FOREWORD

This manual covers the service procedures of the TOYOTA FORKLIFT 6FG/6FD10 – 30. Please use this manual for providing quick, correct servicing of the corresponding forklift models.

This manual deals with the above models as of January 1994. 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 5K ENGINE
REPAIR MANUAL (No.CE617)

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

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

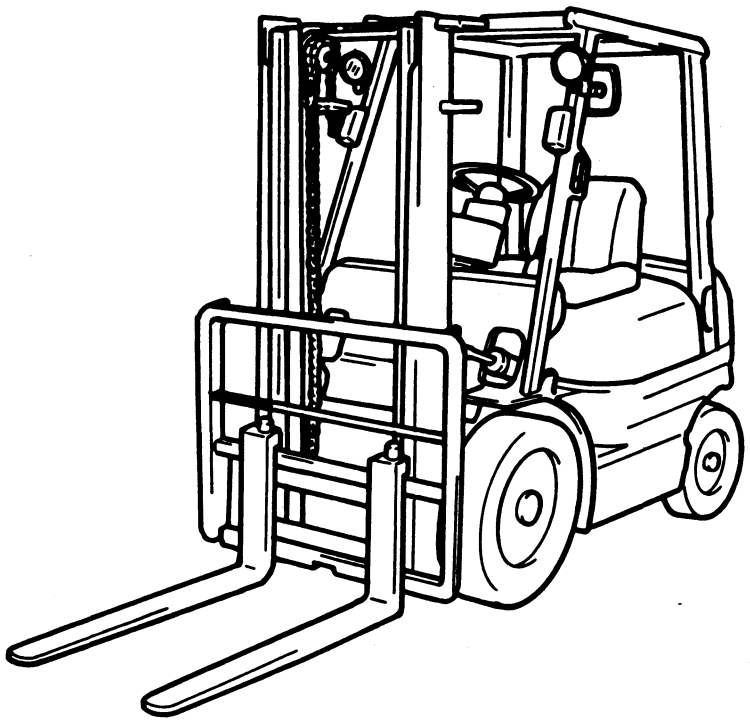
TOYOTA INDUSTRIAL EQUIPMENT 2Z ENGINE
REPAIR MANUAL (No.CE625)

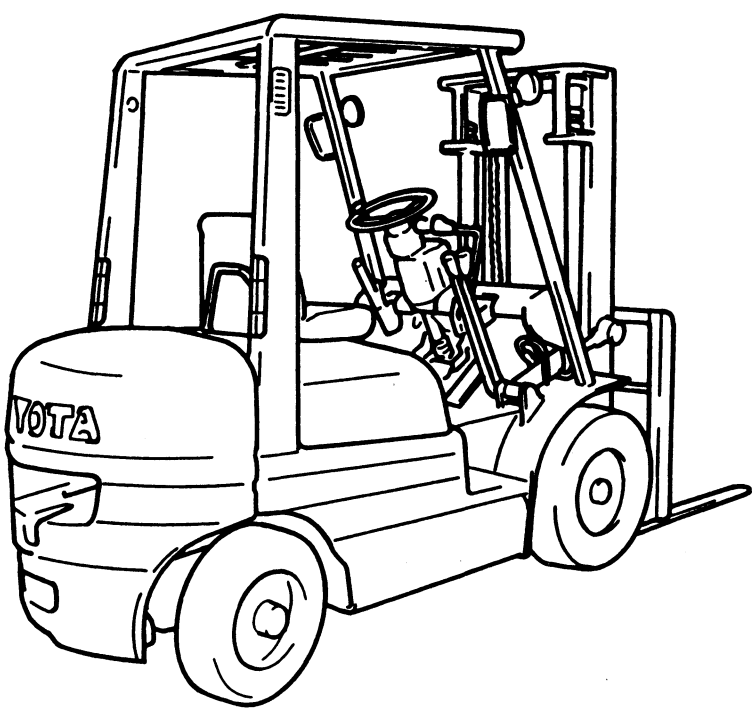
TOYOTA MOTOR CORPORATION

SECTION INDEX

GENERAL

EXTERIOR VIEWS





VEHICLE MODEL

Series	Load capacity	Model	Engine model	Engine type	Drive system
1 ton series	1.0 ton	6FG10	5K	Gasoline	Clutch
		02-6FG10		↑	Torque converter
		40-6FG10	4Y	↑	Clutch
		42-6FG10		↑	Torque converter
		6FD10	1DZ	Diesel	Clutch
		02-6FD10		↑	Torque converter
	1.35 ton	6FG14	5K	Gasoline	Clutch
		02-6FG14		↑	Torque converter
		40-6FG14	4Y	↑	Clutch
		40-6FG14		↑	Torque converter
		6FD14	1DZ	Diesel	Clutch
		02-6FD14		↑	Torque converter
	1.5 ton	6FG15	5K	Gasoline	Clutch
		02-6FG15		↑	Torque converter
		40-6FG15	4Y	↑	Clutch
		42-6FG15		↑	Torque converter
		6FD15	1DZ	Diesel	Clutch
		02-6FD15		↑	Torque converter
	1.75 ton	6FG18	5K	Gasoline	Clutch
		02-6FG18		↑	Torque converter
		40-6FG18	4Y	↑	Clutch
		42-6FG18		↑	Torque converter
		6FD18	1DZ	Diesel	Clutch
		02-6FD18		↑	Torque converter
2 ton series	2.0 ton	6FG20	5K	Gasoline	Clutch
		02-6FG20		↑	Torque converter
		40-6FG20	4Y	↑	Clutch
		42-6FG20		↑	Torque converter
		60-6FD20	1DZ	Diesel	Clutch
		62-6FD20		↑	Torque converter

Series	Load capacity	Model	Engine model	Engine type	Drive system
2 ton series	2.0 ton	6FD20	2Z	Diesel	Clutch
		02-6FD20		↑	Torque converter
	2.25 ton	6FG23	5K	Gasoline	Clutch
		02-6FG23		↑	Torque converter
		40-6FG23	4Y	Gasoline	Clutch
		42-6FG23		↑	Torque converter
		60-6FD23	1DZ	Diesel	Clutch
		62-6FD23		↑	Torque converter
		6FD23	2Z	↑	Clutch
		02-6FD23		↑	Torque converter
	2.5 ton	6FG25	5K	Gasoline	Clutch
		02-6FG25		↑	Torque converter
		40-6FG25	4Y	↑	Clutch
		42-6FG25		↑	Torque converter
		60-6FD25	1DZ	Diesel	Clutch
		62-6FD25		↑	Torque converter
		6FD25	2Z	↑	Clutch
		02-6FD25		↑	Torque converter
3 ton series	2.75 ton	6FG28	4Y	Gasoline	Clutch
		02-6FG28		↑	Torque converter
		60-6FD28	1DZ	Diesel	Clutch
		62-6FD28		↑	Torque converter
		6FD28	2Z	↑	Clutch
		02-6FD28		↑	Torque converter
	3.0 ton	6FG30	4Y	Gasoline	Clutch
		02-6FG30		↑	Torque converter
		60-6FD30	1DZ	Diesel	Clutch
		62-6FD30		↑	Torque converter
		6FD30	2Z	↑	Clutch
		02-6FD30		↑	Torque converter

South Africa

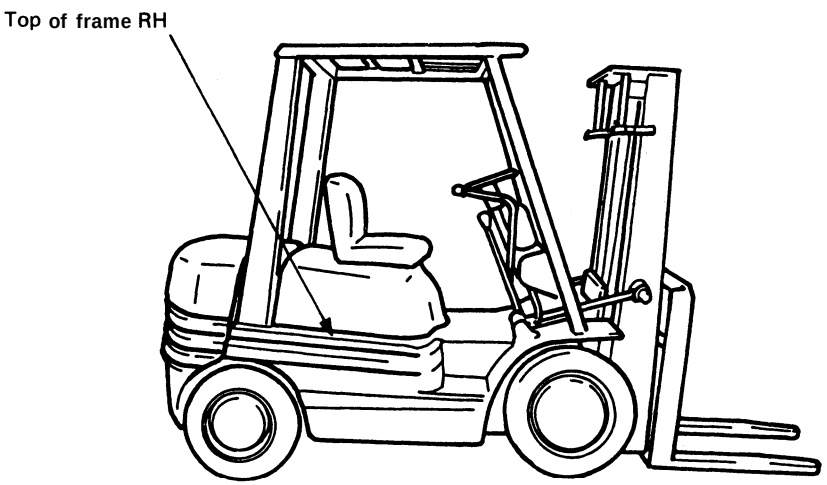
Series	Load capacity	Model	Engine model	Engine type	Drive system
1 ton series	1.5 ton	02-6FGA15	5K	Gasoline	Torque converter
		02-6FDA15	7DZ	Diesel	↑
	1.75 ton	02-6FGA18	5K	Gasoline	↑
		02-6FDA18	1DZ	Diesel	↑
2 ton series	2.0 ton	42-6FGA20	4Y	Gasoline	↑
		02-6FDA20	2Z	Diesel	↑
		62-6FDA20	1DZ	↑	↑
	2.5 ton	42-6FGA25	4Y	Gasoline	↑
		02-6FDA25	2Z	Diesel	↑
		62-6FDA25	1DZ	↑	↑
3 ton series	3.0 ton	02-6FGA30	4Y	Gasoline	↑
		02-6FDA30	2Z	Diesel	↑
		62-6FDA30	1DZ	↑	↑

Indonesia

Series	Load capacity	Model	Engine model	Engine type	Drive system
2 ton series	2.0 ton	6FDN20	2Z	Diesel	Clutch
		60-6FDN20	1DZ	↑	↑
	2.5 ton	6FDN25	2Z	↑	↑
		60-6FDN25	1DZ	↑	↑
3 ton series	3.0 ton	6FDN30	2Z	↑	↑
		60-6FDN30	1DZ	↑	↑

FRAME NUMBER

Frame No. Punching Position



	Engine	Model	Punching format
1 ton series	5K	6FG10	6FG18-10001
		02-6FG10	
		6FG14	
		02-6FG14	
		6FG15	
		02-6FG15	
		6FG18	
		02-6FG18	
	4Y	40-6FG10	406FG18-10001
		42-6FG10	
		40-6FG14	
		42-6FG14	
		40-6FG15	
		42-6FG15	
		40-6FG18	
		42-6FG18	
	1DZ	6FD10	6FD18-10001
		02-6FD10	
		6FD14	
		02-6FD14	
		6FD15	

	Engine	Model	Punching format
1 ton series	1DZ	02-6FD15	6FD18-10001
		6FD18	
		02-6FD18	
2 ton series	5K	6FG20	6FG25-10001
		02-6FG20	
		6FG23	
		02-6FG23	
		6FG25	
		02-6FG25	
	4Y	40-6FG20	406FG25-10001
		42-6FG20	
		40-6FG23	
		42-6FG23	
		40-6FG25	
		42-6FG25	
	2Z	6FD20	6FD25-10001
		02-6FD20	
		6FD23	
		02-6FD23	
		6FD25	
		02-6FD25	
	1DZ	60-6FD20	606FD25-10001
		62-6FD20	
		60-6FD23	
		62-6FD23	
		60-6FD25	
		62-6FD25	
3 ton series	4Y	6FG28	6FG30-10001
		02-6FG28	
		6FG30	
		02-6FG30	
	1DZ	60-6FD28	606FD30-10001
		62-6FD28	
		60-6FD30	
		62-6FD30	
	2Z	6FD28	6FD30-10001
		02-6FD28	
		6FD30	
		02-6FD30	

South Africa

	Engine	Model	Punching format
1 ton series	5K	02-6FGA15	6FGA18-10001
		02-6FGA18	
	1DZ	02-6FDA15	6FDA18-10001
		02-6FDA18	
2 ton series	4Y	42-6FGA20	406FGA25-10001
		42-6FGA25	
	2Z	02-6FDA20	6FDA25-10001
		02-6FDA25	
	1DZ	62-6FDA20	606FDA25-10001
		62-6FDA25	
3 ton series	4Y	02-6FGA30	6FGA30-10001
	2Z	02-6FDA30	6FDA30-10001
	1DZ	62-6FDA30	606FDA30-10001

Indonesia

	Engine	Model	Punching format
2 ton series	2Z	6FDN20	6FDN25-10001
		6FDN25	
	1DZ	60-6FDN20	606FDN25-10001
		60-6FDN25	
3 ton series	2Z	6FDN30	6FDN30-10001
	1DZ	60-6FDN30	606FDN30-10001

HOW TO READ THIS MANUAL

EXPLANATION METHOD

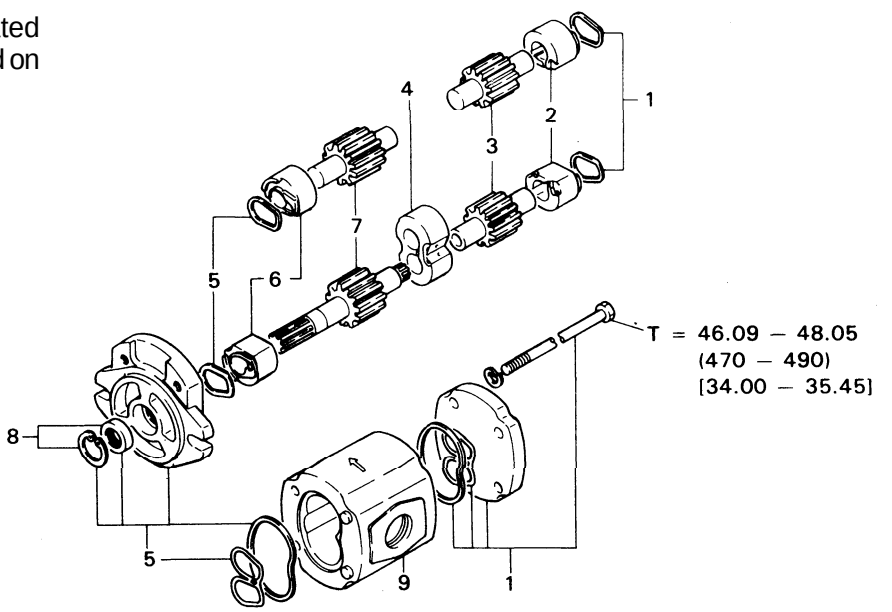
1. Operation procedure
   (1) The operation procedure is described in either pattern A or pattern B below.
   Pattern A: Explanation of each operation step with a photo or illustration.
   Pattern B: Explanation of operation procedure by indicating step numbers in one illustration, followed by explanation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

Example of description in pattern B

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

If a place or part cannot be indicated directly, the part name is described on the either side of the illustration.

Example: 1 Piping



Disassembly Procedure

1 Remove the cover. **[Point 11**

2 Remove the bush **[Point 21** ← Operation explained later

3 Remove the gear.

Point operations Explanation of key point for operation with an illustration

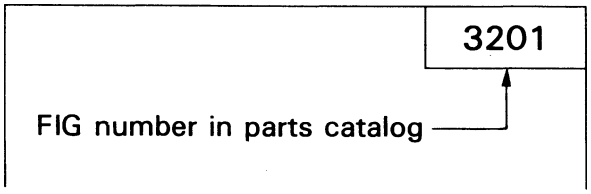
[Point 1]
Disassembly: Put a match mark when removing the pump cover

[Point 21
Inspection: Measure the bush inside diameter.
Bush inside diameter limit: 19.12 mm (0.7528 in)

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	SST	Special service tool
LH	Left hand	STD	Standard
LLC	Long life coolant	T =	Tightening torque
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)		

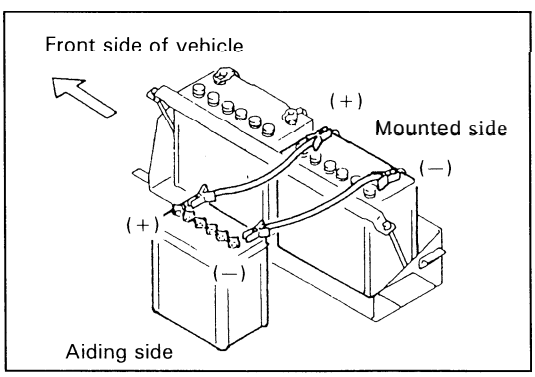
OPERATIONAL TIPS

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

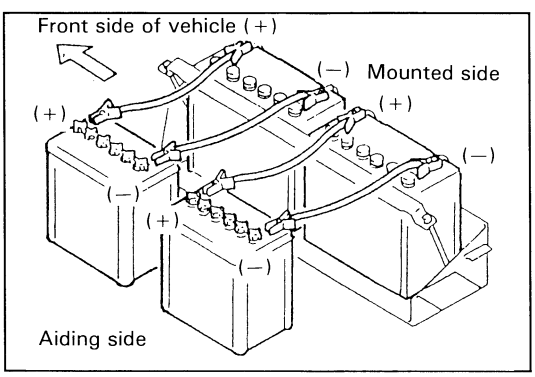
2. Tactful operation
   (1) Prepare the mechanic tools, necessary measuring instruments (circuit tester, megger, oil pressure gauge, etc.) and SSTs before starting operation.
   (2) Before disconnecting wiring, always check the cable color and wiring state.
   (3) When overhauling functional parts, complicated 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. 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. Method for battery connection upon occurrence of run-down batteries on 24-V specification vehicle with 2Z engine (with 12/24 V voltage switching system)



(1) Connect a 12-V aiding battery to the one on the rear side of the two mounted batteries.



(2) If starting falls with one aiding battery, connect another aiding battery to the front side one of the mounted batteries.

Caution:
- As batteries are shorted when the negative (−) terminal of the aiding battery on the front side of the vehicle is connected to the body ground, connect the booster cables to the vehicle side to each corresponding terminal.
- Never connect between aiding batteries.

(3) When the batteries are required to charge by the charger, remove the battery from the vehicle to charge the battery.

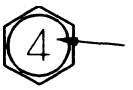
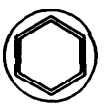
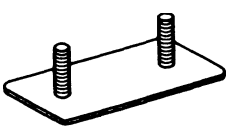
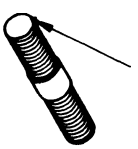
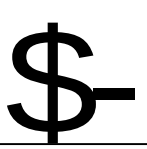
STANDARD BOLT & NUT TIGHTENING TORQUE

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.

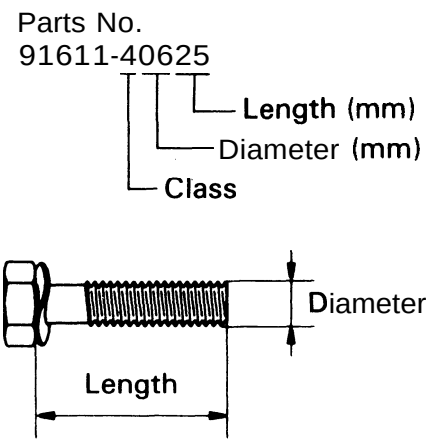
BOLT STRENGTH TYPE IDENTIFICATION METHOD

1. Identification by bolt shape

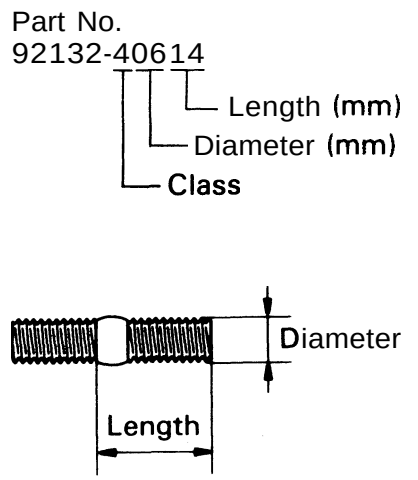
	Shape and class	Class
Hexagon head bolt	 Bolt head No.	4 = 4T 5 = 5T 6 = 6T 7 = 7T
	 No mark	4T
Hexagon flange bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Welded bolt		4T
Stud bolt	 No mark	4T
	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

2. Identification by part No.

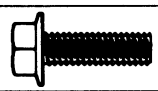
Hexagon head bolt

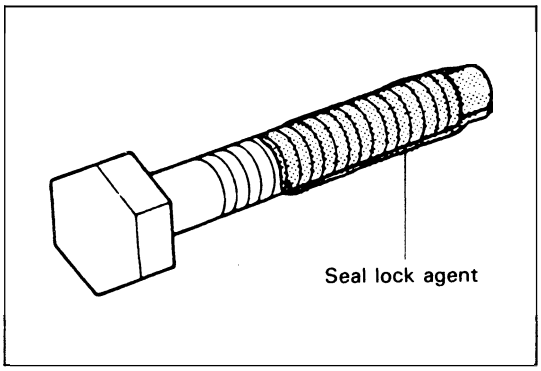


Stud bolt



TIGHTENING TORQUE TABLE

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt 			Hexagon flange bolt 		
			N·m	kg-cm	ft-lb	N·m	kg-cm	ft-lb
4T	6	1.0	5.4	55	48 in.-lb	5.9	60	52 in.-lb
	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.-lb			
	8	1.25	16	160	12			
	10	1.25	32	330	24	—	—	—
	12	1.25	59	600	43			
	14	1.5	91	930	67			
	16	1.5	137	1400	101			
6T	6	1.0	7.8	80	69 in.-lb	8.8	90	78 in.-lb
	8	1.25	19	195	14	21	215	16
	10	1.25	39	400	29	43	440	32
	12	1.25	72	730	53	79	810	59
	14	1.5	—	—	—	123	1250	90
7T	5	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	—	—	—



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) Parfectly 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

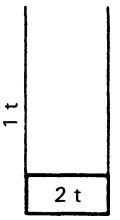
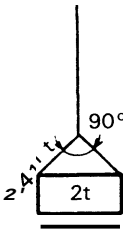
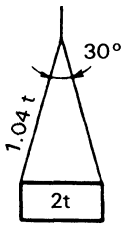
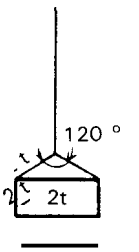
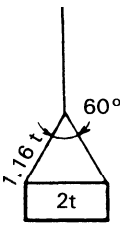
1. When connecting a high pressure hose, wipe the hose fitting and mating nipple contact surfaces with clean cloth to remove foreign matters and dirt. Also check no dent or other damage on the contact surfaces before installation.

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 (kg-cm) [ft-lb]		Hose inside diameter mm (in)
	Standard	Tightening range	
7/16 — 20UNF	25 (250) [18.11	24 - 26 (240 - 270) [17.4 ~ 19.51	6 (0.24)
9/16 — 18UNF	49 (500) [36.2]	47 - 52 (480 - 530) [34.7 ~ 38.31	9 (0.35)
314 — 16UNF	59 (600) [43.4]	56 - 62 (570 ~ 630) 141.2 ~ 45.61	12 (0.47)
718 — 14UNF	59 (600) 143.41	56 ~ 62 (570 ~ 630) 141.2 ~ 45.61	12 (0.47)
718 — 14UNF	78 (800) 157.91	74 - 82 (760 ~ 840) 155.0 ~ 60.81	15 (0.59)
1·1/16 — 12UNF	118 (1200) [86.8]	112 - 123 (1140 - 1250) [82.5 - 90.41	19 (0.75)
1·5/16 — 12UNF	137 (1400) [101.3]	130 - 144 (1330 ~ 1470) t96.2 ~ 106.41	25 (0.98)
PF1/4	25 (250) [18.1]	24 - 26 (240 - 270) [17.4 ~ 19.51	6 (0.24)
PF3/8	49 (500) [36.2]	47 - 52 (480 ~ 530) 134.7 ~ 38.31	9 (0.35)
PF1/2	59 (600) 143.41	56 - 62 (570 - 630) 141.2 ~ 45.61	12 (0.47)
PF3/4	118 (1200) [86.8]	112 ~ 123 (1140 - 1250) [82.5 - 90.41	19 (0.75)
PF1	137 (1400) [101.3]	130 - 144 (1330 - 1470) [96.2 ~ 106.41	25 (0.98)

WIRE ROPE SUSPENSION ANGLE LIST

Lifting angle	Tension	Compression	Suspension method	Lifting angle	Tension	Compression	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 (ton) [lb]

Rope diameter	Cutting load	Single-rope suspension	Two-rope suspension				Four-rope suspension			
		0°	0°	30°	60°	90°	0°	30°	60°	90°
6 mm (0.24 in)	21380 (2.18) [4807]	3040 (0.31) [683.6]	6080 (0.62) [1367]	5880 (0.6) [13231	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) [19851	8530 (0.87) [19181	7650 (0.78) [17201	6280 (0.64) 11411]	17650 (1.8) 139691	17060 (1.74) [3937]	15300 (1.56) 134401	12550 (1.28) [2322]
10 mm (0.4 in)	49230 (5.02) [11069]	6960 (0.71) [1565.61	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) [173871	10980 (1.12) [2469.5]	21570 (2.2) [4851]	21280 (2.1) [4631]	18630 (1.9) [4190]	14710 (1.5) [3308]	43150 (4.4) 197021	41190 (4.2) 19261]	37270 (3.8) I83791	29420 (3.0) [6615]
14 mm (0.56 in)	96400 (9.83) [21675]	13730 (1.4) [3087]	27460 (2.8) 161741	26480 (2.7) 159541	23540 (2.4) 152921	18630 (1.9) 141901	54920 (5.6) 1123481	52960 (5.4) [119071	47070 (4.8) [105841	37270 (3.8) [8379]

COMPONENTS WEIGHT

Unit: kg (lb)

Component		Weight (mass)
Engine	5K	97 (214)
	4Y	134 (295)
	1DZ	176 (388)
	2Z	240 (529)
Transmission		78 (172)
Torque converter	For 1 speed	152 (335)
	For 2 speeds	163 (359)
Balance weight	1.0 ton model	Approx. 460 (1014)
	1.35 ton model	Approx. 710 (1566)
	1.5 ton model	Approx. 845 (1863)
	1.75 ton model	Approx. 985 (2172)
	2.0 ton model	Approx. 1220 (2690)
	2.25 ton model	Approx. 1415 (3120)
	2.5 ton model	Approx. 1555 (3429)
	2.75 ton model	Approx. 1720 (3793)
	3.0 ton model	Approx. 1920 (4234)
V mast ASSY W/lift bracket (with lift cylinder, without fork, max. lifting height: 3000 mm (118 in))	1.0 – 1.75 ton model	Approx. 410 (904)
	2.0 ton model	Approx. 460 (1014)
	2.25.2.5 ton model	Approx. 500 (1103)
	2.75·3.0 ton model	Approx. 570 (1257)
V mast ASSY L/lift bracket and fork (with lift cylinder max. lifting height: 3000 mm (118 in))	1.0 – 1.75 ton model	Approx. 340 (750)
	2.0 ton model	Approx. 370 (816)
	2.25.2.5 ton model	Approx. 400 (882)
	2.75.3.0 ton model	Approx. 445 (981)

RECOMMENDED LUBRICANT QUANTITY & TYPES

Description		Classification	Type	Application	Quantity
Engine	Gasoline	API SD, SE	Motor oil SAE30 (SAE20 in cold area)	5K	4.0 l (1.06 US gal)
			SAE20W-40 (SAE10W-30 in cold area)	4Y	4.0 l (1.06 US gal)
	Diesel	API CC, CD or better	Diesel engine oil SAE30 (SAE20 in cold area)	1DZ	7.9 l (2.09 US gal)
			SAE10W-30	2Z	9.0 l (2.38 US gal)
Transmission		API GL-4 GL-5	Hypoid gear oil SAE85W-90	Clutch models	4.0 ℓ (1.06 US gal)
Torque converter		ATF	GM Dexron® II	Torque converter models	14.0 l (3.70 US gal)
Differential		API GL-4 GL-5	Hypoid gear oil SAE85W-90	1 ton series 2 ton series 3 ton series	5.4 ℓ (1.43 US gal) 6.4 ℓ (1.69 US gal) 9.0 ℓ (2.38 US gal)
Hydraulic oil [Max. fork height = 3000 mm (118 in)]		ISO VG32	Hydraulic oil	Attached Table 2 Hydraulic oil volume	
Fuel tank				1 ton series 2 ton series 3 ton series	45 l (11.9 US gal) 65 ℓ (17.2 US gal) 65 l (17.2 US gal)
Brake and clutch line			SAE J-1703 DOT-3	All models	Proper quantity Reservoir Tank 0.2 ℓ (0.05 US gal)
Chassis parts			MP grease	All models	Proper quantity
Coolant (excluding reservoir tank)		LLC	• LLC 30-50% mixture (for winter or all-season) • Coolant with rust-inhibitor (for spring, summer and autumn)	Attached Table 1 Coolant volume	
Coolant (Reservoir Tank)		↑	↑	All models	1.1 ℓ (0.29 US gal) (at Full level)

Attached Table ▮ Coolant volume Unit: *1* (US gal)

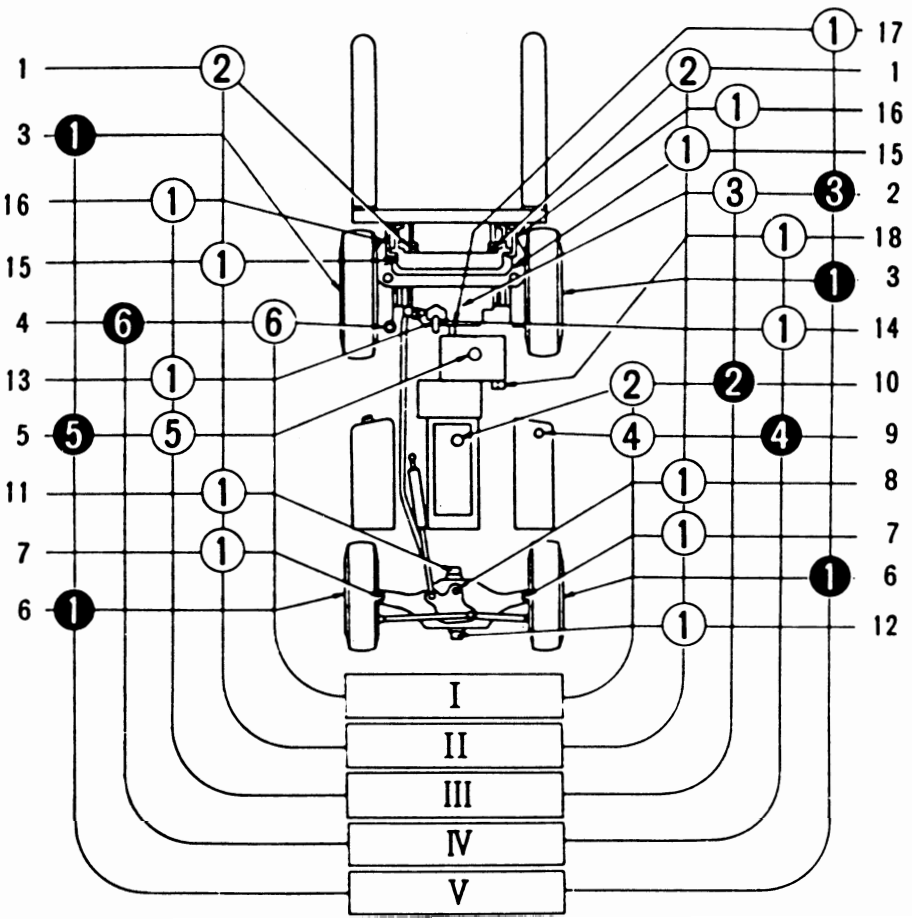
Engine	Drive method	1 ton series	2 ton series	3 ton series
5K	Clutch models	7.1 (1.87)	7.2 (1.90)	
	Torque converter models	7.6 (2.01)	7.3 (1.93)	
4Y	Clutch models	9.1 (2.40)	9.2 (2.43)	10.0 (2.64)
	Torque converter models	9.6 (2.53)	9.3 (2.46)	9.6 (2.53)
1DZ	Clutch models	7.8 (2.06)	8.6 (2.27)	8.7 (2.30)
	Torque converter models	8.1 (2.14)	8.3 (2.19)	8.3 (2.19)
2Z	Clutch models		8.9 (2.35)	9.3 (2.46)
	Torque converter models		9.0 (2.38)	8.9 (2.35)

Attached Table 2 Hydraulic oil volume Unit: *1* (US gal)

Model	1 ton series	2 ton series	3 ton series
5K engine models	27 (7.1)	34 (9.0)	
4Y engine models	27 (7.1)	34 (9.0)	37 (9.8)
1DZ engine models	27 (7.1)	34 (9.0)	37 (9.8)
2Z engine models		39 (10.3)	42 (11.1)

LUBRICATION CHART

Clutch Model

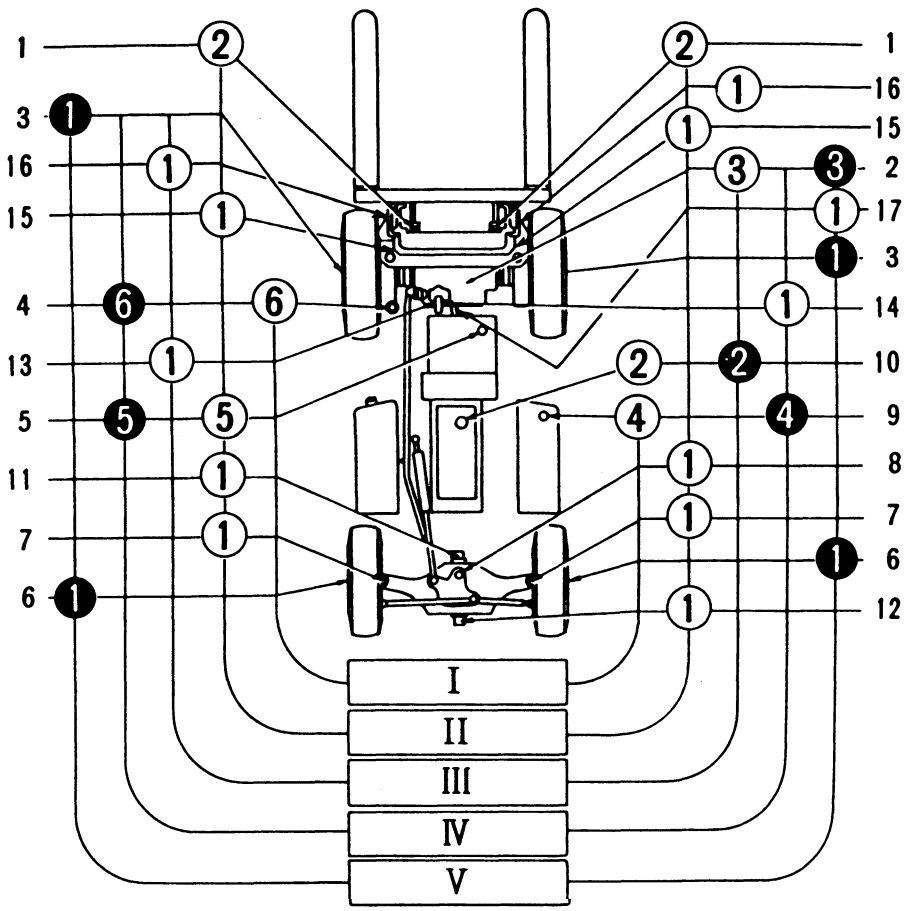


○ Inspection
● Replacement
① MP grease
② Engine oil
③ Hypoid gear oil
④ Hydraulic oil
⑤ Hypoid gear oil
⑥ Brake fluid

I. Inspect every 8 hours (daily)
II. Inspect every 40 hours (weekly)
III. Inspect every 170 hours (monthly)
IV. Inspect every 1000 hours (6 monthly)
V. Inspect every 2000 hours (annually)

1 Chain
2 Differential
3 Front wheel bearing
4 Brake and clutch master cylinder
5 Transmission case
6 Rear wheel bearing
7 Steering knuckle king pin
8 Bell crank pin
9 Oil tank
10 Engine crank case
11 Rear axle beam front
12 Rear axle beam rear
13 Tilt steering universal joint
14 Tilt steering locking mechanism
15 Mast support bushing
16 Tilt cylinder front pin
17 Propeller shaft
18 Gear shift link

Torque Converter Model



3 Inspection
Replacement
① MP grease
② Engine oil
③ Hypoid gear oil
4 Hydraulic oil
⑤ Automatic transmission fluid
⑥ Brake fluid

I. Inspect every 8 hours (daily)
II. Inspect every 40 hours (weekly)
III. Inspect every 170 hours (monthly)
IV. Inspect every 1000 hours (6monthly)
V. Inspect every 2000 hours (annually)

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 Bell crank pin
9 Oil tank
10 Engine crank case
11 Rear axle beam front
12 Rear axle beam rear
13 Tilt steering universal joint
14 Tilt steering locking mechanism
15 Mast support bushing
16 Tilt cylinder front pin
17 Propeller shaft

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 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / 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
	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

Item \ Inspection Period		Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
POWER TRANSMISSION SYSTEM					
Clutch	Clutch pedal play	M	←	←	←
	Abnormal sound and functioning (connection)	I	←	←	←
	Clutch master cylinder function and leak	I	←	←	←
	Fluid level	I	←	←	←
	Oil clutch mechanism function and leak			I	←
Transmission	Leak	I	←	←	←
	Fluid level	I	←	←	←
	Gear function and abnormal noise	I	←	←	←
Differential	Leak	I	←	←	←
	Oil level	I	←	←	←
	Bolt loosening				T
Torque converter and 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 ring and disc wheel damage	I	←	←	←
	Abnormal sound and looseness of front wheel bearing	I	←	←	←

Item \ Inspection Period		Every 1 month / Every 170 hours	Every 3 months / Every 500 hours	Every 6 months / Every 1000 hours	Every 12 months / Every 2000 hours
Wheel	Abnormal sound and looseness of rear wheel bearing	I	←	←	←
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
STEERING SYSTEM					
Steering wheel	Play and looseness	I	←	←	←
	Function	I	←	←	←
Gear box	Oil leak	I	←	←	←
	Looseness of mounting	T	←	←	←
	Clogging of relief valve filter			C	←
Rods, links and arm	Looseness and damage	I	←	←	←
	Linkage wear and mounting condition				I
Power Steering	Oil leak	I	←	←	←
	Mounting and linkage looseness	I	←	←	←
	Damage of power steering hose				I
Knuckle	King pin looseness	I	←	←	←
	Cracks and deformation				I
Steering shaft	Wheel alignment				M
	Left and right turning angle				M
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

Item	Inspection Period	Every 1 month	Every 3 months	Every 6 months	Every 12 months
		Every 170 hours	Every 500 hours	Every 1000 hours	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*'
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 bush				I
	Wear, damage and rotating condition of rollers	I	←	←	←
	Wear and damage of roller pins				I
	Wear and damage of mast strip	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	I	←	←	←
	Deformation and damage of rod, rod screw and rod end	I	←	←	←
	Cylinder operation	I	←	←	←
	Natural drop and natural forward tilt (hydraulic drift)	M	←	←	←

Item \ Inspection Period		Every 1 month	Every 3 months	Every 6 months	Every 12 months
		Every 170 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Cylinder	Oil leak and damage	I	←	←	←
	Wear and damage of pin and cylinder bearing	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	←	←	←

Item \ Inspection Period		Every 1 month	Every 3 months	Every 6 months	Every 12 months
		Every 170 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	←	←	←
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 conditon	I	←	←	←
Rear-view mirror	Dirt, damage	I	←	←	←
	Rear reflection status	I	←	←	←
Seat	Loosening and damage of mounting	I	←	←	←
Body	Damage and cracks of frame, cross members, etc.				I
	Bolt looseness				T
Others	Grease up	L	←	←	←

PERIODIC REPLACEMENT OF PARTS AND LUBRICANTS

●: Replacement

Interval / Item	Every 1 month Every 170 hours	Every 3 months Every 500 hours	Every 6 months Every 1000 hours	Every 12 months Every 2000 hours
Engine oil	●	←	←	←
Engine oil filter		●	←	←
Engine coolant (every 2 years for LLC)		●	←	←
Fuel filter			●	←
Torque converter oil			●	←
Torque converter oil filter			●	←
Transmission oil				●
Differential oil				●
Hydraulic oil			●	←
Hydraulic oil return 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

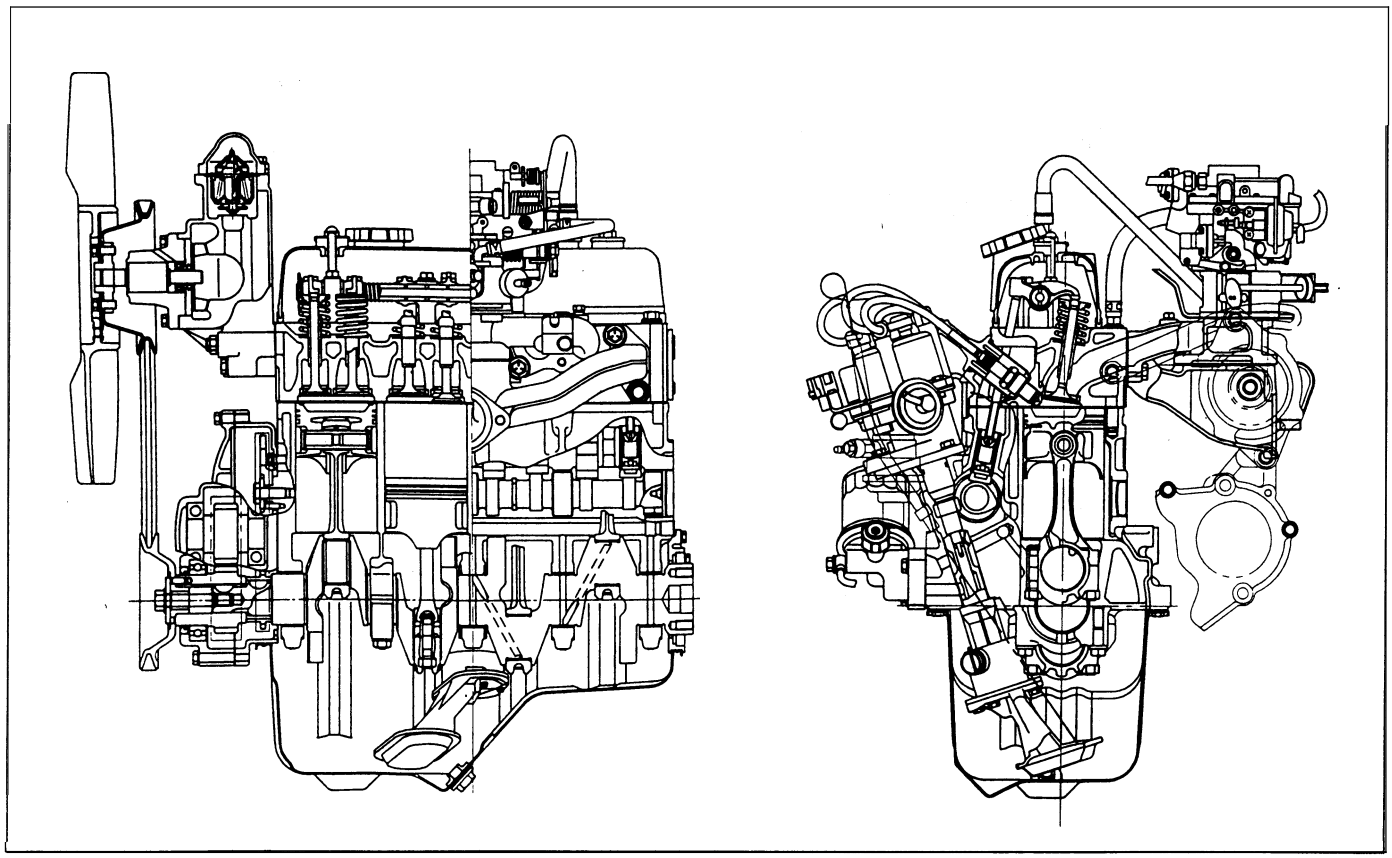
*1: for new vehicle *2: Every 2 years *3: Every 3 years

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

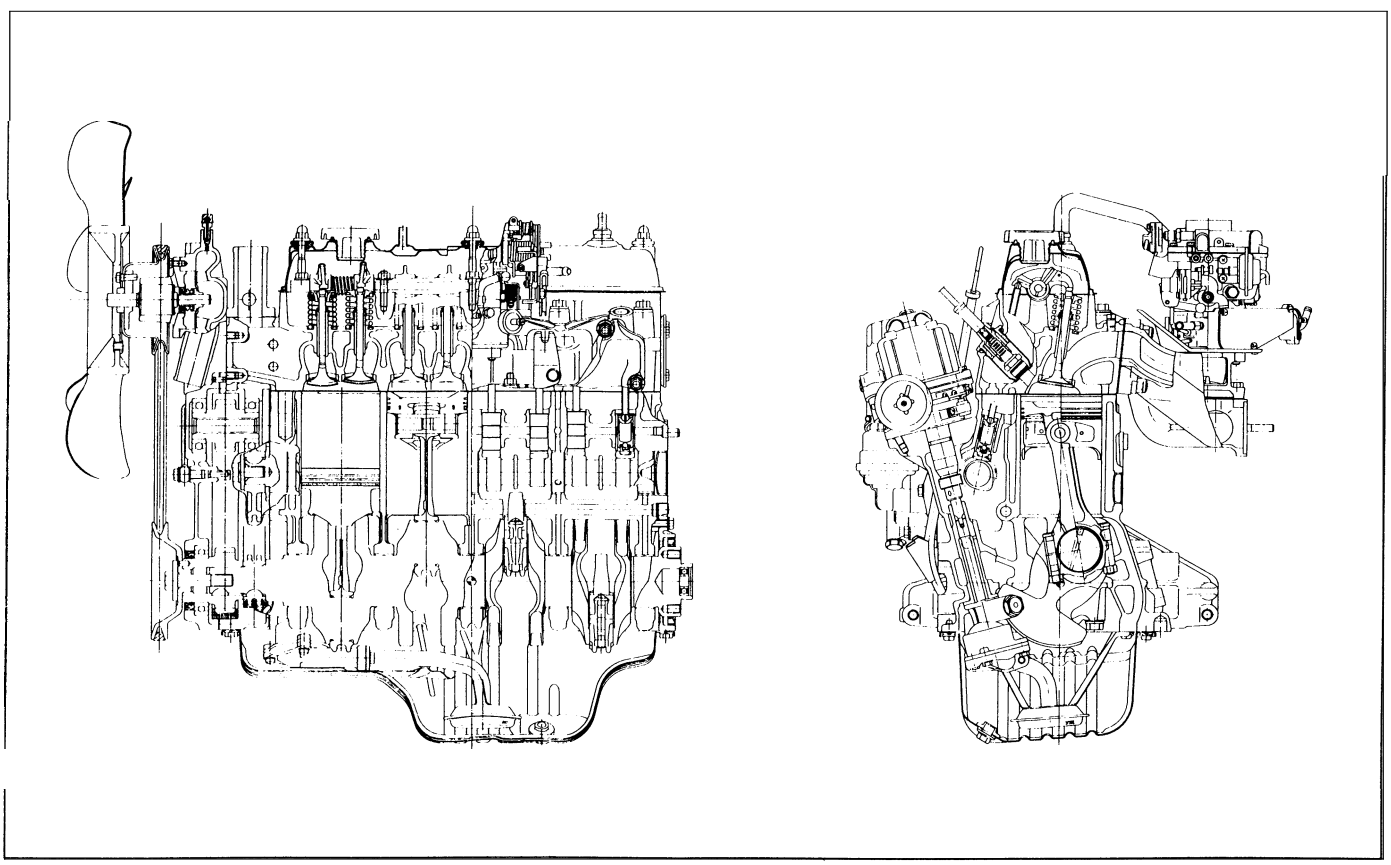
ENGINE

ENGINE SECTIONAL VIEWS

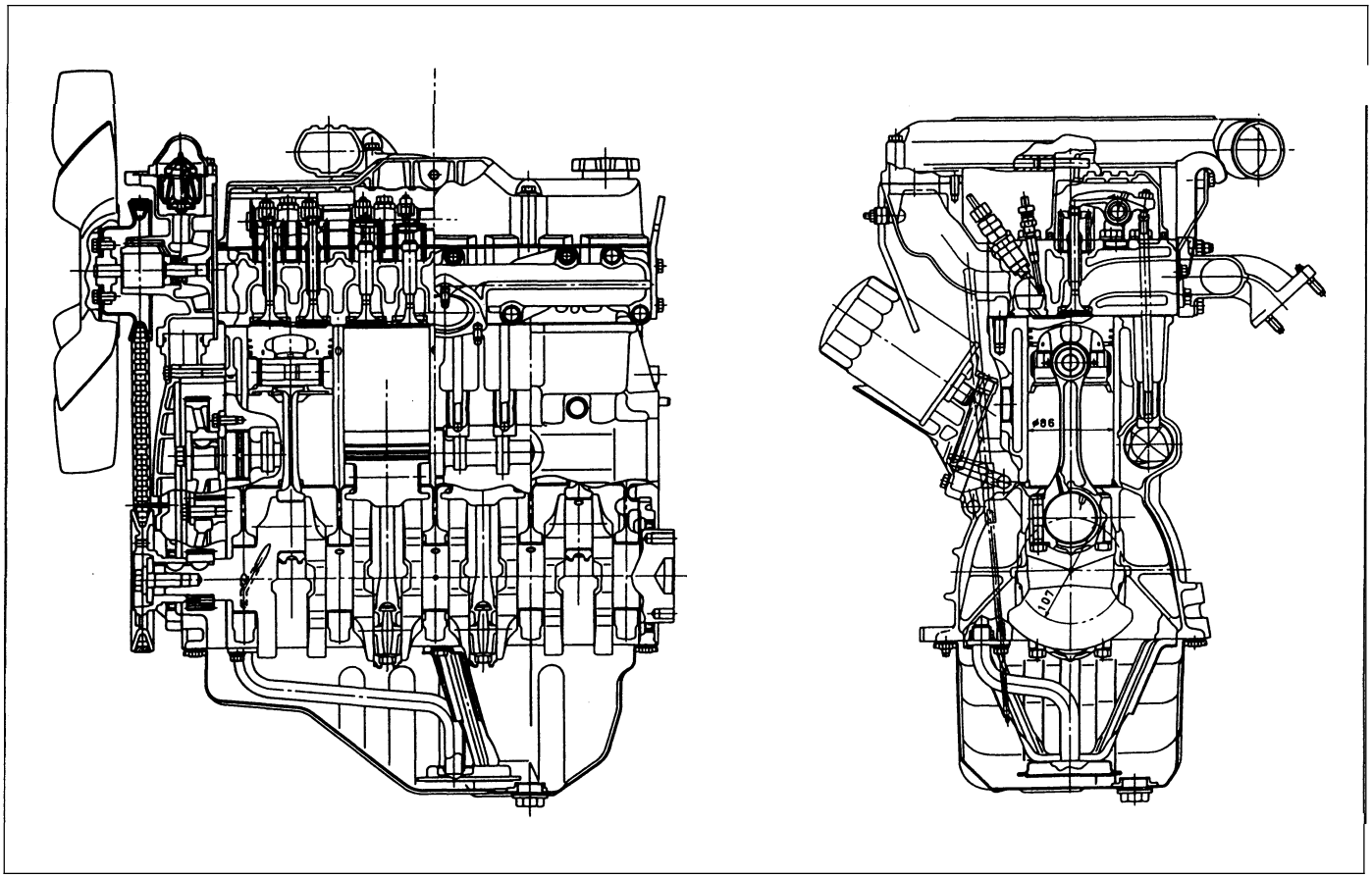
5K Engine



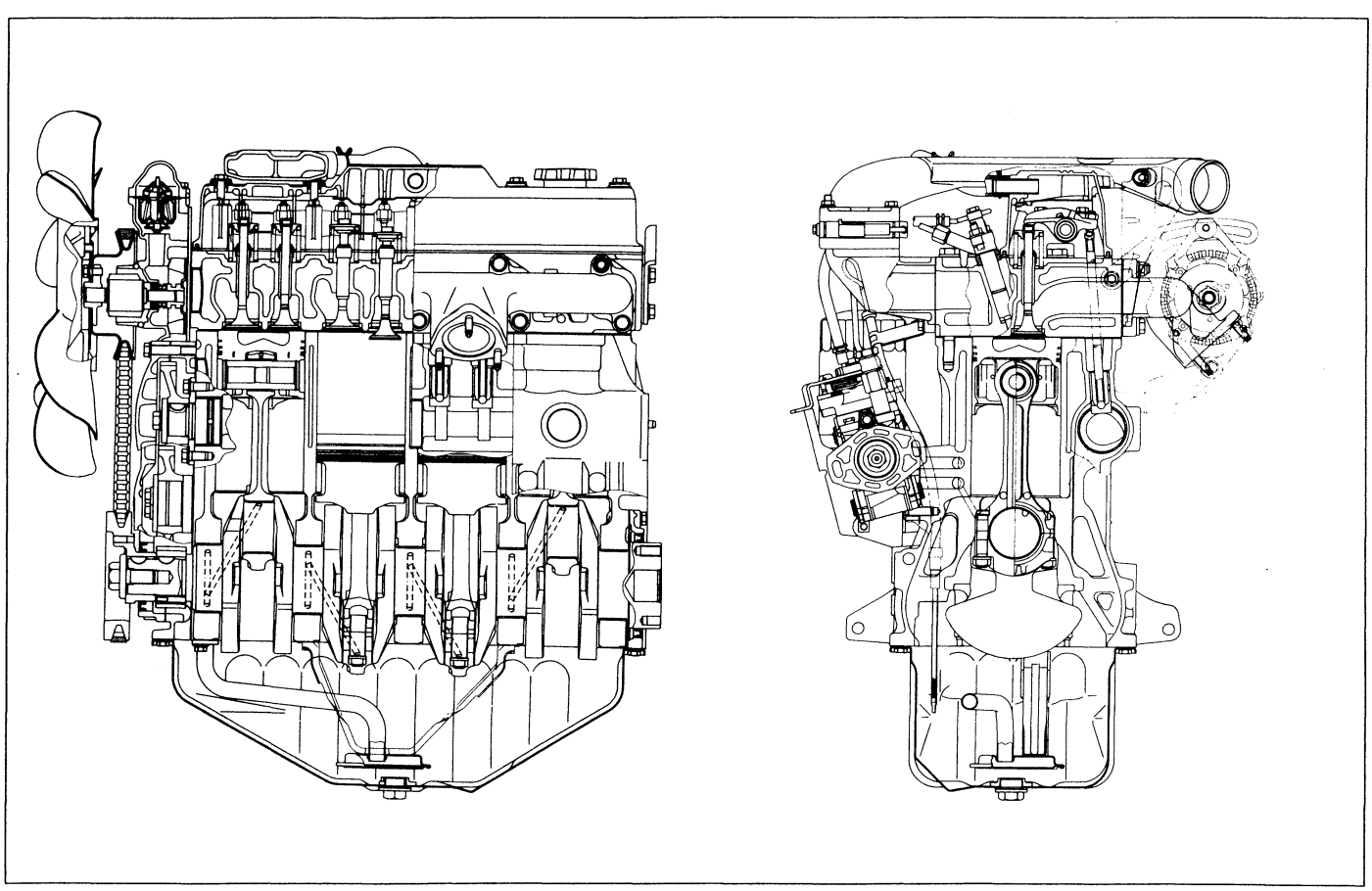
4Y Engine



1DZ Engine



22 Engine



MAJOR SPECIFICATIONS

Gasoline Engines

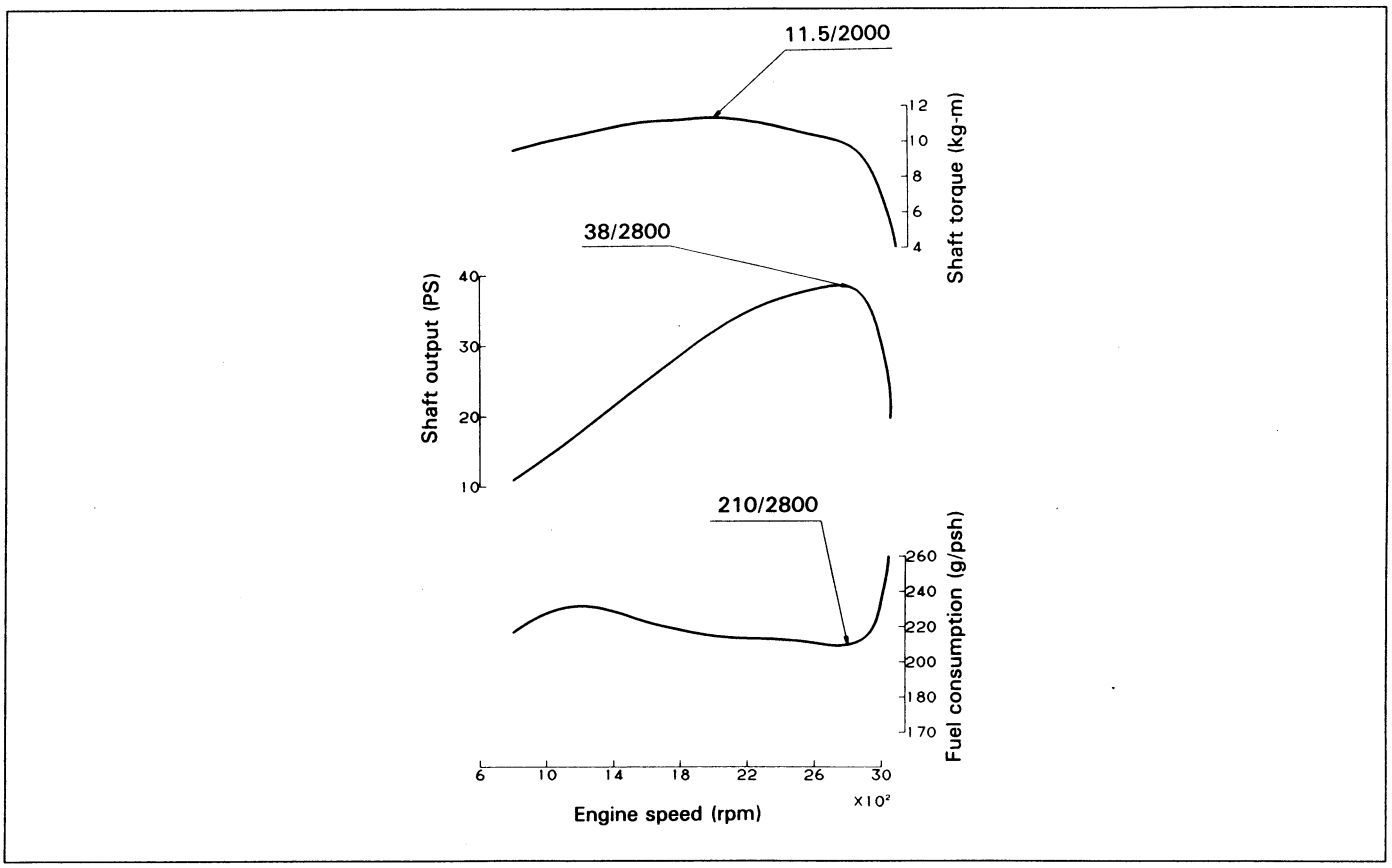
Item \ Engine	5K	4Y (1.2 ton series)	4Y (3 ton series)
Engine type	Gasoline 4-cycle	←	←
Number of cylinders and arrangement	Inline 4 cylinders ·longitudinal	←	←
Combustion chamber type	Wedge type	←	←
Valve mechanism	OHV·chain-driven	←	←
Bore *x* stroke mm (in)	80.5 x 73.0 (3.169 *x* 2.874)	91.0 x 86.0 (3.583 x 3.386)	←
Total displacement cc (cu-in)	1486 (90.68)	2237 (136.51)	←
Compression ratio	9.3	8.8	←
Maximum power PS/rpm	3812800	5412400	5812600
Maximum torque kg-m/rpm	11.512000	16.511800	←
Minimum specific fuel consumption g/PS-h (rpm)	210 (2800)	200 (2300)	←
Service weight N (kg) [lb]	951 (97) [214]	1314 (134) [295]	←
No-load maximum rpm rpm	3050	2600	2800

Diesel Engines

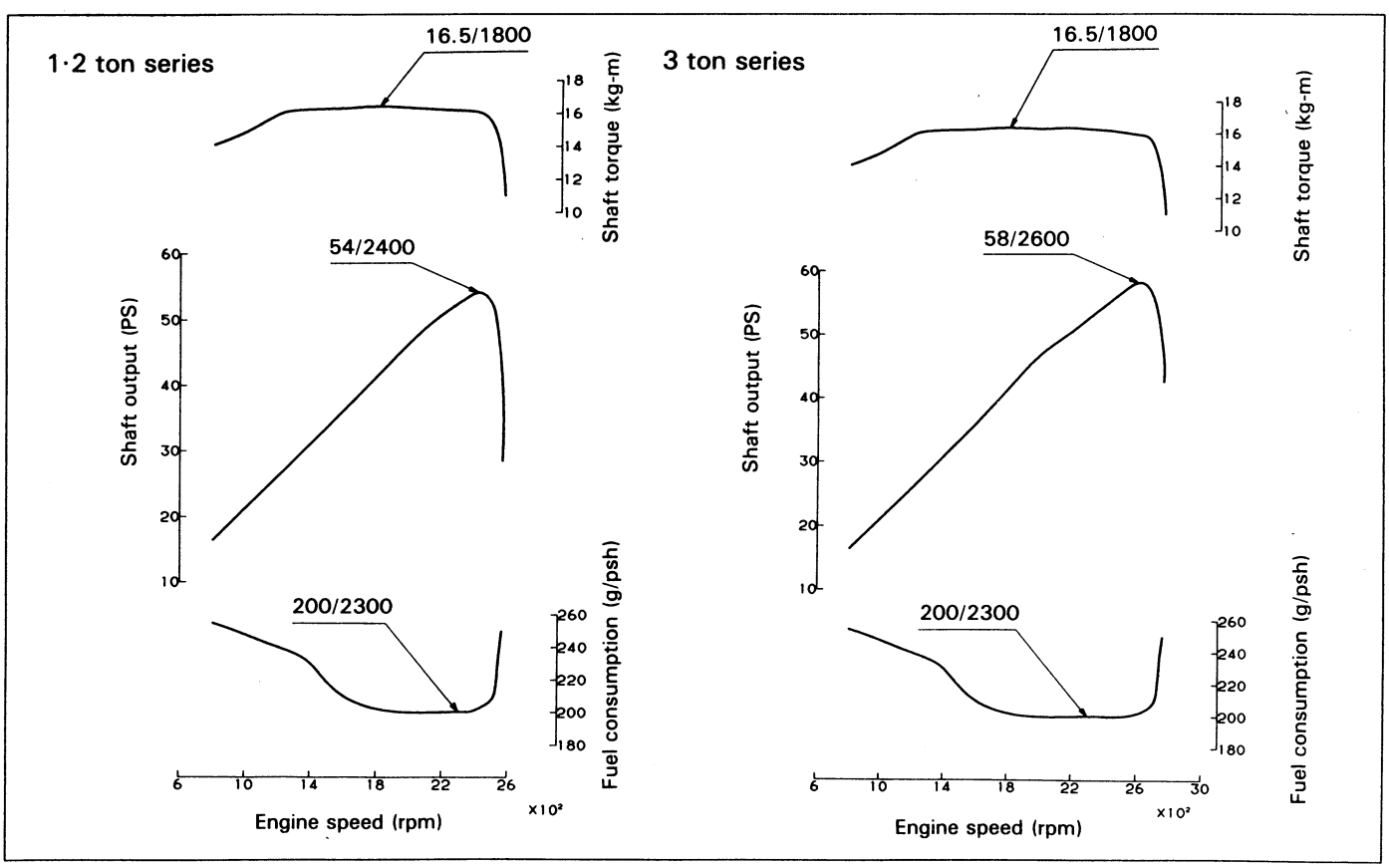
Item \ Engine	1DZ (1 ton series)	1DZ (2·3 ton series)	22
Engine type	Diesel.4-cycle	←	←
Number of cylinders and arrangement	Inline 4 cylinders .longitudinal	←	←
Combustion chamber type	Whirl chamber type	←	Direct injection type
Valve mechanism	OHV·gear-driven	←	←
Bore *x* stroke mm (in)	86.0 x 107.0 (3.386 x 4.213)	←	98.0 x 115.0 (3.858 x 4.528)
Total displacement cc (cu-in)	2486 (151.71)	←	3469 (211.69)
Compression ratio	21.5	←	18.6
Maximum power PS/rpm	5512400	6012600	6612200
Maximum torque kg-m/rpm	17.011600	←	22.011600
Minimum specific fuel consumption g/PS-h (rpm)	185 (1400)	←	154 (1600)
Service weight N (kg) [lb]	1726 (176) [388]	←	2345 (240) [529]
No-load maximum rpm rpm	2600	2800	2400

ENGINE PERFORMANCE CURVES

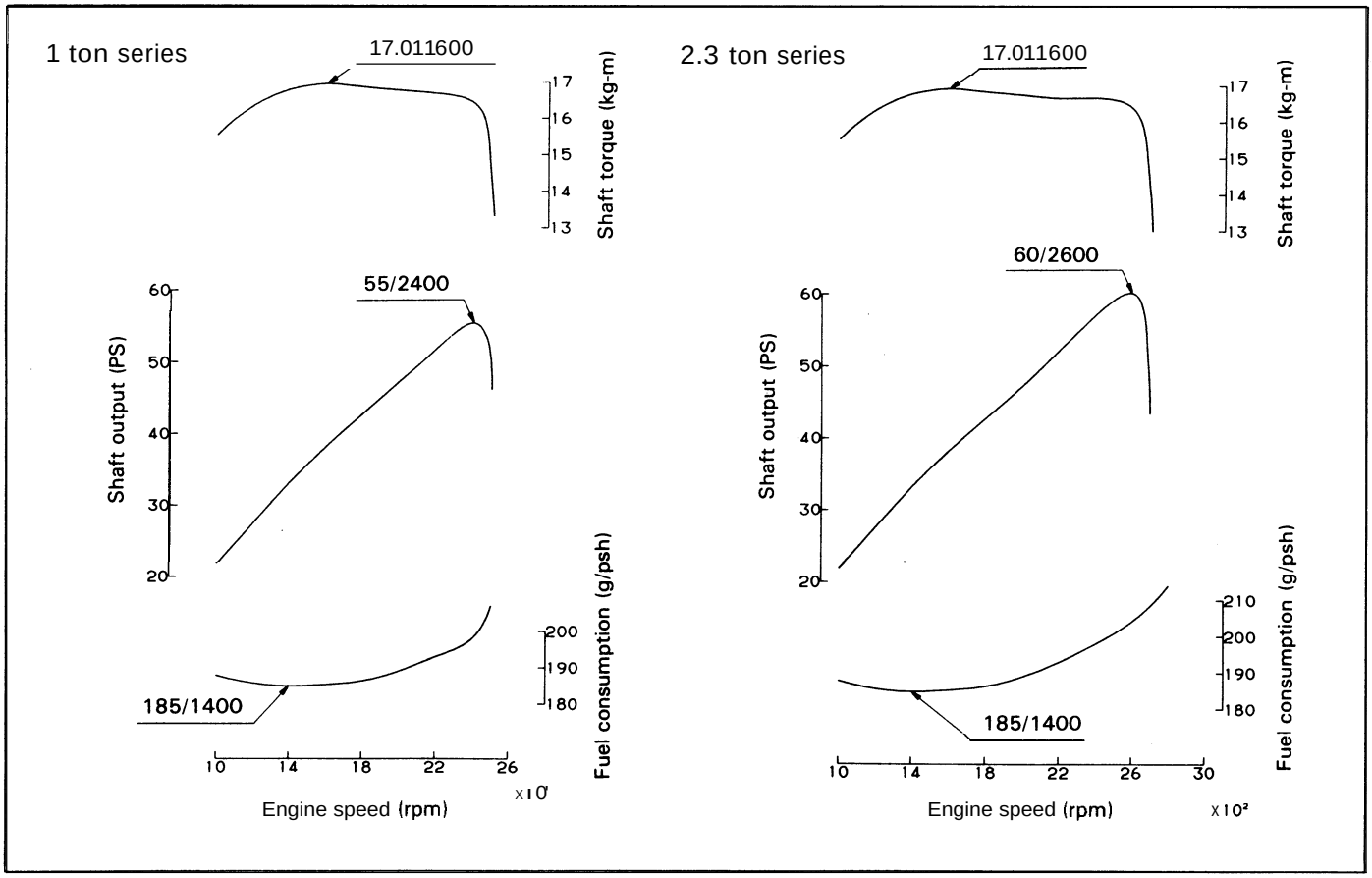
5K Engine



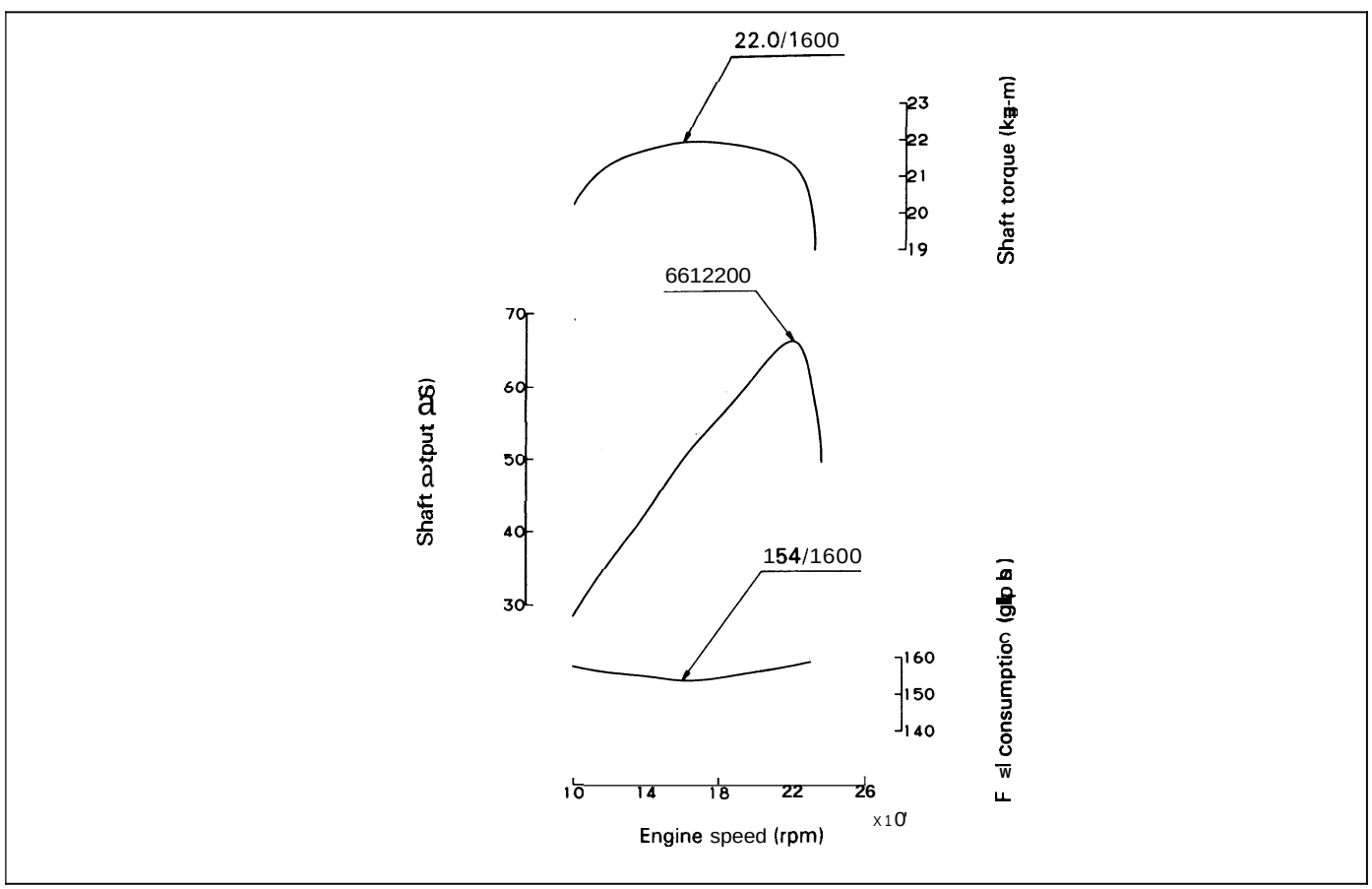
4Y Engine



1DZ Engine

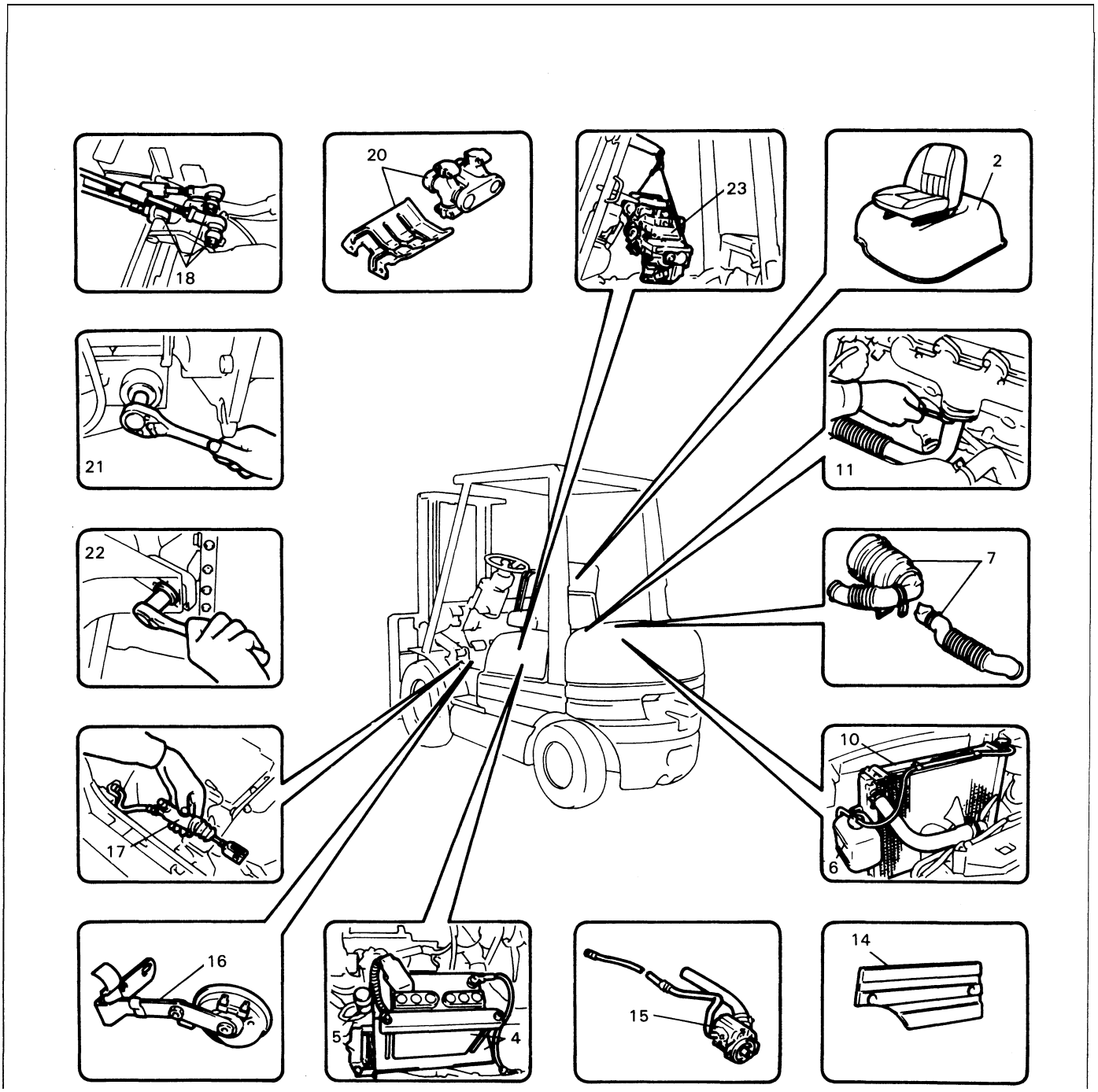


2Z Engine



ENGINE ASSY

ENGINE W/TRANSMISSION REMOVAL·INSTALLATION



1 Radiator cover
3 Toe board
8 Under cover and tire cover
9 Coolant
12 Fuel hose
13 Accelerator wire
19 Electrical wiring

Removal Procedure

1 Remove the radiator cover.

2 Remove the engine hood.

3 Remove the toe board.

4 Remove the battery and battery case.

5 Disconnect the electrical parts wiring, and remove the bracket W/electrical parts.
(Keep the fuse box free by removing the set bolts.)

6 Remove the radiator reservoir tank.

7 Remove the air cleaner. [Point 1]

8 Remove the undercover and tire cover RH.
(Only 2Z engine models)

9 Drain the coolant.

10 Remove the radiator.

11 Disconnect the exhaust pipe.

12 Disconnect the fuel hose. [Point 2]

13 Disconnect the accelerator wire. (Disconnect on the carburetor side on gasoline engine models, or on the injection pump side on diesel engine models.)

14 Remove the frame side covers RH (rear and front).

15 Remove the oil pump W/pump hose.

16 Remove the horn.

17 Disconnect the clutch release cylinder from the clutch housing and keep it free.

18 Disconnect the gear shift lever link rod. [Point 3]

19 Disconnect electrical wiring.

20 Remove the propeller shaft cover and propeller shaft.

21 Remove the transmission mounting set bolts.

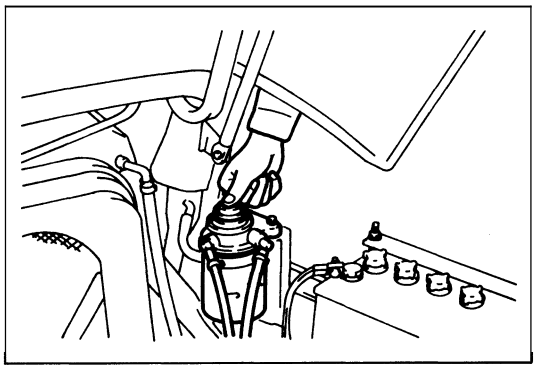
22 Remove the engine mounting set nuts.

23 Remove the engine W/transmission. [Point 4]

Installation Procedure

The installation procedure is the reverse of the removal procedure.

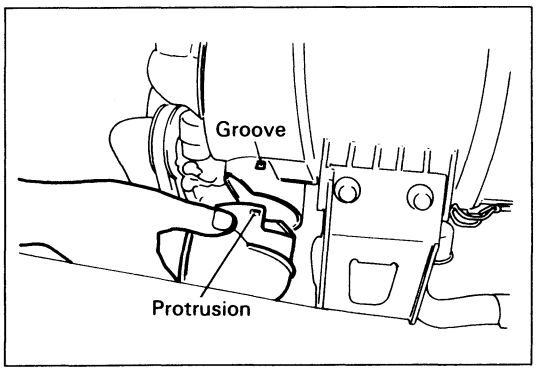
Note:
Bleed air from the fuel system after engine installation. (In diesel engine models only)



Bleeding Air from Fuel System (Diesel Engine Models)

1DZ·2Z engine

1. Operate the fuel filter hand pump until the pump operation becomes heavy to indicate the end of air bleeding.

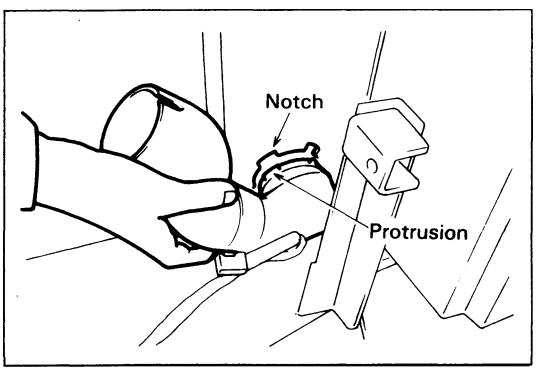


Point Operations

[Point 1]

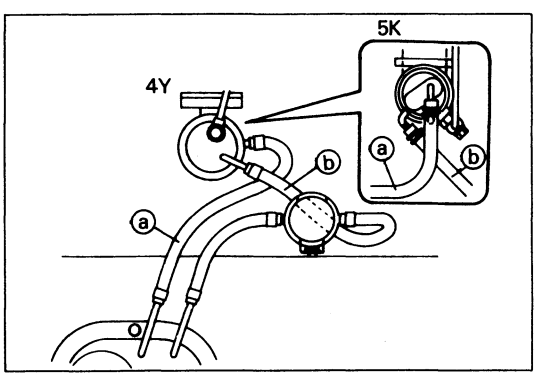
Removal·Installation: Remove the air cleaner inlet side connector as follows.

1. Disconnect the connector on the air cleaner case side.
   (1) Hold the connector elbow portion with a hand, and pull downward until the connector side protrusion comes off from the groove on the case side.



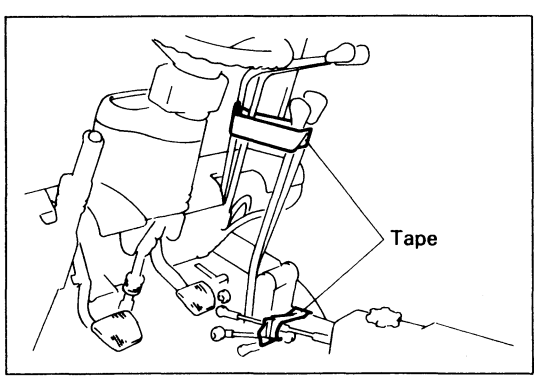
2. Disconnect the head guard pillar side connector.
   (1) Rotate the connector upward as illustrated and disconnect at the position where the pillar side notch aligns with the connector flange protruded portion.

3. Reverse the removal procedure for installation.



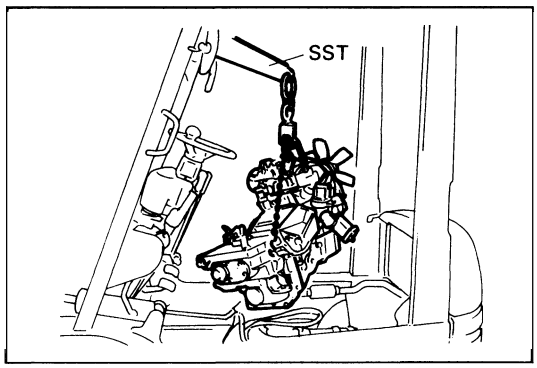
[Point 2]

Installation: Do not mistake the fuel hose connecting position. (Gasoline engine models)



[Point 3]

Removal: Wrap each of the disconnected rod and the freed shift lever with tape for holding in place.



[Point 41

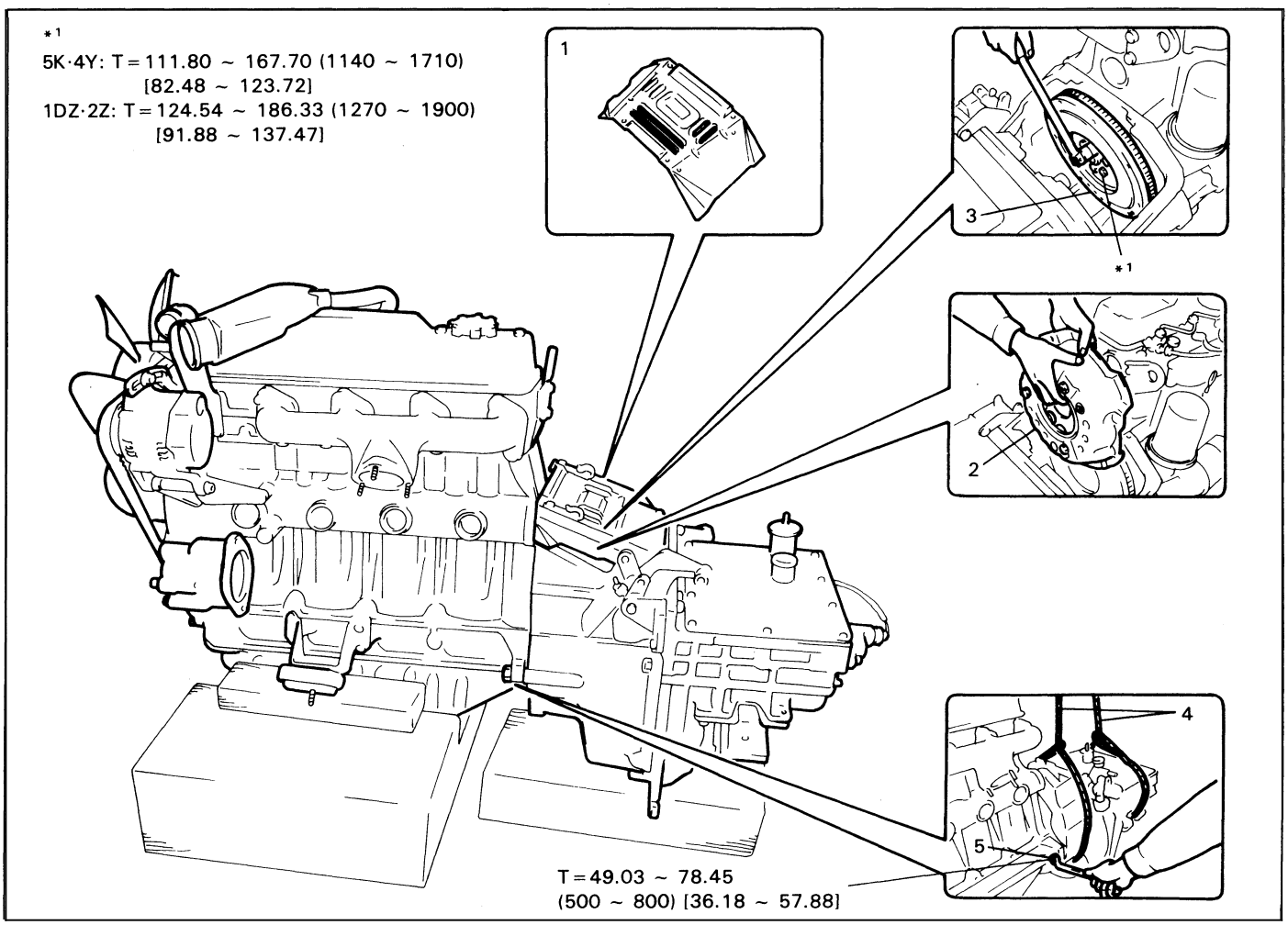
Removal·Installation: SST 09010-20111-71
In the case of the 5K engine, use the SST above and a sling device (SST 09090-04010) for more efficient operation.

Removal: Remove after checking thorough disconnection of wiring, hose and cables.

ENGINE REMOVAL·INSTALLATION (TRANSMISSION MODELS)

Note:
The procedures described here are for the jobs after disconnection in the engine **W/transmission** state.

T = N·m (kg-cm) [ft-lb]



Removal Procedure

1 Remove the clutch housing cover.

2 Remove the clutch disc and clutch cover. (See Clutch Cover Removal section on page 2-5.)

3 Remove the flywheel.

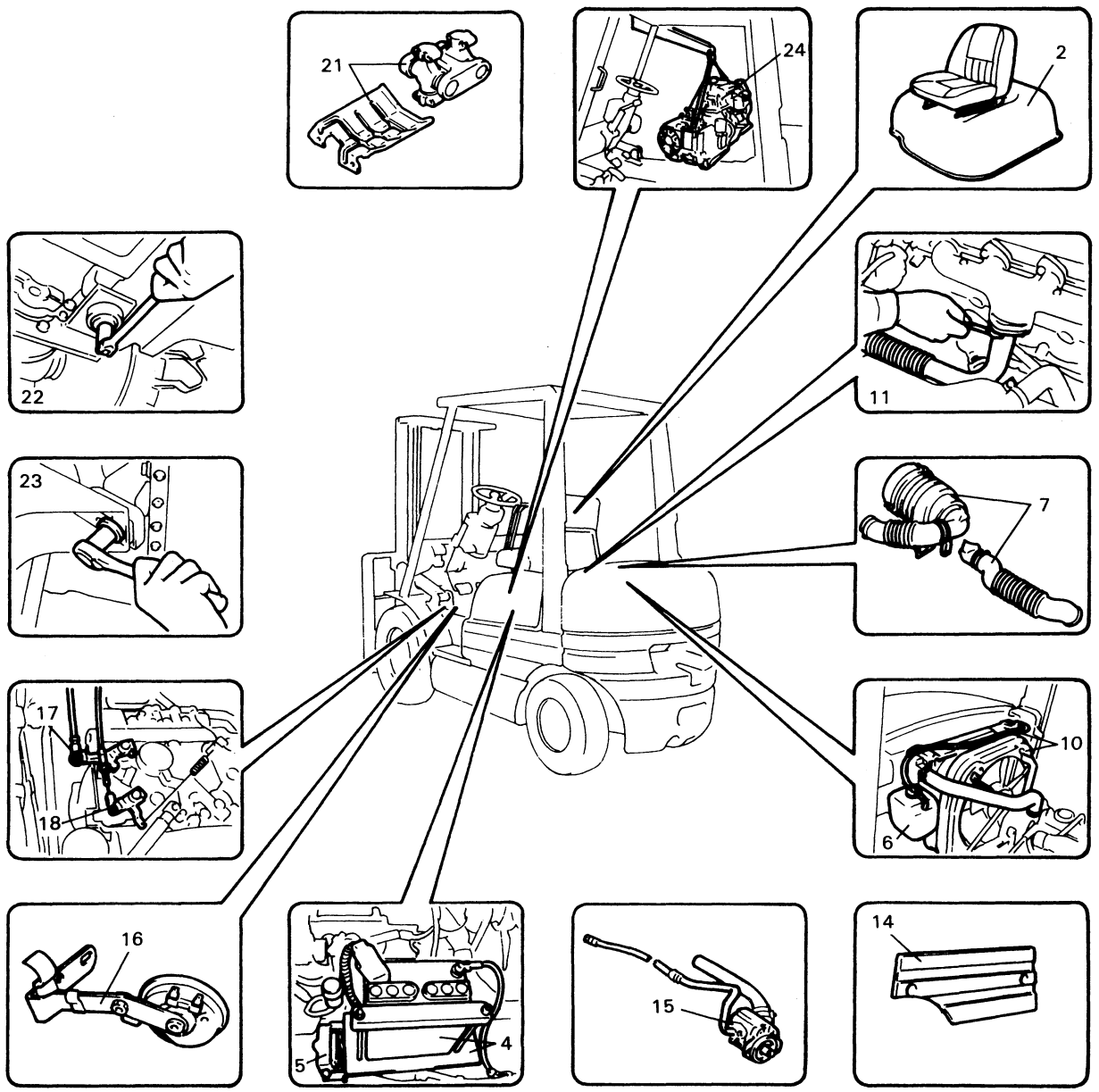
4 Slightly hoist the clutch housing W/transmission.

5 Remove the clutch housing and engine coupling bolts to disconnect the clutch housing W/transmission, and remove the engine.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

ENGINE W/TORQUE CONVERTER REMOVAL·INSTALLATION



1 Radiator cover
3 Toe board
8 Undercover and tire cover
9 Coolant
12 Fuel hose
13 Accelerator wire
19 Torque converter cooler hose
20 Electrical wiring

Removal Procedure

1 Remove the radiator cover

2 Remove the engine hood.

3 Remove the toe board.

4 Remove the battery and battery case.

5 Disconnect the electrical parts wiring, and remove the bracket W/electrical parts. (Keep the fuse box free by removing the set bolts.)

6 Remove the radiator reservoir tank.

7 Remove the air cleaner. **[Point 11**

8 Remove the undercover and tire cover RH. (Only 2Z engine models)

9 Drain the coolant.

10 Remove the fan shroud and radiator.

11 Disconnect the exhaust pipe.

12 Disconnect the fuel hose. **[Point** 21

13 Disconnect the accelerator wire (on the carburetor side in gasoline engine models, or on the injection pump side in diesel engine models).

14 Remove the frame side covers RH (rear and front).

15 Remove the oil pump W/pump hose.

16 Remove the horn.

17 Disconnect the shift lever link rod.

18 Disconnect the inching wire.

19 Disconnect the torque converter cooler hose.

20 Disconnect electrical wiring.

21 Remove the propeller shaft cover and propeller shaft.

22 Remove torque converter mounting set bolts.

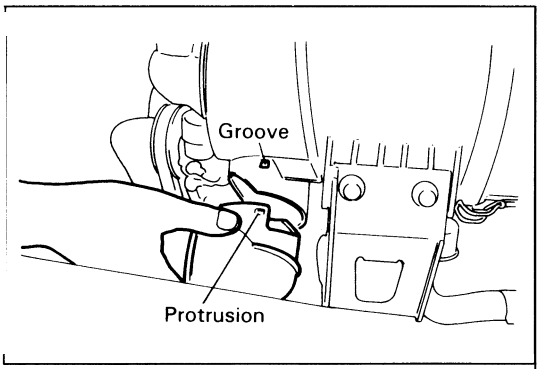
23 Remove engine mounting set nuts.

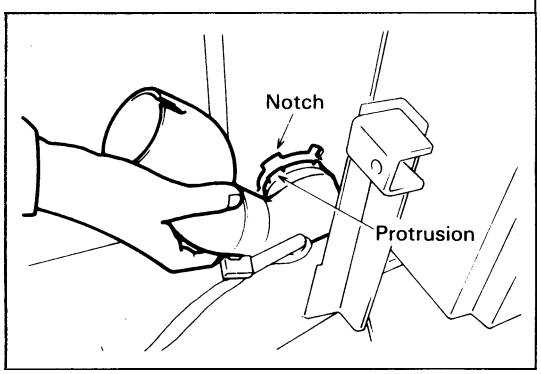
24 Remove the engine W/torque converter. **[Point** 31

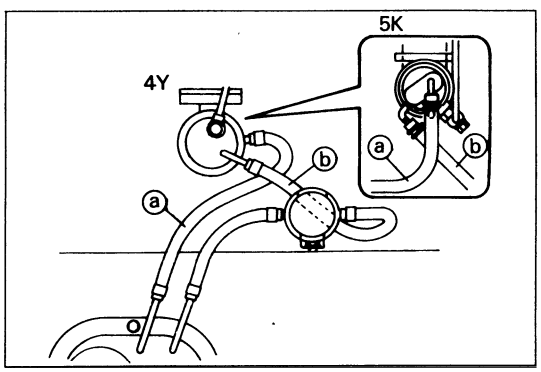
Installation Procedure

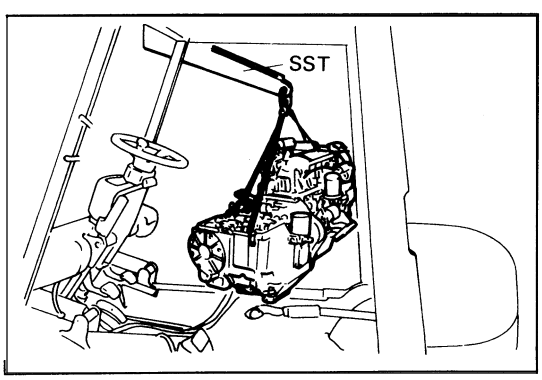
The installation procedure is the reverse of the removal procedure.

Note:
Carry out the following job after engine installation:
- **Air bleeding from fuel system (in diesel engine models only) (See page 1-9.)**
- **Inching wire adjustment (See Page 10-30.)**









Point Operations

[Point 1]

Removal·Installation: Disconnect the air cleaner inlet side connector as follows:

1. Disconnect the air cleaner case side connector.
   (1) Hold the connector elbow portion with a hand, and pull downward until the connector protruded portion comes off from the groove on the case side.

2. Disconnect the head guard pillar side connector.
   (1) Rotate the connector upward and remove when the pillar side notch is aligned with the connector flange protruded portion.

3. Reverse the removal procedure for installation.

[Point 2]

Installation: **Do not mistake the fuel hose connecting position. (Gasoline engine models)**

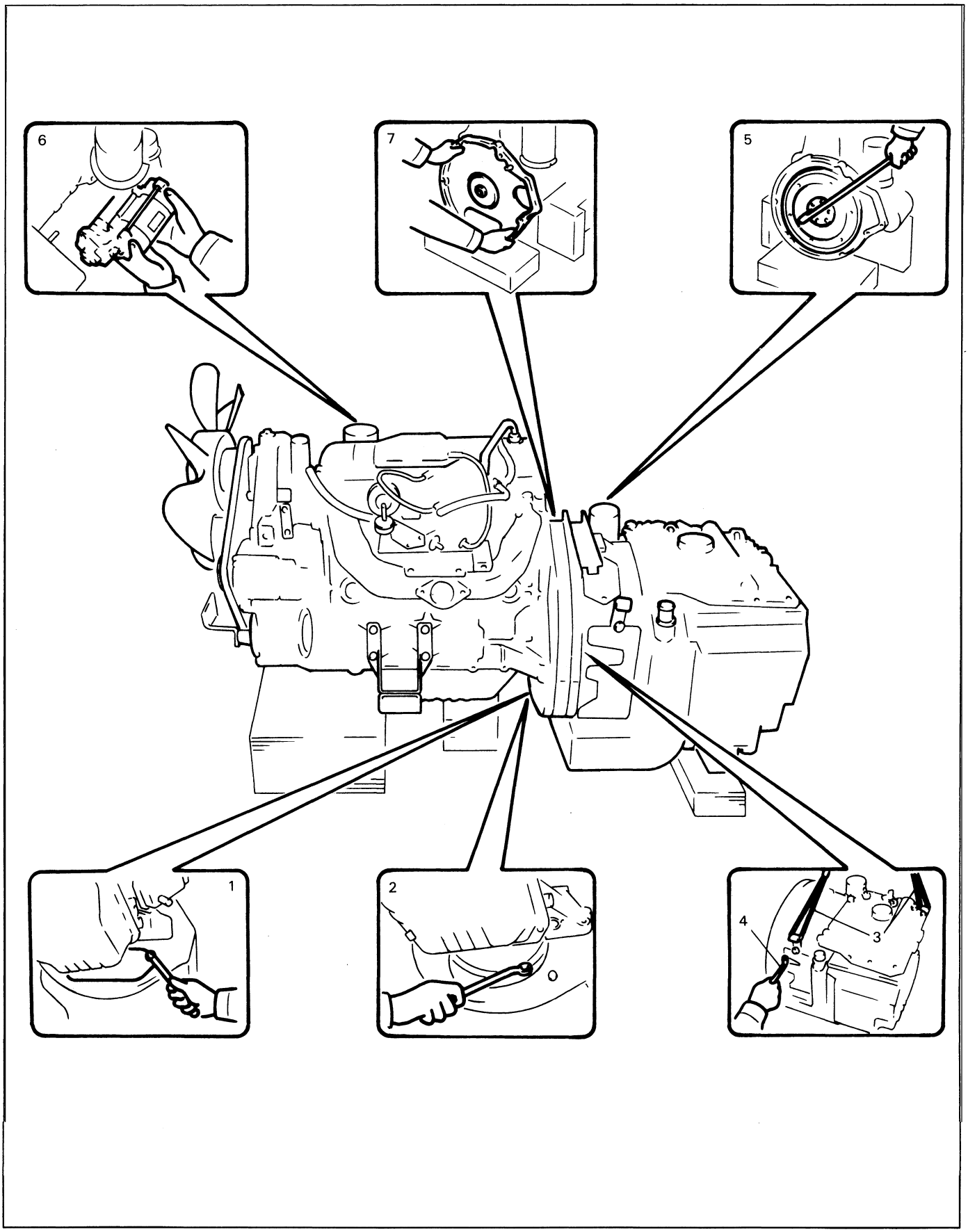
[Point 3]

Removal·Installation: SST 09010-20111-71
In the case of the 5K engine, use a sling device (SST 09090-04010) in addition to the SST above for more efficient operation.

Removal: Remove after checking thorough disconnection of the wiring, hoses and cables.

ENGINE REMOVAL·INSTALLATION (TORQUE CONVERTER MODELS)

Note:
The procedure described here covers the jobs after removing the engine W/torque converter.



Removal Procedure

1 Remove the cover plate.

2 Remove the drive plate set bolts (6 pcs.). **[Point 1]**

3 Slightly hoist the torque converter housing.

4 Remove the torque converter housing and engine connecting bolts to disconnect the torque converter housing, and remove the engine.

5 Remove the flywheel.

6 Remove the starting motor.

7 Remove the torque converter end plate.

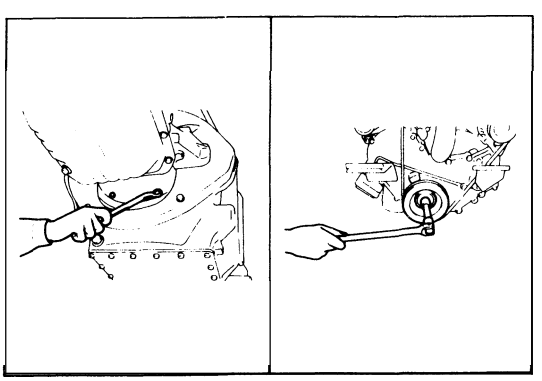
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Tighten the flywheel set bolts after applying thread tightener *(08833-00070).***
- **The tightening torque for each part is as follows:**

Unit: N·m (kg-cm) [ft-lb]

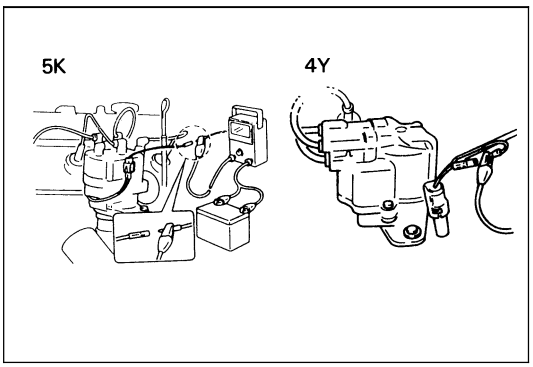
Torque converter end plate set bolt	49.03 – 78.45 (500 – 800) [36.18 – 57.881
Drive plate set bolts (for connecting to the engine crankshaft)	5K·4Y: 56.88 – 64.72 (580 – 660) [41.96 ~ 47.751 1DZ·2Z: 76.49 – 93.16 (780 – 950) [56.43 – 68.731
Drive plate set bolts (flywheel set bolts) (for connecting to torque converter)	14.71 – 21.57 (150 – 220) [10.85 ~ 15.921
Torque converter housing set bolts	29.42 – 44.13 (300 – 450) [21.71 – 32.561

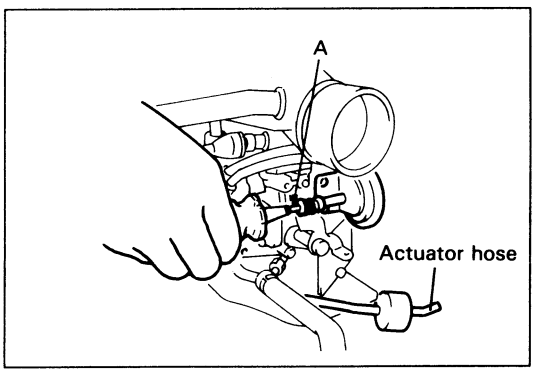


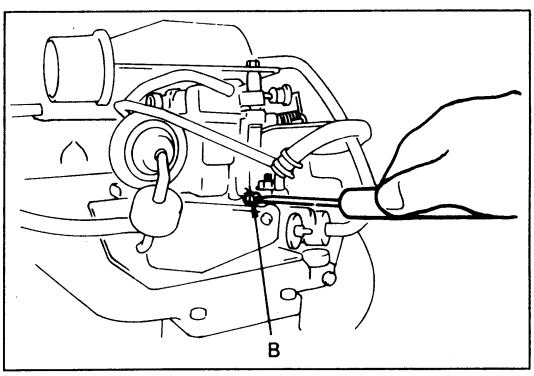
Point Operations

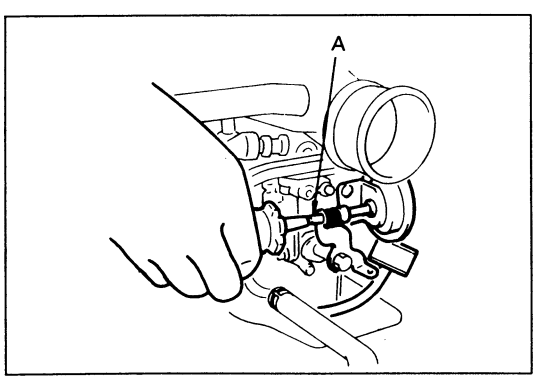
[Point 1]

Removal·Installation: Rotate the flywheel by using a crankshaft pulley set bolt.









ENGINE SPEED ADJUSTMENT

5K·4Y Engine

Idle up and Idling Speed Inspection and Adjustment

1. Warm up the engine.

   Coolant temperature: **80°C (176°F)** or above
   Engine oil: **70°C (158°F)** or above
   Hydraulic oil temperature: **50°C (122°F)** or above
   Auto choke cancellation

2. Install the engine tachometer

3. Inspect and adjust the idle up speed.
   (1) Disconnect the idle up actuator hose and inspect the idle up speed.

   5K-4Y
   Clutch model: 1350 ± 25 rpm
   Torque converter model: 1250 ± 25 rpm
   (2) Turn the adjusting screw (A) to adjust the idle up speed.

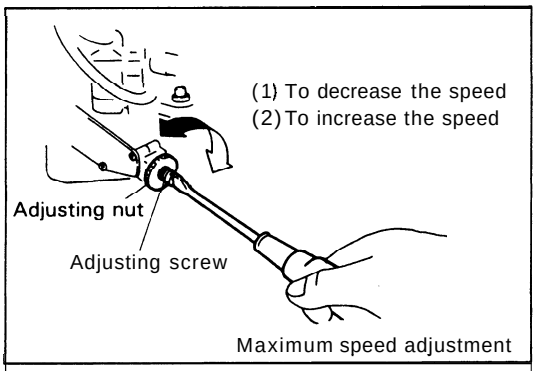
   Increasing the speed: Clockwise turn
   Decreasing the speed: Counterclockwise turn
   (3) Connect the idle up actuator hose.

4. Inspect and adjust the idling speed.
   (1) Inspect the idling speed.

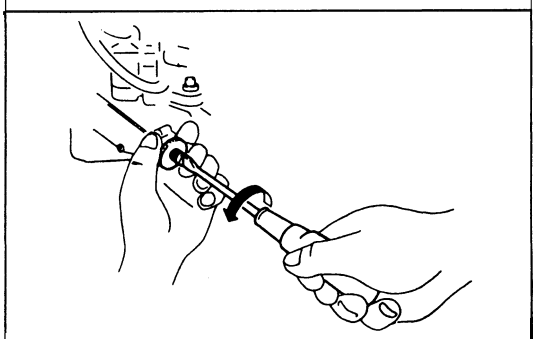
   Idling speed
   5K-4Y: 750 $^{+50}_{0}$ rpm
   (2) Turn the idle adjusting screw (B) to adjust the idling speed.
   (3) If the speed cannot be decreased by turning 'the adjusting screw (B), make adjustment as follows:

   1 Raise the coolant temperature when the auto choke cam is in contact with the throttle lever roller.

   2 When the idle up actuator rod is in contact with the adjusting screw (A), turn the adjusting screw counterclockwise.



Maximum speed adjustment


Relief speed adjustment

No-load Maximum Speed Inspection and Adjustment

1. Warm up the engine.

   Coolant temperature: **80°C** (1**76°F)** or above
   Engine oil temperature: **70°C (158°F)** or above
   Hydraulic oil temperature: **50°C (122°F)** or above

2. Install the engine tachometer.

3. Inspect the no-load maximum speed.

   No-load maximum speed
   5K: 3050 ± 50 rprn
   4Y (1·**2** ton series): 2600 ± 50 rprn
   4Y (3 **ton** series): 2800 ± 50 rprn

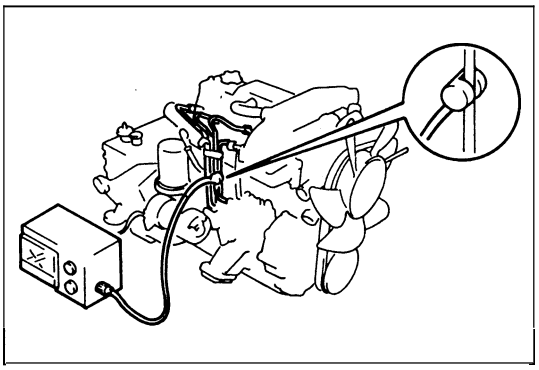
4. Adjust the no-load maximum speed.
   (1) Remove the sealing wire.
   (2) Fully depress the accelerator pedal, and make adjustment by means of the air governor adjusting nut and screw.

5. Inspect the relief speed.
   (1) Operate the material handling lever when the engine is running at the maximum speed and measure the engine speed in the full relief state. Confirm that the speed decrease (relief down) satisfies the following value:

   Engine speed down at full relief
   5K: 250 rprn or less
   4Y (1.2 ton series): 250 rprn or less
   4Y (3 ton series): 250 rprn or less

6. Seal the engine with wire after adjustment.

Note:
- Turn the adjusting nut clockwise to increase the engine speed.
- Turn the screw clockwise to increase the engine speed.
- If the engine speed decrease in relief state is excessive, turn the adjusting nut clockwise and the screw counterclockwise. In the process of this adjustment, the engine is about to start hunting. Stop adjustment immediately before hunting starts.
- If the engine running at the maximum speed is not stabilized (hunting), turn the adjusting nut counterclockwise and the screw clockwise. Excessive turning may increase the relief down to cause hunting.
- If the relief down is about 200 rprn in the new vehicle state or is 300 rprn or above, make adjustment by means of the engine, carburetor and air governor.



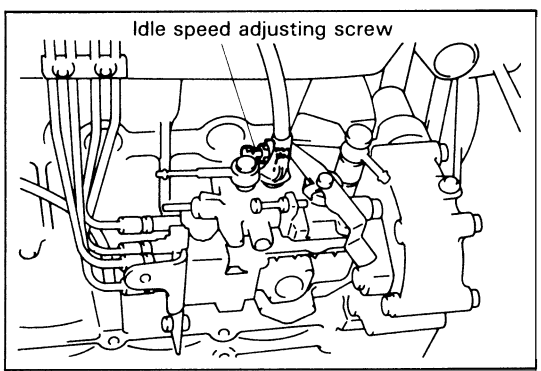
1DZ·2Z Engine

Idling speed inspection and adjustment

1. Warm up the engine.

   Coolant temperature: **80°C (176°F)** or above
   Engine oil temperature: **70°C (158°F)** or above
   Hydraulic oil temperature: **50°C** (122°F) or above

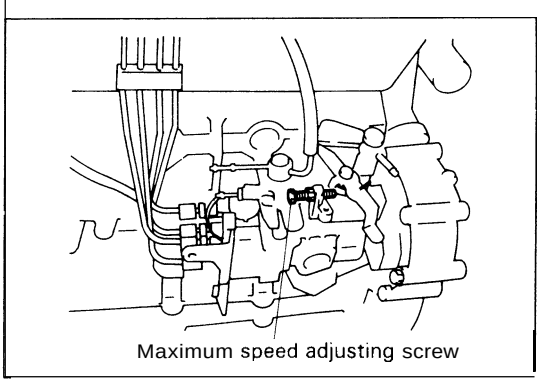
2. Install the engine tachometer.



3. Inspect the idling speed.

   Idling speed
   1DZ·2Z: 750 ± 25 rprn
   (Model with high capacity alternator (OPT):
   800 ± 25 **rpm)**

4. Adjust the idling speed.
   (1) Loosen the lock nut, and make adjustment by means of the idle adjusting screw.



No-load maximum speed inspection and adjustment

1. Warm up the engine.

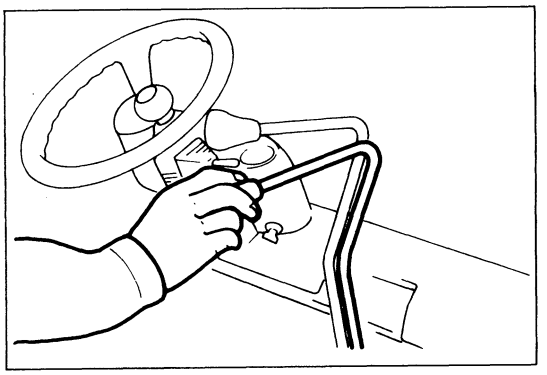
   Coolant temperature: **80°C (176°F)** or above
   Engine oil temperature: **70°C (158°F)** or above
   Hydraulic oil temperature: **50°C (122°F)** or above

2. Install the engine tachometer.

3. Inspect the no-load maximum speed.
   (1) Fully depress the accelerator pedal and inspect the no- load maximum speed.

   No-load maximum speed
   1DZ (1 ton series): 2600 ± 50 rprn
   (**2·3** ton series): 2800 ± 50 rprn
   (Model with high capacity alternator (OPT)
   1 ton series: 2600 ± 50 rprn
   2·3 ton series: 2800 ± 50 rprn)
   22: 2400 ± 50 rprn
   (Model with high capacity alternator (OPT): 2400 ± 50 rpm)

4. Adjust the no-load maximum speed.
   (1) Remove the seal.
   (2) Make adjustment by means of the maximum speed adjusting screw.



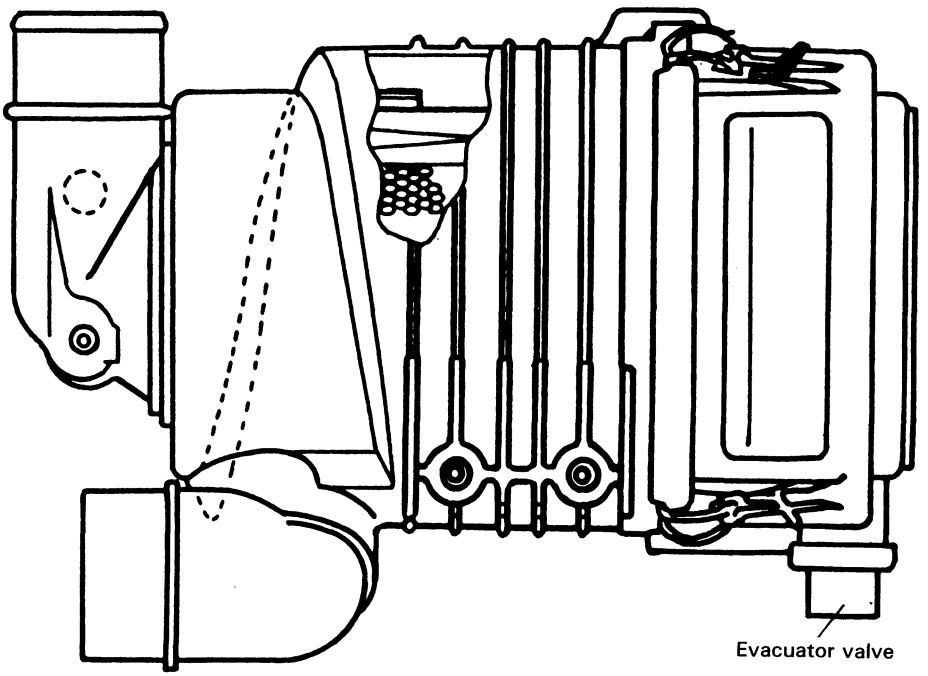
5. Inspect the relief speed.
   (1) Operate the material handling lever when the engine is running at the maximum speed, and measure the engine speed decrease at full relief (relief down) satisfies the following value:

   Engine speed down at full relief
   1DZ (all models): *250* rpm or less
   ***22* (all models): *200* rpm or less**

6. Seal the engine with wire after adjustment.

AIR CLEANER

GENERAL

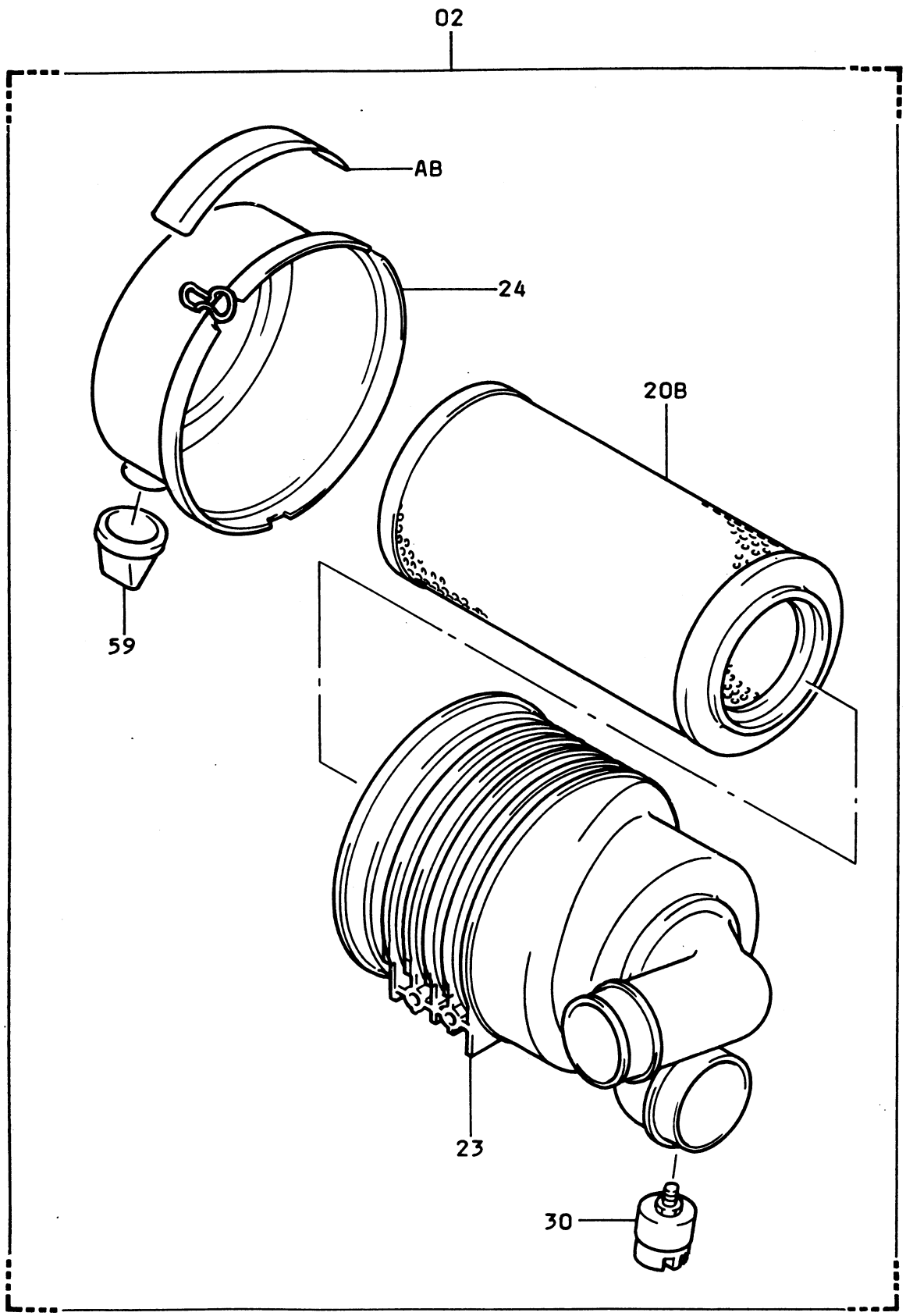


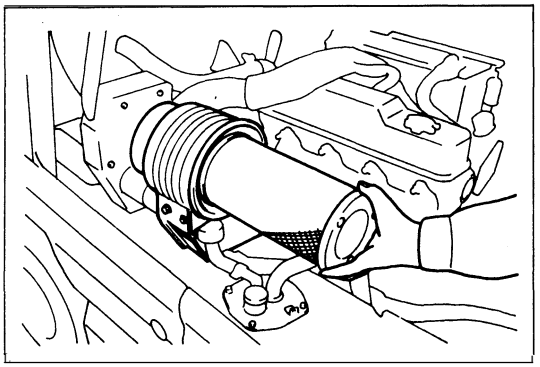
SPECIFICATIONS

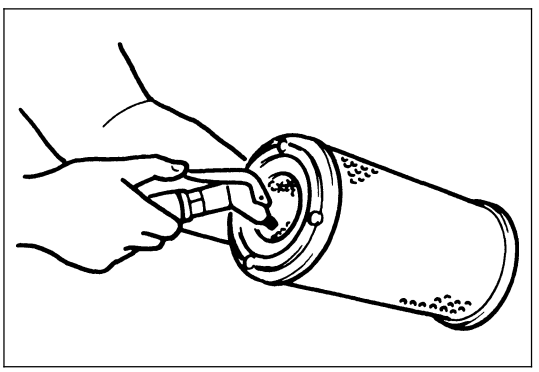
	Single (STD)	Double (OPT)
Type	Cyclone type	←
Size	7-inch	←
Intake type	Fresh air introduction type	←
Filtering area cm^2 (in^2)	14600 (2263)	Outer: 18600 (2883)
		Inner: 510 (79.1)
Others	With evacuator valve	←

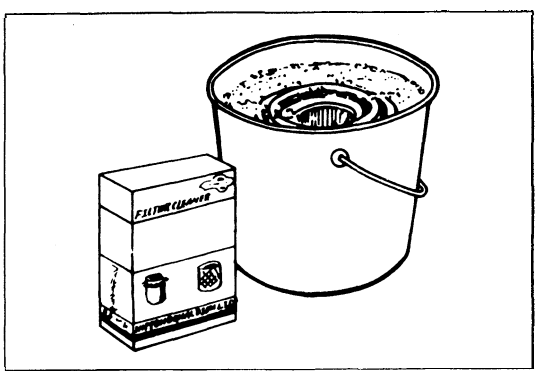
COMPONENTS

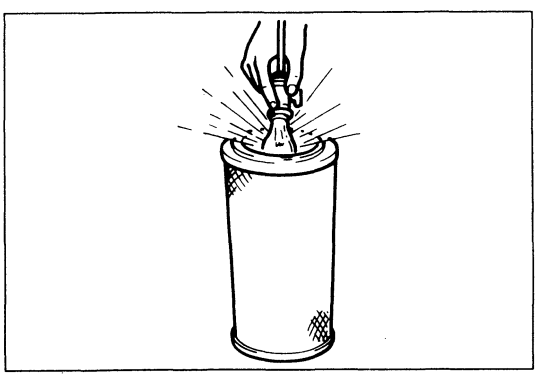
1703











AIR CLEANER CLEANING·INSPECTION

1. Open the engine hood.

2. Remove the element.
   (1) 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 (7kg/cm^2) [100 psil 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 kg/cm^2) [40 psi] or less]
   After washing, naturally dry the element or dry the element with a dryer (cold air).

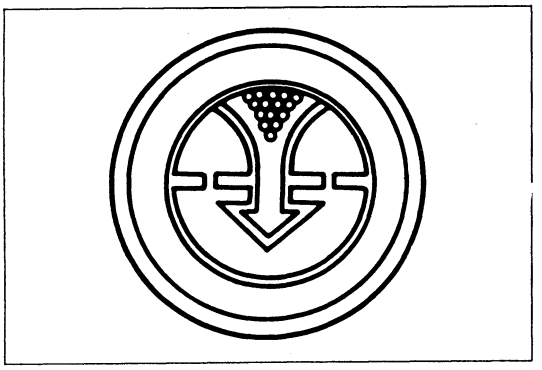
Note:
- **Do not damage the element during washing.**
- **Never use compressed air or hot air for drying.**

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 pin-hole, tear or damage is found, replace it with a new element.

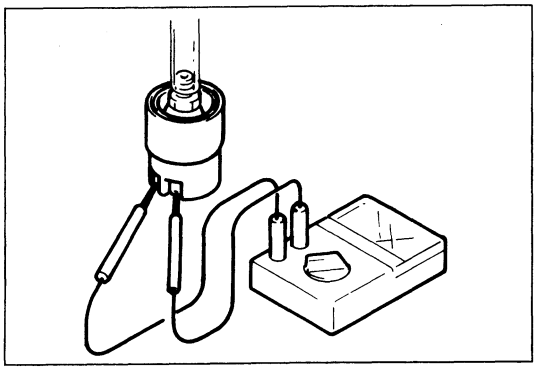
6. Element replacement

   Replace the element after it is washed six times or generally at intervals of 12 months.



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.



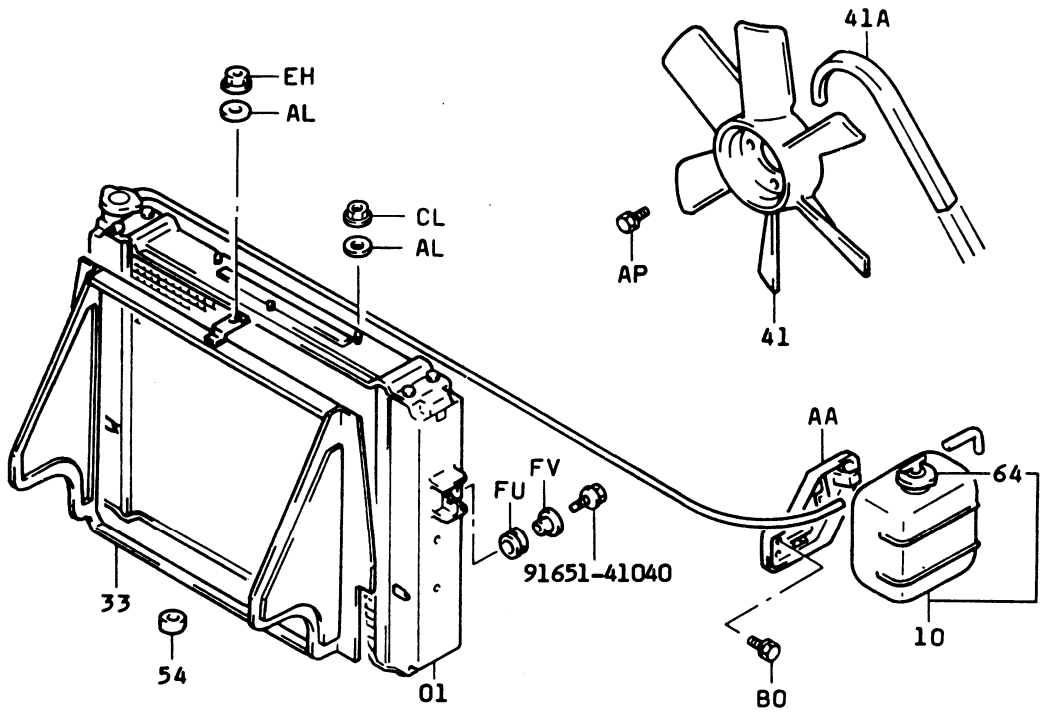
2. Individual inspection
   (1) Use a mity vac to apply a negative pressure to the vacuum switch, and inspect conduction.

Standard
Gasoline models:
2942 ± 294 Pa (300 ± 30 mmAq)
(22.1 ± 2.2 mmHg): Conduction
Diesel models:
7473 ± 569 Pa (762 ± 58 mmAq)
(56.0 ± 4.3 mmHg): Conduction

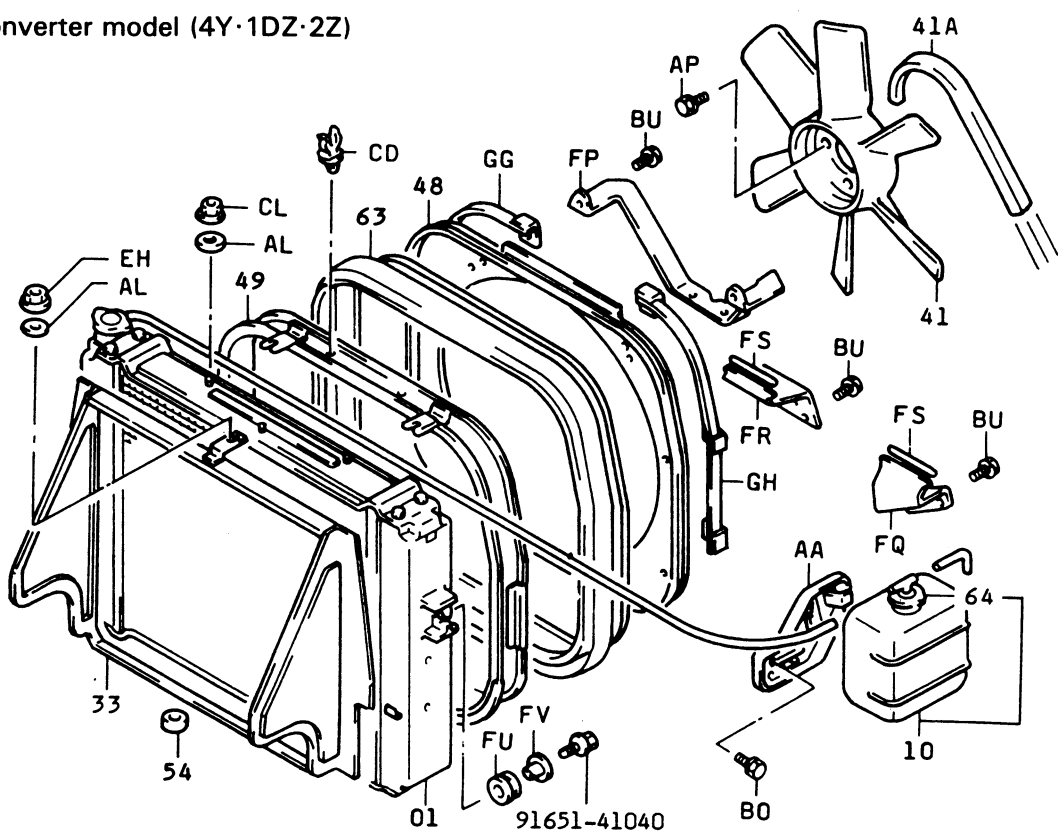
RADIATOR

COMPONENTS

1603



Torque converter model (4Y·1DZ·2Z)



SPECIFICATIONS

Type	Crossflow
Fin type	Corrugated fin
Coolant capacity (in radiator) ℓ	See the table below
Cap opening pressure kPa (kg/cm^2) [psi]	88 ± 14.7 (0.9 ± 0.15) [13 ± 2.11
Others	Built in torque converter cooler (torque converter model)

COOLANT CAPACITY AND ANTIFREEZE TABLE

C: Clutch model T: Torque converter model Unit: ℓ (US gal)

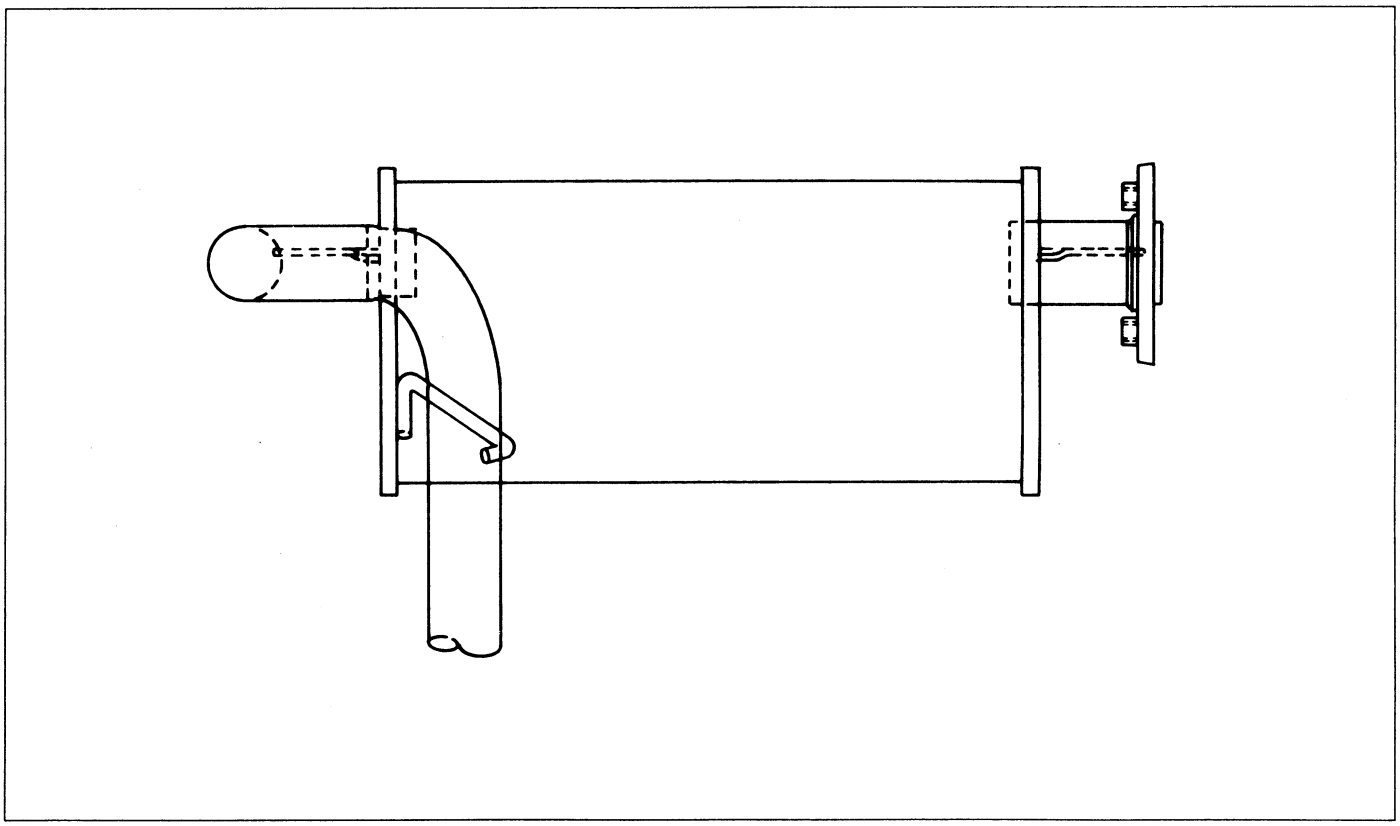
			Radiator capacity	Total amount of coolant	LLC mixing ratio at 25 % (to −12°C)	LLC mixing ratio at 30 % (to −15°C)	LLC mixing ratio at 50 % (to −35°C)	Antirust mixing at 5 %
1 ton series	5K	C	3.3 (0.87)	7.1 (1.87)	1.8 (0.48)	2.1 (0.55)	3.6 (0.95)	0.4 (0.11)
		T	3.8 (1.00)	7.6 (2.01)	1.9 (0.50)	2.3 (0.61)	3.8 (1.00)	0.4 (0.11)
	4Y	C	3.3 (0.87)	9.1 (2.40)	2.3 (0.61)	2.7 (0.71)	4.6 (1.21)	0.5 (0.13)
		T	3.8 (1.00)	9.6 (2.53)	2.4 (0.63)	2.9 (0.77)	4.8 (1.27)	0.5 (0.13)
	1DZ	C	3.3 (0.87)	7.8 (2.06)	2.0 (0.53)	2.3 (0.61)	3.9 (1.03)	0.4 (0.11)
		T	3.6 (0.95)	8.1 (2.14)	2.0 (0.53)	2.4 (0.63)	4.1 (1.08)	0.4 (0.11)
2 ton series	5K	C	3.4 (0.90)	7.2 (1.90)	1.8 (0.48)	2.2 (0.58)	3.6 (0.95)	0.4 (0.11)
		T	3.5 (0.92)	7.3 (1.93)	1.8 (0.48)	2.2 (0.58)	3.7 (0.98)	0.4 (0.11)
	4Y	C	3.4 (0.90)	9.2 (2.43)	2.3 (0.61)	2.8 (0.74)	4.6 (1.21)	0.5 (0.13)
		T	3.5 (0.92)	9.3 (2.46)	2.3 (0.61)	2.8 (0.74)	4.7 (1.24)	0.5 (0.13)
	1DZ	C	4.1 (1.08)	8.6 (2.27)	2.2 (0.58)	2.6 (0.69)	4.3 (1.14)	0.4 (0.11)
		T	3.8 (1.00)	8.3 (2.19)	2.1 (0.55)	2.5 (0.66)	4.2 (1.11)	0.4 (0.11)
	2Z	C	3.4 (0.90)	8.9 (2.35)	2.2 (0.58)	2.7 (0.71)	4.5 (1.19)	0.4 (0.11)
		T	3.5 (0.92)	9.0 (2.38)	2.3 (0.61)	2.7 (0.71)	4.5 (1.19)	0.5 (0.13)
3 ton series	4Y	C	4.2 (1.11)	10.0 (2.64)	2.5 (0.66)	3.0 (0.79)	5.0 (1.32)	0.5 (0.13)
		T	3.8 (1.00)	9.6 (2.53)	2.4 (0.63)	2.9 (0.77)	4.8 (1.27)	0.5 (0.13)
	1DZ	C	4.2 (1.11)	8.7 (2.30)	2.2 (0.58)	2.6 (0.69)	4.2 (1.11)	0.4 (0.11)
		T	3.8 (1.00)	8.3 (2.19)	2.1 (0.55)	2.5 (0.66)	4.2 (1.11)	0.4 (0.11)
	2Z	C	3.8 (1.00)	9.3 (2.46)	2.3 (0.61)	2.8 (0.74)	4.7 (1.24)	0.5 (0.13)
		T	3.4 (0.90)	8.9 (2.35)	2.2 (0.58)	2.7 (0.71)	4.5 (1.19)	0.4 (0.11)

(Note) • The total amount of coolant does not include the capacity of the reservoir tank.
• Reservoir tank capacity: 1.1 ℓ (0.29 US gal) (at FULL mark position)

MUFFLER & EXHAUST PIPE

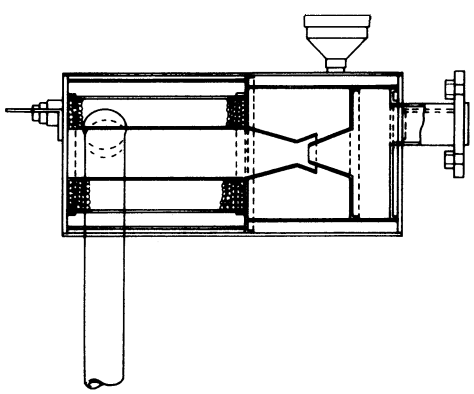
GENERAL

Muffler (STD)

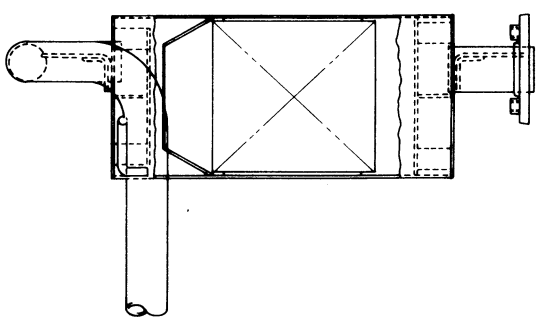


Catalytic muffler (OPT)

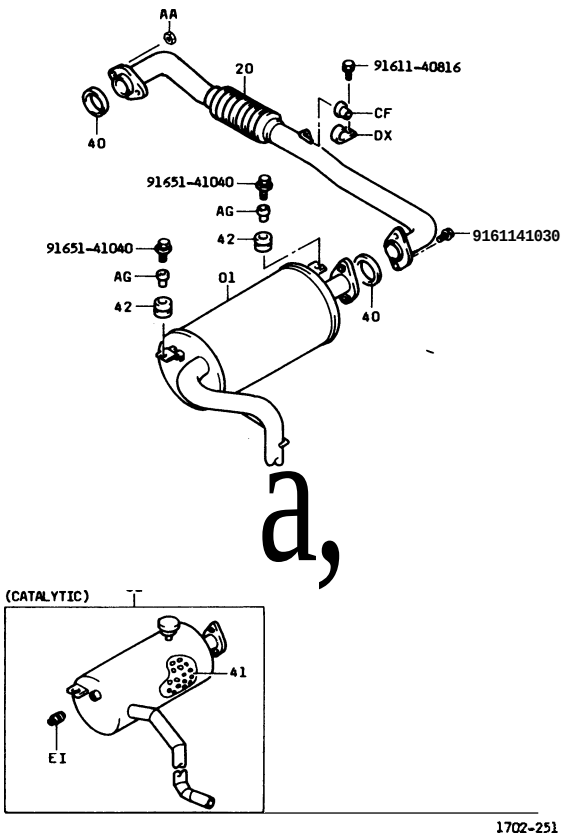
Gasoline model



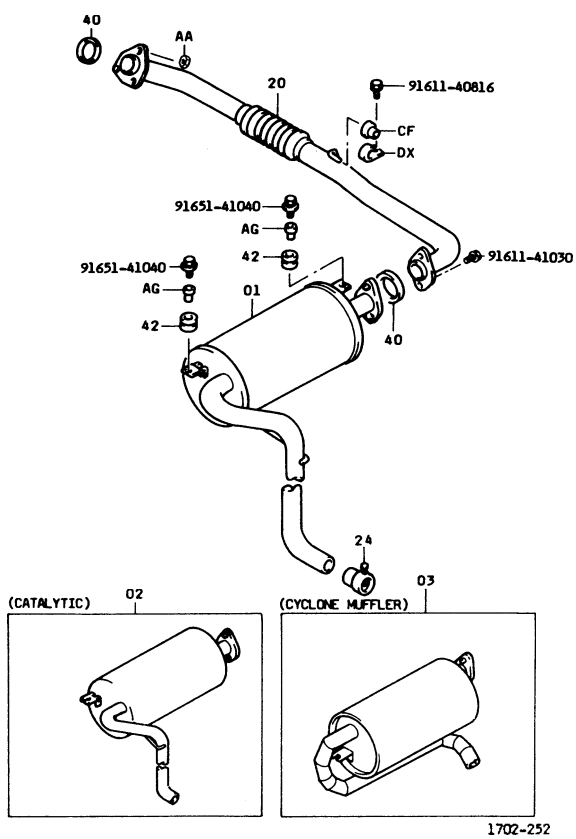
Diesel model



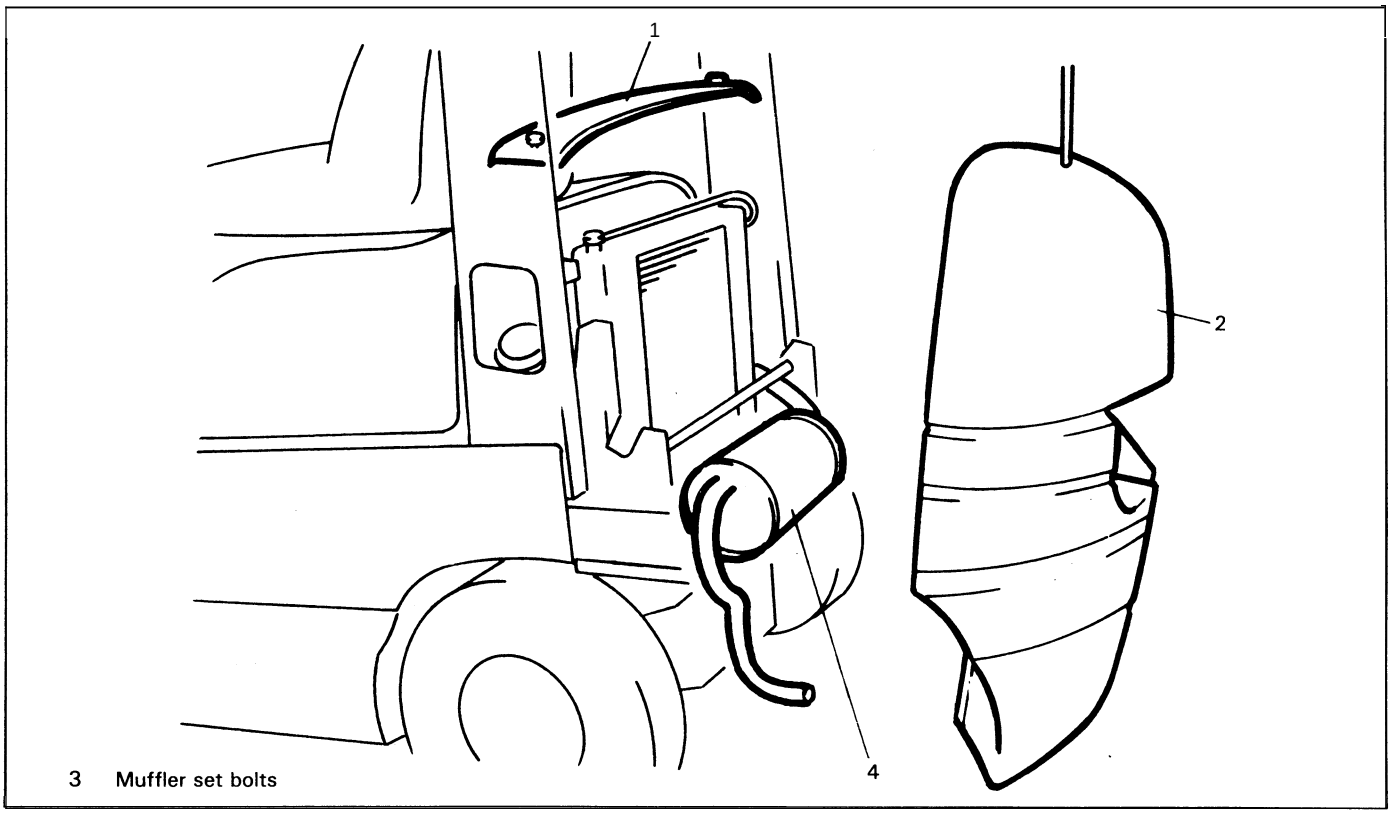
Gasoline model



Diesel model



MUFFLER REMOVAL·INSTALLATION



Removal Procedure

1 Remove the radiator cover.

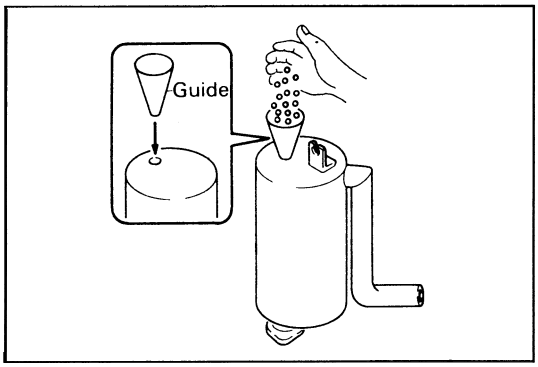
2 Remove the balance weight. (See page 0-14 for the weight of the balance weight.)

3 Remove the muffler set bolts.

4 Disconnect the exhaust pipe and remove the muffler.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

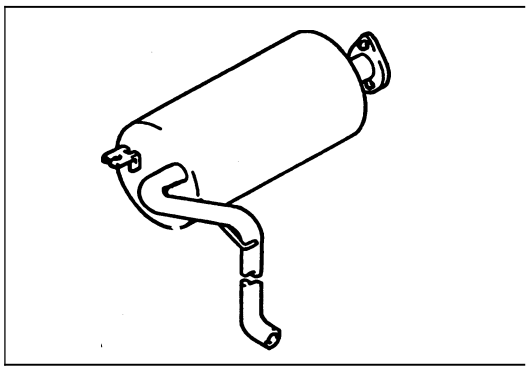


CATALYTIC MUFFLER MAINTENANCE

Jobs Every Year (2000 Hours)

Catalytic Pellets Replacement (Gasoline Engine Models)

1. Remove the muffler.
2. Remove old pellets from the muffler for replacement with new pellets.



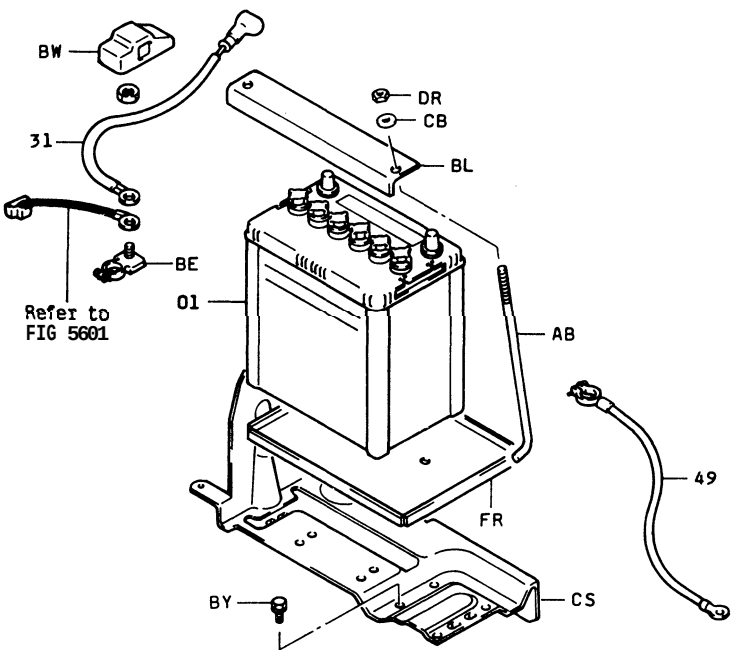
Catalytic Honeycomb Muffler Replacement (Diesel Engine Models)

1. Remove the muffler.
2. For honeycomb replacement, replace the whole muffler ASSY.

BATTERY

COMPONENTS

1901

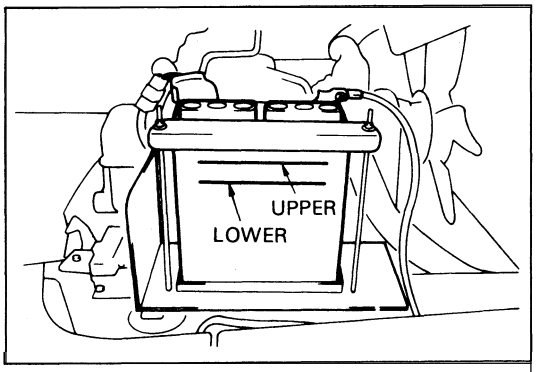


SPECIFICATIONS

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

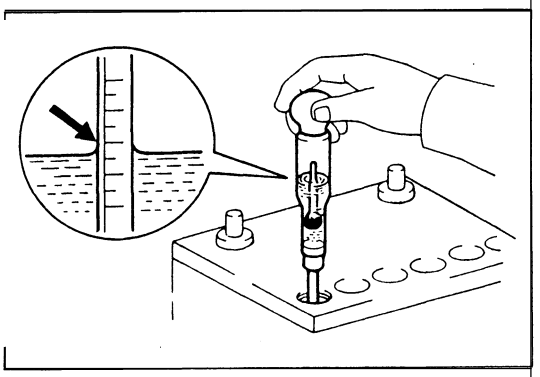
Engine / Specification	5K·4Y	1DZ	2Z (12V specification)	2Z (24V specification)
STD	34B19L	80D26L	95D31L	55B24L x 2
OPT (High capacity battery)	55D23L	95D31L		55D23L x 2

Item / Battery type	34B19L	55B24L	55D23L	80D26L	95D31L
Voltage V	12	←	←	←	←
5-hour rate capacity Ah	27	36	48	55	64
Specific gravity of battery fluid in use (at 20°C (68°F))	1.280	←	←	←	←
Cold cranking current A	272	433	356	582	622
Battery weight N (kg) [lb]	89.2 (9.1) [20.	125.5 (12.8) 128.21	144.2 (14.7) 132.41	168.7 (17.2) [37.9]	210.8 (21.5) 147.41



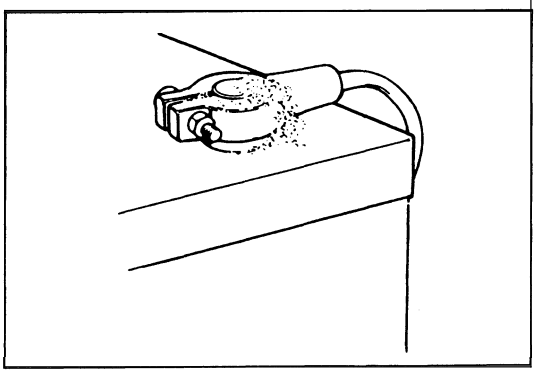
INSPECTION

1. Inspect the battery fluid level.
   (1) Inspect if the battery fluid level is in the range of UPPER ↔ LOWER, If insufficient, add distilled water to the UPPER level.



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.

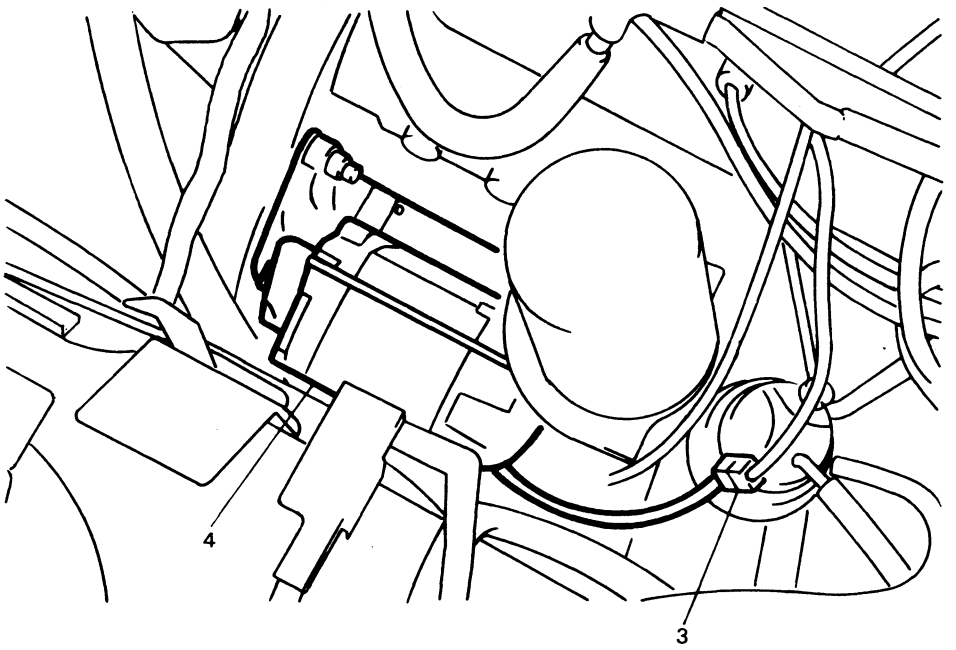
Battery Installation

Reverse the removal procedure.

STARTING MOTOR

REMOVAL·INSTALLATION

Note:
- The starting motor removing direction is either upward or downward, which varies with the vehicle model. Select the appropriate direction by grasping the situations around.
- The starting motor installing position is either on the right side or left side of the vehicle, which varies with the engine. The explanation here is given for the case of the left side. In the case of the right side, change "battery" in step 2 below to "air cleaner".



1 Battery negative terminal
2 Battery

Removal Procedure

1 Disconnect the battery negative terminal.

2 Remove the battery.

3 Disconnect the starting motor wiring.

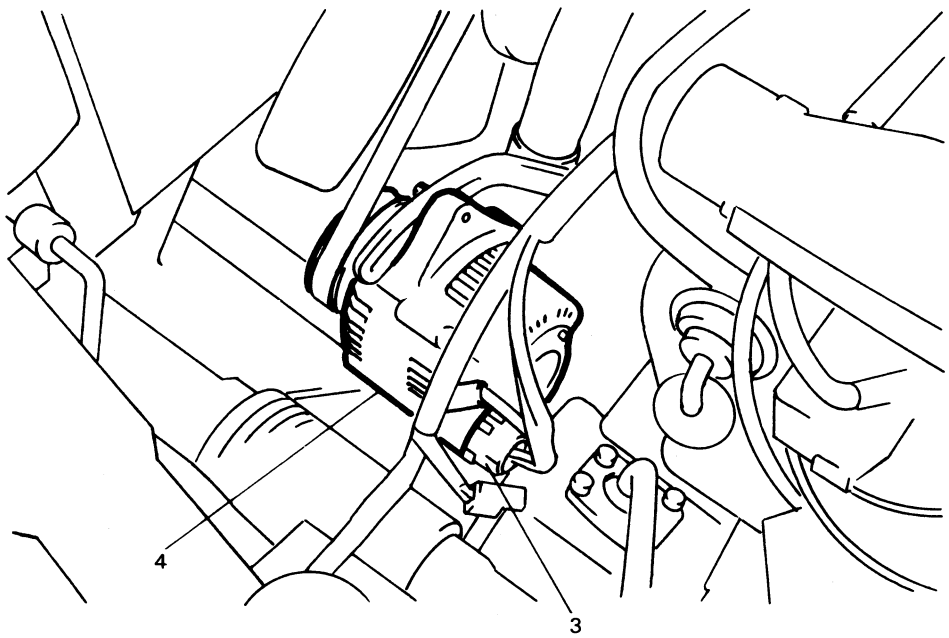
4 Remove the starting motor ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

ALTERNATOR

REMOVAL·INSTALLATION



1 Battery negative terminal
2 Air cleaner

Removal Procedure

1 Disconnect the battery negative terminal.

2 Remove the air cleaner.

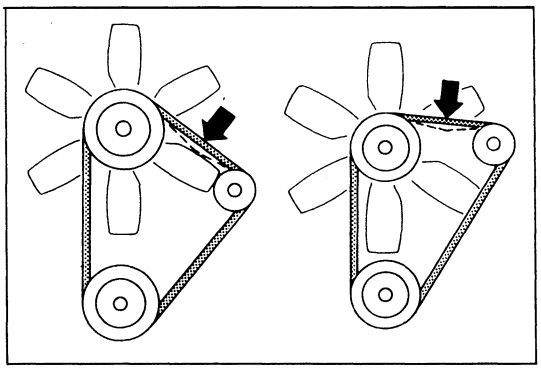
3 Disconnect the alternator wiring.

4 Remove the alternator ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

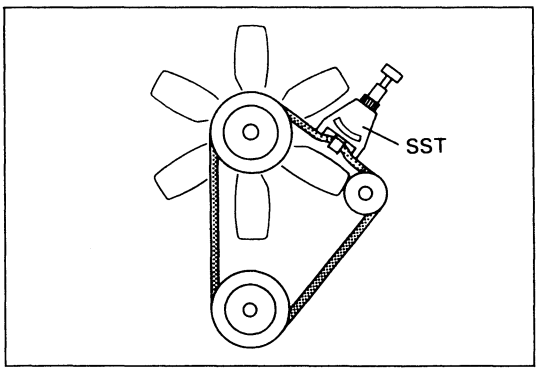
Note:
Adjust the V belt tension after installation.



V Belt Tension Adjustment

1. Inspect the V belt tension.

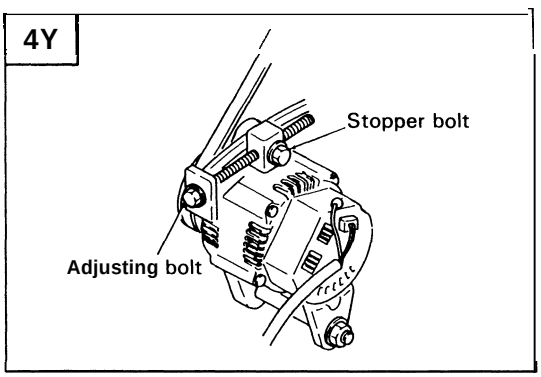
Standard [Deflection when pushed with a force of 98 N (10 kg) [22 lb]]
5K 8 - 13 mm (0.31 - 0.51 in)
4Y 8 - 13 mm (0.31 - 0.51 in)
1DZ·2Z 8 - 13 mm (0.31 - 0.51 in)



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

SST 09216-00021

5K 294 - 490 N (30 - 50 kg) [66 - 110 lb]
4Y 294 - 490 N (30 - 50 kg) [66 - 110 lb]
1DZ·2Z 324 - 559 N (33 - 57 kg) [73 - 126 lb]



2. Adjust the V belt tension.

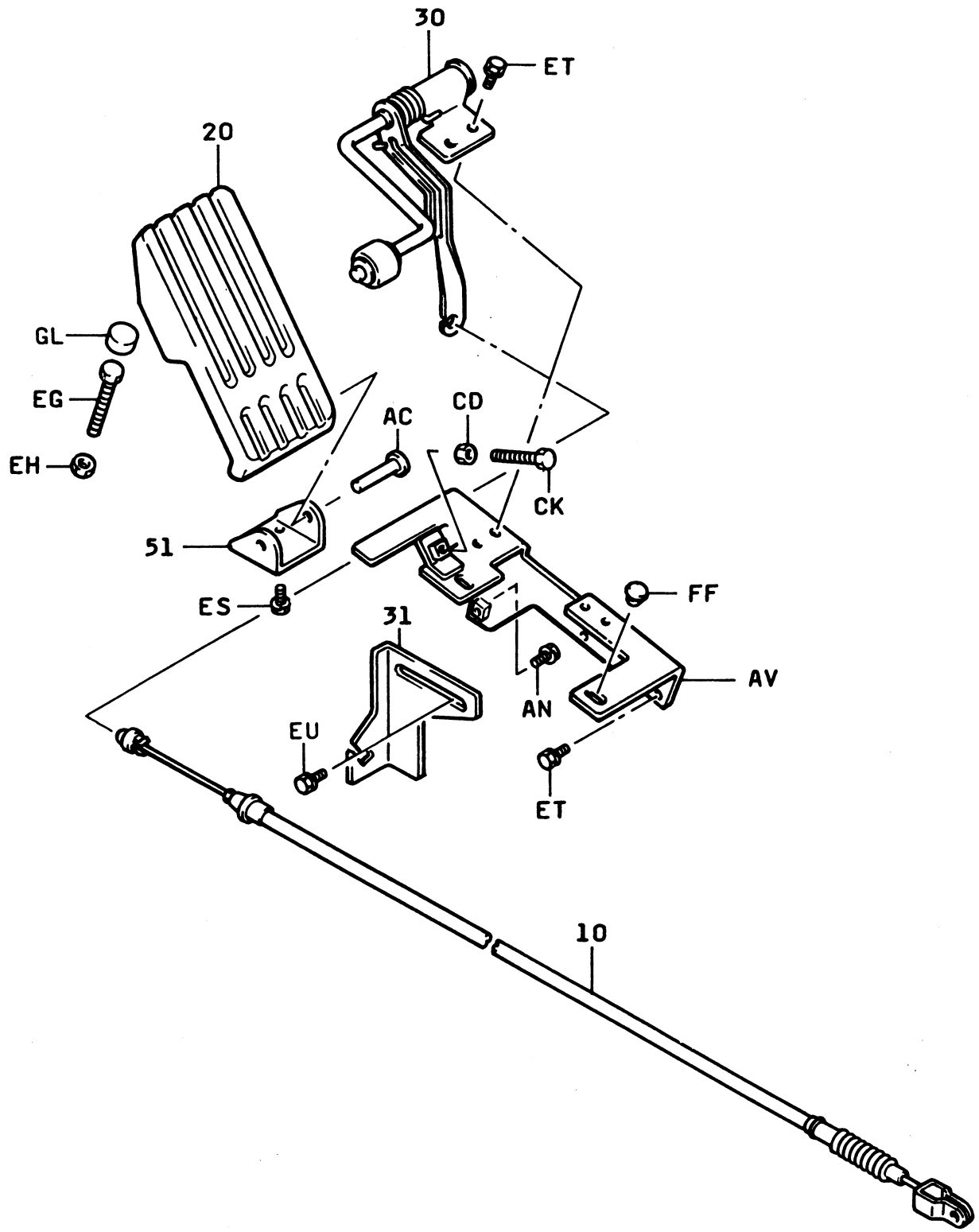
5K·1DZ·2Z
(1) Use a lever rod and move the alternator for adjustment.

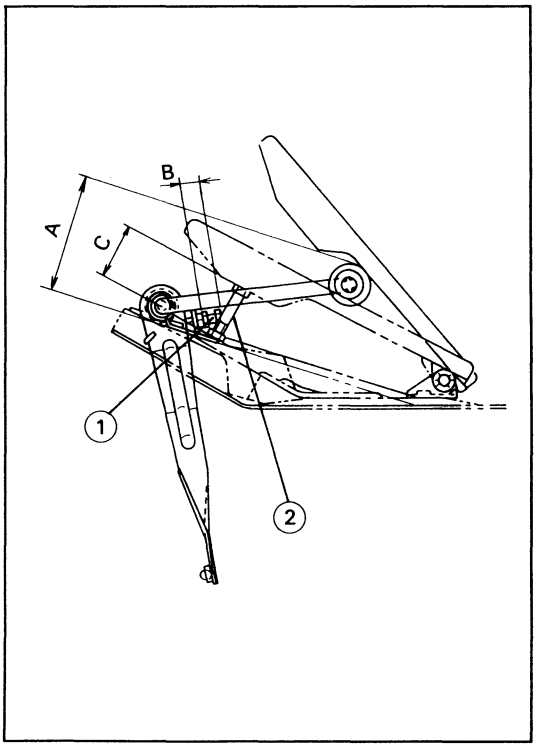
4Y
(1) Make adjustment by turning the adjusting bolt.

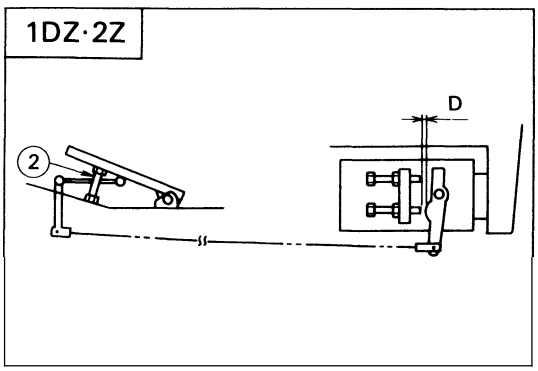
ACCELERATOR PEDAL

COMPONENTS

2601







ACCELERATOR PEDAL ADJUSTMENT

1. Adjust the accelerator pedal height.
   (1) Adjust accelerator link stopper bolt ① to make pedal height A satisfy the following dimension:

   Accelerator pedal roller height
   A = 84 ± 2 mm (3.31 ± 0.08 in)
   (from accelerator bracket to top of roller)
   B = 14 mm (0.55 in) (reference value)

2. Adjust the height of accelerator pedal stopper bolt ②.
   C = 39.7 mm (1.563 in) (reference value)

5K·4Y engine models

(1) Depress the accelerator pedal gradually, and adjust the height of stopper bolt ② so that the carburetor throttle lever stops immediately before the full opening position.

1DZ·2Z engine models

(1) Adjust the height of stopper bolt ② so that the clearance between the injection pump lever and maximum speed adjusting screw satisfies the following range when the accelerator pedal is in contact with stopper bolt @.

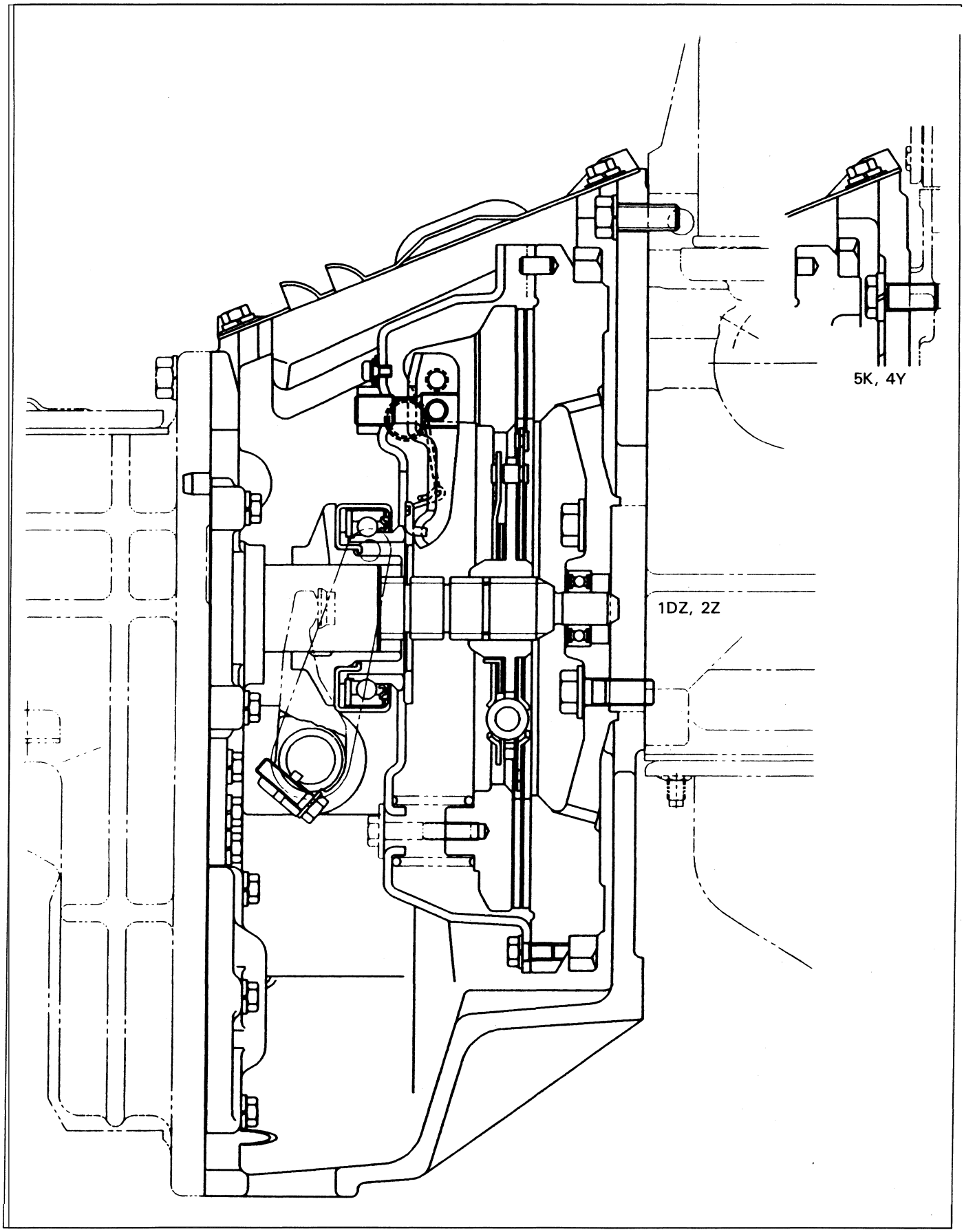
D = 0 - 0.5 mm (0 - 0.020 in)

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 and adjusting screw.

CLUTCH

CLUTCH COVER

GENERAL



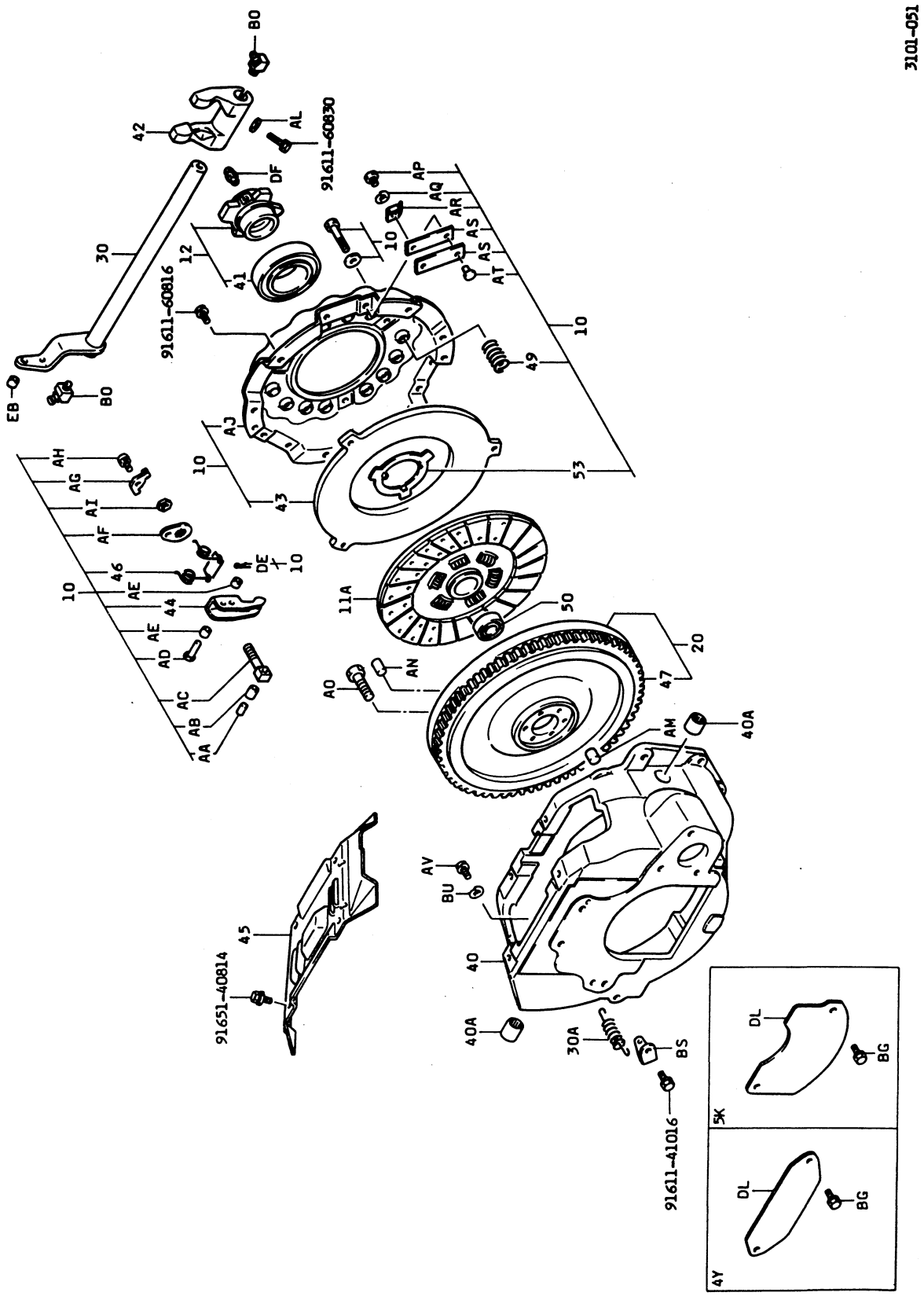
SPECIFICATIONS

CLUTCH COVER

Item \ Vehicle model		5K engine models	4Y·1DZ engine models	2Z engine models
Type		Coil spring type	←	←
Number of springs		6	9	←
Spring installed length	mm (in)	37.7 (1.494)	←	←
Spring installed load (all springs)	N (kg) [lb]	2354 (240) [529]	3236 (330) [728]	3923 (400) [882]

CLUTCH DISC

Item \ Vehicle model		5K engine models	4Y·1DZ engine models	2Z engine models
Type		Dry single plate	←	←
Outside diameter	mm (in)	275 (10.83)	←	←
Inside diameter	mm (in)	175 (6.89)	←	←
Thickness	mm (in)	3.5 (0.138)	←	←
Material		Special woven	←	←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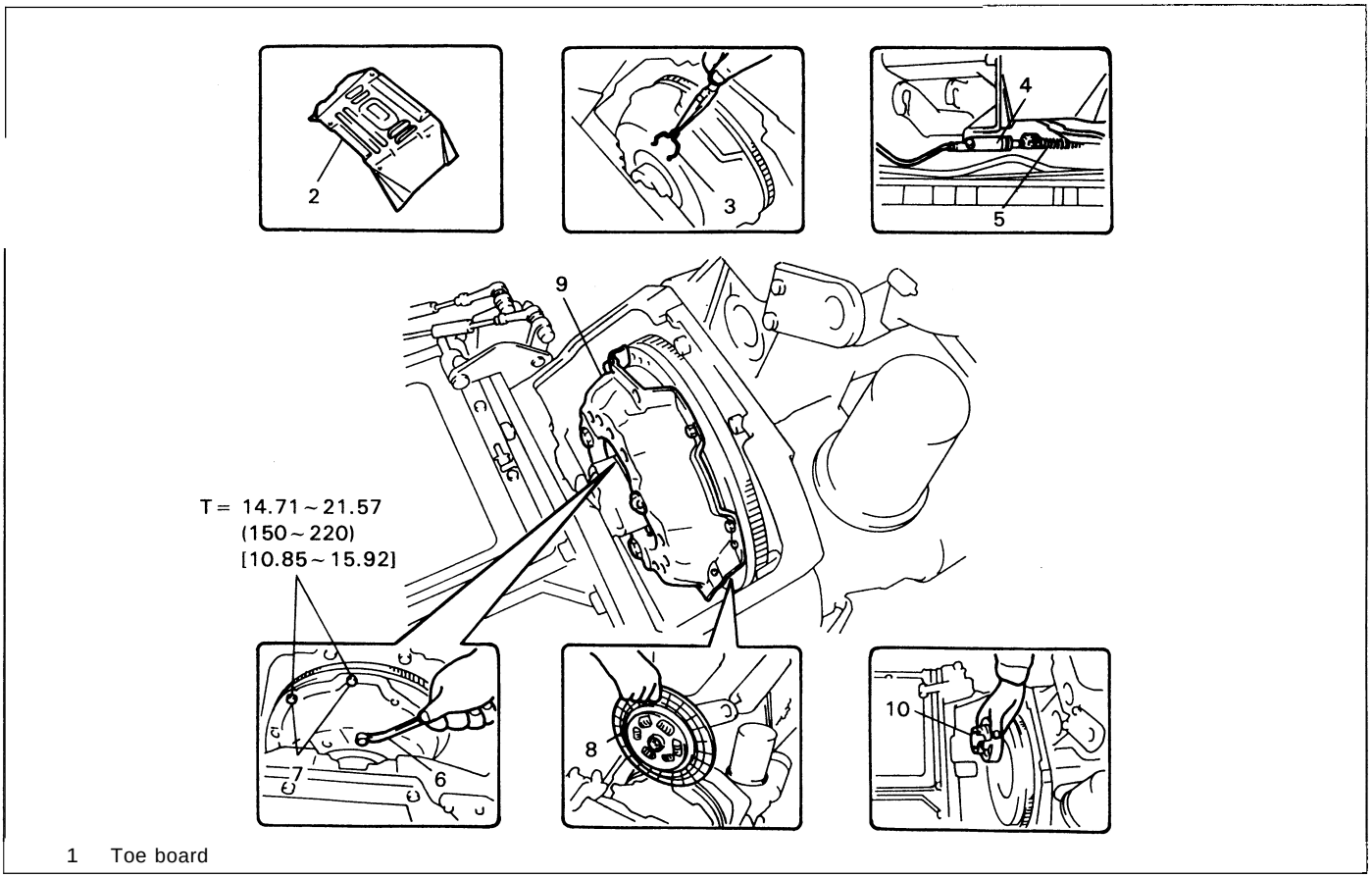
BO
42
AL
91611-60830
DF
AP
AQ
AR
AS
AS
AT
10
30
12
41
91611-60816
49
EB
BO
AJ
10
53
43
AH
AG
AI
AF
46
DE
10
10
AE
44
AE
AD
AC
AB
AA
11A
50
20
47
AO
AN
40A
AM
AV
BU
45
91651-40814
40
40A
30A
BS
91611-41016
5K
DL
BG
4Y
DL
BG

REMOVAL·INSTALLATION

T = N·m (kg-cm) [ft-lb]



Removal Procedure

1 Remove the toe board.

2 Remove the clutch housing cover.

3 Remove the lock ring. **[Point 1]**

4 Disconnect the clutch release cylinder push rod.

5 Disconnect the release shaft lever return spring.

6 Install service bolts (3 pcs.) on the clutch cover. **[Point 2]**

7 Remove the clutch cover set bolts.

8 Remove the clutch disc. **[Point 3]**

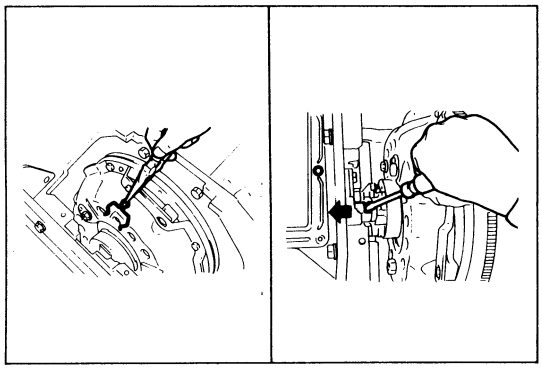
9 Remove the clutch cover. **[Point 4]**

10 Remove the release hub W/bearing. **[Point 5]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Apply a small amount of chassis grease on the input shaft spline portion.**
- **Always remove the service bolts (3 pcs.) after installing the clutch cover.**



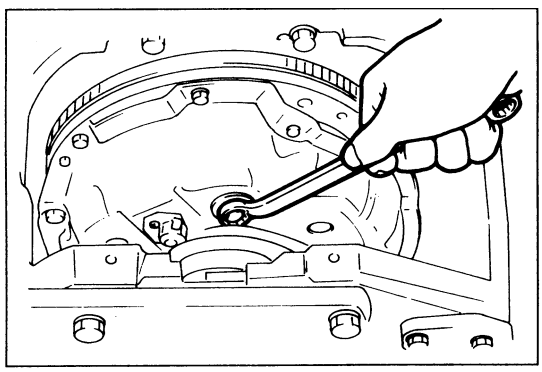
POINT OPERATIONS

[Point 1]

Removal: Remove the lock ring with pliers

Removal: After removing the lock ring, slide the input shaft fully toward the transmission side by using a straight edge screwdriver, etc.

