



Mercedes-Benz
Unimog

Service

Workshop Manual

Unimog 435

Volume 1

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The present Workshop Manual contains the descriptions of all important assembly, adjusting, testing and repair work.

The entire contents of the Workshop Manual are subdivided according to the well-known group system. The group index serves to facilitate finding the individual groups, the list of contents of each group serves to find the individual jobs to be carried out.

The relevant data, settings, dimensions and tolerances as well as the special tools are compiled on the first pages of the respective groups.

The contents are listed according to unit versions and further subdivided into chapters and sections.

The contents are subdivided to provide smaller, integrated sections. Each section begins with a new page 1 and is identified as follows (example):

Removal and Installation of Steering System		46.1
Title of chapter	MB mechanical recirculating ball steering system L 3,5 K	
Unit designation		
Group		
Unit version		
Page reference:		
Page		
Section		
Chapter		
		4.1/1

All references to this page at any point throughout the Workshop Manual are expressed as follows:
See page 46.1-4.1/1.

Introduction

The **unit versions** are consecutively numbered starting with 1; i.e. each version has a special code number. In addition, the unit designation is shown at the head of each page. A separating sheet and a detailed list of contents head each unit.

The sections valid for all unit versions are covered in version 0. The respective data (settings, tightening torques, machining dimensions etc.) and special tools are listed together at the start of each unit version.

The numerical values in SI units resulting from the introduction of the international unit system are converted and rounded-off values (in accordance with DIN 1335).

The pressure values specified in bar are positive.

Pressure in bar

Previous Unit kp/cm²
(Kiloponds per square centimeter)

1 bar = 1.019716 kp/cm² ~ 1.02 kp/cm²
1 kp/cm² = 0.980665 bar ~ 0.981 bar

Power in kW (kilowatt)

Previous unit HP (horsepower)

1 kW = 1.360 HP
1 HP = 0.735 kW

Torque in Nm (Newtonmeters)

Previous unit kpm (kilopond meters)

1 Nm = 0.101972 kpm ~ 0.102 kpm
1 kpm = 9.80665 Nm ~ 9.81 Nm

The specified part numbers and the figure numbers in the exploded views are designed solely for identification purposes and improve differentiation between the individual versions. When ordering spare parts, always use the part numbers given in the valid microfiches.

The job descriptions provided in this Workshop Manual make allowance for special versions (see 00 - 1.6/1).

Special vehicles:

Type Condor

Messrs Thyssen Henschel
D-3500 Kassel

Type TN 170

Messrs Thyssen Maschinenbau GmbH
D-5810 Witten 6

We shall endeavour to keep this Workshop Manual up-to-date by supplying the relevant supplements when necessary.

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General view



435.113



435.113

00 General

General view



435.115 Front- with box-type body



435.115 Rear- with box-type body

Installation Survey

Vehicle	Model	435.110	435.111	435.113 ¹³⁾	435.115	435.115 ¹¹⁾	435.117
	Sales designation	U 1700	U 1700 L	U 1700 L/38	U 1300 L		U 1300 L/37
Engine	Model	353.959			353.961 oder 353.959 ²⁾	353.961	353.961 Or 353.959 ²⁾
	Sales designation	352 A. V/2 352 A. LII/1 ¹²⁾			352. X/2 Or 352 A.V/2 352.A.LII/1 ¹¹⁾	352. X/1	352. X/2 Or 352. A.V/2 352 A.LII/1 ¹¹⁾
	Installation	Series			Series Or SA 36 019 ²⁾	Series with SA 16 457/26 SA 35 975 ¹¹⁾	Series Or SA 36 019 ²⁾
Single clutch	Model	-					
	Sales designation	F & S GFM 330 K replaced by F & S GMF 330					
	Installation	Series					
Double clutch	Model	-	-	-	-	-	-
	Sales designation	DT 330/310 G	-	DT 330/310 G	-	DT 330/310 G	DT 330/310 G
	Installation	SA 35 741	-	SA 35 741	-	SA 35 741	SA 35 741
Converter clutch	Model	-	-	-	-	-	-
	Sales designation	WSK 310	-	WSK 310	-	-	-
	Installation	SA 35 948	-	SA 35 948	-	-	-
Main transmission	Model	717.901 or 717.900	717.901				
	Sales designation	UG 3/40 - 13,01 GPA ⁹⁾	UG 3/40 - 13,01 GPA				
	Installation	Series or SA	Series		with SA 35 977 ¹¹⁾	Series	
Auxiliary transmission	Model	Working or crawler gear	-				
	Sales designation	NG 3/40 - 2/5, 76 ¹⁰⁾	-				
	Installation	SA 35 736	-				
Power take-off	Version	PTO shaft with pump connection					
	Ratio	i = 1					
	Maximum speed 1/min	2 800					
	Installation	SA 35 925					
	Version	PTO shaft					
	Ratio	i = 0,71					
	Maximum speed 1/min	4 000					
	Installation	SA 35 925					
Hydrostatic system	Manufacturer	Linde units	-				
	Sales designation	Gr. 70/75	-				
	Installation	SA 36 036	-				
PTO shaft transmission	Version	Engine and transmission shaft ⁴⁾				Transmission shaft ^{11) 3)}	Engine and transmission shaft
	Ratio	i = 4,32 ⁶⁾ /or 4,32 ⁶⁾ /2,46 ⁷⁾				i = 4,32 ⁶⁾	i = 4,32 ⁶⁾ 2,46 ⁷⁾
	Maximum speed 1/min	540/min/or 540/1000/min				540	540/1000/min.
	Installation	SA 35 737				SA 35 737/4	SA 35 737
	Version	Fast engine and transmission PTO shaft				-	-
	Ratio	i = 0,745				-	i = 0,745
	Maximum speed 1/min	3 700				-	3 700
	Installation	SA 35 926				-	SA 35 926

00 General

Installation Survey

Vehicle	Model Sales designation	435.110 U 1700	435.111 U 1700 L	435.113 ¹³⁾ U 1700 L/38	435.115 U 1300 L	435.115 ¹¹⁾	435.117 U 1300 L/37
Front axle	Model	737.200 ¹²⁾ or 737.201			737.111		
	Sales designation	AU 3/1 S - 5,3			AU 2/14 S - 4,0		
	Installation	Series or SA			Series	with SA 35 973 ¹¹⁾ Series	
Rear axle	Model	747.204 or 747.205 or 747.206			747.111		747.117
	Sales designation	HU 3/1 S - 5,3 or HU 3/1 S - 6,8			HU 2/14 S - 4,0		HU 2/14 S-4,0
	Installation	Series or SA			Series	with SA 35 974 ¹¹⁾	Series
Steering system	Model	765.601 or 765.305			765.601		
	Sales designation	LS 3 B or LS 7 F			LS 3 B		
	Installation	Series or with SA 35 776			Series	with SA 35 976 ¹¹⁾	Series
Steering pump	Model	-			-		
	Sales designation	ZF 7672 or ZF 7673 ⁹⁾			ZF 7672		ZF 7673
	Installation	Series or SA 35 776 ⁹⁾			Series		Series
Drivers gap	Model	425.821/825	425.800/820/821			425.820	425.821/825
	Sales designation	-	-			-	-
	Installation	SA	Series or SA			with SA	SA

