

A0A5054

SERVICE MANUAL

SD20, 30, 31

YANMAR

SERVICE MANUAL



FM23056



JMI-0099

Certified by **ISO 9001**

(International Organization for Standardization)
Standards for Quality Assurance System

SAIL DRIVE

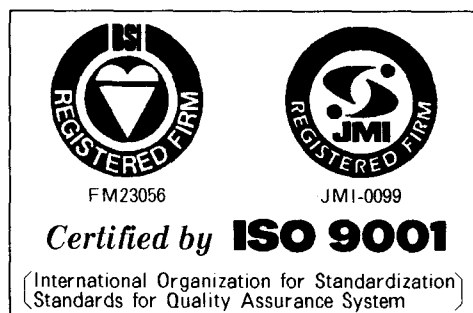
FOREWORD

This Service Manual covers the Model SD20, 30 & 31 sail drive unit only. For service information on the GMC series & 3HMC marine diesel engine which drives it, please refer to the respective GM/HM Series Manuals.

Since the lower gear case is located below the waterline, the hull must be raised and the sail-drive unit removed for inspection and adjustment. To cut down on this inconvenience, the unit must be kept in tip-top running condition. So, when a mechanical or other problem does arise, and you have gone to the trouble of lifting the hull out of the water, do not limit your maintenance to adjusting and/or repairing the defective part. Give the unit a thorough inspection to catch problems before they occur.

Before re-attaching the unit to the hull, always conduct a Bench Test.

Please refer to the Installation and Operation Manual for instructions on removing the unit from the hull.



This product has been developed, designed and produced in accordance with the Standards for Quality System of ISO 9001 (International Organization for Standardization) under the following authorized institutions: JMI (Japan Machinery and Metals Inspection Institute), BSI (British Standards Institution) and EQNET (The European Network for Quality System Assessment and Certification).

Certified under the following standards:
ISO 9001 - 1987 / BS 5750 : Part 1 : 1987 /
EN 29001 - 1987 / JIS Z9901 - 1991

SAIL DRIVE UNIT

Model SD20, SD30 & SD31

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CHAPTER 1

GENERAL

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1. Specifications

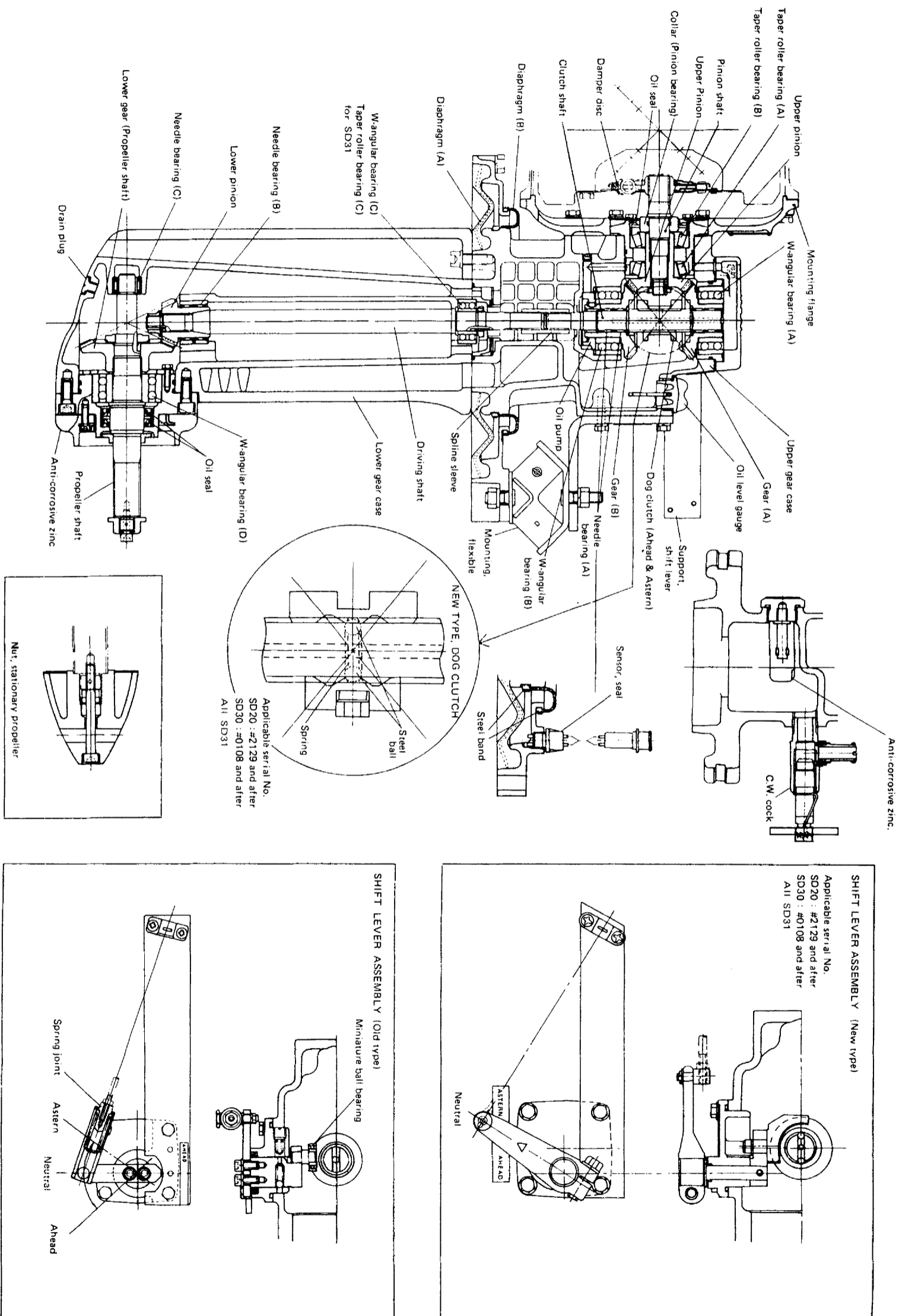
Model		SD20	SD30	SD31			
Reduction gear system		Constant mesh gear with dog clutch					
Direction of rotation	Input shaft	Counter-clockwise viewed from stern					
	Propeller shaft	Counter-clockwise viewed from stern					
Reduction ratio	Ahead	2.64		2.31			
	Astern	2.64		2.31			
Propeller speed rpm (at DIN 6270A rating)		1289	1212	1472			
Lubrication system		Splash lubrication					
Lub.oil capacity (liter)		2.2 (Standard unit) 2.5 (Long-reach unit)					
Dry weight kg (lbs)		30 (66)	32 (70)	33 (73)			
Remote-control device	Control head	Single control lever, Travel 70mm (2 3/4")					
	Cable	"MORSE" 33C (equivalent)					
Applicable eng.	Model	1GMC	2GMC	3GMC	3HMC	**	
	Output kw (HP) /rpm	DIN6270B	6.7 (9.1)/3600	13.4 (18.2)/3600	20.1 (27.3)/3600	25.4 (34.0)/3400	
		DIN6270A	5.9 (8.02)/3400	11.8 (16.0)/3400	17.7 (24.1)/3400	22.4 (30.0)/3200	
Flexible mount	Engine side	2	2	2	2		
	Sail-drive side	1	1	1	1		
Total dry weight kg(lbs)		95 (205)	123 (271)	153 (337)	176 (387)		