Installation: After installing the lock ring, confirm that the input shaft sliding is locked securely by the lock ring.

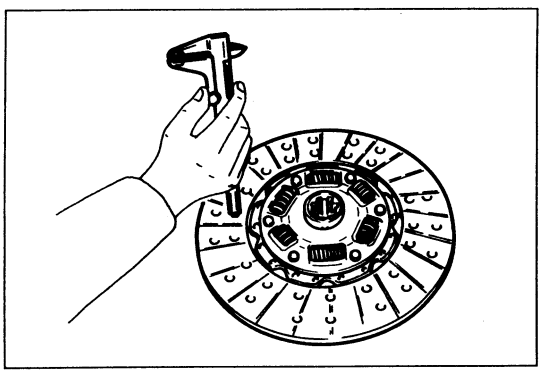


[Point 2]

Removal: Service bolts (3 pcs.)
Size M8 x 1.25 ℓ = 40 mm

Removal·Installation: Turn the flywheel to set to the position allowing easy installation or removal of the service bolts.

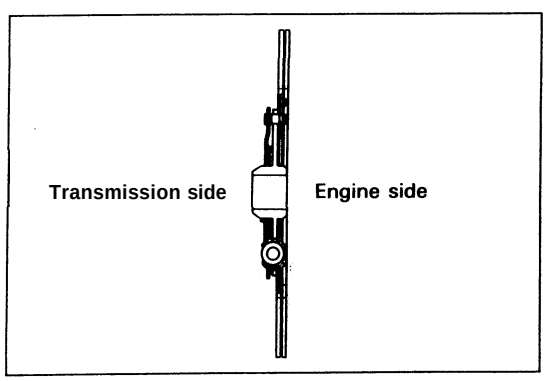
Installation: The service bolts always be removed after installing the clutch cover.



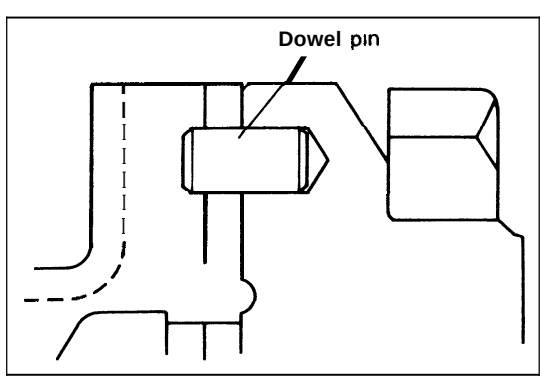
[Point 3]

Inspection: Check the clutch disc for wear.

Wear limit (rivet sinking depth):
0.3 mm **(0.012** in)

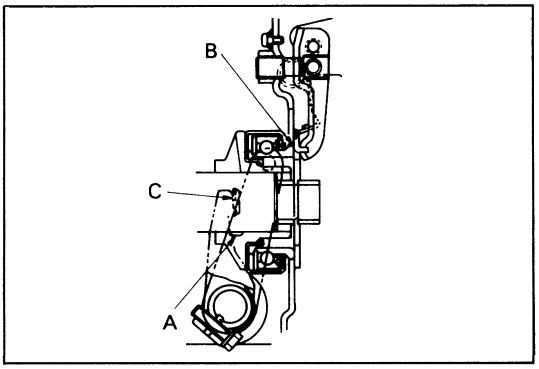


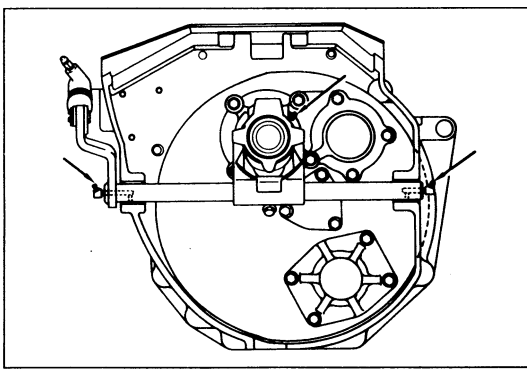
Installation: When installing the clutch disc, the longer boss shall face the transmission.



[Point 4]

Installation: When installing the clutch cover, match the dowel pin holes on the clutch cover flange with dowel pins on the flywheel side.





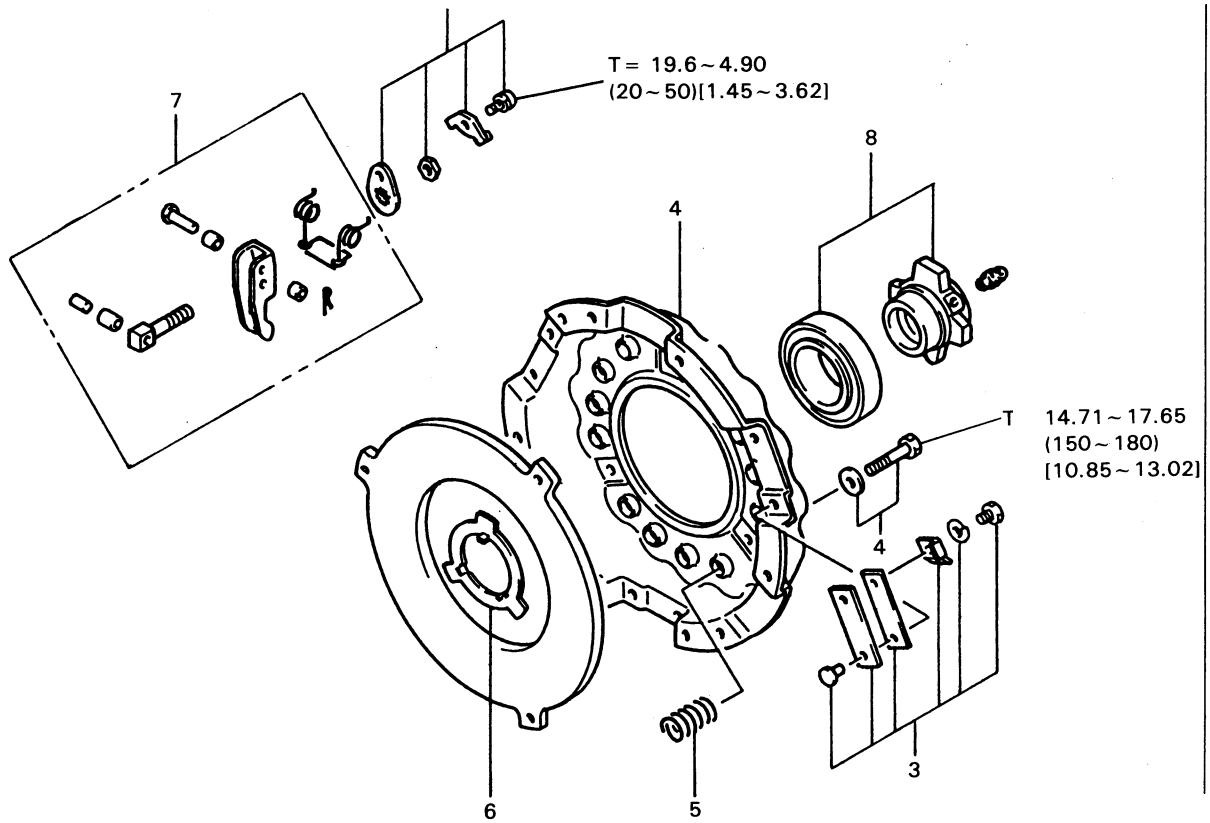
[Point 51

Installation: Apply grease on the following places.
Portion A in figure (in release hub):
Fill MP grease.
Portion B in figure (sliding contact faces of the release bearing and bearing plate):
Apply chassis grease.
Portion C in figure (2 release fork pawl portions):
Apply chassis grease.

Greasing of Clutch Release Fork Shaft and Clutch Release Hub

1. After performing a maintenance job in the clutch housing, apply grease to the clutch release fork shaft and clutch release hub.
   These portions shall be greased periodically according to the vehicle use state.
   Grease to be used: MP grease

T = N·m (kg-cm) [ft-lb]



1 Match **mark**

Disassembly Procedure

1 Punch a match mark. **[Point** 11

2 Remove the adjusting nut. **[Point** 21

3 Remove the strap set bolt and strap seat.

4 Remove the clutch cover. **[Point** 31

5 Remove the compression spring. **[Point** 41

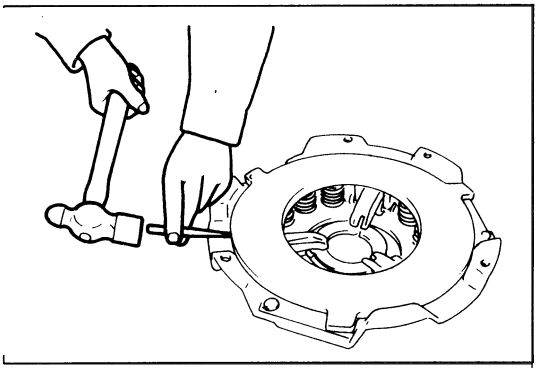
6 Remove the spring and release bearing plate.

7 Remove the eye bolt and release lever. **[Point** 51

8 Remove the release bearing. **[Point** 61

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

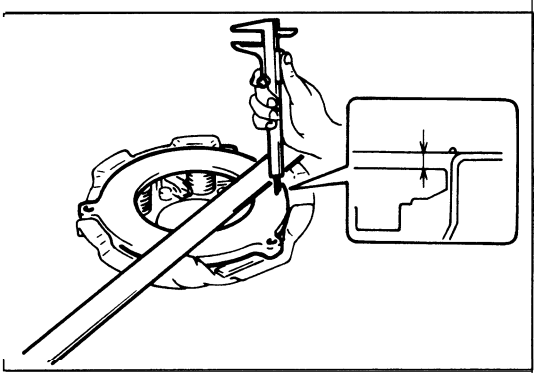


Point Operations

[Point 1]

Disassembly: Punch a match mark on the clutch cover and pressure plate.

Reassembly: Assembly by aligning the match mark.



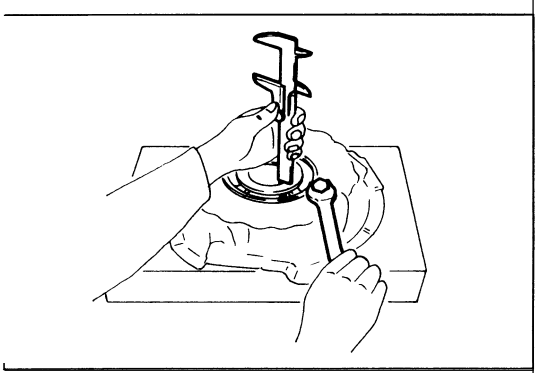
[Point 2]

Reassembly: Carry out reassembly and adjustment according to the following procedure.

1. Adjust the release bearing plate height.

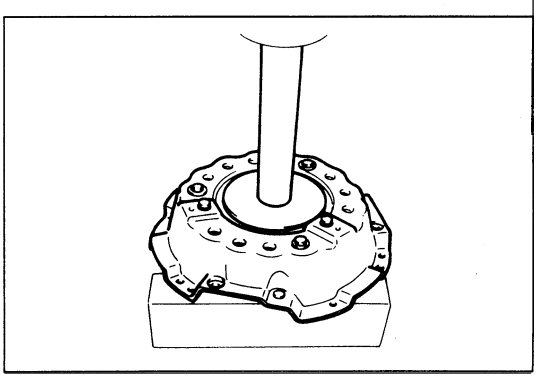
   (1) Adjust the pressure plate height from the clutch cover mounting plane to the following value by using service bolts (3 pcs.).

   Pressure plate height: 8.8 mm (0.346 in)



   (2) Apply a thin coat of chassis grease on the spherical face of the adjusting nut before installation.
   (3) Make adjustment by the adjusting nut to make the release bearing plate height from the clutch cover mounting plane satisfies the following standard.

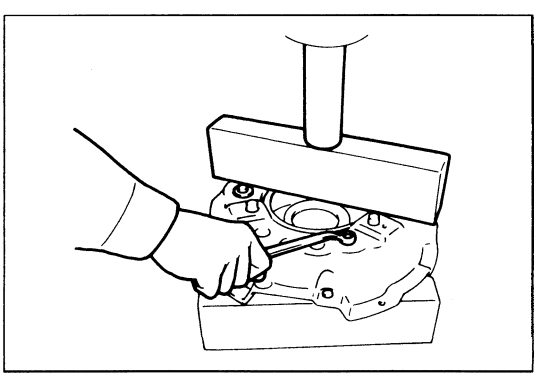
   Release bearing plate height:
   59 ±0.5 mm (2.32 ±0.020 in)
   Release bearing plate parallelism (inclination):
   0.4 mm (0.016 in) or less



2. Use a press to press the release bearing plate several times with a stroke of 8 – 10 mm (0.31 – 0.39 in) and confirm no abnormal motion. Never let the stroke exceed 12 mm (0.47 in).

3. Check the dimension in step 1 again.

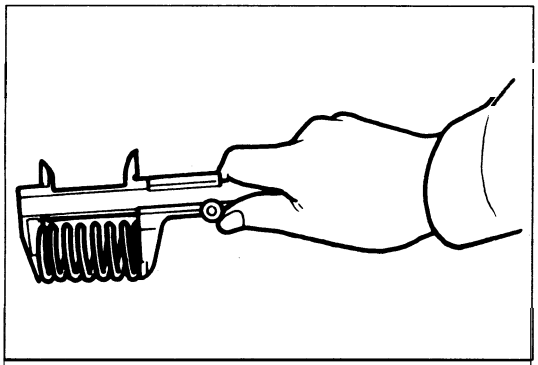
4. Assemble the nut lock plate and lock spring.



[Point 3]

Disassembly: After removing the service bolts (3 pcs.) while holding the clutch cover with a press, gradually release the pressing force to remove the clutch cover.

Reassembly: Install service bolts (3 pcs.) while holding the clutch cover down with a press.

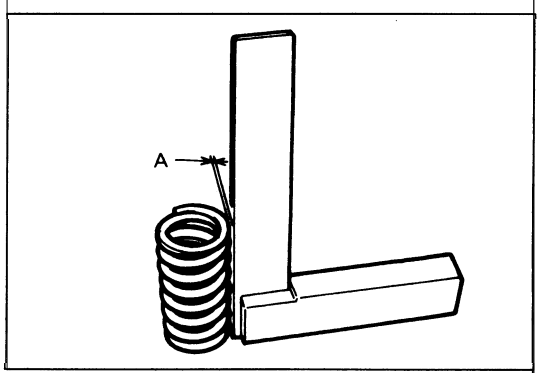


[Point 4]

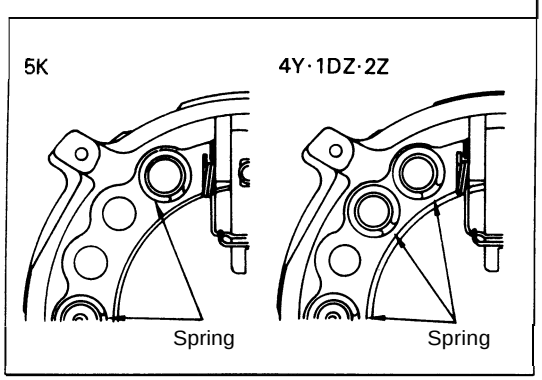
Inspection: Inspect the compression spring.

Free length

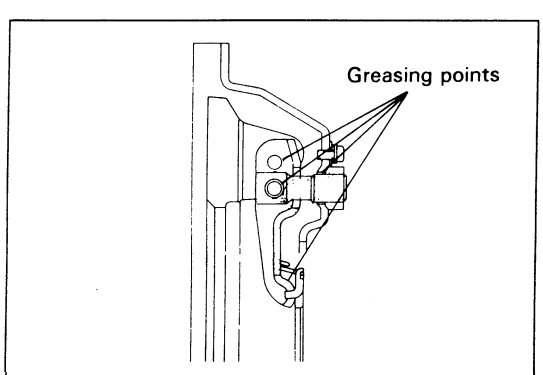
5K	**62 mm (2.44 in)**
4Y·1DZ	**58.3 mm (2.295 in)**
2Z	**62 mm (2.44 in)**



Limit perpendicularity: **A = 2.5 mm (0.098in)**

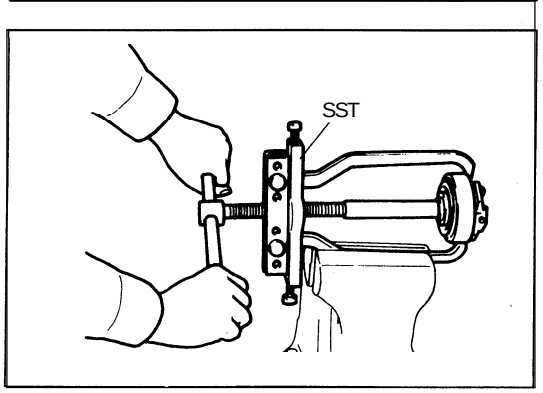


Reassembly: Do not mistake the compression spring mounting position.



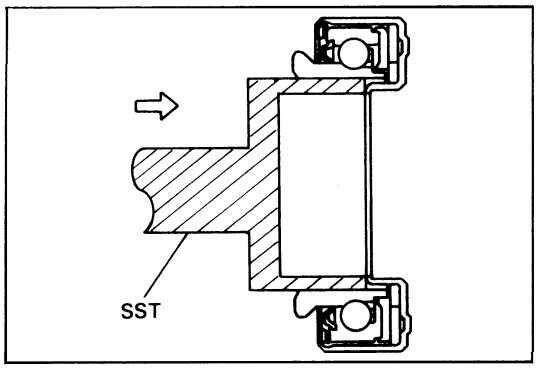
[Point 51

Reassembly: Apply chassis grease on the eye bolt and release lever sliding contact surface before reassembly.



[Point 61

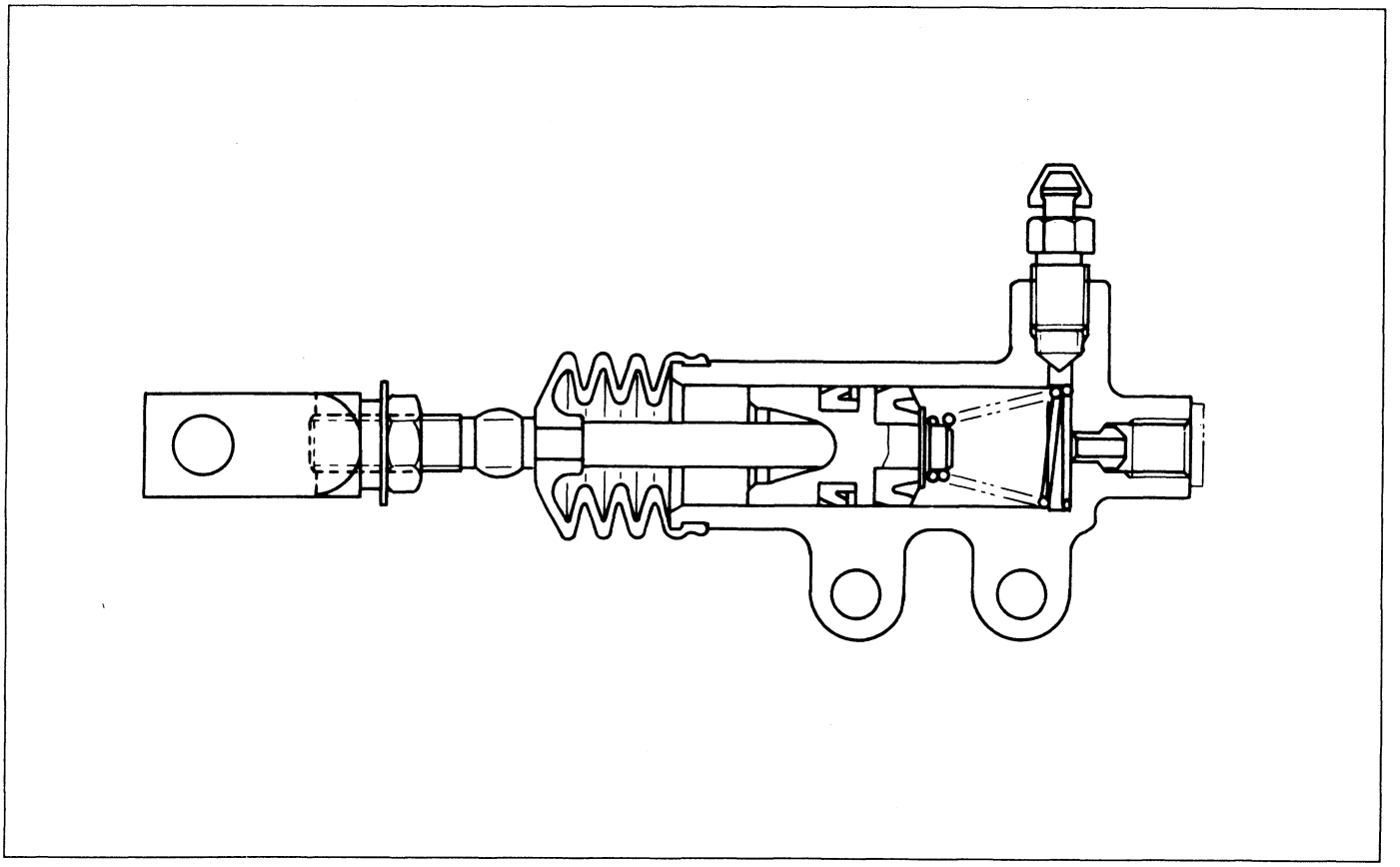
Disassembly: **SST** 09950-20017



Reassembly: **SST 09140-10170-71**
Install by tapping the illustrated portion of the bearing.

CLUTCH RELEASE CYLINDER

GENERAL

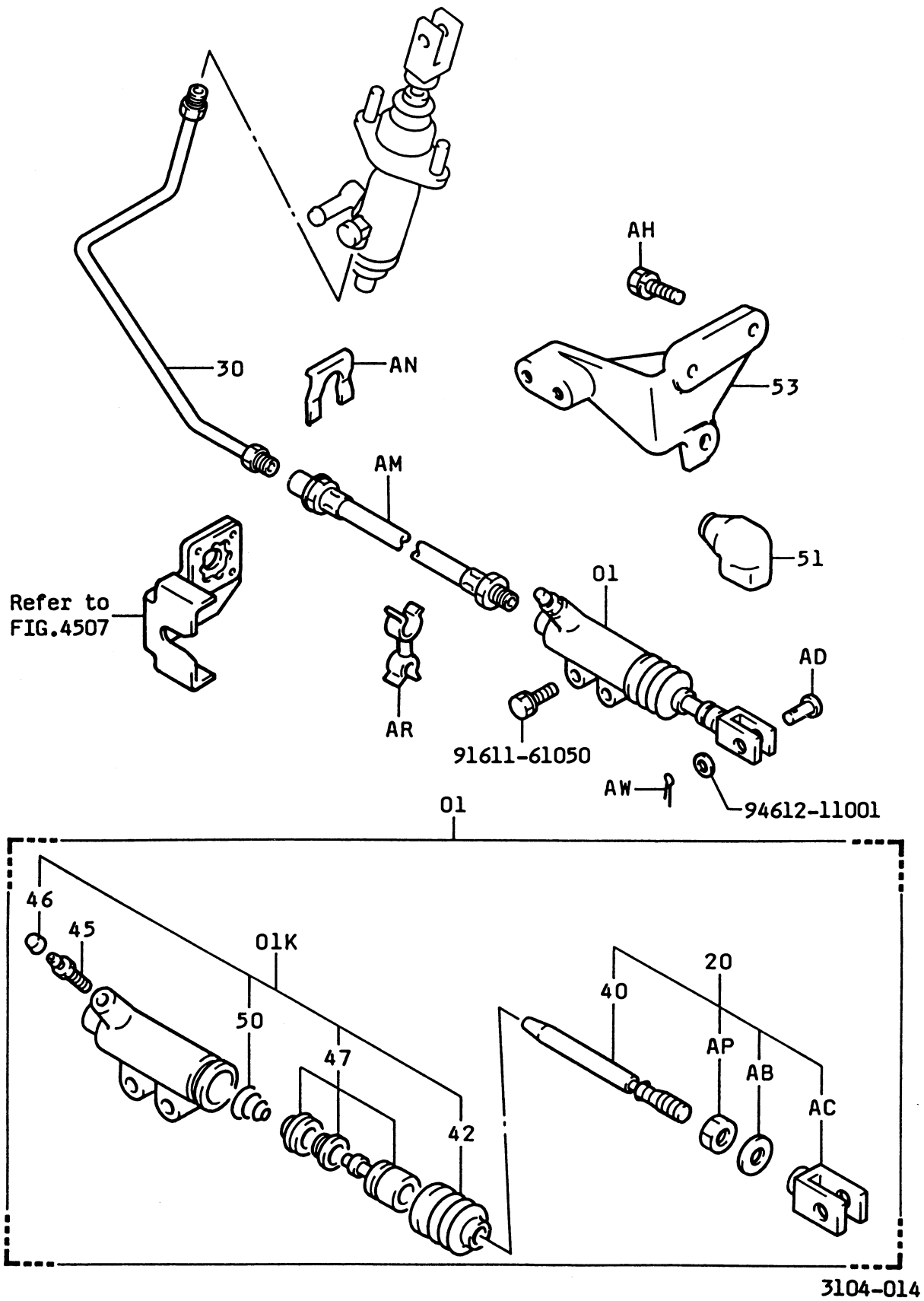


SPECIFICATIONS

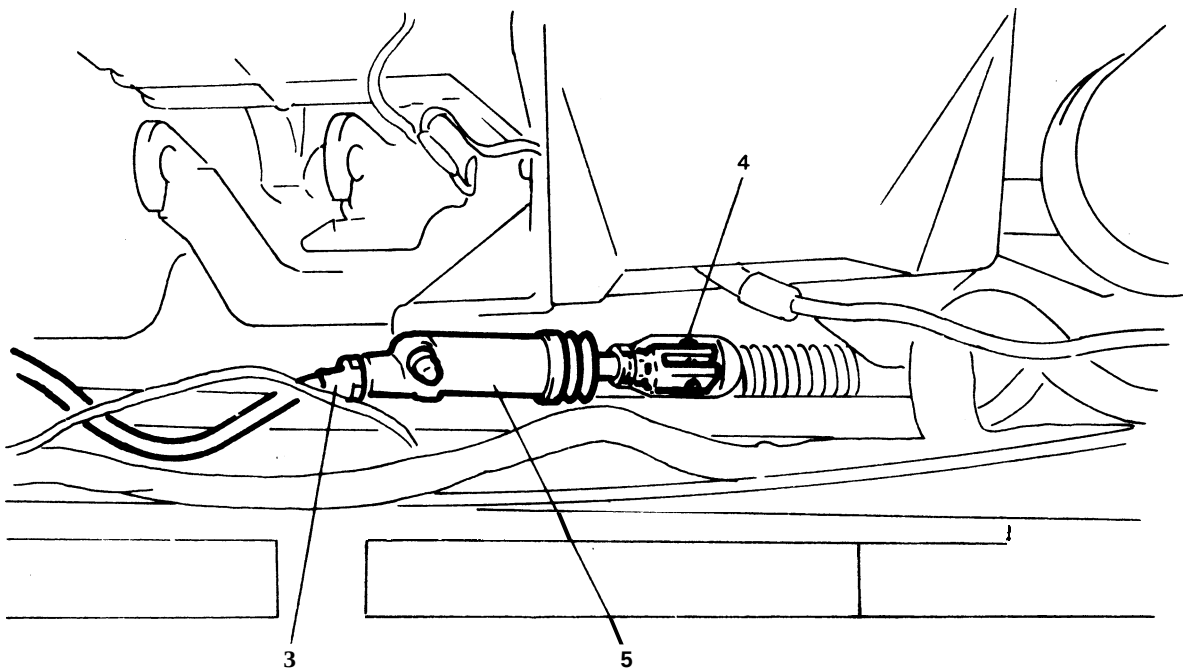
Type	Adjustment-free type
Inside diameter mm (in)	20.64 (0.8126)

COMPONENTS

3104



REMOVAL-INSTALLATION



1 Brake fluid
2 Toe board

Removal Procedure

1 Disconnect the clutch side hose from the reservoir tank and drain the brake fluid.

2 Remove the toe board.

3 Disconnect the hose.

4 Remove the push rod clevis pin.

5 Remove the clutch release cylinder.

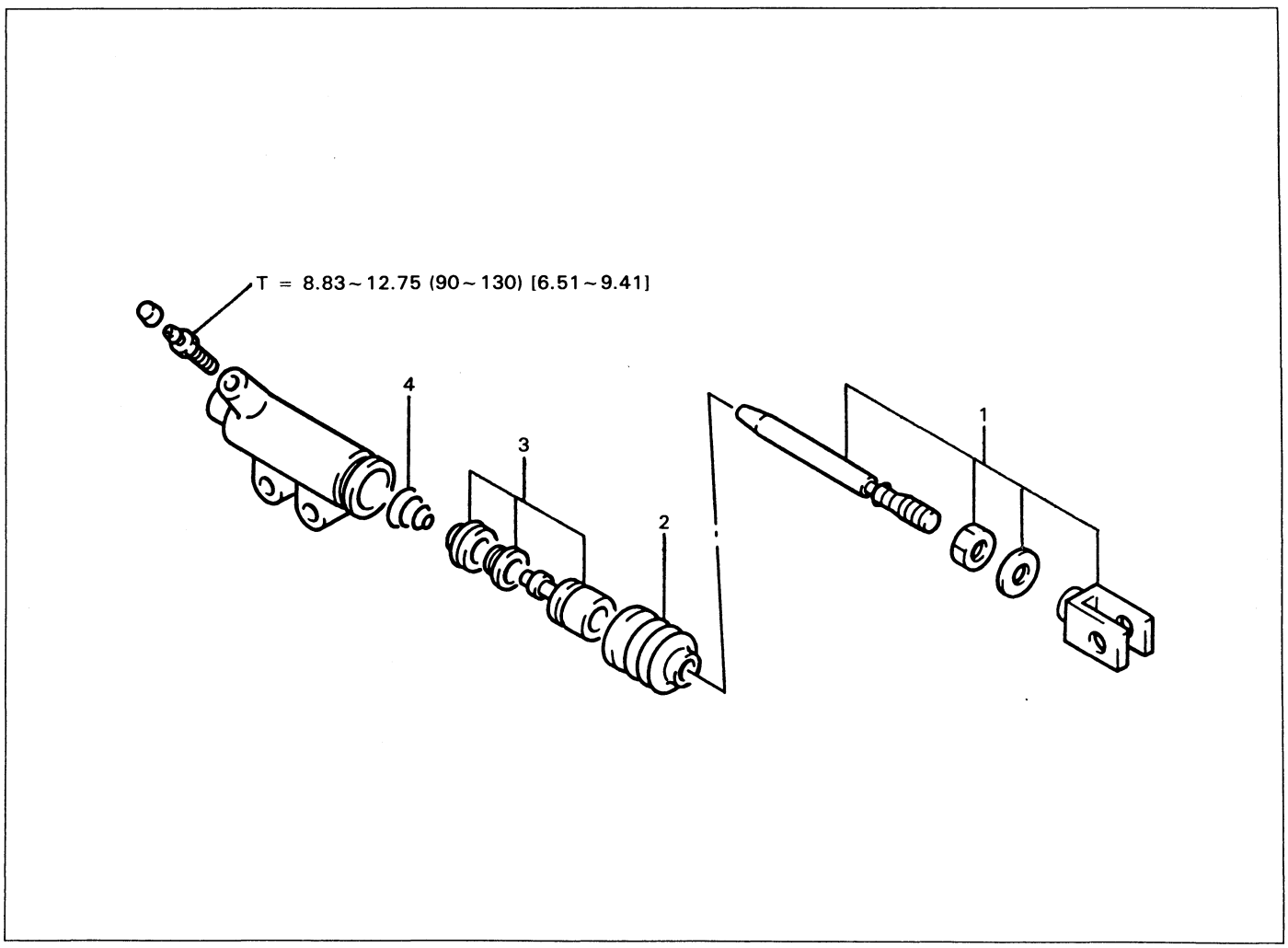
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Clutch release cylinder set bolt tightening torque**
  T = 14.71 - 21.57 N·m (150 - 220 kg-cm) [10.85 - 15.92 ft-lbl
- **See the clutch adjustment section (page 2-23) for the adjustment after installation.**
- **Carry out air bleeding. (See page 2-22.)**

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kg-cm) [ft-lb]



Disassembly Procedure

1 Remove the push rod. **[Point** 11

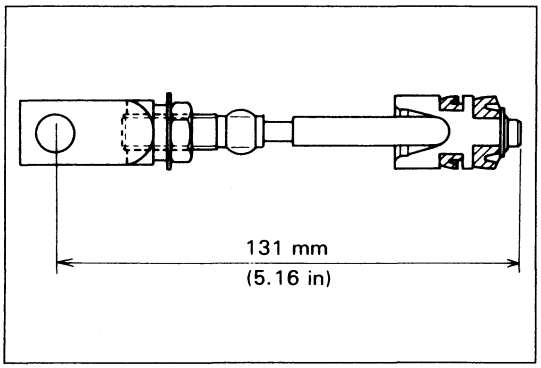
2 Remove the boot.

3 Remove the release cylinder piston. **[Point** 21

4 Remove the conical spring. **[Point** 31

Reassembly Procedure

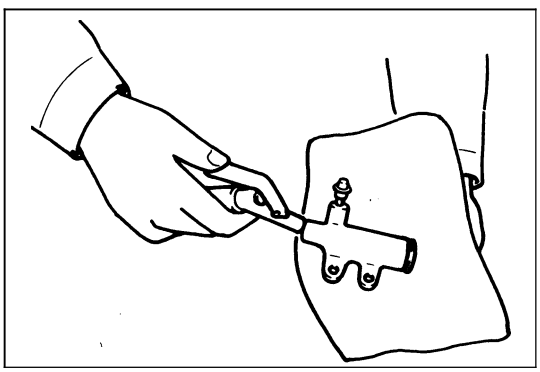
The reassembly procedure is the reverse of the disassembly procedure.



Point Operations

[Point 1]

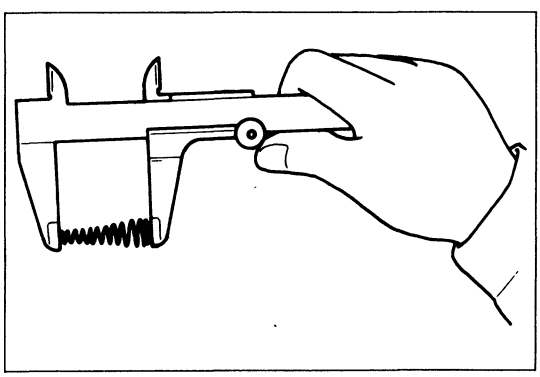
Reassembly: Temporarily set the push rod length to the illustrated dimension, and make readjustment after installation.



[Point 2]

Disassembly: Cover the outlet side with waste cloth and remove the piston by gradually blowing air through the oil inlet.

Reassembly: Apply rubber grease on the cylinder cup before installation.



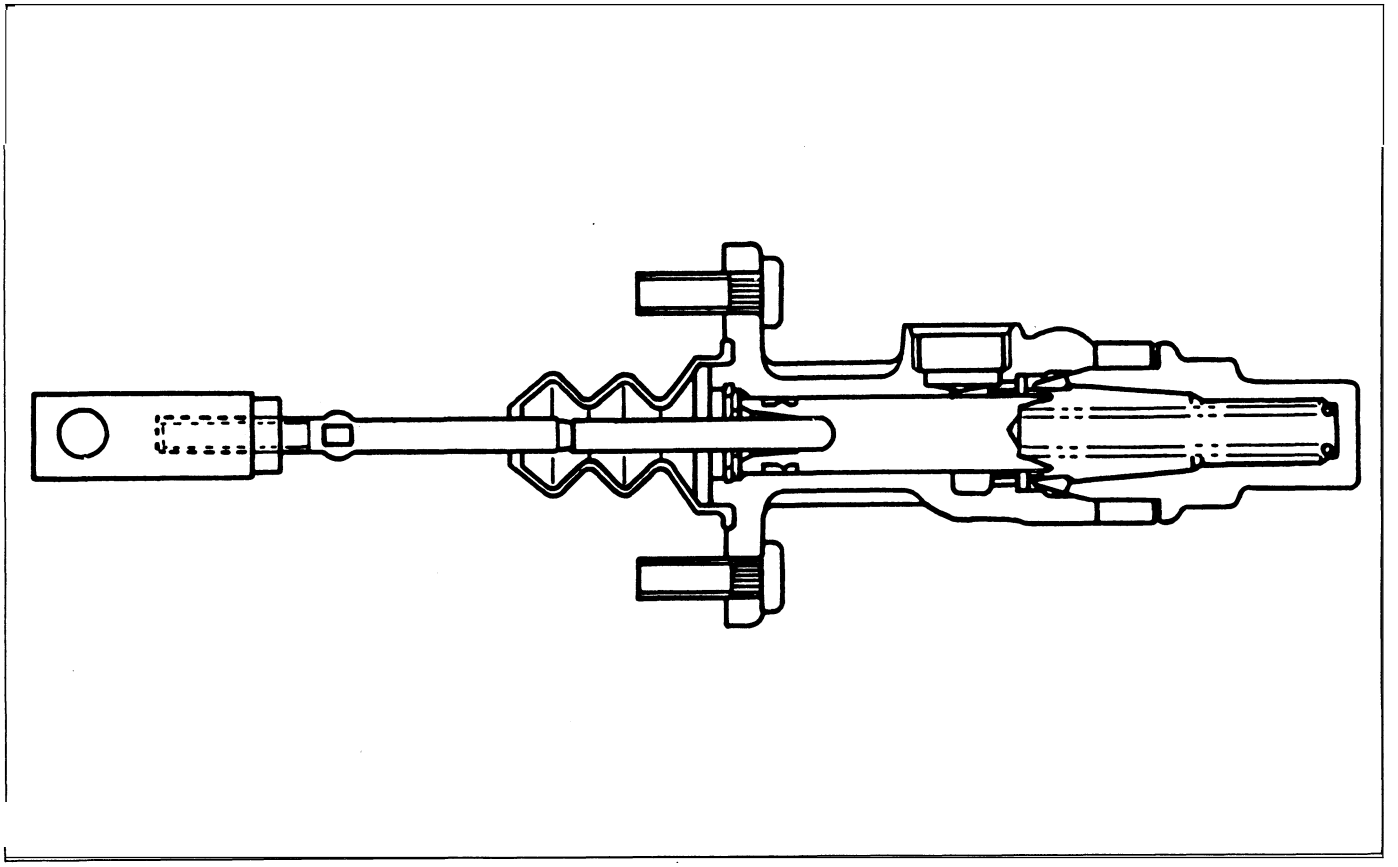
[Point 3]

Inspection: Measure the conical spring free length.

Free length:	**44.4 mm (1.748 in)**
Free length limit:	**41.5 mm (1.634 in)**

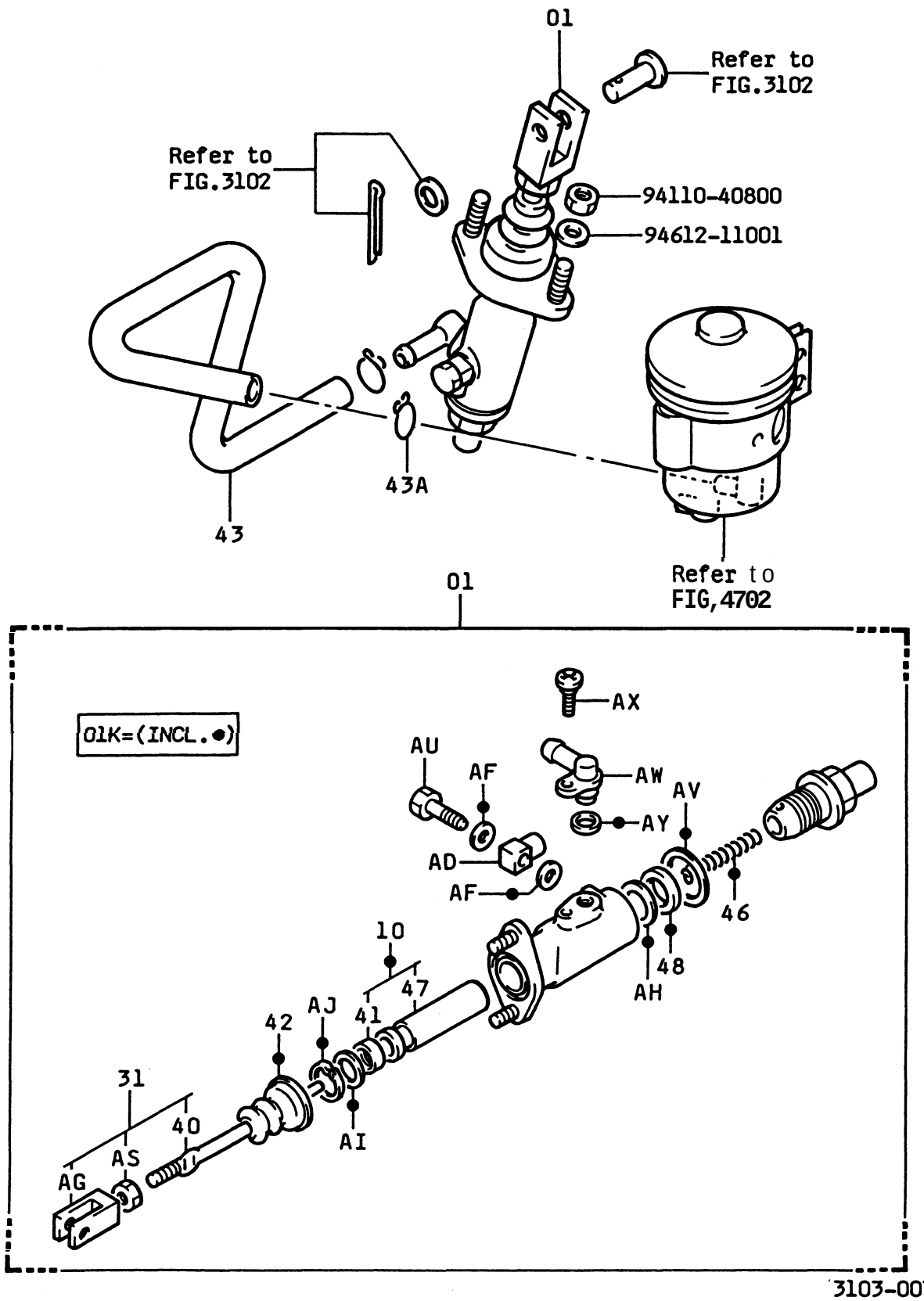
CLUTCH MASTER CYLINDER

GENERAL

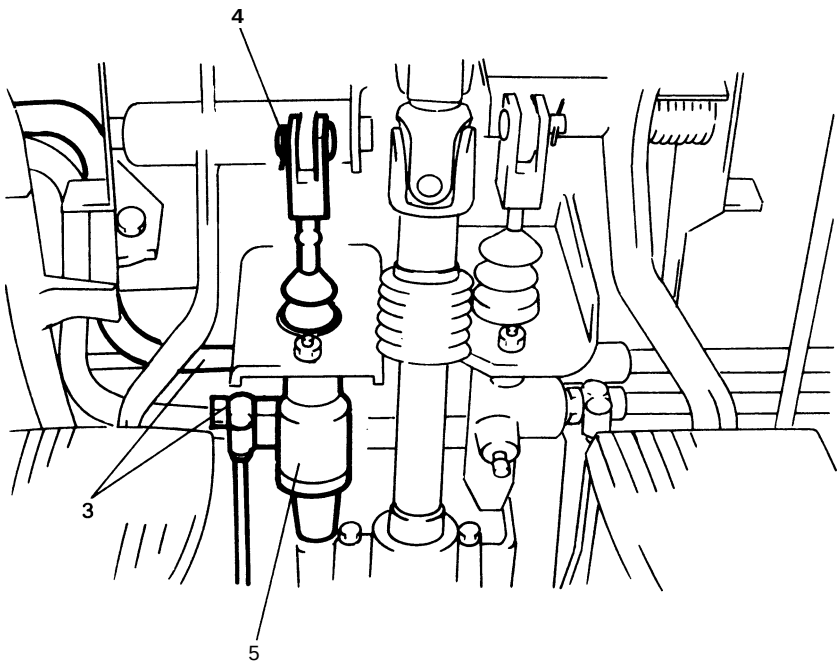


SPECIFICATIONS

Type	Girling
Inside diameter mm (in)	15.87 (0.6248)


01
Refer to FIG.3102
Refer to FIG.3102
94110-40800
94612-11001
43A
43
Refer to FIG,4702
01
01K=(INCL.●)
AX
AU
AF
AW
AV
AY
AD
AF
46
10
48
47
AH
AJ
42
41
31
40
AI
AS
AG
3103-007

REMOVAL-INSTALLATION



1 Brake fluid
2 Toe board and rubber cover

Removal Procedure

1 Disconnect the clutch side hose from the reservoir tank and drain the brake fluid.

2 Remove the toe board and rubber cover.

3 Disconnect the piping.

4 Remove the push rod clevis pin.

5 Remove the clutch master cylinder

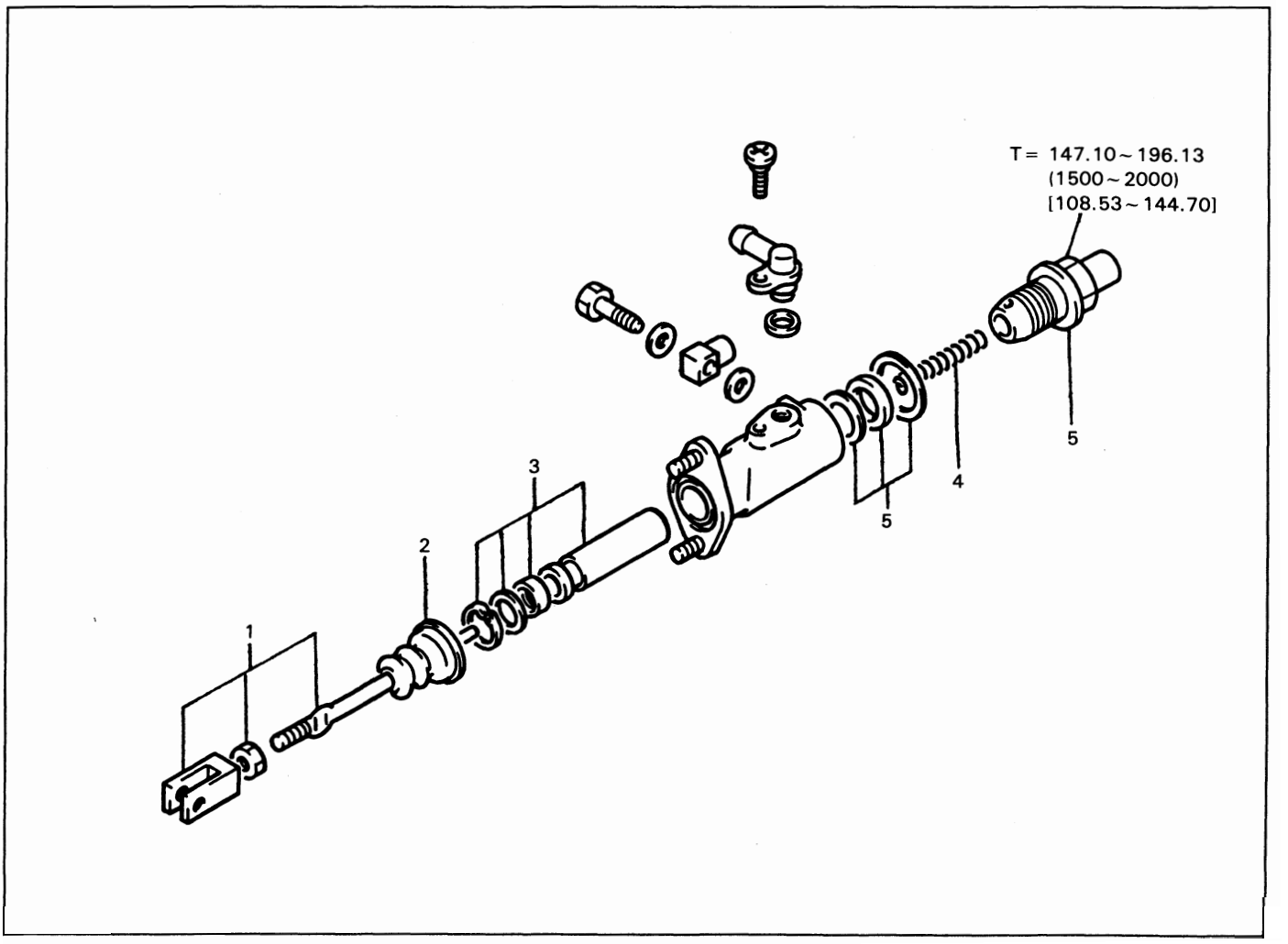
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **See the clutch adjustment section (page 2-23) for the adjustment after installation.**
- **Carry out gir bleeding. (See page 2-22)**

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kg-cm) [ft-lb]



Disassembly Procedure

1 Remove the push rod.

2 Remove the boot.

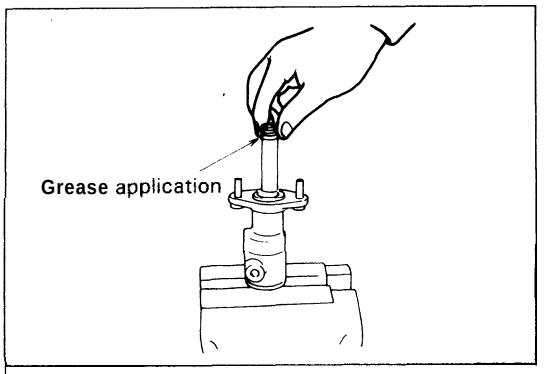
3 Remove the master cylinder piston. **[Point 1]**

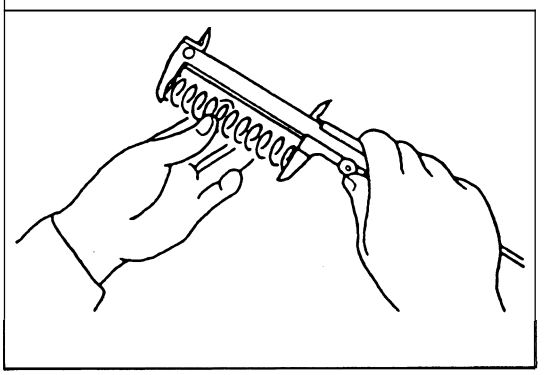
4 Remove the compression spring. **[Point 2]**

5 Remove the cylinder cap and cylinder cup.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.





Point Operations

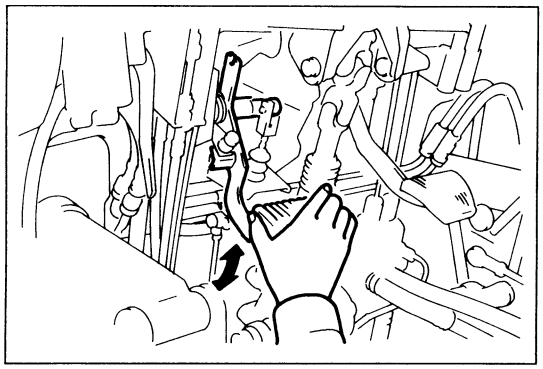
[Point 1]

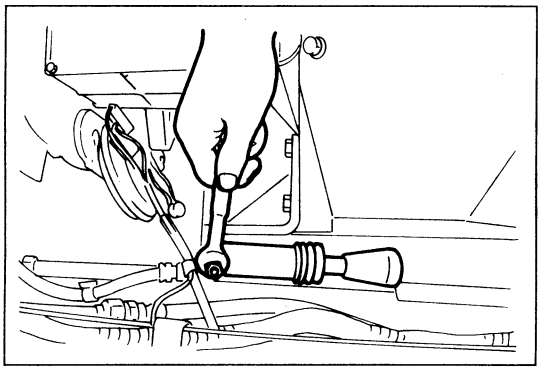
Reassembly: Apply rubber grease on the cylinder cup before installation.

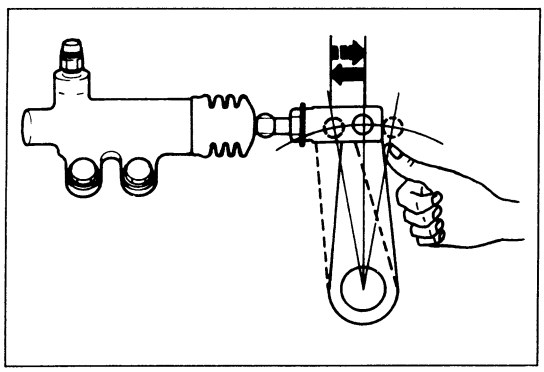
[Point 2]

Inspection: Measure the free length of the compression spring.

Free length: 87 mm (3.43 in)
Free length limit: 85.1 mm (3.35 in)







CLUTCH AIR BLEEDING

Dry Clutch Models (STD)

Note:
During air bleeding operation, add brake fluid from time to time to prevent the level from becoming insufficient.

1. Bleed air from the clutch release cylinder.
   (1) Depress the clutch pedal several times to compress the air in the piping and keep that state.
   (2) Loosen the breather plug to bleed air in the piping with the brake fluid and tighten the plug immediately before the discharge stops.
   (3) Repeat steps (1) and (2) until no air bubble is seen in the discharged brake fluid.

2. Add brake fluid to the specified level.

Oil Clutch Models (OPT)

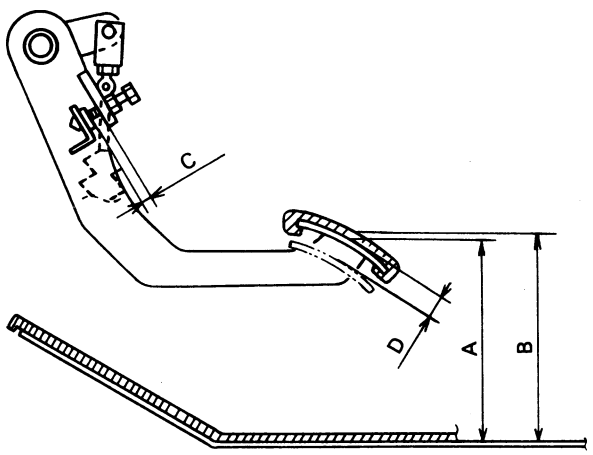
1. While running the engine at idle, slowly push the clutch release cylinder output rod slowly into the cylinder to the stroke end. Push it in again after returning to the out end. Repeat this five cycles.

Note:
Do not depress the clutch pedal.

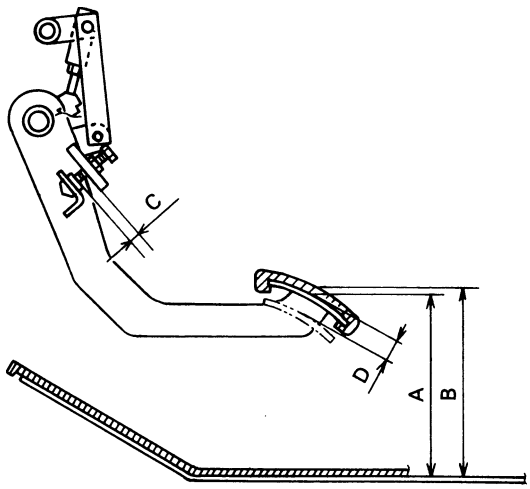
CLUTCH ADJUSTMENT

Clutch Pedal Adjustment

Dry clutch



Oil clutch



1. Adjust the clutch pedal height and play

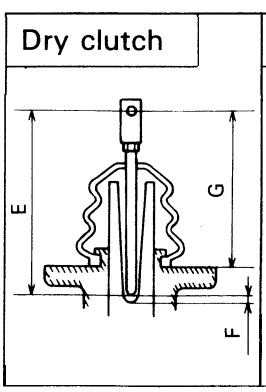
(1) Adjust the stopper bolt length (dimension C) to make the clutch pedal height (dimension A or B) satisfy the standard below.
(2) Adjust the push rod length (dimension E) to make the clutch pedal play (dimension D) satisfy the standard below.

Unit: mm (in)

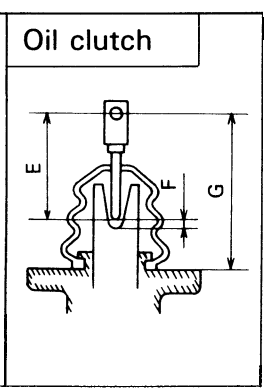
	A	B	C	D
Dry clutch	140–145 (5.51–5.71)	145–150 (5.71–5.91)	7 (0.28)	5–10 (0.20–0.39)
Oil clutch	↑	↑	↑	10–15 (0.39–0.59)

A: Dimension without pad
B: Dimension with pad
C: Reference value
D: Pedal play corresponding to push rod play (F)

Dry clutch



Oil clutch

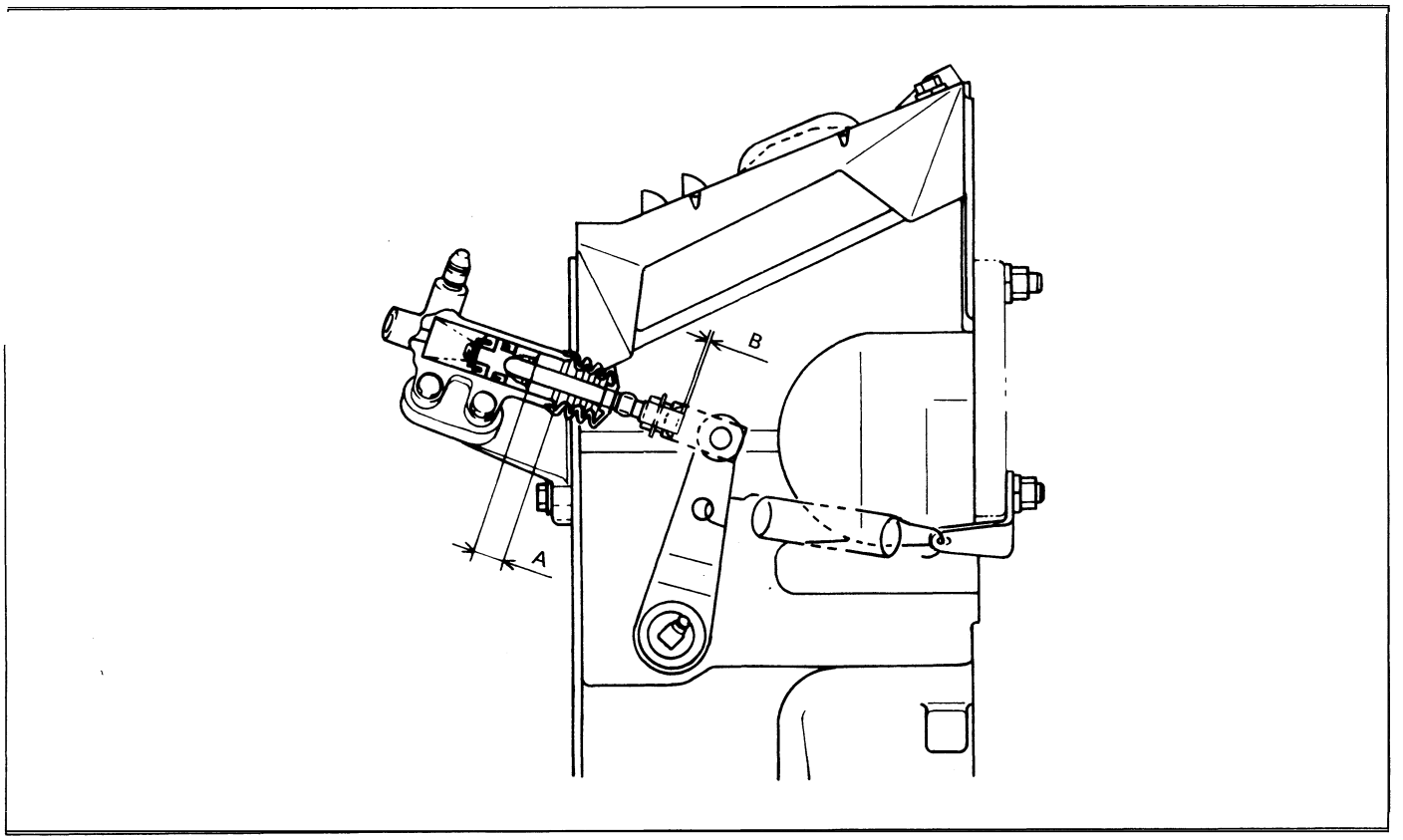


Unit: mm (in)

	E	F	G
Dry clutch	125 (4.92)	1–2 (0.04–0.08)	102 (4.02)
Oil clutch	93 (3.66)	↑	106 (4.17)

E, F and G: Reference values
(Note) The push rod play (F) shall always be over 0.

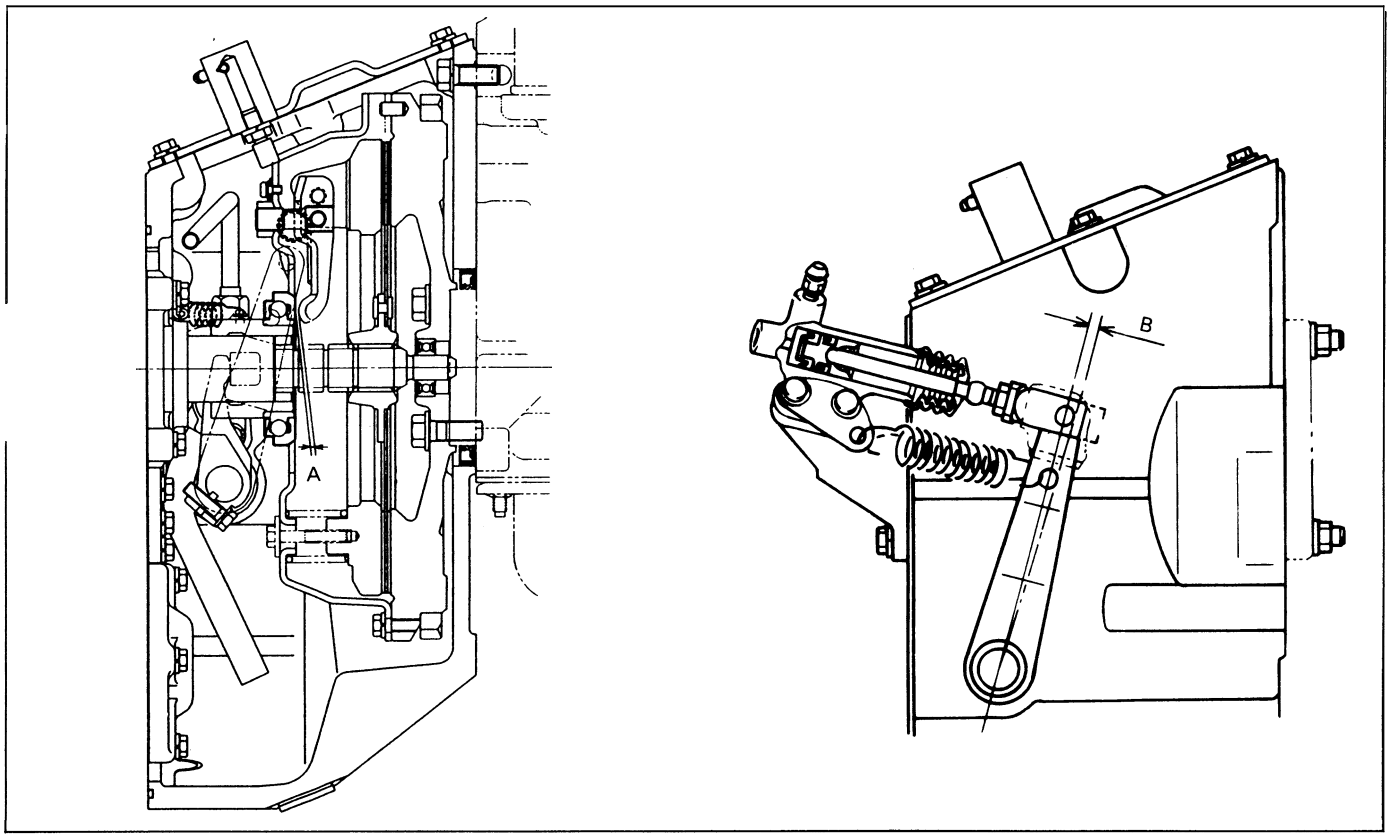
Release Cylinder Adjustment (Dry Clutch)



1. Adjust the release cylinder rod

   (1) With the release bearing in contact with the clutch cover, adjust the push rod length so that the release cylinder piston position (dimension A) satisfy the following standard.
   A = 15 mm (0.59 in)
   (It is allowed **to** adjust dimension B as B = 1 − 2 mm (0.04 − 0.08 in) when A = 15 mm (0.59 in).)
   (2) Bleed air from the release cylinder. (See page 2-22.)

Release Cylinder Adjustment (Oil Clutch)



1. Adjust the release cylinder rod length.

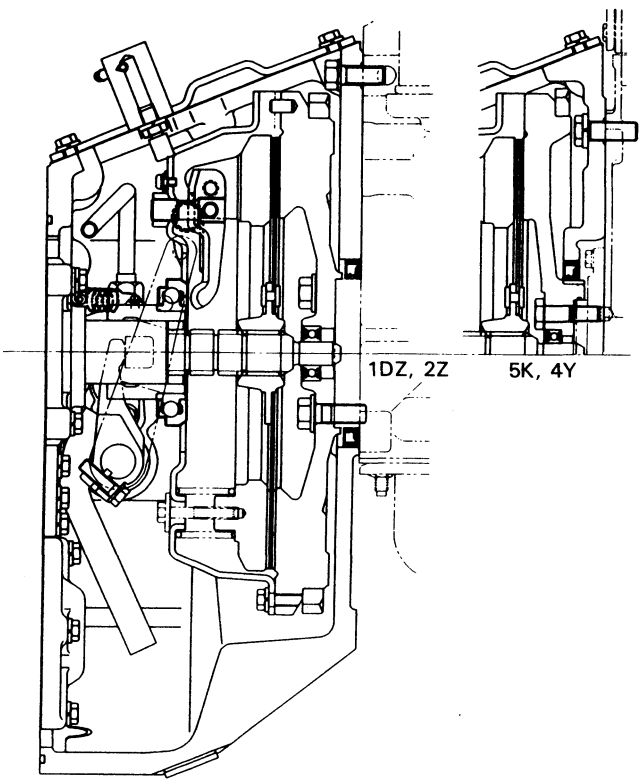
(1) Keep the release cylinder piston in contact with the cylinder bottom and bring the push rod into contact with the piston.
Adjust the push rod length in this state to make the clearance (dimension A) between the release bearing and clutch release lever (release bearing plate) satisfy the following standard.
A = **1 – 2 mm (0.04 – *0.08* in)**
(It is allowed to adjust dimension B as push rod stroke B = 2 – 4 mm (0.08–0.16 in) when A = 1 – 2 mm (0.04 –0.08 in))

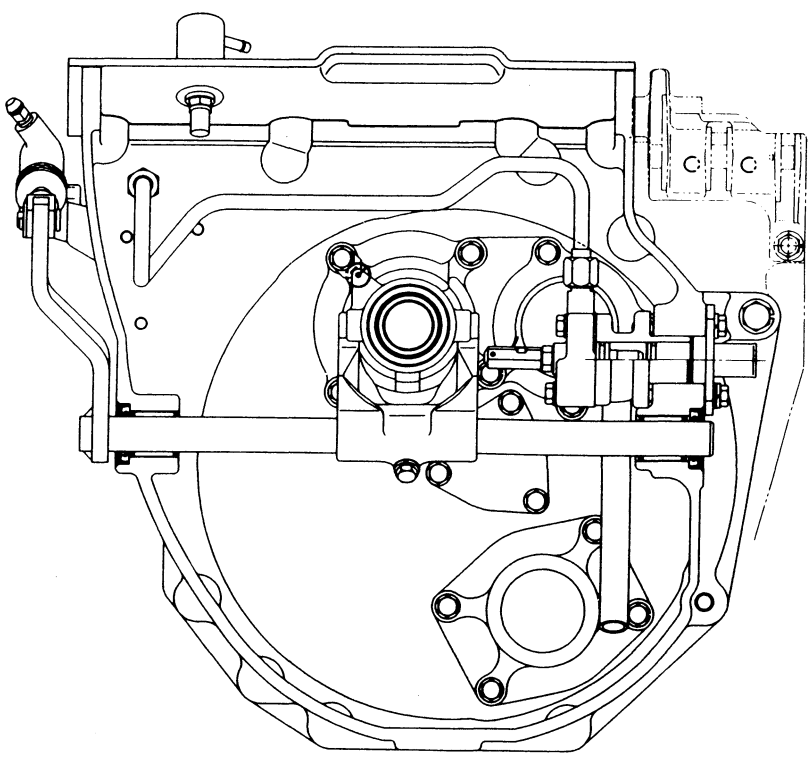
(2) Start the engine, and bleed air from the release cylinder. (See page 2-22.)

OIL CLUTCH (OPT)

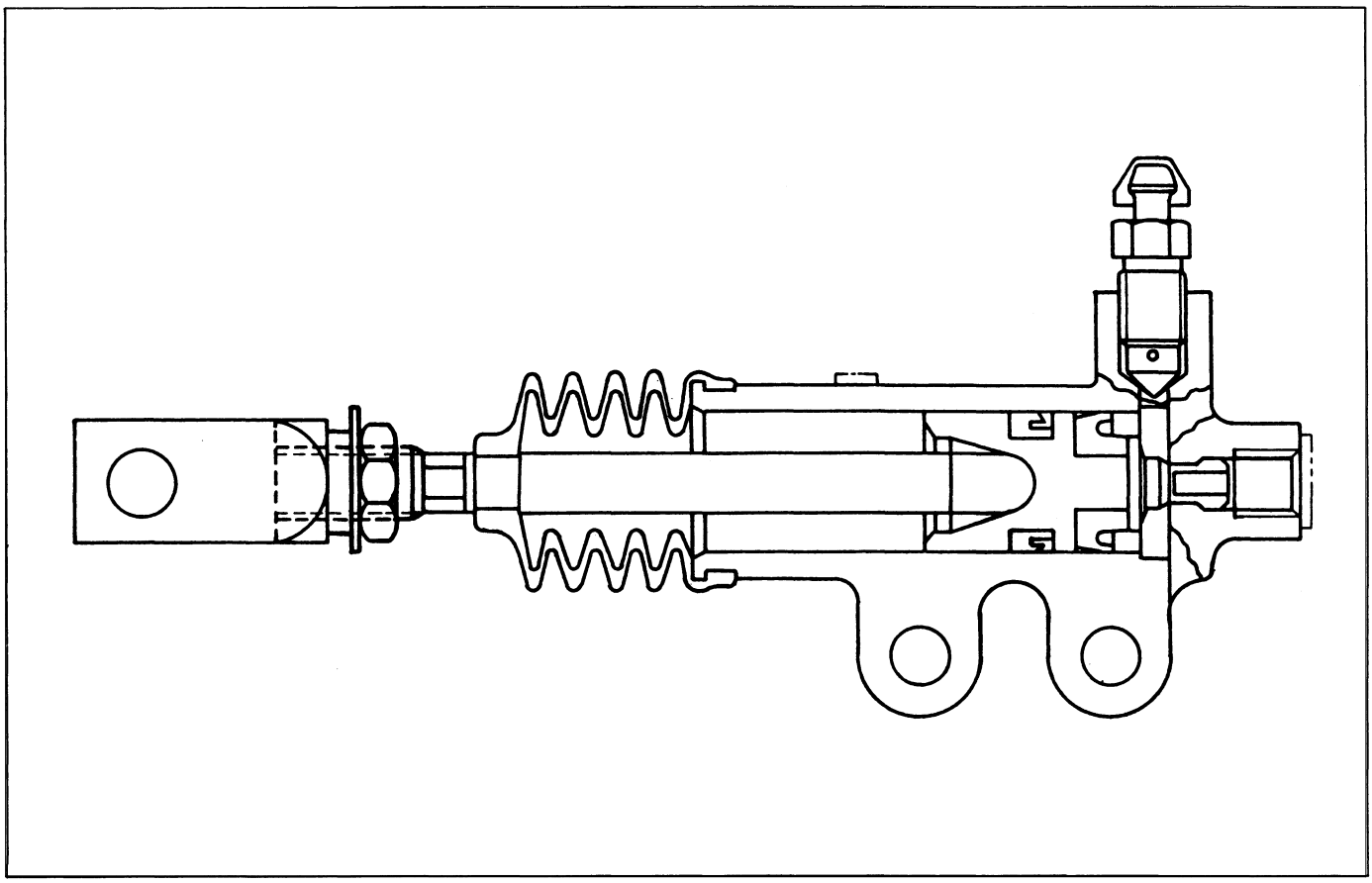
GENERAL

Clutch Cover

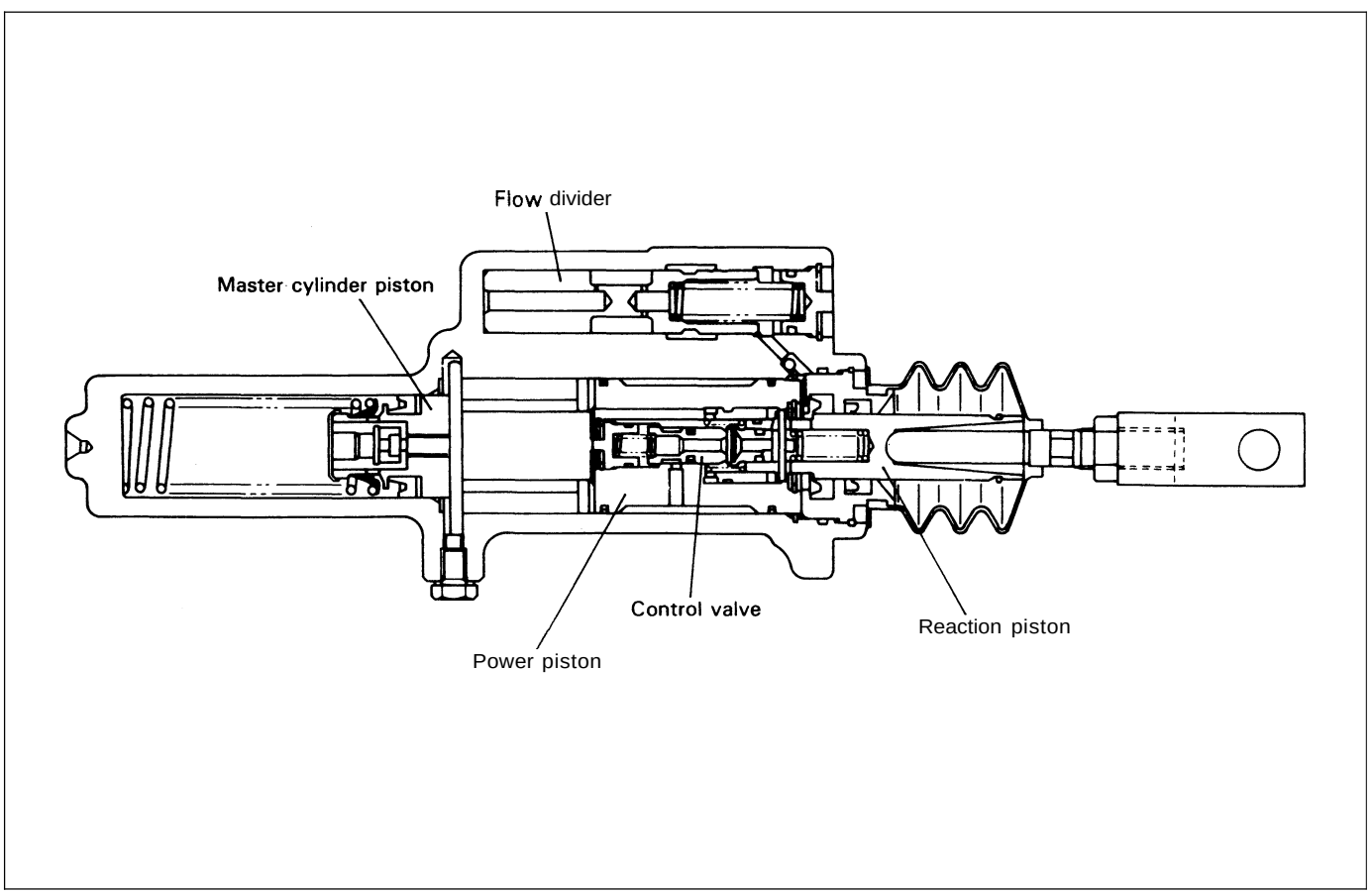




Release Cylinder



Clutch Booster



SPECIFICATIONS

Clutch cover

Item \ Vehicle model	5K engine model	4Y·1DZ engine model	2Z engine model
Type	Coil spring type	←	←
Number of springs	12	←	←
Spring installed length mm (in)	37.7 (1.494)	←	←
Spring installed load (total number of springs) N (kg) [lb]	5070 (517) [11401	←	6865 (700) [15441

Clutch disc

Item \ Vehicle model	5K engine model	4Y·1DZ engine model	2Z engine model
Type	Wet single plate	←	←
Outside diameter mm (in)	275 (1083)	←	←
Inside diameter mm (in)	175 (1544)	←	←
Material	Special cork	←	←

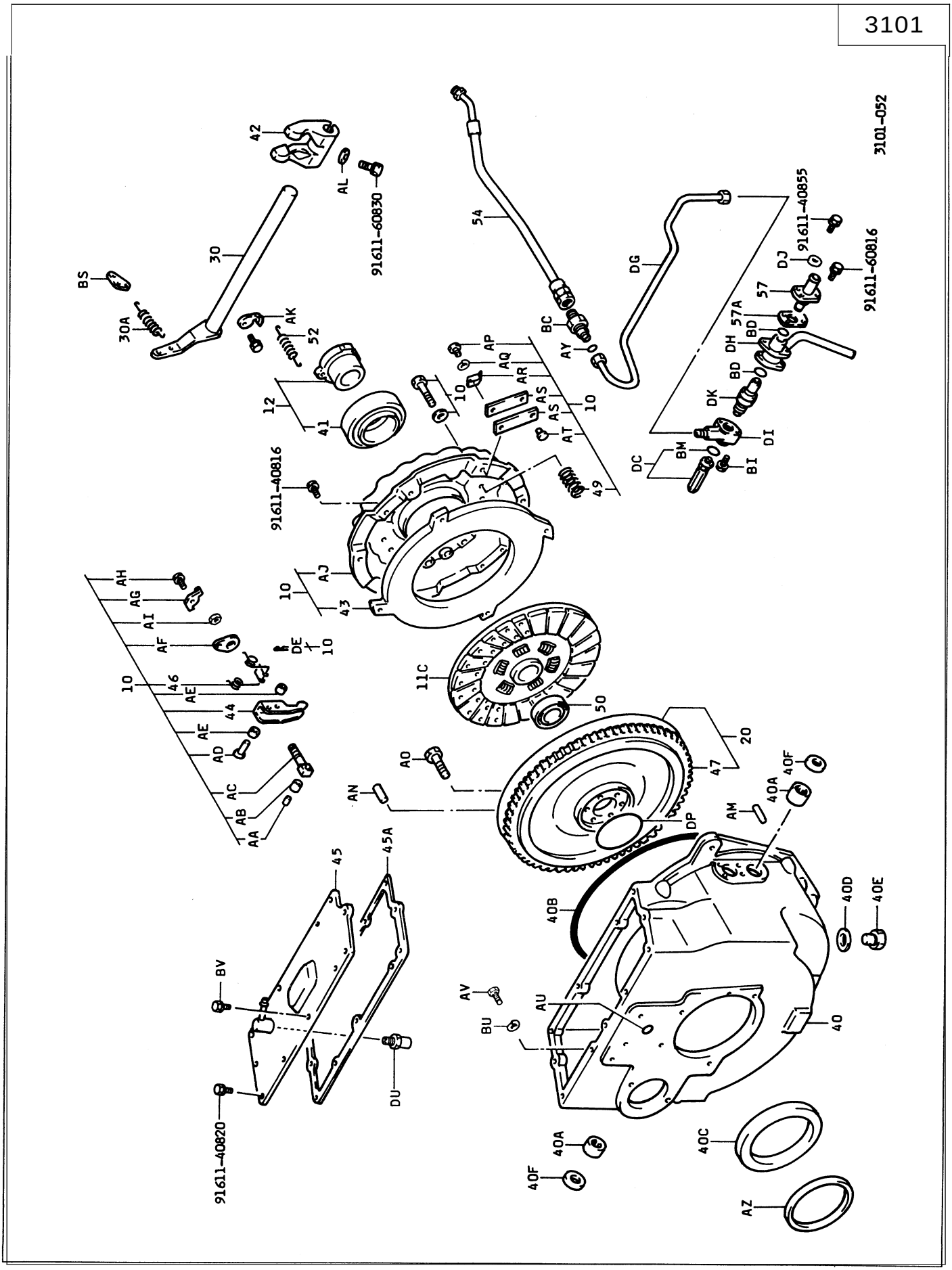
Clutch release cylinder

Type	Adjustable type
Inside diameter mm (in)	20.64 (0.81266)

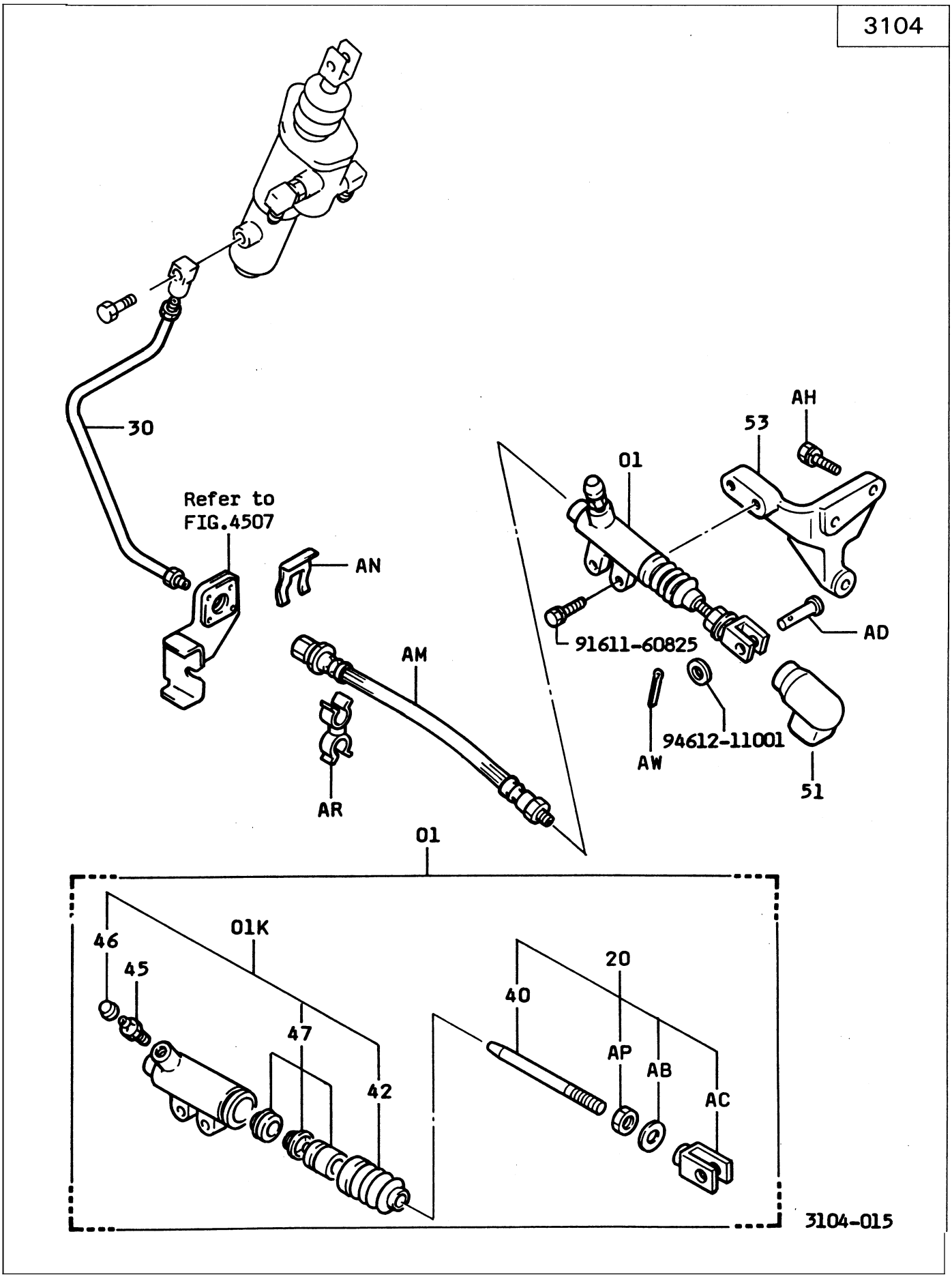
Clutch booster (clutch master cylinder)

Type			Portless with hydraulic booster
Master cylinder piston	Diameter	mm (in)	25.4 (1.000)
	Full stroke	mm (in)	28 (1.10)
Power piston	Diameter	mm (in)	33.6 (1.323)
Reaction piston	Diameter	mm (in)	16 (0.63)
	Full stroke	mm (in)	29.5 (1.161)

COMPONENTS

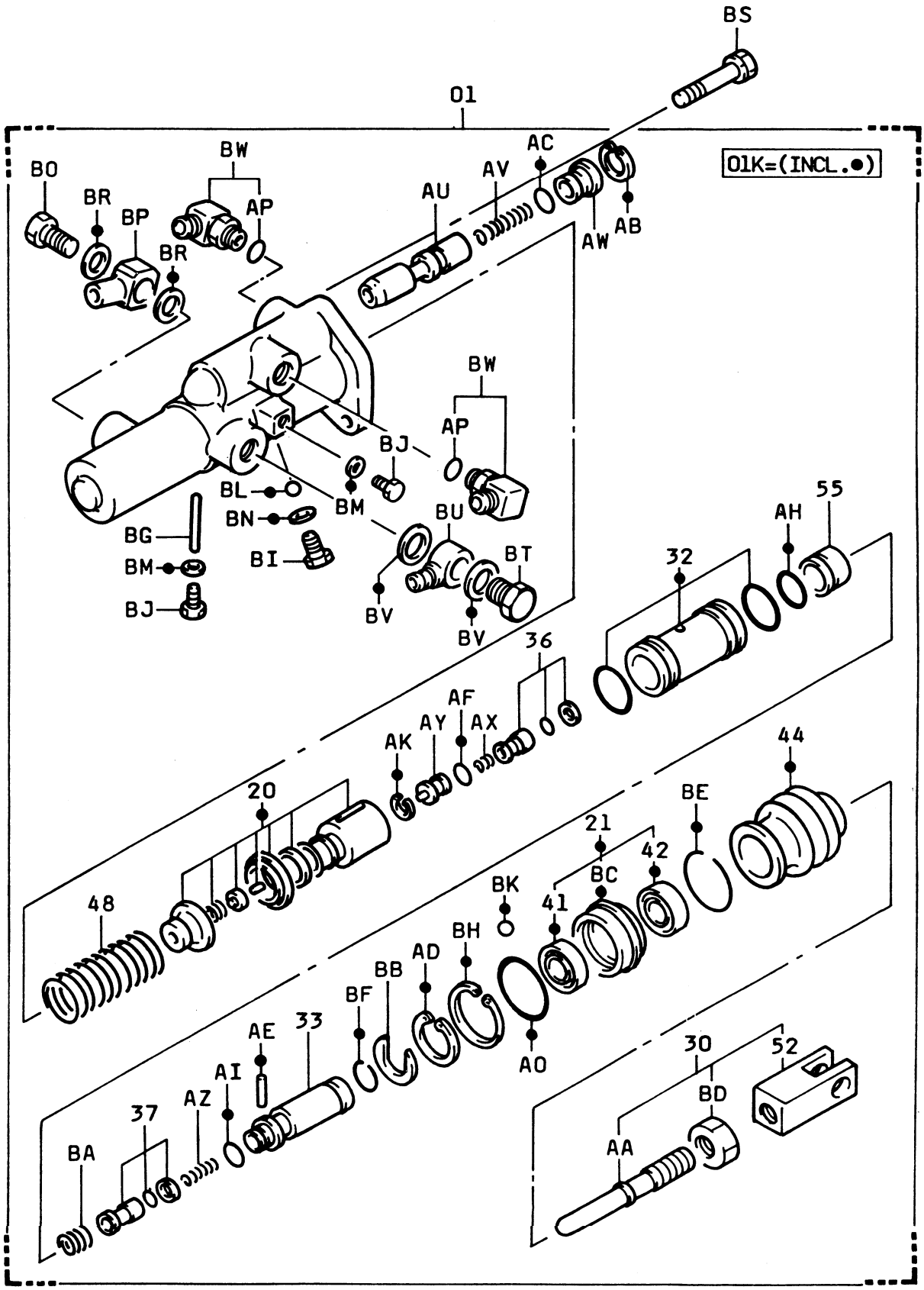

3101
3101-052
42
AL
91611-60830
30
BS
30A
AK
52
12
41
54
BC
AY
DG
91611-40855
DJ
91611-60816
57
57A
BD
DH
DK
DI
BM
BI
DC
AP
AQ
AR
AS
AT
10
49
91611-40816
AJ
43
AH
AG
AI
AF
DE
46
AE
44
AD
AC
AB
AA
11C
50
20
47
AO
AN
DP
AM
40A
40F
40B
40D
40E
40
AV
AU
BU
45
45A
BV
DU
91611-40820
40C
AZ

Clutch Release Cylinder



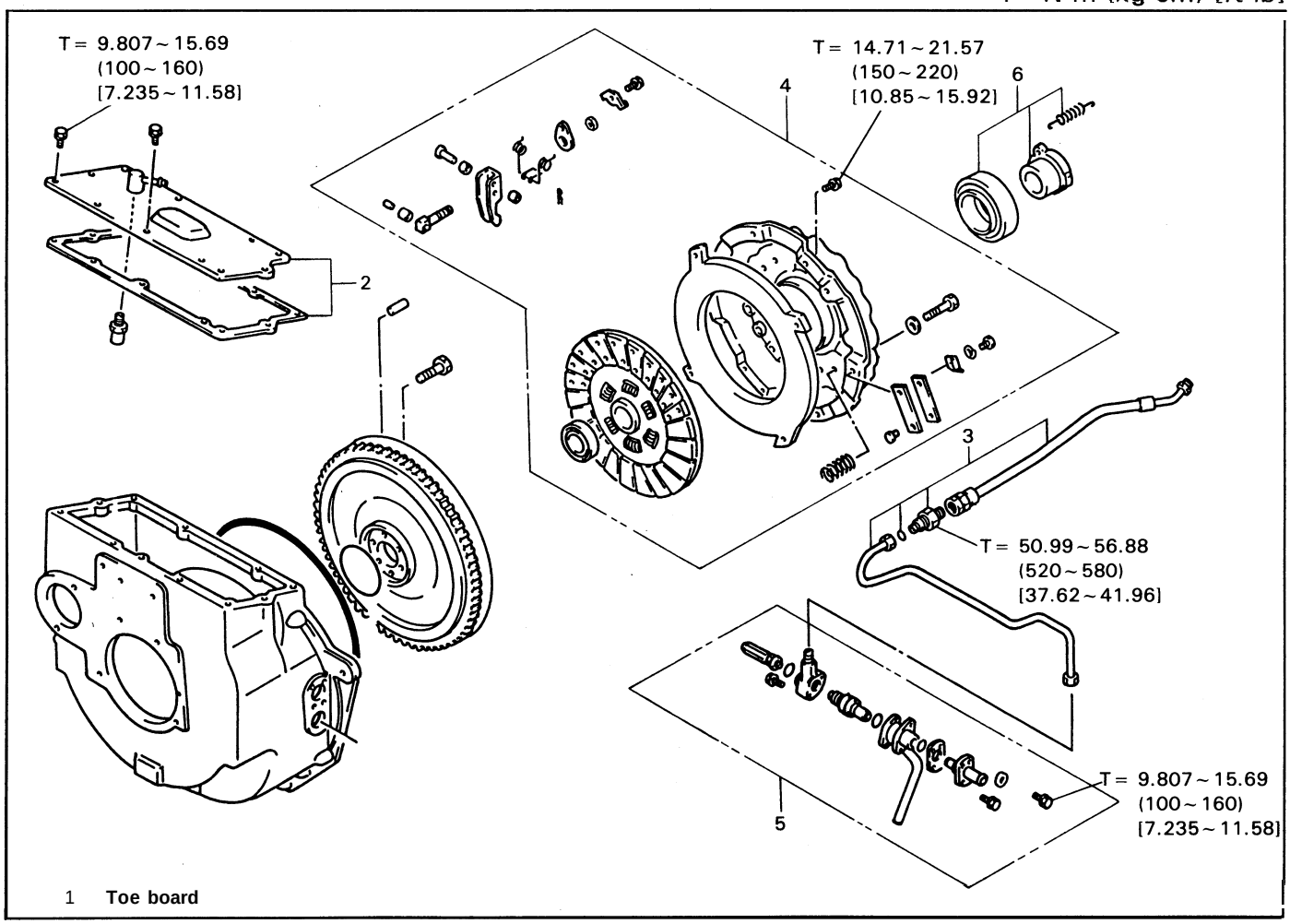
Clutch Booster

3105



OIL CLUTCH REMOVAL·INSTALLATION

T = N·m (kg-cm) [ft-lb]



1 **Toe board**

Removal Procedure

1 Remove the toe board.

2 Remove the clutch housing cover.

3 Remove the oil clutch pipe.

4 Remove the clutch cover and clutch disc.
(See steps 3 to 9 in the removal procedure on page 2-5, as the procedure is the same as for the dry clutch.)

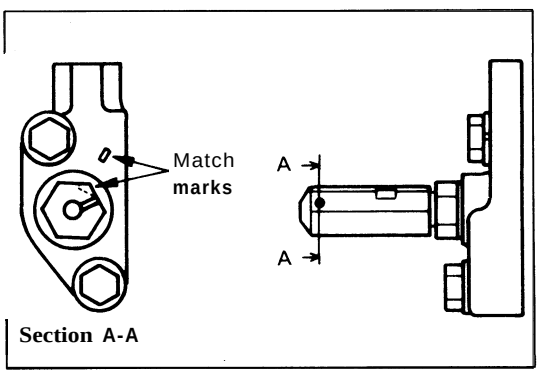
5 Remove the venturi related parts. [Point 11

6 Remove the release hub W/bearing.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- When the oil in the clutch housing is contaminated or the inside of the housing is dirty, drain oil from the drain plug and clean the inside of the housing.
- Use sandpaper and remove dirt (adhesion of rust, anticorrosive or impurities) on the friction surface of the pressure plate.
- Apply a thin coat of chassis grease on the input shaft spline portion, release bearing surface in contact with the release lever, and release hub surface in contact with the release fork.
- When installing the clutch cover, carefully operate to prevent deformation or damage of the oil clutch injection nozzle.
- Always remove the service bolts (3 pcs.) after installing the clutch cover.
- Check the hydraulic oil level.
- When oil in the clutch housing is drained, add the same amount of new hydraulic oil in the housing.



Section A-A

Point Operation

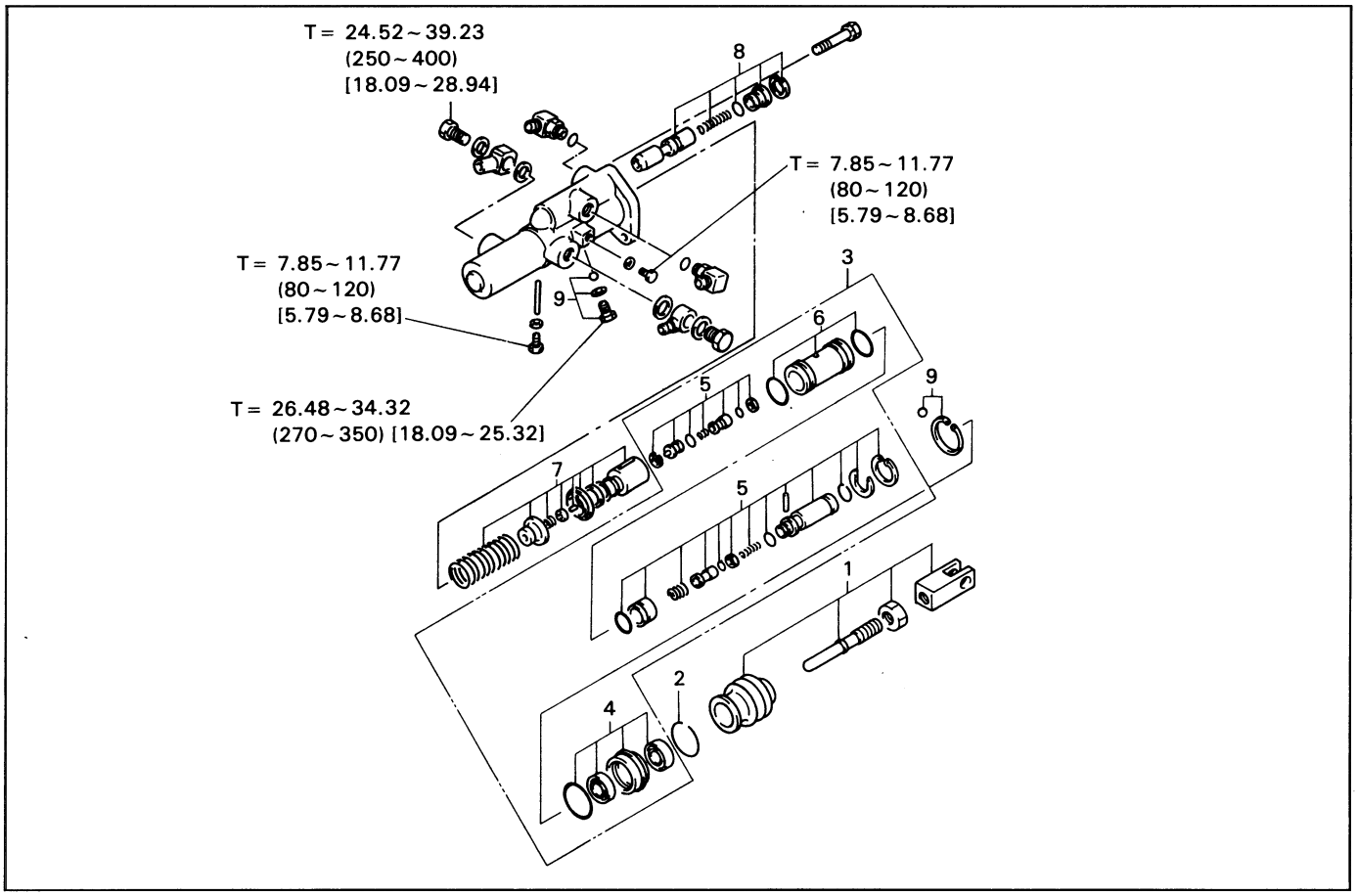
[Point 1]

Installation: Install the oil clutch nipple with its injection hole in the correct direction.

CLUTCH BOOSTER TROUBLESHOOTING

Phenomenon	Estimated cause	Corrective action
1. The clutch pedal is heavy (or becomes heavy from time to time).	• Push rod galling due to defective clutch booster installation • Valve seal defect or foreign matter trapping • Defective seals • Foreign matter intrusion to the spool portion	• Installed position adjustment • Cleaning or replacement of reaction piston or power piston • Replacement of seals • Disassembly and cleaning
2. The pedal is returned quickly upon engine stall.	• Check valve seal defect or foreign matter trapping • Valve seal defect or foreign matter trapping • Defective seals	• Cleaning or replacement • Cleaning or replacement of reaction piston or power piston • Replacement of seals
3. Clutch release failure (Pedal depressible with very light force soon followed by clutch reapplication during pedal depression)	• Release cylinder air bleeding defect • Defective seals	• Air bleeding • Replacement of seals

CLUTCH BOOSTER DISASSEMBLY·INSPECTION·REASSEMBLY T=N·m (kg-cm) [ft-lb]



Disassembly Procedure

1 Remove the push rod and boot.

2 Remove the snap ring.

3 Remove the reaction piston W/power piston from the body.
(If the fitting is tight, hold reaction piston at its portion before the C-ring.)

4 Remove the reaction piston guide.

5 Remove the reaction piston parts and control valve parts. [Point 1]

6 Remove the power piston parts. [Point 2]

7 Remove the master cylinder piston parts. [Point 3]

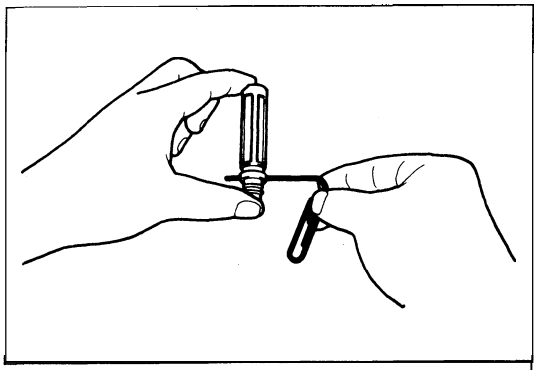
8 Remove the flow divider parts.

9 Remove the check ball.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

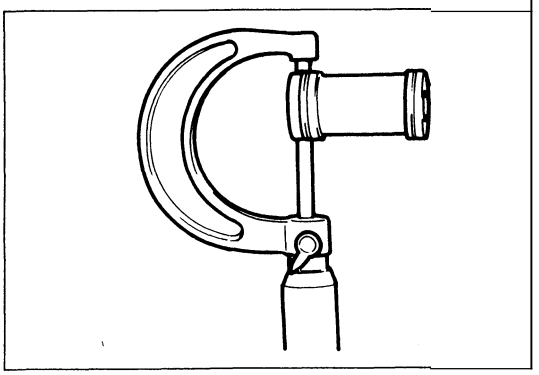
Note:
- Coat hydraulic oil on each part before reassembly.
- Coat silicone grease on the cylinder cup before reassembly.



Point Operations

[Point 1]

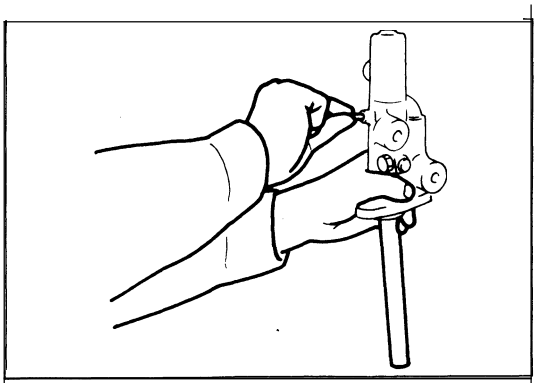
Disassembly: Push the pin connecting the reaction piston with a wire, and remove the reaction piston. Carry out this operation while the control valve seat in the reaction piston is kept slightly pressed.



[Point 21

Inspection: Inspect the wear on the power piston sliding contact surface.

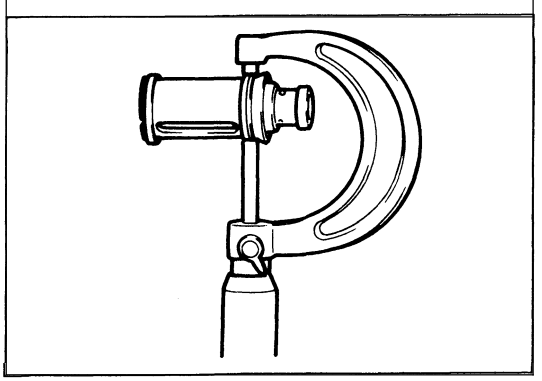
Wear limit: 0.032 mm (0.00126 in) (diametric clearance)



[Point 31

Disassembly: Push the master cylinder piston with a round bar to make the pin retaining the piston fall and extract the master cylinder piston.

Reassembly: Push the master cylinder piston with a round bar and align the piston slit groove with the body pin hole. Insert the pin.



Inspection: Inspect wear on the master cylinder piston sliding contact surface.

Wear limit: 0.032 mm (0.0126 in) (diametric clearance)

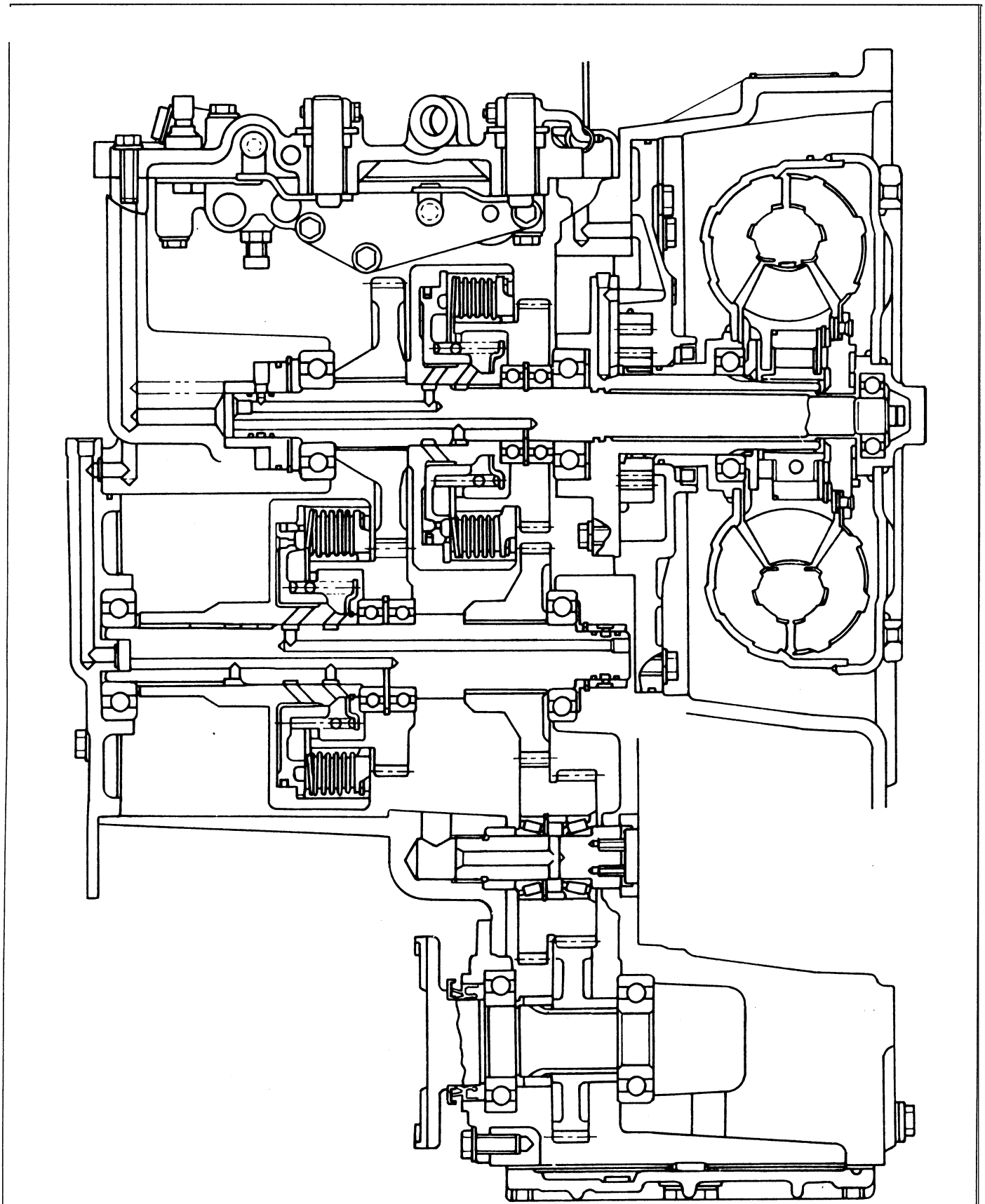
TORQUE CONVERTER

3

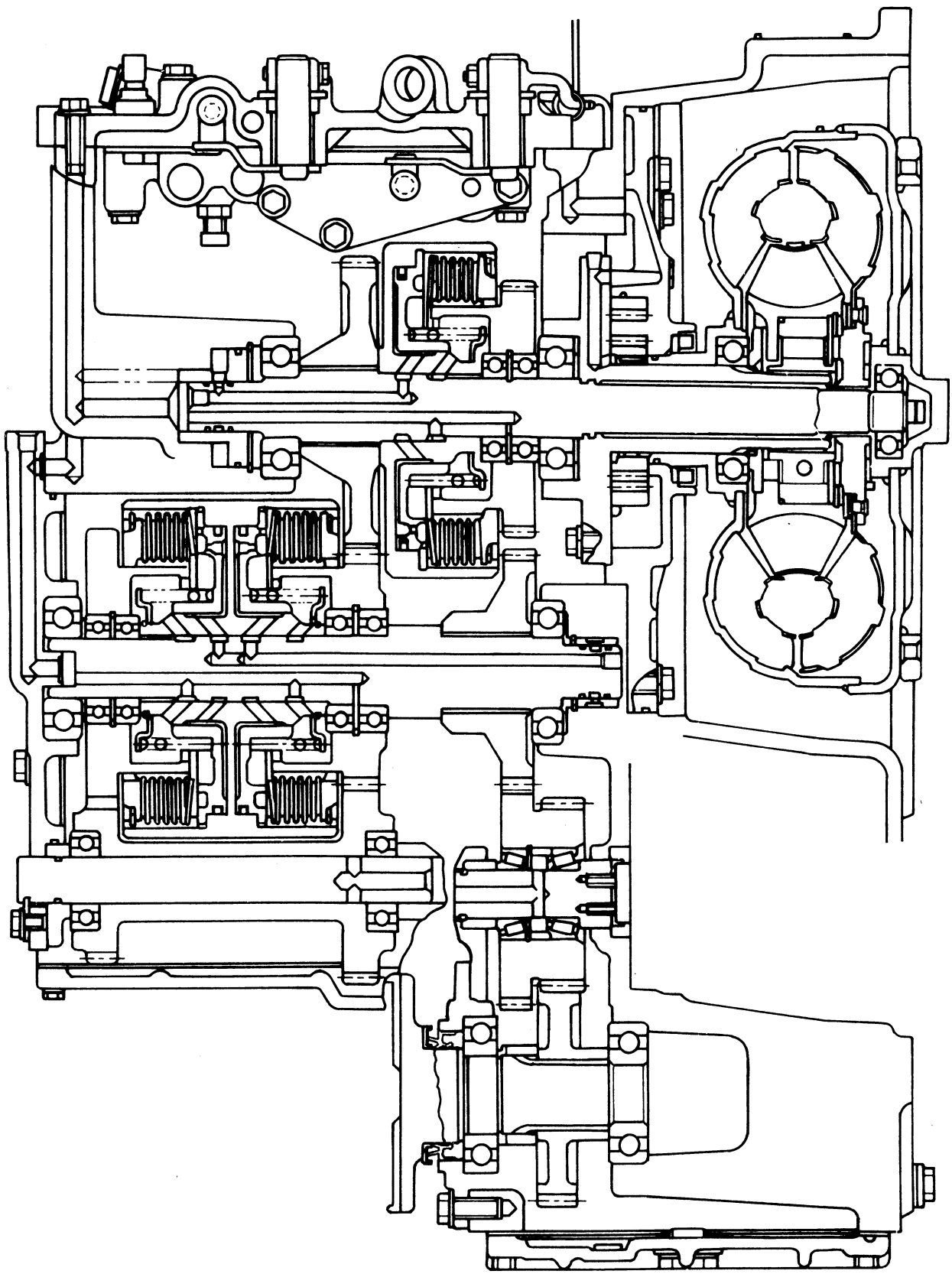
Note:
Refer to Page 3-49 for the repair sequences involved in the 1st speed torque converter manufactured May 1995 and then after.

GENERAL

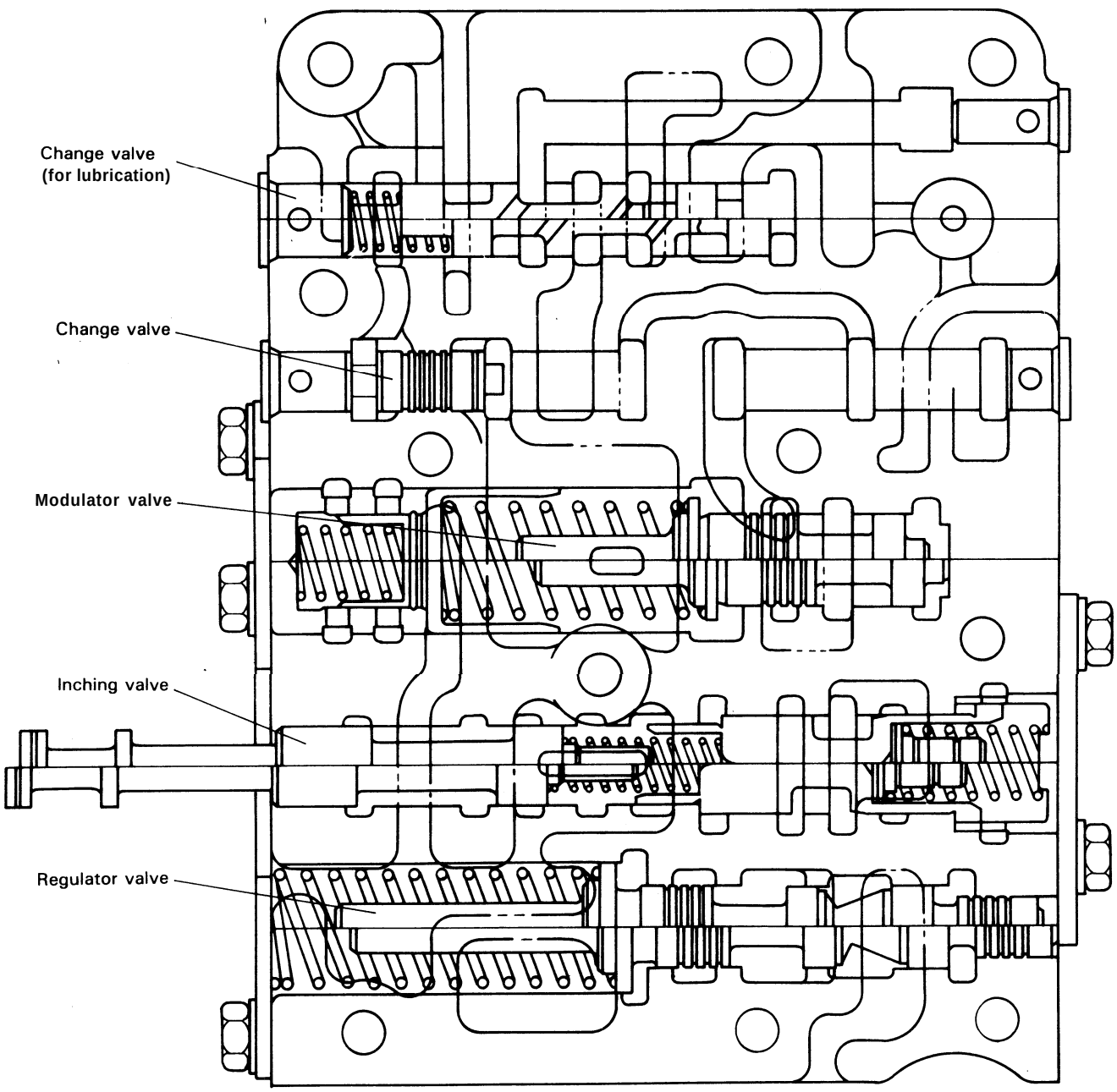
1 Speed Torque Converter (STD)



2 Speeds Torque Converter (OPT)

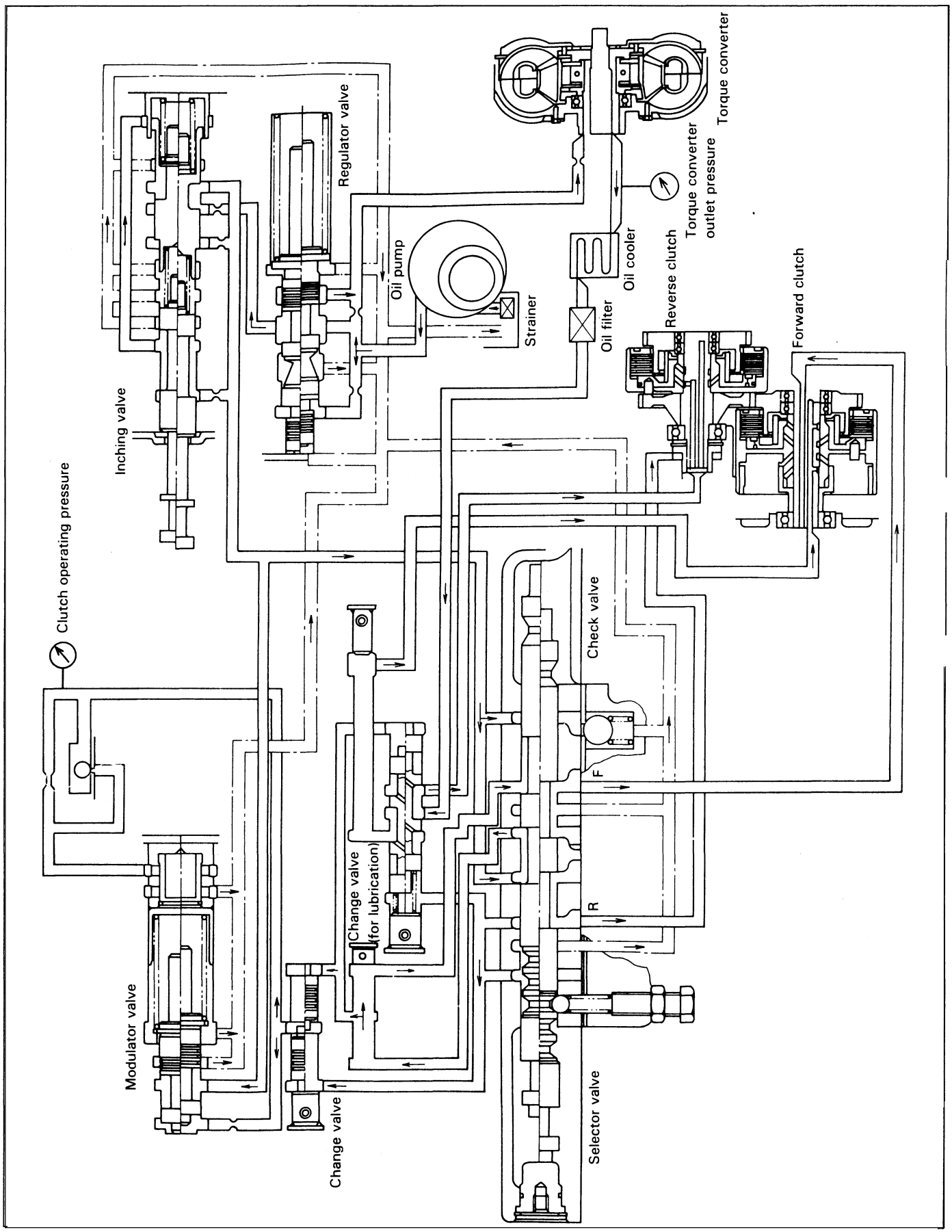


Control Valve

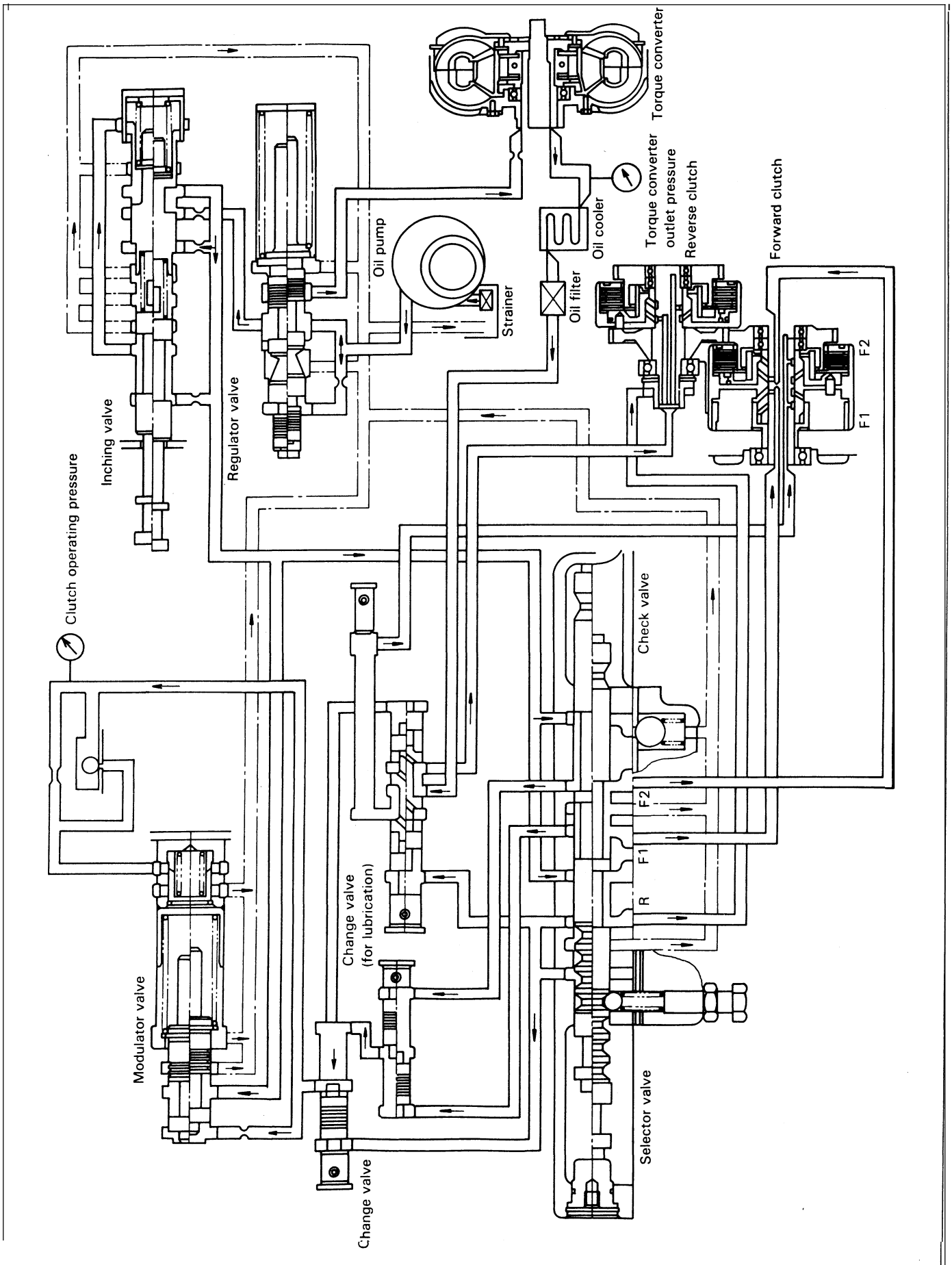


HYDRAULIC CIRCUIT DIAGRAM

For 1 Speed



For 2 Speeds


Torque converter
Torque converter outlet pressure
Reverse clutch
Forward clutch
Oil pump
Oil cooler
Oil filter
Strainer
Inching valve
Regulator valve
Clutch operating pressure
Check valve
F2
F1
R
Change valve (for lubrication)
Modulator valve
Change valve
Selector valve

SPECIFICATIONS

Item	1 speed torque converter (STD)	2 speeds torque converter (OPT)
Manufacturer	AISIN SEIKI	←
Torque converter type	3-element, single-stage, two-phase type	←
Torque converter name	AISIN	←
Stall torque ratio	5K: 2.94 4Y·1DZ: 2.68 2Z: 2.76	4Y·1DZ: 2.68 22: 2.76
Stall speed rpm	5K: 1950 4Y·2Z: 2100 1DZ: 2150	4Y·2Z: 2100 1DZ: 2150
Module control pressure kPa (kg/cm²) [psi]	39 – 490 (0.4 – 5.01 [5.7 ~ 7.11	←
Clutch operating pressure (main pressure) kPa (kg/cm²) [psi]	981 (10.0) [142]	←
Torque converter outlet pressure kPa (kg/cm²) [psi]	392 (4.0) [57]	←
Torque converter oil capacity ℓ (US gal)	14 (3.7)	←
Torque converter oil	Auto fluid	←

(Note) The hydraulic pressure is indicated by the value at an engine speed of 2.000 rpm.

Gear ratio

	1 speed torque converter							2 speeds torque converter	
	1 ton series		2 ton series			3 ton series		2.3 ton series	
	5K	4Y·1DZ	5K	4Y·1DZ	2Z	4Y·1DZ	2Z	4Y·1DZ	2Z
Forward 1st speed	1.366	1.033	1.838	1.220	1.064	1.366	1.126	1.474	1.285
Forward 2nd speed	—	—	—	—		—	—	1.040	0.907
Reverse	1.359	1.028	1.829	1.214	1.059	1.359	1.120	1.214	1.059

TROUBLESHOOTING

Fault status	Inspection method	Judgment-estimated cause-action
1. The vehicle does not move at all or moves very slowly. (Failure of power transmission by clutch)	1.1 Inspect the main pressure. Check both in the case of shifting to forward or reverse and at the neutral state. Standard: (See the measurement-test section.)	• Oil level check—Check by the level gage.
	1.1.a The oil pressure in the neutral state is lower than the standard.	• Regulator valve sticking—Check foreign matter trapping, etc., and wash the regulator valve. • Break down or fatigue of regulator valve spring-+Replacement • Oil pump malfunction ① Oil pump defect-+Replacement ② Damage of extension sleeve→ Replacement • Defect in suction line ① Clogged oil strainer—Replacement ② Air suction—Check the O-ring or gasket at each joint. • Clogging of oil leakage in the oil path between the pump and control valve→Oil path inspection—Check the O-ring and/or replace the gasket.
	1.1.b Abnormally high hydraulic pressure	• Clogged orifice or sticking of regulator valve—Valve inspection and washing
	1.1.c. The hydraulic pressures (clutch pressures) for both forward traveling and reverse traveling are both below the standard. (Normalin neutral state)	• Sticking of inching valve spool—Check foreign matter trapping, etc. and wash. • Inching lever sliding motion defect+ Repair or replace. • Inching rod return defect—Inspect and/or replace the rod link. • Modulator valve sticking—Check foreign matter trapping, etc. and wash. • Clogged orifice valve—Washing
	1.1.d The hydraulic pressure (clutch pressure) is lower than the standard for either forward traveling or reverse traveling.	• See item **1.2** below.
	1.2 Inspect the clutch pressure. Standard: (See the measurement-test section.) • The clutch pressure is slightly lower than the main pressure.	
	1.2.a The main pressure is normal, but the clutch pressure (for both forward traveling and reverse traveling) does not rise at all or is abnormally low.	• The inching spool is sticking to close the oil path.—Check foreign matter trapping, etc. and wash.

Fault status	Inspection method	Judgment-estimated cause-action
	1.2.b The clutch pressure in either forward traveling or reverse traveling is lower than the standard.	• Oil leak in anywhere between the selector valve and main shaft collar→Oil path inspection→Repair or replacement • Worn or broken seal ring (main shaft collar)→Replacement • Fallen plug from main shaft oil path +Repair or replacement • Damage at clutch piston, broken piston ring, piston freeing, etc.→Overhaul the clutch
	1.3 Both the main pressure and clutch pressure are normal.	• Clogging in the oil path between the selector valve and clutch piston (oil path in the forward side if forward traveling fails)→Oil path inspection and clogged material removal • Clutch piston sticking
	1.3.a Mechanical trouble in other part of the transmission (Excessive oil temperature rise involving abnormal noise generation is likely to occur in this case.)	• Overhaul the torque converter
2. Insufficient gradeability or tractive force (insufficient power) (due to torque converter failure in torque generation)	2.1 Inspect the oil level.	• Check the level gage.
	2.2 Inspect the engine no-load maximum rpm and loaded maximum rpm. (See the measurement-test section.)	• Tune up the engine if either speed does not satisfy the standard. (See the engine tune-up section.)
	2.3 Inspect the main pressure and clutch pressure. (See the measurement-test section.)	• If the main pressure or clutch pressure is abnormal, inspect according to 1.1 and 1.2 above.
	2.4 Inspect the stall speed. • Carry out a stall test, and measure the engine speed at the time. (Note) Always check the engine output (loaded maximum rpm), main pressure and clutch pressure to confirm that the engine and clutch systems are normal before inspecting the stall speed. (See the measurement-test section.) (Note) the stall speed may be about 100 rpm above or below the standard above depending on slight performance dispersions of the engine and torque converter as well as delicate matching between them. Therefore, use the standard as a guideline for defect judgment.	• Inspect the stall speed and judge whether the defect exists on the converter side or clutch side. a. The stall speed is too low (300 rpm or more below the standard).→The one-way clutch of the stator is slipping.→Replace the converter ASSY. b. The stall speed is too high.→The clutch is slipping tremendously.→Inspect and replace the clutch parts.

Fault status	Inspection method	Judgment-estimated cause-action
3. The vehicle does not travel in either the forward or reverse direction.	3.1 Set the shift lever neutral and inspect in which direction the vehicle travels.	• When the vehicle travels* Clutch seizure→Disassemble and replace the clutch. • When the vehicle does not travel→See 3.2 below.
	3.2 Inspect the clutch pressure on the faulty side. (See the measurement-test section.)	• When the clutch pressure is normal→Clutch slipping or clutch piston sliding motion defect→Disassemble and replace the clutch. • When the clutch pressure is abnormal-+See 3.3 below.
	3.3 Inspect the selector valve.	• Selector valve defect→Disassemble and replace. • When the selector valve is normal→See 3.4 below.
	3.4 Inspect the main shaft seal ring.	• Seal ring defect→Replace. • When the seal ring is normal *Disassemble the clutch as the clutch system is defective.
4. Excessive time lag at starting	4.1 Depress the accelerator pedal simultaneously with shifting to judge starting delay. (It is desirable to compare with a normal vehicle if any.)	
	4.2 Inspect the main pressure and clutch pressure. Inspect the clutch pressure rise characteristic at the same time. (See the measurement-test section.)	• When the main pressure and/or clutch pressure is abnormal-tInspect according to 1.1 and 1.2 above.
	4.2.a When the clutch pressure rise is abnormal (too slow).	• Breakdown or fatigue of the modulator valve spring→Disassembly, inspection and replacement • Clogged orifice valve→Disassembly, inspection and washing • Clogged orifice of regulator valve→ Disassembly, inspection and washing • Inching spool return defect→Foreign matter trapping or breakdown or fatigue of spring* Disassembly, washing or replacement • Inching lever sliding motion defect→Correct or replace the lever. • Inching rod return defect-tInspect and replace the rod link.
	4.3 Inspect the oil.	• Insufficient oil level, clogged oil strainer or air suction→Oil addition, disassembly and washing

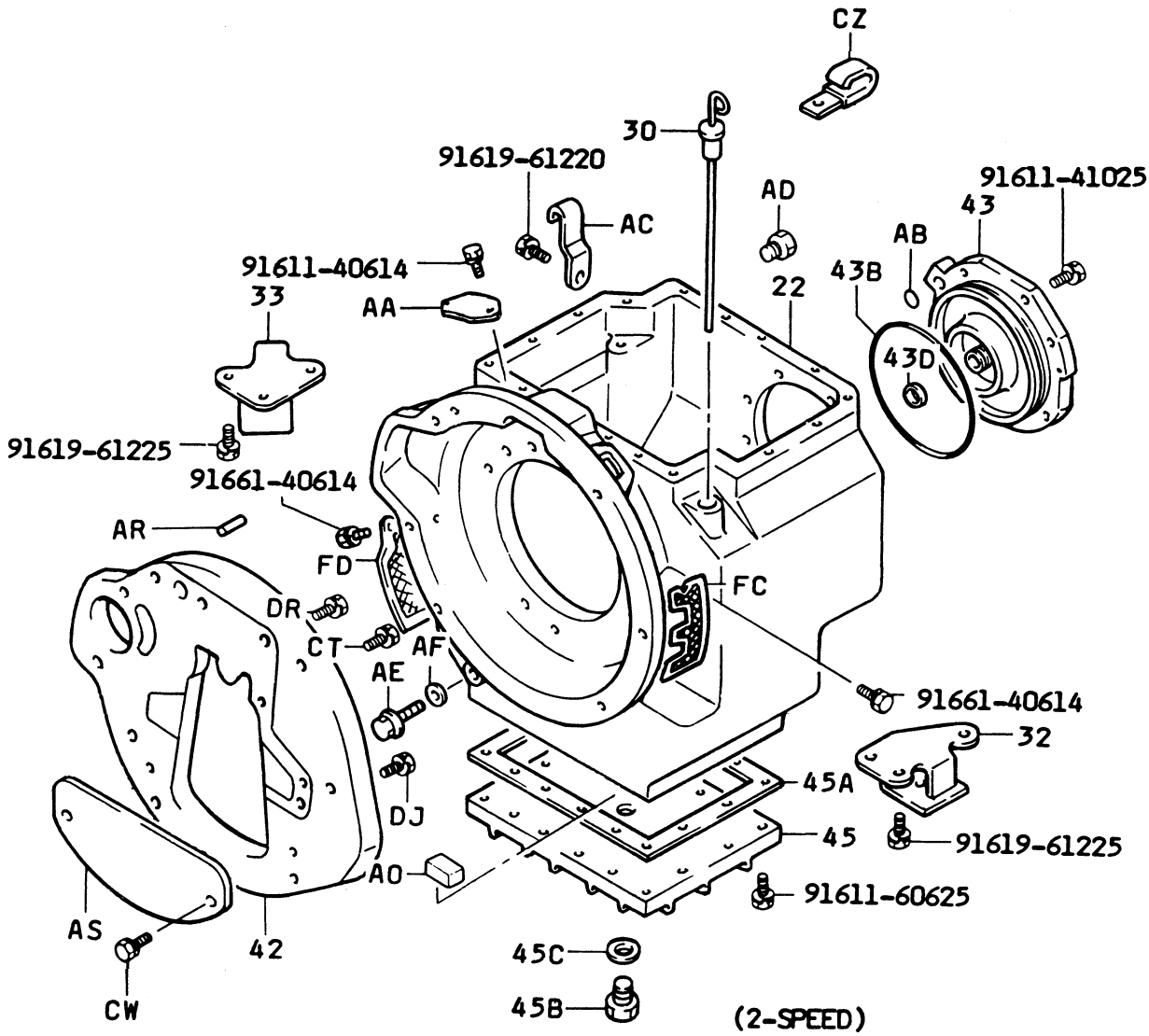
Fault status	Inspection method	Judgment-estimated cause-action
5. Inching defect or jerking (shock generation)	5.1 Inspect inching operation.	• Inching rod return defect— Inspect and replace the rod link and return spring. *Inching lever sliding motion defect— Greasing or replacement • Inching spool return defect— Foreign matter trapping, breakdown or fatigue of spring→Disassembly, washing and replacement
	5.2 Inspect the main pressure and clutch pressure. Operate the inching pedal and inspect the clutch pressure variation. (See the measurement-test section.)	
	5.2.a When the clutch pressure rise characteristic is abnormal	• Inching spool sticking→Check foreign matter trapping, etc. and wash. • Inching lever sliding motion defect→Greasing or replacement • Inching rod return defect— Rod link and return spring inspection and replacement • Clogged orifice valve→Washing
	5.2.b When the clutch pressure rise characteristic is normal (Inspect the clutch pack.)	• Breakdown or fatigue of clutch return spring— Disassembly and replacement • Clutch piston motion detect → Disassembly, inspection and replacement • Clutch plate abnormal wear→ Disassembly and replacement
	5.3 After shifting the shift lever, release the inching pedal suddenly to inspect the shock at starting.	• Fatigue of camber plate → Disassembly, inspection and replacement
6. Clutch connecting point is either too high or too low.	6.1 Inspect the oil pressure (clutch pressure) at the time of inching.	
	6.1.a When the inching pressure is too high	• Breakdown or fatigue of spring for inching spool No.1 (inching rod side)→Replacement
	6.1.b When the inching pressure is too low	• Breakdown or fatigue of inching spool No.2— Replacement
7. Overheat	7.1 Inspect the torque converter oil level and oil quality.	• Inappropriate oil level→Check excessive or insufficient oil level and correct it to the proper level. • Air suction-tInspect the O-ring at each joint. • Moisture content in oil→Oil replacement
	7.2 Inspect the main pressure, clutch pressure and torque converter pressure (outlet pressure). (See the measurement-test section.)	

Fault status	Inspection method	Judgment-estimated cause-action
	7.2.a When the main pressure or clutch pressure is lower than the standard	• Inspect according to 1.1 and 1.2 above.
	7.2.b When the torque converter pressure is lower than the standard	• Regulator valve sticking—Disassembly, inspection and washing • Excessive resistance of internal oil path→Oil path clogging inspection • Clogged oil strainer→Disassembly, washing and replacement
	7.3 Inspect the clutch portion. Set to the neutral position and check if the vehicle travels or not.	
	7.3.a When the vehicle travels in either the forward or reverse direction	• Clutch seizure or damage at clutch pack—Disassembly, inspection and replacement
	7.4 Inspect the torque converter portion.	• Defect in converter portion • Stator sticking—Converter ASSY replacement • Impeller contact→Judge by checking the oil filter and replace the converter ASSY if defective. • Decreased circulating flow rate→Clogged stator shaft orifice, etc.→Disassembly, inspection and replacement
	7.5 Inspect the transmission portion.	• Defect in transmission • Clutch dragging—Disassembly, inspection and replacement • Bearing wear or seizure→Disassembly, inspection and replacement
	7.6 Check the use status at the user. Check the operation status by the operator, use status and operating place.	• Check no push-up, etc. especially by performing inching operation. • Check if excessive switch-back is performed.
8. Abnormal noise is generated.	8.1 Inspect the torque converter portion.	• Damaged drive plate→Replacement • Damaged bearing—Replacement • Contact of impeller (fragment inspection at oil filter)→Converter replacement • Loosened bolt—Retightening • Damaged gear pump → Inspection and replacement
	8.2 Inspect the transmission portion.	• Dragging noise due to clutch seizure→Inspection and replacement • Wear or damage at bearing—Inspection and replacement • Gear damage→Replacement • Spline wear→Replacement

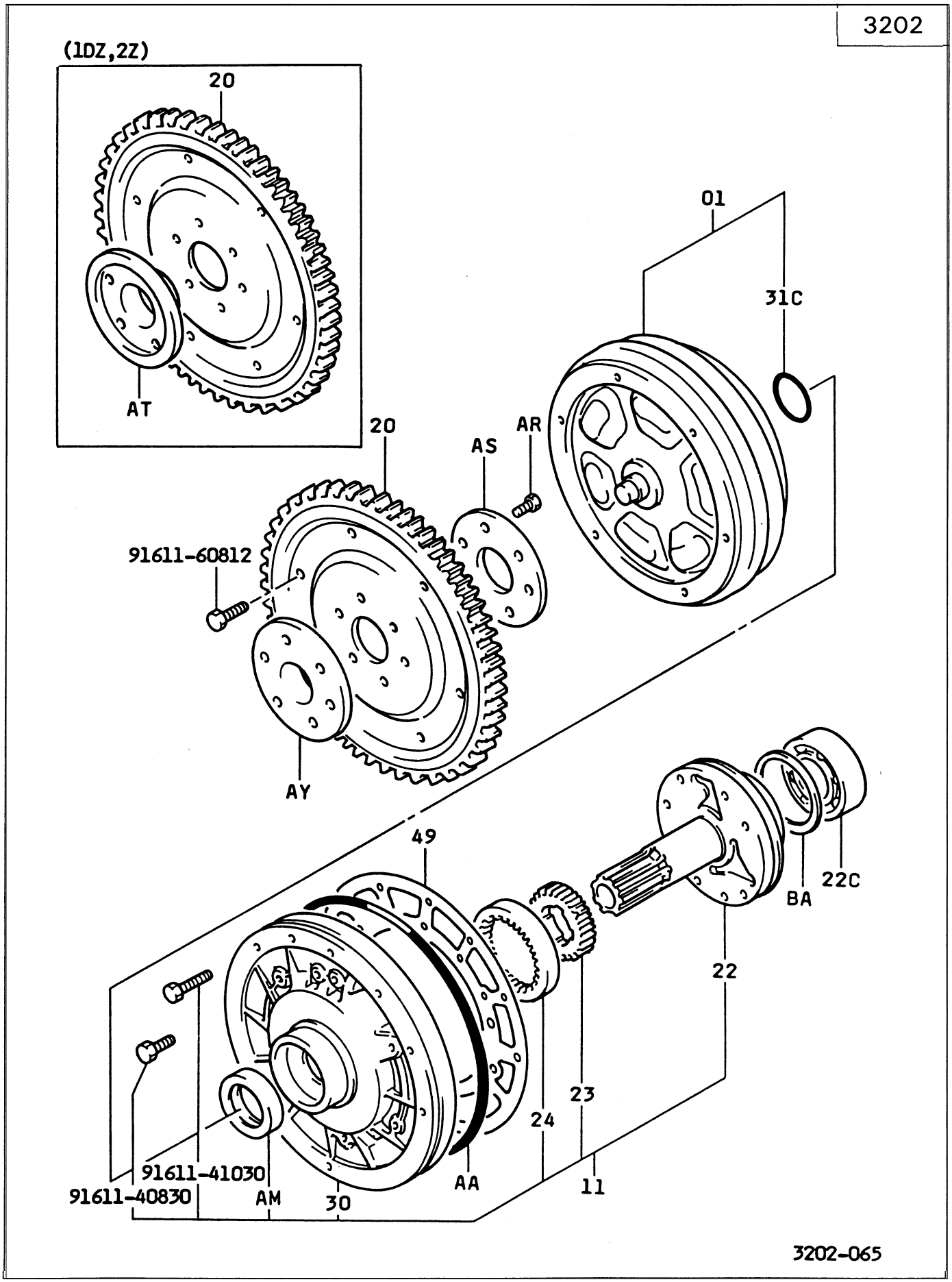
Fault status	Inspection method	Judgment-estimated cause-action
9. Oil leak	9.1 Inspect oil seals.	• Inspect each seal lip and the mating side sliding contact face for damage or wear, and replace if defective.
	9.2 Inspect the case joint.	• Bolt retightening, or replacement of O-ring or packing
	9.3 Inspect for flowhole or crack.	• Repair or replacement
	9.4 If oil is leaking from the air breather	• Overheat • Excessive oil

COMPONENTS

Torque Converter Housing

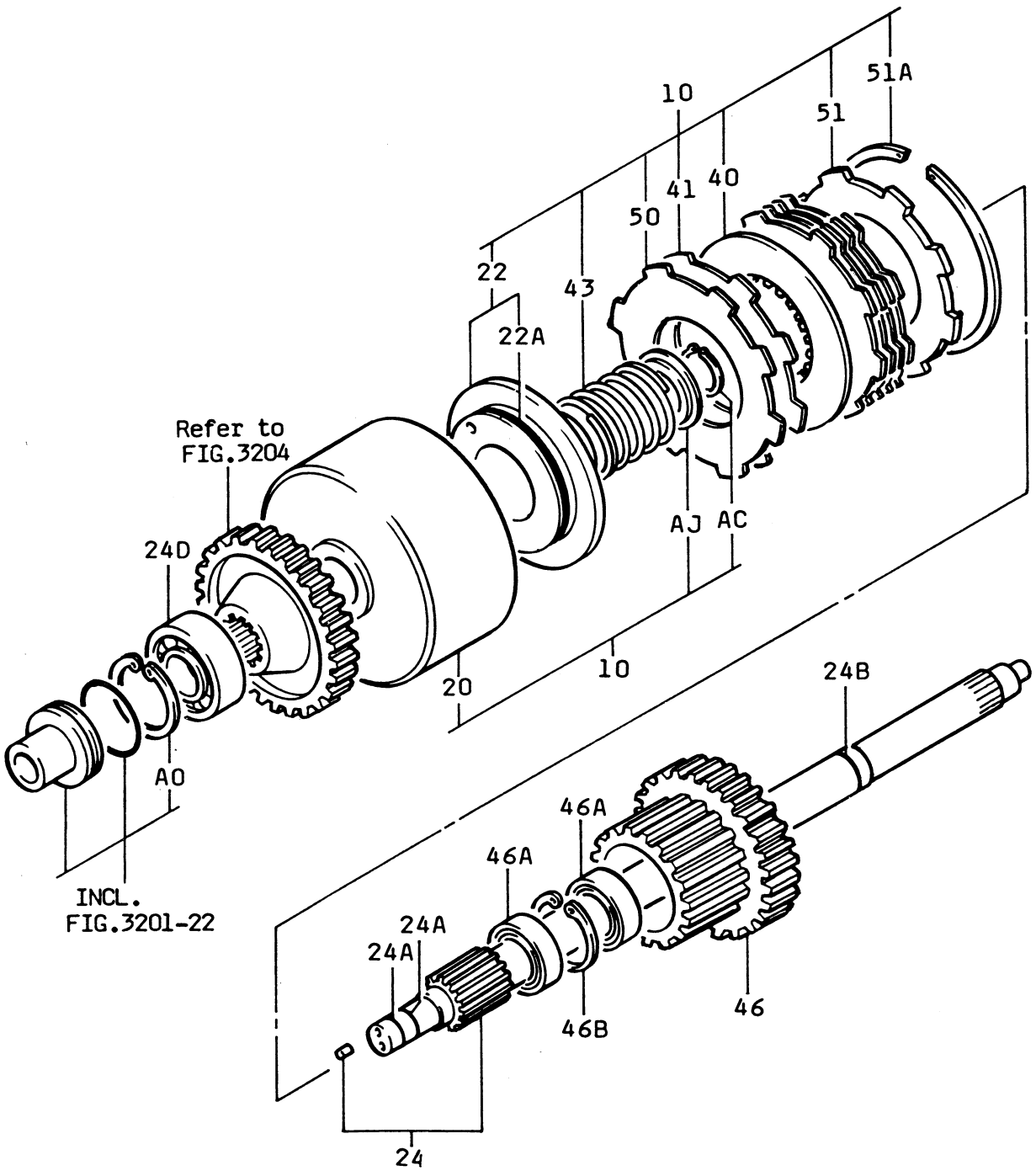


Torque Converter



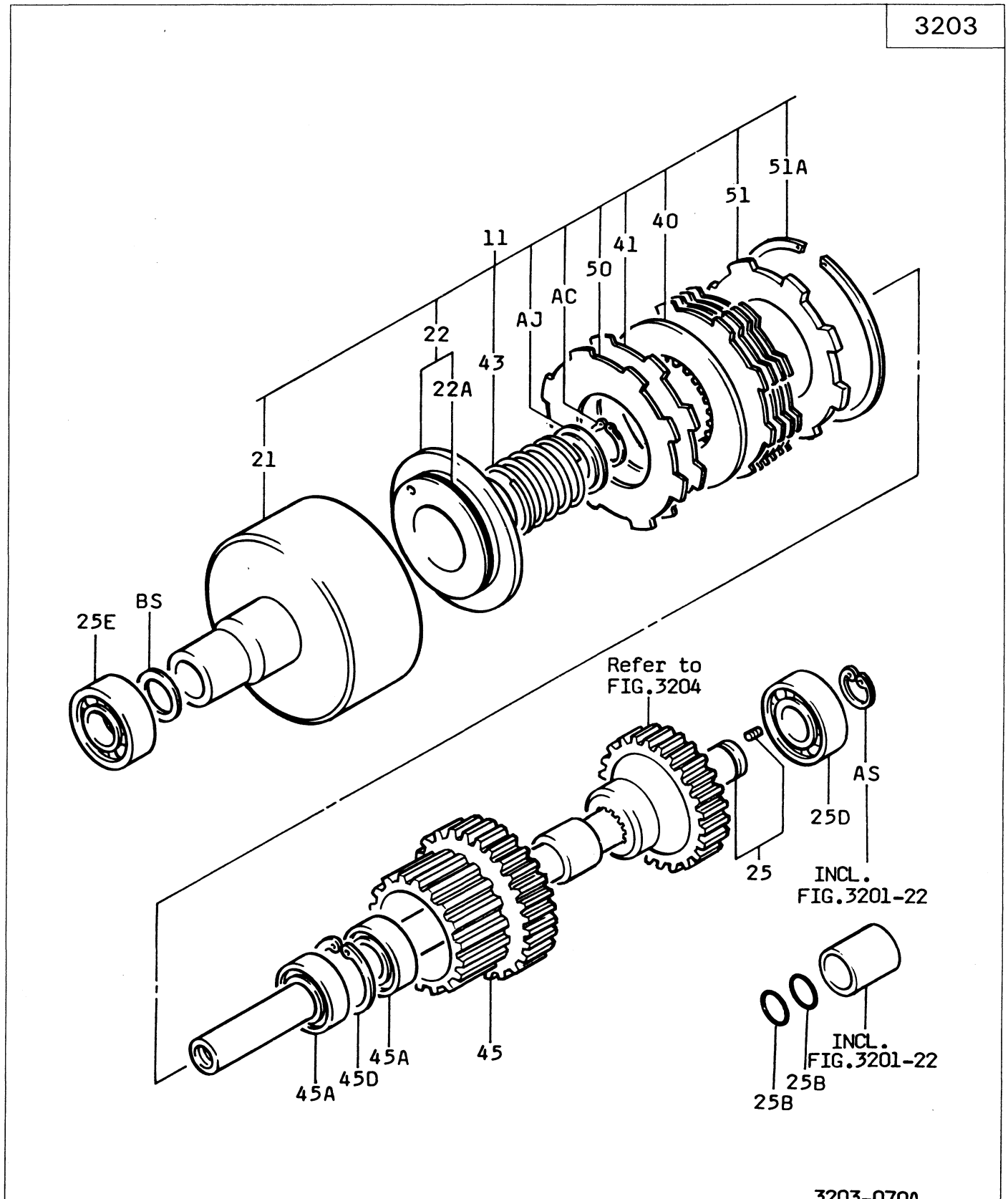
Torque Converter Clutch (Reverse)

3203

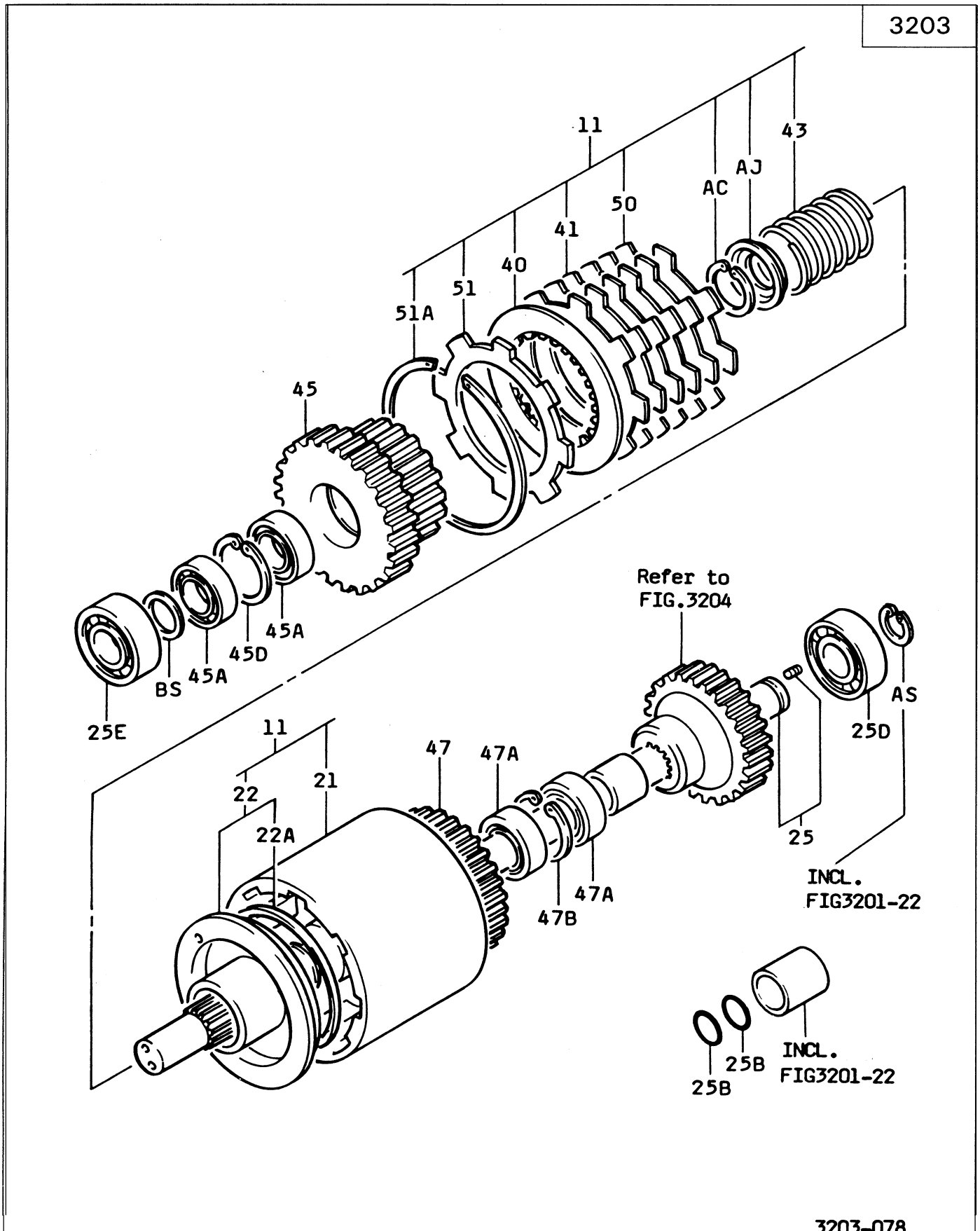


3203-062C

Torque Converter Clutch (Forward)

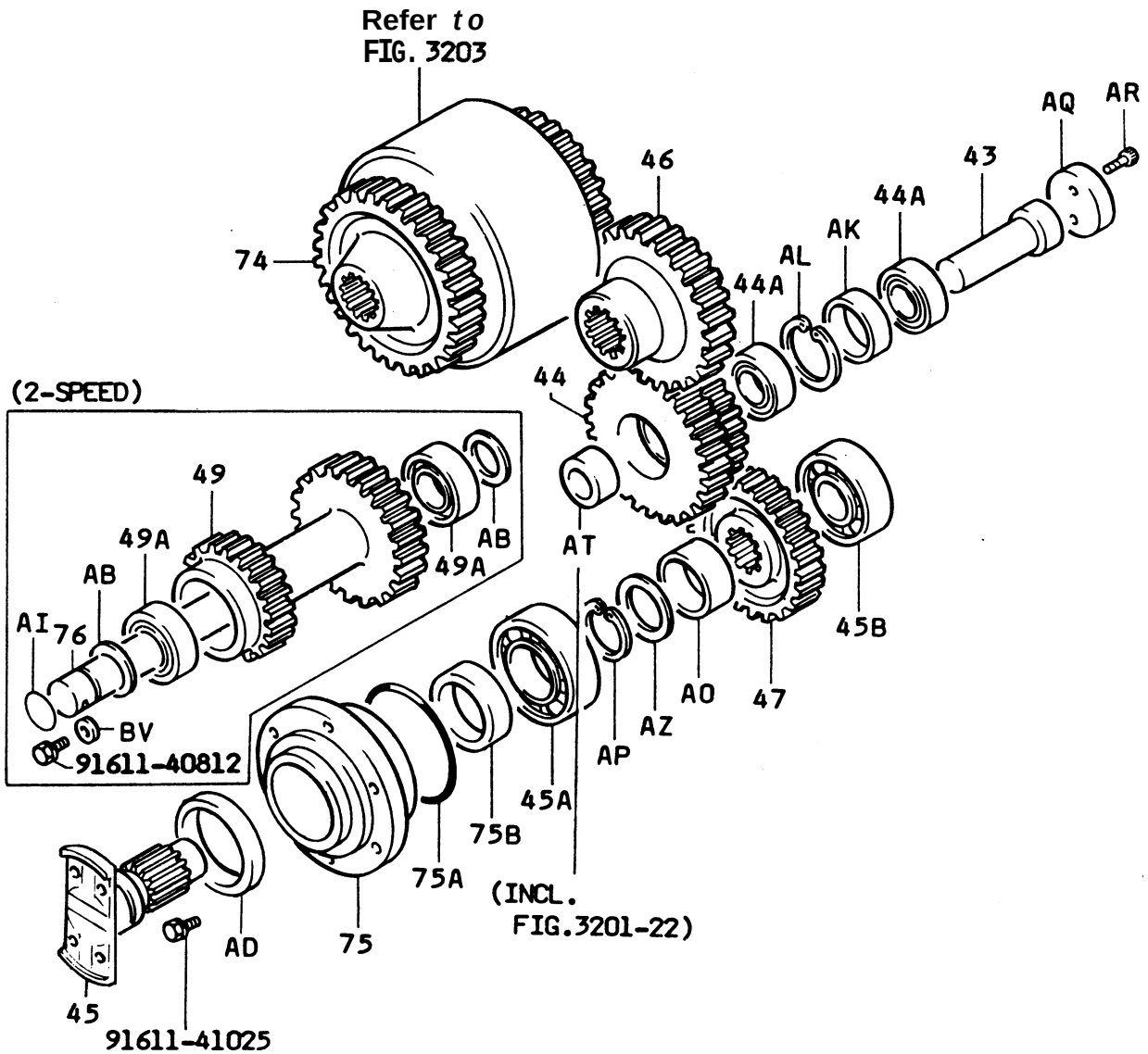


Torque Converter Clutch (Forward) (for 2 Speeds)

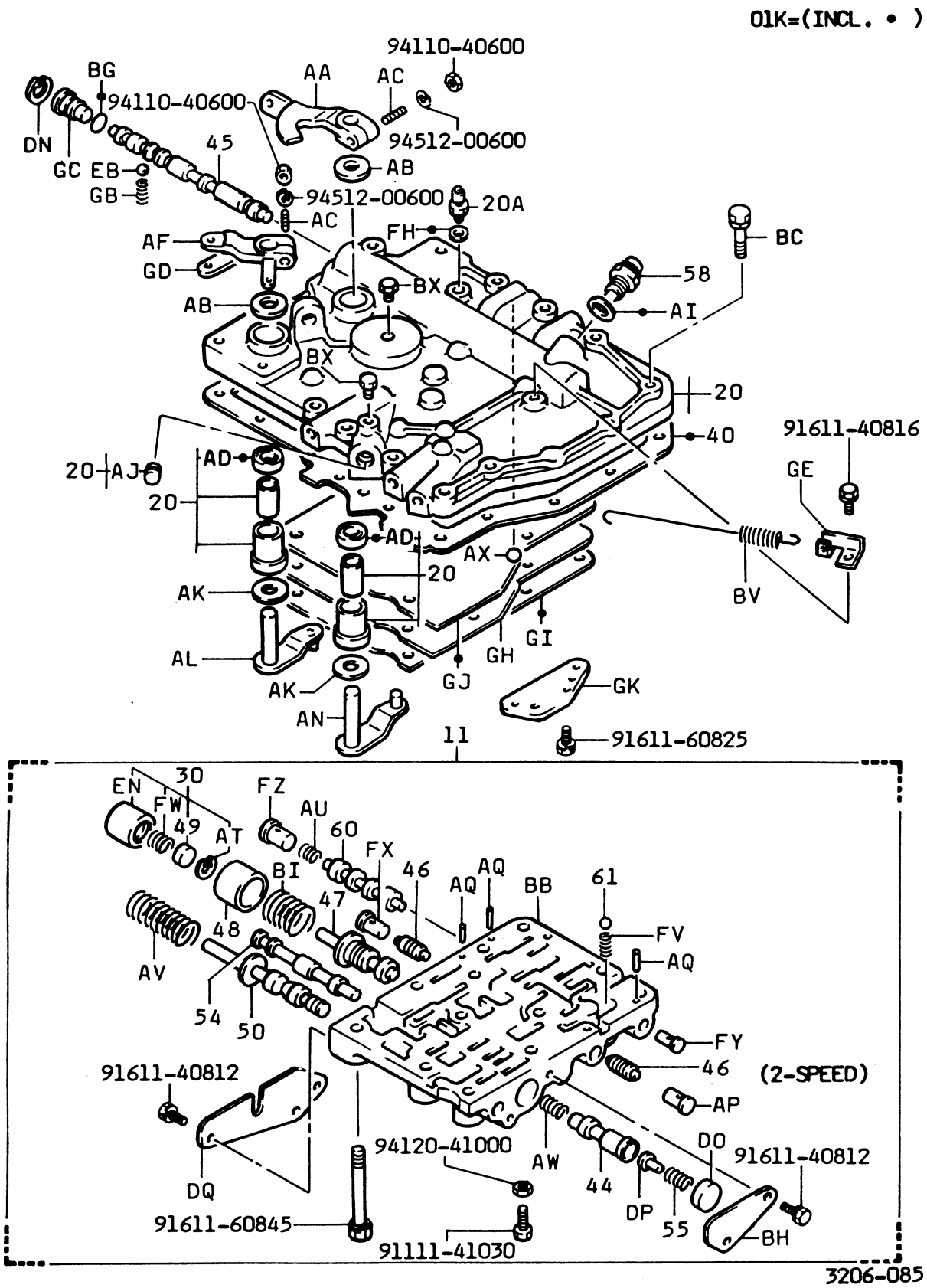


Torque Converter Gear

3204



3204-050


OIK=(INCL. •)
94110-40600
BG
AA
AC
94110-40600
94512-00600
DN
45
AB
GC EB
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94512-00600
20A
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FH
BC
AF
GD
58
BX
AB
AI
BX
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40
91611-40816
20
AJ
AD
GE
20
AD
AX
20
AK
BV
GI
AL
GH
GJ
GK
AK
AN
11
91611-60825
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FW
49
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FZ
AU
60
FX
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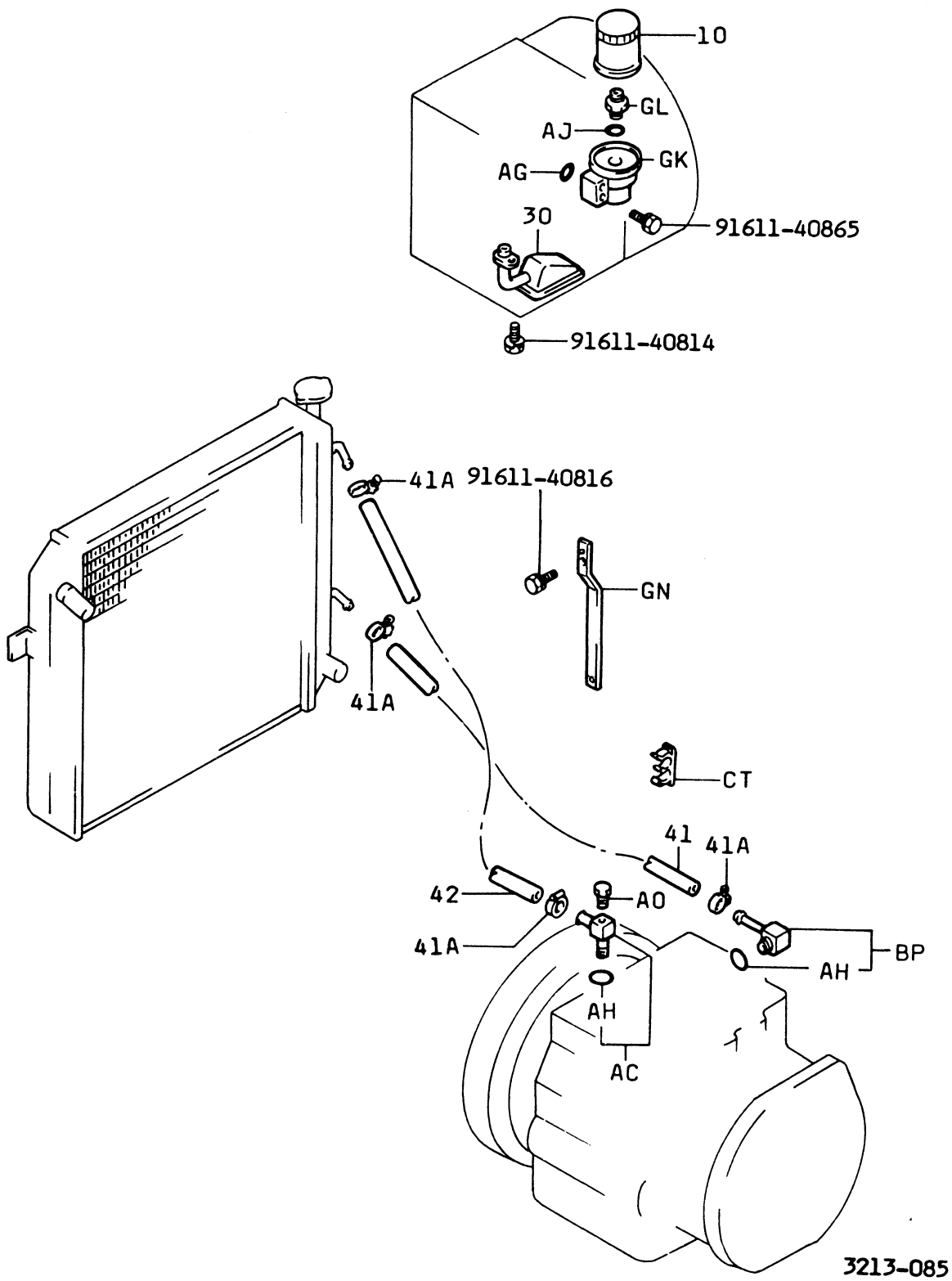
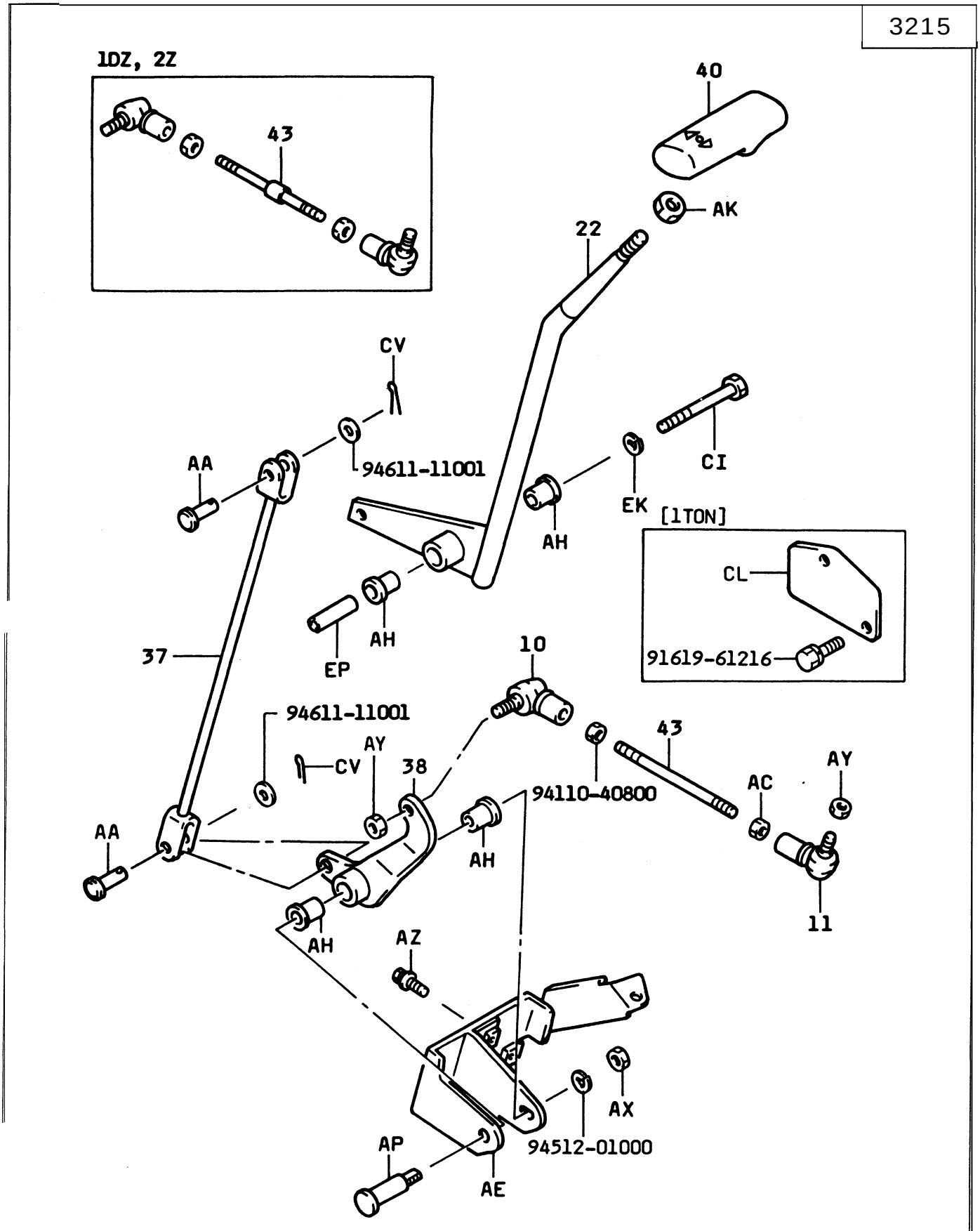
AQ
BB
61
BI
47
48
FV
AQ
AV
54
50
FY
91611-40812
46
(2-SPEED)
AP
94120-41000
AW
DO
91611-40812
DQ
44
DP
55
BH
91611-60845
91111-41030
3206-085

Torque Converter Piping

3213



Shift Lever


3215
1DZ, 2Z
43
40
AK
22
CV
94611-11001
AA
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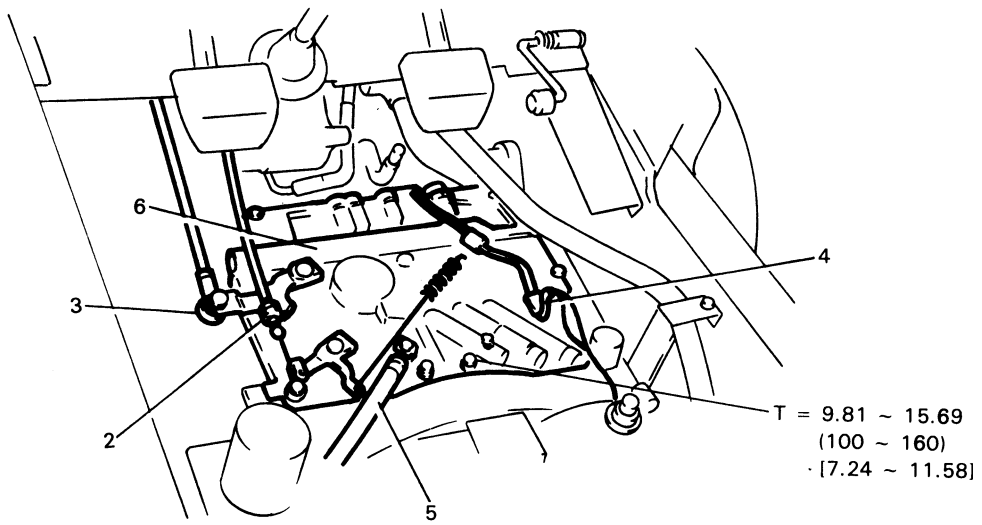
[1TON]
CL
91619-61216
EP
AH
37
10
94611-11001
CV
AY
38
43
AY
AC
94110-40800
AA
AH
11
AH
AZ
AX
94512-01000
AP
AE
3215-037

TRANSMISSION COVER & CONTROL VALVE ASSY

REMOVAL·INSTALLATION

T = N·m (kg-cm) [ft-lb]



1 Toe **board**

Removel Procedure

1 Remove the toe board.

2 Disconnect the inching wire.

3 Disconnect the shift rod.

4 Disconnect electrical wiring.

5 Disconnect the torque converter cooler hose.

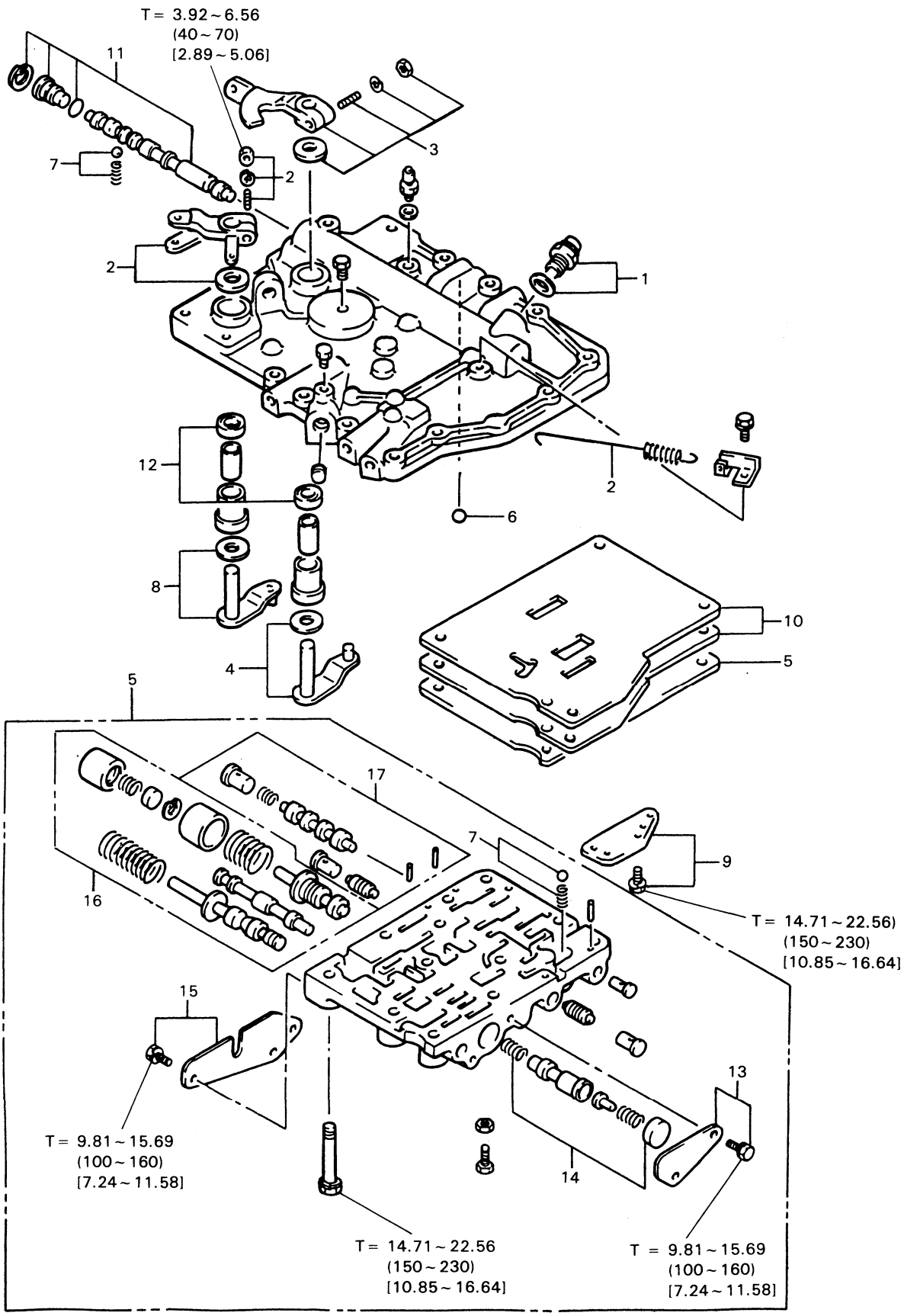
6 Remove the transmission cover & control valve ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m **(kg-cm)** [ft-lb]



Disassembly Procedure

1 Remove the switches (neutral switch and backup lamp switch). **[Point 1]**

2 Remove the inching lever.

3 Remove the shift lever. **[Point** 21

4 Remove the shift cam lever.

5 Remove the control valve (control W/regulator cover ASSY).

6 Remove the steel ball. **[Point** 31

7 Remove the spring and steel ball. **[Point 4)**

8 Remove the inching cam lever.

9 Remove the valve body plate cover.

10 Remove the valve body plate and gasket.

11 Remove the selector valve. **[Point** 51

12 Remove the oil seal. **[Point** 61

13 Remove the valve holder plate. (Pay attention to spring jumping out.)

14 Remove the inching valve. **[Point** 71

15 Remove the valve holder plate. (Pay attention to spring jumping out.)

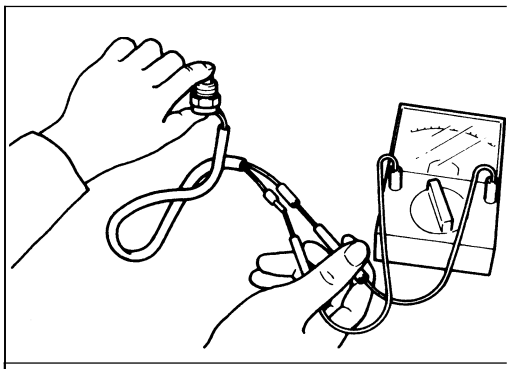
16 Remove the regulator valve, inching rod, orifice valve and modulator valve. **[Point 7]**

17 Remove the change valve. **[Point** 81

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

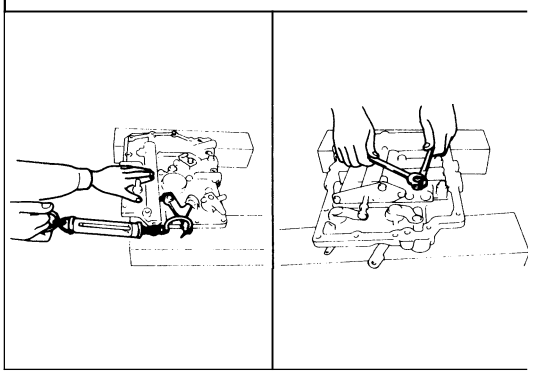
Note:
- **When installing the inching cam lever and shift cam lever, apply a thin coat MP grease on the inside of the upper cover and oil seal.**
- **Coat torque converter oil on each valve before reassembly.**



Point Opreations

[Point 1]

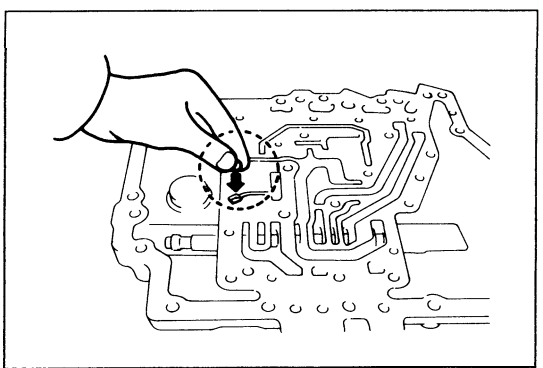
Inspection: Inspect the switches.
Neutral switch:
Normal if turned OFF when depressed.
Backup lamp switch:
Normal if turned ON when depressed.



