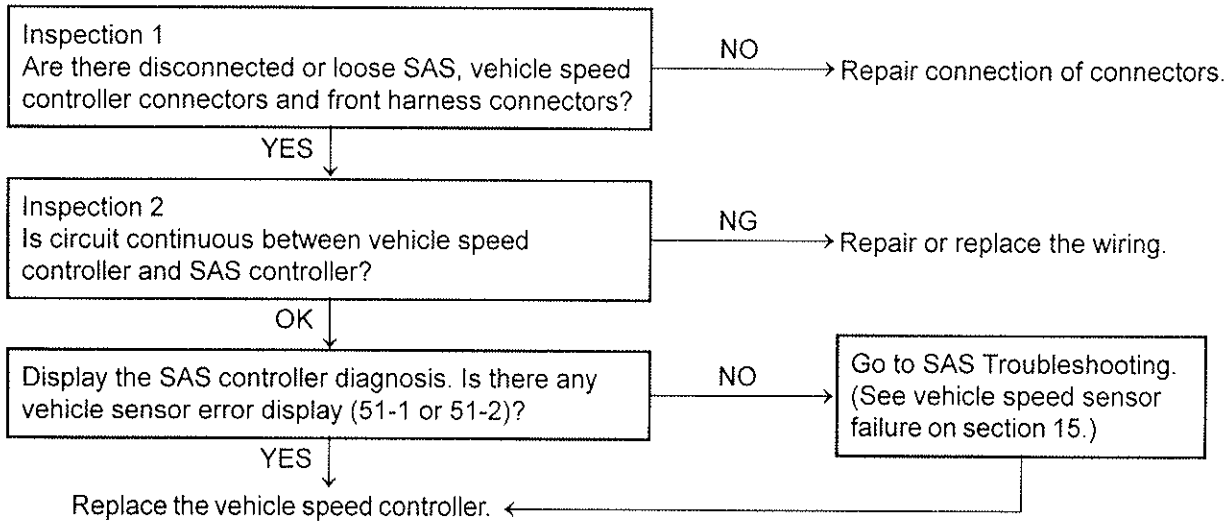
OK → Go to Inspection 7.
NG → Repair or replace the wiring between battery and actuator.

Inspection 7:
Independent actuator inspection (See p. 1-35.)

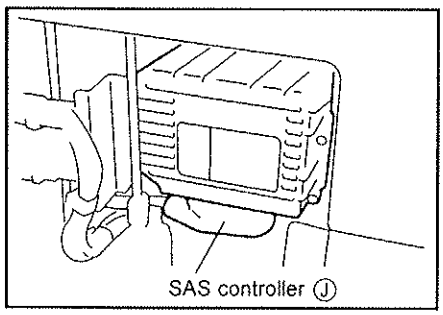
OK → Replace the vehicle speed controller.
NG → Replace the actuator.

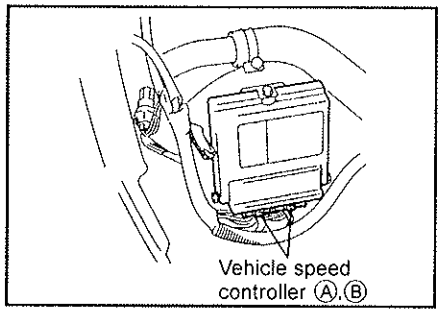
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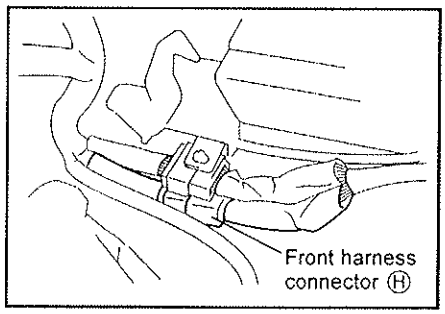
2. Error code 3 (Vehicle speed sensor failure)



Inspection 1:
SAS controller, vehicle speed controller and front harness connector inspection
Check for any disconnected or loose connectors.



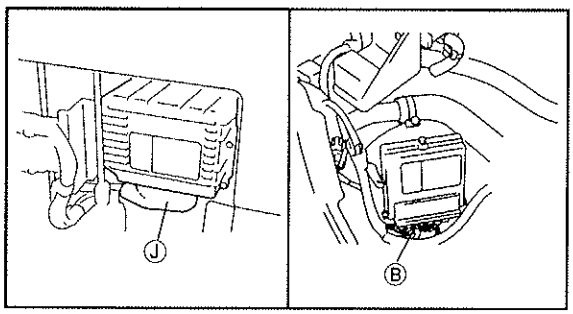


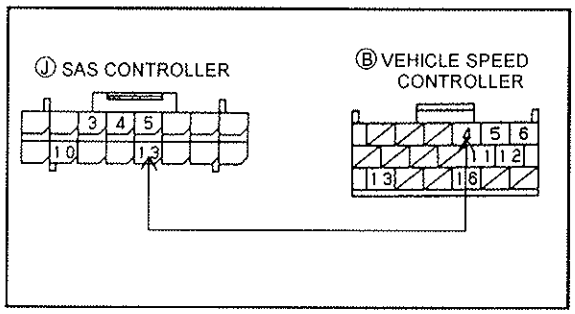


YES → Go to Inspection 2.
NO → Repair connection of connectors.

Inspection 2:
SAS controller harness continuity inspection
Disconnect the SAS controller connector and the vehicle speed controller connector B.

Tester range: Ω × 1	
Measurement terminals	Between vehicle speed controller B-4 and SAS controller J-13
Standard	0 Ω

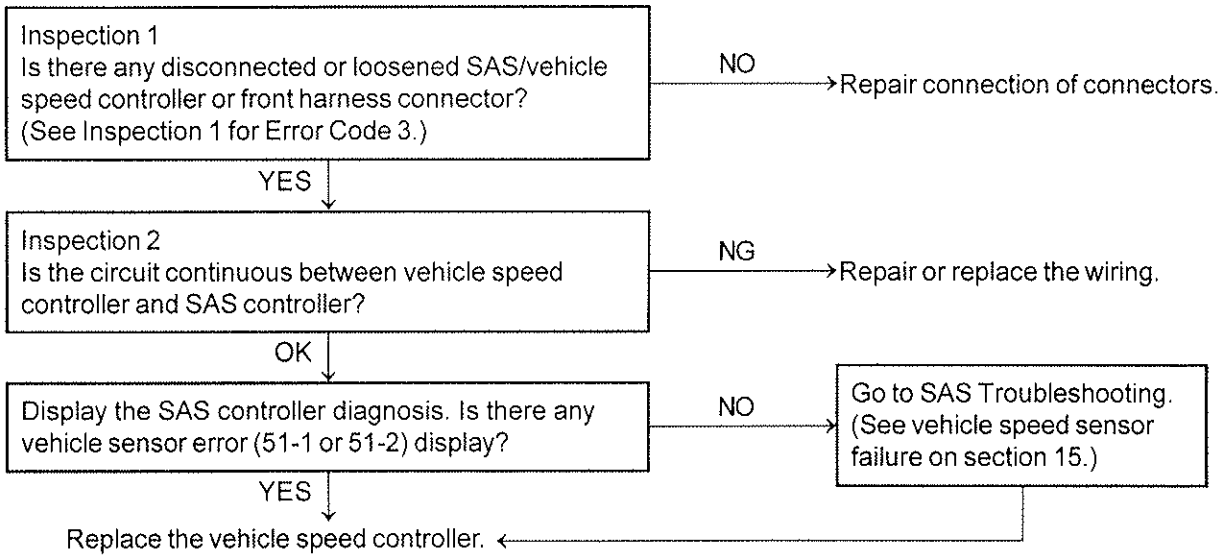




OK → SAS controller diagnosis (vehicle speed sensor error 51-1 or 51-2) check.
NG → Repair or replace the wiring between SAS controller and vehicle speed controller.

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3. Error code 4 (Vehicle speed sensor failure)

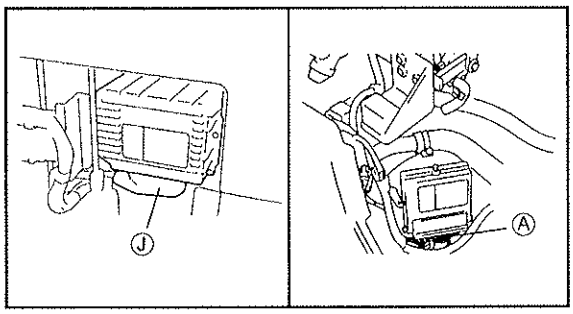


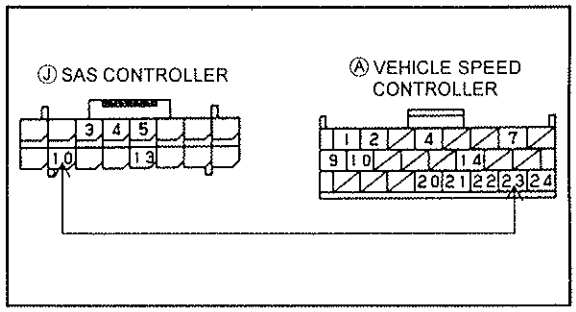
Inspection 1:
SAS controller, vehicle speed controller and front harness connector inspection
(See Inspection 1 of Error Code 3.)

YES → Go to Inspection 2.
NO → Repair connection of connectors.

Inspection 2:
SAS controller harness continuity inspection
Disconnect the SAS controller connector and the vehicle speed controller connector A.

Tester range: Ω × 1	
Measurement terminals	Between vehicle speed controller A-23 and SAS controller J-10
Standard	0 Ω

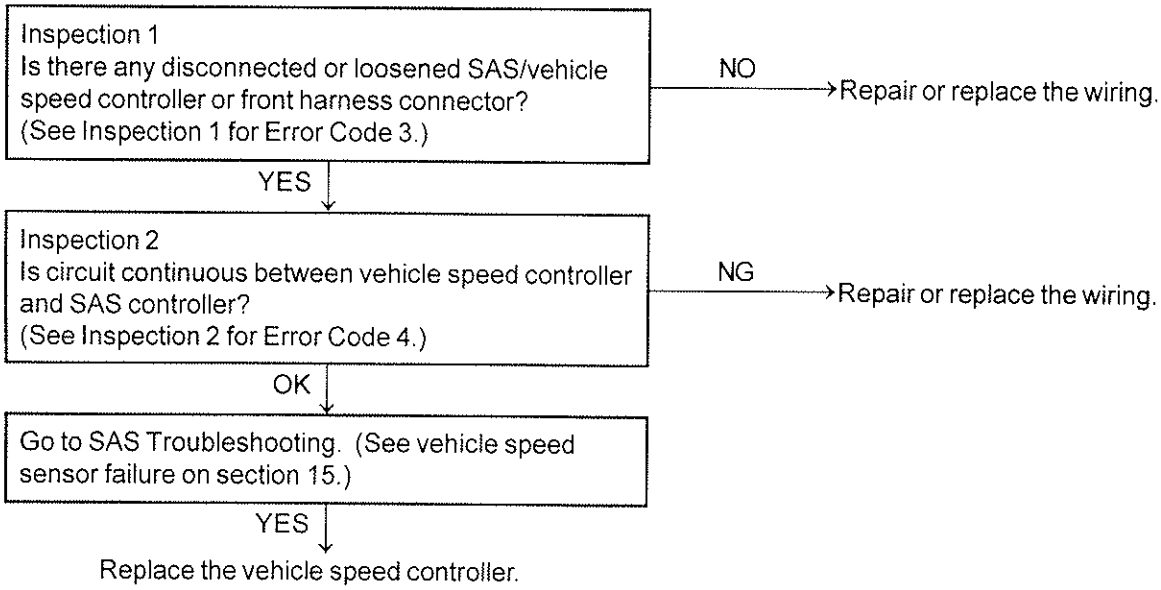




OK → SAS controller diagnosis (vehicle speed sensor error 51-1 or 51-2) check.
NG → Repair or replace the wiring between SAS controller and vehicle speed controller.

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4. Error code 5 (SAS controller failure)



Inspection 1:
SAS controller, vehicle speed controller and front harness connector inspection
(See Inspection 1 for Error Code 3.)

YES → Go to Inspection 2.
NO → Repair connection of connectors.

Inspection 2:
SAS controller harness continuity inspection
(See Inspection 2 for Error Code 4.)

OK → Go to SAS Controller Troubleshooting. (See vehicle speed sensor failure on section 15.)
NG → Repair or replace the wiring between SAS controller and vehicle speed controller.

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5. Error code 6, 7 (Maximum vehicle speed set variable resistor failure)

Inspection 1
Is there any disconnected or loosened NMR variable resistor connector?
NO → Repair connection of connectors.
YES ↓

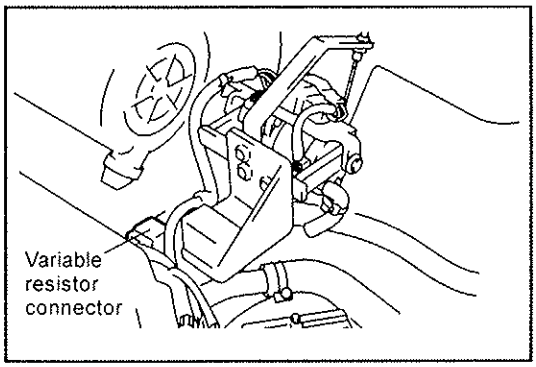
Inspection 2
Is the circuit continuous between vehicle speed controller and NMR variable resistor?
NG → Repair or replace the wiring.
OK ↓

Inspection 3
Check the NMR variable resistor voltage.
NG → Repair or replace the wiring.
OK ↓

Inspection 4
Independent NMR variable resistor inspection
(See p. 1-34.)
NG → Replace the NMR variable resistor.
OK ↓

Replace the vehicle speed controller.

Inspection 1:
NMR variable resistor connector inspection
Check for any disconnected or loosened connector.

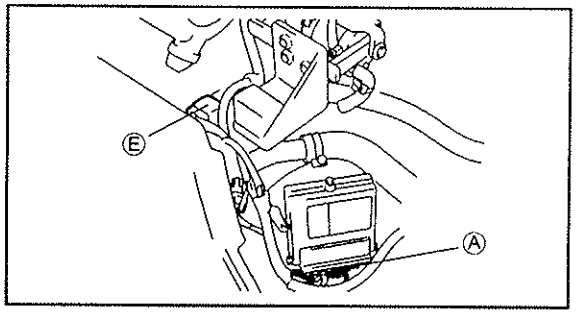


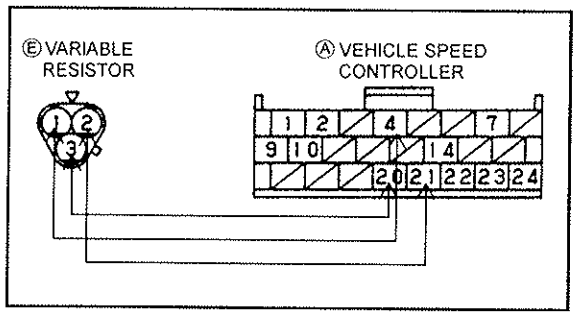
YES → Go to Inspection 2.
NO → Repair connection of connectors.

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Inspection 2:
NMR variable resistor harness continuity inspection
Disconnect the NMR variable resistor connector E and vehicle speed controller connector A.

Tester range: Ω × 1	
Measurement terminals	Between vehicle speed controller A-20 and NMR variable resistor E-3 Between vehicle speed controller A-4 and NMR variable resistor E-1 Between vehicle speed controller A-21 and NMR variable resistor E-2
Standard	0 Ω

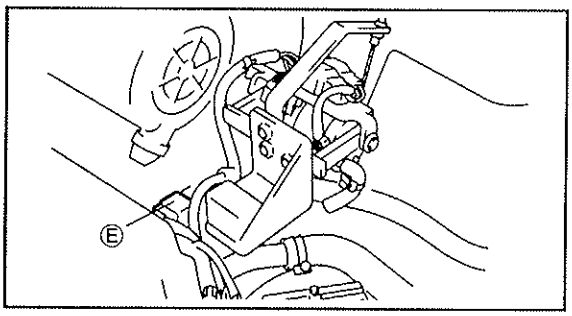


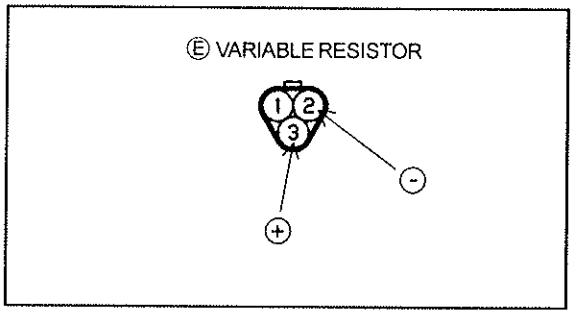


OK → Go to Inspection 3.
NG → Repair or replace the wiring between the NMR variable resistor and vehicle speed controller.

Inspection 3:
NMR variable resistor voltage inspection
Disconnect the NMR variable resistor connector and turn the ignition switch to ON.

Tester range: 50 V DC	
Measurement terminals	NMR variable resistor E-3 ⊕ and Between NMR variable resistor E-2 ⊖
Standard	5 ± 0.25 V





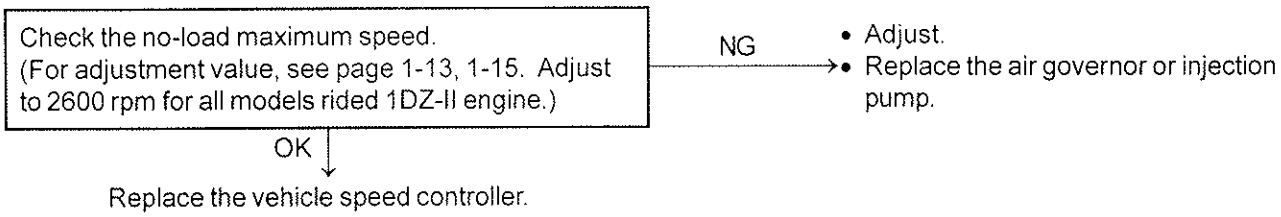
OK → Go to Inspection 4.
NG → Repair or replace the wiring between the battery and NMR variable resistor.

Inspection 4:
Independent NMR variable resistor inspection
(See p. 1-34.)

OK → Replace the vehicle speed controller.
NG → Replace the NMR variable resistor.

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6. Error code 8 (Over-speed)



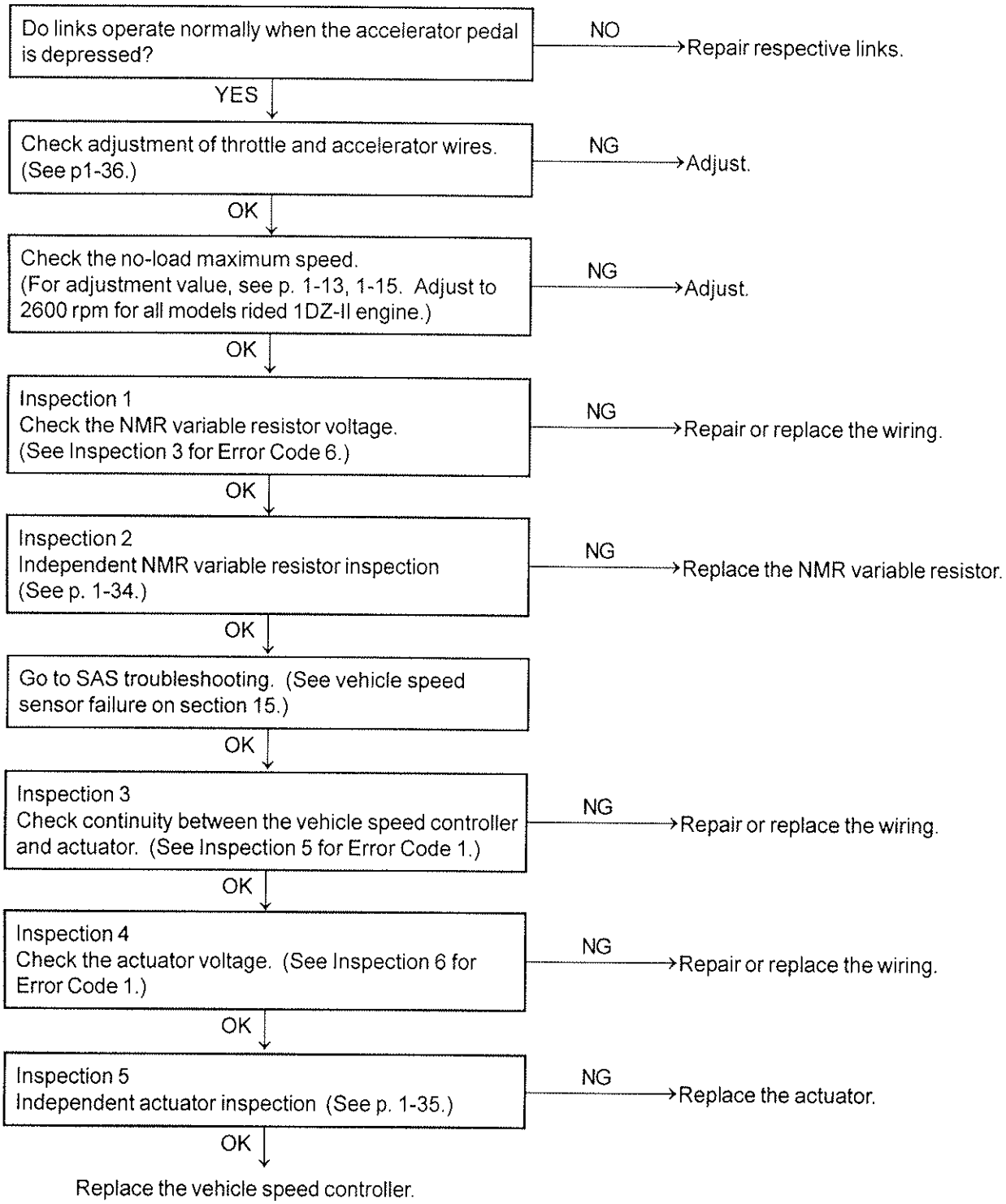
7. Error code 9 (EEP ROM failure)

Replace the vehicle speed controller.

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Troubleshooting for No Error Code Display

1. Mismatching of maximum vehicle speed with set maximum speed



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Inspection 1:
NMR variable resistor voltage inspection
(See Inspection 3 for Error Code 6.)

OK → Go to Inspection 2.
NG → Repair or replace the wiring between the battery and NMR variable resistor.

Inspection 2:
Independent NMR variable resistor inspection
(See p. 1-34.)

OK → Go to SAS Controller Troubleshooting. (See the vehicle speed sensor failure on section 15.)
NG → Replace the NMR variable resistor.

Inspection 3:
Actuator harness continuity inspection (See Inspection 5 for Error Code 1.)

OK → Go to Inspection 4.
NG → Repair or replace the wiring between actuator and vehicle speed controller.

Inspection 4:
Actuator voltage inspection (See Inspection 6 for Error Code 1.)

OK → Go to Inspection 2.
NG → Repair or replace the wiring between battery and actuator.

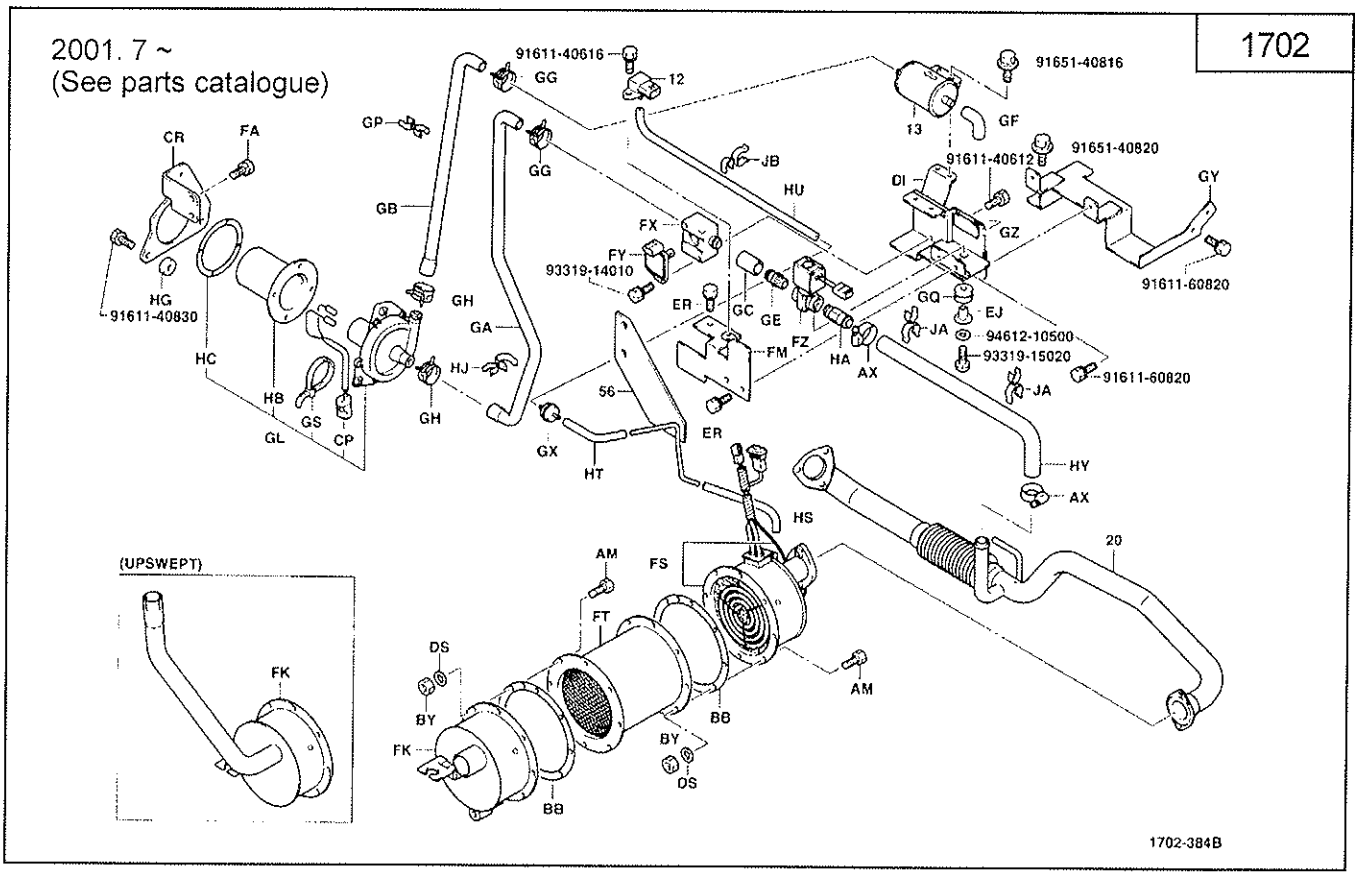
Inspection 5:
Independent actuator inspection (See p. 1-35.)

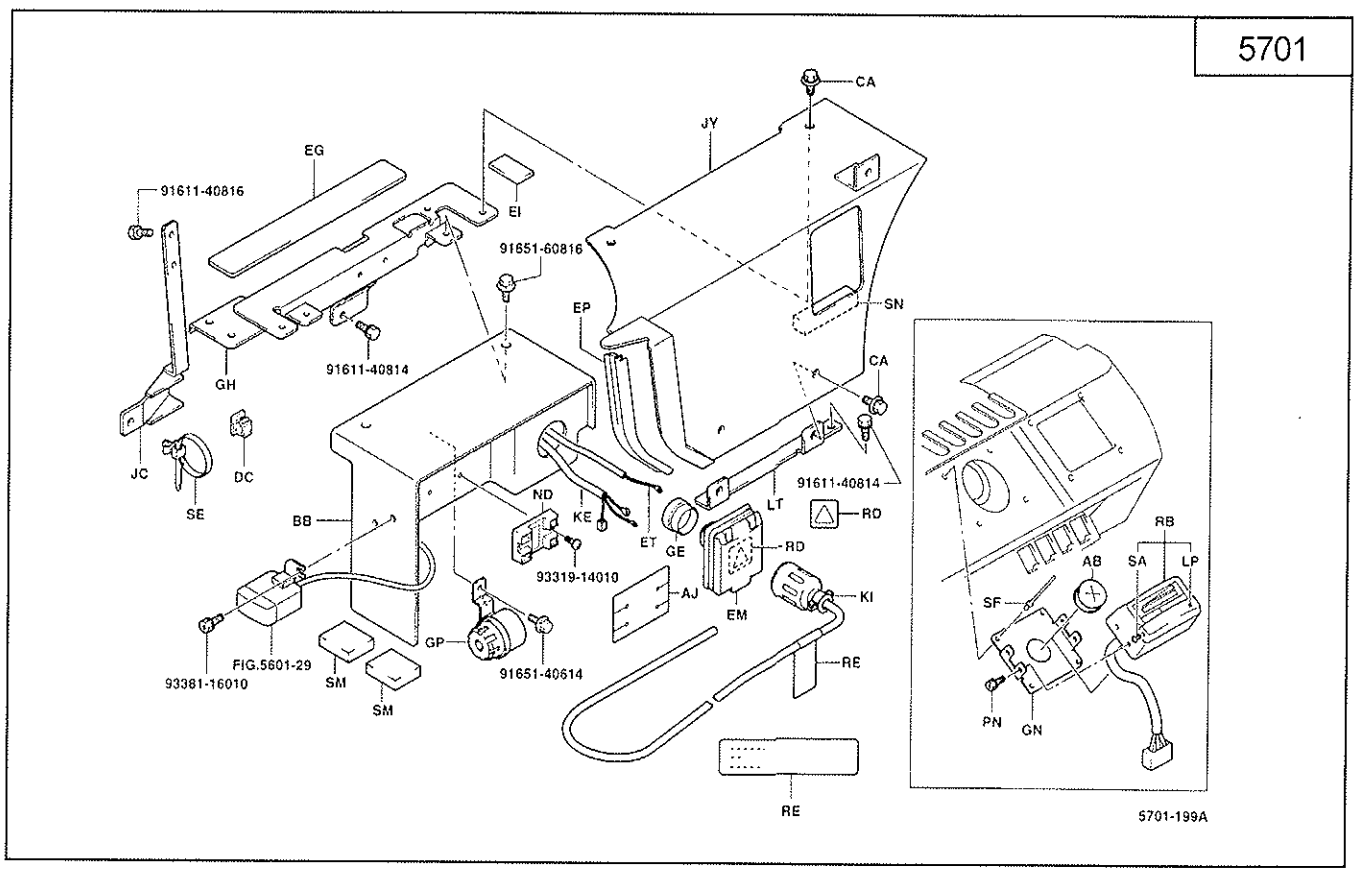
OK → Replace the vehicle speed controller.
NG → Replace the actuator.

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DPF-II SYSTEM (OPT)

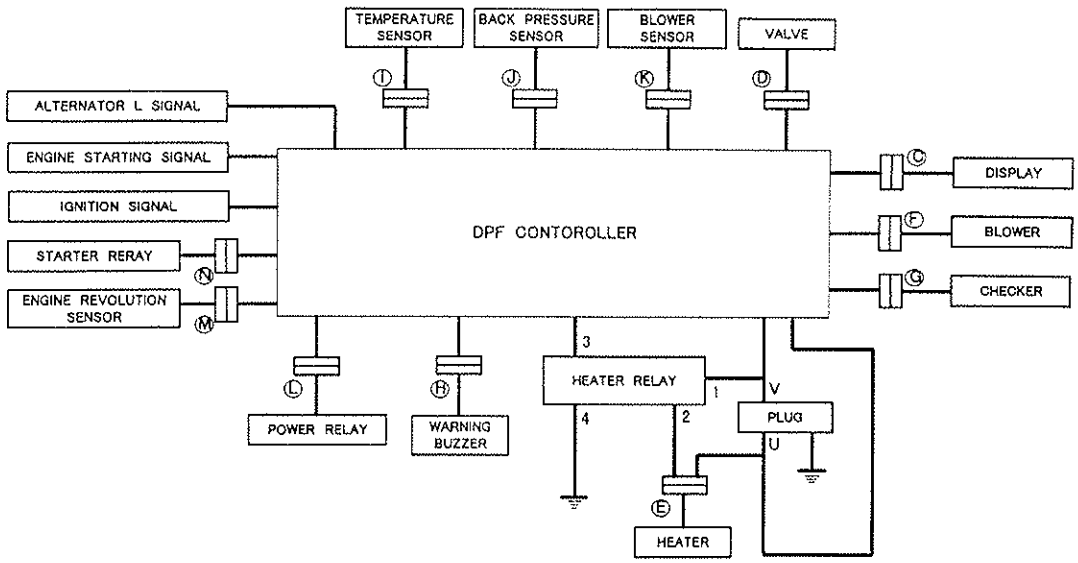
COMPONENTS



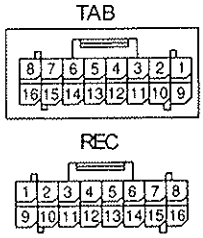


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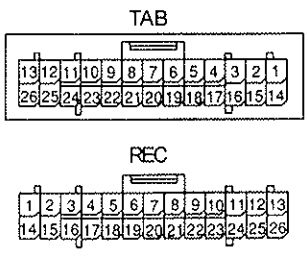
CONNECTING DIAGRAM



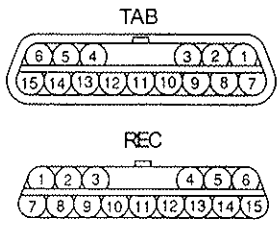
Ⓐ Controller



Ⓑ Controller



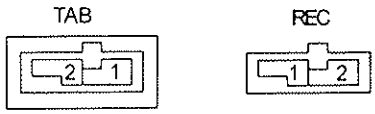
Ⓒ Display



Ⓓ Valve



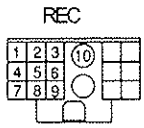
Ⓔ Heater



Ⓕ Blower



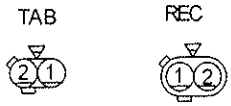
Ⓖ Checker



Ⓗ Buzzer



Ⓘ Temperature sensor



Ⓙ Back pressure sensor



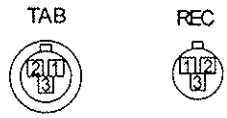
Ⓚ Blower sensor



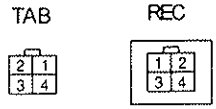
Ⓛ Power relay



Ⓜ Revolution sensor

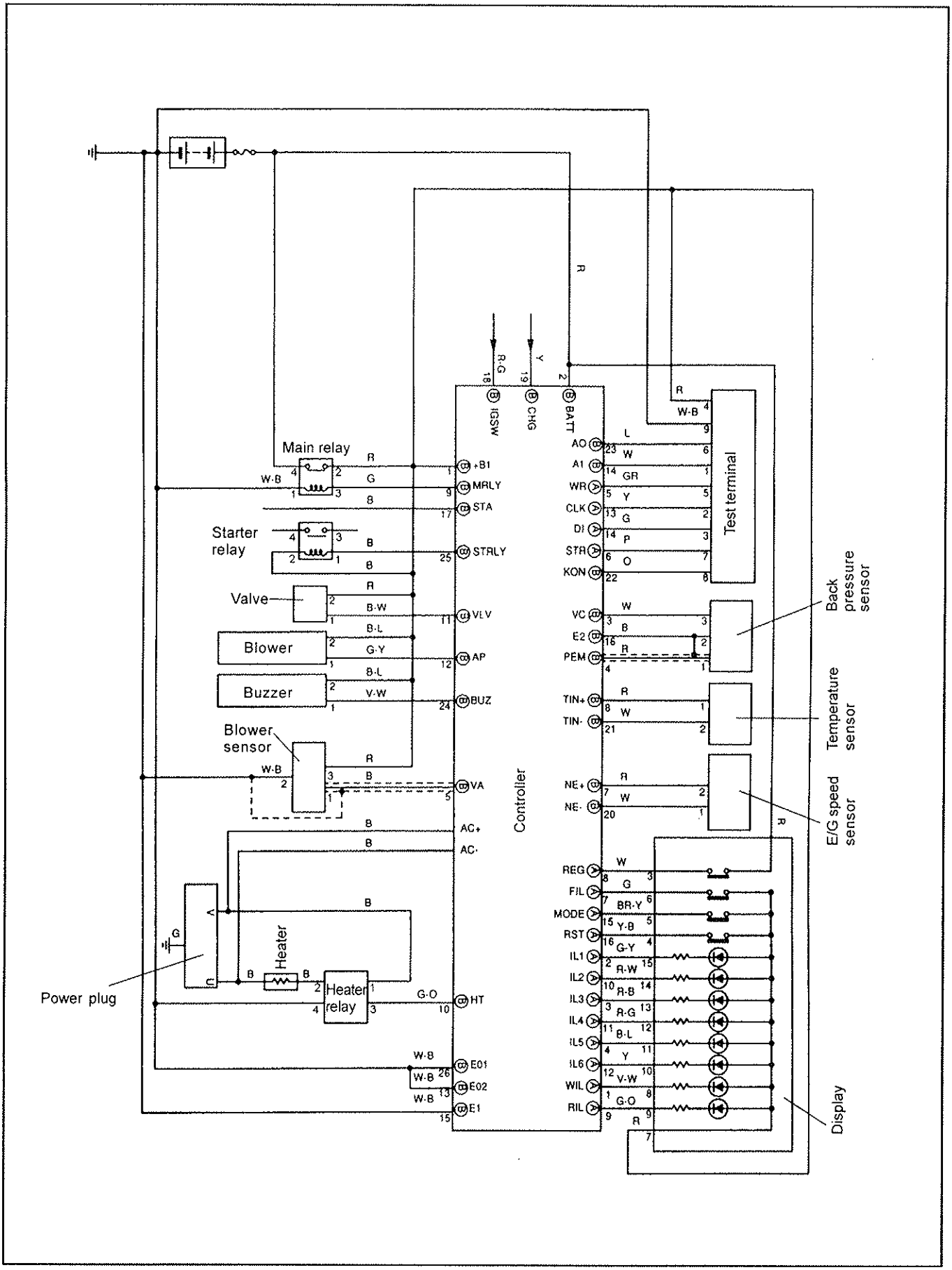


Ⓝ Starter relay



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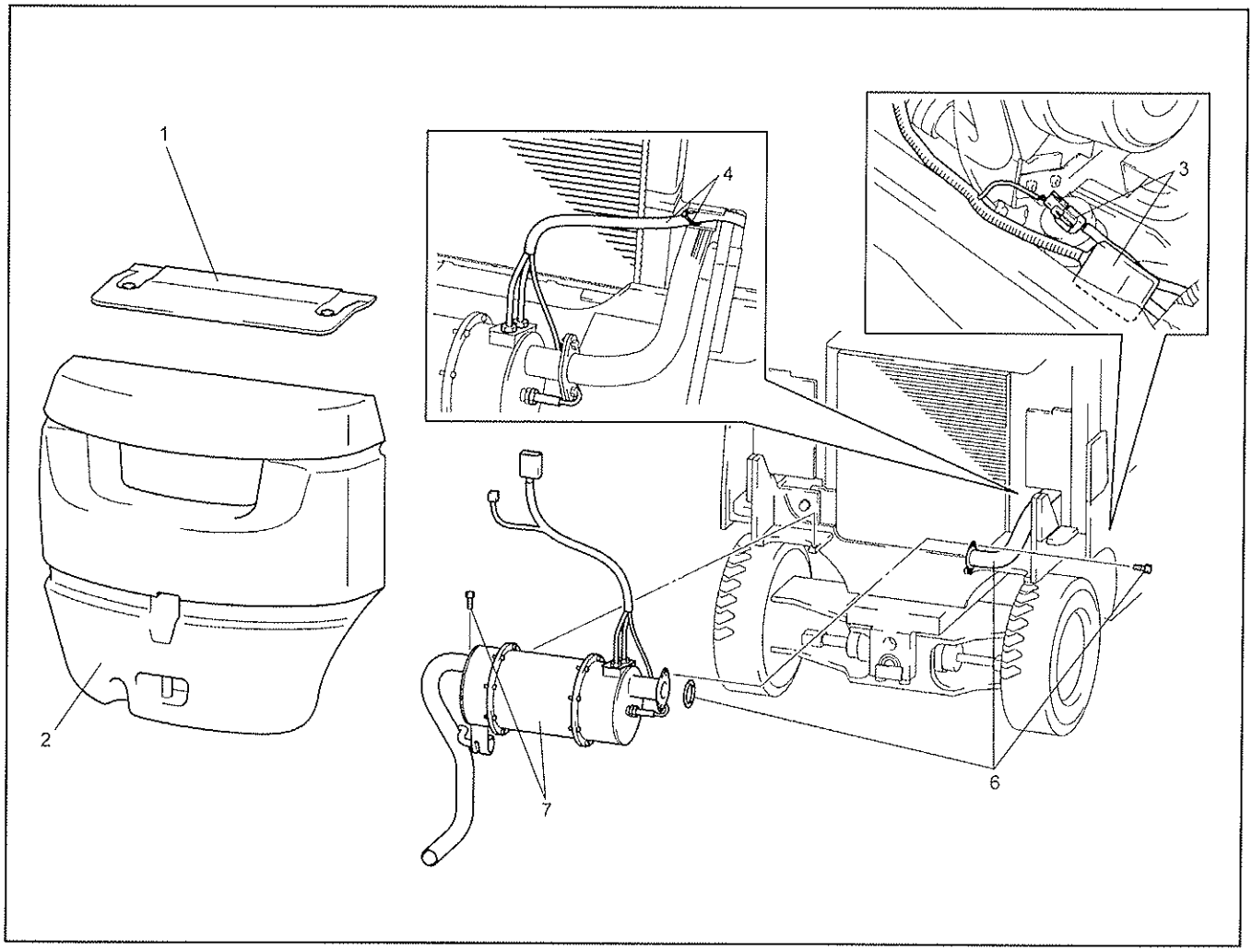
ELECTRICAL CIRCUIT DIAGRAM



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DPF MUFFLER REMOVAL·INSTALLATION

~ 2001. 7



Removal Procedure

1 Remove the radiator cover.

2 Remove the weight.

3 Open the engine hood, and disconnect the heater and temperature sensor connector.

4 Cut the tie-wrap and pull the heater and temperature sensor harness out toward the rear side of the vehicle.

5 Disconnect the back pressure sensor connecting hose.

6 Disconnect the exhaust pipe from the muffler.

7 Remove the DPF muffler ASSY.

Installation Procedure

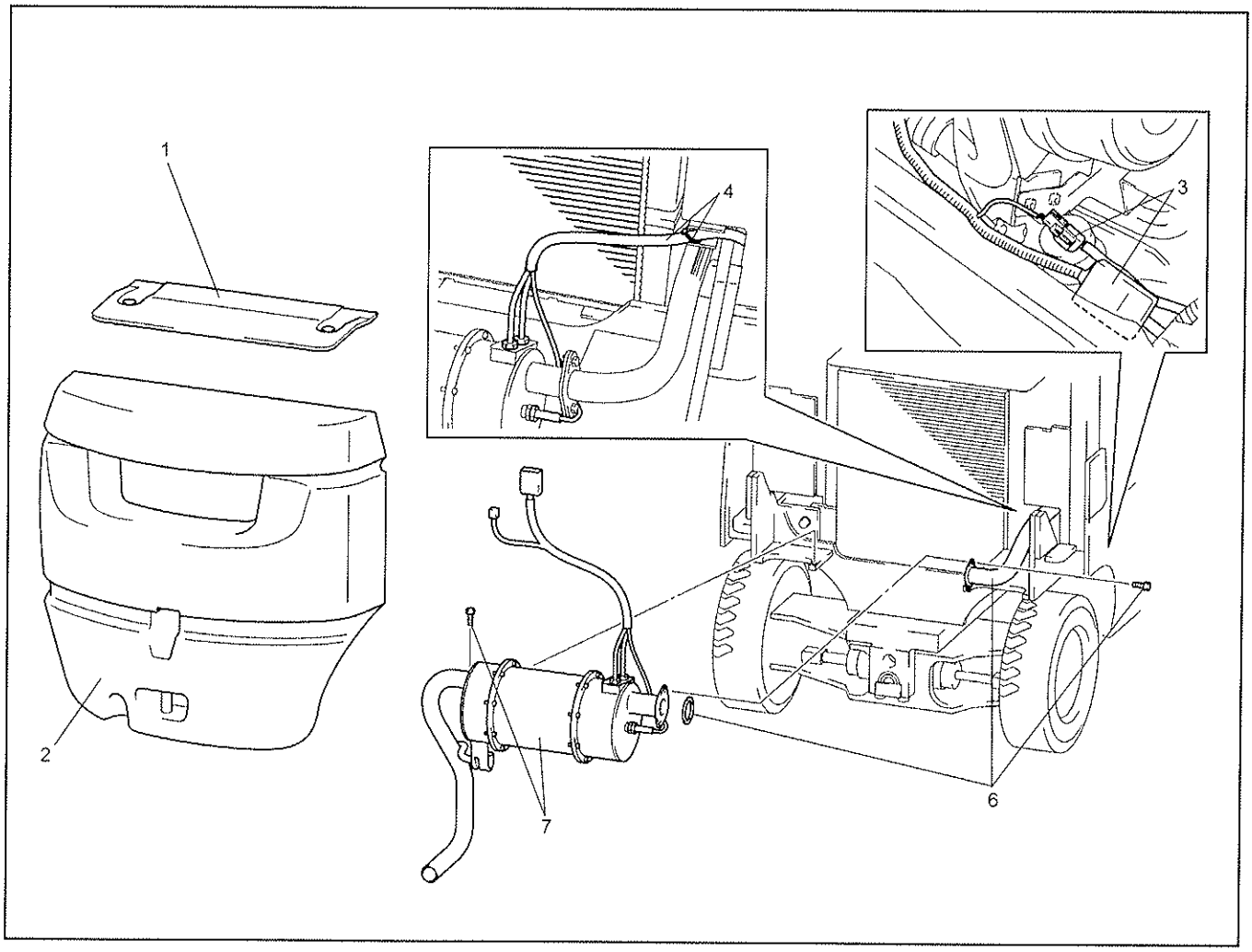
The installation procedure is the reverse of the removal procedure.

Note:

- **Replace the gasket between the muffler and exhaust pipe with a new one.**
- **When the muffler ASSY is replaced, clear the memory. (See page 1-60.)**

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2001. 7 ~



Removal Procedure

1 Remove the radiator cover.

2 Remove the weight.

3 Open the engine hood, and disconnect the heater and temperature sensor connector.

4 Cut the tie-wrap and pull the heater and temperature sensor harness out toward the rear side of the vehicle.

5 Disconnect the back pressure sensor connecting hose.

6 Disconnect the exhaust pipe from the muffler.

7 Remove the DPF muffler ASSY.

Installation Procedure

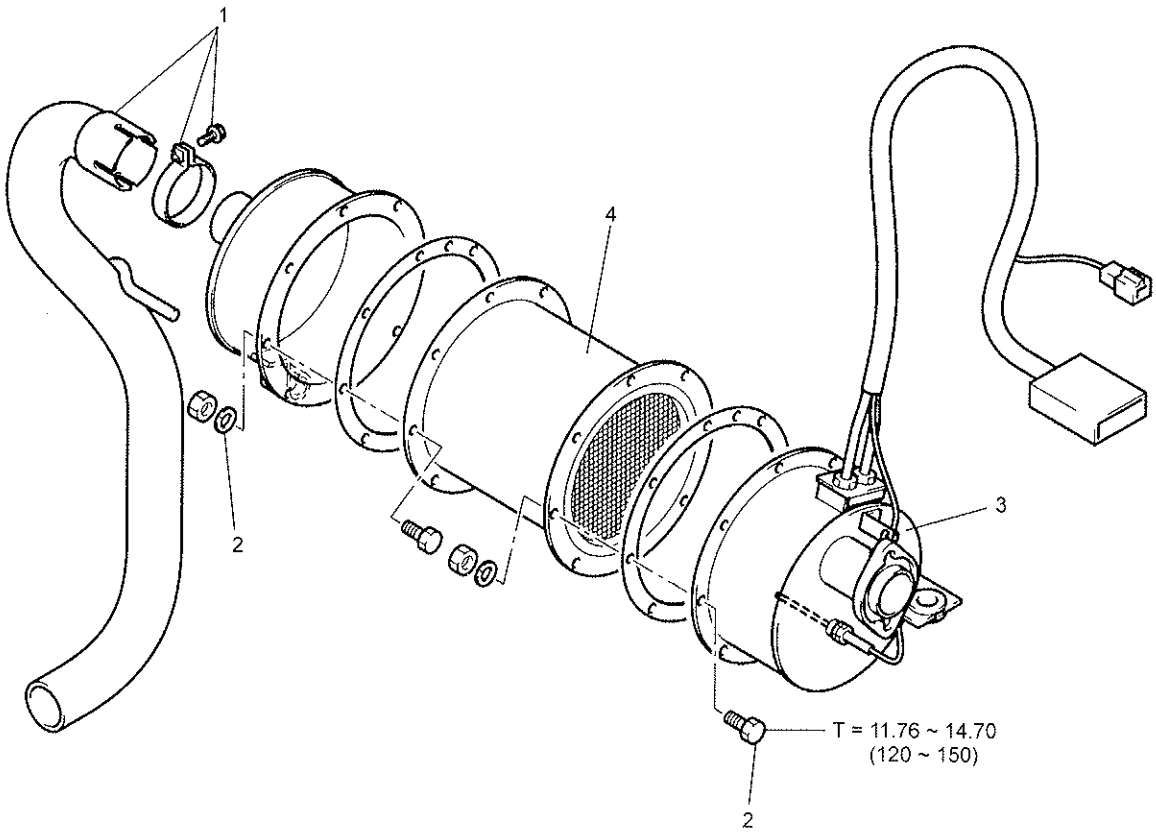
The installation procedure is the reverse of the removal procedure.

Note:
- **Replace the gasket between the muffler and exhaust pipe with a new one.**
- **When the muffler ASSY is replaced, clear the memory. (See page 1-60.)**

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DPF MUFFLER DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the outlet pipe.

2 Remove sixteen bolts. **[Point 1]**

3 Remove the DPF heater ASSY.

4 Remove the DPF jacket ASSY. **[Point 2]**

Reassembly Procedure

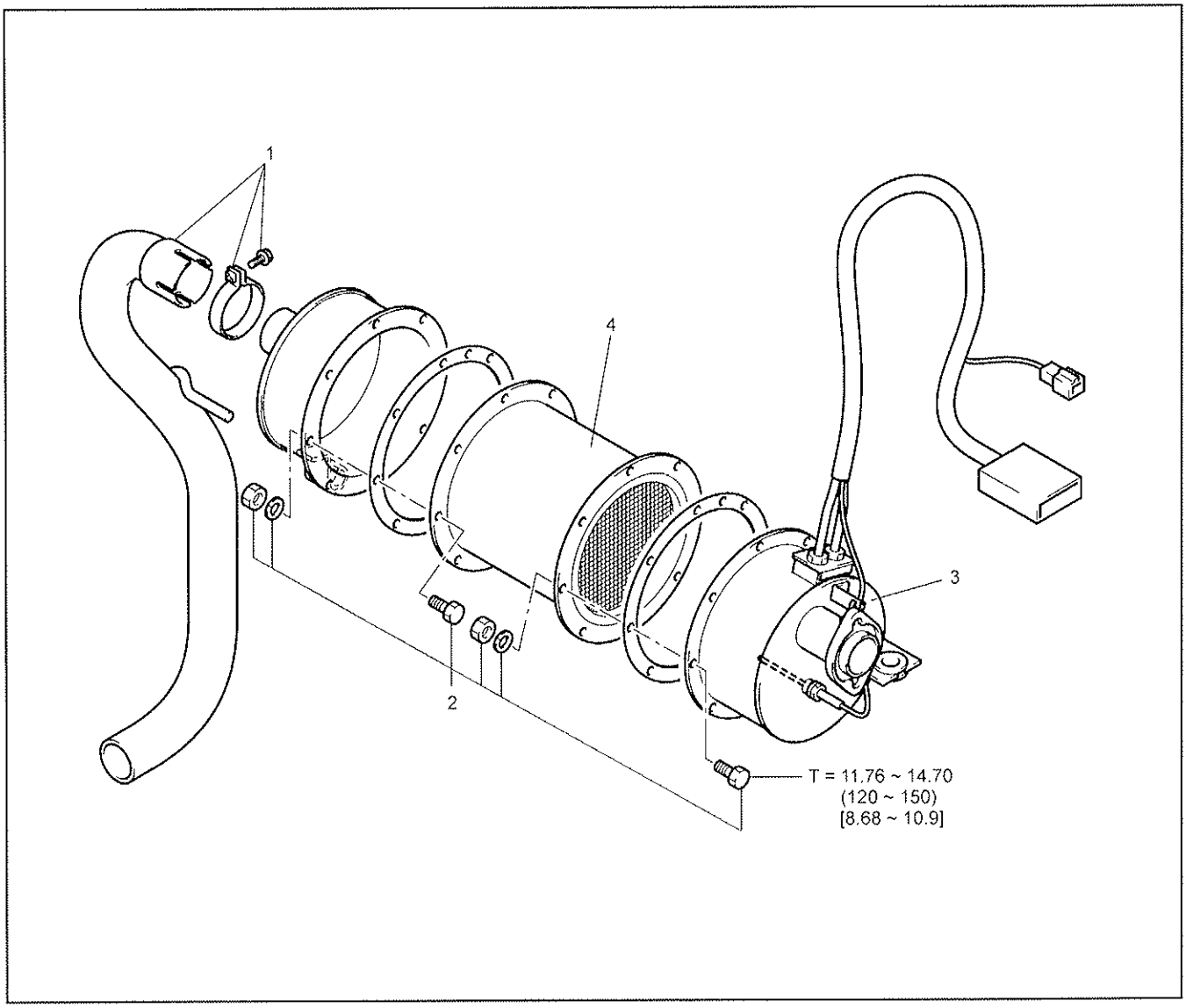
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Replace the DPF jacket ASSY gasket with a new one.**
- **When the DPF jacket ASSY is replaced, clear the memory. (See page 1-60.)**

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2001. 7 ~

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the outlet pipe.

2 Remove sixteen bolts. **[Point 1]**

3 Remove the DPF heater ASSY.

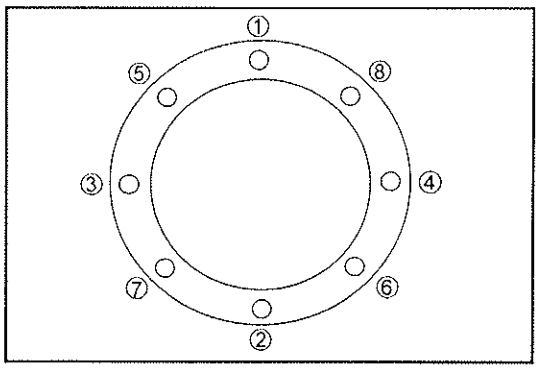
4 Remove the DPF jacket ASSY. **[Point 2]**

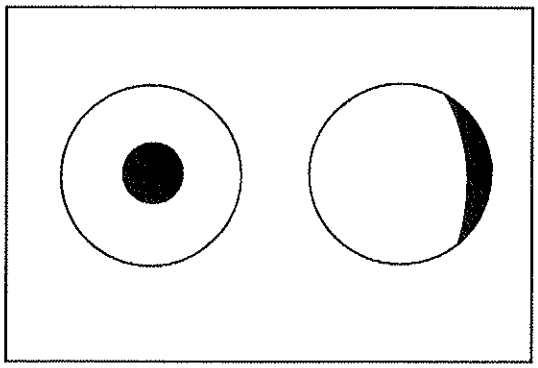
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Replace the DPF jacket ASSY gasket with a new one.**
- **When the DPF jacket ASSY is replaced, clear the memory. (See page 1-60.)**

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Point Operations

[Point 1]
Reassembly:
Install the bolts, nuts and washers in the illustrated order.

Note:
Use the specified bolts, nuts and washers. Use of general items may cause malfunction.

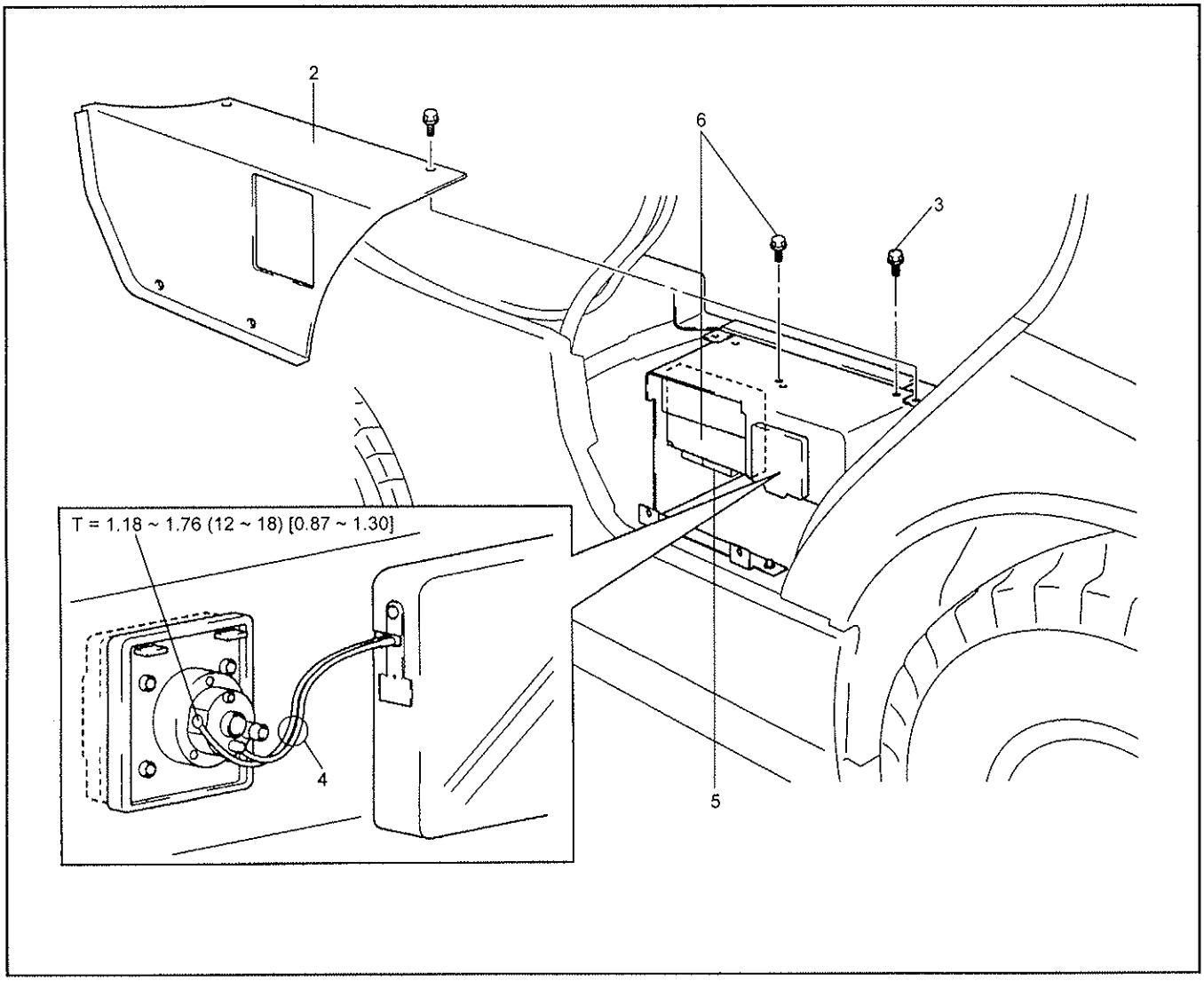
[Point 2]
Inspection:
Replace the DPF jacket ASSY if its center or inside wall is blackened with soot when seen from the outlet side.

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CONTROLLER REMOVAL·INSTALLATION

Note:
Since the two wires from the controller to the outlet are both black, put tags showing the connecting positions.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Open the engine hood, and disconnect the battery negative terminal.
2 Remove the step.
3 Remove the bracket set bolts.
4 Disconnect the wiring from the controller to the outlet.
5 Disconnect the controller connector.
6 Remove the controller ASSY.

Installation Procedure

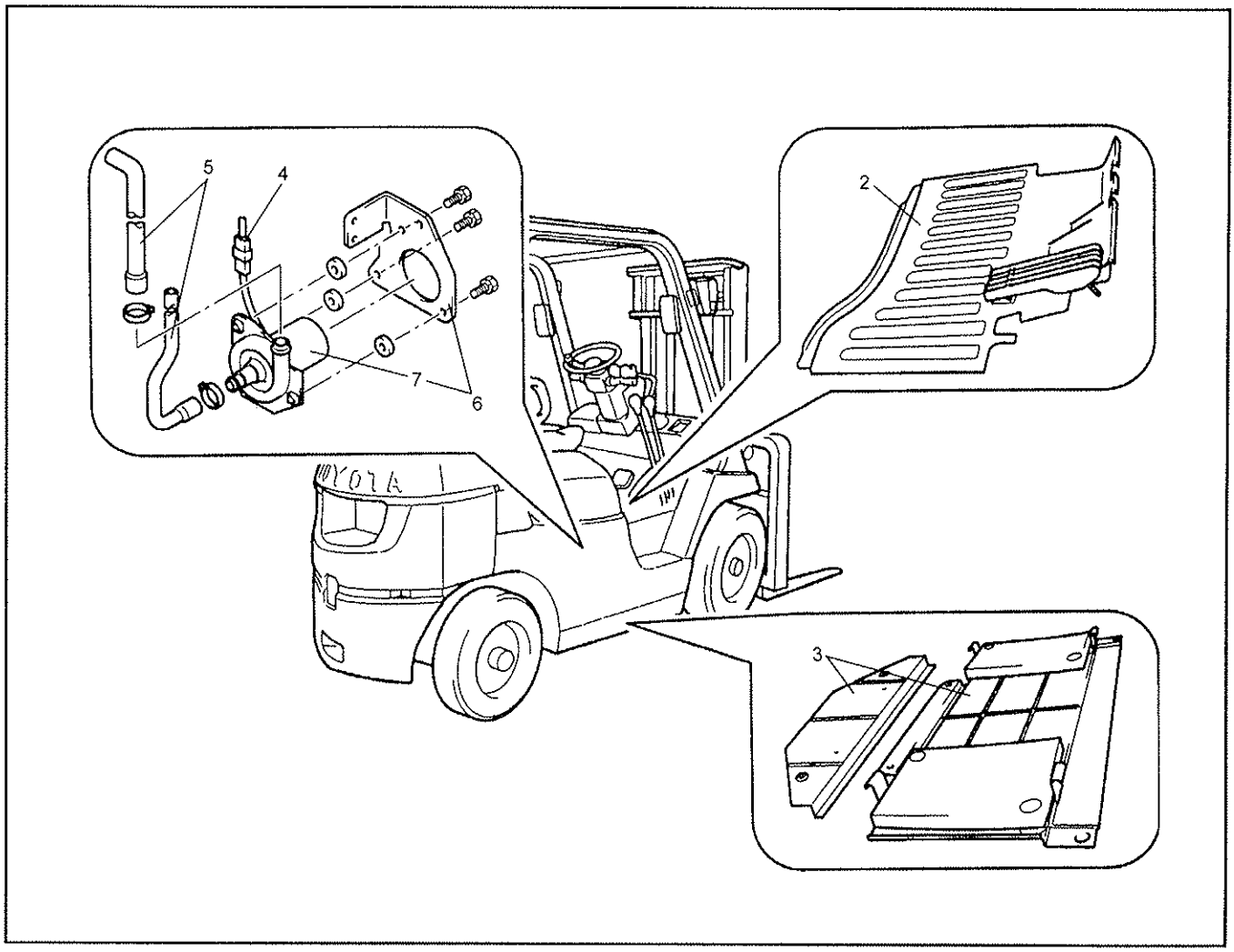
The installation procedure is the reverse of the removal procedure.

Note:
When the controller is replaced, turn the ignition switch ON and check no error occurrence.

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BLOWER REMOVAL·INSTALLATION

Note:
Since the blower is to be removed from under the frame, operate in a pit.



Removal Procedure

1 Open the engine hood, and disconnect the battery negative terminal.

2 Remove the toe board.

3 Remove two under covers from the vehicle.

4 Disconnect the connector.

5 Disconnect the blower hose from the blower.

6 Remove the blower set bolts, and remove the blower W/bracket from under the vehicle.

7 Remove the blower ASSY.

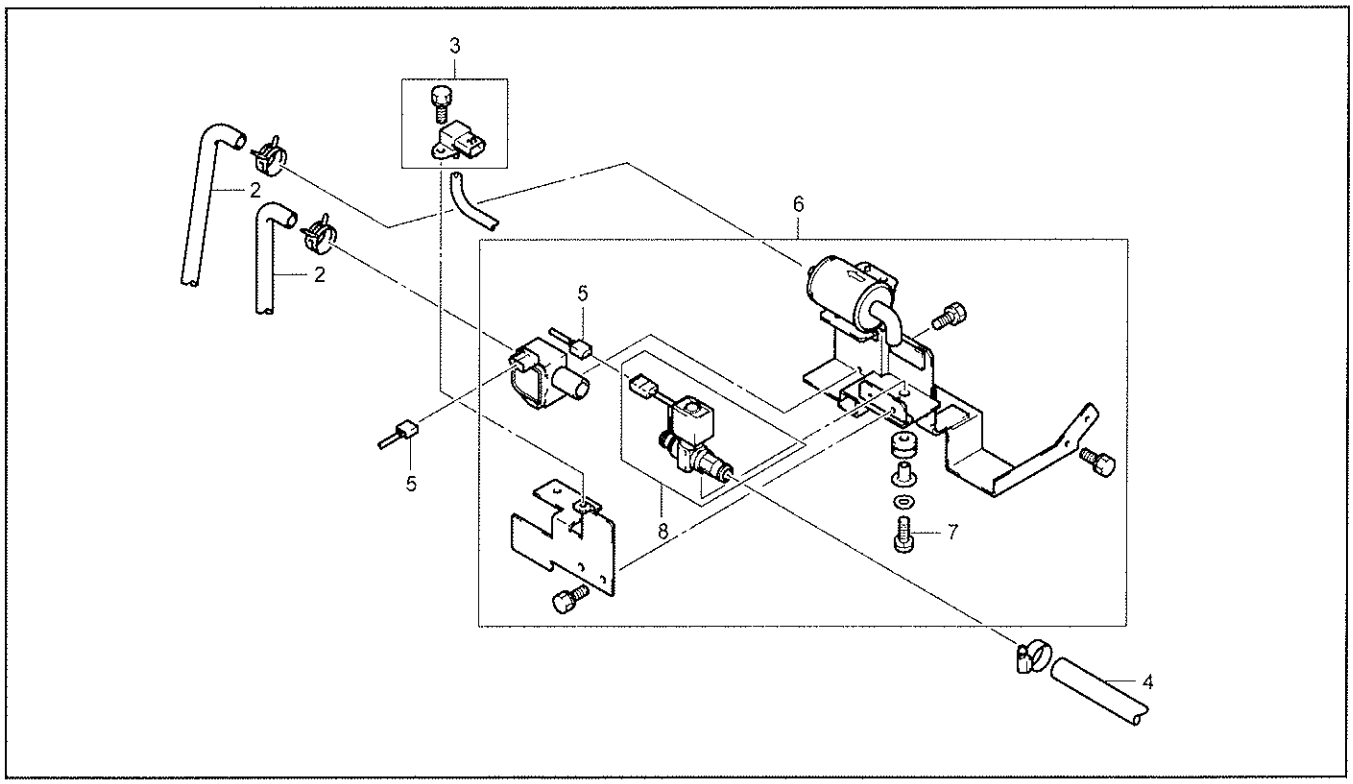
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
When the blower wiring clamp is removed, replace it with a new one.

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DPF VALVE REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the battery earth terminal.

2 Disconnect the DPF air cleaner hose (air cleaner side) and blower hose (blower sensor side).

3 Disconnect the back pressure sensor connector and back pressure sensor hose, and remove the back pressure sensor.

4 Disconnect the DPF valve hose.

5 Disconnect the DPF valve connector and blower sensor connector.

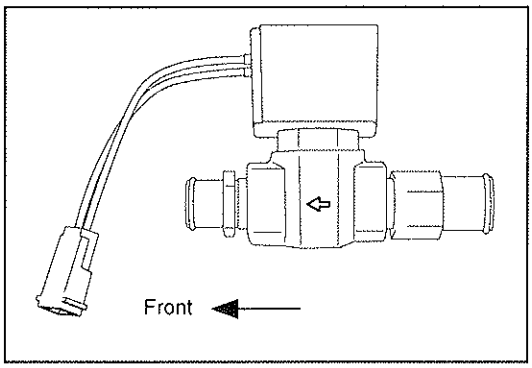
6 Remove the base & bracket W/DPF parts ASSY. Disconnect the wire harness clamps from the base & bracket.

7 Remove the DPF valve set screws.

8 Remove the DPF valve W/fitting. **[Point 1]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.



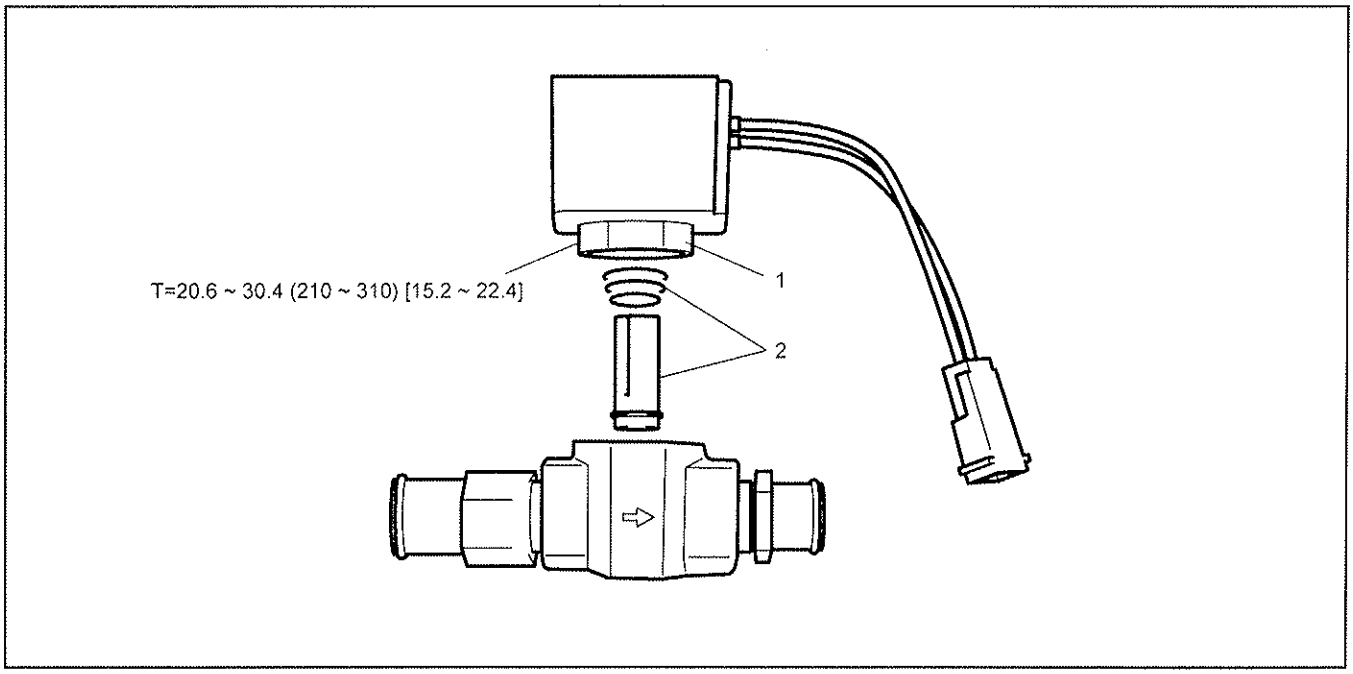
Point Operations

[Point 1]
Installation:
Install the DPF valve in the correct direction.
The arrow marked on the valve body must be pointing to the front of the vehicle.
The connector of the core must be facing the front of the vehicle as well. (The core can be turned by hand.)

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DPF VALVE DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



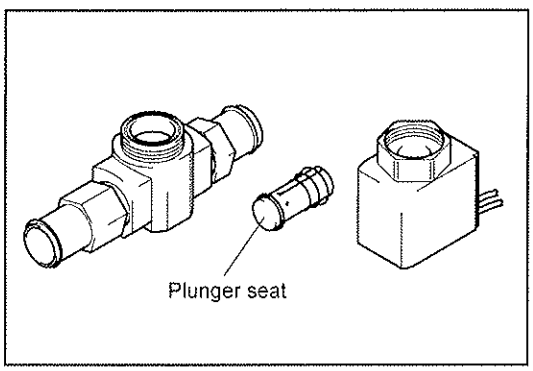
Disassembly Procedure

1 Fix the valve body in a vise, and loosen the lock nut.

2 Separate the valve body and core, and remove the plunger and spring. **[Point 1]**

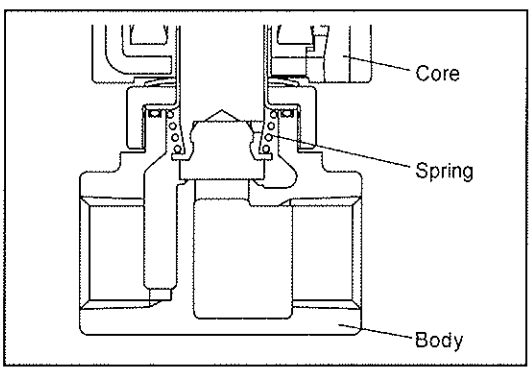
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.



Point Operations

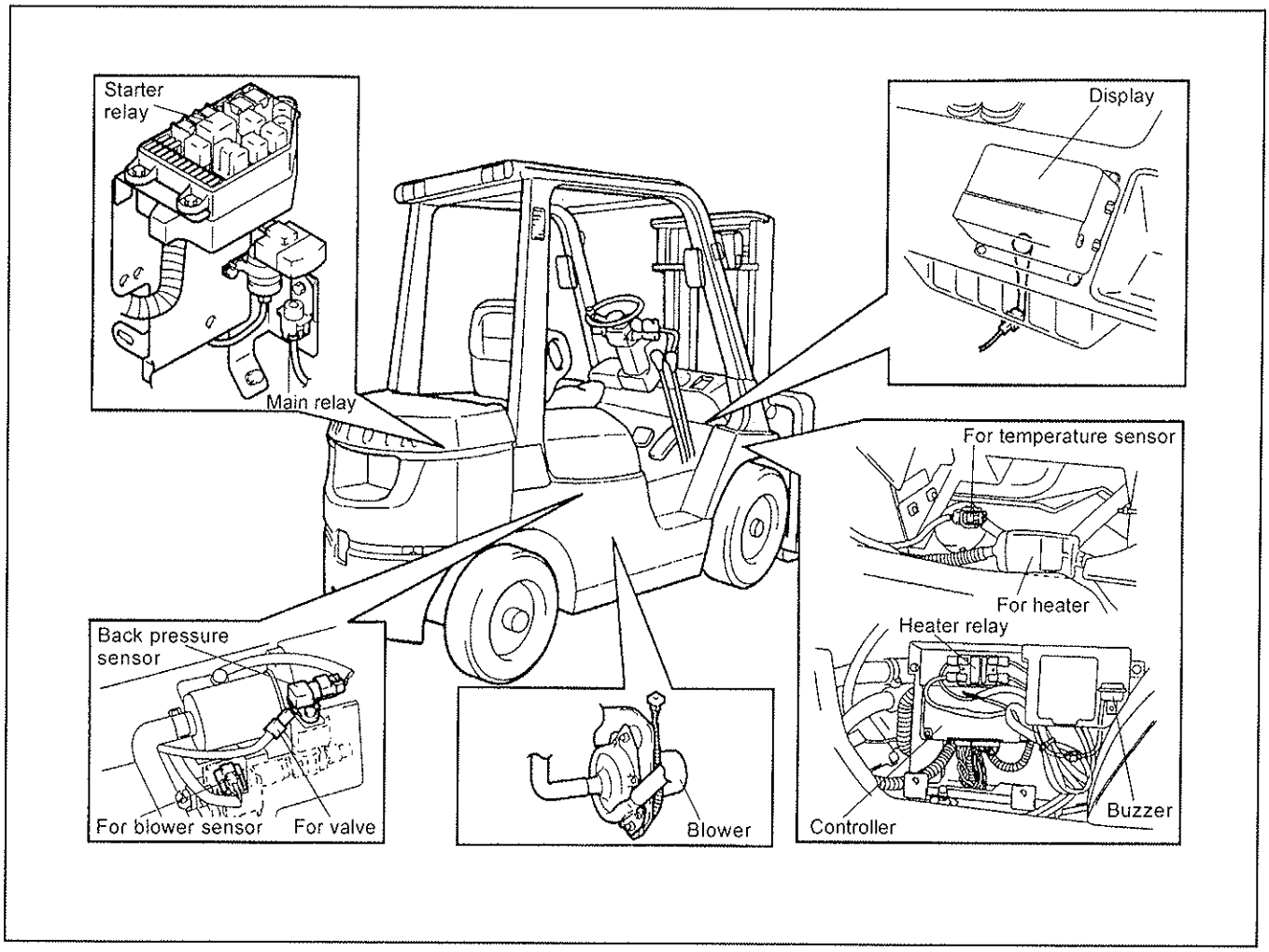
[Point 1]
Inspection:
Clean off soot accumulated in the valve body, plunger, and core with high-pressure air.
Replace the valve ASSY if any damage or wear is seen on the plunger seat.

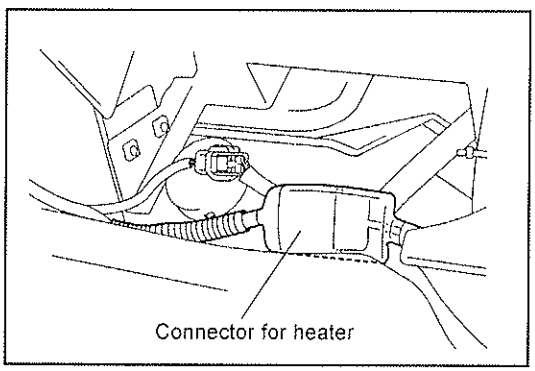


Reassembly:
Install the spring in the correct direction.
Face the minor diameter of the spring to the valve body side.

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INDIVIDUAL FUNCTIONAL PARTS INSPECTION

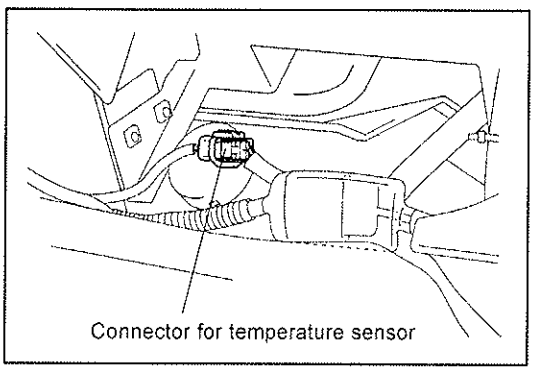




Heater

1. Inspect the heater coil resistance.

   Inspection method:
   Measure the resistance between both terminals of wiring from heater
   Tester range: Ω × 1 range
   Standard: Approx. 22 Ω



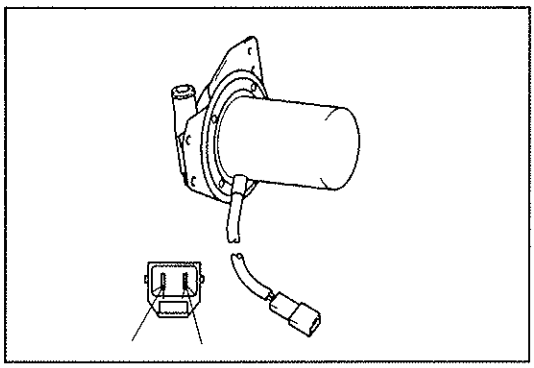
Temperature Sensor

1. Inspect the temperature sensor continuity.

   Inspection method:
   Measure the resistance between both terminals of the temperature sensor connector.
   Tester range: Ω × 1 range
   Standard: Approx. 1 Ω

Note:
Do not scratch gold plating on the connector pins at the time of inspection.

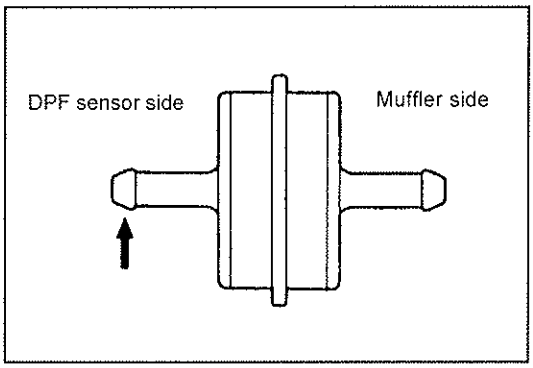
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DPF Blower

1. Inspect the DPF blower for continuity.

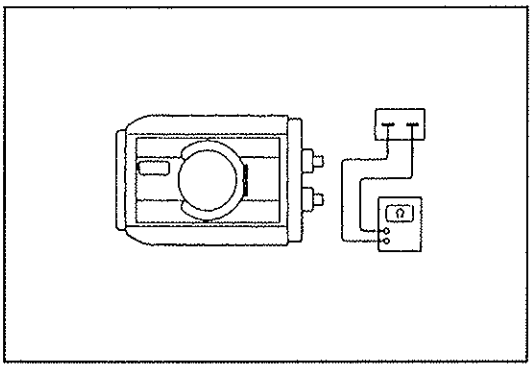
   Inspection method:
   Measure the resistance between both terminals of the DPF blower.
   Tester range: Ω × 1 range
   Standard: Approx. 2.2 Ω



Inline Filter

1. Inspect the outlet of the back pressure sensor for no soot accumulation. If soot is seen, replace the sensor.

Note:
Do not install in the reverse direction after inspection.
There is no directionality when the sensor is new.

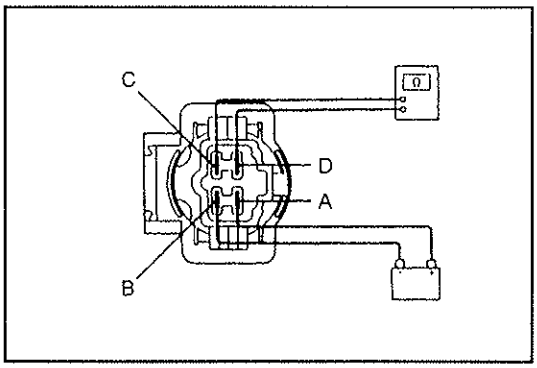


DPF Valve

1. Measure the resistance between both terminals of the DPF valve wiring.

   Inspection method:
   Between both terminals of valve connector
   Tester range: Ω × 1 range
   Standard: Approx. 18 Ω

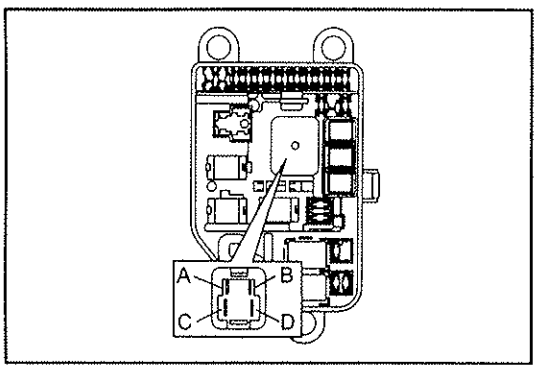
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Main Relay

1. Inspect the function.

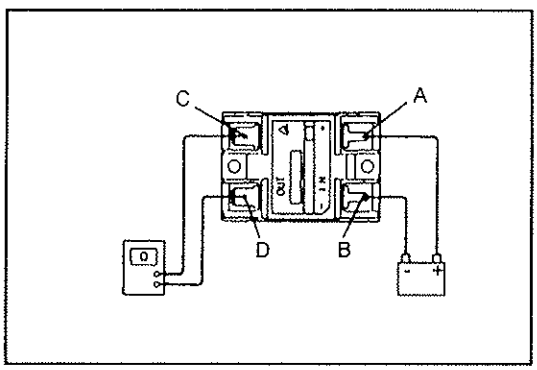
Inspection method:
Inspect continuity between terminals C and D, with the battery voltage applied to terminals A and B.
Tester range: Ω × 1 range
Standard: 0 Ω



Starting Motor Relay

1. Inspect the function.

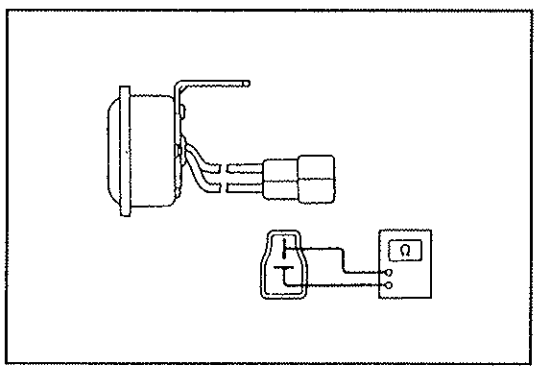
Inspection method:
Inspect continuity between terminals C and D, with the battery voltage applied to terminals A and B.
Tester range: Ω × 1 range
Standard: 0 Ω



Heater Relay

1. Inspect the function.

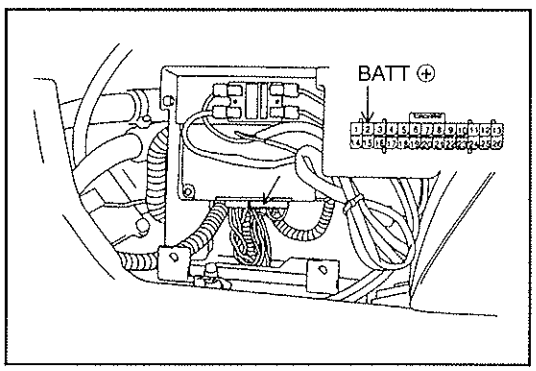
Inspection method:
Inspect continuity between terminals C and D, with the battery voltage applied to terminals A and B.
Tester range: Ω × 1 range
Standard: 0 Ω



Buzzer

1. Inspect the buzzer for continuity.

Inspection method:
Between both terminals of buzzer connector
Tester range: Ω × 1 range
Standard: Approx. 36 Ω

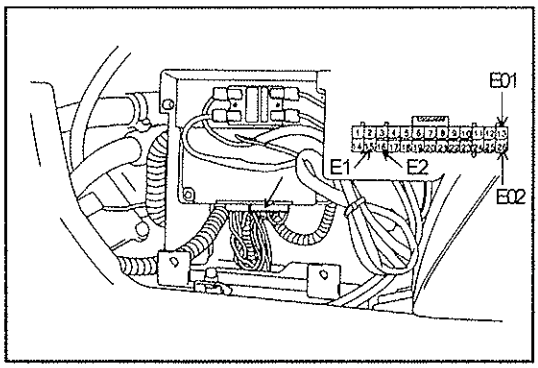


Display

1. Disconnect the controller connector, and measure the applied battery voltage on the wiring side.

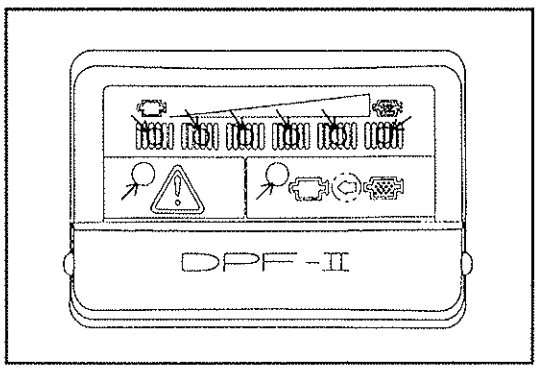
Inspection method:
Between BATT terminal ⊕ of the controller connector (wiring side) and body ground ⊖
Tester range: DC 50V range
Standard: 10 to 14 V

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2. Inspect the controller connector for continuity (on the controller side).

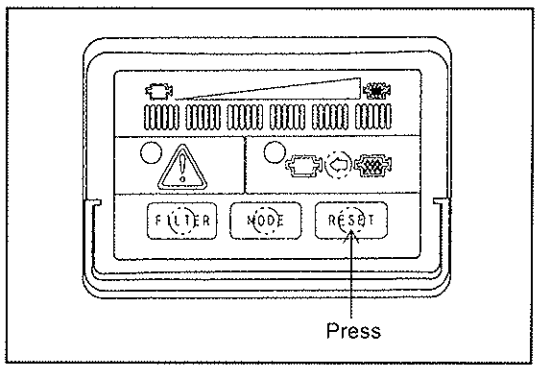
Inspection method: E01 - E1
E02 - E1
E1 - E2
Tester range: Ω × 1 range
Standard: Continuous



3. Inspect if any LED is burnt out.
Turn the ignition switch ON and see if all LEDs are lit for 1 second.
The buzzer sounds for 0.5 second.

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CONTROLLER ERROR CODE CLEARING METHOD

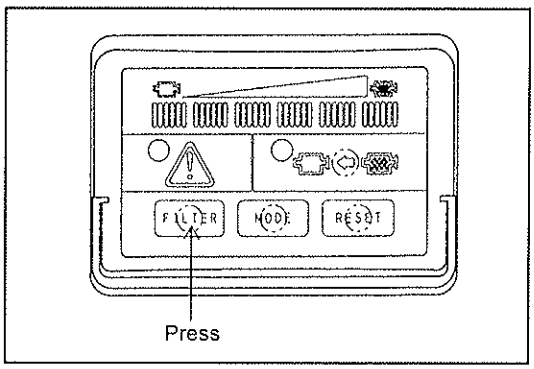


1. Turn the ignition switch ON.
2. Press the RESET switch until the buzzer sounds.
3. Turn the ignition switch OFF after the warning LED goes out.

Note:
- **Do not turn the ignition switch until all LEDs on the display go out.**
- **Do not perform this operation before reading the error code.**
- **If the buzzer does not sound when the RESET switch is pressed, an internal switch defect may be the cause.**

4. After LEDs go out, turn the ignition switch ON and see that the warning LED is not blinking.

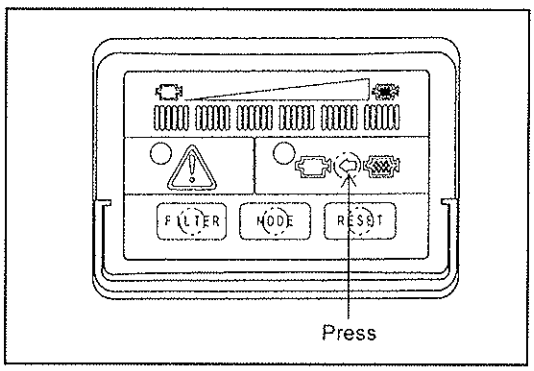
DPF FILTER MEMORY CLEARING METHOD



1. Turn the ignition switch ON.
2. Press the FILTER switch until the buzzer sounds.
3. Turn the ignition switch OFF.

Note:
- **Do not turn the ignition switch ON until all LEDs on the display go out.**
- **Perform this operation only when the filter is replaced.**
- **If the buzzer does not sound when the FILTER switch is pressed, an internal switch defect may be the cause.**

REGENERATION METHOD



1. Connect the external power cord (200 V AC).
2. Press the regeneration switch until the buzzer sounds.

Note:
- **The regeneration process ends in about 50 minutes (about 70 minutes in case of high collection). One soot indicating LEDs goes out every ten minutes, and the process ends when all LEDs go out.**
- **If the buzzer does not soud when the regeneration switch is pressed, an internal switch defect may be the cause.**

3. Disconnect the external power cord (200 V AC).

Note:
- **During the regeneration process, it is controlled that the engine does not start upon turning the ignition switch to the START position. The buzzer sounds in that case to warn the operator.**
- **If the external power supply (200 VAC power) is cut off during the regeneration process, the buzzer sounds and the warning LED blinks to warn the operator.**
- **While the power cord is kept connected after the end of regeneration, it is controlled that the engine does not start even if it is tried. The buzzer sounds and the warning LED blinks to warn the operator.**

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TROUBLESHOOTING

Explanation on Diagnostic Display

The controller lights up the warning LED on the display and sounds the buzzer when any abnormality in the system is detected. Press the MODE switch for about one second or more when the warning LED is lit. The detected faulty portion is indicated by the respective error code by means of the soot amount indicating LEDs.
The connector symbols (A to M) described in the troubleshooting section correspond with the symbols in the connector diagram on page 1-49.

Error Code Indicating Method

Turn the ignition switch ON, and remove the communication switch cover. The error code is displayed by the lighting LED positions while the buzzer sounds.

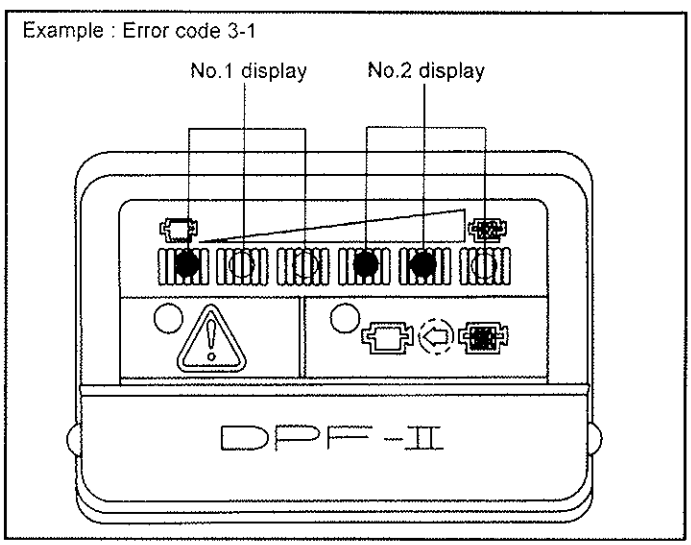
No.	Error code	Abnormal portion
1	1 – 1	During regeneration, the heater temperature does not rise to the specified level within the specified time.
2	1 – 2	The heater temperature drops abnormally during regeneration.
3	1 – 3	The exhaust temperature rises abnormally while the engine is running.
4	1 – 4	The temperature sensor outputs an abnormally high temperature.
5	2 – 1	The back pressure sensor output is above or below the upper or lower limit.
6	2 – 2	The back pressure sensor output remains unchanged when the engine speed varies beyond the given level.
7	3 – 1	The alternator L signal becomes abnormal upon starting the engine.
8	3 – 2	The rpm sensor output becomes abnormal after starting the engine.
9	3 – 3	The alternator L signal becomes abnormal after starting the engine.
10	4 – 1	The flow rate sensor output value is abnormal.
11	4 – 2	The blower flow rate is apart from the target level.
12	4 – 3	The flow rate sensor output deviates though the blower is not operated.
13	5 – 1	The amount of soot accumulated in the DPF filter is above the level that can be regenerated.
14	6 – 1	The controller memory is abnormal.
15	7 – 1	The vehicle battery voltage dropped abnormally.
16	7 – 2	The external power voltage (200 V AC) dropped for 1 minute or more during regeneration.

Explanation on Error Code

The abnormal system portion is indicated by the collection amount LEDs. When multiple system abnormalities are detected at a time, they are indicated alternately at intervals of 5 seconds.

○ : On ● : Off

Code	Soot amount indicating LEDs		
No. 1 display	Green 1	Green 2	Green 3
No. 2 display	Green 4	Green 5	Yellow
1	●	●	○
2	●	○	●
3	●	○	○
4	○	●	●
5	○	●	○
6	○	○	●
7	○	○	○



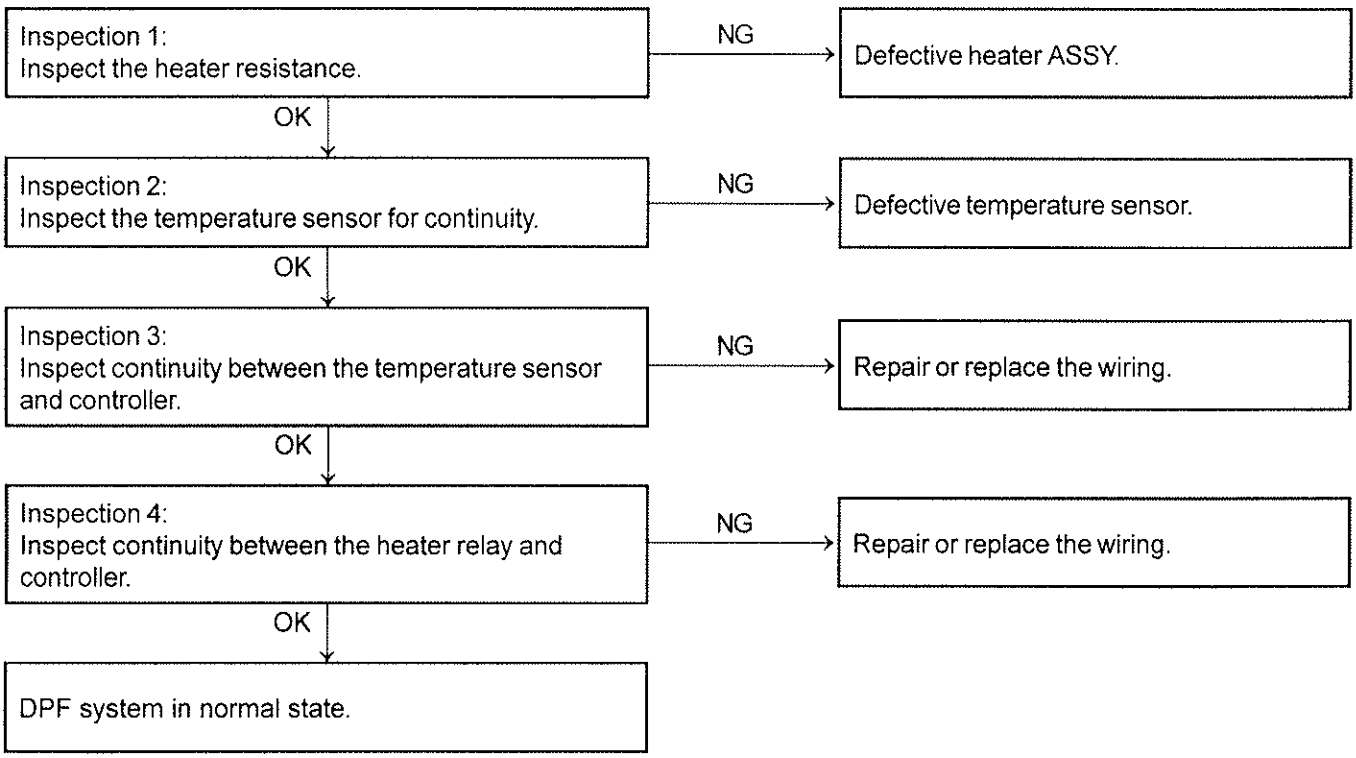
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Before Starting Troubleshooting

1. Check to see no interruption of regeneration due to power plug disconnection or for any other reason. If regeneration has been interrupted, clear the controller error code. (See page 1-60.)
2. Check to see that the battery voltage is as specified (10 to 14 V). If not, charge or replace the battery.
3. Inspect the display for any burnt-out LED.(See page 1-59.) If any LED on the display is not lit upon ignition switch ON, replace the display.
4. See that the display is not constantly lit. Repair or replace the display wiring.

Troubleshooting

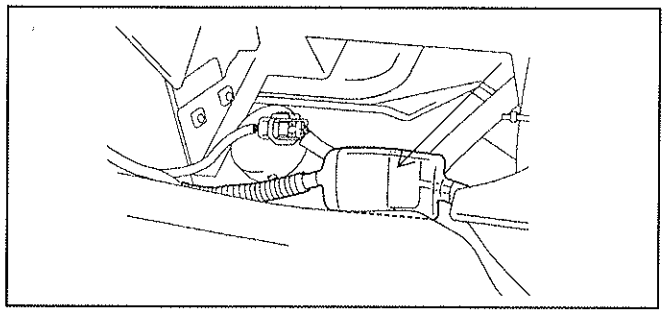
Error Code 1-1 or 1-2

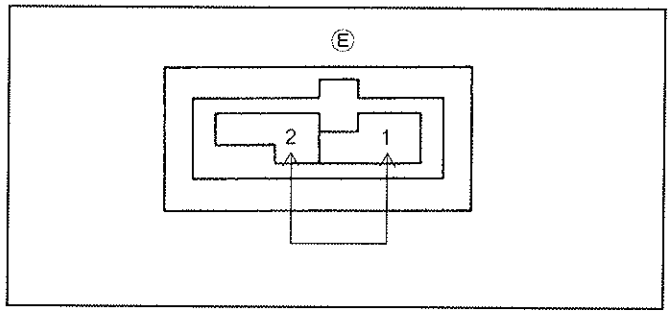


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Inspection 1: Heater resistance inspection
Disconnect the heater connector.

Tester range: Ω × 1	
Measurement terminals	Both terminals of heater connector: E-1 - E-2
Standard	Approx. 22 Ω (at cold state)

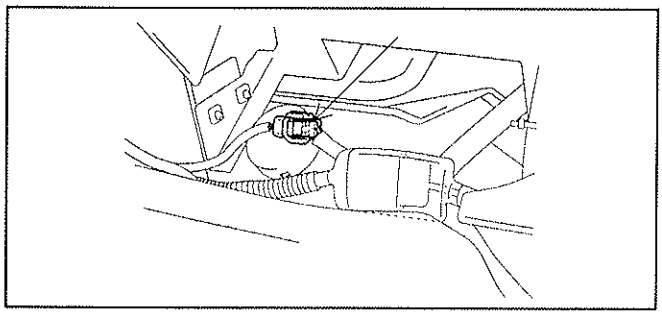


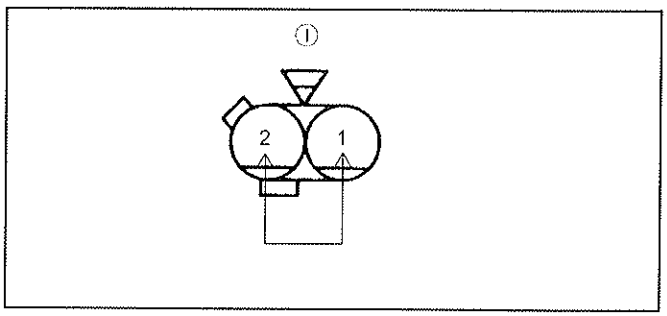


OK → To inspection 2
NG → Heater ASSY defect

Inspection 2: Temperature sensor continuity inspection
Disconnect the temperature sensor connector.

Tester range: Ω × 1	
Measurement terminals	Both terminals of temperature sensor connector: I-1 - I-2
Standard	Approx. 1 Ω (at cold state)



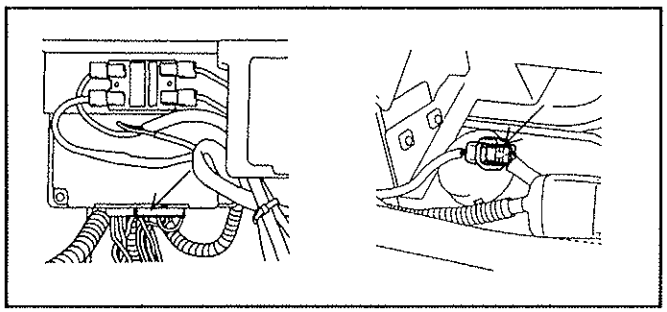


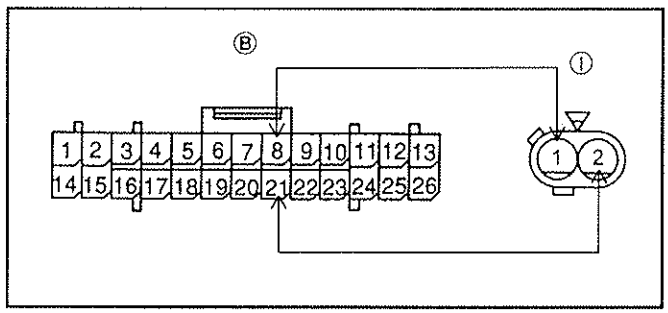
OK → To inspection 3
NG → Temperature sensor defect

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Inspection 3: Temperature sensor wiring continuity inspection
Disconnect the temperature sensor and controller connector.

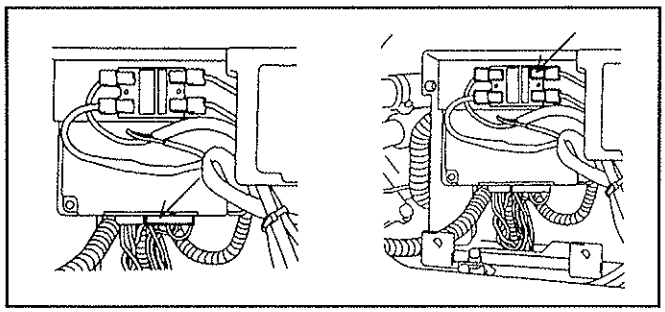
Tester range: Ω × 1	
Measurement terminals	Controller connector B-8 - Temperature sensor connector I-1 Controller connector B-21 - Temperature sensor connector I-2
Standard	0 Ω

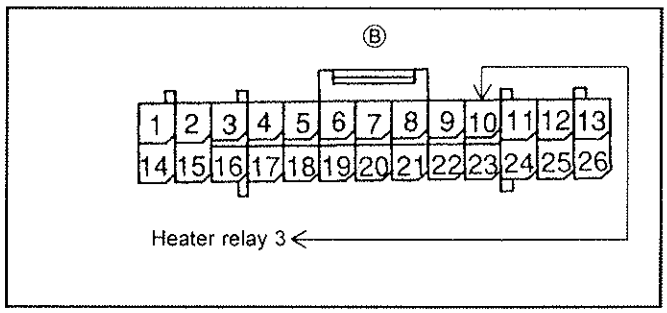




OK → To inspection 4
NG → Repair or replace the wiring

Tester range: Ω × 1	
Measurement terminals	Controller connector B-10 — Heater relay 3
Standard	0 Ω

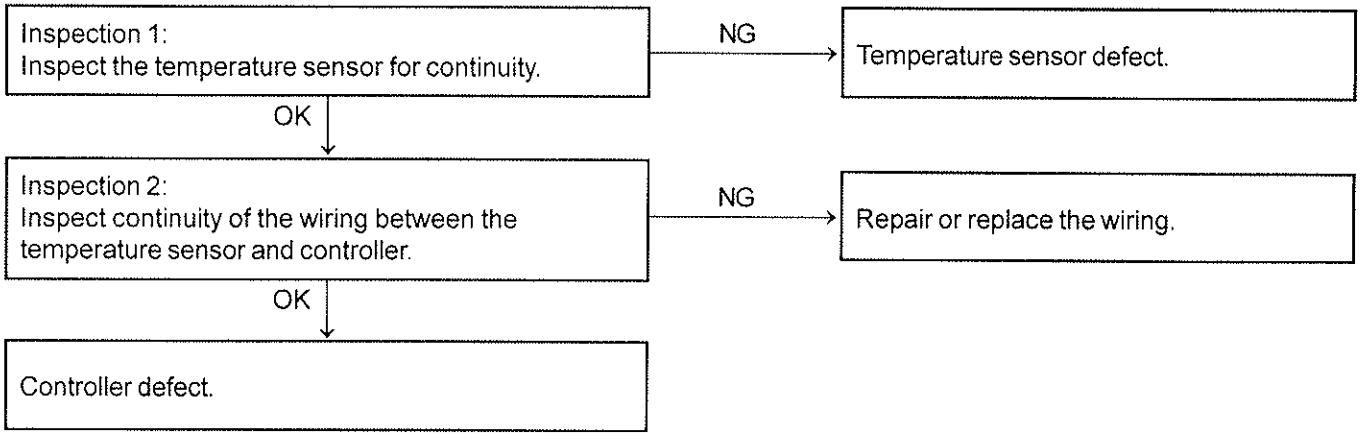




OK → DPF system in normal state
NG → Repair or replace the wiring

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Error Code 1-3



Inspection 1: Temperature sensor continuity inspection
See inspection 2 for error code 1-1.

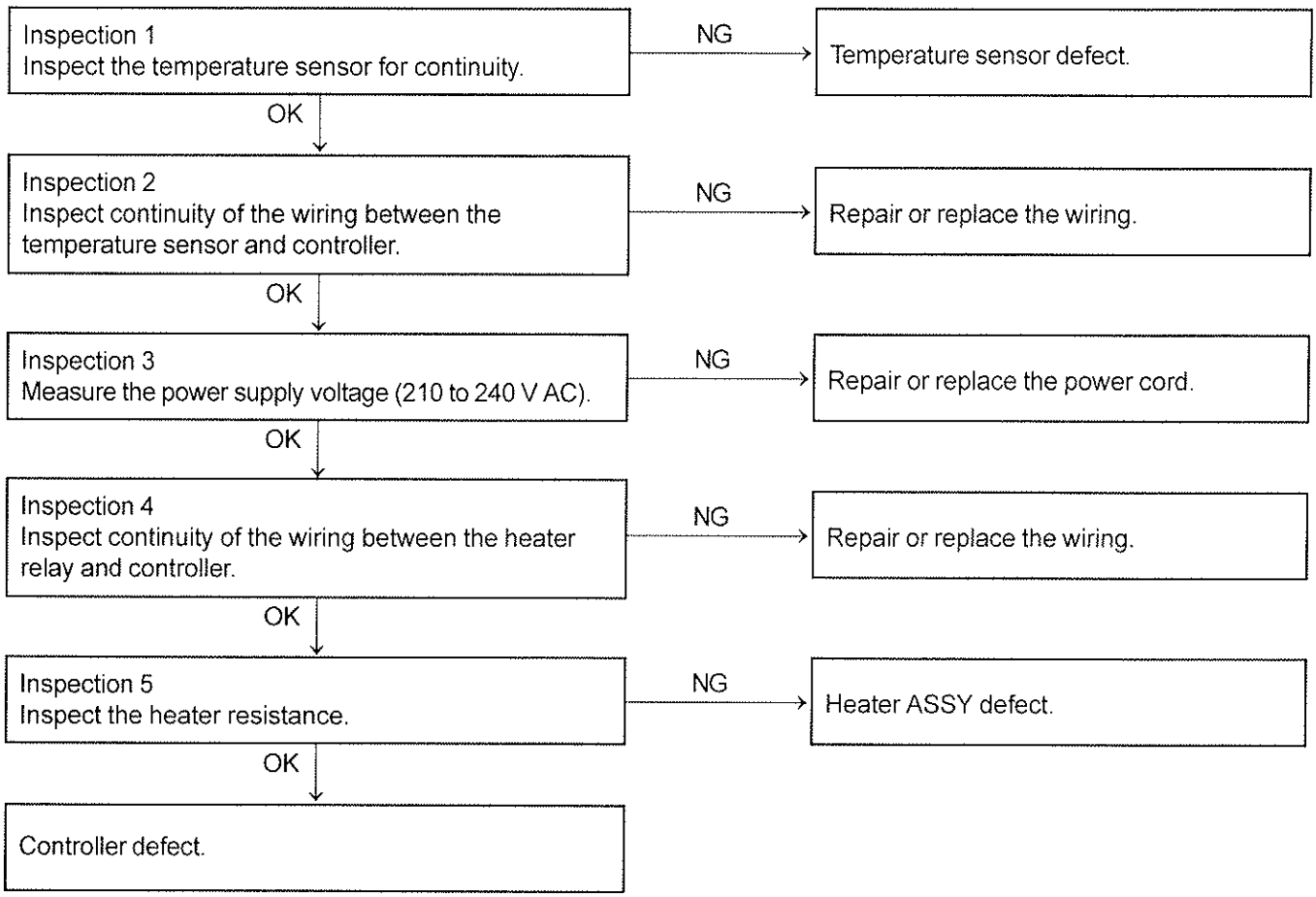
OK → To inspection 2
NG → Temperature sensor defect

Inspection 2: Temperature sensor wiring continuity inspection
See inspection 3 for error code 1-1.

OK → Controller defect
NG → Repair or replace the wiring

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Error Code 1-4



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Inspection 1: Temperature sensor continuity inspection
See inspection 2 for error code 1-1.

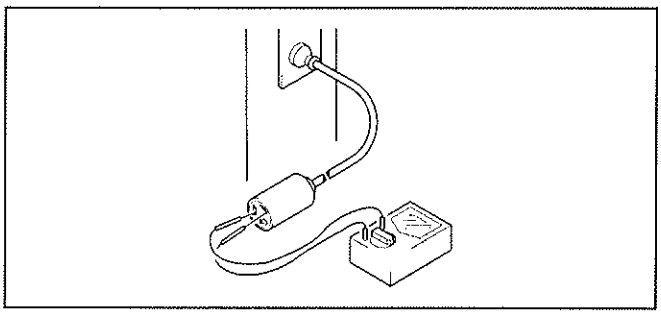
OK → To inspection 2
NG → Temperature sensor defect

Inspection 2: Temperature sensor wiring continuity inspection
See inspection 3 for error code 1-1.

OK → To inspection 3
NG → Repair or replace the wiring

Inspection 3: Power supply voltage inspection
Connect the power cord to the power outlet.

Tester range: AC 500 V	
Measurement terminals	Power cord terminals
Standard	210 to 240 V AC



OK → To inspection 4
NG → Repair or replace the power cord

Inspection 4: Heater relay wiring continuity inspection
See inspection 4 for error code 1-1.

OK → To inspection 5
NG → Repair or replace the wiring

Inspection 5: Heater resistance inspection
See inspection 1 for error code 1-1.

OK → Controller defect
NG → Heater ASSY defect

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Error Code 2-1

Inspection 1
Inspect the back pressure sensor input.
→ OK → Controller defect
↓ NG

Inspection 2
Inspect continuity of the wiring between the back pressure sensor and the controller.
→ OK → Back pressure sensor defect
↓ NG

Repair or replace the wiring.

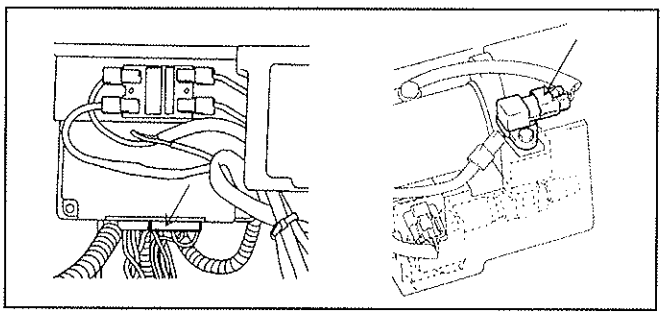
Inspection 1: Back pressure sensor input check
Voltage measurement between terminals
Controller connector: Back pressure sensor connector in connected state
Stop the engine and turn the ignition switch ON.

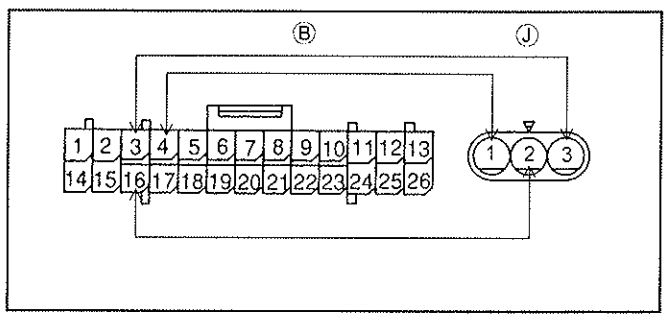
Measurement terminals	Controller connector B-3 — B-4 —	Controller connector B-16 B-16
Standard	B3 — B16 : 5 ± 0.25 V	B4 — B16 : 1.5 ± 0.5 V

OK → Controller defect
NG → To inspection 2

Inspection 2: Back pressure sensor wiring continuity inspection
Disconnect the back pressure sensor and controller connector.

Tester range: Ω × 1		
Measurement terminals	Controller connector B-4 — B-16 — B-3 —	Back pressure sensor connector J-1 J-2 J-3
Standard	0 Ω	

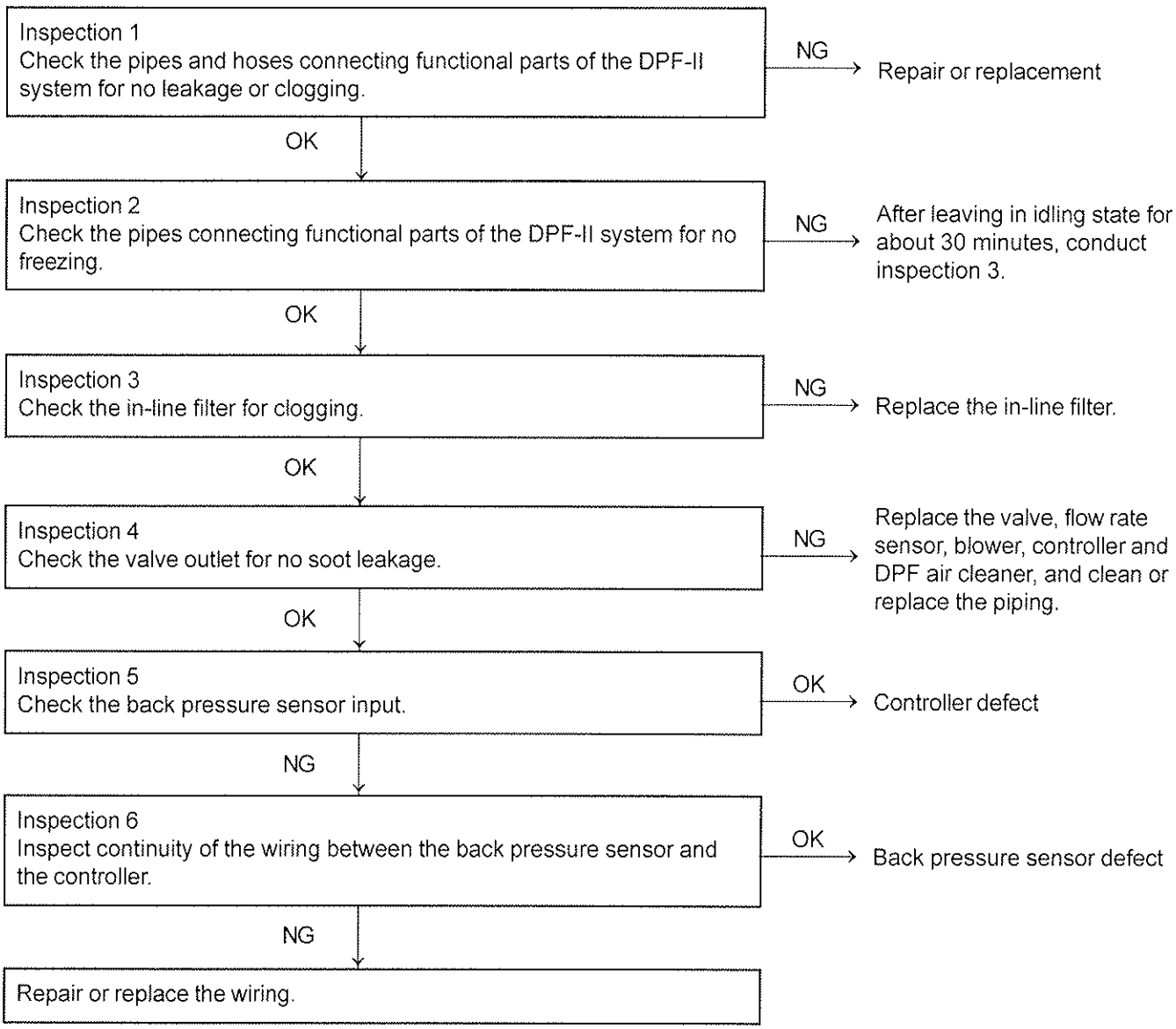




OK → Back pressure sensor defect
NG → Repair or replace the wiring

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Error code 2-2
Check the exhaust pipe and DPF muffler for no exhaust gas leakage from each part or joint.



Inspection 1: DPF-II system gas leakage inspection
Check to see that each pipe or hose connecting the system parts is not leaky or clogged.

OK → To inspection 2
NG → Repair or replacement

Inspection 2: Pipe freezing check
Check the pipes and hoses that connect parts for no freezing.

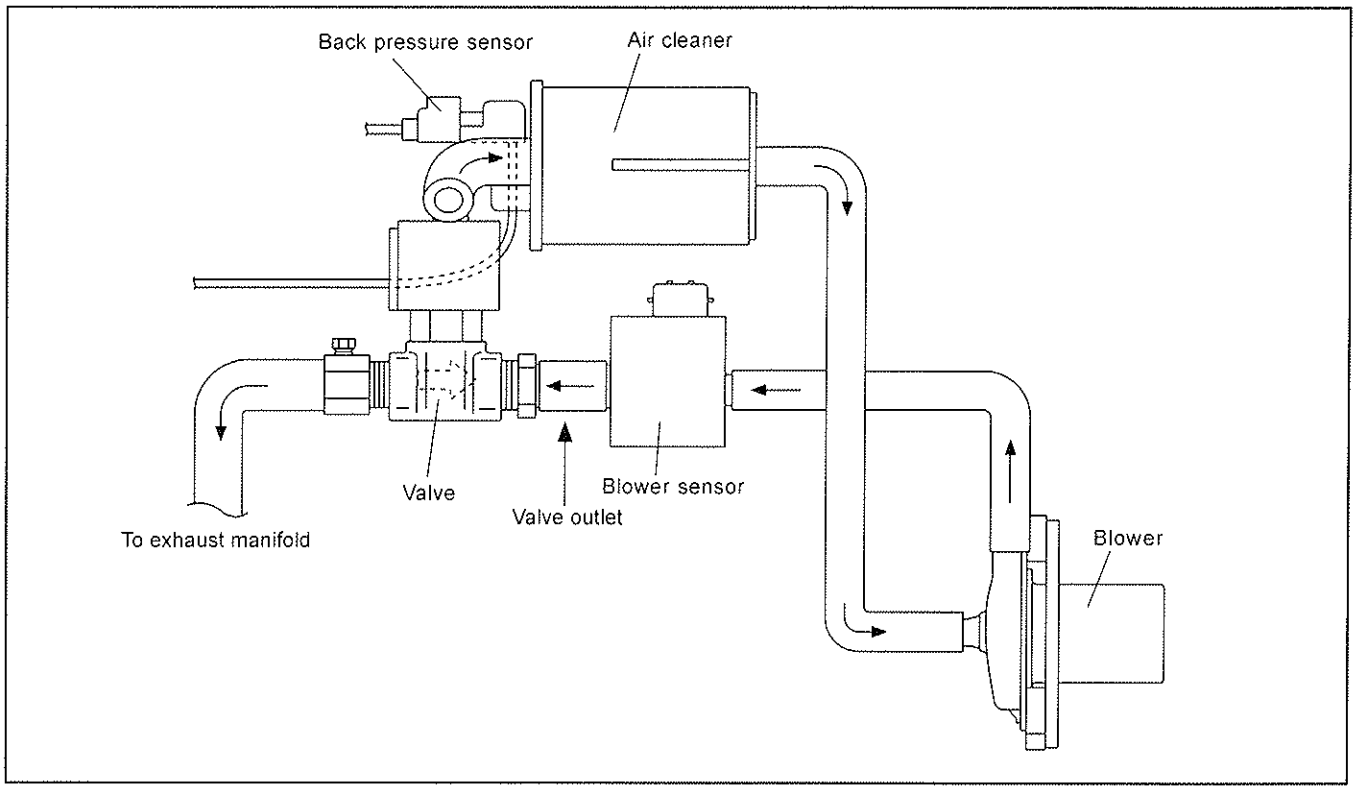
OK → To inspection 3
NG → To inspection 3 after defrosting.

Inspection 3: In-line filter clogging check

OK → To inspection 4
NG → Replacement

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Inspection 4: Valve outlet soot leakage check



OK → To inspection 5
NG → Replace the valve, flow rate sensor, blower and DPF air cleaner, and clean or replace the piping.

Inspection 5: Back pressure sensor input check
Voltage measurement between terminals
Controller connector: Back pressure sensor connector in connected state

(1) Stop the engine and turn the ignition switch ON.

Measurement terminals	Controller connector B-3 — B-4 —	Controller connector B-16 B-16
Standard	B3 — B16 : 5 ± 0.25 V	B4 — B16 : 1.5 ± 0.5 V

(2) Start the engine and keep the NMR running. (*)

Measurement terminals	Controller connector B-4 —	Controller connector B-16
Standard	B4 — B16 : Value measured between B4 and B16 in (1) above + 0.2 V or more	

(*) Perform this inspection only when three or more soot amount indicator LEDs are lit.

OK → Controller defect
NG → To inspection 6

Inspection 6: Back pressure sensor wiring continuity check
See inspection 2 for error code 2-1.

OK → Back pressure sensor defect
NG → Repair or replace the wiring.

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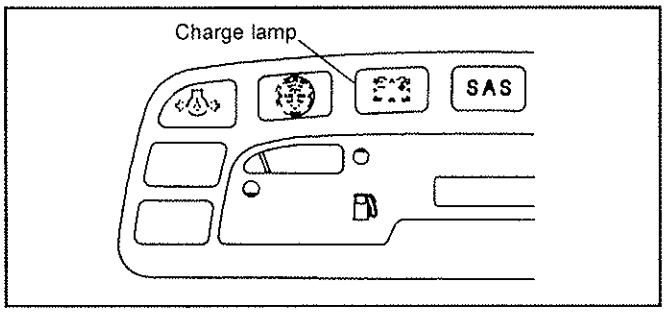
Error Code 3-1 or 3-3

Inspection 1
See that the charge lamp on the combination meter comes on upon turning the ignition switch ON and goes out upon turning it to the START position.
NG → Inspect the alternator by referring to the alternator section in the engine repair manual.
OK ↓

Inspection 2
Inspect continuity of the L signal wiring between the alternator and controller.
NG → Repair or replace the wiring.
OK ↓

Controller defect.

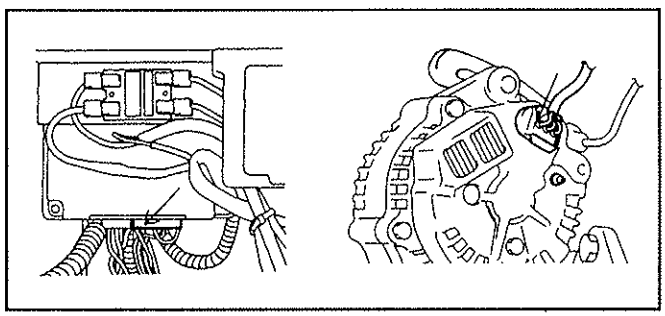
Inspection 1: Charge lamp lighting inspection

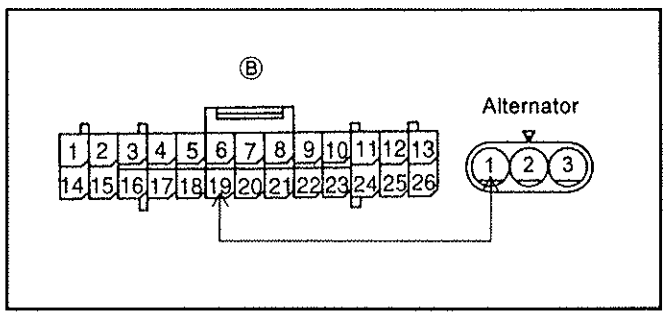


OK → To inspection 2
NG → To alternator inspection in the engine repair manual

Inspection 2: Alternator L signal wiring continuity inspection
Disconnect the alternator and the controller connector

Tester range: Ω × 1	
Measurement terminals	Controller connector B-19 - Alternator 1
Standard	0 Ω





OK → Controller defect
NG → Repair or replace the wiring

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Error Code 3-2

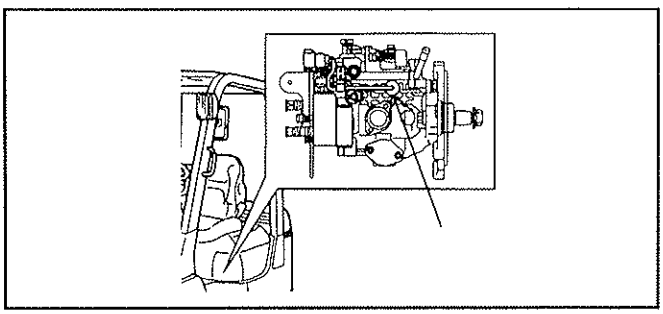
Inspection 1
Inspect the engine rpm sensor installed on the injection pump.
NG → Replace the injection pump ASSY.
OK ↓

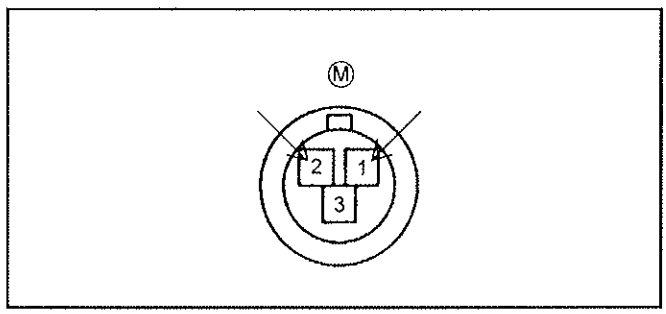
Inspection 2
Inspect continuity of the wiring between the engine rpm sensor and controller.
NG → Repair or replace the wiring.
OK ↓

Controller defect.

Inspection 1: Engine rpm sensor individual inspection
Disconnect the engine rpm sensor.

Tester range: Ω × 1k	
Measurement terminals	Between both terminals M-1 and M-2 of rpm sensor
Standard	Approx. 1kΩ

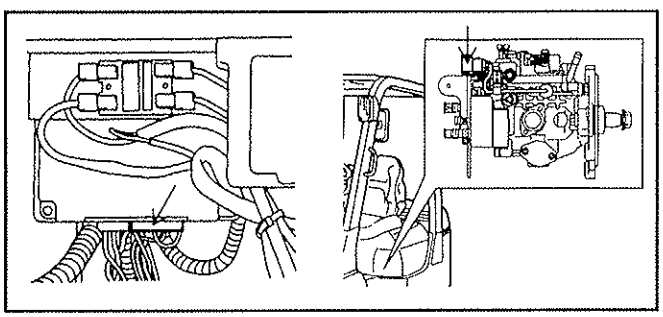


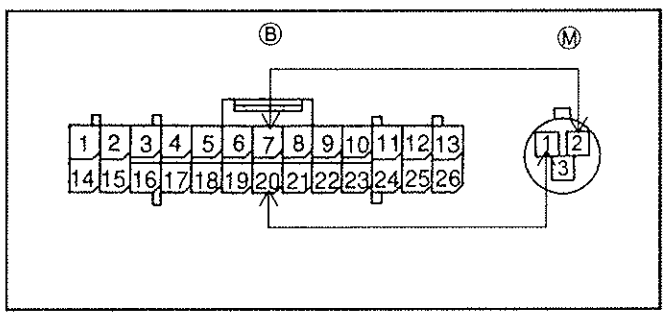


OK → To inspection 2
NG → Replace the injection pump ASSY.

Inspection 2: Engine rpm sensor wiring continuity inspection
Disconnect the engine rpm sensor and controller connector.

Tester range: Ω × 1					
Measurement terminals	Controller connector	B-7 — B-20 —	Engine rpm sensor connector	M-2 M-1
Standard	0 Ω			

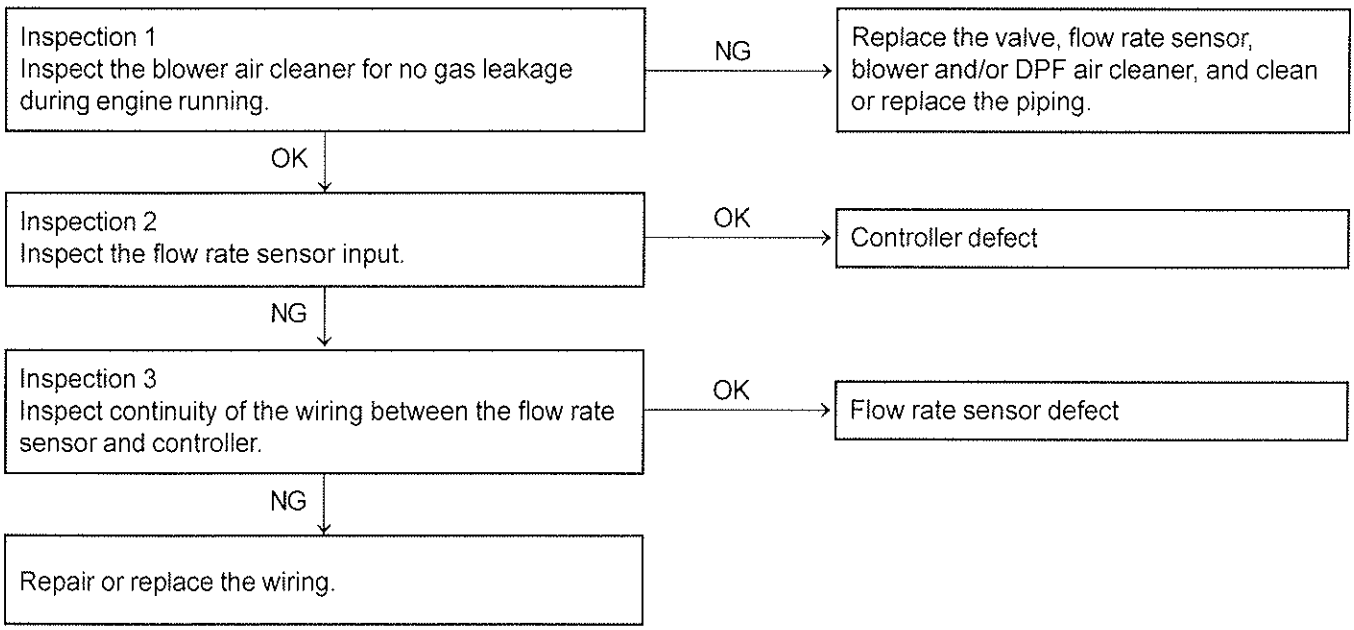




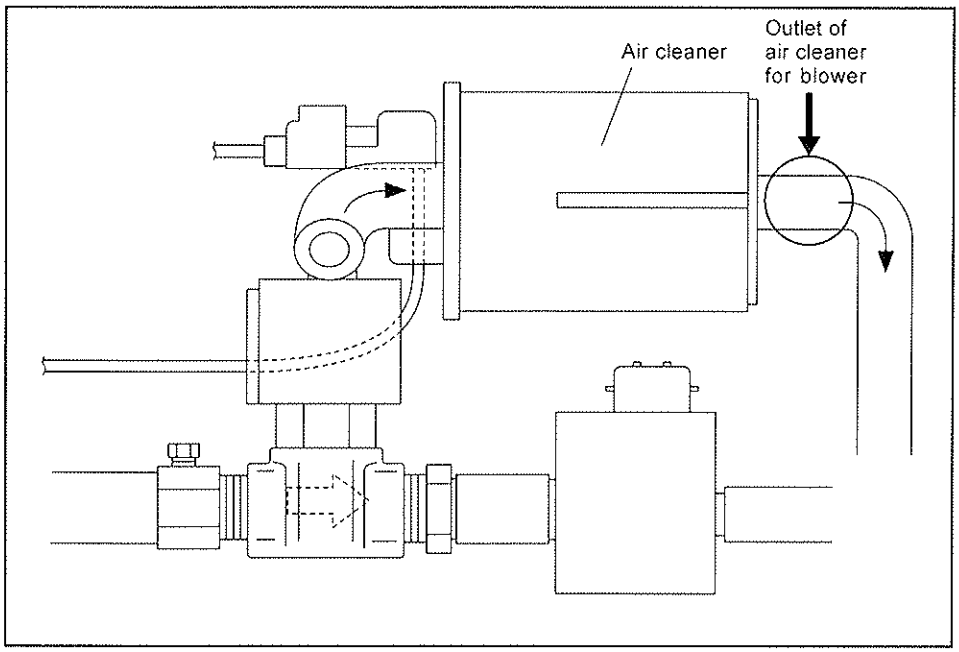
OK → Controller defect
NG → Repair or replace the wiring

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Error Code 4-1



Inspection 1: Air cleaner gas leakage inspection
Check to see no gas leakage from the blower air cleaner outlet.



OK → To inspection 2
NG → Replace the valve, flow rate sensor, blower and/or DPF air cleaner, and clean or replace the piping

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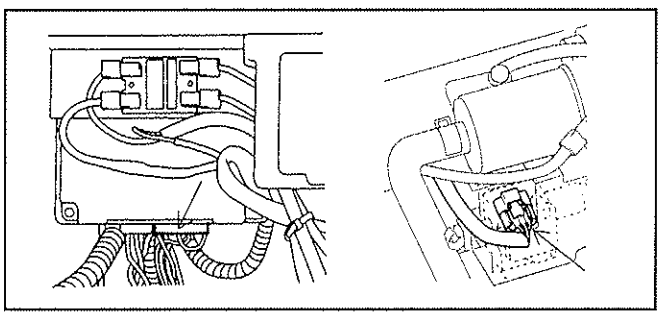
Inspection 2: Flow rate sensor input check
Voltage measurement between terminals
Controller connector: Flow rate sensor connector in connected state
Stop the engine and turn the ignition switch ON.

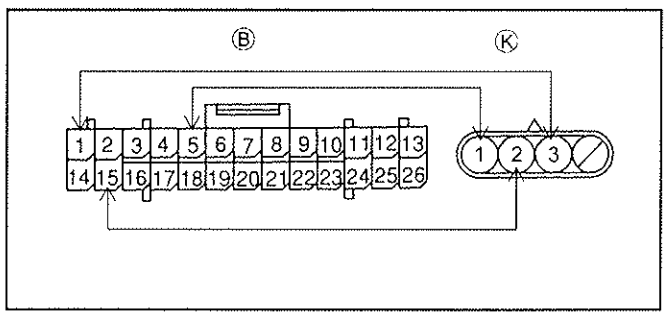
Measurement terminals	Controller connector B-1 — B-5 —	Controller connector B-15 B-15
Standard	B1 — B15 : Battery voltage	B5 — B15 : 2.0 V or less

OK → Controller defect
NG → To inspection 3

Inspection 3: Flow rate sensor wiring continuity inspection
Disconnect the flow rate sensor and controller connector.

	Tester range:Ω × 1		
Measurement terminals	Controller connector	B-1 — B-15 — B-5 —	Flow rate sensor connector K-3 K-2 K-1
Standard	0 Ω		

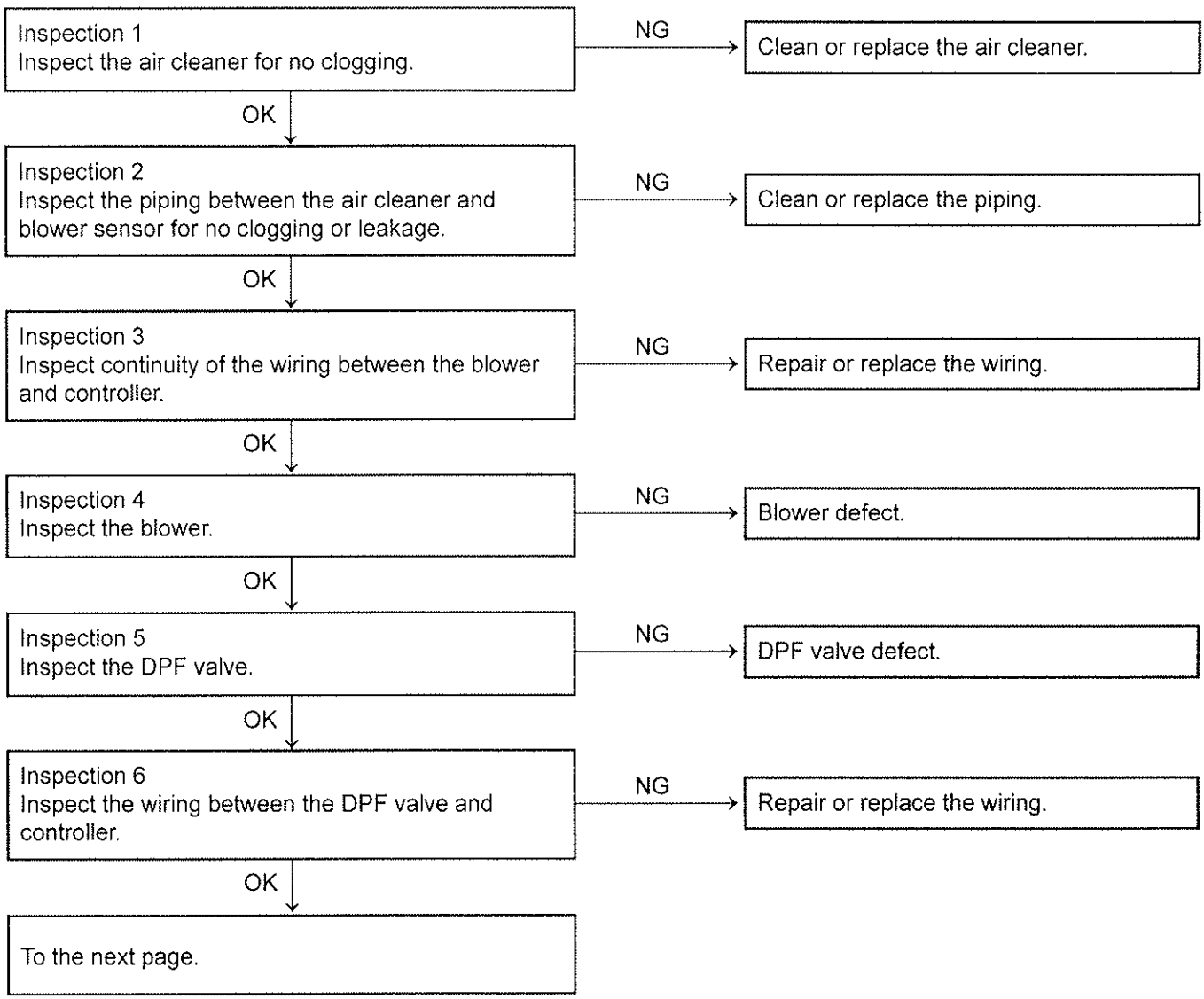




OK → Back pressure sensor defect
NG → Repair or replace the wiring

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Error Code 4-2



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From the preceding page.

OK

Inspection 7
Inspect the flow rate sensor input.

OK → Controller defect

NG

Inspection 8
Inspect continuity between the flow rate sensor and controller.

NG → Reapair or replace the wiring.

OK

Disassmble and inspect the DPF muffler.
Repair or replace if defective.

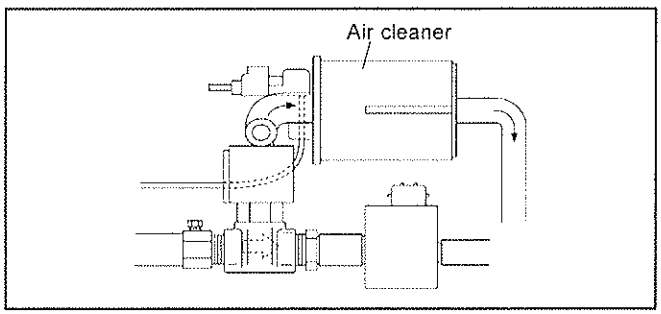
Inspection 9
Inspect no clogging of the piping between the blower sensor and muffler.

OK → Flow rate sensor defect

NG

Clean or replace the piping.

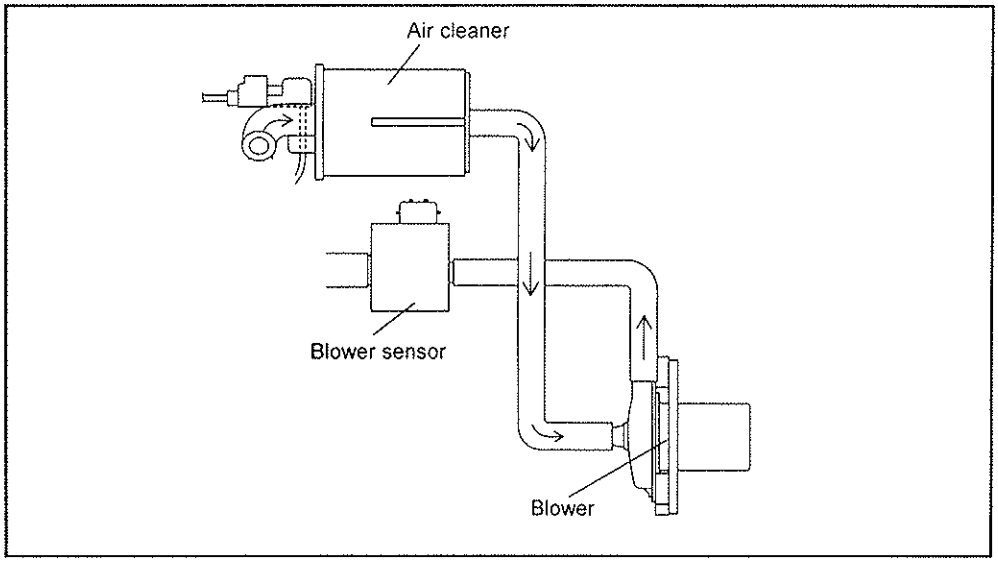
Inspection 1: Air cleaner clogging inspection
See that the blower air cleaner is not clogged.



OK → To inspection 2
NG → Clean or replace the air cleaner

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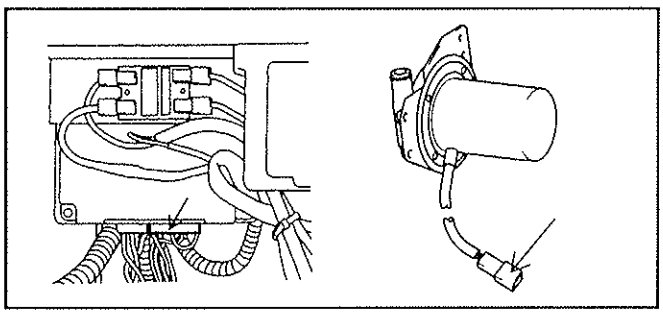
Inspection 2: Gas leakage inspection
See that no gas is leaking from the piping that connect the blower air cleaner and flow rate sensor.

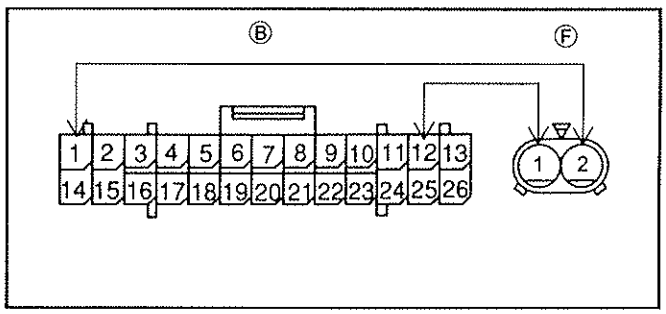


OK → To inspection 3
NG → Clean or replace the piping

Inspection 3: Blower wiring continuity inspection
Disconnect the blower and controller connector.

Tester range: Ω × 1					
Measurement terminals	Controller connector	B-1 — B-12 —	Blower connector	F-2 F-1	
Standard	0 Ω				





OK → To inspection 4
NG → Repair or replace the wiring

Inspection 4: Blowr individual inspection
See page 1-57 in the repair manual.

OK → To inspection 5
NG → Blower defect

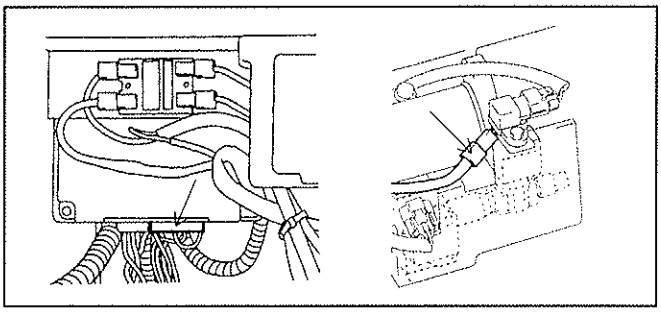
Inspection 5: DPF valve individual inspection
See page 1-57 in the repair manual.

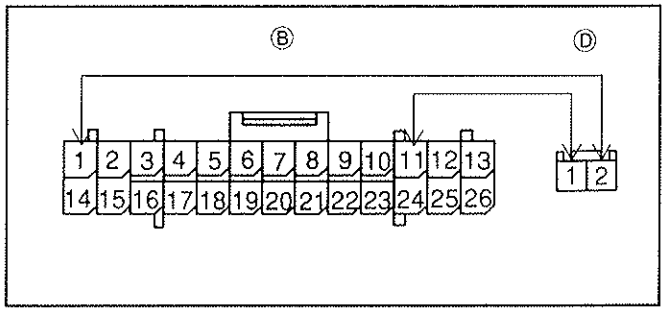
OK → To inspection 6
NG → DPF valve defect

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Inspection 6: DPF valve wiring continuity inspection
Disconnect the DPF valve and controller connector.

Tester range: Ω × 1					
Measurement terminals	Controller connector	B-1 — B-11 —	DPF valve connector	D-2 D-1
Standard	0 Ω				





OK → To inspection 7
NG → Repair or replace the wiring

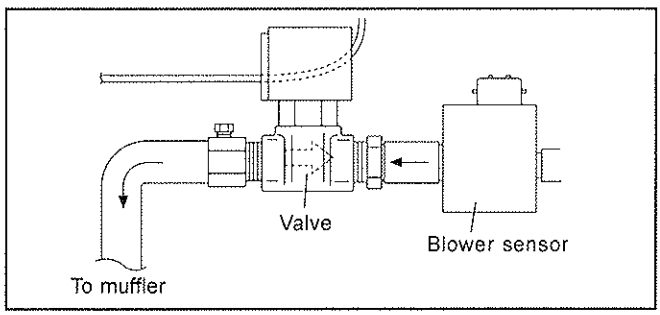
Inspection 7: Flow rate sensor input check
See inspection 2 for error code 4-1.

OK → Controller defect
NG → To inspection 8

Inspection 8: Flow rate sensor wiring continuity inspection
See inspection 3 for error code 4-1.

OK → To inspection 9 after DPF muffler individual inspection
NG → Repair or replace the wiring

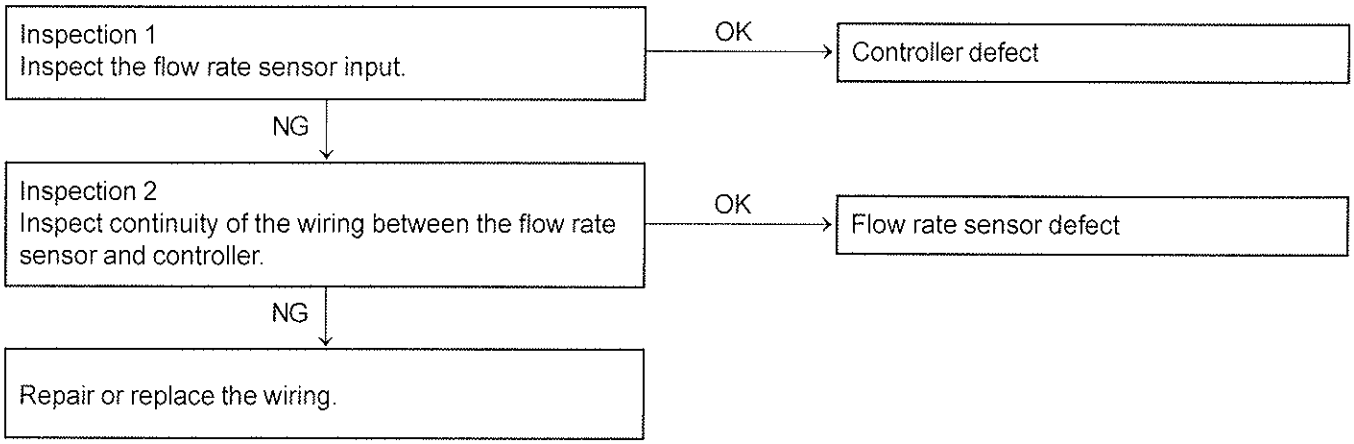
Inspection 9: Clogged piping inspection
See that the piping between the blower sensor and muffler is not clogged.



OK → Flow rate sensor defect
NG → Clean or replace the piping

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Error Code 4-3



Inspection 1: Flow rate sensor input check
See inspection 2 for error code 4-1.

OK → Controller defect
NG → To inspection 2

Inspection 2: Flow rate sensor wiring continuity check
See inspection 3 for error code 4-1.

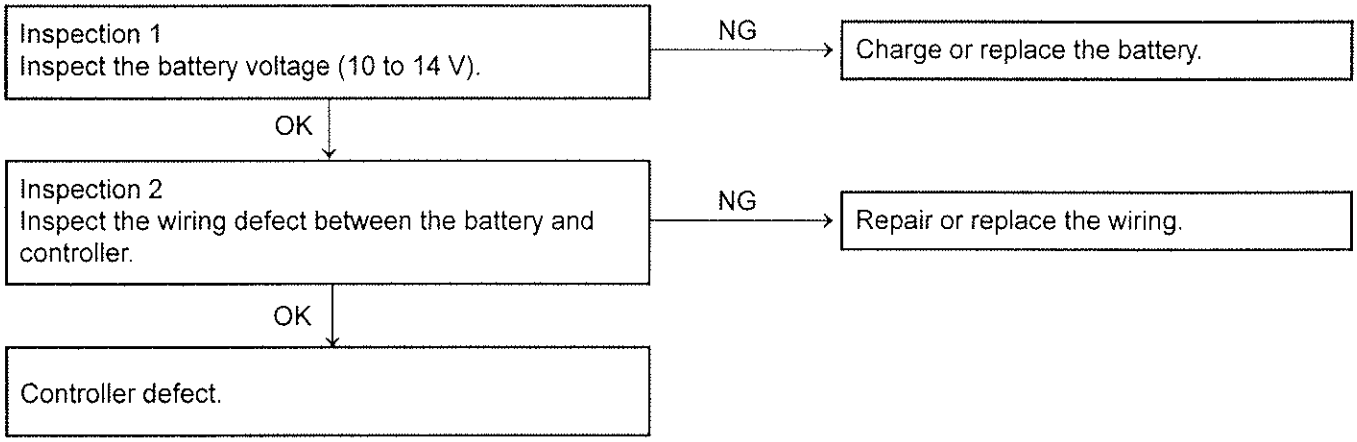
OK → Flow rate sensor defect
NG → Repair or replace the wiring

Error Code 5-1
Replace the DPF filter.

Error Code 6-1
Replace the controller.

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Error Code 7-1



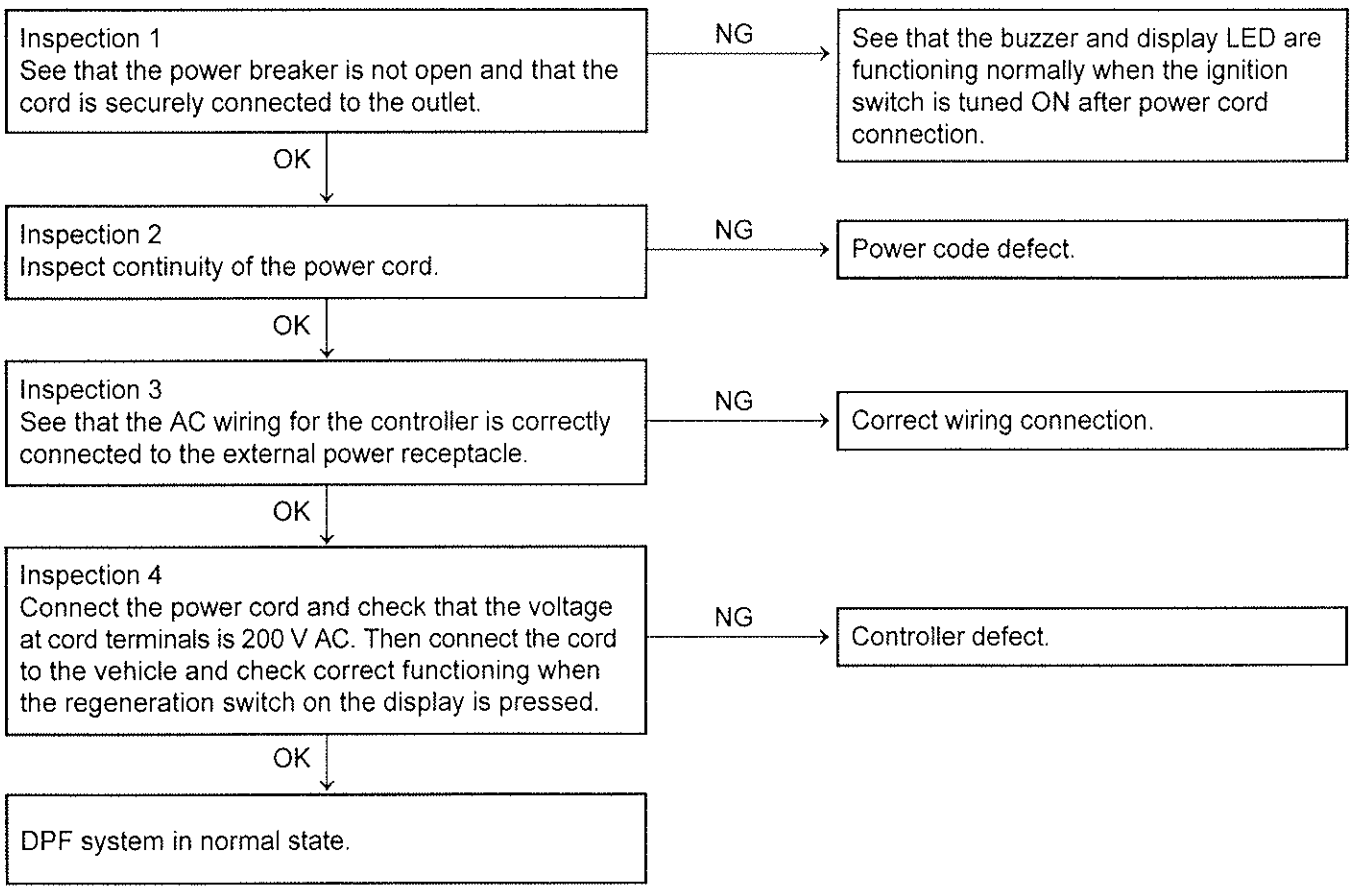
Inspection 1: Battery voltage inspection
See that the battery voltage is between 10 and 14 V.

OK → To inspection 2
NG → Charge or replace the battery

Inspection 2: Wiring inspection
Inspect the wiring defect between the battery and controller.

OK → Controller defect
NG → Repair or replace the wiring.

Error Code 7-2



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Inspection 1: Power supply inspection
Check to see that the power breaker is not opened and the power cord is securely connected.

OK → To inspection 2
NG → Check correct functioning of LEDs after the correction

Inspection 2: Power cord continuity inspection
Inspect continuity between both ends of the power cord.

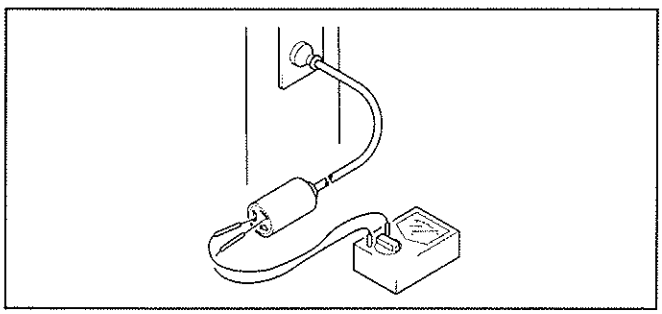
OK → To inspection 3
NG → Power cord defect

Inspection 3: Controller AC wiring inspection
Check that the wiring between the controller and outlet is securely connected.

OK → To inspection 4
NG → Correct wiring connection

Inspection 4: Power supply voltage inspection
Connect the power cord.

Tester range: AC 500 V	
Measurement terminals	Power cord terminals
Standard	210 ~ 240V AC



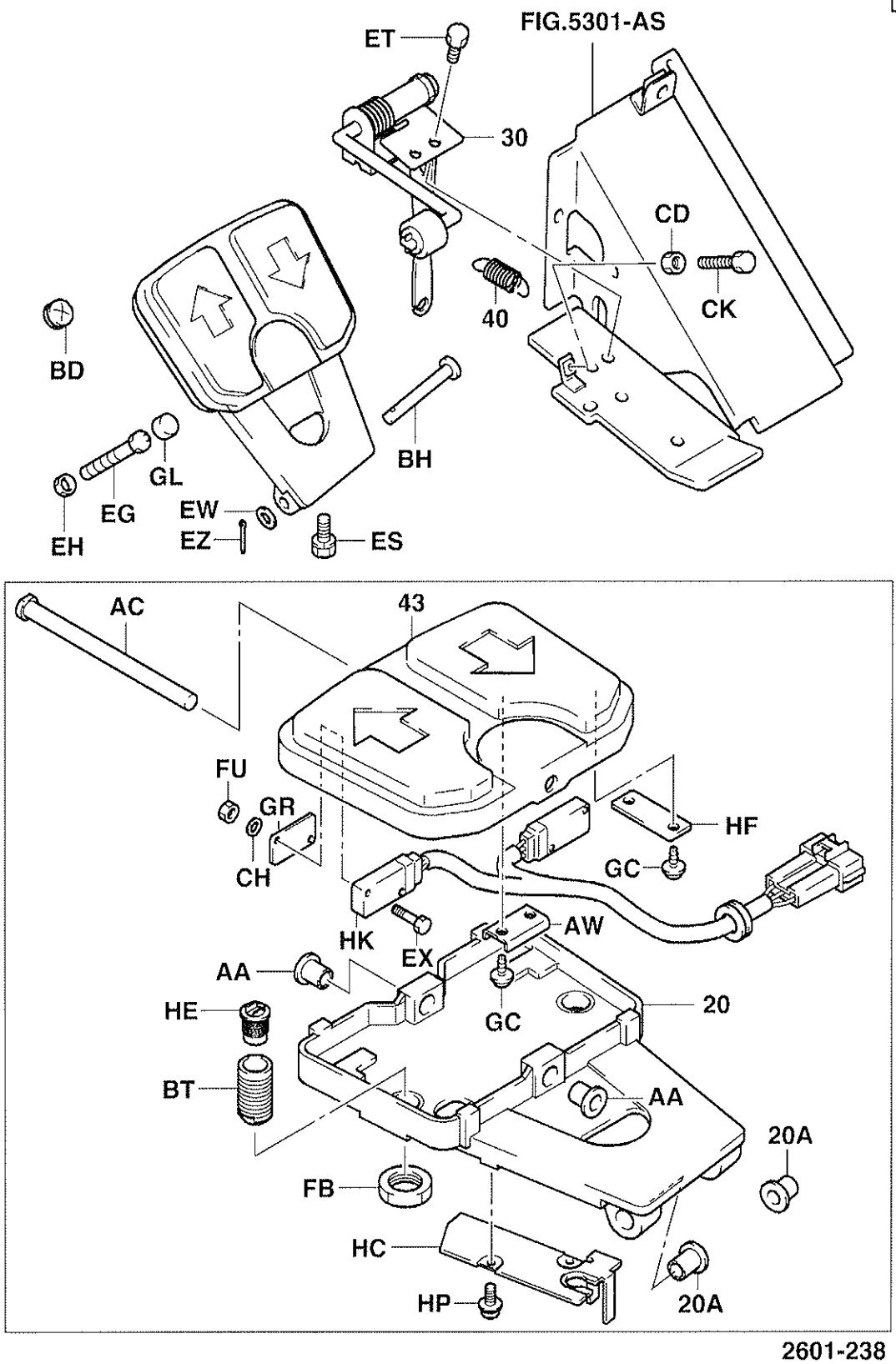
OK → DPF system in normal state
NG → Controller defect

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D2 PEDAL (OPT)

COMPONENTS

2601

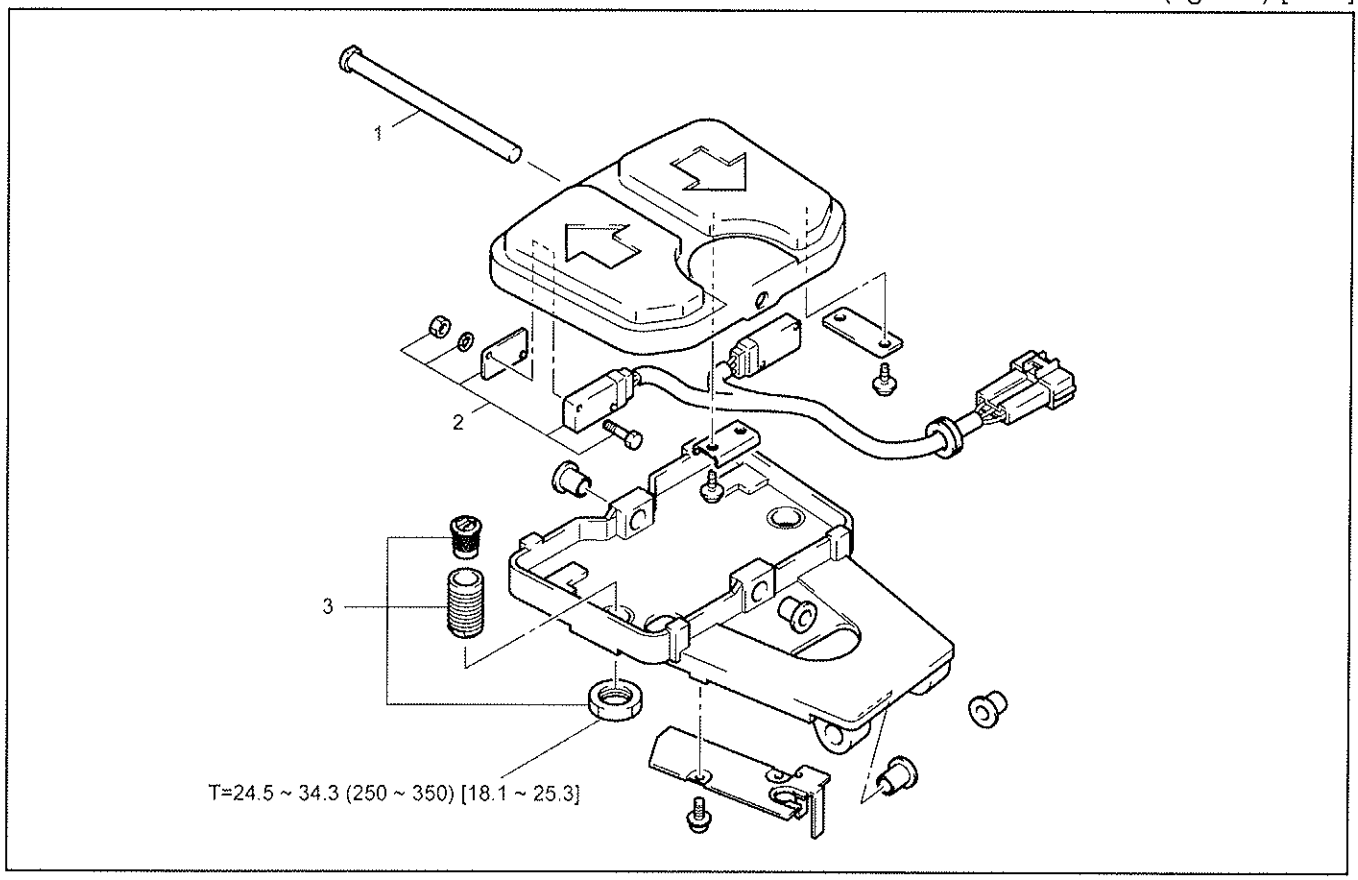


2601-238

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the pin and separate the pad W/switch from the pedal. **[Point 1]**

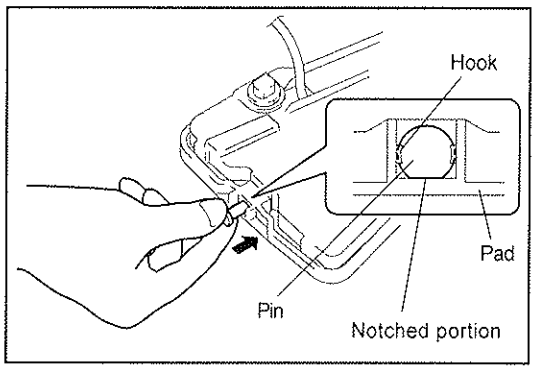
2 Remove the switch ASSY. **[Point 2]**

3 Remove the holder W/magnet. **[Point 3]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Apply grease on the inner surface of each bushing.**
- **After reassembly, adjust the direction switch. (See page 1-85.)**

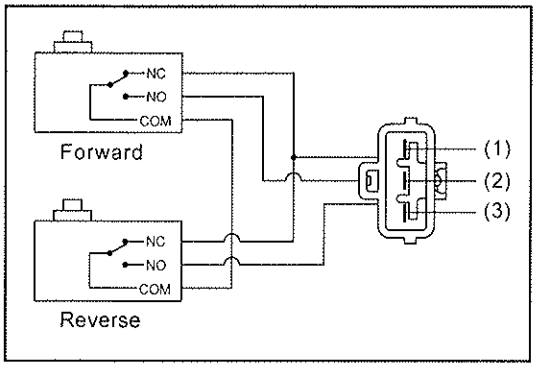


Point Operations

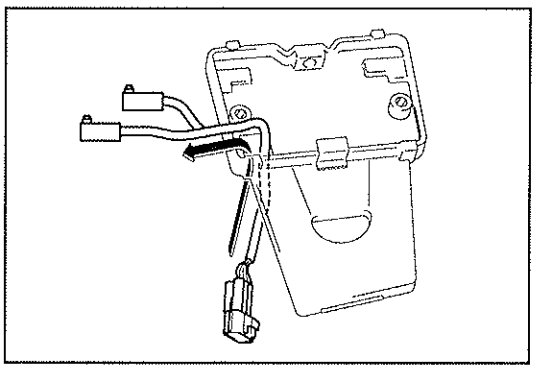
[Point 1]
Disassembly:
Extract the pin by lightly tapping the pin edge (the flangeless side).

Reassembly:
Push the pin in with its notched flange portion in the illustrated direction until it goes beyond the pad side hook.

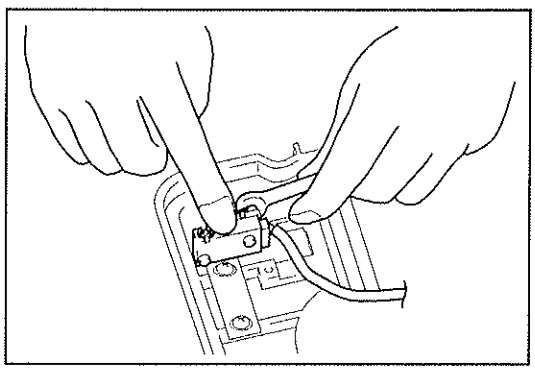
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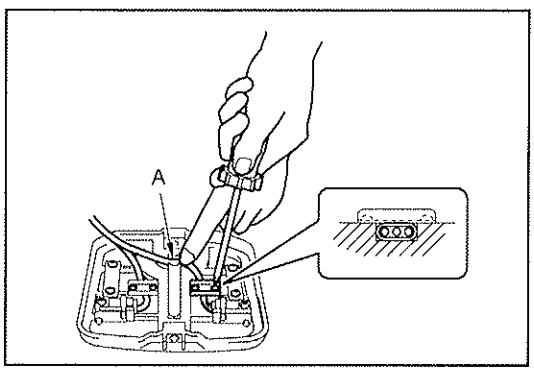
[Point 2]
Inspection:
Check continuity of switches.
Forward side:
Continuity between (1) and (2) when the switch is pressed.
Reverse side:
Continuity between (1) and (3) when the switch is pressed.



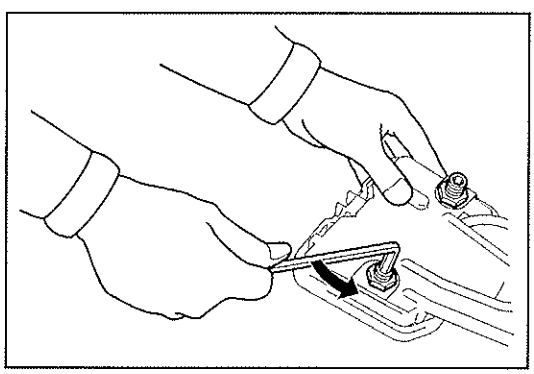
Reassembly:
Reassemble in the following order:
1. Pass the switch through the pedal side hole.



2. Install the switch on the pedal.
Set the switch while fully pressing it onto the pad.
Apply locking agent (08833-76002-71 (08833-00080)) at the tip end of the screw before tightening the nut.



3. Fix the switch harness by means of the plate.
Avoid overlaying of three wire harnesses in the harness tube as illustrated.
Also push portion A of the harness so as not to be raised (to prevent interference at the time of pin insertion).

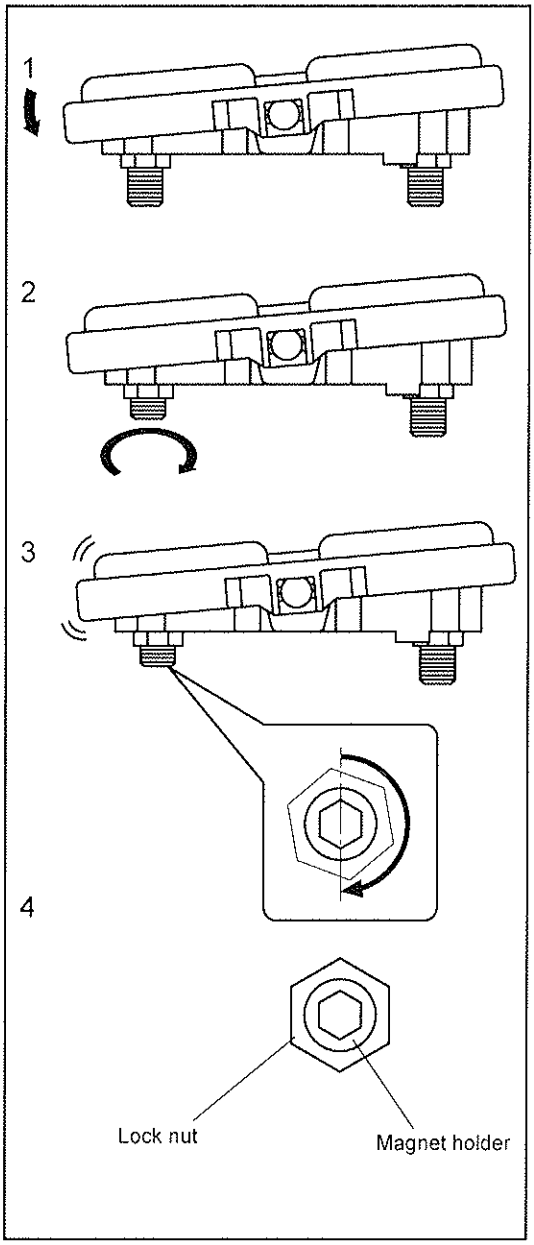


[Point 3]
Reassembly:
Since the holder W/magnet needs height adjustment, set it temporarily in a low position. See page 1-85 for adjustment.

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ADJUSTMENT

Note:
- **Adjust the pedal roller height and pedal stopper bolt height. (See page 1-26)**
- **Direction switch adjustment is explained here.**



Direction Switch Adjustment Procedure

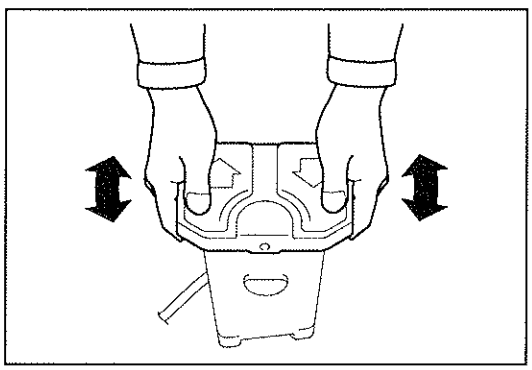
1. Fully tilt the accelerator pedal pad to either of one side. It shall not contact to the magnet at the time.

2. Screw in the magnet holder at the tilted side.

3. Where the pad starts moving slightly is the position that the magnet come to contact with the accelerator pedal pad plate. Then thread in by a half (1/2) turn from that point.

4. Tighten the lock nut.
   Secure the magnet holder so as not to turn.

5. Adjust the other side in the same manner as in 1 to 4 .



6. After adjustment, confirm that the switches are actuated before magnets contact to the pedal pad plate by tilting the pad slowly.

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TORQUE CONVERTER & TRANSMISSION (~ 2003.10)

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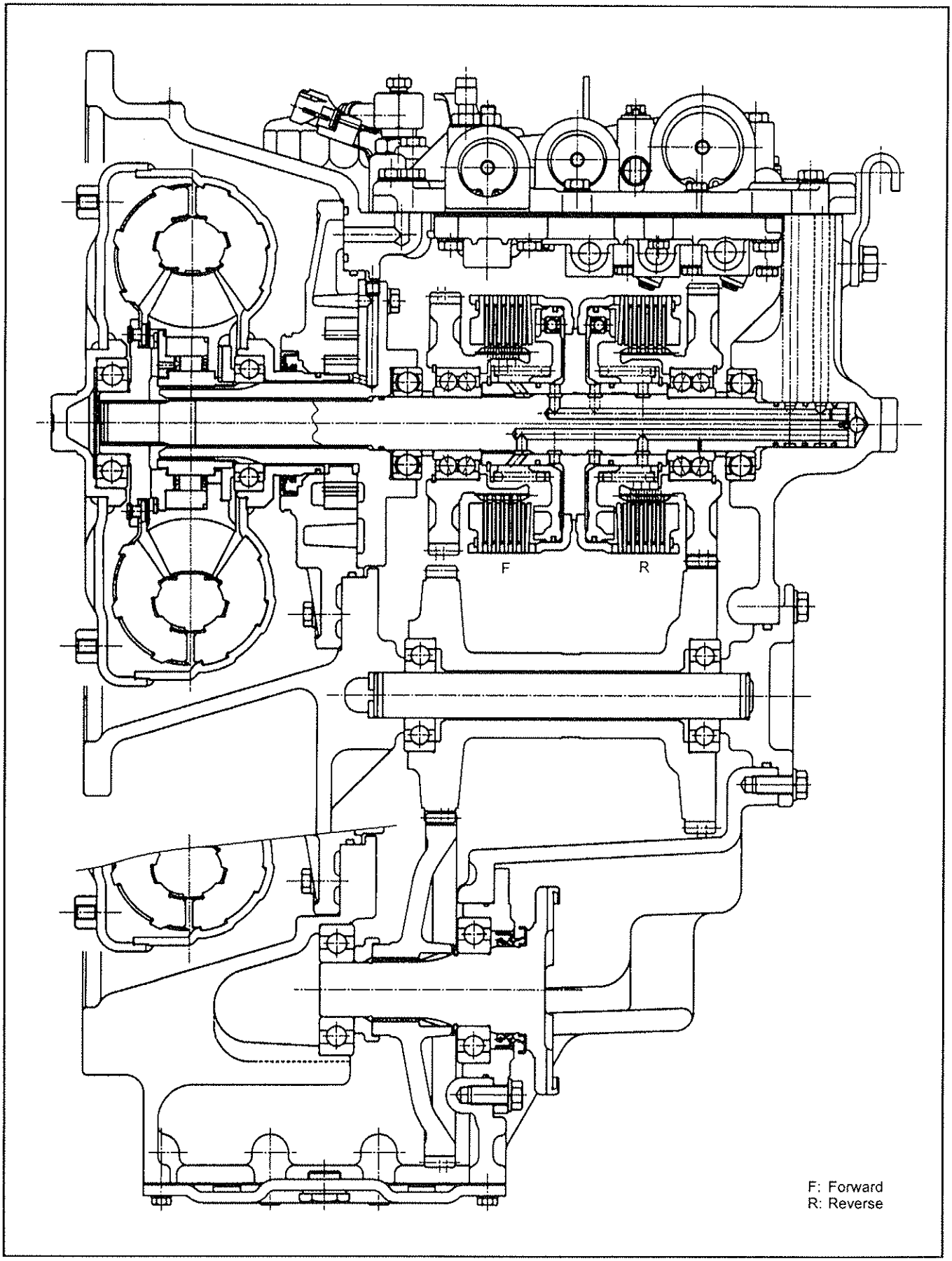
DIRECTION SWITCH ASSY 2-34

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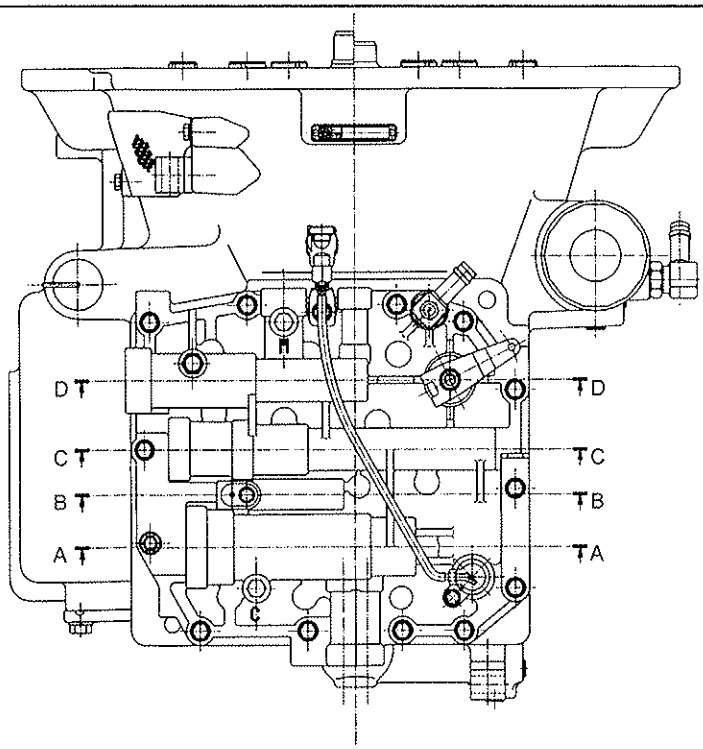
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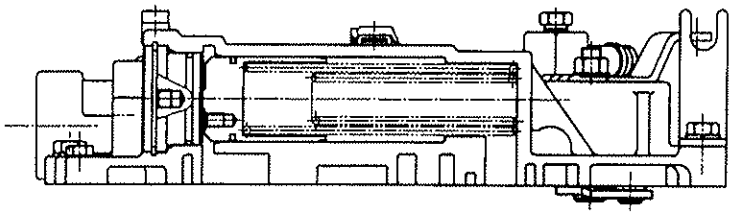
GENERAL



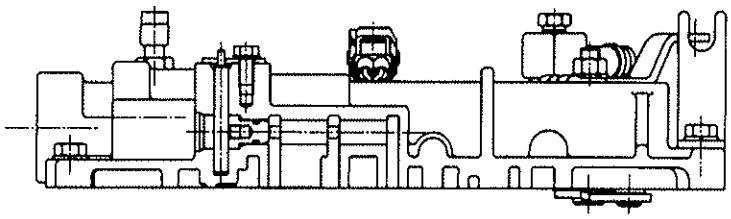
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Control Valve (Upper)

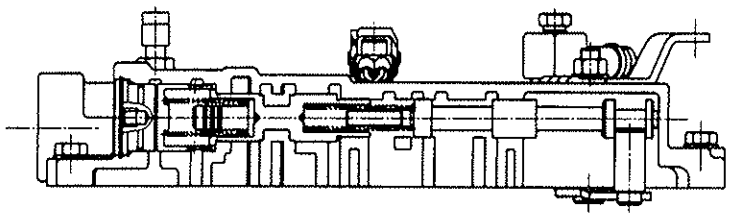




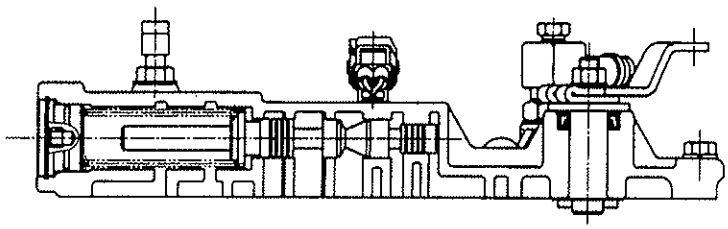
A-A: Accumulator



B-B: Change valve



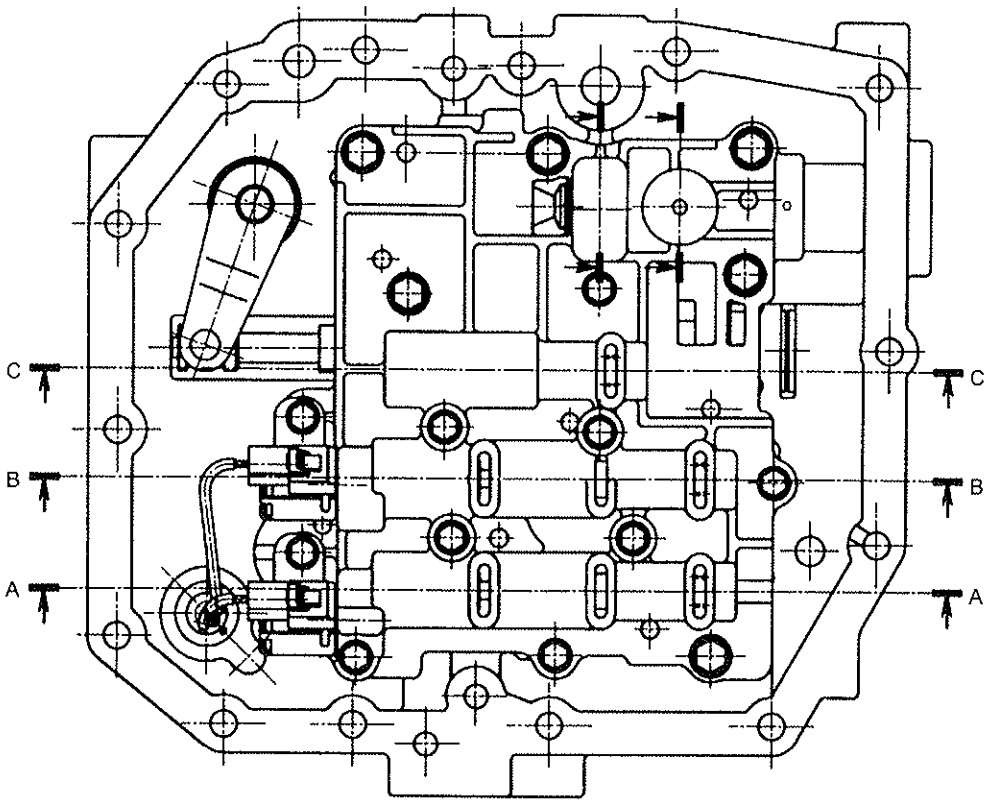
C-C: Inching valve

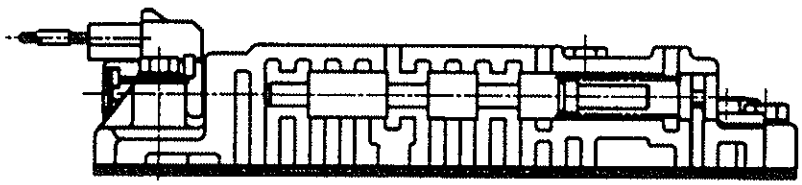


D-D: Regulator valve

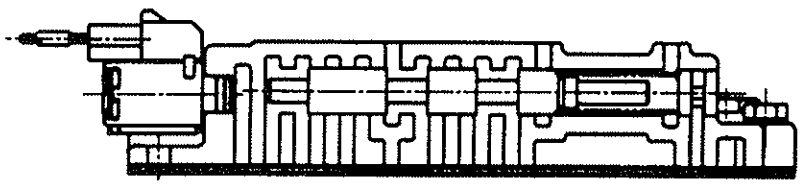
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Control Valve (Lower)

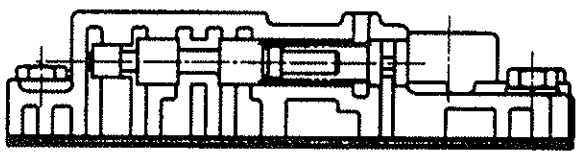




A-A: Shift change valve (R)



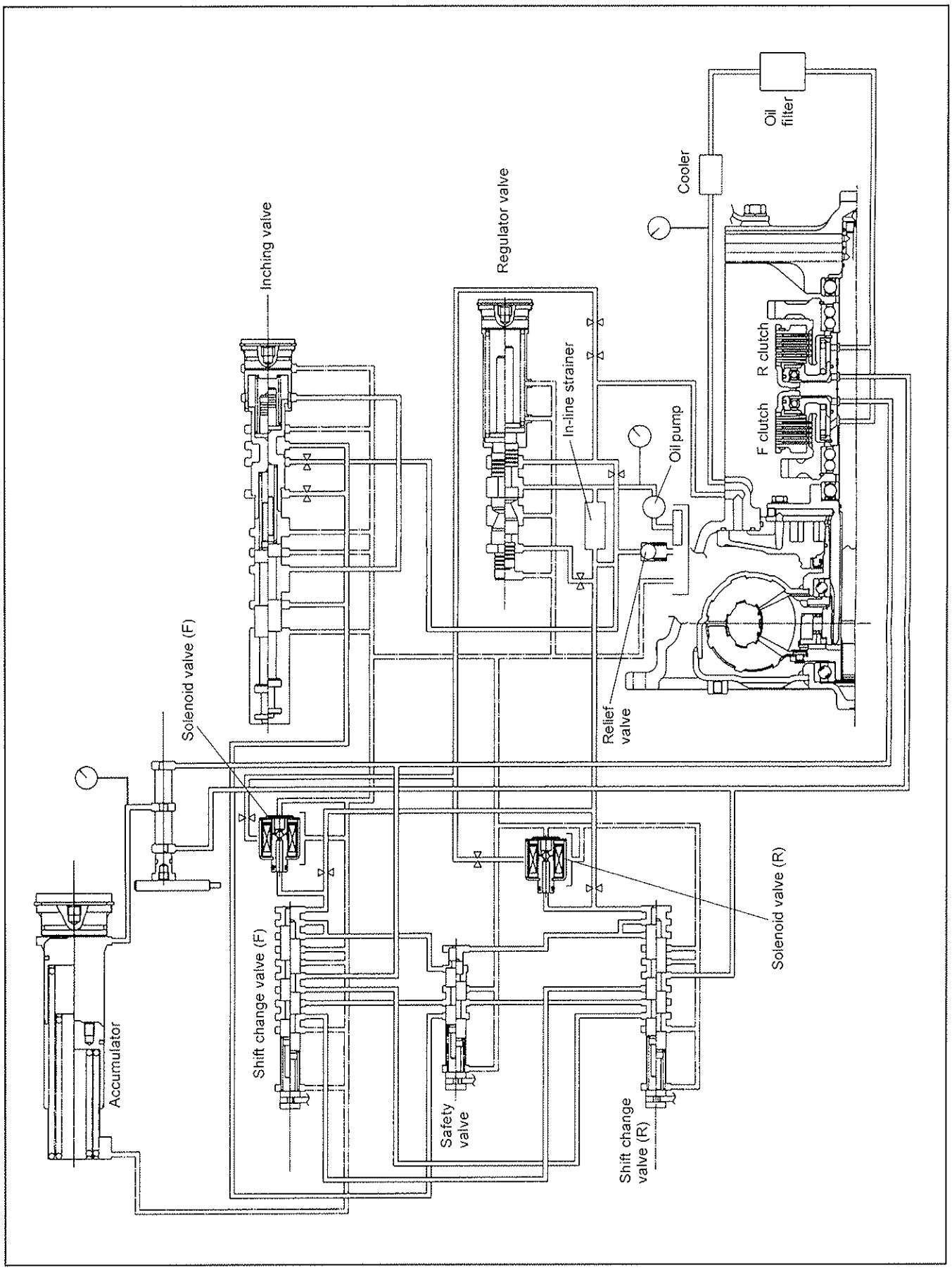
B-B: Shift change valve (F)



C-C: Safety valve

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HYDRAULIC CIRCUIT DIAGRAM



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SPECIFICATIONS

Maker	Aisin
Torque converter type	3 elements, 1 stage, 2 phases type
Torque converter model	AISIN
Stall torque ratio	4Y·1DZ-II : 2.68 2Z : 2.72
Stall speed rpm	4Y·1DZ-II : 2100 2Z : 2050
Control system	Solenoid type selector valve
Clutch operating pressure (main pressure) kPa(kgf/cm²)[psi]	1108 (11.3) [161]
Torque converter outlet pressure kPa(kgf/cm²)[psi]	392 (4.0) [57]
Torque converter oil capacity ℓ (USgal)	9.0 (2.38)
Torque converter oil	ATF GM Dexron® II

Note: The indicated oil pressure is at an engine speed of 2000 rpm.

Torque Converter Ratio

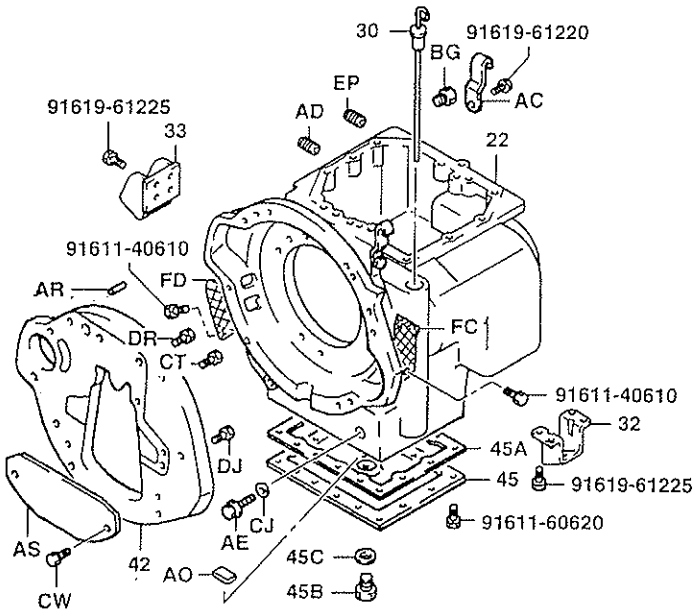
	1 ton series	2·3·J3.5 ton series	
	4Y·1DZ-II	4Y·1DZ-II	2Z
Forward	1.531	1.583	1.340
Reverse	1.540	1.594	1.343

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COMPONENTS

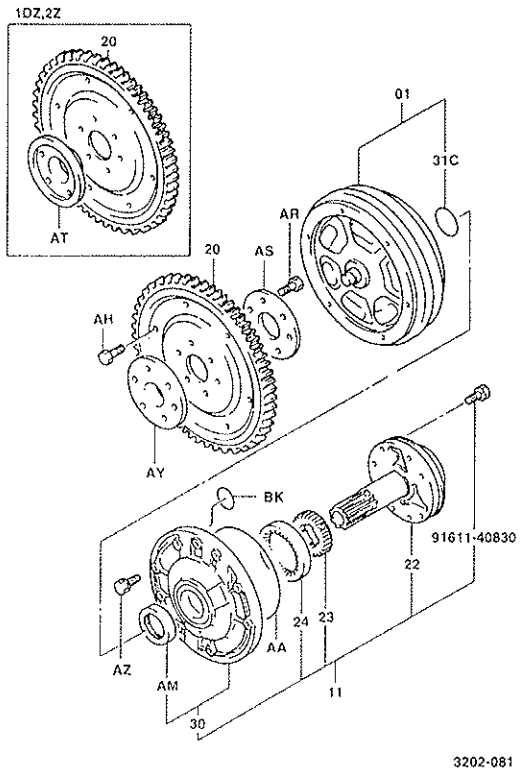
Torque Converter Housing

3201



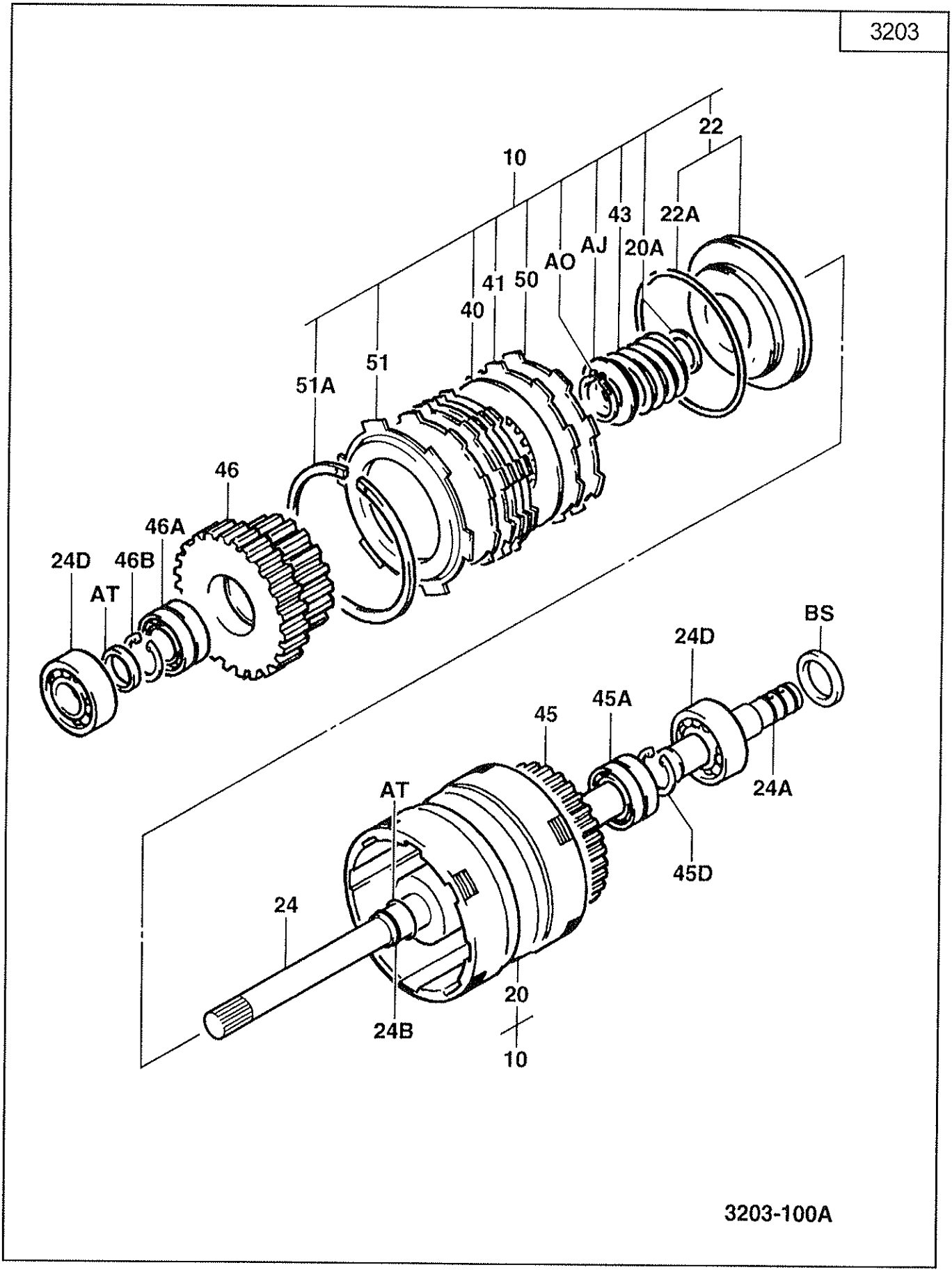
Torque Converter

3202



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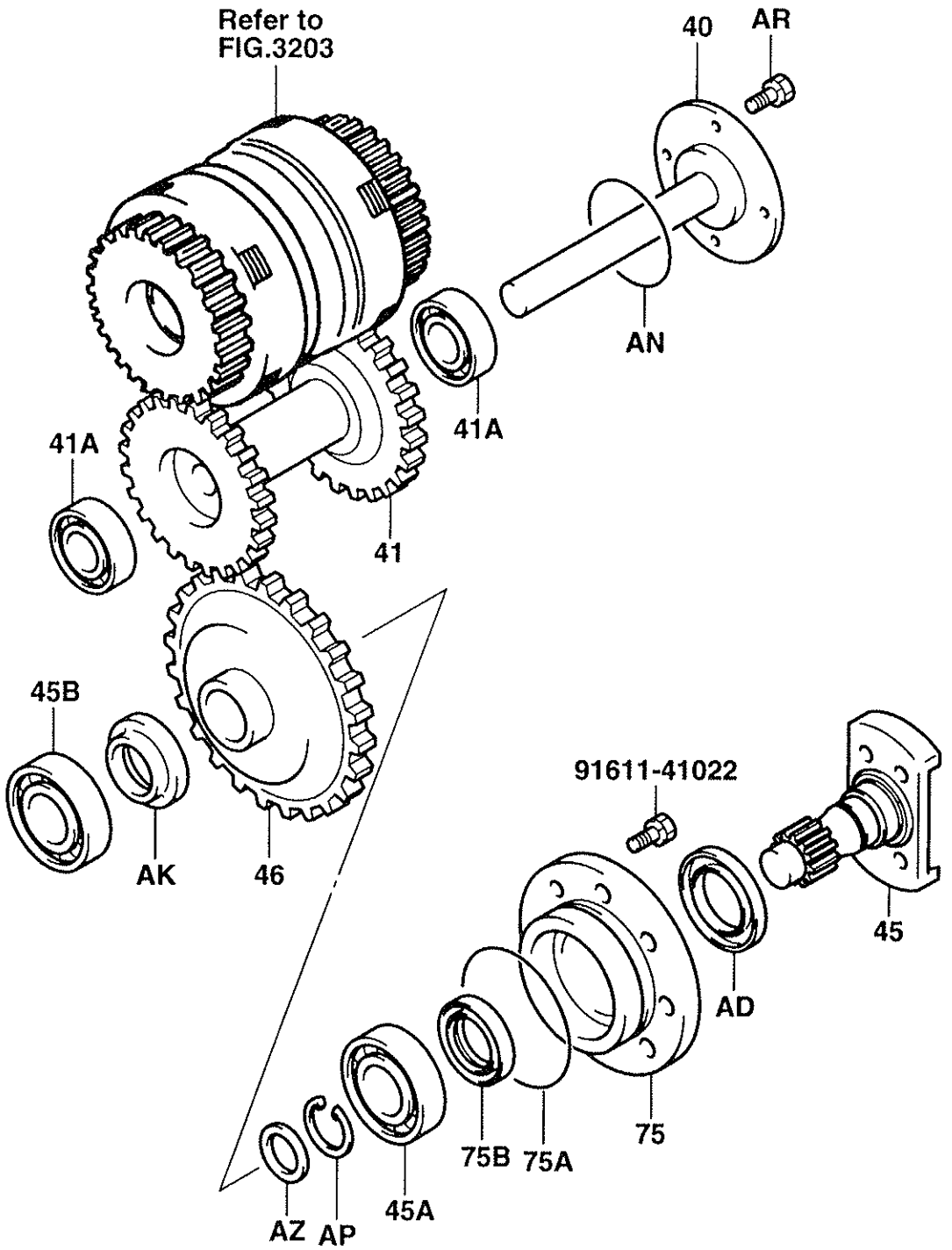
Torque Converter Clutch



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Torque Converter Gear

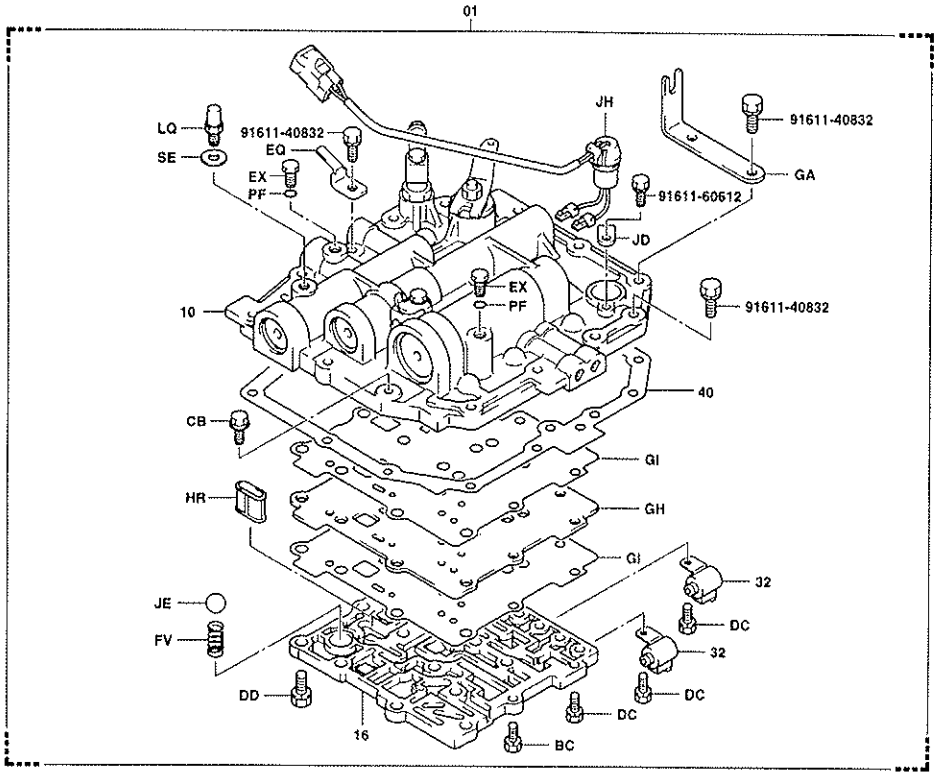
3204

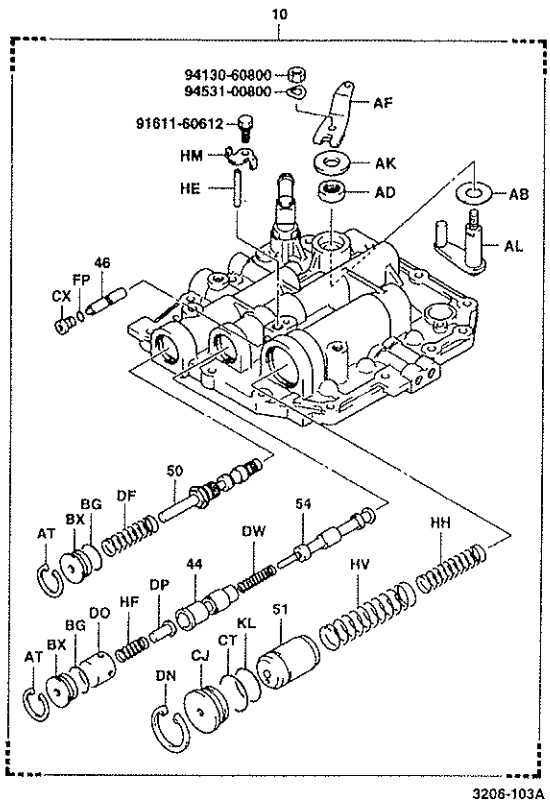


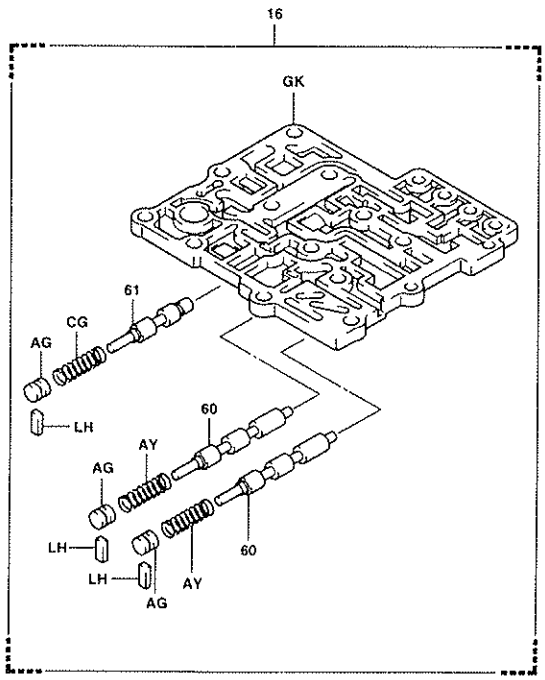
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Control Valve

3206



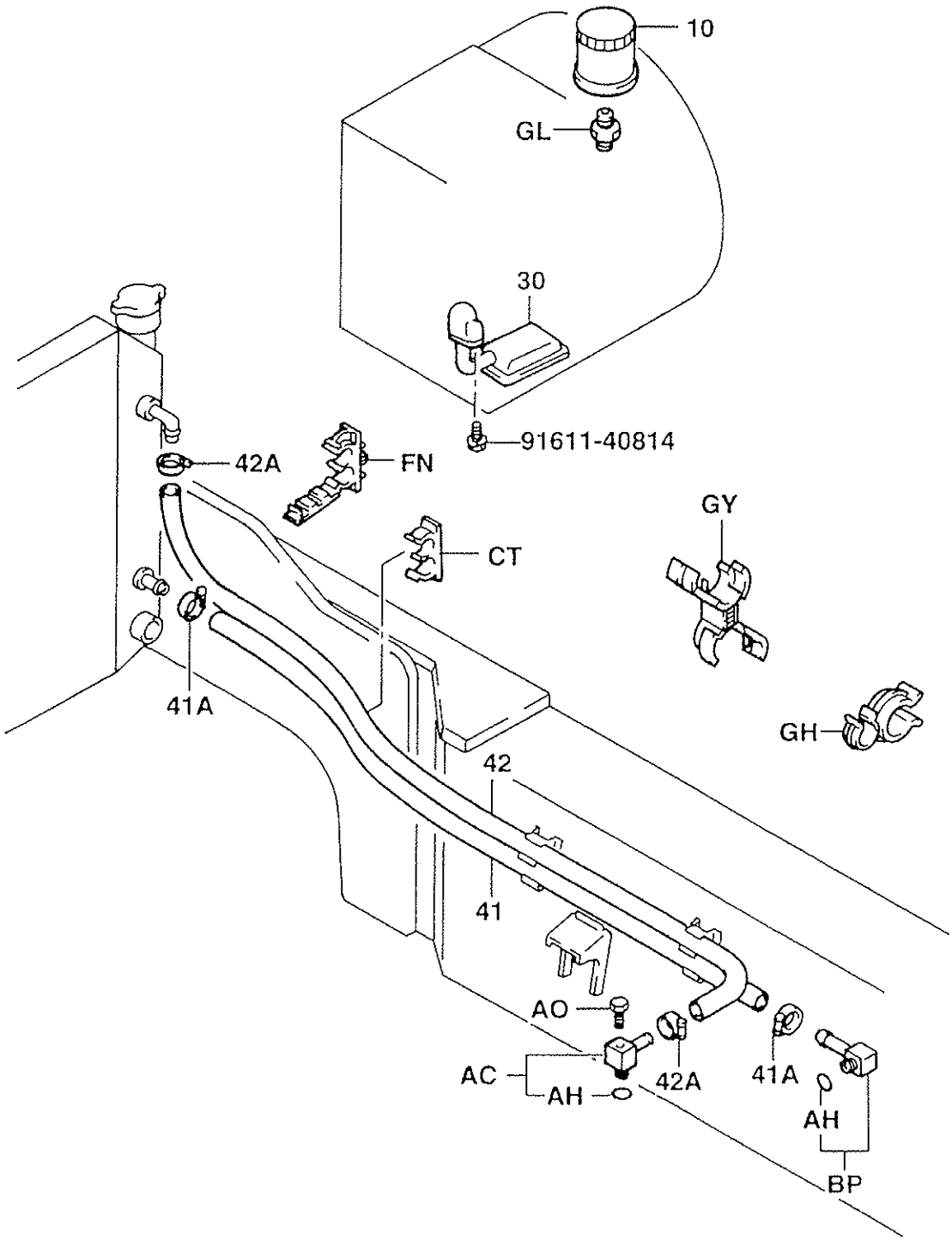




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Torque Converter Piping

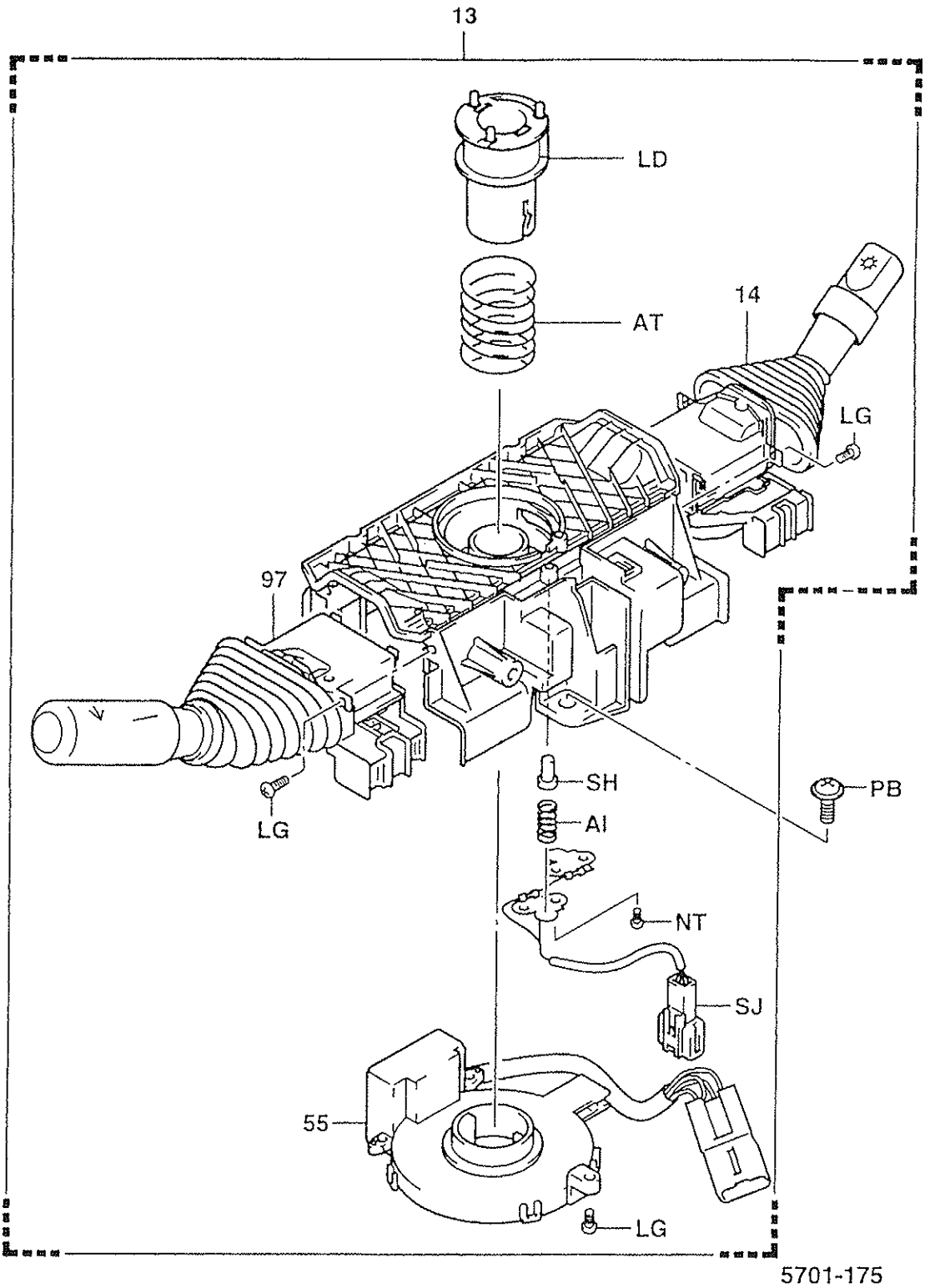
3213



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Direction Switch

5701



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TROUBLESHOOTING

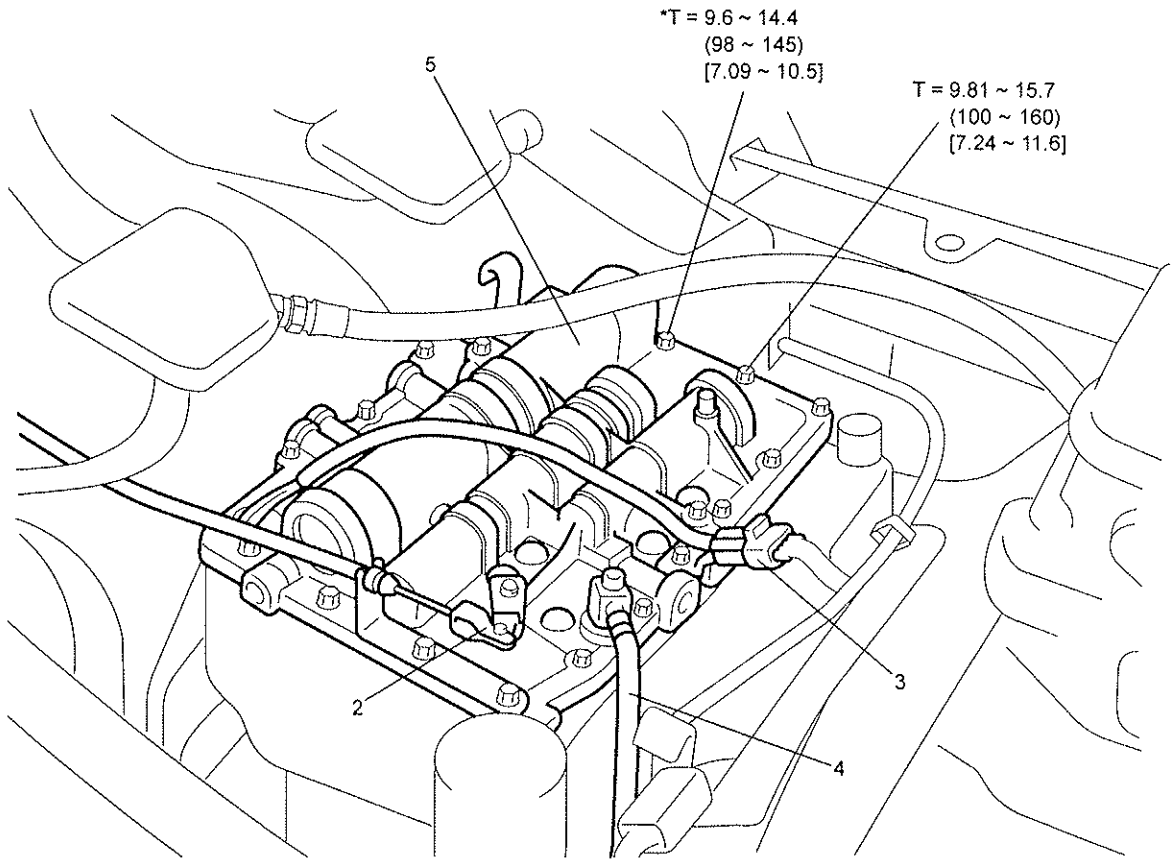
			Disassembly and inspection																										On-board inspection							
			Control valve																Components other than control valves (torque converter & transmission)										Shift lever switch and neutral start switch	ATF level and quality	Inching lever, and wire cable	Oil pressure test	Stall test						
			Regulator valve	Inching valve	Shift change valve for F	Shift change valve for R	Safety valve	Change valve for F↔R	Accumulator for F, R	Solenoid valve For F	Solenoid valve for R	In-line strainer	Relief valve	Wire to solenoid			Oil strainer	Torque converter	Oil pump	Clutch drum for F	Clutch drum for R	Gear, bearing																
Faulty starting	No starting at F		○		○	○				○				○									○					○							
	No starting at R				○	○					○			○							○	○	○					○							
	No starting at any ranges		○	○			○						○	○			○	○	○			○	○					○		○	○				
	Start at N range									○	○									○	○							○							
	Changed naturally from F																																			
Large shock at starting (shifting)	At starting after shifting	At N → F	○					○	○											○															
		At N → R	○					○	○												○														
	Inching start	At F	○	○					○											○															
		At R	○	○					○												○														
Large time lag at starting (shifting)	At N → F		○		○		○						○				○	○	○	○															
	At N → R		○			○	○						○				○	○	○		○														
	At switch back	F ↔ R	○		○	○	○						○				○		○	○	○														
Slippage	At F		○															○	○	○	○														
	At R		○										○					○	○		○														
Others	Starter fails to revolve at N.																							○											
	Starter revolves at ranges other than N.																							○											
	No inching operation		○	○																									○	○					
	Overheating of transmission, no air flow from breather		○														○	○	○	○	○														
	Abnormal noise																																			

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TRANSMISSION & CONTROL VALVE ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



*: Note that only this bolt is M6 in the 1 speed torque converter and that all other bolts are different in size (M8 bolts).

Removal Procedure

1 Remove the toe board.

2 Disconnect the inching wire.

3 Disconnect the electrical wiring.

4 Disconnect the torque converter cooler hose.

5 Remove the transmission cover & control valve ASSY.

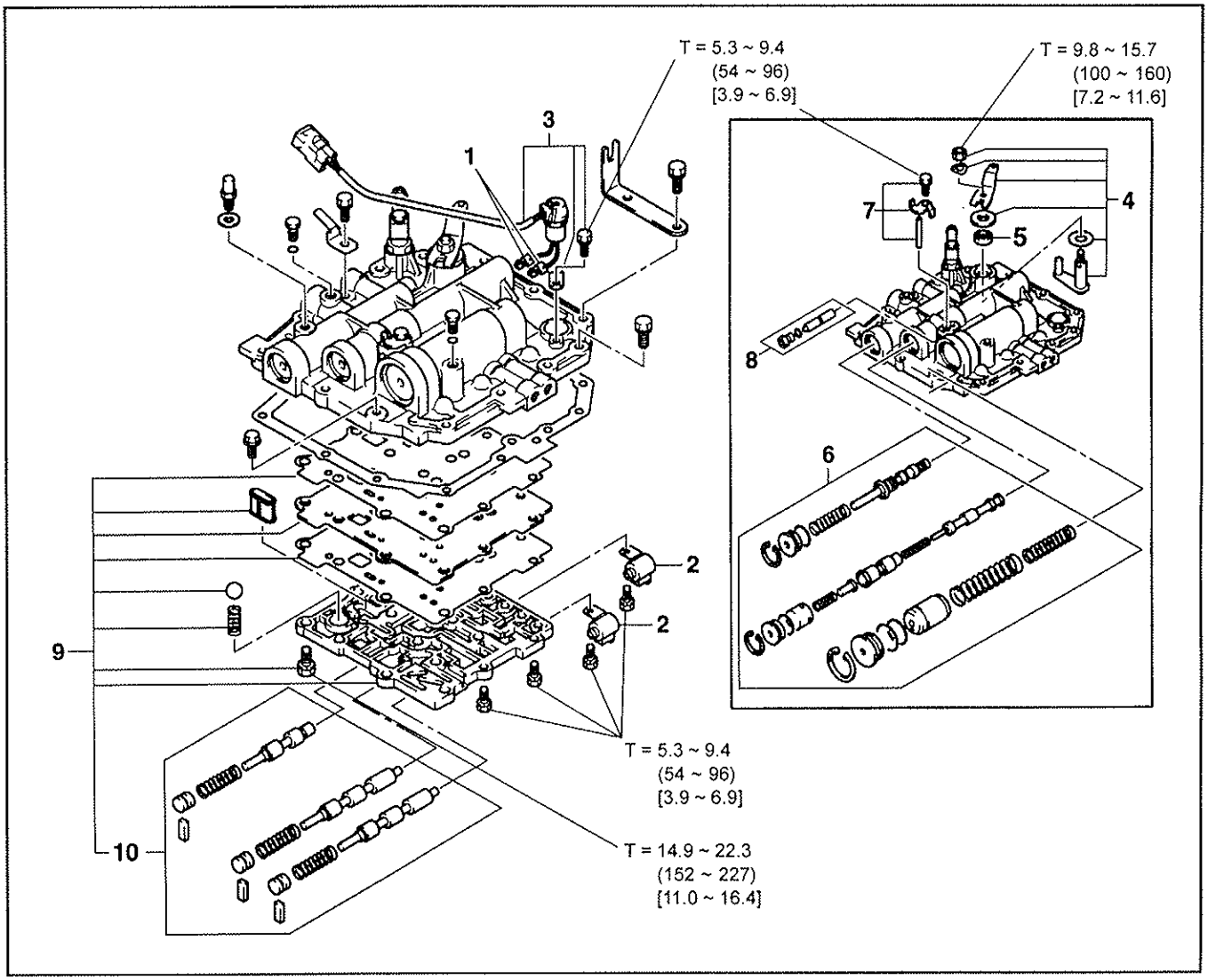
Installation Procedure

The installation procedure is reverse of the removal procedure.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Disconnect the solenoid valve connector.

2 Remove the solenoid valve.

3 Remove the sleeve lock plate and solenoid wire ASSY.

4 Remove the inching lever.

5 Remove the inching lever oil seal. **[Point 1]**

6 Remove the accumulator valve, inching valve and regulator valve. **[Point 2]**

7 Remove the change valve lock plate and pin. **[Point 3]**

8 Remove the change valve.

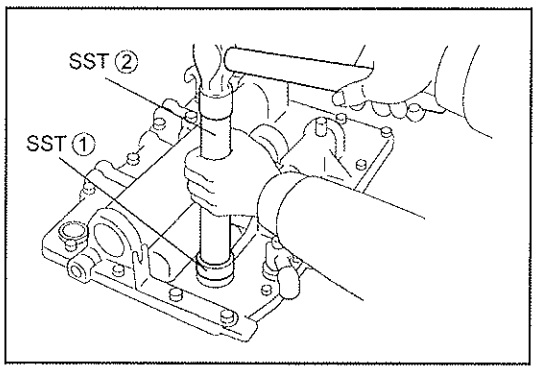
9 Remove the lower valve body ASSY, oil strainer, steel ball and spring. **[Point 4]**

10 Remove the safety valve, F shift valve and R shift valve. **[Point 5]**

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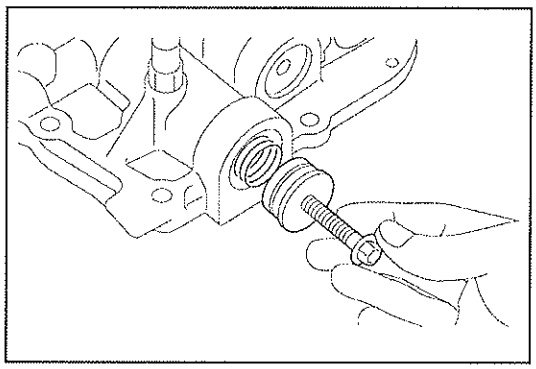
Reassembly Procedure

The reassembly procedure is reverse of the disassembly procedure.



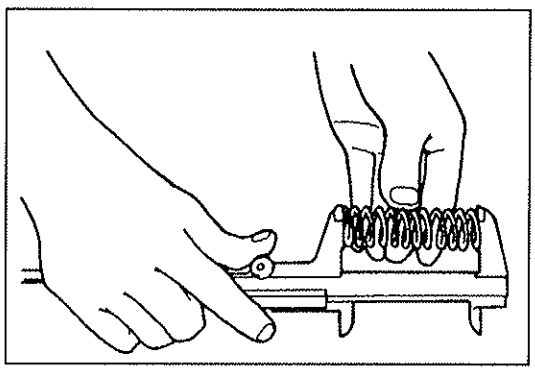
Point Operations

[Point 1]
Reassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



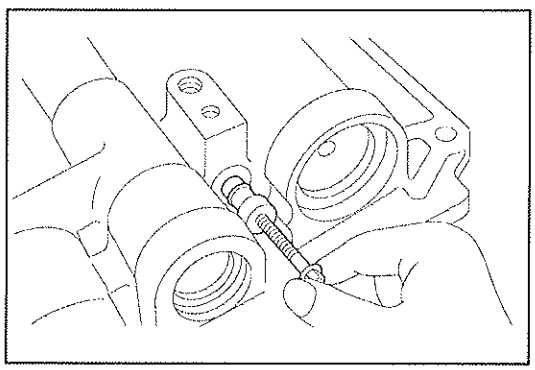
[Point 2]
Disassembly:
Remove the valve plug using the service bolt.

Service bolt size: M8 x 1.25



Inspection:
Measure free length of each valve spring.

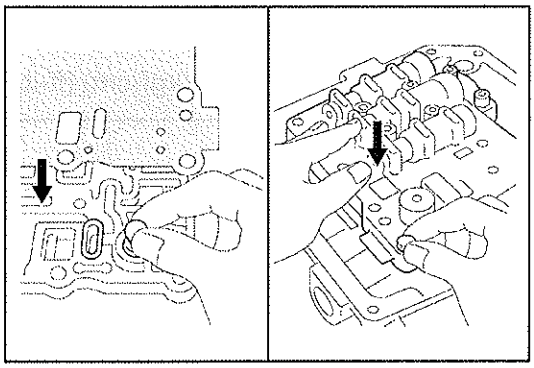
	Standard mm (in)	Limit mm (in)
Accumulator valve (inner)	86.0 (3.386)	81.7 (3.217)
Accumulator valve (outer)	117.0 (4.606)	111.2 (4.378)
Inching valve (plug side)	~ 2000. 3: 70.3 (2.768) 2000. 3 ~: 64.2 (2.528)	~ 2000. 3: 66.8 (2.630) 2000. 3 ~: 61.0 (2.402)
Inching valve (valve side)	49.9 (1.965)	47.4 (1.866)
Regulator valve	88.8 (3.496)	84.4 (3.323)



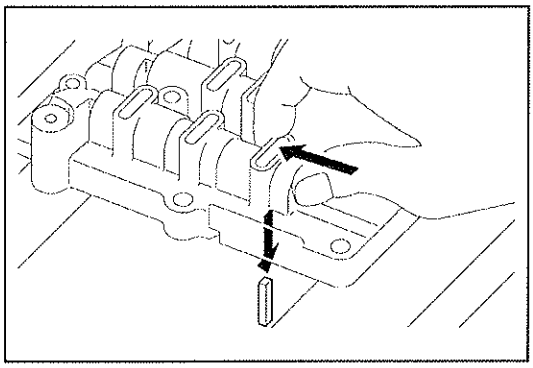
[Point 3]
Disassembly:
1st Speed
1. Remove the pin.
2. Remove the valve plug using the service bolt.

Service bolt size: M6 x 1.0

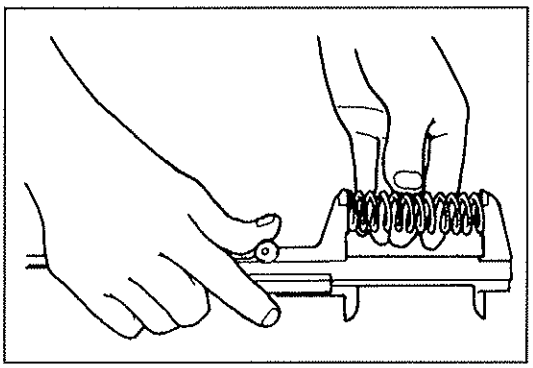
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[Point 4]
Reassembly:
Install the lower valve body.
1. Install the oil strainer, spring and steel ball (*) on the lower valve body, and put the plate and gasket on top.
*: Since June 2000, the cup type is adopted in place of the steel ball.
2. Reverse the above while maintaining the assembled state and install it on the transmission cover.



[Point 5]
Disassembly:
Press in the valve plug with its opening facing downwards and remove the key.



Inspection:
Measure free length of each valve spring.

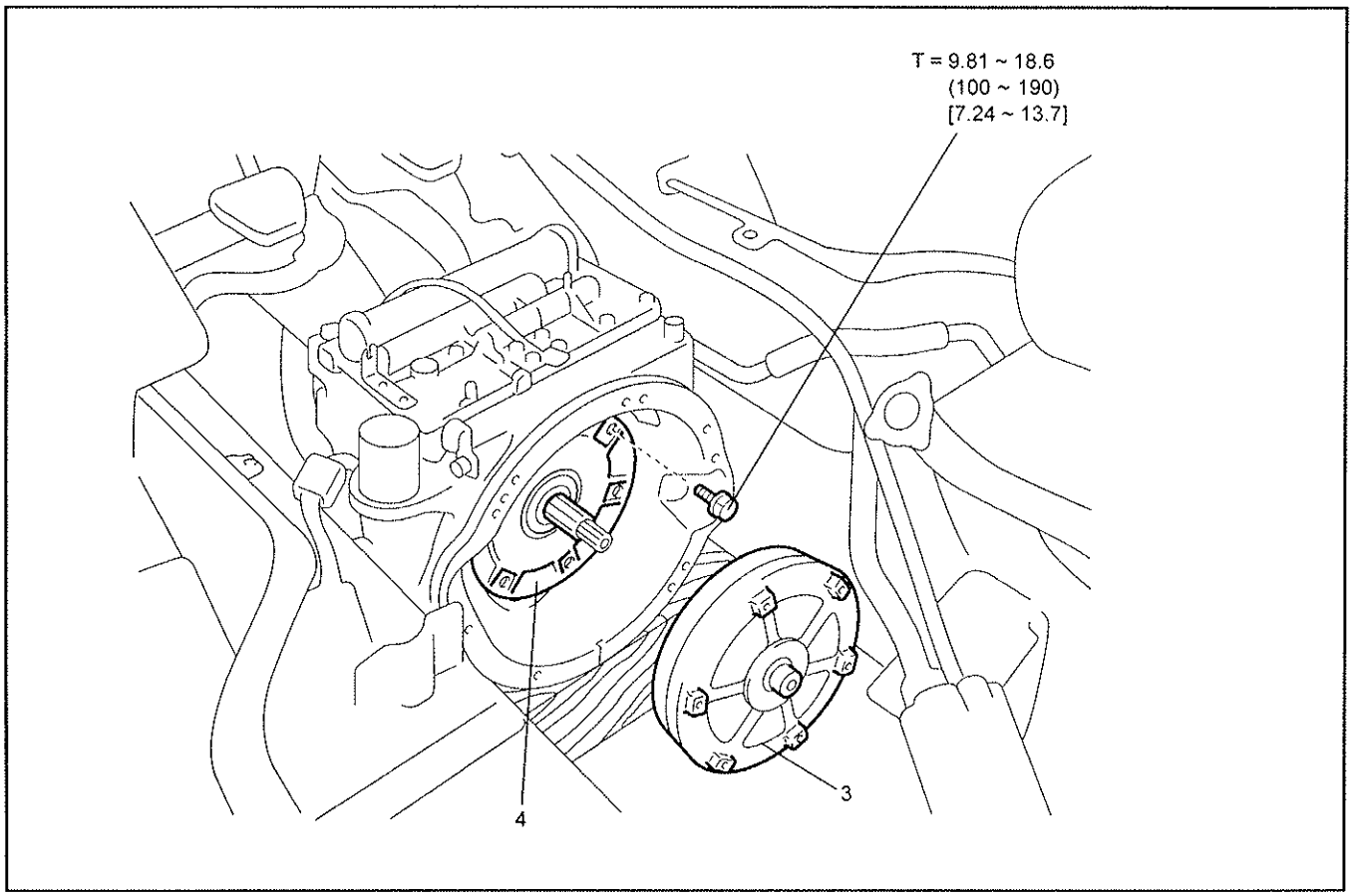
	Standard mm (in)	Limit mm (in)
F/R shift valve	53.5 (2.106)	50.8 (2.000)
Safety valve	59.8 (2.354)	56.8 (2.236)

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TORQUE CONVERTER·OIL PUMP

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Drain the torque converter oil.

2 Remove the engine. (See page 1-8.)

3 Remove the torque converter ASSY. **[Point 1]**

4 Remove the oil pump with stator shaft. **[Point 2]**

5 Remove the stator shaft.

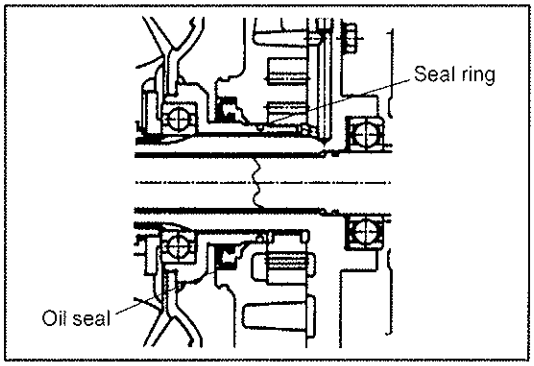
6 Remove the oil pump gear. **[Point 3]**

7 Remove the oil seal. **[Point 4]**

Installation Procedure

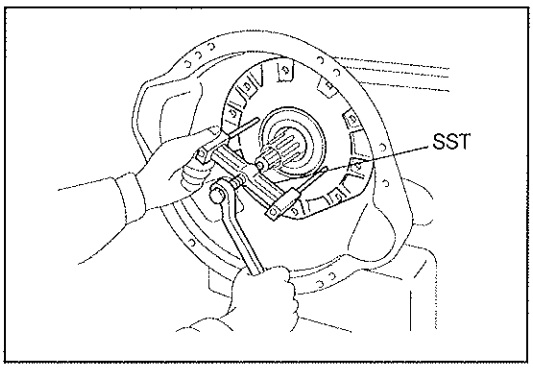
The installation procedure is reverse of the removal procedure.

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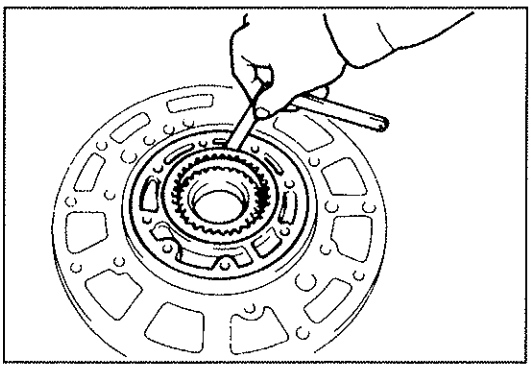


Point Operations

[Point 1]
Removal:
Be careful as the torque converter ASSY contains oil.
Installation:
Apply grease before installing the seal ring and oil seal lip.
Installation:
Install while rotating the torque converter ASSY so that the extension nail enters into the groove in the oil pump drive gear.