Model		* 1GM10C	* 2GM20C	* 3GM30C	* 3HM35C	
Applicable engine (New-GM/HM-series)	Output kw (HP) /rpm	DIN6270B	6.7 (9.1)/3600	13.4 (18.2)/3600	20.1 (27.3)/3600	25.4 (34.0)/3400
	DIN6270A	5.9 (8.02)/3400	11.8 (16.0)/3400	17.7 (24.1)/3400	22.4 (30.0)/3200	
Flexible mount	Engine side	2	2	2	2	
	Sail-drive side	1	1	1	1	
Total dry weight kg (lbs)		104 (229)	134 (295)	153 (337)	180 (397)	

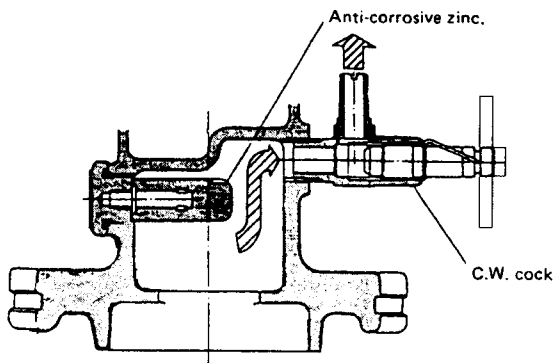
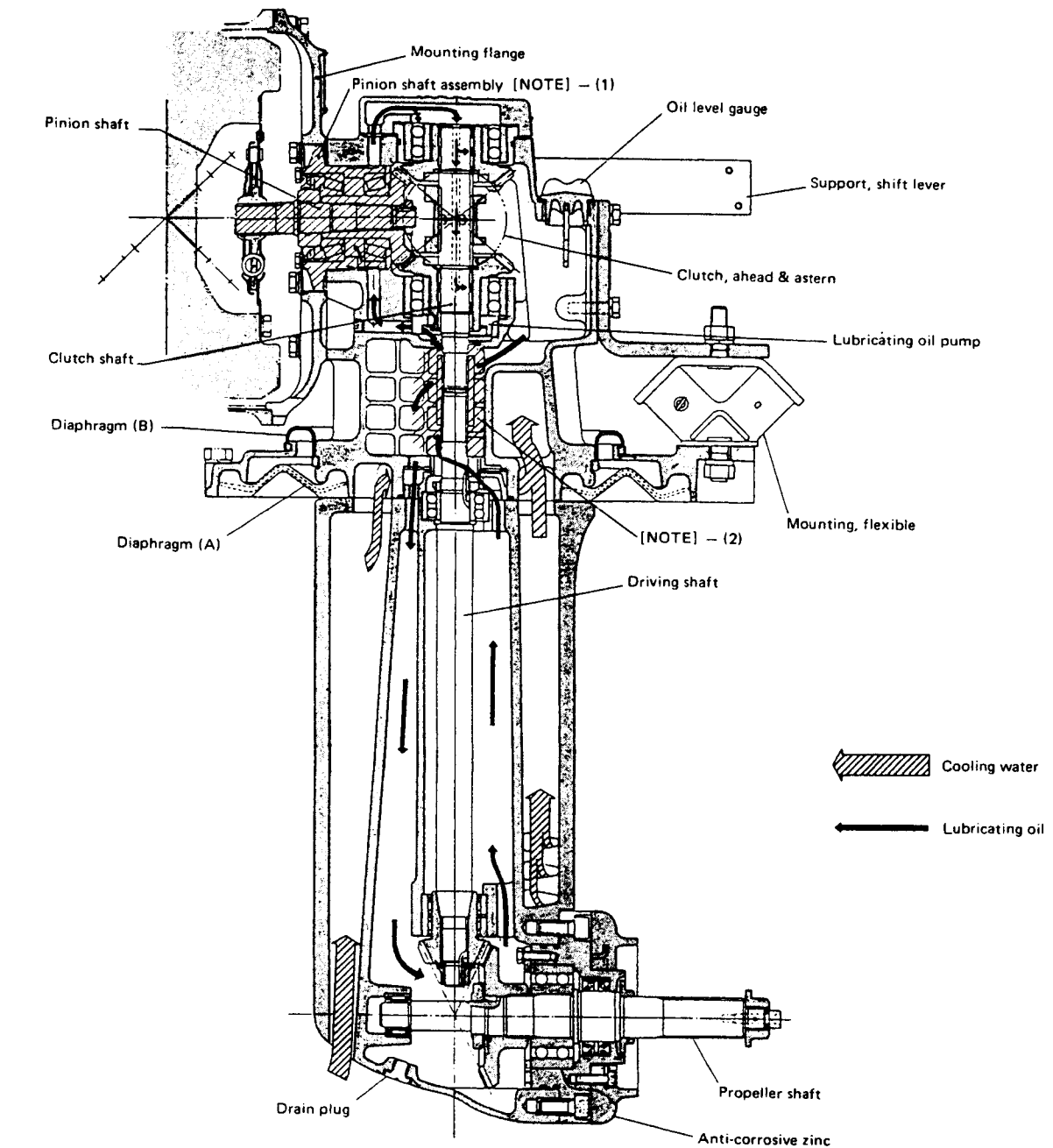
Model		3JH2CE	3JH2-TCE	4JH2CE	
** Applicable engine model for SD31	Output kw (HP) /rpm	DIN6270B	28.5 (38.7)/3600	35.0 (47.6)/3600	37.5 (51.0)/3600
	DIN6270A	25.7 (34.9)/3400	31.6 (43.0)/3400	33.8 (46.0)/3400	
Number of flexible mount	Engine side	2	2	2	
	Sail-drive side	1	1	1	
Total dry weight kg (lbs)		202 (445)	207 (456)	233 (514)	