[Point 2]

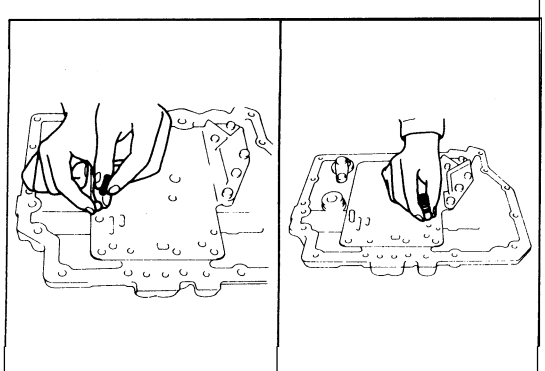
Adjustment: Adjust the shift lever operating force.
Set a spring scale at the shift lever rod installation hole and measure the operating force.
Adjust the operating force to the standard level by turning the adjusting bolt.

Shift lever operating force:
34.3 – 53.9 N (3.5 – 5.5 kg) [7.7 – 12.1 lb]



[Point 3]

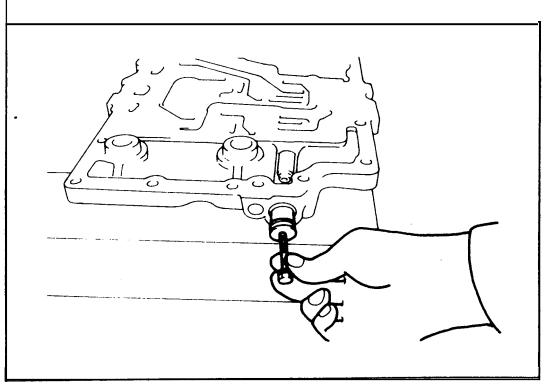
Reassembly: Install the steel ball in the correct position.



[Point 4]

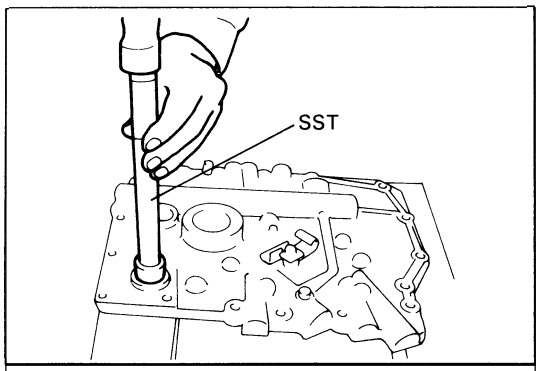
Reassembly: Place the steel ball in the detent hole, coat grease on the detent spring and paste it on the lock ball.

Reassembly: Coat grease on the steel ball (safety valve) and paste it to stand on the safety valve contact face of the upper cover.



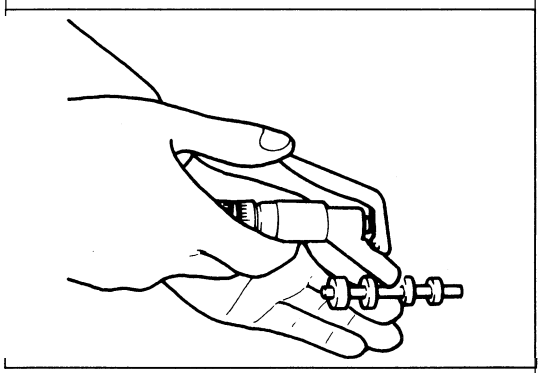
[Point 5]

Disassembly: Use the service bolt to extract the selector valve stopper.
Service bolt size: M6 x 1.0



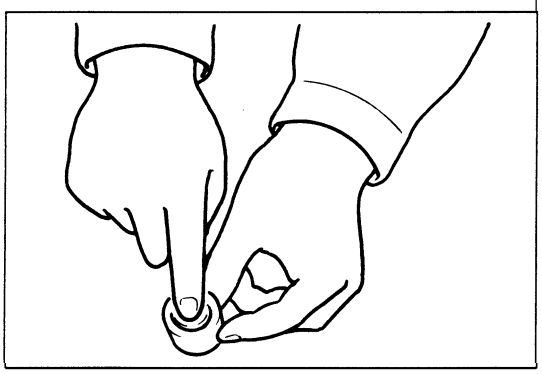
[Point 6]

Reassembly: Use the SST to drive in the oil seal until it is flush with the cover.
SST 09620-30010

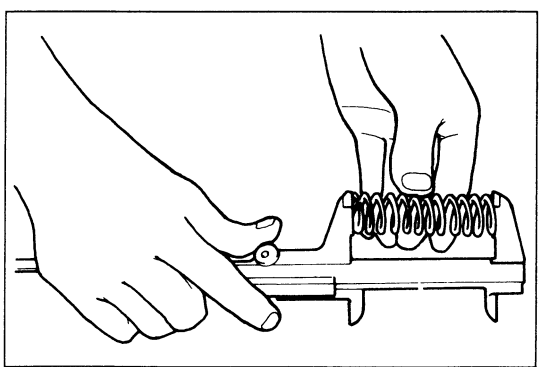


[Point 7]

Inspection: Inspect the regulator valve, inching valve, modulator valve and orifice valve for clogging of the orifice.



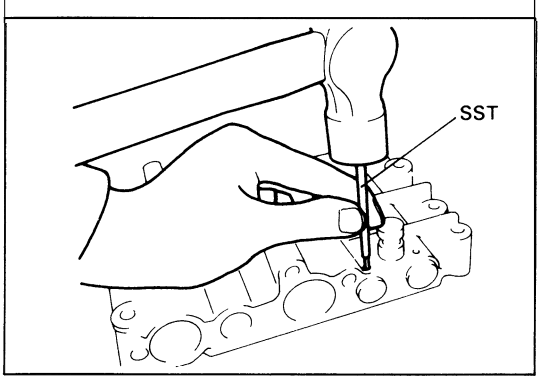
Inspection: Inspect the orifice valve.
Push the center of the valve a few times lightly with a finger to confirm smooth movement without sticking.



Inspection: Measure the free length of each spring.

Unit: rnrn (in)

Spring	Free length	Free length limit
Regulator valve	88.8 (3.496)	85.0 (3.346)
Inching valve	34.5 (1.358)	33.0 (1.299)
Inching valve (compression)	49.4 (1.945)	47.0 (1.850)
Modulator valve	50.5 (1.988)	48.5 (1.909)
Orifice valve	30.0 (1.181)	28.5 (1.122)



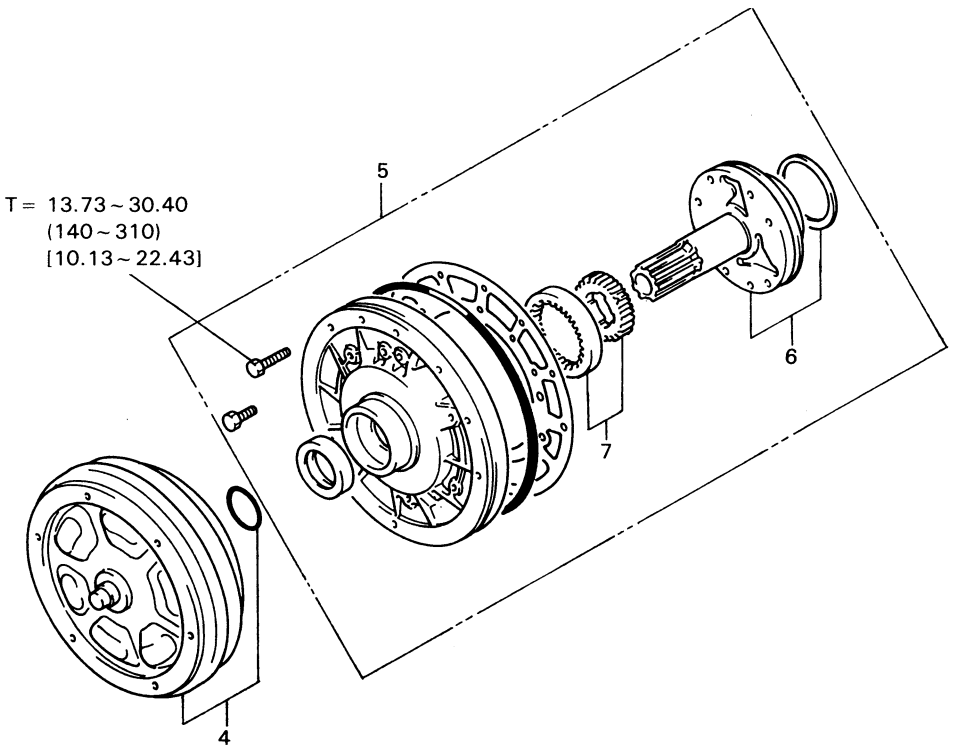
[Point 8]

Reassembly: Use the SST to drive in the spring pin until it is flush with the body.
SST 09700-30200-71

TORQUE CONVERTER·OIL PUMP

REMOVAL·INSTALLATION

T = N·m (kg-cm) [ft-lb]



1 Torque converter oil
2 Engine W/torque converter
3 Torque converter housing ASSY

Removal Procedure

1 Drain torque converter oil.

2 Remove the engine W/torque converter. (See page 1-12 in the engine section.)

3 Disconnect the engine and torque converter housing ASSY. (See steps 1 to **4** of the removal procedure on page 1-16 in the engine section.)

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

5 Remove the oil pump W/stator shaft. **[Point 21**

6 Remove the stator shaft.

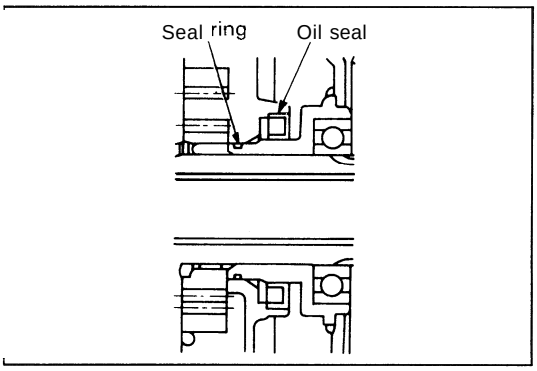
7 Remove the oil pump gear. **[Point 31**

8 Remove the oil seal. **[Point 41**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note
- **Stator shaft set bolt tightening torque: T = 9.81 - 15.69 N·m (100 - 160 kg-cm) [7.24 - 11.58 ft-lb]**
- **See the note for the engine installation procedure. (See page 1-13 and 1-16.)**

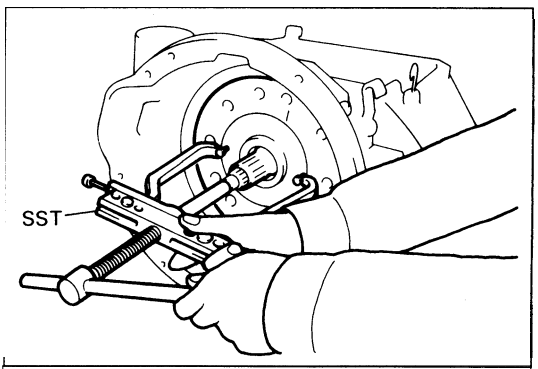


Point Operations

[Point 1]

Removal: Be careful as oil exists in the torque converter **ASSY.**
The torque converter **ASSY** cannot be disassembled.

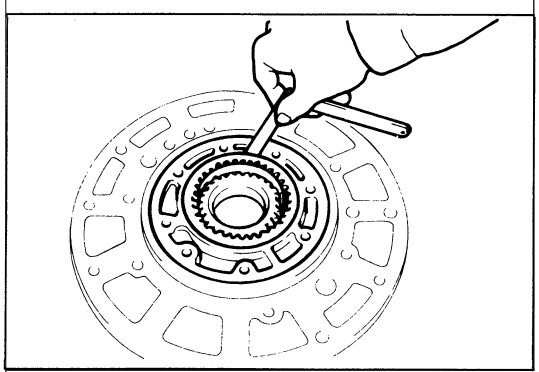
Installation: Coat grease on the seal ring and oil seal lip before installation.



Installation: Install the torque converter **ASSY** with rotation so that the extension pawl fits into the oil pump drive gear groove.

[Point 2]

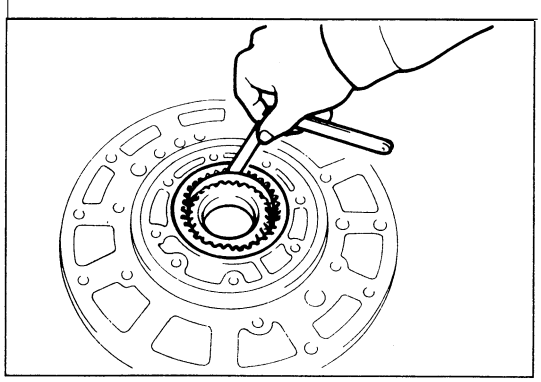
Removal: **SST** 09950-20017



[Point 3]

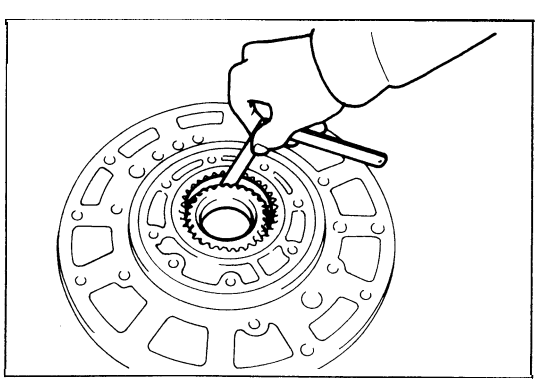
Inspection: Measure the clearance between the oil pump driven gear and pump body.

Limit clearance: 0.3 mm (0.012 in)



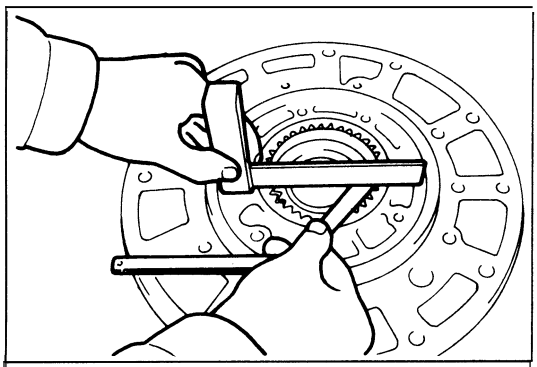
Inspection: Measure the clearance between oil pump driven gear and crescent.

Limit clearance: 0.4 mm (0.016 in)



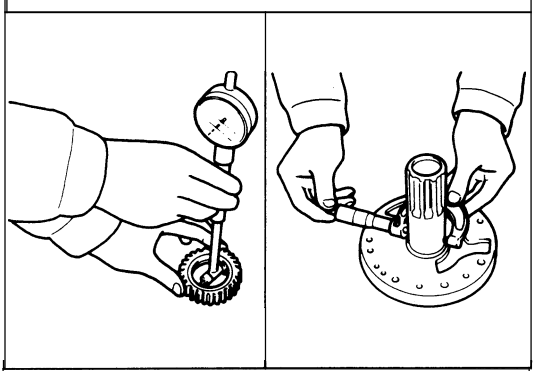
Inspection: Measure the clearance between the oil pump drive gear and crescent.

Limit clearance: 0.4 mm (0.016 in)



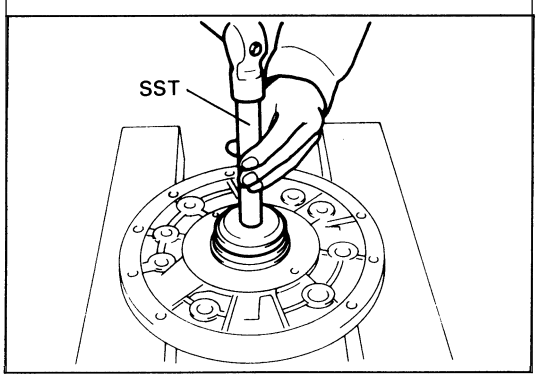
Inspection: Measure the clearance between the pump body and each gear.

Limit clearance: 0.1 mm (0.004 in)



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

Limit clearance: 0.15 mm (0.0059 in)



[Point 41

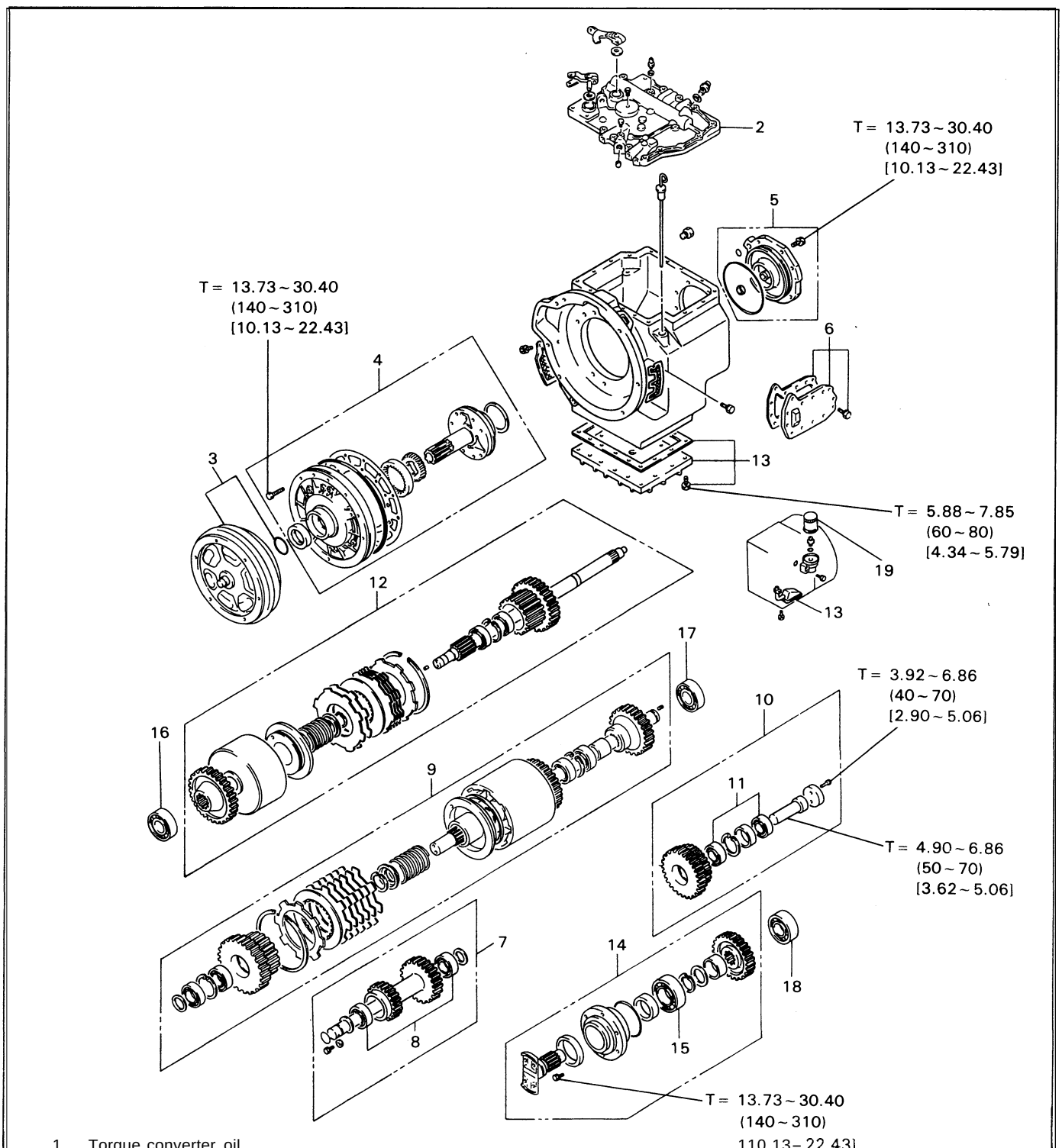
Installation: **SST** 09608-3501**4**

TRANSMISSION

DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
The explanation here covers the jobs for disassembly from torque converter housing ASSY. For disassembly of the oil pump, however, see page 3-28 (torque converter-oil pump section). See page 3-39 for disassembly of the clutch shaft parts.
(Engine **W/torque** converter removal-installation: page 1-12)
(Engine and torque converter disconnection: See steps 1 to 4 in the removal procedure on page 1-16.)

T = N·m (kg-cm) [ft-lbl



1 Torque converter oil

Disassembly Procedure

1 Drain torque converter oil.

2 Remove the transmission cover & control valve ASSY.

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

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

5 Remove the front cover. **[Point 3]**

6 Remove the side cover (in 2-speeds torque converter only).

7 Remove idle gear No.2 (in 2-speeds torque converter only). **[Point 4]**

8 Remove idle gear No.2 bearing (in 2-speeds torque converter only). **[Point 5]**

9 Remove clutch shaft No.2 W/clutch drum No.2 (forward). **[Point 6]**

10 Remove idle gear No.1 and idle shaft. **[Point 7]**

11 Remove idle gear No.1 bearing. **[Point 8]**

12 Remove clutch shaft No.1 W/clutch drum No.1 (reverse). **[Point 9]**

13 Remove the oil strainer.

14 Remove output shaft No.1 and output gear No.2. **[Point 10]**

15 Remove output shaft bearing No.1. **[Point 11]**

16 Remove bearing No.1 (for clutch shaft No.1). **[Point 12]**

17 Remove bearing No.2 (for clutch shaft No.2). **[Point 13]**

18 Remove output shaft bearing No.2. **[Point 14]**

19 Remove the oil filter. (Use the SST 09228-07500.)

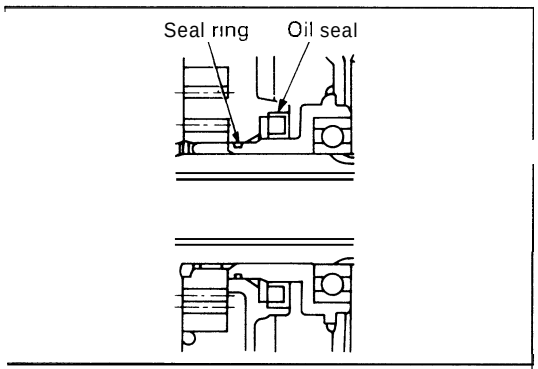
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
The tightening torque for each part is as follows:

Unit: N·m (kg-cm) [ft-lb]

Oil strainer set bolt	**9.81-15.69 (100-160)** [7.24~**11.58**]
Oil pan set bolt	**5.88-7.85 (60-80)** [4.34~**5.79**]
Idle shaft	**4.90-9.81 (50-100)** [3.62~7.24]
Idle shaft set bolt	**3.92-6.86 (40-70)** [2.89~**5.06**]
Front cover set bolt	**18.63-30.40 (190-310)** [**13.75-22.43**]
Side cover set bolt	**3.92-6.86 (40-70)** [2.89~**5.06**]
Transmission cover (upper cover) set bolt	**9.81-15.69** (100~**160**) [7.24~**11.58**]
Stator shaft set bolt	**9.81-15.69** (100~160) [7.24~11.58]

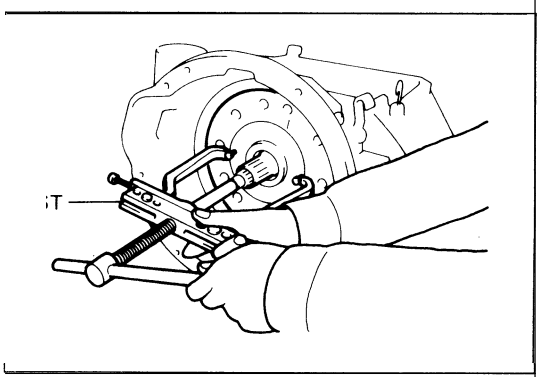


Point Operations

[Point 1]

Disassembly: Be careful as oil exists in the torque converter ASSY.
The torque converter ASSY cannot be disassembled.

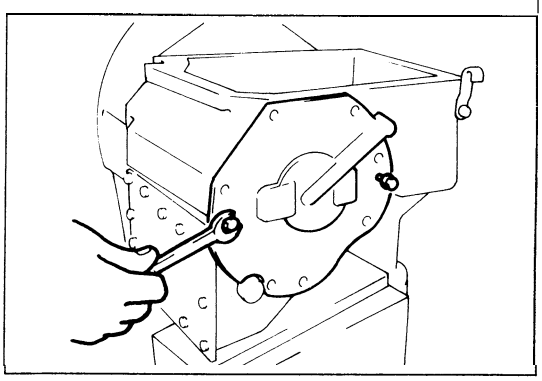
Reassembly: Coat grease on the seal ring and oil seal lip before installation.



Reassembly: Rotate the torque converter ASSY to make the extension pawl fit into the oil pump drive gear groove.

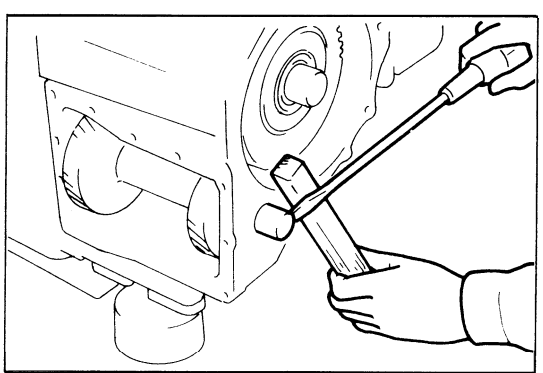
[Point 2]

Disassembly: SST 09950-20017



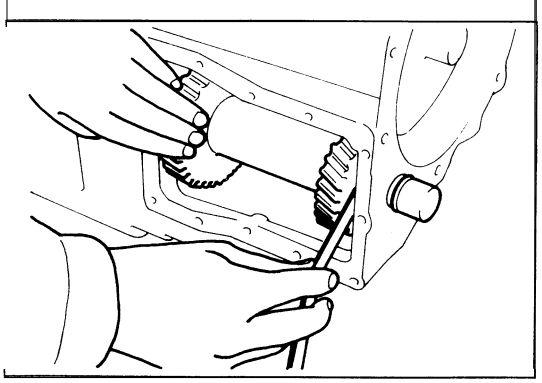
[Point 3]

Disassembly: Use the service bolt for removal
Service bolt size: M10 x 1.25



[Point 4]

Disassembly: Extract the idle shaft by inserting a screwdriver or the like in the lock plate groove.

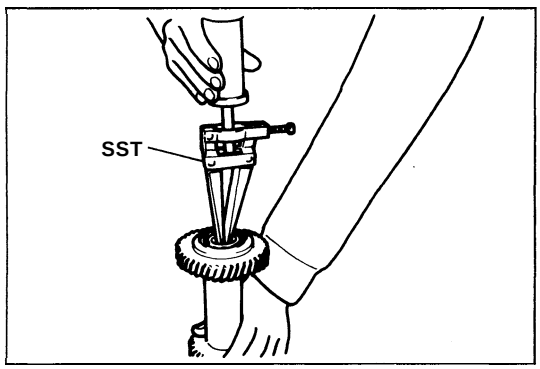


Reassembly: Adjust the thrust clearance of idle gear No. 2.

1. Push the idle gear to one side and measure the clearance between the bearing and spacer.

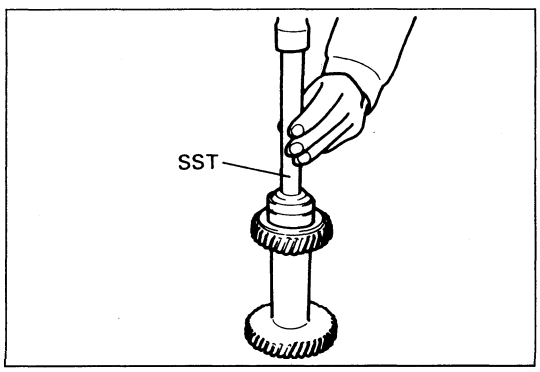
   Standard clearance:
   0.04 – 0.6 mm (0.0016 – 0.024 in)

2. If the measured value does not satisfy the standard, replace the spacer switch new ones.
   Install spaces on both sides of the idle gear.

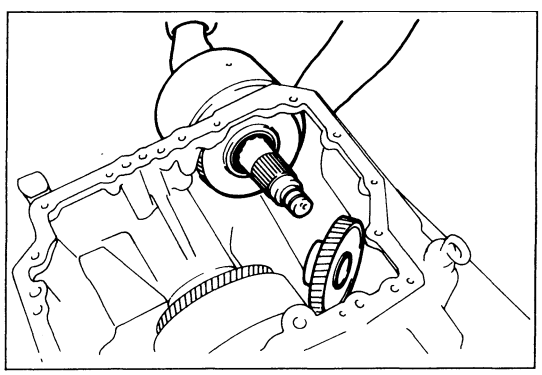


[Point 51

Disassembly: SST 09308-00010



Reassembly: SST 09620-30010



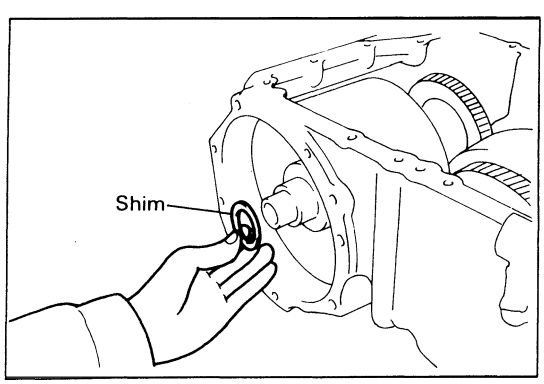
[Point 61

Disassembly: Use a copper rod and tap the end of the shaft from the rear side to drive the shaft out to the front side. Hold the clutch drum during this operation.

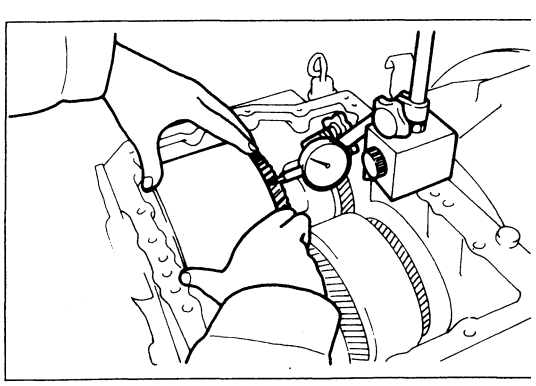
Disassembly: After removing the clutch shaft W/clutch drum, remove output gear No.1 remaining in the case.

Reassembly: Coat grease on the seal ring and install it at the end of the clutch shaft.

Reassembly: Adjust the thrust clearance of clutch shaft No.2 (forward).



1. After installing clutch shaft No.2 W/clutch drum No.2 in the case, install shims on the shaft and temporarily install the front cover.

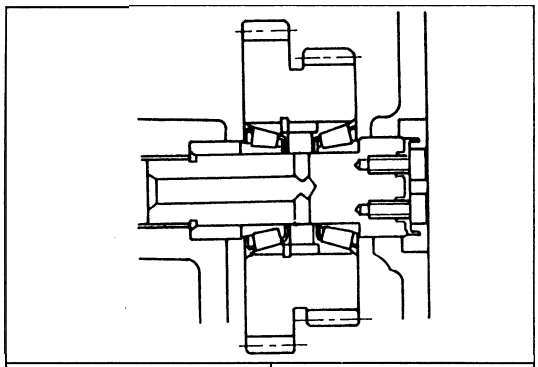


2. Set a dial gage on the side of the clutch gear, and measure the thrust clearance by moving the clutch drum back and forth.

   Standard clearance: 0.05 – 0.55 mm (0.0020 – 0.0217 in)

3. If the measured value does not satisfy the standard, select the shims to be used at the tip end of the shaft.

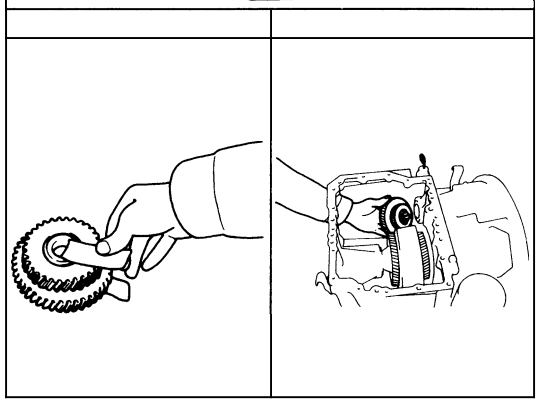
   Shim thickness: 0.5, 0.9 and 1.25 mm (0.020, 0.035 and 0.0492 in)



[Point 7]

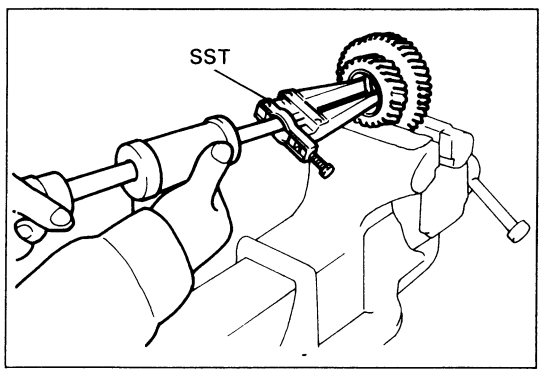
Disassembly: After removing the lock washer and set bolt, rotate the idle shaft counterclockwise for removal.

Reassembly: Clean the idle shaft threaded portion, and check if it can be screwed in lightly without the idle gear.



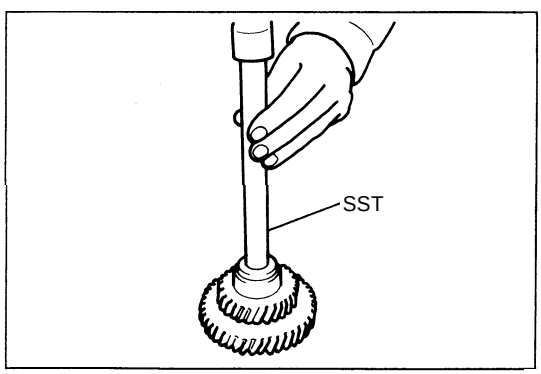
Reassembly: Install the bearing inner race on the idle gear and tape the bearing so as not to let it fall. After inserting the idle gear into the case, remove the tape and insert the idle shaft. Tighten the idle shaft to the specified torque.

T = 4.90 - 9.81 N·m
(50 - 100 kg-cm) [3.62 - 7.24 ft-lbl

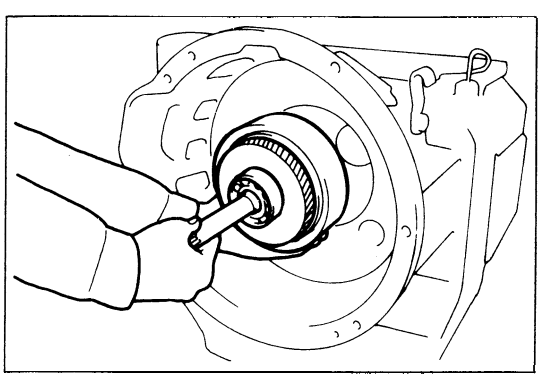


[Point 8]

Disassembly: SST 09308-00010



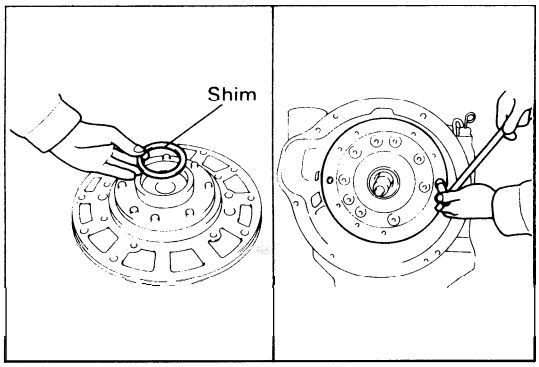
Reassembly: SST 09620-30010



[Point 9]

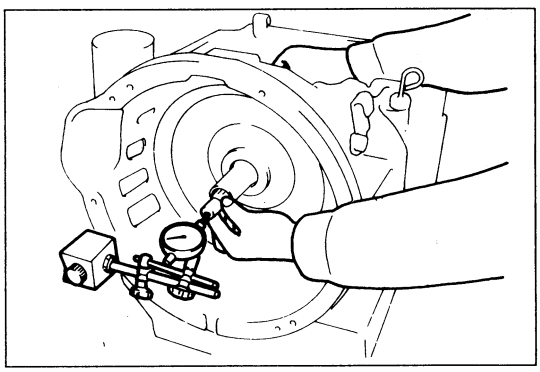
Disassembly: Extract clutch shaft No.1 W/clutch drum No.1 to the converter side.

Reassembly: Coat grease on the seal ring and install it at the end of the clutch shaft.



Reassembly: Adjust the thrust clearance of clutch shaft No.1 (reverse).

1. Install the shim on the stator shaft and temporarily install the oil pump W/stator shaft.

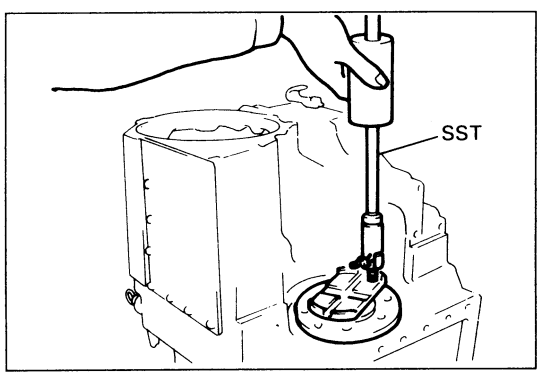


2. Set a dial gage on the front end of the clutch shaft, and measure the thrust clearance by moving the clutch drum back and front.

Standard clearance: 0.15 - 0.75 mm (0.0059 - 0.0296 in)

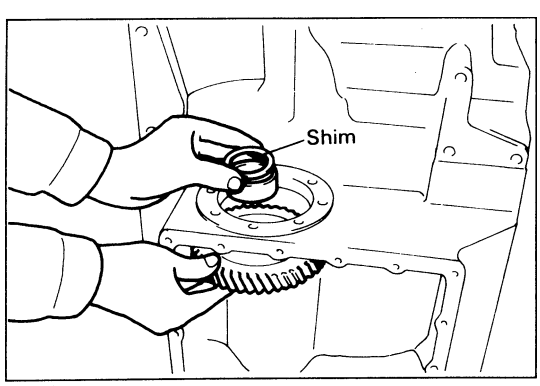
3. If the measured value is not within the standard range, select and change the shim thickness at the stator shaft.

Shim thickness: 0.71, 0.9, 1.12 and 1.4 mm (0.0280, 0.035, 0.0441 and 0.055 in)



[Ponit 101

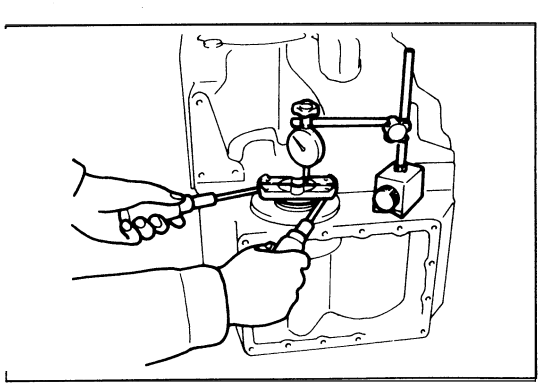
Disassembly: After removing the output cover set bolts, use the SST for removal.
SST 09810-20172-71



Reassembly: Adjust the thrust clearances related to the output shaft.

1. Place a spacer and shim(s) on the output gear No. 2, and temporarily install the output cover W/output shaft.

2. Tap the output shaft with a hammer to eliminate the thrust clearance of the gear, spacer and shim.

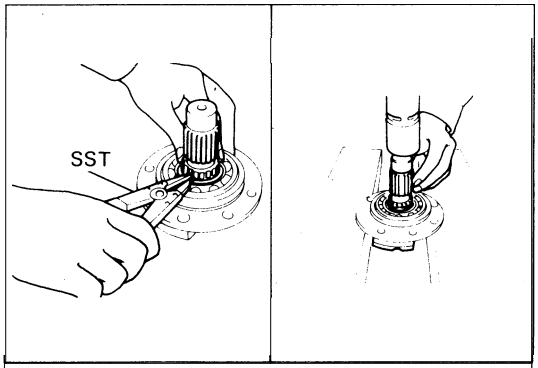


3. Set a dial gage on the upper face of the output shaft, and pry upward with a screwdriver to measure the movement (thrust clearance).

Standard clearance: 0.03 - 0.51 mm (0.0012 - 0.0201 in)

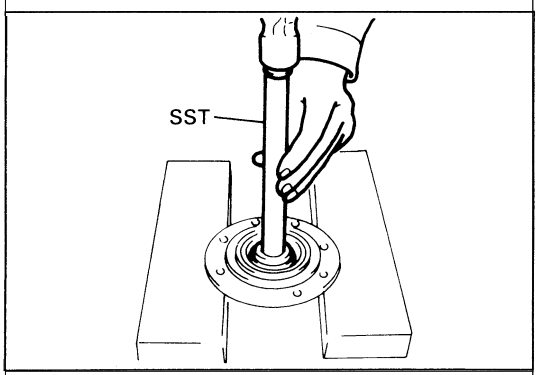
4. If the measured value does not satisfy the standard, select the shims to be used.

Shim thickness: 0.9, 1.25 and 1.6 mm (0.035, 0.0492 and 0.063 in)

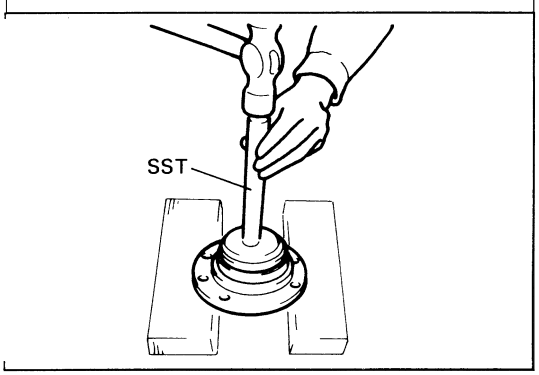


[Point 11]

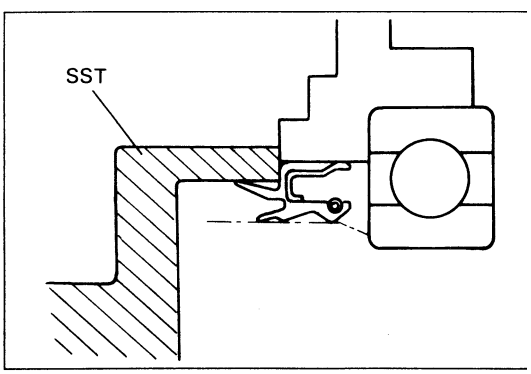
Disassembly: After removing the snap ring with the SST, remove the shaft by tapping its end with a plastic hammer.
SST 09905-00012



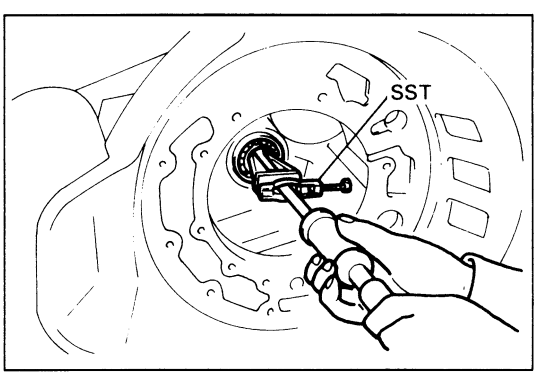
Disassembly: Remove the bearing from the output cover.
SST 09620-30010



Reassembly: Install the bearing in the output cover.
SST 09608-35014

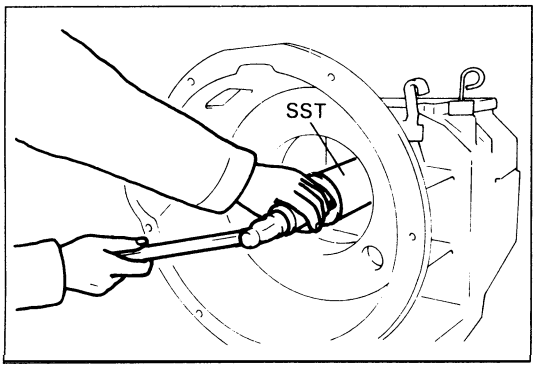


Reassembly: Install the oil seal flush with the output cover so as not to damage its lip.
SST 09150-10170-71
After installation, coat grease on the oil seal lip.

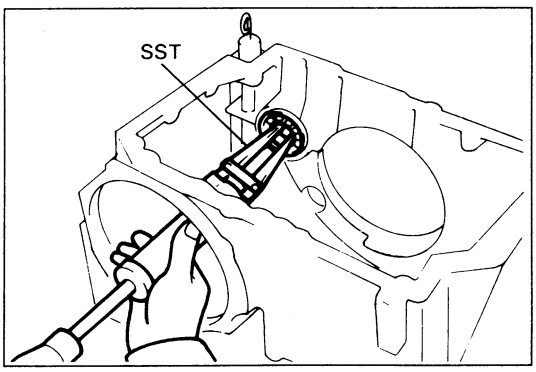


[Point 12]

Disassembly: SST 09308-00010

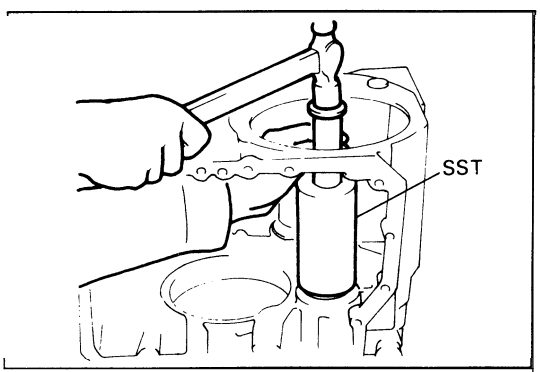


Reassembly: SST 09370-10410-71

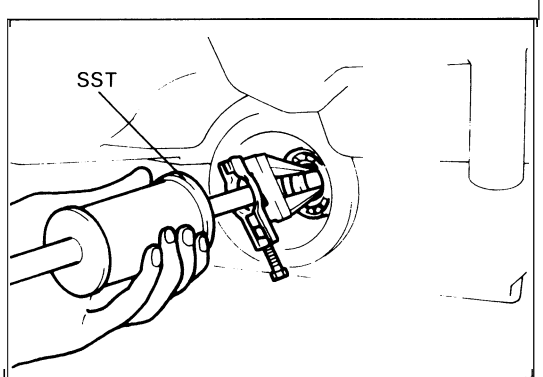


[Point 131

Disassembly: SST 09308-00010

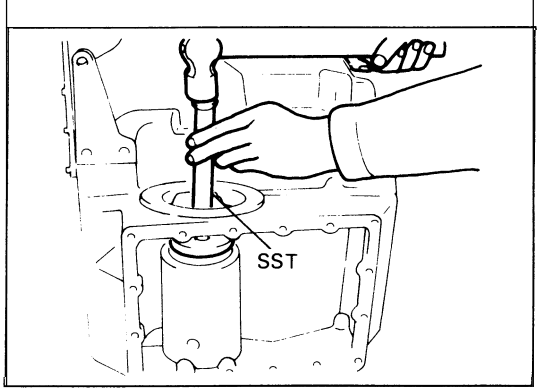


Reassembly: SST 09370-10410-71



[Point 141

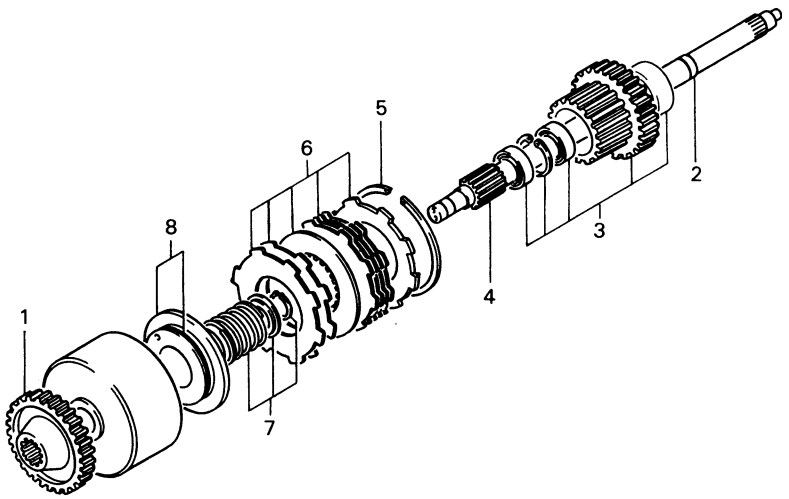
Disassembly: SST 09308-00010



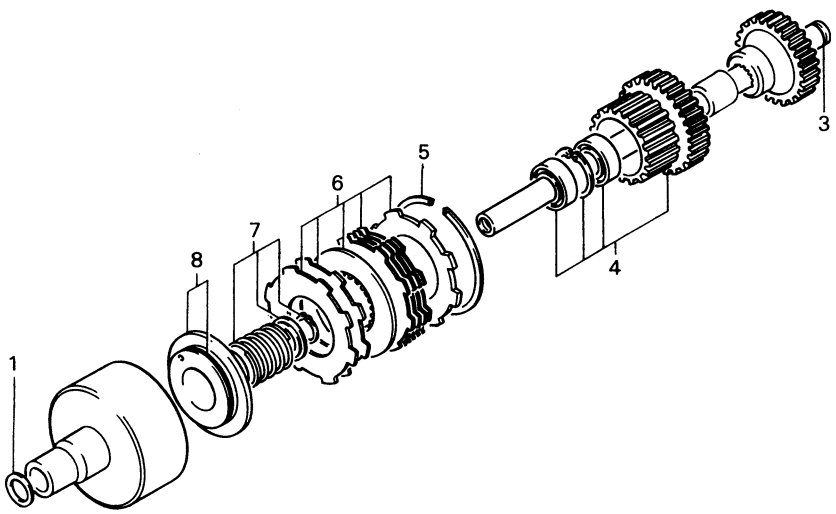
Reassembly: SST 09608-35014

CLUTCH SHAFT DISASSEMBLY·INSPECTION·REASSEMBLY

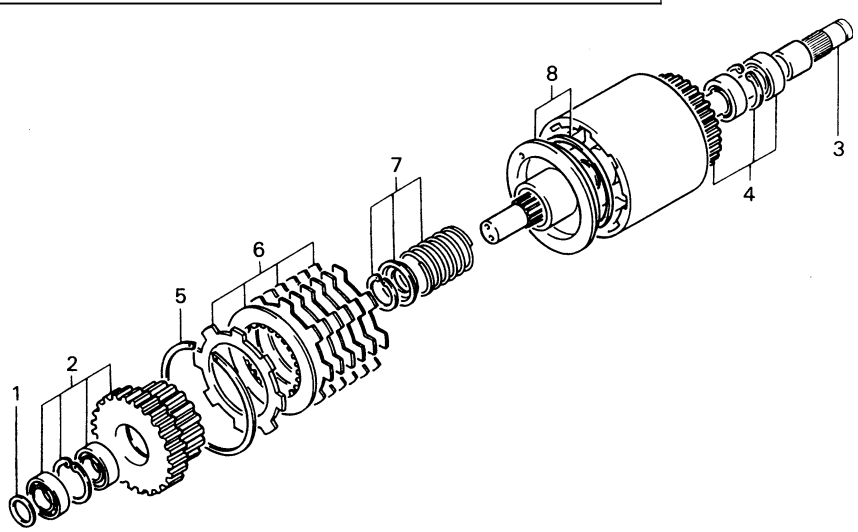
Clutch shaft No.1 (reverse)(for both 1-speed and 2-speeds torque converter)



Clutch shaft No.2 (forward) (for 1-speed)



Clutch shaft No.2 (forward) (for 2-speeds torque converter)



Disassembly Procedure [Clutch Shaft No.1 (Reverse)]

1 Remove the forward input gear.

2 Remove the seal ring.

3 Remove the clutch gear. [Point 1]

4 Remove clutch shaft No.1. [Point 2]

5 Remove the snap ring.

6 Remove the backing plate, clutch disc, clutch plate and camber plate. [Point 3]

7 Remove the clutch return spring. [Point 4]

8 Remove the clutch piston. [Point 5]

Disassembly Procedure [Clutch Shaft No.2 (Forward)]

1 Remove the shim.

2 Remove the clutch gear (in 2-speeds torque converter only). [Point 1]

3 Remove clutch shaft No.2. [Point 2]

4 Remove the clutch gear. [Point 1]

5 Remove the snap ring.

6 Remove the backing plate, clutch disc, clutch plate and camber plate. [Point 3]

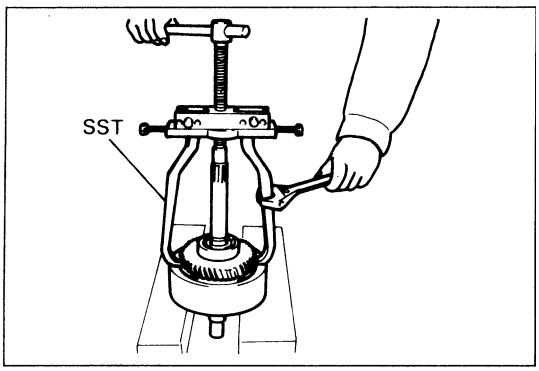
7 Remove the clutch return spring. [Point 4]

8 Remove the clutch piston. [Point 5]

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

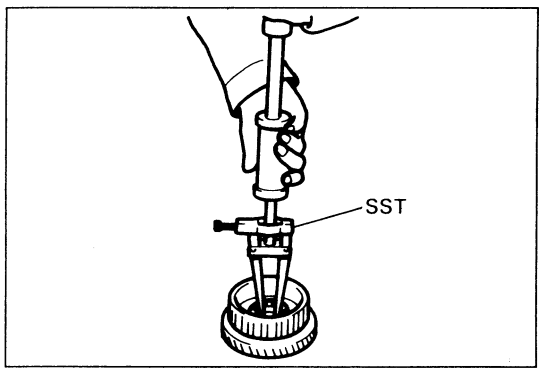
Note:
- Coat grease on the seal ring before reassembly.
- After washing each part, coat torque converter oil sufficiently before reassembly.



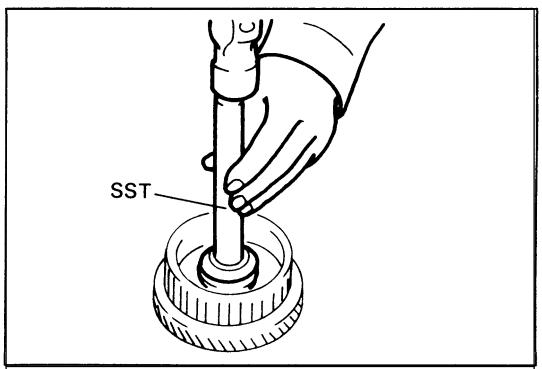
Point Operations

[Point 1]

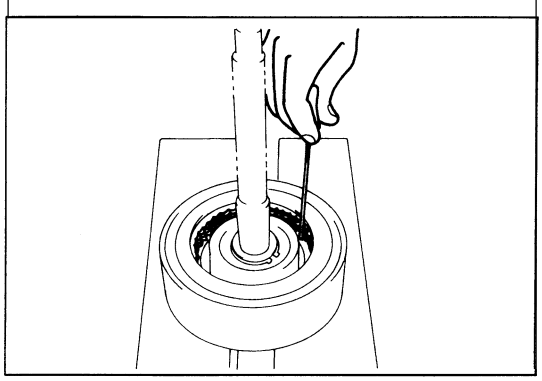
Disassembly: Use the SST and remove the stator shaft bearing and clutch gear (reverse). (in clutch shaft No.1 only)
SST 09950-20017



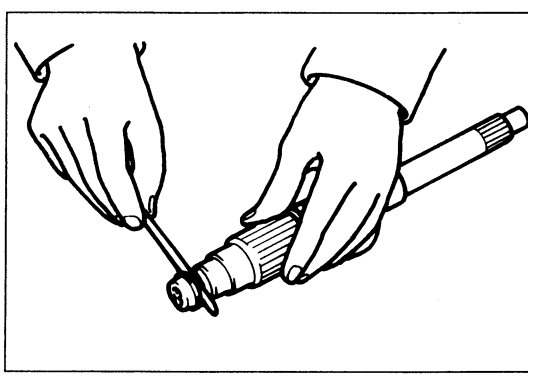
Disassembly: Remove the clutch gear bearing.
SST 09308-00010



Reassembly: Install the clutch bearing.
SST 09608-35014



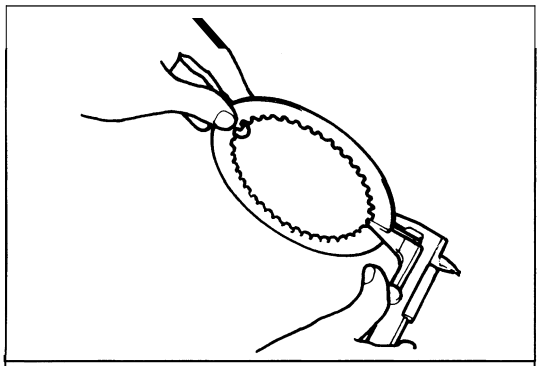
Reassembly: Before installing the clutch gear on the clutch drum, align disc serrations with a screwdriver, etc.



[Point 21

Inspection: Measure the clearance between each clutch shaft and seal ring.

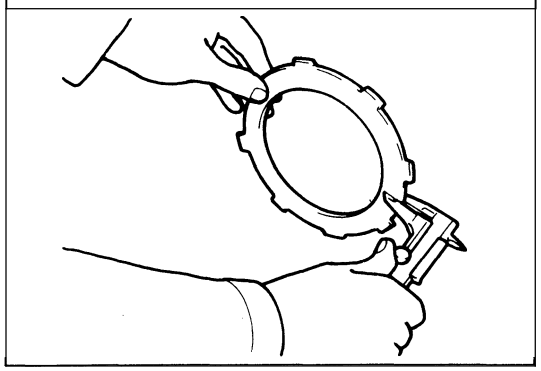
Limit clearance: 0.2 mm 10.008 in)



[Point 31

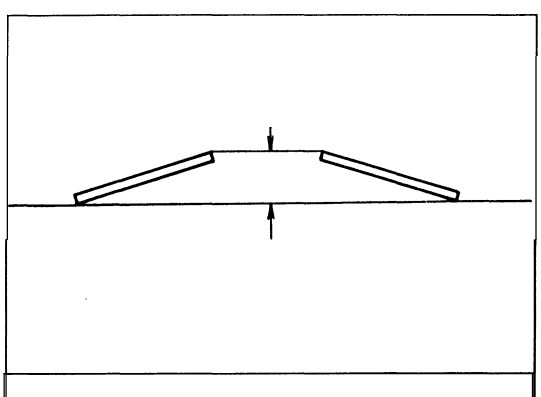
Inspection: Measure the clutch disc thickness.

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



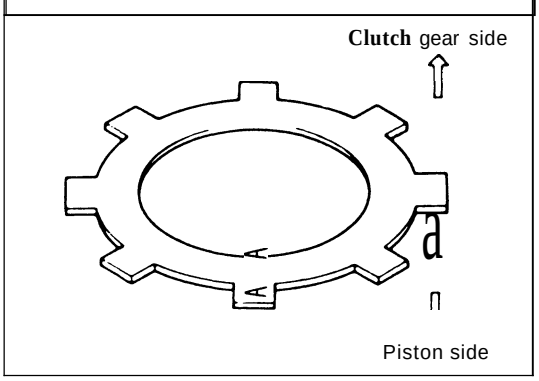
Inspection: Measure the clutch plate thickness.

Standard thickness: 1.8 mm (0.071 in)
Limit thickness: 1.6 mm (0.063 in)

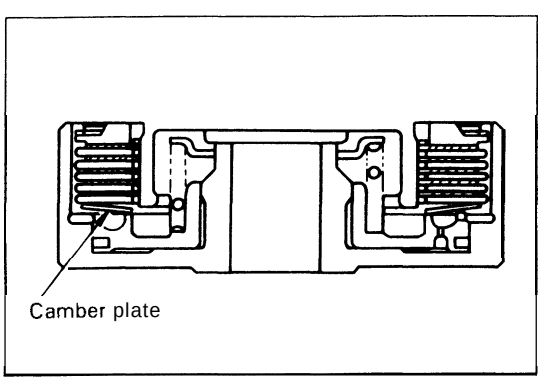


Inspection: Measure the camber plate convex height.

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



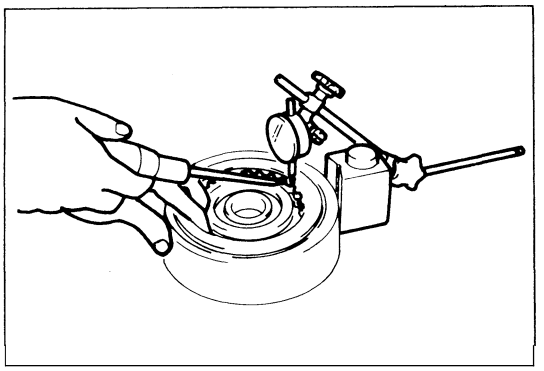
Reassembly: Install the camber plate on the clutch drum, with the A punch mark on the upper side.



Reassembly: Install the clutch plates and clutch discs alternately on the clutch drum while coating torque converter oil.

Number of clutch disc plates

1 ton series	**4**
2 ton series (5K engine)	
2 ton series (4Y·1DZ·2Z engine)	**5**
3 ton series	

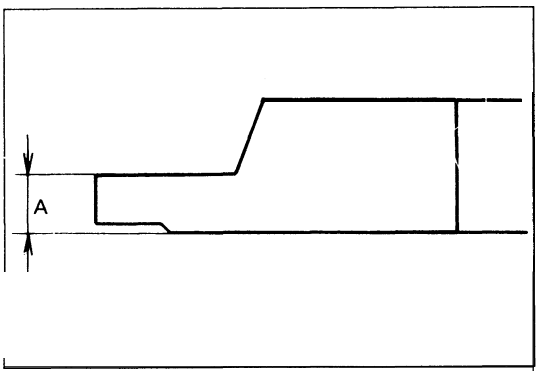


Reassembly: Adjust the clearance between the backing plate and clutch disc.

1. Install the camber plate, clutch plate, clutch disc, backing plate and snap ring on the clutch drum.

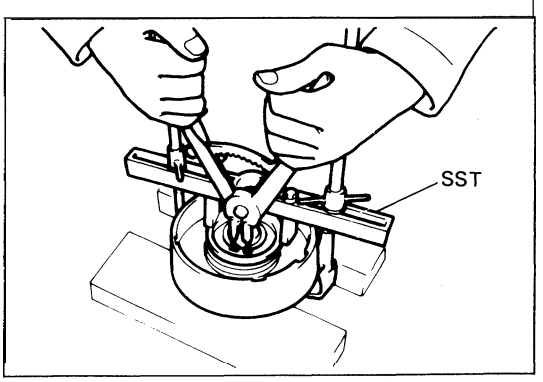
2. Set a dial gage on the upper face of the clutch disc and lift the clutch disc with a screwdriver to measure the clearance with the backing plate.

Standard clearance:
4-disc specification: 0.65 - 1.2 mm (0.0256 - 0.047 in)
5-disc specification: 1.0 - 1.6 mm (0.039 - 0.063 in)



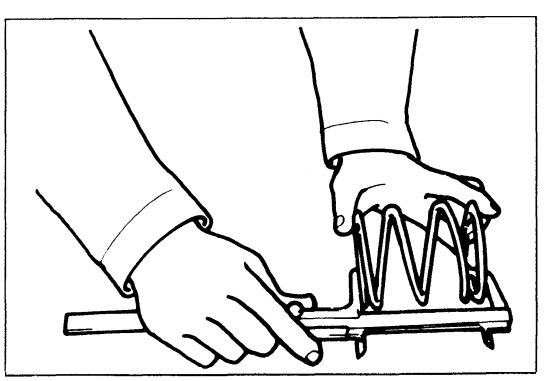
3. If the measured value does not satisfy the standard, select and use an appropriate backing plate.

Backing plate thickness
4-disc specification: A = 7.8 and 8.3 mm (0.307 and 0.327 in)
5-disc specification A = 3.0 and 3.5 mm (0.118 and 0.138 in)



[Point 41

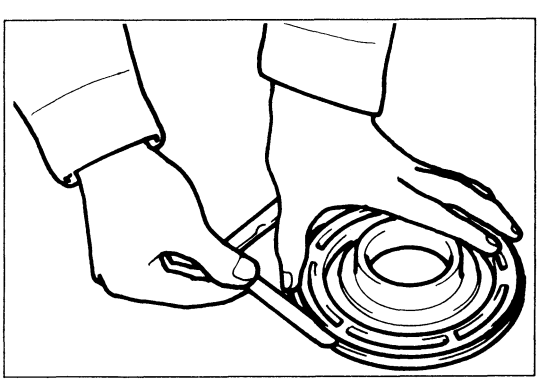
Disassembly·reassembly: SST 09220-22000-71



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

Free length: 92.1 mm (3.626 in)
Limit free length: 85.0 mm (3.346 in)

[Point 51

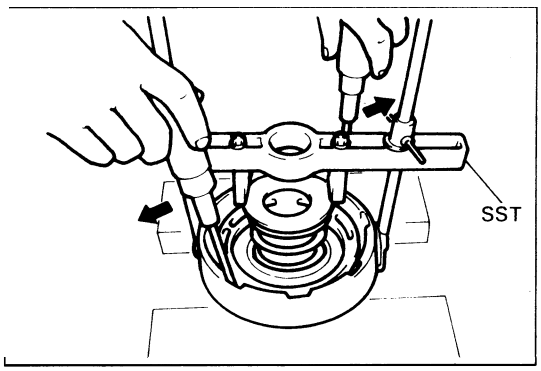


Inspection: Measure the clearance between the clutch piston and piston ring.

Standard clearance: 0.15 mm (0.0059 in)

Inspection: Clean the check valve installed in the clutch piston by blowing compressed air.

Reassembly: Install the piston ring with the side with the "R" punch mark facing the hydraulic oil pressure side.



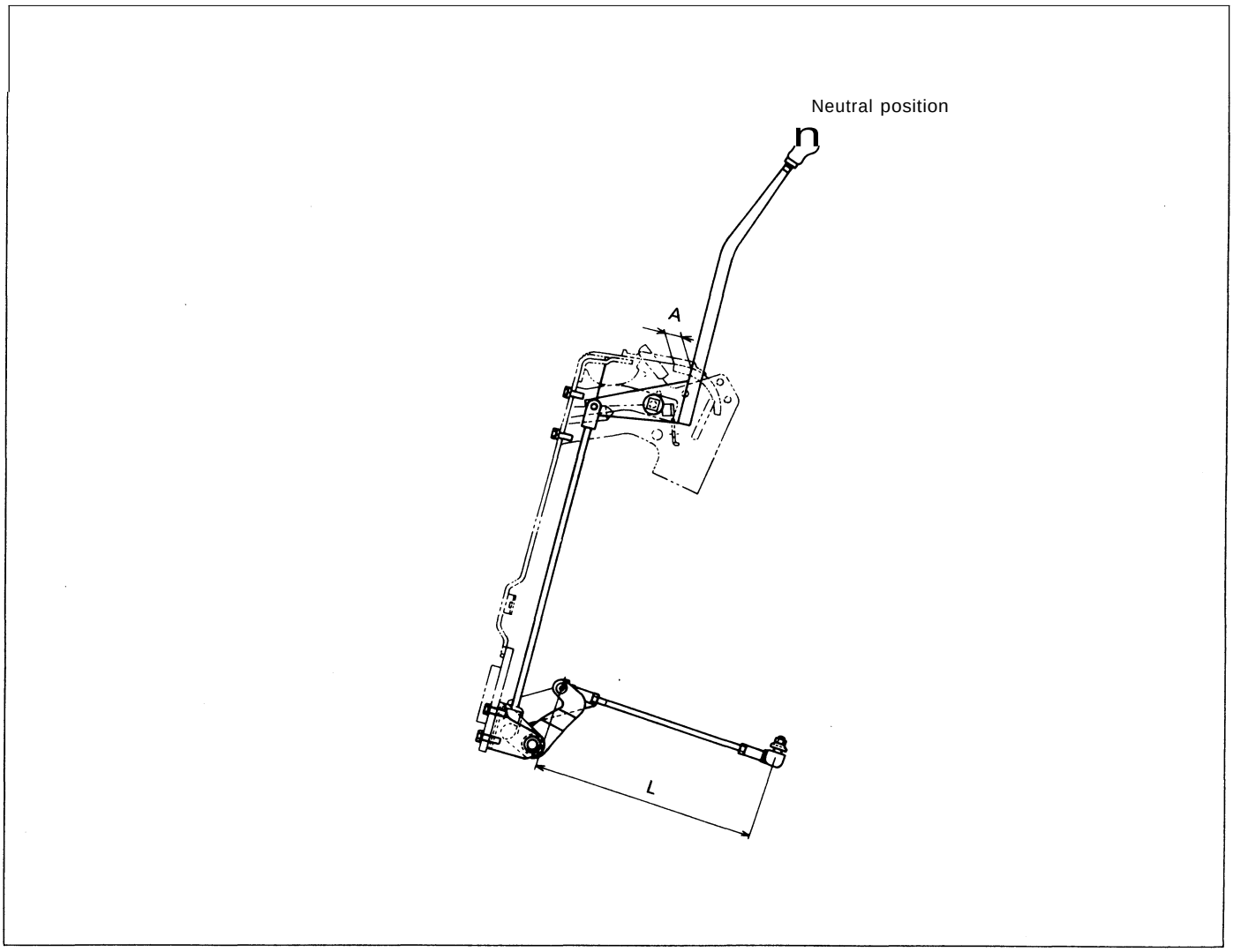
Reassembly: Use the SST and a straight edge screwdriver for inserting the clutch piston W/piston ring into the clutch drum.

SST 09220-22000-71

With the clutch piston held slightly with the SST as shown in the figure, use the straight-edge screwdriver to push the piston ring toward the piston.

SHIFT LEVER

ADJUSTMENT



1. Adjust the shift lever position.
   (1) Set the shift lever in the neutral position.
   (2) Adjust the rod length (dimension L) so that the dimension A from the instrument panel cut face to the lever satisfies the following standard:

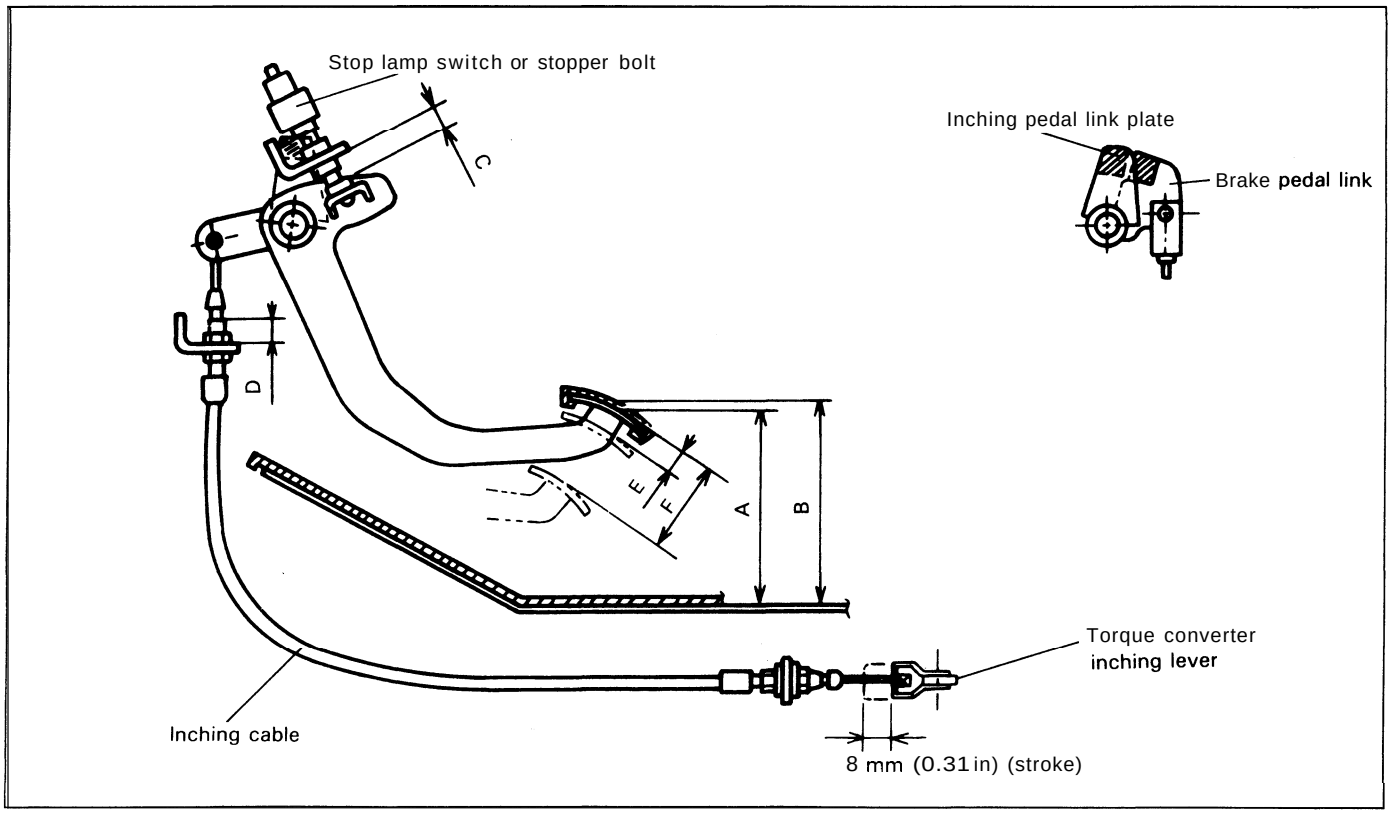
   A = 22 ± 4 mm *(0.87* ± 0.16 in)

   Dimension L (reference)

Vehicle model	Dimension L mm (in)
1.2 ton series	289 (11.38)
3 ton series	305 (12.01)

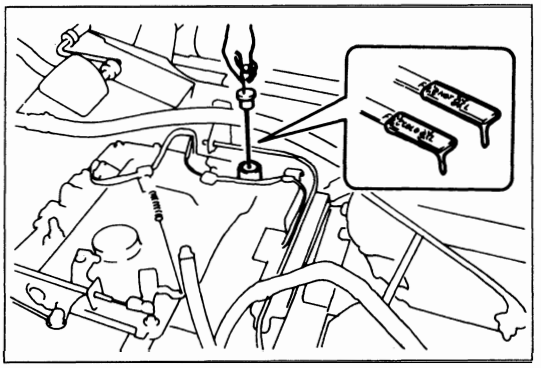
INCHING ADJUSTMENT

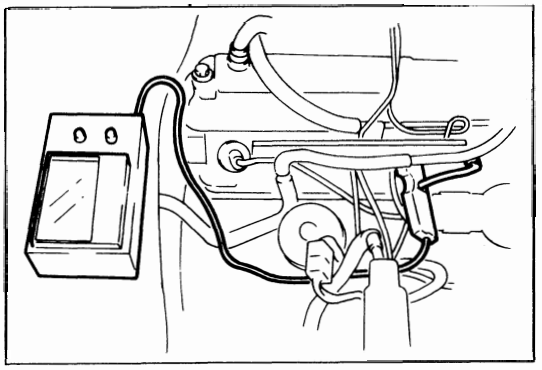
Note:
- Perform inching adjustment after the inching wire is replaced or when an abnormality such as slow vehicle speed or failure in releasing the torque converter clutch by inching pedal depression is felt.
- For the inching pedal height and play adjustment procedure, see the brake pedal adjustment section (on page 10-29).

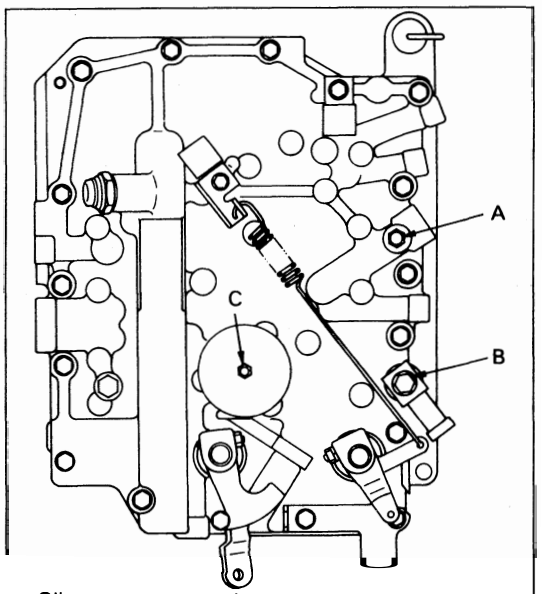


Unit: mm (in)

A	B	C (Reference)	D	E (Reference)	F (Reference)
140–145 (5.51–5.71)	145–150 (5.71–5.91)	12 (0.47)	17.5 (0.689)	3–5 (0.12–0.20)	56–60 (2.20–2.36)







Oil pressure measuring ports
A: Main pressure (size PT1/8)
B: Torque converter outlet pressure (size PT1/8)
C: Clutch operating pressure (size PT1/8)

MEASUREMENT·TEST

1. Oil level measurement
   (1) Keep the vehicle in horizontal state, set the shift lever in the neutral position, and keep the engine in the idling state.
   (2) After warming up the engine, keep it running at the idling speed. Measure the oil level with the level gage. The oil level is appropriate if it is between the upper limit (F) and lower limit (L).
   If insufficient, add oil through the level gage mounting port.

2. Oil pressure measurement
   (1) After warming up the engine, measure the idling speed and no-load maximum speed.

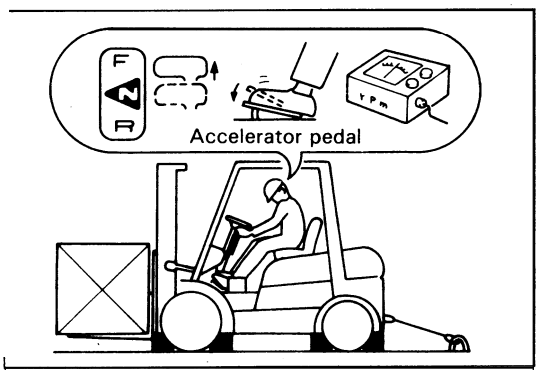
Note:
See the engine speed adjustment section (on page 1-17).

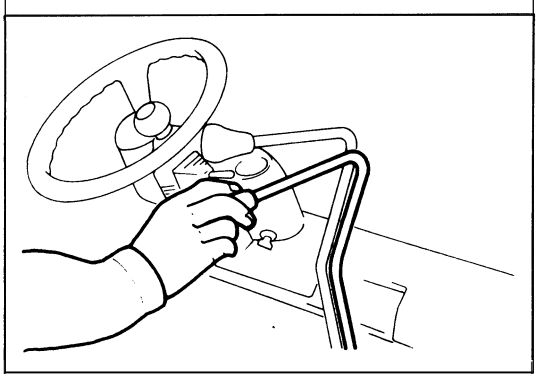
   (2) Stop the engine and jack up the front axle to make the tires (both wheels) float above the ground.
   (3) Remove the toe board and set an oil pressure gage. If three oil pressure gages are available, it is desirable to measure the main pressure, clutch pressure and torque converter pressure at the same time..
   (4) Start the engine. With the shift lever set in the neutral position, measure the main pressure at each of idling and 2000 rpm, and the torque converter outlet pressure at 2000 rpm.
   (5) With the shift lever set at each shift position, measure the clutch operating pressure at each of idling and 2000 rpm.

Note:
Do not depress the inching pedal while measuring the oil pressure.

Standard Oil Pressure Values

	Idling	2000 rprn
Main pressure kPa (kg/cm²) [psi]	490–981 (5.0–10.0) [71–1421	932–1373 (9.5~14.0) [135~199]
Clutch pressure kPa (kg/cm²) [psi]	441–834 (4.5–8.5) [64~121]	883–1373 (9.0–14.0) [128–1991
Torque converter pressure (outlet pressure) kPa (kg/cm²) [psi]	—	200–590 (2~6) [30~901





3. Stall test

(1) Load a cargo near the allowable maximum load, chock the vehicle front and rear wheels securely and apply the parking brake.

Note:
Keep the vehicle in perfectly stopped state, and stretch wires to make the vehicle immovable for safety.

(2) Warm up the engine, and measure the idling speed and no-load maximum speed.

Note:
See the engine speed adjustment section (on page 1-17).

(3) Check the engine output by the maximum speed in loaded state.

Method
After adjusting the no-load maximum speed, operate the tilt lever for backward tilting.
Measure the maximum speed at full acceleration in relief state.

Standard
The relief down from the no-load maximum speed shall be as follows:

Gasoline engine models: 150 – 300 rpm
Diesel engine models: 100 – 200 rpm

The relief down in the LPG engine model in slightly more than the above values.

Judgment
If the engine speed drops excessively, engine tune-up defect may be the reason.

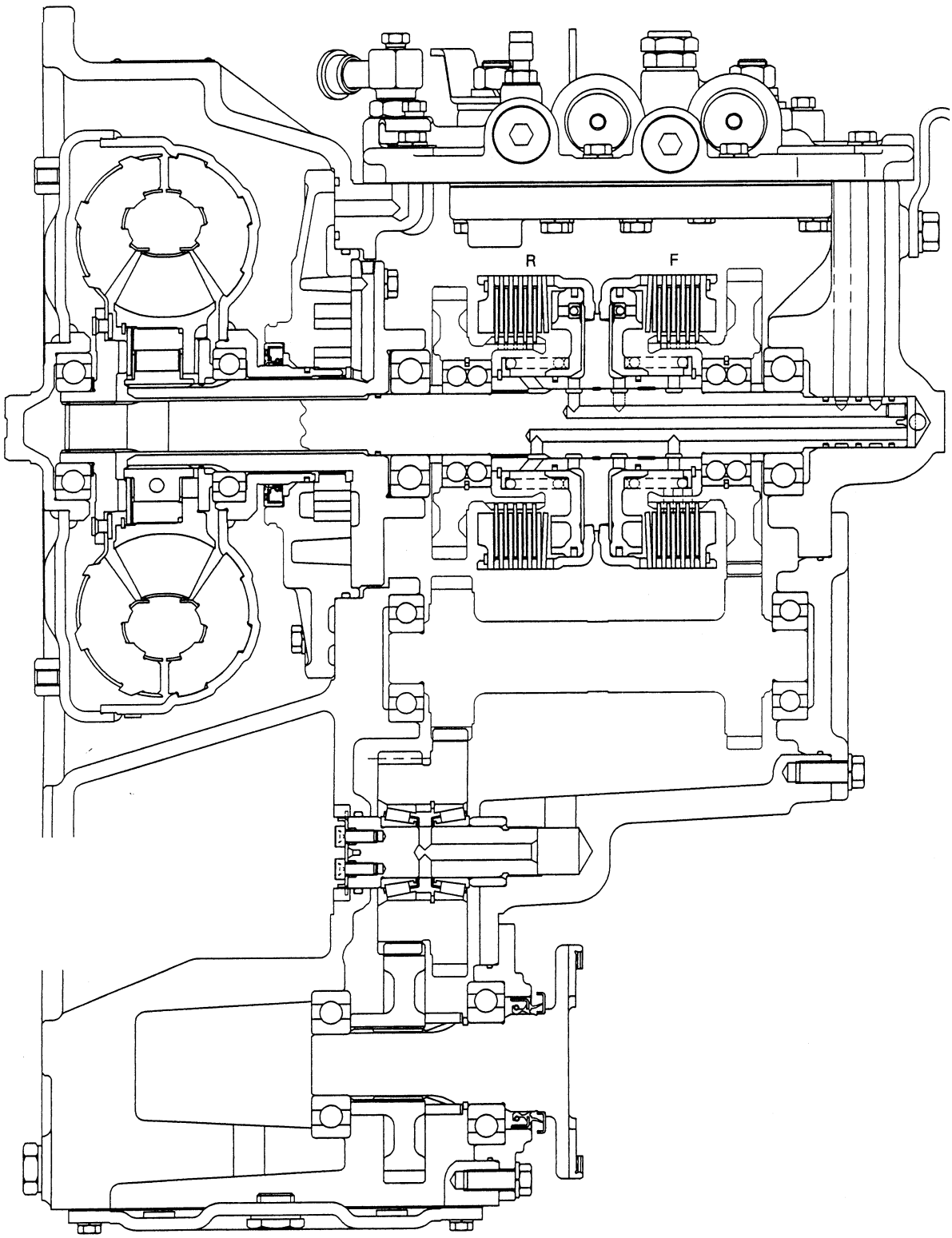
(4) Start the engine, set the control lever in the forward traveling position, race the engine fully, and measure the stall speed after stabilization.

Engine	5K	4Y	1DZ	2Z
Stall speed rpm	1950	2100	2150	2100

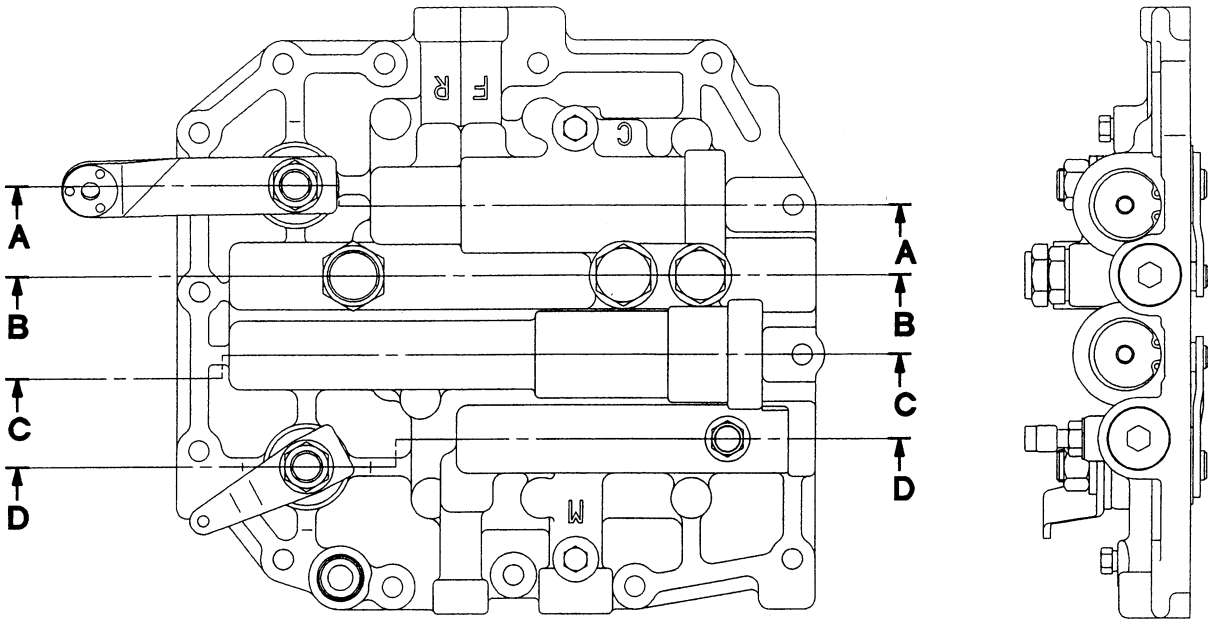
TORQUE CONVERTER
(1995.5 ~)

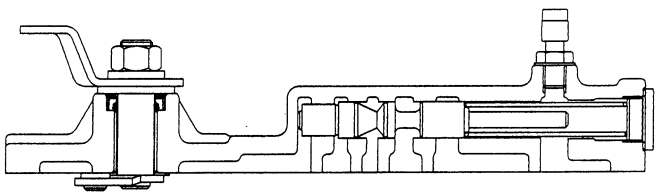
GENERAL

1 Speed Torque Converter (STD)

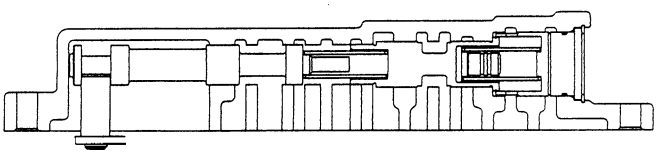


Control Valve (For 1 Speed)

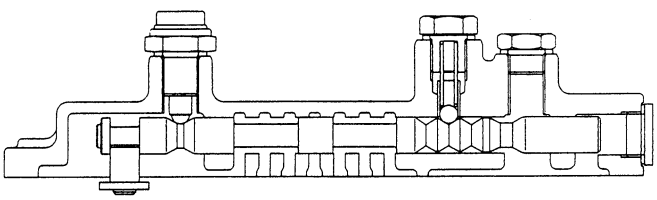




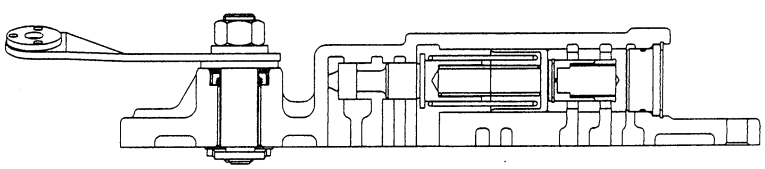
Regulator valve (D-D)



Inching valve (C-C)



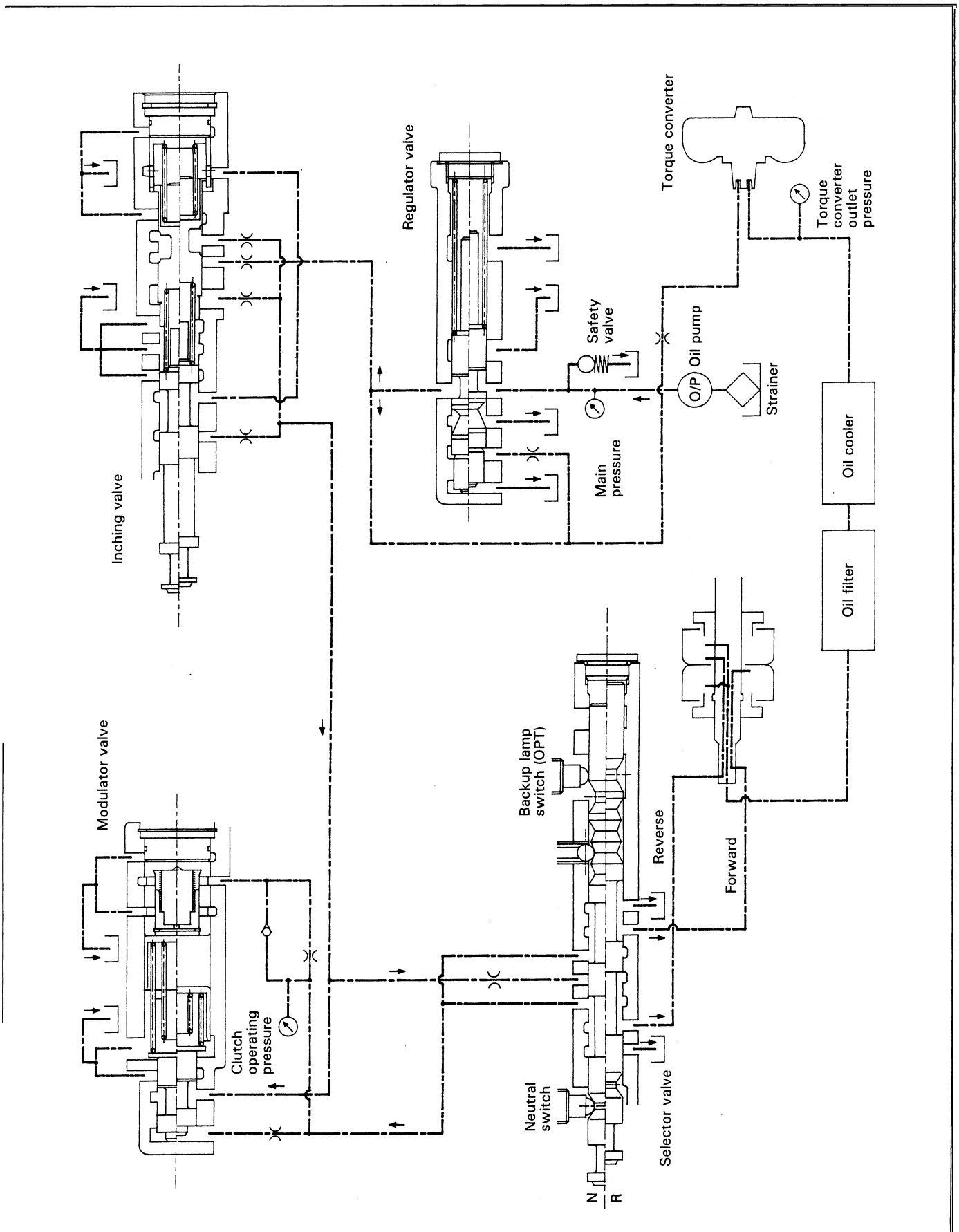
Selector valve (B-B)



Modulator valve (A-A)

HYDRAULIC CIRCUIT DIAGRAM

For 1 Speed



SPECIFICATIONS

Item		1 speed torque converter (STD)
Manufacturer		AISIN SEIKI
Torque converter type		3-element single-stage, two-phase type
Torque converter name		AISIN
Stall torque ratio		5K: 2.94 4Y·1DZ: 2.68 2Z: 2.76
Stall speed	rpm	5K: 1950 4Y·2Z: 2100 1DZ: 2150
Module control pressure	kPa (kgf/cm²) [psi]	39 – 657 (0.4 – 6.7) [5.7 – 9.51
Clutch operating pressure (main pressure)	kPa (kgf/cm²) [psi]	981 (10.0) [142]
Torque converter outlet pressure	kPa (kgf/cm²) [psi]	294 (3.0) [43]
Torque converter oil capacity	ℓ (US gal)	11.5 (3.0)
Torque converter oil		Auto fluid

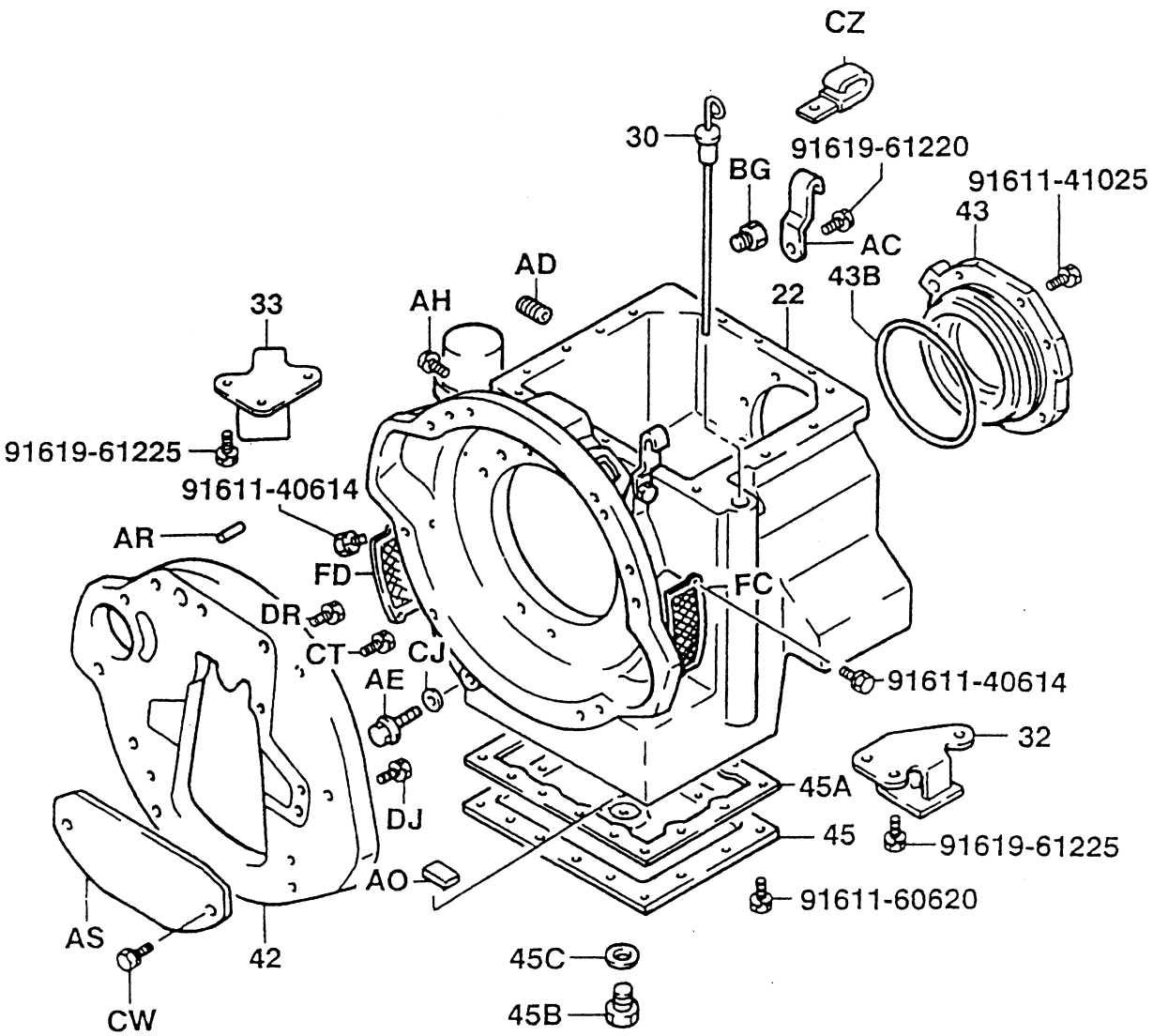
Note:
- The hydraulic pressure is indicated by the value at an engine speed of 2000 rpm.

Gear ratio

	1 ton series		2 ton series			3 ton series	
	5K	4Y·1DZ	5K	4Y·1DZ	2Z	4Y·1DZ	2Z
Forward	1.363	1.030	1.834	1.217	1.062	1.363	1.123
Reverse	1.359	1.028	1.829	1.214	1.059	1.359	1.120

COMPONENTS

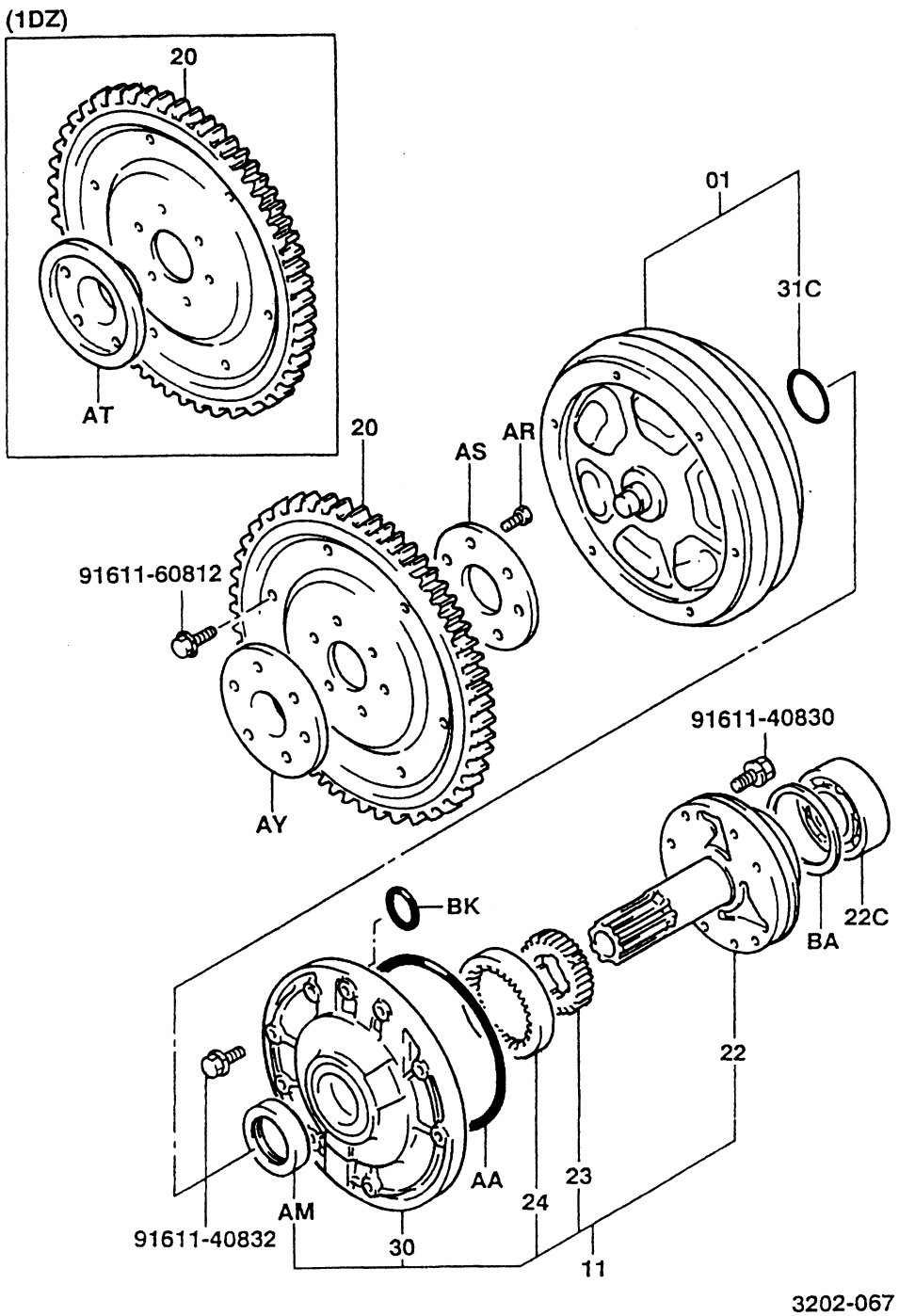
Torque Converter Housing



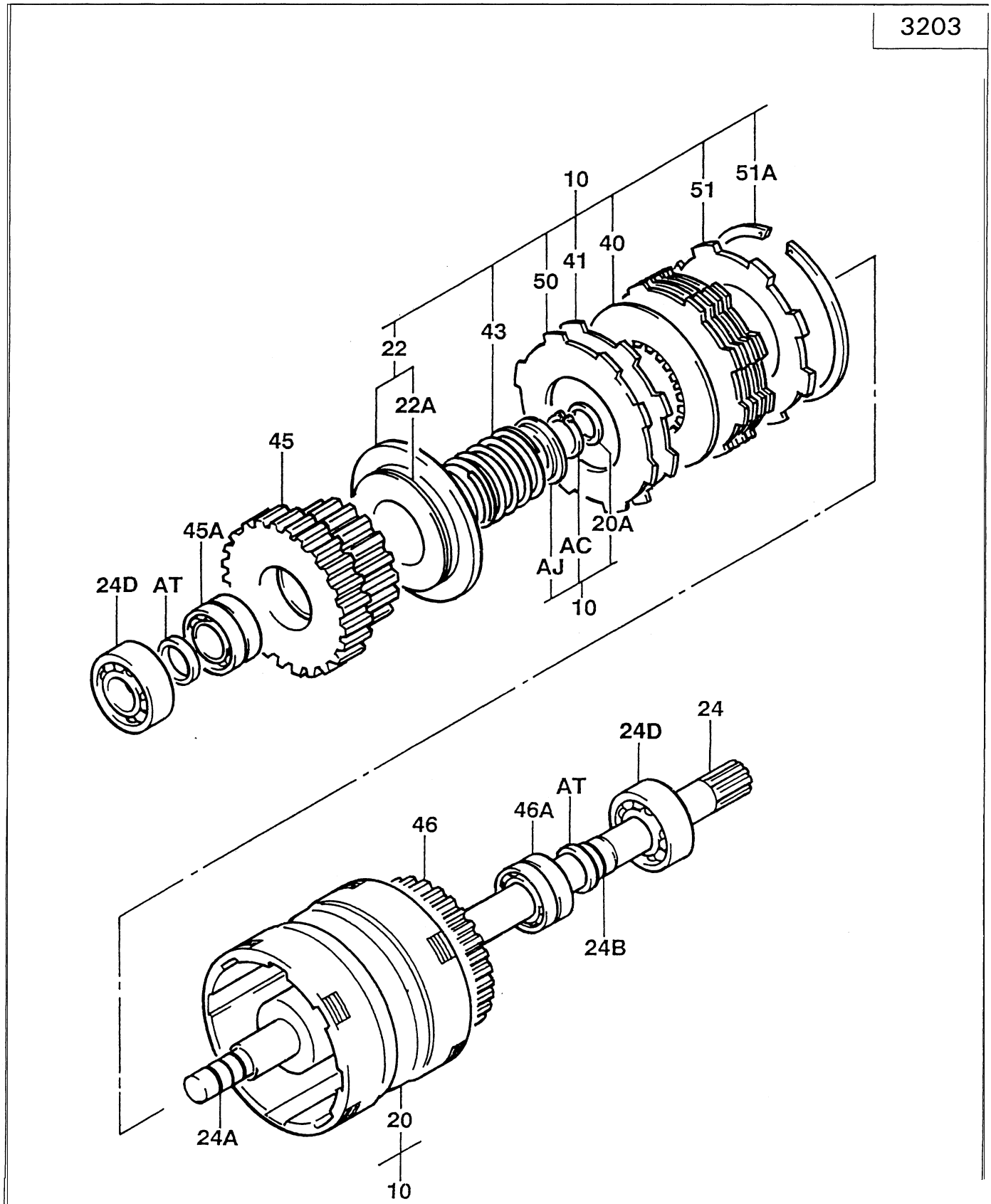
3201-138

Torque Converter

3202

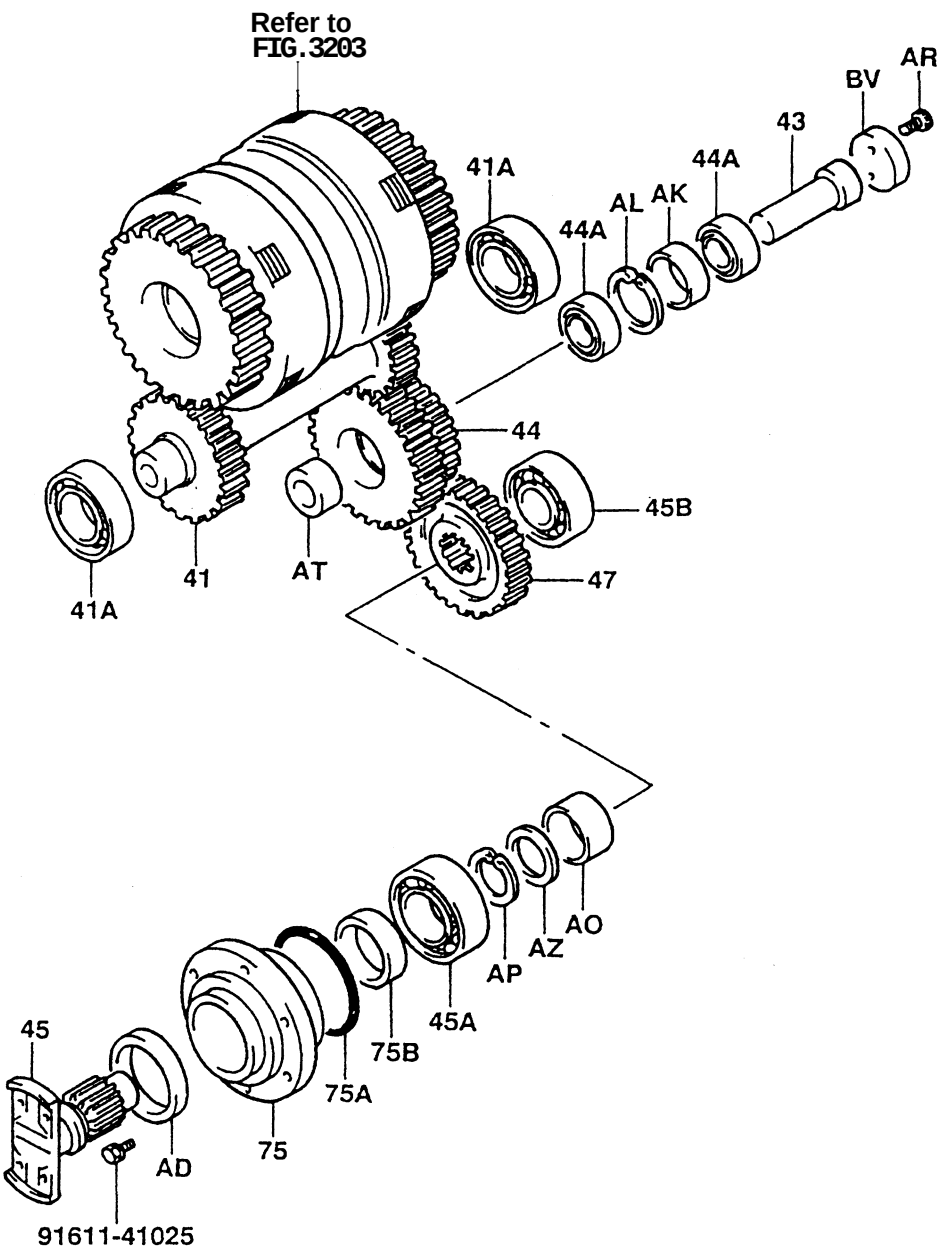


Torque Converter Clutch



Torque Converter Gear

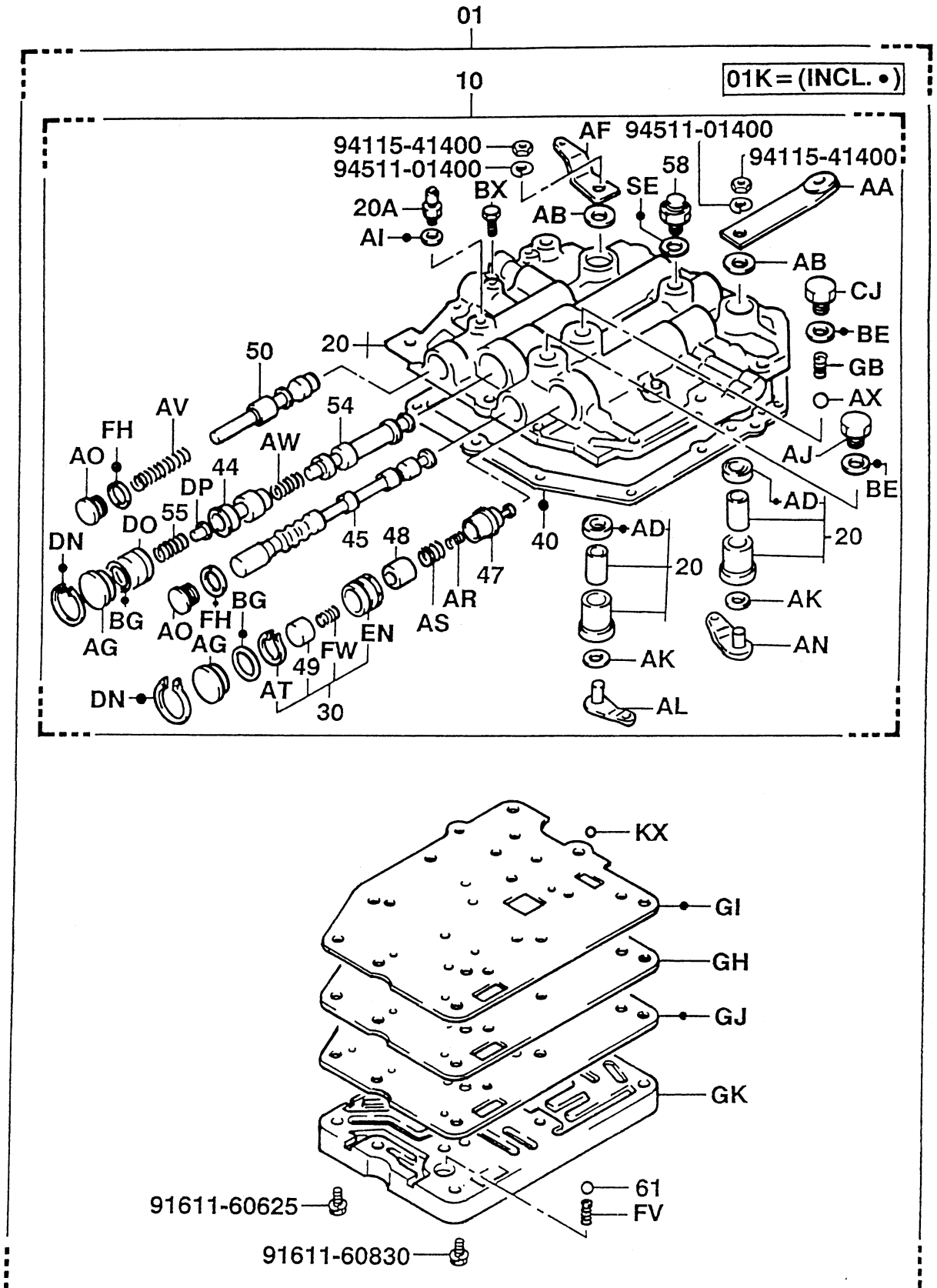
3204



3204-053

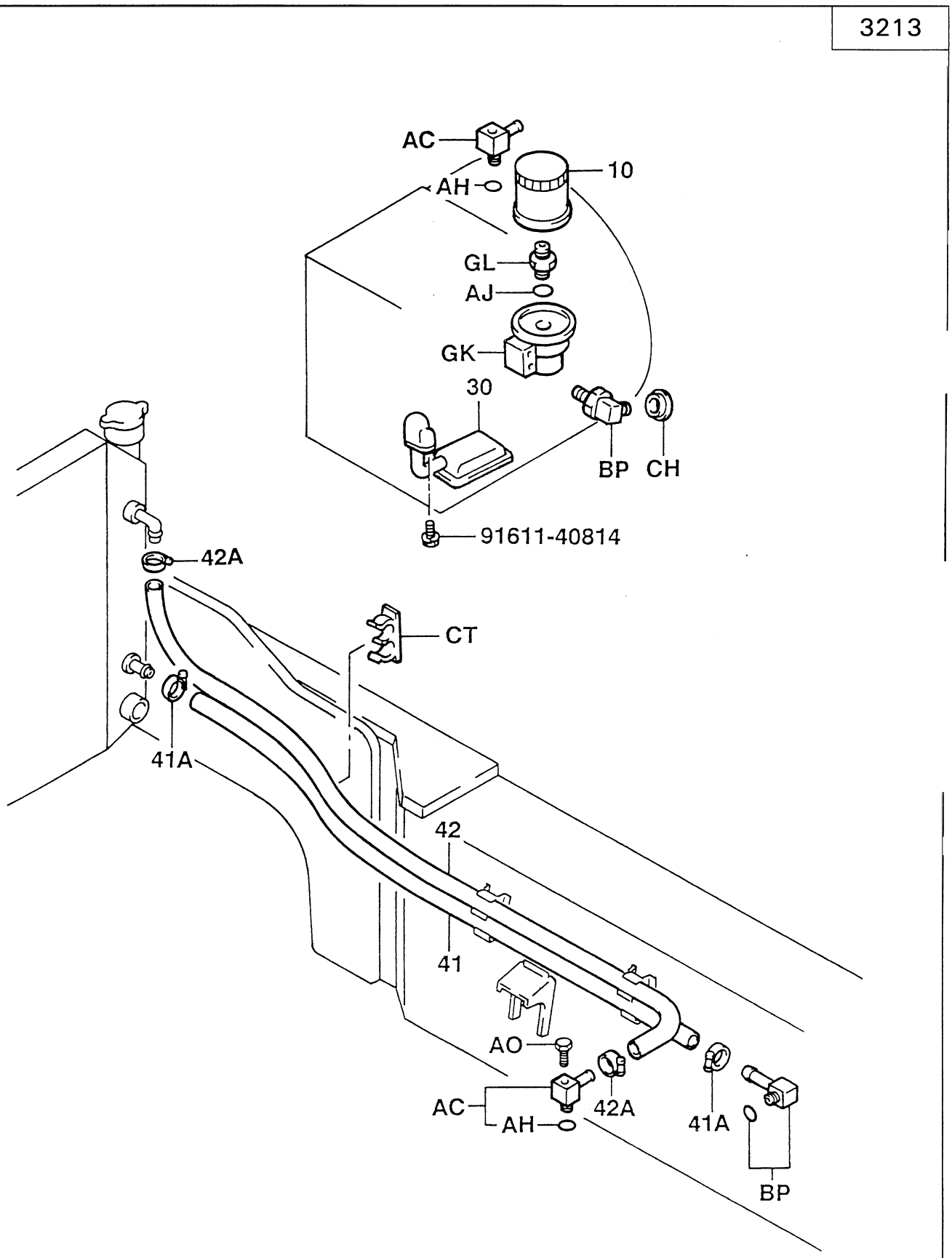
Control Valve

3206



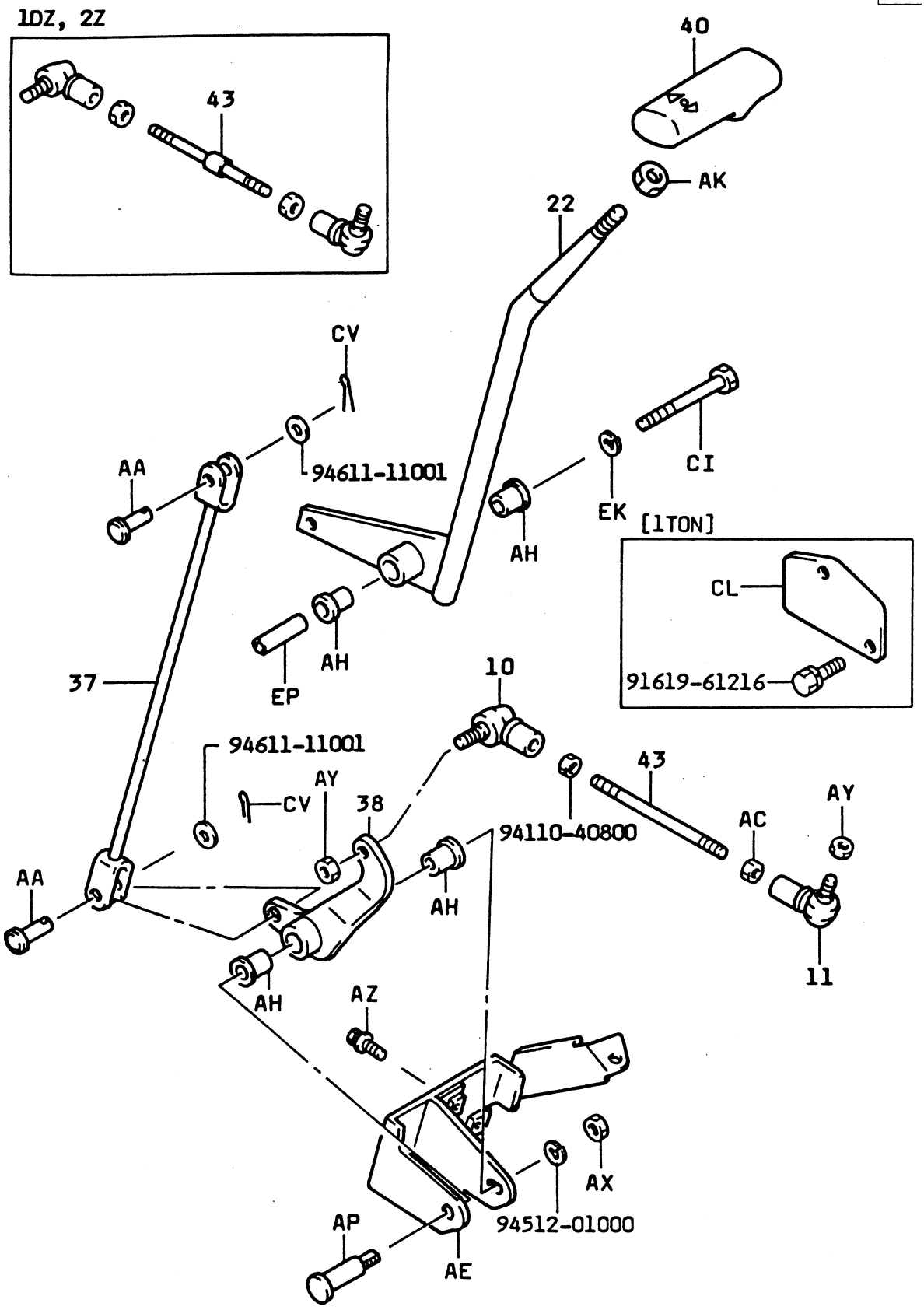
3206-089A

Torque Converter Piping



Shift Lever

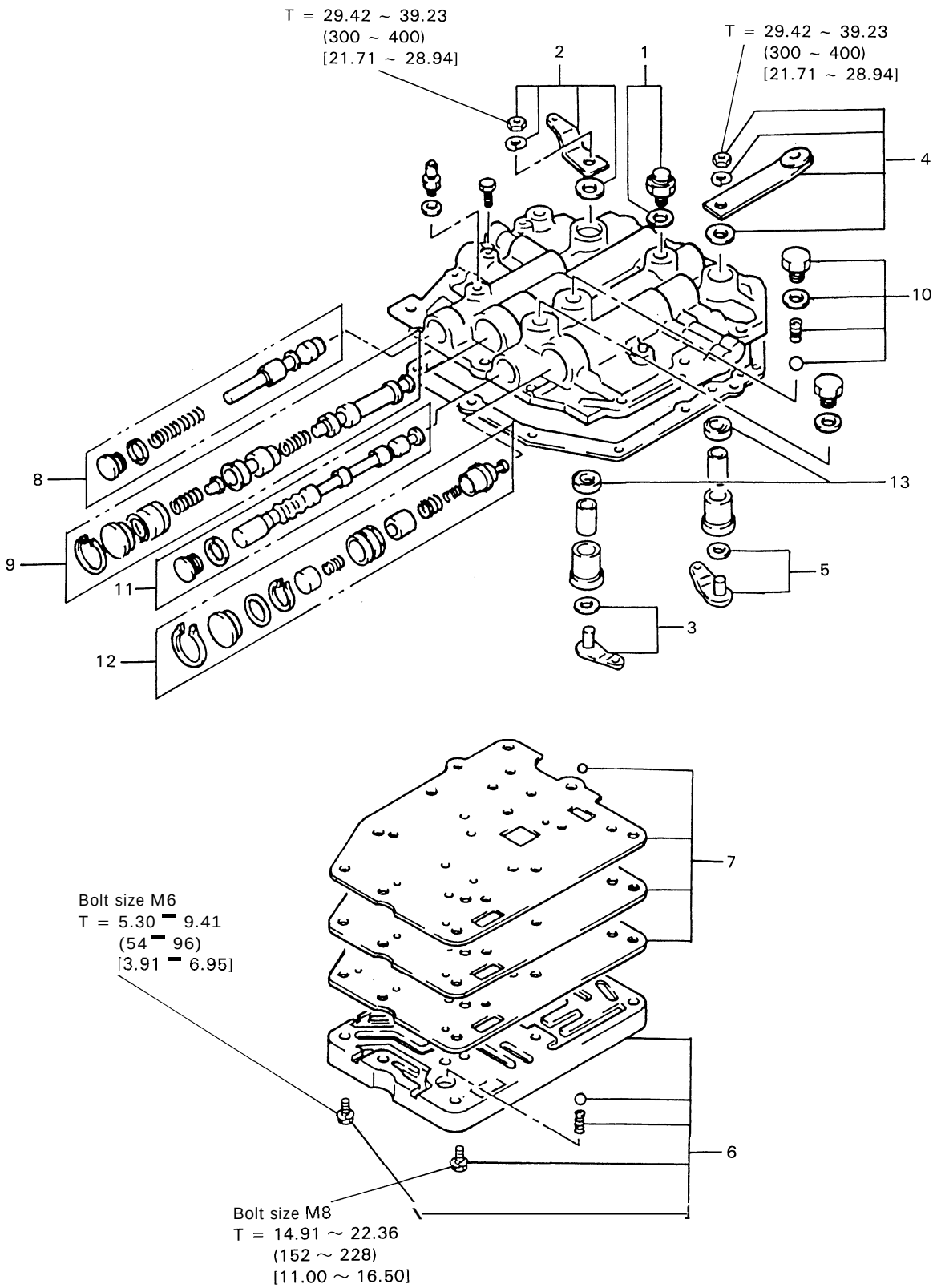
3



TRANSMISSION COVER & CONTROL VALVE ASSY (1 SPEED)

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kgf-cm) [ft-lbfl



Disassembly Procedure

1 Remove the neutral switch and backup lamp switch (OPT). **[Point 1]**

2 Remove the inching lever.

3 Remove the inching cam lever.

4 Remove the shift lever. **[Point 2]**

5 Remove the shift cam lever

6 Remove the valve body plate cover. **[Point 3]**

7 Remove the valve body plate. **[Point 4]**

8 Remove the regulator valve.

9 Remove the inching valve. **[Point 5]**

10 Remove the detent spring and steel ball.

11 Remove the selector valve.

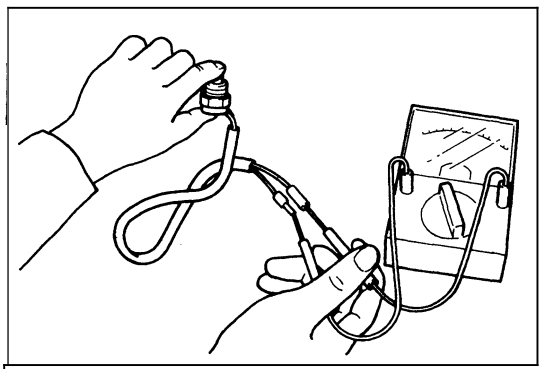
12 Remove the orifice valve and modulator valve. **[Point 6]**

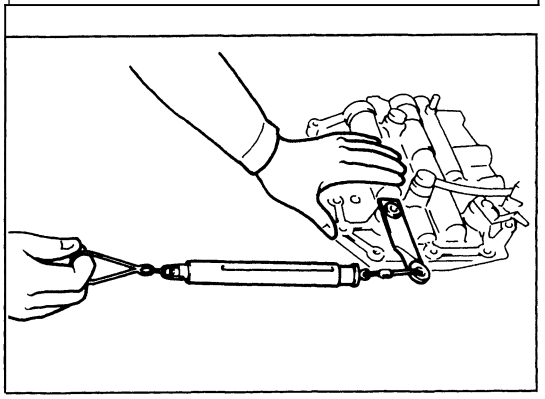
13 Remove the oil seal. **[Point 7]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **When installing the inching cam lever and shift cam lever, apply a thin coat MP grease on the inside of the upper cover and oil seal.**
- **Coat torque converter oil on each valve reassembly.**





Point Operations

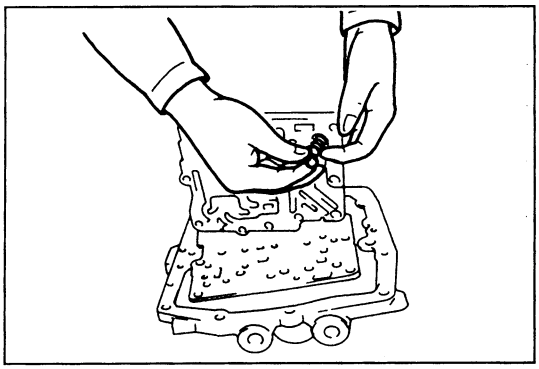
[Point 1]

Inspection: Inspect the switches.
Neutral switch:
Normal if turned OFF when depressed.
Backup lamp switch:
Normal if turned ON when depressed.

[Point 2]

Inspection: Check the shift lever operating force. Set a spring scale at the tip end of the shift lever to measure the operating force. The operating force cannot be adjusted.

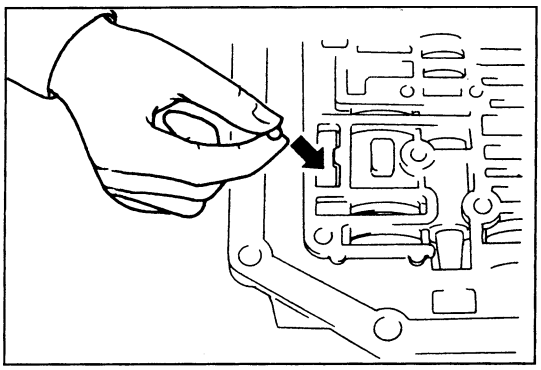
Shift lever operating force (Reference):
34.3 - 53.9N (3.5- 5.5kgf) [7.7 - 12.1 Ibfl



[Point 3]

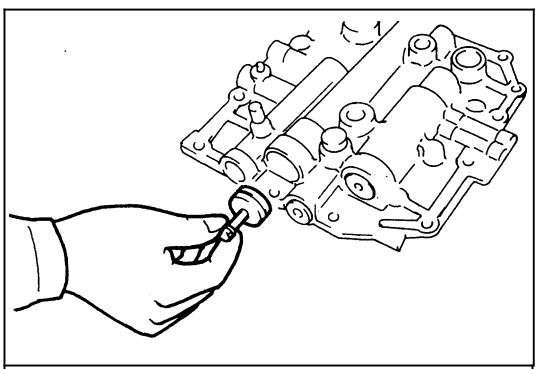
Disassembly: Carefully operate so as not to lose the steel ball as it will be ejected by the spring force when the valve body plate cover is removed.

Reassembly: Install the steel ball in the correct position.



[Point 4]

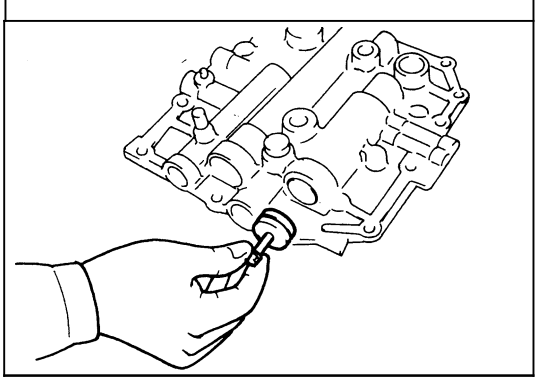
Reassembly: Install the steel ball in the correct position.



[Point 5]

Disassembly: Use the service bolt to extract the plug.
Service bolt size: M8 × 1.25

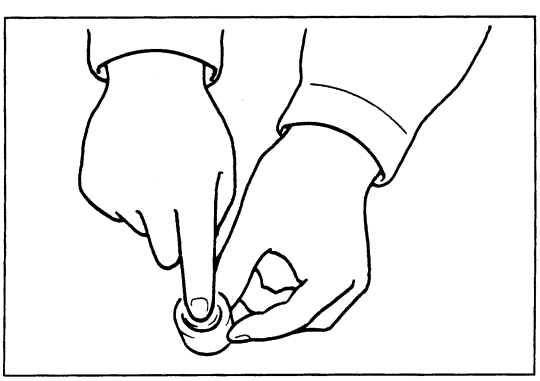
Reassembly: Coat grease on the O-ring of plug before installation.



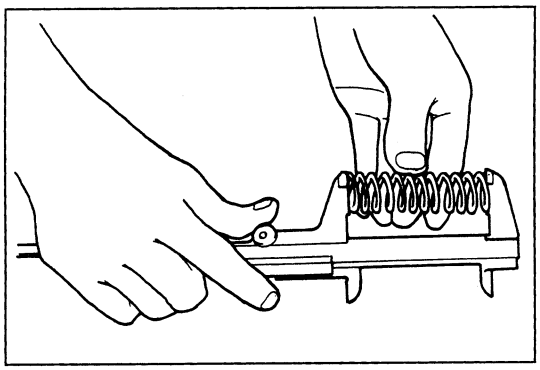
[Point 6]

Disassembly: Use the service bolt to extract the plug.
Service bolt size: M8 × 1.25

Reassembly: Coat grease on the O-ring of plug before installation.



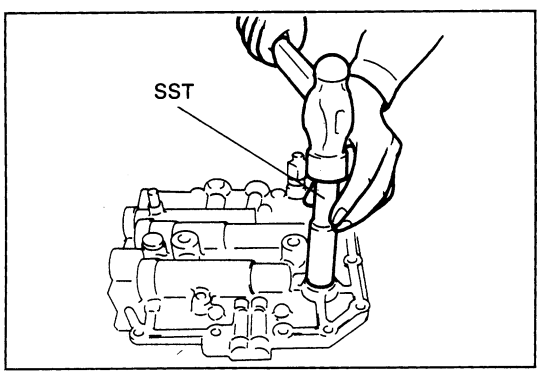
Inspection: Inspect the orifice valve.
Push the center of the valve a few times lightly with a finger to confirm smooth movement without sticking.



Inspection: Measure the free length of each spring.

Unit: mm (in)

Spring	Free length	Free length limit
Regulator valve	91.0 (3.583)	86.5 (3.406)
Inching valve	42.0 (1.654)	40.0 (1.575)
Inching valve compression (Plug side)	40.0 (1.575)	38.0 (1.496)
Modulator valve (Outer)	48.0 (1.890)	46.0 (1.811)
Modulator valve (Inner)	46.0 (1.811)	44.0 (1.732)
Orifice valve	50.0 (1.969)	47.5 (1.870)
Detent lever lock	33.5 (1.319)	32.0 (1.260)



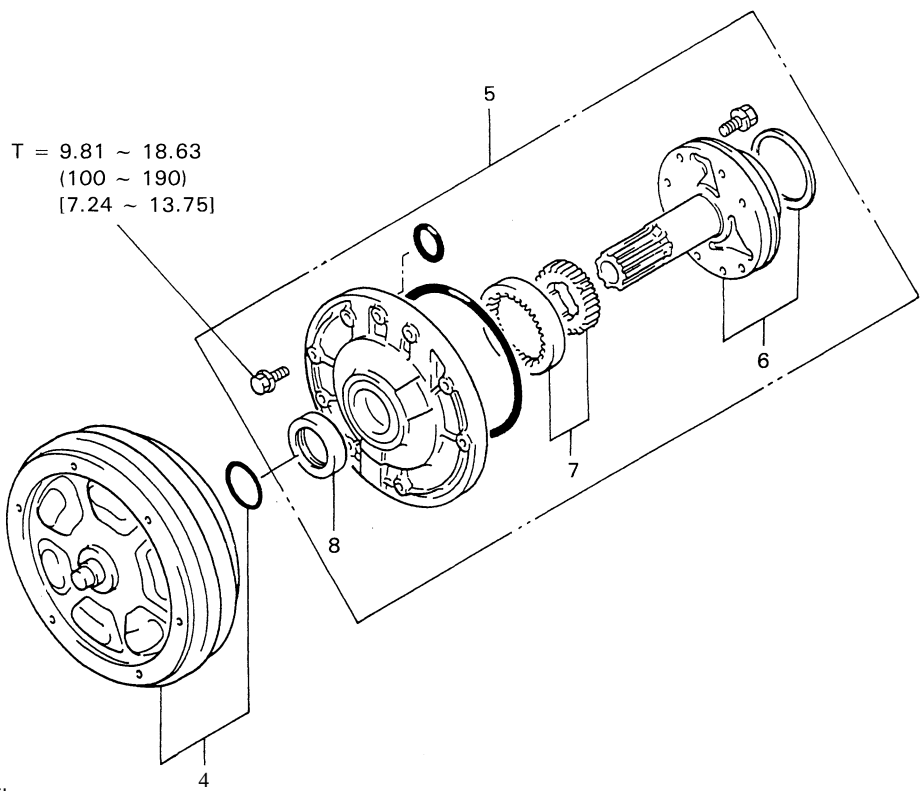
[Point 71

Reassembly: SST 09620-30010

TORQUE CONVERTER·OIL PUMP (1 SPEED)

REMOVAL.INSTALLATION

T = N·m (kgf-cm) [ft-lbfl



1 Torque converter oil
2 Engine W/torque converter
3 Torque converter housing ASSY

Removal Procedure

1 Drain torque converter oil.

2 Remove the engine W/torque converter

3 Disconnect the engine and torque converter housing ASSY

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

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

6 Remove the stator shaft.

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

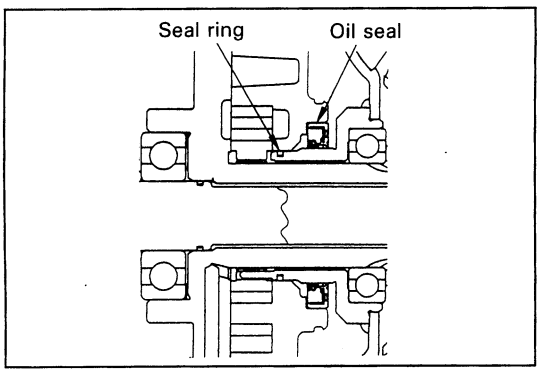
8 Remove the oil seal. **[Point 4]**

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:

- **Oil pump set bolt tightening torque: T = 9.81 - 18.63 N·m (100 - 190 kgf-cm) [7.24 - 13.75 ft-lbfl**
- **Stator shaft set bolt tightening torque: T = 9.81 - 15.69 N·m (100 - 160 kgf-cm) [7.24 - 11.58 ft-lbf]**
- **See the note for the engine installation procedure.**

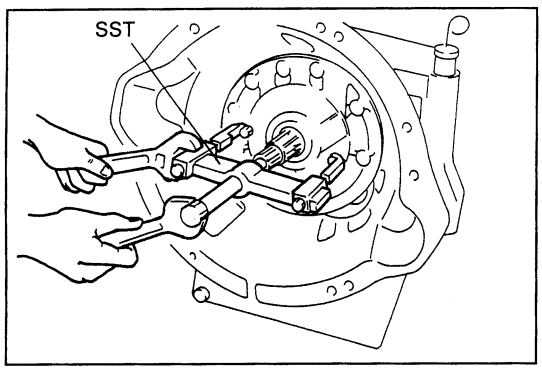


Point Operations

[Point 1]

Removal: Be careful as oil exists in the torque converter ASSY.
The torque converter ASSY cannot be disassembled.

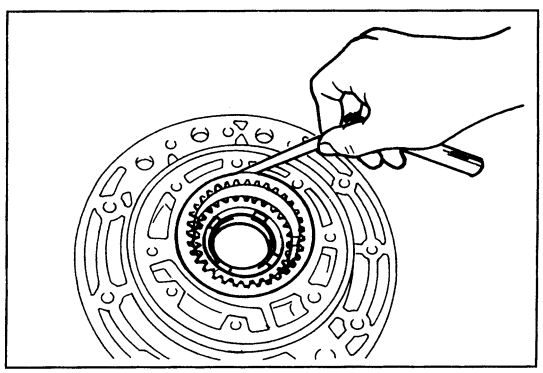
Installation: Coat grease on the seal ring and oil seal lip before installation.



Installation: Install the torque converter ASSY with rotation so that the extension pawl fits into the oil pump drive gear groove.

[Point 21

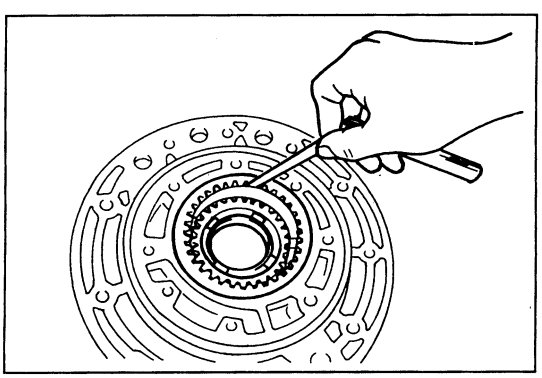
Removal: SST 09950-40010



[Point 31

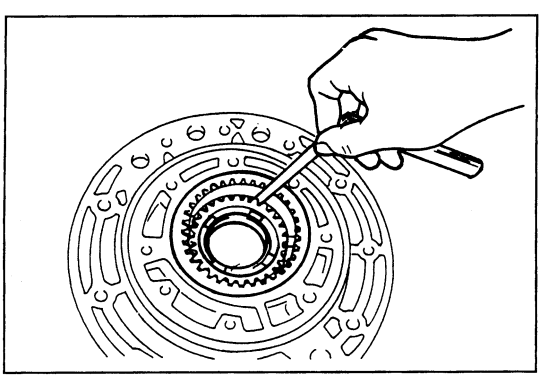
Inspection: Measure the clearance between the oil pump driven gear and pump body.

Limit clearance: 0.3 mm (0.012 in)



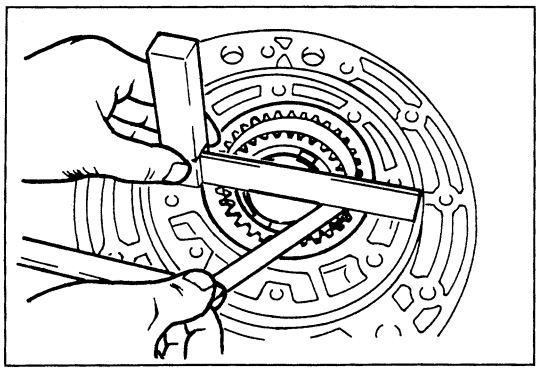
Inspection: Measure the clearance between oil pump driven gear and crescent.

Limit clearance: 0.4 mm (0.016 in)



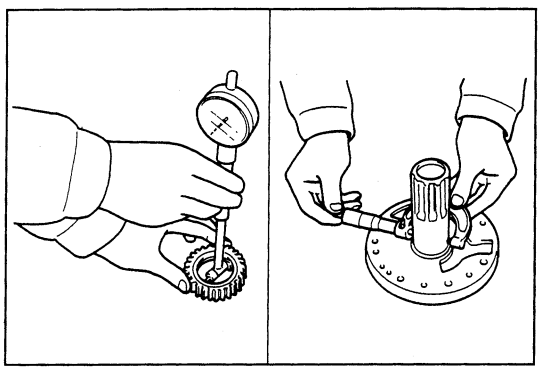
Inspection: Measure the clearance between the oil pump drive gear and crescent.

Limit clearance: 0.4 mm (0.016 in)



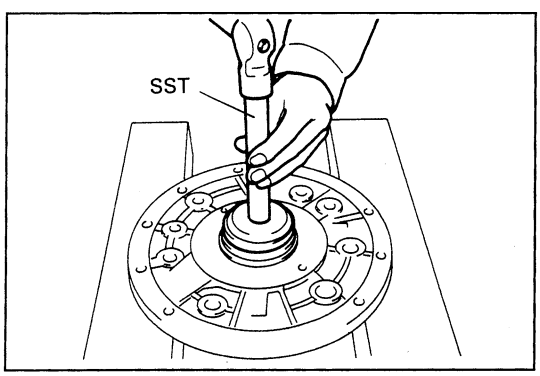
Inspection: Measure the clearance between the pump body and each gear.

Limit clearance: 0.1 mm (0.004 in)



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

Limit clearance: 0.15 mm (0.0059 in)



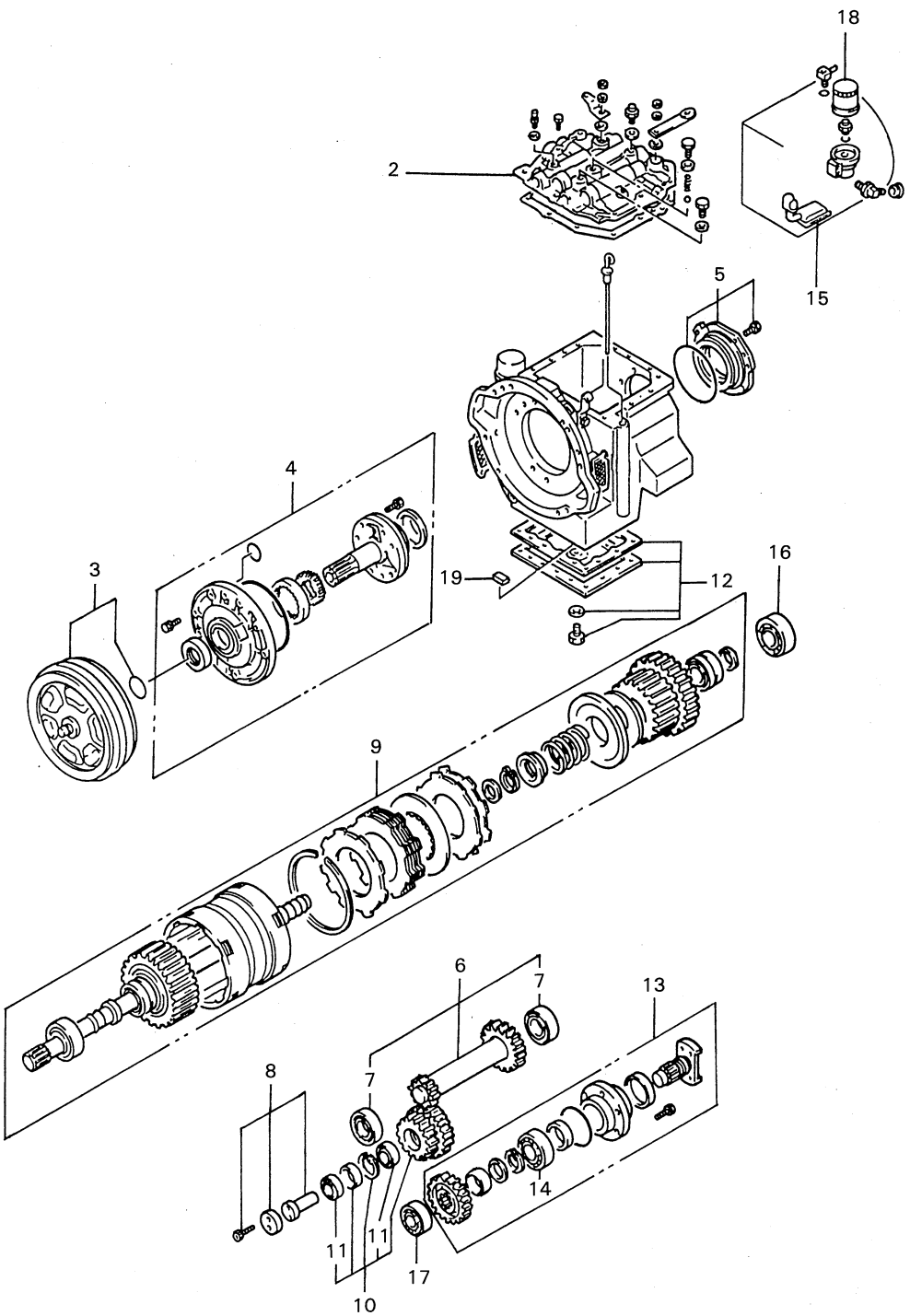
[Point 41

Installation: SST 09608-35014

TRANSMISSION (1 SPEED)

DISASSEMBLY · INSPECTION · REASSEMBLY

Note:
The explanation here covers the jobs for disassembly from torque converter housing ASSY. For disassembly of the oil pump, however, see page 3-65 (torque converter-oil pump section). See page 3-75 for disassembly of the clutch shaft parts.



1 Torque converter oil

Disassembly Procedure

1 Drain torque converter oil.

2 Remove the transmission cover & control valve ASSY.

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

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

5 Remove the front cover.

6 Remove the counter gear No. 1.

7 Remove the counter gear bearing. **[Point 3]**

8 Remove the idle shaft. **[Point 4]**

9 Remove the clutch shaft No. 1 W/clutch drum No. 1 **[Point 5]**

10 Remove the idle gear No. 1 W/bearing.

11 Remove the idle gear No. 1 bearing. **[Point 6]**

12 Remove the oil pan.

13 Remove the output shaft No. 1 and output gear No. 2 **[Point 7]**

14 Remove the output shaft bearing No. 1. **[Point 8]**

15 Remove the oil strainer.

16 Remove the bearing No. 1 (for clutch shaft No. 1). **[Point 9]**

17 Remove the output shaft bearing No. 2. **[Point 10]**

18 Remove the oil filter. **[Point 11]**

19 Remove the magnet. **[Point 12]**

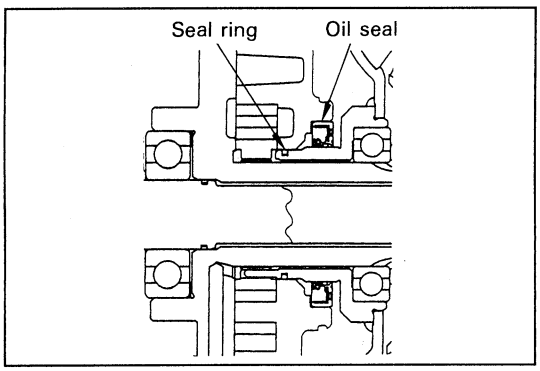
Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure

Note:
The tightening torque for each part is as follows:

Unit: N·m (kgf-cm) [ft-lbf]

Oil strainer set bolt	9.81 – 15.69 (100 – 160) [7.24 – 11.581
Oil pan set bolt	5.88 – 7.85 (60 – 80) (4.34 ~ 5.791
Idle shaft	4.90 – 9.81 (50 – 100) [3.62 – 7.241
Idle shaft set bolt	3.92 – 6.86 (40 – 70) (2.89 – 5.061
Front cover set bolt	18.63 – 30.40 (190 – 310) [13.75 – 22.431
Transmission cover (upper cover) set bolt	9.81 – 15.69 (100 – 160) [7.24 – 11.581
Stator shaft set bolt	9.81 – 15.69 (100 – 160) [7.24 – 11.581
Oil pump set bolt	9.81 – 18.63 (100 – 190) [7.24 – 13.751
Transmission output cover set bolt	18.63 ~ 30.40 (190 ~ 310) [13.75 ~ 22.431

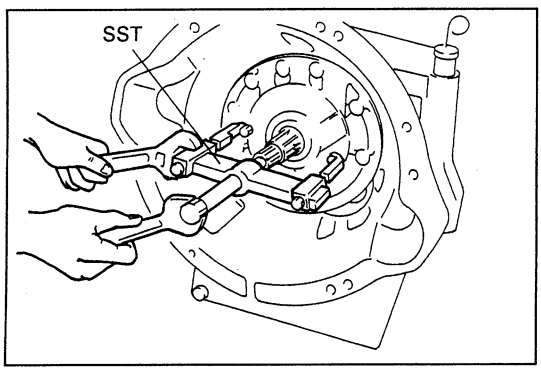


Point Operations

[Point 1]

Disassembly: Be careful as oil exists in the torque converter ASSY.
The torque converter ASSY cannot be disassembled.

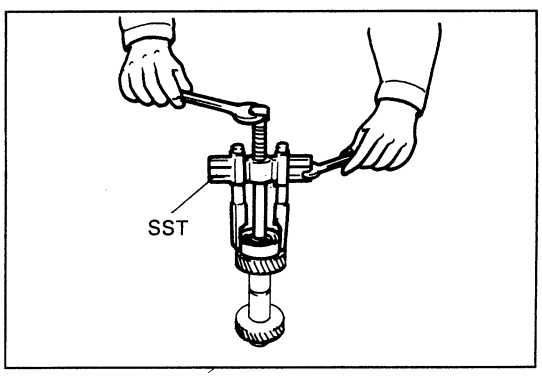
Reassembly: Coat grease on the seal ring and oil seal lip before installation.



Reassembly: Rotate the torque converter ASSY to make the extension pawl fit into the oil pump drive gear groove.

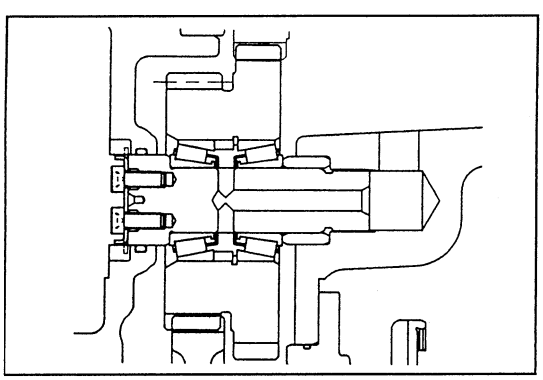
[Point 2]

Disassembly: SST 09950-40010



[point 3]

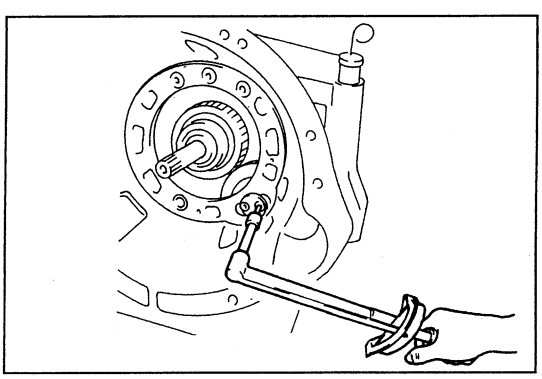
Disassembly: SST 09950-40010



[Point 4]

Disassembly: After removing the set bolt and lock plate, rotate the idle shaft counterclockwise for removal.

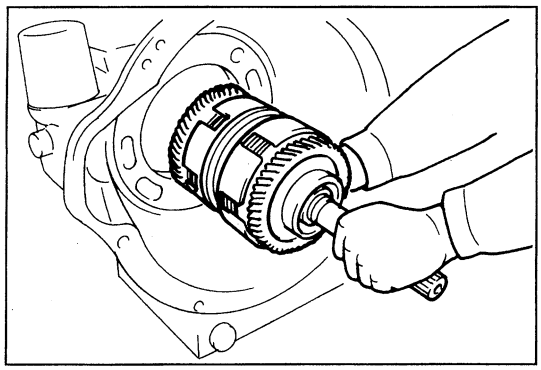
Reassembly: Clean the idle shaft threaded portion, and check if it can be screwed in lightly without the idle gear.



Reassembly: Tighten the idle shaft to the specified torque.

T = 4.90 - 9.81 N·m
(50 - 100 kgf-cm) [3.62 - 7.24 ft-lbf]

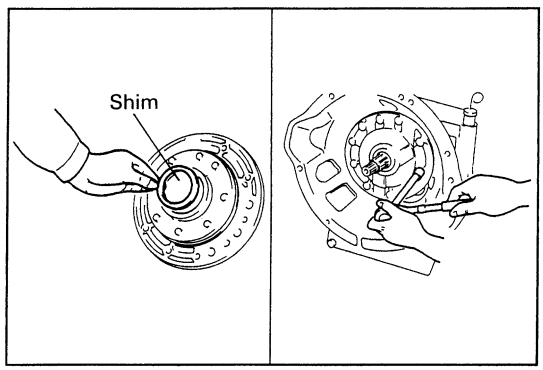
Tigten the set bolt after locking with the lock plate.



[Point 5]

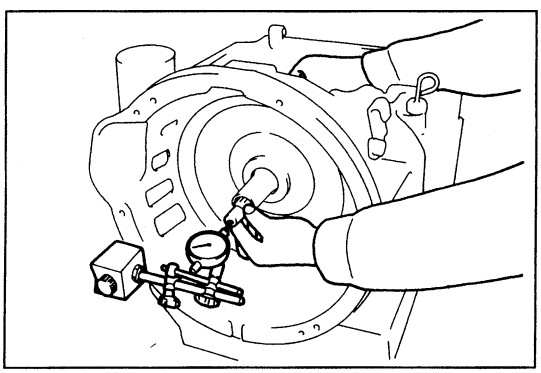
Disassembly: Extract clutch shaft No. 1 W/clutch drum No 1 to the converter side.

Reassembly: Coat grease on the seal ring and install it at the end of the clutch shaft.



Reassembly: Adjust the thrust clearance of clutch shaft NO.1.

1. Install the shim on the stator shaft and temporarily install the oil pump W/stator shaft.

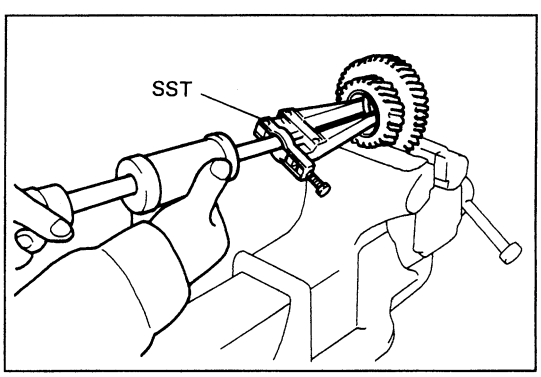


2. Set a dial gage on the front end of the clutch shaft, and measure the thrust clearance by moving the clutch drum to and fro.

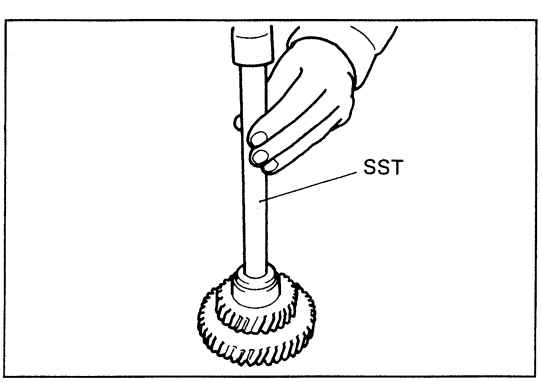
   Standard clearance: 0.20~0.62mm (0.0079~0.0244in)

3. If the measured value is not within the standard range, select and change the shim thickness at the stator shaft.

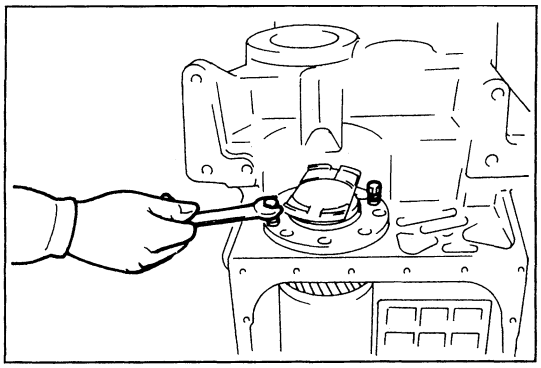
   Shim thickness: 0.71,0.9,1.12and 1.4mm (0.0280,0.035,0.0441 and 0.055in)



[Point 6]
Disassembly: SST 09308-00010

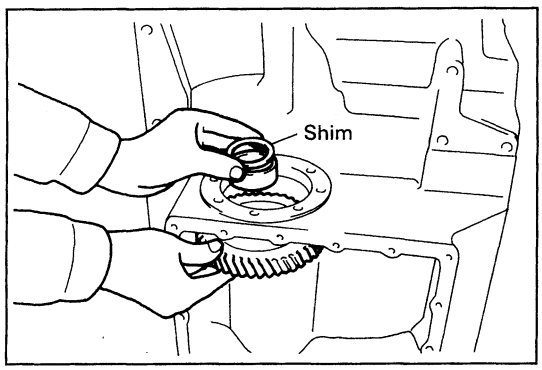


Reassembly: SST 09620-30010



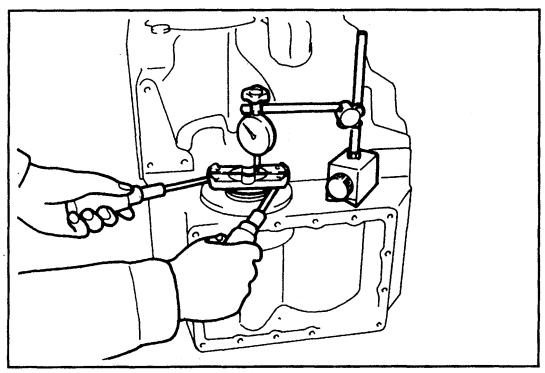
[Point 7]

Disassembly: Use the service bolt for removal.
Service bolt size M10 x 1.25



Reassembly: Adjust the thrust clearances related to the output shaft.

1. Place a spacer and shim(s) on the output gear No. 2, and temporarily install the output cover W/output shaft.
2. Tap the output shaft with a hammer to eliminate the thrust clearance of the gear, spacer and shim.

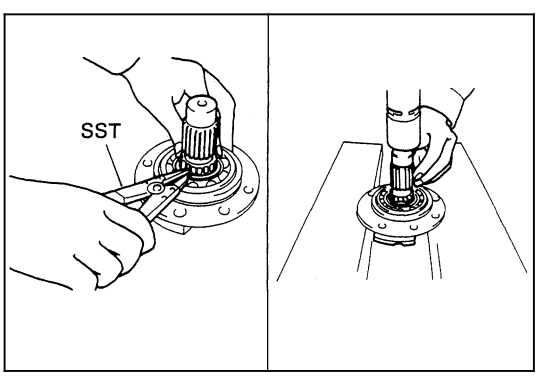


3. Set a dial gage on the upper face of the output shaft, and pry upward with a srewdriver to measure the movement (thrust clearance).

   Standard clearance: 0.03 – 0.51 mm (0.0012 – 0.0201 in)

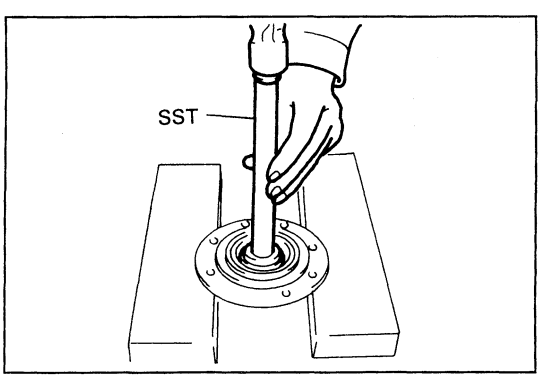
4. If the measured value does not satisfy the standard, select the shims to be used.

   Shim thickness: 0.9, 1.25 and 1.6 mm (0.035, 0.0492 and 0.063 in)

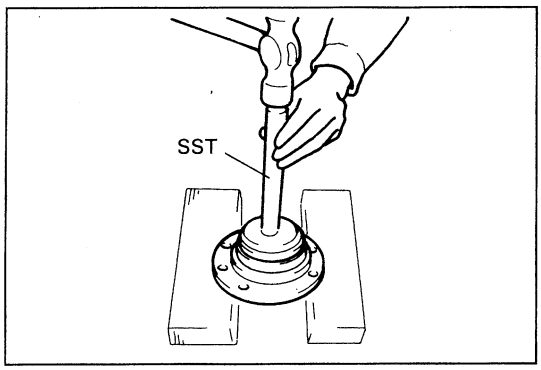


[Point 8]

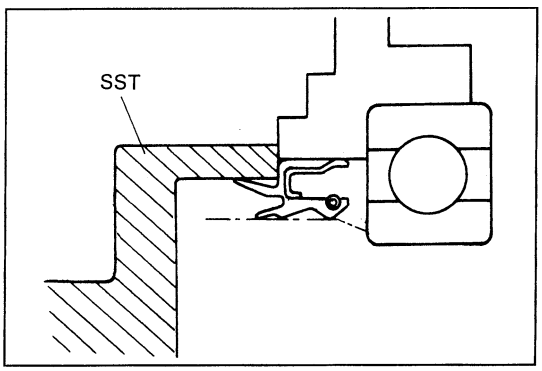
Disassembly: After removing the snap ring with the SST, remove the shaft by tapping its end with a plastic hammer.
SST 09905-00012



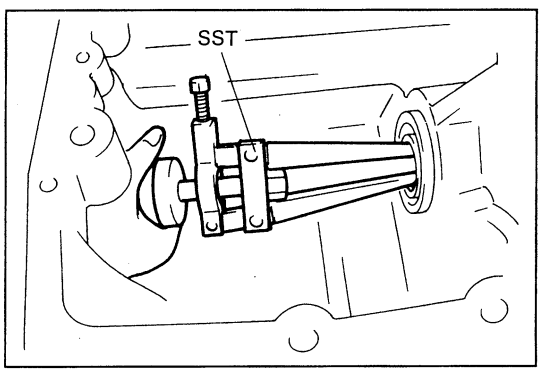
Disassembly: Remove the bearing from the output cover.
SST 09620-30010



Reassembly: Install the bearing in the output cover
SST 09608-35014

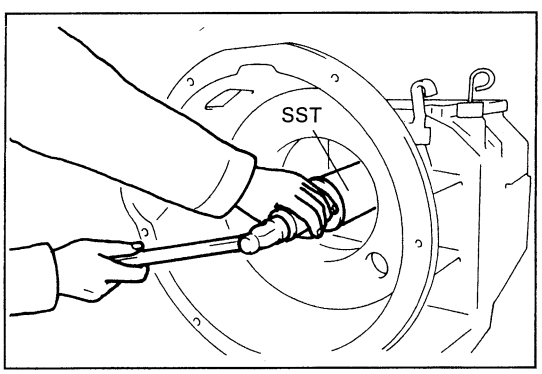


Reassembly: Install the oil seal flush with the output cover so as not to damage its lip.
SST 09150-10170-71
After installation, coat grease on the oil seal lip.

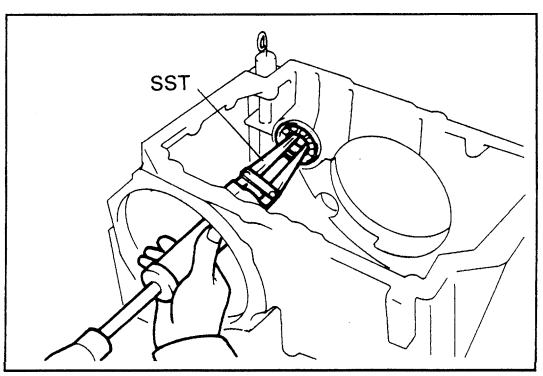


[Point 9]

Disassembly: SST 09308-00010

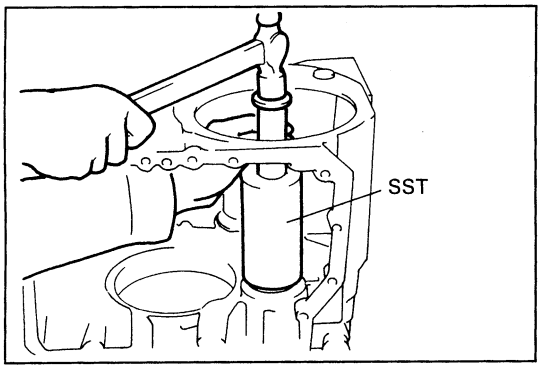


Reassembly: SST 09370-10410-71

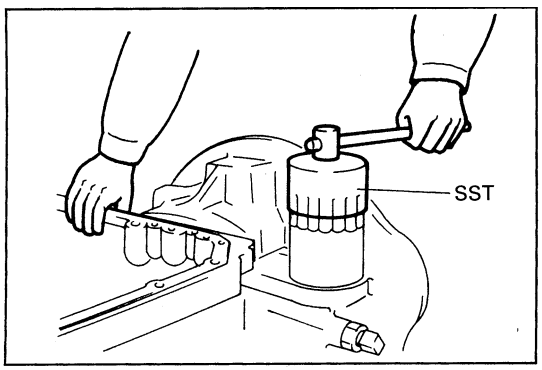


[Point 10]

Disassembly: SST 09308-00010

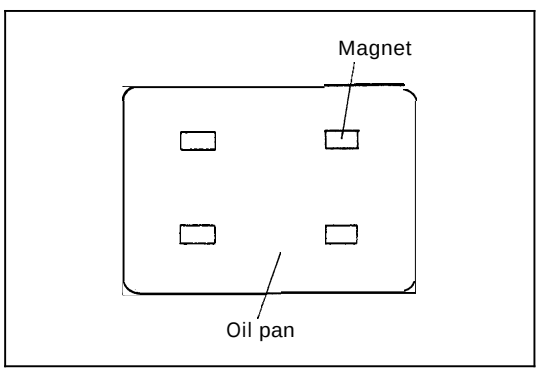


Reassembly: SST 09608-35014



[Point 11]

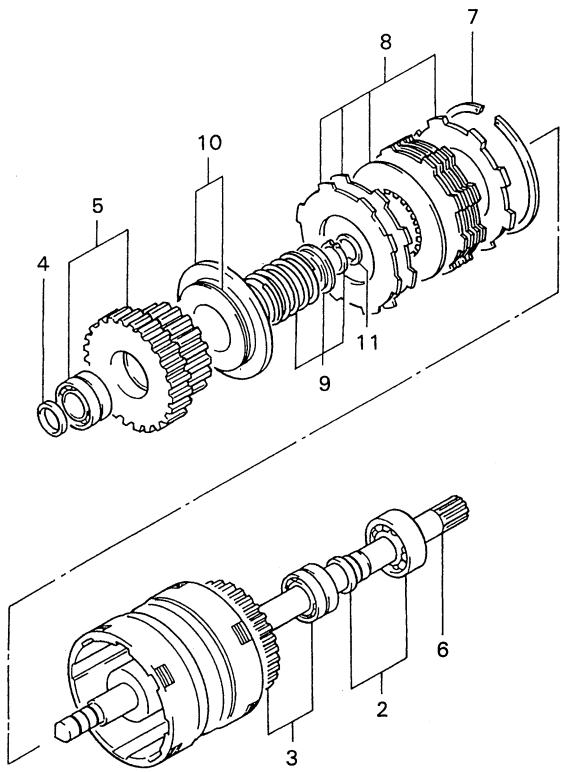
Disassembly, Reassembly: SST 09228-07500



[Point 12]

Reassembly: Remove the metalic burrs and powders stuck to the magnets. Then place the magnet pieces as shown.