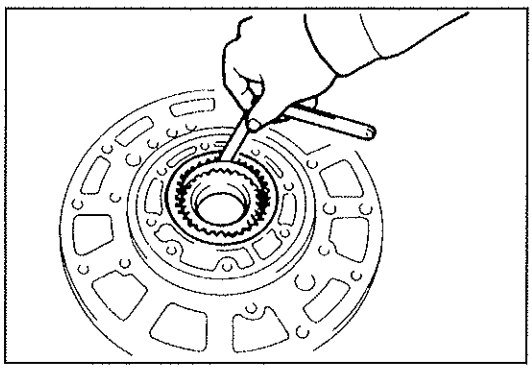


[Point 2]
Removal:
SST 09950-76003-71
(SST 09950-50012)



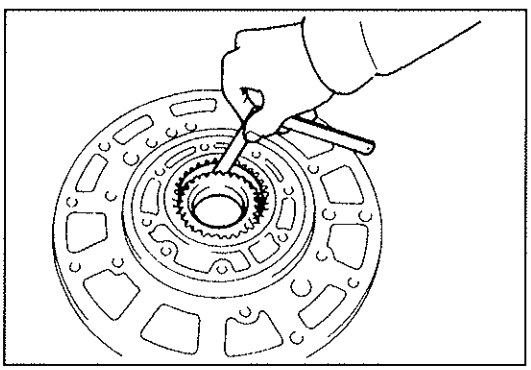
[Point 3]
Inspection:
Measure clearance between the oil pump driven gear and pump body.

Limit: 0.3 mm (0.012 in)



Inspection:
Measure clearance between the oil pump driven gear and crescent.

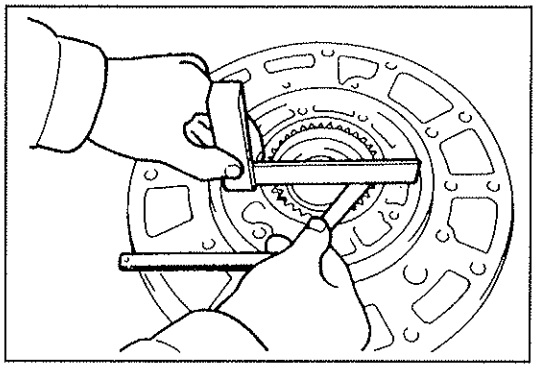
Limit: 0.4 mm (0.016 in)



Inspection:
Measure clearance between the oil pump drive gear and crescent.

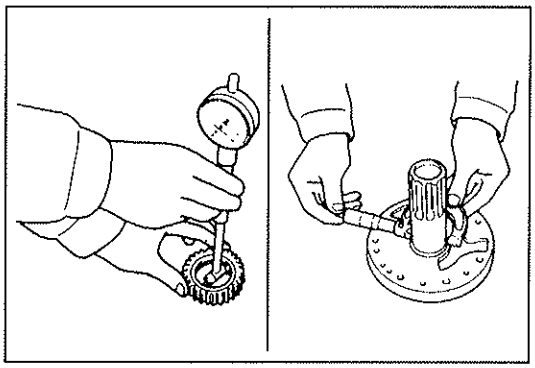
Limit: 0.4 mm (0.016 in)

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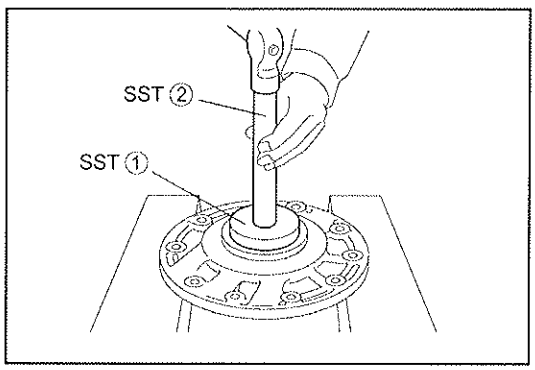
Inspection:
Measure clearance between the pump body and each gear.

Limit: 0.1 mm (0.004 in)



Inspection:
Measure clearance between the oil pump drive gear bushing and stator shaft.

Limit: 0.15 mm (0.0059 in)



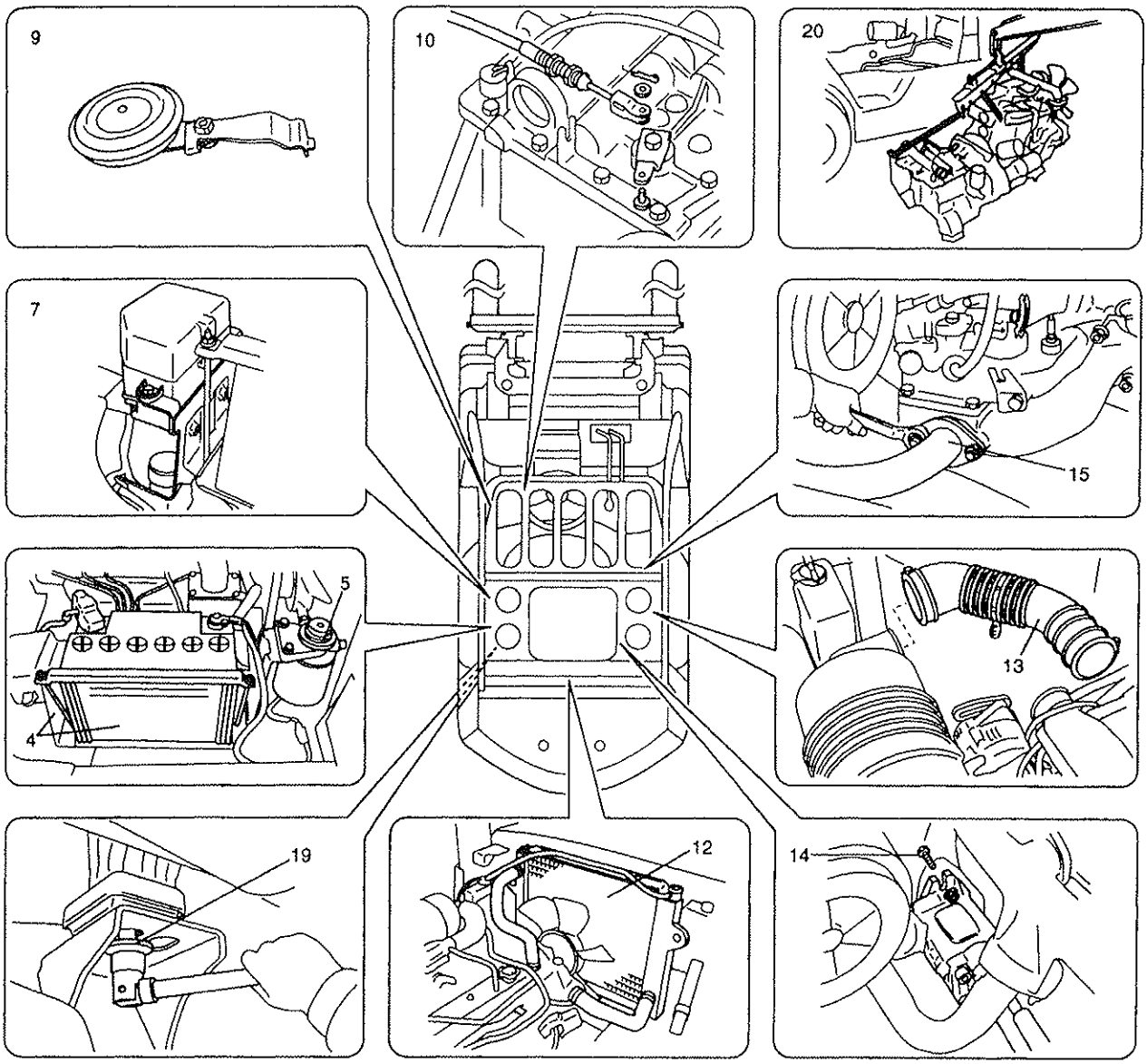
[Point 4]
Installation:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

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TORQUE CONVERTER & TRANSMISSION ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Engine mounting nut	T = 53.9 ~ 99.0 (550 ~ 1010) [39.8 ~ 73.1]
Torque converter mounting set bolt	T = 49.0 ~ 75.5 (500 ~ 770) [36.2 ~ 55.7]
Torque converter housing set bolt	T = 29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
Drive plate set bolt (for connecting to engine crankshaft)	Gasoline model: T = 56.9 ~ 64.7 (580 ~ 660) [42.0 ~ 47.8] Diesel model: T = 76.5 ~ 93.2 (780 ~ 950) [56.4 ~ 68.7]
Drive plate set bolt (for connecting to torque converter)	T = 14.7 ~ 21.6 (150 ~ 220) [10.9 ~ 15.9]

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Removal Procedure

1 Remove the engine hood. (See page 9-5.)

2 Remove the toe board.

3 Drain the coolant.

4 Remove the battery and battery tray.

5 Diesel Vehicle:
Remove the sedimenter bracket set bolt to make the bracket free.

6 Disconnect the accelerator wire and fuel hose. **[Point 1]**

7 Remove fuse box and electrical parts plate set bolts to set them free.

8 Disconnect connectors and wiring harnesses from the engine.

9 Remove the horn with bracket.

10 Disconnect the inching wire.

11 Disconnect the torque converter cooler hose. **[Point 2]**

12 Remove the radiator.

13 Disconnect the air cleaner hose.

14 Remove the oil pump set bolts to set the pump free.

15 Disconnect the exhaust pipe.

16 Remove the under cover.

17 Remove the propeller shaft. (See page 3-3.)

18 Remove the transmission mounting bolts.

19 Remove the engine mounting nuts.

20 Remove the engine with torque converter. **[Point 3]**

21 Remove the cover plate.

22 Remove the drive plate set bolts. **[Point 4]**

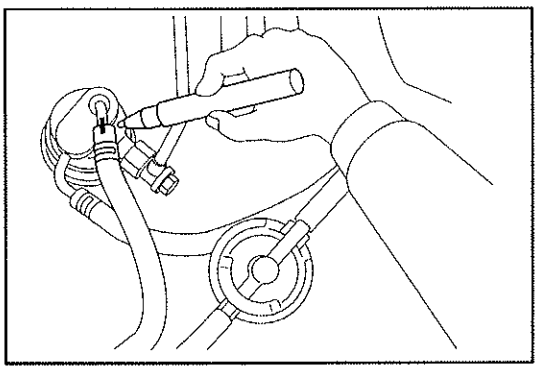
23 Separate the engine from the torque converter housing.

24 Remove the transmission cover and control valve ASSY.

Installation Procedure

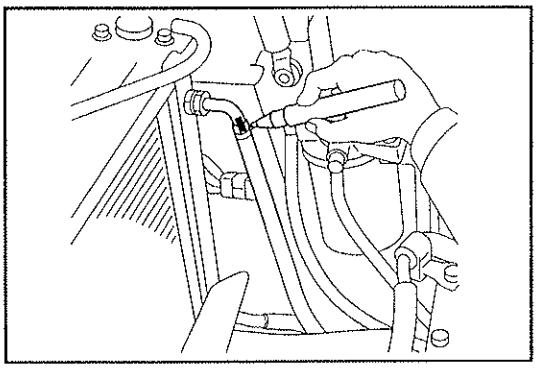
The installation procedure is reverse of the removal procedure.

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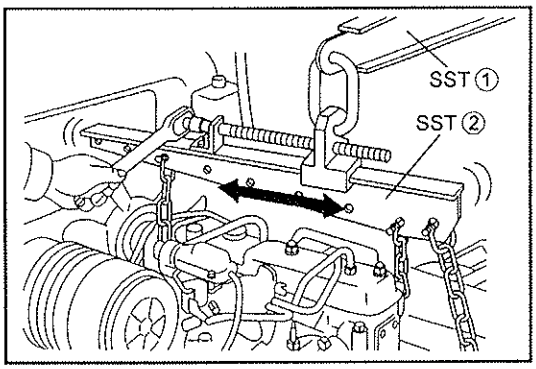


Point Operations

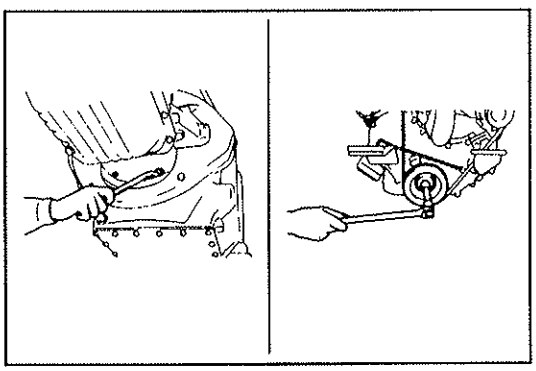
[Point 1]
Removal:
Put match marks on the fuel hose and the mating joint.



[Point 2]
Removal:
Put match marks on the radiator and torque converter cooler hose.



[Point 3]
Removal·installation:
SST 09010-20111-71 --- ①
09010-23320-71 --- ②
Move the SST hook position to adjust the balance.



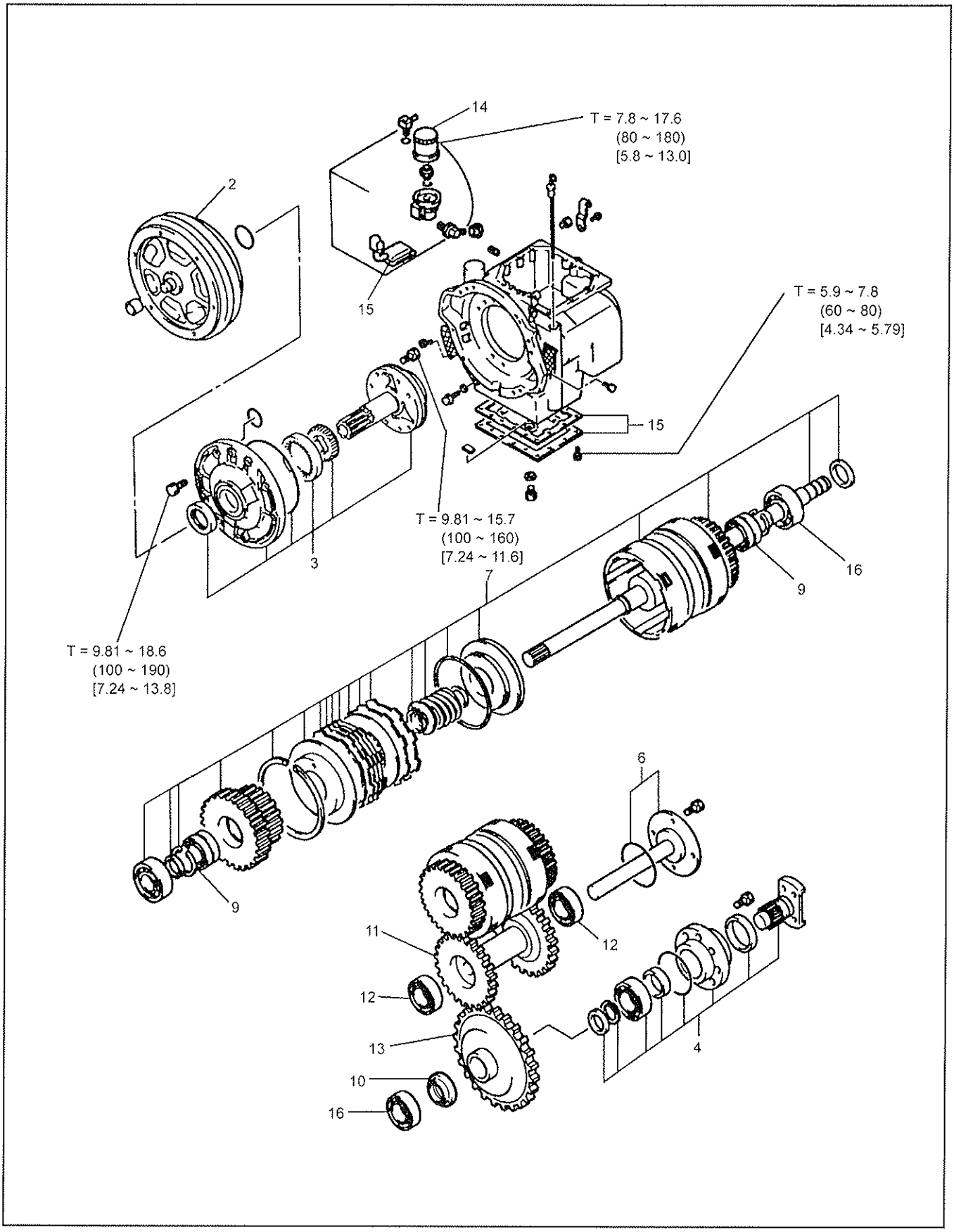
[Point 4]
Removal·Installation:
Turn the flywheel using the crankshaft pulley set bolt.

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TRANSMISSION ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



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Disassembly Procedure

1 Drain the torque converter oil.

2 Remove the torque converter.

3 Remove the oil pump with stator shaft and shim. **[Point 1]**

4 Remove the output shaft with front bearing case and the shim. **[Point 2]**

5 Disassemble the output shaft with front bearing case. **[Point 3]**

6 Remove the counter gear shaft.

7 Remove the main shaft ASSY. **[Point 4]**

8 Remove the spacer, rear bearing, reverse clutch gear, forward clutch gear and reverse & forward clutch drum ASSY. **[Point 5]**
(For disassembly, inspection and reassembly of the clutch drum ASSY, see page 2-31.)

9 Remove the reverse and forward clutch gear bearings. **[Point 6]**

10 Remove the bearing spacer from the output gear portion. **[Point 7]**

11 Remove the counter gear.

12 Remove the counter gear bearing. **[Point 8]**

13 Remove the output gear.

14 Remove the oil filter. **[Point 9]**

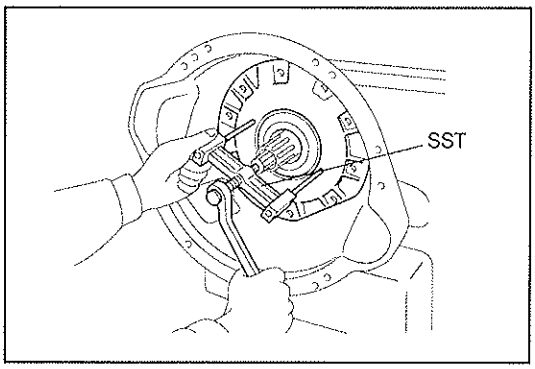
15 Remove the oil pan and oil strainer. **[Point 10]**

16 Remove the main shaft front bearing and output shaft rear bearing. **[Point 11]**

Reassembly Procedure

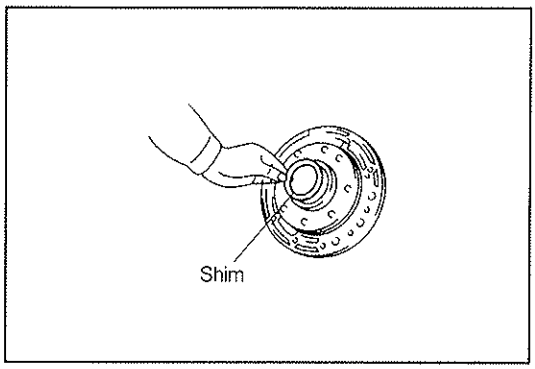
The reassembly procedure is reverse of the disassembly procedure.

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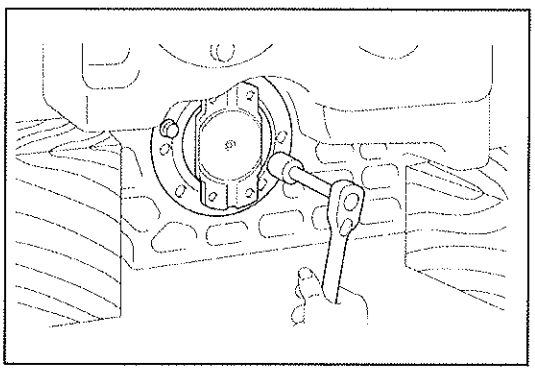
Point Operations

[Point 1]
Disassembly:
SST 09950-76003-71
(SST 09950-50012)

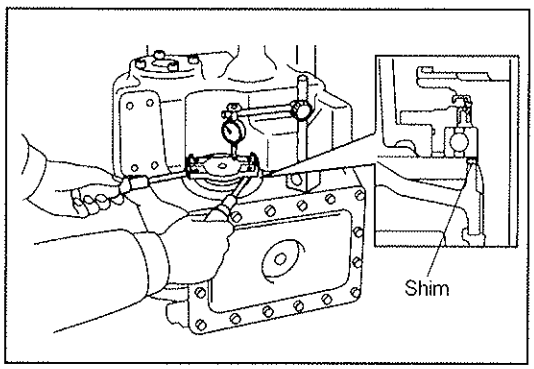


Reassembly:
Tentatively install the oil pump with stator shaft and check the main shaft thrust clearance.
Standard: 0.20 to 0.62 mm (0.0079 to 0.0244 in)
If the measured clearance fails to fall within the specified range, increase or decrease the shim thickness for adjustment.

Mark	Thickness mm (in)
0	0.67 ~ 0.75 (0.026 ~ 0.030)
1	0.855 ~ 0.945 (0.034 ~ 0.037)
2	1.065 ~ 1.175 (0.042 ~ 0.046)
3	1.335 ~ 1.465 (0.053 ~ 0.058)

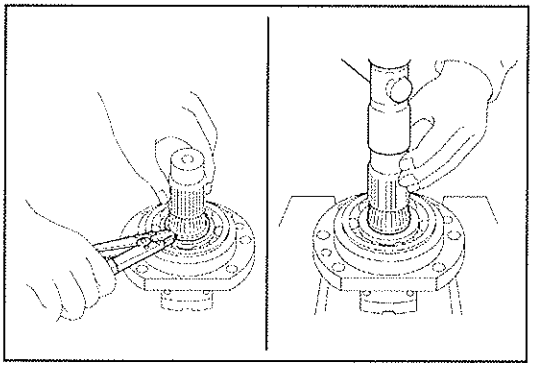


[Point 2]
Disassembly:
Remove the output shaft with front bearing case using the service bolt.
Service bolt size: M10 x 1.25



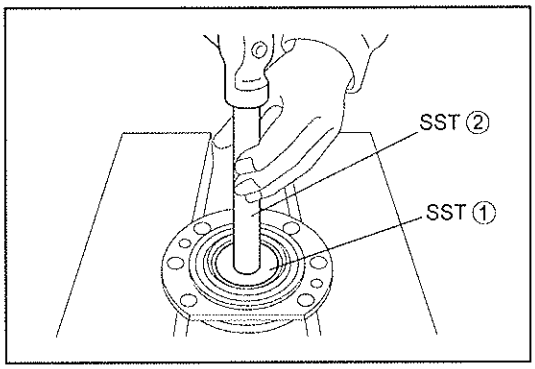
Reassembly:
Check the output shaft thrust clearance.
Standard: 0.03 to 0.51 mm (0.0012 to 0.0200 in)
If the measured clearance fails to fall within the specified range, increase or decrease the shim thickness for adjustment.

Mark	Thickness mm (in)
0	0.855 ~ 0.945 (0.034 ~ 0.037)
1	1.190 ~ 1.310 (0.047 ~ 0.052)
2	1.530 ~ 1.670 (0.060 ~ 0.066)

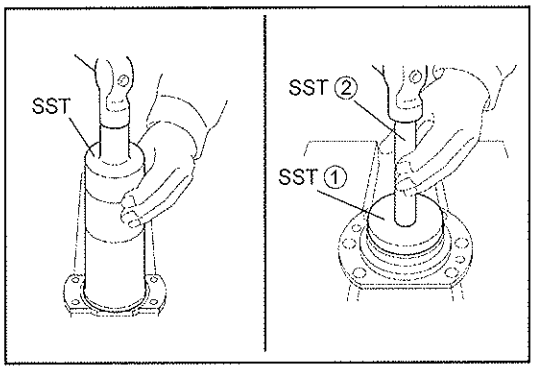


[Point 3]
Disassembly:
Disassemble the output shaft front bearing case.
1. Remove the snap ring using the SST.
   SST 09905-76002-71
   (SST 09905-00012)
2. Remove the output shaft using a plastic hammer.
3. Remove the oil seal using a straight-edge screwdriver.

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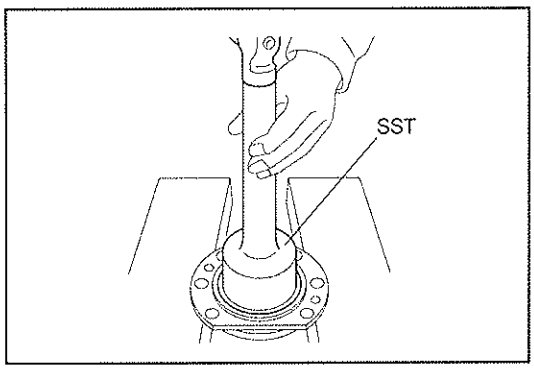


4. Remove the front bearing using the SST.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)
5. Remove the dust deflector using a screwdriver.

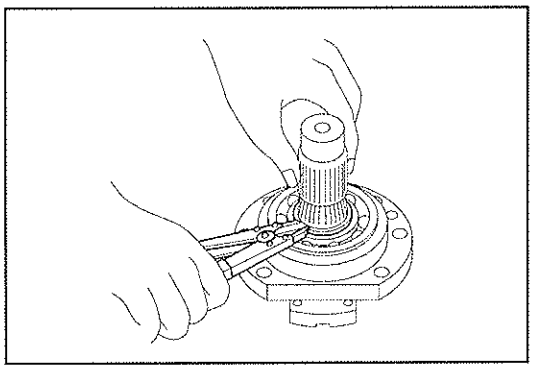


Reassembly:
Install the output shaft front bearing case.

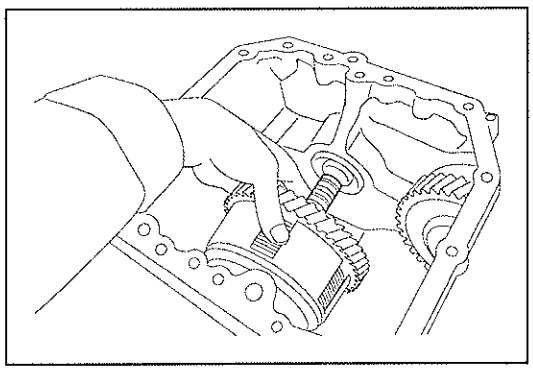
1. Install the dust deflector using the SST.
   SST 09316-76008-71
   (SST 09316-60011)
2. Install the front bearing using the SST.
   SST 09950-76019-71 --- ①
   (SST 09950-60020)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)



3. Install the oil seal using the SST.
   SST 09150-10170-71
4. Install the output shaft using a plastic hammer.



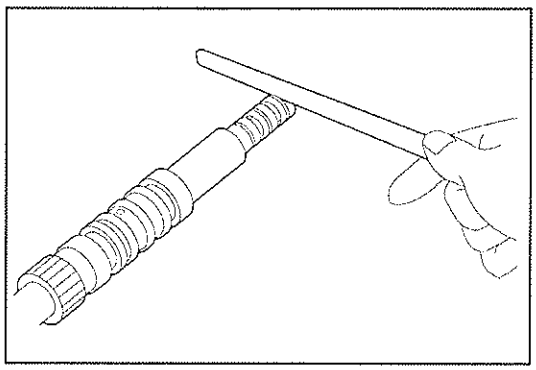
5. Install the snap ring using the SST.
   SST 09905-76002-71
   (SST 09905-00012)



[Point 4]
Disassembly·Reassembly:
Remove or install components while supporting them from disconnection or falling down.

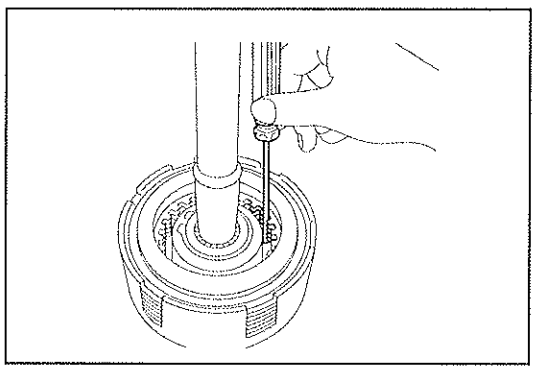
Reassembly:
Apply grease to the seal ring at the tip of main shaft before reassembly.

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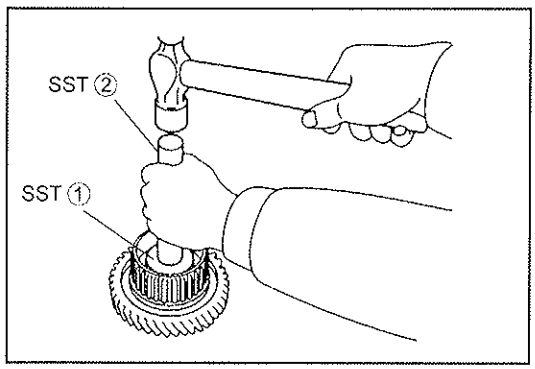


[Point 5]
Inspection:
Measure side clearance of the seal ring.

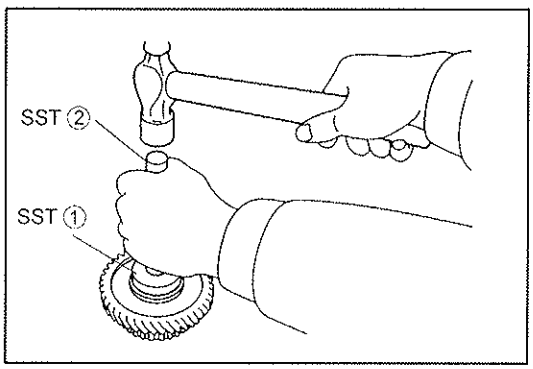
Limit: 0.2 mm (0.008 in)



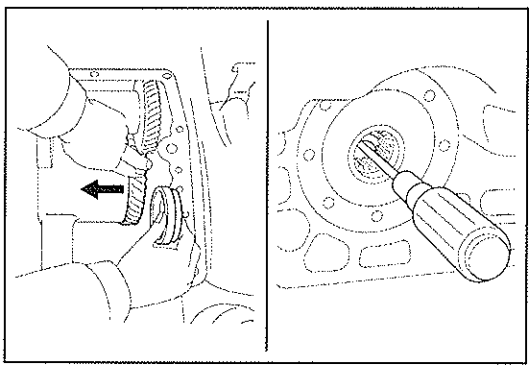
Reassembly:
Trrce up the clutch disc serrations with a screwdriver and then install the clutch gear.



[Point 6]
Disassembly:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

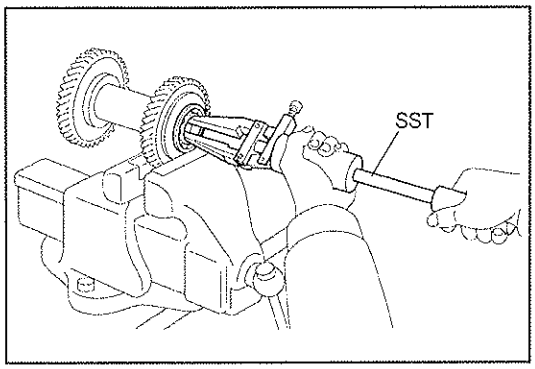


Reassembly:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

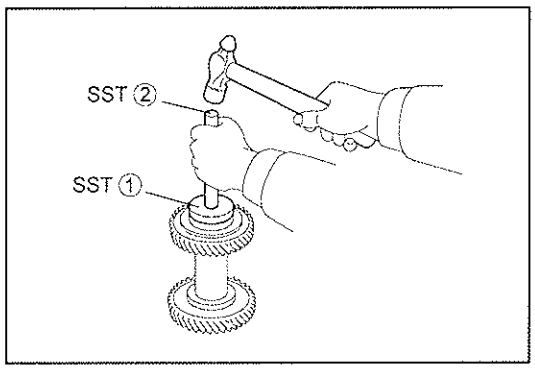


[Point 7]
Reassembly:
Install the baring spacer.
1. Tentatively secure the bearing spacer by bringing the output gear towards the output shaft.
2. Secure it from the outside by a screwdriver to protect it from falling down.

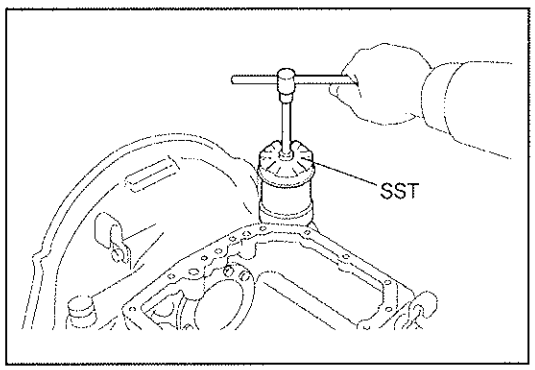
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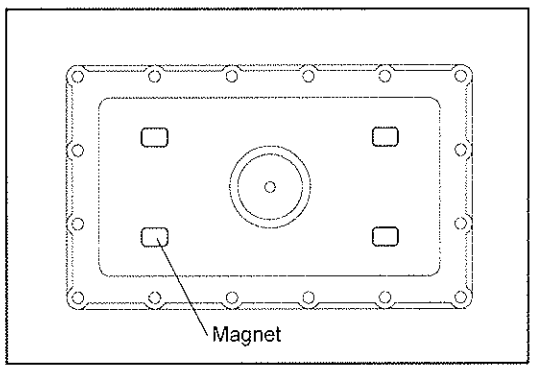
[Point 8]
Disassembly:
SST 09320-23000-71



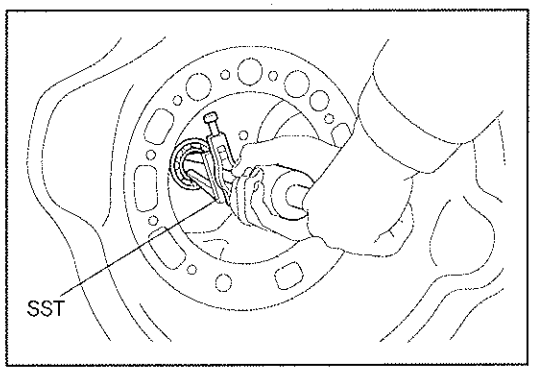
Reassembly:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 9]
Disassembly-Reassembly:
SST 09228-76004-71
(SST 09228-07501)

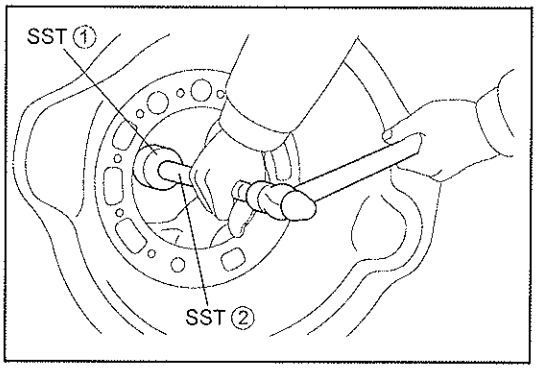


[Point 10]
Reassembly:
Remove iron chips adhering on the magnet and locate the magnet as shown.

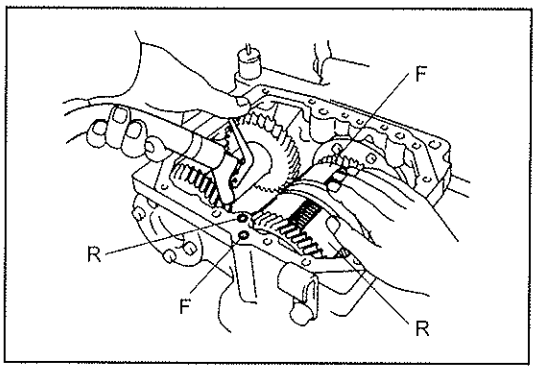


[Point 11]
Disassembly:
SST 09320-23000-71

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Reassembly:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)

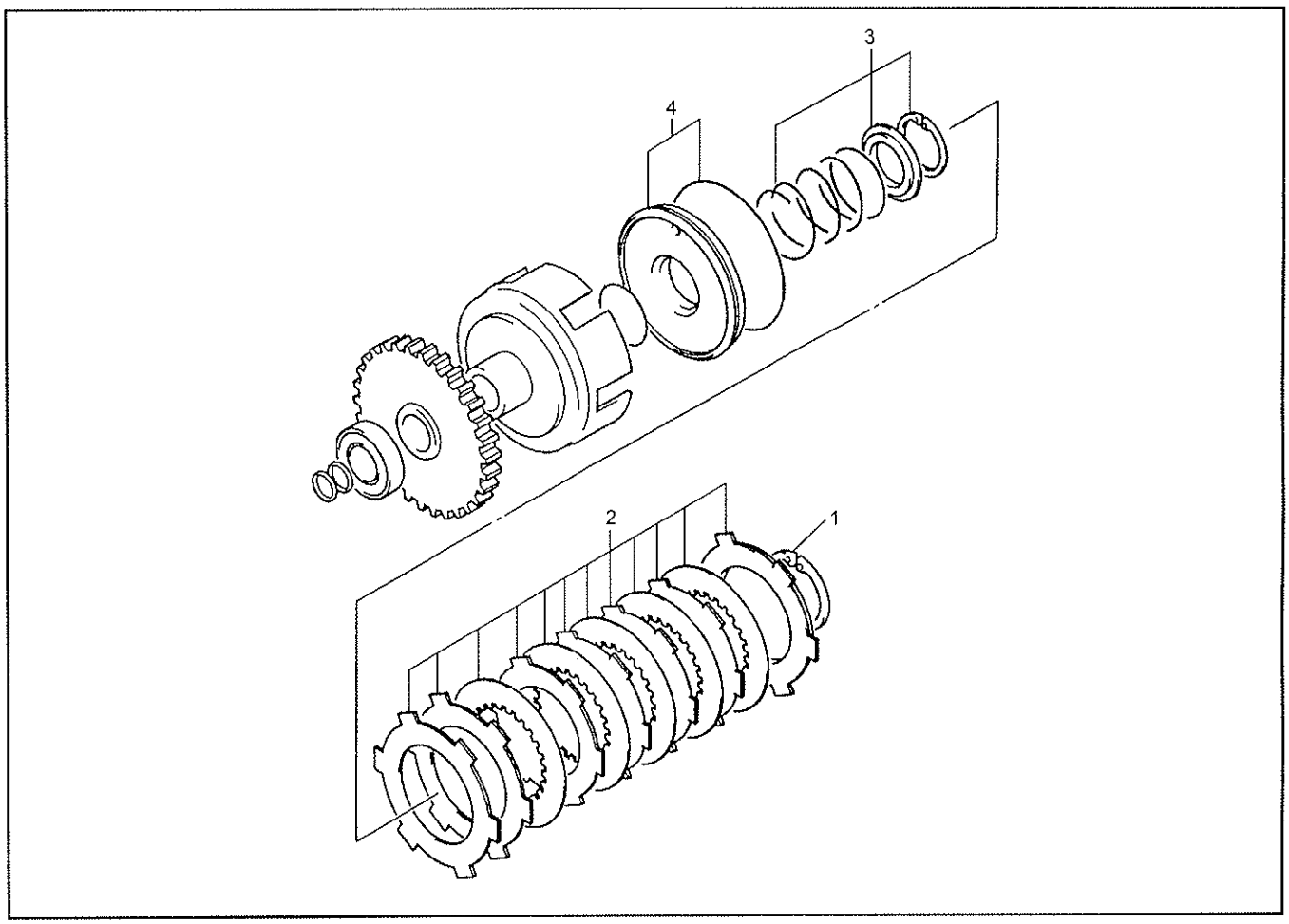


Clutch operation check after reassembly
Blow air through the oil hole on top of the transmission case and see that each clutch piston is operated.

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CLUTCH DRUM ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the snap ring.

2 Remove the backing plate, clutch disc, clutch plate and camber plate. **[Point 1]**

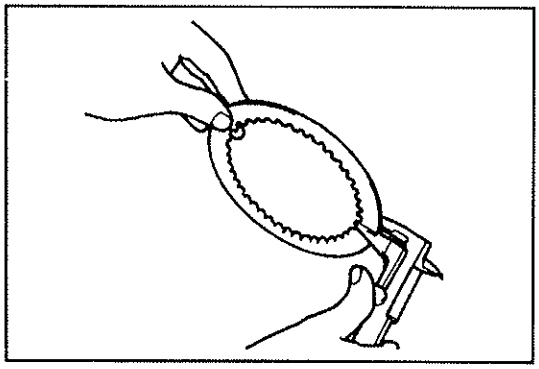
3 Remove the snap ring and clutch piston return spring. **[Point 2]**

4 Remove the clutch piston. **[Point 3]**

Reassembly Procedure

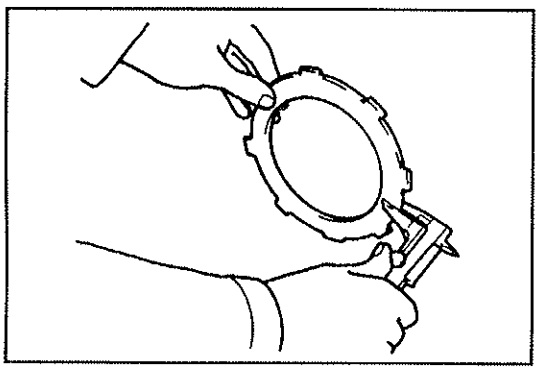
The reassembly procedure is reverse of the disassembly procedure.

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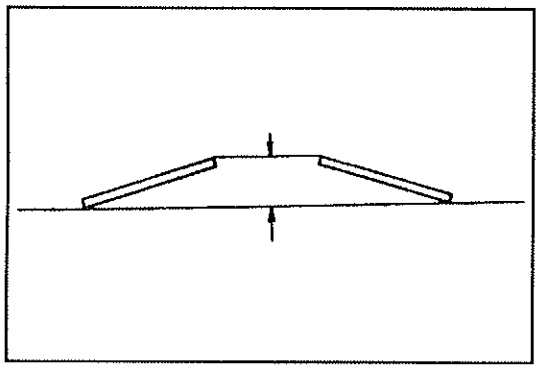
[Point 1]
Inspection:
Measure the clutch disc thickness.

Standard: 2.6 mm (0.102 in)
Limit: 2.3 mm (0.091 in)



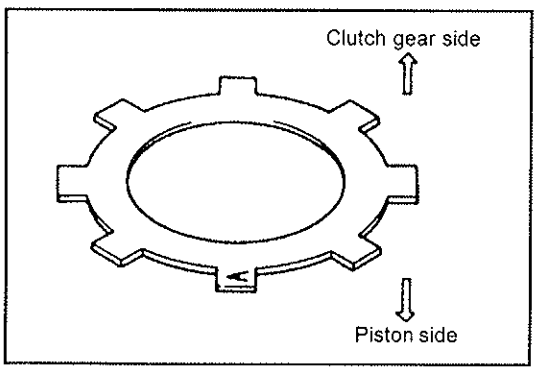
Inspection:
Measure thickness of the clutch plate.

Standard: 2.0 mm (0.079 in)
Limit: 1.8 mm (0.071 in)

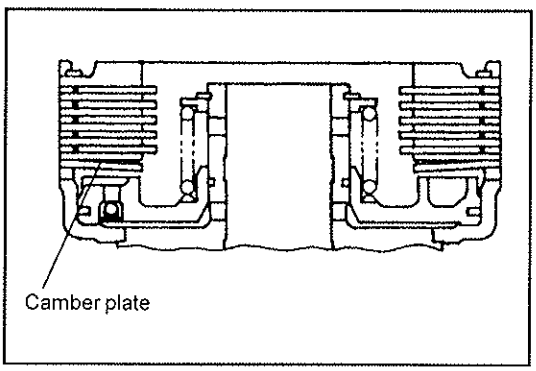


Inspection:
Measure height of the camber plate curving.

Standard: 3.4 mm (0.134 in)
Limit: 3.1 mm (0.122 in)



Reassembly:
Install the camber plate to the clutch drum, with punched mark A facing up.

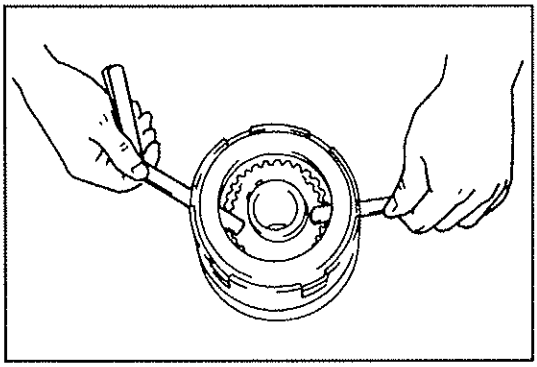


Reassembly:
Install the clutch plate and clutch disc alternately on the clutch drum, while applying torque converter oil.

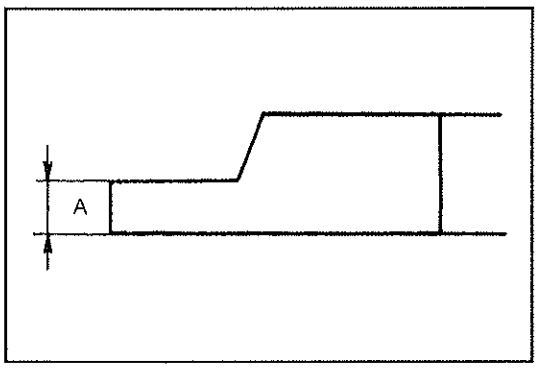
Number of clutch discs

1 ton series	4Y and 1DZ-II models	4
2·3 ton series	4Y and 1DZ-II models	5
	2Z model	5
J3.5 ton series	4Y model	5
	2Z model	5

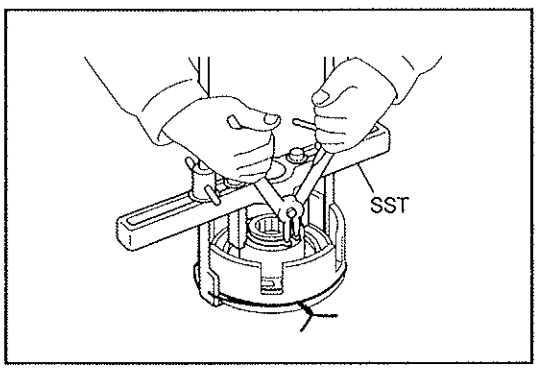
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Reassembly:
Adjust the clearance between the backing plate and clutch disc.
1. Install the camber plate, clutch plate, clutch disc, backing plate and snap ring on the clutch drum.
2. Measure clearance between the backing plate and clutch disc using thickness gauges.
Standard:
4-disc specification: 0.8 to 1.3 mm (0.031 to 0.051 in)
5-disc specification: 1.0 to 1.6 mm (0.039 to 0.063 in)

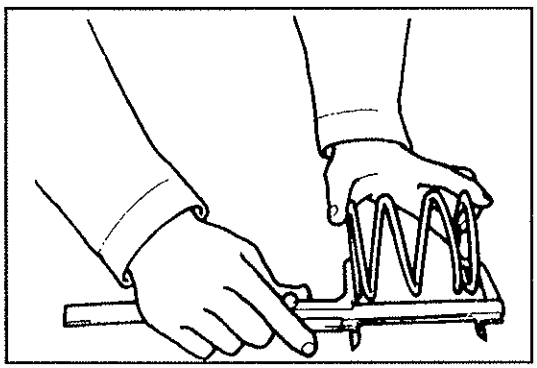


3. If the measured value is out of the specified range, select a suitable backing plate.
Backing plate thickness: A = 3.0, 3.5 and 4.0 mm (0.118, 0.138 and 0.157 in)



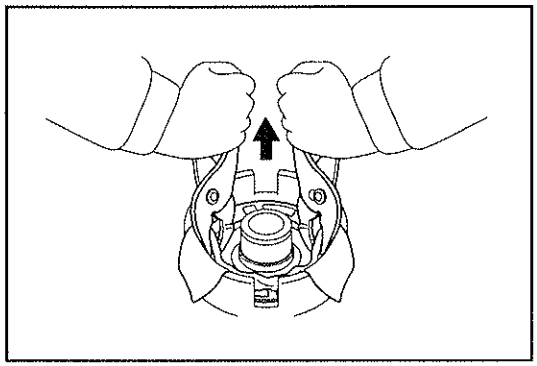
[Point 2]
Disassembly·Reassembly:
Compress the return spring using the SST and remove or install the snap ring.
Tie two hooks of the SST by a wire or string as shown and secure the hooks so that they will not disconnected from the clutch drum.
SST 09220-22001-71

Caution:
If the hooks are disconnected from the clutch drum while the SST is in use, spring will jump out, which is dangerous.



Inspection:
Measure free length of the clutch piston return spring.

Standard: 63.4 mm (2.496 in)
Limit: 58.5 mm (2.303 in)

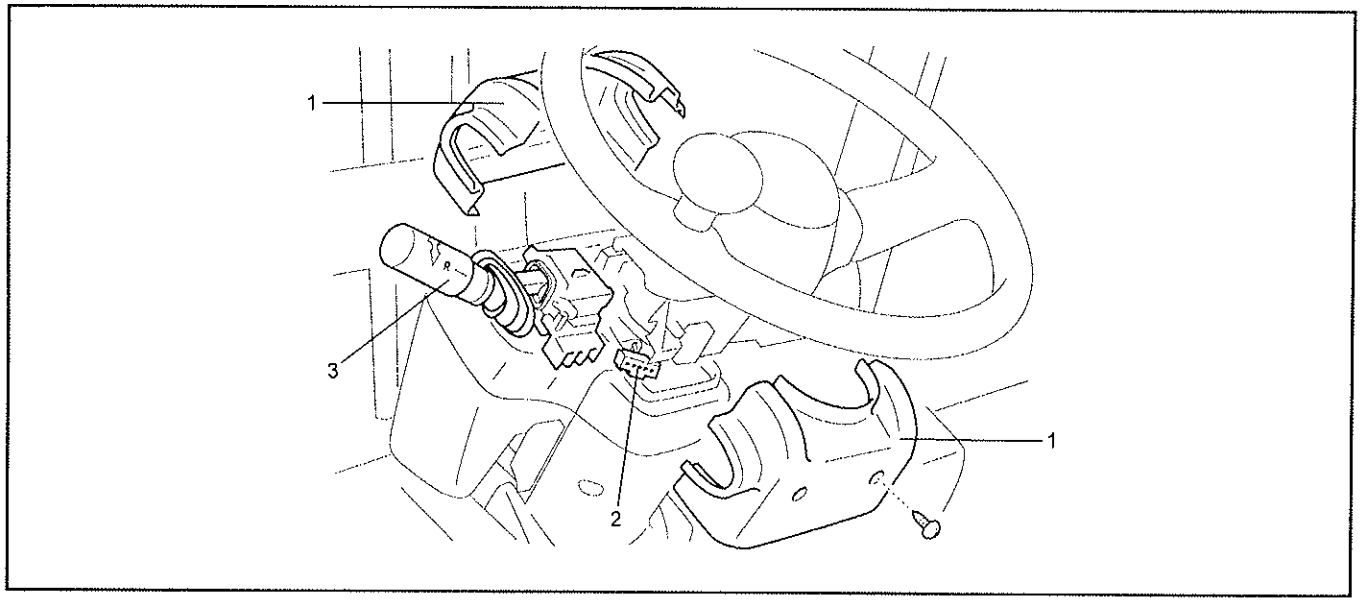


[Point 3]
Disassembly:
Pinch the rib of clutch piston by pliers with cloth in-between and remove the piston.

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DIRECTION SWITCH ASSY

REMOVAL·INSTALLATION



Removal Procedure

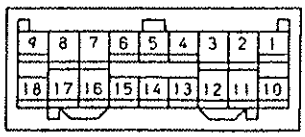
1 Remove the turn signal switch cover.

2 Disconnect the wiring.

3 Remove the direction switch ASSY. **[Point 1]**

Installation Procedure

The installation procedure is reverse of the removal procedure.



LH spec. (STD)	RH spec. (OPT)
1 : VR	1 : —
2 : Ra	2 : IG2
3 : ST	3 : N
4 : VF2	4 : IG1
5 : VF	5 : VF
6 : IG1	6 : VF2
7 : N	7 : ST
8 : IG2	8 : Ra
	9 : VR

VF : Forward solenoid
VR : Reverse solenoid
ST : Starting motor relay
Ra : Backup lamp & buzzer

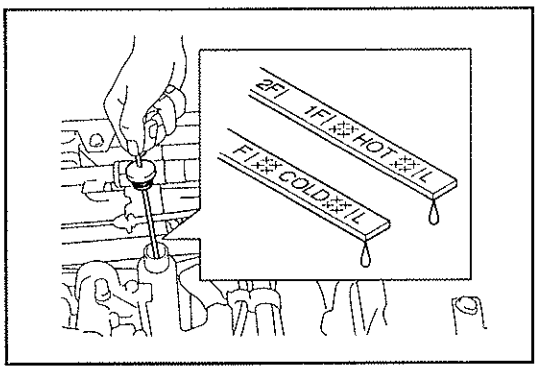
Point Operations

[Point 1]
Inspection:
Check electrical continuity between switch connector terminals.

(P: Position, T: Terminal No., ○—○: Continuous)

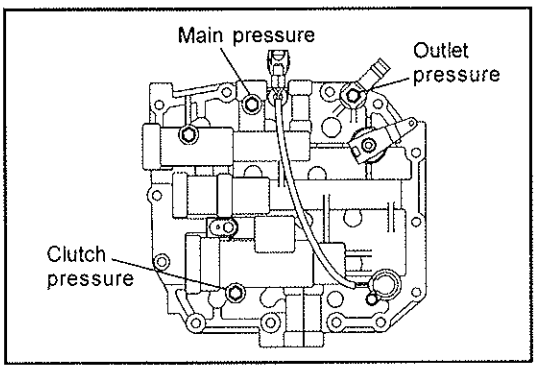
P \ T	N	IG1	IG2	VF	VF2	ST	VR	Ra
F1		○		○	○			
N	○					○		
R		○					○	
Ra			○					○

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OIL PRESSURE MEASUREMENT AND STALL TEST

1. Maintain the vehicle horizontally and warm up the engine with the direction switch at the N position.
2. Measure the oil level.
   (1) Measure the oil level during idling using the level gauge.
   (2) If the oil level is not between F (upper limit) and L (lower limit), adjust to an appropriate level.



3. Measure the oil pressure.
   (1) Check and adjust the engine speed. (See page 1-11.)
   (2) Stop the engine and jack up at the front axle to float wheels (both tires).
   (3) Set the oil pressure gauge. (If three oil pressure gauges are available, measure the main, clutch and torque converter outlet pressures at a time.)
   Use the adapter (SST) at each of the main pressure and clutch pressure detection port.
   SST 09350-23320-71
   (SST thread size: Valve side 5/16 UNF, Oil pressure gauge side PT1/8)
   (4) Start the engine, set the direction switch to the N position, and measure the main pressures at idling and 2000 rpm, and the torque converter outlet pressure at 2000 rpm.
   (5) Operate the direction switch to each shift position and measure clutch operating pressures at idling and 2000 rpm.

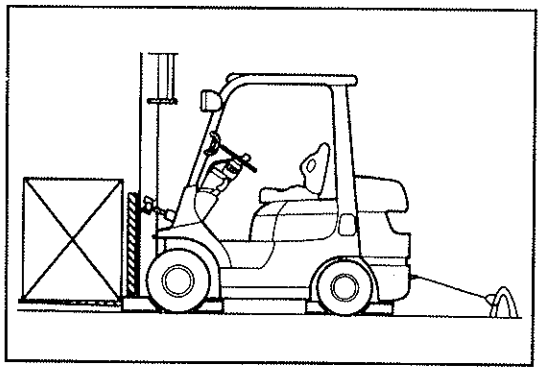
Note:
Do not step on the inching pedal during measurements of oil pressures.

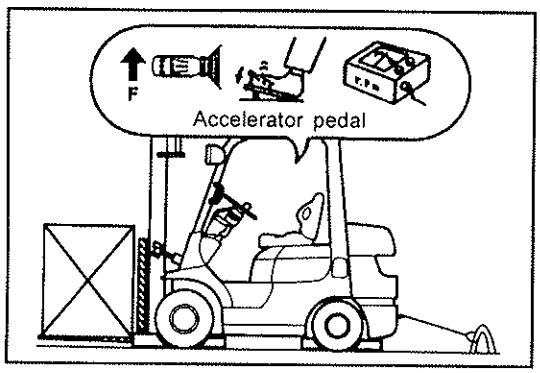
Standard

kPa (kgf/cm²) [psi]

Detecting pressure	Plug size	Idling	2000 rpm
Main pressure	PT 1/8 (SST)	735 ~ 1324 (7.5 ~ 13.5) [107 ~ 192]	834 ~ 1373 (8.5 ~ 14.0) [121 ~ 199]
Clutch pressure	↑	↑	834 ~ 1324 (8.5 ~ 13.5) [121 ~ 192]
Torque converter outlet pressure	PT 1/8	–	49 ~ 441 (0.5 ~ 4.5) [7 ~ 64]

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4. Carry out the stall test.
   (1) Load a cargo having near the permissible maximum load, firmly locate stoppers to the front and rear wheels, and activate the parking brake.

   Caution:
   Prevent the vehicle from movement by pulling at the rear by a wire as shown, for safety during test.

   (2) Warm up the engine and measure the idling speed, no-load static maximum revolution and relief down. (See page 1-11.)
   (3) Set the direction switch to the forward position, press on the acceleration pedal all the way and measure the stall revolution after the revolution is stabilized.

   Standard:
   4Y: Approx. 2100 rpm
   1DZ-II: Approx. 2100 rpm
   2Z: Approx. 2050 rpm

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TORQUE CONVERTER & TRANSMISSION (2003.10 ~)

Page

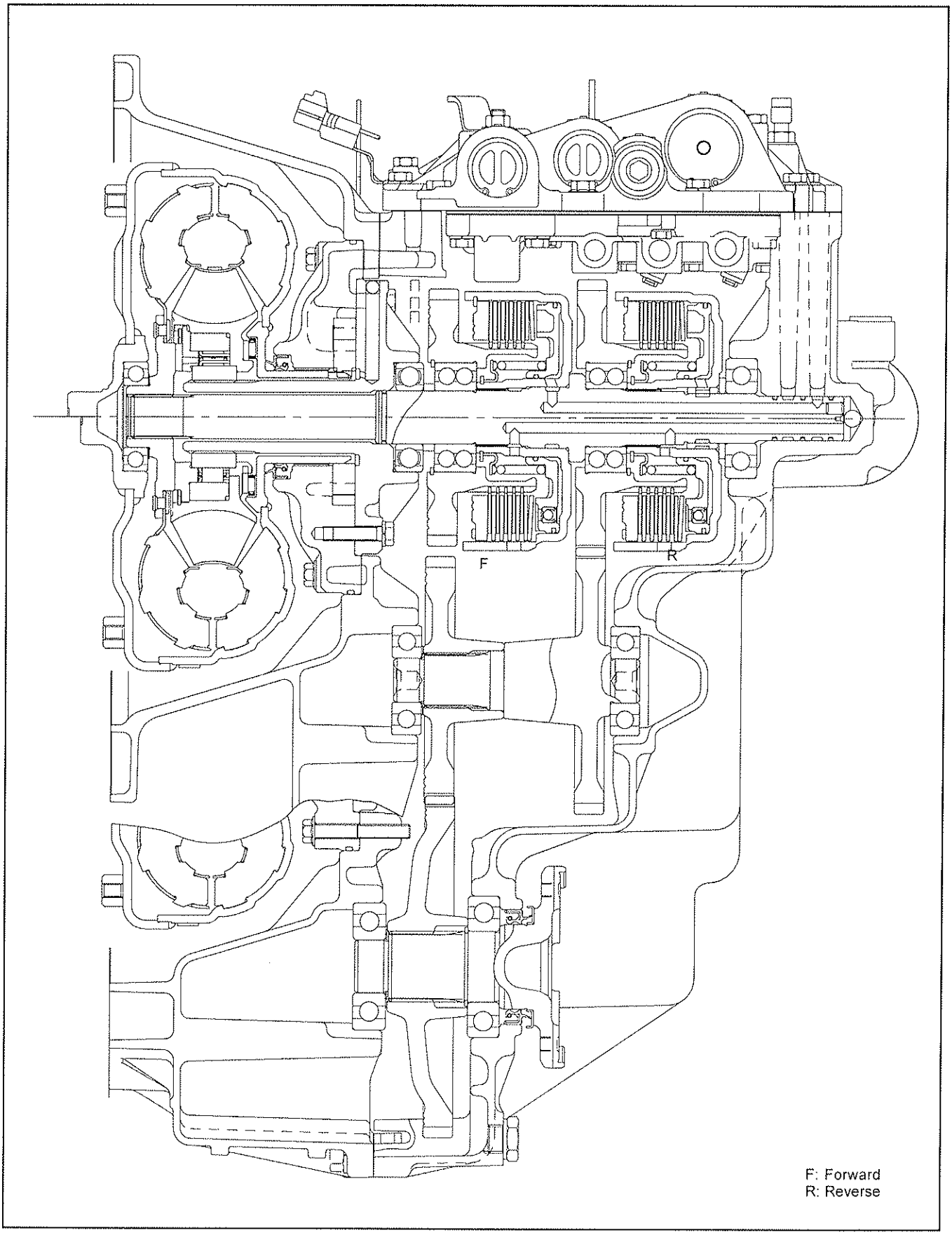
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COMPONENTS 2A-7
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TRANSMISSION & CONTROL VALVE ASSY 2A-14
REMOVAL·INSTALLATION 2A-14
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DISASSEMBLY·INSPECTION·REASSEMBLY 2A-30
OIL PRESSURE MEASUREMENT AND STALL TEST 2A-34

Note:
See page 2-34 for the DIRECTION SWITCH ASSY.

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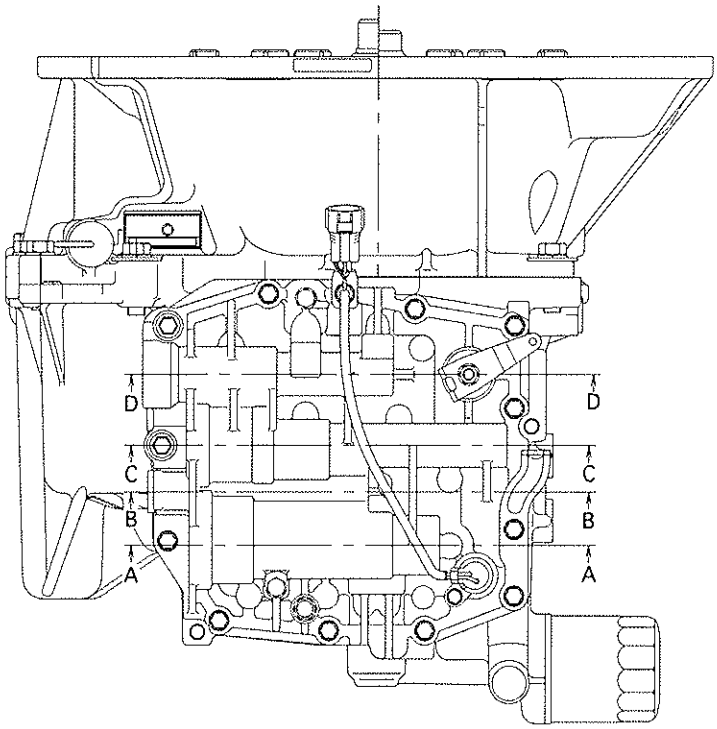
GENERAL

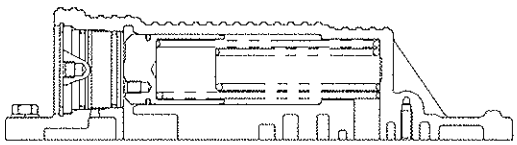
Torque Converter



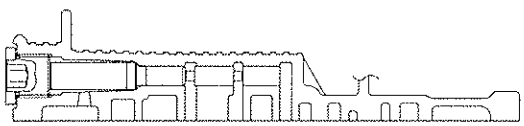
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Control Valve (Upper)

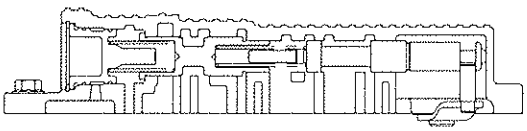




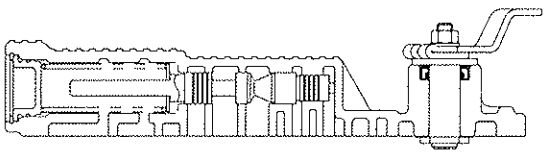
A-A: Accumulator



B-B: Change valve



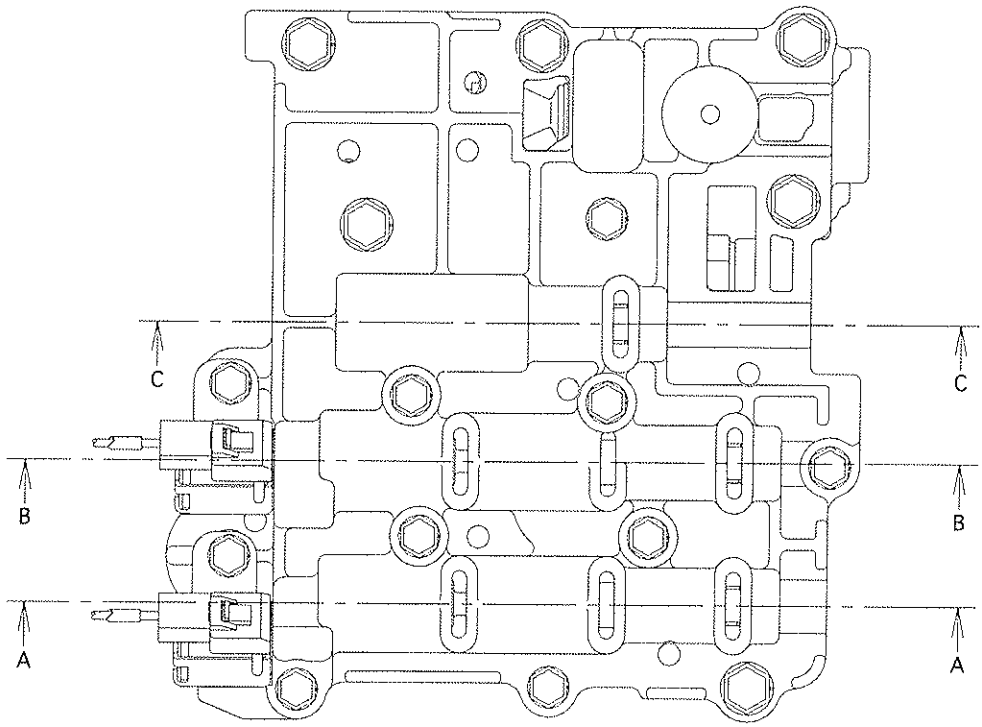
C-C: Inching valve

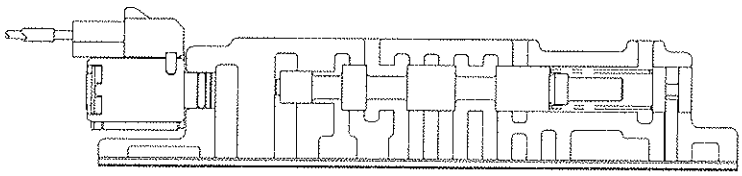


D-D: Regulator valve

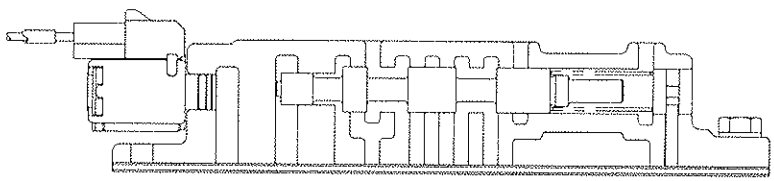
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Control Valve (Lower)

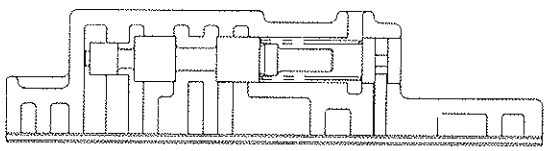




A-A: Shift change valve (R)



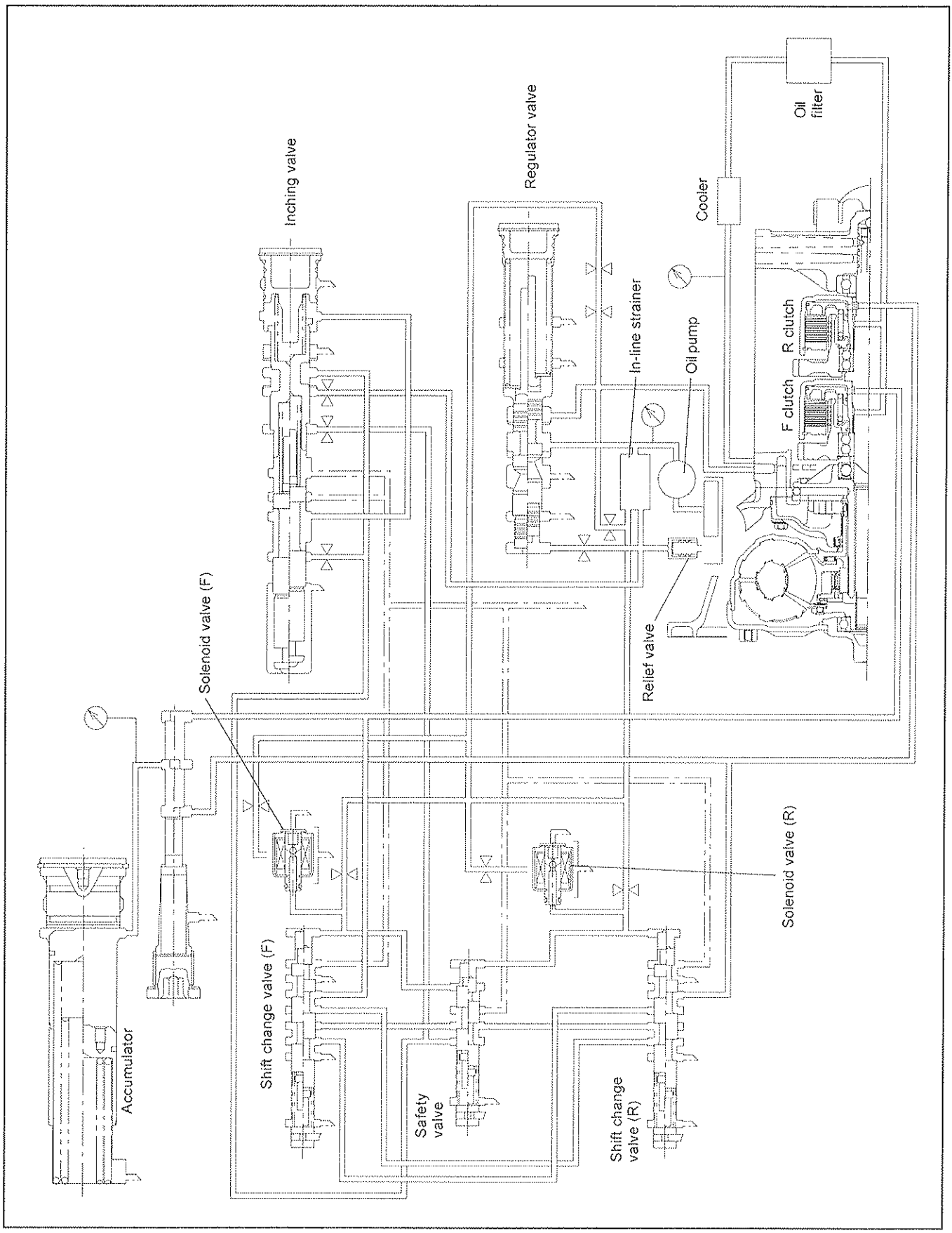
B-B: Shift change valve (F)



C-C: Safety valve

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HYDRAULIC CIRCUIT DIAGRAM



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SPECIFICATIONS

Maker	Aisin
Torque converter type	3 elements, 1 stage, 2 phases type
Torque converter model	AISIN
Stall torque ratio	4Y·1DZ-II : 2.68 2Z : 2.72
Stall speed rpm	4Y·1DZ-II : 2100 2Z : 2050
Control system	Solenoid type selector valve
Clutch operating pressure (main pressure) kPa(kgf/cm²)[psi]	1108 (11.3) [161]
Torque converter outlet pressure kPa(kgf/cm²)[psi]	392 (4.0) [57]
Torque converter oil capacity ℓ (USgal)	9.0 (2.38)
Torque converter oil	ATF GM Dexron® II

Note: The indicated oil pressure is at an engine speed of 2000 rpm.

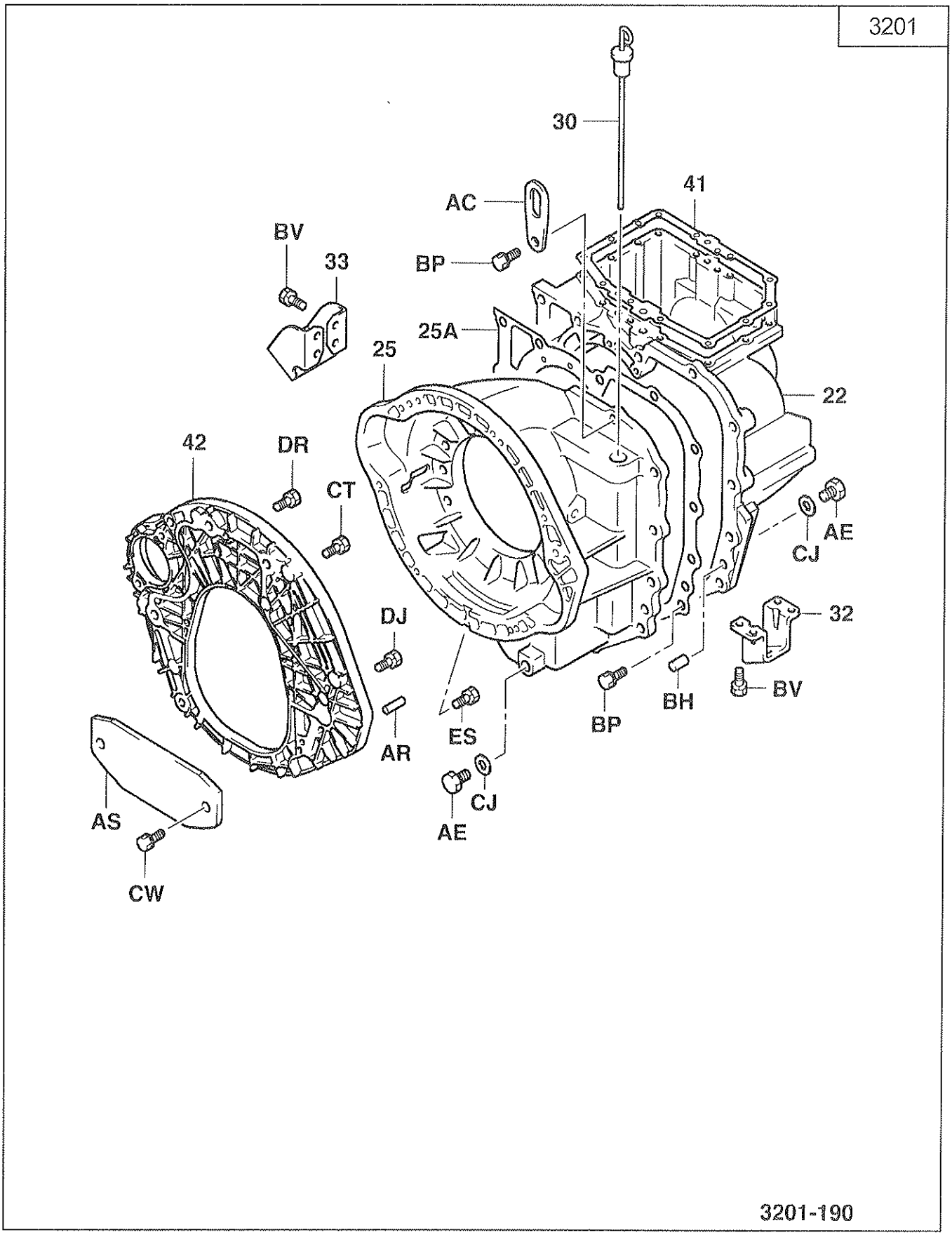
Torque Converter Ratio

	1 ton series	2·3·J3.5 ton series	
	4Y·1DZ-II	4Y·1DZ-II	2Z
Forward 1st speed	1.531	1.583	1.340
Reverse	1.540	1.594	1.343

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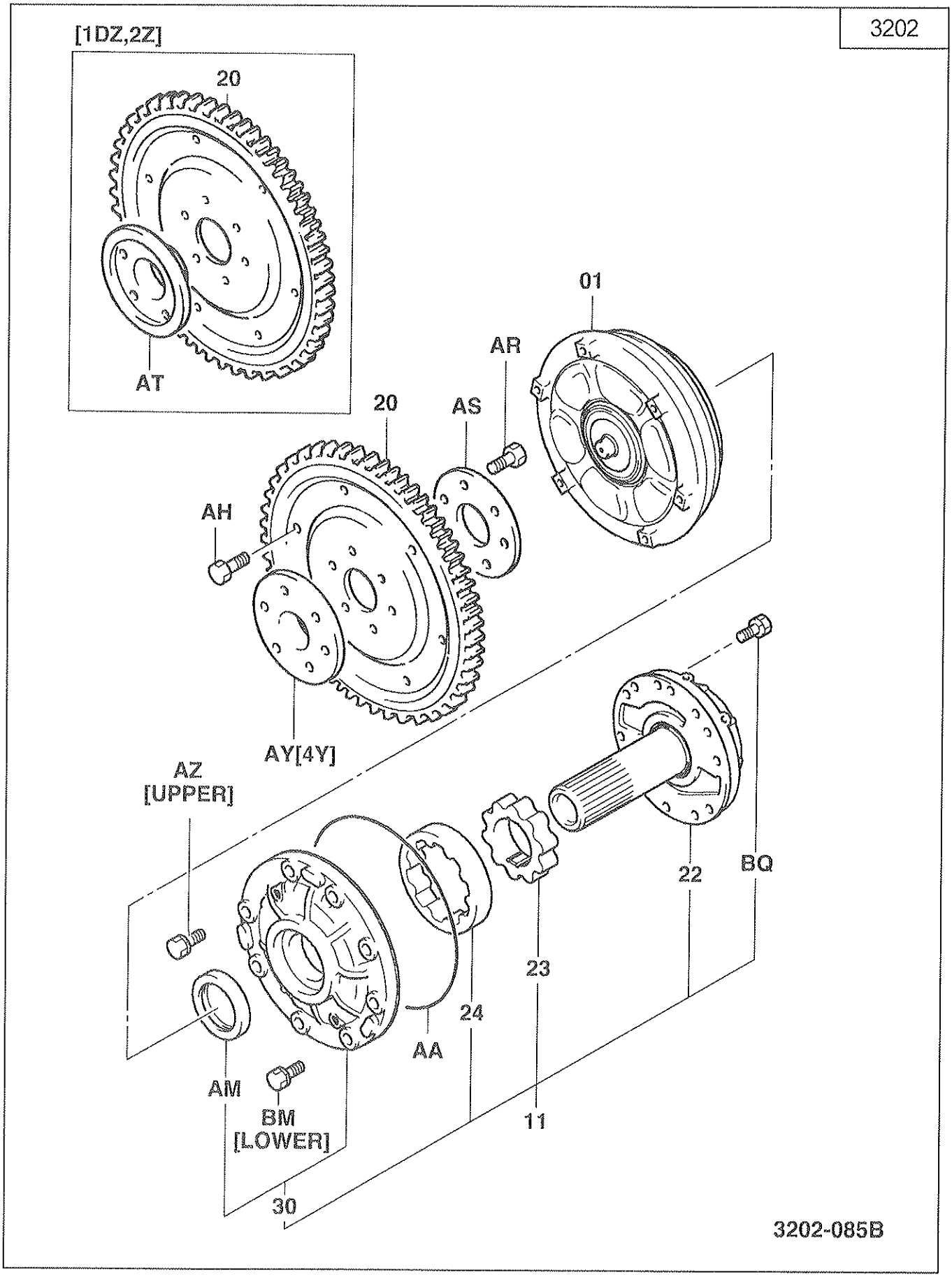
COMPONENTS

Torque Converter Housing



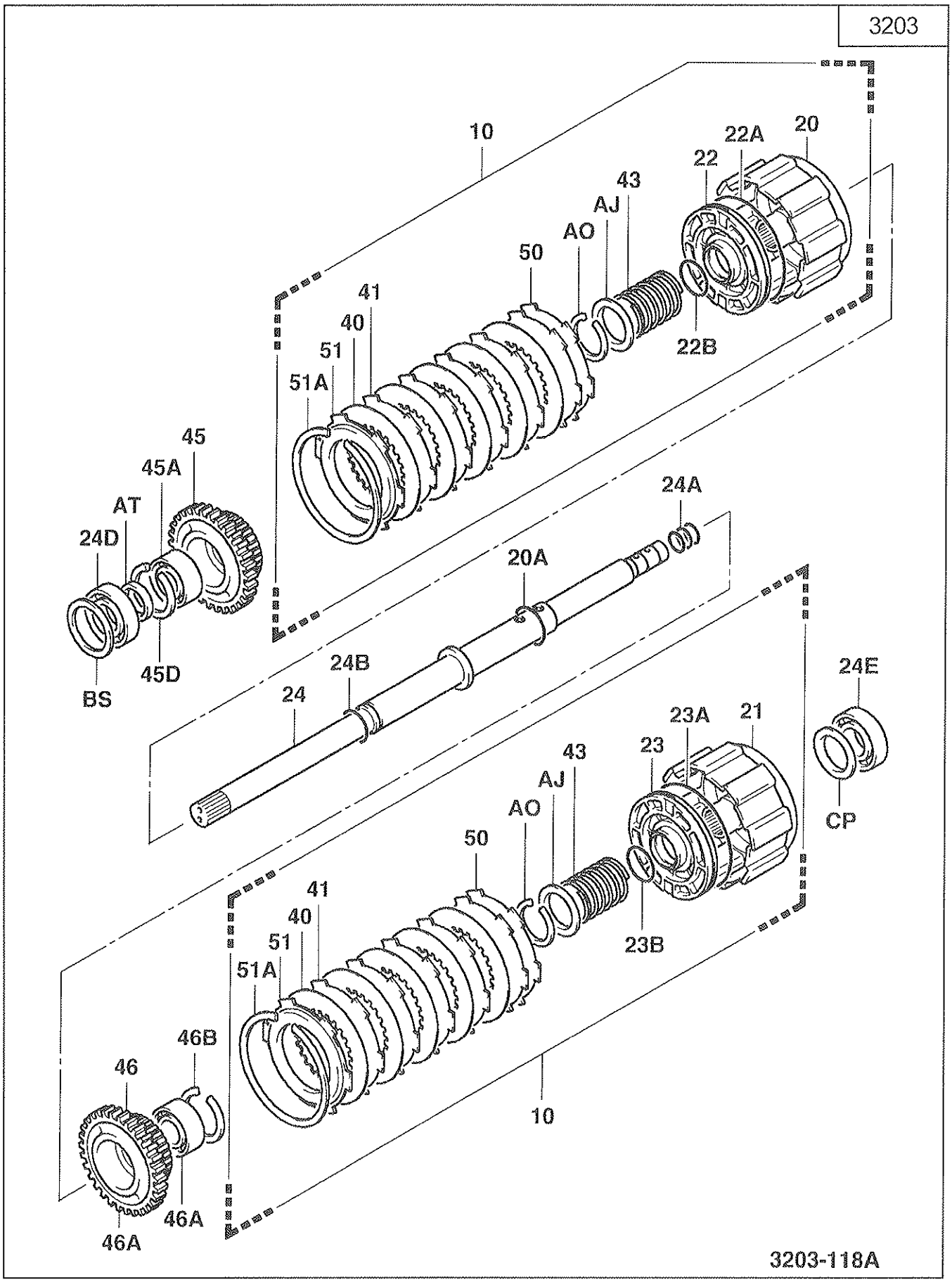
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Torque Converter



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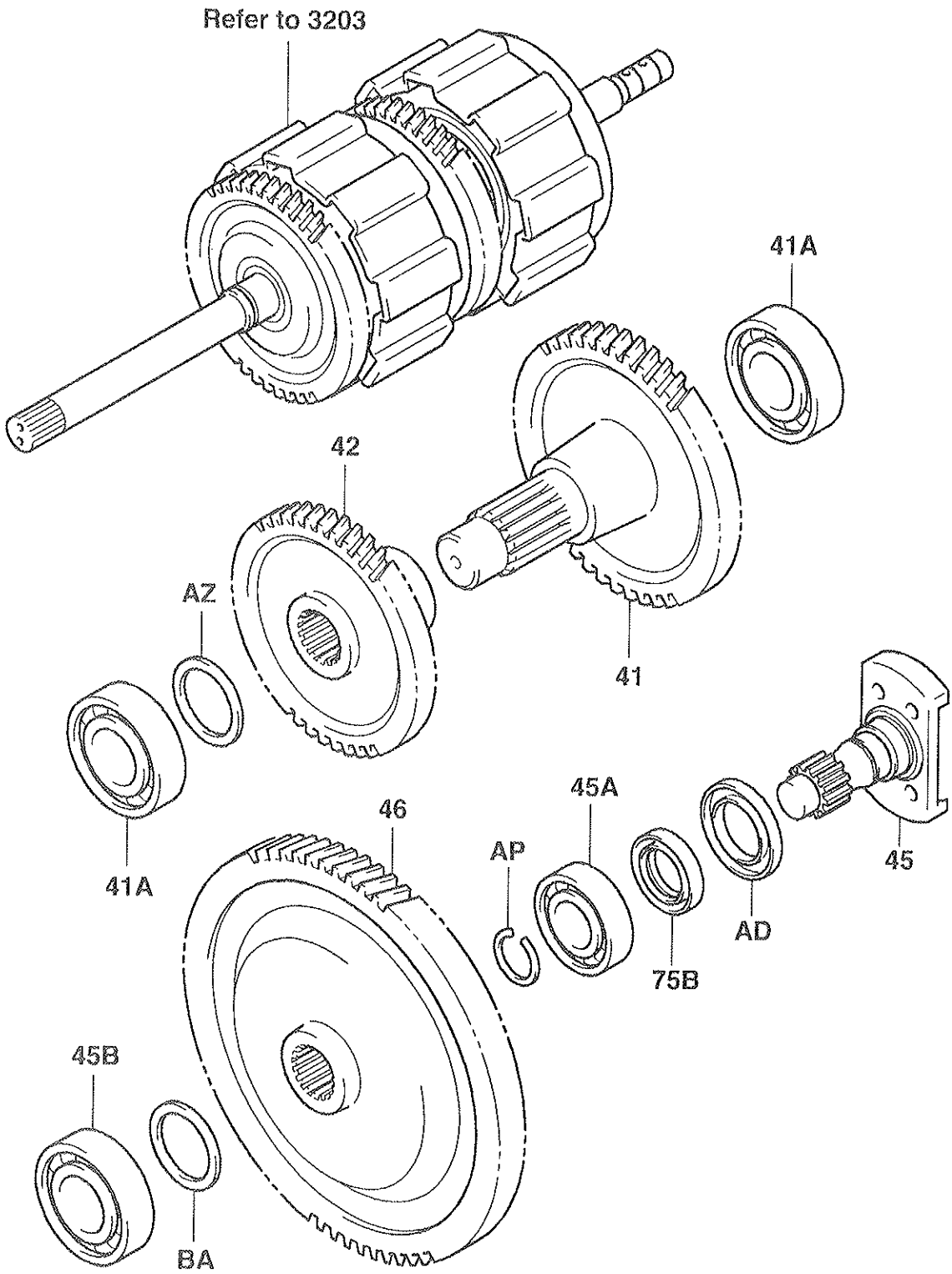
Torque Converter Clutch



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Torque Converter Gear

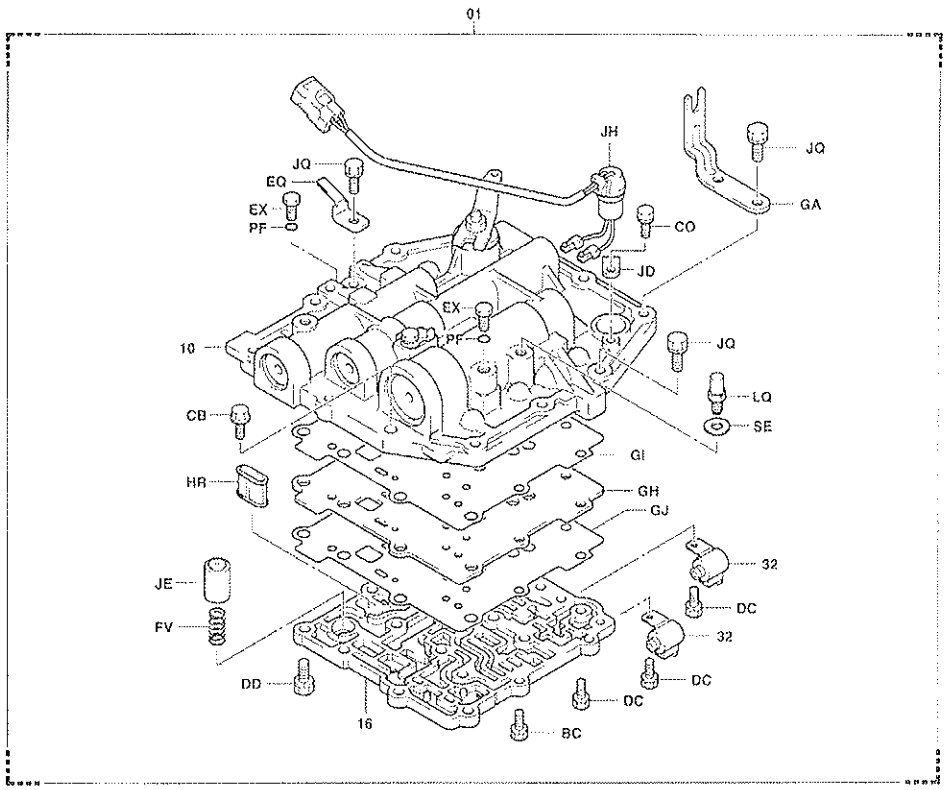
3204

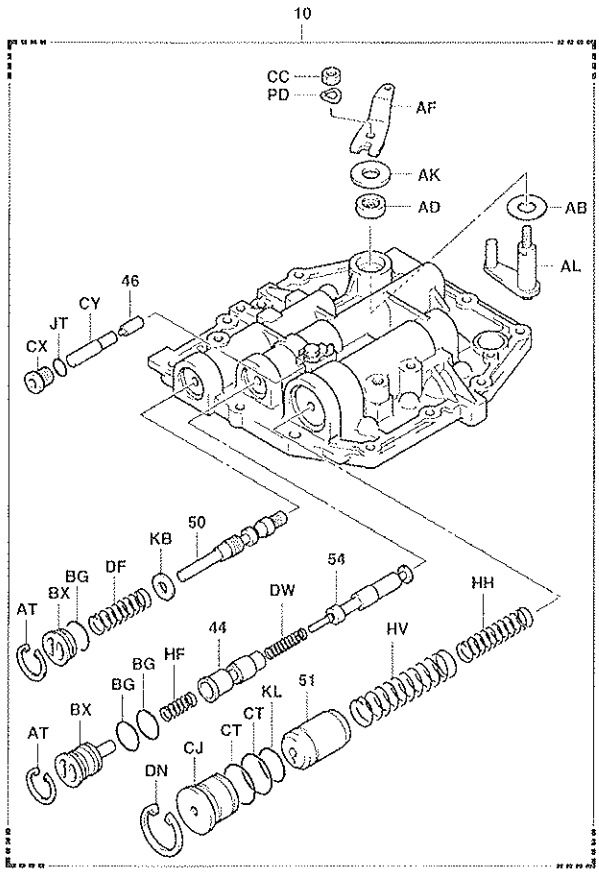


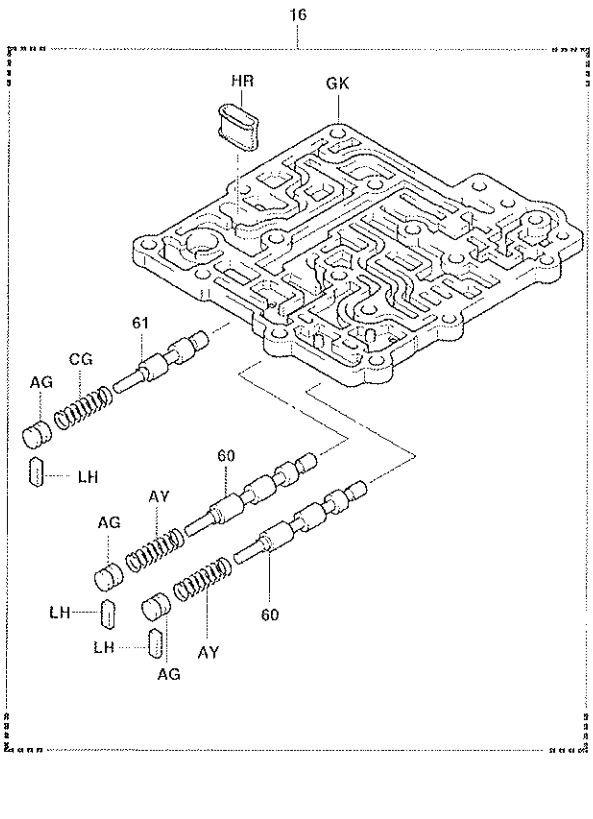
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Control Valve

3206

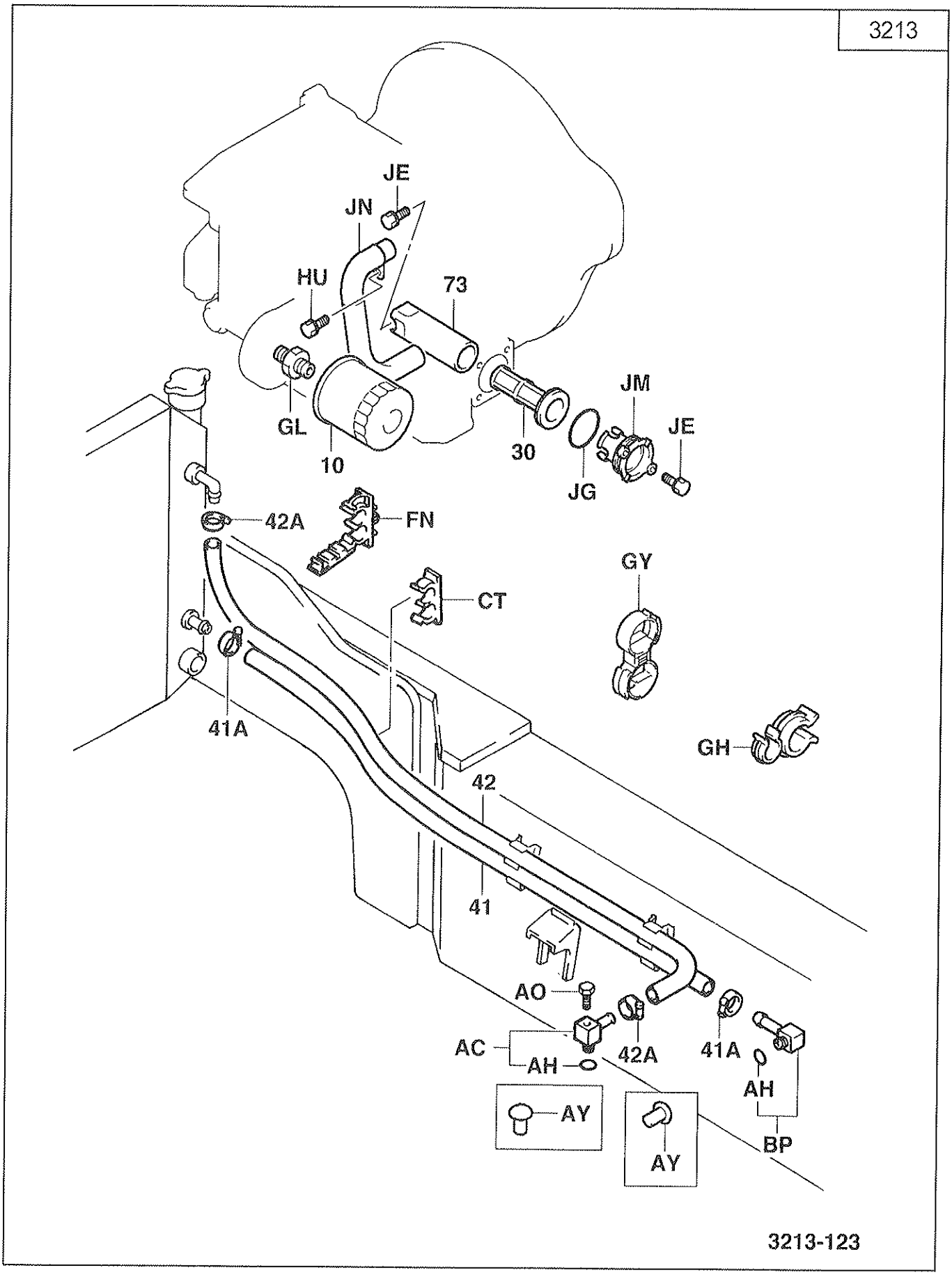






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Torque Converter Piping



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TROUBLESHOOTING

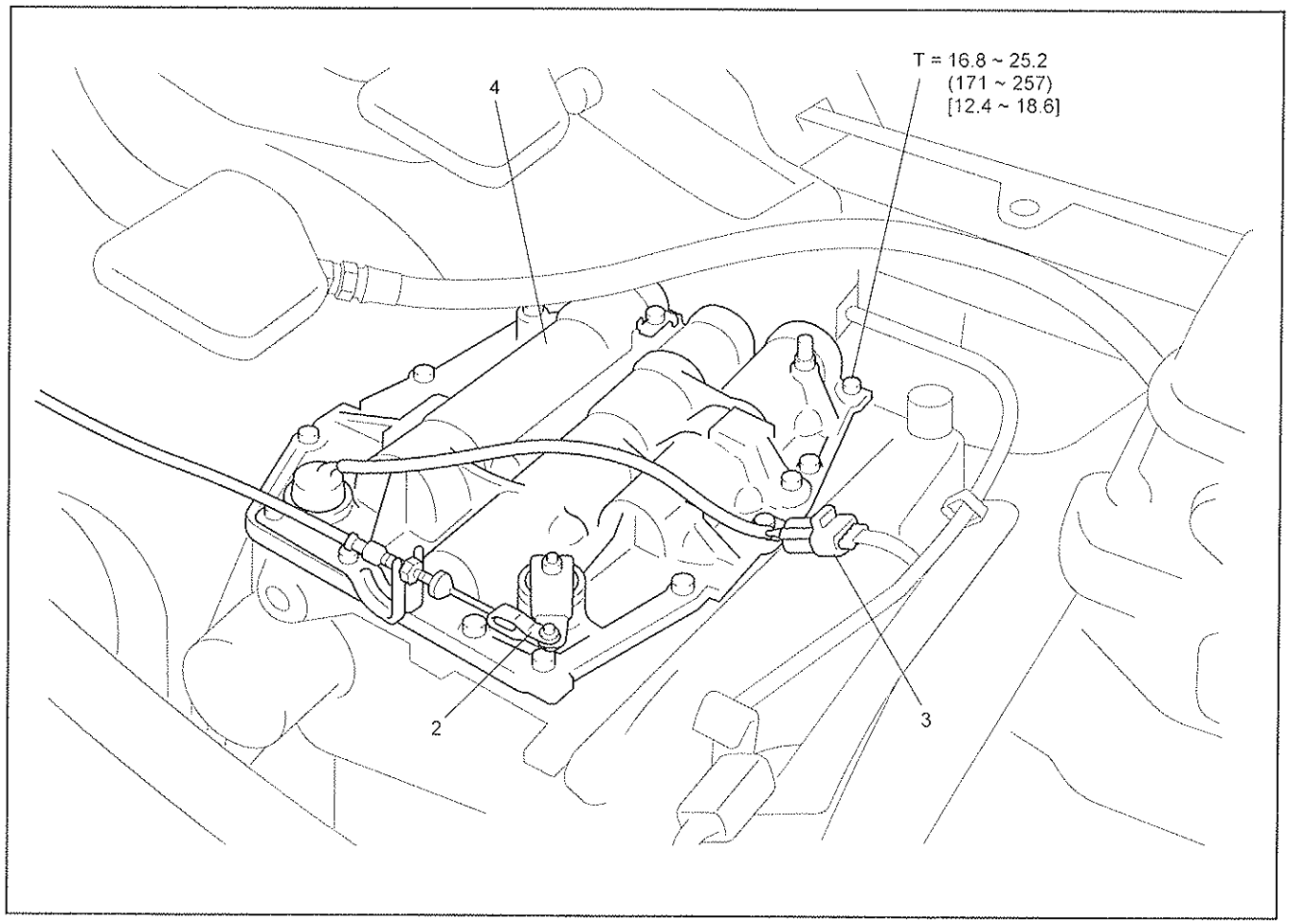
		Disassembly and inspection																										On-board inspection										
		Control valve																Components other than control valves (torque converter & transmission)																						
		Regulator valve	Inching valve	Shift change valve for F	Shift change valve for R	Safety valve	Change valve for F↔R	Accumulator for F, R	Solenoid valve For F	Solenoid valve for R	In-line strainer	Relief valve	Wire to solenoid				Oil strainer	Torque converter	Oil pump	Clutch drum for F	Clutch drum for R	Gear, bearing						Shift lever switch and neutral start switch	ATF level and quality	Inching lever, and wire cable	Oil pressure test	Stall test							
Faulty starting	No starting at F			○	○				○				○															○			○						
	No starting at R			○	○					○			○															○			○						
	No starting at any ranges		○			○					○		○				○	○	○									○	○	○	○						
	Start at N range								○	○										○	○							○									
Large shock at starting (shifting)	At starting after shifting: At N → F	○					○	○																												
	At starting after shifting: At N → R	○					○	○																												
	Inching start: At F		○					○																												
	Inching start: At R		○					○																												
Large time lag at starting (shifting)	At N → F	○		○		○					○	○				○		○	○	○																
	At N → R	○			○	○					○	○				○		○	○		○															
	At switch back	○		○	○	○					○	○				○			○	○	○								○							
Slippage	At F	○										○						○	○										○							
	At R	○										○						○	○		○								○							
Others	Starter fails to revolve at N.																										○									
	Starter revolves at ranges other than N.																										○									
	No inching operation		○																										○							
	Overheating of transmission, no air flow from breather	○																											○							
	Abnormal noise																																			

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TRANSMISSION & CONTROL VALVE ASSY

REMOVAL·INSTALLATION

T = N·m (kgf·cm) [ft·lbf]



Removal Procedure

1 Remove the toe board.

2 Disconnect the inching wire.

3 Disconnect the electrical wiring.

4 Remove the transmission cover & control valve ASSY.

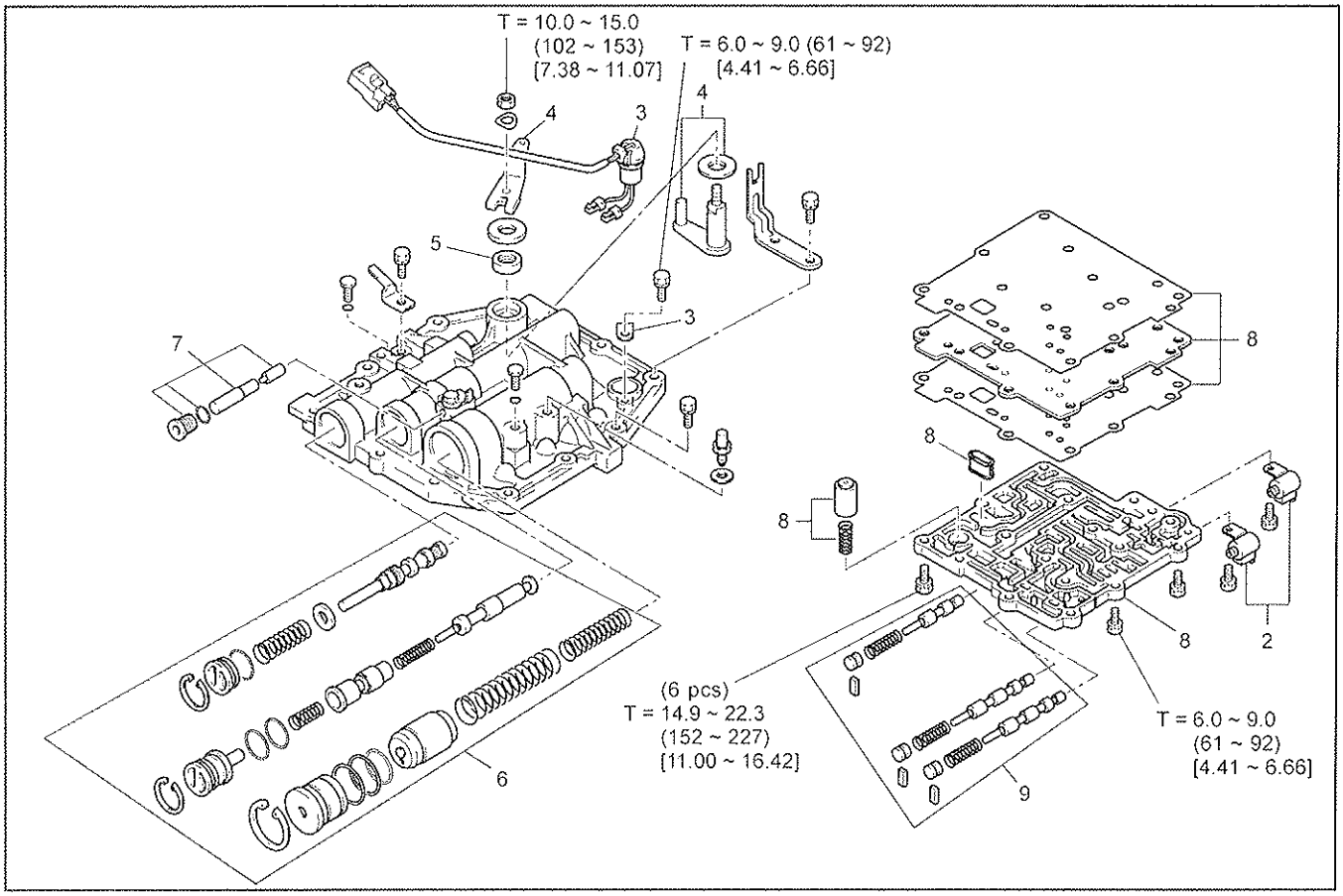
Installation Procedure

The installation procedure is reverse of the removal procedure.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf·cm) [ft·lbf]



Disassembly Procedure

1 Disconnect the solenoid valve connector.

2 Remove the solenoid valve.

3 Remove the sleeve lock plate and solenoid wire ASSY.

4 Remove the inching lever.

5 Remove the inching level oil seal. **[Point 1]**

6 Remove the accumulator valve, inching valve and regulator valve. **[Point 2]**

7 Remove the change valve. **[Point 3]**

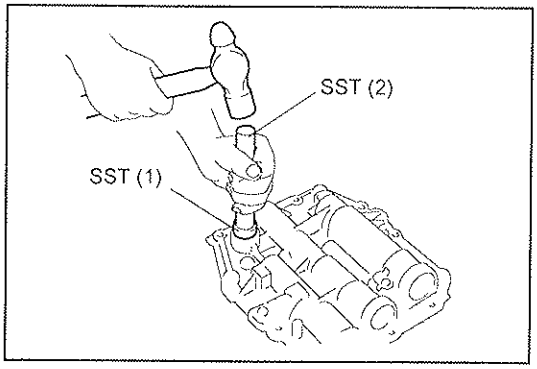
8 Remove the lower valve body ASSY, oil strainer, relief valve piston and spring. **[Point 4]**

9 Remove the safety valve, F shift valve and R shift valve. **[Point 5]**

Reassembly Procedure

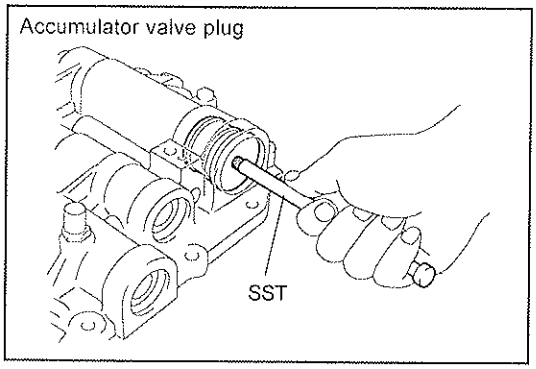
The reassembly procedure is reverse of the disassembly procedure.

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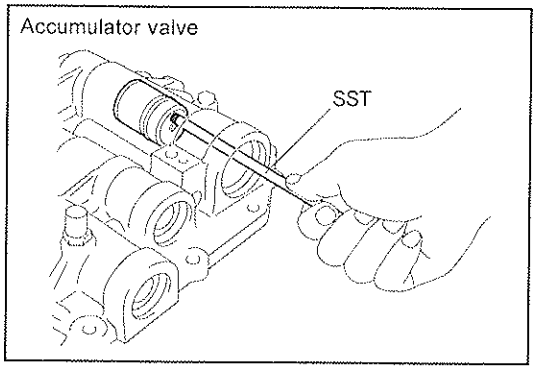


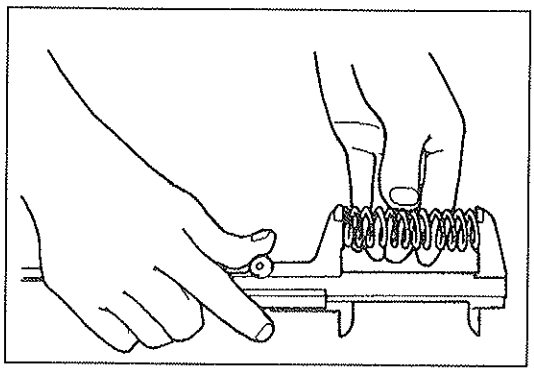
Point Operations

[Point 1]
Reassembly:
SST 09950-76018-71 --- (1)
(SST 09950-60010)
SST 09950-76020-71 --- (2)
(SST 09950-70010)



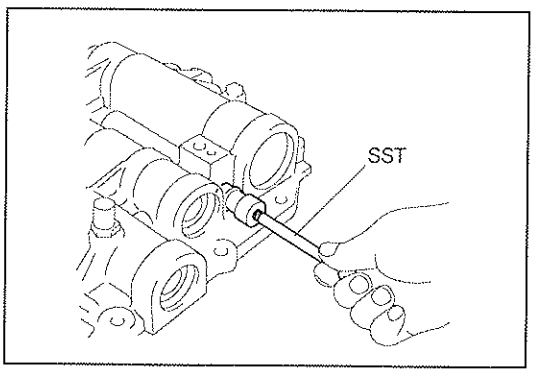
[Point 2]
Disassembly:
Remove the accumulator valve plug and accumulator valve using the SST.
SST 09950-76003-71
(SST 09950-50012)





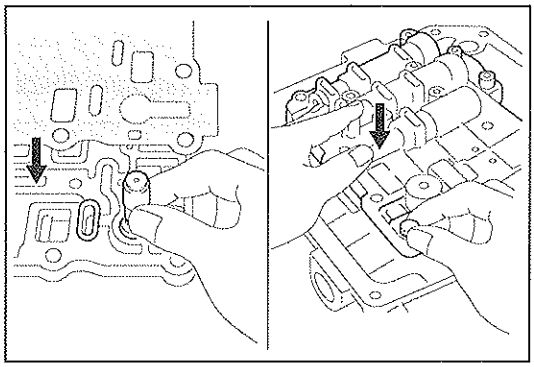
Inspection:
Measure free length of each valve spring.

		Standard mm (in)	Limit mm (in)
Accumulator valve 1 ton series	inner	86.1 (3.390)	81.8 (3.220)
	outer	151.7 (5.972)	144.1 (5.673)
Accumulator valve 2-3-J3.5 ton series	inner	84.4 (3.323)	80.2 (3.157)
	outer	122.3 (4.815)	116.2 (4.575)
Inching valve	plug side	64.2 (2.528)	61.0 (2.402)
	valve side	49.9 (1.965)	47.4 (1.866)
Regulator valve		132.4 (5.213)	125.8 (4.953)



[Point 3]
Disassembly:
Remove the valve plug as follows:
1. Remove the pin.
2. Remove the valve plug using the SST.
SST 09950-76003-71
(SST 09950-50012)

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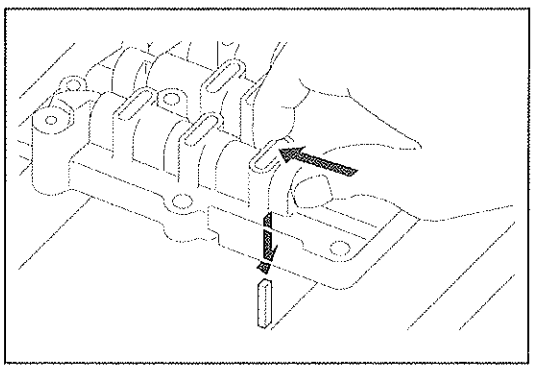


[Point 4]

Reassembly:

Install the lower valve body.

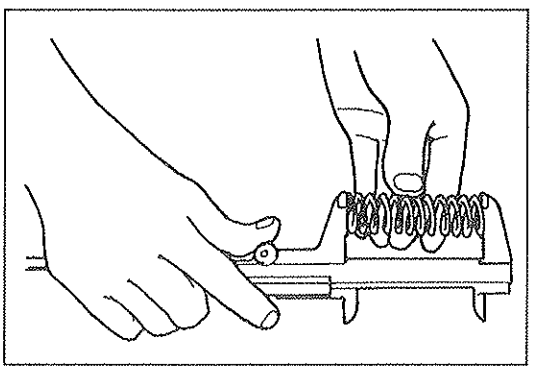
1. Install the oil strainer, spring and relief valve piston on the lower valve body, and put the gasket on top.
2. Reverse the above while maintaining the assembled state and install it on the transmission cover.



[Point 5]

Disassembly:

Press in the valve plug with its opening facing downwards and remove the key.



Inspection:

Measure free length of each valve spring.

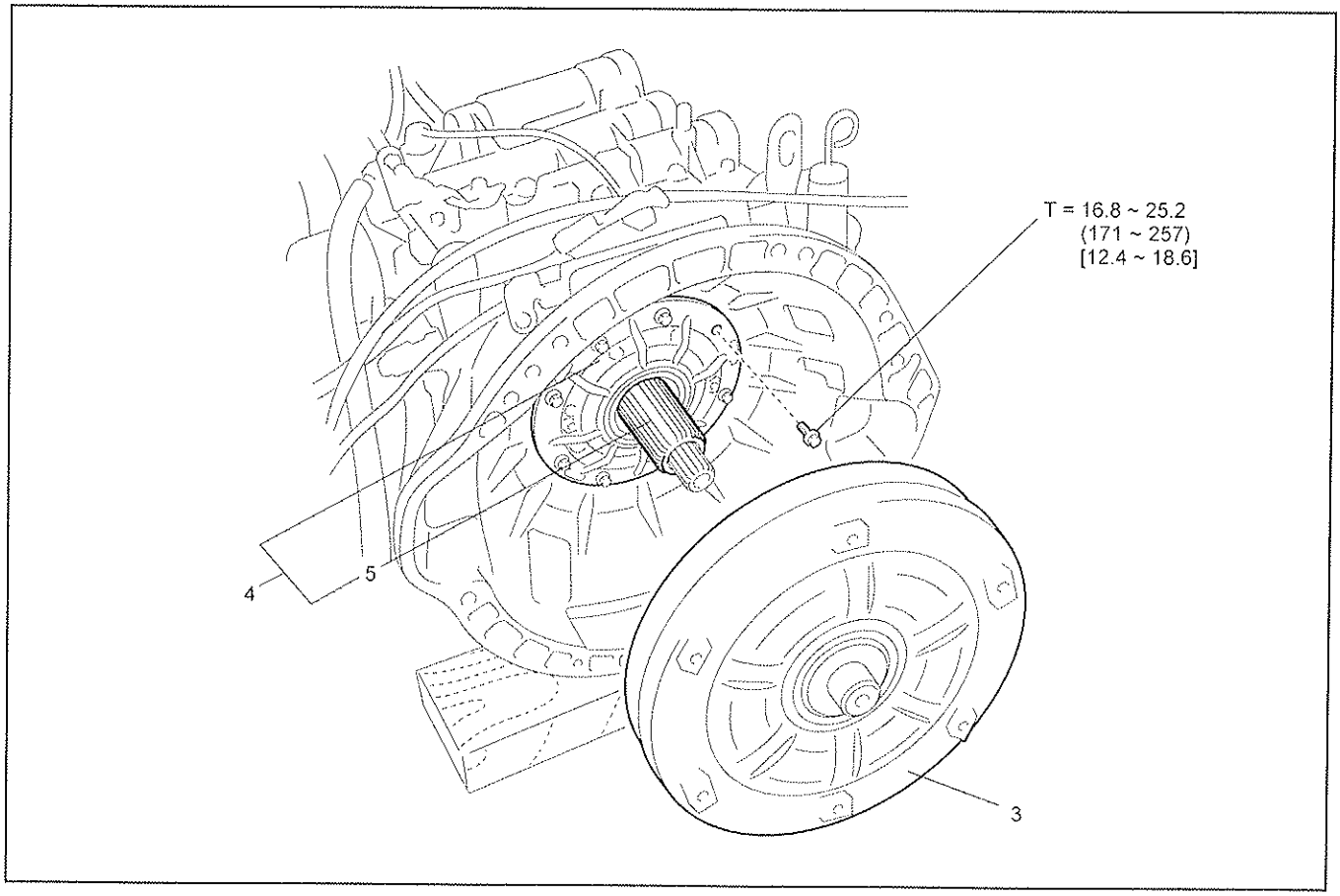
	Standard mm (in)	Limit mm (in)
F/R shift valve	59.8 (2.354)	56.8 (2.236)
Safety valve	59.8 (2.354)	56.8 (2.236)

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TORQUE CONVERTER·OIL PUMP

REMOVAL·INSTALLATION

T = N·m (kgf·cm) [ft·lbf]



Removal Procedure

1 Drain the torque converter oil.

2 Remove the engine. (See page 1-8.)

3 Remove the torque converter ASSY. **[Point 1]**

4 Remove the oil pump W/stator shaft. **[Point 2]**

5 Remove the stator shaft.

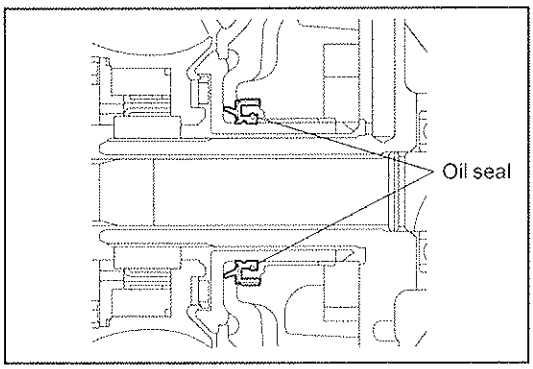
6 Remove the oil pump gear. **[Point 3]**

7 Remove the oil seal. **[Point 4]**

Installation Procedure

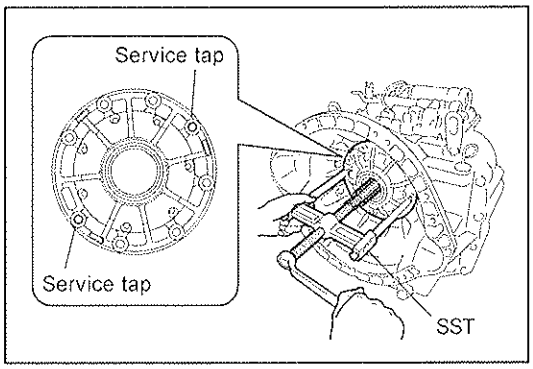
The installation procedure is reverse of the removal procedure.

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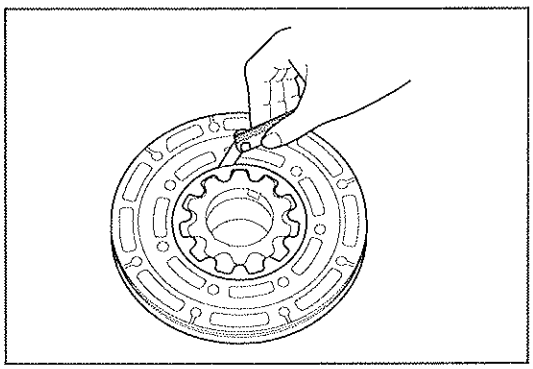


Point Operations

[Point 1]
Removal:
Be careful as the torque converter ASSY contains oil.
Installation:
Apply grease before installing the oil seal lip.
Installation:
Install while rotating the torque converter ASSY so that the extension nail enters into the groove in the oil pump drive gear.

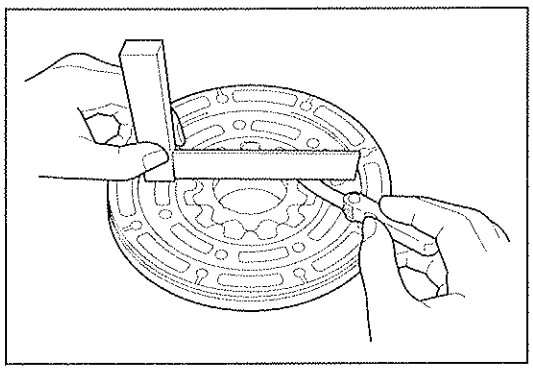


[Point 2]
Removal:
SST 09950-76014-71
(SST 09950-40011)



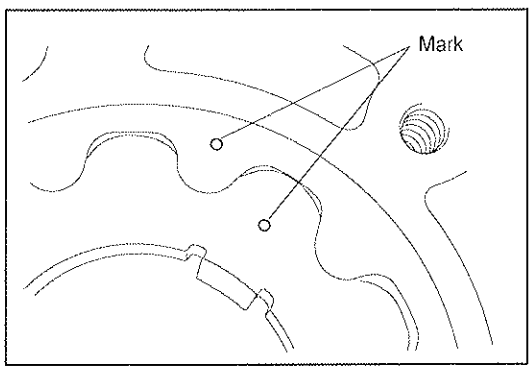
[Point 3]
Inspection:
Measure clearance between the oil pump driven gear and pump body.

Limit: 0.3 mm (0.012 in)



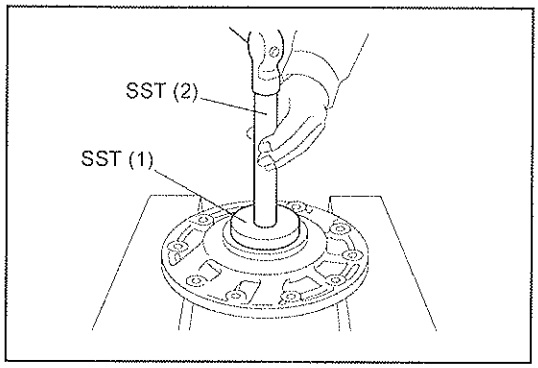
Inspection:
Measure clearance between the pump body and each gear.

Limit: 0.1 mm (0.004 in)



Inspection:
The mark has no meaning for reassembly.

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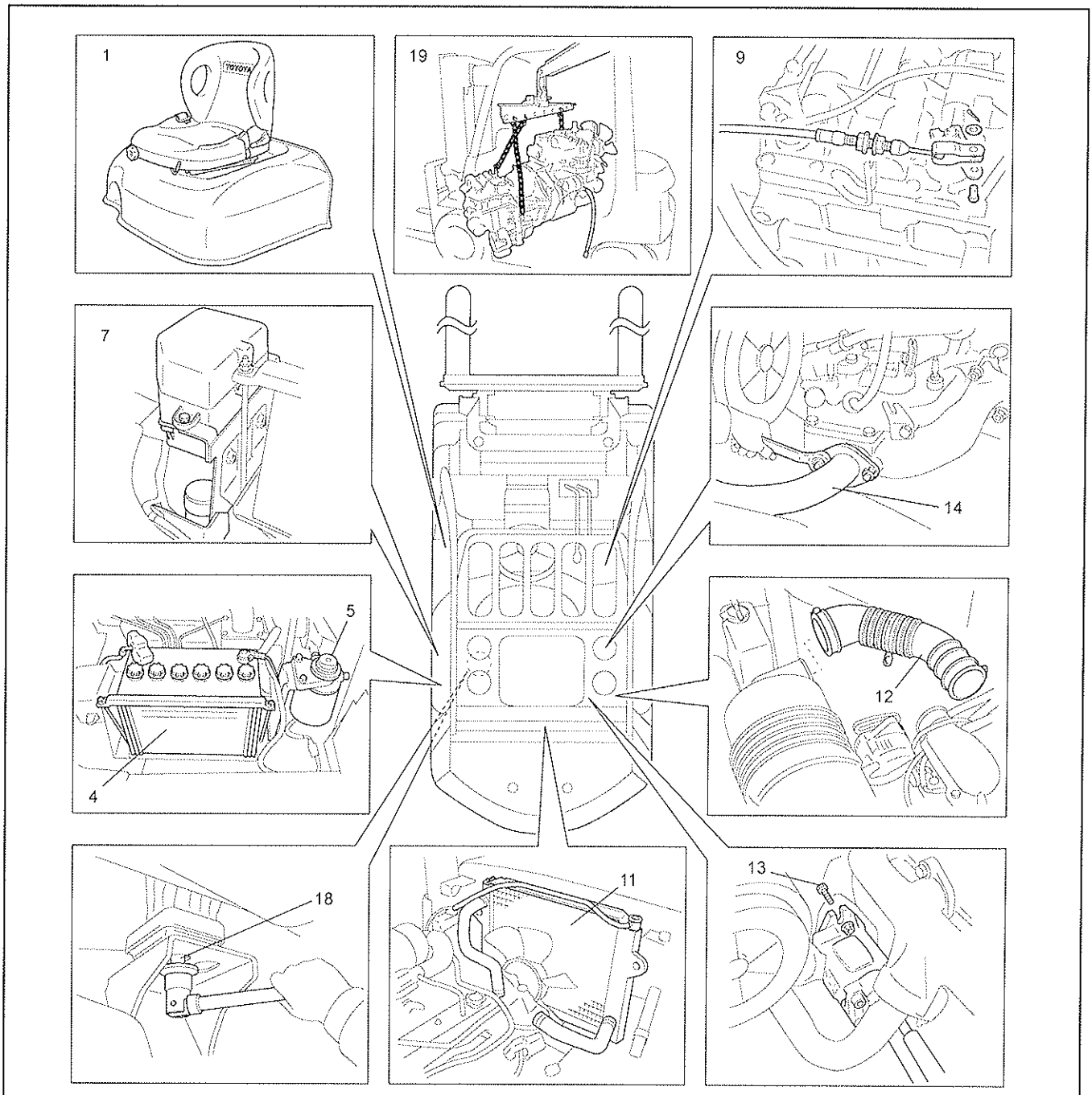
[Point 4]
Installation:
SST 09950-76018-71 --- (1)
(SST 09950-60010)
SST 09950-76020-71 --- (2)
(SST 09950-70010)

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TORQUE CONVERTER & TRANSMISSION ASSY

REMOVAL·INSTALLATION

T = N·m (kgf·cm) [ft·lbf]



Engine mounting nut	T = 53.9 ~ 99.0 (550 ~ 1010) [39.8 ~ 73.1]
Torque converter mounting set bolt	T = 49.0 ~ 75.5 (500 ~ 770) [36.2 ~ 55.7]
Torque converter housing set bolt	T = 29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
Drive plate set bolt (for connecting to engine crankshaft)	Gasoline model: T = 56.9 ~ 64.7 (580 ~ 660) [42.0 ~ 47.8] Diesel model: T = 76.5 ~ 93.2 (780 ~ 950) [56.4 ~ 68.7]
Drive plate set bolt (for connecting to torque converter)	T = 14.7 ~ 21.6 (150 ~ 220) [10.9 ~ 15.9]

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Removal Procedure

1 Remove the engine hood. (See page 9-5.)

2 Remove the toe board.

3 Drain the coolant.

4 Remove the battery and battery tray.

5 Diesel Vehicle:
Remove the sedimenter bracket set bolt to make the bracket free.

6 Disconnect the accelerator wire and fuel hose. **[Point 1]**

7 Remove fuse box and electrical parts plate set bolts to set them free.

8 Disconnect connectors and wiring harnesses from the engine.

9 Disconnect the inching wire.

10 Disconnect the torque converter cooler hose. **[Point 2]**

11 Remove the radiator.

12 Disconnect the air cleaner hose.

13 Remove the oil pump set bolts to set the pump free.

14 Disconnect the exhaust pipe.

15 Remove the under cover.

16 Remove the propeller shaft. (See page 3-3.)

17 Remove the transmission mounting bolts.

18 Remove the engine mounting nuts.

19 Remove the engine with torque converter. **[Point 3]**

20 Remove the cover plate.

21 Remove the drive plate set bolts (6 pcs.). **[Point 4]**

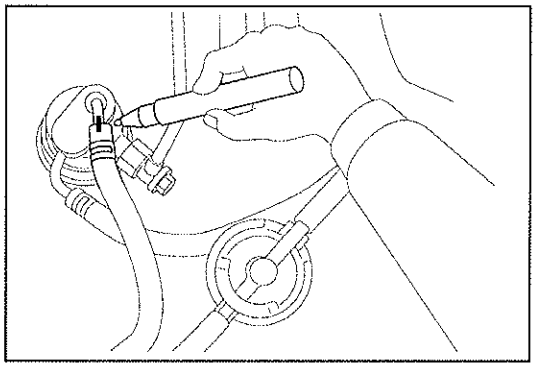
22 Separate the engine from the torque converter housing.

23 Remove the transmission cover and control valve ASSY.

Installation Procedure

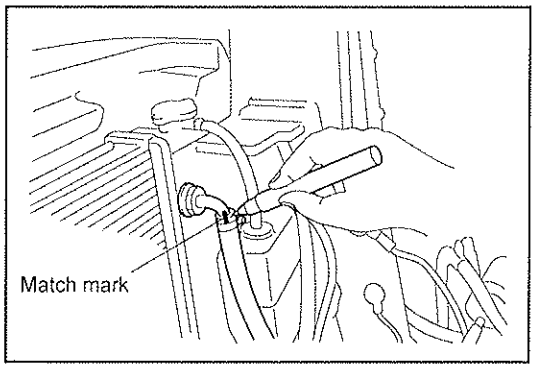
The installation procedure is reverse of the removal procedure.

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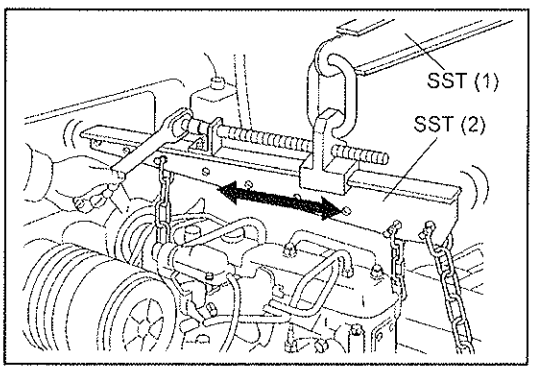


Point Operations

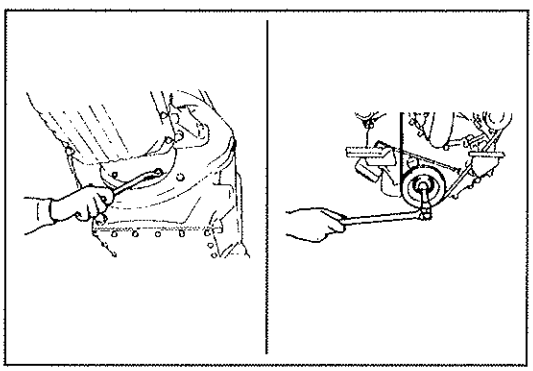
[Point 1]
Removal:
Put match marks on the fuel hose and the mating joint.



[Point 2]
Removal:
Put match marks on the radiator and torque converter cooler hose.



[Point 3]
Removal·installation:
SST 09010-20111-71 --- (1)
SST 09010-23320-71 --- (2)
Move the SST hook position to adjust the balance.



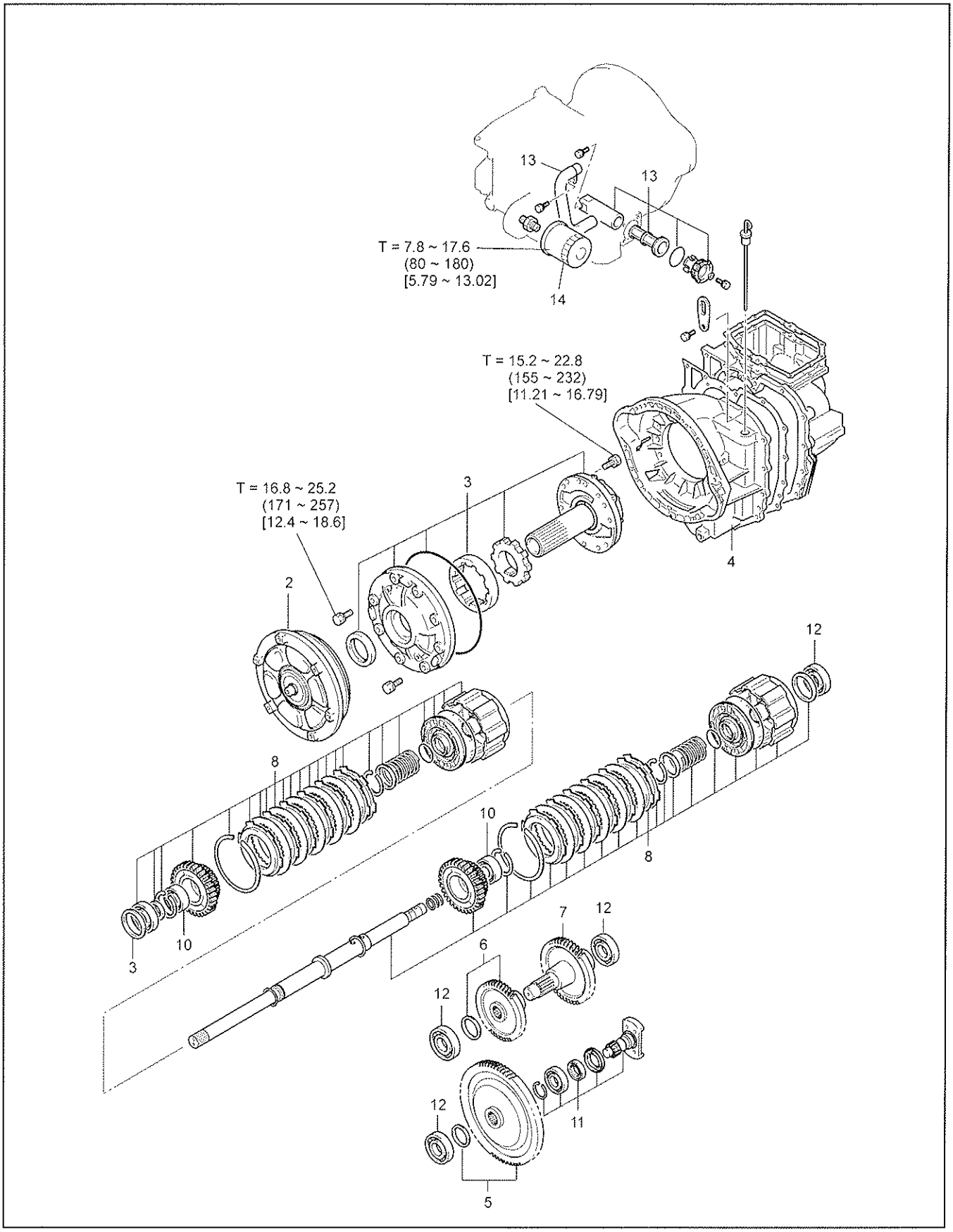
[Point 4]
Removal·Installation:
Turn the flywheel using the crankshaft pulley set bolt.

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TRANSMISSION ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf·cm) [ft·lbf]



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Disassembly Procedure

1 Drain the torque converter oil.

2 Remove the torque converter.

3 Remove the oil pump W/stator shaft and shim. **[Point 1]**

4 Remove the rear case. **[Point 2]**

5 Remove the output gear and shim.

6 Remove the counter gear and shim. **[Point 3]**

7 Remove the counter gear shaft.

8 Remove the main shaft ASSY.

9 Remove the spacer, rear bearing, reverse clutch gear, forward clutch gear and reverse & forward clutch drum ASSY. **[Point 4]**
(For disassembly, inspection and reassembly of the clutch drum ASSY, see page 2A-30)

10 Remove the reverse and forward clutch gear bearings. **[Point 5]**

11 Remove the output shaft. **[Point 6]**

12 Remove the main shaft rear bearing, counter gear bearing and output shaft bearing. **[Point 7]**

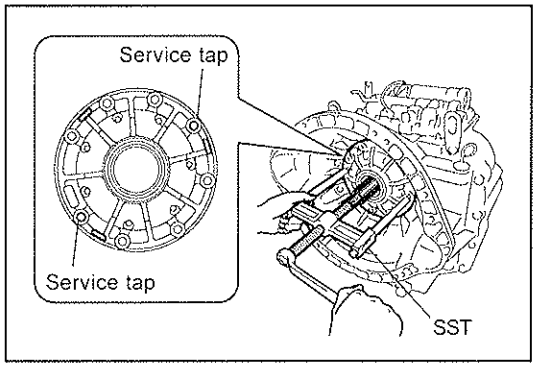
13 Remove the oil strainer, oil strainer case and piping.

14 Remove the oil filter. **[Point 8]**

Reassembly Procedure

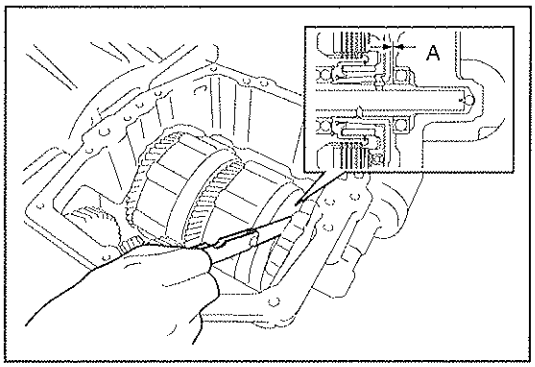
The reassembly procedure is reverse of the disassembly procedure.

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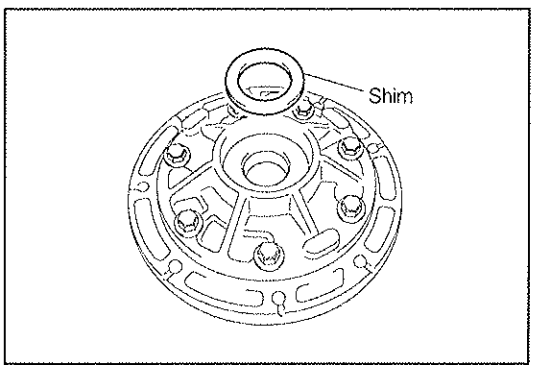
Point Operations

[Point 1]
Disassembly:
SST 09950-76013-71
(SST 09950-40010)



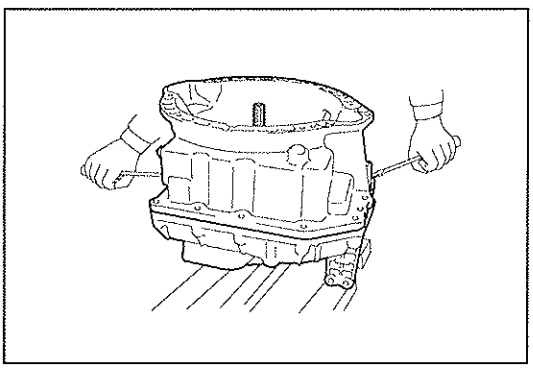
Reassembly:
Adjust the thrust clearance of the main shaft system.
1. Temporarily install the oil pump W/stator shaft and shim(s), and inspect the thrust clearance of the main shaft gear system.

Standard: A=0.10 ~ 0.43 mm (0.004 ~ 0.017 in)

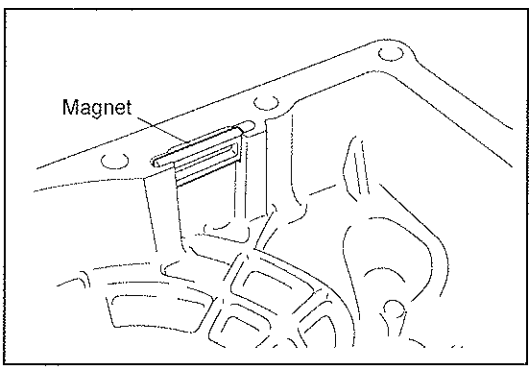


2. If the standard is not satisfied, increase or decrease the shim thickness for adjustment.

Mark	Thickness mm (in)
0	0.67 ~ 0.75 (0.0264 ~ 0.0295)
1	0.855 ~ 0.945 (0.0337 ~ 0.0372)
2	1.065 ~ 1.175 (0.0419 ~ 0.0463)
3	1.335 ~ 1.465 (0.0526 ~ 0.0577)
4	0.47 ~ 0.53 (0.019 ~ 0.021)
5	1.24 ~ 1.36 (0.049 ~ 0.054)
6	1.39 ~ 1.51 (0.055 ~ 0.059)
7	1.53 ~ 1.67 (0.060 ~ 0.066)

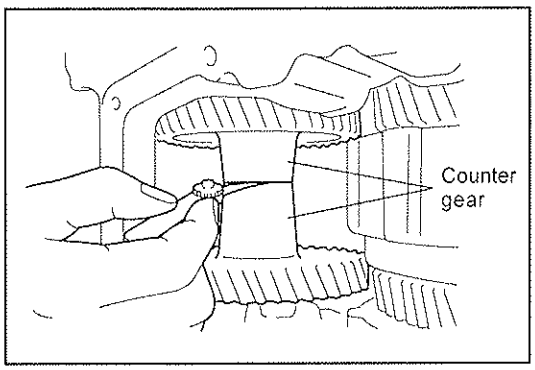


[Point 2]
Disassembly:
Insert a flat head screwdriver in the cut portion of the case for removal.



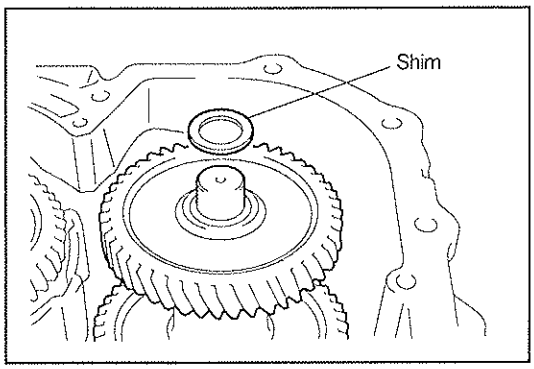
Reassembly:
Assemble after removing iron particles staying on the magnet.

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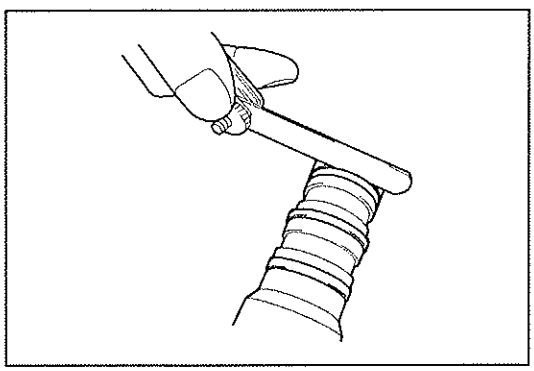
[Point 3]
Reassembly:
Adjust the counter gear thrust clearance.
1. Temporarily install the rear cover, and inspect the counter gear thrust clearance.

Standard: 0.10 ~ 0.54 mm (0.004 ~ 0.021 in)



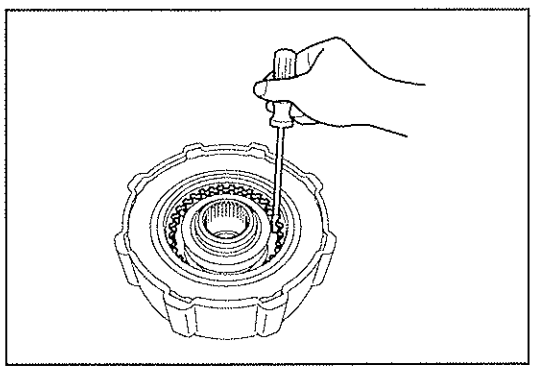
2. If the standard is not satisfied, increase or decrease the shim thickness for adjustment.

Mark	Thickness mm (in)
0	0.375 ~ 0.425 (0.015 ~ 0.017)
1	0.565 ~ 0.635 (0.022 ~ 0.025)
2	0.67 ~ 0.75 (0.026 ~ 0.030)
3	0.855 ~ 0.945 (0.034 ~ 0.037)
4	1.01 ~ 1.11 (0.040 ~ 0.044)
5	1.12 ~ 1.24 (0.044 ~ 0.049)

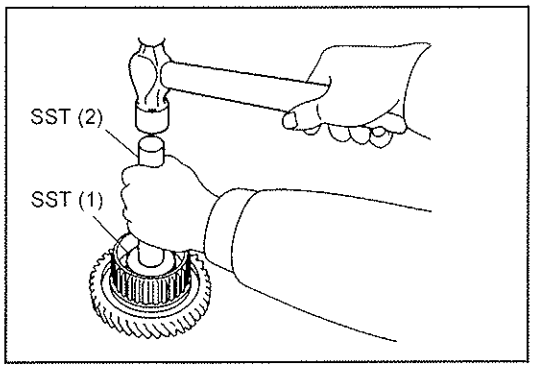


[Point 4]
Inspection:
Measure the seal ring side clearance.

Limit: 0.2 mm (0.008 in)

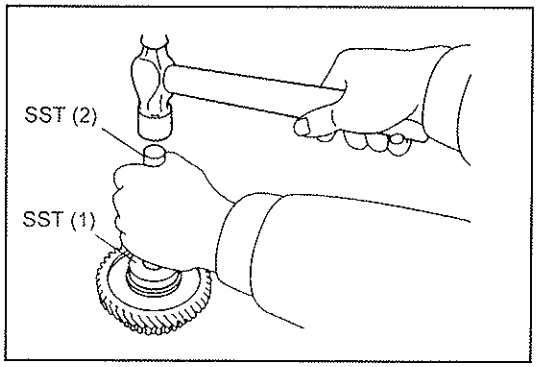


Reassembly:
After adjusting the clutch disc serration with a screwdriver or the like, install the clutch gear.

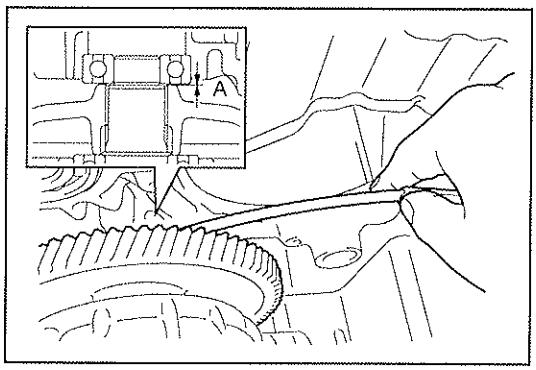


[Point 5]
Disassembly:
SST 09950-76018-71 --- (1)
(SST 09950-60010)
SST 09950-76020-71 --- (2)
(SST 09950-70010)

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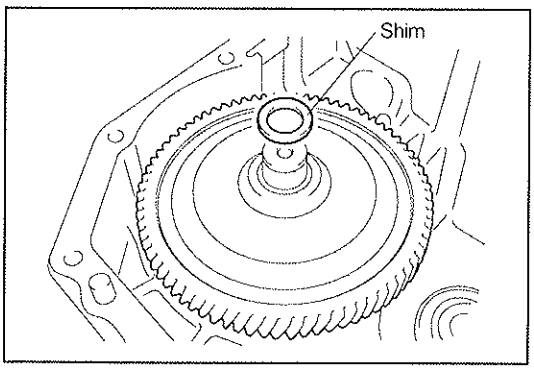


Reassembly:
SST 09950-76018-71 --- (1)
(SST 09950-60010)
SST 09950-76020-71 --- (2)
(SST 09950-70010)



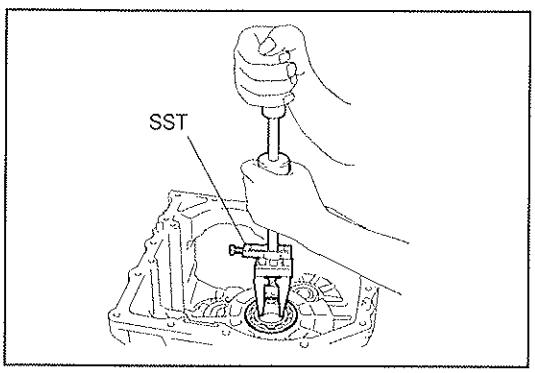
[Point 6]
Reassembly:
Adjust the output gear thrust clearance.
1. Temporarily install the output gear and rear cover, and inspect the output gear thrust clearance.

Standard: A=0.10 ~ 0.49 mm (0.004 ~ 0.019 in)

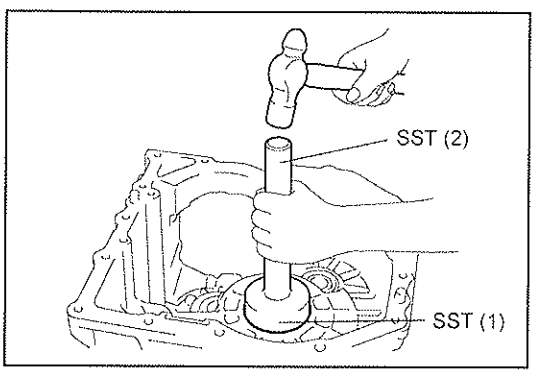


2. If the standard is not satisfied, increase or decrease the shim thickness for adjustment.

Mark	Thickness mm (in)
0	0.375 ~ 0.425 (0.015 ~ 0.017)
1	0.525 ~ 0.595 (0.021 ~ 0.023)
2	0.67 ~ 0.75 (0.026 ~ 0.030)
3	0.755 ~ 0.845 (0.030 ~ 0.033)
4	0.855 ~ 0.945 (0.034 ~ 0.037)
5	0.95 ~ 1.05 (0.037 ~ 0.041)
6	1.065 ~ 1.175 (0.042 ~ 0.046)

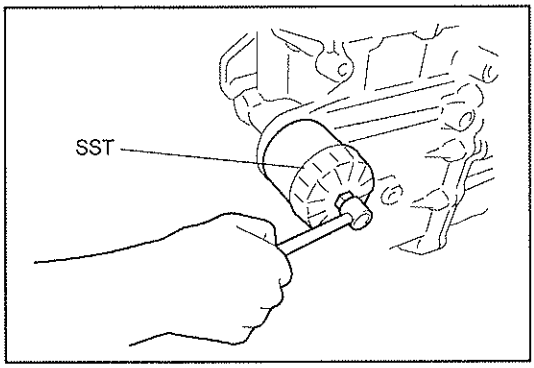


[Point 7]
Disassembly:
SST 09320-23000-71

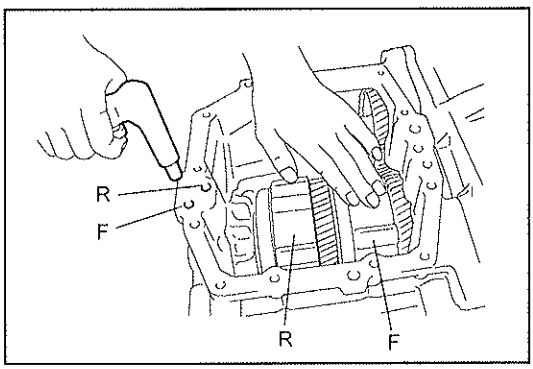


Reassembly:
SST 09950-76018-71 --- (1)
(SST 09950-60010)
SST 09950-76020-71 --- (2)
(SST 09950-70010)

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[Point 8]
Disassembly·Reassembly:
SST 09228-76004-71
(SST 09228-07501)

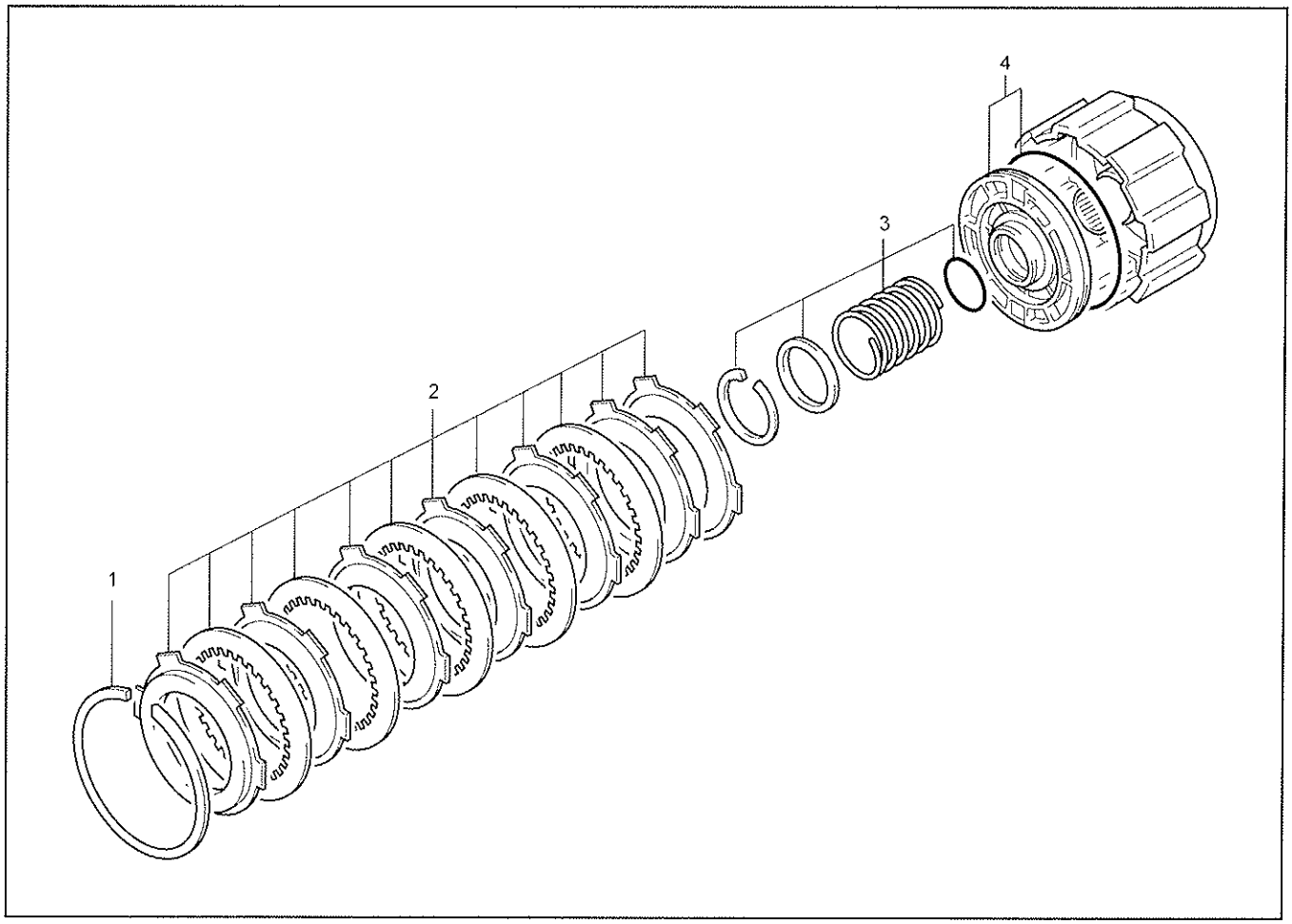


Clutch operation check after reassembly
Blow air through the oil hole on top of the transmission case and see that each clutch piston is operated.

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CLUTCH DRUM ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the snap ring.

2 Remove the backing plate, clutch disc, clutch plate and camber plate. **[Point 1]**

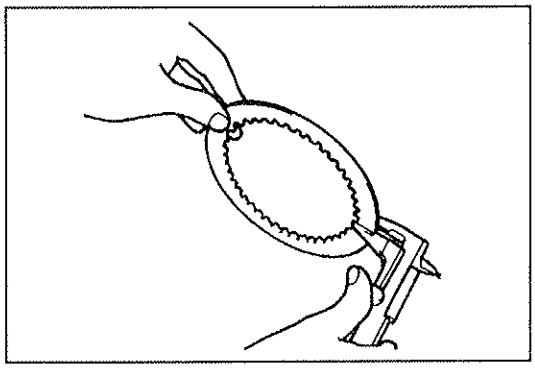
3 Remove the snap ring and clutch piston return spring. **[Point 2]**

4 Remove the clutch piston, piston ring and seal ring. **[Point 3]**

Reassembly Procedure

The reassembly procedure is reverse of the disassembly procedure.

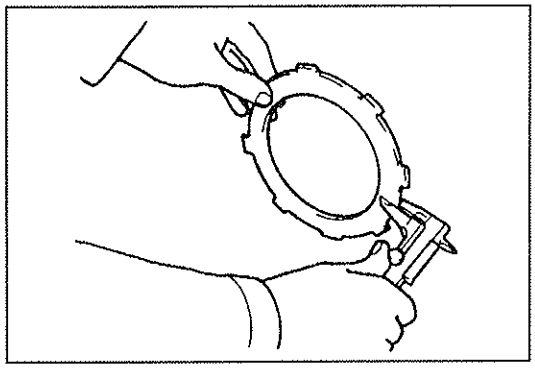
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Point Operations

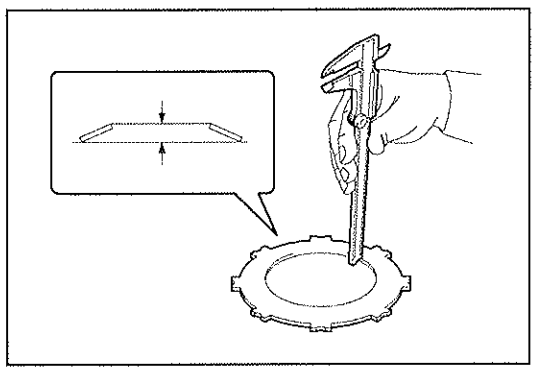
[Point 1]
Inspection:
Measure the clutch disc thickness.

Standard: 2.6 mm (0.102 in)
Limit: 2.3 mm (0.091 in)



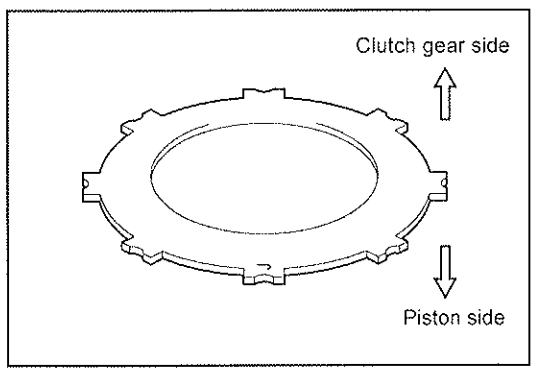
Inspection:
Measure thickness of the clutch plate.

Standard: 2.0 mm (0.079 in)
Limit: 1.8 mm (0.071 in)

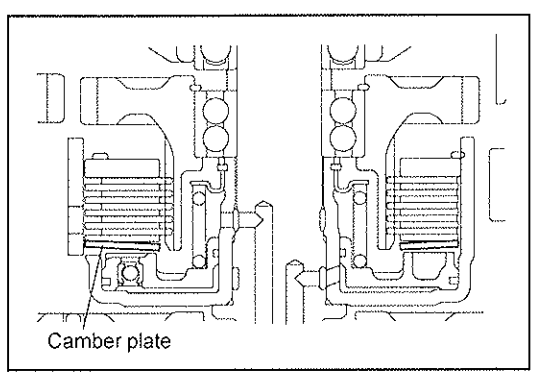


Inspection:
Measure height of the camber plate curving.

Standard: 3.4 mm (0.134 in)
Limit: 3.1 mm (0.122 in)



Reassembly:
Install the camber plate to the clutch drum, with punched mark J facing up.

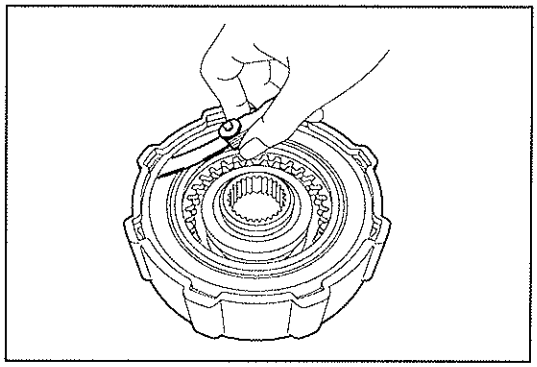


Reassembly:
Install the clutch plate and clutch disc alternately on the clutch drum, while applying torque converter oil.

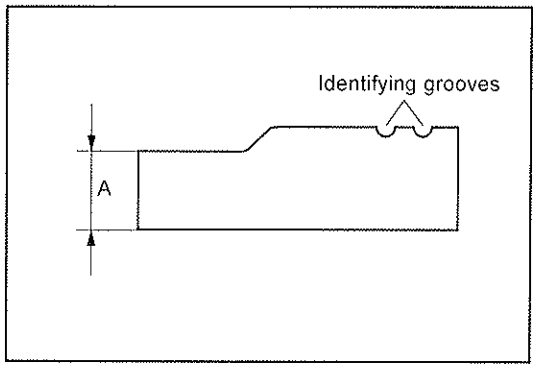
Number of clutch discs

1 ton series	4Y and 1DZ-II models	4
2•3 ton series	4Y and 1DZ-II models	5
	2Z model	5
J3.5 ton series	4Y model	5
	2Z model	5

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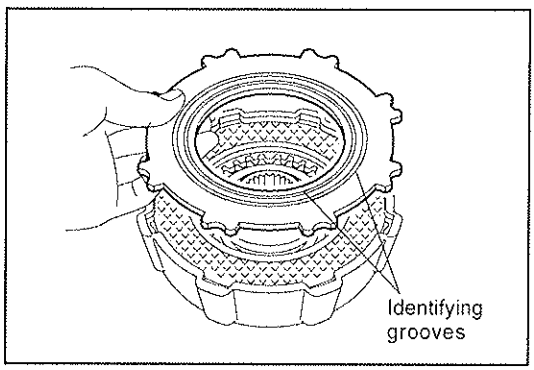


Reassembly:
Adjust the clearance between the backing plate and clutch disc.
1. Install the camber plate, clutch plate, clutch disc, backing plate and snap ring on the clutch drum.
2. Measure clearance between the backing plate and snap ring using thickness gauges.
Standard:
4-disc specification: 0.8 ~ 1.3 mm (0.031 ~ 0.051 in)
5-disc specification: 1.0 ~ 1.6 mm (0.039 ~ 0.063 in)

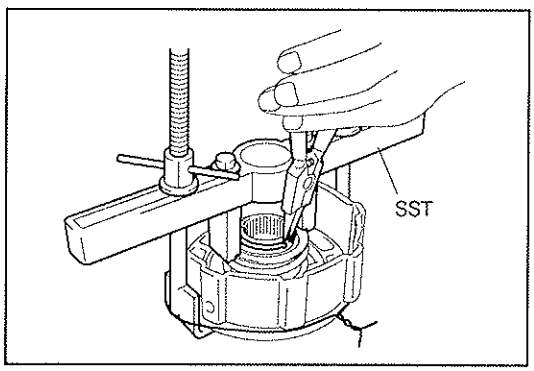


3. If the measured value is out of the specified range, select a suitable backing plate.
Backing plate thickness:

A	Identifying grooves
5.7 mm (0.224 in)	0
6.2 mm (0.244 in)	One groove
6.7 mm (0.264 in)	Two grooves

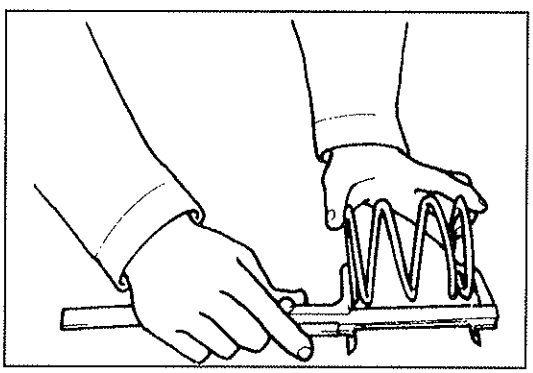


Reassembly:
Install the backing plate with its stepped side (with groove) facing upward (on the clutch gear side).



[Point 2]
Disassembly·Reassembly:
Compress the return spring using the SST and remove or install the snap ring.
Tie two hooks of the SST by a wire or string as shown and secure the hooks so that they will not disconnected from the clutch drum.
SST 09220-22001-71

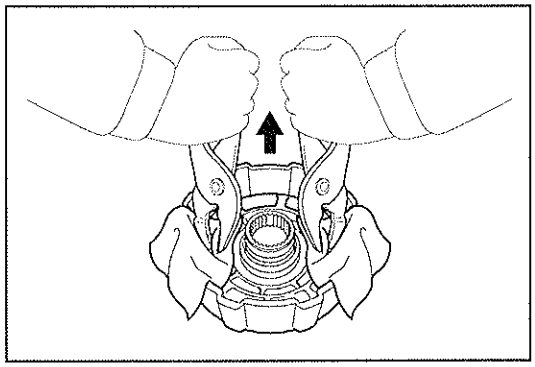
Caution:
If the hooks are disconnected from the clutch drum while the SST is in use, spring will jump out, which is dangerous.



Inspection:
Measure free length of the clutch piston return spring.

Standard: 63.4 mm (2.496 in)
Limit: 58.5 mm (2.303 in)

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[Point 3]

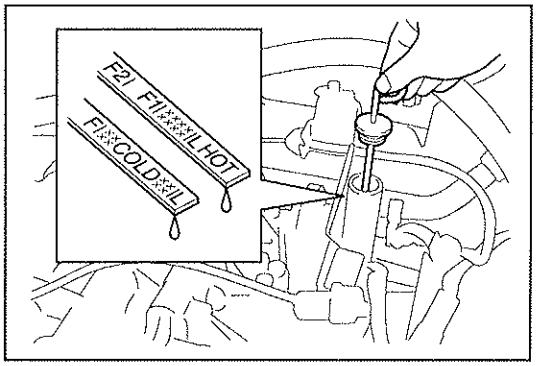
Disassembly:

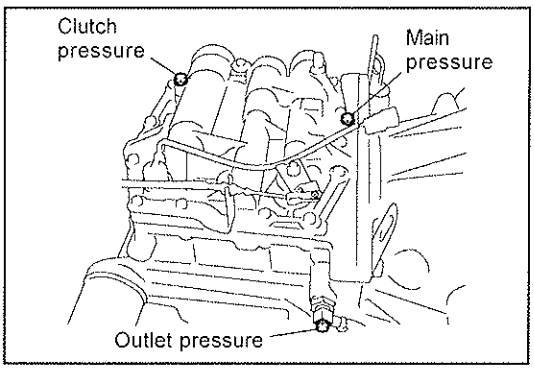
Pinch the rib of clutch piston by pliers with cloth in-between and remove the piston.

Reassembly:

Apply torque converter oil on the piston ring and seal ring, and assemble the clutch piston.

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OIL PRESSURE MEASUREMENT AND STALL TEST

1. Maintain the vehicle horizontally and warm up the engine with the direction switch at the N position.
2. Measure the oil level.
   (1) Measure the oil level during idling using the level gauge.
   (2) If the oil level is not between F (upper limit) and L (lower limit), adjust to an appropriate level.

3. Measure the oil pressure.
   (1) Check and adjust the engine speed.
   (2) Stop the engine and jack up at the front axle to float wheels (both tires).
   (3) Set the oil pressure gauge. (If three oil pressure gauges are available, measure the main, clutch and torque converter outlet pressures at a time.)
   Use the adapter (SST) at each of the main pressure and clutch pressure detection port.
   SST 09350-23320-71
   (SST thread size: Valve side 5/16 UNF, Oil pressure gauge side PT1/8)
   (4) Start the engine, set the direction switch to the N position, and measure the main pressures at idling and 2000 rpm, and the torque converter outlet pressure at 2000 rpm.
   (5) Operate the direction switch to each shift position and measure clutch operating pressures at idling and 2000 rpm.

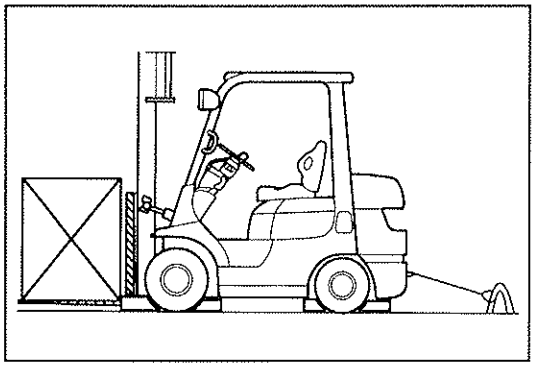
Note:
Do not step on the inching pedal during measurements of oil pressures.

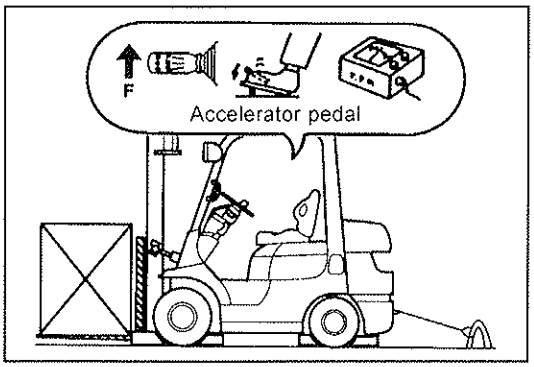
Standard

kPa (kgf/cm²) [psi]

Detecting pressure	Plug size	Idling	2000 rpm
Main pressure	PT 1/8 (SST)	830 ~ 1220 (8.5 ~ 12.4) [121 ~ 176]	890 ~ 1270 (9.1 ~ 13.0) [129 ~ 185]
Clutch pressure	↑	↑	890 ~ 1270 (9.1 ~ 13.0) [129 ~ 185]
Torque converter outlet pressure	PT 1/8	–	80 ~ 540 (0.8 ~ 5.5) [11.3 ~ 78.2]

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4. Carry out the stall test.
   (1) Load a cargo having near the permissible maximum load, firmly locate stoppers to the front and rear wheels, and activate the parking brake.

   Caution:
   Prevent the vehicle from movement by pulling at the rear by a wire as shown, for safety during test.

   (2) Warm up the engine and measure the idling speed, no-load static maximum revolution and relief down.
   (3) Set the direction switch to the forward position, press on the acceleration pedal all the way and measure the stall revolution after the revolution is stabilized.

   Standard:
   4Y: Approx. 2100 rpm
   1DZ-II: Approx. 2100 rpm
   2Z: Approx. 2050 rpm

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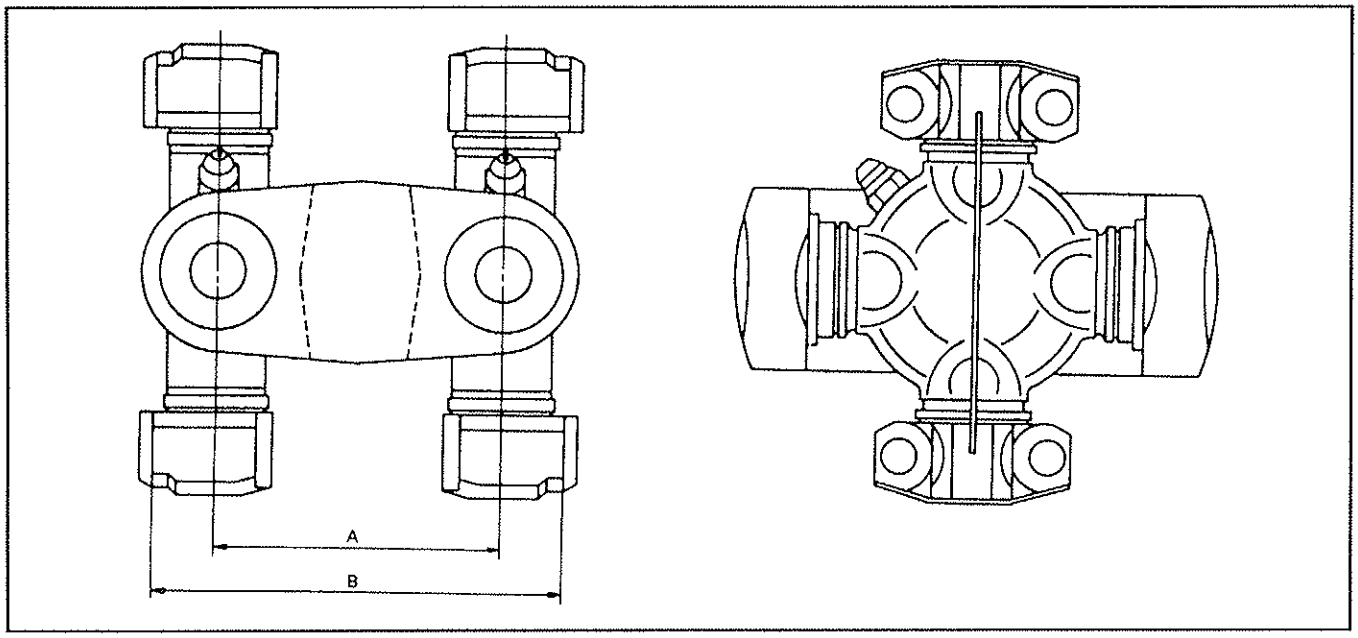
PROPELLER SHAFT

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GENERAL

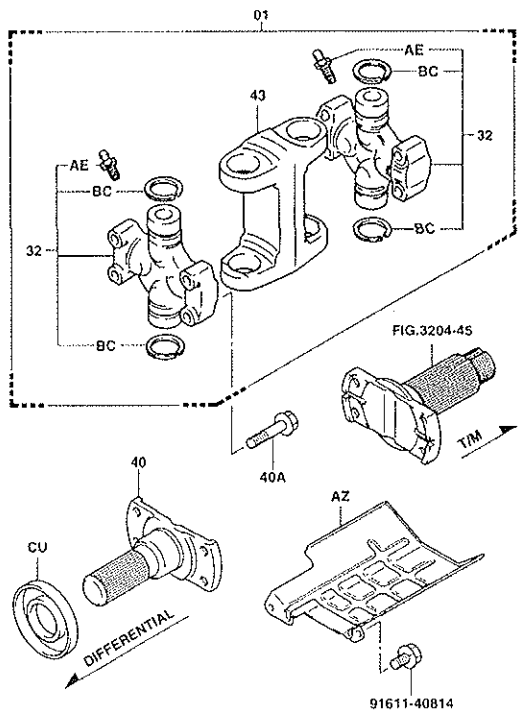


SPECIFICATIONS

Joint type			Cross type
Length	mm (in)	A	77.5 (3.051)
		B	108.5 (4.272)

COMPONENTS

3701



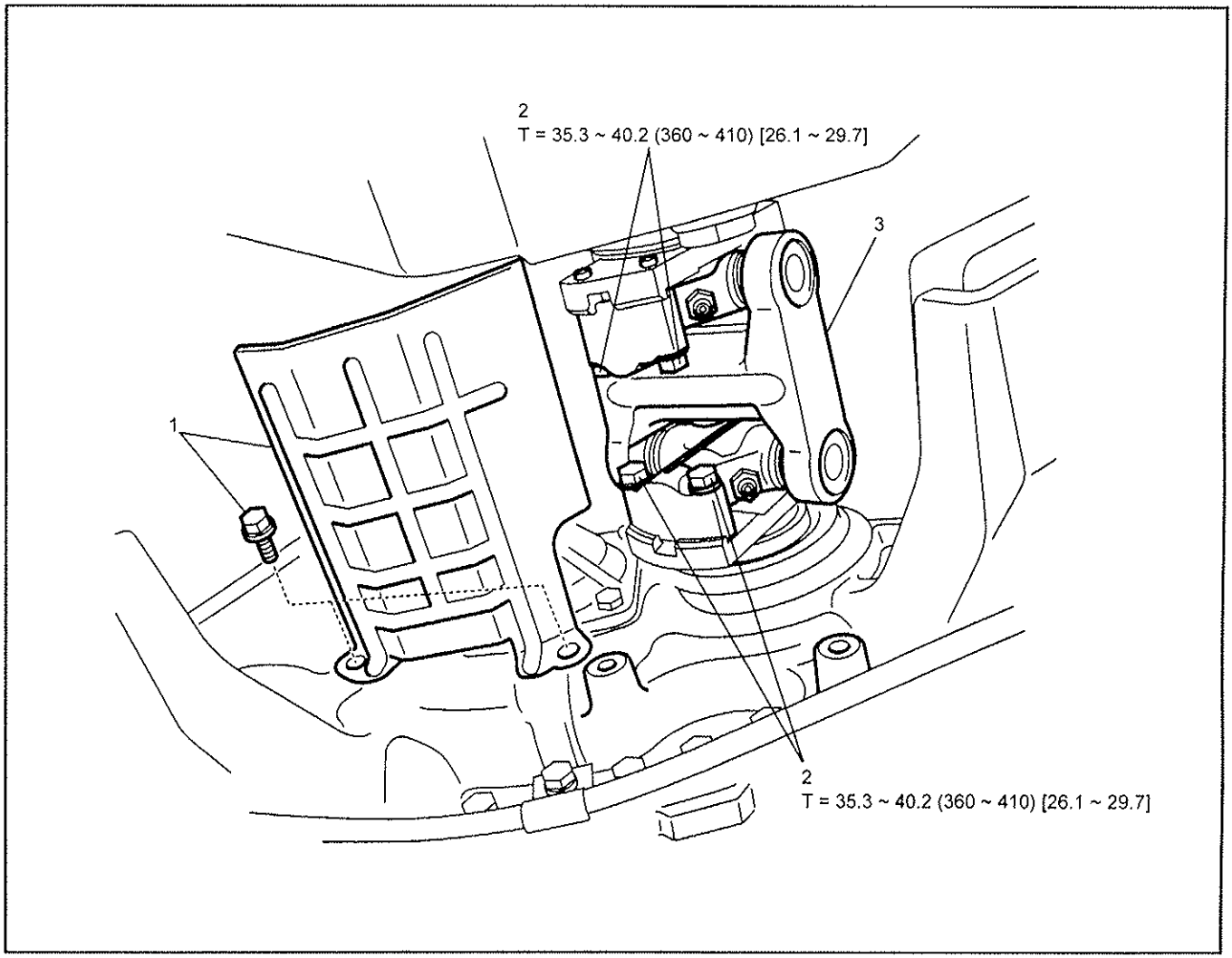
3701-063

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PROPELLER SHAFT

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the propeller shaft cover.

2 Remove the propeller shaft set bolt.

3 Remove the propeller shaft.

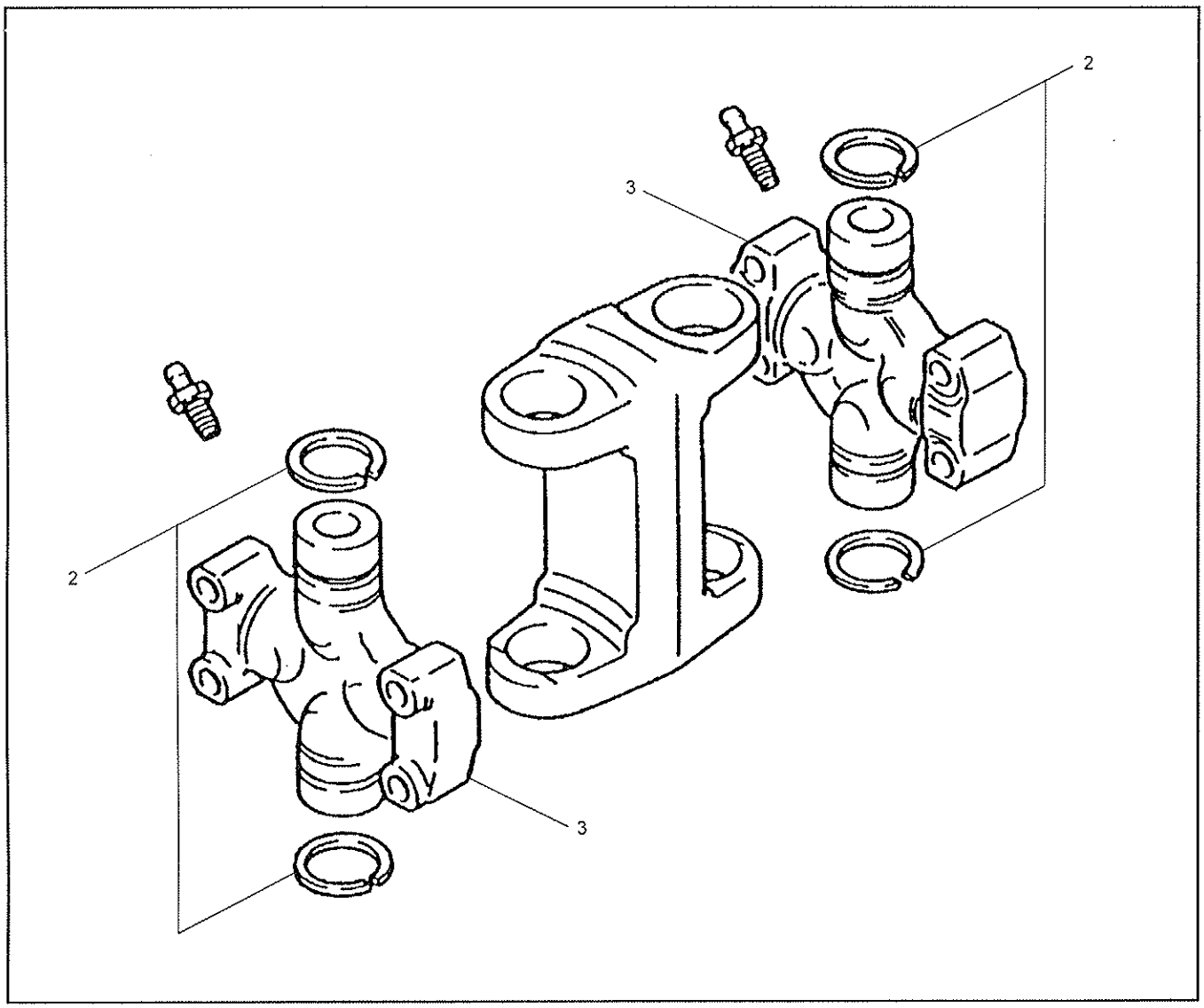
Installation procedure

The installation procedure is the reverse of the removal procedure.

Note:
Add MP grease through the grease fitting.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Fix the propeller shaft in a vise.

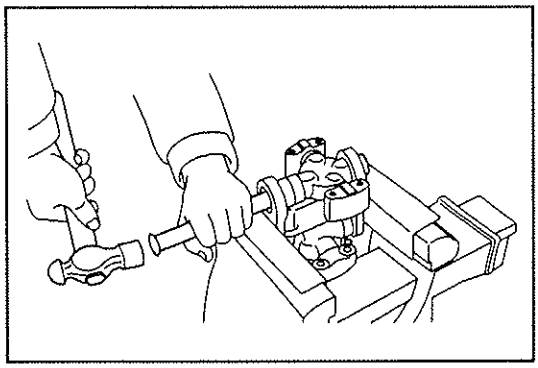
2 Remove the snap rings.

3 Remove the universal spider sets. **[Point 1]**

Reassembly Procedure

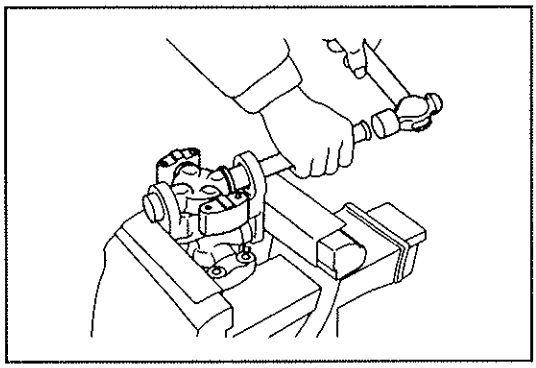
The reassembly procedure is the reverse of the disassembly procedure.

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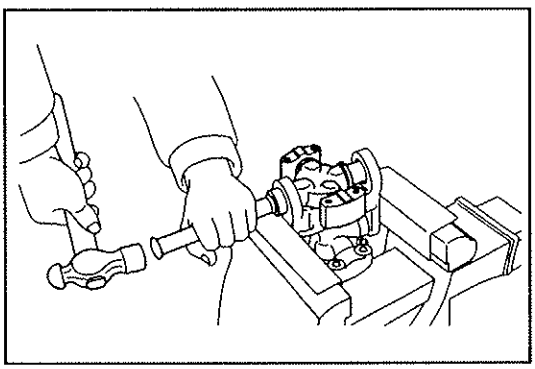


Point Operations

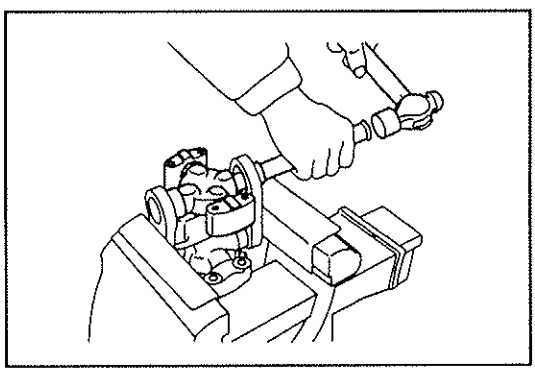
[Point 1]
Disassembly:
Remove the universal spider sets.
1. Use a brass bar and extract the bearing cup.



2. Use the brass bar to extract the bearing cup on the other side and remove the spider.
3. Remove the spider set on the opposite side in the same way.



Reassembly:
Install the universal spider sets.
1. Coat MP grease on the needle roller in the bearing cup.
2. Use a brass bar and drive in the bearing cup a little.
3. Install the spider.
4. Use the brass bar and drive in the bearing cup until the snap ring groove appears.



5. Use the brass bar and drive in the bearing cup on the opposite side until the snap ring groove appears.
6. Install the spider set on the opposite side in the same way.

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DIFFERENTIAL

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DISASSEMBLY·INSPECTION·REASSEMBLY
(1 TON SERIES: 2000.11 ~) 4-13A

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(ALL MODELS: ~ 2002.12, 1 TON SERIES: 2003.6 ~,
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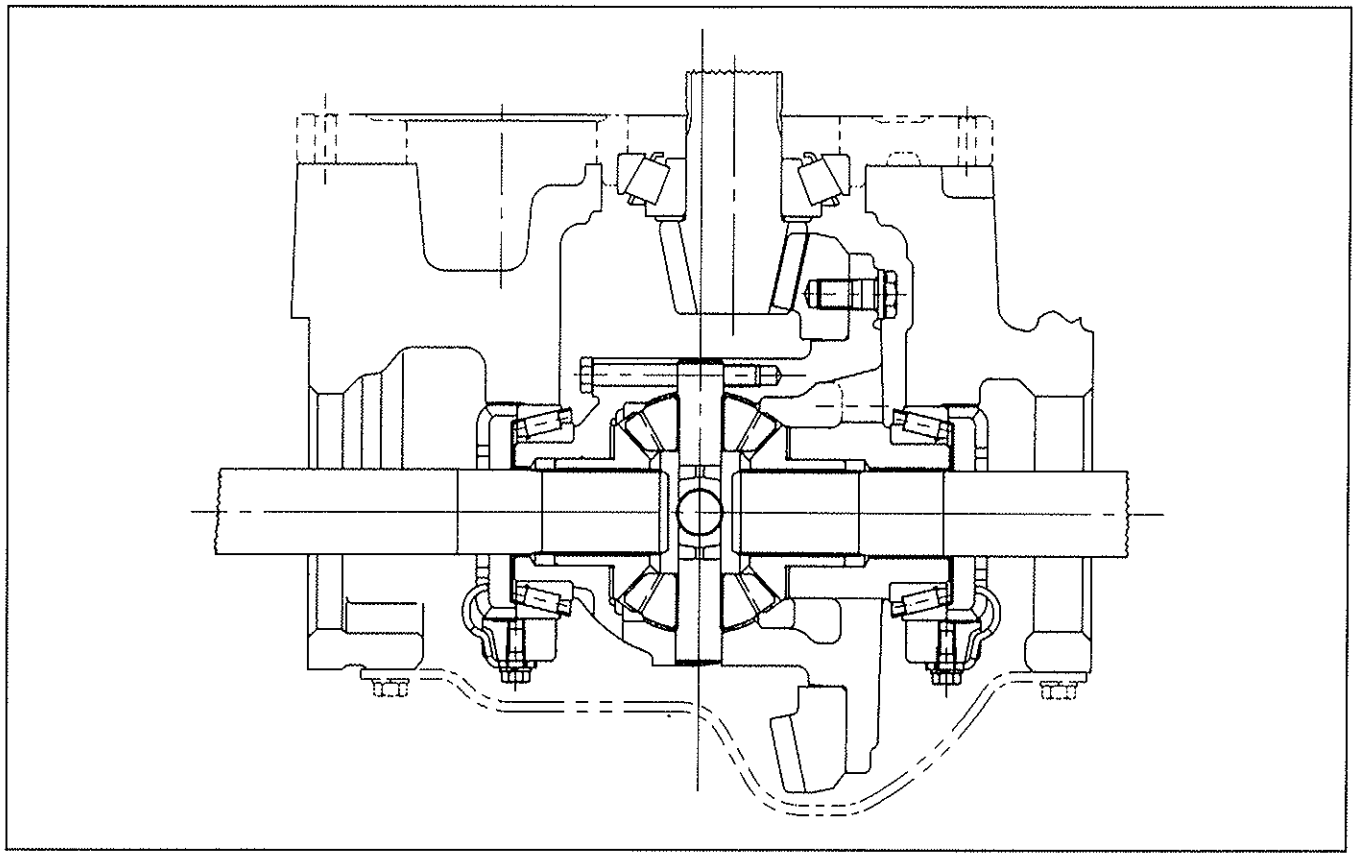
DIFFERENTIAL CARRIER 4-17

DISASSEMBLY·INSPECTION·REASSEMBLY 4-17

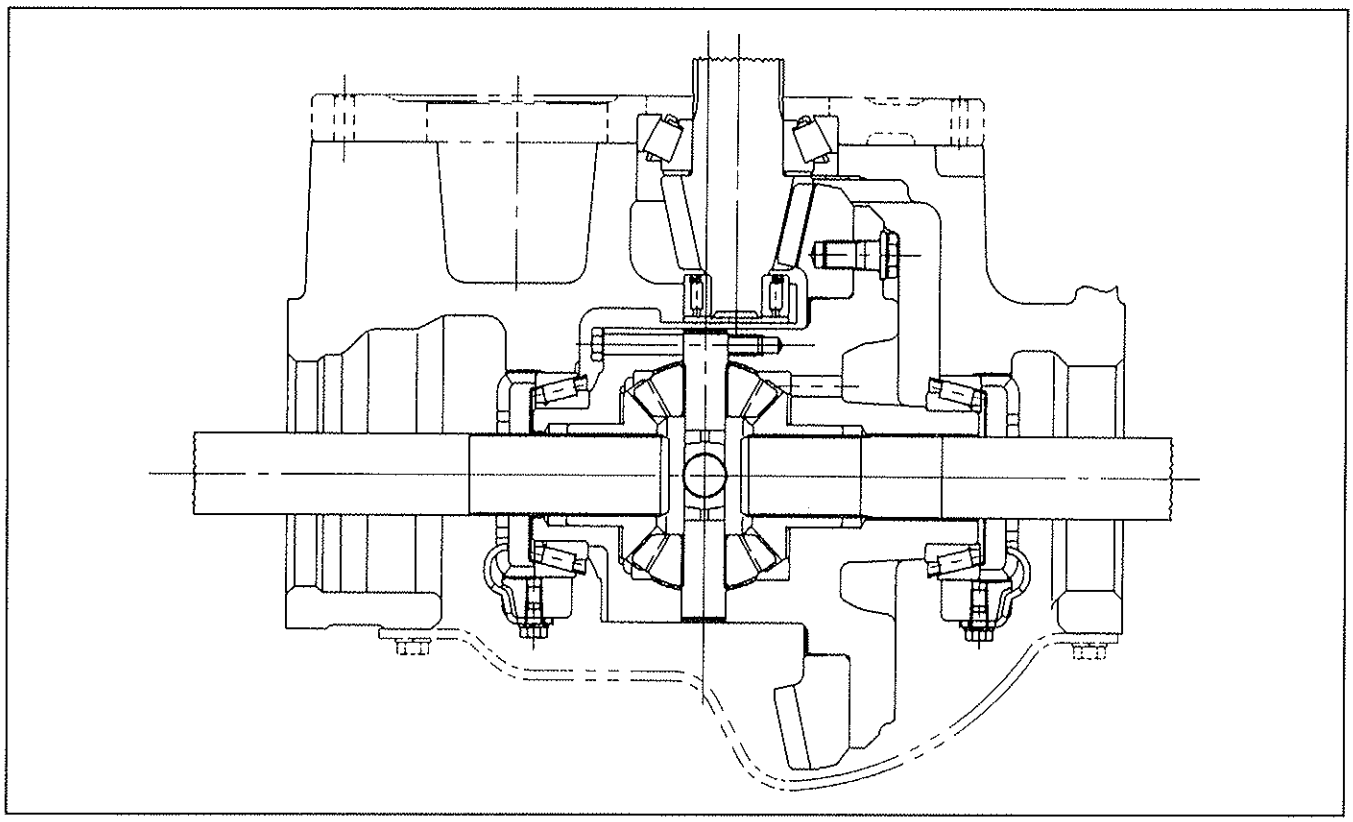
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GENERAL

Differential (1 Ton Series: ~ 2000.11)

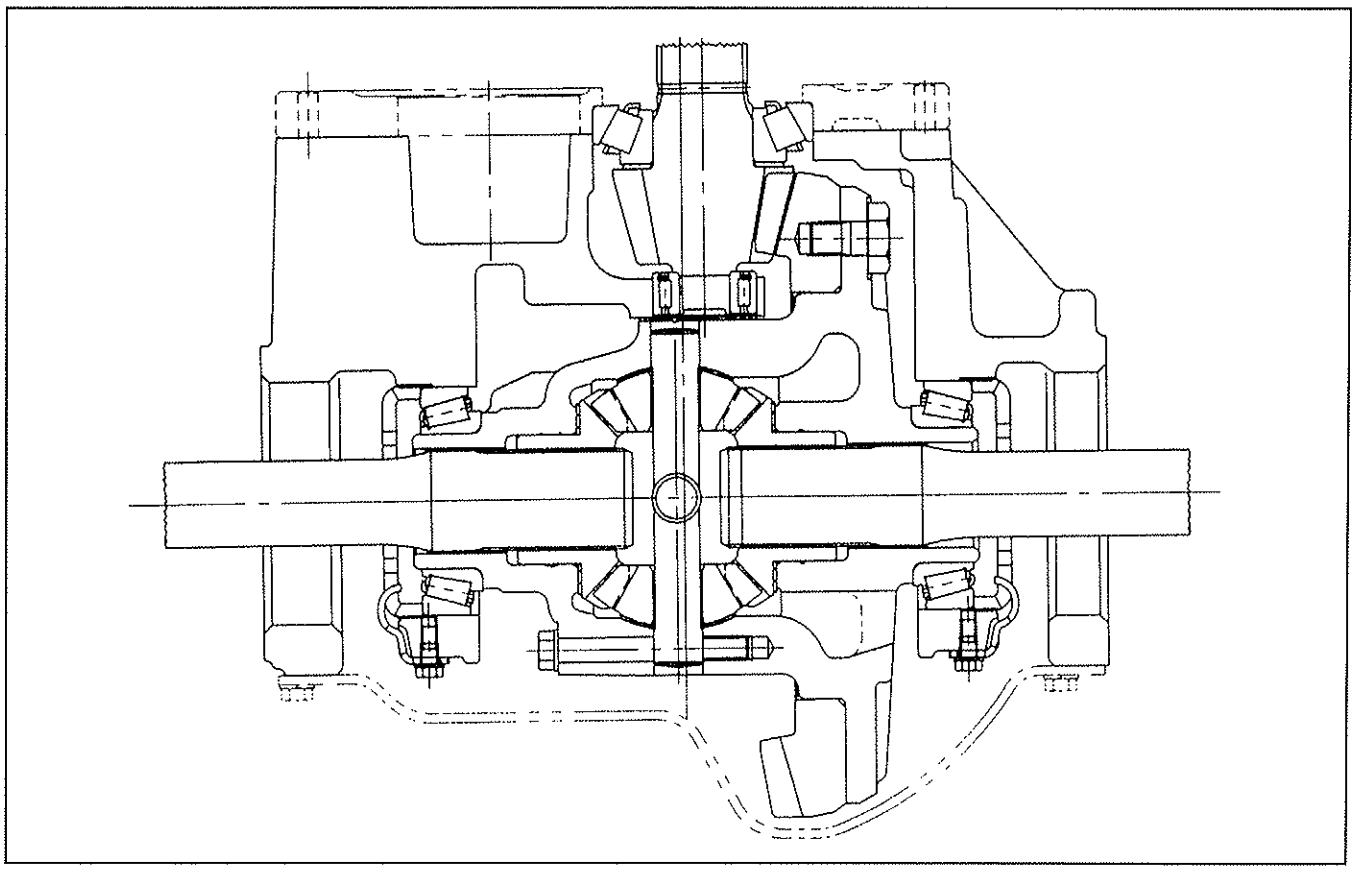


Differential (2 Ton Series: ~ 1999.11)

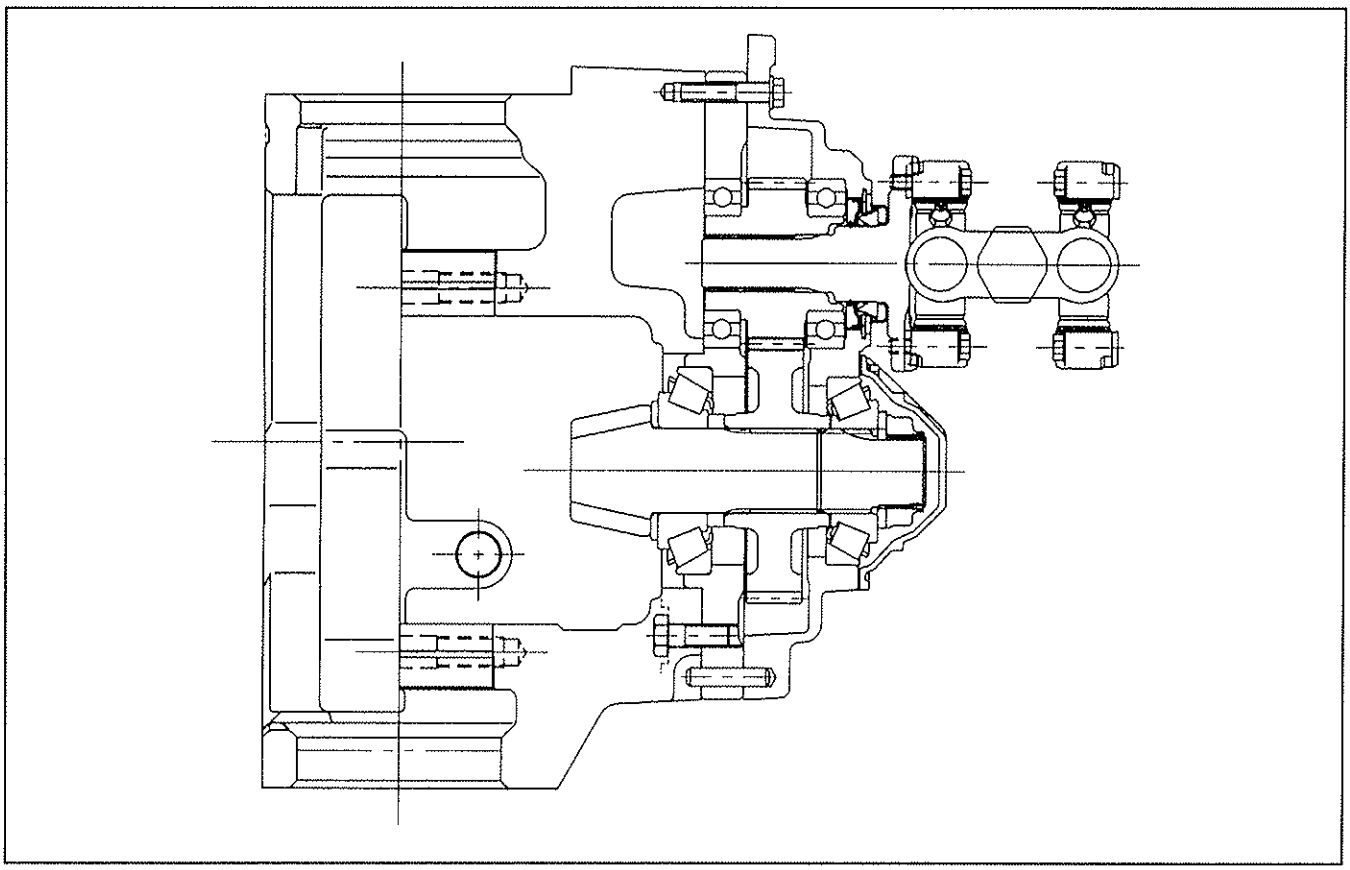


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Differential (3•J3.5 Ton Series: ~ 1999.11)

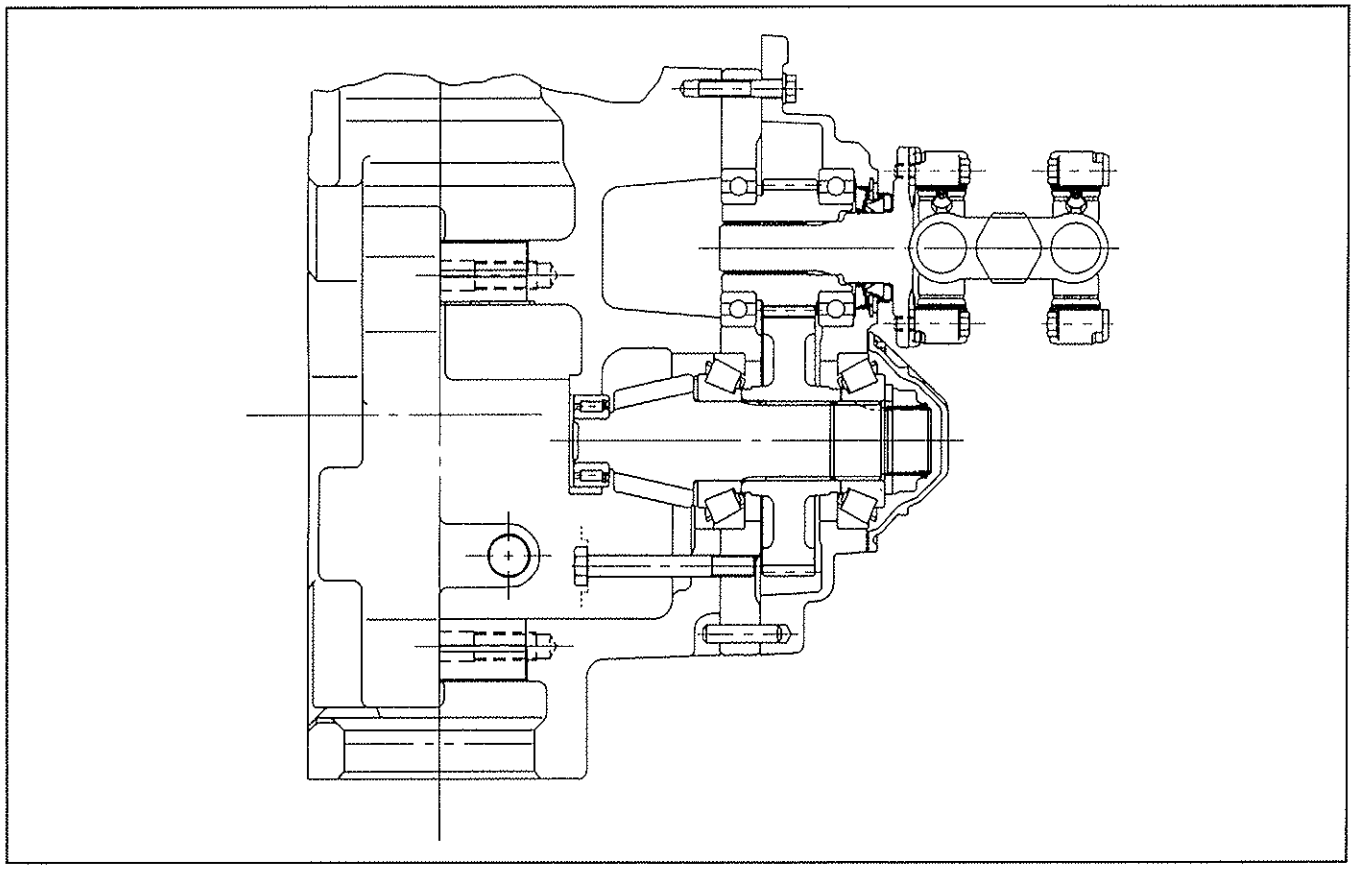


Reduction Gear (1 Ton Series: ~ 2000.11)

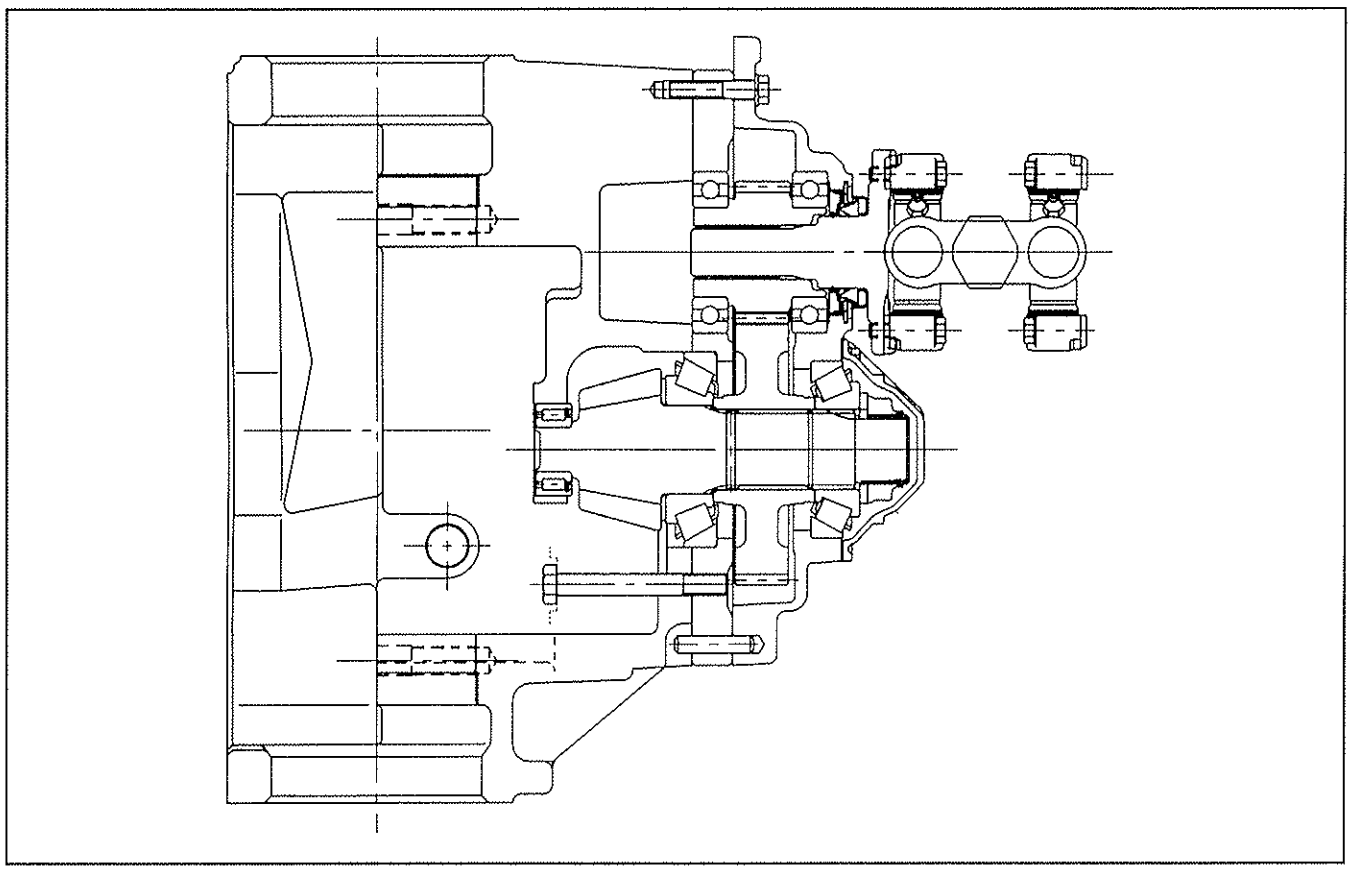


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Reduction Gear (2 Ton Series: ~ 1999.11)

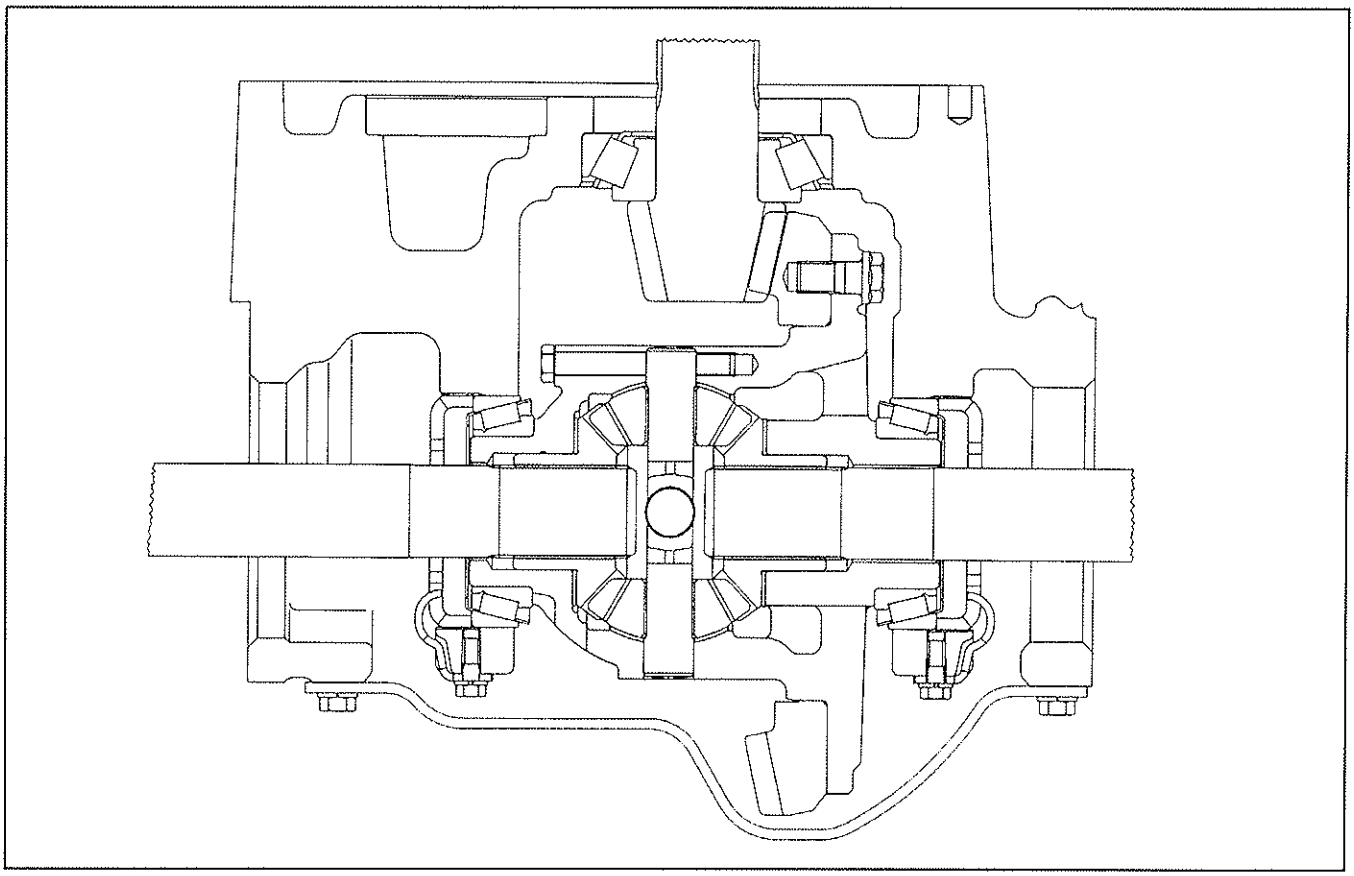


Reduction Gear (3•J3.5 Ton Series: ~ 1999.11)

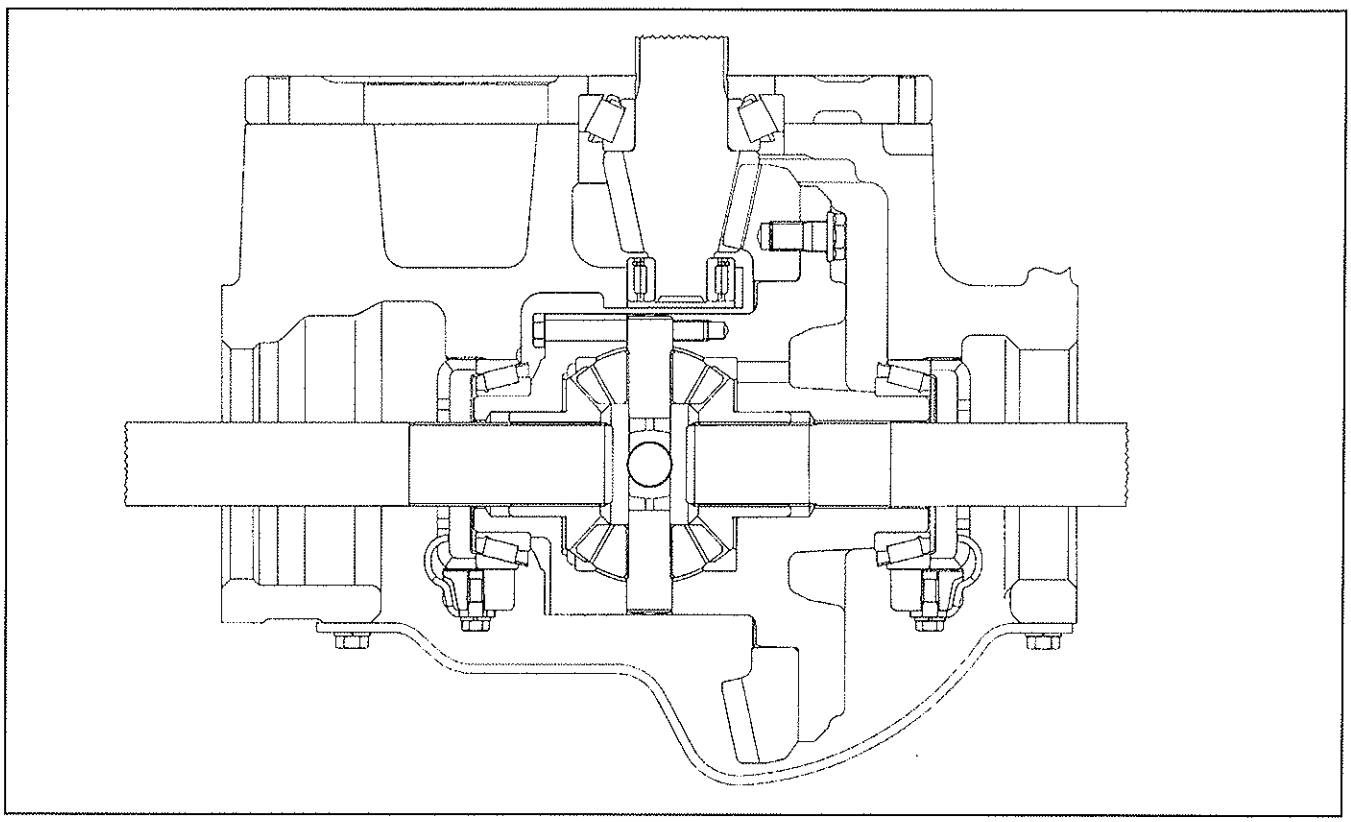


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Differential (1 Ton Series: 2000.11 ~ 2002.12, 2003. 6 ~)

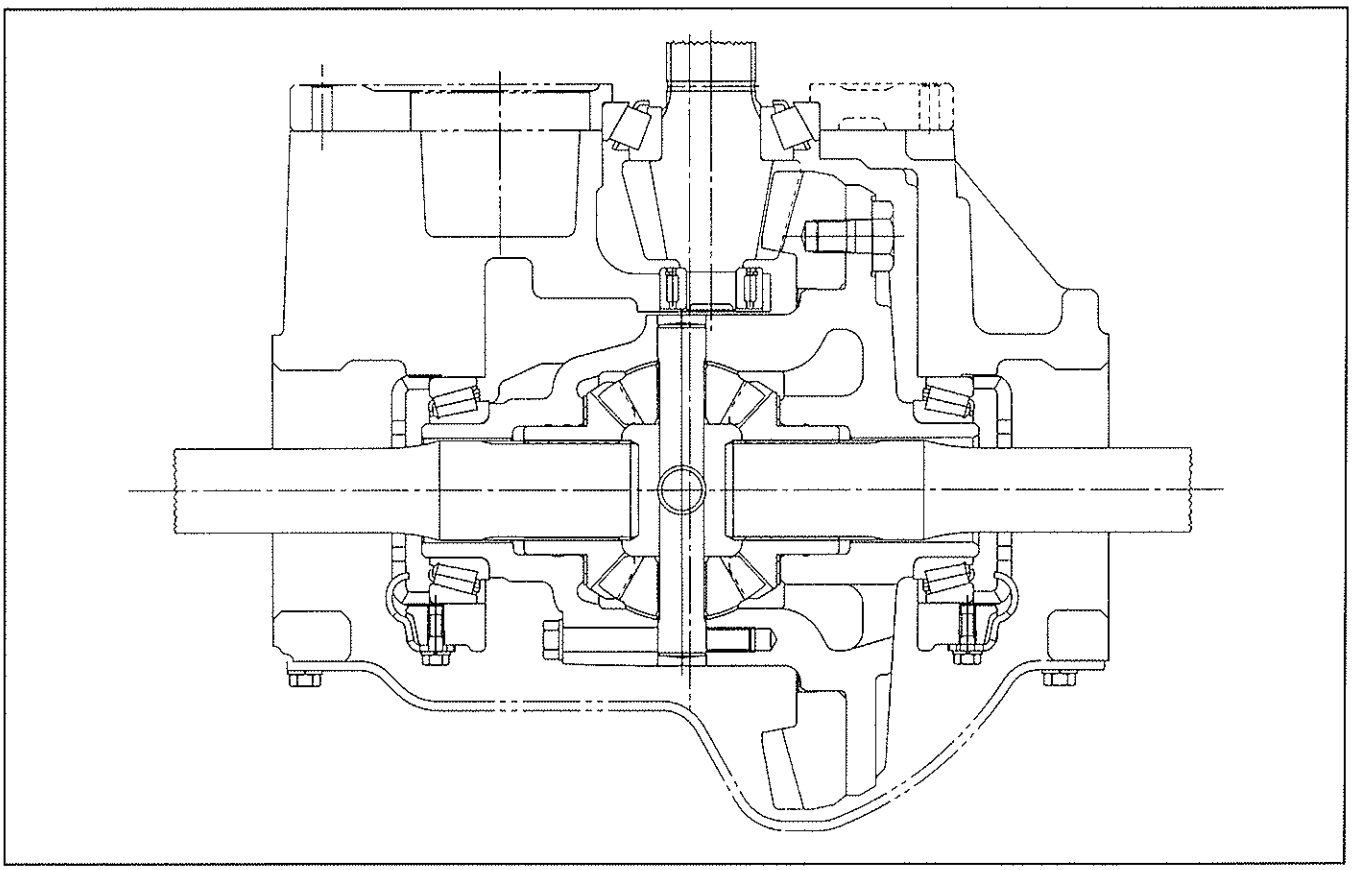


Differential (2 Ton Series: 1999.11 ~)

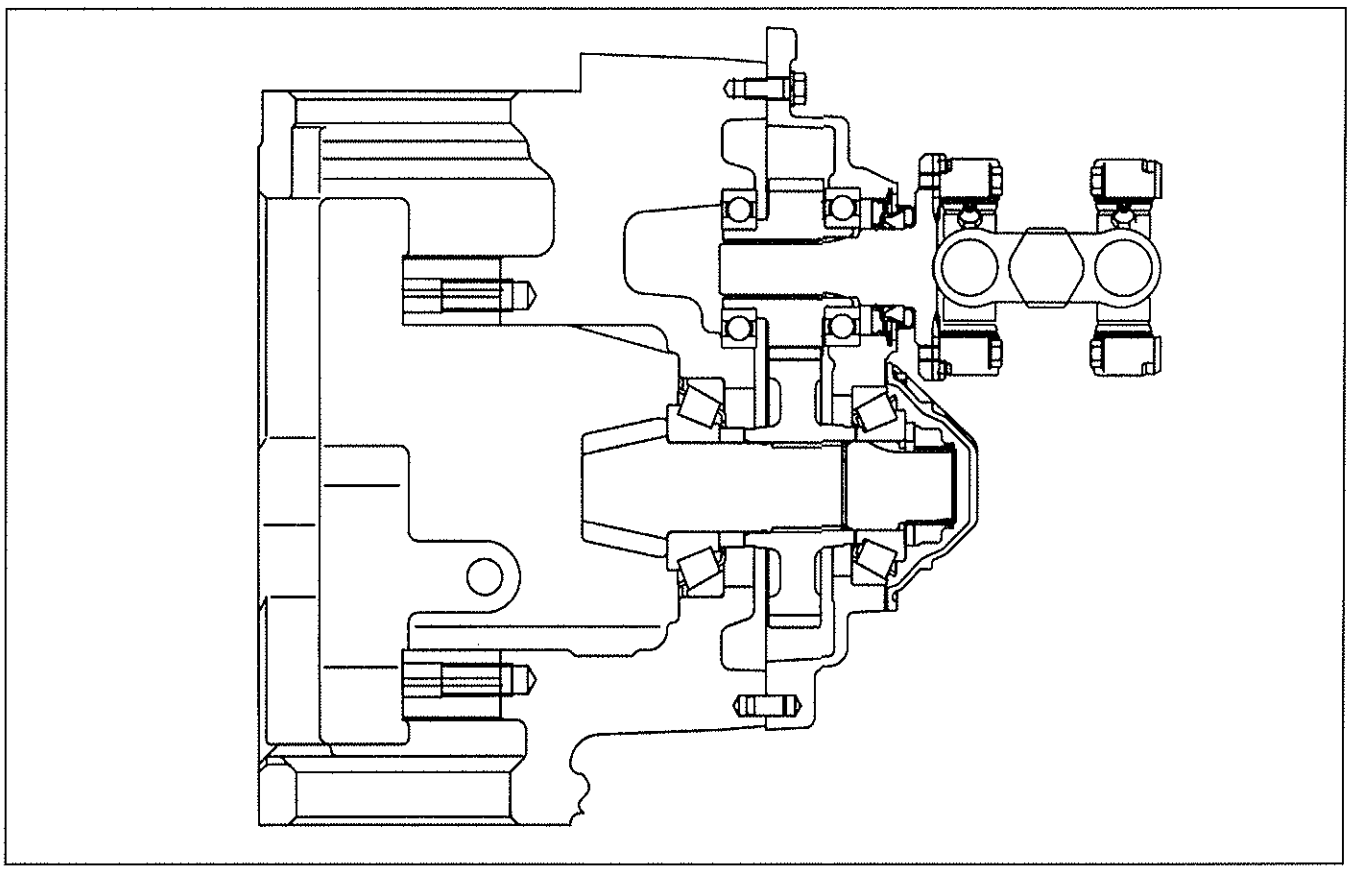


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Differential (3·J3.5 Ton Series: 1999.11 ~)

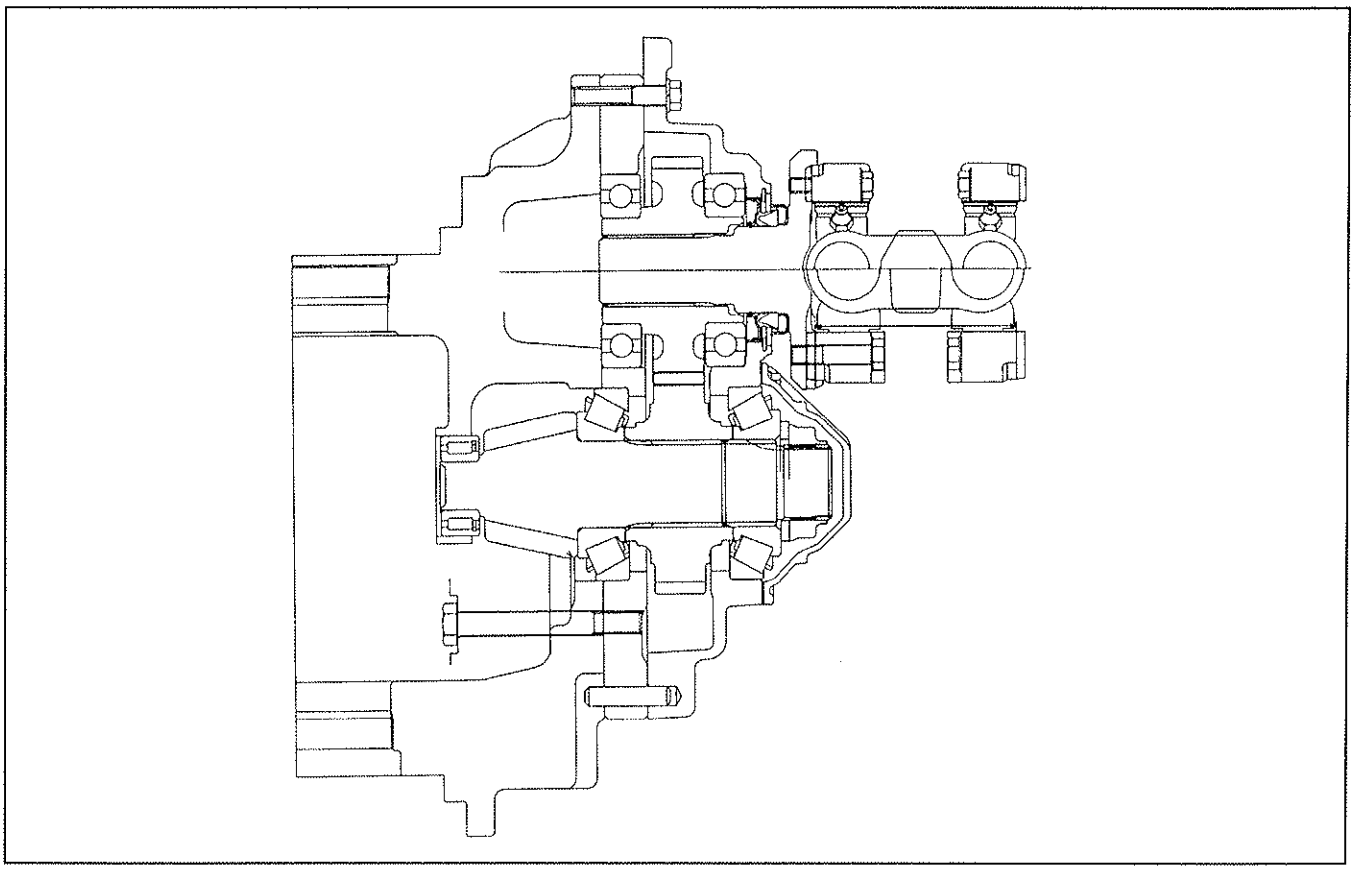


Reduction Gear (1 Ton Series: 2000.11 ~)

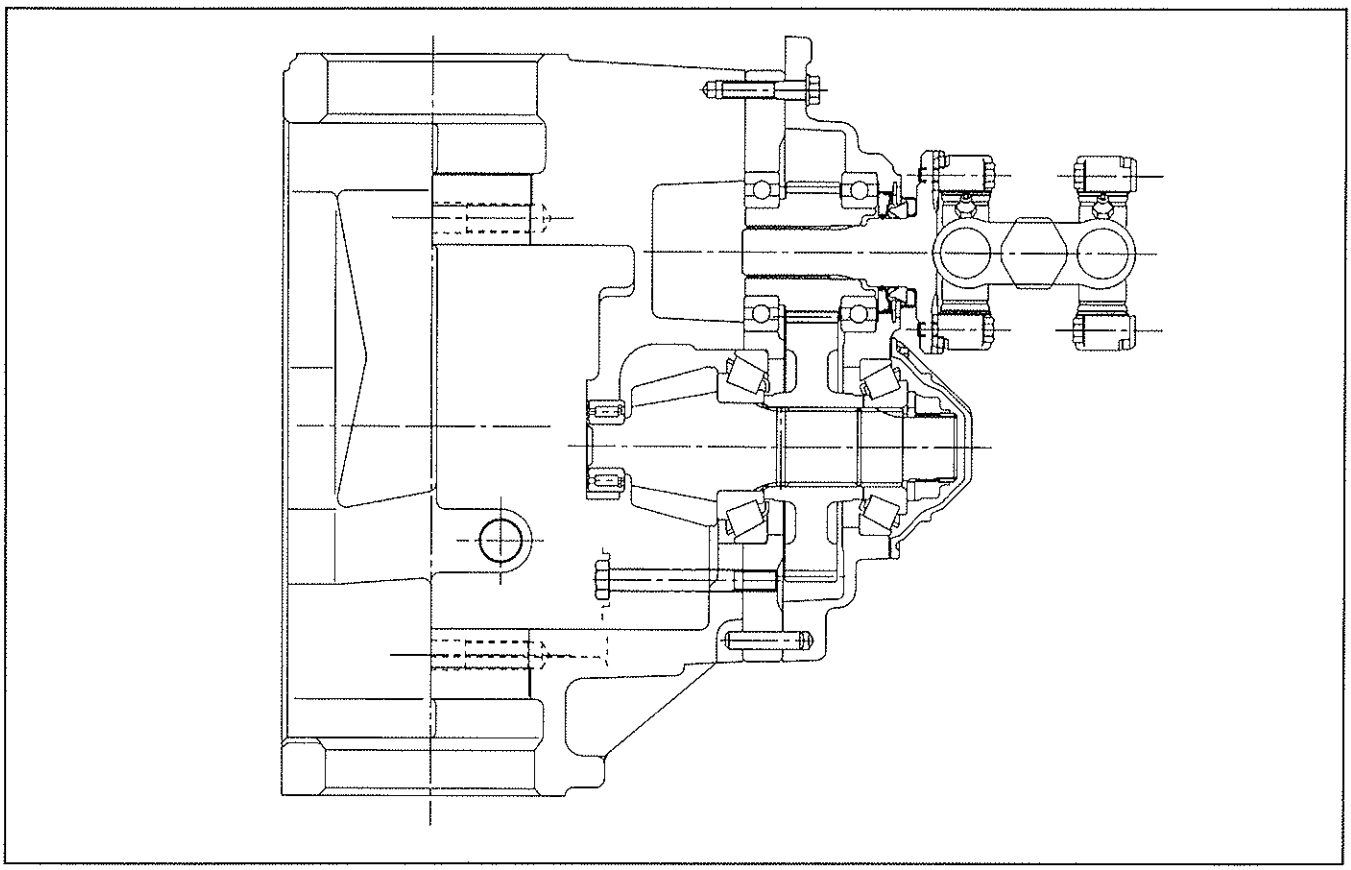


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Reduction Gear (2 Ton Series: 1999.11 ~)

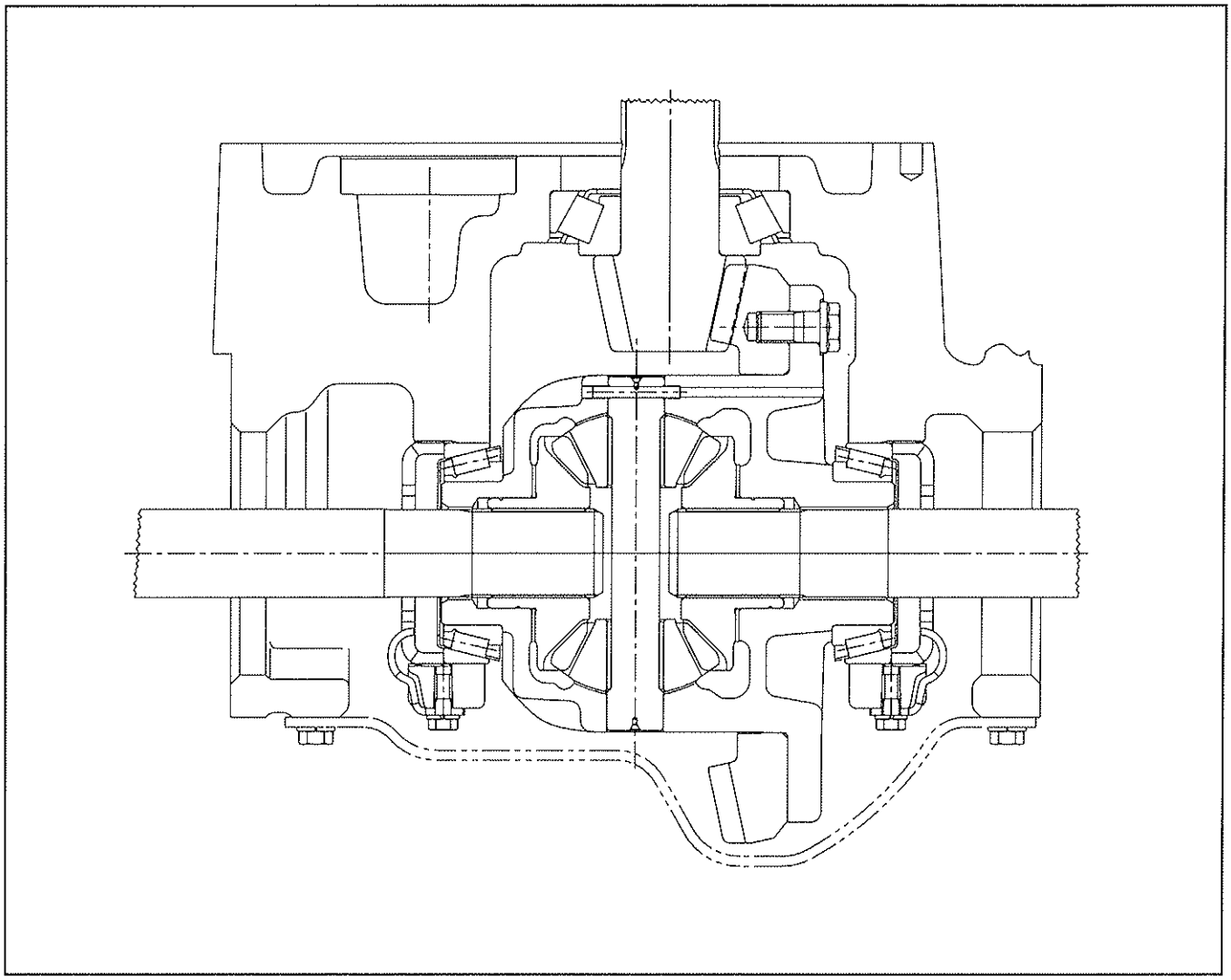


Reduction Gear (3·J3.5 Ton Series: 1999.11 ~)



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Differential (1 TON SERIES: 2002.12 ~ 2003. 6)



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SPECIFICATIONS

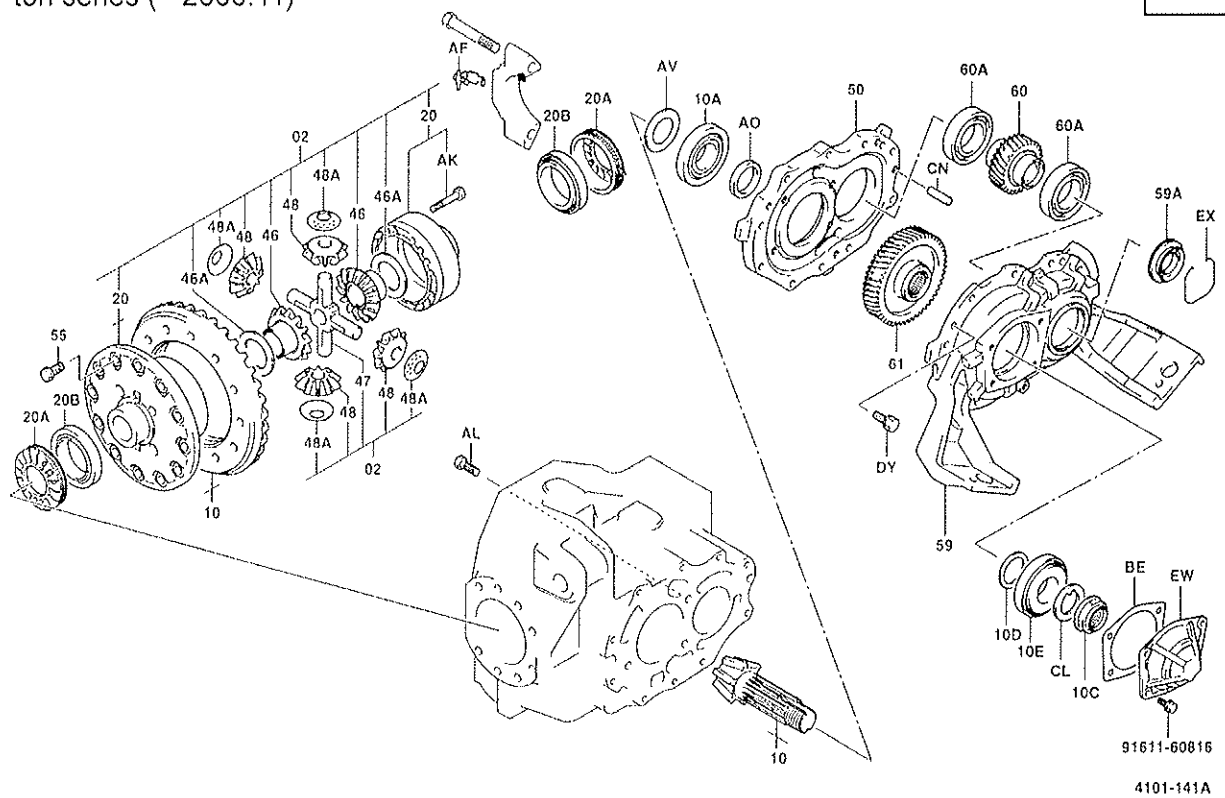
Item \ Vehicle model			1 ton series	2 ton series 3·J3.5 ton series
Differential	Differential case type		Banjo type	←
	Reduction ratio (ring gear/drive pinion)		5.833	←
	Number of teeth	Drive pinion	6	←
		Ring gear	35	←
	Number of teeth × quantity	Pinion gear	~ 2002.12, 2003.6 ~ : 10 × 4 2002.12 ~ 2003.6 : 11 × 2	10 × 4
		Side gear	~ 2002.12, 2003.6 ~ : 14 × 2 2002.12 ~ 2003.6 : 16 × 2	14 × 2
Differential oil quantity ℓ (US gal)			6.3 (1.66)	2 ton series: 6.6 (1.74) 3·J3.5 ton series: 7.7 (2.03)

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COMPONENTS

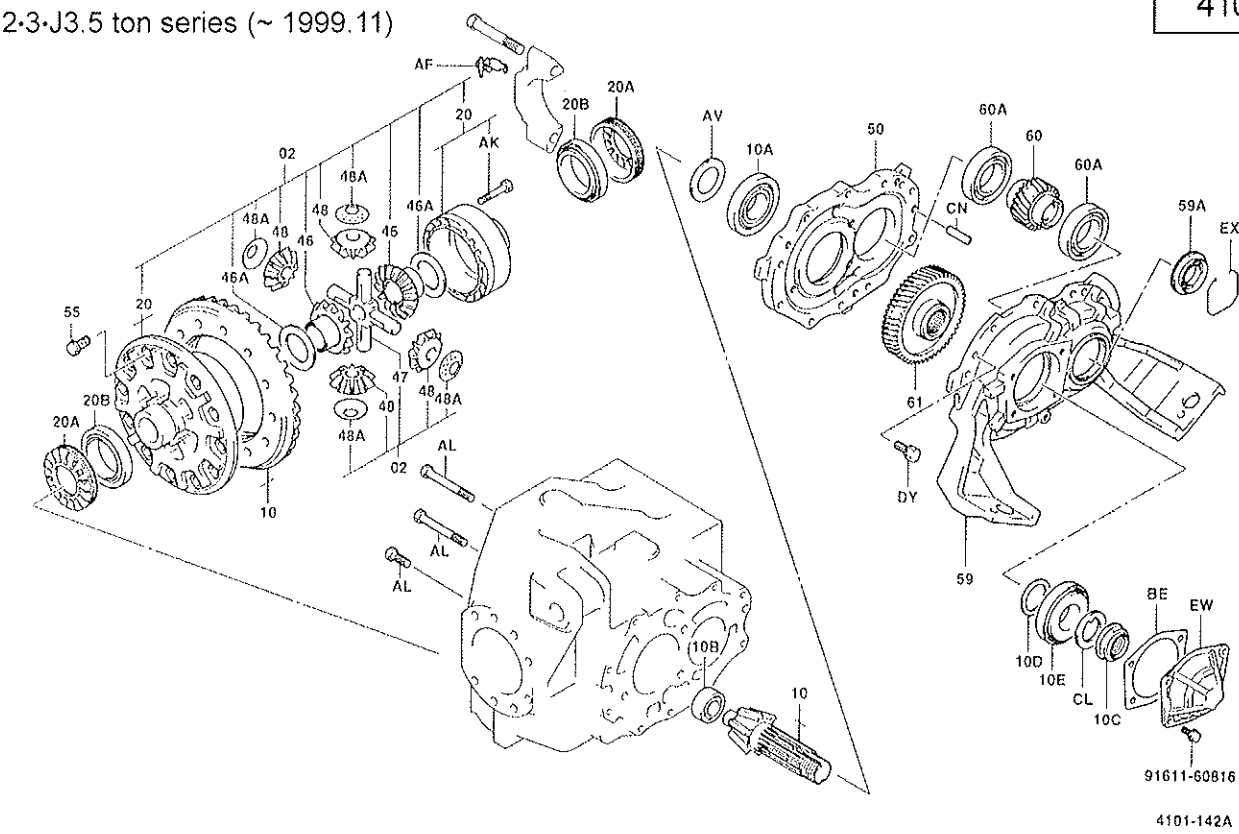
4101

1 ton series (~ 2000.11)



4101

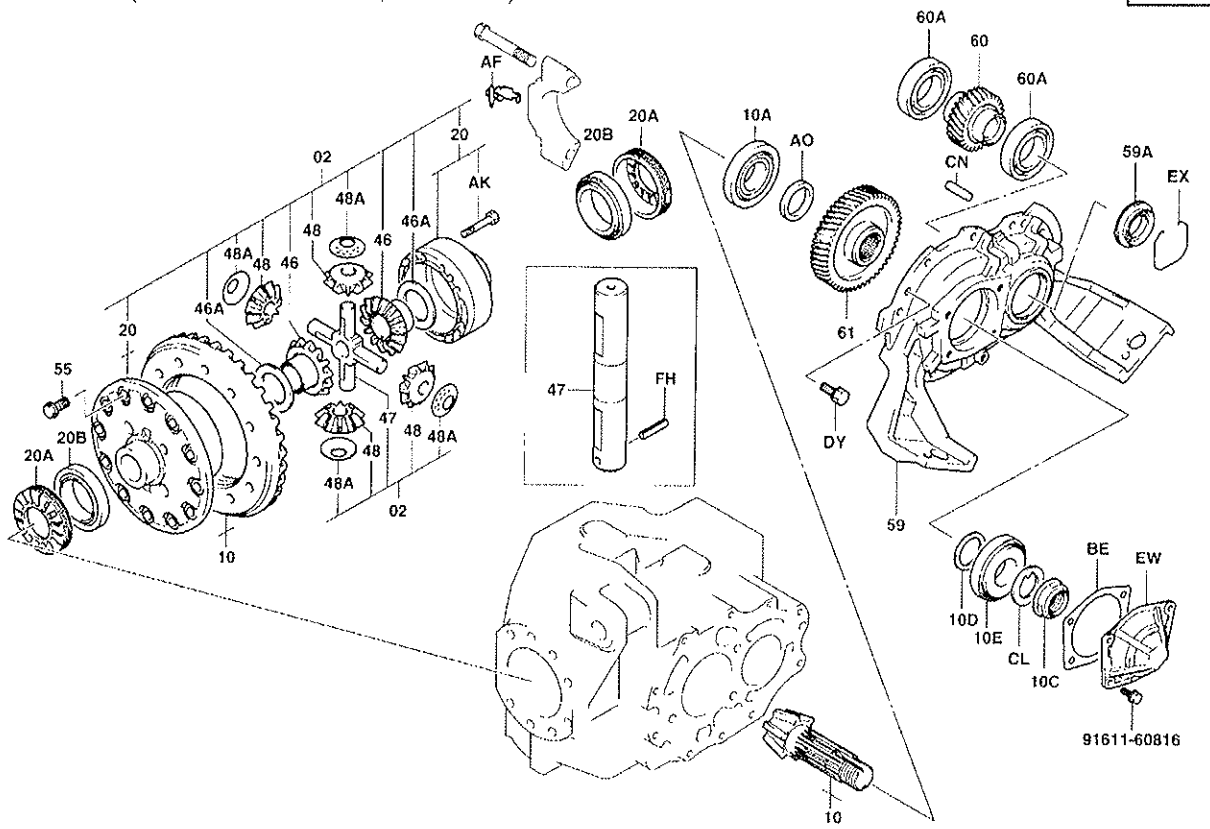
2·3·J3.5 ton series (~ 1999.11)



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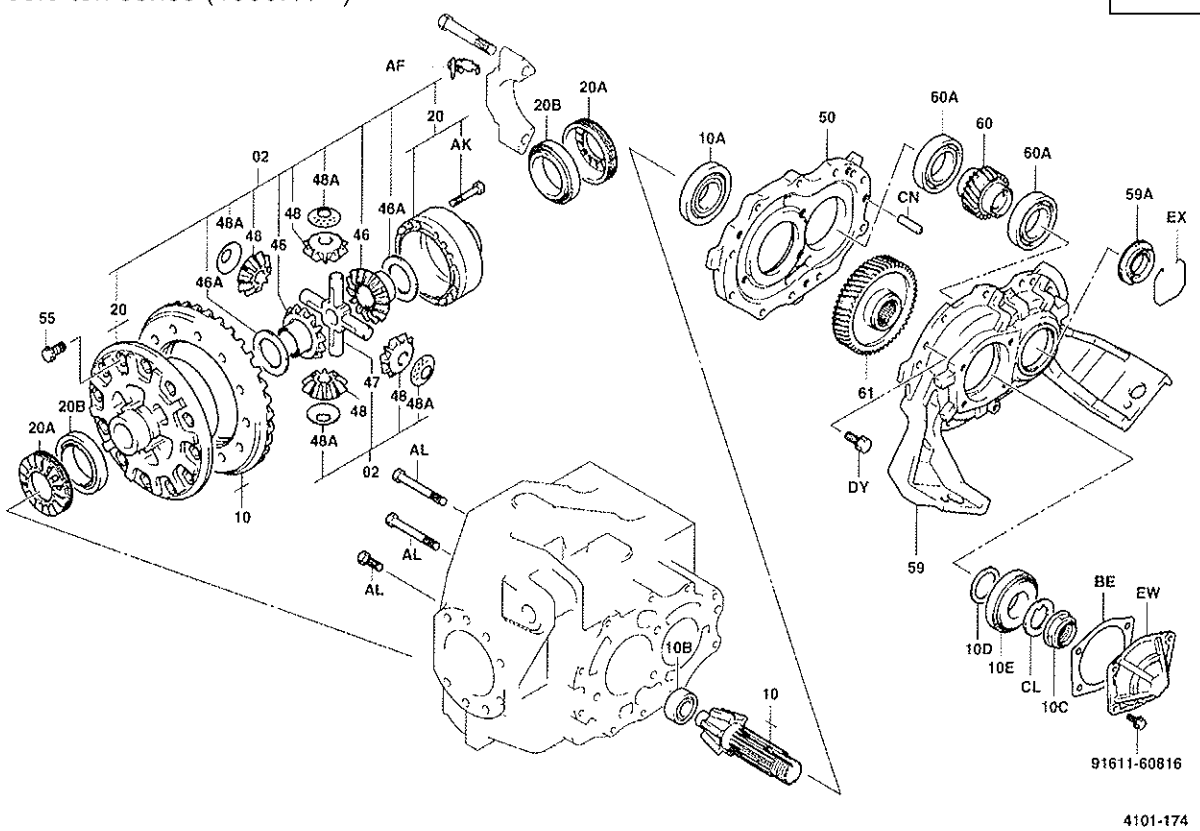
1 ton series (2000.11 ~ 2002.12, 2003.6 ~)

4101

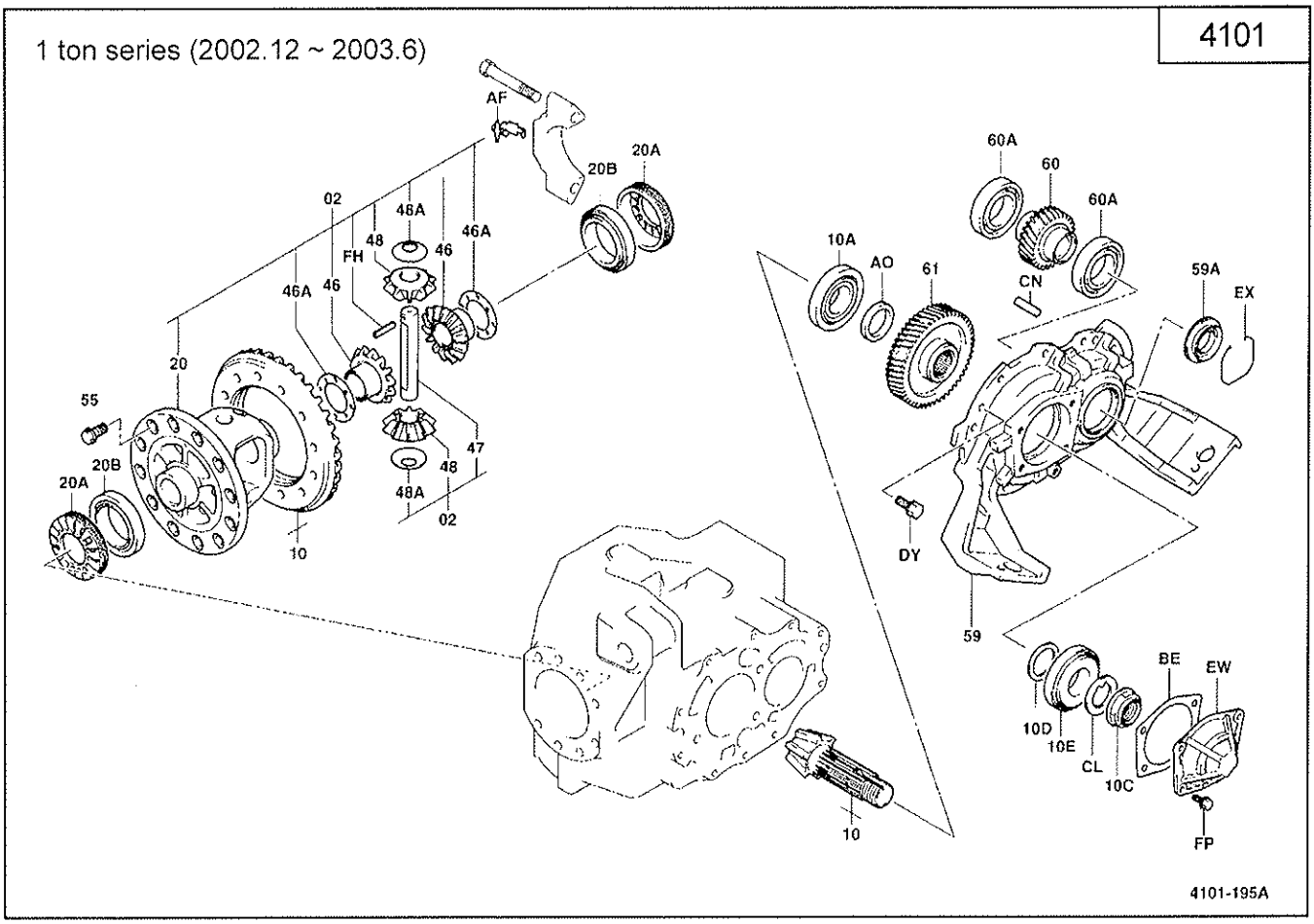


2·3·J3.5 ton series (1999.11 ~)

4101

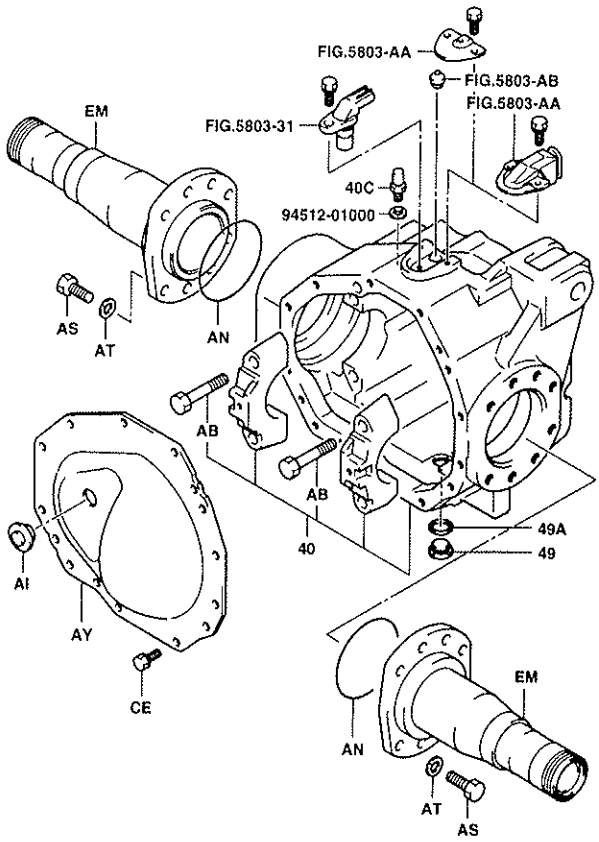


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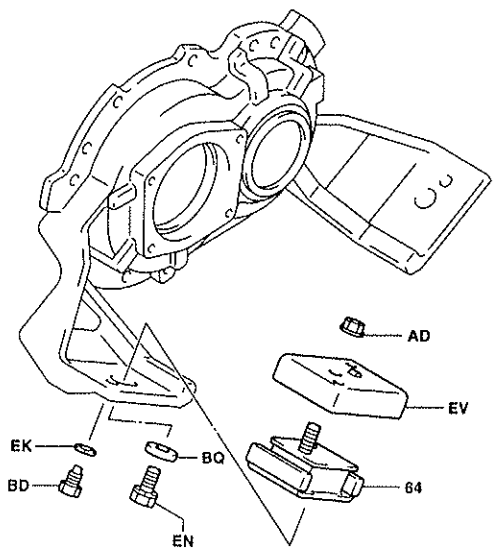
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4101



4101-153

4101



4101-145A

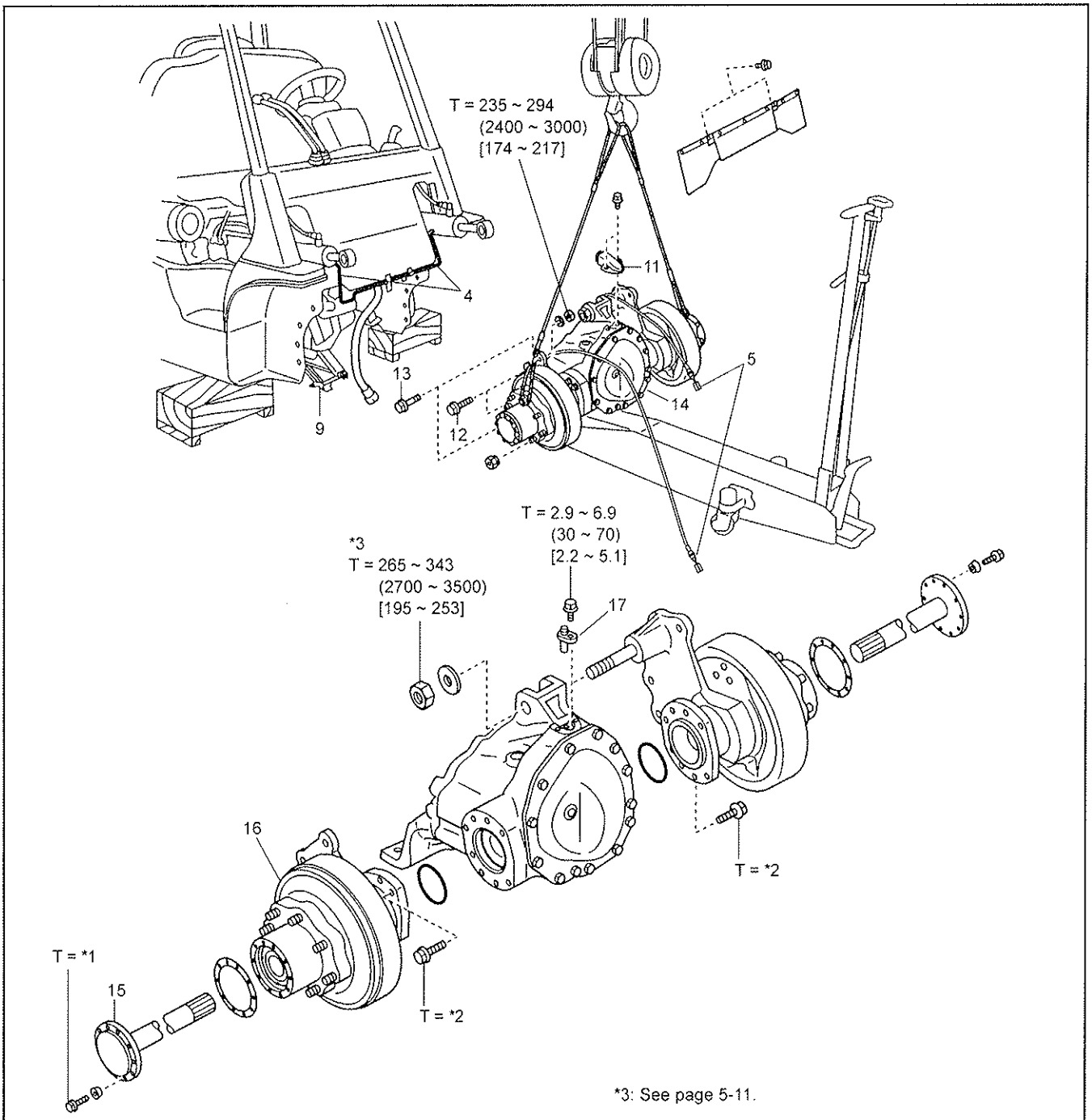
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DIFFERENTIAL ASSY

REMOVAL·INSTALLATION

Note:
Never apply impact to the frame at the time of removal or installation to protect the SAS controller from damage.