2. Sectional View & Names of Parts

2-1 Sectional View & Names of Parts



2-2 Route of Cooling Water & Lubricating Oil

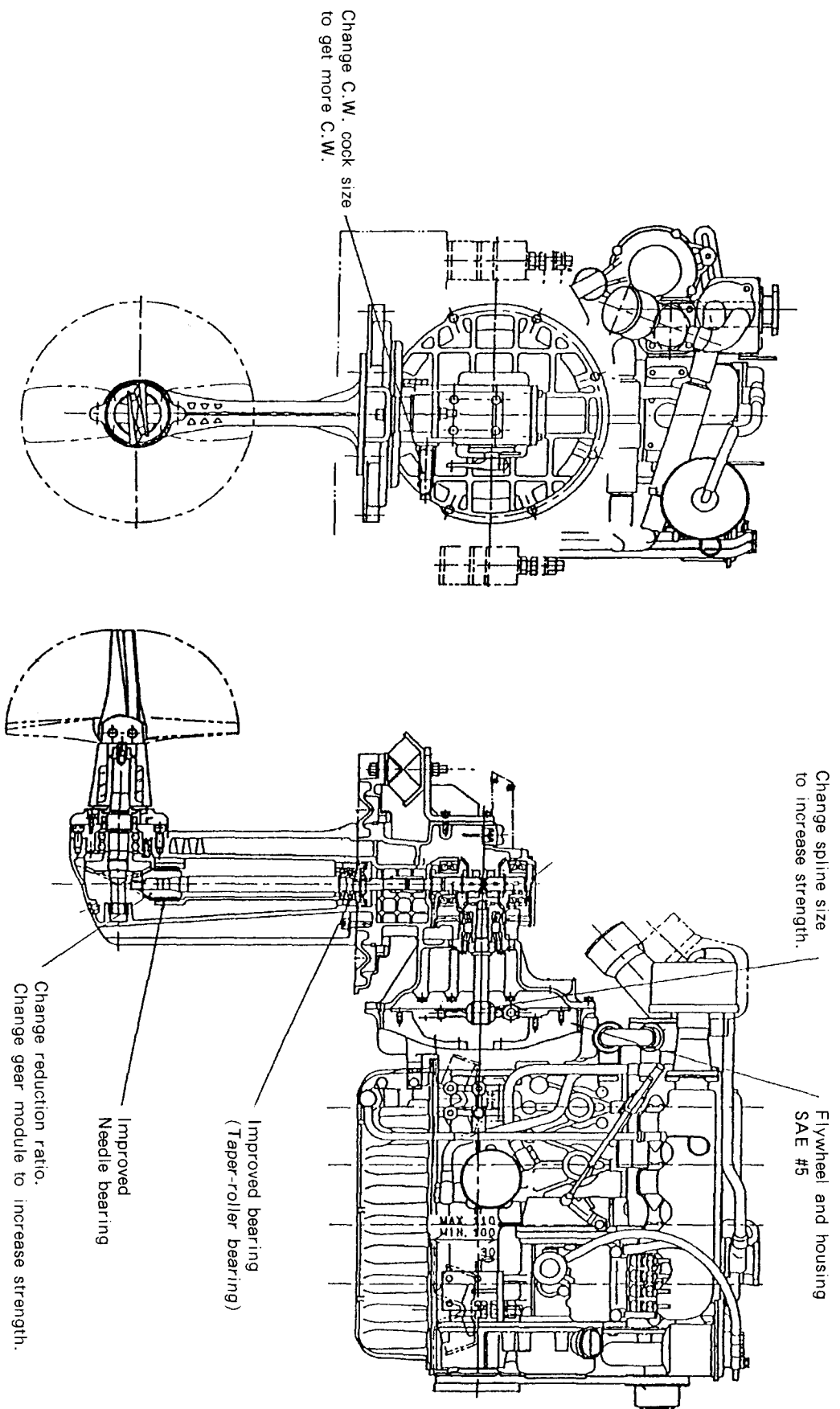


[NOTE]

The following changes have been incorporated in products prior to D/#0454:

- (1) The pinion shaft assembly is provided with a lubricating oil pouring port in the upperward-facing direction. Refer to page 3-8.
- (2) The spline sleeve in the upper gear case is fitted with an oil guide.