- 1) Basic unit with SA fording ability
- 2) Only valid for fire service vehicles
- 3) Connection only for front PTO shaft
- 4) Connection for front or front and area
- 5) Fast engine or transmission PTO shaft
- 6) From chassis end No. 072 513 i = 4,08
- 7) From chassis end No. 072 513 i = 2,32
- 8) Only in connection with steering system LS 7 F
- 9) Or UG 3/40-8/9,35 GPA
- 10) Or NG 3/40-3/55,87
- 11) From engine end No. 691 150
- 12) From chassis end No. 084 389 model 737.202
- 13) From chassis end No. 084 389

Installation Survey

Vehicle	Model	435.160	435.170
	Sales designation	Attachment TM 170	Attachment Condor
Engine	Model	353.959	353.977
	Sales designation	352 A.LII/1	352 A.V/2
	Installation	Series	
Single clutch	Model	-	
	Sales designation	GFM 330 K replaced by GFM 330	
	Installation	Series	
Double clutch	Model	-	
	Sales designation	-	
	Installation	-	
Converter clutch	Model	-	
	Sales designation	-	
	Installation	-	
Main transmission	Model	717.931	717.930
	Sales designation	UG 63/40-8/13,01 GPA	
	Installation	Series	
Auxiliary transmission	Model	-	
	Sales designation	-	
	Installation	-	
Power take-off	Version	Transmission PTO shaft with pump connection	
	Ratio	i = 1	
	Maximum speed 1/min	2800	
	Installation	Series	
	Version	-	
	Ratio	-	
	Maximum speed 1/min	-	
	Installation	-	
Hydrostatic unit	Manufacturer	-	
	Sales designation	-	
	Installation	-	
PTO shaft transmission	Version	-	
	Ratio	-	
	Maximum speed 1/min	-	
	Installation	-	
	Ratio	-	
	Version	-	
	Maximum speed 1/min	-	
	Installation	-	

00 General

Installation Survey

Vehicle	Model	435.160	435.170
	Sales designation	Attachment TM 170	Attachment Condor
Front axle	Model	737.232	737.231
	Sales designation	AU 3/1 S-6,8	
	Installation	Series	
Rear axle	Model	747.231	747.230
	Sales designation	HU 3/1 S-6,8	
	Installation	Series	
Steering	Model	765.305	
system	sales designation	LS 7 F	
	Installation	mit SA 35 776	
Steering	Model	-	
pump	Sales designation	ZF 7673	
	Installation	SA 35 776	
Driver's cab	Model	-	
	Sales designation	-	
	Installation	-	

General View



435.115



435.115

00 General

General View



435.111



435.111

Vehicle dimensions 435.115

		12,5 – 20 12,5 R 20 ¹⁾	9,00 – 20 9,00 R 20	14,5 – 20 14,5 R 20
Tire sizes				
Wheelbase	mm	3 250	3 250	3 250
Track front	mm	1 860	1 860	1 860
Track rear	mm	1 860	1 860	1 860
Track circle diameter	mm	12 890	12 890	12 890
Turning circle diameter	mm	13 800	13 800	13 800
Length without winch	mm	5 540	5 540	5 540
Length with winch	mm	5 870	5 870	5 870
Overall width (without rear-view mirror)	mm	2 300	2 300	2 300
Overall height (unladen)	approx. mm	2 830	2 880	2 900
Height above cab, unladen	approx. mm	2 750 ²⁾	2 630	2 650
Ground clearance on a convex surface	approx. mm	470	465	495
Overhang front, without winch	°	46	46	46
Overhang front, with winch	°	40	40	40
Overhang rear	approx. °	51	51	51
Ground clearance, front axle (laden)	approx. mm	440	435	465
Ground clearance, rear axle (laden)	approx. mm	440	435	465
Wading depth	approx. mm	1 220	–	–
Permissible height of center of gravity above platform floor for 2000 kg payload, with stabilier at front	mm	800	–	–
Height of trailer coupling (unladen)	mm	945	950	970

Loading space

Length inside	mm	3 150	3 150	3 150
Width inside	mm	2 200	2 200	2 200
Height of side boards	mm	500	500	500
Height beneath canopy top, min.	mm	1 370	1 370	1 370
Height beneath canopy top, max.	mm	1 480	1 480	1 480
Loading height above ground (unladen)	mm	1 290	1 285	1 315

1) special vehicle

2) with camouflage net support

00 General

Vehicle dimensions 435.110/.111/.113

Tire sizes	mm	14,75/80 R 20 ¹⁾²⁾	12,5 R 22,5 14,5 R 20	14,5 – 20 16/17 – 24	12,00 R 20 13 R 22,5 14,75/80 R 20 ¹⁾
Wheelbase	mm	3 850	3 250	3 250	3 250
Track front	mm	1 840	1 840	1 840	1 890
Track rear	mm	1 840	1 840	1 840	1 890
Track circle diameter	mm	—	12 880	12 880	12 930
Turning circle diameter	mm	15 800	14 200	14 200	14 200
Length without winch	mm	5 580	5 345	5 345	5 345
Length with winch	approx. mm	6 500	—	—	—
Overall width (without rear-view mirror)	mm	2 350	2 350	2 350	2 350
Overall width (with rear-view mirror)	mm	2 465	2 465	2 465	2 465
Overall height, unladen	approx. mm	3 050	3 030	3 010	3 050
Ground clearance on a convex surface, unladen	approx. mm	680	660	640	680
Overhang front	approx. °	48	50	50	50
Overhang rear	approx. °	47	—	—	—
Ground clearance, front axle (laden)	approx. mm	520	500	480	520
Ground clearance, rear axle (laden)	approx. mm	520	500	480	520
Wading depth	approx. mm	1 200	1 200	1 200	1 200
Height of trailer coupling (unladen)	mm	1 050	1 050	1 050	1 070

Loading space

Length inside	mm	4 050	3 150 ³⁾	3 150 ³⁾	3 150 ³⁾
Width inside	mm	2 350	2 200	2 200	2 200
Height of side boards	mm	500	500	500	500
Loading height above ground (unladen)	mm	1 500	1 480	1 460	1 500

1) 13,00 – 20 Pilote XL

2) 435.113

3) at 435.110 optional 2050, 2550, 3000



Vehicle dimensions 435.115
(Special vehicle with box-type body)

General 00



Maximum speeds 435.115/.117

Total axle ratio 6.53		Maximum speeds km/h at engine rated speed 2800/min																	
Main transmission	Main gears	Forwards								Reverse								Tires	
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾		
		6.0	8.7	13.2	17.9	26.4	38.1	57.7	78.5	6.2	9.0	13.6	18.5	27.2	39.2	59.4	80.9	18 - 20 12.5 - 20 ²⁾	
		6.3	9.1	13.7	18.6	27.5	39.7	60.1	81.7	6.5	9.3	14.1	19.3	28.4	40.8	61.9	84.2	12.5 R 20	
		6.3	9.1	13.8	18.8	27.8	40.0	60.6	82.5	6.5	9.4	14.3	19.4	28.6	41.2	62.5	85.0	14.5 - 20	
		6.6	9.5	14.4	19.6	28.9	41.7	63.2	85.9	6.8	9.8	14.9	20.3	29.8	43.0	65.1	88.6	14.5 R 20	
		6.1	8.7	13.2	18.0	26.5	38.2	57.9	78.8	6.2	9.0	13.6	18.6	27.3	39.4	59.6	81.2	9.00 - 20	
		6.1	8.9	13.4	18.2	26.9	38.8	58.7	79.9	6.3	9.1	13.8	18.8	27.7	39.9	60.5	82.4	9.00 R 20	