T = N·m (kgf-cm) [ft-lbf]



*1 Axle shaft set bolt	3·J3.5 ton series	T = 98.07 ~ 127.5 (1000 ~ 1300) [72.35 ~ 94.06]
	Other	T = 68.6 ~ 88.3 (700 ~ 900) [50.6 ~ 65.1]
*2 Front axle ASSY set bolts	1·2 ton series	T = 107.9 ~ 137.3 (1100 ~ 1400) [79.59 ~ 101.3]
	3 ton series, J3.5 ton series	T = 127.5 ~ 166.7 (1300 ~ 1700) [94.06 ~ 123.0]

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Removal Procedure

1 Remove the mast. (See page 11-9.)

2 Drain differential oil. **[Point 1]**

3 Jack up the vehicle and remove the front wheels.

4 Drain brake fluid, and disconnect the brake pipe (from the wheel cylinder).

5 Disconnect the parking brake cable (from the lever).

6 Remove the parking brake cable clamp.

7 Remove the propeller shaft. (See page 3-3.)

8 Remove the transmission mount bolts.

9 Support the lower side of the transmission with a pantograph jack or wooden block.

10 Support the front axle & differential ASSY with a hoist and garage jack. **[Point 2]**

11 Remove the speed sensor cover and disconnect the connector.

12 Remove the front axle bracket through bolt.

13 Remove the front axle bracket reamer bolt. **[Point 3]**

14 Remove the front axle & differential ASSY.

15 Remove the front axle shaft.

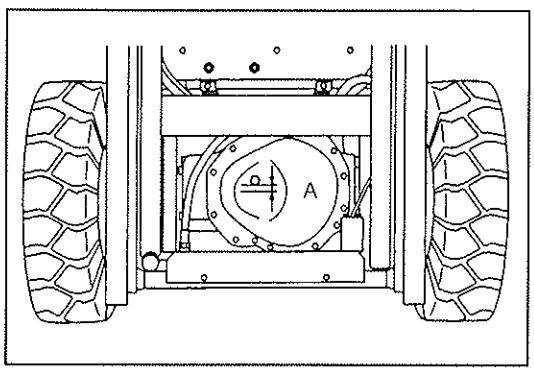
16 Remove the front axle W/bracket.

17 Remove the speed sensor.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Bleed air from the brake system after installation. (See page 8-23.)

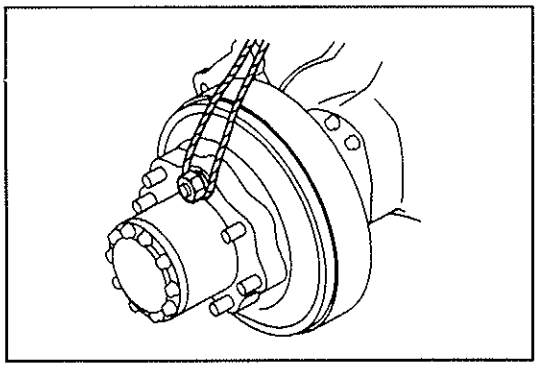


Point Operations

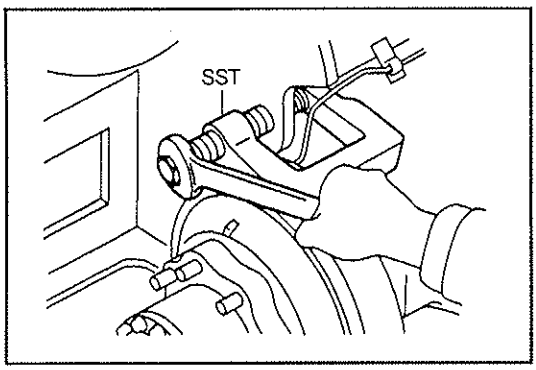
[Point 1]
Installation:
After reassembly, fill hypoid gear oil to the specified level.

A = 8 ~ 15 mm (0.31 ~ 0.59 in)

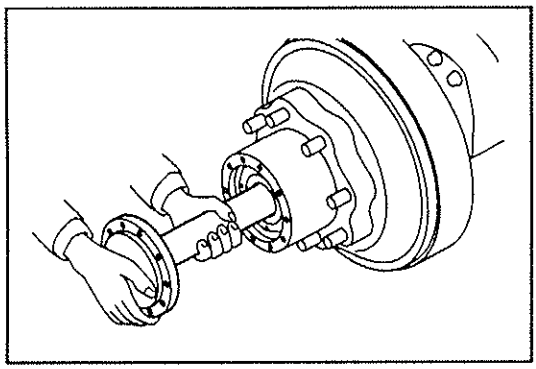
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[Point 2]
Removal·Installation:
Install hub nuts on hub bolts on the left and right side, and sling wire at the tapered portion.



[Point 3]
Removal:
SST 09310-23320-71

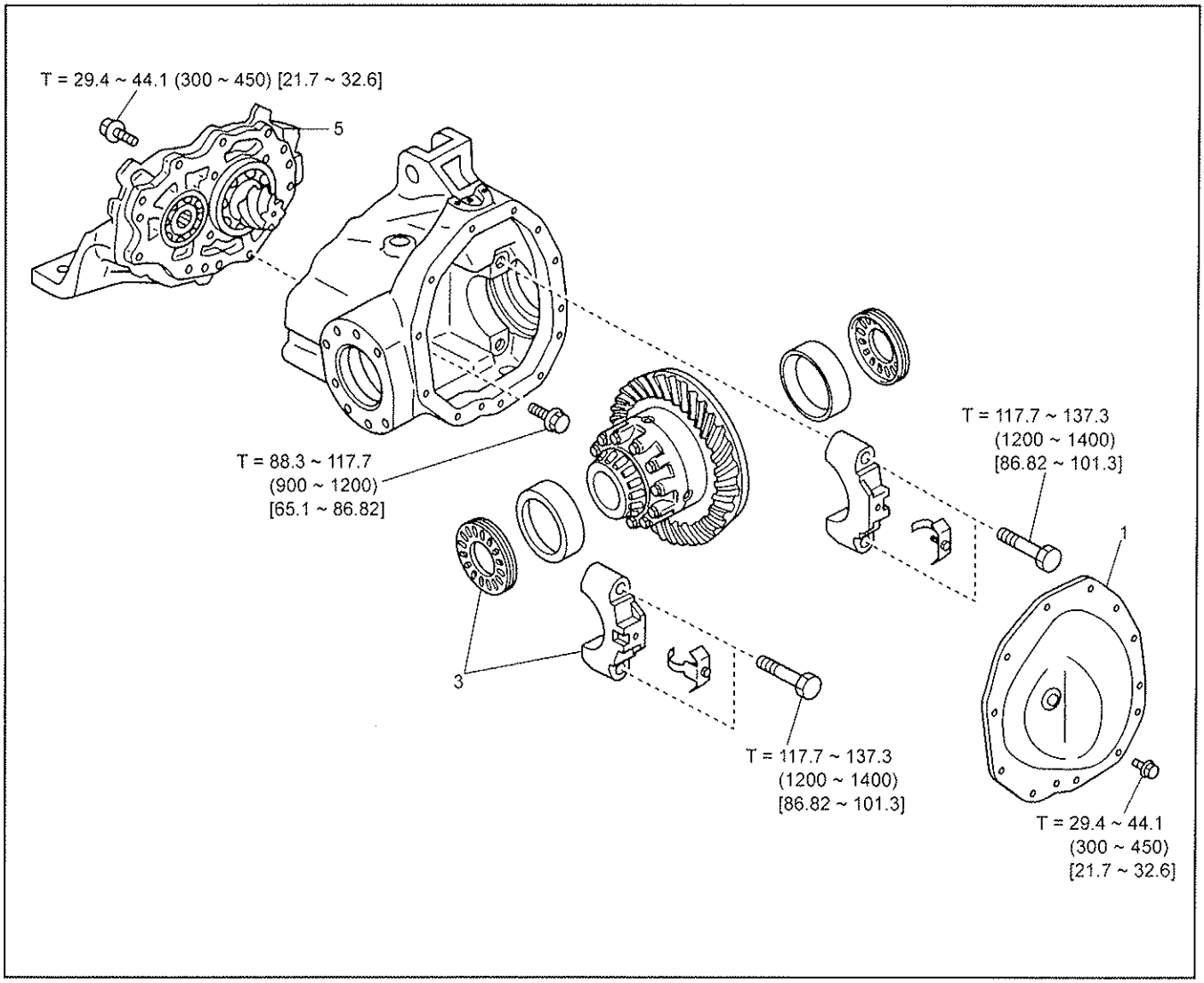


[Point 4]
Removal·Installation:
Operate carefully so as not to bring the axle shaft into contact with the oil seal lip to damage it.

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DISASSEMBLY·INSPECTION·REASSEMBLY
(ALL MODELS: ~ 2000.11, 2·3·J3.5 TON SERIES: 2000.11 ~)

N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the differential cover. **[Point 1]**

2 Measure the ring gear backlash. **[Point 2]**

3 Remove the bearing cap and adjusting nut. **[Point 3]**

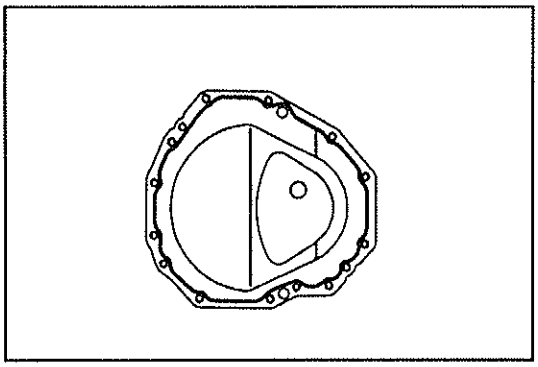
4 Remove the differential case ASSY. (See page 4-14 for the disassembly, inspection and reassembly procedure.)

5 Remove the differential carrier. **[Point 4]** (See page 4-17 for the disassembly, inspection and reassembly procedure.)

Reassembly Procedure

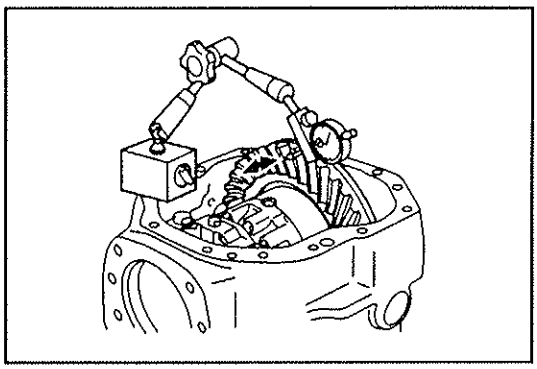
The reassembly procedure is the reverse of the disassembly procedure.

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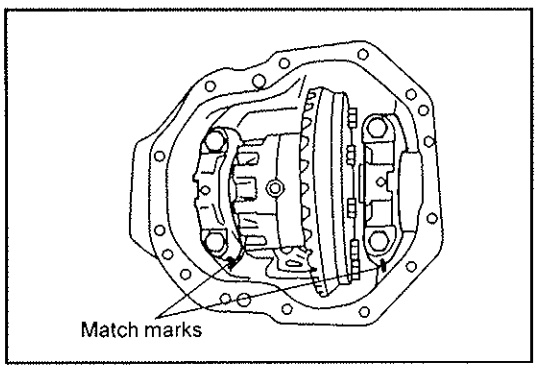
Point Operations

[Point 1]
Reassembly:
Apply sealing agent (Three Bond's No.1217C or the equivalent) on the mating surfaces of the differential cover and housing before reassembly.



[Point 2]
Inspection:
Measure the ring gear backlash.

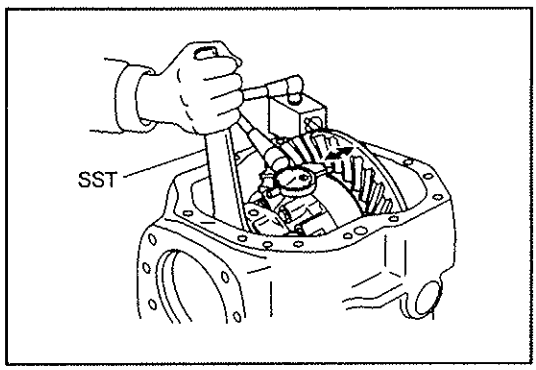
Standard:
1·2 ton series: 0.2 ~ 0.3 mm (0.008 ~ 0.012 in)
3 ton series, J3.5 ton series: 0.3 ~ 0.4 mm (0.012 ~ 0.016 in)



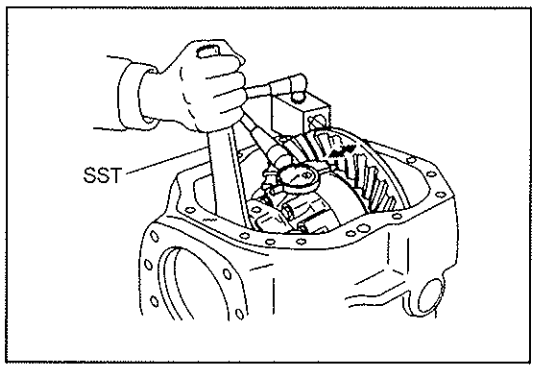
[Point 3]
Disassembly:
Put match marks on the bearing cap and differential housing.

Reassembly:
Install the adjusting nuts and bearing cap.
1. Install the adjusting nuts.
2. Install the bearing cap by aligning the match marks and temporarily tighten the set bolt.
   T = 19.6 N·m (200 kgf-cm) [14.5 ft-lbf]
3. Set the dial gauge in the thrust direction of the differential case.
4. Use the SST and tighten until the thrust clearance is eliminated.
   SST 09630-10110-71
5. Tighten adjusting nuts on both sides by one notch each.
6. Set the dial gauge vertical to the ring gear tooth surface, and measure the backlash.

Standard:
1·2 ton series: 0.2 ~ 0.3 mm (0.008 ~ 0.012 in)
3 ton series, J3.5 ton series: 0.3 ~ 0.4 mm (0.012 ~ 0.016 in)



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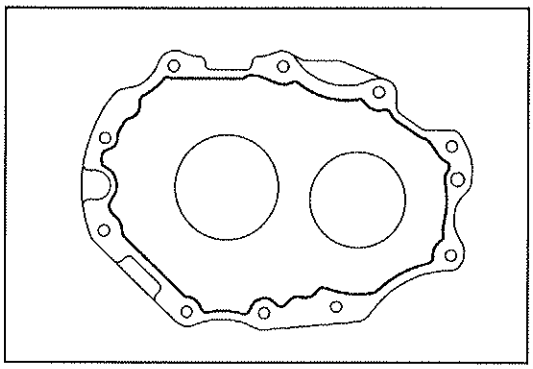


If the standard is not satisfied, adjust by turning the adjusting nut to move the differential case ASSY in the thrust direction.

(1) When the backlash is excessive:
Loosen the adjusting nut on the ring gear teeth side and tighten the adjusting nut on the rear side as much to bring the ring gear closer to the drive pinion.

(2) When the backlash is insufficient:
Loosen the adjusting nut of the rear side of the ring gear and tighten the adjusting nut on the teeth side as much to bring the ring gear away from the drive pinion.

7. Tighten the adjusting nut on the rear side of the ring gear further by 1.5 to 2 notches.
8. Install the adjusting nut lock plate.
9. Finally tighten the bearing cap set bolts.
T = 117.7 ~ 137.3 N·m (1200 ~ 1400 kgf-cm)
[86.82 ~ 101.3 ft-lbf]



[Point 4]

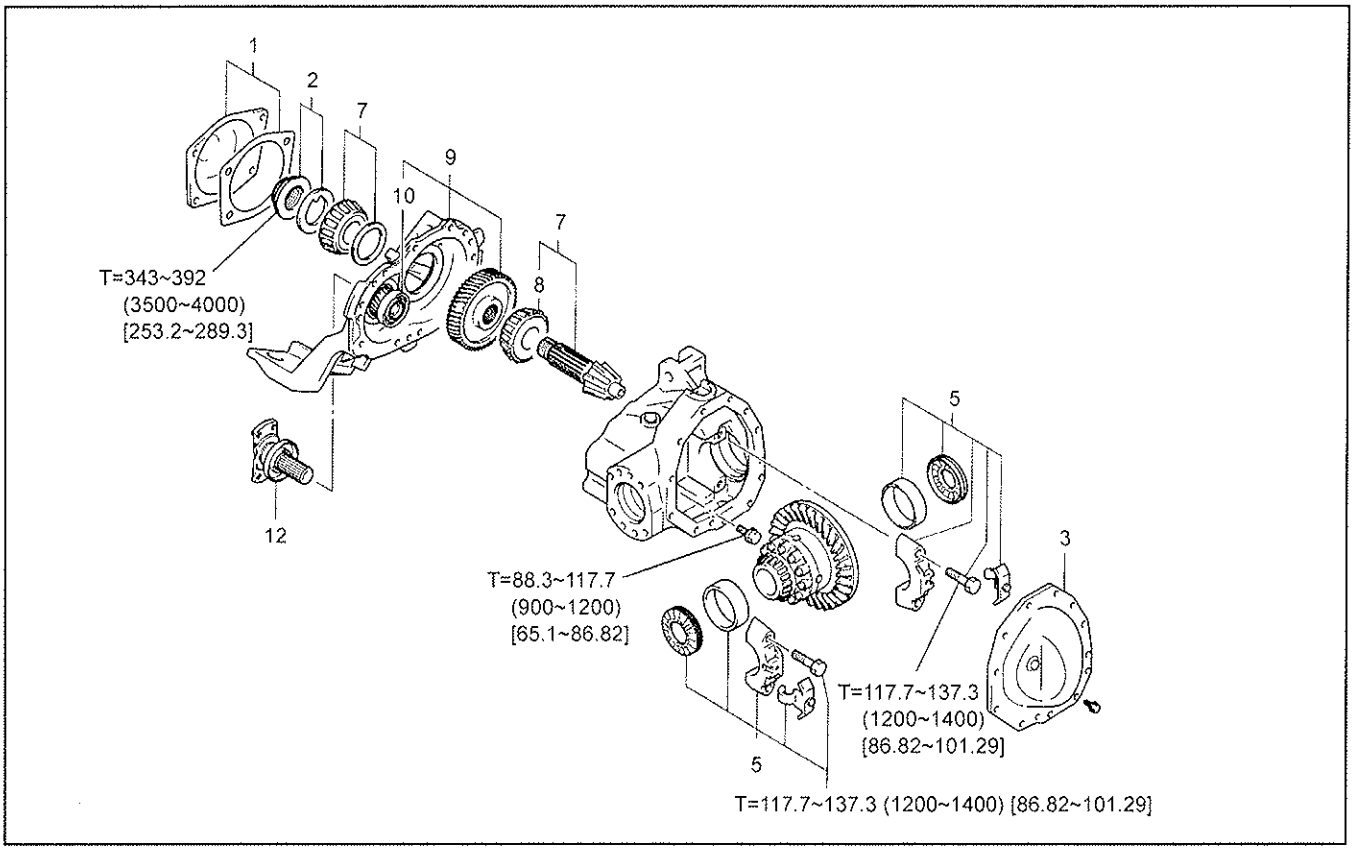
Reassembly:
Apply sealing agent (08826-76002-71 (08826-00090)) on the mating surfaces of the differential carrier and housing before reassembly.

Reassembly:
Coat thread tightener (08833-76002-71 (08833-00080)) on the differential carrier set bolts before tightening it.

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DISASSEMBLY·INSPECTION·REASSEMBLY (1 TON SERIES: 2000.11 ~)

N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the drive pinion rear cover and the gasket.

2 Remove the lock nut and washer. **[Point 1]**

3 Remove the differential cover. **[Point 2]**

4 Measure the ring gear backlash. **[Point 3]**

5 Remove the bearing cap and adjusting nut. **[Point 4]**

6 Remove the differential case ASSY. (See page 6-14 for the disassembly, inspection and reassembly.)

7 Remove the drive pinion W/bearing. **[Point 5]**

8 Remove the drive pinion bearing. **[Point 6]**

9 Remove the output gear and reduction gear W/carrier cover. **[Point 7]**

10 Remove the reduction gear W/bearing. **[Point 8]**

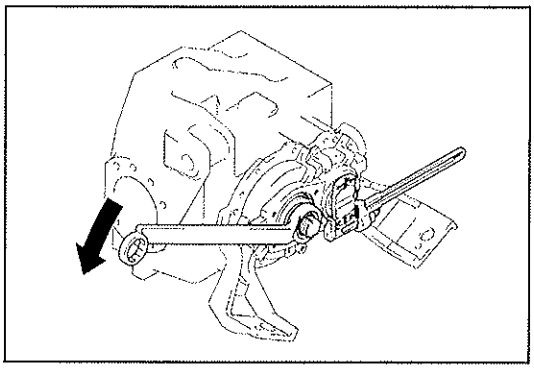
11 Remove the drive pinion outer race from the carrier cover.

12 Remove the input shaft dust deflector. **[Point 9]**

Reassembly Procedure

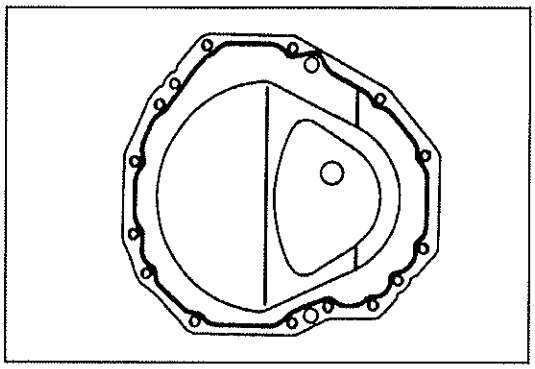
The reassembly procedure is the reverse of disassembly procedure.

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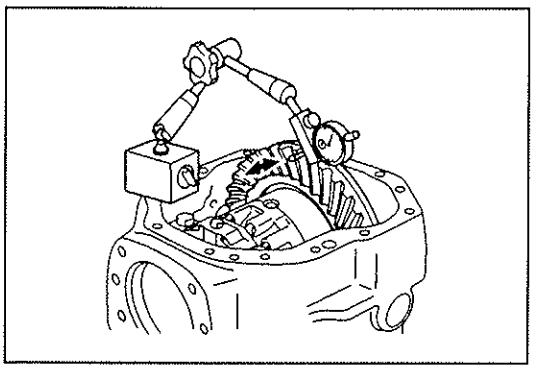


Point Operations

[Point 1]
Disassembly:
Remove the lock nut, washer, rear bearing roller and shim.
1. Unlock the lock nut.
2. Install the input shaft and use a pipe wrench to lock the gear from rotation.
3. Remove the lock nut and washer.

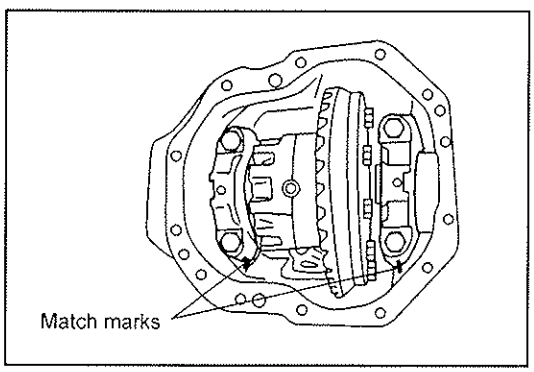


[Point 2]
Reassembly:
Apply sealing agent (Three Bond 1217C or equivalent) on the differential cover surface to be in contact with the differential housing.



[Point 3]
Inspection:
Measure the ring gear backlash.

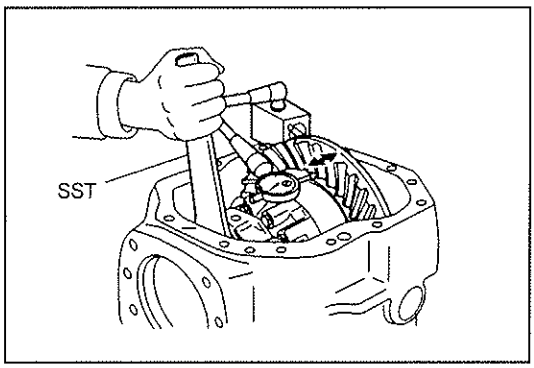
Standard: 0.2 ~ 0.3 mm (0.008 ~ 0.012 in)

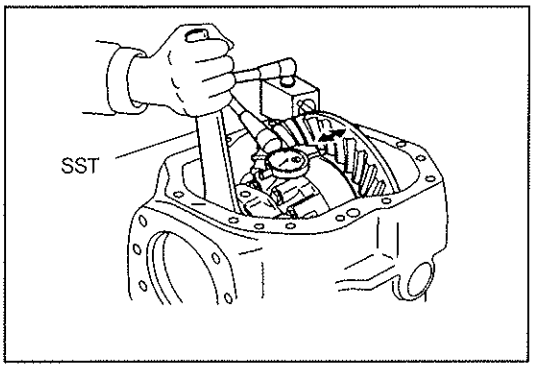


[Point 4]
Disassembly:
provide match marks on the bearing cap and differential housing.

Reassembly:
Install the adjusting nut and bearing cap.
1. Install the adjusting nut.
2. Install the bearing cap by aligning the match marks and temporarily tighten the set bolts.
T = 19.6 N·m (200 kgf-cm) [14.5 ft-lbf]

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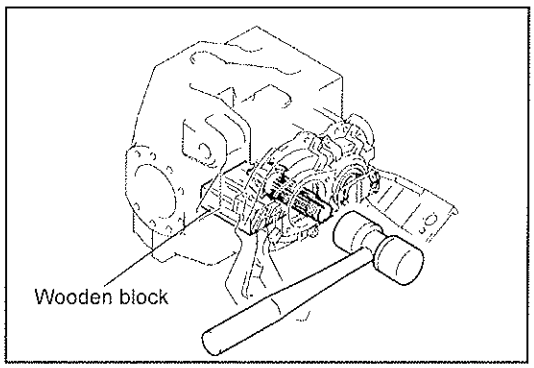




3. Set a dial gauge in the thrust direction of the differential case.
4. Use the SST and tighten until the thrust clearance is eliminated.
   SST 09630-10110-71
5. Tighten both adjusting nuts by one notch each.
6. Set the dial gauge vertically to the ring gear tooth flanks and measure the backlash.

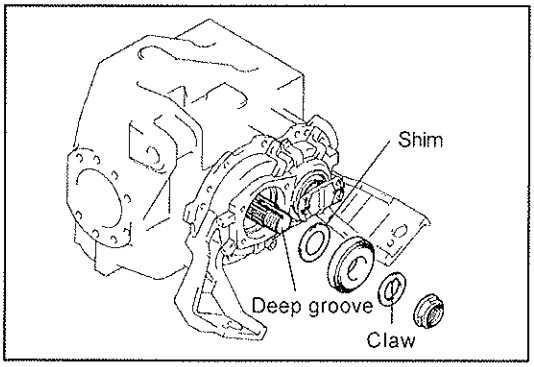
   Standard: 0.2 ~ 0.3 mm (0.008 ~ 0.012 in)

   If the standard is not satisfied, make adjustment by moving the differential case ASSY in the thrust direction by means of the adjusting nuts.
   ① When the backlash is excessive:
   Loosen the adjusting nut on the tooth flanks side of the ring gear and tighten the adjusting nut on the rear side equally to bring the ring gear closer to the drive pinion.
   ② When the backlash is insufficient:
   Loosen the adjusting nut on the rear side of the ring gear and tighten the adjusting nut on the tooth flank side equally to bring the ring gear away from the drive pinion.
7. Tighten the adjusting nut on the rear side of the ring gear further by 1.5 to 2 notches.
8. Install the adjusting nut lock plate.
9. Finally tighten the bearing cap set bolts.
   T =117.7 ~ 137.3 N·m (1200 ~ 1400 kgf-cm)
   [86.82 ~ 101.30 ft-lbf]



[Point 5]
Disassembly:
1. Prevent the drive pinion from damage by inserting a wooden block in the differential housing.
2. Use a plastic hammer and remove the drive pinion W/ bearing.

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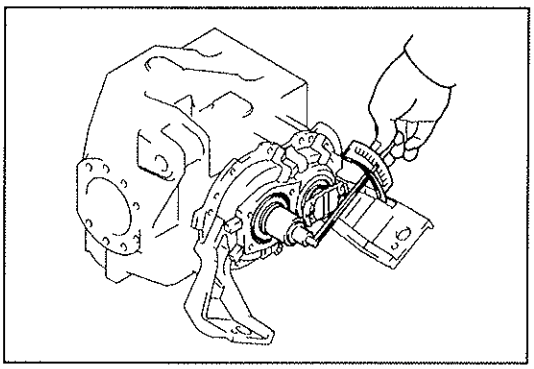
Reassembly:
Assemble the shim, rear bearing roller, washer and lock nut.

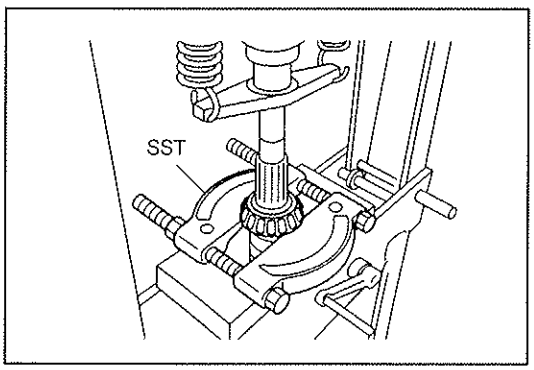
1. While supporting the drive pinion, assemble the shim, rear bearing, washer and lock nut. The washer claw shall face the deep groove side.
2. Use the input shaft to prevent the gear from rotation.
3. Tighten the lock nut to the specified torque.
4. Measure the drive pinion starting torque.

Standard:
8.82 ~ 13.23 N·m (90 ~ 135 kgf-cm)
[6.51 ~ 9.77 ft-lbf]
If the standard is not satisfied, increase or decrease the shim thickness for adjustment.

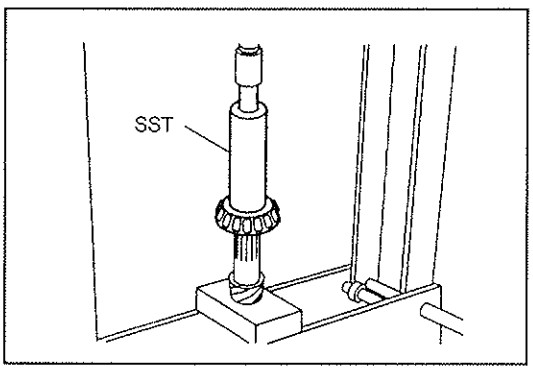
Shim thickness:
0.13, 0.1, 0.15, 0.35 and 0.4 mm

5. Securely lock the lock nut.



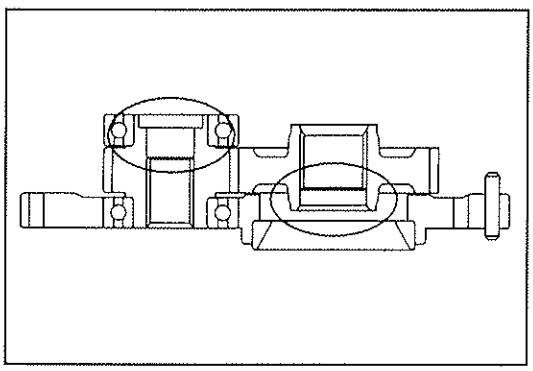


[Point 6]
Disassembly:
SST 09420-23000-71



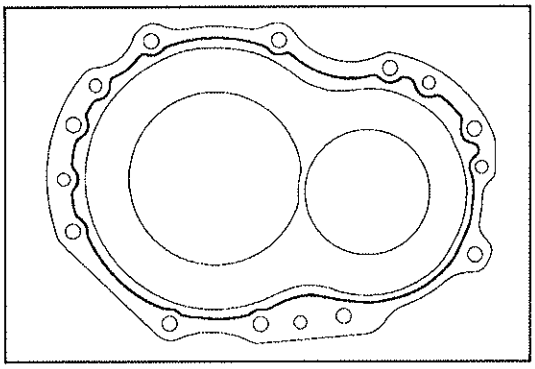
Reassembly:
Install the drive pinion front bearing.

1. Use the SST for front bearing installation.
   SST 09316-76008-71
   (SST 09316-60011)

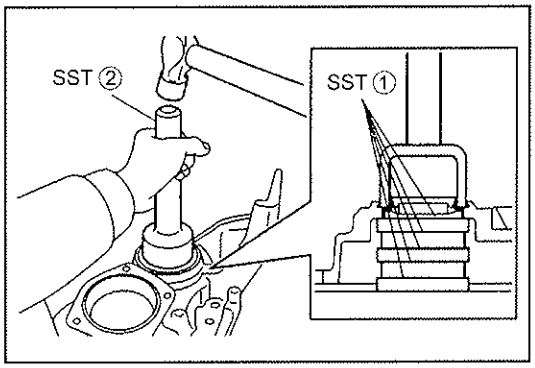


[Point 7]
Reassembly:
Check the mounting directions of the output gear and reduction gear.

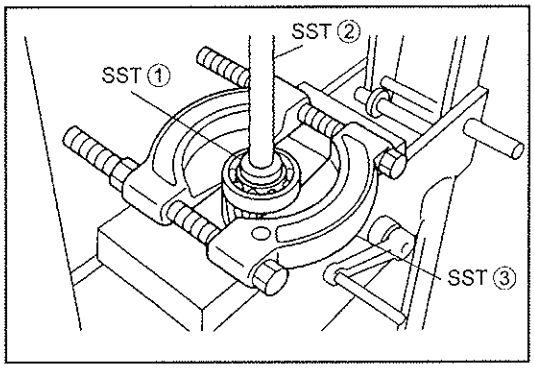
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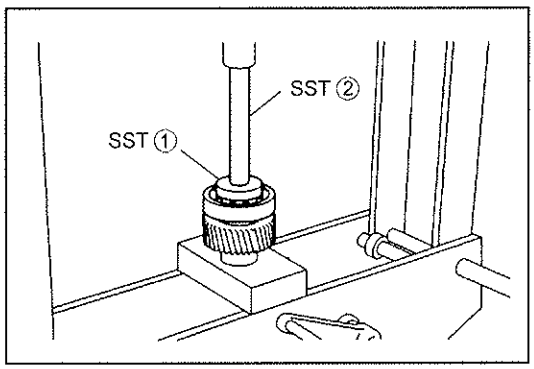
Reassembly:
Apply sealing agent (Three Bond No. 1281 or equivalent) on the bearing retainer surface to be in contact with the differential carrier cover.



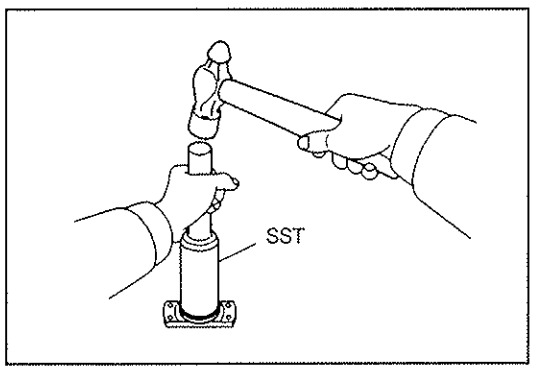
Reassembly:
Use the SST and drive a new oil seal to be in flush with the inside surface of the differential carrier cover.
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09150-10170-71 --- ②
After assembly, apply grease on the oil seal lip portion.



[Point 8]
Disassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)
SST 09420-23000-71 --- ③



Reassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



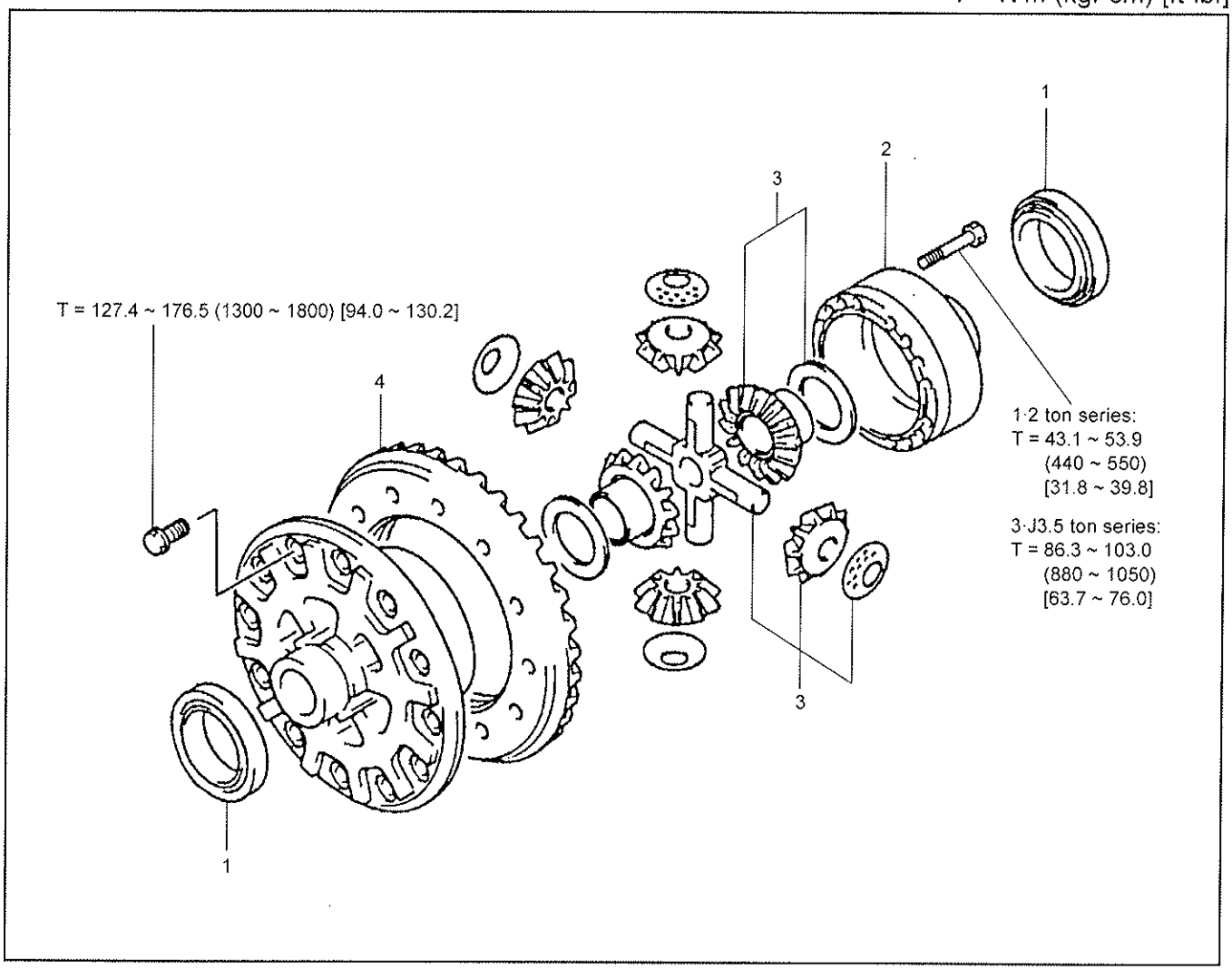
[Point 9]
Reassembly:
SST 09370-20270-71

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DIFFERENTIAL CASE ASSY

DISASSEMBLY·INSPECTION·REASSEMBLY
(ALL MODELS: ~ 2002.12, 1 TON SERIES: 2003.6 ~, 2·3·J3.5 TON SERIES: 2002.12 ~)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the differential case bearings. **[Point 1]**

2 Remove the differential upper case. **[Point 2]**

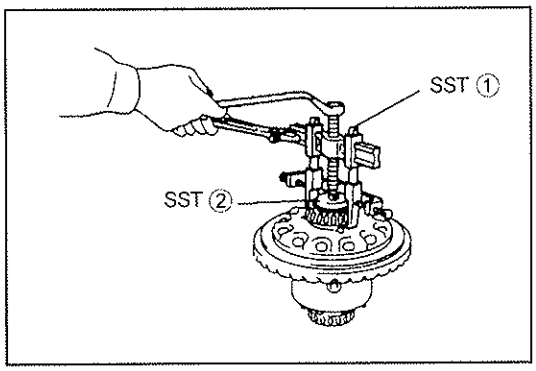
3 Remove the side gear and pinion gear. **[Point 3]**

4 Remove the ring gear. **[Point 4]**

Reassembly Procedure

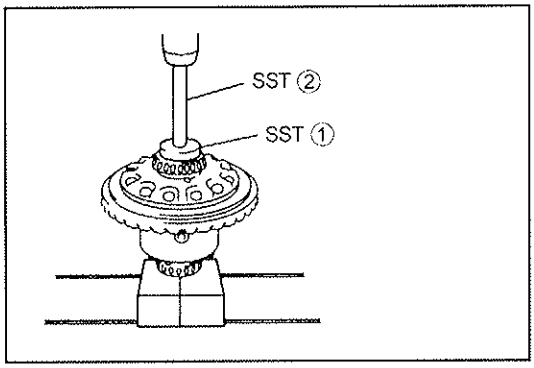
The reassembly procedure is the reverse of the disassembly procedure.

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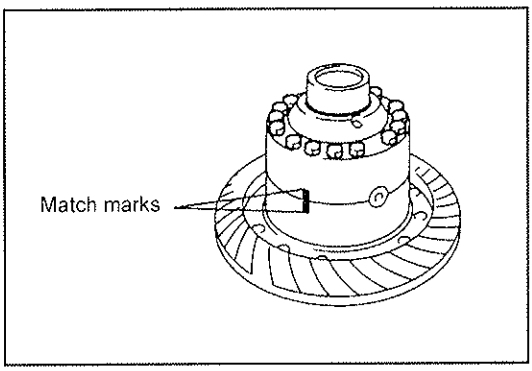


Point Operations

[Point 1]
Disassembly:
SST 09950-76014-71 --- ①
(SST 09950-40011)
SST 09950-76018-71 --- ②
(SST 09950-60010)

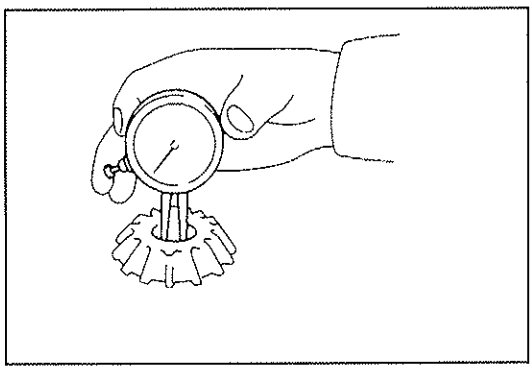


Reassembly:
Install the side bearing.
1. Use the SST and drive in the side bearing to the end surface.
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)
2. Use a striking driver and fully drive in the bearing.

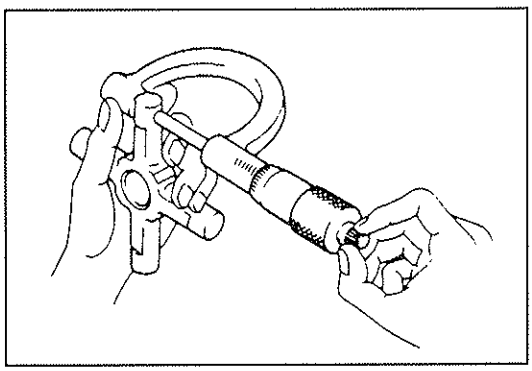


[Point 2]
Disassembly-Reassembly:
Check the match marks.

Reassembly:
Apply locking agent (08833-76001-71 (08833-00070)) on the set bolt threaded portion before reassembly.

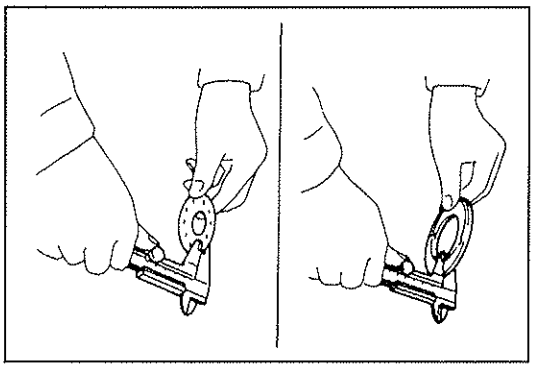


[Point 3]
Inspection:
Measure the inside diameter of the differential pinion.
1·2 ton series
Standard: 22.12 mm (0.8709 in)
Limit: 22.22 mm (0.8748 in)
3·J3.5 ton series
Standard: 24.67 mm (0.9713 in)
Limit: 24.77 mm (0.9752 in)



Inspection:
Measure the spider outside diameter.
1·2 ton series
Standard: 22.00 mm (0.8661 in)
Limit: 21.75 mm (0.8563 in)
3·J3.5 ton series
Standard: 24.50 mm (0.9646 in)
Limit: 24.25 mm (0.9547 in)

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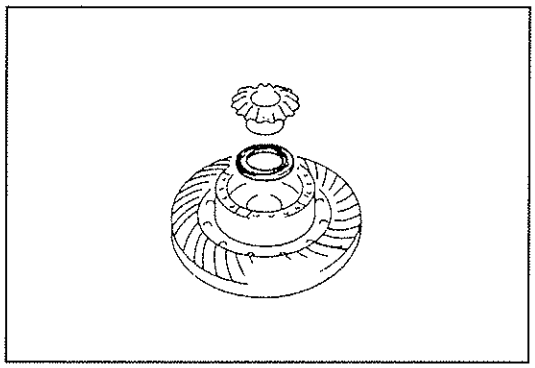


Inspection:
Measure the side gear thrust washer thickness.

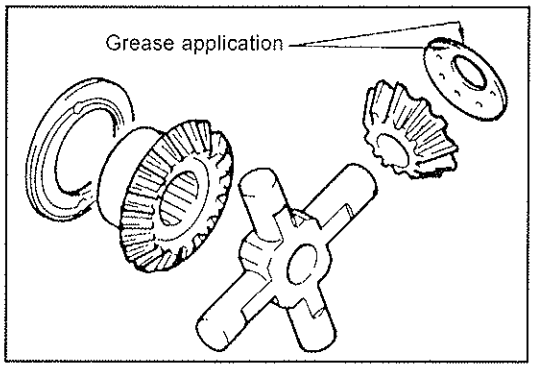
Standard: 1.6 mm (0.063 in)
Limit: 1.3 mm (0.051 in)

Inspection:
Measure the pinion gear thrust washer thickness.

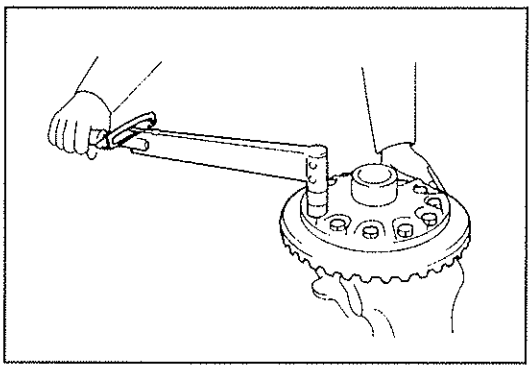
Standard: 1.6 mm (0.063 in)
Limit: 1.0 mm (0.039 in)



Reassembly:
Install the side gear thrust washer with its oil groove facing the gear.



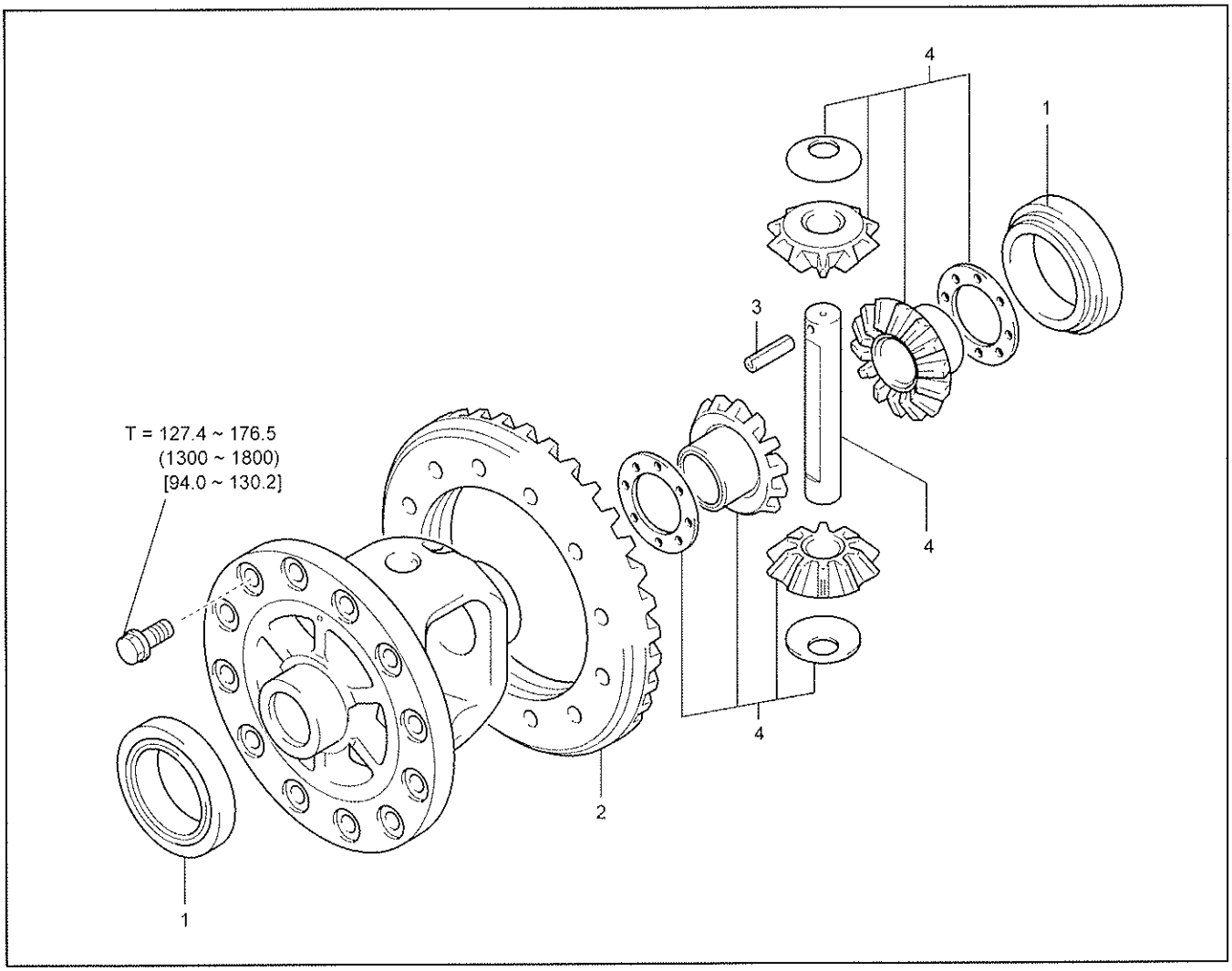
Reassembly:
Apply chassis grease (molybdenum disulfide grease) on both sides of the spider pinion thrust washer before reassembly.



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DISASSEMBLY·INSPECTION·REASSEMBLY (1 TON SERIES: 2002.12 ~ 2003.6)

T = N·m (kgf·cm) [ft·lbf]



Disassembly Procedure

1 Remove the differential case bearings. **[Point 1]**

2 Remove the ring gear. **[Point 2]**

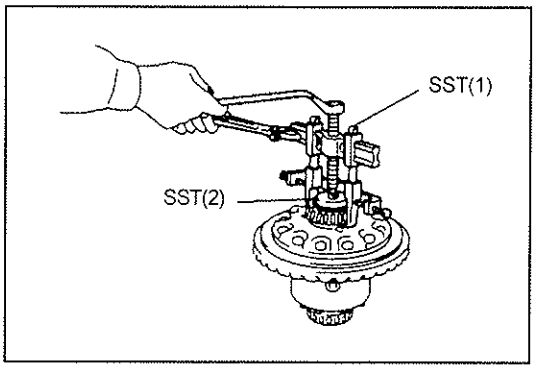
3 Remove the spring pin. **[Point 3]**

4 Remove the side gear, pinion gear and pinion shaft. **[Point 4]**

Reassembly Procedure

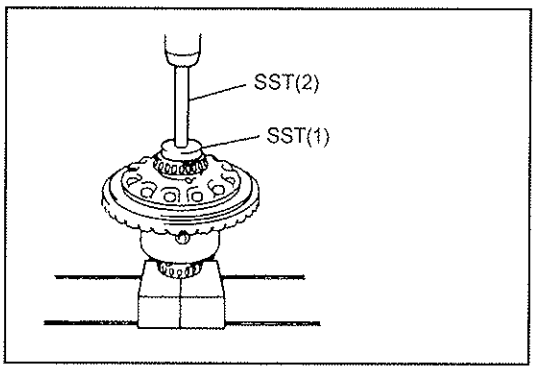
The reassembly procedure is the reverse of the disassembly procedure.

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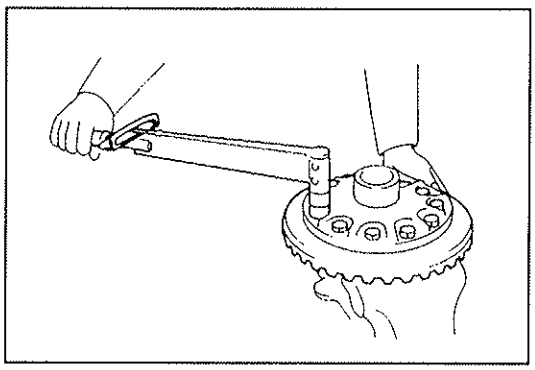


Point Operations

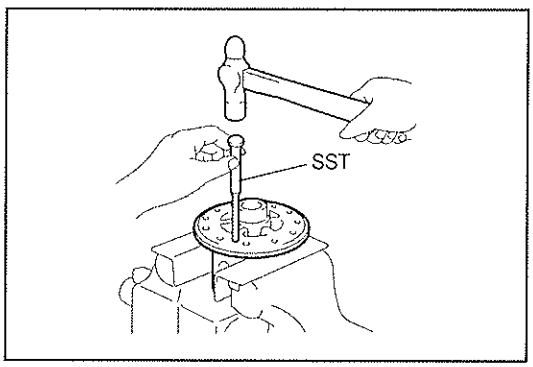
[Point 1]
Disassembly:
SST 09950-76014-71 --- ①
(SST 09950-40011)
SST 09950-76018-71 --- ②
(SST 09950-60010)



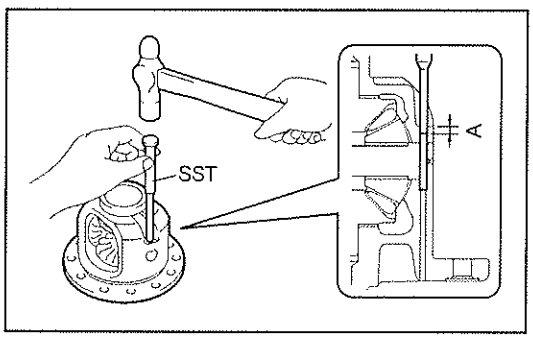
Reassembly:
Install the side bearing.
1. Use the SST and drive in the side bearing to the end surface.
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)
2. Use a striking driver and fully drive in the bearing.



[Point 2]
Reassembly:
Apply locking agent (08833-76001-71(08833-00070)) on the set bolt threaded portion before reassembly. Tighten the set bolts gradually in the diagonal order, and finally tighten in the circular order to the specified torque.

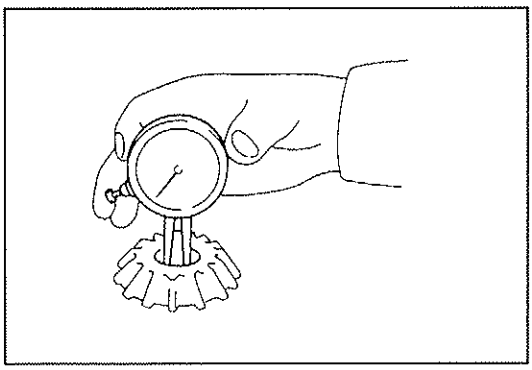


[Point 3]
Disassembly:
Uncaulk the differential case pin hole and drive the spring pin out using the SST.
SST 09411-13330-71

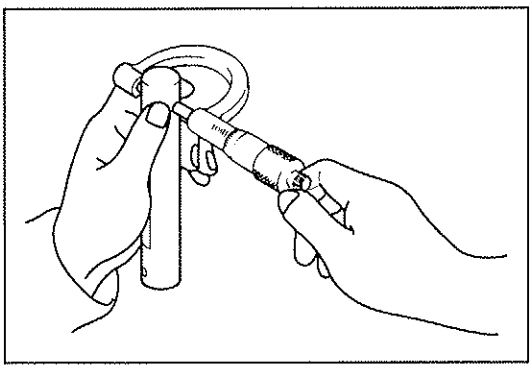


Reassembly:
Use the SST and drive the spring pin down to the staged portion in the differential case pin hole.
(Reference: A = 5 mm (0.20 in))
SST 09411-13330-71
After driving in, caulk the differential case pin hole with a chisel.

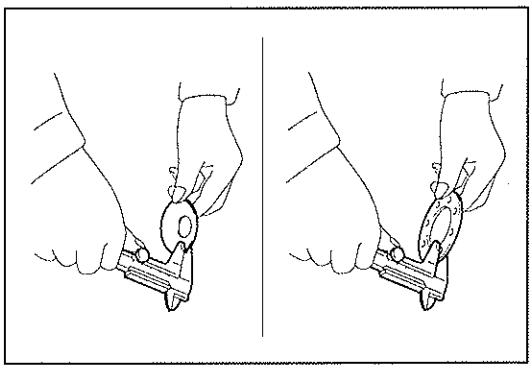
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[Point 4]
Inspection:
Measure the inside diameter of the pinion gear.
Standard: 26.12 mm (1.0283 in)
Limit: 26.22 mm (1.0323 in)

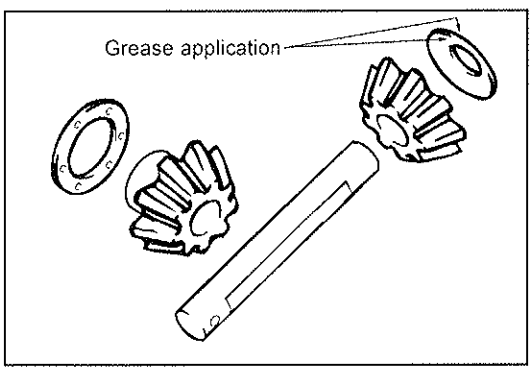


Inspection:
Measure the pinion shaft outside diameter.
Standard: 26.00 mm (1.023 in)
Limit: 25.75 mm (1.0138 in)

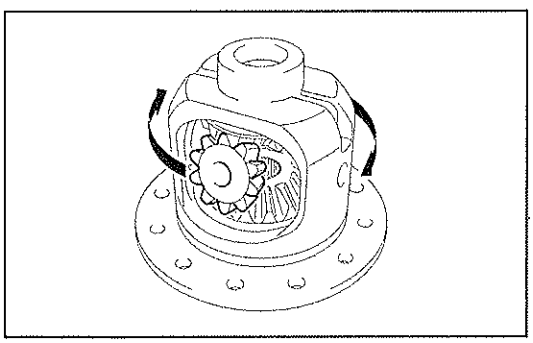


Inspection:
Measure the side gear thrust washer thickness.
Standard: 1.6 mm (0.063 in)
Limit: 1.3 mm (0.051 in)

Inspection:
Measure the pinion gear thrust washer thickness.
Standard: 1.0 mm (0.039 in)
Limit: 0.7 mm (0.028 in)

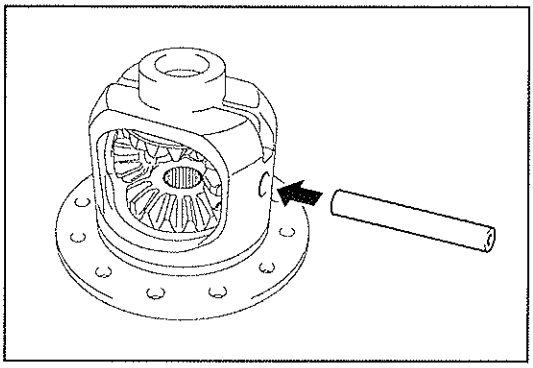


Reassembly:
Apply chassis grease (molybdenum disulfide grease) on both sides of the spider pinion thrust washer before reassembly.



Reassembly:
The reassembly procedure is as follows:
1. Install the side gear and pinion gear in the differential case.
2. Turn the pinion gear for alignment with the pinion shaft hole.

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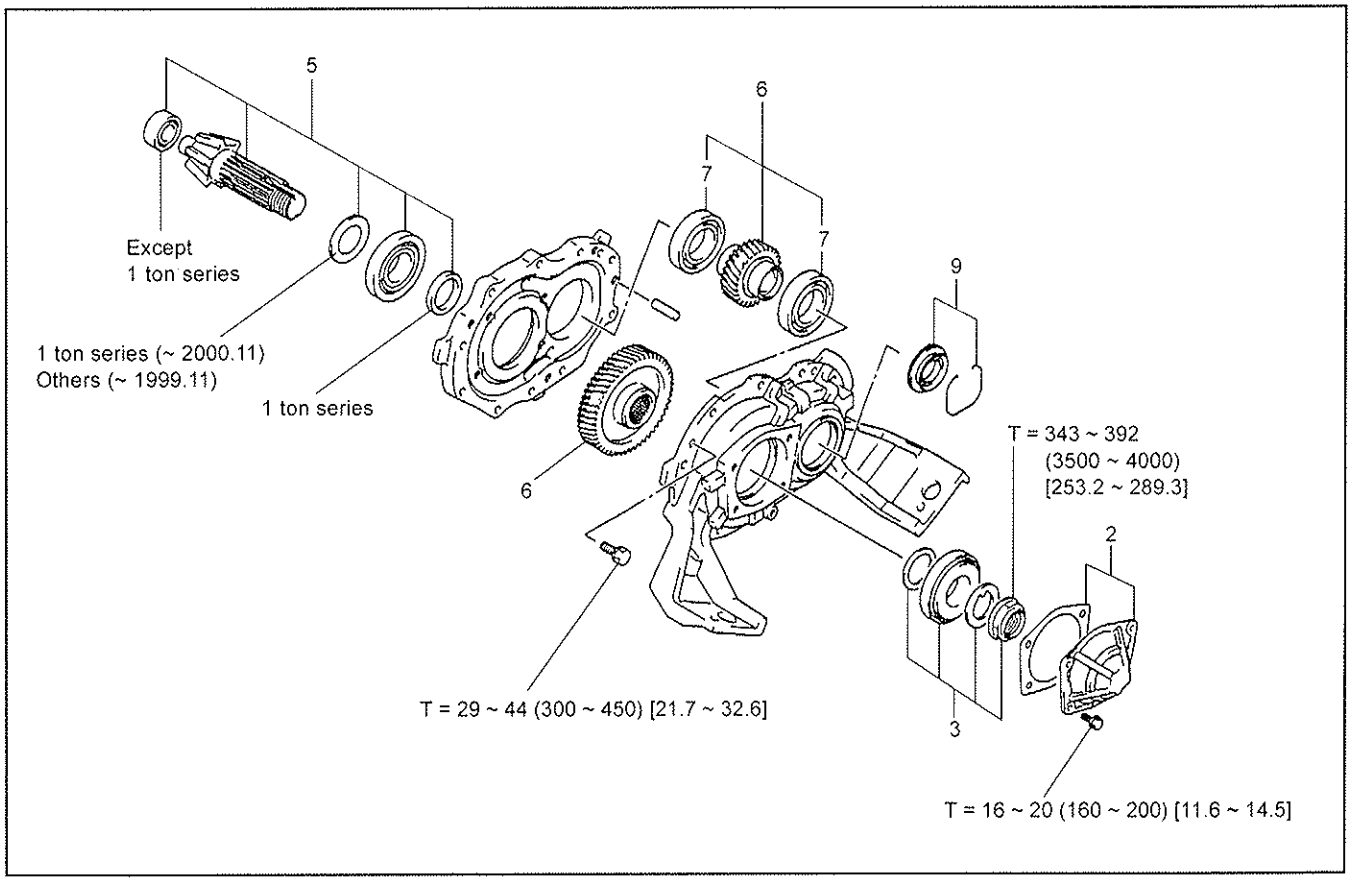
3. Install the pinion shaft.

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DIFFERENTIAL CARRIER

DISASSEMBLY·INSPECTION·REASSEMBLY
(ALL MODELS: ~ 2000.11, 2·3·J3.5 TON SERIES: 2000.11 ~)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Fix the differential carrier ASSY in a vise. **[Point 1]**

2 Remove the drive pinion rear cover and gasket.

3 Remove the lock nut, washer, rear bearing roller and shim. **[Point 2]**

4 Remove the differential carrier ASSY from the vise. **[Point 3]**

5 Remove the bearing spacer, front bearing roller, spacer and pilot bearing from the drive pinion. **[Point 4]**

6 Remove the differential carrier cover, output gear and reduction gear W/bearing. **[Point 5]**

7 Remove the reduction gear bearing. **[Point 6]**

8 Remove the drive pinion bearing outer race.

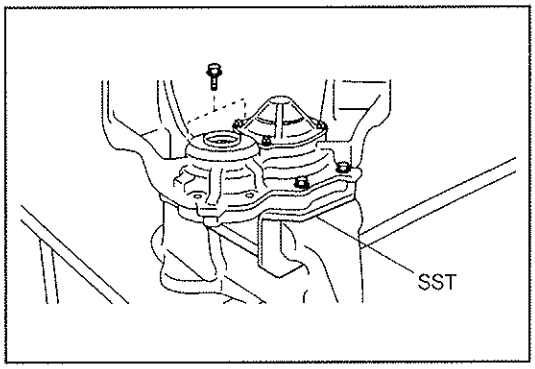
9 Remove the input shaft oil seal. **[Point 7]**

10 Remove the input shaft dust deflector. **[Point 8]**

Reassembly Procedure

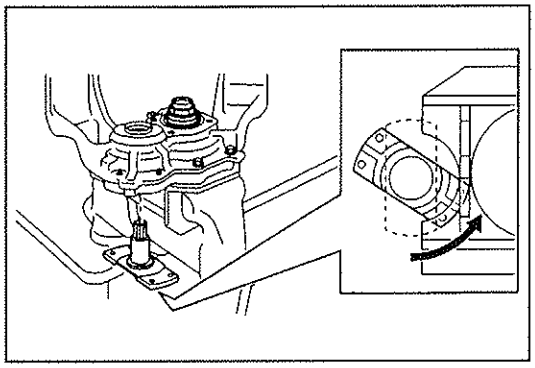
The reassembly procedure is the reverse of the disassembly procedure.

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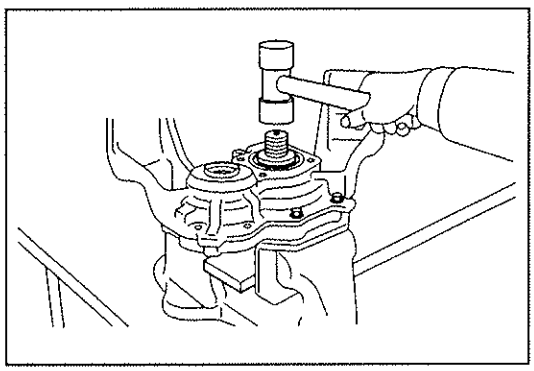


Point Operations

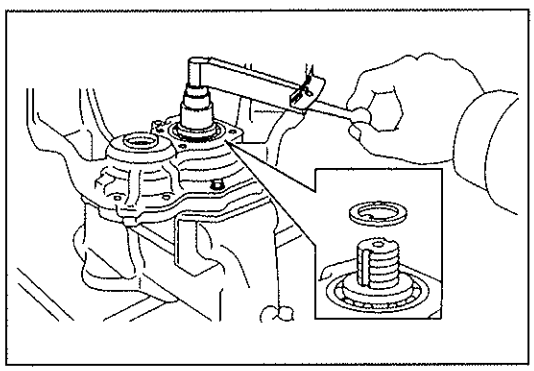
[Point 1]
Disassembly:
Fix the differential carrier ASSY in a vise.
1. Fix the SST in the vise.
   SST 09410-23320-71
2. Use the service bolt and install the differential carrier ASSY on the SST.



[Point 2]
Disassembly:
Remove the lock nut, washer, rear bearing roller and shim(s).
1. Unlock the lock nut.
2. Use the input shaft to stop the gear from rotation.
3. Remove the lock nut and washer.



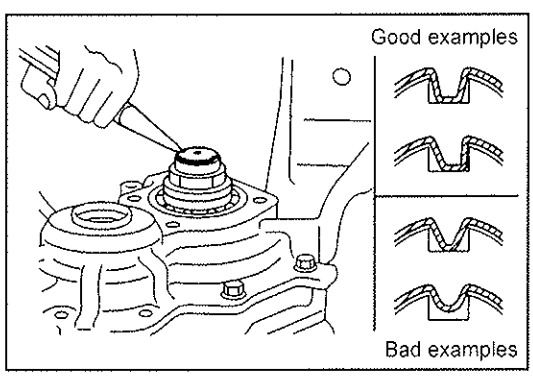
4. Apply a wooden block under the drive pinion to prevent it from damage.
5. Use a plastic hammer and remove the rear bearing roller.
6. Remove the shim(s).



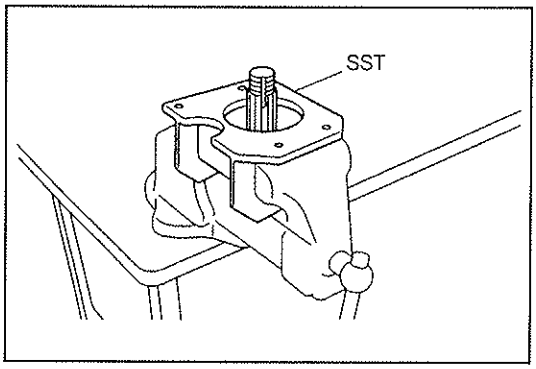
Reassembly:
Install the shim(s), rear bearing roller, washer and lock nut.
1. While supporting the drive pinion, install the shim(s), rear bearing, washer and lock nut. Place the washer with its claw on the deep groove side.
2. Use the input shaft to stop the gear from rotation.
3. Tighten the lock nut to the specified torque.
4. Remove the input shaft.
5. Measure the drive pinion starting torque.

   Standard: 8.82 ~ 13.23 N·m (90 ~ 135 kgf-cm)
   If the standard is not satisfied, make adjustment by increasing or decreasing the shim thickness.

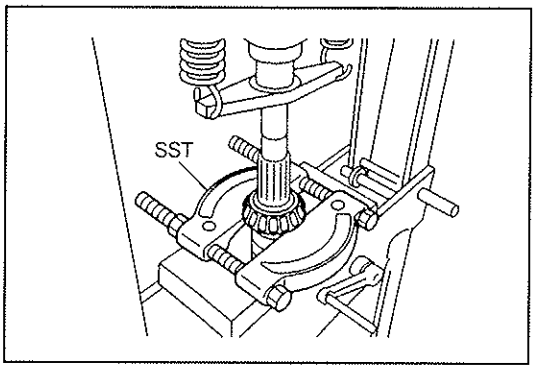
   Shim thickness:
   0.13, 0.10, 0.15, 0.35 and 0.40 mm
   (0.0051, 0.0039, 0.0059, 0.018 and 0.016 in)
6. Securely swage the lock nut.



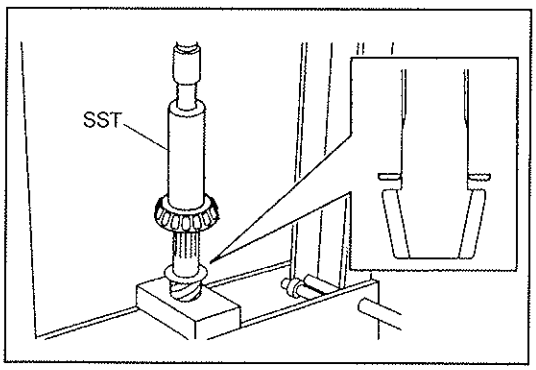
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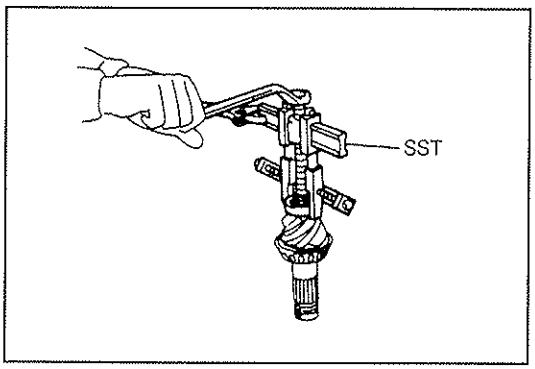
[Point 3]
Reassembly:
Fix the differential carrier ASSY in a vise.
1. Fix the SST in the vise.
   SST 09410-23320-71
2. Place the drive pinion in the center of the service hole.
3. Use the service bolts and install the differential carrier ASSY on the SST



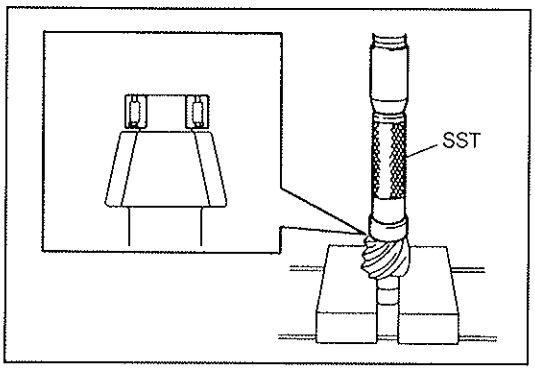
[Point 4]
Disassembly:
SST 09420-23000-71



Reassembly:
Install the drive pinion front bearing.
1. Check correctness of spacer direction at the time of installation. (1 ton series: ~ 2000.11, Others: ~ 1999.11)
2. Use the SST and install the front bearing.
   SST 09316-76008-71
   (SST 09316-60011)

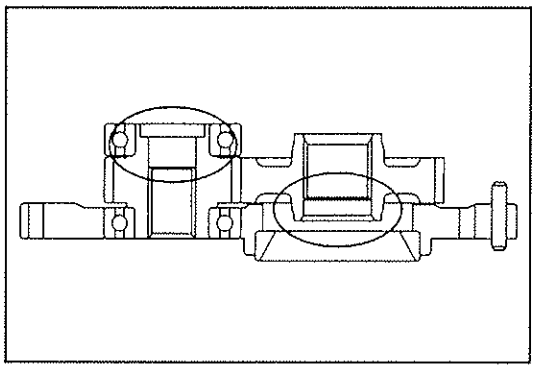


Excluding 1 ton series
Disassembly:
SST 09950-76014-71
(SST 09950-40011)

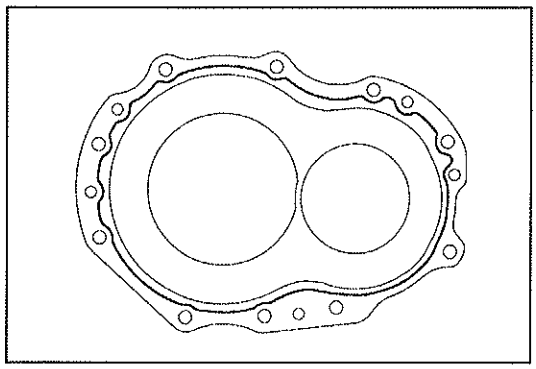


Excluding 1 ton series
Reassembly:
Use the SST and install the pilot bearing.
SST 09608-76003-71
(SST 09608-04031)
Check the installed direction.

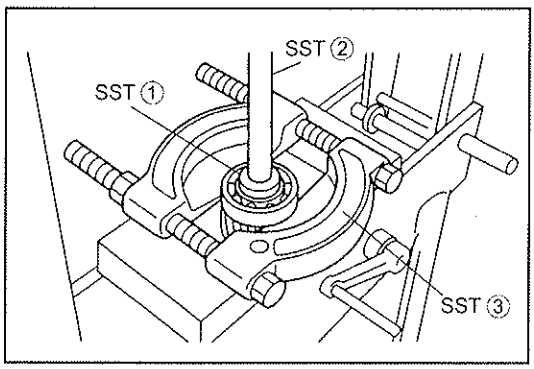
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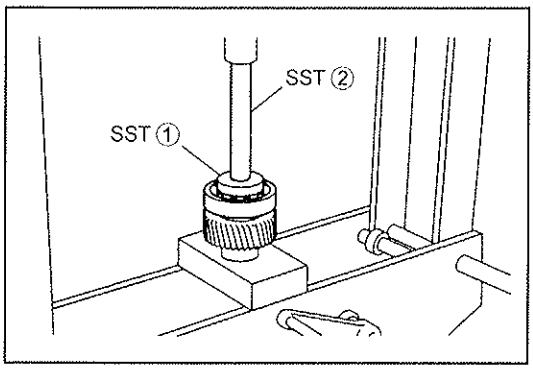
[Point 5]
Reassembly:
Check the installing directions of the output gear and reduction gear.



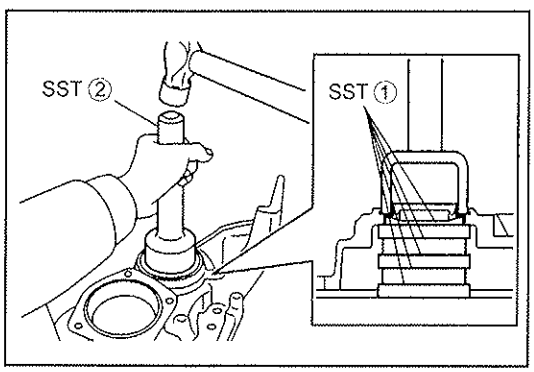
Reassembly:
Apply sealing agent (08826-00090) on the bearing retainer surface to come into contact with the differential carrier cover.



[Point 6]
Disassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)
SST 09420-23000-71 --- ③

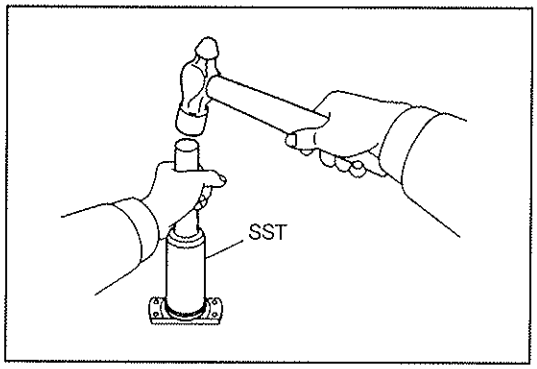


Reassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 7]
Reassembly:
Use the SST to drive in the new oil seal to be flush with the inside end face of the differential carrier cover.
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09150-10170-71 --- ②
After installation, apply grease on the oil seal lip portion.

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[Point 8]
Reassembly:
SST 09370-20270-71

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FRONT AXLE

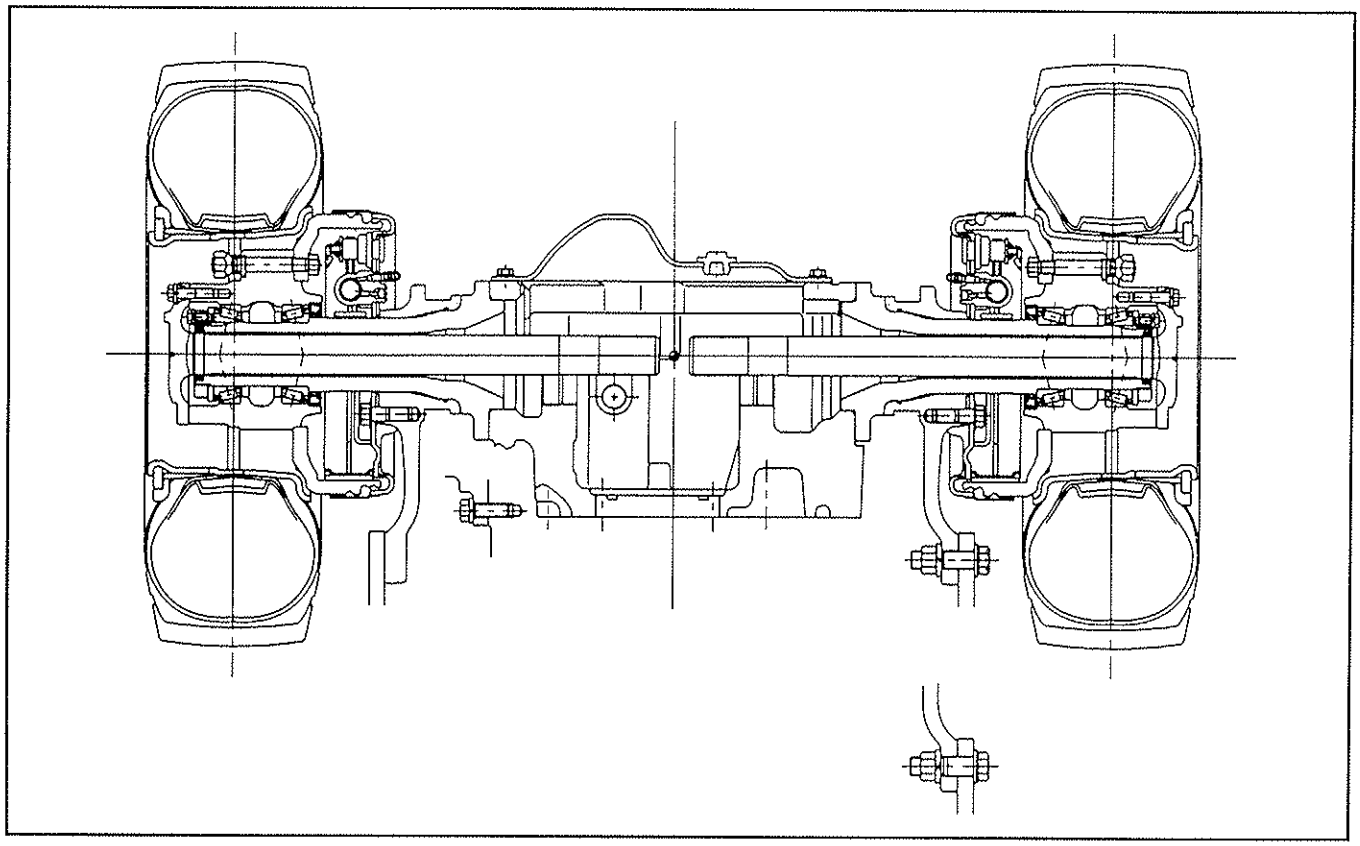
Page

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REMOVAL·INSTALLATION 5-7
FRONT AXLE BRACKET·AXLE HOUSING 5-11
REMOVAL·INSTALLATION 5-11

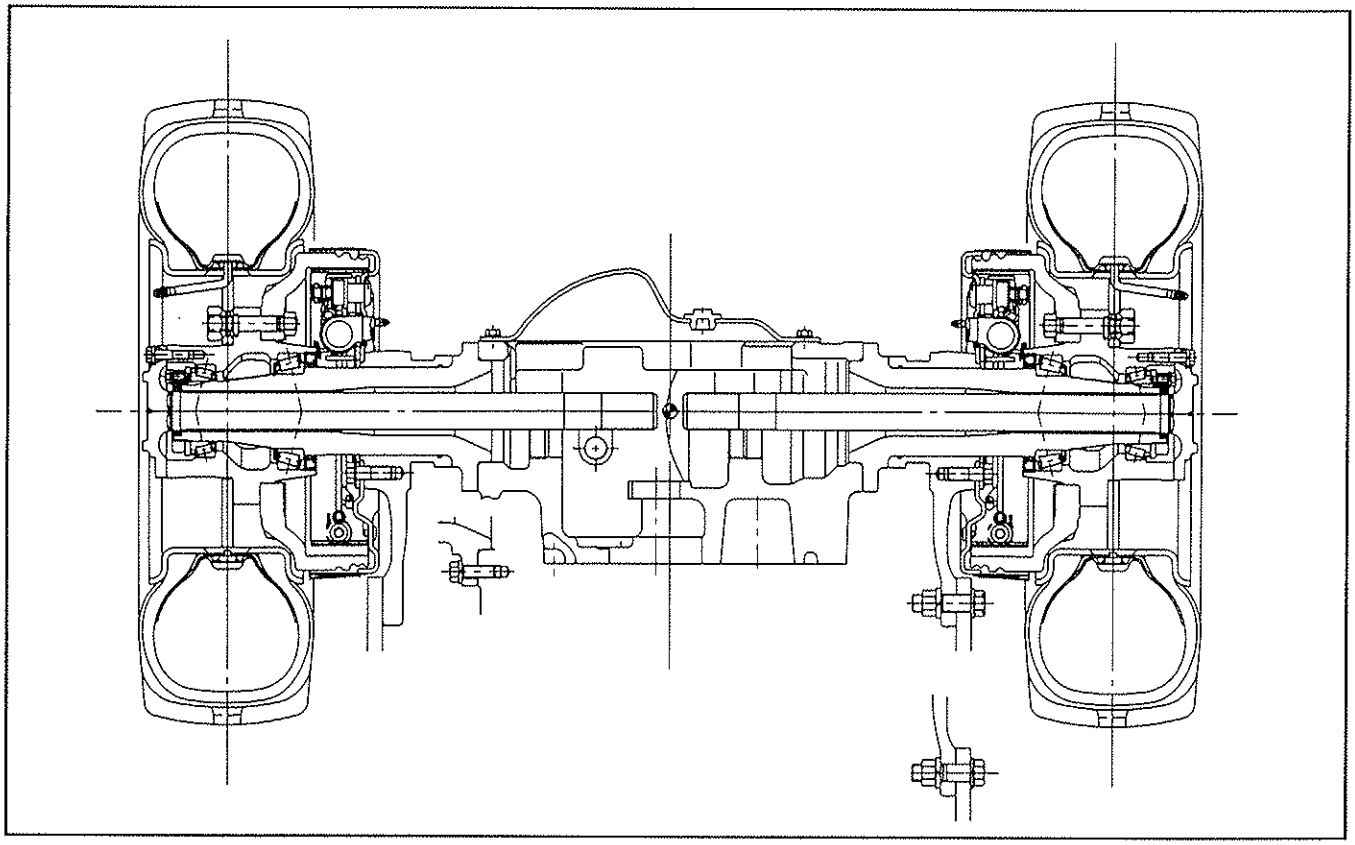
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GENERAL

1 ton series

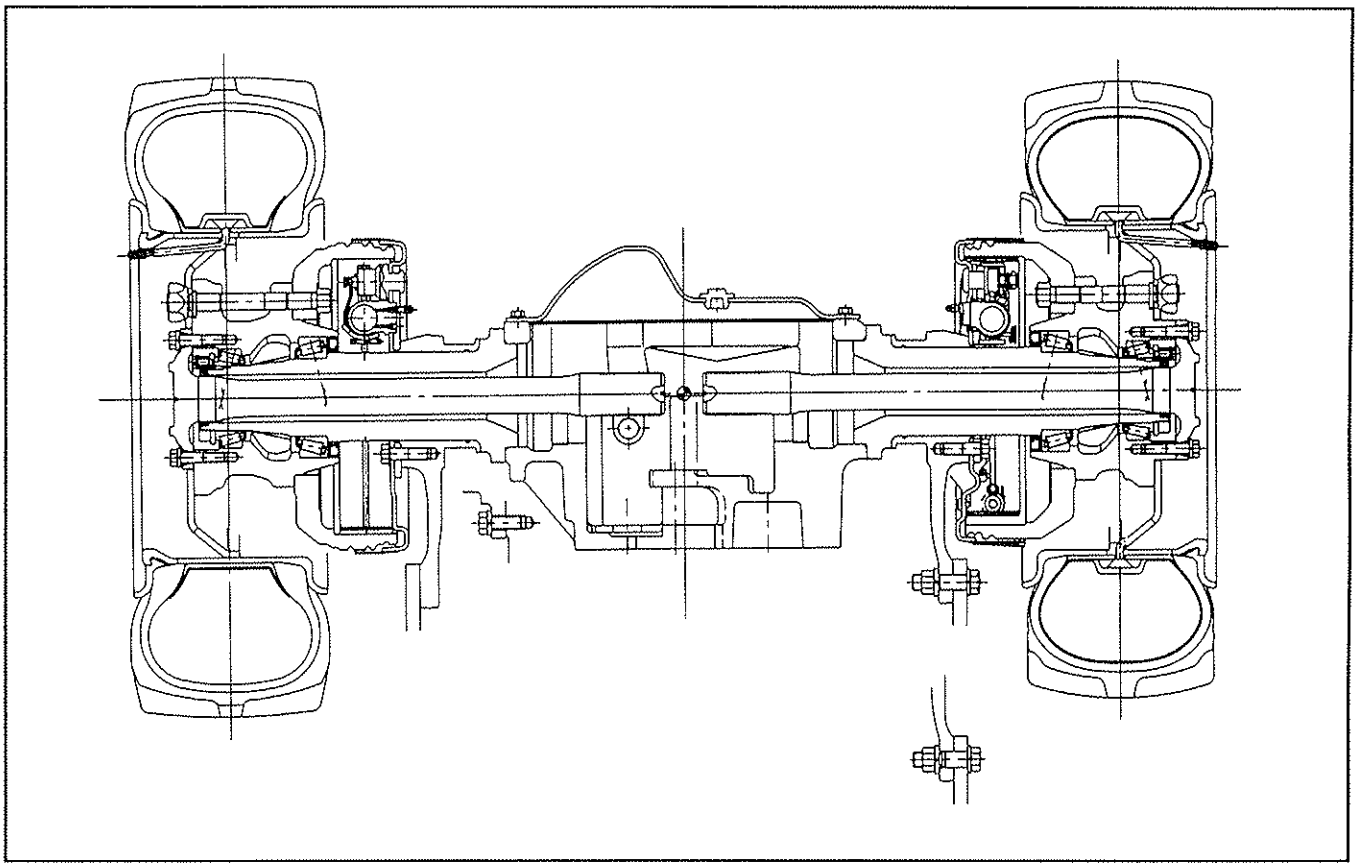


2 ton series



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3·J3.5 ton series



SPECIFICATIONS

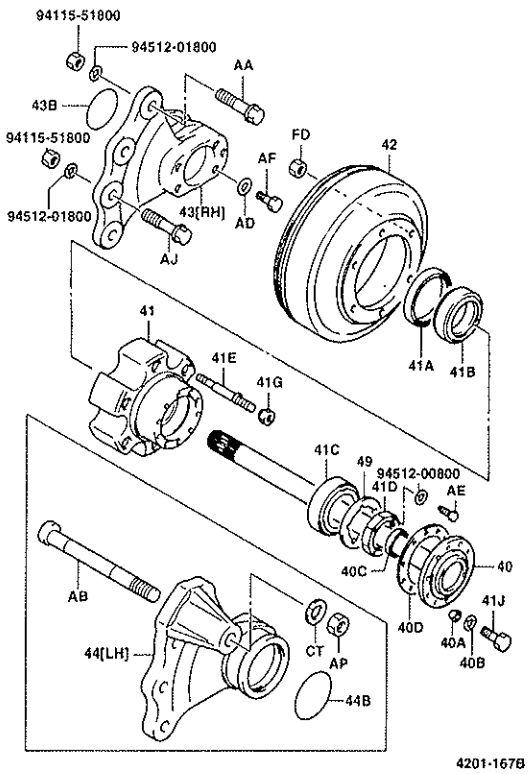
Item \ Vehicle model		1 ton series	2 ton series	3·J3.5 ton series
Front axle type		Full-floating	←	←
Suspension type		Fixed to frame	←	←
Axle shaft diameter	mm (in)	40 (1.57)	←	42 (1.65)
Axle shaft diameter (spline portion)	mm (in)	40 (1.57)	←	49.5 (1.949)

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COMPONENTS

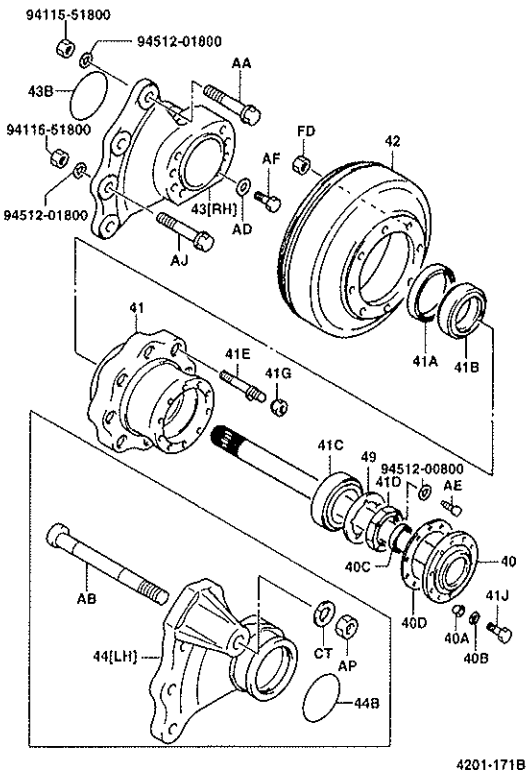
1 ton series

4201



2 ton series

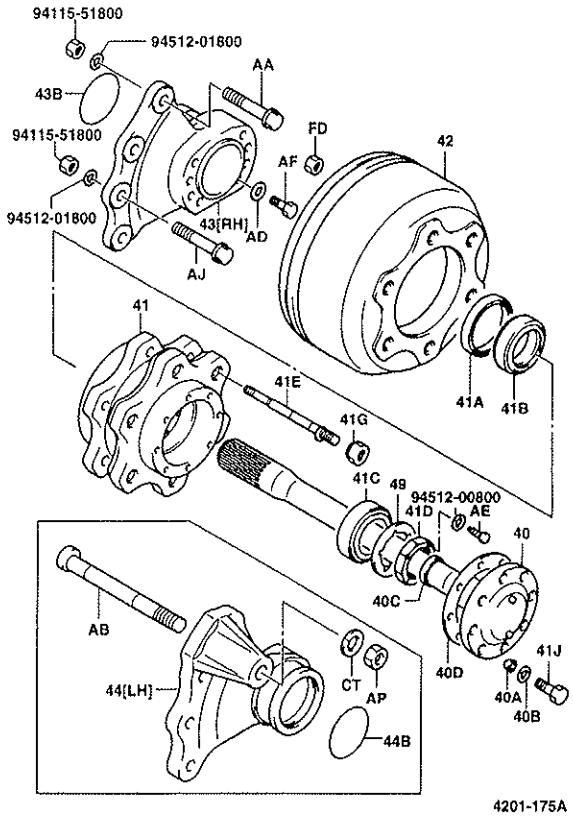
4201



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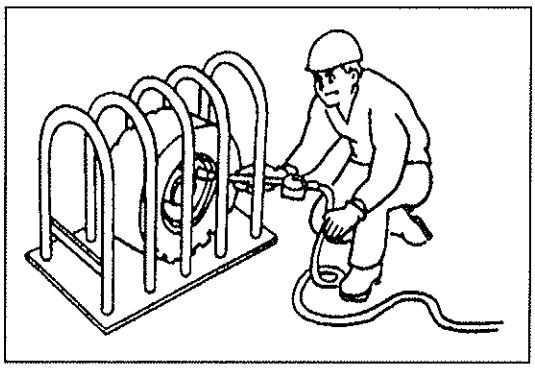
3·J3.5 ton series

4201



5

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TIRES·WHEELS

1 Adjusting the Inflating Pressure

Caution:
- **Do not inflate tires beyond the specified pressure because it may cause dangerous tire bursting.**
- **When inflating a tire removed from the vehicle, place it in a safety fence.**

Specified Inflating Pressure

Classification	Specification	Tire size	Rim type	Maker	Inflating pressure kPa (kgf/cm²) [psi]
1.5 ton model	STD	6.50-10-10PR	Side ring	BRIDGESTONE	700 (7.0) [100]
	S-RING	6.50-10-14PR	↑	CONTINENTAL	800 (8.0) [114]
	SPL-D	6.00-9-10PR	↑	BRIDGESTONE	700 (7.0) [100]
	SPL-D	↑	↑	CONTINENTAL	800 (8.0) [114]
1.75 ton model	STD	6.50-10-10PR	↑	BRIDGESTONE	700 (7.0) [100]
	S-RING	6.50-10-14PR	↑	CONTINENTAL	900 (9.0) [128]
	SPL-D	6.00-9-10PR	↑	BRIDGESTONE	700 (7.0) [100]
	SPL-D	↑	↑	CONTINENTAL	800 (8.0) [114]
2 ton series	STD	7.00-12-12PR	↑	BRIDGESTONE	700 (7.0) [100]
	S-RING	7.00-12-14PR	↑	CONTINENTAL	900 (9.0) [128]
	SPL-D	7.00-12-12PR	↑	BRIDGESTONE	700 (7.0) [100]
	SPL-D	7.00-12-14PR	↑	CONTINENTAL	900 (9.0) [128]
3 ton series	STD	28X9-15-12PR	↑	BRIDGESTONE	700 (7.0) [100]
	S-RING	28X9-15-14PR	↑	CONTINENTAL	800 (8.0) [114]
	SPL-D	28X8-15-12PR	↑	BRIDGESTONE	700 (7.0) [100]
J3.5 ton series	STD	250-15-16PR	↑	↑	850 (8.5) [121]
	S-RING	↑	↑	CONTINENTAL	950 (9.5) [135]
	SPL-D	28X8-15-12PR	↑	BRIDGESTONE	700 (7.0) [100]

Abbreviations used in the specification column:
STD = Standard, S-RING = Side ring, SPL-D = Special double

2 Wheel Disassemly·Reassembly

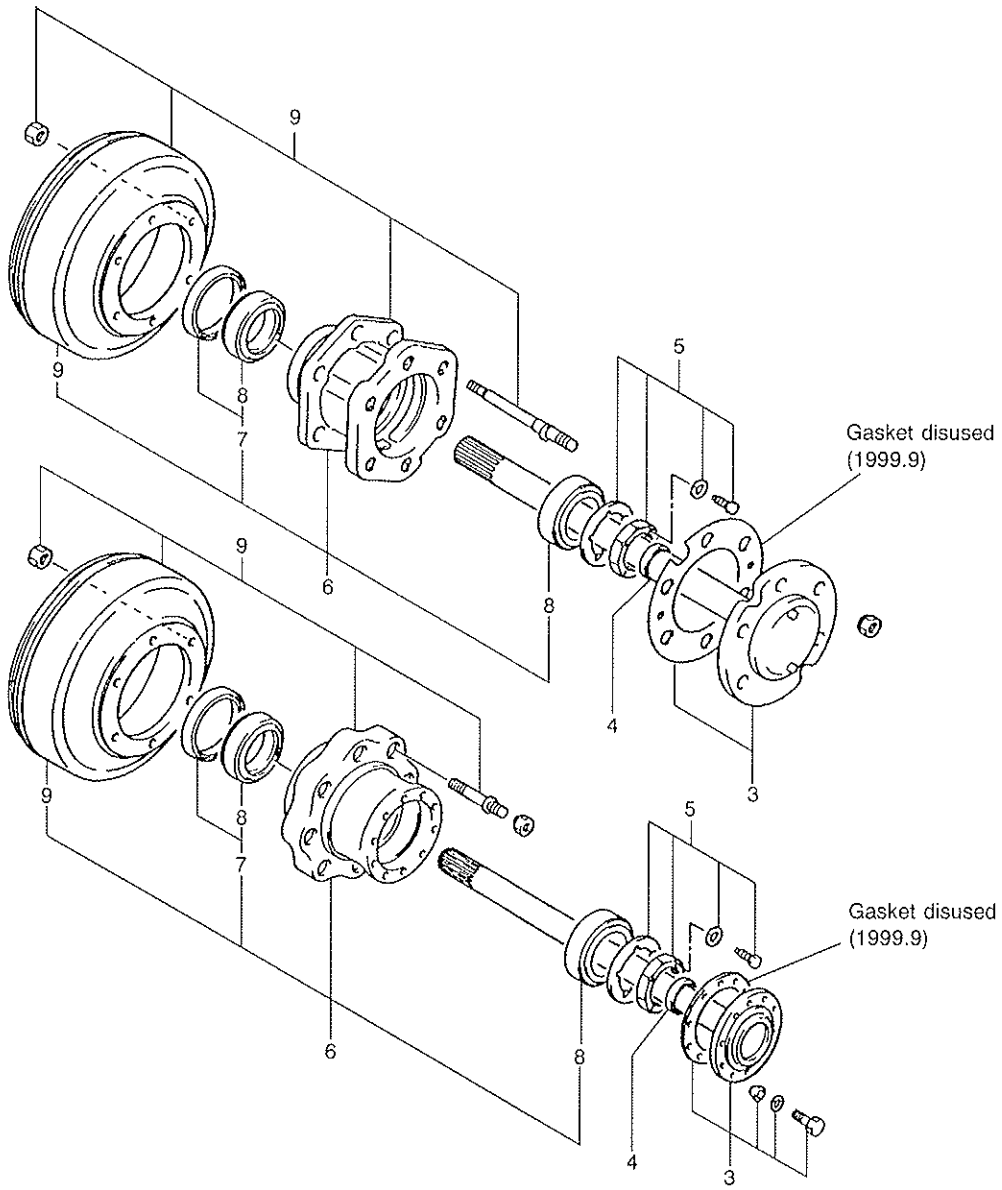
Caution:
Always discharge air fully before disassembling the wheel. Otherwise, it is very dangerous since the rim may come off suddenly due to the internal pressure.

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FRONT AXLE SHAFT·AXLE HUB

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Hub nut (single tire)	1 ton series	T = 107.9 ~ 196.1 (1100 ~ 2000) [79.59 ~ 144.7]
	2 ton series	T = 176.5 ~ 392.3 (1800 ~ 4000) [130.2 ~ 289.4]
	3·J3.5 ton series	T = 294.2 ~ 588.4 (3000 ~ 6000) [217.1 ~ 434.1]
Hub nut (double tire)	1·2 ton series	T = 176.5 ~ 392.3 (1800 ~ 4000) [130.2 ~ 289.4]
	3·J3.5 ton series	T = 294.2 ~ 588.4 (3000 ~ 6000) [217.1 ~ 434.1]
Axle shaft set bolt	1·2 ton series	T = 68.6 ~ 88.3 (700 ~ 900) [50.6 ~ 65.1]
	3·J3.5 ton series	T = 98.07 ~ 127.5 (1000 ~ 1300) [72.35 ~ 94.06]
Brake drum set nut	1 ton series	T = 78.5 ~ 107.9 (800 ~ 1100) [57.9 ~ 79.59]
	2 ton series	T = 147.1 ~ 186.3 (1500 ~ 1900) [108.5 ~ 137.5]
	3·J3.5 ton series	T = 166.7 ~ 205.9 (1700 ~ 2100) [123.0 ~ 151.9]

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Removal Procedure

1 Drain differential oil. **[Point 1]**

2 Jack up the vehicle and remove front wheels.

3 Remove the front axle shaft. **[Point 2]**

4 Remove the axle shaft oil seal. **[Point 3]**

5 Remove the bearing lock nut and plate. **[Point 4]**

6 Remove the outer bearing roller and front axle hub W/brake drum. **[Point 5]**

7 Remove the oil seal and inner bearing roller. **[Point 6]**

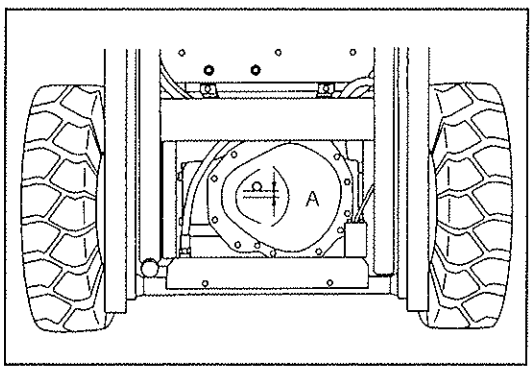
8 Remove the bearing outer race. **[Point 7]**

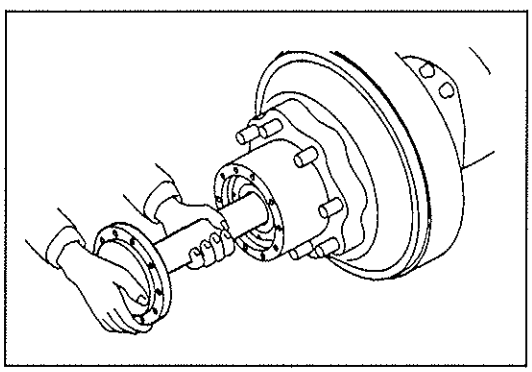
9 Remove the brake drum.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Apply thread tightener (08833-76001-71 (08833-00070)) on the brake drum set nut before tightening.





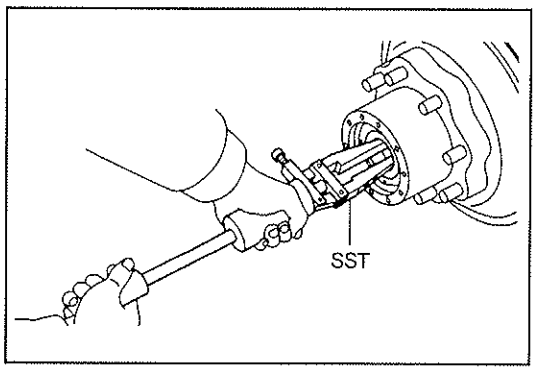
Point Operations

[Point 1]
Installation:
Fill Hypoid gear oil to the specified level after installation.

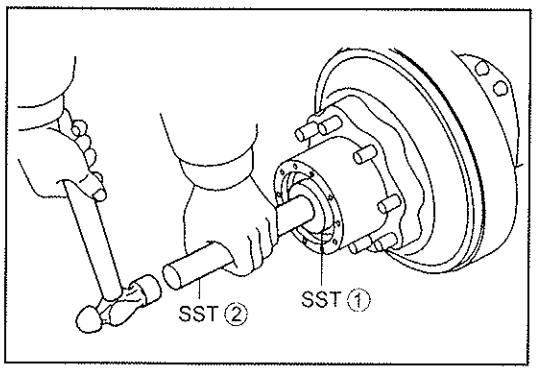
A = 8 ~ 15 mm (0.31 ~ 0.59 in)

[Point 2]
Removal·Installation:
Carefully operate so as not to damage the oil seal by contact with the axle shaft.

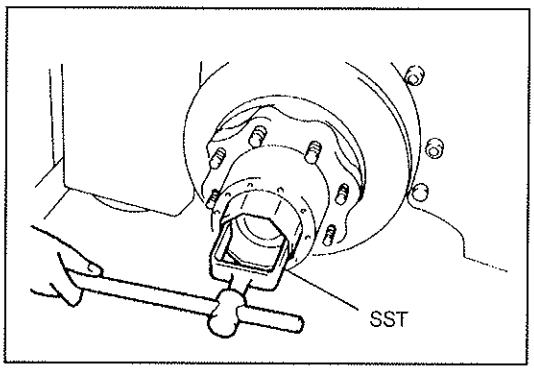
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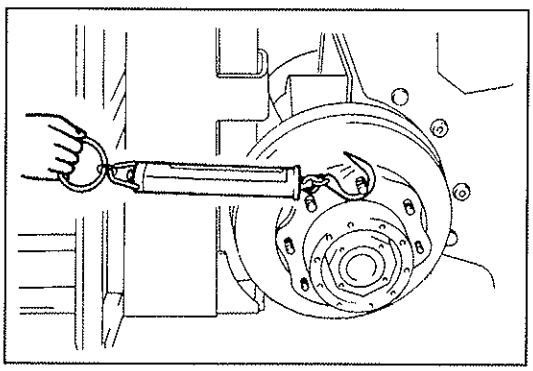
[Point 3]
Removal:
SST 09320-23000-71

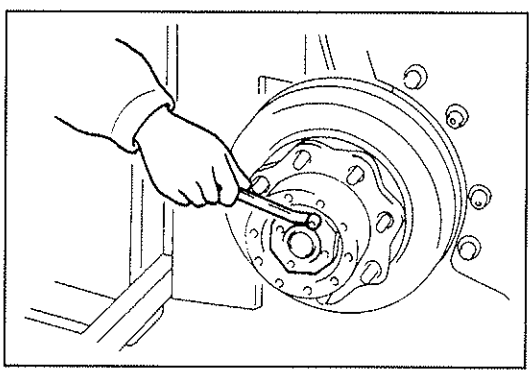


Installation:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 4]
Removal·Installation:
1·2 ton series
SST 09509-76002-71
(SST 09509-55020)
3·J3.5 ton series
SST 09509-76003-71
(SST 09509-55030)



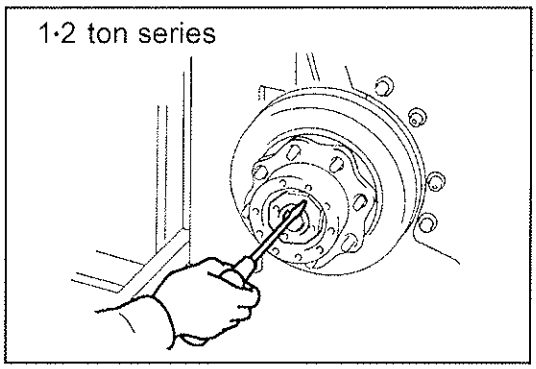


Installation:
Adjust the front axle hub starting force.
1. Install the plate.
2. Fully tighten the bearing lock nut, and rotate the hub by 4 to 5 turns to run in the bearing.
3. Return the bearing lock nut by 1/12 to 1/6 turn (30 to 60°), and rotate the hub by 4 to 5 turns again.
4. Set a spring scale on a hub bolt, and measure the starting force.

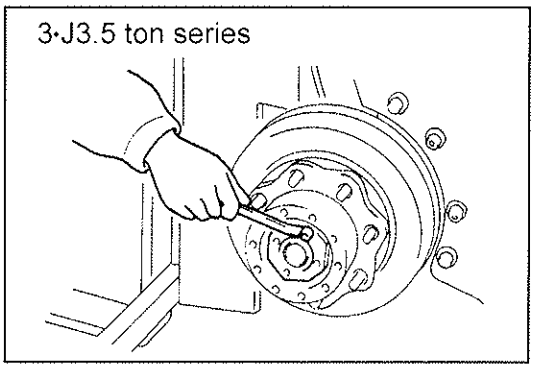
   Standard:
   1 ton series (side ring rim), K2 ton series:
   24.5 ~ 99.0 N (2.5 ~ 10.1 kgf) [5.5 ~ 22.3 lbf]
   Other:
   19.6 ~ 78.4 N (2.0 ~ 8.0 kgf) [4.4 ~ 17.6 lbf]

5. If the standard is not satisfied, adjust the degree of bearing lock nut tightening for adjustment.
6. Install the nut lock bolt. (~1999.12)
   Coat thread tightener (08833-76001-71 (08833-00070)) on the nut lock bolt before tightening.

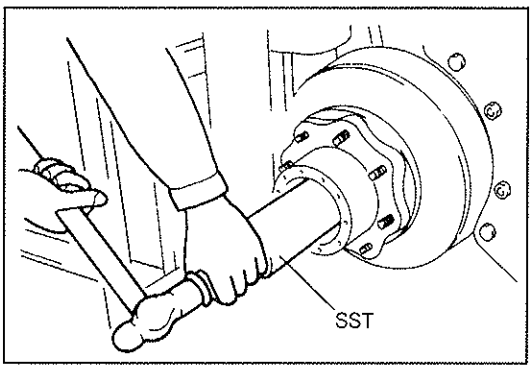
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6. Install the nut lock screw or nut lock bolt. (1999.12 ~)
   1·2 ton series:
   Coat thread tightener (08833-76002-71 (08833-00080)) on the nut lock screw before tightening.

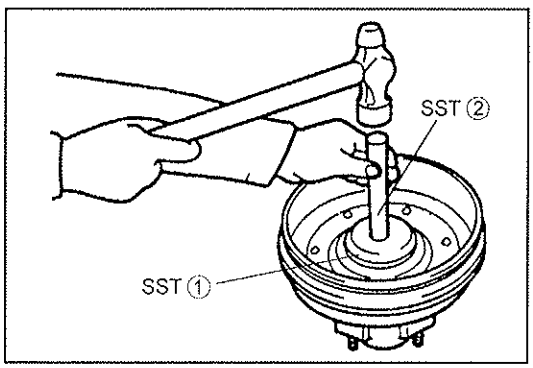


   3·J3.5 ton series:
   Coat thread tightener (08833-76001-71 (08833-00070)) on the nut lock bolt before tightening.



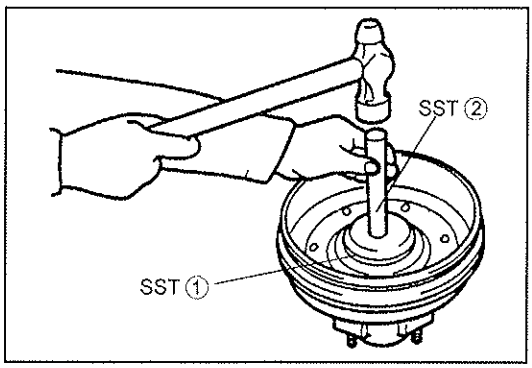
[Point 5]
Installation:
   Fill MP grease in the hub before installing the front axle hub W/brake drum.

Installation:
   1·2 ton series:
   SST 09370-10410-71
   3·J3.5 ton series
   SST 09421-33020-71



[Point 6]
Removal:
   Use a screwdriver or the like to remove the oil seal.

Installation:
   SST 09950-76019-71 --- ①
   (SST 09950-60020)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)



[Point 7]
Removal:
   Use a brass bar to remove the bearing outer race.

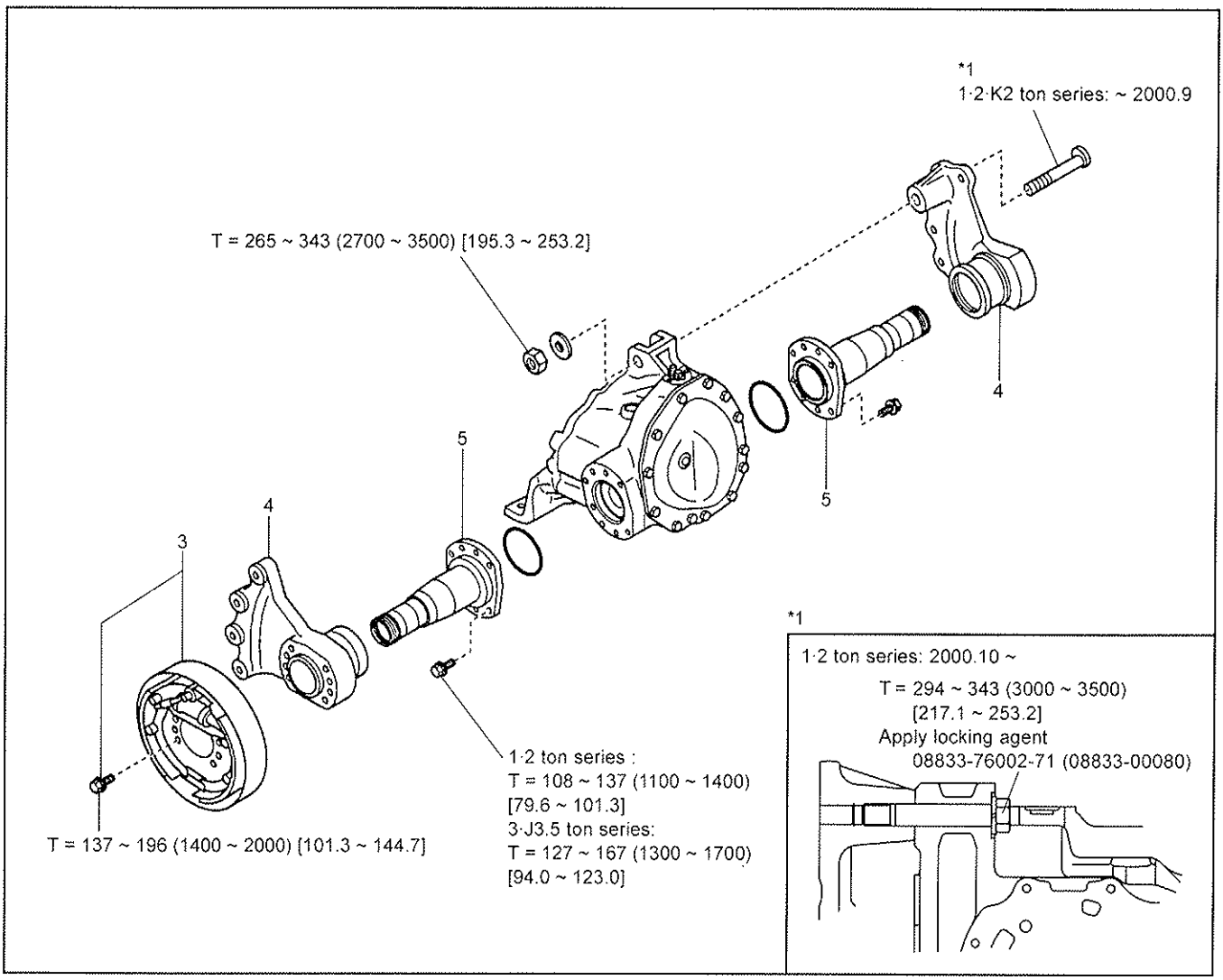
Installation:
   SST 09950-76019-71 --- ①
   (SST 09950-60020)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)

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FRONT AXLE BRACKET•AXLE HOUSING

REMOVAL•INSTALLATION

T = N•m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the front axle & differential ASSY. (See page 4-8)

2 Remove the front axle shaft and axle hub. (See page 5-7)

3 Remove the backing plate W/brake ASSY. **[Point 1]**

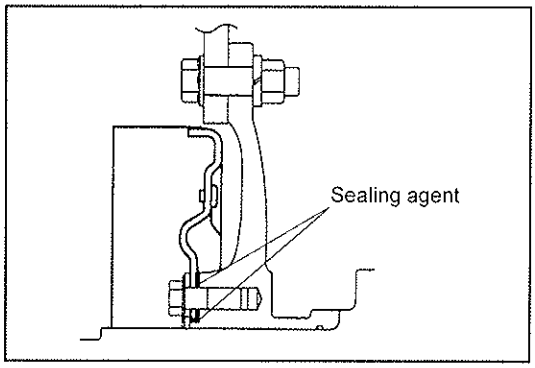
4 Remove the front axle bracket.

5 Remove the axle hosing.

Installation Procedure

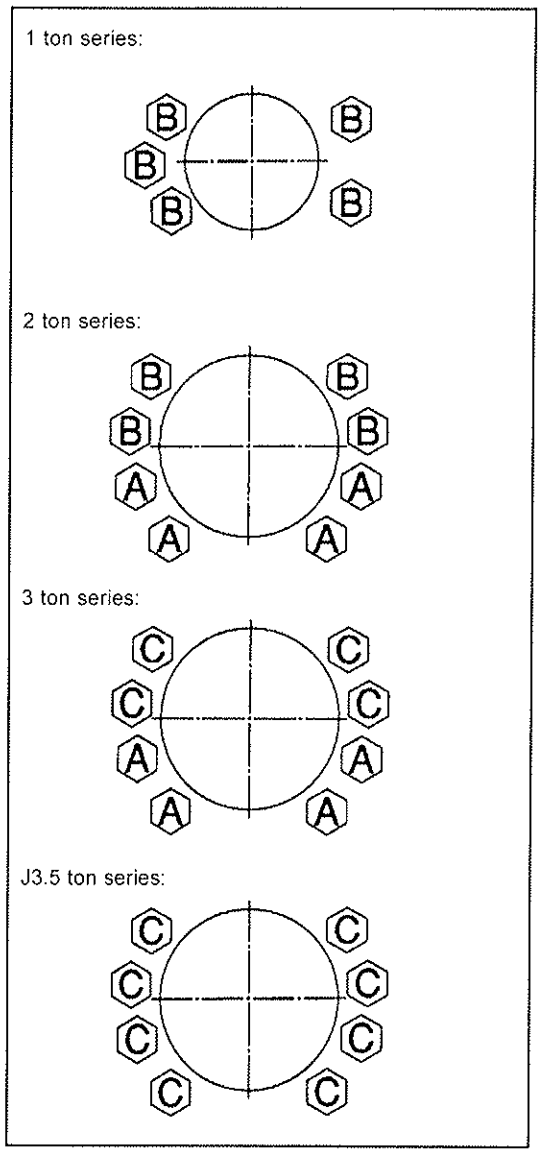
The installation procedure is the reverse of the removal procedure.

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Point Operations

[Point 1]
Installation:
Apply sealing agent (08826-76001-71 (08826-00080)) on the mating surfaces of the brake backing plate and front axle bracket before installation.



Installation:
Be careful as the brake backing plate set bolts are different in length.
Apply locking agent (08833-76001-71 (08833-00070)) on the set bolts before tightening.
Bolt length
A: ℓ = 36 mm (1.42 in)
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)

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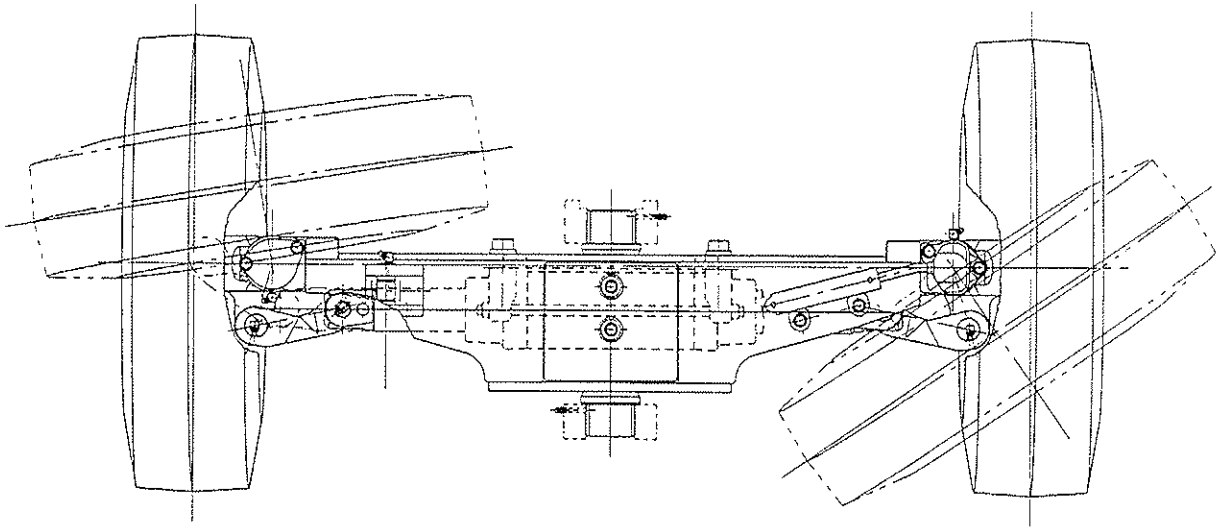
REAR AXLE

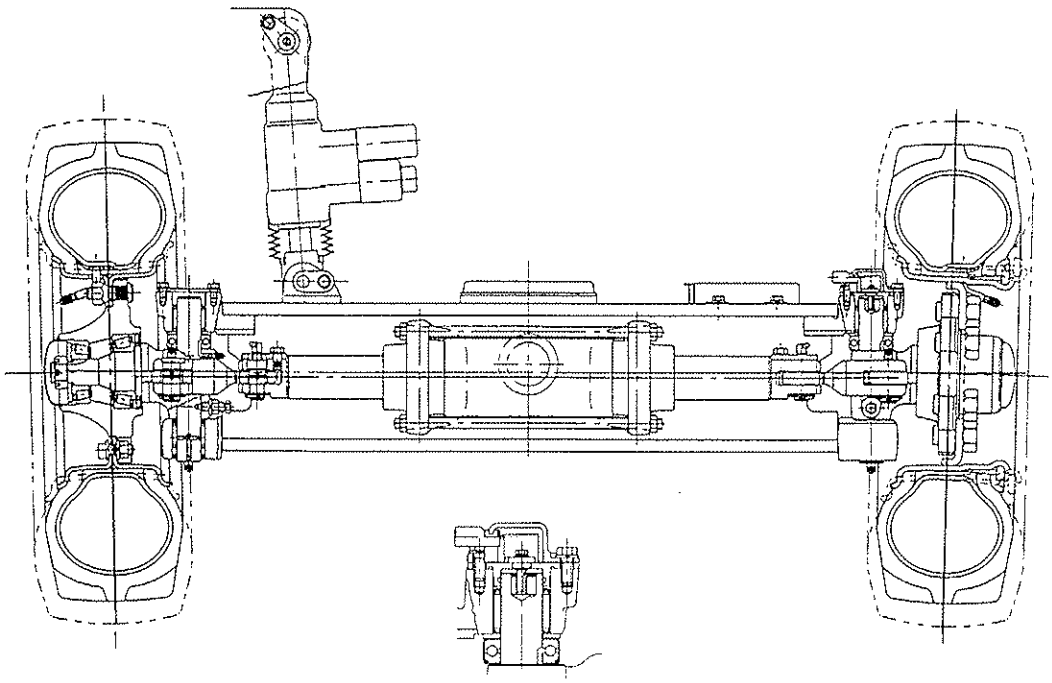
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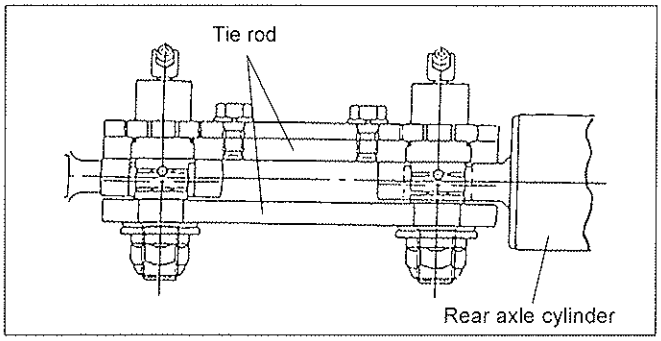
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GENERAL



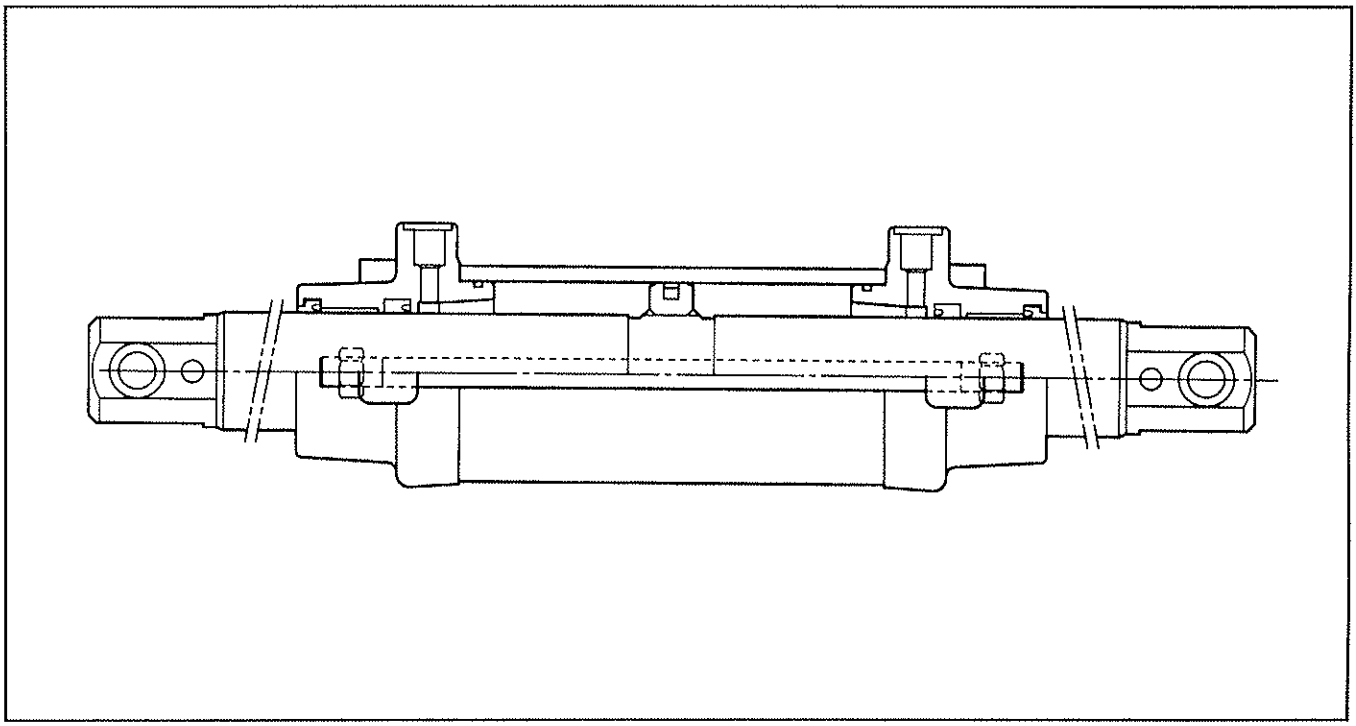


2001. 12 ~



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Rear Axle Cylinder



SPECIFICATIONS

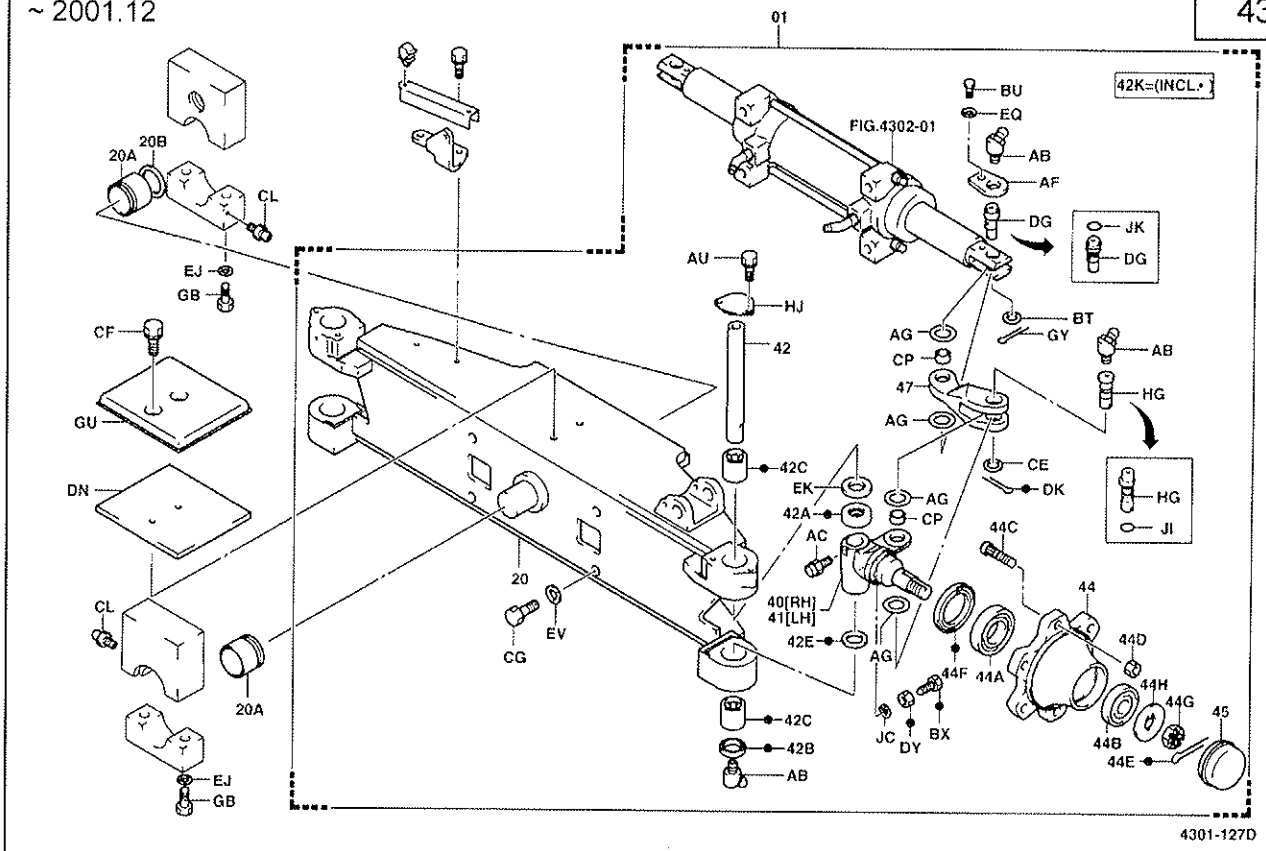
Rear axle type			Elliot type
Rear axle suspension type			Center-supported right-left rocking type
Wheel alignment	Toe-in	mm (in)	0 (0)
	Camber	degree	1.5°
	Caster	degree	0°
	King pin angle		0°
Minimum turning radius (outermost)		mm (in)	1.5 ton : 1960 (77.2) 1.75 ton : 1980 (78.0)
			2.0 ton : 2170 (85.4) 2.5 ton : 2240 (88.2)
			3.0 ton : 2400 (94.5)
			J3.5 ton : 2500 (98.4)

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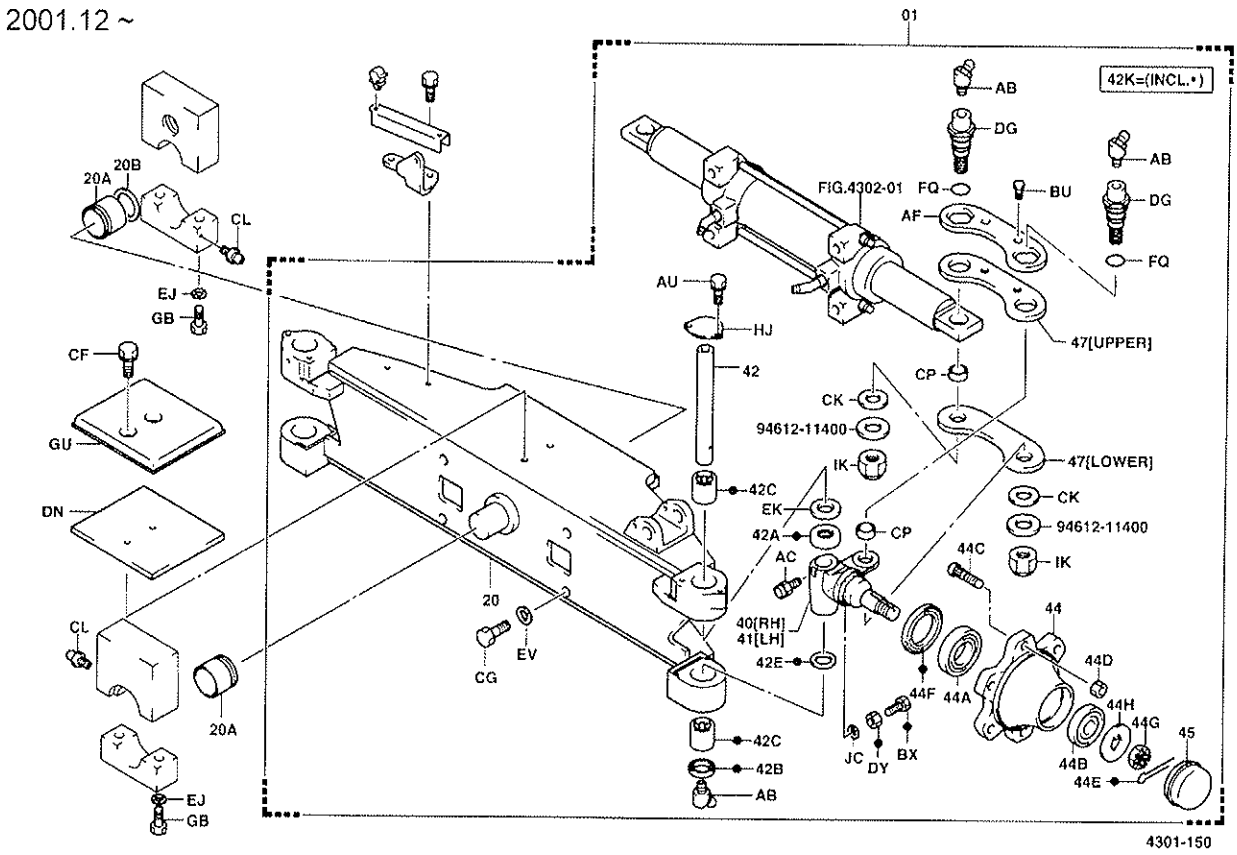
COMPONENTS

4301

~ 2001.12

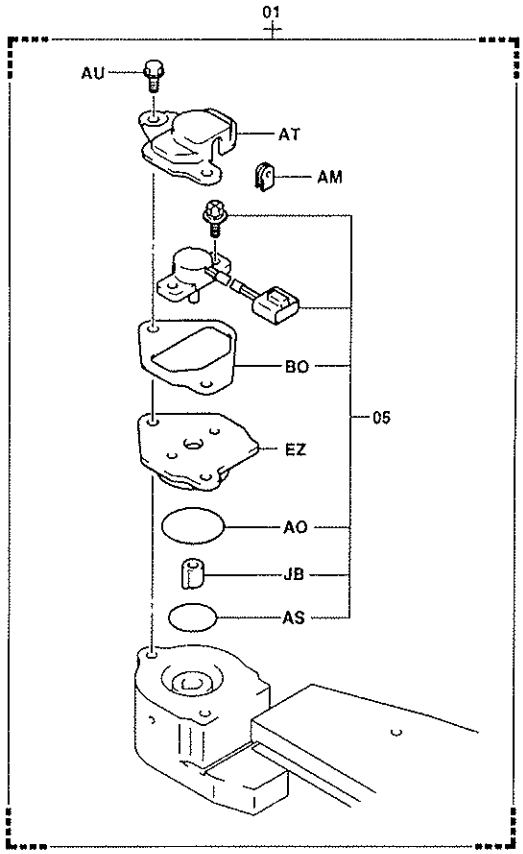


2001.12 ~



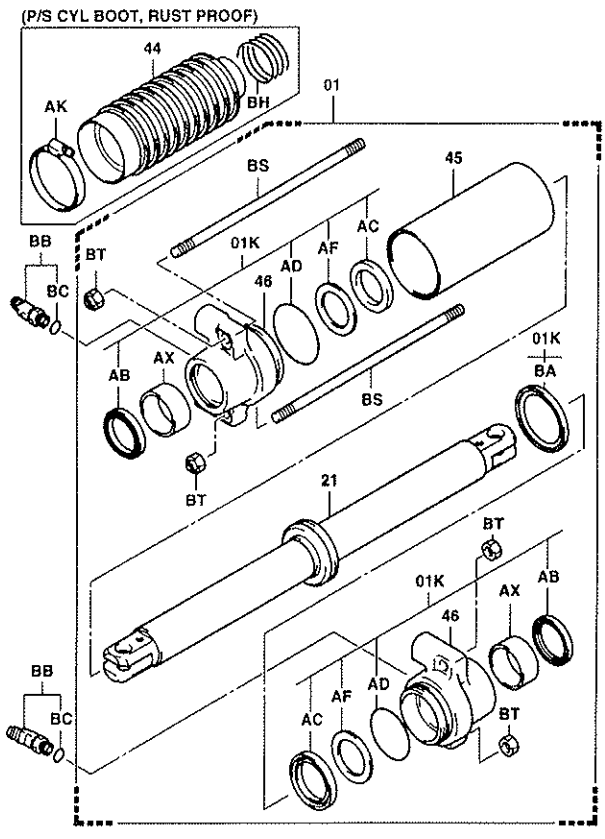
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4301



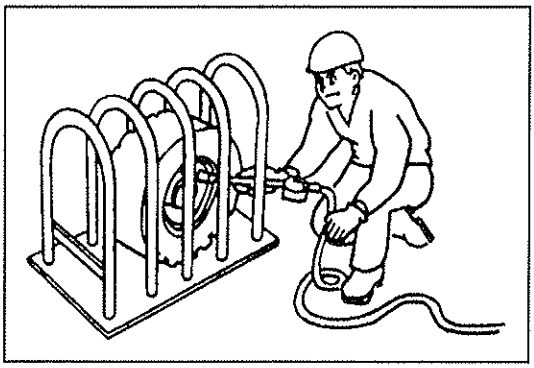
4301-120A

4302



4302-020A

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TIRES·WHEELS

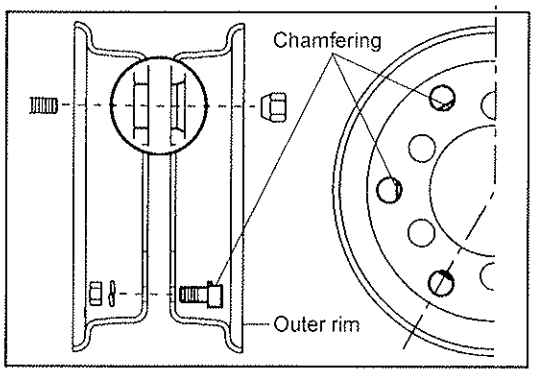
1. Adjusting the Inflating Pressure

Caution:
- **Do not inflate tires beyond the specified pressure because it may cause dangerous tire bursting.**
- **When inflating a tire removed from the vehicle, place it in a safety fence.**

Specified Inflating Pressure

Classification	Specification	Tire size	Rim type	Maker	Inflating pressure kPa (kgf/cm²) [psi]
1 ton series	STD	5.00-8-8PR	Divided rim	BRIDGESTONE	800 (8.0) [114]
	DIVIDED	↑	↑	CONTINENTAL	↑
	S-RING	↑	Side ring	BRIDGESTONE	↑
	S-RING	↑	↑	CONTINENTAL	↑
2 ton series	STD	6.00-9-10PR	Divided rim	BRIDGESTONE	700 (7.0) [100]
	DIVIDED	↑	↑	CONTINENTAL	800 (8.0) [114]
	S-RING	↑	Side ring	BRIDGESTONE	850 (8.5) [121]
	S-RING	↑	↑	CONTINENTAL	800 (8.0) [114]
3 ton series	STD	6.50-10-10PR	↑	BRIDGESTONE	775 (7.75) [110.2]
	S-RING	6.50-10-14PR	↑	CONTINENTAL	800 (8.0) [114]
J3.5 ton series	STD	6.50-10-12PR	↑	BRIDGESTONE	900 (9.0) [128]
	S-RING	6.50-10-14PR	↑	CONTINENTAL	↑

Abbreviations used in the specification column:
STD = Standard, S-RING = Side ring



2. Wheel Disassemly·Reassembly

Caution:
Always discharge air fully before disassembling the wheel. Otherwise, it is very dangerous since the rim may come off suddenly due to the internal pressure.

Note:
Install each divided rim set bolt with its head on the outer rim side and the chamfered portion facing the center of the wheel.

T = N·m (kgf-cm) [ft-lbf]

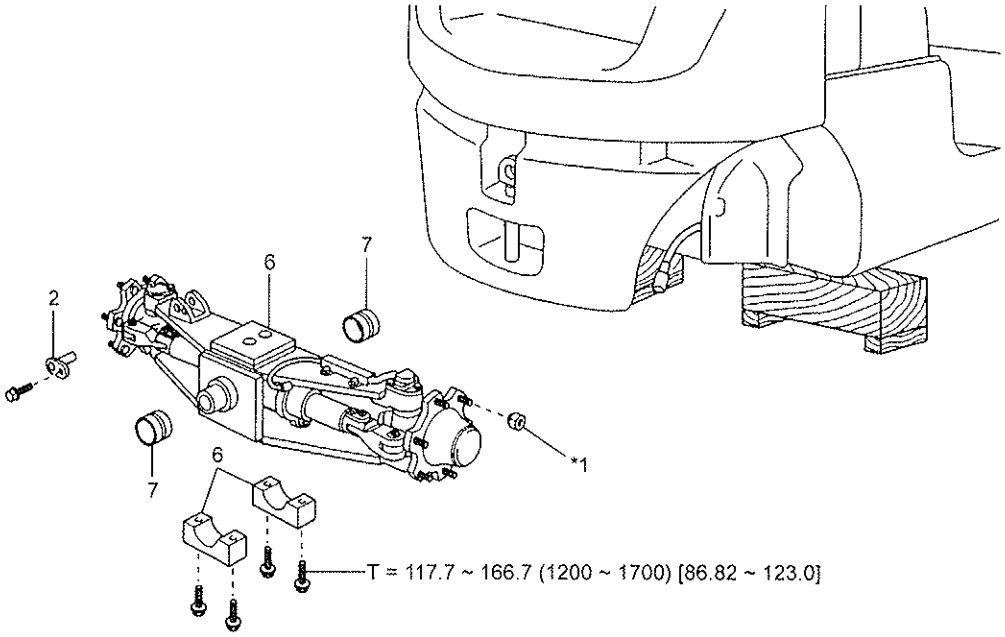
1 ton series	T = 29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
2 ton series	T = 49.0 ~ 68.6 (500 ~ 700) [36.2 ~ 50.7]

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REAR AXLE ASSY

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



*1 Hub nut

	1 ton series	2 ton series	3·J3.5 ton series
Devided rim	88.3 ~ 157.0 (900 ~ 1600) [65.12 ~ 115.8]	117.6 ~ 196 (1200 ~ 2000) [86.82 ~ 144.7]	–
Side ring rim	88.3 ~ 157.0 (900 ~ 1600) [65.12 ~ 115.8]	176.4 ~ 392 (1800 ~ 4000) [130.2 ~ 289.4]	117.6 ~ 196 (1200 ~ 2000) [86.82 ~ 144.7]

Removal Procedure

1 Jack up the vehicle and remove rear wheels.

2 Remove the swing lock cylinder lower pin. (See section 15.)

3 Disconnect the rear axle cylinder hose.

4 Disconnect the tire angle sensor connector.

5 Support the rear axle ASSY with a garage jack.

6 Remove the rear axle ASSY. **[Point 1]**

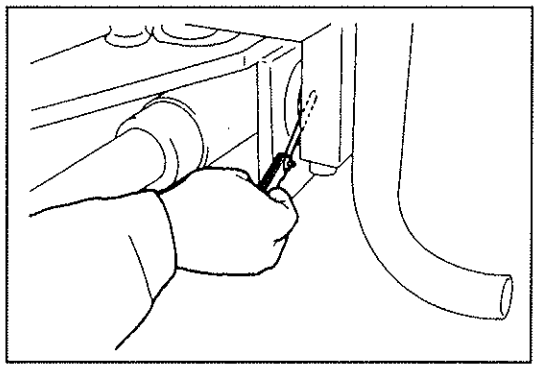
7 Remove the center pin bushing. **[Point 2]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
After installation, add grease through each grease fitting. Add genuine molybdenum disulfide grease at the rear axle beam center pins (two places) and swing lock cylinder lower pin. Use MP grease to other grease fittings.

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Point Operations

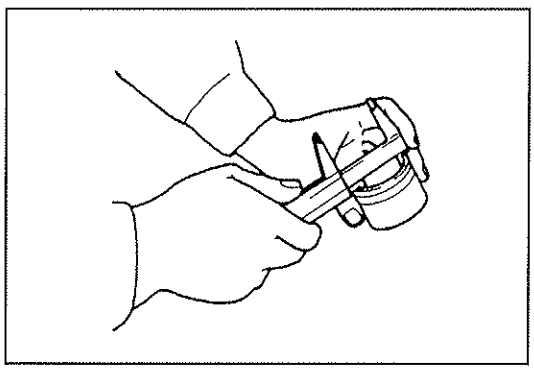
[Point 1]
Inspection:
Measure the rear axle front to rear clearance.

1. Before removing the rear axle ASSY, measure the front to rear clearance on the rear side.

   Standard clearance: 0.7 mm (0.028 in) or less

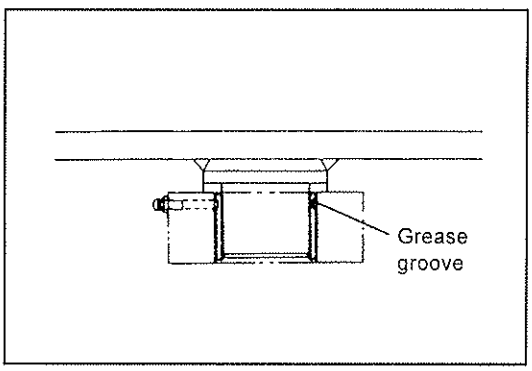
2. If the measured value does not satisfy the standard, remove the rear axle ASSY and make adjustment by selecting the spacer.

   Spacer thickness:
   0.5·1.2·2.3·3.0·3.5·4.0·4.5 and 5.0 mm (0.020·0.047·0.091·0.118·0.138·0.157·0.177 and 0.197 in)



[Point 2]
Inspection:
Inspect the inside diameter of the rear axle center pin bushing.

Limit: 52.0 mm (2.047 in)



Installation:
Apply molybdenum disulfide grease on the bushing and install the bushing by aligning the grease groove in the bushing with the grease fitting position.

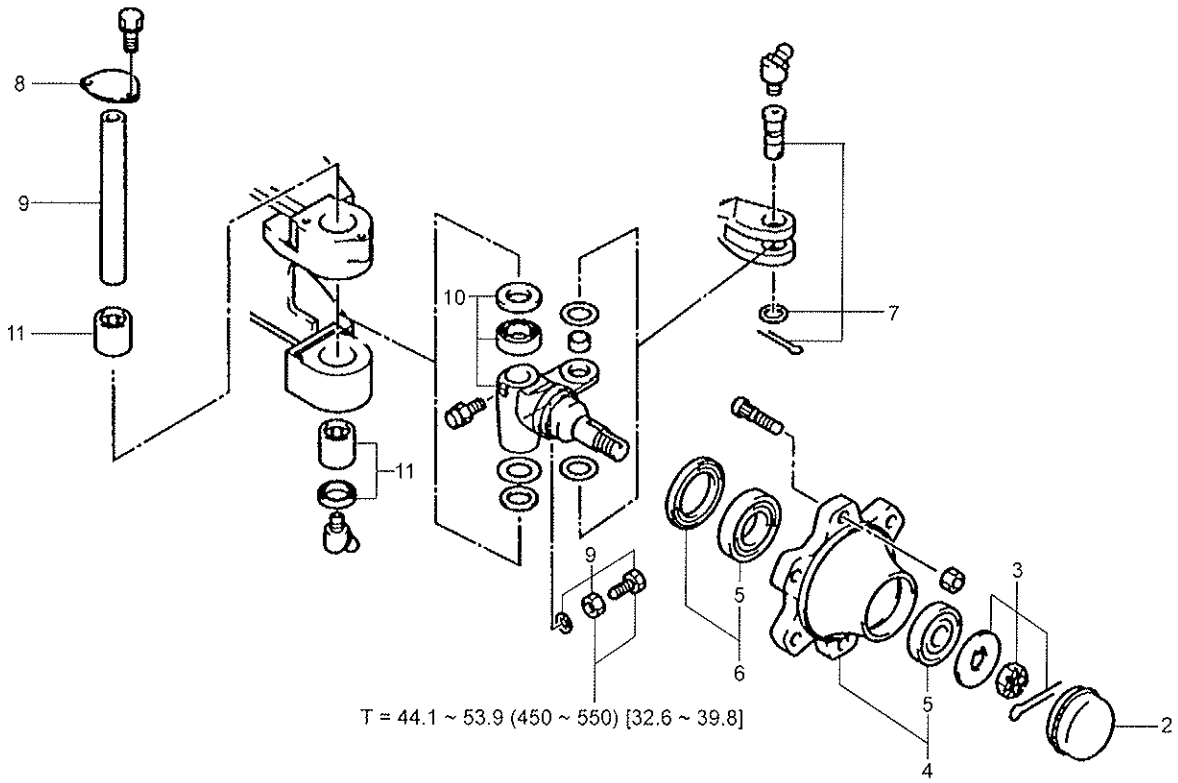
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REAR AXLE HUB·STEERING KNUCKLE

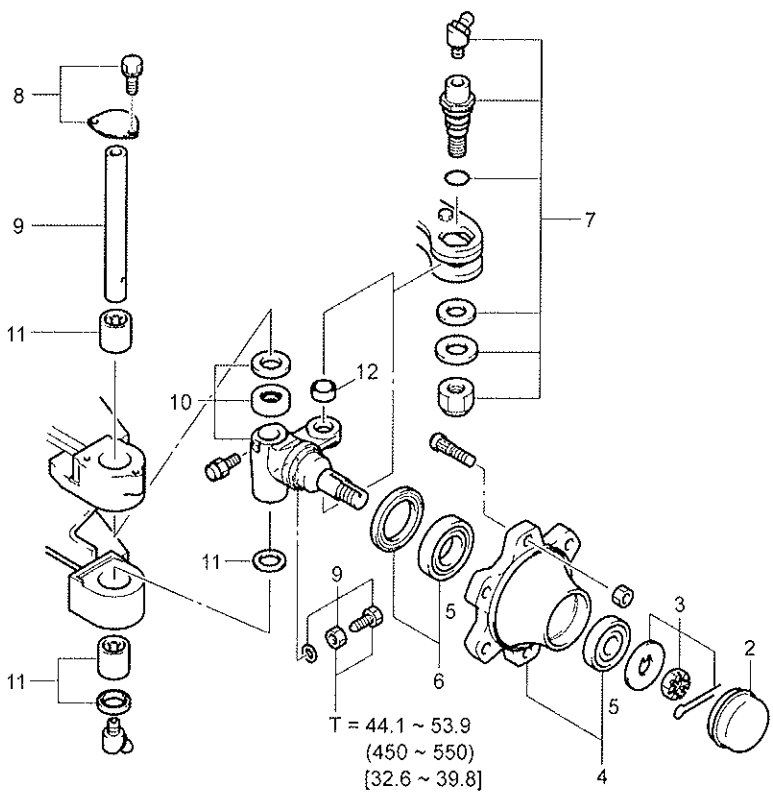
REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]

~ 2001.12



2001.12 ~



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Removal Procedure

~ 2001.12:

1 Jack up the vehicle and remove rear wheels.
2 Remove the hub caps. **[Point 1]**
3 Remove the castle nut and claw washer. **[Point 2]**
4 Remove the outer bearing and axle hub. **[Point 3]**
5 Remove the bearing outer race from the axle hub. **[Point 4]**
6 Remove the inner bearing roller and oil seal. **[Point 5]**
7 Disconnect the tie rod (on the knuckle side).
8 Remove the king pin cover (on the LH side) or the tire angle sensor (on the RH side).
9 Remove the king pin lock bolt and king pin. **[Point 6]**
10 Remove the thrust bearing, spacer and steering knuckle.
11 Remove the king pin oil seal and needle roller bearing. **[Point 7]**

2001.12 ~:

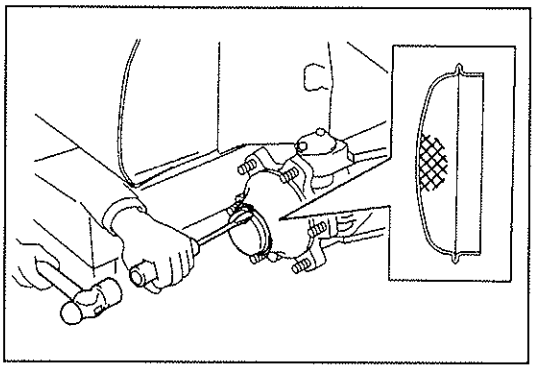
1 Jack up the vehicle and remove rear wheels.
2 Remove the hub caps. **[Point 1]**
3 Remove the castle nut and claw washer. **[Point 2]**
4 Remove the outer bearing and axle hub. **[Point 3]**
5 Remove the bearing outer race from the axle hub. **[Point 4]**
6 Remove the inner bearing roller and oil seal. **[Point 5]**
7 Disconnect the tie rod (on the knuckle side). **[Point 8]**
8 Remove the king pin cover (on the LH side) or the tire angle sensor (on the RH side).
9 Remove the king pin lock bolt and king pin. **[Point 6]**
10 Remove the thrust bearing, spacer and steering knuckle.
11 Remove the king pin oil seal and needle roller bearing. **[Point 7]**
12 Remove the bushing from the steering knuckle. **[Point 9]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

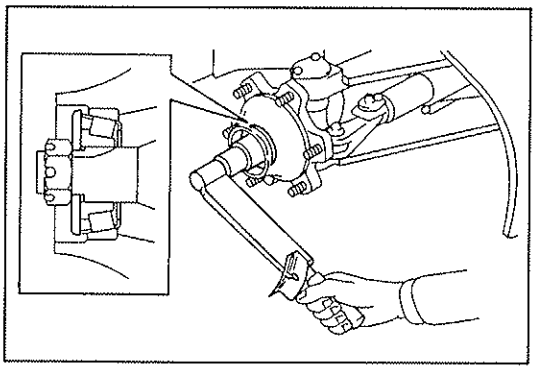
Note:
After installation, add MP grease through grease fittings.

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Point Operations

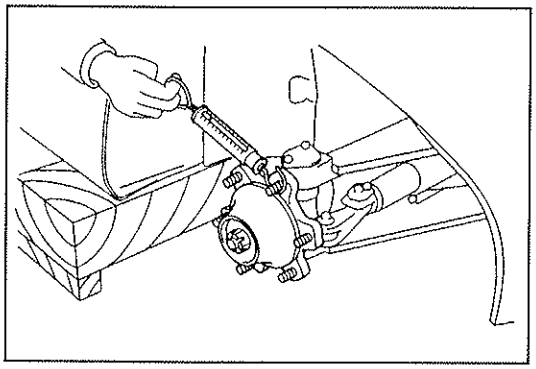
[Point 1]
Installation:
Fill MP grease in the hub cap, and install by tapping the flange portion.

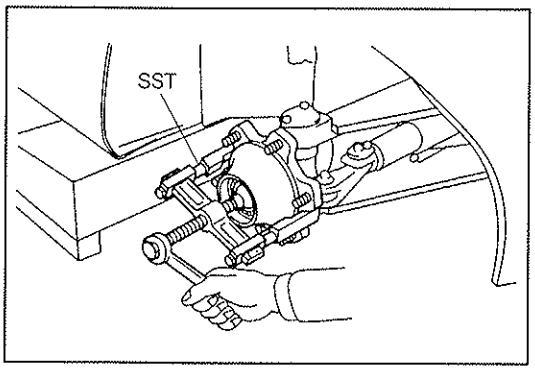


[Point 2]
Installation:
Adjust the rear axle hub starting force.
1. Install the claw washer in the correct direction.
2. Install the castle nut and temporarily tighten it to a torque of 15 to 32 N·m (150 to 330 kgf-cm) [10.9 to 23.9 ft-lbf].
3. Rotate the hub by 3 to 5 turns to run in the bearing.
4. Set a spring scale on a hub bolt, and measure the starting force.

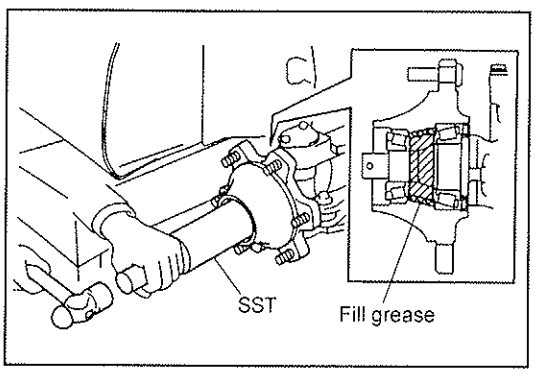
Standards:
1 ton series: 15 ~ 39 (1.5 ~ 4.0 kgf) [3.3 ~ 8.5 lbf]
2·3·J3.5 ton series: 15 ~ 44 N (1.5 ~ 4.5 kgf) [3.3 ~ 9.9 lbf]

5. If the standard is not satisfied, adjust the degree of castle nut tightening for adjustment.
6. Install a new cotter pin.



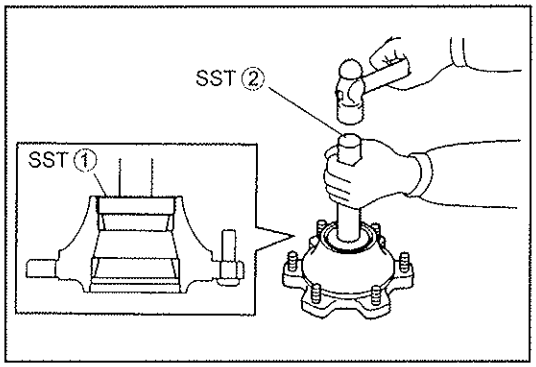


[Point 3]
Removal:
SST 09950-76014-71
(SST 09950-40011)



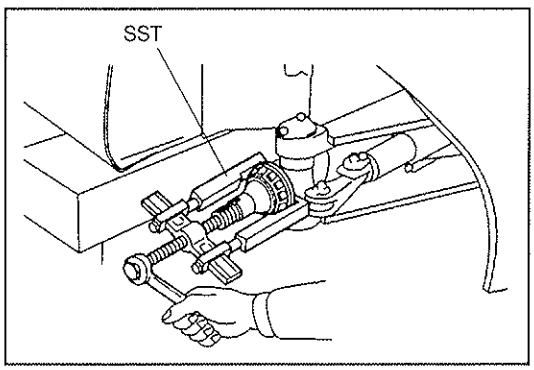
Installation:
Install the axle hub and outer bearing.
1. Fill MP grease in the axle hub and knuckle spindle.
2. Install the axle hub.
3. Use the SST and install the outer bearing roller.
SST 09370-20270-71

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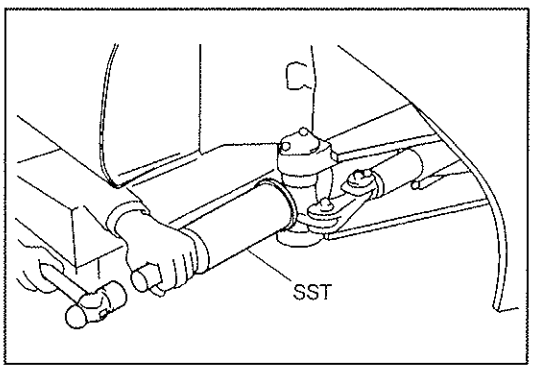


[Point 4]
Removal:
Use a brass bar and remove the bearing outer race.

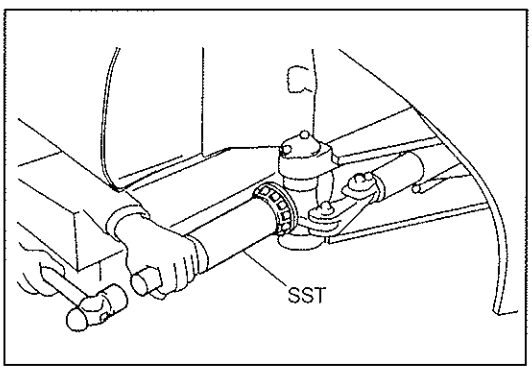
Installation:
SST 09950-76019-71 --- ①
(SST 09950-60020)
SST 09950-76020-71 --- ②
(SST 09950-70010)



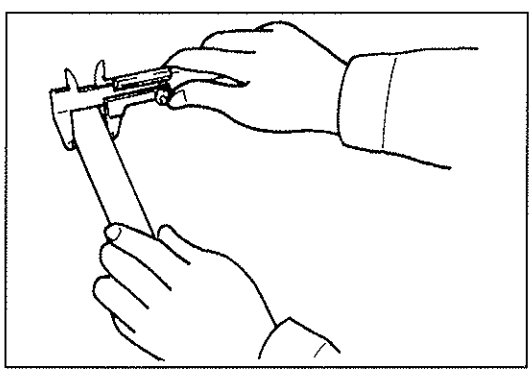
[Point 5]
Removal:
SST 09950-76014-71
(SST 09950-40011)



Installation:
Install the oil seal and inner bearing roller.
1. Use the SST and install the oil seal.
SST 09370-10410-71



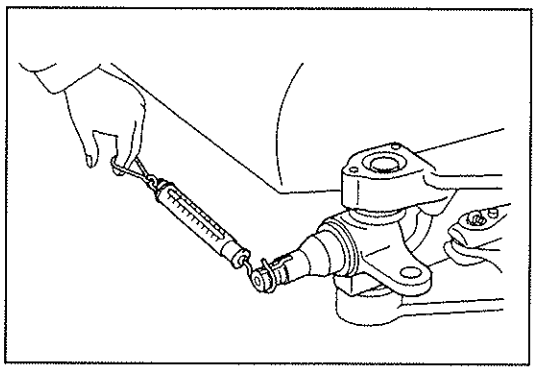
2. Use the SST and install the inner bearing roller.
SST 09370-20270-71

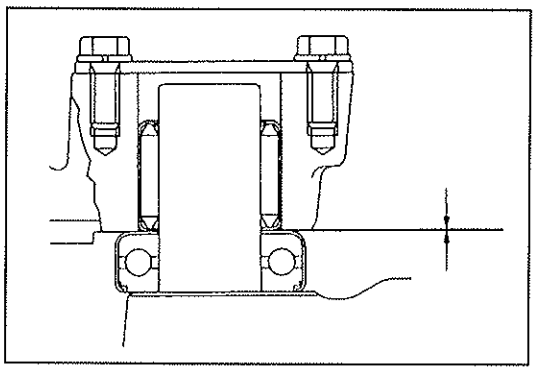


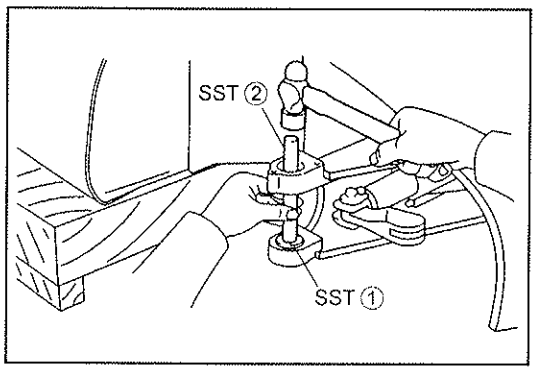
[Point 6]
Inspection:
Measure the king pin outside diameter.

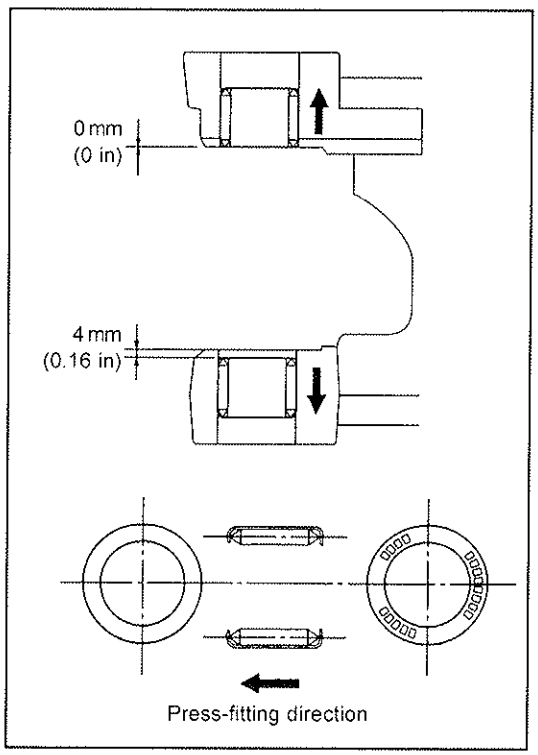
Limit: 27.8 mm (1.094 in)

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Installation:

Measure the steering knuckle starting force.

1. Temporarily install the king pin and king pin lock bolt. Select the spacer so as to minimize vertical looseness of the knuckle, and install it on top of the thrust bearing.

2. Set a spring scale at the tip end of the knuckle spindle, and measure the starting force.

   Standard: 19.3 N (2.0 kgf) [4.4 lbf] or less

3. If the standard is exceeded, check the king pin for bend, the needle bearing for damage and axle beam for deformation.

   Spacer thickness:
   ~ 1999.9: 3.0, 3.5, 4.0 and 4.5 mm (0.118, 0.138, 0.157 and 0.177 in)
   1999.9 ~: 1 ton series
   0.5 and 1.0 mm (0.020 and 0.039 in)
   2·3 ton series
   3.0, 3.5, 4.0 and 4.5 mm (0.118, 0.138, 0.157 and 0.177 in)

4. Tighten the lock nut for the king pin lock bolt.

[Point 7]

Removal:

Remove the king pin oil seal and needle roller bearing.

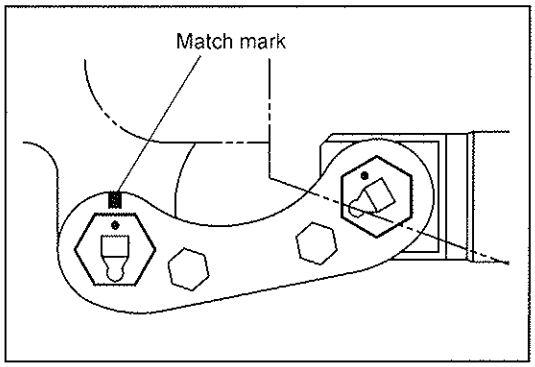
1. Use a straight-edge screwdriver to remove the dust seal and oil seal.
2. Use the SST and remove the needle roller bearing.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)

Installation:

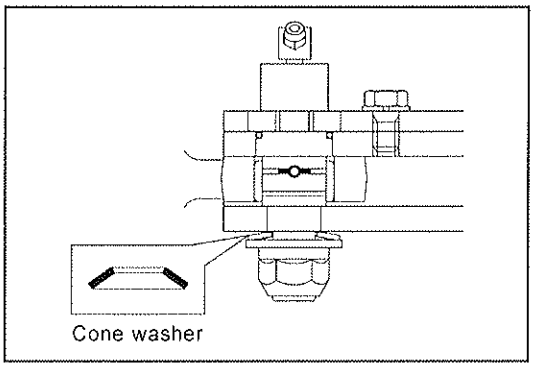
Install the needle roller bearing and king pin oil seal.

1. Use the SST and install the needle bearing.
   Check the needle roller bearing press-fitting surface, pressing direction and installation depth.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)
2. Install the dust seal.
3. Use the SST and install the oil seal.
   SST 09950-76018-71 --- ①
   (SST 09950-60010)
   SST 09950-76020-71 --- ②
   (SST 09950-70010)

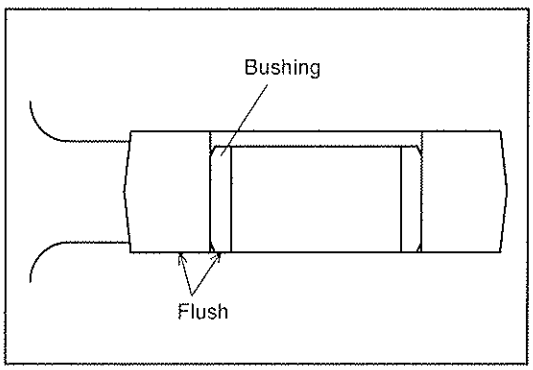
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[Point 8]
Removal:
Mark the end pin punch mark position to the plate side.
Installation:
Install by matching the end pin punch mark position to the marking on the plate side.



Installation:
To install the end pin lock nut, install the cone washer in the illustrated direction and tighten to a specified torque.
T = 49.0 ~ 78.5 N·m (500 ~ 800 kgf-cm)
[36.2 ~ 57.9 ft-lbf]



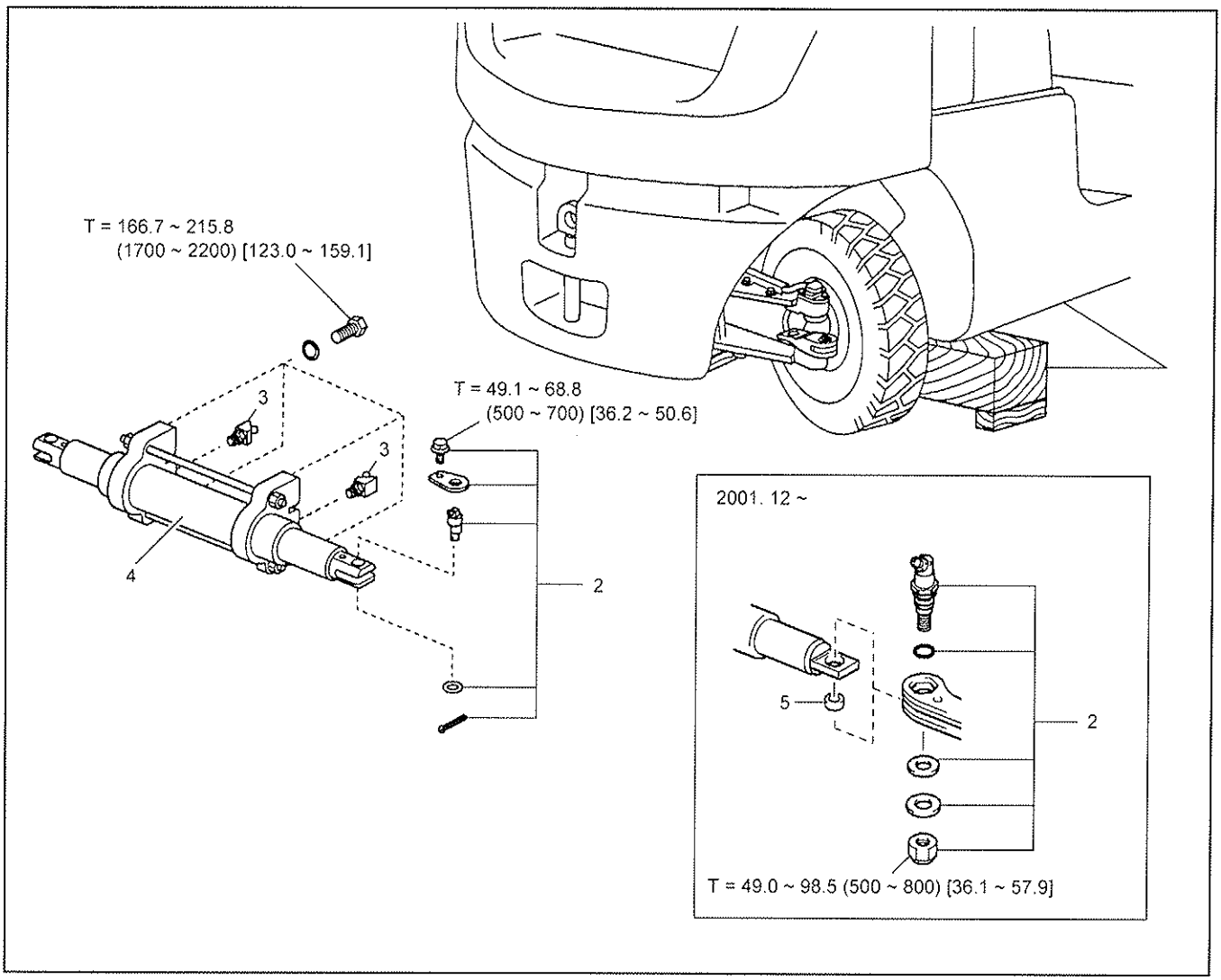
[Point 9]
Installation:
Press-in the bushing flush to the lower surface of the knuckle. (Clearance on the upper side will be used for the grease well.)

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REAR AXLE CYLINDER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Jack up the vehicle.

2 Disconnect the tie rod (on the piston rod side). **[Point 1]**

3 Disconnect the rear axle cylinder hose and remove the fitting. **[Point 2]**

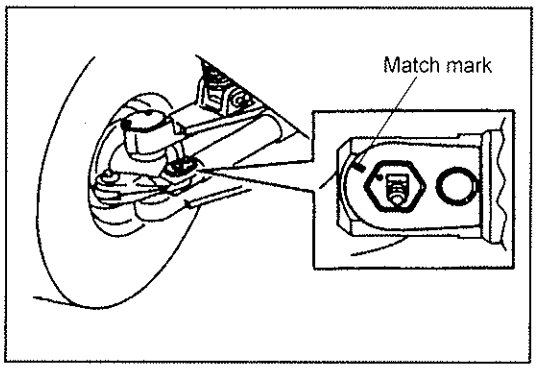
4 Remove the rear axle cylinder.

5 Remove the bushing from the piston rod. **[Point 3]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

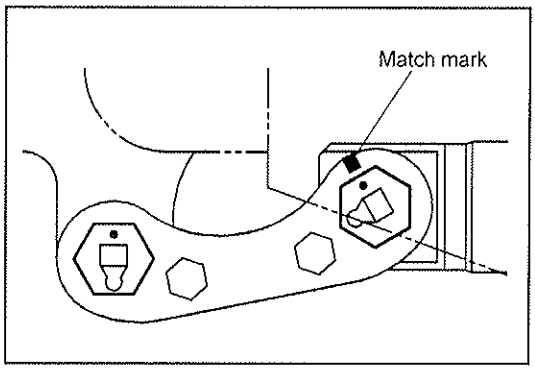
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Point Operations

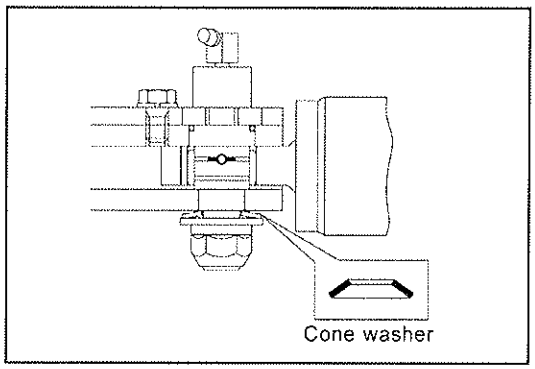
[Point 1] (~ 2001.12)
Removal:
Mark the punch mark position on each of cylinder end pins LH and RH.

Installation:
Install each cylinder end pin by aligning the punch mark with the mark.

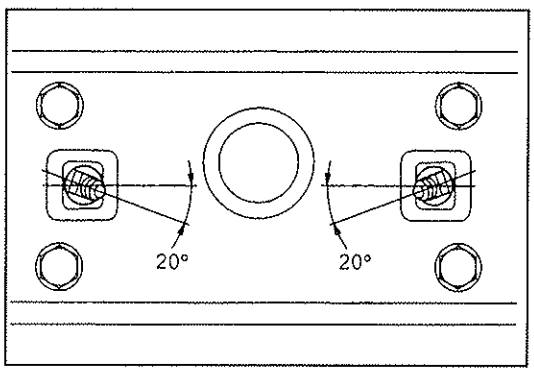


[Point 1] (2001.12 ~)
Removal:
Mark the end pin punch mark position to the plate side.

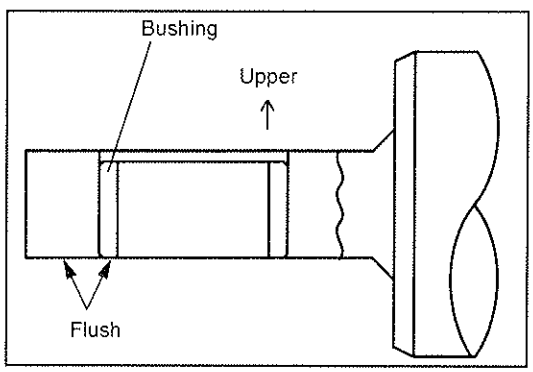
Installation:
Install by matching the end pin punch mark position to the marking on the plate side.



Installation:
To install the end pin lock nut, install the cone washer in the illustrated direction and tighten to a specified torque.
T = 49.0 ~ 78.5 N·m (500 ~ 800 kgf-cm)
[36.2 ~ 57.9 ft-lbf]



[Point 2]
Installation:
Install the fitting in the illustrated direction.

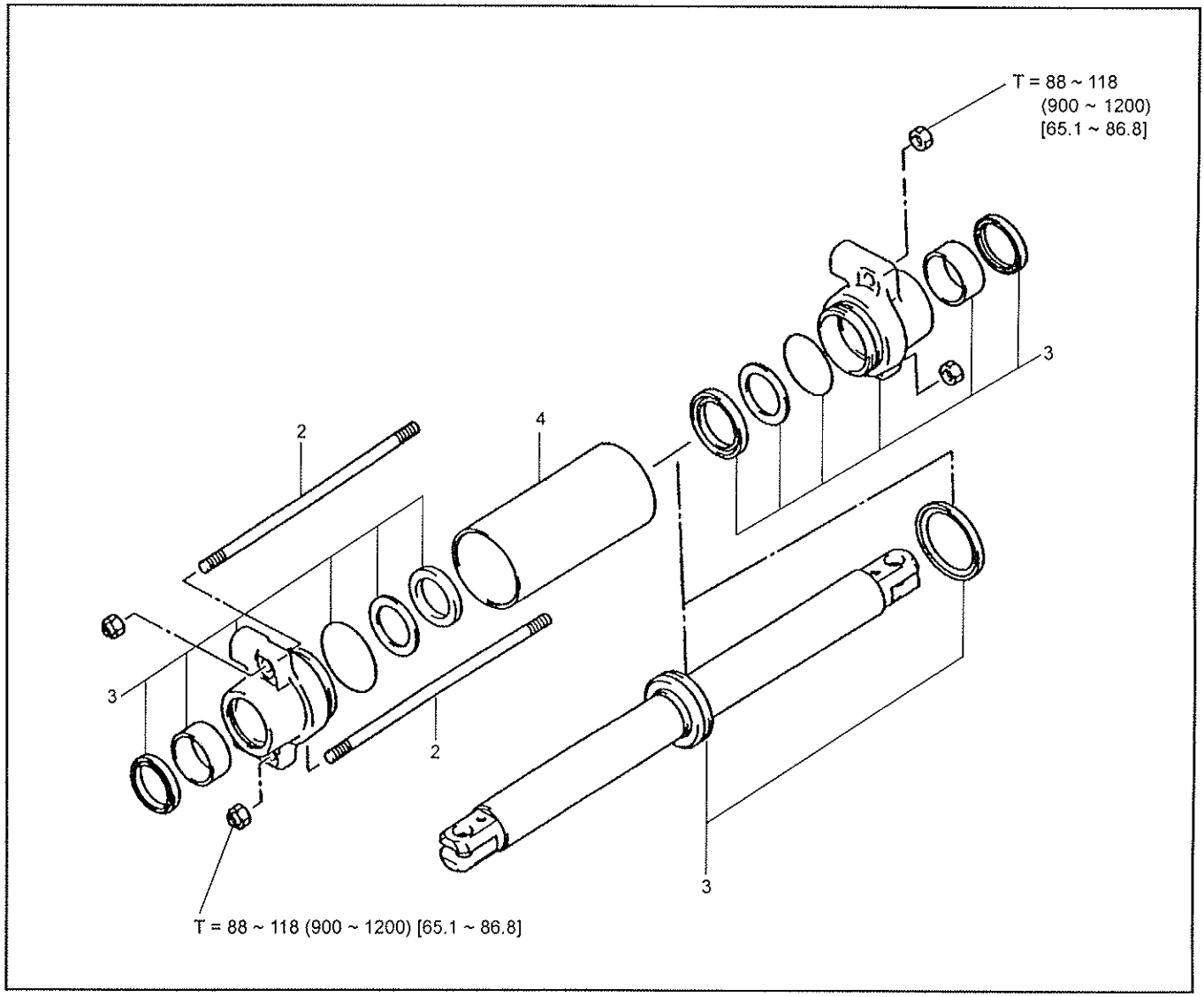


[Point 3] (2001.12 ~)
Installation:
Press-in the bushing flush to the lower surface of the rod on both ends. (Clearance on the upper side will be used for the grease well.)
Check the vertical direction of the rod when installing the cylinder.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the through bolt.

2 Remove the piston rod guide.

3 Remove the piston rod. **[Point 1]**

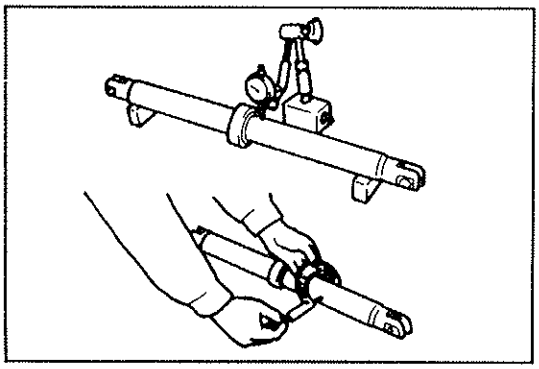
4 Inspect the cylinder. **[Point 2]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Coat hydraulic oil before reassembly.

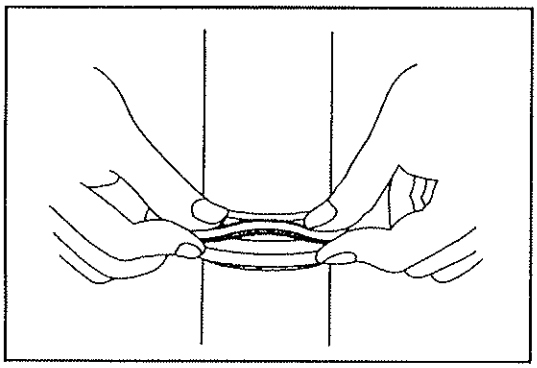
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Point Operations

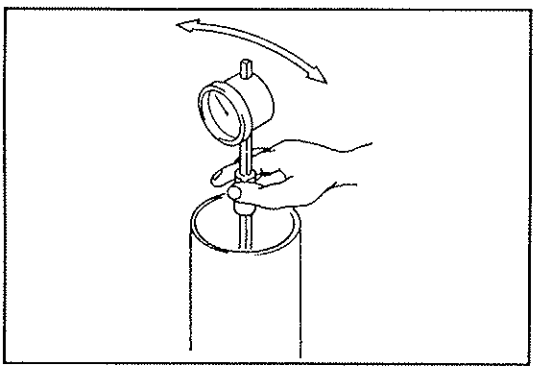
[Point 1]
Inspection:
Measure the piston rod outside diameter.
Limit: 49.92 mm (1.9654 in)

Inspection:
Measure the bend of the piston rod.
Limit: 0.5 mm (0.020 in)



Reassembly:
Warm the seal ring to a little below 80°C (176°F) in hot oil or water before installation.
Do not stretch it excessively.

Caution:
Operate carefully to avoid scalding.



[Point 2]
Inspection:
Measure the rear axle cylinder bore.

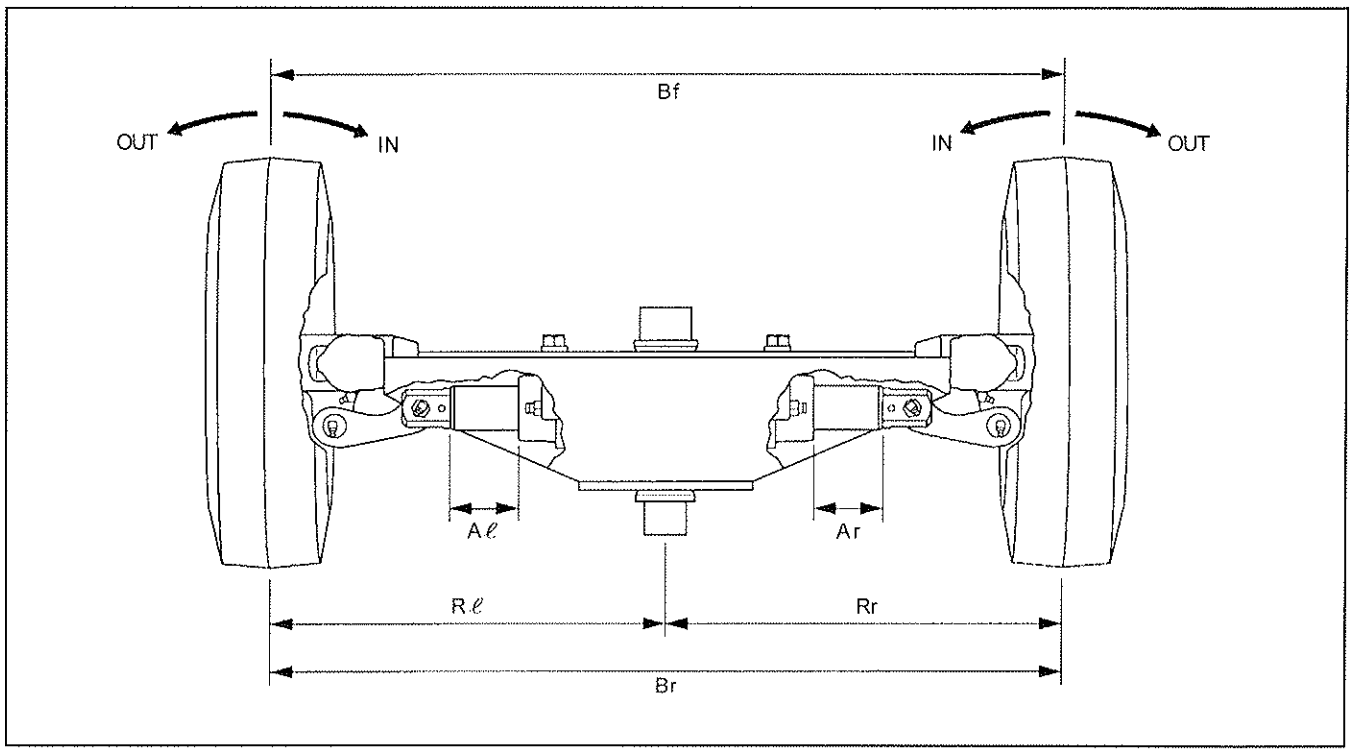
Limit:
1 ton series: 76.35 mm (3.0059 in)
2 ton series: 80.35 mm (3.1634 in)
3 ton series: 84.40 mm (3.3228 in)
J3.5 ton series: 87.40 mm (3.4409 in)

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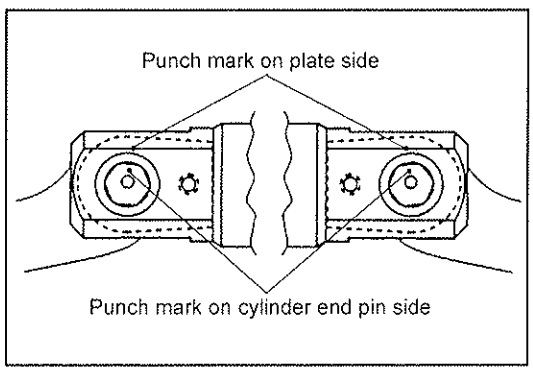
REAR WHEEL ALIGNMENT (~ 2001.12)

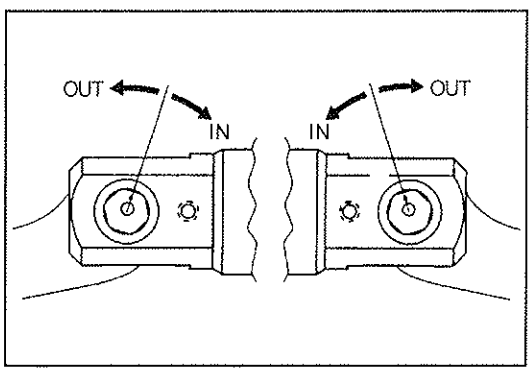
Toe-in Inspection

1. Check to see that dimensions Ar and Aℓ of the rear axle cylinder are equal.
2. Measure the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)



Toe-in Adjustment





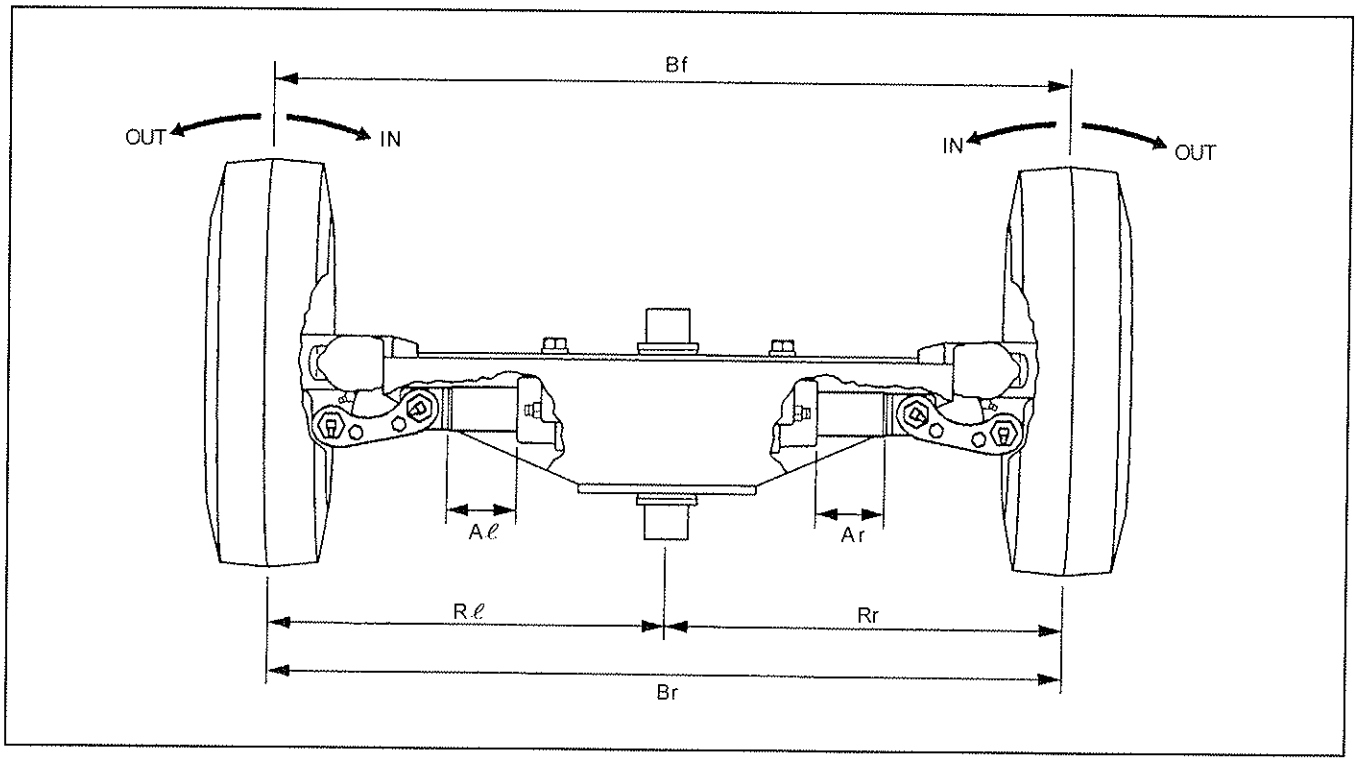
1. Check to see that Ar and Aℓ of the rear axle cylinder are equal.
2. Align the punch mark on the cylinder end pin (eccentric pin) with the punch mark on the plate on the front side for both the LH and RH sides.
3. Measure and adjust the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)
   If the standard is not satisfied, make adjustment by the cylinder end pin in the range where the difference between Rℓ and Rr is within 0 ± 3 mm (0.12 in).
   (1) When measued value > 4 mm (0.16 in):
   Measure Rℓ and Rr, and adjust the cylinder end pin on the smaller side toward IN.
   (2) When measured value < 4 mm (0.16 in):
   Measure Rℓ and Rr, and adjust the cylinder end pin on the greater side toward OUT.
   Note:
   - **If Rℓ equals to Rr, adjust the same amount on the LH and RH sides.**
   - **If the standard is not attained by adjustment on one side, make adjustment also on the other side.**
4. Install the plate. The plate can be installed with either face up.
5. After adjustment, fully steer the tires and check to see that they do not come into contact with the vehicle body.

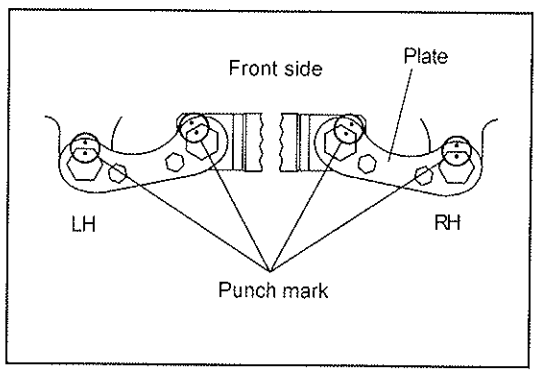
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REAR WHEEL ALIGNMENT (2001.12 ~)

Toe-in Inspection

1. Check to see that dimensions Ar and Aℓ of the rear axle cylinder are equal.
2. Measure the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)

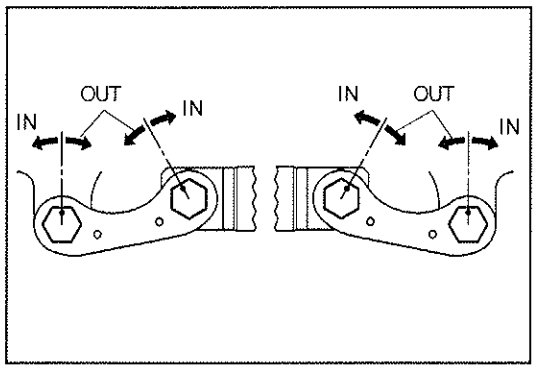




Toe-in Adjustment

1. Check to see that Ar and Aℓ of the rear axle cylinder are equal.
2. Match the punch marks on the end pin (eccentric pin) and the plate to the front side for all four points as illustrated.

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3. Measure and adjust the toe-in (Bf - Br).
   Standard: 0 ± 4 mm (0 ± 0.16 in)
   If outside the reference value, remove the lock plate and make adjustment using end pins in the range where the difference between Rℓ and Rr is within 0 ± 3 mm (0 ± 0.12 in).
   (1) When measured value > 4 mm (0.16 in)
   Measure Rℓ and Rr. Adjust the end pins of the smaller value to the IN side.
   (2) When measured value < 4 mm (0.16 in)
   Measure Rℓ and Rr. Adjust the end pins of the greater value to the OUT side.
   Note:
   - **If Rℓ equals to Rr, adjust the same amount on the LH and RH sides.**
   - **If the standard is not attained by adjustment on one side, make adjustment also on other side.**
4. After adjustment, fully steer the tires and check to see that they do not come into contact with the vehicle body.

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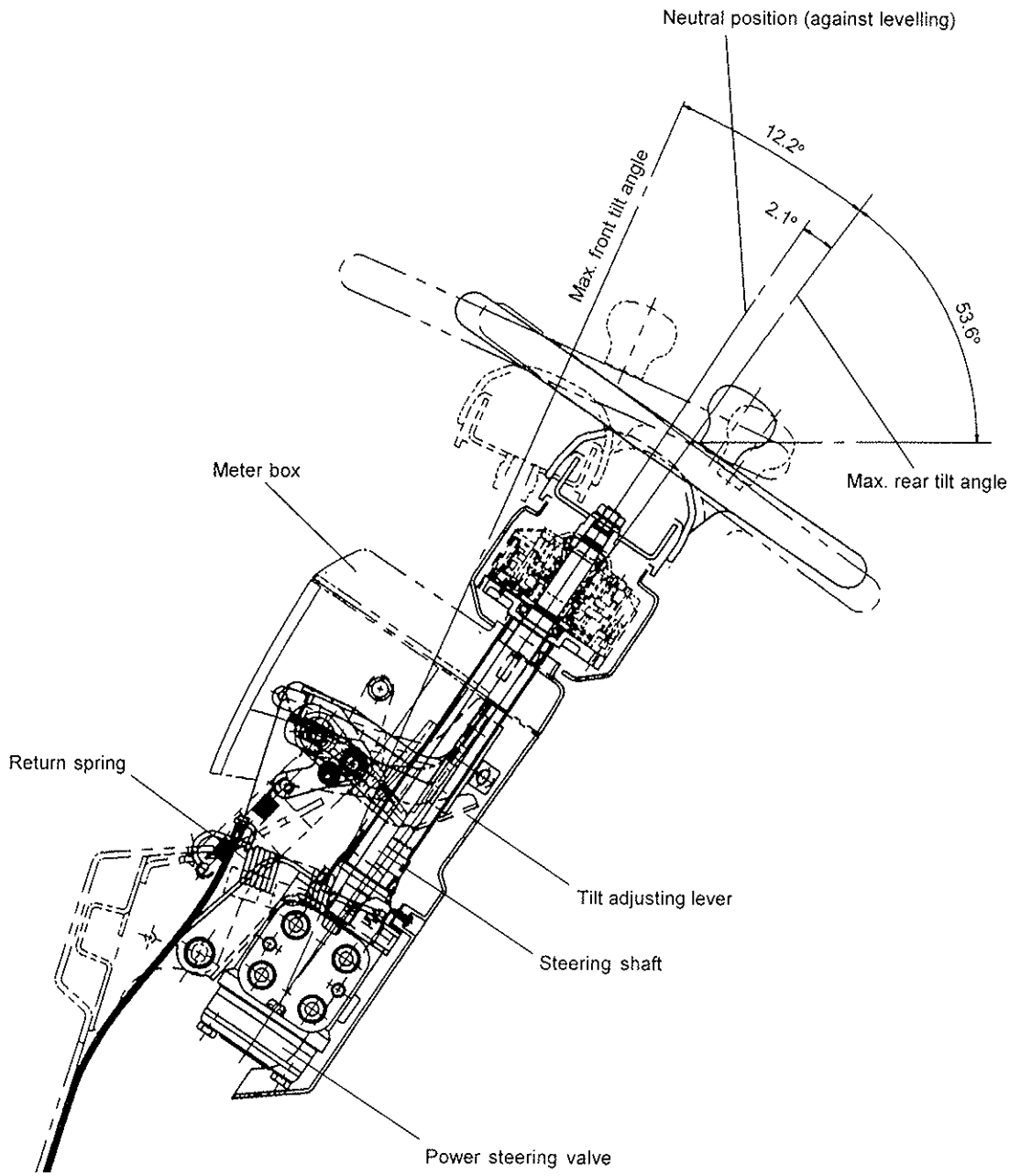
STEERING

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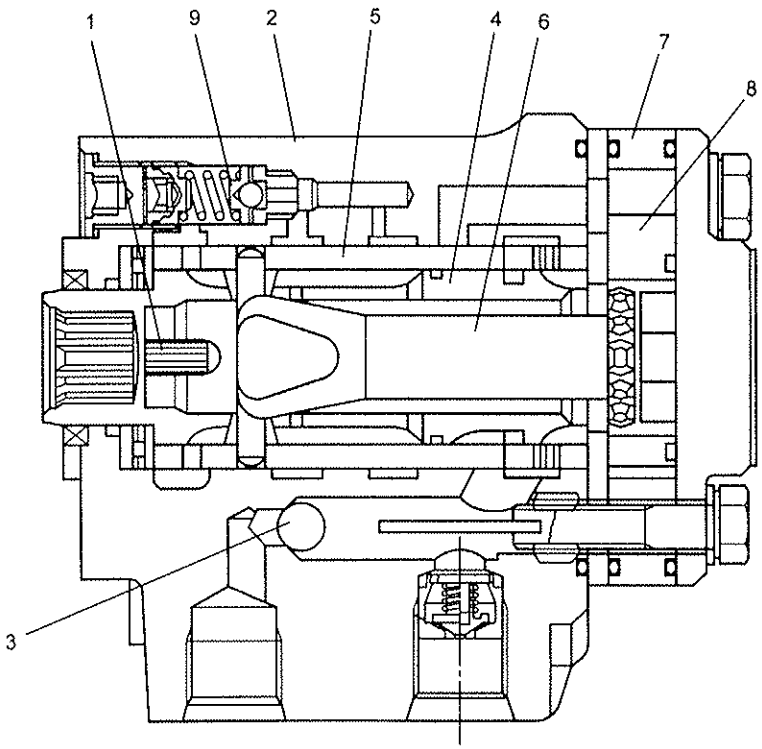
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GENERAL

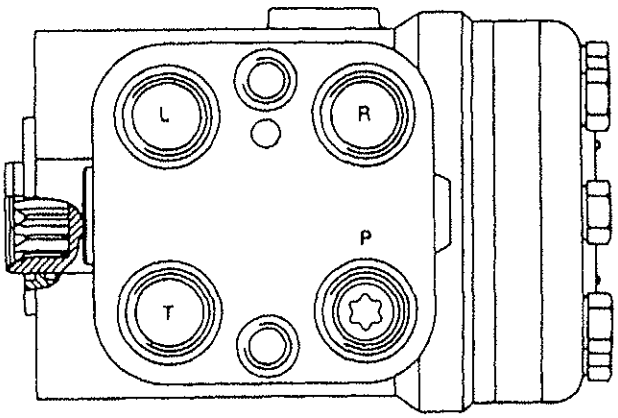


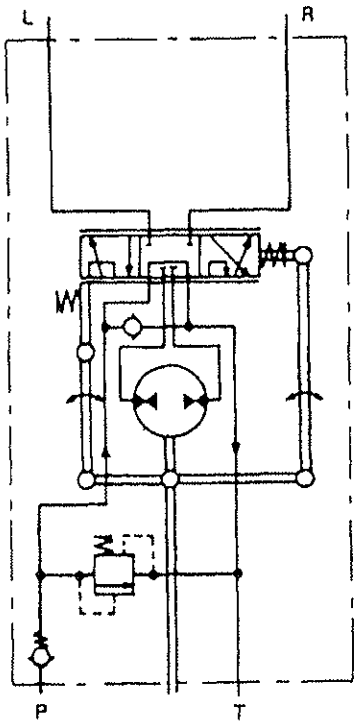
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Hydrostatic Steering Valve



1. Neutral position spring
2. Housing
3. Check valve
4. Spool
5. Sleeve
6. Cardan shaft
7. Gear rim
8. Gear wheel (rotor)
9. Relief valve





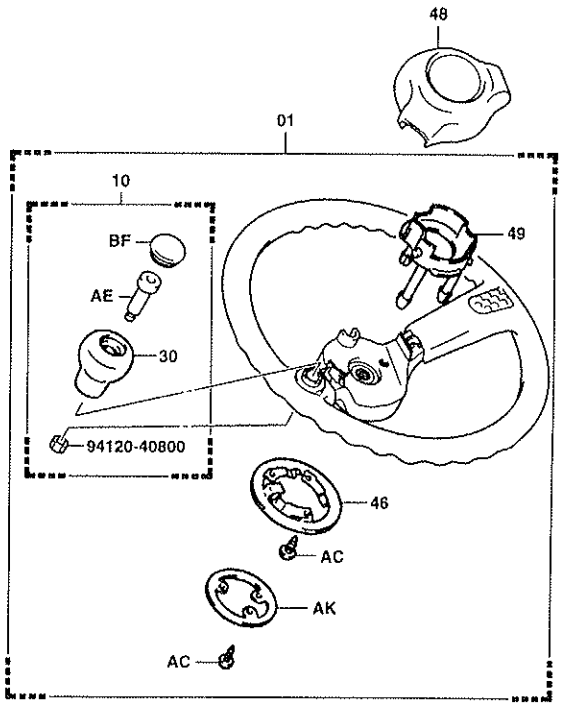
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SPECIFICATIONS

Item \ Vehicle series		1·2 ton series	3 ton series	J3.5 ton series
Steering wheel diameter mm (in)		360 (14.2)		
Steering wheel play (at idling) mm (in)		20 ~ 50 (0.79 ~ 1.97)		
Power steering type		Hydrostatic steering		
Hydrostatic steering valve	Type (manufacturer)	ospc (Danfoss)		
	Delivery cm^3 (in^3)/rev	100 (6.10)	115 (7.02)	125 (7.63)
	Rated flow rate ℓ(US gal)/min	13 (3.43)	←	15.2 (4.01)
	Relief set pressure kPa (kgf/cm^2) [psi]	8040 (82) [1170]	←	8340 (85) [1210]

COMPONENTS

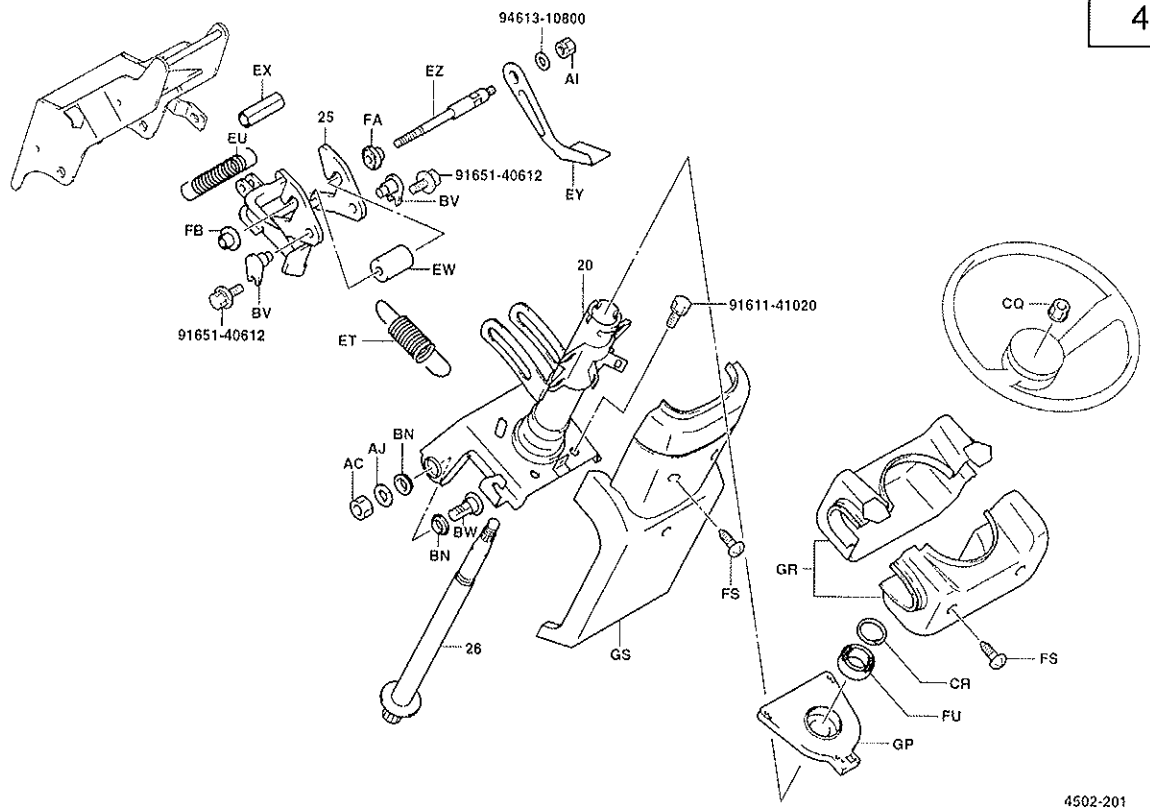
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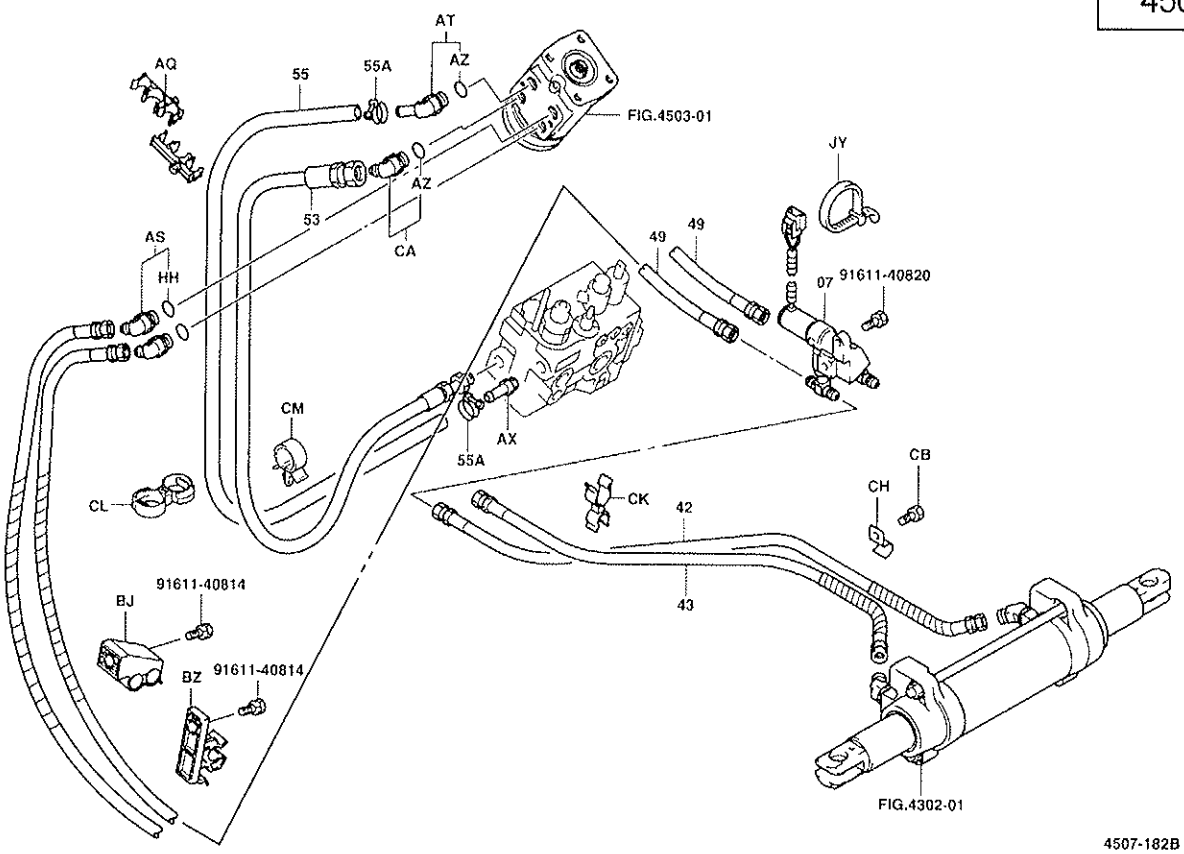
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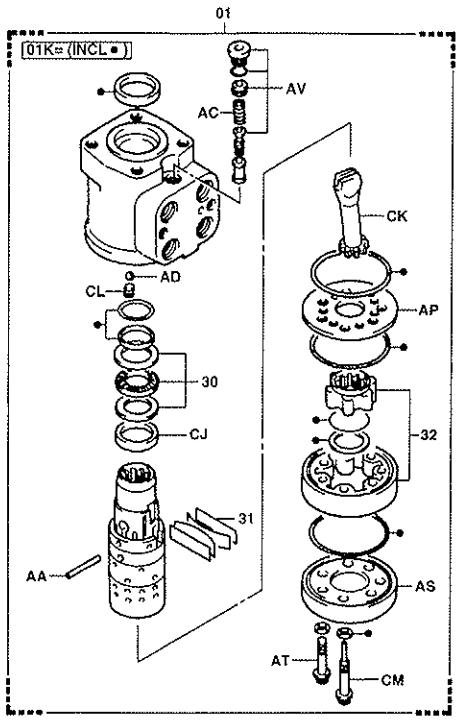
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4507



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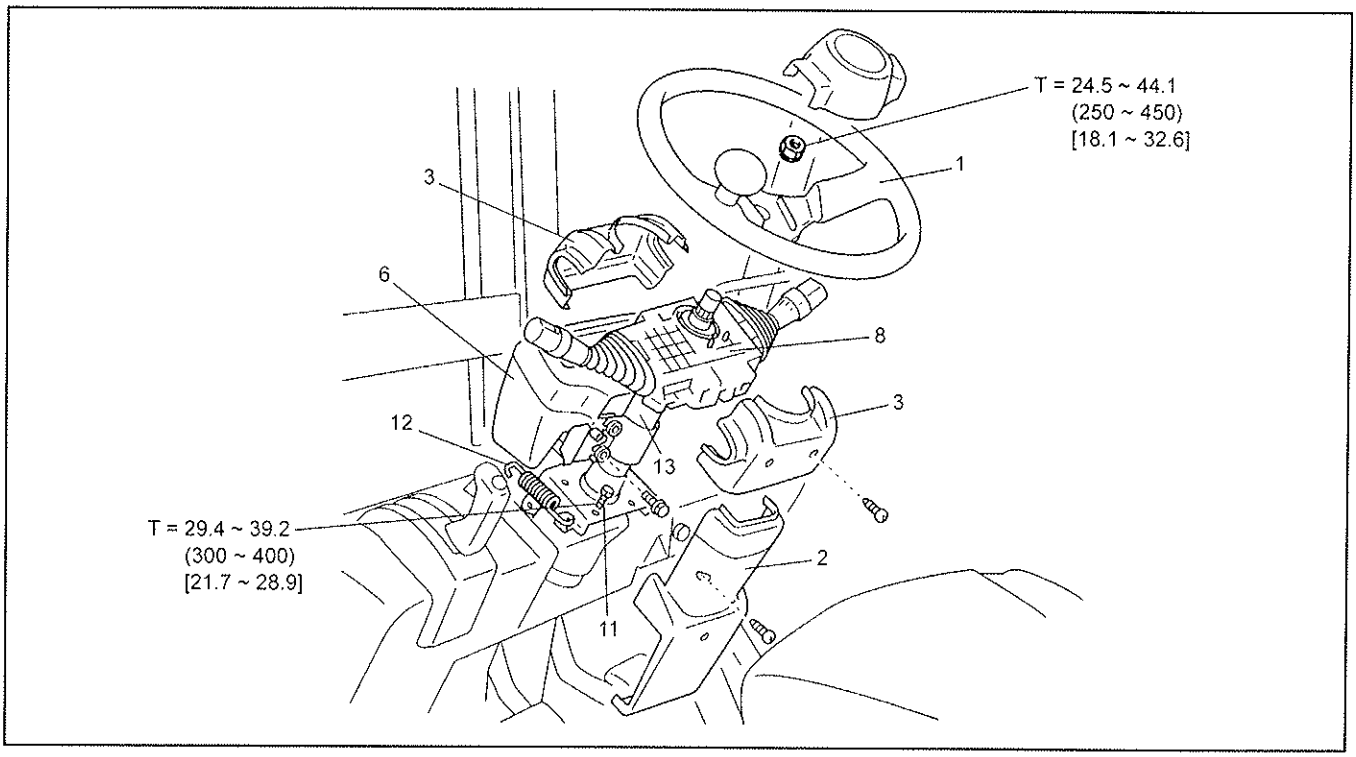
4503-035

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STEERING WHEEL·MAST JACKET

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the steering wheel. **[Point 1]**

2 Remove the combination meter ASSY cover.

3 Remove the lever switch ASSY cover. **[Point 2]**

4 Remove the combination meter ASSY set bolts.

5 Disconnect the combination meter wiring.

6 Remove the combination meter ASSY.

7 Disconnect the lever switch ASSY wiring.

8 Remove the lever switch ASSY.

9 Remove the tilt lock mechanism. **[Point 3]**

10 Disconnect the engine hood opening device.

11 Remove the steering valve set bolt and keep the valve free.

12 Remove the return spring.

13 Remove the mast jacket ASSY.

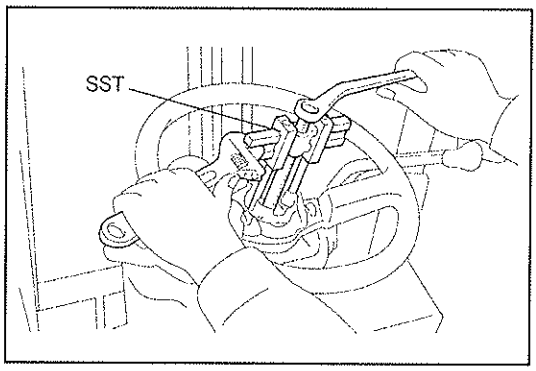
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:

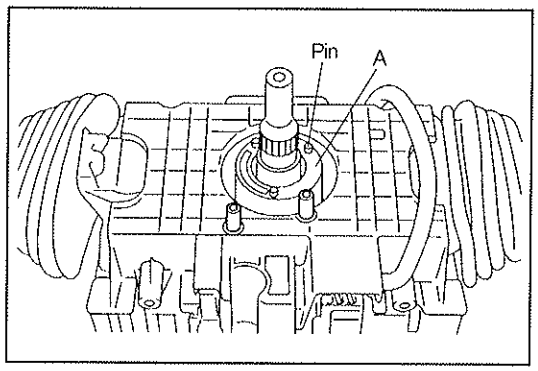
- **Apply MP grease on each sliding portion of the tilt lock mechanism and engine hood opening device.**
- **Fill MP grease at the coupling between the tilt steering shaft and steering valve.**

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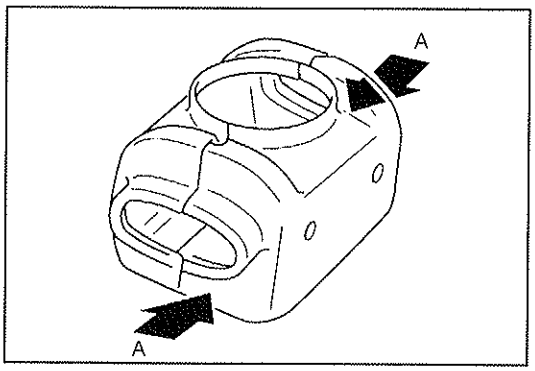


Point Operations

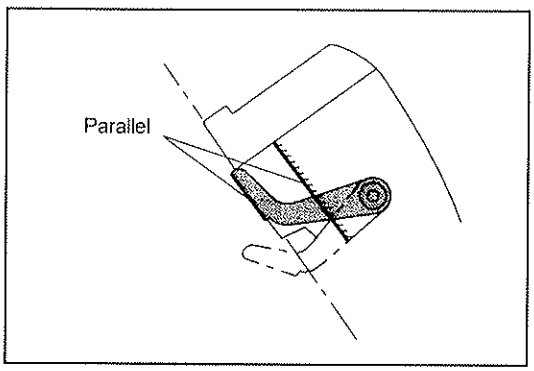
[Point 1]
Removal:
SST 09950-76003-71
(SST 09950-50012)



Installation:
Install the steering wheel after applying rubber grease on the sliding portion of the lever switch steering wheel angle sensor. After installation, rotate the steering wheel. (When the steering wheel is rotated, pins (3 pcs.) on the sensor side are automatically set in the holes on the steering wheel side.)