CLUTCH SHAFT DISASSEMBLY·INSPECTION·REASSEMBLY



1 Seal ring (for clutch shaft)

Disassembly Procedure

1 Remove the seal ring (for clutch shaft)

2 Remove the bearing and spacer.

3 Remove the clutch gear (reverse). **[Point 1]**

4 Remove the spacer.

5 Remove the clutch gear (forward). **[Point 1]**

6 Remove the clutch shaft No. 1 **[Point 2]**

7 Remove the snap ring.

8 Remove the backing plate, clutch disc, clutch plate and camber plate. **[Point 3]**

9 Remove the clutch return spring. **[Point 4]**

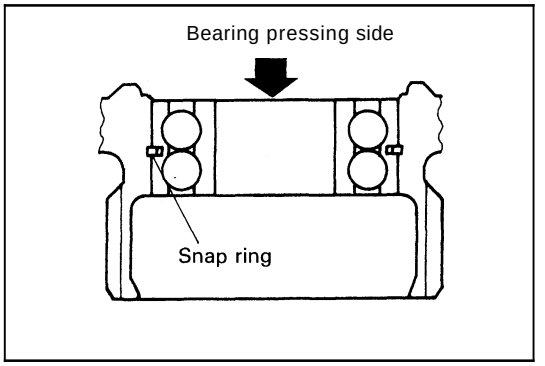
10 Remove the clutch piston. **[Point 5]**

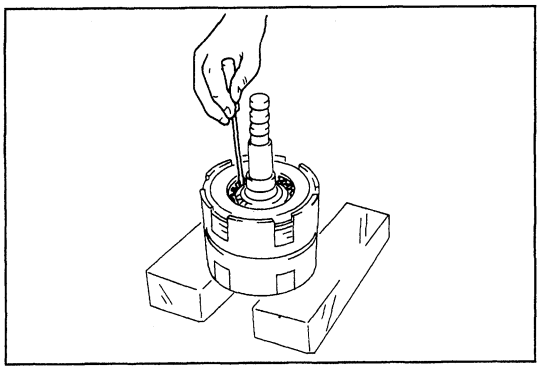
11 Remove the seal ring (for clutch drum).

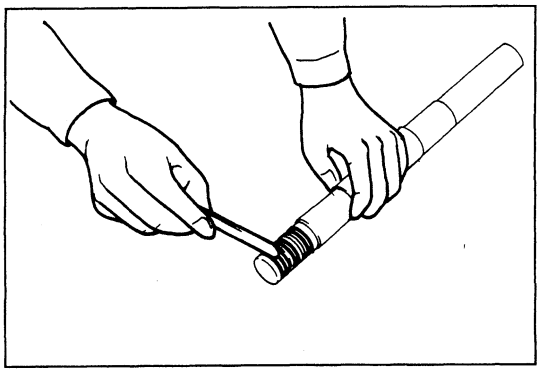
Reassembly Procedure

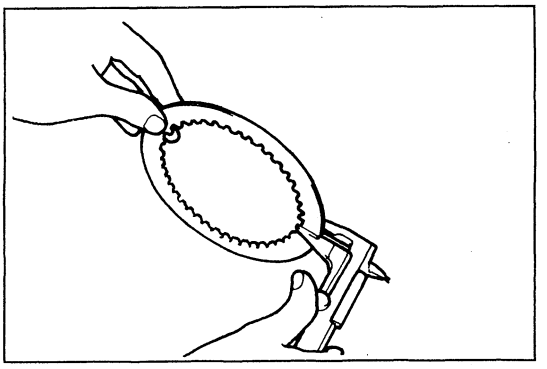
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Coat grease on the seal ring before reassembly.**
- **After washing each part, coat torque converter oil sufficiently before reassembly**









Point Operations

[Point 1]

Disassembly: The clutch gear bearing cannot be removed. Always replace the bearing with the clutch gear as a set.

Reassembly: When pressing the bering into the gear, slowly push it with a press and make sure that the snap ring at the center of the bearing fits securaly into the gear groove.

Reassembly: Before installing the clutch gear on the clutch drum, align disc serrations with a screwdriver, etc.

[Point 2]

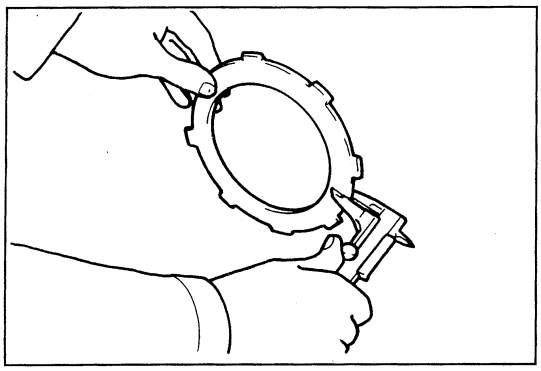
Inspection: Measure the clearance between each clutch shaft and seal ring.

Limit clearance: 0.2 mm (0.008 in)

[Point 3]

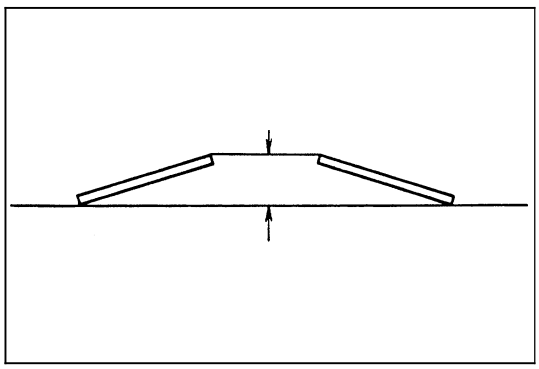
Inspection: Measure the clutch disc thickness.

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



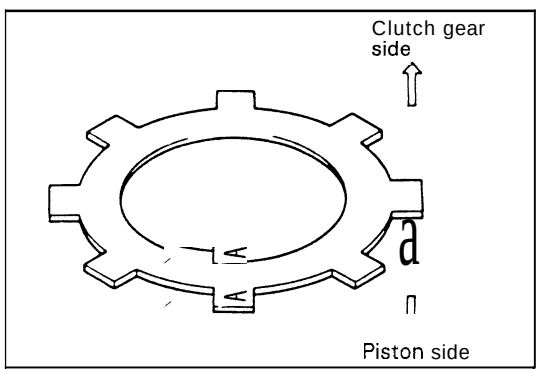
Inspection: Measure the clutch plate thickness.

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

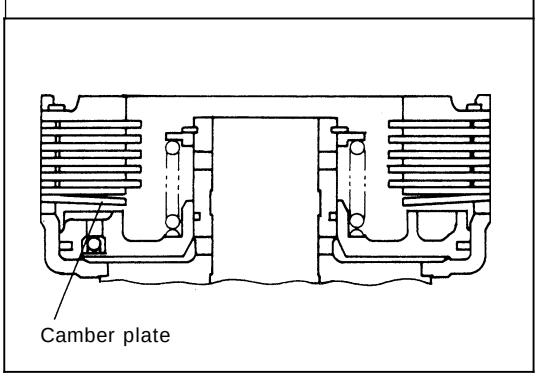


Inspection: Measure the camber plate convex height.

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



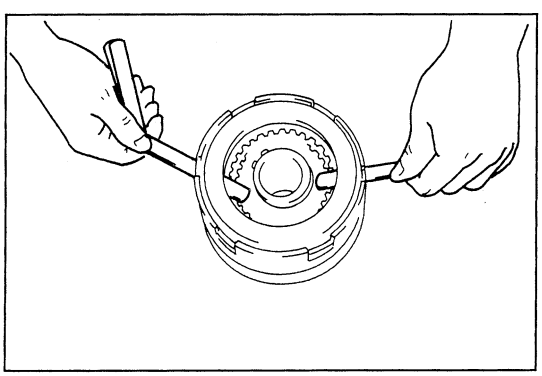
Reassembly: Install the camber plate on the clutch drum, with the A punch mark on the upper side.



Reassembly: Install the clutch plates and clutch discs alternately on the clutch drum while coating torque converter oil.

Number of clutch disc plates

5K engine	4
4Y·1DZ·2Z engine	5

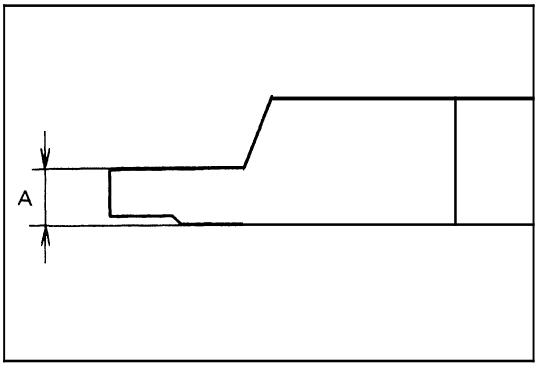


Reassembly: Adjust the clearance between the backing plate and clutch disc.

1. Install the camber plate, clutch plate, clutch disc, backing plate and snap ring on the clutch drum.

2. Measure the clearance between the backing plate and clutch disc with a thickness gage.

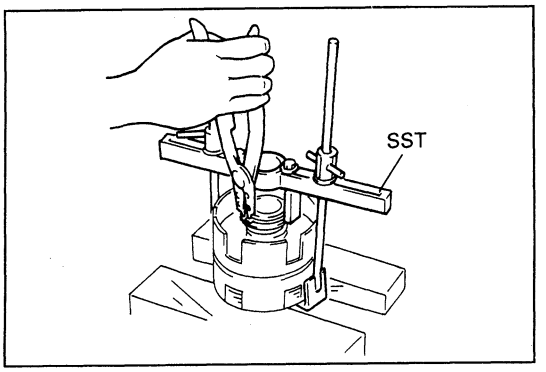
Standard clearance:
4-disc specification: 0.65 – 1.2 mm (0.0256 – 0.047 in)
5-disc specification: 1.0 – 1.6 mm (0.039 – 0.063 in)



3. If the measured value does not satisfy the standard, select and use an appropriate backing plate.

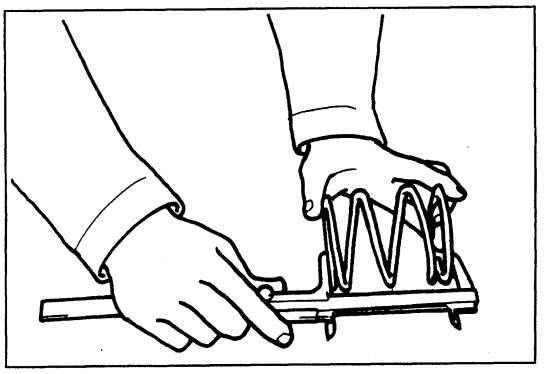
Backing plate thicknes:

4-disc specification:	**A = 7.8 and 8.3 mm (0.307 and 0.327 in)**
5-disc specification:	**A = 3.0 and 3.5 mm (0.118 and 0.138 in)**



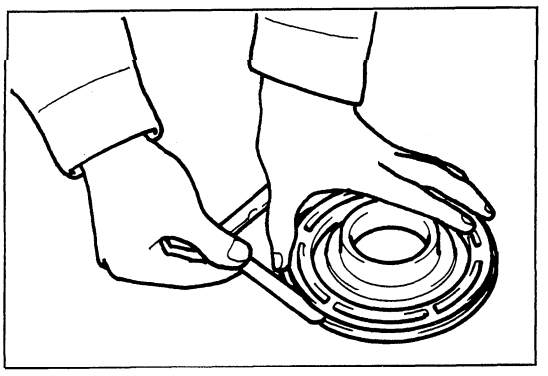
[Point 4]

Disassembly·Reassembly: **SST** 09220-22000-71



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

Free length:	**63.4 mm (2.496 in)**
Limit free length:	**58.5 mm (2.303 in)**



[Point 5]

Inspection: Measure the clearance between the clutch piston and piston ring.

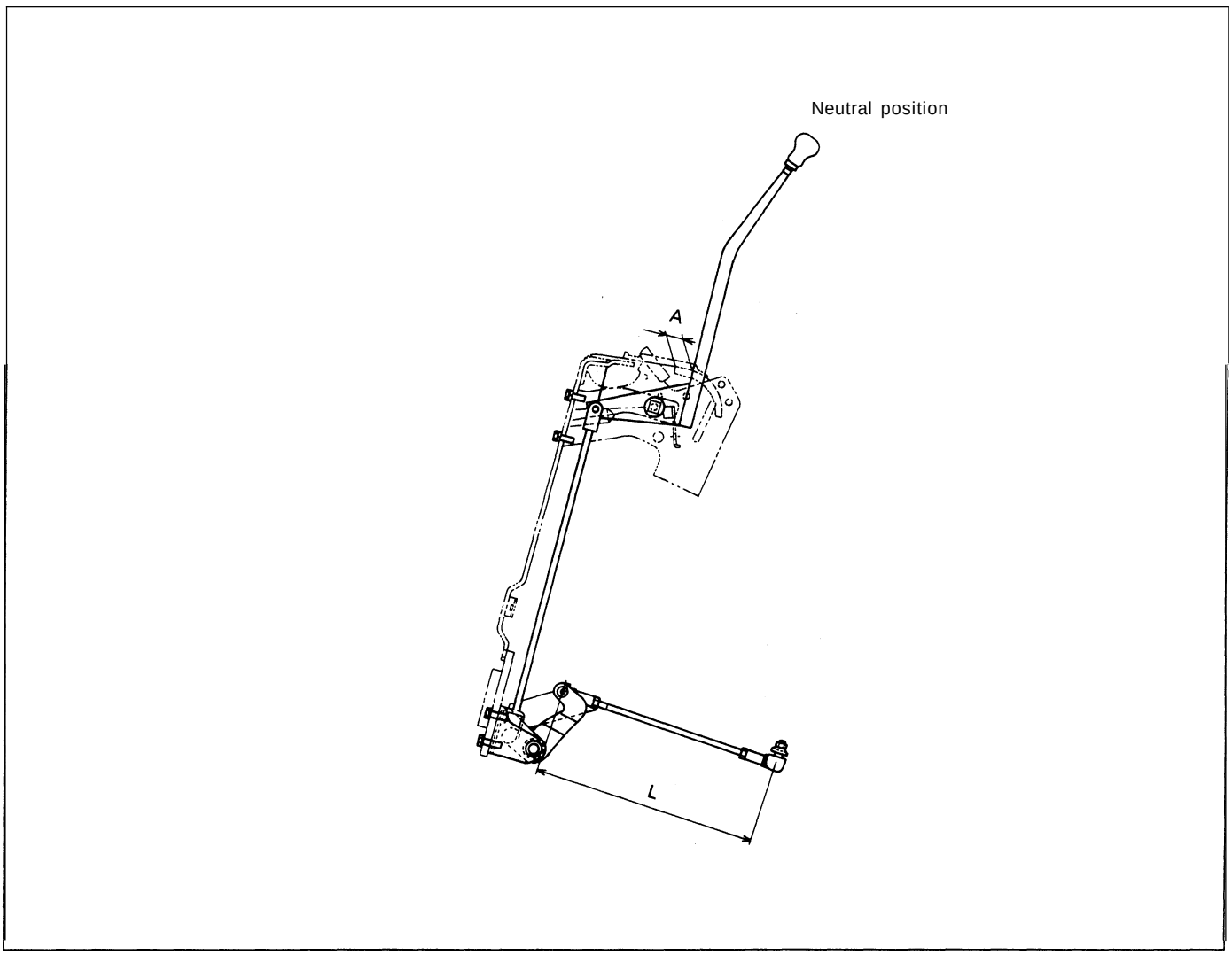
Standard clearance: 0.17 mm (0.0067 in)

Inspection: Clean the check valve installed in the clutch piston by blowing compressed air.

Reassembly: Install the piston ring with its side marked with white paint facing the hydraulic oil pressure side.

SHIFT LEVER (1 SPEED)

ADJUSTMENT



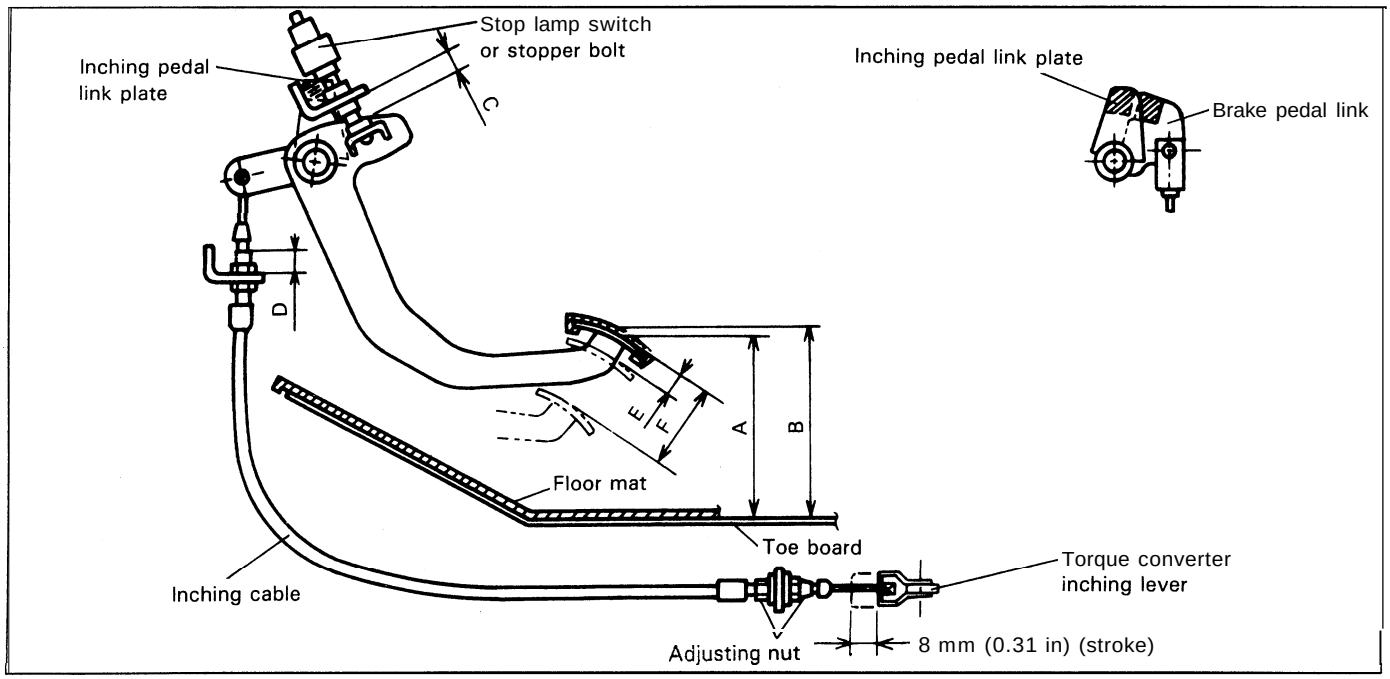
1. Adjust the shift lever position.
   (1) Set the shift lever in the neutral position.
   (2) Adjust the rod length (dimension L) so that the dimension A from the instrument panel cut face to the lever satisfies the following standard:

   A = 22 ± 4 mm (0.87 ± 0.16 in)

   Dimension L (reference)

Vehicle model	Dimension L mm (in)
1·2 ton series	255 (10.04)
3 ton series	270 (10.63)

INCHING PEDAL ADJUSTMENT



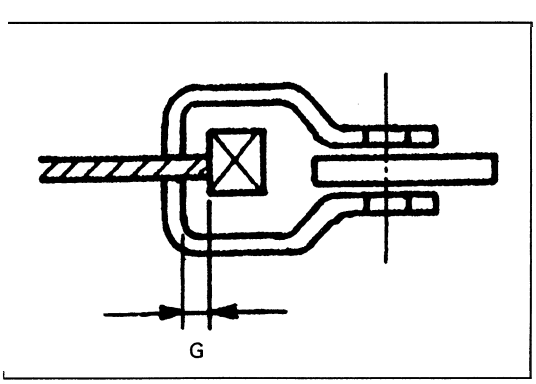
1. Adjust the inching pedal height and play.

   (1) Adjust the stop lamp switch or stopper bolt length (dimension C) to make the inching pedal height (dimension A or B) satisfy the standard below.
   (2) Adjust the inching cable adjusting nut to make the torque converter inching lever 8 mm (0.31 in) at the position (dimension F) where the inching pedal link plate come into contact with the brake pedal link to start brake application.
   The brake application start position means the position where the brake master cylinder rod is stroked by 8 mm (0.31 in).

Unit: mm (in)

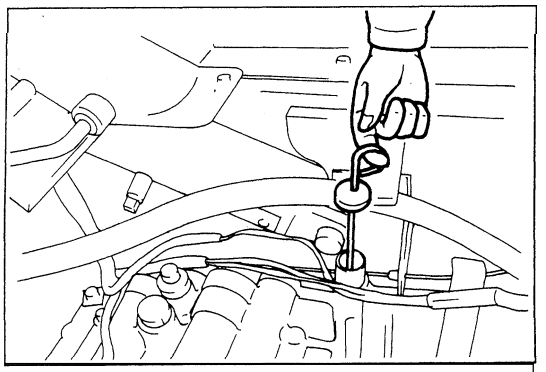
A	B	C (Reference)	D	E (Reference)	F (Reference)
140 – 145 (5.51 ~ 5.71)	145 – 150 (5.71 – 5.91)	12 (0.47)	17.5 (0.689)	3 – 5 (0.12 ~ 0.20)	56 – 60 (2.20 – 2.36)

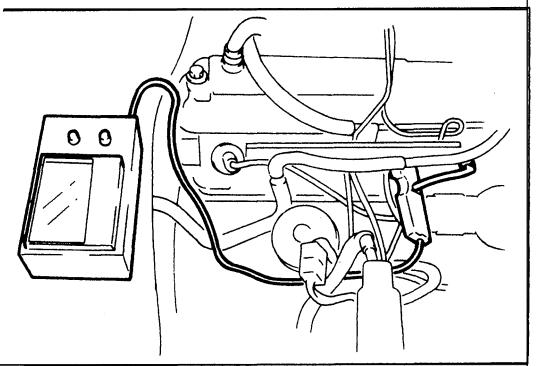
A: Dimension without pad
B: Dimension with pad
C, E and F: Reference dimensions
E: Pedal play corresponding to wire play (G)

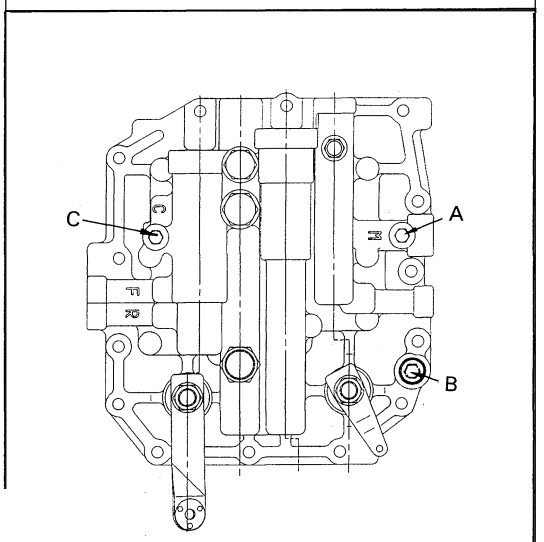


[Reference]
The inching pedal play is determined as the result of the above adjustment, but it is recommended to use wire cable play (dimension G) in the inching lever clevis as the reference.

G = 0.5 mm (0.020 in)







Oil pressure measuring ports
A: Main pressure (size PT1/8)
B: Torque converter outlet pressure (size PT1/8)
C: Clutch operating pressure (size PT1/8)

MEASUREMENT·TEST

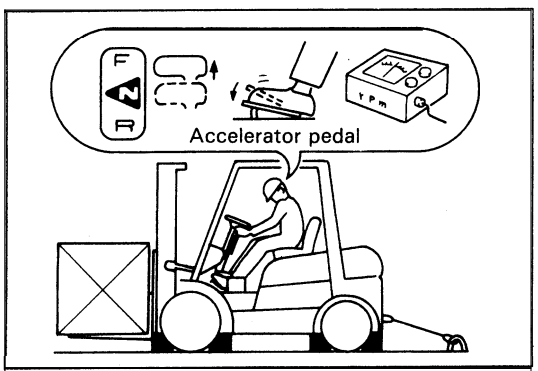
1. Oil level measurement
   (1) Keep the vehicle in horizontal state, set the shift lever in the neutral position, and keep the engine in the idling state.
   (2) After warming up the engine, keep it running at the idling speed. Measure the oil level with the level gage. The oil level is appropriate if it is between the upper limit (F) and lower limit (L).
   If insufficient, add oil through the level gage mounting port.

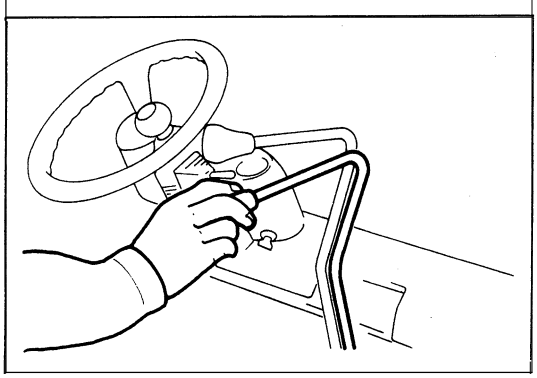
2. Oil pressure measurement
   (1) After warming up the engine, measure the idling speed and no-load maximum speed.
   (2) Stop the engine and jack up the front axle to make the tires (both wheels) lift above the ground.
   (3) Remove the toe board and set an oil pressure gage. If three oil pressure gages are available, it is desirable to measure the main pressure, clutch pressure and torque converter pressure at the same time.
   (4) Start the engine. With the shift lever set in the neutral position, measure the main pressure at each of idling and 2000 rpm, and the torque converter outlet pressure at 2000 rpm.
   (5) With the shift lever set at each shift position, measure the clutch operating pressure at each of idling and 2000 rpm.

Note:
Do not depress the inching pedal while measuring the oil pressure.

Standard Oil Pressure Values

	Idling	2000 rpm
Main pressure kPa (kgf/cm²) [psi]	441 – 834 (4.5–8.5) 164–121)	932—1275 (9.5— 13.0) [135—1851
Clutch pressure kPa (kgf/cm²) [psi]	↑	883—1226 (9.0～12.5) [128～1781
Torque converter pressure (outlet pressure) kPa (kgf/cm²) [psi]	—	200–590 (2–6) [30 – 901





3. Stall test

(1) Load a cargo near the allowable maximum load, chock the vehicle front and rear wheels securely and apply the parking brake.

Note:
Keep the vehicle in perfectly stopped state, and stretch wires to make the vehicle immovable for safety.

(2) Warm up the engine, and measure the idling speed and no-load maximum speed.

Note:
See the engine speed adjustment section (on page 1-17).

(3) Check the engine output by the maximum speed in loaded state.

Method
After adjusting the no-load maximum speed, operate the tilt lever for backward tilting.
Measure the maximum speed at full acceleration in relief state.

Standard
The relief down from the no-load maximum speed shall be as follows:

Gasoline engine models: 150 – 300 rpm
Diesel engine models: 100 – 200 rpm

The relief down in the LPG engine model is slightly more than the above values.

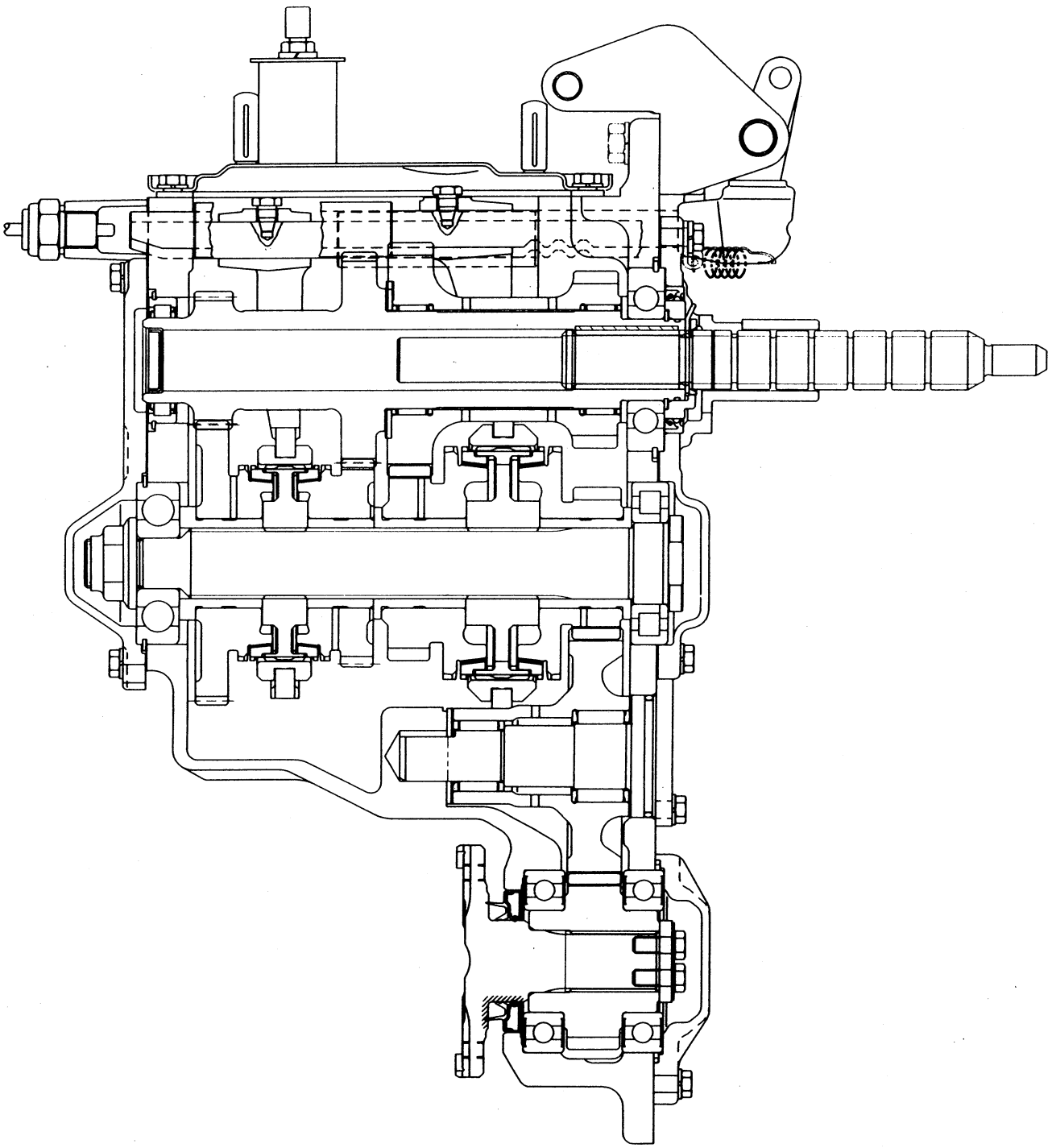
Judgment
If the engine speed drops excessively, engine tune-up defect may be the reason.

(4) Start the engine, set the control lever in the forward traveling position, race the engine fully, and measure the stall speed after stabilization.

Engine	5K	4Y	1DZ	2Z
Stall speed rpm	1950	2100	2150	2100

TRANSMISSION

GENERAL



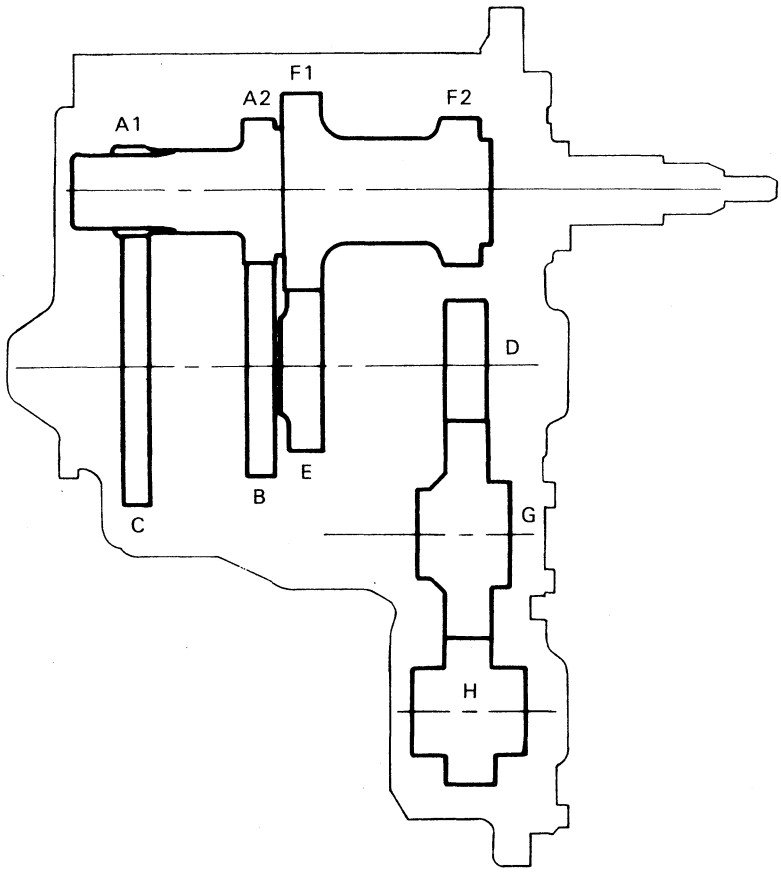
SPECIFICATIONS

Transmission type	Full synchromesh type
Operating method	Floor shift link method
Transmission case oil capacity ℓ (US gal)	4.0 (1.06)
Transmission oil	Hypoid gear oil

Gear ratio

Series	Vehicle model (engine)	Gear ratio			
		Forward		Reverse	
		1st speed	2nd speed	1st speed	2nd speed
1 ton series	40-6FG10~18 (4Y) 6FD10~18 (1DZ)	2.323	1.028	2.403	1.063
	6FG10~18 (5K)	2.884	1.238	2.983	1.280
2 ton series	40-6FG20~25 (4Y) 60-6FD20~25 (1DZ)	↑	↑	↑	↑
	6FG20~25 (5K)	3.237	1.807	3.348	1.869
	6FD20~25 (2Z)	2.582	1.155	2.670	1.194
3 ton series	6FG28·30 (4Y) 60-6FD 28.30 (1DZ)	2.884	1.297	2.983	1.341
	6FD28·30 (2Z)	2.582	1.155	2.670	1.194

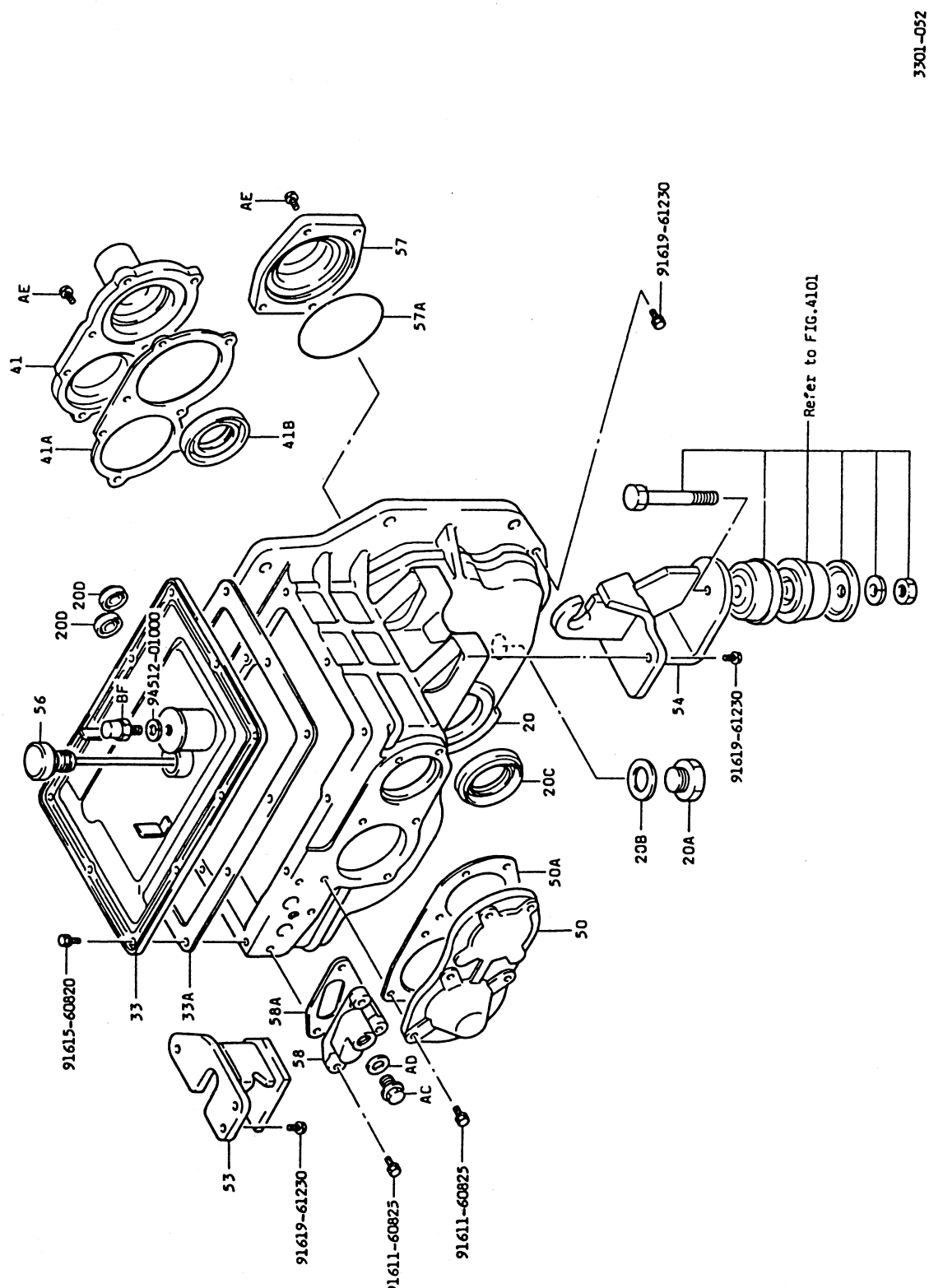
Number of gear teeth



A1: Speed shaft gear 1st
A2: Speed shaft gear 2nd
B: Countershaft gear 2nd
C: Countershaft gear 1st
D: Countershaft forward gear
E: Countershaft reverse gear
F1: Reverse idle gear
F2: Reverse idle gear
G: Transmission idle gear
H: Output gear

	Vehicle model \ Gear	A1	A2	B	C	D	E	F1	F2	G	H
1 ton series	40·6FG10~18 (4Y) 6FD10~18 (1DZ)	29T	46T	40T	57T	22T	27T	33T	26T	38T	26T
	6FG10~18 (5K)	25T	42T	44T	61T	↑	↑	↑	↑	↑	↑
2 ton series	40-6FG20~25 (4Y) 60·6FD20-25 (1DZ)	t	↑	↑	↑	↑	↑	↑	↑	t	↑
	6FG20~25 (5K)	23T	34T	52T	63T	↑	↑	↑	↑	↑	↑
	6FD20~25 (2Z)	27T	44T	43T	59T	↑	↑	↑	↑	↑	↑
3 ton series	6FG28·30 (4Y) 60-6FD28·30 (1DZ)	25T	41T	45T	61T	↑	↑	↑	↑	↑	↑
	6FD28·30 (2Z)	27T	44T	43T	59T	↑	↑	↑	↑	↑	↑

3301


3301-052
AE
41
41A
41B
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57A
91619-61230
Refer to FIG.4101
20D
20D
94512-01000
BF
56
20
20C
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91619-61230
20B
20A
50A
50
91615-60820
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91619-61230
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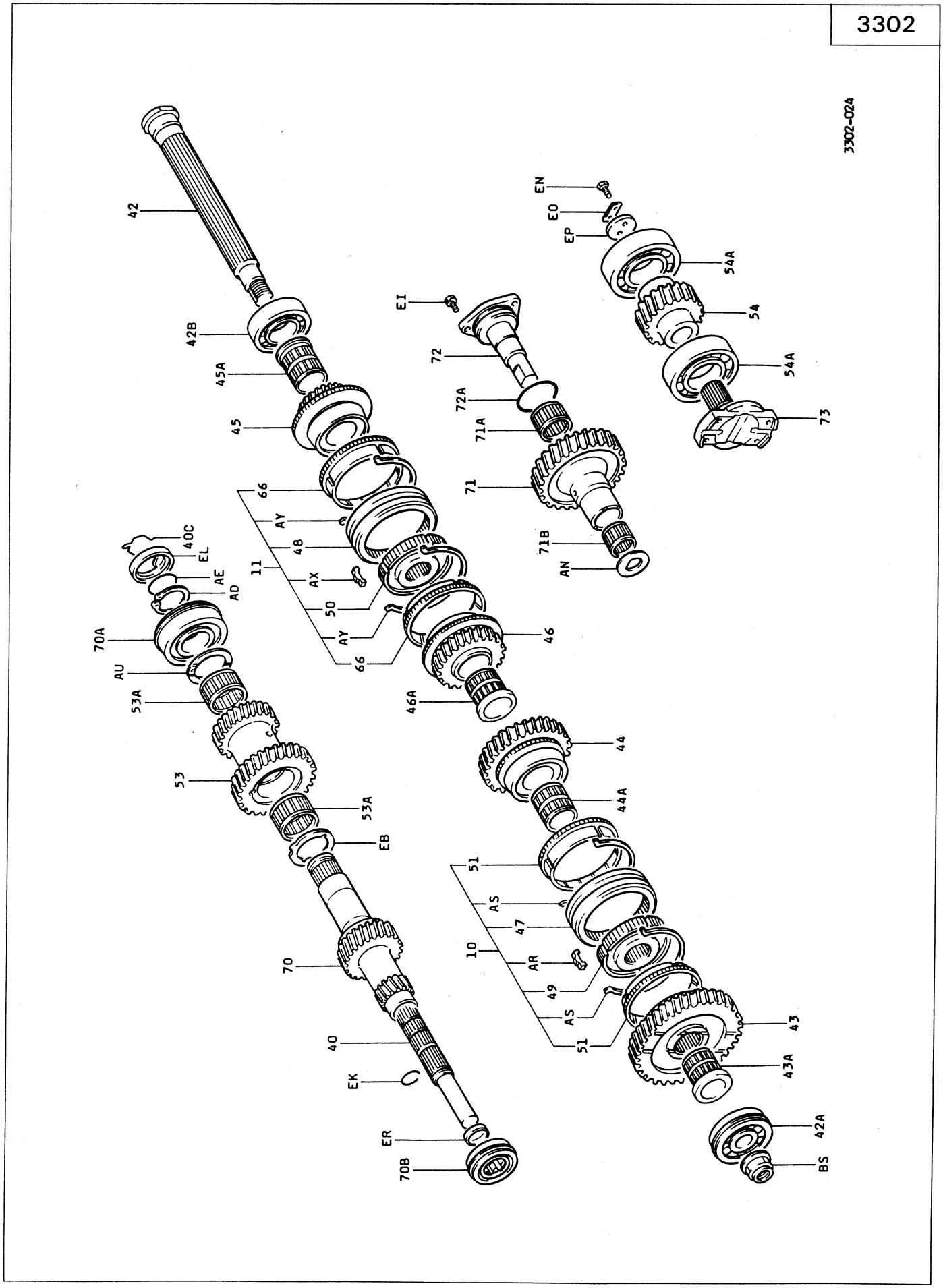
3302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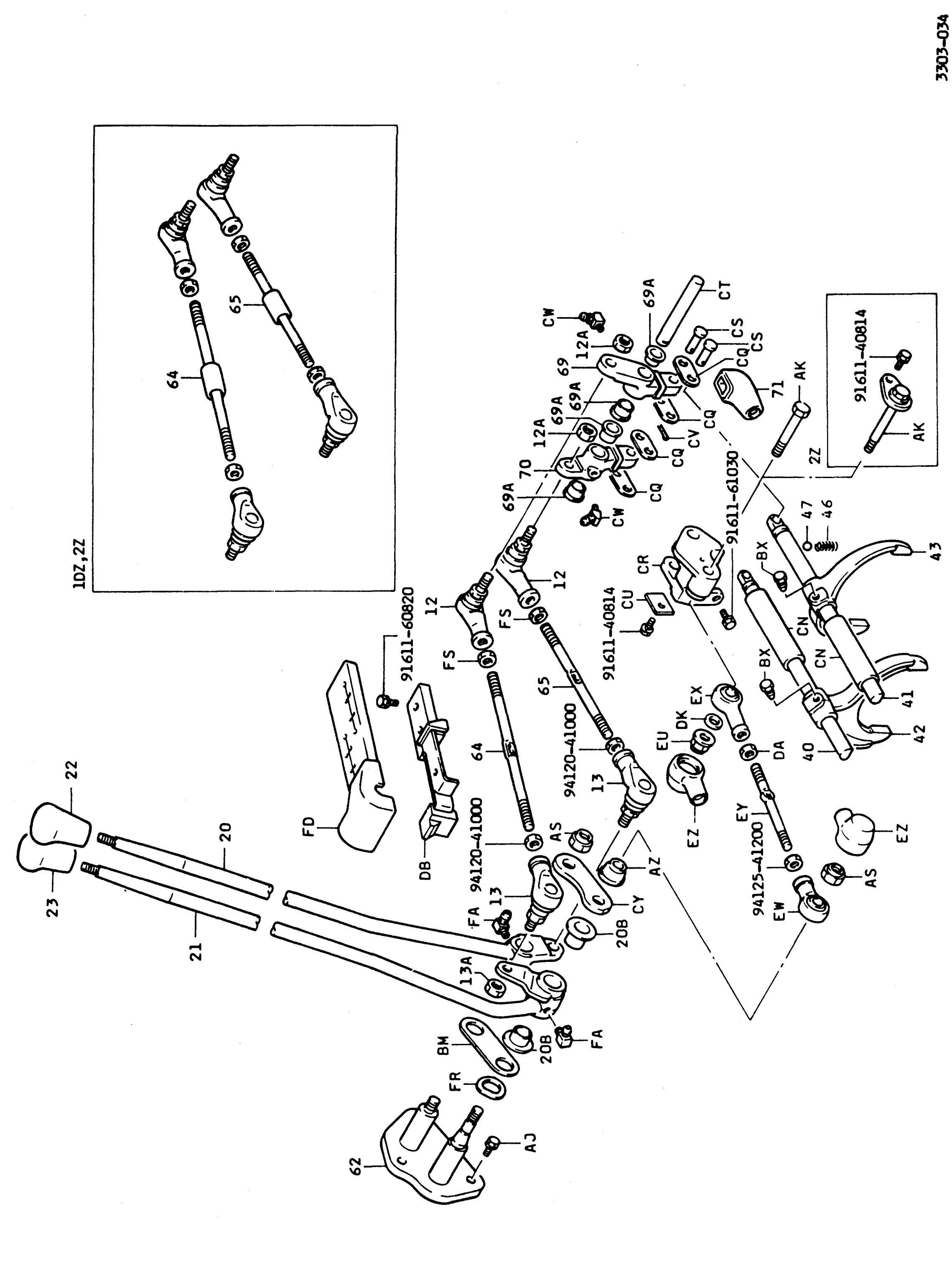
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FS
94120-41000
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CY
20B
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12A
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AK
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CN
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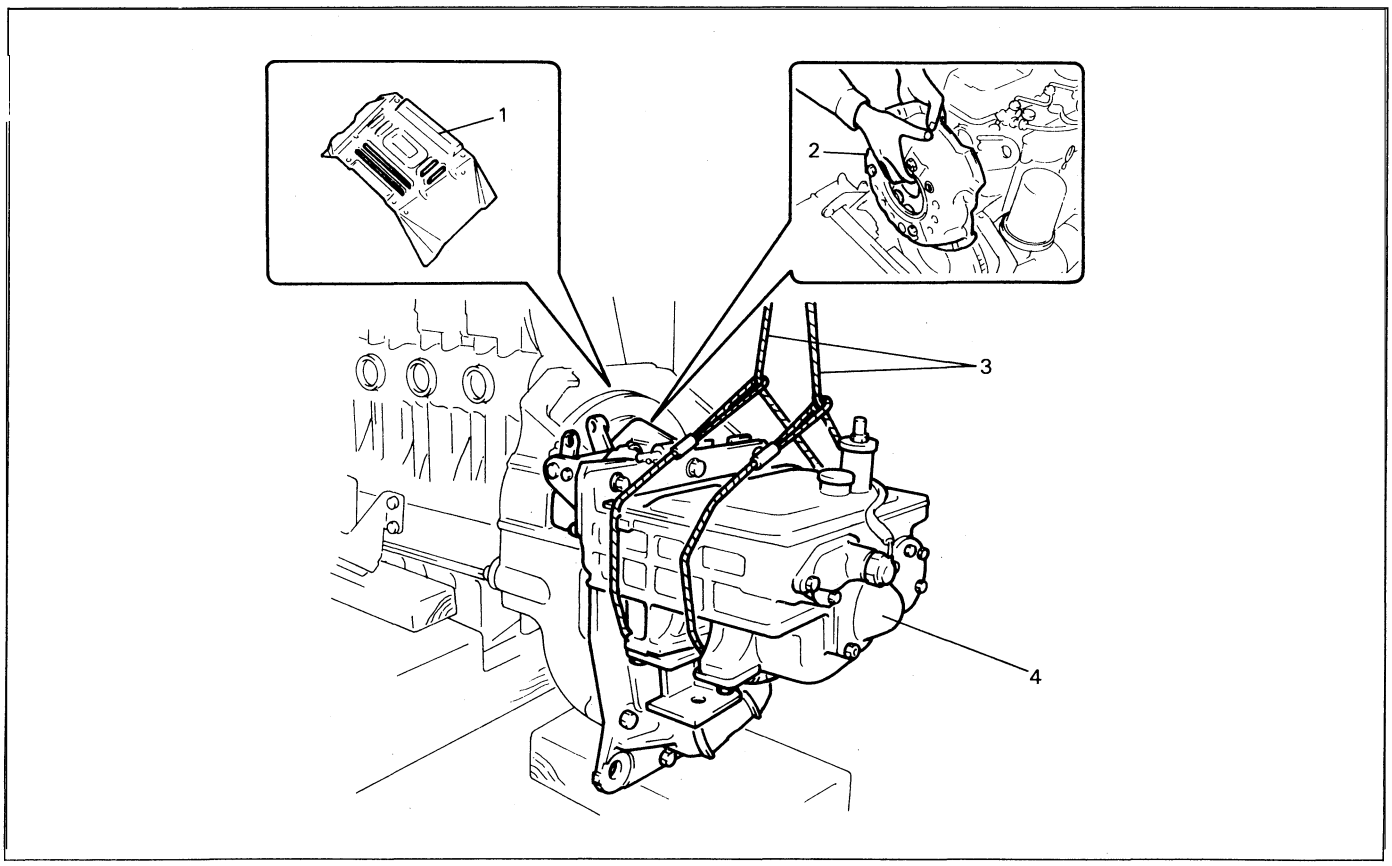
TRANSMISSION ASSY

REMOVAL-INSTALLATION

Note:
See page 1-7 for removal of the engine W/transmission.



Removal Procedure

1 Remove the clutch housing cover

2 Remove the clutch disc and clutch cover.
(See clutch cover removal-instaliation section on page 2-5)

3 Slightly hoist the transmission.

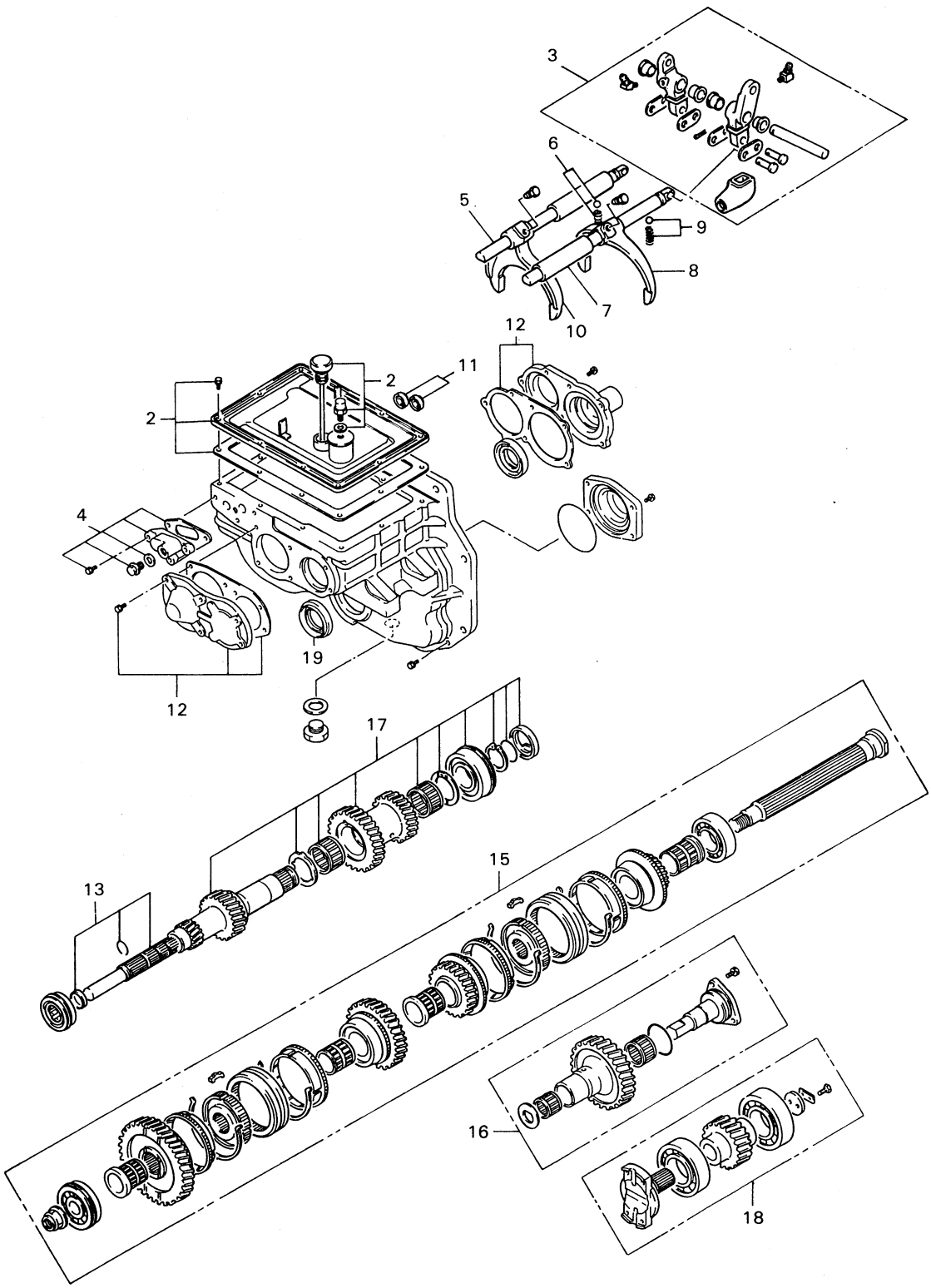
4 Remove the clutch housing and transmission connecting bolts, and remove the transmission.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Transmission case connecting bolt tightening torque:
T = 49.03 – 78.45 N·m (500 – 800kg-cm) [36.18 – 57.88ft-lb]

DISASSEMBLY·INSPECTION·REASSEMBLY



1 Transmission oil
14 Backlash and thrust clearance

Disassembly Procedure

1 Drain transmission oil.
2 Remove the upper cover.
3 Remove the shift link bracket. **[Point 1]**
4 Remove the back-up lamp cover. **[Point 2]**
5 Remove the 1st and 2nd shift fork shaft.
6 Remove the steel ball and spring.
7 Remove the forward/reverse shift fork shaft.
8 Remove the forward/reverse shift fork. **[Point 3]**
9 Remove the steel ball and spring.
10 Remove the 1st and 2nd shift fork. **[Point 3]**
11 Remove the oil seal. **[Point 4]**
12 Remove the transmission front cover and rear cover
13 Remove the input shaft. **[Point 5]**
14 Measure the backlash and thrust clearance. **[Point 6]**
15 Remove the countergear and synchronizer ring ASSY. **[Point 7]**
16 Remove the idle gear and idle gear shaft. **[Point 8]**
17 Remove the shaft speed gear and reverse idle gear. **[Point 9]**
18 Remove the output gear. **[Point 10]**
19 Remove the oil seal. **[Point 11]**

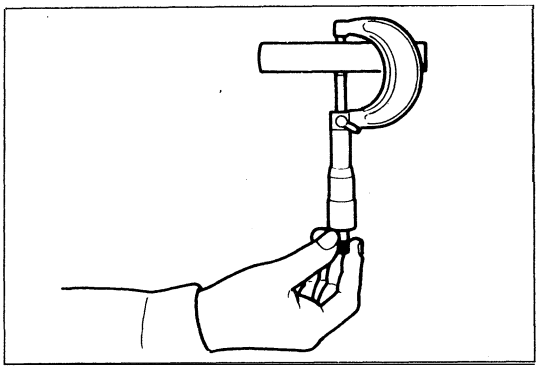
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat thread tightener (08833-00070) on the fork shaft taper bolt before installation.**
- **The tightening torque for each portion is as follows:**

Unit: N·m(kg-cm)[ft-lb]

Joint yoke stopper set bolt	**35.30** - 40.21(360 - 410)[26.05 - 29.66]
Idle gear shaft set bolt	**14.71** - 21.57(150 - 220)[10.85 - **15.92**]
Countershaft lock nut	**166.71** - 225.55(1700 - 2300)[123.00 - **166.41**]
Front cover set bolt	**14.71** - 21.57(150 - 220)[10.85 - **15.92**]
Rear cover set bolt	**14.71** - 21.57(150 - 220)[10.85 - **15.92**]
Lower rear cover set bolt	**14.71** - 21.57(150 - 220)[10.85 - **15.92**]
Fork shaft taper bolt	**40.21** - 53.94(410 - 550)[29.66 - **39.79**]
Shift link bracket set bolt	**29.42** - 44.13(300 - 450)[21.71 - **32.56**]
Link shaft stopper plate set bolt	**9.81** - 15.69(100 - 160)[7.24 - **11.58**]
Transmission upper cover set bolt	9.81 ~ 15.69(100 ~ 160)[7.24 ~ 11.58]

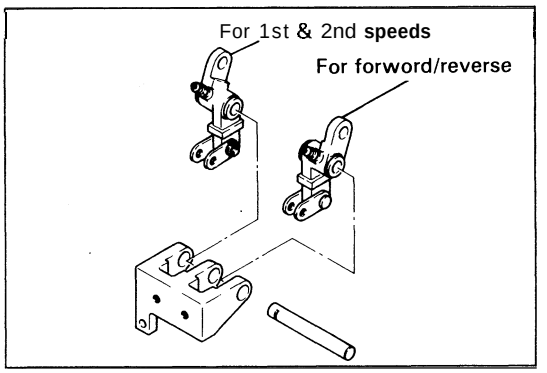


Point Operations

[Point 1]

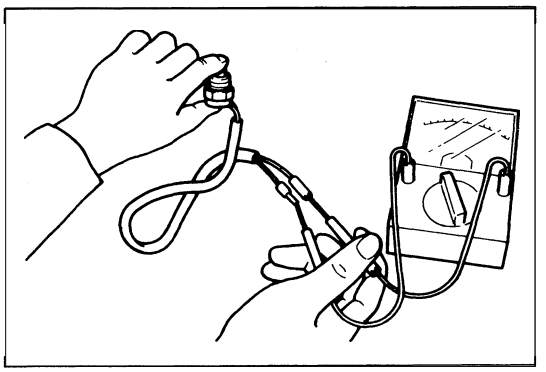
Inspection: Measure the link shaft outside diameter.

Standard shaft outside diameter:
15.0 mm (0.591 in)
Limit shaft outside diameter:
14.9 mm (0.587 in)



Reassembly: Do not confuse forwardlreverse shift link and 1st & 2nd shift link.

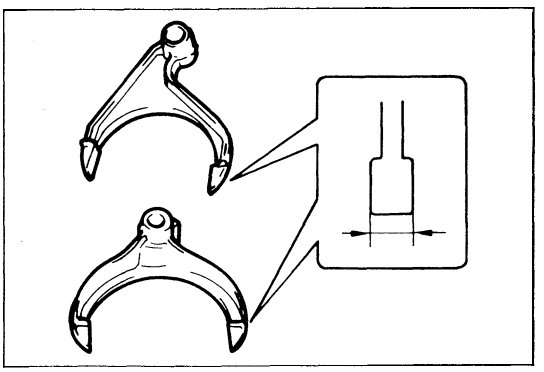
Reassembly: Coat MP grease on the link shaft sliding contact face.
Add grease through the grease fitting after reassembly.



[Point 2]

Inspection: Check the backup lamp switch conduction.

Switch OFF: No conduction (open circuit)
Switch ON (depressed state): Conduction

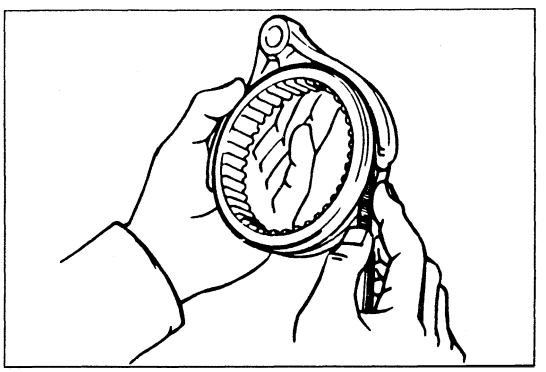


[Point 3]

Inspection: Measure the shift fork tip end thickness.

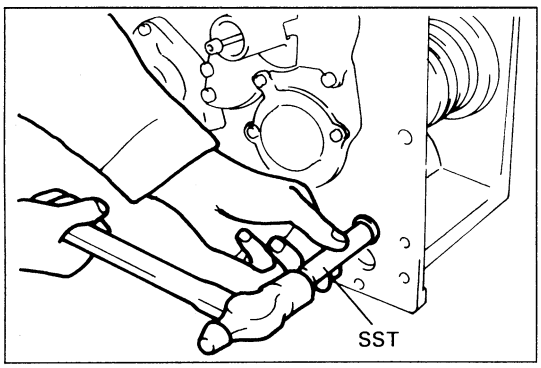
Standard thickness: 9.7 mm (0.382 in)
Limit thickness: 9.2 mm (0.362 in)

Reassembly: Do not confuse the forwardlreverse shift fork and 1st & 2nd shift fork.



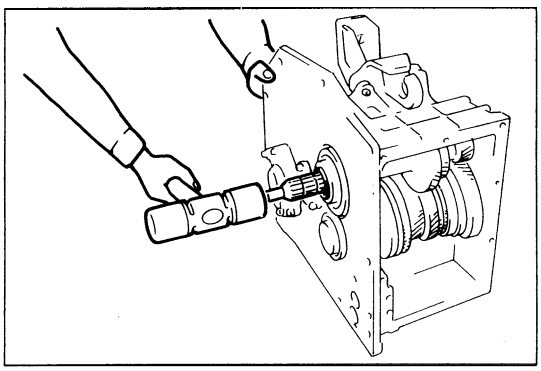
Inspection: Measure the clearance between the shift fork and clutch hub sleeve.

Limit clearance: 1.0 mm (0.039 in)



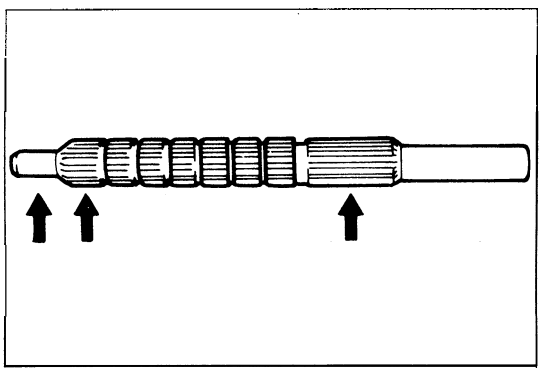
[Point 41

Reassembly: SST 09311-23000-71



[Point 51

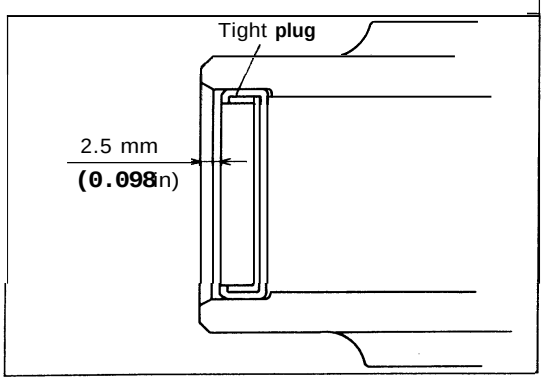
Disassembly: Tap the end of the input shaft with a plastic hammer to extract it toward the front (differential) side.



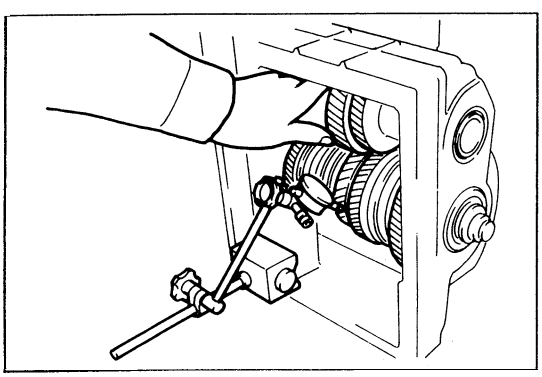
Inspection: Measure the input shaft bend.

Limit bend: 0.1 mm (0.004 in)

Reassembly: Coat grease (molybdenum disulfide grease) on the spline portion (indicated by the arrow).



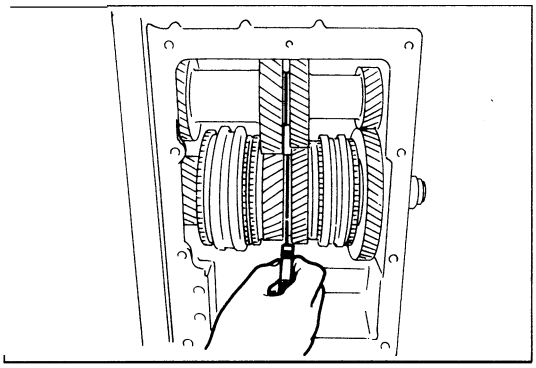
Reassembly: Install the tight plug after inserting the input shaft.

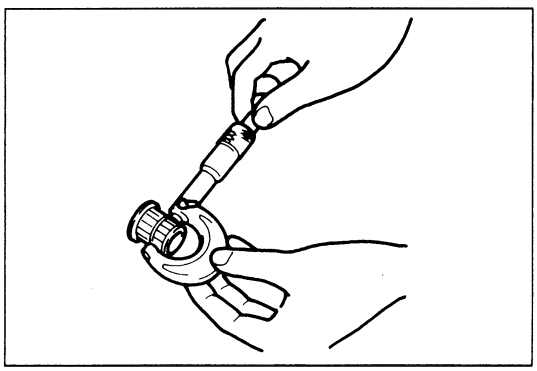


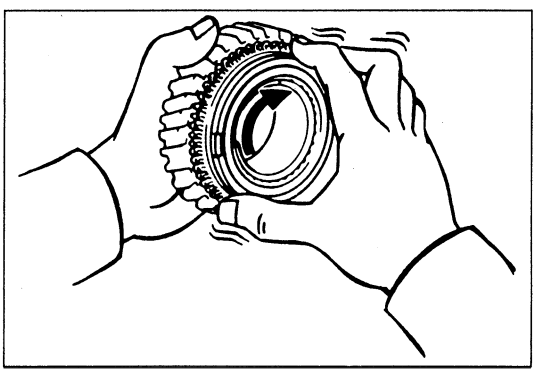
[Point 61

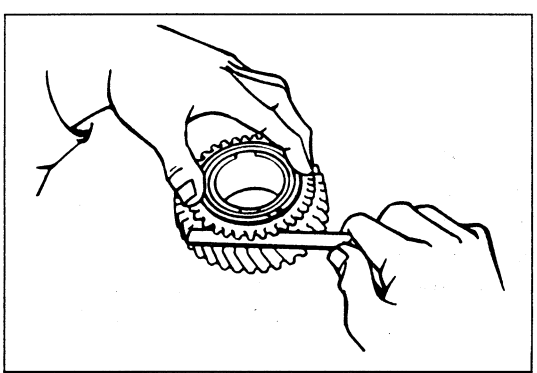
Disassembly·reassembly: Measure the backlash of each gear.

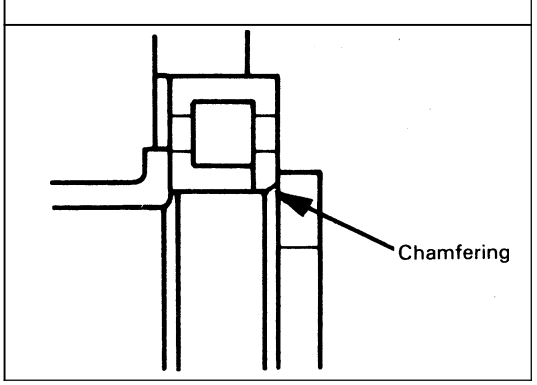
Standard backlash:
0.03 – 0.18 mm
(0.0012 – 0.0071 in)
Limit backlash:
0.25 mm (0.0098 in)











Disassembly·reassembly: Measure the thrust clearance of each gear.

Countergear
Standard thrust clearance:
0.1 - 0.2mm **(0.004- 0.008**in)
Limit thrust clearance: **0.3**mm **(0.012**in)
Transmission idle gear
Standard thrust clearance:
0.1 - 0.25mm (0.004- 0.0098in)
Limit thrust clearance:
0.4mm **(0.016**n)
Reverse idle gear
Standard thrust clearance:
0.1 - 0.4mm **(0.004- 0.016**in)
Limit thrust clearance:
0.7mm **(0.028**n)

[Point 7]

Inspection: Measure the bushing outside diameter.

Standard bushing outside diameter:
44.0mm **(1.732**n)
Limit bushing outside diameter:
43.9mm **(1.728**n)

Reassembly: Coat grease (molybdenum disulfide grease) on the bushing.

Inspection: Check the clearance between the hub sleeve and fork. (See Point 3.)

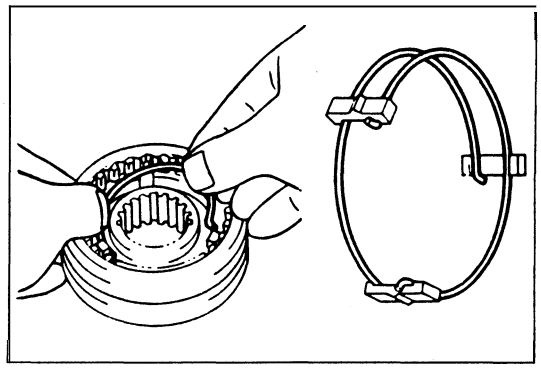
Inspection: Coat gear oil on the gear taper portion and bring the ring manually into contact to check no slipping.

Inspection: Insert the clearance between the synchronizer ring and gear.

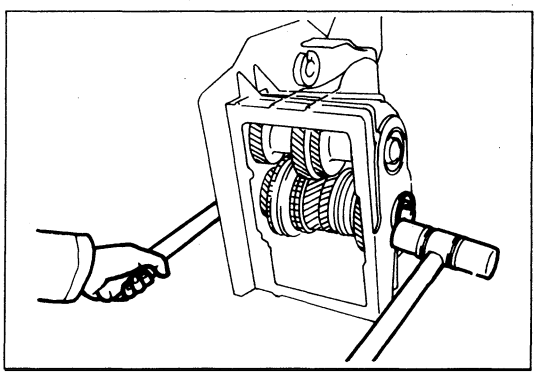
Forward/ reverse
Standard clearance:
1.**10 - 2.30mm (0.0433- 0.0906**in)

Limit clearance: **0.3**mm **(0.012**n)
1st & 2nd
Standard clearance:
1.**10 - 1.90**mm **(0.0433- 0.0748**in)
Limit clearance: **0.3**mm **(0.012** in)

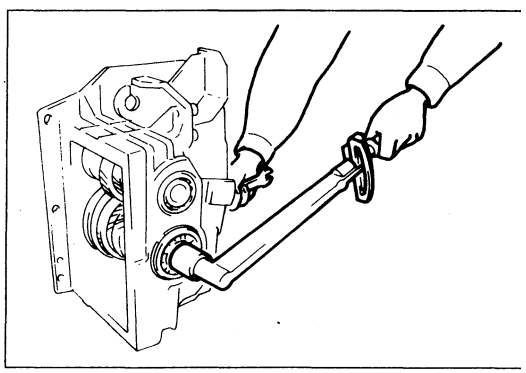
Reassembly: When driving the bearing into the countershaft, make the chamfered side (inside diameter) of the bearing (spacer) face outward.



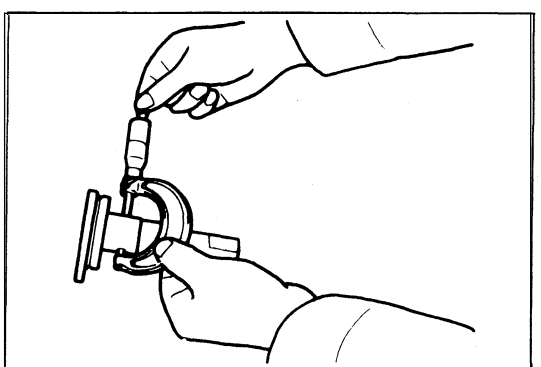
Reassembly: When assembly the clutch hub and hub sleeve, do not align the joints of the key springs.



Reassembly: When driving the differential side bearing in, apply a plastic hammer to the bearing on the opposite side.



Reassembly: Use a new lock nut. Stop shaft rotation by using the width across flats **(42** mm (1.65 in)) at the end of the countershaft. Securely caulk the lock nut at 2 places.



[Point 81

Inspection: Measure the outside diameter of the trans-idle shaft.

Standard shaft outside diameter

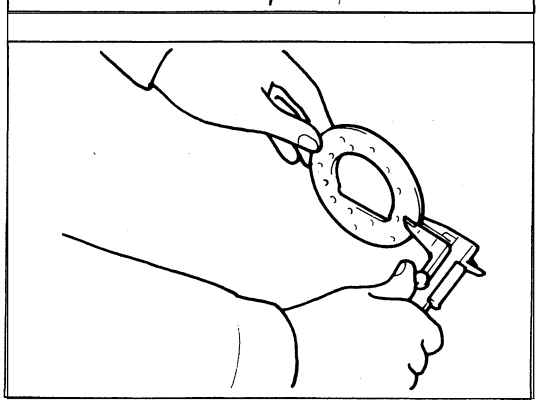
Clutch side: 32.0 mm (1.260 in)

Differential side: 25.0 mm (0.984 in)

Limit shaft diameter

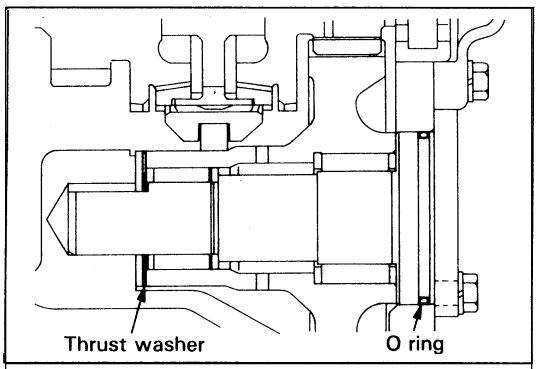
Clutch side: 31.9 mm (1.256 in)

Differential side: 24.9 mm (0.980 in)



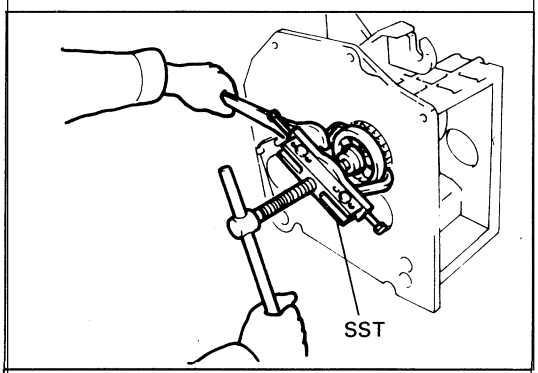
Inspection: Measure the thrust washer thickness.

Limit thickness: 2.7 mm (0.106 in)



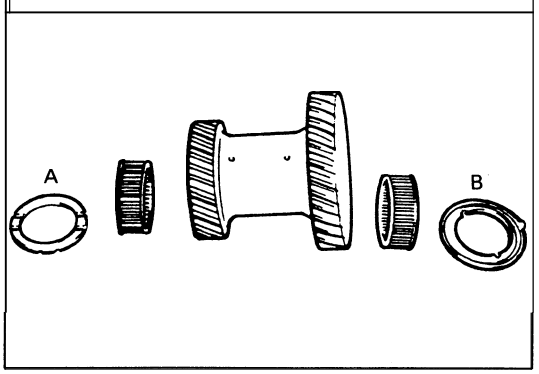
Reassembly: Apply MP grease amply on the O-ring before reassembly.

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

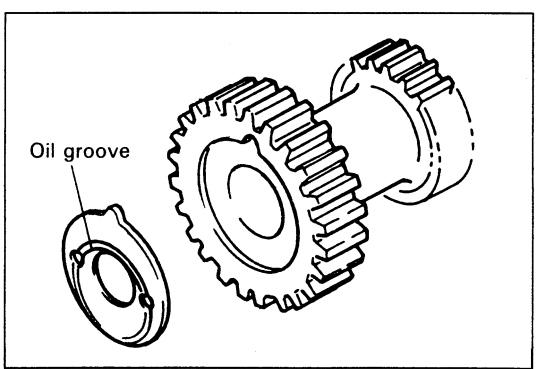


[Point 91

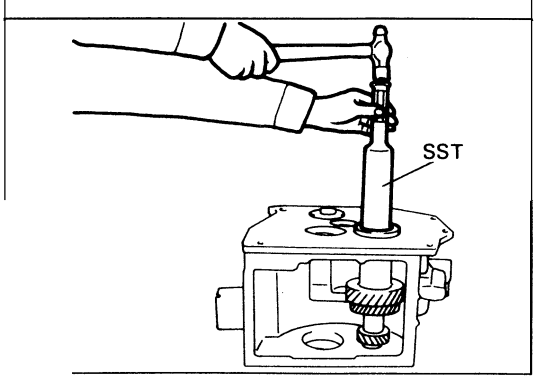
Disassembly: Remove the snap ring for the speed gear bearing (on clutch side), and remove the bearing with the SST.
SST 09950-20017



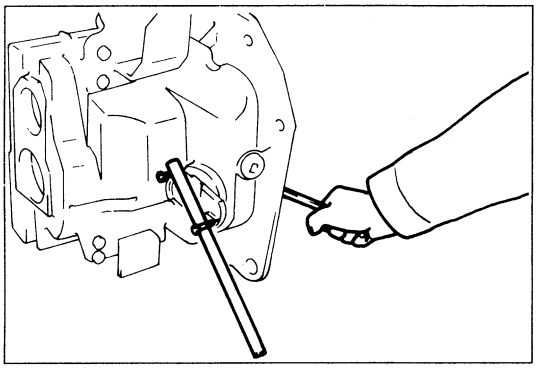
Inspection: Measure the thickness of the reverse idle gear washer.
Limit thickness
Washer **A** (clutch side):
2.6 mm (0.102 in)
Washer B (differential side):
2.7 mm (0.106 in)



Reassembly: Install the thrust plate on the reverse idle gear side, with its oil groove side facing the differential.

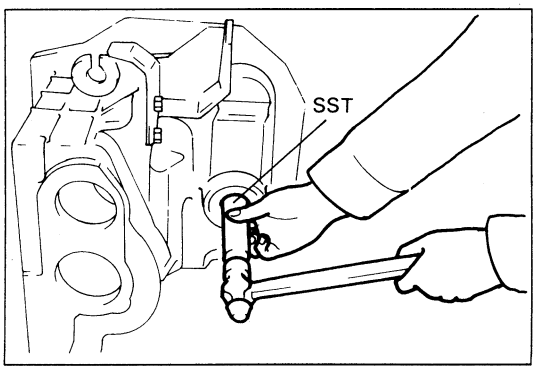


Reassembly: SST 09370-20270-71

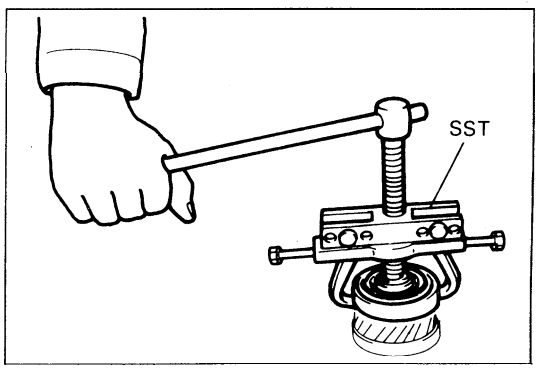


[Point 10]

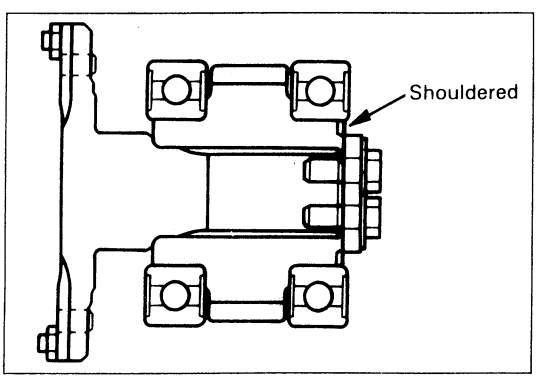
Disassembly·reassembly: Screw in the service bolt into the joint yoke bolt hole and use an appropriate round bar for stopping rotation. Remove the stopper plate set bolt.
At the time of reassembly, coat grease on the joint yoke surface in sliding contact with the oil seal.
After tightening the bolt, fold the bolt lock plate at 2 places.



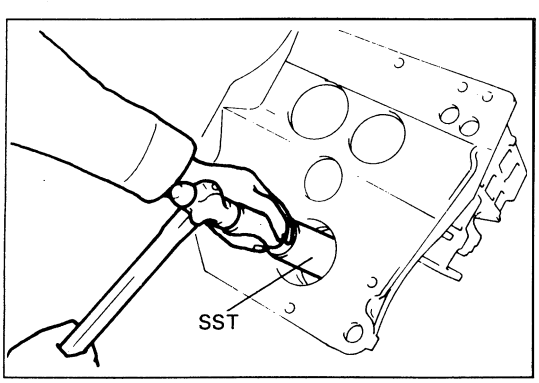
Disassembly: SST 09420-20150-71
Take a note of the output gear direction.



Disassembly: SST 09950-20017

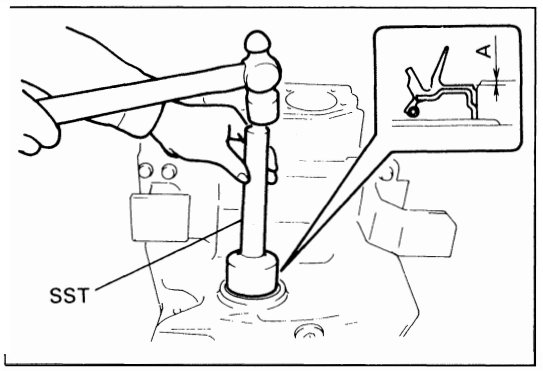


Reassembly: Install the output gear with its shouldered boss on the clutch side.



[Point 11]

Disassembly: SST 09370-20270-71

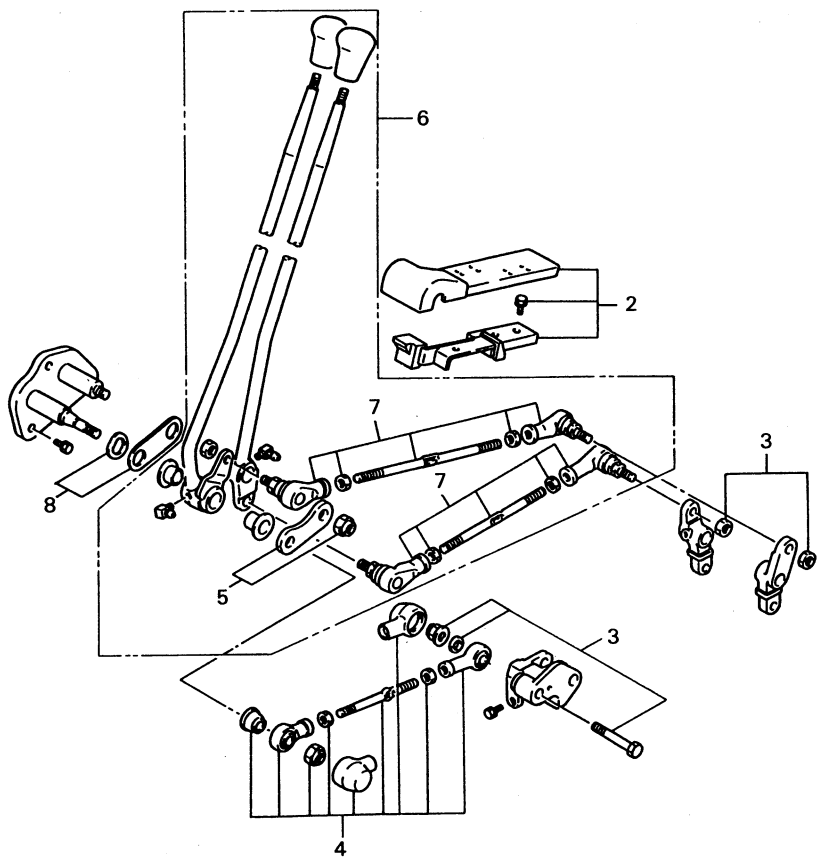


Reassembly: SST 09150-1O170-71

Drive-in depth
(sinking from case outside surface):
A = 0.5 – 1.0 mm
(0.020 – 0.039 in)

SHIFT LEVER

REMOVAL·INSTALLATION



1 Toe board

Removal Procedure

1 Remove the toe board.

2 Remove the lever stopper bracket.

3 Disconnect the shift rod end and brace rod end on the transmission side.

4 Disconnect the brace rod.

5 Remove the plate.

6 Remove the shift lever W/rod.

7 Disconnect the shift rod.

8 Remove the plate and washer.

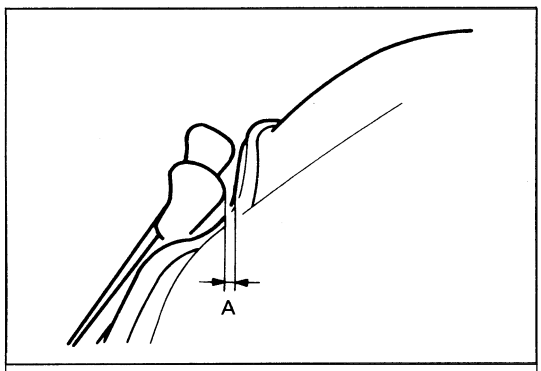
Installation Procedure

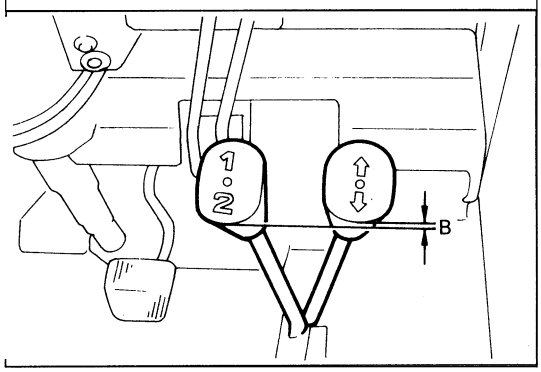
The installation .procedure is the reverse of the removal procedure.

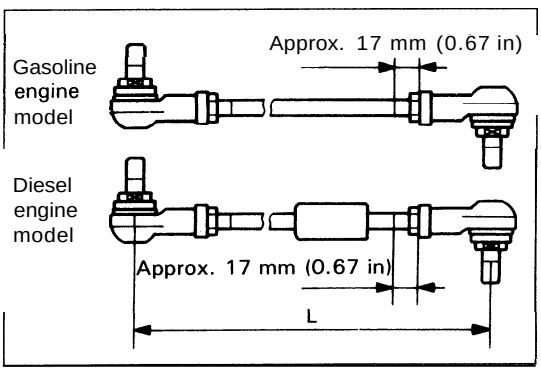
Note:
- **Supply MP grease through the grease fitting after installation.**
- **See the shift rod adjustment section (page 4-20) for the adjustment after installation.**
- **The tightening torque for each portion is-as follows:**

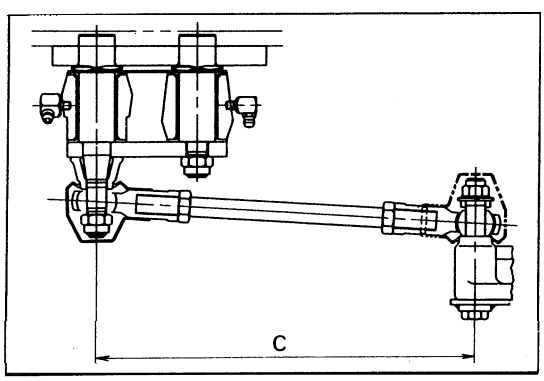
Unit: N·m(kg-cm)[ft-lb]

Shift rod set nut	134.32 - 53.94(350 - 550)[13.78 - 21.651
Brace rod set nut	88.26 - 117.68(900 - 1200)[35.43 - 47.241
Shift lever set nut	88.26 ~ 117.68(900 ~ 1200)[35.43 ~ 47.24]









SHIFT ROD ADJUSTMENT

I. Adjust the shift rod length

(1) With the shift lever set in the neutral position, adjust the length of each shift rod (forward/reverse and 1st & 2nd) to make the clearance (dimension A) between the lever knob and engine hood satisfy the following value:

A = 10 – 15 mm (0.39 – 0.59 in)

(2) Further adjust the shift rod length within the range of dimension A to make the deviation (diameter B) between shift levers LH and RH satisfy the following value:

B = 5 mm (0.20 in) or less

(3) Shift rod length (diameter L: reference)

Unit: mm (in)

		1st & 2nd rod	Forward/ reverse rod
Gasoline engine models	1·2 ton series	266 (10.47)	329 (12.95)
	3 ton series	282 (11.10)	345 (13.58)
Diesel engine models	1.2 ton series	266 (10.47)	329 (12.95)
	3 ton series	282 (11.10)	345 (13.58)

The dimensions shown above for diesel engine models are in the retracted state as the rod has a certain degree of looseness.

2. Adjust the brace rod length.

(1) Install the brace rod with adjustment to the length between the transmission and shift lever shaft (dimension C). After installation, check if the transmission side is forcibly pulled or forced in by turning the rod. Check looseness at the fitting between the end bushing on the transmission side and the pin in the 1DZ and 2Z model in 2 and 3 ton series.

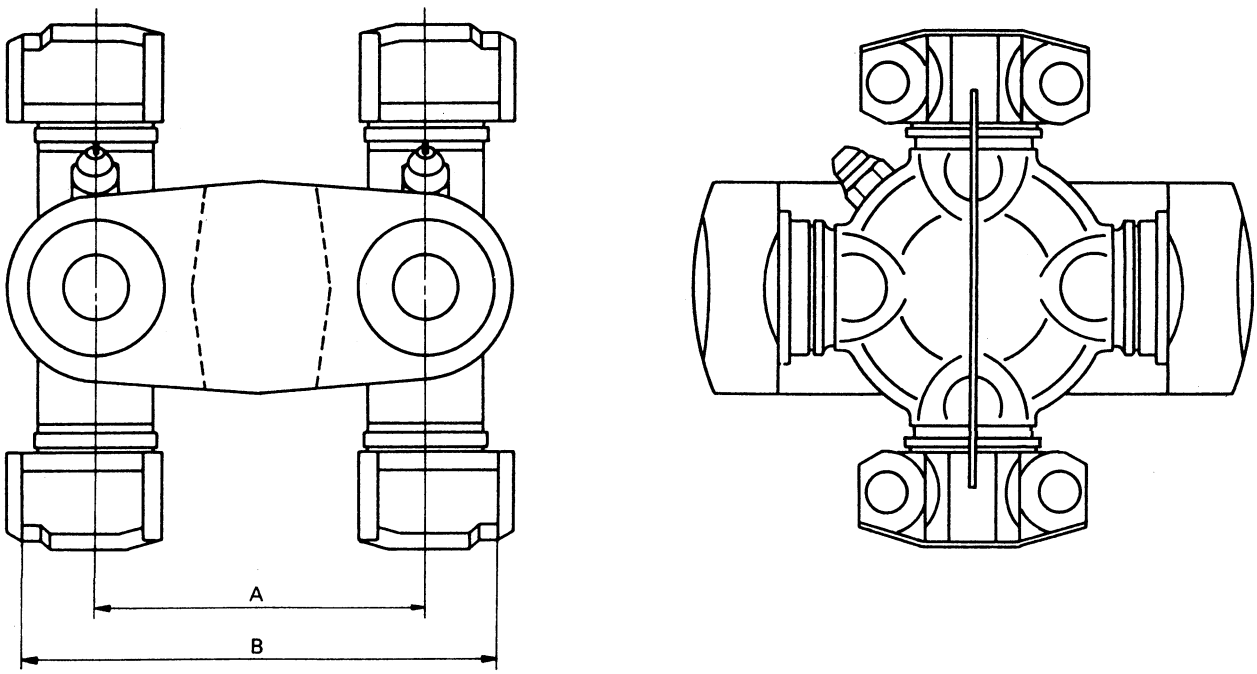
(2) Brace rod length (dimension C: reference)

1.2 ton series C = 202 mm (7.95 in)

3 ton series C = 218.5 mm (8.602 in)

PROPELLER SHAFT

GENERAL

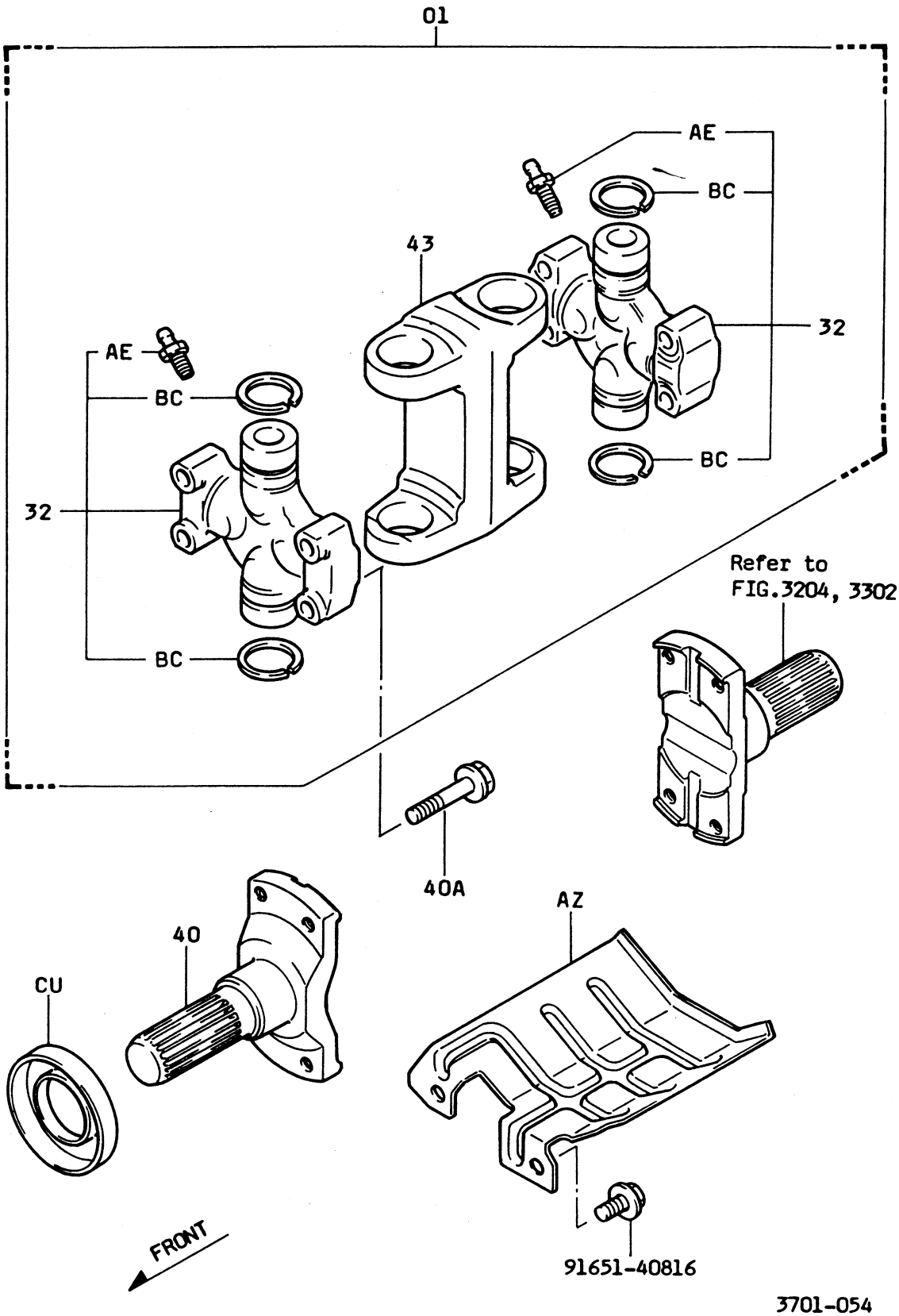


SPECIFICATIONS

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

COMPONENTS

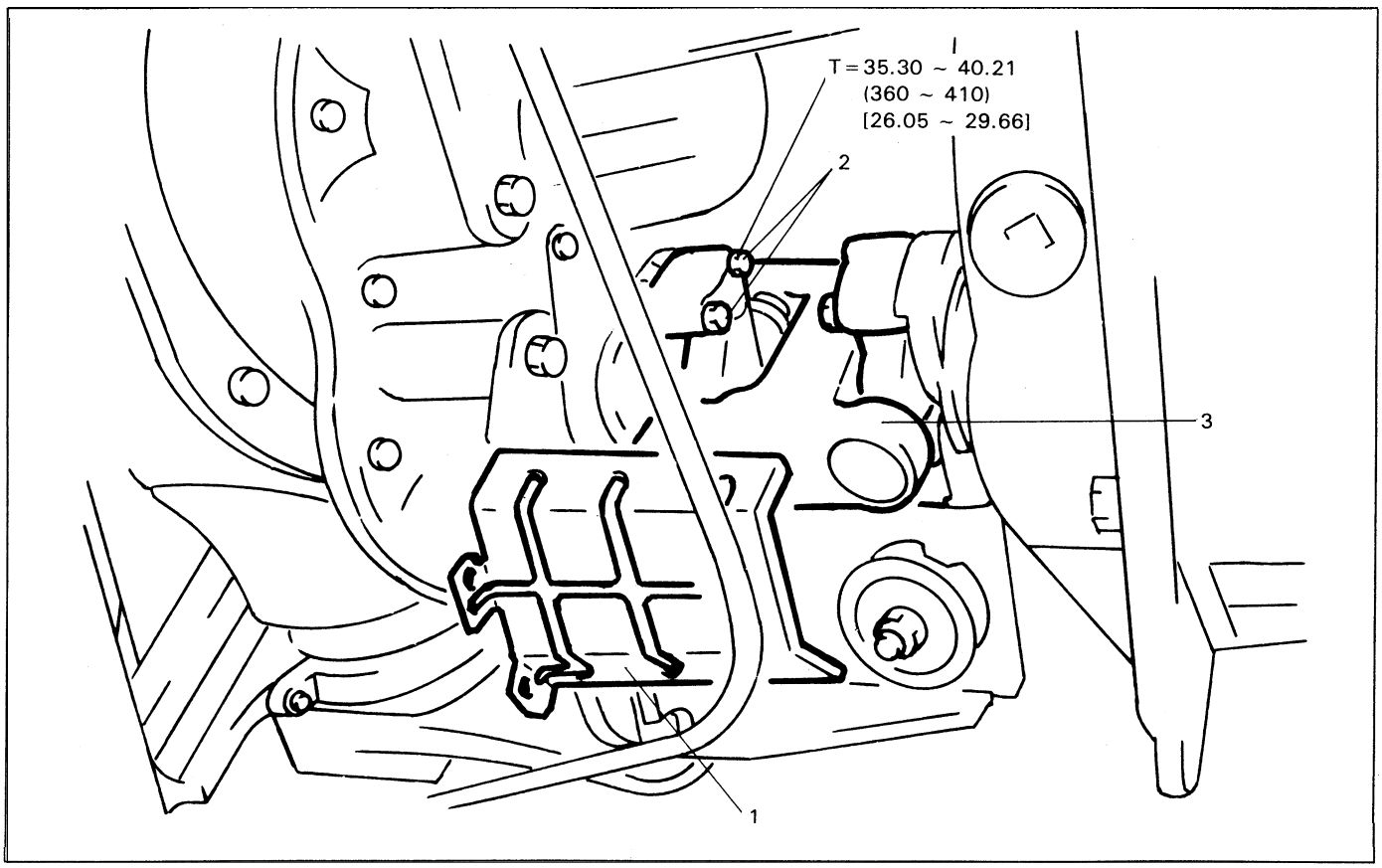
3701



PROPELLER SHAFT

REMOVAL·INSTALLATION

T = N·m (kg-cm) [ft-lb]



Removal Procedure

1 Remove the cover.

2 Remove the set bolt.

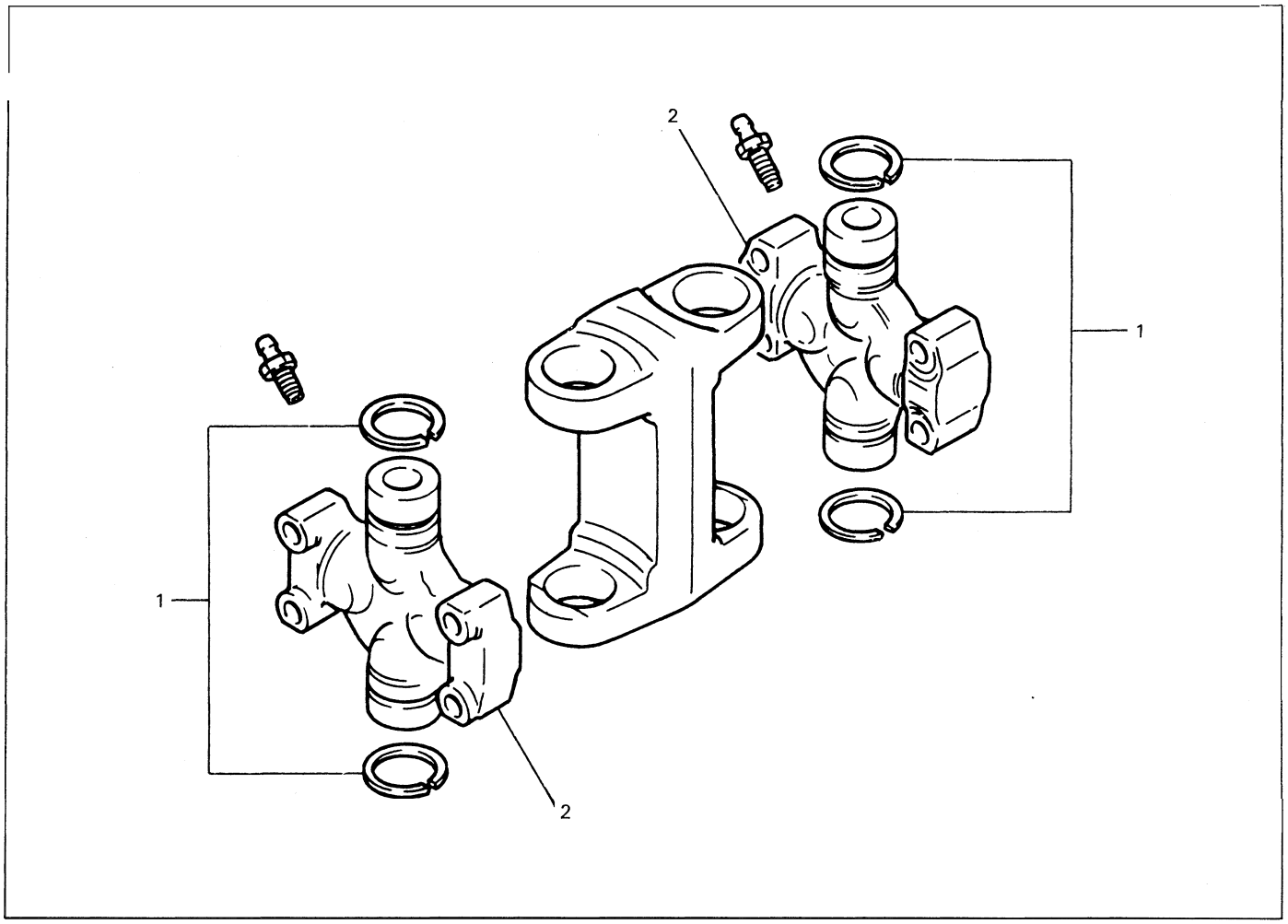
3 Remove the propeller shaft ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Add MP grease through the grease fitting.

DISASSEMBLY·INSPECTION·REASSEMBLY



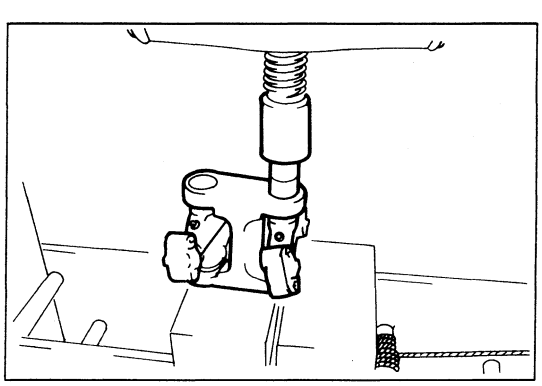
Disassembly Procedure

1 Remove the snap ring.

2 Remove the bearing cup, and remove the universal spider set. **[Point 1]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.



Point Operation

[Point 1]

Disassembly·reassembly: Use a press and box wrench for removing the bearing cup.

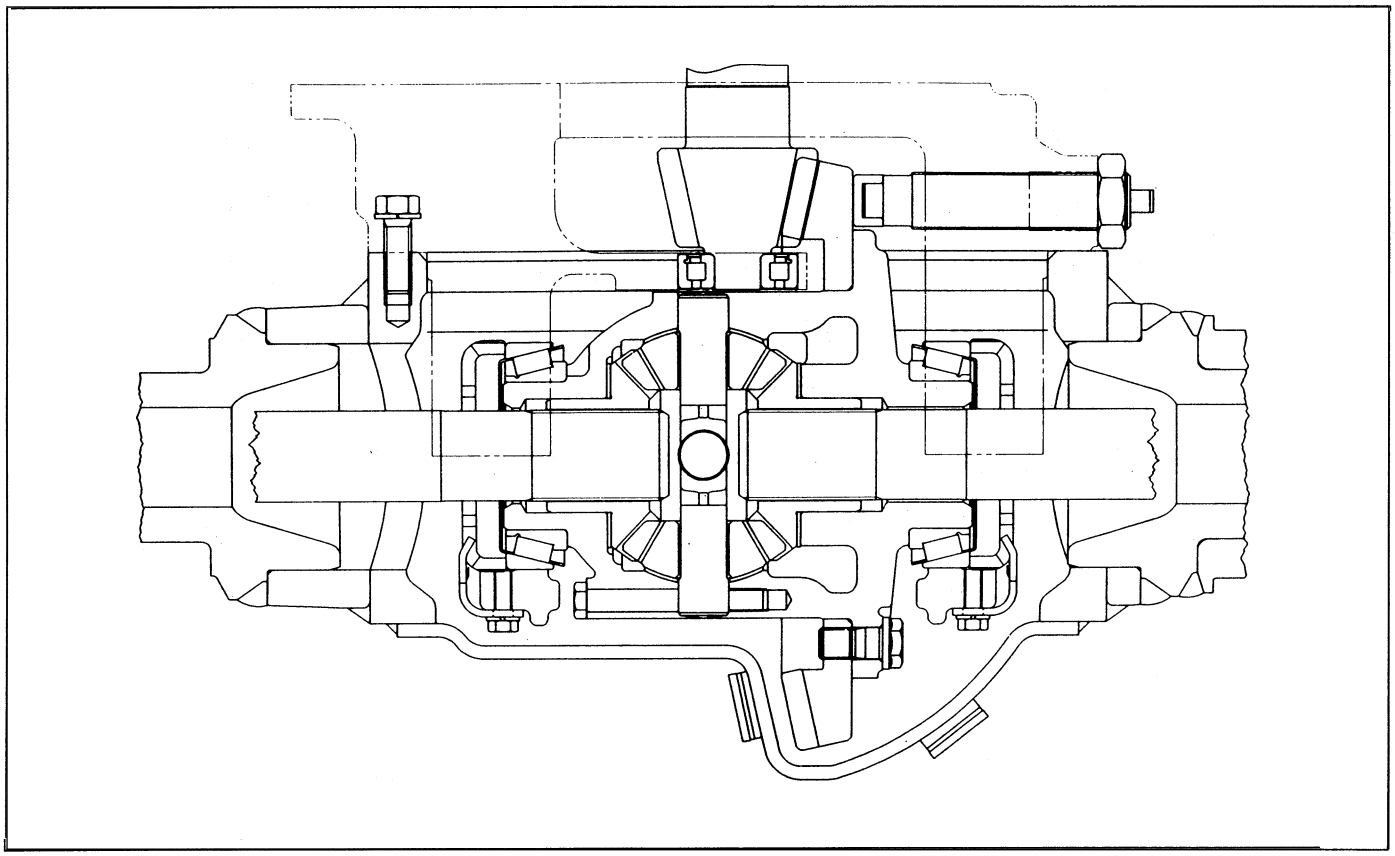
Inspection: Make sure that the grease path in the spider is not clogged.

Reassembly: Coat MP grease on the needle roller in the bearing cup.

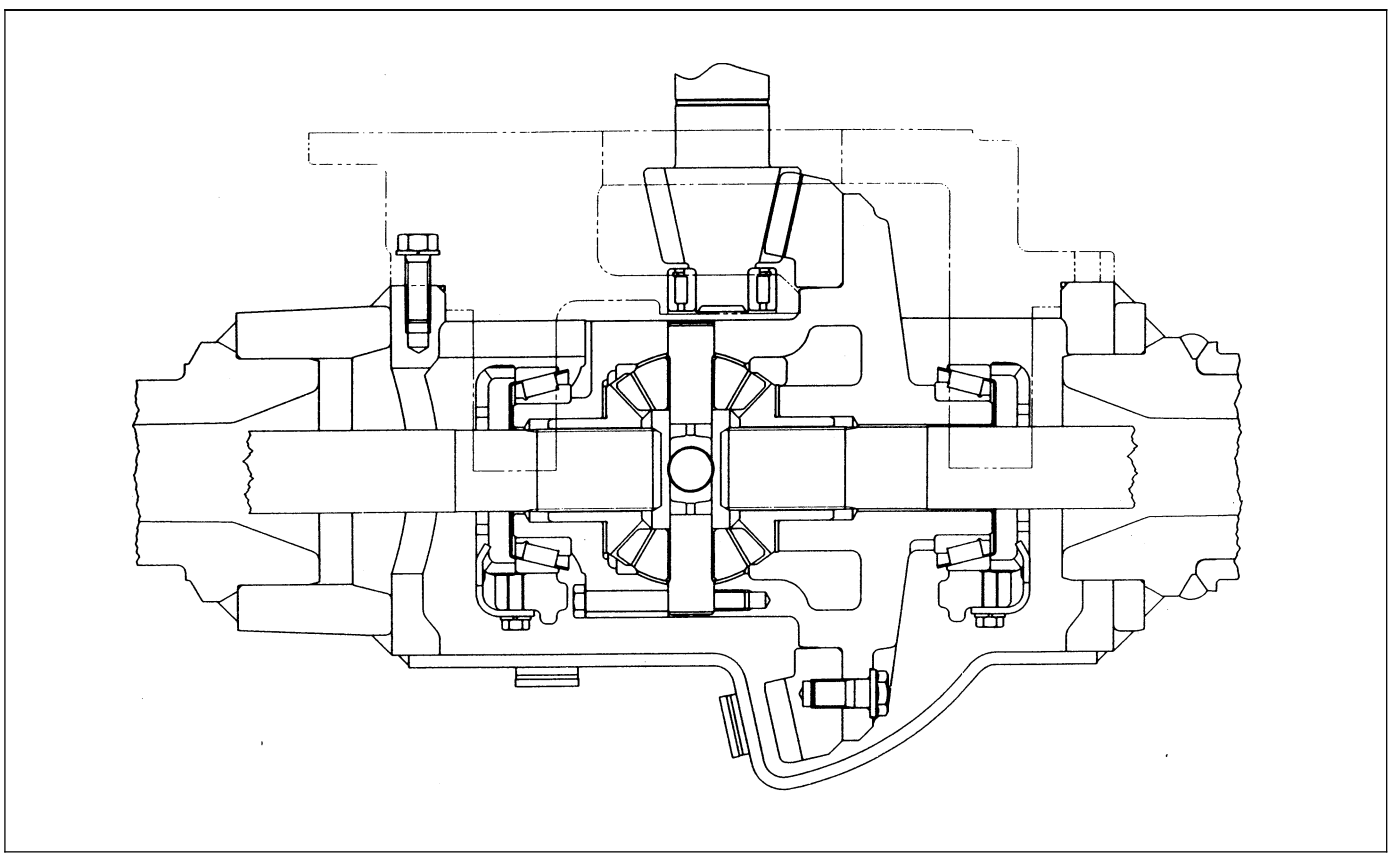
DIFFERENTIAL

GENERAL

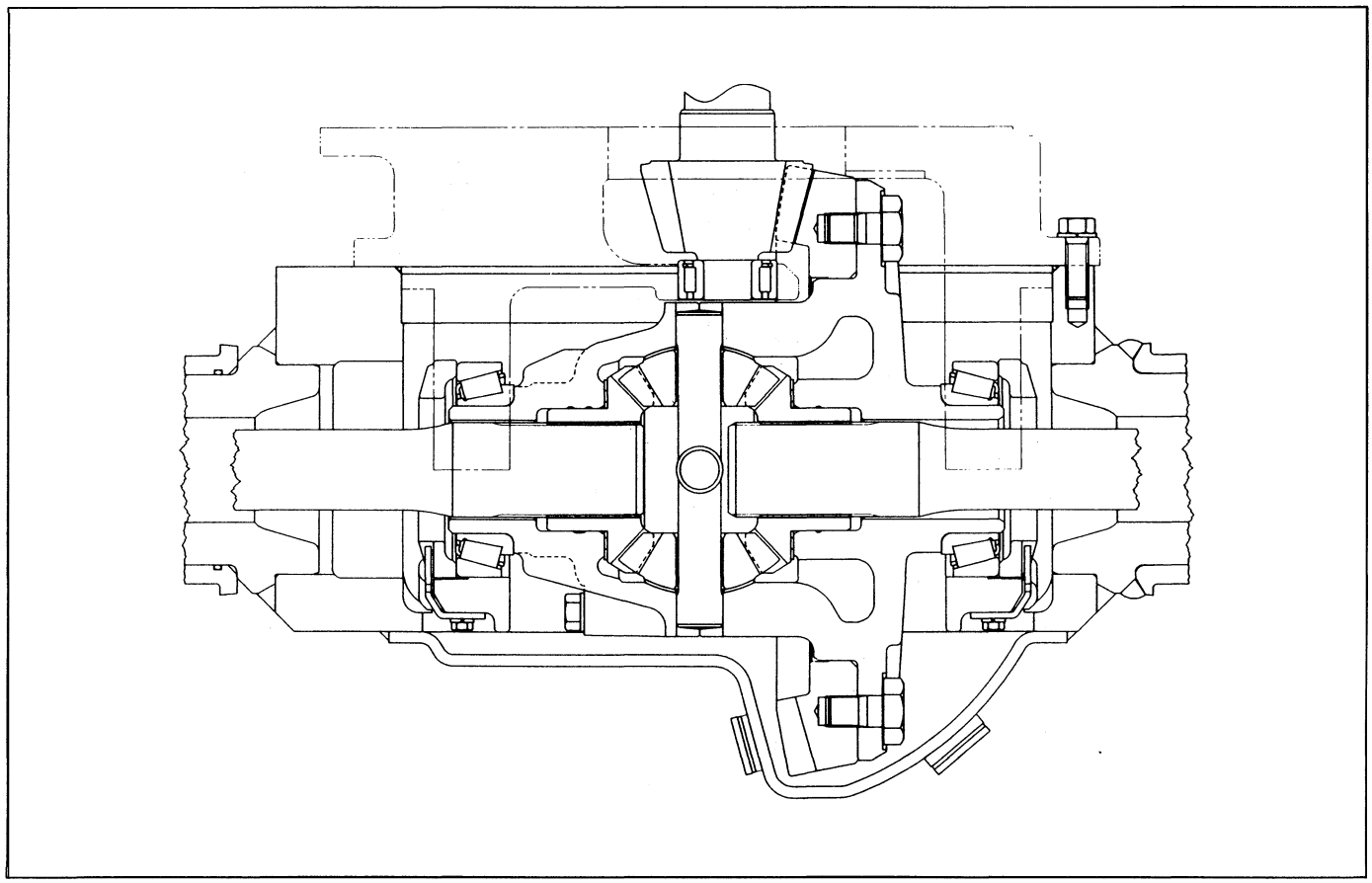
Differential (1 Ton Series)



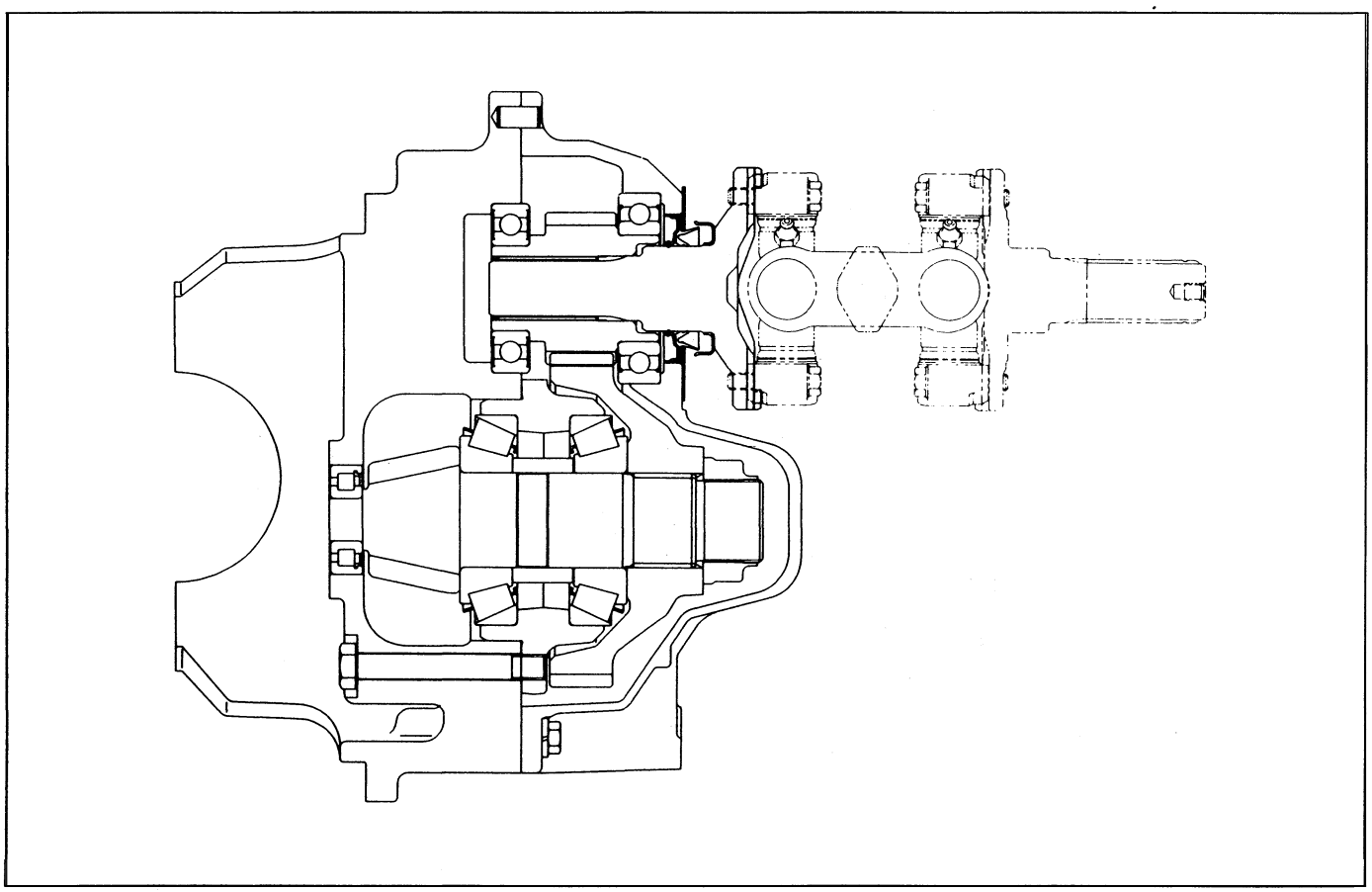
Differential (2 Ton Series)



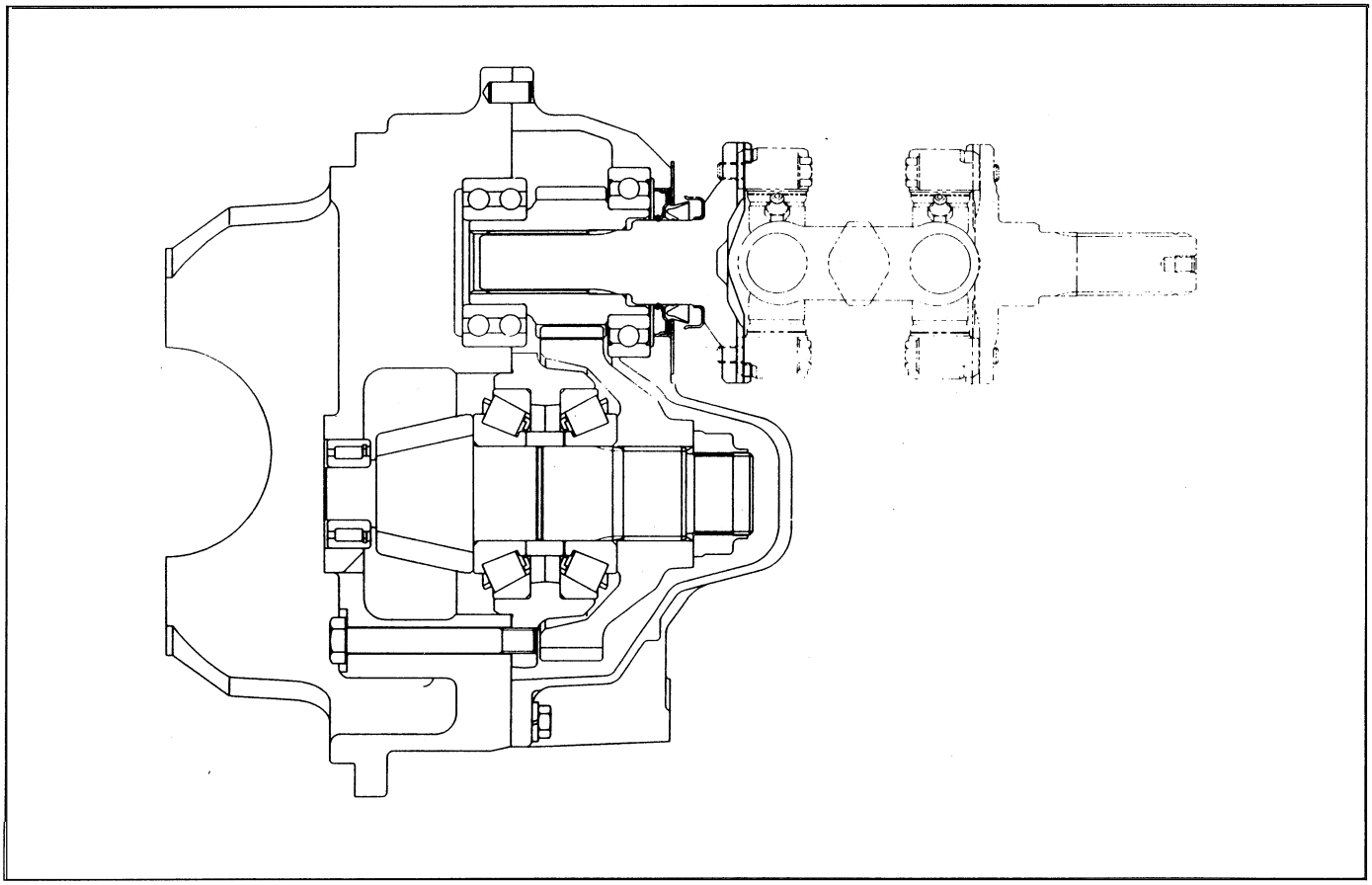
Differential (3 Ton Series)



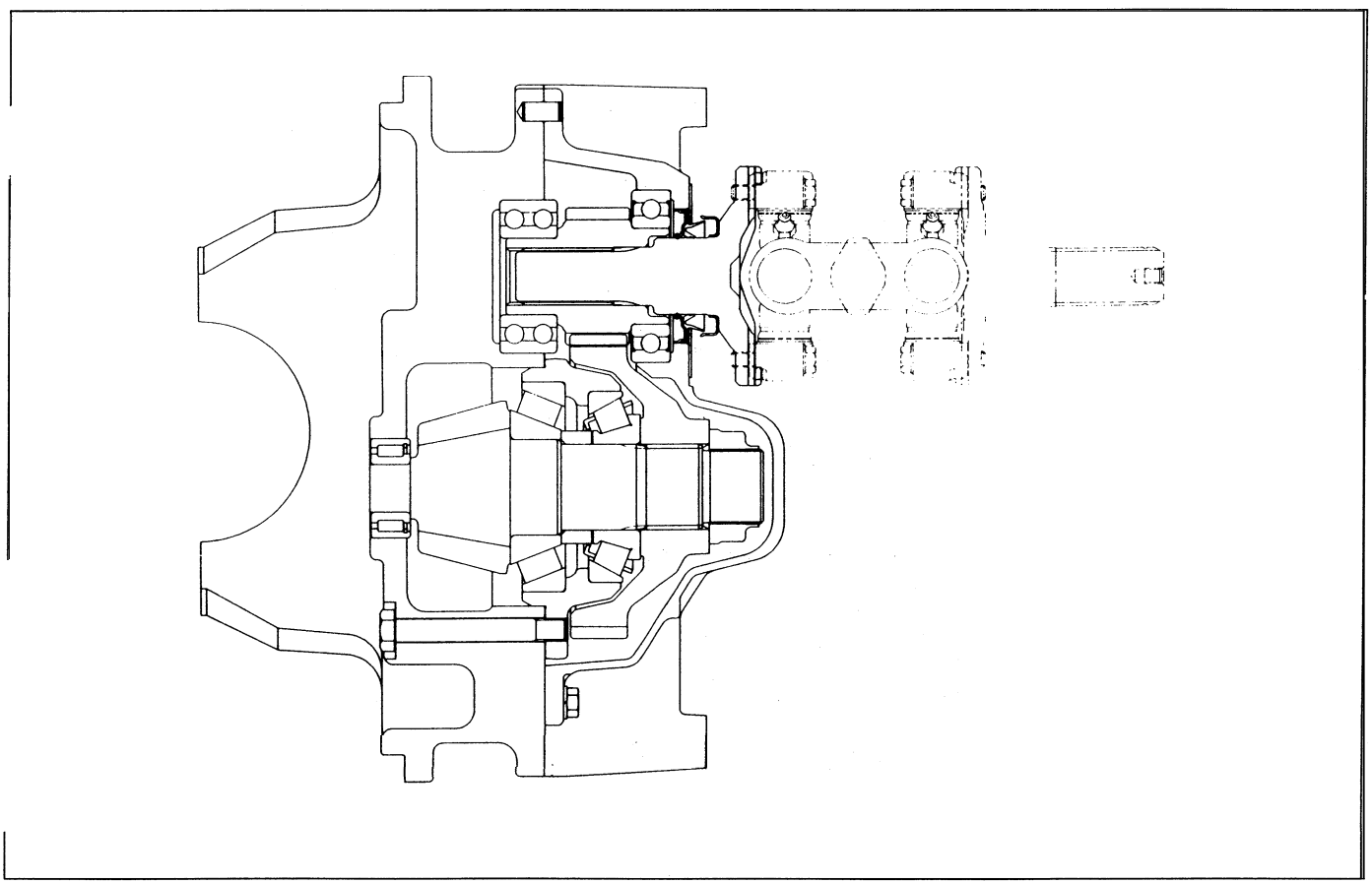
Reduction Gear (1 Ton Series)



Reduction Gear (2 Ton Series)



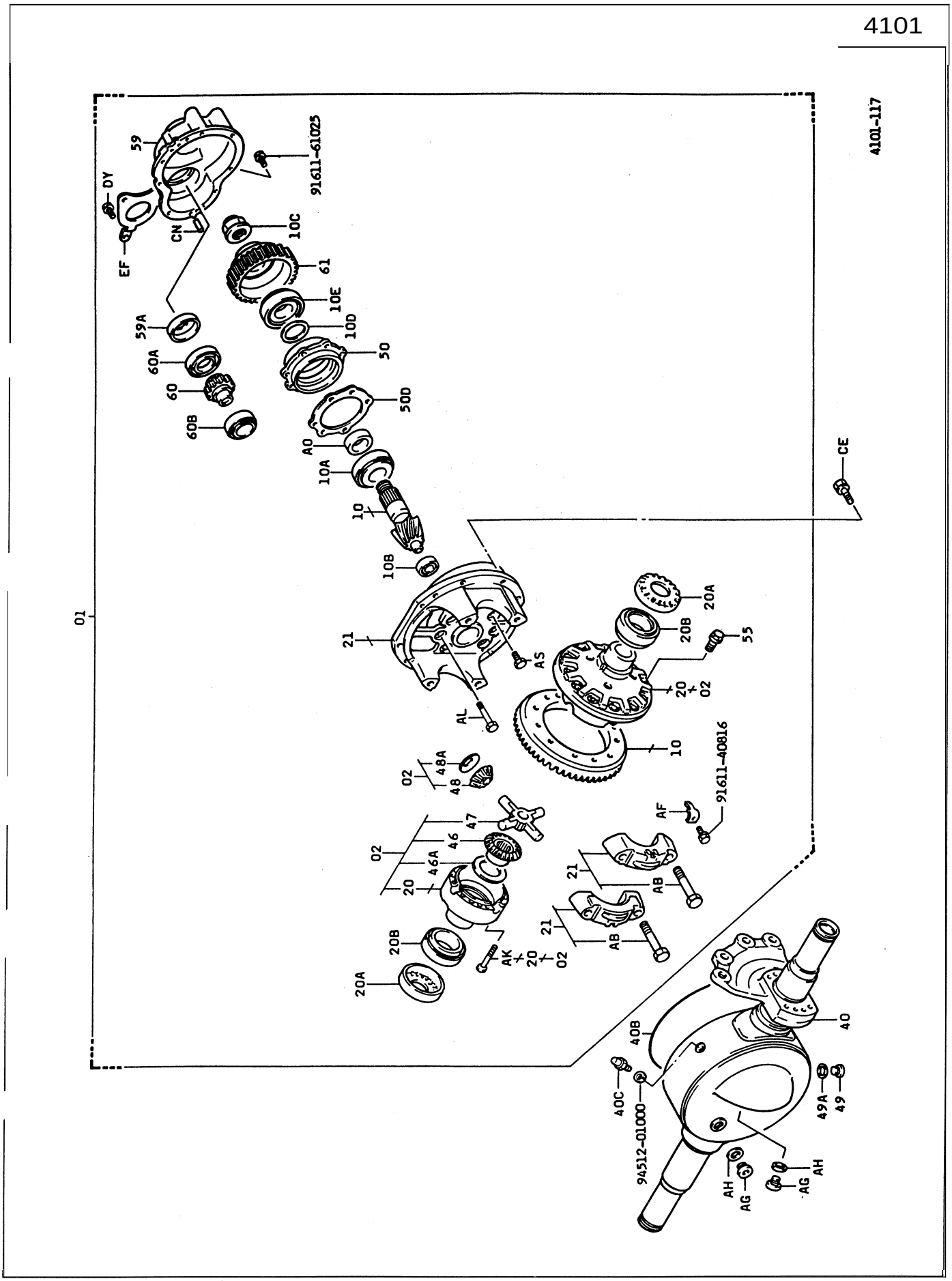
Reduction Gear (3 Ton Series)



SPECIFICATIONS

Item \ Vehicle model			1 ton series		2.3 ton series
			1.0.1.35 ton models	1.5.1.75 ton models	
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 x quantity	Pinion gear	10 x 2 (Clutch models with 5K engine) 10 x 4 (Clutch models with 4Y·1DZ engine) (All torque converter models)	10 x 4	
		Side gear	14 x 2	←	←
Reduction gear	Reduction ratio (output gear/reduction gear)		2.125	2.364	←
	Number of teeth	Reduction gear	24	22	←
		Output gear	51	52	←
Differential oil quantity ℓ (US gal)			5.4 (1.43)	←	2 ton series: 6.4 (1.69) 3 ton series: 9.0 (2.38)

COMPONENTS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4101-117
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59
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10C
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10E
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50D
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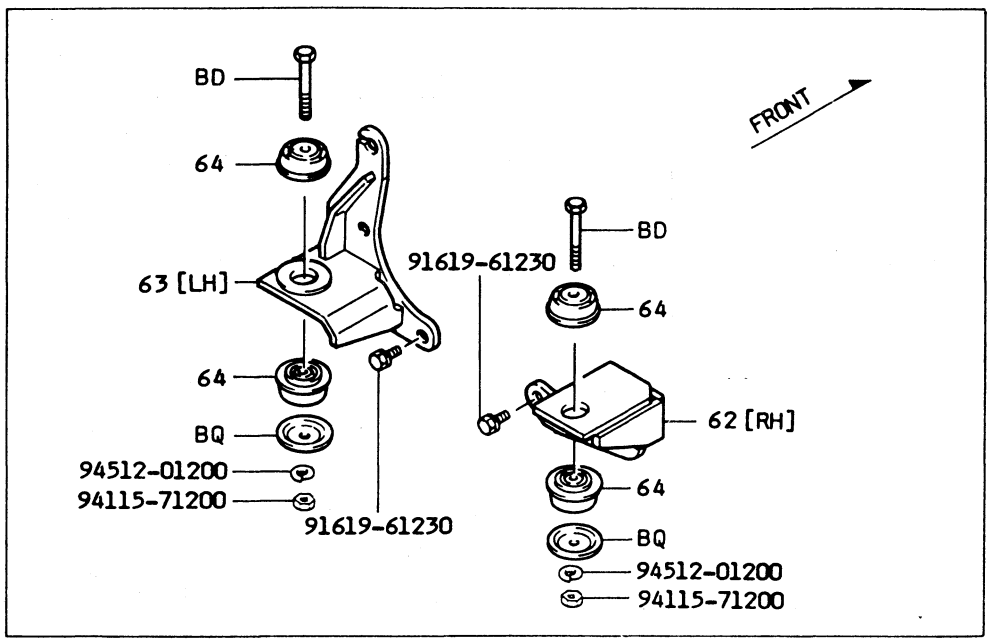
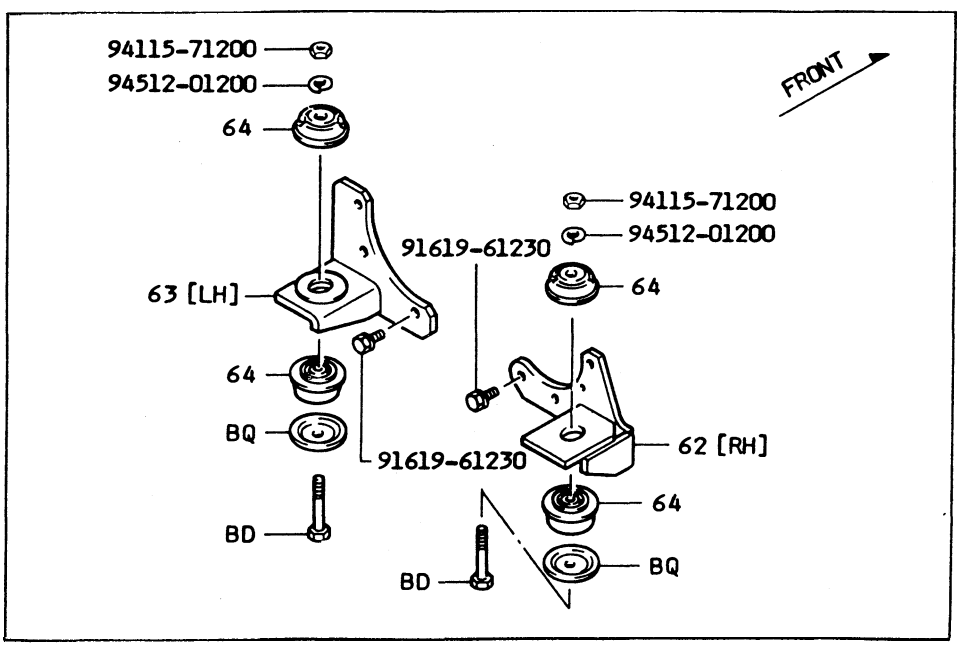
10
10B
59A
60A
60
60B
21
AS
AL
CE
20A
20B
55
20
02
10
91611-40816
AF
48A
48
47
46
46A
AB
AK
40
40B
40C
94512-01000
49A
49
AH
AG

Clutch models



4101-118

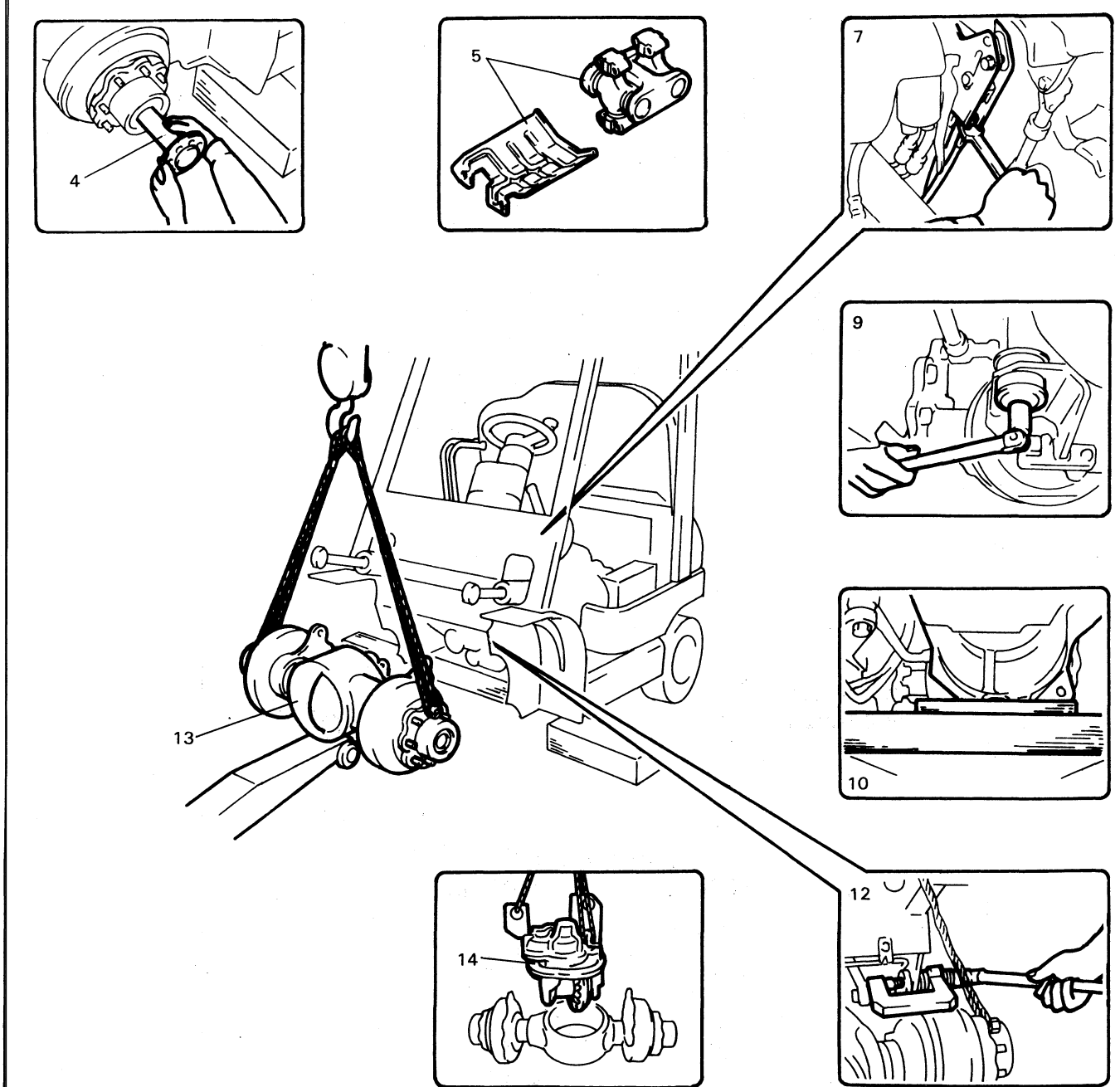
Torque converter models



4101-119

DIFFERENTIAL ASSY

REMOVAL·INSTALLATION



1 Mast ASSY
2 Differential oil
3 Front wheel
6 Toe board
8 Brake pipe
11 Hoist the front axle
15 Carrier bracket and joint flange yoke

Removal Procedure

1 Remove the mast ASSY. (See the mast removal-installation section on page 13-5.)

2 Drain differential oil.

3 Jack up the vehicle and remove the front wheels.

4 Remove the axle shaft.

5 Remove the propeller shaft.

6 Remove the toe board.

7 Disconnect the parking brake cable and cable clamp.

8 After draining the brake oil, disconnect the brake pipe from the wheel cylinder.

9 Remove the transmission (or torque converter) case mount bolts, nuts and mounting insulator (lower side).

10 Support the bottom of the transmission (or torque converter) case with wooden blocks. **[Point 1]**

11 Slightly hoist the front axle. **[Point** 21

12 Remove the front axle bracket set bolts. **[Point 31**

13 Remove the front axle W/differential. **[Point 41**

14 Remove the differential carrier ASSY. **[Point 5]**

15 Remove the carrier bracket and joint flange yoke.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat chassis grease on the joint flange yoke surface in sliding contact with the oil seal.**
- **See the note for mast installation procedure (on page 13-6).**
- **After installation, carry out parking brake adjustment. (See page 10-27.)**
- **After installation, bleed air from the brake circuit. (See page 10-18.)**
- **The tightening torque for each portion is as follows:**

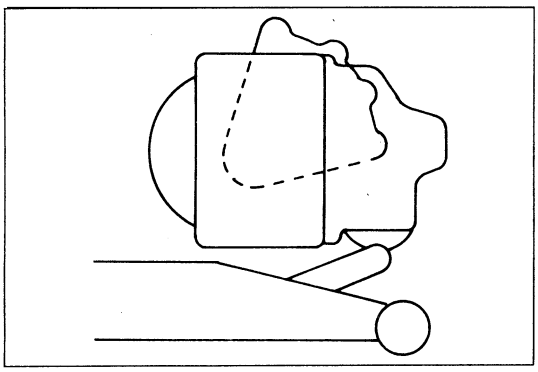
Unit: N·m (kg-cm) [ft-lb]

Carrier bracket set bolt	**49.03 - 78.45(500 - 800)136.18 - 57.881**
Differential carrier set bolt	**49.03 - 78.45(500 - 800)136.18 - 57.881**
Front axle bracket set bolt	**235.36 - 294.20(2400 - 3000)11 73.64 - 21 7.051**
Transmission (or torque converter) case mount bolt	**49.03 - 88.26(500 - 900)**[36.18 ~ **65.121**
Propeller shaft set bolt	**35.30 - 40.21 (360** - 410) **126.05 - 29.661**
Propeller shaft cover set bolt	**9.81 - 15.69**(100 - 160) **t7.24 - 11.581**
Axle shaft set bolt	1·2 ton series: **68.65-88.26(700 -**900) [50.65 **- 65.121** **3** ton series: **98.07- 127.49(1000 -1300)**[72.35 **- 94.061**
Front wheel hub nut	See page **7·10.**

Point Operations

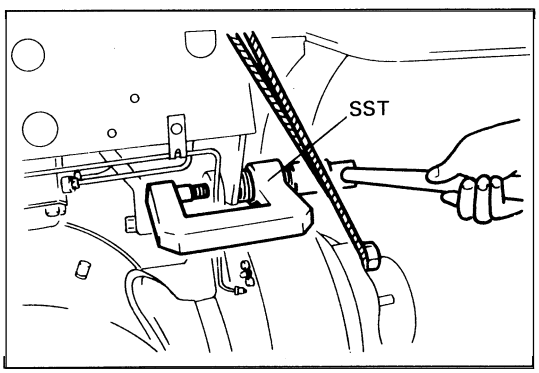
[Point 1]

Removal: Sling wires on the transmission (or torque converter) case, hoist it slightly and support the bottom of the case with wooden blocks or a pantograph jack.



[Point 2]

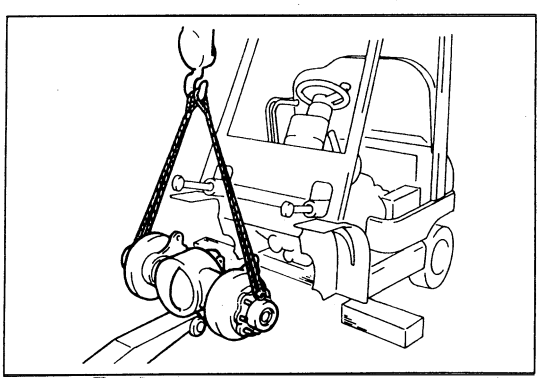
Removal: Sling wires at hub bolts on the left and right sides, lock wires with hub nuts and slightly hoist the front axle. Support the bottom of the differential carrier with a garage jack.



[Point 3]

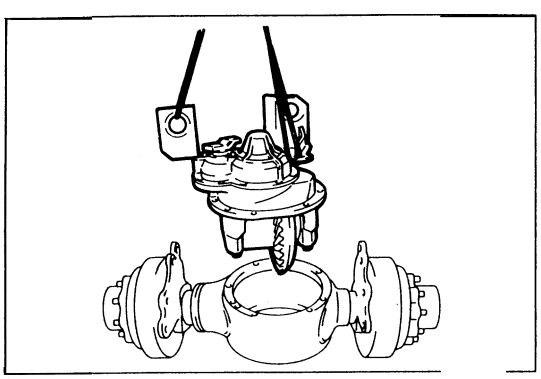
Removal: Two out of four on each side are reamer bolts. Remove them by using the SST.

SST 09310-22000-71



[Point 4]

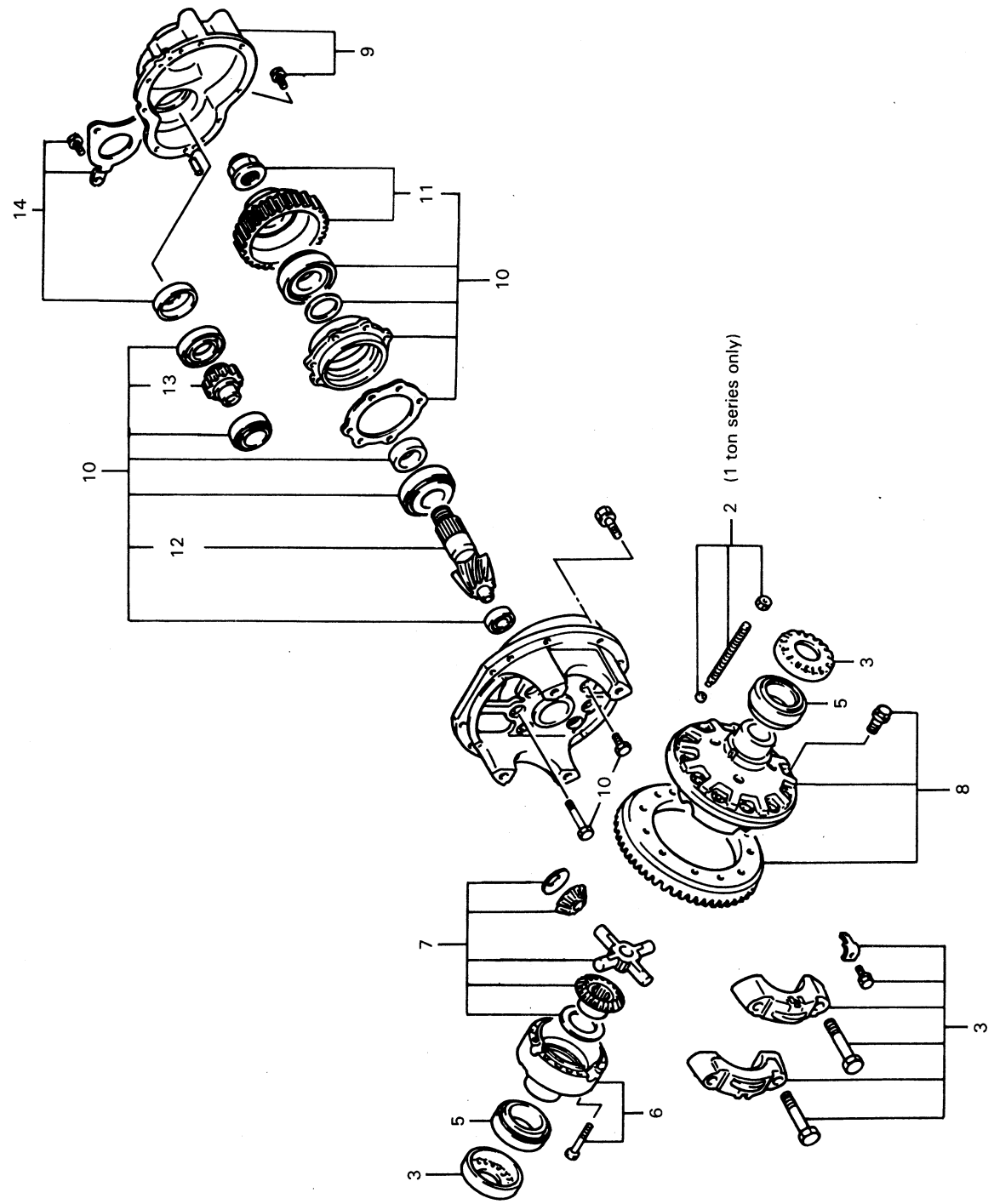
Removal·installation: Use the hoist and garage jack for this operation.



[Point 5]

Removal: Turn the differential to make the carrier face upward.
Sling wires on the carrier bracket and hoist it slightly.
Remove the set bolts and use the service bolt for separation.
Service bolt size: M10 x 1.25

DISASSEMBLY·INSPECTION·REASSEMBLY



1 Ring gear backlash and runout measurement
4 Differential case ASSY

Disassembly Procedure

1 Measure the ring gear backlash and runout. (Runout measurement applies only to the 1 ton series) **[Point 1]**

2 Remove the thrust screw. (Only in 1 ton series) **[Point 2]**

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

4 Remove the differential case ASSY.

5 Remove the side bearing. **[Point 4]**

6 Remove the differential upper case. **[Point 5]**

7 Remove the side gear, pinion gear, spider and thrust washer. **[Point 6]**

8 Remove the ring gear.

9 Remove the differential carrier cover. **[Point 7]**

10 Remove the drive pinion bearing retainer set bolts, and remove the retainer W/drive pinion & output gear and the reduction gear W/bearing. **[Point 8]**

11 Remove the output gear. **[Point 9]**

12 Remove the drive pinion. **[Point 10]**

13 Remove the reduction gear. **[Point 11]**

14 Remove the oil seal. **[Point 12]**

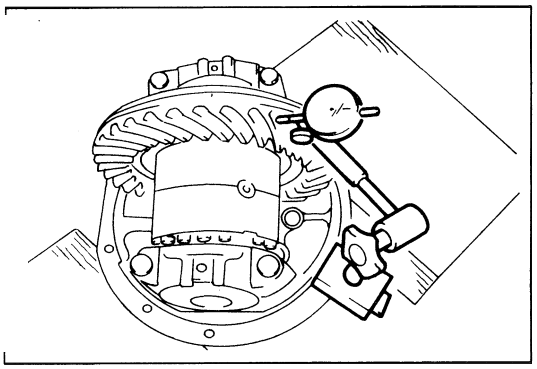
Reassembly Procedure

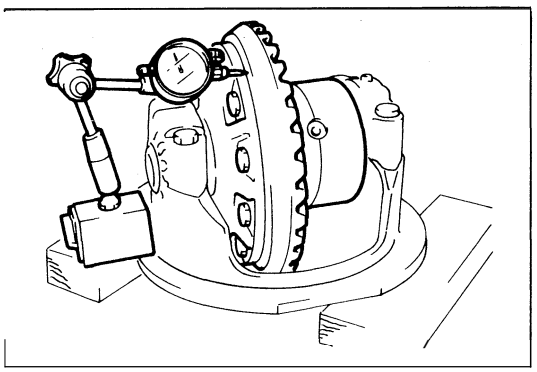
The reassembly procedure is the reverse of the disassembly procedure

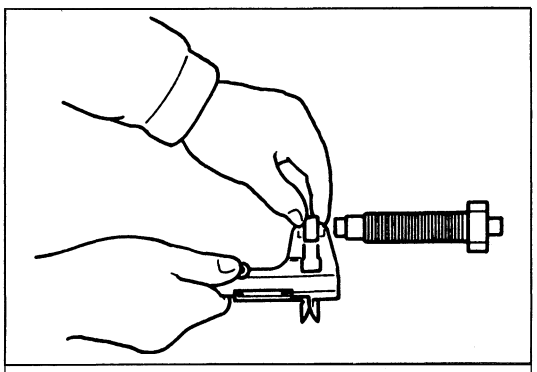
Note:
- **Coat thread tightener (08833-00070) on the ring gear set bolt before tightening it.**
- **Coat thread tightener (08833-00080) on the drive pinion bearing retainer set bolt before tightening it.**
- **Coat sealing agent (08826-00090) on the mating surfaces between the differential carrier cover and differential carrier.**
- **The tightening torque for each portion is as follows:**

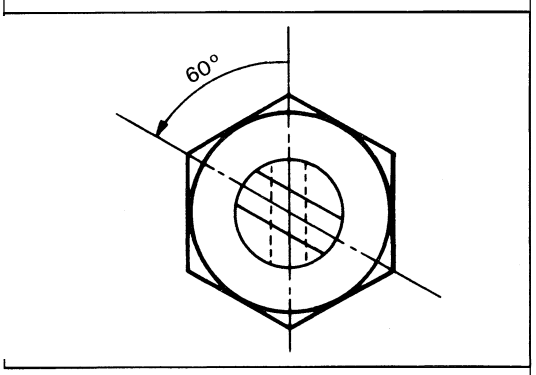
Unit: N·m (kg-cm) [ft-lb]

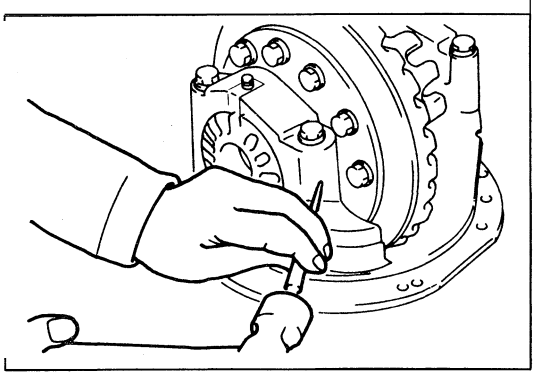
Output gear lock nut	343.23 – 392.27 (3500 – 4000) 1253.23 – 289.401
Drive pinion bearing retainer set bolt	88.26 – 117.68 (900 – 1200) [65.12 – 86.821
Differential carrier cover set bolt	29.42 – 44.13 (300 – 450) [21.71 – 32.561
Ring gear set bolt	127.49 – 176.52 (1300 – 1800) [94.06 – 130.231
Differential upper case set bolt	1.2 ton series: 43.15–53.94 (440–550) [31.83~39.791 3 ton series: 86.30–102.97 (880–1050) [63.67~75.971
Differential case bearing cap set bolt	117.68 – 137.29 (1200–1400)[86.82~101.29]
Thrust screw lock nut (1 ton series only)	102.97 – 127.49 (1050 – 1300) [75.97~ 94.061











Point Operations

[Point 1]

Disassembly: Measure the ring gear backlash and runout before starting disassembly.

1. Measure the ring gear backlash.

   Backlash:
   1.2 ton series: **0.2 – 0.3** mm **(0.008 – 0.012** in)
   3 ton series: **0.3 – 0.4** mm **(0.012 – 0.016** in)

2. Measure the ring gear runout (1 ton series only).

   Ring gear **runout** limit: **0.1** mm **(0.004** in)

[Point 2]

Inspection: Measure the thrust screw cap length.

   Standard length: **13.0** mm **(0.512** in)
   Limit length: **12.2** mm **(0.480** in)

Reassembly: Coat liquid packing (08826-00080) on the threaded portion of the thrust screw before reassembly.

Reassembly: Adjust the clearance between the thrust screw cap and rear face of the ring gear). (Fully tighten the thrust screw, and return it by 1/6 turn.)

   Clearance:
   0.2 – 0.3 mm **(0.008 – 0.012** in)

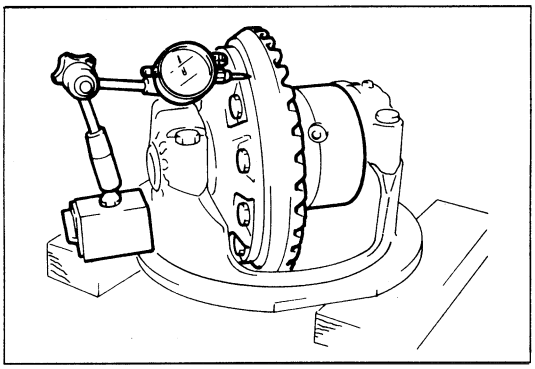
[Point 3]

Disassembly: Punch a match mark on the bearing cap and carrier.

Reassembly: Align the match marks on the bearing cap and carrier at the time of reassembly.

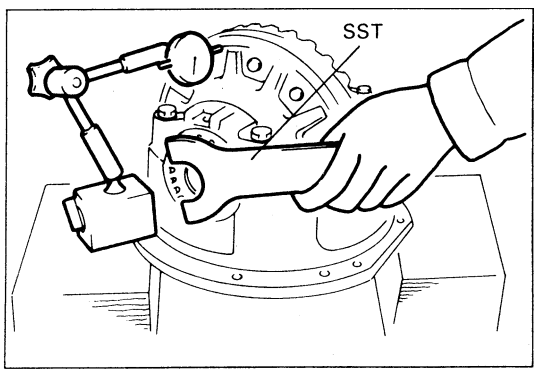
Reassembly: When tightening the bearing cap set bolt, temporarily tighten to the following torque first. After adjusting the side bearing starting force and ring gear backlash, tighten to the final tightening torque shown below.

   Temporary tightening:
   T = 19.61 N·m (200 kg-cm) [14.47 ft-lbl
   Final tightening:
   T = 117.68 – 137.29 N·m
   (1200 – 1400 kg-cm)
   [86.82 ~ 101.29 ft-lb]



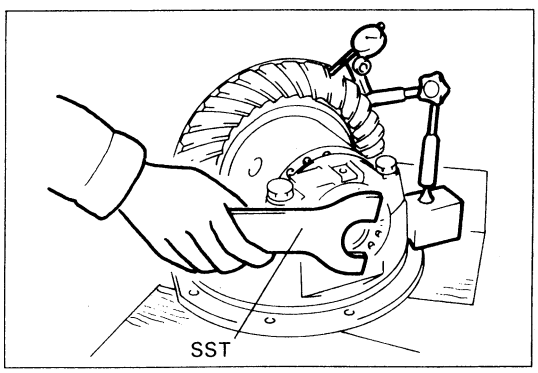
Reassembly: Make the following adjustments after installing the adjusting nut.

1. Adjust the side bearing starting force.
   (1) Set a dial gage on the rear face of the ring gear.



   (2) Tighten the adjusting nuts on both sides until the thrust clearance is eliminated.
   1.2 ton series: SST 09630-10110-71
   3 ton series: SST 09330-10170-71
   (3) Tighten the adjusting nuts on both sides one more notch each from the position where the thrust clearance becomes 0.

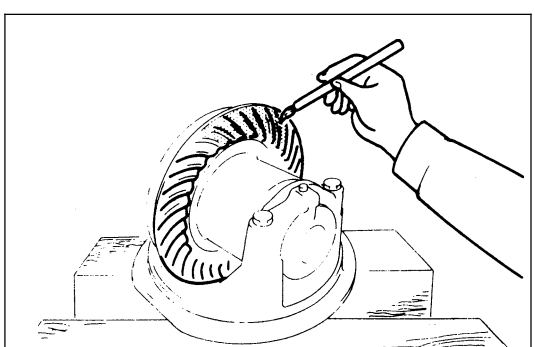
2. Adjust the backlash between the drive pinion and ring gear.
   (1) Set a dial gage into vertical contact with the ring gear tip surface.
   (2) For adjustment, move the differential case by loosening one adjusting nut by one notch while tightening the other by one notch until the backlash satisfies the following standard:

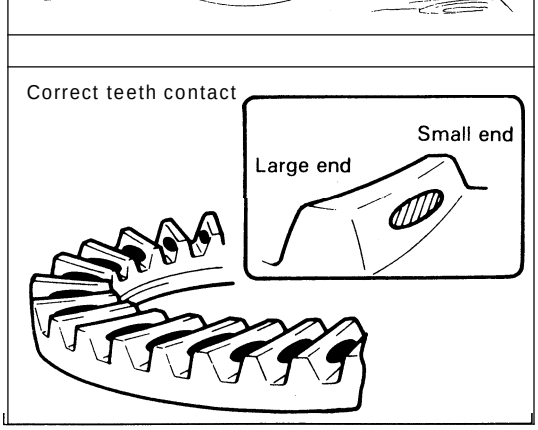


Backlash:
1·2 ton series: 0.2 – 0.3 mm (0.008 – 0.012 in)
3 ton series: 0.3 – 0.4 mm (0.012 – 0.016 in)

   (3) After backlash adjustment, tighten the side bearing adjusting nut on the ring gear side by 1.5 to 2 notches.

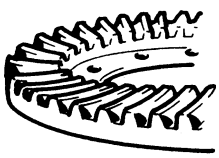
3. Check teeth contact between the drive pinion and ring gear.
   (1) Coat red lead thinly and uniformly on 7 to 8 teeth of the ring gear.
   Set a box wrench on the lock nut of the output gear and turn the ring gear several turns in the forward and in the reverse traveling directions.
   Check according to the teeth contact trace.
   If the teeth contact is incorrect, carry out drive pinion protrusion adjustment and ring gear backlash adjustment.



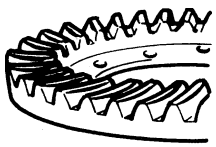


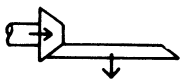
   (2) Correct teeth contact
   The teeth contact should be slightly on the small end side of the center of the tooth width as illustrated.

Heel contact



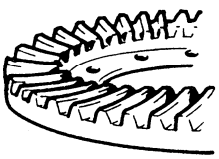
Face contact



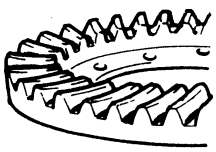


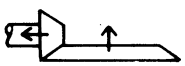
Decrease the drive pinion adjusting shim thickness to bring the pinion closer to the ring gear, and move the ring gear away from the pinion for backlash adjustment.

Toe contact

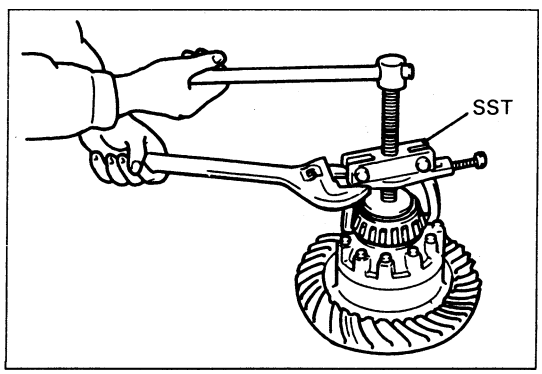


Flank contact



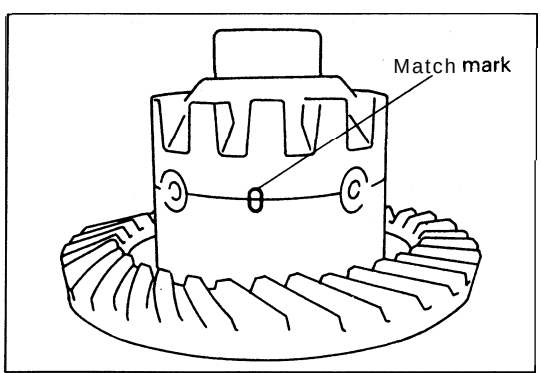


Increase the drive pinion adjusting shim thickness to bring the pinion away from the ring gear, and bring the ring gear closer to the pinion for backlash adjustment.



[Point 4]

Disassembly: SST 09950-20017

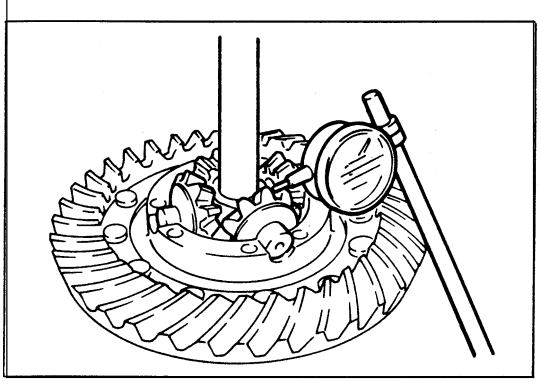


[Point 5]

Disassembly: Punch a match mark on the differential upper and lower cases.

Reassembly: Align the case match marks for reassembly.

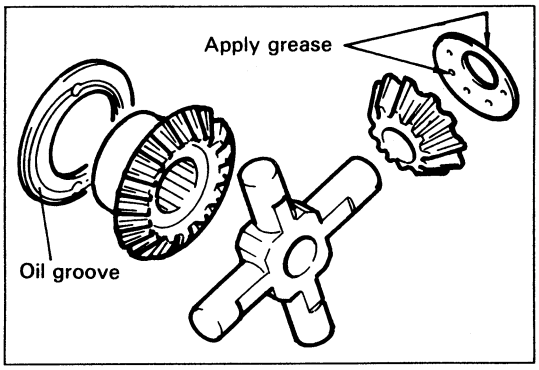
Reassembly: After washing and degreasing the female screw portion of the lower case, coat thread tightener (08833- 00070) on the threaded portion of the set bolts.



[Point 6]

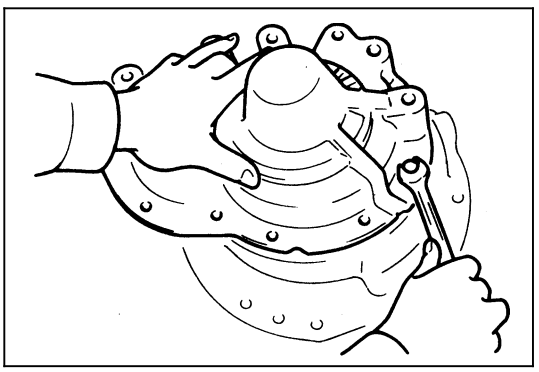
Inspection: Measure the backlash between the side gear and pinion gear.
Install the side gear and pinion gear on the case. Lightly push the spider to bring pinion gear and side gear close to the thrust washer for measurement.

Backlash:
0.2 - 0.3mm (0.008 - 0.012in)



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

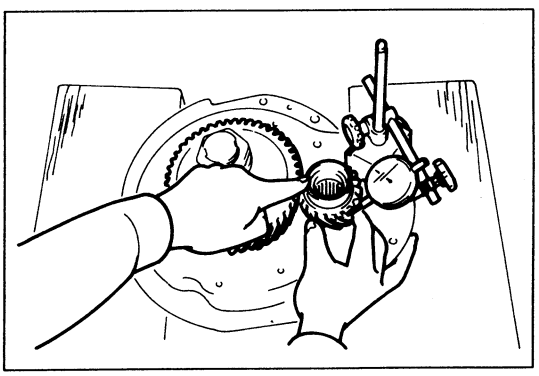
Reassembly: Coat chassis grease (molybdenum disulfide grease) uniformly on both sides of the spider pinion thrust washer before reassembly.



[Point 7]

Disassembly: Use the service bolt for removal.

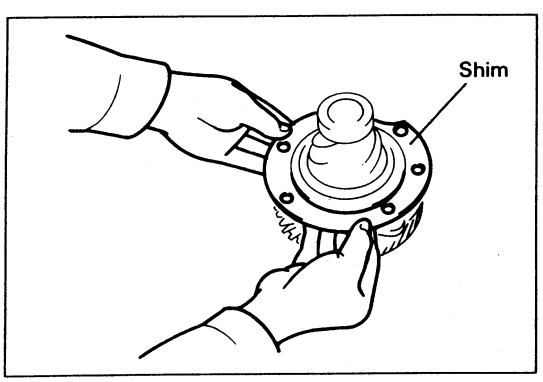
Service bolt size: M10 × 1.25



[Point 8]

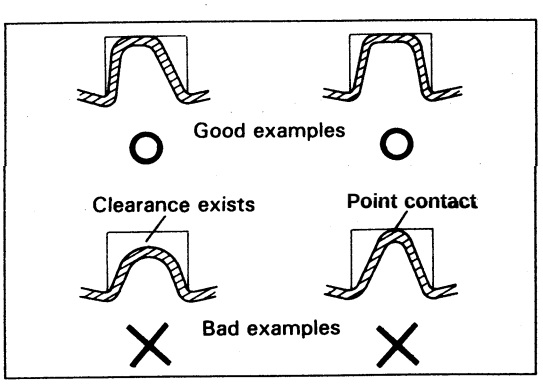
Inspection: Measure the backlash between the output gear and reduction gear.

Backlash:
0.1 – 0.2 mm (0.004 – 0.008 in)



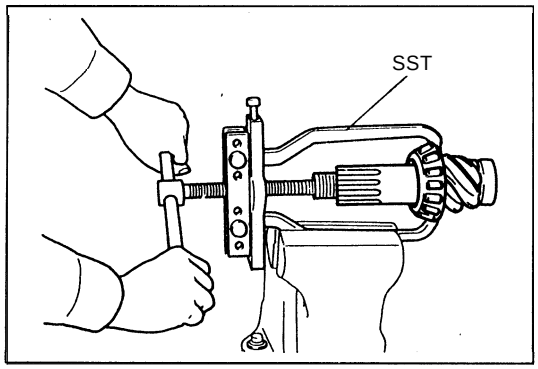
Reassembly: Adjust the drive pinion protrusion by means of the drive pinion bearing retainer shims. Select the shim by teeth contact inspection. (See Point 3.)

Shim thickness:
0.10·0.15·0.35 and 0.45 mm
(0.0039·0.0059·0.0138 and 0.0177 in)



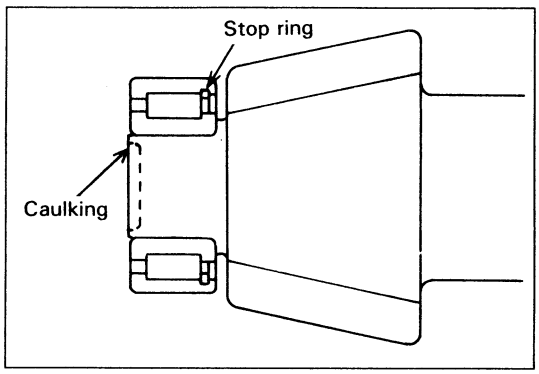
[Point 9]

Reassembly: After the end of teeth contact inspection and drive pinion protrusion adjustment, caulk the output gear lock nut.



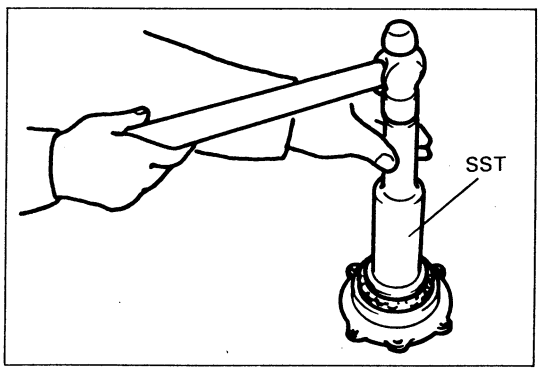
[Point 101

Disassembly: SST 09950-20017

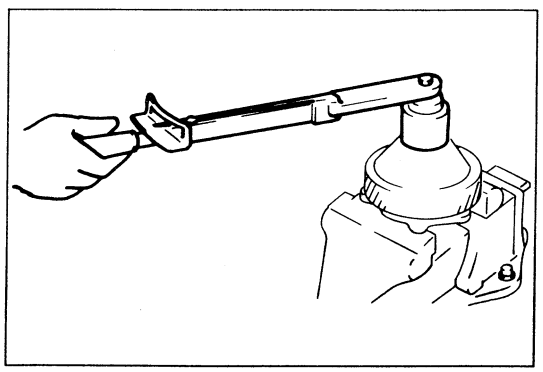


Reassembly: Never install the drive pinion pilot bearing in the wrong direction. The roller stop ring of the bearing shall be on the pinion side.

Reassembly: After installing the drive pinion pilot bearing, caulk the tip end of the drive pinion at 3 places.



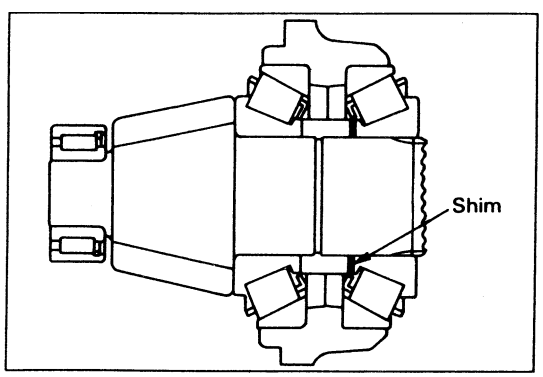
Reassembly: SST 09608-35014



Reassembly: Adjust the drive pinion bearing starting torque.

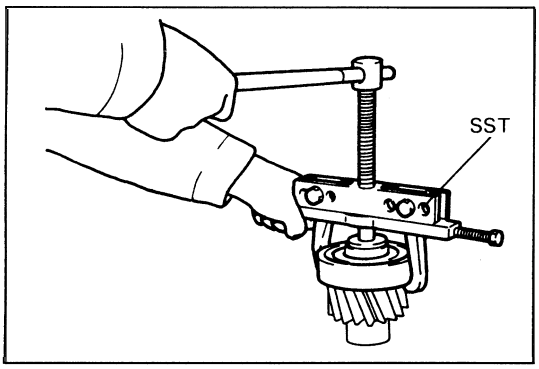
1. Install the output gear and tighten the lock nut to the specified torque.
2. Set a torque wrench on the lock nut, and measure the starting torque.

Starting torque:
1·2 ton series: 10.79 – 13.24 N·m (110 – 135 kg-cm) [7.96 ~ 9.77 ft-lb]
3 ton series: 11.28 – 13.73 N·m (115 – 140 kg-cm) [8.32 ~ 10.13 ft-lb]



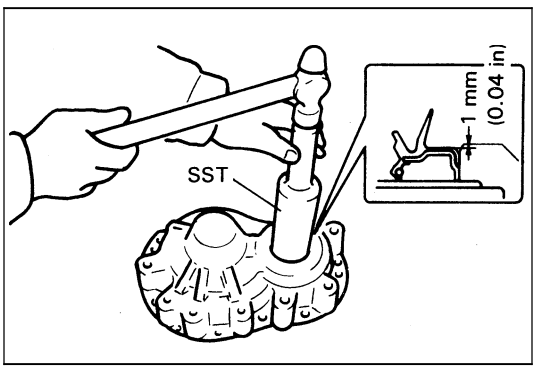
3. If the starting torque does not satisfy the standard make adjustment by changing the shim thickness.