1) Locked with SA 35 985

2) standard

Total axle ratio 5.31		Maximum speeds km/h at engine rated speed 2800/min																	
Main transmission	Main gears	Forwards								Reverse								Tires	
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾		
		7.4	10.7	16.2	22.0	32.5	46.8	71.0	96.5	7.6	11.0	16.7	22.8	33.5	48.2	73.1	99.5	18 - 20 12.5 - 20 ²⁾	
		7.7	11.1	16.9	22.9	33.8	48.8	73.9	100.5	8.1	11.5	17.4	23.7	34.9	50.2	76.1	103.6	12.5 R 20	
		7.8	11.2	17.0	23.2	34.1	49.2	74.6	101.4	8.0	11.6	17.5	23.9	35.2	50.7	76.8	104.5	14.5 - 20	
		8.1	11.7	17.7	24.1	35.6	51.3	77.7	105.7	8.4	12.1	18.3	24.9	36.7	52.8	80.0	109.0	14.5 R 20	
		7.4	10.7	16.2	22.1	32.6	47.0	71.2	96.8	7.7	11.1	16.8	22.8	33.6	48.4	73.3	99.8	9.00 - 20	
		7.6	10.9	16.5	22.4	33.1	47.7	72.2	98.2	7.8	11.2	17.0	23.2	34.1	49.1	74.4	101.3	9.00 R 20	

1) Locked with SA 35 985

2) standard

00 General

Maximum speeds 435.110/.111/.113

Total axle ratio 6.38		Maximum speeds km/h at engine rated speed 2800/min																	
Main transmission	Main gears	Forwards								Reverse								Tires	
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾		
		6.5	9.4	14.2	19.3	28.4	41.0	62.1	84.4	6.7	9.7	14.6	19.9	29.3	42.2	63.9	87.0	14.5 - 20 16/70 - 24	
		6.8	9.8	14.8	20.1	29.6	42.7	64.7	88.0	7.0	10.1	15.2	20.7	30.5	44.0	66.6	90.7	12 R 22.5 ²⁾ 14.5 R 20	
		7.4	10.6	16.1	21.9	32.3	46.6	70.6	96.0	7.6	11.0	16.6	22.6	33.3	48.0	72.7	99.0	14.5 R 24	
		7.1	10.3	15.6	21.2	31.2	45.0	68.2	92.7	7.4	10.6	16.0	21.9	32.2	46.3	70.2	95.6	14.5 - 24	
		6.6	9.6	14.5	19.7	29.1	41.9	63.5	86.4	6.9	9.9	14.9	20.4	30.0	43.2	65.4	89.0	11.00 - 20 11.00 R 20	
		7.0	10.1	15.2	20.7	30.6	44.1	66.8	90.8	7.2	10.4	15.7	21.4	31.5	45.4	68.8	93.7	12.00 R 20 13 R 22.5 16/70 - 24 14.75/80 R 20	
		6.0	9.9	15.0	20.4	30.1	43.3	65.6	89.3	7.1	10.2	15.4	21.1	31.0	44.6	67.6	92.0	12.00 - 20	

1) Locked with SA 35 985

2) standard

Total axle ratio 5.40		Maximum speeds km/h at engine rated speed 2800/min																	
Main transmission	Main gears	Forwards								Reverse								Tires	
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾		
		7.66	11.05	16.72	22.75	33.55	48.39	73.31	99.64	7.91	11.40	17.24	23.50	34.50	49.82	75.47	102.69	14.5 - 20 16/70 - 24	
		7.98	11.52	17.44	23.73	34.99	50.47	76.47	103.94	8.25	11.89	17.98	24.51	36.06	51.97	78.72	107.11	12.5 R 22.5 ²⁾ 14.5 R 20	
		8.71	12.56	19.02	25.87	38.15	55.03	83.37	113.32	8.99	12.96	19.61	26.72	39.35	56.66	85.82	116.78	14.5 R 24	
		8.41	12.14	18.38	25.00	36.87	53.18	80.57	109.51	8.69	12.53	18.95	25.82	38.03	54.76	82.94	112.85	14.5 - 24	
		7.84	11.31	17.11	23.79	34.33	49.53	75.03	101.99	8.09	11.67	17.65	24.05	35.42	50.99	77.24	105.10	11.00 - 20 11.00 R 20	
		8.25	11.90	18.01	24.51	36.13	52.12	78.96	107.33	8.52	12.28	18.57	25.31	37.27	53.67	81.29	110.61	12.00 R 20 13 R 22.5 16/70 - 24 14.75/80 R 20	
		8.11	16.69	17.70	24.08	35.51	51.22	77.59	105.47	8.37	12.07	18.25	24.87	36.63	52.73	79.88	108.69	12.00 - 20	

1) Locked with SA 35 985

2) standard

Maximum speeds 435.110/111 (transmission model 717.901)

Total axle ratio 6,38		Maximum speeds km/h at engine rated speed 2800/min																
Main transmission	main gears	Forwards								Reverse								Tires
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾	
		6,5	9,4	14,2	19,3	28,4	41,0	62,1	84,4	6,7	9,7	14,6	19,9	29,3	42,2	63,9	87,0	14,5 - 20 16/70 - 24
		6,8	9,8	14,8	20,1	29,6	42,7	64,7	88,0	7,0	10,1	15,2	20,7	30,5	44,0	66,6	90,7	12 R 22,5 ³⁾ 14,5 R 20
		7,4	10,6	16,1	21,9	32,3	46,6	70,6	96,0	7,6	11,0	16,6	22,6	33,3	48,0	72,7	99,0	14,5 R 24
		7,1	10,3	15,6	21,2	31,2	45,0	68,2	92,7	7,4	10,6	16,0	21,9	32,2	46,3	70,2	95,6	14,5 - 24
		6,6	9,6	14,5	19,7	29,1	41,9	63,5	86,4	6,9	9,9	14,9	20,4	30,0	43,2	65,4	89,0	11,00 - 20 11,00 R 20
		7,0	10,1	15,2	20,7	30,6	44,1	66,8	90,8	7,2	10,4	15,7	21,4	31,5	45,4	68,8	93,7	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾
		6,9	9,9	15,0	20,4	30,1	43,3	65,6	89,3	7,1	10,2	15,4	21,1	31,0	44,6	67,6	92,0	12,00 - 20
		Additional gear box	working gears	1,13	1,62	2,46	3,35	4,93	7,11	10,77	14,65	1,16	1,68	2,54	3,46	5,09	7,33	11,10
1,17	1,69			2,56	3,49	5,14	7,41	11,23	15,27	1,21	1,75	2,64	3,60	5,30	7,64	11,57	15,74	12 R 22,5 ³⁾ 14,5 R 20
1,28	1,85			2,80	3,80	5,61	8,09	12,25	16,66	1,32	1,91	2,88	3,93	5,79	8,33	12,62	17,18	14,5 R 24
1,24	1,78			2,70	3,67	5,42	7,81	11,83	16,09	1,28	1,84	2,78	3,80	5,59	8,05	12,19	16,59	14,5 - 24
1,15	1,66			2,62	3,42	5,05	7,28	11,03	15,00	1,19	1,72	2,59	3,54	5,21	7,50	11,36	15,46	11,00 - 20 11,00 R 20
1,21	1,75			2,65	3,60	5,31	7,66	11,60	15,77	1,25	1,81	2,73	3,72	5,48	7,89	11,95	16,26	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾
1,19	1,72			2,60	3,54	5,22	7,52	11,40	15,50	1,23	1,77	2,68	3,66	5,38	7,75	11,74	15,98	12,00 - 20
crawler gears	0,116		0,167	0,253	0,345	0,509	0,733	1,111	1,511	0,120	0,173	0,261	0,356	0,524	0,755	1,144	1,557	14,5 - 20 16/70 - 24
	0,121		0,175	0,264	0,359	0,530	0,764	1,157	1,574	0,125	0,180	0,272	0,371	0,547	0,787	1,193	1,623	12 R 22,5 ³⁾ 14,5 R 20
	0,132		0,190	0,288	0,392	0,578	0,834	1,263	1,718	0,136	0,197	0,297	0,405	0,597	0,859	1,301	1,771	14,5 R 24
	0,128	0,184	0,278	0,379	0,559	0,805	1,220	1,659	0,132	0,190	0,287	0,391	0,576	0,830	1,257	1,710	14,5 - 24	
	0,119	0,171	0,259	0,353	0,521	0,750	1,137	1,564	0,123	0,177	0,267	0,365	0,537	0,773	1,171	1,594	11,00 - 20 11,00 R 20	
	0,125	0,180	0,273	0,371	0,547	0,789	1,196	1,626	0,129	0,186	0,281	0,383	0,585	0,813	1,232	1,676	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾	
	0,123	0,177	0,268	0,365	0,538	0,776	1,175	1,598	0,127	0,183	0,276	0,377	0,555	0,799	1,210	1,647	12,00 - 20	