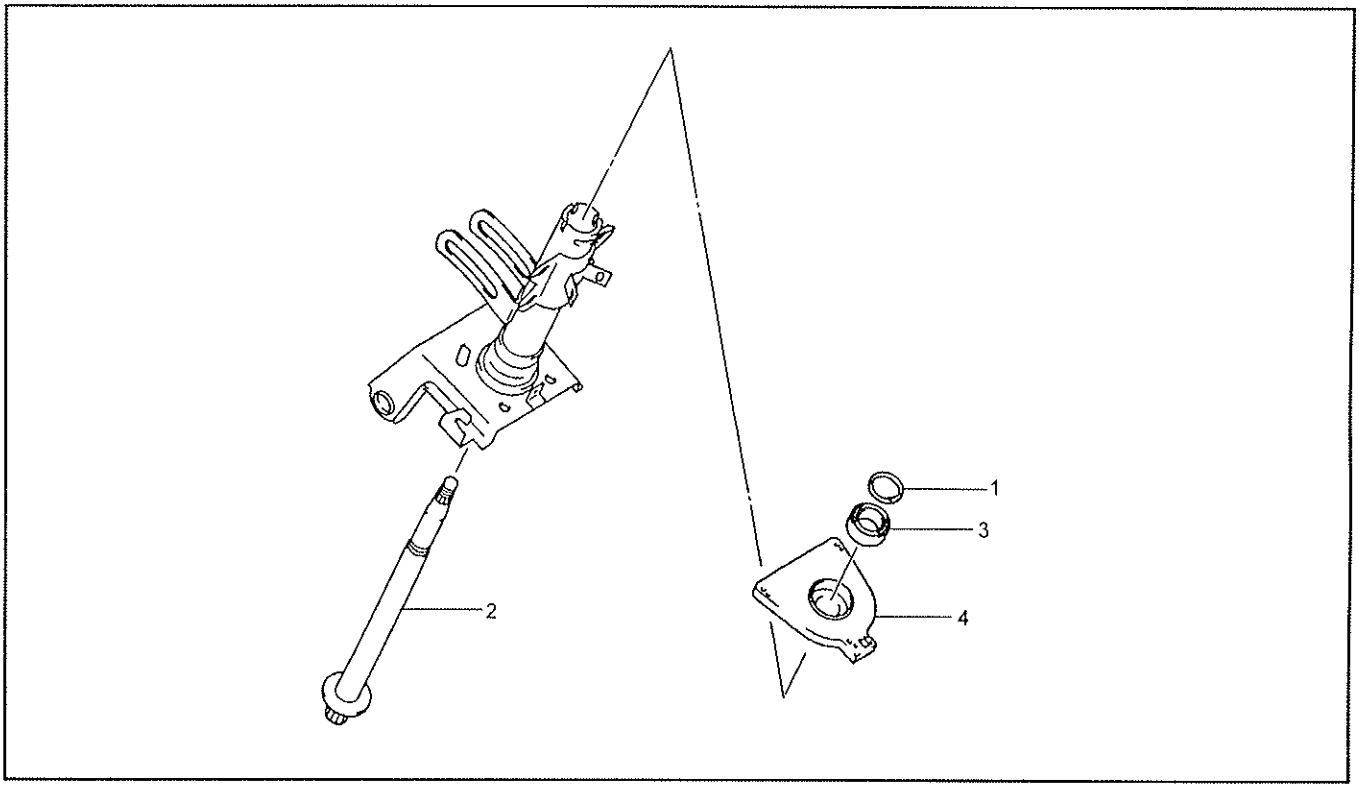
[Point 2]
Removal:
Remove the set screw, and disengage the front cover and rear cover by pushing the A portion of the rear cover for removal.



[Point 3]
Installation:
Install so that the tilt lever line and meter box line are in parallel, and see that the tilt lock operation is normal.

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DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the snap ring.

2 Remove the tilt steering shaft.

3 Remove the bearing.

4 Remove the lever switch ASSY bracket.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Apply rubber grease on each sliding portion of the lever switch ASSY.

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HYDROSTATIC STEERING VALVE ASSY

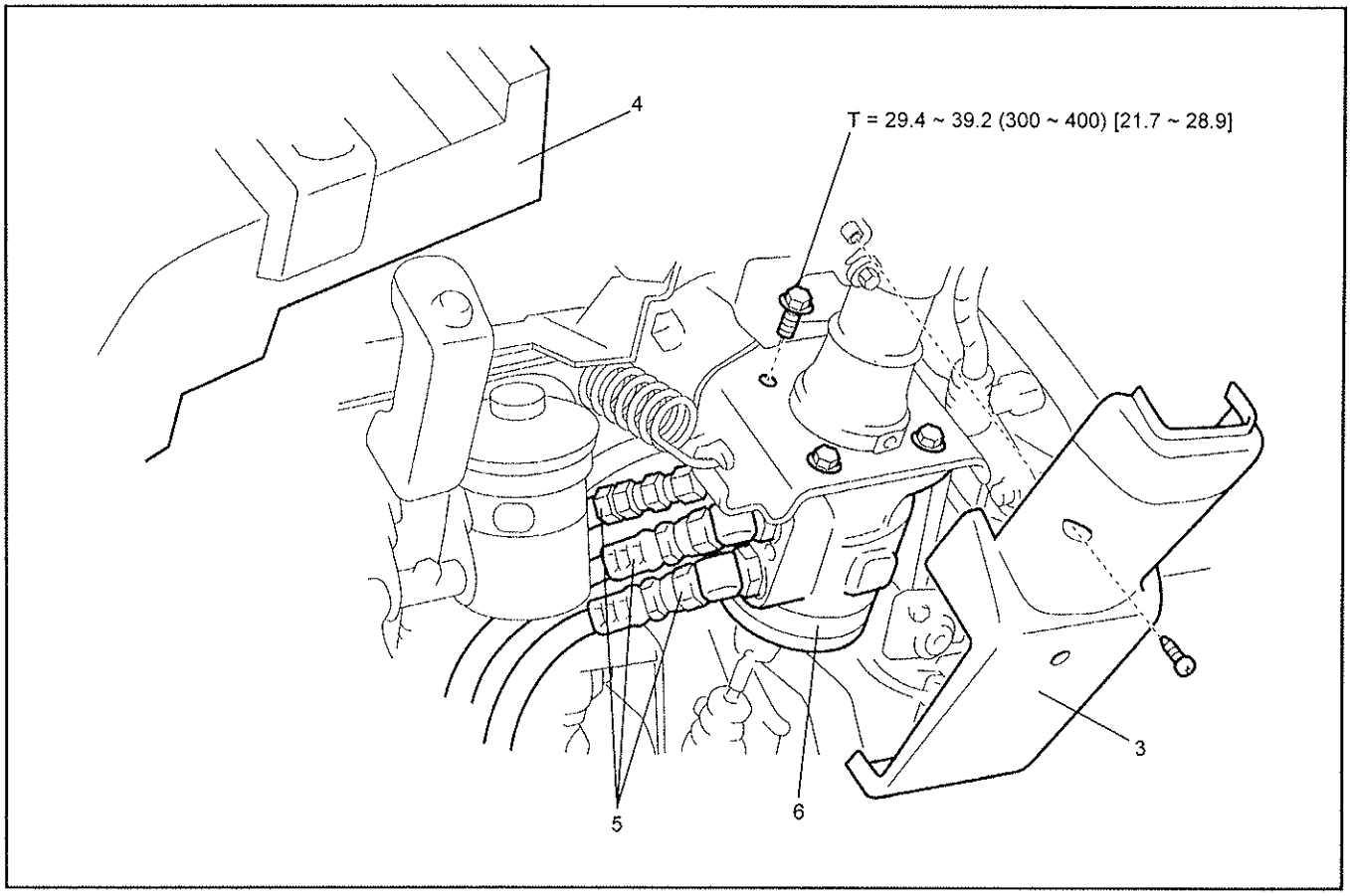
TROUBLESHOOTING

Fault	Possible cause	Remedy
1. Steering wheel is heavy to turn	1.1 No or insufficient oil pressure	• Repair or replace oil pump. • Repair or replace flow divider valve.
	1.2 Pressure relief valve is stuck in open position or setting pressure is too low.	• Repair or clean pressure relief valve. • Adjust the valve to the correct pressure.
	1.3 Too much friction at mechanical parts of the vehicle	• Lubricate joints of steering link or repair if necessary. • Check steering column installation.
2. Regular adjustments of the steering wheel are necessary. ("meandering")	2.1 Leaf spring without sufficient spring force or broken	• Replace leaf springs.
	2.2 Worn gear wheel set	• Replace gear wheel set.
	2.3 Seized cylinder or worn piston seal.	• Replace defects parts.
3. The steering wheel can turn on its own.	3.1 Leaf springs are stuck or broken and have therefore reduced spring force.	• Replace leaf springs.
	3.2 Inner and outer spools are stuck, possibly due to dirt.	• Clean steering unit.
4. Backlash	4.1 Cardan shaft worn or broken	• Replace Cardan shaft.
	4.2 Leaf springs without spring force or broken	• Replace leaf springs.
	4.3 Worn splines on the steering column	• Replace steering column.
5. Steering wheel can be turned wholly without moving the steered wheels.	5.1 Gear wheel set worn	• Replace gear wheel set.
6. Steering is too slow and heavy when operated quick-ly.	6.1 Insufficient oil supply to steering unit	• Repair or replace oil pump. • Repair or replace flow divider valve.
	6.2 Relief valve setting too low	• Adjust valve to correct setting.
	6.3 Relief valve stuck due to dirt	• Clean the valve.
7. Heavy kick-back in steering wheel in both directions	7.1 Wrong setting of Cardan shaft and gear-wheel set	• Correct setting as shown in Repair Manual.
8. Turning the steering wheel moves the steered wheels in opposite direction.	8.1 Hydraulic hoses for the steering cylinders have been connected reversely.	• Reverse the hoses.
9. Leakage at either input shaft, end cover, gear-wheel set, housing or top part.	9.1 Shaft seal defective	• Replace shaft seal.
	9.2 Screws loose	• Tighten screws.
	9.3 O-rings defective	• Replace O-ring.

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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.
2 Remove the lower panel.
3 Remove the combination meter cover.
4 Remove the instrument panel.
5 Disconnect the piping.
6 Remove the steering valve ASSY.
7 Remove the steering valve spacer.

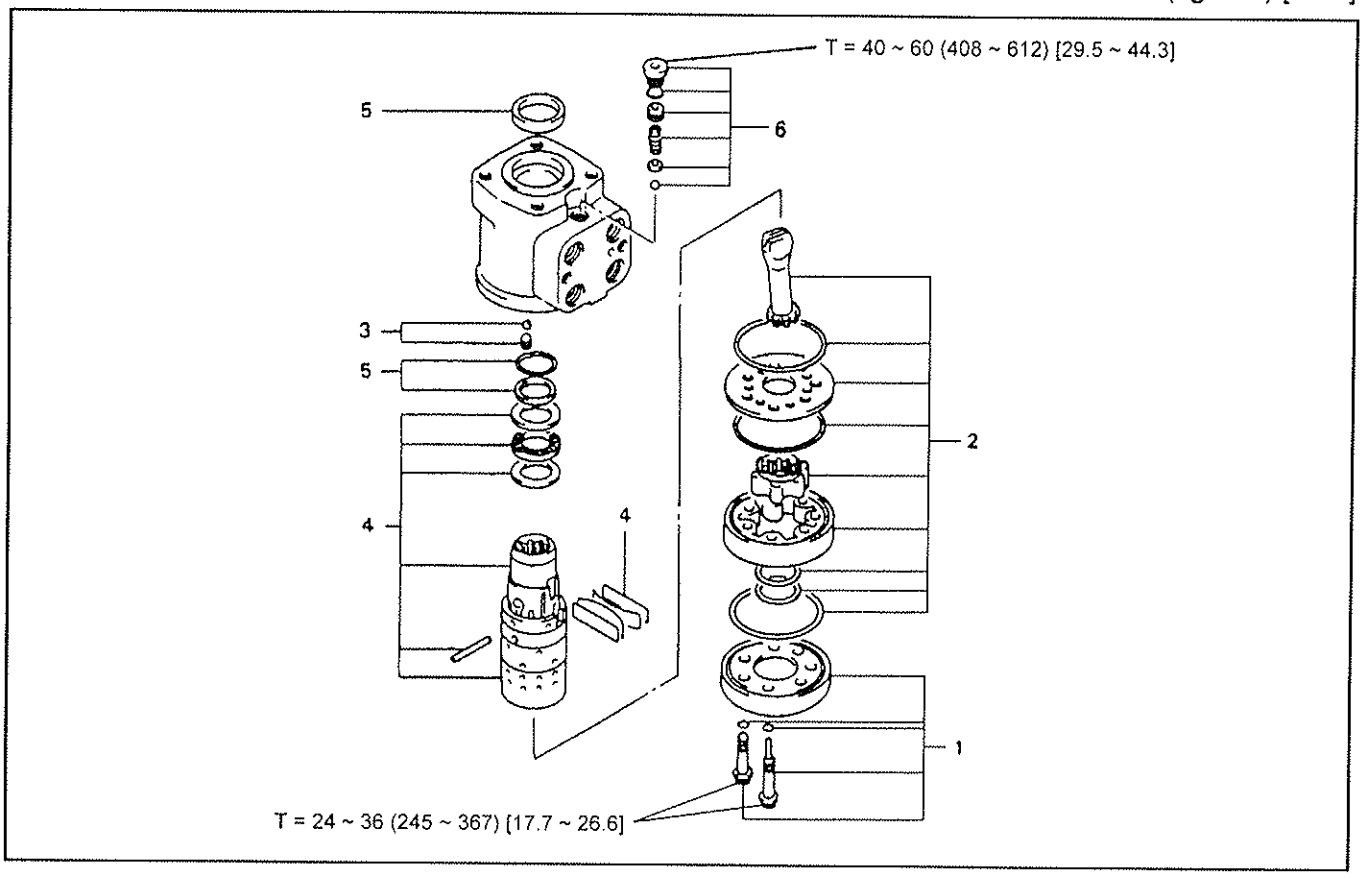
Installation Procedure

The installation procedure is the reverse of the removal procedure.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

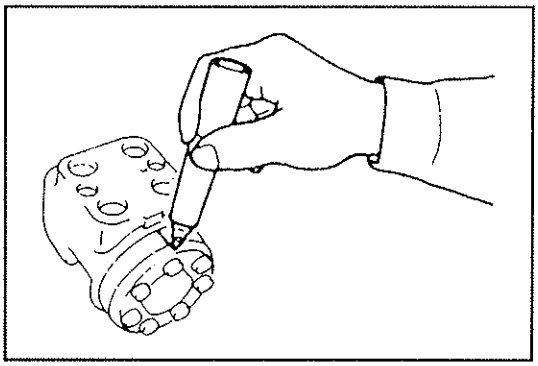
1 Remove the end cover. **[Point 1]**
2 Remove the gear wheel set, cardan shaft and distributor plate. **[Point 2]**
3 Remove the check valve.
4 Remove the sleeve W/spool and bearing. **[Point 3]**
5 Remove the O-ring, kin-ring and dust seal ring. **[Point 4]**
6 Remove the rerief valve. **[Point 5]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Wash each part with clean hydraulic oil before assembly.

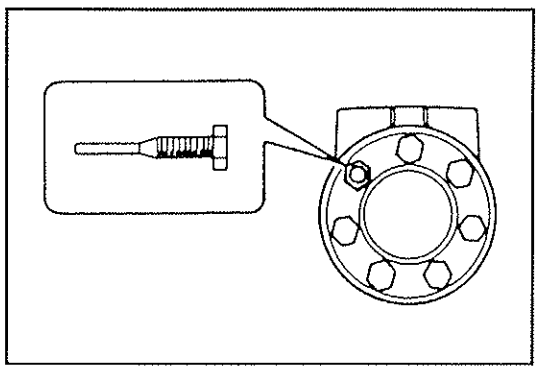
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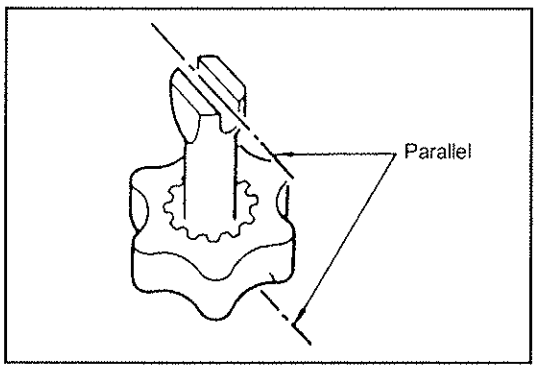
Point Operations

[Point 1]
Disassembly:
Put a match mark.

Reassembly:
Align the match marks.

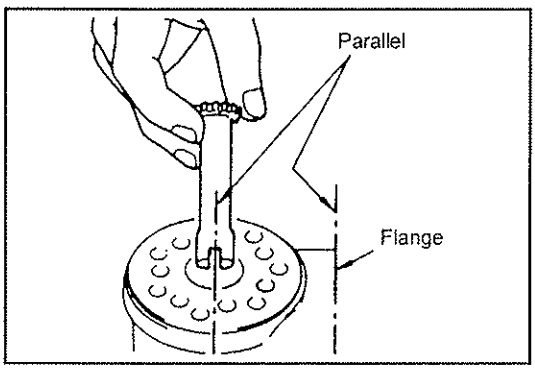


Reassembly:
As one out of seven set bolts is a bolt with pin, install it in the correct position.

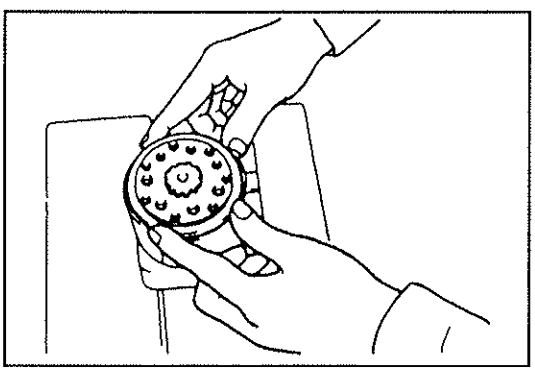


[Point 2]
Reassembly:
Pay attention to the following points at the time of reassembly.

1. Fit the gearwheel (rotor) and cardan shaft so that a tooth base in the rotor is positioned in relation to the shaft slot as shown. Turn the gear rim so that the seven through holes match the holes in the housing.

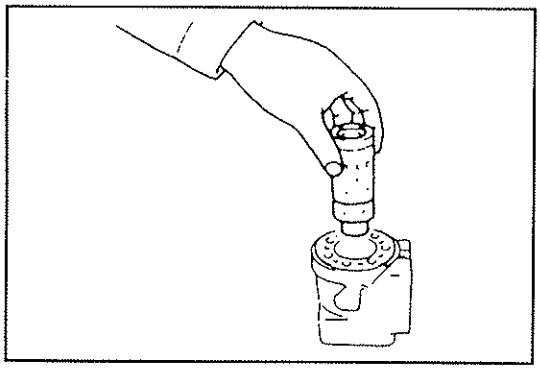


2. Guide the carden shaft down into the bore so that the slot is parallel with the connection flange.

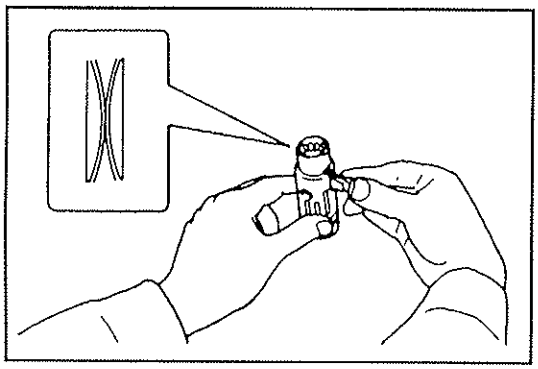


3. Align the match marks on the distributor plate and gear wheel made at the time of disassembly.
When these parts are replaced, match the holes in the housing and plate at the time of reassembly.

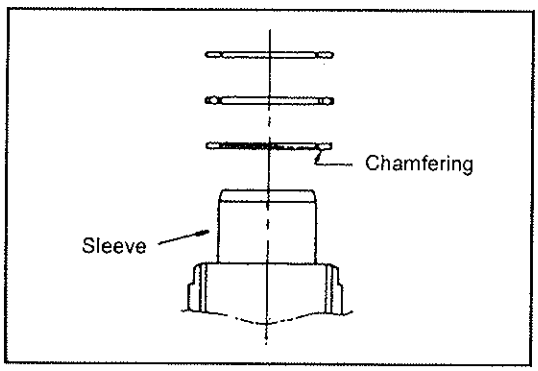
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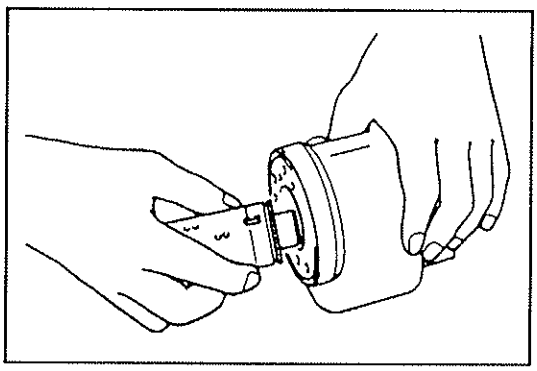
[Point 3]
Disassembly:
Extract the spool W/sleeve upward. Otherwise, the spool cross pin may move during extraction to cause sticking.



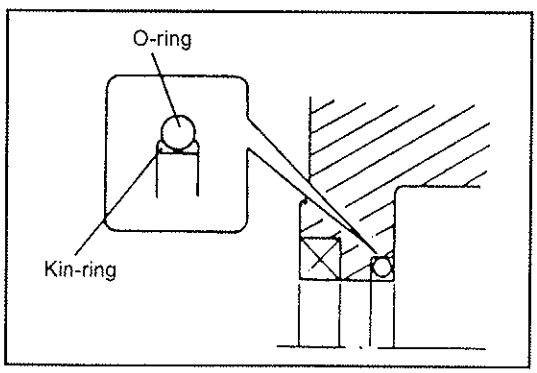
Reassembly:
Set and install the neutral position spring correctly.



Reassembly:
Pay attention to the bearing direction for installation. (See the figure.)



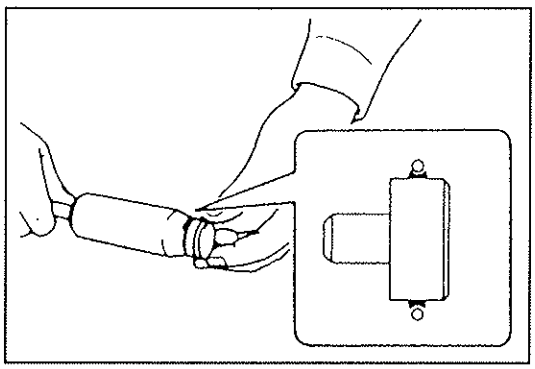
Reassembly:
Place the housing with its flanged side facing down, and insert the spool W/sleeve into the housing. Set the cross pin of the spool in horizontal state during insertion.



[Point 4]
Reassembly:
Install the kin-ring and O-ring correctly.

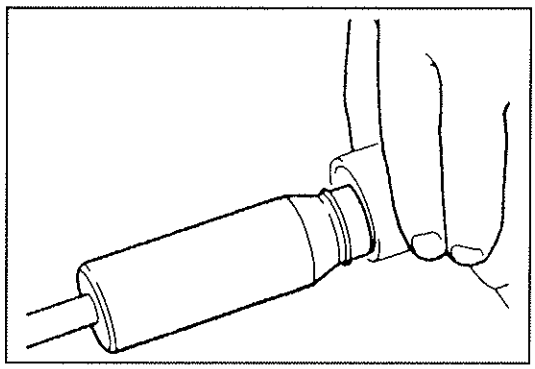
Note:
For SST No. SJ150-9000-11, please inquire at the nearest Danfoss service shop.
(Refer to Parts & Service News Ref. No. GE-7022 of July 1, 1997 for detail.)

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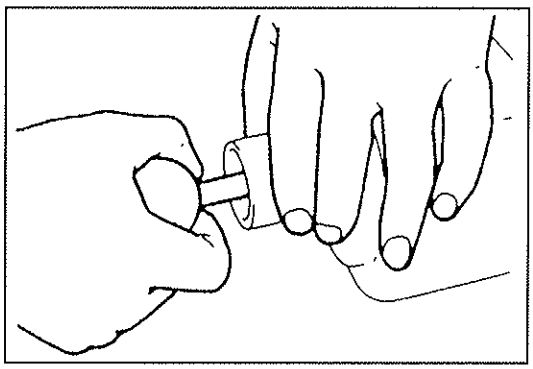


1. Turn the steering unit until the bore is horizontal. Guide the outer part of the assembly tool into the bore for the spool W/sleeve.

2. Apply O-ring and kin-ring with hydraulic oil and place them on the tool.

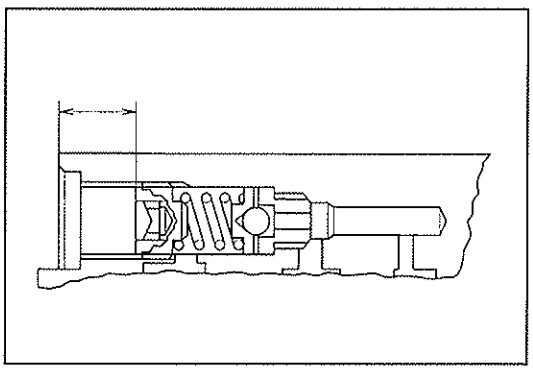


3. Hold the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.



4. Press and turn the O-ring W/kin-ring into position in the housing.

5. Draw the inner and outer parts of the assembly tool out of the steering unit bore, leaving the guide from the inner part in the bore.



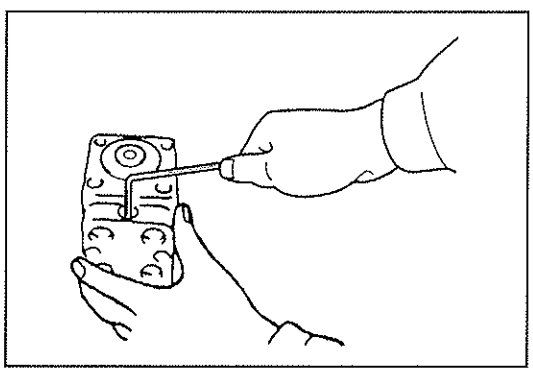
[Point 5]

Disassembly:

Do not remove the relief valve unless it is judged defective. The valve seat cannot be removed.

Disassembly:

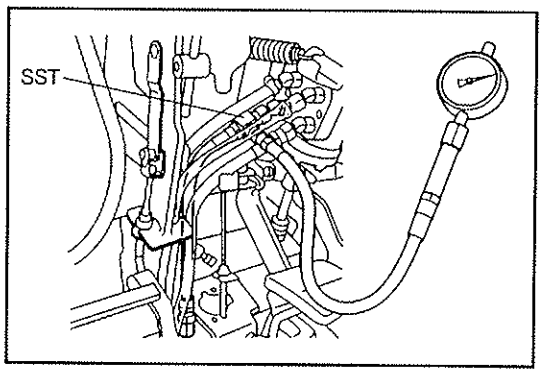
Measure the screwed-in depth of the relief valve adjusting screw before starting disassembly.

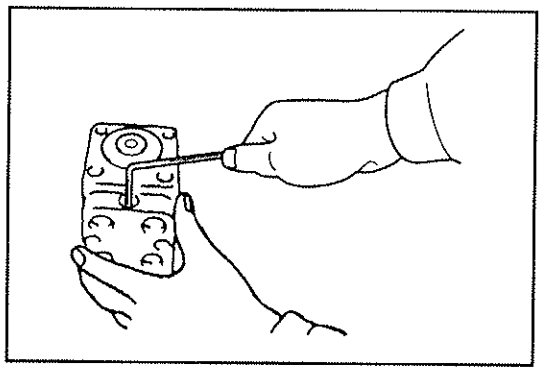


Reassembly:

Reassemble by adjusting to the screwed-in depth of the valve spring retainer measured before disassembly. After installing the steering valve ASSY on the vehicle, measure the relief pressure. If it is not within the standard range, adjust it by changing the screwed-in depth of the retainer.

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RELIEF PRESSURE INSPECTION·ADJUSTMENT

1. Install an oil pressure gauge.
   (1) Disconnect the hose from the steering valve P port, and connect the adapter (SST).
   SST 09450-23320-71
   (2) Install the pressure gauge.
   Plug size: PT1/8
2. Start the engine and turn the steering wheel slowly clockwise and counterclockwise.
3. Start the engine, rotate the steering wheel and measure the relief pressure when the relief occurs.

Standard:

1 ~ 3 ton series	8040 $^{+490}_{0}$ (82^{+5}_{0}) [1170^{+70}_{0}]
J3.5 ton series	8340 $^{+490}_{0}$ (85^{+5}_{0}) [1210^{+70}_{0}]

4. If the standard is not satisfied, remove the steering valve and make adjustment by turning the relief valve adjusting screw.

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BRAKE

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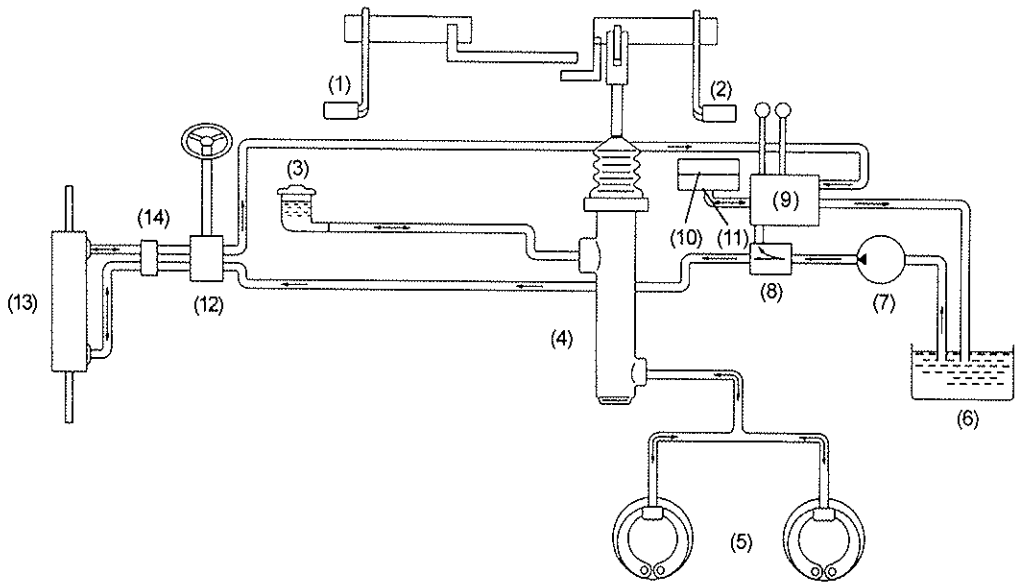
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GENERAL

Hydraulic Circuit Diagram

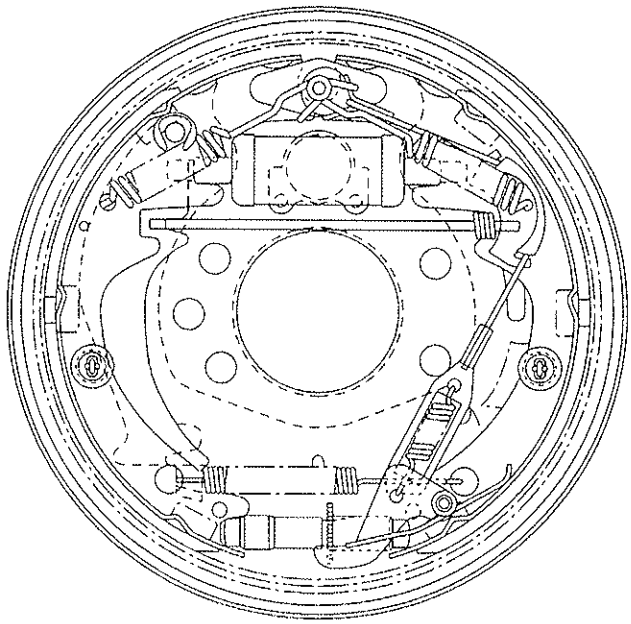


(1)	Inching pedal	(8)	Flow divider
(2)	Brake pedal	(9)	Oil control valve
(3)	Reservoir tank	(10)	Lift cylinder
(4)	Brake master cylinder	(11)	Tilt cylinder
(5)	Brake wheel cylinder	(12)	Steering valve
(6)	Oil tank	(13)	Power steering cylinder
(7)	Oil pump	(14)	Solenoid valve

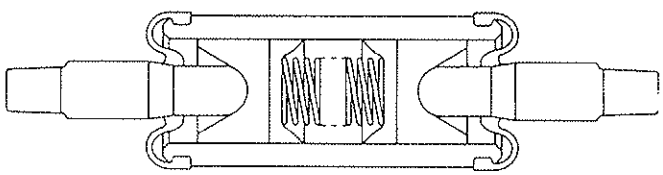
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Front Brake

1 ton Series

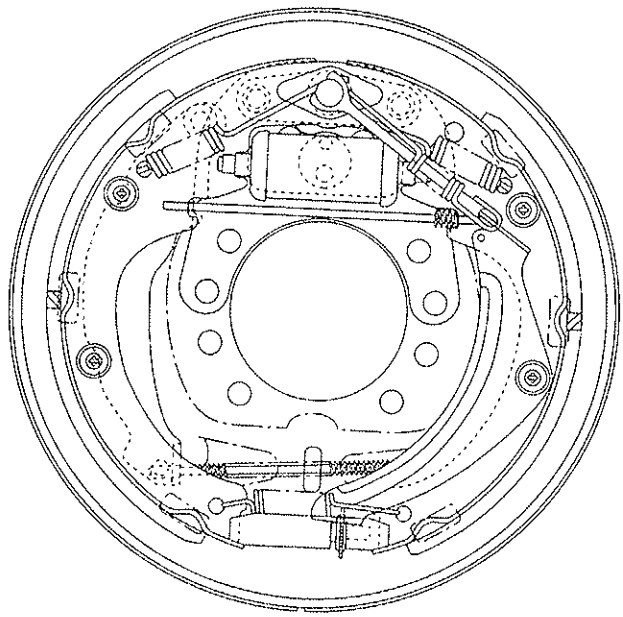


Wheel Cylinder

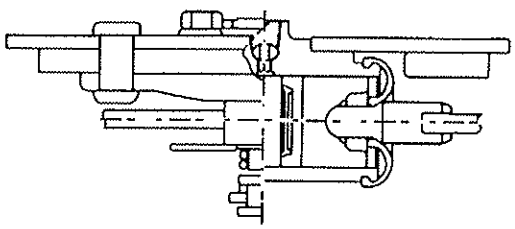


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2·3 ton Series

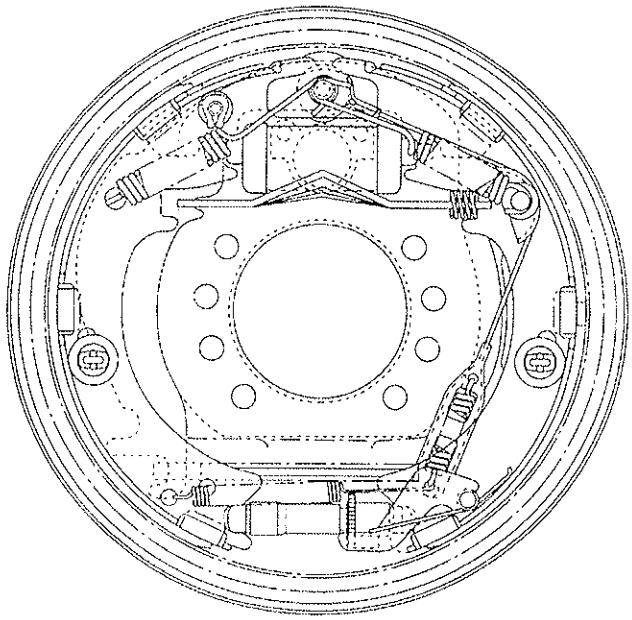


Wheel Cylinder

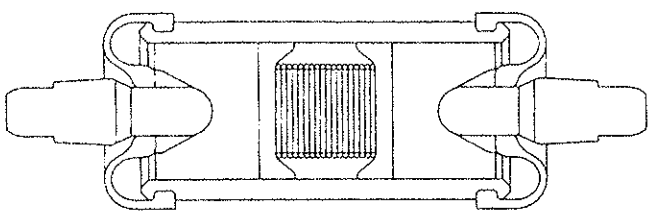


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J3.5 ton Series

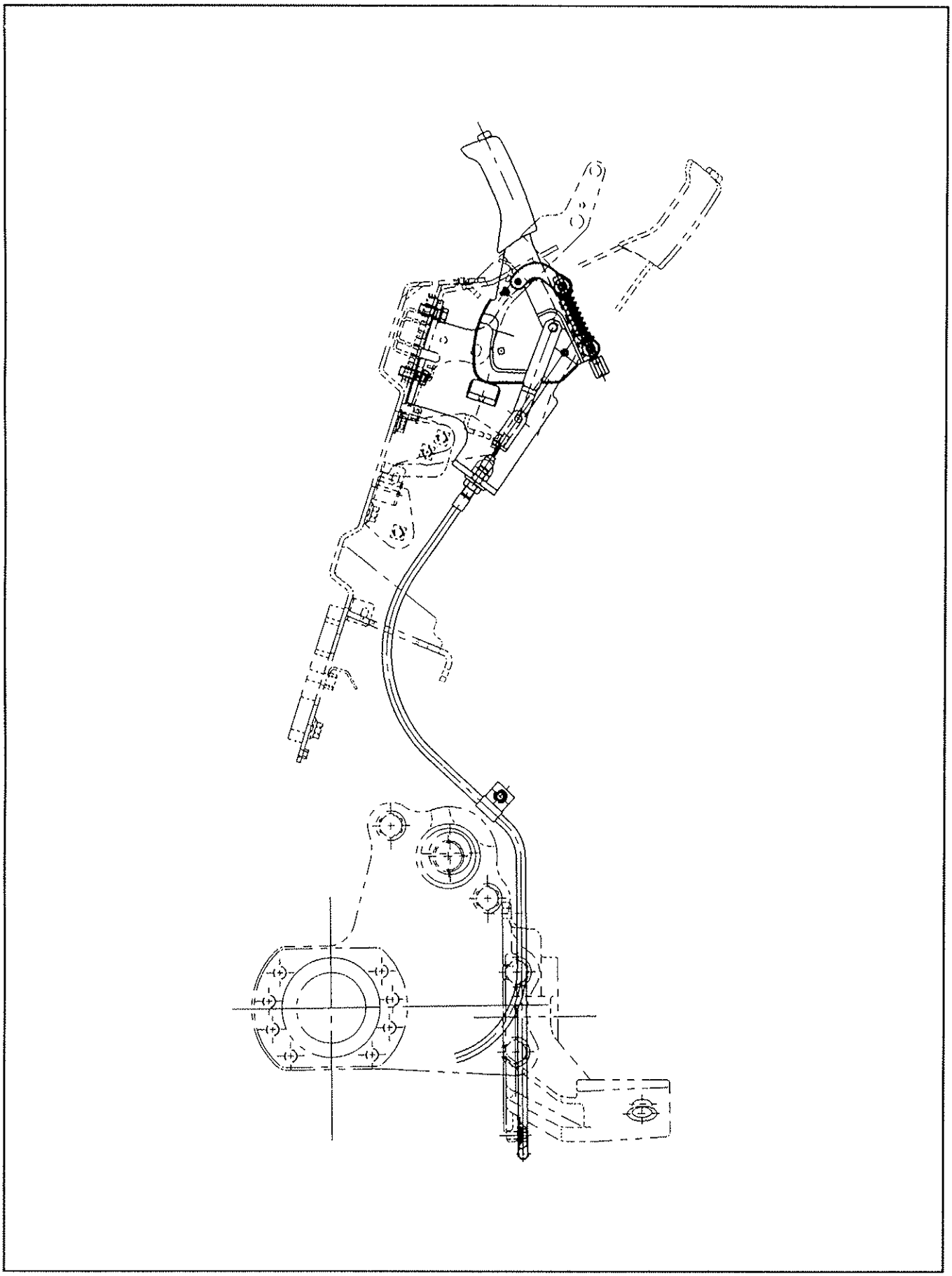


Wheel Cylinder



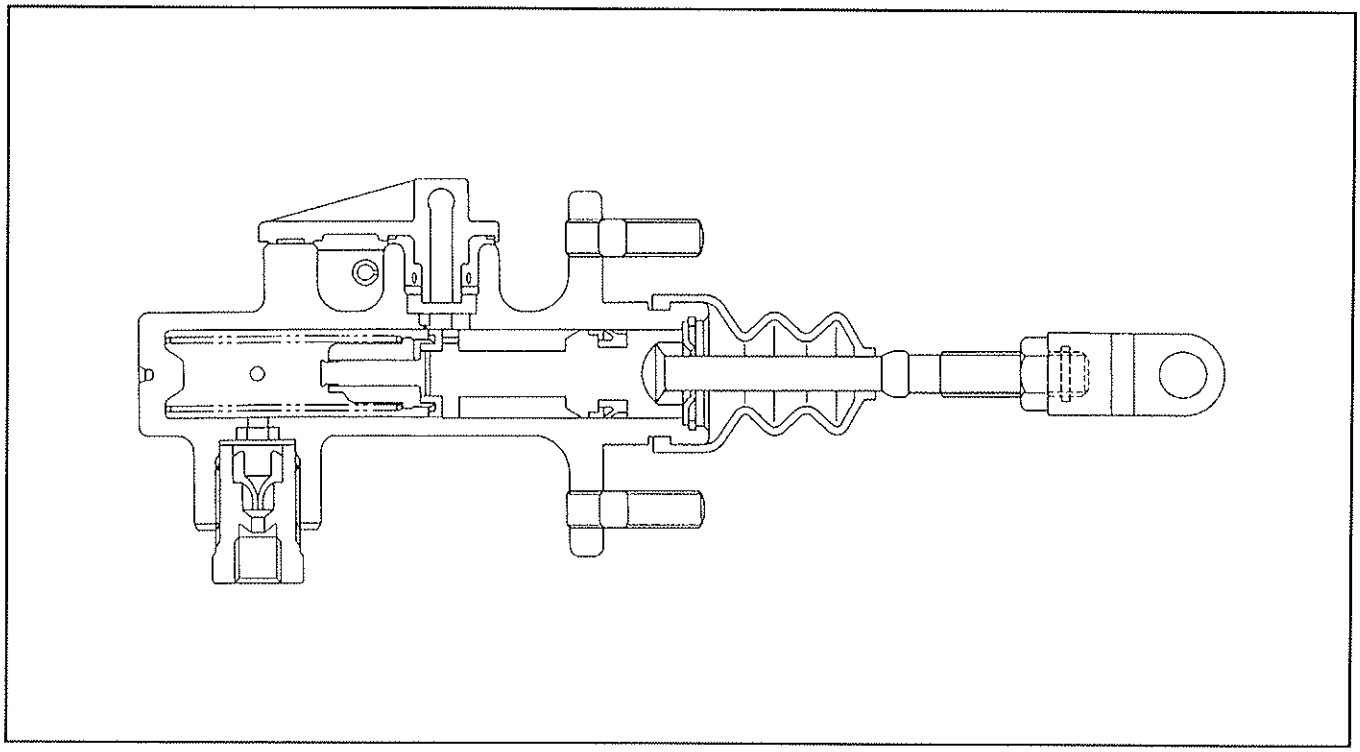
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Parking Brake



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Master Cylinder



SPECIFICATIONS

Item \ Vehicle model		1 ton series	2 ton series	3 ton series	J3.5 ton series
Foot brake type		Hydraulic internal expanding duo servo brake	←	←	←
Parking brake		Internal expanding mechanical brake	←	←	←
Brake drum inside diameter mm (in)		254 (10.0)	310 (12.2)	←	317.5 (12.5)
Brake lining	Material	Resin mold (asbestos-free)	←	←	←
	Dimensions Length x width x thickness mm (in)	279 x 48.5 x 5 (11.0 x 1.91 x 0.20)	323 x 60 x 7 (12.7 x 2.36 x 0.28)	343 x 60 x 7 (13.5 x 2.36 x 0.28)	352 x 60 x 5.6 (13.9 x 2.36 x 0.22)
Wheel cylinder bore mm (in)		22.2 (0.87)	28.5 (1.12)	←	←
Brake master cylinder	Bore mm (in)	19.05 (0.75)	←	←	←
	Stroke mm (in)	30 (1.18)	←	←	←
Applicable oil		SAE J-1703-DOT-3	←	←	←

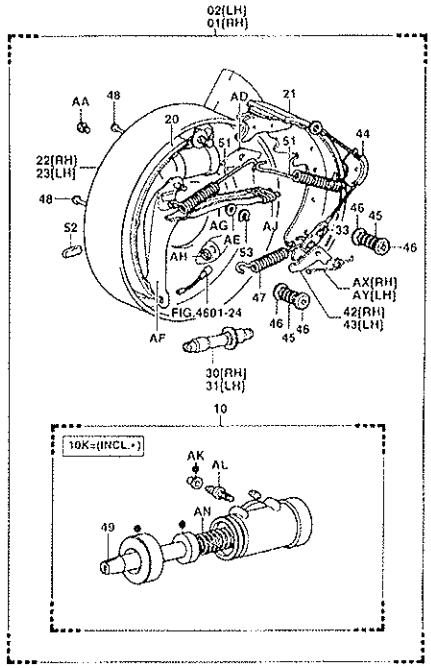
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COMPONENTS

Front Brake

1 ton Series

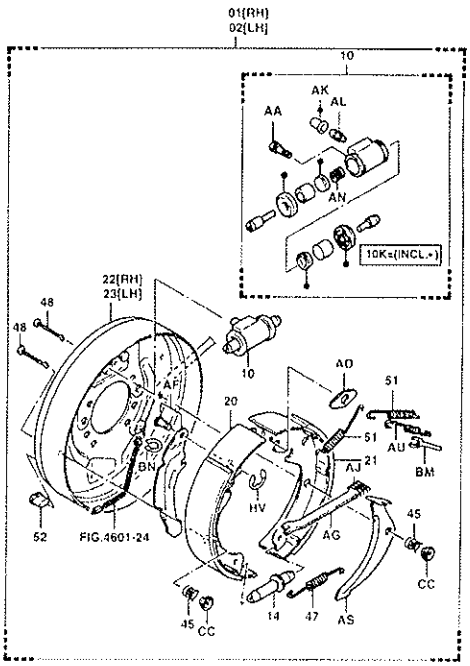
4715



4715-096

2·3 ton Series

4715

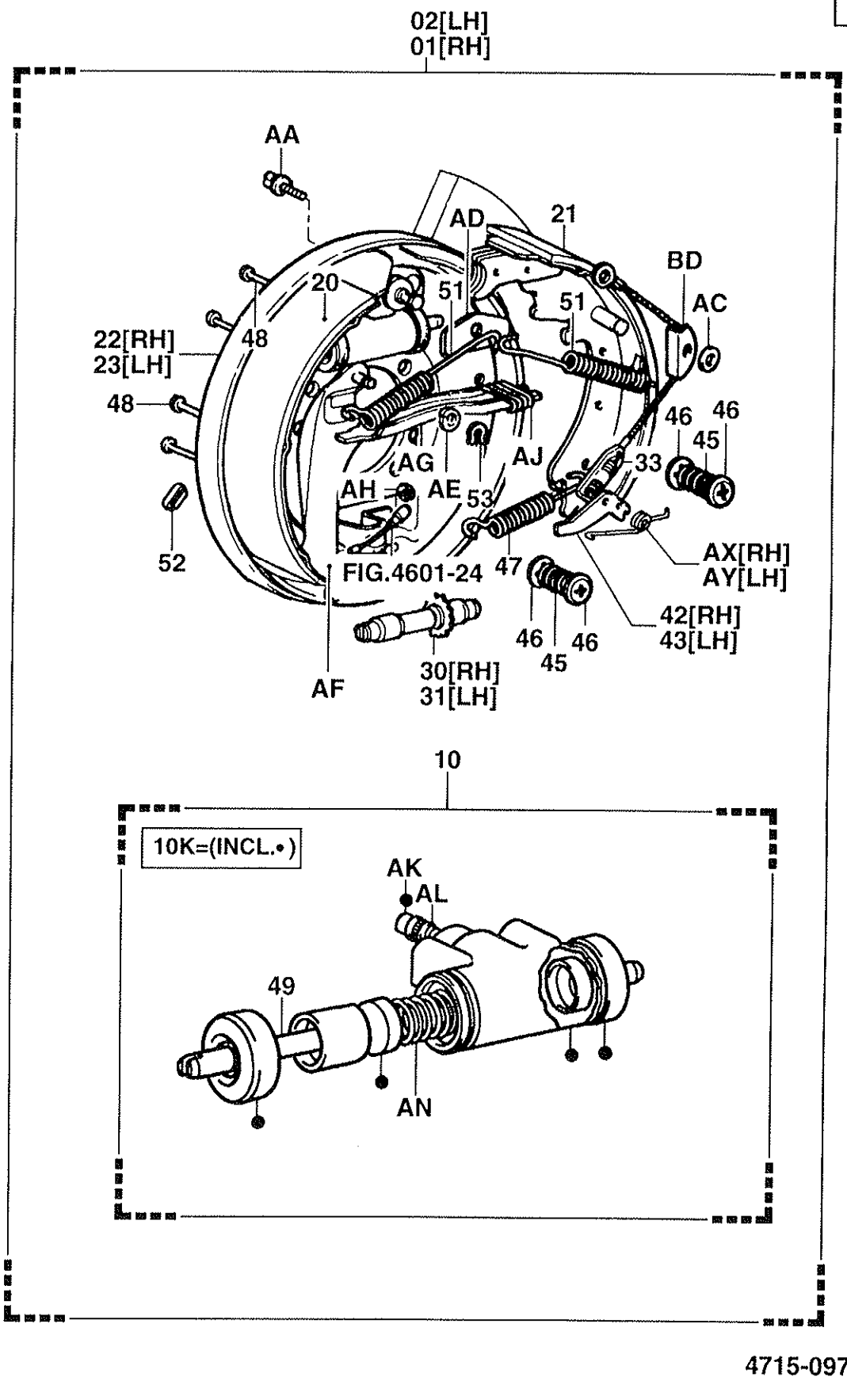


4715-095

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J3.5 ton Series

4715

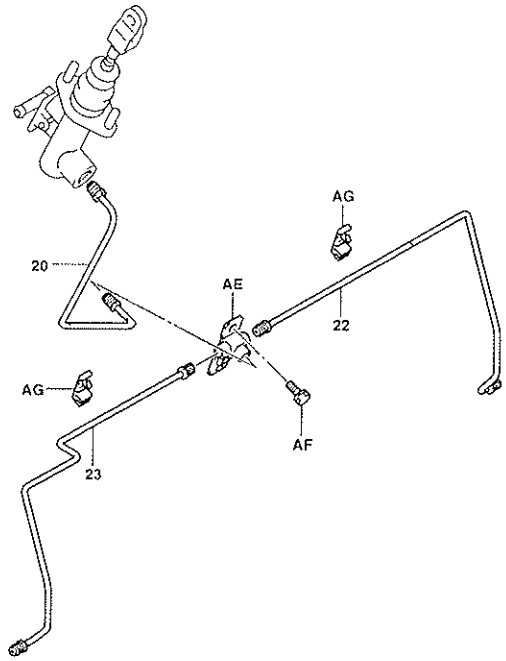


4715-097A

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Brake Pipe

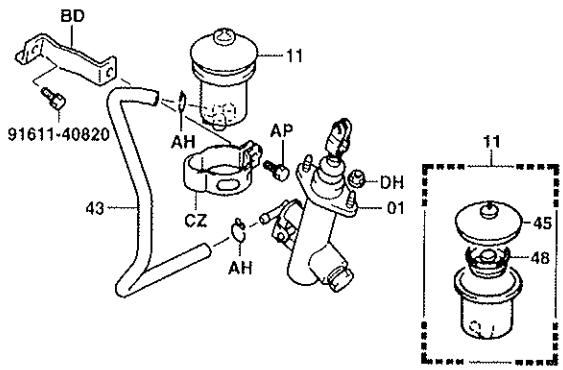
4714

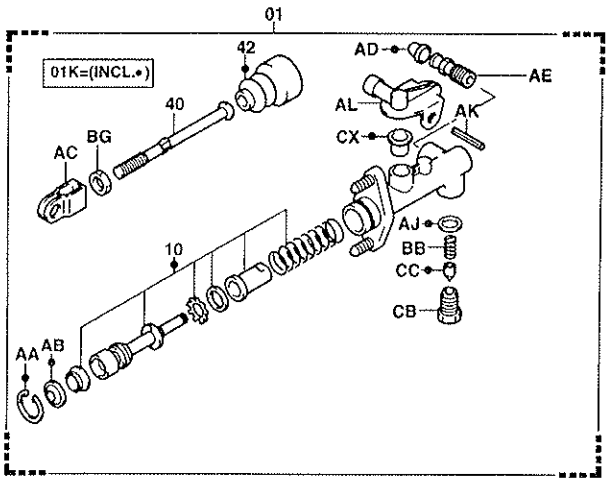


4714-191

Brake Master Cylinder

4702

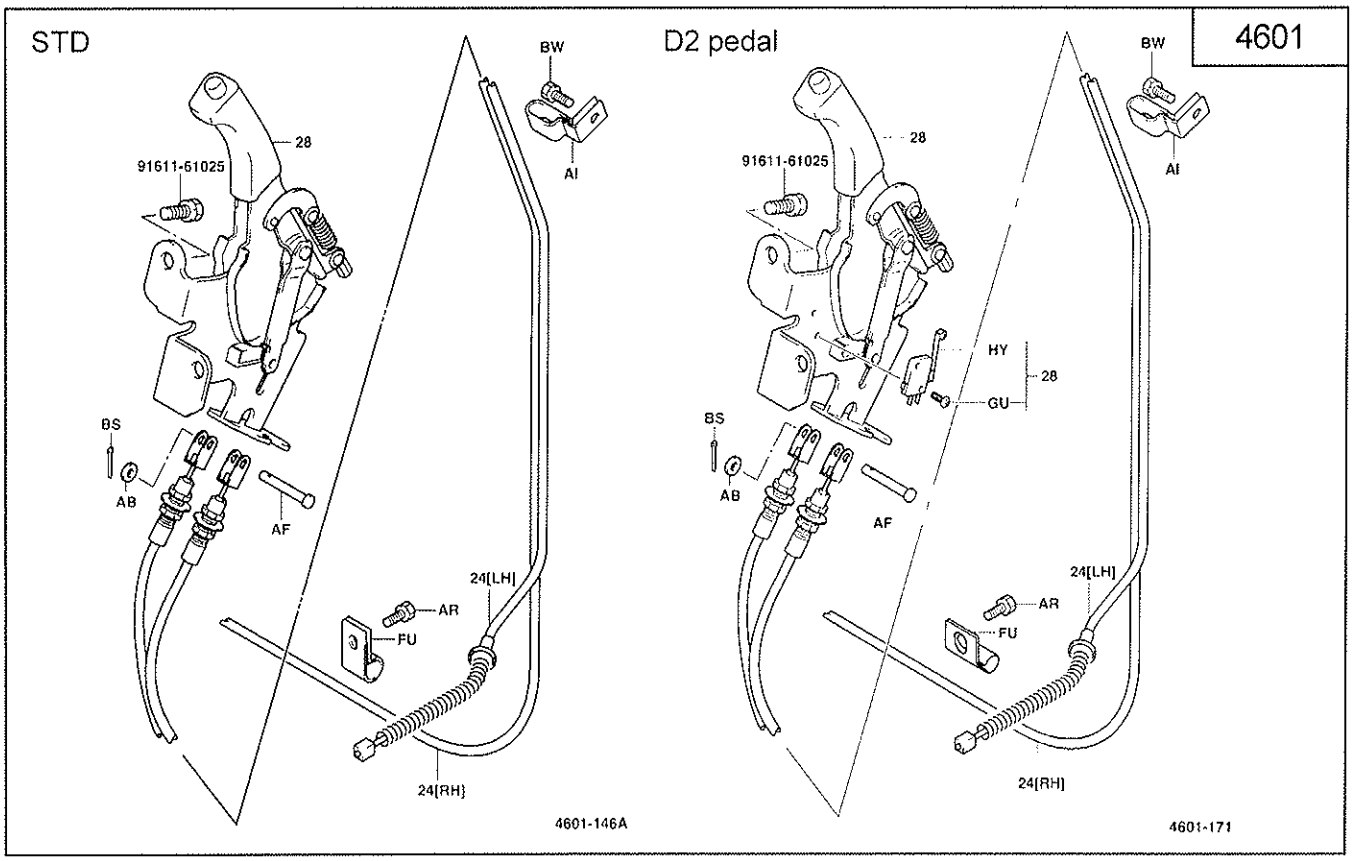




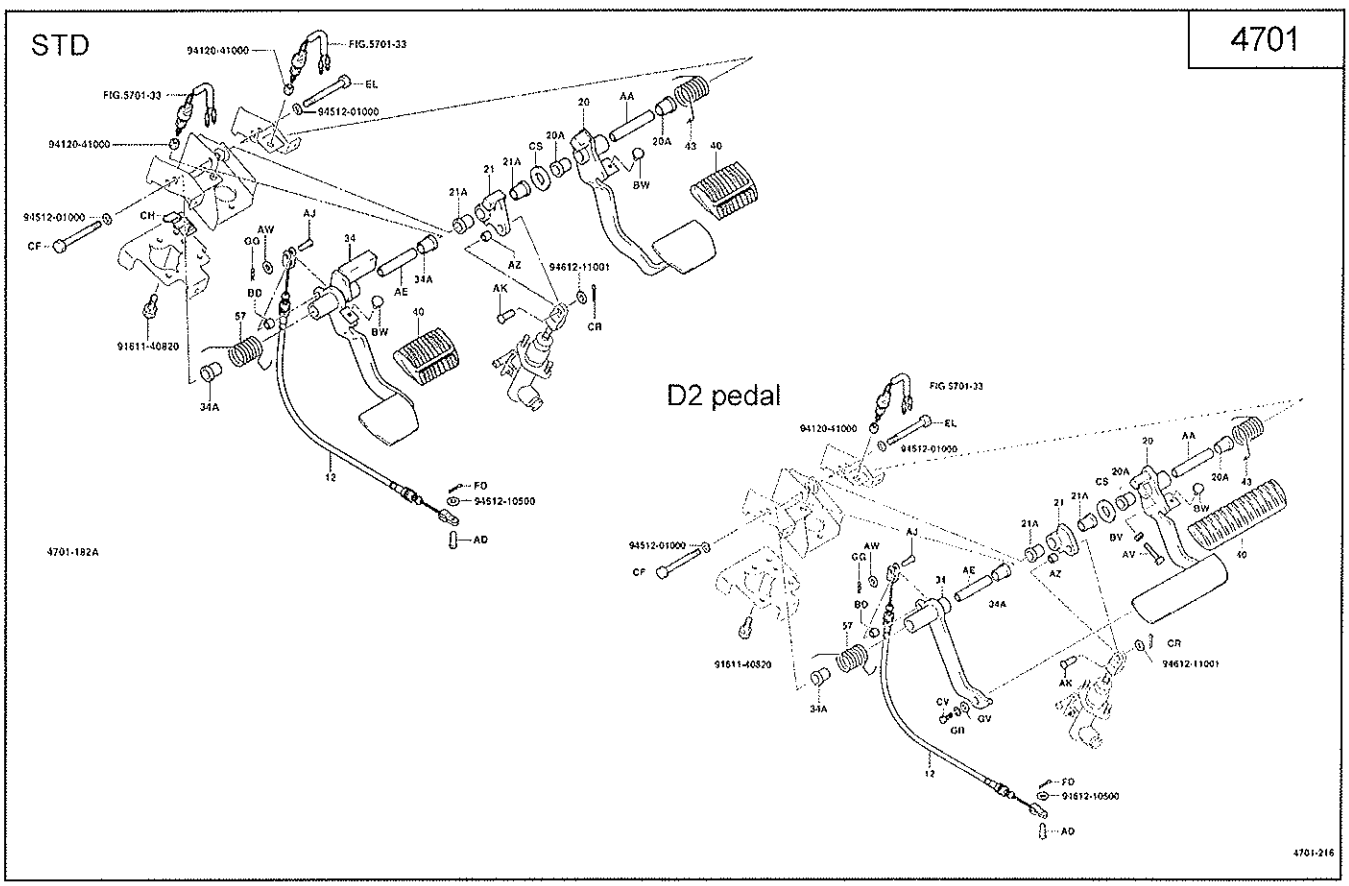
4702-083

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Parking Brake



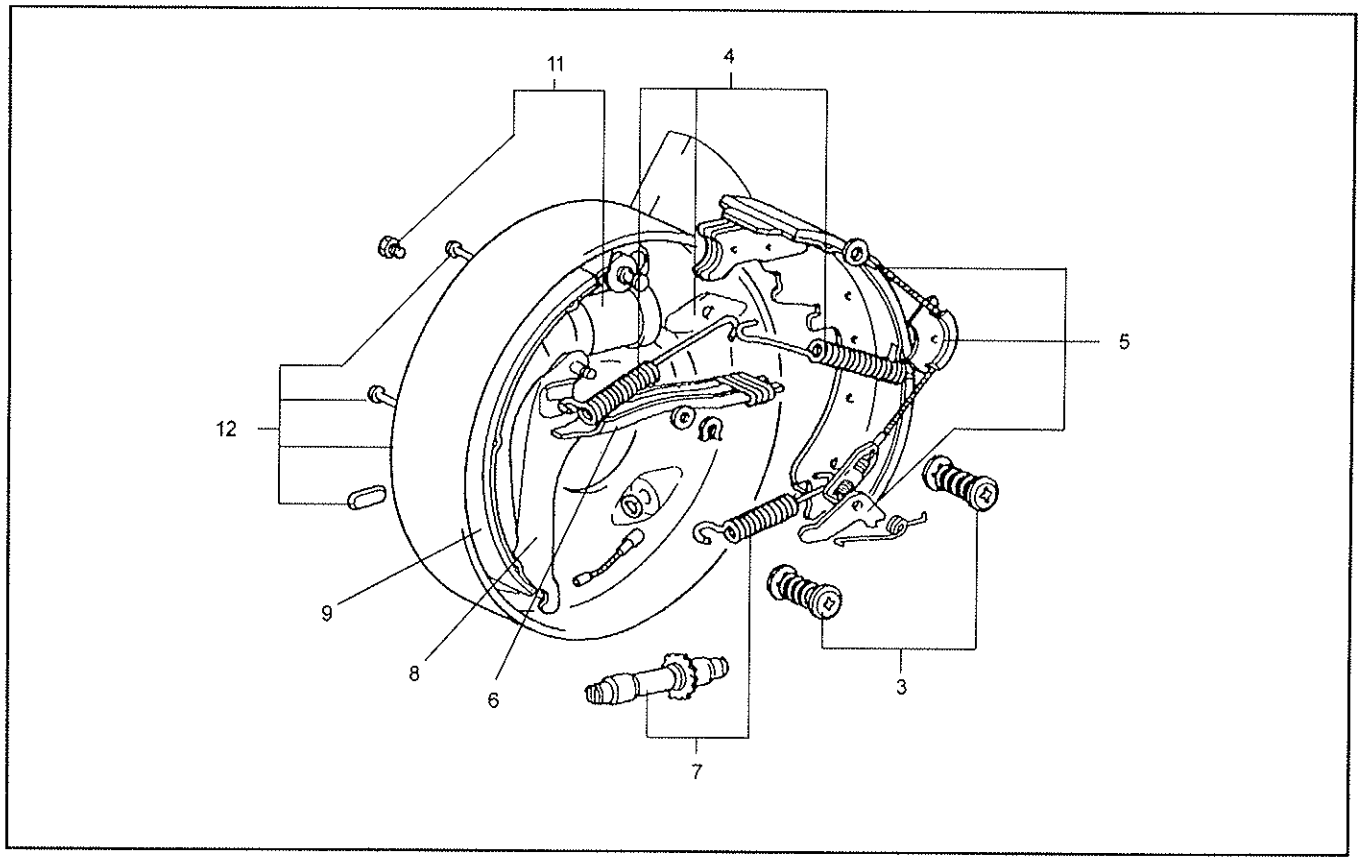
Brake Pedal



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FRONT BRAKE

DISASSEMBLY·INSPECTION·REASSEMBLY (1·J3.5 TON SERIES)



Disassembly Procedure

1 Drain brake fluid.

2 Remove the front axle hub W/brake drum. (See page 5-7.)

3 Remove the shoe hold down spring and cup. **[Point 1]**

4 Remove the anchor to shoe spring and shoe guide plate. **[Point 2]**

5 Remove the cable and cable guide.

6 Remove the lever strut. **[Point3]**

7 Remove the adjuster spring and adjusting screw. **[Point 4]**

8 Disconnect the parking brake cable. **[Point 5]**

9 Remove the brake shoe. **[Point 6]**

10 Disconnect the brake pipe.

11 Remove the wheel cylinder ASSY. **[Point 7]**

12 Remove the backing plate. **[Point 8]**

13 Separate the brake drum from the front axle hub. **[Point 9]**

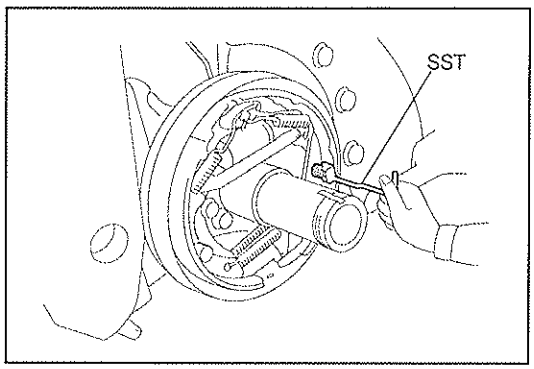
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Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

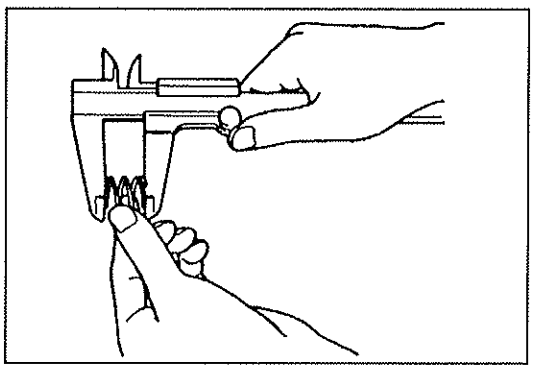
Note:

- **See that the brake lining and brake drum interior surface are free from grease or oil before installation.**
- **Before reassembly, decrease the brake drum outside diameter for installation to approx. 1 mm (0.04 in) less than the drum inside diameter by tightening the adjusting screw.**
- **After reassembly, perform brake air bleeding (see page 8-23) and braking force inspection (see page 8-23).**



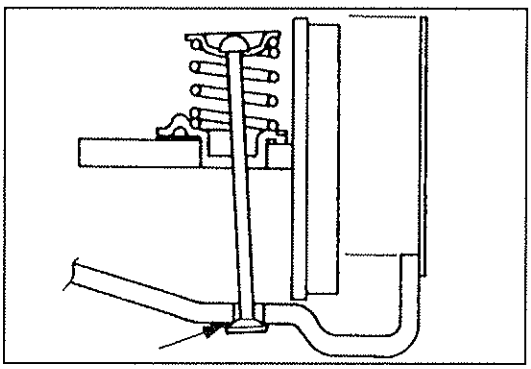
Point Operations

[Point 1]
Disassembly·Reassembly:
SST 09510-31960-71



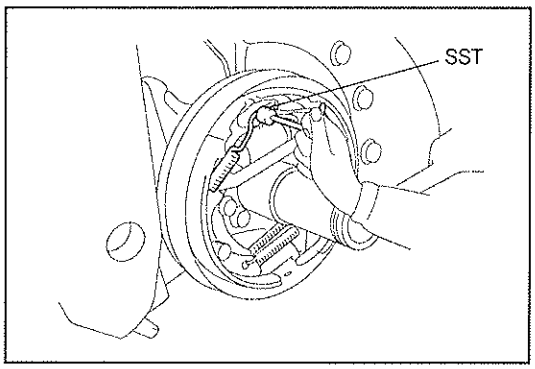
Inspection:
Measure the free length of the hold down spring.

Standard:
1 ton series: 25.5 mm (1.004 in)
J3.5 ton series: 44.0 mm (1.732 in)

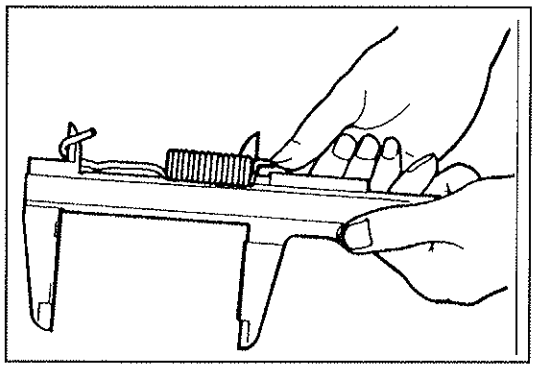


Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the shoe hold down pin and the contact surface on the back side of the backing plate to eliminate any clearance.

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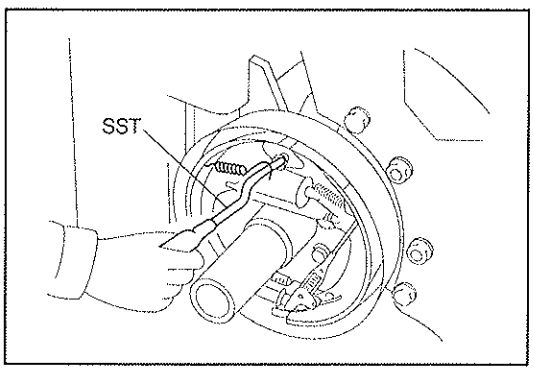


[Point 2]
Disassembly:
SST 09717-76001-71
(SST 09717-20010)

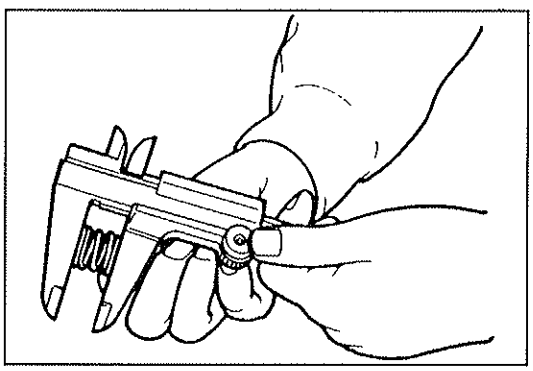


Inspection:
Measure the free length of the anchor to shoe spring.

Standard:
1 ton series: 102.2 mm (4.024 in)
J3.5 ton series: On the side of lining W/pin
138.2 mm (5.441 in)
On the side of lining L/pin
121.2 mm (4.772 in)
Limit: No clearance between coil turns

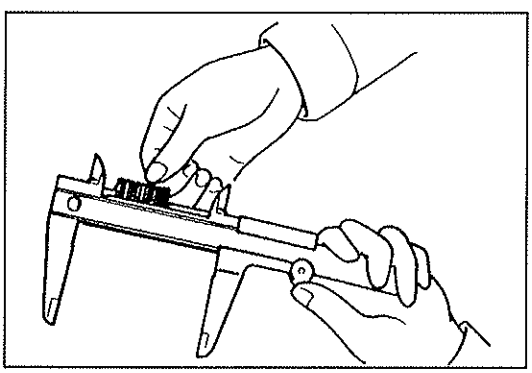


Reassembly:
SST 09718-76001-71
(SST 09718-20010)



[Point 3]
Inspection:
Measure the free length of the strut to shoe spring.

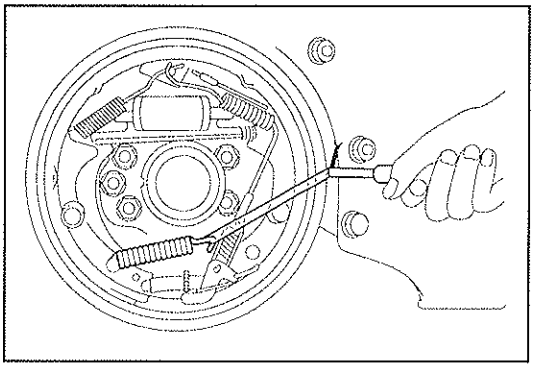
Standard:
1 ton series: 19.7 mm (0.776 in)
J3.5 ton series: 31.4 mm (1.236 in)



[Point 4]
Inspection:
Measure the free length of the adjuster spring.

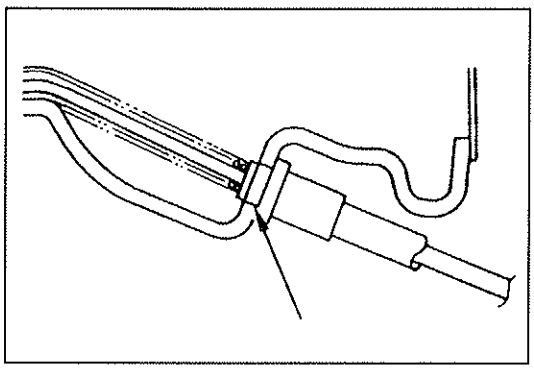
Standard:
1 ton series: 99.4 mm (3.913 in)
J3.5 ton series: 125.4 mm (4.937 in)
Limit: No clearance between coil turns

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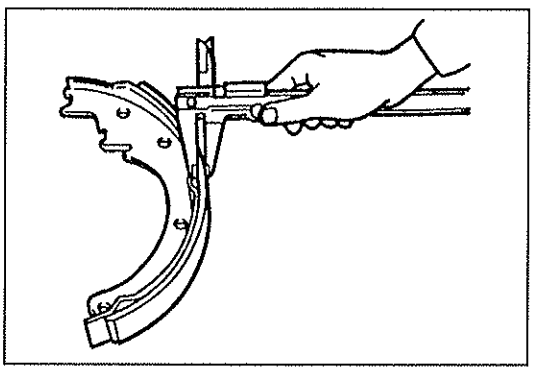


Reassembly:
Apply grease on the adjusting screw threaded portion and fill grease in the cap.

Reassembly:
Tie a wire to the free end of the adjuster spring and set by pulling with a screwdriver.

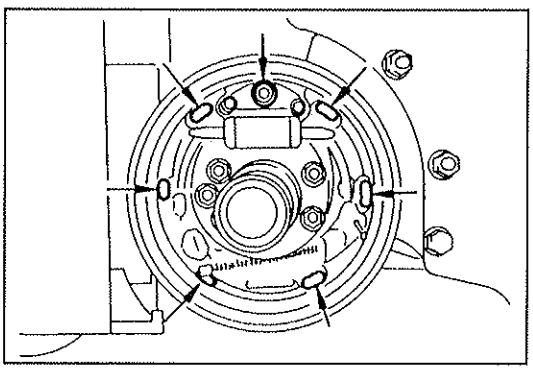


[Point 5]
Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the parking brake cable outlet in the backing plate to eliminate any clearance.

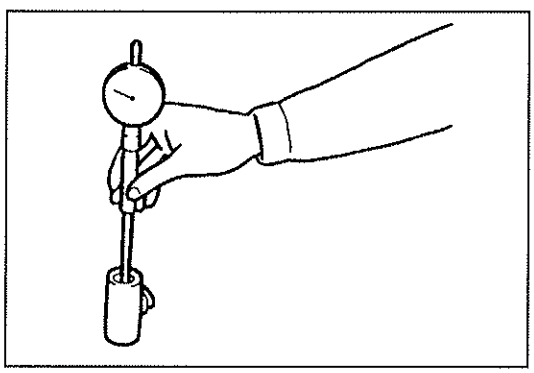


[Point 6]
Inspection:
Measure the brake lining thickness.

Standard:
1 ton series: 4.9 mm (0.193 in)
J3.5 ton series: 5.6 mm (0.220 in)
Limit:
1 ton series: 1.0 mm (0.039 in)
J3.5 ton series: 1.0 mm (0.039 in)



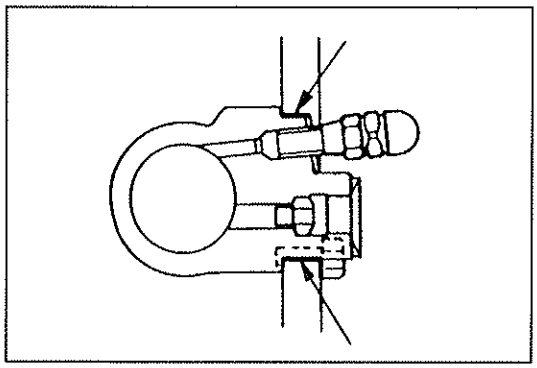
Reassembly:
Before brake shoe installation, apply grease on illustrated portions of the backing plate (6 places in contact with the shoe rim and the anchor pin).



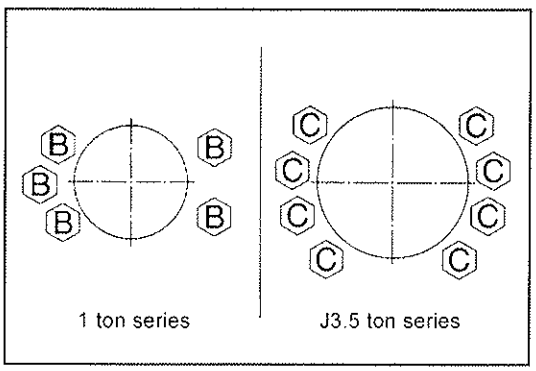
[Point 7]
Inspection:
Measure the clearance between the wheel cylinder and piston.

Limit:
1 ton series: 0.125 mm (0.00492 in)
J3.5 ton series: 0.15 mm (0.0059 in)

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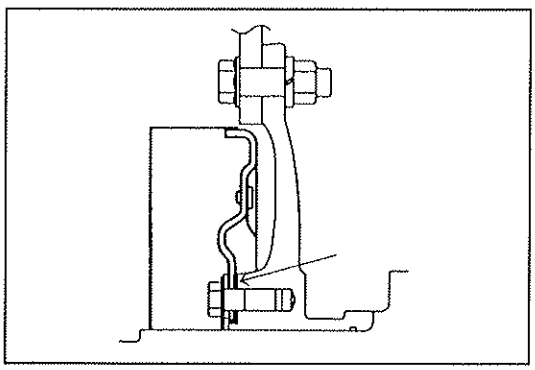


Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) to backing plate fitting portion of the wheel cylinder and on whole periphery of the set bolts to eliminate any clearance.

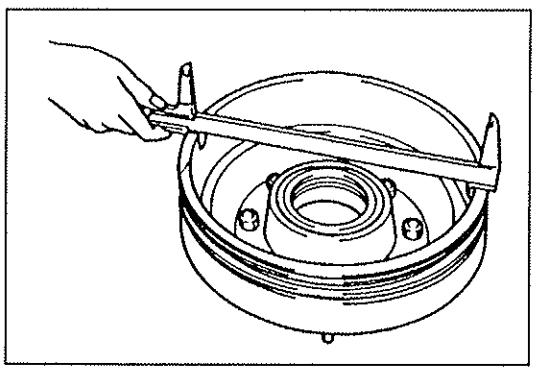


[Point 8]
Reassembly:
Carefully install the backing plate set bolts because they are different in length.
Apply thread tightener (08833-76001-71 (08833-00070)) on the set bolts before reassembly.

Bolt length
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)



Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the backing plate surface in contact with the front axle bracket to eliminate any clearance.



[Point 9]
Inspection:
Measure the brake drum inside diameter.

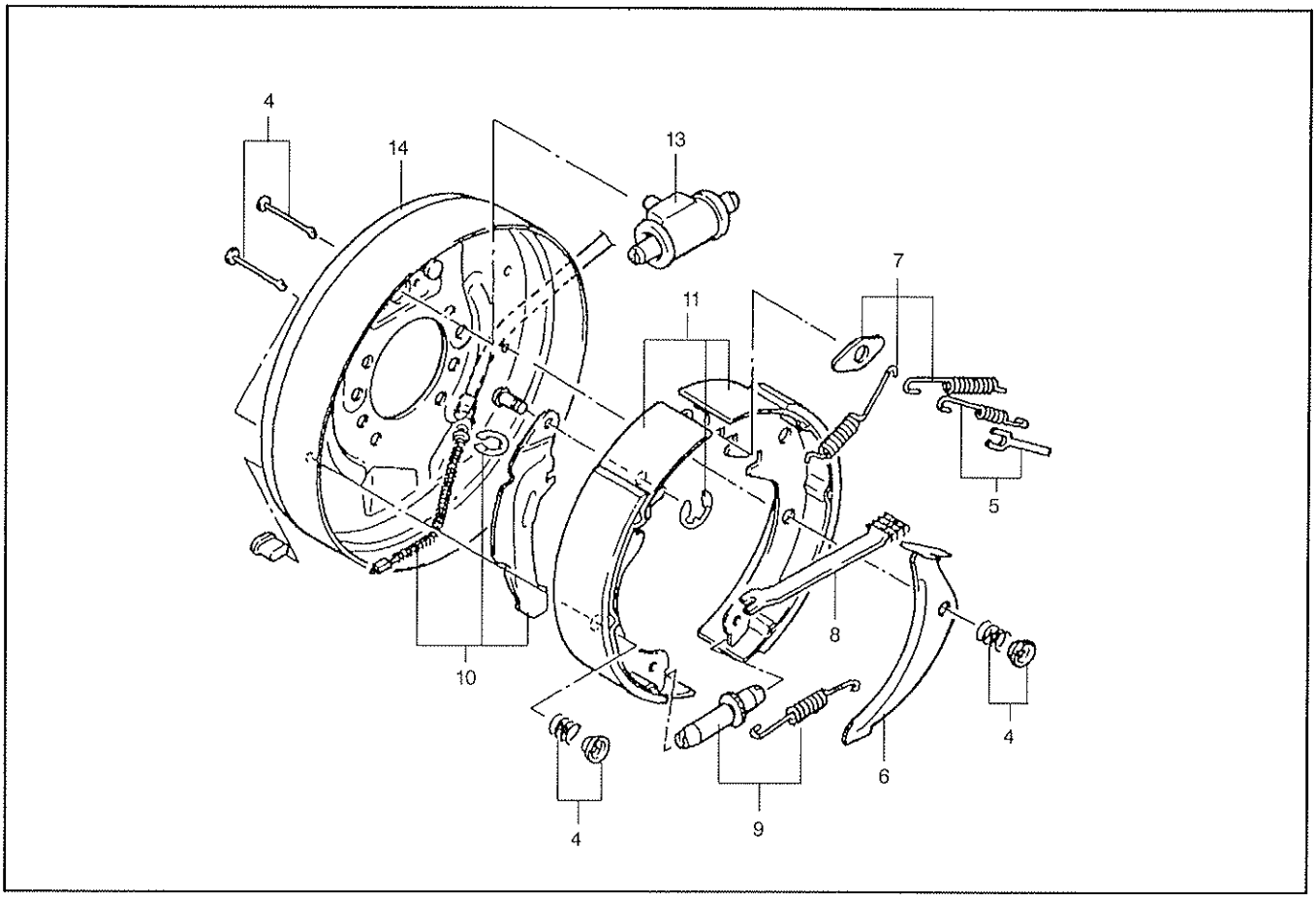
Standard:
1 ton series: 254 mm (10.0 in)
J3.5 ton series: 317.5 mm (12.50 in)

Limit:
1 ton series: 256 mm (10.1 in)
J3.5 ton series: 319.5 mm (12.579 in)

Reassembly:
Apply thread tightener (08833-76001-71 (08833-00070)) on the brake drum set nut before reassembly.

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DISASSEMBLY·INSPECTION·REASSEMBLY (2·3 TON SERIES)



Disassembly Procedure

1 Drain brake fluid.

2 Remove front wheels.

3 Remove the front axle hub W/brake drum. (See page 5-7.)

4 Remove the hold down spring. **[Point 1]**

5 Remove the pawl lever stopper. **[Point 2]**

6 Remove the pawl lever.

7 Remove the anchor to shoe spring. **[Point 3]**

8 Remove the strut lever. **[Point 4]**

9 Remove the adjuster spring and adjusting screw. **[Point 5]**

10 Disconnect the parking brake cable. **[Point 6]**

11 Remove the brake shoe. **[Point 7]**

12 Disconnect the brake piping.

13 Remove the wheel cylinder ASSY. **[Point 8]**

14 Remove the backing plate. **[Point 9]**

15 Separate the brake drum from the front axle hub. **[Point 10]**

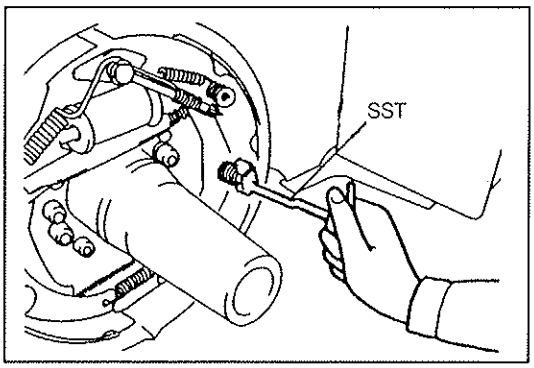
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Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.
(With regard to steps 4 and 5, however, install the pawl lever stopper after installing the hold down spring.)

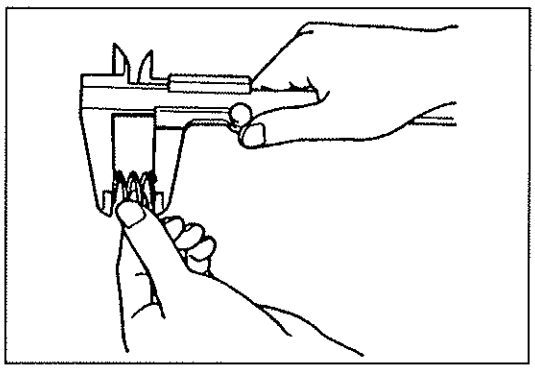
Note:

- **See that the brake lining and brake drum interior surface are free from grease or oil before reassembly.**
- **Before reassembly, decrease the brake shoe outside diameter for installation to approx. 1 mm (0.04 in) less than the brake drum inside diameter by tightening the adjusting screw.**
- **After reassembly, perform brake air bleeding (page 8-23) and braking force inspection and adjustment (page 8-23).**



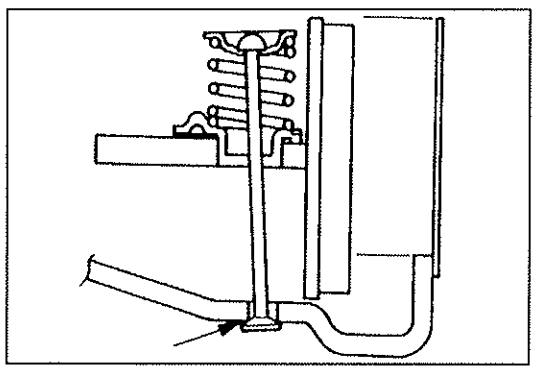
Point Operations

[Point 1]
Disassembly-Reassembly:
SST 09510-31960-71



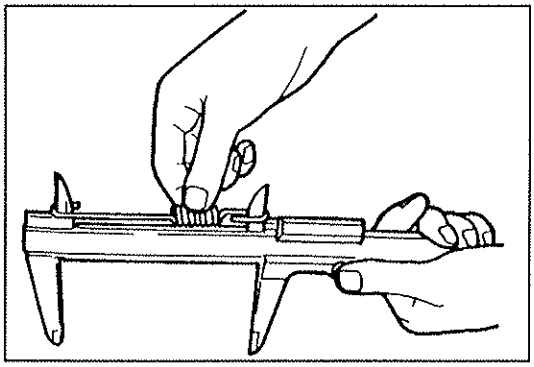
Inspection:
Measure the free length of hold down spring.

Standard: 32.3 mm (1.272 in)
Limit: 29.1 mm (1.146 in)



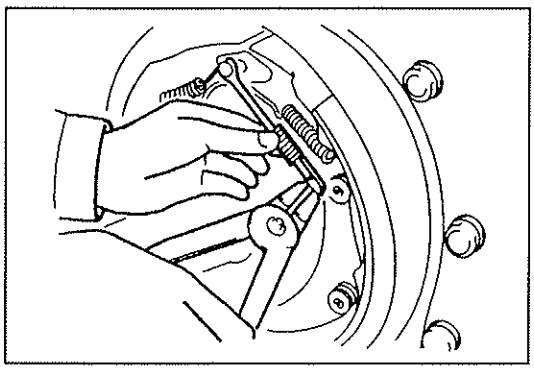
Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the back side of the backing plate in contact with the shoe hold down spring to eliminate any clearance.

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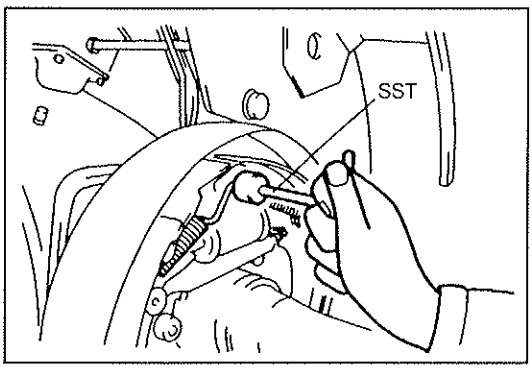


[Point 2]
Inspection:
Measure the free length of the actuator spring.

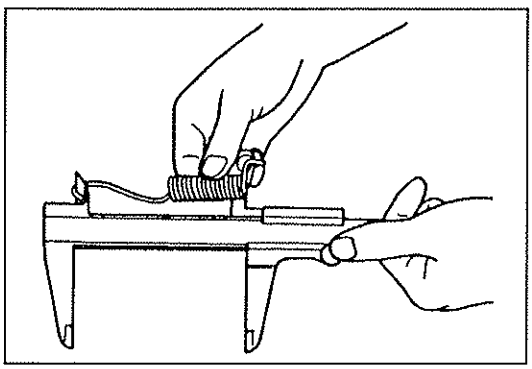
Standard: 124.5 mm (4.902 in)
Limit: No clearance between coil turns



Reassembly:
Use snap ring pliers and install the pawl lever stopper and actuator spring.

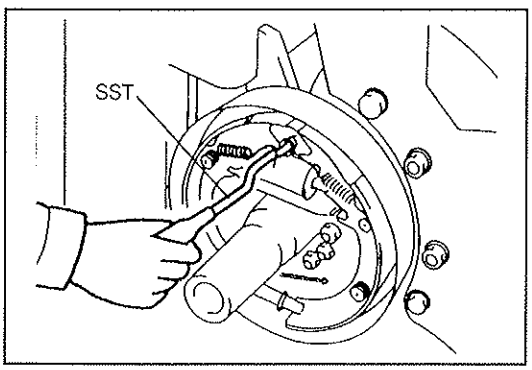


[Point 3]
Disassembly:
SST 09717-76001-71
(SST 09717-20010)



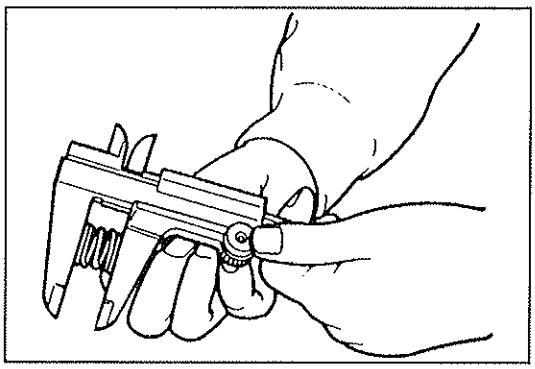
Inspection:
Measure the free length of the anchor to shoe spring.

Standard: 106 mm (4.17 in)
Limit: No clearance between coil turns



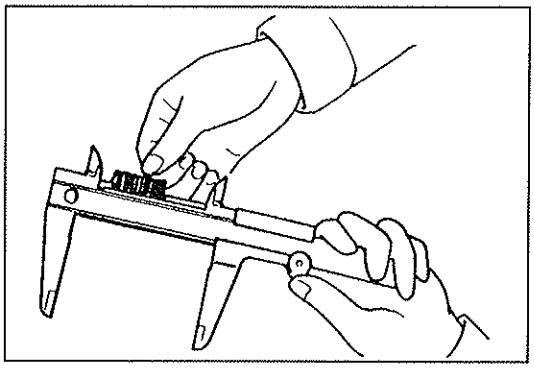
Reassembly:
SST 09718-76001-71
(SST 09718-20010)

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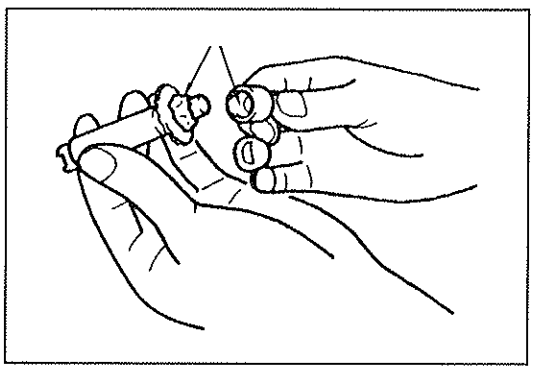
[Point 4]
Inspection:
Measure the free length of the strut to shoe spring.

Standard: 23 mm (0.91 in)
Limit: 20 mm (0.79 in)

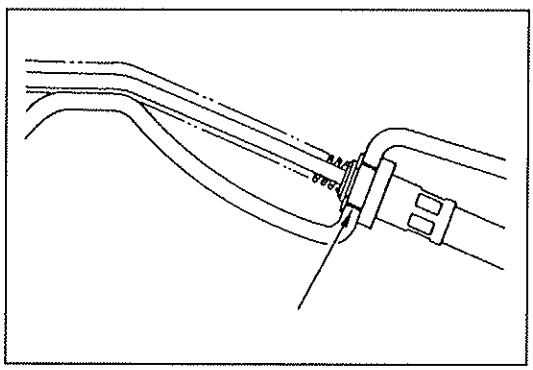


[Point 5]
Inspection:
Measure the free length of the adjuster spring.

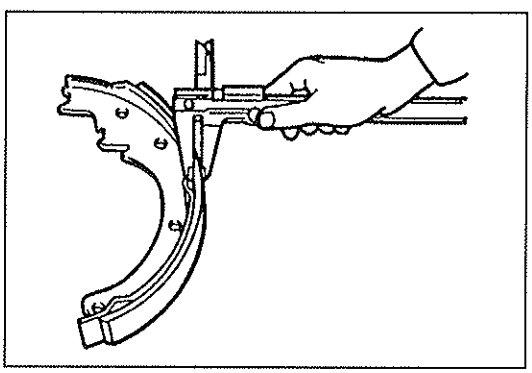
Standard: 86 mm (3.39 in)
Limit: No clearance between coil turns



Reassembly:
Apply grease on the adjusting screw threaded portion and fill grease in the cap.



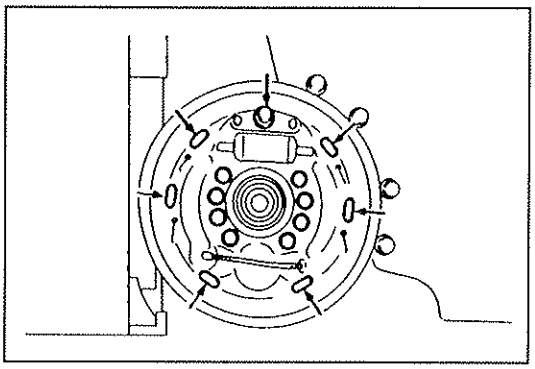
[Point 6]
Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the parking brake outlet on the backing plate to eliminate any clearance.



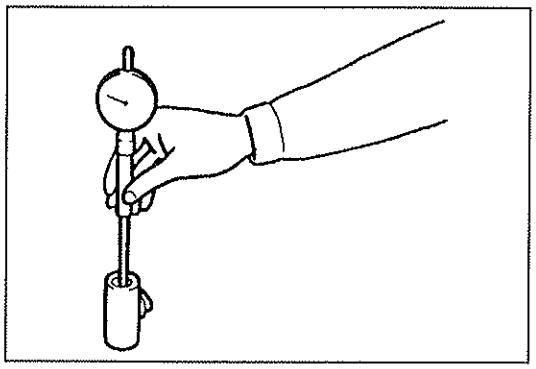
[Point 7]
Inspection:
Measure the brake lining thickness.

Standard: 7.0 mm (0.276 in)
Limit: 2.0 mm (0.079 in)

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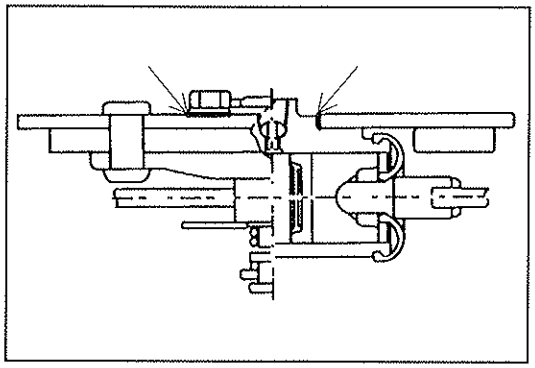


Reassembly:
Apply grease on the illustrated portions of the backing plate (6 places in contact with the shoe rim and the anchor pin) before brake shoe installation.

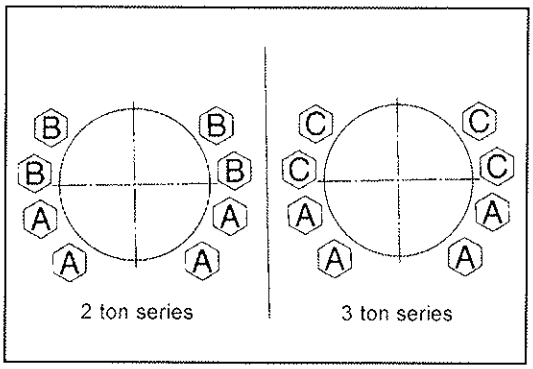


[Point 8]
Inspection:
Measure the clearance between the wheel cylinder and piston.

Limit: 0.145 mm (0.00571 in)

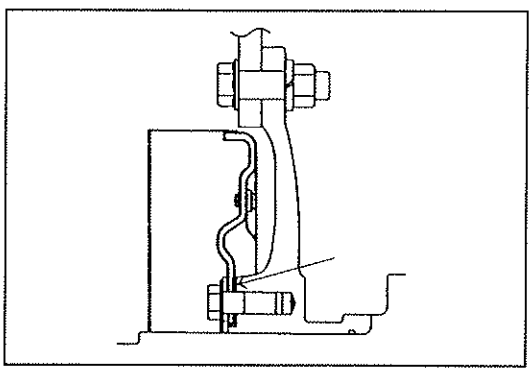


Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the wheel cylinder backing plate fitting portion and whole periphery of set bolts to eliminate any clearance.



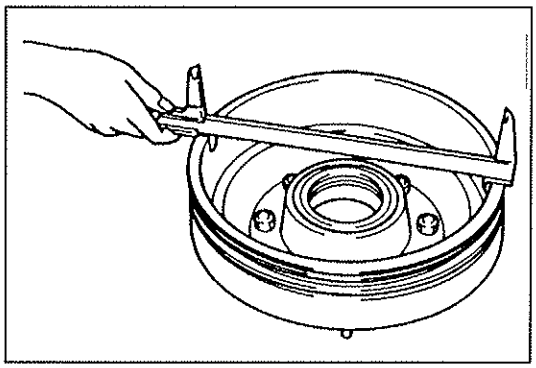
[Point 9]
Reassembly:
Carefully install the backing plate set bolts in correct positions since they are different in length.
Apply thread tightener (08833-76001-71 (08833-00070)) on the set bolts before reassembly.

Bolt length
A: ℓ = 36 mm (1.42 in)
B: ℓ = 40 mm (1.57 in)
C: ℓ = 45 mm (1.77 in)



Reassembly:
Apply liquid packing (08826-76001-71 (08826-00080)) on the backing plate surface in contact with the front axle bracket to eliminate any clearance.

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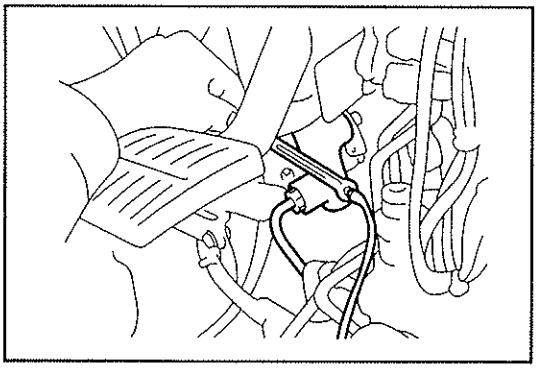


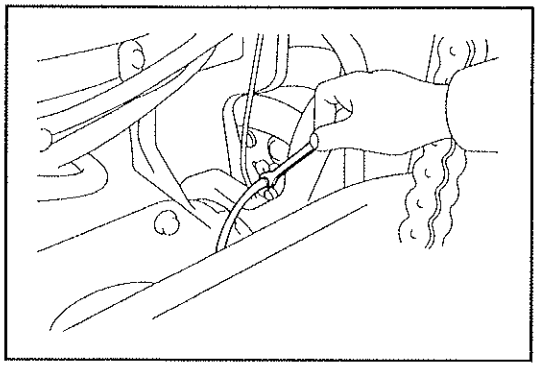
[Point 10]
Inspection:
Measure the brake drum inside diameter.

Standard: 310 mm (12.20 in)
Limit: 312 mm (12.28 in)

Reassembly:
Apply thread tightener (08833-76001-71 (08833-00070)) on the brake drum set nut before reassembly.

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BRAKE AIR BLEEDING

Note:
Add brake fluid to the reservoir tank during air bleeding to prevent it from becoming insufficient.

1. Bleed air from the brake master cylinder.
   (1) Depress the brake pedal several times to compress the air in the piping, and hold that state.
   (2) Loosen the breather plug to discharge air in the piping with the brake fluid, and tighten the plug immediately before the fluid stops to run out.
   (3) Repeat steps (1) and (2) above until no air bubbles are seen in the discharged brake fluid.
2. Bleed air from wheel cylinders RH and LH.
   (1) Operate as described in step 1 above for each of the RH and LH side at a time.
3. Add brake fluid to the specified level.
   (1) Add brake fluid through the filter provided at the reservoir tank.
   (2) Add brake fluid up to the staged portion in the reservoir tank.

BRAKING FORCE INSPECTION·ADJUSTMENT

1. Inspect the braking force by means of a brake tester or traveling test.
   Braking distance (without load)

Initial speed of braking	km/h (mph)	Max. speed
Braking distance	m (ft)	5.0 or less (16.4)

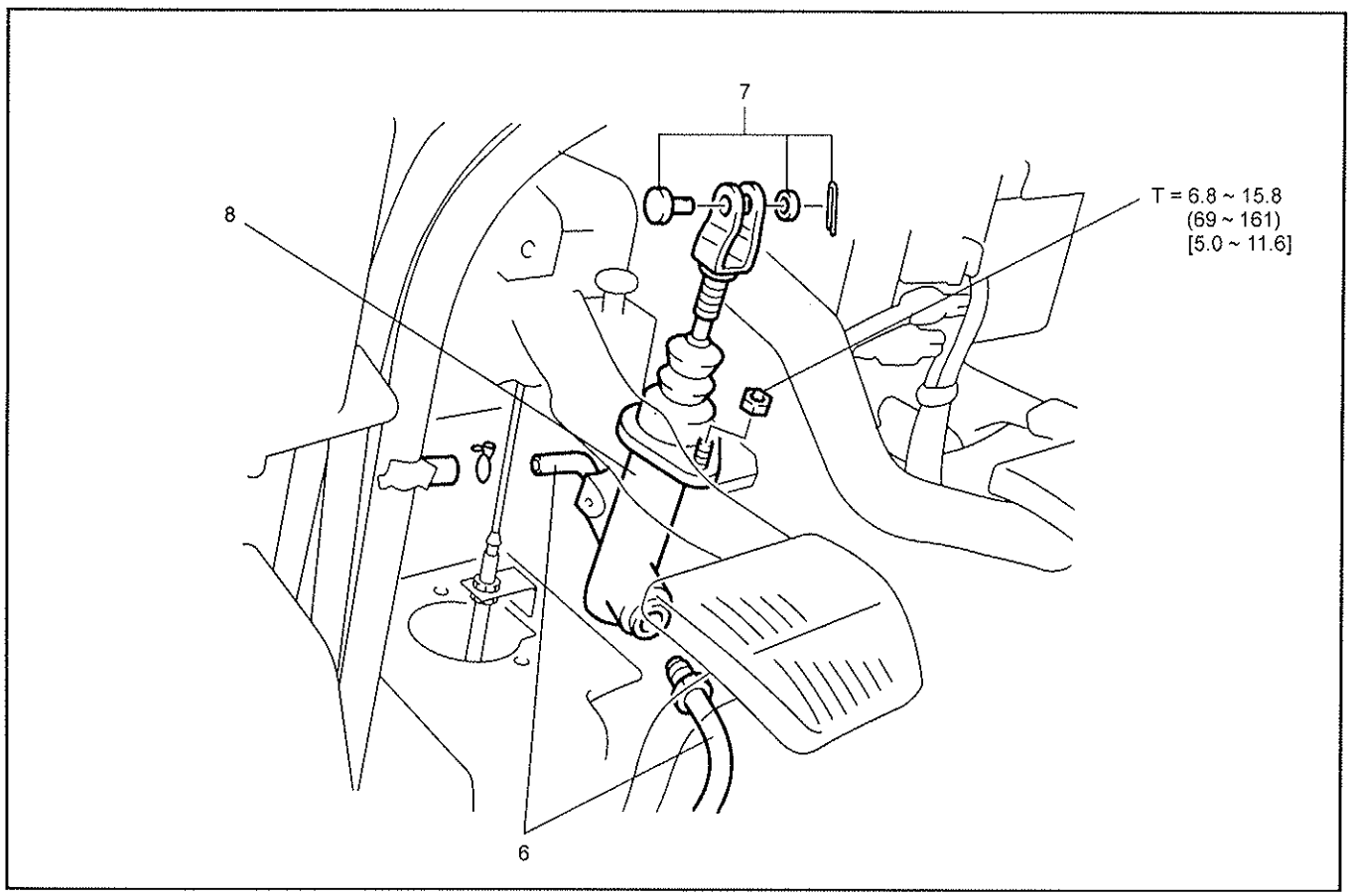
2. Adjust the braking force.
   (1) Repeat traveling in the forward and reverse directions to adjust the brake shoe clearance.
   The adjusting screw adjusts the clearance automatically when the brake pedal is depressed in reverse traveling.
   (2) If the braking force is insufficient, adjuster malfunction, lining contact defect, foreign matter adhesion on the lining or brake fluid leakage is assumed. Remove and inspect the brake drum.
   (3) When the brake shoe is replaced with a new one, repeat traveling in the forward and reverse directions for running in.

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BRAKE MASTER CYLINDER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.

2 Remove the lower panel.

3 Remove the instrument panel.

4 Remove the combination meter cover.

5 Disconnect the brake side hose from the reservoir tank and drain brake fluid.

6 Disconnect the piping.

7 Remove the push rod clevis pin.

8 Remove the brake master cylinder.

Installation Procedure

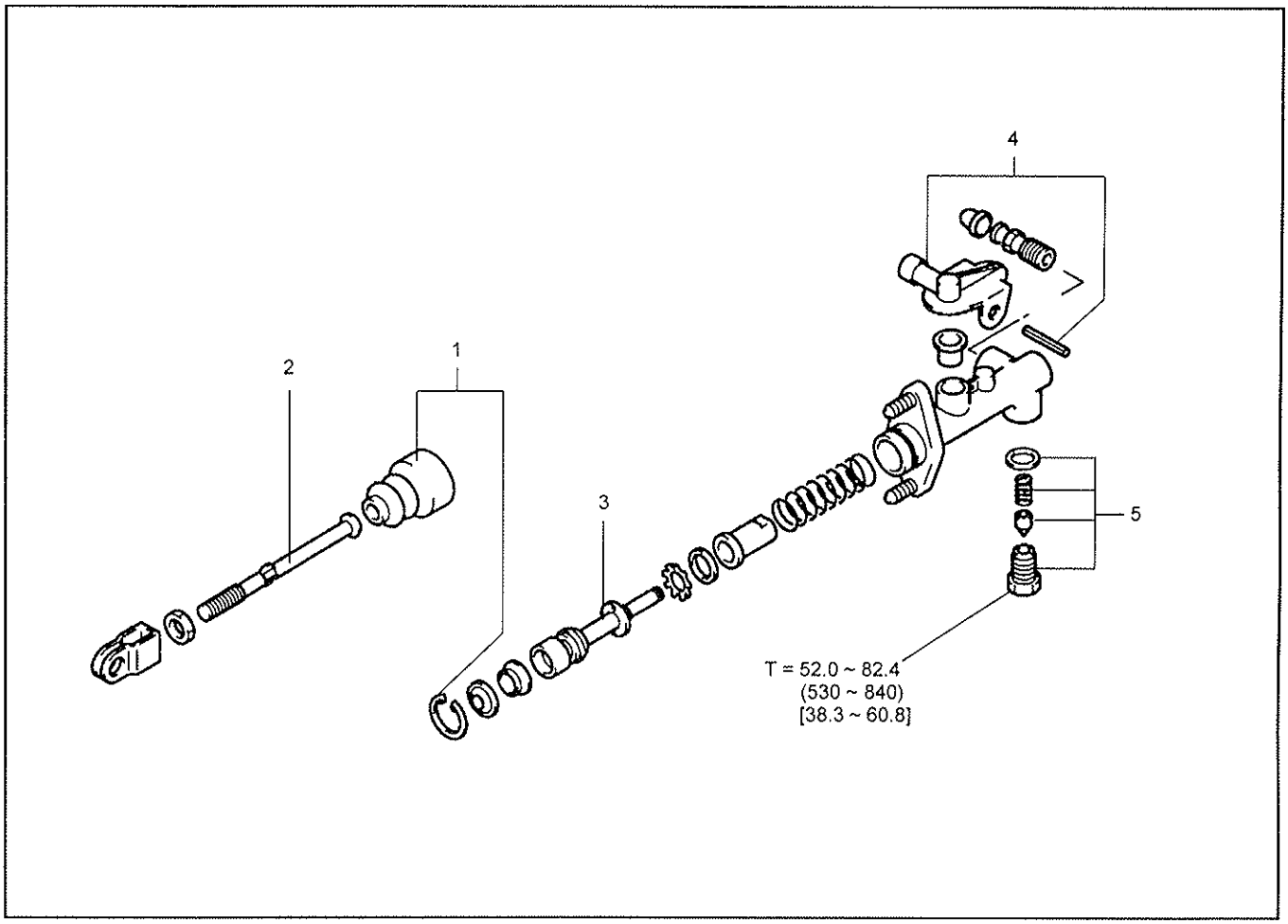
The installation procedure is the reverse of the removal procedure.

Note:
After installation, perform brake pedal adjustment (page 8-28) and air bleeding (page 8-23).

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Turn the boot up and remove the snap ring.

2 Remove the push rod. **[Point 1]**

3 Remove the piston. **[Point 2]**

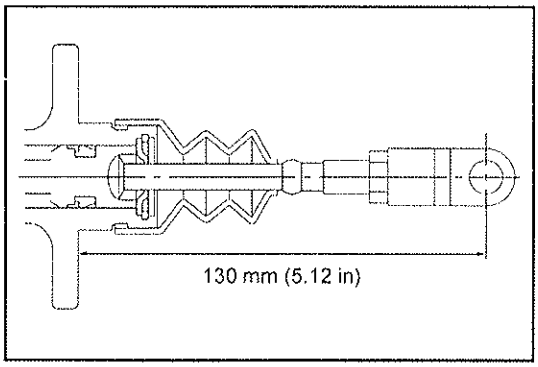
4 Remove the pin and the fluid inlet elbow.

5 Remove the outlet plug and valve.

Reassembly Procedure

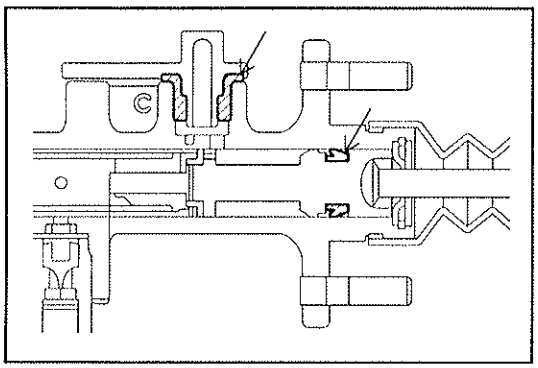
The reassembly procedure is the reverse of the disassembly procedure.

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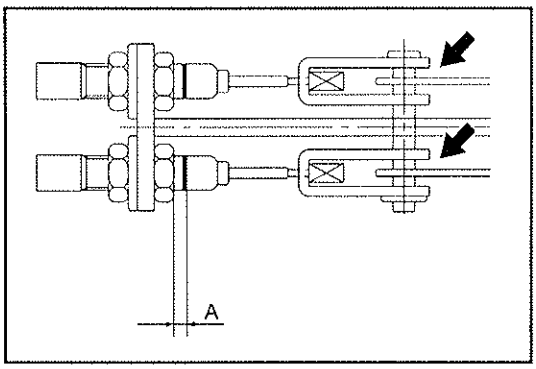
Point Operations

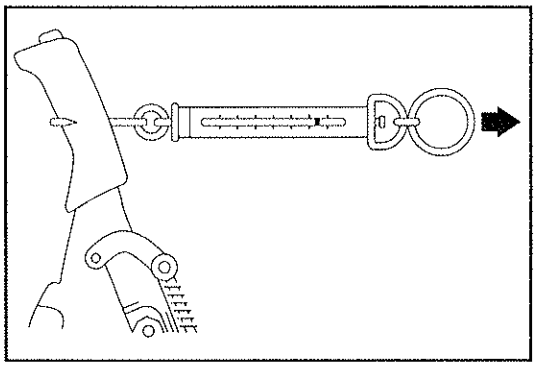
[Point 1]
Installation:
Temporarily set the push rod length to the illustrated dimension, and make readjustment after installation.

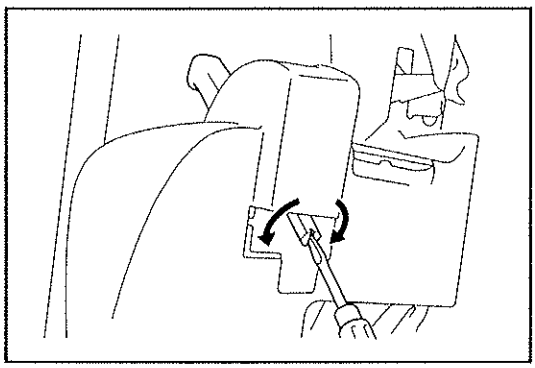


[Point 2]
Installation:
Apply rubber grease on the piston cup and whole periphery of the cup before reassembly.

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PARKING BRAKE INSPECTION·ADJUSTMENT

1. Check the parking brake cable set position.

   Standard: A = 0 ~ 2 mm (0 ~ 0.08 in)

2. Apply chassis grease on the portions indicated by arrows.

3. Inspect and adjust the parking brake lever operating force.
   (1) Set a spring scale at the center of the lever knob, and measure the operating force by pulling it backward.

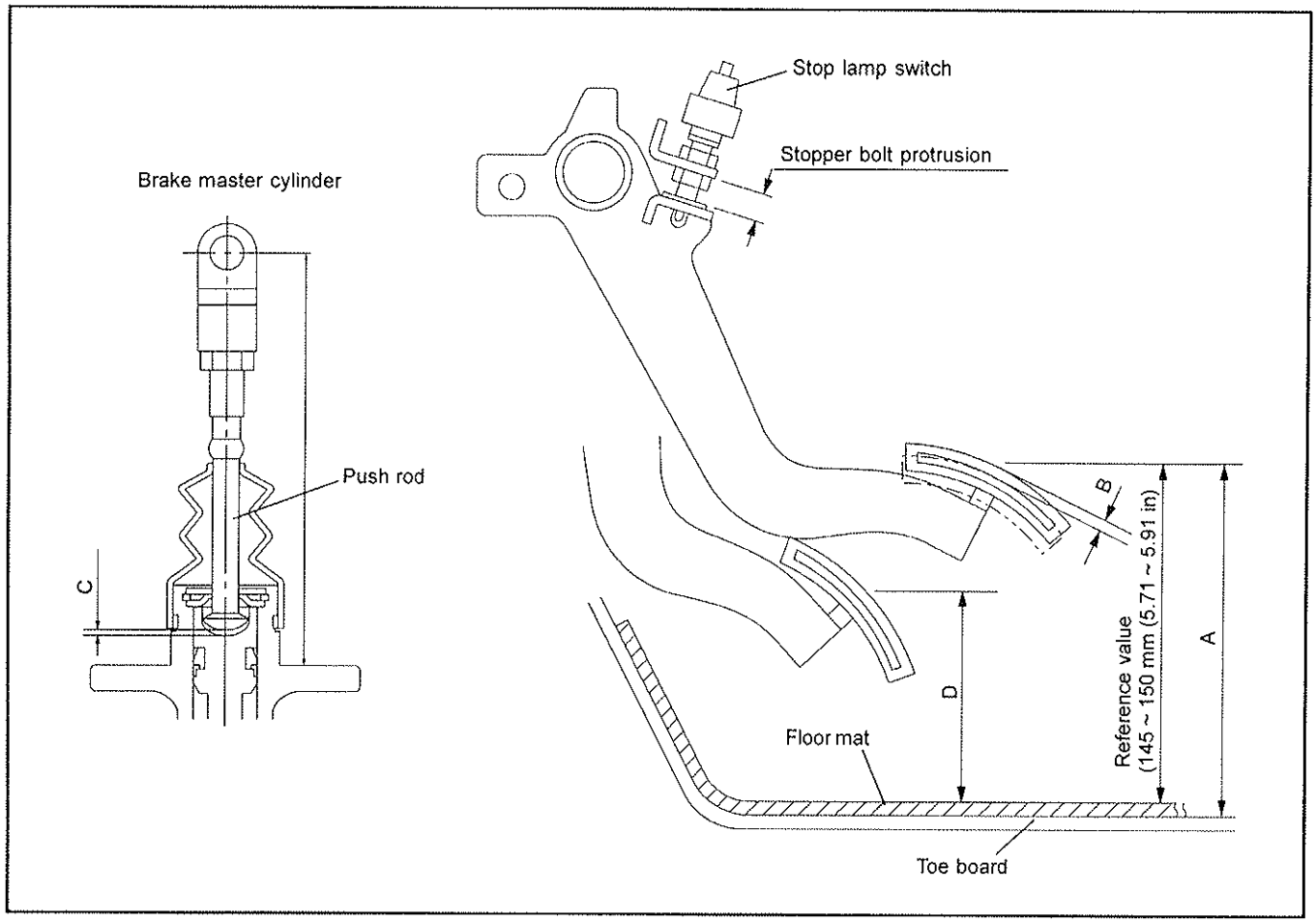
   Standard:
   1~3 ton series
   147 ~ 196 N (15 ~ 20 kgf) [33 ~ 44 lbf]
   J3.5 ton series
   196 ~ 245 N (20 ~ 25 kgf) [44 ~ 55 lbf]

   (2) If the operating force is out of the standard range, release the parking brake and make adjustment at the adjusting portion.

   Clockwise turn: Increases the operating force.
   Counterclockwise turn: Decreases the operating force.

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BRAKE PEDAL INSPECTION·ADJUSTMENT



1. Inspect brake pedal height A. (From toe board to top of pedal)

   Standard: A = 150 ~ 155 mm (5.91 ~ 6.10 in) (with pedal pad)

   If the standard is not satisfied, make adjustment by changing the stop lamp switch position or the stopper bolt protrusion.

2. Inspect brake pedal play B.

   Standard: B = 3 ~ 7 mm (0.12 ~ 0.28 in)

   If the standard is not satisfied, make adjustment by changing the master cylinder push rod length.

3. Check master cylinder push rod play C with the brake pedal in the above state.

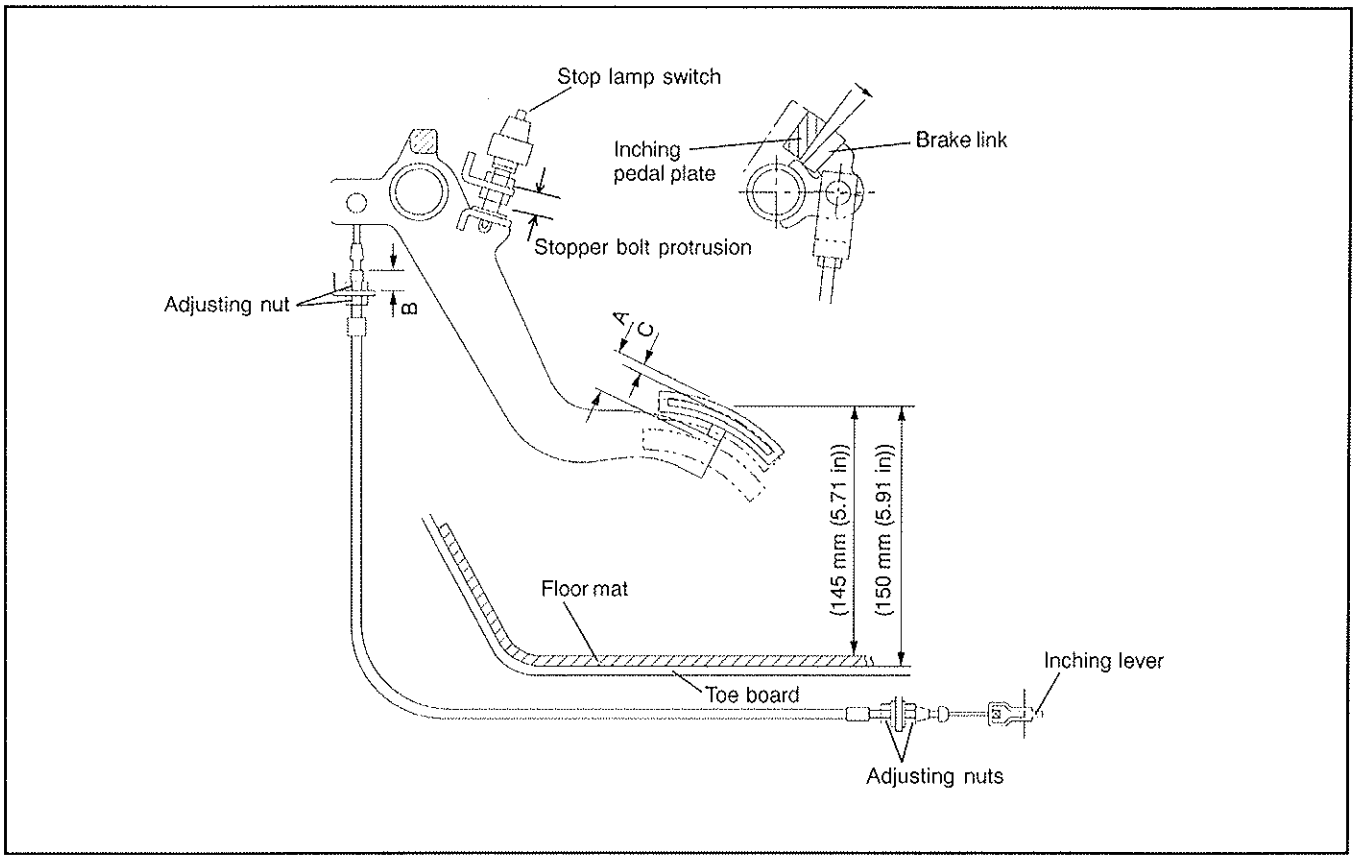
   Standard: C = 1 mm (0.04 in)

4. After the adjustment, fully depress the brake pedal D and inspect the pedal height in that state.

   Standard: D = 90 mm (3.54 in) or more

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INCHING PEDAL INSPECTION·ADJUSTMENT (~ Mar. 2000)



1. Inspect and adjust the brake pedal height and play (See page 8-28).

2. Inspect stroke A of the inching pedal until interlocking with the brake (pedal stroke until the inching pedal plate comes into contact with the brake link).

   Standard: 1 ton series A = 35 ~ 46 mm (1.38 ~ 1.81 in)
   Others A = 25 ~ 36 mm (0.98 ~ 1.42 in)

   If the standard is not satisfied, adjust the stop lamp switch or stopper bolt protrusion.
   Make adjustment to make the deviation from the brake pedal height within ± 15 mm (0.59 in).

3. Inspect and adjust the inching cable.

   (1) Inspect the inching cable length B on the pedal side.

   Standard: B = 17.5 mm (0.689 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the pedal side.

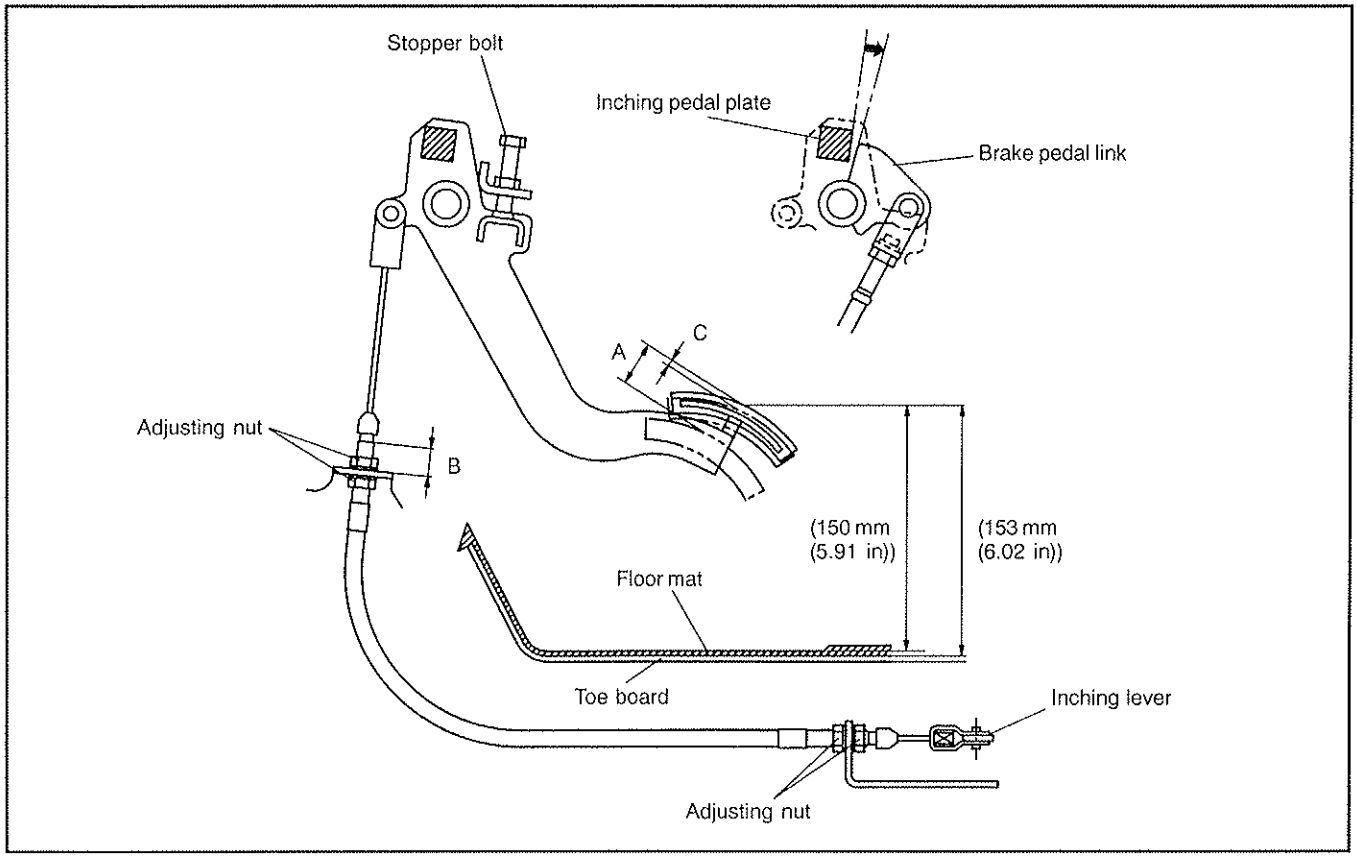
   (2) Inspect inching pedal play C until the torque converter inching lever starts to move.

   Standard: C = 1 ~ 3 mm (0.04 ~ 0.20 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the torque converter side.

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INCHING PEDAL INSPECTION·ADJUSTMENT (Mar. 2000 ~)



1. Inspect and adjust the brake pedal height and play (See page 8-28).

2. Inspect stroke A of the inching pedal until interlocking with the brake (pedal stroke until the inching pedal plate comes into contact with the brake link).

   Standard: 1 ton series A = 35 ~ 41 mm (1.38 ~ 1.61 in)
   Others A = 26 ~ 32 mm (1.02 ~ 1.26 in)

   If the standard is not satisfied, adjust the stopper bolt protrusion.
   Make adjustment to make the deviation from the brake pedal height within ± 15 mm (0.59 in).

3. Inspect and adjust the inching cable.

   (1) Inspect the inching cable length B on the pedal side.

   Standard: B = 17.5 mm (0.689 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the pedal side.

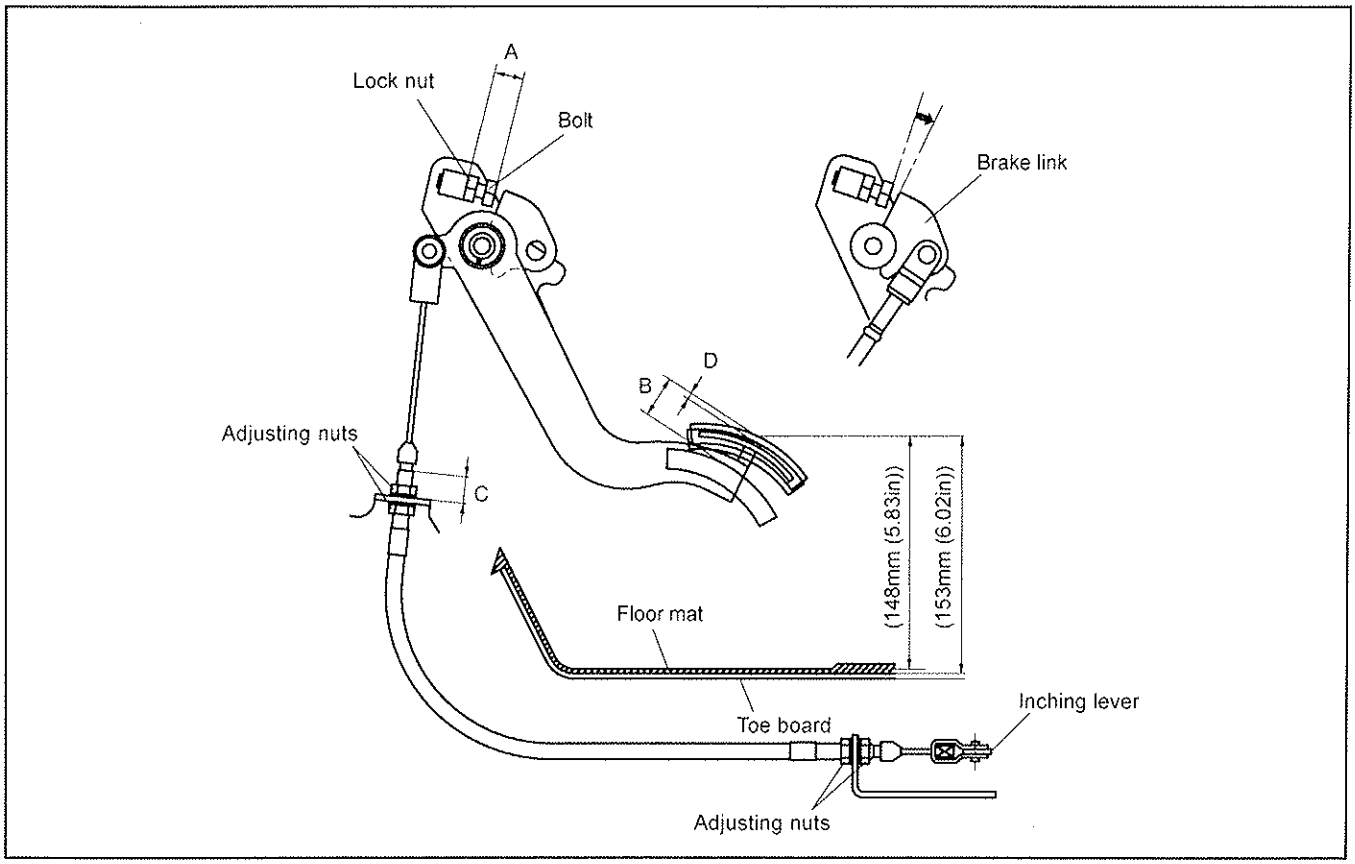
   (2) Inspect inching pedal play C until the torque converter inching lever starts to move.

   Standard: C = 1 ~ 3 mm (0.04 ~ 0.20 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the torque converter side.

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SINGLE BRAKE (INCHING) PEDAL INSPECTION·ADJUSTMENT (1-PEDAL: OPT)



1. Tighten the lock nut after adjust the bolt length A.

   Standard: A = 18 mm (0.71 in)

2. Inspect and adjust the brake pedal height. (See page 8-28)

3. Inspect stroke B of the pedal until interlocking with the brake (pedal stroke until the bolt head comes into contact with the brake link).

   Standard: 1 ton series B = 35 ~ 41 mm (1.38 ~ 1.61 in)
   Others B = 26 ~ 32 mm (1.02 ~ 1.26 in)

   If the standard is not satisfied, adjust the stop lamp switch or stopper bolt protrusion.

4. Inspect and adjust the inching cable.
   (1) Inspect the inching cable length C on the pedal side.

   Standard: C = 17.5 mm (0.689 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the pedal side.

   (2) Inspect inching pedal play D until the torque converter inching lever starts to move.

   Standard: D = 1 ~ 3 mm (0.04 ~ 0.12 in)

   If the standard is not satisfied, make adjustment by turning the adjusting nuts on the torque converter side.

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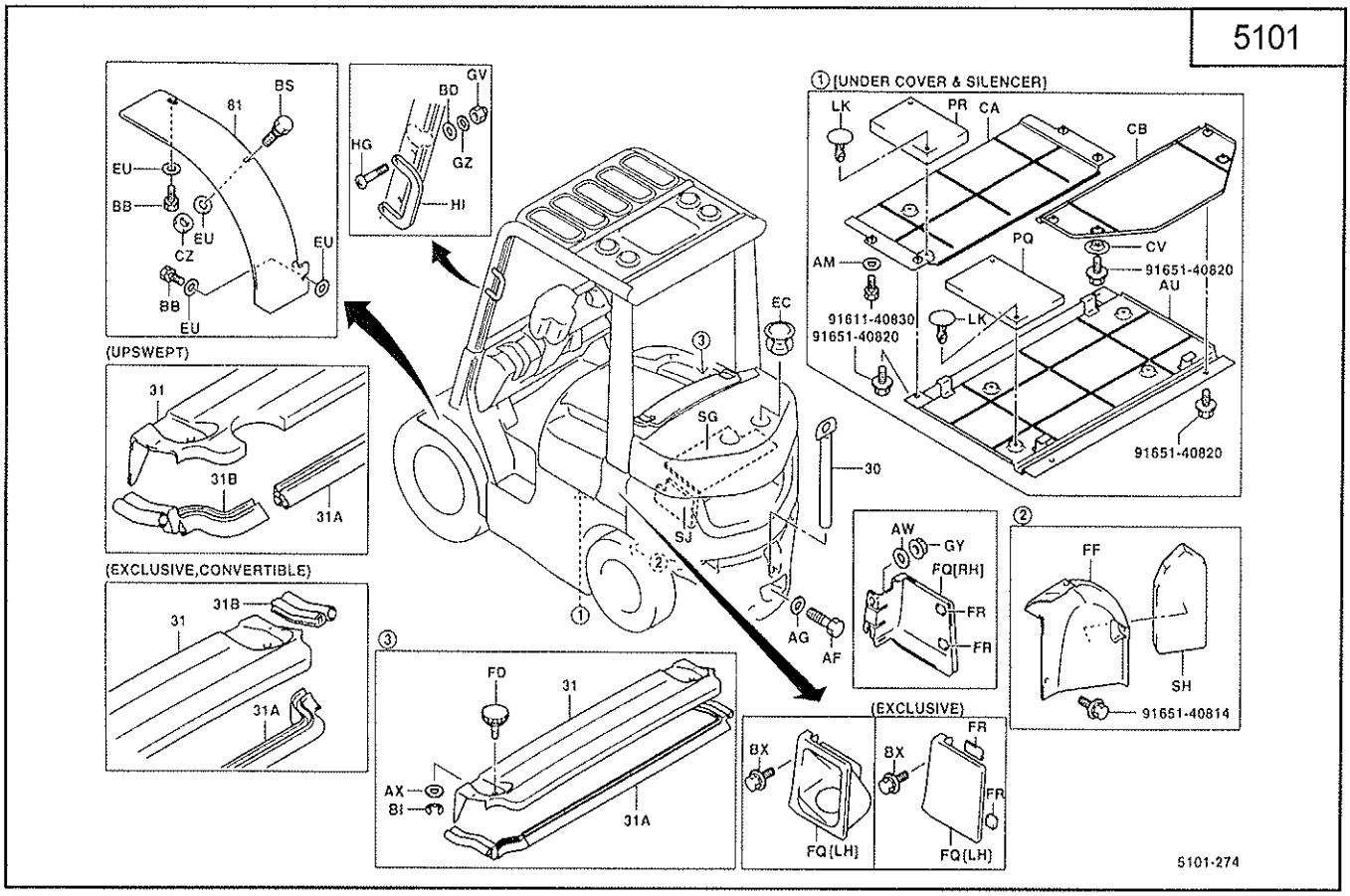
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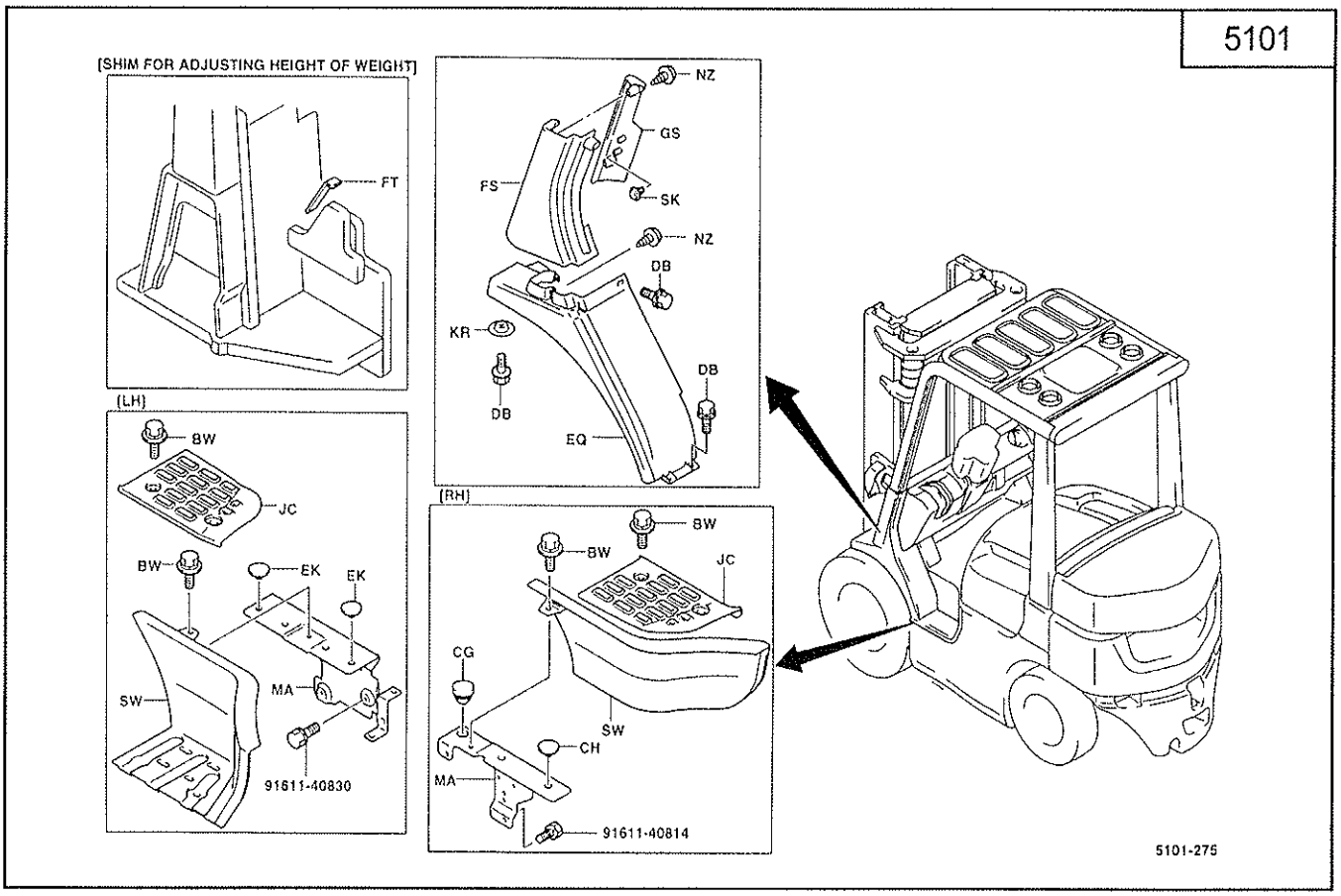
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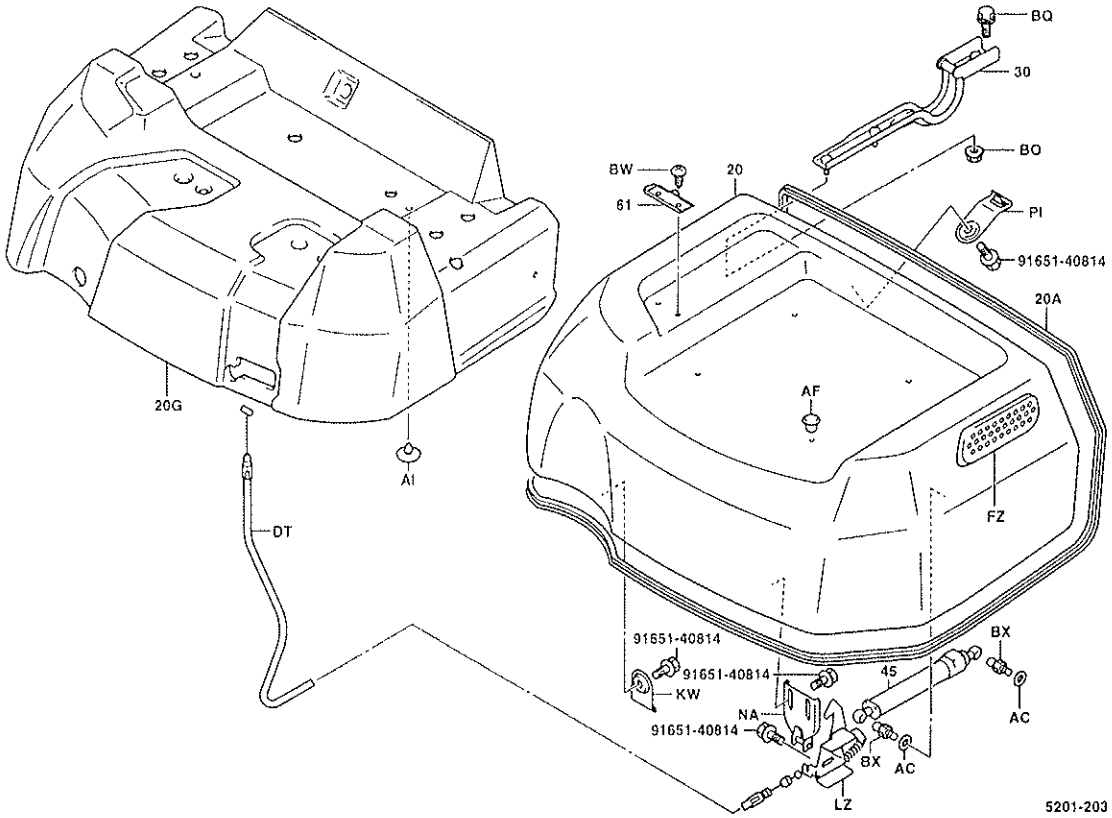
COMPONENTS



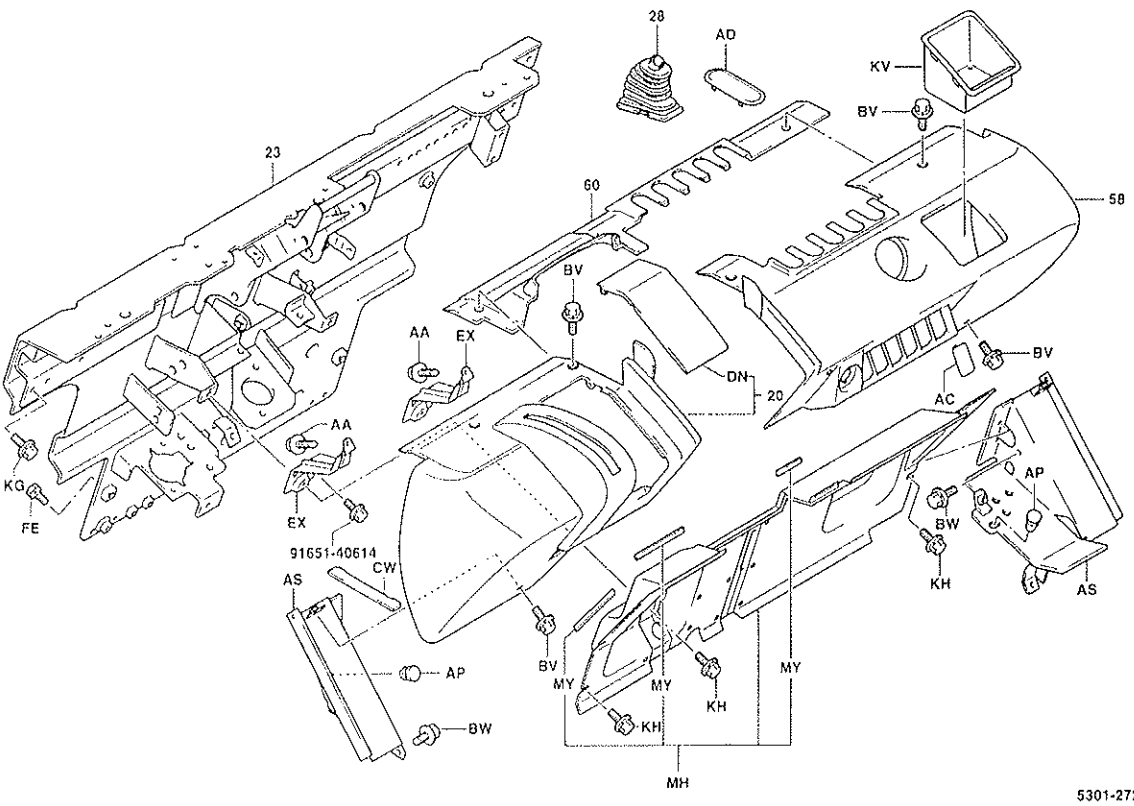


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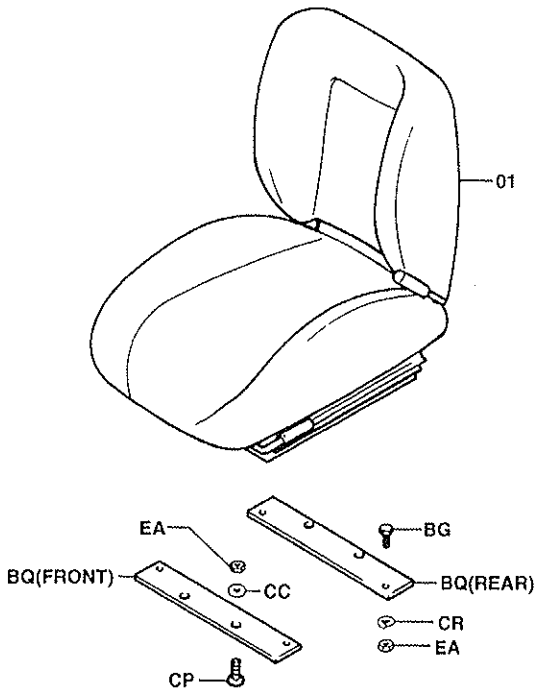


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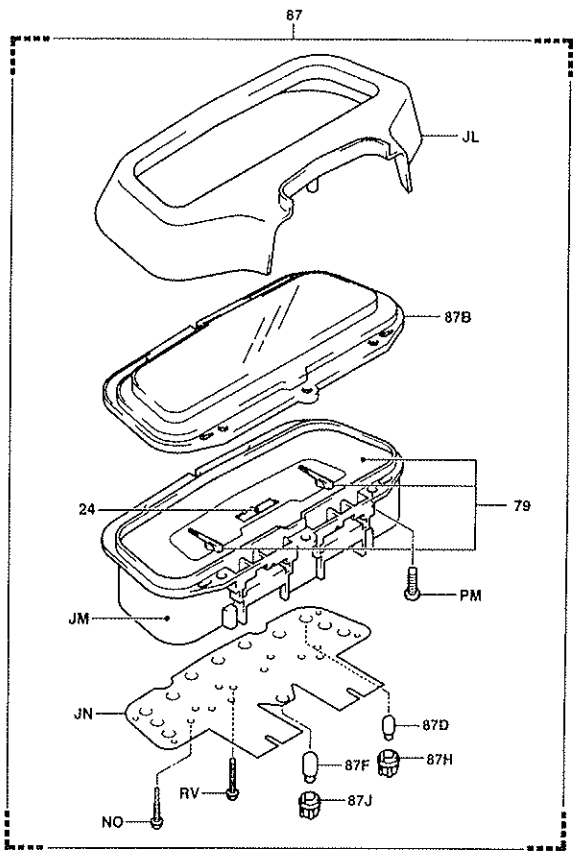
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5308



5308-200C

5701

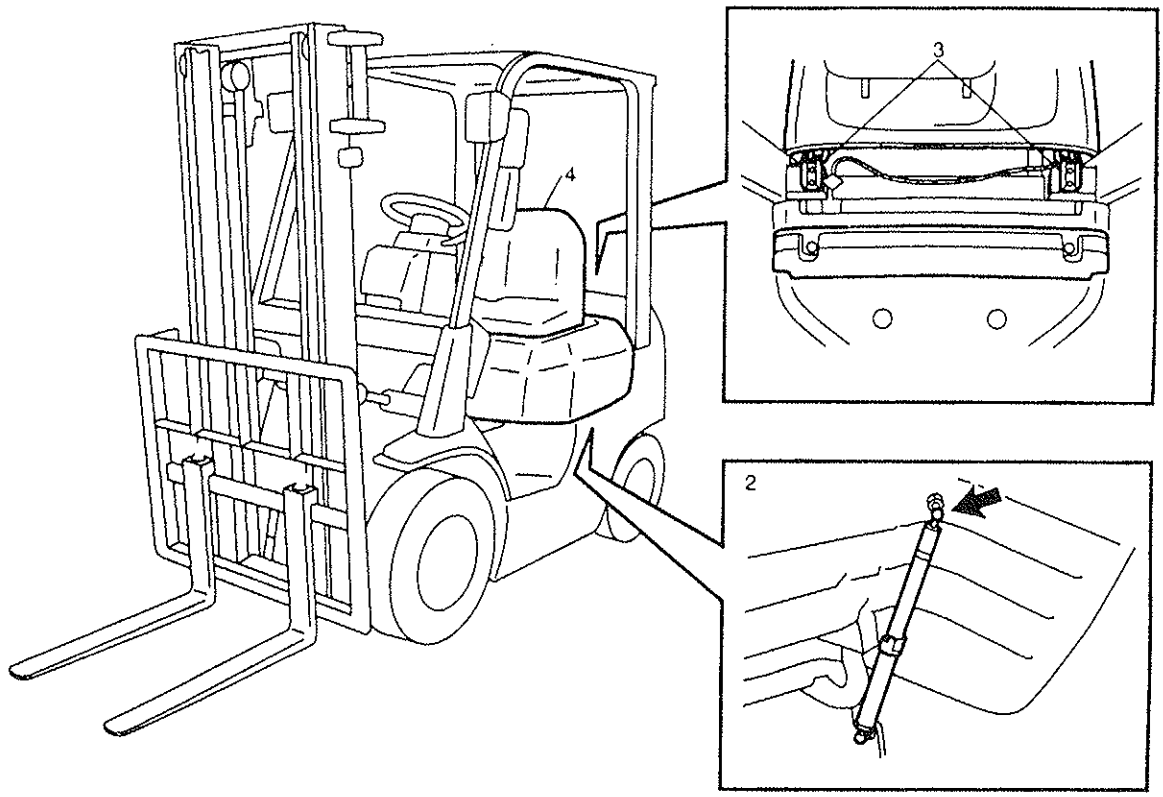


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ENGINE HOOD ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the radiator cover.

2 Open the engine hood.

3 Disconnecting the engine hood damper (on the engine hood side).

4 Remove the engine hood bracket set bolts.

5 Remove the engine hood.

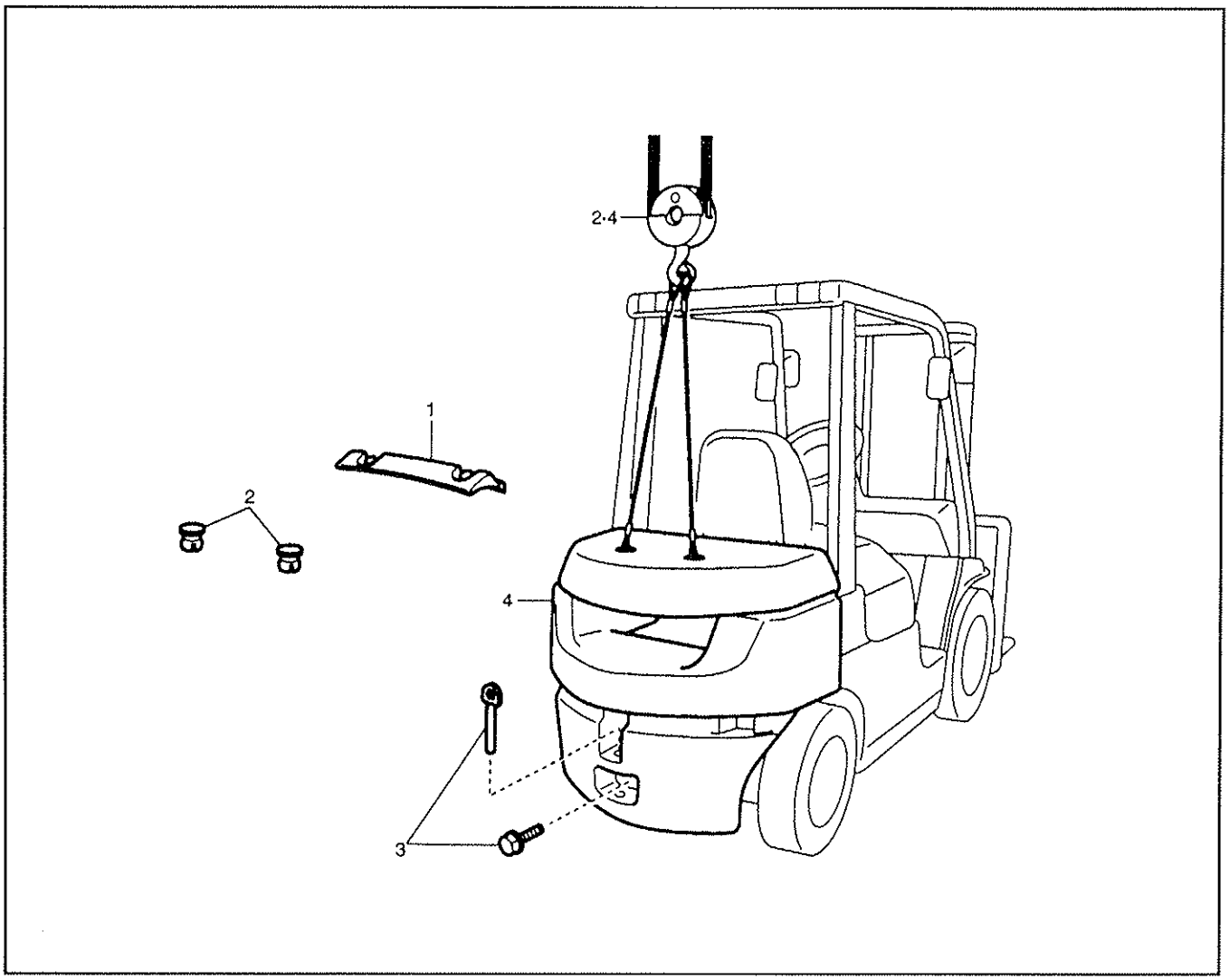
Installation procedure

The installation procedure is the reverse of the removal procedure.

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COUNTERWEIGHT

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the radiator cover.

2 Remove the weight cap and temporarily hoist the counterweight using a wire rope.

3 Remove the drawbar and remove the counterweight set bolts.

4 Remove the counterweight.

Installation Procedure

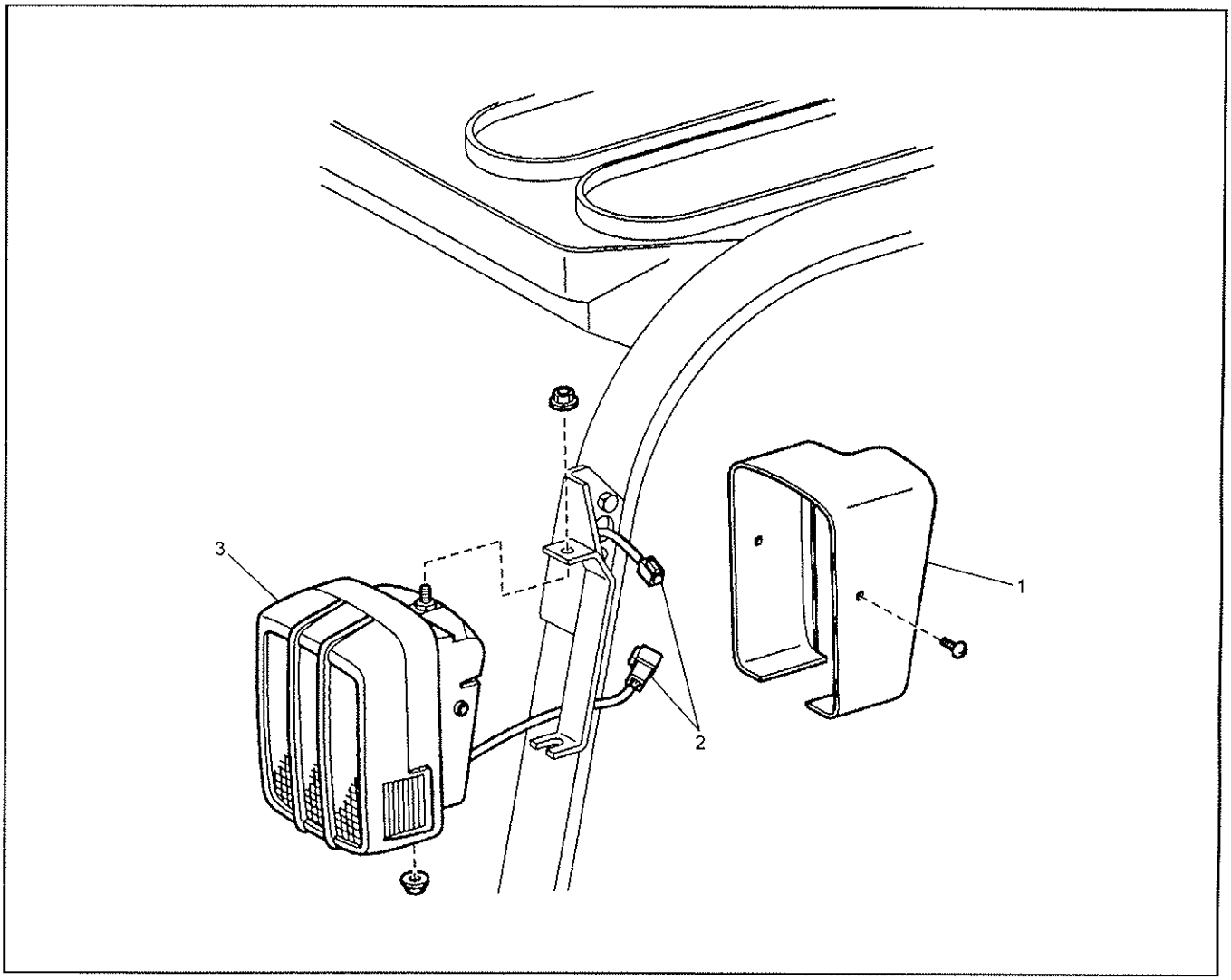
The installation procedure is the reverse of the removal procedure.

Note:
See page 0-15 for the weight of the counterweight.

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HEAD LAMPS (Front Combination Lamp: OPT)

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the headlamp cover.

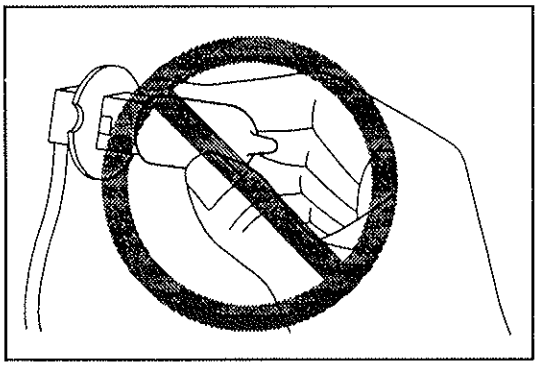
2 Pull the connector out from the pillar hole and disconnect it.

3 Remove each headlamp.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

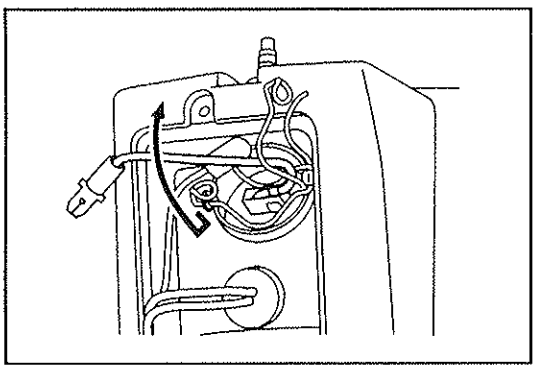
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BULB REPLACEMENT

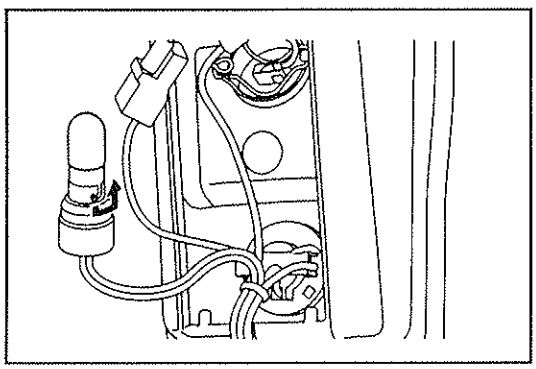
Note:

- **Since the halogen bulb (of the headlamp) becomes hot during lighting, its life is shortened if oil or grease adheres on the glass surface. When handling the bulb, therefore, hold the flange portion to avoid direct contact between the glass surface and a hand or finger.**
- **Since the internal pressure of the halogen bulb (of the headlamp) is high, it may be broken to cause scattering of glass fragments when it is dropped or struck or when the glass surface is scratched.**
- **Always use a bulb showing the same (specified) wattage for replacement.**
  Headlamp: 12 V, 55 W, and H3
  Clearance lamp: 12 V, 5 W
  Turn signal lamp: 12 V 21 W (amber color)

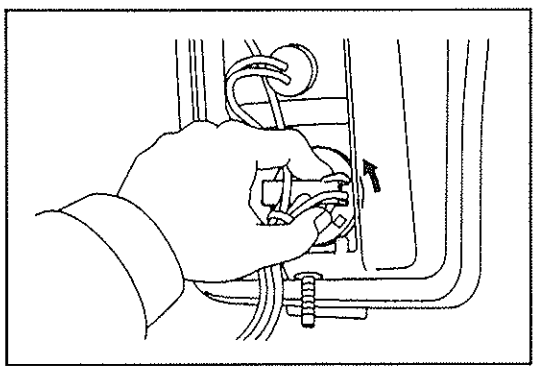


1. Remove the headlamp ASSY.
2. Remove the rear cover.
3. Remove each bulb.

   Head lamp:
   (1) Disconnect the connector.
   (2) Unlock the set spring, and remove the bulb.



Clearance lamp:
(1) Extract the bulb socket.
(2) Remove the bulb by turning it counterclockwise while pushing it.



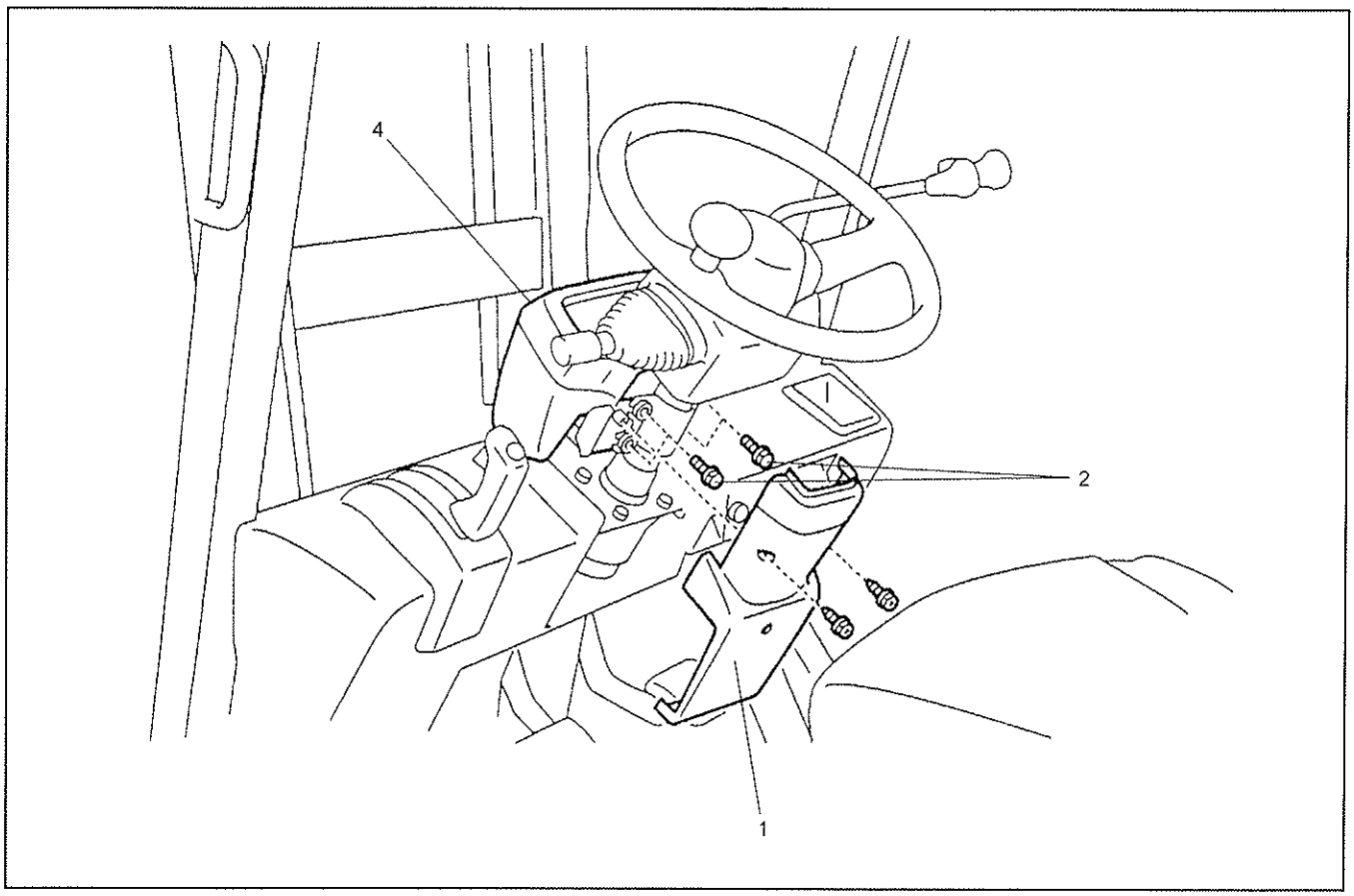
Turn signal lamp:
(1) Remove the bulb socket by turning it counterclockwise.
(2) Remove the bulb by turning it counterclockwise.

4. The installation procedure is the reverse of the removal procedure above.

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COMBINATION METER

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the combination meter cover.

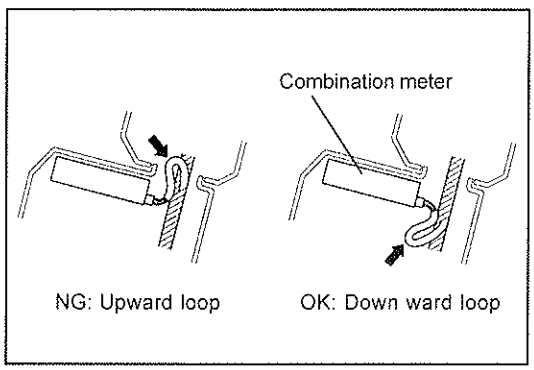
2 Remove the combination meter set bolts.

3 Disconnect the combination meter wiring. **[Point 1]**

4 Remove the combination meter ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operations

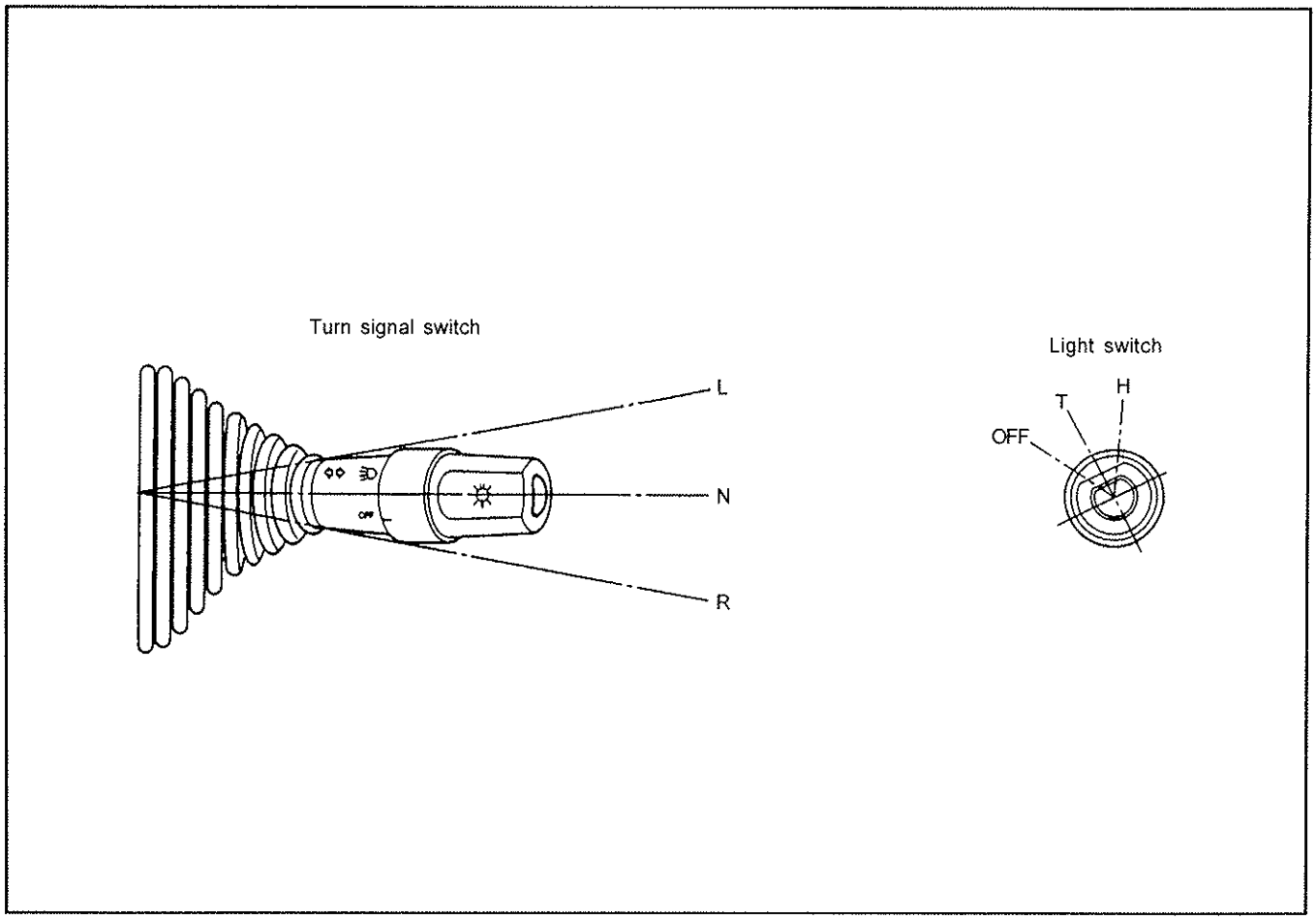
[Point 1]
Installation:
The combination meter wiring must form downward loop. When the combination meter wiring is looped upward, moist on the harness, or water droplet may permeate into the connector.

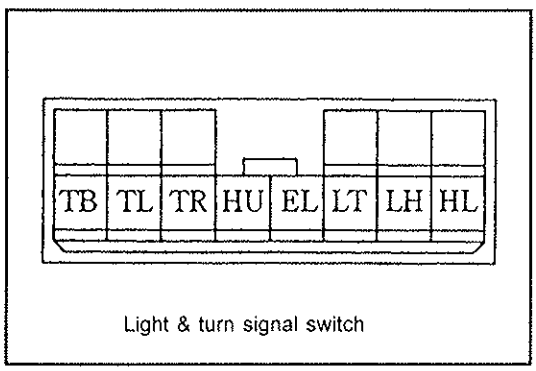
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COMBINATION SWITCH

Note:
See page 2-34 for the direction switch inspection.

INSPECTION





Light & turn signal switch

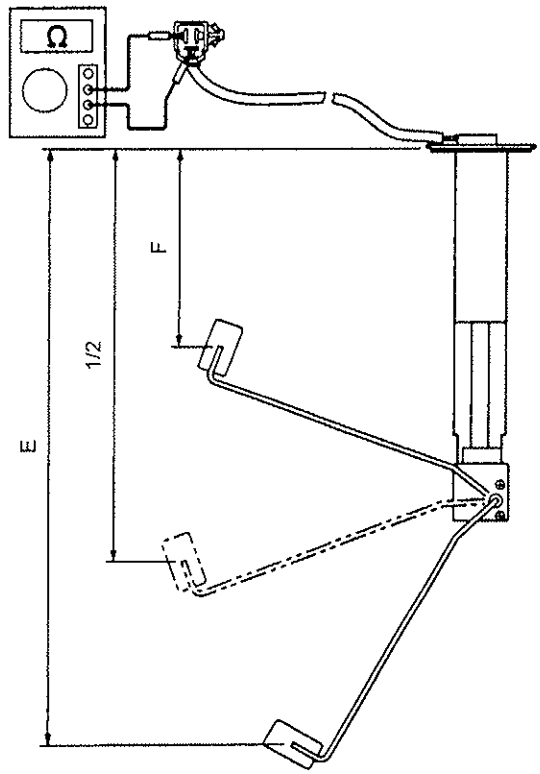
1. Individual switch continuity inspection

Switch position	Measurement terminals	Standard
Light switch		
OFF	EL-LT-LH	No continuity
T	EL-LT	Continuity
H	EL-LT-LH	Continuity
Turn signal switch		
R	TB-TR	Continuity
OFF	TB-TR-TL	No continuity
L	TB-TL	Continuity

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FUEL SENDER GAUGE

INSPECTION



1. Measure the resistance.
   (1) Check to see if the float moves smoothly.
   (2) Measure the resistance between the sender positive terminal and sender negative (body ground) terminal while the float position is varied between F and E.
   Also check if the resistance varies continuously

Note:
- **Measure in the direction of float movement from F to E.**
- **The resistance at each of F and E points shall be measured when the arm is in contact with the respective stopper.**

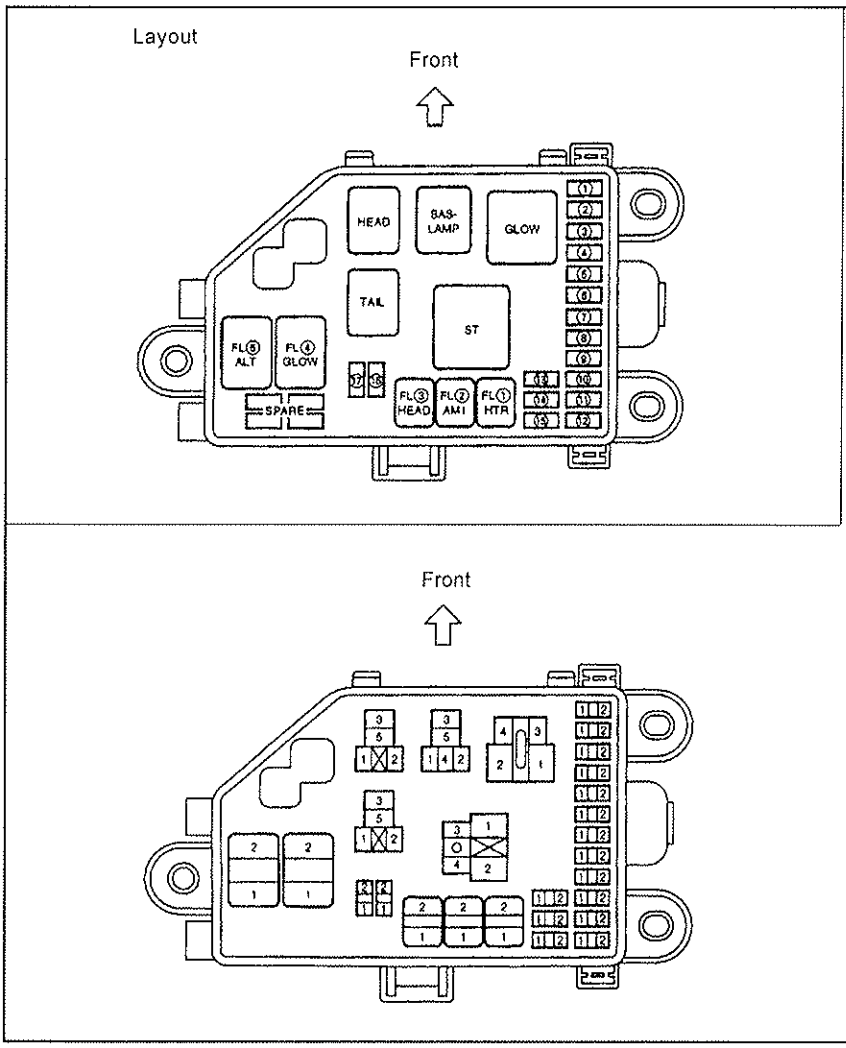
Standard

Float position	mm (in)	Resistance Ω
F	141.3 ± 8 (5.563 ± 0.31)	3 ± 2
1/2 (Reference value)	291.8 (11.488)	32.5
E	423.5 ± 8 (16.673 ± 0.31)	110 ± 7

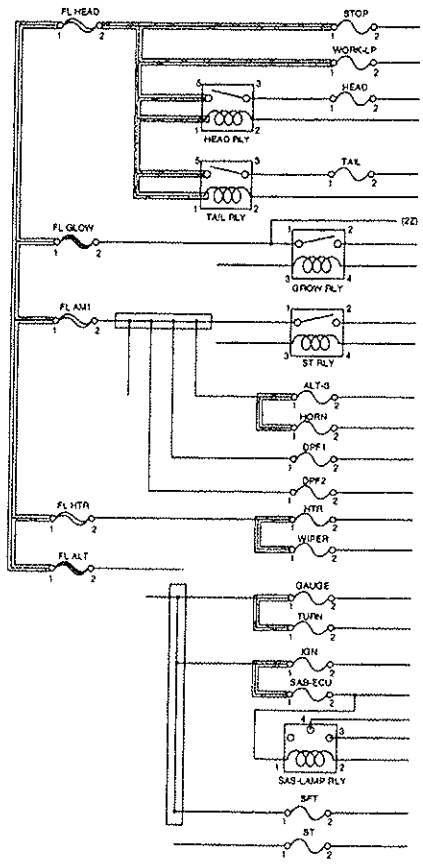
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RELAY BLOCK

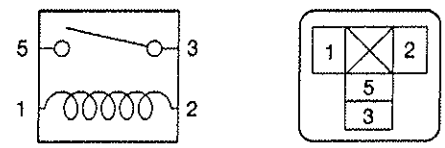
Layout



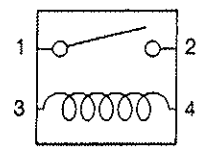
Wiring Diagram

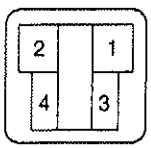


Head/tail relay

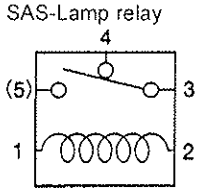


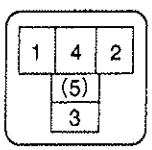
Glow/ST relay





SAS-Lamp relay





RELAY INSPECTION

Individual Relay Continuity Inspection

Measurement state	Measurement positions	Standard
Head/tail relay		
Normal state	1-2	Continuity
	3-5	No continuity
When the battery voltage is applied to terminals 1 and 2:	3-5	Continuity
Glow/ST relay		
Normal state	1-2	No continuity
	3-4	Continuity
When the battery voltage is applied to terminals 3 and 4:	1-2	Continuity
SAS-LAMP relay		
Normal state	1-2, 3-4	Continuity
When the battery voltage is applied to terminals 1 and 2:	3-4	No continuity

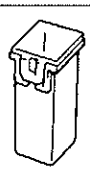
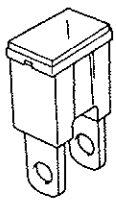
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PORTIONS PROTECTED BY FUSES

NO	Name	Capacity	Main protected portions
①	DPF1	15A	DPF system drive circuit
②	DPF2	7.5A	DPF ECU activation
③	ST (Starting motor)	7.5A	Starting motor relay (IG) and glow plug timer (IG)
④	SFT (Shift)	7.5A	Electric shift T/C
⑤	SAS-ECU	7.5A	SAS controller, steering angle sensor, and SAS error lamp relay
⑥	IGN (Ignition)	7.5A	Alternator, glow plug timer, ignition coil, emission control, ABCV, injection, LPG main solenoid, LPG slow solenoid, fuel cut and emission controller
⑦	TURN (Turn)	7.5A	Turn signal lamp and flasher relay
⑧	GAUGE (Meter)	10A	Hour meter, water temperature gauge, fuel gauge, warning lamps (charge, engine oil pressure, air cleaner, lock indicator, sedimenter, glow indicator, fuel, brake, cooling water and battery), back-up buzzer, T/C oil thermometer, speed meter, strobo, speed alarm, wiper relay (coil side), heater relay (coil side), back-up lamp and SAS buzzer
⑨	HTR (Heater)	10A	Heater
⑩	WIPER (Wiper)	15A	Front wiper, rear wiper, room lamp and washer motor
⑪	HORN (Horn)	7.5A	Horn
⑫	ALT-S (Alternator sending)	5A	Alternator sending
⑬	HEAD (Headlamp)	15A	Headlamp
⑭	CHARGE (Charge)	7.5A	Charge lamp, choke and glow plug timer
⑮	TAIL (Tail)	7.5A	Tail lamp, clearance lamp and meter illumination
⑯	WORK-LP (Work lamp)	10A	Rear work lamp
⑰	STOP (Stop lamp)	7.5A	Stop lamp

Including options

Fusible links

NO.	Name	Capacity	Type
FL ①	HTR	30A	 Cartridge type
FL ②	AM1	40A	
FL ③	HEAD	40A	
FL ④	GLOW	2Z engine 120A 1DZ-II engine 60A	 Screw-fastened type
FL ⑤	ALT	80A	

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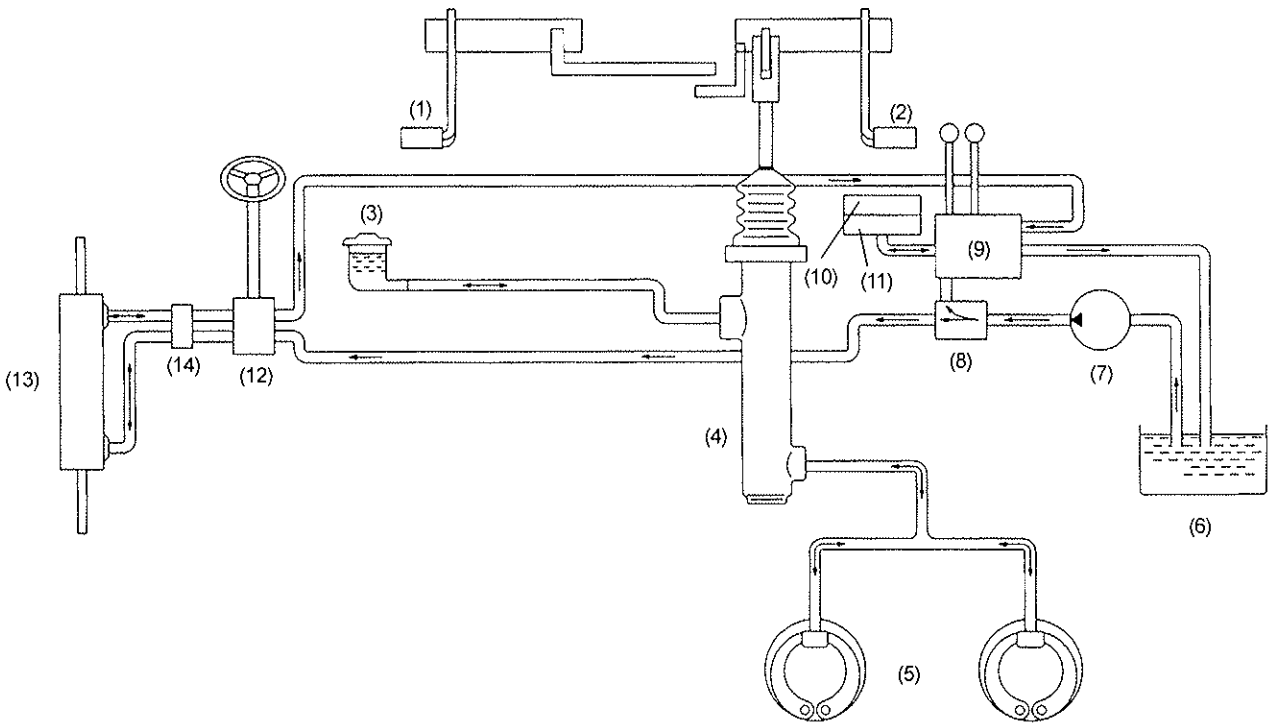
MATERIAL HANDLING SYSTEM

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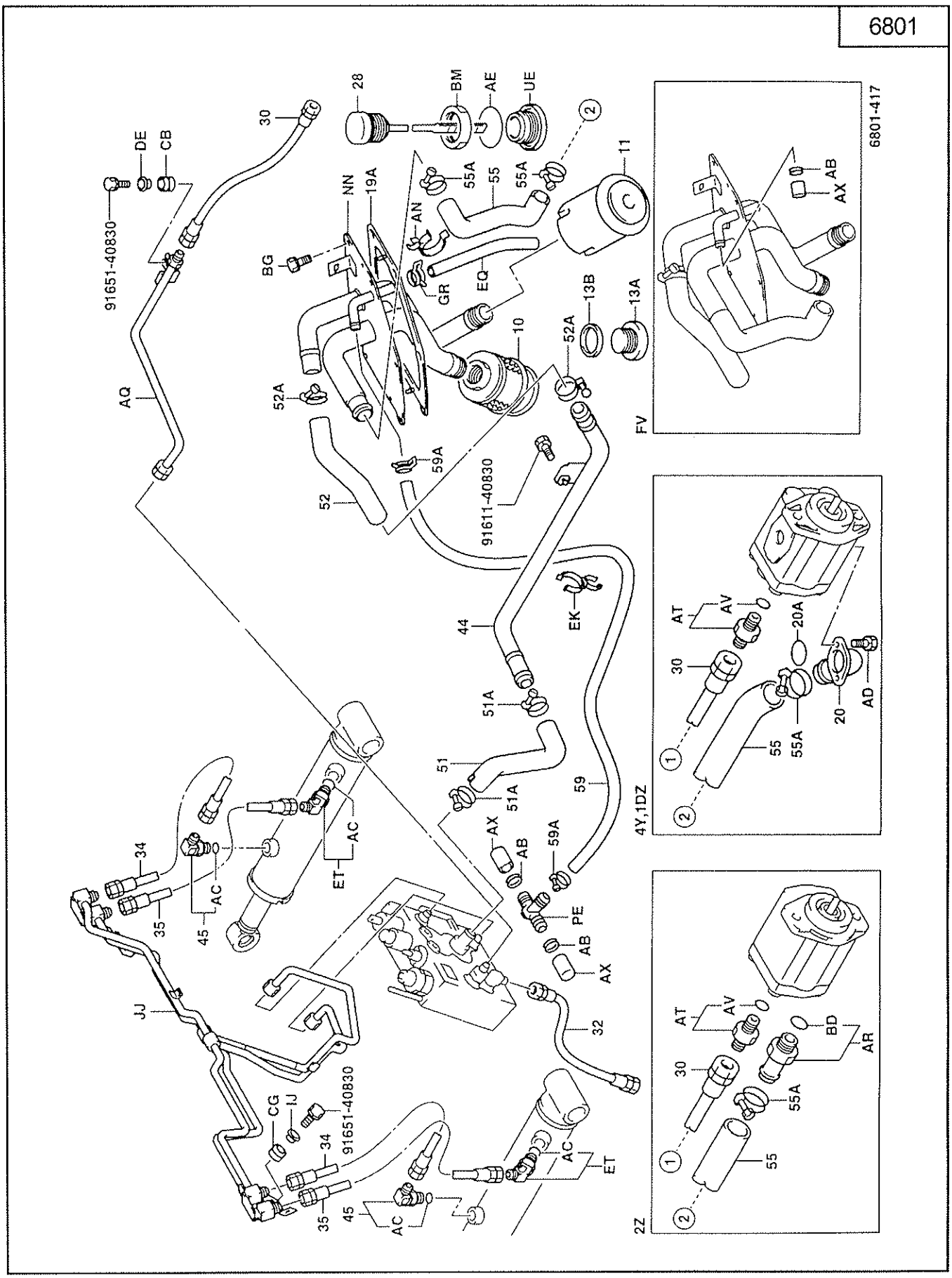
HYDRAULIC CIRCUIT DIAGRAM



(1) Inching pedal
(2) Brake pedal
(3) Reservoir tank
(4) Brake master cylinder
(5) Brake wheel cylinder
(6) Oil tank
(7) Oil pump
(8) Flow divider
(9) Oil control valve
(10) Lift cylinder
(11) Tilt cylinder
(12) Steering valve
(13) Power steering cylinder
(14) Solenoid valve

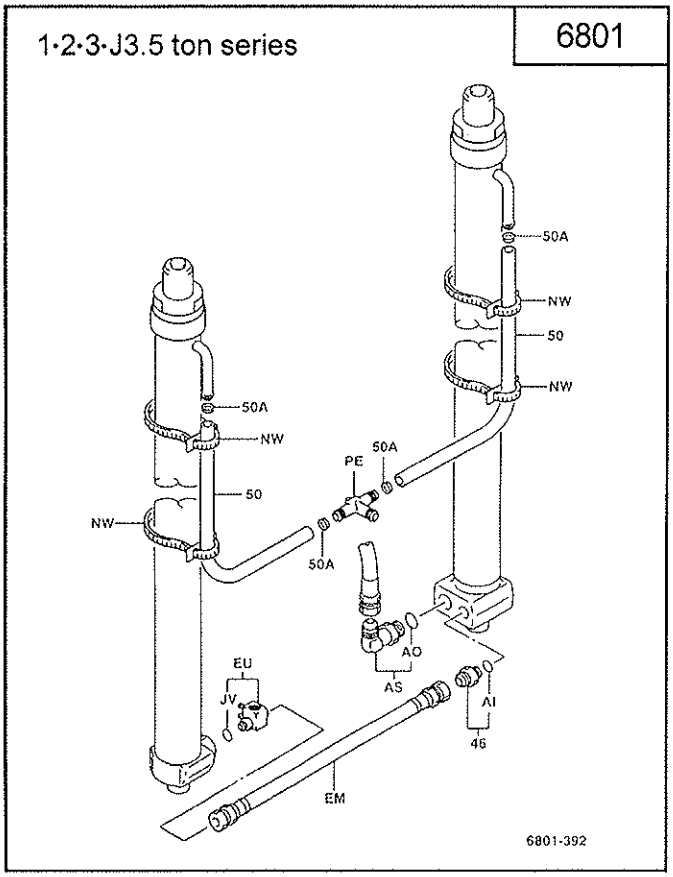
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COMPONENTS

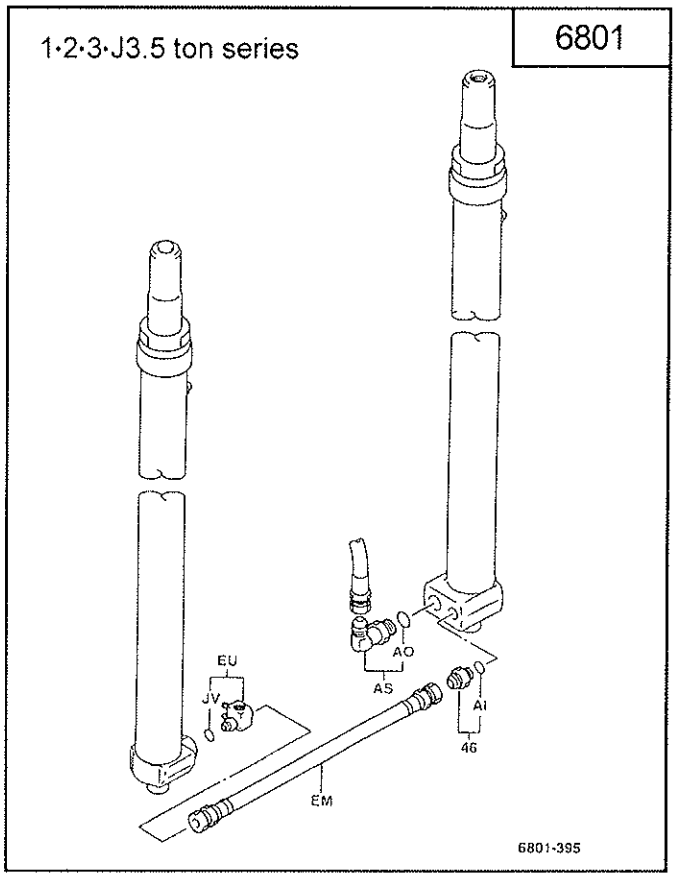


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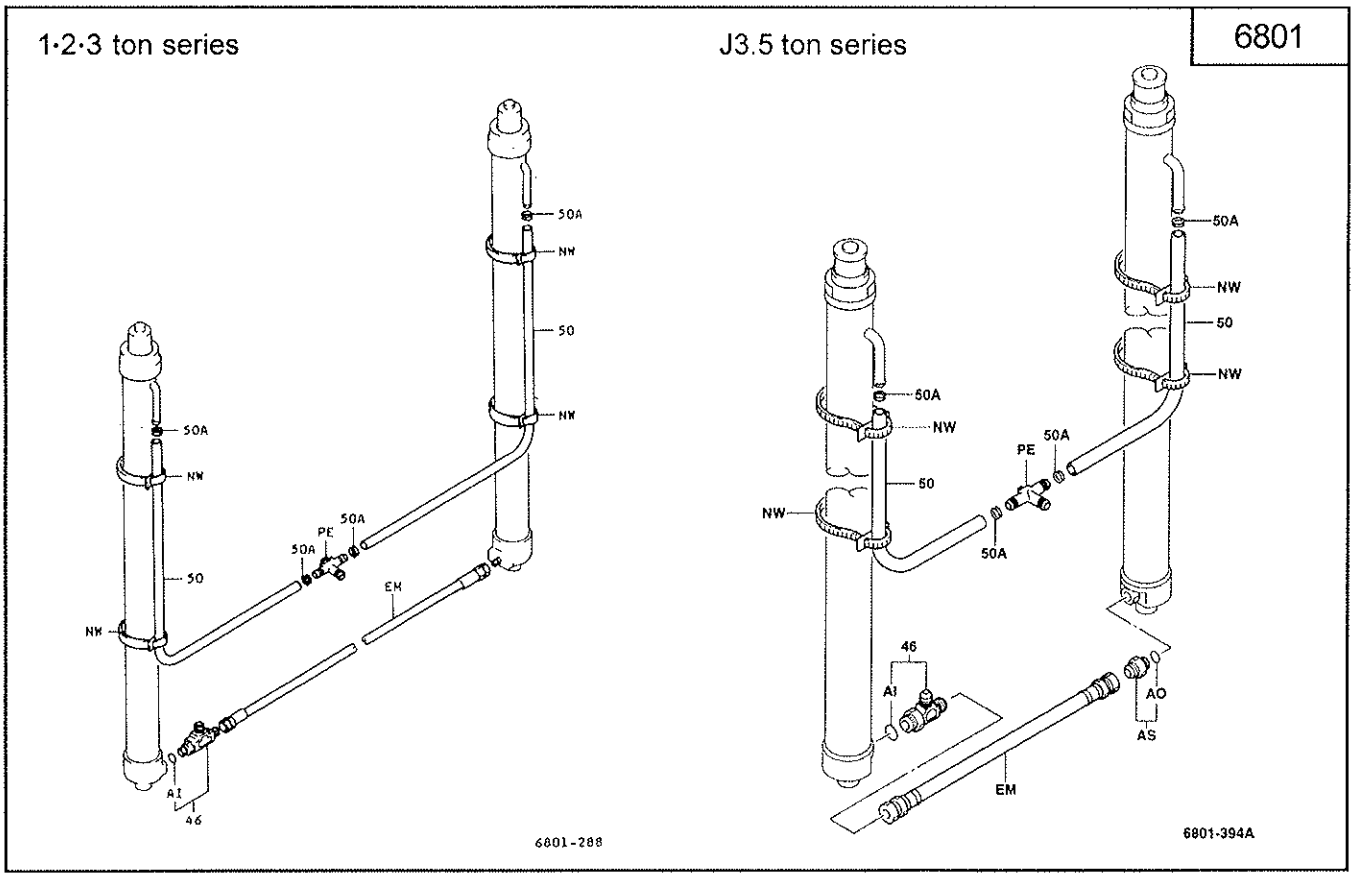
V Mast



FV Mast



FSV Mast

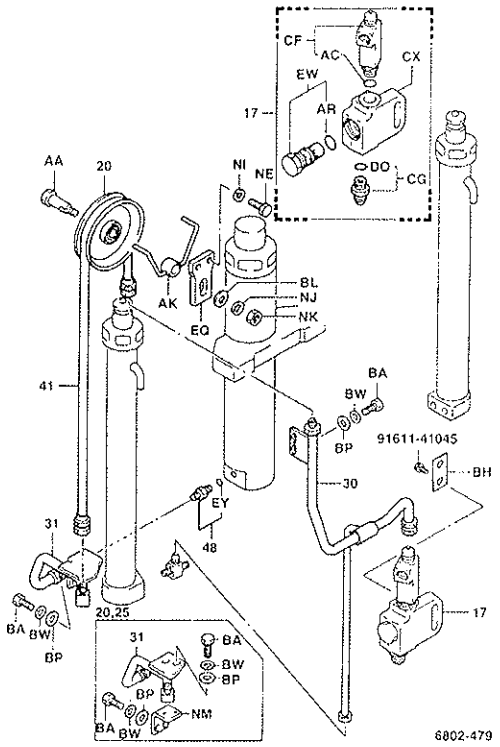


www.truck-freeworkshop.com

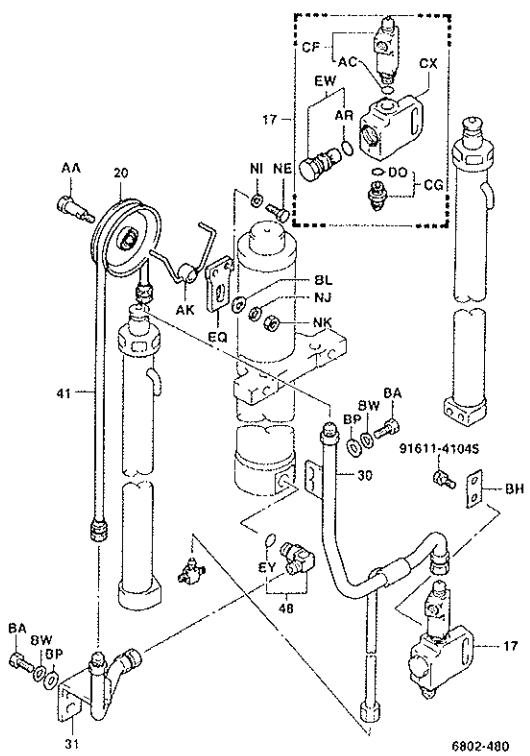
FSV Mast

1·2 ton series

6802



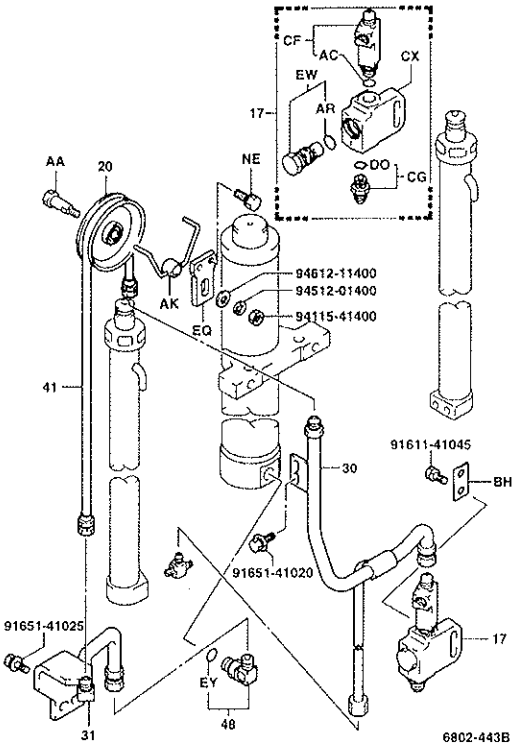
3 ton series



FSV Mast

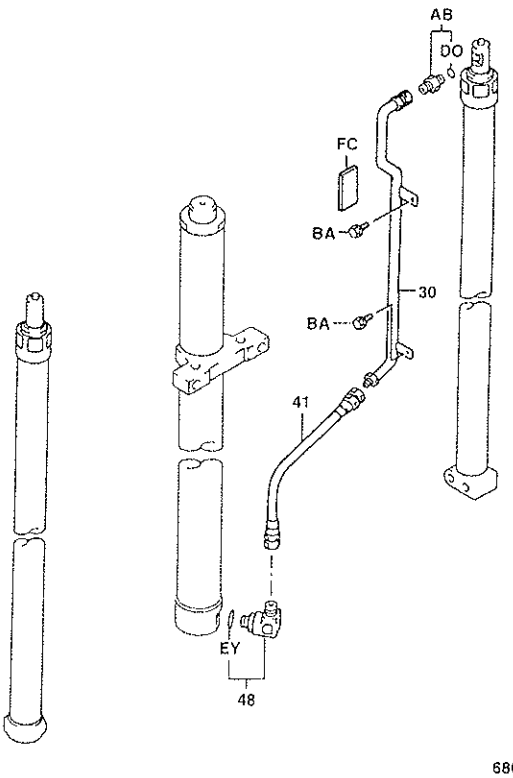
J3.5 ton series

6802



FV Mast

6802



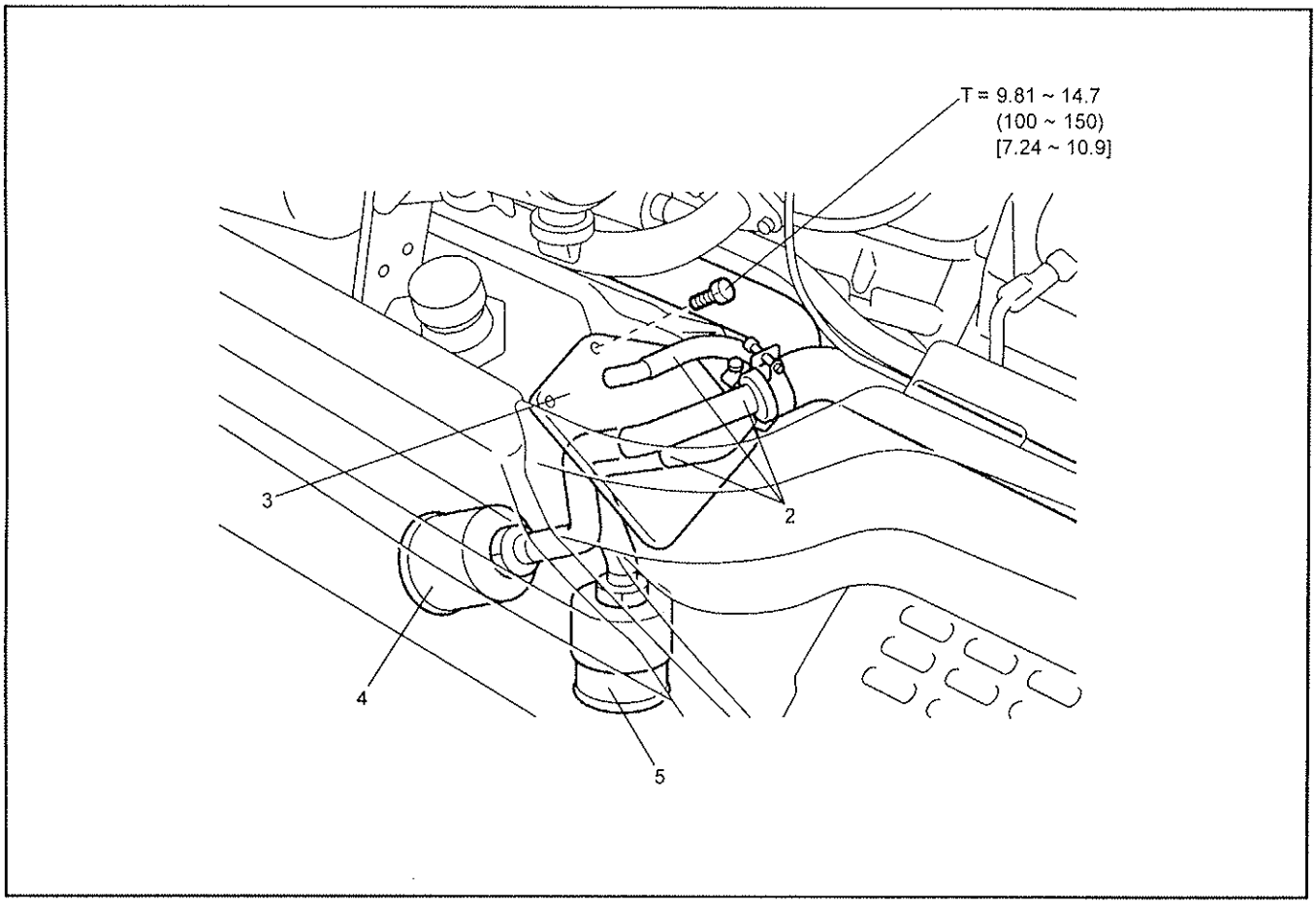
10

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RETURN FILTER·SUCTION FILTER

REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Open the engine hood.

2 Disconnect the return hose, suction hose and overflow hose.

3 Remove the tank cover W/return filter and suction filter.

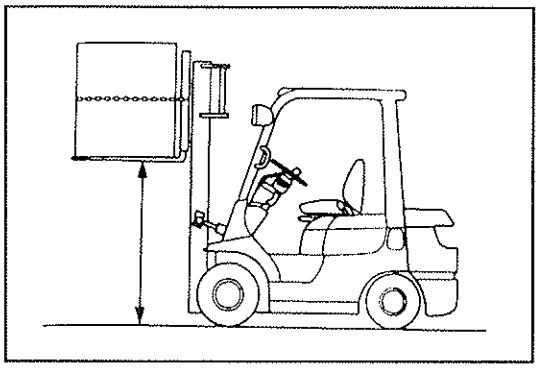
4 Remove the return filter.

5 Remove the suction filter.

Installation Procedure

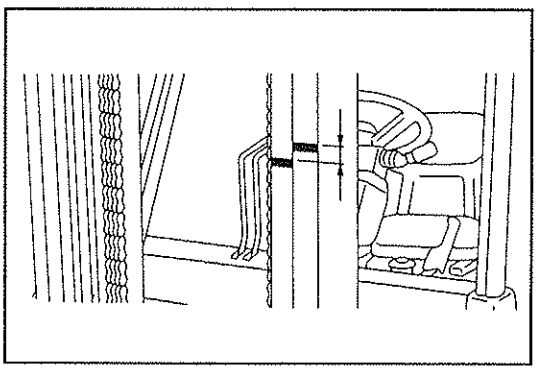
The installation procedure is the reverse of the removal procedure.

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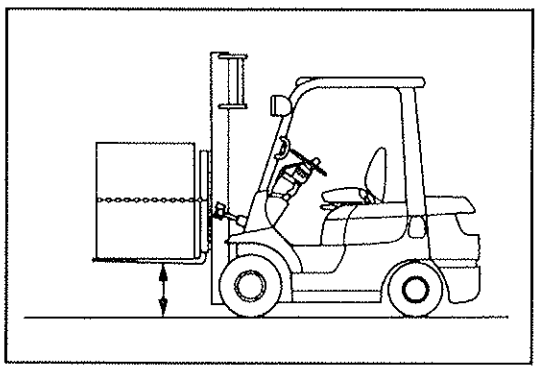


NATURAL DROP TEST

1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 to 1.5 m (40 to 59 in), and stop the engine.

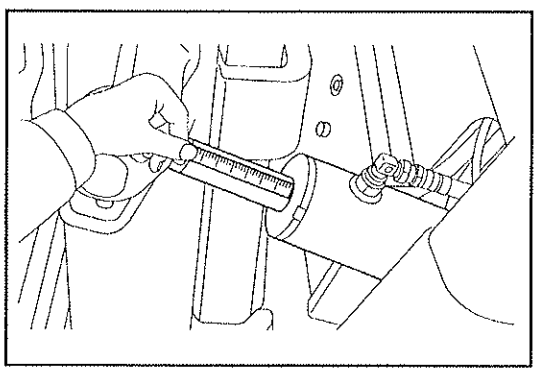


2. Draw datum lines on the inner and outer masts, and measure the drop in 15 minutes.
Limit: 45 mm (1.77 in)



NATURAL FORWARD TILT TEST

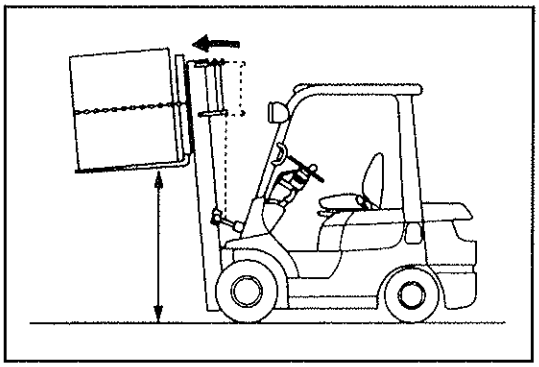
1. Set the mast in the vertical position with standard load on the fork. Lift the fork by about 50 cm (19.7 in) and stop the engine.



2. Measure the tilt cylinder rod extension in 15 minutes.

Vehicle model	Natural forward tilt amount mm (in)
1 ton series	15 (0.59) or less
2 ton series	20 (0.79) or less
3·J3.5 ton series	25 (0.98) or less

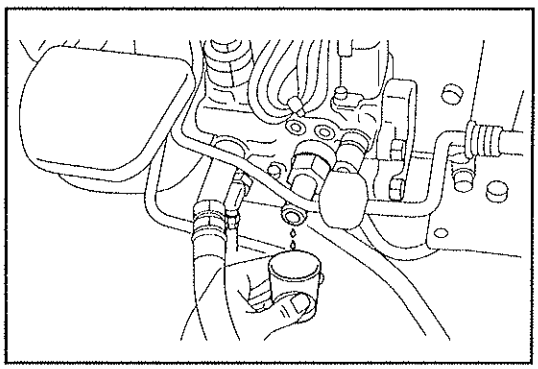
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OIL LEAK TEST

LIFT CYLINDER

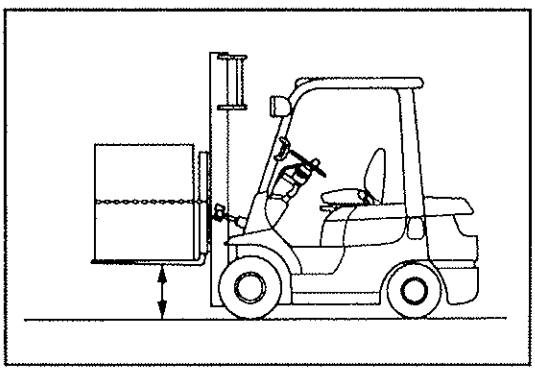
1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 to 1.5 m (40 to 59 in).



2. Slowly tilt the mast fully forward, and stop the engine. After 5 minutes, disconnect the oil control valve to oil tank hose. Place a measuring cylinder under the elbow and measure the amount of oil leaking in one minute.

   Standard (at lift port): 8 cm³ (0.49 in³) or less

   Note:
   If the natural drop is great even though the oil leak amount is within the standard, the lift cylinder packing is defective.

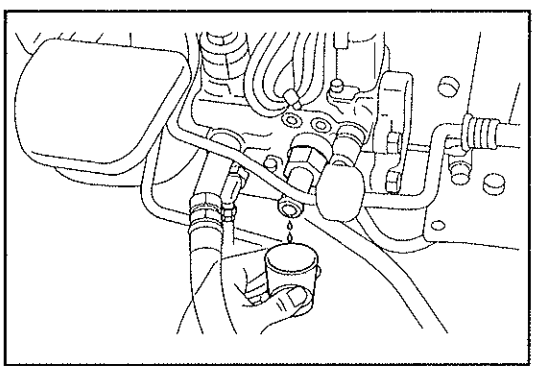


TILT CYLINDER

1. Set the mast in the vertical position with standard load on the fork. Lift the fork by about 50 cm (19.7 in) and stop the engine.

2. After waiting for 5 minutes, disconnect the oil control valve to oil tank hose. Place a measuring cylinder under the elbow and measure the amount of oil leaking in one minute.

   Standard (total for lift and tilt): 16 cm³ (0.98 in³)or less



3. The leak amount at the tilt port is the total leak amount less the leak amount from the lift port.

   Note:
   If the natural forward tilt is great even though the oil leak amount is within the standard, either the tilt lock valve or the tilt cylinder packing is defective.

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MAST

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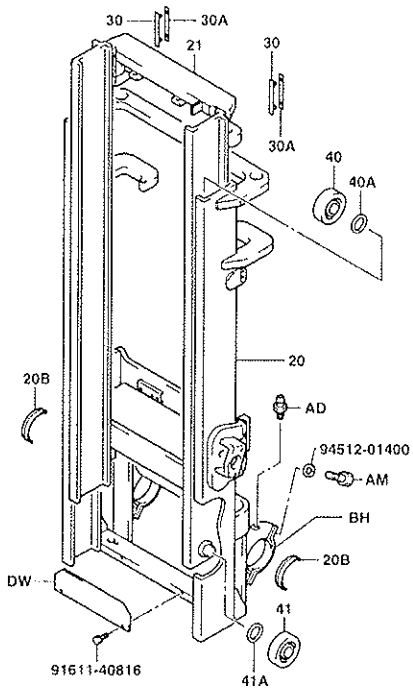
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V MAST ASSY

COMPONENTS

1·2·3 ton series

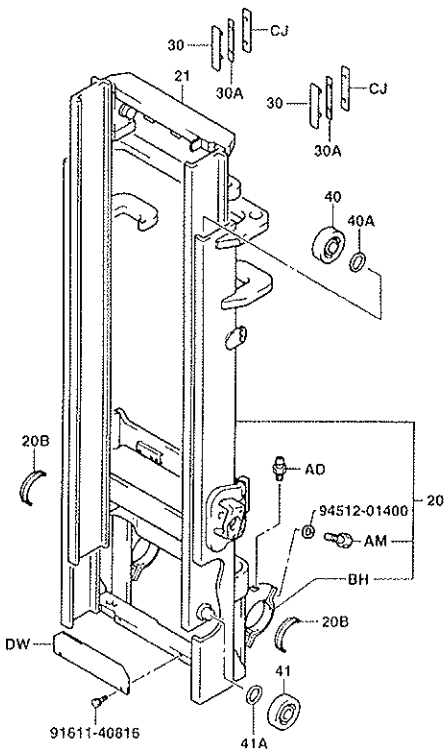
6101



6101-470B

J3.5 ton series

6101

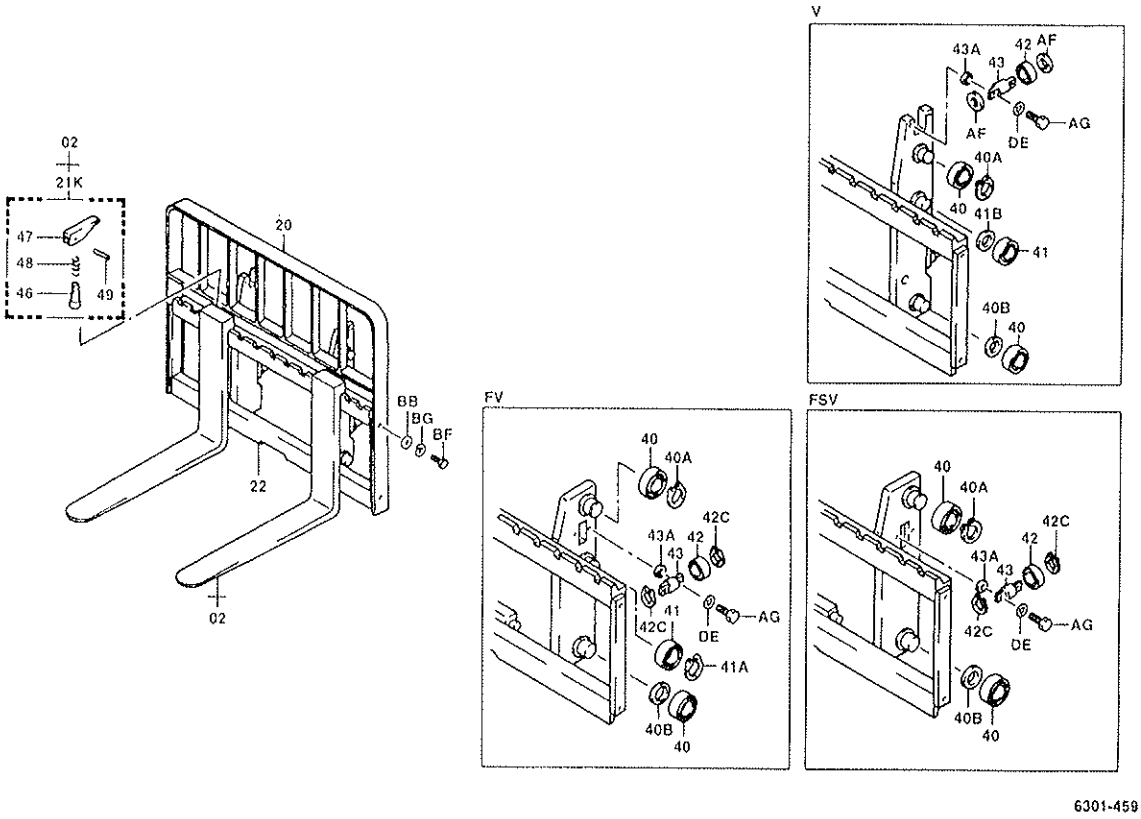


6101-472B

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1 ton series

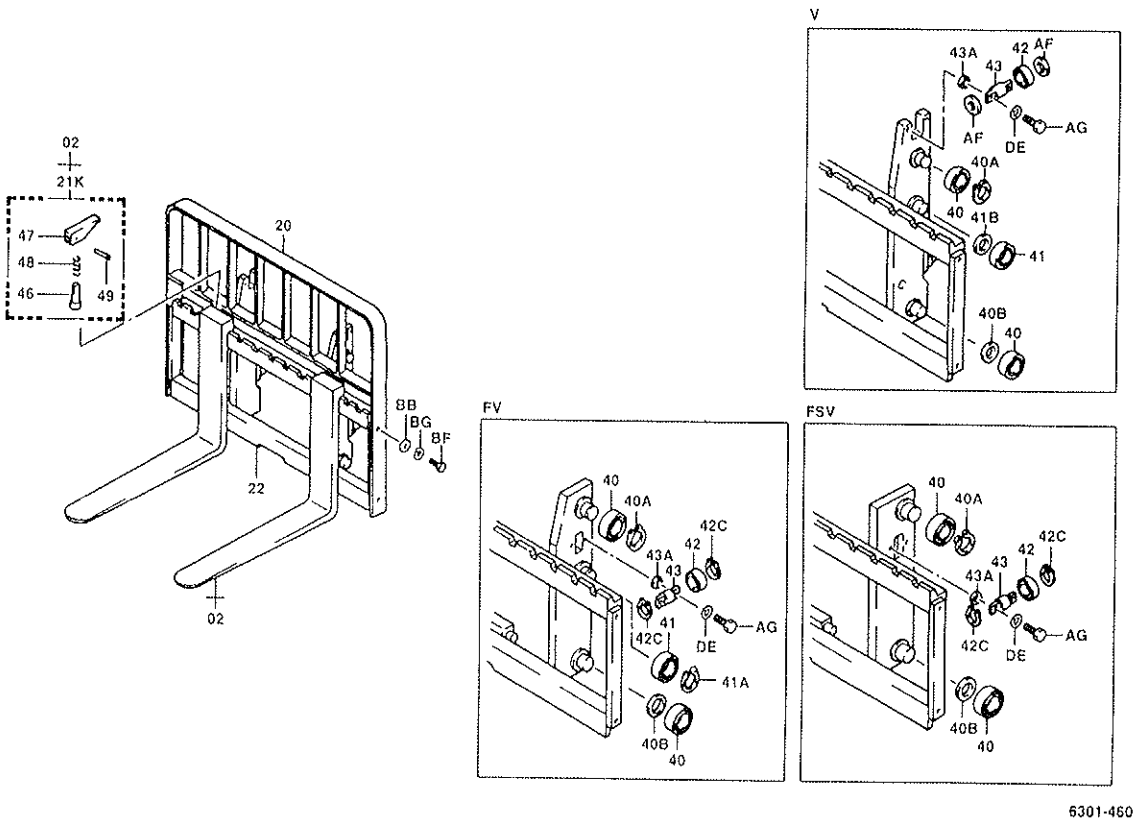
6301



6301-459

2 ton series

6301

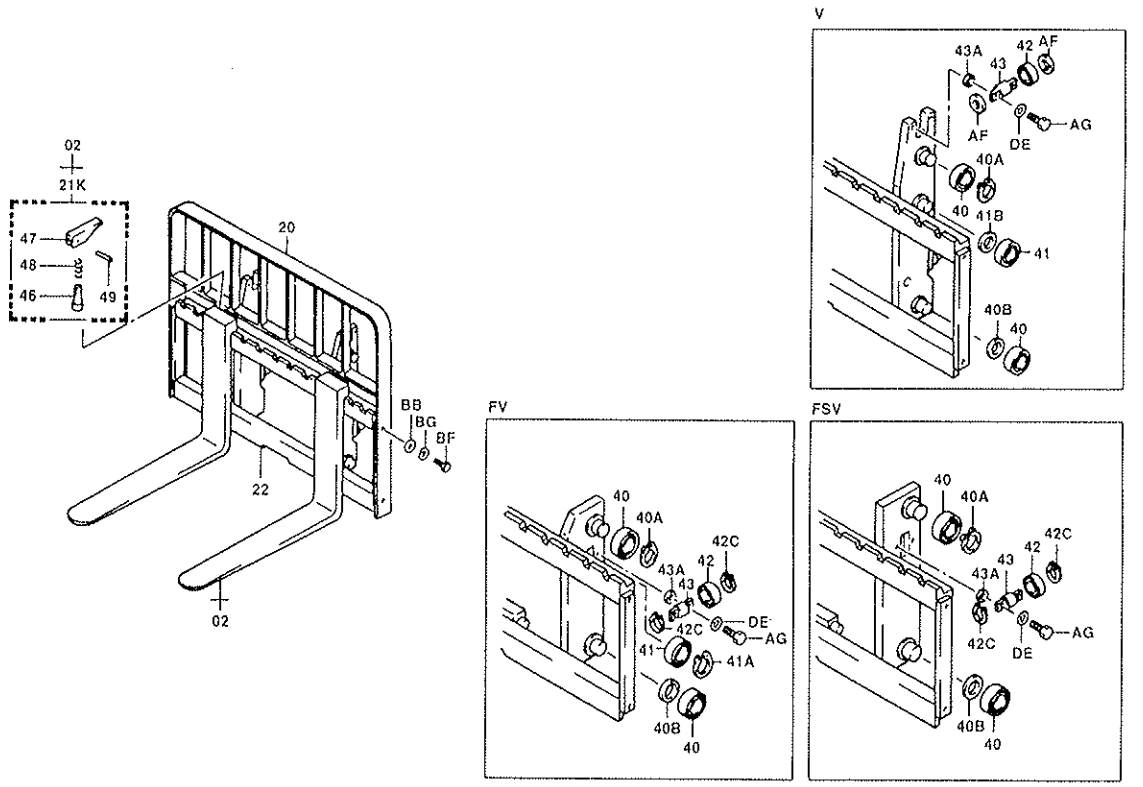


6301-460

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3 ton series

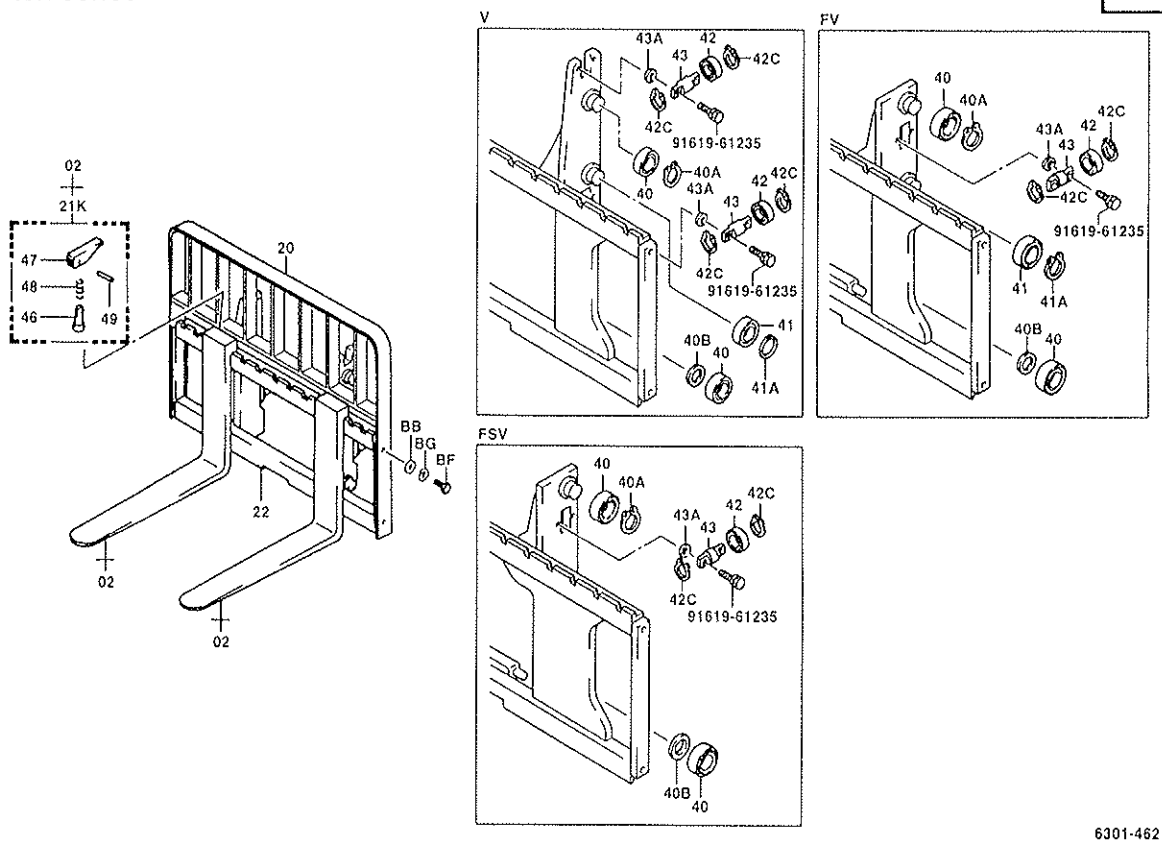
6301



6301-461

J3.5 ton series

6301

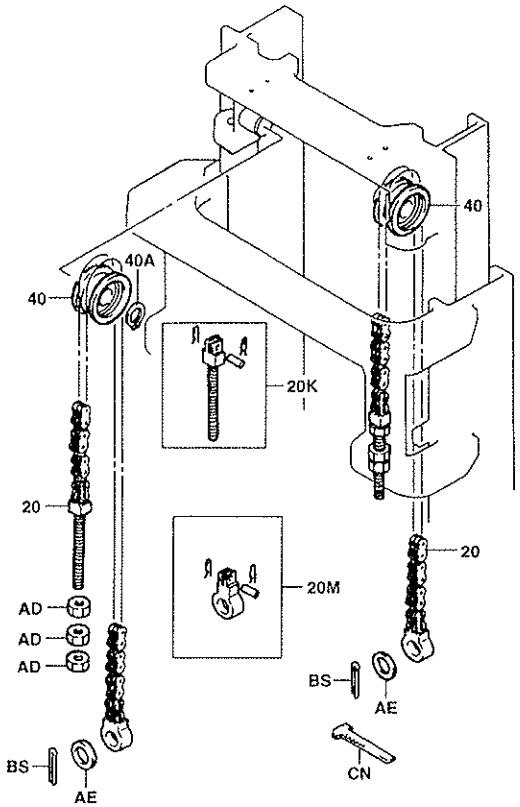


6301-462

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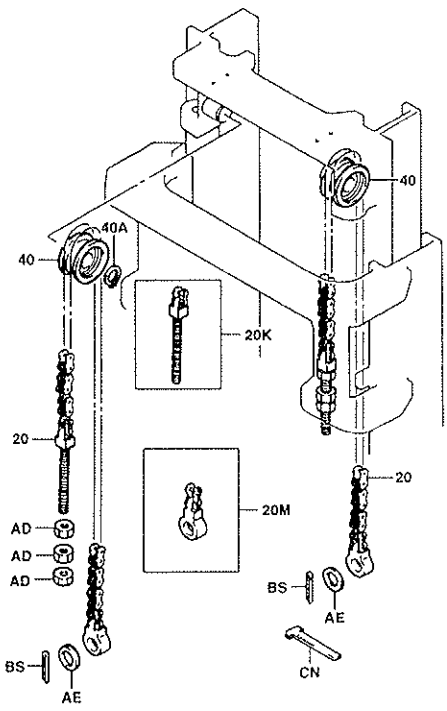
6302

1·2 ton series



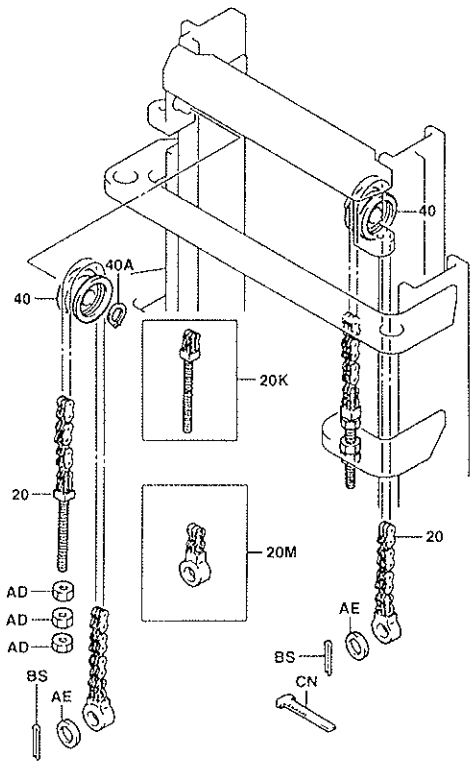
6302-363A

3 ton series



6302-366A

J3.5 ton series



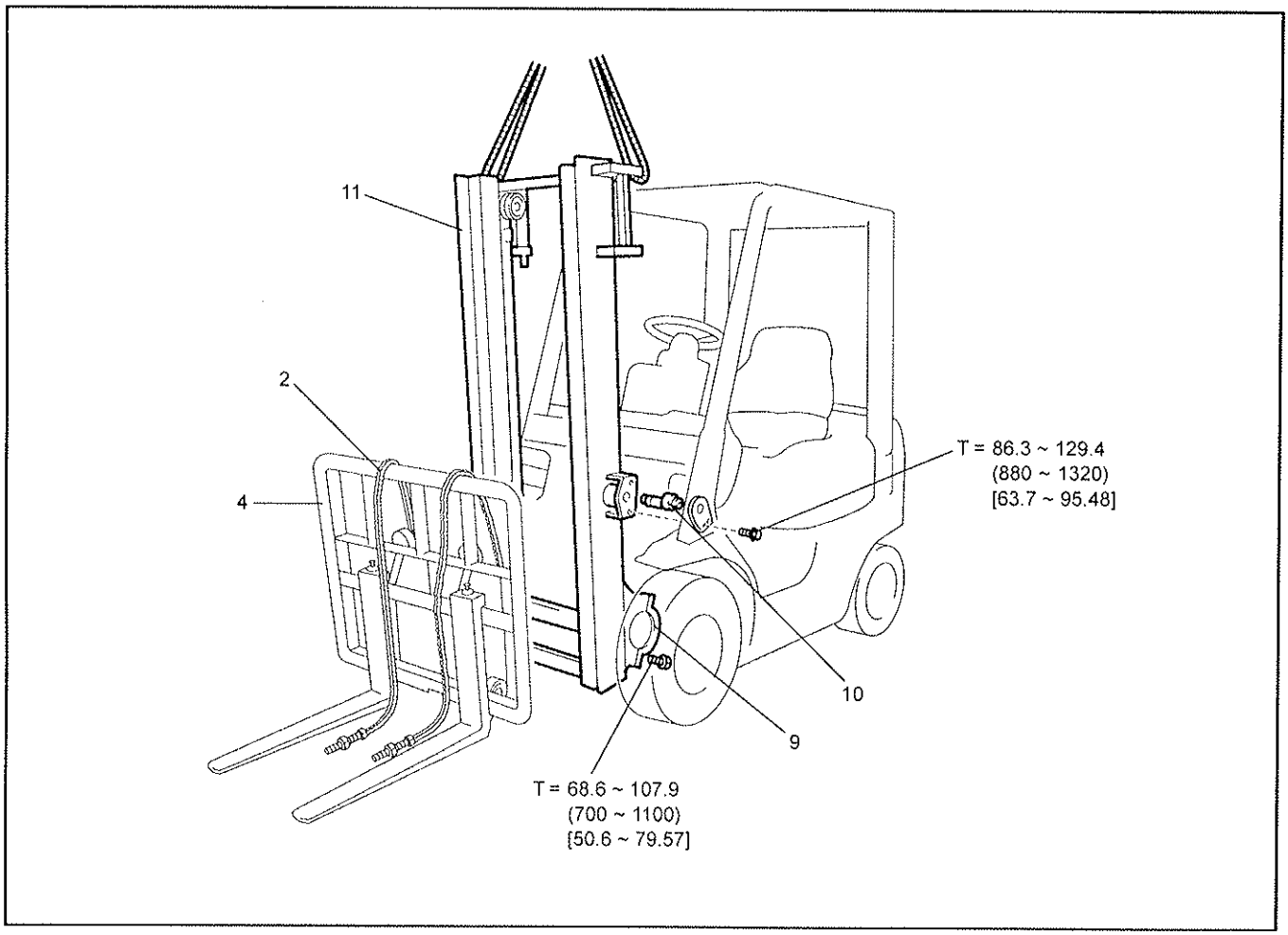
6302-369

11

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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Set the mast vertical and fully lower the fork.