Shim thickness:
0.03·0.10·0.15.0.35 and 0.45 mm (0.0012·0.0039·0.0059·0.0138 and 0.0177 in)



[Point 11]

Disassembly: SST 09950-20017



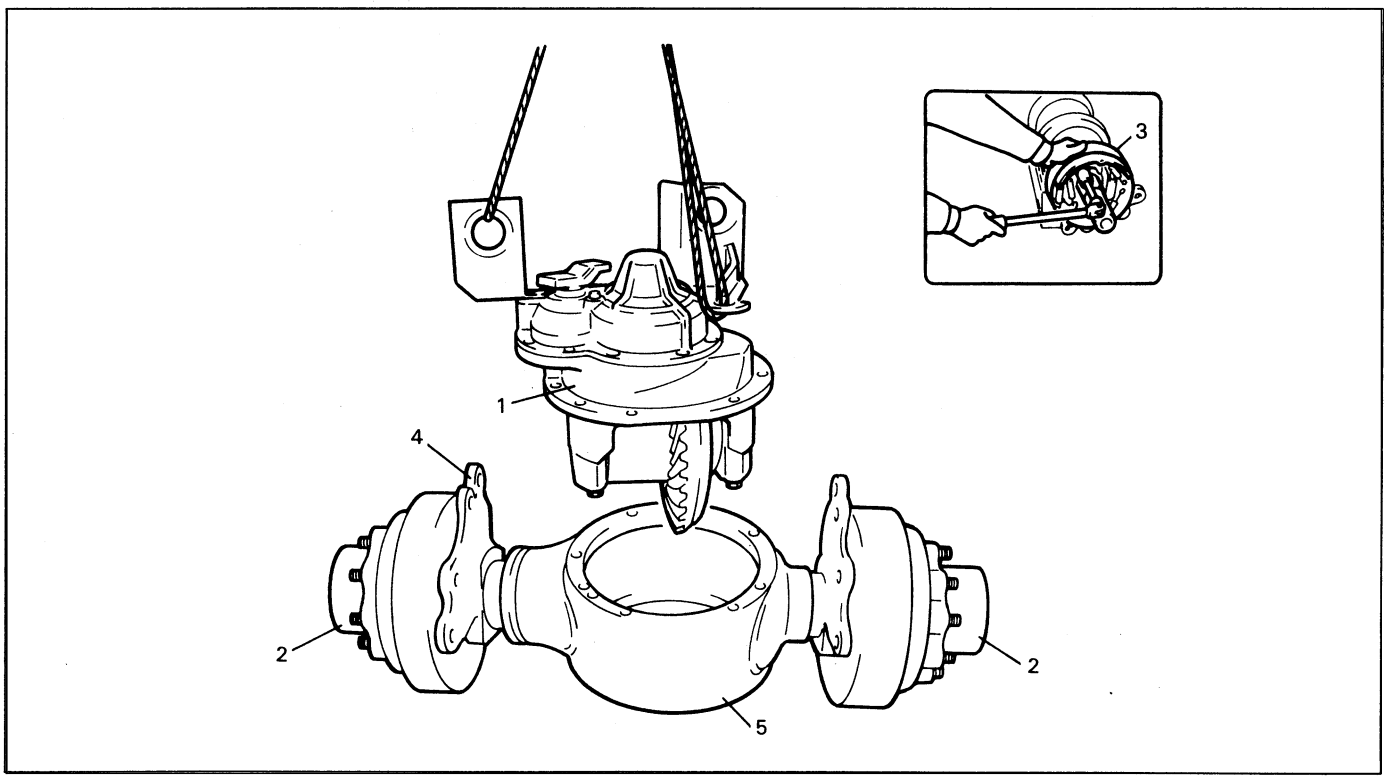
[Point 121

Reassembly: Use the SST to drive in the oil seal until it is flush with the carrier cover. Then use a proper driving rod and drive the oil seal in further to 1 mm (0.04 in) below the cover end face.
SST 09370-20270-71

Reassembly: Coat MP grease on the oil seal lip.

DIFFERENTIAL HOUSING

REMOVAL·INSTALLATION



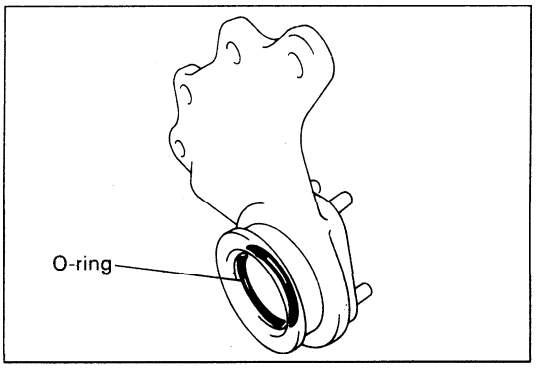
Removal Procedure

1. Remove the differential ASSY. (See page 6-8.)
2. Remove the front axle. (See removal procedure steps 7 and 8 in the front axle hub removal, installation section on page 7-9.)
3. Remove the brake ASSY.
4. Remove the axle bracket. [Point 1]
5. Remove the differential housing. [Point 21

Installation Procedure

The installation procedure is the reverse of the removal procedure.

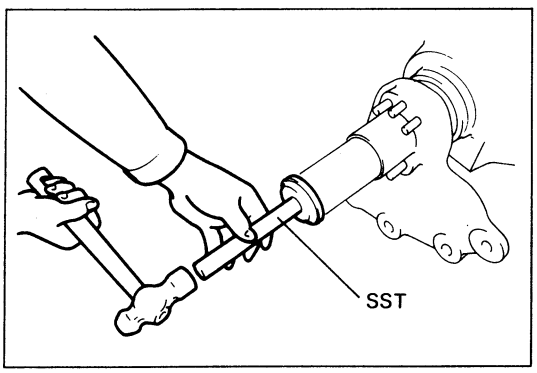
Note:
- See the note (page 6-9) for the differential ASSY removal procedure.
- Coat liquid packing (08826-00100) on the joint surfaces of the brake backing plate and axle bracket.
- Brake ASSY set nut (backing plate self lock nut) tightening torque T = 117.68 - 137.29 N·m (1200 - 1400 kg-cm) [86.82 - 101.29 ft-lb]
- After installation, adjust the brake performance. For adjustment, make the vehicle travel in the forward and reverse directions about 10 times each. Drepress the brake pedal each time for stopping the vehicle. (This operation is especially required when the brake auto adjuster is moved to the shortening side.)



[Point 1]

Removal: Remove the axle bracket on the right side.
The axle bracket on the left side cannot be removed because of the welded structure.

Installation: Coat grease on the entire periphery of the O-ring before reassembly.



[Point 2]

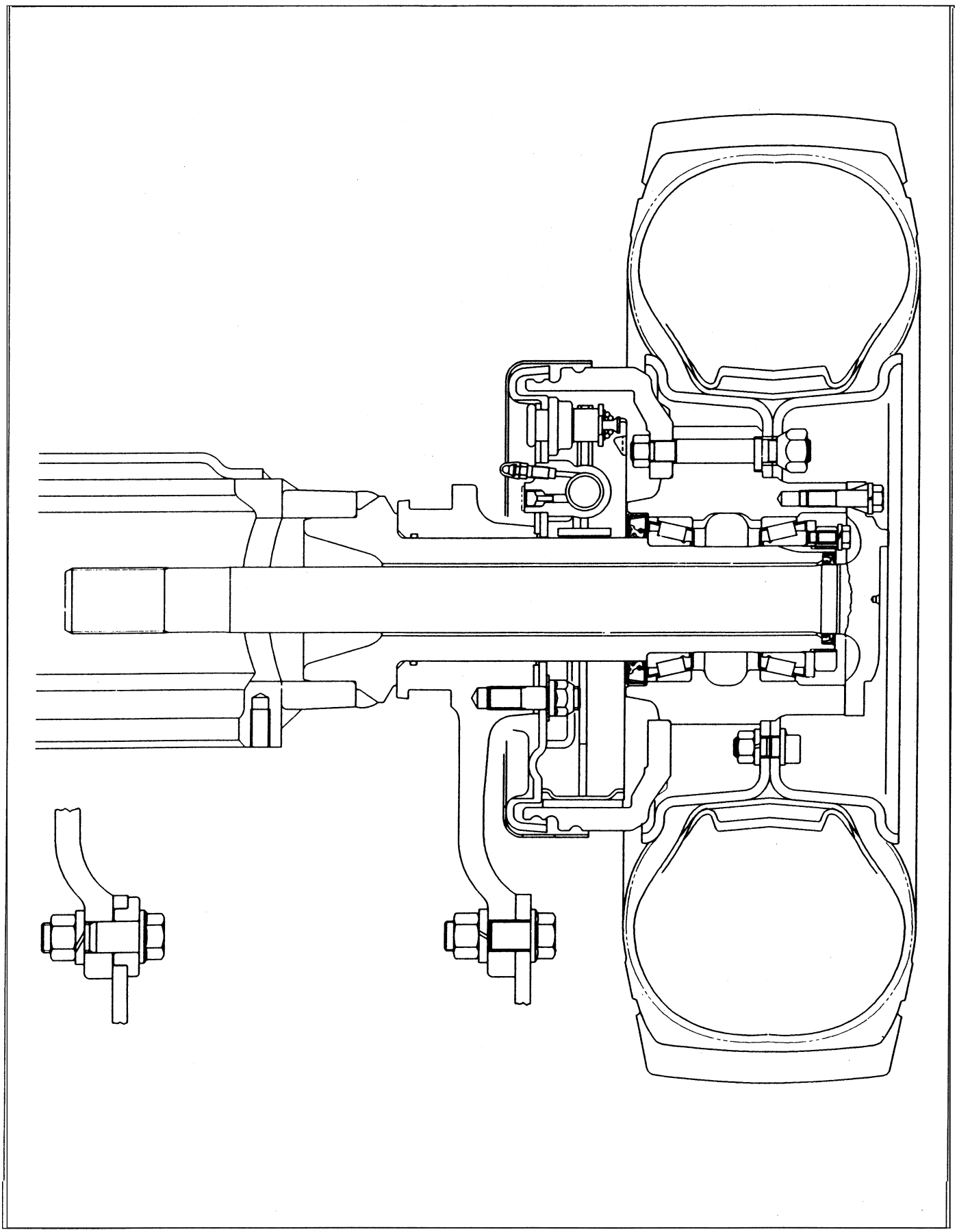
Installation: Install the oil seal on the differential housing
SST 09608-35014

Installation: Coat MP grease on the oil seal lip.

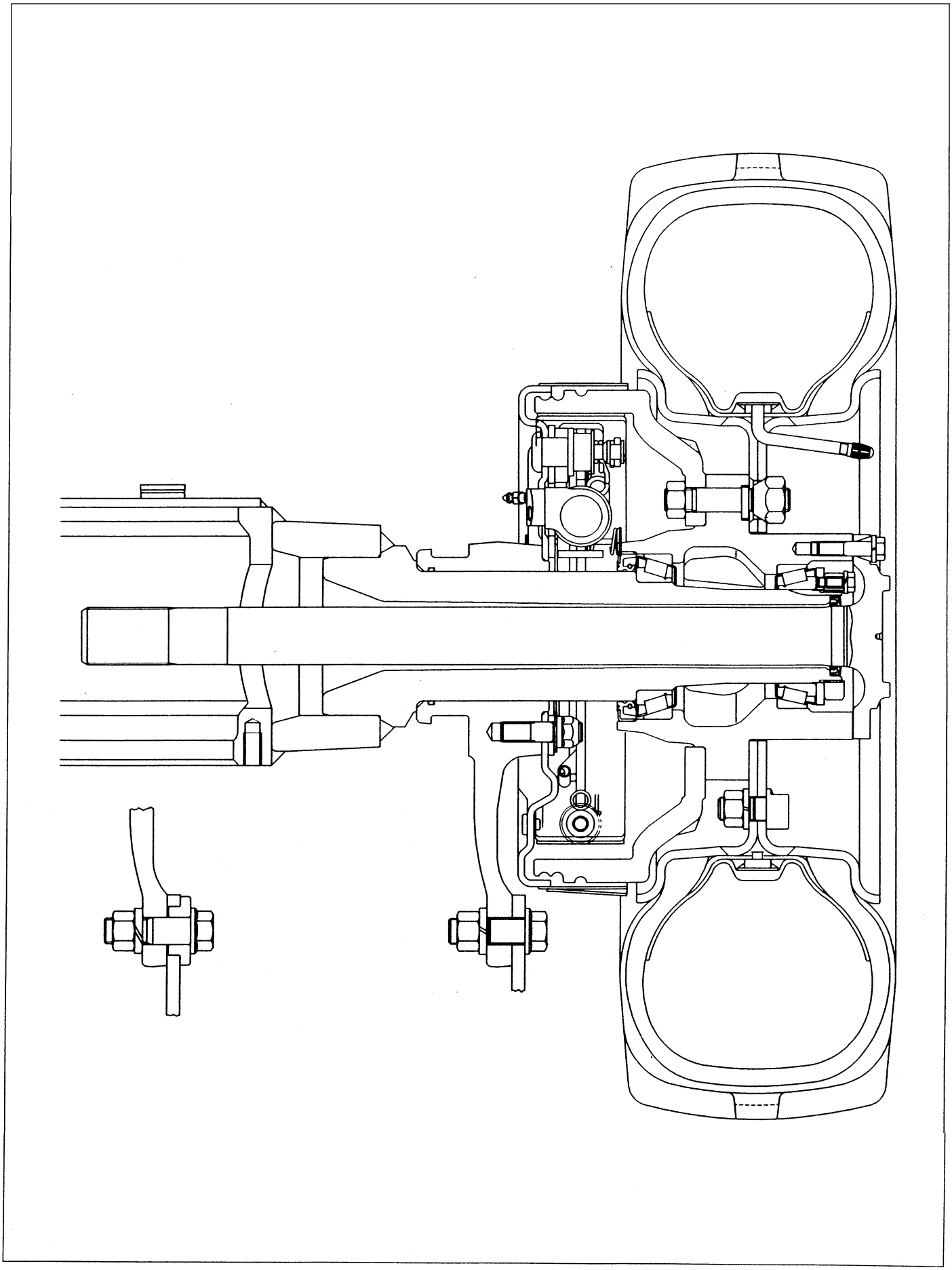
FRONT AXLE

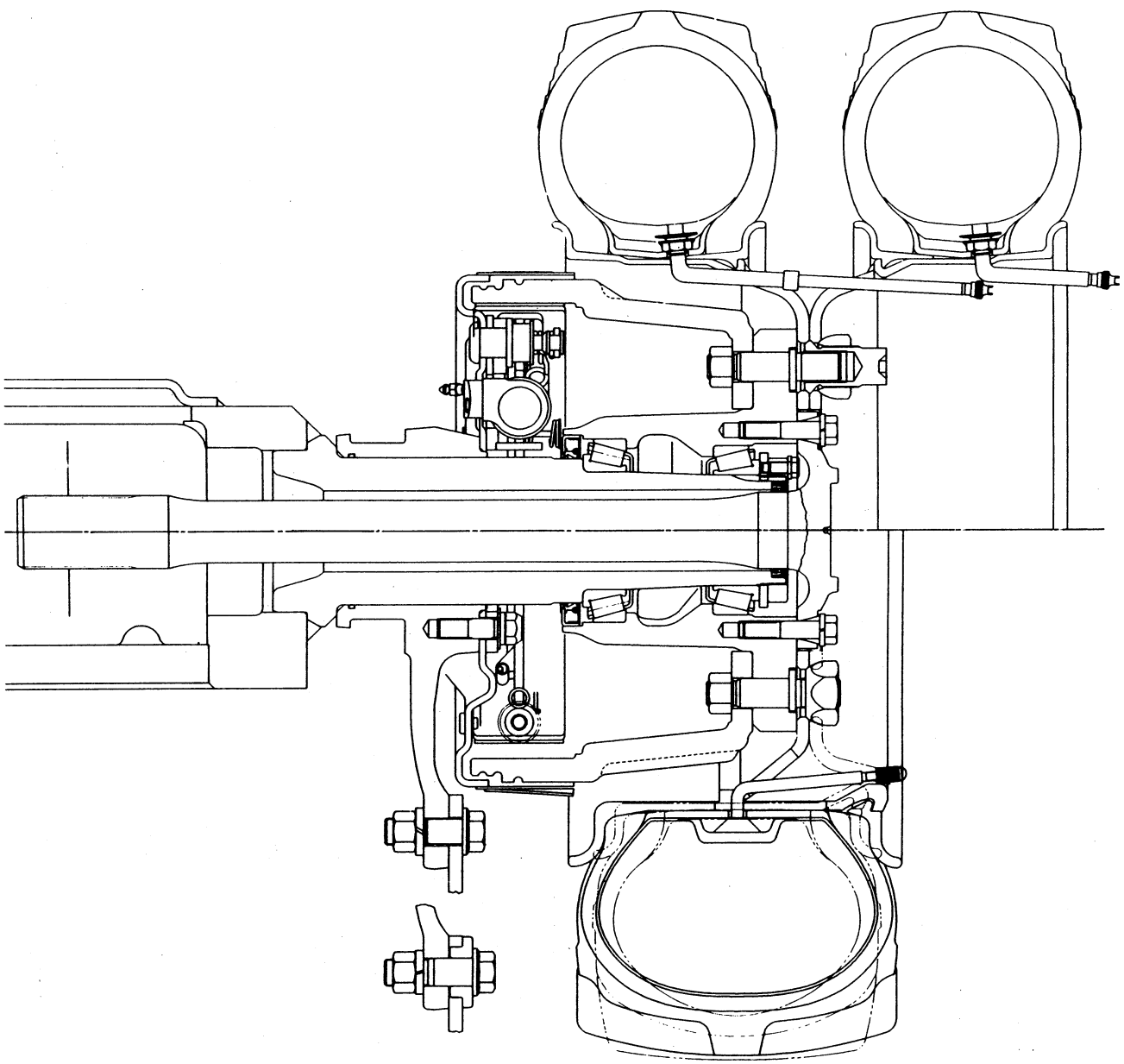
GENERAL

1 ton series



2 ton series





SPECIFICATIONS

Item \ Vehicle model		1 ton series	2 ton series	3 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)
Wheel (STD)	Tire size	1.0·1.35 ton: 6.00-9-10PR(I) 1.5·1.75 ton: 6.50-10-10PR(I)	7.00-12-12PR(I)	2.75 ton: 28X8-15-12PR(I) 3.0 ton: 28X9-15-12PR(I)
	Rim size	1.0.1.35 ton: 4.00E x 9DT 1.5.1.75 ton: 5.00F x 1ODT	5.00S × 12DT	2.75 ton: 6.00S x 151R 3.0 ton: 7.00T × 151R
	Inflating pressure kPa (kg/cm²) [psi]	686 (7.0) [100]	←	←

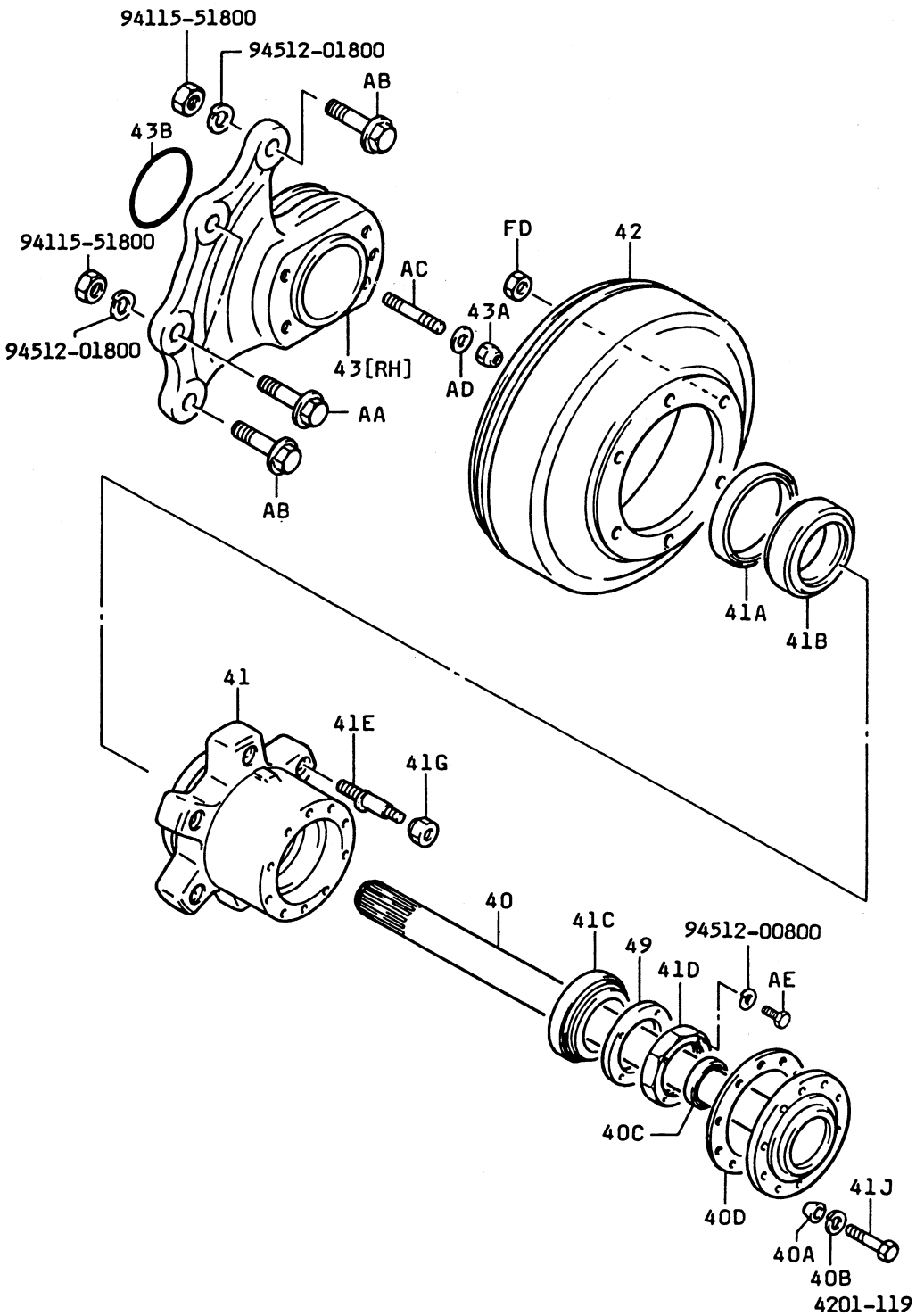
Tire inflating pressure

- The inflating pressure for the optional tire size 21 x 8-9-10PR(I) is 612.9 kPa (6.25kg/cm²) [88.9 psi]. It is 686 kPa (7.0 kg/cm²) [100 psi] for all other optional tires (excluding radial tires).
- The inflating pressure for radial tires is always 883 kPa (9.0 kg/cm²) [128 psi] irrelevant to the tire size.

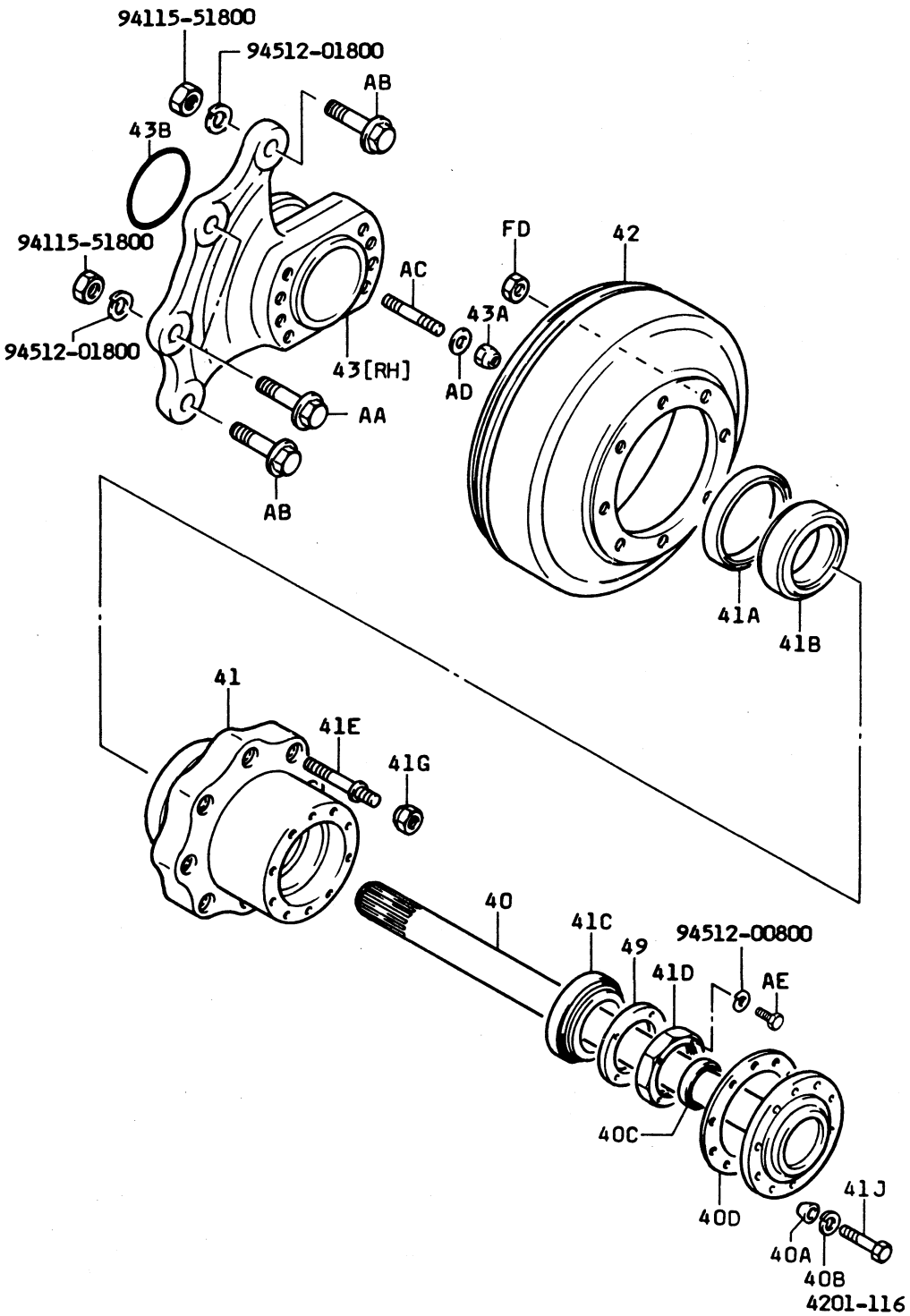
COMPONENTS

1 ton series

4201

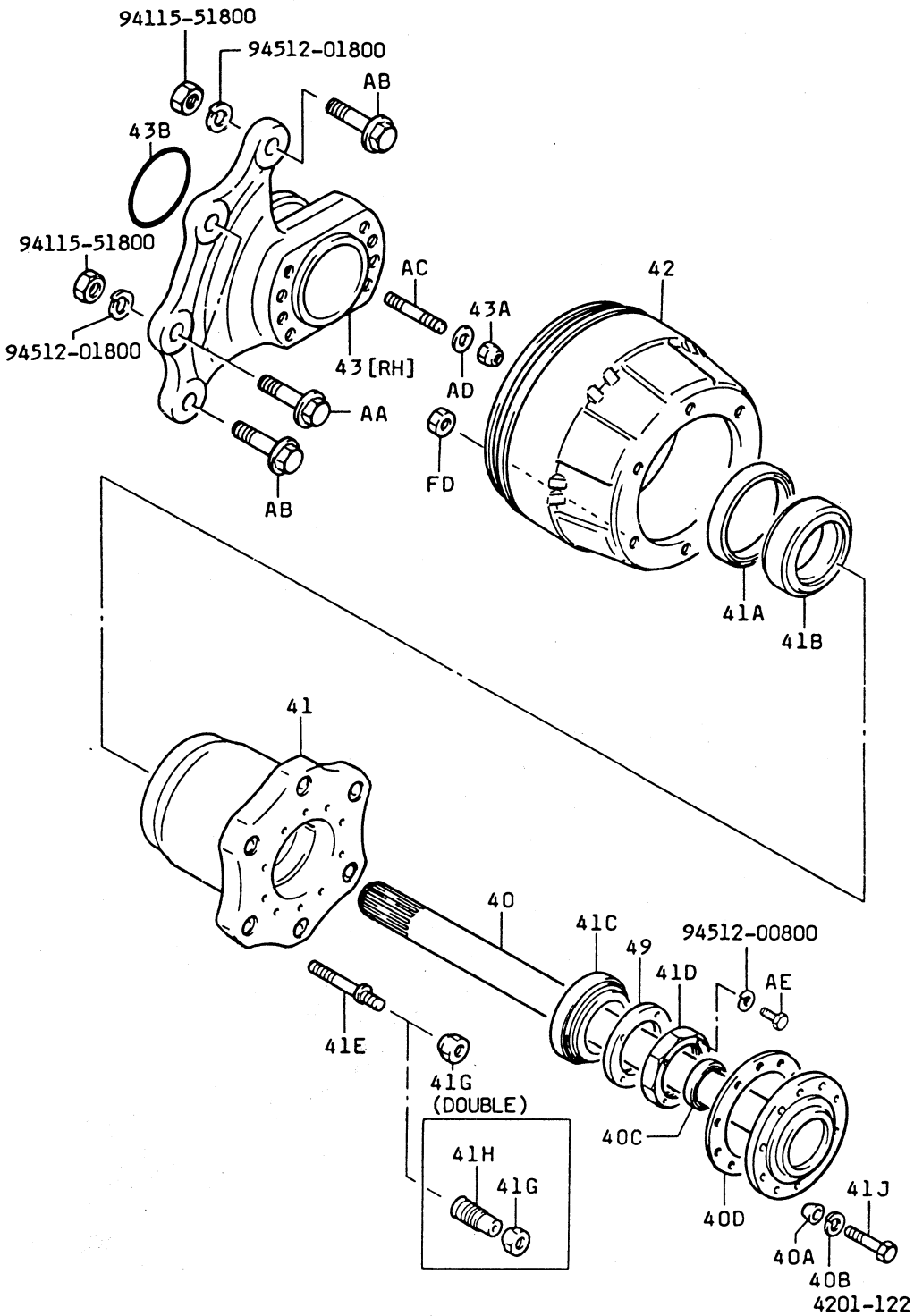


4201


94115-51800
94512-01800
AB
43B
94115-51800
94512-01800
43[RH]
AA
AB
AC
FD
42
43A
AD
41A
41B
41
41E
41G
40
41C
49
94512-00800
41D
AE
40C
40D
41J
40A
40B
4201-116

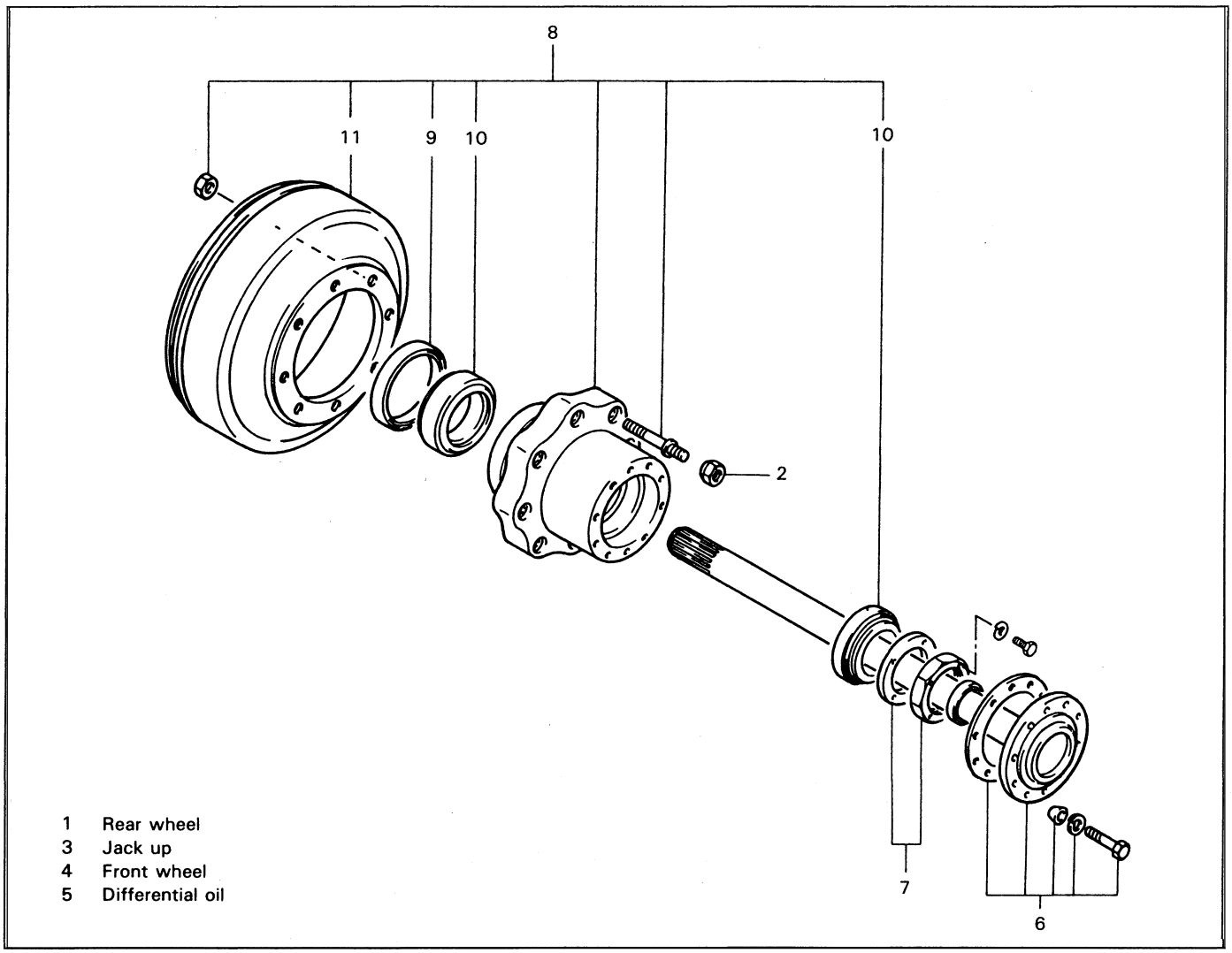
3 ton series

4201



FRONT AXLE SHAFT·HUB

REMOVAL·INSTALLATION



Removal Procedure

1 Check the rear wheels.

2 Loosen the front wheel hub nuts.

3 Jack up the frame and support its bottom with a stand or wooden blocks.

4 Remove the front wheels. **[Point 1]**

5 Drain differential oil.

6 Remove the axle shaft. **[Point** 21

7 Remove the bearing lock nut and lock nut plate. **[Point** 31

8 Remove the front axle hub W/brake drum. **[Point 41**

9 Remove the oil seal. **[Point 51**

10 Remove the bearing.

11 Disconnect the brake drum.

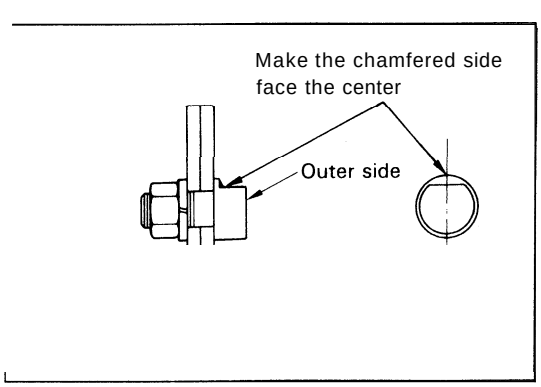
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat thread tightener (08833-00070) on the brake drum set nut before tightening.**
- **Adjust the braking performance after installation. Make the vehicle travel in the forward and reverse directions about 10 times and depress the brake pedal to stop the vehicle each time.**
- **The tightening torque for each portion is as follows:**

Unit: N·m (kg-cm) [ft-lb]

Brake drum set nut (hub bolt set nut)	1 ton series: 68.65 – 88.26 (700 – 900) [50.65 ~ 86.821 2 ton series: 147.10 – 186.33 (1500 – 1900) [108.53 ~ 137.471 3 ton series: 166.71 – 205.94 (1700 – 2100) [123.00 ~ 151.94]
Bearing lock nut stopper bolt	14.71 – 21.57 (150 – 220) [10.85 ~ 15.921
Axle shaft set bolt	1.2 ton series: 68.65 – 88.26 (700 – 900) [50.65 ~ 86.821 3 ton series: 98.07 – 127.49 (1000 – 1300) [72.35 ~ 94.061
Combination rim set nut (1·2 ton series only)	1 ton series: 49.03 – 68.65 (500 – 700) [36.18 – 50.651 2 ton series: 117.68 – 176.52 (1200 – 1800) [86.82 ~ 130.231
Hub nut (single tire)	1 ton series (divided rim): 107.87 – 196.13 (1100 – 2000) [79.59 ~ 144.701 1 ton series (side ring rim): 176.52 – 392.27 (1800 – 4000) [130.23 ~ 289.401 2 ton series: 176.52 – 392.27 (1800 – 4000) [130.23 – 289.401 3 ton series: 294.20 – 588.40 (3000 – 6000) [217.05 – 434.101
Hub nut (double tire)	1 ton series: Inside: 176.52 – 392.27 (1800 – 4000) [130.23 – 289.401 Outside: 176.52 – 392.27 (1800 – 4000) [130.23 – 289.401 2 ton series: Inside: 176.52 – 392.27 (1800 – 4000) [130.23 – 289.401 Outside: 176.52 ~ 392.27 (1800 – 4000) [130.23 – 289.401 3 ton series: Inside: 294.20 – 588.40 (3000 – 6000) [217.05 ~ 434.101 Outside: 294.20 – 588.40 (3000 – 6000) [217.05 – 434.101



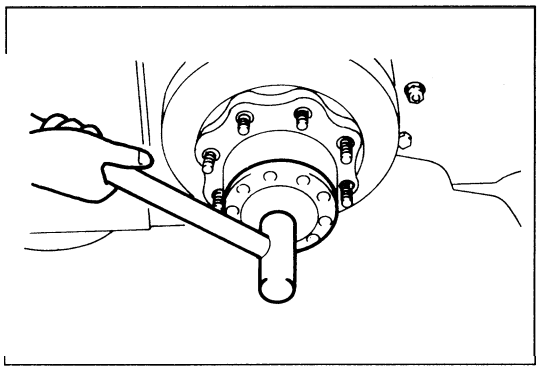
Point Operation

[Point 1]

Installation: In case of a divided rim wheel, install it, with the head of the divided rim set bolt on the outer side of the vehicle.

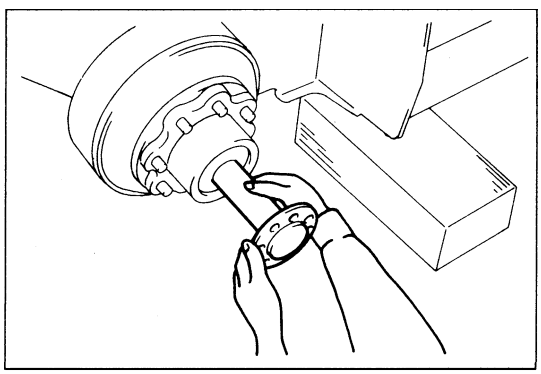
Disassembly: When a wheel is removed for disassembly, always discharge air fully before starting disassembly.

Reassembly: The divided rim set bolt shall be installed with its head chamfered side facing the center of the wheel.

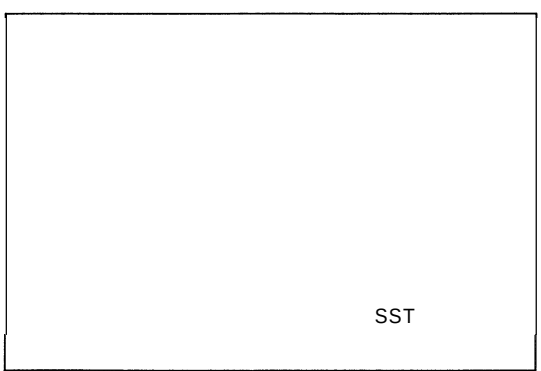


[Point 2]

Removal: After removing the axle shaft set bolts, lightly tap the center of the axle shaft flange with a copper hammer for easy removal.



Removal~installation: Carefully operate so as not to damage the oil seal.



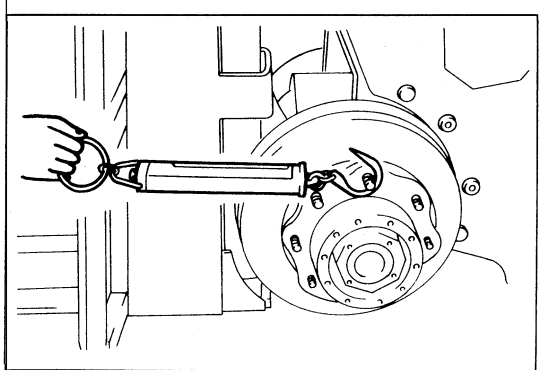
[Point 3]

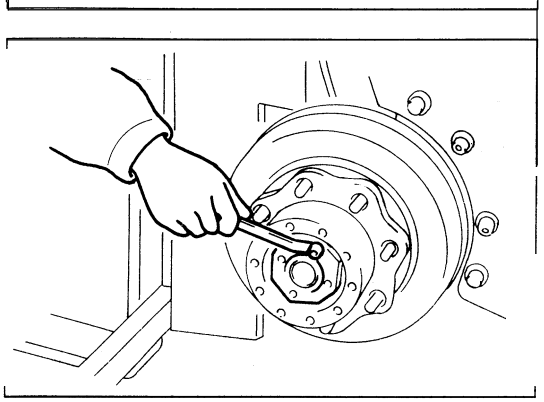
Removal·installation: 1.2 ton series SST 09509-55020
3 ton series SST 09509-55030

Installation: Adjust the front axle bearing starting torque.

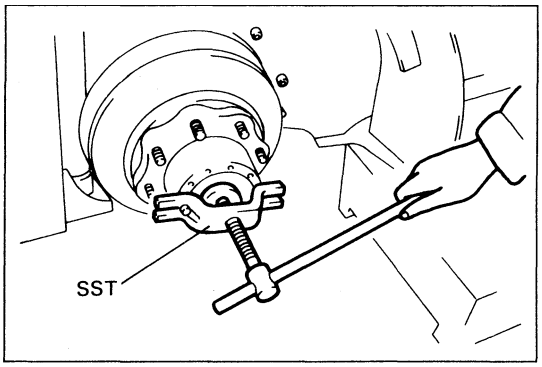
1. Fully tighten the bearing lock nut, rotate the hub by 4 to 5 turns. Then loosen the lock nut by 1/12 to 1/6 turn and rotate the hub by 4 to 5 turns again.
2. Set a spring scale on the hub bolt and measure the starting force.

Starting force
1 ton series hub for divided rim:
25.5 – 72.6N (2.6 – 7.4 kg) [5.7 – 16.3 lb]
1 ton series hub for side ring rim:
32.4 – 92.2 N (3.3 – 9.4 kg) [7.3 ~ 20.7 lb]
2.3 ton series:
25.5 – 72.6 N (2.6 – 7.4 kg) [5.7 – 16.3 lb]



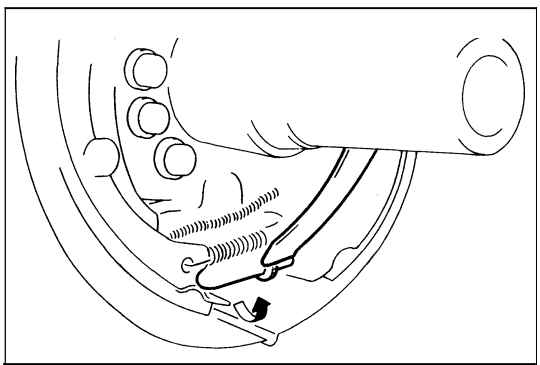


3. If the measured value does not satisfy the standard above, make adjustment by tightening or loosening the lock nut.
4. Align the lock nut plate stopper hole with the lock nut threaded hole.
5. Coat thread tightener (08833-00070) on the lock nut stopper bolt, and tighten it.

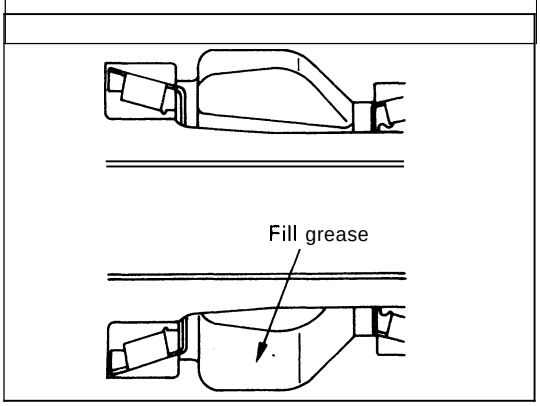


[Point 4]

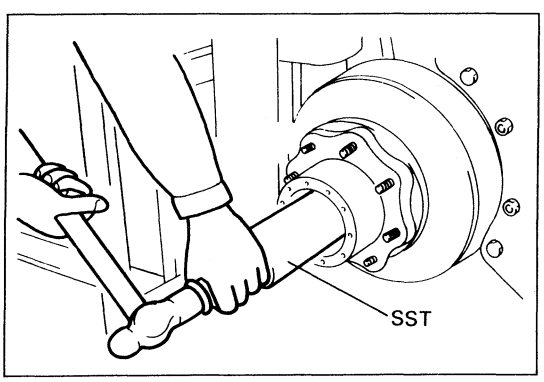
Removal: SST 09310-10160-71



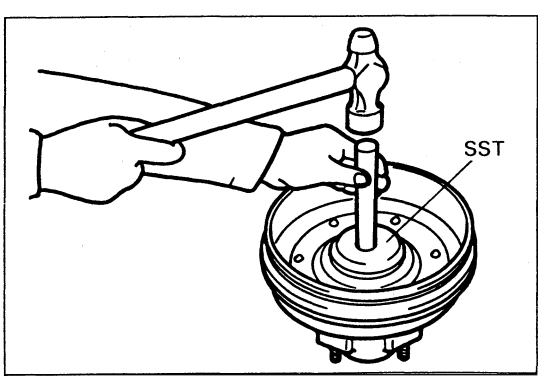
Installation: Turn the brake auto adjuster screw to contract the brake shoe slightly for easier brake drum installation.



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 ton series SST 09421-33020-71

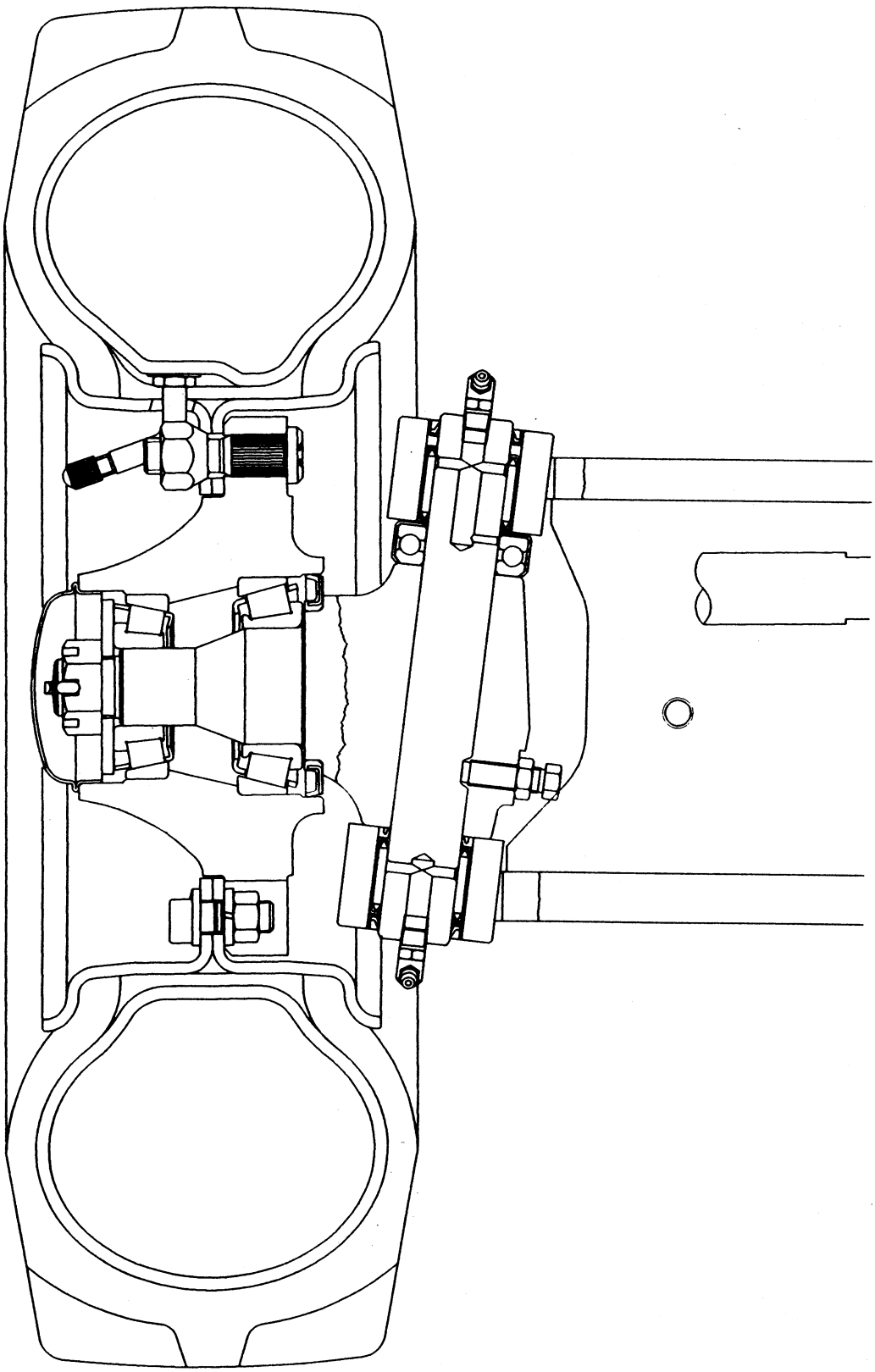


[Point 5]

Installation: SST 09608-35014
Installation: Coat grease on the oil seal lip.

REAR AXLE

GENERAL



SPECIFICATIONS

Item \ Vehicle model		1 ton series	2 ton series	3 ton series
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°		
	Caster degree	0°		
	King pin angle	6°		
Minimum turning radius (outermost) mm (in)		1.0 ton : 1880 (74.02) 1.35 ton: 1920 (75.59) 1.5 ton : 1960 (77.17) 1.75 ton: 1980 (77.95)	2.0 ton : 2170 (85.43) 2.25 ton: 2200 (86.61) 2.5 ton : 2240 (88.19)	2.75 ton: 2370 (93.31) 3.0 ton : 2400 (94.49)
Wheel (STD)	Tire size	5.00-8-8PR(I)	6.00-9-10PR(I)	6.50-10-10PR(I)
	Rim size	8 x 3.00D DT	6 x 4.00E DT	10 × 5.00F DT
	Inflating pressure kPa(kg/cm²) [psi]	785 (8.0) [114]	686 (7.0) [100]	760.0 (7.75) [110.21

Tire inflating pressure list

○: Provided

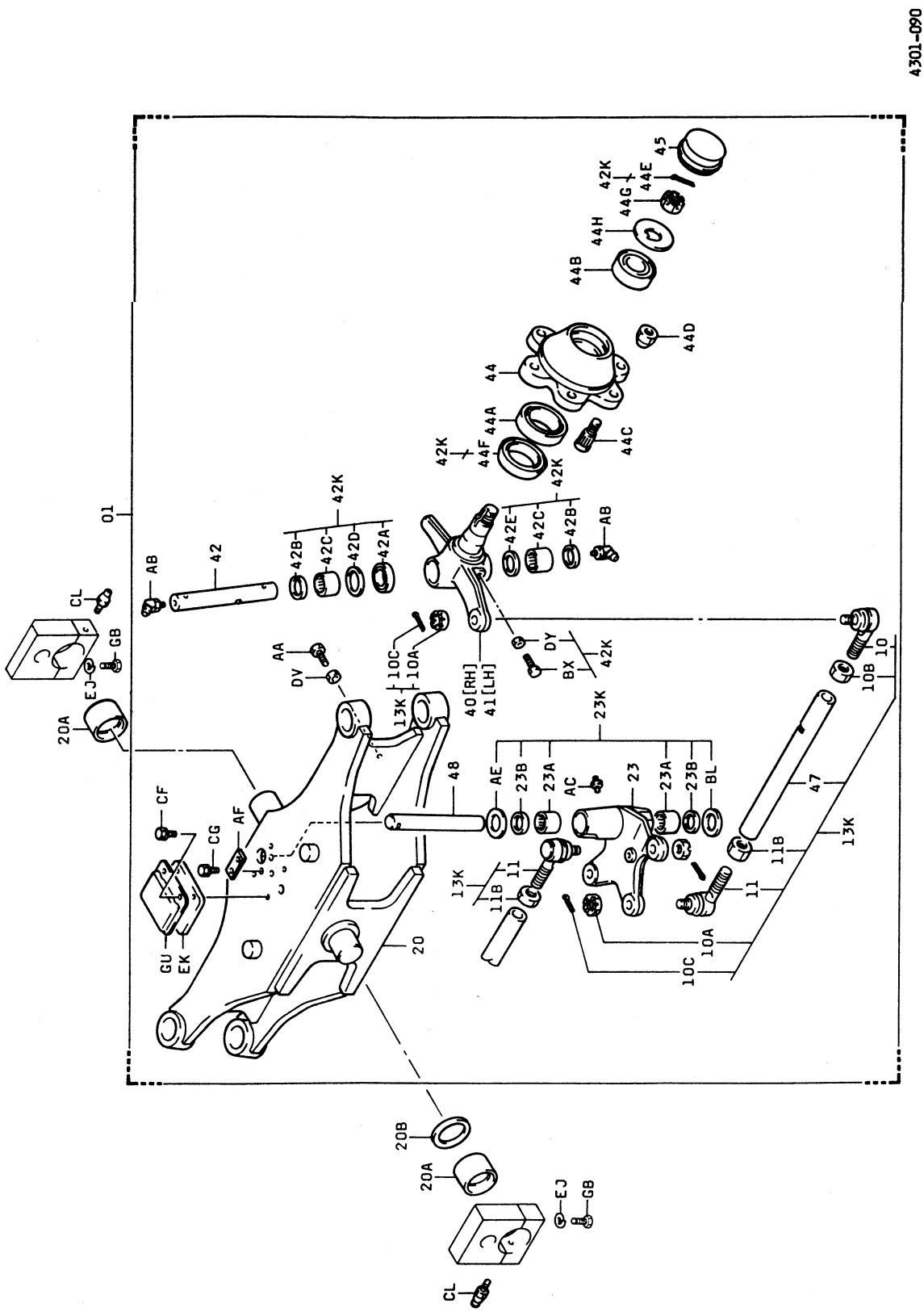
Applicable vehicle model					Tire size	Rim type	Inflating pressure kPa (kg/cm²) [psil
1 ton series	1.0 ton	1.35 ton	1.5 ton	1.75 ton			
	⊙	⊙	⊙	⊙	5.00-8-8PR(I)	Divided	785 (8.0) [114]
						Side ring	↑
2 ton series	2.0 ton	2.25 ton	**2.5** ton				
	O	O	⊙		6.00-9-10PR(I)	Divided	686 (7.0) [1001
	○					Side ring	↑
		⊙	⊙			Side ring	834 (8.5) [121]
			○		6.50-10-10PR(I)	Divided	686 (7.0) [100]
						Side ring	↑
3 ton series	2.75 ton	3.0 ton					
	○	○			6.50-10-10PR(I)	Divided	760.0 (7.75) [110.21
						Side ring	↑
	○	○			6.50-10-12PR(I)	Side ring	883 (9.0) [128]

(Note) The inflating pressure for radial tires is 883 kPa (9.0 kg/cm²) [128 psil irrelevant to the tire size.

8

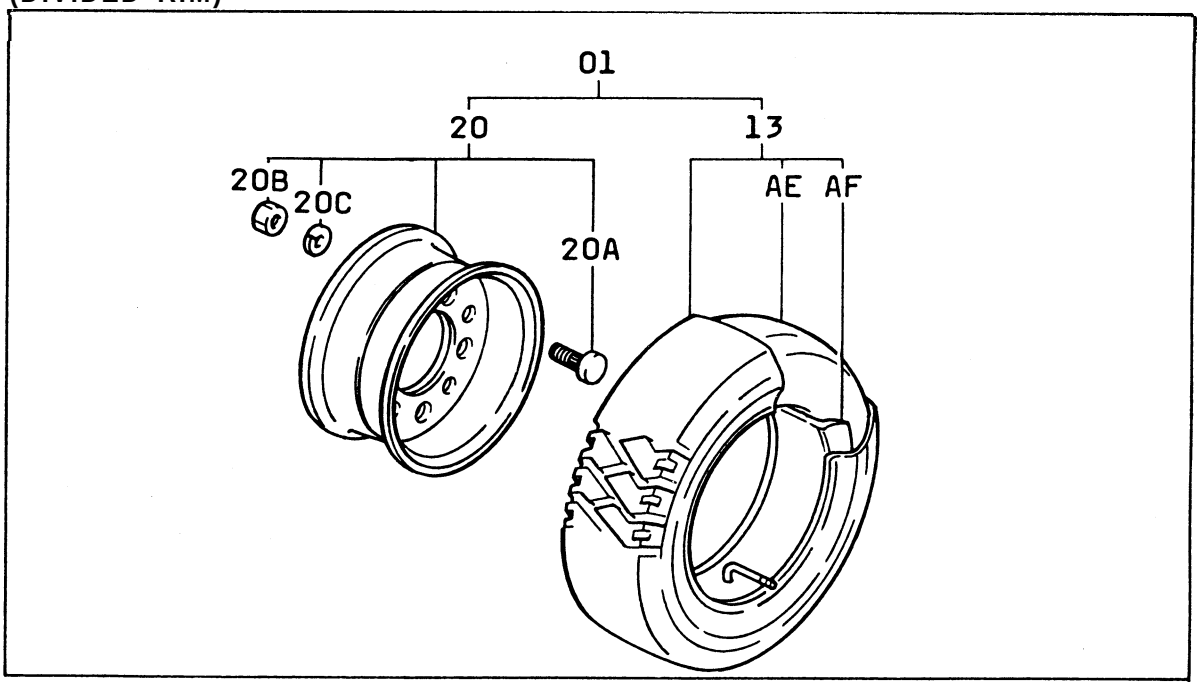
COMPONENTS

4301

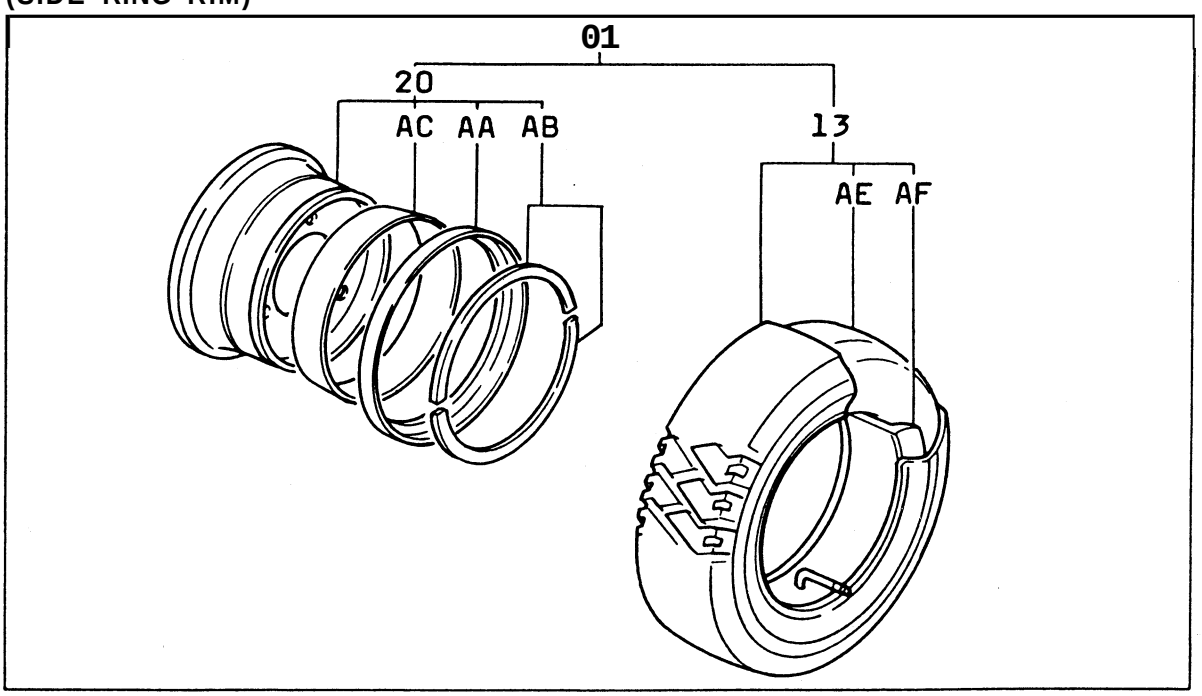


4403

(DIVIDED RIM)



(SIDE RING RIM)

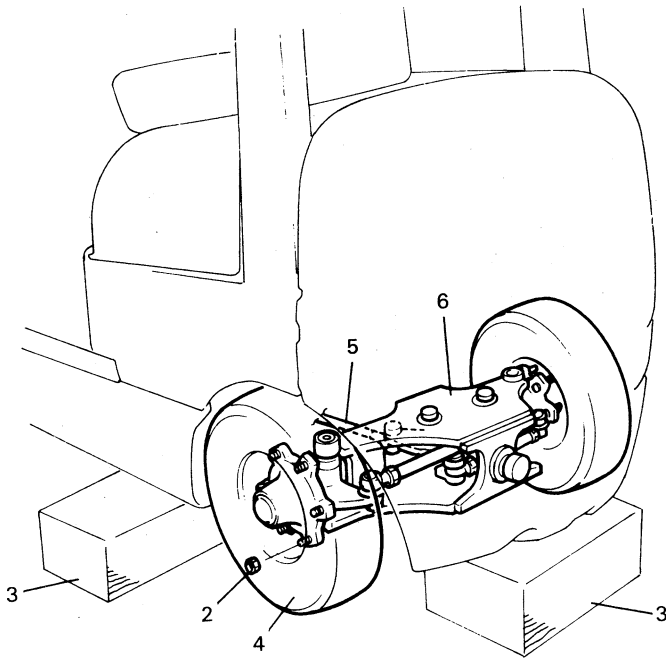


4403-075A

8

REAR AXLE ASSY

REMOVAL·INSTALLATION



1 Front wheel
7 Rear axle center pin bush

Removal Procedure

1 Check the front wheels.

2 Loosen the rear wheel hub nuts.

3 Jack up the frame and support it with a stand or wooden blocks.

4 Remove the rear wheels.

5 Disconnect the power cylinder rod end. **[Point** 11

6 Remove the rear axle ASSY. **[Point** 21

7 Remove the rear axle center pin bush. **[Point** 31

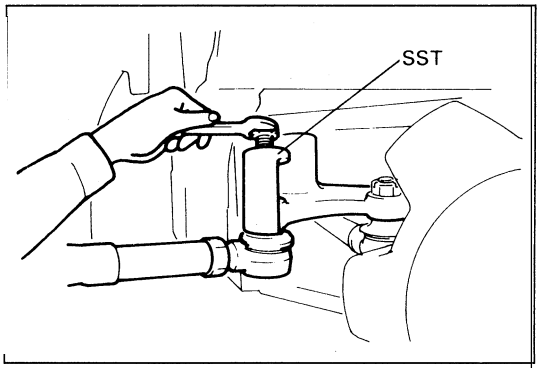
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Supply grease through each grease fitting after installation.**
- **The tightening torque for each portion is as follows:**

Unit: N·m (kg/cm)[ft-lb]

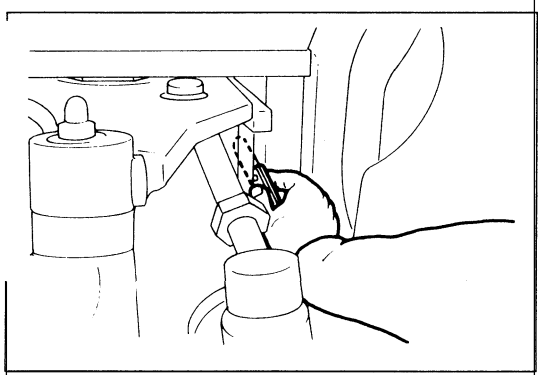
Axle bracket cap set bolt	117.68– 166.71 (1200–1700) [86.82 ~ 123.00]
Rear axle damper set bolt	186.33 ~ 304.01 (1900 ~ 3100) [137.47 ~ 224.291
Hub nut	See page 8-13.



Point Operations

[Point 1]

Removal: **SST** 09430-23600-71



[Point 2]

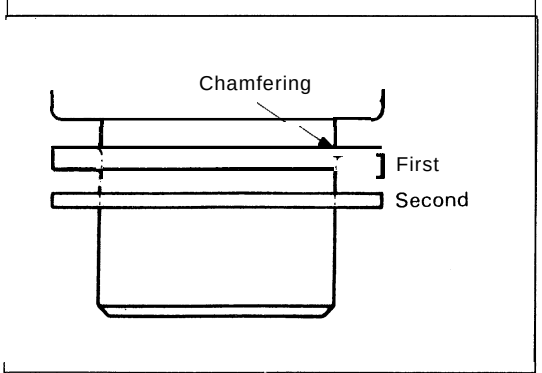
Inspection: Measure the rear axle front to rear clearance.

1. Before removing the rear axle ASSY, measure the front to rear clearance on the rear side.

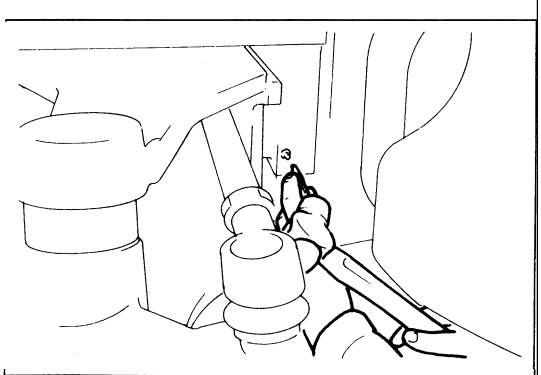
   Standard clearance: 0.5 mm (0.020 in) or less

2. If the measured value does not satisfy the standard, remove the rear axle ASSY and make adjustment by selecting the spacer.

   Spacer thickness:
   3.0·3.5·4.0·4.5·5.0 and 5.5 mm
   (0.118.0.138.0.157.0.177.0.197 and 0.217 in)



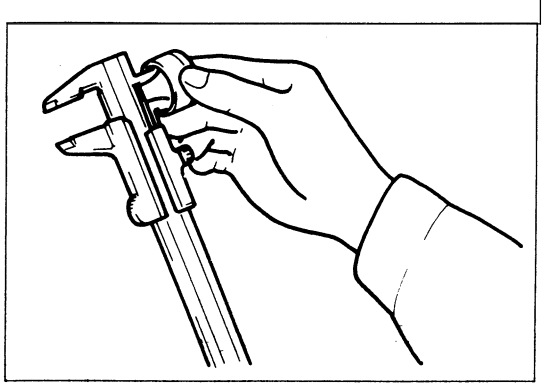
3. Install the spacer at the rear side center pin.
   The first spacer shall be installed with its chamfered at the inside diameter in contact with the center pin boss.



Removal: Punch different match marks on the rear axle bracket caps front and rear to prevent confusion.

Removal: Remove the rear axle bracket cap while supporting the rear axle ASSY with a garage jack.

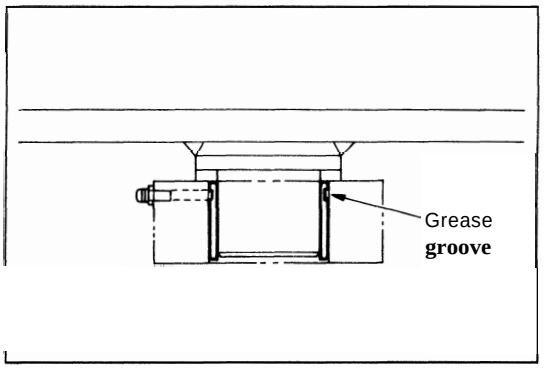
Installation: Install after aligning the match mark.



[Point 3]

Inspection: Measure the inside diameter of the rear axle center pin bushing.

Limit inside diameter: 52.0 mm (2.047 in)

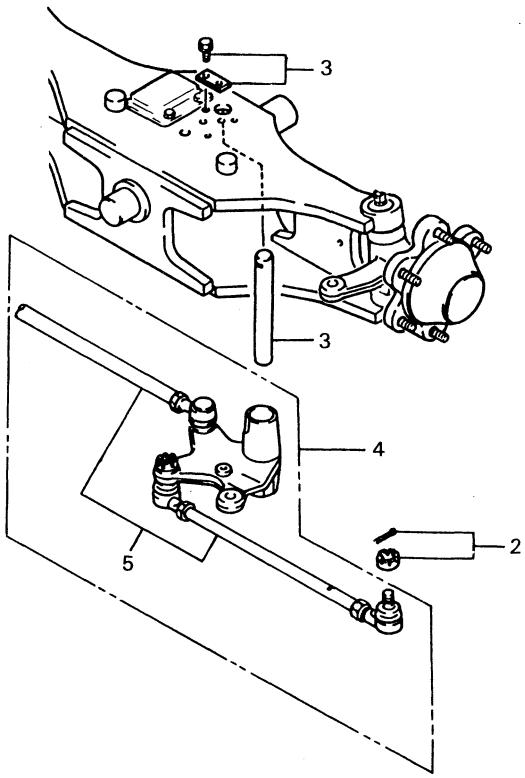


Installation: Coat MP grease on the bush before installation.

Installation: Install the bush with its grease groove facing the grease fitting hole in the bracket cap.

BELL CRANK·TIE ROD

REMOVAL·INSTALLATION



1 Rear axle ASSY
6 Bearing,oil seal

Removal Procedure

1 Remove the rear axle ASSY. (See page 8-6.)

2 Disconnect the tie rod end (on the steering knuckle side). **[Point** 11

3 Remove the bell crank pin. **[Point** 21

4 Remove the bell crank W/tie rod. **[Point 3]**

5 Disconnect the tie rod end, and remove the tie rod. **[Point 4]**

6 Remove the bearing and oil seal from the bell crank. **[Point 5]**

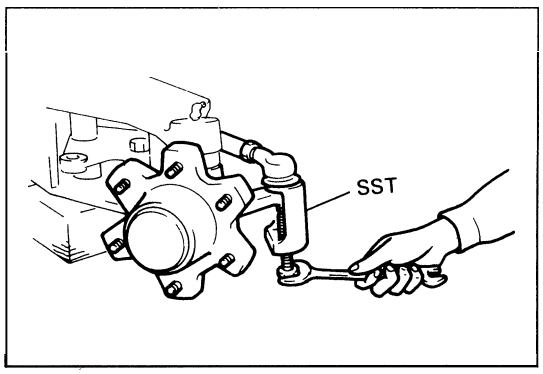
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **See the note for rear axle ASSY installation (on page 8-6).**
- **The tightening torque for each portion is as follows:**

Unit: N·m (kg-cm)[ft-lb]

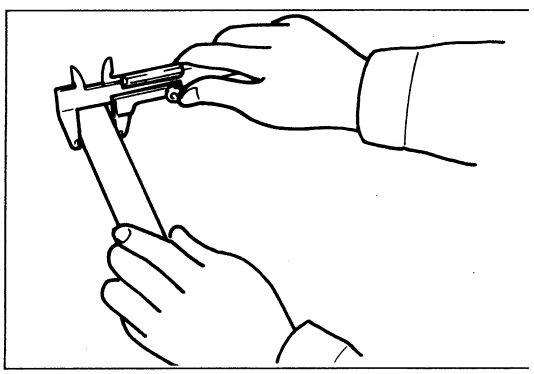
Tie rod end lock nut	117.68–147.10 (1200–1500)[86.82~108.53]
Tie rod end castle nut	1.2 ton series: 68.65–98.067 (700–1000) [50.65~72.351 3 ton series: 147.10–196.13 (1500–2000) [108.53–144.701



Point Operations

[Point 1]

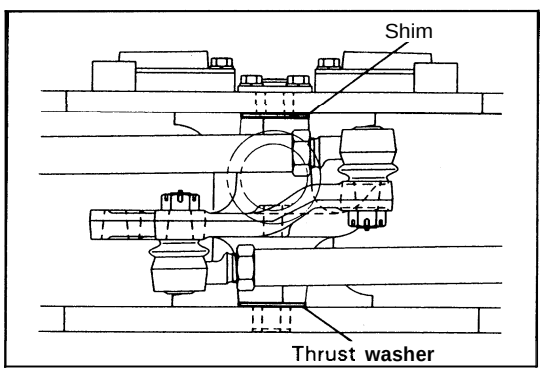
Removal: **SST** 09610-20012



[Point 2]

Inspection: Measure the bell crank pin outside diameter.

Standard outside diameter: 28.0 mm (1.102 in)
Limit outside diameter: 27.8 mm (1.094 in)

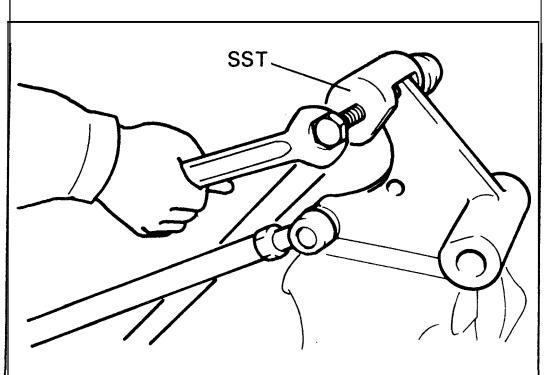


[Point 3]

Installation: Coat MP grease on both faces of the thrust washer.

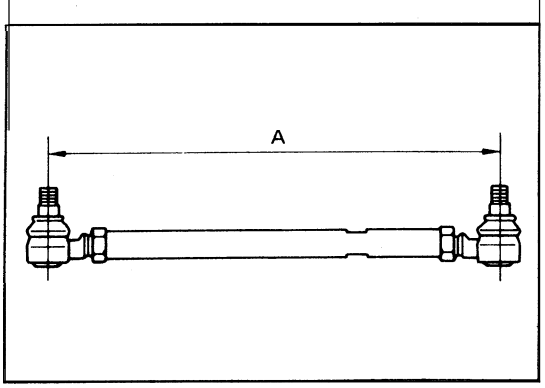
Installation: Adjust the clearance between the bell crank upper face and rear axle beam to the following value by changing the shim thickness.
Install the shim on the upper side of the bell crank.

Standard clearance:
0.5 mm (0.020 in) or less
Shim thickness:
0.5 and 1.0 mm (0.020 and 0.039 in)



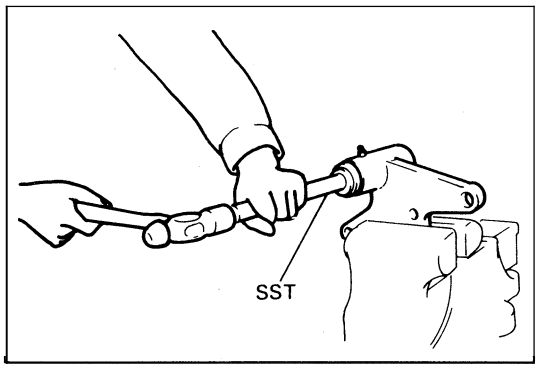
[Point 4]

Removal: SST 09610-20012



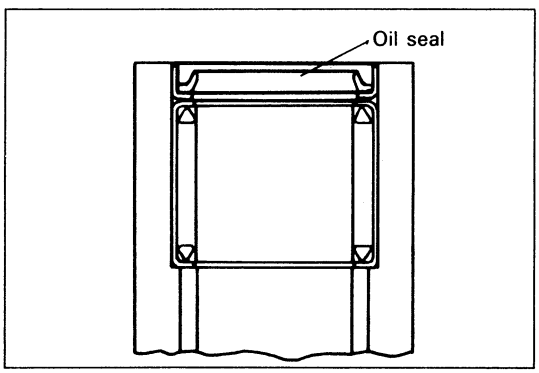
Installation: When the tie rod is replaced, install the tie rod with temporary adjustment of the tie rod length (A), and adjust the toe-in after installation.

Tie rod length (reference value)
1 ton series : A = 425 mm (16.73 in)
2·3 ton series: A = 448 mm (17.64 in)



[Point 51

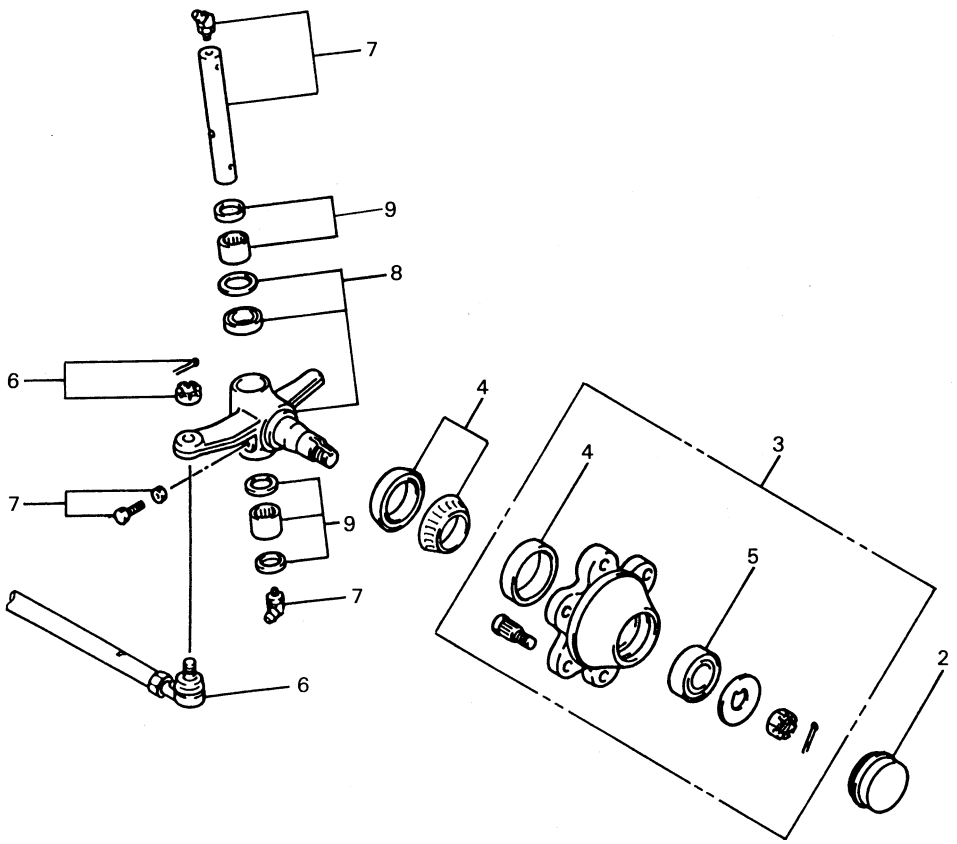
Installation: Install the needle bearing by using the SST.
SST 09620-30010



Installation: Carefully install the oil seal in the correct direction.

REAR AXLE HUB·STEERING KNUCKLE

REMOVAL·INSTALLATION



1 Rear wheel

Removal Procedure

1 Remove the rear wheels. (See page 8-6.) **[Point 1]**

2 Remove the hub cap. **[Point 2]**

3 Remove the rear axle hub W/bearing. **[Point 3]**

4 Remove the bearing and oil seal from the steering knuckle. **[Point 4]**

5 Remove the bearing from the hub. **[Point 5]**

6 Disconnect the tie rod end. **[Point 6]**

7 Remove the king pin lock bolt, and remove the king pin. **[Point 7]**

8 Remove the steering knuckle and thrust bearing. **[Point 8]**

9 Remove the oil seal and bearing from the rear axle beam. **[Point 9]**

Installation Procedure

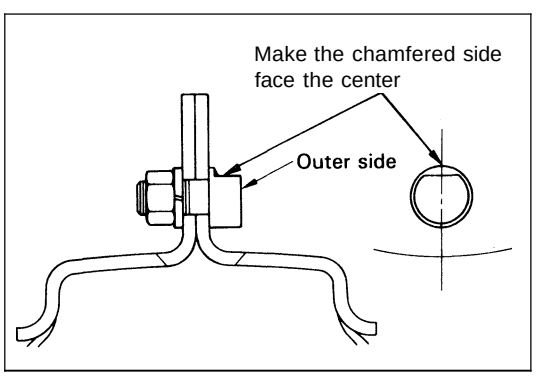
The installation,procedure is the reverse of the removal procedure

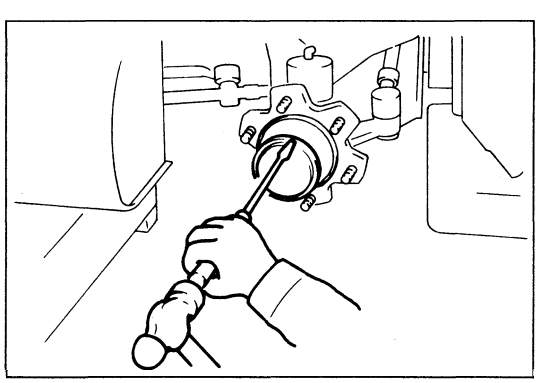
Note:

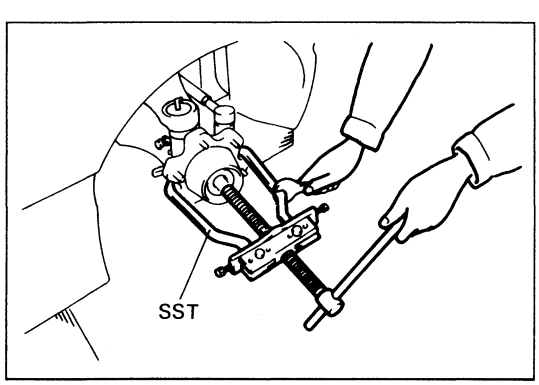
- **Supply MP grease through the king pin grease fitting.**
- **The tightening torque for each portion is as follows:**

Unit: N·m (kg-cm) [ft-lb]

King pin lock bolt,lock nut	19.61 – 31.38 (200 ~ 320) [14.47 – 23.151
Tie rod end castle nut	1·2 ton series: 68.65 – 98.067 (700 – 1000) [50.65 ~ 72.35] 3 ton series: 147.10 – 196.13 (1500 – 2000) [108.53 – 144.70]
Divided rim bolt set nut	1 ton series: 29.42 – 44.13 (300 – 450) [21.71 – 32.561 2.3 ton series: 49.03 ~ 68.85 (500 – 700) [36.18 ~ 50.651
Hub nut (Note) 2 ton series 6.50-10-10PR (I) tire (OPT): 117.68 – 196.13 N·m (1200 – 2000 kg-cm) [86.82 ~ 144.70 lb-ft] for both divided rim and side ring rim	1 ton series (Both divided rim and side ring rim): 88.26 – 156.9 (900 – 1600) [65.12 ~ 115.761 2 ton series (divided rim): 117.68 – 196.13 (1200 – 2000) [86.82 ~ 144.701 2 ton series (side ring rim): 176.52 – 392.27 (1800 – 4000) [130.23 – 289.401 3 ton series (Both divided rim and side ring rim): 117.68 – 196.13 (1200 – 2000) [86.82 ~ 144.70]







Point Operations

[Point 1]

Installation: In the case of a divided rim type wheel, install with the divided rim set bolt head on the outer side of the vehicle.

Disassembly: When a wheel is removed for disassembly, always discharge air fully before disassembling the wheel.

Reassembly: The divided rim set bolt shall be installed with its head chamfered side facing the center of the wheel.

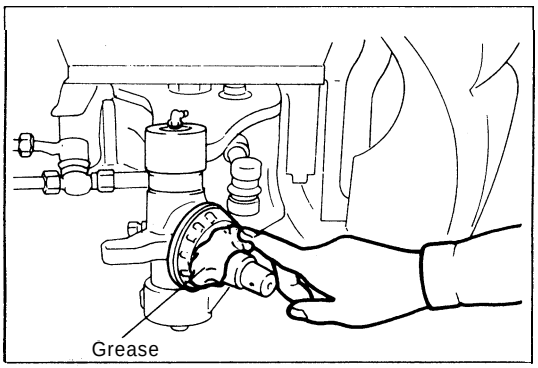
[Point 21

Installation: Fill MP grease in the cap.

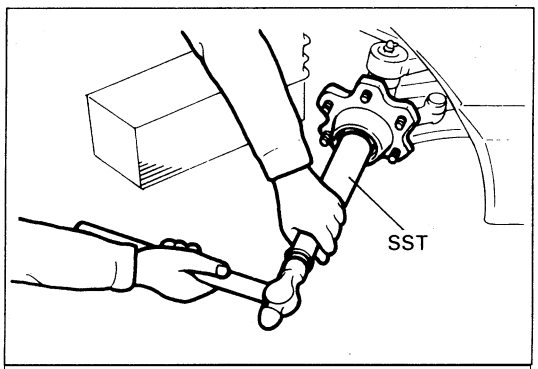
Installation: Install by tapping the cap flange portion.

[Point 31

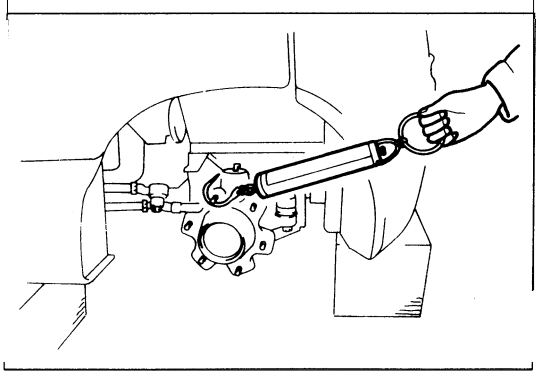
Removal: SST 09950-20017



Installation: Fill grease in the hub and knuckle spindle.



Installation: SST 09370-20270-71



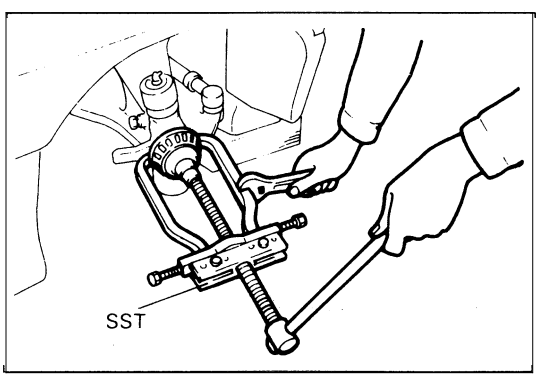
Installation: Adjust the rear axle hub starting force.

1. Temporarily tighten the castle nut to a torque of 0.98 N·m (10 kg-cm) [0.72 ft-lbl, and rotate the hub by 3 to 5 turns.

2. Set a spring scale on the hub bolt, and measure the starting force.

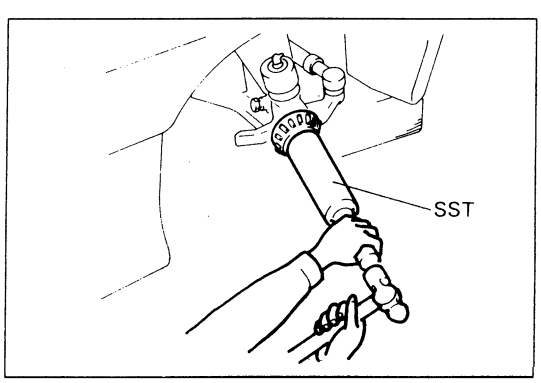
   Starting force:
   1 **ton series**
   14.7 **- 39.2** N (1.5 **-** 4.0 **kg) [3.3 - 8.8 lb]**
   2·3 ton series
   14.7 **-** 44.1 N (1.5 **-** 4.5 **kg) [3.3 - 9.9 lb]**

3. If the measured value does not satisfy the standard, make adjustment by tightening or loosening the castle nut.

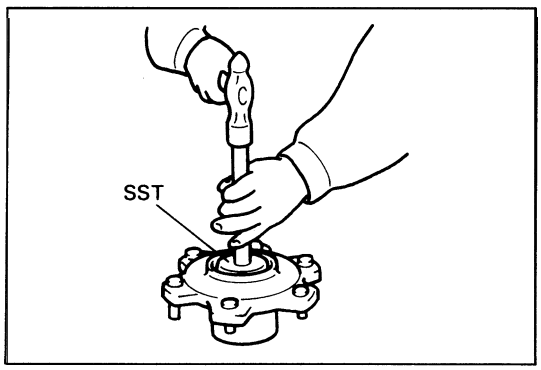


[Point 41

Hernoval: SST 09950-20017

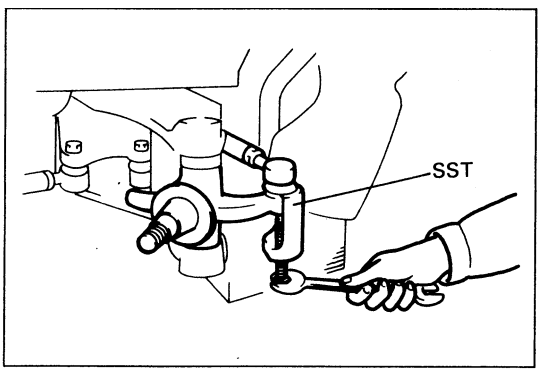


Installation: SST 09370-20270-71



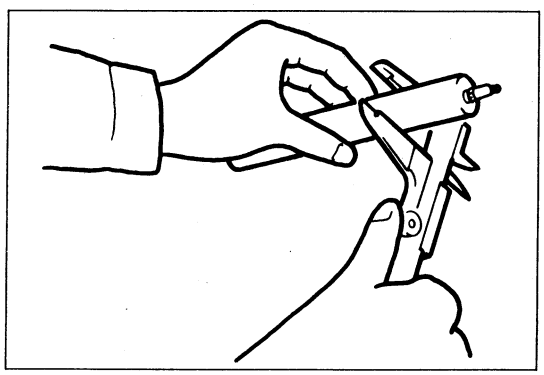
[Point 51

Installation: SST 09370-10170-71
SST 09608-20012



[Point 61

Removal: SST 09610-20012

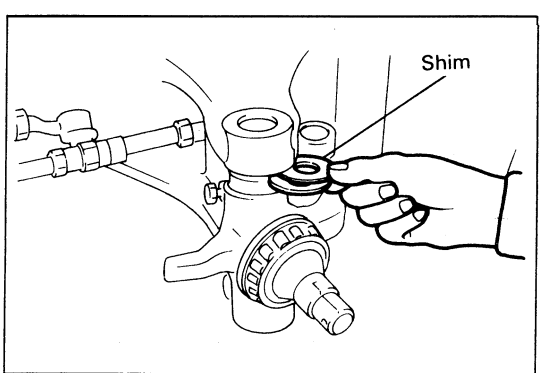


[Point 71

Inspection: Measure the king pin outside diameter

Standard outside diameter:
28.0 mm (1.102 in)
Limit outside diameter: 27.8 mm (1.094 in)

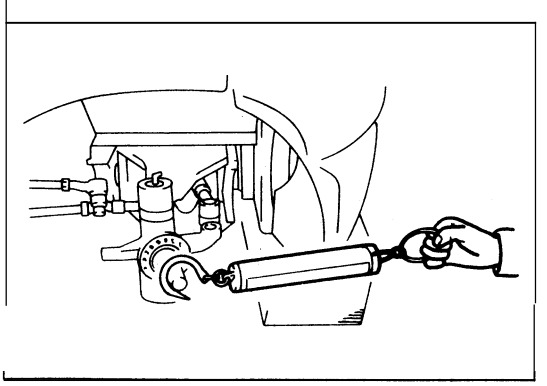
Installation: Align the king pin cut groove and lock bolt hole, tighten the lock bolt, and lock by tightening the lock nut.



[Point 81

Installation: Adjust the steering knuckle starting force.

1. Insert the shim on the upper side of the thrust bearing and install the king pin.

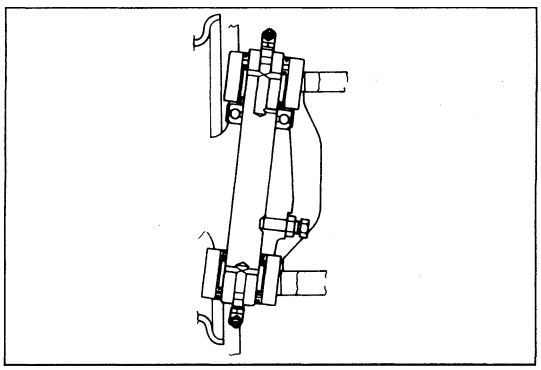


2. Set a spring scale on the tip end of the knuckle and measure the starting force.

Starting force:
14.7 – 39.2 N (1.5 – 4.0 kg) [3.3 – 8.8 lb]

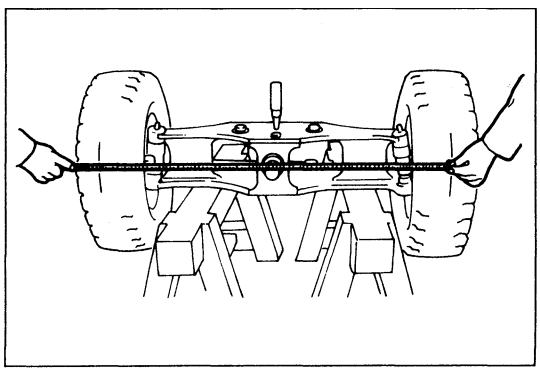
3. If the measured value does not satisfy the standard, make adjustment by changing the shim.

Shim thickness: 0.1·0.2·0.5 and 1.0 mm
(0.22, 0.44, 1.1 and 2.2 in)



[Point 9]

Installation: Pay attention to the relative positions of the needle bearing and oil seal in the assembled state.
SST **09620-30010**



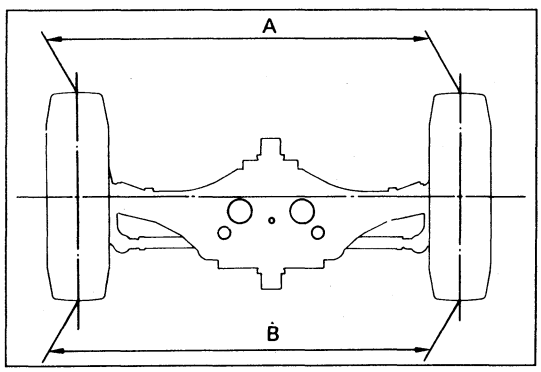
REAR WHEEL ALIGNMENT

TOE-IN ADJUSTMENT

Note:
Remove the rear axle when measuring or adjusting the toe-in.

1. Set the wheels to the straight traveling state.

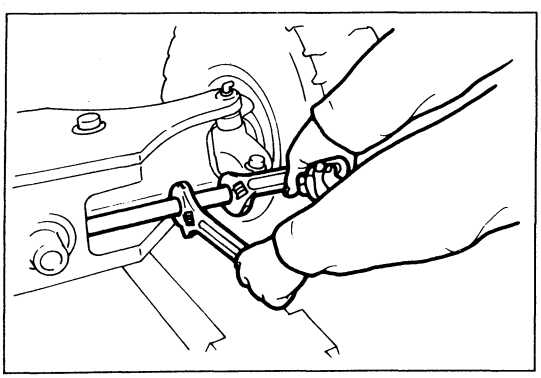
   (1) Align the rear axle beam center hole and bell crank side hole, and insert an appropriate round bar in the holes.



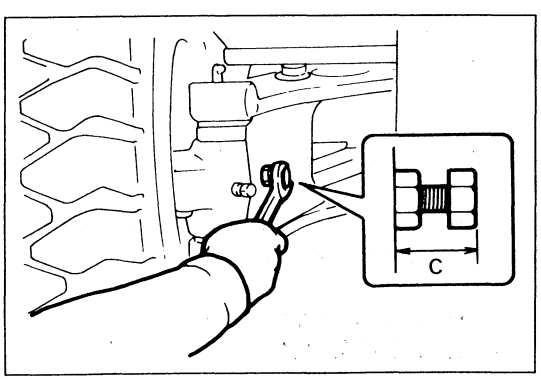
2. Put marks on the center of wheels on the left and right sides.

3. Measure the distance between the marks on both wheels with a toe-in gage or a convex rule in parallel with the ground surface. (On the front side)
   Measured value = A
   Then rotate the wheels by a half turn and measure the distance between marks on both wheels on the rear side.
   Measured value = B
   Toe-in = **A – B**

   Standard toe-in: 0 ± 4 mm (0 ± 0.16 in)



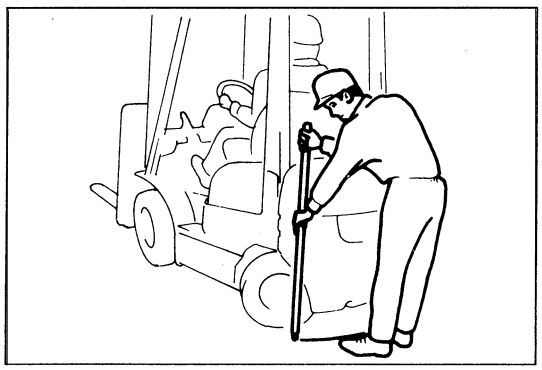
4. If the toe-in does not satisfy the standard, loosen the tie rod lock nut and change the tie rod length by turning the tie rod for adjustment.
   In this case, make the tie rod length equal on the left and right sides.



REAR WHEEL STEERING ANGLE ADJUSTMENT

1. Adjust the rear wheel steering angle by the knuckle stopper bolt protrusion (dimension C).

   Knuckle stopper bolt protrusion (reference value)
   1 ton series C = 22.6 mm (0.890 in)
   2·3 ton series C = 25.0 mm (0.984 in)



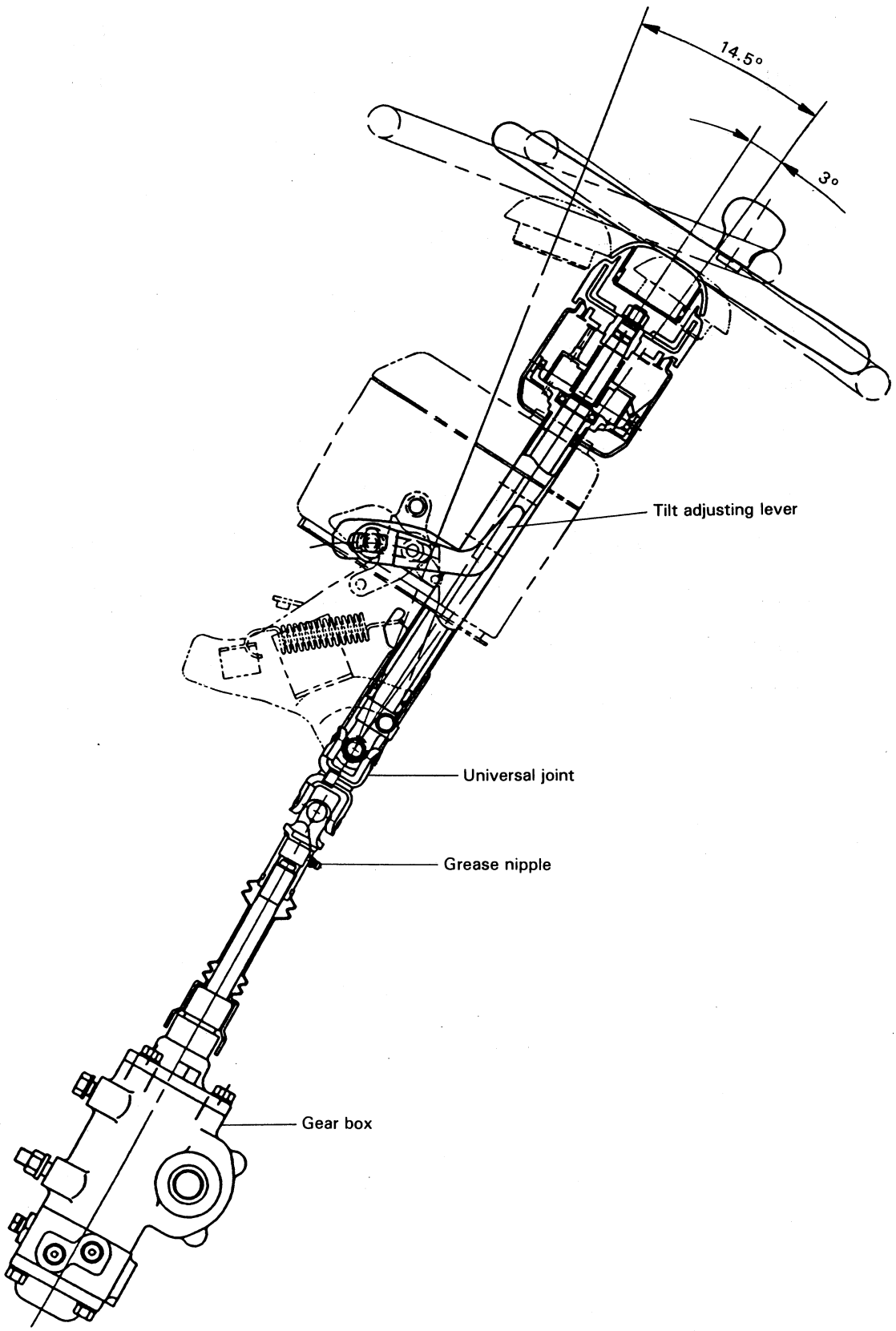
2. Measure the minimum turning radius to confirm the steering angle.

Minimum turning radius

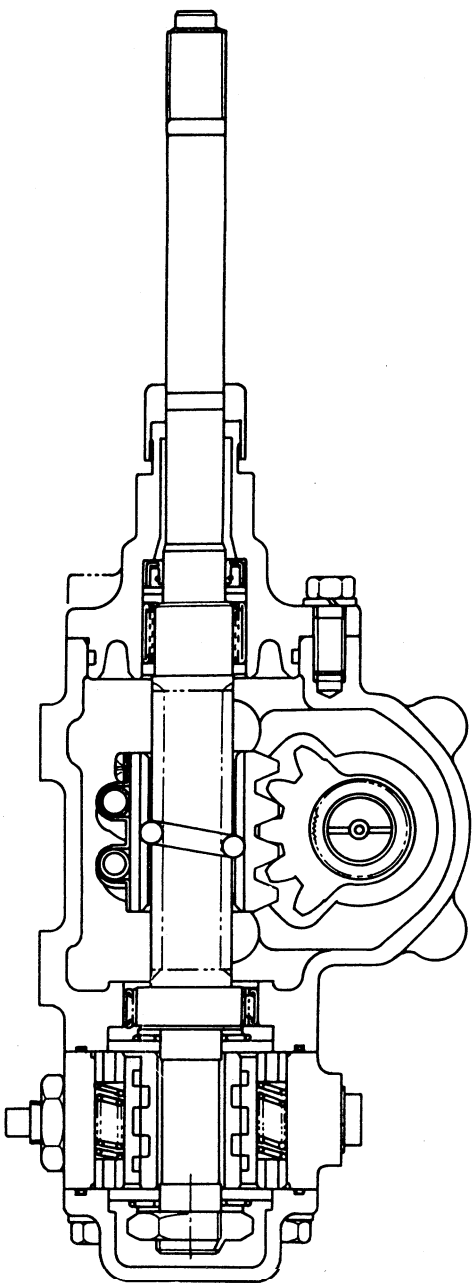
1.0 ton model:	**1880 mm (74.02 in)**
1.35 ton model:	**1920 mm (75.59 in)**
1.5 ton model:	**1960 mm (77.17 in)**
1.75 ton model:	**1980 mm (77.95 in)**
2.0 ton model:	**2170 mm (85.43 in)**
2.25 ton model:	**2200 mm (86.61 in)**
2.5 ton model:	**2240 mm (88.19 in)**
2.75 ton model:	**2370 mm (93.31 in)**
3.0 ton model:	**2408 mm (94.49 in)**

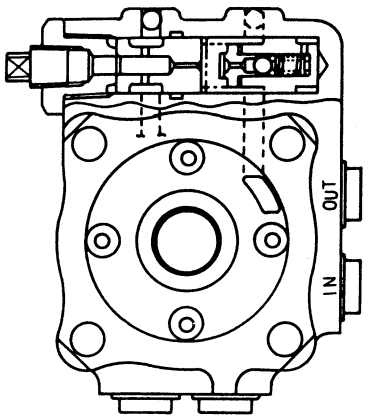
STEERING

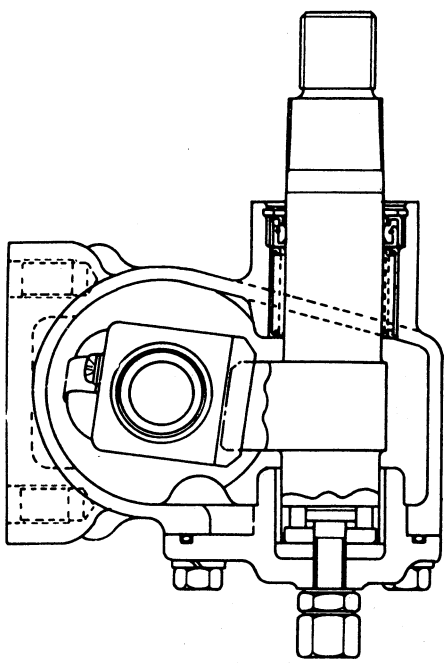
GENERAL


14.5°
3°
Tilt adjusting lever
Universal joint
Grease nipple
Gear box

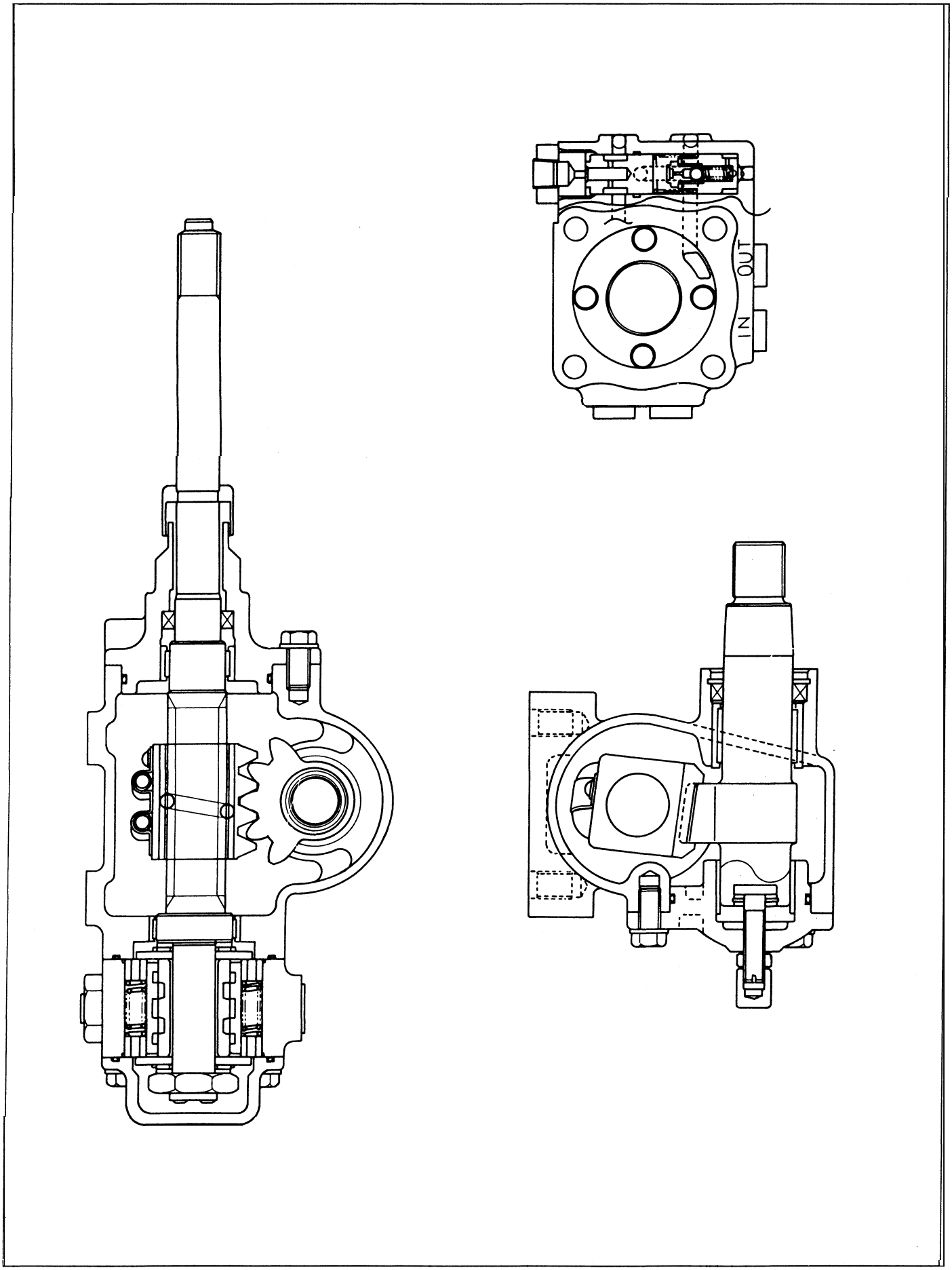
Steering Gear Box (1 Ton Series)



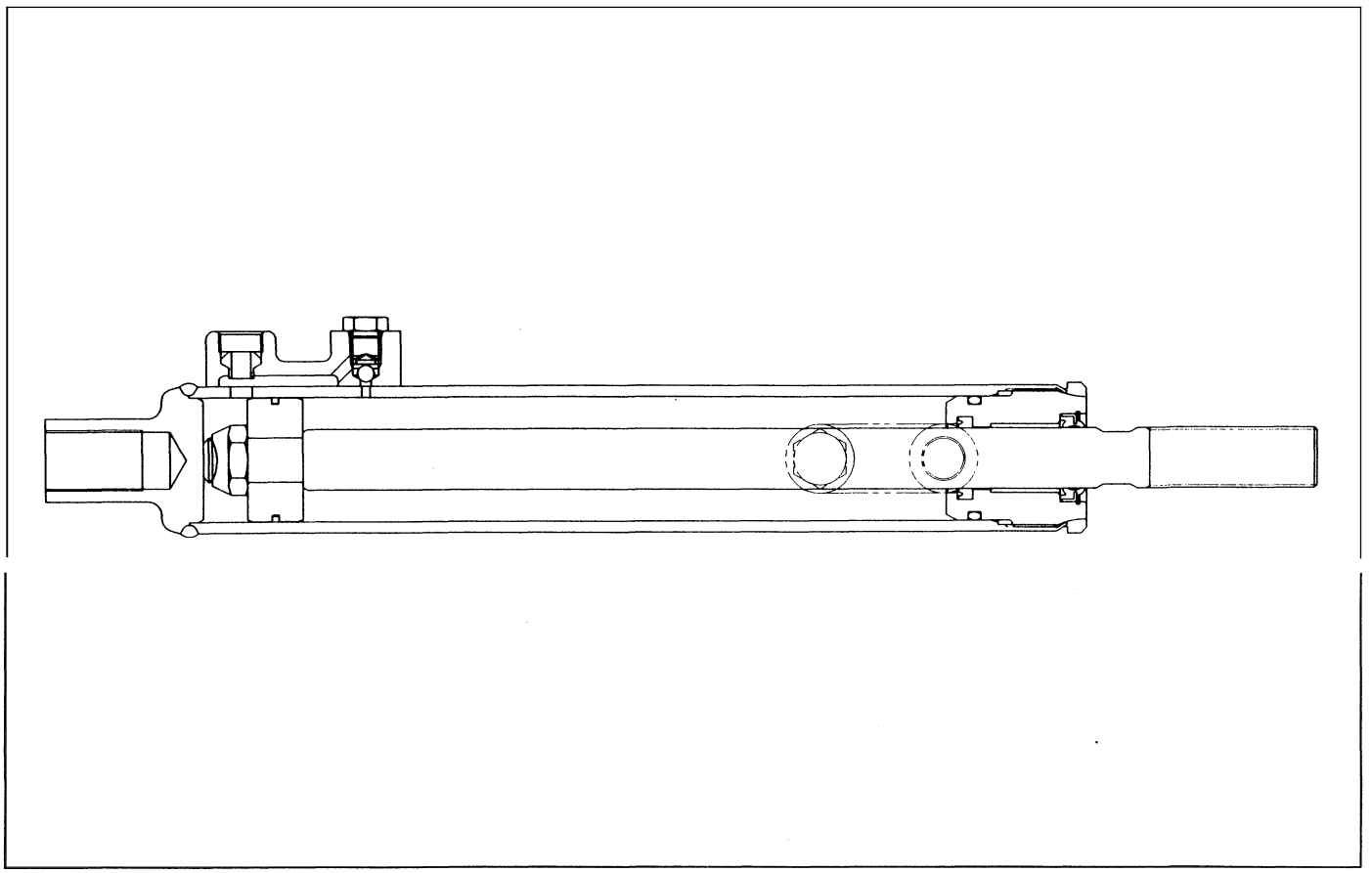




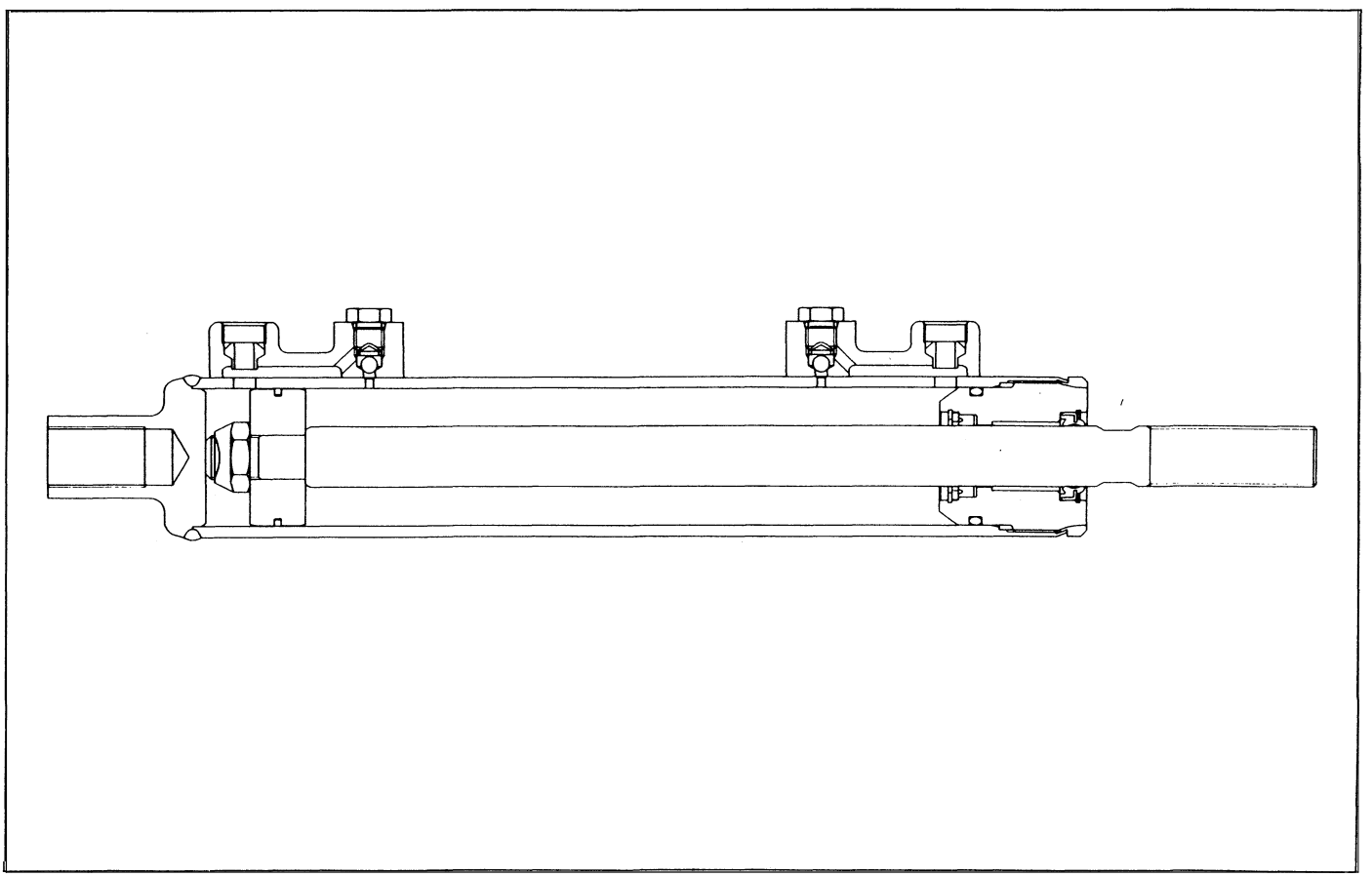
Steering Gear Box (2·3 Ton Series)



Power Cylinder (1 Ton Series)



Power Cylinder (2·3 Ton Series)

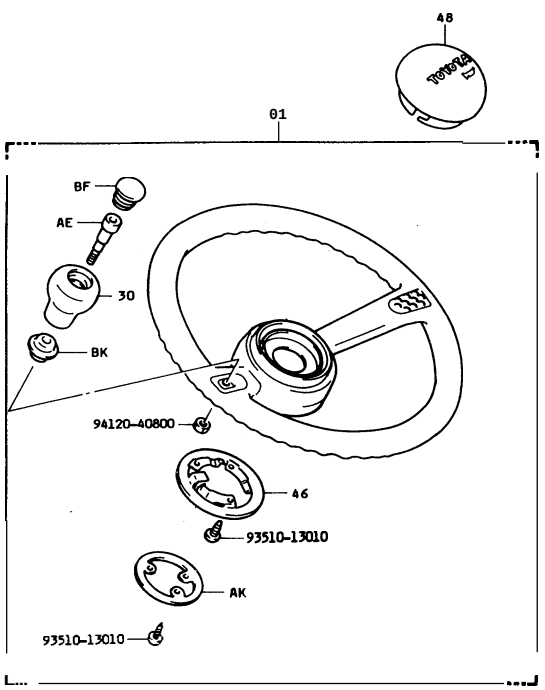


SPECIFICATIONS

Item \ Vehicle model		1 ton series	2.3 ton series
Steering wheel diameter mm(in)		360 (14.17)	←
Steering wheel play mm(in)		25 – 50 (0.98 – 1.97)	←
Steering gears	Manufacturer	Koyo Seiko	Toyoda Sulzer
	Type	Semi-integral	←
	Gear type	Recirculating ball screw type	
	Gear ratio	1:18.5	1:20
	Lock-to-lock	3.6	←
	Ball twist direction	Counterclockwise	+-
	Relief valve set pressure kPa(kg/cm^2) [psi]	5880 (60) [850]	8040 (82) [1170]
Power cylinder	Cylinder bore mm(in)	45 (1.77)	2 ton series: 50 (1.97) 3 ton series: 55 (2.17)
	Piston rod outside diameter mm(in)	22 (0.87)	2 ton series: 22 (0.87) 3 ton series: 25 (0.98)
	Piston seal type	Piston ring	←
	Rod seal type	U packing	←

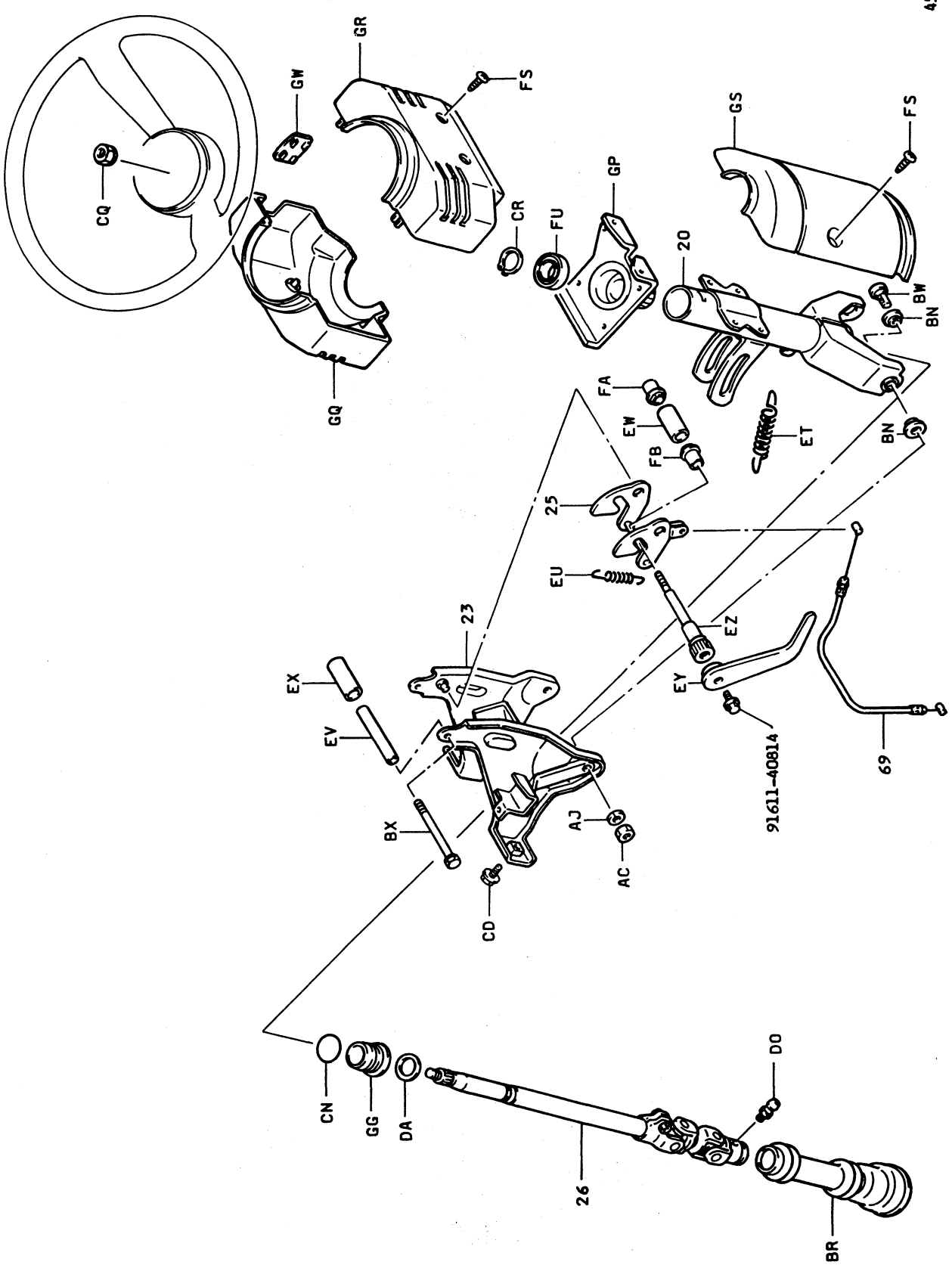
COMPONENTS

4501

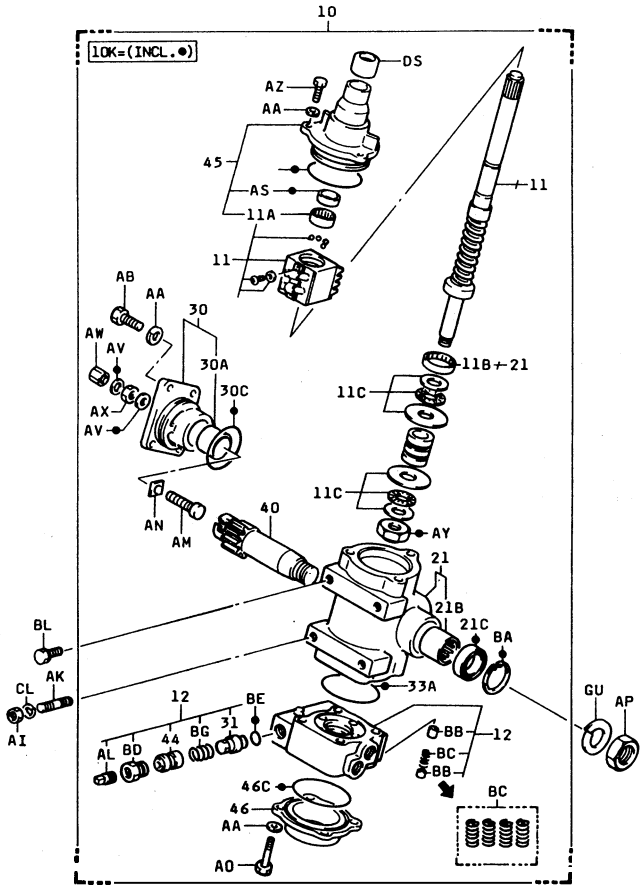


4501-040

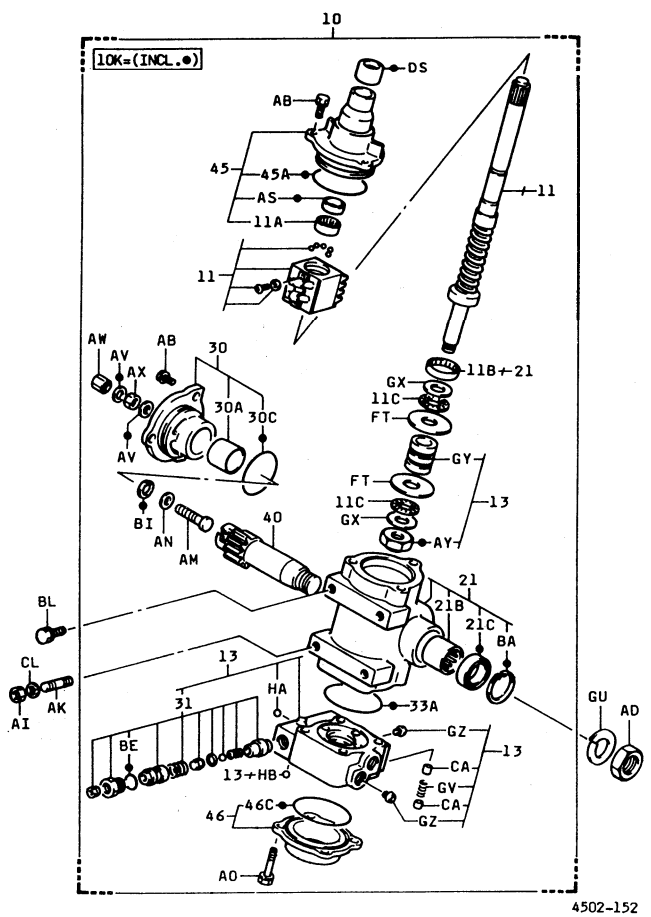
4502


4502-151
CQ
GW
GR
FS
GQ
CR
FU
GP
GS
FS
20
BW
BN
BN
FA
EW
FB
ET
25
EU
EZ
EY
91611-40814
69
23
EX
EV
BX
AJ
AC
CD
CN
GG
DA
26
DO
BR

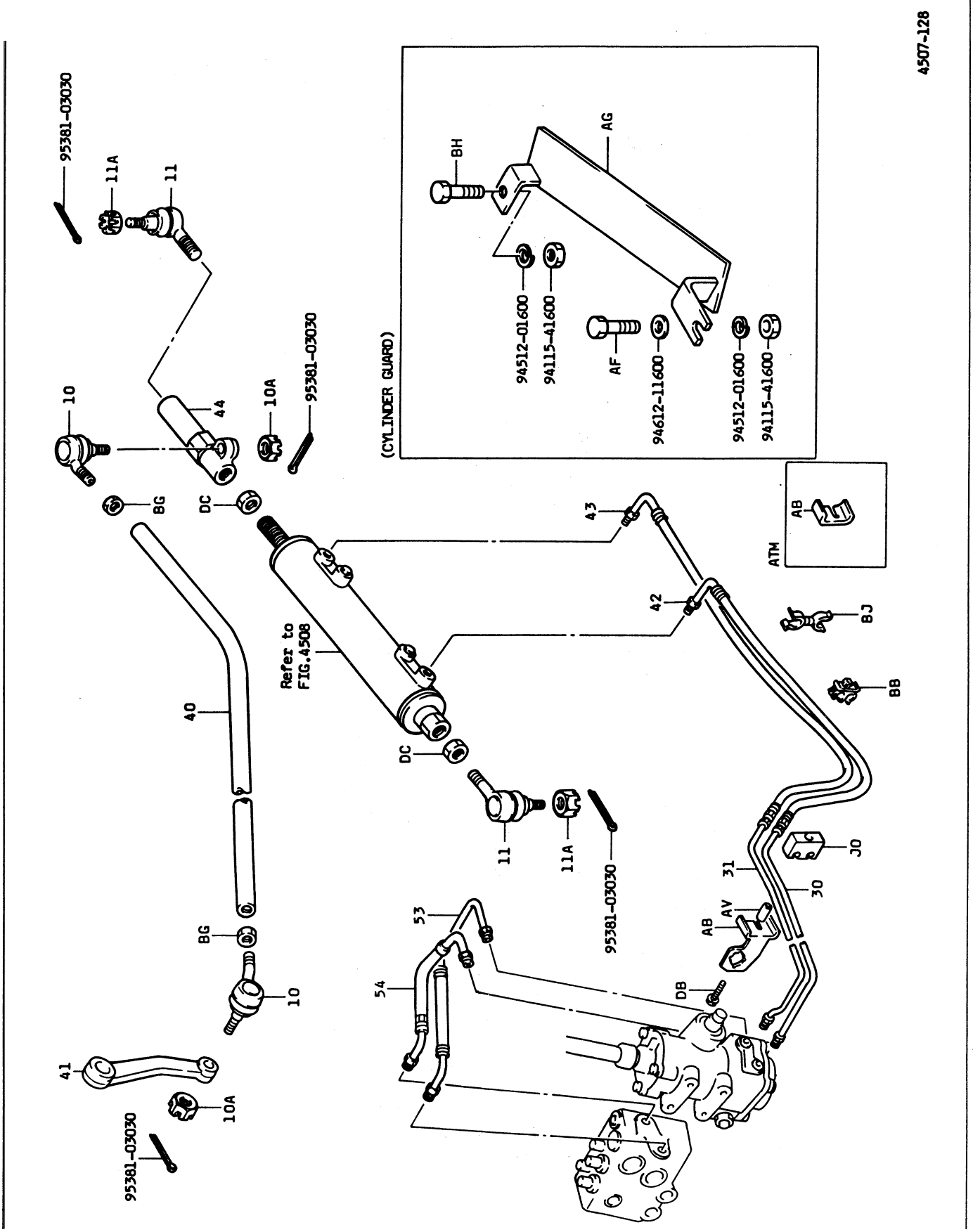
1 ton **series**



2.3 ton **series**

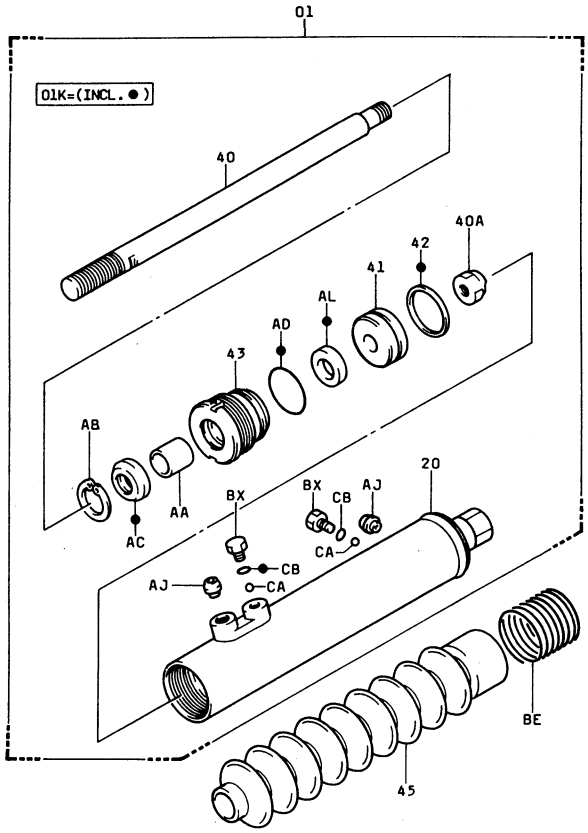


4507


4507-128
95381-03030
11A
11
10
44
10A
95381-03030
BG
DC
40
Refer to FIG.4508
DC
11
11A
95381-03030
BG
10
41
10A
95381-03030
(CYLINDER GUARD)
BH
AG
94512-01600
94115-41600
AF
94612-11600
94512-01600
94115-41600
43
42
ATM
AB
BJ
BB
JO
31
30
AB
AV
53
54
DB

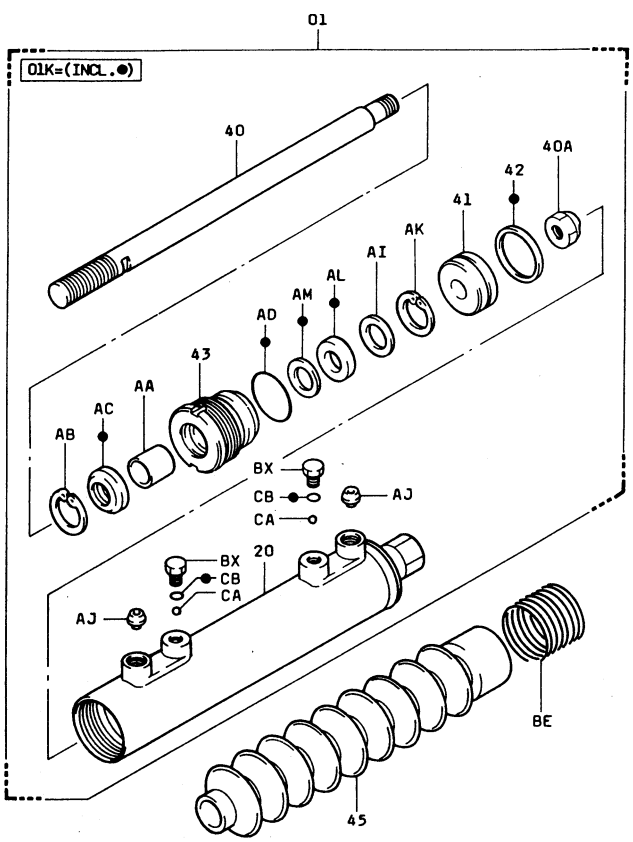
4508

1 ton series



4508-062

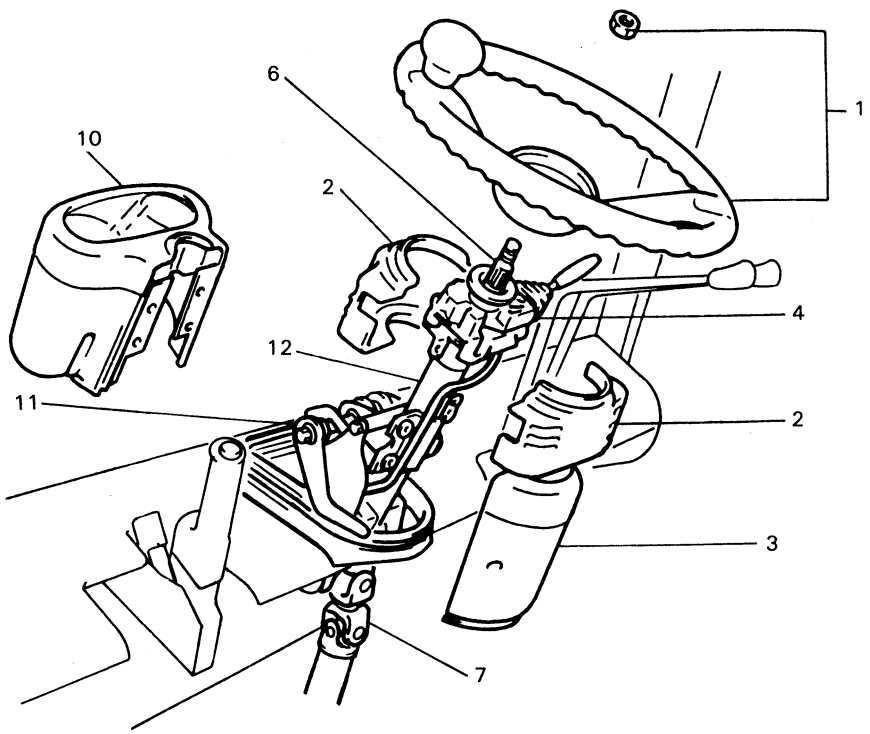
2.3 ton series



4508-061

STEERING WHEEL·MAST JACKET

REMOVAL·INSTALLATION



5 Universal joint set bolt
8 Combination meter ASSY set bolt
9 Combination meter wiring

Removal Procedure

1 Remove the steering wheel. **[Point** 11

2 Remove the turn signal switch cover.

3 Remove the combination meter cover.

4 Remove the turn signal switch.

5 Remove the steering universal joint set bolts. **[Point 2]**

6 Extract the **tilt** steering shaft upward.

7 Remove the steering universal joint.

8 Remove the combination meter **ASSY** set bolts.

9 Disconnect the combination meter wiring.

10 Remove the combination meter **ASSY.**

11 Remove the tilt lock device. **[Point 3]**

12 Remove the mast jacket.

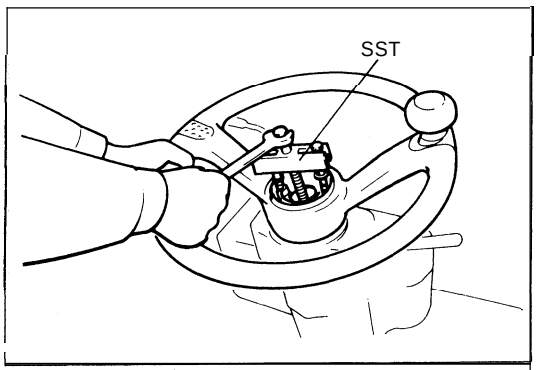
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Coat MP grease on the tilt lock device and each sliding contact portion.**
- **Add MP grease through the grease fitting of the steering universal joint.**
- **The tightening torque for each portion is as follows:**

Unit: N·m (kg-cm) [ft-lb]

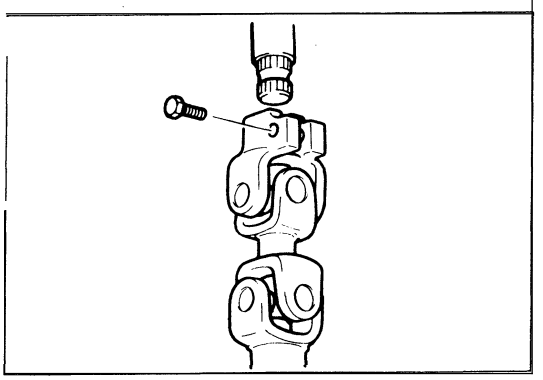
Steering universal joint set bolt	17.65 – 24.52 (180 ~ 250) [13.02 ~ 18.091
Mast jacket set nut	34.32 – 53.94 (350 – 550) [25.32 ~ 39.791
Steering wheel set nut	19.61 – 29.42 (200 ~ 300) [14.47 ~ 21.711



Point Operations

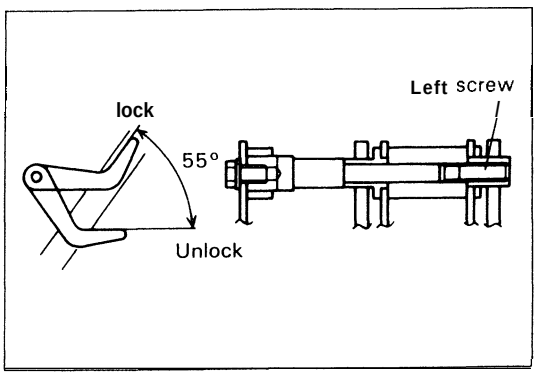
[Point 1]

Removal: SST 09609-20011



[Point 2]

Removal: The main shaft and joint are fixed by through bolts at the mainshaft shouldered portion as illustrated.
Therefore, the bolts must be loosened and removed.

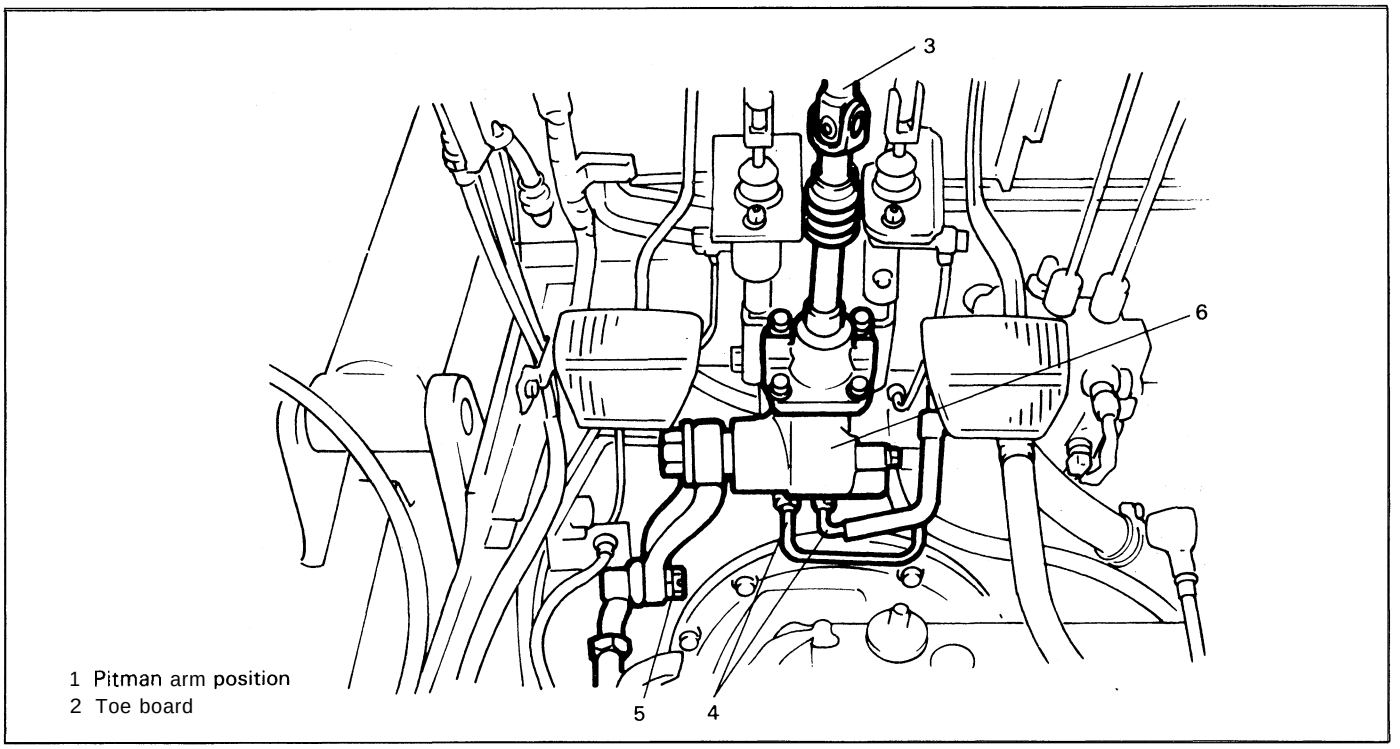


[Point 3]

Installation: Check the functioning of the tilt lock device.

STEERING GEAR BOX ASSY

REMOVAL-INSTALLATION



Removal Procedure

1 Move the pitman arm and drag link coupling position toward the rear side. **[Point** 11

2 Remove the toe board.

3 Remove the steering universal joint. (See mast jacket removal procedure steps 1 to 7 on page 9-11.)

4 Disconnect the piping.

5 Disconnect the drag link. **[Point** 21

6 Remove the steering gear box ASSY.

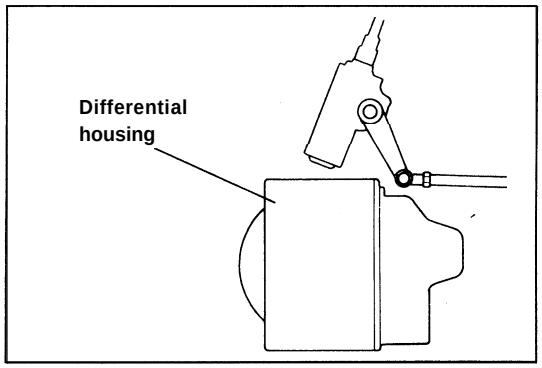
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
The tightening torque for each portion is as follows:

Unit: N·m (kg-cm) [ft-lb]

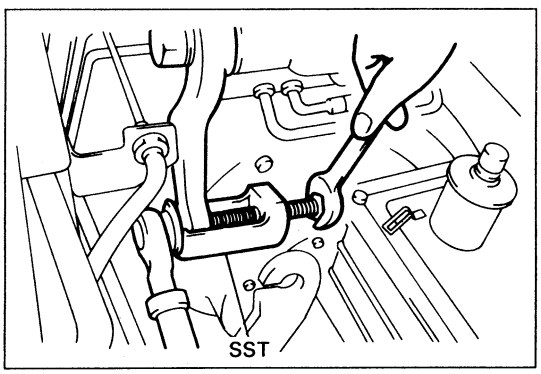
Steering gear box set bolt and nut	49.03 - 78.45 (500 - 800) [36.18 - 57.881
Steering universal joint set bolt	17.65 - 24.52 (180 - 250) [13.02 - 18.091
Steering wheel set nut	19.61 - 29.42 (200 - 300) [14.47 - 21.711
Drag link end castle nut	1·2 ton series: 68.65 - 98.07 (700 - 1000) [50.65 - 72.35] 3 ton series: 147.10 - 196.13 (1500 - 2000) [108.53 - 144.701



Point Operations

[Point 1]

Removal: Rotate the steering wheel clockwise to move the pitman arm and drag link coupling portion toward the rear side (avoiding the differential housing).

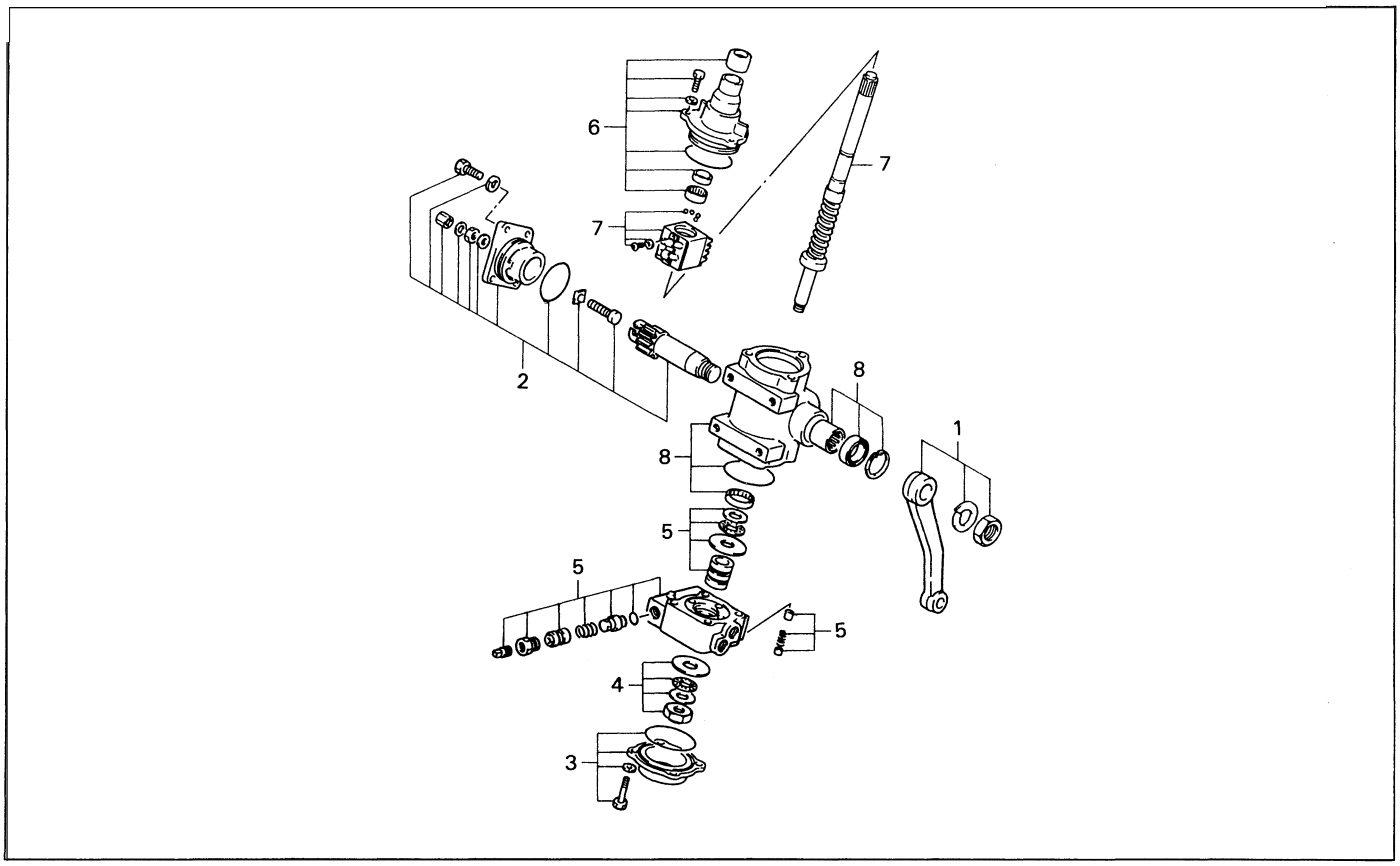


[Point 2]

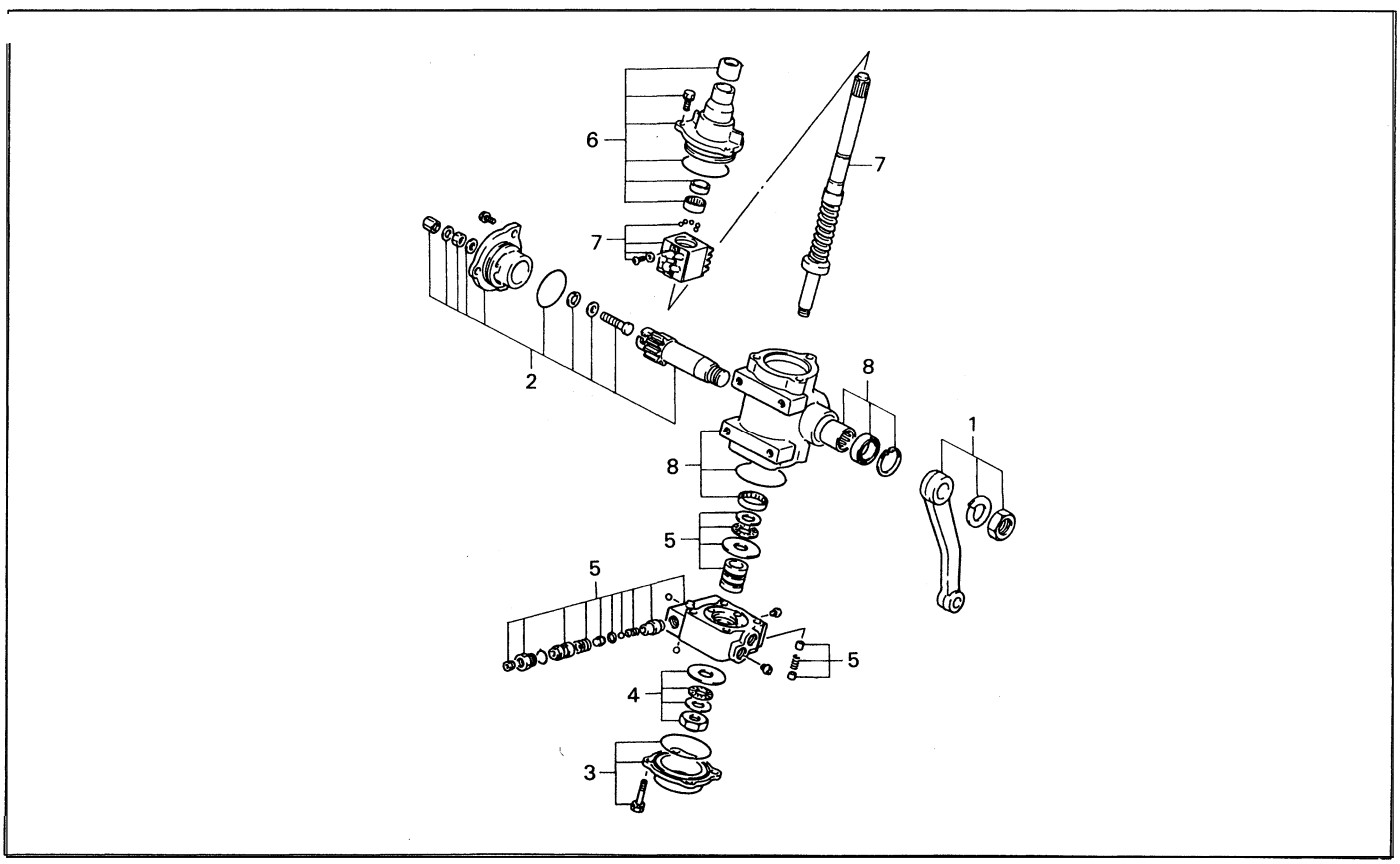
Removal: **SST** 09610-20012

DISASSEMBLY·INSPECTION·REASSEMBLY

1 Ton Series



2·3 Ton Series



Disassembly Procedure (Common to 1 - 3 Ton Series)

1 Remove the pitman arm. **[Point** 11

2 Remove the side cover and sector shaft. **[Point 21**

3 Remove the end cover. ,

4 Remove the lock nut. **[Point 31**

5 Remove the valve body ASSY. **[Point 41**

6 Remove the top cover. **[Point** 51

7 Remove the ball screw set.

8 Remove the gear box. **[Point 61**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

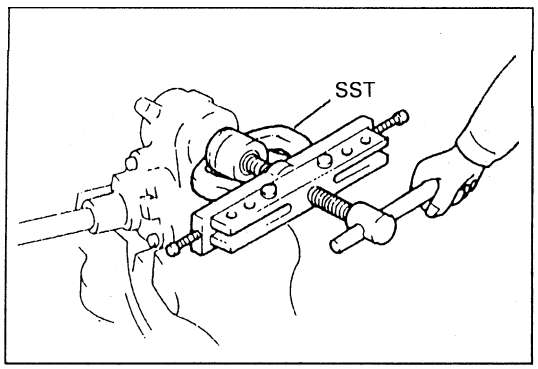
Note:
- **After reassembly, rotate the shaft of the ball screw set 3 to 4 turns to check smooth rotation without uneven or unreasonable movement. Also check that the shaft of the ball screw set is returned smoothly by the reaction spring force after it is rotated to the lock position.**
- **The tightening torque for each portion is as follows:**

1 ton series — Unit: N·m (kg-cm) [ft-lb]

Top cover set bolt	**44.13 - 53.94(450 - 550)**[32.56 ~ **39.791**
End cover set bolt	**39.23 - 49.03(400 - 500)**[28.94 - **36.181**
Side cover set bolt	**44.13 - 53.94(450 -** 550) [32.56 - **39.791**
Sector shaft adjusting bolt lock nut	**29.42 - 44.13(300 - 450)**[21.71 - **32.561**
Sector shaft adjusting bolt cap nut	**29.42 - 44.13(300 - 450)**[21.71 - **32.561**
Pitman arm set nut	**156.91 - 196.13**(1**600 - 2000)**[1**15.76 - 144.701**

2.3 ton series — Unit: N·m (kg-cm) [ft-lb]

Top cover set bolt	**34.32 - 44.13(350 - 450)**[25.32 - **32.561**
End cover set bolt	**34.32 - 44.13(350 -** 450) [25.32 - **32.561**
Side cover set bolt	**34.32 - 44.13(350 -** 450) **125.32 - 32.561**
Sector shaft adjusting bolt lock nut	**24.52 - 34.32(250 -** 350) [18.09 - **25.321**
Sector shaft adjusting bolt cap nut	**24.52 - 29.42(250 - 300)**[18.09 - **21.711**
Pitman arm set nut	**156.91 - 196.13**(1**600 - 2000)**[1**15.76 - 144.701**

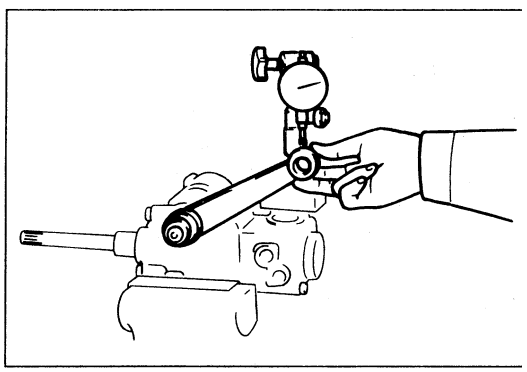


Point Operations

[Point 1]

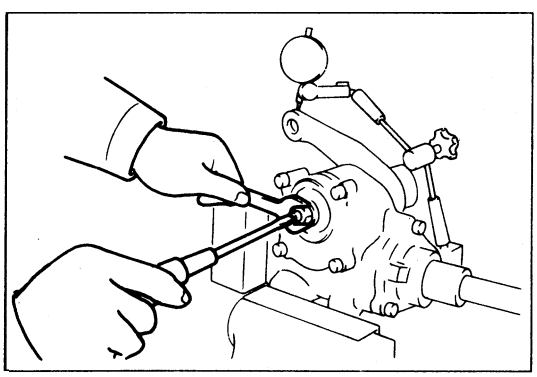
Disassembly·reassembly: Check the match marks on the sector shaft and pitman arm.

Disassembly: SST 09950-20017

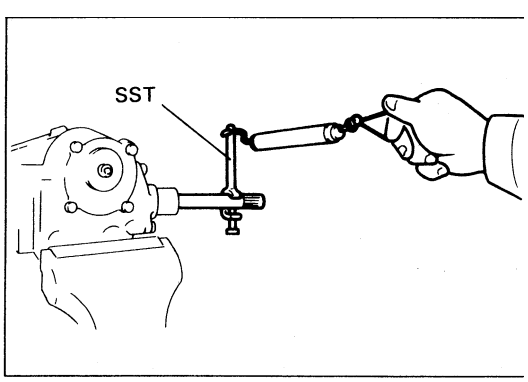


Reassembly: After installing the pitman arm, adjust the backlash of the sector gear.

1. Stop the pitman arm in the lock-to-lock center position and set a dial gage on the end of the pitman arm.



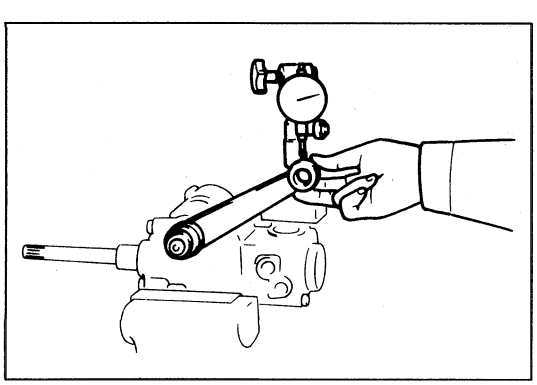
2. Tighten the adjusting bolt until the backlash at the center of the pitman arm becomes 0 mm (0 in).



3. After rotating the shaft of the ball screw set by 3 to 4 turns, place the pitman arm in the lock-to-lock center position and install the SST on the shaft to measure the overall starting force.
SST 09470-10171-71

Overall starting force:
2.0 – 5.9 N (0.2 – 0.6 kg) [0.44 ~ 1.3 lb]

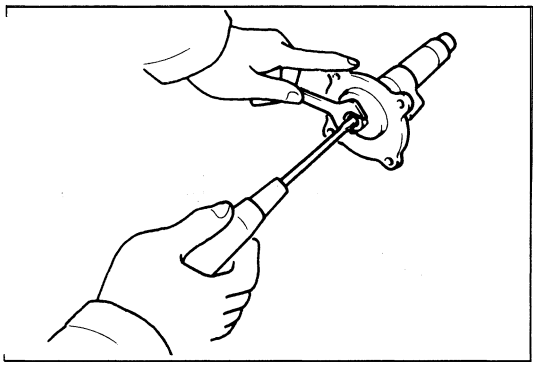
4. If the overall starting force does not satisfy the standard, place the pitman arm again in the lock-to-lock center position and make adjustment by tightening or loosening the adjusting bolt.

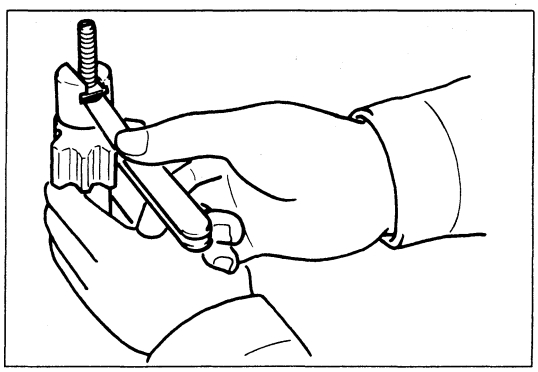


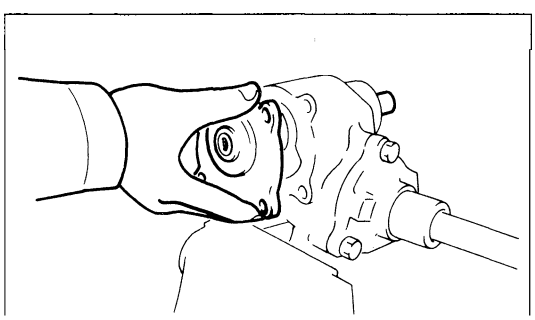
5. Measure the backlash where the pitman arm is in the lock- to-lock center position and where the pitman arm is turned fully clockwise/counterclockwise.

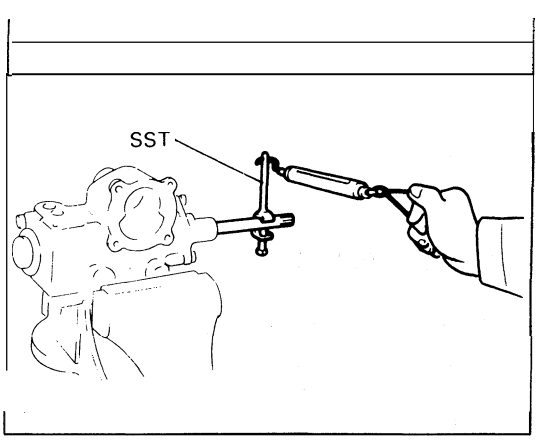
Backlash:
Lock-to-lock center position: 0 mm (0 in)
End of clockwise/counterclockwise rotation:
0.1 – 1.5 mm (0.004 – 0.059 in)

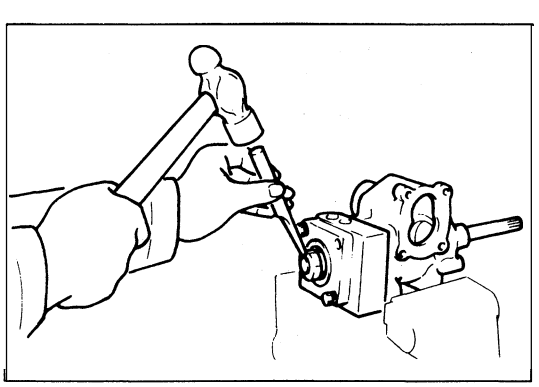
6. After backlash adjustment, tighten the adjusting bolt lock nut and cap nut.











[Point 21

Disassembly: After removing the side cover W/sector shaft, tighten the adjusting bolt until freeing from the side cover for disconnecting the sector shaft.

Inspection: Measure the clearance between the sector shaft and adjusting nut. If it exceeds the limit, select and use the appropriate adjusting plater to obtain the standard clearance.

Limit clearance: *0.1* mm *(0.004*in)
Adjusting plate thickness
***1* ton series:**
1.95·2.00·2.05·2.10 and *2.15* mm
(0.0768·0.0787·0.0807·0.0827
and *0.0846* in)
2·3 ton series: 2.1·2.2·2.3·2.4
and *2.5* mm
(0.083·0.087·0.091·0.094 and *0.098* in)

Reassembly: Fill grease in the slit groove of the sector shaft where the adjusting bolt fits.

Reassembly: Assemble by bringing the top of the tooth crest of the sector shaft into contact with the center of the root of the ball screw set.

[Point 31

Reassembly: Adjust the ball screw set starting force.

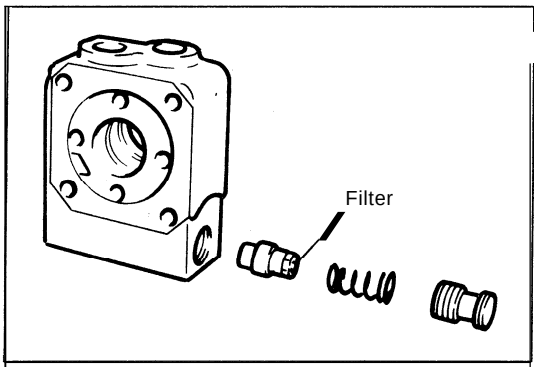
1 ton series: Temporarily tighten the lock nut to a torque of 9.81 – 19.61 N·m (100 – 200 kg-cm) [7.24 – 14.47 ft-lbl, rotate the ball screw set shaft for adaptation and loosen the lock nut. Then install the SST and measure the starting force.
SST 09470-10171-71

Starting force:
***0.98* – *2.9 N (0.1* – *0.3* kg)**
[0.22 – *0.66* lb]

Adjust the degree of lock nut tightening to make the starting force satisfy the standard.

2.3 ton series: After tightening the lock nut to a torque of 9.81 – 29.42 N·m (100 – 300 kg-cm) [7.24 – 21.71 ft-lb], return the lock nut by 180°, then tighten the lock nut again to a torque of 0.0294 N·m (30 kg-cm) [2.17 ft-lb].

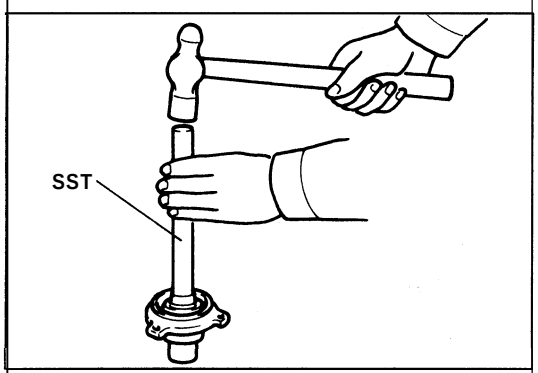
Reassembly: After adjusting the starting force, be sure to caulk the lock nut.



[Point 4]

Disassembly: Disassemble the relief valve only when the relief pressure is abnormal.

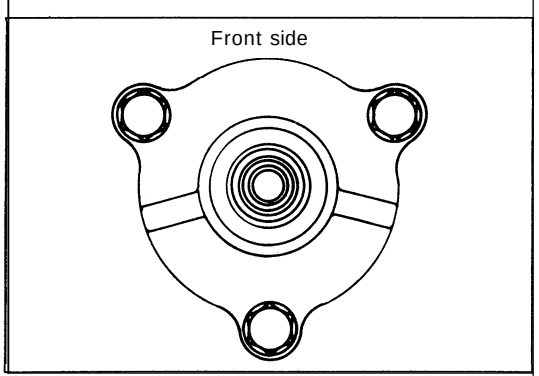
Inspection: Inspect the relief valve for clogged orifice or foreign matter trapping, and clean the relief valve filter.



[Point 5]

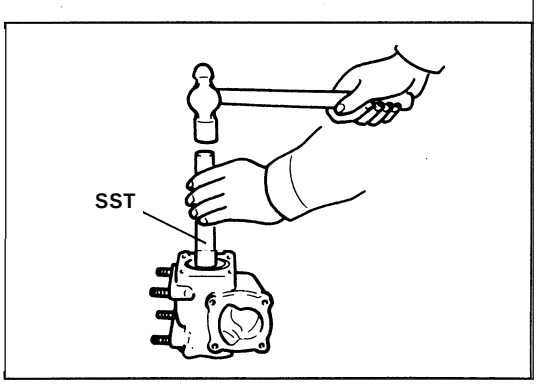
Reassembly: Install the oil seal and bearing to the top cover.
SST 09620-30010

Reassembly: Coat grease on the oil seal lip.



Reassembly: Do not mistake the top cover installing direction.
Pay attention to the rib position. (See the illustration.)

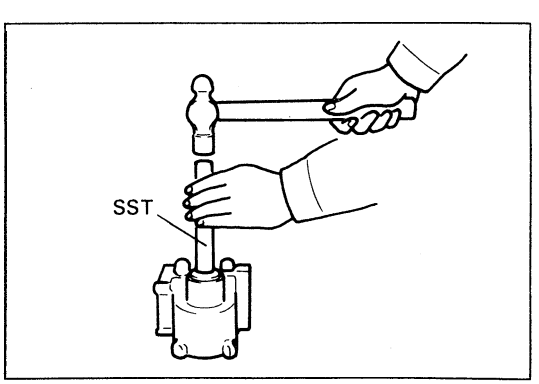
Reassembly: Coat grease on the inside surface of the boot to be installed on top of the top cover.



[Point 6]

Disassembly: Remove the bearing on the end cover side of the gear box.
SST 09608-20012

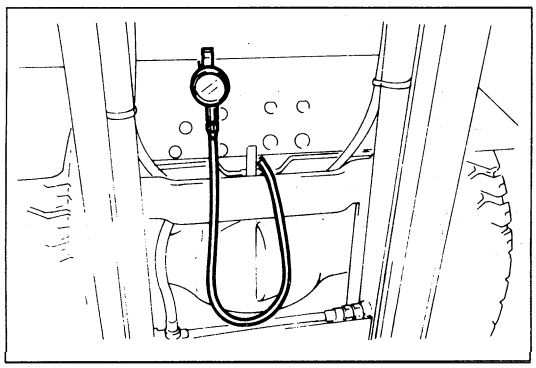
Reassembly: Install the bearing on the end cover side of the gear box.
SST 09608-20012



Disassembly: Remove the bearing and oil seal on the sector shaft side of the gear box.
SST 09480-10170-71

Reassembly: Install the bearing and oil seal on the sector shaft side of the gear box.
SST 09608-20012

Reassembly: Coat grease on the oil seal lip.

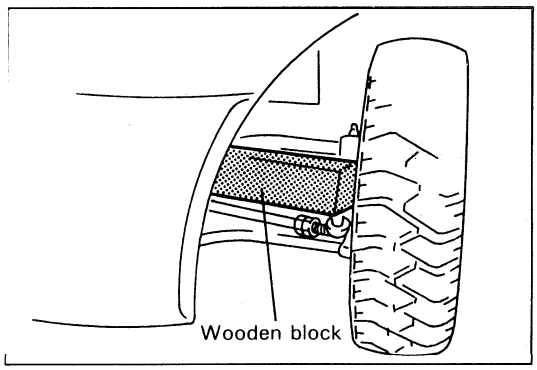


RELIEF PRESSURE MEASUREMENT

1. Measure the power steering relief pressure.

(1) Remove the relief valve plug and set an oil pressure gage.
Oil pressure detecting hole plug size: PT1/4

(2) Start the engine and turn the steering wheel slowly clockwise and counterclockwise.



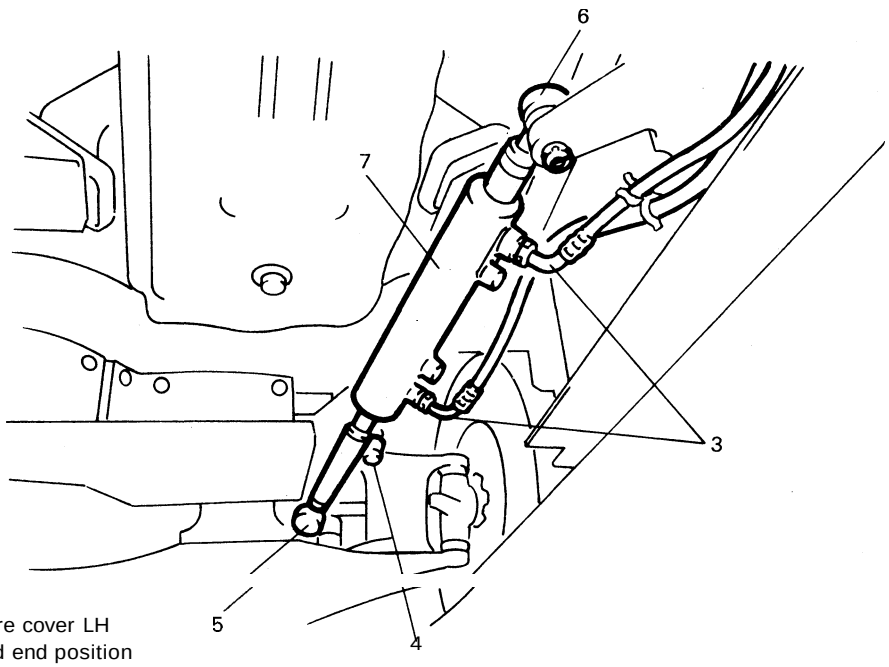
(3) With the rear wheels slightly steered from the straight traveling state, lock the wheels, run the engine at the maximum speed, and measure the relief pressure upon relieving.

Standard relief pressure

1 ton series:	***5880*** **± 490 kPa**
	(60 ± *5* kg/cm^2) [850 ± 70 psil
2·3 ton series:	**8040 ± 490 kPa**
	(82 ± *5* kg/cm^2) [*1*170 ± *70* psil

POWER CYLINDER

REMOVAL·INSTALLATION



1 Undercover and tire cover LH
2 Power cylinder rod end position
8 Power cylinder end

Removal Procedure

1 Remove the undercover and tire cover LH (in 2Z engine models only).

2 Rotate the steering wheel and stop at the position where the power cylinder rod end comes out from the rear axle beam.

3 Disconnect the piping.

4 Disconnect the drag link end. [Point 11

5 Disconnect the power cylinder rod end. [Point 21

6 Disconnect the power cylinder bottom end. [Point 31

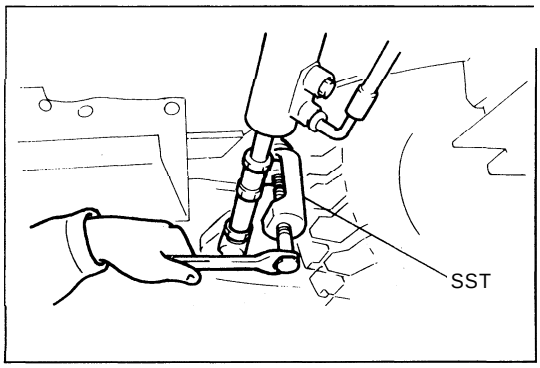
7 Remove the power cylinder ASSY W/power cylinder end.

8 Disconnect the power cylinder end. [Point 41

Installation Procedure

The installation procedure is the reverse of the removal procedure.