1) Locked with SA 35 985

2) 13.00 - 20 Pilote XL

3) Standard

00 General

Maximum speeds 435.110/111 (transmission model 717.900)

Total axle ratio 6,38		Maximum speeds km/h at engine rated speed 2800/min																
Main transmission	main gears	Forwards								Reverse								Tires
		1	2	3	4	5	6	7	8	1	2	3	4	5 ¹⁾	6 ¹⁾	7 ¹⁾	8 ¹⁾	
		9,0	12,5	17,1	23,3	32,7	45,4	62,1	84,4	9,3	13,0	17,7	24,1	33,8	46,9	64,0	87,0	14,5 - 20 16/70 24
		9,4	13,1	17,9	24,3	34,1	47,3	64,7	88,0	9,7	13,5	18,4	25,1	35,2	48,9	66,7	90,7	12 R 22,5 ³⁾ 14,5 R 20
		10,3	14,3	19,5	26,5	37,2	51,6	70,6	96,0	10,6	14,7	20,1	27,4	38,4	53,4	72,8	99,0	14,5 R 24
		9,9	13,8	18,8	25,6	35,9	49,8	68,2	92,7	10,2	14,2	19,4	26,4	37,1	51,5	70,3	95,6	14,5 24
		9,2	12,8	17,5	23,9	33,4	46,4	63,5	86,4	9,5	13,3	18,1	24,6	34,6	48,0	65,5	89,1	11,00 - 20 11,00 R 20
		9,7	13,5	18,4	25,1	35,2	48,9	66,8	90,9	10,0	13,9	19,0	25,9	36,4	50,5	68,9	93,7	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾
		9,6	13,3	18,1	24,7	34,6	48,0	65,6	89,3	9,9	13,7	18,7	25,4	35,7	49,6	67,7	92,1	12,00 - 20
	Additional gear box	working gears	1,57	2,18	2,97	4,05	5,68	7,88	10,78	14,66	1,62	2,25	3,07	4,18	5,86	8,14	11,11	15,11
1,63			2,27	3,10	4,22	5,92	8,21	11,23	15,28	1,69	2,34	3,20	4,35	6,11	8,49	11,57	15,75	12 R 22,5 ³⁾ 14,5 R 20
1,78			2,48	3,38	4,61	6,46	8,96	12,26	16,67	1,84	2,56	3,49	4,75	6,67	9,26	12,63	17,19	14,5 R 24
1,72			2,39	3,27	4,45	6,24	8,66	11,84	16,10	1,78	2,47	3,37	4,59	6,44	8,94	12,20	16,60	14,5 - 24
1,60			2,23	3,04	4,14	5,81	8,07	11,03	15,00	1,66	2,30	3,14	4,27	6,00	8,33	11,37	15,47	11,00 20 11,00 R 20
1,69			2,34	3,20	4,36	6,12	8,48	11,60	15,78	1,74	2,42	3,30	4,50	6,31	8,77	11,95	16,27	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾
1,66			2,30	3,15	4,28	6,01	8,34	11,40	15,51	1,71	2,38	3,24	4,42	6,20	8,61	11,75	15,98	12,00 - 20
crawler gears		0,162	0,225	0,307	0,418	0,586	0,813	1,111	1,511	0,167	0,232	0,316	0,431	0,605	0,840	1,145	1,558	14,5 - 20 16/70 - 24
		0,168	0,234	0,319	0,435	0,610	0,847	1,158	1,575	0,174	0,242	0,330	0,449	0,630	0,875	1,193	1,624	12 R 22,5 ³⁾ 14,5 R 20
		0,184	0,255	0,349	0,475	0,666	0,924	1,264	1,719	0,190	0,264	0,360	0,490	0,688	0,955	1,302	1,772	14,5 R 24
		0,178	0,247	0,337	0,459	0,643	0,892	1,221	1,660	0,183	0,255	0,347	0,473	0,664	0,922	1,258	1,711	14,5 - 24
		0,165	0,230	0,314	0,427	0,600	0,832	1,137	1,547	0,171	0,237	0,324	0,441	0,619	0,859	1,172	1,595	11,00 - 20 11,00 R 20
		0,174	0,242	0,330	0,449	0,631	0,875	1,196	1,627	0,180	0,250	0,340	0,463	0,651	0,904	1,232	1,677	12,00 R 20 13 R 22,5 14,75/80 R 20 ²⁾
		0,171	0,238	0,324	0,442	0,620	0,860	1,175	1,600	0,176	0,245	0,334	0,455	0,693	0,888	1,211	1,648	12,00 - 20

1) Locked with SA 35 985

2) 13,00 - 20 Pilote XL

3) Standard

Weights and Trailer Loads Weights

Chassis			Tires			Axle loads		Weights Unladen weight				
Model	Sales designation	Version	Size	Type	PR	FA kg	RA kg	Chas- sis kg	with platform kg	Permissible payload kg	Total weight kg	
435.115 .117	U 1300 L U 1300 L/ 37	Series	12,5 – 20	MPT	10	3700	3700	3750	5252 ¹⁾	1 ¹²⁾	7400	
			14,5 – 20	MPT	10	3960	3960					
			14,5 R 20	MPT	10							
			12,5 – 20	MPT	12	4000	4000					
			12,5 R 20	MPT	12							
14,5 R 20		14										
9,0 – 20		14										
			9,0 R 20		14							
.115	U 1300 L Special vehicle with box-type body		12,5 – 20	MPT	12					6130		7490