2 Disconnect the chain. **[Point 1]**

3 Remove the chain wheel. **[Point 2]**

4 Remove the lift bracket. (For lift bracket removal, raise the inner mast until it comes off from the lift bracket, and slowly run the vehicle backward to depart from the lift bracket.)

5 Remove the toe board.

6 Disconnect the fork height switch and load sensor wiring.

7 Disconnect the overflow hose and high pressure hose. (Before hose disconnection, fully lower the inner mast, operate the lift lever several times to release the residual pressure in the lift cylinder.)

8 Slightly hoist the mast.

9 Remove the mast support cap.

10 Remove the tilt cylinder front pin. **[Point 3]**

11 Remove the mast ASSY.

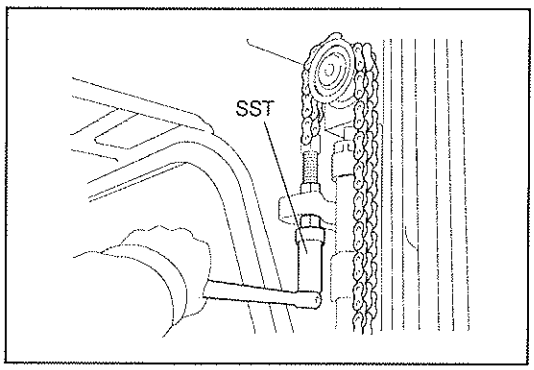
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Installation Procedure

The installation procedure is the reverse of the removal procedure.

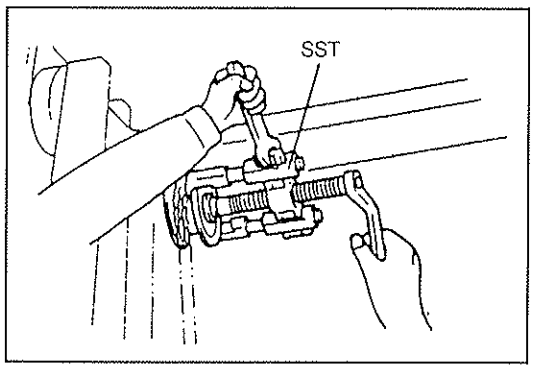
Note:

- **Apply molybdenum disulfide grease on the mast support bushing and mast support cap interior surfaces. Apply MP grease to the tilt cylinder front pin.**
- **Adjust lift cylinder uneven movement when the mast ASSY, outer mast, inner mast or either lift cylinder is replaced. (See page 11-32.)**
- **Adjust the chain tension after installation. (See page 11-22.)**
- **When the mast is replaced, perform SAS re-setting after installation. (See section 15.)**



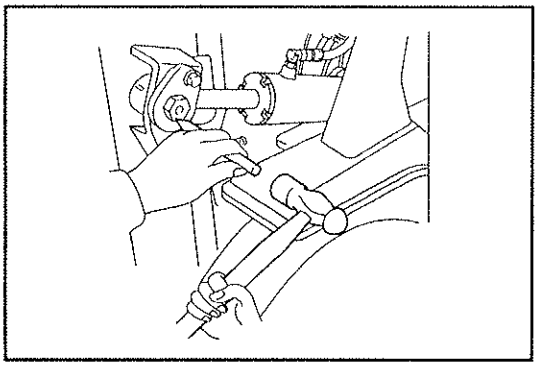
Point Operations

[Point 1]
Removal-Installation:
SST 09630-23600-71

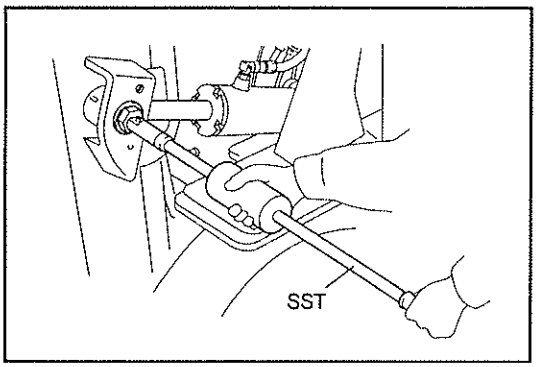


[Point 2]
Removal:
If the fitting is hard, use the SST for removal.
SST 09950-76014-71
(SST 09950-40011)

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[Point 3]
Removal:
Put match marks to clarify relative positions of the front pin, stopper plate and lock bolt. Match marks, however, are unnecessary when the mast or mast ASSY is replaced since mast tilt angle adjustment is to be done after the replacement.

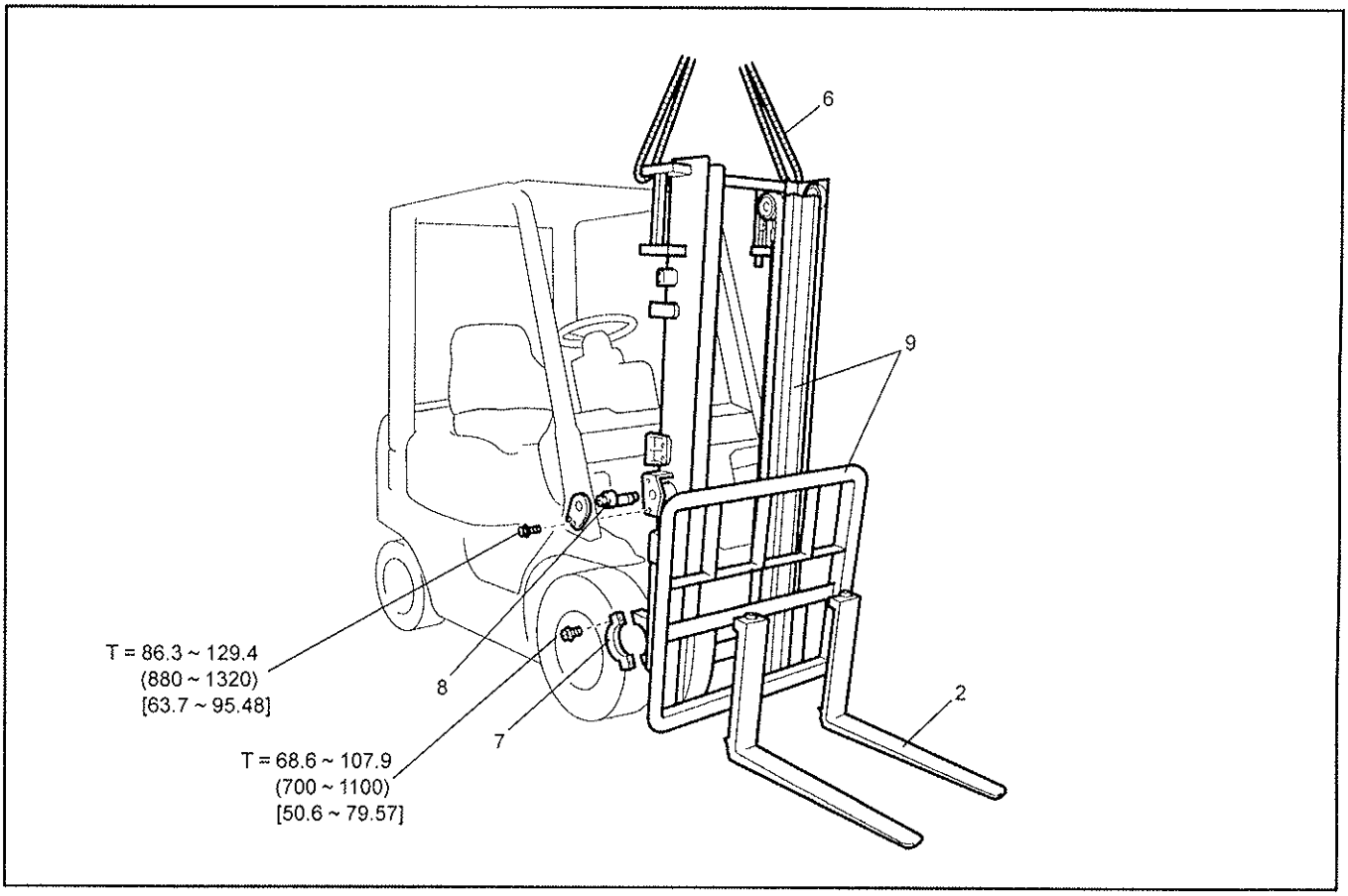


Removal:
SST 09810-20172-71

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REMOVAL·INSTALLATION (W/LIFT BRACKET)

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Set the mast vertical.

2 Remove the fork. (See page 11-22.)

3 Remove the toe board.

4 Disconnect the wiring of the fork height switch and load sensor.

5 Disconnect the overflow hose and high pressure hose. (Before hose disconnection, fully lower the inner mast and operate the lift lever several times to release the residual pressure from the lift cylinder.)

6 Slightly hoist the mast.

7 Remove the mast support cap.

8 Remove the tilt cylinder front pin. **[Point 1]**

9 Remove the mast ASSY W/lift bracket.

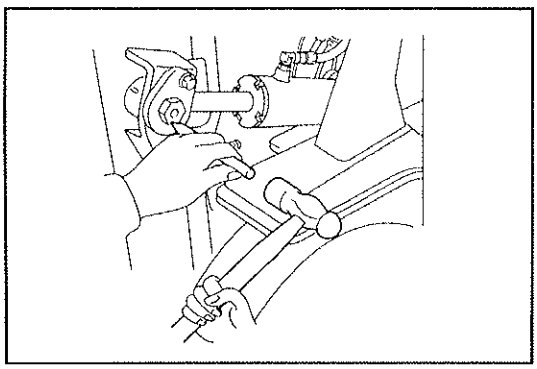
Installation Procedure

The installation procedure is the reverse of the removal procedure.

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Note:

- **Apply molybdenum disulfide grease on the mast support bushing and mast support cap interior surfaces. Apply MP grease to the tilt cylinder front pin.**
- **Correct lift cylinder uneven lifting, if any, when the mast ASSY, outer mast, inner mast or either lift cylinder is replaced. (See page 11-32.)**
- **When the mast is replaced, perform SAS re-setting after installation. (See section 15.)**

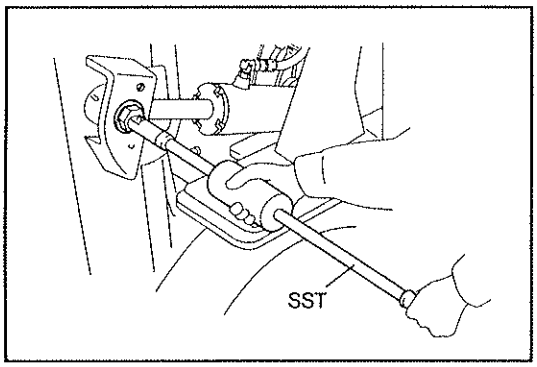


Point Operation

[Point 1]

Removal:

Put match marks to clarify relative positions of the front pin, stopper plate and lock bolt. Match marks, however, are unnecessary when the mast or mast ASSY is replaced since mast tilt angle adjustment is to be done after the replacement.

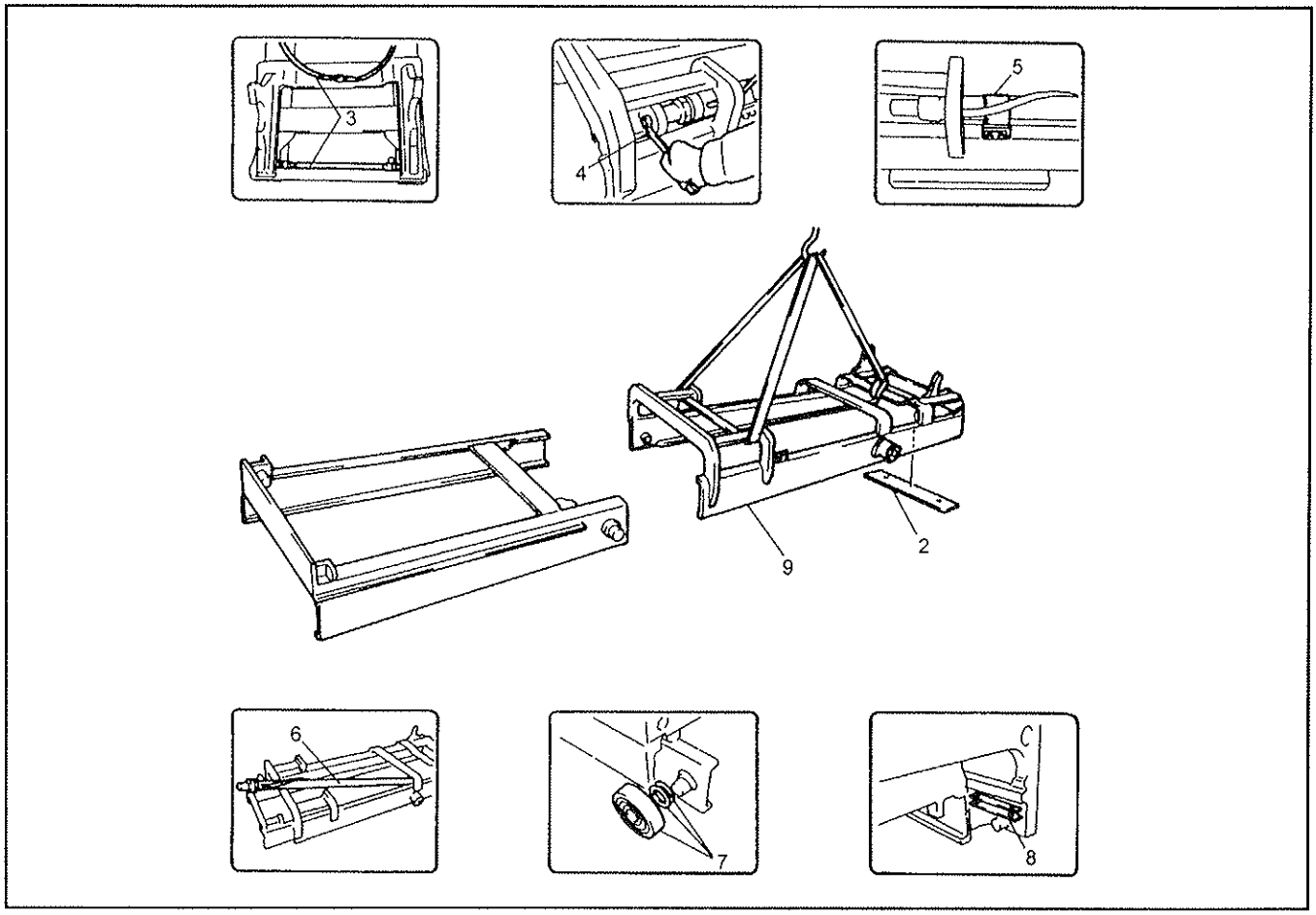


Removal:

SST 09810-20172-71

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MAST DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the fork height switch.

2 Remove the hose cover.

3 Disconnect the overflow hose and high pressure hose.

4 Remove each cylinder rod end set bolt, and take each rod end off. **[Point 1]**

5 Remove each cylinder support. **[Point 2]**

6 Remove each cylinder bottom set bolt, and remove each lift cylinder.

7 Slide the inner mast in the lowering direction, and remove the lift rollers.

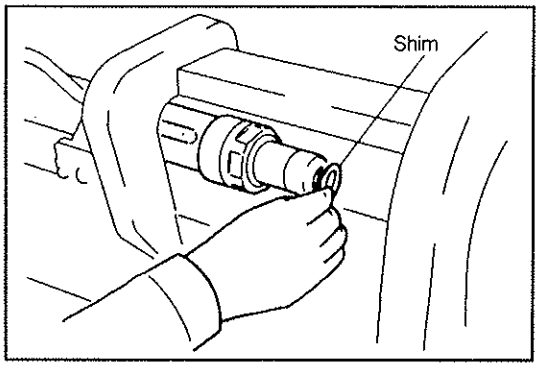
8 Remove the mast strip. **[Point 3]**

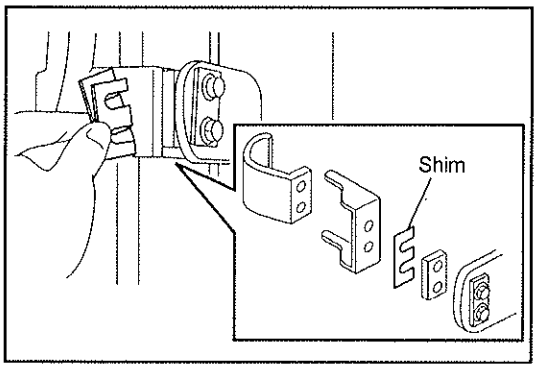
9 Remove the outer mast.

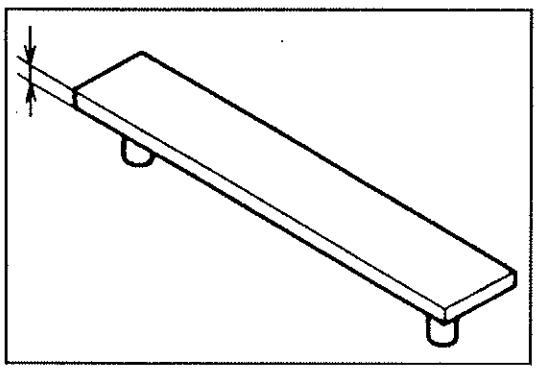
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

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Point Operations

[Point 1]
Disassembly:
Shim adjustment is made at the lift cylinder rod end for preventing uneven lifting by lift cylinders LH and RH.
Take a note on the cylinder where the adjustment is made and the number of shims in use.

[Point 2]
Disassmbly:
Take a note on the number of cylinder support shims in use.

Reassembly:
Make cylinder support shim adjustment if the mast or either cylinder is replaced.
With the cylinder rod end inserted to the inner mast, insert shim(s) between the cylinder support and outer mast to eliminate the clearance. The shim thickness should be slightly greater than the clearance.

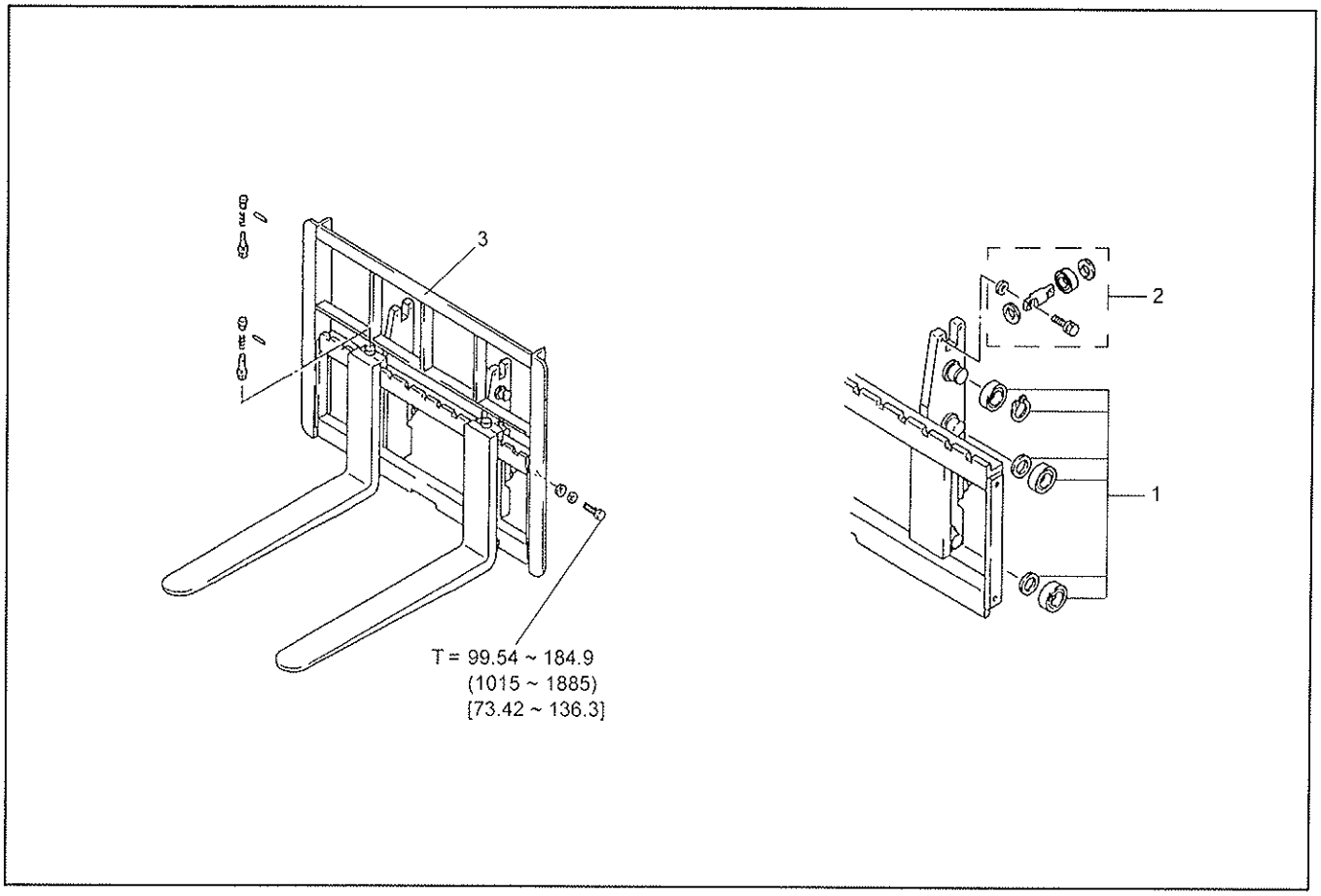
[Point 3]
Inspection:
Measure the mast strip thickness.

Limit: 1.5 mm (0.059 in)

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LIFT BRACKET DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

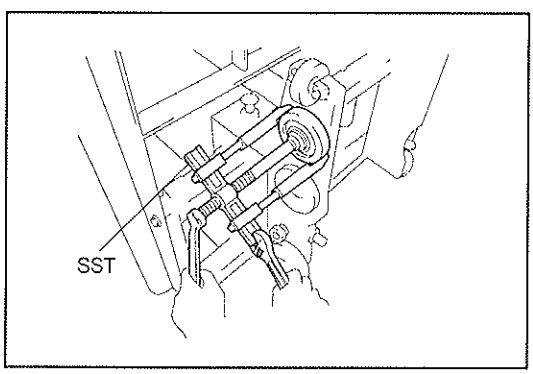
1 Remove lift rollers. **[Point 1]**

2 Remove side rollers. **[Point 2]**

3 Remove the back rest.

Reassembly Procedure

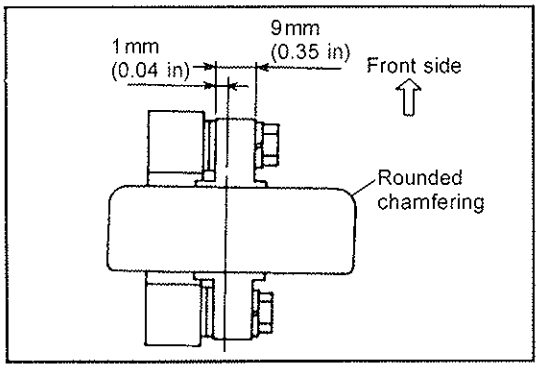
The reassembly procedure is the reverse of the disassembly procedure.



Point Operations

[Point 1]
Disassembly:
SST 09950-76014-71
(SST 09950-40011)

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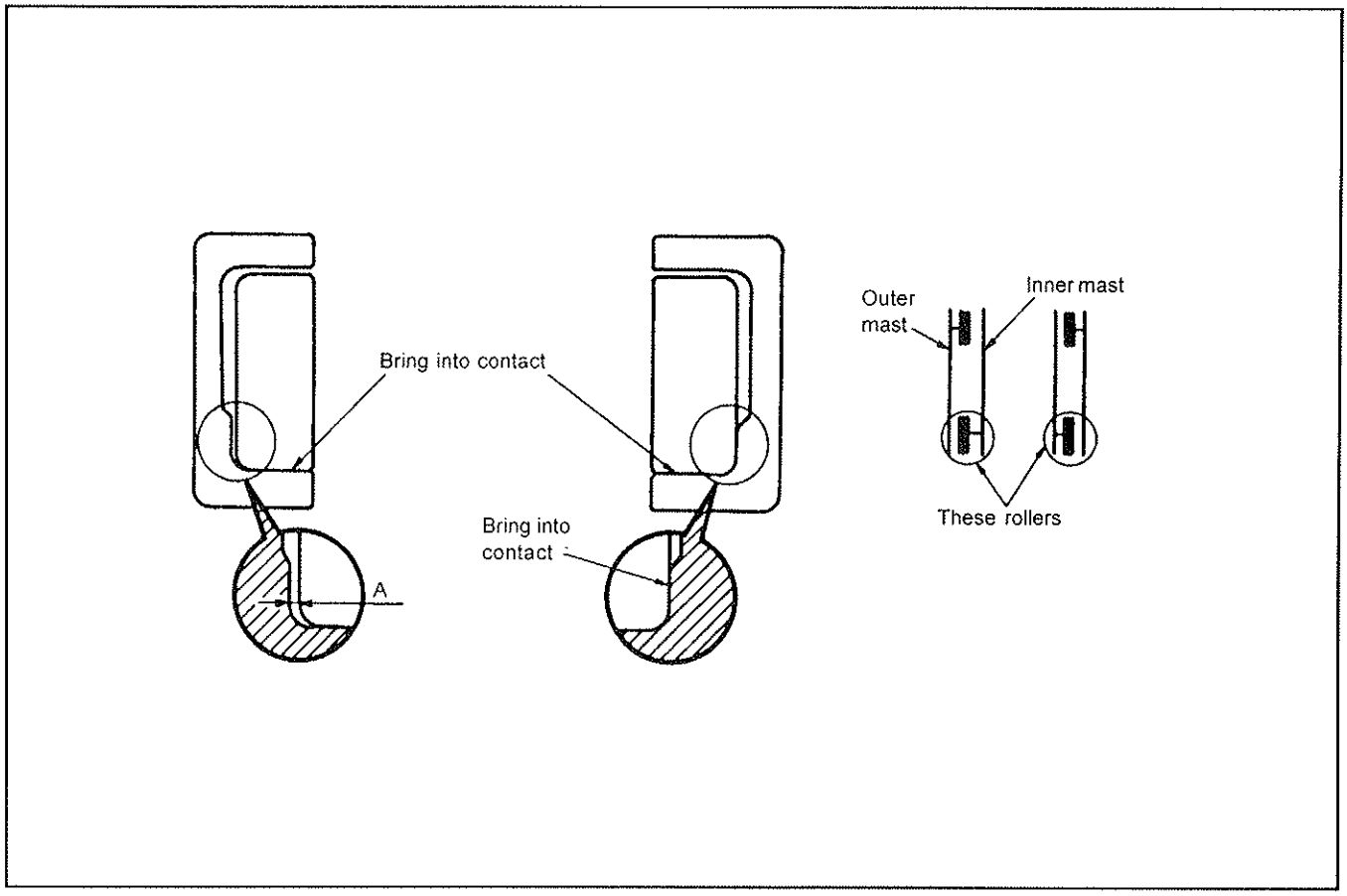
[Point 2]
Reassembly:
Install the side roller in the correct direction.
The side chamfered with a greater radius of the roller shall be on the front side of the vehicle.

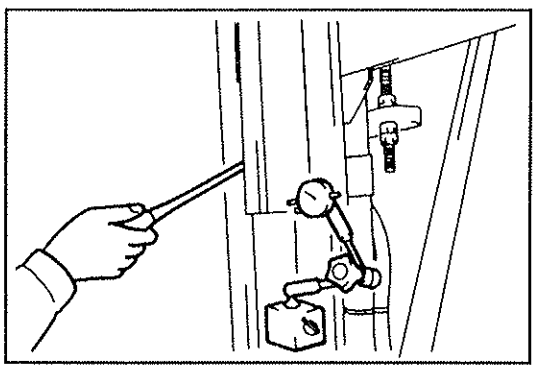
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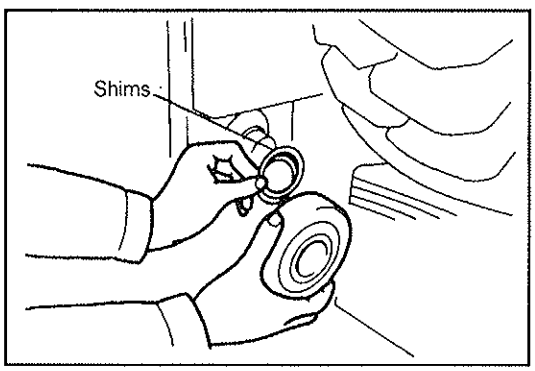
MAST ADJUSTMENT (V MAST)

Lift Roller Adjustment at Mast

1. Inner mast to roller clearance adjustment







(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: A = 0 ~ 0.8 mm (0 ~ 0.031 in)

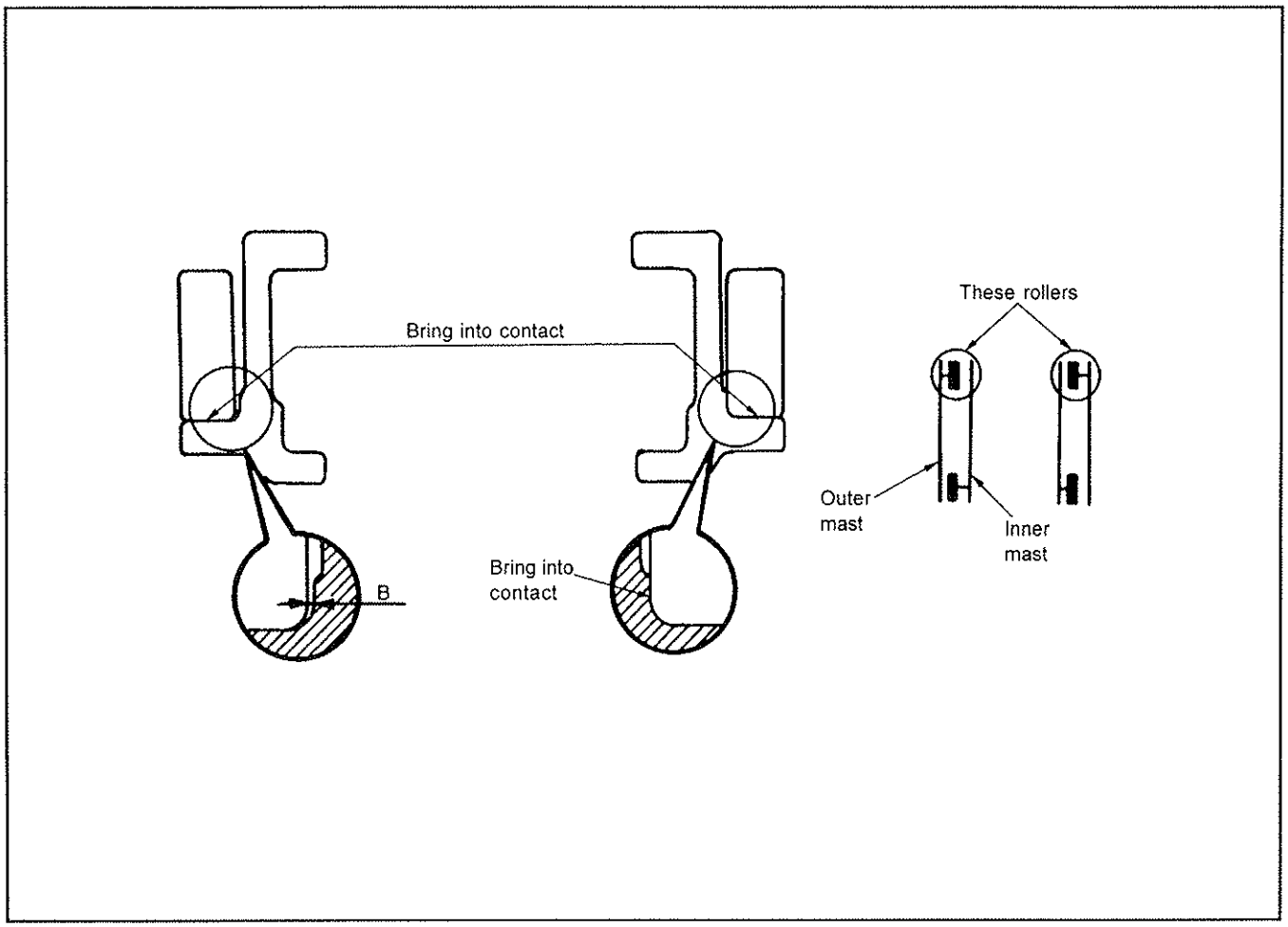
If the standard is not satisfied, make adjustment by changing the inner mast roller shim thickness. (See page 13-22 for the mast roller removal and installation.)

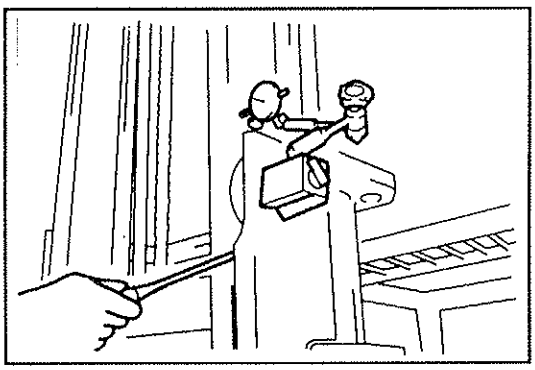
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

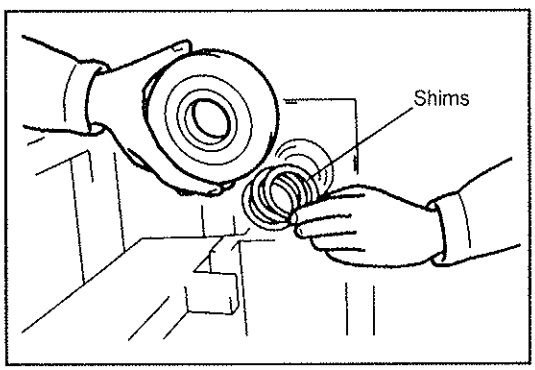
(3) Distribute shims equally to the rollers on the left and right side.
(4) After the adjustment, see that the inner mast moves smoothly in the outer mast.

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2. Outer mast roller clearance adjustment







(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: B = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the outer mast roller shim thickness.
(See page 13-22 for the mast roller removal and installation.)

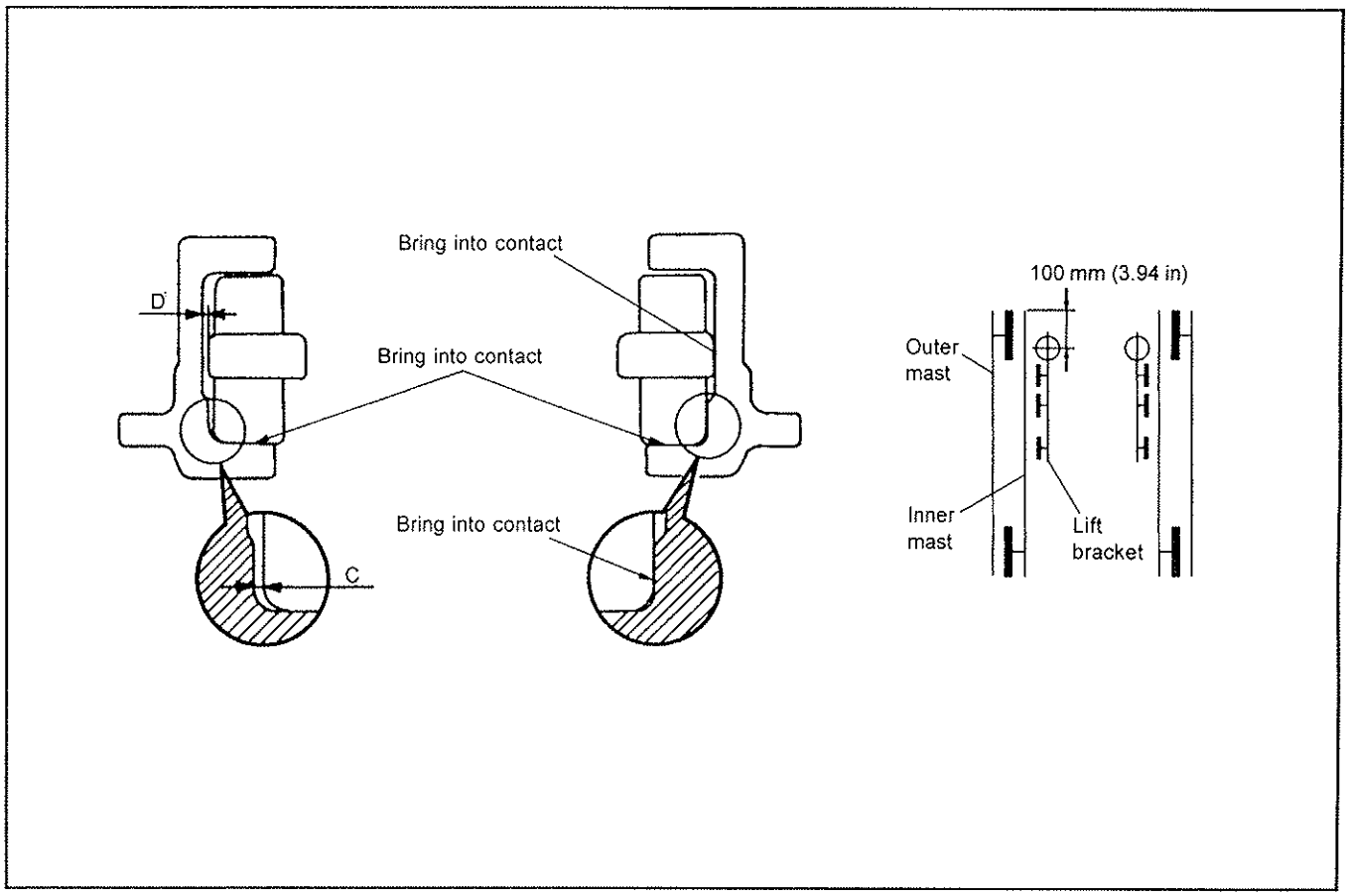
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

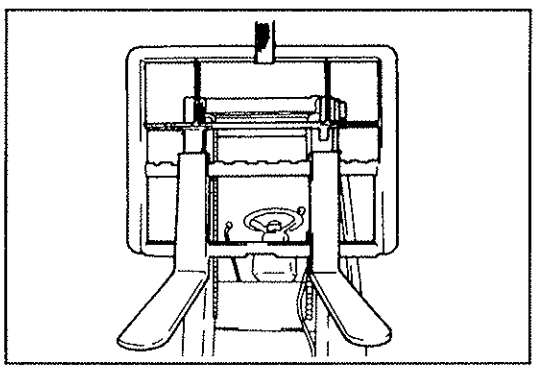
(3) Distribute shims equally to the rollers on the left and right side.
(4) After the adjustment, see that the inner mast moves smoothly in the outer mast.

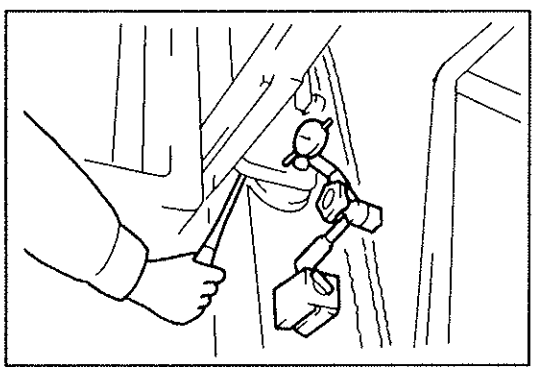
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Roller Adjustment at Lift Bracket

1. Middle/lower lift roller and side roller clearance adjustment







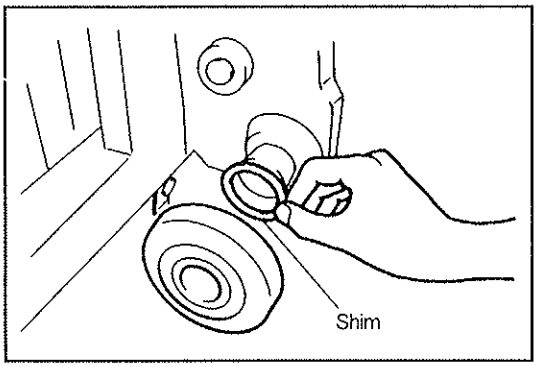
(1) Bring the center of the side roller in the upper part of the lift bracket to approx. 100 mm (3.94 in) from the top of the inner mast.
(2) Remove side rollers.
(3) Shift the lift bracket to one side to bring the roller into contact with the inner mast, and inspect on the opposite side the clearance between the roller side face and the mast where they are the closest. (No adjustment is necessary for the upper lift rollers since they are fastened by snap rings.)

Standard:
C = 0 ~ 0.8 mm (0 ~ 0.031 in)

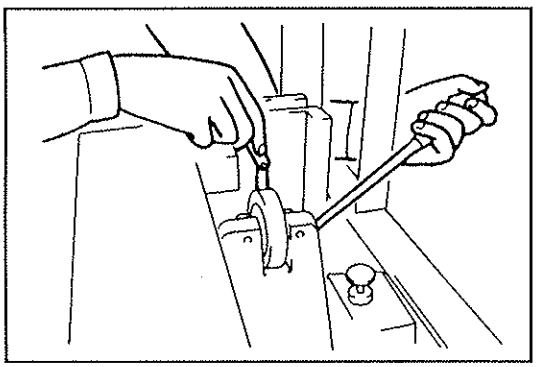
If the standard is not satisfied, make adjustment by changing the lift roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

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(4) Distribute shims equally to the left and right side.
(5) Install side rollers.

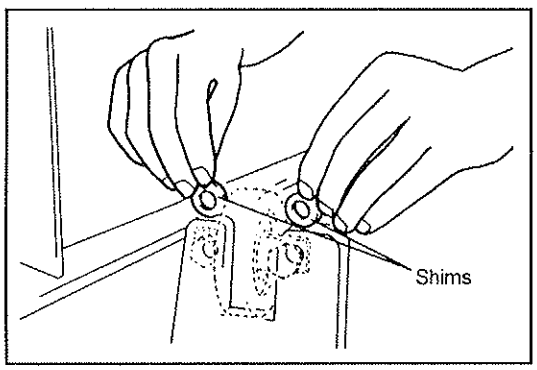


(6) After adjusting the middle and lower lift rollers, bring the side roller on one side into contact with the outer mast and measure on the opposite side the clearance between the side roller and inner mast surface.

Standard:
D = 0 ~ 0.6 mm (0 ~ 0.024 in)

If the standard is not satisfied, make adjustment by changing the side roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

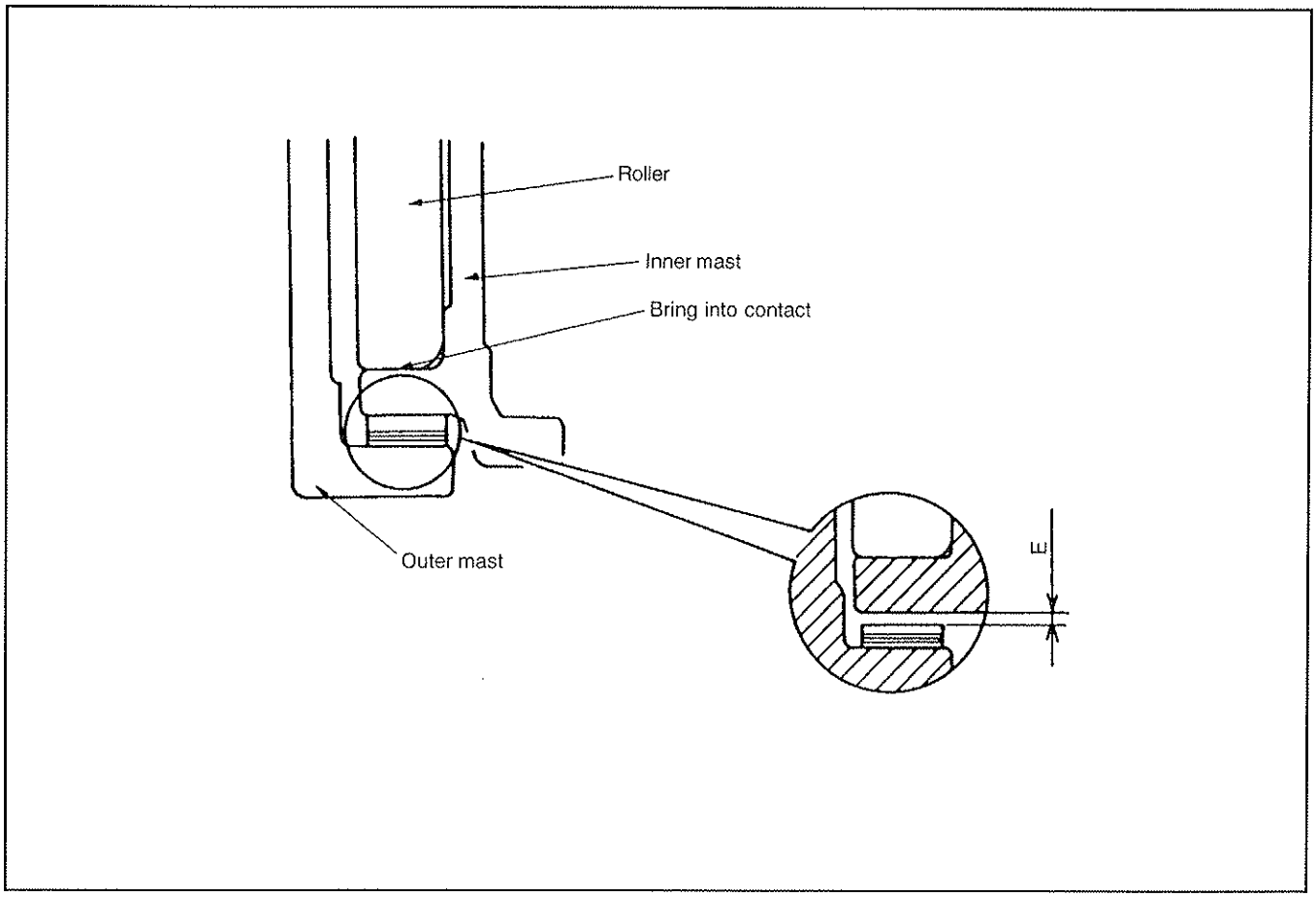


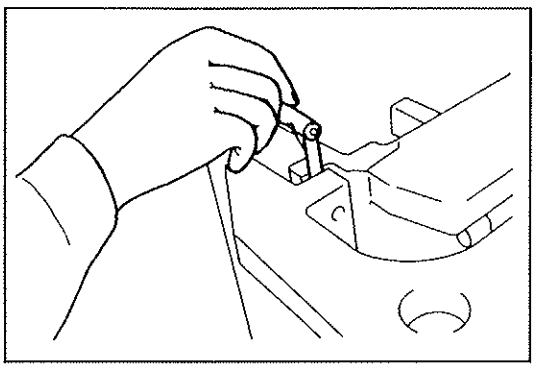
(7) Distribute shims equally to the left and right side. (See Lift Bracket Disassembly-Inspection-Reassembly section for the side roller installation method. Shim replacement is possible on the vehicle.)
(8) After the adjustment, see that the lift bracket moves smoothly over the entire length of the mast.

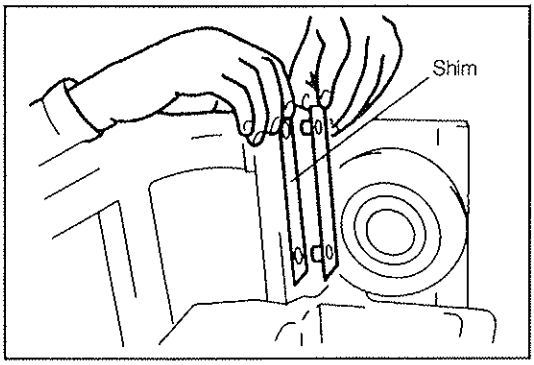
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Mast Strip Adjustment

1. Mast strip clearance adjustment







(1) Lower the inner mast fully.
(2) With the inner mast in contact with the outer mast roller, measure the clearance between the mast strip and inner mast.

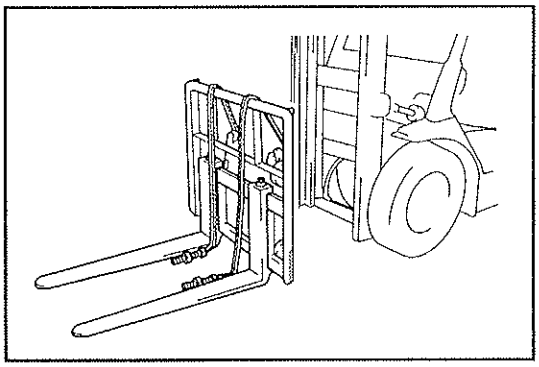
Standard: E = 0 ~ 0.8 mm (0 ~ 0.031 in)

If the standard is not satisfied, make adjustment by changing the mast strip shim thickness. (See page 11-20 for the mast roller removal/installation method.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

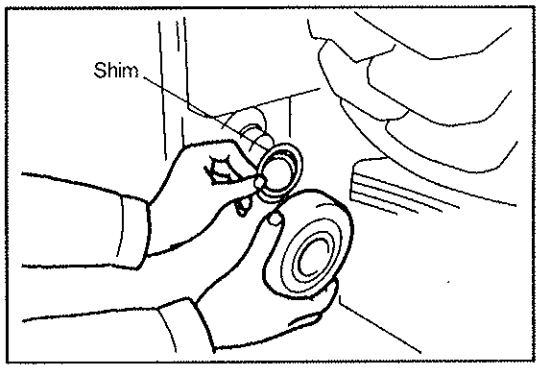
(3) After the adjustment, check the mast for smooth movement.

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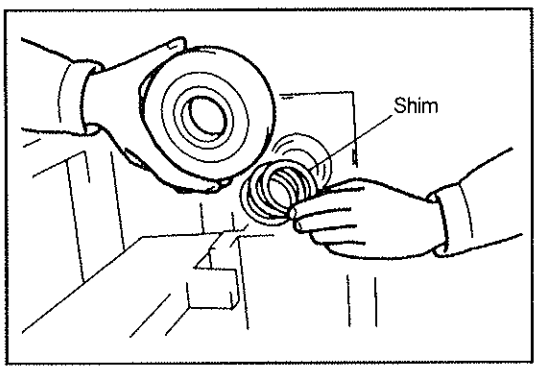


MAST ROLLER REMOVAL·INSTALLATION

1. Remove the lift bracket. (See steps 1 to 4 of the mast ASSY removal procedure on page 11-6.)
2. Jack up the vehicle, and support tires with wooden blocks. Also lock the front and rear tires from rotation.
3. Remove the lift cylinders. (See page 12-11.)

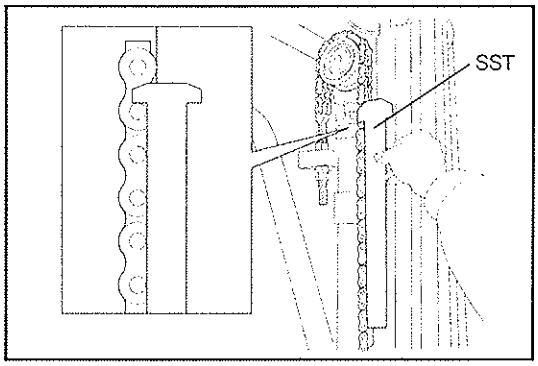


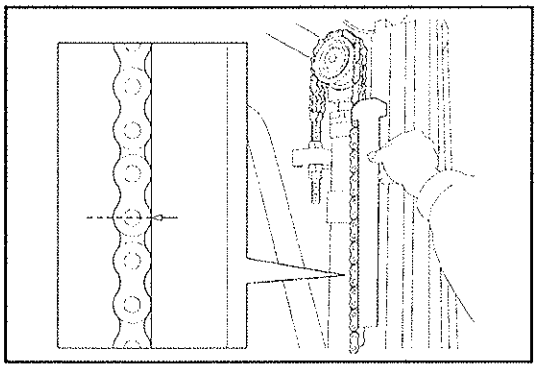
4. Remove mast rollers.
   (1) Remove wooden blocks under the inner mast, and lower the hoisted inner mast slowly until mast rollers appear.
   (2) Support the bottom of the inner mast with wooden blocks.
   (3) Remove the inner mast rollers and shims.



   (4) Remove the outer mast rollers and shims.
5. The installation procedure is the reverse of the removal procedure.

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CHAIN

INSPECTION

1. Inspect the chain elongation according to the following procedure:
   SST 09631-22000-71
   (1) Since the SST measurement line varies with the chain type, set the corresponding line on the chain as illustrated.
   (2) Check the number of the chain to be inspected, and check the pin center position.
   If the pin center is at the arrow mark on the chain gauge, it is the limit.

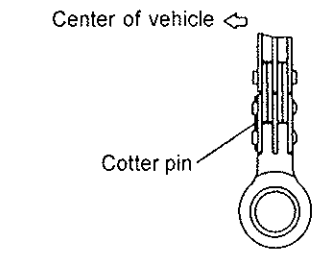
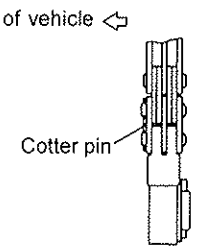
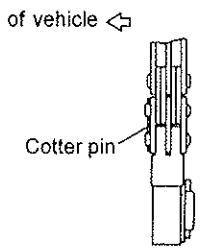
Chain Link Pitch Standard

Vehicle model	Pitch mm (in)	Type	Chain No.
1 ton series	15.88 (0.6252)	BL534	50
2 ton series	19.05 (0.7500)	BL634	60
3 ton series	25.4 (1.0)	BL823	80
J3.5 ton series	25.4 (1.0)	BL834	80

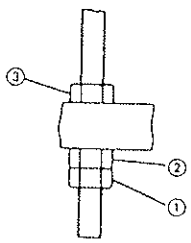
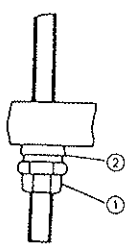
Note:
- **Perform measurement without removing the chain from the vehicle.**
- **Inspect elongation over the entire chain length since it may be localized.**

REASSEMBLY

1. Installing direction

Applicable mast and portion	V: Lift bracket	FV: Lift bracket FSV: Lift bracket	FSV inner mast
Rough sketch			
	Install the chain with the cotter pin facing the center of the vehicle.	Install the chain with the cotter pin facing the center of the vehicle.	Install the chain with the cotter pin on the front side of the vehicle.

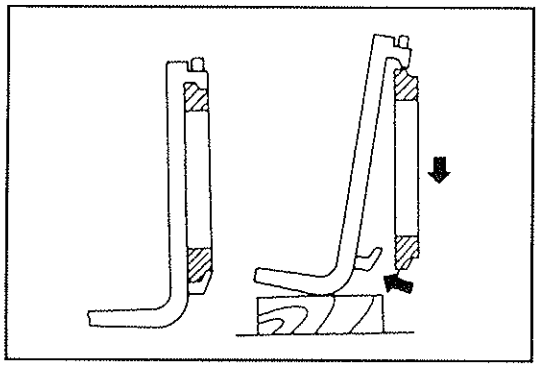
2. Chain adjusting nut tightening order
   (1) Tighten nuts ① and ②. T = 49.0 ~ 78.0 N·m (500 ~ 800 kgf-cm) [36.1 ~ 57.5 ft-lbf]
   (2) Tighten nut ③.

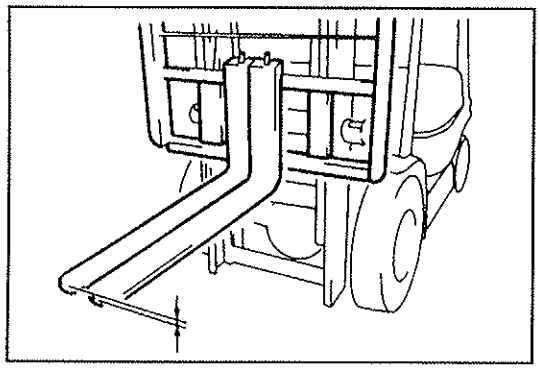
Applicable mast and portion	Outer mast	FV: Front cylinder FSV: Front cylinder
Rough sketch		

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ADJUSTMENT

1. Park the vehicle on a flat ground and set the mast vertical.
2. Lower the fork to the ground, and make adjustment to eliminate any chain sag by turning the adjusting nut.
3. Check to see that the chain tension is equal on the left and right side.
4. Check to see no chain twist.
5. See that the fork height is the standard.
6. With the fork raised fully, check to see that the lift bracket freeing prevention stopper at the inner mast is not in contact with the lift bracket.





FORK

REMOVAL

1. Set the fork at approx. 20 cm (7.9 in) above the ground.
2. Place a wooden block under the knotched portion of the fork rail.
3. Unlock the fork by lifting the fork stopper pin, and shift the fork blades, one at a time, to the center.
4. Slowly lower the fork for removal.

INSTALLATION

The installation procedure is the reverse of the removal procedure.

INSPECTION

1. Inspect misalignment of the fork tip ends.

   Limit: 10 mm (0.39 in)

   If the limit is exceeded, inspect individual fork bend, looseness of fork installation and lift bracket finger bar distortion.

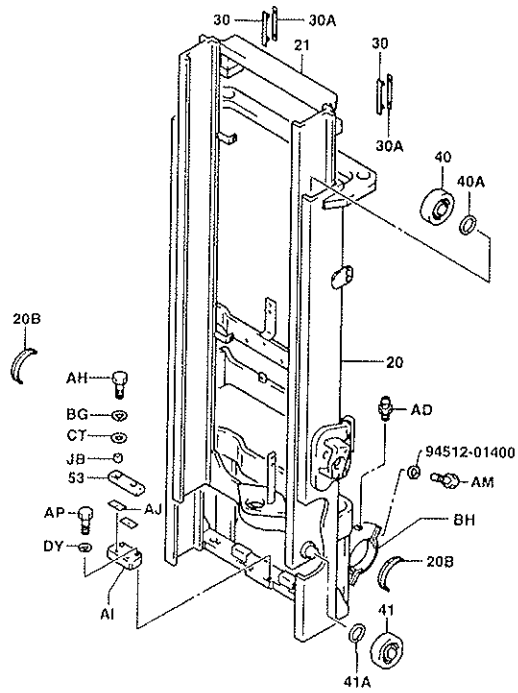
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FV·FSV MAST ASSY

COMPONENTS

FV (1·2·3 ton series)

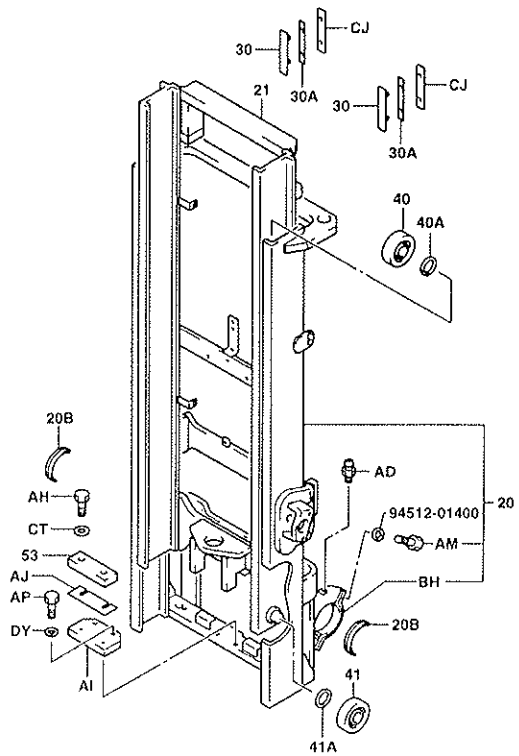
6101



6101-466A

FV (J3.5 ton series)

6101

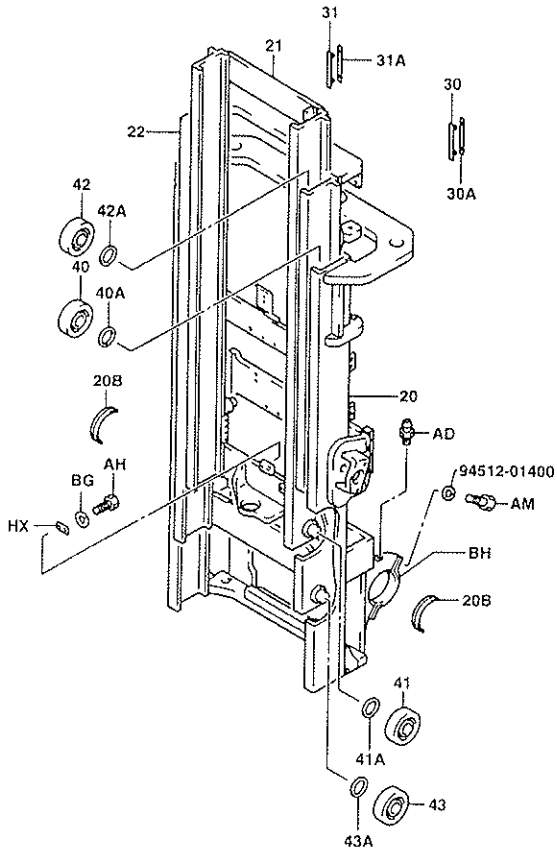


6101-468A

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FSV (1·2·3 ton series)

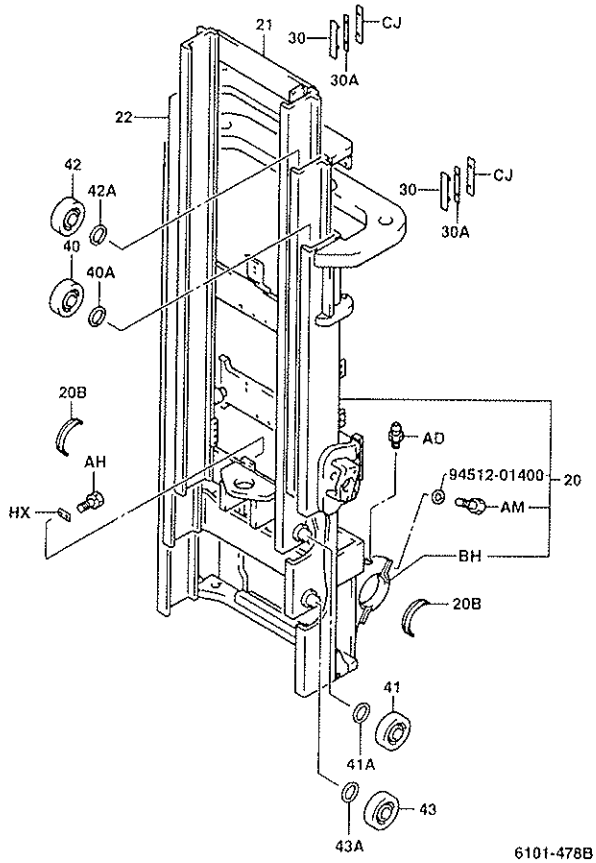
6101



6101-477A

FSV (J3.5 ton series)

6101

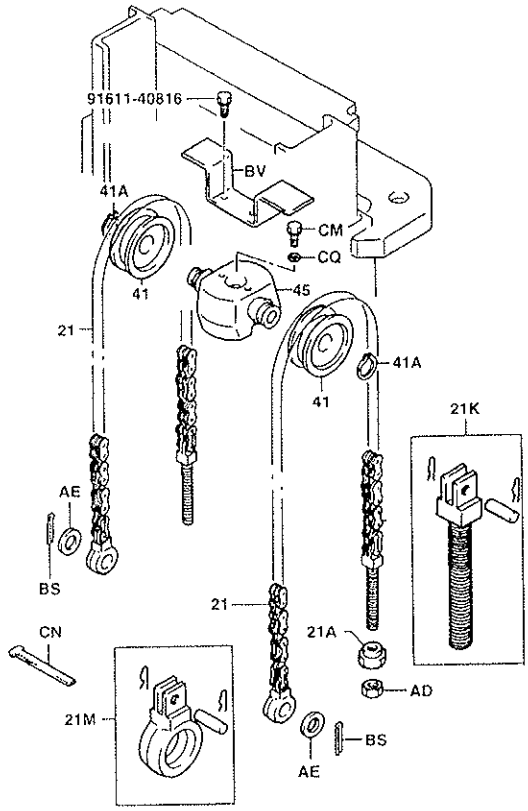


6101-478B

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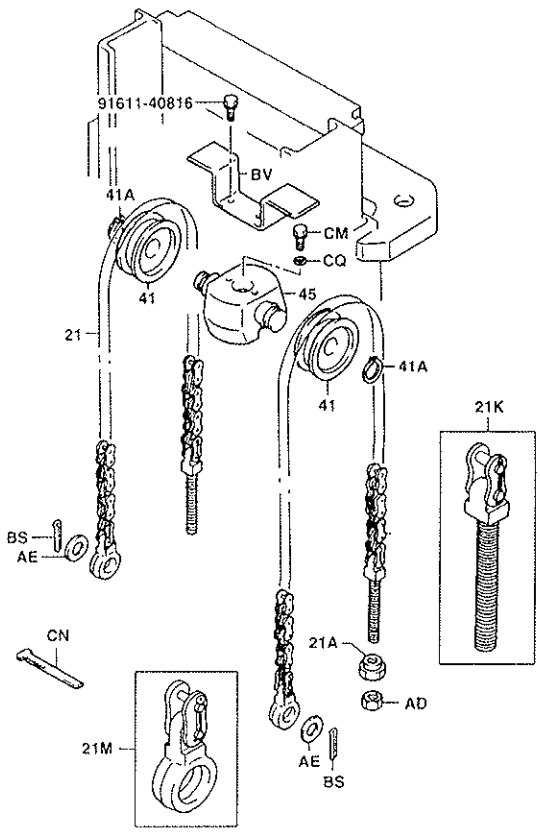
FV (1·2 ton series)

6302



FV (3 ton series)

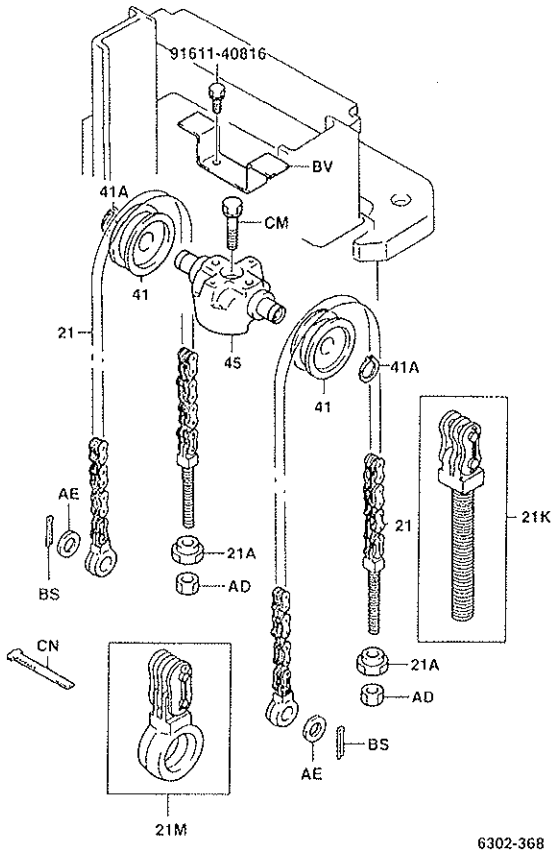
6302



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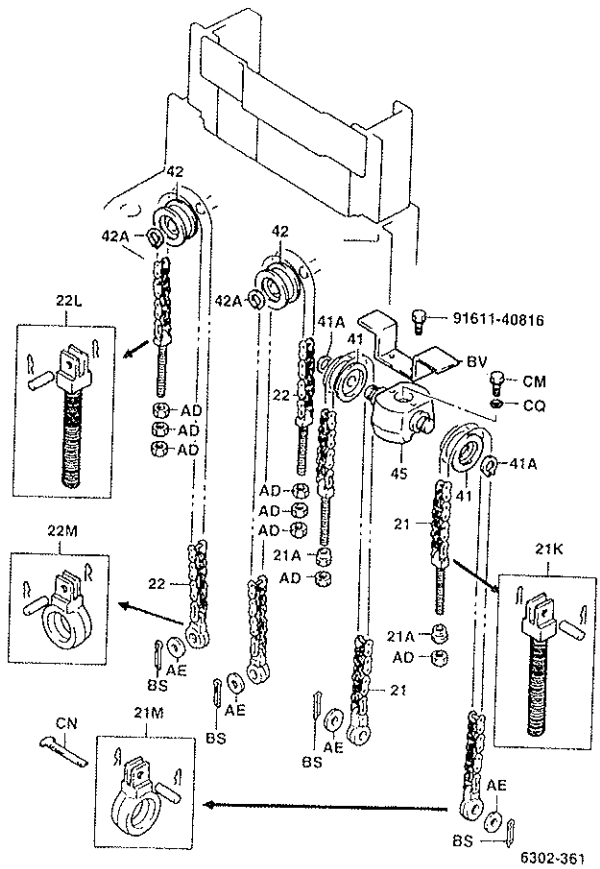
FV (J3.5 ton series)

6302



FSV (1·2 ton series)

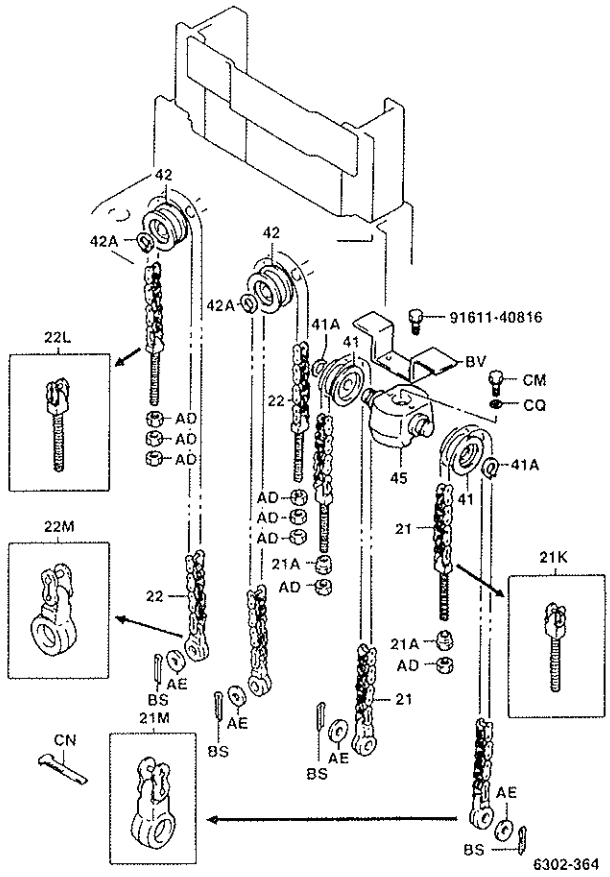
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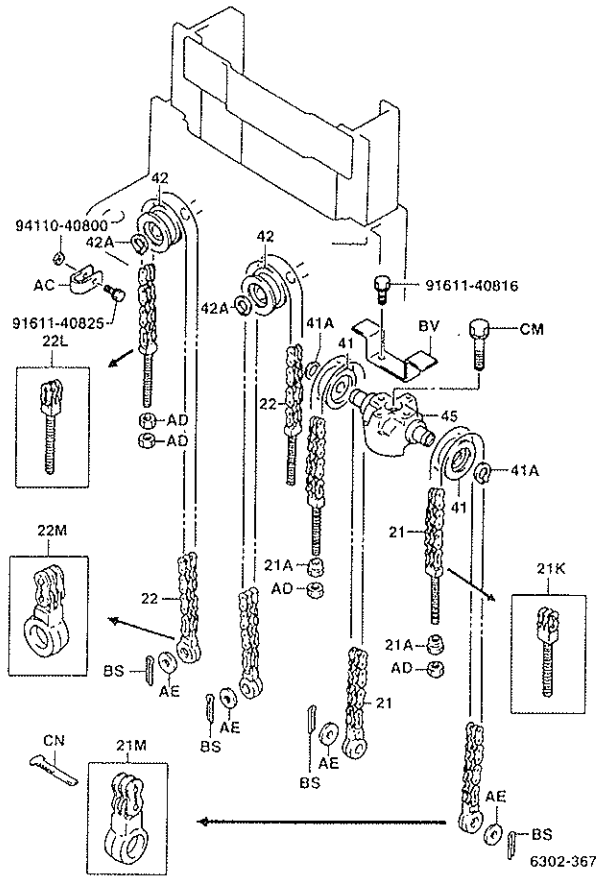
FSV (3 ton series)

6302



FSV (J3.5 ton series)

6302

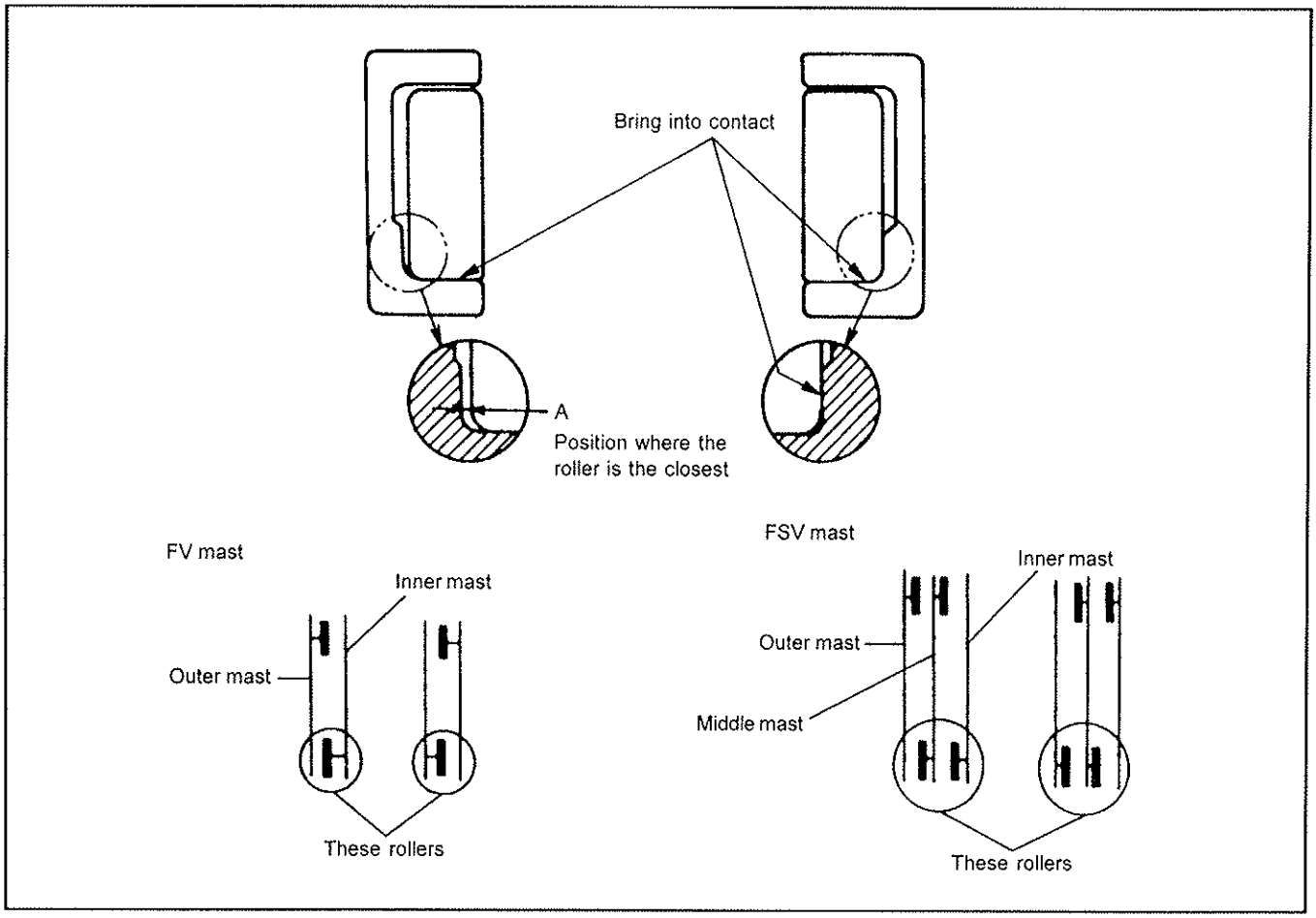


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MAST ADJUSTMENT (FV·FSV)

Lift Roller Adjustment at Mast

1. Inner mast roller (FV·FSV) and middle mast lower roller (FSV) clearance adjustment



(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and inspect the clearance between the roller side face and mast where they are the closest.

Standard: A = 0 ~ 0.8 mm (0 ~ 0.031 in)

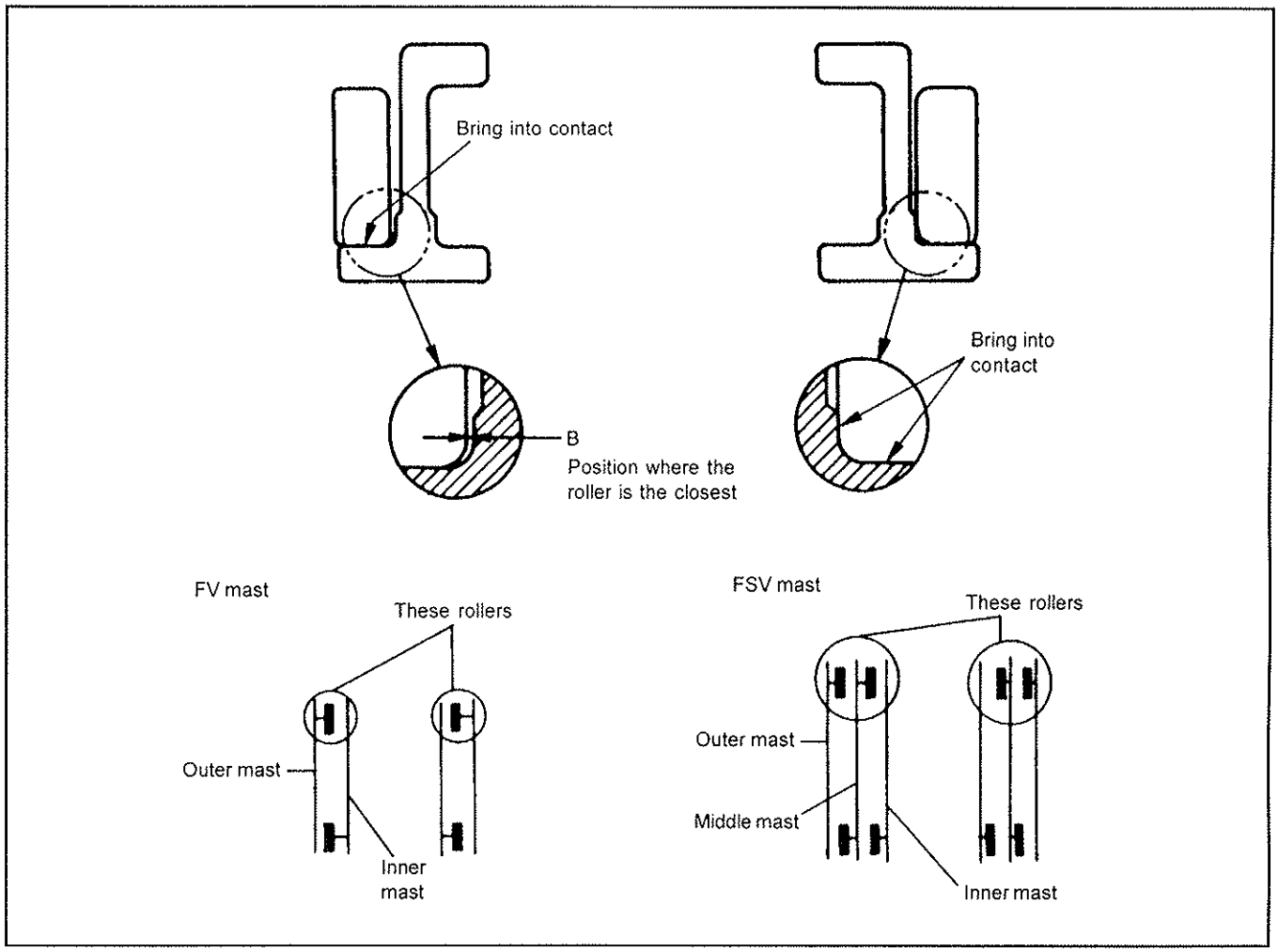
If the standard is not satisfied, make adjustment by changing the inner mast roller shim thickness.

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(3) Distribute shims equally to the rollers on the left and right sides.
(4) After the adjustment, see that mutual mast movement is smooth.

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2. Outer mast roller (FV·FSV) and middle mast upper roller (FSV) clearance adjustment



(1) Adjust the mast overlap to approx. 450 mm (17.72 in).
(2) Shift the inner mast to one side to bring the roller into contact with the inner mast, and measure on the opposite side the clearance between the roller side face and mast where they are the closest.

Standard: B = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the outer mast roller shim thickness.

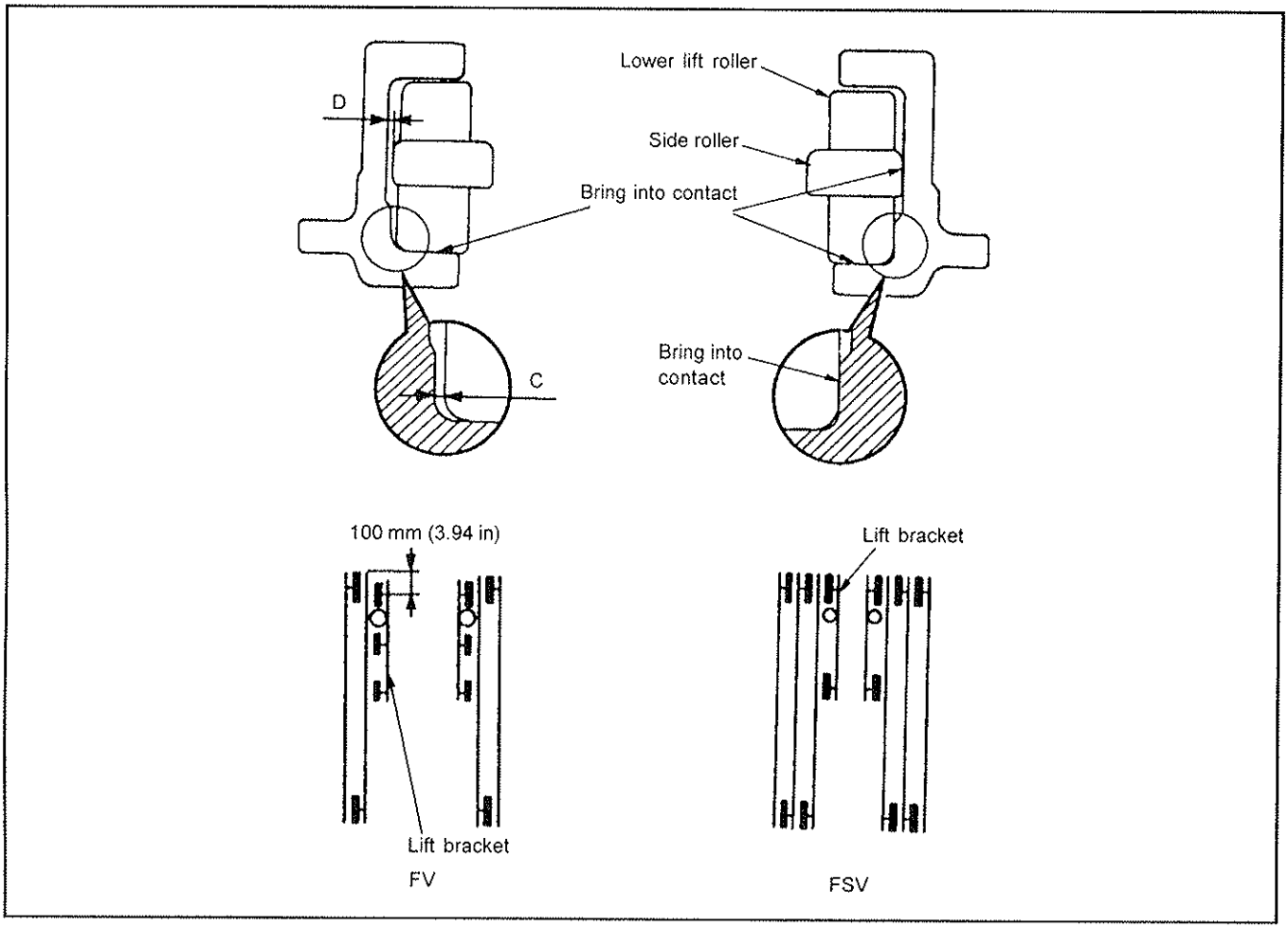
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(3) Distribute shims equally to the rollers on the left and right sides.
(4) After the adjustment, see that mutual mast movement is smooth.

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Lift/Side Roller Adjustment at Lift Bracket

FV-FSV mast



(1) Raise the lift bracket to the uppermost position for the FSV mast, and bring the center of the upper lift roller to approx. 100 mm (3.94 in) from the top of the inner mast for FV mast.
(2) No adjustment is necessary for the upper lift rollers and intermediate rollers (FV only) since they are fastened by snap rings.
(3) Shift the lift bracket to one side to bring the lower lift roller and side roller, and measure on the opposite side the clearance between the roller side face and the mast where they are the closest.

Standard: C = 0 ~ 0.5 mm (0 ~ 0.020 in)

If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(4) After the inspection and adjustment in step (3) above, inspect and adjust the side rollers.
Bring the side roller on one side into contact with mast side surface, measure on the opposite side the clearance between the side roller and the inner mast side surface where they are the closest.

Standard: D = 0 ~ 0.6 mm (0 ~ 0.024 in)

If the standard is not satisfied, make adjustment by changing the shim thickness. (Distribute shims equally to the rollers on the left and right sides.)

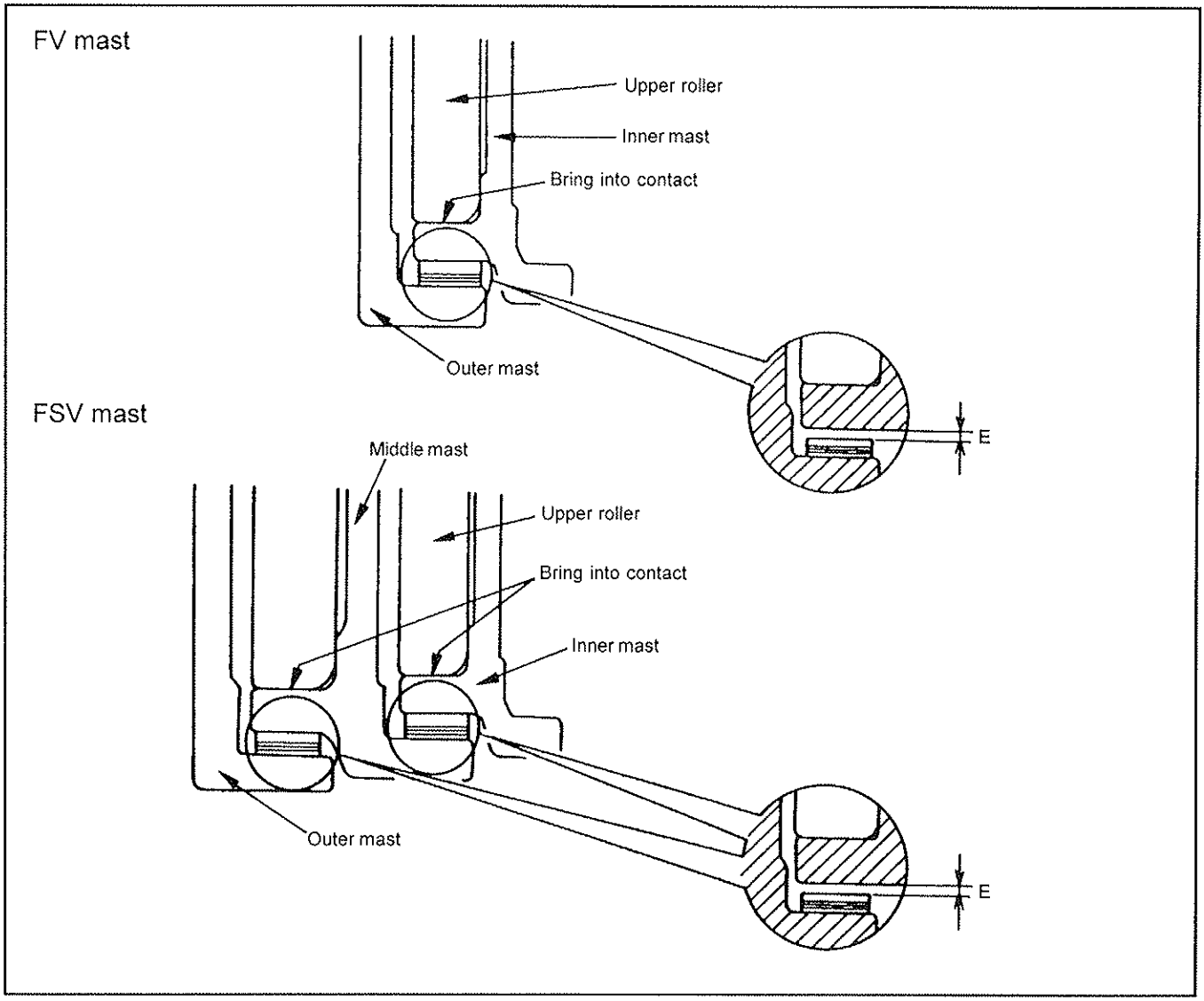
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

(5) After the adjustment, check to see that the lift bracket moves smoothly over the entire length of the mast.

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Mast Strip Adjustment

Mast strip clearance adjustment



(1) Lower the inner (or middle) mast fully.
(2) With the inner (or middle) mast in contact with the outer mast roller (or middle mast upper roller), measure the clearance between the mast strip and mast.

Standard: E = 0 ~ 0.8 mm (0 ~ 0.031 in)

If the standard is not satisfied, make adjustment by changing the mast strip shim thickness.

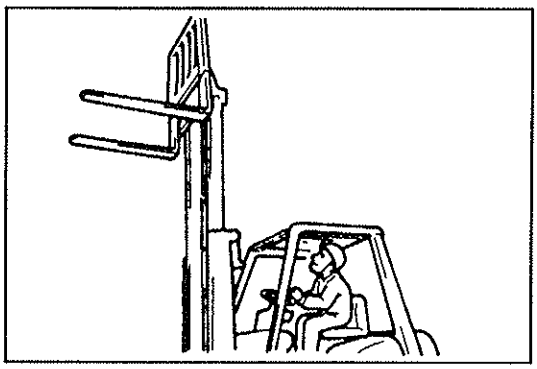
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

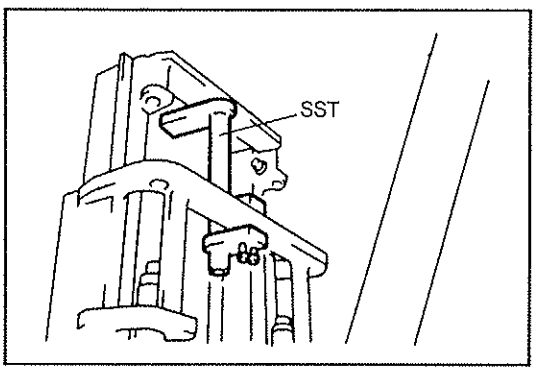
(3) After the adjustment, check the mast for smooth movement.

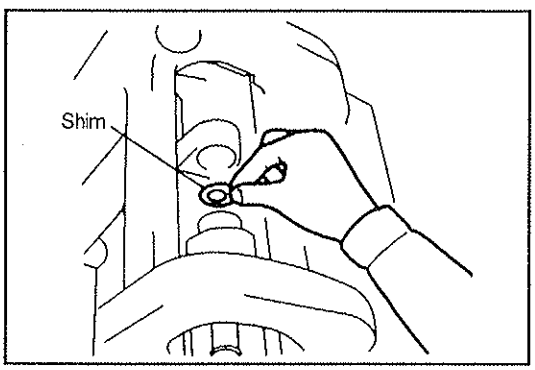
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LIFT CYLINDER ROD SHIM ADJUSTMENT (PREVENTION OF UNEVEN LIFTING)

Note:
- **For double lift cylinders, inspection and adjustment are required to prevent uneven lifting on the left and right sides due to tolerances of parts, etc.**
- **The inspection and adjustment must be made whenever any of the following parts is replaced: Lift cylinder ASSY, lift cylinder rod SUB-ASSY, lift cylinder SUB-ASSY, mast ASSY, outer mast SUB-ASSY, and inner mast SUB-ASSY**







1. Inspection method
   Slowly raise the inner mast, and observe the stopping states of the left and right cylinder rods at the moment when the inner mast reaches the maximum height.
   (1) Normal case
   Both the left and right rods stop almost simultaneously with almost no shaking of the inner mast.
   (2) Abnormal case
   The rods stop with slight difference and the top of the inner mast shakes at the time of stopping. To correct this, add shims to the cylinder that stops first.

2. Adjustment method
   (1) Raise the inner mast, set the SST to the outer mast tie beam, and lower the inner mast until it reaches the SST.
   SST 09610-22000-71
   (2) Remove the set bolt of the cylinder rod end on the side requiring shim adjustment.
   (3) Slowly lower the lift cylinder rod and disconnect the cylinder rod end.
   (4) Place shims on the cylinder rod end. Slowly raise the cylinder rod end into the inner mast.
   (5) Fix the set bolt of the cylinder rod end.
   (6) Raise the inner mast for reinspection.
   (7) Repeat the inspection and adjustment until the number of shims is determined.

   Shim thickness:
   0.5 and 1.0 mm (0.020 and 0.039 in)

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CYLINDER

Page

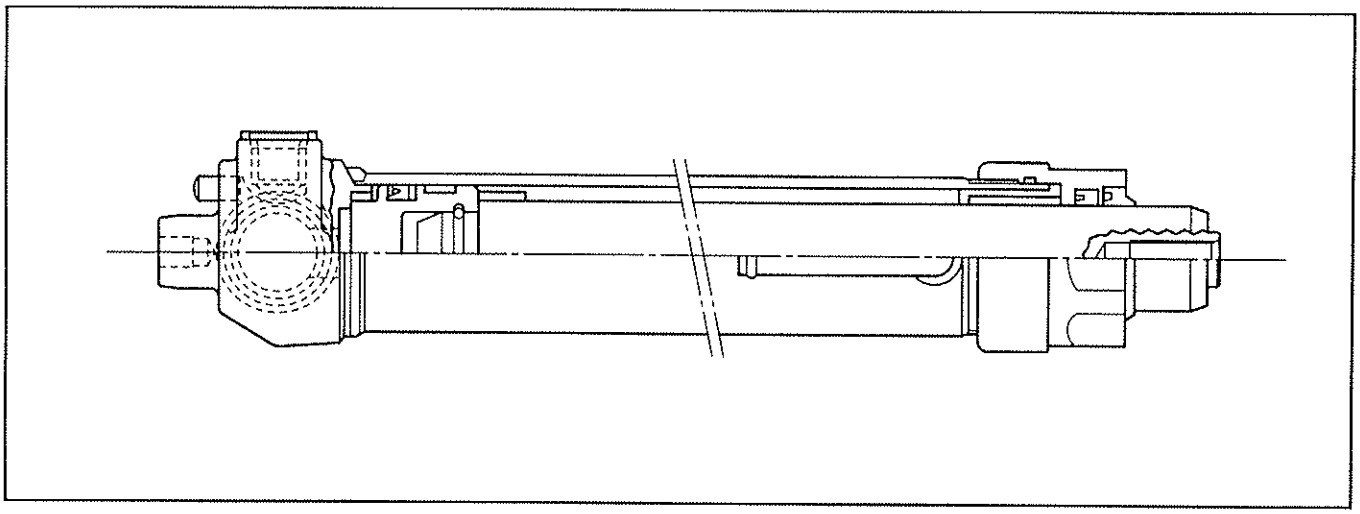
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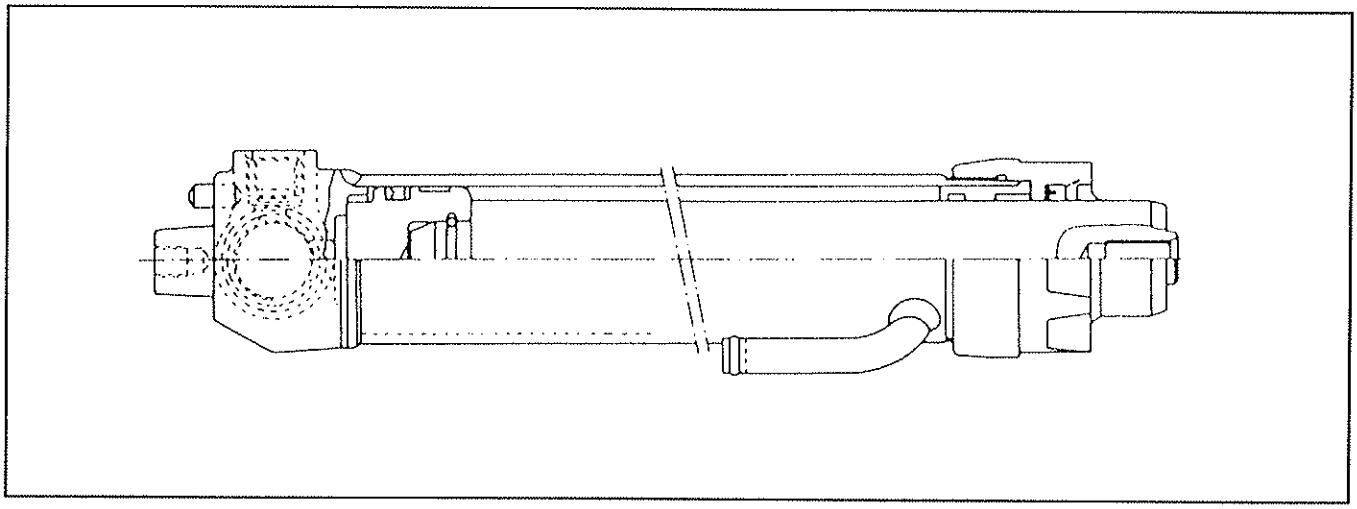
LIFT CYLINDER (V) · REAR LIFT CYLINDER (FV·FSV)

GENERAL

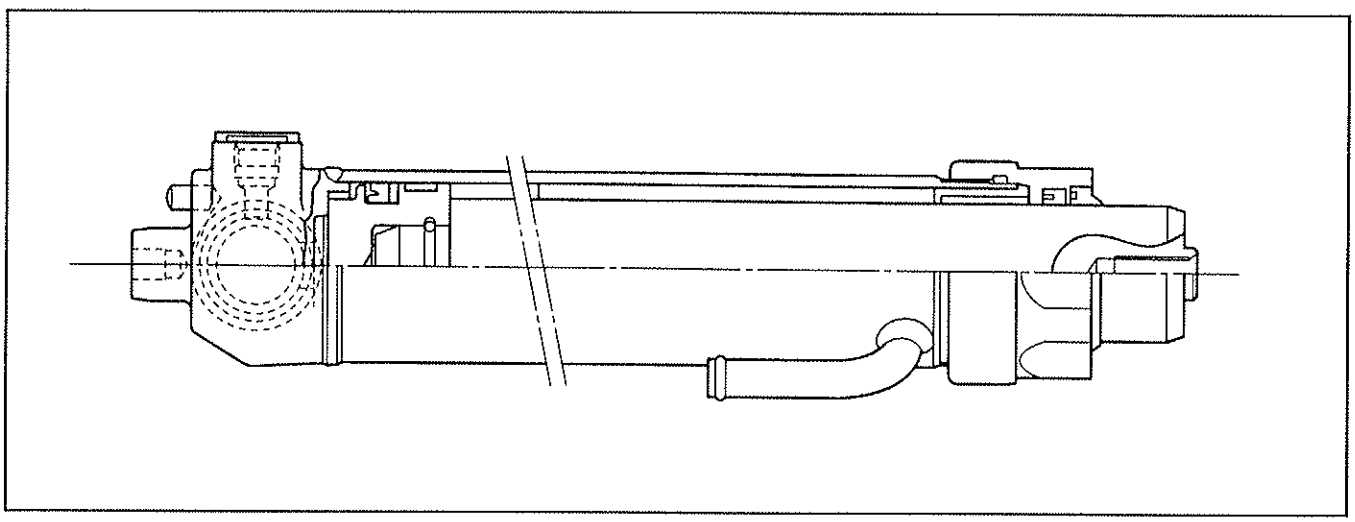
Lift Cylinder (V/1 ton Series)



Lift Cylinder (V/2 ton Series)



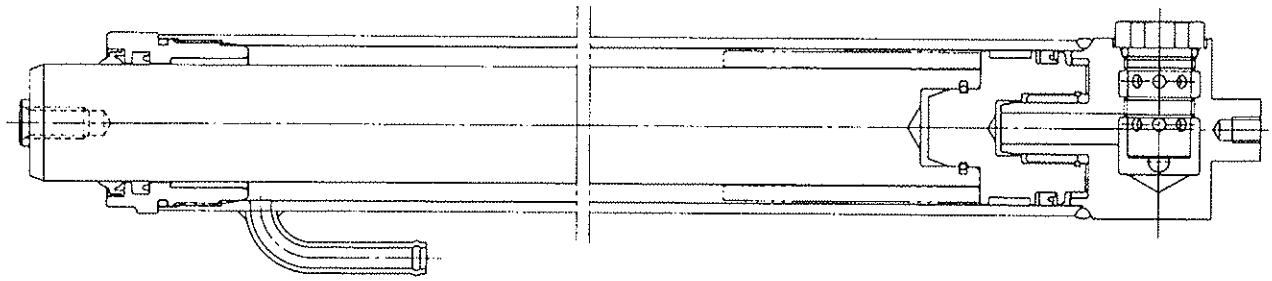
Lift Cylinder (V/3 ton Series)



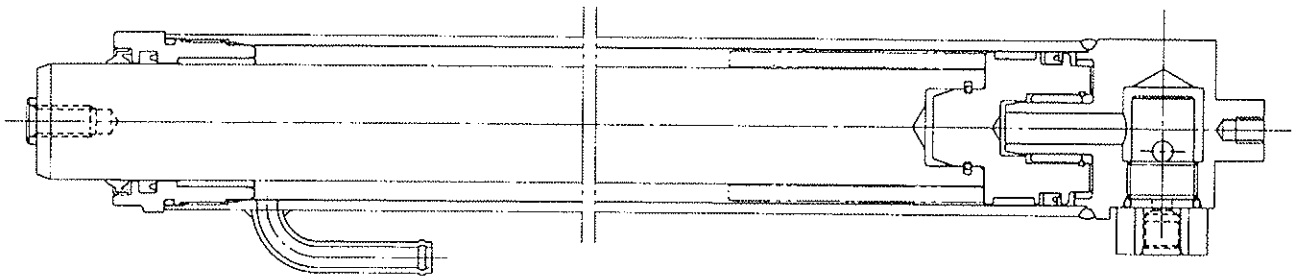
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Lift Cylinder (V/J3.5 ton Series)

RH

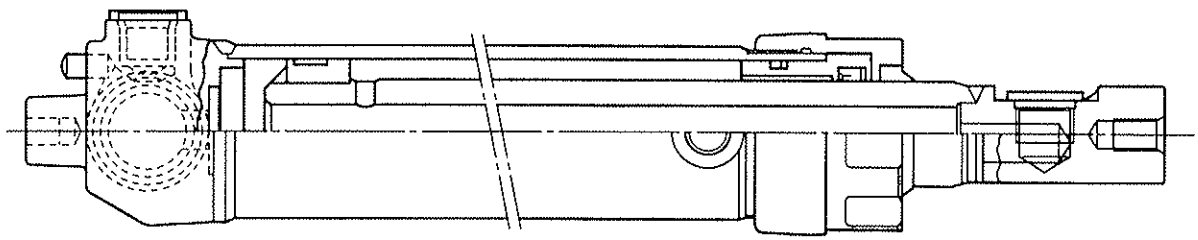


LH

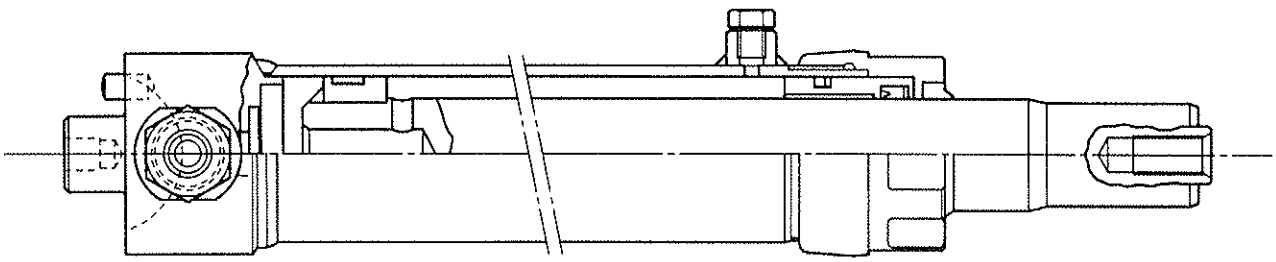


Lift Cylinder (FV/1·2·3 ton Series)

RH



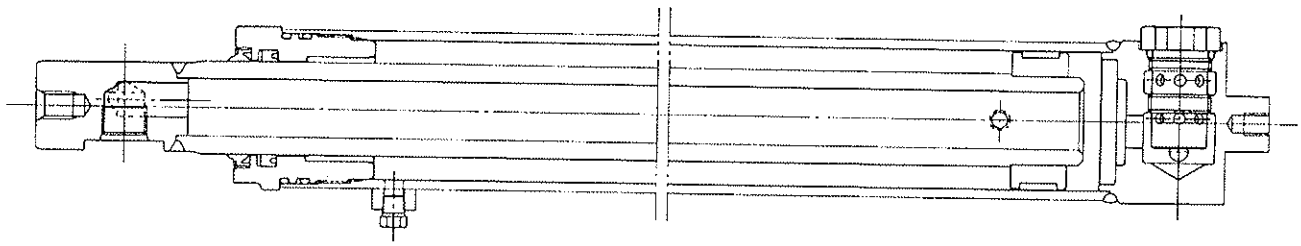
LH



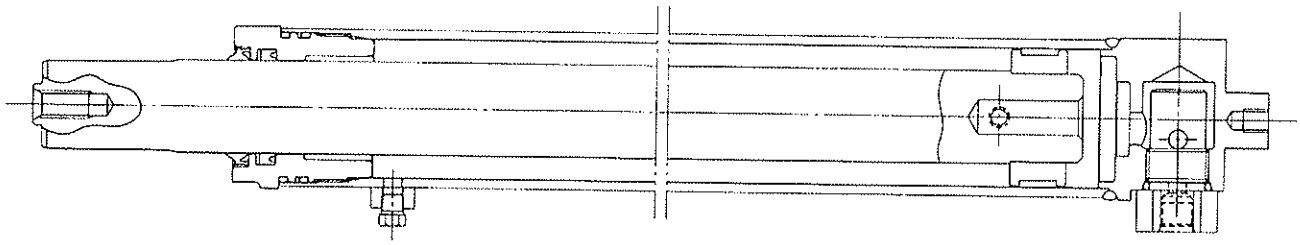
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Rear Lift Cylinder (FV/J3.5 ton Series)

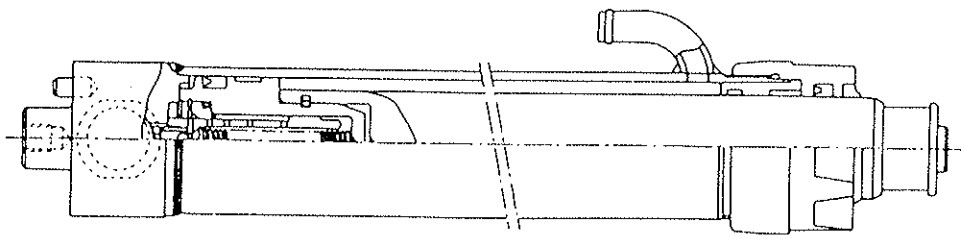
RH



LH



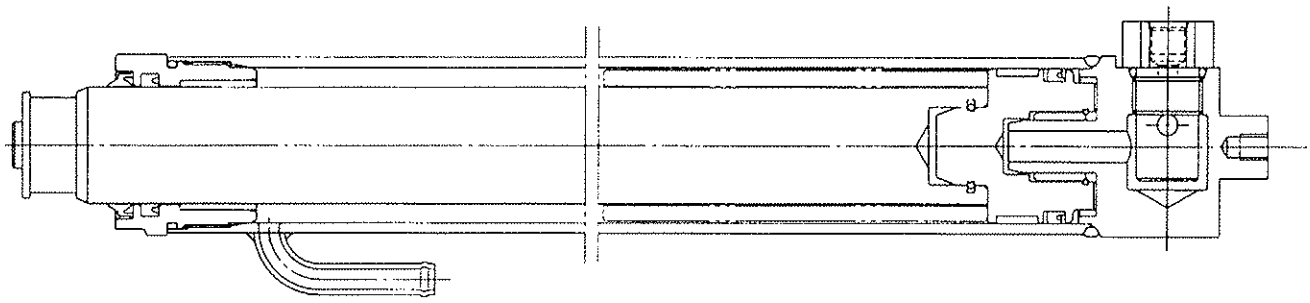
Rear Lift Cylinder (FSV/1·2·3 ton Series)



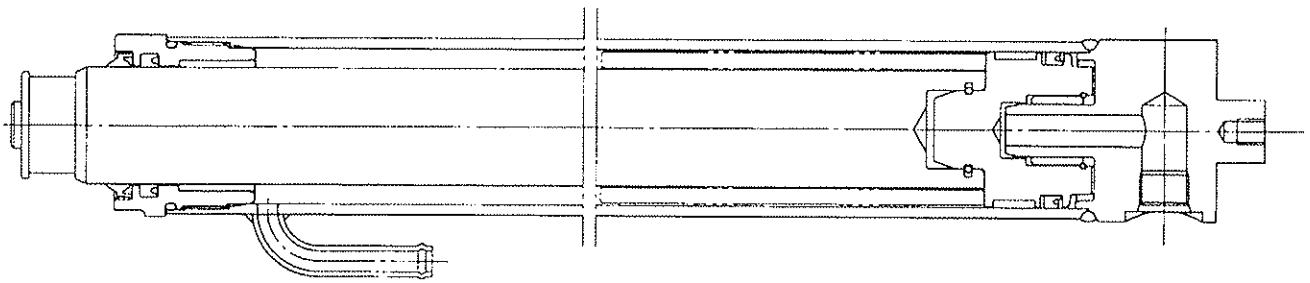
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Rear Lift Cylinder (FSV/J3.5 ton Series)

RH



LH



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SPECIFICATIONS

Lift Cylinder (V)

Item \ Vehicle model		1 ton series	2 ton series	3 ton series	J3.5 ton series
Cylinder type		Single-acting type	←	←	←
Cylinder bore	mm (in)	4 5 (1.77)	5 0 (1.97)	5 5 (2.17)	6 0 (2.36)
Piston rod outside diameter	mm (in)	3 5 (1.38)	4 0 (1.57)	4 5 (1.77)	4 5 (1.77)
Piston seal type		U packing	←	←	←
Rod seal type		U packing	←	←	←
Others		Built-in flow regulator valve (RH) Built-in safety down valve (LH)			

Rear Lift Cylinder (FV)

Item \ Vehicle model		1 ton series	2 ton series	3 ton series	J3.5 ton series
Cylinder type		Single acting type	←	←	←
Cylinder bore	mm (in)	4 5 (1.77)	5 0 (1.97)	5 5 (2.17)	6 0 (2.36)
Piston rod outside diameter	mm (in)	3 2 (1.26)	3 5 (1.38)	4 0	←
Rod seal type		U packing	←	←	←
Others		Built-in flow regulator valve (RH) Built-in safety down valve (LH)			

Rear Lift Cylinder (FSV)

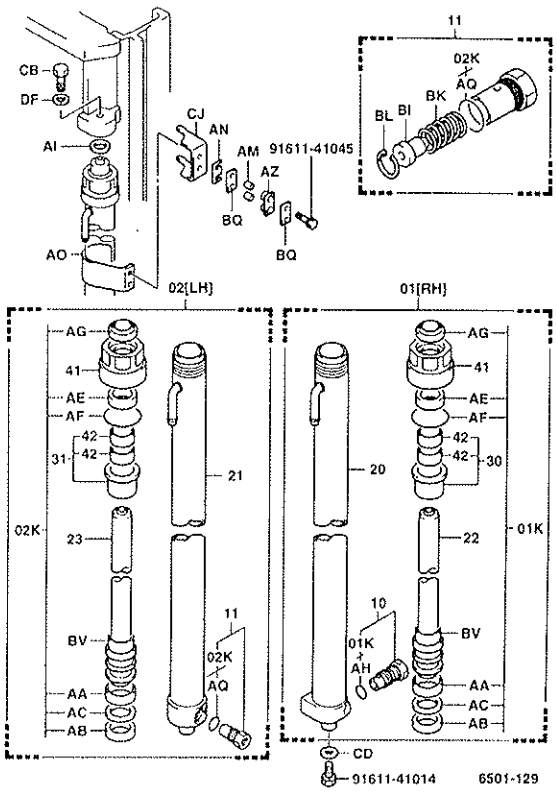
Item \ Vehicle model		1 ton series	2 ton series	3 ton series	J3.5 ton series
Cylinder type		Single acting type	←	←	←
Cylinder bore	mm (in)	4 5 (1.77)	5 0 (1.97)	5 5 (2.17)	6 0 (2.36)
Piston rod outside diameter	mm (in)	3 5 (1.38)	4 0 (1.57)	4 5 (1.77)	←
Piston seal type		U packing	←	←	←
Rod seal type		U packing	←	←	←
Others		Built-in safety down valve (RH)			

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COMPONENTS

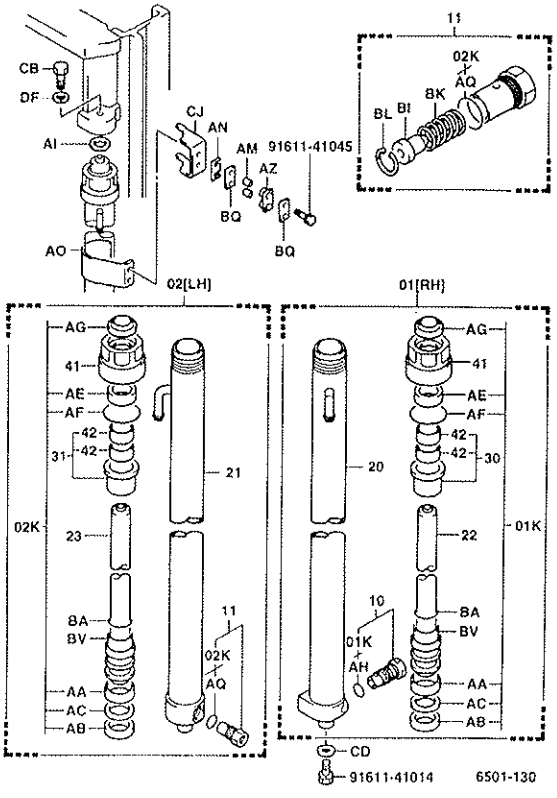
Lift Cylinder (V/1 ton Series)

6501



Lift Cylinder (V/2·3 ton Series)

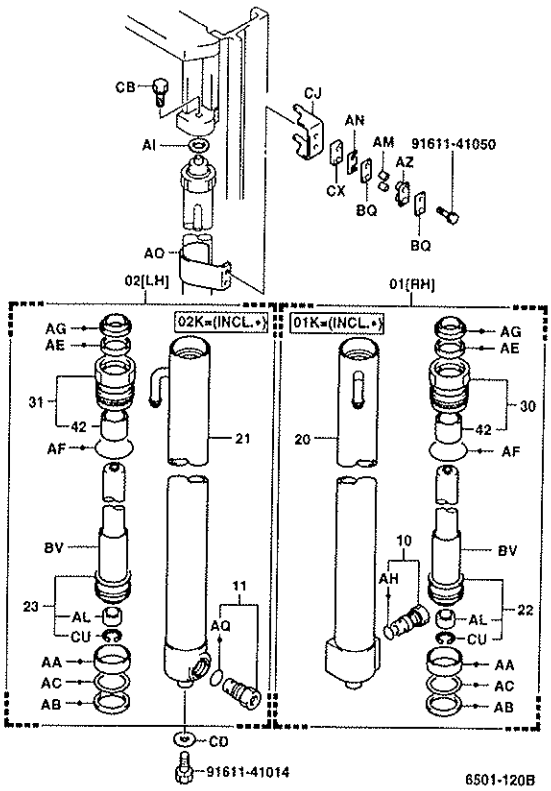
6501



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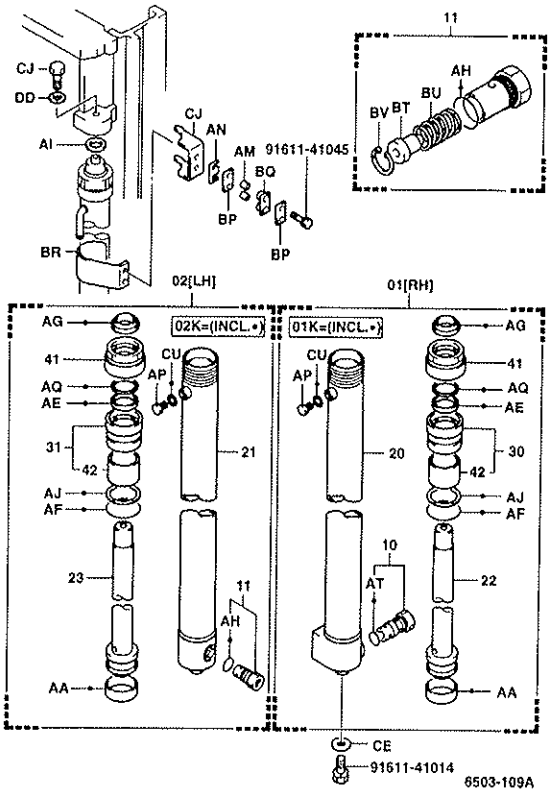
Lift Cylinder (V/J3.5 ton Series)

6501



Rear Lift Cylinder (FV/1·2·3 ton Series)

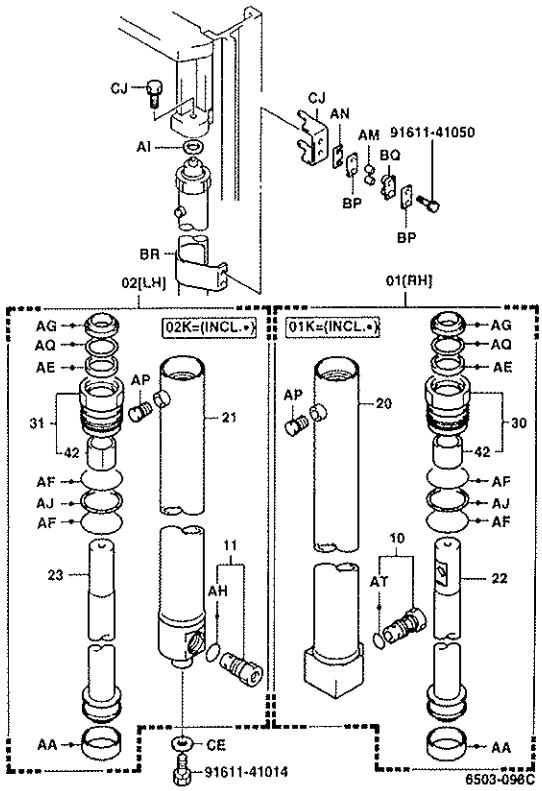
6503



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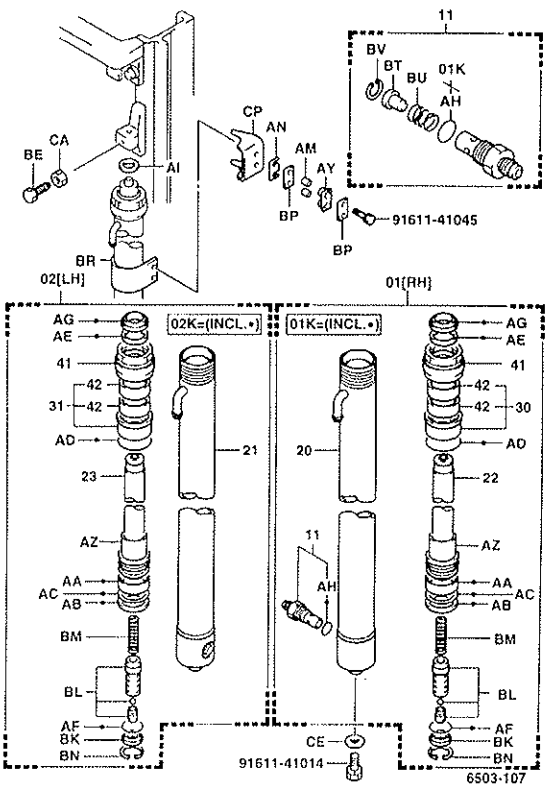
Rear Lift Cylinder (FV/J3.5 ton Series)

6503



Rear Lift Cylinder (FSV/1 ton Series)

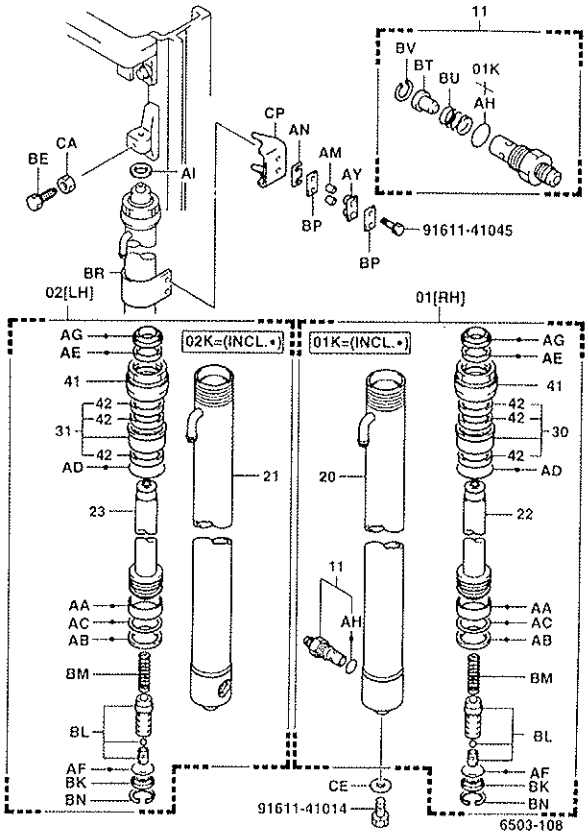
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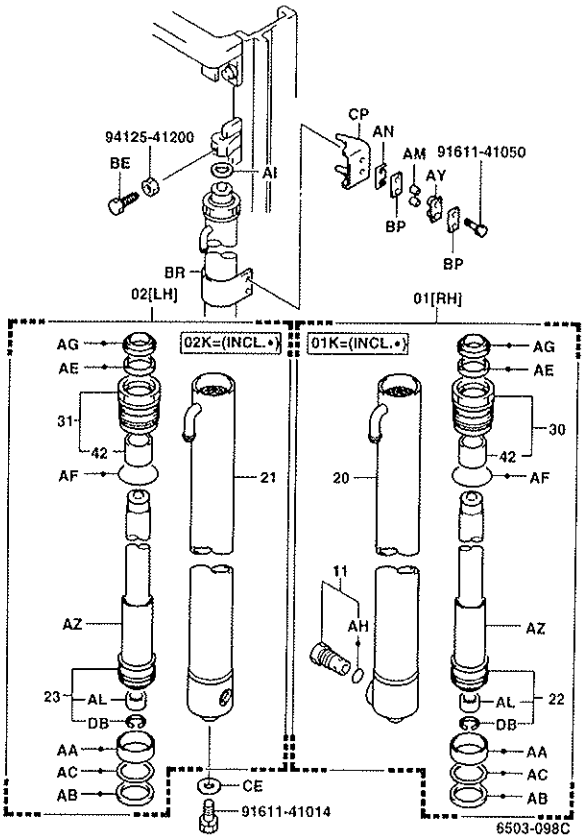
Rear Lift Cylinder (FSV/2·3 ton Series)

6503



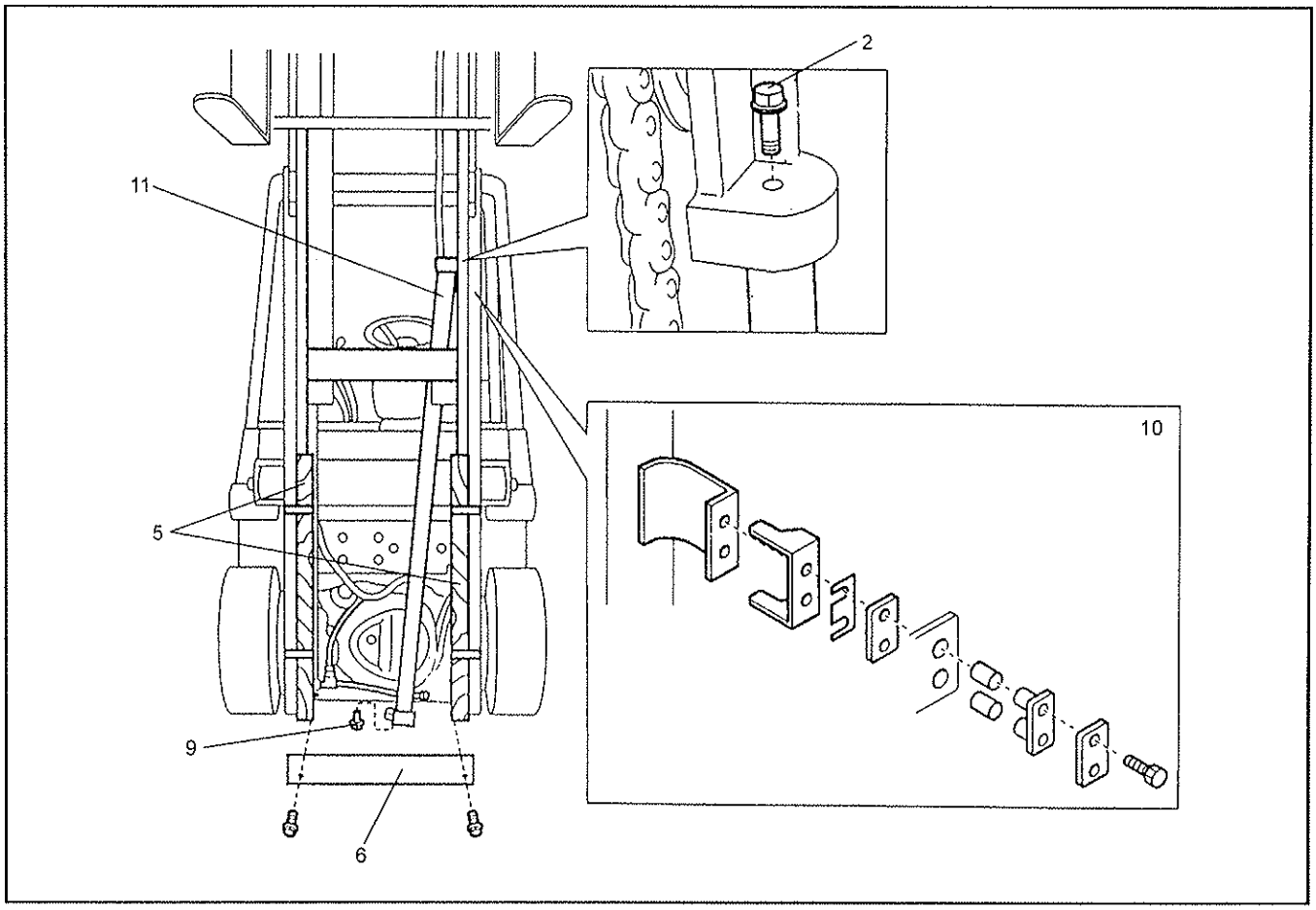
Rear Lift Cylinder (FSV/J3.5 ton Series)

6503



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REMOVAL·INSTALLATION



Removal Procedure

1 Set the mast vertical and lower the fork fully.

2 Remove the lift cylinder rod end set bolt.

3 Hoist the inner mast by slinging with a wire and disconnect the lift cylinder rod end. **[Point 1]**

4 Hoist the inner mast further so that the lift cylinder ASSY can be removed from the front space.

5 Support the bottom of the inner mast with wooden blocks and fix the blocks by taping onto the outer mast.

6 Remove the hose cover.

7 Disconnect the hose.

8 Disconnect the load sensor wiring.

9 Remove the lift cylinder bottom end set bolt.

10 Remove the lift cylinder support. **[Point 2]**

11 Remove the lift cylinder ASSY.

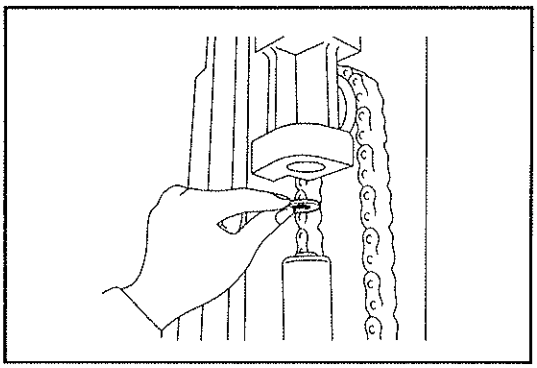
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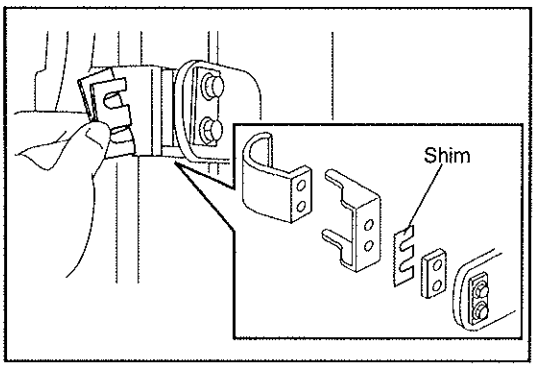
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
After installing the lift cylinder, follow the steps below.

1. **Repeat full-stroke raising and lowering of the cylinder to bleed air and check normal functioning.**
2. **Check the hydraulic oil level and add if insufficient.**
3. **Inspect lift cylinders for uneven lifting, and make necessary adjustment. (See page 11-32.)**





Point Operations

[Point 1]
Removal:

Shim adjustment is made at the lift cylinder rod end to prevent uneven lifting by lift cylinders LH and RH. Take notes on the cylinder where adjustment is made and the number of shims used.

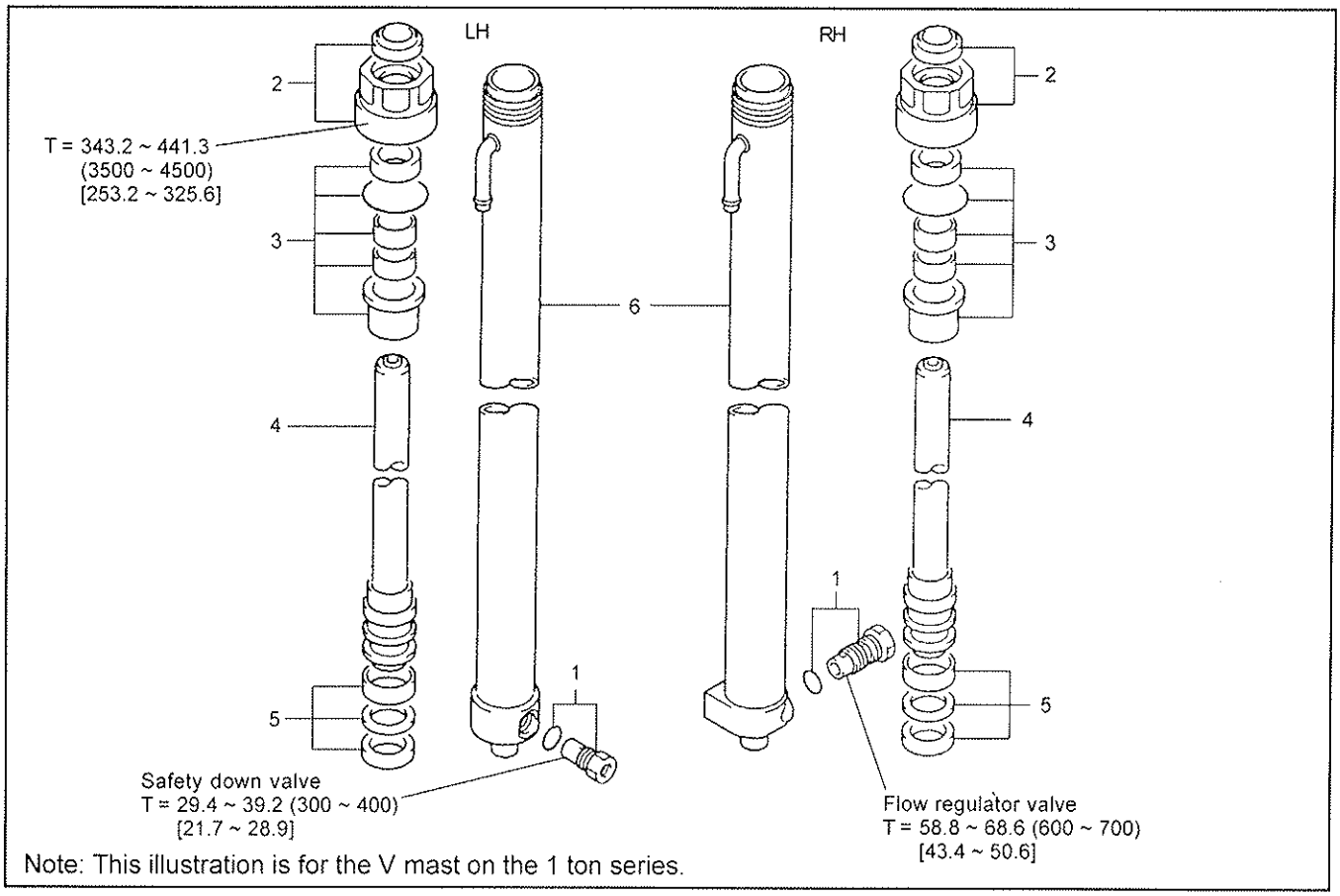
[Point 2]
Installation:

Temporarily fasten the cylinder support here, and eliminate any clearance between the cylinder support and outer mast by shim insertion after connecting the rod end. (Use shim(s) slightly thicker than the clearance.)

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Note: This illustration is for the V mast on the 1 ton series.

Disassembly Procedure

1 Remove the flow regulator valve or safety down valve.

2 Remove the cylinder cover.

3 Remove the rod guide.

4 Remove the piston rod. **[Point 1]**

5 Remove seals on the piston side.

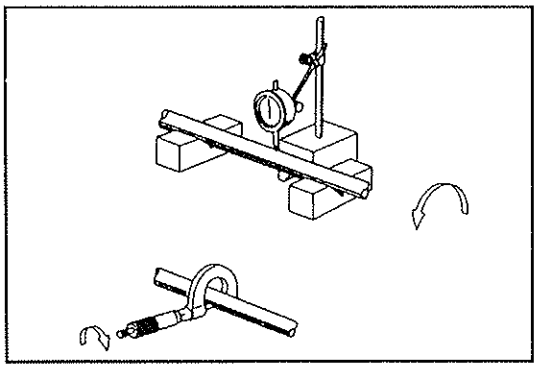
6 Remove the lift cylinder. **[Point 2]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring, and dust seal lip portion.**
- **Apply sealant (08833-76002-71 (08833-00080)) on the threaded portion of the cylinder cover before tightening.**

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Point Operations

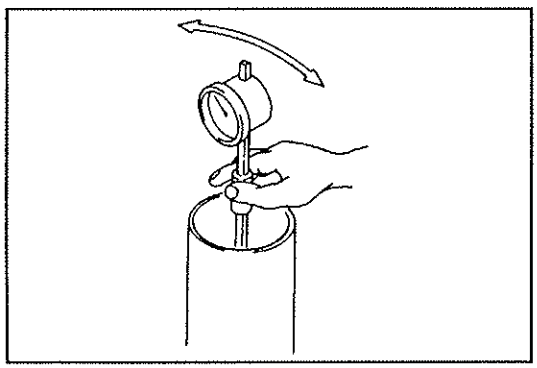
[Point 1]
Inspection:
Measure the piston rod outside diameter.

Unit: mm (in)

		Standard	Limit
V FSV	1 ton series	35 (1.38)	34.92 (1.3748)
	2 ton series	40 (1.57)	39.92 (1.5717)
	3·J3.5 ton series	45 (1.77)	44.92 (1.7685)
FV	1 ton series	32 (1.26)	31.92 (1.2567)
	2 ton series	35 (1.38)	34.92 (1.3748)
	3·J3.5 ton series	40 (1.57)	39.92 (1.5717)

Inspection:
Measure the bend of the piston rod.

Limit: 2.0 mm (0.079 in)



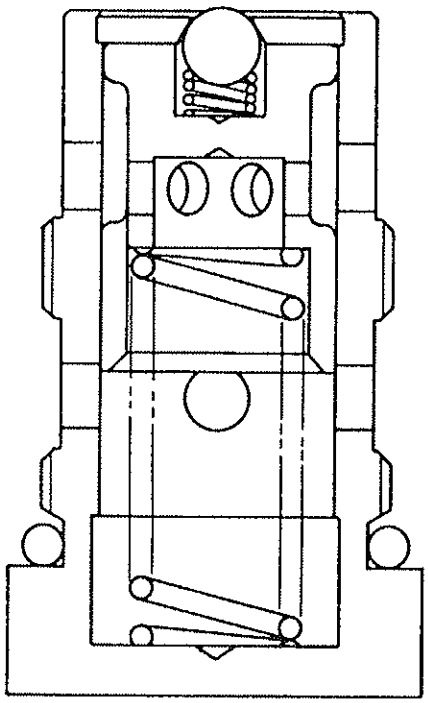
[Point 2]
Inspection:
Measure the lift cylinder bore.

Unit: mm (in)

	Standard	Limit
1 ton series	45 (1.77)	45.20 (1.7795)
2 ton series	50 (1.97)	50.20 (1.9764)
3 ton series	55 (2.17)	55.35 (2.1791)
J3.5 ton series	60 (2.36)	60.35 (2.3760)

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FLOW REGULATOR VALVE (V·FV·FSV)



Lowering Speed Specifications

Unit: mm/sec (fpm)

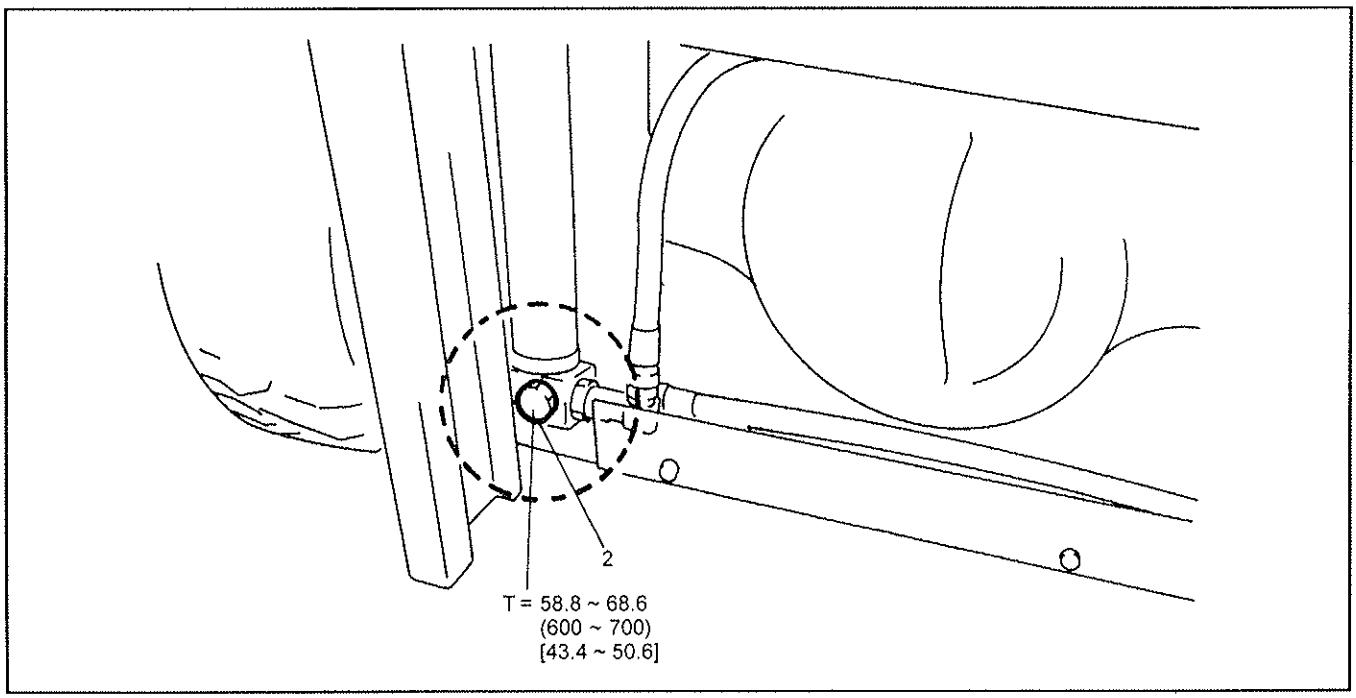
Vehicle model \ Mast type		V	FV	FSV
1 ton series	No-load	550 (108)	420 (83)	450 (89)
	Loaded	500 (98)	480 (94)	480 (94)
2 ton series	No-load	500 (98)	420 (83)	450 (89)
	Loaded	500 (98)	480 (94)	480 (94)
3 ton series	No-load	500 (98)	390 (77)	420 (83)
	Loaded	500 (98)	460 (91)	460 (91)
J3.5 ton series	No-load	450 (89)	390 (77)	390 (77)
	Loaded	500 (98)	460 (91)	460 (91)

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REMOVAL·INSTALLATION

Note:
The explanation here is for the flow regulator valve for V or FV mast.
In the case of the FSV mast, the flow regulator valve is installed on the outer mast.

T = N·m (kgf-cm) [ft-lbf]



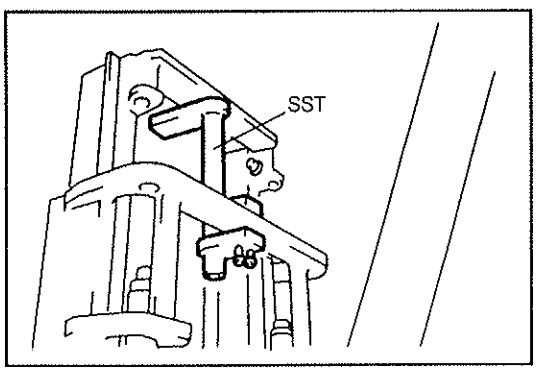
Removal Procedure

1 Hoist the inner mast. **[Point 1]**

2 Remove the flow regulator valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

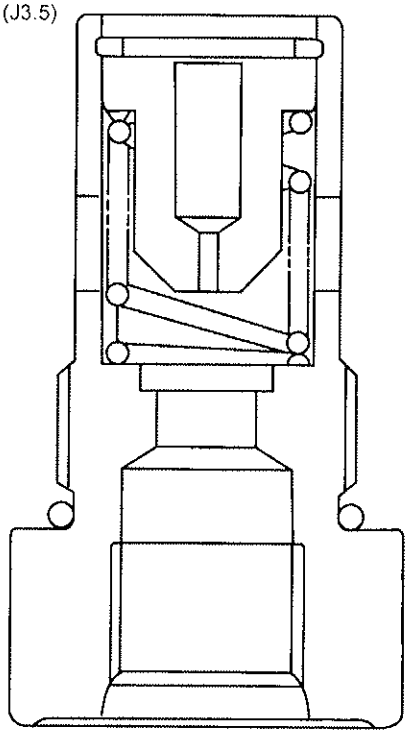
[Point 1]
Removal-Installation:
Hoist the inner (middle) mast by slinging with a wire, set the SST on the inner (middle) mast tie beam, and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

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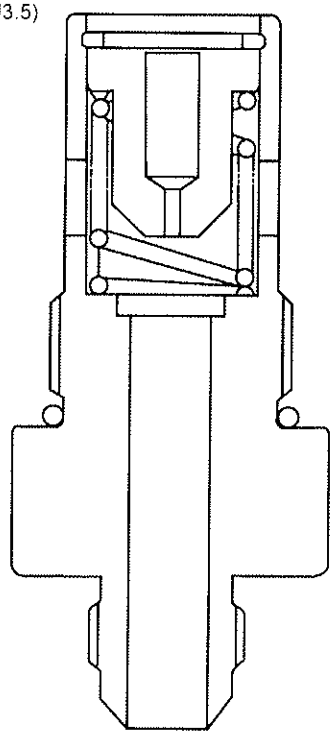
SAFETY DOWN VALVE (V·FV·FSV)

Safety Down Valve Sectional View (for V) (for FV·FSV Rear Lift Cylinder)

V·FV·FSV (J3.5)

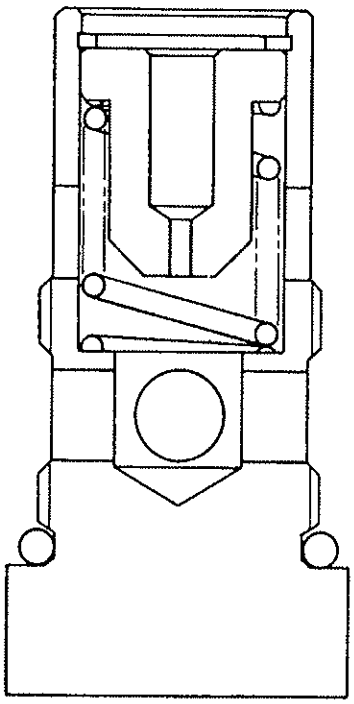


FSV (Except for J3.5)

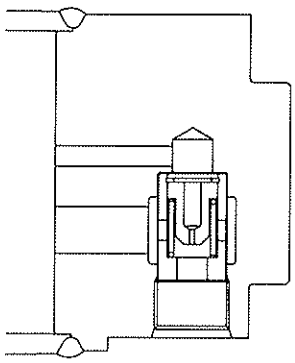


Safety Down Valve Sectional View (for FV·FSV Front Lift Cylinder)

1 ~ 3 ton series
J3.5 ton series (~ 2000. 3)



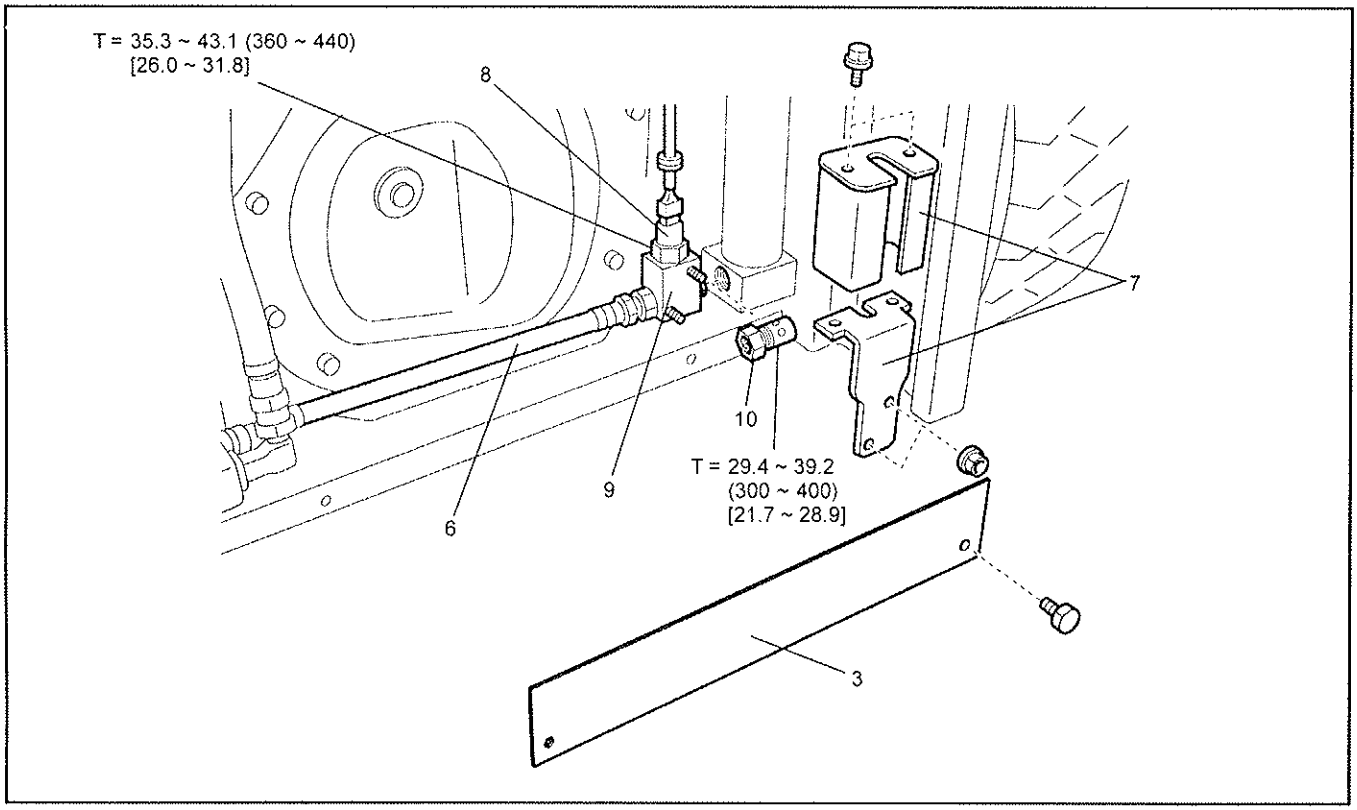
J3.5 ton series (2000. 3 ~)



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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]

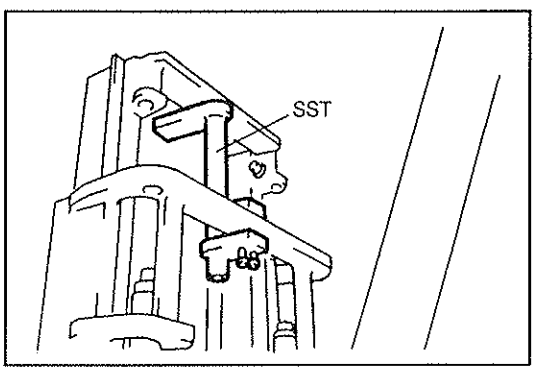


Removal Procedure

1 Remove the lift cylinder rod end set bolt.
2 Hoist the inner mast. **[Point 1]**
3 Remove the front hose cover.
4 Remove the lift cylinder (LH) bottom end set bolt.
5 Loosen the lift cylinder (LH) support set bolt.
6 Disconnect the hose.
7 Remove the load sensor cover.
8 Disconnect the load sensor connector and remove the load sensor.
9 With the lift cylinder (LH) hoisted slightly upward, remove the three-way.
10 Remove the safety down valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.



Point Operation

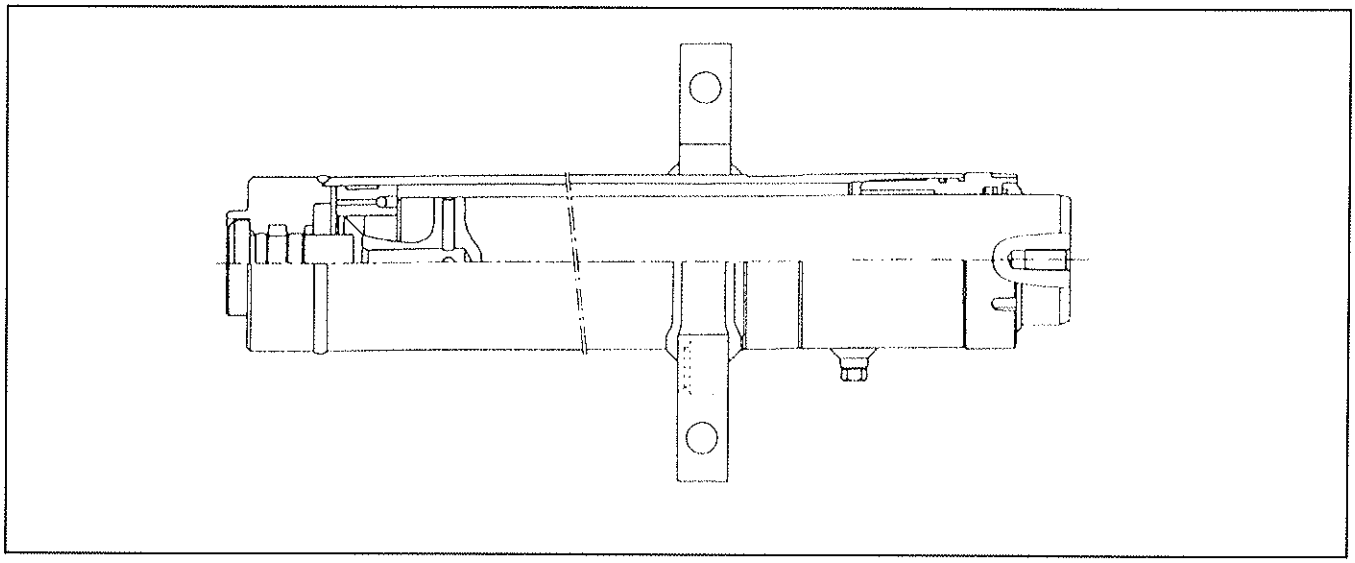
[Point 1]
Removal-Installation:
Hoist the inner (middle) mast by slinging with a wire, set the SST on the inner (middle) mast tie beam, and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

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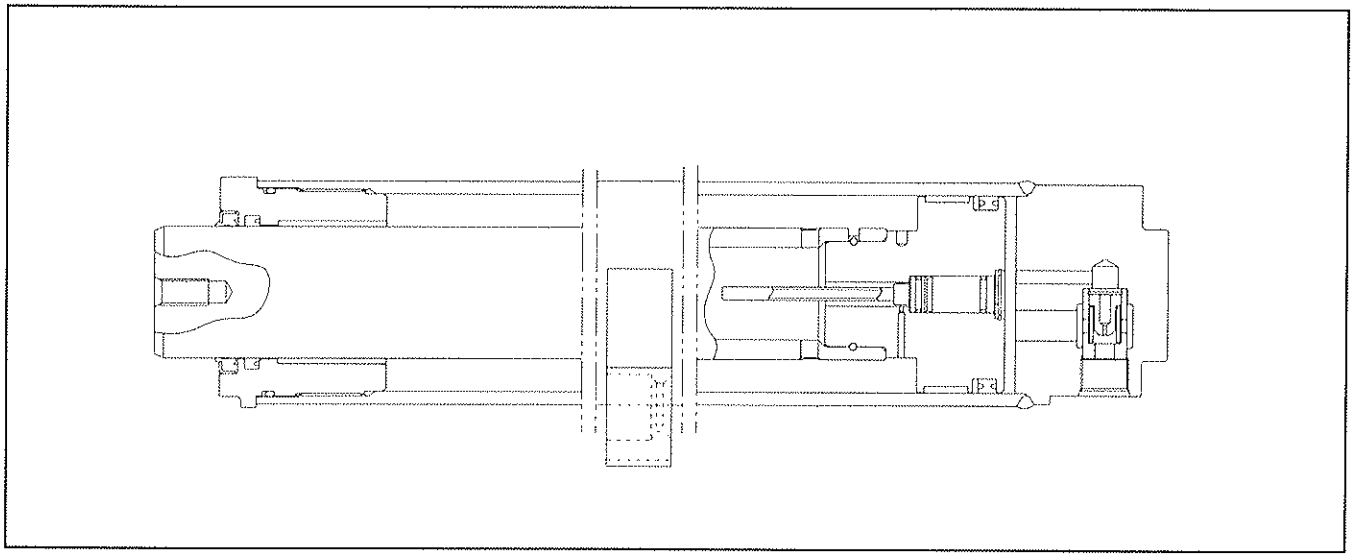
FRONT LIFT CYLINDER (FV·FSV)

GENERAL

Front Lift Cylinder (1 ~ 3 Ton Series, J3.5 Ton Series: ~ 2000. 3)



Front Lift Cylinder (J3.5 Ton Series: 2000. 3 ~)



SPECIFICATIONS

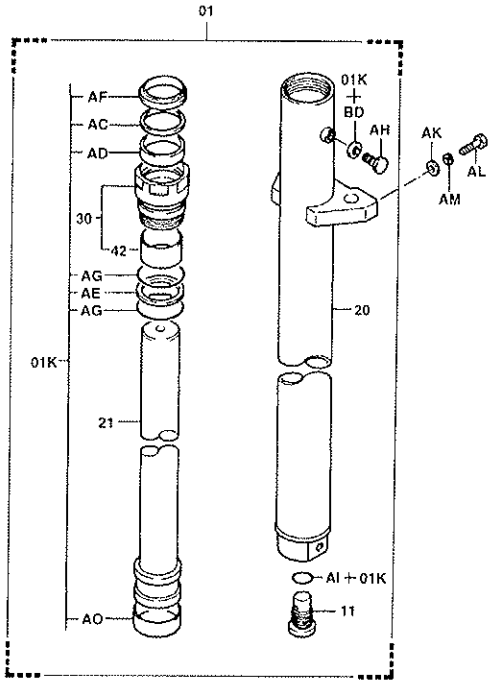
Item \ Vehicle model		1 ton series	2 ton series	3 ton series	J3.5 ton series
Cylinder type		Single acting type	←	←	←
Cylinder bore	mm (in)	8 5 (3.35)	9 0 (3.54)	105 (4.13)	9 0 (3.54)
Piston rod outside diameter	mm (in)	7 0 (2.76)	7 5 (2.95)	8 5 (3.35)	6 0 (2.36)
Rod seal type		U packing	←	←	←
Others		Built-in safety down valve			

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COMPONENTS

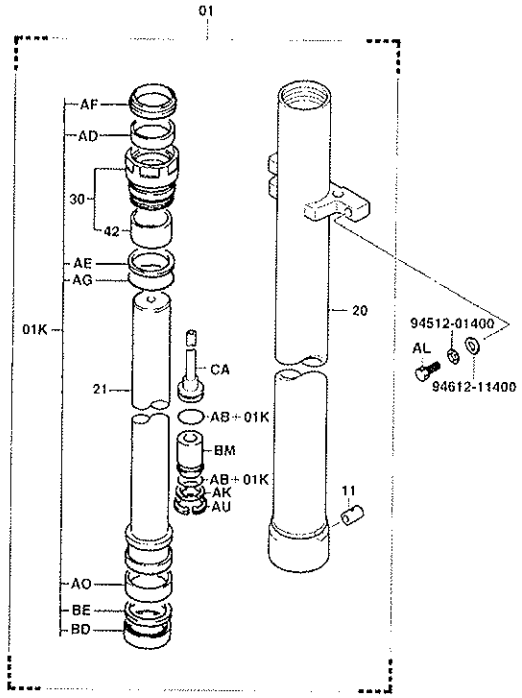
6502

1·2·3 ton Series
J3.5 ton Series (~ 2000. 3)



6502-070A

J3.5 ton Series (2000. 3 ~)



6502-093A

REMOVAL·INSTALLATION

Removal Procedure

1 Remove the lift bracket W/fork.

2 Disconnect the piping.

3 Remove the front lift cylinder.

Installation Procedure

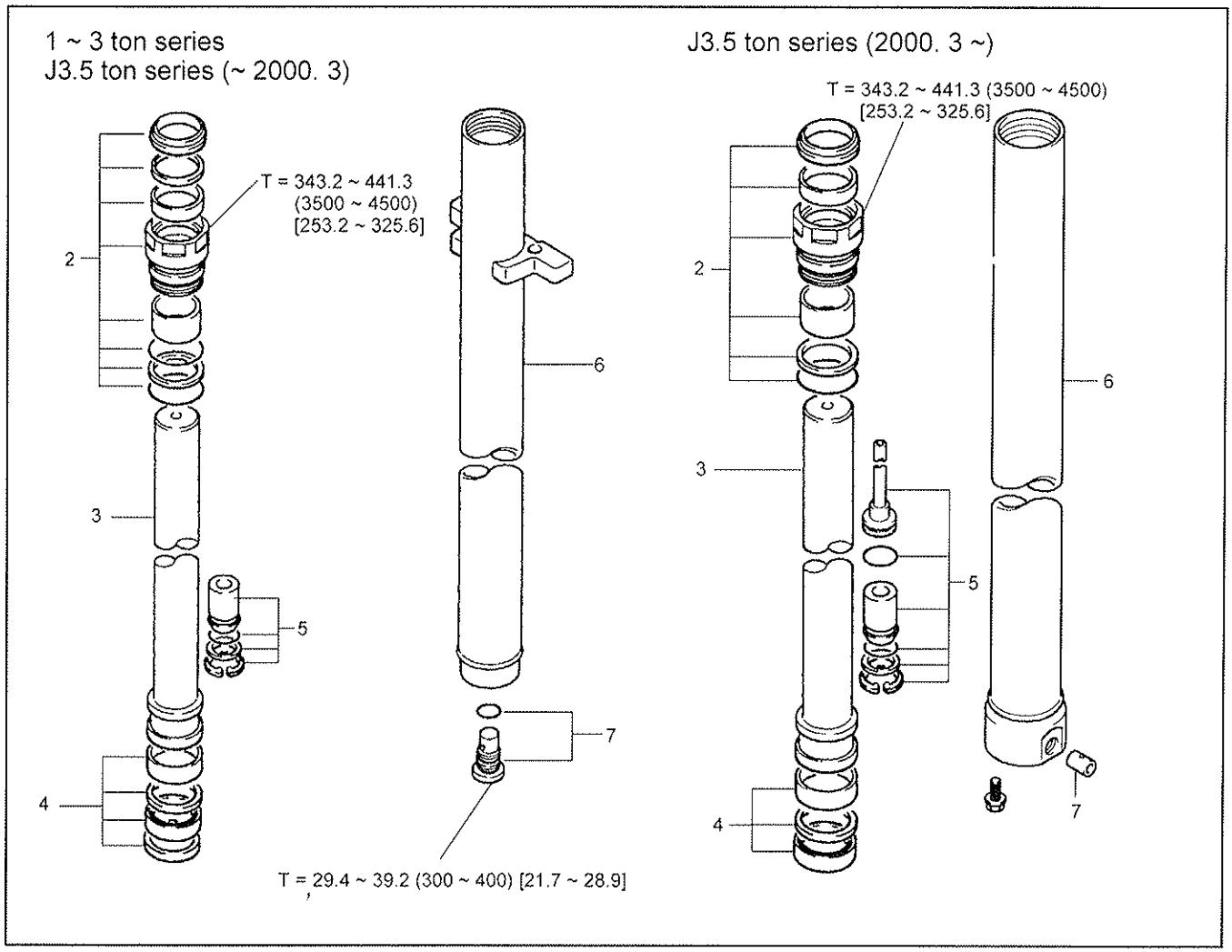
The installation procedure is the reverse of the removal procedure.

Note:
After installing the lift cylinder, follow the steps below.
(1) Repeat full-stroke raising and lowering without load to bleed air and check normal functioning.
(2) Check the hydraulic oil level, and add if insufficient.
(3) Adjust the lift chain tension equally on the left and right sides.

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Remove the chain wheel supporter.

2 Remove the cylinder rod guide.

3 Remove the piston rod. **[Point 1]**

4 Remove the wear ring and U packing.

5 Remove the check valve. (J3.5 ton series only)

6 Remove the lift cylinder. **[Point 2]**

7 Remove the safety down valve.

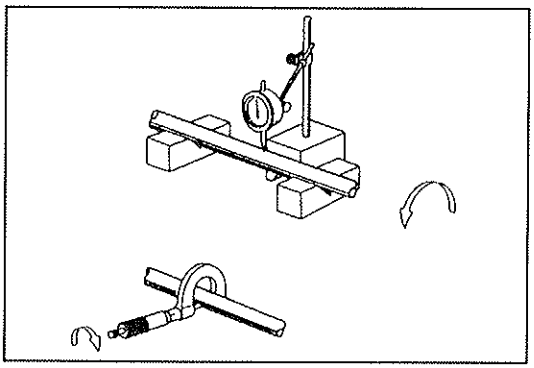
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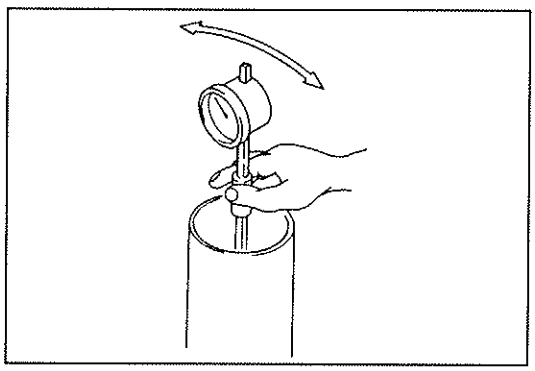
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring, and dust seal lip portion.**
- **Apply sealant (08833-00080) on the threaded portion of the rod guide before tightening.**
- **Fill the amount of hydraulic oil specified into the cylinder from its top before installing the rod guide. (J3.5 ton series only)**

  Filling amount: 55 ~ 85 cm^3 (3.36 ~ 5.19 in^3)





Point Operations

[Point 1]
Inspection:
Measure the piston rod outside diameter.

Unit: mm (in)

	Standard	Limit
1 ton series	70 (2.76)	69.91 (2.7524)
2 ton series	75 (2.95)	74.91 (2.9429)
3 ton series	85 (3.35)	84.90 (3.3425)
J3.5 ton series	60 (2.36)	59.91 (2.3587)

Inspection:
Measure the bend of the piston rod.

Limit: 2.0 mm (0.079 in)

[Point 2]
Inspection:
Measure the lift cylinder bore.

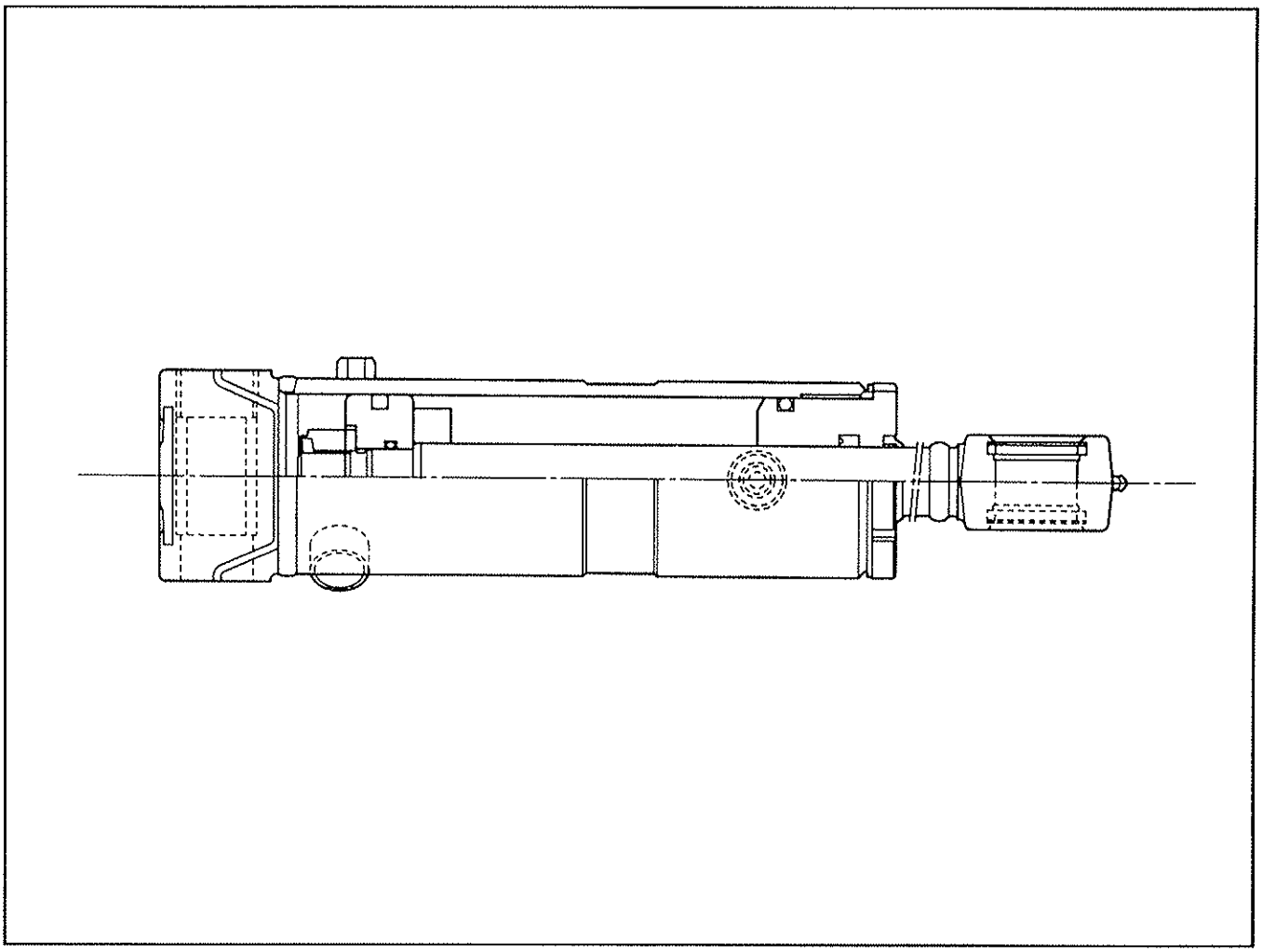
Unit: mm (in)

	Standard	Limit
1 ton series	85 (3.35)	85.40 (3.3622)
2 ton series	95 (3.54)	95.40 (3.7559)
3 ton series	105 (4.13)	105.40 (4.1496)
J3.5 ton series	90 (3.54)	90.40 (3.5591)

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TILT CYLINDER

GENERAL



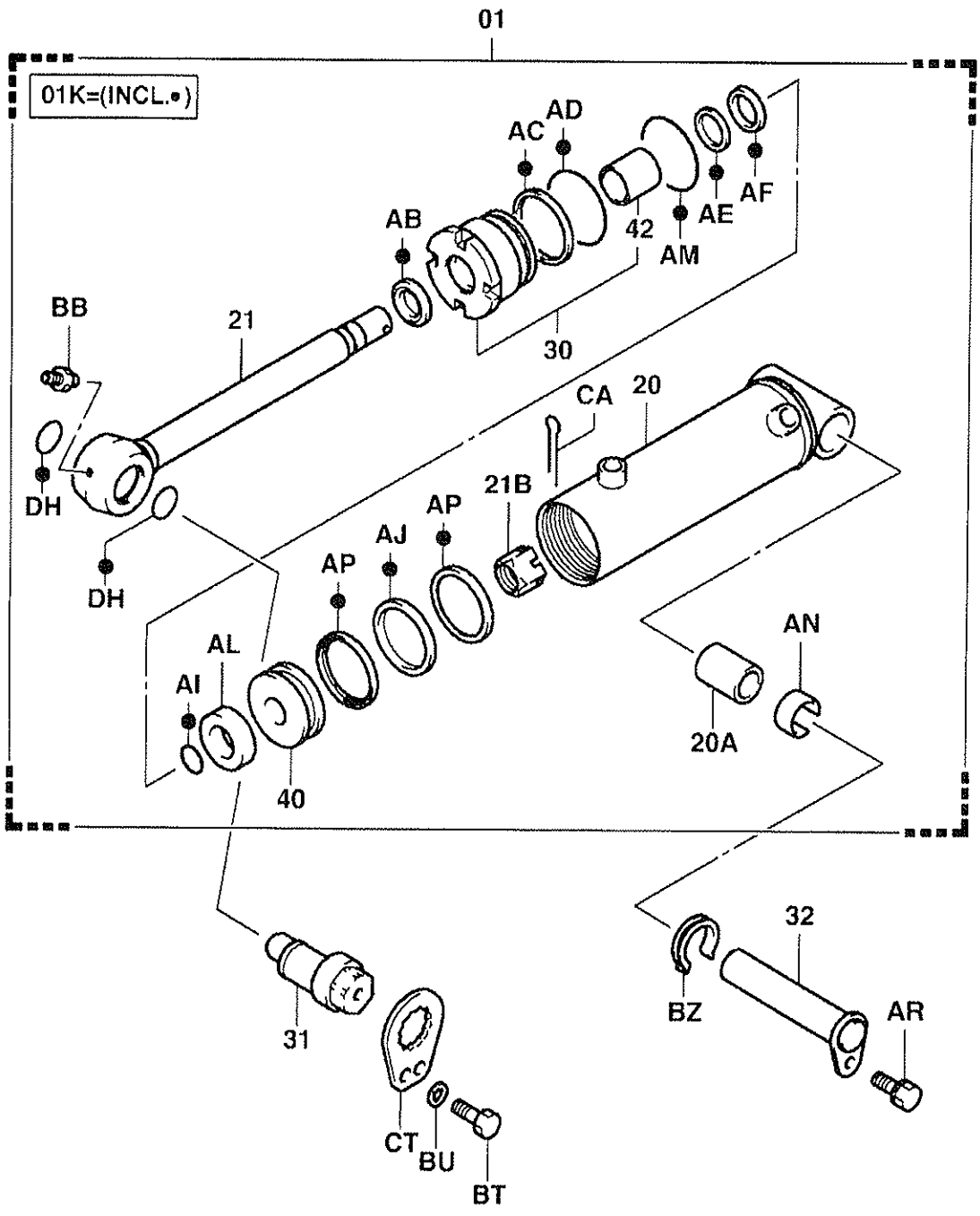
SPECIFICATIONS

Cylinder type		Double acting type
Cylinder bore	mm (in)	70 (2.76)
Piston rod outside diameter	mm (in)	30 (1.18)

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COMPONENTS

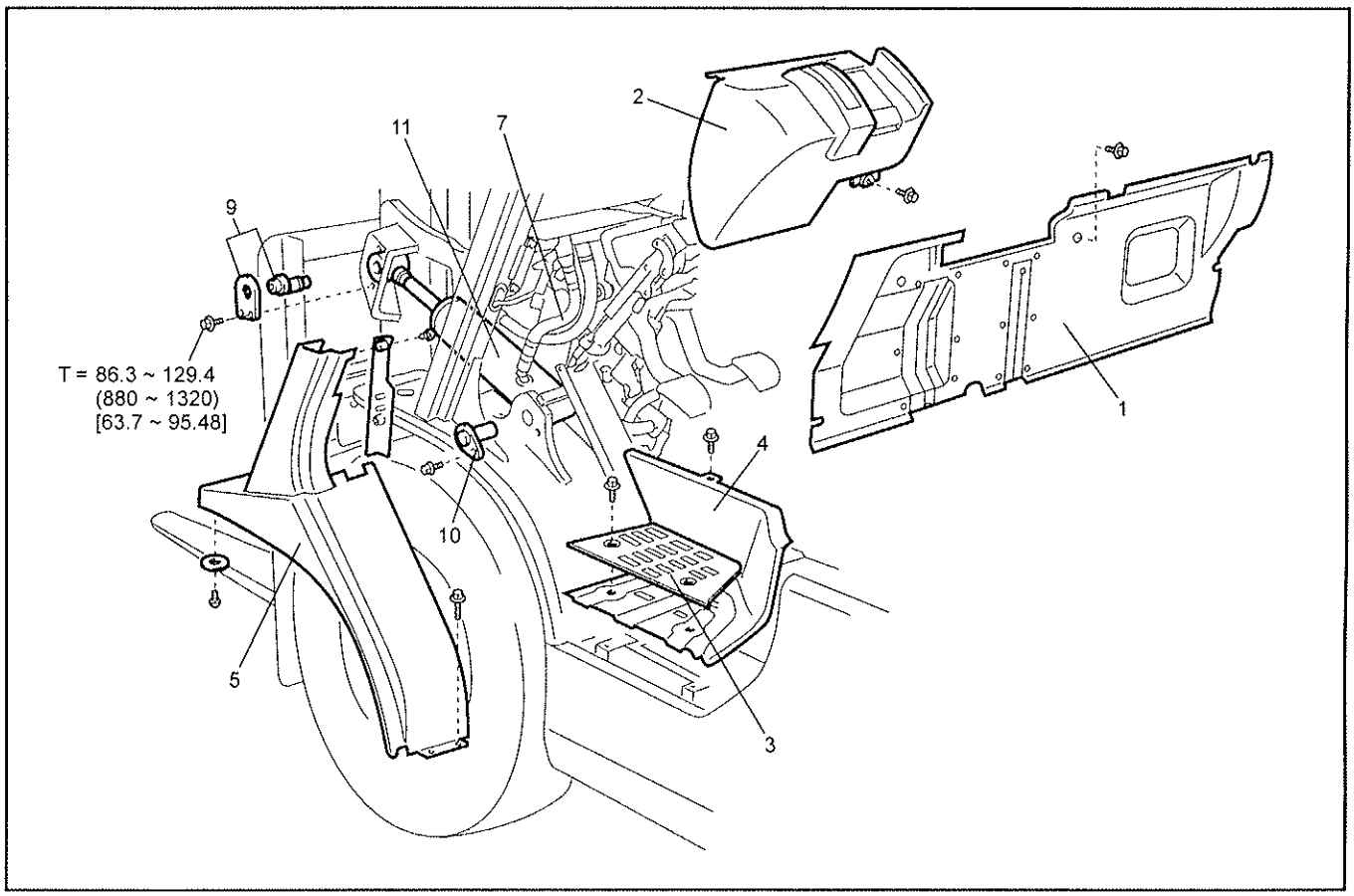
6511



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REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

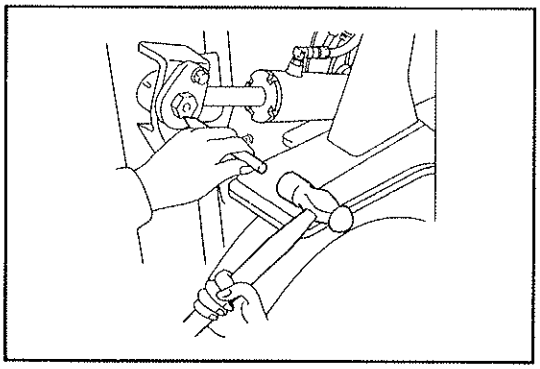
1 Remove the toe board and lower panel.
2 Remove the instrument panel.
3 Remove the step.
4 Remove the side cover.
5 Remove the fender cover.
6 Hoist the mast slightly.
7 Disconnect the hose.
8 Disconnect the tilt angle sensor link (RH).
9 Remove the tilt cylinder front pin. **[Point 1]**
10 Remove the tilt cylinder rear pin.
11 Remove the tilt cylinder ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

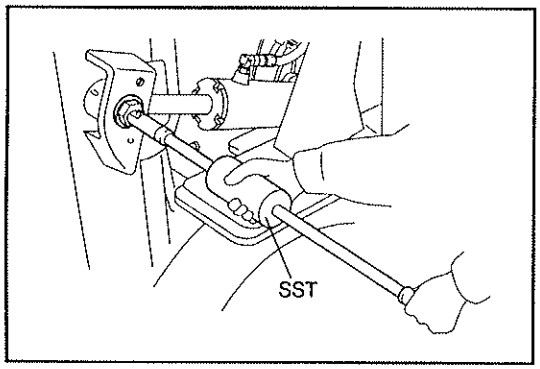
Note:
- **Apply MP grease on the portions for inserting tilt cylinder front and rear pins before installation.**
- **After installation, slowly tilt the mast forward and backward a few times to check normal functioning.**
- **Check the hydraulic oil level, and add if insufficient.**
- **After installation, perform SAS re-setting. (See section 15.)**

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Point Operation

[Point 1]
Removal:
Put a match mark to indicate relative positions of the stopper plate and tilt cylinder front pin.

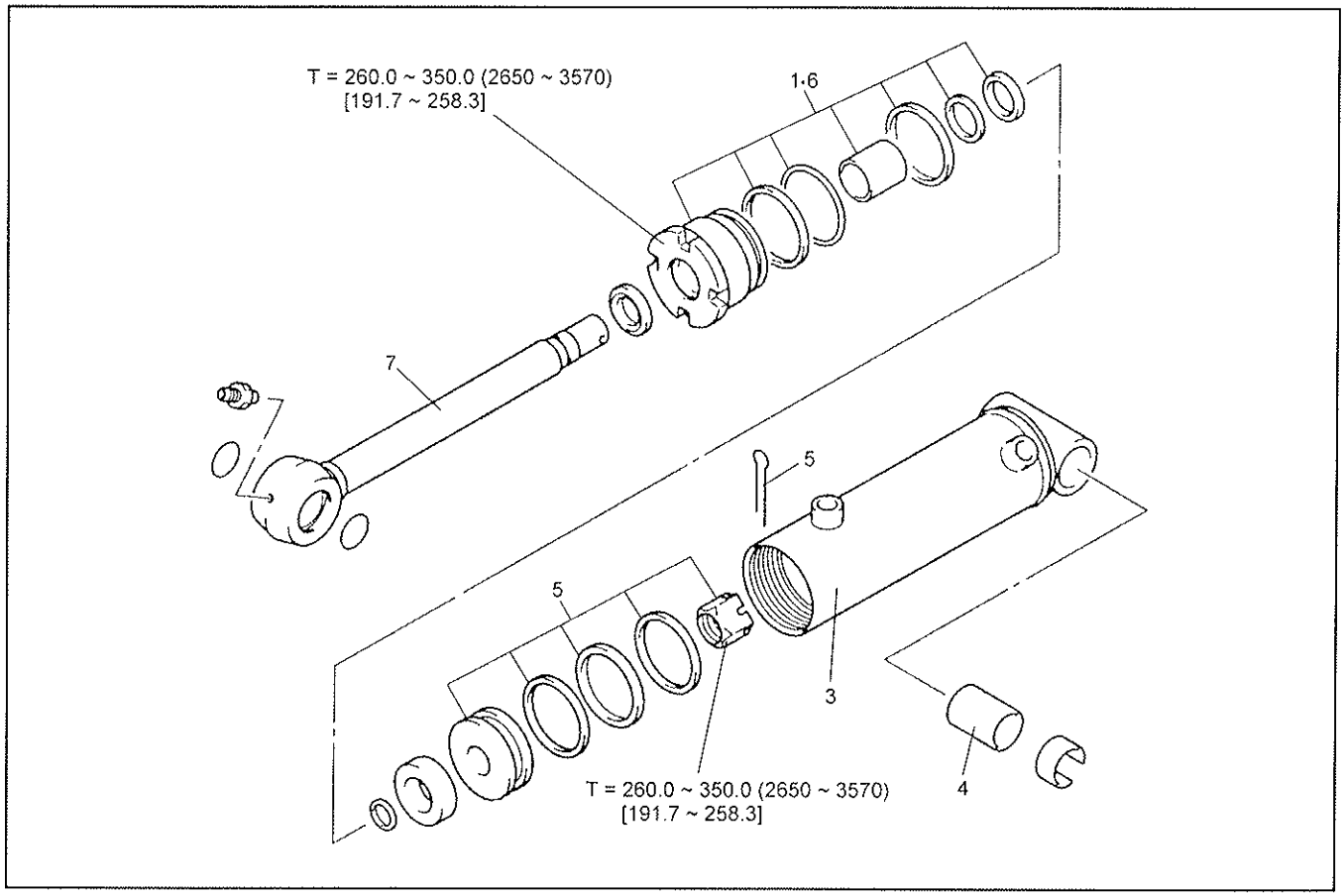


Removal:
SST 09810-20172-71

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DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Loosen the rod guide. **[Point 1]**

2 Extract the piston rod W/piston.

3 Remove the tilt cylinder. **[Point 2]**

4 Remove the bushing. **[Point 3]**

5 Remove the piston.

6 Remove the rod guide.

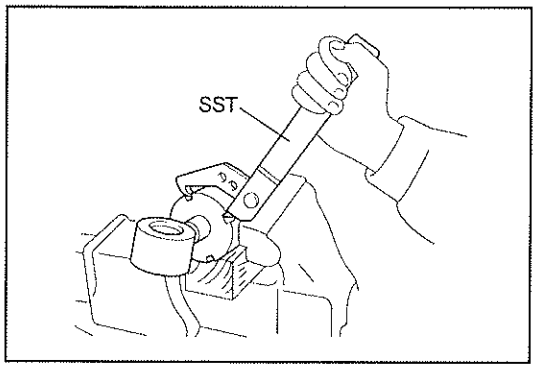
7 Remove the piston rod. **[Point 4]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

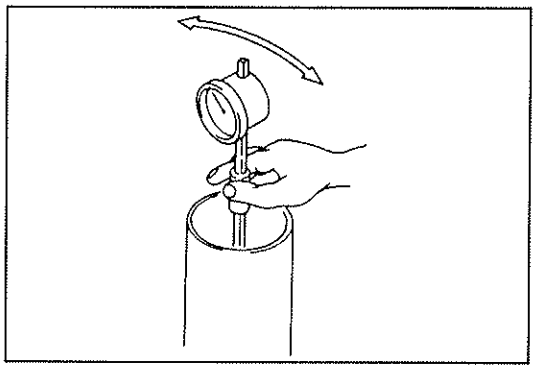
Note:
- **Apply MP grease or hydraulic oil on the packing, O-ring,and dust seal lip portion.**
- **Apply sealant (08833-76002-71 (08833-00080)) on the threaded portion of the rod guide before reassembly.**

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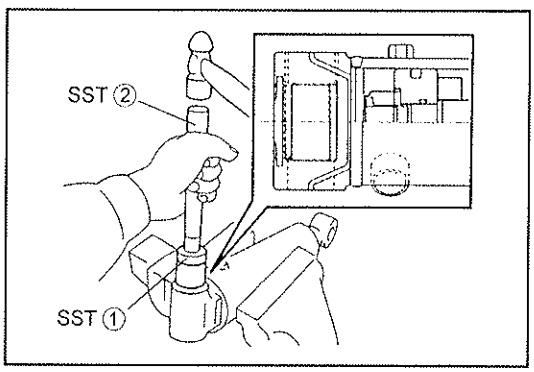
Point Operations

[Point 1]
Disassembly-Reassembly:
SST 09620-10100-71

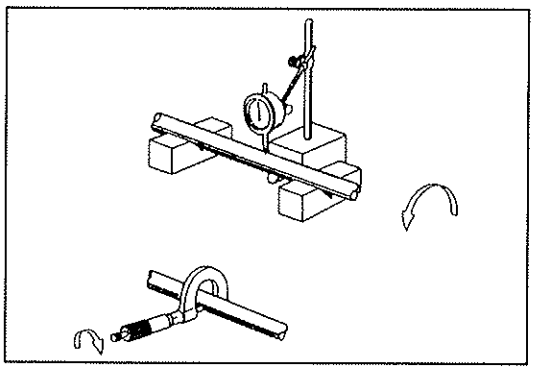


[Point 2]
Inspection:
Measure the cylinder bore.

Standard: 70.0 mm (2.756 in)
Limit: 70.35 mm (2.7697 in)



[Point 3]
Removal-Installation:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)



[Point 4]
Inspection:
Measure the piston rod outside diameter.

Standard: 30.0 mm (1.181 in)
Limit: 29.92 mm (1.1780 in)

Inspection:
Measure the bend of the piston rod.

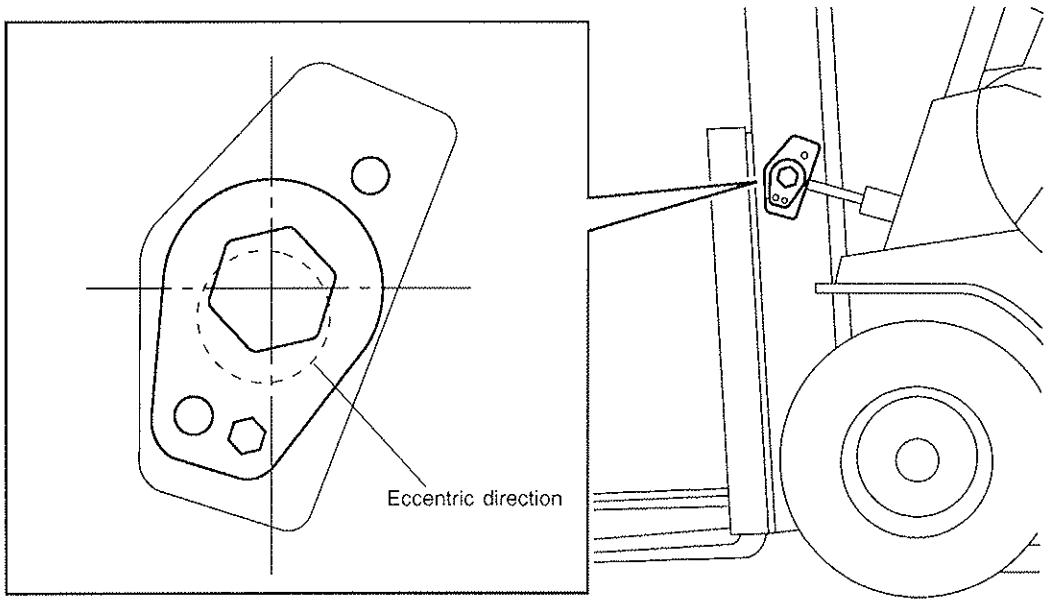
Limit: 1.0 mm (0.039 in)

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MAST FORWARD BACKWARD TILTING ANGLE ADJUSTMENT (PREVENTION OF UNEVEN TILTING)

Note:
Adjust the mast forward and backward tilting angles (to prevent uneven tilting) when the tilt cylinder and mast ASSY are replaced or overhauled.
After adjustment, perform SAS re-setting. (See section 15.)

1. With the mast in the neutral position, install the stopper with the tilt cylinder pin eccentric direction on the lower side.



Note:
The front pin eccentric direction is not in fixed relative position to the flat sides of the hexagonal head.

2. Inspect the forward and backward tilting angles and unevenness in tilting at the pin position above.

   Standard:
   Mast forward tilting angle: Standard set angle -0.6° ~ +1.6°
   Mast backward tilting angle: Standard set angle -0.8° ~ +0.6°
   Unevenness: 1 mm (0.04 in) or less

3. If the standard is not satisfied, make adjustment by changing the combination among eight types (two tapped holes in the mast side tilt bracket, two holes in pin fixing plate and by reversing the fixing plate). (The joint center axis is shifted by ± 5 mm (0.20 in) when the eccentric pin is rotated.)
4. After the adjustment, tighten the stopper set bolt to lock the front pin.

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OIL PUMP

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DISASSEMBLY·INSPECTION·REASSEMBLY (1DZ-II: ~ 2000.12) 13-10

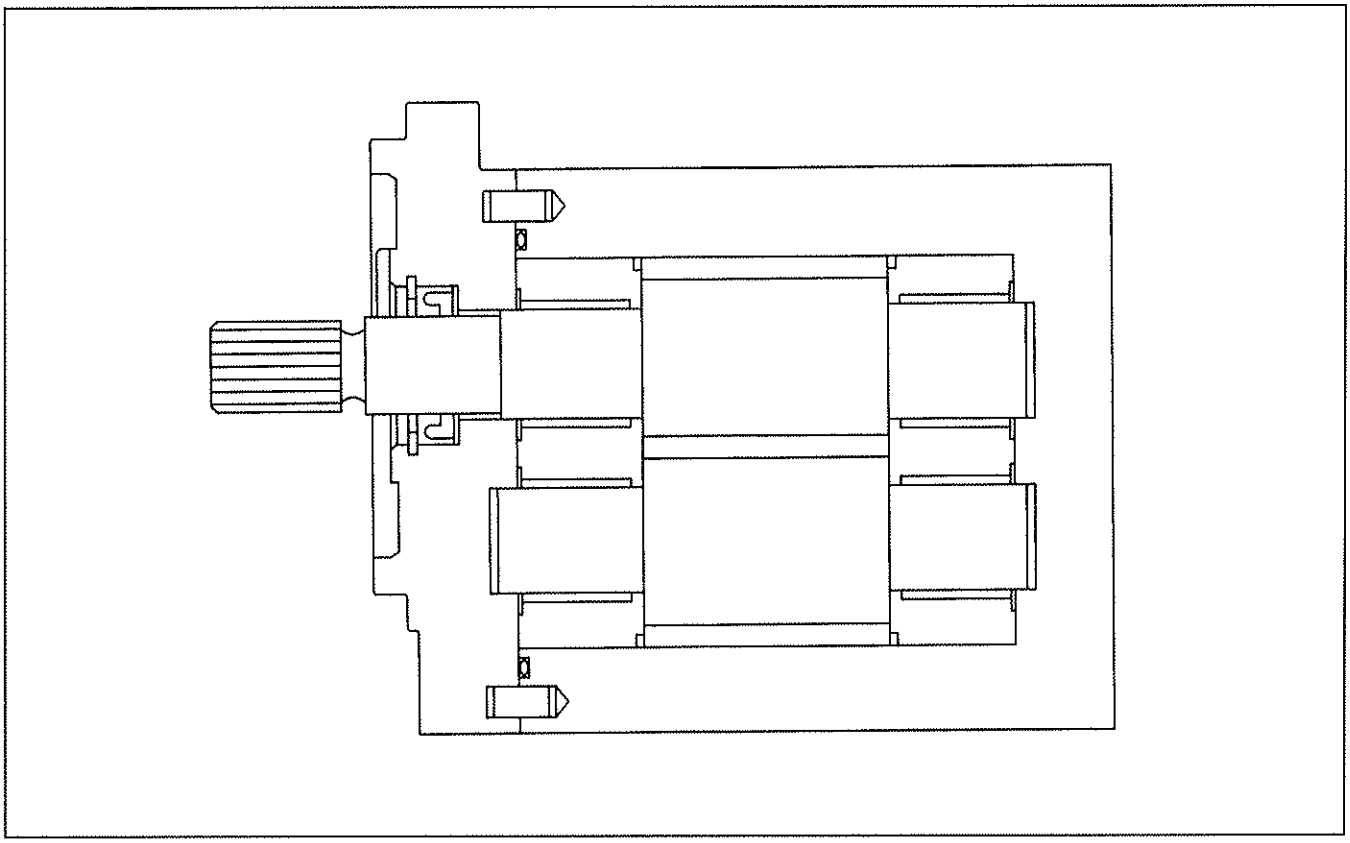
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PERFORMANCE TEST 13-16

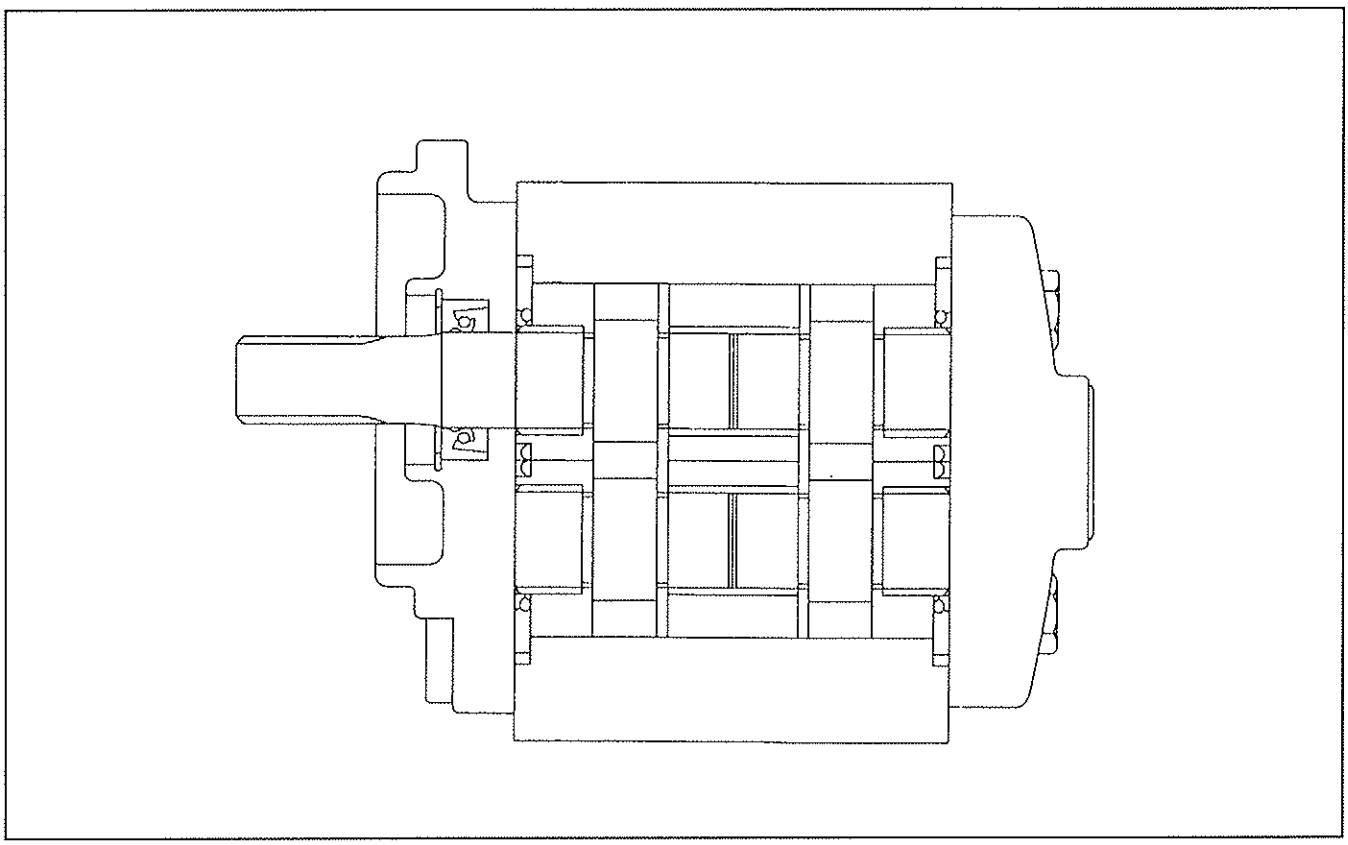
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GENERAL

Single Gear Pump (4Y Engine: 1999. 6 ~, 1DZ-II Engine: 2000.12 ~)

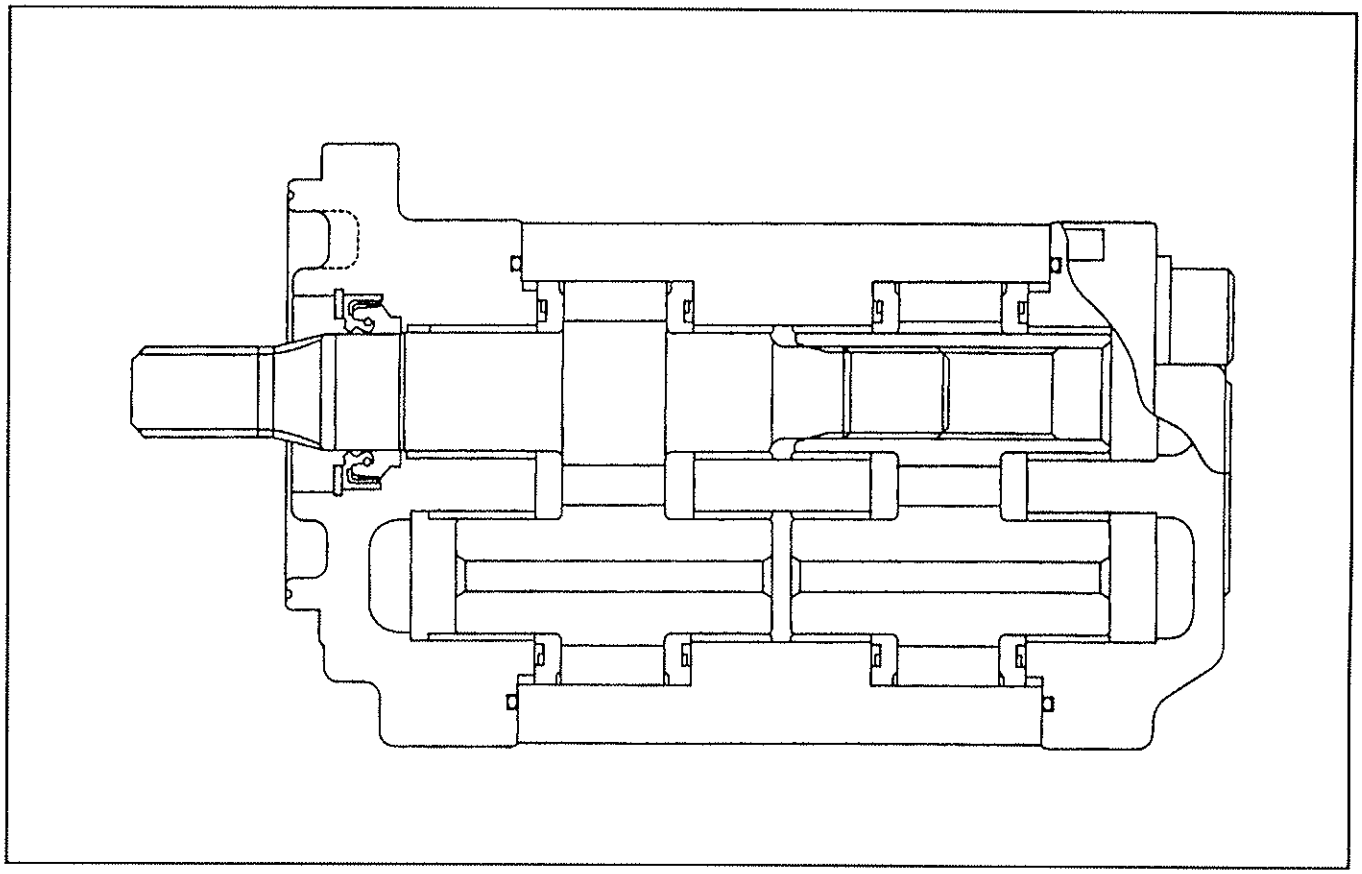


Double Gear Pump on 1DZ-II Engine (~ 2000.12)



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Double Gear Pump on 2Z Engine



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SPECIFICATIONS

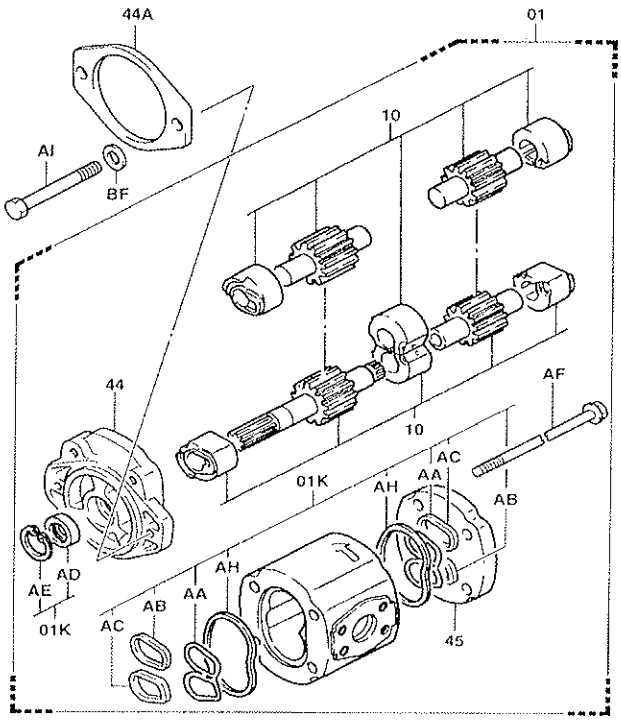
Vehicle models	Engine	Manufacturer (Type)	Pump Type	Theoretical delivery cm^3 (in^3)/rev
1 ton series	4Y	CASAPPA (PLP20-24.5)	Single gear pump	24.5 (1.495)
	1DZ-II (~ 2000.12)	Kayaba (DZP4-25)	Double gear pump	25.0 (1.526)
	1DZ-II (2000.12 ~)	CASAPPA (WSP20-24.5)	Single gear pump	25.1 (1.532)
2 ton series	4Y	CASAPPA (PLP20-27)	Single gear pump	27.8 (1.696)
	1DZ-II (~ 2000.12)	Kayaba (DZP4-27)	Double gear pump	26.5 (1.617)
	1DZ-II (2000.12 ~)	CASAPPA (WSP20-26)	Single gear pump	26.6 (1.623)
	2Z	Shimadzu (DSG1A32)	Double gear pump	32.4 (1.977)
3 ton series	4Y	CASAPPA (PLP20-27)	Single gear pump	27.8 (1.696)
	1DZ-II (~ 2000.12)	Kayaba (DZP4-27)	Double gear pump	26.5 (1.617)
	1DZ-II (2000.12 ~)	CASAPPA (WSP20-26)	Single gear pump	26.6 (1.623)
	2Z	Shimadzu (DSG1A32)	Double gear pump	32.4 (1.977)
J3.5 ton series	4Y	CASAPPA (PLP20-27)	Single gear pump	27.8 (1.696)
	2Z	Shimadzu (DSG1A32)	Double gear pump	32.4 (1.977)

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COMPONENTS

Double Gear Pump on 1DZ-II Engine (~ 2000.12)

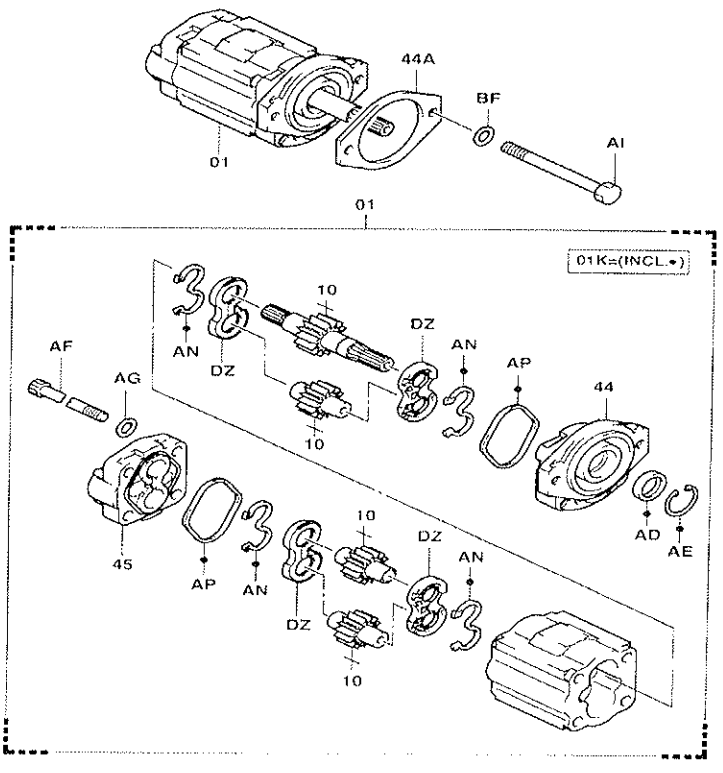
6701



6701-164B

Double Gear Pump on 2Z Engine

6701



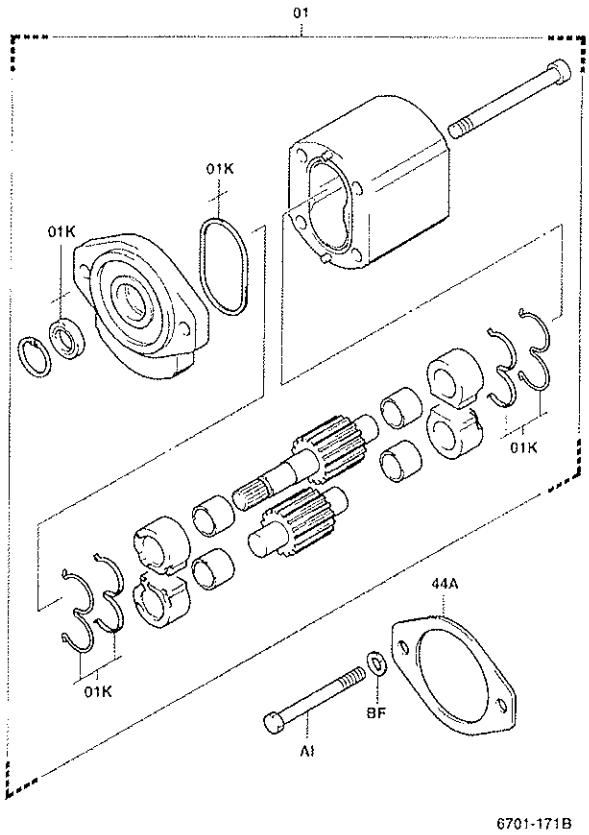
6701-162A

13

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Single Gear Pump (4Y Engine: 1999. 6 ~, 1DZ-II Engine: 2000.12 ~)

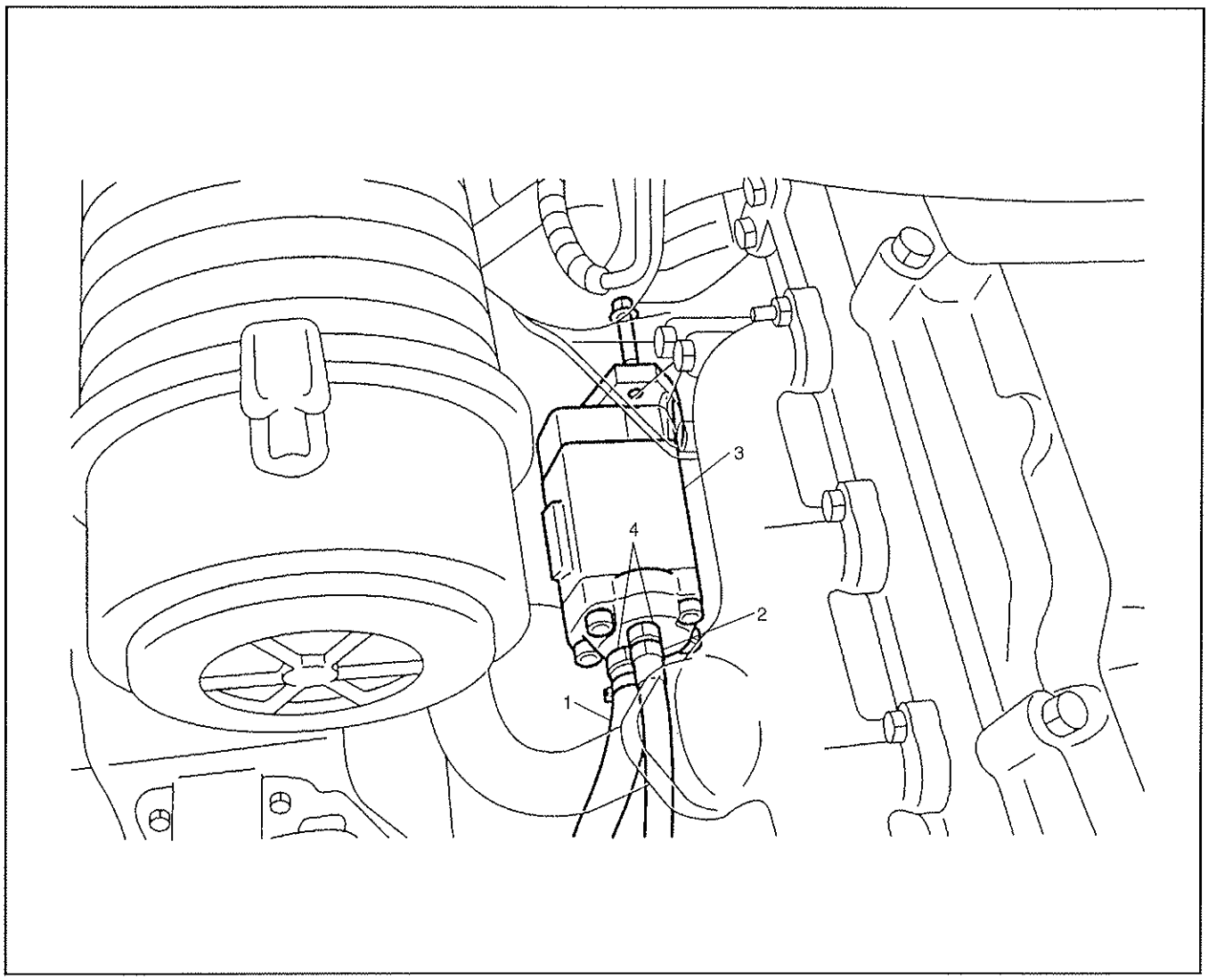
6701



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OIL PUMP ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Disconnect the inlet hose.

2 Disconnect the outlet hose.

3 Remove the oil pump ASSY.

4 Remove the oil hose fitting.

5 Remove the gasket.

Installation Procedure

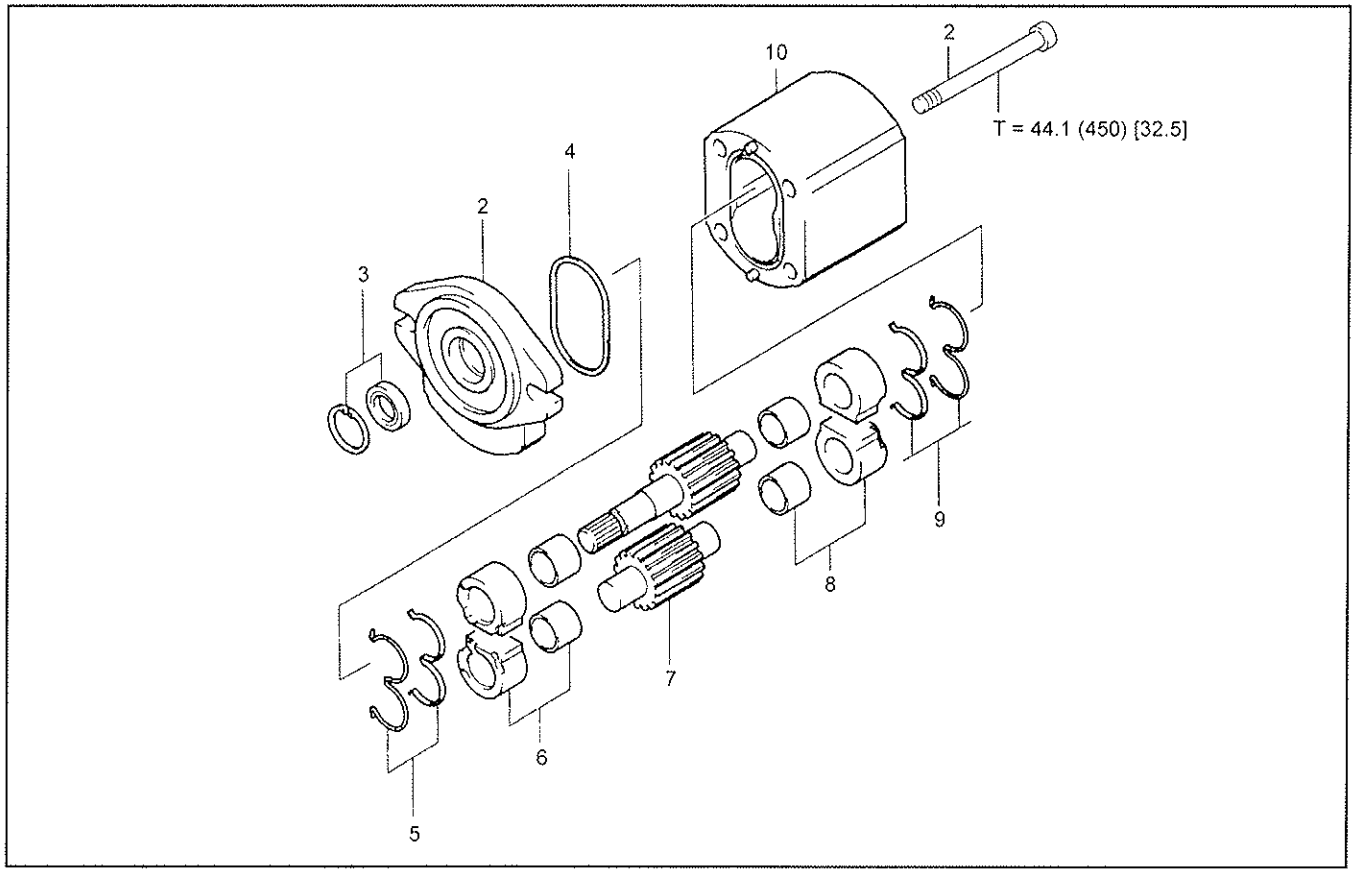
The installation procedure is the reverse of the removal procedure.

Note:
Apply grease (molybdenum disulfide grease) on the pump shaft spline portion before installation.

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DISASSEMBLY·INSPECTION·REASSEMBLY (4Y: 1999. 6 ~, 1DZ-II: 2000.12 ~)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Put match mark on the body and the mount plange cover.

2 Remove the mount flange cover.

3 Remove the oil seal.

4 Remove the body seal.

5 Remove the bushing seals.

6 Put match mark on each bushing with the pump body, and remove the bushings. **[Point 1]**

7 Remove the drive & driven gear. **[Point 2]**

8 Put match mark on each bushing with the pump body, and remove the bushings. **[Point 1]**

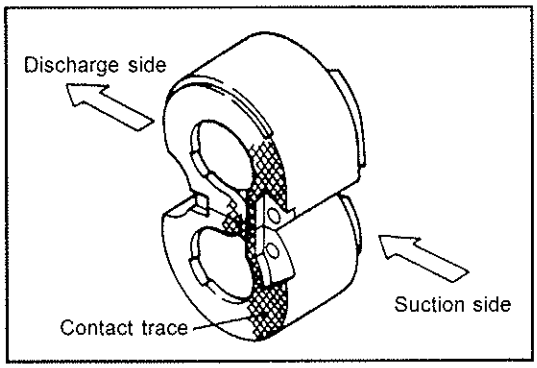
9 Remove the bushing seals.

10 Inspect the body. **[Point 3]**

Reassembly Procedure
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Use new seals for reassembly.**
- **Wash each part, blow with compressed air and apply the hydraulic oil before reassembly.**

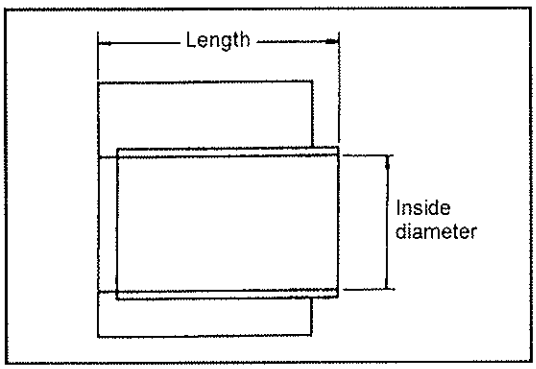
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Point Operations

[Point 1]
Inspection:
Inspect the bushing set contact trace.

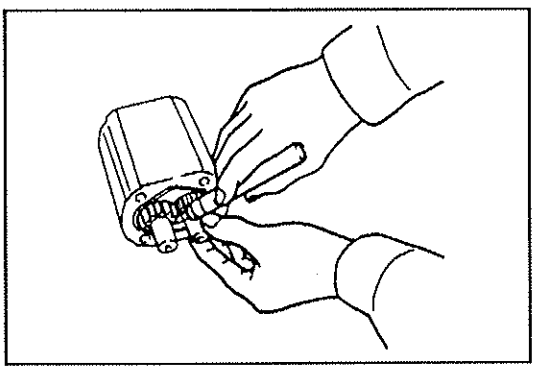
Standard:
Glossy contact trace about half on suction side.



Inspection:
Measure the bushing set length.

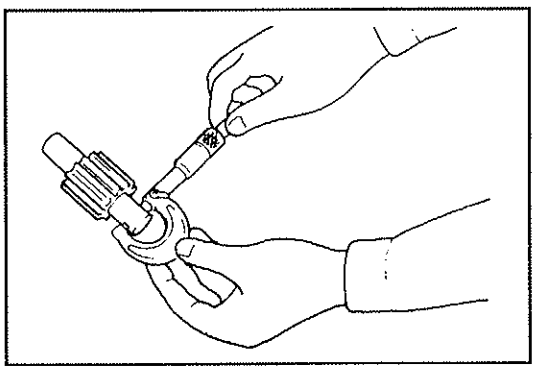
Limit: 21.957 mm (0.8644 in)
Measure the bushing set inside diameter.

Limit: 20.095 mm (0.7894 in)



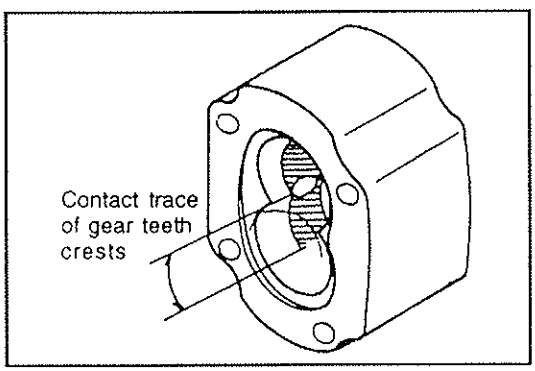
[Point 2]
Disassembly:
Put match marks on the teeth of the drive and driven gears.

Reassembly:
Align match marks at the time of reassembly.



Inspection:
Measure the outside diameter of each gear shaft.

Limit: 19.964 mm (0.7860 in)



[Point 3]
Inspection:
Inspect the contact trace on the inner surface of the body (suction side).

Limit: Contact trace covers more than half of the circumference.

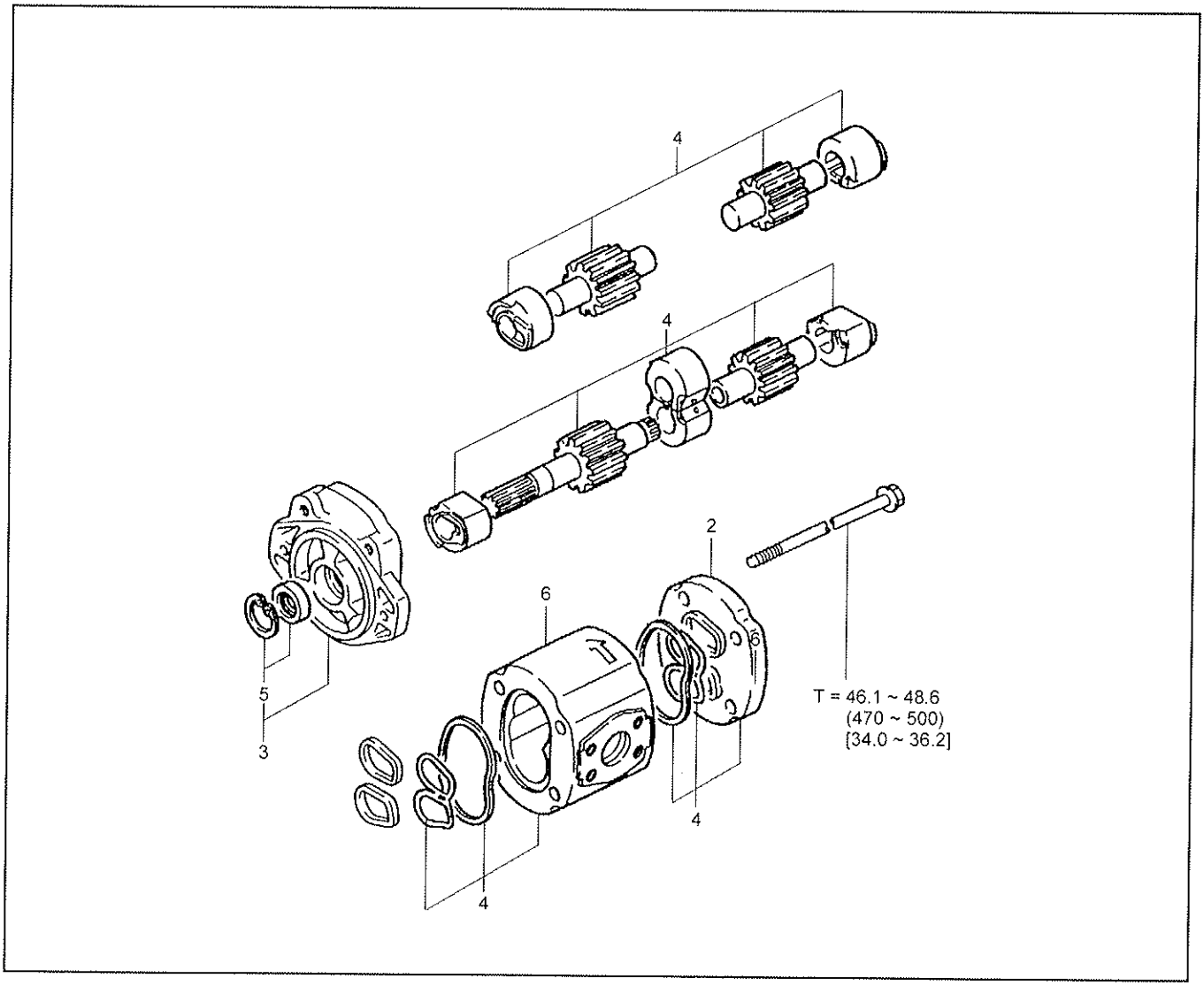
Inspection:
Measure the depth of flaw on the inner surface of the body.

Limit: 0.14 mm (0.0055 in)

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DISASSEMBLY·INSPECTION·REASSEMBLY (1DZ-II: ~ 2000.12)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Put match marks on the cover, body and mounting flange.

2 Remove the cover.

3 Remove the mounting flange.

4 Remove the bushing set and pump gear set. **[Point 1]**

5 Remove nthe oil seal. **[Point 2]**

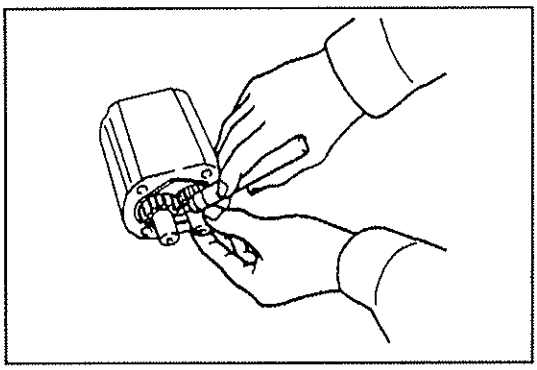
6 Inspect the body. **[Point 3]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Use new seals for reassembly.**
- **Wash each part, blow with compressed air and apply the hydraulic oil before reassembly.**

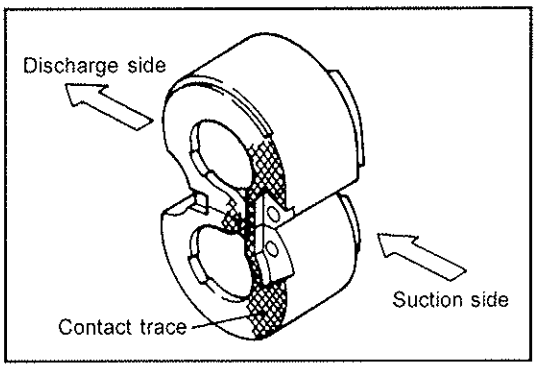
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Point Operations

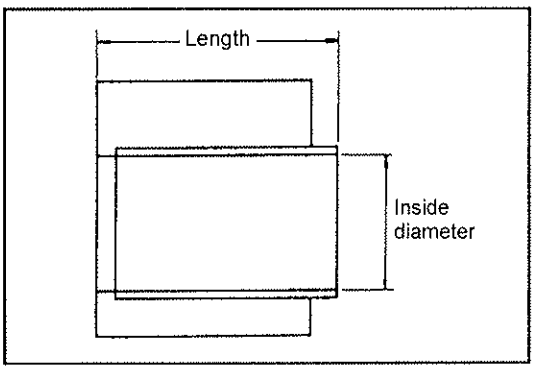
[Point 1]
Disassembly:
Put match marks on the teeth of the drive and driven gears.

Reassembly:
Align match marks at the time of reassembly.



Inspection:
Inspect the bushing set contact trace.

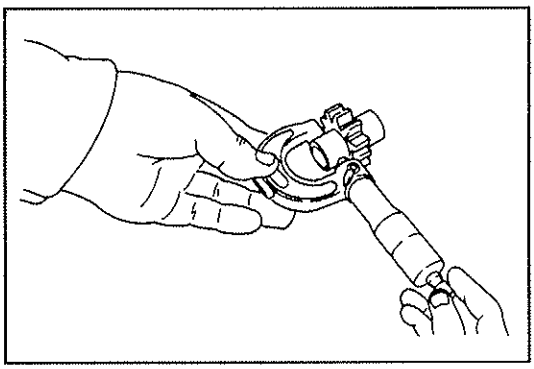
Standard:
Relatively stronger contact trace on the suction side, with slight trace on the discharge side.



Inspection:
Measure the bushing set length.

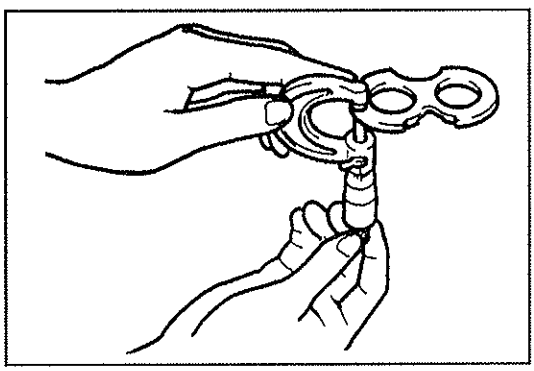
Limit: 14.77 mm (0.5555 in)

Inspection:
Inspect the bushing set for wear at the interior surface.
Limit:
Replace if the teflon coating layer is wron out even locally.



Inspection:
Measure the outside diameter of each gear shaft.

Limit: 18.935 mm (0.74547 in)



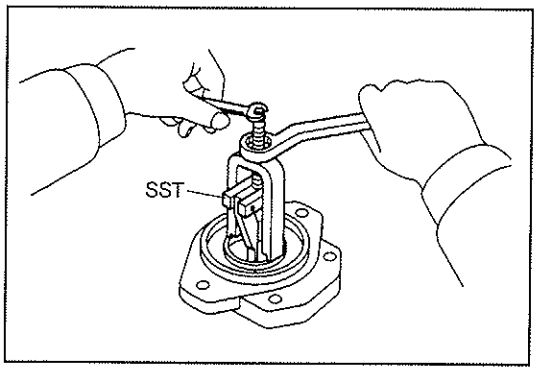
[Point 2]
Inspection:
Inspect the trace of contact with the side plate.

Standard:
Relatively stronger contact trace on the suction side, with slight trace on the discharge side.

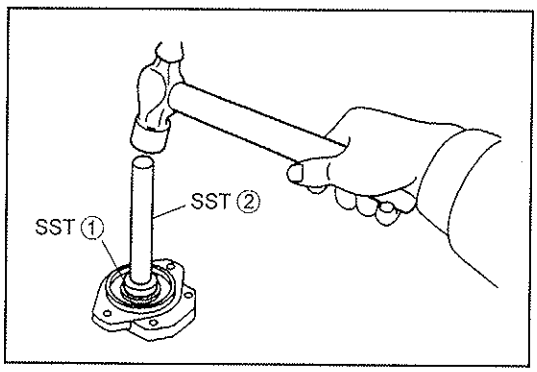
Inspection:
Measure the side plate thickness.

Limit: 1.9 mm (0.075 in)

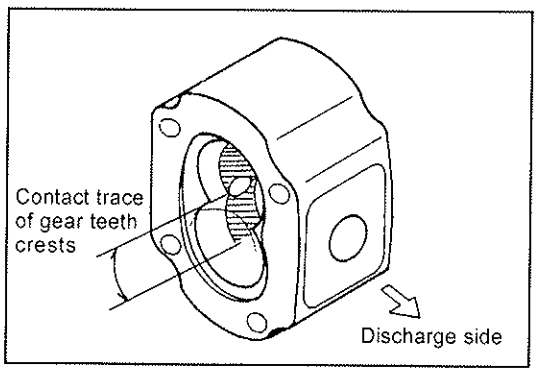
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[Point 3]
Disassembly:
SST 09319-76001-71
(SST 09319-60020)



Reassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)
After installation, apply MP grease on the oil seal lip portion.



[Point 4]
Inspection:
Inspect the contact trace on the inner surface of the body (suction side).

Limit: Contact trace covers more than half of the circumference.

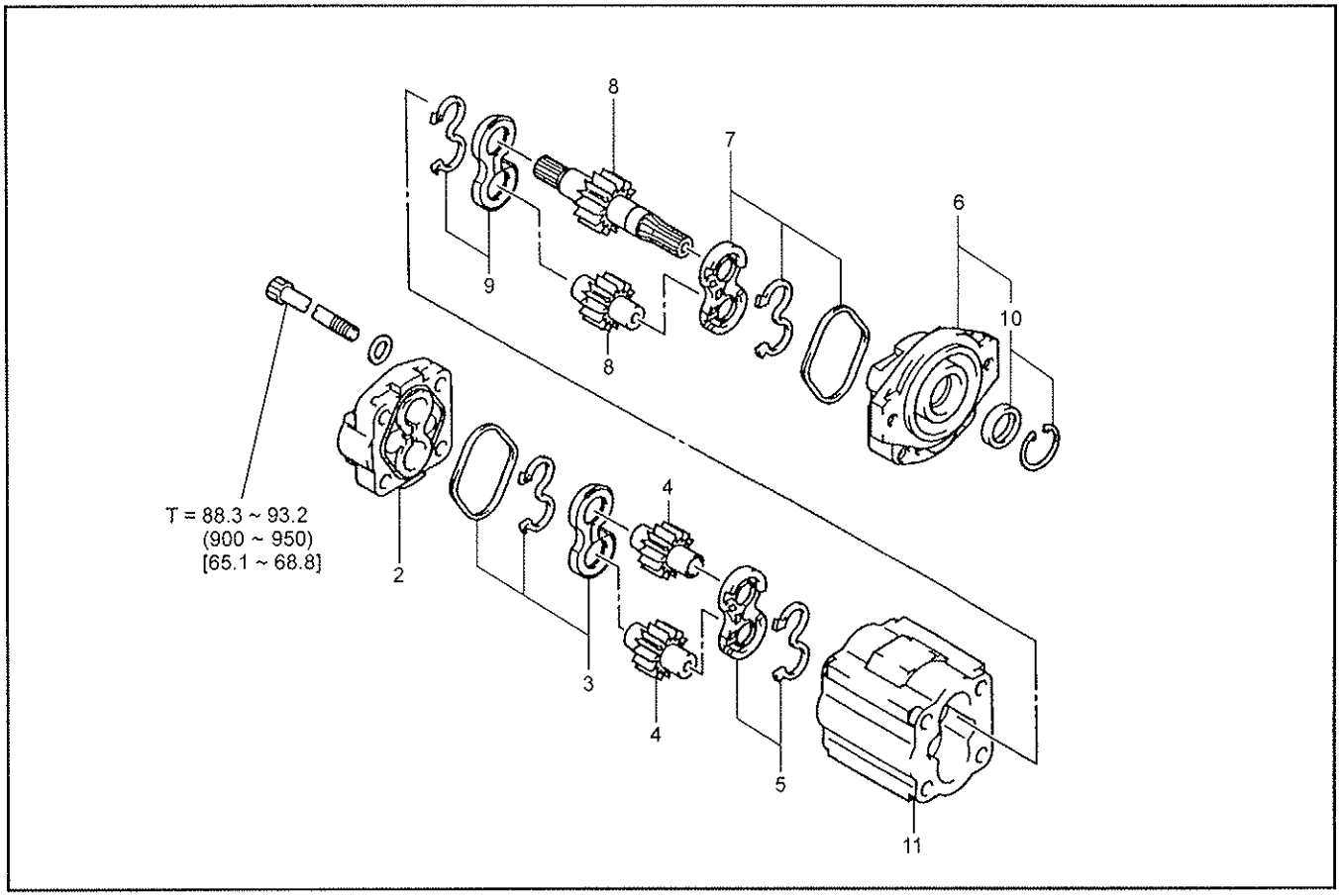
Inspection:
Measure the depth of flaw on the inner surface of the body.