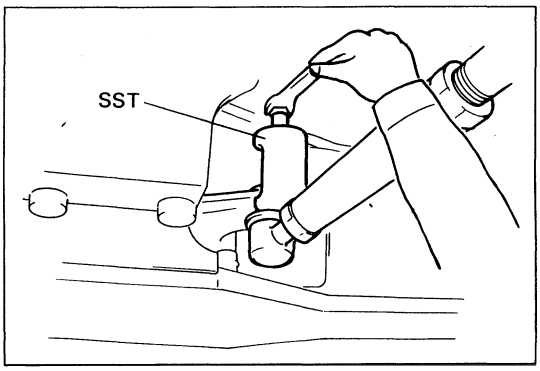
Note:
- See the steering link adjustment (on page 9-26) for the power cylinder installed dimension.
- Power cylinder end castle nut tightening torque.
  1.2 ton series: T = 68.65 - 98.07 **N·m** (700 - 1000 kg- **cm**) [**50.65** - 72.35 ft-lb]
  3 ton series: T = 147.10 - 196.13 **N·m** (1500 - 2000 kg- **cm**) [**108.53** - 144.70 ft-lb]



Point Operations

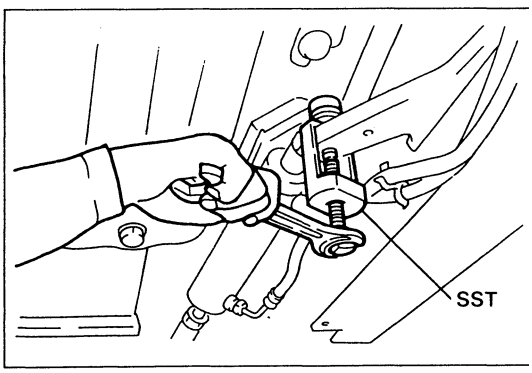
[Point 1]

Removal: SST 09610-20012



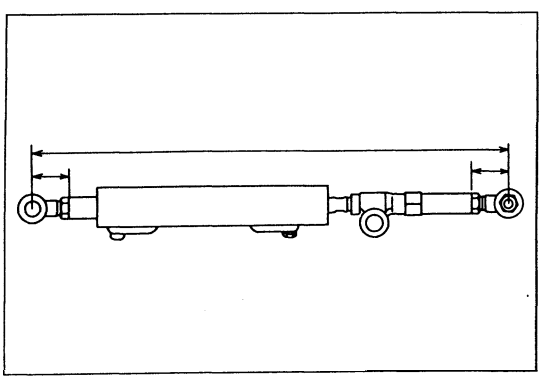
[Point 2]

Removal: **SST** 09430-23600-71



[Point 3]

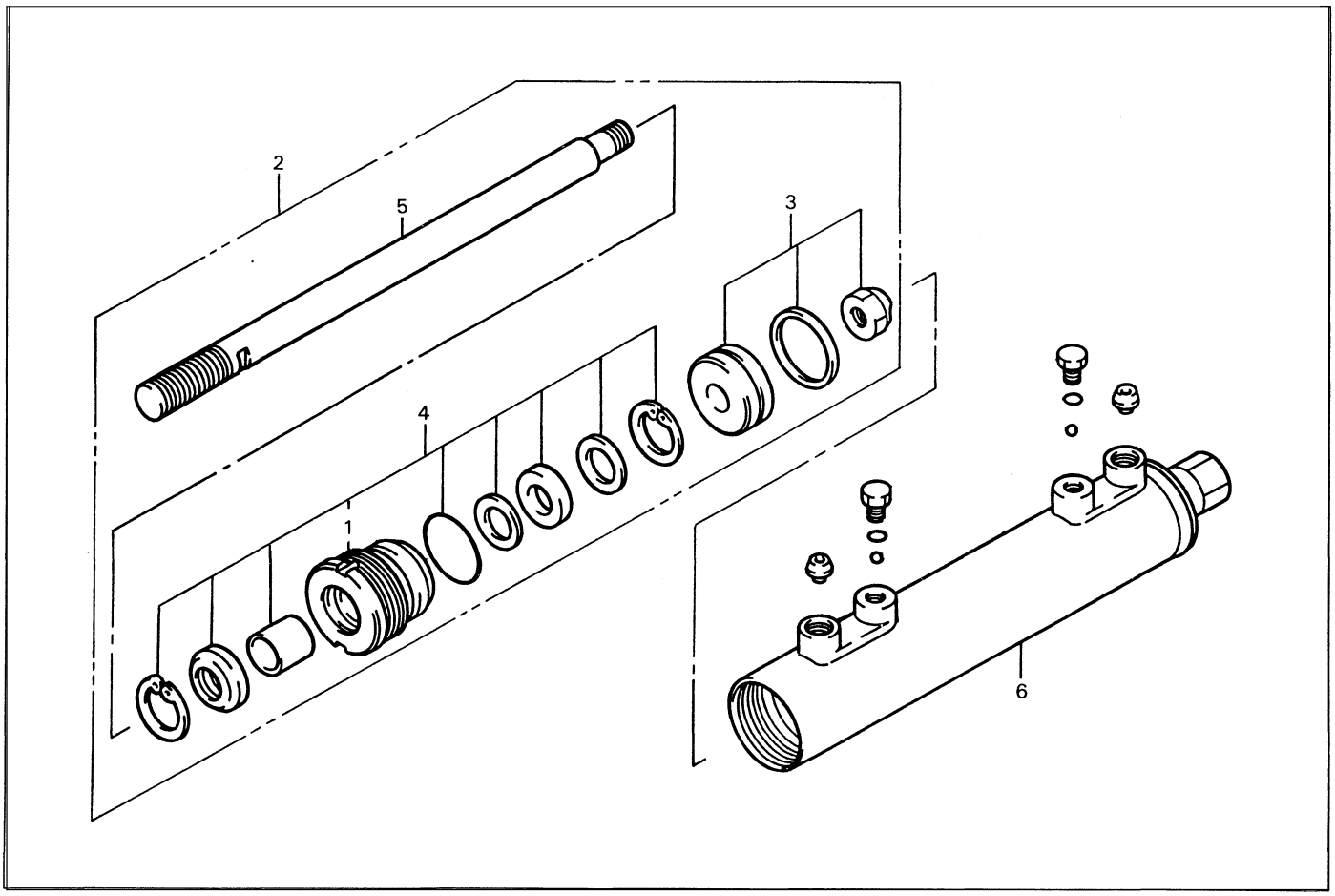
Removal: **SST** 09610-20012



[Point 4]

Removal: Before disconnecting the power cylinder end, measure the dimension at cylinder rod full retracted position for reference at the time of installation.

DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Loosen the rod guide. **[Point 1]**

2 Extract the piston rod W/piston. **[Point 2]**

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

4 Remove the rod guide.

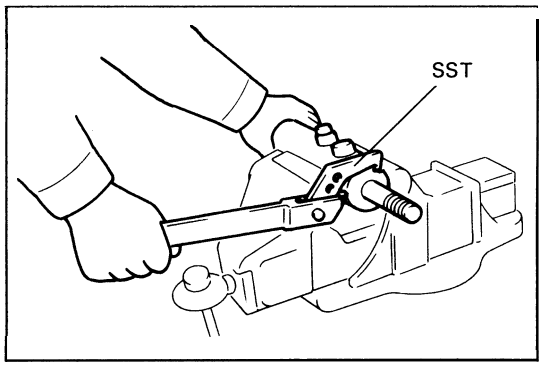
5 Remove the piston rod. **[Point 4]**

6 Remove the cylinder. **[Point 5]**

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

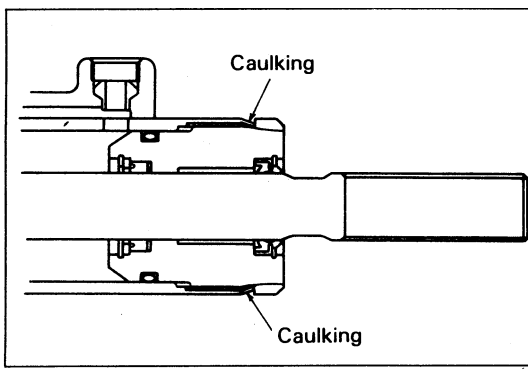
Note:
- **Coat hydraulic oil before reassembly.**
- **Coat liquid packing (08833-00080) on the threaded portion of the rod guide.**
- **Piston lock nut tightening torque T = 117.68 ~ 156.91 N·m (1200 ~ 1600 kg-cm) [86.82 ~ 115.76 ft-lb]**



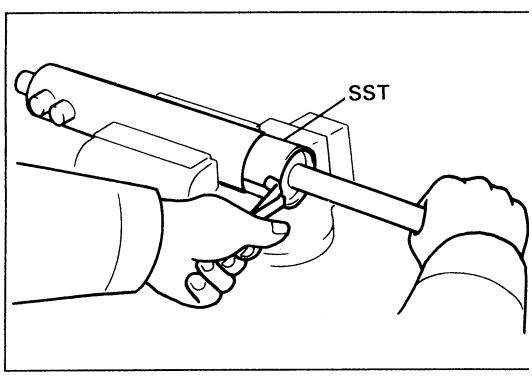
Point Operations

[Point 1]

Disassembly·reassembly: SST 09620-10100-71

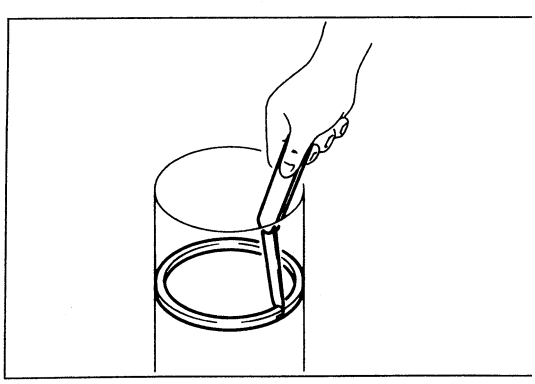


Reassembly: After tightening the rod guide, caulk the cylinder end face with the rod guide groove securely.



[Point 21

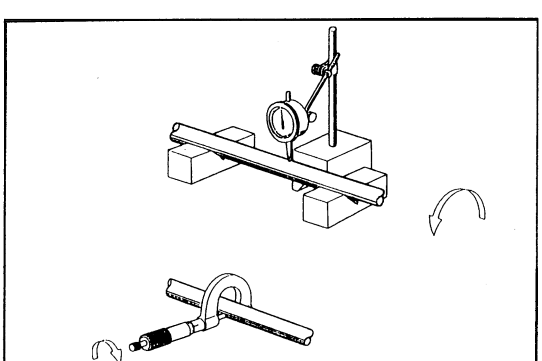
Reassembly: Compress the piston ring with the SST and insert it into the cylinder.
1 ton series: SST 09610-41830-71
2 ton series: SST 09490-20340-71



[Point 31

Inspection: Measure the piston ring joint clearance.
Measure by inserting the piston ring in the cylinder.

Standard clearance: 0.05 – 0.25 mm (0.0020 – 0.0098 in)
Limit clearance: 0.8 mm (0.031 in)



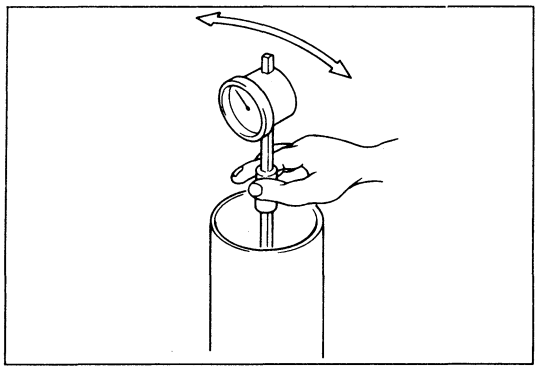
[Paint 41

Inspection: Measure the piston rod outside diameter.

1·2 ton series
Standard outside diameter:
22 mm (0.87 in)
Limit autside diameter:
21.92 mm (0.8634 in)
3 ton series
Standard outside diameter:
25 mm (0.98 in)
Limit outside diameter:
24.92 mm (0.9811 in)

Inspection: Measure the piston rod bend.

Limit bend: 0.5 mm (0.020 in)



[Point 51

Inspection: Measure the cylinder bore.

1 ton series
Standard bore: 45 mm (1.77 in)
Limit bore: 45.20 mm (1.7795 in)
2 ton series
Standard bore: 50 mm (1.97 in)
Limit bore: 50.20 mm (1.9764 in)
3 ton series
Standard bore: 55 mm (2.17 in)
Limit bore: 55.35 mm (2.1791 in)

STEERING LINK ADJUSTMENT

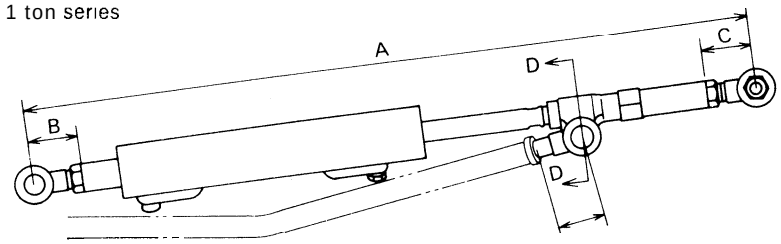
Power Cylinder End Installed Dimension

1 Fully retract the power cylinder

2 Adjust to the dimension shown below by adjusting the screwed-in dimensions of the cylinder ends at both ends of the cylinder.

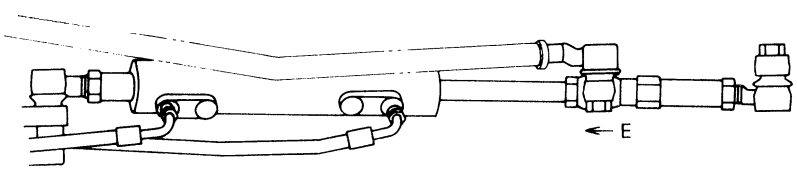
Note:
- The screwed-in dimensions of cylinder ends at both ends of the cylinder shall be the same.
- If the end angle is incorrect when installing the power cylinder on the vehicle, adjust the angle by loosening the end lock nut.
- Power cylinder end lock nut tightening torque
  T = 117.68 – 147.10 N·m (1200 – 1500 kg-cm) [86.82 – 108.53 ft-lbl

1 ton series



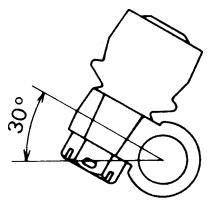
70 mm (2.76 in) (Reference)

2.3 ton series

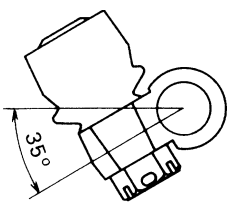


Section D-D

1 ton series

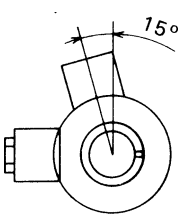


2.3 ton series

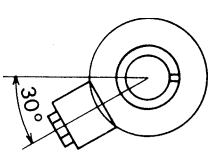


View E

1 ton series



2·3 ton serres



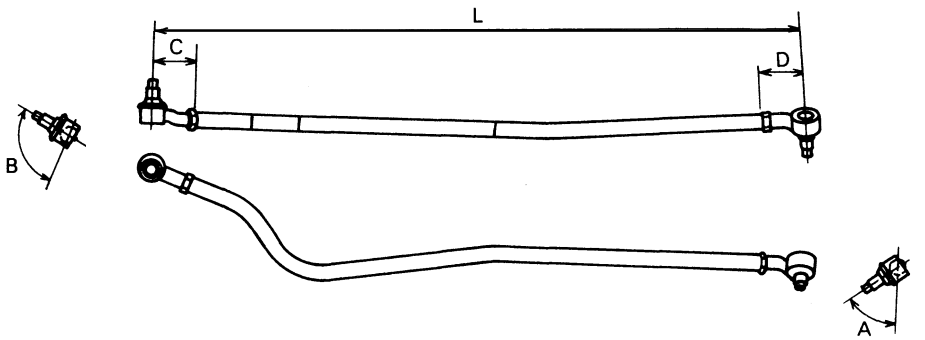
	A mm (in)	B (actual length) (reference value) mm (in)	C (actual length) (reference value) mm (in)
1 ton series	690±2 (27.17±0.08)	60 (2.36)	60 (2.36)
2.3 ton series	682±2 (26.85±0.08)	↑	↑

Drag Link End Installed Dimension

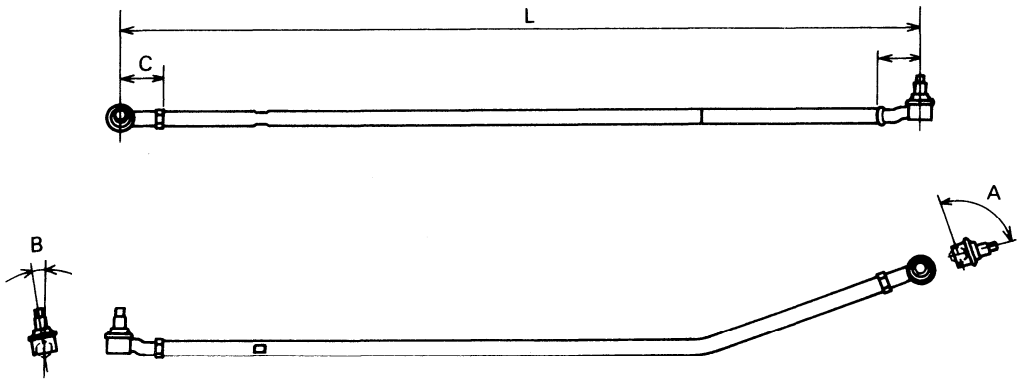
1 Adjust the .installed dimension to the value shown below by adjusting the screwed-in dimensions of the drag link ends.

Note:
- The screwed-in dimensions of the drag link ends at both ends shall be the same.
- If the end angle is incorrect when installing the drag link on the vehicle, adjust the angle by loosening the end lock nut.
- Drag link end lock nut tightening torque
  T = 117.68 – 147.10N·m (1200 – 1500 kg-cm) [**86.82 – 108.53**ft-lbl
- After installation, operate the drag link to confirm no undesirable contact with the frame or other part.

1 ton series



2.3 ton series

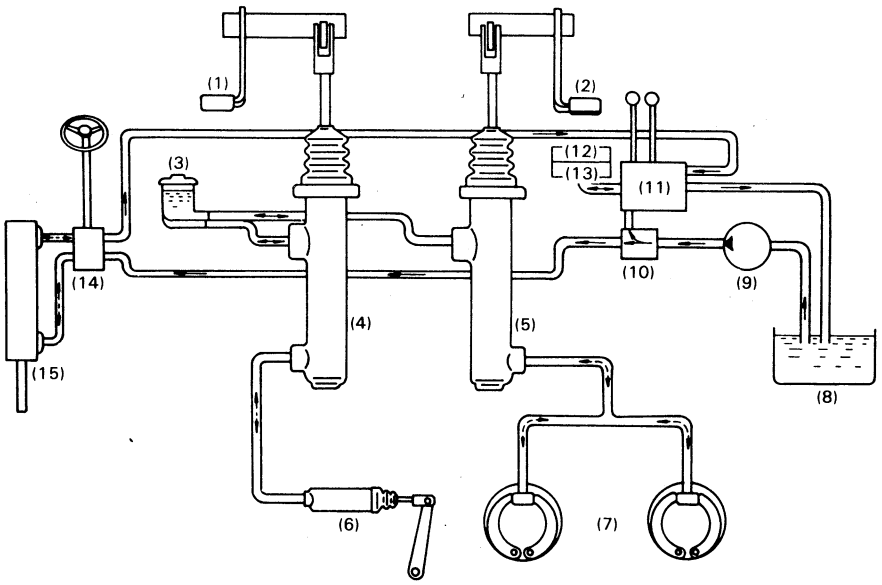


	L (Actual length, mm (in)	Installed angle A	Installed angle B	C (actual length) (reference value) mm (in)	D (actual length) (reference value) mm (in)
1 ton series	1056 ± 5 (41.57 ± 0.20)	40° ± 2.5°	110° ± 2.5°	70 (2.76)	70 (2.76)
2 ton series	1315±5 (51.77±0.20)	95°±2.5°	9°±2.5°	↑	↑
3 ton series	1420±5 (55.9110.20)	↑	↑	↑	↑

BRAKE

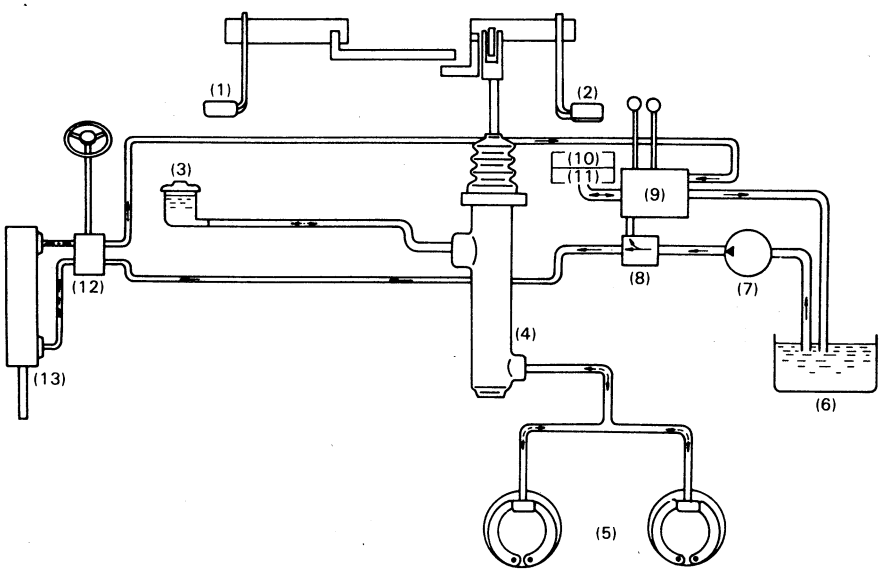
HYDRAULIC CIRCUIT DIAGRAM

Clutch Model



(1) Clutch pedal
(2) Brake pedal
(3) Reservoir tank
(4) Clutch master cylinder
(5) Brake master cylinder
(6) Clutch release cylinder
(7) Brake wheel cylinder
(8) Oil tank
(9) Oil pump
(10) Flow divider
(11) Oil control valve
(12) Lift cylinder
(13) Tilt cylinder
(14) Steering gear box
(15) Power steering cylinder

Torque Converter Model



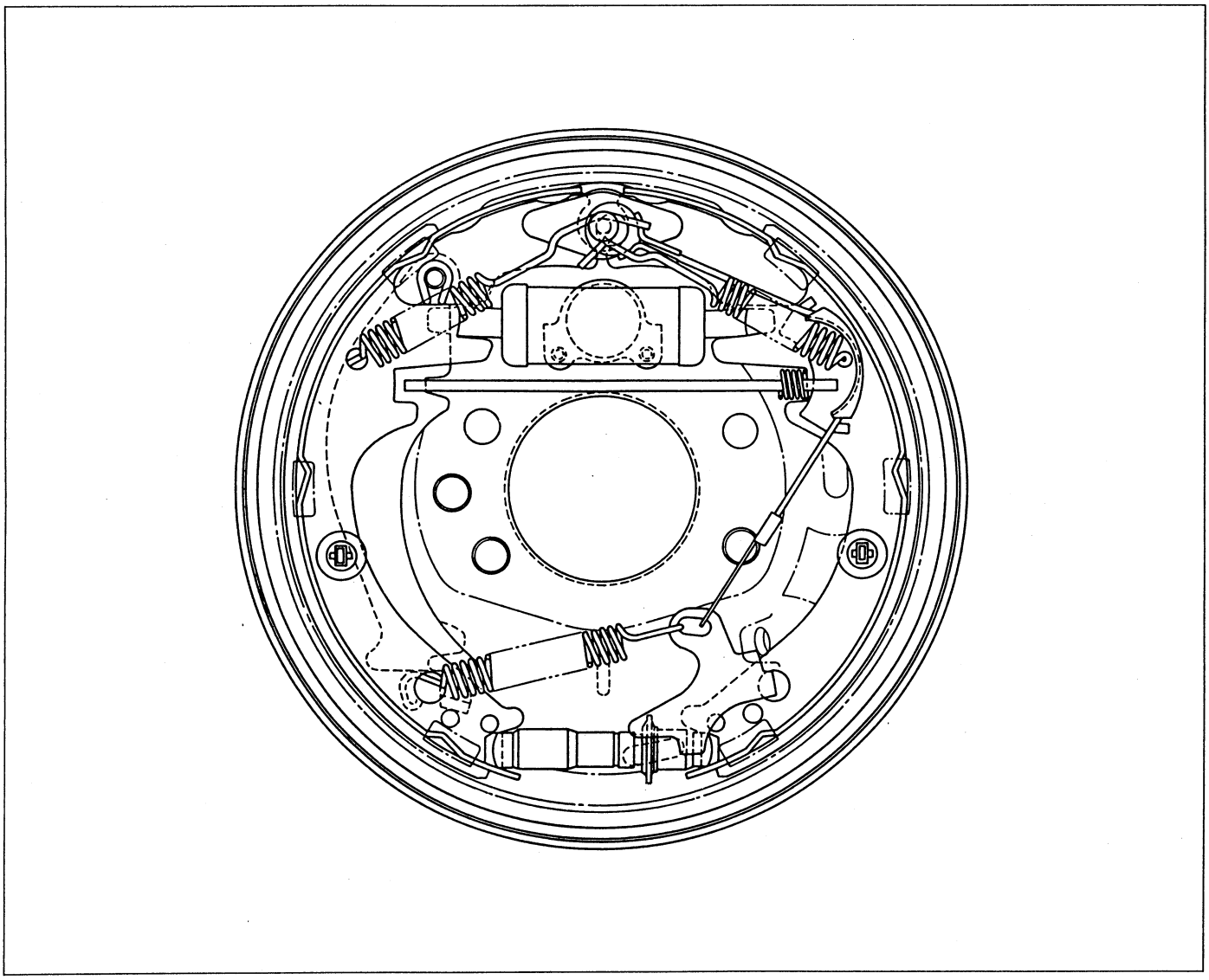
(1) Inching pedal
(2) Brake pedal
(3) Reservoir tank
(4) Brake master cylinder
(5) Brake wheel cylinder
(6) Oil tank
(7) Oil pump
(8) Flow divider
(9) Oil control valve
(10) Lift cylinder
(11) Tilt cylinder
(12) Steering gear box
(13) Power steering cylinder

SPECIFICATIONS

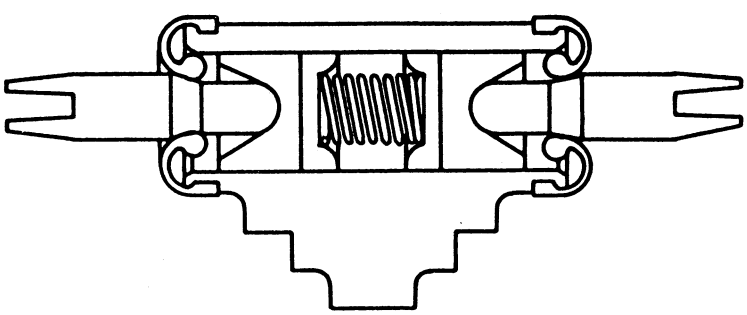
Item \ Vehicle model		1 ton series	2·3 ton series
Foot brake type		Hydraulic internal expansion type duo servo brake	
Brake drum inside diameter mm (in)		254 (10.00)	310 (12.20)
Brake lining	Material	Resin mold	←
	Dimensions (width x thickness x length) mm (in)	48.5×5×279 (1.909x 0.20×10.98)	2 ton series: 60×7×323 (2.36x 0.28 x 12.72) 3 ton series: 60 x 7 x 343 (2.36 x 0.28 x 13.50)
Wheel cylinder bore		22.22 (0.8748)	28.58 (1.1252)
Brake master cylinder	Bore mm (in)	19.05 (0.7500)	←
	Stroke mm (in)	30 (1.18)	←
Applicable oil		Brake fluid	

FRONT BRAKE

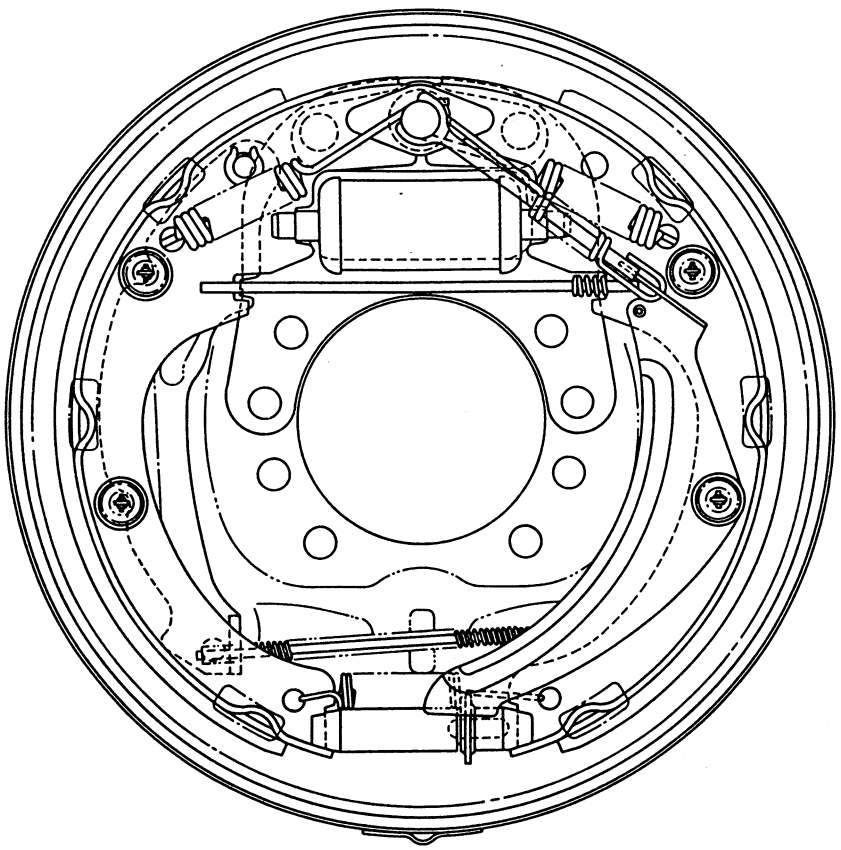
1 Ton Series



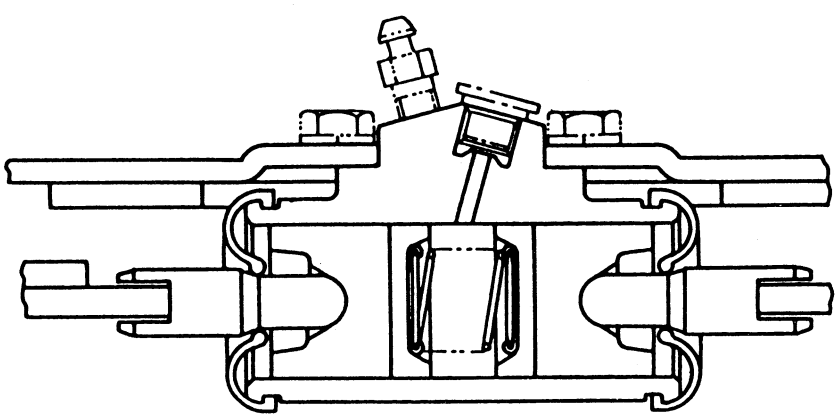
Wheel Cylinder (1 Ton Series)



2·3 Ton Series



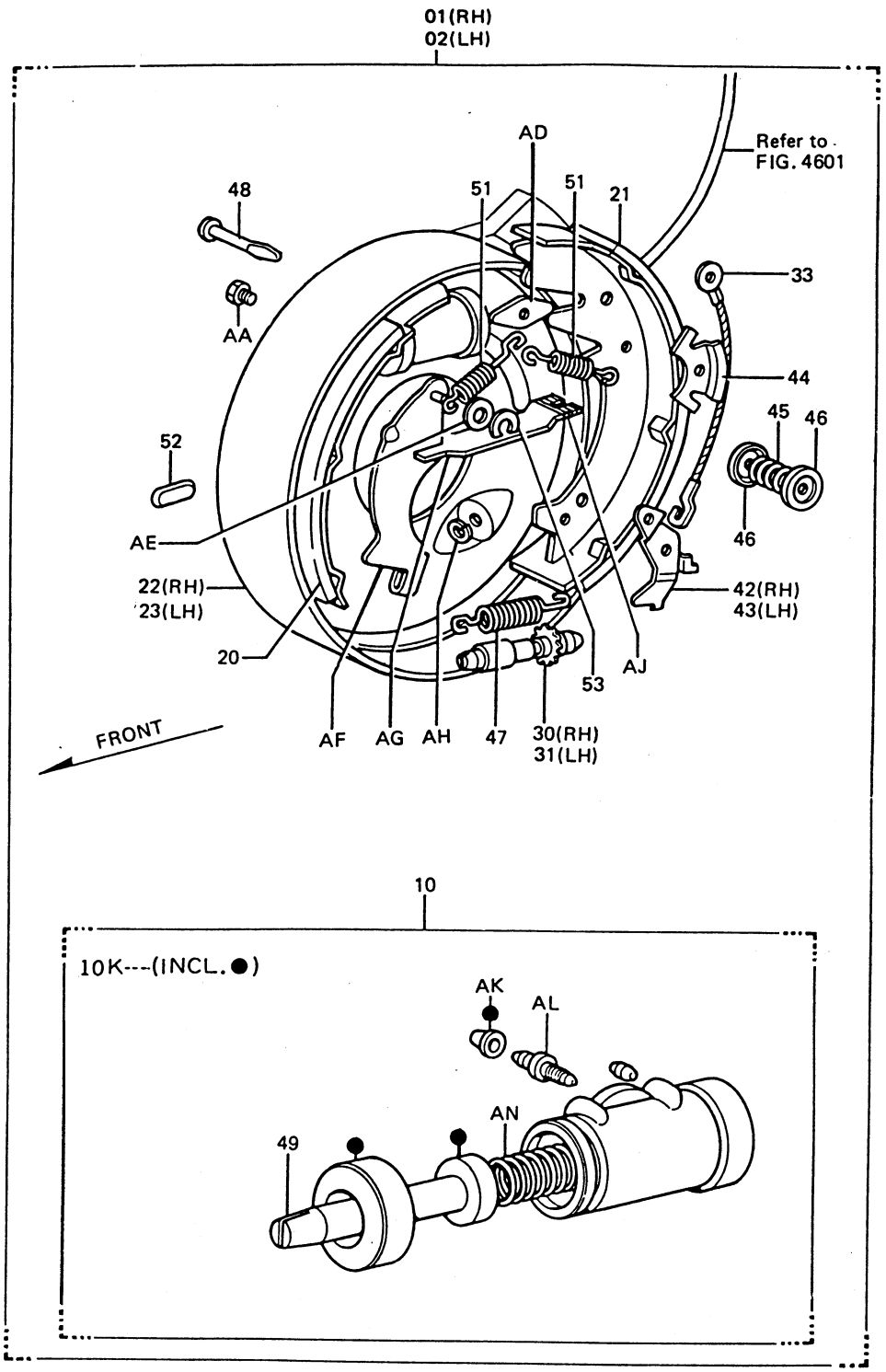
Wheel Cylinder (2·3 Ton Series)



COMPONENTS

1 Ton Series

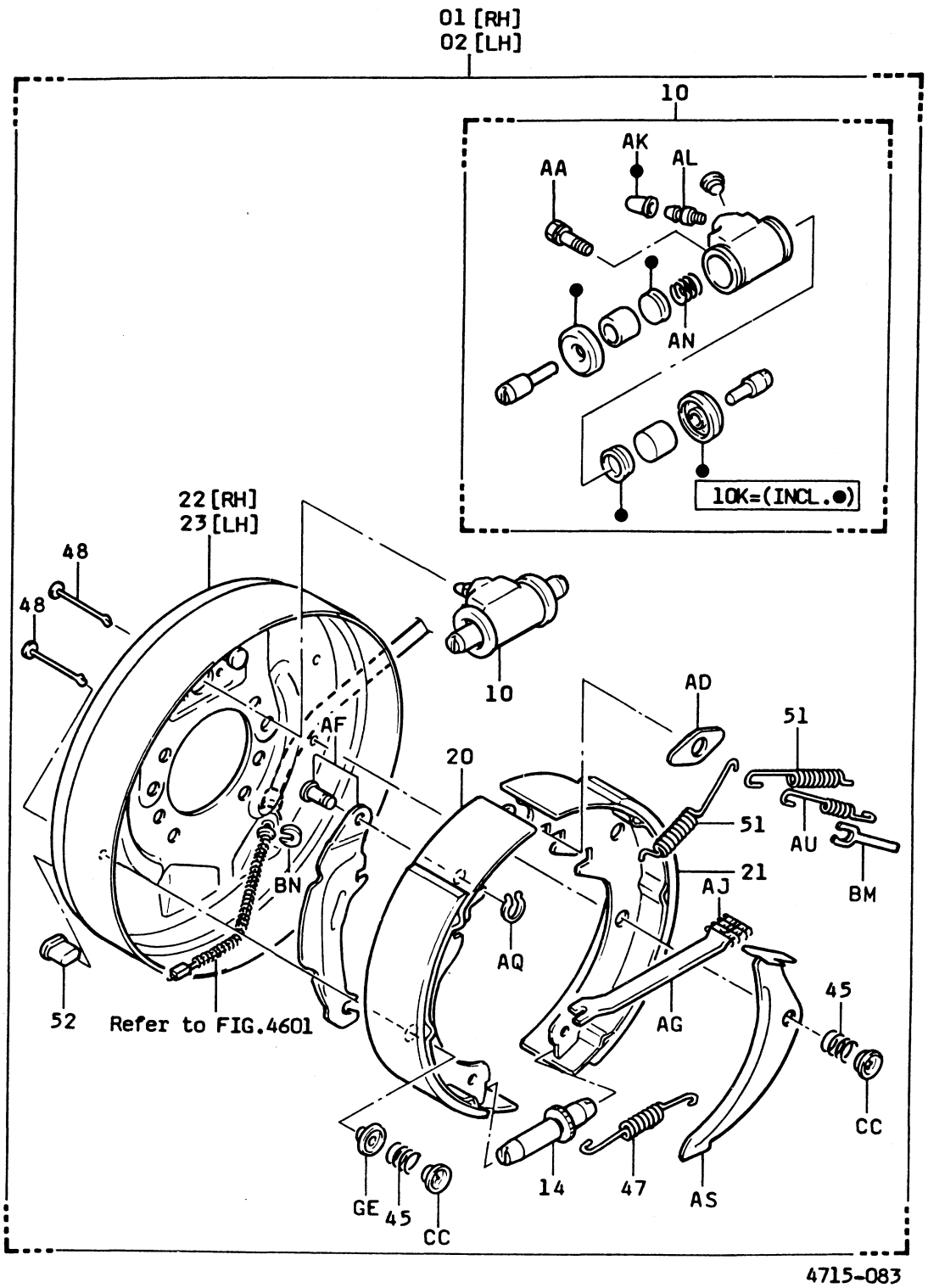
4715



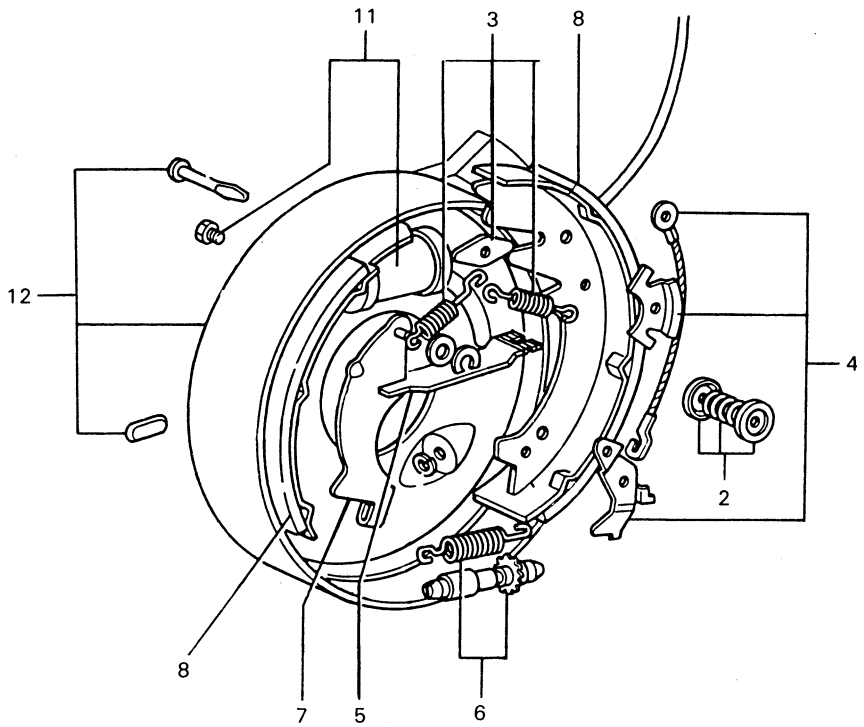
4715-001C

2.3 Ton Series

4715



DISASSEMBLY·INSPECTION·REASSEMBLY (1 TON SERIES)



1 **Front axle** hub
9 **Brake** fluid
10 **Brake pipe**
13 **Brake** drum

Disassembly Procedure

1 Remove the front axle hub.
(See the front axle shaft,hub removal section on page 7-9.)

2 Remove the hold down spring. **[Point 1]**

3 Remove the anchor-to-shoe spring. **[Point** 21

4 Remove the cable and cable guide.

5 Remove the strut lever. **[Point** 31

6 Remove the adjuster spring and adjusting screw. **[Point** 41

7 Disconnect the parking brake cable. **[Point** 51

8 Remove the brake shoe. **[Point** 61

9 Drain brake fluid.

10 Disconnect the brake pipe.

11 Remove the wheel cylinder ASSY. **[Point** 71

12 Remove the backing plate. **[Point** 81

13 Disconnect the brake drum from the hub. **[Point** 91
(See the front axle shaft, hub removal section on page 7-9.)

Reassembly Procedure

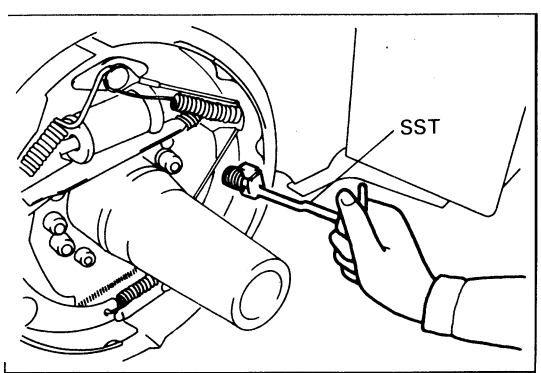
The reassembly procedure is the reverse of the disassembly procedure.

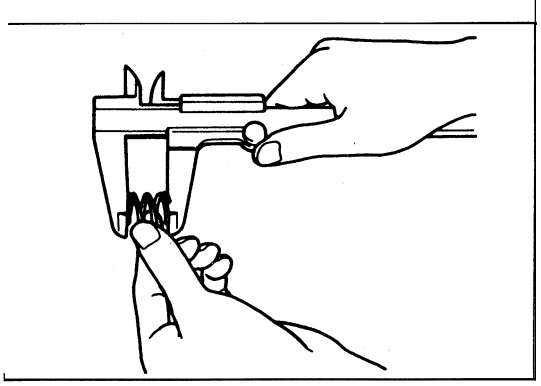
Note:

- See the note for front axle shaft, hub installation. (See Page 7-10.)
- Check no oil or grease adhesion on the brake lining and interior surface of the brake drum before reassembly.
- Set the installed brake shoe outside diameter to the value below by tightening the adjusting screw before installing the hub **W/brake** drum. (Set to 1 mm (0.04 in) smaller than the brake drum inside diameter.)
  Installed brake shoe outside diameter: 253 mm (9.96 in)
- Coat thread tightener (08833-00070) before tightening the brake drum set nuts. (Applicable when the hub and brake drum are disconnected.)
- Bleed air from the brake system after reassembly.
- Adjust the brake performance after reassembly. For adjustment, repeat forward travel and reverse travel of the vehicle, and stop the vehicle each time by depressing the brake pedal.
- The tightening torque for each portion is as follows:

Unit: N·m (kg-cm)[ft-lb]

Brake drum set nut (hub bolt set nut)	68.65 – 88.26 (700–900) 150.65– 65.121
Backing plate self lock nut	117.68 –137.29 (1200–1400) [86.82 ~ 101.291
Wheel cylinder set bolt	7.85– 11.77 (80–120) [5.79 ~ 8.68]





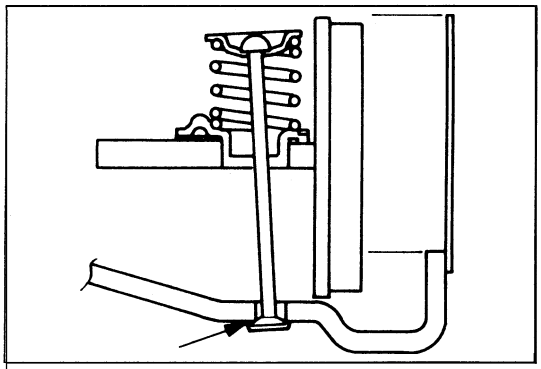
Point Operations

[Point **1**]

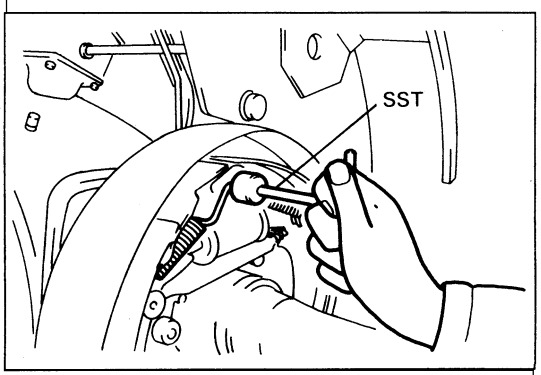
Disassembly,reassembly: SST 09510-31960-71

Inspection: Measure the free length of the hold down spring.

Standard free length: 25.7 mm (1.012 in)
Limit free length: 23 mm **(0.91in)**

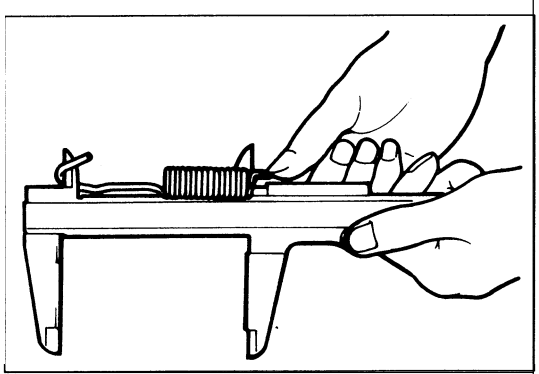


Reassembly: Coat liquid packing (08826-00080) on shoe hold down pin and the contact face on the rear side of the backing plate to eliminate any clearance.



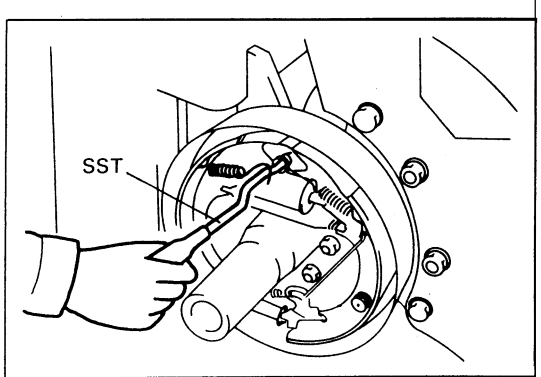
[Point 2]

Disassembly: SST 09717-20010

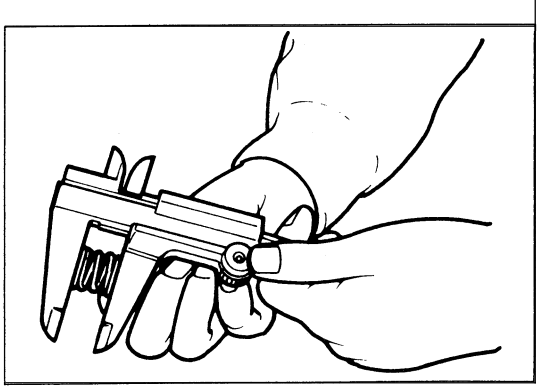


Inspection: Measure the free length of the anchor-to-shoe spring.

Standard free length: 102 mm (4.02 in)
Limit free length: Replace if there is any clearance in the coil.



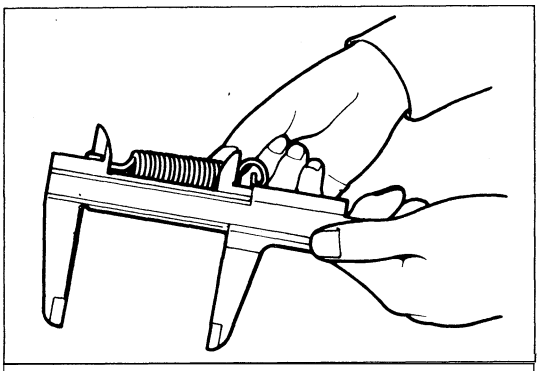
Reassembly: SST 09718-20010



[Point 3]

Inspection: Measure the free length of the strut-to-shoe spring.

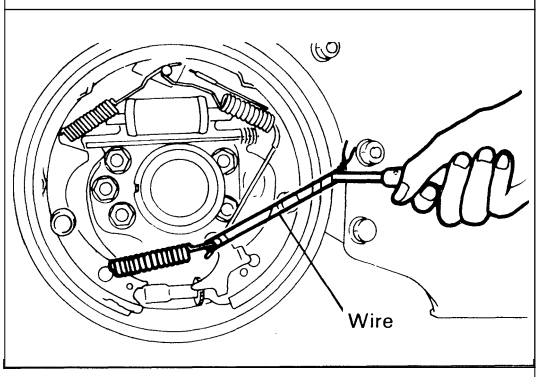
Standard free length: 20 mm (0.79 in)
Limit free length: 17 mm (0.67 in)



[Point 4]

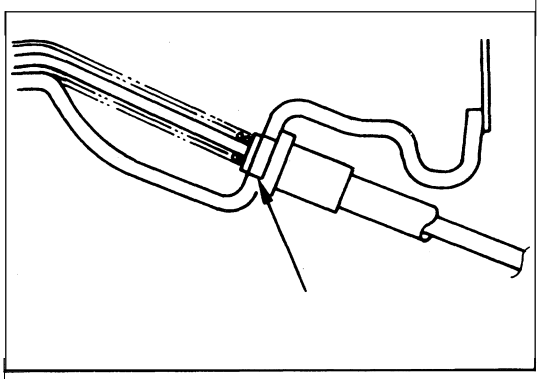
Inspection: Measure the free length of the adjuster spring.

Standard free length: 79 mm (3.11 in)
Limit free length: Replace if there is any clearance in the coil.



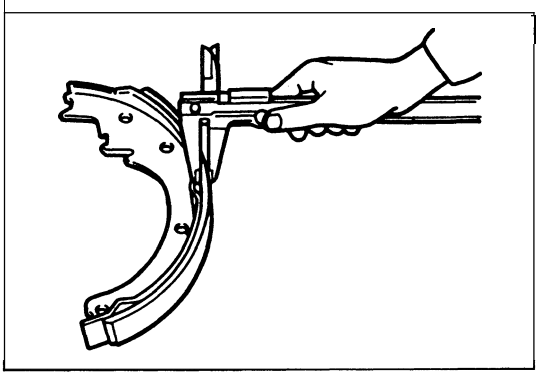
Reassembly: Apply grease on the threaded portion of the adjusting screw and in the cap.

Reassembly: Tie a wire at the end of the adjuster spring and set the spring by pulling it with a screw driver.



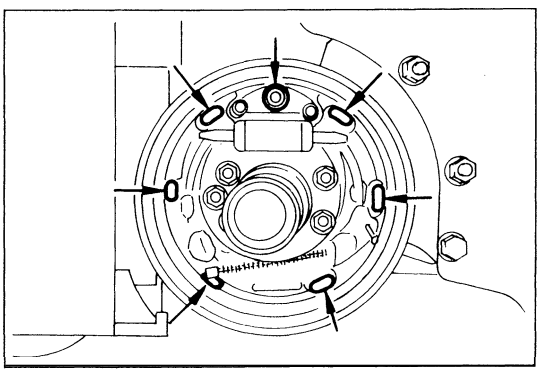
[Point 5]

Reassembly: Coat liquid packing (08826-00080) on the parking brake cable port of the backing plate to eliminate any clearance.

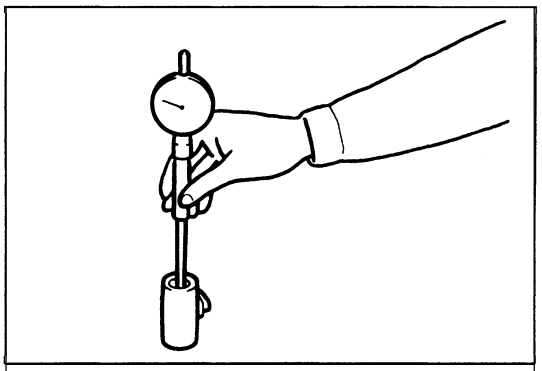


[Point 6]
Inspection: Measure the brake lining thickness.

Standard thickness: 5.0 mm (0.197 in)
Limit thickness: 1.0 mm (0.039 in)



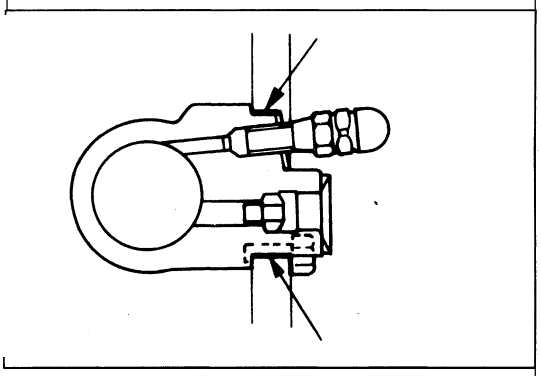
Reassembly: Coat grease on the illustrated portions (6 places in contact with the shoe rim and anchor pin) of the backing plate before installing the brake shoe.



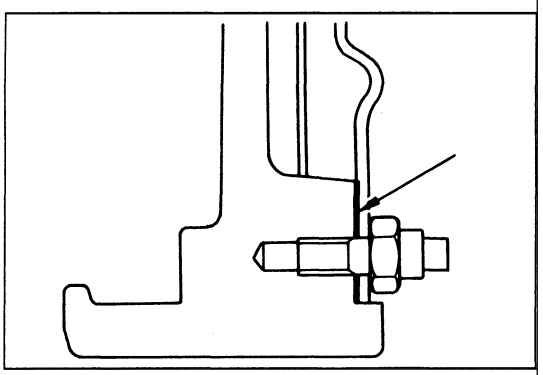
[Point 71

Inspection: Measure the clearance between the wheel cylinder and piston.

Limit piston clearance: **0.125** mm **(0.00492** in)

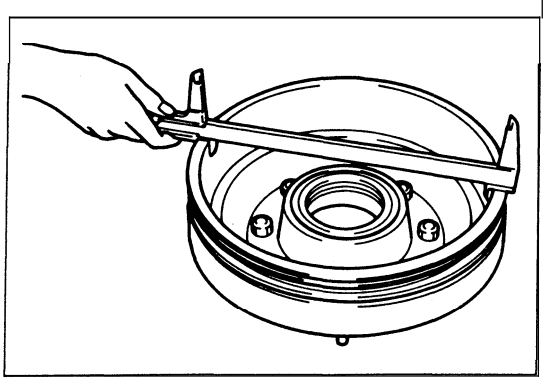


Reassembly: Coat liquid packing (08826-00080) on the wheel cylinder portion for fitting to the backing plate and whole circumference on the set bolt to eliminate any clearance.



[Point **81**

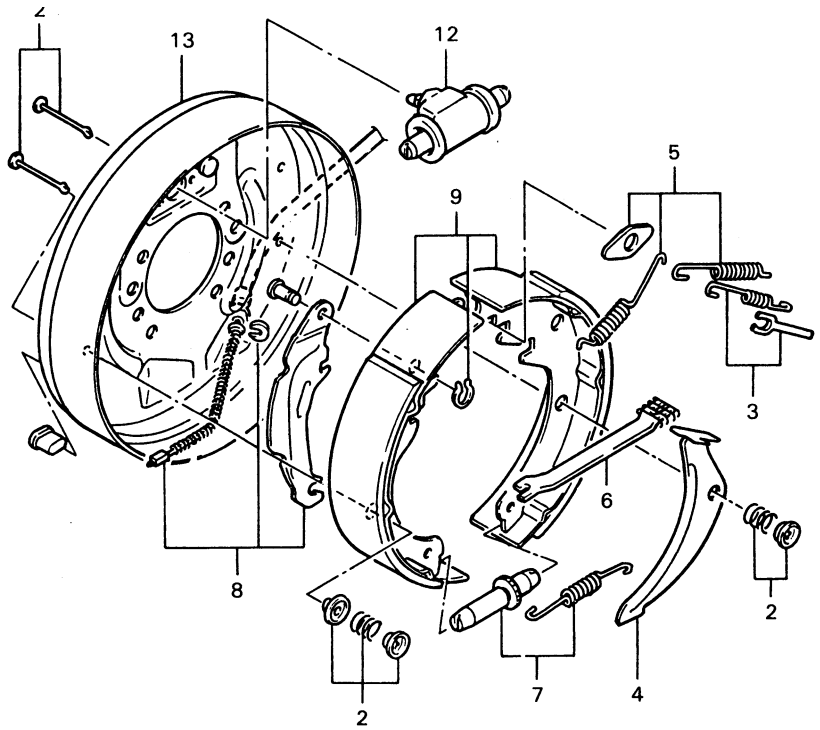
Reassembly: Coat liquid packing *(08826-00080)* on the joint face between the backing plate and front axle bracket to eliminate any clearance.



[Point **91**

Inspection: Measure the inside diameter of the brake drum.

Standard inside diameter: **254 mm (10.00** in)
Limit inside diameter: 256 mm **(10.08** in)



1 Front axle hub
10 Brake fluid
11 Brake pipe
14 Brake drum

Disassembly Procedure

1 Remove the front axle hub. (See the front axle shaft,hub removal section on page 7-9.)

2 Remove the hold down spring. **[Point** 11

3 Remove the pawl lever stopper. **[Point** 21

4 Remove the pawl lever.

5 Remove the anchor-to-shoe spring. **[Point** 31

6 Remove the strut lever. **[Point 41**

7 Remove the adjuster spring and adjusting screw. **[Point 51**

8 Disconnect the parking brake cable. **[Point** 61

9 Remove the brake shoe. **[Point** 71

10 Drain brake fluid.

11 Disconnect the brake pipe

12 Remove the wheel cylinder ASSY. **[Point** 81

13 Remove the backing plate. **[Point** 91

14 Disconnect the brake drum from the hub. **[Point** 101
(See the front axle shuft,hub removal section on page 7-9.)

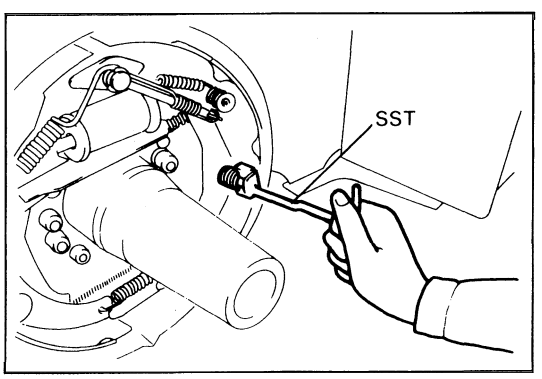
Reassembly Procedure

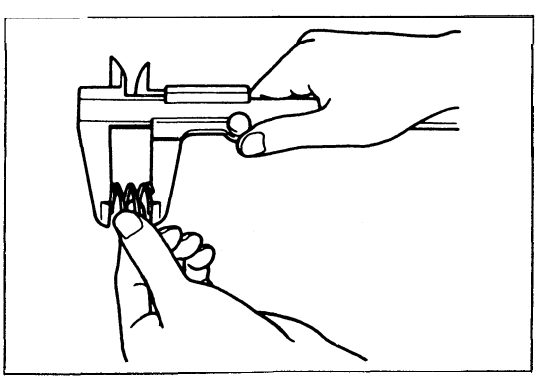
The reassembly procedure is the reverse of the disassembly procedure.
In the reassembly procedure, however, reverse the order of steps 2 and 3 in disassembly procedure. (Install the pawl lever stopper after installing the hold spring.)

Note:
- Refer to the note for the front axle **shaft,hub** installation procedure (on page 7-10).
- Check no grease or oil adhesion on the brake lining and brake drum interior surface before reassembly.
- Set the installed brake shoe outside diameter to the following dimension by tightening the adjusting screw before installing the hub **W/brake** drum. (Set it to approx. 1 mm (0.04in) smaller than the brake drum inside diameter.)
  Installed brake shoe outside diameter: 309 mm (12.17 in)
- Coat thread tightener (08833-00070) on the brake drum set nut before tightening. (Applicable when the hub and brake drum are disconnected.)
- Drain air from the brake system after reassembly.
- After reassembly, adjust the brake performance. For adjustment repeat vehicle forward travel and reverse travel and stop the vehicle by depressing the brake pedal each time.
- The tightening torque for each portion is as follows:

Unit: N·m (kg-cm)[ft-lb]

Brake drum set nut (hub bolt set nut)	2 ton series: 147.10 - 186.33 (1500–1900) [108.53–137.47] 3 ton series: 166.71 - 205.94 (1700–2100) [123.00~151.94]
Backing plate self lock nut	117.68 - 137.29 (1200–1400) [86.82~101.29]
Wheel cylinder set bolt	14.71 - 19.61 (150–200) [10.85~14.47]





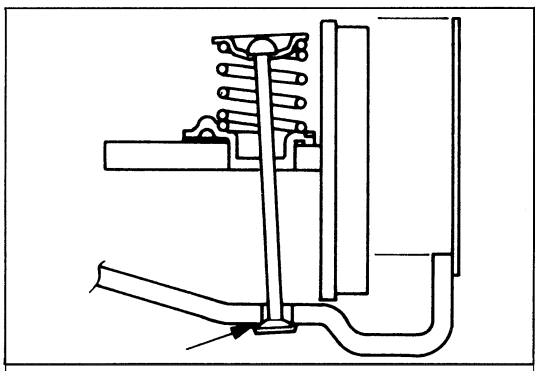
Point Operations

[Point 1]

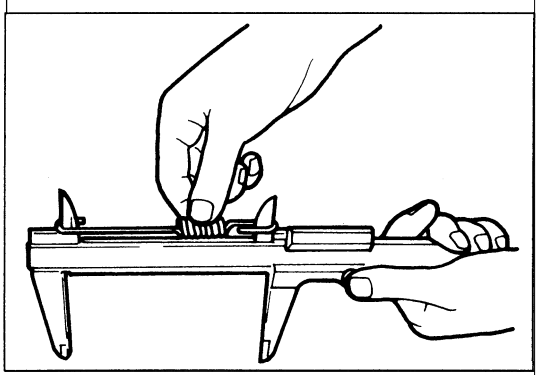
Disassembly·reassembly: SST 09510-31960-71

Inspection: Measure the free length of the hold down spring.

Standard free length: 31.3 mrn (1.232 in)
Limit free length: 28.2 mm (1.110 in)



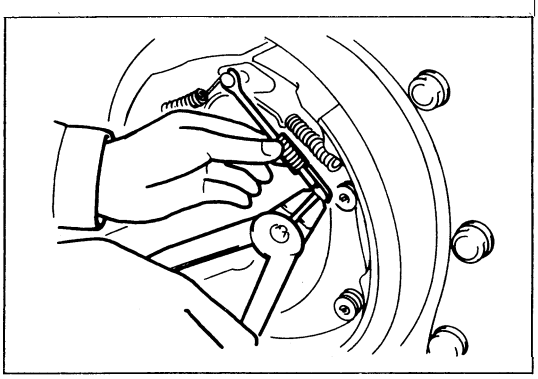
Reassembly: Coat liquid packing *(08826-00080)* on the shoe hold down pin contact portion the rear side of the backing plate to eliminate any clearance.



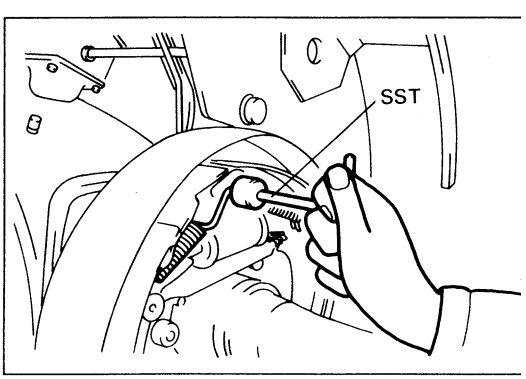
[Point 2]

Inspection: Measure the free length of the actuator spring.

Standard free length: 124.5 mm (4.902 in)
Limit free length: Replace if there is any clearance in the coil.

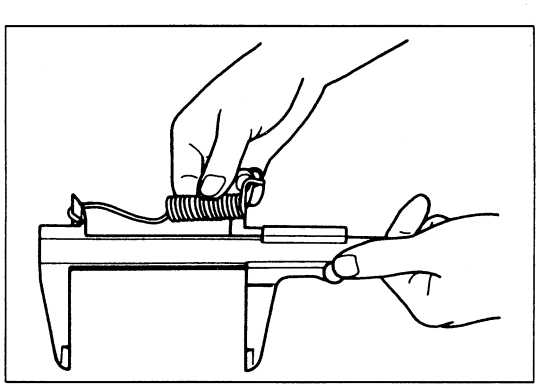


Reassembly: Use snap ring pliers and install the pawl lever stopper and actuator spring.



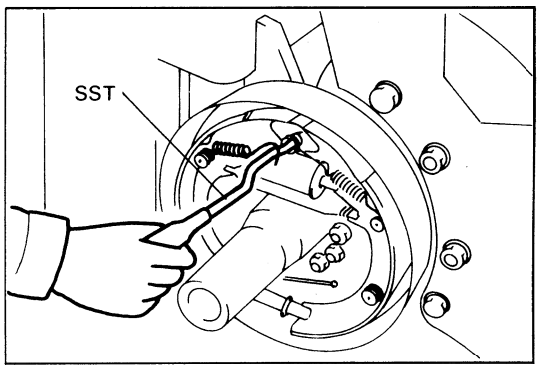
[Point 3]

Disassembly: **SST** 09717-20010

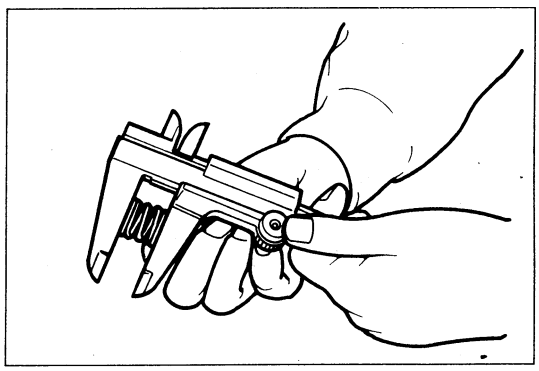


Inspection: Measure the free length of the anchor-to-shoe spring.

Standard free length: 106 mm (4.17 in)
Limit free length: Replace if there is any clearance in the coil.



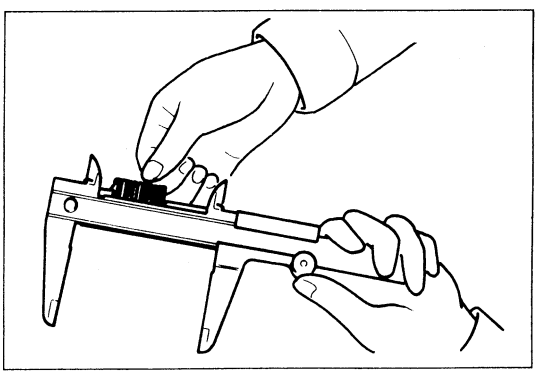
Reassembly: SST 09718-20010



[Point 41

Inspection: Measure the free length of the strut-to-shoe spring.

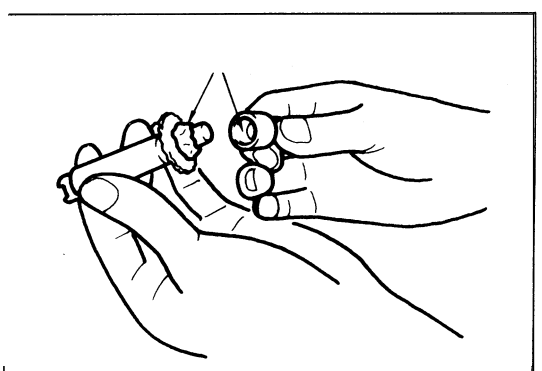
Standard free length: 23 mm (0.91 in)
Limit free length: 20 mm (0.79 in)



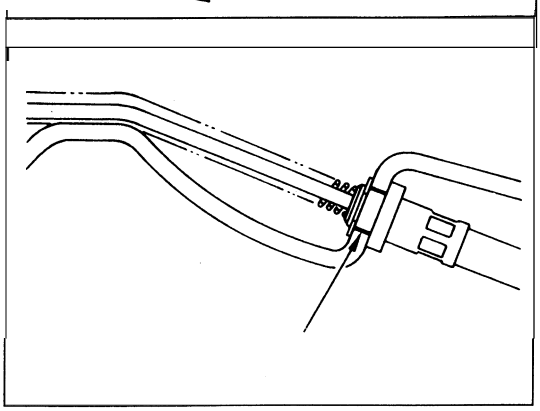
[Point 51

Inspection: Measure the free length of the adjuster spring.

Standard free length: 86 mm (3.39 in)
Limit free length: Replace if there is any clearance in the coil.

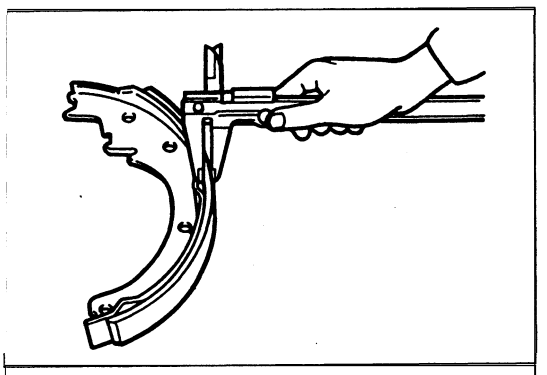


Reassembly: Apply grease to the threaded portion of the adjusting spring and in the cap.



[Point 61

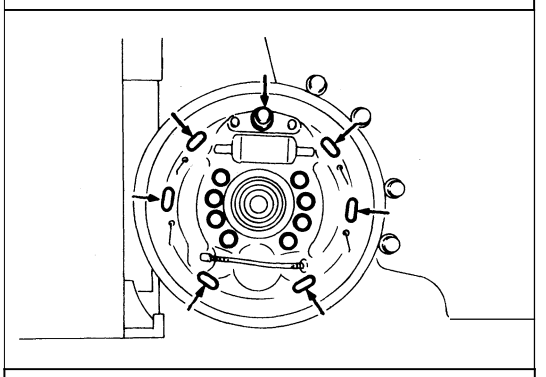
Reassembly: Coat liquid packing (08826-00080) on the parking brake cable outlet in the backing plate to eliminate any clearance.



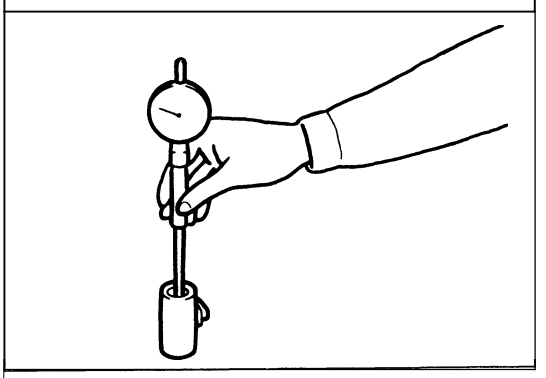
[Point 7]

Inspection: Measure the brake lining thickness.

Standard thickness: 7.0 mm (0.276 in)
Limit thickness: 2.0 mm (0.08 in)



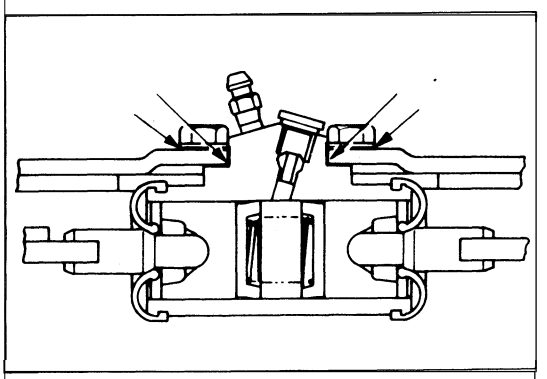
Reassembly: Before installing the brake shoe, coat grease on the illustrated portions *(6* places in contact with the shoe rim and anchor pin) of the backing plate.



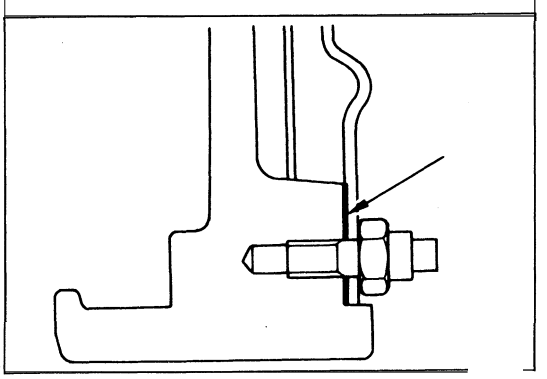
[Point 8]

Inspection: Measure the clearance between the wheel cylinder and piston:

Limit piston clearance: 0.145 mm (0.00571 in)

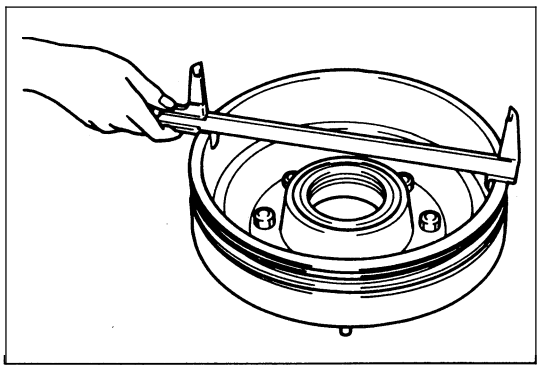


Reassembly: Coat liquid packing *(08826-00080)* on the wheel cylinder portion for fitting in the backing plate and whole circumference of the set bolt to eliminate any clearance.



[Point 9]

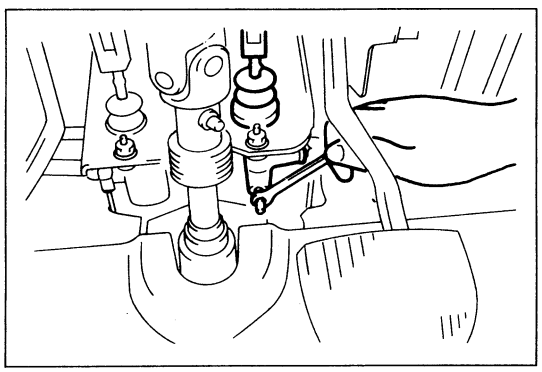
Reassembly: Coat liquid packing *(08826-00080)* on the joint face of the backing plate with the front axle bracket to eliminate any clearance.

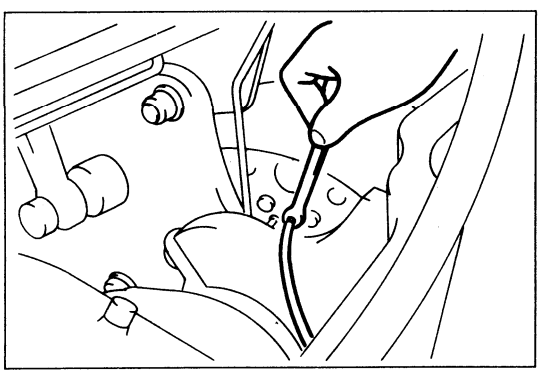


[Point 10]

Inspection: Measure the brake drum inside diameter.

Standard inside diameter: 310 mm (12.20 in)
Limit inside diameter: 312 mm (12.28 in)





AIR BLEEDING FROM BRAKE SYSTEM

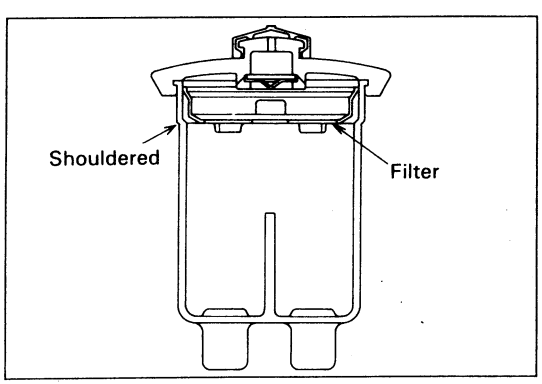
Note:
Carry out air bleeding operation while adding brake fluid to the reservoir tank to prevent it from becoming insufficient.

1. Bleed air from the brake master cylinder.

   (1) Depress the brake pedal several times to compress the air in the piping and maintain that state.
   (2) Loosen the breather plug to bleed air in the piping with the brake fluid and tighten the plug immediately before the brake fluid discharge stops.
   (3) Repeat steps (1) and (2) above until no air bubble is seen in the flowing out brake fluid.

2. Bleed air from wheel cylinders RH and LH.

   (1) Perform the same operation as above for each of the wheel cylinder RH and LH at a time.



3. Add brake fluid to the specified level.

   (1) For addition, pour brake fluid through the filter provided at the reservoir tank.
   (2) Add brake fluid to the shouldered portion in the reservoir tank.

BRAKING FORCE INSPECTION·ADJUSTMENT

1. Inspect the braking force by using a brake tester or by the brake test.

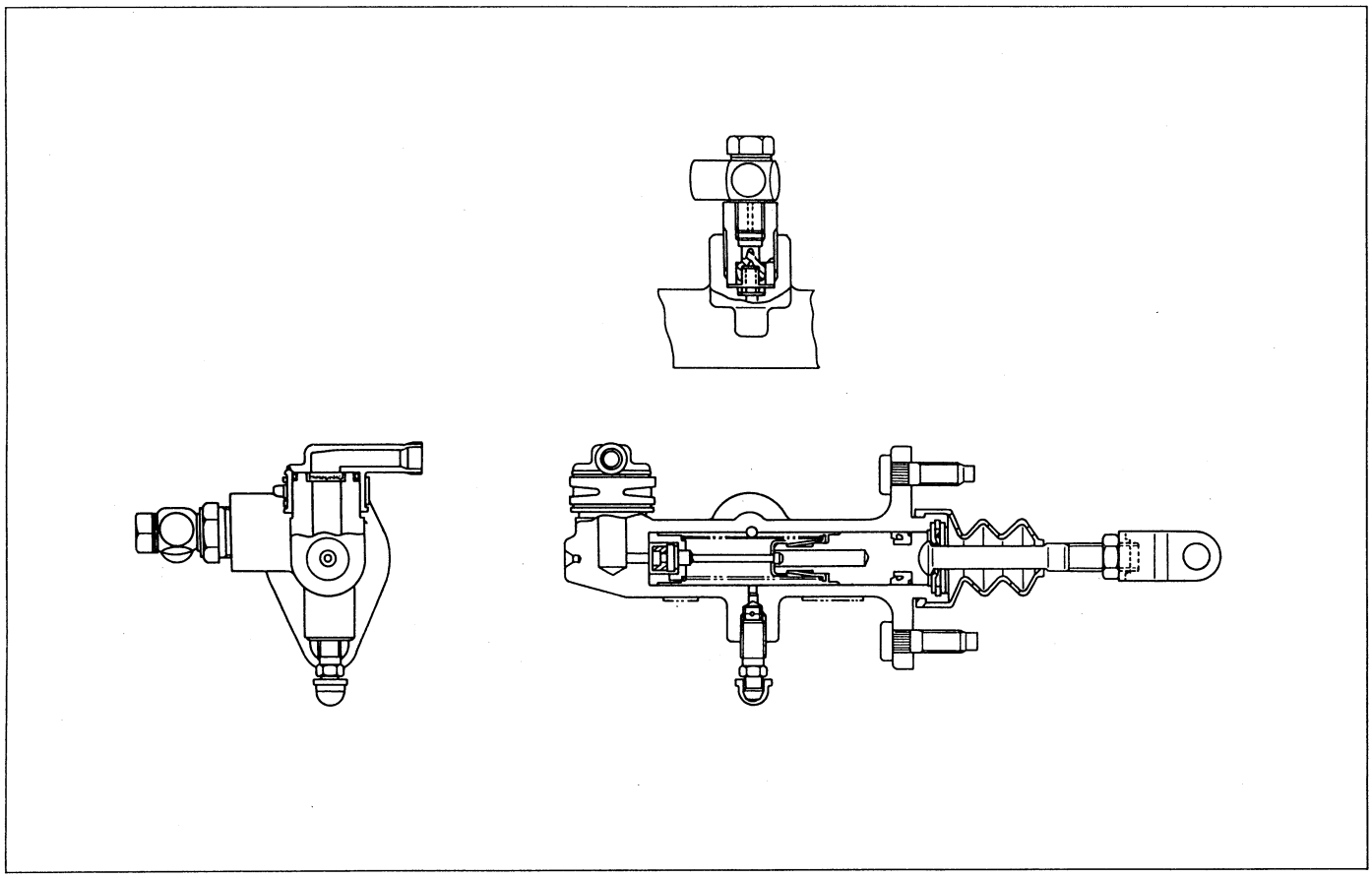
   Braking distance (no-load state)

	1 ton series	2 ton series	3 ton series
Initial speed of braking km/h (mph)	18.0 (11.18)	16.0 (9.94)	19.5 (12.11)
Stopping distance m (ft)	5.0 (16.4) or less	←	←

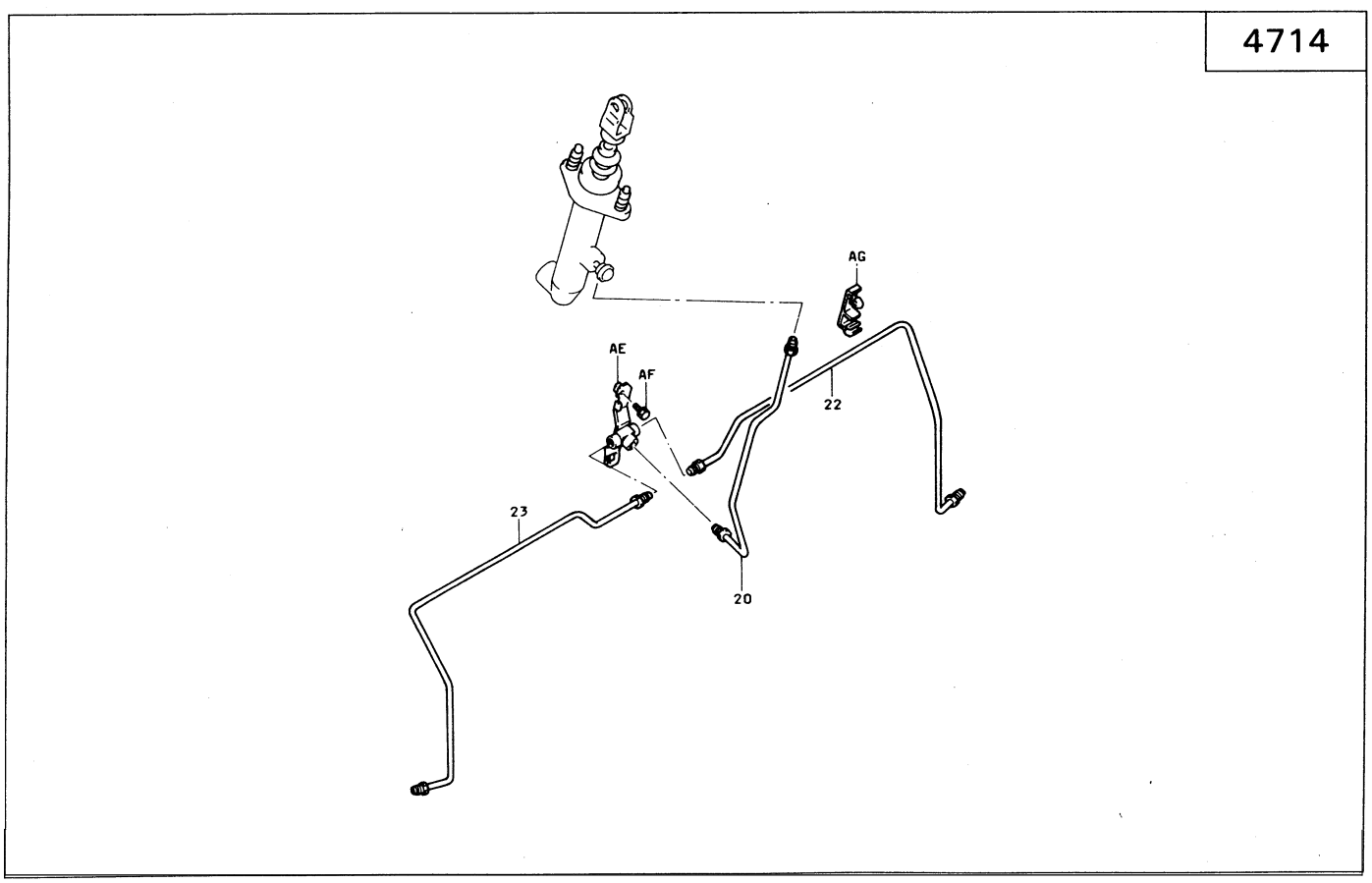
2. Adjust the braking force.

   (1) Repeat forward travel and reverse travel, and adjust the brake shoe clearance.
   The adjusting screw automatically adjust the brake shoe clearance when the brake pedal is depressed at the time of reverse traveling.
   (2) When the braking force is insufficient, remove the brake drum and perform inspection as adjuster malfunction, lining contact defect, foreign matter adhesion on lining surface, brake fluid leakage or other defect is suspected.
   (3) When the brake shoe is replaced with a new one, repeat forward travel and reverse travel for running in.

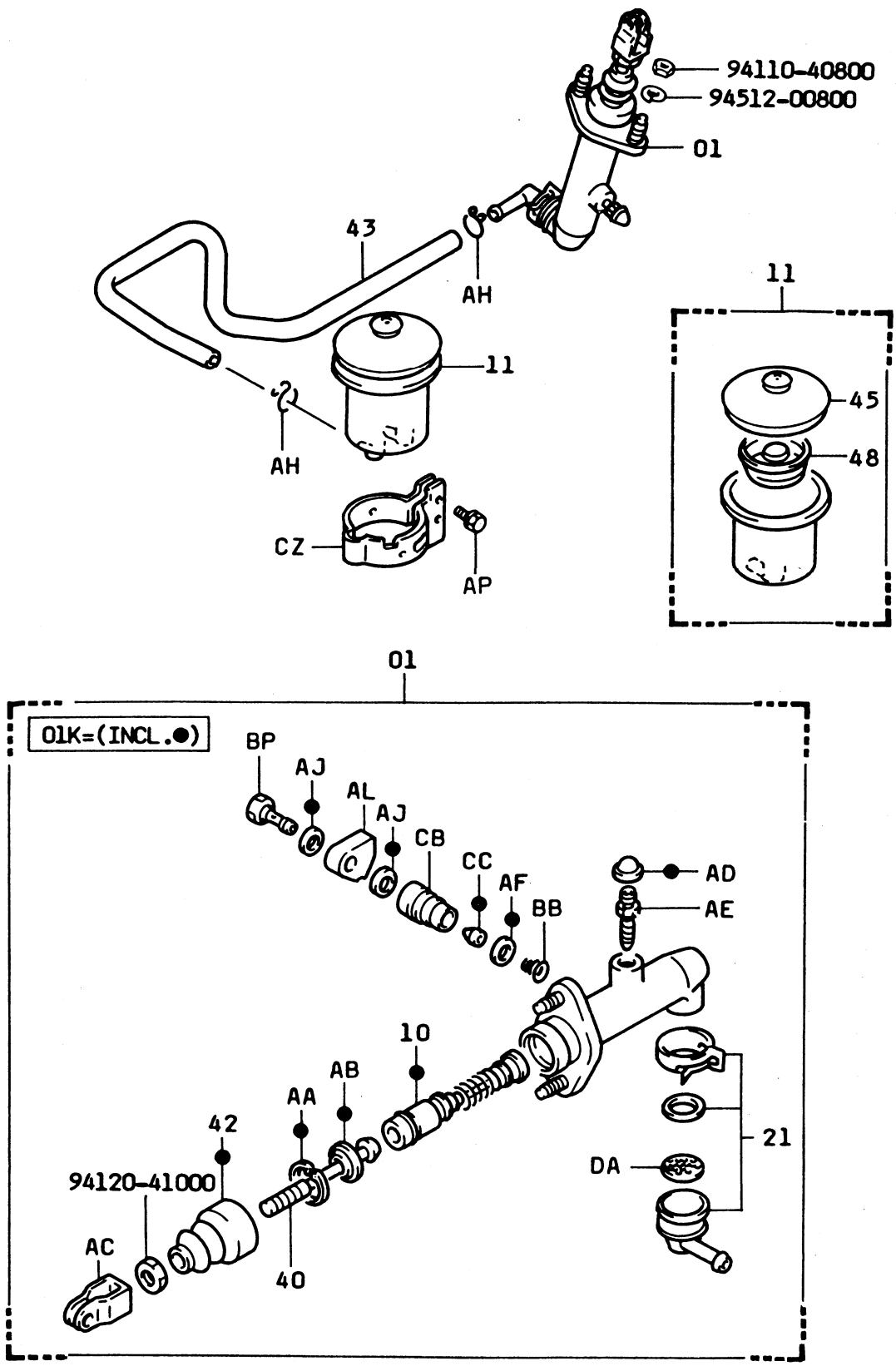
MASTER CYLINDER



COMPONENTS

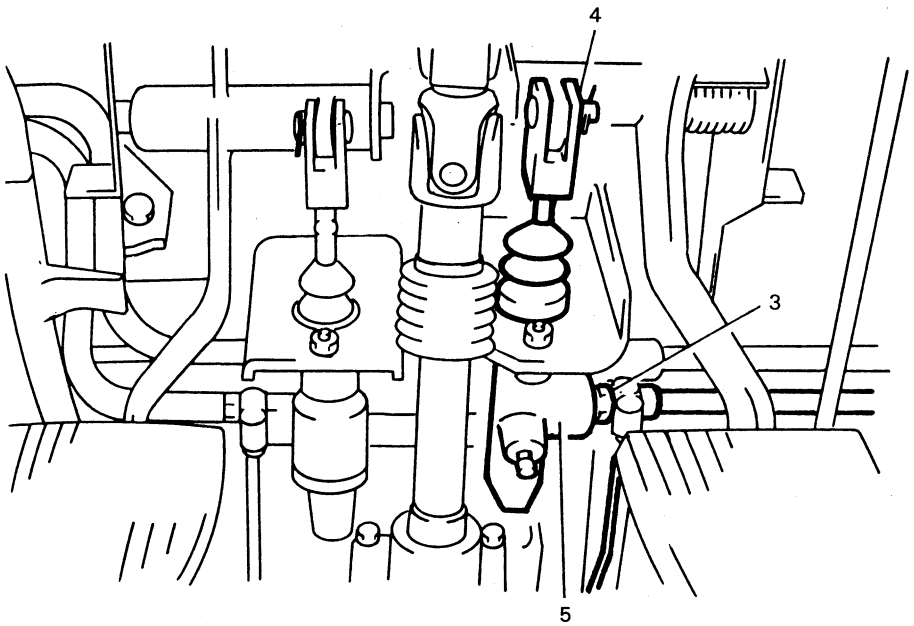


4702



4702-071

REMOVAL·INSTALLATION



1 Brake fluid
2 Toe board and rubber cover

Removal Procedure

1. Disconnect the brake side hose from the reservoir tank and drain brake fluid.
2. Remove the toe board and rubber cover.
3. Disconnect the piping.
4. Remove the push rod clevis pin.
5. Remove the brake master cylinder

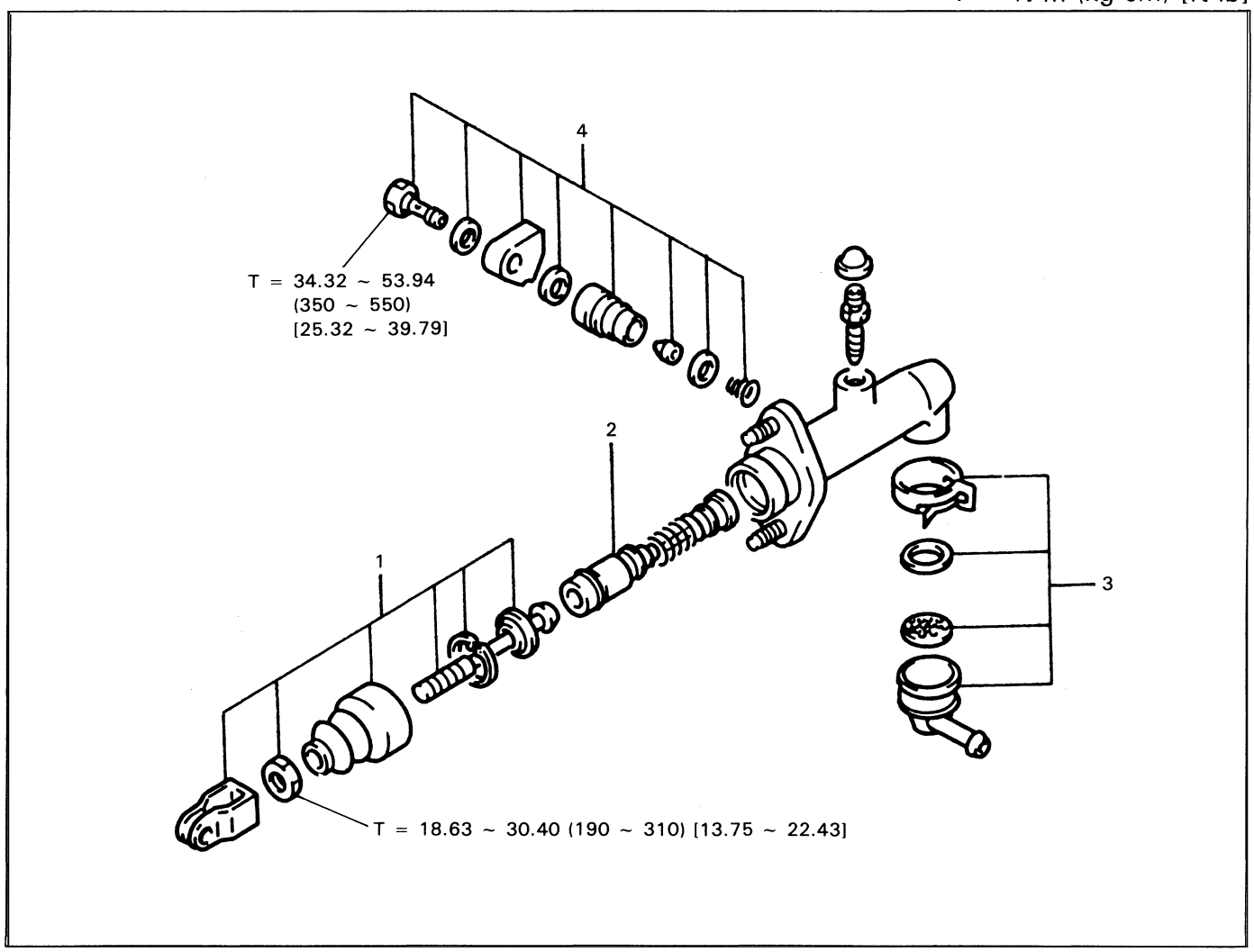
Installation Procedure

The installation procedure is the reverse of the removal procedure

Note:
- **See the brake pedal adjustment procedure (on page 10-29) for adjustment after installation.**
- **Carry out air bleeding (on page 10-18).**

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N·m (kg-cm) [ft-lb]



Disassembly Procedure

1 Turn up the boot and remove the snap ring to remove the push rod. **[Point** 11

2 Remove the piston.

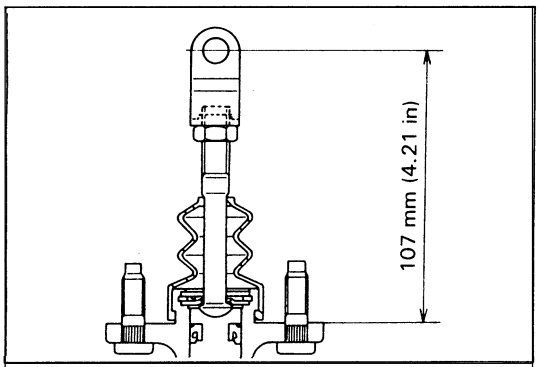
3 Remove the fluid inlet elbow. **[Point** 21

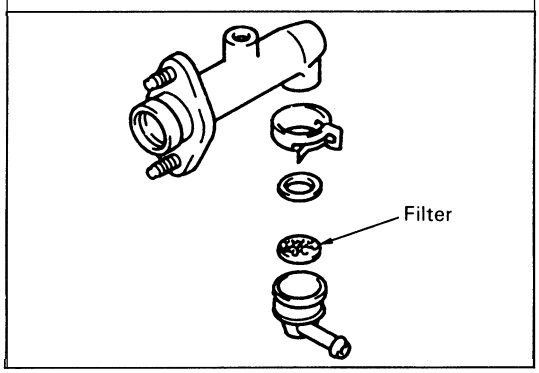
4 Remove the outlet plug and valve.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
Coat rubber grease on the piston cup before reassembly.





Point Operations

[Point 1]

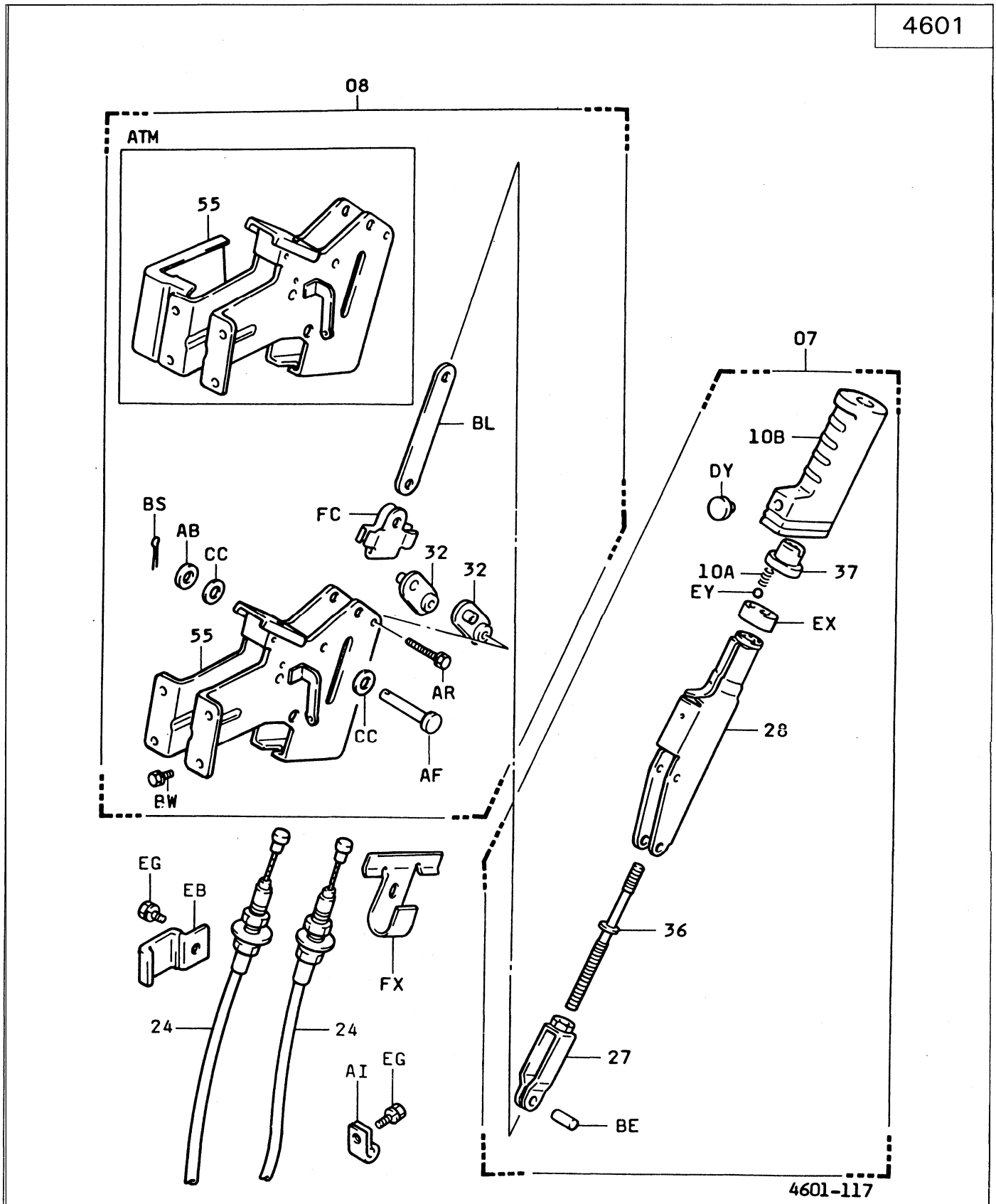
Installation: Temporarily set the push rod length to the illustrated dimension and make readjustment after installation.

[Point 2]

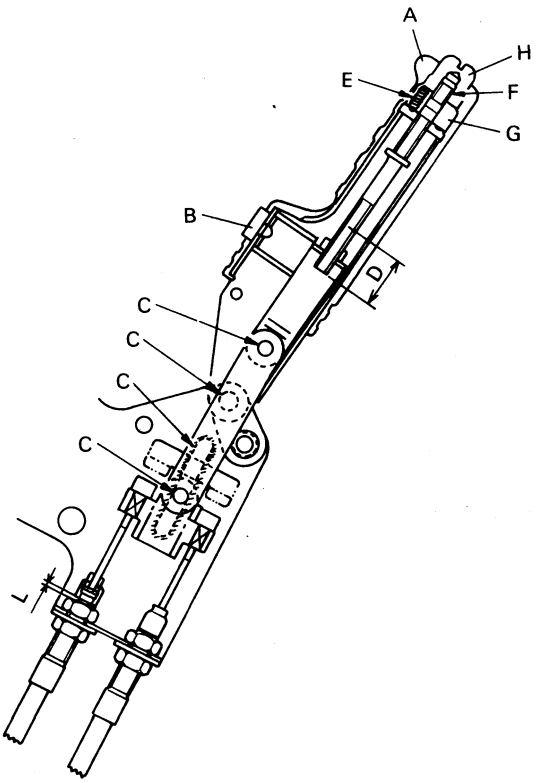
Inspection: Check if the filter is clogged or not.

PARKING BRAKE

COMPONENTS



KEY POINTS IN SERVICE JOBS



1. Parking brake knob **(A)** removal and installation procedure:

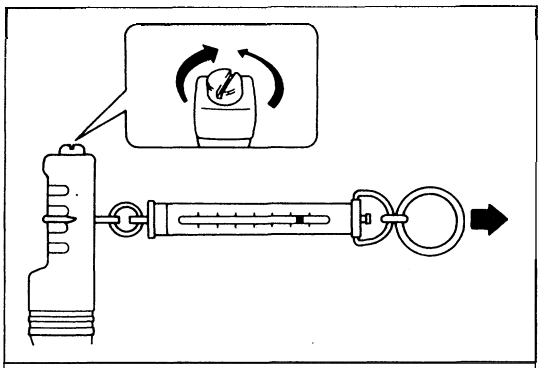
   (1) Remove the 'lever.
   (2) Immerse the knob in hot water (70 – 80°C (158 – 176 °F)) for 10 to 20 seconds. (Do not use water at 100 °C (212 °F) or above.)
   (3) Remove plug (B) from the front face of the knob.
   (4) Extract the knob upward.
   (5) Operate in the reverse order for installation.

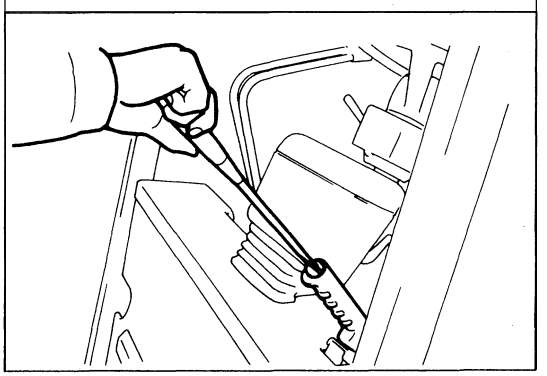
2. Key points for reassembly

   (1) Coat grease on the link pin and moving surface (C).
   (2) Coat grease on the rod threaded portion (D).
   (3) Sufficiently apply MP grease at the compression spring installing portion (E).
   (4) Coat thread tightener (08833-00070) on the threaded portion (F).
   (5) After fully tightening knob (G), return it by a half turn, and tighten knob (H).
   Tightening torque T = **9.81 – 15.69 N·m (100 – 160 kg-cm) [7.24 – 11.58 ft-lb]**

3. Lock parking cable set dimension (L) on each of the left and right sides to the following value:
   L = **0 – 2** mm **(0 – 0.08 in)**

4. Adjust the parking brake lever operating force. (See page 10-27.)





ADJUSTMENT

1. Adjust the parking brake lever operating force.

(1) Set a spring scale at the center of the lever knob and pull it backward to measure the operating force.

Operating force
1 ton series:
147 – 196N (15 ~ 2Q kg) [33 ~ 44 lbl
2·3 ton series:
196 – 245 N (20 ~ 25 kg) [44 ~ *55* lb]

(2) When the operating force does not satisfy the standard, turn the knob at the end of the iever for adjustment.
Make adjustment while the brake is released.

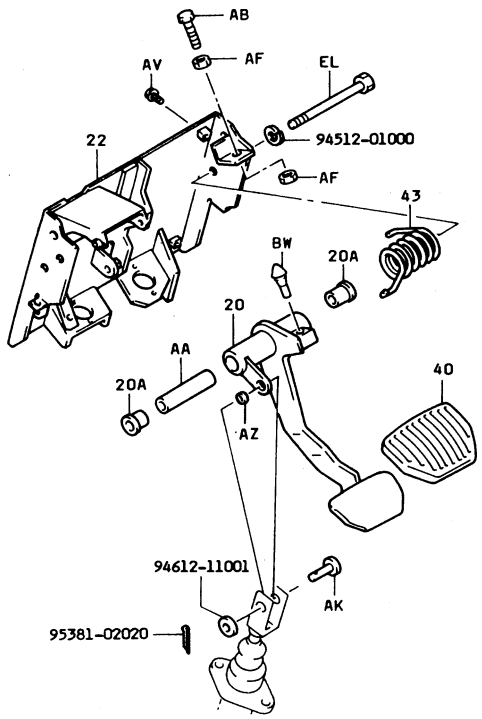
Clockwise turn: To increase the operating force.
Counterclockwise turn: To decrease the operating force.

BRAKE PEDAL

COMPONENTS

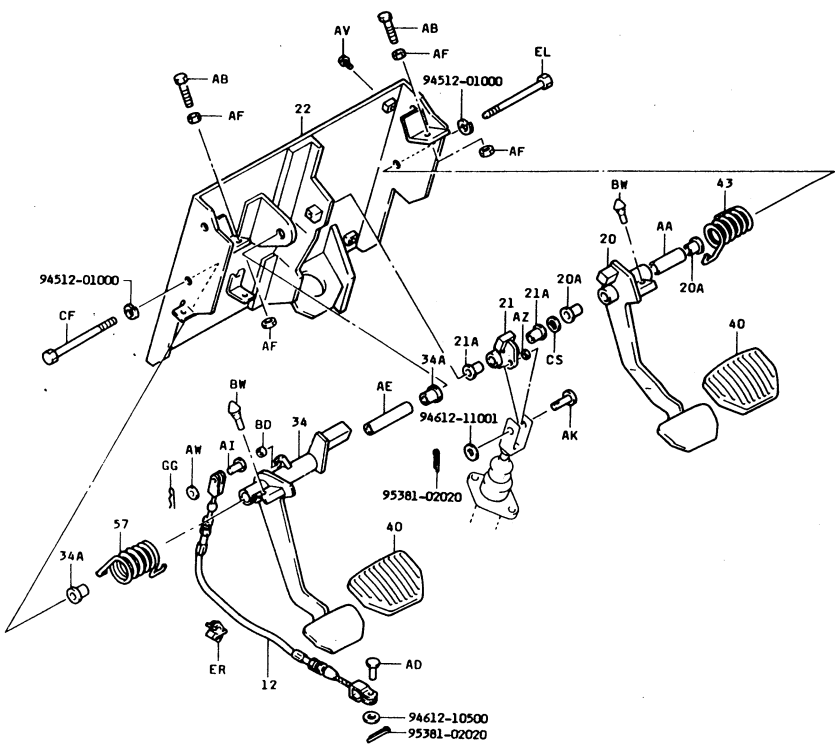
Clutch Model

4701



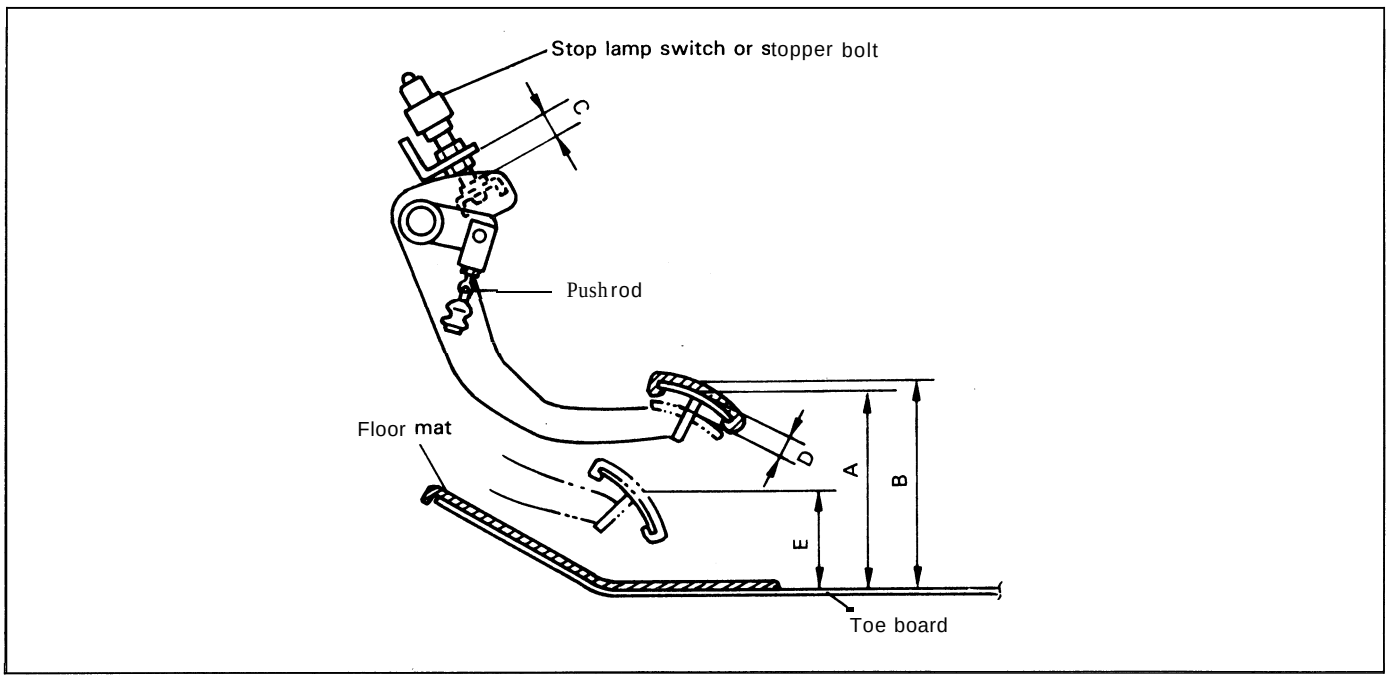
Torque Converter Model

4701



ADJUSTMENT

Brake Pedal Adjustment



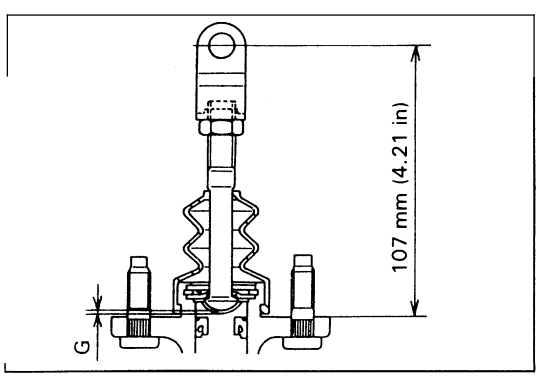
1. Adjust the brake pedal height and play.

   (1) Adjust the stop lamp switch or stopper bolt length (dimension C) to make the brake pedal height (dimension A or B) satisfy the standard below.
   (2) Adjust the push rod length to make the brake pedal play (dimension D) satisfy the standard below.
   (3) After adjustment, check the depressed height (dimension E).

Unit: mm (in)

A	B	C (Reference)	D	E
140 – 145 (5.51 – 5.71)	145 – 150 (5.71 – 5.91)	12 (0.47)	5 – 10 (0.20 – 0.39)	70 (2.76) or more

A: Dimension without pad
B: Dimension with pad
C: Reference value
D: Pedal play corresponding to push rod play (G)
E: Depressed height (with pad)

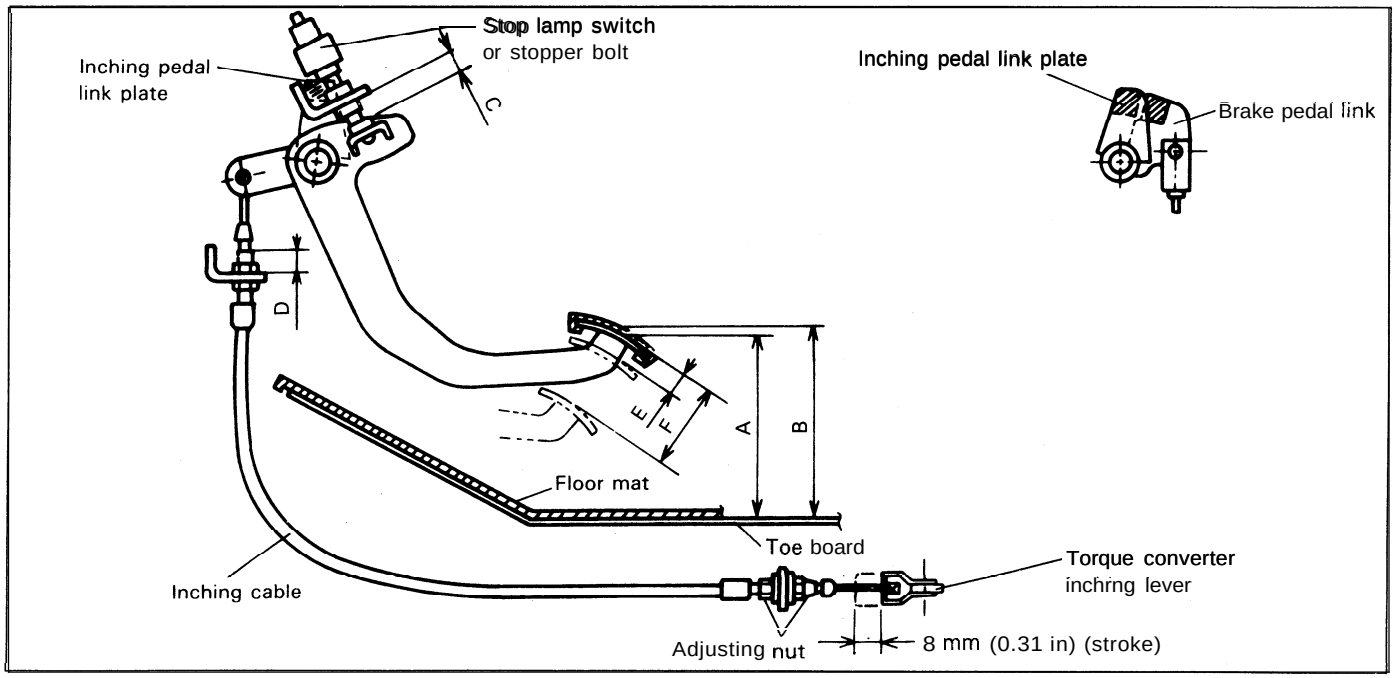


Push rod play

		G mm (in)
1 ton series		1 ~ 2 (0.04 ~ 0.08)
2.3 ton series	Clutch model	1 ~ 2 (0.04 – 0.08)
	Torque converter model	0 ~ 1 (0 – 0.04)

(Note) Always provide the push rod play (G).

Inching Pedal Adjustment (in Models with Torque Converter Only)



1. Adjust the inching pedal height and play.

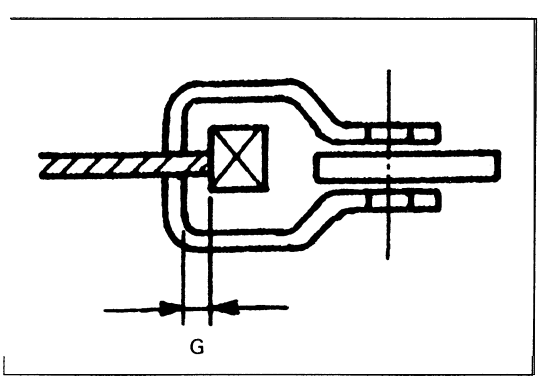
(1) Adjust the stop lamp switch or stopper bolt length (dimension C) to make the inching pedal height (dimension A or B) satisfy the standard below.

(2) Adjust the inching cable adjusting nut to make the torque converter inching lever 8 mm (0.31 in) at the position (dimension F) where the inching pedal link plate come into contact with the brake pedal link to start brake application.
The brake application start position means the position where the brake master cylinder rod is stroked by 8 mm (0.31 in).

Unit: mm (in)

A	B	C (Reference)	D	E (Reference)	F (Reference)
140 – 145 (5.51 – 5.71)	145 – 150 (5.71 – 5.91)	12 (0.47)	17.5 (0.689)	3 – 5 (0.12 ~ 0.20)	56 – 60 (2.20 – 2.36)

A: Dimension without pad
B: Dimension with pad
C, E and F: Reference dimensions
E: Pedal play corresponding to wire play (G)



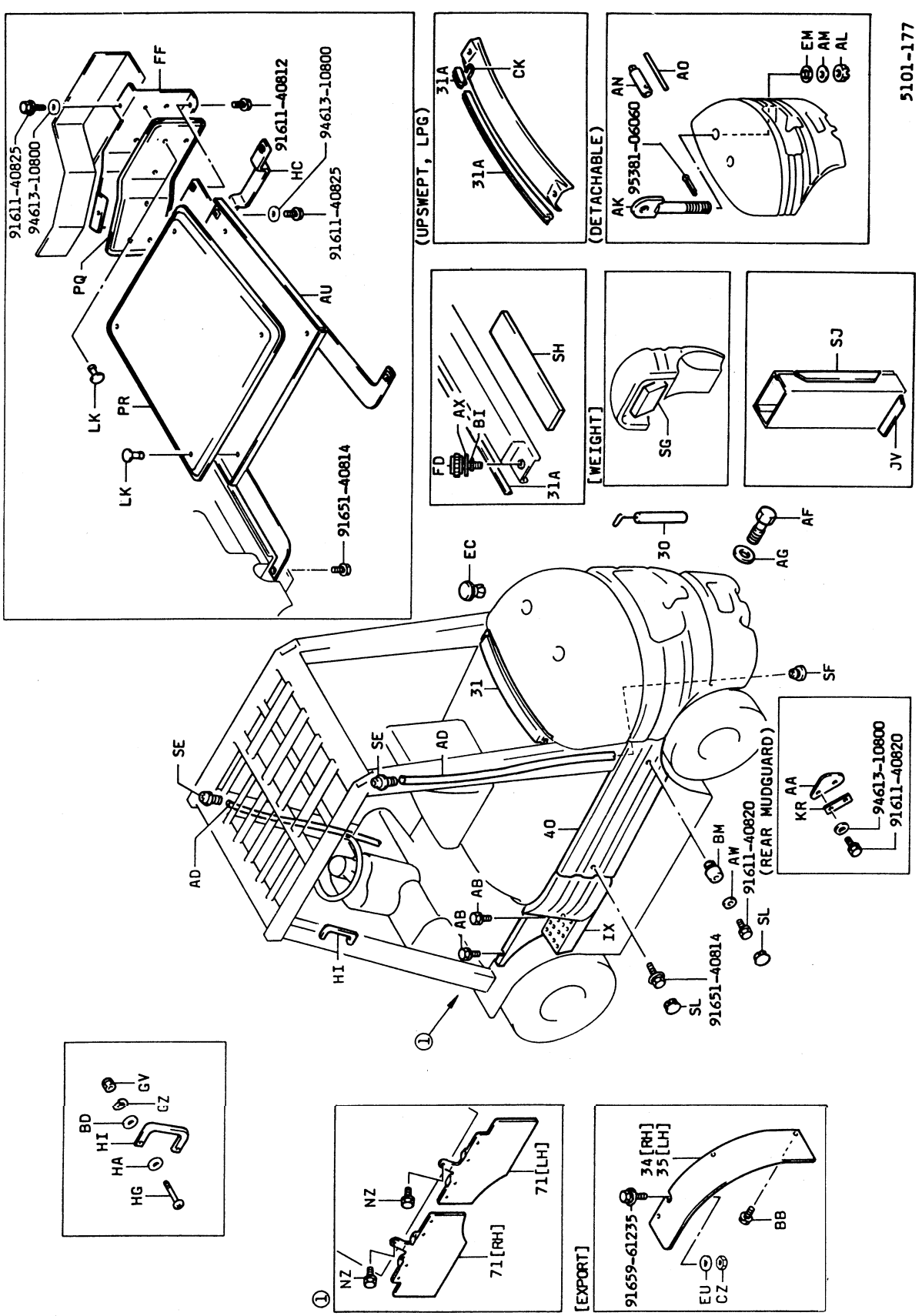
[Reference]
The inching pedal play is determined as the result of the above adjustment, but it is recommended to use the inching lever clevis and wire cable play (dimension G) as the reference.

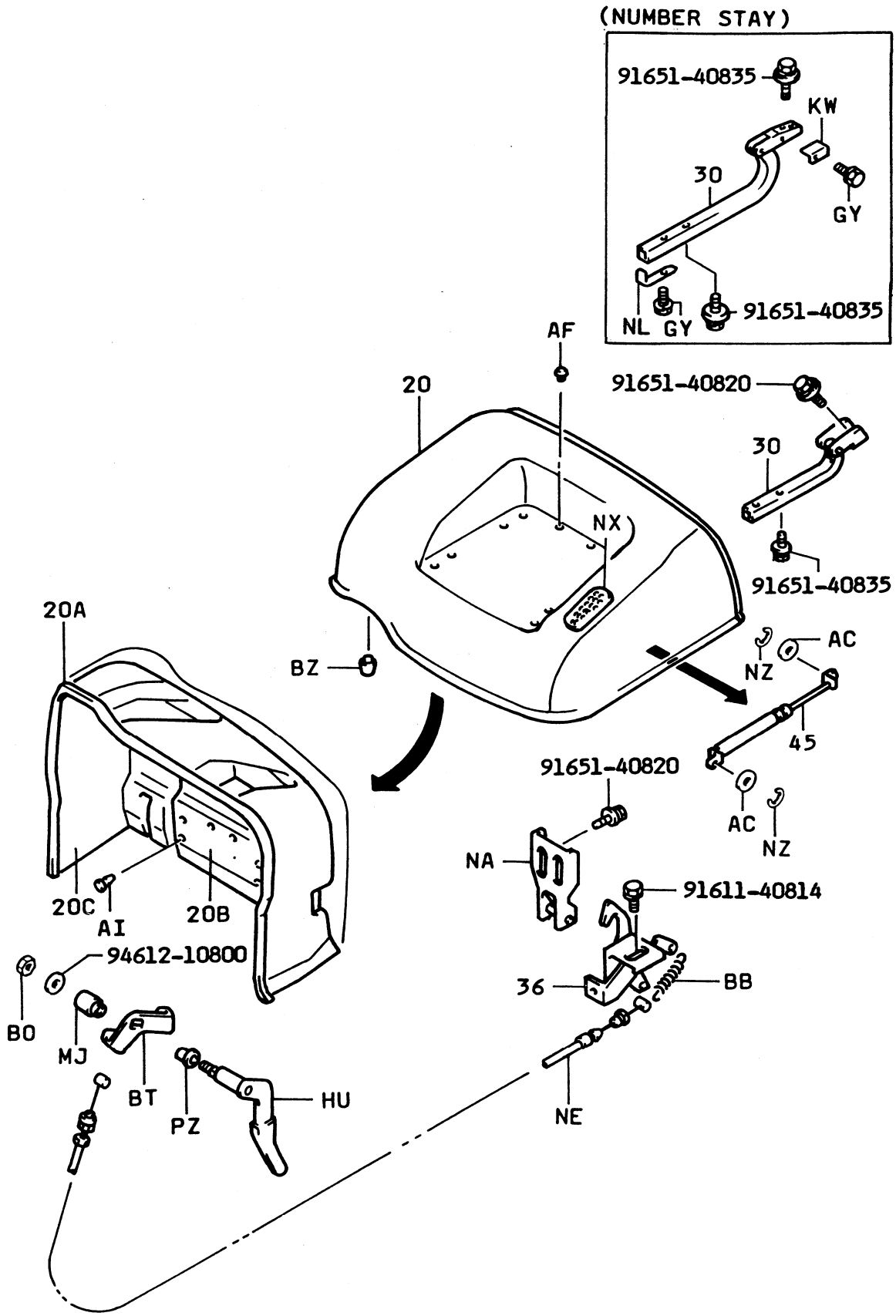
G = 0.5 mm (0.020 in)

BODY

COMPONENTS

5101




(NUMBER STAY)
91651-40835
KW
30
GY
NL
GY
91651-40835
AF
20
91651-40820
30
NX
91651-40835
20A
BZ
AC
NZ
45
91651-40820
AC
NZ
NA
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BB
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BO
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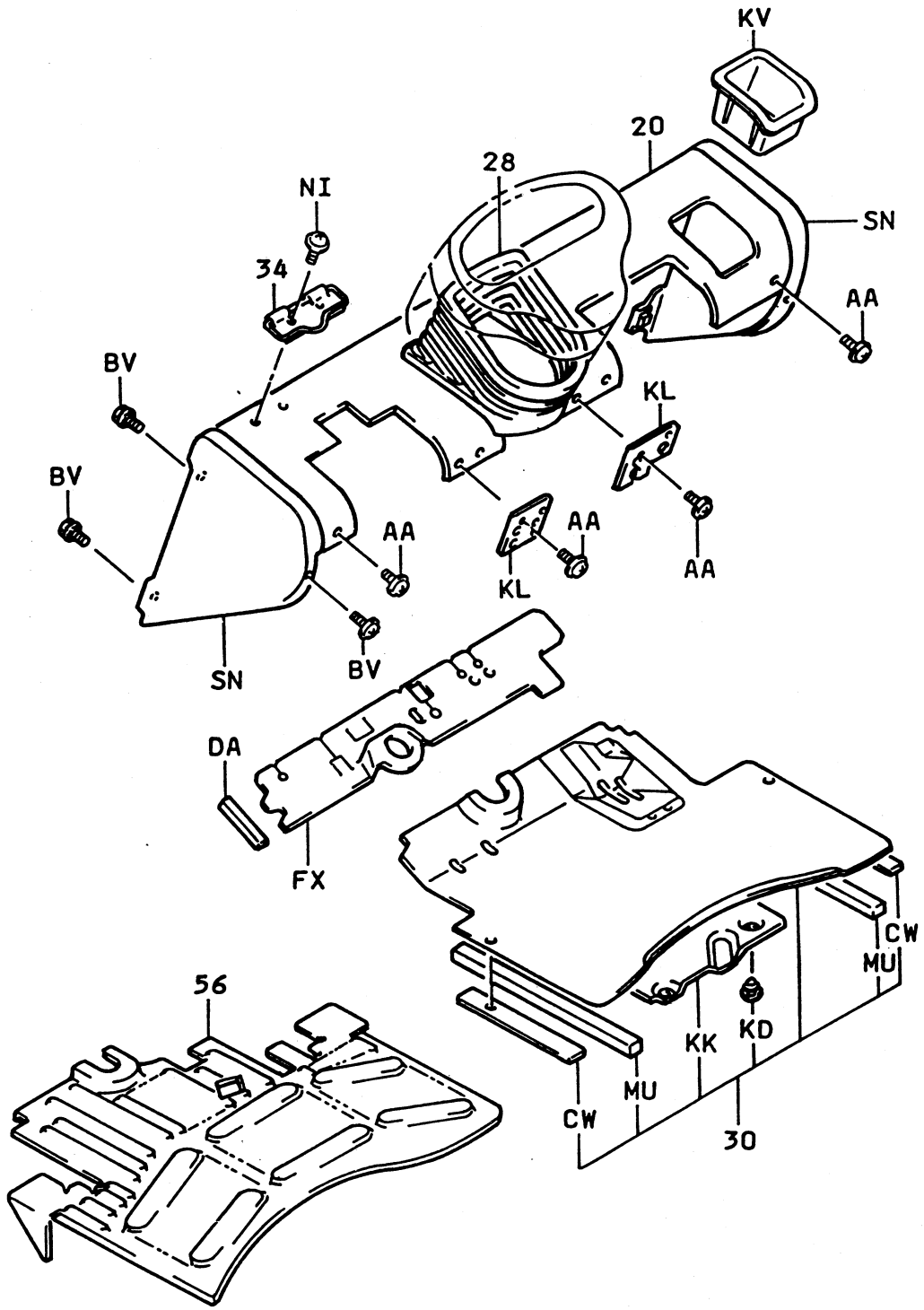
BT
PZ
HU
NE

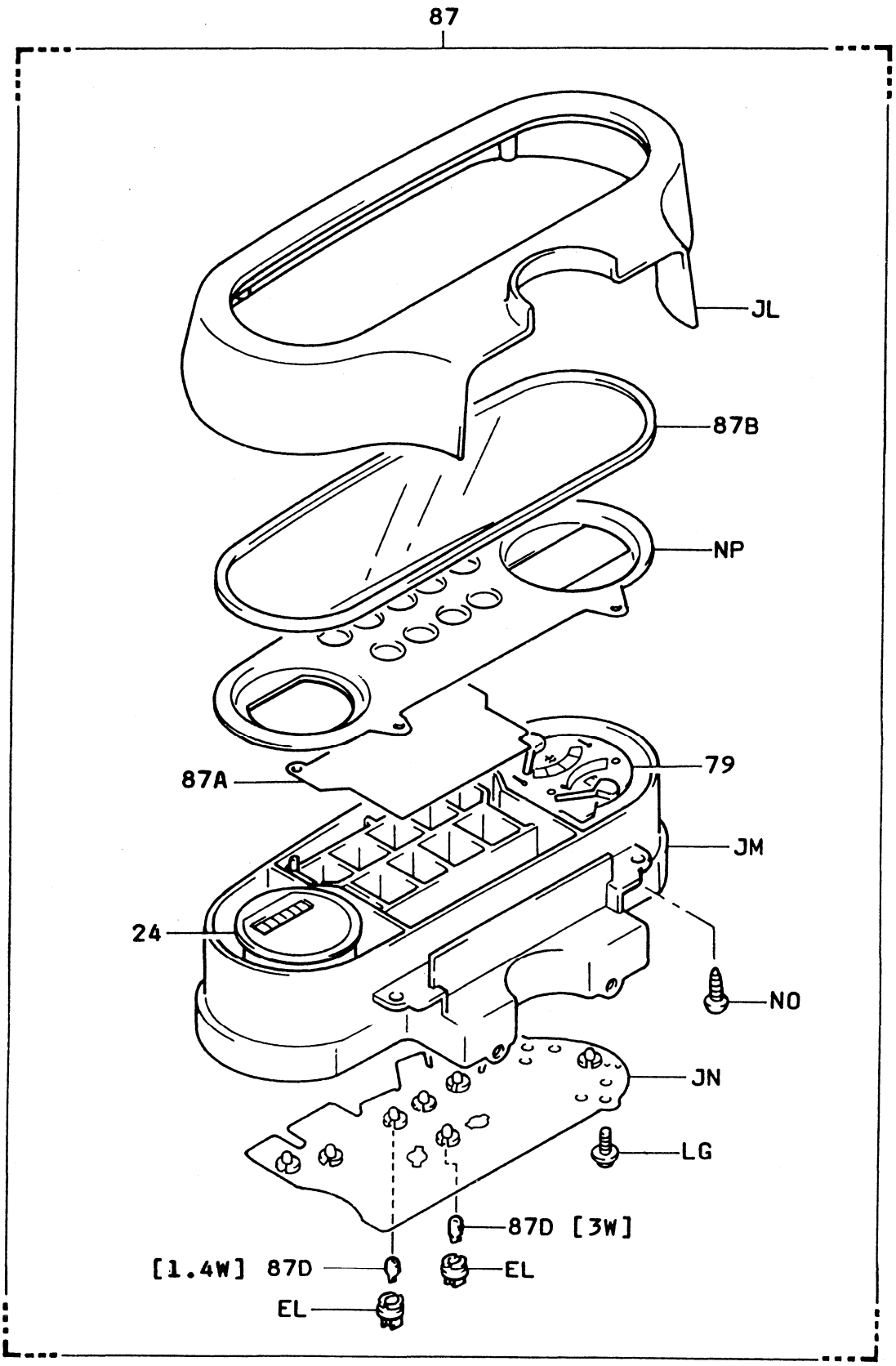
5201-144

5301

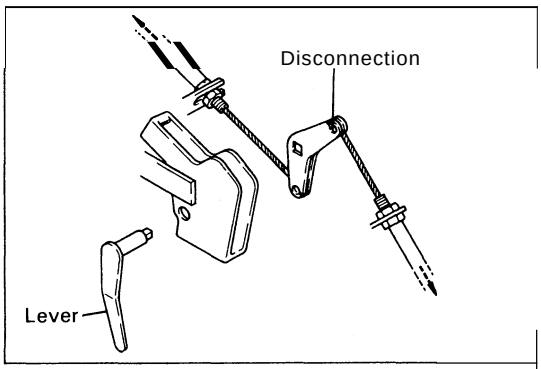


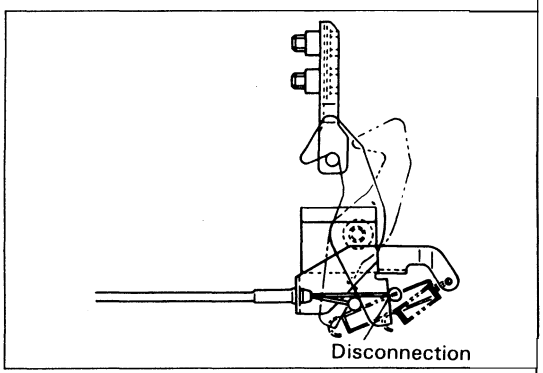
5301-197

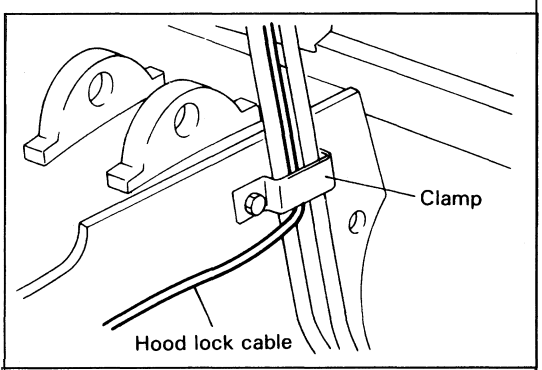
5701

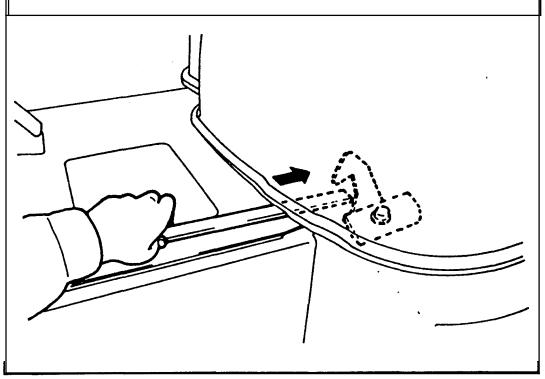


5701-116









ENGINE HOOD LOCK CABLE

REMOVAL

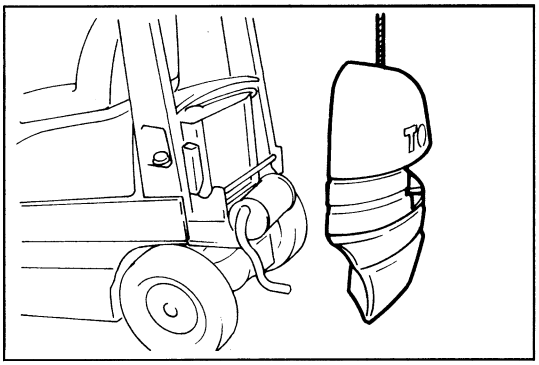
1. Open the engine hood.
2. Remove the toe board.
3. Remove the engine hood lock cable.
   (1) Loosen the cable lock nut and disconnect the end of the cable from the hood lock hook on the lever side.
   (2) Disconnect the end of the cable from the stopper plate on the engine hood side.

INSTALLATION

The installation procedure is the reverse of the removal procedure.

Note:
- **Apply grease to the lever pin and the stopper plate portion in sliding contact with the hood.**
- **Tighten the bolt which fastens hood lock cable and parking brake cable clamp together.**

Action when the engine hood cannot be opened.
When the engine hood cannot be opened because of disconnection of the engine hood lock cable or other reason, release the stopper by inserting a thin strip as illustrated.



BALANCE WEIGHT

REMOVAL. INSTALLATION

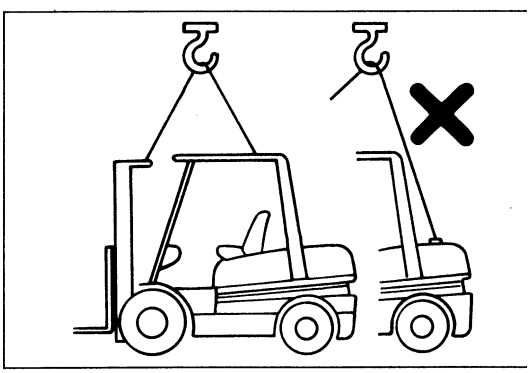
1. Remove the radiator cover.

2. Hook the wire rope in the hoisting hole provided on top of the weight.

Caution:
- Use a wire rope having sufficient strength. (See page **0-1**3 for the weight of the balance weight and page **0-14** for the safe load for each wire rope.)

3. Remove the weight set bolts and remove the weight.

4. The installation procedure is the reverse of the removal procedure.



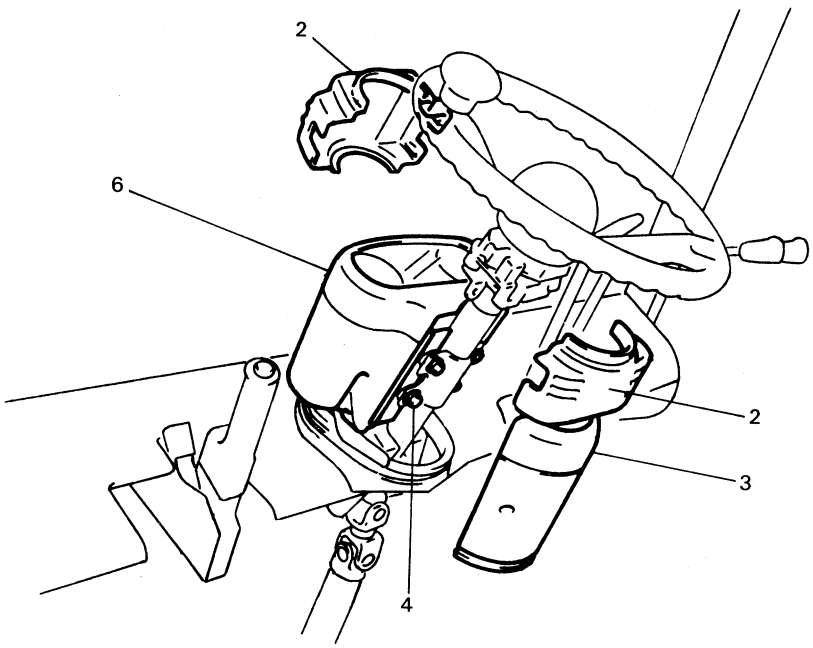
HOISTING THE VEHICLE

When hoisting the vehicle sling the wire rope on the mast hook and the rear sides of headguard.

Caution:
- Use wire ropes having sufficient strength.
- The holes on the weight are solely for hoisting the weight for removal and installation. Do not use them for hoisting the vehicle.

COMBINATION METER

REMOVAL. INSTALLATION



1 Tilt steering
5 Combination meter wiring

Removal Procedure

1 Tilt the tilt steering post backward.

2 Remove the turn signal switch cover.

3 Remove the combination meter cover.

4 Remove the combination meter set bolts.

5 Disconnect the combination meter wiring.

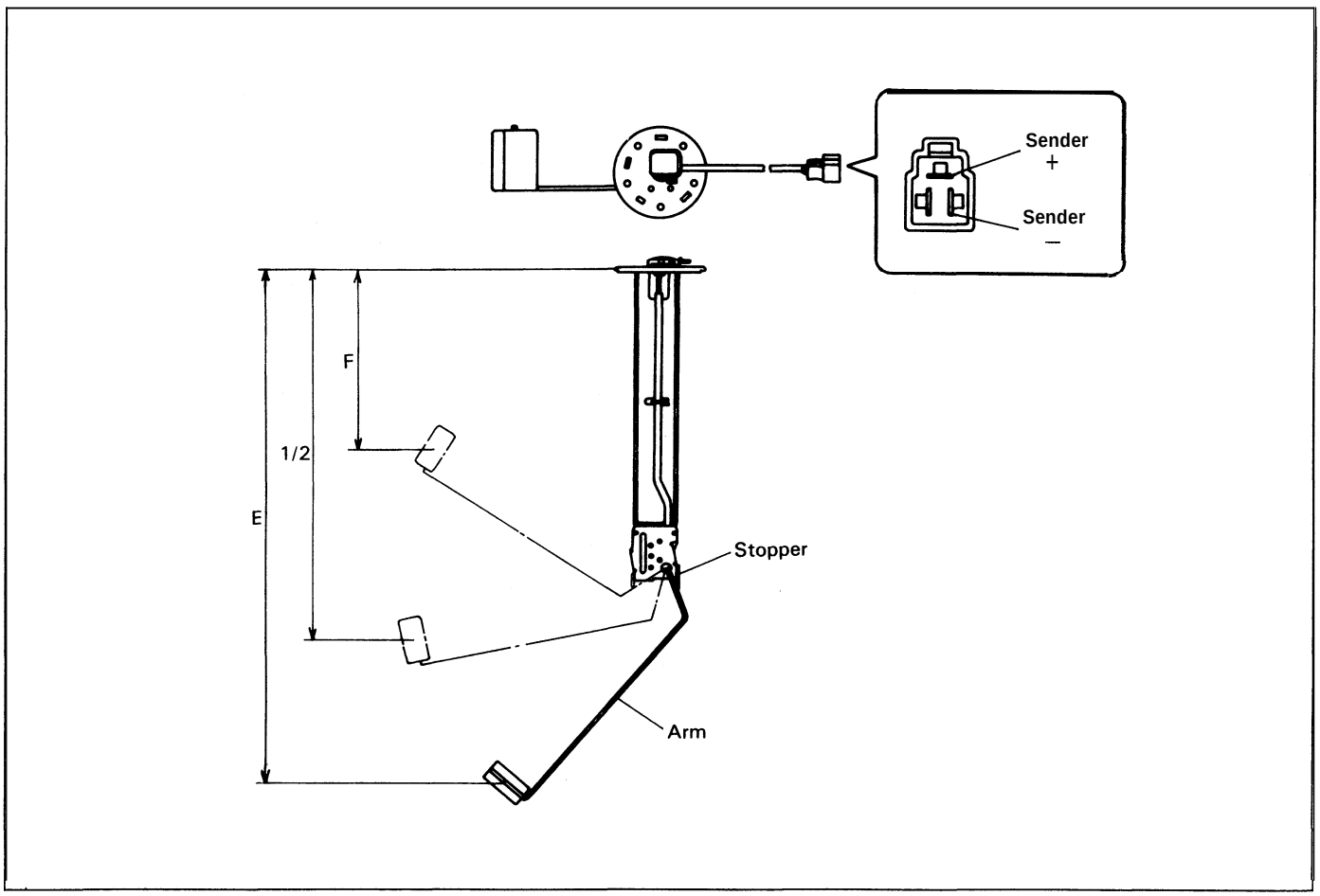
6 Remove the combination meter ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

FUEL SENDER GAGE

INSPECTION



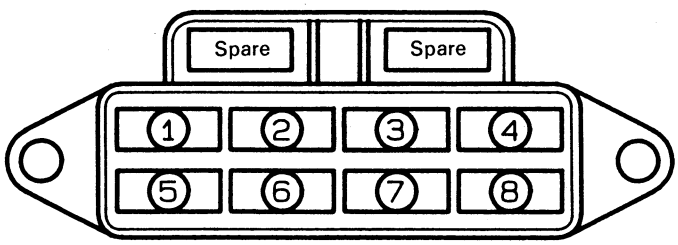
1. Measure the resistance.
   (1) Check to see that the float moves smoothly.
   (2) Measure the resistance between the sender positive terminal and sender negative (body grounding) terminal while the float position is moved from point F to point E. Also check continuous variation of the resistance value.

Note:
- **Measure with the float being lowered in the direction from point F to point E.**
- **The resistance at each of point F and point E shall be measured with the arm in contact with the stopper.**

Standard

Float position mm (in)		Resistance Ω
F	150.6 ± 8 (5.929 ± 0.31)	3 ± 2
1/2	310.7 (12.232) (Reference valve)	32.5 (Reference valve)
E	428.9 ± 8 (16.886 ± 0.31)	110 ± 7

FUSE



Portions protected by fuses

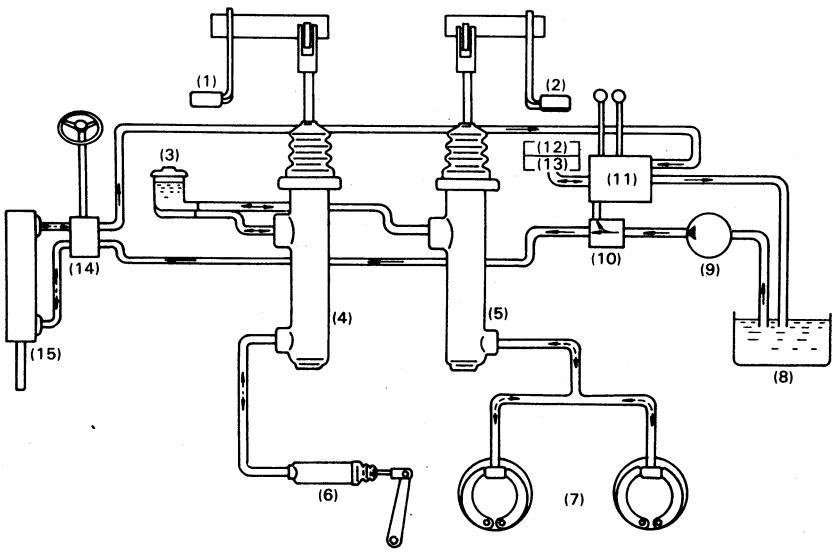
No.	Name	Capacity	Main protected portion
①	HORN	7.5 A	Horn
②	ENGINE	7.5 A	I.I.A. and fuel cut solenoid
③	ECU-ST	—	———
④	ECU-IG*1	7.5 A	Emission control computer
⑤	STOP	7.5 A	Stop lamp
⑥	TURN	7.5 A	Turn signal lamp and turn signal flasher
⑦	LAMP	20 A	Head lamps, clearance lamps, tail lamps, rear working lamp and meter lamps
⑧	METER	15 A	Alternator, washer temperature meter, fuel meter, glow indicator lamp, hour meter and warning lamps (engine oil pressure, charge, sedimenter, brake, air cleaner, fuel and cooling water)

*1: Models with three-way catalytic converter

MATERIAL HANDLING SYSTEM

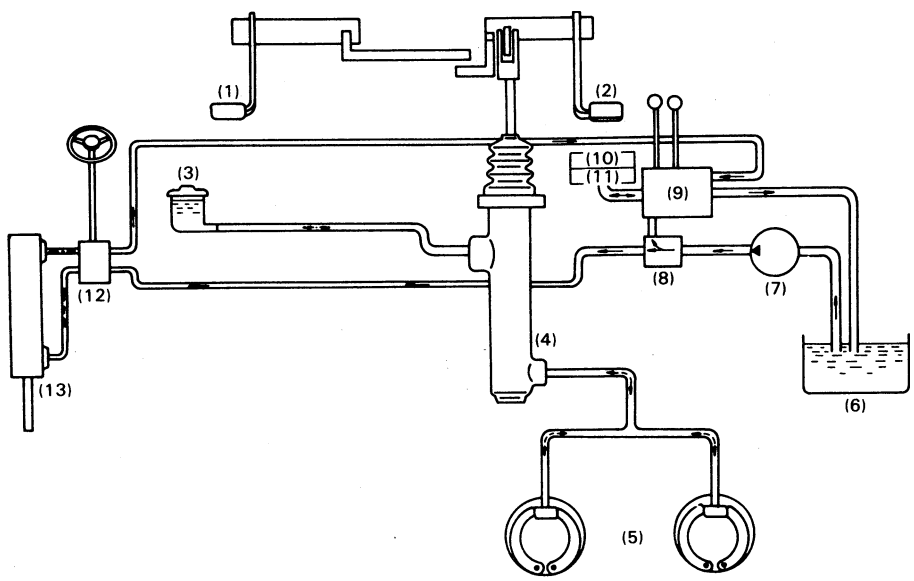
HYDRAULIC SYSTEM DIAGRAM

Clutch Model



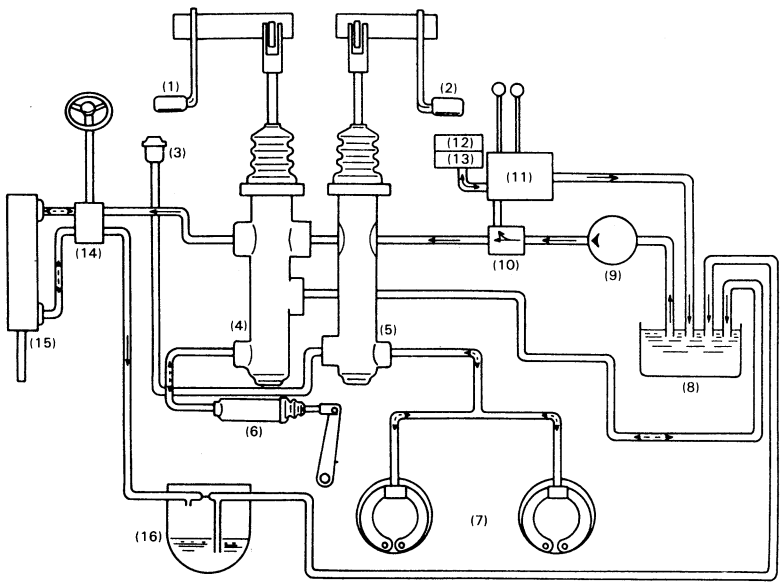
(1) Clutch pedal
(2) Brake pedal
(3) Reservoir tank
(4) Clutch master cylinder
(5) Brake master cylinder
(6) Clutch release cylinder
(7) Brake wheel cylinder
(8) Oil tank
(9) Oil pump
(10) Flow divider
(11) Oil control valve
(12) Lift cylinder
(13) Tilt cylinder
(14) Steering gear box
(15) Power steering cylinder

Torque Converter Model



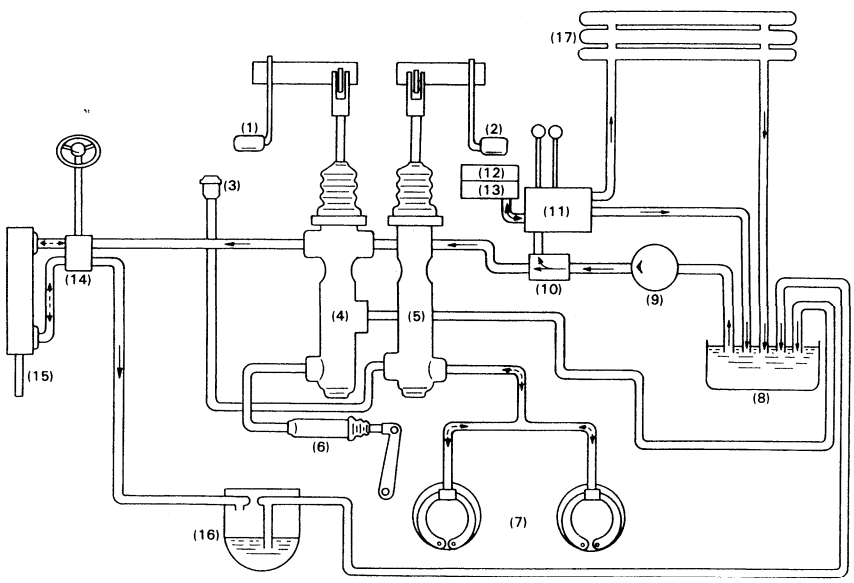
(1) Clutch pedal
(2) Brake pedal
(3) Reservoir tank
(4) Brake master cylinder
(5) Brake wheel cylinder
(6) Oil tank
(7) Oil pump
(8) Flow divider
(9) Oil control valve
(10) Lift cylinder
(11) Tilt cylinder
(12) Steering gear box
(13) Power steering cylinder

Oil Clutch Model (OPT)



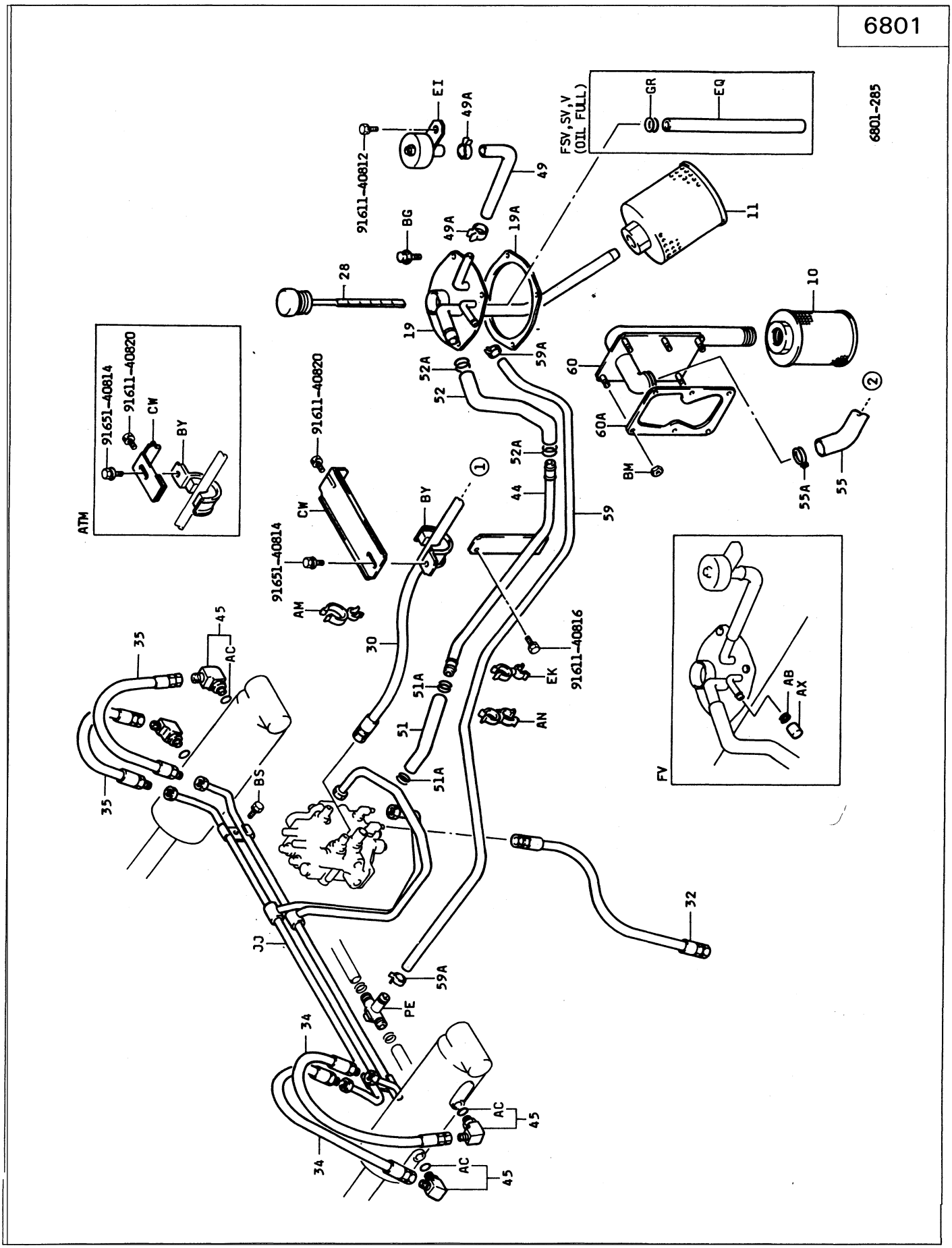
(1) Clutch pedal
(2) Brake pedal
(3) Reservoir tank
(4) Clutch booster
(5) Brake master cylinder
(6) Clutch release cylinder
(7) Brake wheel cylinder
(8) Oil tank
(9) Oil pump
(10) Flow divider
(11) Oil control valve
(12) Lift cylinder
(13) Tilt cylinder
(14) Steering gear box
(15) Power steering cylinder
(16) Oil clutch

22 Engine- Oil Clutch Model- with Attachment (OPT)



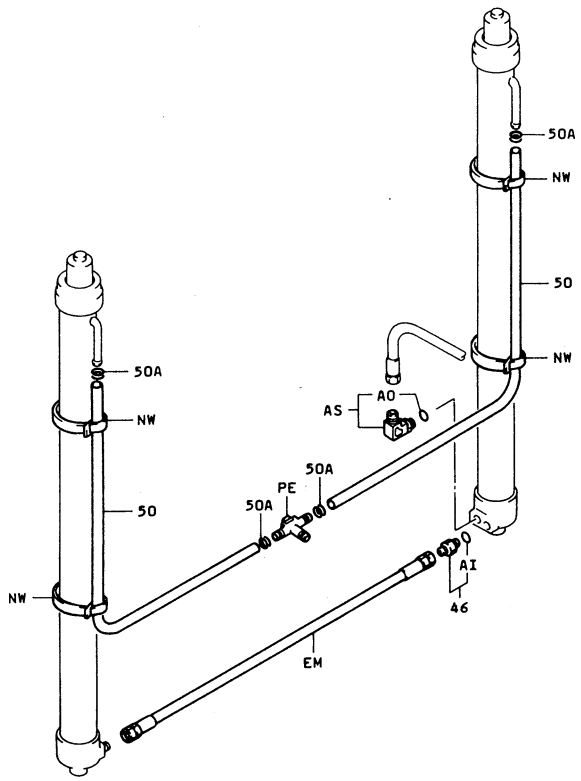
(1) Clutch pedal
(2) Brake pedal
(3) Reservoir tank
(4) Clutch booster
(5) Brake master cylinder
(6) Clutch release cylinder
(7) Brake wheel cylinder
(8) Oil tank
(9) Oil pump
(10) Flow divider
(11) Oil control valve
(12) Lift cylinder
(13) Tilt cylinder
(14) Steering gear box
(15) Power steering cylinder
(16) Oil clutch
(17) Oil cooler (built in the radiator)

COMPONENTS


6801
6801-285
FSV,SV,V (OIL FULL)
GR
EQ
EI
49A
49
91611-40812
BG
19A
11
28
19
10
59A
60
52A
52
60A
BM
55A
55
2
91611-40820
91651-40814
CW
BY
ATM
1
44
59
AM
30
91611-40816
EK
AN
51A
51
35
45
AC
BS
JJ
PE
34
32
FV
AB
AX

V·SV Mast

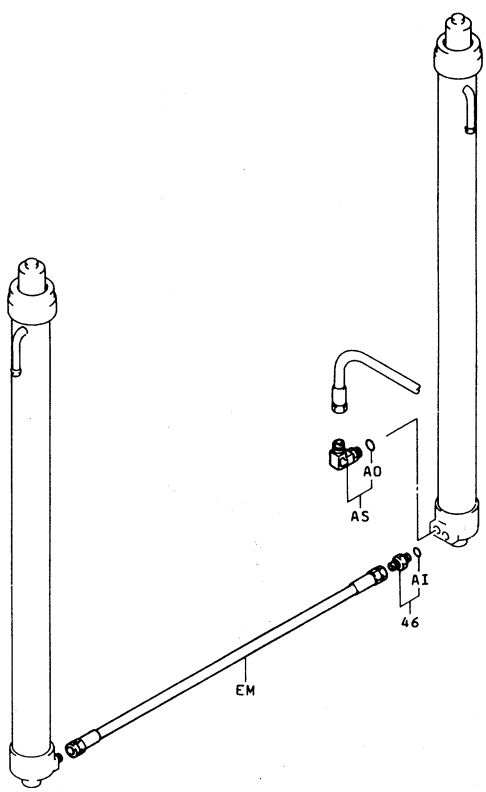
6801



6801-289

FV Mast

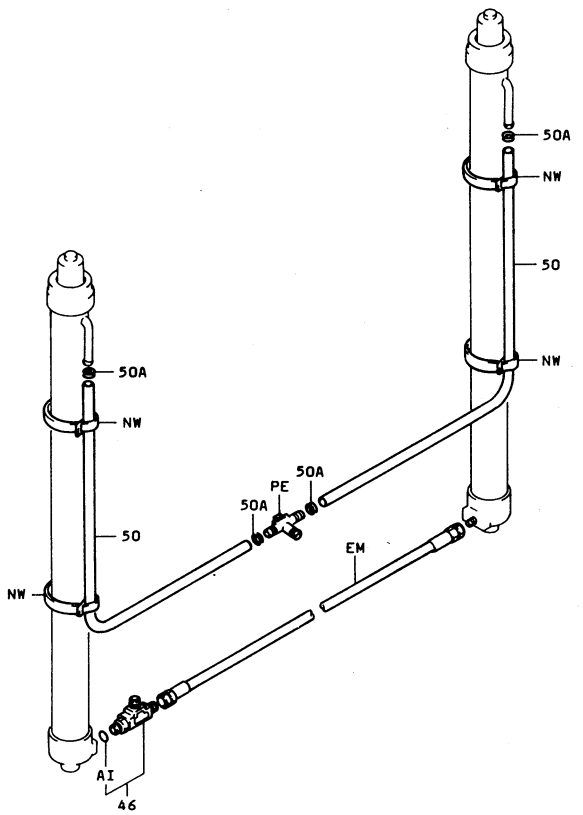
6801



6801-290

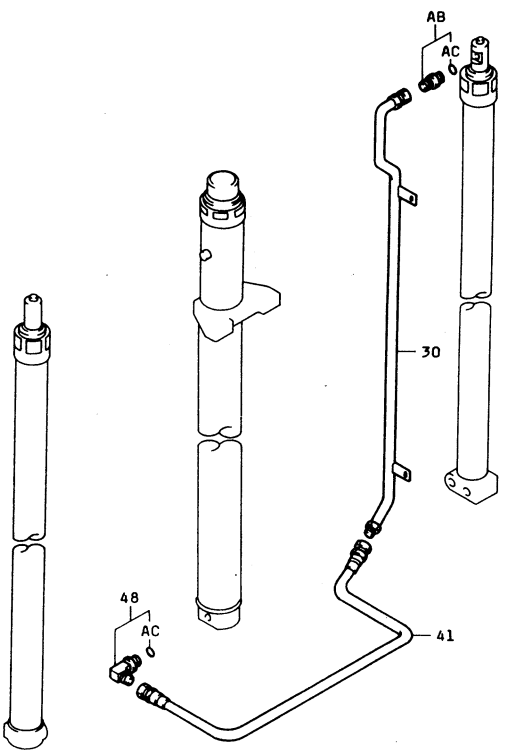
FSV Mast

6801



FV Mast

6802



FSV Mast

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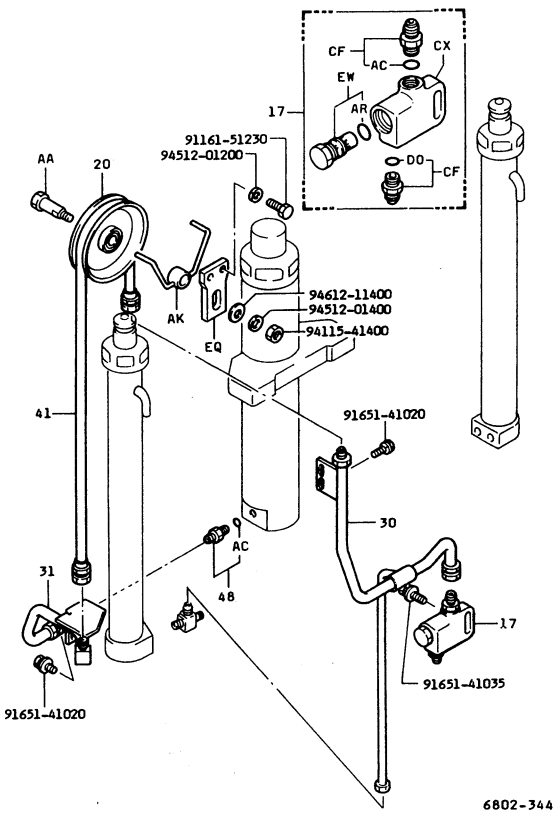
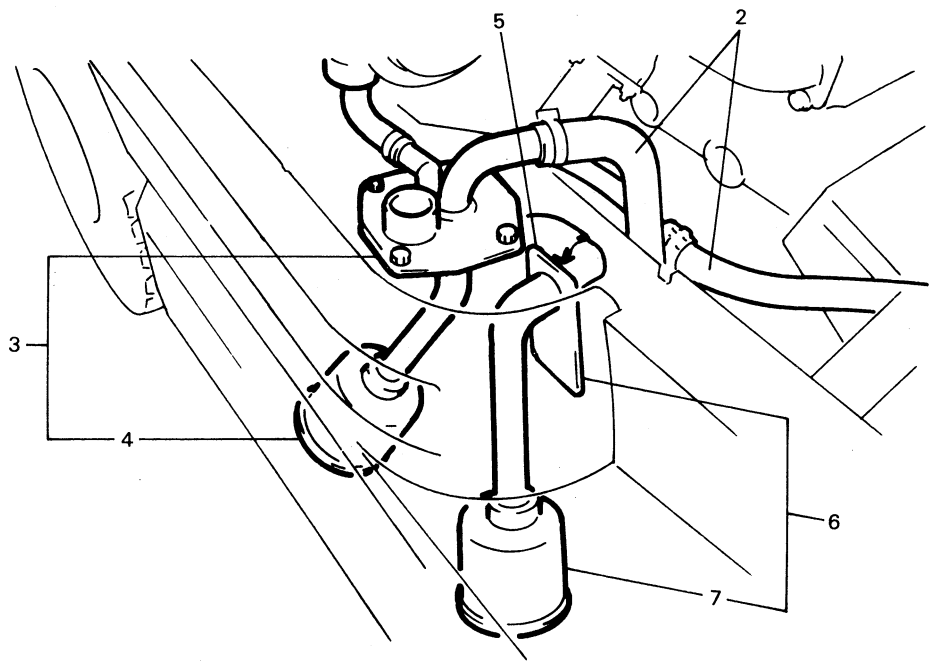


RETURN FILTER·SUCTION FILTER

REMOVAL·INSTALLATION



1 Breather set bolt

Removal Procedure

1 Remove the hydraulic oil breather set bolt.

2 Disconnect the hoses (control valve to tank hose and lift cylinder to tank hose) from the tank side.

3 Remove the tank cover W/return filter.

4 Disconnect the return filter.

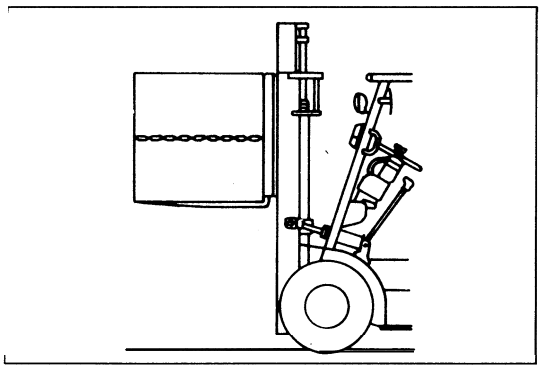
5 Remove the hose (tank to oil pump hose) from the tank.

6 Remove the set nut on the side of the tank and remove the pipe W/suction filter.

7 Disconnect the suction filter.

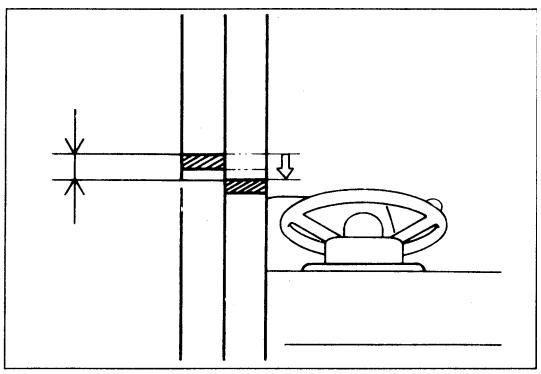
Installation Procedure

The installation procedure is the reverse of the removal procedure.



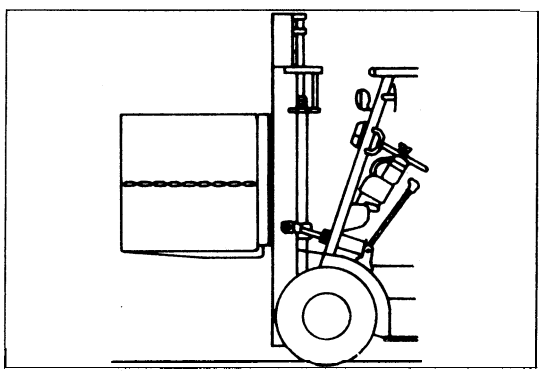
NATURAL DROP TEST

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.



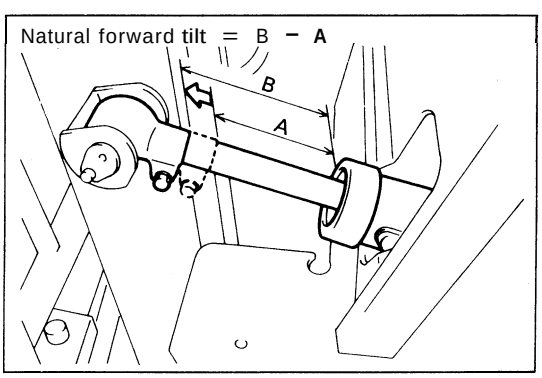
2. Draw datum lines on the inner and outer masts, and measure the drop in 15 minutes.

Vehicle model	Natural drop amount mm (in)
1 ton series	90 (3.54) or less
2 ton series	↑
3 ton series	↑



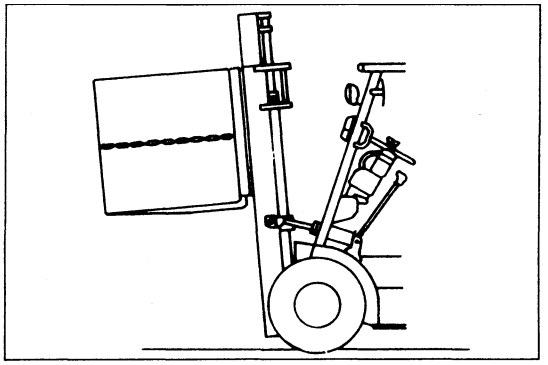
NATURAL FORWARD TILT TEST

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.

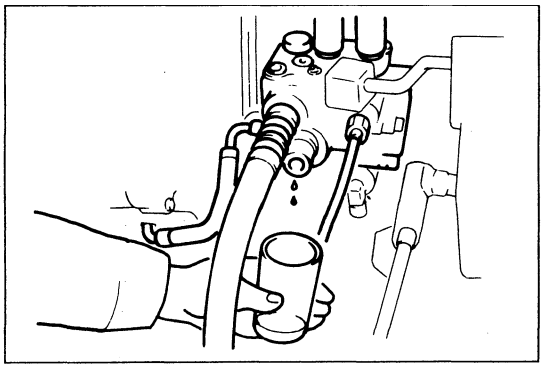
Vehicle model	Natural forward tilt amount mm (in)
1 ton series	30 (1.18) or less
2 ton series	45 (1.77) or less
3 ton series	↑



OIL LEAK TEST

LIFT CYLINDER

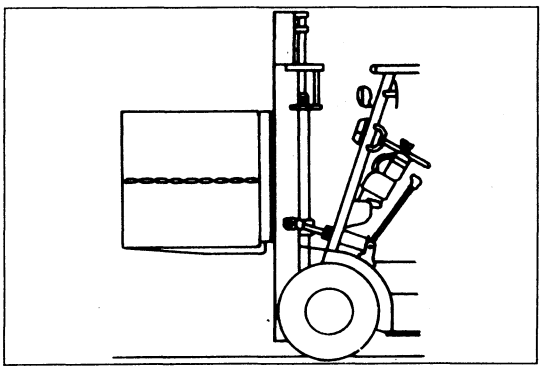
1. Set the mast in the vertical position with the standard load on the fork. Lift the fork by 1 to 1.5 m (40 to 59 in).



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 oil leak amount (at lift port):
   16 cc (0.98 cu-in) 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.

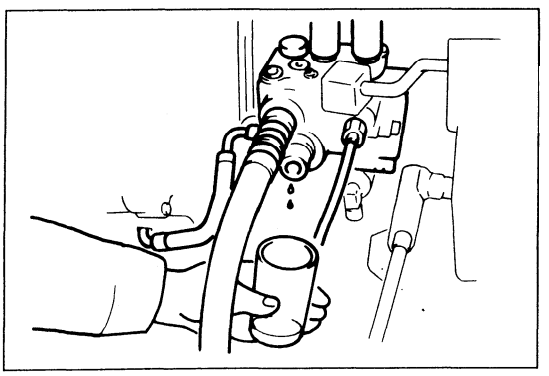


TILT CYLINDER

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 oil leak amount (total for lift and tilt):
   32 cc (1.95 cu-in) or less



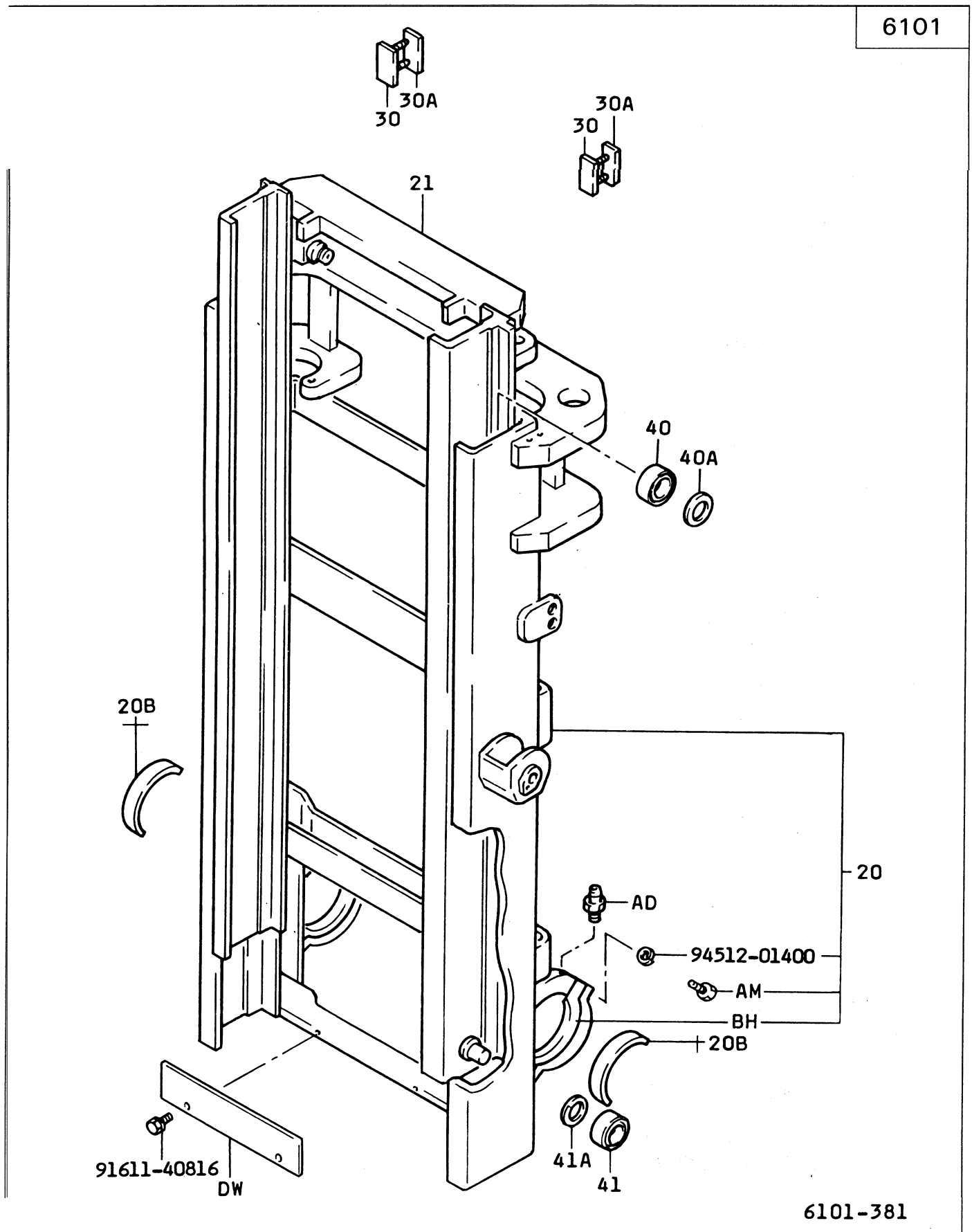
3. The leak amount at the tilt port is the total leak amount less the leak amount from the lift port.