2-3 Sectional View with Engine



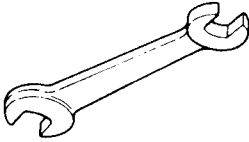
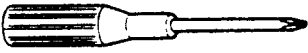
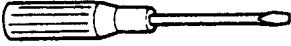

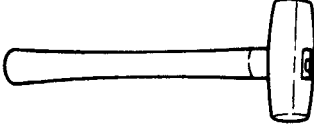
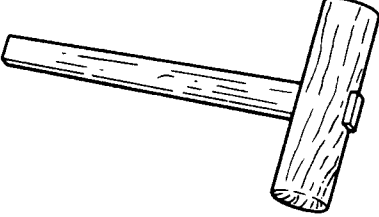
3. Criteria for Replacing Parts

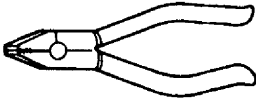


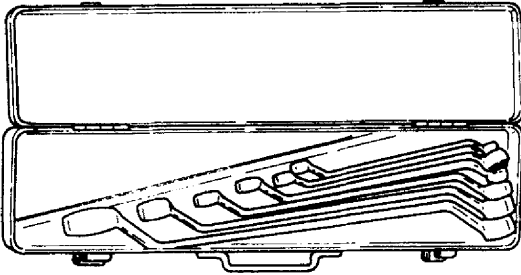
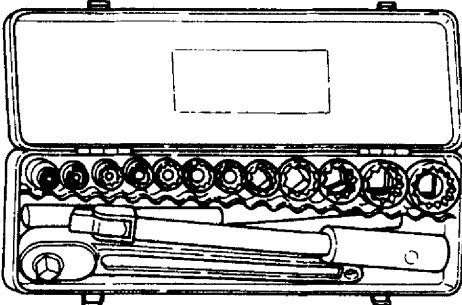
Criteria for replacement		Criteria for replacement	
		Standard value	Standard service life
Bearings	Needle bearing (A) (B/# K20×24×13)	Evidence of needle flaking or loss	1,500 hrs.
	Needle bearing (B) (B/# RNA69/28) (RNA49/32RD2)		
	Needle bearing (C) (B/# NA5903)	1) Evidence of needle flaking or loss 2) Replacement of propeller shaft	
	Miniature ball bearing (B/# 609)	Axial internal clearance ≥ 0.1 mm	Total of 100,000 engagements and disengagements
Oil pump		Outer radius : ≤ 59.3 mm	2,000 hrs.
Anti-corrosive zinc parts	Anti-corrosive zinc parts (Upper gear case)	Weight : ≤ 140 g (with plug)	One year
	Anti-corrosive zinc parts (Lower gear case)	Weight : ≤ 400 g	A half year
Oil seals		1) Lip hardening or hair cracks 2) Disassembly	1,000 hrs. or 2 years
Diaphragms (A) & (B)		Hair cracks	2 years
Washers		Disassembly	
Steel band		Disassembly	
Clutch	Dog clutch	Dog corner Standard : 0.2 C Replacement standard : ≥ 3.0 R	
	Upper gear (A)	Dog corner Standard : 0.7 R Replacement standard : ≥ 3.0 R	
	Upper gear (B)		

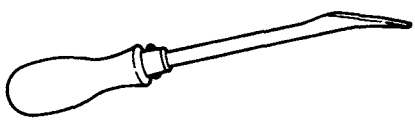
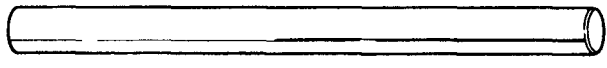
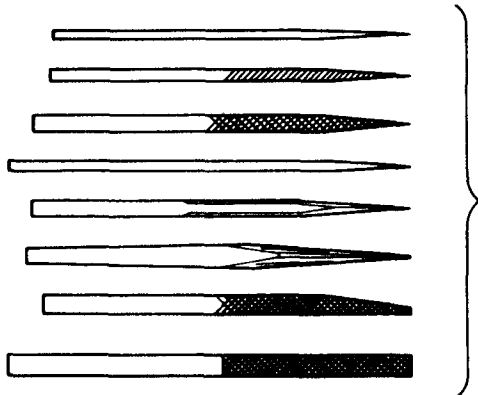
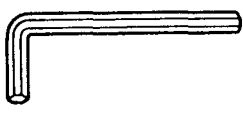
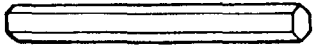
4. Disassembly and Reassembly Tools

The following tools are necessary when disassembling and reassembling the engine. These tools must be used according to disassembly process and location.