Limit: 0.1 mm (0.004 in)

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DISASSEMBLY·INSPECTION·REASSEMBLY (2Z)

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

1 Put match marks on the rear cover, body and mounting flange.

2 Remove the rear cover. **[Point 1]**

3 Remove the side plate and gasket. **[Point 2]**

4 Double gear pump: Remove the rear pump gear set. **[Point 3]**

5 Double gear pump: Remove the side plate and gasket. **[Point 2]**

6 Remove the mounting flange. **[Point 1]**

7 Remove the side plate and gasket. **[Point 2]**

8 Remove the pump gear set (double gear pump: front pump gear set). **[Point 3]**

9 Double gear pump: remove the side plate and gasket. **[Point 2]**

10 Remove the oil seal. **[Point 4]**

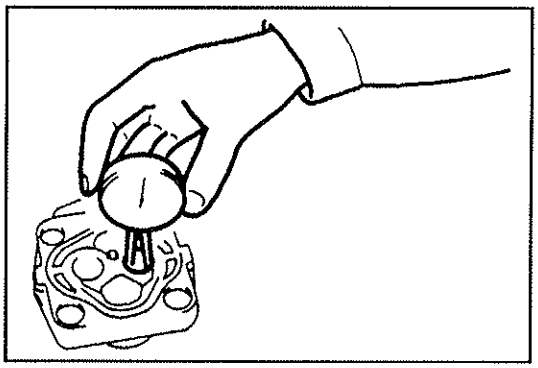
11 Inspect the body. **[Point 5]**

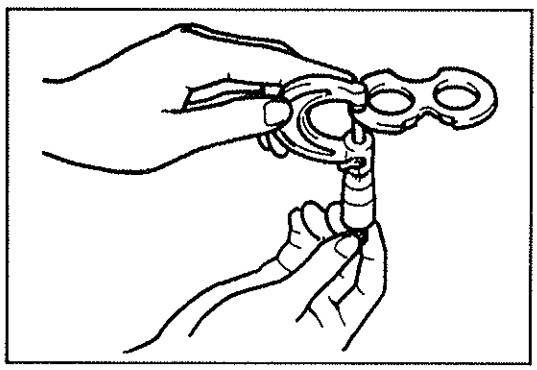
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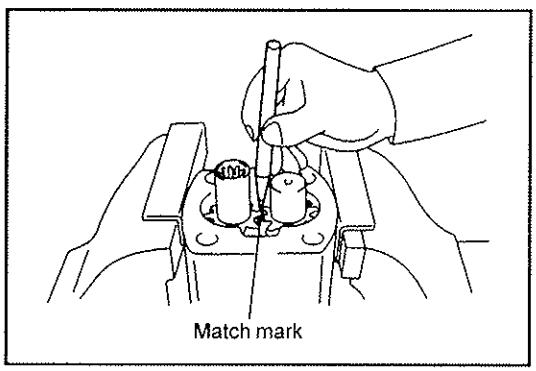
Reassembly Procedure

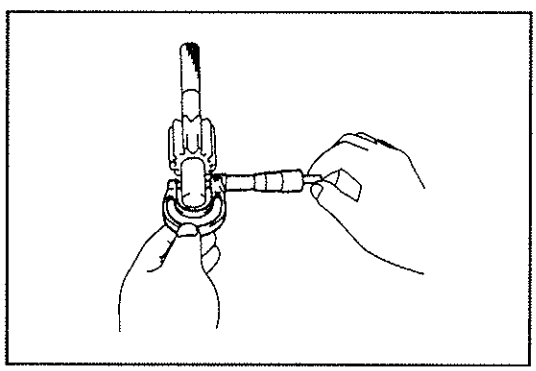
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Use new seals for reassembly.**
- **Wash each part, blow with compressed air and apply hydraulic oil before reassembly.**









Point Operations

[Point 1]
Inspection:
Measure the inside diameter of the bushing.

Limit: 22.23 mm (0.8752 in)

[Point 2]
Inspection:
Inspect the trace of contact with the side plate.

Standard:
Relatively stronger contact trace on the suction side, with slight trace on the discharge side.

Inspection:
Measure the side plate thickness.

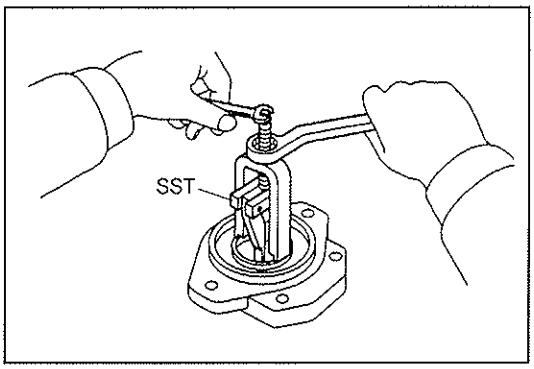
Limit: 4.83 mm (0.1902 in)

[Point 3]
Disassembly:
Put match marks on the teeth of drive and driven gears.
Put match marks on the spline portions of the front and rear drive gears.
Reassembly:
Check the match marks before installing the gear set on the body to see that the front and rear gears are offset by 1/2 pitch in phase.
Reassembly:
Align match marks at the time of reassembly.

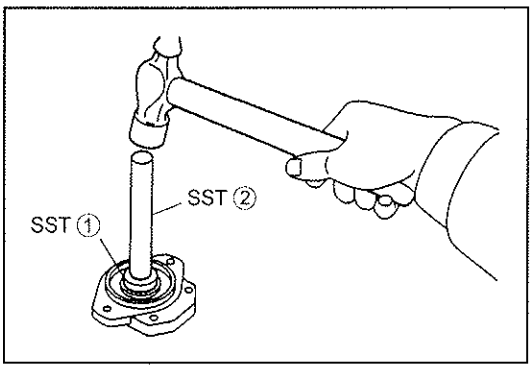
Inspection:
Measure the outside diameter of each gear shaft.

Limit: 21.95 mm (0.8642 in)

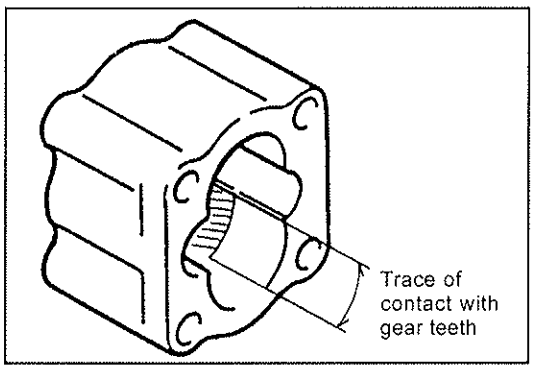
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[Point 4]
Disassembly:
SST 09319-76001-71
(SST 09319-60020)



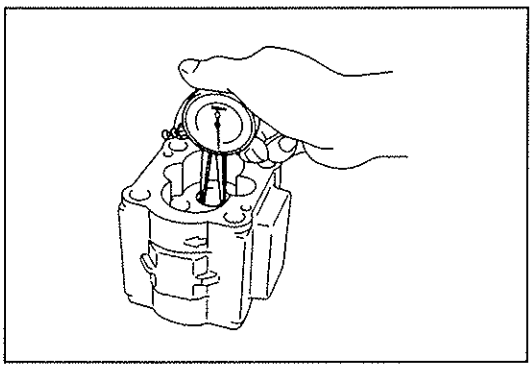
Reassembly:
SST 09950-76018-71 --- ①
(SST 09950-60010)
SST 09950-76020-71 --- ②
(SST 09950-70010)
Apply MP grease on the oil seal lip portion after reassembly.



[Point 5]
Inspection:
Inspect the contact trace on the inner surface of the body.

Standard:
Contact trace on about 1/3 of the body inside circumference.

Inspection:
Measure the depth of the flaw at the body inside surface.
Limit: 0.15 mm (0.0059 in)



Inspection:
Measure the bushing inside diameter.

Limit: 22.23 mm (0.8752 in)

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PERFORMANCE TEST

As the performance test in servicing of the oil pump, judge the quality by the lifting speed of the forks by installing the oil pump on the vehicle. Bench test measurements shall be made for strict testing of the performance.

Note:
The engine rpm and relief pressure shall be adjusted to satisfy respective standards.
(See the engine rpm adjustment procedure on page 1-11, and the relief pressure adjustment procedure on page 14-14.)

1. Set the engine tachometer.
2. Operate the oil pump for running in.

Note:
- **Do not operate material handling levers.**
- **Immediately stop the engine if any abnormality is observed.**

   (1) Start the engine and operate at the idling speed to 1,000 rpm for 10 minutes.
   (2) If no abnormality is found in the oil pump, operate for another 10 minutes by raising the engine speed to 1,500 to 2,000 rpm.
3. Measure the full-stroke lifting time of the forks, and calculate the lifting speed for performance judgment.

Lifting Speed

	Engine model	Lifting speed (loaded/no-load) mm/sec (fpm)					
		V mast		FSV mast		FV mast	
1 ton series	4Y	600 (118)	640 (126)	570 (112)	610 (120)	550 (108)	600 (118)
	1DZ-II	650 (128)	670 (132)	620 (122)	650 (128)	600 (118)	640 (126)
2 ton series	4Y	600 (118)	640 (126)	560 (110)	600 (118)	560 (110)	600 (118)
	2Z	650 (128)	670 (132)	620 (122)	640 (126)	610 (120)	630 (124)
	1DZ-II	610(120)	640 (126)	580 (114)	610 (120)	570 (112)	600 (118)
3 ton series	4Y	510 (100)	550 (108)	480 (94)	520 (102)	450 (89)	490 (97)
	2Z	550 (108)	570 (112)	510 (100)	530 (104)	480 (94)	500 (98)
	1DZ-II	500 (98)	530 (104)	470 (93)	500 (98)	440 (86)	470 (93)
J3.5 ton series	4Y	410 (81)	450 (89)	400 (79)	440 (86)	420 (83)	460 (91)
	2Z	440 (86)	460 (91)	430 (85)	460 (91)	450 (89)	480 (95)

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OIL CONTROL VALVE

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OIL CONTROL VALVE ASSY 14-8

REMOVAL·INSTALLATION 14-8

DISASSEMBLY·INSPECTION·REASSEMBLY 14-9

CONTROL VALVE LEVER ASSY 14-13

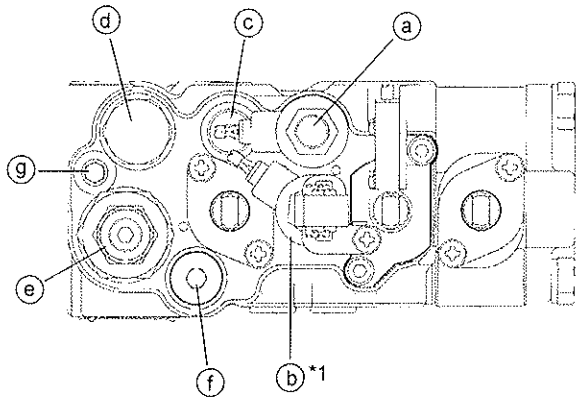
REMOVAL·INSTALLATION 14-13

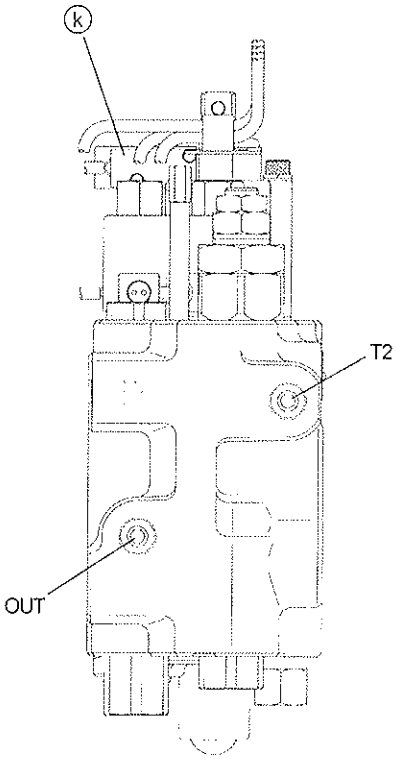
RELIEF PRESSURE ADJUSTMENT (~ 2000.11) 14-14

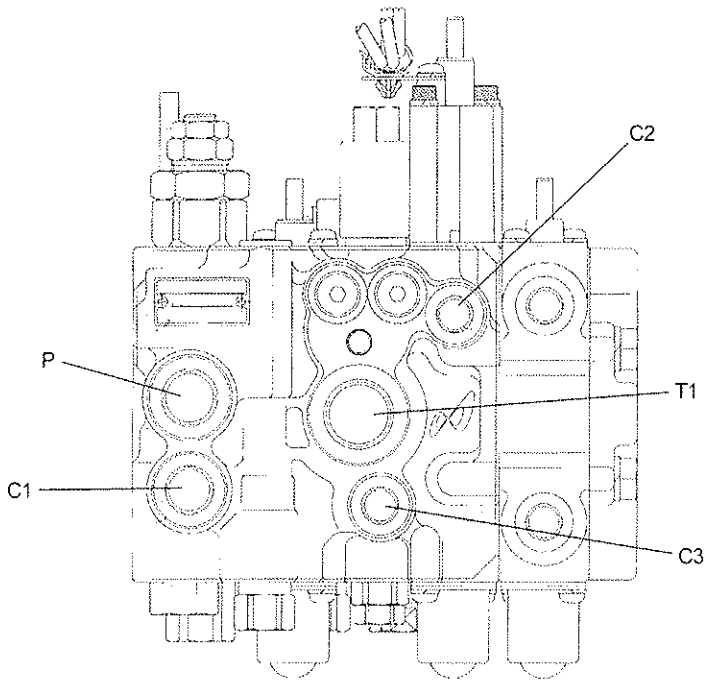
RELIEF PRESSURE ADJUSTMENT (2000.11 ~) 14-15A

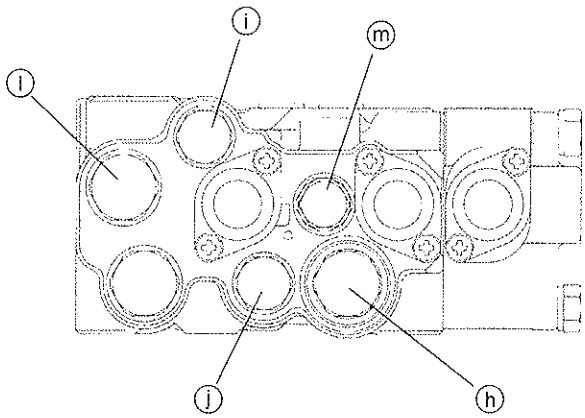
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GENERAL







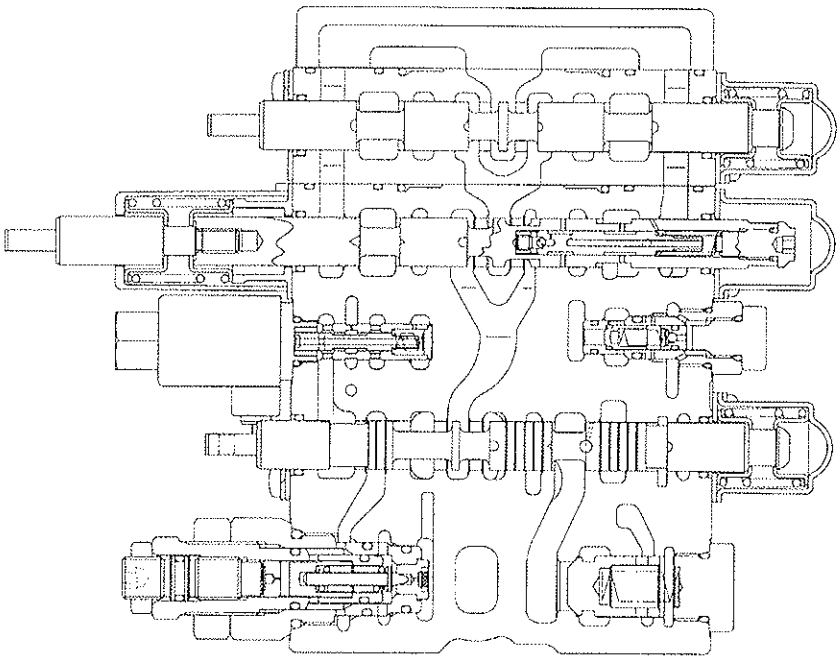


*1: A solenoid at ⓑ has been dispensed with since November, 2000.

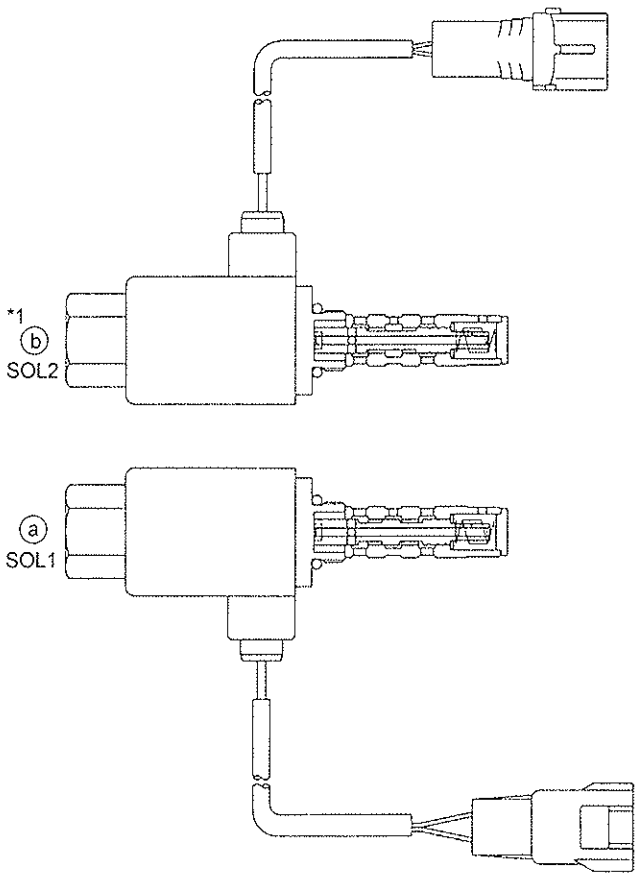
Note:
For symbols ⓐ to ⓜ, respective sectional views are shown on succeeding pages.

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Oil Control Valve



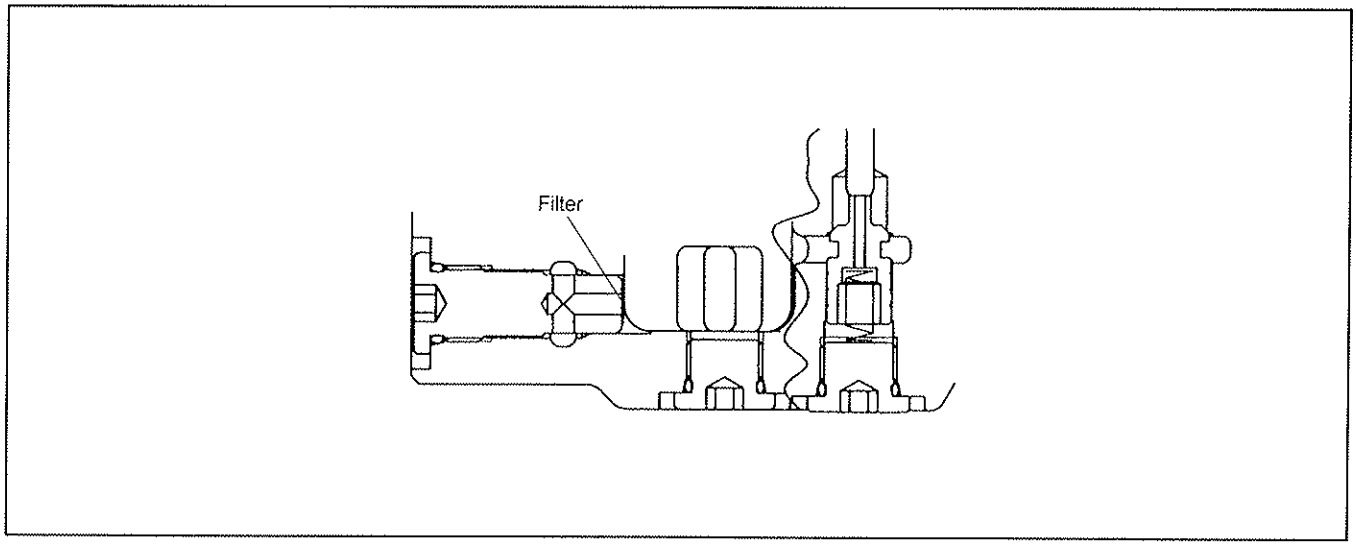
ⓐⓑ Solenoid Valve



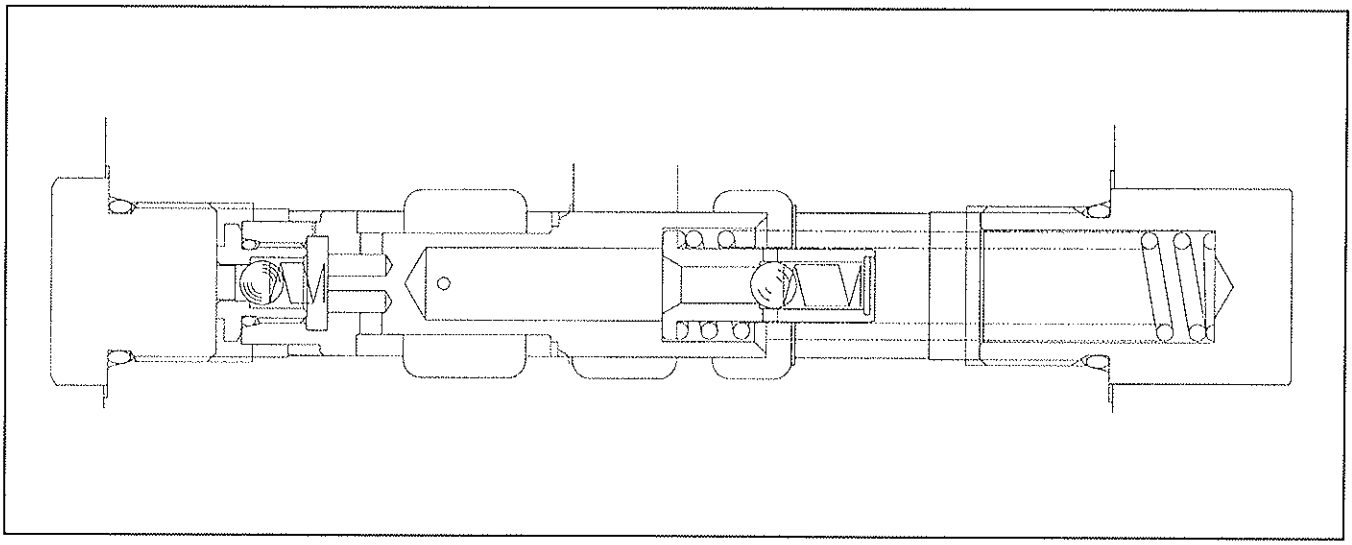
*1: A solenoid at ⓑ (SOL2) has been dispensed with since November, 2000.

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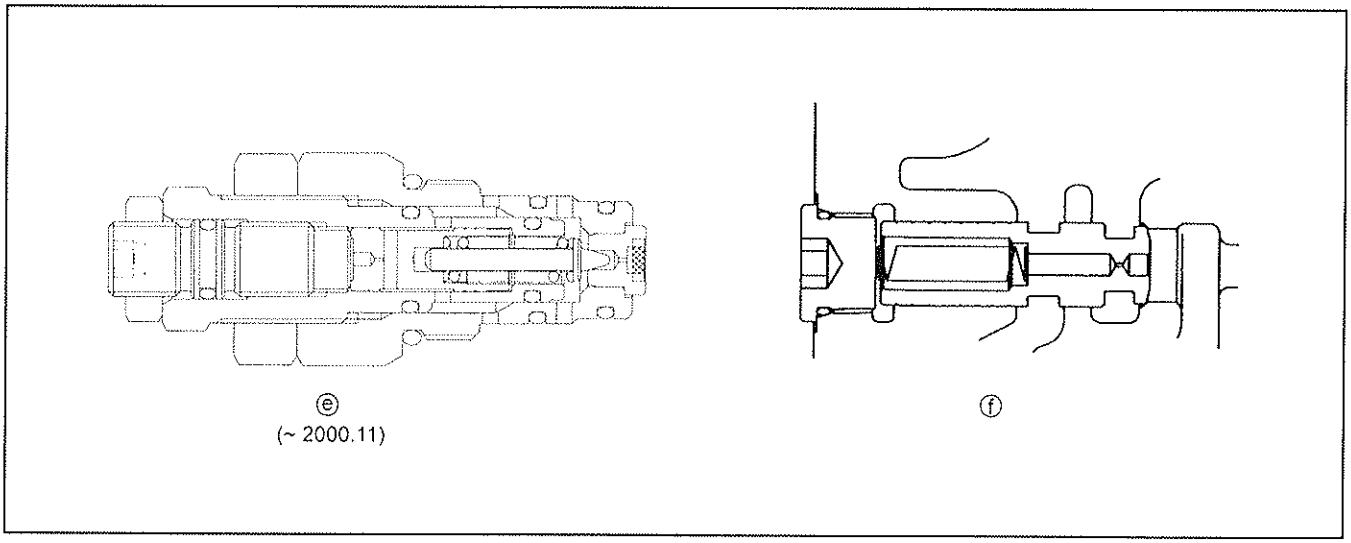
ⓒ Filter and Lift Load Check Valve



ⓓ Flow Divider Valve



ⓔⓕ Relief Valve

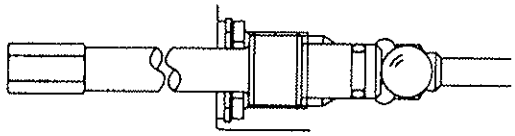


ⓔ
(~ 2000.11)

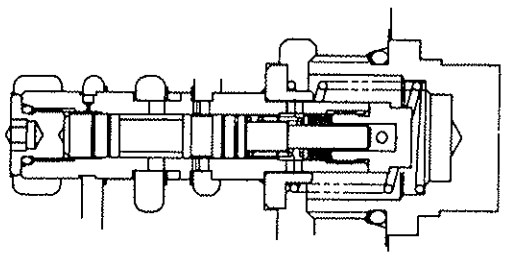
ⓕ

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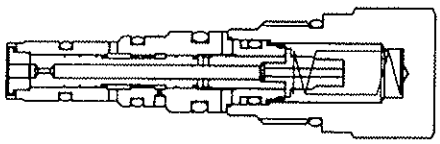
ⓖ Needle Valve (Manual Down Valve)



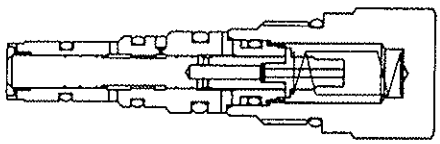
ⓗ Flow Control Valve (~ 2000.11)



ⓘ Lift Select Valve

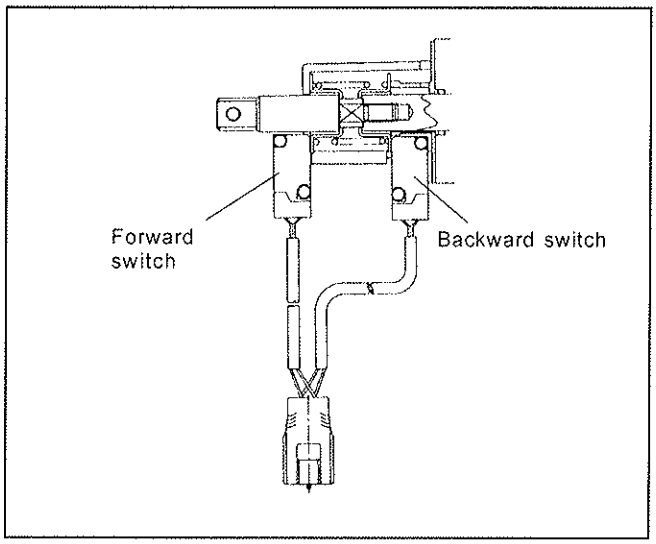


ⓙ Tilt Select Valve

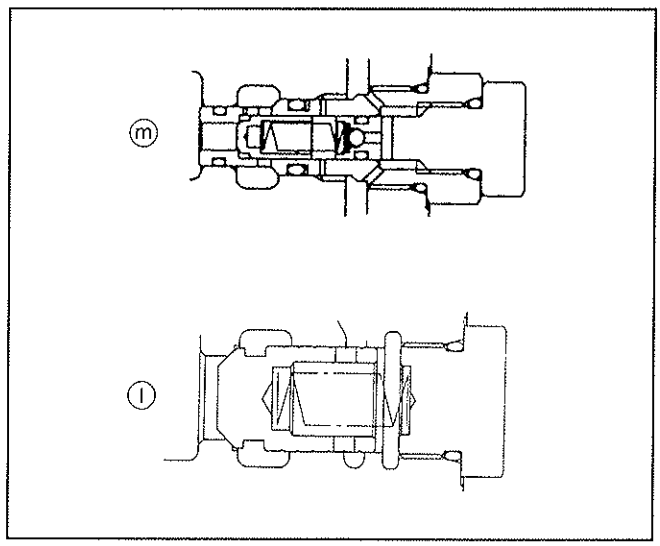


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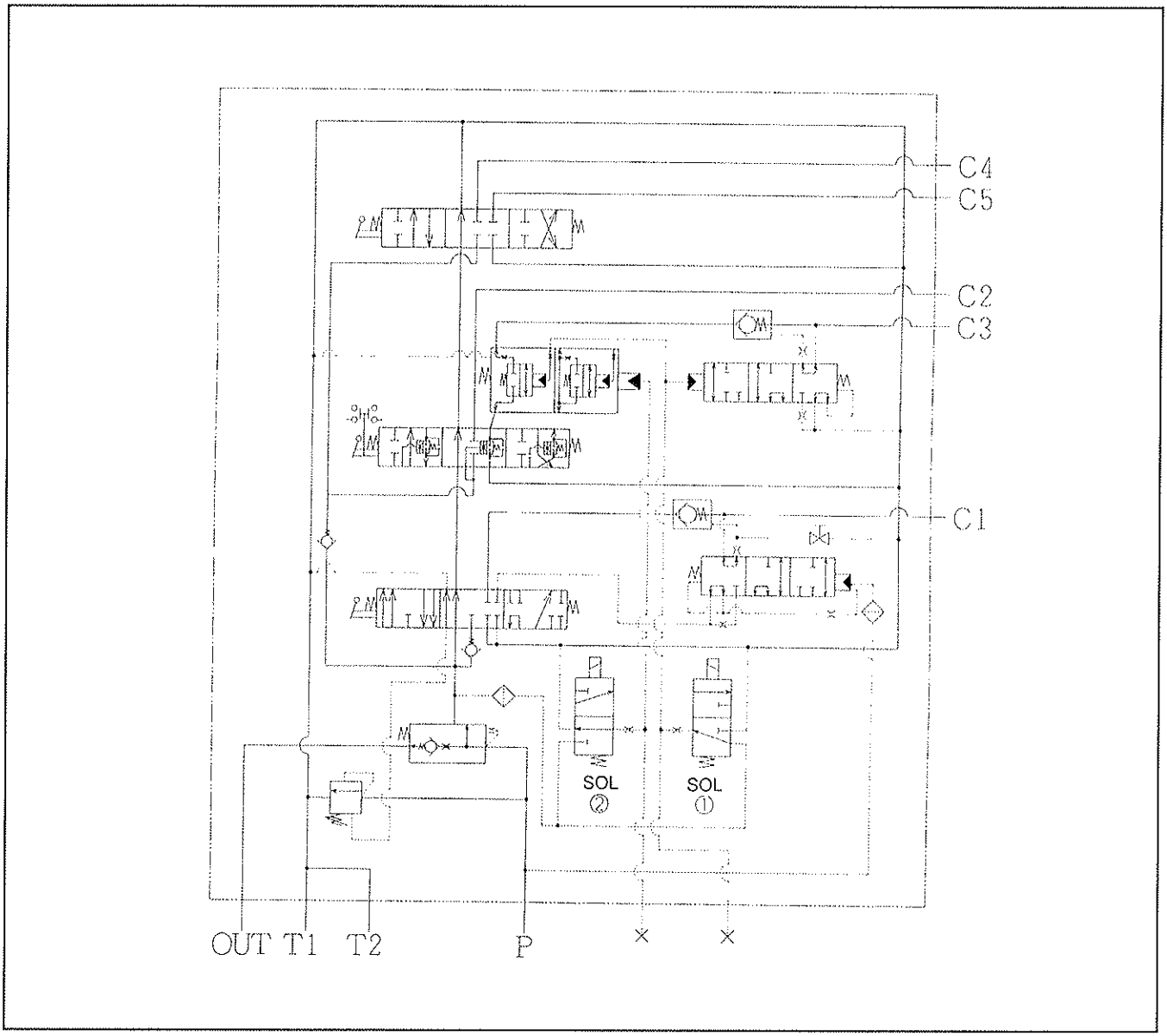
ⓚ Limit Switch



ⓛ Lift Lock Check Valve ⓜ Tilt Lock Check Valve

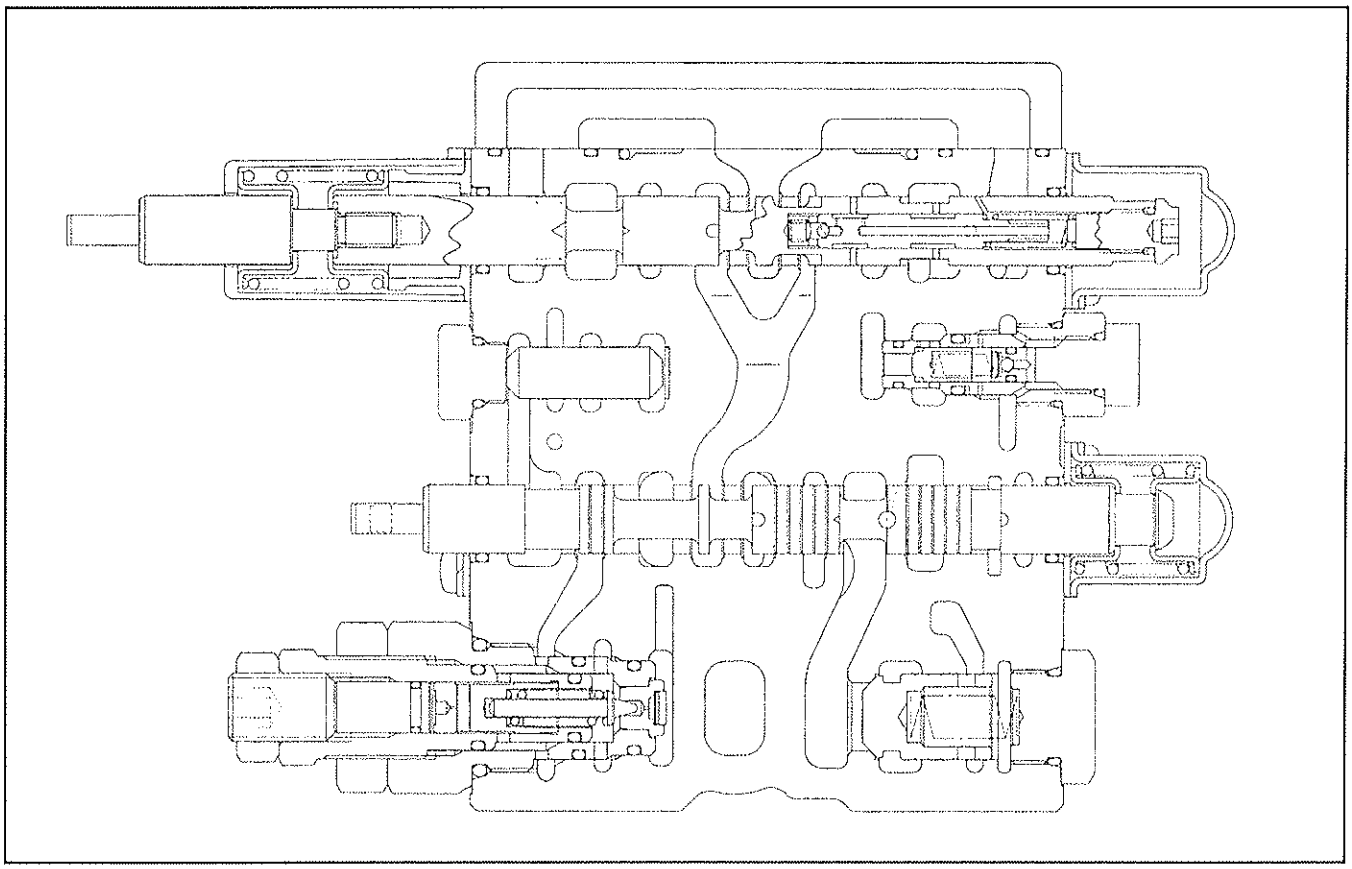


Hydraulic Circuit Diagram (~ 2000.11)

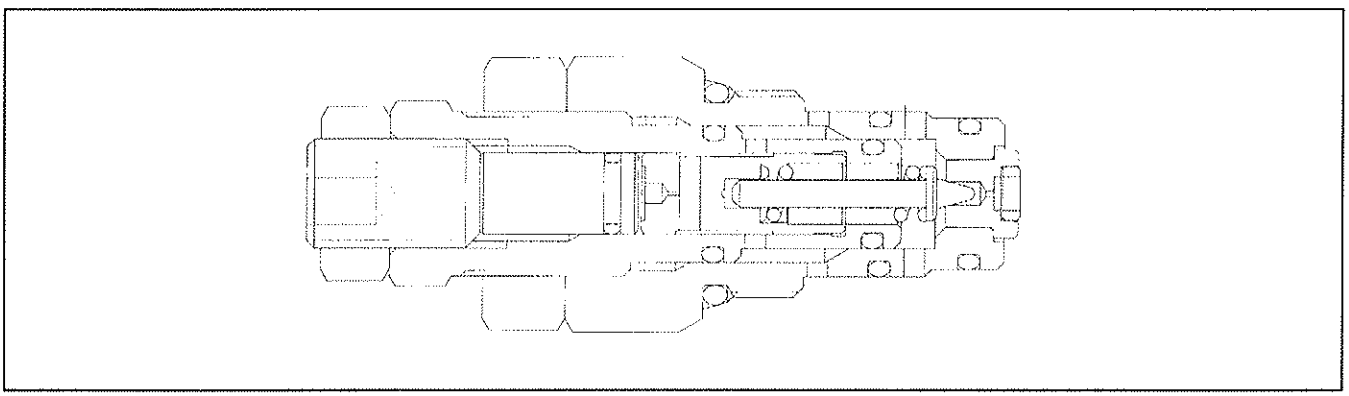


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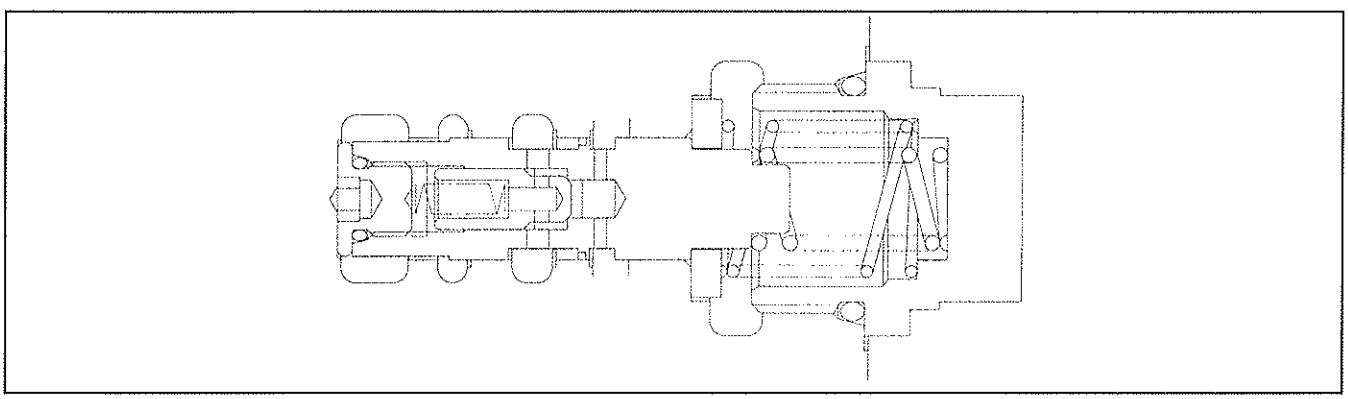
Oil Control Valve (2000.11 ~)



ⓔ Relief Valve (2000.11 ~)

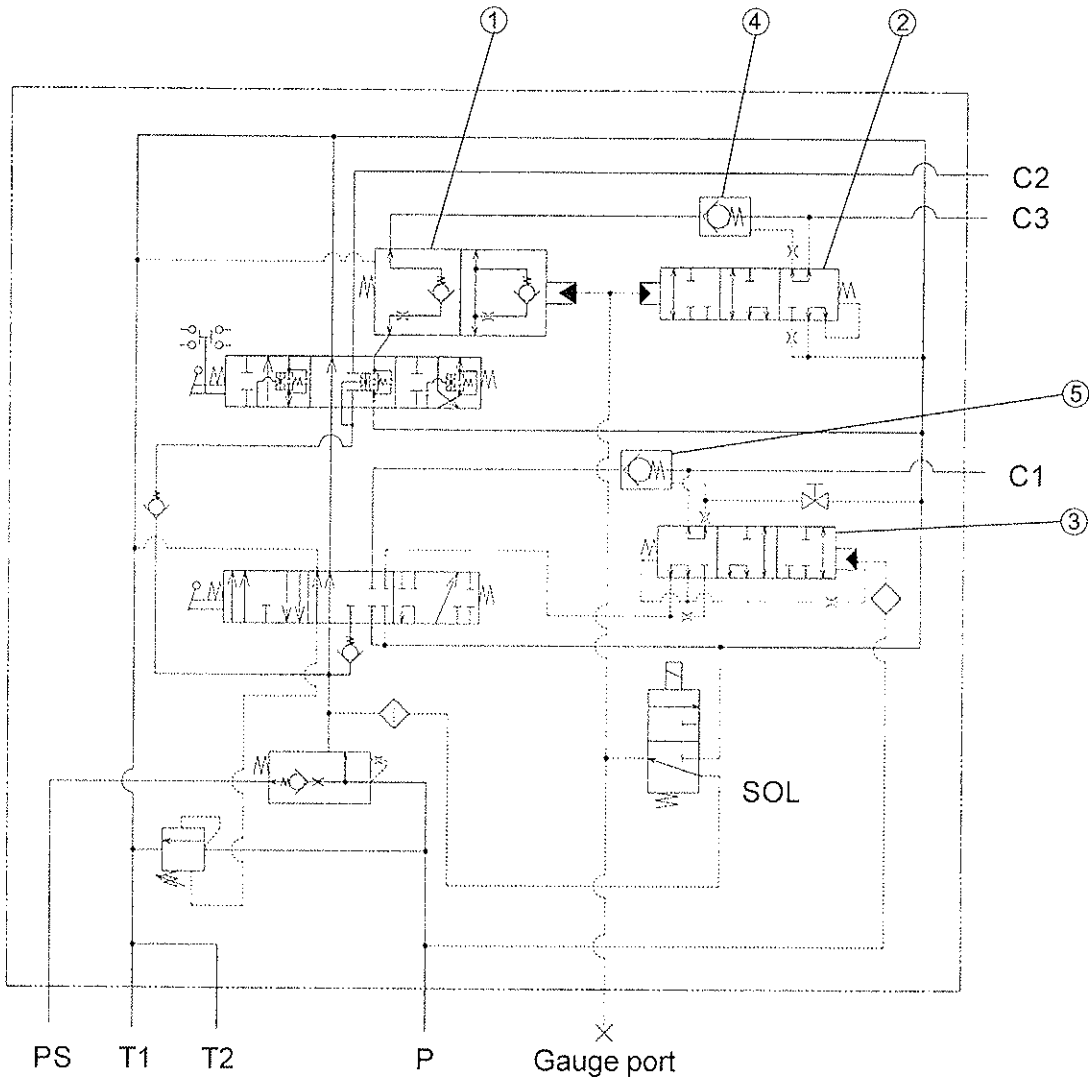


ⓗ Flow Control Valve (2000.11 ~)



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Hydraulic Circuit Diagram (2000.11 ~)



① Flow control valve
② Tilt switch valve
③ Lift switch valve
④ Tilt lock check valve (leak lock valve)
⑤ Lift lock check valve (leak lock valve)

Note:
Oil circuit involving 3rd spool (C4, C5 port) is omitted since it remains unchanged.

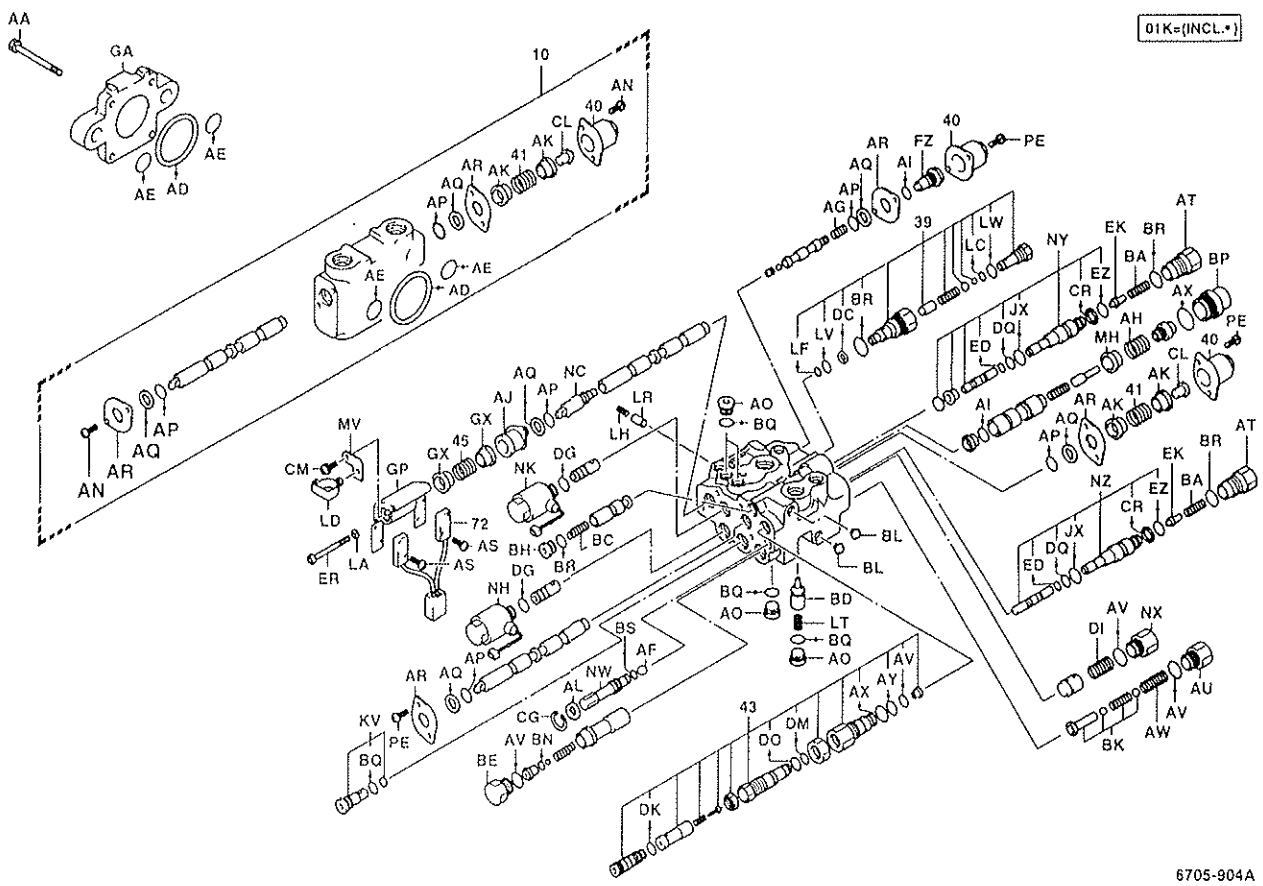
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SPECIFICATIONS

Item \ Vehicle model		1 ton series	2·3 ton series	J3.5 ton series
Oil control valve type		Add-on type (1-, 2-spool monoblock)	←	←
Relief set pressure kPa (kgf/cm²) [psi]	Lift	17160 (175) [2490]	18140 (185) [2630]	←
	Tilt	11770 (120) [1710]	14710 (150) [2130]	15690 (160) [2280]
Flow divider flow rate ℓ/min (USgal/min)		13.0 (3.43)	←	15.2 (4.02)
Others		Built-in flow divider valve	←	←

COMPONENTS

6705



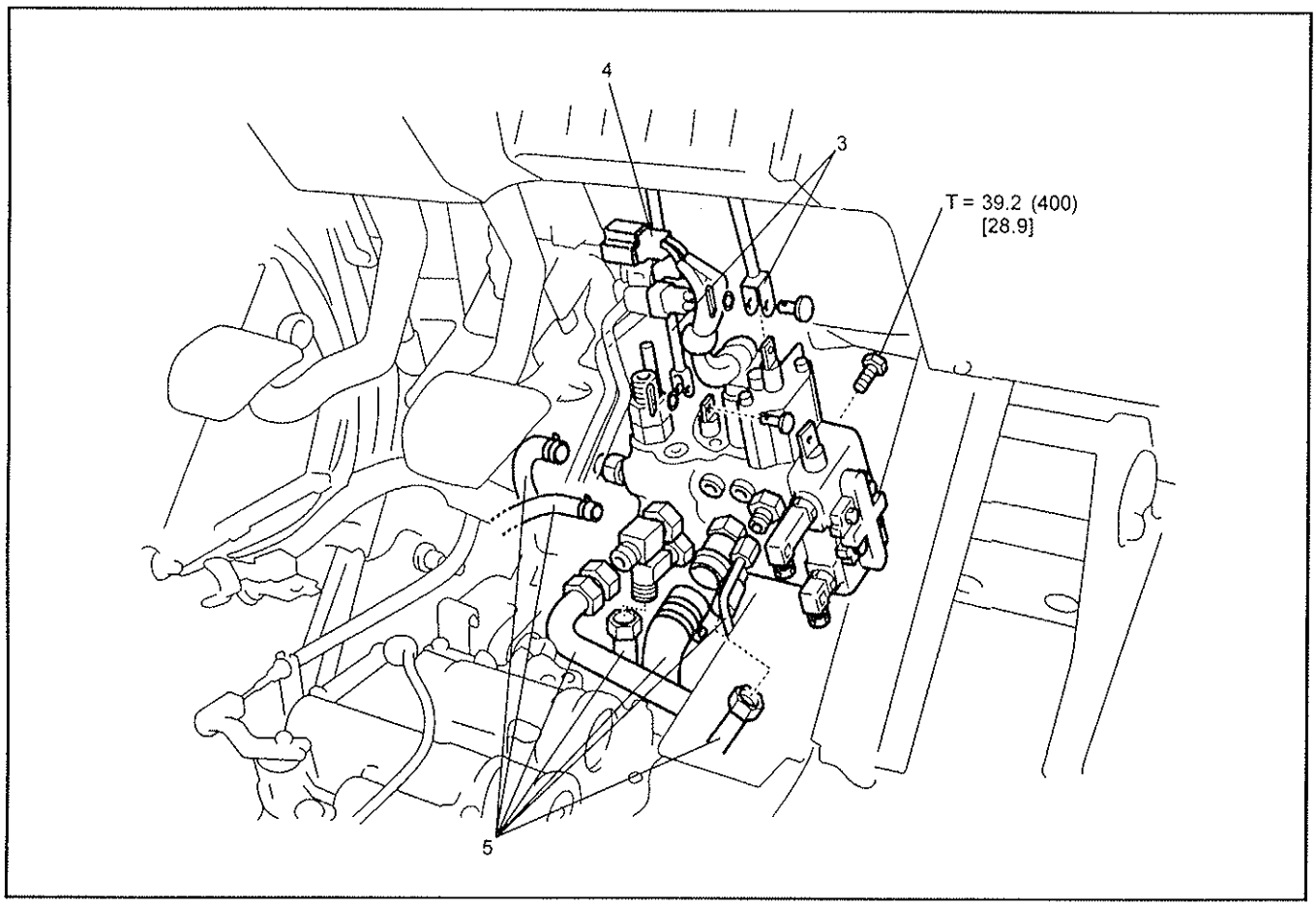
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OIL CONTROL VALVE ASSY

REMOVAL·INSTALLATION

Note:
Before disconnecting the lever rod, operate the control levers to bring the mast to the neutral position and fully lower the fork to release the residual pressure in the material handling system piping.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.

2 Remove the lower panel.

3 Disconnect the lever rod.

4 Disconnect the wiring.

5 Disconnect the piping.

6 Remove the oil control valve ASSY.

Installation procedure

The installation procedure is the reverse of the removal procedure.

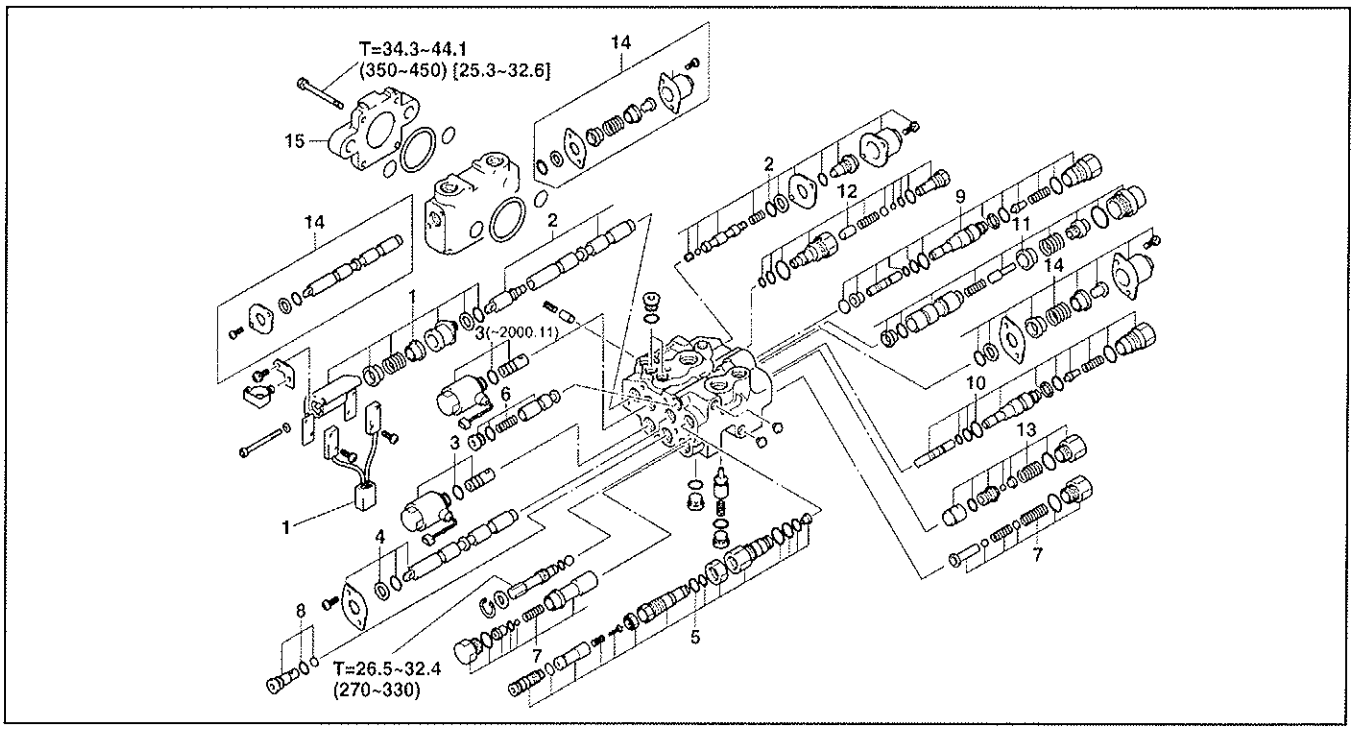
Note:
- **Apply grease (chassis grease) on the oil control valve lever links.**
- **Inspect the hydraulic oil level, and add if insufficient.**

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DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- **Select a clean location for operation.**
- **Since individual parts are finished with high precision, carefully disassemble so as not to damage them.**

T = N·m (kgf-cm) [ft-lbf]



Disassembly Procedure

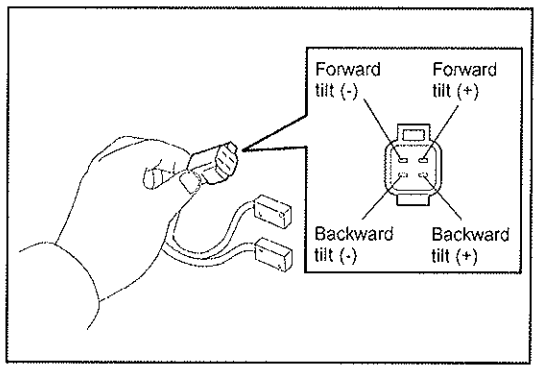
1 Remove the limit switch and spring cover. **[Point 1]**
2 Remove the tilt spool.
3 Remove the solenoid valve. **[Point 2]**
4 Remove the lift spool. **[Point 3]**
5 Remove relief valve No.1. **[Point 4]**
6 Remove relief valve No.2. **[Point 5]**
7 Remove the flow divider valve. **[Point 6]**
8 Remove the filter. **[Point 7]**
9 Remove the lift select valve. **[Point 8]**
10 Remove the tilt select valve. **[Point 9]**
11 Remove the flow control valve. **[Point 10]**
12 Remove the tilt lock check valve.
13 Remove the lift lock check valve.
14 Remove the additional spool.
15 Remove the outlet housing.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Wash each part thoroughly, remove dirt by blowing compressed air and apply hydraulic oil before reassembly.

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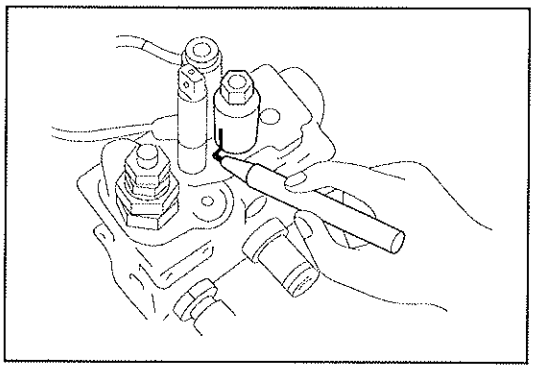
Point Operations

[Point 1]
Inspection:
Check continuity of limit switches.

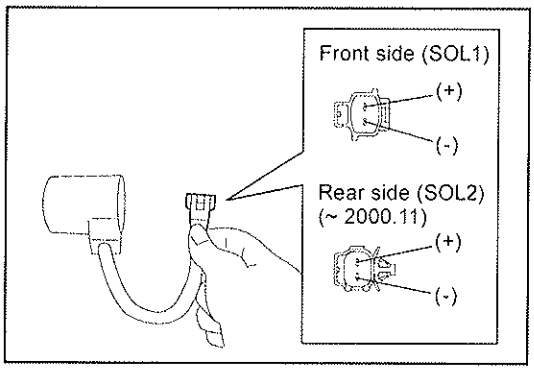
Forward tilt side:
No continuity when the switch is pressed.

Backward tilt side:
No continuity when the switch is pressed.

Reassembly:
Carefully connect the limit switches on the forward and backward tilt sides in correct positions. Install the one for the forward tilt on the upper side. (It is regular that the both switches must be in pressed state when installed.)



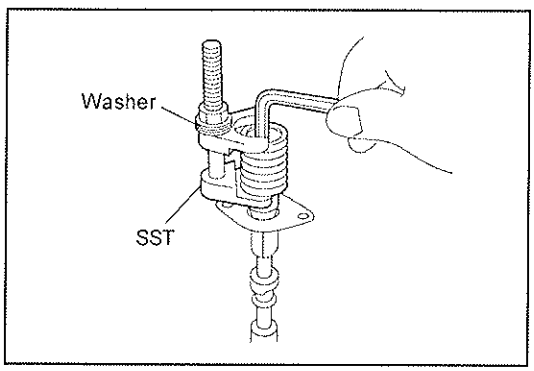
[Point 2]
Disassembly:
Put a match mark to ensure installation of each solenoid in the correct position.



Inspection:
Check continuity of each solenoid.

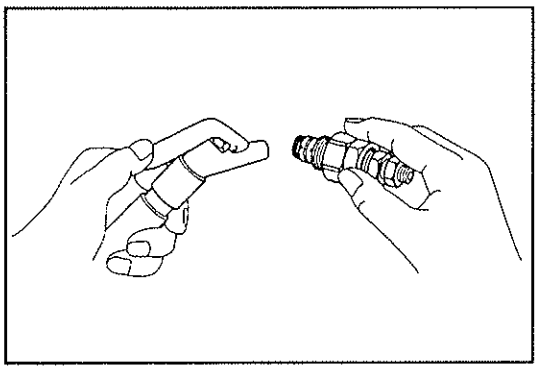
Inspection:
Inspect and wash each orifice to eliminate clogging.

Reassembly:
Carefully install SOL1 and SOL2 spools in correct positions.

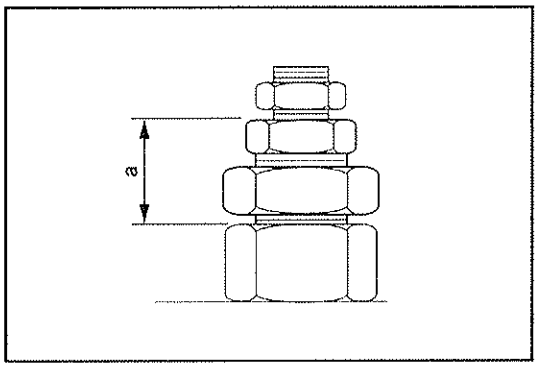


[Point 3]
Disassembly·Reassembly:
Remove the compression spring from the lift spool.
SST 09610-10161-71
Use the SST with a washer.

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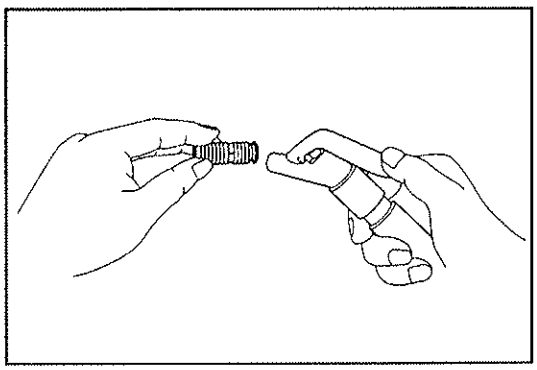


[Point 4]
Inspection:
Inspect and wash the orifice to eliminate clogging.

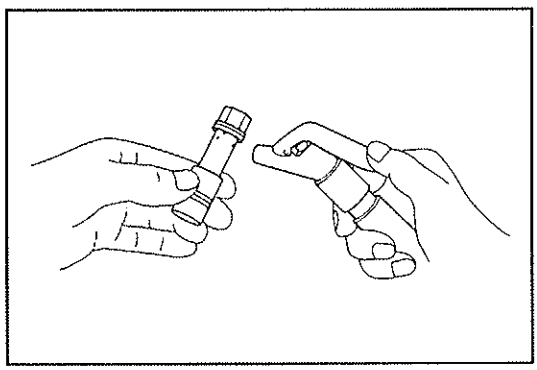


Reassembly:
When the relief valve is disassembled, temporalily reassemble after positioning the nuts as illustrated.

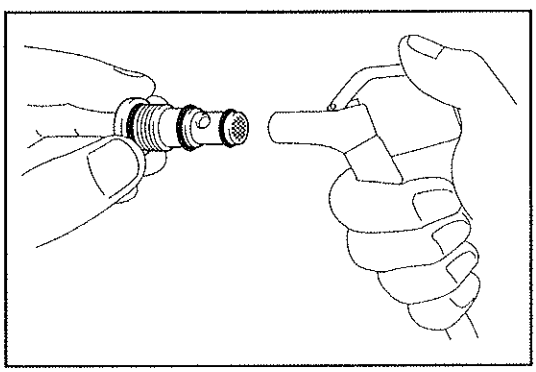
a = 27.0 mm (0.62 in)



[Point 5]
Inspection:
Inspect and wash the orifice to eliminate clogging.

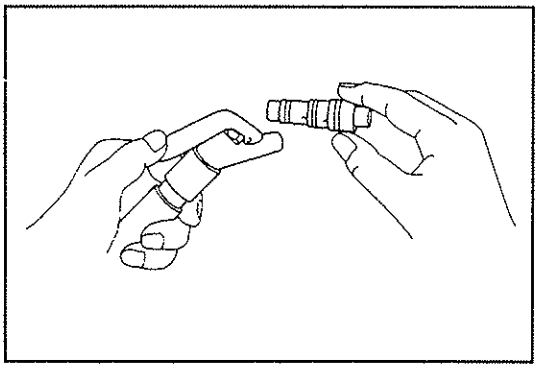


[Point 6]
Inspection:
Inspect and wash the orifice to eliminate clogging.

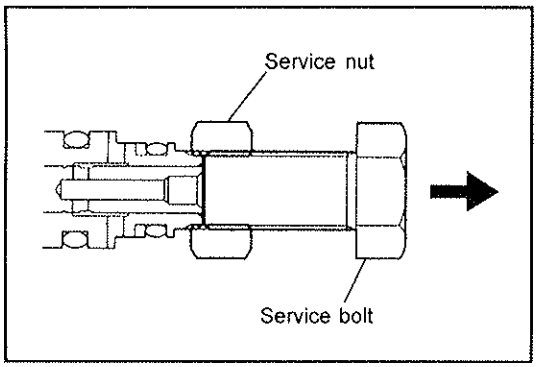


[Point 7]
Inspection:
Inspect and wash the filter to eliminate clogging.

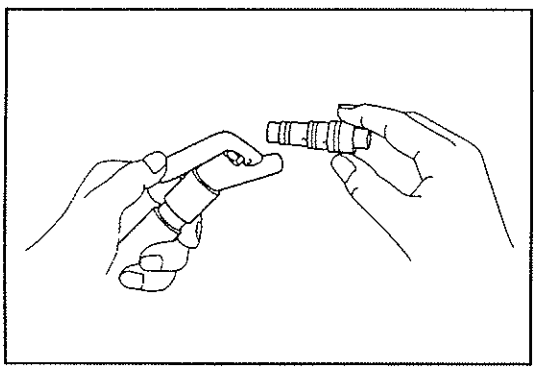
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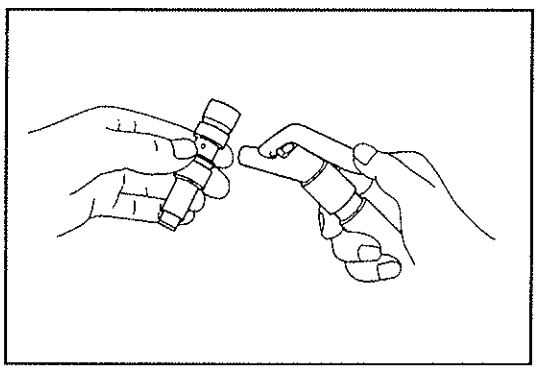
[Point 8]
Inspection:
Inspect and wash the filter to eliminate clogging.



[Point 9]
Disassembly:
Use the service bolt and nut to remove the sleeve.
Service bolt size: M10 x 1.25



Inspection:
Inspect and wash the filter to eliminate clogging.

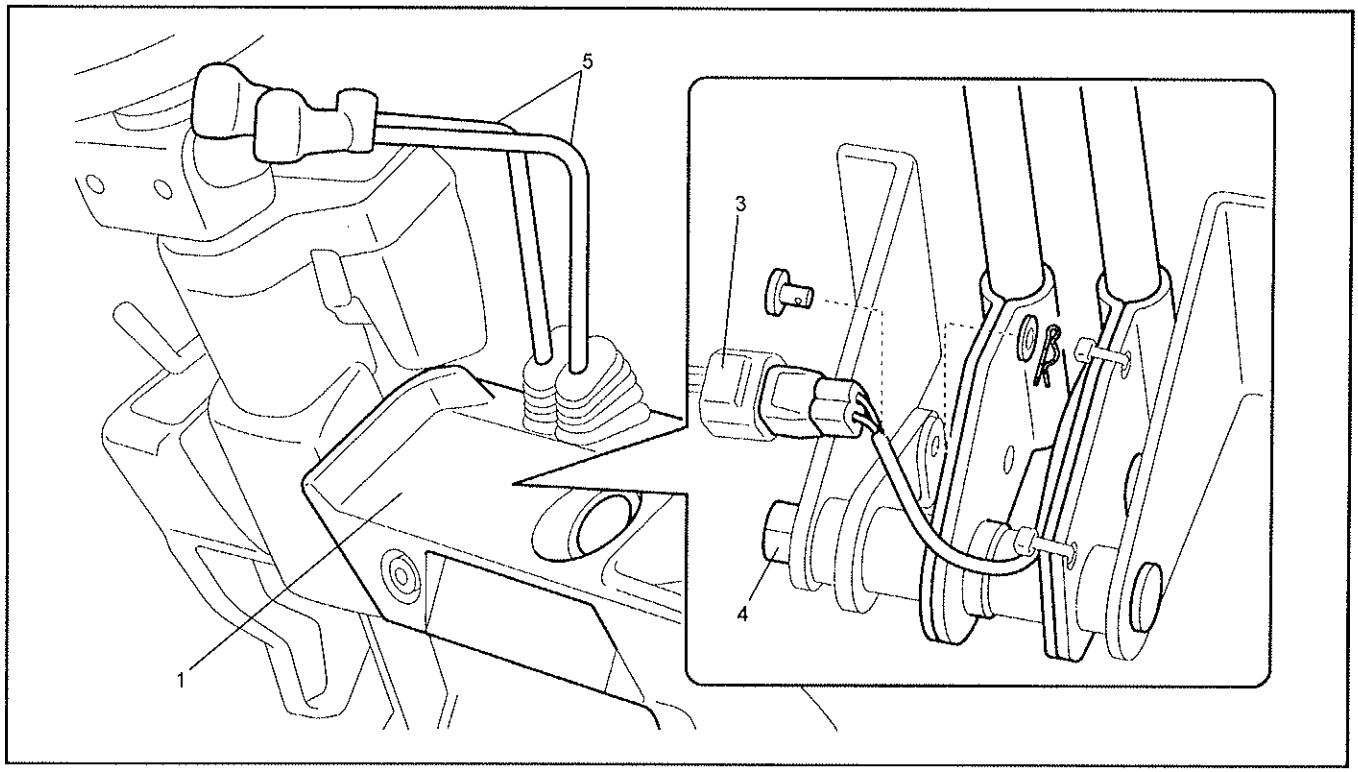


[Point 10]
Inspection:
Inspect and wash the filter to eliminate clogging.

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CONTROL VALVE LEVER ASSY

REMOVAL·INSTALLATION



Removal Procedure

1 Remove the instrument panel.

2 Disconnect the lever rod.

3 Disconnect the knob switch wiring at the tilt lever.

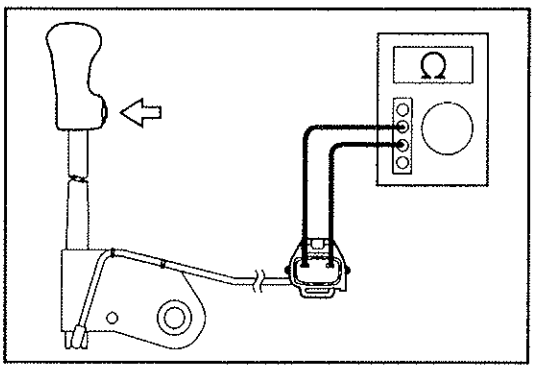
4 Remove the set bolt.

5 Remove control valve levers. **[Point 1]**

Installation procedure

The installation procedure is the reverse of the removal procedure.

Note:
Apply chassis grease on the control valve lever links.



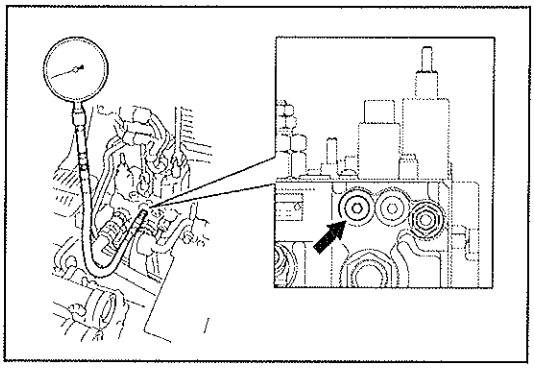
Point Operations

[Point 1]
Inspection:
Check the knob switch for continuity.

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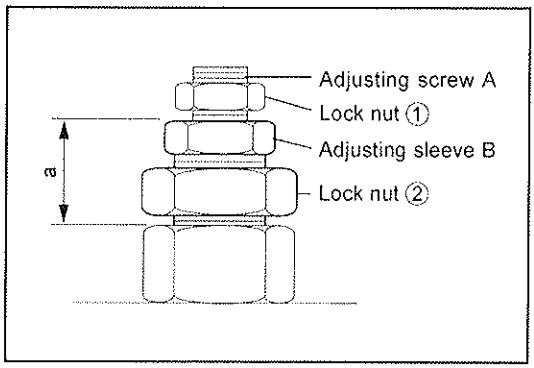
RELIEF PRESSURE ADJUSTMENT (~ 2000.11)

Note:
Always adjust the relief pressure in due order, the lift (high pressure) side first and then the tilt (low pressure) side since the relief valve is structured in two stages. (If the lift side is normal and the tilt side is abnormal as a result of relief pressure inspection, it is allowed to adjust only the tilt side pressure.)



1. Install an oil pressure gauge.
   (1) Remove the oil pressure detection port plug (illustrated) from the front side of the oil control valve, and install the oil pressure gauge.

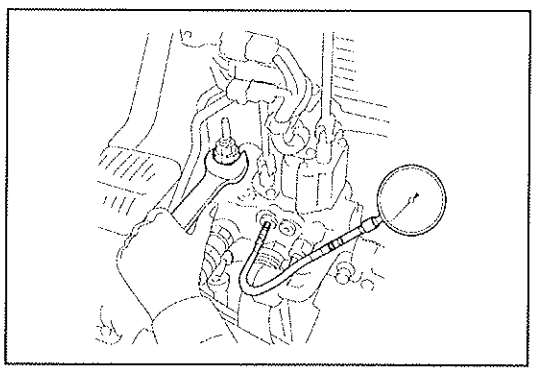
   Plug size: 9/16-18UNF-2B



2. Set adjusting screw A and adjusting sleeve B of the relief valve as follows:
   (1) Loosen lock nut ① and fully tighten adjusting screw A. Then loosen it by one to two turns.
   (2) Loosen lock nut ② and position adjusting sleeve B to satisfy the following dimension:

   a = 27.0 mm (0.62 in)

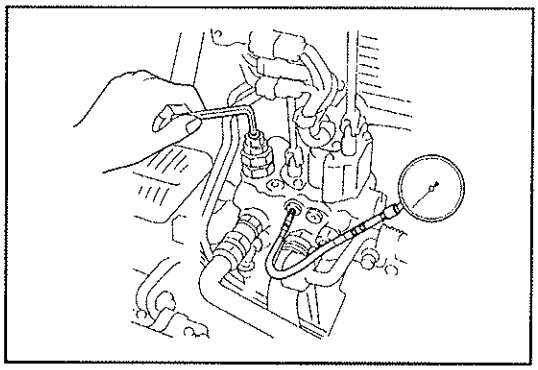
3. Start the engine and check for any oil leak or abnormal noise.
4. Adjust the lift side relief pressure.
   (1) Operate the lift lever to raise the forks to the uppermost position.
   (2) Operate the tilt lever slightly to the backward side without causing backward tilt of the mast, and hold the lever with the backward tilt limit switch in actuated state.
   (3) In the state of (2) above, operate the lift lever in the upward direction while the engine is running at the maximum speed. Gradually tighten adjusting sleeve B until the oil pressure in the relief state satisfies the standard below. Then fix the position by turning lock nut ②.



Standard Unit: kPa (kgf/cm²) [psi]

Vehicle model	1 ton series	2·3 ton series	J3.5 ton series
Lift relief set pressure	17160^{+490}_{0} (175^{+5}_{0}) [2490^{+70}_{0}]	18140^{+490}_{0} (185^{+5}_{0}) [2630^{+70}_{0}]	←

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5. Adjust the tilt side relief pressure.
   (1) Operate the tilt lever to tilt the mast fully backward.
   (2) Operate the tilt lever the backward tilt direction while the engine is running at the maximum speed. Gradually tighten adjusting screw A until the oil pressure in the relief state satisfies the standard below. Then fix the position by turning lock nut ①.

Standard Unit: kPa (kgf/cm²) [psi]

Vehicle model	1 ton series	2·3 ton series	J3.5 ton series
Tilt relief set pressure	11770^{+490}_{0} (120^{+5}_{0}) [1710^{+70}_{0}]	14710^{+490}_{0} (150^{+5}_{0}) [2130^{+70}_{0}]	15690^{+490}_{0} (160^{+5}_{0}) [2280^{+70}_{0}]

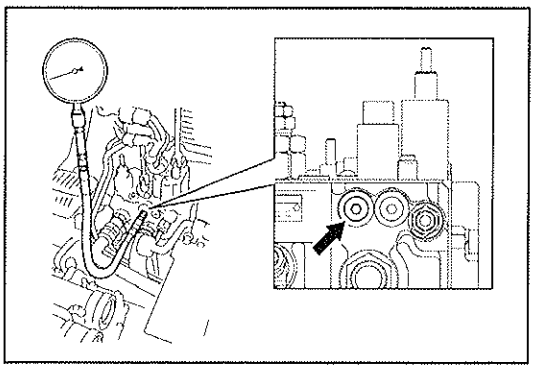
6. Remove the oil pressure gauge and tighten the plug.

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RELIEF PRESSURE ADJUSTMENT (2000.11 ~)

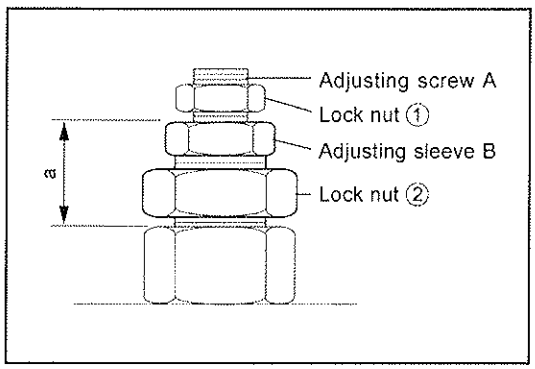
Note:

- **Always adjust the relief pressure in due order, the lift (high pressure) side first and then the tilt (low pressure) side since the relief valve is structured in two stages. (If the lift side is normal and the tilt side is abnormal as a result of relief pressure inspection, it is allowed to adjust only the tilt side pressure.)**
- **There are two cases:**
  Case A: The method in which the plug in-analyzer (SST 09240-23320-71 or SST 09240-23321-71) is utilized.
  Case B: The method in which the plug in-analyzer is unused.



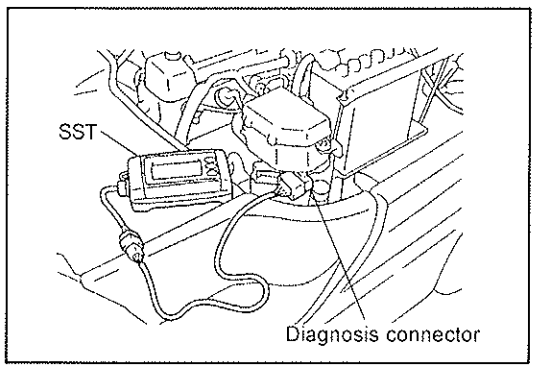
1. Install an oil pressure gauge.
   (1) Remove the oil pressure detection port plug (illustrated) from the front side of the oil control valve, and install the oil pressure gauge.

   Plug size: 9/16-18UNF



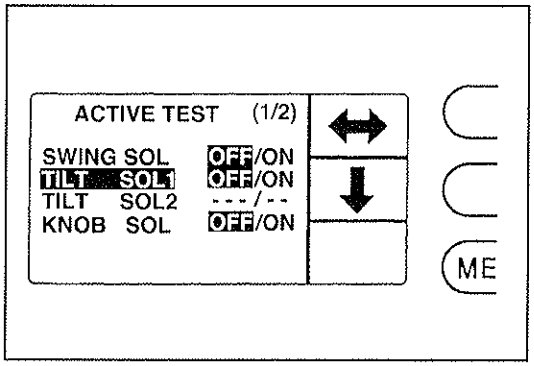
2. Set adjusting screw A and adjusting sleeve B of the relief valve as follows:
   (1) Loosen lock nut ① and fully tighten adjusting screw A. Then loosen it by one to two turns.
   (2) Loosen lock nut ② and position adjusting sleeve B to satisfy the following dimension:

   a = 27.0 mm (0.62 in)

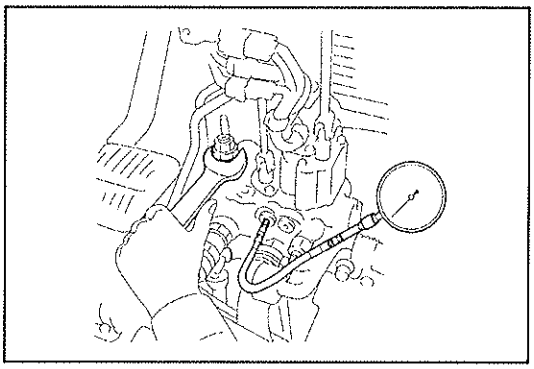


Case A:

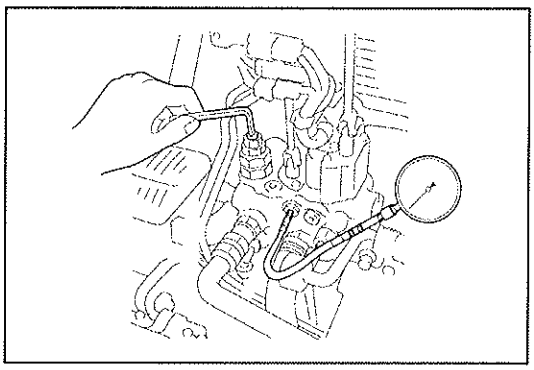
3. Connect the plug in-analyzer.
4. Turn the ignition switch ON (stop the engine).
5. Manipulate the analyzer so that ACTIVE TEST (1/2) will be displayed.
   Analyzer manipulation steps:
   MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST (1/2)
6. Choose TILT SOL1, as it is shown in the illustration and check to confirm that TILT SOL1 is in OFF state.
   (If the fork height is at low, around 2 m (79 in) or less, it is in OFF state.)
   On this displayed condition, proceed to next step.



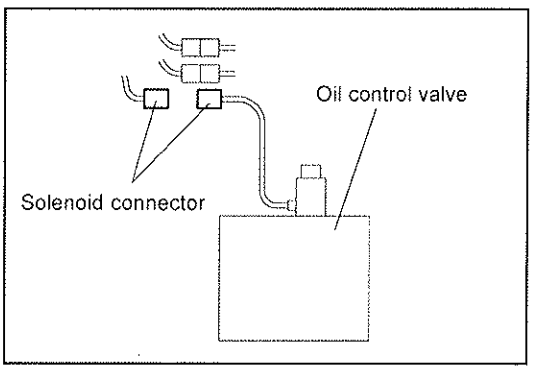
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7. Start the engine and check for any oil leak or abnormal noise.
8. Adjust the lift side relief pressure.
   (1) Operate the lift lever to raise the forks to the uppermost position.
   (2) Operate the lift lever in the upward direction while the engine is running at the maximum speed. Gradually tighten adjusting sleeve B until the oil pressure in the relief state satisfies the standard below. Then fix the position by turning lock nut ②.



9. Adjust the tilt side relief pressure.
   (1) Operate the tilt lever to tilt the mast fully backward.
   (2) Operate the tilt lever the backward tilt direction while the engine is running at the maximum speed. Gradually tighten adjusting screw A until the oil pressure in the relief state satisfies the standard below. Then fix the position by turning lock nut ①.
10. Return the plug in-analyzer to MAIN MENU.
11. Turn the ignition switch OFF.
12. Remove the oil pressure gauge and tighten the plug.



Case B:

3. Disconnect the solenoid connector.
4. Do the same operations as in Case A, step 7 to 9.
5. Turn the ignition switch OFF.
6. Connect the solenoid connector.
7. Remove the pressure gauge and tighten the plug.

Note:
In the event of Case B relief pressure measurement, there remains error code "64-1" in memory since the solenoid connector has been removed once.

Standard

Unit: kPa (kgf/cm²) [psi]

Vehicle model	1 ton series	2·3 ton series	J3.5 ton series
Lilt relief set pressure	17160^{+490}_{0} (175^{+5}_{0}) [2490^{+70}_{0}]	18140^{+490}_{0} (185^{+5}_{0}) [2630^{+70}_{0}]	←
Tift relief set pressure	11770^{+490}_{0} (120^{+5}_{0}) [1710^{+70}_{0}]	14710^{+490}_{0} (150^{+5}_{0}) [2130^{+70}_{0}]	15690^{+490}_{0} (160^{+5}_{0}) [2280^{+70}_{0}]

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SAS

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GENERAL

Composition of SAS (System of Active Stability)

This system performs rear wheel swing control (S), mast tilting control (T) and steering knob position control (K) by driving various actuators according to the vehicle movement signals sent to the SAS controller from the sensors and switches installed on necessary portions on the vehicle.

Control			Functional part
S	T	K	
○	○		Fork height switch
	○		Tilt angle sensor
	○		Forward tilt switch
	○		Backward tilt switch
○	○		Load sensor
	○		Tilt knob switch
○		○	Speed sensor
		○	Steering wheel angle sensor
		○	Tire angle sensor
○			Yaw rate sensor

Input → SAS controller → Output

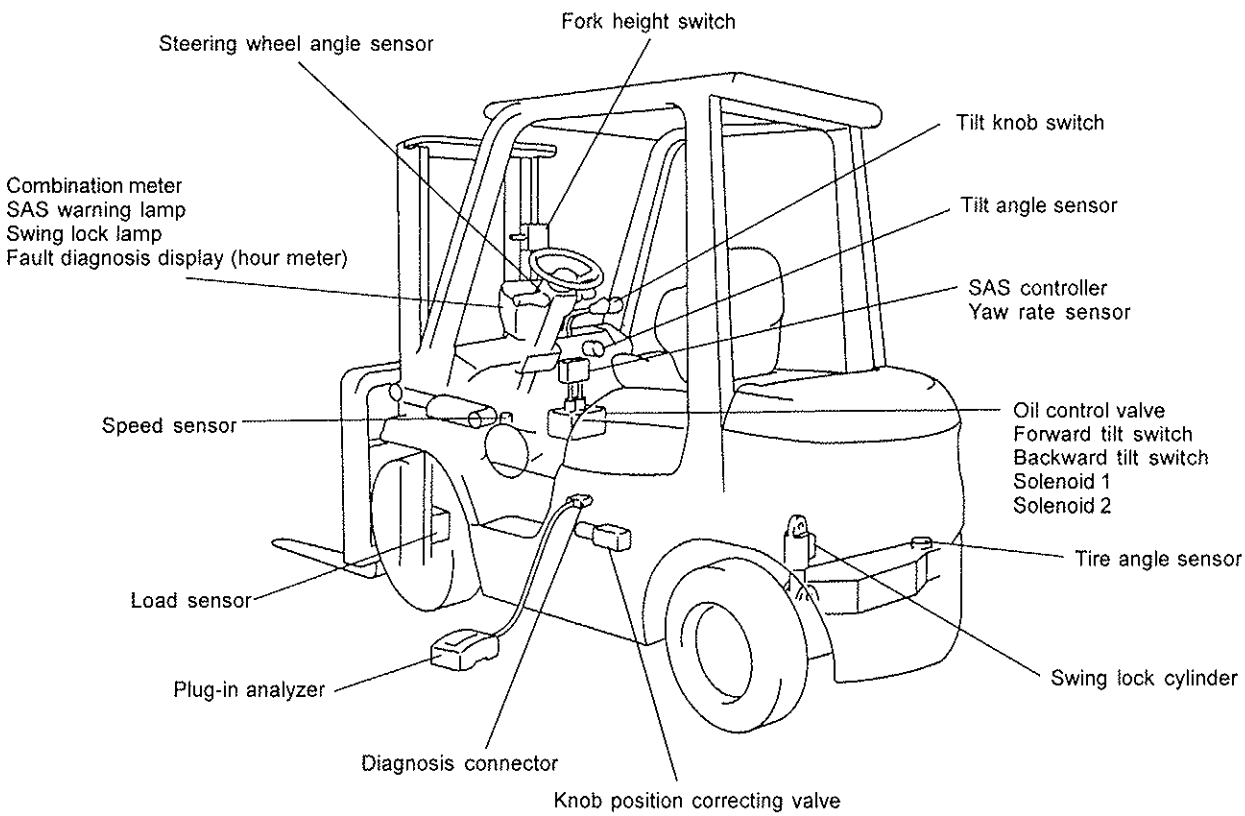
Functional part	Control		
	S	T	K
Swing lock cylinder	○		
Oil control valve SOL1·SOL2		○	
Knob position correcting valve			○

SAS warning lamp & buzzer	○	○	○
Swing lock lamp	○		
Diagnosis (hour meter)	○	○	○

Diagnosis connector	○	○	○

↓

Plug-in analyzer

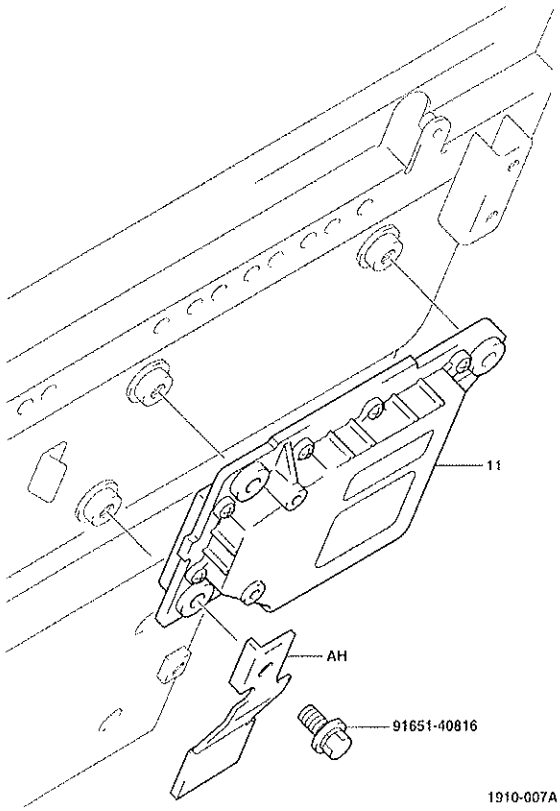


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COMPONENTS

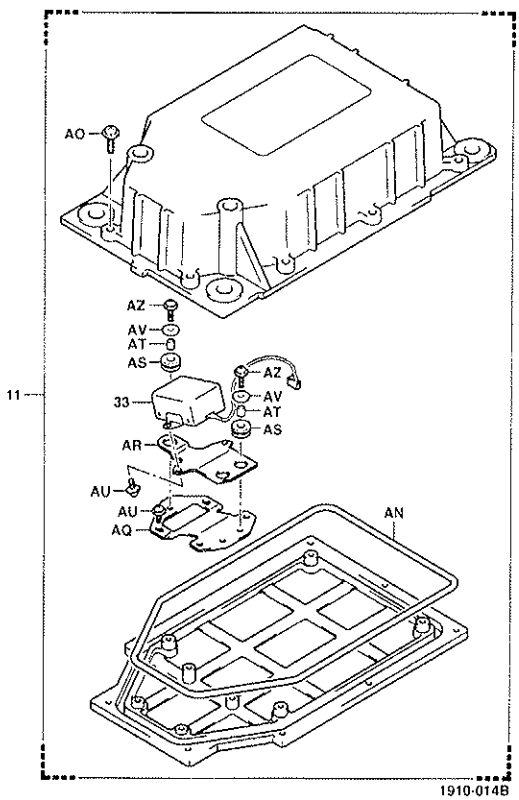
Controller

1910



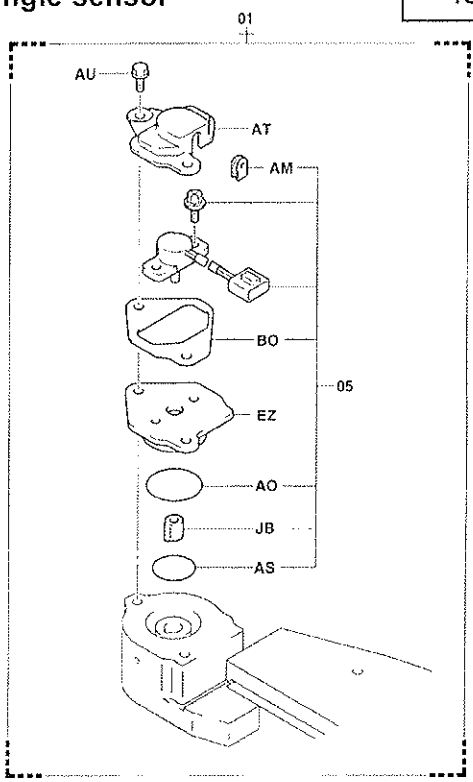
Yaw rate sensor

1910



Tire angle sensor

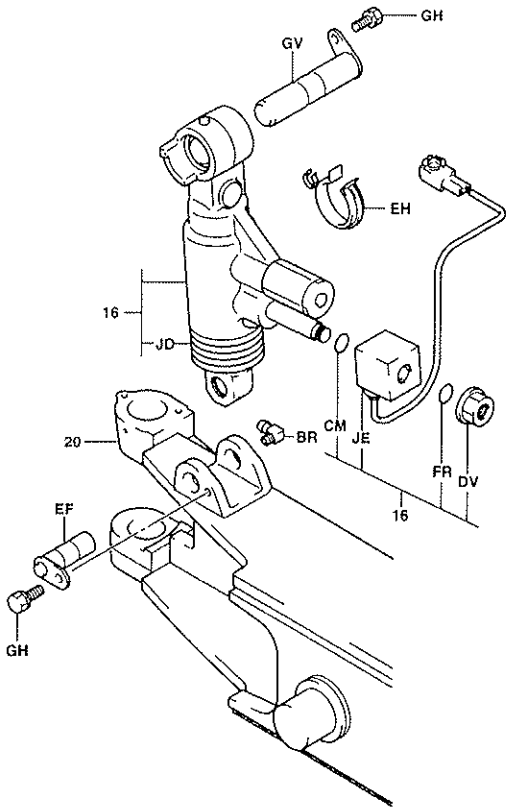
4301



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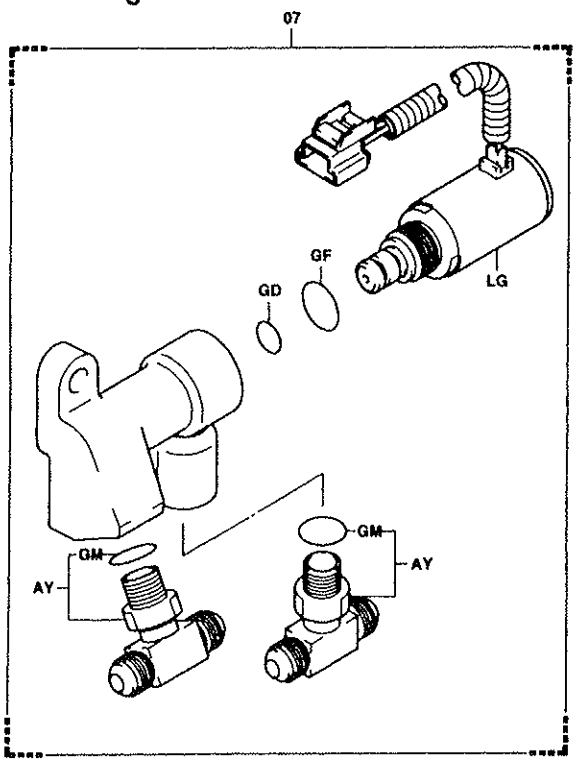
Swing lock cylinder

4301



Steering knob position correcting valve

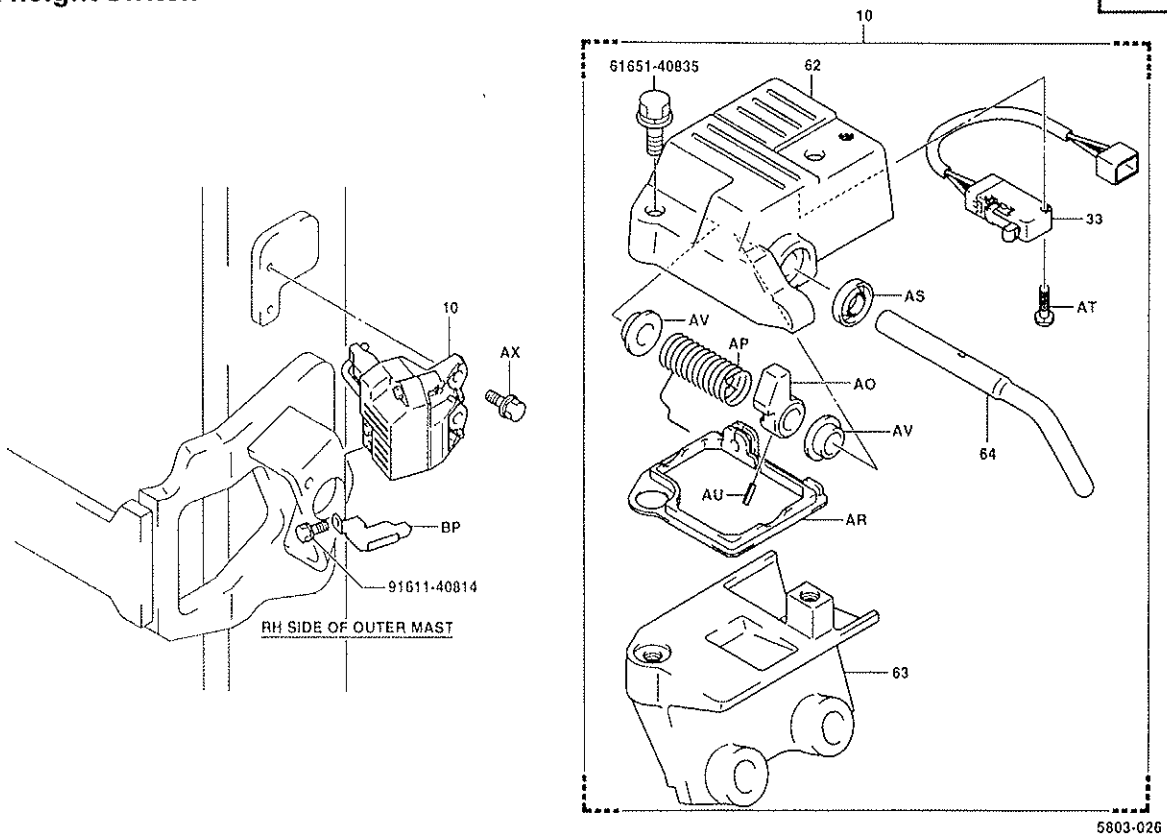
4507



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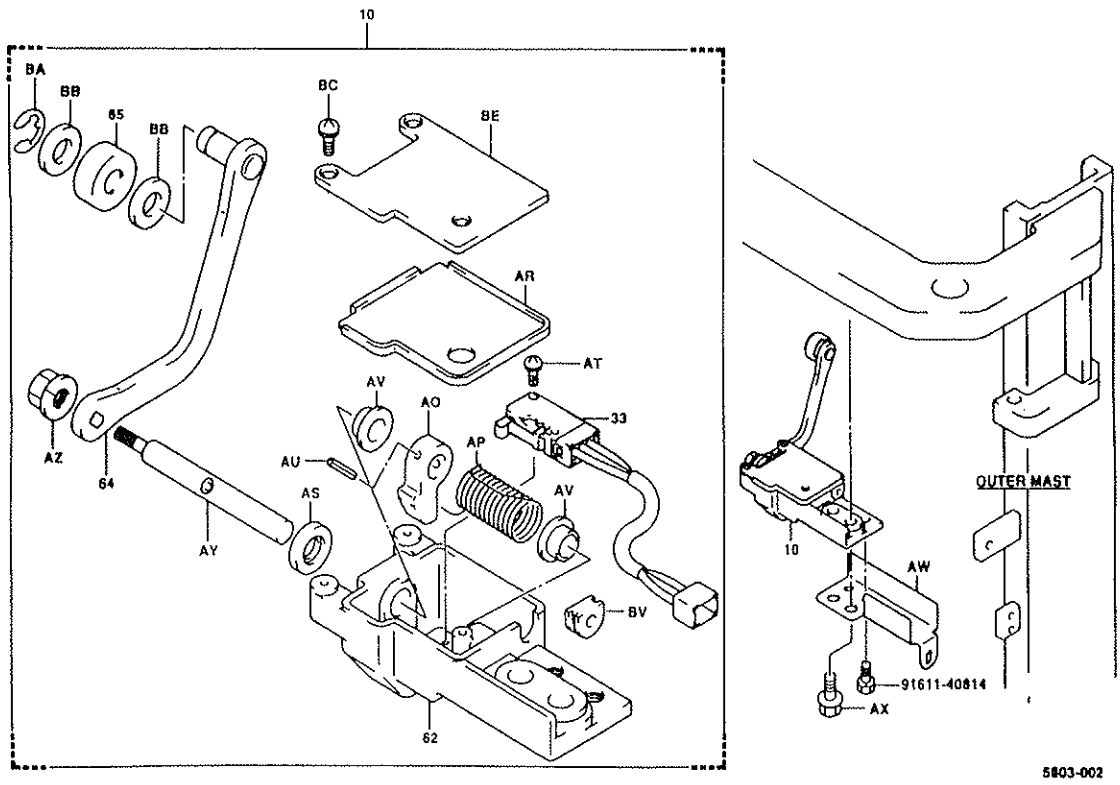
Fork height switch

5803



Fork height switch (FV·FSV)

5803

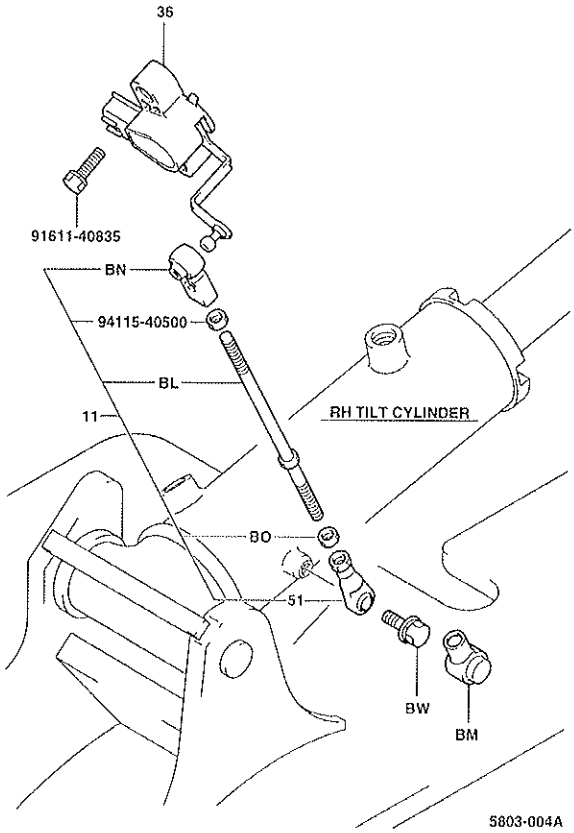


15

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Tilt angle sensor

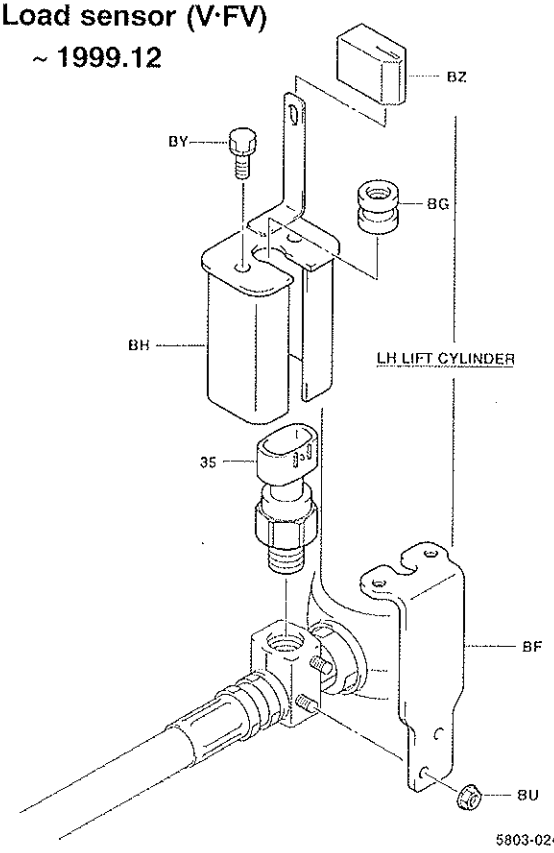
5803



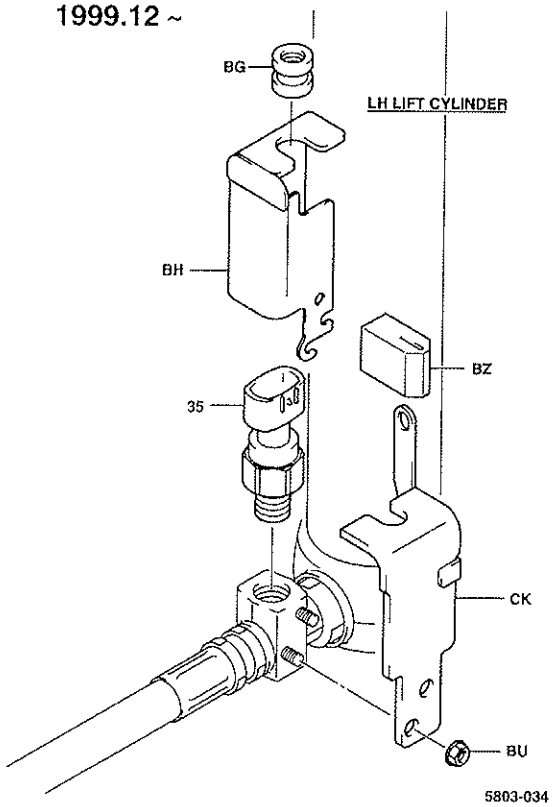
Load sensor (V·FV)

5803

~ 1999.12



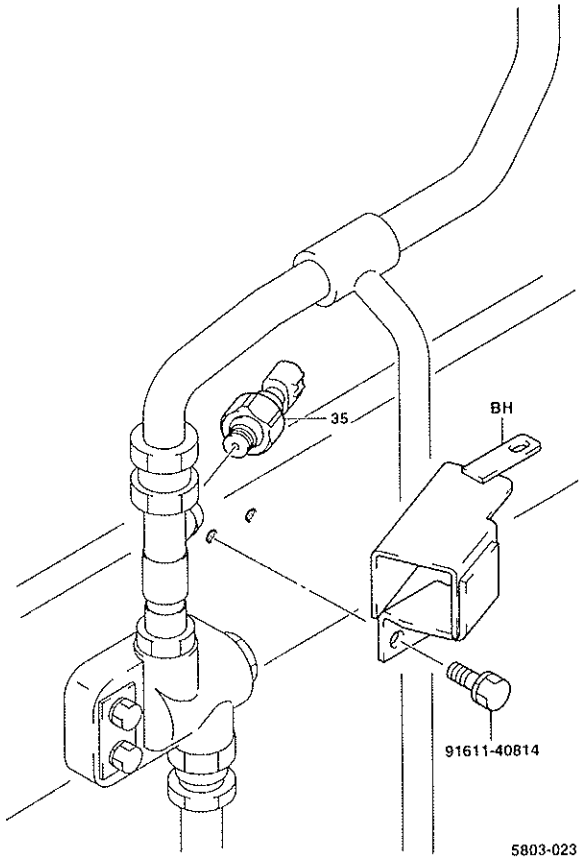
1999.12 ~



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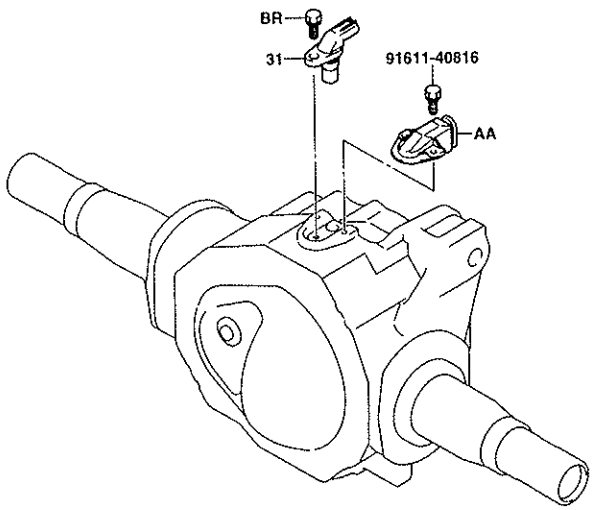
Load sensor (FSV)

5803



Speed sensor

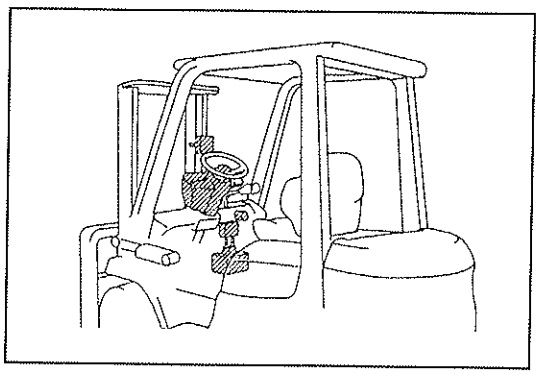
5803



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PRECAUTIONS FOR REPAIR

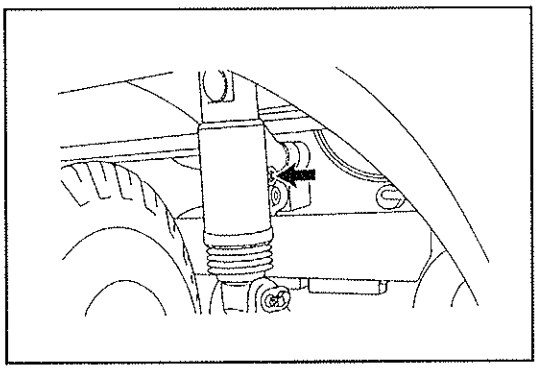
Fully understand the functions of SAS (System of Active Stability) before repairing it.



1. Preparation for repair
   (1) When washing the vehicle, care should be taken not to splash water directly to the electrical components. Don't apply high pressure washing to the controller, tilt angle sensor, lifting height switch, horn button, meters, switches on the instrument panel and electrical components and parts in the engine room.
   (2) Remove contamination and/or water from respective sections.
   (3) Transport a controller in cushioned packing and open it only before installation. Never transport it unpacked. Care should be taken not to drop the controller or give it impact by allowing contact with other objects.
   (4) Part number for a controller varies by the vehicle specifications. Check correct part number in advance.
   (5) Should a repair work require matching, always park the vehicle on a flat place.
   (6) Arrange for necessary tools and measuring instrument (such as a plug-in analyzer (SST 09240-23320-71) and TOYOTA electrical tester (SST 09082-76002-71 (SST 09082-00050)), etc.).

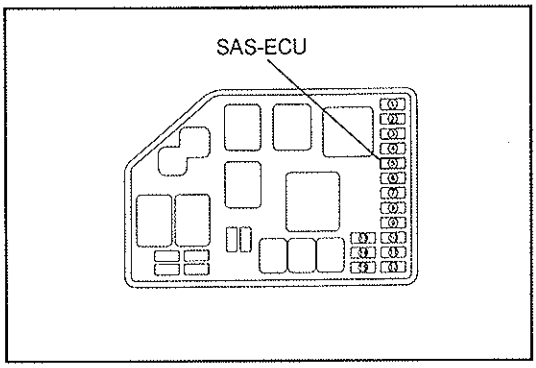
2. During repair
   (1) Never apply an impact wrench for removing the controller. Lay waste beneath the controller in precaution for an accidental dropping.
   (2) Don't turn the key switch ON-OFF for no specific reason when the sensor wiring is disconnected. Turning the key switch ON in this state causes an error and an error code will be stored in the controller. The error code is not erasable and a maximum of ten errors will be stored. Beyond 10th error code, the older error will be sequentially erased.
   (3) When turning the solenoid (for lock cylinder, knob misalignment correction valve) ON during an "Active Test" of the analyzer, don't keep it ON for more than one (1) minute. Since SAS functions are forcibly suspended during an operation check, perform the running test carefully at low speed.
   (4) SAS functions are suspended during matching. Don't operate the vehicle in this state.
   (5) Don't turn the key switch ON with one side (RH or LH) of a vehicle jacked up. It is very dangerous to turn the key switch ON in this state as it releases the swing lock and the vehicle becomes suddenly tilted.
   (6) If a vehicle is in tilted condition because of the repair of a flattened tire or otherwise, keep the key switch turned ON throughout from the start of jacking up, tire replacement and lowering to the ground.
   (7) When the hydraulic piping is disconnected, apply cover to the fitting and hose to prevent the dirts from entering.
   (8) If the oil control valve for manual lowering is loosened, tighten it up to a prescribed torque level.
   (9) Tighten respective set bolts with prescribed toque.
   (10) Respective sensors require no adjustment during installation. Make initialization during matching.
   (11) To extract a connector, do not pull it by the harness.
   (12) When inspecting the harness, carefully operate so as not to damage connector terminals.
   (13) The swing lock cylinder must not be disassembled. If disassembled, air enters to make it not re-usable.
   (14) Do not apply strong impacts to the frame and head guard to prevent the controller from damage.
   (15) The meanings of high and low fork heights in the troubleshooting section are as follows:
   Low fork height: From the lowermost position to immediately before actuation of the fork height switch
   High fork height: Height above the position where the fork height switch is actuated

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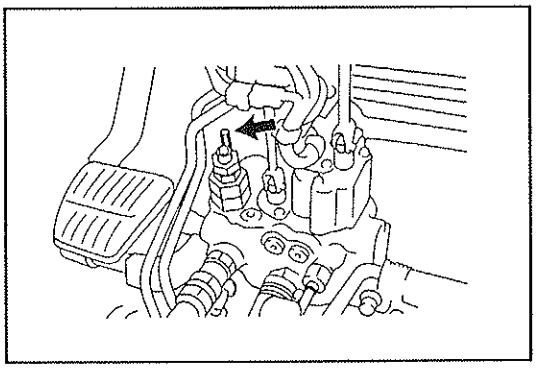


3. Temporary measures

(1) If swing lock fails to unlock for some trouble when the key switch is turned ON, it may be unlocked manually for temporary action.
Loosen the illustrated plug of the swing lock cylinder by 1 to 2 turns for unlocking. Care should be taken not to over-loosen it. After the repair, tighten it properly.
T = 8 ~ 10 N·m (80 ~ 100 kgf-cm)
[5.8 ~ 7.24 ft-lbf]



(2) If the mast should fail to tilt forward or backward because of the failure of the forward or backward tilt limit switch, tilting operation may be made by extracting SAS-ECU fuse in the relay box for temporary measure. Care should be taken in this case that SAS functions are suspended. The swing control enters the lock state.



(3) If the mast should fail to lower because of some trouble, it can be lowered manually.
Loosening the illustrated valve on the top of the oil control valve lowers the mast. Operate the lift lever for lowering with the manual lowering valve loosened. After the repair, tighten it appropriately.

T = 26.5 ~ 32.4 N·m (270 ~ 330 kgf-cm)
[19.5 ~ 23.9 ft-lbf]

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4. Precautions for vehicle modification

H (fork height): mm (in)

No.	Content of modification	Condition	Content of work
1	Single tire → Double tire	—	Change controller. (for vehicle without swing control) Remove the lock cylinder.
2	Double tire → Single tire	—	Change controller. (for vehicle with swing control) Change the rear axle beem. Install the lock cylinder.
3	Mast replacement	—	Change the mast.
4	Installation/Removal of attachment	—	Install or remove attachment.
5	Mast installation (Mast less spec. model)	—	Install the mast. Install the lifting height switch. Install the mast harness.

Note:

- **Proceed with the alignment (re-setting) procedure after the above-mentioned modification. (See page 15-20.)**
- **After modification, replace the caution label affixed on the vehicle with the one matching the new SAS function.**
- **When placing a supply order for a mast ASSY, place order for sensors (for lifting height switch, load sensor, mast harness and other SAS related parts) simultaneously if such parts are required.**

FUNCTIONAL PARTS

Note:

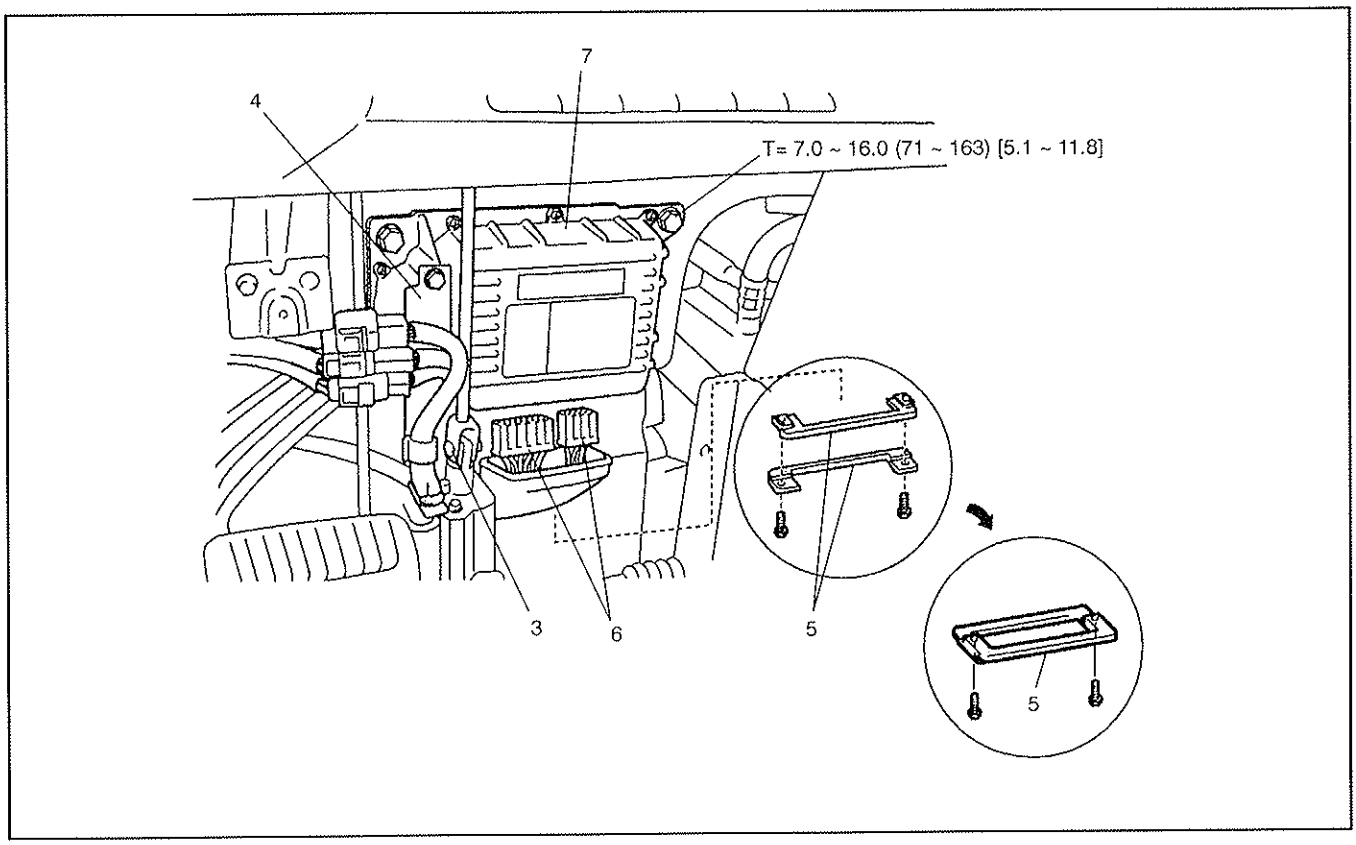
- **Read Section 7 for the steering wheel angle sensor and Section 14 for the oil control valve solenoids 1 and 2, forward tilt switch, backward tilt switch and the tilt lever knob switch.**
- **Checking of functional parts is described in the troubleshooting.**

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SAS CONTROLLER REMOVAL·INSTALLATION

Note:
SAS controller has a built-in yaw rate sensor. Care should be taken in handling it by preventing the dropping, contact with other objects and so forth. If dropped, replace with a new one. Don't apply the impact wrench in removing/installing the set bolts from/to the oil control lever valve connector bracket, connector boot bracket, and SAS controller.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.

2 Remove the lower panel.

3 Disconnect the tilt lever rod.

4 Remove the oil control valve connector bracket.

5 Remove the connector boot bracket.

6 Disconnect the connector.

7 Remove the controller.

Installation Procedure

Reverse the removal procedure.

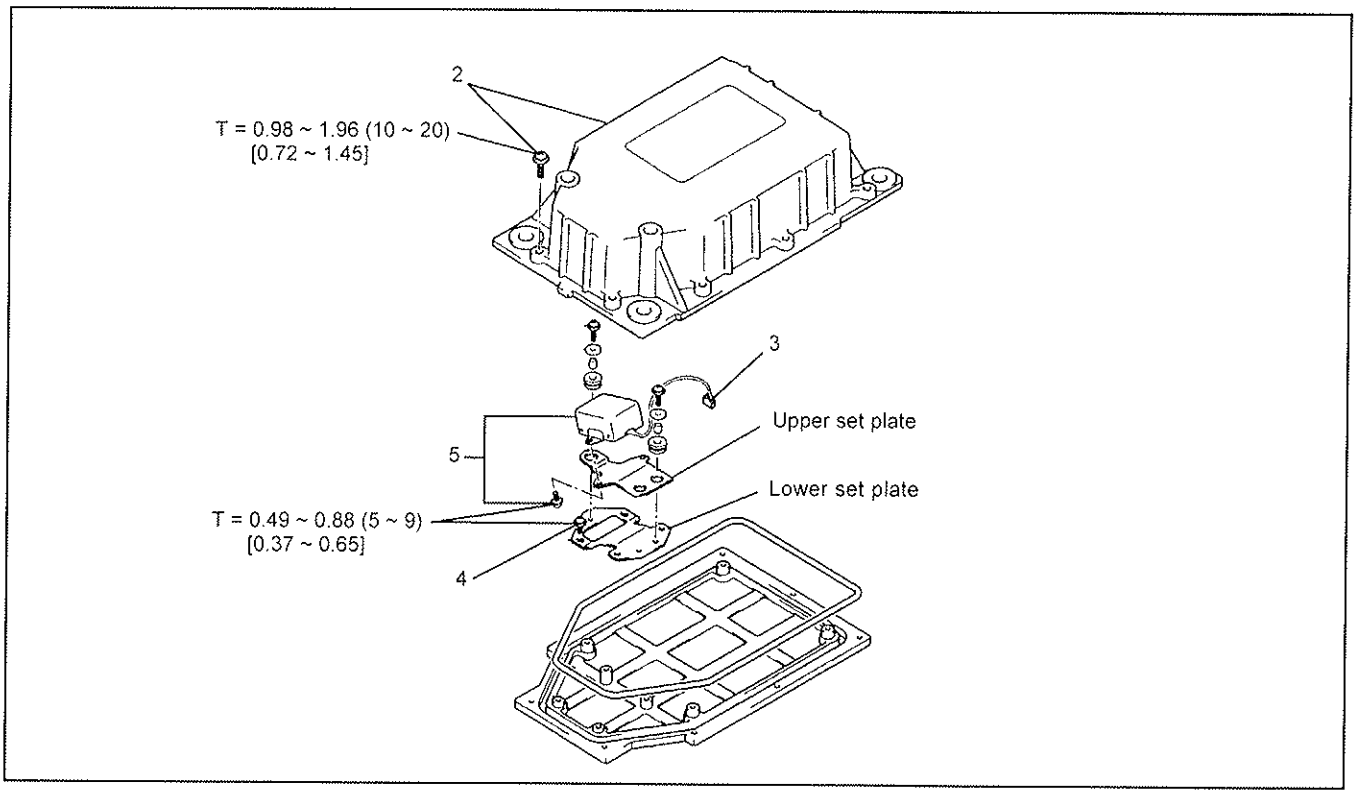
Note:
When the SAS controller is replaced, perform the re-setting (read 15-20).

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YAW RATE SENSOR REMOVAL·INSTALLATION

Note:
Take the utmost care so as not to give a shock or impact on the yaw rate sensor. Don't use an air impact wrench on controller parts wholly.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove SAS controller. (See page 15-11.)

2 Remove the cover. **[Point 1]**

3 Disconnect the jumper on the base print board connector. **[Point 2]**

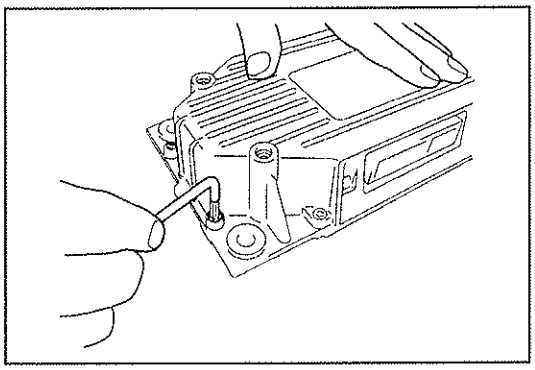
4 Loosen the lower set plate mount screw, and remove the yaw rate sensor together with the lower set plate. **[Point 3]**

5 Remove the yaw rate sensor mount screw, and separate the yaw rate sensor from the set plate. **[Point 4]**

Installation Procedure

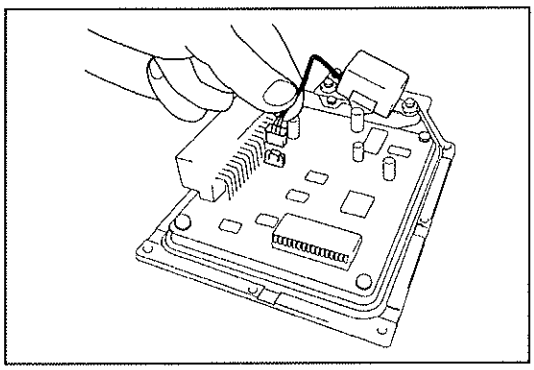
The installation procedure is the reverse of the removal procedure.

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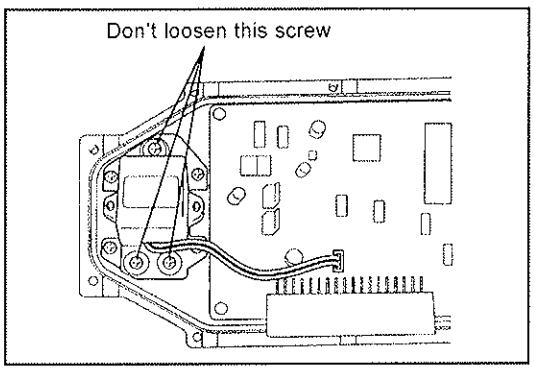


Point Operations

[Point 1]
Removal·Installation:
Use "Torx (size: Torx Tamper Proof T-20)" wrench.



[Point 2]
Removal·Installation:
When removing or installing the jumper, take care so as not to harm the base plate connector.
Insert firmly when installing. And avoid adverse contact such as to element.



[Point 3]
Removal:
Never separate the upper set plate from the lower set plate, in other words, don't loosen three pieces M3 screws.
If this screw is loosened, apply thread tightener (08833-76002-71 (08833-00080)) and tighten it to the specified torque.
T = 0.49 ~ 0.88 Nm (5 ~ 9 kgf-cm)
[0.36 ~ 0.65 ft-lbf]

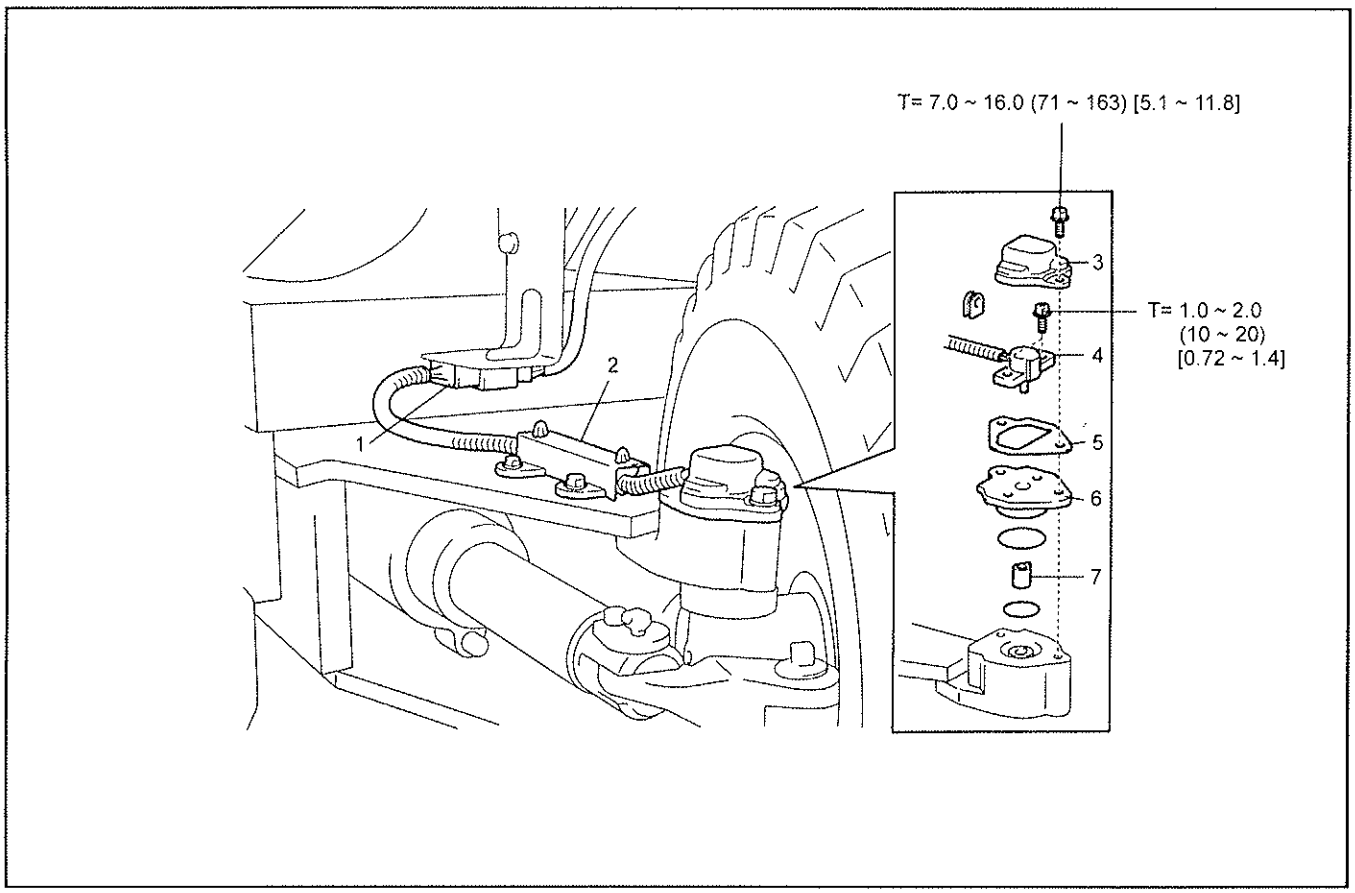
[Point 4]
Installation:
Don't change the direction (or orientation) on the yaw rate sensor when re-installation.

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TIRE ANGLE SENSOR REMOVAL·INSTALLATION

Note:
If play is generated between the tire angle sensor and the bushing, correct tire angle cannot be detected. Therefore, remove or install the sensor carefully in vertical direction. Don't remove the bushing unless necessary.

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Disconnect the connector.

2 Remove the harness protector.

3 Remove the sensor cover.

4 Remove the tire angle sensor.

5 Remove the gasket.

6 Remove the sensor base.

7 Remove the bushing.

Installation Procedure

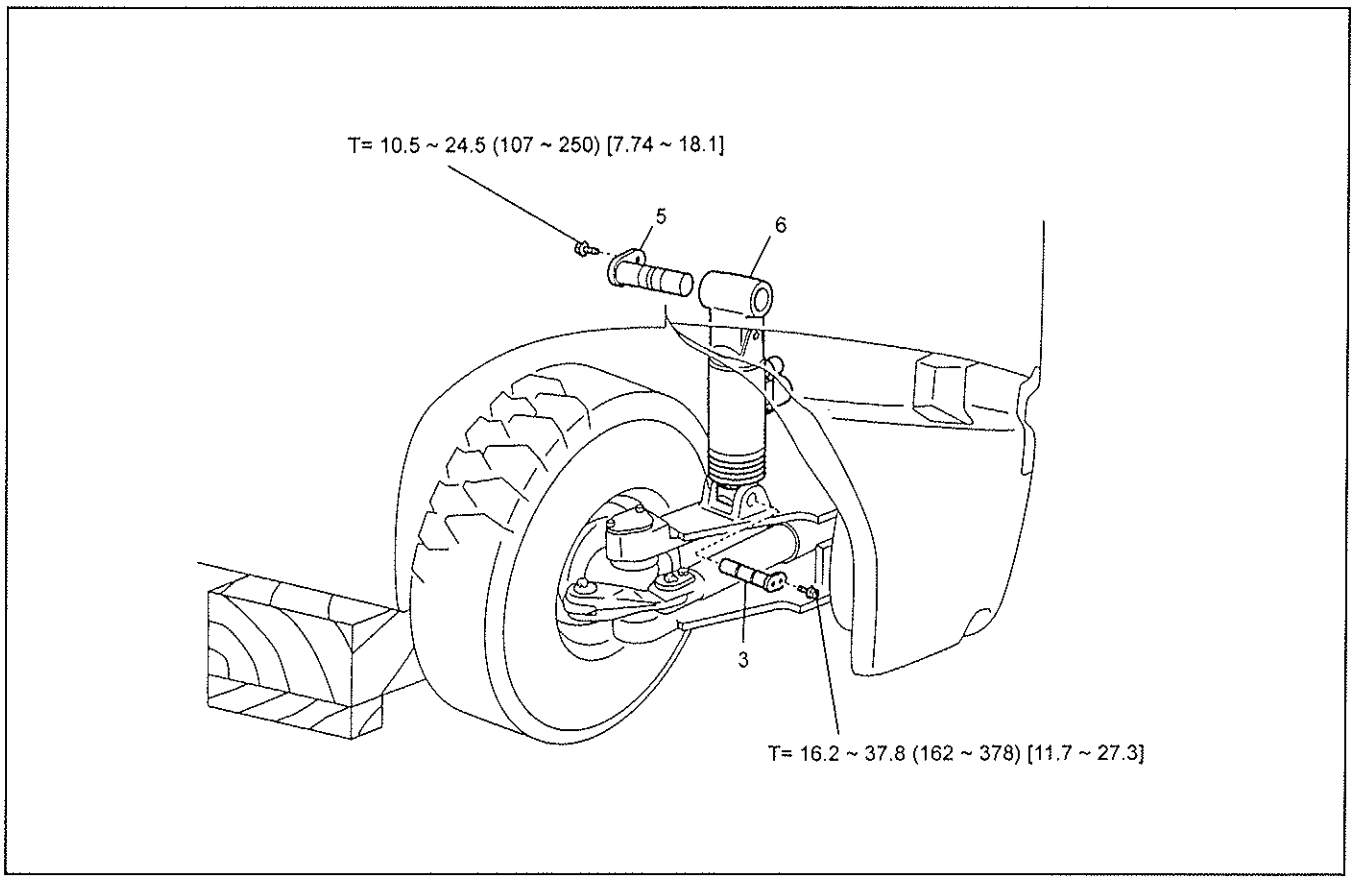
Reverse the removal procedure.

Note:
When the tire angle sensor or sensor cover is removed/installed or replaced, proceed with the re-setting procedure.

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SWING LOCK CYLINDER REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 This is not applicable to 1-ton series vehicles.
Remove the radiator.

2 Jack up the vehicle.

3 Remove the lower pin, swing lock cylinder.

4 Disconnect the swing lock solenoid connector.

5 Remove the upper pin, swing lock cylinder. **[Point1]**

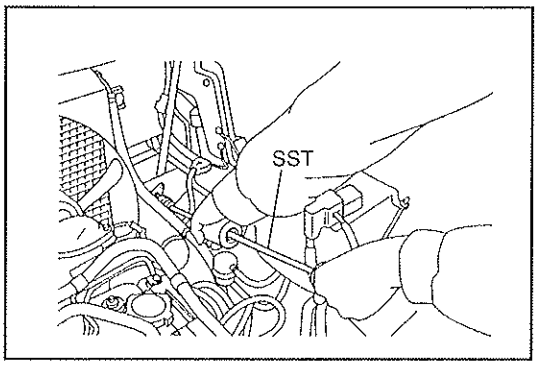
6 Remove the swing lock cylinder. **[Point 2]**

Installation Procedure

Reverse the removal procedure.

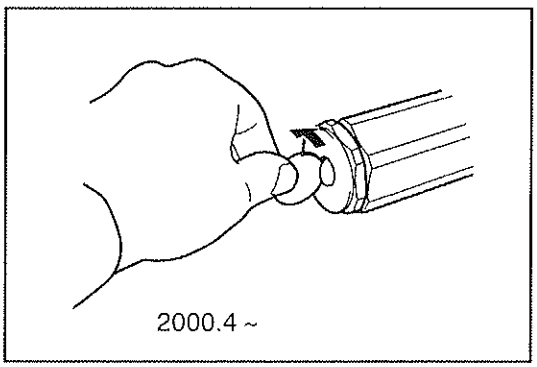
Note:
- **Apply chassis grease to the spherical portion of the upper pin and its mounting hole before installation.**
- **Apply thread tightener (08833-76001-71 (08833-00070)) to the threaded portions of the upper and lower pin set bolts before tightening them.**
- **After installation, apply chassis grease from the grease fitting.**

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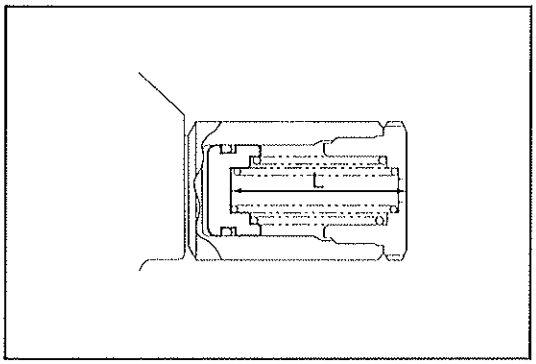


Point Operations

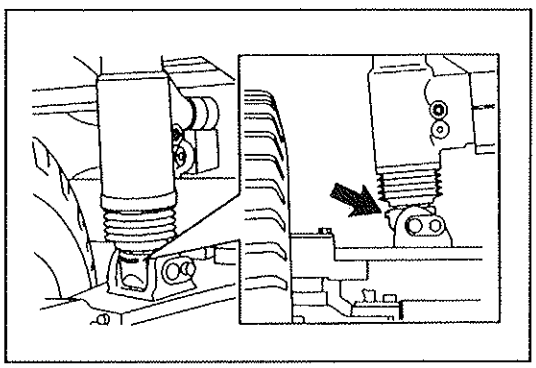
[Point 1]
Removal:
SST 09810-20172-71



[Point 2]
Inspection:
~ 2000.4 :
Remove the plug from the center at the end of the accumulator, and measure accumulator piston depth L.
Standard : 46 mm (1.81 in) (20°C (68°F))
Limit : 52 mm (2.05 in) (20°C (68°F))
If the limit value is exceeded, replace the swing lock cylinder ASSY.
After inspection, tighten the plug to be flush with the end face of the accumulator (do not tighten it excessively).



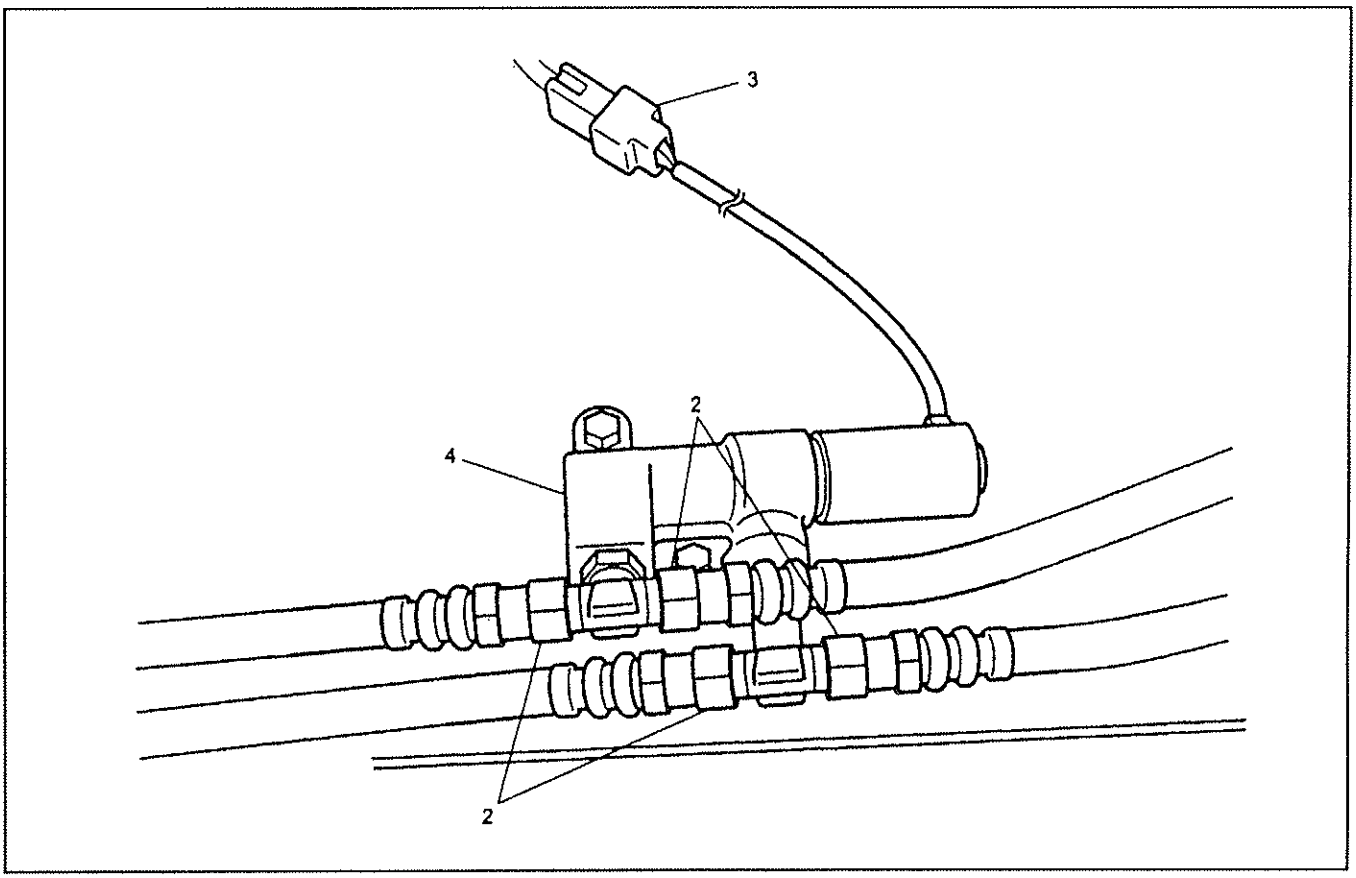
2000.4 ~ :
Remove the plug, with a coin (or a screw driver) from the center at the end of the accumulator. Measure accumulator piston depth L.
Standard : 46 mm (1.81 in) (20°C (68°F))
Limit : 52 mm (2.05 in) (20°C (68°F))
If the limit value is exceeded, replace the swing lock cylinder ASSY.
After inspection, push a plug in with a finger.



Installation:
Install with the mark (protruded portion) at the rod end facing outward.

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STEERING KNOB POSITION CORRECTING VALVE REMOVAL·INSTALLATION



Removal Procedure

1 Remove the under cover.

2 Disconnect the piping.

3 Disconnect the connector.

4 Remove the steering knob position correcting valve.

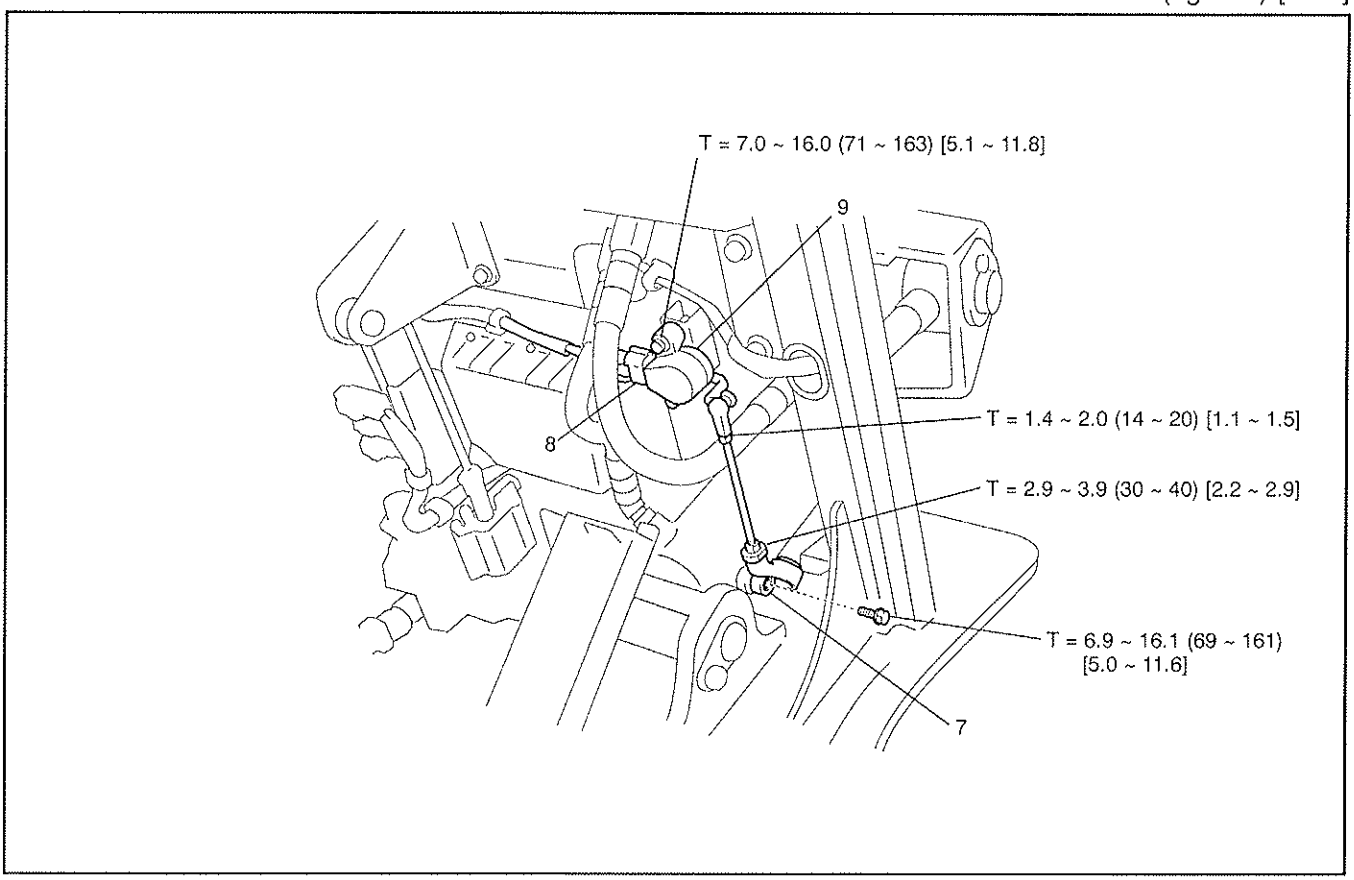
Installation Procedure

Reverse the removal procedure.

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TILT ANGLE SENSOR REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the toe board.

2 Remove the lower panel.

3 Remove the instrument panel (RH).

4 Remove the step.

5 Remove the side cover.

6 Remove the fender cover.

7 Disconnect the tilt angle sensor link.

8 Disconnect the connector.

9 Remove the tilt angle sensor.

Installation Procedure

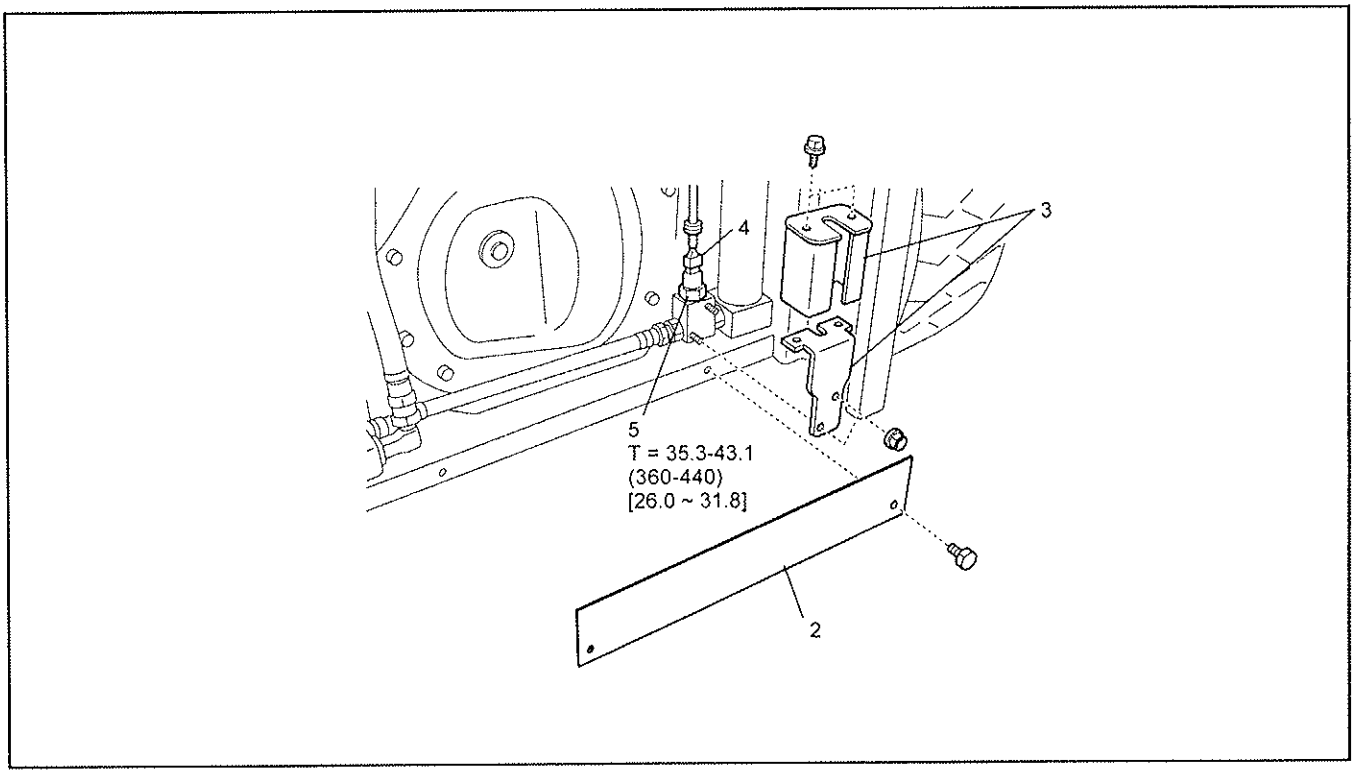
Reverse the removal procedure.

Note:
When the tilt angle sensor is remove/installed or replaced, or when the length of the tilt angle sensor link is adjusted or replaced, proceed with the matching/re-setting procedure.
(Read 15-20.)

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LOAD SENSOR REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Hoist the inner mast. **[Point 1]**

2 Remove the front hose cover.

3 Remove the sensor cover.

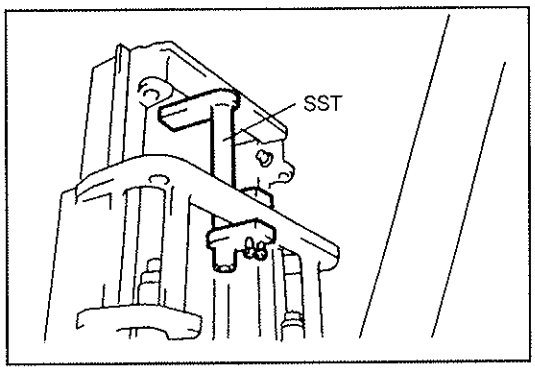
4 Disconnect the connector.

5 Remove the load sensor.

Installation Procedure

Reverse the removal procedure.

Note:
When the load sensor is replaced, proceed with the re-setting procedure. (Read 15-20.)



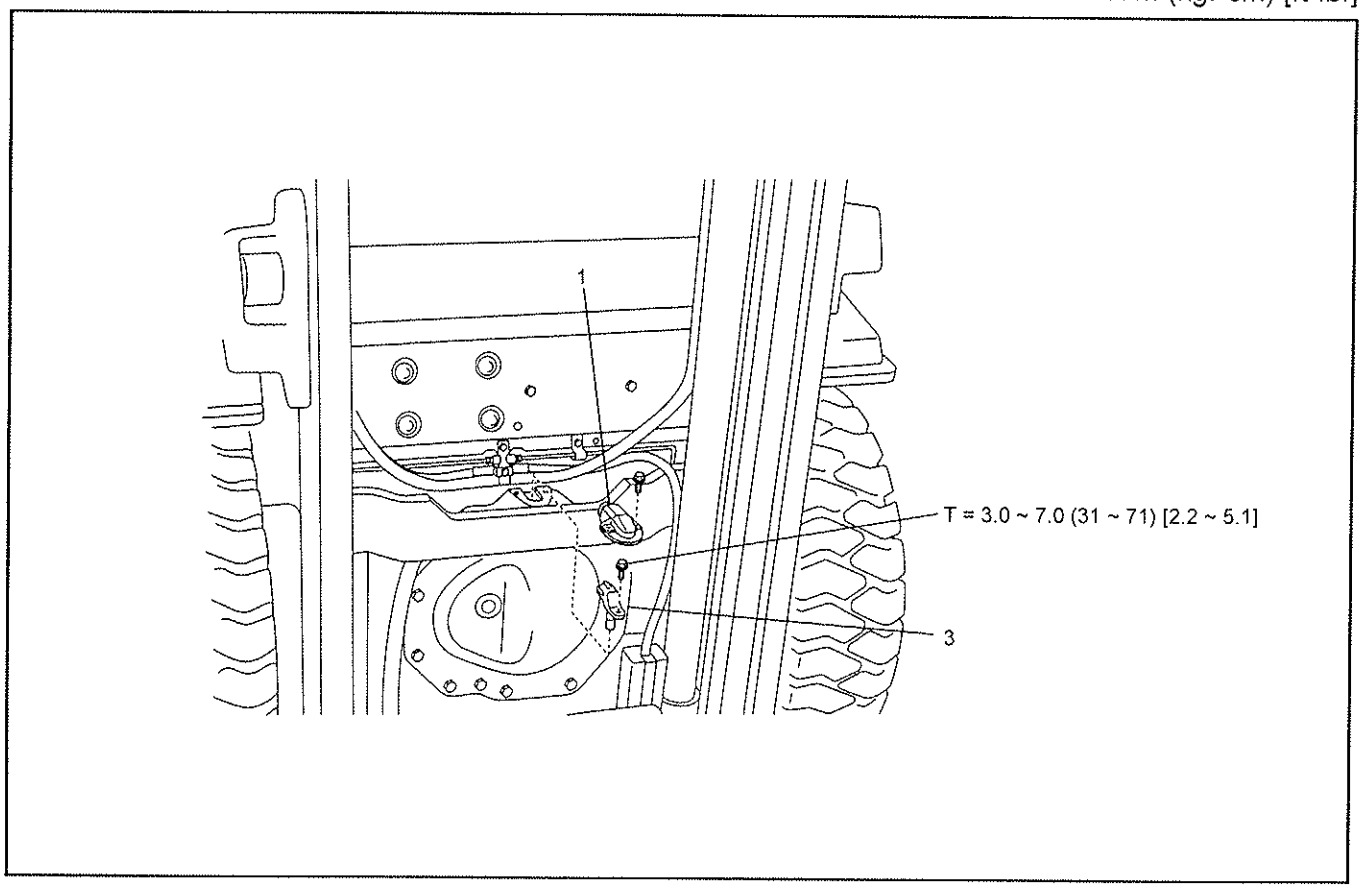
Point Operations

Removal·Installation:
Raise the inner mast, set SST to the outer mast tie beam and lower the inner mast until it makes contact with SST.
SST 09610-22000-71

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SPEED SENSOR REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]



Removal Procedure

1 Remove the speed sensor cover.

2 Disconnect the connector.

3 Remove the speed sensor

Installation Procedure

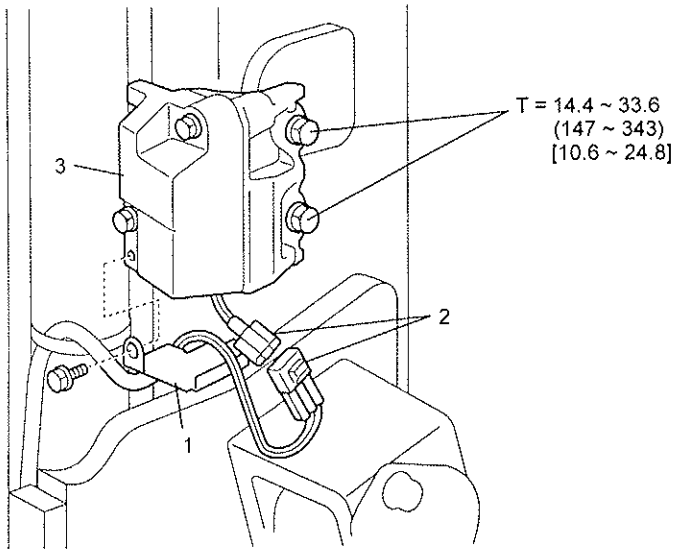
Reverse the removal procedure.

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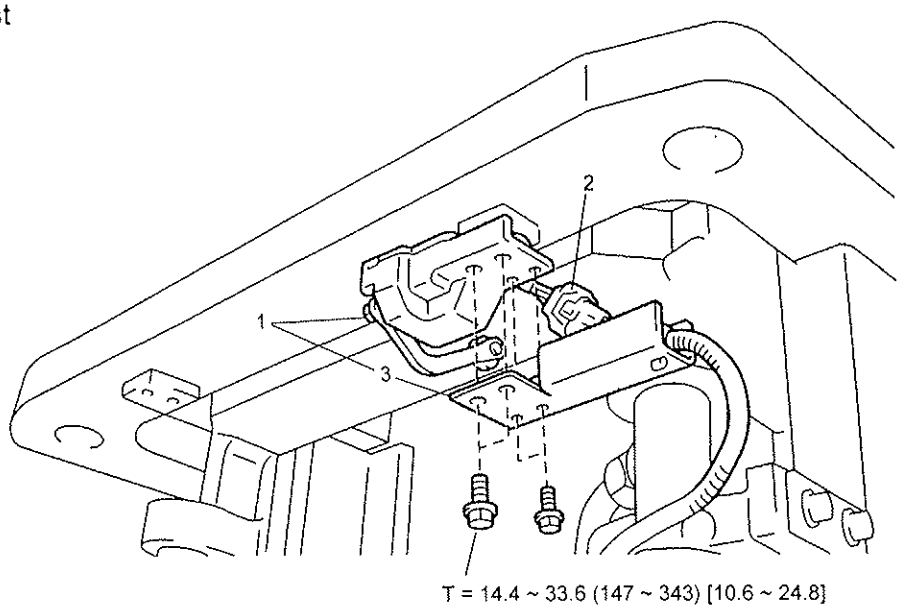
FORK HEIGHT SWITCH REMOVAL·INSTALLATION

T = N·m (kgf-cm) [ft-lbf]

V mast



FV·FSV mast



Removal Procedure

1 Remove the lower cover.

2 Disconnect the connector.

3 Remove the mast lifting height switch.

Installation Procedure

Reverse the removal procedure.

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RE-SETTING

Of the sensors used for SAS, the signal voltage values of the tilt angle sensor, load sensor and tire angle sensor are stored respectively to the SAS controller for control accordingly when the mast is in vertical state, in no-load state, or when the tire is for straight forward driving. Therefore, when making service for these sensors or replacing their parts, re-setting (updating of sensor signal voltage values in the standard vehicle condition) is required. Re-setting is also required for the tilt angle sensor when the vehicle attitude is sharply changed and for the load sensor when the weight changes sharply because of the addition/removal of the attachment.
Re-setting may be performed by using the hour meter and the tilt knob switch or plug-in analyzer (SST 09240-23320-71) (read 15-40).

	Re-setting required		
Object of re-setting	Fork stopping position with automatic leveling	• Forward tilting limit position • No-load standard load	Tire straight traveling position
Re-setting condition	Mast in vertical position	• Mast in vertical position*1 • No load	Tires in straight traveling position
Vehicle indication (hour meter)	SET1	SET2	SET3
Analyzer (SST) indication	TILT LEVEL	CONT-LOAD	TIRE
Object sensor / Work example	Tilt angle sensor	Tilt angle sensor and load sensor	Tire angle sensor
Replacement of SAS controller	○	○	○
Removal/Installation or replacement of tilt angle sensor	○	○	
Change of the length of tilt angle sensor rod or replacement	○	○	
Replacement of load sensor	○	○	
Removal/Installation or replacement of tire angle sensor or sensor cover			○
Change to other attachment	○	○	
Replacement of mast	○	○	
Replacement of tilt cylinder	○	○	
Adjustment of tilt cylinder uneven tilting	○	○	

*1: Perform re-setting with the mast in the vertical position since the controller calculated the limit position for forward tilting.

Note:
The tilt angle sensor re-setting value of SET1 determines the mast stop position under the automatic fork stop control at horizontal level. Accordingly, if the fork fails to stop at the horizontal level due to the service condition by the user (inclination of the floor, etc.), bring the mast vertical on the site and perform re-setting. (In such a case, the mast stop angle drifts on the level floor.)

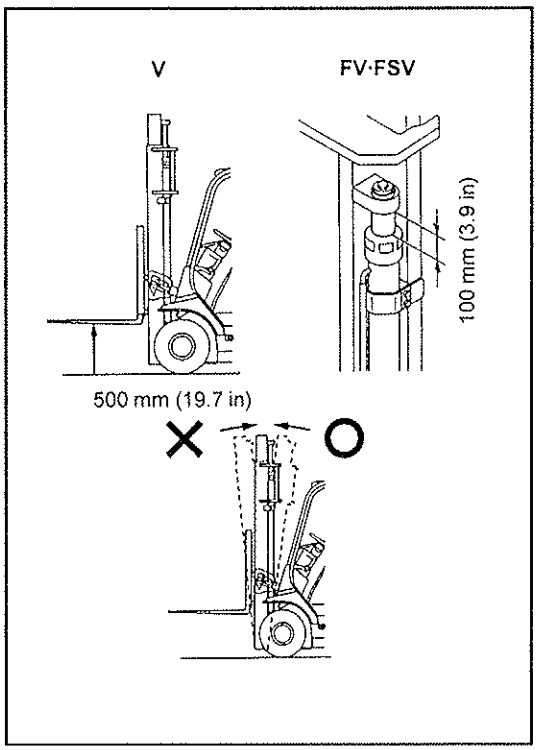
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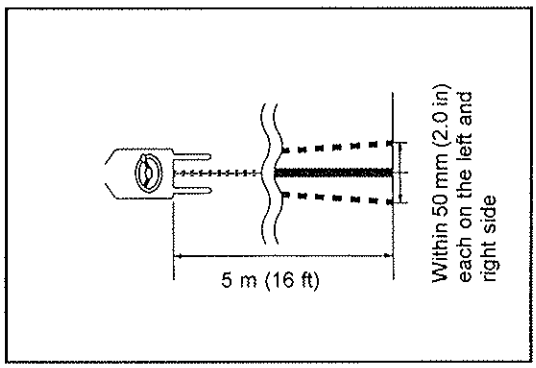
STANDARD STATE OF VEHICLE

If the surface on which re-setting is to be performed is slanted, error occurs to the standard state. Select a level floor without irregularity for re-setting.

Note:

The finishing accuracy of the floors for factories, warehouses and buildings in general calls for the floor inclination to be 0.5° or under. Therefore, re-setting on these floors is not affected. Don't perform re-setting on a floor that is inclined for over 0.5° for draining purpose.





Fork stop position with automatic leveling and forward tilting limit position

- Set the vehicle in the following condition so as to have the tilt angle sensor signal voltage value stored with the mast held vertical to the floor surface:Load sensor

No-load standard load

- Set the vehicle in the following condition so as to have the load sensor signal voltage value stored under no-load condition:

Standard:

- **Raise the fork to a height of 500 mm (19.7 in) for the V mast or raise the rear lift cylinder to a height of 100 mm (3.9 in) for the FV or FSV mast. Place a level (goniometer) at a height of 1200 to 1500 mm (47.2 to 59.1 in) on the front or rear side of the outer mast and set the mast in the vertical position.**
- **On a vehicle with attachment U61C241 or U61C281, set the mast vertical with the attachment at a height of 500 mm (19.7 in) and perform relief at the topmost position.**

Note:

- **Keep the fork or attachment installed on the vehicle.**
- **Set the mast vertical from a backward tilted position (not from the forward tilted position).**
- **In case of a detachable attachment, keep the attachment installed on the vehicle.**

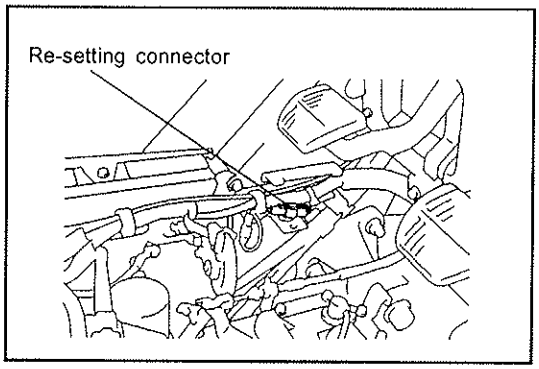
Tires in straight traveling position

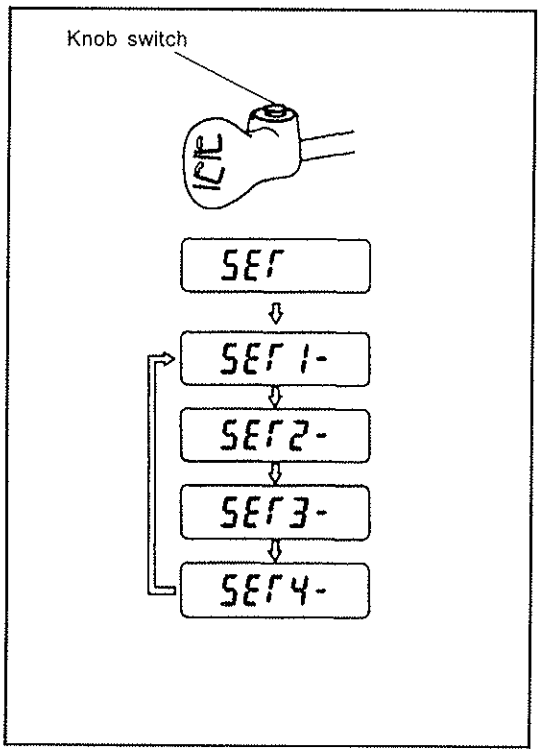
- Set the vehicle in the following condition so as to have the tire angle sensor signal voltage value stored with the tire in straight position.

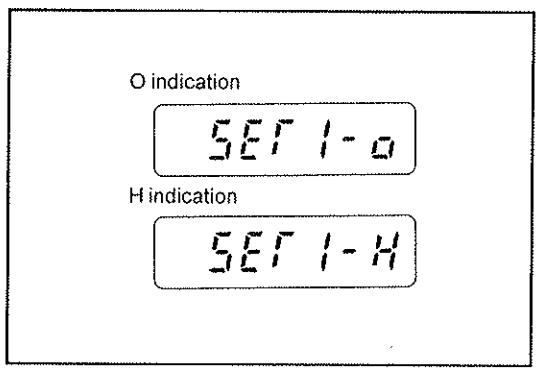
Standard:

Align the center of the vehicle to the line on the level road surface and drive the vehicle for 5 meters (16 ft) with the steering handle fixed. And the center of the vehicle stays within 50 mm (2.0 in) each to the left and the right.

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RE-SETTING PROCEDURE

Note:
Turning the key switch ON (or starting engine) after disconnecting the re-setting connector causes an error (error code 41) to be displayed and stored to the controller, for which care must be taken.

1. Turn the key switch ON (or start the engine).
2. Disconnect the re-setting connector (orange color).
   (1) The hour meter display reads "SET" and the SAS lamp turns ON. (The buzzer sounds.)
3. Press the knob switch until the re-setting mode (SET1 is displayed) is displayed (2 seconds or over).
4. Display the set number subject to the re-setting.
   (1) Set number display changes sequentially each time the knob switch is pressed for less than 2 seconds.

Note:
Pressing the knob switch 2 seconds and over will run the re-setting, for which care should be taken.

Set No.	Object of re-setting
SET1	Fork stop position with automatic leveling
SET2	Forward tilting limit position and no-load standard load
SET3	Tires in straight traveling position
SET4 *1	—

*1: Indication may be made but actually it is not used.

5. Set the sensor of the display set number to the standard state (or check if it is in the standard state). Read 15-21 page.
6. Press the knob for 2 seconds or more and execute re-setting.

   O indication: Re-setting is completed. (SAS lamp starts to blink)
   H indication: Check for the sensor abnormality, disconnection of the harness and the short-circuit since the signal voltage value is outside the re-setting rang. (Read the troubleshooting section.)

Note:
- **For re-re-setting, repeat Step 6.**
- **To make a separate re-setting, repeat Steps 4 to 6.**

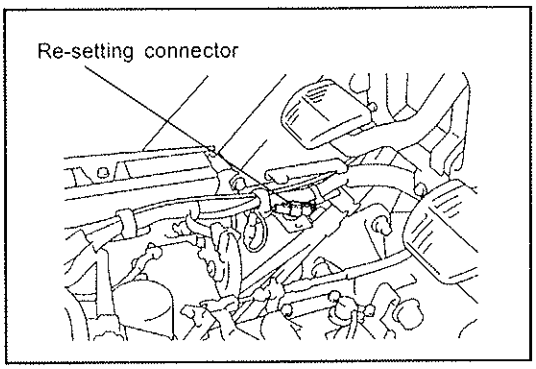
7. Connect the re-setting connector and turn the key switch OFF.

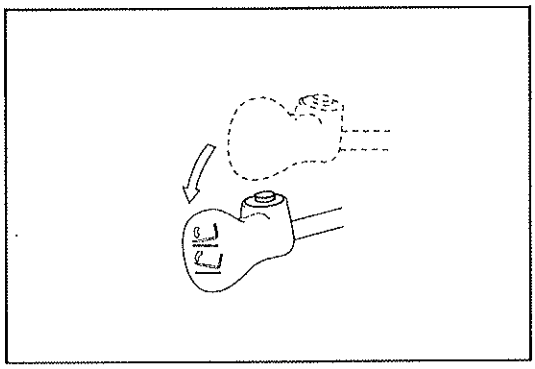
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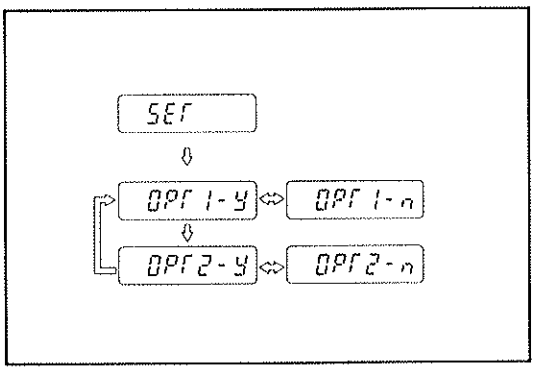
CUSTOMIZE

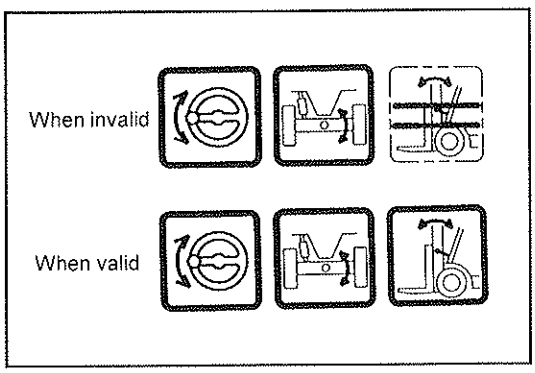
The customize function is to invalidate the mast forward tilting angle control. There are two methods to do this; one is to use the hour meter and tilt knob switch and the other method is to use the plug-in analyzer (SST). (See 15-24.)

Caution:
When the customize is changed, maintain the caution label of "CAUTION FOR OPERATION."









CUSTOMIZE PROCEDURE

Note:
Turning the key switch ON (or starting engine) after disconnecting the re-setting connector causes an error (error code 41) to be displayed and stored to the controller, for which care must be taken.

1. Turn the key switch ON (or start the engine).
2. Disconnect the re-setting connector.
   (1) The hour meter display reads "SET" and the SAS lamp turns ON. (The buzzer sounds.)
3. Set the tilt lever to backward tilt for 5 seconds and over. Then press the knob switch until the option set mode (OPT1 is displayed) is displayed (2 seconds and over), then return the lever.
4. Display the option number to change the option set.
   (1) Set number display changes sequentially each time the knob switch is pressed for less than 2 seconds.

Option No.	Control name
OPT1	Mast forward tilt angle control
OPT2*	—

*:Displayed but not in use.

5. Keep the knob switch pressed until the SAS lamp starts blinking (for 2 seconds or over) to change y to n, and n to y.

   y: Control valid
   n: Control invalid

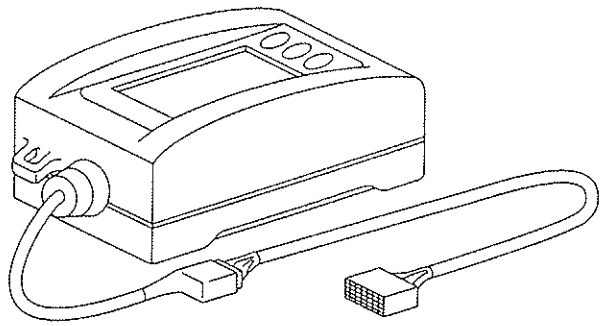
6. Connect the re-setting connector and turn the key switch OFF.
7. Perform the maintenance of caution label.
   If the control is invalidated:
   Remove the pertinent validation indication to replace with invalid indication.
   If the control is validated:
   Replace the caution label to indicate valid control.

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PLUG-IN ANALYZER

For the maintenance and service of SAS functions, a separate type plug-in analyzer is introduced as an SST (Special Tool for Service).
The plug-in analyzer is designed to read the operating state of sensors and actuators used for the SAS functions and the error information detected by the controller. It serves to check on the operating state of SAS functions and shortens the repair time for a trouble. Moreover, it is installed with save function to file data displayed on the screen in the SST.

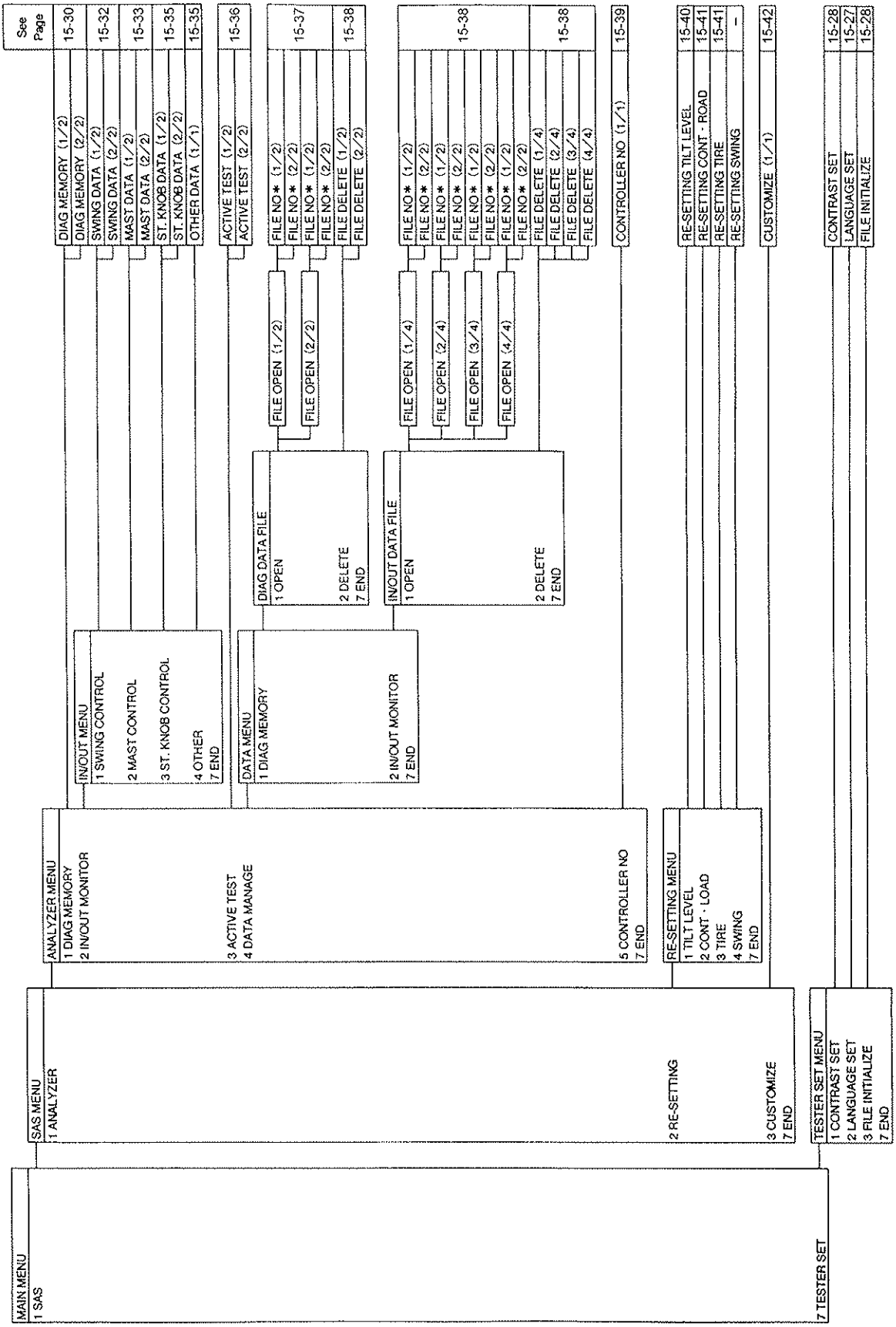
SST 09240-23320-71



	Menu name			Content of function	Save function	Reference page
Communication function with the SAS controller on the vehicle side	SAS/SAS	ANALYZER	DIAG MEMORY	Indication of ten error codes and sub-codes in past.	○	15-29
			IN/OUT MONITOR	Monitoring input voltage value from the sensors and the output signal, etc. to the solenoid, etc.	○	
			ACTIVE TEST	Forced operation of solenoids and warning lamps.		
			DATA MANAGE	Display and erasure of save screen		
			CONTROLLER NO	Reading controller part number, ROM part number and controller manufacturing number.		
		RE-SETTING		Implementation of re-setting (updating the sensor signal voltage value in the vehicle standard state).		15-40
		CUSTOMIZE		Setting valid/invalid of forward tilt restriction control		15-42
Functions of main unit	TESTER SET	CONTRAST SET		Adjustment of the screen contrast		15-26
		LANGUAGE SET		Change to the display language.		
		FILE INITIALIZE		Main unit data initialization		

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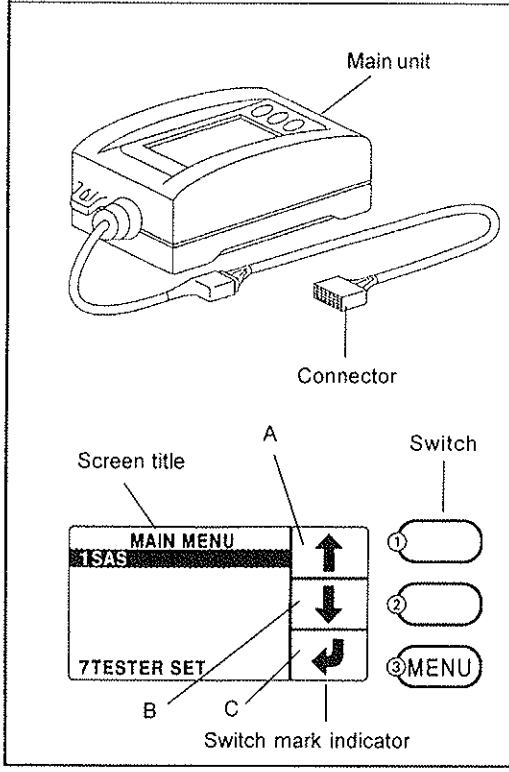
Screen Configuration



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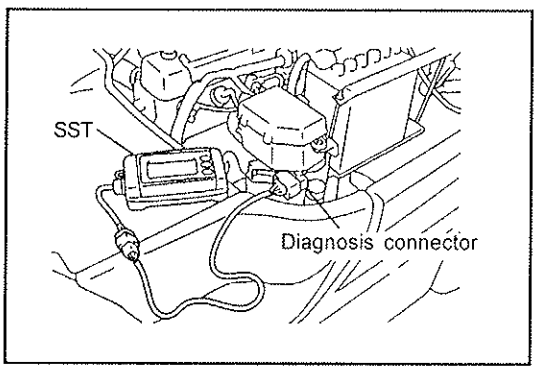
BASIC OPERATION

Name of Sections and the Switch Functions

Name of section	Position of indication	Mark	Function	Switch
	A	⬆	• Move the cursor to the above item. • Move to the preceding page.	Selector switch ①
		⬌	• Move the cursor to right or left.	
		SAVE	• Save the screen.	
		SET	• Re-set the display screen.	
		START	• Initialize the file.	
		<Blank>	<No function>	
	B	⬇	• Select the item below. • Move to the following page.	Selector switch ②
		<Blank>	<No function>	
	C	↵	Determine an item for selection.	Menu switch ③
		<Blank>	• Move to MENU screen.	

Caution on using:

- **Keep the main unit, wire harness, connector, etc. away from the exhaust and other heated sections.**
- **Operate the switch with finger tip.**
- **Don't give it strong impact from dropping or collision.**
- **Don't leave it under the direct rays of the sun for long time.**

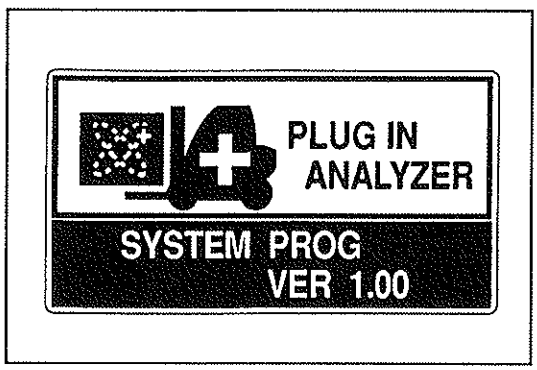


Connection and Operation of SST

1. Turn the key switch OFF.
2. Open the diagnosis connector cover of the vehicle and properly connect the connector on the SST side.
   SST 09240-23320-71

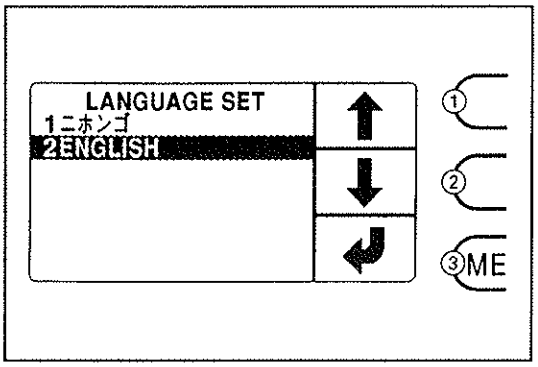
Note:
Since the connector has no locking device, securely connect it to prevent contact defect upon closing the engine hood with the connector in connected state.

3. Turn the key switch ON or start engine.



4. Display of the initialization screen
   After about 15 seconds of display, "LANGUAGE SET" or "MAIN MENU" screen appears. The screen may be changed during this period by pressing the menu switch ③.

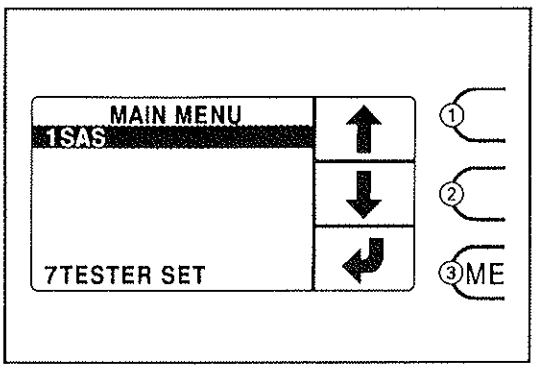
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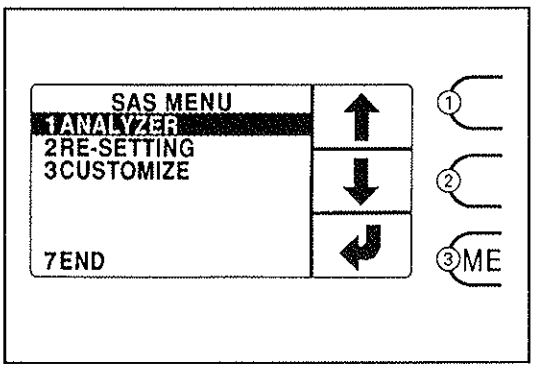
5. "LANGUAGE SET" screen
Since this screen appears only when the language is undefined, determine a language to use for display.
(1) Select a display language by pressing selector switch ① and ②.
- Japanese
- English

(2) Press MENU switch ③ to determine the language setting.

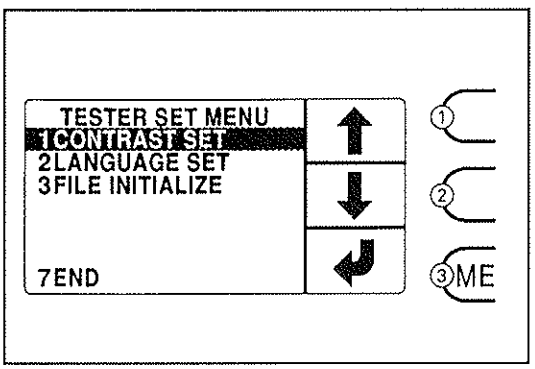
Note:
Once the display language is defined, "LANGUAGE SET" screen will not be displayed from the next time onward. To change language, go to Step 8 "TESTER SET."



6. "MAIN MENU" screen
(1) Select the menu using selector switch ① and ② and determine by pressing menu switch ③.
- SAS/SAS: Moves to SAS MENU screen. (Step 7)
- TESTER SET: Moves to TESTER SET screen. (Step 8)

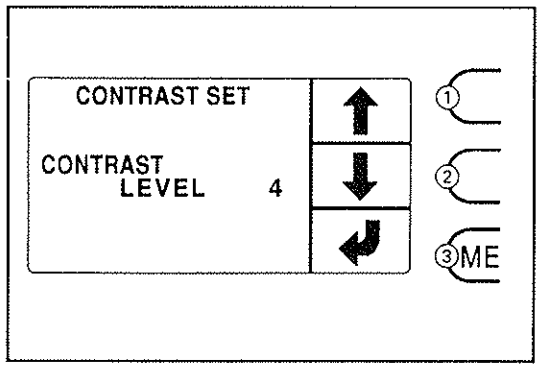


7. "SAS MENU" screen
(1) Select the menu using selector switch ① and ② and determine by pressing menu switch ③.
- ANALYZER: Moves to ANALYZER MENU screen.
- RE-SETTING: Moves to RE-SETTING screen.
- CUSTOMIZE: Moves to CUSTOMIZE (1/1) screen.
- END/END: Returns to MAIN MENU screen.

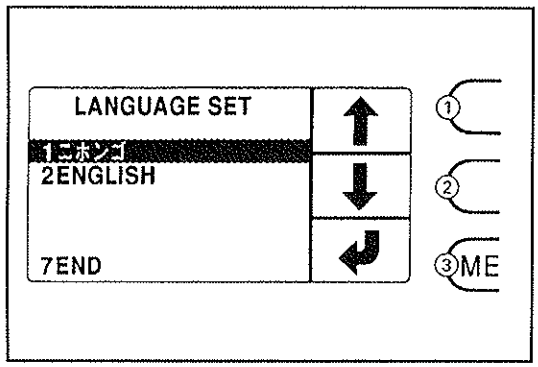


8. "TESTER SET" screen
(1) Select the menu using selector switch ① and ② and press MENU switch ③ to determine the setting.
- CONTRAST SET: Moves to CONTRAST SET screen for contrast adjustment. (Read Step 9.)
- LANGUAGE SET: Moves to LANGUAGE SET screen for changing language. (Read Step 10.)
- FILE INITIALIZE: Moves to FILE INITIALIZE screen for a total erasure of the main unit data. (Read Step 11.)
- END: Returns to MAIN MENU screen.

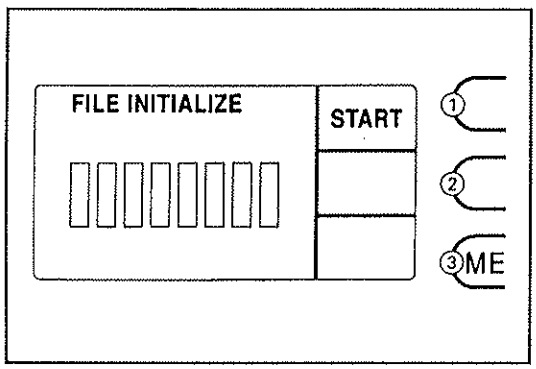
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9. "CONTRAST SET" screen
   (1) Select the level of contrast using selector switch ① and ②.
   Contrast level: (Light) 1 2 3 4 5 6 7 8 (Dark)
   (2) Press the menu switch ③ to determine the setting. Then "SAVING→COMPLETE" appears to the message column and the screen returns to INITIAL SET MENU.



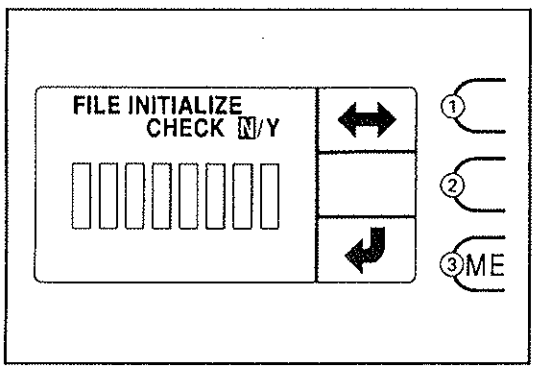
10. "LANGUAGE SET" screen
   (1) Select other language using selector switch ① and ②.
   • Japanese
   • English
   (2) Press MENU switch ③ to determine the setting. Then "SAVING→COMPLETE" appears in the message column.
   (3) Select END by selector switches ① and ② and press MENU switch ③. The INITIAL SET MENU screen reappears.



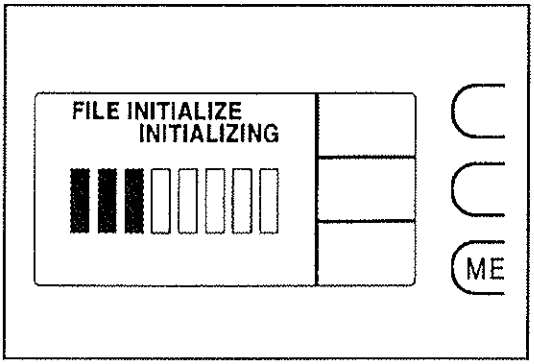
11. "FILE INITIALIZE" screen

Note:
Check the databeforehand because the main unit data is initialized.

   (1) Have the message displayed on the screen by pressing selector switch ①.

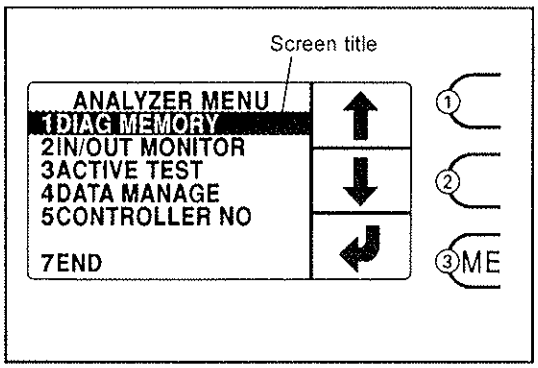


   (2) Select an item using selector switch ① and determine by pressing MENU switch ③.
   N: File initialization can be cancelled.
   Y: Starts file initialization. Initialization ends when INITIALIZING→COMPLETE appears to the message column.



   (3) Press MENU switch ③ to return to the TESTER SET MENU screen.

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Removal of SST

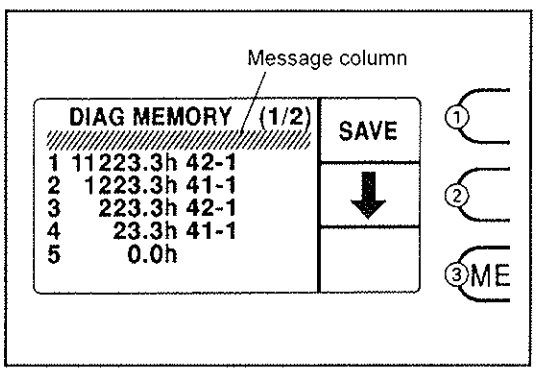
1. Check that the screen title is for one of the MENU screens.
2. Turn the key switch OFF.
3. Disconnect the connector.

Note:
To disconnect, hold the body of the connector.

4. Close the diagnosis connector cover.

ANALYZER

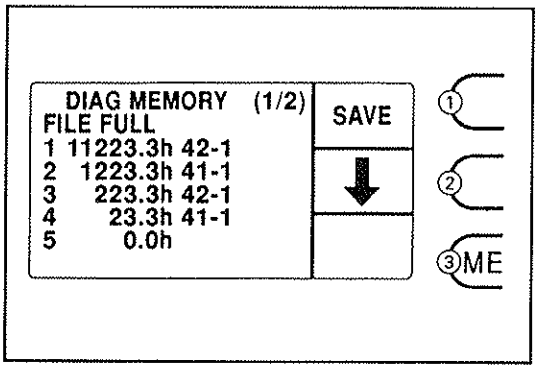
ANALYZER MENU			Content of display and function	Save function	Page
1 DIAG MEMORY			Indicates ten error codes and the time of error generation in the past.	Yes*1	15-30
2 IN/OUT MONITOR	IN/OUT MENU	1 SWING DATA	Indicates the swing control-related controller data.	Yes*2	15-32
		2 MAST DATA	Indicates the TILT control-related controller data.	Yes*2	15-33
		3 ST. KNOB DATA	Indicates the KNOB control-related controller data.	Yes*2	15-35
		4 OTHER	Indicates other controller data.	Yes*2	15-35
3 ACTIVE TEST			Forcibly outputs operating signal to a selected item.		15-36
4 DATA MANAGE	DATA MENU	1 DIAG MEMORY	Indicates and erases DIAG MEMORY saved data. (Display screen of *1)		15-37
		2 IN/OUT MONITOR	Indicates and erases IN/OUT MONITOR saved data. (Display screen of *2)		15-37
5 CONTROLLER NO			Indicates SAS controller part number, ROM part number and manufacturing number.		15-39



Save function

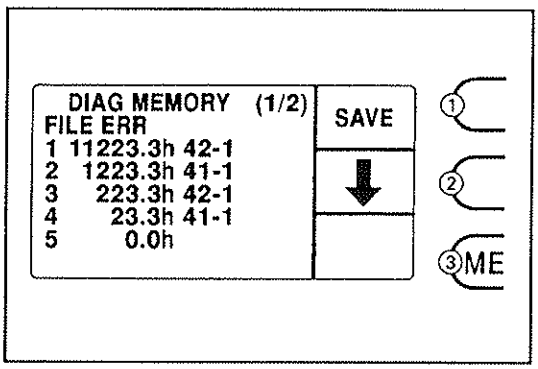
In the screen *1 and *2 in the table, pressing selector switch ① saves the content to respective menu of "4 DATA MANGE." Upon running the SAVE function, "SAVING" appears to the message column and "FILE*/COMPLETE FILE*"(* representing the number in the file) appears when the saving normally ends. After checking the file number, press MENU switch ③ to return to "ANALYZER MENU" screen.

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Other messages

- FILE FULL: Since no free number is available in "FILE MANAGE", press MENU switch ③ to return to "ANALYZER MENU" screen and erase unnecessary files.

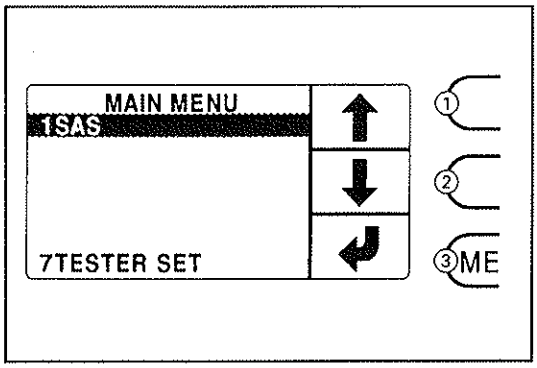


- FILE ERR: Saving disabled for an error.

  [Action]
  (1) Press selector switch ① to re-run the saving.
  (2) If FILE ERR is displayed again, some abnormality exists in the file. To recover from the abnormal state, initialize the main unit data on the FILE INITIALIZE screen. (See the step 11 on page 15-28.)

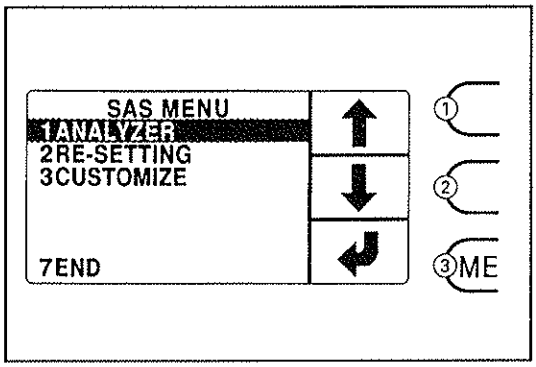
Note:
Since all main unit data is initialized upon FILE INITIALIZE, check the data beforehand.

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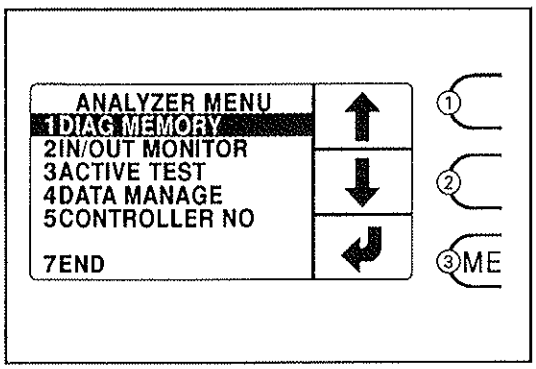


OPERATING PROCEDURE

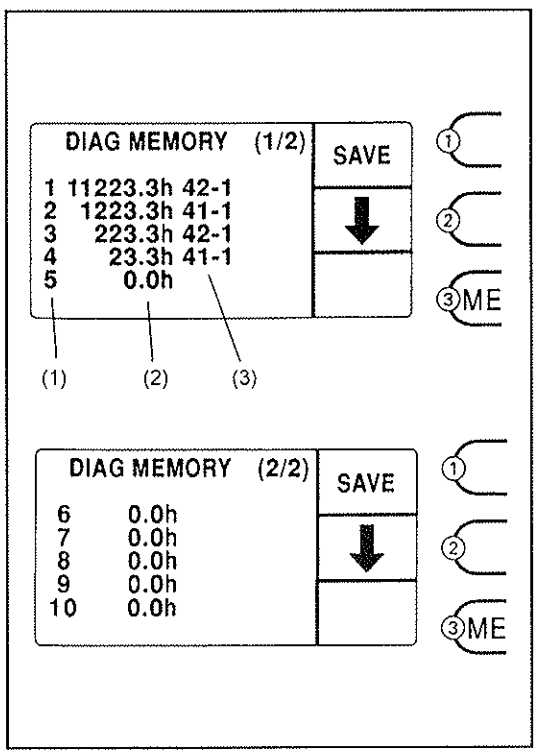
1. Select and enter "1 SAS" in MAIN MENU screen to have "SAS MENU" displayed on the screen.



2. Select and enter "1 ANALYZER" in SAS MENU screen to have "ANALYZER MENU" displayed on the screen.



3. "ANALYZER MENU" screen
   (1) Using selector switch ① and ② move the cursor to a desired menu in "ANALYZER MENU" screen and enter by pressing MENU switch ③.
   (2) Select and enter "END" to return to "SAS MENU" screen.



"1 DIAG MEMORY"
This screen displays the hour meter time for generated errors and ten latest error codes and sub-codes sequentially in two separate screens.

[Descriptions on the contents of display]
(1) Sequence of error generation
(2) Hour meter time for error generation
(3) Error code

[Transfer of page]
Selector switch ②

[End]
Press MENU switch ③ and return to "ANALYZER MENU" screen.

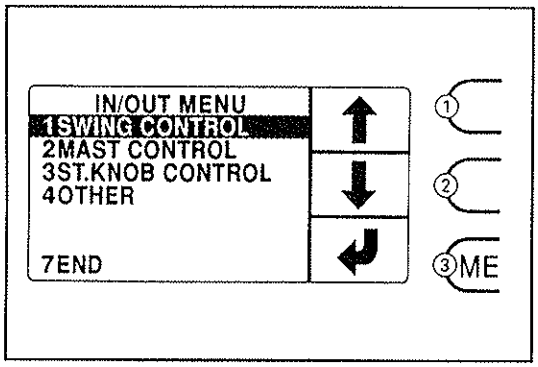
[SAVE]
Press selector switch ① from any screen to save the two screens as one file.

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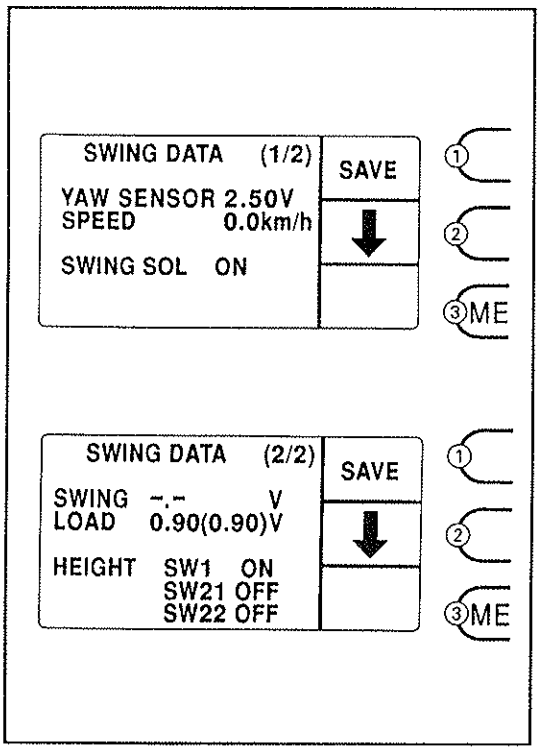
"2 IN/OUT MONITOR"

This menu has the following menus in addition: swing control, TILT control, ST. KNOB control and other. It can display the following data on the screen:

Menu name	Content of display
1 SWING CONTROL	Indicates the swing control-related sensor analog input voltage, switch input state, controller internal calculation value and the signal state to the solenoid.
2 MAST CONTROL	Indicates the TILT control-related sensor analog input voltage, switch input state and the signal state to the solenoid.
3 ST. KNOB CONTROL	Indicates the ST. KNOB control-related sensor analog input voltage, switch input state, controller internal calculation value and the signal state to the solenoid.
4 OTHER	Indicates the controller input voltage, hour meter value, RE ADJUST CONNECTOR state and DIAG PIN state.



1. Select and enter "2 IN/OUT MONITOR" in "ANALYZER MENU" screen to have "IN/OUT MENU" displayed on the screen.
2. Move the cursor to the desired menu by using selector switches ① and ②, and determine by pressing MENU switch ③.
   • END: Return to "ANALYZER MENU."



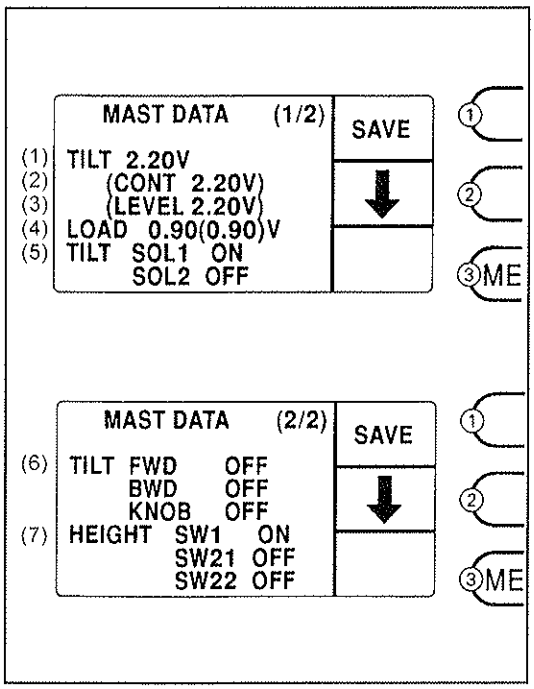
1. SWING DATA

[Descriptions on the content of display]

(1) YAW SENSOR: Yaw rate sensor input voltage
(2) SPEED: A speed calculated and recognized by the controller from the speed sensor signals. (NG is indicated for abnormality.)
(3) SWING SOL: Output signal to the swing solenoid.
ON for energization: Swing lock resetting
OFF for de-energization: Swing lock application
(4) SWING: -
(Unused)
(5) LOAD: Load sensor input voltage. (Parentheses) represent the re-setting voltage.
(6) HEIGHT SW 1: Lifting height switch 1 input signal
SW21: Lifting height switch 21 input signal
SW22: Not set

See page 15-34 for the relationship between the fork height and the fork height switch (ON/OFF).

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2. MAST DATA

[Descriptions on the content of display]

(1) TILT: Tilt angle sensor input voltage.
(2) CONT: R-setting voltage (CONT-LOAD)
(3) LEVEL: Re-setting voltage (TILT LEVEL)
(4) LOAD: Pressure sensor input voltage. (Parentheses) represent the re-setting voltage.
(5) TILT SOL1: Output signal to tilt solenoid 1.
SOL2: Output signal to tilt solenoid 2.

The tilt solenoid output signal ON indicates energization, and OFF de-energization. The combinations are shown in the table below.

~ 2000.11

		SOL1	
		OFF	ON
SOL2	OFF	**Semi-open circuit** • High lift height Rear tilt speed control • Low lift height Rear tilt speed control* • Front tilt	**Tilt stop circuit** • Tilt lever neutral • Front tilt angle restrain & stop • Fork leveling & automatic stop
	ON	**Full open circuit** • Low lift height Rear tilt	Not applicable

*: Rear tilting operation with the tilt lever knob depressed.
Example: If SOL1 is ON and SOL2 is OFF, the tilt hydraulic circuit is considered to be in the state of tilt stop circuit.

2000.11 ~

SOL		
OFF	ON	
Full open circuit: • Low lift height Backward tilt • Forward tilt	**Semi-open circuit:** • High lift height Backward tilt speed control • Low lift height Backward tilt speed control*	**Tilt stop circuit:** • Tilt lever neutral • Forward tilt angle restrain & stop • Fork leveling & automatic stop

*: Backward tilt operation with the tilt lever knob depressed.

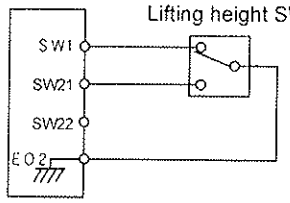
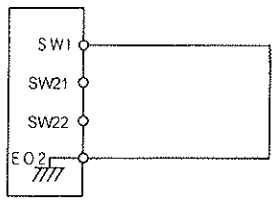
(6) TILT FWD: Tilt forward switch input signal.
BWD: Tilt backward switch input signal.
KNOB: Tilt knob switch input signal.
(7) HEIGHT SW 1: Lifting height switch 1 input signal.
SW21: Lifting height switch 21 input signal.
SW22: Not set.

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[Transfer of page]
Selector switch ②

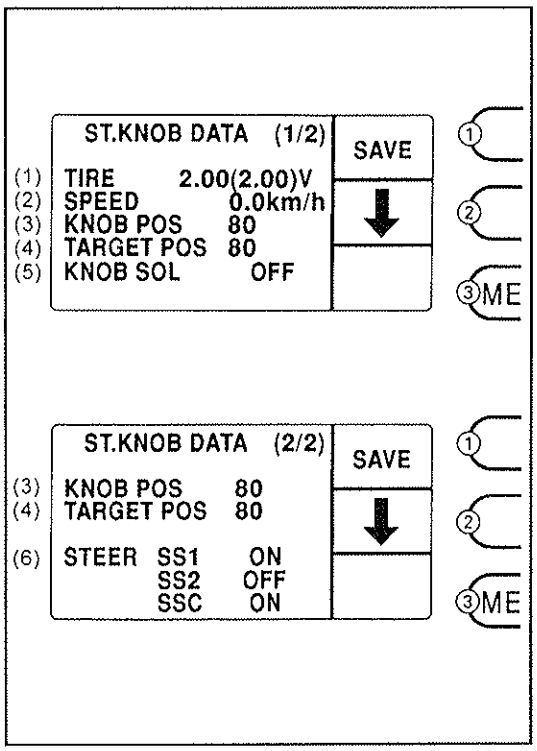
[End]
Press MENU switch ③ to return to "IN/OUT MENU" screen.

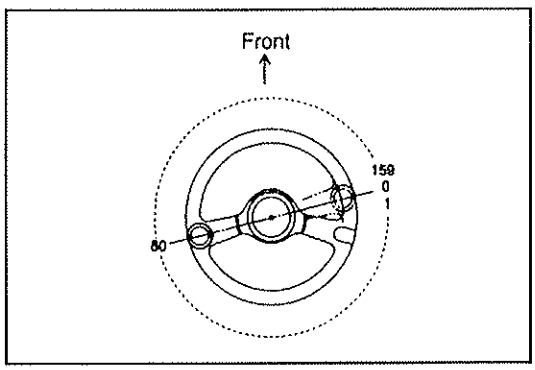
[SAVE]
Pressing selector switch ① from any screen saves the contents of two screens as one file.

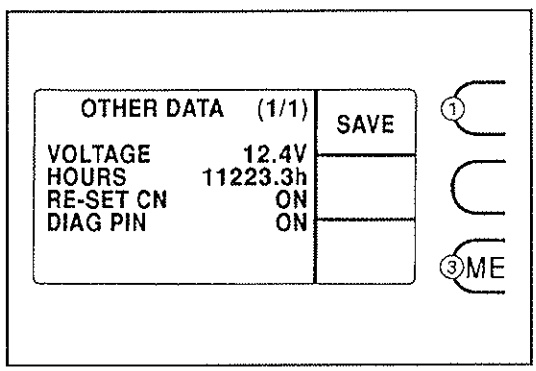
<table>
<tr><td rowspan="2"></td><td colspan="2">With lifting height SW provided</td><td colspan="2">Without lifting height SW provided*</td></tr>
<tr><td colspan="2">SAS controller
Lifting height SW1
 
</td><td colspan="2">SAS controller
 
</td></tr>
<tr><td rowspan="3">Low fork height</td><td>SW1</td><td>ON</td><td>SW1</td><td>ON</td></tr>
<tr><td>21</td><td>OFF</td><td>21</td><td>OFF</td></tr>
<tr><td>22</td><td>OFF</td><td>22</td><td>OFF</td></tr>
<tr><td rowspan="3">High fork height</td><td>SW1</td><td>OFF</td><td>SW1</td><td>ON</td></tr>
<tr><td>21</td><td>ON</td><td>21</td><td>OFF</td></tr>
<tr><td>22</td><td>OFF</td><td>22</td><td>OFF</td></tr>
</table>

*: Specification, "Without lifting height SW" has not been applied to your destination.

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3. ST. KNOB DATA

[Descriptions of display content]

(1) TIRE: Tire angle sensor input voltage. (Parentheses) represent the re-setting voltage.

(2) SPEED: A speed calculated and recognized by the controller from the speed sensor signal. (NG indicated when in abnormal condition)

(3) KNOB POS: Knob position calculated and recognized by the controller from the steering wheel angle sensor signal.
One steering wheel rotation is divided into 160 segments (0 to 159) with the illustrated knob position as 80. This value increases with clockwise turn and decreases with counterclockwise turn.

(4) TARGET POS: The target knob position recognized by calculation from the tire angle sensor by the controller

(5) KNOB SOL: Output signal to the knob solenoid.
The knob solenoid output signal ON indicates energization (correcting valve open) and OFF indicates de-energization (correcting valve close).

(6) STEER SS1: Steering wheel angle sensor SS1 input signal.
SS2: Steering wheel angle sensor SS2 input signal.
SSC: Steering wheel angle sensor SSC input signal.
The steering wheel angle sensor outputs 40 pulses for one rotation. Slow steering wheel rotation causes the display to be changed as ON → OFF → ON. SSC, however, causes change at only the reference point position in one rotation (illustrated position). (Displays ON at the reference point and OFF at other points.)

[Transfer of page]
Selector switch ②

[End]
Press MENU switch ③ to return to "IN/OUT MENU" screen.

[SAVE]
Press selector switch ① from any screen to save the contents of two screens as one file.

4. OTHER

[Descriptions of display content]

(1) VOLTAGE: Controller supply voltage.

(2) HOURS: Hour meter values.

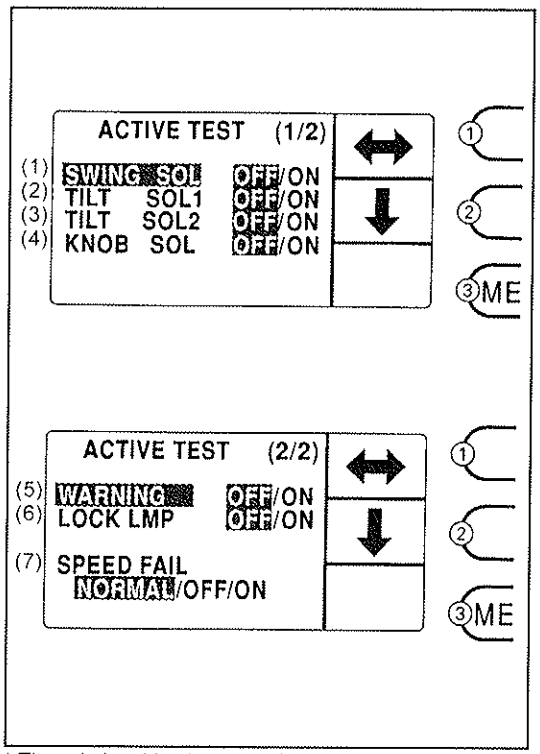
(3) RE ADJUST CN: State of re-setting connector.

(4) DIAG PIN: State of diagnosis pin.

[End]
Press MENU switch ③ to return to "IN/OUT MENU."

[SAVE]
Press selector switch ① from any screen to save the contents of a screen as one file.

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* The relationships between ON and OFF of SOL1 and SOL2 are as follows: (~ 2000.11)

		SOL 1	
		OFF	ON
SOL 2	OFF	Tilt hydraulic circuit half open	Tilt hydraulic circuit closed
	ON	Tilt hydraulic circuit full open	–

* The relationship between ON and OFF of SOL1 is as follows: (2000.11 ~)

SOL 1		
OFF	ON	
Tilt hydraulic circuit full open	Tilt hydraulic circuit semi-open	Tilt hydraulic circuit closed

"3. ACTIVE TEST"

This menu enables to check a selected item through a forcible output of operating signal to it.

Caution:

When the swing lock cylinder solenoid and/or knob solenoid are turned ON, drive vehicle at low speed (for test drive, etc.).

Note:

- **"ON" on the screen indicates that the controller is in an output state. Therefore, check operation visually or with the operating sound, etc.**
- **Don't allow the solenoid to operate over one minute as it causes a failure.**

1. Select an item using selector switch ② and set ON-OFF using selector switch ①.

[Descriptions of display content]

(1) SWING SOL: When set to ON, outputs forcible operation signal to swing lock cylinder solenoid. (Constantly unlock)

(2) TILT SOL1: When set to ON, outputs forcible operation signal to tilt solenoid 1.*

(3) TILT SOL2: When set to ON, outputs forcible operation signal to tilt solenoid 2.* (~ 2000.11)

(4) KNOB SOL: When set to ON, outputs forcible operation signal to the knob solenoid. (Constantly knob solenoid valve open)

(5) WARNING: When set to ON, outputs forcible operation signal to SAS warning lamp (buzzer interlocked). (SAS lamp on and continuous buzzer sounding)

(6) LOCK LMP: When set to ON, outputs forcible operation signal to swing lock lamp. (Swing lock lamp on)

(7) SPEED FAIL: When set to OFF or ON, outputs vehicle speed controller signal.

- OFF: Outputs LOW signal irrespective of vehicle speed.
- ON: Outputs Hi signal irrespective of vehicle speed.

If the vehicle is driven with this menu turned OFF or ON, an error will be stored to the vehicle speed controller.

2. After turning all items OFF or returning to NORMAL setting, press MENU switch ③ to return to "ANALYZER MENU" screen.

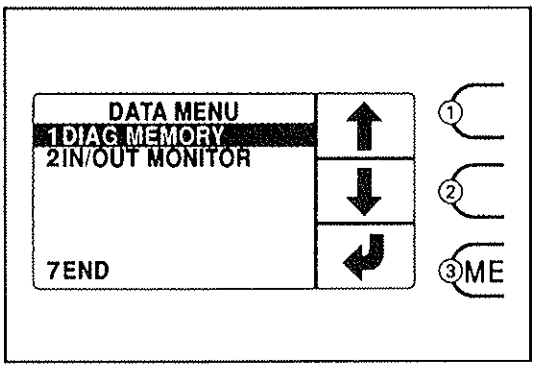
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"4. DATA MANAGE"

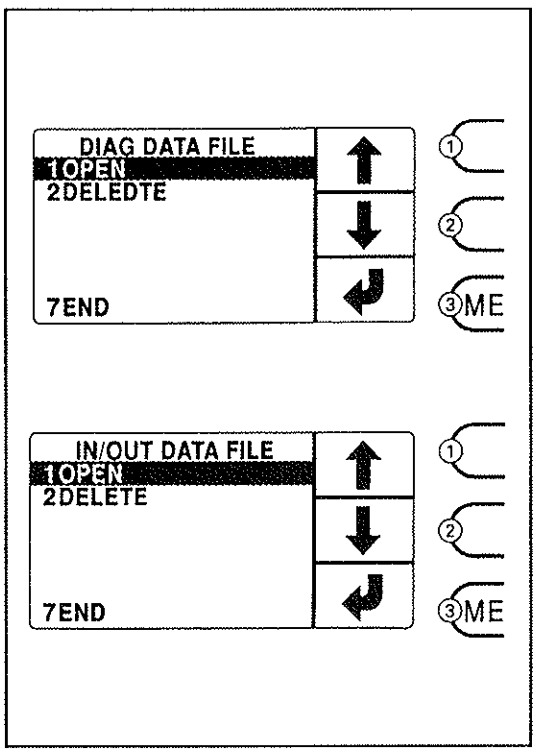
This menu has DATA MENU for DIAG MEMORY and IN/OUT MONITOR. It can display saved data of DIAG MEMORY and IN/OUT MONITOR or erase them.

File numbers on "OPEN" and "DELETE" screens indicate the number displayed when the saving ends normally, and the file number is displayed after processing it according to the following rules:

Saved to:			File name		Max. number of file
1 DIAG MEMORY			Manufacturing number of the opposite SAS controller	Example: 800001	10
2 IN/OUT MONITOR	IN/OUT MENU	1 SWING CONTROL	Add "S" to the end of the manufacturing number of the SAS controller.	Example: 800001S	Total: 20
		2 MAST CONTROL	Add "T" to the end of the manufacturing number of the SAS controller.	Example: 800001T	
		3 ST. KNOB CONTROL	Add "K" to the end of the manufacturing number of the SAS controller.	Example: 800001K	
		4 OTHER	Add "O" to the end of the manufacturing number of the SAS controller.	Example: 800001O	

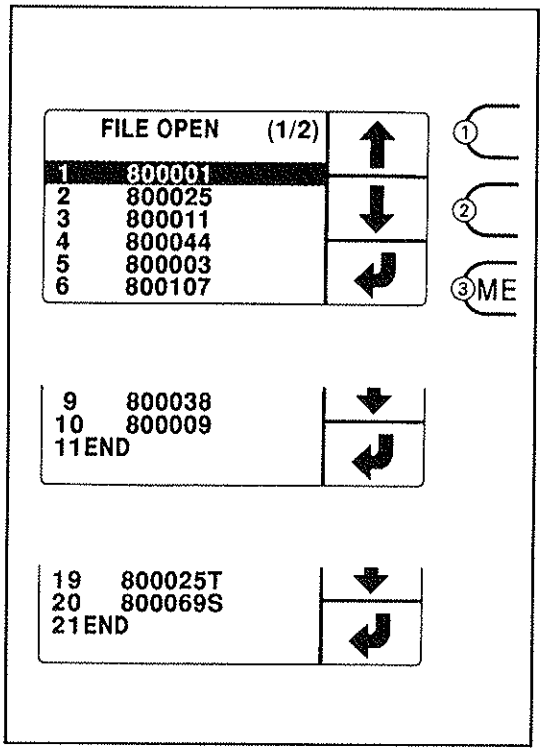


1. Select and enter "4. DATA MANAGE" on "ANALYZER MENU" screen and have "FILE MENU/DATA MENU" displayed on the screen.
2. "DATA MENU" screen
   Move the cursor to a desired menu on "DATA MENU" using selector switch ① and ②, enter it by pressing MENU switch ③ and move to "DIAG DATA FILE" or "IN/OUT DATA FILE."



3. "DIAG DATA FILE" screen
   "IN/OUT DATA FILE" screen
   (1) Select the menu using selector switch ① and ② and press MENU switch ③ to determine the setting.
   - OPEN: Moves to "FILE OPEN" screen. (Step 4)
   - DELETE:
     Moves to "FILE DELETE" screen. (Step 5)
   - END: Returns to "FILE MENU" screen.

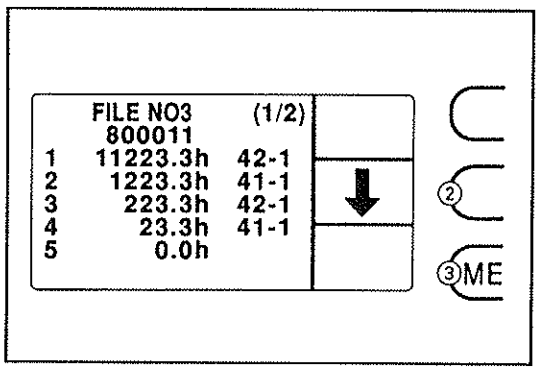
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4. "FILE OPEN" screen
   (1) Select an item using selector switch ① and ②.
   - END: Returns to "DIAG DATA FILE" or "IN/OUT DATA END FILE."

Note:
The file name is displayed only when it is saved. If not saved, only END is displayed.

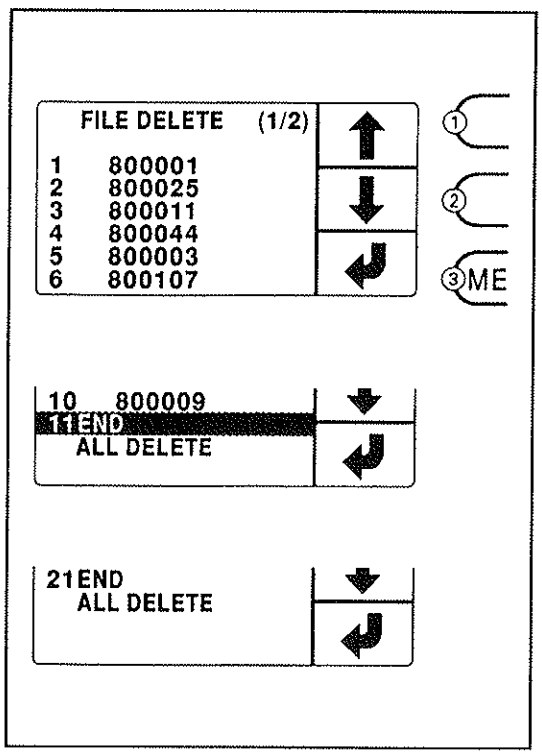
   (2) When entry is made using MENU switch ③, the screen returns to "FILE."



   (3) "FILE" screen
   Saved data is displayed along with the file number and name.

[Transfer of page]
Selector switch ②

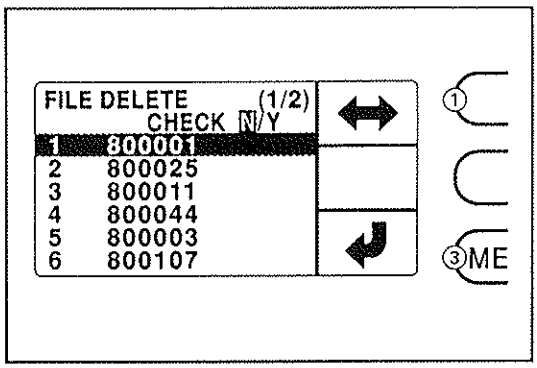
[End]
Press MENU switch ③ to return to "FILE OPEN" screen.



5. "FILE DELETE" screen
   (1) Select an item using selector switch ① and ②.
   - ALL DELETE: Select this for totally erasing files displayed on all the pages of FILE DELETE screen.
   - END: Returns to "DIAG DATA FILE" or "IN/OUT DATA FILE."

   (2) Press MENU switch ③ to have a message displayed.

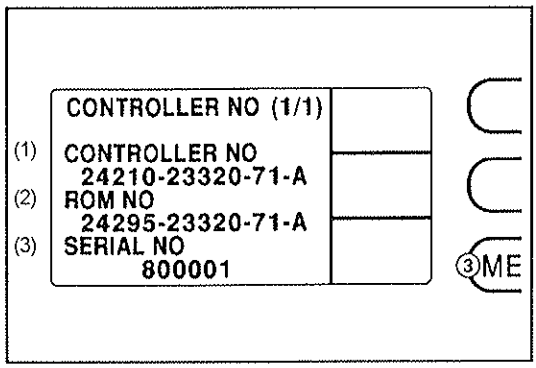
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(3) Select N or Y using selector switch ① and make entry by pressing MENU switch ③.
N: File delete can be cancelled.

Y: Starts deletion. Operation ends when COMPLETE is displayed in the message column.

(4) Press MENU switch (③ to return to the FILE DELETE screen.



"5. DATA"
This menu is used to display the part number of the SAS controller, ROM part number and manufacturing number.

[Descriptions of display content]
(1) CONTROLLER NO.: Controller part number.
(2) ROM NO.: ROM part number.
(3) SERIAL NO.: Controller manufacturing number.

[End]
Press MENU switch ③ to return to "ANALYZER MENU."

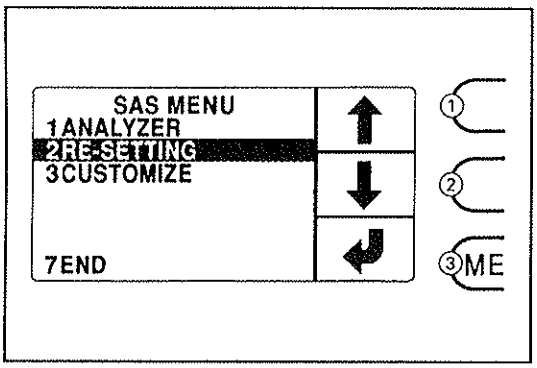
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RE-SETTING

Re-setting can be also performed by using the hour meter and tilt knob switch on the vehicle. Using this menu, re-setting can be made by monitoring the signal voltage of respective sensors on the screen.

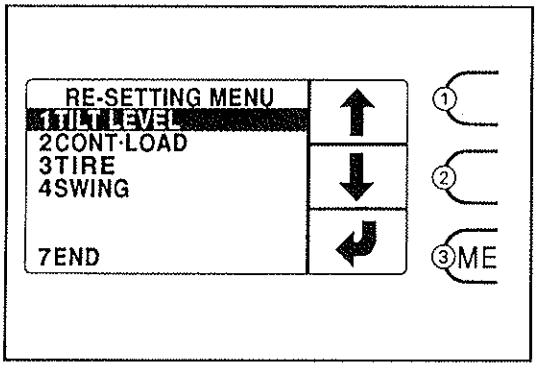
RE-SETTING MENU	Re-setting name	Object sensor
1 TILT LEVEL	RE-SETTING TILT LEVEL	Tilt angle sensor
2 CONT·LOAD	RE-SETTING CONT·LOAD	Tilt angle sensor and load sensor
3 TIRE	RE-SETTING TIRE	Tire angle sensor
4 SWING	RE-SETTING SWING	—

- "RE-SETTING" screen is also displayed for a specification that requires no re-setting on the part of the vehicle. If re-setting is run on such a vehicle NG will be displayed on the screen.

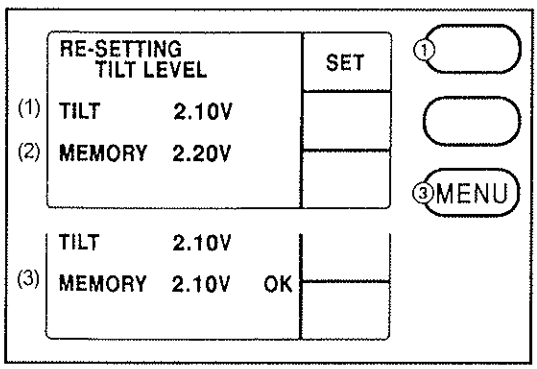


Operating Procedure

1. Select and enter "2. RE-SETTING" on "SAS MENU" screen to have RE-SETTING MENU displayed on the screen.



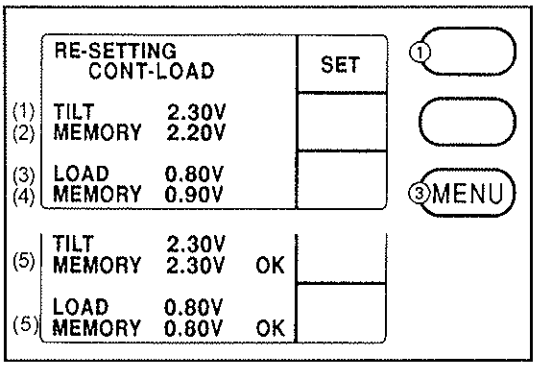
2. RE-SETTING MENU SCREEN
   (1) Move the cursor to a desired menu using selector switch ① and ② and make entry using MENU switch ③.
   (2) Selecting and entering "END" returns to "SAS MENU" screen.



3. "RE-SETTING" screen
TILT LEVEL

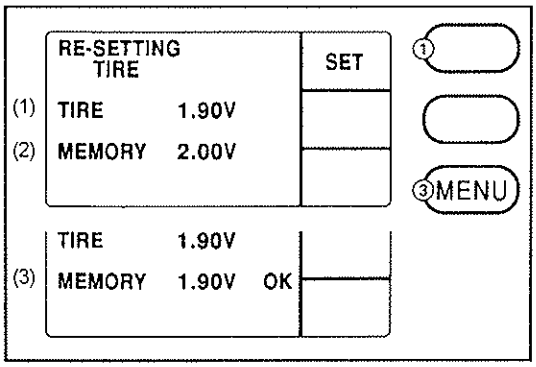
[Descriptions of display content]
   (1) TILT: Tilt angle sensor input voltage.
   (2) MEMORY: Tilt angle sensor re-setting value prior to the re-setting. (Standard voltage for fork automatic leveling control)
   (3) MEMORY: Re-setting value after running re-setting.

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CONT-LOAD

(1) TILT: Tilt angle sensor input voltage.
(2) MEMORY: Tilt angle sensor resetting voltage before resetting (standard voltage for forward tilt restriction control).
(3) LOAD: Load sensor input voltage.
(4) MEMORY: Load sensor re-setting value prior to the re-setting.
(5) MEMORY: Re-setting value after running re-setting.

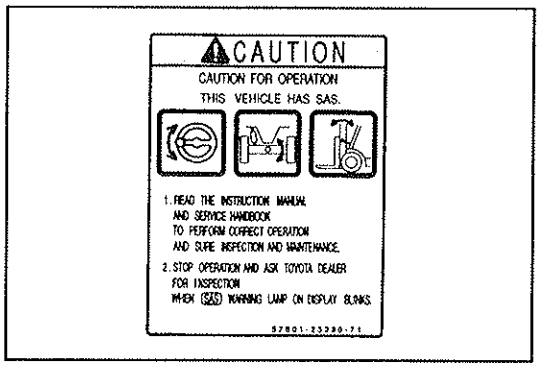


TIRE

(1) TIRE: Tire angle sensor input voltage.
(2) MEMORY: Tire angle sensor re-setting value prior to the re-setting.
(3) MEMORY: Re-setting value after running re-setting.

1. Set the sensor to be re-set to the standard state. (Or check that it is in the standard state.) (Read 15-21.)
2. Press SELECTOR switch ① and excute re-setting.
   OK: Re-setting complete under the indicated voltage.
   NG: The signal voltage value is outside the re-setting range. Check for sensor abnormality, harness disconnection and/or short-circuit. (Read Trouble-shooting.)
3. Press MENU switch ③ in respective screens to return to "RE-SETTING MENU" screen.

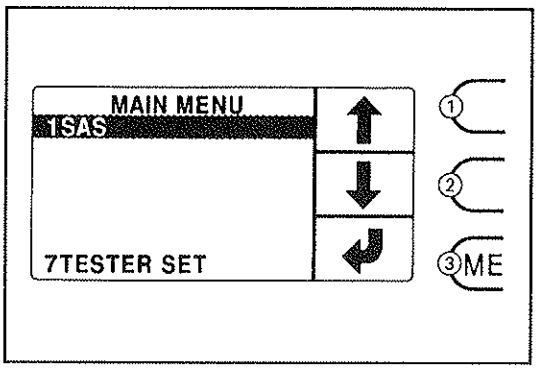
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OPTION SET (CUSTOMIZE)

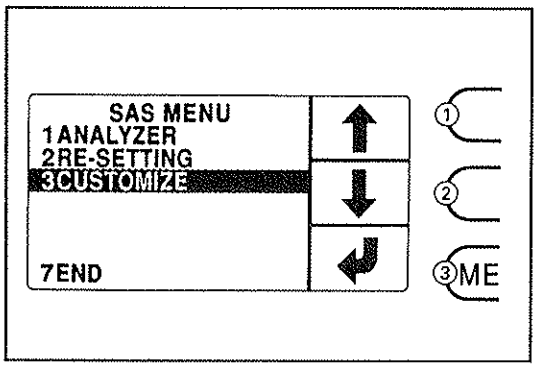
This menu is used for setting VALIDATION/INVALIDATION of the mast forward tilt angle control.

Caution:
If CUSTOMIZE is changed, perform the maintenance of the label for "CAUTION FOR OPERATION."