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.

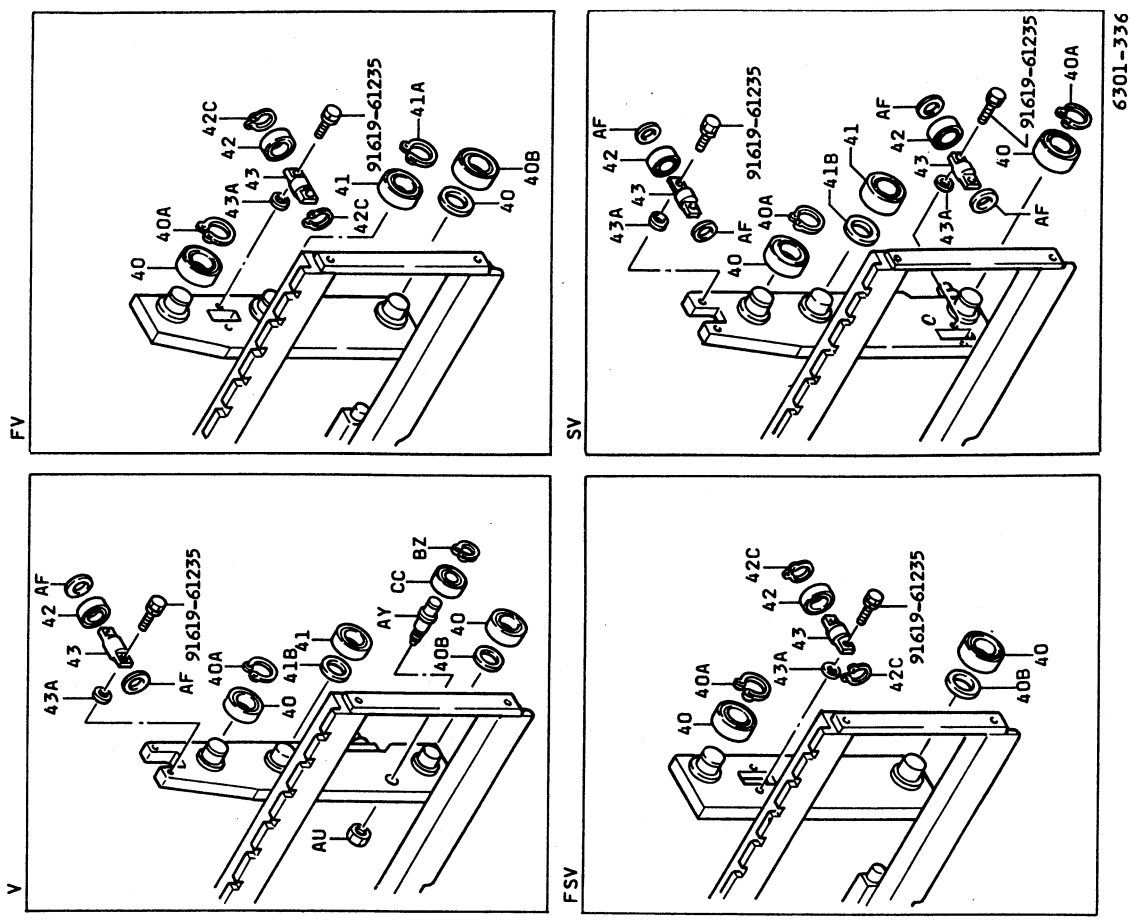
MAST

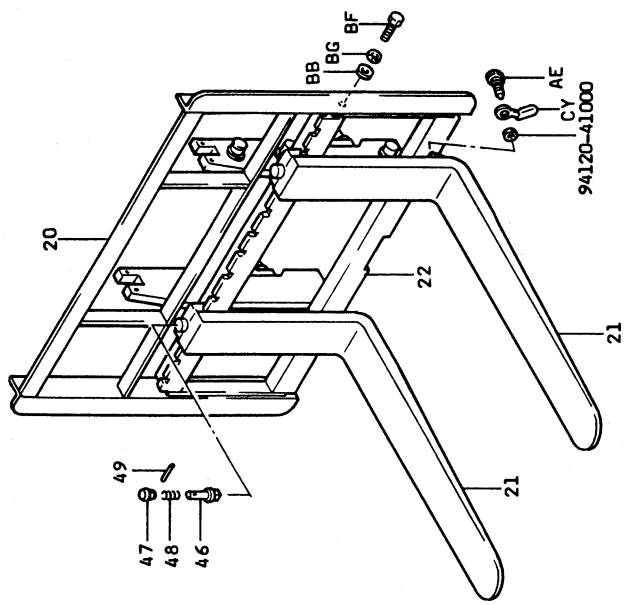
V MAST ASSY

COMPONENTS



6301


FV
SV
V
FSV
6301-336
40
40A
43A
43
42
42C
41
91619-61235
41A
40B
AF
41B
AU
AY
CC
BZ


BB
BG
BF
AE
CY
94120-41000
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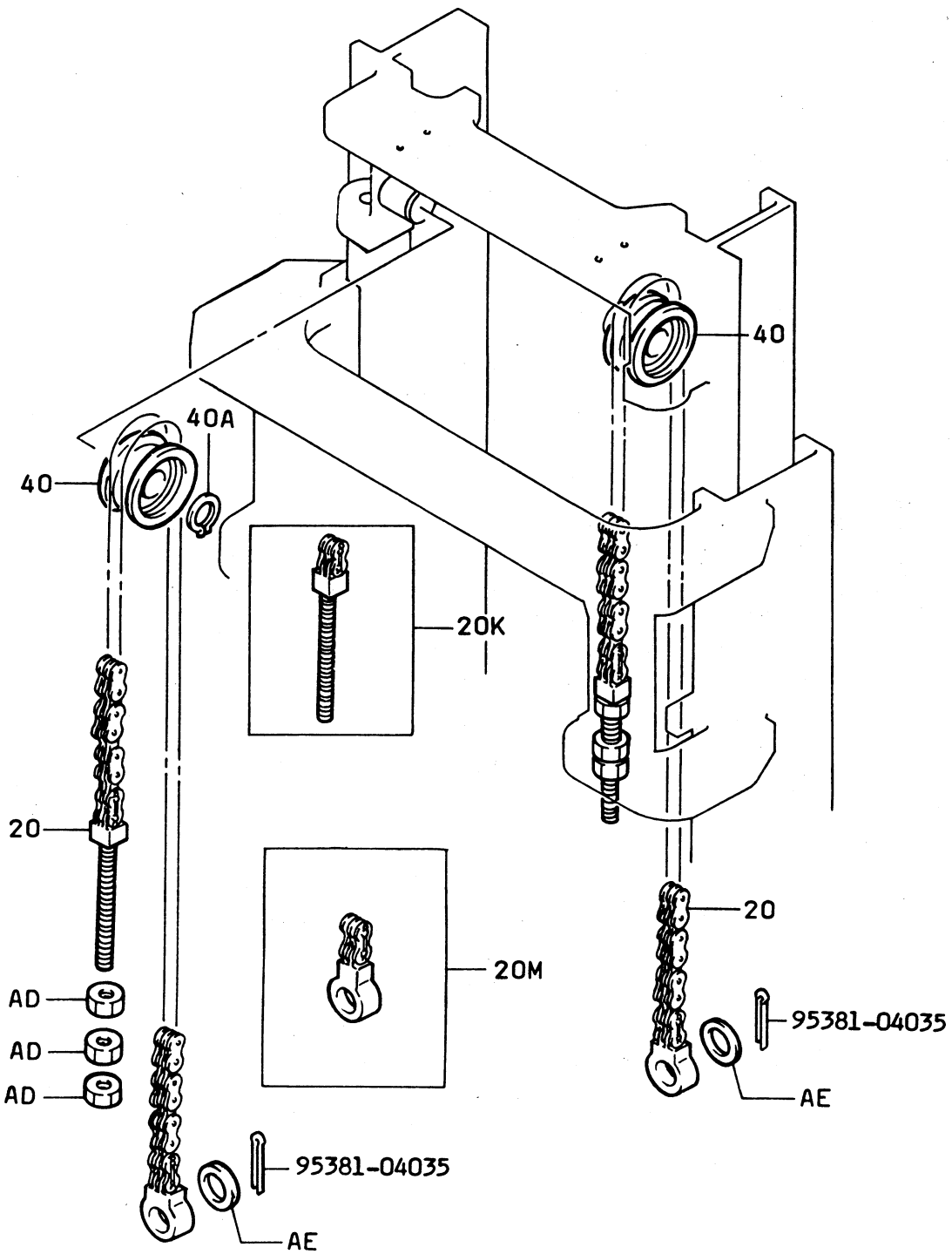
47
48
46

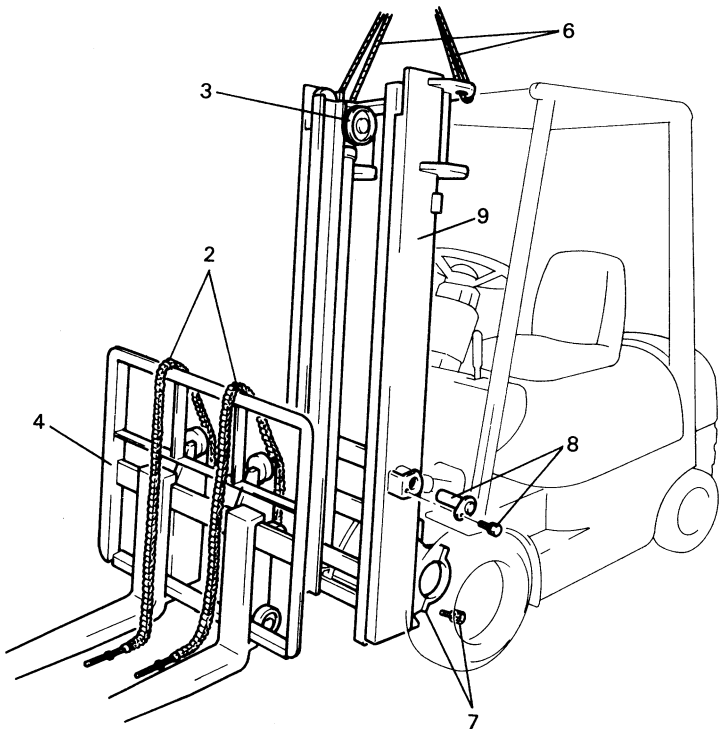
13

6302



6302-268

REMOVAL·INSTALLATION



1 Mast in vertical position and fork at the lowermost position
5 Hose

Removal Procedure

1 Set the mast vertical and lower the fork to the bottom position.

2 Disconnect the chain.

3 Remove the chain wheel. **[Point** 11

4 Remove the lift bracket. (Raise the inner mast until it comes off from the lift bracket, and slowly move the vehicle in the reverse direction to depart from the lift bracket. Then stop the engine.) **[Point** 21

5 Disconnect the overflow hose and high pressure hose. (Lower the inner mast to the bottom position and operate the lift lever several times to release the residual pressure in the lift cylinder before disconnecting the hoses.)

6 Slightly hoist the mast.

7 Remove the mast support caps.

8 Remove the tilt cylinder front pin. **[Point 3]**

9 Remove the mast ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:

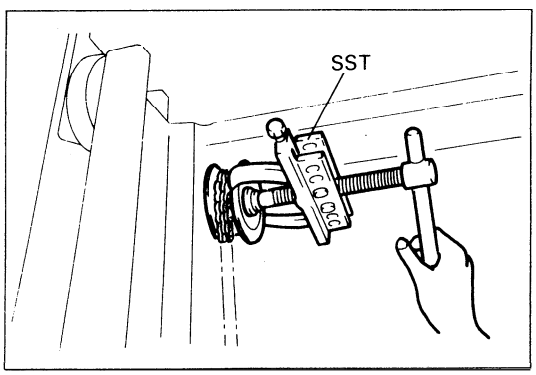
Apply MP grease on the interior surface of the mast support bushing, inner surface of the mast support cap and tilt cylinder front pin.

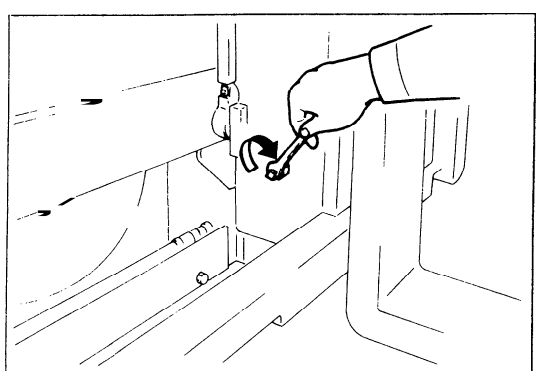
Mast support cap set bolt tightening torque:

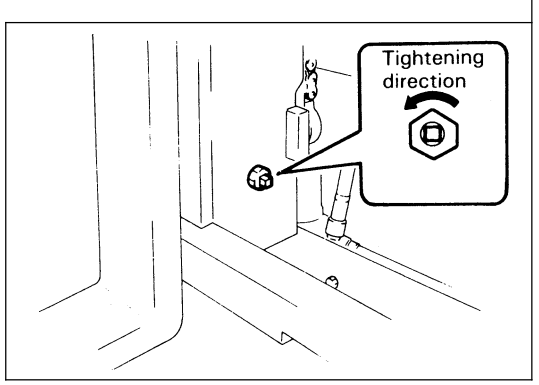
T = 68.65 – 107.87 **N·m** (700 – 1100 kg-cm) **[50.65 – 79.59 ft-lb]**

If any of the mast ASSY, outer mast, inner mast and lift cylinder is replaced, it is necessary to inspect and adjust uneven motion of the lift cylinder. See the lift cylinder rod shim adjustment section (on page 13-38) for the inspection and adjustment method.

Adjust the chain tension. (See page 13-19.)







Point Operations

[Point 1]

Removal: Use the SST for removal if the fitting is tight.
SST 09950-20017

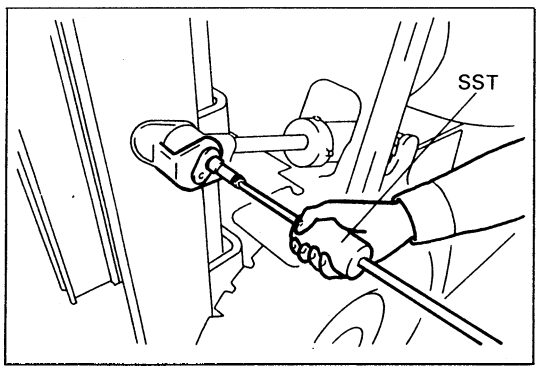
Installation: Install the chain wheel with its side having greater radius at the periphery of its hole facing the boss of the mast side pin.

[Point 21

Installation: Adjust the eccentric roller (OPT) after lift bracket installation. (Common to the V and SV masts.)

1. Turn the eccentric roller pin in the direction shown in the illustration, and lock with the set nut at the position where the roller comes into contact with the inner mast.
   The direction for turning the pins on the left and right sides are the same as illustrated.
2. (1 994.1 ~ 1994.7)
   The pin on the right side is punched with punched "R" mark while the one on the left side has no mark.
   (1 994.7 ~)
   The pin on the left side is punched with punched "L" mark while the one on the right side has no mark.

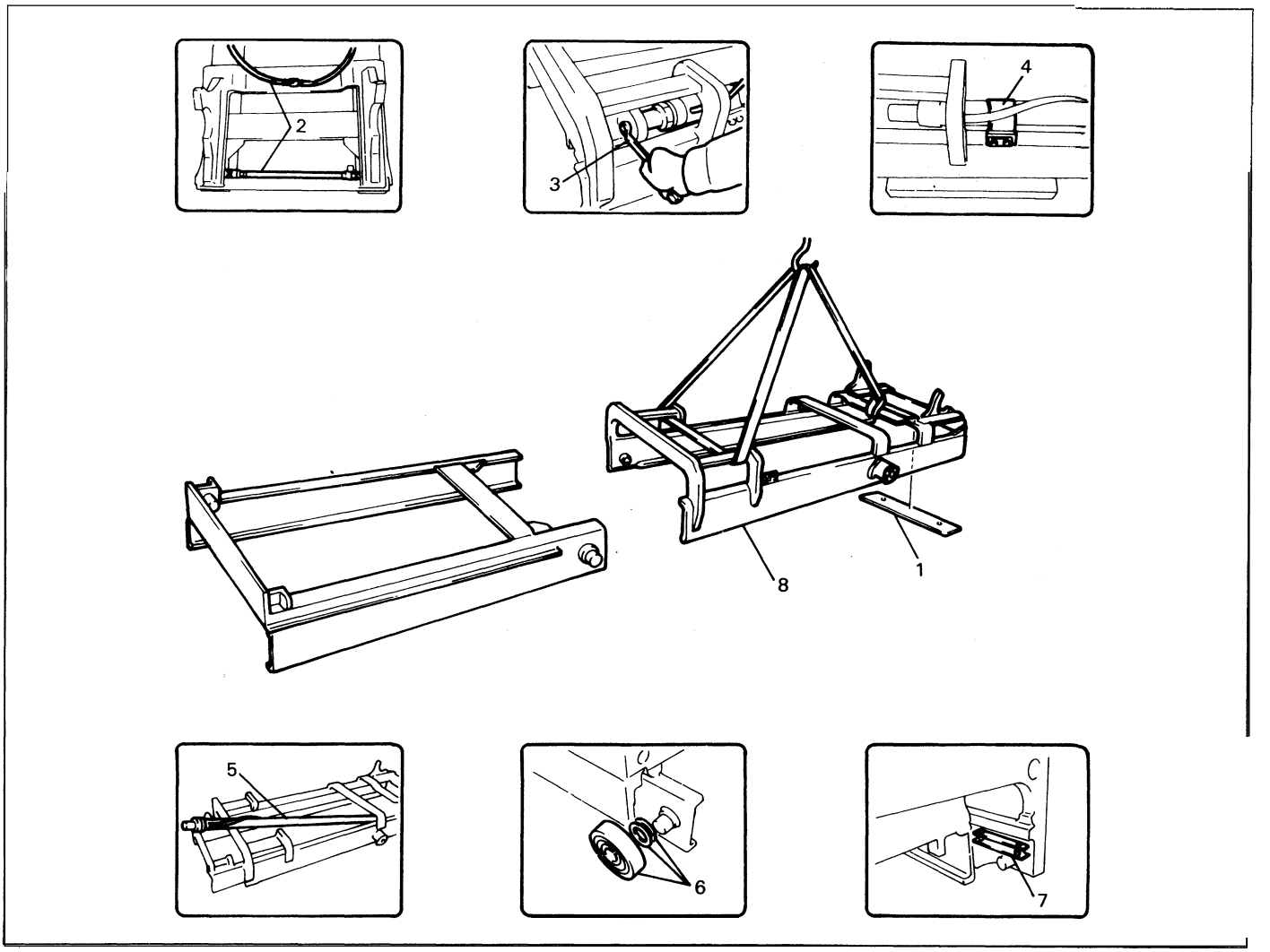
3. As the pin on the right and left sides use lefthand screw and righthand screw, respectively, the set nut tightening direction is the same as the roller pin turning direction in step 1 above.



[Point 31

Removal: SST 09810-20172-71

MAST DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the hose cover.

2 Disconnect the overflow hose and high pressure hose.

3 Remove the cylinder rod end set bolt and disconnect the rod end. **[Point 1]**

4 Remove the cylinder support. **[Point 2]**

5 Remove the cylinder bottom set bolts and remove the lift cylinder.

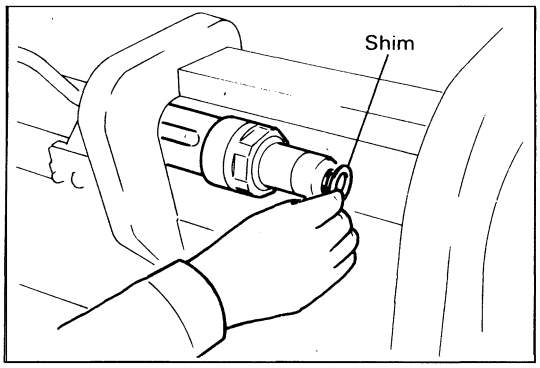
6 Slide the inner mast in the lowering direction and remove the lift rollers.

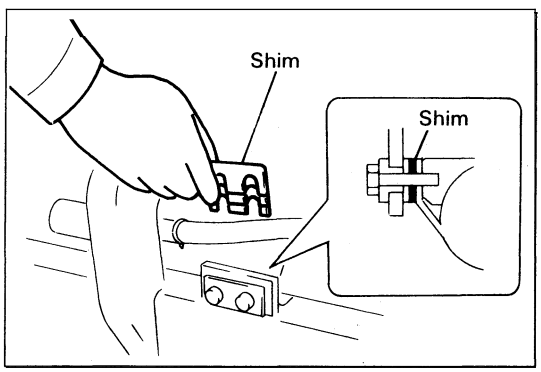
7 Remove the mast strip. **[Point 3]**

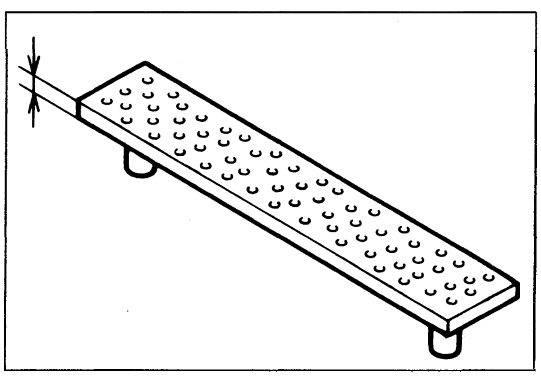
8 Remove the outer mast.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.







Point Operations

[Point 1]

Disassembly: Shim adjustment has been made at the lift cylinder rod end for prevention of cylinder uneven motion between the left and right sides. Take a note on which side the shim adjustment is made and the number of shims used.

[Point 2]

Disassembly: Take a note on the number of cylinder support shims used.

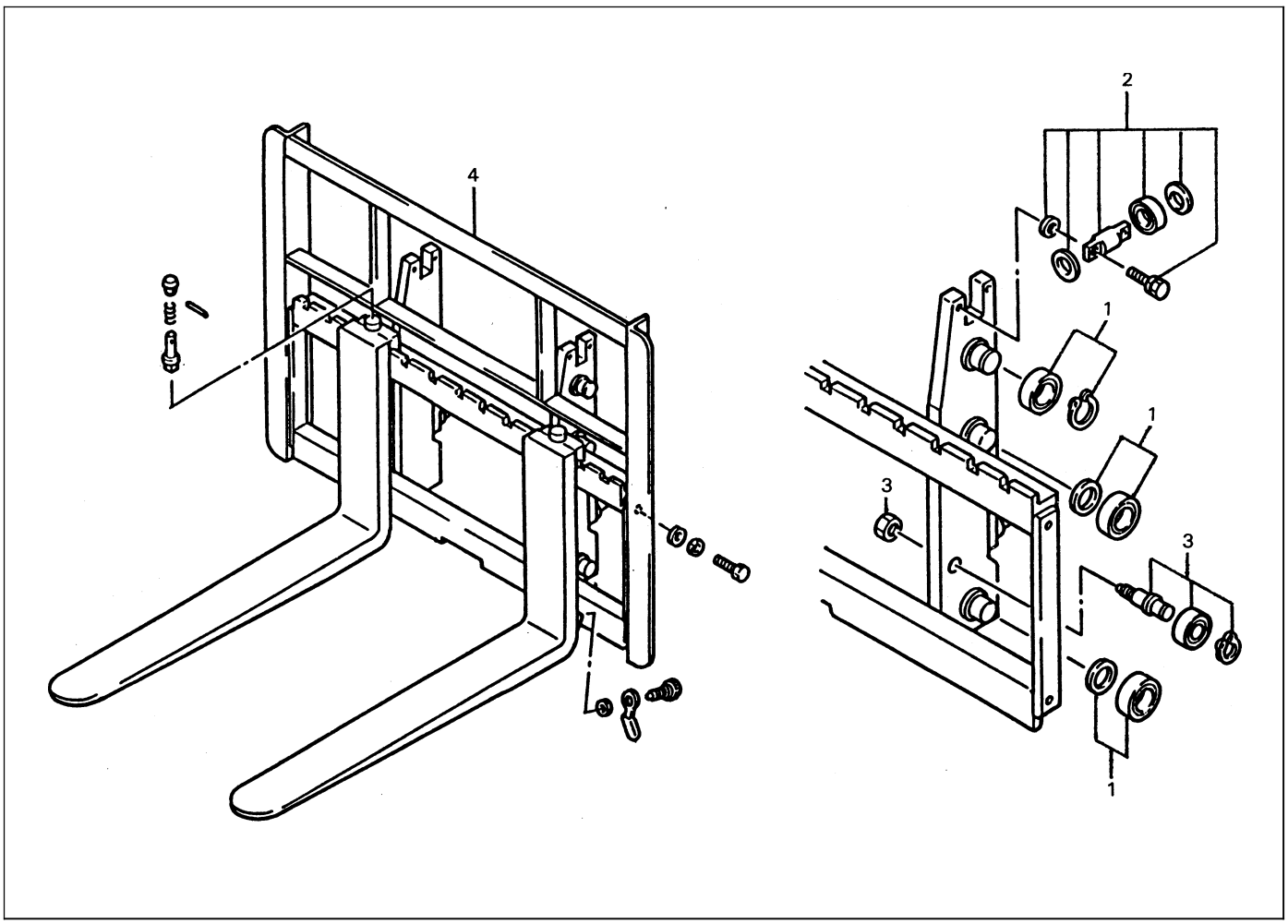
Reassembly: When the mast or cylinder is replaced, make shim adjustment at the cylinder support. With the cylinder rod end inserted to the inner mast, eliminate the clearance between the cylinder support and outer mast by inserting shims. The shim thickness should be slightly thicker.

[Point 3]

Inspection: Measure the mast strip thickness.

Thickness limit: 1.5 mm (0.059 in)

LIFT BRACKET DISASSEMBLY·INSPECTION·REASSEMBLY



Disassembly Procedure

1 Remove the lift rollers. **[Point 11**

2 Remove the side rollers. **[Point 21**

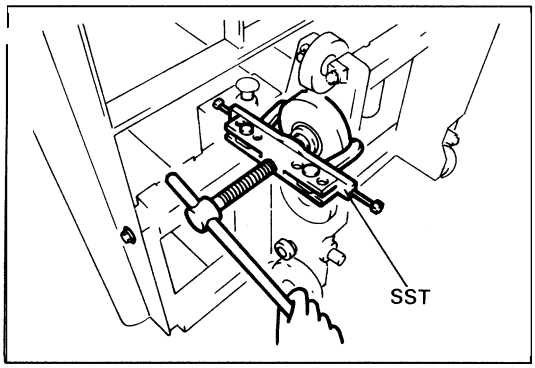
3 Remove the eccentric rollers (OPT). **[Point 3]**

4 Remove the back rest.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

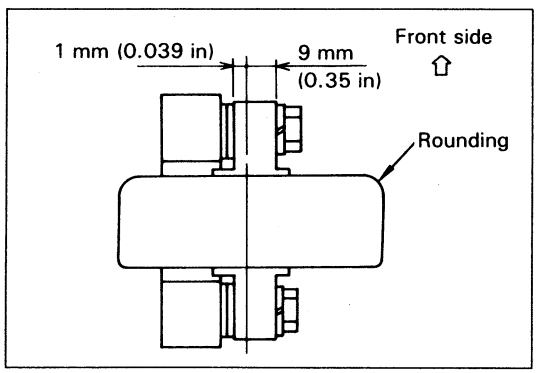
Note:
Back rest set bolt tightening torque T = 99.54 - 184.86 N·m (1015 - 1885 kg-cm) [73.44 - 136.38 ft-lb]



Point Operations

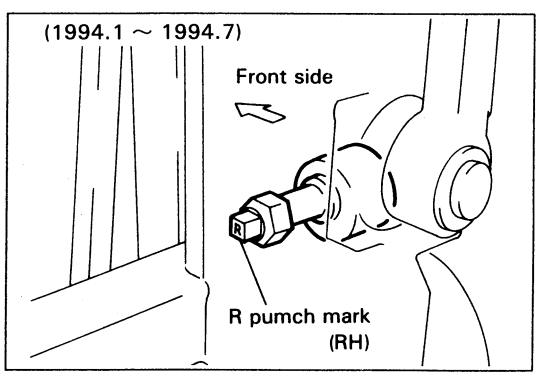
[Point 1]

Disassembly: SST 09950-20017



[Point 21

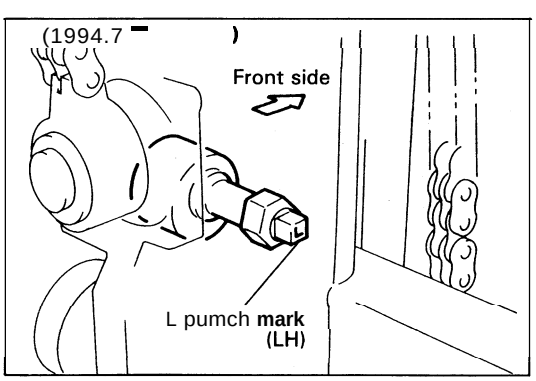
Reassembly: Do not mistake the side roller mounting direction.
The side where the chamfering radius of the roller outer circumference shall face the front side.



[Point 31

Disassembly: The eccentric roller pin set nuts use lefthand screw on the right side and right-hand screw on the left side.

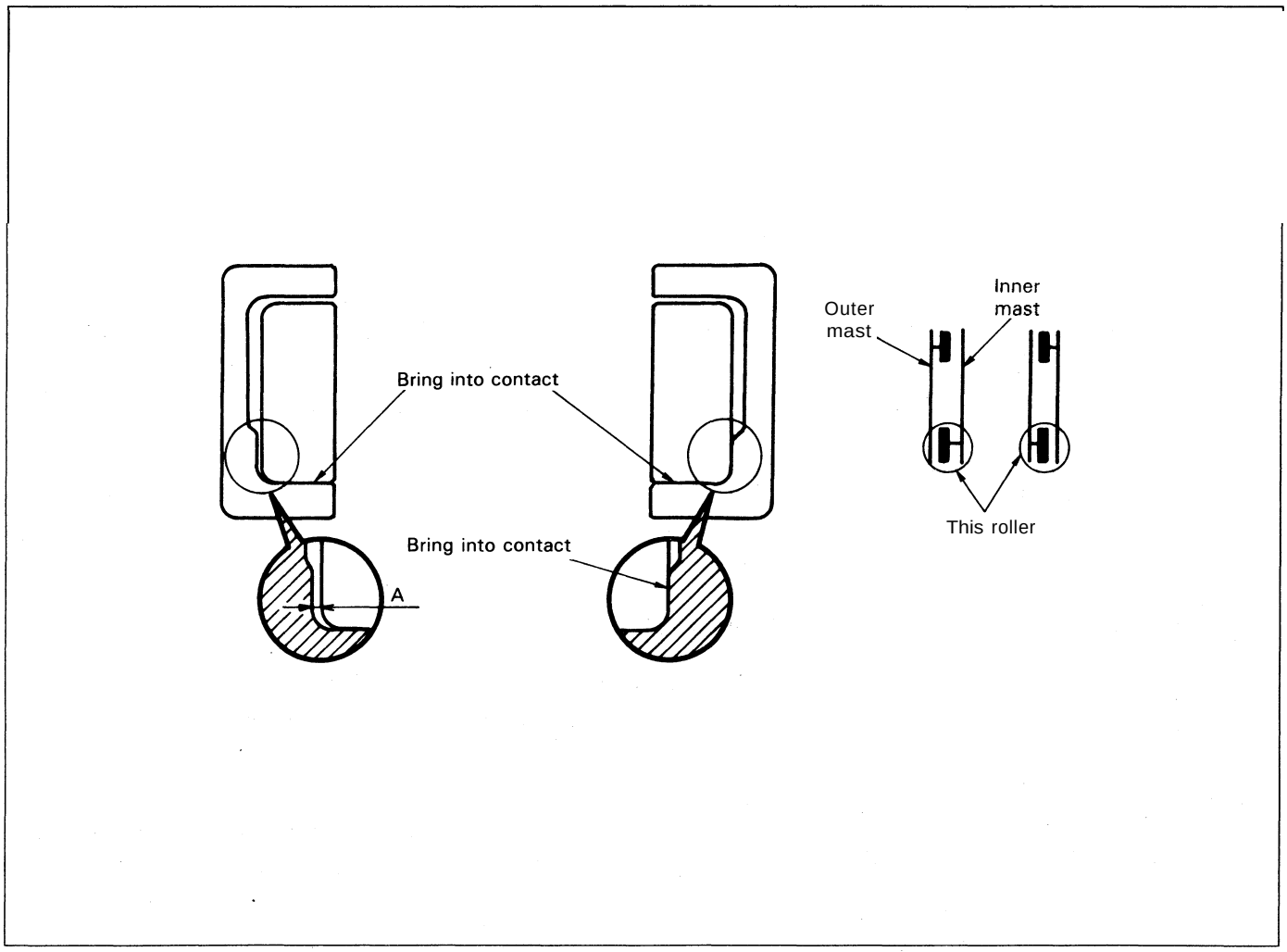
Reassembly: (1 994.1 ~ 1994.7)
Install the eccentric roller pin punched with the "R" mark on the right side and the one without a punch mark on the left side.
(1 994.7 ~)
Install the eccentric roller pin punched with the "L" mark on the left side and the one without a punch mark on the right side.

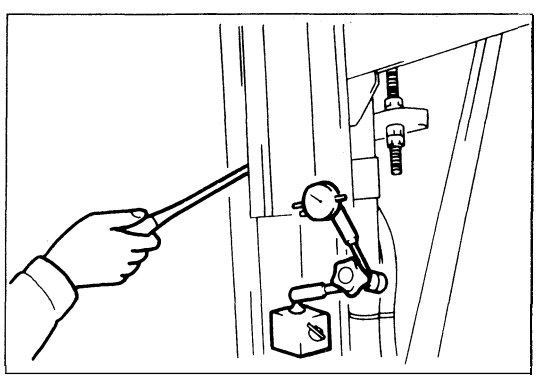


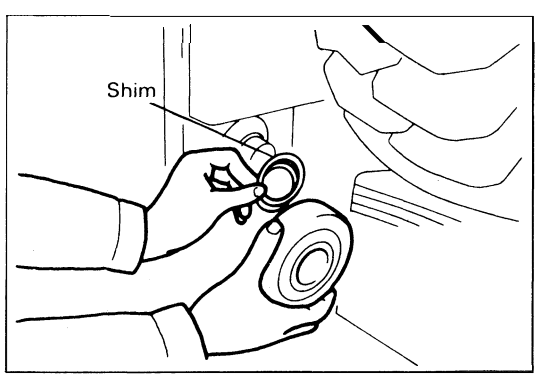
Reassembly: Keep the eccentric roller pin set nuts not tightened here and adjust the eccentric rollers after installing the lift bracket on the vehicle.

MAST ADJUSTMENT (V MAST)

Mast Lift Roller Adjustment



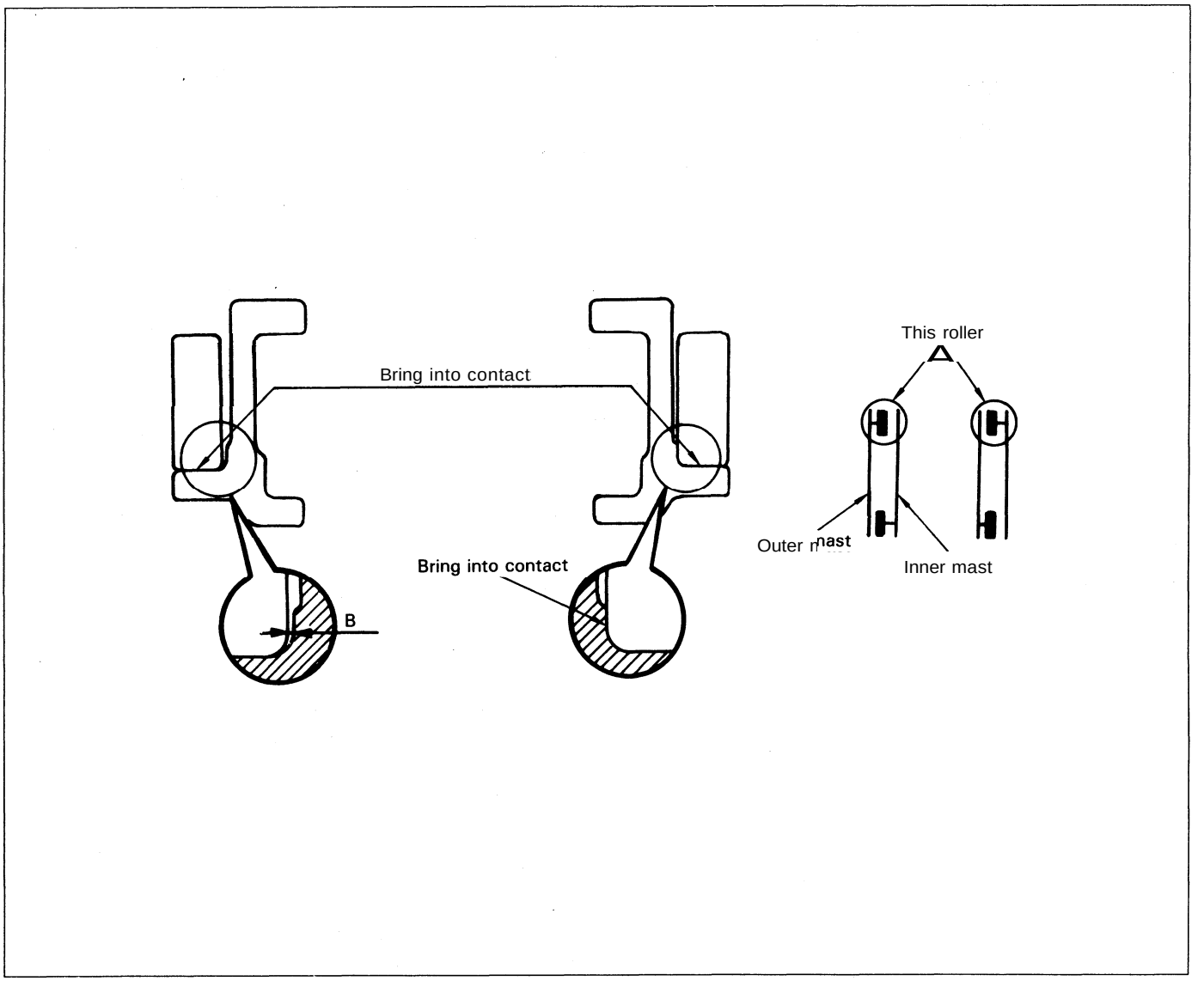


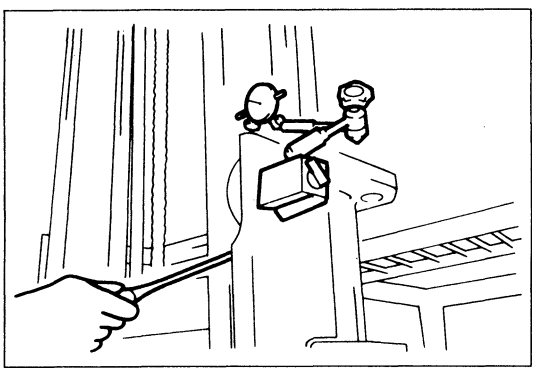


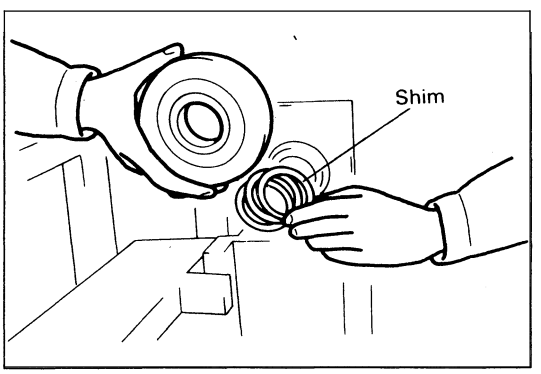
1. Inner mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim.

   Standard clearance A = 0 − 0.8 mm (0 − 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers. (See the "mast roller removal·installation" section for the shim replacement procedure.)
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.



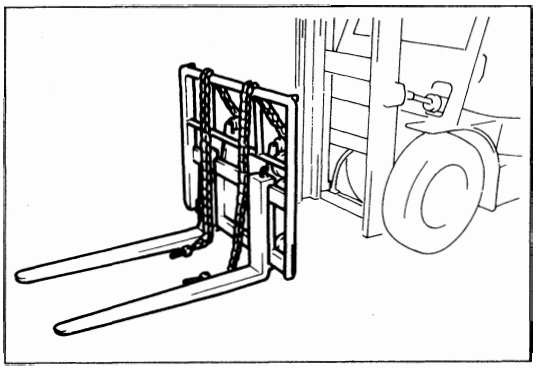


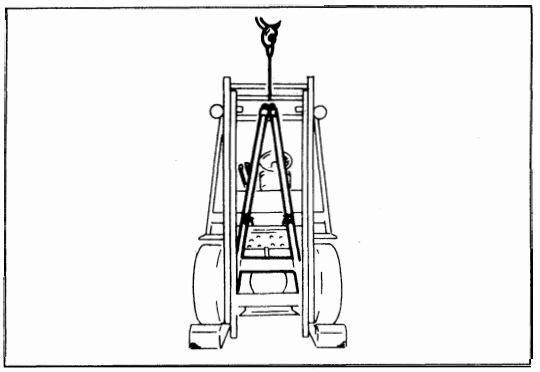


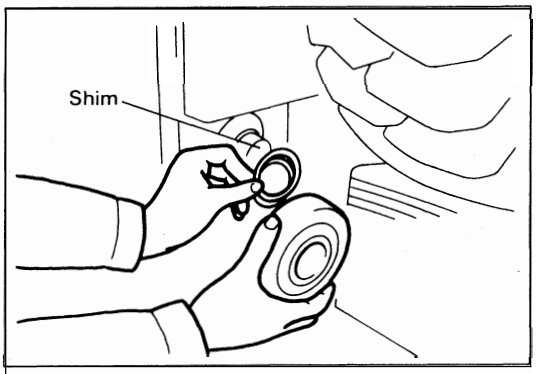
2. Outer mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim:

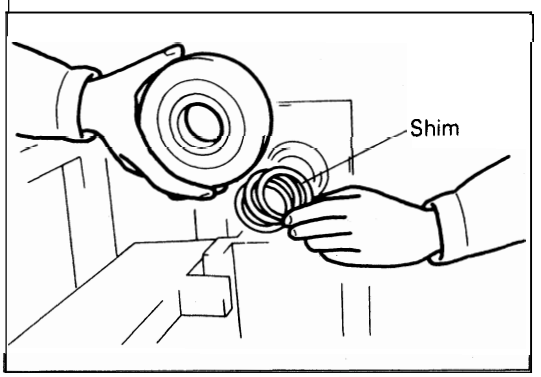
   Standard clearance B = 0 - 0.8 mm (0 - 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right sides. (See the "mast roller removal·installation" section for the shim replacement procedure.)
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.









Mast Roller Removal·Installation

1. Remove the lift bracket. (See the mast ASSY removal procedure steps 1 to 4 on page 13-5.)

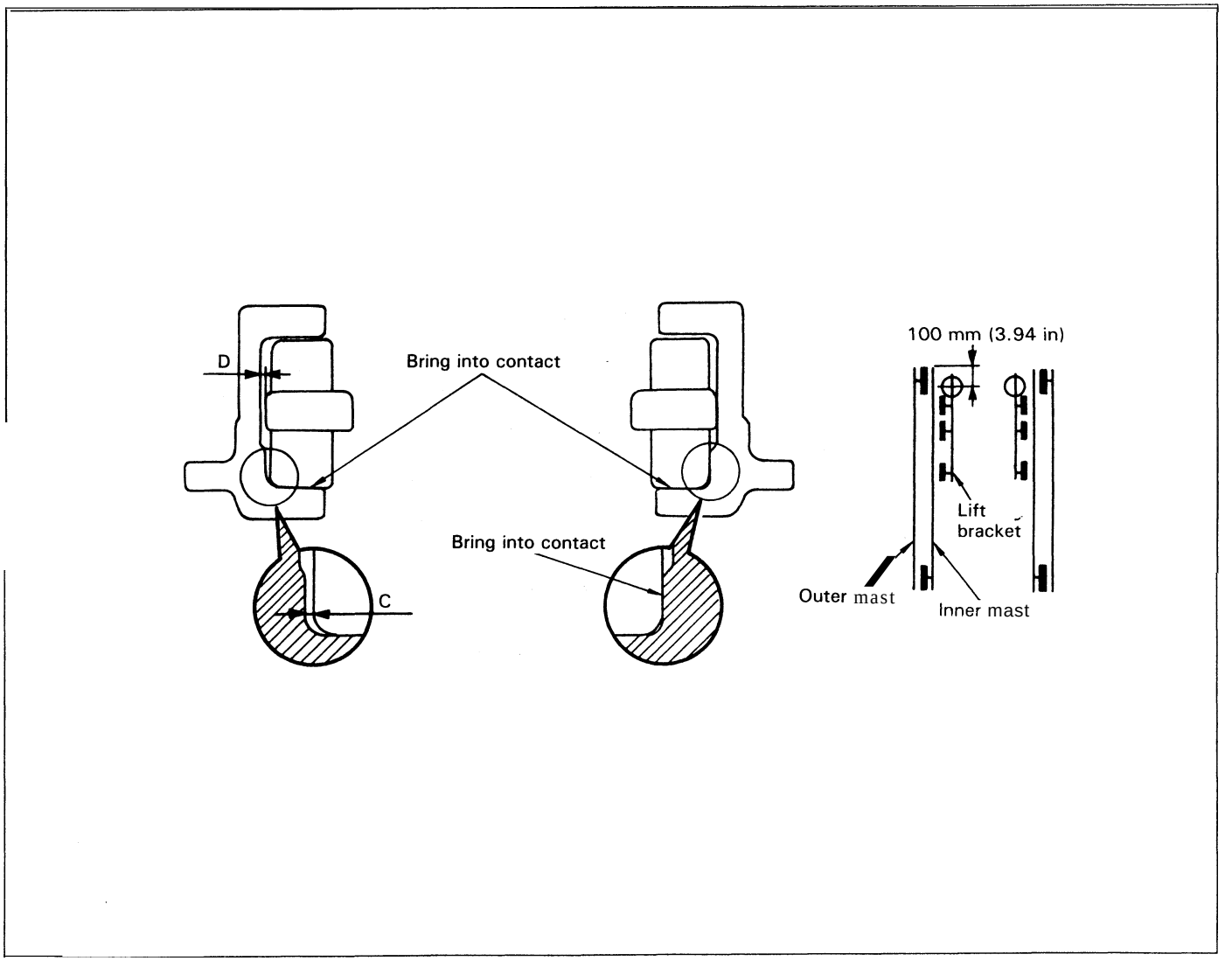
2. Jack up the vehicle and support the tires with wooden blocks. Lock the front and rear tires to prevent rotation.

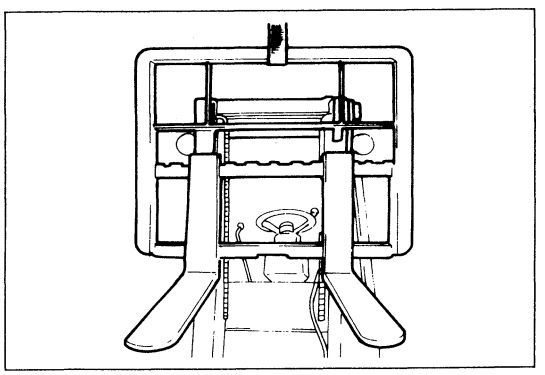
3. Tilt the lift cylinder.
   (1) Remove the hose cover at the bottom of the mast and disconnect the lift cylinder hose on the LH side.
   (2) Remove the lift cylinder bottom set bolts.
   (3) Sling the inner mast upper tie beam with a wire and slightly hoist it.
   (4) Remove the lift cylinder rod end set bolts, and disconnect the rod end by hoisting the inner mast.
   (5) Remove the lift cylinder support.
   (6) Tile the lift cylinders LH and RH and tie them with ropes to the outer mast tie beam.

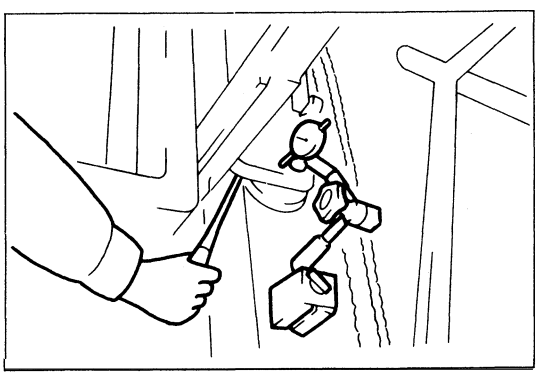
4. Remove the mast rollers.
   (1) Lower the hoisted inner mast slowly until mast rollers are visible, and support the bottom with wooden blocks.
   (2) Remove the inner mast rollers and shims.
   (3) Remove the outer mast rollers and shims.

5. The installation procedure is the reverse of the removal procedure.

Lift Bracket Roller Adjustment







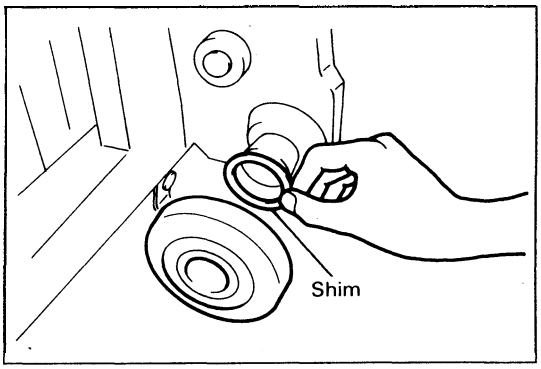
1. Lift roller and side roller clearance adjustment

(1) Measure the clearance when the center of the lift bracket upper side rolier is 100 mm (3.93 in) from the top of the inner mast.

(2) The upper lift rollers need no adjustment because they are fixed by snap rings.

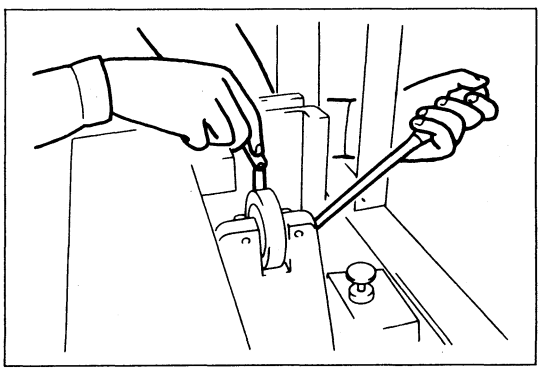
(3) Measure the clearances at the middle and lower lift rollers after removing the side rollers.
Shift the lift bracket to one side to bring the roller into contact with the inner mast, and measure the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

Standard clearance C = 0 − 0.8 mm (0 − 0.031 in)
Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)



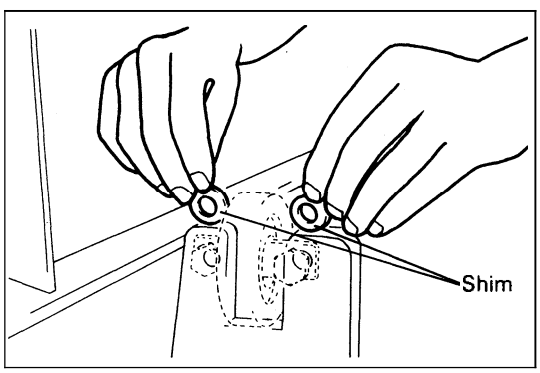
(4) Distribute the shim thickness equally to the left and right sides. (For the shim replacement procedure, see the lift bracket disassembly section on page 13-10.)

(5) Install the side rollers.



(6) Side roller adjustment shall be made after adjusting the middle and lower lift rollers.
Bring the side roller on one side into contact with the mast side surface, and make adjustment by shim insertion to make the clearance between the side roller and inner mast side surface on the opposite side satisfy the following standard.

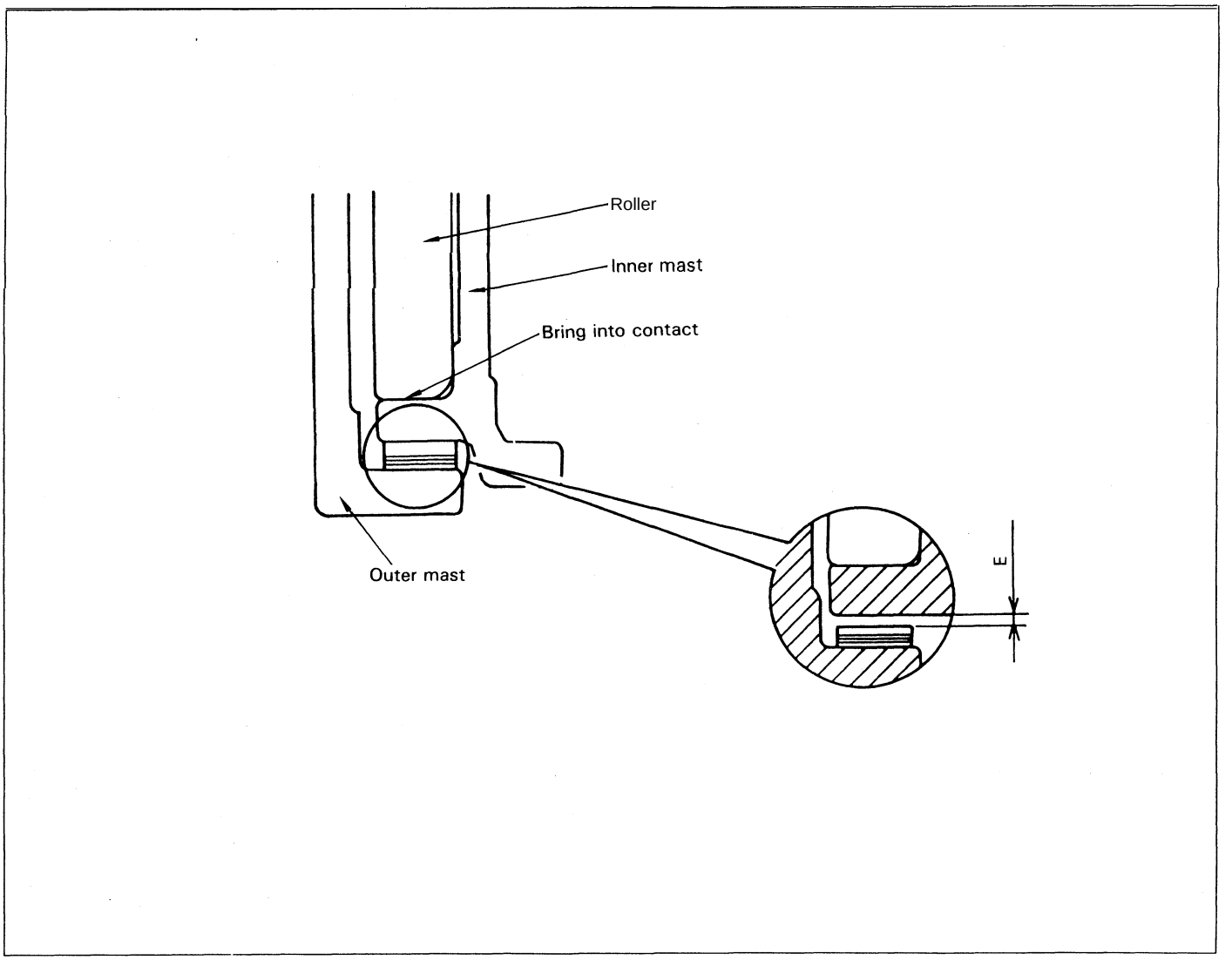
Standard clearace D = 0 – 0.6 mm
(0 – 0.024 in)
Shim thickness: 0.5 and 1.0 mm
(0.020 and 0.039 in)

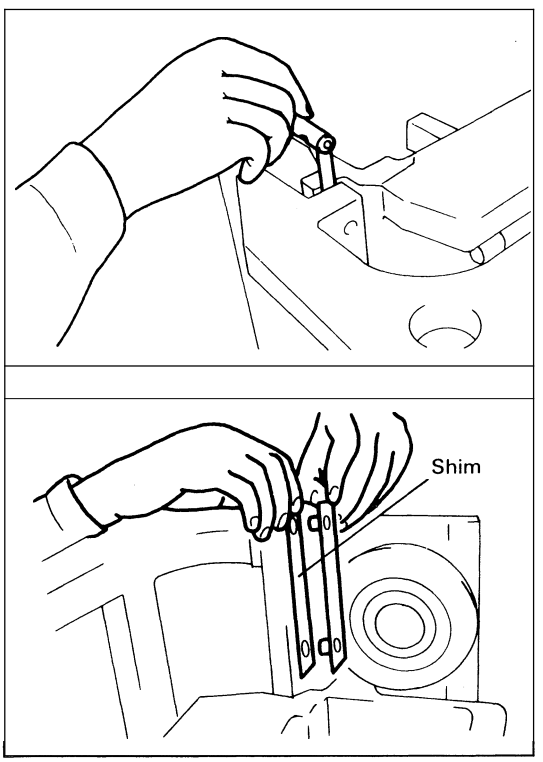


(7) The shim thickness shall be distributed equally into the left and right sides. (Shim replacement is possible on the vehicle. For the side roller installation, see the lift bracket disassembly section on page 13-10.)

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

Mast Strip Adjustment

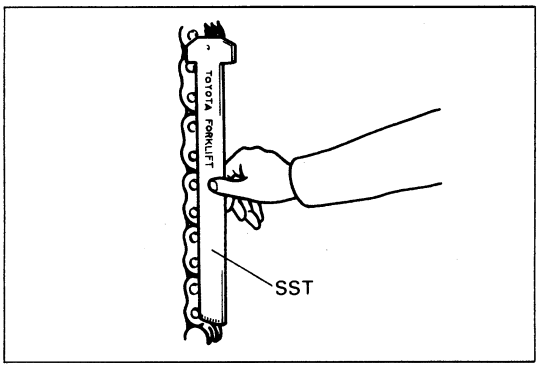




1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast at the bottom position.
   (2) With the inner mast in contact with the outer mast roller, adjust the clearance between the mast strip and inner mast to the following value by inserting the mast strip shim. (The shim replacement procedure is the same as that described in the "mast roller removal·installation'' section on page 13-14.)

   Standard clearance E = 0.5 – 1.0 mm (0.020 – 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) After the adjustment, the mast should move smoothly.



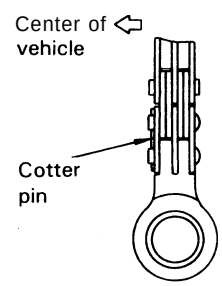
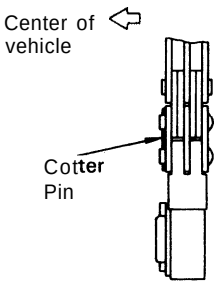
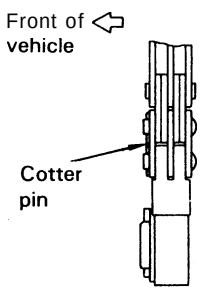
CHAIN

INSPECTION

1. Inspect the chain elongation.
   SST 09631-22000-71

Note:
- When inspecting the chain elongation, use the SST above and inspect without removal from the vehicle. The chain elongation rate varies from place to place; thereby check the whole span.
- Standard chain link pitch
  1 ton series: 15.88 mm (0.6252 in) (Type: **BL534**)
  2 ton series: 19.05 mm (0.7500 in) (Type: **BL634**)
  3 ton series: 25.4 mm (1.000 in) (Type: **BL823**)

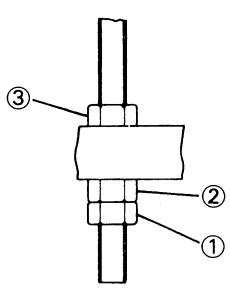
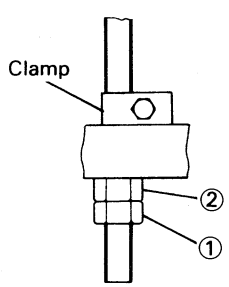
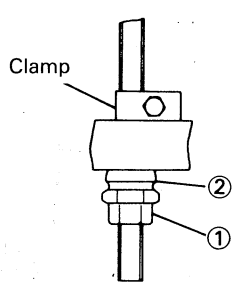
REASSEMBLY

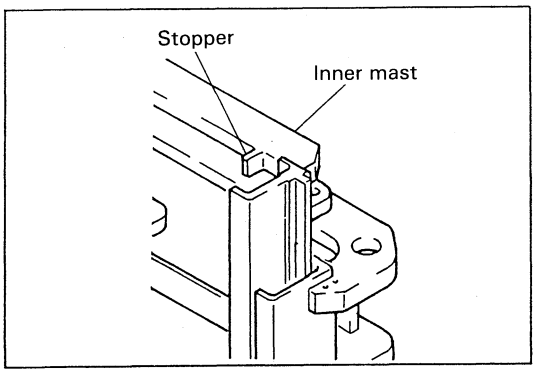
Applicable mast and portion	V: Lift bracket SV: Lift bracket	FV: Lift bracket FSV: Lift bracket	FSV: Inner mast
Sketch	 Install with the cotter pin on the vehicle center side.	 Install with the cotter pin on the vehicle center side.	 Install with the cotter pin on the vehicle front side.

Chain Adjusting Nut Tightening Sequence

1 Tighten nuts ① and ② . Tightening torque T = 49.03 – 78.45 **N·m** (500 – 800 kg-cm) [**36.18** ~ 57.88 **ft-lb**]

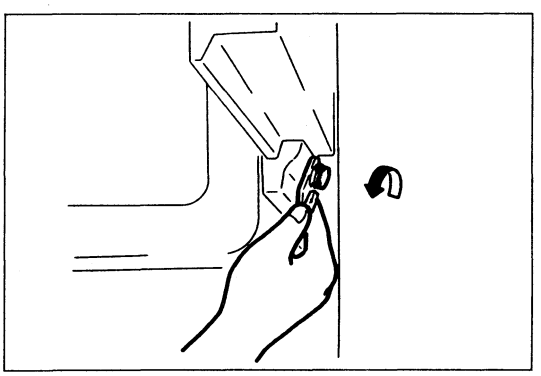
2 Tighten nut ③.

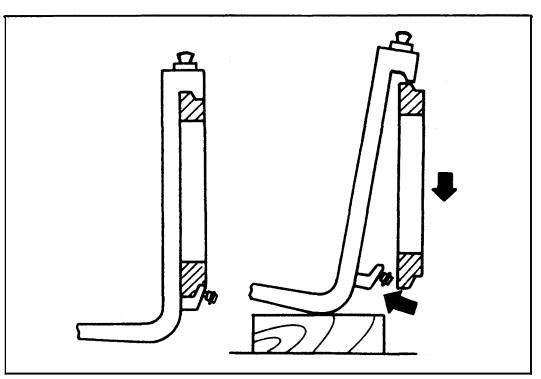
Applicable mast and portion	V: Outer mast SV: Outer mast (maximum fork height at 3000 mm (118 in) or more)	FV: Front cylinder FSV: Front cylinder SV: Outer mast (maximum fork height at 2700 mm (106 in) or more)	FSV: Outer mast
Sketch		 The clamp is used only for the SV mast.	

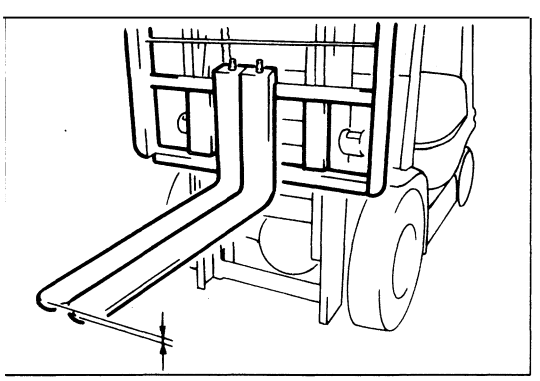


ADJUSTMENT

1. Place the vehicle on a level floor, and set the mast in the vertical position.
2. Lower the forks to lay them on the floor, and adjust the chain tensions with the adjust-nuts so that the chains are stretched with no slacks.
3. Check the chains for equal tension on the left and right sides.
4. Check that the chains are not twisted.
5. Check that the maximum fork height is as specified.
6. Check to see that the lift bracket will not come into contact with the stopper portion of the top inner mast tie beam when raised fully.







FORK

REMOVAL

1. Loosen the set bolts (OPT) for preventing the fork from loosening.

Note:
Always set the lever for preventing the fork from loosening in the horizontal position after it is used.

2. Position the fork at 20 cm (7.9 in) above the ground.
3. Place a wooden block under the notched portion of the fork rail.
4. Unlock after lifting the fork stopper pin, and shift the fork blades one by one to the center.
5. Gradually lower the fork and remove it.

INSTALLATION

The installation procedure is the reverse of the removal procedure.

INSPECTION

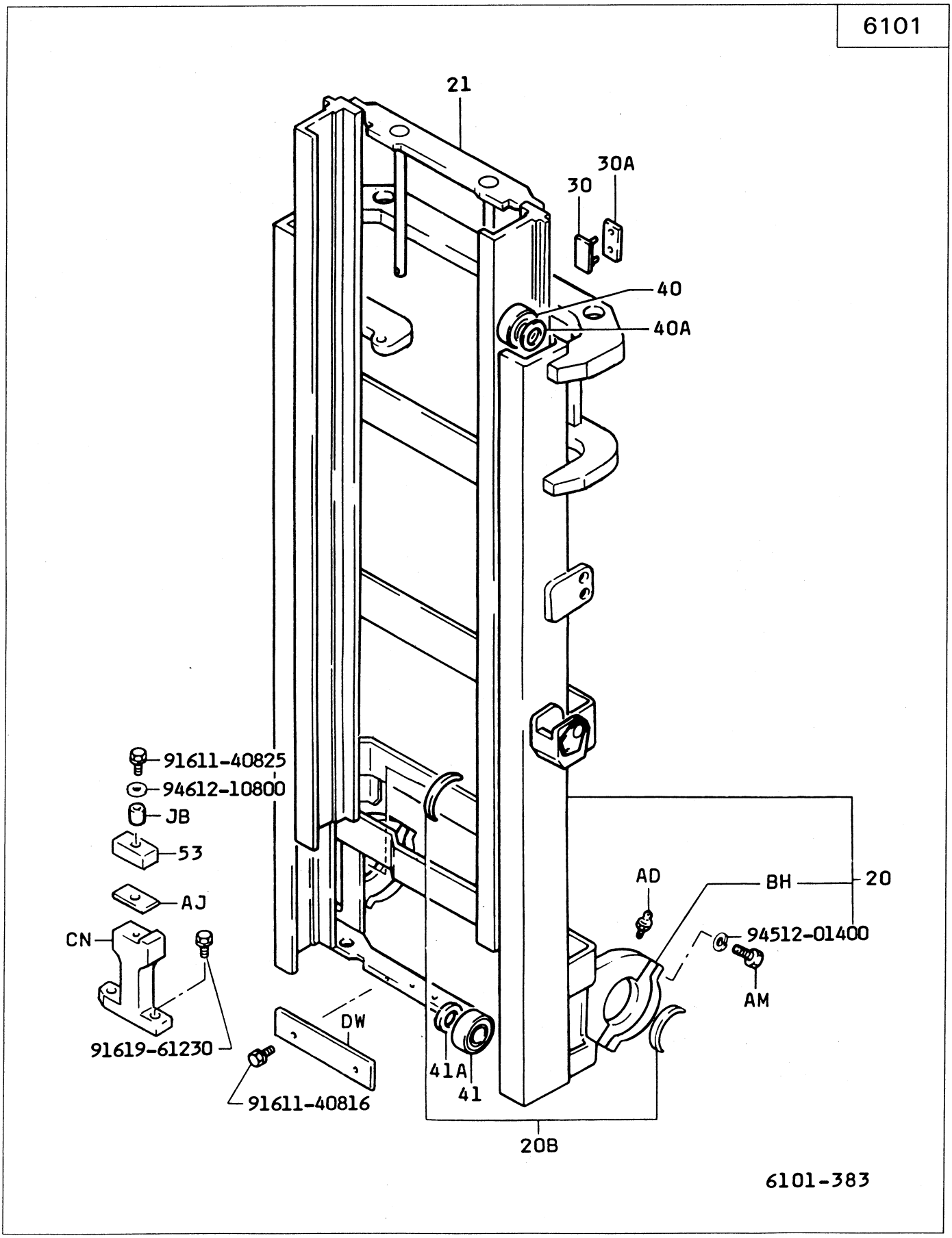
1. Inspect the fork.

Fork tip end limit misalignment: 10 mm (0.39 in)

Note:
If the tip end limit misalignment is exceeded, inspect the bend, fork mounting looseness and lift bracket finger bar distortion for each blade.

SV MAST ASSY

COMPONENTS



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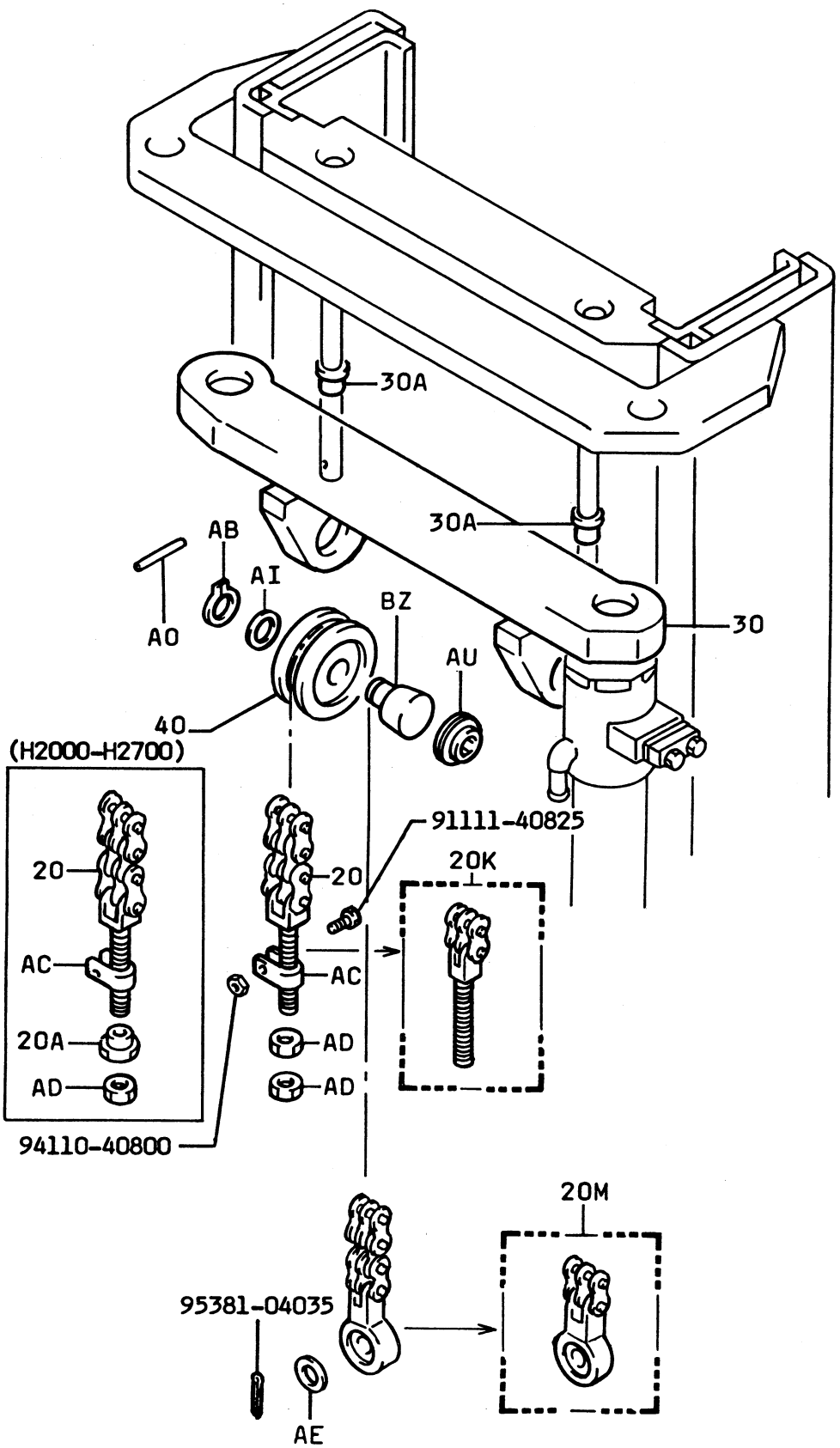
30A
30A
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AO
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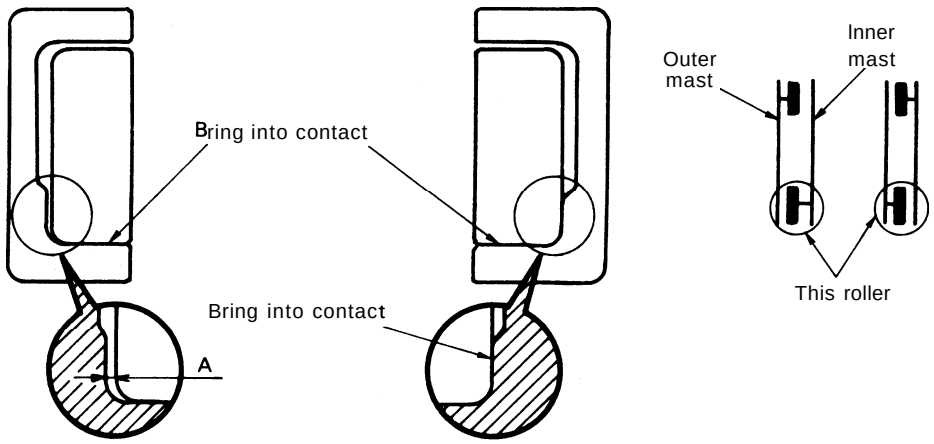
40
(H2000-H2700)
20
AC
20A
AD
94110-40800
20
AC
AD
AD
91111-40825
20K
20M
95381-04035
AE
6302-266

MAST ADJUSTMENT (SV MAST)

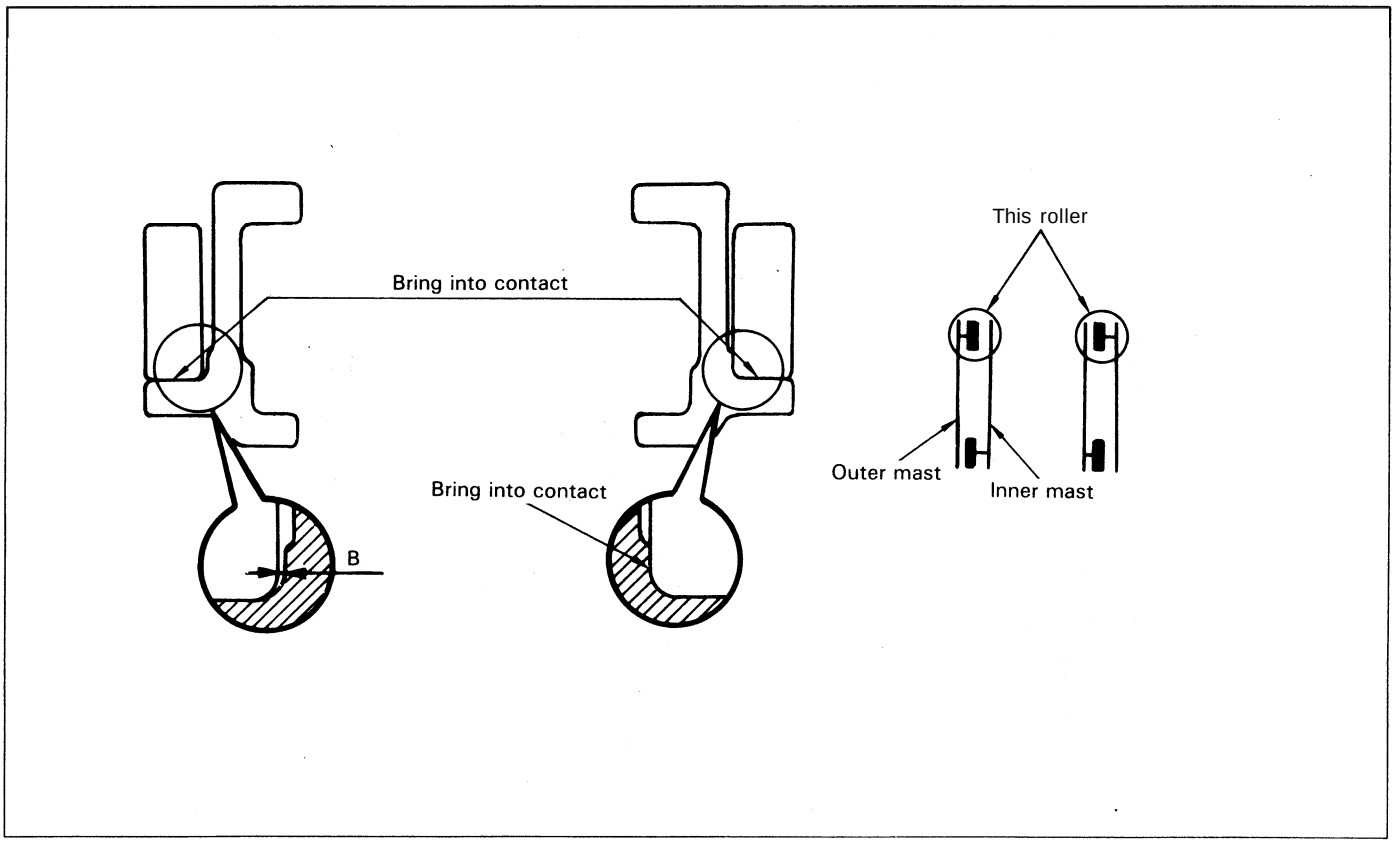
Mast Lift Roller Adjustment (SV)



1. Inner mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim.

   Standard clearance A = 0 – 0.8 mm (0 – 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers.
   (4) After the adjustment, check that the inner mast move smoothly in the outer mast.

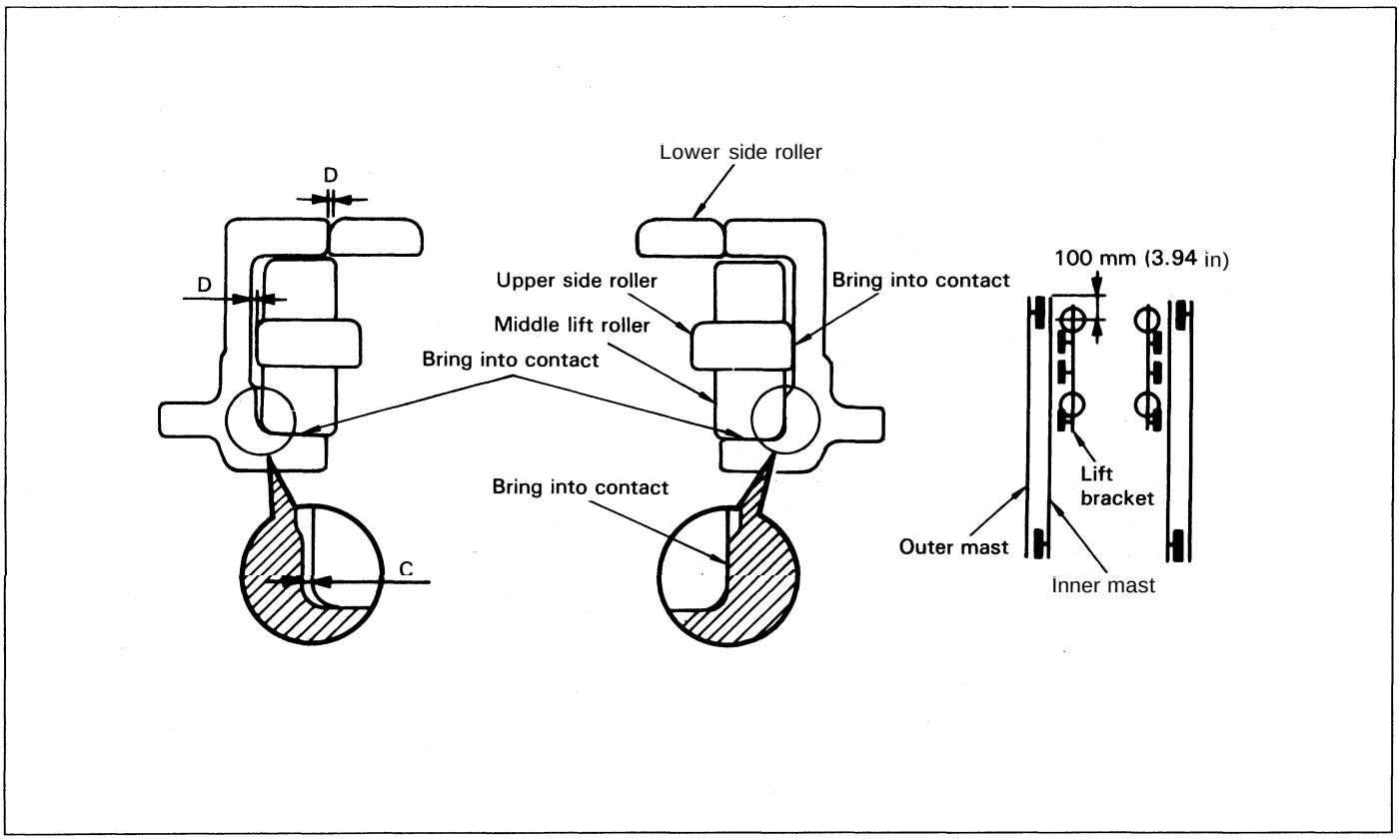


2. Outer mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim.

   Standard clearance B = 0 – 0.8 mm (0 – 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right sides. (See the mast roller removal. installation section for the shim replacement procedure.)
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.

Lift Bracket Roller Adjustment **(SV)**



1. Lift roller and side roller clearance adjustment
   (1) Measure the clearance when the center of the lift bracket upper side roller is 100 mm (3.94 in) from the top of the inner mast.
   (2) The upper and lower lift rollers need no adjustment because they are fixed by snap rings.
   (3) Adjust the clearances at the middle lift rollers as follows: Shift the lift bracket to one side to bring the roller into contact with the inner mast, and adjust the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

   Standard clearance **C = 0 – 0.8** mm **(0 – 0.031** in)
   Shim thickness: **0.5** and **1.0** mm **(0.020** and **0.039** in)

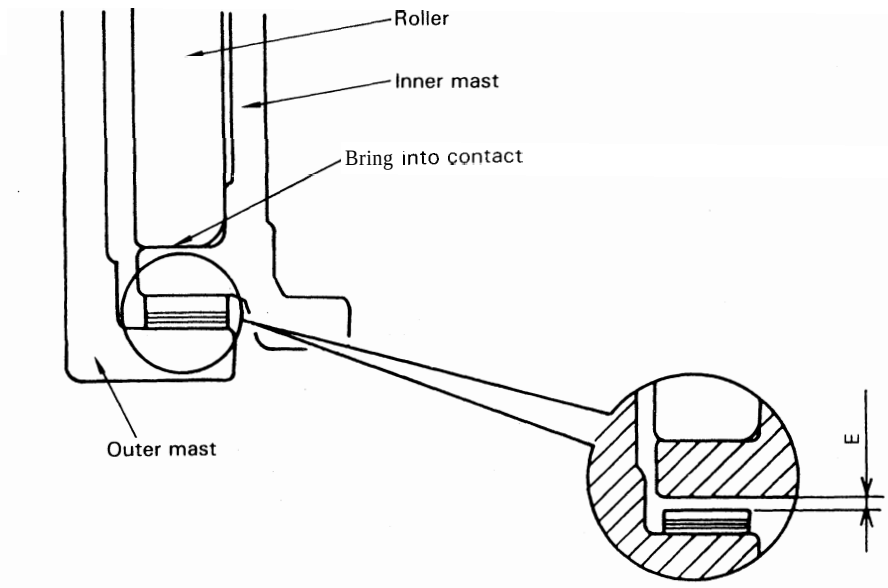
   (4) Distribute the shim thickness equally to the left and right sides.
   (5) Adjust the upper and lower side rollers after adjusting the middle lift rollers. Bring the side roller on one side into contact with the mast side surface and adjust the clearance between the side roller and inner mast surface to the following value by inserting the side roller shim.

   Standard clearance **D = 0 – 0.6** mm **(0 – 0.024** in)
   Shim thickness: 0.5 and 1.0 mm **(0.020** and **0.039** in)

   (6) Distribute the shim thickness equally to the left and right side rollers.

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

Mast Strip Adjustment (SV)



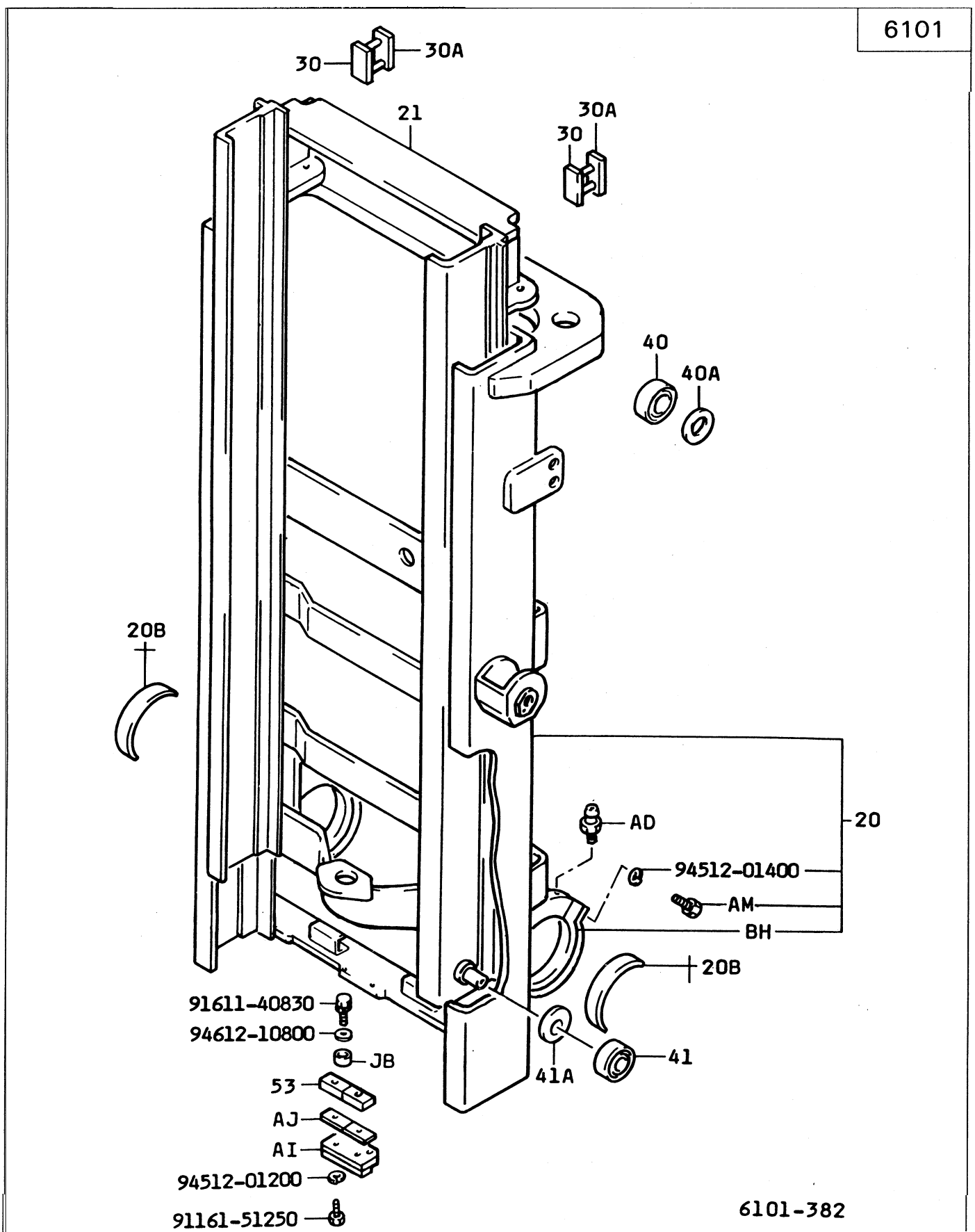
1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast at the bottom position.
   (2) With the inner mast in contact with the outer mast roller, adjust the clearance between the mast strip and inner mast to the following value by inserting the mast strip shim.

   Standard clearance E = 0.5 – 1.0 mm 10.020 – 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) After the adjustment, the mast should move smoothly.

FV MAST ASSY

COMPONENTS



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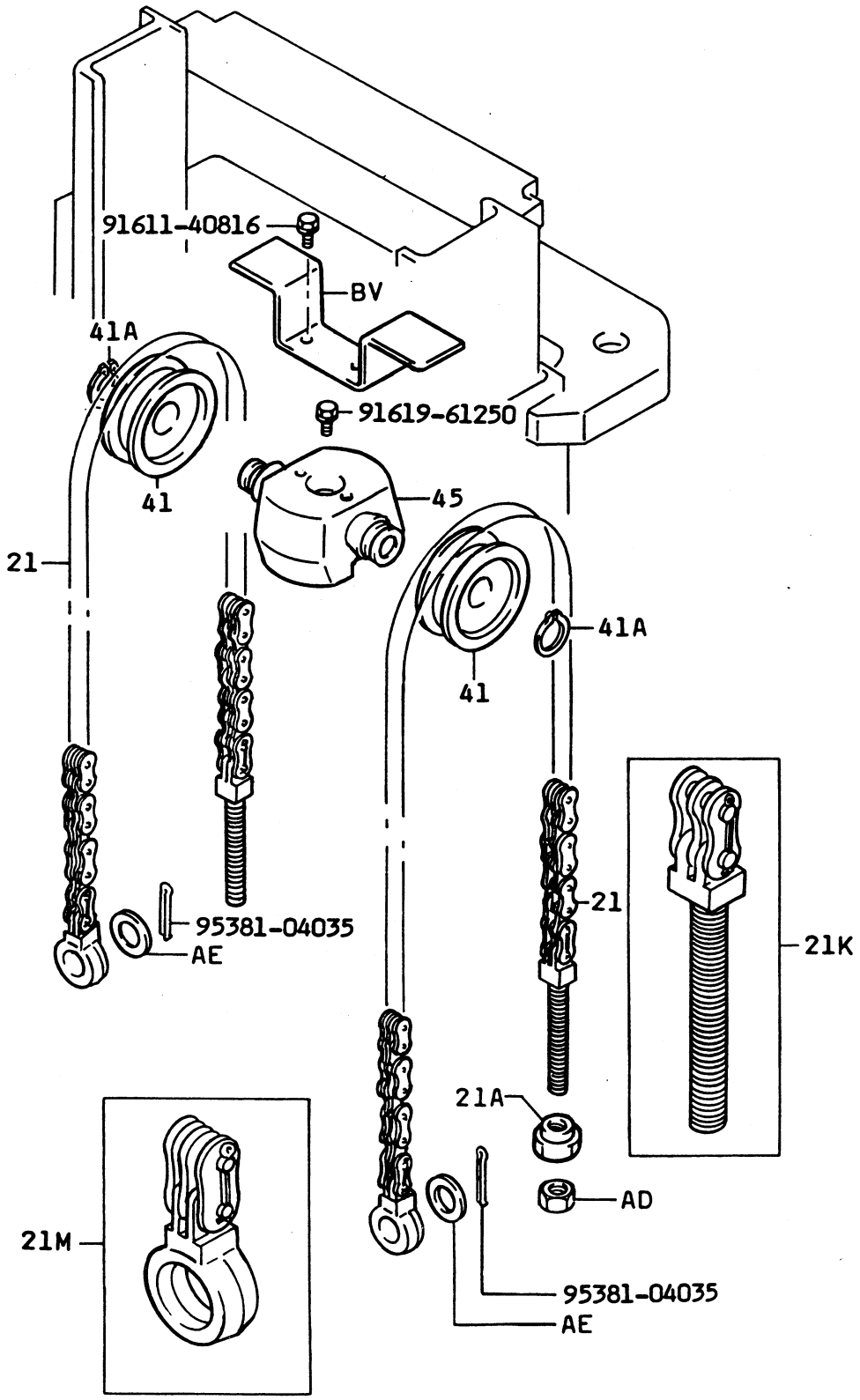

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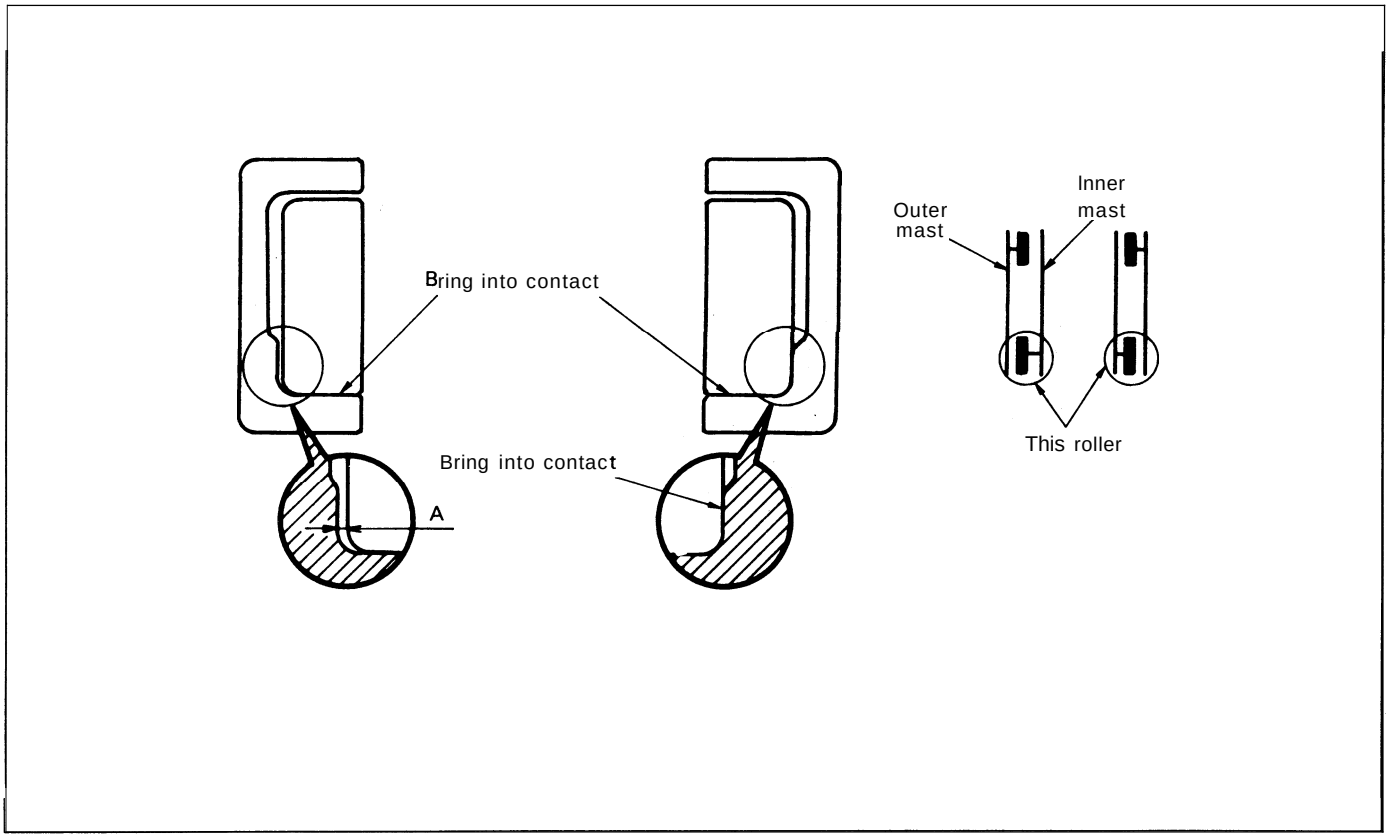
MAST ADJUSTMENT (FV MAST)

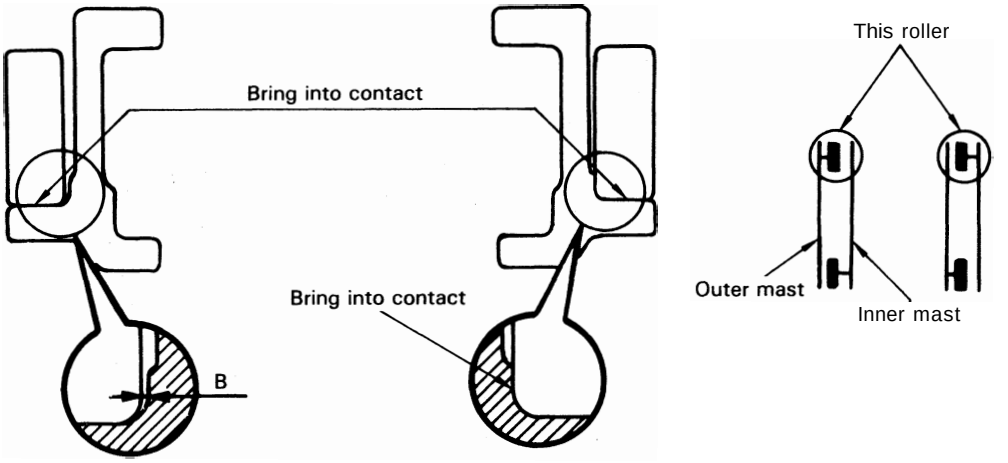
Mast Lift Roller Adjustment (FV)



1. Inner mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim.

   Standard clearance A = 0 - 0.8 mm (0 - 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers.
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.

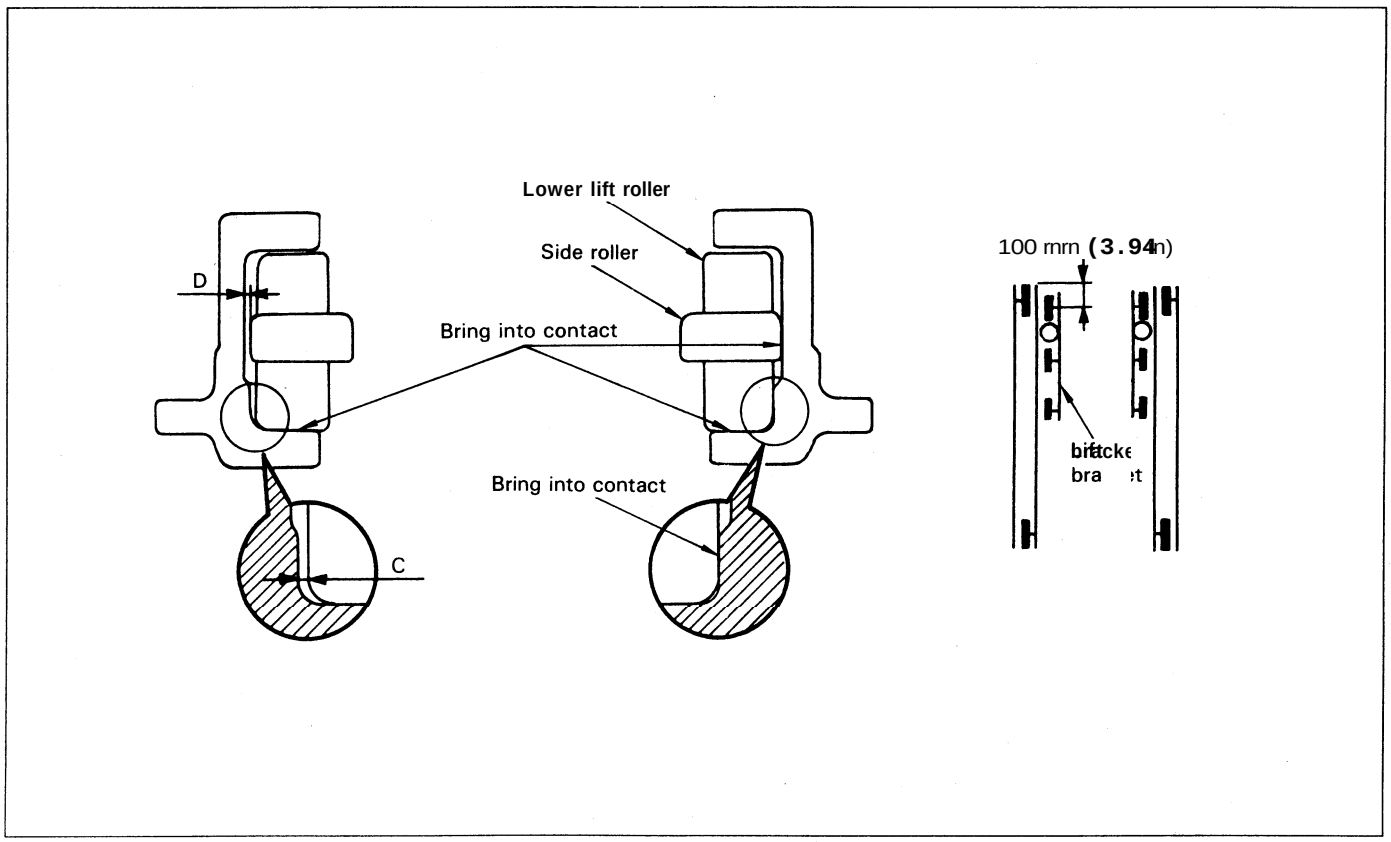


2. Outer mast roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim:

   Standard clearance B = 0 - 0.8 mm (0 - 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers.
   (4) After the adjustment, check that the inner mast moves smoothly in the outer mast.

Lift Bracket Roller Adjustment (FV)



1. Lift roller and side roller clearance adjustment
   (1) Measure the clearance when the center of the lift bracket upper side roller is 100 mm (3.94 in) from the top of the inner mast.
   (2) The upper and middle lift rollers need no adjustment because they are fixed by snap rings.
   (3) For the lower lift roller, shift the lift bracket to one side to bring the roller into contact with the inner mast, and adjust the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

   Standard clearance C = 0 – 0.5 mm (0 – 0.020 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

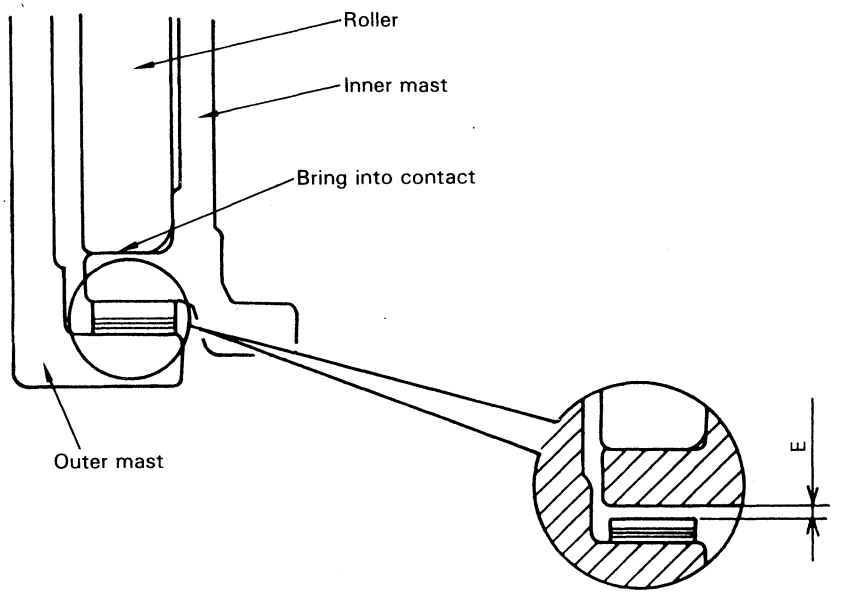
   (4) Distribute the shim thickness equally to the left and right sides.
   (5) Adjust the side rollers after adjusting the lower lift rollers. Bring the side roller on one side into contact with the mast side surface and adjust the clearance between the side roller and inner mast on the opposite side to the following value by inserting the side roller shim:

   Standard clearance D = 0 – 0.6 mm (0 – 0.024 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (6) Distribute the shim thickness equally to the left and right side rollers.

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

Mast Strip Adjustment (FV)



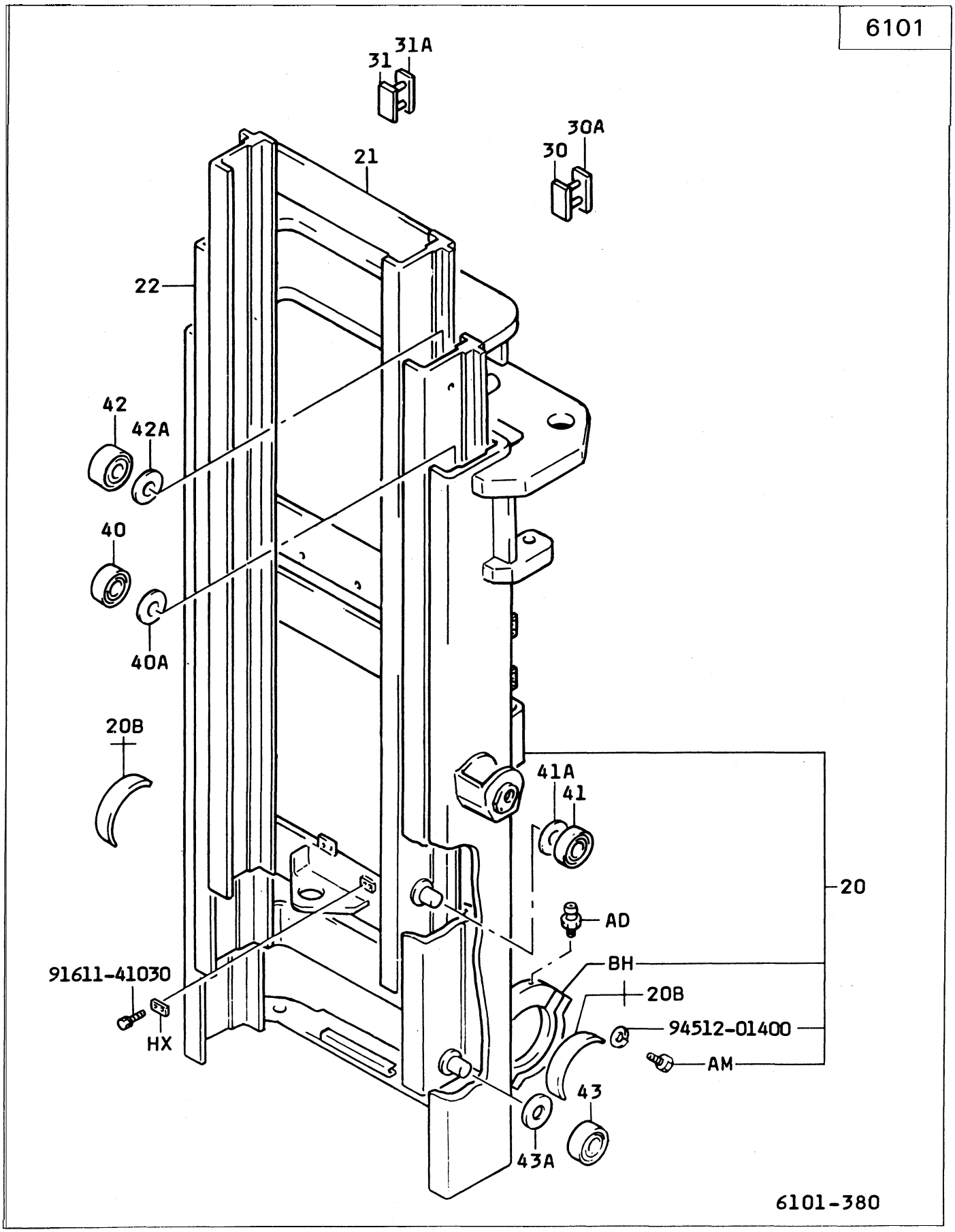
1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast at the bottom position.
   (2) With the inner mast in contact with the outer mast roller, adjust the clearance between the mast strip and inner mast to the following value by inserting the mast strip shim.

   Standard clearance E = 0.5 − 1.0 mm (0.020 − 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) After the adjustment, the mast should move smoothly.

FSV MAST ASSY

COMPONENTS



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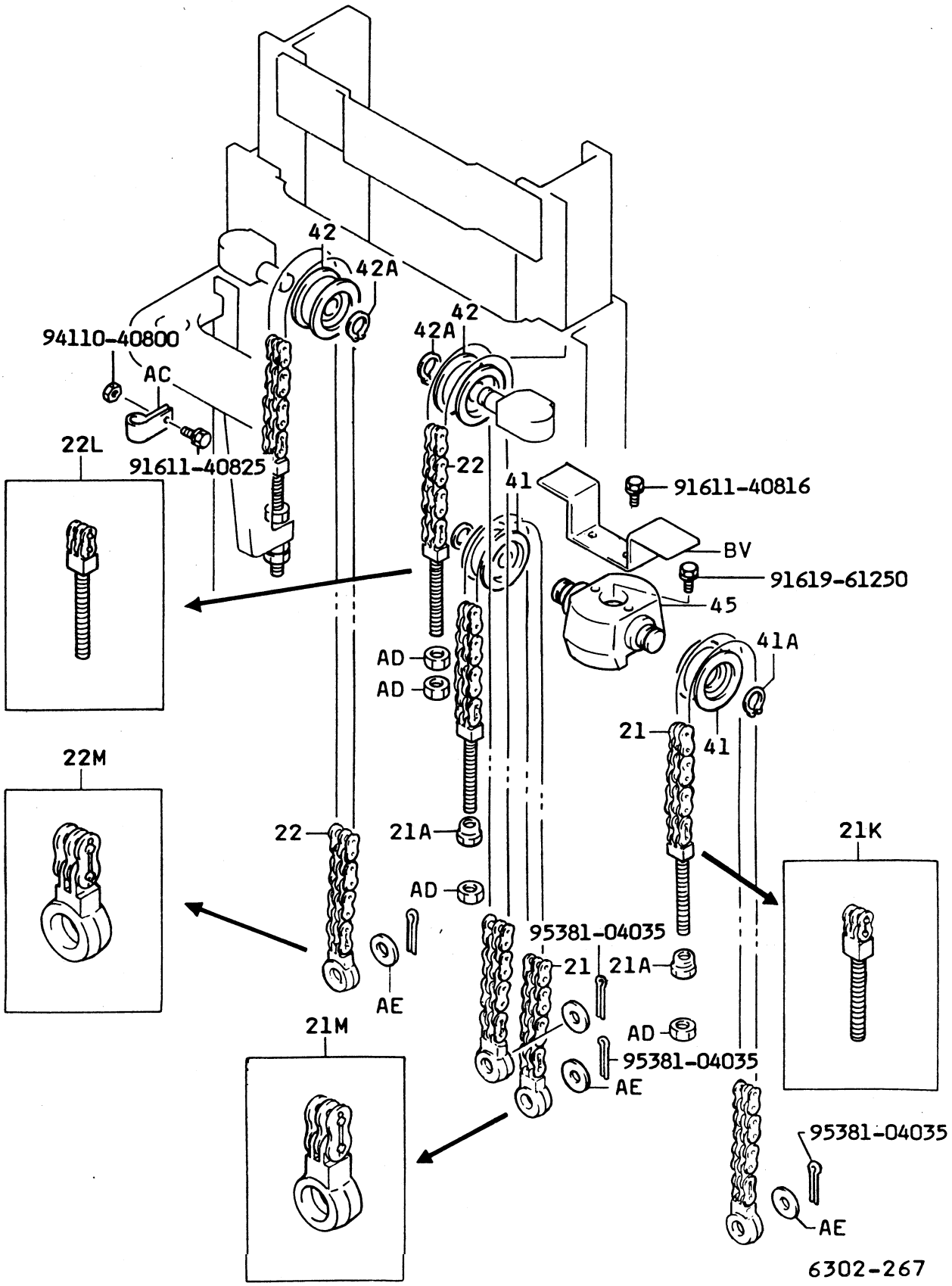
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42A
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AC
22L
91611-40825
22
41
91611-40816
BV
91619-61250
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41A
AD
AD
21
41
22M
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21A
21K
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95381-04035
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21A
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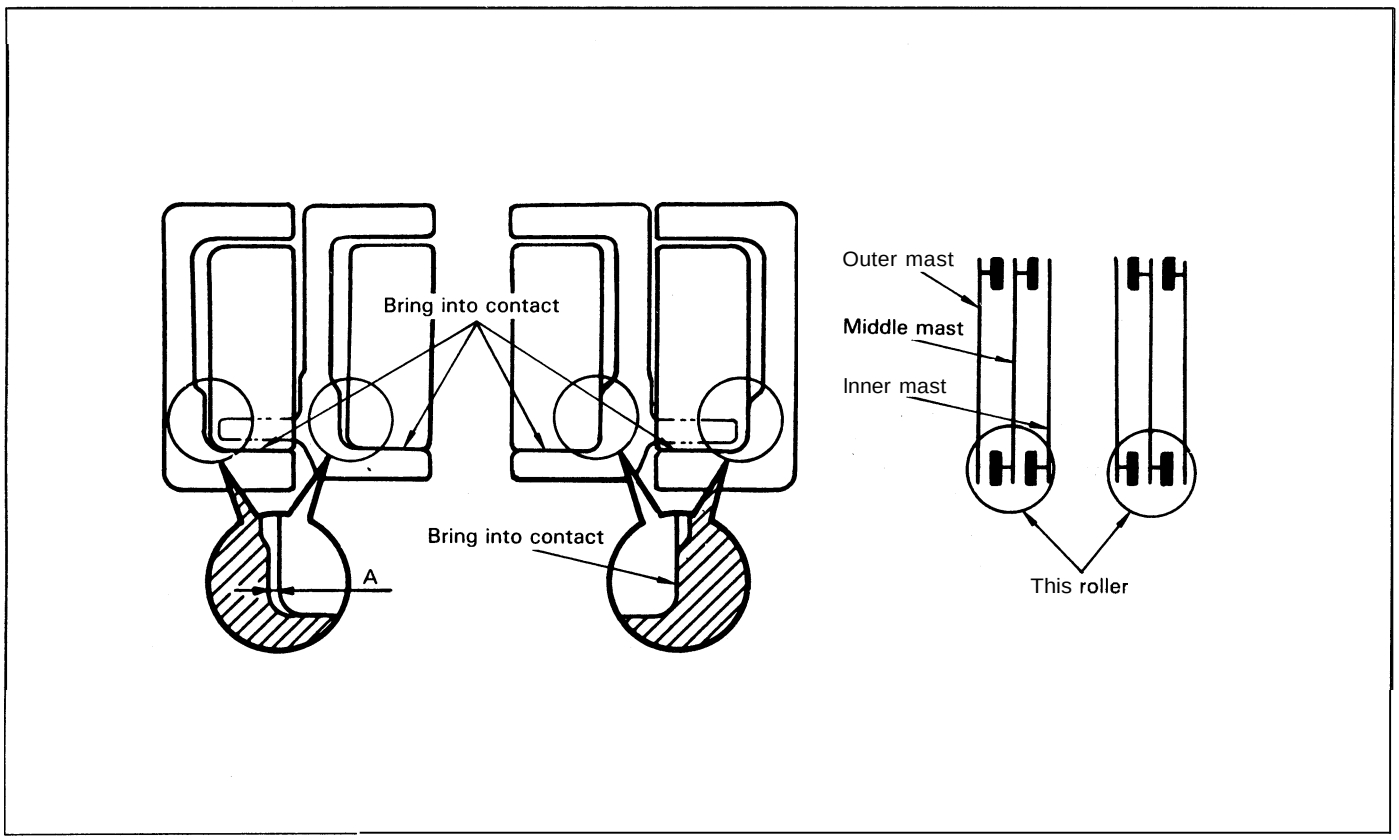
MAST ADJUSTMENT (FSV MAST)

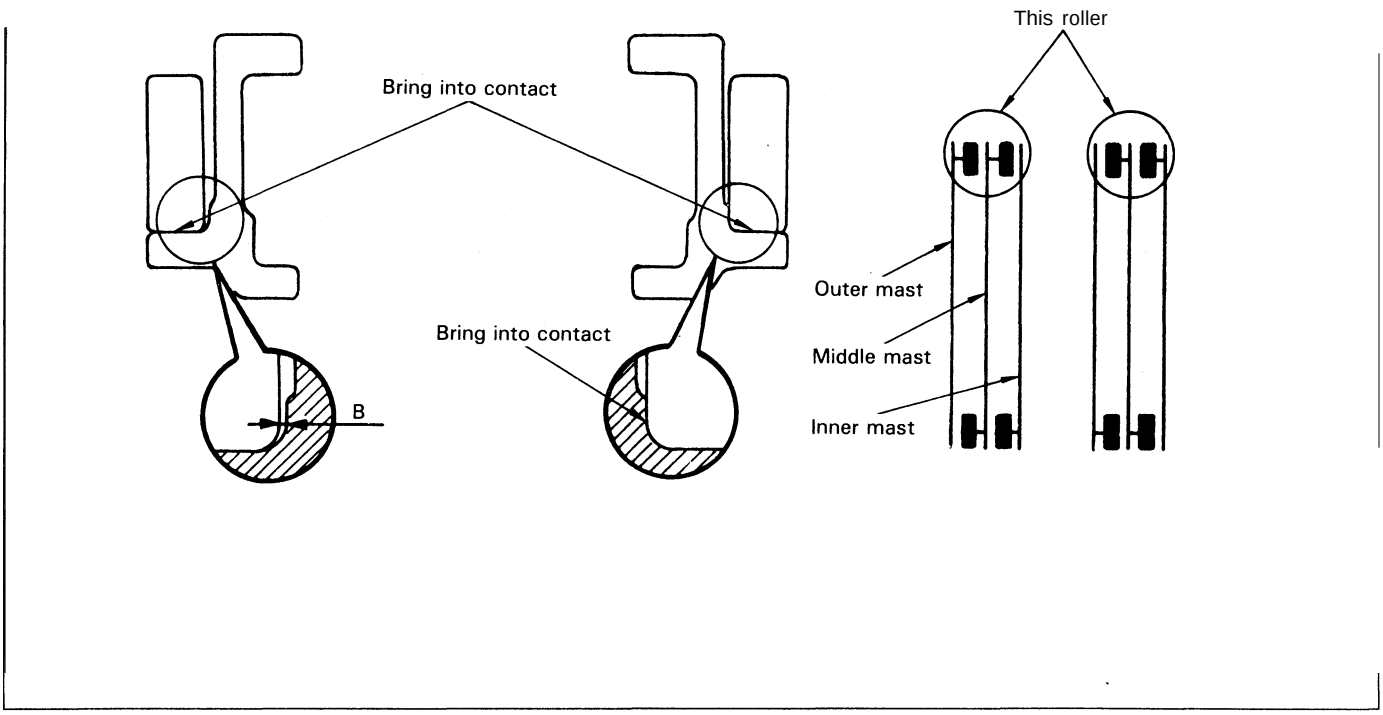
Mast Lift Roller Adjustment (FSV)



1. Inner mast roller and middle mast lower roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the outer mast and the middle mast, and adjust the clearance between the roller side face and mast at the closest position on the opposite side to the following value by inserting the inner mast roller shim and middle mast lower roller shim, respectively.

   Standard clearance A = 0 – 0.8 mm (0 – 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right rollers.
   (4) After the adjustment, check that the inner mast moves smoothly in the middle mast, and the middle mast moves smoothly in the outer mast.

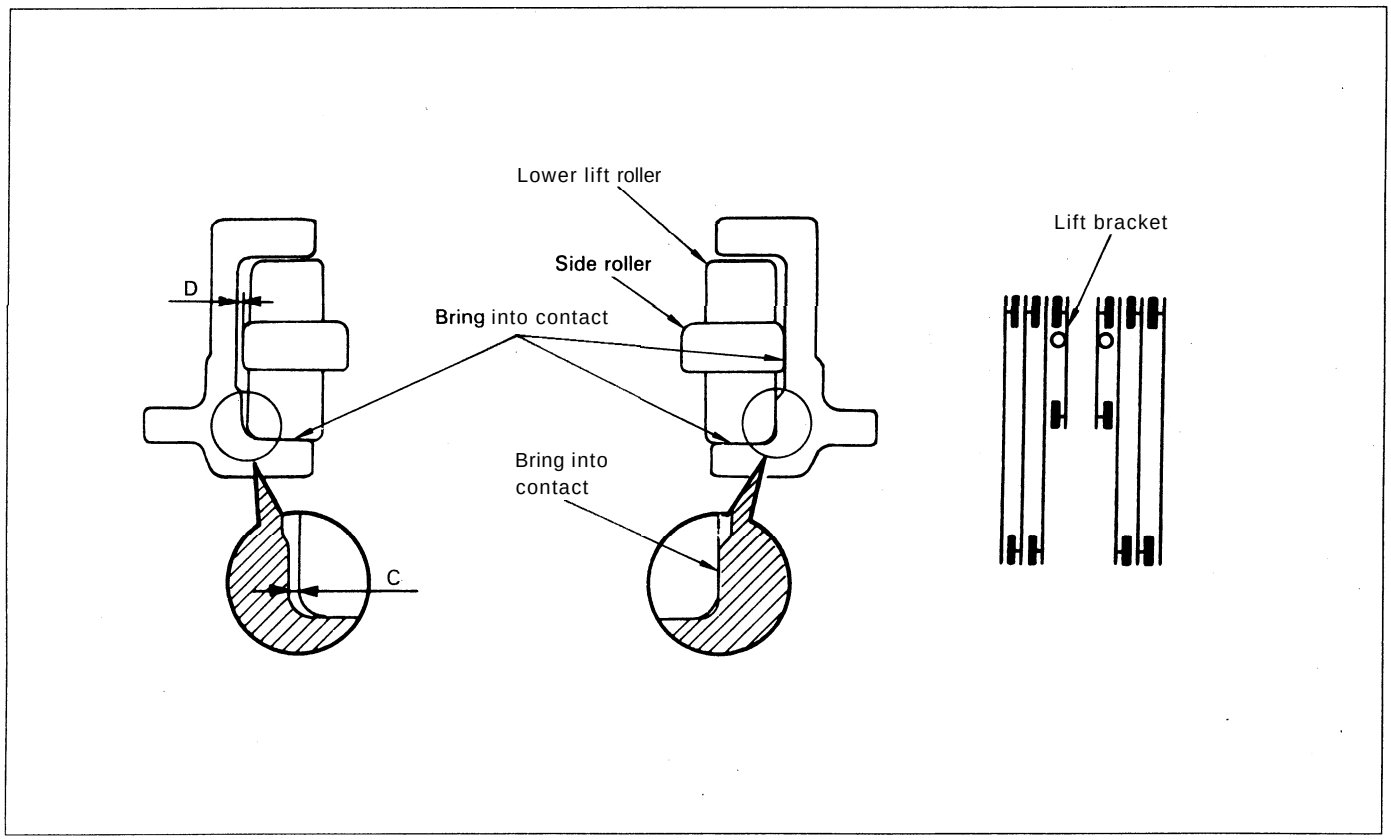


2. Outer mast roller and middle mast upper roller clearance adjustment
   (1) Measure the clearance with the mast overlap at near 450 mm (17.72 in).
   (2) Shift the inner mast to one side to bring the roller into contact with the inner mast and middle mast, and adjust the clearance between the roller and mast at the closest position on the opposite side to the following value by inserting the outer mast roller shim and middle mast upper roller shim respectively.

   Standard clearance B = 0 – 0.8 mm (0 – 0.031 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

   (3) Distribute the shim thickness equally to the left and right sides.
   (4) After the adjustment, check that the inner mast moves smoothly in the middle mast and the middle mast moves smoothly in the outer mast.

Lift Bracket Roller Adjustment (FSV)



1. Lift roller and side roller clearance adjustment
   (1) Measure the clearance with the lift bracket at the uppermost position.
   (2) The upper lift rollers need no adjustment because they are fixed by snap rings.
   (3) For the lower lift rollers, shift the lift bracket to one side to bring the roller into contact with the inner mast, and measure the clearance between the roller side face and the mast at the closest position on the opposite side to the following value by inserting the lift roller shim.

   Standard clearance C = 0 – 0.5 mm (0 – 0.020 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 and 0.039 in)

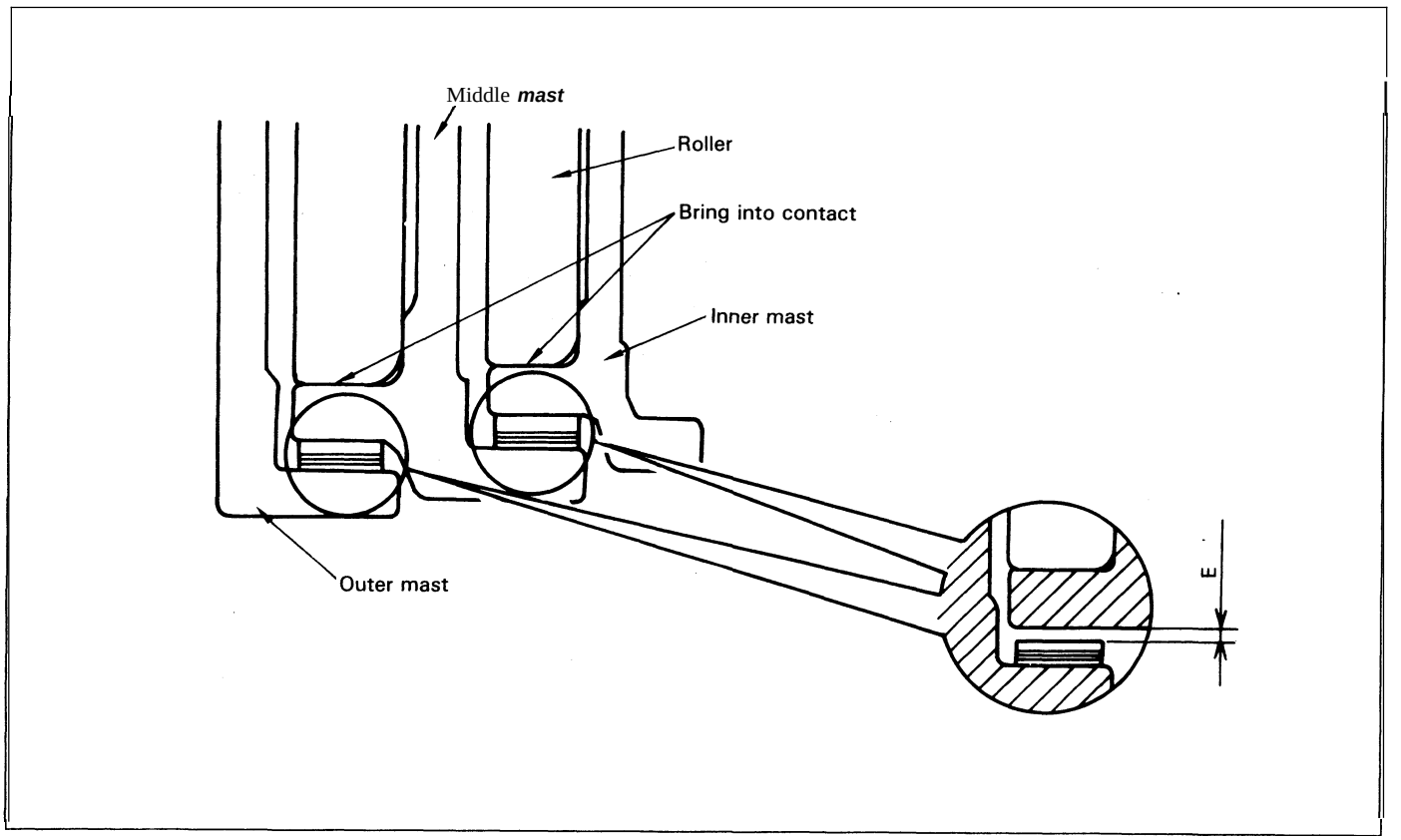
   (4) Distribute the shim thickness equally to the left and right rollers.
   (5) Adjust the side rollers after adjusting the lower lift rollers.
   Bring the side roller on one side into con-tact with the mast side surface, and adjust the clearance between the side roller and inner mast side surface to the following value by inserting the side roller shim:

   Standard clearance D = 0 – 0.6 mm (0 – 0.024 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 – 0.039 in)

   (6) Distribute the shim thickness equally to the left and right sides.

2. After the adjustment, the lift bracket should move smoothly along the overall mast length.

Mast Strip Adjustment (FSV)



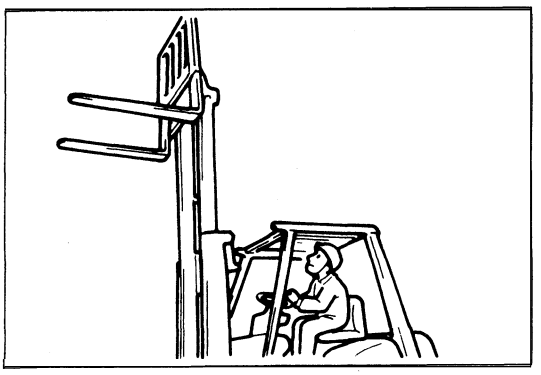
1. Mast strip clearance adjustment
   (1) Measure the clearance with the inner mast or middle mast at the bottom position.
   (2) With the inner mast in contact with the middle mast upper roller, adjust the clearance between the mast strip and inner mast to the value shown below by inserting the mast strip shim. Then, with the middle mast in contact with the outer mast roller, adjust the clearance between the mast strip and the middle mast to the value shown below by inserting the mast strip shim.

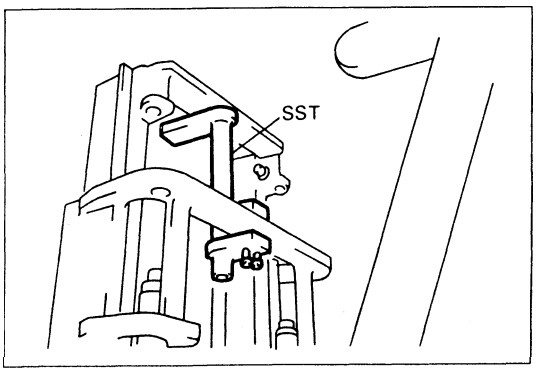
   Standard clearance E = 0.5 – 1.0 mm (0.020 – 0.039 in)
   Shim thickness: 0.5 and 1.0 mm (0.020 – 0.039 in)

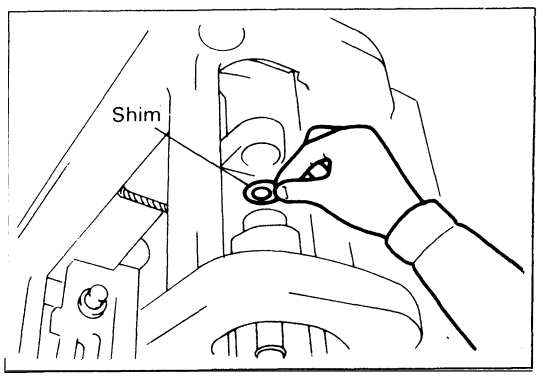
   (3) After the adjustment, the mast should move smoothly.

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 adjustments 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.

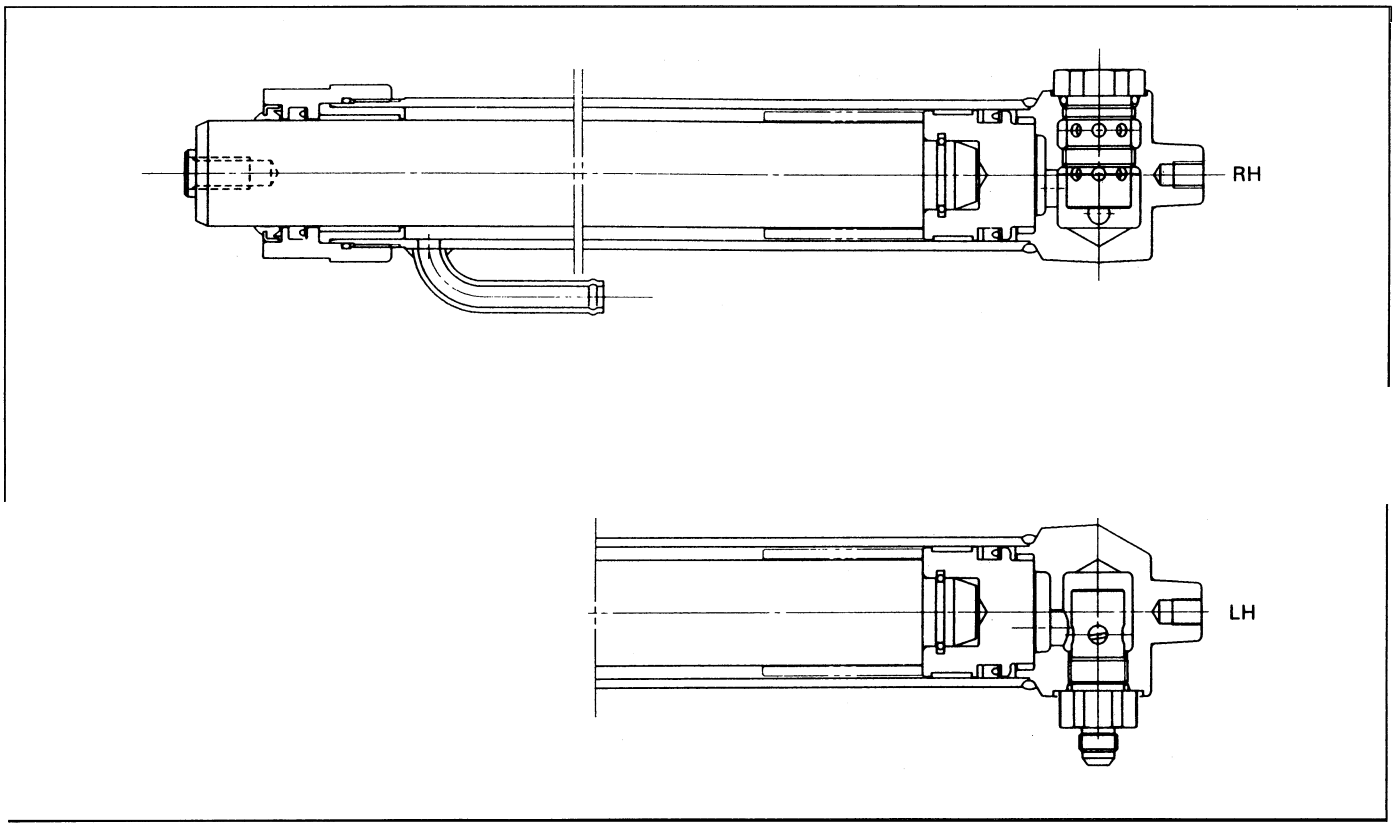
   Shim thickness:
   0.5 and 1.0 mm (0.020 and 0.039 in)

CYLINDER

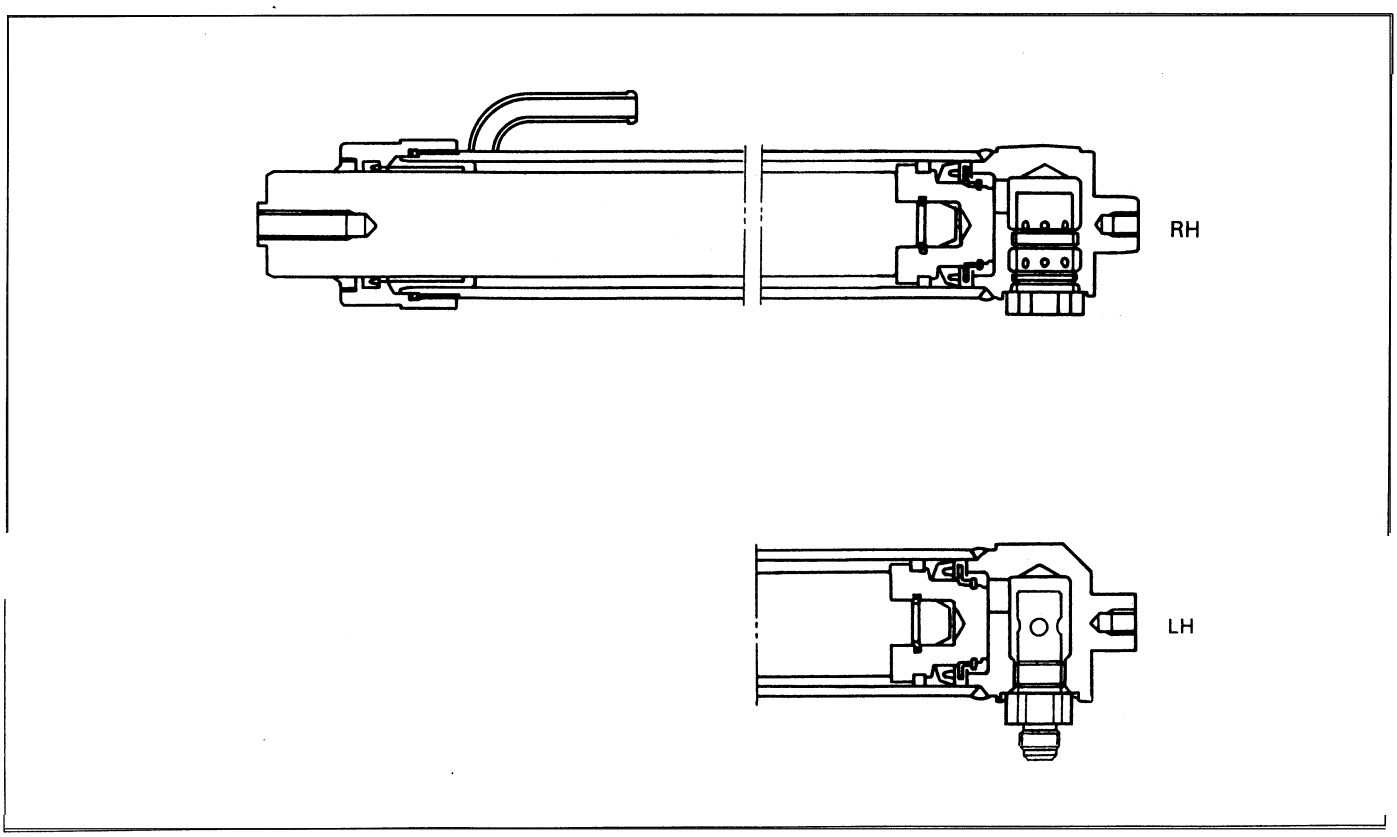
LIFT CYLINDER (V·SV)· REAR LIFT CYLINDER (FV·FSV)

GENERAL

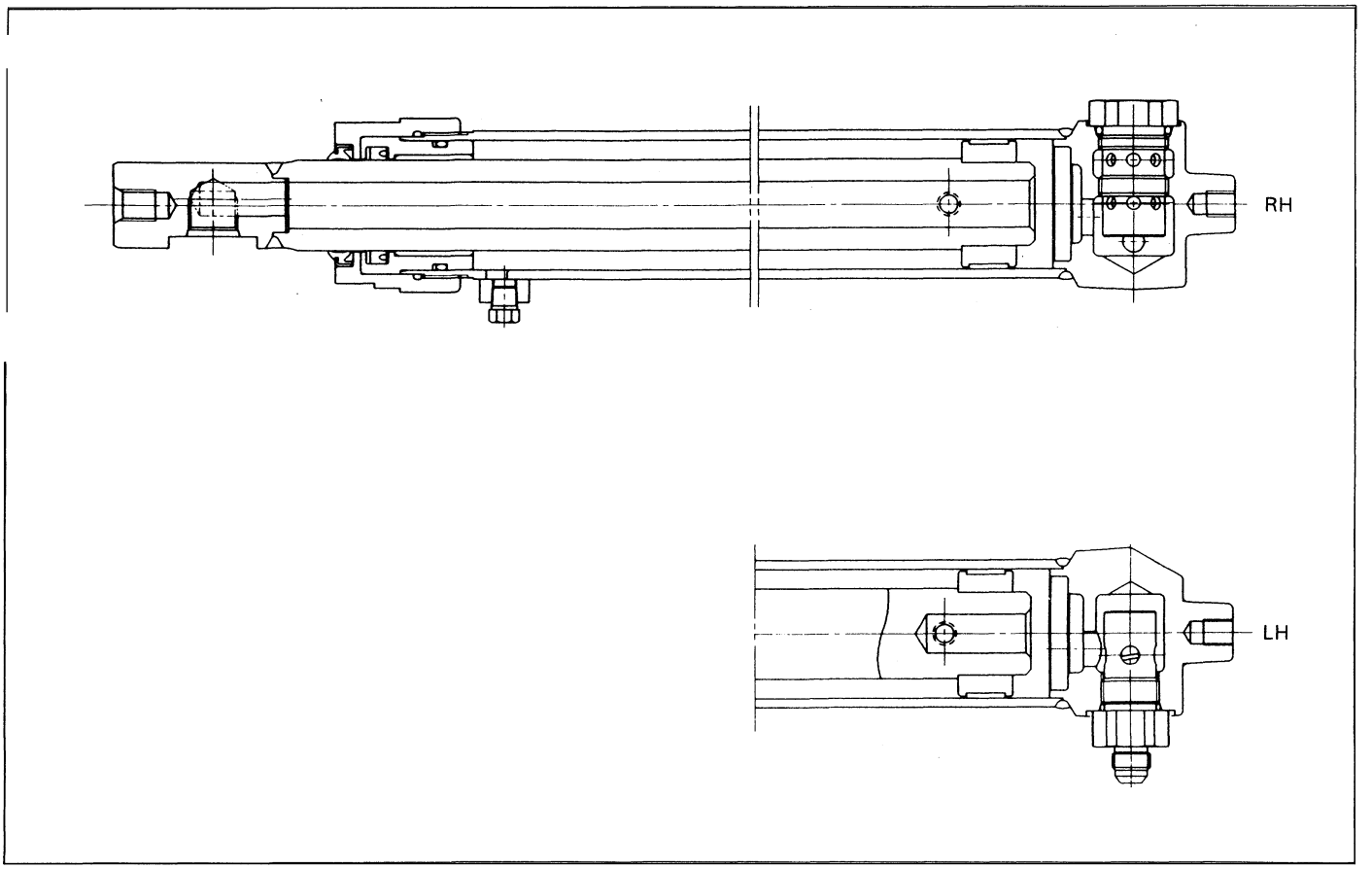
Lift Cylinder (V·SV) (1.2 Ton Series)



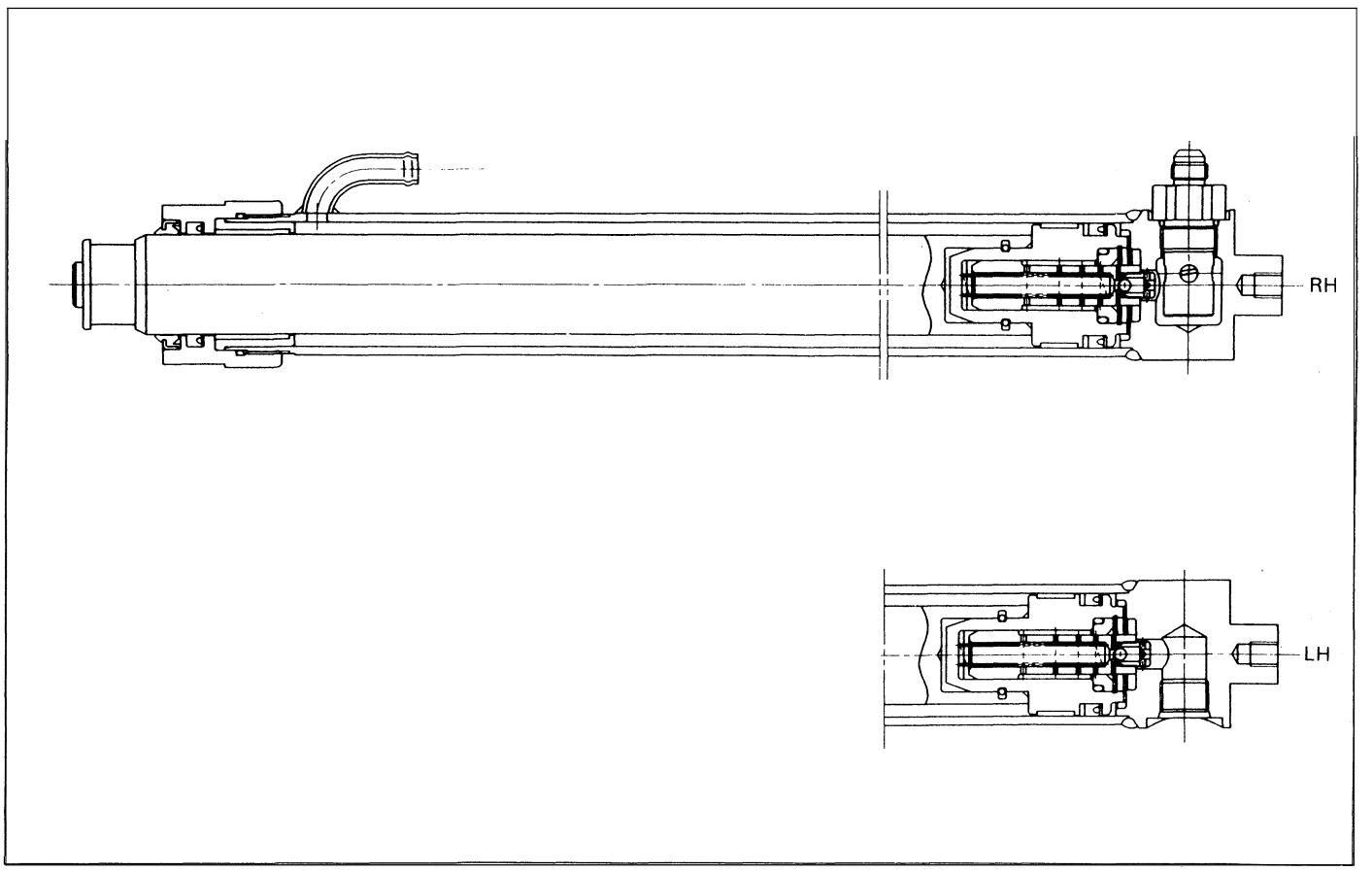
Lift Cylinder (V·SV) (3 Ton Series)



Rear Lift Cylinder (FV)



Rear Lift Cylinder (FSV)



SPECIFICATIONS

Lift Cylinder (V·SV)

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Lift cylinder rod outside diameter mm (in)	35 (1.38)	40 (1.57)	45 (1.77)
Piston seal type	U packing	←	←
Rod seal type	U packing	←	←
Others	With flow regulator valve (RH) With safety down valve (LH)	←	←

Rear Lift Cylinder (FV)

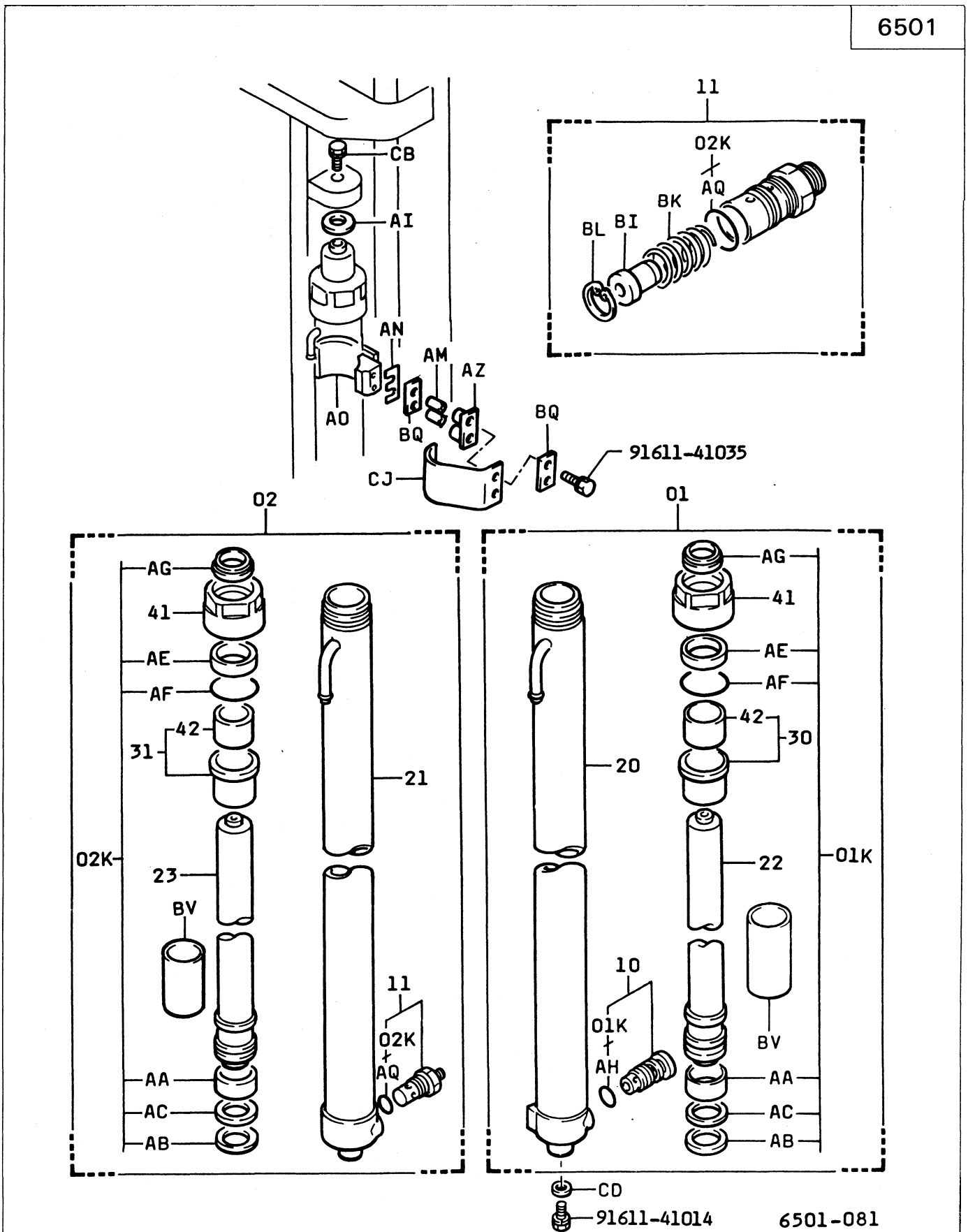
Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Cylinder rod outside diameter mm (in)	32 (1.26)	35 (1.38)	40 (1.57)
Rod seal type	U packing	←	←
Others	With flow regulator valve (RH) With safety down valve (LH)	←	←

Rear Lift Cylinder (FSV)

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Lift cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	45 (1.77)	50 (1.97)	55 (2.17)
Cylinder rod outside diameter mm (in)	35 (1.38)	40 (1.57)	45 (1.77)
Piston seal type	U packing	←	←
Rod seal type	U packing	←	←
Others	With safety down valve (RH)	←	←

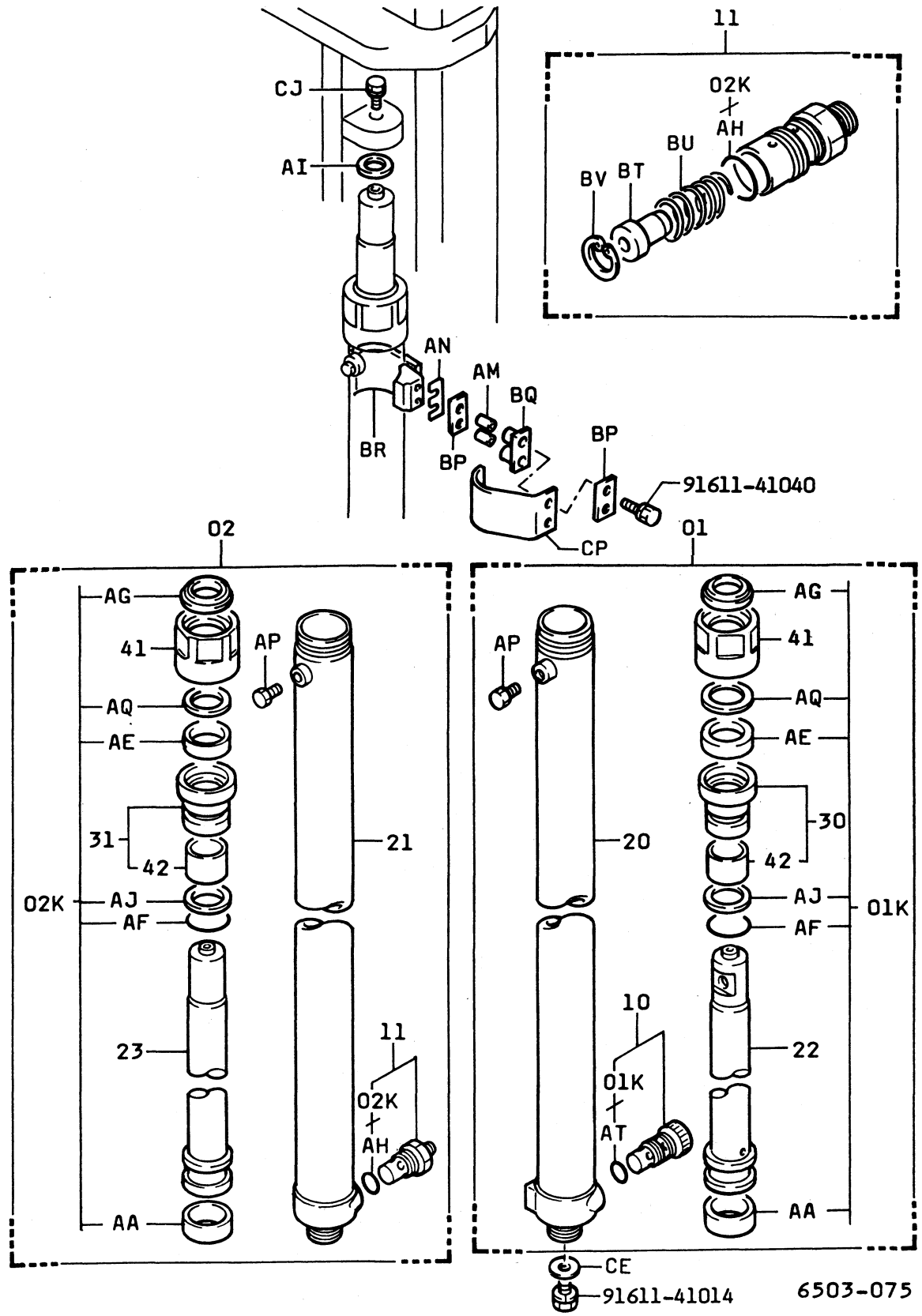
COMPONENTS

Lift Cylinder (V·SV)



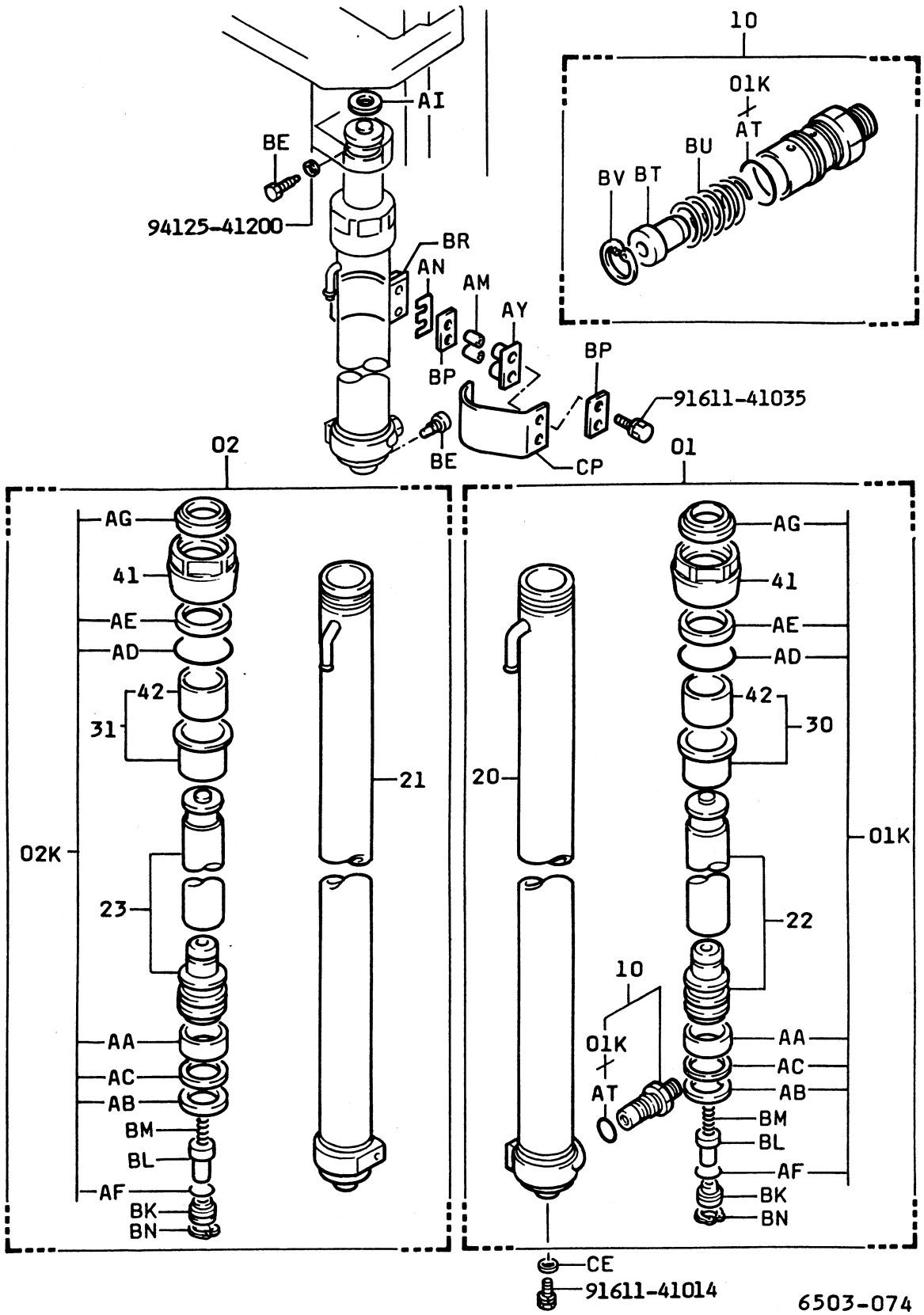
Rear Lift Cylinder (FV)

6503

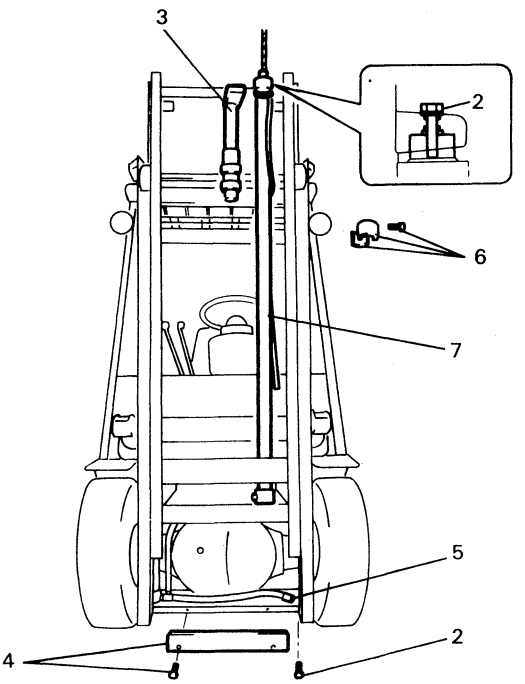


Rear Lift Cylinder (FSV)

6503



REMOVAL·INSTALLATION



1 Lift bracket

Removal Procedure

1 Remove the lift bracket. (See removal procedure steps 1 to 4 in mast removal-installation section on page 13-5.)

2 Remove the cylinder rod end set bolt and cylinder bottom set bolt.

3 Disconnect the cylinder rod end. [Point **1**]

4 Remove the hose cover.

5 Disconnect the hose.

6 Remove the lift cylinder support. [Point **2**]

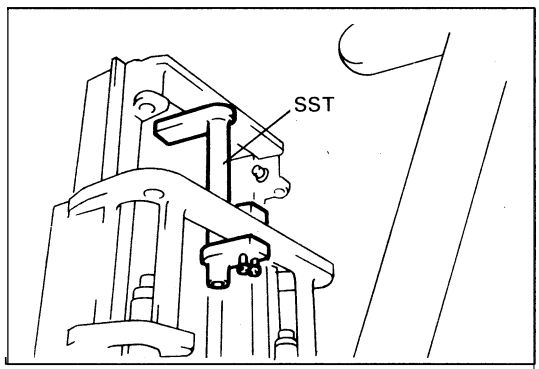
7 Remove the lift cylinder ASSY.

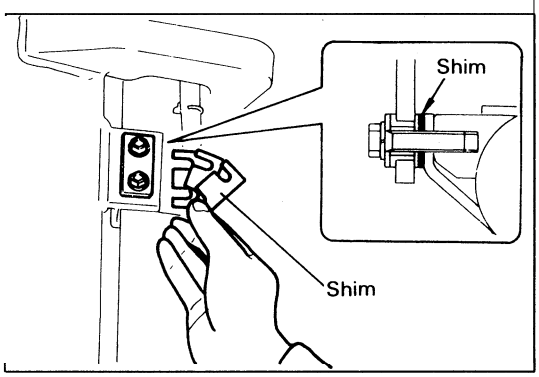
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Perform the following operations after installing the lift cylinder:
Repeat lifting and lowering to stroke ends without load to bleed the air and to check normal operation.

- After the operation check, check the hydraulic oil level and add oil if insufficient.
  Inspect the lift cylinders for uneven movements and make adjustment if necessary. (See the lift cylinder rod shim adjustment section on page **13-38.)**





Point Operations

[Point 1]

Removal: Hoist the inner mast (middle mast) and set the SST to the inner mast (middle mast) tie beam.
SST 09610-22000-71

Removal: Shim adjustment is made at the lift cylinder rod end to prevent uneven movements of the lift cylinders RH and LH. Take a note on which side the adjustment is made and the number of shims used.

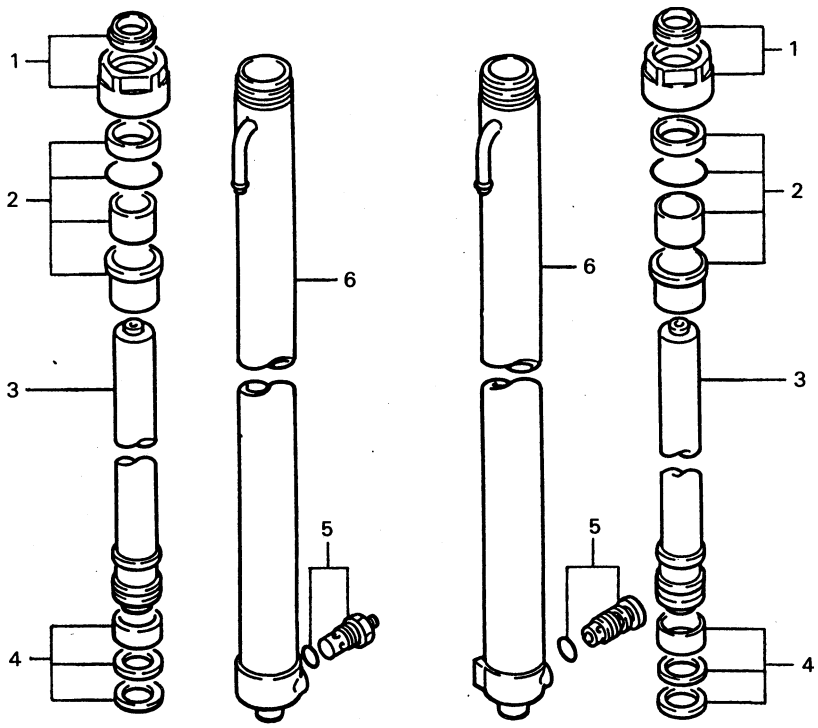
[Point 2]

Installation: The cylinder support shall be tightened temporarily here and make shim adjustment after rod end connection.

Adjustment: With the rod end connected, insert shims between the cylinder support and outer mast to eliminate the clearance. The shim thickness shall be slightly on the thicker side.

DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- Oil will leak if the U packing or dust seal at the rod guide portion is defective.
- Natural drop will occur if the U packing at the piston portion is defective.



Disassembly Procedure

1 Remove the cylinder cover.

2 Remove the rod guide.

3 Remove the piston rod. [Point **1**]

4 Remove seals from the piston side.

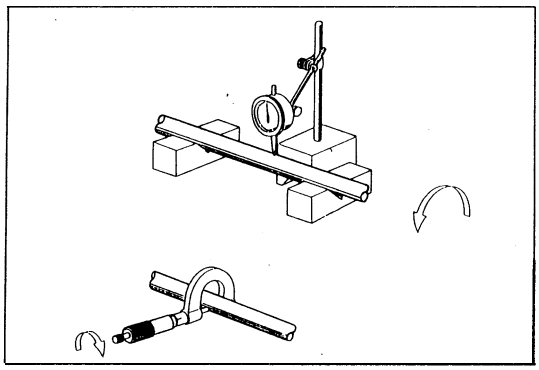
5 Remove the flow regulator valve or safety down valve.

6 Remove the lift cylinder. [Point **2**]

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- Do not install dry parts but apply hydraulic oil before reassembly.
- Apply liquid packing **(08833-00080)** on the threaded portion of the cylinder cover before tightening.
- Cylinder cover tightening torque T = 284.39 – 421.69 **N·m** (2900 – 4300 kg-cm) **[209.82 – 311.11 ft-lb]**



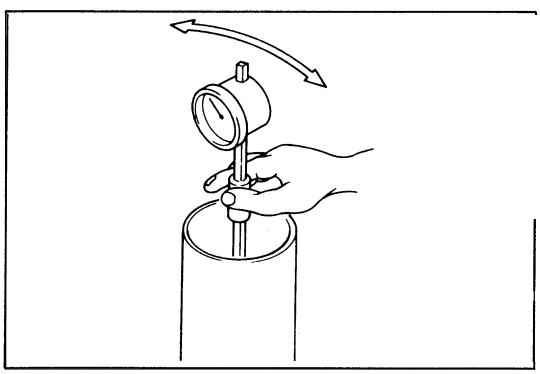
Point Operations

[Point 1]

Inspection: Measure the piston rod outside diameter.

Unit: mm (in)

		Standard outside diameter	Limit outside diameter
V SV FSV	1 ton series	35 (1.38)	34.92 (1.3748)
	2 ton series	40 (1.57)	39.92 (1.5717)
	3 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 ton series	40 (1.57)	39.92 (1.5717)



Inspection: Measure the piston rod bend.

Limit bend: 2.0 mm (0.079 in)

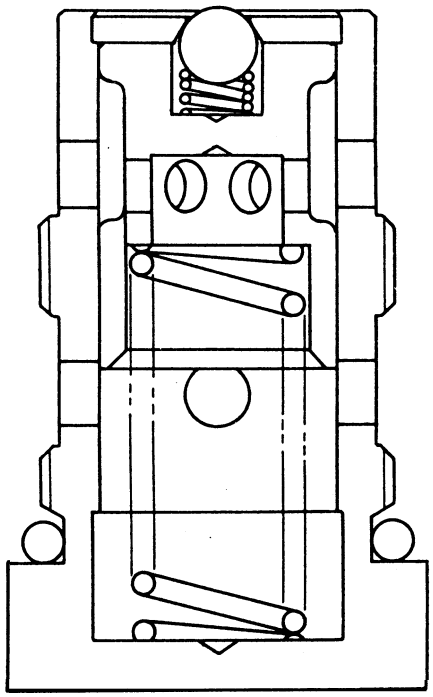
[Point 2]

Inspection: Measure the lift cylinder bore.

Unit: mm (in)

	Standard bore	Limit bore
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)

FLOW REGULATOR VALVE (V·SV·FV·FSV)

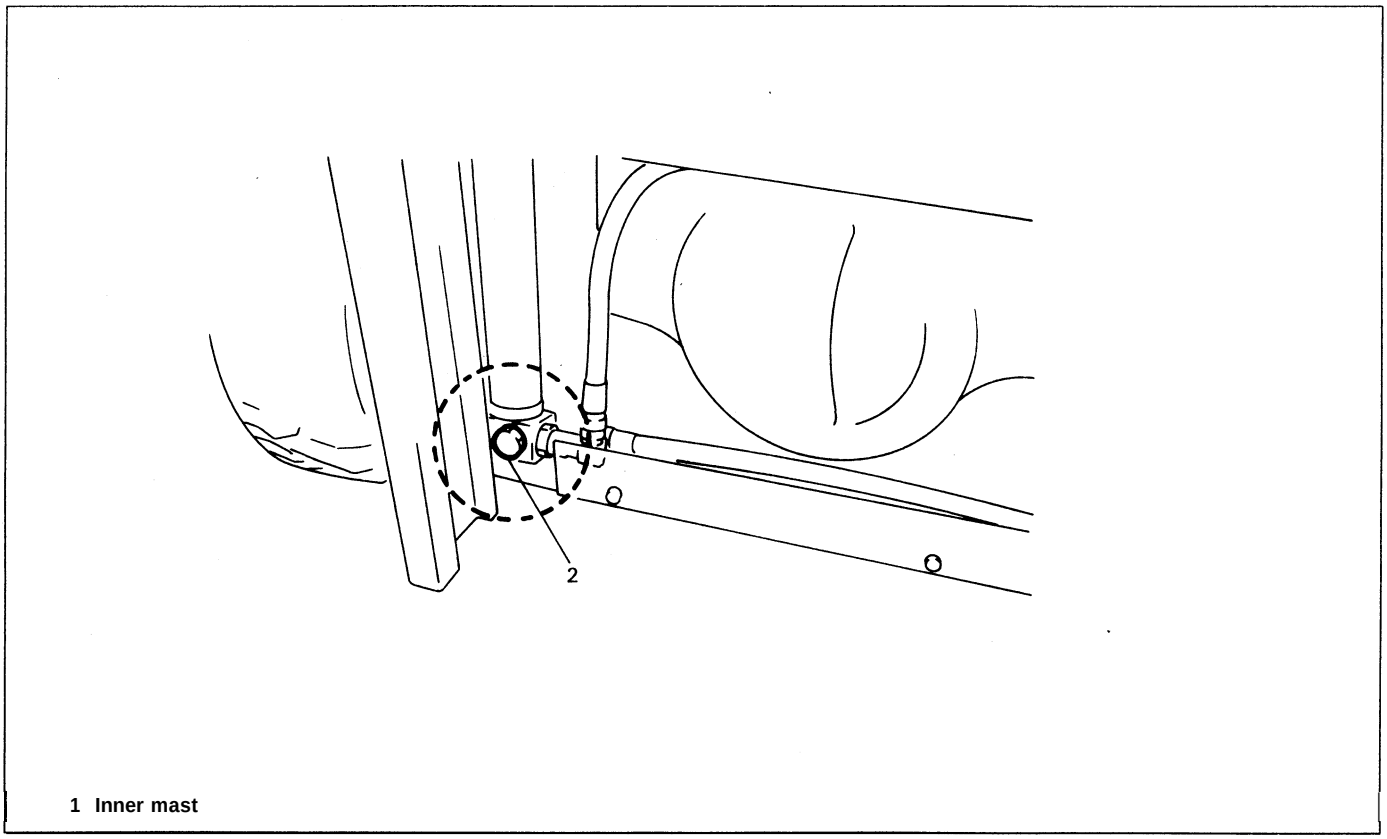


Lowering Speed Specifications Unit: mm/sec (fpm)

Vehicle model \ Mast		V	SV	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)

REMOVAL·INSTALLATION

Note:
- The description here is for the flow regulator valve for the **V·SV·FV** mast.
- The flow regulator valve is installed on the outer mast side in case of the FSV mast.



1 Inner mast

Removal Procedure

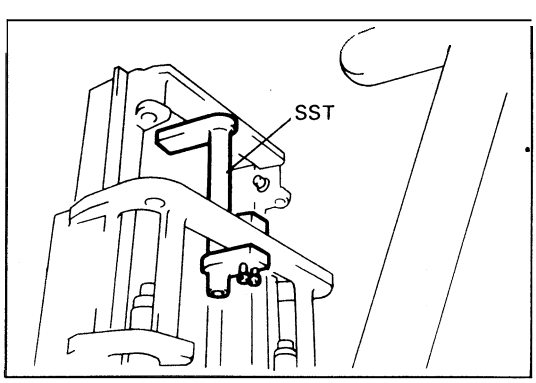
1 Hoist the inner mast. [Point **1**]

2 Remove the flow regulator valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Flow regulator valve tightening torque
T = 58.84 – 68.65 **N·m** (600 – 700 kg-cm) **[43.41** – 50.65 **ft-lb]**



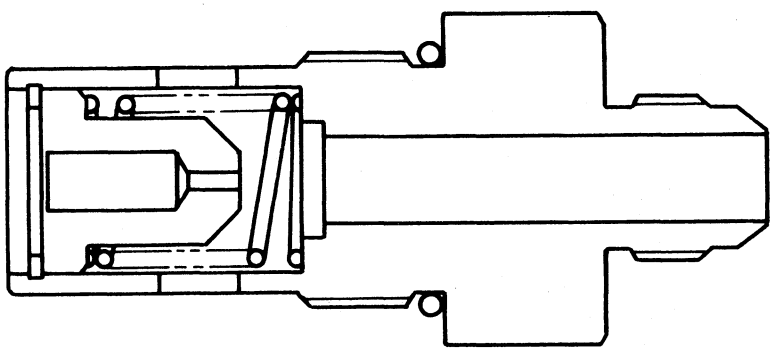
Point Operation

[Point 1]

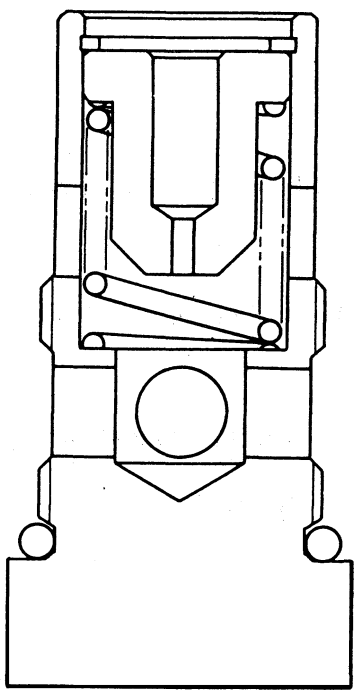
Removal·installation: Sling the inner mast (middle mast) with a wire rope and hoist it. Set the SST on the inner mast (middle mast) tie beam and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

SAFETY DOWN VALVE (V·SV·FV·FSV)

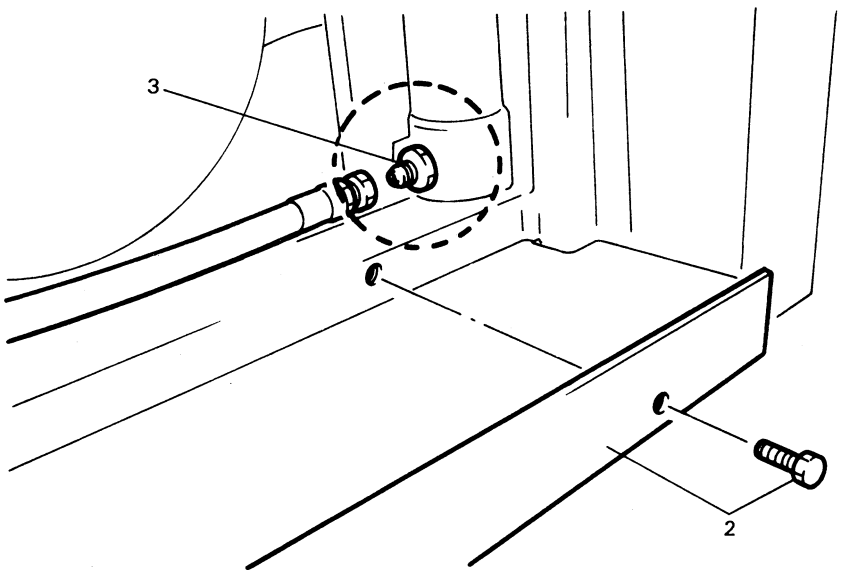
Safety Down Valve Sectional View (for V·SV) (for FV·FSV Rear Lift Cylinder)



Safety Down Valve Sectional View (for FV·FSV Front Lift Cylinder)



REMOVAL·INSTALLATION



1 Inner mast

Removal Procedure

1 Hoist the inner mast. **[Point 1]**

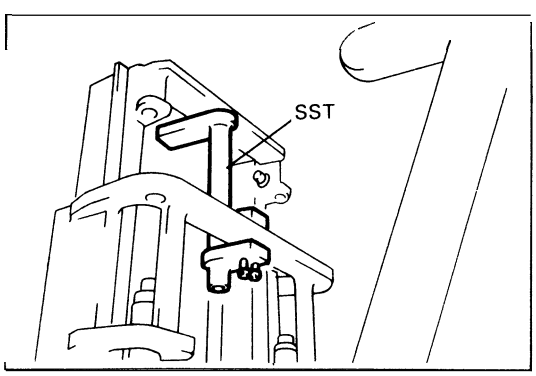
2 Remove the front hose cover.