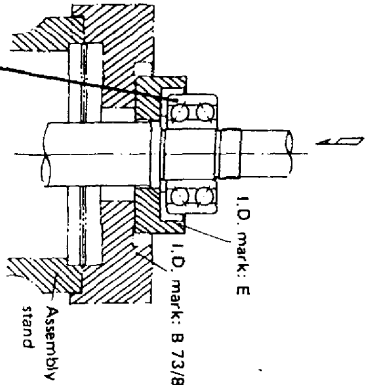
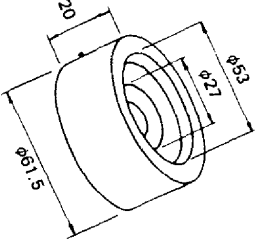
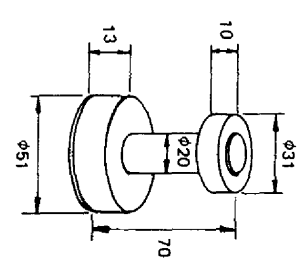
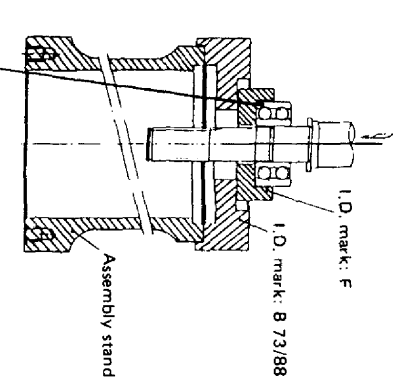
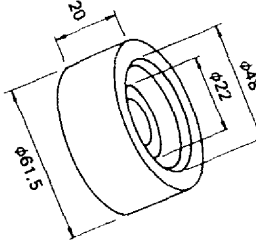
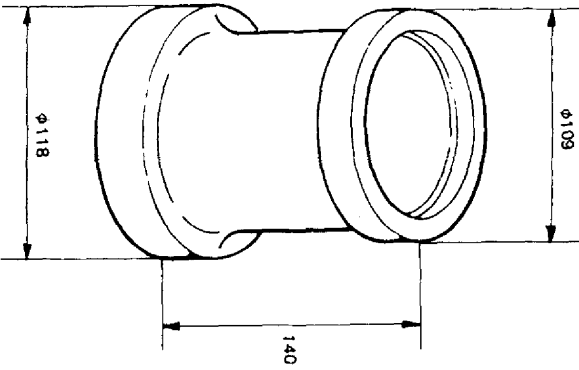
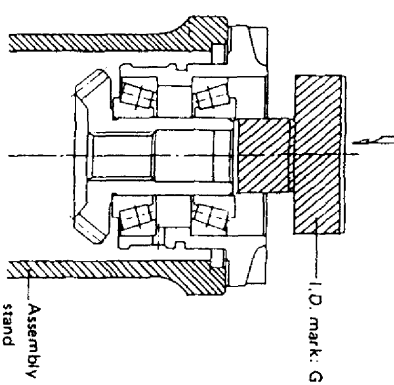
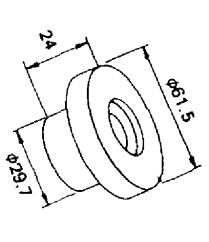
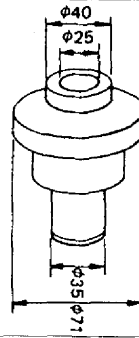
4-1 General Handtools

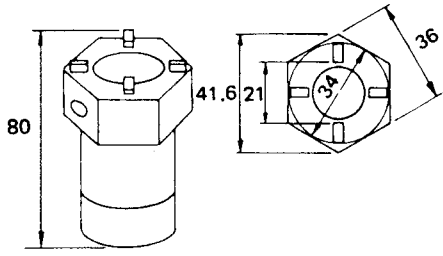
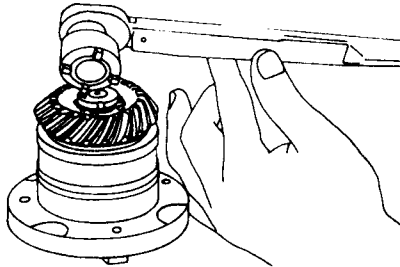
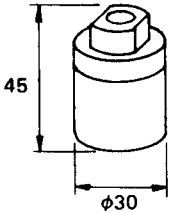
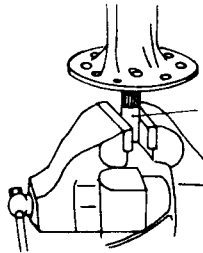
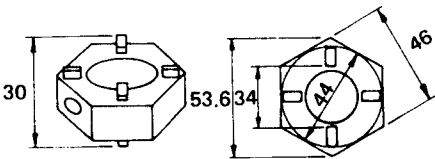
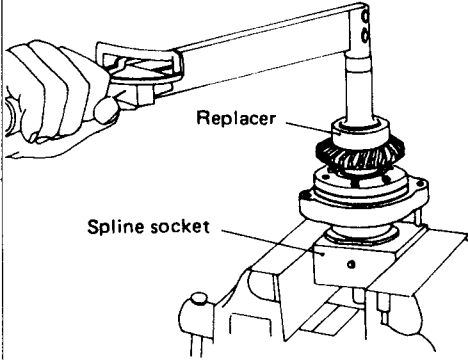
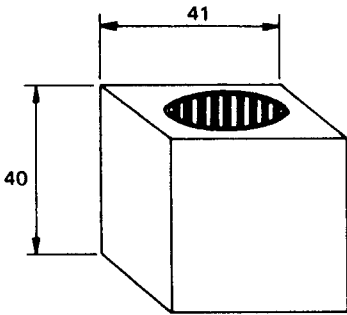
Name of tool	Shape	Remarks
Spanner		10 × 13 12 × 14 17 × 19 21 × 23 21 × 24
Screwdriver for + (Cross recessed head) screws		
Screwdriver for - (Phillips head) screws		
Steel hammer		
Copper hammer		
Mallet		