1) Varies depending on equipment

2) Corresponding to specifications of body manufacturer

Chassis m			Tires			Axle loads		Weights Unladen weight				
Model	Sales designation	Version	Size	Type	PR	FA	RA	Chas- sis	with platform	Permissible payload	Permis- sible total weight kg	
						kg	kg	kg	kg	kg		
435.111	U 1700L	Series	11,00–20		16	5300	5300	4450	5600 ¹⁾	1 ¹²⁾	9000	
			11,00 R 20		16							
			12,00–20		18							
			12,00 R 20		18							
			12 R 22,5									
			13 R 22,5									
		14,5–20	MPT	18	5290	5290	4450	5600 ¹⁾	1 ¹²⁾	9000		
		14,5 R 20	MPT	18								
		14,5–24	MPT	16							5300	5300
		14,5 R 24	MPT	16								
16/70–24	MPT	14										
14,75/80 R 20/												
13,00–20–Pilot XL												
Series with SA 35810	11,00–20		16	5300	5800	4450	5600 ¹⁾	1 ¹²⁾	10 000			
	11,00 R 20		16									
	12,00–20		18									
	12,00 R 20		18									
	14,75/80 R 20/											
	13,00–20–Pilot XL											
12 R 22,5			5290	5290	4450	5600 ¹⁾	1 ¹²⁾	10 000				
13 R 22,5												
14,5–20	MPT	18										
14,5 R 20	MPT	18										
14,5–24	MPT	16	5300	5400								
14,5 R 24	MPT	16										
16/70–24	MPT	14	5300	5800								
435.113	U 1700 L/38	with SA 35810 35969	13,5 R 22,5 13,00–20–Pilot XL			5300 ⁴⁾	7000	–	7000	1 ¹⁵⁾	12 000	
435.115	U 1700L	Fire service with SA 35810	11,00–20		16	5300	6200	4450	5600 ¹⁾	1 ¹²⁾	10 600	
			11,00 R 20		16							
			12,00–20		18							
			12,00 R 20		18							
			14,75/80 R 20/									
			13,00–20–Pilot XL									
			12 R 22,5			5300	5550	4450	5600 ¹⁾	1 ¹²⁾	10 600	
			13 R 22,5									
			14,5–20	MPT	18							
			14,5 R 20	MPT	18							
14,5–24	MPT	16	5300	5670								
14,5 R 24	MPT	16										
16/70–24	MPT	14	5300	6200								

1) Varies depending on equipment

4) 5600 kg with SA 35 968, 35 969, 35 779, 35 810

MPT = Multipurpose tire

2) For tractor unit - chassis, determined during acceptance

5) Max. 4000 kg for cross-country applications

3) Special vehicle

00 General

Loads

Chassis			Tires			Axle loads		Weights			
Model	Sales designation	Version	Size	Type	PR	FA kg	RA kg	Unladen Chassis kg	with platform kg	perm. payload kg	Total weight kg
435.110	U 1700	Series ²⁾	14,5 R 20	MPT	18						
			14,5 – 20	MPT	18						
			14,5 R 24	MPT	16						
			14,5 – 24	MPT	16						
			16/70 – 24	MPT	14						
			11,00 R 20		16	5300	5300	4450	5820	3180	9000
			11,00 – 20		16						
			12 R 22,5								
			13 R 22,5								
			12,00 R 20		18						
			12,00 – 20		18						
			14,75/80 R 20								
			13,00 – 20 – Pilote XL								
		Series ²⁾ with SA 35810	14,5 R 20	MPT	18						
			14,5 – 20	MPT	18						
			14,5 R 24	MPT	16						
			14,5 – 24	MPT	16						
			16/70 – 24	MPT	14						
			11,00 R 20		16	5300	5300	4450	5820	3440	10000
			11,00 – 20		16						
			12 R 22,5								
			13 R 22,5								
			12,00 R 20		18						
			12,00 – 20		18						
			14,75/80 R 20								
			13,00 – 20 – Pilote XL								
		with ³⁾ SA 35810 SA 35969	14,5 R 20	MPT	18	5300	5450			3600	
			14,5 – 20	MPT	18						
			14,5 R 24	MPT	16						
			14,5 – 24	MPT	16						
			16/70 – 24	MPT	14	5300	6140	4450	5820		
			11,00 R 20		16						
			11,00 – 20		16						
			12 R 22,5			5300	6200			4240	10600
			13 R 22,5								
			12,00 R 20		18						
			12,00 – 20		18						
			14,75/80 R 20								
			13,00 – 20 Pilote XL								
		with ³⁾ SA 35776 SA 35810 SA 35968 SA 35969	14,5 R 20	MPT	18	5450	5450			3600	
			14,5 – 20	MPT	18						
			14,5 R 24	MPT	16						
			14,5 – 24	MPT	16						
			16/70 – 24	MPT	14	5600	6140				
			11,00 R 20		16			4450	5820		
			11,00 – 20		16						
			12 R 22,5			5600	6200			4240	
			13 R 22,5								
			12,00 R 20		18						
			12,00 – 20		18						
			14,75/80 R 20								
			13,00 – 20 Pilote XL								

1) applicable only for tractive unit and equal weight distribution

MPT = Multipurpose tire

on the tractive unit chassis.

Decided when body is agreed.

2) and as tractive unit and tractive unit chassis

3) tractive unit and tractive unit chassis

Authorized towed weights**Trailers with brakes**

Chassis Model	Sales designation	Gross weight of towing vehicle kg	Trailer, gross weight	
			with non-continuous brake (over-run brake) kg	with continuous brake kg
435.115	U 1300 L	7 490	7020 to 7500	10 480
435.111	U 1700 L	9 000 10 000 10 600	8 000	12 600 14 000 14 840

Trailers without brakes

Chassis Model	Sales designation	Gross weight of towing vehicle kg	Trailer Gross weight kg
435.115	U 1300 L	7 490	2 300
435.111	U 1700 L	9 000 10 000 10 600	2 000

Trailers with brakes

Chassis ⁴⁾			Trailer, gross weight		Trailer coupling ¹⁾
Model	Sales designation	Gross weight of towing vehicle kg	with non-continuous brake (over-run brake) kg	with continuous brake kg	
435.110	U 1700	9 000	8 000	29 000	all
		10 000 ³⁾		28 000	
		10 600 ^{1) 3)}		25 600	64 G 135 or 605
		10 600 ^{2) 3)}		27 400	225 G 110
.113	U 1700 L/38	12 000	—	12 000	64 G 135

1) see technical data 31.3 - 1.1/1

Trailers without brakes

Chassis ⁴⁾			Trailer Gross weight kg
Model	Sales designation	Gross weight of towing vehicle kg	
435.110	U 1700	9 000	2 000
		10 000 ³⁾	
		10 600 ^{1) 3)}	
		10 600 ^{2) 3)}	
435.113	U 1700 L/38	12 000	2 500

1) with reinforced rear axle

2) with reinforced rear- and front axle and steering LS 7 F, SA 35 968, SA 35 969, SA 35 776