3 Remove the safety down valve.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
Safety down valve tightening torque
T = 29.42 – 39.23 N·m (300 – 400kg-cm) [21.71 – 28.94 ft-lb]



Point Operation

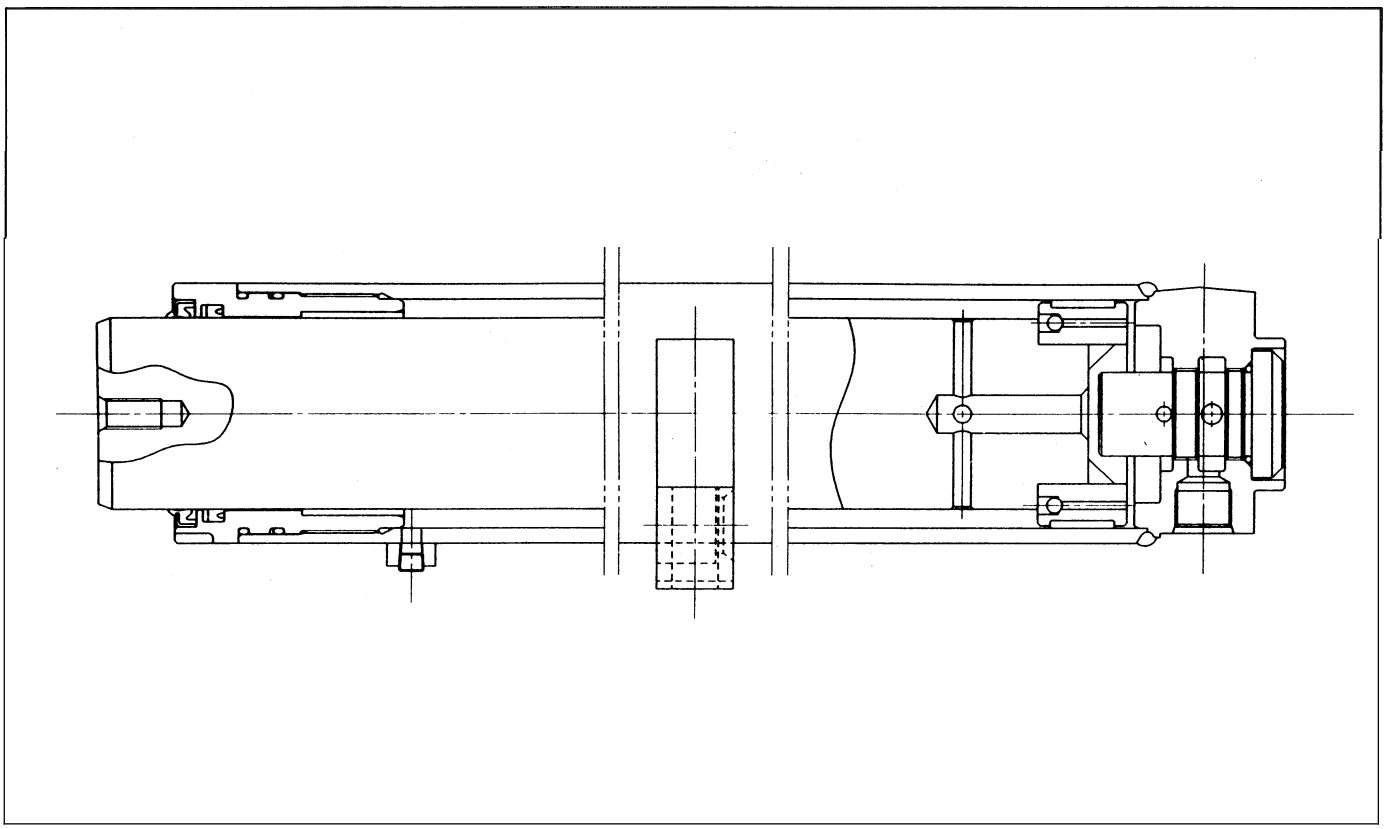
[Point 1]

Removal·installation: Sling the inner mast (middle mast) with a wire rope, and hoist it. Set the SST on the inner mast (middle mast) tie beam and lower the inner mast until it comes into contact with the SST.
SST 09610-22000-71

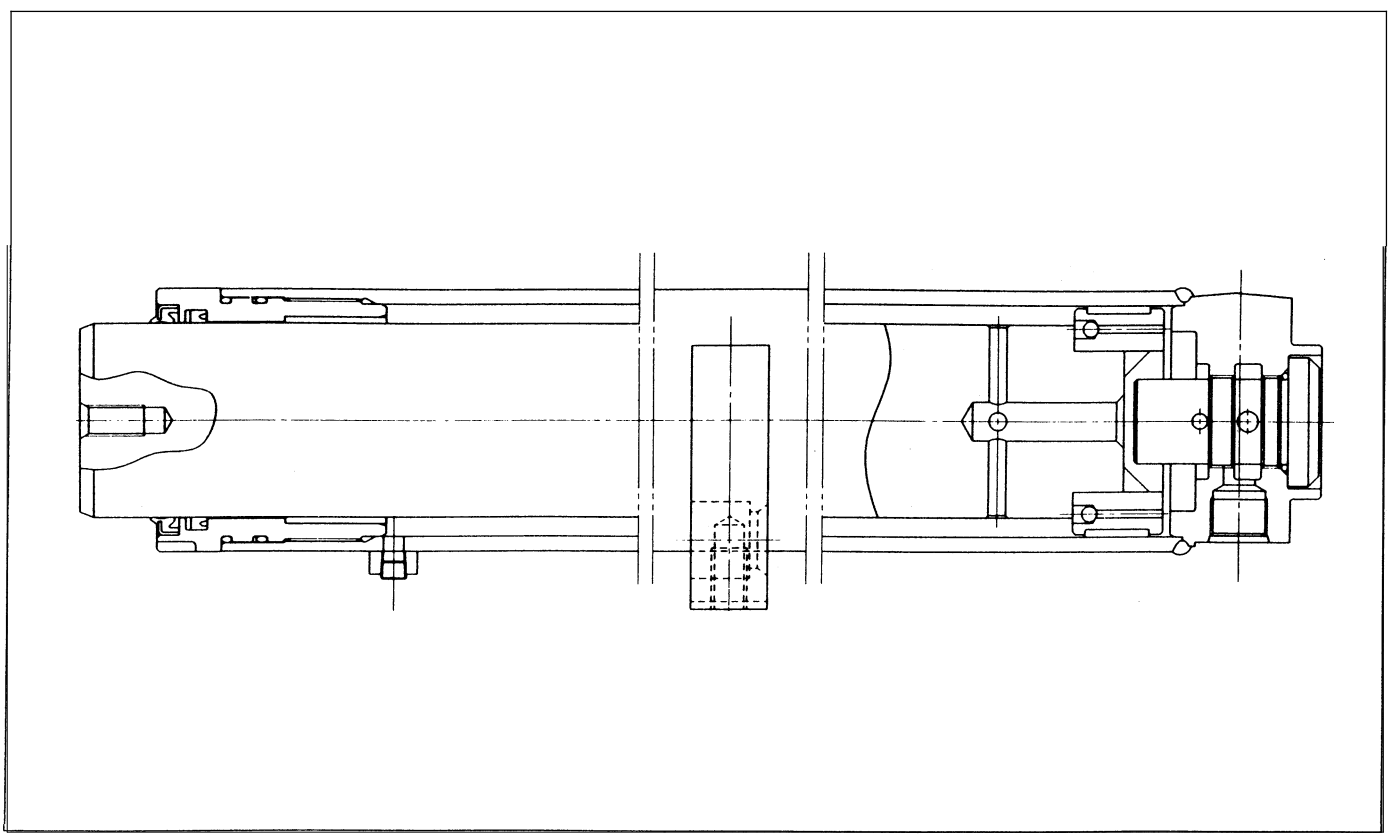
FRONT LIFT CYLINDER (FV·FSV)

GENERAL

Front Lift Cylinder (FV)



Front Lift Cylinder (FSV)

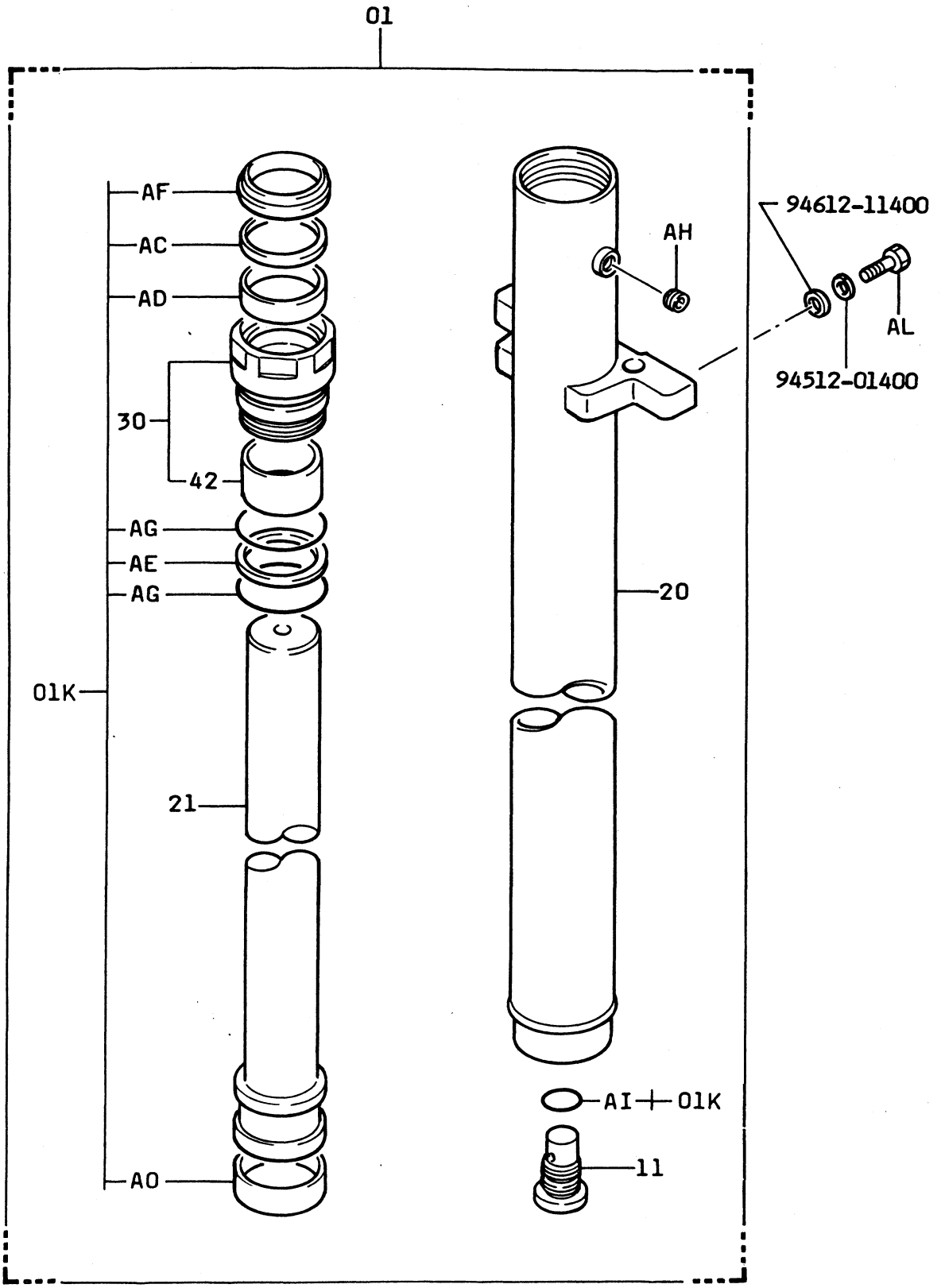


SPECIFICATIONS

Item \ Vehicle model	1 ton series	2 ton series	3 ton series
Cylinder type	Single acting	←	←
Lift cylinder bore mm (in)	85 (3.35)	90 (3.54)	105 (4.13)
Cylinder rod outside diameter rnrn (in)	70 (2.76)	75 (2.95)	85 (3.35)
Piston seal type	Wear ring	←	←
Rod seal type	U packing	←	←
Others	With safety down valve	←	←

COMPONENTS

6502



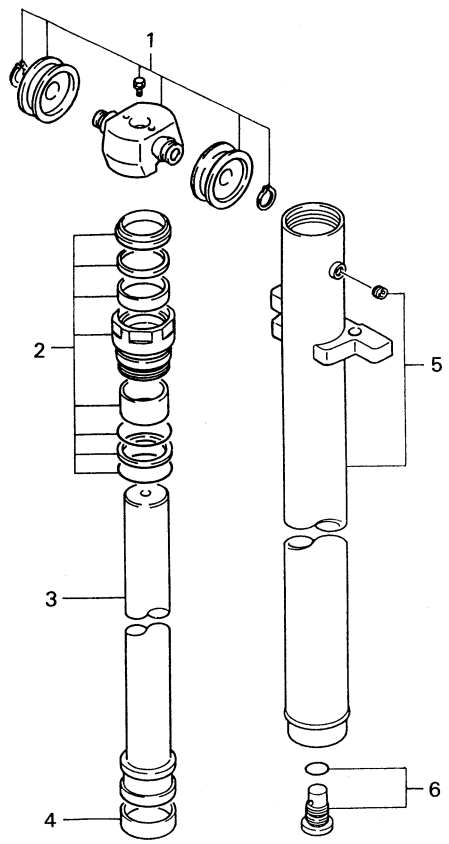
6502-065

REMOVAL·INSTALLATION

Note:

- See the lift cylinder ASSY (V·SV) removal section for the removal of the front lift cylinder **ASSY.** Perform the following operations after installation:
  Repeat lifting and lowering to stroke ends without load for air bleeding and check normal operation.
- After the operation check, check the hydraulic oil level and add if insufficient.
- Adjust the lift chain tension equally on the left and right sides.

DISASSEMBLY·INSPECTION·REASSEMBLY



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.

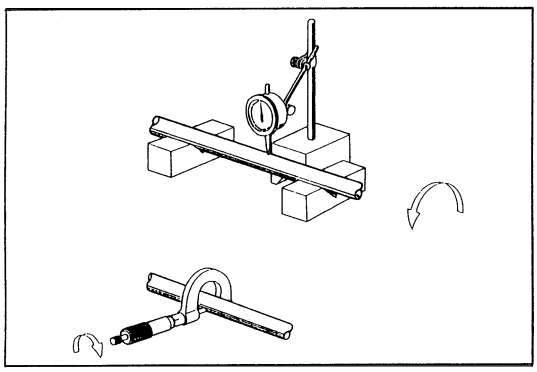
5 Remove the lift cylinder. [Point 2]

6 Remove the safety down valve.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Do not reassemble dry parts, but apply hydraulic oil before reassembly.**
- **Apply liquid packing (08833-00080) on the threaded portion of the rod guide.**
- **Rod guide tightening torque**
  T = 343.23 – 441.30 N·m (3500 – 4500 kg-cm) [253.23 – 325.58 ft-lbl



Point Operations

[Point 1]

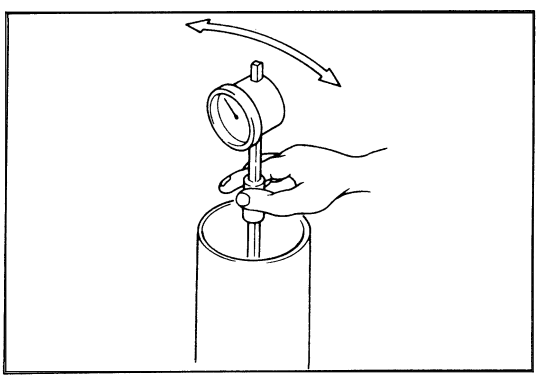
Inspection: Measure the piston rod outside diameter.

Unit: mm (in)

	Standard outside diameter	Limit outside diameter
1 ton series	70 (2.76)	69.91 (2.7524)
2 ton series	75 (2.95)	74.91 (2.9492)
3 ton series	85 (3.35)	84.90 (3.3425)

Inspection: Measure the piston rod bend.

Limit bend: 2.0 mm (0.079 in)



[Point 21

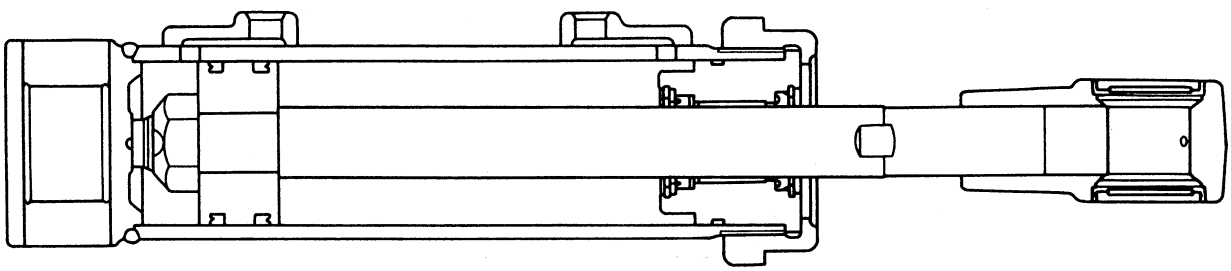
Inspection: Measure the lift cylinder bore.

Unit: mm (in)

	Standard bore	Limit bore
1 ton series	85 (3.35)	85.40 (3.3622)
2 ton series	90 (3.54)	90.40 (3.5591)
3 ton series	105 (4.13)	105.40 (4.1496)

TILT CYLINDER (V·SV·FV·FSV)

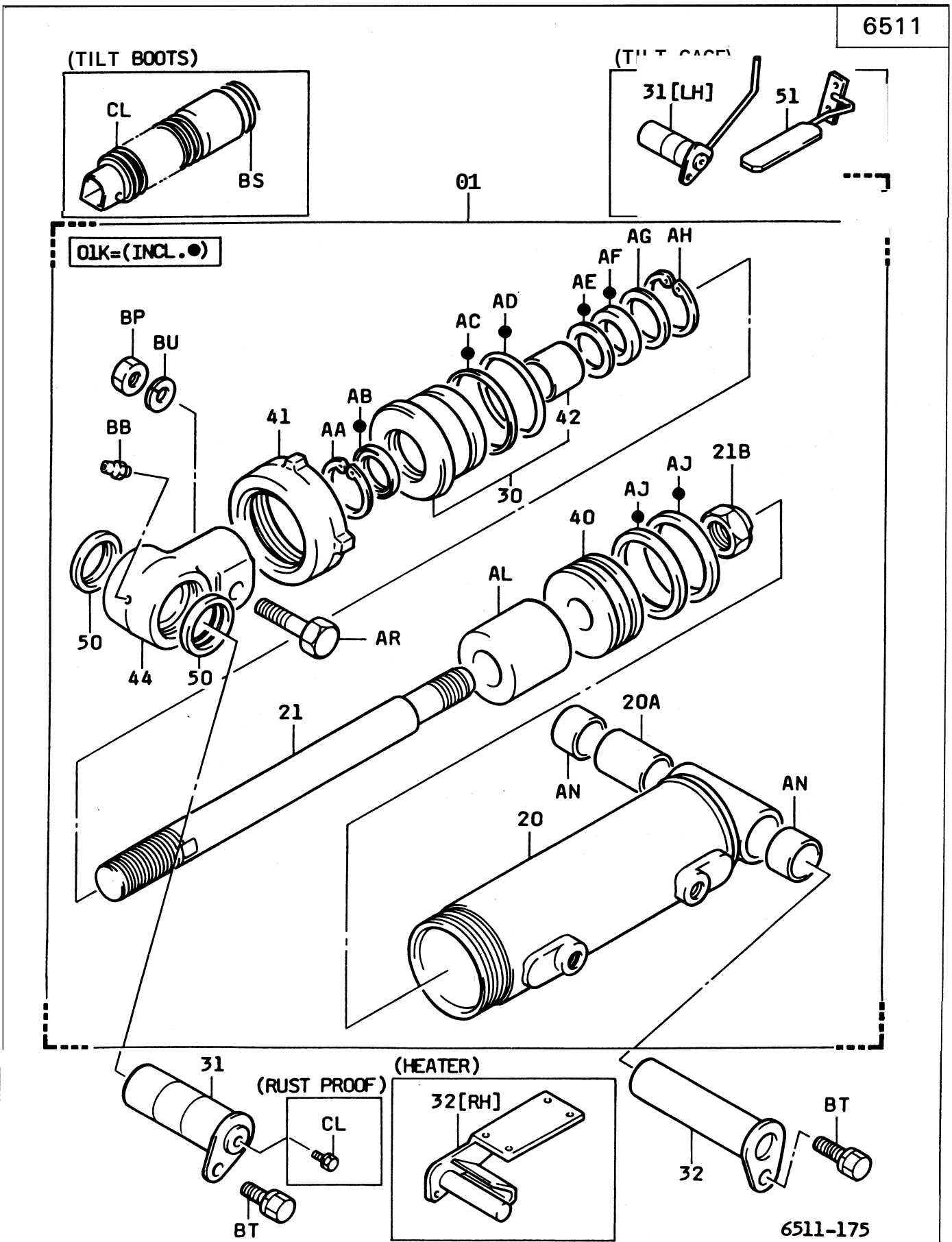
GENERAL



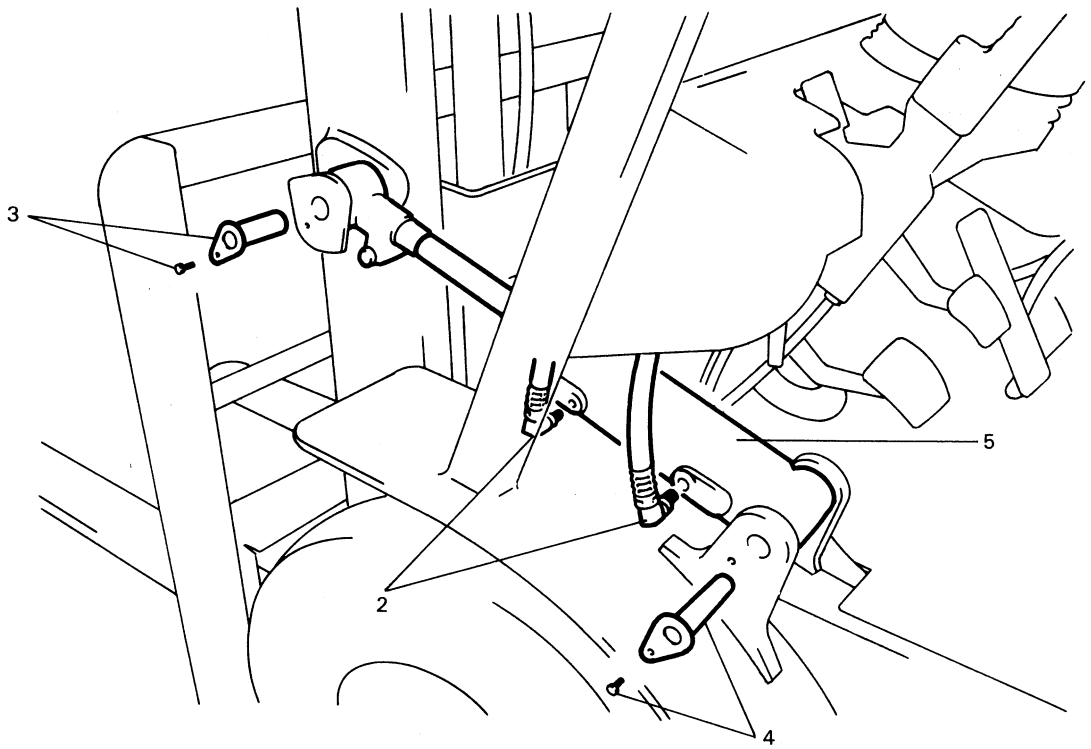
SPECIFICATIONS

Cylinder type		Double acting
Cylinder bore	mm (in)	70 (2.76)
Piston rod outside diameter	mm (in)	30 (1.18)
Piston seal type		U packing
Rod seal type		U packing

COMPONENTS


6511
(TILT BOOTS)
CL
BS
(TILT CASE)
31 [LH]
51
01
O1K=(INCL.●)
BP
BU
BB
41
AA
AB
AC
AD
AE
AF
AG
AH
42
30
40
AJ
AJ
21B
AL
AR
50
44
50
21
20A
AN
AN
20
31
(RUST PROOF)
CL
BT
(HEATER)
32 [RH]
32
BT
6511-175

REMOVAL·INSTALLATION



1 **Mast**

Removal Procedure

1 Hoist the mast.

2 Disconnect the hose.

3 Remove the tilt cylinder front pin. [Point **1**]

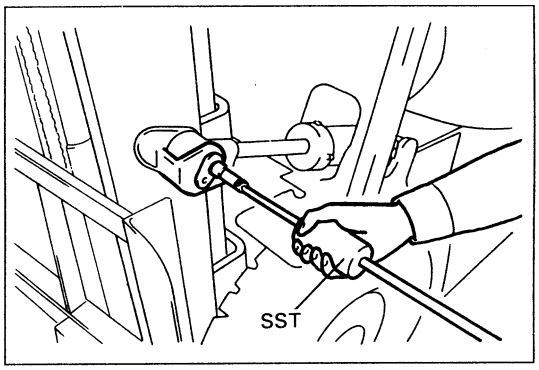
4 Remove the tilt cylinder rear pin.

5 Remove the **tilt** cylinder ASSY.

Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- Apply MP grease on the **tilt** cylinder front pin and rear pin inserting portions.
- Tilt the mast slowly forward and backward a few times to confirm normal operation.
- Check the hydraulic oil level and add if insufficient.
- Tile **the** mast fully forward and backward to check no uneven movements between the left and right sides. To adjust uneven movements, change the screw-in amount of the rod joint.

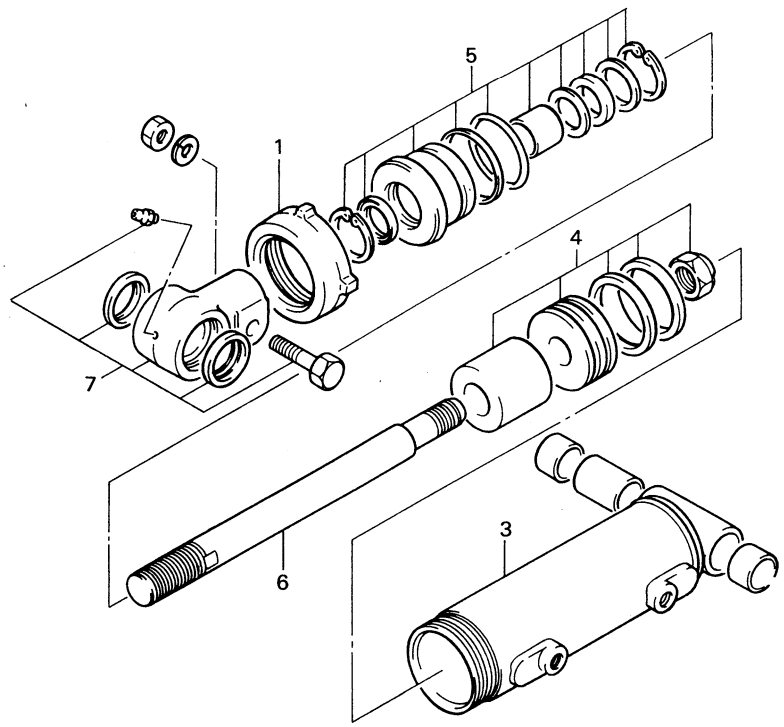


Point Operation

[Point 1]

Removal: SST 09810-20172-71

DISASSEMBLY·INSPECTION·REASSEMBLY



2 Piston rod Wlpiston

Disassembly Procedure

1 Loosen the tilt cylinder cover. [Point 1]

2 Extract the piston rod W/piston.

3 Remove the tilt cylinder. [Point 21

4 Remove the piston.

5 Remove the rod guide.

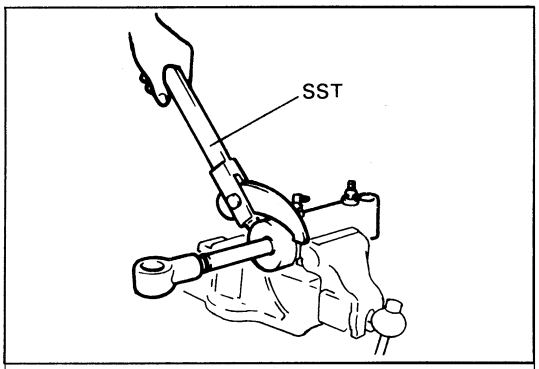
6 Remove the piston rod. [Point 31

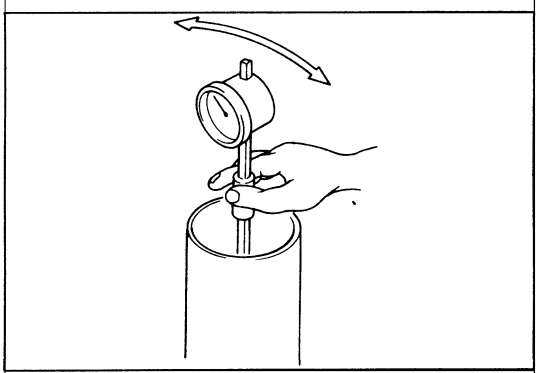
7 Remove the piston rod joint. [Point 41

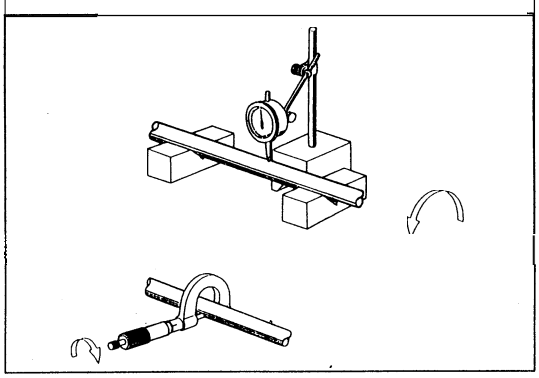
Reassembly Procedure

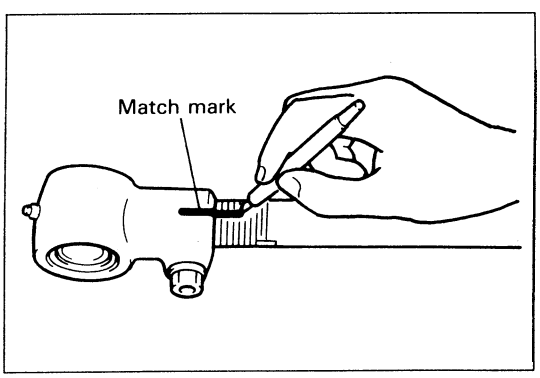
The reassembly procedure is the reverse of the disassembly procedure.

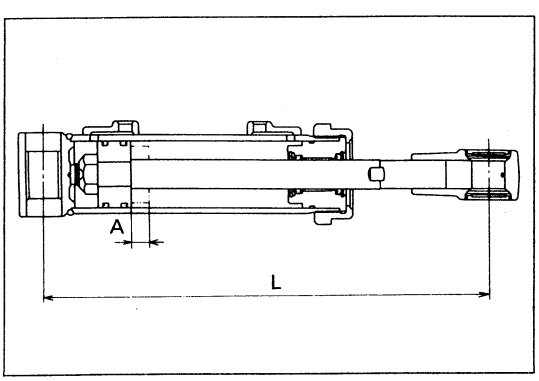
Note:
- Do not disassemble dry parts but apply hydraulic oil before reassembly.
- Apply liquid packing (08833-00080) on the threaded portion of the cylinder cover before tightening.
- Piston castle nut tightening torque
  T = 284.39 – 343.23 N·m (2900 – 3500 kg-cm) [209.82 – 253.23 ft-lbl
- Rod joint set bolt tightening torque
  T = 60.90 – 113.17 N·m (621 – 1154 kg-cm) [44.93 – 83.49 ft-lbl
- Cylinder cover tightening torque
  T = 284.39 – 421.69 N·m (2900 – 4300 kg-cm) [209.82 – 311.11 ft-lbl











Point Operations

[Point 1]

Disassembly·reassembly: SST 09620-10160-71

[Point 21

Inspection: Measure the cylinder bore.

Standard bore: 70.0 mm (2.756 in)
Limit bore: 70.35 mm (2.7697 in)

[Point 31

Inspection: Measure the piston rod outside diameter.

Standard outside diameter:
30.0 mm (1.181 in)
Limit outside diameter:
29.92 mm (1.1780 in)

Inspection: Measure the piston rod bend.

Limit bend: 1.0 mm (0.039 in)

[Point 4]

Disassembly: Put a match mark.

Reassembly: Check the match mark.

Reassembly: When the rod or rod joint is replaced, adjust the installed dimensions to be equal on the left and right sides.

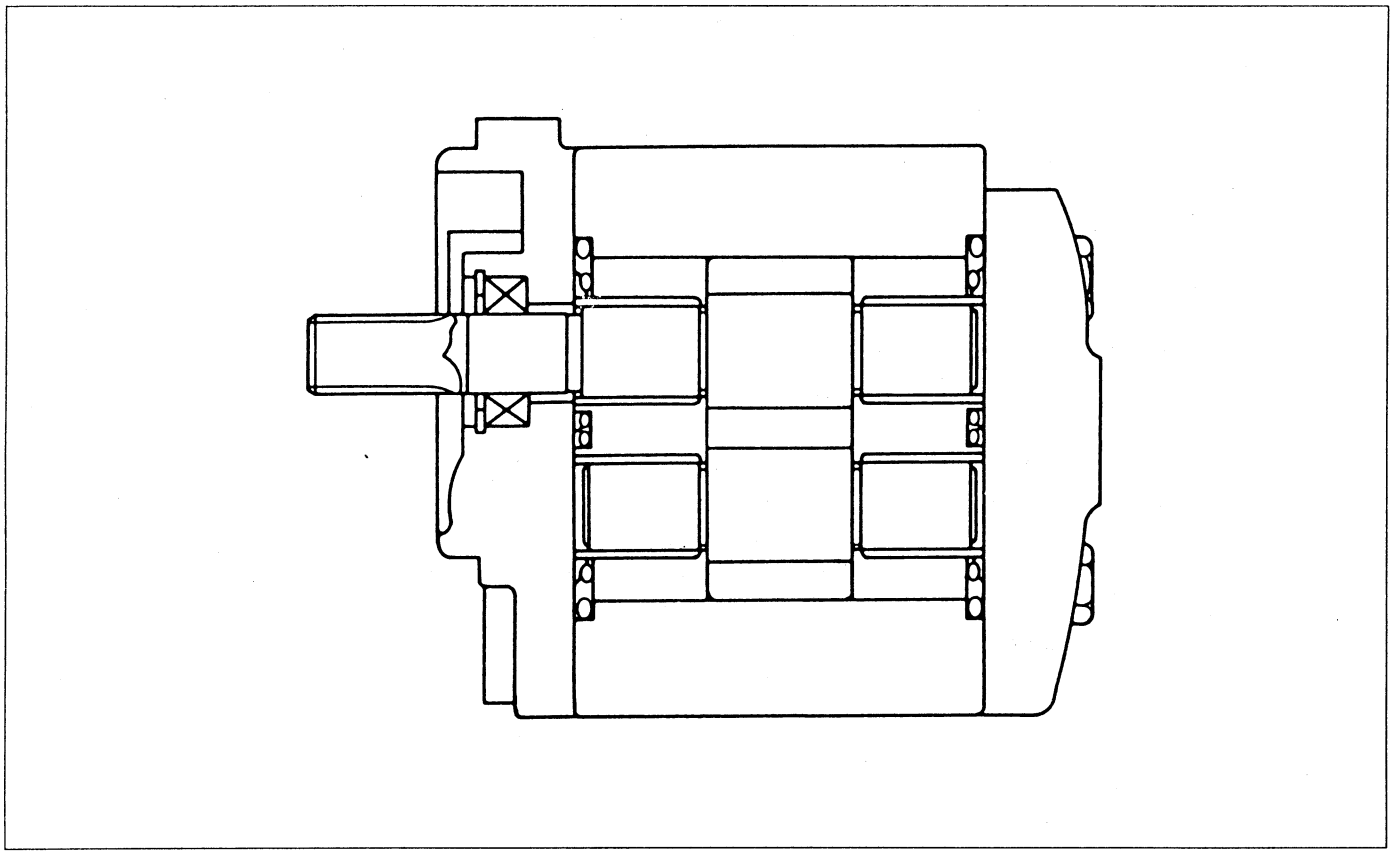
Unit: mm (in)

Forward· backward tilt	Dimension L (reference value)	Dimension A (spacer)
6°·12°	460 (18.11)	—
6°·10°	478 (18.82)	19 (0.75)
6°·6°	513 (20.20)	55 (2.17)
3°·12°	460 (18.11)	27 (1.06)
3°·10°	478 (18.82)	45 (1.77)
3°·6°	513 (20.20)	81 (3.19)

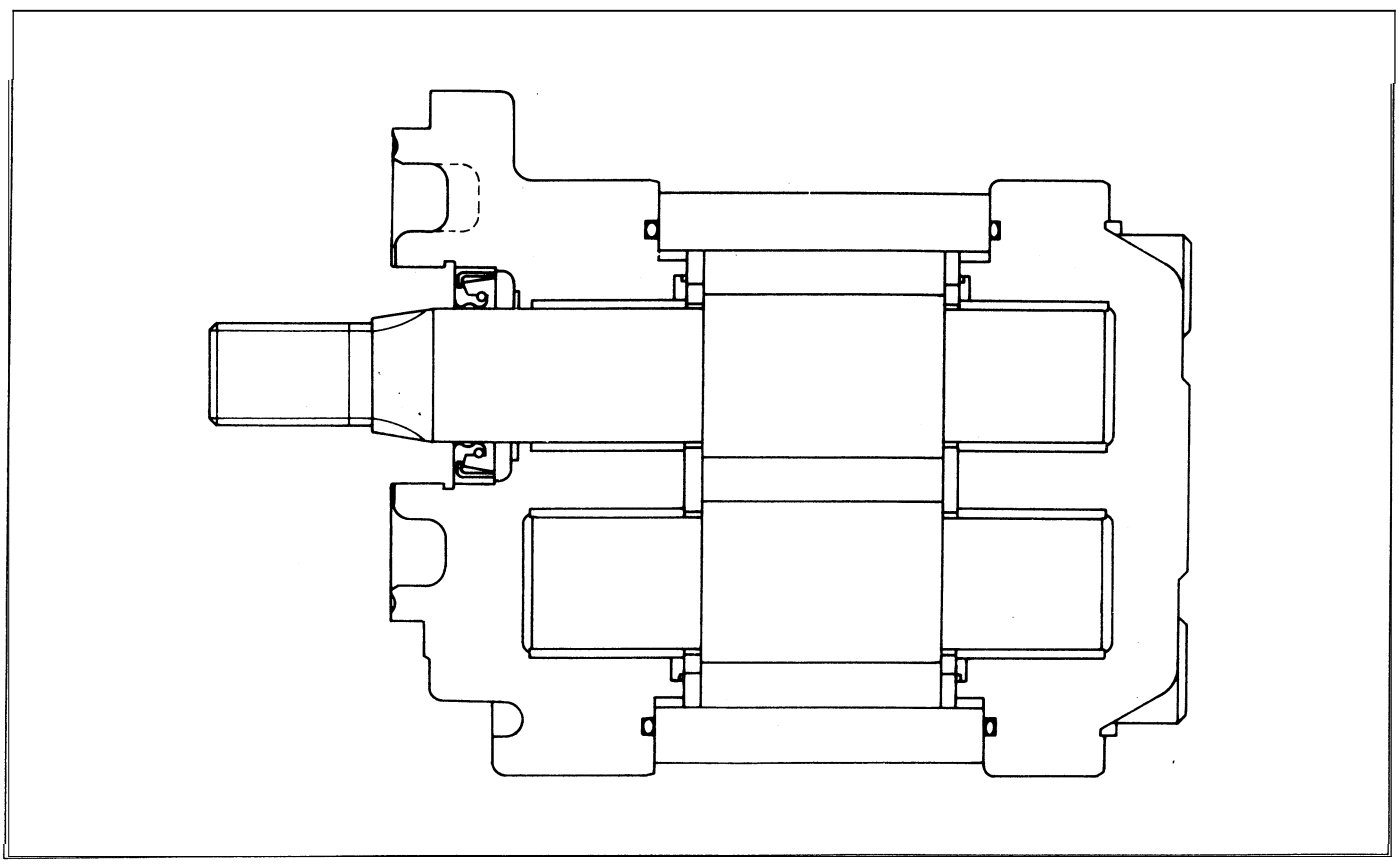
OIL PUMP

GENERAL

5K·4Y·1DZ Engine Model



22 Engine Model



SPECIFICATIONS

Oil Pump List

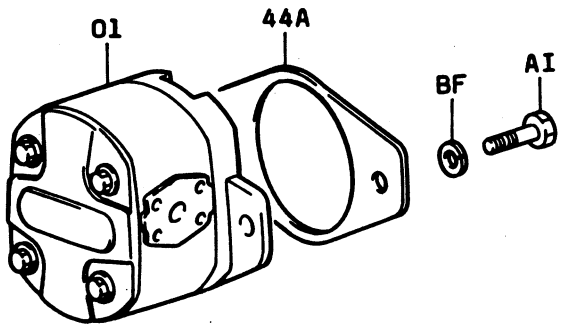
	5K	4Y	1DZ	2Z
1 ton series	KZP4-23C	KZP4-25C	KZP4-25C	
2 ton series	↑	KZP4-28.3C	KZP4-27C	SGP1-32C
3 ton series		KZP4-28C	↑	↑

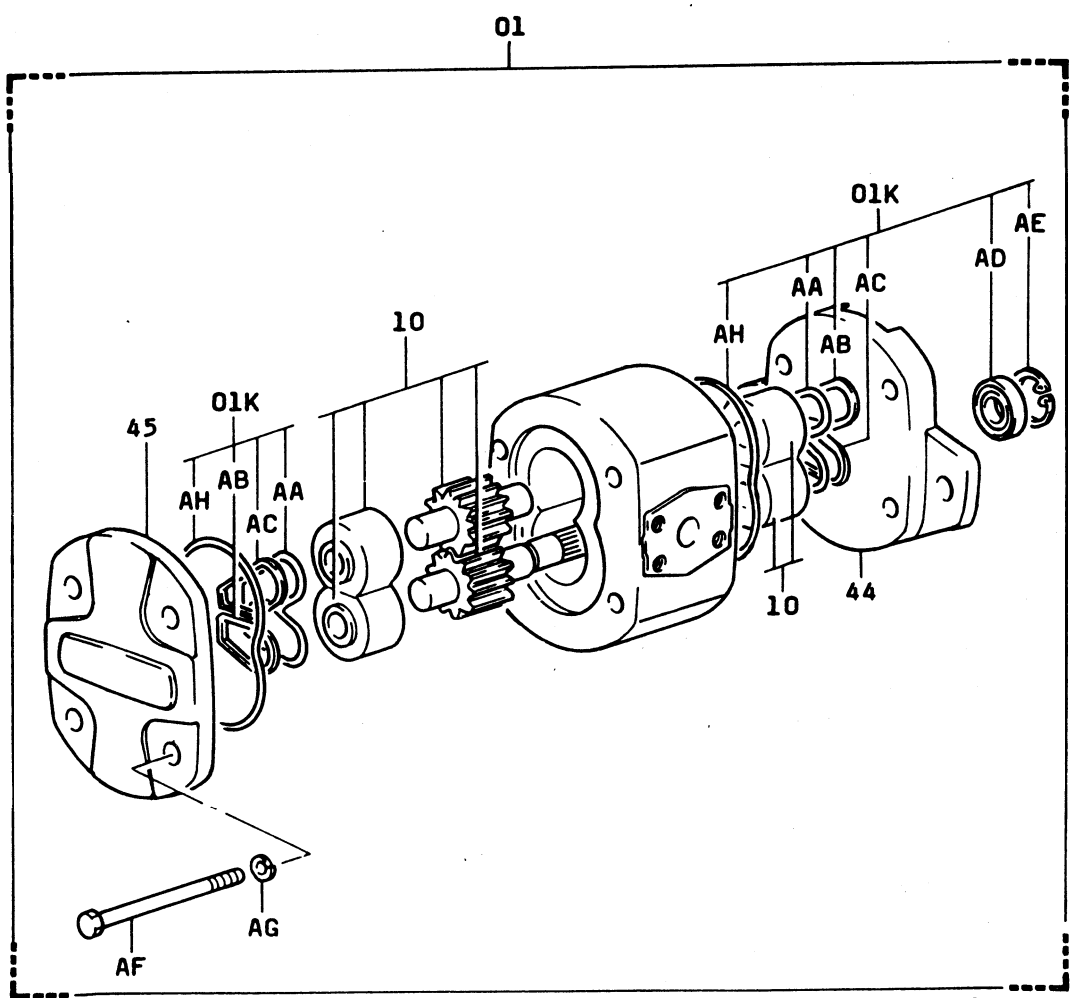
Item \ Type	KZP4-23C	KZP4-25C	KZP4-27C	KZP4-28C	KZP4-28.3C	SGP1-32C
Oil pump kind	Single pump	←	←	←	←	←
Oil pump type	Gear pump	←	←	←	←	←
Theoretical delivery cc/rev (cu-in/rev)	22.9 (1.397)	24.5 (1.495)	26.5 (1.617)	27.5 (1.678)	28.3 (1.727)	31.9 (1.947)
Delivery ℓ/min (USgal/min) (at pump speed of 1500 rpm)	32.8 (8.66)	35.5 (9.37)	38.3 (10.11)	39.4 (10.40)	40.5 (10.69)	45.0 (11.88)
Drive type	PTO silent chain	←	PTO gear	PTO silent chain	←	PTO gear

COMPONENTS

5K·4Y.1DZ Engine Model

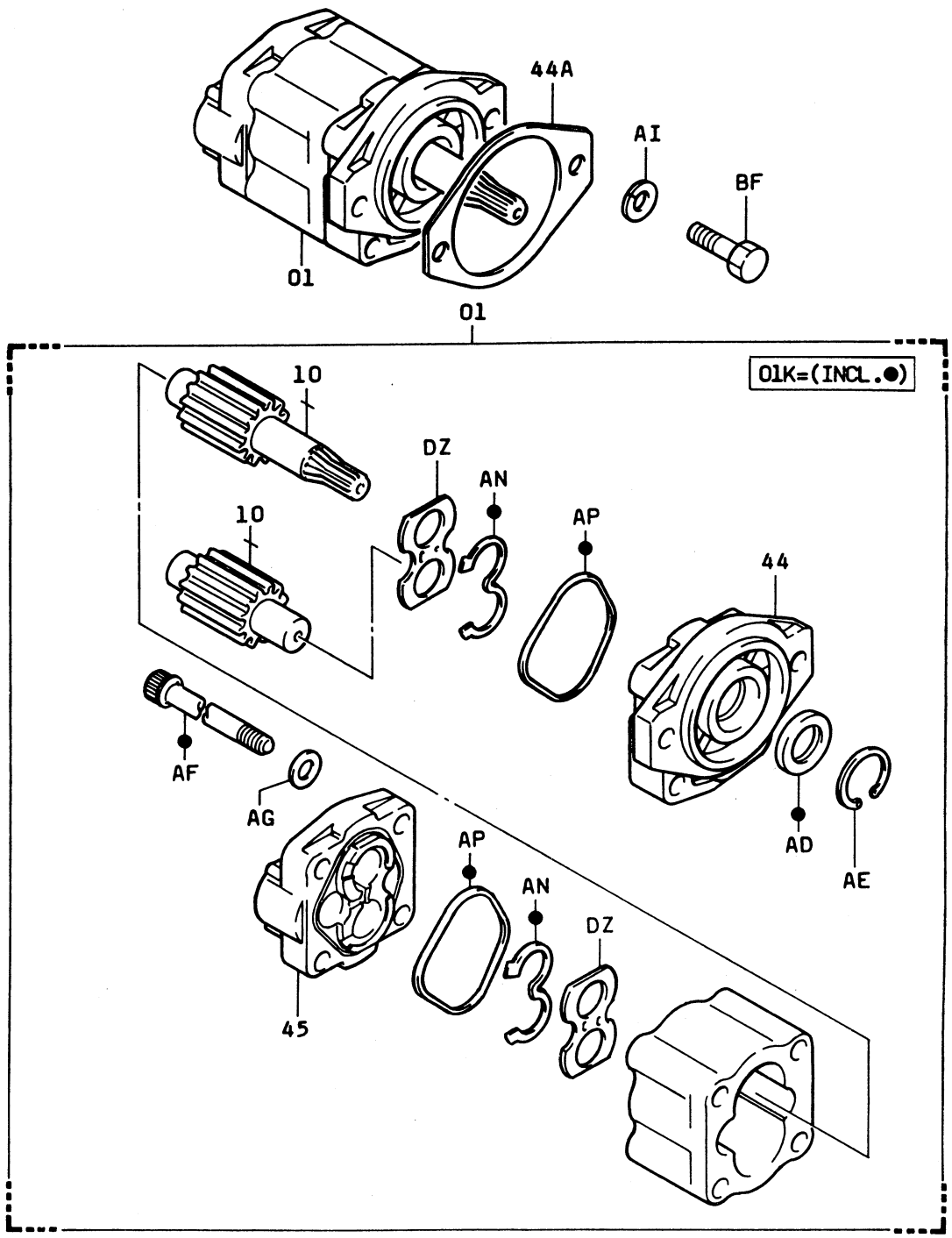
6701





22 **Engine Model**

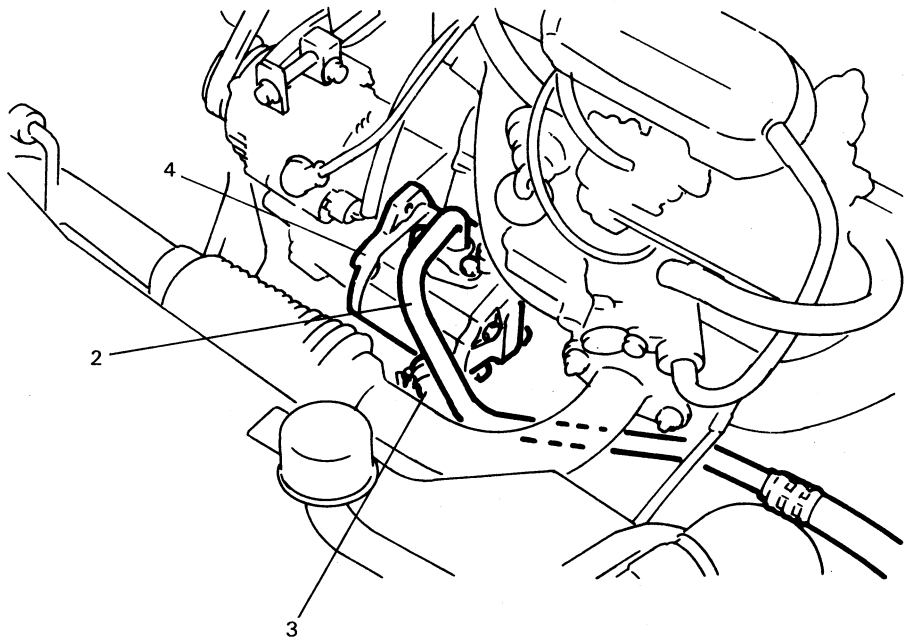
6701



6701-123

OIL PUMP ASSY

REMOVAL-INSTALLATION



1 **Air cleaner**

Removal Procedure

1 Remove the air cleaner ASSY. (See the "engine removal- installation" section on page 1-7.)

2 Disconnect the high pressure hose.

3 Disconnect the inlet hose.

4 Remove the oil pump ASSY.

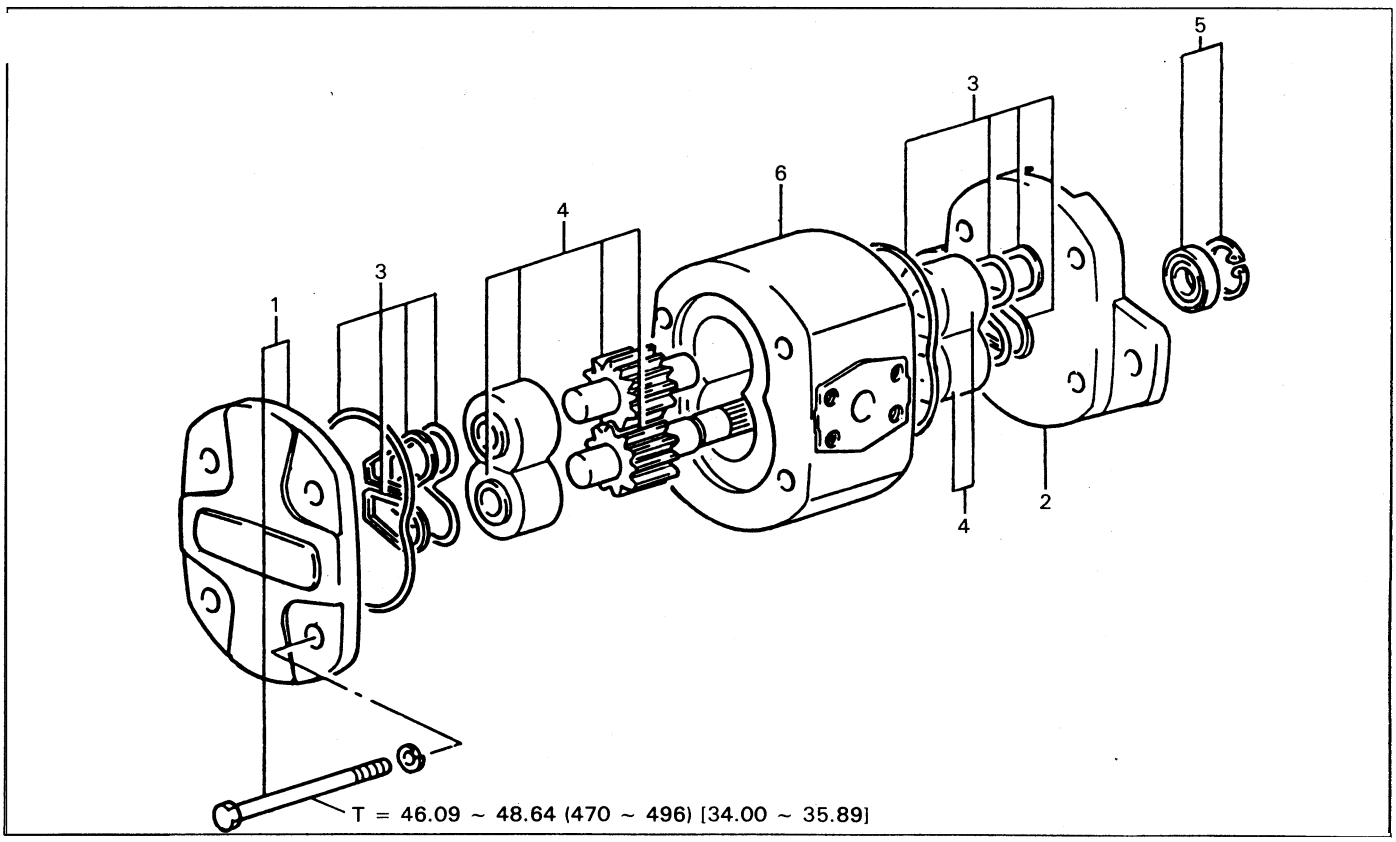
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- **Apply grease (molybdenum disulfide grease) on the pump spline portion before installation.**
- **Clean the fitting mounting portion thoroughly to prevent damage to the O-ring.**

DISASSEMBLY·INSPECTION·REASSEMBLY (5K·4Y·1DZ)

T = N·m (kg-cm) [ft-lb]



Disassembly Procedure

1 Remove the cover. **[Point** 11

2 Remove the mounting flange.

3 Remove the backing, bushing seal and body seal,

4 Remove the gear and bushing set. **[Point** 21

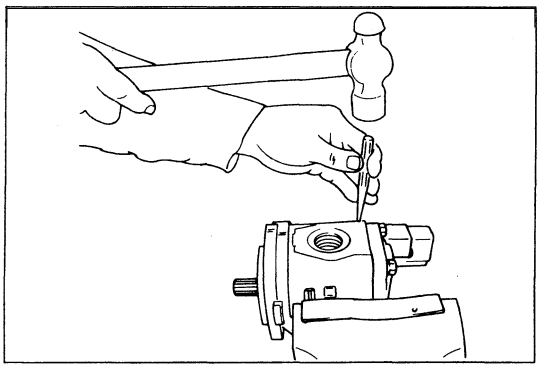
5 Remove the oil seal.

6 Remove the body. **[Point** 31

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part, blow with compressed air and apply hydraulic oil before reassembly.**
- **Use new seals for reassembly.**

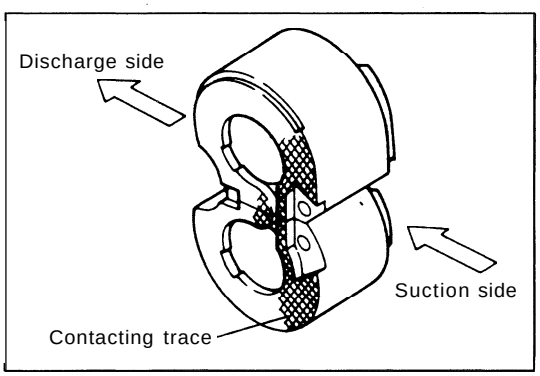


Point Operations

[Point 1]

Disassembly: Punch a match mark.

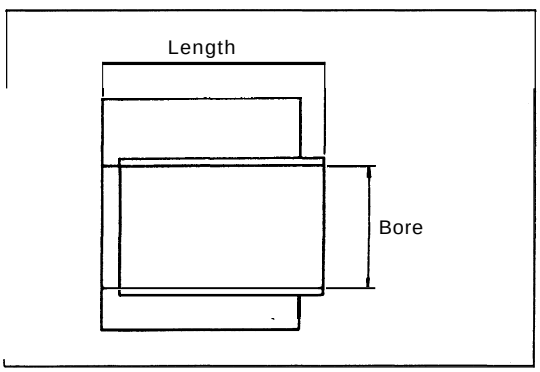
Reassembly: Align the match marks.



[Point 2]

Inspection: Inspect the contact trace on the side face of the bushing.

Normal = Contact trace relatively stronger on the suction side and slight on the discharge side

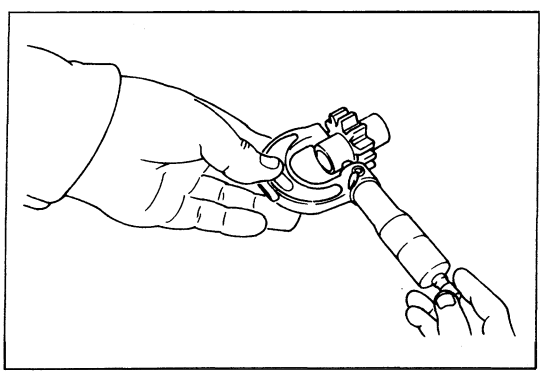


Inspection: Measure the bushing inside diameter.

Limit inside diameter:
19.123 mm (0.75287 in)

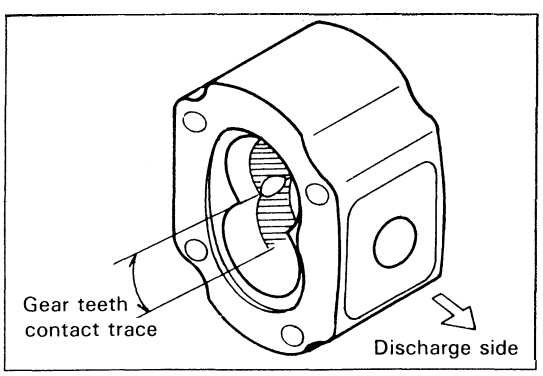
Inspection: Measure the bushing length in the axial direction.

Limit length: 26.411 mm (1.03980 in)



Inspection: Measure the gear shaft outside diameter.

Limit outside diameter:
18.935 mm (0.74547 in)



[Point 3]

Inspection: Inspect the gear contact trace on the body inside surface on the suction side.

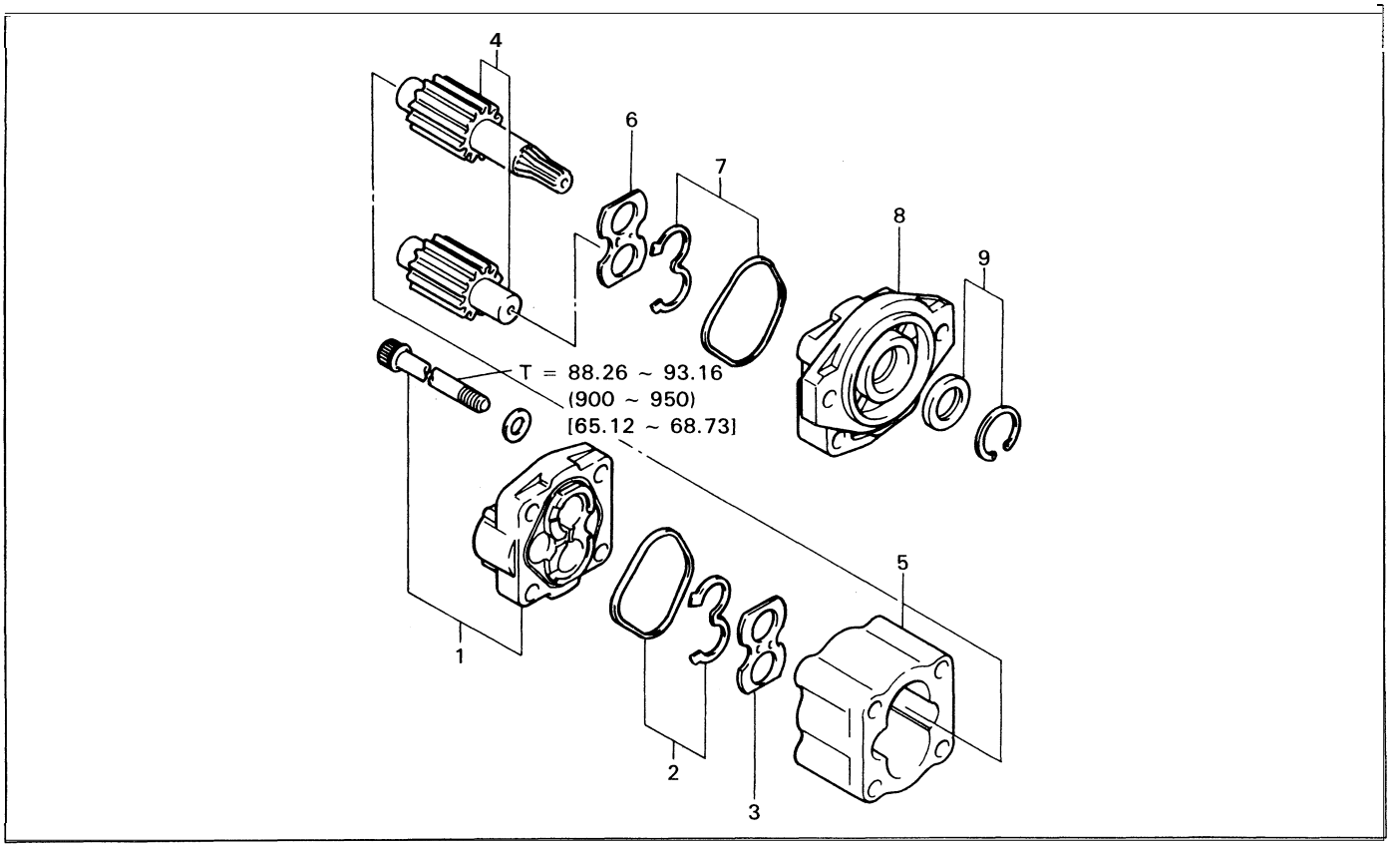
Limit: Contact trace on more than half of circumference

Inspection: Measure the depth of flaw on the body inside surface.

Limit flaw depth: 0.1 mm (0.004 in)

DISASSEMBLY·INSPECTION·REASSEMBLY (2Z)

T = N·m (kg-cm) [ft-lb]



Disassembly Procedure

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

2 Remove the seals.

3 Remove the side plate. **[Point** 21

4 Remove the pump gear. **[Point** 31

5 Remove the body. **[Point 41.**

6 Remove the side plate. **[Point** 21

7 Remove the seals.

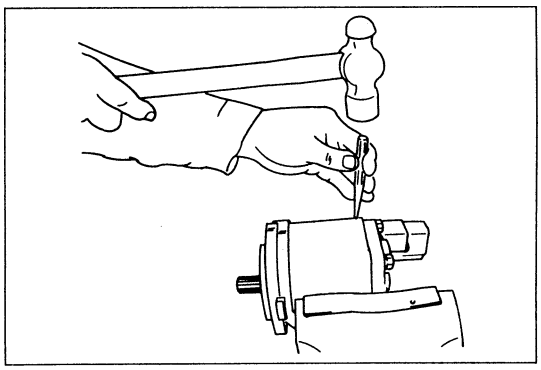
8 Remove the cover (mounting flange).

9 Remove the oil seal.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- **Wash each part, blow with compressed air and apply hydraulic oil before reassembly.**
- **Use new seals for reassembly.**

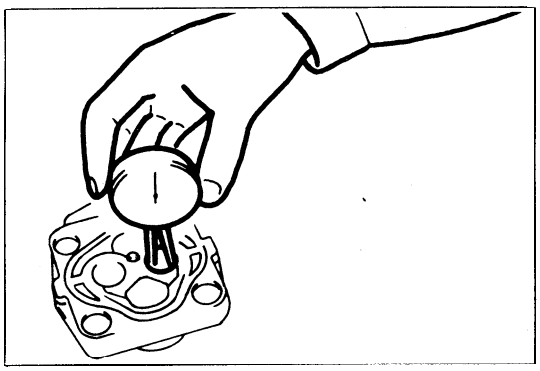


Point Operations

[Point 1]

Disassembly: Punch a match mark.

Reassembly: Align the match marks.

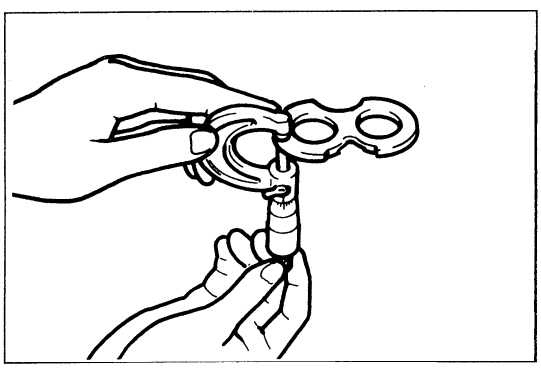


Inspection: Measure the bushing inside diameter.

Limit inside diameter: 22.23 mm (0.8752 in)

Inspection: Inspect the inside surface in sliding contact.

Normal = Glossy contact trace on about half on suction side



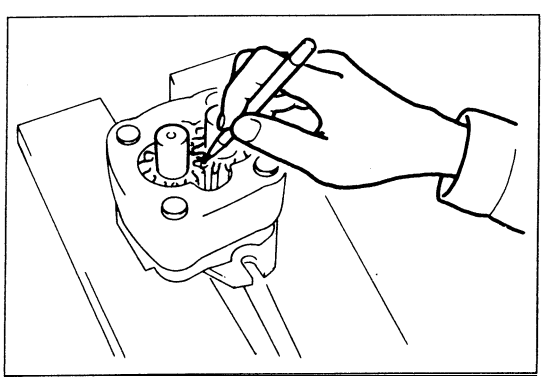
[Point 2]

Inspection: Measure the thickness of the side plate.

Limit thickness: 2.70 mm (0.1063 in)

Inspection: Inspect the side plate sliding contact surface.

Normal = Contact trace relatively stronger on the suction side and slight on the discharge side

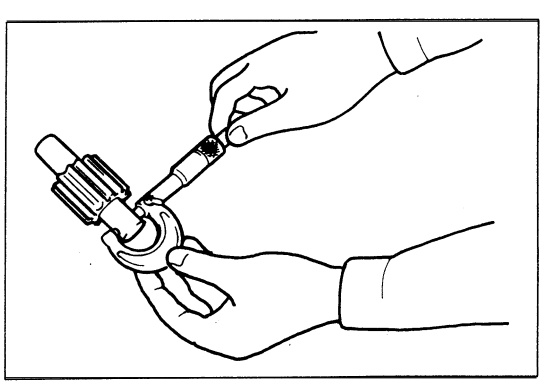


Reassembly: Install the side plate with its grooved side facing the gear.

[Point 3]

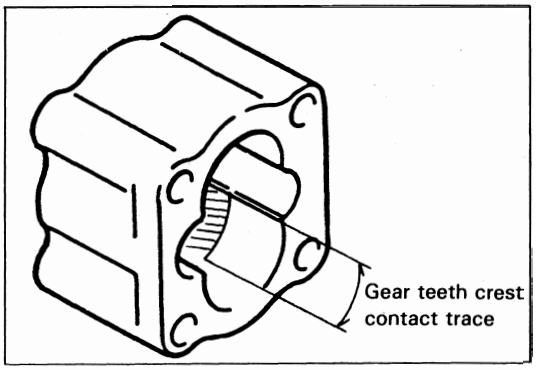
Disassembly: Make a match mark. Do not damage the gear.

Reassembly: Align the match marks.



Inspection: Measure the gear shaft outside diameter.

Limit outside diameter: 21.95 mm (0.8642 in)



[Point 41

Inspection Inspect the depth of flaw on the inside surface of the body.

Limit flaw depth: 0.15 mm (0.0059 in)
(Normal = contact trace at about 1/3 on the body inside surface)

TEST METHOD

Note:
A bench test shall be performed for strict testing. Since it is impossible in actual service jobs, install the oil pump on an actual vehicle and judge the oil pump delivery quality by the cylinder operation state.

1. Install an oil pressure gage and engine tachometer.
   (1) Set the oil pressure gage on the oil control valve.
   (2) Set the engine tachometer on the engine.

2. Operate the oil pump for running in.
   (1) Start the engine. With the oil control valve lever in the neutral position, run the engine for 10 minutes at 500 to 1000 rpm.

3. If no abnormality is found in the oil pump, run the engine for 10 minutes by raising the speed to 1500 to 2000 rpm.

Note:
If any abnormality is found in step 2 or 3 above, immediately stop the engine and disassemble the oil pump again.

4. Check if the relief set pressure of the oil control valve is as specified. See the oil control valve adjustment section (on page 16-9) for details.

5. Check if the engine speed is as specified. See the engine speed adjustment section (on page 1-17) for details.

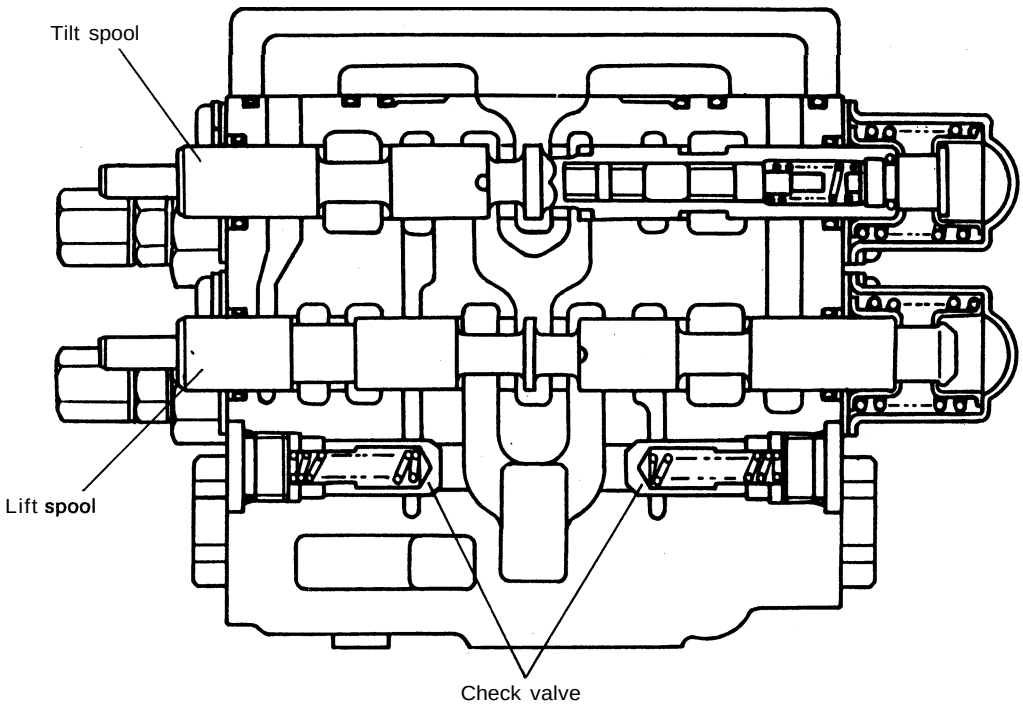
6. Lifting speed table (average for full stroke)

Vehicle model	Engine model	Oil pump type	Mast type	Lifting speed mm/sec (fpm)	
				No-load	Loaded
1 ton series	5K	KZP4-23C	V·SV	620 (122)	590 (116)
			FV	570 (112)	540 (106)
			FSV	590 (116)	560 (110)
	4Y	KZP4-25C	V·SV	640 (126)	600 (118)
			FV	600 (118)	550 (108)
			FSV	610 (120)	570 (112)
	1DZ	KZP4-25C	V·SV	670 (132)	650 (128)
			FV	640 (126)	600 (118)
			FSV	650 (128)	620 (122)
2 ton series	5K	KZP4-23C	V·SV	520 (102)	480 (94)
			FV	490 (97)	440 (86)
			FSV	500 (98)	450 (89)
	4Y	KZP4-28.3C	V·SV	640 (126)	600 (118)
			FV	600 (118)	560 (110)
			FSV	600 (118)	560 (110)
	1DZ	KZP4-27C	V·SV	640 (126)	610 (120)
			FV	600 (118)	570 (112)
			FSV	610 (120)	580 (114)
	2Z	SGP1-32C	V·SV	670 (132)	650 (128)
			FV	630 (124)	610 (120)
			FSV	640 (126)	620 (122)
3 ton series	4Y	KZP4-28C	V·SV	550 (108)	510 (100)
			FV	490 (97)	450 (89)
			FSV	520 (102)	480 (94)
	1DZ	KZP4-27C	V·SV	530 (104)	500 (98)
			FV	470 (93)	440 (86)
			FSV	500 (98)	470 (93)
	2Z	SGP1-32C	V·SV	570 (112)	550 (108)
			FV	500 (98)	480 (94)
			FSV	530 (104)	510 (100)

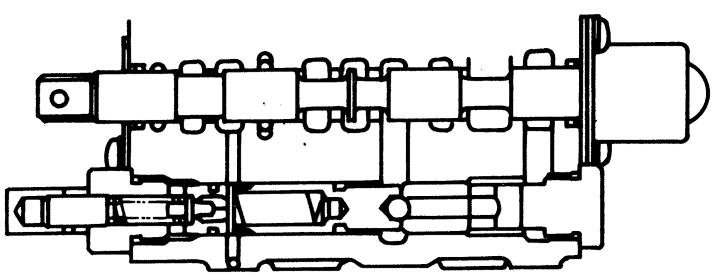
OIL CONTROL VALVE

GENERAL

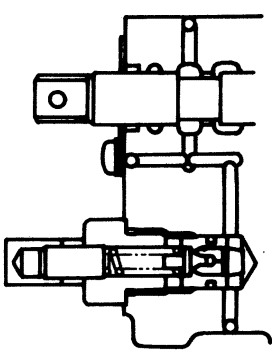
Oil Control Valve



Relief Valve

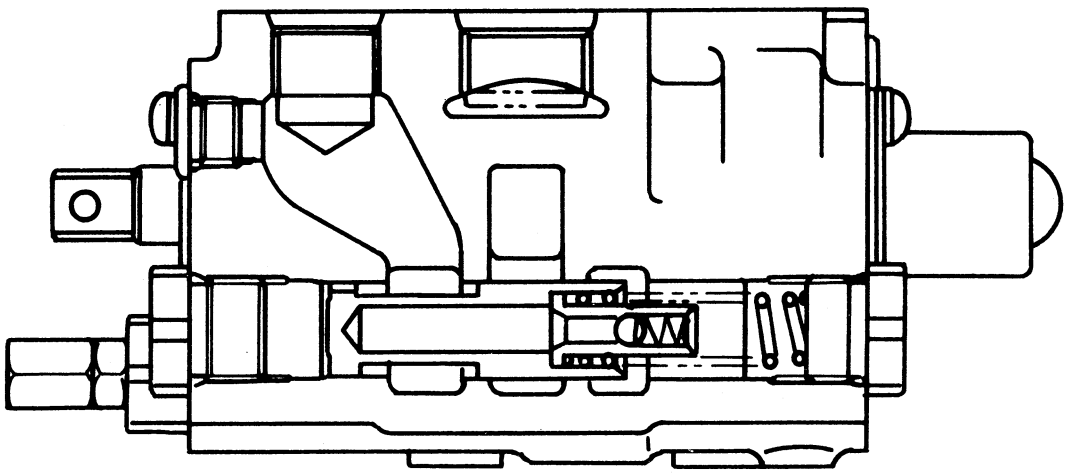


Relief valve for lift cylinder

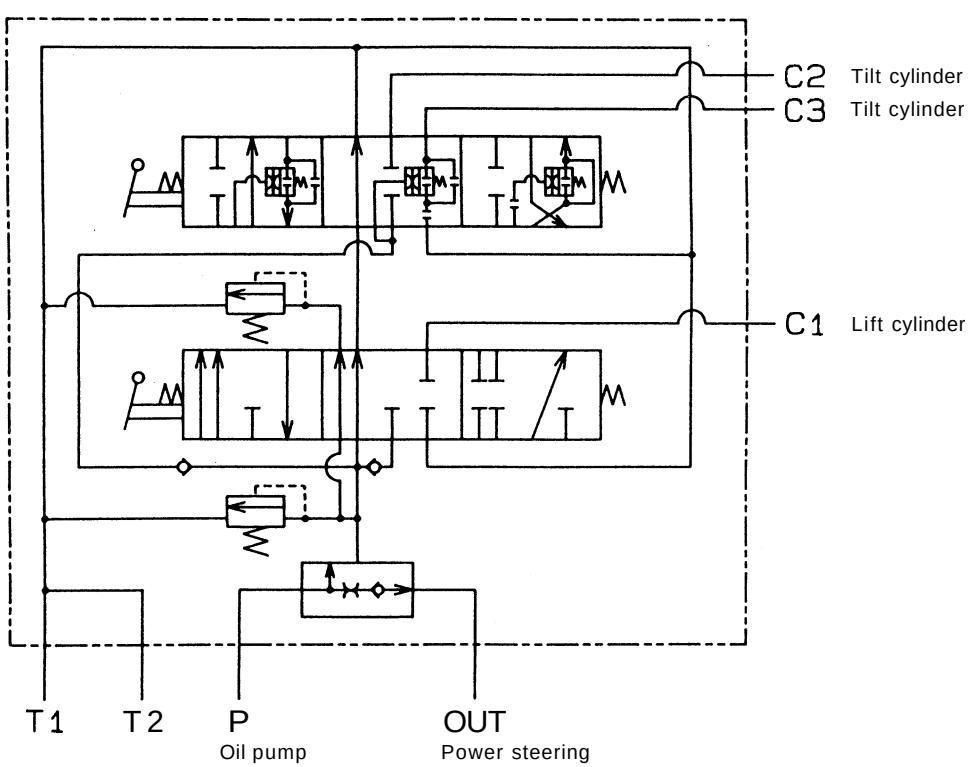


Relief valve for tilt cylinder

Flow Divider



Hydraulic Circuit



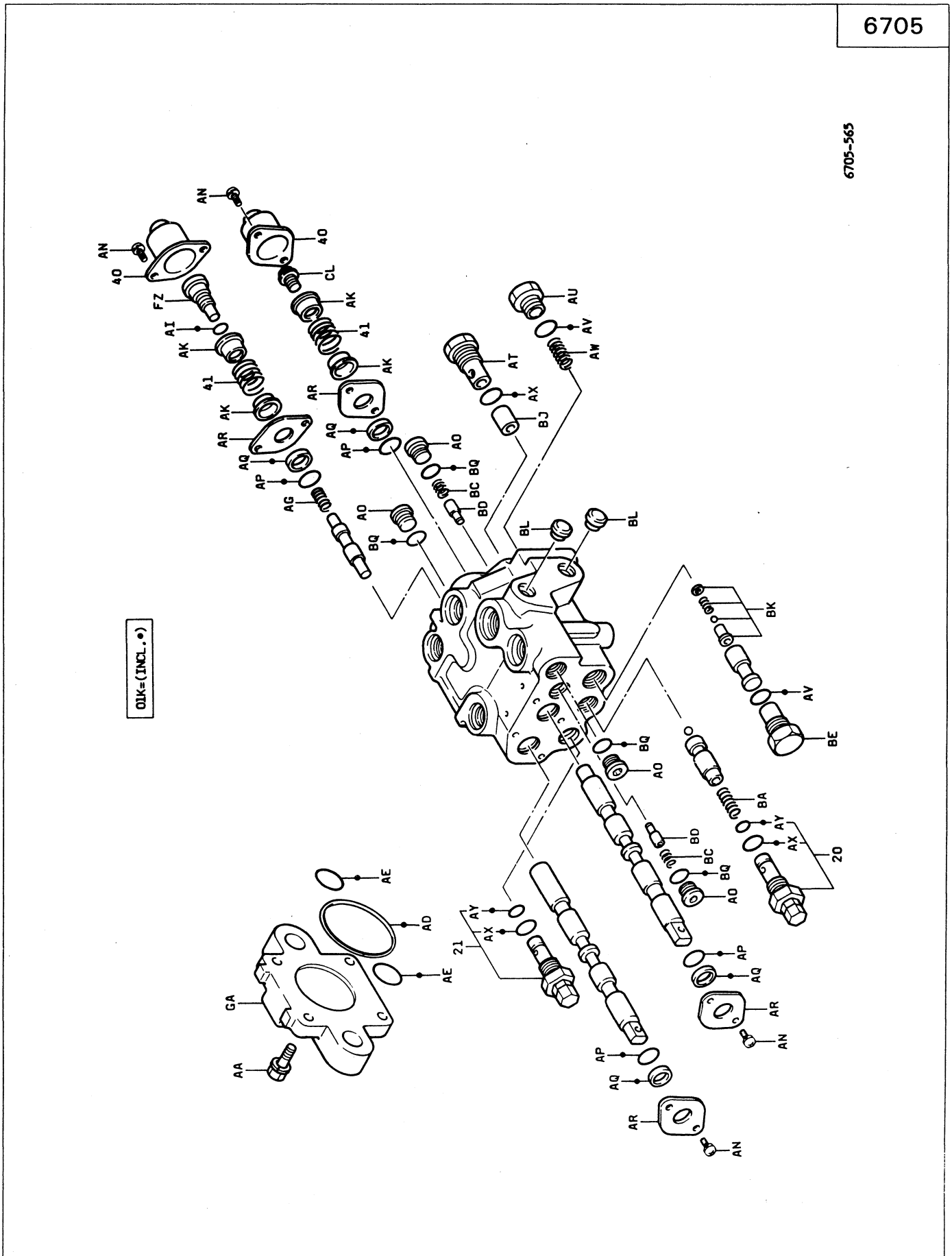
P: Pump port
T: Tank port
T1: To tank
T2: From power steering

SPECIFICATIONS

Item \ Vehicle model		1 ton series	2.3 ton series
Oil control valve type		Add-on type (1-, 2-spool monoblock)	←
Relief set pressure kPa (kg/cm^2) [psi]	Lift	17160 (175) [2490]	18140 (185) [2630]
	Tilt	11770 (120) [1710]	14710 (150) [2130]
Flow divider flow rate ℓ/min (USgal/min)		11.7 (3.09)	13.0 (3.43)
Spool outside diameter mm (in)		16.0 (0.630)	←
Stroke mm (in)		7.0 (0.276)	←
Others		Built-in tilt lock valve	←
		Built-in flow divider valve	←

COMPONENTS

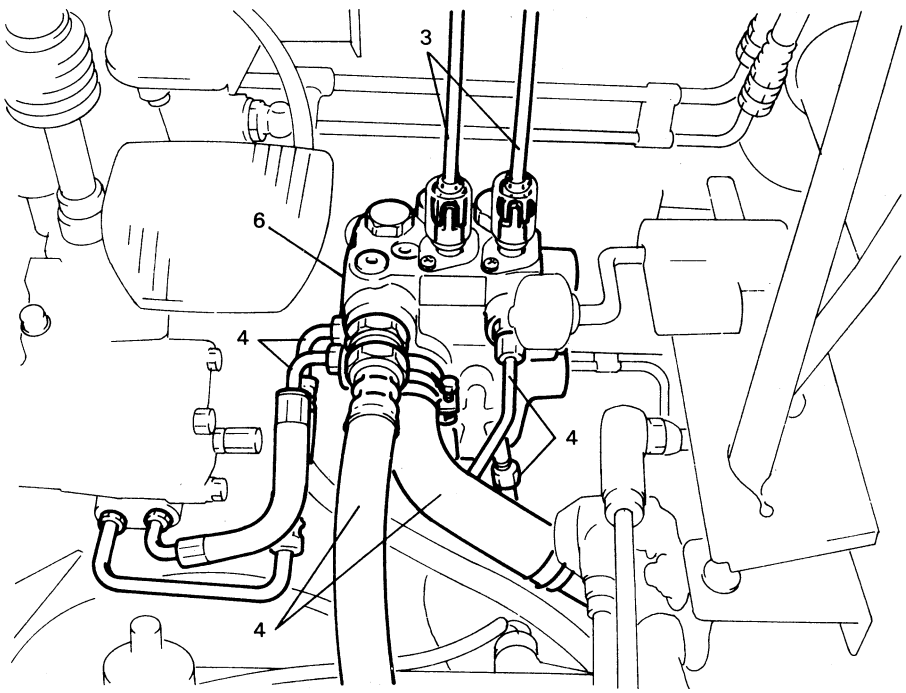
6705



OIL CONTROL VALVE ASSY

REMOVAL·INSTALLATION

Note:
Before disconnecting the control lever link, release the residual pressure in the material handling system piping by operating the control lever, set the mast in the neutral state and lowering the fork to the bottom position.



1 Toe board
2 Rubber cover
5 Set bolt

Removal Procedure

1 Remove the toe board.

2 Remove the rubber cover

3 Disconnect the control valve lever link.

4 Disconnect the piping.

5 Remove the oil control valve set bolt.

6 Remove the oil control valve ASSY.

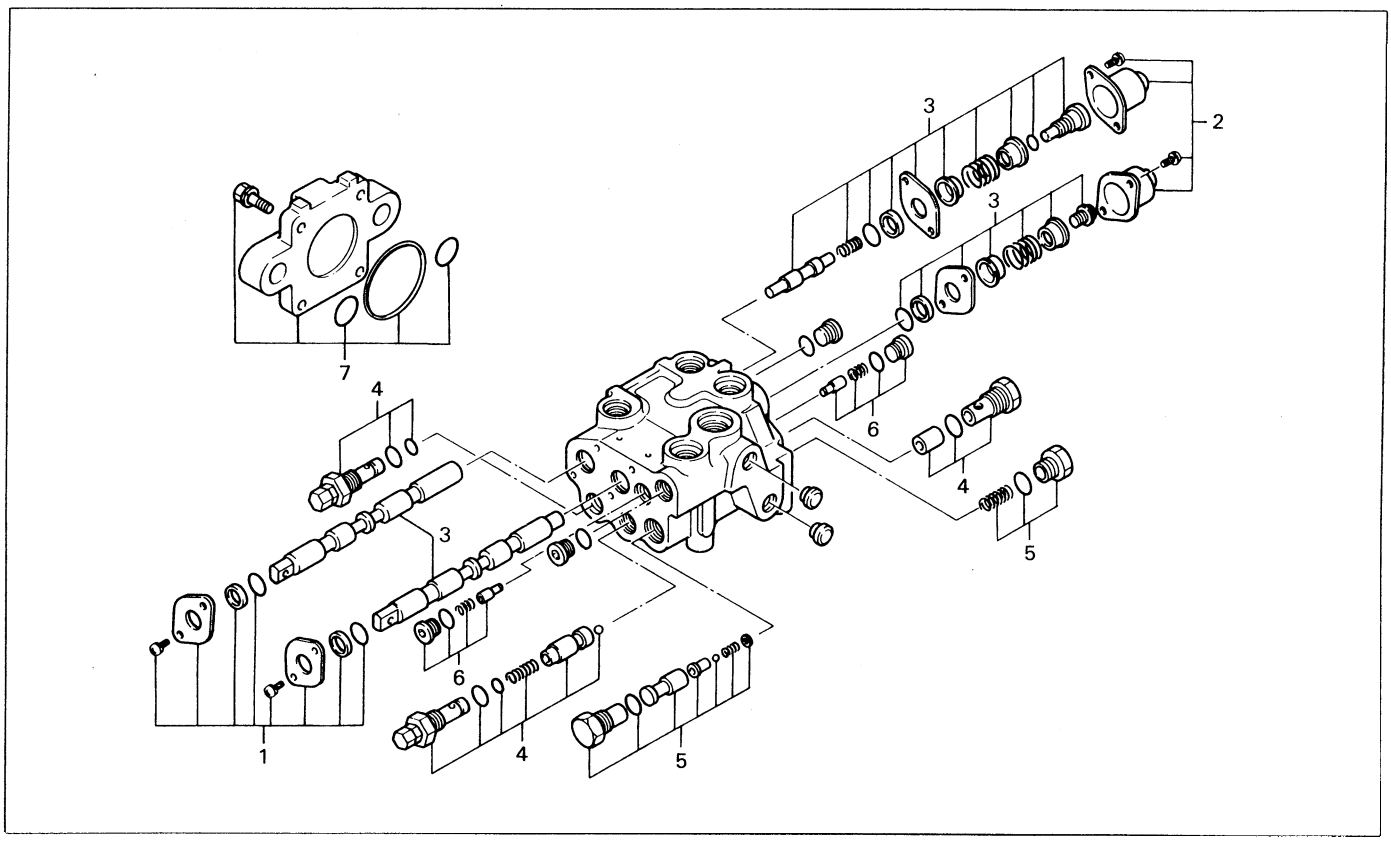
Installation Procedure

The installation procedure is the reverse of the removal procedure.

Note:
- Apply grease the oil control valve lever link parts.
- Check the hydraulic oil level, and add if insufficient.

DISASSEMBLY·INSPECTION·REASSEMBLY

Note:
- **Operate in a clean place.**
- **As each part is finished with high precision, carefully disassemble them to prevent any damage.**



Disassembly Procedure

1 Remove the seal holder.

2 Remove the spring cover.

3 Remove the tilt spool and lift spool. **[Point 1]**

4 Remove the relief valve. **[Point** 21

5 Remove the flow divider valve.

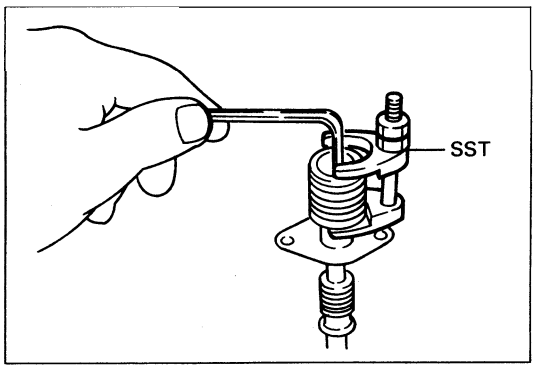
6 Remove the check plunger.

7 Remove the outlet housing.

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

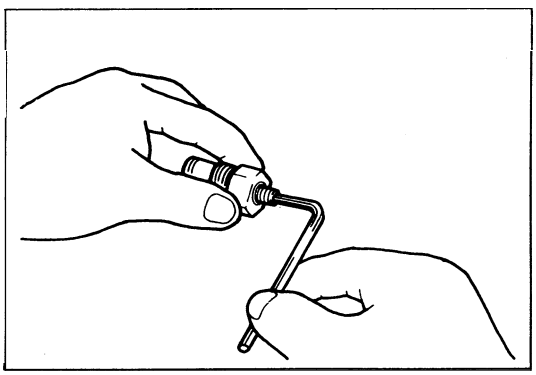
Note:
Wash each part thoroughly, blow with compressed air and apply hydraulic oil before reassembly.



Point Operations

[Point 1]

Disassembly·reassembly: SST 09610-10160-71



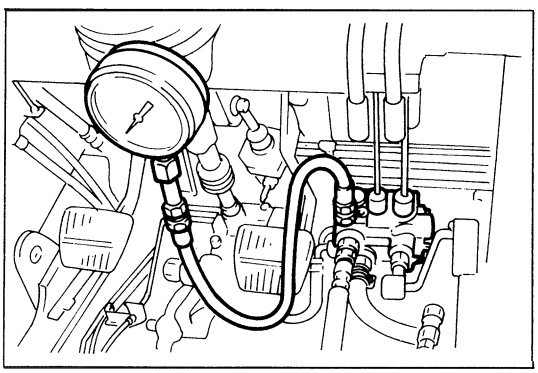
[Point 2]

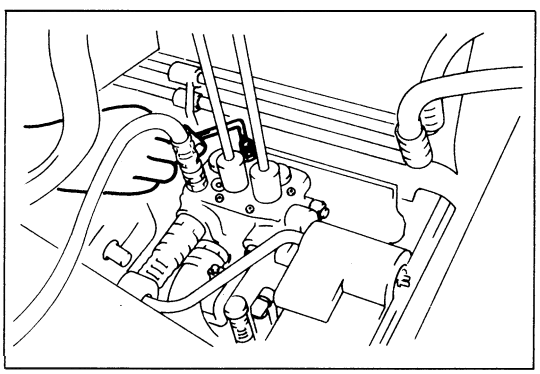
Reassembly: When the relief valve is disassembled, always loosen the adjust screw fully.

ADJUSTMENT

Note:

- **Always make adjustment according to the procedure described below. Careless adjustment may generate a high pressure to cause damage to the oil pump or other hydraulic devices.**
- **Always check that the no-load maximum speed is as specified.**





Relief set pressure

Unit: kPa (kg/cm^2) [psi]

	1 ton series	**2.3**ton series
Lift	17160^{+490}_{0} (175^{+5}_{0}) [2490^{+70}_{0}]	18140^{+490}_{0} (185^{+5}_{0}) [2630^{+70}_{0}]
Tilt	11770^{+490}_{0} (120^{+5}_{0}) [1710^{+70}_{0}]	14710^{+490}_{0} (150^{+5}_{0}) [2130^{+70}_{0}]

1. Install an oil pressure gage.
   (1) Remove the oil pressure detection plug (9/16-18UNF-2B) installed on top of the oil control valve, and install the oil pressure gage.

2. Check loosening of the adjust screw.
   (1) Remove the cap nuts and packings on top of the relief valves LH and RH. Loosen the lock nut and loosen the adjust screw to a degree not to come off from the body.

3. Start the engine and check for no oil leak or abnormal noise.

4. Adjust the lift side relief pressure.
   (1) Set the control lever to the lift position and gradually tighten the adjust screw on the left side until the fork starts to rise.
   (2) Run the engine at the maximum 'speed, and read the pressure gage when the fork is raised to the maximum height. Adjust the oil pressure then to the specified level by turning the adjust screw and lock with the lock nut.

5. Adjust the tilt side relief pressure.
   (1) Set the control lever at the backward tilt position, and gradually tighten the adjust screw on the right side until the mast starts to be tilted backward.
   (2) Run the engine at the maximum speed, and read the oil pressure gage when the mast is tilted fully backward. Adjust the oil pressure then to the specified level by turning the adjust screw and lock by the lock nut.

6. After the adjustment, insert the packing and tighten the cap nut. Inspect the relief pressure again.

7. Remove the oil pressure gage, and tighten the plug.

APPENDIX

SST LIST

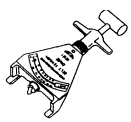
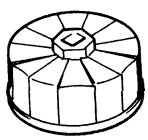
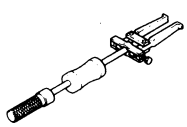
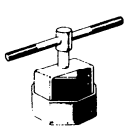
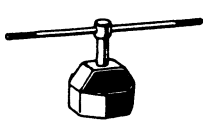
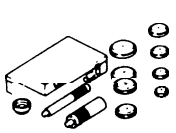
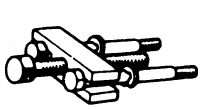
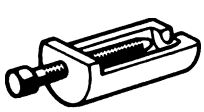
Illustration	Part No.	Part Name	Section											
			1	2	3	4	6	7	8	9	10	13	14	16
	09090-04010	Engine sling device	○											
	09216-00021	Belt tension gage	O											
	09228-07500	Oil filter wrench			O									
	09308-00010	Oil seal puller			○									
	09509-55020	Rear wheel bearing nut wrench						○						
	09509-55030	Rear wheel bearing nut wrench						○						
	09608-20012	Front hub and drive pinion bearing replacer set							⊙	⊙				
	09608-35014	Axle hub and drive pinion bearing tool set			⊙		⊙	⊙						
	09609-20011	Steering wheel puller								⊙				
	09610-20012	Pitman arm puller							⊙	⊙				

Illustration	Part No.	Part Name	Section											
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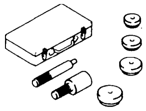
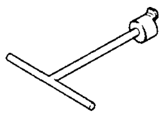
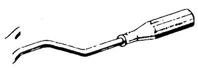
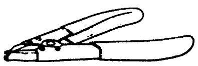
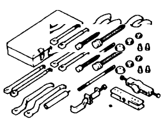
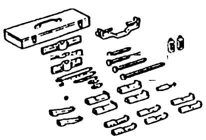
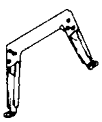
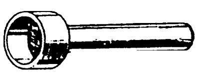
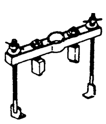
	09620-30010	Steering gear box replacer set			O				O	O				
	09717-20010	Brake shoe return spring remover									O			
	09718-20010	Brake shoe return spring replacer									O			
	09905-00012	Snap ring No. 1 expander			O									
	09950-20017	Universal puller		O	O	O	O		O	O		O		
	09950-40010	Puller B set			O									
	09010-20111-71	Engine unit hanger	O											
	09150-10170-71	Transmission bearing replacer			O	O								
	09220-22000-71	Torque converter clutch drum spring remover and replacer			O									
	09310-10160-71	Front axle hub remover						O						

Illustration	Part No.	Part Name	Section												
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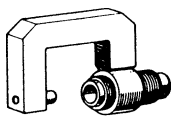
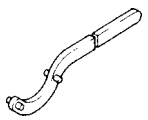
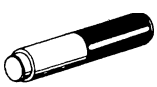
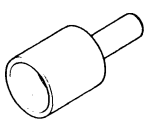
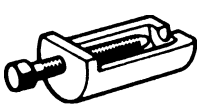
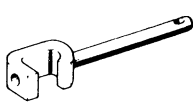
	09310-22000-71	Reamer bolt					O								
	09311-23000-71	Shift fork shaft oil seal replacer				⊙									
	09330-10170-71	Drive pinion					⊙								
	09370-10170-71	Front axle bearing replacer							○						
	09370-10410-71	Front axle bearing replacer			⊙			⊙							
	09370-20270-71	Drive pinion bearing replacer				⊙	⊙		⊙						
	09420-20150-71	King pin needle bearing remover and replacer				⊙									
	09421-33020-71	Front axle hub replacer						⊙							
	09430-23600-71	Tie rod end puller							⊙	⊙					
	09470-10171-71	Main shaft preload								⊙					

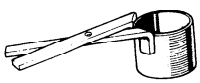
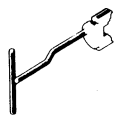
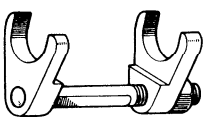
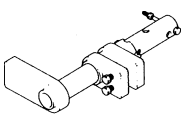
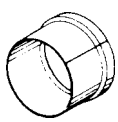
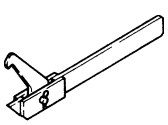
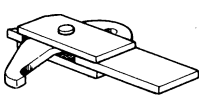
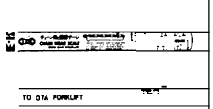
Illustration	Part No.	Part Name	Section												
			1	2	3	4	6	7	8	9	10	13	14	16	
	09480-10170-71	Steering gear box remover and replacer								⊙					
	09490-20340-71	Booster piston ring replacer								⊙					
	09510-31960-71	Brake hold down spring remover and replacer									○				
	09610-10160-71	Oil control valve spring remover and replacer												○	
	09610-22000-71	Inner mast stopper										○	○		
	09610-41830-71	Piston replacer								⊙					
	09620-10100-71	Cylinder cap remover and replacer								⊙					
	09620-10160-71	Cylinder cap remover and replacer											⊙		
	09630-10110-71	Tilt cylinder cap remover and replacer					⊙								
	09631-22000-71	Wear scale chain										⊙			

Illustration	Part No.	Part Name	Section												
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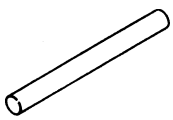
	09700-30200-71	Spring pin			O									
	09810-20172-71	Joint pin			○	○						Θ	Θ	

SERVICE STANDARDS LIST

ENGINE

Engine				
Idling speed rpm		5K·4Y	Standard	750 +50 0
		1DZ·2Z	Standard	750f 25
No-load static maximum speed rpm		5K	Standard	3050±50
	4Y	1·2 ton series	Standard	2600±50
		3 ton series	Standard	2800±50
	1DZ	1 ton series	Standard	2600±50
		2.3 ton series	Standard	2800±50
		2Z	Standard	2400±50
Full relief engine speed down rpm		5K	Standard	250 or less
		4Y	Standard	↑
		1DZ	Standard	↑
		2Z	Standard	200 or less
Air cleaner				
Vacuum switch conduction test (conduction base) Pa (mm Aq) [mm Hgl		Gasoline engine	Standard	2942±294 (300±30) [22.1 ± 2.21
		Diesel engine	Standard	7473±569 (762±58) [56.0 ± 4.31
Radiator				
Radiator cap opening pressure kPa (kg/cm^2) (psi)			Standard	88* 14.7 (0.9±0.15) 113 ± 2.1]
Battery				
Electrolyte specific gravity (at 20°C [68°F])			Standard	1.280
Alternator				
Fan belt tension (when pushed with 98 N (10 kg) [22 lb]) mm (in)		5K	Standard	8 – 13 (0.31 – 0.51)
		4Y	Standard	↑
		1DZ·2Z	Standard	↑
Fan belt tension (when measured with a tension gage (SST)) N (kg) [lb]		5K	Standard	294 – 490 (30 – 50) I66 – 110]
		4Y	Standard	↑
		1DZ·2Z	Standard	324 – 559 (33 – 57) 173 – 1261
Accelerator pedal				
Pedal roller height (from accelerator bracket to top of roller) mm (in)			Standard	84±2

Tightening torque Unit: N·m (kg-cm) [ft-lb]			
Flywheel set bolt (clutch model)	5K·4Y	Standard	111.80 – 167.70 (1140 – 1710) [82.48 – 123.721
	1DZ·2Z	Standard	124.54 – 186.33 (1270 – 1900) [91.88 – 137.471
Clutch housing set bolt		Standard	49.03 – 78.45 (500 – 800) [36.18 – 57.881
Torque converter end plate set bolt		Standard	↑
Drive plate set bolt (for engine crankshaft connection)	5K·4Y	Standard	56.88 – 64.72 (580 – 660) [41.96 – 47.751
	1DZ·2Z	Standard	76.49 – 93.16 (780 – 950) [56.43 – 68.731
Drive plate set bolt (for torque converter connection)		Standard	14.71 – 21.57 (150 – 220) [10.85 – 15.921
Torque converter housing set bolt		Standard	29.42 – 44.13 (300 – 450) [21.71 – 32.561

CLUTCH

Clutch disc			
Rivet sinking depth mm (in)		Limit	0.3 (0.012)
Pressure plate height mm (in)		Standard	8.8 (0.346)
Release bearing plate height mm (in)		Standard	59±0.5 (2.32±0.020)
Release bearing plate parallelism (inclination) mm (in)		Standard	0.4 (0.016)
Compression spring free length mm (in)	5K	Standard	62 (2.44)
	4Y·1DZ	Standard	58.3 (2.295)
	22	Standard	62 (2.44)
Compression spring squareness mm (in)		Limit	2.5 (0.098)
Clutch release cylinder			
Conical spring free length mm (in)		Standard	44.4 (1.748)
		Limit	41.5 (1.634)
Clutch master cylinder			
Compression spring free length mm (in)		Standard	87 (3.43)
		Limit	85.1 (3.35)
Clutch pedal			
Height (from toe board: with pad) mm (in)		Standard	145 – 150 (5.51 – 5.71)
Clutch pedal play mm (in)		Standard	5 – 10 (0.20 – 0.39)
Tightening torque Unit: N·m (kg-cm) [ft-lb]			
Clutch release cylinder set bolt		Standard	14.71 – 21.57 (150 ~ 220) [10.85 ~ 15.921
Clutch cover set bolt		Standard	↑

TORQUE CONVERTER

Transmission cover & control valve ASSY		
Shift lever operating force N (kg) [lb]	Standard	34.3 – 53.9 (3.5 – 5.5) [7.7 – 12.11
Regulator valve spring free length mm (in)	Standard	88.8 (3.496)
	Limit	85.0 (3.346)
Inching valve spring free length rnm (in)	Standard	34.5 (1.358)
	Limit	33.0 (1.299)
Inching valve spring free length (compression) mm (in)	Standard	49.4 (1.945)
	Limit	47.0 (1.850)
Modulator valve spring free length mrn (in)	Standard	50.5 (1.988)
	Limit	48.5 (1.909)
Orifice valve spring free length mm (in)	Standard	30.0 (1.181)
	Limit	28.5 (1.122)
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 rnm (in)	Limit	0.4 (0.016)
Oil pimp 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 bush to stator shaft clearance mm (in)	Limit	0.15 (0.0059)
Transmission		
Idle gear No.2 thrust clearance mm (in)	Standard	0.04 – 0.6 (0.0016 – 0.024)
Clutch shaft No.2 (forward) thrust clearance rnm (in)	Standard	0.05 – 0.55 (0.0020 – 0.0217)
Clutch shaft No.1 (reverse) thrust clearance mm (in)	Standard	0.15 – 0.75 (0.0059 – 0.0295)
Output shaft thrust clearance mrn (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	1.8 (0.071)
	Limit	1.6 (0.063)

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 0.65 – 1.2 (0.0256 – 0.047) 5-disc type 1.0 – 1.6 (0.039 – 0.063)
Clutch return spring free length mm (in)		Standard	92.1 (3.626)
		Limit	85.0 (3.346)
Clutch piston to piston ring clearance mm (in)		Standard	0.15 (0.0059)
Shift lever			
Instrument panel notch to lever clearance mm (in)		Standard	22 ± 4 (0.87 ± 0.16)
Inching pedal			
Height (from toe board: with pad) mm (in)		Standard	145 – 150 [5.71 – 5.911
Inching pedal play (reference) rnm (in)		Standard	3 – 5 10.12 – 0.201
Measurement and tests			
Stall speed rpm	5K	Standard	1950
	4Y	Standard	2100
	1DZ	Standard	2150
	22	Standard	2100
Main pressure kPa (kg/cm^2) [psi]	At idling	Standard	490 – 981 (5.0 – 10.0) [71 – 142]
	At 2000 rpm	Standard	932 – 1373 (9.5 – 14.0) [135 – 199]
Clutch pressure kPa (kg/cm^2) [psi]	At idling	Standard	441 – 834 (4.5 – 8.5) [64 – 1211
	At 2000 rpm	Standard	883 – 1373 (9.0 – 14.0) [128 – 199]
Torque converter pressure (outlet pressure) kPa (kg/cm^2) [psi]	At 2000 rpm	Standard	200 – 590 (2 – 6) 130 – 901
Tightening torque Unit: **N·m (kg-cm) [ft-lb]**			
Stator shaft set bolt		Standard	9.81 – 15.69 (100 – 160) [7.24 – 11.581
Oil strainer set bolt		Standard	↑
Oil pan set bolt		Standard	5.88 – 7.85 (60 – 80) 14.34 – 5.791
Idle shaft		Standard	4.90 – 9.81 (50 – 100) 13.62 – 7.241
Idle shaft set bolt		Standard	3.92 – 6.86 (40 – 70) [2.89 – 5.061
Front cover set bolt		Standard	18.63 – 30.40 (190 – 310) [13.75 – 22.431

Side cover set bolt	Standard	3.92 – 6.86 (40 – 70) [2.89 – 5.061
Transmission cover (upper cover) set bolt	Standard	9.81 – 15.69 (100 ~ 160) [7.24 ~ 11.581

TORQUE CONVERTER (For ▮ SPEED: 1995.5 –)

Transmission cover & control valve ASSY		
Shift lever operating force (Reference) N (kgf) [lbf]	Standard	34.3 – 53.9 (3.5 – 5.5) [7.7 – 12.11
Regulator valve spring free length mm (in)	Standard	91.0 (3.583)
	Limit	86.5 (3.406)
Inching valve spring free length mm (in)	Standard	42.0 (1.654)
	Limit	40.0 (1.575)
Inching valve compression spring free length (Plug side) mm (in)	Standard	40.0 (1.575)
	Limit	38.0 (1.496)
Modulator valve spring free length (Outer) mm (in)	Standard	48.0 (1.890)
	Limit	46.0 (1.811)
Modulator valve spring free length (Inner) mm (in)	Standard	46.0 (1.811)
	Limit	44.0 (1.732)
Orifice valve spring free length mm (in)	Standard	50.0 (1.969)
	Limit	47.5 (1.870)
Detent lever lock spring free length mm (in)	Standard	33.5 (1.319)
	Limit	32.0 (1.260)
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)
Transmission		
Clutch shaft No.1 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	1.0 – 1.6 (0.039 – 0.063))

Clutch return spring free length mm (in)		Standard	63.4 (2.496)
		Limit	58.5 (2.303)
Clutch piston to piston ring clearance mm (in)		Standard	0.17 (0.0067)
Shift lever			
Instrument panel notch to lever clearance mm (in)		Standard	22 ± 4 (0.87 ± 0.16)
Inching pedal			
Height (from toe board: with pad) mm (in)		Standard	145 – 150 (5.71 – 5.91)
Inching pedal play (reference) mm (in)		Standard	3 – 5 (0.12 – 0.20)
Measurement and tests			
Stall speed rpm	5K	Standard	1950
	4Y	Standard	2100
	1DZ	Standard	2150
	2Z	Standard	2100
Main pressure kPa (kgf/cm^2) [psi]	At idling	Standard	196 – 441 (2.0 ~ 4.5) [28 ~ 641
	At 2000 rpm	Standard	932 – 1275 (9.5 – 13.0) [135 ~ 1851
Clutch pressure kPa (kgf/cm^2) [psi]	At idling	Standard	196 – 441 (2.0 ~ 4.5) [28 ~ 641
	At 2000 rpm	Standard	883 – 1226 (9.0 – 12.5) [128 – 178]
Torque converter pressure (outlet pressure) kPa (kgf/cm^2) [psi]	At 2000 rpm	Standard	200 – 590 (2 – 6) [30 – 901
Tightening torque Unit: N·m (kgf-cm) [ft-lbf]			
Stator shaft set bolt		Standard	9.81 – 15.69 (100 ~ 160) [7.24 ~ 11.581
Oil pump set bolt		Standard	9.81 – 18.63 (100 – 190) [7.24 – 13.75]
Oil strainer set bolt		Standard	9.81 – 15.69 (100 ~ 160) [7.24 ~ 11.581
Oil pan set bolt		Standard	5.88 – 7.85 (60 – 80) [4.34 – 5.791
Idle shaft		Standard	4.90 – 9.81 (50 – 100) [3.62 – 7.241
Idle shaft set bolt		Standard	3.92 – 6.86 (40 – 70) [2.89 – 5.061
Front cover set bolt		Standard	18.63 – 30.40 (190 – 310) [13.75 – 22.431
Transmission output cover		Standard	↑
Transmission cover (upper cover) set bolt		Standard	9.81 – 15.69 (100 – 160) [7.24 – 11.581

TRANSMISSION

Transmission ASSY			
Link shaft outside diameter mm (in)		Standard	15.0 (0.591)
		Limit	14.9 (0.587)
Shift fork front end thickness mm (in)		Standard	9.7 (0.382)
		Limit	9.2 (0.362)
Shift fork to clutch hub sleeve clearance mm (in)		Limit	1.0 (0.039)
Input shaft bend mm (in)		Limit	0.1 (0.004)
Each gear backlash mm (in)		Standard	0.03 – 0.18 (0.0012 – 0.007)
		Limit	0.25 (0.0098)
Counter-gear thrust clearance mm (in)		Standard	0.1 – 0.2 (0.004 – 0.008)
		Limit	0.3 (0.012)
Trans-idle gear thrust clearance mm (in)		Standard	0.1 – 0.25 (0.004 – 0.009)
		Limit	0.4 (0.016)
Reverse idle gear thrust clearance mm (in)		Standard	0.1 – 0.4 (0.004 – 0.016)
		Limit	0.7 (0.028)
Counter-gear bushing outside diameter mm (in)		Standard	44.0 (1.732)
		Limit	43.9 (1.728)
Synchronizer ring to gear clearance mm (in)	For forward and reverse	Standard	1.10 – 2.30 (0.0433 – 0.0906)
		Limit	0.3 (0.012)
	For 1st and 2nd	Standard	1.10 – 1.90 (0.0433 – 0.0748)
		Limit	0.3 (0.012)
Idle gear thrust washer thickness mm (in)		Limit	2.7 (0.106)
Trans-idle shaft outside diameter mm (in)	Clutch side	Standard	32.0 (1.260)
		Limit	31.9 (1.256)
	Differential side	Standard	25.0 (0.984)
		Limit	24.9 (0.980)
Reverse idle gear washer thickness mm (in)	Clutch side	Limit	2.6 (0.102)
	Differential side	Limit	2.7 (0.106)

Tightening torque Unit: N·m (kg-cm) [ft-lb]		
Transmission case connecting bolt	Standard	49.03 - 78.45(500 - 800)[36.18 - 57.881
Joint yoke stopper set bolt	Standard	35.30 - 40.21 (360 - 410) [26.05 - 29.661
Idle gear shaft set bolt	Standard	14.71 - 21.57(150 - 220)[10.85 - 15.921
Counter-shaft lock nut	Standard	166.71 - 225.55(1700 - 2300)[123.00 - 166.41l
Front cover set bolt	Standard	14.71 - 21.57(150 - 220)[10.85 - 15.921
Rear cover set bolt	Standard	↑
Lower rear cover set bolt	Standard	↑
Fork shaft taper bolt	Standard	40.21 - 53.94(410 - 550) [29.66 - 39.791
Shift link bracket set bolt	Standard	29.42 - 44.13(300 - 450)[21.71 - 32.561
Link shaft stopper plate set bolt	Standard	9.81 - 15.69(100 - 160)[7.24 - 11.581
Transmission upper cover set bolt	Standard	↑
Shift rod set nut	Standard	34.32 - 53.94(350 - 550)[13.78 - 21.651
Brace rod set nut	Standard	88.26 - 117.68(900 - 1200)[35.43 - 47.24]
Shift lever set nut	Standard	↑

DIFFERENTIAL

Differential			
Ring gear backlash mm (in)	1.2ton series	Standard	0.2 - 0.3(0.008 - 0.012)
	3 ton series	Standard	0.3 - 0.4(0.012 - 0.016)
Ring gear runout mm (in)	1 ton series only	Limit	0.1(0.004)
Thrust screw cap length mm (in)		Standard	13.0(0.512)
		Limit	12.2(0.480)
Thrust screw cap to ring gear rear face clearance mm (in)		Standard	0.2 - 0.3(0.008~ 0.012)
Side gear and pinion gear backlash mm (in)		Standard	0.2 - 0.3(0.008 - 0.012)
Output gear and reduction gear backlash mm (in)		Standard	0.1 - 0.2(0.004 - 0.008)
Drive pinion bearing starting torque N·m (kg-cm) [ft-lb]	1.2ton series	Standard	10.79 - 13.24(110 - 135)[7.96 - 9.771
	3 ton series	Standard	11.28 - 13.73(115 - 140)[8.32 - 10.131

Tightening torque Unit: N·m (kg-cm) [ft-lbl			
Carrier bracket set bolt		Standard	49.03 – 78.45 (500 – 800) [36.18 – 57.681
Differential carrier set bolt		Standard	↑
Front axle bracket set bolt		Standard	235.36 – 294.20 (2400 – 3000) [173.64 – 217.051
Transmission (or torque converter) case mount bolt		Standard	49.03 – 88.26 (500 – 900) 136.18 – 65.121
Propeller shaft set bolt		Standard	35.30 – 40.21 (360 – 410) 126.05 – 29.661
Propeller shaft cover set bolt		Standard	9.81 – 15.69 (100 – 160) [7.24 – 11.581
Axle shaft set bolt	1·2 ton series	Standard	68.65 – 88.26 (700 – 900) 150.65 – 65.121
	3 ton series	Standard	98.07 – 127.49 (1000 – 1300) [72.35 – 94.06]
Output gear lock nut		Standard	343.23 – 392.27 (3500 – 4000) L253.23 – 289.401
Drive pinion bearing retainer set bolt		Standard	88.26 – 117.68 (900 – 1200) [65.12 – 86.821
Differential carrier cover set bolt		Standard	29.42 – 44.13 (300 – 450) [21.71 – 32.561
Ring gear set bolt		Standard	127.49 – 176.52 (1300 – 1800) [94.06 – 130.231
Differential upper case set bolt	1.2 ton series	Standard	43.15 – 53.94 (440 – 550) [31.83 – 39.791
	3 ton series	Standard	86.30 – 102.97 (880 – 1050) [63.67 – 75.971
Differential case bearing cap set bolt		Standard	117.68 – 137.29 (1200 – 1400) [86.82 – 101.291
Thrust screw lock nut	1 ton series only	Standard	102.97 – 127.49 (1050 – 1300) [75.97 – 94.061
Brake ASSY set nut (backing plate self lock nut)		Standard	117.68 – 137.29 (1200 – 1400) [86.82 – 101.291

FRONT AXLE

Front axle shaft hub				
Front axle bearing starting force N (kg) [lb]	1 ton series	Divided rim hub	Standard	25.5 – 72.6 (2.6 – 7.4) [5.7 – 16.31
		Side ring rim hub	Standard	32.4 – 92.2 (3.3 – 9.4) L7.3 – 20.71
	2·3 ton series		Standard	25.5 – 72.6 (2.6 ~ 7.4) 15.7 ~ 16.31
Tightening torque Unit: N·m (kg-cm) [ft-lbl				
Brake drum set nut (hub bolt set nut)	1 ton series		Standard	68.65 – 88.26 (700 – 900) [57.88 – 79.591
	2 ton series		Standard	147.10 – 186.33 (1500 – 1900) [108.53 – 137.47]
	3 ton series		Standard	166.71 – 205.94 (1700 – 2100) [123.00 – 151.941
Bearing lock nut stopper bolt			Standard	14.71 – 21.57 (150 – 220) [10.85 – 15.921

Axle shaft set bolt		1·2 ton series	Standard	68.65 – 88.26 (700 – 900) [50.65 – 86.821
		3 ton series	Standard	98.07 – 127.49 (1000 – 1300) [72.35 – 94.061
Divided rim set nut (1·2 ton series only)		1 ton series	Standard	49.03 – 68.65 (500 – 700) [36.18 – 50.651
		2 ton series	Standard	117.68 – 176.52 (1200 – 1800) [86.82 – 130.231
Front wheel hub nut (single tire)	1 ton series	Divided rim	Standard	107.87 – 196.13 (1100 – 2000) [79.59 – 144.701
		Side ring rim	Standard	176.52 – 392.27 (1800 – 4000) [130.23 – 289.401
	2 ton series	Divided rim	Standard	↑
		Side ring rim	Standard	↑
	3 ton series		Standard	294.20 – 588.40 (3000 – 6000) [217.05 – 434.101
Front wheel hub nut (double tire)	1 ton series	Inside	Standard	176.52 – 392.27 (1800 – 4000) [130.23 – 289.401
		Outside	Standard	↑
	2 ton series	Inside	Standard	↑
		Outside	Standard	↑
	3 ton series	Inside	Standard	294.20 – 588.40 (3000 – 6000) [217.05 – 434.101
		Outside	Standard	↑

REAR AXLE

Rear axle **ASSY**			
Rear axle ASSY front to rear clearance mm (in)		Standard	0.5 (0.020) or less
Rear axle center pin 'bushing inside diameter mm (in)		Limit	52.0 (2.047)
Bellcrank and tie rod			
Bellcrank pin outside diameter mm (in)		Standard	28.0 (1.102)
		Limit	27.8 (1.094)
Bellcrank upper face to rear axle beam clearance mm (in)		Standard	0.5 (0.020) or less
Rear axle hub and steering knuckle			
Rear axle hub starting force (at hub bolt) N (kg) [lb]	1 ton series	Standard	14.7 – 39.2 (1.5 – 4.0) [3.3 – 8.81
	2.3 ton series	Standard	14.7 – 44.1 (1.5 – 4.5) [3.3 – 9.91
King pin outside diameter 'mm (in)		Standard	28.0 (1.102)
		Limit	27.8 (1.094)
Steering knuckle starting force (at front end of knuckle) N (kg) [lb]		Standard	14.7 – 39.2 (1.5 – 4.0) [3.3 – 8.81

Rear wheel alignment				
Toe-in mm (in)			Standard	0*4 (0±0.16)
Minimum turning radius mm (in)		1.0 ton model	Standard	1880 (74.02)
		1.35 ton model	Standard	1920 (75.59)
		1.5 ton model	Standard	1960 (77.17)
		1.75 ton model	Standard	1980 (77.95)
		2.0 ton model	Standard	2170 (85.43)
		2.25 ton model	Standard	2200 (86.61)
		2.5 ton model	Standard	2240 (88.19)
		2.75 ton model	Standard	2370 (93.31)
		3.0 ton model	Standard	2400 (94.49)
Tightening torque Unit: N·m (kg-cm) [ft-lb]				
Axle bracket cap set bolt			Standard	117.68 - 166.71 (1200 - 1700) [86.82 - 123.01
Rear axle damper set bolt			Standard	186.33 - 304.01 (1900 - 3100) [137.47 - 224.291
Tie rod end			Standard	117.68 - 147.10 (1200 - 1500) [86.82 - 108.531
Tie rod end castle nut		1.2 ton series	Standard	68.65 - 98.07 (700 - 1000) [50.65 - 72.351
		3 ton series	Standard	147.10 - 196.13 (1500 - 2000) [108.53 - 144.701
King pin lock bolt and lock nut			Standard	19.61 - 31.38 (200 - 320) [14.47 - 23.151
Divided rim bolt set nut		1 ton series	Standard	29.42 - 44.13 (300 - 450) [21.71 - 32.561
		2.3 ton series	Standard	49.03 - 68.65 (500 - 700) [36.18 - 50.651
Hub nut	1 ton series	Divided rim	Standard	88.26 - 156.91 (900 - 1600) [65.12 - 115.761
		Side ring rim	Standard	↑
	2 ton series	Divided rim	Standard	117.68 - 196.13 (1200 - 2000) [86.82 - 144.701
		Side ring rim	Standard	176.52 - 392.27 (1800 - 4000) [130.23 - 289.40]
		6.50-10-10 PR (OPT)	Standard	117.68 - 196.13 (1200 - 2000) [86.82 - 144.701
	3 ton series	Divided rim	Standard	↑
		Side ring rim	Standard	↑

STEERING

Steering gear box ASSY			
Steering shaft overall starting force (measured with SST) N (kg) [lb]		Standard	2.0 - 5.9 (0.2 - 0.6) 10.44 - 1.31
Pitman arm backlash mm (in)	At lock-to-lock center	Standard	0 (0)
	At end of clockwise/counterclockwise turn	Standard	0.1 - 1.5 (0.004 - 0.059)
Sector shaft to adjusting plate clearance mm (in)		Limit	0.1 (0.004)
Ball screw set starting force (measured with SST) N (kg) [lb]		Standard	0.98 - 2.9 (0.1 - 0.3) [0.22 - 0.661
Power steering relief pressure kPa (kg/cm^2) [psi]	1 ton series	Standard	5880±490 (60±5) [850±701
	2.3 ton series	Standard	8040±490 (82±5) [1170±701
Power cylinder			
Piston ring joint clearance mm (in)		Standard	0.05 - 0.25 (0.0020 - 0.0098)
		Limit	0.8 (0.031)
Piston rod outside diameter mm (in)	1·2 ton series	Standard	22 (0.87)
		Limit	21.92 (0.8634)
	3 ton series	Standard	25 (0.98)
		Limit	24.92 (0.9811)
Piston rod bend mm (in)		Limit	0.5 (0.020)
Cylinder bore mm (in)	1 ton series	Standard	45 (1.77)
		Limit	45.20 (1.7795)
	2 ton series	Standard	50 (1.97)
		Limit	50.20 (1.9764)
	3 ton series	Standard	55 (2.17)
		Limit	55.35 (2.1791)
Tightening torque **Unit: N·m (kg-cm) [ft-lb]**			
Steering universal joint set bolt		Standard	17.65 - 24.52 (180 - 250) 113.02 - 18.091
Mast jacket set nut		Standard	34.32 - 53.94 (350 - 550) 125.32 - 39.791
Steering wheel set nut		Standard	19.61 - 29.42 (200 - 300) 114.47 - 21.71]
Steering gear box set bolt and nut		Standard	49.03 - 78.45 (500 - 800) 136.18 - 57.881
Drag link end castle nut	1·2 ton series	Standard	68.65 - 98.07 (700 - 1000) 150.65 - 72.351
	3 ton series	Standard	147.10 - 196.13 (1500 - 2000) [108.53 - 144.701

Gear box top cover set bolt	1 ton series	Standard	44.13 – 53.94 (450 – 550) 132.56 – 39.791
	2.3 ton series	Standard	34.32 – 44.13 (350 – 450) 125.32 – 32.561
Gear box end cover set bolt	1 ton series	Standard	39.23 – 49.03 (400 – 500) 128.94 – 36.181
	2·3 ton series	Standard	34.32 – 44.13 (350 – 450) 125.32 – 32.561
Gear box side cover set bolt	1 ton series	Standard	44.13 – 53.94 (450 – 550) 132.56 – 39.791
	2.3 ton series	Standard	34.32 – 44.13 (350 – 450) 125.32 – 32.561
Sector shaft adjusting bolt lock nut	1 ton series	Standard	29.42 – 44.13 (300 – 450) 121.71 – 32.561
	2.3 ton series	Standard	24.52 – 34.32 (250 – 350) [18.09 – 25.321
Sector shaft adjusting bolt cap nut	1 ton series	Standard	29.42 – 44.13 (300 – 450) 121.71 – 32.561
	2.3 ton series	Standard	24.52 – 29.42 (250 – 300) [18.09 – 21.711
Pitrnan arm set nut	1 ton series	Standard	156.91 – 196.13 (1600 – 2000) [115.76 – 144.701
	2.3 ton series	Standard	↑
Power cylinder end castle nut	1.2 ton series	Standard	68.65 – 98.07 (700 – 1000) [50.65 – 72.351
	3 ton series	Standard	147.10 – 196.13 (1500 – 2000) [108.53 – 144.70]
Power cylinder piston lock nut		Standard	117.68 – 156.91 (1200 – 1600) [86.82 – 115.761
Power cylinder end lock nut		Standard	117.68 – 147.10 (1200 – 1500) 186.82 – 108.531
Drag link end lock nut		Standard	↑

BRAKE

Front brake (1 ton series)			
Hold down spring free length	rnm (in)	Standard	25.7 (1.012)
		Limit	23 (0.91)
Anchor to shoe spring free length	mm (in)	Standard	102 (4.02)
		Limit	Replace if any clearance in coil exists.
Strut to shoe spring free length	mm (in)	Standard	20 (0.79)
		Limit	17 (0.67)
Adjuster spring free length	mm (in)	Standard	79 (3.11)
		Limit	Replace if any clearance in coil exists.
Brake lining length	mm (in)	Standard	5.0 (0.197)
		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	31.3 (1.232)
			Limit	28.2 (1.110)
Actuator spring free length mm (in)			Standard	124.5 (4.902)
			Limit	Replace if any clearance in coil exists.
Anchor to shoe spring free length mm (in)			Standard	106 (4.17)
			Limit	Replace if any clearance in coil exists.
Strut to she spring free length mm (in)			Standard	23 (0.91)
			Limit	20 (0.79)
Adjuster spring free length mm (in)			Standard	86 (3.39)
			Limit	Replace if any clearance in coil exists.
Brake lining thickness mm (in)			Standard	7.0 (0.276)
			Limit	2.0 (0.08)
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)
Parking brake				
Parking brake operating force (measured at center of lever knob) N (kg) [lb]	1 ton series		Standard	147 - 196 (15 - 20) [33 - 441
	2.3 ton series		Standard	196 - 245 (20 - 25) [44 - 551
Brake pedal				
Brake pedal height (from toe board: with pad) mm (in)			Standard	145 - 150 (5.71 - 5.91)
Brake pedal play mm (in)			Standard	5 - 10 (0.20 - 0.39)
Brake pedal depressed height (with pad) mm (in)			Standard	70 (2.76) or more
Push rod play mm (in)	1 ton series		Standard	1 - 2 (0.04 - 0.08)
	2.3 ton series	Clutch model	Standard	1 - 2 (0.04 - 0.08)
		Torque converter model	Standard	0 - 1 (0 - 0.04)
Inching pedal height (from toe board: with pad) mm (in)			Standard	145 - 150 (5.71 ~ 5.91)
Inching pedal play (reference) mm (in)			Standard	3 - 5 (0.12 - 0.20)

Tightening torque	Unit: N·m (kg-cm) [ft-lb]		
Brake drum set nut (hub bolt set nut)	1 ton series	Standard	68.65 – 88.26 (700 – 900) 150.65 – 65.12]
	2 ton series	Standard	147.10 – 186.33 (1500 – 1900) [108.53 – 137.471
	3 ton series	Standard	166.71 – 205.94 (1700 – 2100) [123.00 – 151.941
Backing plate self lock nut		Standard	117.68 – 137.29 (1200 – 1400) [86.82 – 101.291
Wheel cylinder set bolt	1 ton series	Standard	7.85 – 11.77 (80 – 120) 15.79 – 8.681
	2·3 ton series	Standard	14.71 – 19.61 (150 – 200) 110.85 – 14.471

MATERIAL HANDLING SYSTEM

Natural drop test			
Natural drop mm (in)	1 ton series	Standard	90 (3.54) or less
	2 ton series	Standard	↑
	3 ton series	Standard	↑
Natural forward tilt test			
Natural forward tilt mm (in)	1 ton series	Standard	30 (1.18) or less
	2 ton series	Standard	45 (1.77) or less
	3 ton series	Standard	↑
Oil leak test			
Lift cylinder oil leak amount cc (cu-in)		Standard	16 (0.98) or less
Tile cylinder oil leak amount (total for lift and tilt) cc (cu-in)		Standard	32 (1.95) 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	↑
Lift bracket rollers	Middle and lower lift roller clearance mm (in)	Standard	↑
	Side roller clearance mm (in)	Standard	0 – 0.6 (0 – 0.024)
Mast strip to inner mast clearance mm (in)		Standard	0.5 – 1.0 (0.020 – 0.039)
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 (kg-cm) [ft-lb]		
Mast support cap set bolt	Standard	68.65 – 107.87 (700 – 1100) L50.65 – 79.591
Back rest set bolt	Standard	99.54 – 184.86 (1015 – 1885) [73.44 – 136.381
Chain adjusting nut	Standard	49.03 – 78.45 (500 – 800) L36.18 – 57.881

CYLINDERS

Lift cylinder					
Piston rod outside diameter mm (in)	V SV FSV	1 ton series	Standard	35 (1.38)
			Limit	34.92 (1.3748)
		2 ton series	Standard	40 (1.57)
			Limit	39.92 (1.5717)
		3 ton series	Standard	45 (1.77)
			Limit	44.92 (1.7685)
	FV	1 ton series	Standard	32 (1.26)
			Limit	31.92 (1.2567)
		2 ton series	Standard	35 (1.38)
			Limit	34.92 (1.3748)
		3 ton series	Standard	40 (1.57)
			Limit	39.92 (1.5717)
Lift cylinder bore mm (in)		1 ton series	Standard	45 (1.77)
			Limit	45.20 (1.7795)
		2 ton series	Standard	50 (1.97)
			Limit	50.20 (1.9764)
		3 ton series	Standard	55 (2.17)
			Limit	55.35 (2.1791)
Front lift cylinder (FV·FSV)				
Lift cylinder bore mm (in)		1 ton series	Standard	85 (3.35)
			Limit	85.40 (3.3622)
		2 ton series	Standard	90 (3.54)
			Limit	90.40 (3.5591)
		3 ton series	Standard	105 (4.13)
			Limit	105.40 (4.1496)

Piston rod outside diameter mm (in)	1 ton series	Standard	**70 (2.76)**
		Limit	**69.91 (2.7524)**
	2 ton series	Standard	**75** (2.95)
		Limit	**74.91 (2.9492)**
	3 ton series	Standard	**85** (3.35)
		Limit	**84.90(3.3425)**
Tilt cylinder			
Cylinder bore mm (in)		Standard	**70.0(2.756)**
		Limit	**70.35(2.7697)**
Piston rod outside diameter mm (in)		Standard	**30.0(1.181)**
		Limit	**29.92(1.1780)**
Piston rod bend mm (in)		Limit	1.0 **(0.039)**
Tightening torque Unit: N·m (kg-cm) [ft-lb]			
Lift cylinder cover		Standard	**284.39 - 421.69(2900 - 4300)**[209.82 - **311.11**]
Flow regulator valve		Standard	**58.84 - 68.65(600 - 700)**[43.41 - **50.651**
Safety down valve		Standard	**29.42 - 39.23(300 -** 400) [21.71 - **28.941**
Front lift cylinder rod guide		Standard	**343.23 - 441.30(3500 - 4500)**[253.23 - **325.581**
Tilt cylinder piston castle nut		Standard	**284.39 - 343.23(2900 - 3500)t209.82 - 253.231**
Tile cylinder rod joint set bolt		Standard	**60.90 -** 11**3.17(621 -** 1154) [44.93 - **83.491**
Tilt cylinder cover		Standard	**284.39 - 421.69(2900 - 4300)**[209.82 - **311.11**]

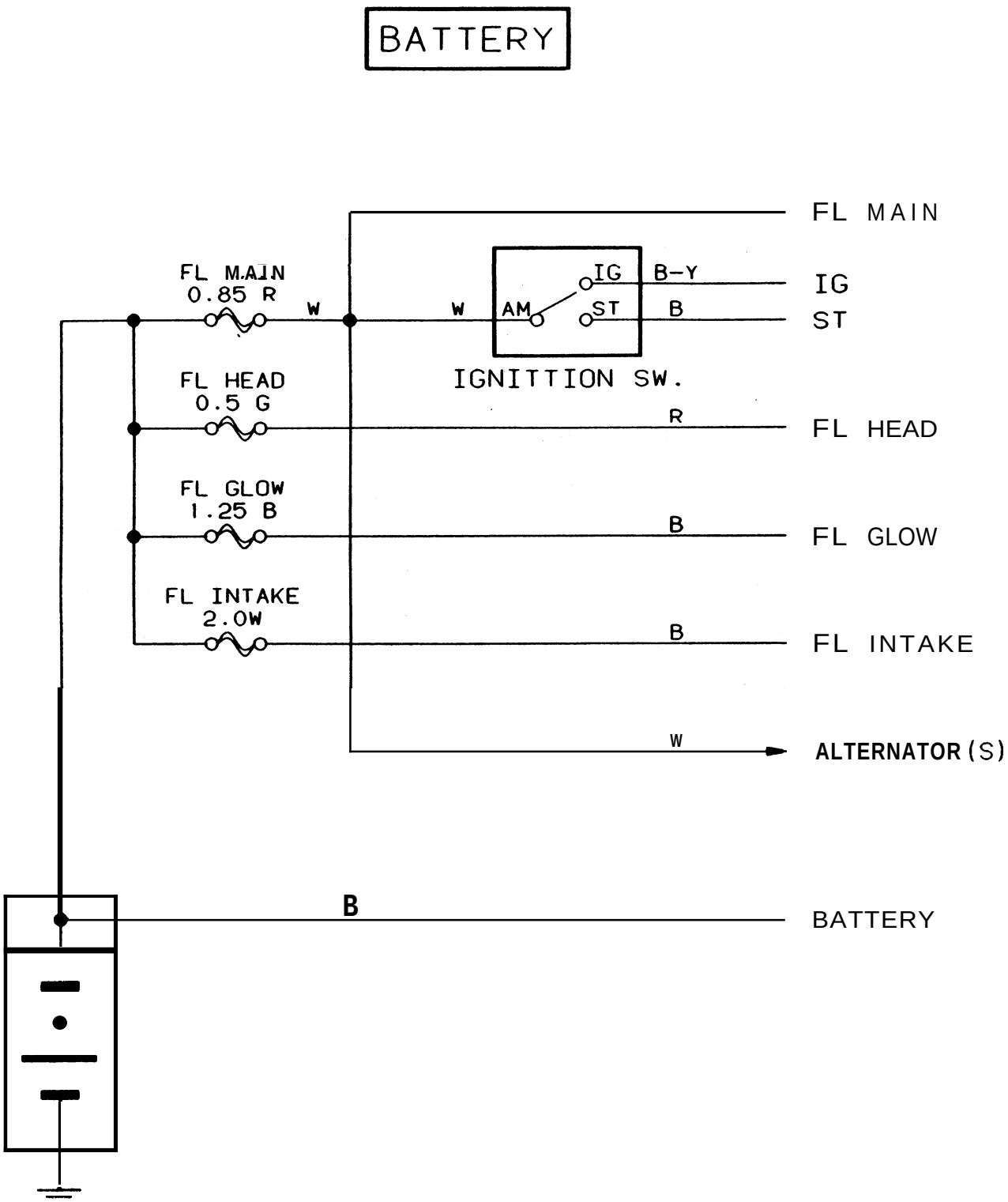
OIL PUMP

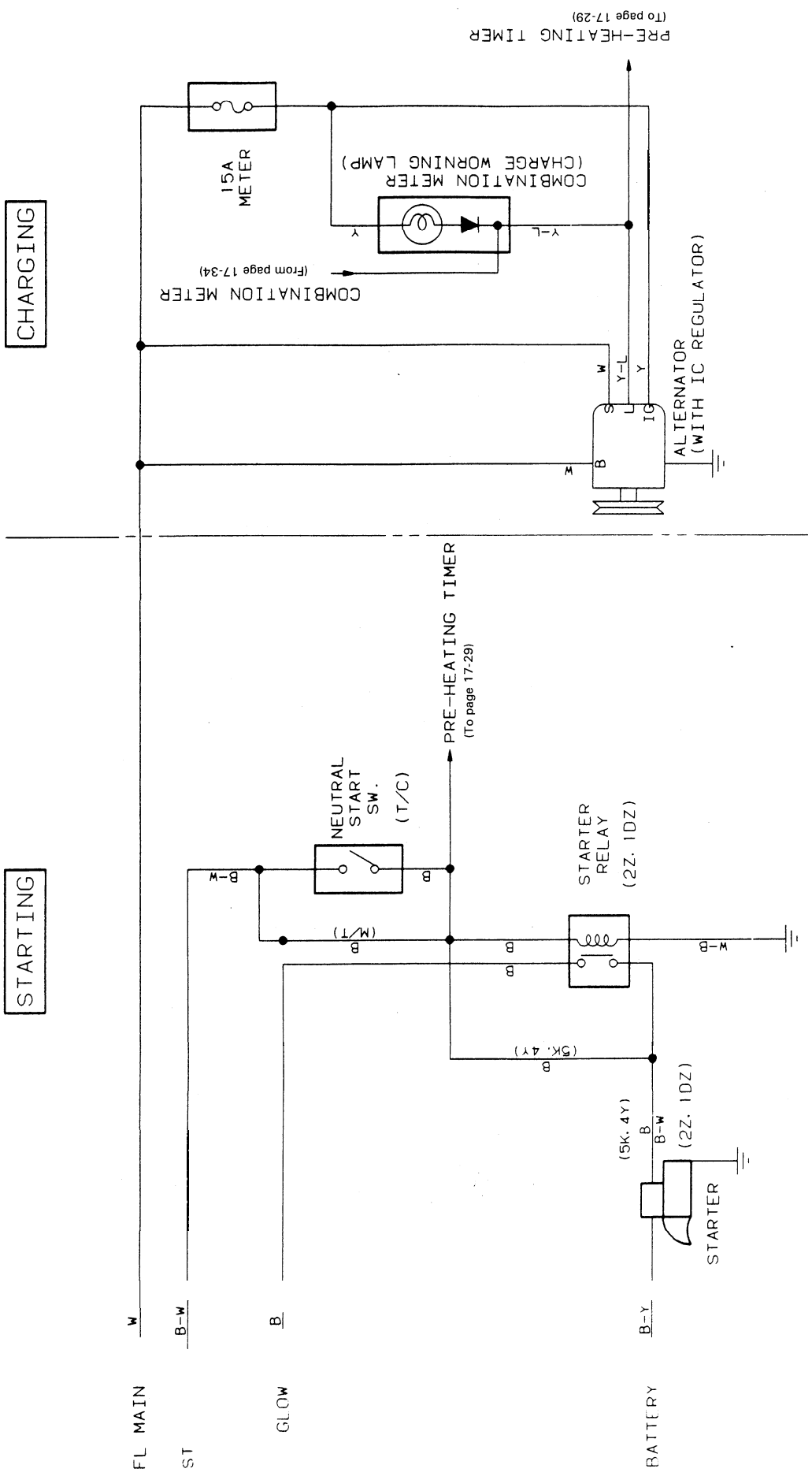
Oil **pump ASSY (5K·4Y·1DZ)**			
Bushing inside diameter	mm (in)	Limit	19.123 (0.75287)
Bushing axial length	mm (in)	Limit	26.411 (1.03980)
Gear shaft outside diameter	mm (in)	Limit	18.935 (0.74547)
Body inside surface flaw depth	mm (in)	Limit	0.1 (0.004)
Oil **pump ASSY (2Z)**			
Bushing inside diameter	mm (in)	Limit	22.23 (0.8752)
Side plate thickness	mm (in)	Limit	2.70 (0.1063)
Gear shaft outside diameter	mm (in)	Limit	21.95 (0.8642)
Body inside surface flaw depth	mm (in)	Limit	0.15 (0.0059)

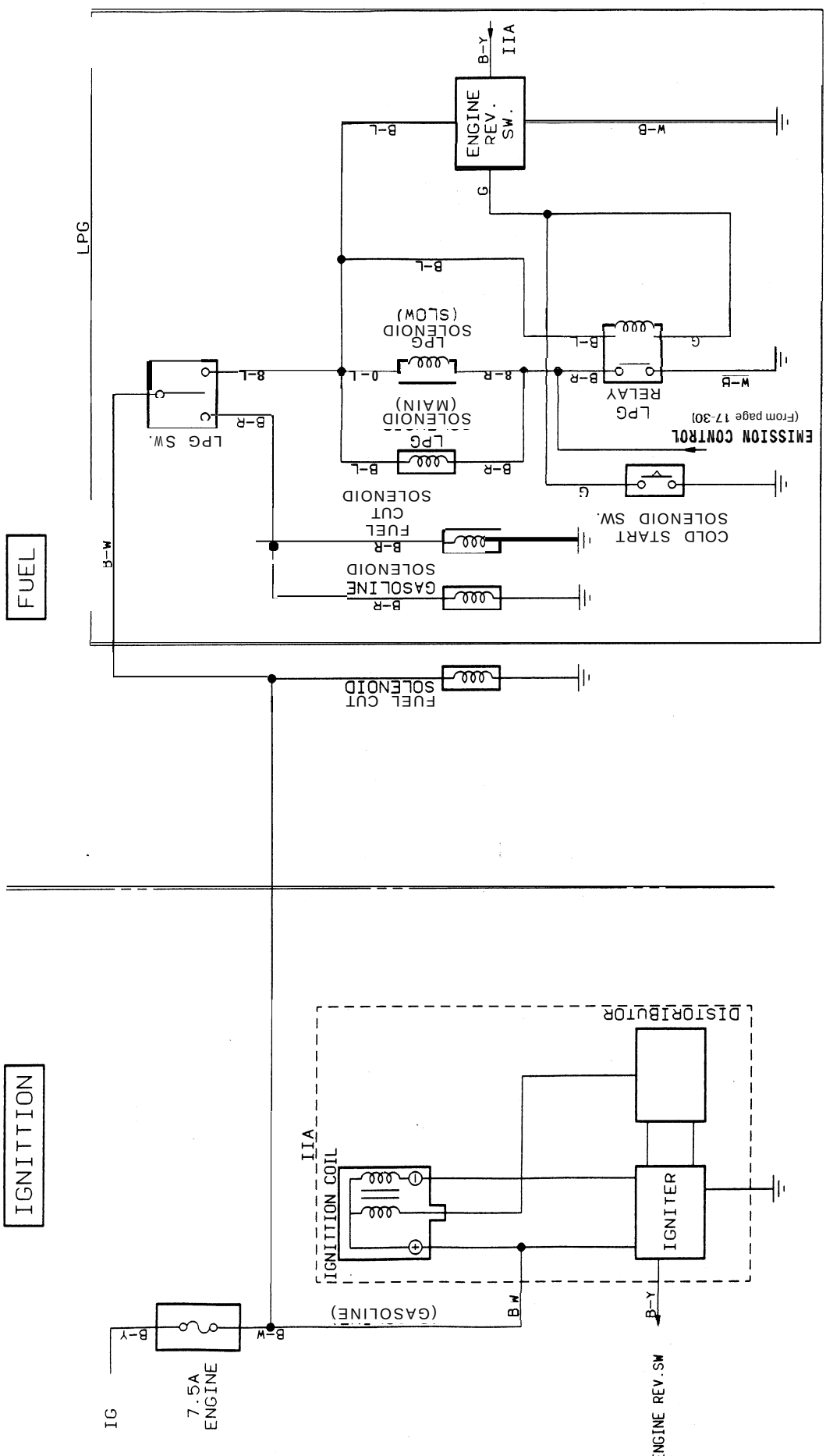
OIL CONTROL VALVE

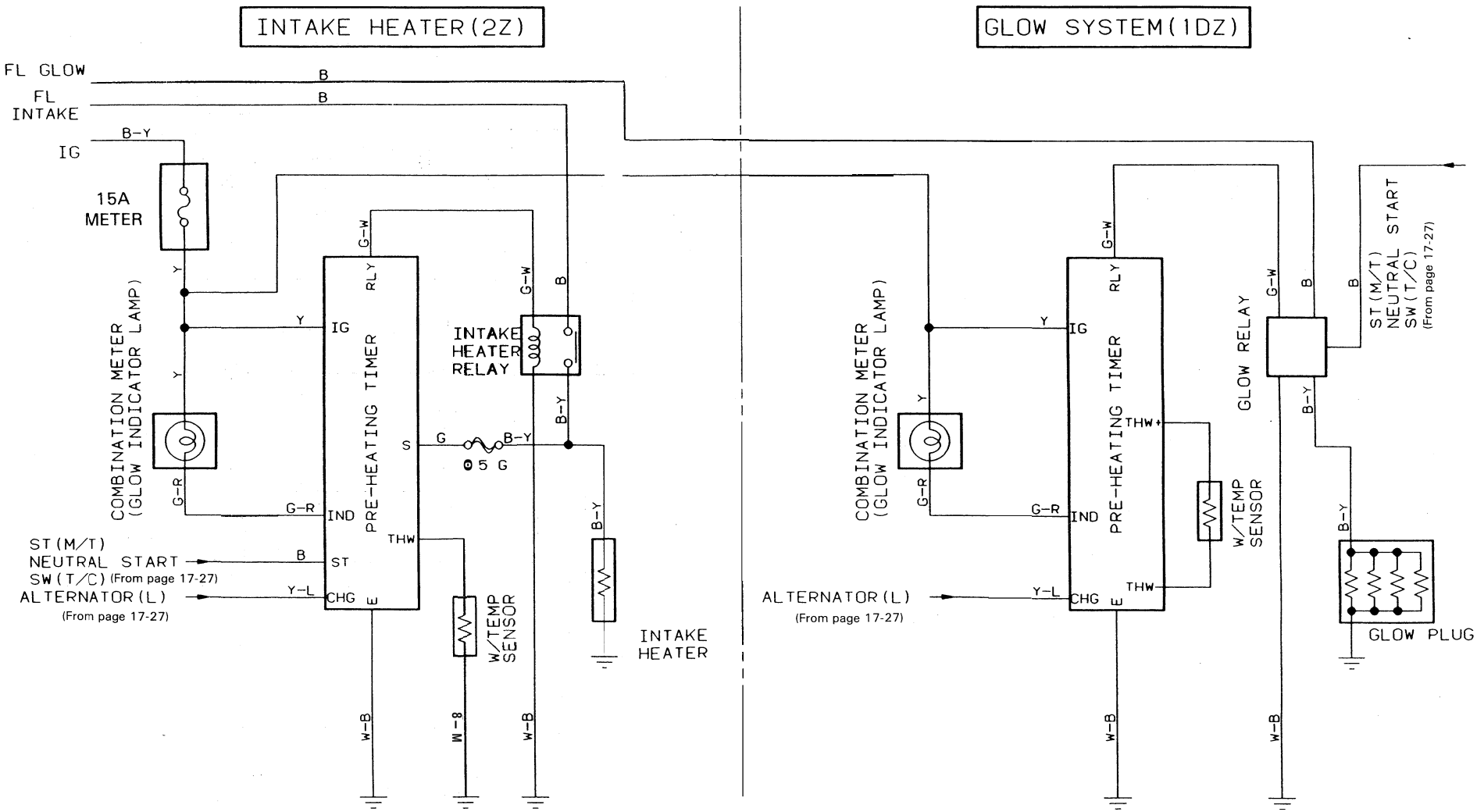
Oil control **valve**						
Relief set pressure kPa (kg/cm^2) (psi)	Lift	1 ton series	Standard	$17160\ ^{+490}_{0}$	$(175\ ^{+5}_{0})$	$[2490\ ^{+70}_{0}]$
		2·3 ton series	Standard	$18140\ ^{+490}_{0}$	$(185\ ^{+5}_{0})$	$[2630\ ^{+70}_{0}]$
	Tilt	1 ton series	Standard	$11770\ ^{+490}_{0}$	$(120\ ^{+5}_{0})$	$[1710\ ^{+70}_{0}]$
		2.3 ton series	Standard	$14710\ ^{+490}_{0}$	$(150\ ^{+5}_{0})$	$[2130\ ^{+70}_{0}]$

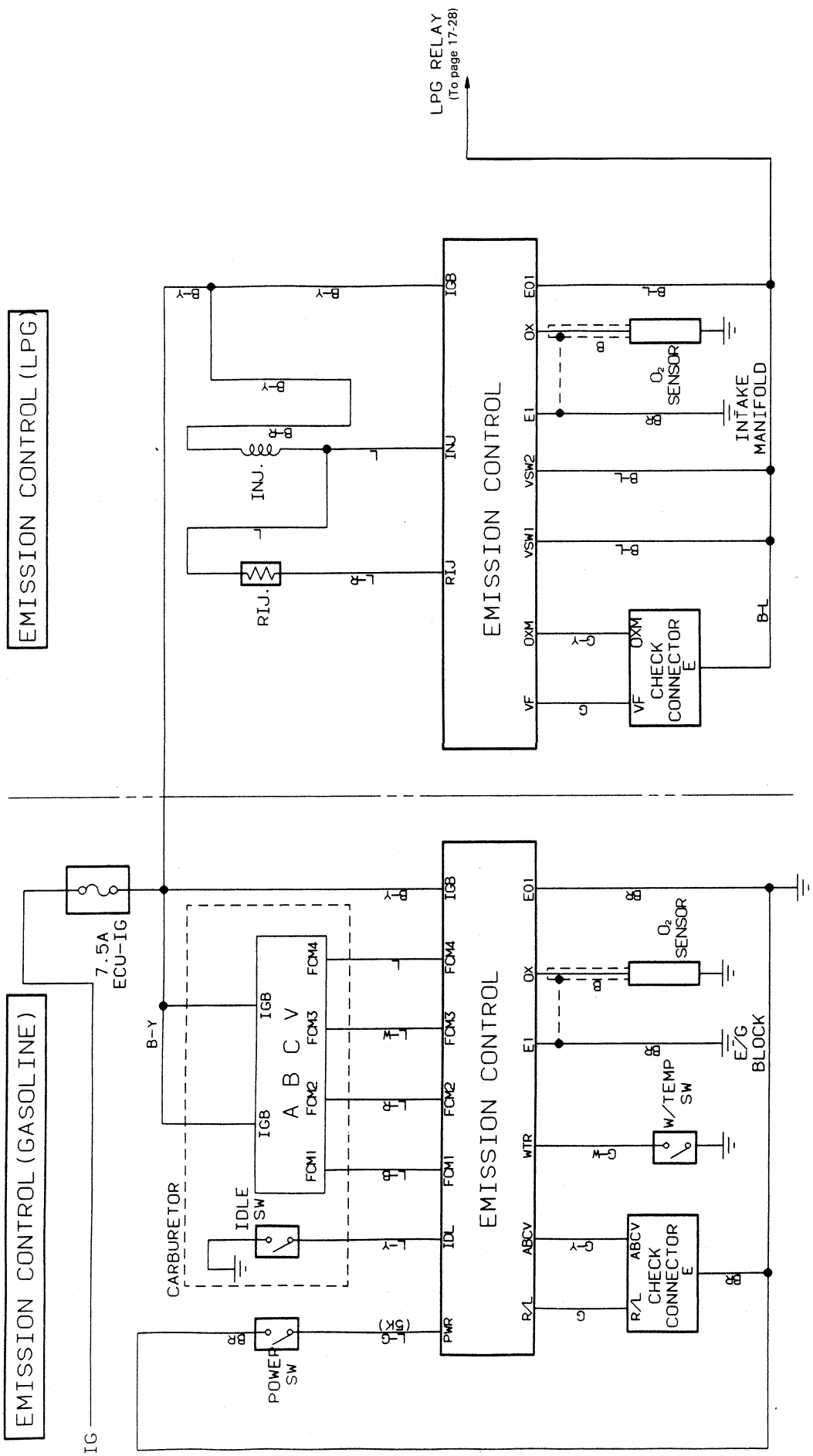
WIRING DIAGRAM

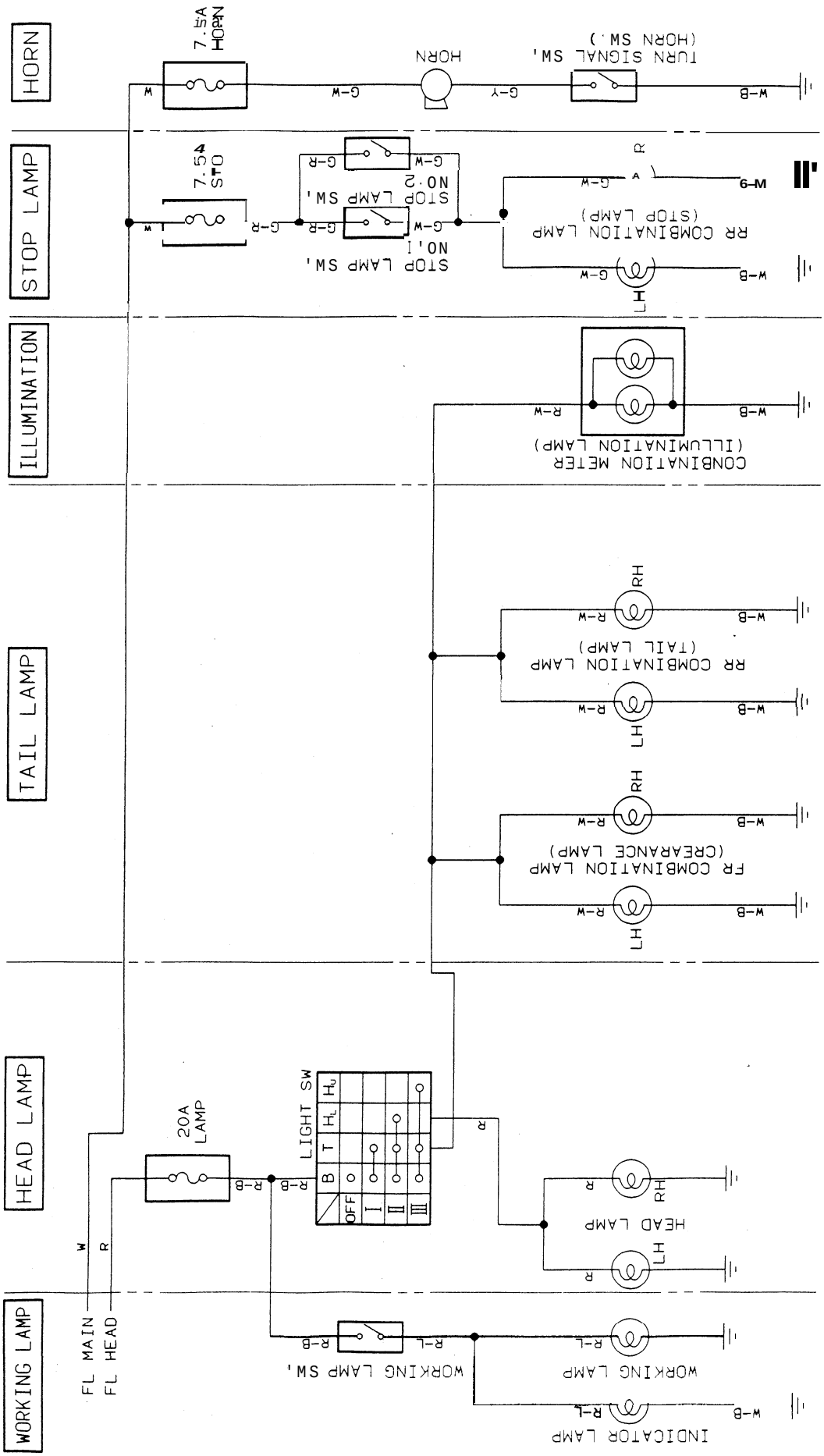

BATTERY
FL MAIN
FL MAIN
0.85 R
W
W
AM
IG
ST
B-Y
B
IG
ST
IGNITTION SW.
FL HEAD
0.5 G
R
FL HEAD
FL GLOW
1.25 B
B
FL GLOW
FL INTAKE
2.0W
B
FL INTAKE
W
ALTERNATOR (S)
B
BATTERY

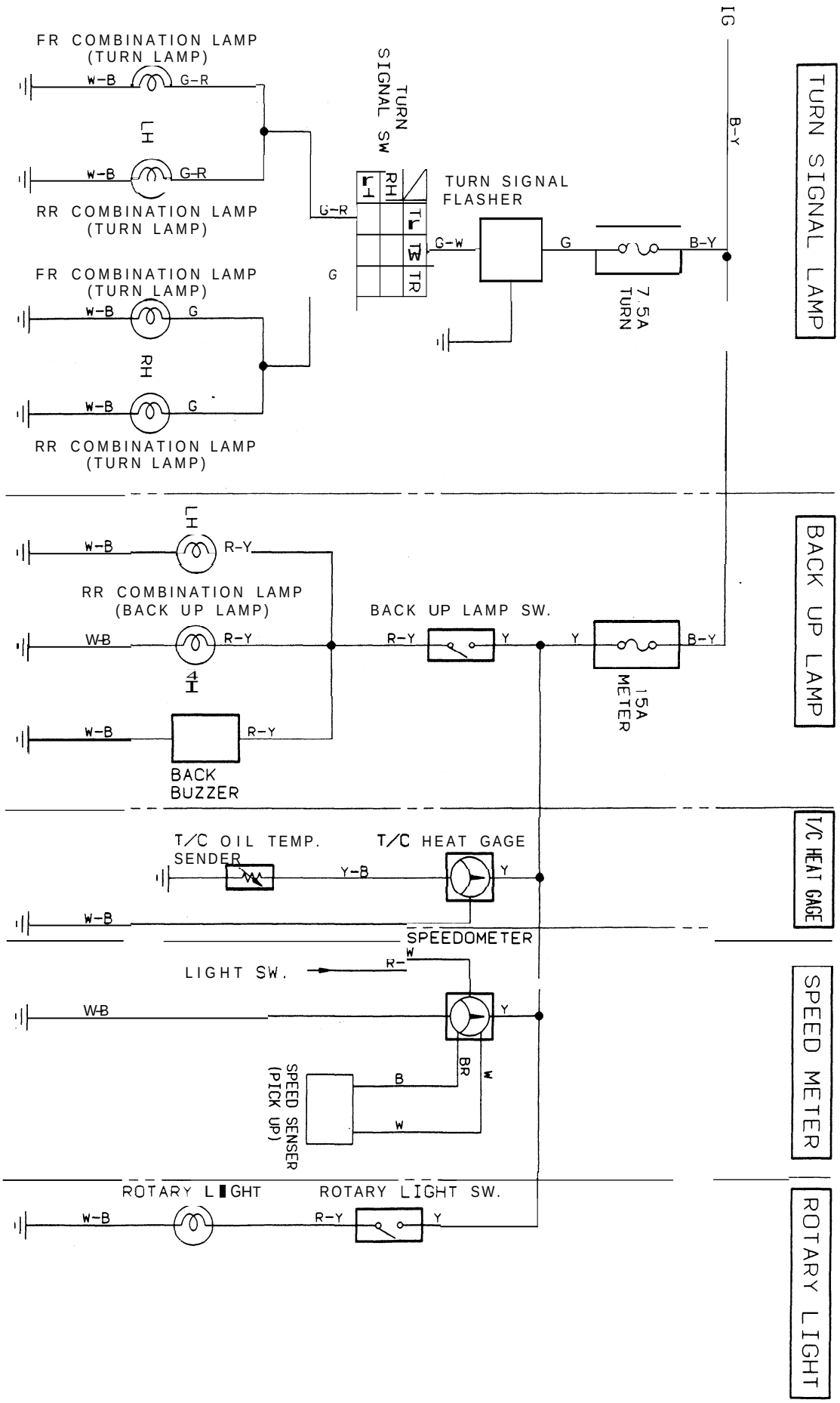

CHARGING
STARTING
PRE-HEATING TIMER
(To page 17-29)
15A METER
COMBINATION METER (CHARGE WORNING LAMP)
COMBINATION METER
(From page 17-34)
ALTERNATOR (WITH IC REGULATOR)
S
L
IG
B
M
W
Y-L
Y
NEUTRAL START SW. (T/C)
STARTER RELAY (2Z. 1DZ)
(M/T)
B-W
W-B
(5K. 4Y)
(2Z. 1DZ)
STARTER
FL MAIN
ST
GLOW
BATTERY
W
B-W
B
B-Y

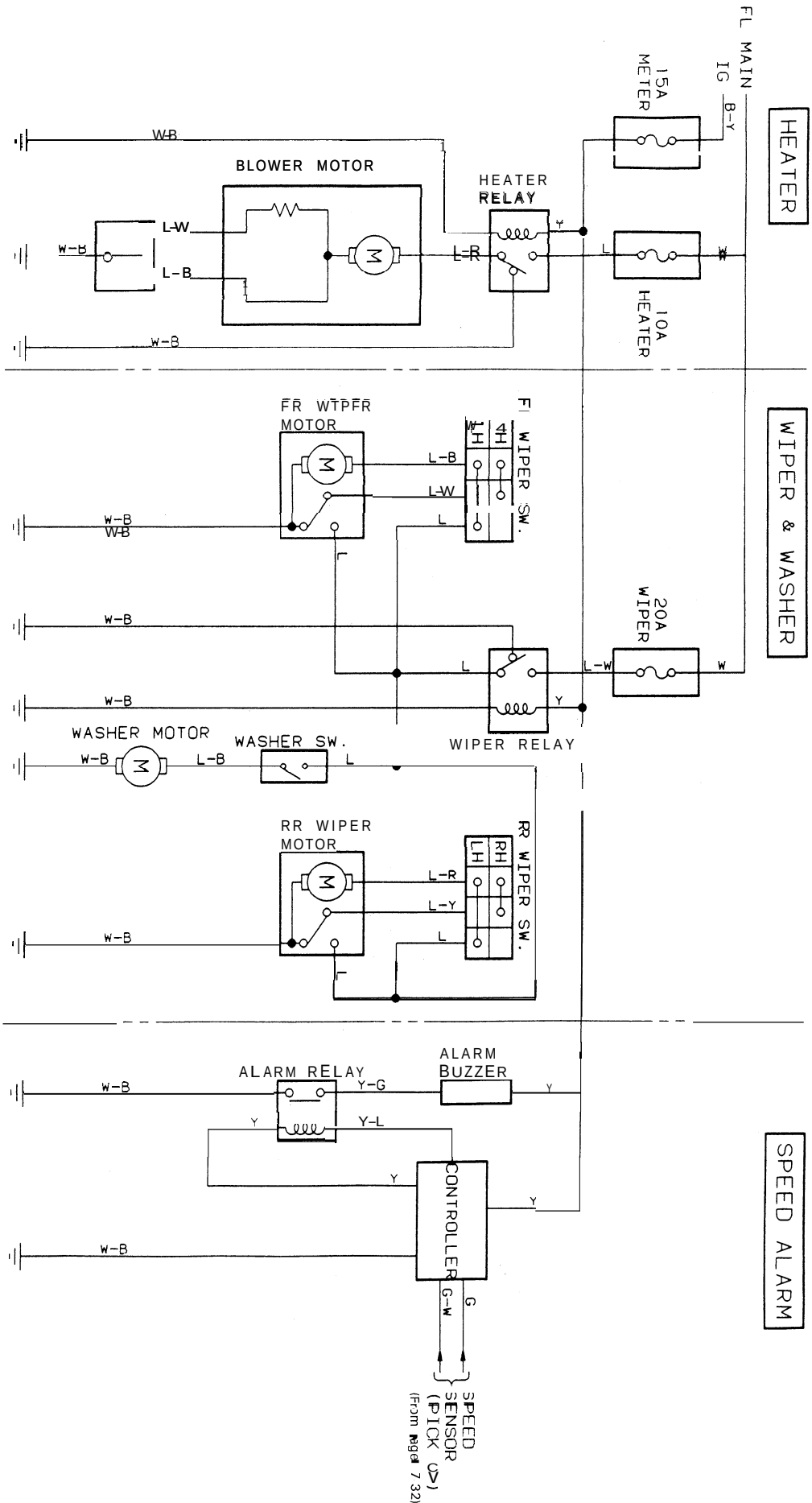

FUEL
LPG
B-Y
IIA
ENGINE REV. SW.
B-L
W-B
G
B-L
LPG SOLENOID (SLOW)
B-L
G
W-B
LPG SW.
B-L
O-L
B-R
B-R
LPG RELAY
B-R
W-B
EMISSION CONTROL
(From page 17-30)
LPG SOLENOID (MAIN)
B-R
B-L
G
COLD START SOLENOID SW.
FUEL CUT SOLENOID
B-R
M-R
GASOLINE SOLENOID
B-R
FUEL CUT SOLENOID
IGNITION
DISTRIBUTOR
IIA
IGNITION COIL
IGNITER
B-W
B-Y
(GASOLINE)
B-Y
B-W
IG
7.5A ENGINE
ENGINE REV.SW

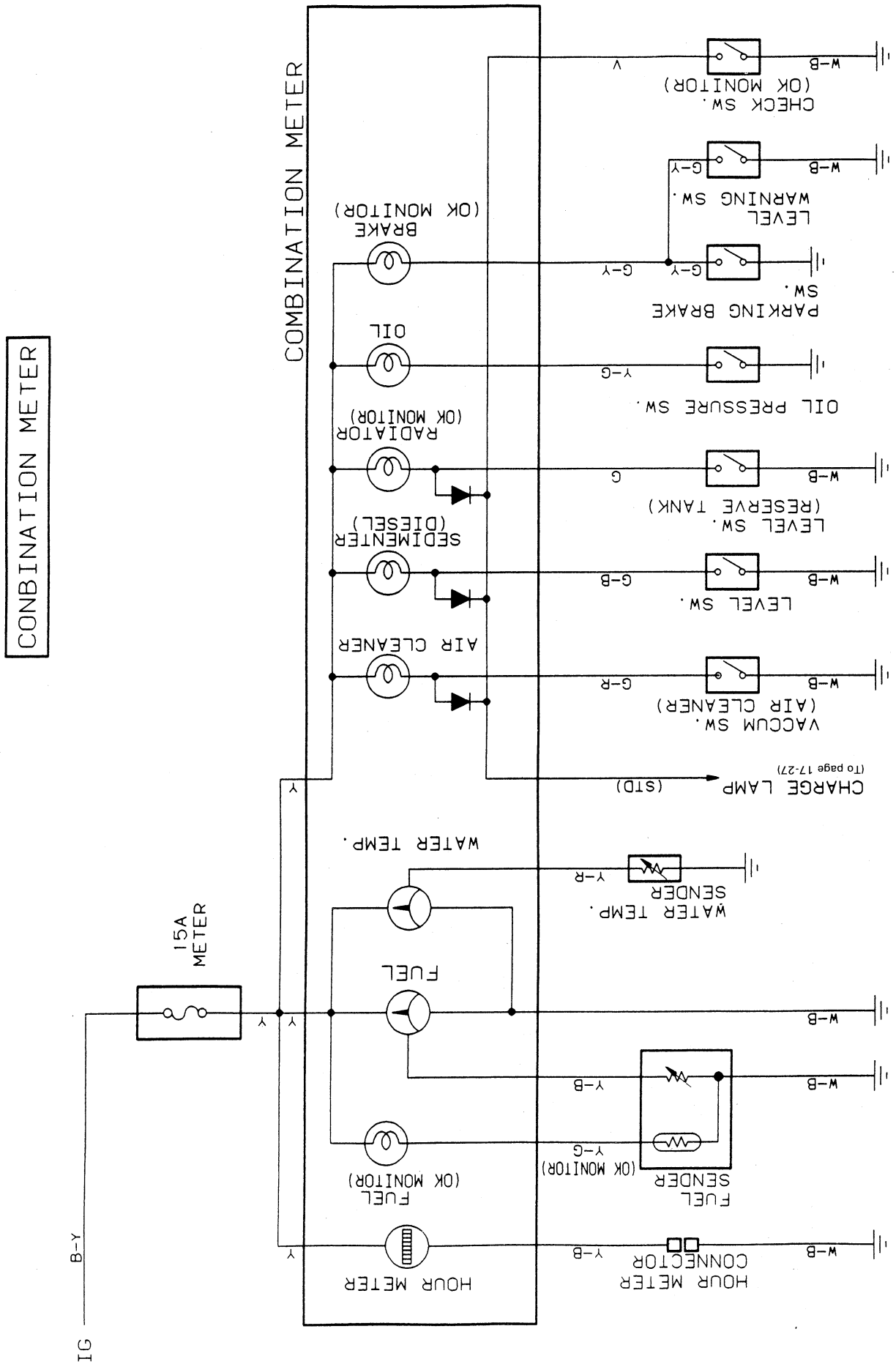

INTAKE HEATER(2Z)
GLOW SYSTEM(1DZ)
FL GLOW
FL INTAKE
IG
B
B
B-Y
15A METER
COMBINATION METER (GLOW INDICATOR LAMP)
PRE-HEATING TIMER
RLY
IG
IND
THW
S
ST
CHG
E
G-W
Y
G-R
B-Y
G
INTAKE HEATER RELAY
W/TEMP SENSOR
INTAKE HEATER
ST(M/T) NEUTRAL START SW(T/C) (From page 17-27)
ALTERNATOR(L) (From page 17-27)
GLOW RELAY
GLOW PLUG
W-B
W-8


EMISSION CONTROL (LPG)
EMISSION CONTROL (GASOLINE)
LPG RELAY
(To page 17-28)
7.5A
ECU-IG
IG
B-Y
INJ.
RIJ.
IGB
INJ
RIJ
EMISSION CONTROL
OX
E01
E1
VSW2
VSW1
OXM
VF
O2 SENSOR
INTAKE MANIFOLD
B-L
CHECK CONNECTOR E
CARBURETOR
A B C V
FCM1
FCM2
FCM3
FCM4
IDLE SW
POWER SW
IDL
PWR
ABCV
R/L
WTR
W/TEMP SW
E/G BLOCK


HORN
STOP LAMP
ILLUMINATION
TAIL LAMP
HEAD LAMP
WORKING LAMP
7.5A HORN
HORN
TURN SIGNAL SW.
(HORN SW.)
7.5A STOP
STOP LAMP SW. NO.1
STOP LAMP SW. NO.2
RR COMBINATION LAMP (STOP LAMP)
CONBINATION METER (ILLUMINATION LAMP)
RR COMBINATION LAMP (TAIL LAMP)
FR COMBINATION LAMP (CREARANCE LAMP)
20A LAMP
LIGHT SW
HEAD LAMP
WORKING LAMP SW.
WORKING LAMP
INDICATOR LAMP
FL MAIN
FL HEAD


TURN SIGNAL LAMP
FR COMBINATION LAMP (TURN LAMP)
W-B
G-R
LH
RR COMBINATION LAMP (TURN LAMP)
FR COMBINATION LAMP (TURN LAMP)
G
RH
RR COMBINATION LAMP (TURN LAMP)
TURN SIGNAL SW
RH
TURN SIGNAL FLASHER
G-W
IG
B-Y
7.5A TURN
BACK UP LAMP
RR COMBINATION LAMP (BACK UP LAMP)
R-Y
BACK UP LAMP SW.
Y
15A METER
BACK BUZZER
T/C HEAT GAGE
T/C OIL TEMP. SENDER
Y-B
SPEEDOMETER
LIGHT SW.
SPEED SENSER (PICK UP)
BR
ROTARY LIGHT
ROTARY LIGHT SW.


HEATER
WIPER & WASHER
SPEED ALARM
FL MAIN
IG
B-Y
15A METER
10A HEATER
BLOWER MOTOR
HEATER RELAY
W-B
L-W
L-B
L-R
L
W
FR WIPER MOTOR
FL WIPER SW.
LH
HI
4
L-B
L-W
20A WIPER
WIPER RELAY
Y
WASHER MOTOR
WASHER SW.
RR WIPER MOTOR
RR WIPER SW.
RH
L-R
L-Y
ALARM RELAY
ALARM BUZZER
Y-G
Y-L
CONTROLLER
G-W
G
SPEED SENSOR (PICK UP)
(From Page 7-32)


CONBINATION METER
COMBINATION METER
IG
B-Y
15A METER
HOUR METER
HOUR METER CONNECTOR
FUEL (OK MONITOR)
FUEL SENDER
(OK MONITOR)
FUEL
WATER TEMP.
WATER TEMP. SENDER
CHARGE LAMP
(STD)
(To page 17-27)
VACCUM SW.
(AIR CLEANER)
AIR CLEANER
LEVEL SW.
SEDIMENTER
(DIESEL)
LEVEL SW.
(RESERVE TANK)
RADIATOR
(OK MONITOR)
OIL PRESSURE SW.
OIL
PARKING BRAKE SW.
BRAKE
(OK MONITOR)
LEVEL WARNING SW.
CHECK SW.
(OK MONITOR)