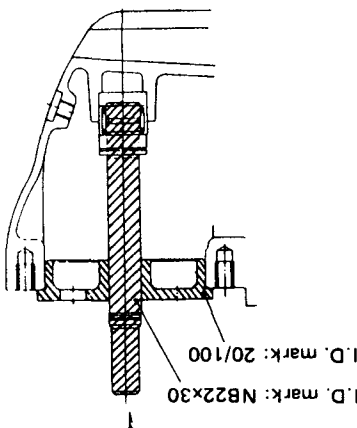
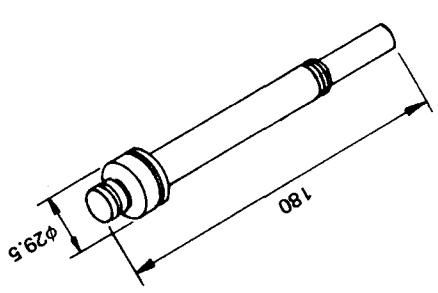
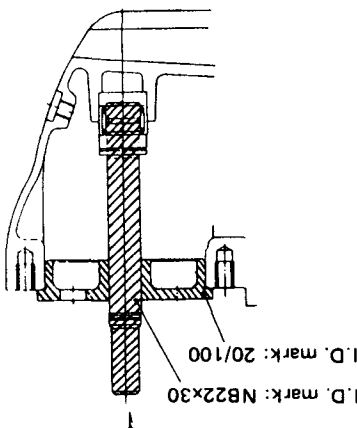
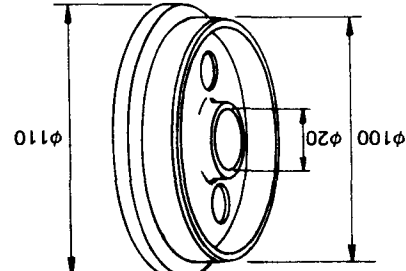
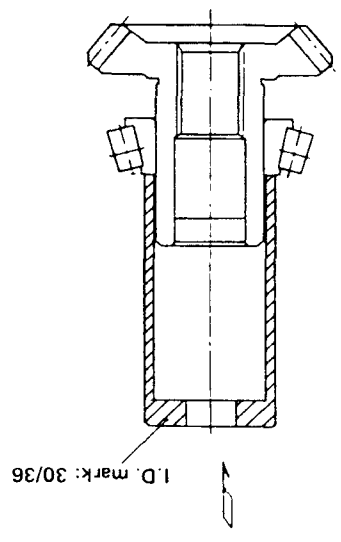
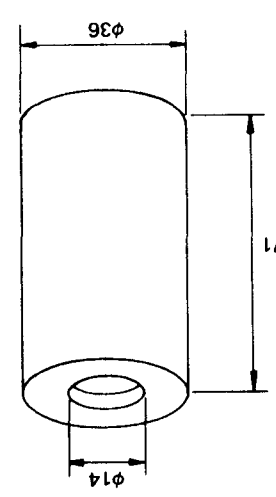
Name of tool	Shape	Remarks
Nipper		
Plier		
Starting plier		
Offset wrench		1 set
Box spanner		1 set

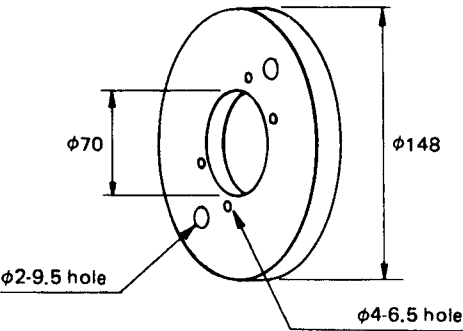
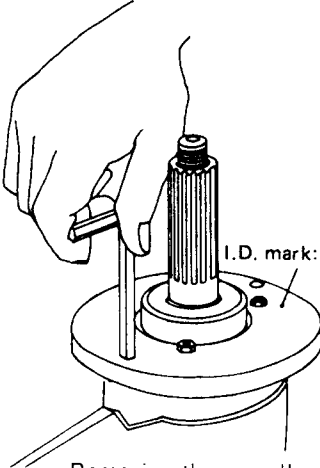
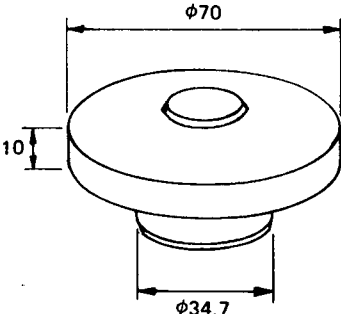
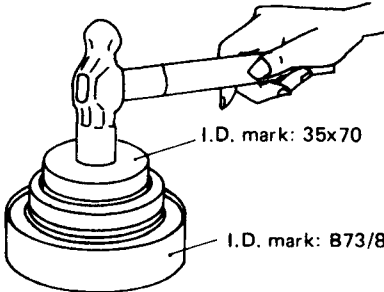
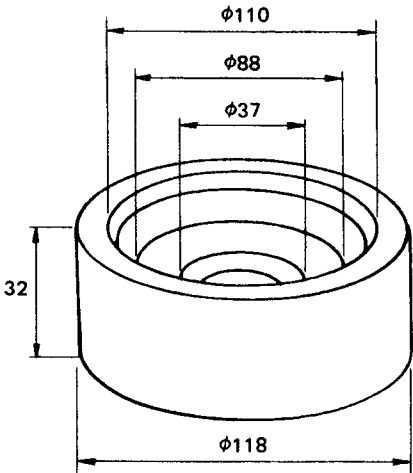
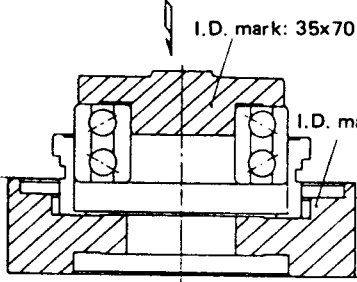
Name of tool	Shape	Remarks
Scraper		
Lead rod		
File		1 set
Rod spanner for hexagon socket head screws (L-type)		5 mm 6 mm 8 mm
Rod spanner for hexagon socket head screws (Straight type)		5 mm 6 mm 8 mm