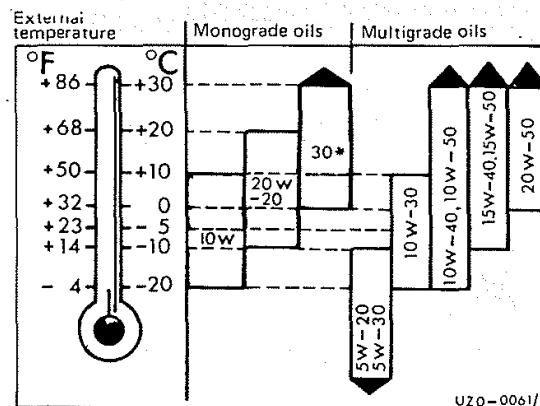
3) exhaust brake SA 35 810

4) tractor and chassis tractor

Filling capacities

Assembly		Service product (page No. of MB specification for service products	SAE class	Season	Capacity (l) 435.110 435.115 .117 .113 .113		
Engine	with oil filter	Engine oil (226-227.1)	12)	12)	max.15 min. 12	max.15 min. 12	
	proportion in oil filter				2 x 1.0 1.5	2 x 1.0	
Lock-up torque converter		Engine oil (226-227.1)	10 W 7)	all year round	17.5		
Clutch operation	Control reservoir	Brake fluid ⁵⁾ (331.1 331.2)	—	all year round	0.2		
Transmission	Main transmission	Engine oil ¹⁾ ⁶⁾ (226-227.1)	10 W	all year r.	10.5		
	- with low ratio gears	Transmission oil (235.1)	80 ⁹⁾ 80 W ⁹⁾ 80 W/ 85 W ⁹⁾ 80W/90 ¹⁰⁾ 90 ¹⁰⁾	all year round	11.5		
	- with crawler gears		12.5				
	- with pto 1:1		9.5				
	- with pto 0.7 : 1		10.0				
Hydrostat		Engine oil	10 W ³⁾	all year round	—	17.0	
		Hydraulic oil					
Pto shaft drive	540/1000/min	Transmission oil (235.1)	80	all year round	5.75		
		Engine oil ¹⁾ (226-227.1)	10				
	3 700/min	Transmission oil (235.1)	80		8.0		
Pto shafts	Shaft bearings ⁸⁾	Transmission oil (235.1)	80	all year round	0.1	0.1	
		Engine oil ¹⁾ (226-227.1)	10 W				
Axles	Central housing	Hypoid gear oil (235)	90	all year r.	2.5	2.5	
	Wheel hub drive				ea.0.3	ea.0.3	
	Differential lock	Initial operation oil (225)	10 W		0.001	—	
Steering	Hydraulic steering	Engine oil (226, 227)	10 W ³⁾	all year round	2.25	2.25	
		or ATF (236,2)	—		3.25 ⁴⁾		
		Hydraulic oil (226,227,236,2)					
Braking circuit	Complete capacity	Brake fluid ⁵⁾ (331.1)	—	all year r.	app.0.8	app.1.0	
Compressed air brakes	with anti-freeze bottle	Ethyl alcohol (methylated spirits)	—	all year round	app.0.2	app.0.2	
		Iso propyl alcohol ¹⁾					
Grease nipples	Axle, chassis, cab	Lubricating grease (266)	—	all year r.	as required		
Winch	at front	Transmission oil	80	all year r.	2.0	2.0	

12) Viscosity ranges



* With a continuous external temperature above +30°C (86°F) SAE 40 can be used.

- 1) Applicable for military vehicles
- a) Only those oils specified by Daimler-Benz may be used.
- b) Use oils specified by the vehicle owner. If he has not left any instructions, use the normal oils specified.
- 2) Listed oils may not be mixed with each other.
- 3) Use SAE 5 W-20/30 in cold regions.
- 4) Applicable for LS 7.
- 5) Change yearly (safety requirement).
- 6) Only applicable for transmission model 717.901 without auxiliary transmission.
- 7) In cold regions SAE 5 W-20/30
In hot regions SAE 30
- 8) Long-term filling
- 9) Optional
- 10) In hot zones
- 11) With turbocharged engines use only S3 grade engine oil

Assembly		Service product (page No. of MB specification for service products)	Season	Capacity (l)	
				435.115 .117	435.110 .111 .113
Battery	- Terminals	Acid-resistant grease FT 40 VI (350) tech. vaseline ¹⁾	all year round	as required	
	- Topping up	Distilled water			
Start pilot	Supply reservoir	Starter fuel	all year r.	0.05	0.05
Fuel system	Fuel tank	Diesel fuel DIN 51 601	all year r.	160	160
Cooling circuit	with heater	Coolant ⁷⁾ (325)	all year round	20	20
	proportion of anti-freeze down to -25°C -13°F (standard filling)	Anti-freeze (325)		8	8
	proportion of anti-freeze down to -40°C -40°F	Anti-freeze (325)		10.2	10.2
	and corrosion inhibitor	Corrosion inhibitor (311)		0.2	0.2
Screen wash circuit	Screen wash bottle	MB screen wash additive	all year round	9.5	7

- 1) Applicable for military vehicles
a) Only those oils specified by Daimler-Benz may be used.
b) Use oils specified by the vehicle owner. If he has not left any instructions, use the normal oils specified.
7) Consisting of water, anti-freeze and corrosion inhibitor.

Special versions U 1300 L considered:

Engine:	16.457/26	18.638/03	39.975/01	83.036/01
	35.737/04	35.738/02	35.949/02	35.977/01
Clutch:	35.741			
Transmission:	35.737/04	35.738/02	35.949/02	35.977/01
	35.985/01			
Frame:	35.014/17	35.149/04	35.238/03	35.460/09
	35.780/01	35.817/08	35.851/02	35.951/01
	35.951/02	35.976/01		
Suspension:	35.633/02	35.772/04		
Axle:	35.973/01	35.974/01		
Brake:	35.734/10	35.822/01	35.823/02	35.966/01
	35.981/01	35.988/01	35.992/01	35.997/01
	35.998/01			
Steering:	35.987/01			
Fuel system:	35.778/02	35.921/01		
Electrical equipment:	35.496/05	35.647/03	35.775/03	35.769/05
	35.769/10	35.769/11	35.827/01	35.827/02
	35.828/01	35.831/01	35.912/05	35.942/01
	35.965/02	35.979/01	35.980/01	35.986/01
	35.993/01	53.482/01	82.509/54	82.983/24
Cab:	35.765/10	35.928/09	53.472/01	53.473/02
	53.474/03	53.477/02	53.478/02	53.479/03
	53.480/03	53.483/07	53.484/02	53.485/02
	53.486/01	53.489/02	53.491/06	53.492/01
	53.495/01	53.497/01	53.950/01	53.951/01
	53.962/01	53.977/01	53.977/02	53.978/01
	53.980/01	53.982/02	53.983/01	
Platform:	435.611	35.017/10	35.074/03	35.149/04
	35.270/09	35.270/14	35.534/07	35.761/01
	35.762/02	35.763/02	35.764/01	35.766/02
	35.767/01	35.768/01	35.777/01	35.825/01
	35.982/01	70.071/01		
Special parts:	35.847/02	35.951/02		

If a particular unit incorporates only one or two special versions (SA's), these will be indicated beneath the heading.

The job descriptions may differ for vehicles which do not feature corresponding special versions (SA's).

00 General

Special versions U 1700 L/38 considered:

Engine:	16.074	18.631	18.638	35.810
	35.975	81.408	82.773	82.928
	83.017	83.036	83.069	
Clutch:	35.741			
Transmission:	35.737	35.738	35.749	35.970
	35.977	35.985		
Frame:	35.872	35.999		
Suspension:	35.301	35.772		
Axle:	36.140			
Wheels:	36.103			
Brake:	35.643	35.810	35.966	35.976
	36.043	36.089		
Steering:	35.776			
Fuel system:	35.270	35.778	35.921	
Electrical equipment:	35.098	35.647	35.693	35.703
	35.769	35.827	35.965	35.979
	35.980	35.986	35.992	35.993
	36.017	36.089	36.139	53.482
	53.484	53.496	53.957	53.985
	82.509	82.983		
Cab:	35.847	36.048	53.472	53.473
	53.474	53.475	53.480	53.482
	53.483	53.484	53.485	53.489
	53.491	53.493	53.499	53.950
	53.951	53.955	53.958	53.978
	53.980	53.982	53.984	53.985
	53.991			
Platform:	35.074	35.270	35.437	35.460
	35.503	35.534	35.559	35.761
	35.762	35.763	35.764	35.768
	35.777	35.825	36.105	36.133
	36.137	39.725	39.729	

Where only one or two special versions (SA) of a unit are fitted, this/these is/are listed in the heading.