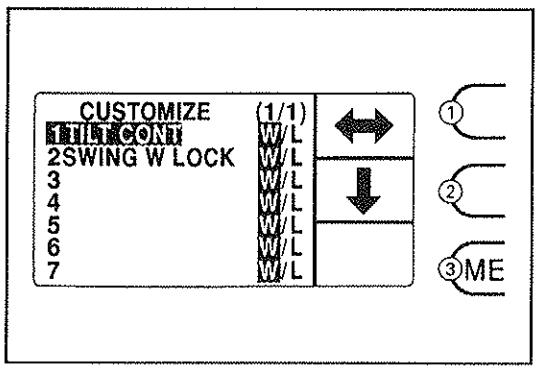


Operating Procedure

1. Select and enter "1 SAS" in "MAIN MENU" screen to have "SAS MENU" displayed on the screen.

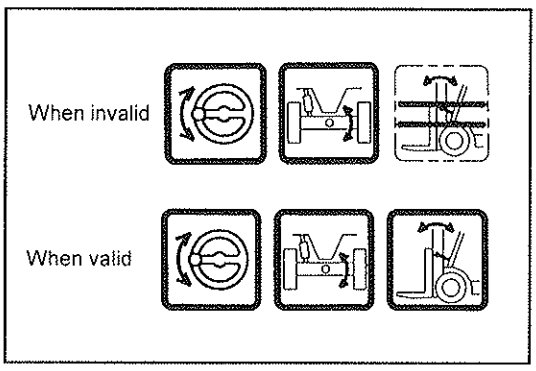


2. Select and enter "3 CUSTOMIZE" to have "CUSTOMIZE" displayed on the screen.



3. "CUSTOMIZE" screen
   (1) Move the cursor to a desired item using selector switch ② and set W/L using selector switch ①.
   - TILT CONT: Mast forward tilt angle control.
   - SWING W LOCK: (Display only, not for actual application)
   - W: Valid control
   - L: Invalid control

   (2) Press MENU switch ③ to return to the SAS MENU screen.



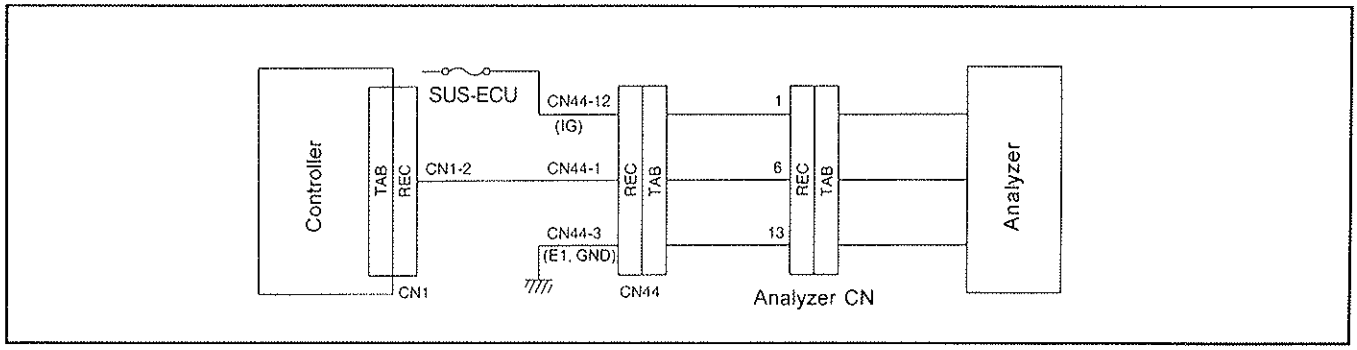
4. Perform the maintenance of caution label
   When respective controls are invalidated: Peel the pertinent valid indication off to change to the invalid indication.
   When respective controls are validated: Replace the caution label to change to the valid indication.

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TROUBLESHOOTING

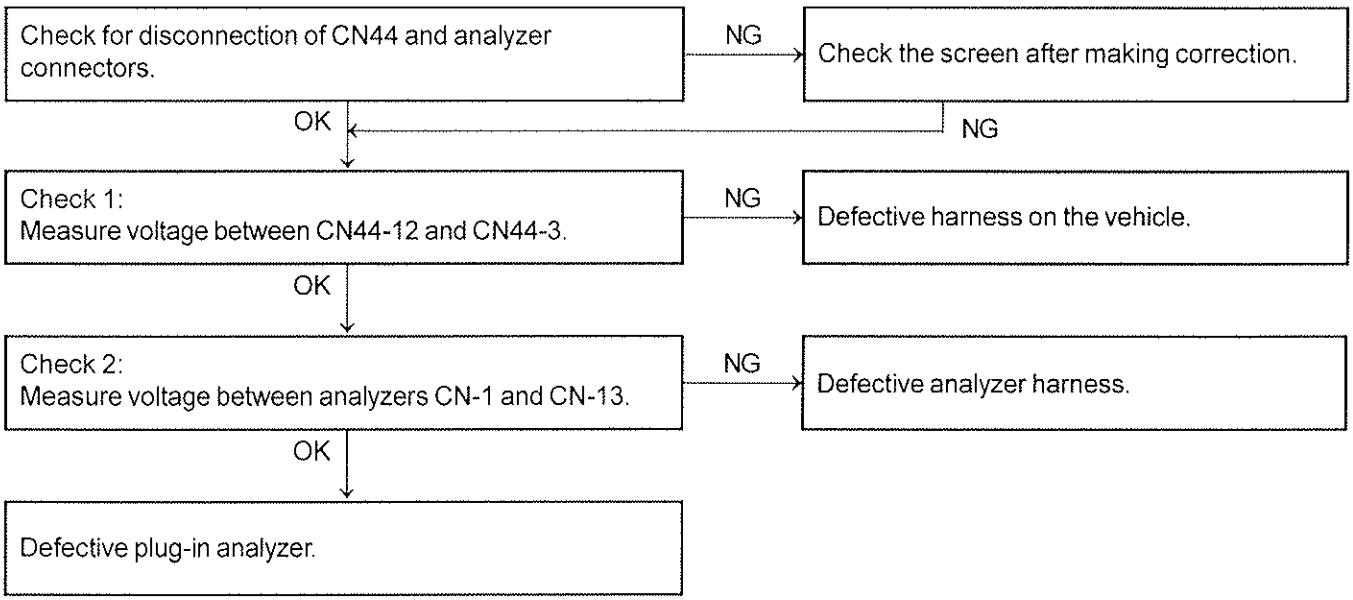
● **Nothing appears on the screen.**

Related Portion

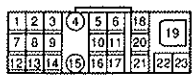


Estimated causes:

① Incomplete contact of connector
② Defective analyzer harness (power supply)
③ Defective plug-in analyzer



Check 1: Measure voltage between CN44-12 and CN44.
Turn the key switch ON (with engine stopped)
Standard: CN44-12 ⊕ - CN44-3 ⊖: 8 ~ 16 V



CN44 (REC)

Check 2: Measure voltage between analyzer CN-1 and analyzer CN-13.
Turn the key switch ON (with engine stopped)
Standard: Analyzer CN-1 ⊕ - Analyzer CN-13 ⊖: 8 ~ 16 V

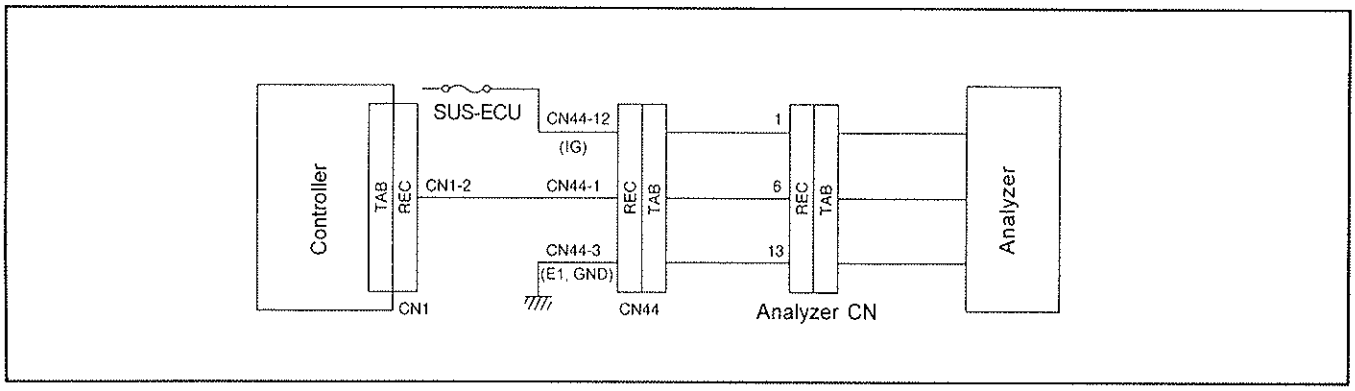


Analyzer CN (REC)

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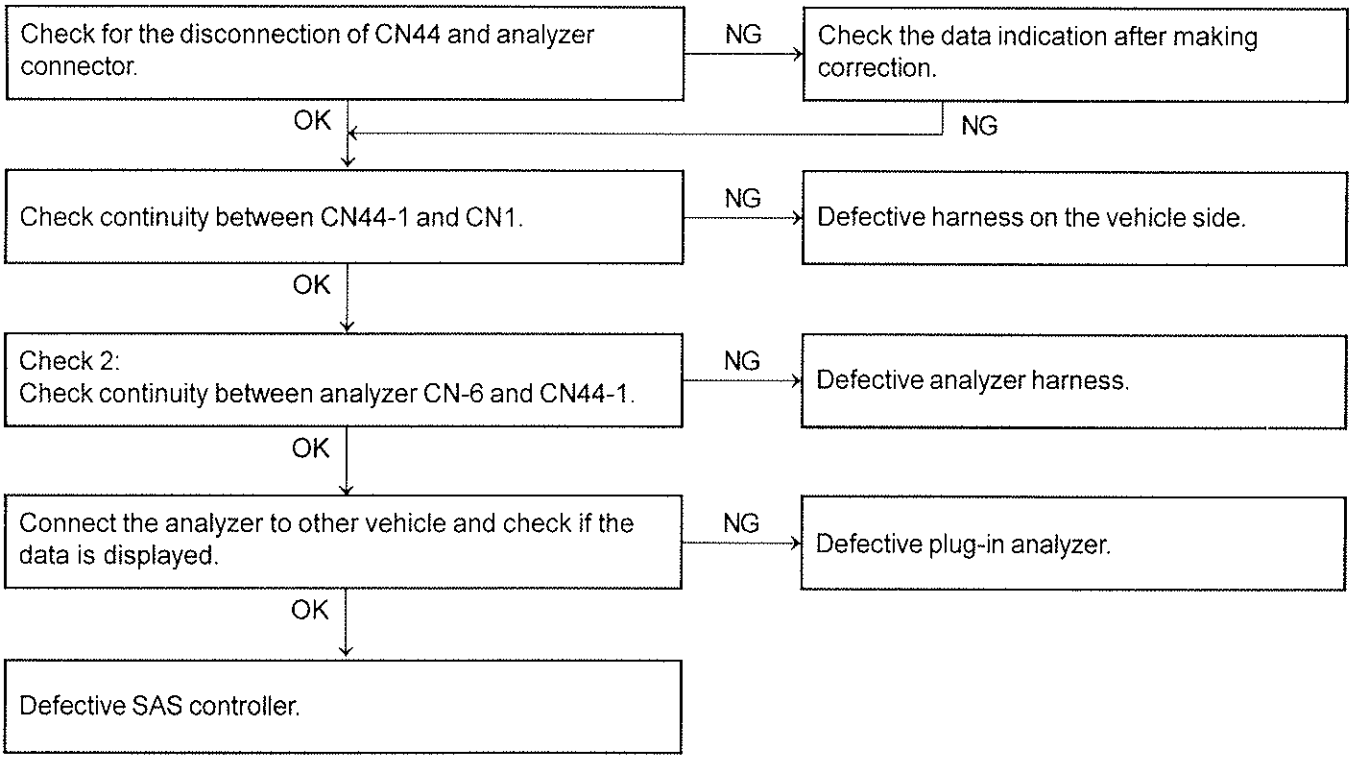
● **Screen for data (DIAG MONITOR, voltage values and speed, etc.) does not display data.**

Related Portion

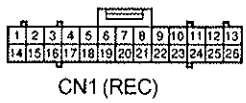


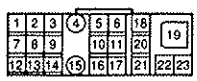
Estimated causes

① Incomplete contact of connectors
② Defective analyzer harness (communications)
③ Defective SAS controller

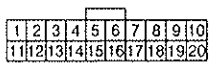


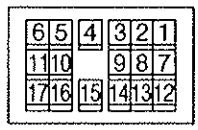
Check 1: Check continuity between CN44-1 and CN1-2.
Turn the key switch OFF and disconnect CN44 and CN1.
Standard: CN44-1 and CB1-2: Continuity shall exist


CN1 (REC)


CN44 (REC)

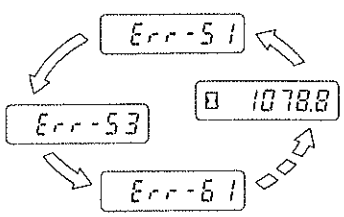
Check 2: Check continuity between analyzer CN-6 and CN44-1.
Turn the key switch OFF and disconnect analyzer CN and CN44.
Standard: Analyzer CN-6 to CN44-1: Continuity shall exist

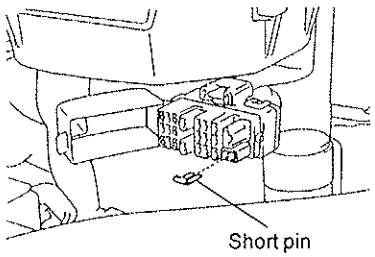

Analyzer CN (REC)


CN44 (TAB)

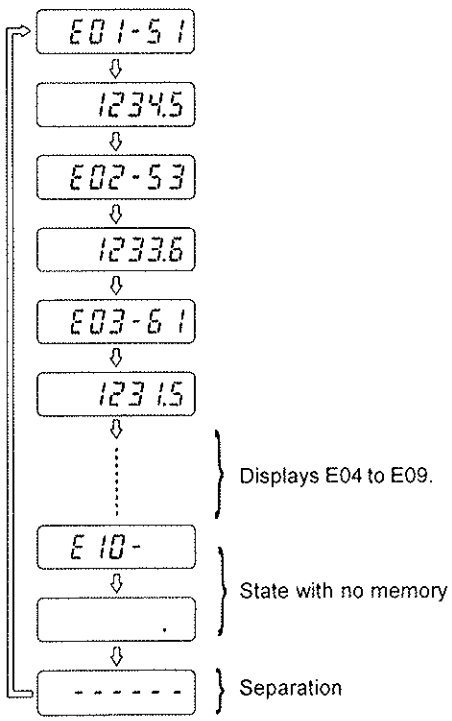
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SAS is provided with the following diagnosis function:





Display example of diagnosis memory



DIAGNOSIS

When abnormality is detected with SAS sensors and switches, SAS warning lamp starts blinking or is turned ON with the sounding of the buzzer. At the same time, error codes (maximum 5 error codes for multiple errors) are displayed to the hour meter.
The SAS controller stores these error codes and their time of generation (in maximum ten memories). Displaying those errors on the hour meter enables to check abnormality that has occurred temporarily. When these error memory contents are displayed on the analyzer (SST), further classified error codes can be checked. (See page 15-48.)
Perform repair promptly by referring to a pertinent troubleshooting to the error code concerned.

How to display diagnosis memory

Note:
Turning the key switch ON (or starting engine) after removing the DIAG MEMORY short pin causes an error (code 42) displayed and stored to the controller, for which care should be taken.

1. Turn the key switch ON (or start engine).
2. Open the diag connector cover and remove the diag memory short pin.
   (1) Ten error codes and the corresponding hour meter times are displayed sequentially from the latest one.
   (2) If no error code memory exists, the error number is followed with a blank space and the hour meter time with a period only.
   (3) Upon indicating tenth error code and generation time, the dotted line appears to make separation and the display starts again with the latest error code in memory.
3. Install the diag memory short pin and close the diag connector cover.

Note:
- **Install position error may cause a controller failure, for which care should be taken.**
- **Don't substitute a short pin with other object.**

4. Turn the key switch OFF.

List of Diagnosis Error Codes

Error code	Content	Phenomenon generated to the machine							
		Rear wheel swing control		Mast tilt control					Steering knob position control
		Lateral G lock	Yaw rate lock	Mast forward tilt angle control	Automatic horizontal stop control	Mast backward tilt speed control	Manual forward tilting operation	Manual backward tilting operation	
41	Re-setting switch abnormality	Normal control	←	Normal control	←	←	←	←	Normal control
42	Diag switch abnormality	Normal control	←	Normal control	←	←	←	←	Normal control
51	Speed sensor abnormality	Locking disabled *3	Locking disabled	Normal control	←	←	←	←	Knob misalignment generation
52	Yaw rate sensor abnormality	Locking disabled *3	Locking disabled	Normal control	←	←	←	←	Normal control
54	Swing solenoid abnormality	Phenomenon differs by the state of a failure	←	Normal control	←	←	←	←	Normal control
61	Load sensor abnormality	Normal control	Control as no load	Operates to a maximum forward tilt position	Stops when knob switch is turned ON	←	Normal control	←	Normal control
62	Tilt angle sensor abnormality	Normal control	←	Operates to a maximum forward tilt position	Stops when knob switch is turned ON	←	Normal control	←	Normal control
63	Tilt lever switch abnormality	Normal control	←	Operates to a maximum forward tilt position	Stops when knob switch is turned ON	←	Normal control	←	Normal control
64	Tilt solenoid No. 1 abnormality	Normal control	←	Phenomenon differs by the state of a failure	←	←	←	←	Normal control
65	Tilt solenoid No. 2 abnormality	Normal control	←	Phenomenon differs by the state of a failure	←	←	←	←	Normal control
66	Tilt angle re-setting abnormality	Normal control	←	Operates to a maximum forward tilt position	Stops when know switch is turned ON	←	Normal control	←	Normal control

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Error code	Content	Phenomenon generated to the machine							
		Rear wheel swing control		Mast tilt control					Steering knob position control
		Lateral G lock	Yaw rate lock	Mast forward tilt angle control	Automatic horizontal stop control	Mast backward tilt speed control	Manual forward tilting operation	Manual backward tilting operation	
67	Lifting height switch abnormality	Controlled as the lower lifting height	←	Operates to a maximum forward tilt position	Stops when knob switch is turned ON	←	Normal control	Backward tilting speed is faster for a high lifting height	Normal control
71	Tire angle sensor abnormality	Normal control	←	Normal control	←	←	←	←	Knob misalignment generation
72	Handle angle sensor abnormality	Normal control	←	Normal control	←	←	←	←	Knob misalignment generation
73	Knob solenoid abnormality	Normal control	←	Normal control	←	←	←	←	Knob misalignment generation
74	Tire angle re-setting value abnormality	Normal control	←	Normal control	←	←	←	←	Knob misalignment generation
(AF)*1	Controller abnormality	Constant locking	←	Operable to a maximum forward tilt position	Does not stop horizontal	Slower backward tilting speed for a lower lifting height	Normal control	Slower backward tilting speed for a lower lifting height	Knob misalignment generation
EF	Controller abnormality	Constant locking	←	Operable to a maximum forward tilt position	Does not stop horizontal	Slower backward tilting speed for a lower lifting height	Normal control	Slower backward tilting speed for a lower lifting height	Knob misalignment generation
F1*2	Communication abnormality between the controller and the hour meter	Normal control	←	Normal control	←	←	←	←	Normal control

*1: Stores sub-error codes only to the SAS control without display on the hour meter.

*2: Because of an error code output by the hour meter, no storage is made on the SAS controller.

*3: If an error is detected in the locked state, locking is maintained until the ignition switch is turned OFF.

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TROUBLESHOOTING

Perform troubleshooting according to the troubleshooting by error code when an error code is displayed, and according to the troubleshooting by phenomenon when no error code is displayed.

TROUBLESHOOTING BY ERROR CODE

Troubleshooting by error code is described below in the order of the error code. Perform troubleshooting according to the procedure corresponding to each error code. When the plug in analyzer (SST) is available, use the DIAG MEMORY and check the error code and perform troubleshooting accordingly.

List of Reference Pages for Error Codes and Sub Error Codes

Without analyzer (SST)			With analyzer (SST)		
Error code	Error description	Page	Error code	Error description	Page
41	Resetting switch abnormality	15-50	41-1	Resetting switch abnormality	15-50
42	DIAG switch abnormality	15-51	42-1	DIAG switch abnormality	15-51
51	Speed sensor abnormality	15-52	51-1	Speed sensor open circuit	15-52
			51-2	Speed sensor short circuit	15-52
52	Yaw rate sensor abnormality	15-54	52-1	Yaw rate sensor open circuit	15-54
			52-2	Yaw rate sensor short circuit	15-54
			52-3	Yaw rate sensor neutral voltage abnormality	15-54
54	Swing solenoid abnormality	15-55	54-1	Swing solenoid abnormality	15-55
61	Load sensor abnormality	15-59	61-1	Load sensor open circuit	15-59
			61-2	Load sensor short circuit	15-59
62	Tilt angle sensor abnormality	15-65	62-1	Tilt angle sensor open circuit	15-65
			62-2	Tilt angle sensor short circuit	15-65
63	Tilt lever switch abnormality	15-69	63-1	Tilt lever switch simultaneous ON	15-69
			63-2	Forward tilt switch short circuit for 2 minutes	15-69
			63-3	Backward tilt switch short circuit for 2 minutes	15-69

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Without analyzer (SST)			With analyzer (SST)		
Error code	Error description	Page	Error code	Error description	Page
64	Tilt solenoid No.1 abnormality	15-76	64-1	Tilt solenoid No.1 abnormality	15-76
65 (~ 2000.11)	Tilt solenoid No.2 abnormality	15-78	65-1 (~ 2000.11)	Tilt solenoid No.2 abnormality	15-78
66	Tilt angle resetting value abnormality	15-80	66-1	Tilt angle resetting value abnormality	15-80
67	Fork height switch abnormality (When there is no fork height switch)	15-81	67-1	Fork height switch abnormality (When there is no fork height switch)*3	15-81
	Fork height switch abnormality (When fork height switch is used)	15-85		Fork height switch abnormality (When fork height switch is used)	15-85
71	Tire angle sensor abnormality	15-91	71-1	Tire angle sensor open circuit	15-91
			71-2	Tire angle sensor short circuit	15-91
72	Steering wheel angle sensor abnormality	15-97	72-1	Steering wheel angle sensor SS1 abnormality	15-97
			72-2	Steering wheel angle sensor SS2 abnormality	15-97
			72-3	Steering wheel angle sensor SSC abnormality	15-97
			72-4	Steering wheel angle sensor open circuit	15-97
73	Knob solenoid abnormality	15-104	73-1	Knob solenoid abnormality	15-104
74	Tire angle resetting value abnormality	15-107	74-1	Tire angle resetting value abnormality	15-107
(AF)*1	Controller abnormality	—	AF-1	CPU abnormality	—
			AF-2	ROM abnormality	—
			AF-3	RAM abnormality	—
			AF-4	AD conversion abnormality	—
EF	Controller abnormality	—	EF-1	EEPROM abnormality	—
			EF-2	EEPROM abnormality	—
F1*2	Abnormal communication between controller and hour meter	15-108	—	—	—

*1: The error code is stored in the SAS controller, and display by the hour meter is not made.

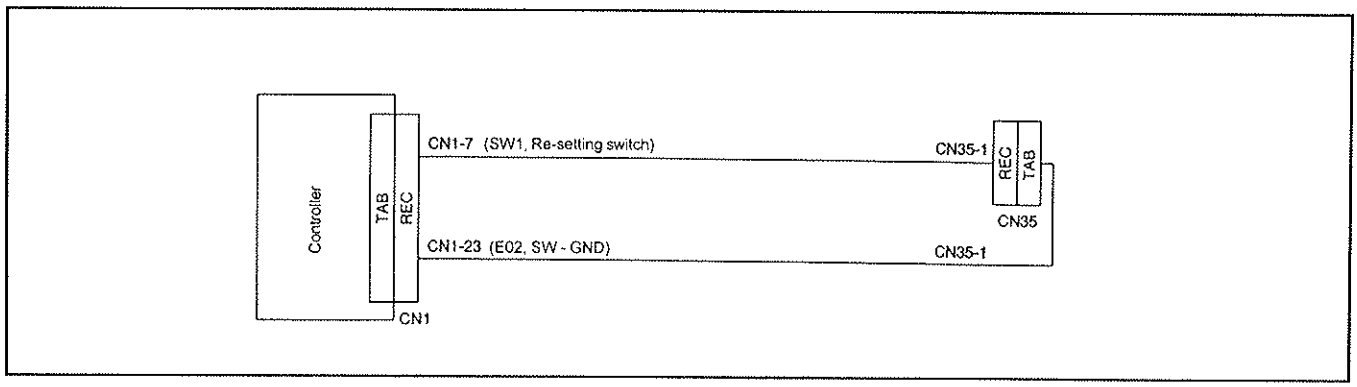
*2: Because of the error code output from the hour meter, it is not stored in the SAS controller and checking by the analyzer fails.

*3: Specification, "No fork height SW" has not been applied to your destination.

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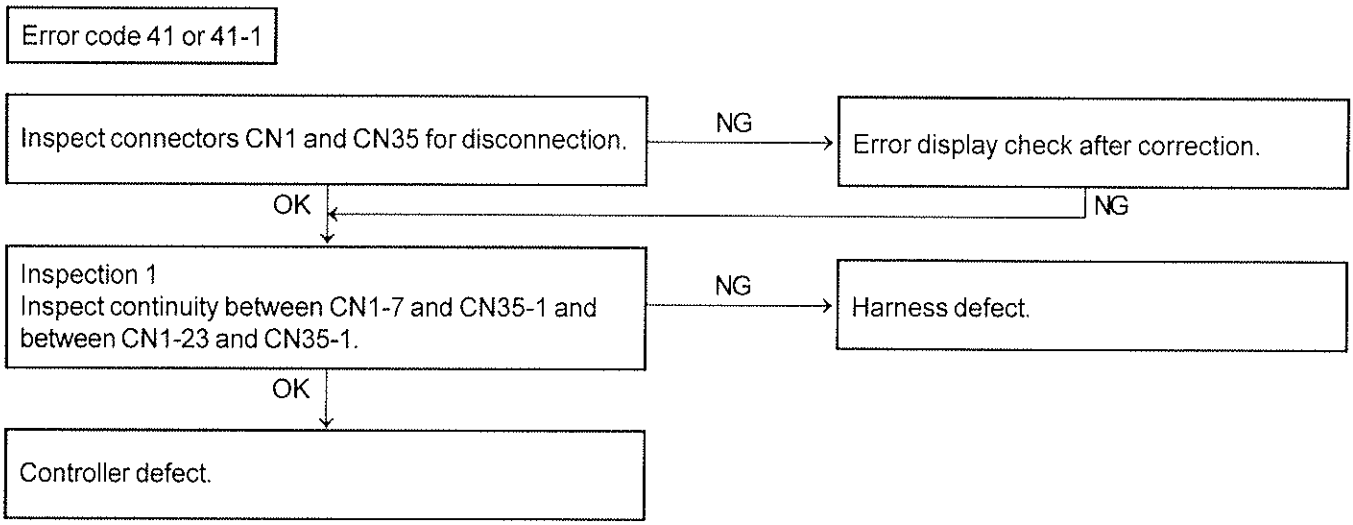
● Error Code 41 or 41-1 (Re-setting switch abnormality)

Related Portion



Estimated Causes:

① Connector contact defect
② Resetting connector harness defect
③ Controller defect



Inspection 1:

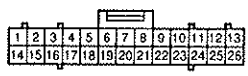
Continuity inspection between CN1 and CN35

Turn the ignition switch OFF, and disconnect CN1 and CN35.

Standard:

CN1-7 ~ CN35-1: Continuity shall exist.

CN1-23 ~ CN35-1: Continuity shall exist.



CN1 (REC)

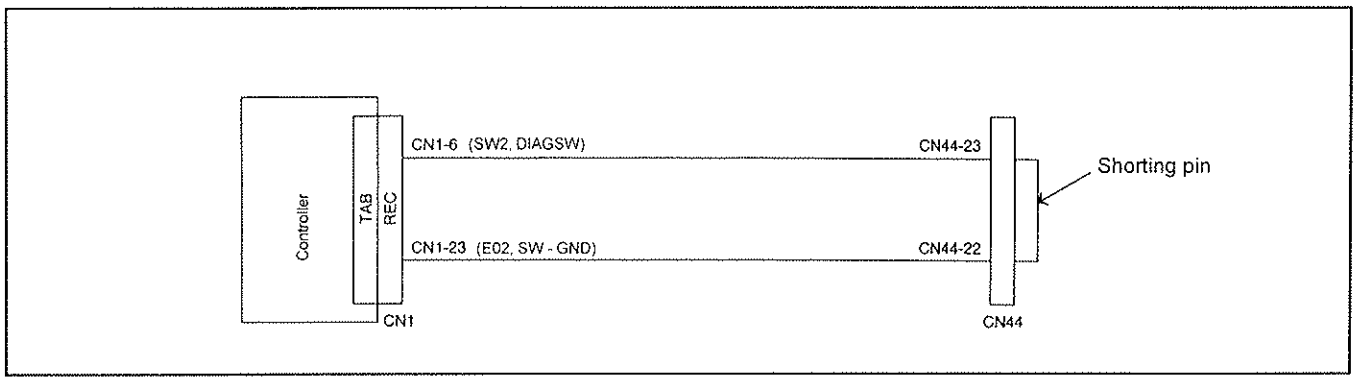


CN35 (REC)

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● Error Code 42 or 42-1 (Diag. switch abnormality)

Related Portion



Estimated Causes:

① Disconnected shorting pin
② Connector contact defect
③ DIAG connector harness defect
④ Controller defect

Error code 42 or 42-1

Inspect the shorting pin at CN44 for disconnection.
NG → Error display check after correction.
OK ↓ / NG ←

Inspect the CN1 connector for disconnection.
NG → Error display check after correction.
OK ↓ / NG ←

Inspection 1
Inspect continuity between CN1-6 and CN44-23 and between CN1-23 and CN44-22.
NG → Harness defect.
OK ↓

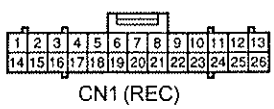
Controller defect.

Inspection 1:

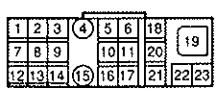
Inspect continuity between CN1 and CN44.
Turn the ignition switch OFF and disconnect CN1 and CN44 shorting pin.

Standard:

CN1-6 ~ CN44-23: Continuity shall exist.
CN1-23 ~ CN44-22: Continuity shall exist.



CN1 (REC)

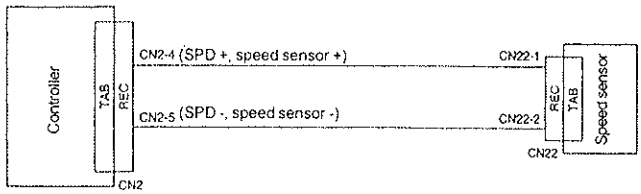


CN44 (REC)

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- **Error Code 51 (Speed sensor abnormality)**
- **Error Code 51-1 (Speed sensor open circuit)**
- **Error Code 51-2 (Speed sensor short circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Speed sensor harness defect
③ Speed sensor defect
④ Controller defect

Error code 51

Inspect CN2 and CN22 connectors for disconnection or internal wetting.
NG → Check SAS lamp off after correction.
NG
OK

Inspection 1
Inspect continuity between harness CN2 and CN22 and between the SPD+/SPD– line and frame.
NG → Harness defect.
OK

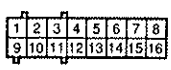
Inspection 2
Inspect resistance between sensor CN22-1 and CN22-2 and continuity between CN22-1 or CN22-2 and frame.
NG → Speed sensor defect.
OK

Controller defect.

Inspection 1:
Inspect continuity between harness CN2 and CN22 and between the SPD+/SPD– line and frame.

Turn the ignition switch OFF and disconnect CN2 and CN22.

Standard:
CN2-4 ~ CN22-1: Continuity shall exist.
CN2-5 ~ CN22-2: Continuity shall exist.
CN22-1 ~ CN22-2: No continuity.
CN22-1 ~ Frame: No continuity.
CN22-2 ~ Frame: No continuity.



CN2 (REC)



CN22 (REC)

Inspection 2:
Inspect resistance between sensor CN22-1 and CN22-2 and continuity between CN22-1 or CN22-2 and frame.

Turn the ignition switch OFF and disconnect CN22.

Standard:
Resistance between CN22-1 and CN22-2: 620 ± 60 Ω (standard)
CN22-1 ~ Frame: No continuity
CN22-2 ~ Frame: No continuity.



CN22 (TAB)

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Error code 51-1

Inspect for disconnection and internal wetting of the CN2 and CN22 connectors.
NG → After correction, make sure the SAS lamp goes out.
NG →
OK ↓

Inspection 1
Inspect continuity between harness CN2 and CN22.
NG → Harness defect.
OK ↓

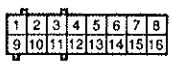
Inspection 2
Make sure that speed indication corresponding to the actual speed is made during traveling.
NG → Speed sensor defect.
OK ↓

Controller defect.

Inspection 1:
Inspect continuity between CN2 and CN22.

Turn the ignition switch OFF and disconnect CN2 and CN22.

Standard:
CN2-4 ~ CN22-1: Continuity shall exist.
CN2-5 ~ CN22-2: Continuity shall exist.
CN22-1 ~ CN22-2: No continuity.



CN2 (REC)



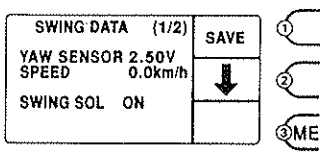
CN22 (REC)

Inspection 2:
Make sure that speed indication corresponding to the actual speed is made during traveling.

Connect all connectors, turn the ignoition switch ON (start the engine) and travel.

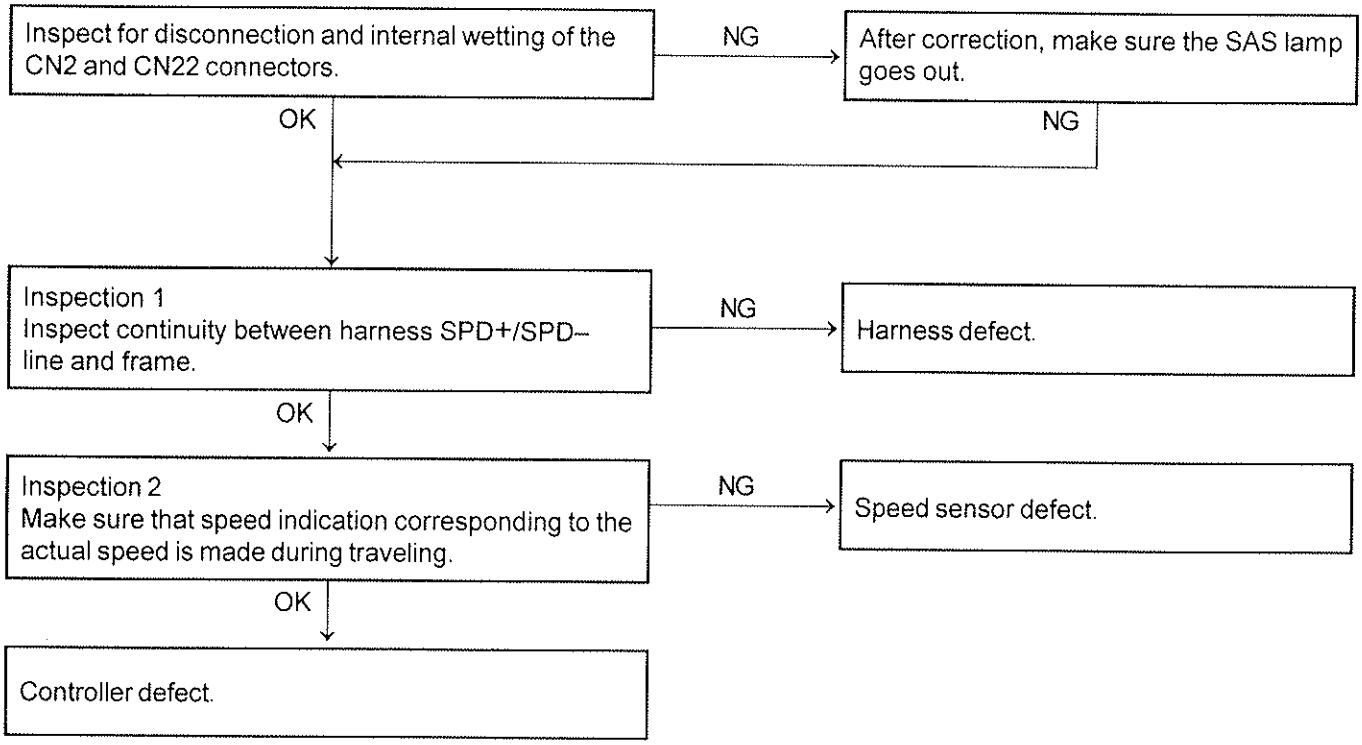
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → SWING DATA

Standard:
Speed indication shall change depending on the traveling speed.



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Error code 51-2



Inspection 1:
Inspect continuity between the harness SPD+/SPD– line and frame.

Turn the ignition switch OFF and disconnect CN2 and CN22.

Standard:
CN22-1 ~ Frame: No continuity.
CN22-2 ~ Frame: No continuity.



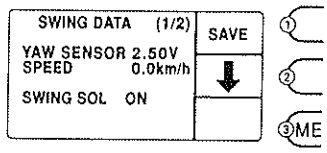
CN22 (REC)

Inspection 2:
Make sure that speed indication corresponding to the actual speed is made during traveling.

Connect all connectors, turn the ignoition switch ON (start the engine) and travel.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → SWING DATA

Standard:
Speed indication shall change depending on the traveling speed.



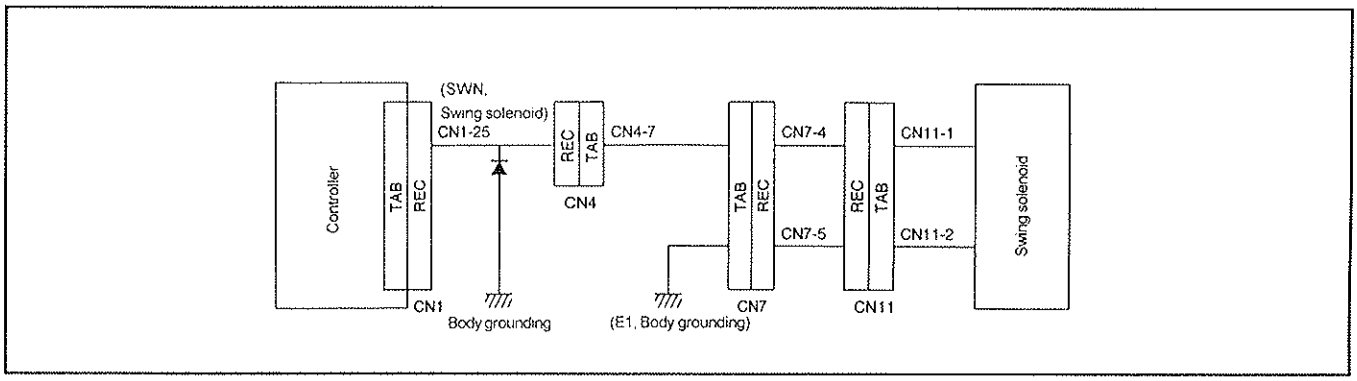
- **Error code 52 (Yaw rate sensor abnormality)**
- **Error code 52-1 (Yaw rate sensor open circuit)**
- **Error code 52-2 (Yaw rate sensor short circuit)**
- **Error code 52-3 (Yaw rate sensor neutral voltage abnormality)**

Estimated Cause:
① Controller defect

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- **Error code 54 (Swing solenoid abnormality)**
- **Error code 54-1 (Swing solenoid abnormality)**

Related Portion



Estimated Causes:

① Connector contact defect
② Swing solenoid harness defect
③ Swing solenoid defect
④ Diode defect
⑤ Controller defect

Error code 54

Inspect for disconnection and internal wetting of the CN1, CN4, CN7, and CN11 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → Inspect for disconnection and internal wetting of the CN1, CN4, CN7, and CN11 connectors.
OK

Inspection 2
Inspect continuity with the diode (between CN1-25 and frame).
NG → Diode defect.
OK

Inspection 3
Inspect continuity between harness CN1-25 and CN11-1, between the SWN line and frame, and between CN11-2 and frame.
NG → Harness defect.
OK

Inspection 4
Resistance between solenoid CN11-1 and CN11-2, and inspect continuity between CN11-1 and frame.
NG → Solenoid defect.
OK

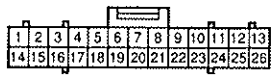
Controller defect.

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Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignoition switch on (start the engine).
Standard:
The SAS lamp shall not blink upon swing or slalom traveling (traveling that lights the lock lamp normally).
Caution:
Perform the traveling test carefully at a low speed.

Inspection 2:
Inspect continuity with the diode (between CN1-25 and frame).



CN1 (REC)

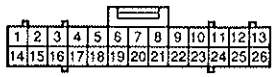
Turn the ignition switch OFF and disconnect CN1 and CN4.

Standard:
CN1-25 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN1-25 (Digital circuit tester ⊖) ~ Frame (Digital circuit tester ⊕): Continuity shall exist.
CN1-25 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN1-25 (Analog circuit tester ⊕) ~ Frame (Analog circuit tester ⊖): Continuity shall exist.

Inspection 3:
Inspect continuity between harness CN1-25 and CN11-1, between the SWN line and frame, and between CN11-2 and frame.

Turn the ignition switch OFF and disconnect CN1 and CN11.

Standard:
CN1-25 ~ CN11-1: Continuity shall exist.
CN11-1 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN11-1 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN11-2 ~ Frame: Continuity shall exist.
CN11-1 (Digital circuit tester ⊕) ~ CN11-2 (Digital circuit tester ⊖): No continuity.
CN11-1 (Analog circuit tester ⊖) ~ CN11-2 (Analog circuit tester ⊕): No continuity.



CN1 (REC)



CN11 (REC)

Inspection 4:
Resistance between solenoid CN11-1 and CN11-2 and inspect continuity between CN11-1 and frame.

Turn the ignition switch OFF and disconnect CN11.

Standard:
CN11-1 ~ Frame: No continuity.
Resistance between CN11-1 and CN11-2: Approx. 6 Ω (20°C).



CN11 (TAB)

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Error code 54-1

Inspect for disconnection and internal wetting of the CN1, CN4, CN7, and CN11 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect for disconnection and internal wetting of the CN1, CN4, CN7, and CN11 connectors.)
OK ↓

Inspection 2
Inspect continuity with the diode (between CN1-25 and frame).
NG → Diode defect.
OK ↓

Inspection 3
Inspect continuity between harness CN1-25 and CN11-1, between the SWN line and frame, and between CN11-2 and frame.
NG → Harness defect.
OK ↓

Inspection 4
Resistance between solenoid CN11-1 and CN11-2 and inspect continuity between CN11-1 and frame.
NG → Solenoid defect.
OK ↓

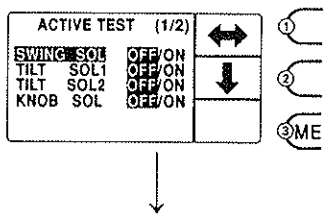
Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

Standard:
The SAS lamp shall not blinkupon returning to the ANALYZER MENU by setting the SWING SOL to ONH (for 1 second or more) and OFF (for 1 second or more).

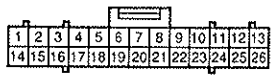


↓

Return to the ANALYZER MENU.

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Inspection 2:
Inspect continuity with the diode (between CN1-25 and frame).



CN1 (REC)

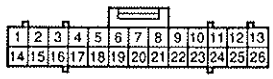
Turn the ignition switch OFF and disconnect CN1 and CN4.

Standard:
CN1-25 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN1-25 (Digital circuit tester ⊖) ~ Frame (Digital circuit tester ⊕): Continuity shall exist.
CN1-25 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN1-25 (Analog circuit tester ⊕) ~ Frame (Analog circuit tester ⊖): Continuity shall exist.

Inspection 3:
Inspect continuity between harness CN1-25 and CN11-1, between the SWN line and frame, and between CN11-2 and frame.

Turn the ignition switch OFF and disconnect CN1 and CN11.

Standard:
CN1-25 ~ CN11-1: Continuity shall exist.
CN11-1 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN11-1 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN11-2 ~ Frame: Continuity shall exist.
CN11-1 (Digital circuit tester ⊕) ~ CN11-2 (Digital circuit tester ⊖): No continuity.
CN11-1 (Analog circuit tester ⊖) ~ CN11-2 (Analog circuit tester ⊕): No continuity.



CN1 (REC)



CN11 (REC)

Inspection 4:
Resistance between solenoid CN11-1 and CN11-2 and inspect continuity between CN11-1 and frame.

Turn the ignition switch OFF and disconnect CN11.

Standard:
CN11-1 ~ Frame: No continuity.
Resistance between CN11-1 and CN11-2: Approx. 6 Ω (20°C).

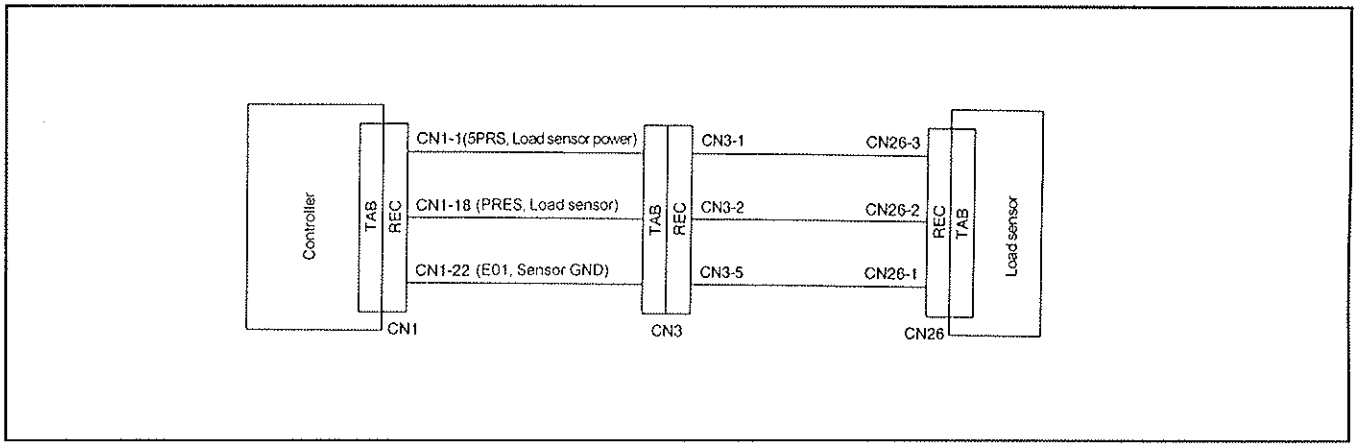


CN11 (TAB)

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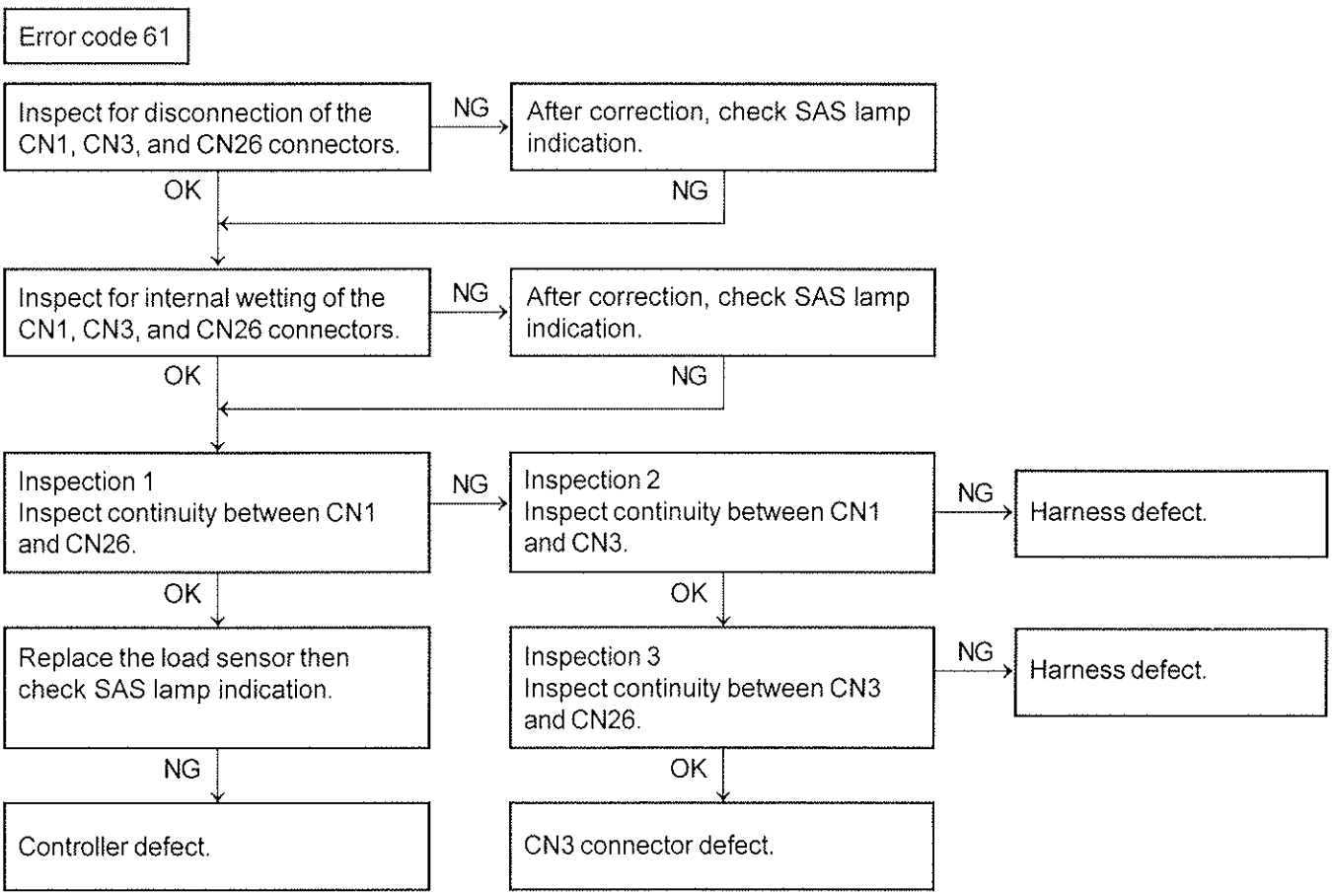
- **Error code 61 (Load sensor abnormality)**
- **Error code 61-1 (Load sensor open circuit)**
- **Error code 61-2 (Load sensor short circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Load sensor harness defect
③ Load sensor defect
④ Controller defect

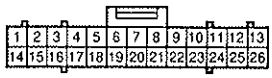


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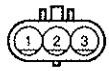
Inspection 1:
Inspect continuity between CN1 and CN26.

Turn the ignition switch OFF and disconnect CN1 and CN26.

Standard:
CN1-1 ~ CN26-3: Continuity shall exist.
CN1-18 ~ CN26-2: Continuity shall exist.
CN1-22 ~ CN26-1: Continuity shall exist.
CN1-1 ~ CN1-18: No continuity.
CN1-1 ~ CN1-22: No continuity.
CN1-18 ~ CN1-22: No continuity.



CN1 (REC)



CN26 (REC)

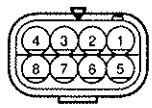
Inspection 2:
Inspect continuity between CN1 and CN3.

Turn the ignition switch OFF and disconnect CN1 and CN3.

Standard:
CN1-1 ~ CN3-1: Continuity shall exist.
CN1-18 ~ CN3-2: Continuity shall exist.
CN1-22 ~ CN3-5: Continuity shall exist.
CN1-1 ~ CN1-18: No continuity.
CN1-1 ~ CN1-22: No continuity.
CN1-18 ~ CN1-22: No continuity.



CN1 (REC)

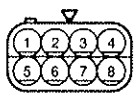


CN3 (TAB)

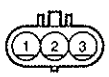
Inspection 3:
Inspect continuity between CN3 and CN26.

Turn the ignition switch OFF and disconnect CN3 and CN26.

Standard:
CN3-1 ~ CN26-3: Continuity shall exist.
CN3-2 ~ CN26-2: Continuity shall exist.
CN3-5 ~ CN26-1: Continuity shall exist.
CN3-1 ~ CN3-2: No continuity.
CN3-1 ~ CN3-5: No continuity.
CN3-2 ~ CN3-5: No continuity.



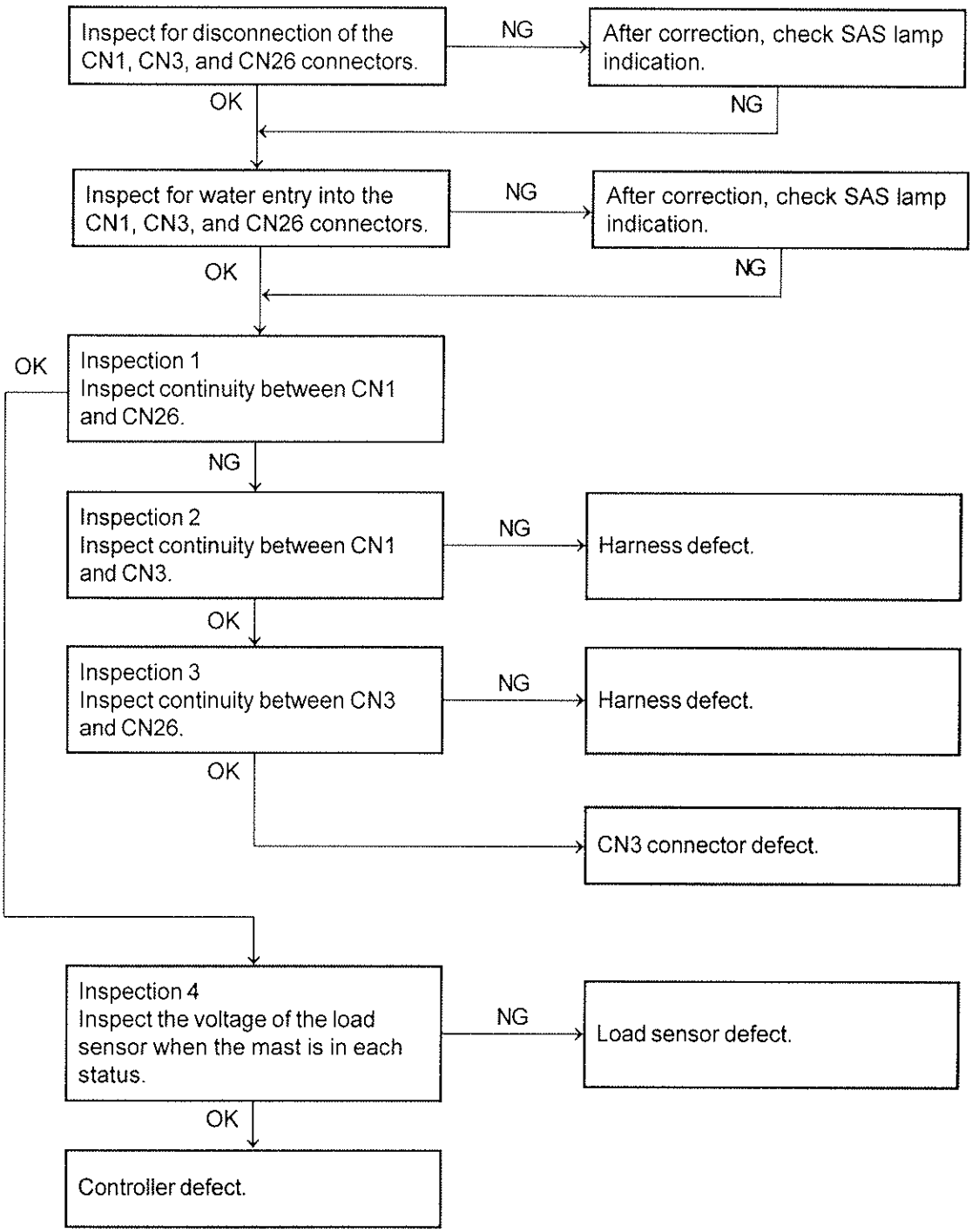
CN3 (REC)



CN26 (REC)

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Error code 61-1

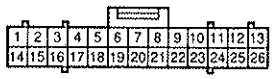


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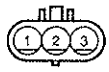
Inspection 1:
Inspect continuity between CN1 and CN26.

Turn the ignition switch OFF and disconnect CN1 and CN26.

Standard:
CN1-1 ~ CN26-3: Continuity shall exist.
CN1-18 ~ CN26-2: Continuity shall exist.
CN1-22 ~ CN26-1: Continuity shall exist.
CN1-1 ~ CN1-22: No continuity.
CN1-18 ~ CN1-22: No continuity.



CN1 (REC)

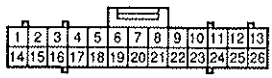


CN26 (REC)

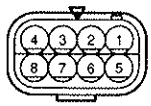
Inspection 2:
Inspect continuity between CN1 and CN3.

Turn the ignition switch OFF and disconnect CN1 and CN3.

Standard:
CN1-1 ~ CN3-1: Continuity shall exist.
CN1-18 ~ CN3-2: Continuity shall exist.
CN1-22 ~ CN3-5: Continuity shall exist.
CN1-1 ~ CN1-22: No continuity.
CN1-18 ~ CN1-22: No continuity.



CN1 (REC)

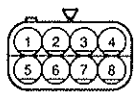


CN3 (TAB)

Inspection 3:
Inspect continuity between CN3 and CN26.

Turn the ignition switch OFF and disconnect CN3 and CN26.

Standard:
CN3-1 ~ CN26-3: Continuity shall exist.
CN3-2 ~ CN26-2: Continuity shall exist.
CN3-5 ~ CN26-1: Continuity shall exist.
CN3-1 ~ CN3-5: No continuity.
CN3-2 ~ CN3-5: No continuity.



CN3 (REC)



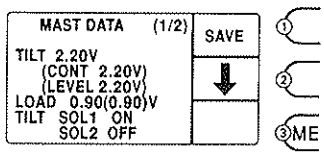
CN26 (REC)

Inspection 4:
Inspect the voltage of the load sensor when the mast is in each status.

Turn the ignition switch ON (start the engine).

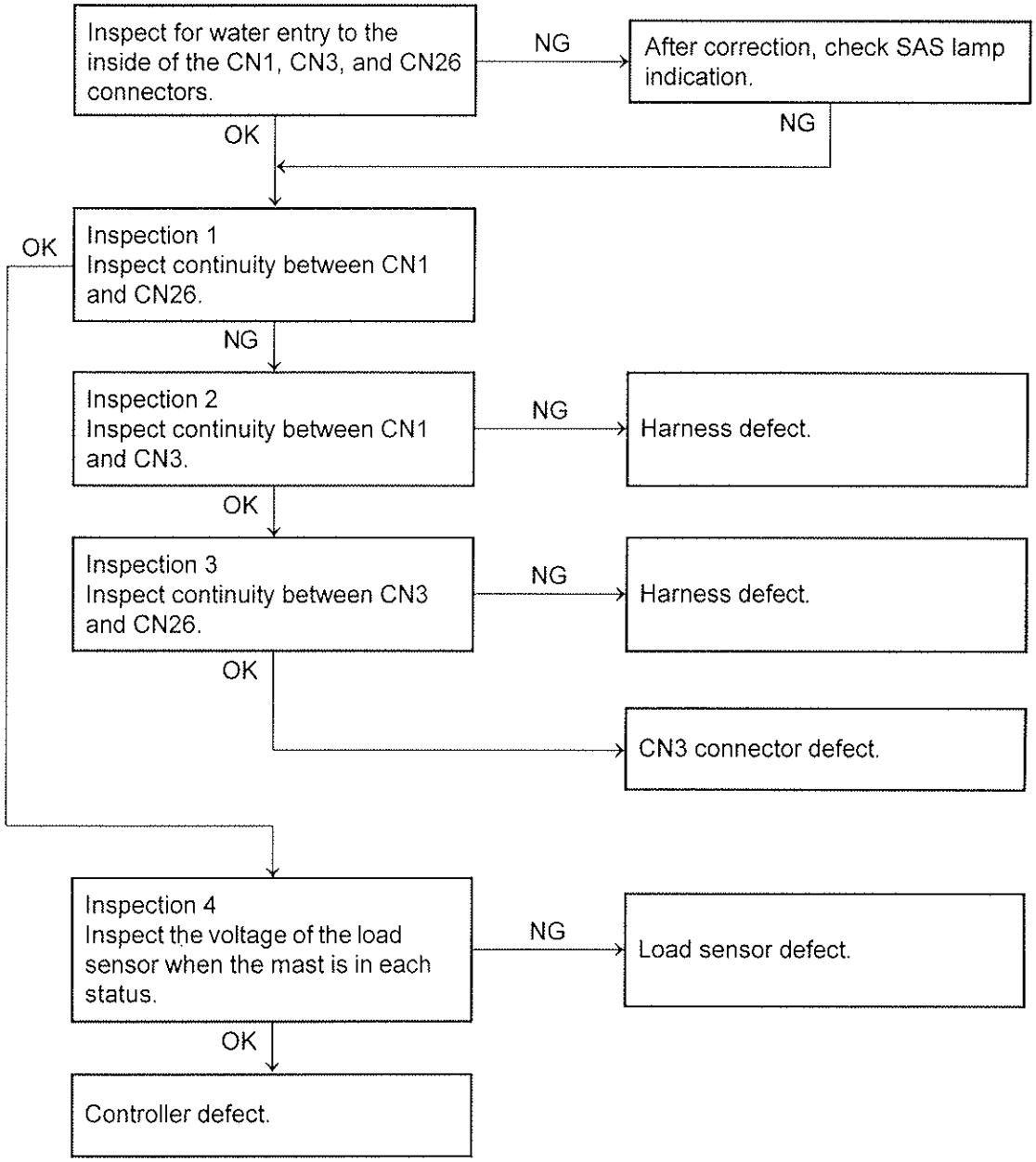
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
Load value
Fully lowered state (with the lift cylinder pressure released):
0.10 to 1.00 V
Relief state at the uppermost end:
3.5 to 4.8 V



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Error code 61-2

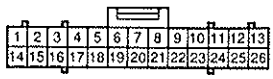


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Inspection 1:
Inspect continuity between CN1 and CN26.

Turn the ignition switch OFF and disconnect CN1 and CN26.

Standard:
CN1-1 ~ CN1-18: No continuity.

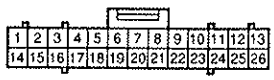


CN1 (REC)

Inspection 2:
Inspect continuity between CN1 and CN3.

Turn the ignition switch OFF and disconnect CN1 and CN3.

Standard:
CN1-1 ~ CN1-18: No continuity.

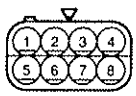


CN1 (REC)

Inspection 3:
Inspect continuity between CN3 and CN26.

Turn the ignition switch OFF and disconnect CN3 and CN26.

Standard:
CN3-1 ~ CN3-2: No continuity.



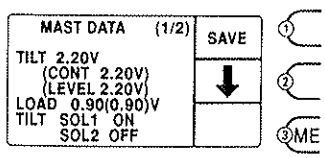
CN3 (REC)

Inspection 4:
Inspect the voltage of the load sensor when the mast is in each status.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

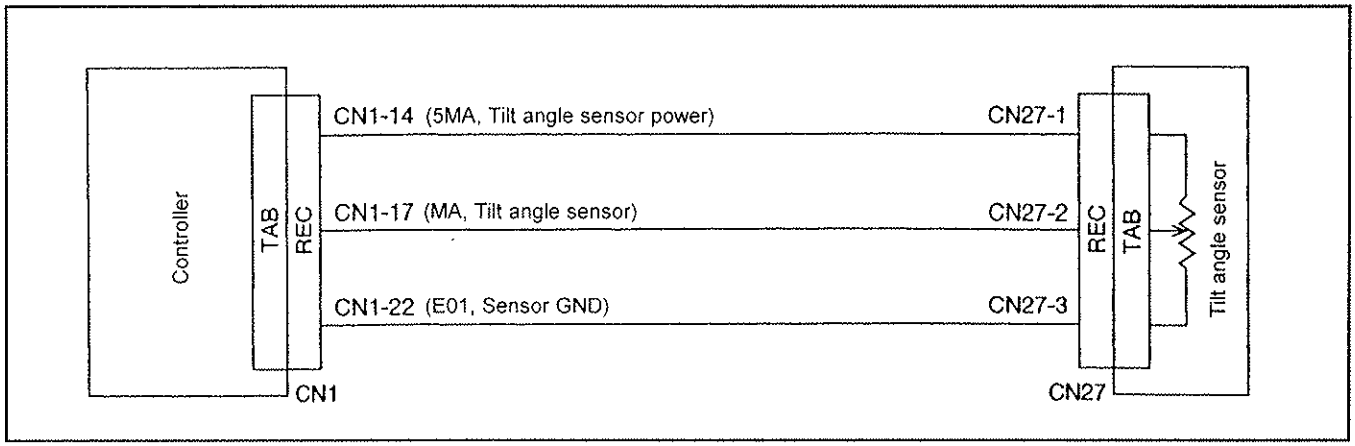
Standard:
Load value
Fully lowered state (with the lift cylinder pressure released):
0.10 to 1.00 V
Relief state at the uppermost end:
3.5 to 4.8 V



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- **Error code 62 (Tilt angle sensor abnormality)**
- **Error code 62-1 (Tilt angle sensor open circuit)**
- **Error code 62-2 (Tilt angle sensor short circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Tilt angle sensor harness defect
③ Tilt angle sensor defect
④ Controller defect

Error code 62

Inspect the tilt angle sensor for disconnection from the link and damages.
NG → After correction, check SAS lamp indication.
OK ↓
NG ←

Inspect for connector disconnection between CN1 and CN27.
NG → After correction, check SAS lamp indication.
OK ↓
NG ←

Inspect for water entry into the connector between CN1 and CN27.
NG → After correction, check SAS lamp indication.
OK ↓
NG ←

Inspection 1
Inspect continuity between CN1 and CN27.
NG → Harness defect.
OK ↓

Inspection 2
Inspect the tilt angle sensor.
NG → Tilt angle sensor defect.
OK ↓

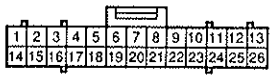
Controller defect.

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Inspection 1:
Inspect continuity between CN1 and CN27.

Turn the ignition switch OFF and disconnect CN1 and CN27.

Standard:
CN1-14 ~ CN27-1: Continuity shall exist.
CN1-17 ~ CN27-2: Continuity shall exist.
CN1-22 ~ CN27-3: Continuity shall exist.
CN1-14 ~ CN1-17: No continuity.
CN1-14 ~ CN1-22: No continuity.
CN1-17 ~ CN1-22: No continuity.



CN1 (REC)

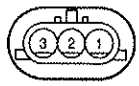


CN27 (REC)

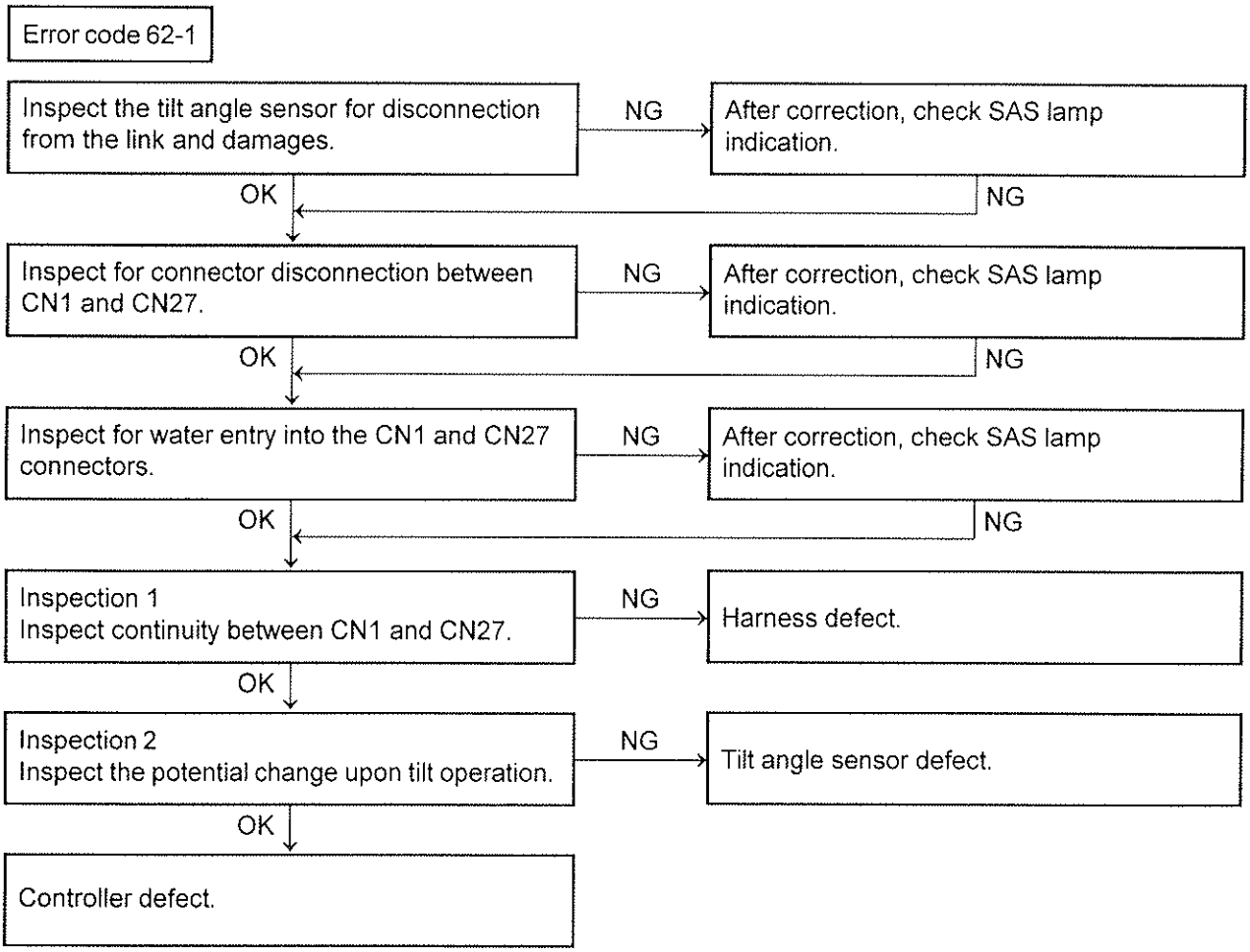
Inspection 2:
Inspect the potential change upon tilt operation.

Remove the tilt angle sensor and perform re-setting after installing the tilt angle sensor.

Standard:
Measure resistance between tilt angle sensor terminals.
CN27-1 ~ CN27-3: 1.5 kΩ ± 0.3 kΩ
CN27-2 ~ CN27-3: 0 kΩ when the sensor lever is free:
1.5 kΩ ± 0.3kΩ when the sensor lever is in full stroke:



CN27 (TAB)

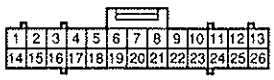


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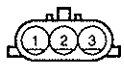
Inspection 1:
Inspect continuity between CN1 and CN27.

Turn the ignition switch OFF and disconnect CN1 and CN27.

Standard:
CN1-14 ~ CN27-1: Continuity shall exist.
CN1-17 ~ CN27-2: Continuity shall exist.
CN1-14 ~ CN1-22: No continuity.
CN1-17 ~ CN1-22: No continuity.



CN1 (REC)



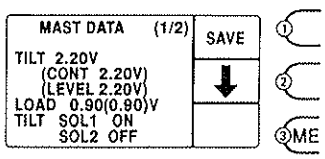
CN27 (REC)

Inspection 2:
Inspect the potential change upon tilt operation.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
The tilt value shall be 0.1 ~ 4.8 V when the mast is tilted fully backward from the full forward position. The value shall rise as the mast is tilted backward.



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Error code 62-2

Inspect the tilt angle sensor for disconnection from the link and damages.
NG → After correction, check SAS lamp indication.
OK

Inspect for connector disconnection between CN1 and CN27.
NG → After correction, check SAS lamp indication.
OK

Inspect for water entry into the CN1 and CN27 connectors.
NG → After correction, check SAS lamp indication.
OK

Inspection 1
Inspect continuity between CN1 and CN27.
NG → Harness defect.
OK

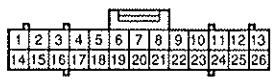
Inspection 2
Inspect the potential change upon tilt operation.
NG → Tilt angle sensor defect.
OK

Controller defect.

Inspection 1:
Inspect continuity between CN1 and CN27.

Turn the ignition switch OFF and disconnect CN1 and CN27.

Standard:
CN1-22 ~ CN27-3: Continuity shall exist.
CN1-14 ~ CN1-17: No continuity.



CN1 (REC)



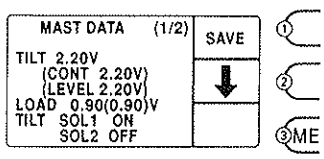
CN27 (REC)

Inspection 2:
Inspect the potential change upon tilt operation.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

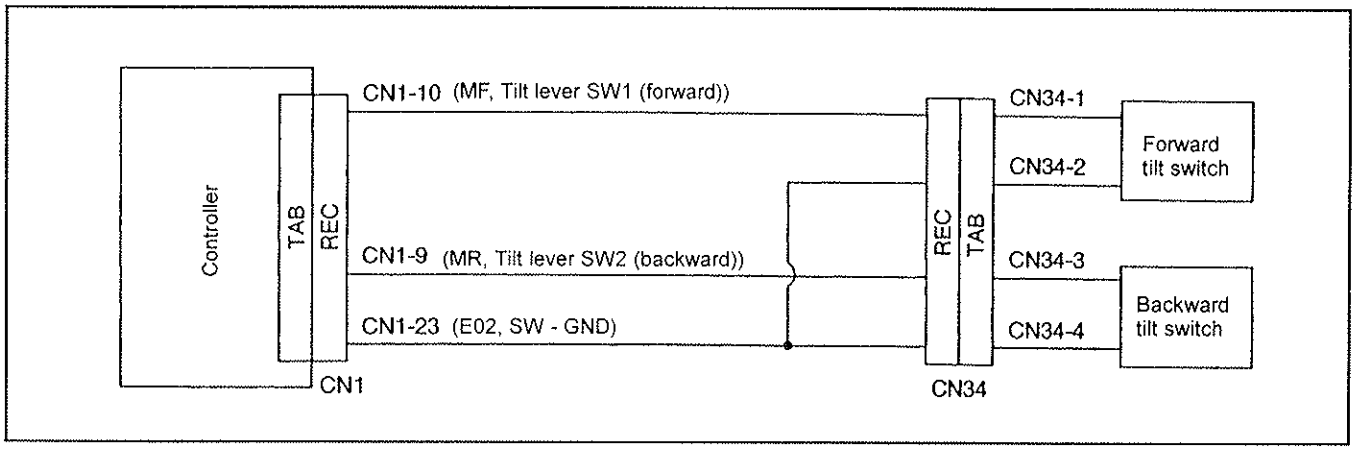
Standard:
The tilt value shall be 0.1 ~ 4.8 V when the mast is tilted fully backward from the full forward tilt position.
The value shall rise as the mast is tilted backward.



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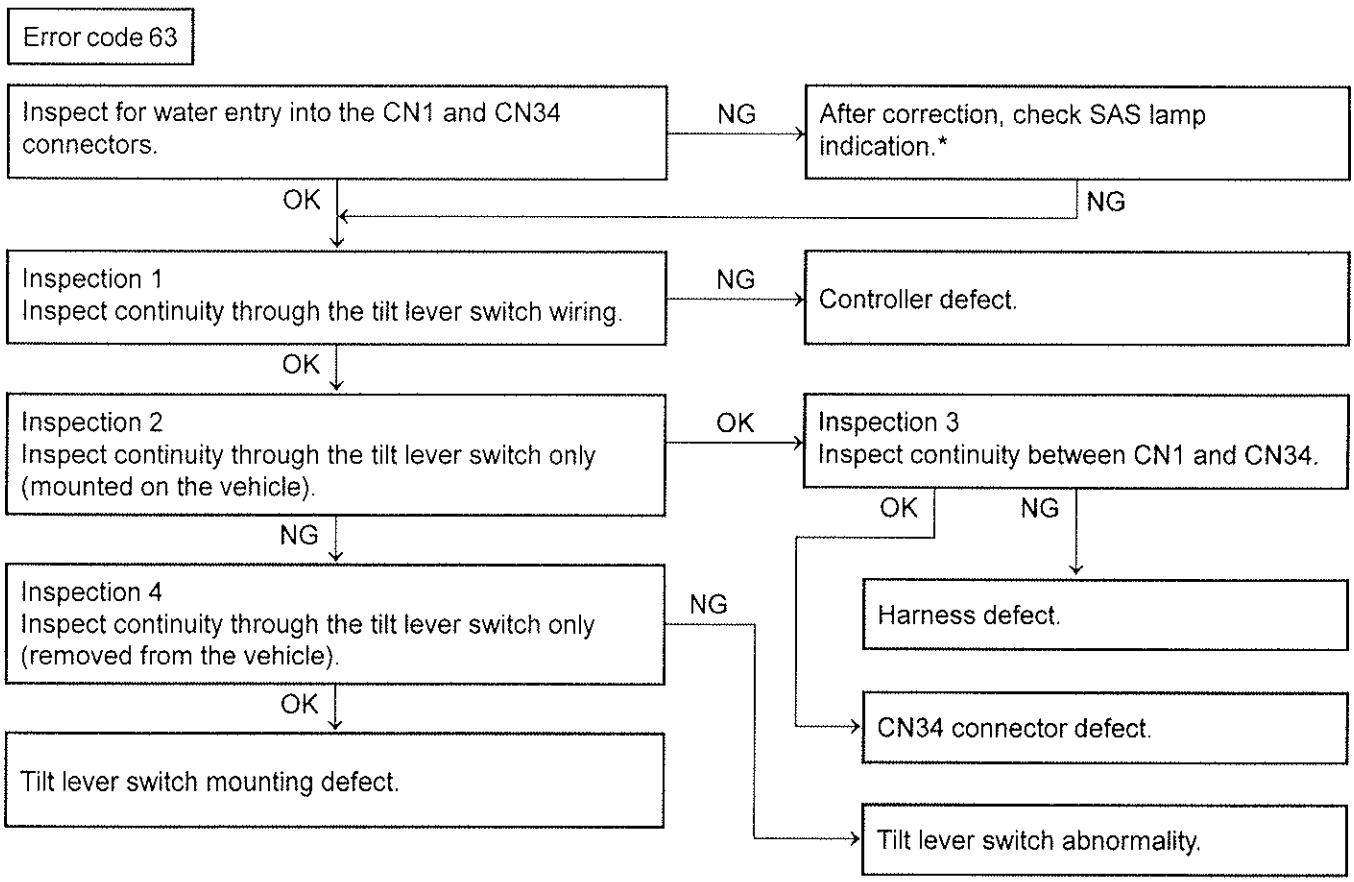
- **Error code 63 (Tilt lever switch abnormality)**
- **Error code 63-1 (Both tilt lever switches ON at the same time)**
- **Error code 63-2 (Forward tilt switch 2-minute short circuit)**
- **Error code 63-3 (Backward tilt switch 2-minute short circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Tilt switch harness defect
③ Forward tilt switch defect
④ Backward tilt switch defect
⑤ Tilt switch mounting defect
⑥ Controller defect

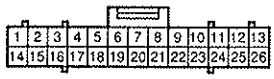


* After the ignition switch is turned ON, make sure that the SAS lamp is lit upon tilting forward and backward. Make sure that the 2-minute waiting SAS lamp blinks when the tilt lever is on the neutral position.

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Inspection 1:
Inspect continuity through the tilt lever switch wiring.

Turn the ignition switch OFF and disconnect CN1.



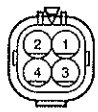
CN1 (REC)

Standard:

	Lever at neutral position	Lever at forward tilt position	Lever at backward tilt position
CN1-10 ~ CN1-23	No continuity.	Continuity shall exist.	No continuity.
CN1-9 ~ CN1-23	No continuity.	No continuity.	Continuity shall exist.

Inspection 2:
Inspect continuity through the tilt lever switch only (mounted on the vehicle).

Turn the ignition switch OFF and disconnect CN34.



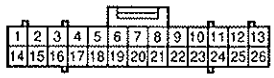
CN34 (TAB)

Standard:

	Lever at neutral position	Lever at forward tilt position	Lever at backward tilt position
CN34-1 ~ CN34-2	No continuity.	Continuity shall exist.	No continuity.
CN34-3 ~ CN34-4	No continuity.	No continuity.	Continuity shall exist.

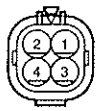
Inspection 3:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.



CN1 (REC)

Standard:
CN1-10 ~ CN1-9: No continuity.
CN1-10 ~ CN1-23: No continuity.
CN1-9 ~ CN1-23: No continuity.



CN34 (TAB)

Inspection 4:
Inspect continuity through the tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.

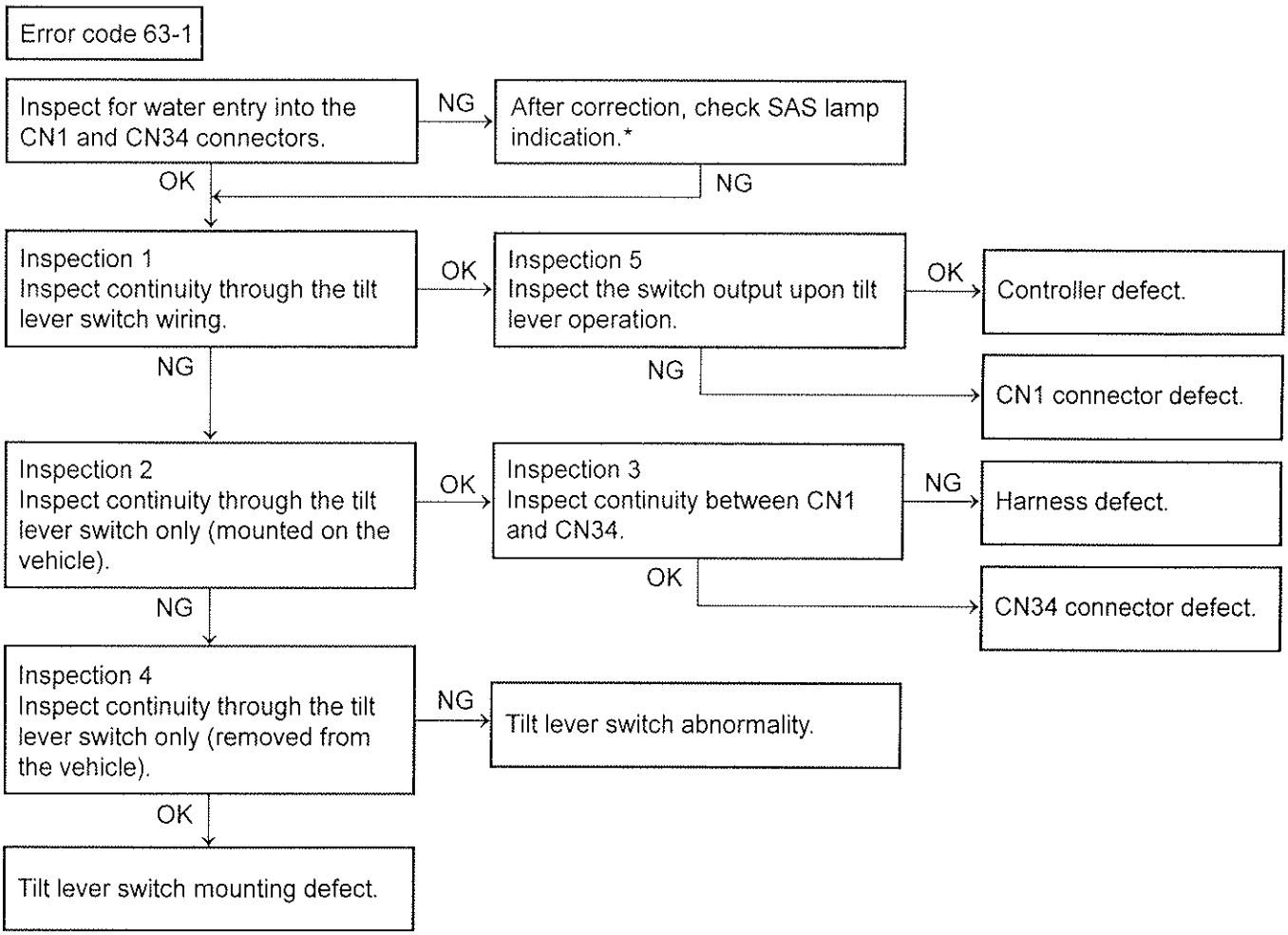
Standard:
• Upper side switch (switch on the top when mounted on the vehicle)

	Switch free	Switch depressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity.

• Lower side switch (switch on the bottom when mounted on the vehicle)

	Switch free	Switch depressed
CN34-3 ~ CN34-4	Continuity shall exist.	No continuity.

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* After the ignition switch is turned ON, make sure that the SAS lamp is lit upon tilting forward and backward.

Inspection 1:

Inspect continuity through the tilt lever switch wiring.

Turn the ignition switch OFF and disconnect CN1.



CN1 (REC)

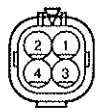
Standard:

	Lever at neutral position	Lever at forward tilt position	Lever at backward tilt position
CN1-10 ~ CN1-23	No continuity.	Continuity shall exist.	No continuity.
CN1-9 ~ CN1-23	No continuity.	No continuity.	Continuity shall exist.

Inspection 2:

Inspect continuity through the tilt lever switch only (mounted on the vehicle).

Turn the ignition switch OFF and disconnect CN34.



CN34 (TAB)

Standard:

	Lever at neutral position	Lever at forward tilt position	Lever at backward tilt position
CN34-1 ~ CN34-2	No continuity.	Continuity shall exist.	No continuity.
CN34-3 ~ CN34-4	No continuity.	No continuity.	Continuity shall exist.

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Inspection 3:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.

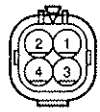
Standard:
CN1-10 ~ CN1-9: No continuity.
CN1-10 ~ CN1-23: No continuity.
CN1-9 ~ CN1-23: No continuity.



CN1 (REC)

Inspection 4:
Inspect continuity through the tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.



CN34 (TAB)

Standard:
• Upper side switch (switch on the top when mounted on the vehicle)

	Switch free	Switch depressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity.

• Lower side switch (switch on the bottom when mounted on the vehicle)

	Switch free	Switch depressed
CN34-3 ~ CN34-4	Continuity shall exist.	No continuity.

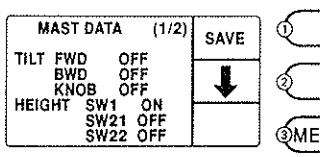
Inspection 5:
Inspect the switch output upon tilt lever operation.

Turn the ignition switch ON (stop the engine).

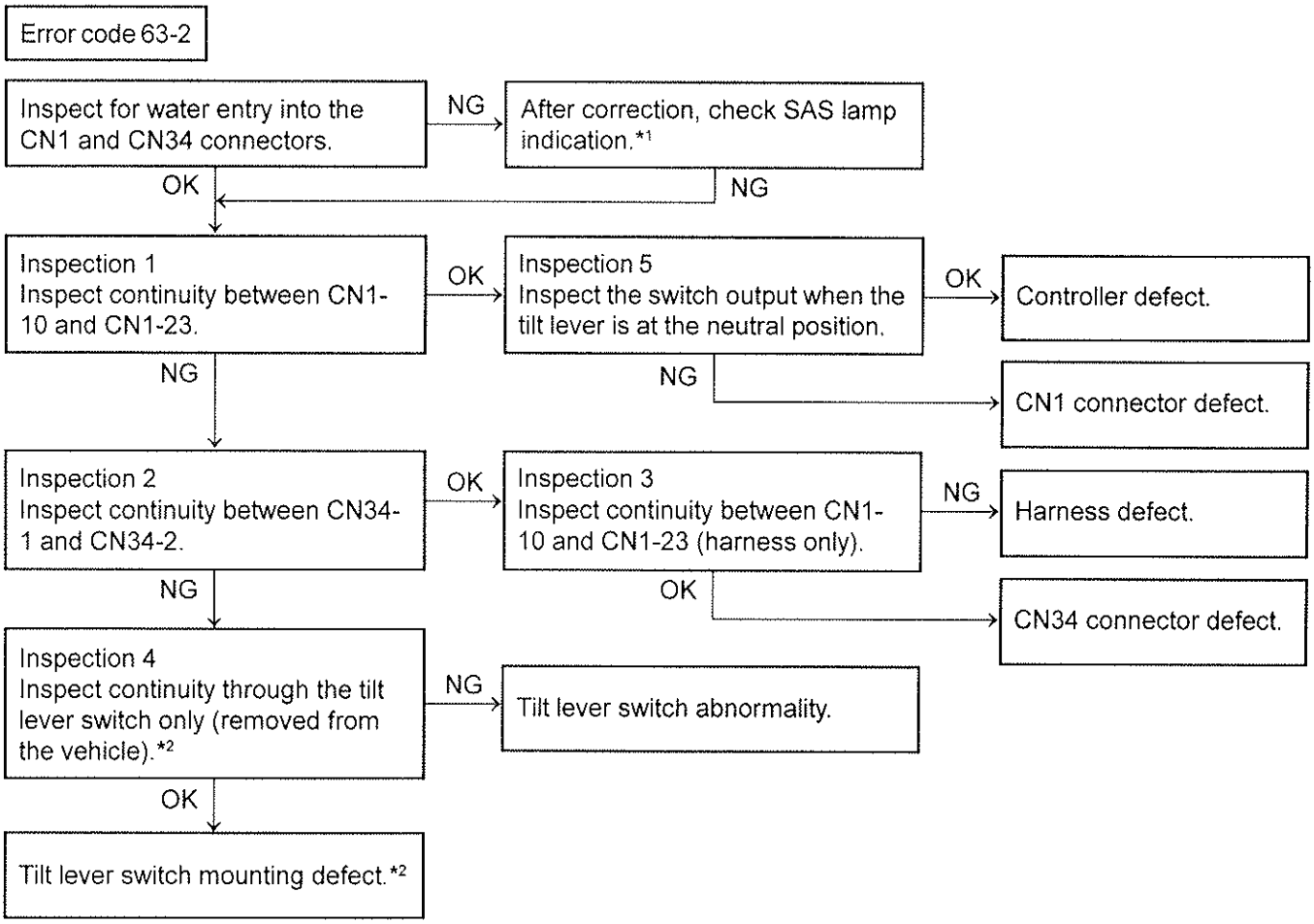
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

	Lever at neutral position	Lever tilted forward	Lever tilted backward
Forward tilt	OFF	ON	OFF
Backward tilt	OFF	OFF	ON



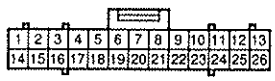
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*1: Make sure that the 2-minute waiting SAS lamp blinks when the tilt lever is at the neutral position.
*2: This tilt lever switch is the upper switch among two switches mounted on the second spool of the control valve.

Inspection 1:
Inspect continuity between CN1-10 and CN1-23.

Turn the ignition switch OFF and disconnect CN1.

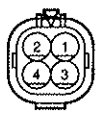


CN1 (REC)

Standard:
CN1-10 ~ CN1-23: No continuity.

Inspection 2:
Inspect continuity between CN34-1 and CN34-2. (Inspect on the connector at the tilt switch side.)

Turn the ignition switch OFF and disconnect CN34.



CN34
(TAB)

Standard:
CN1-10 ~ CN1-23: No continuity.

Inspection 3:
Inspect continuity between CN1-10 and CN1-23 (harness only).

Turn the ignition switch OFF and disconnect CN1 and CN34.



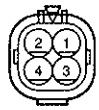
CN1 (REC)

Standard:
CN1-10 ~ CN1-23: No continuity.

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Inspection 4:
Inspect continuity through the tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.



CN34 (TAB)

Standard:
- Upper side switch (switch on the top when mounted on the vehicle)

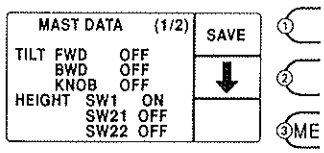
	Switch free	Switch depressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity.

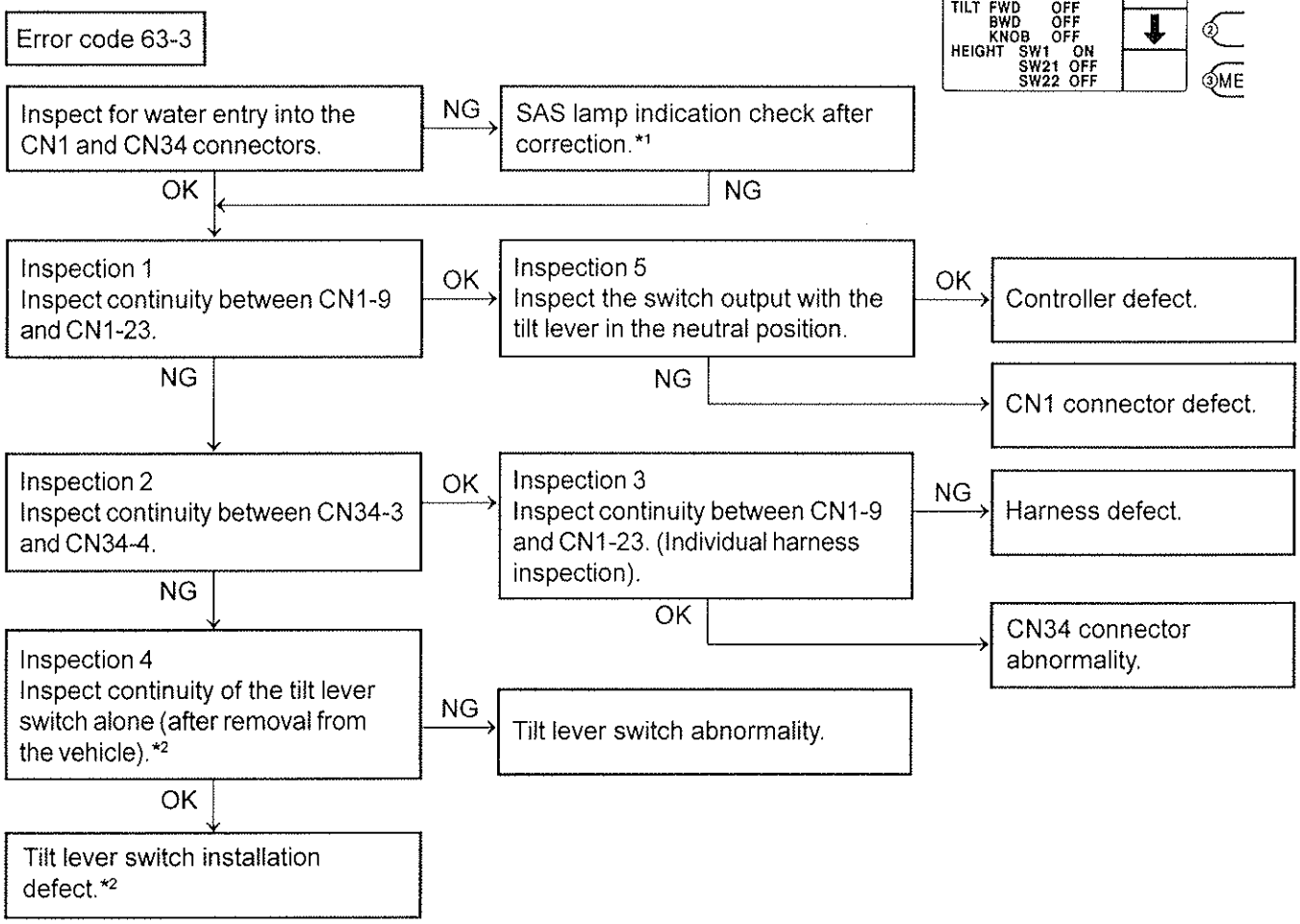
Inspection 5:
Inspect the switch output when the tilt lever is at the neutral position.

Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
FORWARD OFF when the tilt lever is at the neutral position





*1: Wait for 2 minutes with the tilt lever in the neutral position, and check if the SAS lamp blinks.
*2: This tilt lever switch is the lower one out of two switches in stalled on the second spool of the control valve.

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Inspection 1:
Inspect continuity between CN1-9 and CN1-23.



CN1 (REC)

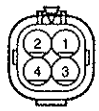
Turn the ignition switch OFF and disconnect CN1.

Standard:
CN1-9 ~ CN1-23: No continuity.

Inspection 2:
Inspect continuity between CN34-3 and CN34-4. (Inspect on the connector at the tilt switch side.)

Turn the ignition switch OFF and disconnect CN34.

Standard:
CN34-3 ~ CN34-4: No continuity.



CN34 (TAB)

Inspection 3:
Inspect continuity between CN1-9 and CN1-23 (harness only).

Turn the ignition switch OFF and disconnect CN1 and CN34.

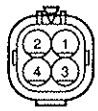


CN1 (REC)

Standard:
CN1-9 ~ CN1-23: No continuity.

Inspection 4:
Inspect continuity of the tilt lever switch alone (after removal from the vehicle).

Turn the ignition switch OFF and disconnect CN34.



CN34 (TAB)

Standard:
Lower switch (switch on the lower side when installed on the vehicle)

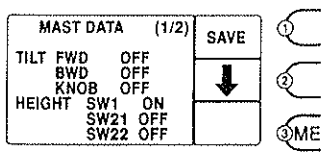
	Switch in free state	Switch in pressed state
CN34-3 ~ CN34-4	Continuity shall exist.	No continuity.

Inspection 5:
Inspect the switch output when the tilt lever is at the neutral position.

Turn the ignition switch ON (engine in stopped state)

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

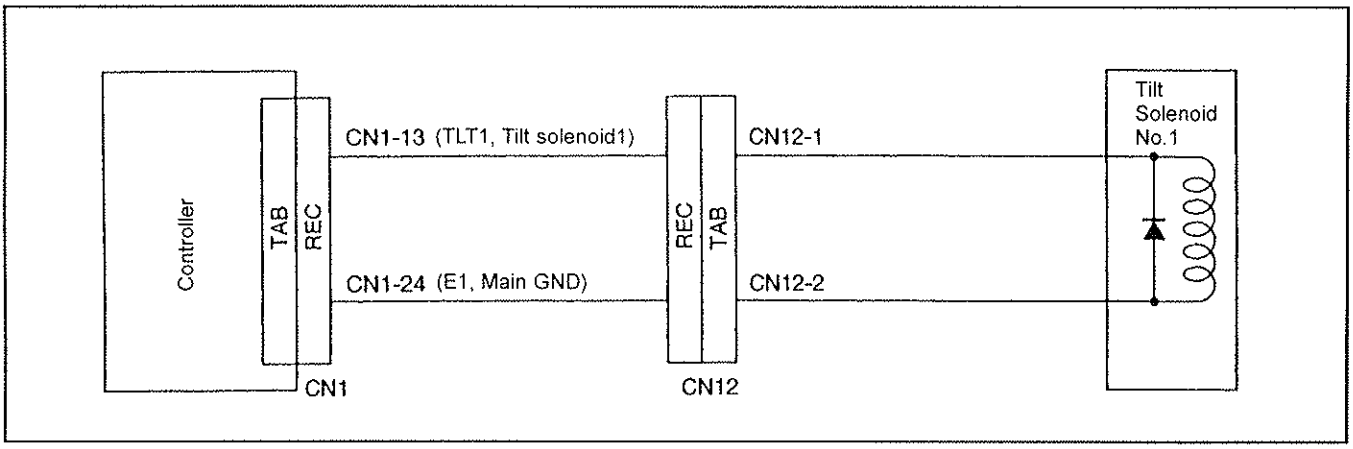
Standard:
BACKWARD OFF state when the tilt lever is in the neutral position.



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- **Error code 64 (Tilt solenoid No.1 abnormality)**
- **Error code 64-1**

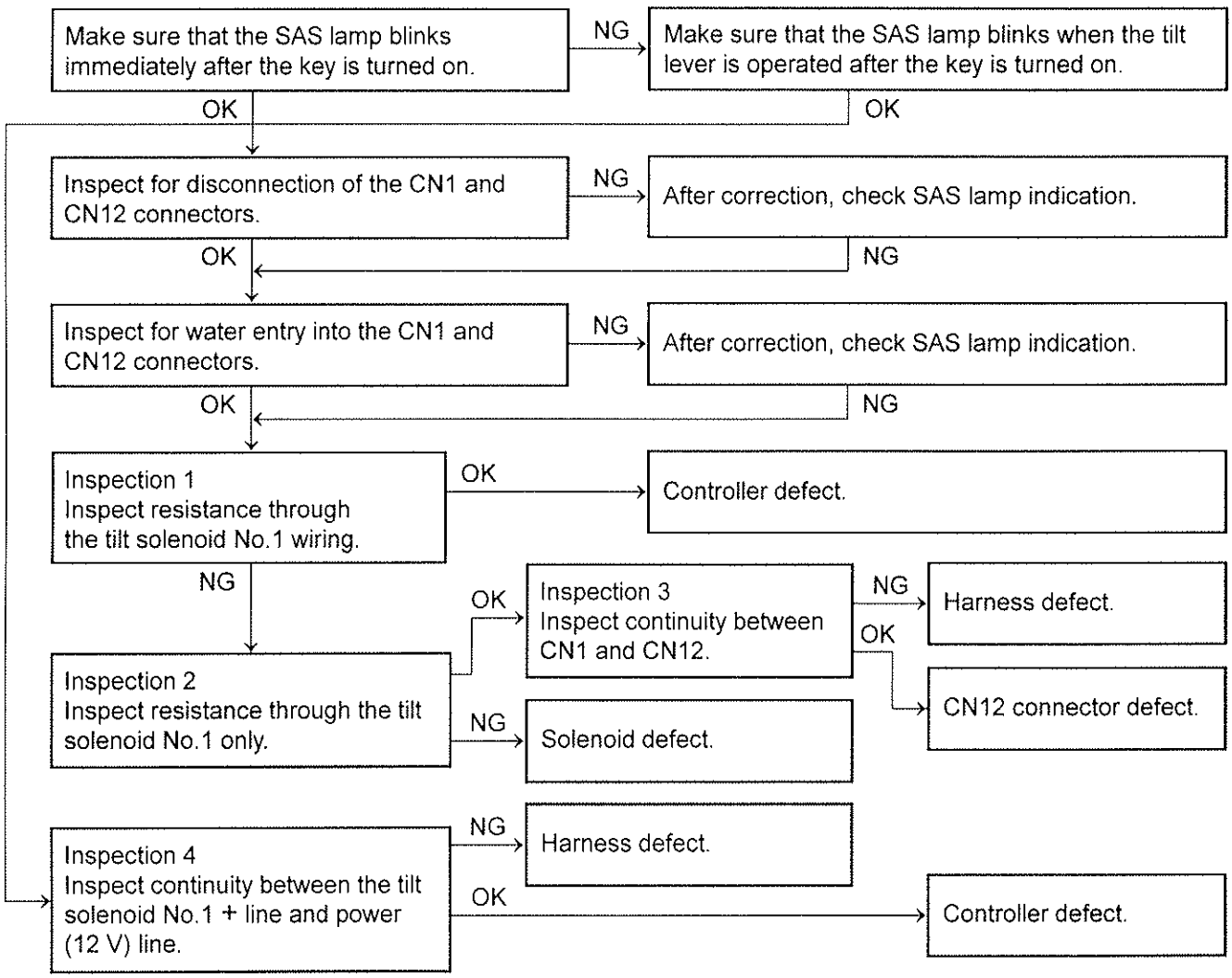
Related Portion



Estimated Causes:

① Connector contact defect
② Tilt solenoid No.1 harness defect
③ Tilt solenoid No.1 defect
④ Controller defect

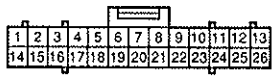
Error code 64 • 64-1



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Inspection 1:
Inspect resistance through the tilt solenoid No.1 wiring.

Turn the ignition switch OFF and disconnect CN1.



CN1 (REC)

Standard:
CN1-13 (Digital circuit tester ⊕) ~ CN1-24 (Digital circuit tester ⊖): Resistance Approx. 10 Ω
CN1-13 (Analog circuit tester ⊖) ~ CN1-24 (Analog circuit tester ⊕): Resistance Approx. 10 Ω

Inspection 2:
Inspect resistance through the tilt solenoid No.1 only.

Turn the ignition switch OFF and disconnect CN12.



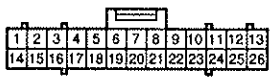
CN12 (TAB)

Standard:
CN12-1 (Digital circuit tester ⊕) ~ CN12-2 (Digital circuit tester ⊖): Resistance Approx. 10 Ω
CN12-1 (Analog circuit tester ⊖) ~ CN12-2 (Analog circuit tester ⊕): Resistance Approx. 10 Ω

Inspection 3:
Inspect continuity between CN1 and CN12.

Turn the ignition switch OFF and disconnect CN1 and CN12.

Standard:
CN1-13 ~ CN12-1: Continuity shall exist.
CN1-24 ~ CN12-2: Continuity shall exist.
CN1-13 ~ CN1-24: No continuity.



CN1 (REC)



CN12 (REC)

Inspection 4:
Inspect continuity between the tilt solenoid No.1 + line and power (12 V) line.

Turn the ignition switch OFF and disconnect CN1.

Standard:
CN1-11 ~ CN1-13: No continuity.

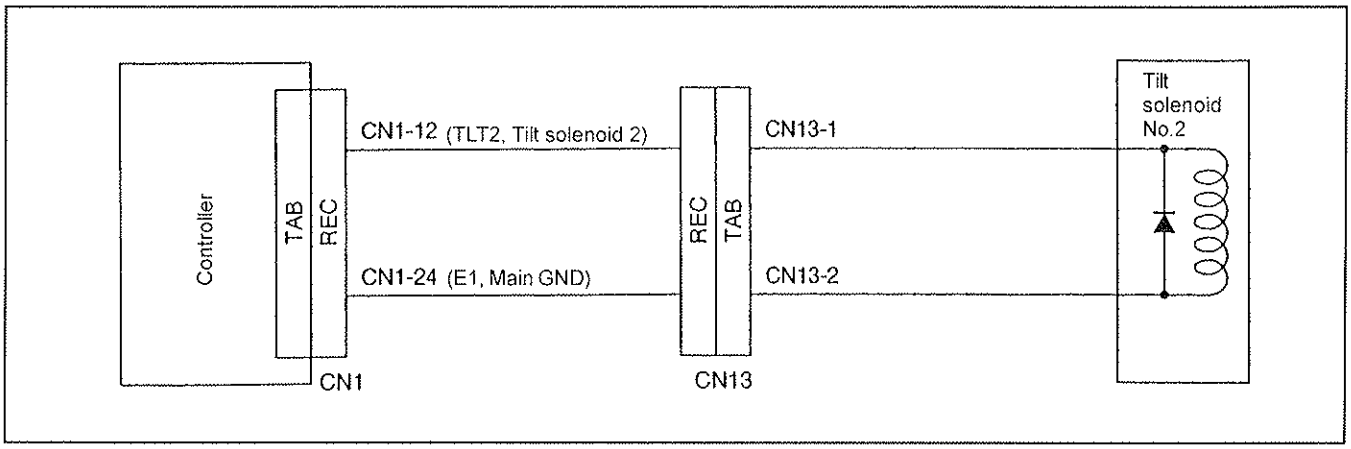


CN1 (REC)

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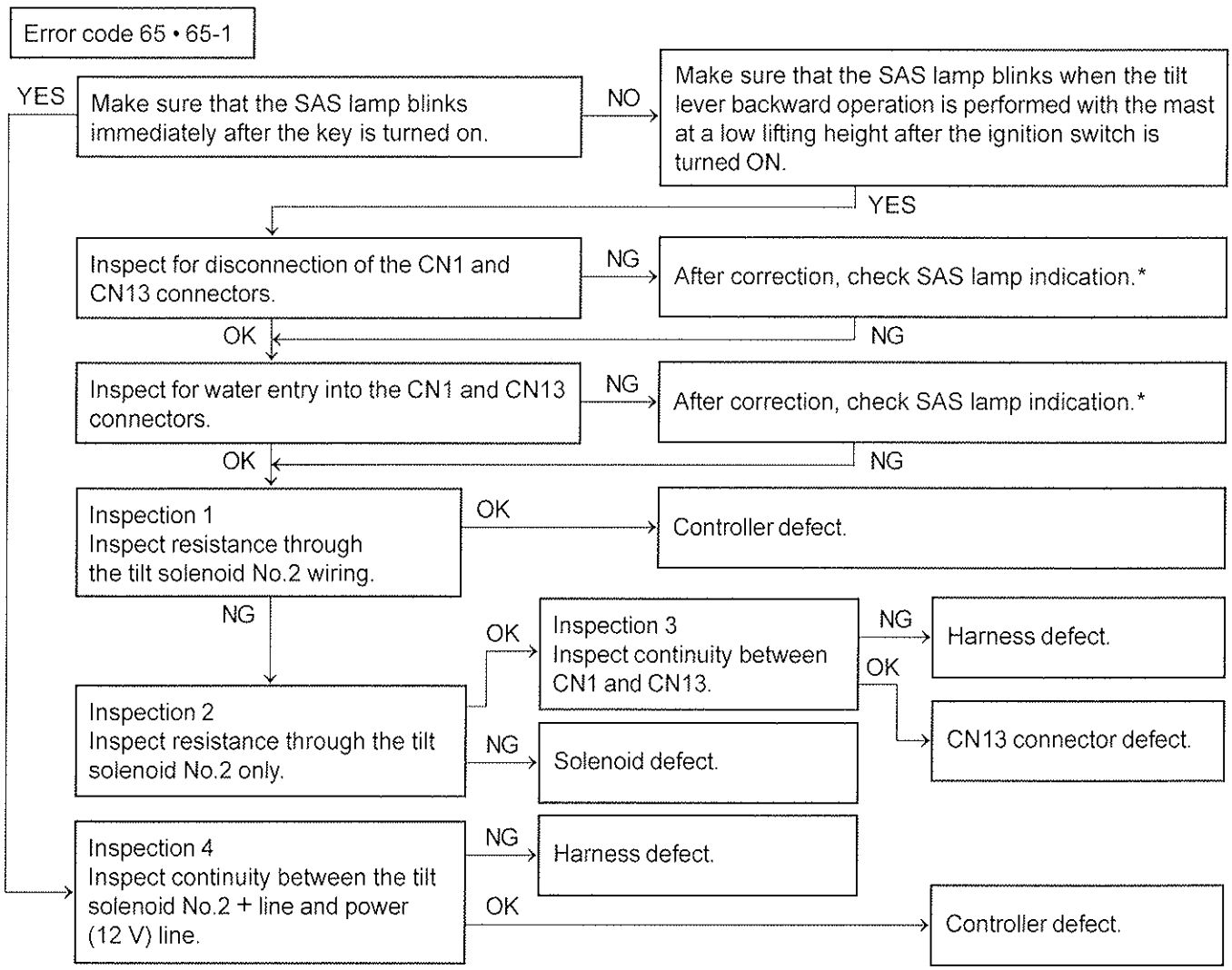
- **Error code 65 (Tilt solenoid No.2 abnormality) (~ 2000.11)**
- **Error code 65-1 (~ 2000.11)**

Related Portion



Estimated Causes:

① Connector contact defect
② Tilt solenoid No.2 harness defect
③ Tilt solenoid No.2 defect
④ Controller defect

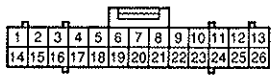


*: Make sure that the SAS lamp blinks when the tilt lever backward operation is performed with the mast at a low lifting height after the ignition switch is turned on.

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Inspection 1:
Inspect resistance through the tilt solenoid No.2 wiring.

Turn the ignition switch OFF and disconnect CN1.



CN1 (REC)

Standard:
CN1-12 (Digital circuit tester ⊕) ~ CN1-24 (Digital circuit tester ⊖): Resistance Approx. 10 Ω
CN1-12 (Analog circuit tester ⊖) ~ CN1-24 (Analog circuit tester ⊕): Resistance Approx. 10 Ω

Inspection 2:
Inspect resistance through the tilt solenoid No.2 only.

Turn the ignition switch OFF and disconnect CN13.



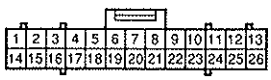
CN13 (TAB)

Standard:
CN13-1 (Digital circuit tester ⊕) ~ CN13-2 (Digital circuit tester ⊖): Resistance Approx. 10 Ω
CN13-1 (Analog circuit tester ⊖) ~ CN13-2 (Analog circuit tester ⊕): Resistance Approx. 10 Ω

Inspection 3:
Inspect continuity between CN1 and CN13.

Turn the ignition switch OFF and disconnect CN1 and CN13.

Standard:
CN1-12 ~ CN13-1: Continuity shall exist.
CN1-24 ~ CN13-2: Continuity shall exist.
CN1-12 ~ CN1-24: No continuity.



CN1 (REC)

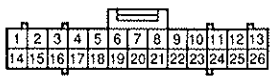


CN13 (REC)

Inspection 4:
Inspect continuity between the tilt solenoid No.2 + line and power (12 V) line.

Turn the ignition switch OFF and disconnect CN1.

Standard:
CN1-11 ~ CN1-12: No continuity.



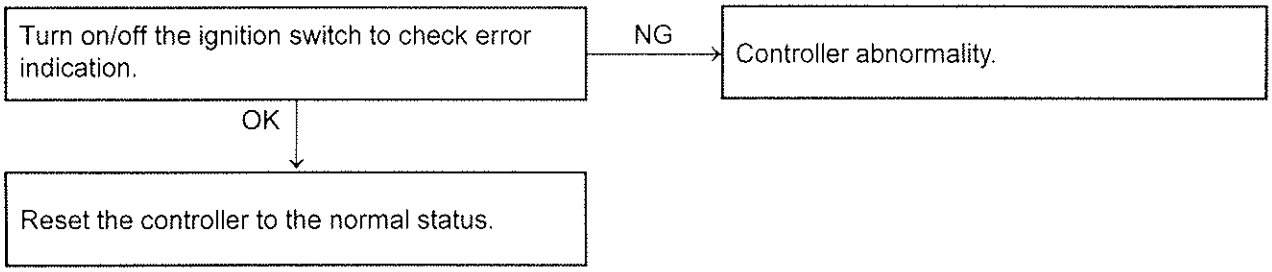
CN1 (REC)

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● Error code 66 • 66-1 (Tilt angle/NL load re-setting value abnormality)

Estimated Cause:

① Controller defect



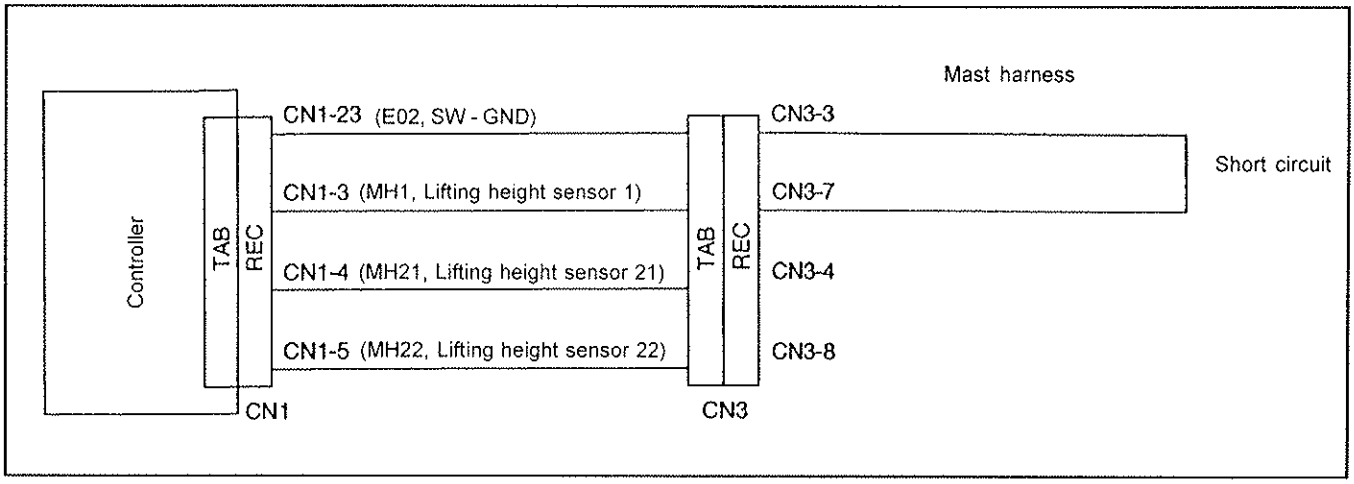
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● Error code 67 • 67-1 (Lifting height switch abnormality)

<When there is no fork height switch:>*1

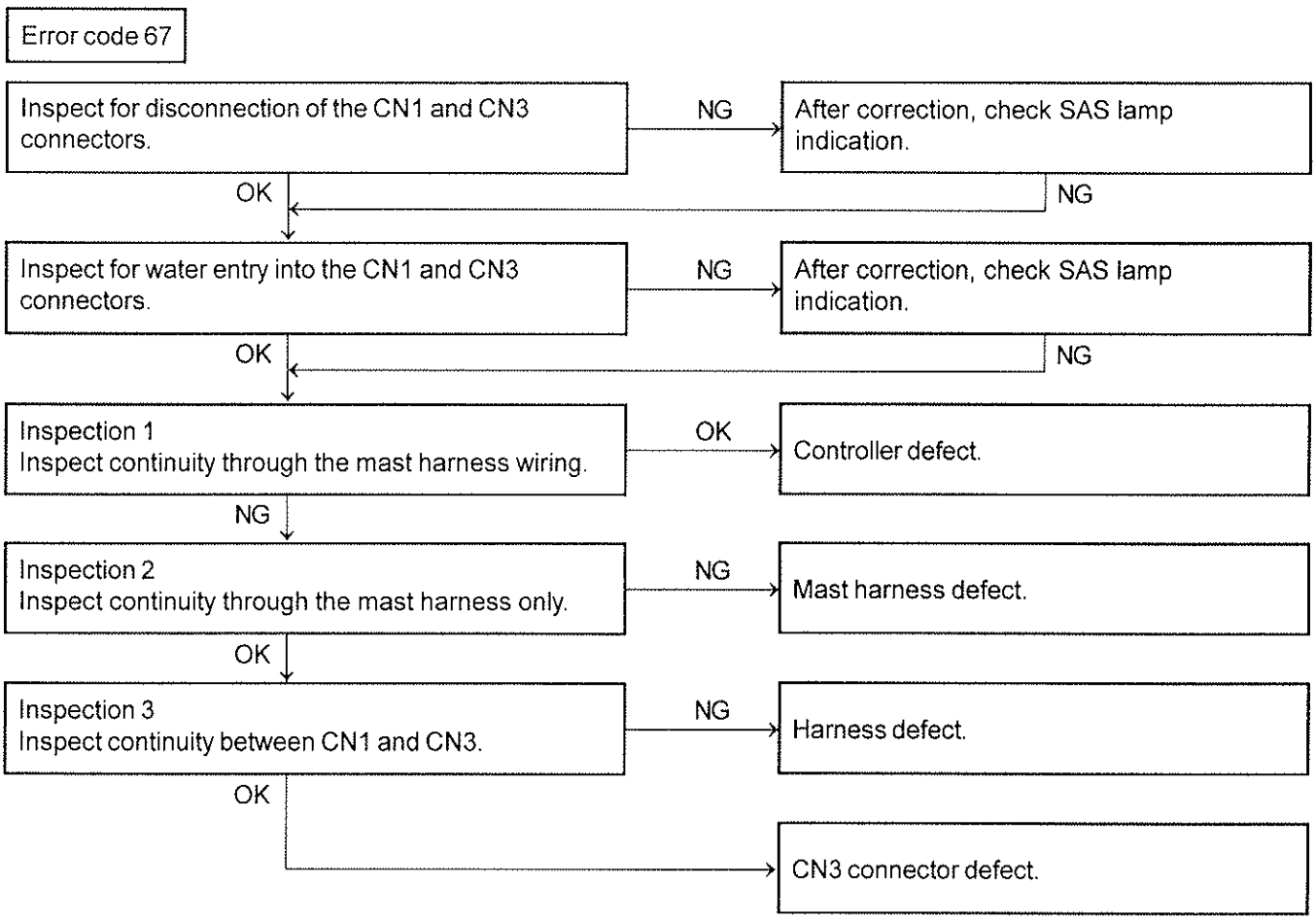
*1: Specification, "No fork height SW" has not been applied to your destination.

Related Portion



Estimated Causes:

① Connector contact defect
② (Lifting height switch) Harness defect
③ Controller defect



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Inspection 1:
Inspect continuity through the mast harness wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:
CN1-23 ~ CN1-3: Continuity shall exist.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.

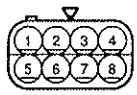


CN1 (REC)

Inspection 2:
Inspect continuity through the mast harness only.

Turn the ignition switch OFF and disconnect CN3.

Standard:
CN3-3 ~ CN3-7: Continuity shall exist.
CN3-3 ~ CN3-4: No continuity.
CN3-3 ~ CN3-8: No continuity.
CN3-4 ~ CN3-8: No continuity.



CN3 (REC)

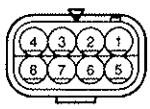
Inspection 3:
Inspect continuity between CN1 and CN3.

Turn the ignition switch OFF and disconnect CN1 and CN3.

Standard:
CN1-23 ~ CN3-3: Continuity shall exist.
CN1-3 ~ CN3-7: Continuity shall exist.
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.

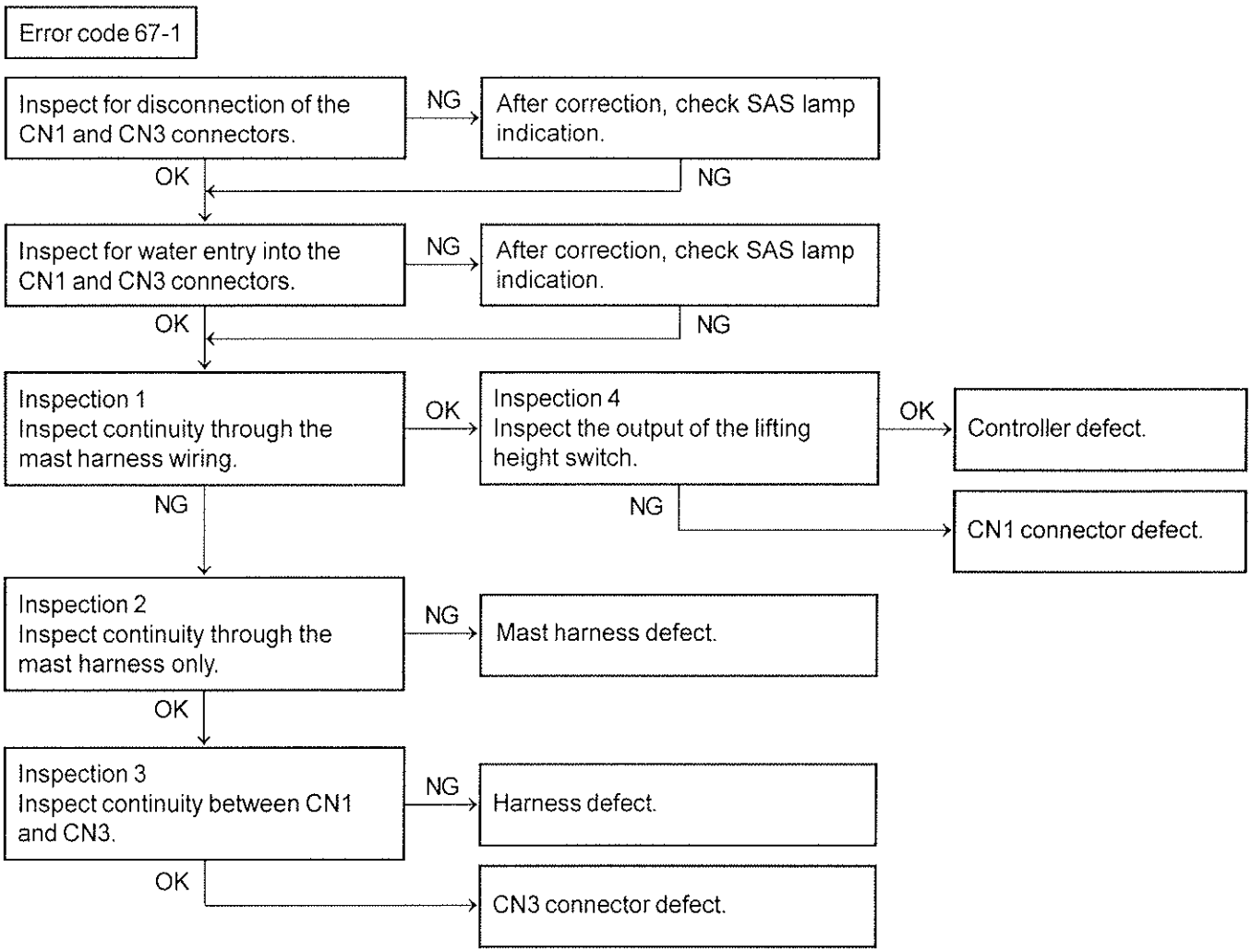


CN1 (REC)



CN3 (TAB)

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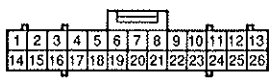
Inspection 1:

Inspect continuity through the mast harness wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

CN1-23 ~ CN1-3: Continuity shall exist.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



CN1 (REC)

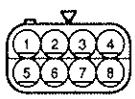
Inspection 2:

Inspect continuity through the mast harness only.

Turn the ignition switch OFF and disconnect CN3.

Standard:

CN3-3 ~ CN3-7: Continuity shall exist.
CN3-3 ~ CN3-4: No continuity.
CN3-3 ~ CN3-8: No continuity.
CN3-4 ~ CN3-8: No continuity.



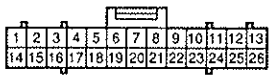
CN3 (REC)

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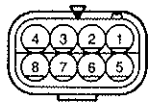
Inspection 3:
Inspect continuity between CN1 and CN3.

Turn the ignition switch OFF and disconnect CN1 and CN3.

Standard:
CN1-23 ~ CN3-3: Continuity shall exist.
CN1-3 ~ CN3-7: Continuity shall exist.
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



CN1 (REC)



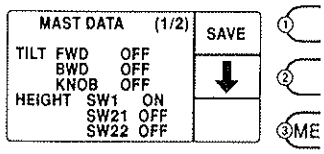
CN3 (TAB)

Inspection 4:
Inspect the output of the lifting height switch.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
SW1: ON
SW21: OFF
SW22: OFF

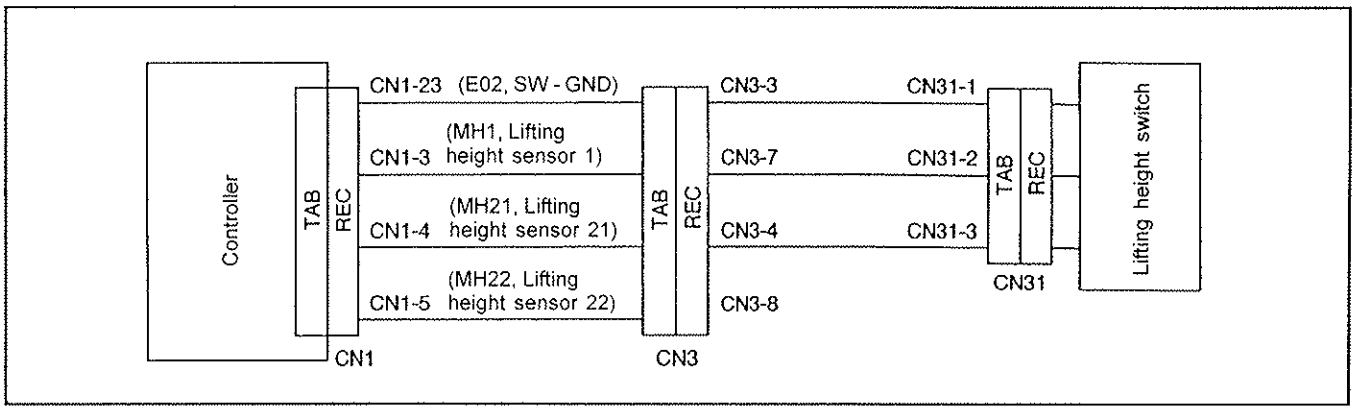


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● Error code 67 • 67-1 (Lifting height switch abnormality)

<When fork height switch is used:>

Related Portion



Estimated Causes:

① Connector contact defect
② (Lifting height switch) Harness defect
③ Lifting height switch defect
④ Controller defect

Error code 67

Inspect for disconnection of the CN1, CN3, and CN31 connectors. — NG → After correction, check SAS lamp indication.*

OK ← NG

Inspect for water entry into the CN1, CN3, and CN31 connectors. — NG → After correction, check SAS lamp indication.*

OK ← NG

Inspection 1
Inspect continuity through the lifting height switch wiring. — OK → Controller defect.

NG ↓

Inspection 2
Inspect continuity through the lifting switch only. — NG → Lifting height switch defect.

OK ↓

Inspection 3
Inspect continuity between CN1 and CN31. — OK → CN31 connector defect.

NG ↓

Inspection 4
Inspect continuity between CN1 and CN3. — NG → Harness defect.

OK ↓

Inspection 5
Inspect continuity between CN3 and CN31. — NG → Harness defect.

OK → CN3 connector defect.

*: If the SAS lamp blinks at a particular lifting height, check SAS lamp indication at the height.

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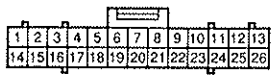
Inspection 1:
Inspect continuity through the lifting height switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Small lifting height	Large lifting height
CN1-23 ~ CN1-3	Continuity shall exist.	No continuity.
CN1-23 ~ CN1-4	No continuity.	Continuity shall exist.

CN1-23 ~ CN1-5	No continuity.
CN1-3 ~ CN1-4	No continuity.
CN1-3 ~ CN1-5	No continuity.
CN1-4 ~ CN1-5	No continuity.



CN1 (REC)

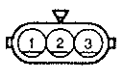
Inspection 2:
Inspect continuity through the lifting switch only.

Turn the ignition switch OFF and disconnect CN31.

Standard:

	Small lifting height	Large lifting height
CN31-1 ~ CN31-2	Continuity shall exist.	No continuity.
CN31-1 ~ CN31-3	No continuity.	Continuity shall exist.

CN31-2 ~ CN31-3	No continuity.

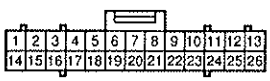


CN31 (REC)

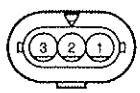
Inspection 3:
Inspect continuity between CN1 and CN31.

Turn the ignition switch OFF and disconnect CN1 and CN31.

Standard:
CN1-23 ~ CN31-1: Continuity shall exist.
CN1-3 ~ CN31-2: Continuity shall exist.
CN1-4 ~ CN31-3: Continuity shall exist.
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



CN1 (REC)



CN31 (TAB)

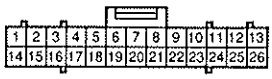
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Inspection 4:
Inspect continuity between CN1 and CN3.

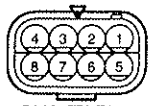
Turn the ignition switch OFF and disconnect CN1 and CN3.

(1) If continuity does not exist between connector terminals in which continuity should exist in inspection 3:

Standard:
CN1-23 ~ CN3-3: Continuity shall exist.
CN1-3 ~ CN3-7: Continuity shall exist.
CN1-4 ~ CN3-4: Continuity shall exist.



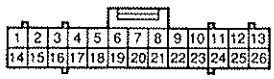
CN1 (REC)



CN3 (TAB)

(2) If continuity exist between connector terminals in which continuity should not exist in inspection 3:

Standard:
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



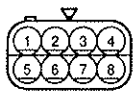
CN1 (REC)

Inspection 5:
Inspect continuity between CN3 and CN31.

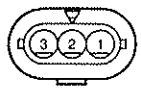
Turn the ignition switch OFF and disconnect CN3 and CN31.

(1) If continuity does not exist between connector terminals in which continuity should exist in inspection 3:

Standard:
CN3-3 ~ CN31-1: Continuity shall exist.
CN3-7 ~ CN31-2: Continuity shall exist.
CN3-4 ~ CN31-3: Continuity shall exist.



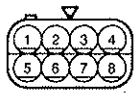
CN3 (REC)



CN31 (TAB)

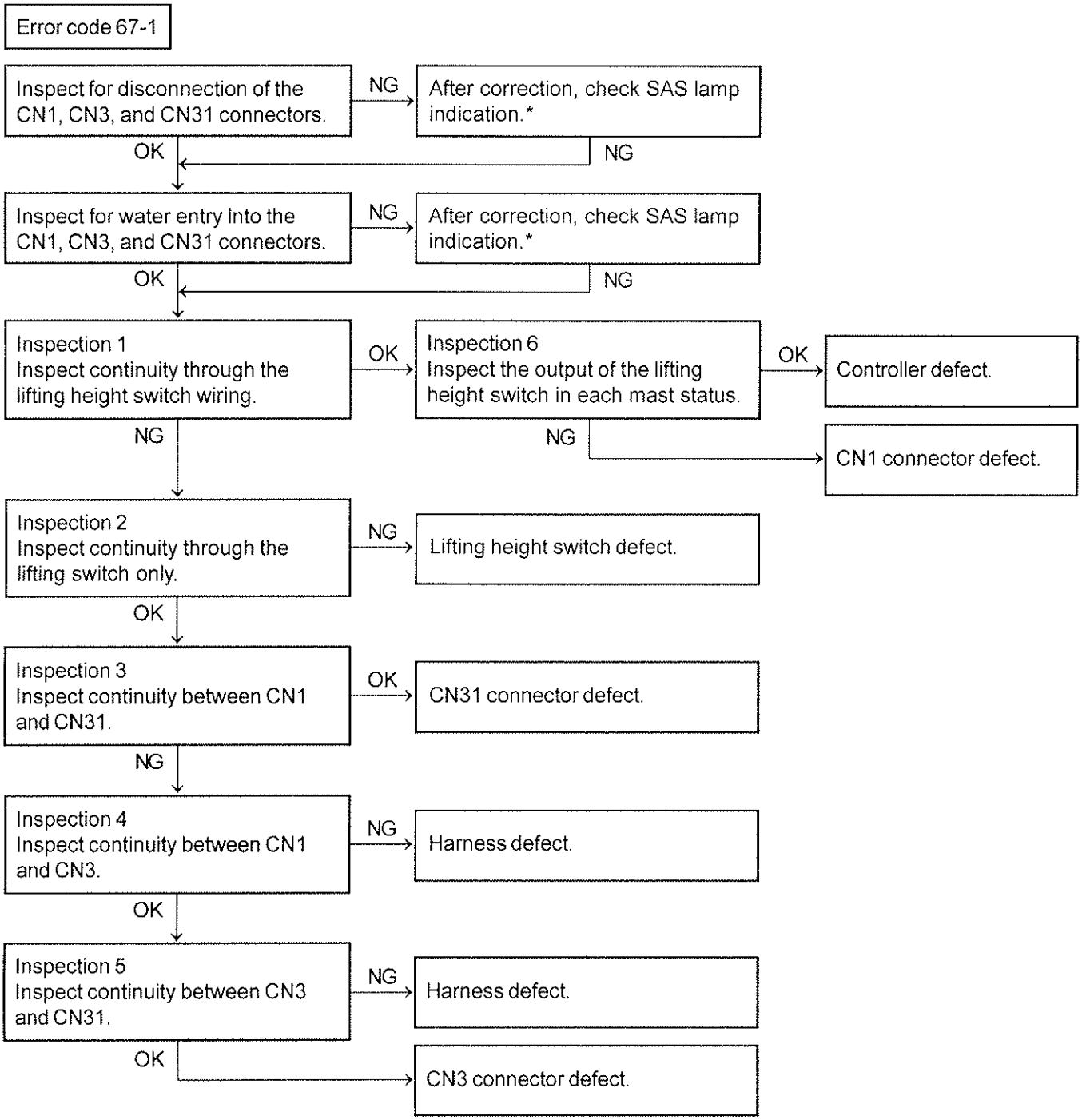
(2) If continuity exists between connector terminals in which continuity should not exist in inspection 3:

Standard:
CN3-3 ~ CN3-7: No continuity.
CN3-3 ~ CN3-4: No continuity.
CN3-7 ~ CN3-4: No continuity.



CN3 (REC)

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*: If the SAS lamp blinks at a particular lifting height, check SAS lamp indication at the height.

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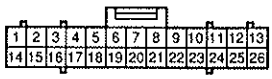
Inspection 1:
Inspect continuity through the lifting height switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Small lifting height	Large lifting height
CN1-23 ~ CN1-3	Continuity shall exist.	No continuity.
CN1-23 ~ CN1-4	No continuity.	Continuity shall exist.

CN1-23 ~ CN1-5	No continuity.
CN1-3 ~ CN1-4	No continuity.
CN1-3 ~ CN1-5	No continuity.
CN1-4 ~ CN1-5	No continuity.



CN1 (REC)

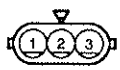
Inspection 2:
Inspect continuity through the lifting switch only.

Turn the ignition switch OFF and disconnect CN31.

Standard:

	Small lifting height	Large lifting height
CN31-1 ~ CN31-2	Continuity shall exist.	No continuity.
CN31-1 ~ CN31-3	No continuity.	Continuity shall exist.

CN31-2 ~ CN31-3	No continuity.

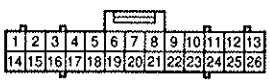


CN31 (REC)

Inspection 3:
Inspect continuity between CN1 and CN31.

Turn the ignition switch OFF and disconnect CN1 and CN31.

Standard:
CN1-23 ~ CN31-1: Continuity shall exist.
CN1-3 ~ CN31-2: Continuity shall exist.
CN1-4 ~ CN31-3: Continuity shall exist.
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



CN1 (REC)



CN31 (TAB)

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Inspection 4:
Inspect continuity between CN1 and CN3.

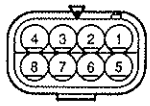
Turn the ignition switch OFF and disconnect CN1 and CN3.

(1) If continuity does not exist between connector terminals in which continuity should exist in inspection 3:

Standard:
CN1-23 ~ CN3-3: Continuity shall exist.
CN1-3 ~ CN3-7: Continuity shall exist.
CN1-4 ~ CN3-4: Continuity shall exist.



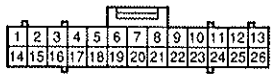
CN1 (REC)



CN3 (TAB)

(2) If continuity does not exist between connector terminals in which continuity should not exist in inspection 3:

Standard:
CN1-23 ~ CN1-3: No continuity.
CN1-23 ~ CN1-4: No continuity.
CN1-23 ~ CN1-5: No continuity.
CN1-3 ~ CN1-4: No continuity.
CN1-3 ~ CN1-5: No continuity.
CN1-4 ~ CN1-5: No continuity.



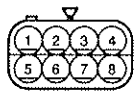
CN1 (REC)

Inspection 5:
Inspect continuity between CN3 and CN31.

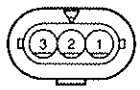
Turn the ignition switch OFF and disconnect CN3 and CN31.

(1) If continuity does not exist between connector terminals in which continuity should exist in inspection 3:

Standard:
CN3-3 ~ CN31-1: Continuity shall exist.
CN3-7 ~ CN31-2: Continuity shall exist.
CN3-4 ~ CN31-3: Continuity shall exist.



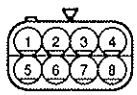
CN3 (REC)



CN31 (TAB)

(2) If continuity exists between connector terminals in which continuity should not exist in inspection 3:

Standard:
CN3-3 ~ CN3-7: No continuity.
CN3-3 ~ CN3-4: No continuity.
CN3-7 ~ CN3-4: No continuity.



CN3 (REC)

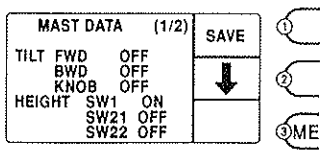
Inspection 6:
Inspect the output of the lifting height switch in each mast status.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

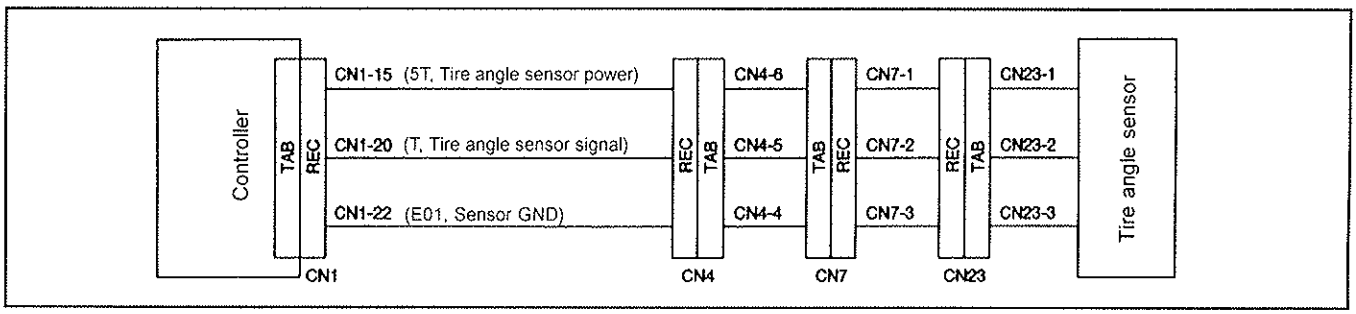
	Small lifting height	Large lifting height
SW1	ON	OFF
SW21	OFF	ON
SW22	OFF	OFF



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- **Error code 71 (Tire angle sensor abnormality)**
- **Error code 71-1 (Tire angle sensor open circuit)**
- **Error code 71-2 (Tire angle sensor short circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Tire angle sensor harness defect
③ Tire angle sensor defect
④ Tire angle sensor joint/rear axle link system defect
⑤ Controller defect

Error code 71

Inspect disconnection and internal wetting of the CN1, CN4, CN7, and CN23 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect disconnection and internal wetting of the CN1, CN4, CN7, and CN23 connectors.)
OK

Inspection 2
Inspect continuity between harness CN1-15 and CN23-1, between CN1-20 and CN23-2, and between each line and frame.
NG → Harness defect.
OK

Inspection 3
Inspect continuity sensor and between CN23-2 and frame and resistance between sensor CN23-1 and CN23-2 or between CN23-1 and CN23-3.
NG → Tire angle sensor defect.
OK

Inspection 4
Inspect for mechanical link damages or disconnection of the tire angle sensor joint, king pin, etc.
NG → Joint/link system defect.
OK

Controller defect.

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Inspection 1:
After correction, make sure that the SAS lamp goes out.

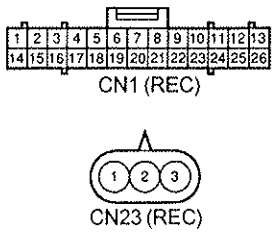
Connect all connectors then turn the ignoition switch ON.

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN1-15 and CN23-1, between CN1-20 and CN23-2, between CN1-22 and CN23-3, between CN23-1 and CN23-2, and between the 5T or T line and frame.

Turn the ignition switch OFF and disconnect CN1 and CN23.

Standard:
CN1-15 ~ CN23-1: Continuity shall exist.
CN1-20 ~ CN23-2: Continuity shall exist.
CN23-1 ~ Frame: No continuity.
CN23-2 ~ Frame: No continuity.
CN1-22 ~ CN23-3: Continuity shall exist.
CN23-1 ~ CN23-2: No continuity.
CN23-1 ~ CN23-3: No continuity.
CN23-2 ~ CN23-3: No continuity.



Inspection 3:
Inspect continuity sensor and between CN23-2 and frame and resistance between sensor CN23-1 and CN23-2 or between CN23-1 and CN23-3.

Turn the ignition switch OFF with tires in straight-forward status and disconnect CN23.

Standard:
CN23-2 ~ Frame: No continuity.
CN23-1 ~ CN23-2: Resistance 400 Ω ~ 1.5 kΩ
CN23-1 ~ CN23-3: Resistance 1.6 kΩ ~ 2.4 kΩ



Inspection 4:
Inspect for mechanical link damages or disconnection of the tire angle sensor joint, king pin, etc.

Turn the ignition switch OFF.

Standard:
Damages and disconnection the link are not permissible.

Note:
Re-setting is necessary after removing and installing the tire angle sensor and tire angle sensor cover.

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Error code 71-1

Inspect disconnection and internal wetting of the CN1, CN4, CN7, and CN23 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect disconnection and internal wetting of the CN1, CN4, CN7, and CN23 connectors.)
OK ↓

Inspection 2
Inspect continuity between harness CN1-15 and CN23-1, between CN1-20 and CN23-2, and between each line and frame.
NG → Harness defect.
OK ↓

Inspection 3
Inspect continuity between sensor CN23-1 and CN23-2 and between CN23-2 and frame and resistance between CN23-1 and CN23-3.
NG → Tire angle sensor defect.
OK ↓

Inspection 4
Inspect the tire angle sensor output voltage (voltage changed between the straight-forward status and steering).
NG → Joint/link system defect.
OK ↓

Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON.

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN1-15 and CN23-1, between CN1-20 and CN23-2, and between each line and frame.

Turn the ignition switch OFF and disconnect CN1 and CN23.

Standard:
CN1-15 ~ CN23-1: Continuity shall exist.
CN1-20 ~ CN23-2: Continuity shall exist.
CN23-1 ~ Frame: No continuity.
CN23-2 ~ Frame: No continuity.
CN23-1 ~ CN23-3: No continuity.
CN23-2 ~ CN23-3: No continuity.



CN1 (REC)



CN23 (REC)

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Inspection 3:
Inspect resistance between sensor CN23-1 and CN23-2 and continuity between CN23-2 and frame.

Turn the ignition switch OFF and disconnect CN23.

Standard:
CN23-1 ~ CN23-2: Resistance 400 Ω ~ 1.5 kΩ
CN23-1 ~ CN23-3: Resistance 1.6 kΩ ~ 2.4 kΩ
CN23-2 ~ Frame: No continuity.



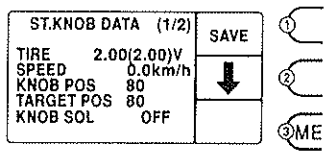
CN23 (TAB)

Inspection 4:
Inspect the tire angle sensor output voltage (voltage changed between the straight-forward status and steering).

Connect all connectors then turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

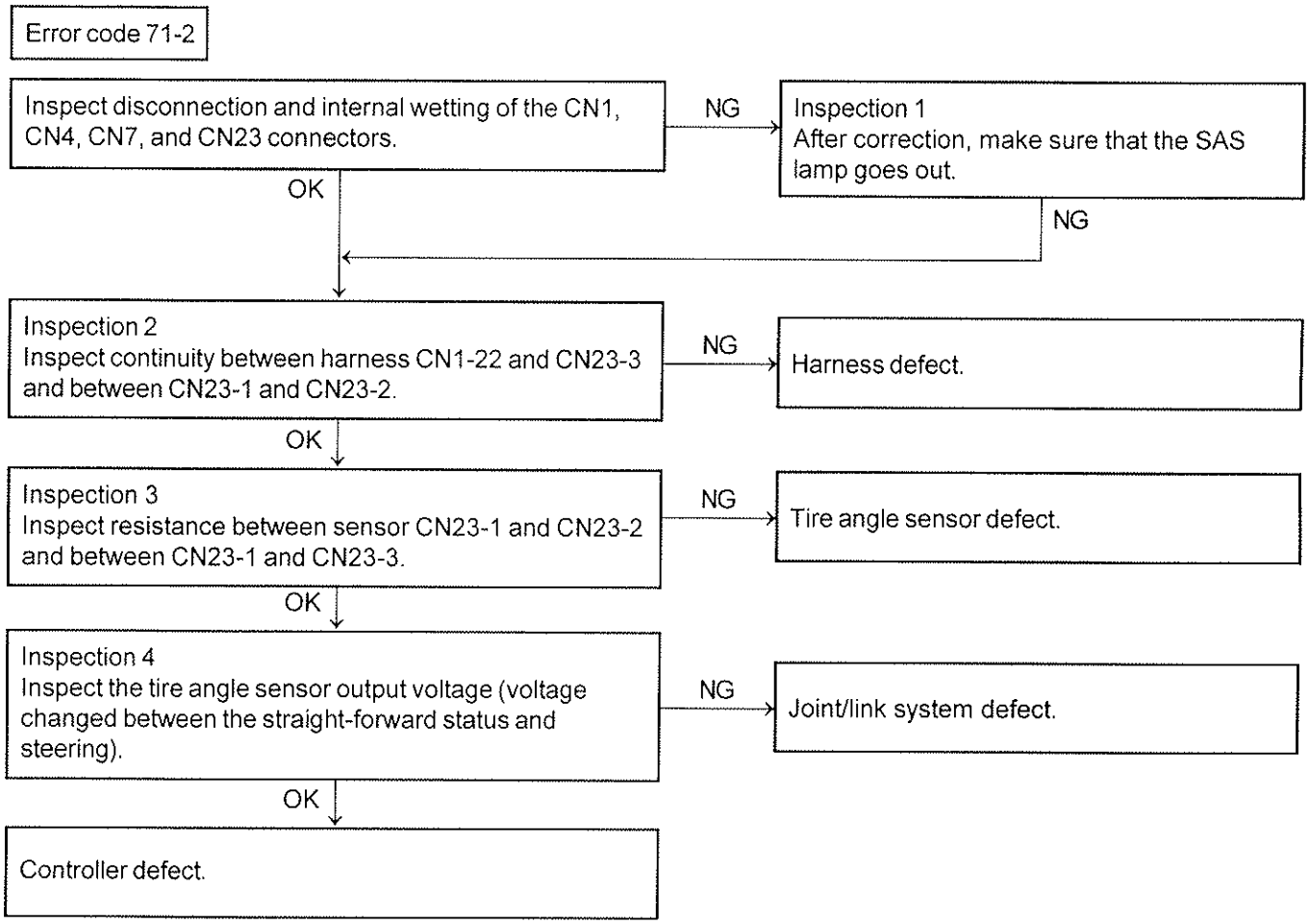
Standard:
1) Voltage value for tires set in the straight-forward status on an approx. flat surface: 1.50 to 3.00 V
2) The tire voltage value shall change according the steering operation to the right and left.



Reference:

At stroke end for left turn	Straight-forward	At stroke end for right turn
Approx. 0.4 V	Approx. 2.00 V	Approx. 4.5 V

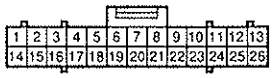
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Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignoition switch ON.



CN1 (REC)

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN1-22 and CN23-3 and between CN23-1 and CN23-2.

Turn the ignition switch OFF and disconnect CN1 and CN23.

Standard:
CN1-22 ~ CN23-3: Continuity shall exist.
CN23-1 ~ CN23-2: No continuity.

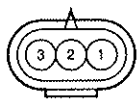


CN23 (REC)

Inspection 3:
Inspect resistance between CN23-1 and CN23-2 and between CN23-1 and CN23-3.

Turn the ignition switch OFF with tires almost in straight-forward status and disconnect CN23.

Standard:
CN23-1 ~ CN23-2: Resistance 400 Ω ~ 2.4 kΩ
CN23-1 ~ CN23-3: Resistance 1.6 kΩ ~ 2.4 kΩ



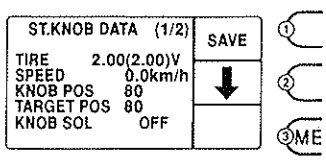
CN23 (TAB)

Inspection 4:
Inspect the tire angle sensor output voltage (voltage changed between the straight-forward status and steering).

Connect all connectors then turn the ignoition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:
1) Voltage value for tires set in the straight-forward status on an approx. flat surface: 1.50 to 3.00 V
2) The tire voltage value shall change according the steering operation to the right and left.



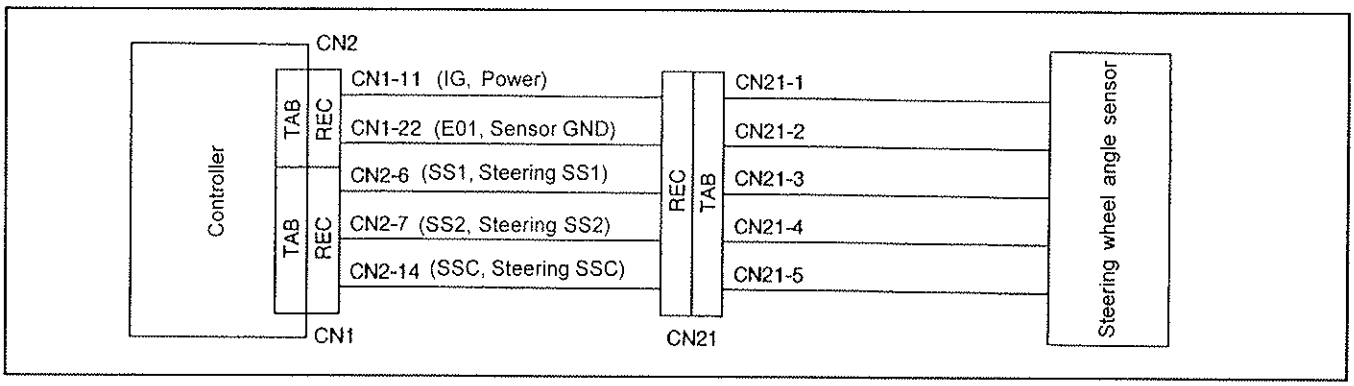
Reference:

At stroke end for left turn	Straight-forward	At stroke end for right turn
Approx. 0.4 V	Approx. 2.00 V	Approx. 4.5 V

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- **Error code 72 (Steering wheel angle sensor abnormality)**
- **Error code 72-1 (Steering wheel angle sensor SS1 abnormality)**
- **Error code 72-2 (Steering wheel angle sensor SS2 abnormality)**
- **Error code 72-3 (Steering wheel angle sensor SSC abnormality)**
- **Error code 72-4 (Steering wheel angle sensor open circuit)**

Related Portion



Estimated Causes:

① Connector contact defect
② Steering wheel angle sensor harness defect
③ Steering wheel angle sensor defect
④ Controller defect

Error code 72

Inspect disconnection and internal wetting of the CN1, CN2, and CN21 connectors.

NG → Inspection 1
After correction, make sure that the SAS lamp goes out.

NG

OK

Inspection 2
Inspect continuity between harness CN2-6 and CN21-3, between CN2-7 and CN21-4, between CN2-14 and CN21-5, between each of these lines and frame, between harness CN1-11 and CN21-1, and between CN1-22 and CN21-2.

NG → Harness defect.

OK

Inspection 3
Inspect voltage changes of SS1, SS2, and SSC when the steering wheel is turned.

NG → Steering wheel angle sensor defect.

OK

Controller defect.

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Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (start the engine).

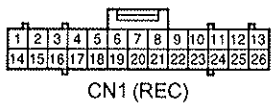
Method:
Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.

Standard:
The SAS lamp shall not blink.

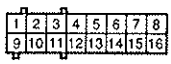
Inspection 2:
Inspect continuity between harness CN2-6 and CN21-3, between CN2-7 and CN21-4, between CN2-14 and CN21-5, between each of these lines and frame, between harness CN1-11 and CN21-1, and between CN1-22 and CN21-2.

Turn the ignition switch OFF and disconnect CN1, CN2, and CN21.

Standard:
CN1-11 ~ CN21-1: Continuity shall exist.
CN1-22 ~ CN21-2: Continuity shall exist.
CN2-6 ~ CN21-3: Continuity shall exist.
CN21-3 ~ Frame: No continuity.
CN2-7 ~ CN21-4: Continuity shall exist.
CN21-4 ~ Frame: No continuity.
CN2-14 ~ CN21-5: Continuity shall exist.
CN21-5 ~ Frame: No continuity.
CN21-3 ~ CN21-2: No continuity.
CN21-4 ~ CN21-2: No continuity.
CN21-5 ~ CN21-2: No continuity.



CN1 (REC)



CN2 (REC)

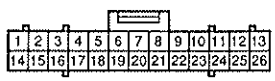


CN21 (REC)

Inspection 3:
Inspect the voltage change of SS1, SS2, and SSC when the steering wheel is operated.

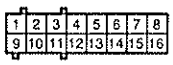
Connect all connectors, remove the cover from the direction switch, and turn the ignition switch ON (start the engine).

Method:
1) Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.
2) Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.
3) Move the steering wheel alternately by 30 degrees to the right and left near the neutral position (straight-forward position) and check the potential between CN2-14 and CN1-22.



CN1 (REC)

Standard:
1) The potential between CN2-6 (+) and CN1-22 (-) shall repeatedly change between 1 V and 4 V when the steering wheel is operated.
2) The potential between CN2-7 (+) and CN1-22 (-) shall repeatedly change between 1 V and 4 V when the steering wheel is operated.
3) The potential between CN2-14 (+) and CN1-22 (-) shall change from 4 V to 1 V near the neutral position of the steering wheel.



CN2 (REC)

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Error code 72-1

Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.)
OK ↓

Inspection 2
Inspect continuity between harness CN2-6 and CN21-3 and between this line and frame.
NG → Harness defect.
OK ↓

Inspection 3
Inspect to see if SS1 goes on and off when the steering wheel is rotated (right end → left end → right end).
NG → Steering wheel angle sensor defect.
OK ↓

Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (start the engine).

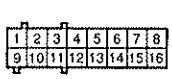
Method:
Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN2-6 and CN21-3 and between this line and frame.

Turn the ignition switch OFF and disconnect CN2 and CN21.

Standard:
CN2-6 ~ CN21-3: Continuity shall exist.
CN21-3 ~ Frame: No continuity.
CN21-3 ~ CN21-2: No continuity.



CN2 (REC)



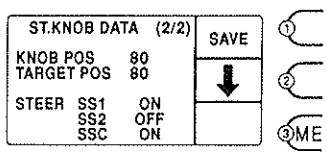
CN21 (REC)

Inspection 3:
Inspect to see if SS1 goes on and off when the steering wheel is operated (right end → left end → right end).

Connect all connectors and turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:
Turn the steering wheel slowly to the right or left. Steering SS1 repeats OFF and ON.



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Error code 72-2

Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.
OK → Inspection 2
Inspect continuity between harness CN2-7 and CN21-4 and between this line and frame.
NG → Harness defect.
OK → Inspection 3
Inspect to see if SS2 goes on and off when the steering wheel is rotated (right end → left end → right end).
NG → Steering wheel angle sensor defect.
OK → Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (start the engine).

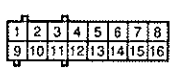
Method:
Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN2-7 and CN21-4 and between this line and frame.

Turn the ignition switch OFF and disconnect CN2 and CN21.

Standard:
CN2-7 ~ CN21-4: Continuity shall exist.
CN21-4 ~ Frame: No continuity.
CN21-4 ~ CN21-2: No continuity.



CN2 (REC)



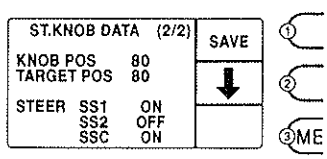
CN21 (REC)

Inspection 3:
Inspect to see if SS2 goes on and off when the steering wheel is operated (right end → left end → right end).

Connect all connectors and turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:
Turn the steering wheel slowly to the right or left. Steering SS2 repeats OFF and ON.



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Error code 72-3

Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.)
OK ↓

Inspection 2
Inspect continuity between harness CN2-14 and CN21-5 and between this line and frame.
NG → Harness defect.
OK ↓

Inspection 3
Inspect to see if SSC goes on and off when the steering wheel is rotated to the right and left near the neutral position.
NG → Steering wheel angle sensor defect.
OK ↓

Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (start the engine).

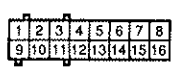
Method:
Operate the steering wheel to the right and left (right end ⇒ left end ⇒ right end) for 5 to 10 second each.

Standard:
The SAS lamp shall not blink.

Inspection 2:
Inspect continuity between harness CN2-14 and CN21-5 and between this line and frame.

Turn the ignition switch OFF and disconnect CN2 and CN21.

Standard:
CN2-14 ~ CN21-5: Continuity shall exist.
CN21-5 ~ Frame: No continuity.
CN21-5 ~ CN21-2: No continuity.



CN2 (REC)



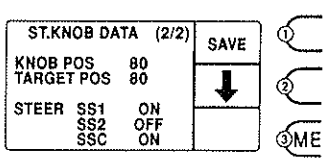
CN21 (REC)

Inspection 3:
Inspect to see if SSC goes on and off when the steering wheel is operated to the right and left near the neutral position.

Connect all connectors and turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:
Steering SSC is switched between OFF and ON near the neutral position when the steering wheel knob is slowly turned by approximately 30 degrees to the right and left each near the neutral position.



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Error code 72-4

Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG → (back to Inspect slip off and internal wetting of the CN1, CN2, and CN21 connectors.)
OK ↓

Inspection 2
Inspect continuity between harness CN1-11 and CN21-1, between CN1-22 and CN21-2, between CN2-6 and CN21-3, between CN2-7 and CN21-4, and between CN2-14 and CN21-5.
NG → Harness defect.
OK ↓

Inspection 3
Inspect to see if SS1, SS2, and SSC go on and off when the steering wheel is rotated (right end → left end → right end).
NG → Steering wheel angle sensor defect.
OK ↓

Inspection 4
Inspect to see if the knob position value changes smoothly when the steering wheel is operated to the right and left.
NG → Steering wheel angle sensor link system defect.
OK ↓

Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.

Connect all connectors then turn the ignition switch ON (start the engine).

Method:
Operate the steering wheel to the right and left two times (right end ⇒ left end ⇒ right end ⇒ left end).

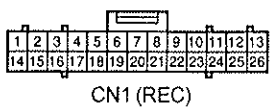
Note: The steering wheel rotation speed shall be 1 second for 1 turn.

Standard:
The SAS lamp shall not blink.

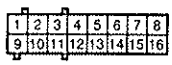
Inspection 2:
Inspect continuity between harness CN1-11 and CN21-1, between CN1-22 and CN21-2, between CN2-6 and CN21-3, between CN2-7 and CN21-4, and between CN2-14 and CN21-5.

Turn the ignition switch OFF and disconnect CN1, CN2 and CN21.

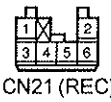
Standard:
CN1-11 ~ CN21-1: Continuity shall exist.
CN1-22 ~ CN21-2: Continuity shall exist.
CN2-6 ~ CN21-3: Continuity shall exist.
CN2-7 ~ CN21-4: Continuity shall exist.
CN2-14 ~ CN21-5: Continuity shall exist.



CN1 (REC)



CN2 (REC)



CN21 (REC)

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Inspection 3:

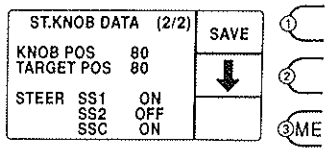
Inspect to see if SS1, SS2, and SSC go on and off when the steering wheel is operated (right end → left end → right end).

Connect all connectors and turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:

1) Turn the steering wheel slowly to the right or left. SS1 and SS2 shall repeat OFF and ON somewhere before the right/left end.
2) When the steering wheel is slowly moved by approximately 30 degrees to the right and left near the neutral position, SSC shall be switched between OFF and ON near the neutral position.



Note: If the SSC is not switched ON and OFF when the steering wheel is turned slowly, turn the steering wheel quickly fully clockwise and counterclockwise to see if it is switched ON and OFF.

Inspection 4:

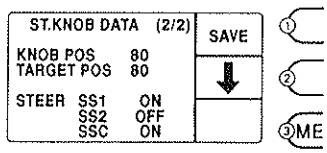
Inspect to see if the knob position value changes smoothly when the steering wheel is operated to the right and left.

Connect all connectors and turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST. KNOB DATA

Standard:

When the steering wheel is turned to the right and left, the knob position value shall change smoothly between 0 and 159.

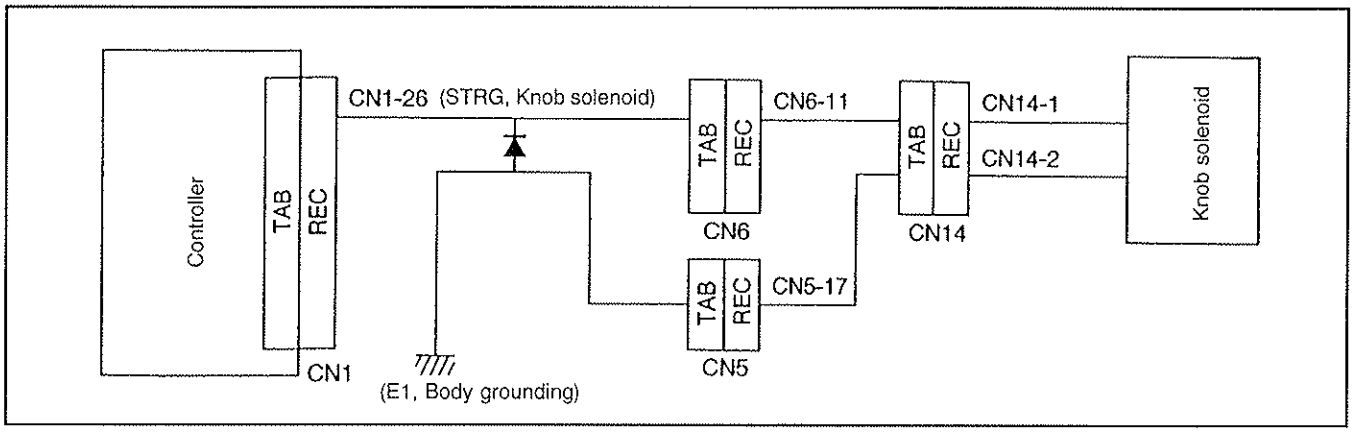


Note: The value does not change or the value sometimes changes and sometimes does not. ⇒ NG
The value should change in the order of 0 to 159 ⇒ 0 to 159 ⇒ ...

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● Error code 73, 73-1 (Knob solenoid abnormality)

Related Portion



Estimated Causes:

① Connector contact defect.
② Knob solenoid harness defect
③ Knob solenoid defect
④ Diode abnormality
⑤ Controller defect

Error code 73

Inspect slip off and internal wetting of the CN1, CN5, CN6, and CN14 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG
OK

Inspection 2
Inspect diode continuity (between CN1-26 and frame).
NG → Diode defect.
OK

Inspection 3
Inspect continuity between harness CN1-26 and CN14-1, between the STRG line and frame, and between CN14-2 and frame.
NG → Harness defect.
OK

Inspection 4
Inspect continuity between solenoid CN14-1 and CN14-2 and between CN14-1 and frame.
NG → Solenoid defect.
OK

Controller defect.

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Inspection 1:
After correction, make sure that the SAS lamp goes out.
Connect all connectors then turn the ignition switch ON (start the engine).

Method:
Operate the steering wheel to the right and left ends back and forth a few times (1 turn for 2 seconds).

Standard:
The SAS lamp shall not blink.

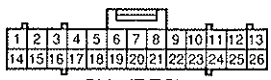
Inspection 2:
Inspect diode continuity (between CN1-26 and frame).
Turn the ignition switch OFF and disconnect CN1, CN5 and CN6.



CN1 (REC)

Standard:
CN1-26 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN1-26 (Digital circuit tester ⊖) ~ Frame (Digital circuit tester ⊕): Continuity shall exist.
CN1-26 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN1-26 (Analog circuit tester ⊕) ~ Frame (Analog circuit tester ⊖): Continuity shall exist.

Inspection 3:
Inspect continuity between harness CN1-26 and CN14-1, between the STRG line and frame, and between CN14-2 and frame.
Turn the ignition switch OFF and disconnect CN1 and CN14.



CN1 (REC)



CN14 (TAB)

Standard:
CN1-26 ~ CN14-1: Continuity shall exist.
CN14-1 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖): No continuity.
CN14-1 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN14-2 ~ Frame: Continuity shall exist.
CN14-1 (Digital circuit tester ⊕) ~ CN14-2 (Digital circuit tester ⊖): No continuity.
CN14-1 (Analog circuit tester ⊖) ~ CN14-2 (Analog circuit tester ⊕): No continuity.

Inspection 4:
Inspect resistance between solenoid CN14-1 and CN14-2 and continuity between CN14-1 and frame.
Turn the ignition switch OFF and disconnect CN14.

Standard:
CN14-1 ~ CN14-2: Resistance Approx. 10 Ω
CN14-1 ~ Frame: No continuity



CN14 (REC)

Error code 73-1

Inspect slip off and internal wetting of the CN1, CN5, CN6, and CN14 connectors.
NG → Inspection 1
After correction, make sure that the SAS lamp goes out.
NG
OK

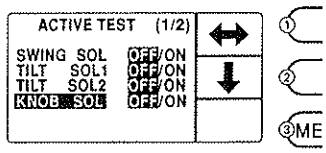
Inspection 2
Inspect diode continuity (between CN1-26 and frame).
NG → Diode defect.
OK

Inspection 3
Inspect continuity between harness CN1-26 and CN14-1, between the STRG line and frame, and between CN14-1 and frame.
NG → Harness defect.
OK

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Inspection 4
Inspect resistance between solenoid CN14-1 and CN14-2 and continuity between CN14-1 and frame.
NG → Solenoid defect.
OK ↓
Controller defect.

Inspection 1:
After correction, make sure that the SAS lamp goes out.



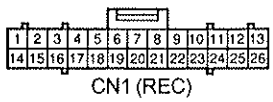
Connect all connectors then turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

Standard:
The SAS lamp not blink upon returning to the ANALYEZ MUME by turning the KNOB SOL ON (for 1 second more)and OFF (for 1 second or more).

Inspection 2:
Inspect diode continuity (between CN1-26 and frame).

Turn the ignition switch OFF and disconnect CN1, CN5 and CN6.



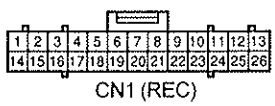
CN1 (REC)

Standard:
CN1-26 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖):No continuity.
CN1-26 (Digital circuit tester ⊖) ~ Frame (Digital circuit tester ⊕): Continuity shall exist.
CN1-26 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕): No continuity.
CN1-26 (Analog circuit tester ⊕) ~ Frame (Analog circuit tester ⊖):Continuity shall exist.

Inspection 3:
Inspect continuity between harness CN1-26 and CN14-1, between the STRG line and frame, and between CN14-2 and frame.

Turn the ignition switch OFF and disconnect CN1 and CN14.

Standard:
CN1-26 ~ CN14-1: Continuity shall exist.
CN14-1 (Digital circuit tester ⊕) ~ Frame (Digital circuit tester ⊖):No continuity.
CN14-1 (Analog circuit tester ⊖) ~ Frame (Analog circuit tester ⊕):No continuity.
CN14-2 ~ Frame: Continuity shall exist.
CN14-1 (Digital circuit tester ⊕) ~ CN14-2 (Digital circuit tester ⊖): No continuity.



CN1 (REC)



CN14 (TAB)

Inspection 4:
Inspect resistance between solenoid CN14-1 and CN14-2 and continuity between CN14-1 and frame.

Turn the ignition switch OFF and disconnect CN14.

Standard:
CN14-1 ~ CN14-2: Resistance Approx. 10 Ω (20°C).
CN14-1 ~ Frame: No continuity.



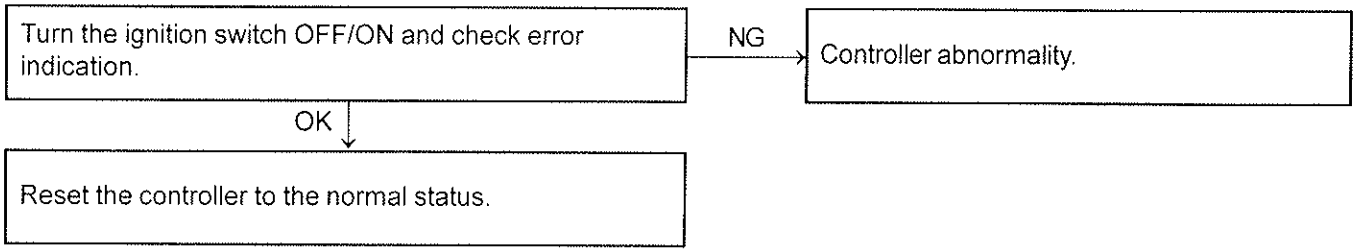
CN14 (REC)

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● **Error code 74, 74-1 (Tire angle re-setting value abnormality)**

Estimated Cause:

① Controller defect



● **Error code AF-1 (CPU abnormality)**
● **Error code AF-2 (ROM abnormality)**
● **Error code AF-3 (RAM abnormality)**
● **Error code AF-4 (AD conversion abnormality)**
● **Error code EF, EF-1 (EEPROM abnormality)**
● **Error code EF, EF-2 (EEPROM abnormality)**

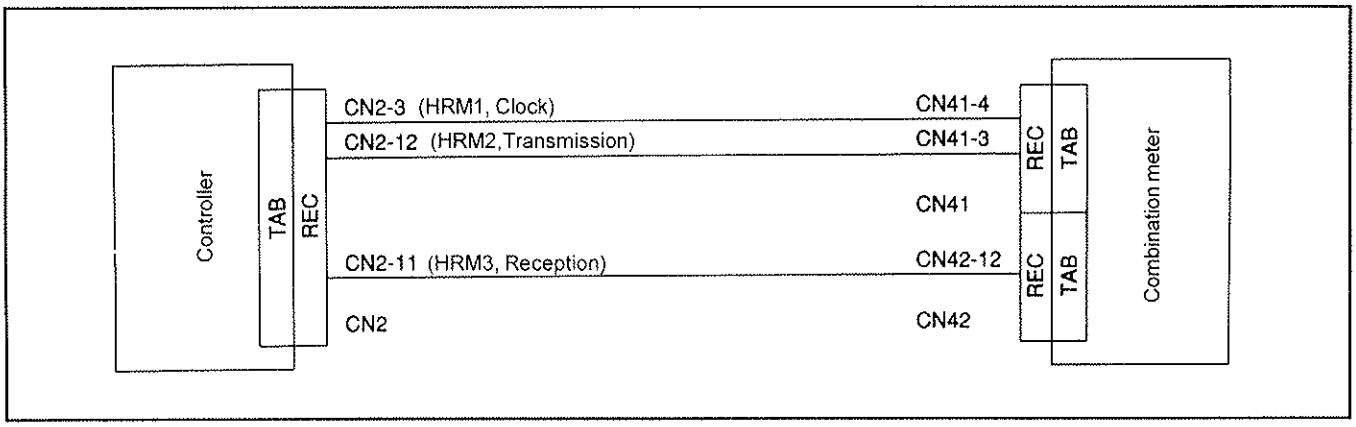
Estimated Cause:

① Controller defect

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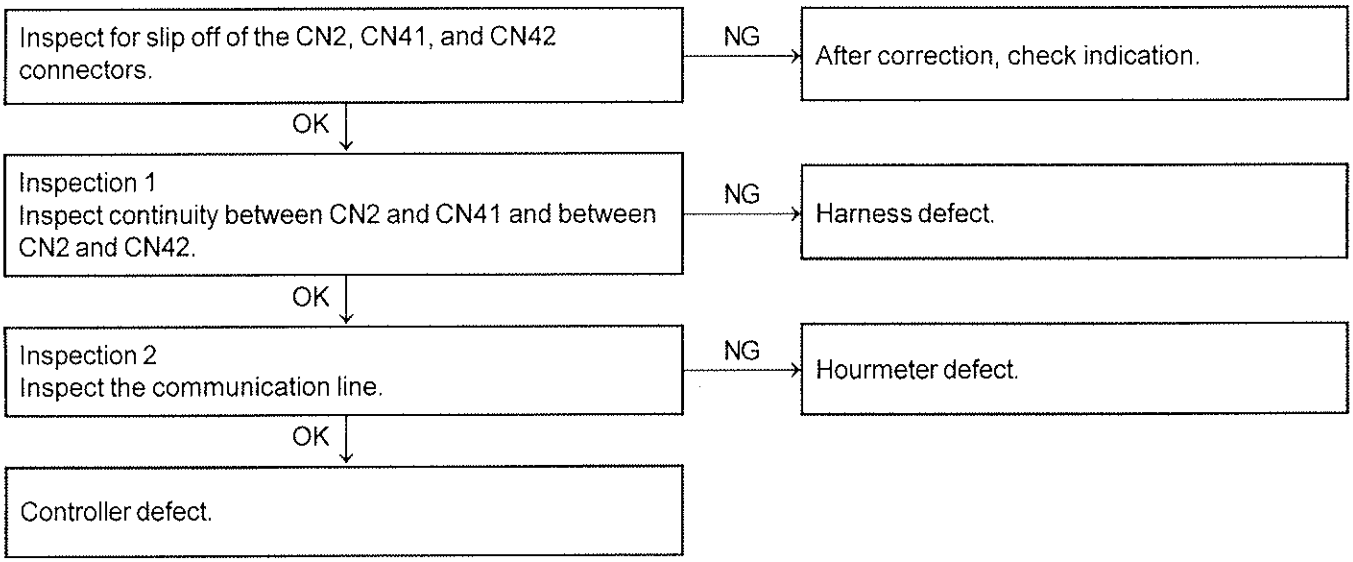
● Error code F1 (Controller ~ hourmeter communication abnormality)

Related Portion



Estimated Causes:

① Connector contact defect
② Hourmeter harness defect
③ Hourmeter defect
④ Controller defect

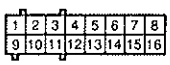


Inspection 1:

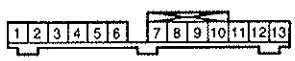
Inspect continuity between CN2 and CN41 and between CN2 and CN42.
Turn the ignition switch OFF and disconnect CN2, CN41, and CN42.

Standard:

CN2-3 ~ CN41-4: Continuity shall exist.
CN2-12 ~ CN41-3: Continuity shall exist.
CN2-11 ~ CN42-12: Continuity shall exist.



CN2 (REC)



CN41 (REC)



CN42 (REC)

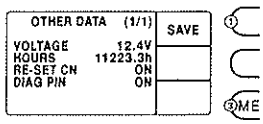
Inspection 2:

Inspect continuity between CN2 and CN41 and between CN2 and CN42.
Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → OTHER DATA

Standard:

The correct time is indicated by the hourmeter (0.1 hour shortage permissible).



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TROUBLESHOOTING BY PHENOMENON

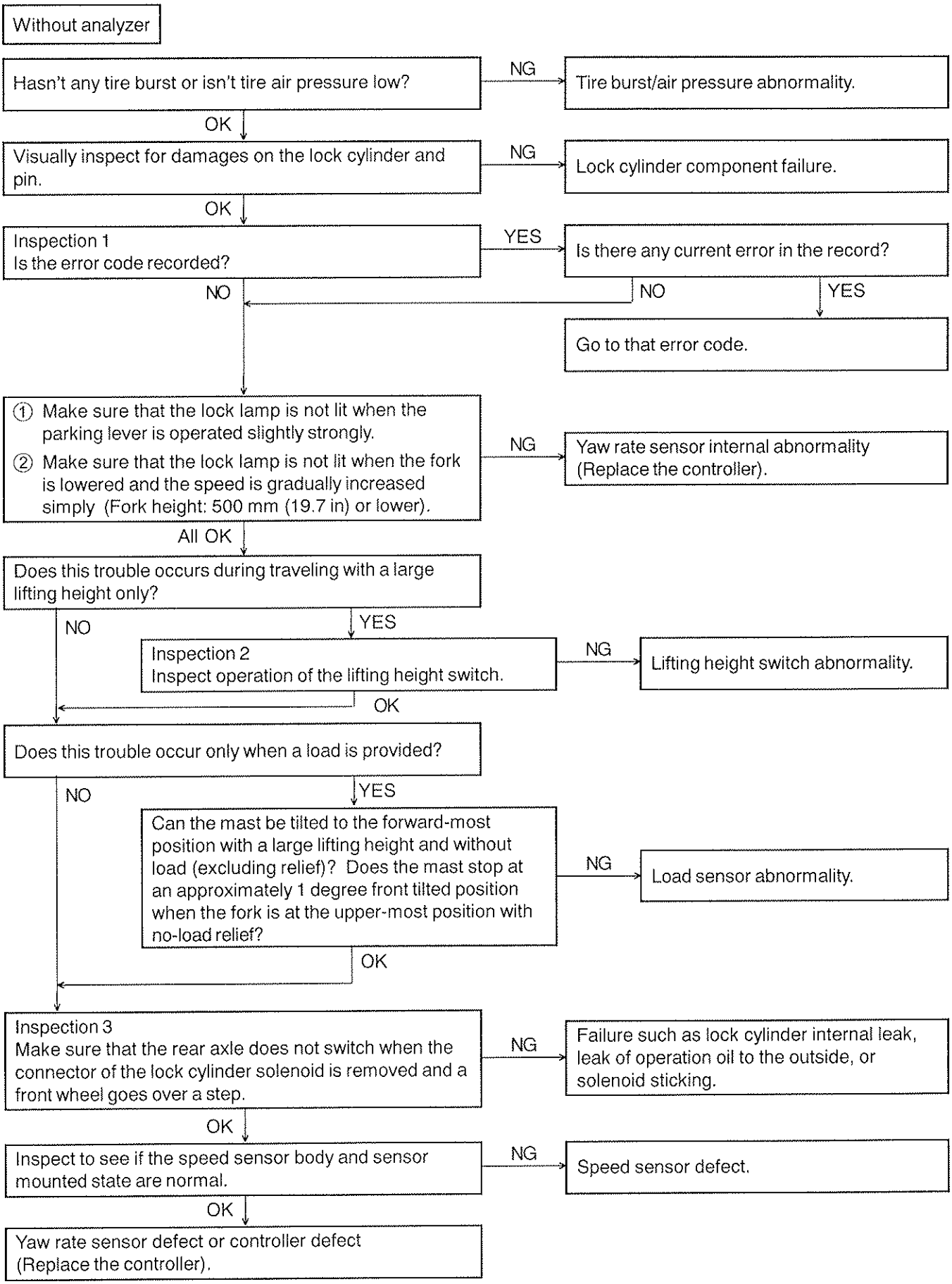
For SAS control related troubleshooting on failures with no error code indicated, procedures are described for without analyzer (SST) and with analyzer (SST). For combination meter (SAS) related troubles, a procedure contains the case without analyzer (SST) and the case with analyzer (SST). Perform troubleshooting according to each procedure.

List of pages to be referenced by symptom

	Description	Page to be referenced	
		Without analyzer	With analyzer
Active control rear stabilizer	Stability not provided during traveling. (Locking hardly or not provided during traveling.)	15-110	15-112
	Swing lock always occurs during traveling or loading work. Or, swing lock frequently occurs	15-115	15-116
Active mast function controller	Active fork leveling is not provided. (Does not stop at a horizontal position but tilts at the forward-most position.)	15-117	15-120
	Active fork leveling is not provided. (Stops at a non-horizontal position.)	15-123	15-124
	Active fork leveling is not provided. (Stops at a position when the knob switch is pressed.)	15-125	15-127
	The active mast rear tilt speed control is not regulatated, or the backward tilting speed is always slow.	15-129	15-132
	The mast does not perform front/rear tilt.	15-134	15-139
Active Steering Synchronizer	The knob position runs out to a certain point (at least by 10 degrees from the straight-forward position).	15-143	15-144
	The knob position runs out. (The knob position in straight-forward status is not constant.)	15-146	15-147
Combination meter (SAS)	No error code is indicated although SAS warning lamp blinks.	15-150	←
	"_" (underscore) is displayed on the hourmeter.	15-150	←
	The SAS warning lamp is always lit.	15-151	←
	When the ignition switch is turned on, the SAS warning lamp is not lit.	15-153	←
	No hourmeter indication	15-155	←
	The buzzer is not interlocked with the SAS warning lamp.	15-156	←
	When the ignition switch is turned on, the swing lock lamp is not lit.	15-157	←

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● Stability not provided during traveling. (Locking hardly or not provided during traveling.)



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Inspection 1:
Is the error code recorded?

Turn ignition switch ON then remove the diagnosis shorting pin and check error code indication on the hourmeter display.

Standard:
Errors near the current time shall not exist.

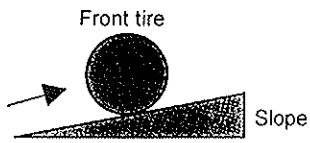
Inspection 2:
Inspect operation of each lifting height switch.

Standard:
Tilt backward at heights of small lifting height (fast) and large lifting height (slow), respectively, without load. The speeds shall be different.

Inspection 3:
Make sure that the rear axle does not switch when the connector of the lock cylinder solenoid is removed and a front wheel goes over a step. (Alternatively, lift the rear of the vehicle with a jack and make sure that the rear axle does not swing.)

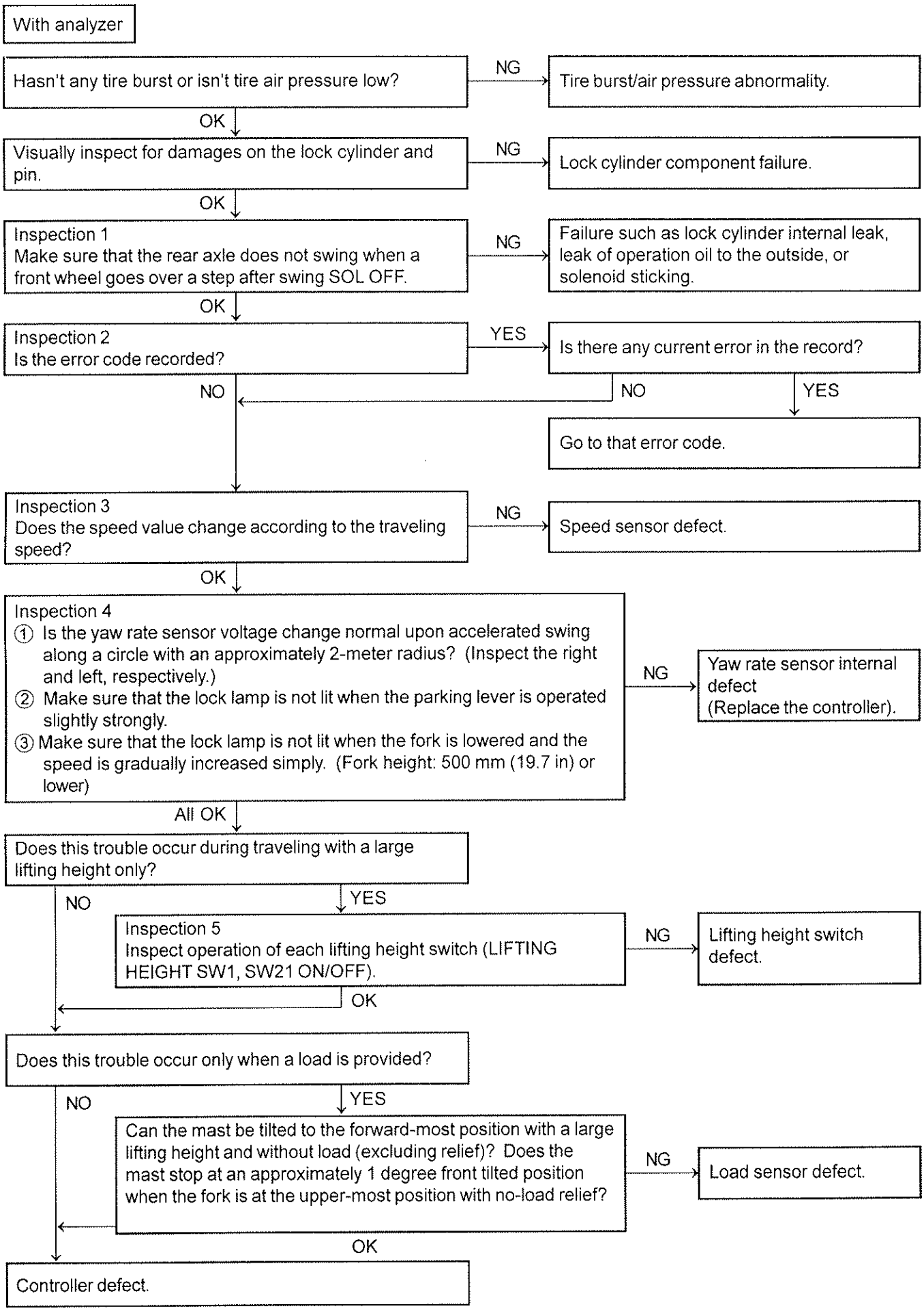
Standard:
Remove the lock cylinder solenoid connector on a flat road. A front wheel or rear wheel shall be lifted when swing lock is performed and a front wheel goes over a step.

Caution:
- **Perform this operation without load and at a small lifting height.**
- **Check for rocking for a large lifting height mast.**
- **After check, return to a flat road then connect the connector.**



Note:
Since this inspection requires connector removal and ignition switch ON, an error occurs, the SAS lamp blinks, and the error code is indicated and stored.

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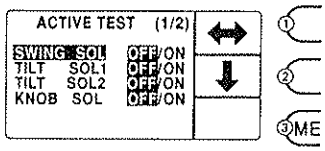


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Inspection 1:
See that the rear axle does not swing when one front wheel rides on a high place after swing solenoid OFF.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

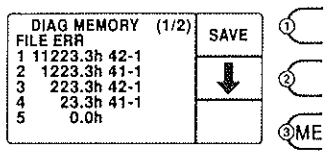
Standard:
When one front wheel rides on a high place after the swing solenoid is set to ON and OFF on a flat road, one front or rear wheel shall float above the ground.
Caution:
Perform this inspection with no load at a low fork height.



Inspection 2:
Is any error code recorded?

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → DIAG MEMORY

Standard:
No error shall be displayed near the current time on the hour meter.

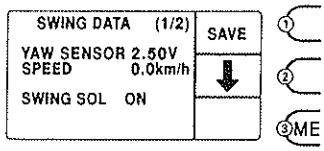


Inspection 3:
Does the speed value change according to the traveling speed?

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → SWING DATA

Standard:
During traveling the speed value shall change according to the varying vehicle speed.

Note:
The speed value is in a range of 95 to 130% of the actual vehicle speed.



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Inspection 4:

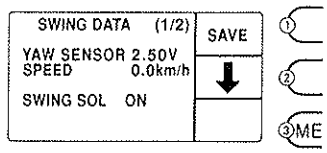
① Let the vehicle travel with acceleration on a circle whose radius is approx. 2 m (79 in), and check if the yaw sensor voltage variation is appropriate (check for each of right and left turns).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → SWING DATA

Standard:

At a low fork height with no load, travel with gradual acceleration (a t a speed of 5 to 6 km/h (3.1 ~ 3.7 mile/h)) on a circle whose radius is approx. 2 m (79 in) (with respect to the center of the vehicle). The yaw sensor voltage shall vary smoothly.

In right turn	2.5 V (stationary state) → approx. 3.0 V
In left turn	2.5 V (stationary state) → approx. 2.0 V



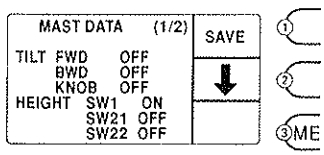
Inspection 5:

Check functioning of each fork height switch (ON/OFF of fork height SW1 and SW21).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

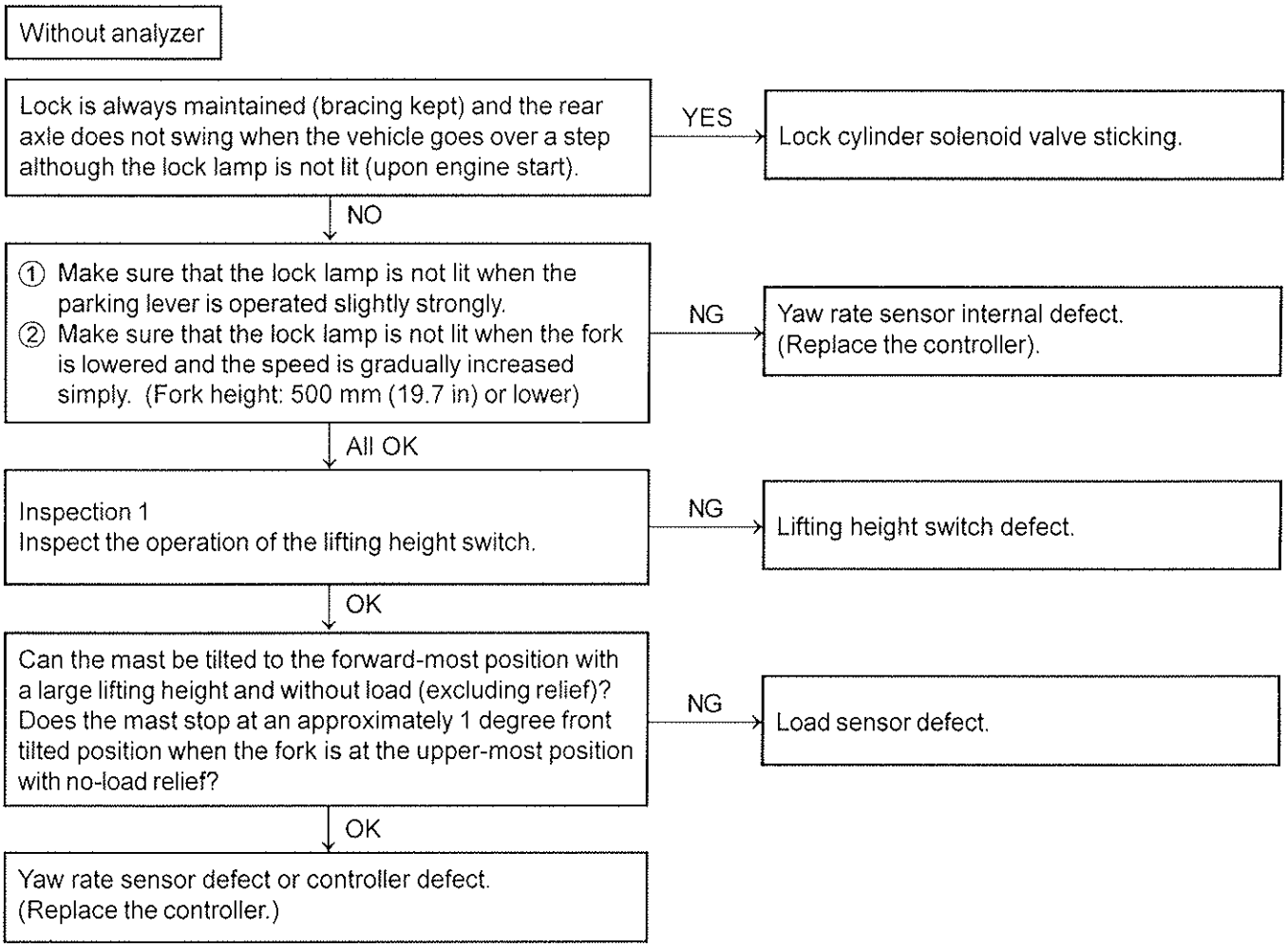
Standard:

① Lift and lower the fork at around 2,200 mm (86.6 in) to actuate the fork height switch.
Only fork height SW1 is ON at a low fork height (below the fork height switch).
Only SW21 is ON at a high fork height (above the fork height switch).



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● **Swing lock always occurs during traveling or loading work. Or, swing lock frequently occurs.**



Inspection 1:
Inspect operation of lifting height switch.

Standard:
Tilt backward at heights of small lifting height (fast) and large lifting height (slow), respectively, without load. The speeds shall be different.

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With analyzer

Lock is always maintained (bracing kept) and the rear axle does not swing when the vehicle goes over a step although the lock lamp is not lit (upon engine start).
- YES → Failure such as lock cylinder solenoid valve sticking or clogging.
- NO ↓

Inspection 1
① Is the yaw rate sensor voltage change normal upon accelerated swing along a circle with an approximately 2-meter radius? (Inspect the right and left, respectively.)
② Make sure that the lock lamp is not lit when the parking lever is operated slightly strongly.
③ Make sure that the lock lamp is not lit when the fork is lowered and the speed is gradually increased simply. (Fork height: 500 mm (19.7 in) or lower).
- NG → Yaw rate sensor internal abnormality (Replace the controller).
- All OK ↓

Inspection 2
Inspect the operation of each the lifting height switch. (LIFTING HEIGHT SW1, SW21 ON/OFF)
- NG → Lifting height switch.
- OK ↓

Can the mast be tilted to the forward-most position with a large lifting height and without load (excluding relief)? Does the mast stop at an approximately 1 degree front tilted position when the fork is at the upper-most position with no-load relief?
- NG → Load sensor abnormality.
- OK ↓

Controller defect.

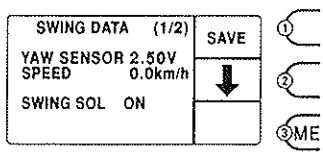
Inspection 1:

① Is the yaw rate sensor voltage change normal upon accelerated swing along a circle with an approximately 2-meter radius? (Inspect the right and left, respectively.)

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → SWING DATA

Standard:
With a small lifting height and without load, perform accelerated swing along an approximately 2-meter radius circle (based on the vehicle center) gradually (up to 5 to 6 km/h (3.1 ~ 3.7 mile/h)). The yaw rate sensor voltage shall change.

Swing to the right	2.5 V (stop) to Approx.3.0 V
Swing to the left	2.5 V (stop) to Approx. 2.0 V



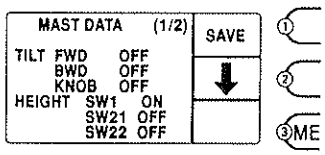
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Inspection 2:
Inspect the operation of each the lifting height switch.
(LIFTING HEIGHT SW1, SW21 ON/OFF)

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

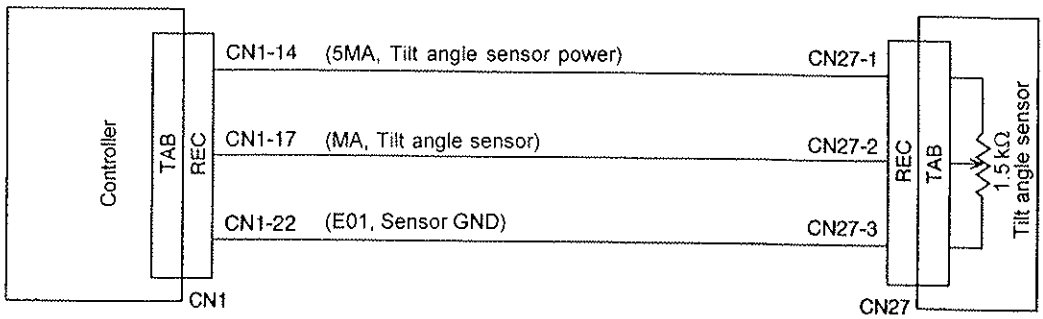
① Lift and lower the fork at a height of approximately 2200 mm (87 in) to activate the lifting height switch.
Note:
- LIFTING HEIGHT SW1 only is turned ON for a small lifting height (below the switch).
- LIFTING HEIGHT SW21 only is turned ON for a large lifting height (above the switch).



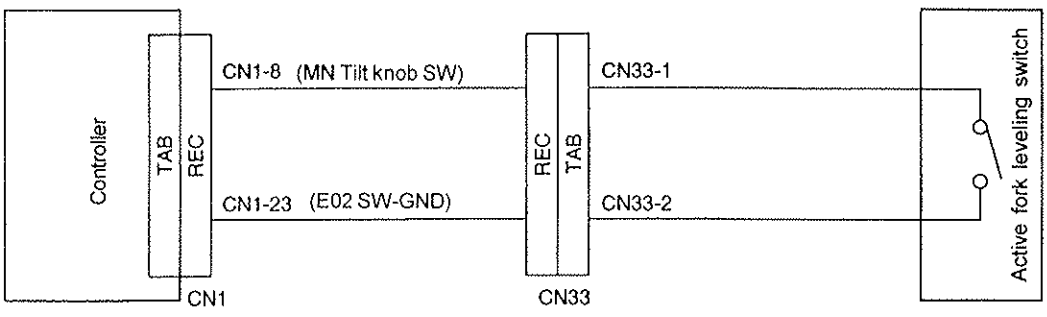
- **Stopping with automatic leveling fails. (Does not stop at a horizontal position but tilts at the forward-most position.)**

Related Portion

Tilt angle sensor

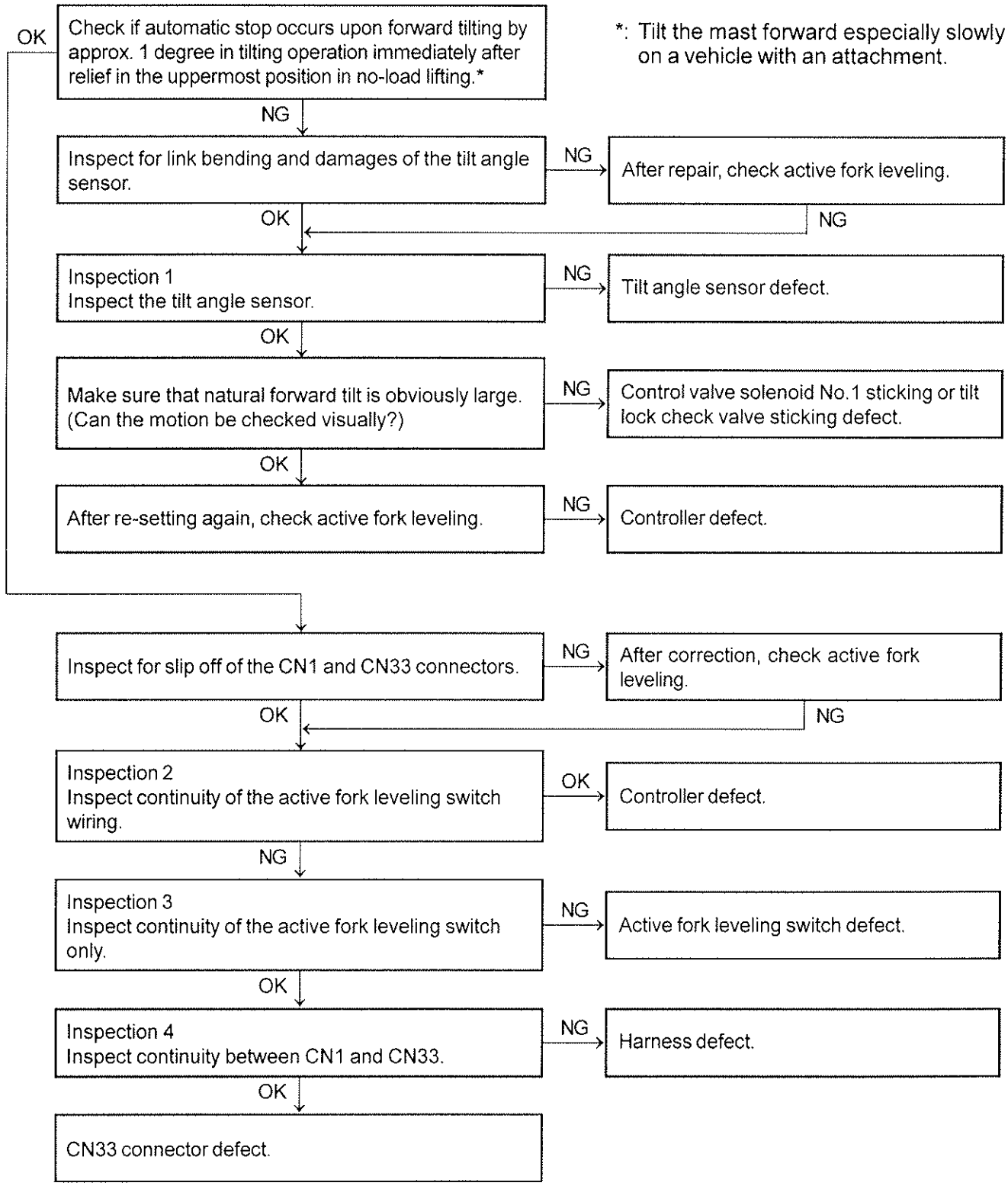


Active fork leveling switch



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Without analyzer



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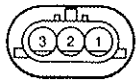
Inspection 1:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

	Sensor lever free	Sensor lever with full stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



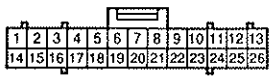
CN27 (TAB)

Inspection 2:
Inspect continuity of the active fork leveling switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Active fork leveling switch free	Active fork leveling switch with full stroke
CN1-8 ~ CN1-23	No continuity	Continuity shall exist.



CN1 (REC)

Inspection 3:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN33.

Standard:

	Active fork leveling switch free	Active fork leveling switch with full stroke
CN33-1 ~ CN33-2	No continuity	Continuity shall exist.

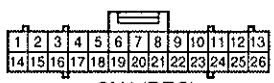


CN33 (TAB)

Inspection 4:
Inspect continuity between CN1 and CN33.

Turn the ignition switch OFF and disconnect CN1 and CN33.

Standard:
CN1-8 ~ CN33-1: Continuity shall exist.
CN1-23 ~ CN33-2: Continuity shall exist.



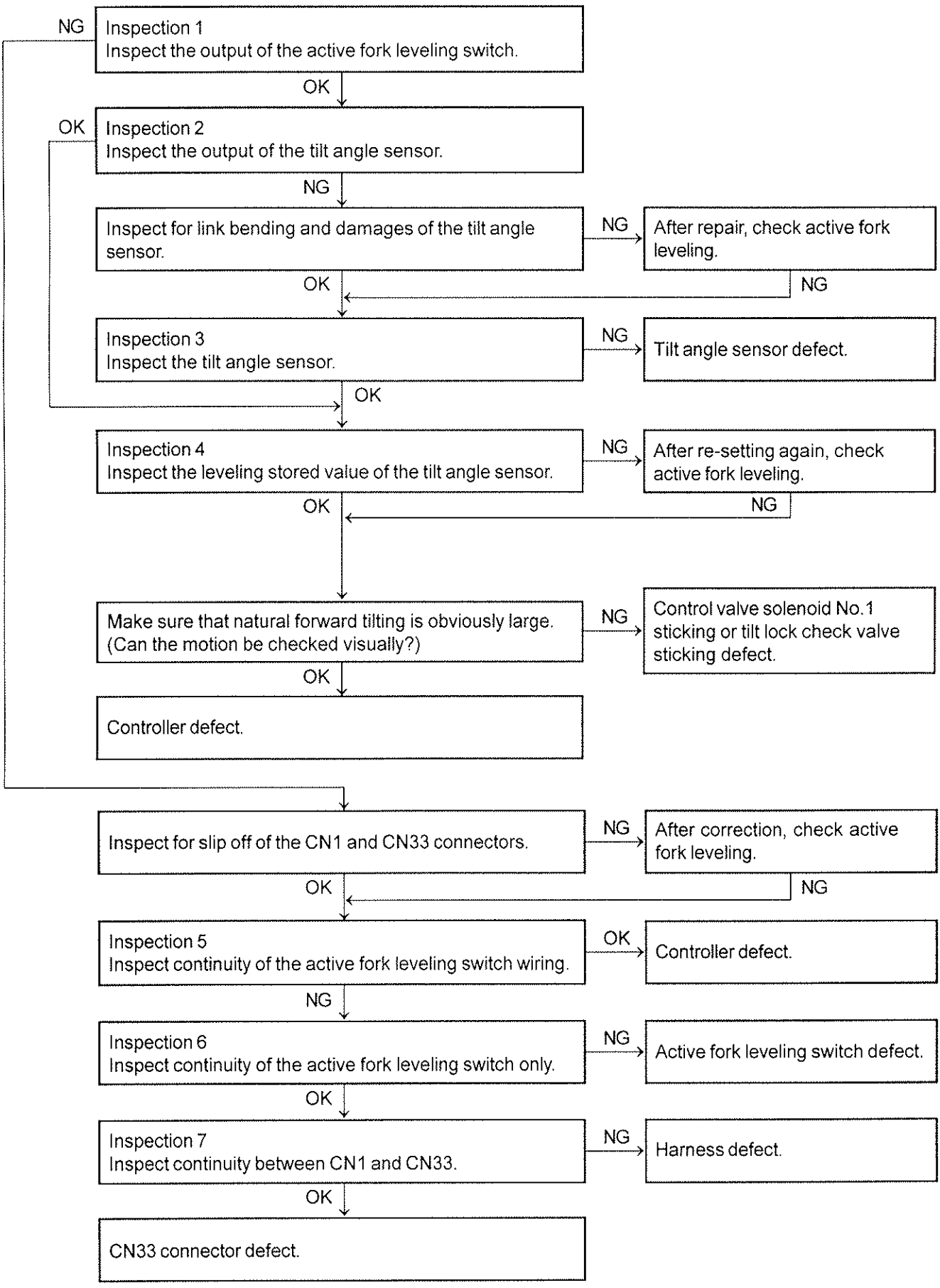
CN1 (REC)



CN33 (REC)

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With analyzer



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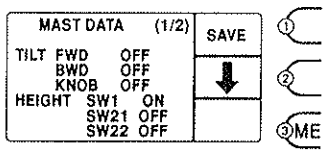
Inspection 1:
Inspect the output of the active fork leveling switch.

Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
KNOB	OFF	ON

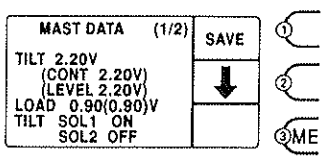


Inspection 2:
Inspect the output of the tilt angle sensor.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
When the tilt operation is performed and the mast is moved from the forward-most tilt position to the backward-most tilt position, the potential shall rise between 0.1 V and 4.9 V along with backward tilting.



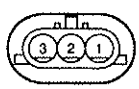
Inspection 3:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

	Sensor lever free	Sensor lever with full stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



CN27 (TAB)

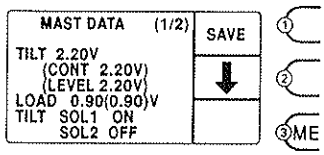
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Inspection 4:
Inspect the leveling stored value of the tilt angle sensor.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
The TILT value shall be smaller than the LEVEL value when the tilt is at the forward-most position.

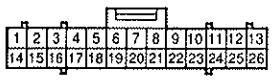


Inspection 5:
Inspect continuity of the active fork leveling switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN1-8 ~ CN1-23	No continuity	Continuity shall exist.



CN1 (REC)

Inspection 6:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN33.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN33-1 ~ CN33-2	No continuity	Continuity shall exist.

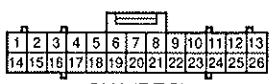


CN33 (TAB)

Inspection 7:
Inspect continuity between CN1 and CN33.

Turn the ignition switch OFF and disconnect CN1 and CN33.

Standard:
CN1-8 ~ CN33-1: Continuity shall exist.
CN1-23 ~ CN33-2: Continuity shall exist.



CN1 (REC)

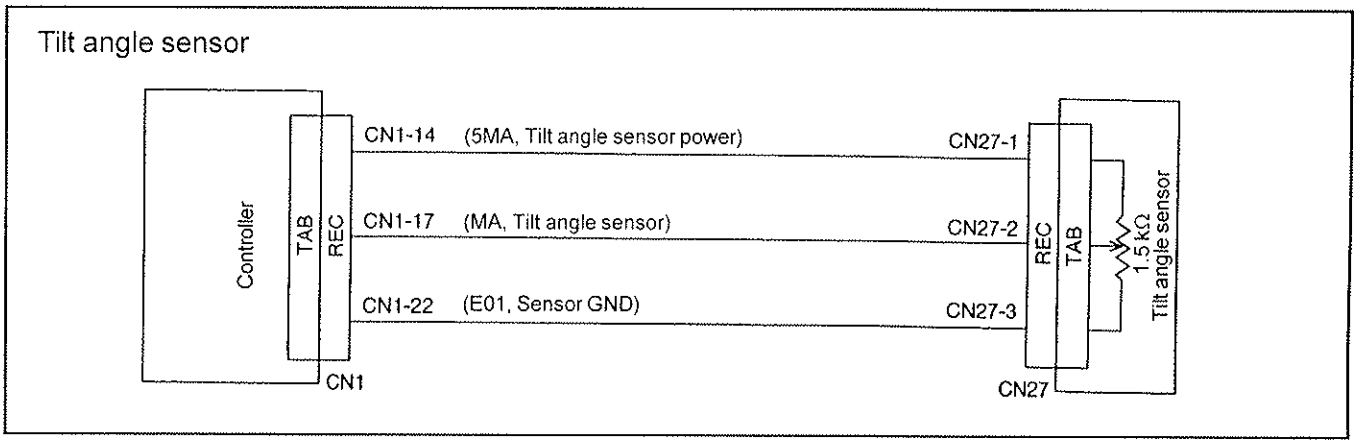


CN33 (REC)

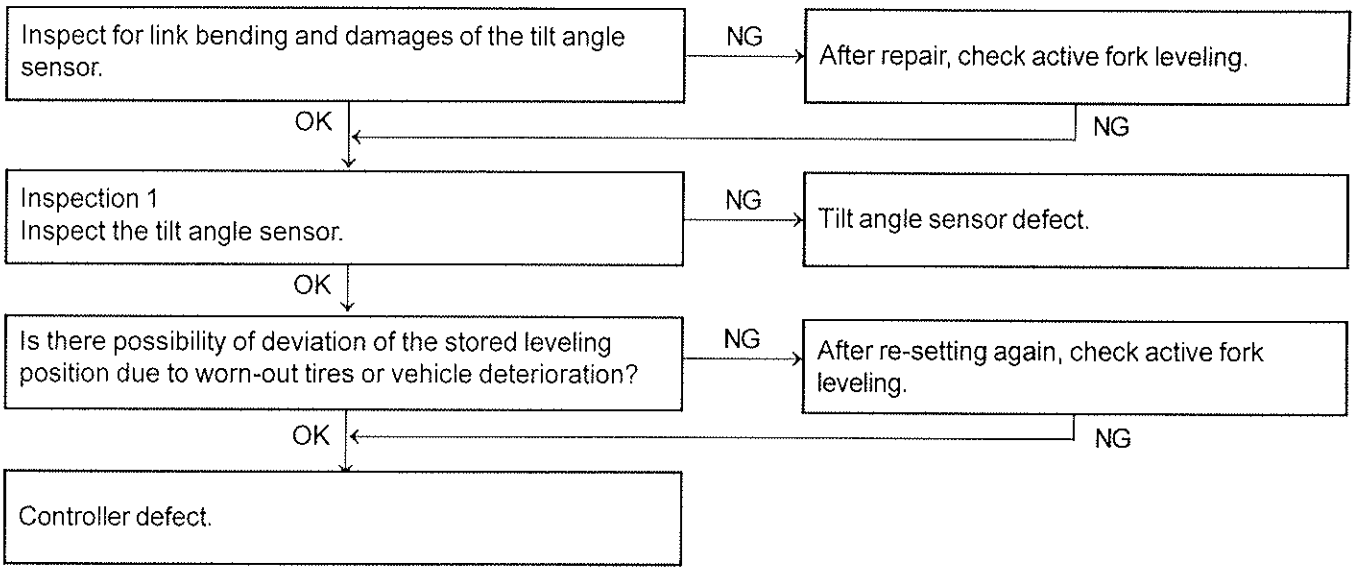
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● **Active fork leveling is not provided. (Stops at a non-horizontal position.)**

Related Portion:



Without analyzer



Inspection 1:

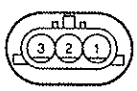
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

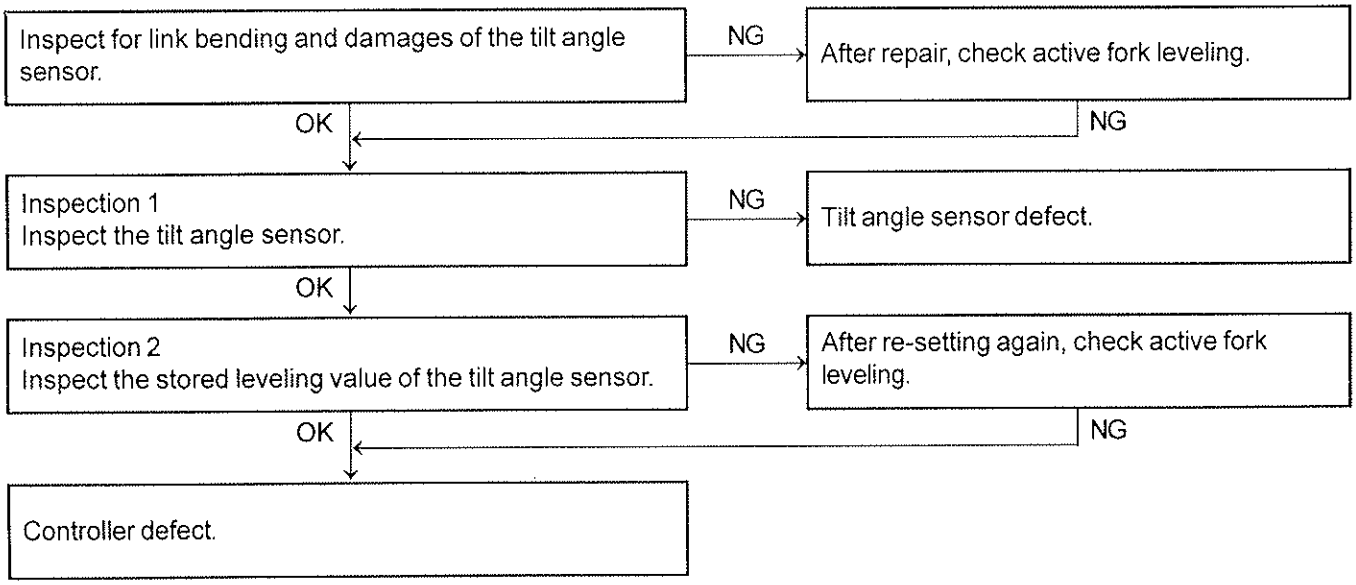
	Sensor lever free	Sensor lever with full stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



CN27 (TAB)

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With analyzer



Inspection 1:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

	Sensor lever free	Sensor lever with full-stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



CN27 (TAB)

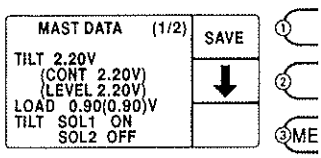
Inspection 2:
Inspect the stored leveling value of the tilt angle sensor.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
The TILT value shall be the LEVEL value ± 0.05 V when the mast is upright.

Note:
Set the mast slowly forward from the backward-tilted position.

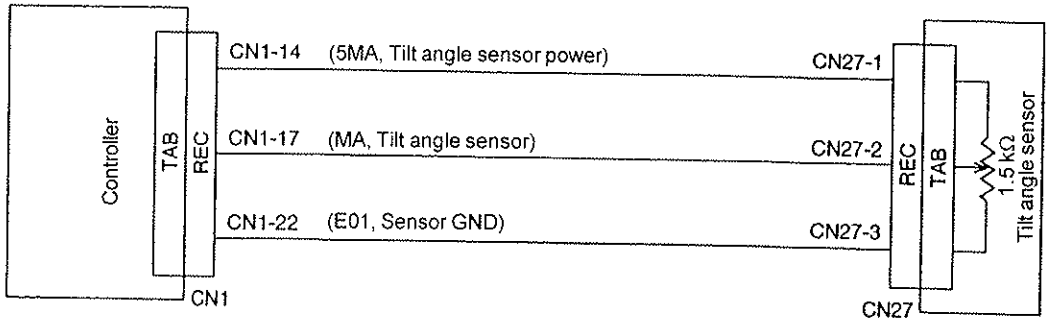


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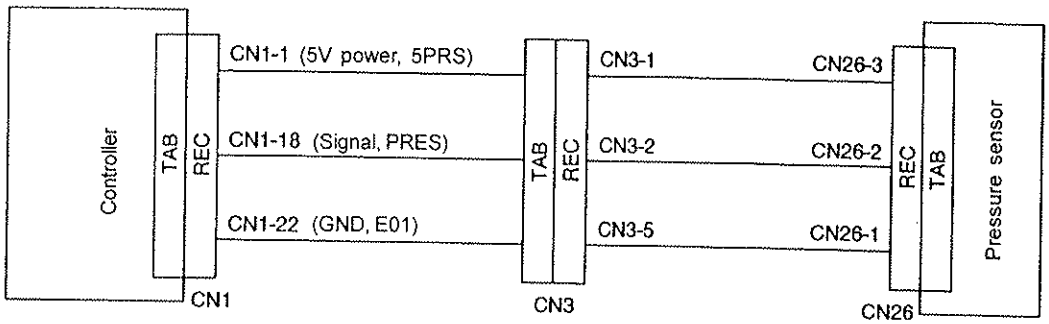
- **Active fork leveling is not provided. (Stops at a position when the knob switch is pressed.)**

Related Portion

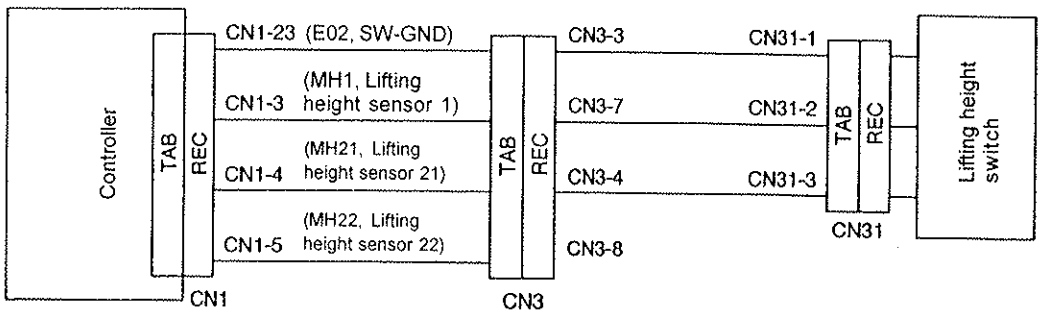
Tilt angle sensor



Load sensor

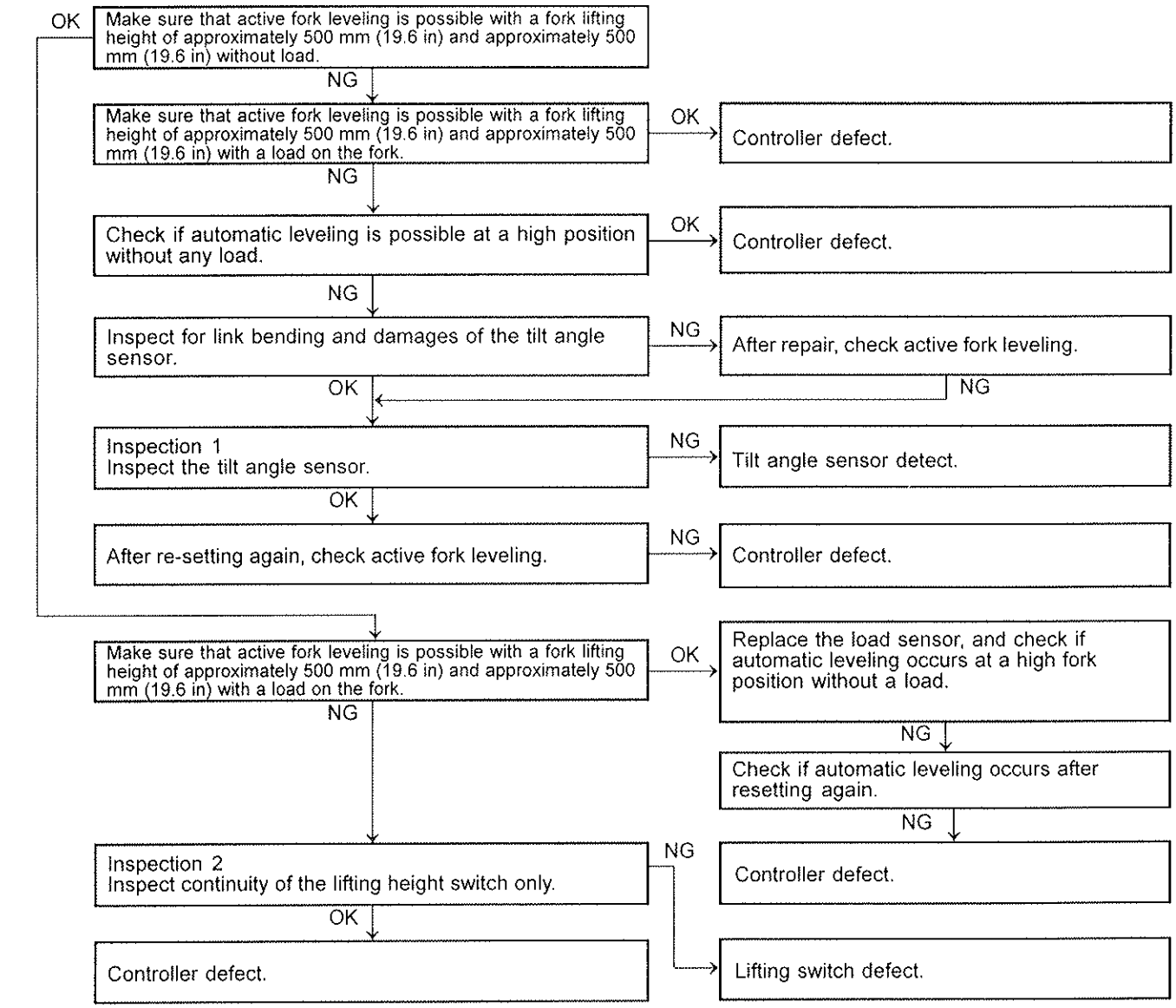


Lifting height switch



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Without analyzer



Inspection 1:

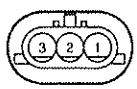
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

	Sensor lever free	Sensor lever with full-stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



CN27 (TAB)

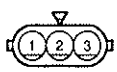
Inspection 2:

Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN31.

Standard:

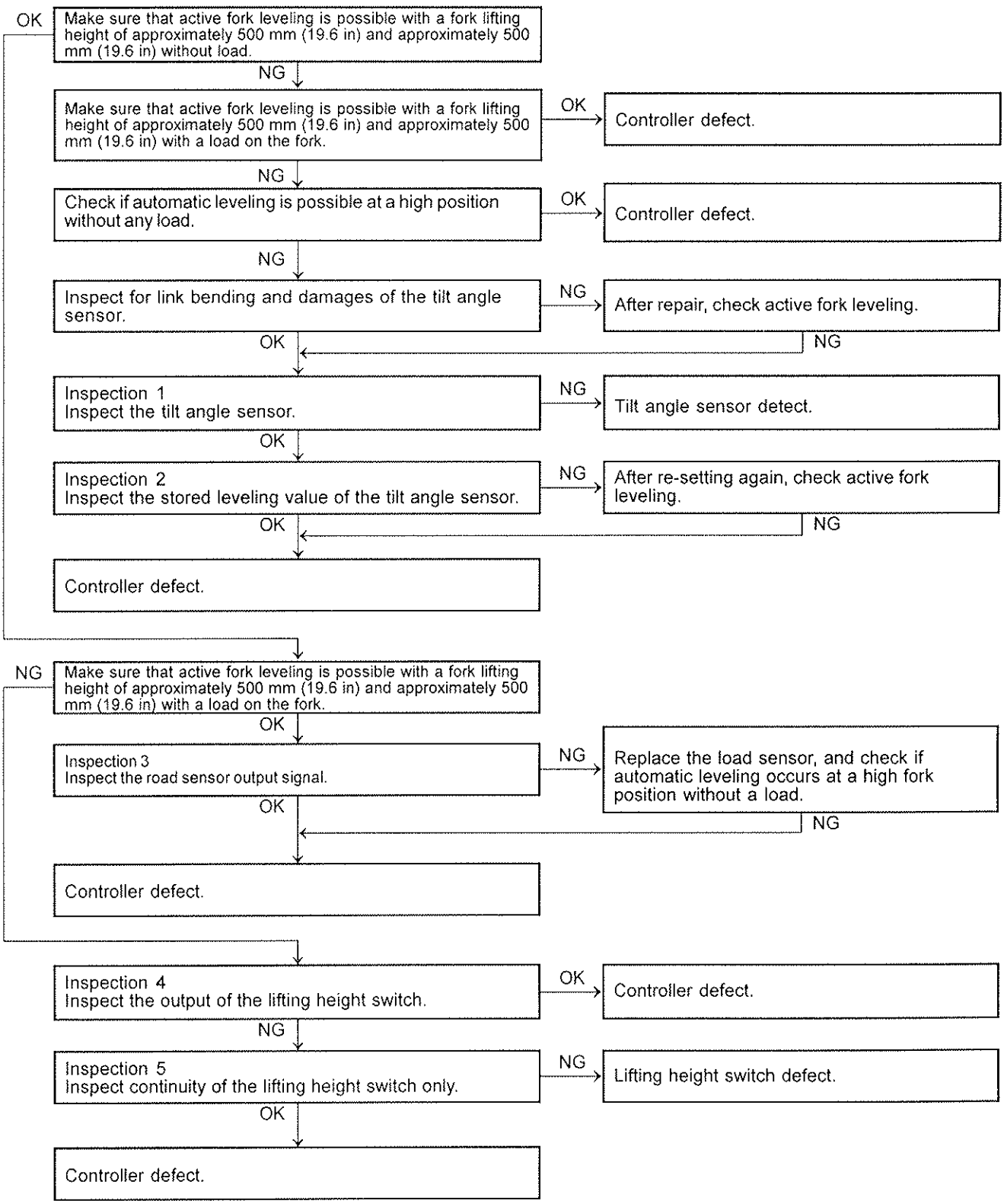
	Fork height: Approximately 500 mm (19.6 in)
CN31-1 ~ CN31-2	Continuity shall exist.
CN31-1 ~ CN31-3	No continuity



CN31 (REC)

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With analyzer



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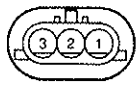
Inspection 1:
Inspect the tilt angle sensor.

Turn the ignition switch OFF and remove the tilt angle sensor.

Standard:

CN27-1 ~ CN27-3	1.5kΩ ± 0.3kΩ

	Sensor lever free	Sensor lever with full-stroke
CN27-2 ~ CN27-3	0kΩ	1.5kΩ ± 0.3kΩ



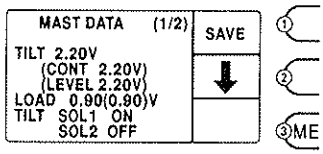
CN27 (TAB)

Inspection 2:
Inspect the stored leveling value of the tilt angle sensor.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
The TILT value with the mast tilted fully backward is greater than the LEVEL value.

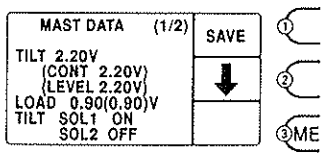


Inspection 3:
Inspect the load sensor output signal.

Turn the ignition switch ON (Start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
The LOAD value is the value in ( ) ± 0.2 V or lower.
(Fork lifting height of approximately 500 mm (19.6 in) without load.)

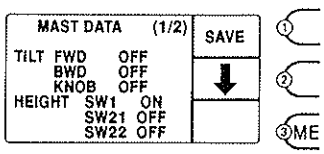


Inspection 4:
Inspect the lifting height switch output signal.

Turn the ignition switch ON (Start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
When the fork height is 500 mm (19.6 in). the LIFTING HEIGHT output shall be as follows:
SW1: ON
SW21: OFF
SW22: OFF



Inspection 5:
Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN31.

Standard:

	Fork height: Approximately 500 mm (19.6 in)
CN31-1 ~ CN31-2	Continuity shall exist.
CN31-1 ~ CN31-3	No continuity

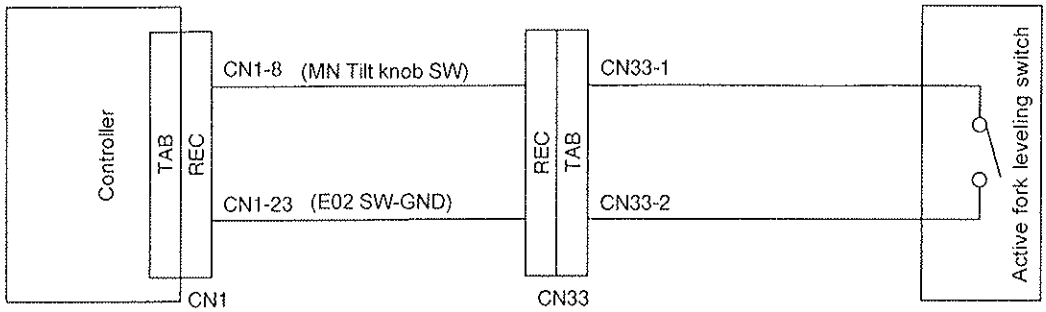


CN31 (REC)

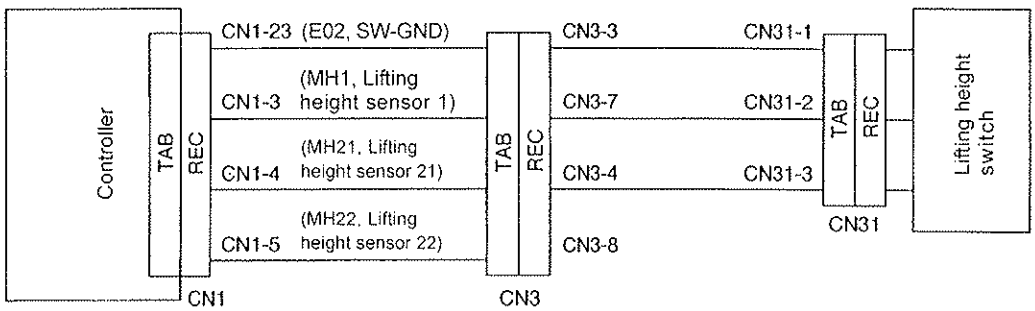
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● **The active mast rear tilt speed is not regulated, or the backward tilting speed is always slow.**
Related Portion

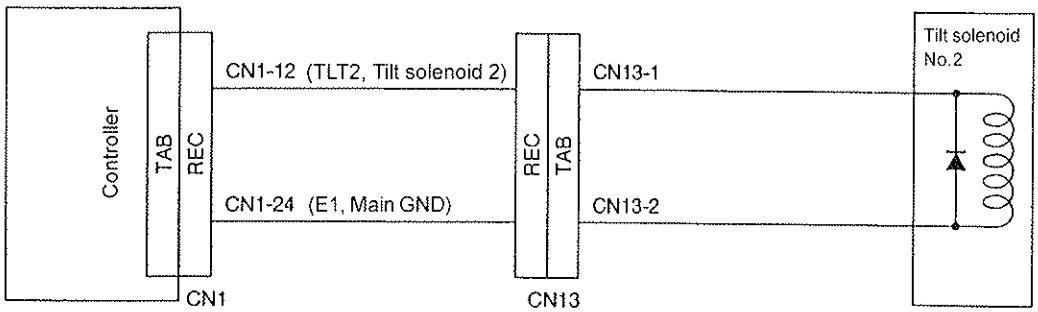
Active fork leveling switch



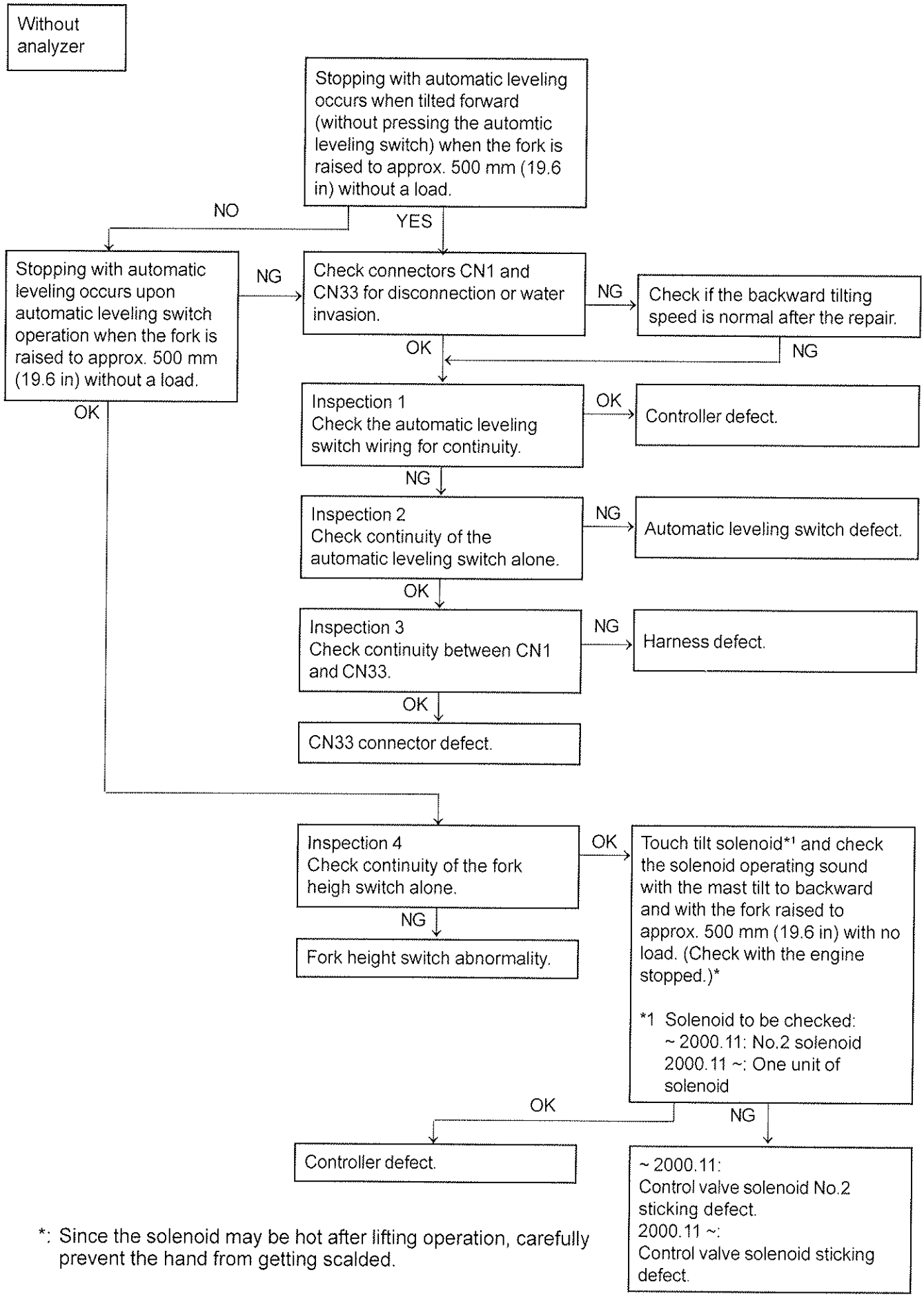
Lifting height switch



Tilt solenoid No. 2 (~ 2000.11)



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*: Since the solenoid may be hot after lifting operation, carefully prevent the hand from getting scalded.

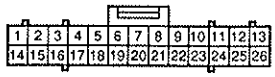
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Inspection 1:
Inspect continuity of the active fork leveling switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN1-8 ~ CN1-23	No continuity.	Continuity shall exist.



CN1 (REC)

Inspection 2:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN33.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN33-1 ~ CN33-2	No continuity.	Continuity shall exist.