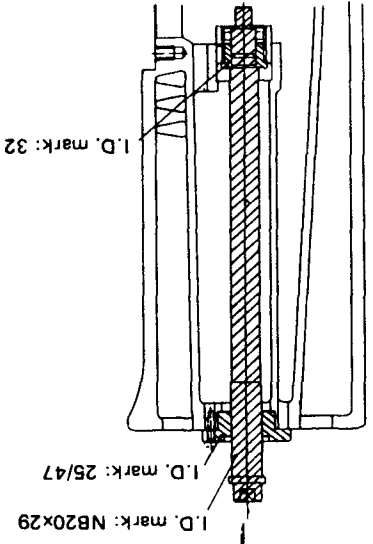
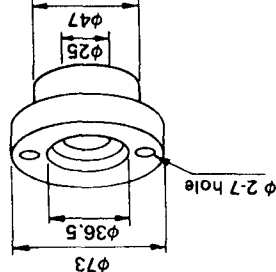
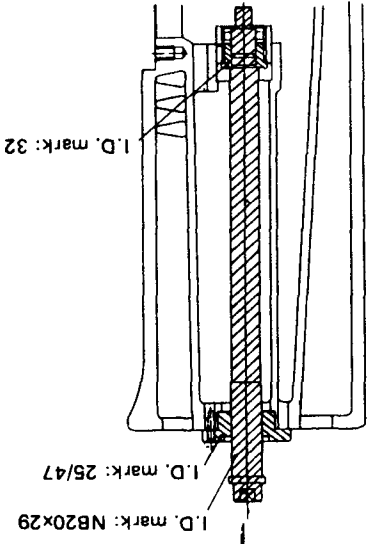
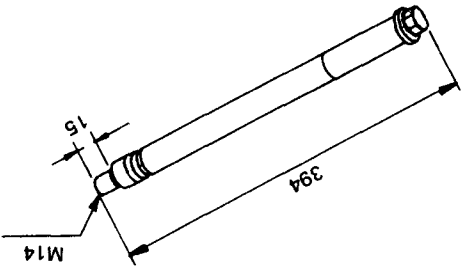
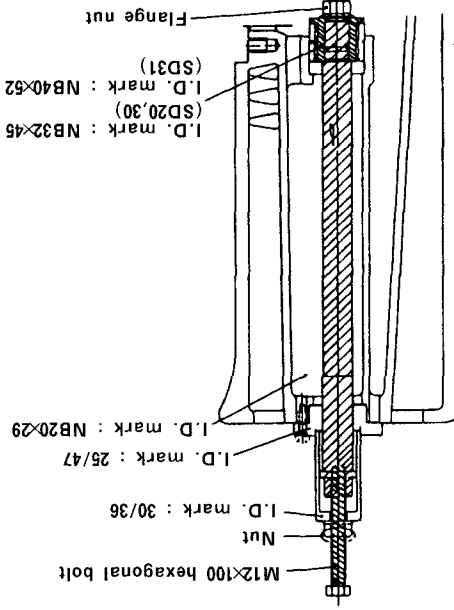
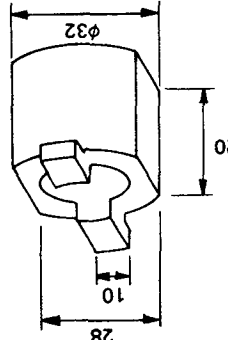
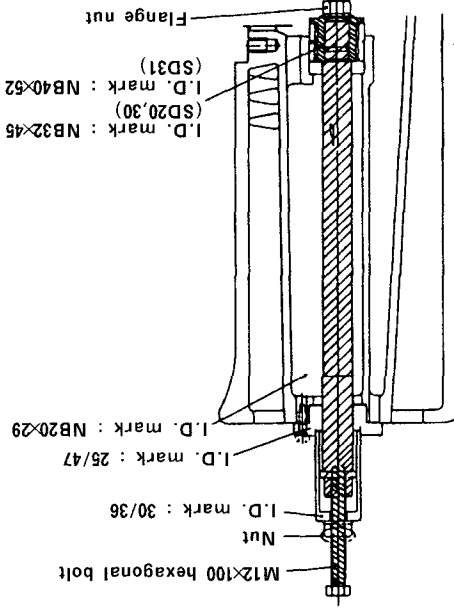
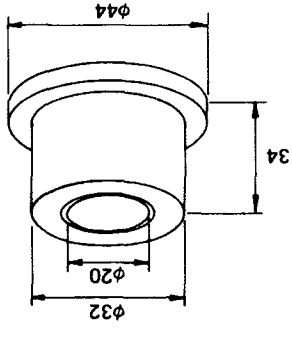
4-2 Special Tools