The description of jobs may differ in the case of vehicles without corresponding special versions (SA).

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3 Removal and installation of cylinder head cover	3.1/1
4 Removal and installation of cylinder head	4.1/1
5 Disassembly and assembly of cylinder head	5.1/1
6 Reconditioning of cylinder head	
Checking, exchanging valve guides	6.1/1
Refacing valve seats with valve seat cutter	6.2/1
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Removal and installation of valve seat rings	6.4/1
Remachining basic bore for valve seat rings	6.5/1
7 Checking compression pressures	7.1/1

Installation Survey

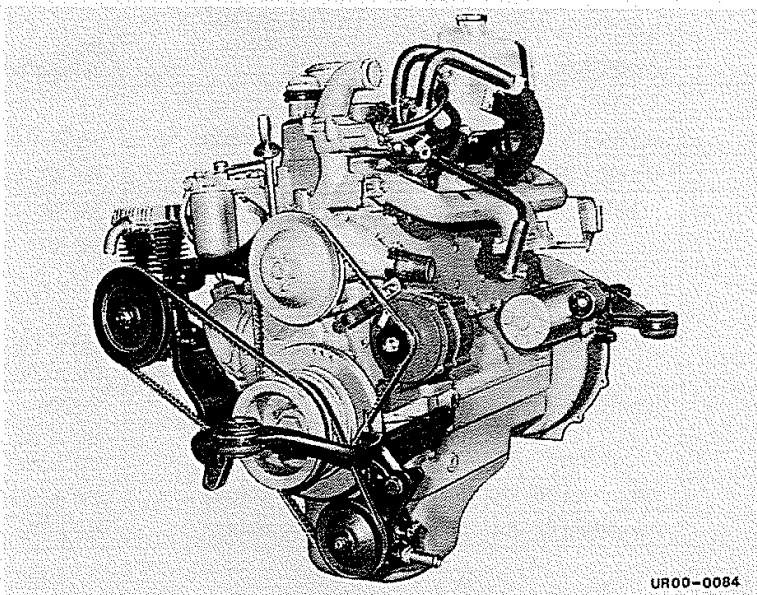
Chassis Model	Sales designation	Series Chassis end No.	Engine Model	Sales designation	Series/SA Engine end No.
435.110	U 1700	from 002 230	353.959	352 A. V/2 352 A. LII/1 ⁵⁾	Series from 577 967
.111	U 1700 L ¹⁾	from 000 008			Series from 413 968
.113	U 1700 L/38	from 084 642			Series from 693 577
.115	U 1300 L ¹⁾	from 000 019	353.961	352.X/2	Series from 482 095
		from 000 061 ²⁾		352.X/1 ²⁾	SA 16 457/26 ²⁾ SA 35 975 ²⁾ SA 83 036 ²⁾ from 509 465
		from PB ³⁾		352 A. V/2 352 A. LII/1 ⁵⁾	SA 36 019 ⁴⁾ from PB ³⁾
.117	U 1300 L/37	from PB ³⁾	353.961	352.X/2	Series from PB ³⁾
		from 071 796	353.959	352 A. V/2 352 A. LII/1 ⁵⁾	SA 36 019 ⁴⁾ from 627 976
.160	Attachment TM 170	from PB ³⁾	353.959	352 A. LII/1	from PB ³⁾
.170	Attachment Condor	from PB ³⁾	353.977	352 A. V/2	Series from 575 178

- 1) L = Truck
- 2) Special vehicle BW
- 3) PB = Start of production
- 4) Valid only for fire service vehicles
- 5) From engine end No. 691 150