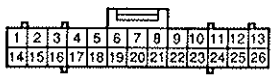


CN33 (TAB)

Inspection 3:
Inspect continuity between CN1 and CN33.

Turn the ignition switch OFF and disconnect CN1 and CN33.

Standard:
CN1-8 ~ CN33-1: Continuity shall exist.
CN1-23 ~ CN33-2: Continuity shall exist.



CN1 (REC)



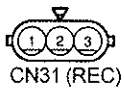
CN33 (REC)

Inspection 4:
Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN31.

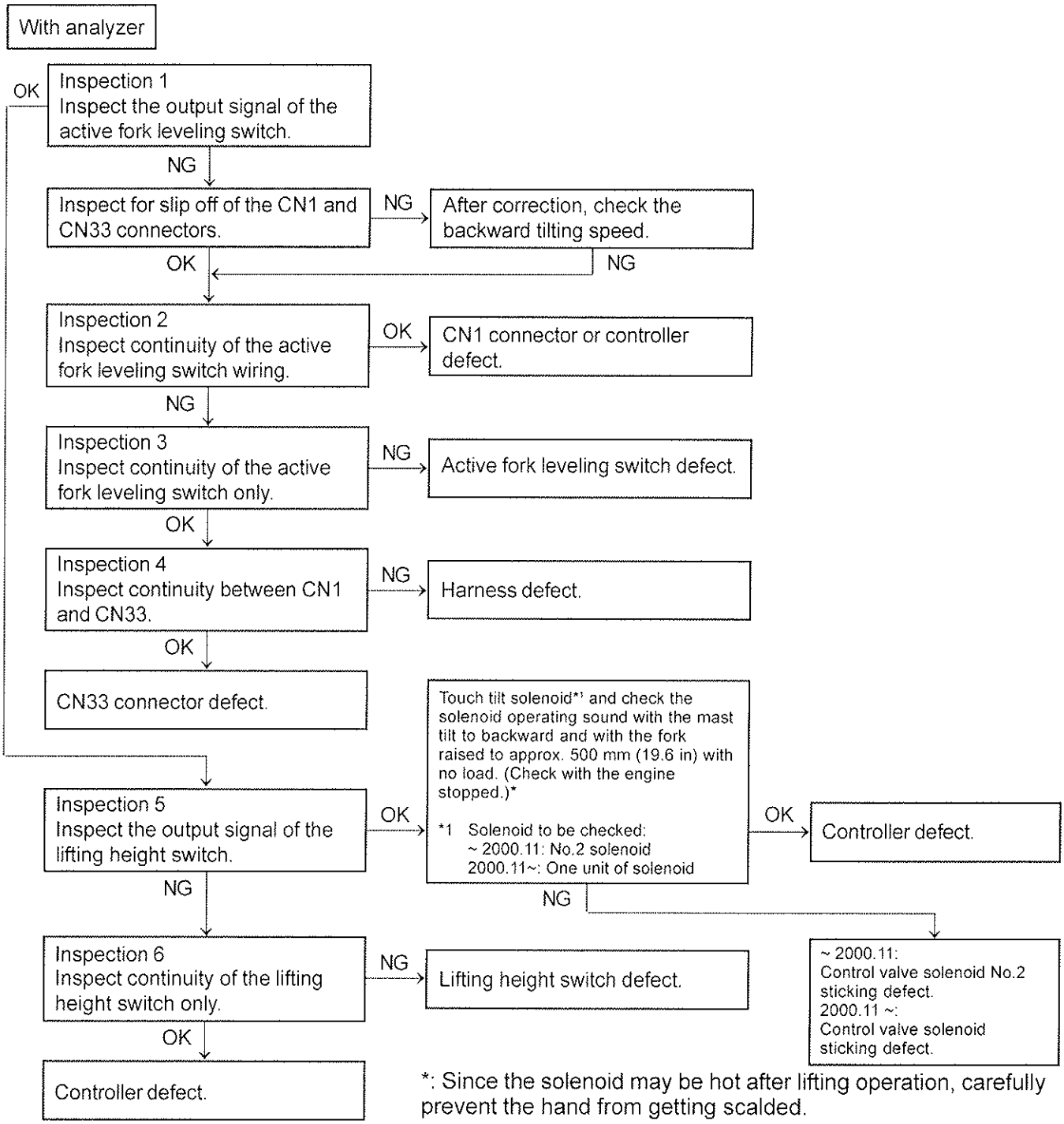
Standard:

	Small lifting height	Large lifting height
CN31-1 ~ CN31-2	Continuity shall exist.	No continuity.
CN31-1 ~ CN31-3	No continuity.	Continuity shall exist.



CN31 (REC)

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Inspection 1:

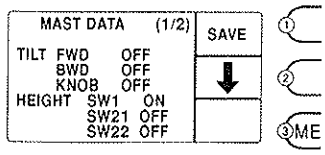
Inspect the output signal of the active fork leveling switch.

Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
KNOB	OFF	ON



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Inspection 2:
Inspect continuity of the active fork leveling switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Active fork leveling switch free	Active fork leveling switch depressed
CN1-8 ~ CN1-23	No continuity	Continuity shall exist.



CN1 (REC)

Inspection 3:
Inspect continuity of the active fork leveling switch only.

Turn the ignition switch OFF and disconnect CN33.

Standard:

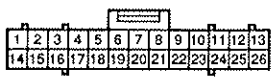
	Active fork leveling switch free	Active fork leveling switch depressed
CN33-1 ~ CN33-2	No continuity	Continuity shall exist.



CN33 (TAB)

Inspection 4:
Inspect continuity between CN1 and CN33.

Turn the ignition switch OFF and disconnect CN1 and CN33.



CN1 (REC)

Standard:
CN1-8 ~ CN33-1: Continuity shall exist.
CN1-23 ~ CN33-2: Continuity shall exist.



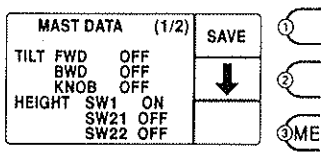
CN33 (REC)

Inspection 5:
Inspect the output signal of the lifting height switch.

Turn the ignition switch ON (start the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:
When the fork height is 500 mm (19.6 in). the LIFTING HEIGHT output shall be as follows:
SW1: ON
SW21: OFF
SW22: OFF



Inspection 6:
Inspect continuity of the lifting height switch only.

Turn the ignition switch OFF and disconnect CN31.

Standard:

	Small lifting height	Large lifting height
CN31-1 ~ CN31-2	Continuity shall exist.	No continuity.
CN31-1 ~ CN31-3	No continuity.	Continuity shall exist.

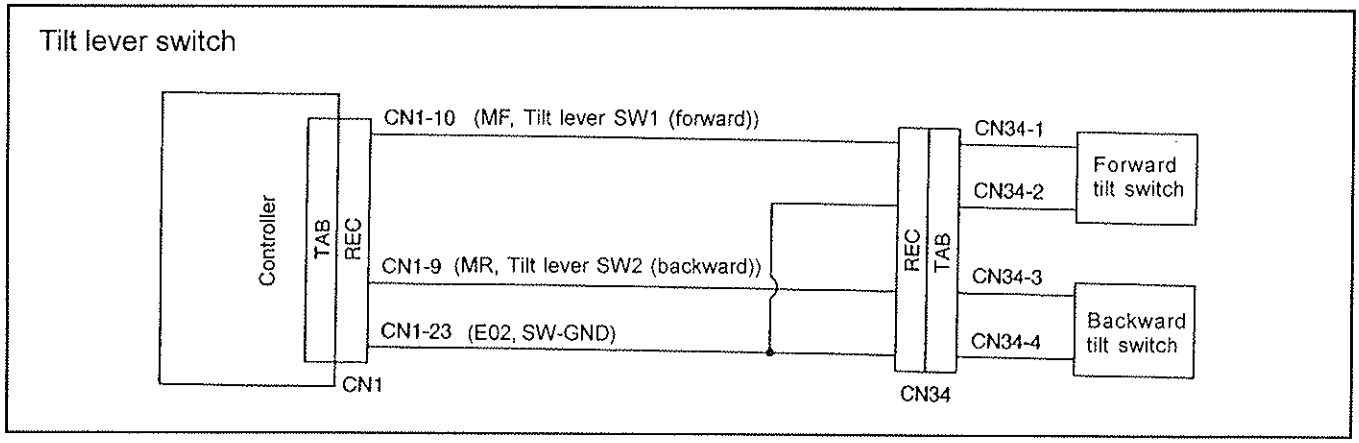


CN31 (REC)

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● **The mast does not perform forward/backward tilt.**

Related Portion



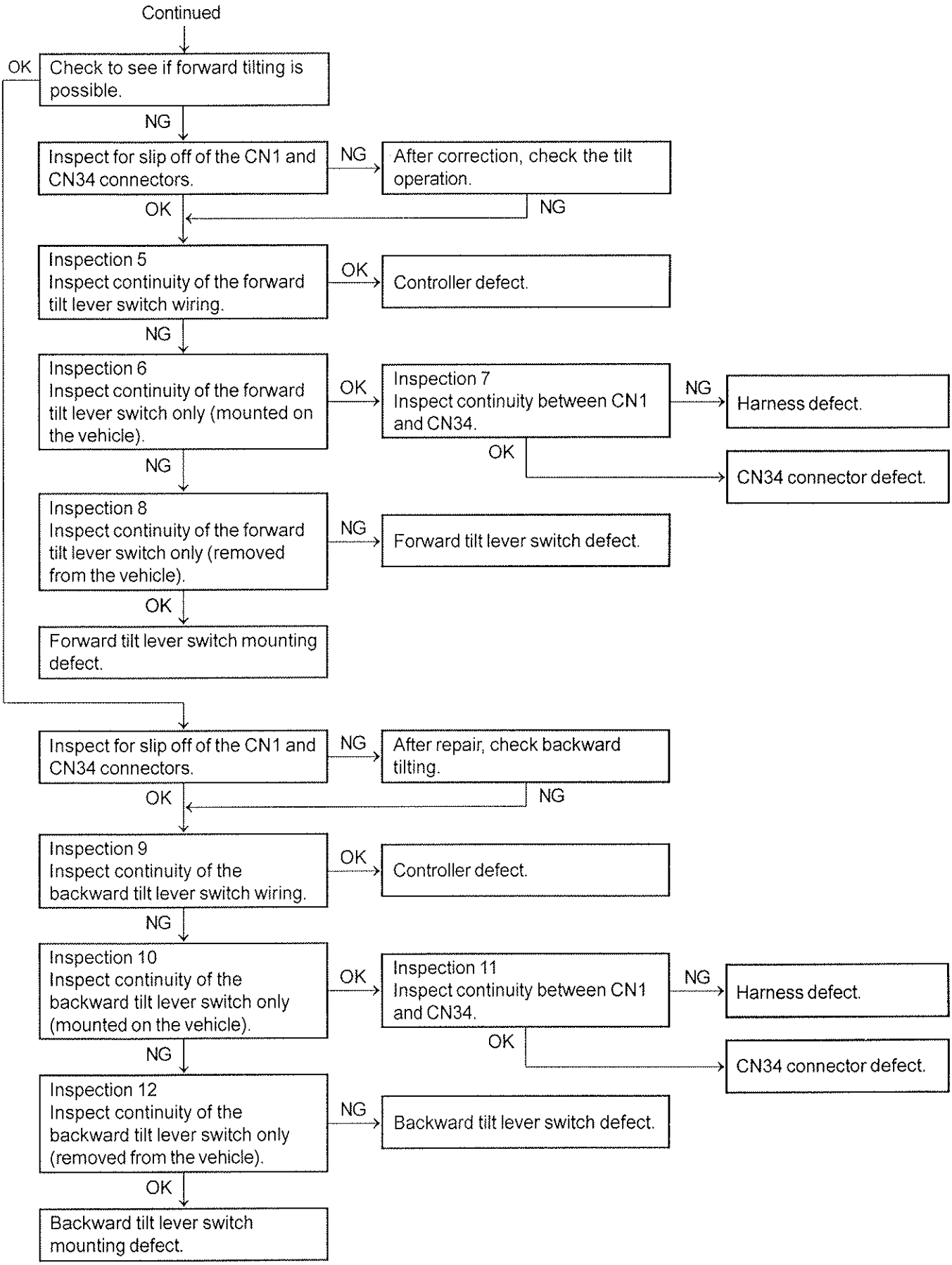
Without analyzer

OK
Neither forward nor backward tilting fails.
NG
Check CN34 connector for disconnection.
NG
Check tilting operation after correction.
NG
OK
Inspection 1
Check the tilt lever switch wiring for continuity.
OK
Touch tilt solenoid No.1 (solenoid valve on the upper rear side (truck FWD) of the control valve) and check the solenoid operating sound when the tilt lever is operated.(Check with the engine in stopped state.)*
NG
Sticking defect of the controlvalve for solenoid No.1.
OK
Controller defect.
NG
Inspection 2
Check continuity of the tilt lever switch alone (without removal from the vehicle).
OK
Inspection 3
Check continuity between CN1 and CN34.
NG
Harness defect.
OK
CN34 connector defect.
NG
Inspection 4
Check continuity of the tilt lever switch alone (after removal from the vehicle).
NG
Tilt lever switch defect.
OK
Tilt lever switch installation defect.

* Since the solenoid may be hot after lifting operation, carefully prevent the hand from getting scalded.

Go to the next page.

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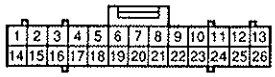


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Inspection 1:
Check the tilt lever switch wiring for continuity.
Turn the ignition switch OFF and disconnect CN1.

Standard:

	Tilt lever in neutral	Tilt lever in forward	Tilt lever in backward
CN1-10 ~ CN1-23	No continuity	Continuity shall exist.	No continuity
CN1-9 ~ CN1-23	No continuity	No continuity	Continuity shall exist.

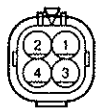


CN1 (REC)

Inspection 2:
Check continuity of the tilt lever switch alone (without removal from the vehicle).
Turn the ignition switch OFF and disconnect CN34.

Standard:

	Tilt lever in neutral	Tilt lever in forward	Tilt lever in backward
CN34-1 ~ CN34-2	No continuity	Continuity shall exist.	No continuity
CN34-3 ~ CN34-4	No continuity	No continuity	Continuity shall exist.

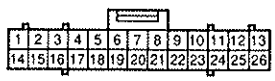


CN34 (TAB)

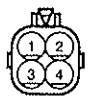
Inspection 3:
Check continuity between CN1 and CN34.
Turn the ignition switch OFF and disconnect CN1 and CN34.

Standard:

CN1-10 ~ CN34-1	Continuity shall exist.
CN1-9 ~ CN34-3	Continuity shall exist.
CN1-23 ~ CN34-2	Continuity shall exist.
CN1-23 ~ CN34-4	Continuity shall exist.



CN1 (REC)

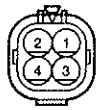


CN34 (REC)

Inspection 4:
Check continuity of the tilt lever switch alone (after removal from the vehicle).
Turn the ignition switch OFF and disconnect CN34.

Standard:

	Switch in free state	When the forward tilt switch is pressed	When the backward tilt switch is pressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity	Continuity shall exist.
CN34-3 ~ CN34-4	Continuity shall exist.	Continuity shall exist.	No continuity

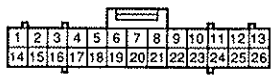


CN34 (TAB)

Inspection 5:
Inspect continuity of the forward tilt lever switch wiring.
Turn the ignition switch OFF and disconnect CN1.

Standard:

	Tilt lever in neutral	Tilt lever at forward
CN1-10 ~ CN1-23	No continuity	Continuity shall exist.



CN1 (REC)

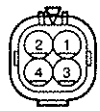
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Inspection 6:
Inspect continuity of the forward tilt lever switch only (mounted on the vehicle).

Turn the ignition switch OFF and disconnect CN34.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN34-1 ~ CN34-2	No continuity	Continuity shall exist.



CN34 (TAB)

Inspection 7:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.



CN1 (REC)

Standard:
CN1-10 ~ CN34-1: Continuity shall exist.
CN1-23 ~ CN34-2: Continuity shall exist.



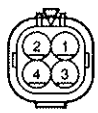
CN34 (REC)

Inspection 8:
Inspect continuity of the forward tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.
Remove the forward tilt lever switch (upper-side switch on the control valve).

Standard:

	Switch free	Switch depressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity



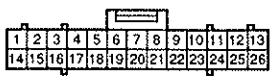
CN34 (TAB)

Inspection 9:
Inspect continuity of the backward tilt lever switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN1-9 ~ CN1-23	No continuity	Continuity shall exist.



CN1 (REC)

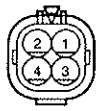
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Inspection 10:
Inspect continuity of the backward tilt lever switch only (mounted on the vehicle).

Turn the ignition switch OFF and disconnect CN34.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN34-3 ~ CN34-4	No continuity	Continuity shall exist.

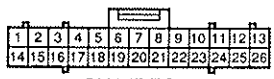


CN34 (TAB)

Inspection 11:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.

Standard:
CN1-9 ~ CN34-3: Continuity shall exist.
CN1-23 ~ CN34-4: Continuity shall exist.



CN1 (REC)



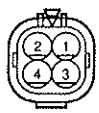
CN34 (REC)

Inspection 12:
Inspect continuity of the backward tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.
Remove the backward tilt lever switch (lower-side switch on the control valve).

Standard:

	Switch free	Switch depressed
CN34-3 ~ CN34-4	Continuity shall exist.	No continuity



CN34 (TAB)

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With analyzer

OK — Check to see if forward and backward tilting is impossible.

NG ↓

OK — Inspection 1
Inspect the switch output signal when the tilt lever is operated.

NG ↓

Inspect slip off of the CN34 connector. — NG → After correction, check the tilt operation. — NG → OK

OK ↓

Touch tilt solenoid No.1 (solenoid valve on the upper rear side (truck FWD) of control valve) and check the solenoid operating sound when the tilt lever is operated. (Check with the engine in stopped state.) *

NG → Solenoid No.1 control valve sticking defect.

OK → Controller defect.

*: Since the solenoid may be hot after lifting operation, carefully prevent the hand from getting scalded.

OK — Check to see if forward tilting is possible.

NG ↓

Inspection 2
Inspect the switch output signal when the tilt lever is operated for forward tilting.

OK → Controller defect.

NG ↓

Inspect for slip off of the CN1 and CN34 connectors. — NG → After correction, check the forward tilting operation. — NG → OK

OK ↓

Inspection 3
Inspect continuity of the forward tilt lever switch wiring.

OK → Controller defect.

NG ↓

Inspection 4
Inspect continuity of the forward tilt lever switch only (mounted on the vehicle).

OK → Inspection 5
Inspect continuity between CN1 and CN34.

NG → Harness defect.

OK → CN34 connector defect.

NG ↓

Inspection 6
Inspect continuity of the forward tilt lever switch only (removed from the vehicle).

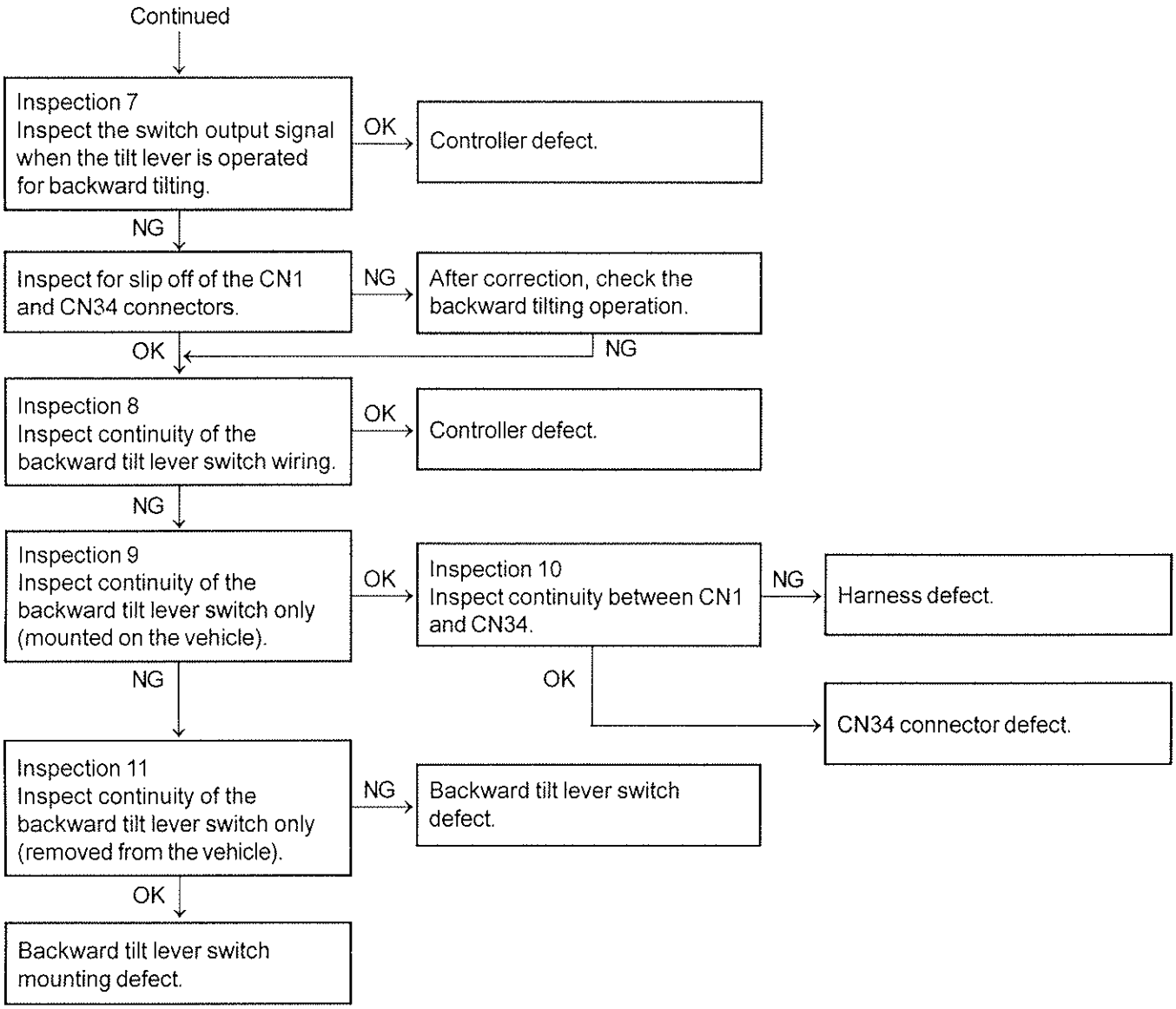
NG → Forward tilt lever switch defect.

OK ↓

Forward tilt lever switch mounting defect.

Go to the next page.

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Inspection 1:

Inspect the switch output signal when the tilt lever is operated for backward tilting.
Turn the ignition switch ON (stop the engine).
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

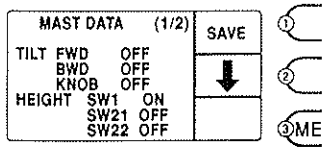
	Tilt lever neutral	Tilt lever at forward	Tilt lever at backward
TILT FWD	OFF	ON	OFF
TILT BWD	OFF	OFF	ON

Inspection 2:

Inspect the switch output signal when the tilt lever is operated for forward tilting.
Turn the ignition switch ON (stop the engine).
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

	Tilt lever neutral	Tilt lever at forward
TILT FWD	OFF	ON
TILT BWD	OFF	OFF



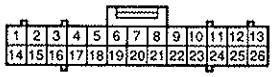
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Inspection 3:
Inspect continuity of the forward tilt lever switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN1-10 ~ CN1-23	No continuity	Continuity shall exist.



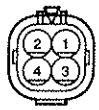
CN1 (REC)

Inspection 4:
Inspect continuity of the forward tilt lever switch only (mounted on the machine).

Turn the ignition switch OFF and disconnect CN34.

Standard:

	Tilt lever neutral	Tilt lever at forward
CN34-1 ~ CN34-2	No continuity	Continuity shall exist.

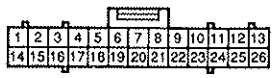


CN34 (TAB)

Inspection 5:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.

Standard:
CN1-10 ~ CN34-1: Continuity shall exist.
CN1-23 ~ CN34-2: Continuity shall exist.



CN1 (REC)



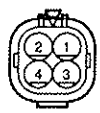
CN34 (REC)

Inspection 6:
Inspect continuity of the forward tilt lever switch only (removed from the machine).

Turn the ignition switch OFF and disconnect CN34.
Remove the forward tilt lever switch (upper-side switch on the control valve).

Standard:

	Switch free	Switch depressed
CN34-1 ~ CN34-2	Continuity shall exist.	No continuity



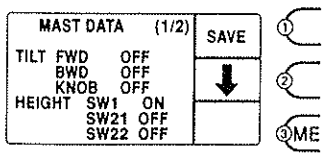
CN34 (TAB)

Inspection 7:
Inspect the switch output signal when the tilt lever is operated for backward tilting.

Turn the ignition switch ON (stop the engine).
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → MAST DATA

Standard:

	Tilt lever neutral	Tilt lever at backward
TILT FWD	OFF	OFF
TILT BWD	OFF	ON



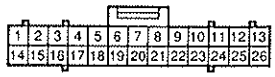
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Inspection 8:
Inspect continuity of the backward tilt lever switch wiring.

Turn the ignition switch OFF and disconnect CN1.

Standard:

	Tilt lever neutral	Tilt lever at backward
CN1-9 ~ CN1-23	No continuity	Continuity shall exist.



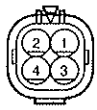
CN1 (REC)

Inspection 9:
Inspect continuity of the backward tilt lever switch only (mounted on the vehicle).

Turn the ignition switch OFF and disconnect CN34.

Standard:

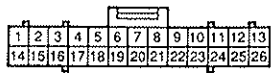
	Tilt lever neutral	Tilt lever at backward
CN34-3 ~ CN34-4	No continuity	Continuity shall exist.



CN34 (TAB)

Inspection 10:
Inspect continuity between CN1 and CN34.

Turn the ignition switch OFF and disconnect CN1 and CN34.



CN1 (REC)

Standard:
CN1-9 ~ CN34-3: Continuity shall exist.
CN1-23 ~ CN34-4: Continuity shall exist.



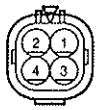
CN34 (REC)

Inspection 11:
Inspect continuity of the backward tilt lever switch only (removed from the vehicle).

Turn the ignition switch OFF and disconnect CN34.
Remove the backward tilt lever switch (lower-side switch on the control valve).

Standard:

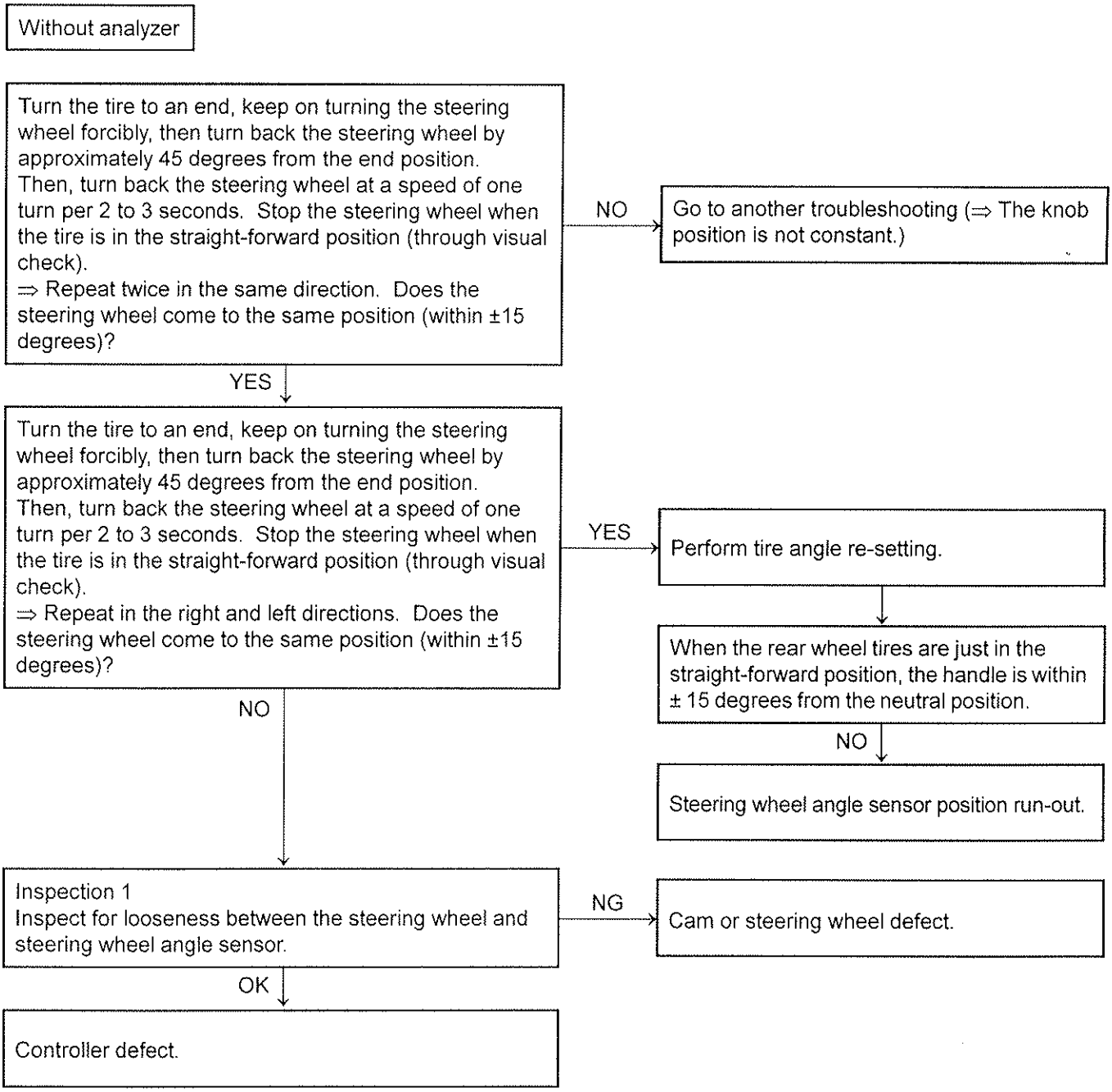
	Switch free	Switch depressed
CN34-3 ~ CN34-4	Continuity shall exist.	No continuity



CN34 (TAB)

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- **The knob position runs out to a certain point (at least by 10 degrees from the straight-forward position).**



Inspection 1:

Inspect for looseness between the steering wheel and steering wheel angle sensor.

Method: When the steering wheel is turned alternately to the right and left within approximately 9 degrees, the steering angle sensor link (shaft) shall move.

Note:

- **Remove the T/C lever beside the combination meter for check.**
- **9 degrees — Approximately 24 mm (0.95 in.) knob stroke**

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With analyzer

Inspection 1
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.
NG → Cam or steering wheel defect.
OK ↓

Inspection 2
Make sure that the central value of the knob position value is within 80 ± 1 when the steering wheel is turned from the right or left to the neutral (straight-forward) position.
NG → Steering wheel angle sensor run-out.
OK ↓

Inspection 3
Inspect the difference between the tire voltage value and re-setting voltage value when the rear wheel tires are just in straight-forward position.
⇒ The difference shall be at least 0.04 V.
NG → Tire angle re-setting defect
Perform re-setting again.
OK ↓

Inspection 4
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end (Turning speed: 1 turn per 2 to 3 seconds).
NG → Knob solenoid valve closed failure (plunger sticking, orifice clogged, etc.)
OK ↓

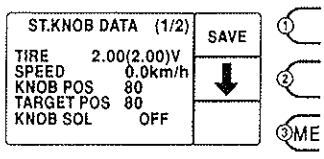
Inspection 5
Does the knob SOL go ON/OFF during stationary steering to the right and left?
OK → (Knob solenoid valve closed failure)
NG ↓

Controller defect.

Inspection 1:
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
The difference between the knob position values obtained when the steering wheel is turned from the right or left end to just the neutral position shall be 4 or less.

Example: Turning from the right end — 78
Turning from the left end — 83
83 — 78 = 5 (NG)

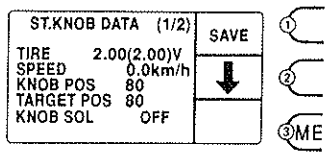


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Inspection 2:
Make sure that the central value of the knob position value is within 80 ± 1 when the steering wheel is turned from the right or left end to the neutral (straight-forward) position.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
The knob position value shall be within 80 ± 1 when the steering wheel is turned from the right or left end to the neutral (straight-forward) position.

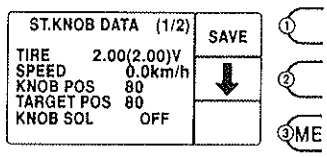


Note:
Start from at least 1/3 turn before the TOYOTA mark center position.

Inspection 3:
Inspect the difference between the tire voltage value and re-setting voltage value when the rear wheel tires are just in straight-forward position.
⇒ The difference shall be at least 0.04 V.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

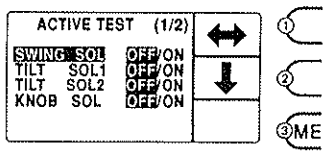
Standard:
The difference between the tire voltage value and re-setting voltage value shall be at least 0.04 V when the rear wheel tires are just in straight-forward position.



Inspection 4:
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end. (Turning speed: 1 turn per 2 to 3 seconds)

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

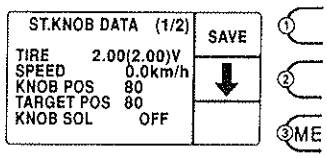
Standard:
The steering wheel shall turn idle when the knob SOL is turned ON and the steering wheel turns idle at the tire end. (Turning speed: 1 turn per 2 to 3 seconds)



Inspection 5:
Does the knob SOL go ON/OFF during stationary steering to the right and left?

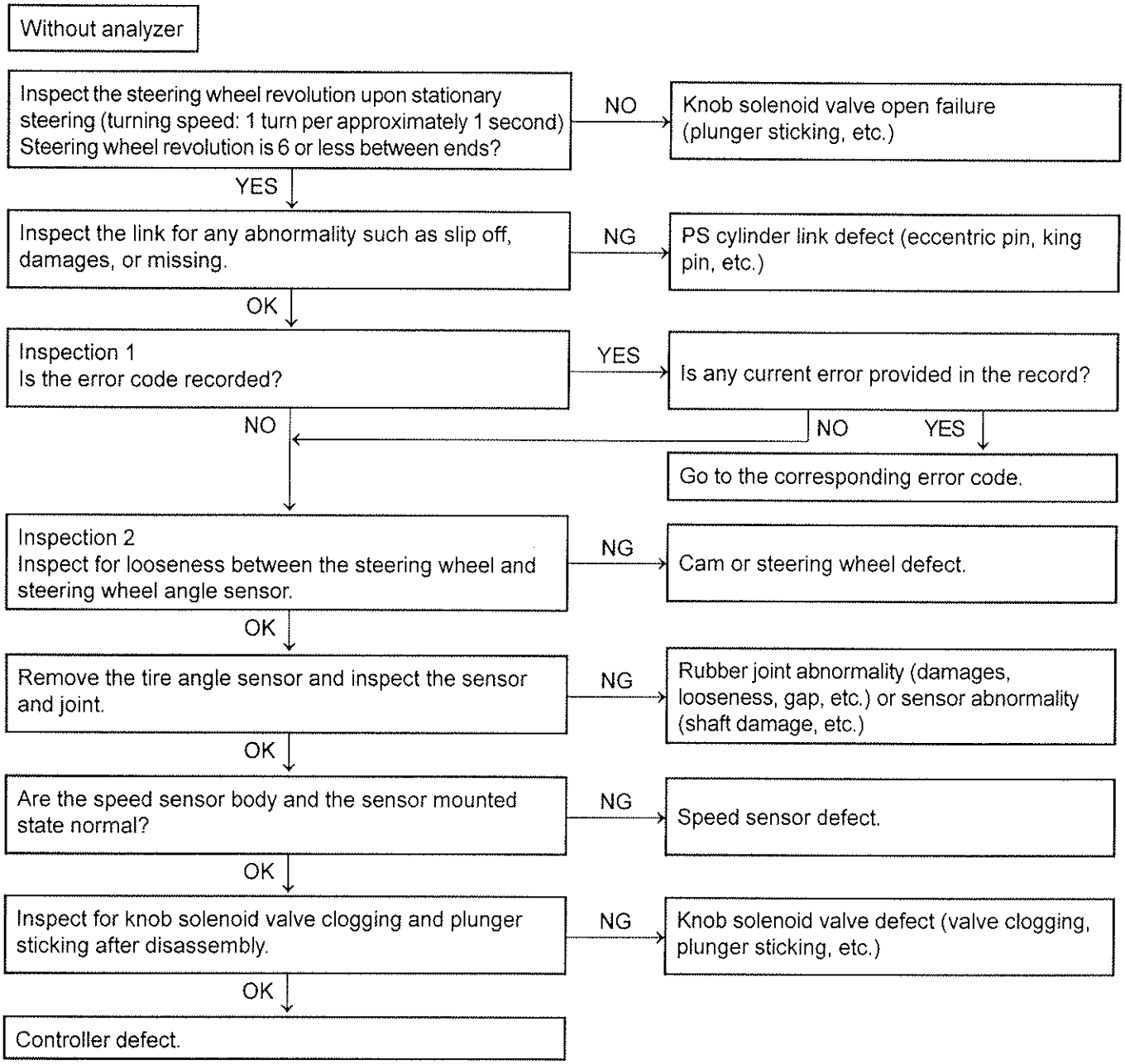
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
The knob SOL shall sometimes go ON/OFF when the steering wheel is turned from an end to another alternately. Perform this operation three times.



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● **The knob position runs out. (The knob position in straight-forward status is not constant.)**



Inspection 1:
Is the error code recorded?
Turn the ignition switch ON, remove the diagnosis short pin, then check error code indication on the hourmeter display.

Standard:
Errors shall not exist near the current time.

Inspection 2:
Inspect for looseness between the steering wheel and steering wheel angle sensor.

Method: When the steering wheel is turned alternately to the right and left within approximately 9 degrees, the steering wheel angle sensor link (shaft) shall move.

Note:
- **Remove the T/C lever beside the combination meter for check.**
- **9 degrees — Approximately 24 mm (0.95 in.) knob stroke.**

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With analyzer

Inspection 1
Turn the knob SOL OFF and inspect the steering wheel revolution upon stationary steering (turning speed: 1 turn per 2 to 3 seconds) ⇒ Steering wheel revolution is 6 or less between ends?

NG → Knob solenoid valve open failure (plunger sticking, etc.)

OK ↓

Inspection 2
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end (turning speed: 1 turn per 2 to 3 seconds).

NG → Knob solenoid valve closed failure (plunger sticking, orifice clogged, etc.)

OK ↓

Inspection 3
Is the tire voltage value changed when the steering wheel is turned to the right and left?

NG → Sensor or joint missing or damaged.

OK ↓

Inspection 4
Is the error code recorded?

YES → Is any current error provided in the record?

NO ← NO

YES ↓

Go to the corresponding error code.

NO ↓

Inspection 5
Make sure that the knob position value changes smoothly when the steering wheel is turned.

NG → Cam or steering wheel angle sensor defect.

OK ↓

Inspection 6
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.

NG → Cam or steering wheel defect.

OK ↓

Inspection 7
Inspect the gap between the tire angle sensor and the rubber bushing.

NG → Check to see if the link has abnormality such as slip off, damages, missing, etc.

OK ↓ → Rear axle cylinder link defect (eccentric pin, king pin, etc.)

NG ↓ → Rubber joint abnormality (looseness, gap, etc.)

OK ↓

Inspection 8
Does the speed value change according to the traveling speed?

NG → Speed sensor defect.

OK ↓

Inspection 9
Does the knob SOL go ON/OFF upon stationary steering to the right and left?

OK → Knob solenoid valve defect (valve clogged, etc.)

NG ↓

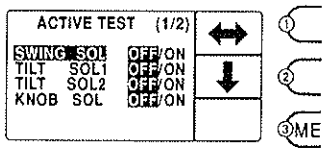
Controller defect.

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Inspection 1:
Turn the knob SOL OFF and inspect the steering wheel revolution upon stationary steering (turning speed: 1 turn per 2 to 3 seconds)
⇒ Steering wheel revolution is 6 or less between ends?

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

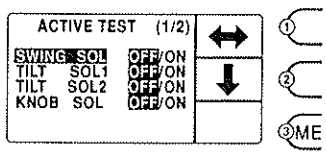
Standard:
Six or fewer rotations upon stationary steering after the knob SOL is turned OFF (turning speed: 1 turn per 2 to 3 seconds)



Inspection 2:
Turn the knob SOL ON and make sure that the steering wheel turns idle at the tire end (turning speed: 1 turn per 2 to 3 seconds).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

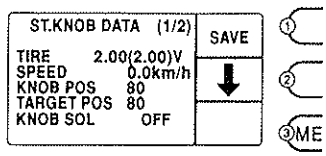
Standard:
When the knob SOL is turned ON, the steering wheel is turned to the tire end, and the steering wheel is further turned, the steering wheel shall turn idle (turning speed: 1 turn per 2 to 3 seconds).



Inspection 3:
Is the tire voltage value changed when the steering wheel is turned to the right and left?

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

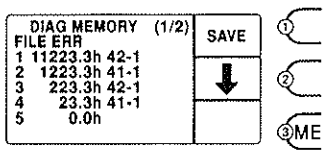
Standard:
When the steering wheel is turned to the right and left, the tire voltage value should change smoothly and continuously in the whole rage.



Inspection 4:
Is the error code recorded?

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → DIAG MEMORY

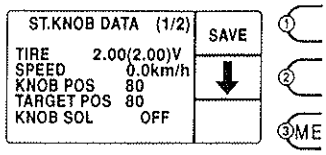
Standard:
Errors shall not exist near the current time.



Inspection 5:
Make sure that the knob position value changes smoothly when the steering wheel is turned.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
When the steering wheel is turned to the right and left, the knob position value shall change smoothly.
0 to 159 ⇒ 0 to 159 ⇒ repeated



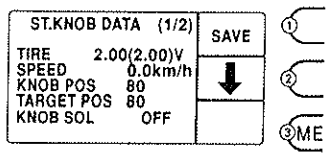
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Inspection 6:
Make sure that the difference between the knob position values from the right and left is 4 or less when the steering wheel is turned from the right or left to the neutral (straight-forward) position.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
The difference between the knob position values from the right and left shall be 4 or less when the steering wheel is turned from the right or left to the neutral position.

Example: Turning from the right end — 78
Turning from the left end — 83
83 - 78 = 5 (NG)

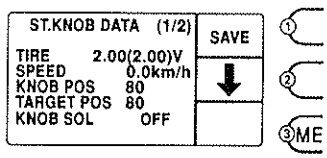


Note:
Start from at least 1/3 turn before the TOYOTA mark center position.

Inspection 7:
Jack up the vehicle until rear wheels leave the ground, and fully turn the steering wheel to either side. Then return the knob by approx. 70 mm (2.8 in) (approx. 25 degrees) from that position, and inspect variation in the tire voltage value. Inspect this for one direction at a time.

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

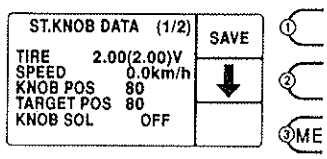
Standard:
The tire voltage change shall be at least 0.02 V when the knob is turned by 70 mm (2.8 in) (approx. 25 degrees) in each direction (when the tire is moved slightly).



Inspection 8:
Does the speed value change according to the traveling speed?

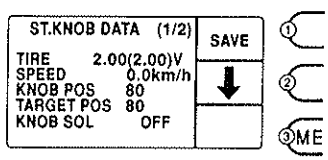
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

Standard:
The speed value shall change according to the traveling speed.



Inspection 9:
Does the knob SOL go ON/OFF upon stationary steering to the right and left?
Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → ST.KNOB DATA

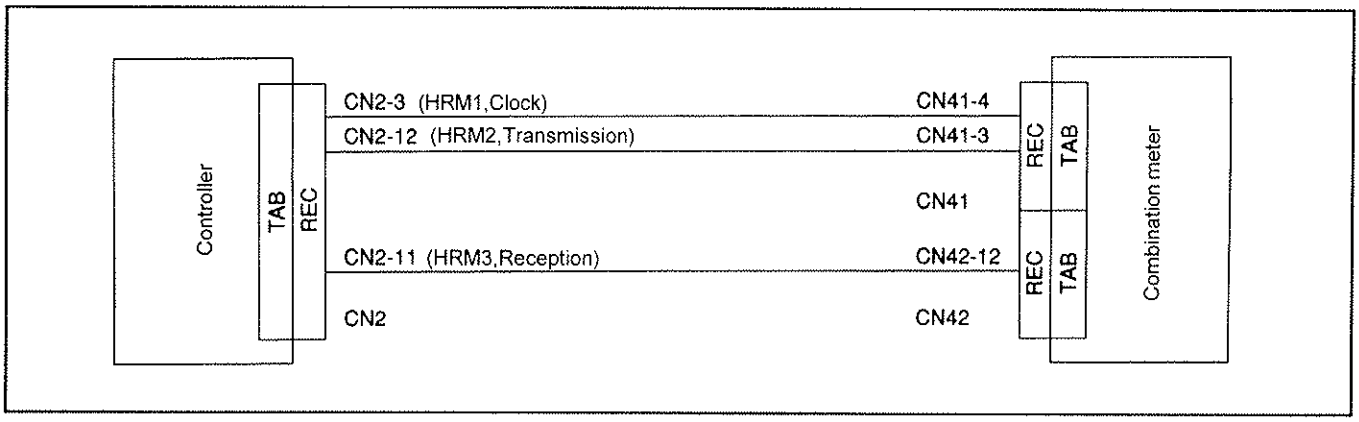
Standard:
The knob SOL shall sometimes go ON/OFF when the steering wheel is turned from an end to another alternately. Perform this operation three times.



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- **No error code is indicated although SAS warning lamp blinks.**
- **"_" (underscore) is displayed on the hourmeter.**

Related Portion



Estimated Causes:

① Connector contact defect
② Hourmeter harness defect
③ Hourmeter defect
④ Controller defect

Inspect for slip off of the CN2, CN41, and CN42 connectors. → NG → After correction, check indication.

OK ↓ / NG ←

Inspection 1
Inspect continuity between CN2 and CN41 and between CN2 and CN42. → NG → Harness defect.

OK ↓

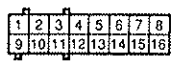
Inspection 2
Inspect the communication line. → NG → Hourmeter defect.

OK ↓

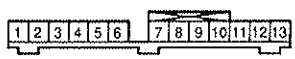
Controller defect.

Inspection 1:

Inspect continuity between CN2 and CN41 and between CN2 and CN42.
Turn the ignition switch OFF and disconnect CN2, CN41, and CN42.



CN2 (REC)



CN41 (REC)



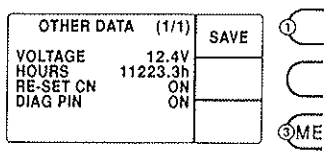
CN42 (REC)

Standard:
CN2-3 ~ CN41-1: Continuity shall exist.
CN2-12 ~ CN41-3: Continuity shall exist.
CN2-11 ~ CN42-12: Continuity shall exist.

Inspection 2:

Inspect continuity between CN2 and CN41 and between CN2 and CN42.
Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → IN OUT MENU → OTHER DATA
Display the hourmeter time on the analyzer.

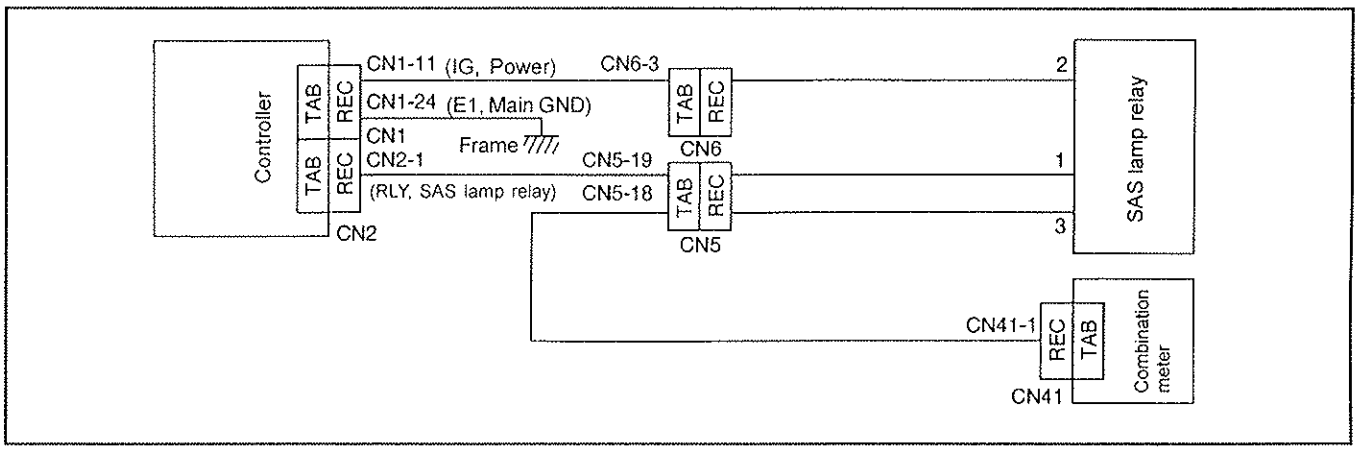


Standard:
Same time as the time displayed on the hourmeter (0.1 hour shortage permissible).

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● The SAS warning lamp is always lit.

Related Portion



Estimated Causes:

① Re-setting not complete
② SAS-ECU fuse defect
③ Connector contact defect
④ Power system harness defect
⑤ SAS lamp relay defect
⑥ Low battery voltage
⑦ Controller defect

Re-setting complete (when the controller is replaced).
NG → After re-setting, SAS lamp indication.
OK ← NG

Inspect the SAS-ECU fuse.
NG → After correction, SAS lamp indication.
OK ← NG

Inspect for slip off of the CN1, CN2, CN5, CN7, and CN41 connectors.
NG → After correction, SAS lamp indication.
OK ← NG

Inspection 1
Inspect continuity between CN1 and CN6, between CN2 and CN5, between CN1 and the frame, between CN6 and the relay block, between CN5 and the relay block, and between CN5 and CN41.
NG → Harness defect.
OK

Inspection 2
Inspect the supply voltage of the controller.
NG → Defect of the power supply harness before the relay block.
SAS-ECU fuse defect. Battery voltage defect.
OK

Inspection 3
Inspect the SAS lamp relay.
NG → SAS lamp relay defect.
OK

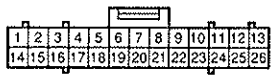
Controller defect.

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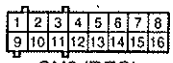
Inspection 1:
Inspect continuity between CN1 and CN6, between CN2 and CN5, between CN6 and the relay block, between CN5 and the relay block, and between CN5 and CN41.

Turn the ignition switch OFF and disconnect CN1, CN5, CN6, CN41, and the SAS lamp relay.

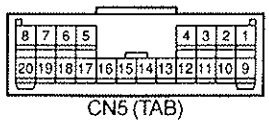
Standard:
CN1-11 ~ CN6-3: Continuity shall exist.
CN1-24 ~ Frame: Continuity shall exist.
CN2-1 ~ CN5-19: Continuity shall exist.
CN6-3 ~ SAS lamp relay terminal 2: Continuity shall exist.
CN5-18 ~ SAS lamp relay terminal 3: Continuity shall exist.
CN5-19 ~ SAS lamp relay terminal 1: Continuity shall exist.
CN5-18 ~ CN41-1: Continuity shall exist.



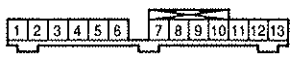
CN1 (REC)



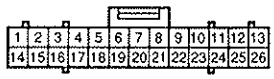
CN2 (REC)



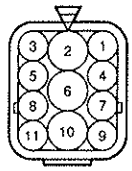
CN5 (TAB)



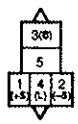
CN41 (REC)



CN1 (REC)



CN6 (TAB)



SAS lamp relay

Inspection 2:
Inspect the supply voltage of the controller.
Turn the ignition switch ON (stop the engine).

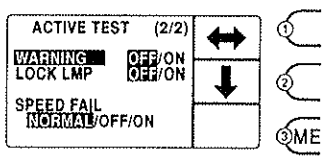
Standard:
CN1-11 ~ CN1-24: 11 ~ 16V

Inspection 3:
Inspect the SAS lamp relay.

• With analyzer:
Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST
Operate the SAS lamp forcibly.

Standard:
OFF — Turned off
ON — Lit

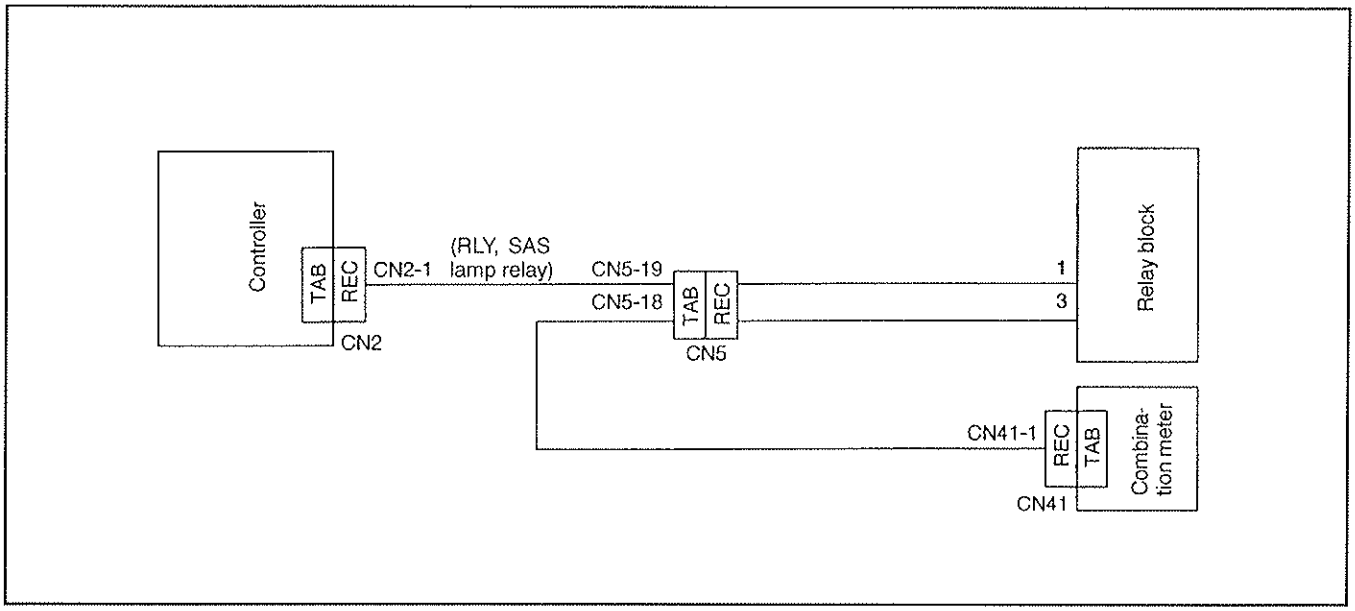


• Without analyzer:
The controller is defective if the lamp is kept lit even after replacing the SAS lamp relay.

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● **When the ignition switch is turned on, the SAS warning lamp is not lit.**

Related Portion



Estimated Causes:

① SAS lamp bulb blown
② GAUGE fuse defect
③ Connector contact defect
④ Power system harness defect
⑤ SAS lamp relay defect
⑥ Controller defect

Check to see if the SAS lamp bulb is blown. → NG → After the bulb is replaced, SAS lamp indication.
OK ↓ / NG ←

Check to see if the combination meter fuse is blown. → NG → After the fuse is replaced, SAS lamp indication.
OK ↓ / NG ←

Inspect for slip off of the CN5 and CN41 connectors. → NG → After correction, SAS lamp indication.
OK ↓ / NG ←

Inspection 1
Inspect continuity between CN2 and CN5, between CN5 and the relay block, and between CN5 and CN41. → NG → Harness defect.
OK ↓

Inspection 2
Inspect the SAS lamp relay. → NG → SAS lamp relay defect.
OK ↓

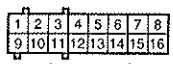
Controller defect.

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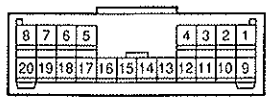
Inspection 1:
Inspect continuity between CN2 and CN5, between CN5 and the relay block, and between CN5 and CN41.

Turn the ignition switch OFF and disconnect CN2, CN5, CN41, and the SAS lamp relay.

Standard:
CN2-1 - CN5-19: Continuity shall exist.
CN5-18 - SAS lamp relay terminal 3: Continuity shall exist.
CN5-19 - SAS lamp relay terminal 1: Continuity shall exist.
CN5-18 - CN41-1: Continuity shall exist.



CN2 (REC)



CN5 (TAB)

Inspection 2:
Inspect the SAS lamp relay.



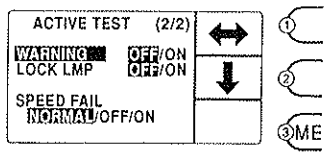
CN41 (REC)

• With analyzer
Turn the ignition switch ON (stop the engine).

Analyzer: MAIN MENU → SAS MENU → ANALYZER MENU → ACTIVE TEST

Operate the SAS lamp forcibly.

Standard:
OFF — Turned off
ON — Lit

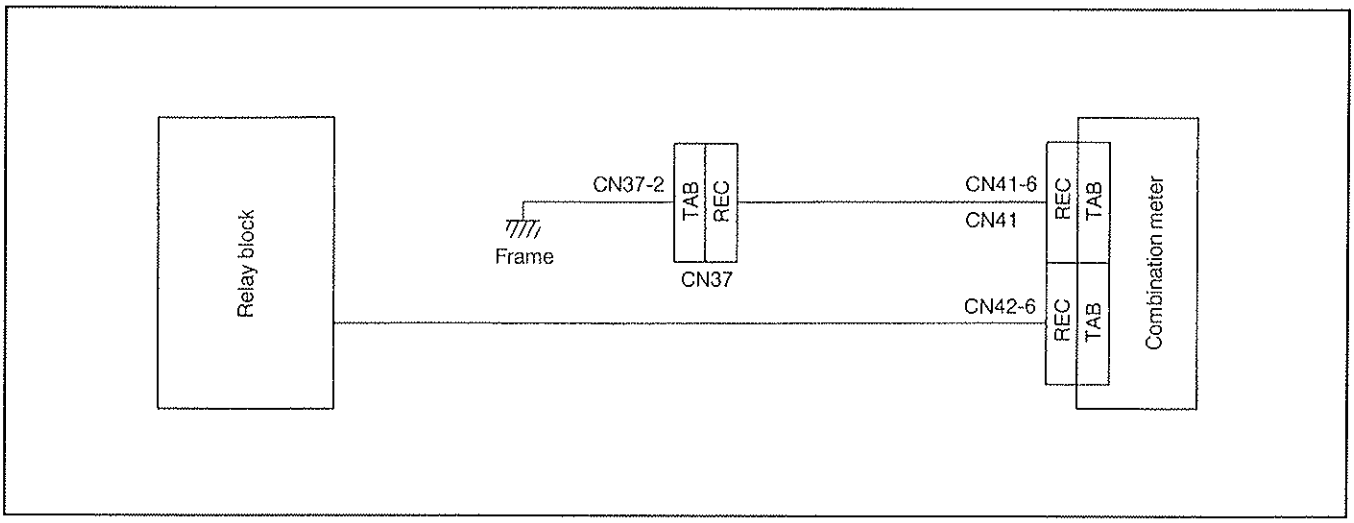


• Without analyzer:
The controller is defective if the lamp is kept lit even after replacing the SAS lamp relay.

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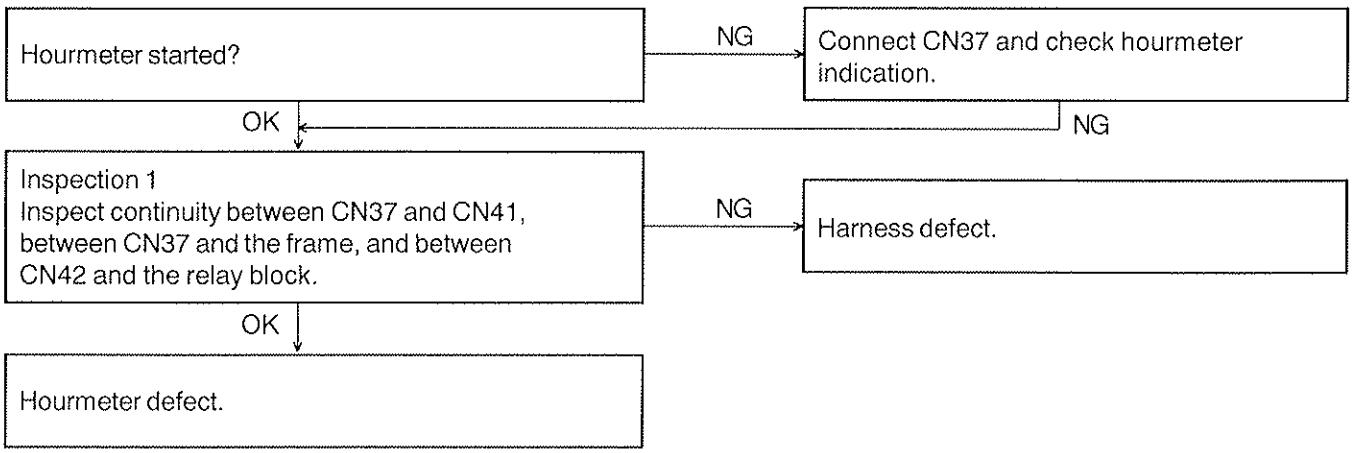
● No hourmeter indication

Related Portion



Estimated Causes:

① Hourmeter not started
② Connector contact defect
③ Hourmeter harness defect



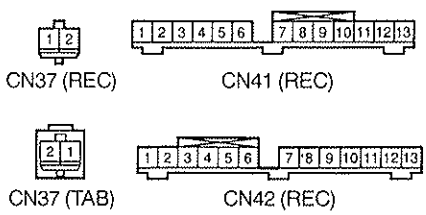
Inspection 1:

Inspect continuity between CN37 and CN41, between CN37 and the frame, and between CN42 and the relay block.

Turn the ignition switch OFF and disconnect CN37, CN41, and GAGE fuse.

Standard:

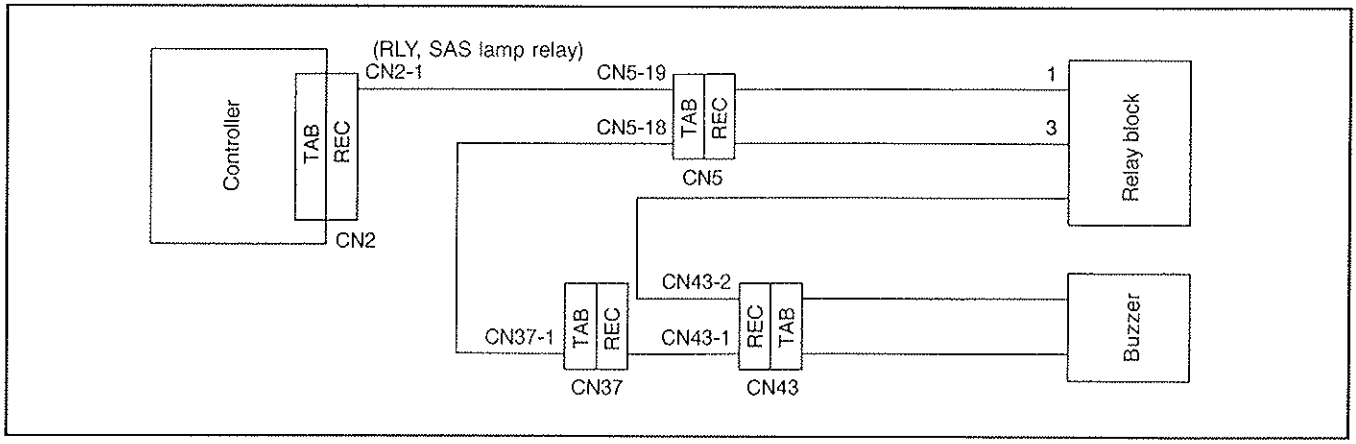
CN37 ~ CN41: Continuity shall exist.
CN37 ~ Frame: Continuity shall exist.
CN42 ~ Controller-side terminal of the GAUGE fuse in the relay block: Continuity shall exist.



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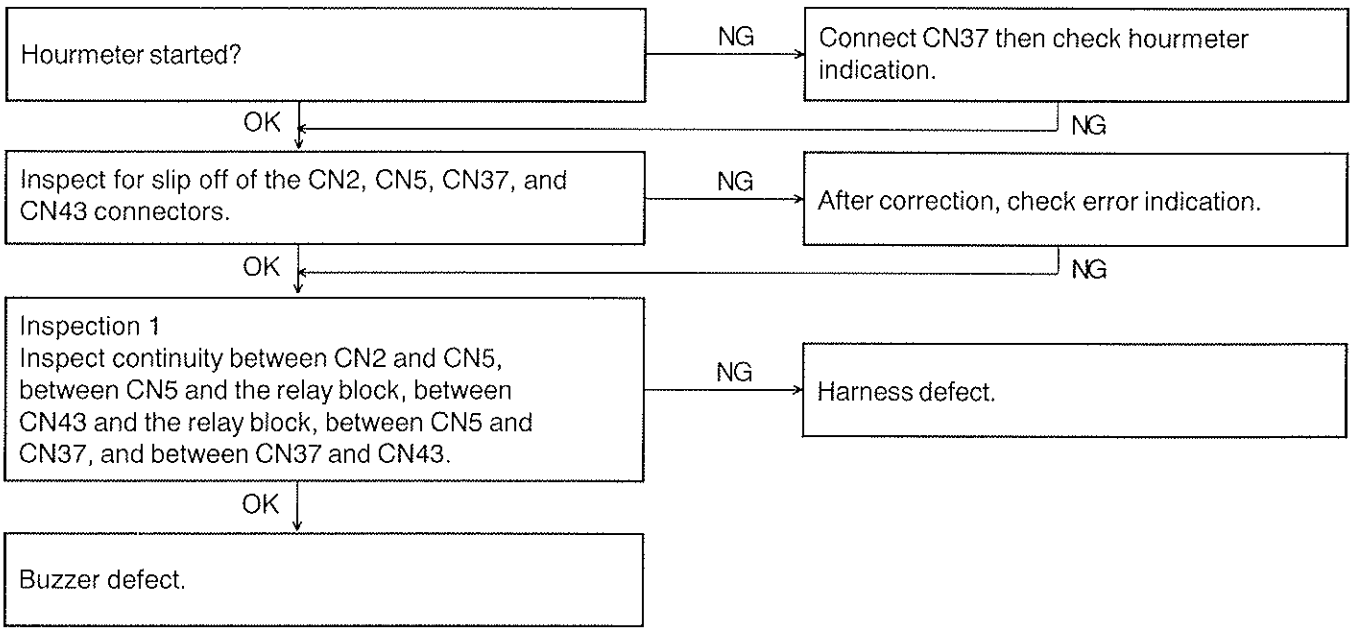
● **The buzzer is not interlocked with the SAS warning lamp.**

Related Portion



Estimated Causes:

① Hourmeter not started
② Connector contact defect
③ Hourmeter harness defect
④ Buzzer defect



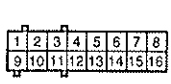
Inspection 1:

Inspect continuity between CN2 and CN5, between CN5 and the relay block, between CN43 and the relay block, between CN5 and CN37, and between CN37 and CN43.

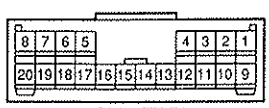
Turn the ignition switch OFF and disconnect CN2, CN5, CN37, CN43, and the GAUGE fuse in the relay block.

Standard:

CN2-1 ~ CN5-19: Continuity shall exist.
CN5-18 ~ SAS lamp relay terminal 3: Continuity shall exist.
CN5-19 ~ SAS lamp relay terminal 1: Continuity shall exist.
CN43-2 ~ Controller-side terminal of the GAUGE fuse in the relay block: Continuity shall exist.
CN5-18 ~ CN37-1: Continuity shall exist.
CN37-1 ~ CN43-1: Continuity shall exist.



CN2 (REC)



CN5 (TAB)



CN43 (REC)

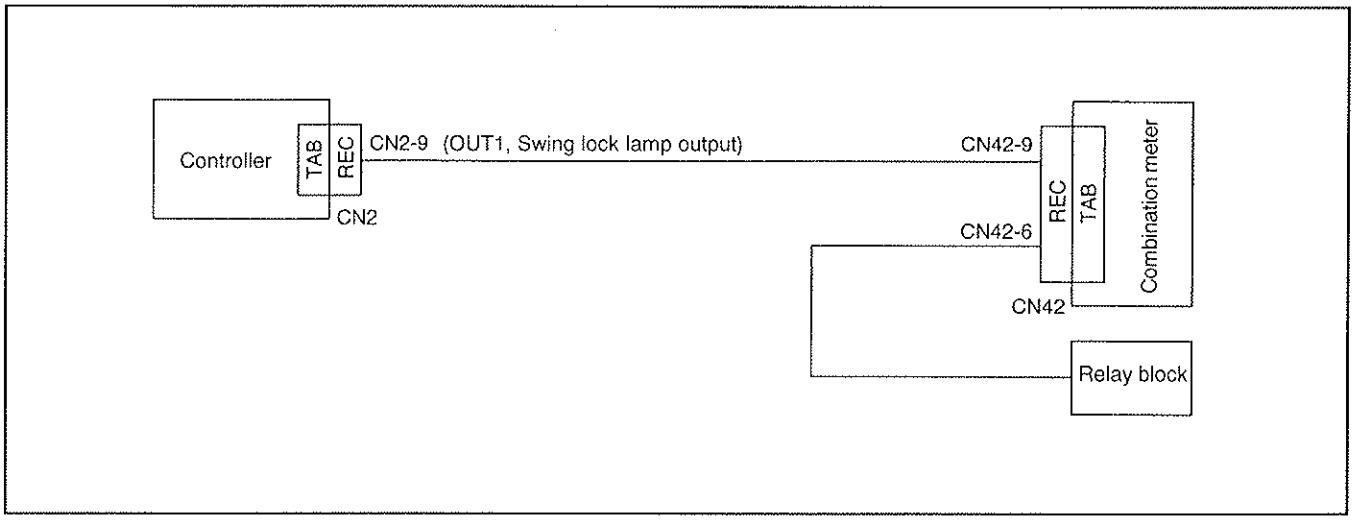


CN37 (TAB)

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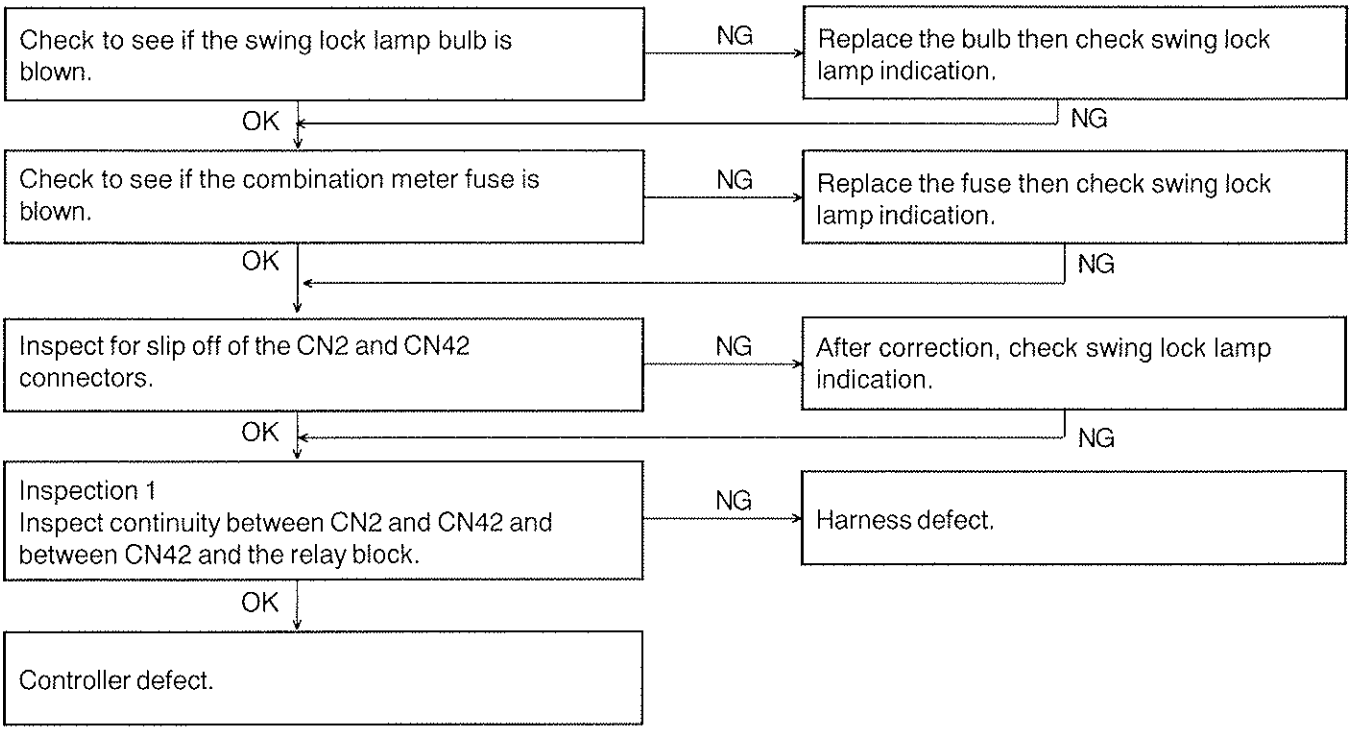
● **When the ignition switch is turned on, the swing lock lamp is not lit.**

Related Portion



Estimated Causes:

① Swing lock lamp bulb blown
② GAUGE fuse defect
③ Connector contact defect
④ Swing lock lamp harness defect
⑤ Controller defect

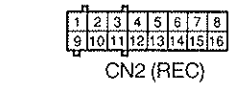


Inspection 1:

Inspect continuity between CN2 and CN42 and between CN42 and the relay block.
Turn the ignition switch OFF and disconnect CN2, CN42, and the GAGE fuse in the relay block.

Standard:

CN2-9 ~ CN42-9: Continuity shall exist.
CN42-6 ~ Controller-side terminal of the GAUGE fuse in the relay block: Continuity shall exist.



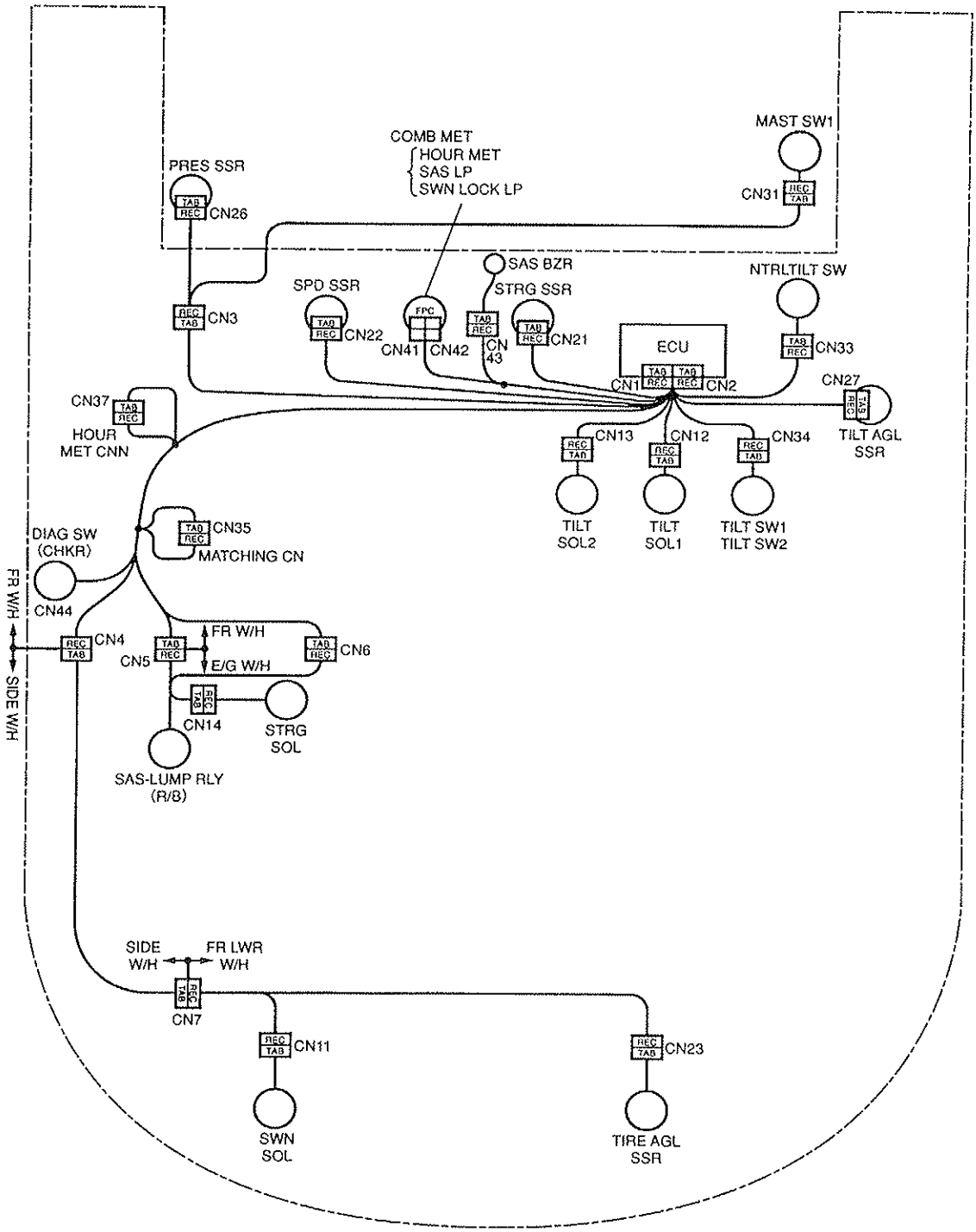
CN2 (REC)



CN42 (REC)

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CONNECTOR LAYOUT



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CONTROLLER SEQUENCE

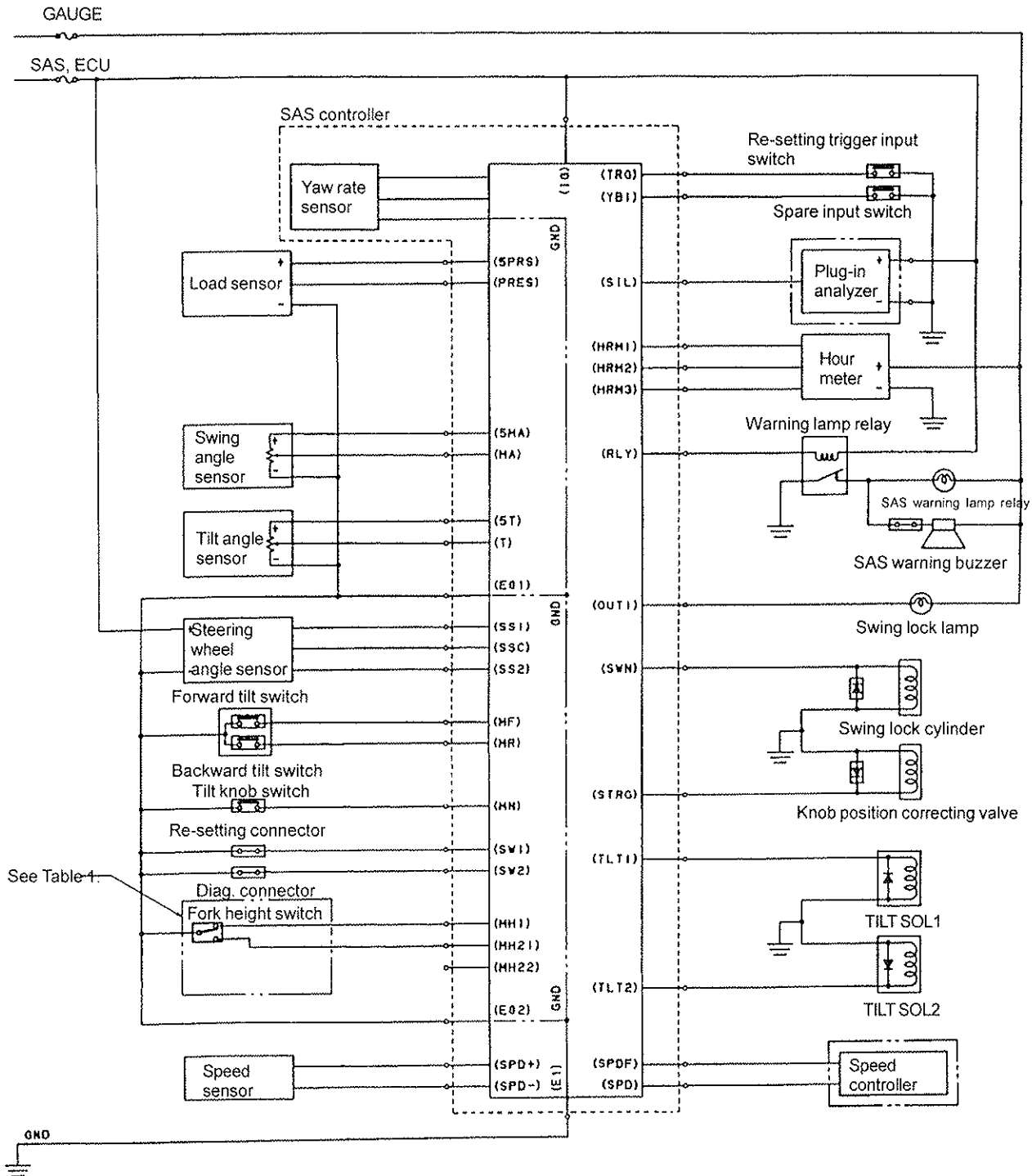
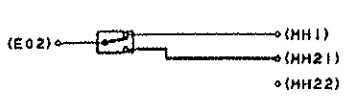


Table 1

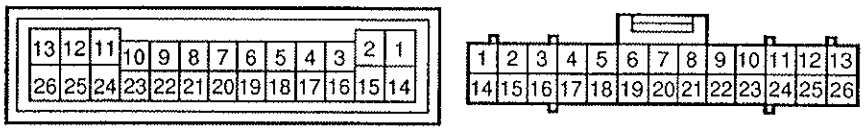
A	
	
SAS spec.	*1 SAS less spec.

*1: "SAS less spec." has not been applied to your destination.

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CONNECTOR DIAGRAMS

CN1



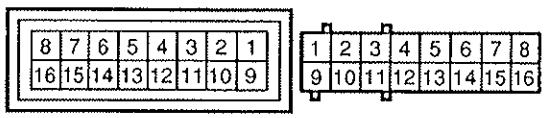
TAB

No.	C	J
1		5PRS
2		SIL
3		MH1
4		MH21
5		MH22
6		SW2
7		SW1
8		MN
9		MR
10		MF
11		IG
12		TLT2
13		TLT1
14		5MA
15		5T
16		YR
17		MA
18		PRES
19		-
20		T
21		SA
22		E01
23		E02
24		E1
25		SWN
26		STRG

REC

No.	C	J
1	G-	CN3-1
2	V	CN44-1
3	L-	CN3-7
4	L-B	CN3-4
5	L-W	CN3-8
6	LG-B	CN44-23
7	LG	CN35-1
8	P-G	CN33-1
9	Y-B	CN34-3
10	Y	CN34-1
11	B-R	CN6-3
12	L-W	CN13-1
13	L-	CN12-1
14	G-	CN27-1
15	P-B	CN4-6
16	-	-
17	Y-G	CN27-2
18	G-Y	CN3-2
19	-	-
20	G-W	CN4-5
21	G-W	CN4-2
22	BR-	W/SPLICE-A
23	BR-	W/SPLICE-A
24	W-B	BODY EARTH02
25	L-B	CN4-7
26	L-W	CN6-11

CN2



TAB

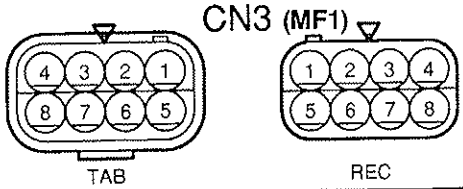
No.	C	J
1		RLY
2		-
3		HRM1
4		SPD+
5		SPD−
6		SS1
7		SS2
8		5SA
9		OUT1
10		SPDF
11		HRM3
12		HRM2
13		SPD
14		SSC
15		YB1
16		TRG

REC

No.	C	J
1	L-W	CN5-19
2	-	-
3	V-G	CN41-4
4	G-B	CN22-1
5	G-R	CN22-2
6	Y-R	CN21-3
7	V-W	CN21-4
8	G-	CN4-3
9	L-O	CN42-9
10	P-B	CN6-5
11	P-L	CN42-12
12	V-R	CN41-3
13	P-	CN6-7
14	LG-B	CN21-5
15	L-Y	CN44-9
16	L-B	CN44-14

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CN3 (MF1)



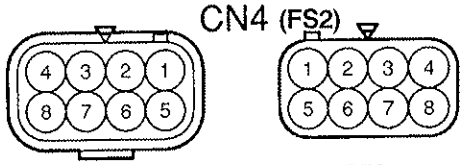
TAB

No.	C	J
1	G	CN1-1
2	G-Y	CN1-18
3	BR	W/SPLICE-A(E)
4	L-B	CN1-4
5	BR	W/SPLICE-A(E)
6	B-R	CN1-11
7	L	CN1-3
8	L-W	CN1-5

REC

No.	C	J
1	G	CN26-3
2	G-Y	CN26-2
3	BR-W	CN31-1
4	L-B	CN31-3
5	BR	CN26-1
6	-	-
7	L	CN31-2
8	-	-

CN4 (FS2)



TAB

No.	C	J
1	Y-B	*
2	L-W	CN7-7
3	G-	CN7-6
4	BR-	CN7-3
5	G-W	CN7-2
6	P-B	CN7-1
7	L-B	CN7-4
8	V-G	*

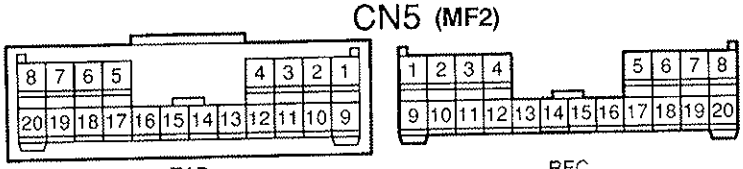
REC

No.	C	J
1	Y-B	*
2	G-W	CN1-21
3	G-	CN2-8
4	BR-	CN1-22
5	G-W	CN1-20
6	P-B	CN1-15
7	L-B	CN1-25
8	V-G	*

Note:

- ***:Terminal not related to SAS**
- **Parenthesized connectors are used also for other functions than SAS. For function other than SAS, see the electrical wiring diagram in Section 16.**

CN5 (MF2)



TAB

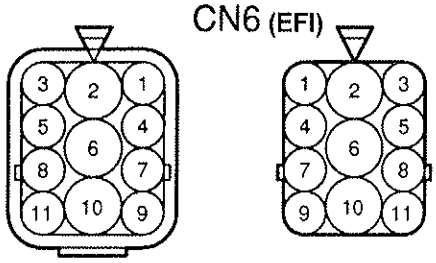
No.	C	J
1	R-L	*
2	R-B	*
3	R-W	*
4	G-	*
5	G-Y	*
6	R-Y	*
7	G-W	*
8	W-	*
9	LG-R	*
10	R-G	*
11	LG-B	*
12	-	*
13	Y-	*
14	B-O	*
15	B-Y	*
16	B-	*
17	W-B	BODY EARTH02
18	F-G	CN41-1
19	L-W	CN2-1
20	R-W	*

REC

No.	C	J
1	R-L	*
2	R-B	*
3	R-W	*
4	G-	*
5	G-Y	*
6	R-Y	*
7	G-W	*
8	W-	*
9	LG-R	*
10	R-G	*
11	LG-B	*
12	R-	*
13	Y-	*
14	B-O	*
15	B-Y	*
16	B-	*
17	W-B	CN14-2,SAS-LAMP RLY(L)
18	F-G	SAS-LAMP RLY(B)
19	L-W	SAS-LAMP RLY(+S)
20	-	*

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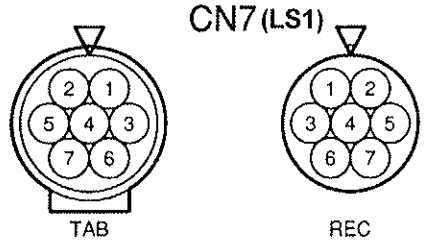
CN6 (EFI)



No.	C	J
1	B-	*
2	B-W	*
3	B-R	CN1-11
4	B-W	*
5	P-B	CN2-10
6	B-Y	*
7	P-	CN2-13
8	L-	*
9	B-L	*
10	W-L	*
11	L-W	CN1-26

No.	C	J
1	B-	*
2	B-W	*
3	B-R	F=ECU-IG(L) SAS-LAMP RLY(-S)
4	B-W	*
5	-	-
6	B-Y	*
7	-	-
8	L-	*
9	-	*
10	W-L	*
11	L-W	CN14-1

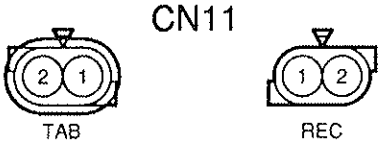
CN7 (LS1)



No.	C	J
1	P-B	CN4-6
2	G-W	CN4-5
3	BR-	CN4-4
4	L-B	CN4-7
5	W-B	BODY EARTH03
6	G-	CN4-3
7	L-W	CN4-2

No.	C	J
1	P-	CN23-1
2	G-W	CN23-2
3	W-B	CN23-3,CN24-1
4	L-B	CN11-1
5	W-B	CN11-2
6	G-	CN24-3
7	L-W	CN24-2

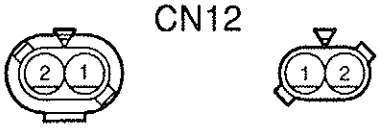
CN11



No.	C	J
1	-	Phorting: (+)
2	-	Phorting: (-)

No.	C	J
1	L-B	CN7-4
2	W-B	CN7-5

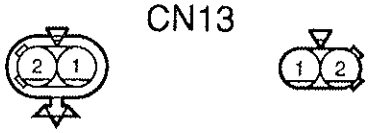
CN12



No.	C	J
1	R	Phorting : (+)
2	B	Phorting : (−)

No.	C	J
1	L	CN1-13
2	BR-W	W/SPLICE-B(E)

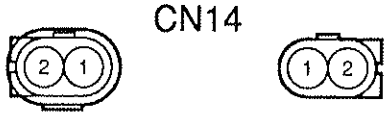
CN13



No.	C	J
1	R	Phorting : (+)
2	B	Phorting : (−)

No.	C	J
1	L-W	CN1-12
2	BR-W	W/SPLICE-B(E)

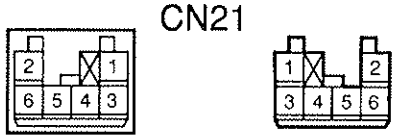
CN14



No.	C	J
1	L-W	CN6-11
2	W-B	CN5-17

No.	C	J
1		Phorting : (+)
2		Phorting : (−)

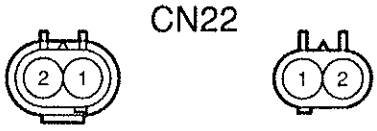
CN21



No.	C	J
1	-	IG (12V)
2	-	GND
3	-	SS1
4	-	SS2
5	-	SSC
6	-	*

No.	C	J
1	B-R	CN1-11
2	BR-	CN1-22
3	Y-R	CN2-6
4	V-W	CN2-7
5	LG-B	CN2-14
6	-	*

CN22

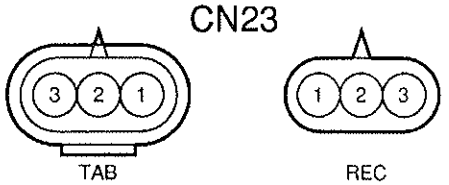


No.	C	J
1		+S
2		−S

No.	C	J
1	G-B	CN2-4
2	G-R	CN2-5

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CN23



No.	C	J
1	-	Sensor power supply
2	-	Sensor output
3	-	Sensor GND

No.	C	J
1	P-	CN7-1
2	G-W	CN7-2
3	W-B	CN7-3

CN33



No.	C	J
1	BR	5V or GND
2	BR	GND or 5V

No.	C	J
1	P-G	CN1-8
2	BR	W/SPLICE-A

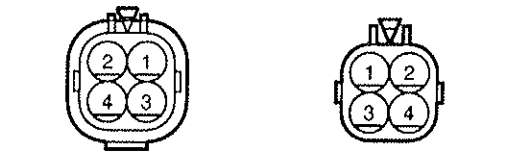
CN26



No.	C	J
1	-	GND (Ground)
2	-	Vout (Output signal)
3	-	Vcc (Power suply)

No.	C	J
1	BR	CN3-5
2	G-Y	CN3-2
3	G	CN3-1

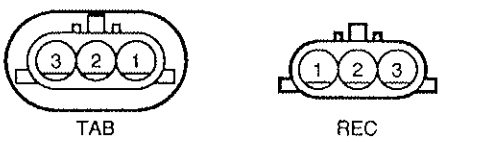
CN34



No.	C	J
1	R	Forward tilt side
2	BR	Forward tilt side (-)
3	R	Backward tilt side
4	B	Backward tilt side (-)

No.	C	J
1	Y	CN1-10
2	BR-W	W/SPLICE-A(E02)
3	Y-B	CN1-9
4	BR-W	W/SPLICE-A(E02)

CN27



No.	C	J
1	-	Power supply
2	-	Sensor output
3	-	GND

No.	C	J
1	G	CN1-14
2	Y-G	CN1-17
3	BR	W/SPLICE-A

CN35

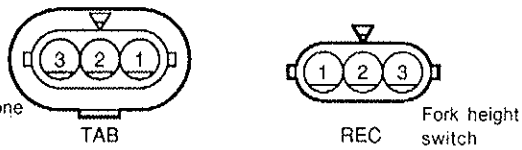


No.	C	J
1	BR-	

No.	C	J
1	LG-	CN1-7

CN31

In case of one fork height switch



No.	C	J
1	BR-W	CN3-3
2	L	CN3-7
3	L-B	CN3-4

No.	C	J
1	BR	COM
2	W	NC
3	R	NO

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CN37



TAB

No.	C	J
1	PG	CN5-18
2	W-B	BODY EARTH02



REC

No.	C	J
1	LW	CN43-1
2	Y-B	CN41-6

CN43



TAB

No.	C	J
1	B	GND
2	R	Power supply



REC

No.	C	J
1	L-W	SAS relay
2	R-G	Fuse

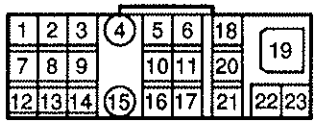
CN41



REC

No.	C	J
1	V-Y	CN5-18
2	Y-R	*
3	V-R	CN2-12
4	V-G	CN2-3
5	-	*
6	Y-B	CN37-2
7	W-B	BODY EARTH02
8	V-	*
9	-	*
10	LG-R	*
11	Y-G	*
12	V-W	*
13	Y-	*

CN44



REC

No.	C	J
1	V-	CN2-2
2	-	*
3	BR-W	BODY EARTH02
:		
:		
9	L-Y	CN2-15
:		
:		
12	B-R	STK ECU(IG)
13		*
14	L-B	CN2-16
:		
:		
22	BR-	W/SPLICE-A(E)
23	LG-B	CN1-6

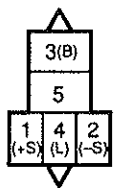
CN42



REC

No.	C	J
1	V-G	*
2	LG-B	*
3	W-B	BODY EARTH02
4	R-W	*
5	-	*
6	R-G	*
7	Y-B	*
8	R-	*
9	L-O	CN2-9
10	-	*
11	G-	CN5-4
12	P-L	CN2-11
13	W-B	BODY EARTH02

SAS Lamp relay (Base side)



No.	C	J
1	L-W	CN5-19
2	B-R	CN6-3,F=ECU-1G
3	F-G	CN5-18
4	W-B	CN5-17
5	-	*

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APPENDIX

Page

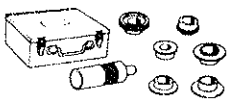
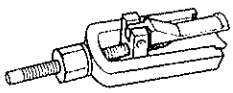
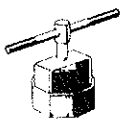
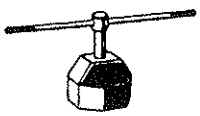
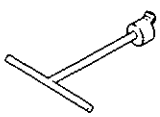
SST LIST 16-2

SERVICE STANDARDS LIST 16-6

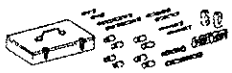
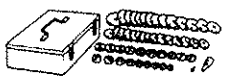
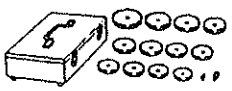
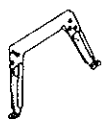
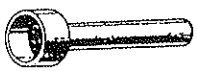
WIRING DIAGRAM 16-19

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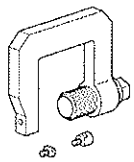
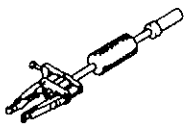
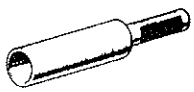
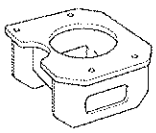
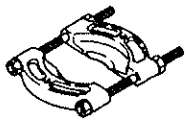
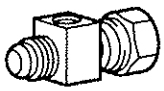
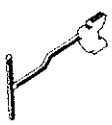
SST LIST

Illustration	Part No.	Part Name	Section												
			1	2	2A	4	5	6	7	8	11	12	13	14	15
	09082-76002-71 (09082-00050)	TOYOTA electrical tester													○
	09216-76002-71 (09216-00021)	Belt tension gage	○												
	09228-76004-71 (09228-07501)	Oil filter wrench		○	○										
	09316-76008-71 (09316-60011)	Transmisson & transfer bearing replacer		○		○									
	09319-76001-71 (09319-60020)	Output shaft needle roller bearing remover											○		
	09509-76002-71 (09509-55020)	Rear wheel bearing nut wrench					○								
	09509-76003-71 (09509-55030)	Rear wheel bearing nut wrench					○								
	09608-76003-71 (09608-04031)	Front hub inner bearing cone replacer		○		○									
	09717-76001-71 (09717-20010)	Brake shoe return spring remover								○					
	09718-76001-71 (09718-20010)	Brake shoe return spring replacer								○					

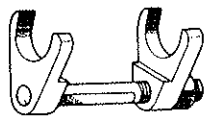
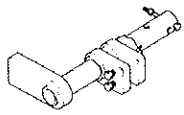
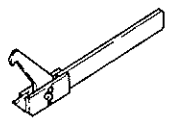
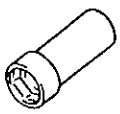
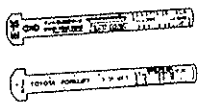
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Illustration	Part No.	Part Name	Section												
			1	2	2A	4	5	6	7	8	11	12	13	14	15
	09905-76002-71 (09905-00012)	Snap ring No. 1 expander		○											
	09950-76014-71 (09950-40011)	Puller B set		○	○	○		○			○				
	09950-760003-71 (09950-50012)	Puller C set		○	○				○						
	09950-76018-71 (09950-60010)	Replacer set		○	○	○	○	○				○	○		
	09950-76019-71 (09950-60020)	Replacer set No. 2		○		○	○	○							
	09950-76020-71 (09950-70010)	Handle set		○	○	○	○	○				○	○		
	09010-20111-71	Engine unit hanger	○	○	○										
	09010-23320-71	Engine with transmission hanger	○	○	○										
	09150-10170-71	Transmission bearing replacer		○		○									
	09220-22001-71	Torque converter clutch drum spring remover & replacer		○	○										

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Illustration	Part No.	Part Name	Section												
			1	2	2A	4	5	6	7	8	11	12	13	14	15
	09240-23320-71	Plug-in analyzer													○
	09310-23320-71	Reamer bolt remover				○									
	09320-23000-71	Bearing remover		○	○		○								
	09350-23320-71	Adapter		○	○										
	09370-10410-71	Front axle bearing replacer						○							
	09370-20270-71	Drive pinion bearing replacer				○		○							
	09410-23320-71	Differential carrier stand				○									
	09420-23000-71	Bearing remover				○									
	09450-23320-71	Adapter							○						
	09510-31960-71	Brake hold down spring remover and replacer								○					

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Illustration	Part No.	Part Name	Section												
			1	2	2A	4	5	6	7	8	11	12	13	14	15
	09610-10161-71	Oil control valve spring remover and replacer												○	
	09610-22000-71	Inner mast stopper									○	○			
	09620-10100-71	Cylinder cap remover and replacer										○			
	09630-10110-71	Tilt cylinder cap remover and replacer				○									
	09630-23600-71	Deep socket A									○				
	09631-22000-71	Wear scale chain									○				
	09810-20172-71	Joint pin remover									○	○			

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SERVICE STANDARDS LIST

ENGINE

Engine				
Idling speed rpm		4Y	Standard	See page 1-11.
		1DZ-II·2Z	Standard	750 ± 25
No-load static maximum speed rpm	4Y	1·2 ton series	Standard	2600 ± 50
		3·J3.5 ton series	Standard	2800 ± 50
	1DZ-II	1 ton series	Standard	2600 ± 50
		2·3 ton series	Standard	2800 ± 50
		2Z	Standard	2400 ± 50
Full relief engine speed down rpm		Gasoline engine	Standard	300 or less
		Diesel engine	Standard	200 or less
Air cleaner				
Vacuum switch conduction test (conduction base) Pa (mm H_2O) [mm Hg]		Gasoline engine	Standard	2942 ± 294 (300 ± 30) [22.1 ± 2.2]
		Diesel engine	Standard	7473 ± 569 (762 ± 58) [56.0 ± 4.3]
Radiator				
Radiator cap opening pressure kPa (kgf/cm²) (psi)			Standard	88 ± 14.7 (0.9 ± 0.15) [13 ± 2.1]
Battery				
Electrolyte specific gravity (at 20°C [68°F])			Standard	1.280
Alternator				
Fan belt tension (when pushed with 98 N (10 kgf) [22 lbf] mm (in)		4Y	Standard	8 ~ 13 (0.31 ~ 0.51)
		1DZ-II·2Z	Standard	↑
Fan belt tension (when measured with a tension gage (SST)) N (kgf) [lbf]		4Y	Standard	294 ~ 490 (30 ~ 50) [66 ~ 110]
		1DZ-II·2Z	Standard	324 ~ 559 (33 ~ 57) [73 ~ 126]
Accelerator pedal				
Pedal roller height (from accelerator bracket to top of roller) (Reference) mm (in)		Gasoline engine	Standard	68 (2.68)
		Diesel engine	Standard	71 (2.80)

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Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Engine mounting nut		Standard	53.9 ~ 99.0 (550 ~ 1010) [39.8 ~ 73.1]
Torque converter end plate set bolt		Standard	49.0 ~ 78.5 (500 ~ 800) [36.2 ~ 57.9]
Drive plate set plate (for engine crankshaft connection)	4Y	Standard	56.9 ~ 64.7 (580 ~ 660) [42.0 ~ 47.7]
	1DZ-II·2Z	Standard	76.5 ~ 93.2 (780 ~ 950) [56.4 ~ 68.7]
Drive plate set bolt (for torque converter connection)		Standard	14.7 ~ 21.6 (150 ~ 220) [10.9 ~ 15.9]
Torque converter housing set bolt		Standard	29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]

TORQUE CONVERTER (~ 2003.10)

Transmission cover & control valve ASSY		
Regulator valve spring free length mm (in)	Standard	88.8 (3.496)
	Limit	84.4 (3.323)
Inching valve spring free length (plug side) mm (in)	Standard	~ 2000. 3: 70.3 (2.768) 2000. 3 ~ :64.2 (2.528)
	Limit	~ 2000. 3: 66.8 (2.630) 2000. 3 ~ :61.0 (2.402)
Inching valve spring free length (valve side) mm (in)	Standard	49.9 (1.965)
	Limit	47.4 (1.866)
Accumulator valve spring free length (inner side) mm (in)	Standard	86.0 (3.386)
	Limit	81.7 (3.217)
Accumulator valve spring free length (outer side) mm (in)	Standard	117.0 (4.606)
	Limit	111.2 (4.378)
F/R shift valve spring free length	Standard	53.5 (2.106)
	Limit	50.8 (2.000)
Safety valve spring free length	Standard	59.8 (2.354)
	Limit	56.8 (2.236)
Torque converter and oil pump		
Oil pump driven gear to pump body clearance mm (in)	Limit	0.3 (0.012)
Oil pump driven gear to crescent clearance mm (in)	Limit	0.4 (0.016)
Oil pump drive gear to crescent clearance mm (in)	Limit	↑
Pump body to each gear clearance mm (in)	Limit	0.1 (0.004)
Oil pump drive gear bushing to stator shaft clearance mm (in)	Limit	0.15 (0.0059)

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Transmission			
Main shaft thrust clearance	mm (in)	Standard	0.20 ~ 0.62 (0.0079 ~ 0.0244)
Output shaft thrust clearance	mm (in)	Standard	0.03 ~ 0.51 (0.0012 ~ 0.0201)
Each clutch shaft to seal ring clearance	mm (in)	Limit	0.2 (0.008)
Clutch disc thickness	mm (in)	Standard	2.6 (0.102)
		Limit	2.3 (0.091)
Clutch plate thickness	mm (in)	Standard	2.0 (0.079)
		Limit	1.8 (0.071)
Camber plate warpage height	mm (in)	Standard	3.4 (0.134)
		Limit	3.1 (0.122)
Clutch disc to backing plate clearance	mm (in)	Standard	4-disc type 0.8 ~ 1.3 (0.031 ~ 0.051) 5-disc type 1.0 ~ 1.6 (0.039 ~ 0.063)
Clutch piston return spring free length	mm (in)	Standard	63.4 (2.496)
		Limit	58.5 (2.303)
Measurement and tests			
Stall speed	rpm	4Y	Standard	2100
		1DZ-II	Standard	2100
		2Z	Standard	2050
Main pressure	kPa (kgf/cm²) [psi]	At idling	Standard	735 ~ 1324 (7.5 ~ 13.5) [107 ~ 192]
		At 2000 rpm	Standard	834 ~ 1373 (8.5 ~ 14.0) [121 ~ 199]
Clutch pressure	kPa (kgf/cm²) [psi]	At idling	Standard	735 ~ 1324 (7.5 ~ 13.5) [107 ~ 192]
		At 2000 rpm	Standard	834 ~ 1324 (8.5 ~ 13.5) [121 ~ 192]
Torque converter pressure (outlet pressure)	kPa (kgf/cm²) [psi]	At 2000 rpm	Standard	49 ~ 441 (0.5 ~ 4.5) [7.1 ~ 64]
Tightening torque	**Unit: N·m (kgf-cm) [ft-lbf]**			
Oil pump set bolt			Standard	9.81 ~ 18.6 (100 ~ 190) [7.24 ~ 13.8]
Stator shaft set bolt			Standard	9.81 ~ 15.7 (100 ~ 160) [7.24 ~ 11.6]
Oil strainer set bolt			Standard	9.81 ~ 15.7 (100 ~ 160) [7.24 ~ 11.6]
Oil pan set bolt			Standard	5.9 ~ 7.8 (60 ~ 80) [4.34 ~ 5.79]
Side cover set bolt			Standard	3.92 ~ 6.86 (40 ~ 70) [2.89 ~ 5.06]
Transmission cover (upper cover) set bolt			Standard	M6: 9.6 ~ 14.4 (98 ~ 145) [7.09 ~ 10.5] M8: 9.81 ~ 15.7 (100 ~ 160) [7.24 ~ 11.6]

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TORQUE CONVERTER (2003.10 ~)

Transmission cover & control valve ASSY			
Regulator valve spring free length mm (in)		Standard	132.4 (5.213)
		Limit	125.4 (4.937)
Inching valve spring free length (plug side) mm (in)		Standard	64.2 (2.528)
		Limit	61.0 (2.402)
Inching valve spring free length (valve side) mm (in)		Standard	49.9 (1.965)
		Limit	47.4 (1.866)
Accumulator valve (inner side) mm (in)	1 ton series	Standard	86.1 (3.390)
		Limit	81.8 (3.220)
	2·3·J3.5 ton series	Standard	84.4 (3.323)
		Limit	80.2 (3.157)
Accumulator valve (outer side) mm (in)	1 ton series	Standard	151.7 (5.972)
		Limit	144.1 (5.673)
	2·3·J3.5 ton series	Standard	122.3 (4.815)
		Limit	116.2 (4.575)
F/R shift valve mm (in)		Standard	59.8 (2.354)
		Limit	56.8 (2.236)
Safety valve mm (in)		Standard	59.8 (2.354)
		Limit	56.8 (2.236)
Torque converter and oil pump			
Oil pump driven gear to pump body clearance mm (in)		Limit	0.3 (0.012)
Pump body to each gear clearance mm (in)		Limit	0.1 (0.004)

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Transmission			
Main shaft thrust clearance	mm (in)	Standard	0.10 ~ 0.43 (0.0039 ~ 0.0169)
Output gear thrust clearance	mm (in)	Standard	0.10 ~ 0.43 (0.0039 ~ 0.0169)
Counter gear thrust clearance	mm (in)	Standard	0.10 ~ 0.43 (0.0039 ~ 0.0169)
Each clutch shaft to seal ring clearance	mm (in)	Limit	0.2 (0.008)
Clutch disc thickness	mm (in)	Standard	2.6 (0.102)
		Limit	2.3 (0.091)
Clutch plate thickness	mm (in)	Standard	2.0 (0.079)
		Limit	1.8 (0.071)
Camber plate warpage height	mm (in)	Standard	3.4 (0.134)
		Limit	3.1 (0.122)
Snapring to backing plate clearance	mm (in)	Standard	4-disc type 0.8 ~ 1.3 (0.031 ~ 0.051) 5-disc type 1.0 ~ 1.6 (0.039 ~ 0.063)
Clutch piston return spring free length	mm (in)	Standard	63.4 (2.496)
		Limit	58.5 (2.303)
Measurement and tests			
Stall speed	rpm	4Y	Standard	2100
		1DZ-II	Standard	2100
		2Z	Standard	2050
Main pressure	kPa (kgf/cm²) [psi]	At idling	Standard	830 ~ 1220 (8.5 ~ 12.4) [121 ~ 176]
		At 2000 rpm	Standard	890 ~ 1270 (9.1 ~ 13.0) [129 ~ 185]
Clutch pressure	kPa (kgf/cm²) [psi]	At idling	Standard	830 ~ 1220 (8.5 ~ 12.4) [121 ~ 176]
		At 2000 rpm	Standard	890 ~ 1270 (9.1 ~ 13.0) [129 ~ 185]
Torque converter pressure (outlet pressure)	kPa (kgf/cm²) [psi]	At 2000 rpm	Standard	80 ~ 540 (0.8 ~ 5.5) [11.3 ~ 78.2]
Tightening torque	**Unit: N·m (kgf·cm) [ft·lbf]**			
Stator shaft set bolt			Standard	16.8 ~ 25.2 (171 ~ 257) [12.4 ~ 18.6]
Transmission cover (upper cover) set bolt			Standard	16.8 ~ 25.2 (171 ~ 257) [12.4 ~ 18.6]

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DIFFERENTIAL

Differential			
Ring gear backlash mm (in)	1·2 ton series	Standard	0.2 ~ 0.3 (0.008 ~ 0.012)
	3·J3.5 ton series	Standard	0.3 ~ 0.4 (0.012 ~ 0.016)
Differential pinion bore mm (in)	1·2 ton series	Standard	22.12 (0.8709)
		Limit	22.22 (0.8748)
	3·J3.5 ton series	Standard	24.67 (0.9713)
		Limit	24.77 (0.9752)
Spider outside diameter mm (in)	1·2 ton series	Standard	22.00 (0.8661)
		Limit	21.75 (0.8563)
	3·J3.5 ton series	Standard	24.50 (0.9646)
		Limit	24.25 (0.9547)
Side gear thrust washer thickness mm (in)		Standard	1.6 (0.063)
		Limit	1.3 (0.051)
Pinion gear thrust washer thickness mm (in)		Standard	1.6 (0.063)
		Limit	1.0 (0.039)
Drive pinion bearing starting torque N·m (kgf-cm) [ft-lbf]		Standard	8.82 ~ 13.23 (90 ~ 135) [6.51 ~ 9.77]
Differential case (integral-type) (1 ton series: 2002.12 ~)			
Pinion gear inside diameter mm (in)		Standard	26.12 (1.0283)
		Limit	26.22 (1.0322)
Pinion shaft outside diameter mm (in)		Standard	26.0 (1.0236)
		Limit	25.75 (1.0138)
Side gear thrust washer thickness mm (in)		Standard	1.6 (0.063)
		Limit	1.3 (0.051)
Pinion gear thrust washer thickness mm (in)		Standard	1.0 (0.039)
		Limit	0.7 (0.028)
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Drive pinion lock nut		Standard	343.2 ~ 392.3 (3500 ~ 4000) [253.23 ~ 289.40]
Drive pinion rear cover set bolt		Standard	15.7 ~ 19.6 (160 ~ 200) [11.6 ~ 14.5]
Differential carrier cover set bolt		Standard	29.4 ~ 44.1 (300 ~ 450) [21.71 ~ 32.56]
Ring gear set bolt		Standard	127.4 ~ 176.5 (1300 ~ 1800) [94.06 ~ 130.23]
Differential upper case set bolt	1·2 ton series	Standard	43.2 ~ 53.9 (440 ~ 550) [31.83 ~ 39.79]
	3·J3.5 ton series	Standard	86.3 ~ 103.0 (880 ~ 1050) [63.67 ~ 75.97]
Differential case bearing cap set bolt		Standard	117.7 ~ 137.3 (1200 ~ 1400) [86.82 ~ 101.29]
Differential front cover set bolt		Standard	29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
Differential carrier set bolt		Standard	88.3 ~ 117.7 (900 ~ 1200) [65.1 ~ 86.82]

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FRONT AXLE

Front axle shaft hub			
Front axle bearing starting force N (kgf) [lbf]	1 ton series	Standard	24.5 ~ 99.0 (2.5 ~ 10.1) [5.5 ~ 22.3]
	Others	Standard	19.6 ~ 78.4 (2.0 ~ 8.0) [4.40 ~ 17.6]
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Brake drum set nut (hub bolt set nut)	1 ton series	Standard	78.0 ~ 108 (800 ~ 1100) [57.9 ~ 79.59]
	2 ton series	Standard	147.1 ~ 186.3 (1500 ~ 1900) [108.5 ~ 137.47]
	3·J3.5 ton series	Standard	166.7 ~ 205.9 (1700 ~ 2100) [123.0 ~ 151.9]
Bearing lock nut stopper bolt		Standard	14.7 ~ 21.6 (150 ~ 220) [10.9 ~ 15.9]
Axle shaft set bolt	1·2 ton series	Standard	69.0 ~ 88.0 (700 ~ 900) [50.7 ~ 65.1]
	3·J3.5 ton series	Standard	98.0 ~ 127 (1000 ~ 1300) [72.35 ~ 94.06]
Front wheel hub nut (single tire)	1 ton series	Standard	108.5 ~ 196.1 (1100 ~ 2000) [79.59 ~ 144.7]
	2 ton series	Standard	176.5 ~ 392.3 (1800 ~ 4000) [130.2 ~ 289.4]
	3·J3.5 ton series	Standard	294.2 ~ 588.4 (3000 ~ 6000) [217.1 ~ 434.1]
Front wheel hub nut (double tire)	1·2 ton series	Standard	176.5 ~ 392.3 (1800 ~ 4000) [130.2 ~ 289.4]
	3·J3.5 ton series	Standard	294.2 ~ 588.4 (3000 ~ 6000) [217.1 ~ 434.1]

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REAR AXLE

Rear axle ASSY			
Rear axle ASSY front to rear clearance mm (in)		Standard	0.7 (0.028) or less
Rear axle center pin bushing inside diameter mm (in)		Limit	52.0 (2.047)
Rear axle hub and steering knuckle			
Rear axle hub starting force (at hub bolt) N (kgf) [lbf]	1 ton series	Standard	15 ~ 39 (1.5 ~ 4.0) [3.3 ~ 8.8]
	2·3·J3.5 ton series	Standard	15 ~ 44 (1.5 ~ 4.5) [3.3 ~ 9.9]
King pin outside diameter mm (in)		Limit	27.8 (1.094)
Steering knuckle starting force (at front end of knuckle) N (kgf) [lbf]		Standard	19.3 (2.0) [4.4] or less
Rear axle cylinder			
Rear axle cylinder piston rod outside diameter mm (in)		Limit	49.92 (1.9654)
Rear axle cylinder piston rod bend mm (in)		Limit	0.5 (0.017)
Rear axle cylinder inside diameter mm (in)	1 ton series	Limit	76.35 (3.0059)
	2 ton series	Limit	80.35 (3.1634)
	3 ton series	Limit	84.40 (3.3228)
	J3.5 ton series	Limit	87.40 (3.4409)

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Rear wheel alignment				
Toe-in mm (in)			Standard	0 ± 4 (0 ± 0.16)
Minimum turning radius mm (in)		1.5 ton model	Standard	1960 (77.2)
		1.75 ton model	Standard	1980 (78.0)
		2.0 ton model	Standard	2170 (85.4)
		2.5 ton model	Standard	2240 (88.2)
		3.0 ton model	Standard	2400 (94.5)
		J3.5 ton model	Standard	2500 (98.4)
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]				
Axle bracket cap set bolt			Standard	117.7 ~ 166.7 (1200 ~ 1700) [86.82 ~ 123.0]
King pin lock bolt and lock nut			Standard	44.1 ~ 53.9 (450 ~ 550) [32.6 ~ 39.8]
Divided rim bolt set nut		1 ton series	Standard	29.4 ~ 44.1 (300 ~ 450) [21.7 ~ 32.6]
		2 ton series	Standard	49.0 ~ 68.4 (500 ~ 700) [36.2 ~ 50.7]
Rear axle cylinder rod guide set nut			Standard	88 ~ 118 (900 ~ 1200) [65.1 ~ 86.8]
Rear axle cylinder set bolt			Standard	116.7 ~ 215.8 (1700 ~ 2200) [123.00 ~ 159.17]
Hub nut	1 ton series	Divided rim	Standard	88.3 ~ 157.0 (900 ~ 1600) [65.1 ~ 115.8]
		Side ring rim	Standard	88.3 ~ 157.0 (900 ~ 1600) [65.1 ~ 115.8]
	2 ton series	Divided rim	Standard	117.6 ~ 196 (1200 ~ 2000) [86.82 ~ 144.7]
		Side ring rim	Standard	176.4 ~ 392 (1800 ~ 4000) [130.2 ~ 289.4]
	3·J3.5 ton series	Side ring rim	Standard	117.6 ~ 196 (1200 ~ 2000) [86.82 ~ 144.7]

STEERING

Hydrostatic steering valve ASSY			
Relief pressure kPa (kgf/cm²) [psi]	1·2·3 ton series	Standard	8040^{+490}_{0} (82^{+5}_{0}) [1170^{+70}_{0}]
	J3.5 ton series	Standard	8340^{+490}_{0} (85^{+5}_{0}) [1210^{+70}_{0}]
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Mast jacket set nut		Standard	34.3 ~ 53.9 (350 ~ 550) [25.3 ~ 39.8]
Steering wheel set nut		Standard	24.5 ~ 44.1 (250 ~ 450) [18.1 ~ 32.6]
Steering valve ASSY set bolt		Standard	29.4 ~ 39.2 (300 ~ 400) [21.7 ~ 28.9]
Steering valve end cap set screw		Standard	24 ~ 36 (245 ~ 367) [17.7 ~ 26.6]

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BRAKE

Front brake (1 ton series)			
Hold down spring free length	mm (in)	Standard	25.5 (1.004)
Anchor to shoe spring free length	mm (in)	Standard	102.2 (4.024)
		Limit	Replace if any clearance in coil exists.
Strut to shoe spring free length	mm (in)	Standard	19.7 (0.776)
Adjuster spring free length	mm (in)	Standard	99.4 (3.913)
		Limit	Replace if any clearance in coil exists.
Brake lining length	mm (in)	Standard	4.9 (0.193)
		Limit	1.0 (0.039)
Wheel cylinder to piston clearance	mm (in)	Limit	0.125 (0.00492)
Brake drum inside diameter	mm (in)	Standard	254 (10.00)
		Limit	256 (10.08)
Front brake (2·3 ton series)			
Hold down spring free length	mm (in)	Standard	32.3 (1.272)
		Limit	29.1 (1.146)
Actuator spring free length	mm (in)	Standard	124.5 (4.902)
		Limit	No clearance between coil turns
Anchor to shoe spring free length	mm (in)	Standard	106 (4.17)
		Limit	No clearance between coil turns
Strut to shoe spring free length	mm (in)	Standard	23 (0.91)
		Limit	20 (0.79)
Adjuster spring free length	mm (in)	Standard	86 (3.39)
		Limit	No clearance between coil turns
Brake lining thickness	mm (in)	Standard	7.0 (0.276)
		Limit	2.0 (0.079)
Wheel cylinder to piston clearance	mm (in)	Limit	0.145 (0.00571)
Brake drum inside diameter	mm (in)	Standard	310 (12.20)
		Limit	312 (12.28)
Front brake (J3.5 ton series)			
Hold down spring free length	mm (in)	Standard	44.0 (1.732)
Anchor to shoe spring free length (On the side of lining W/pin)	mm(in)	Standard	138.2 (5.441)
		Limit	No clearance between coil turns
Anchor to shoe spring free length (On the side of lining L/ pin)	mm(in)	Standard	121.2 (4.772)
		Limit	No clearance between coil turns
Strut to shoe spring free length	mm (in)	Standard	31.4 (1.236)

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Adjuster spring free length mm (in)		Standard	125.4 (4.937)
		Limit	No clearance between coil turns
Brake lining thickness mm (in)		Standard	5.6 (0.220)
		Limit	1.0 (0.039)
Wheel cylinder to piston clearance mm (in)		Limit	0.15 (0.0059)
Brake drum inside diameter mm (in)		Standard	317.5 (12.500)
		Limit	319.5 (12.579)
Parking brake			
Parking brake operating force (measured at center of lever knob) N (kgf) [lbf]	1~3 ton series	Standard	147 ~ 196 (15 ~ 20) [33 ~ 44]
	J3.5 ton series	Standard	196 ~ 245 (20 ~ 25) [44 ~ 55]
Brake pedal			
Brake pedal height (from toe board: with pad) mm (in)		Standard	150 ~ 155 (5.91 ~ 6.10)
Brake pedal play mm (in)		Standard	3 ~ 7 (0.12 ~ 0.28)
Brake pedal depressed height (with pad) mm (in)		Standard	90 (3.54) or more
Brake master cylinder push rod play mm (in)		Standard	1 (0.04)
Inching pedal stroke until interlocking with brake (~ Mar. 2000) mm (in)		Standard	1 ton series: 35 ~ 46 (1.38 ~ 1.81) Others: 25 ~ 36 (0.98 ~ 1.42)
Inching pedal stroke until interlocking with brake (Mar. 2000 ~) mm (in)		Standard	1 ton series: 35 ~ 41 (1.38 ~ 1.61) Others: 26 ~ 32 (1.02 ~ 1.26)
Inching cable set dimension mm (in)		Standard	17.5 (0.689)
Inching pedal play (until start of inching lever movement) mm (in)		Standard	1 ~ 3 (0.04 ~ 0.20)
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Brake drum set nut (hub bolt set nut)	1 ton series	Standard	78.5 ~ 107.9 (800 ~ 1100) [57.9 ~ 79.57]
	2 ton series	Standard	147.1 ~ 186.3 (1500 ~ 1900) [108.5 ~ 137.5]
	3·J3.5 ton series	Standard	166.7 ~ 205.9 (1700 ~ 2100) [123.00 ~ 151.9]
Backing plate set bolt		Standard	137 ~ 196 (1400 ~ 2000) [101.3 ~ 144.7]
Wheel cylinder set bolt	1 ton series	Standard	7.85 ~ 11.77 (80 ~ 120) [5.79 ~ 8.68]
	2·3 ton series	Standard	14.7 ~ 19.6 (150 ~ 200) [10.85 ~ 14.47]
	J3.5 ton series	Standard	17.7 ~ 26.5 (180 ~ 270) [13.0 ~ 19.5]

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MATERIAL HANDLING SYSTEM

Natural drop test				
Natural drop		mm (in)	Limit	45 (1.77)
Natural forward tilt test				
Natural forward tilt		mm (in)	Standard	15 (0.59) or less
			Standard	20 (0.79) or less
			Standard	25 (0.98) or less
Oil leak test				
Lift cylinder oil leak amount		cm^3 (in^3)	Standard	8 (0.49) or less
Tilt cylinder oil leak amount (total for lift and tilt)		cm^3 (in^3)	Standard	16 (0.98) or less

MAST

Mast adjustment (V mast)				
Mast rollers	Inner mast roller clearance	mm (in)	Standard	0 ~ 0.8 (0 ~ 0.031)
	Outer mast roller clearance	mm (in)	Standard	0 ~ 0.5 (0 ~ 0.017)
Lift bracket rollers	Middle and lower lift roller clearance	mm (in)	Standard	0 ~ 0.8 (0 ~ 0.031)
	Side roller clearance	mm (in)	Standard	0 ~ 0.6 (0 ~ 0.024)
Mast strip to inner mast clearance		mm (in)	Standard	0 ~ 0.8 (0 ~ 0.031)
Mast strip thickness		mm (in)	Limit	1.5 (0.059)
Fork				
Fork front end misalignment		mm (in)	Limit	10 (0.39)

Tightening torque **Unit: N·m (kgf-cm) [ft-lb]**		
Mast support cap set bolt	Standard	68.6 ~ 107.9 (700 ~ 1100) [50.7 ~ 79.57]
Back rest set bolt	Standard	99.54 ~ 184.9 (1015 ~ 1885) [73.42 ~ 136.4]
Chain adjusting nut	Standard	49.0 ~ 78.0 (500 ~ 800) [36.2 ~ 57.9]

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CYLINDER

Lift cylinder (V·SV)					
Piston rod outside diameter mm (in)	1 ton series		Limit		34.92 (1.3748)
	2 ton series		Limit		39.92 (1.5433)
	3 ton series		Limit		44.92 (1.7685)
	J3.5 ton series		Limit		↑
Cylinder bore mm (in)	1 ton series		Limit		45.20 (1.7795)
	2 ton series		Limit		50.20 (1.9764)
	3 ton series		Limit		55.35 (2.1791)
	J3.5 ton series		Limit		60.35 (2.3760)
Piston rod bend mm (in)			Limit		2.0 (0.079)
Rear lift cylinder (FV·FSV)					
Piston rod outside diameter mm (in)	1 ton series	FV	Limit		31.92 (1.2567)
		FSV	Limit		34.92 (1.3748)
	2 ton series	FV	Limit		↑
		FSV	Limit		39.92 (1.5717)
	3 ton series	FV	Limit		↑
		FSV	Limit		44.92 (1.7685)
	J3.5 ton series	FV	Limit		39.92 (1.5717)
		FSV	Limit		44.92 (1.7685)
Cylinder bore mm (in)	1 ton series		Limit		45.20 (1.7795)
	2 ton series		Limit		50.20 (1.9764)
	3 ton series		Limit		55.35 (2.1791)
	J3.5 ton series		Limit		60.35 (2.3760)
Piston rod bend mm (in)			Limit		2.0 (0.08)
Front lift cylinder (FV·FSV)					
Piston rod outside diameter mm (in)	1 ton series		Limit		69.91 (2.7524)
	2 ton series		Limit		74.91 (2.9429)
	3 ton series		Limit		84.90 (3.3425)
	J3.5 ton series		Limit		59.91 (2.3587)
Cylinder bore mm (in)	1 ton series		Limit		85.40 (3.3622)
	2 ton series		Limit		95.40 (3.7559)
	3 ton series		Limit		105.40 (4.1496)
	J3.5 ton series		Limit		90.40 (3.5590)
Piston rod bend mm (in)			Limit		2.0 (0.079)

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Tilt cylinder			
Cylinder bore	mm (in)	Limit	70.35 (2.7697)
Piston rod outside diameter	mm (in)	Limit	29.92 (1.1780)
Piston rod bend	mm (in)	Limit	1.0 (0.039)
Tightening torque	**Unit: N·m (kgf-cm) [ft-lbf]**		
Lift cylinder cover		Standard	343.2 ~ 441.3 (3500 ~ 4500) [253.2 ~ 325.6]
Flow regulator valve		Standard	58.8 ~ 68.7 (600 ~ 700) [43.4 ~ 50.7]
Safety down valve		Standard	29.4 ~ 39.2 (300 ~ 400) [21.7 ~ 28.9]
Front lift cylinder rod guide		Standard	343.2 ~ 441.3 (3500 ~ 4500) [253.2 ~ 325.6]
Tilt cylinder piston castle nut		Standard	260.0 ~ 350.0 (2650 ~ 3570) [191.7 ~ 258.3]
Tilt cylinder cover		Standard	260.0 ~ 350.0 (2650 ~ 3570) [191.7 ~ 258.3]

OIL PUMP

Oil pump ASSY (4Y: 1999. 6 ~, 1DZ-II: 2000.12 ~)			
Bushing inside diameter	mm (in)	Limit	20.095 (0.7894)
Bushing axial length	mm (in)	Limit	21.957 (0.8644)
Gear shaft outside diameter	mm (in)	Limit	19.964 (0.7860)
Body inside surface flaw depth	mm (in)	Limit	0.14 (0.0055)
Oil pump ASSY (1DZ-II: ~ 2000.12)			
Bushing inside diameter	mm (in)	Limit	14.77 (0.5555)
Side plate tickness	mm (in)	Limit	1.9 (0.075)
Gear shaft outside diameter	mm (in)	Limit	18.935 (0.74547)
Body inside surface flaw depth	mm (in)	Limit	0.1 (0.004)
Oil pump ASSY (2Z)			
Bushing inside diameter	mm (in)	Limit	22.23 (0.8752)
Side plate tickness	mm (in)	Limit	4.83 (0.1902)
Gear shaft outside diameter	mm (in)	Limit	21.95 (0.8642)
Body inside surface flaw depth	mm (in)	Limit	0.15 (0.0059)

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OIL CONTROL VALVE

Oil control valve				
Relief set pressure kPa (kgf/cm²) [psi]	Lift	1 ton series	Standard	17162$^{+490}_{0}$ (175$^{+5}_{0}$) [2489$^{+71}_{0}$]
		2·3 ton series	Standard	18142$^{+490}_{0}$ (185$^{+5}_{0}$) [2631$^{+71}_{0}$]
		J3.5 ton series	Standard	↑
	Tilt	1 ton series	Standard	11770$^{+490}_{0}$ (120$^{+5}_{0}$) [1707$^{+71}_{0}$]
		2·3 ton series	Standard	14710$^{+490}_{0}$ (150$^{+5}_{0}$) [2133$^{+71}_{0}$]
		J3.5 ton series	Standard	15690$^{+490}_{0}$ (160$^{+5}_{0}$) [2276$^{+71}_{0}$]

SAS

Tightening torque Unit: N·m (kgf-cm) [ft-lbf]		
SAS controller set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Tire angle sensor set bolt	Standard	1.0 ~ 2.0 (10 ~ 20) [0.72 ~ 1.4]
Tire angle sensor cover set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Swing lock cylinder pin set bolt	Standard	Upper side: 10.5 ~ 24.5 (107 ~ 250) [7.74 ~ 18.1] Lower side : 16.2 ~ 37.8 (162 ~ 378) [11.7 ~ 27.3]
Tilt angle sensor set bolt	Standard	7.0 ~ 16.0 (71 ~ 163) [5.1 ~ 11.8]
Load sensor	Standard	35.3 ~ 43.1 (360 ~ 440) [26.0 ~ 31.8]
Speed sensor set bolt	Standard	3.0 ~ 7.0 (31 ~ 71) [2.2 ~ 5.1]
Fork height switch ASSY set bolt	Standard	14.4 ~ 33.6 (147 ~ 343) [10.6 ~ 24.8]

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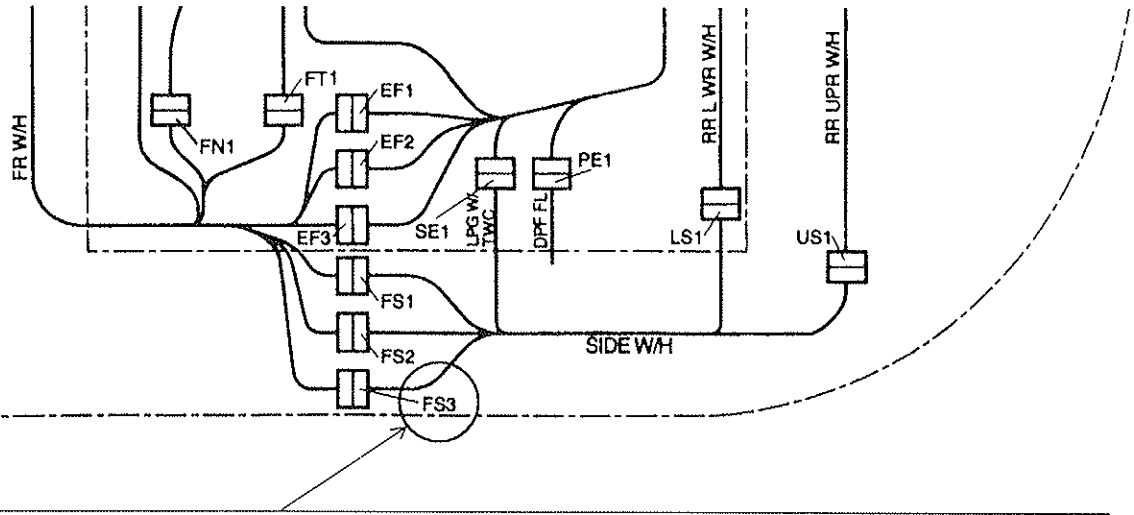
WIRING DIAGRAM

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WIRING DIAGRAM EXPLANATION

Wire to Wire List (Route)



Wire to wire connector No.
Indicates the No. of the connector which connect wire harnesses.

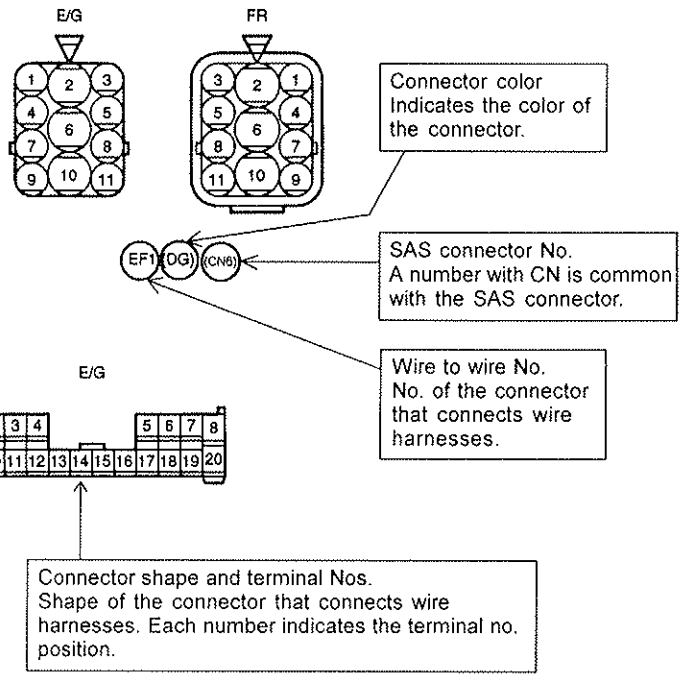
EF 1

Indicates the wire harnesses to be connected. EF, for example, indicates connection of E wire female connector (terminal = female) and F wire male connector (terminal = male).
(See the wire to wire list (connector) for symbols such as E and F for each portion.)
Wire to Wire List (Connector)

Wire to wire connector No.

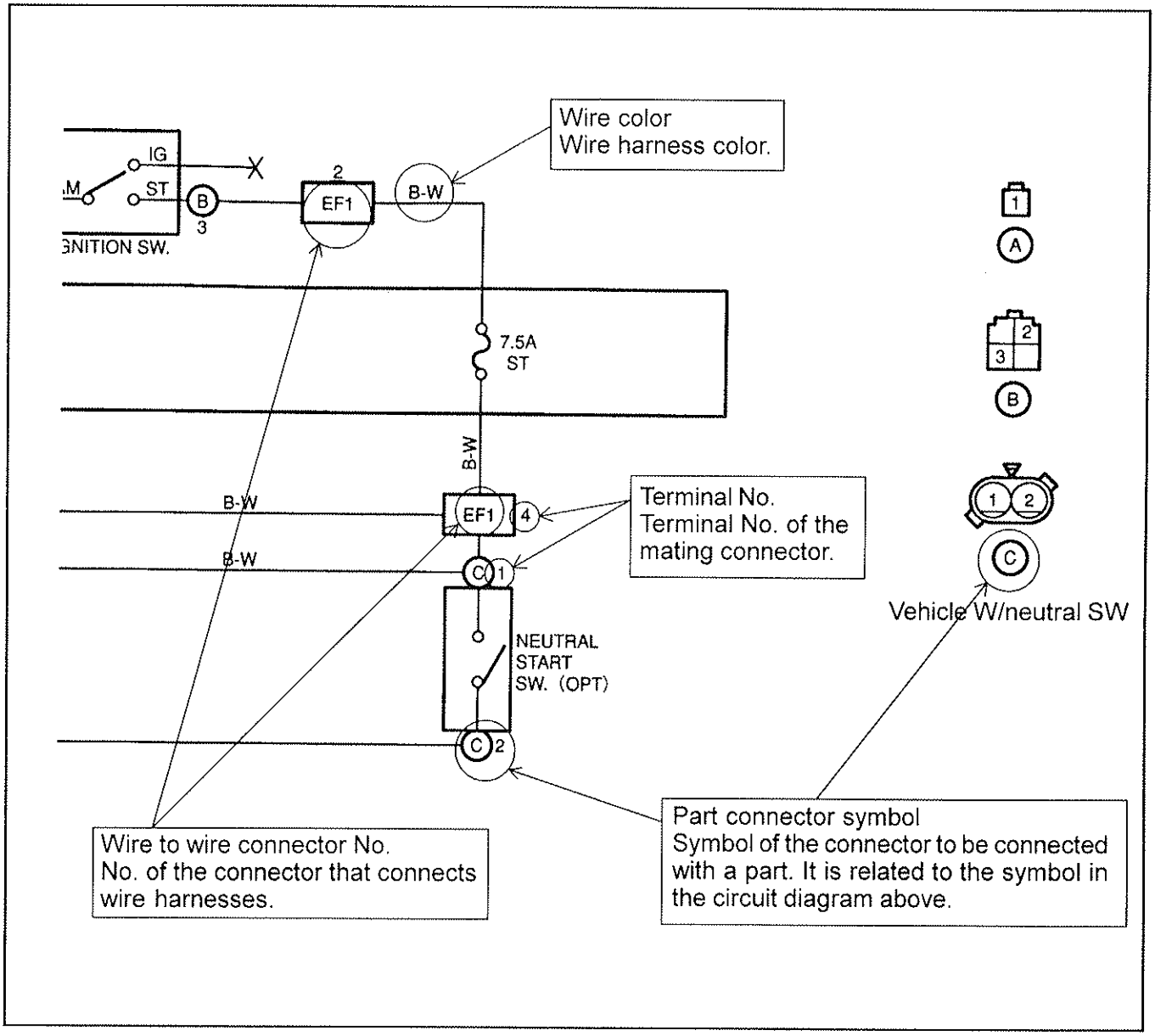
Portion	Symbol
E/G	E
FR	F
T/M	T
Side	S
RR LWR	L
RR VPR	U
Instrument panel	I
FR STAY	A
Mast	(M)

Wire harness symbol
Symbol of each wire harness which is used as the leading character of a part connctor No. or wire to wire connector No.



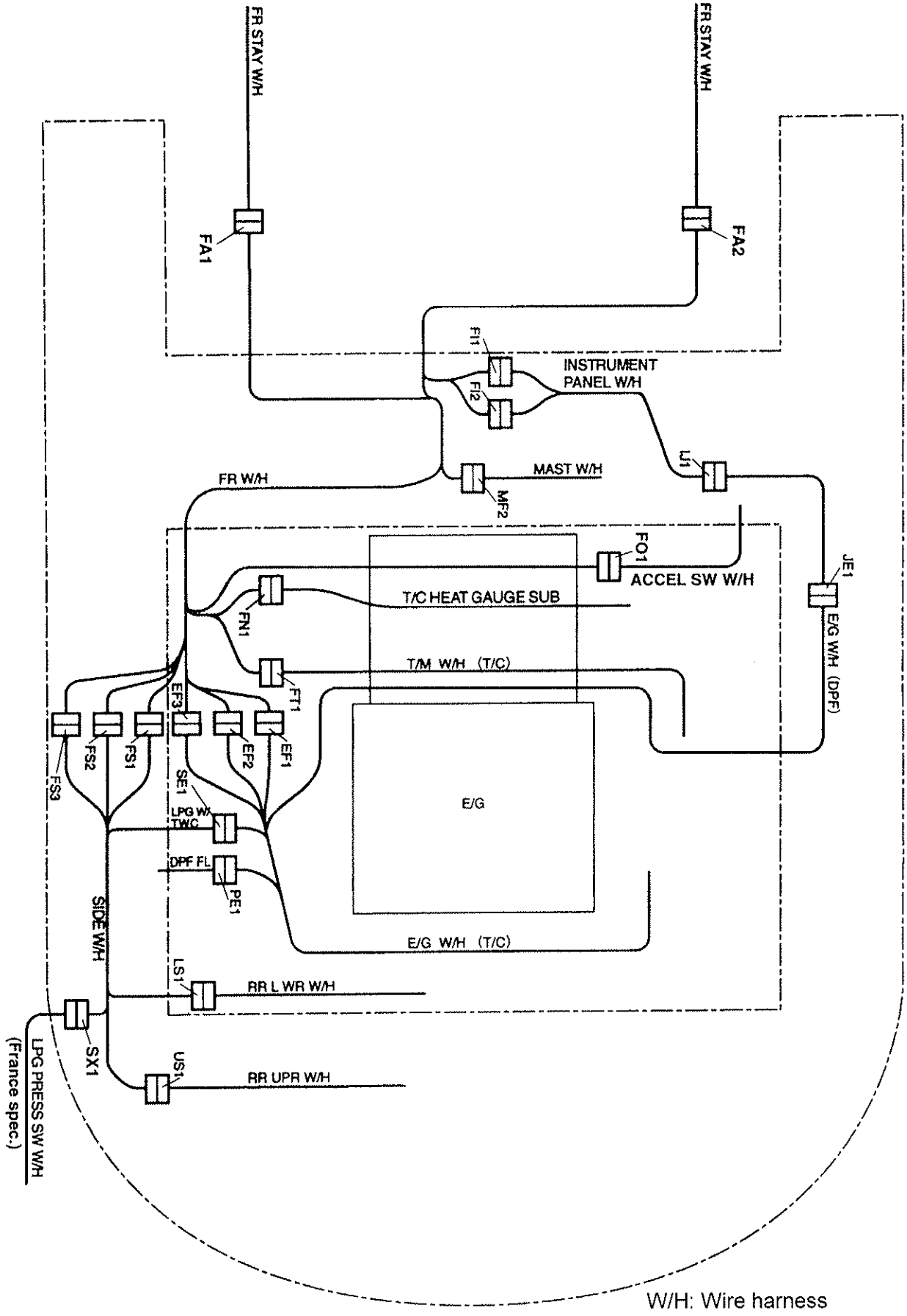
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Wiring Diagram of Each System



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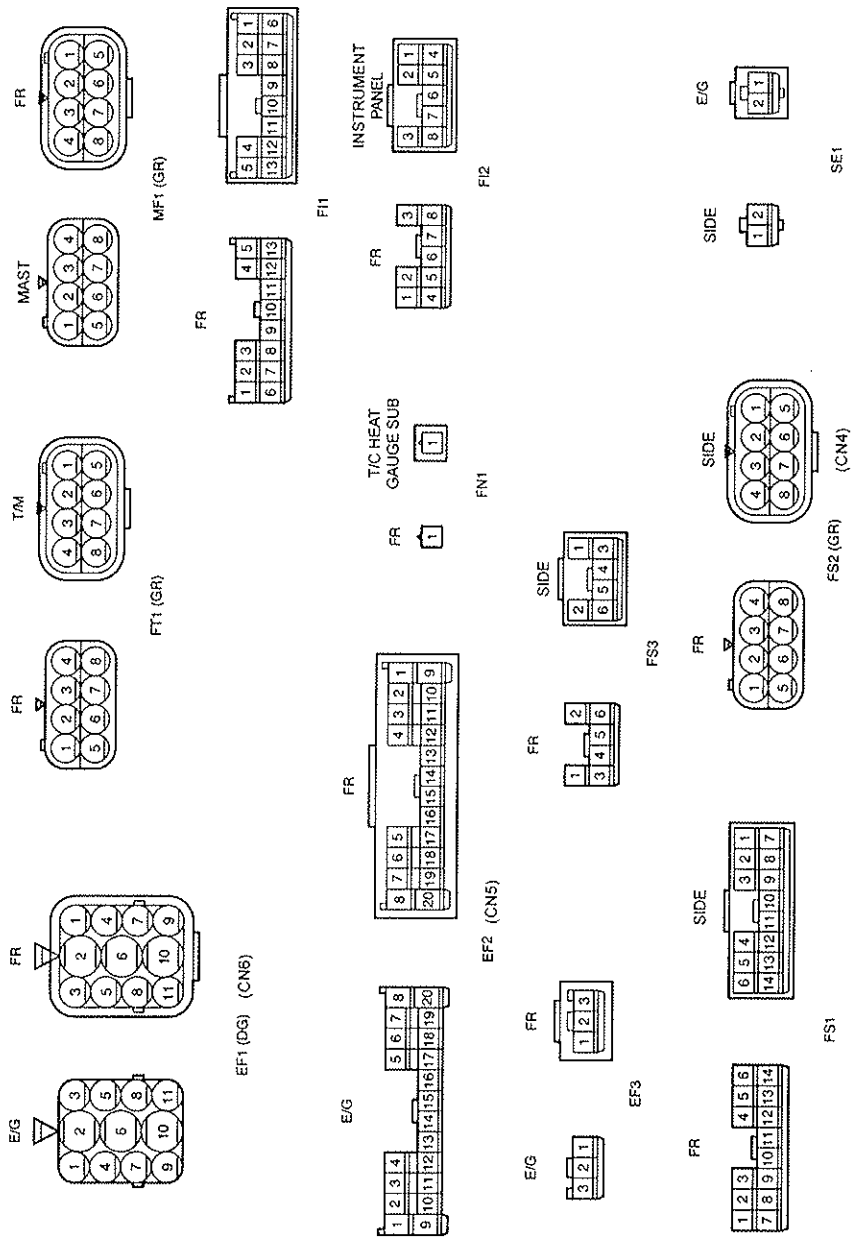
WIRE TO WIRE LIST (ROUTE)



W/H: Wire harness

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WIRE TO WIRE LIST (CONNECTOR)

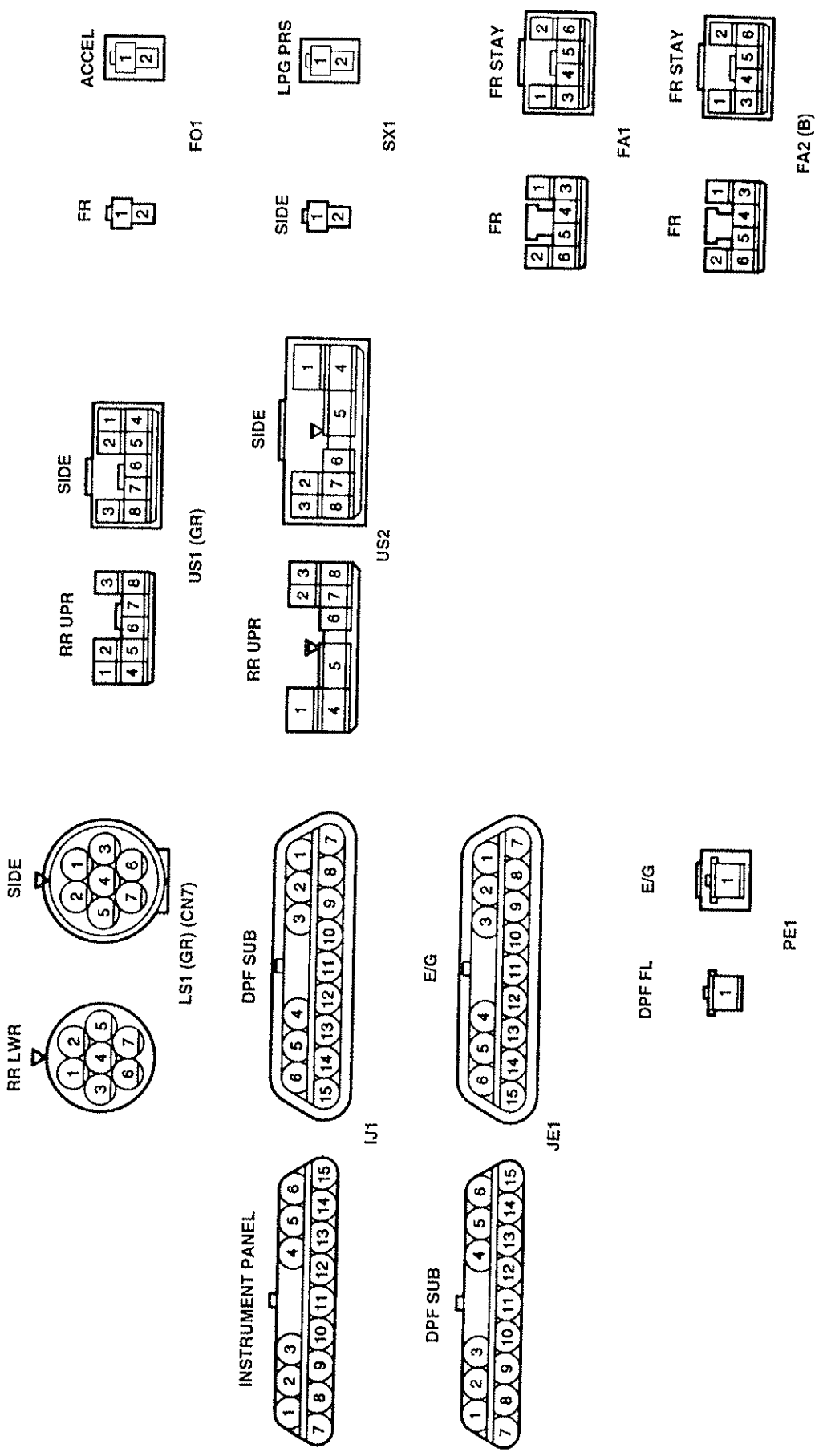


Portion	Symbol
E/G	E
FR	F
T/M	T
Side	S
RR LWR	L
RR UPR	U
Instrument panel	I
FR STAY	A
Mast	M
ACCEL SW	O

OPT

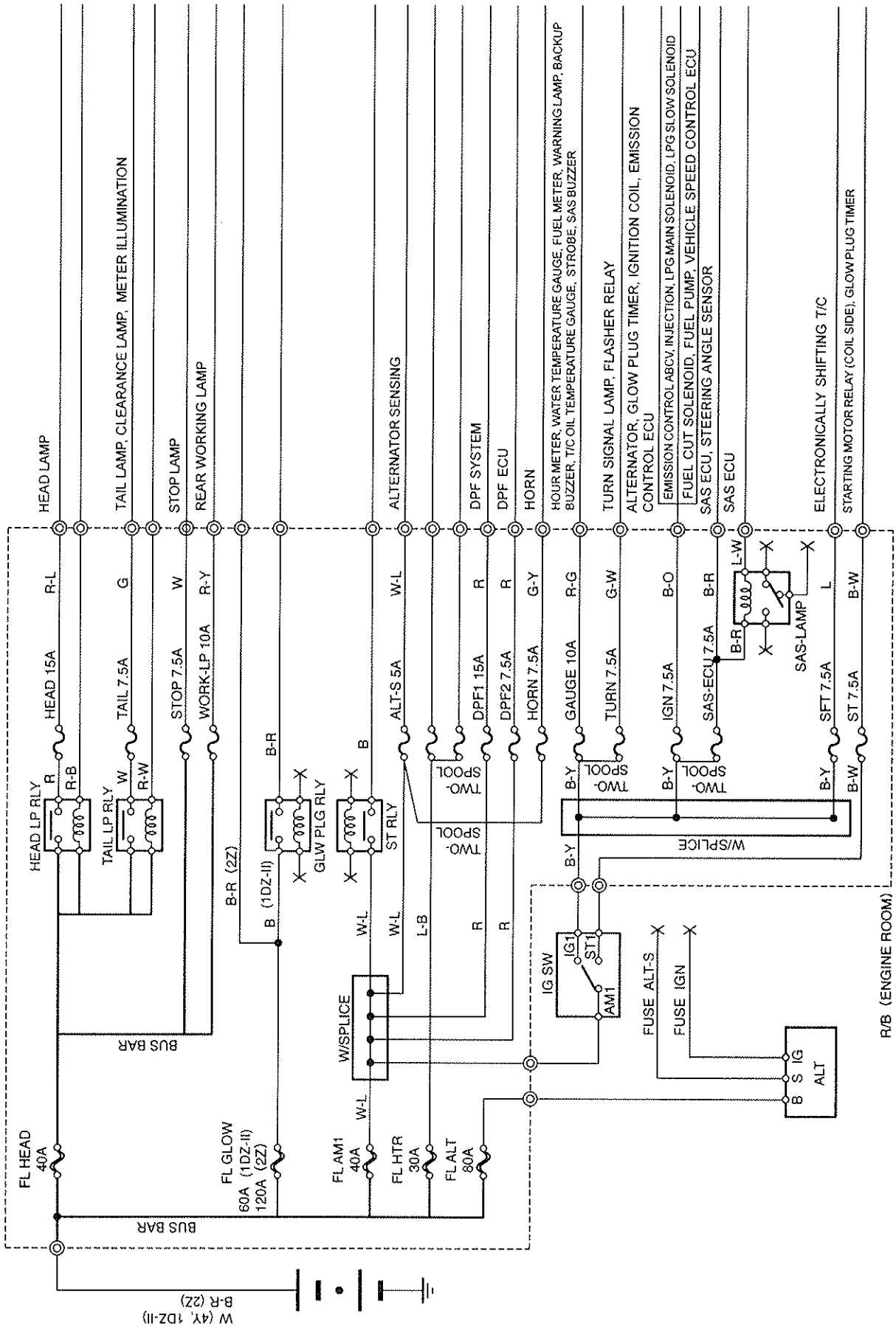
Portion	Symbol
DPF display	J
T/C heat gauge	N
DPF FL	P
LPG PRESS SW (France spec.)	X

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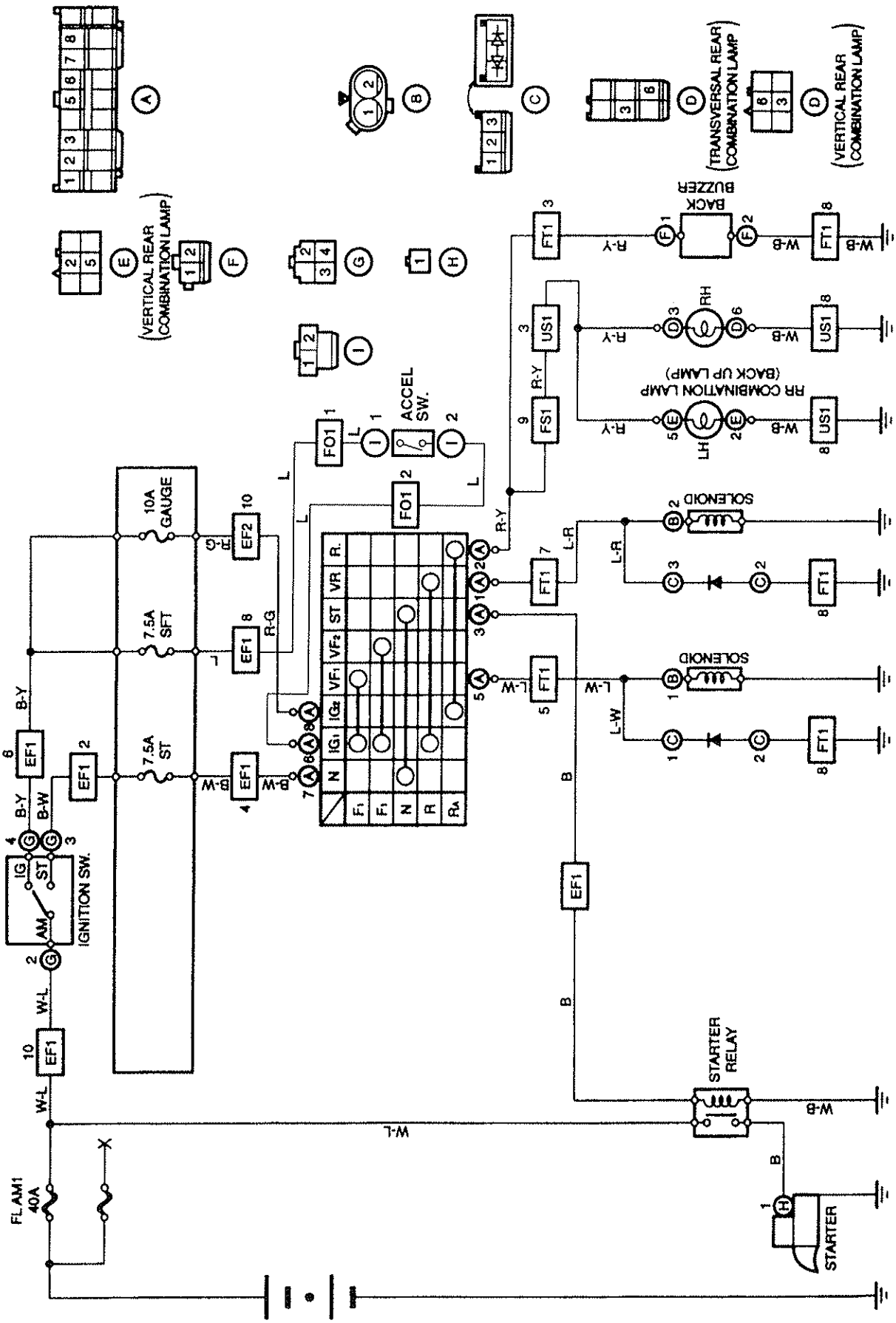
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POWER FUSES (R/B)



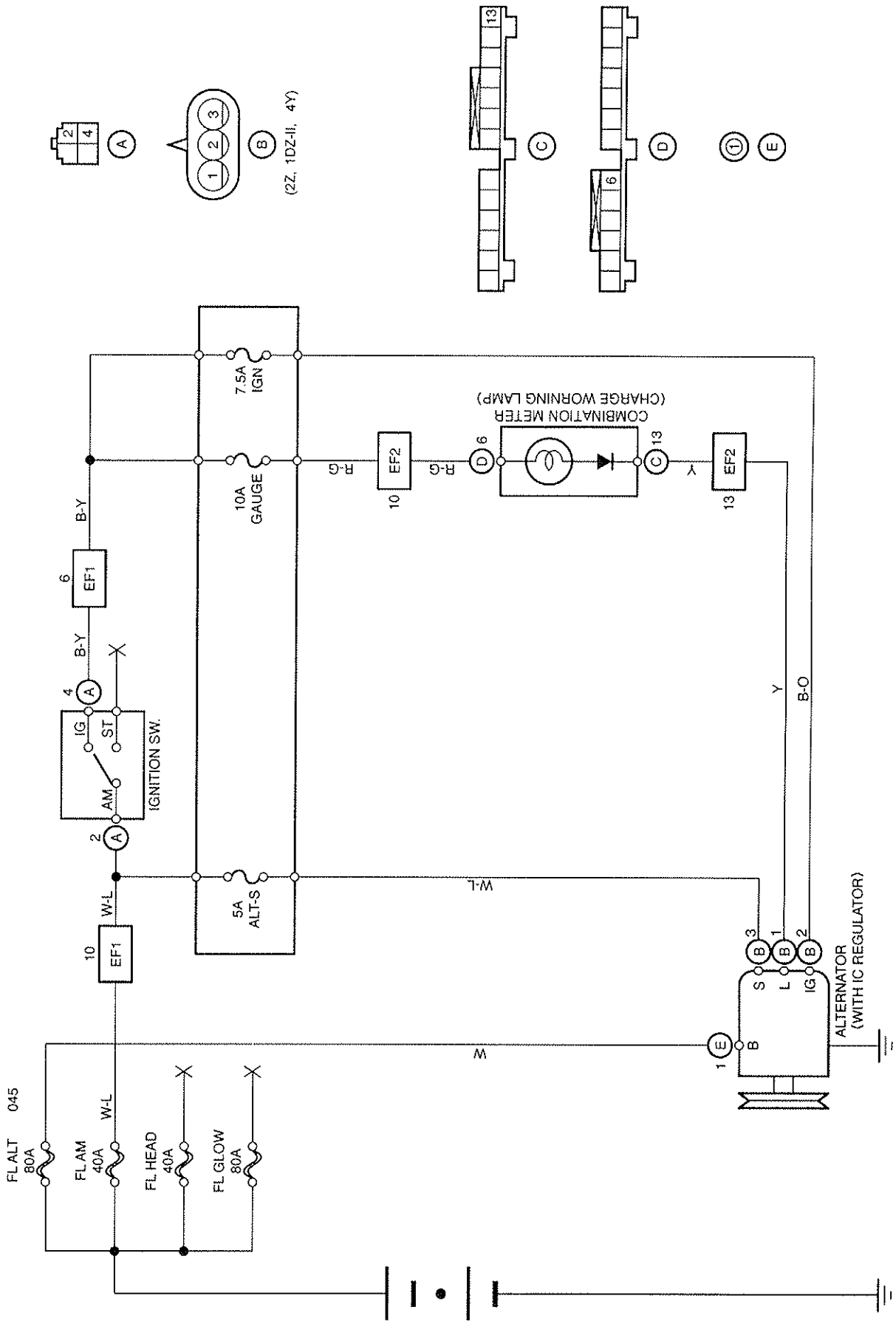
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ELECTRICAL SHIFT TORQUE CONVERTER



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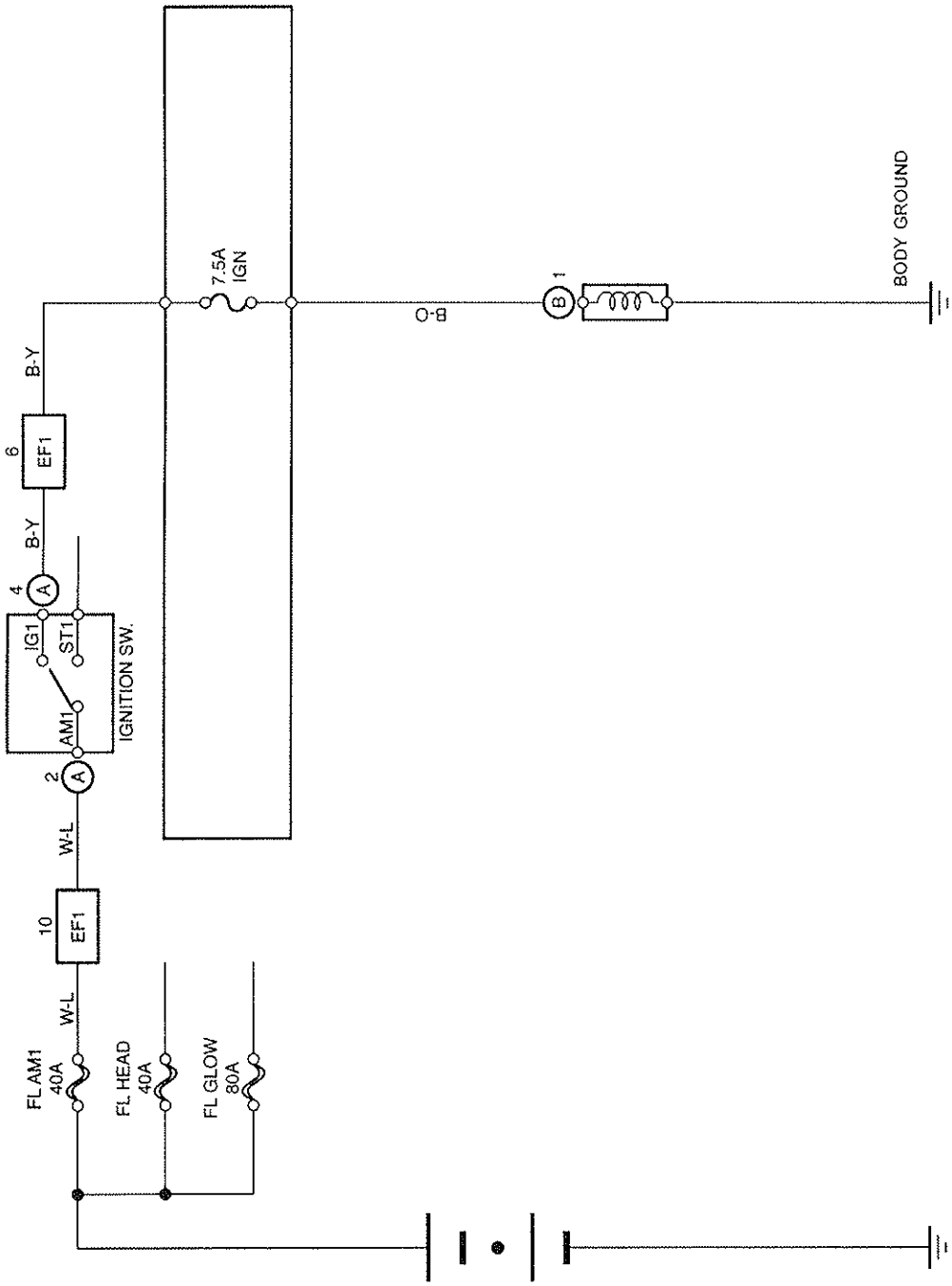
CHARGING



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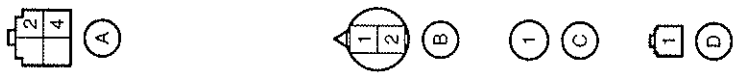
FUEL (1DZ-II·2Z)

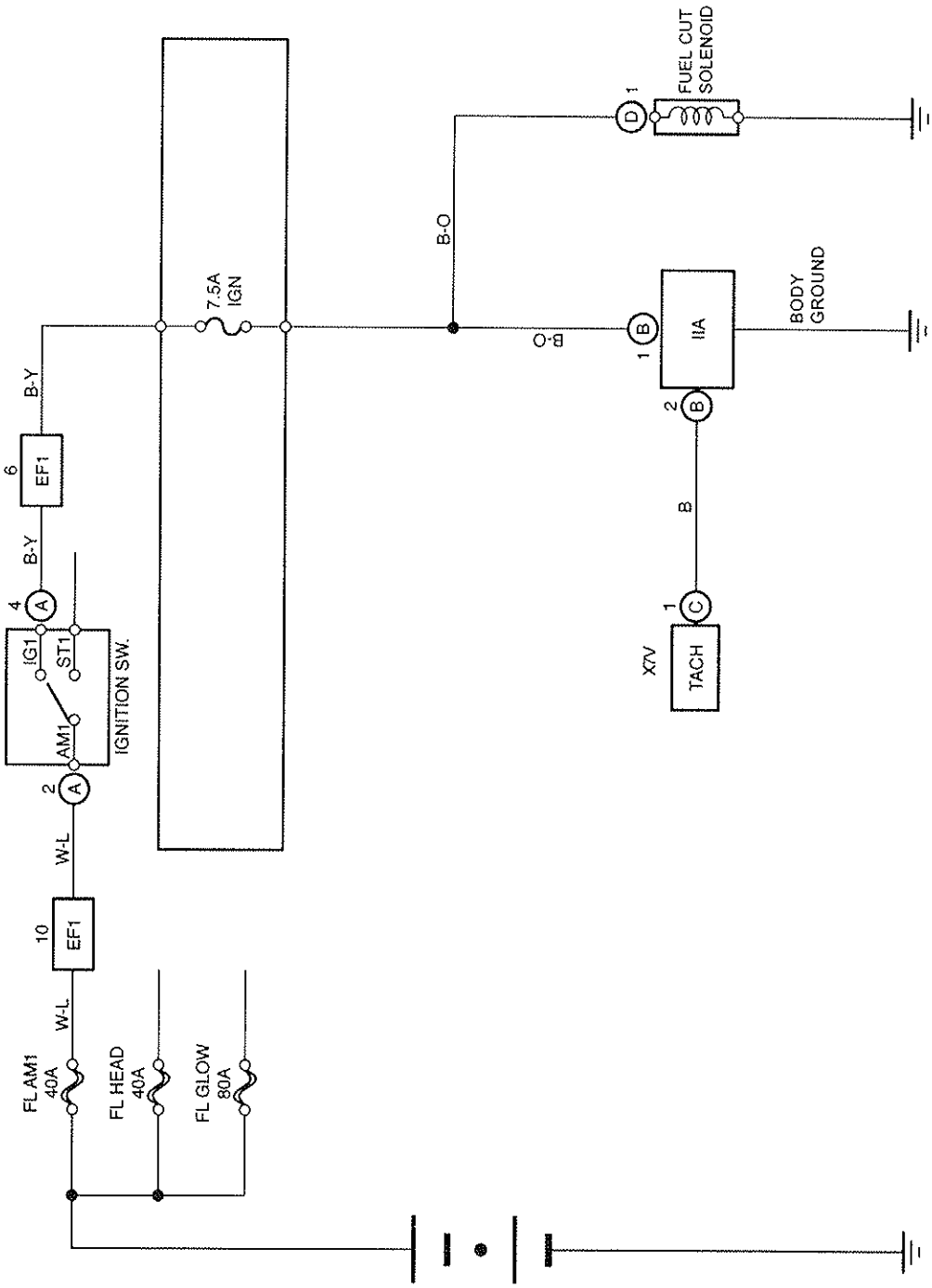




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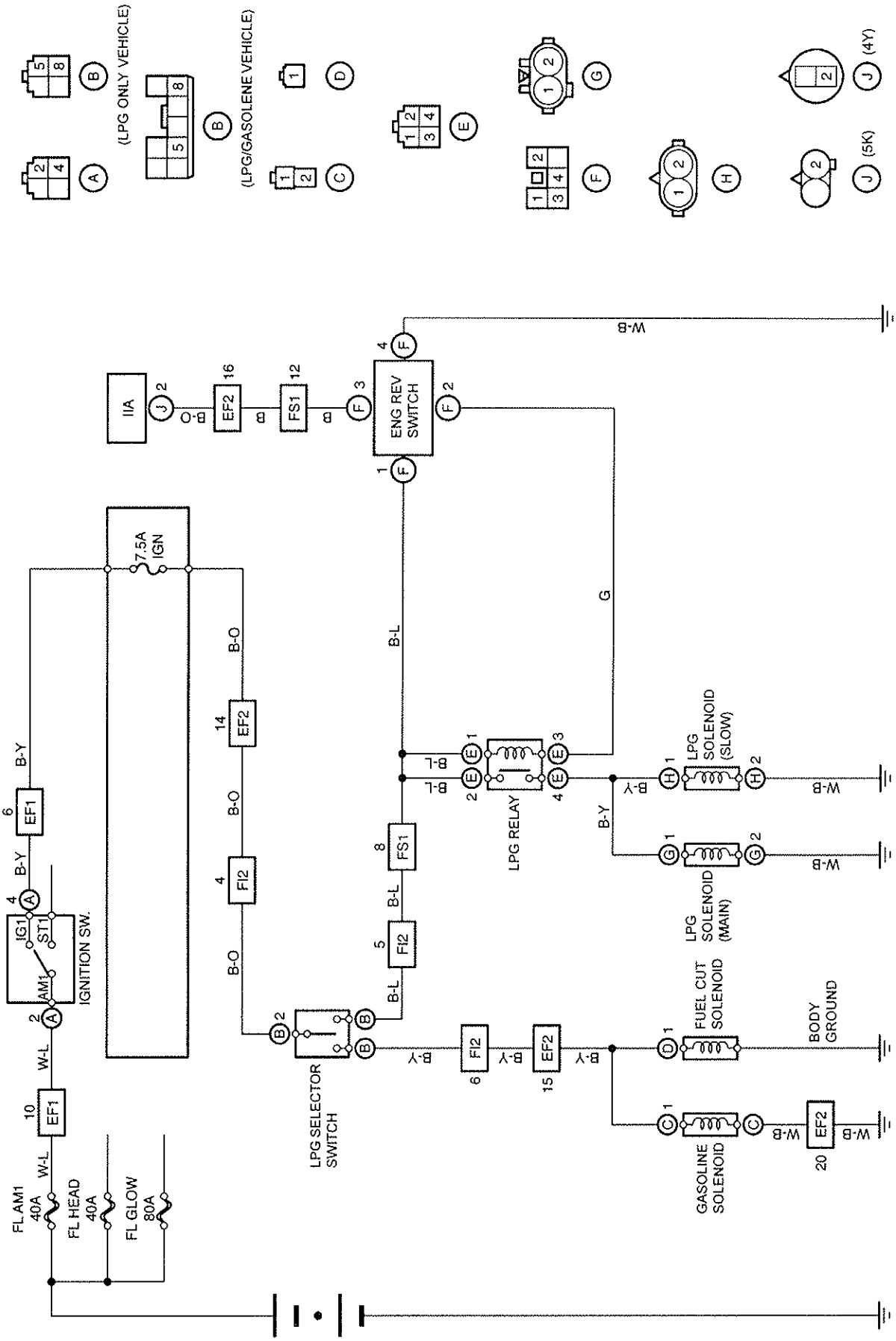
FUEL & IGNITION (4Y)





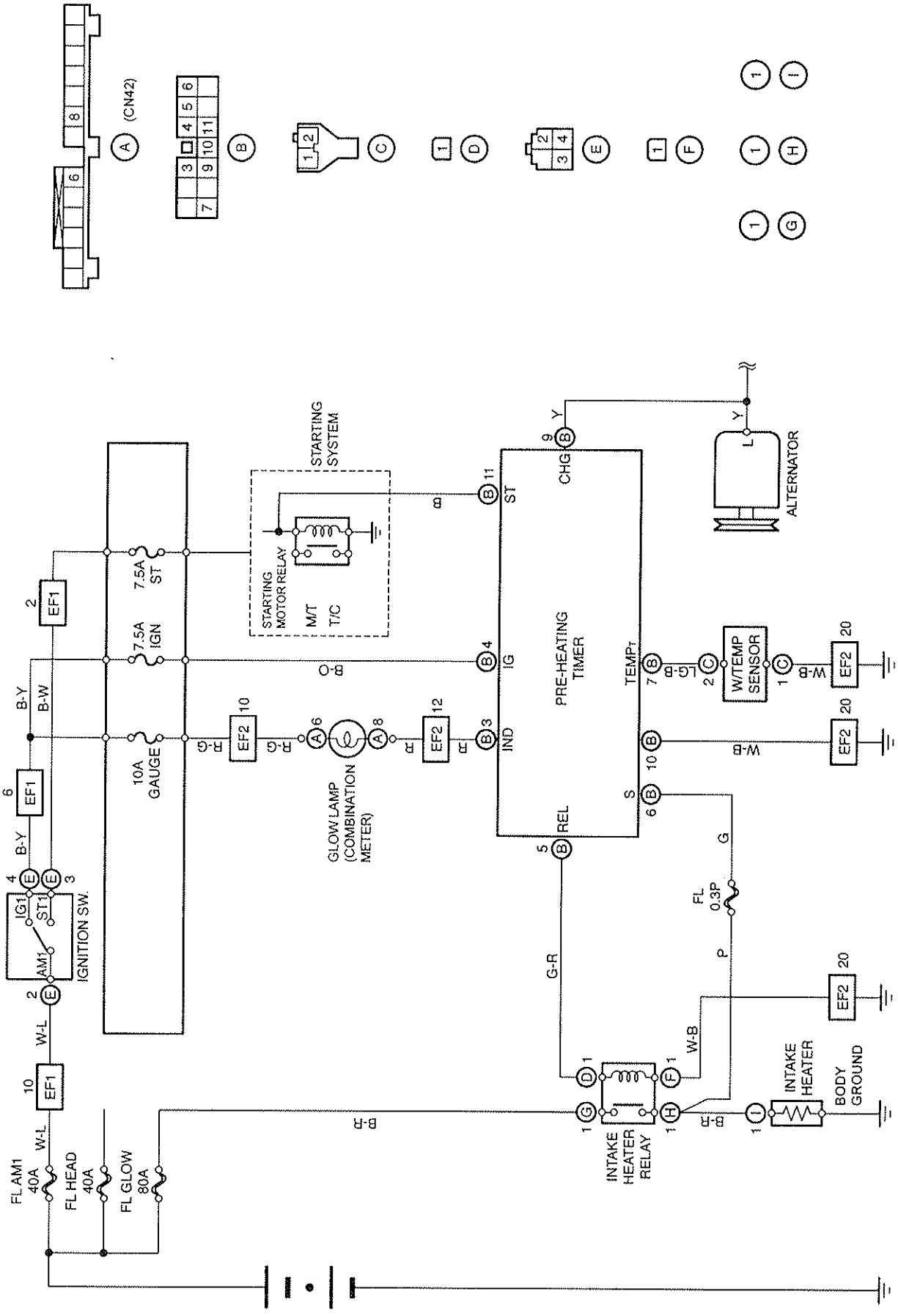
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FUEL & IGNITION (LPG & GASOLINE·LPG ONLY)



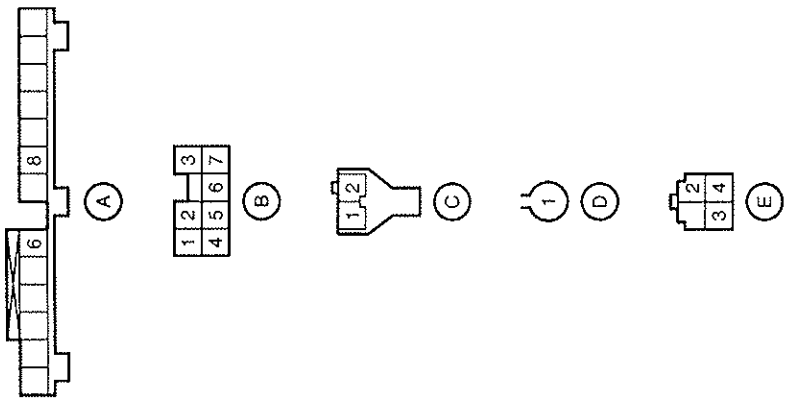
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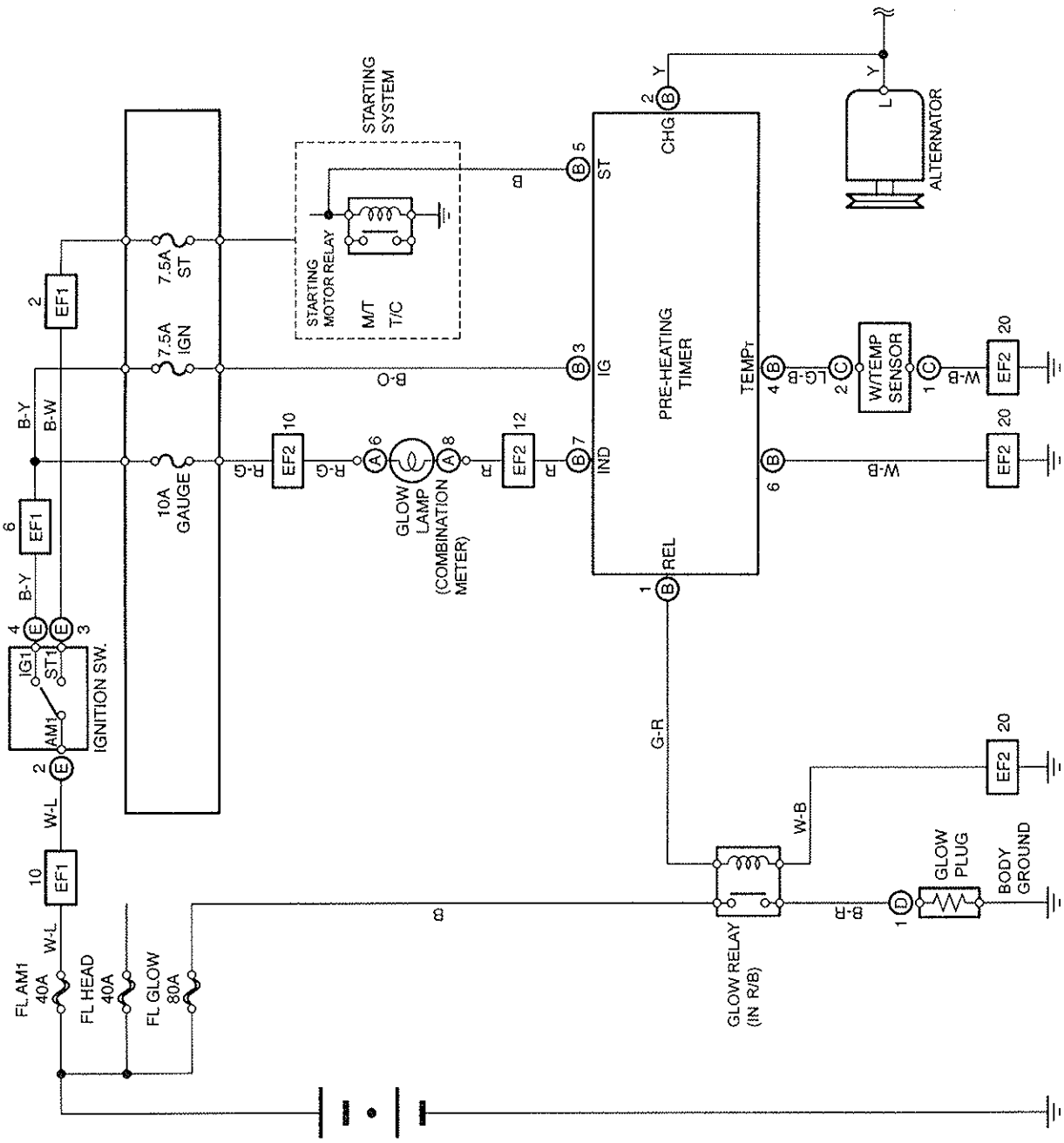
INTAKE HEATER (2Z)



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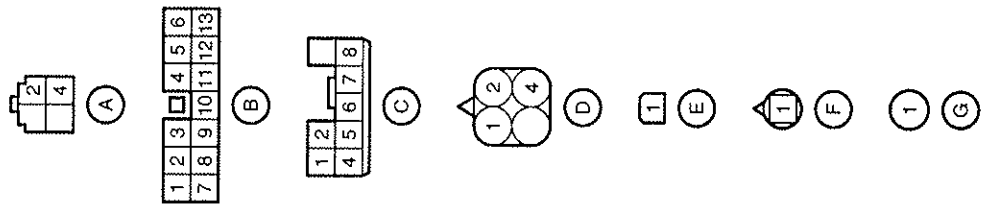
GLOW (1DZ-II)

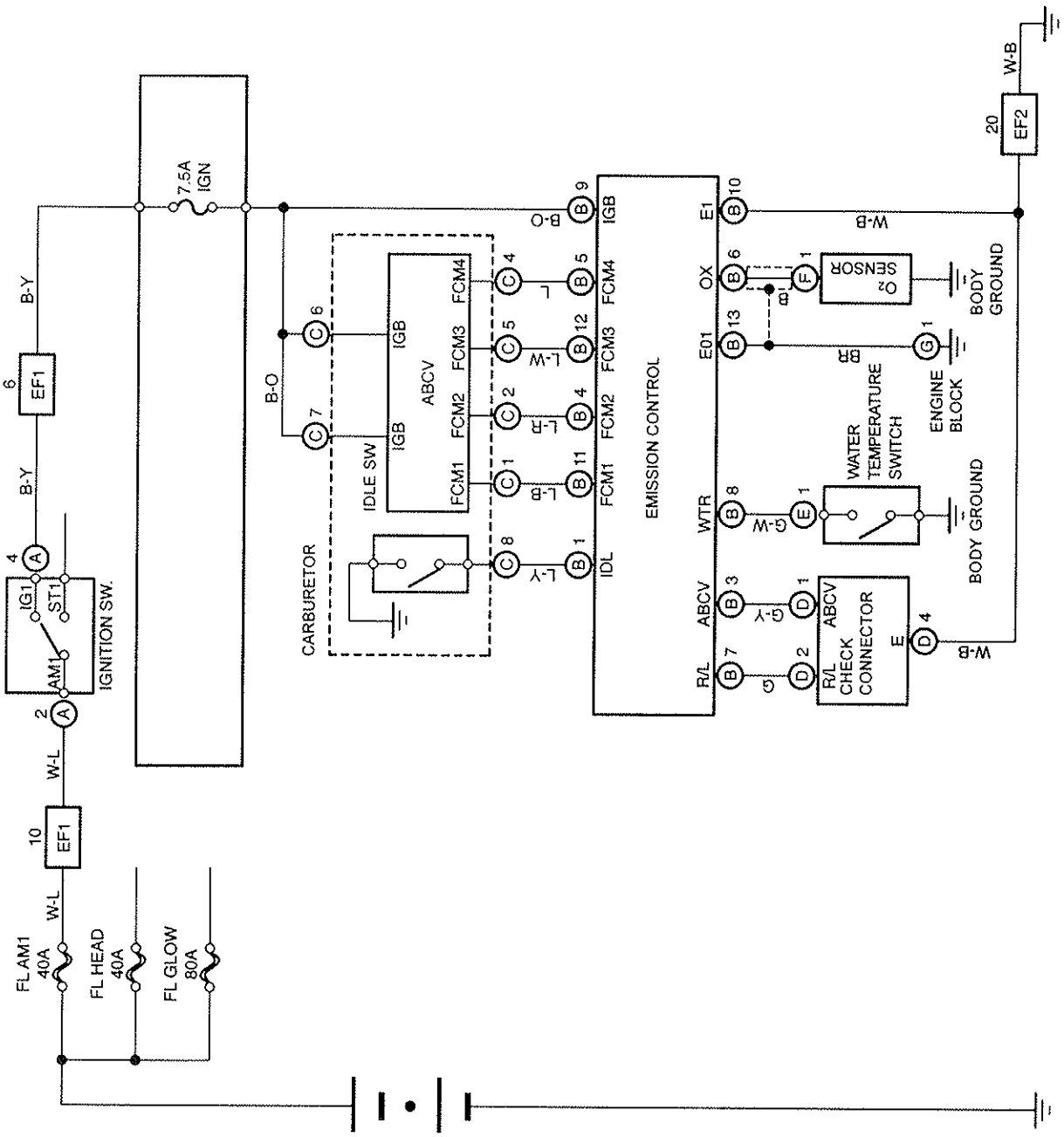




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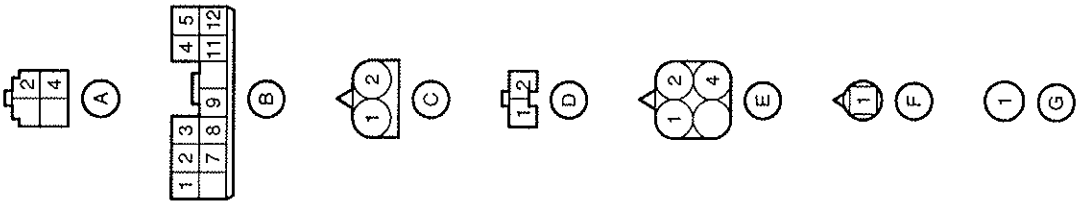
EMISSION CONTROL (GASOLINE) (3-Way Catalytic Converter System)

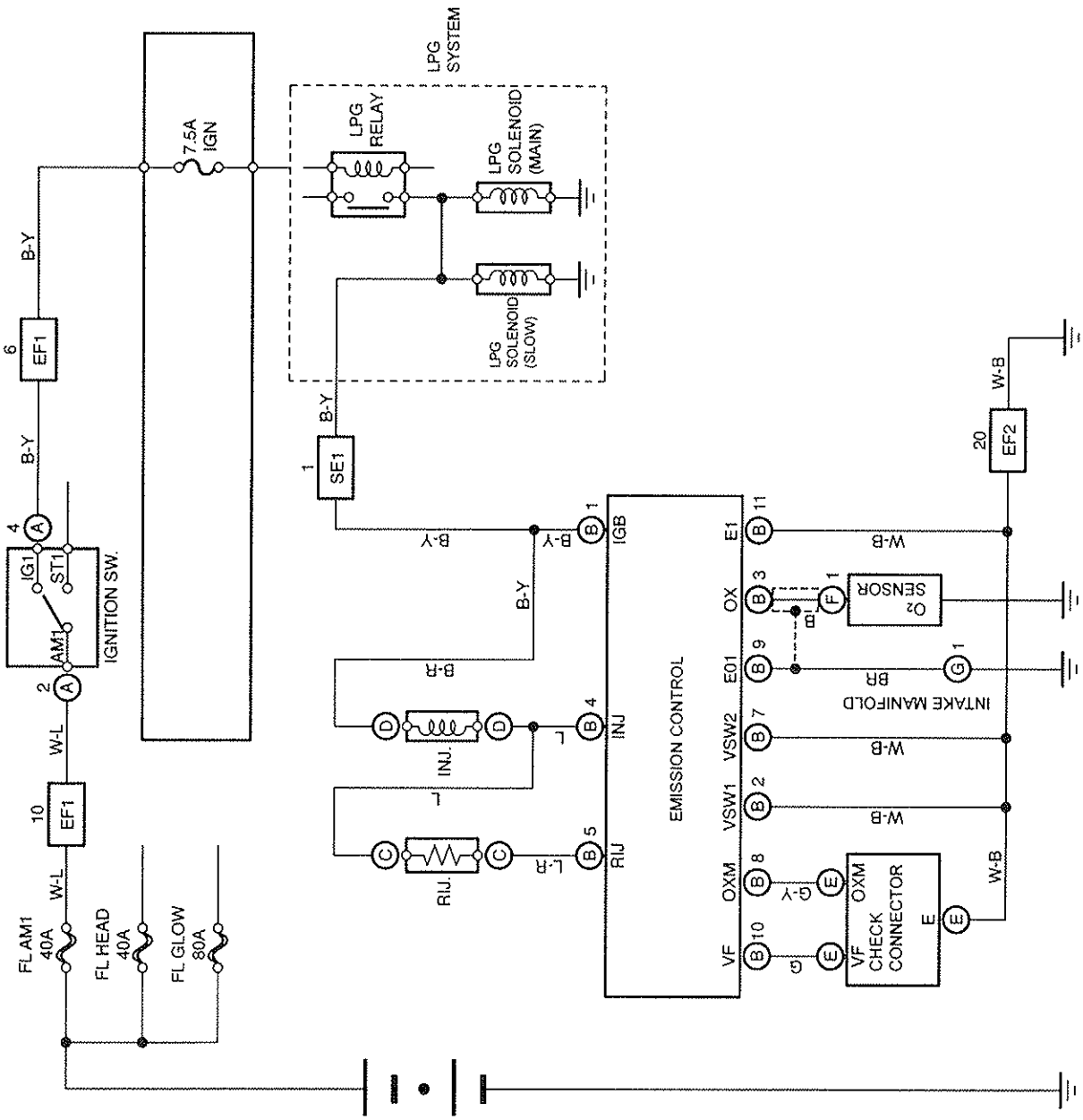




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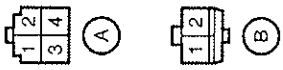
EMISSION CONTROL (LPG) (3-Way Catalytic Converter System)

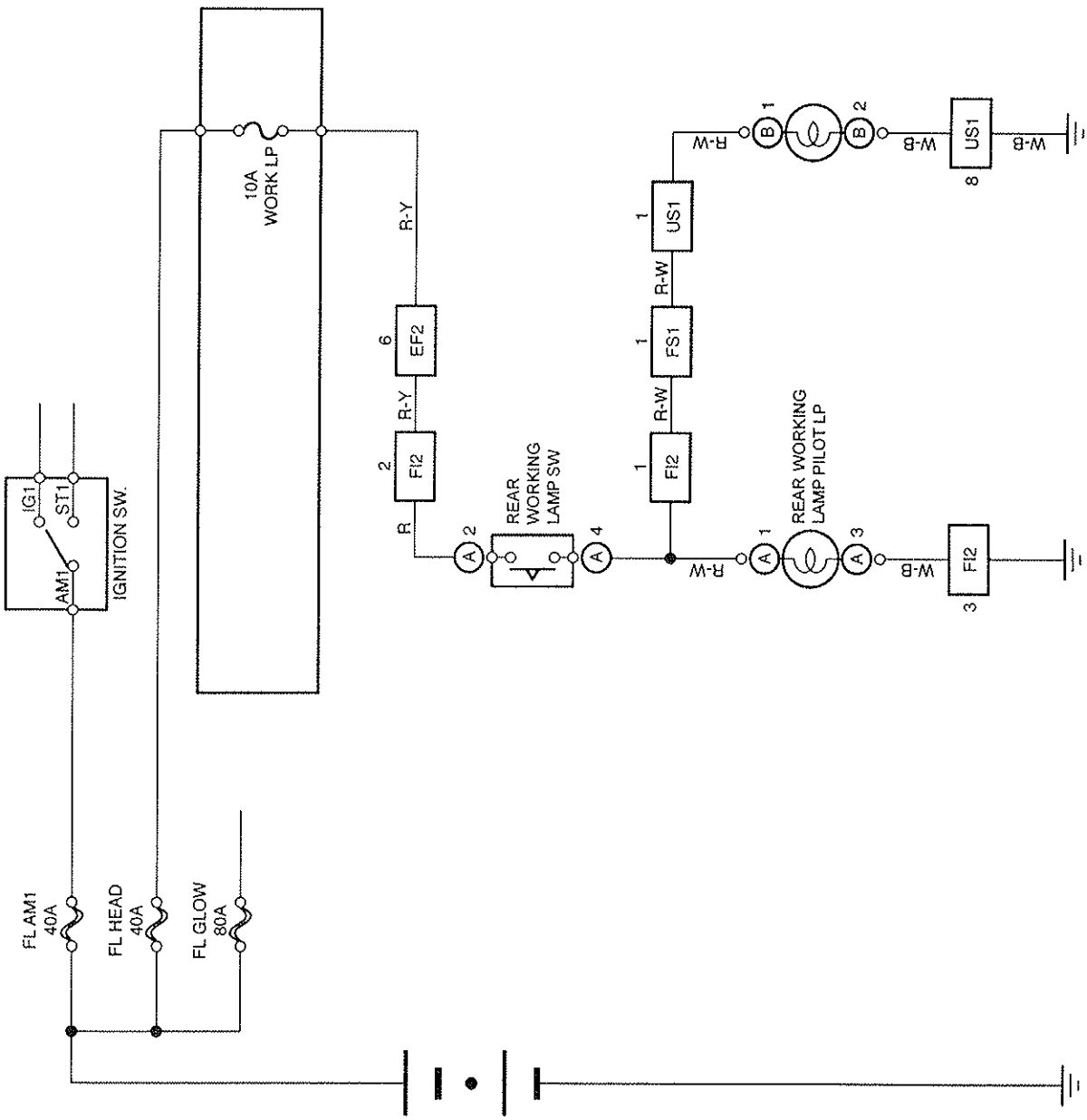




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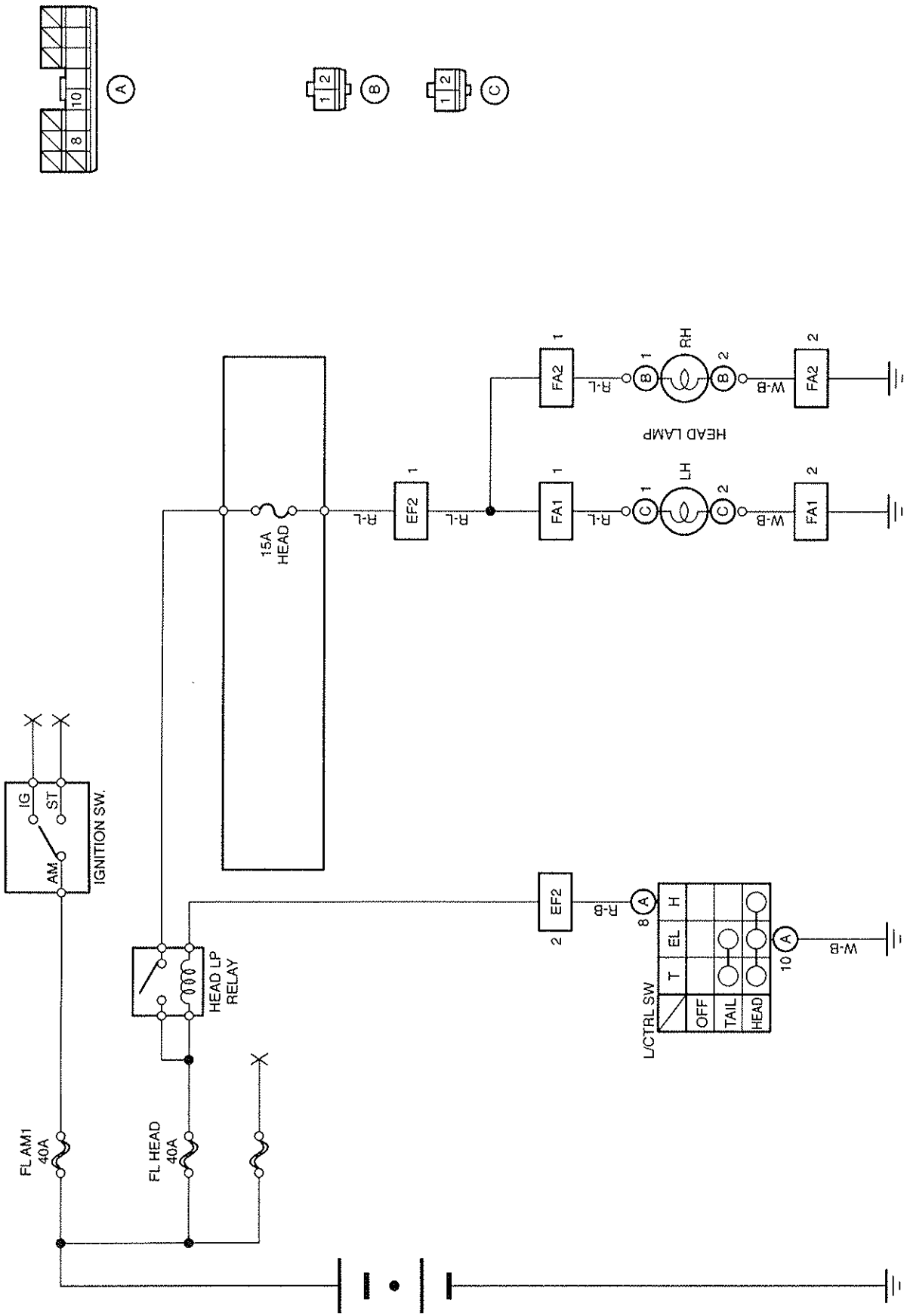
REAR WORK LAMP





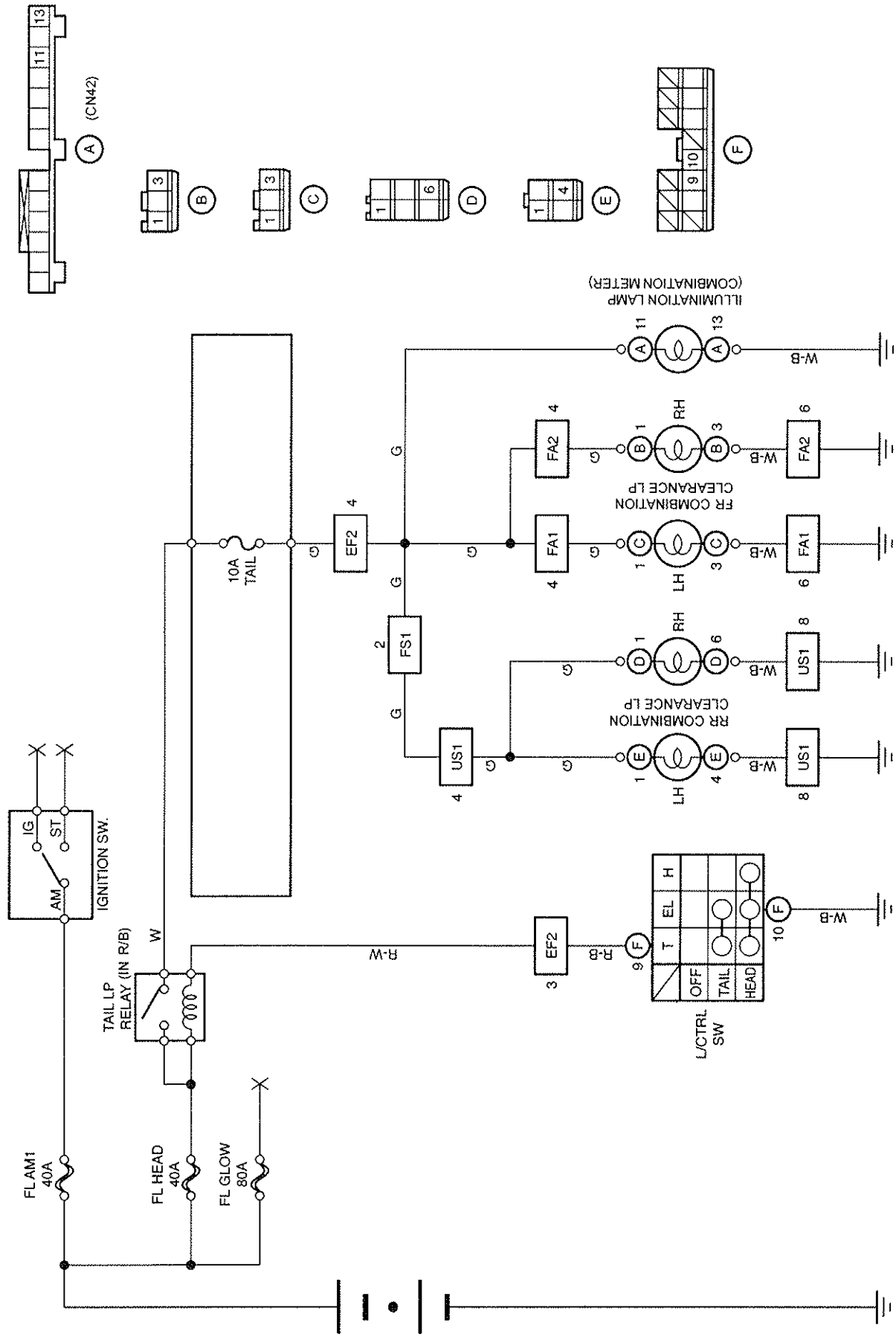
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HEAD LAMP



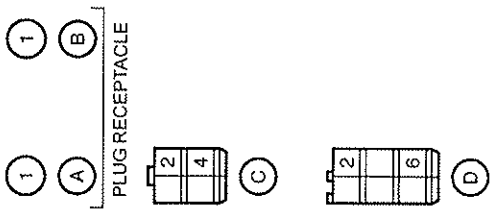
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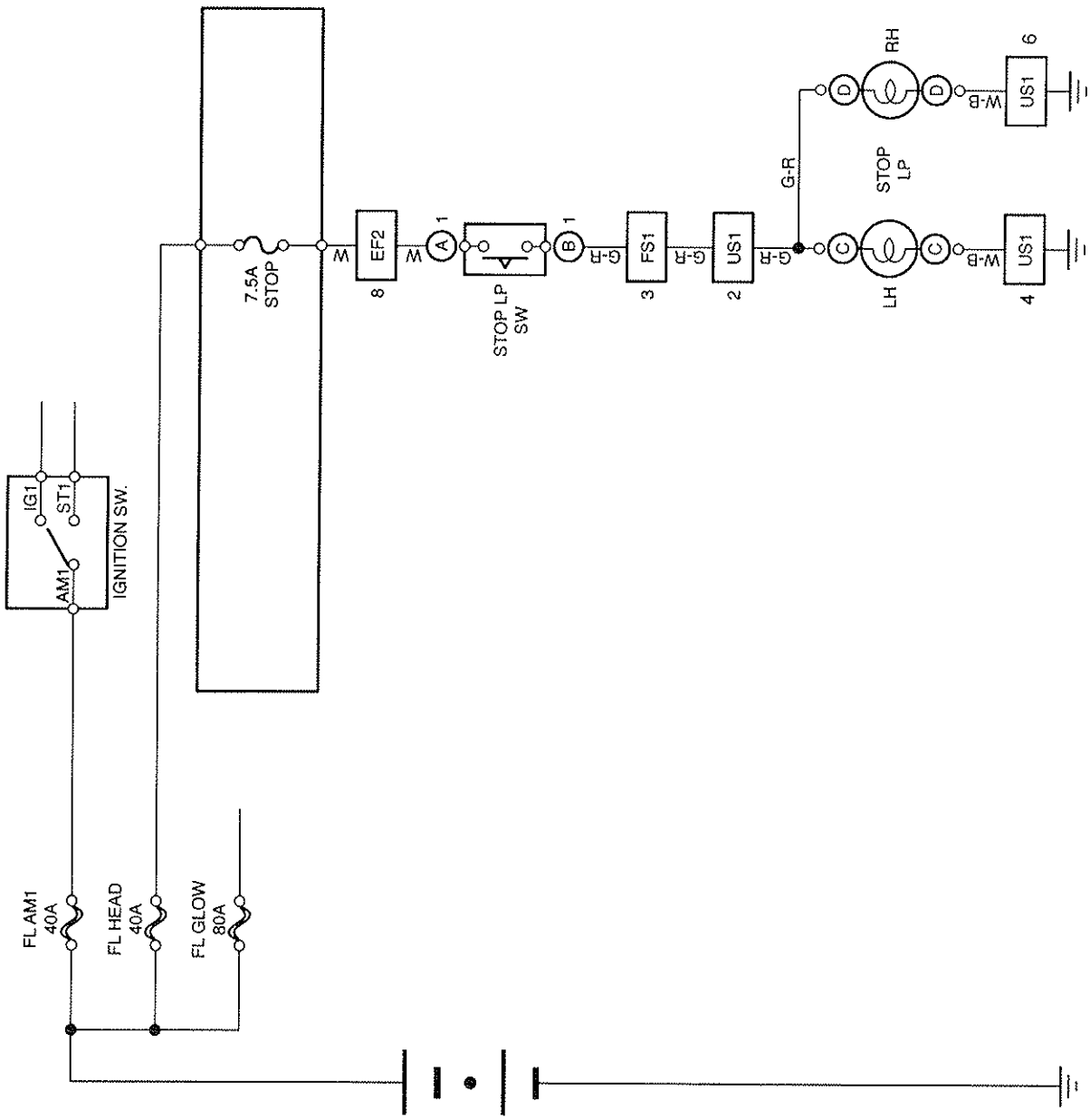
CLEARANCE LAMP (ILLUMINATION LAMP)



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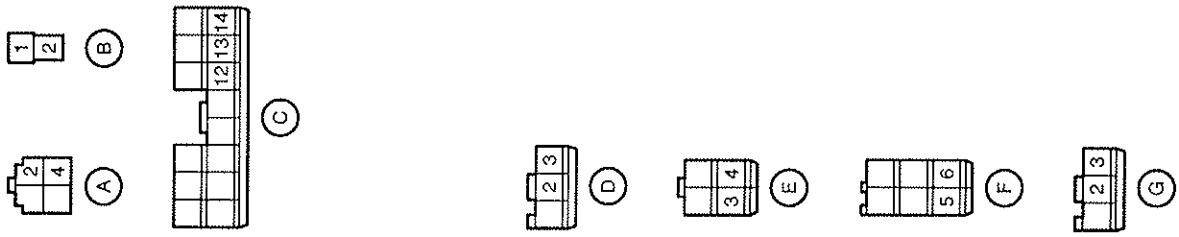
STOP LAMP

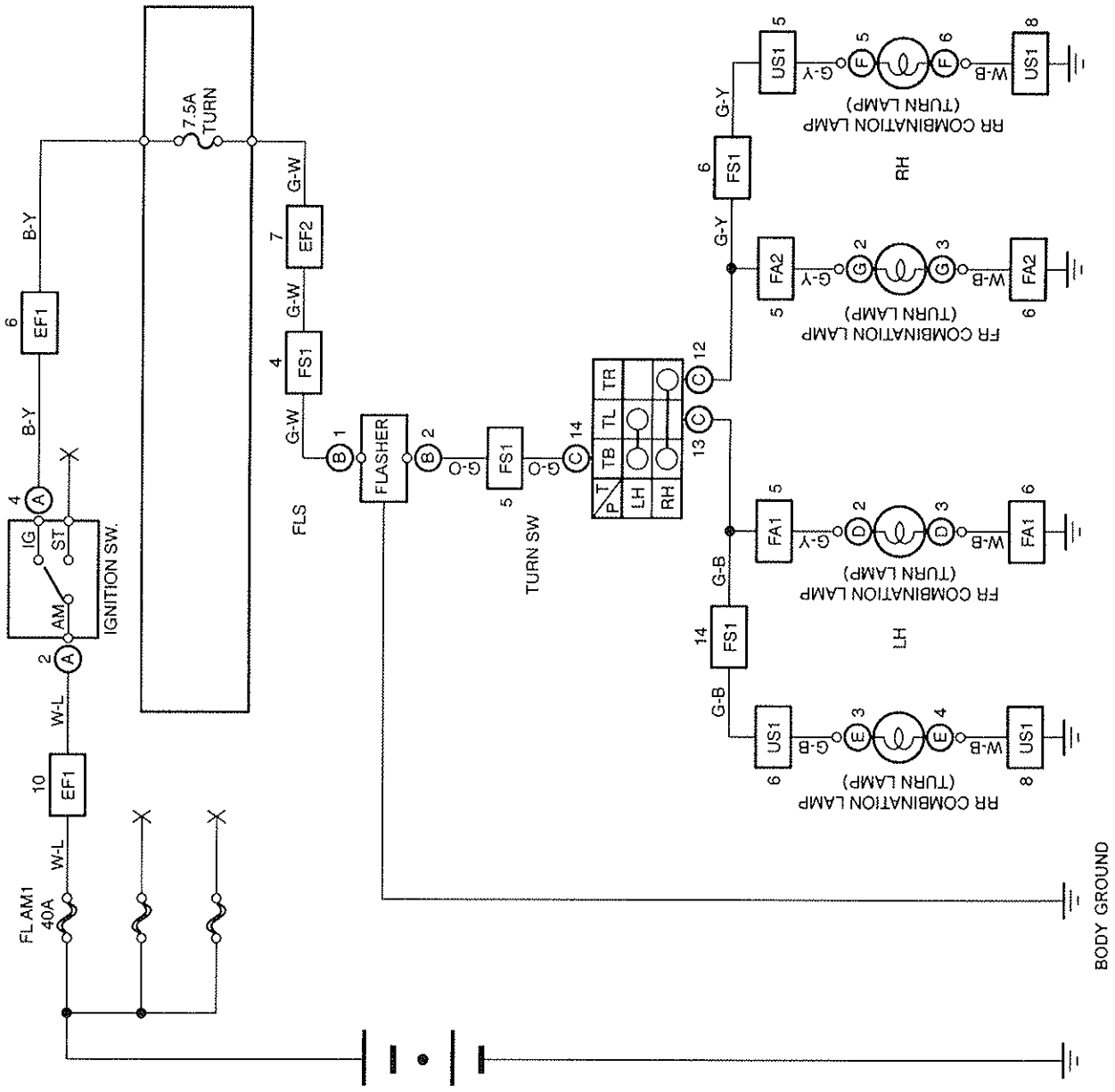




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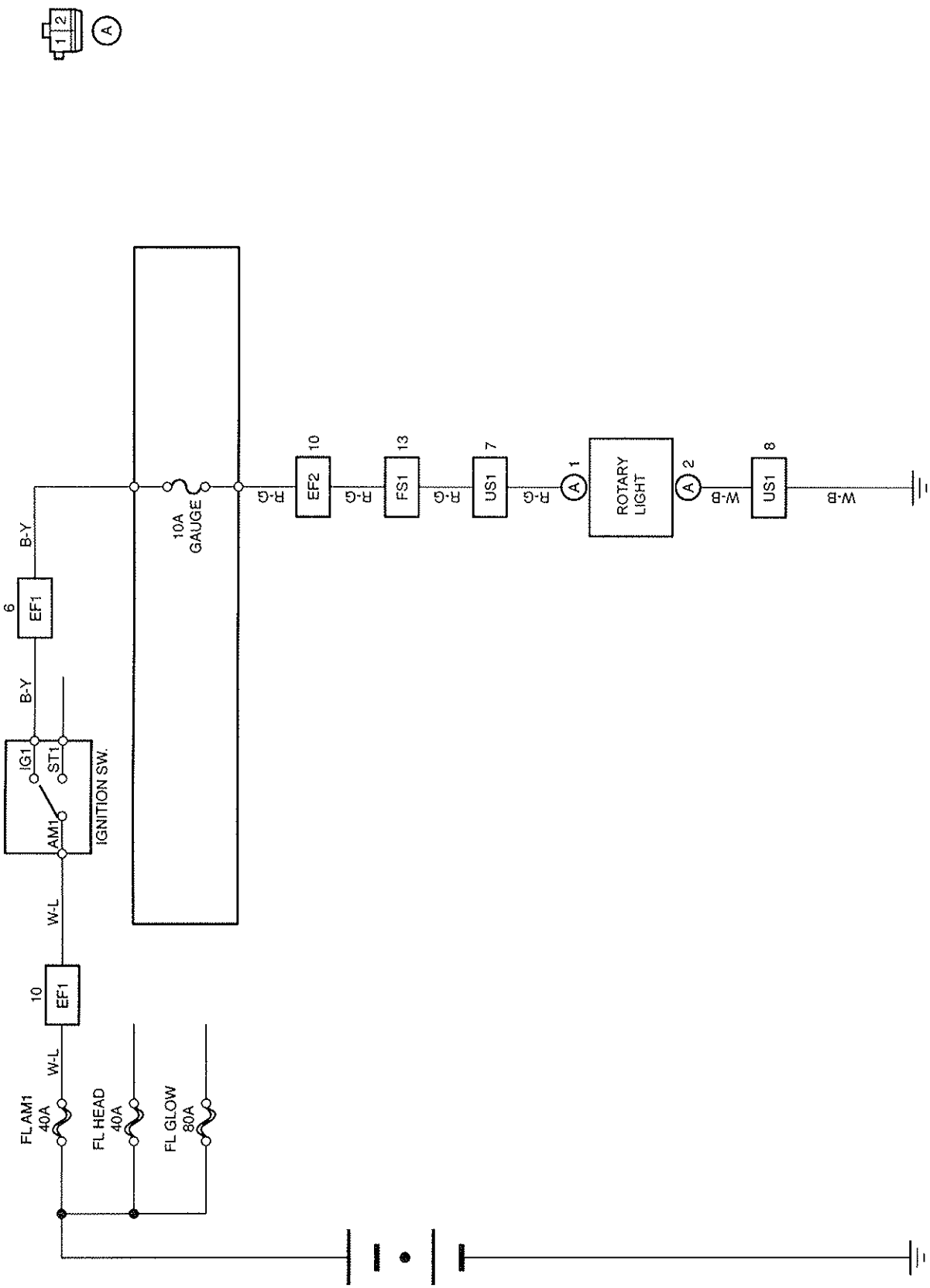
TURN SIGNAL LAMP





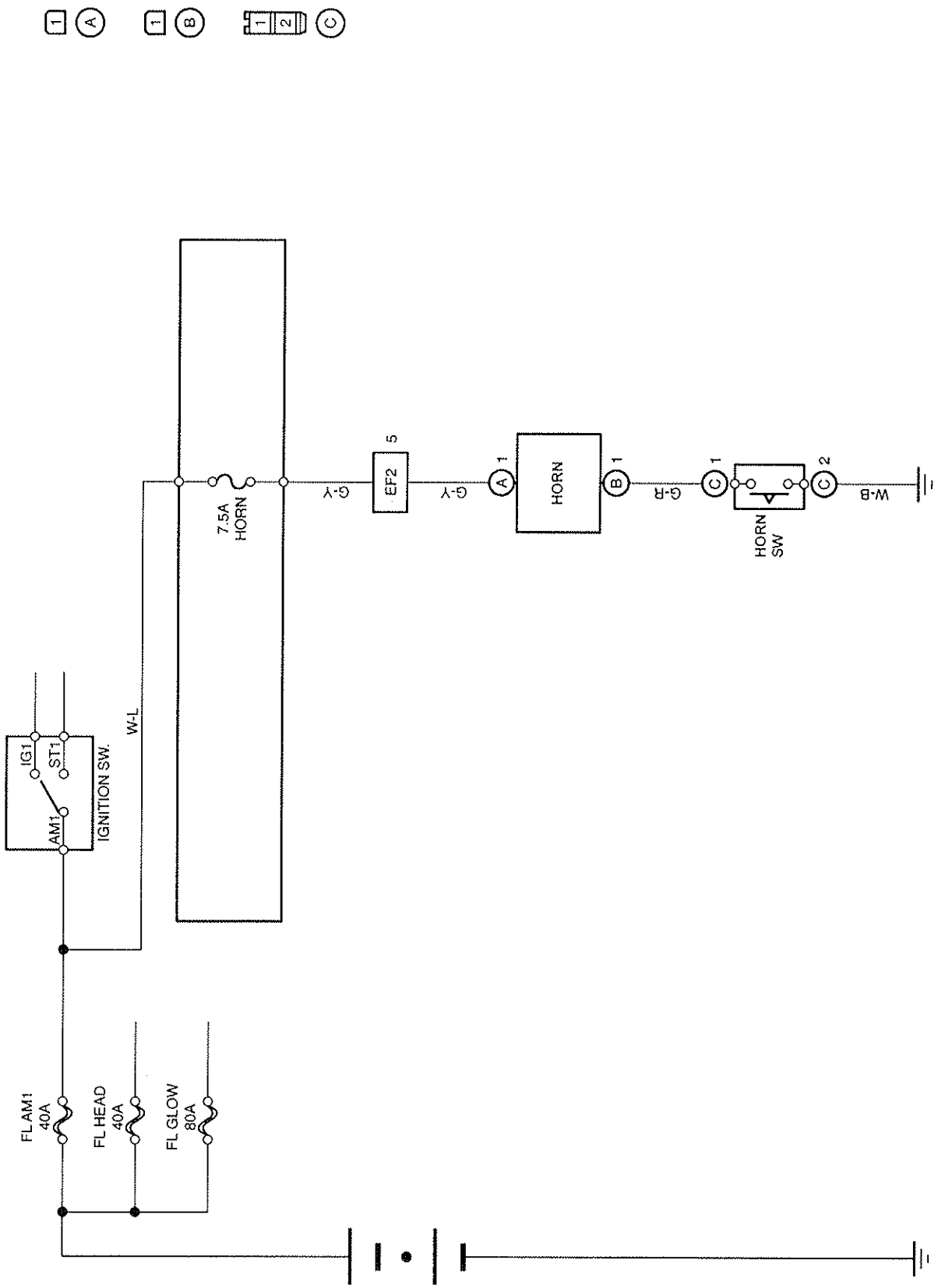
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ROTARY LIGHT (BEACON)



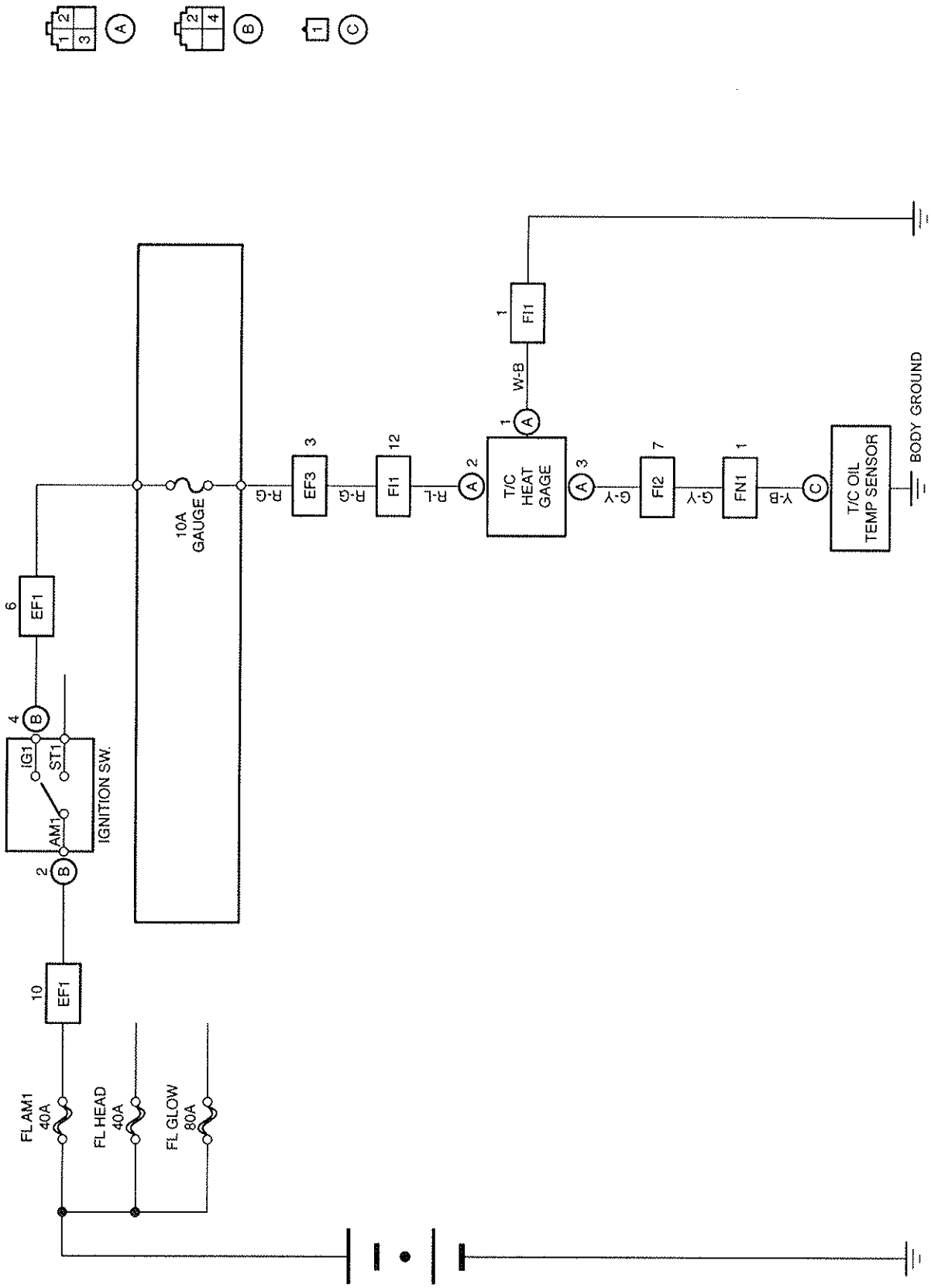
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HORN



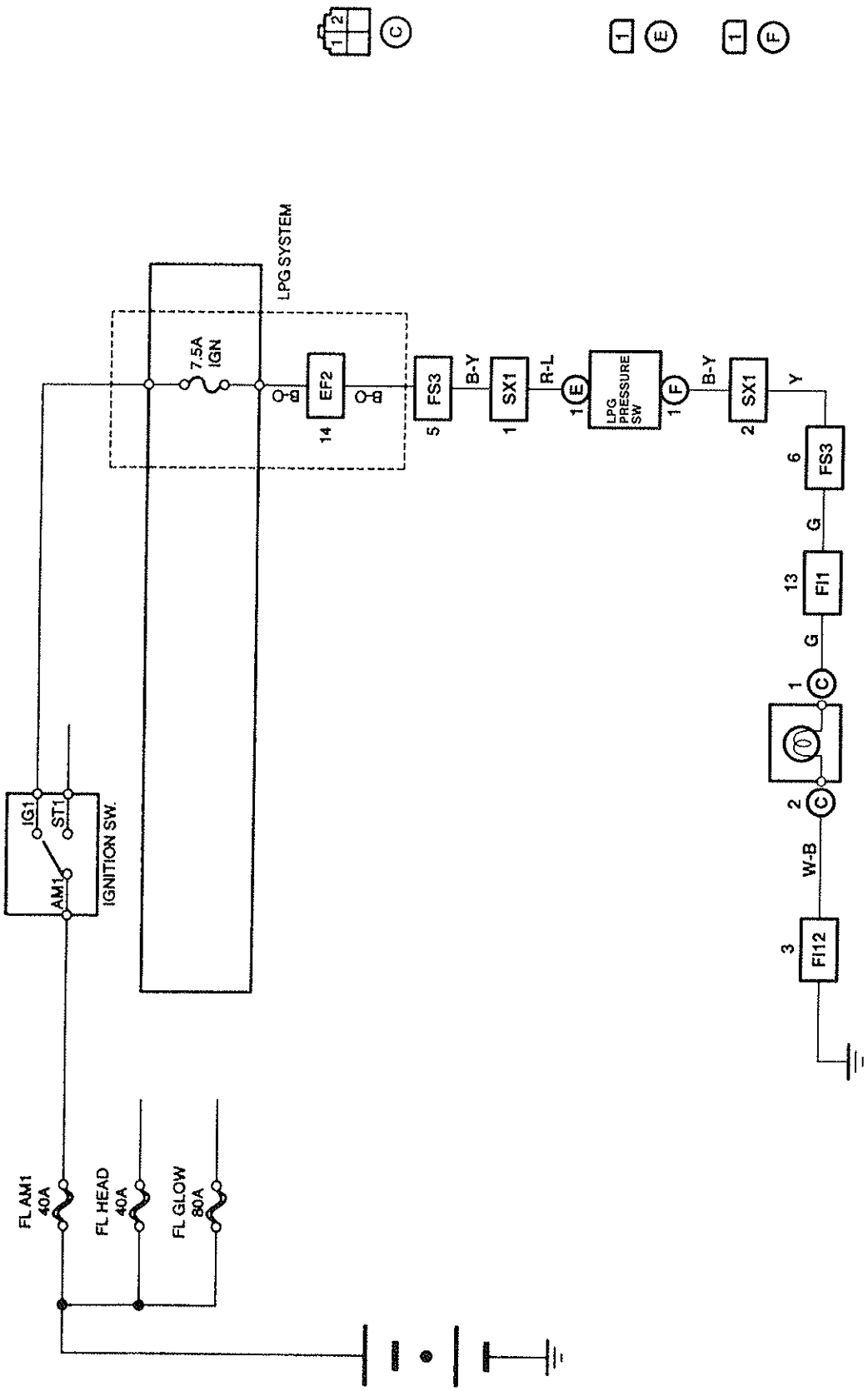
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T/C HEAT GAUGE



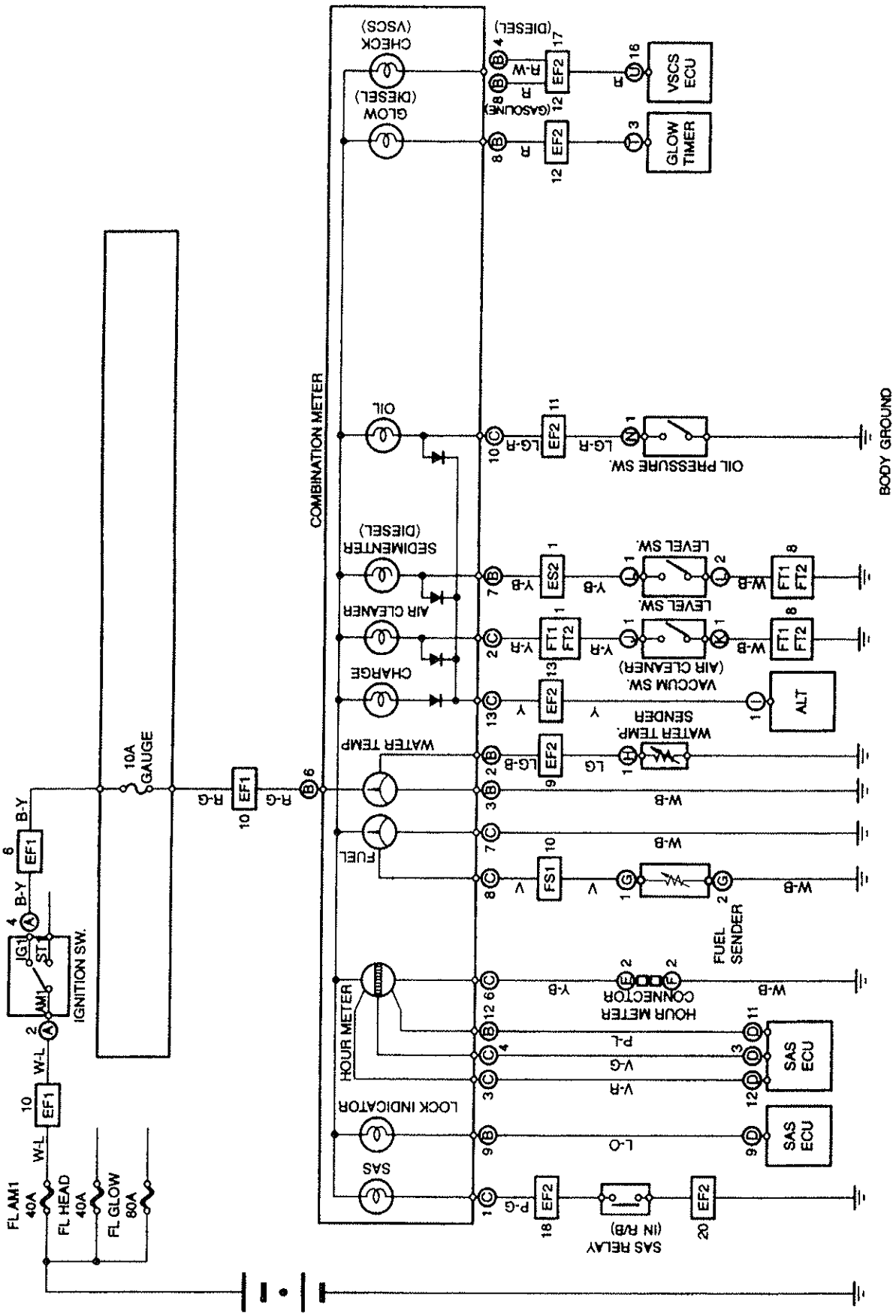
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LOW LPG LEVEL ALARM

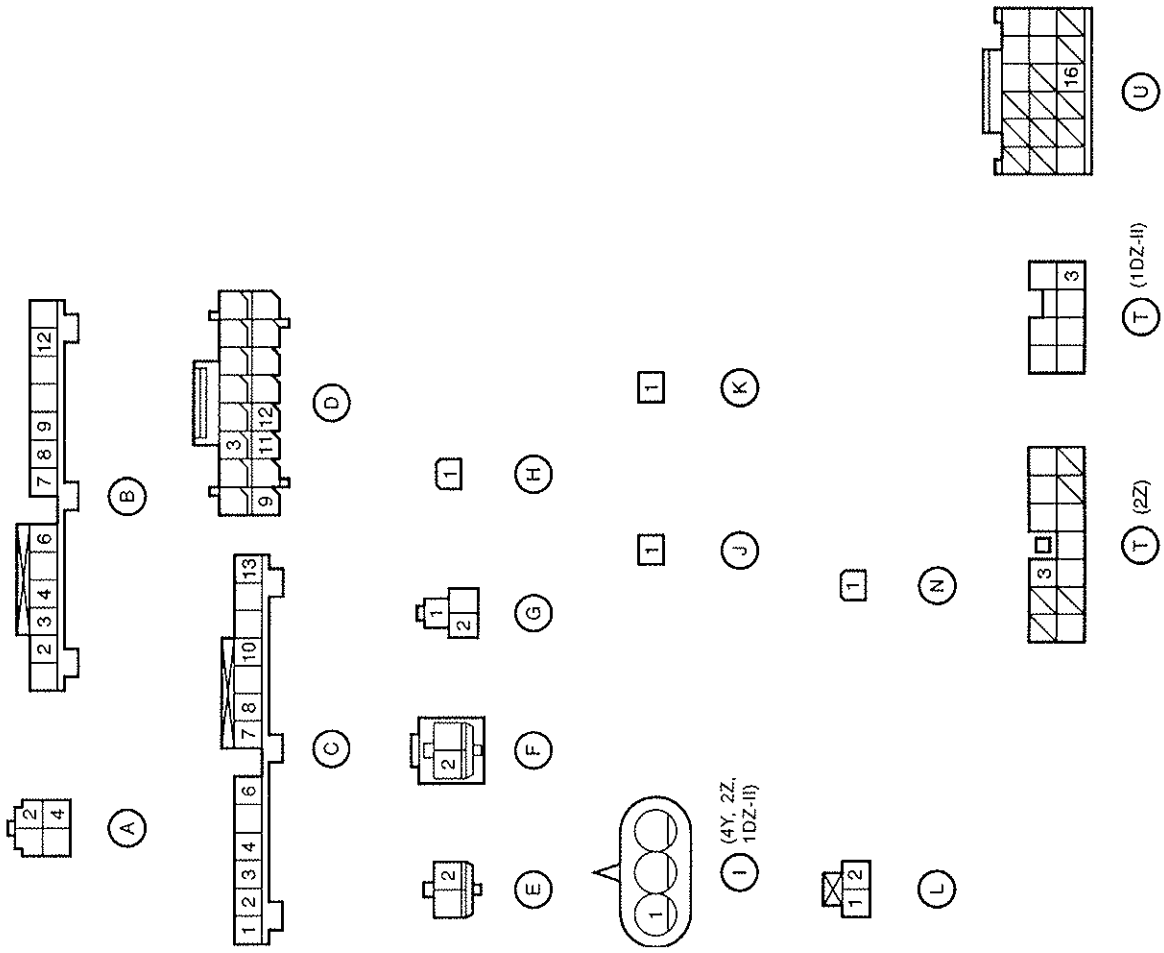


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COMBINATION METER

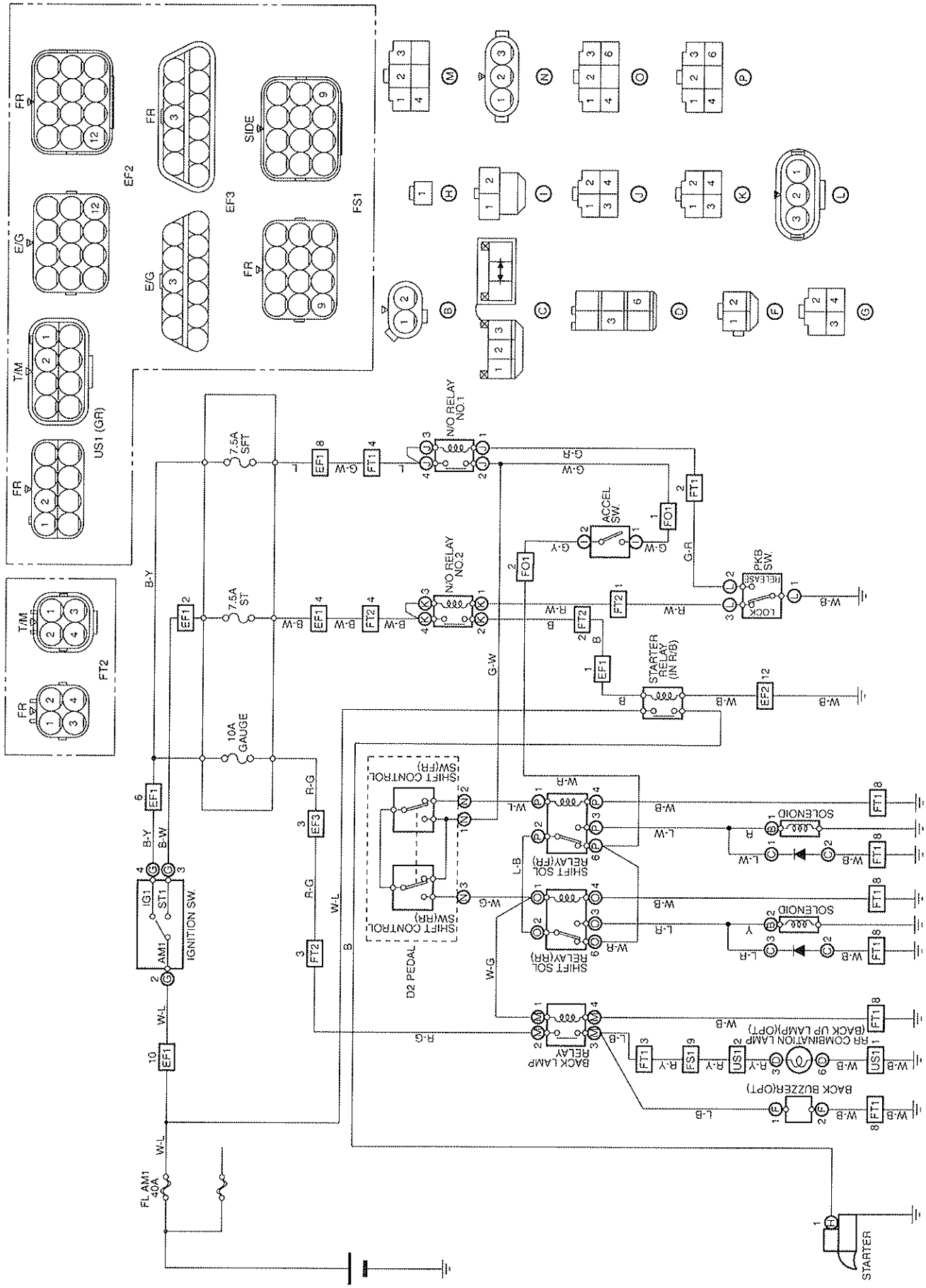


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ELECTRICAL SHIFT TORQUE CONVERTER (D2 PEDAL)



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