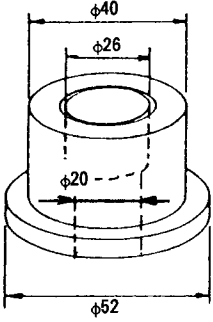
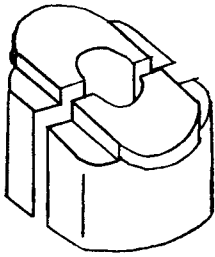
Ref.	Application	Name of tools & Shape and size	Application	Ref.
5-4	 <p>I.D. mark: E I.D. mark: B 73/88 Taper-roller bearing for SD31 Assembly stand</p>	 <p>I.D. mark : E Part No. : 196311-92580</p>	 <p>I.D. mark : 32 × 52 Part No. : 196311-92690</p>	5-1 5-2
5-5	 <p>I.D. mark: F I.D. mark: B 73/88 Taper-roller bearing for SD31 Assembly stand</p>	 <p>I.D. mark : F Part No. : 196311-92590</p>	 <p>ASSEMBLY STAND Part No. : 196420-92510</p>	5-1
2-7 3-5 5-7	 <p>I.D. mark: G Assembly stand</p>	 <p>I.D. mark : G Part No. : 196311-92600</p>	 <p>I.D. mark : OS 35 × 40 Part No. : 196311-92860</p>	3-6 5-8

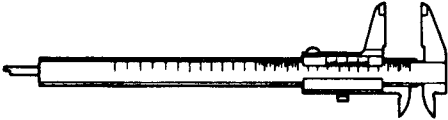
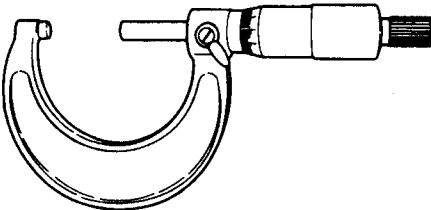
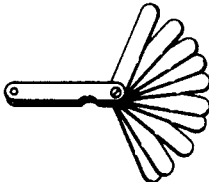
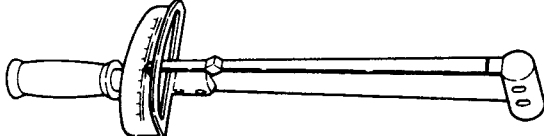
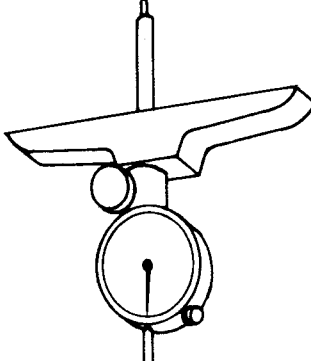
Name of tools	Shape and size	Application	Ref.
Replacer	 <p>Part No. : 196311-92030</p>	 <p>For propeller shaft in upper pinion</p>	2-7 5-5
Spline socket	 <p>Part No. : 196311-92010</p>	 <p>For drive shaft</p>	3-3 5-4
Replacer	 <p>Part No. : 196311-92020</p>	 <p>Replacer</p> <p>Spline socket</p>	2-10 3-2
Spline socket	 <p>Part No. : 196320-92130</p>	<p>Disassembly and reassembly tools for propeller shaft</p>	2-10 3-2

Ref.	Application	Shape and size	Name of tools
4-7 5-11	 <p>I.D. mark: NB22x30 I.D. mark: 20/100</p>	 <p>180 29.5</p>	I.D. mark: NB 22x30
4-7 5-11	 <p>I.D. mark: 20/100 I.D. mark: NB22x30</p>	 <p>110 100 20</p>	I.D. mark: 20/100
3-5 3-6 5-10	 <p>I.D. mark: 30/36</p>	 <p>71 36 14</p>	I.D. mark: 30/36

Name of tools	Shape and size	Application	Ref.
<p>I.D. mark : 70/148</p>	 <p>Part No. : 196420-92040</p>	 <p>Removing the propeller shaft assembly</p>	<p>2-8</p>
<p>I.D. mark : 35x70</p>	 <p>Part No. : 196420-92550</p>	 <p>Reassembling the upper gear (A) bearing</p>	
<p>I.D. mark : B73/88</p>	 <p>Part No. : 196420-92560</p>	 <p>Reassembling the upper gear (A) and (B) bearing</p>	<p>5-2 5-4 5-5 5-6</p>

Ref.	Application	Shape and size	Name of tools
5-9 5-10	 <p>Disassembling the drive shaft bearing</p>	 <p>Part No. : 196420-92660</p>	I.D. mark : 25/47 Guide
5-9 5-10	 <p>Disassembling the drive shaft bearing</p>	 <p>Part No. : 196420-92650</p>	I.D. mark : NB 20x29
5-9	 <p>Reassembling the drive shaft bearing</p>	 <p>Part No. : 196420-92680</p>	I.D. mark : NB 32 for disassembling
5-10	 <p>Reassembling the drive shaft bearing</p>	 <p>Part No. : 196420-92700</p>	I.D. mark : NB 32 x45 for reassembling

Name of tools	Shape and size	Application	Ref.
NB 40×52 for reassembling	 <p>Part No. : 196320-92671</p>		5-10
I.D. mark : NB 40×44	 <p>Part No. : 196431-92680</p>		

Name	Illustration	Accuracy & range	Ref.
Vernier calipers		1/20 mm, 0-150 mm	
Micrometer		1/100 mm, 0-25 mm, 25-50 mm, 100-125 mm	4-4 4-7
Thickness gauge		0.05-2 mm	
Torque wrench		0-15 kgf-m	
Dial depth gauge		1/100 mm, 0-150 mm	4-3 4-4 4-7