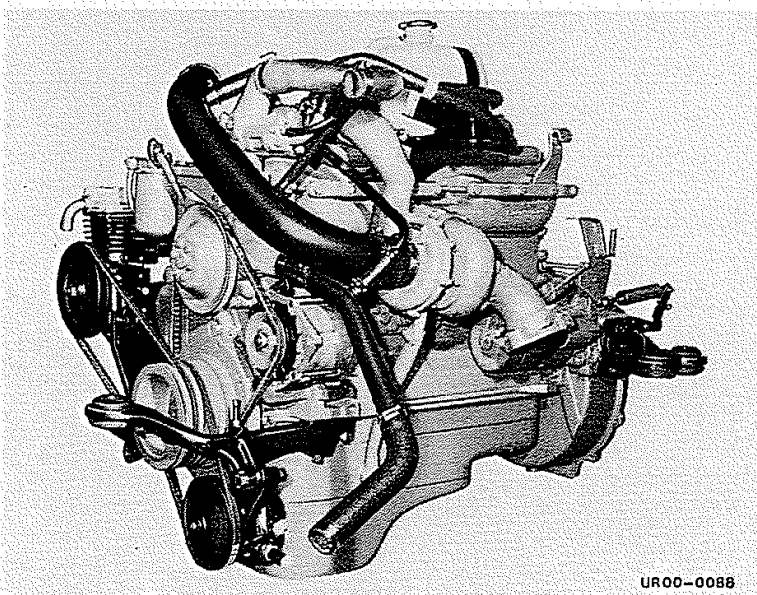
01.8 General

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General View

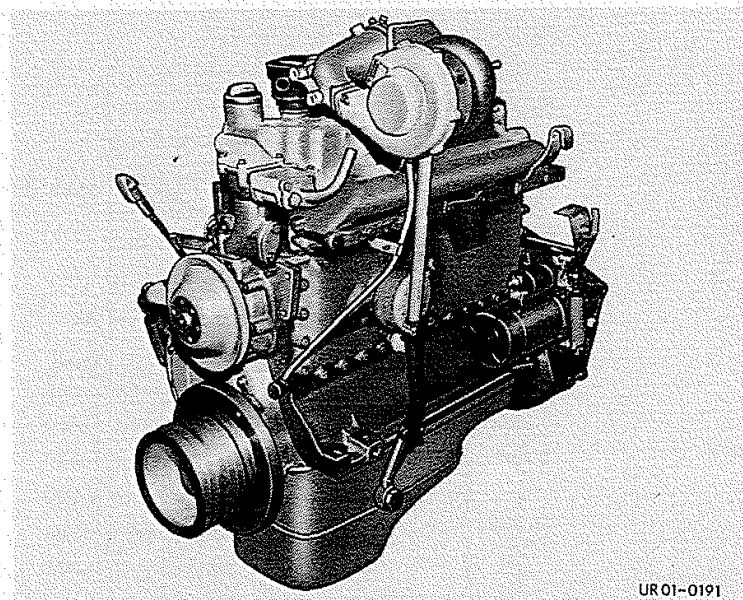


Engine 353.961



Engine 353.959

General view

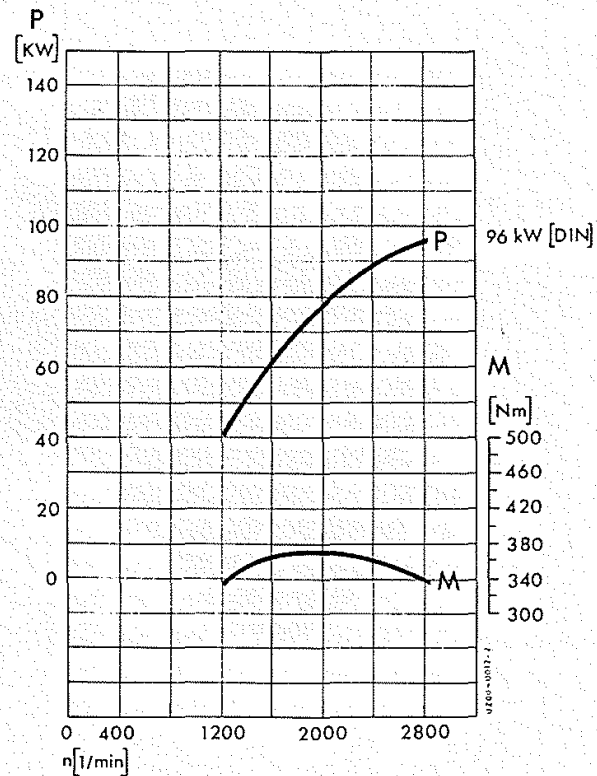


Engine 353.977

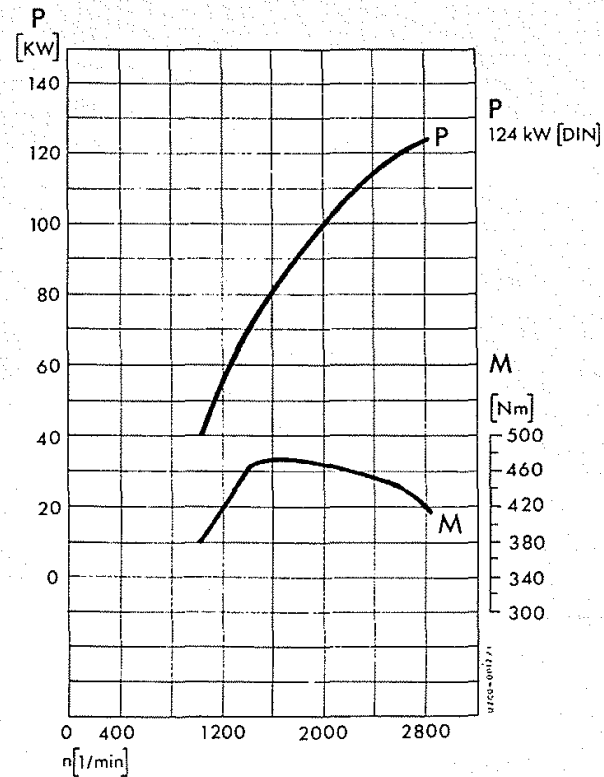
01.8 General

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Performance diagram

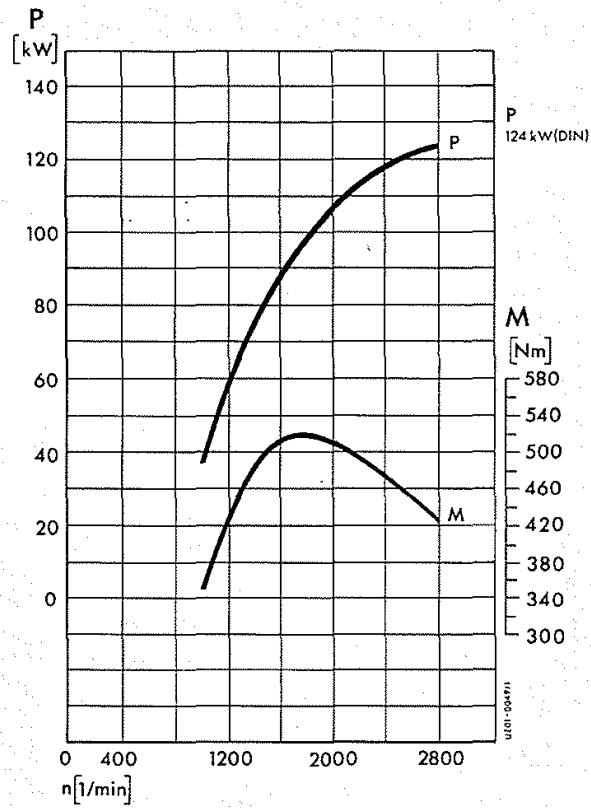


Engine 353.961



Engine 353.957 to engine end No. 691 149
.977

Performance Diagram



Engine 353.959 from engine end No. 691 150

Technical Data

Mercedes Benz type			352		352 A	
Model			353.961		353.959	353.977
Combustion system			Four-stroke diesel with direct injection		Four-stroke diesel with direct injection	
Number of cylinders Cylinder arrangement			6, vertical in-line			
Bore ø		mm	97			
Stroke		mm	128			
Total displacement		cm ³	5657			
Compression ratio			17		16	
Compression at starting speed		bar	22 up to 24 min. 20			
Continuous output at nominal speed		kW (HP) 1/min	96 (130) 2800		124 (168) 2800	
Maximum torque at speed		Nm 1/min	363 1700		491 ¹⁾ 1600	530 ²⁾ 1600 491 1600
Idle speed		1/min	700			
Start of delivery before TDC		°	18		21 ¹⁾	19 ²⁾ 21
Injection sequence			1 - 5 - 3 - 6 - 2 - 4			
Valve clearance, cold	Inlet	mm	0,20		0,25 ²⁾	0,20
	Exhaust	mm	0,30		0,40 ²⁾	0,30
Opening pressure	new	bar	200 + 10			
of injection nozzles	used	bar	min. 180			
Operating temperature		° C	95			
Oil pressure	normal	bar	2 to 5			
	at idle speed	bar	min. 0.6			
Weight, dry		kg	460		480	

1) To end engine No. 691 149.

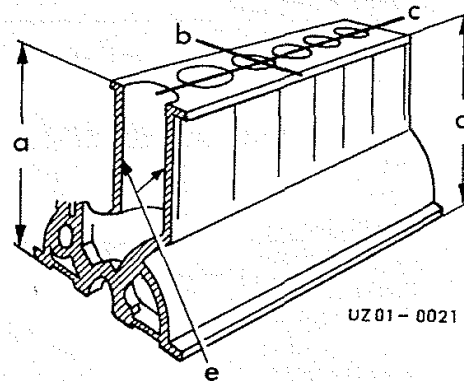
2) From end engine No. 691 150.

01.8 General

352/352 A

Crankcase

Engine Type			352	352 A
Overall height of crankcase (Production size)	a	mm	359,10	359,00
			358,80	358,70
Repair stage I ¹⁾		mm	358,50	358,40
Repair stage II ¹⁾		mm	358,20	358,10
Repair stage III ¹⁾		mm		
Permissible unevenness of mating surface	Crosswise	b	mm	0,017
	Lengthwise	c	mm	0,03
Peak-to-valley height of upper mating surface		mm	0,008 up to 0,016	
Permissible parallel misalignment of upper to lower mating surface in lengthwise direction	d	mm	0,1	
Pressure test in water		bar	2,5	
Piston may recede	= -	mm	0,07	
Piston may project	= +	mm	0,30	



1) If mating surface is remachined to next repair stage, pistons of reduced compression height must be installed.

Cylinder Bores (e)

Normal mm	Normal I mm	Normal II mm	Repair stage I mm	Repair stage II mm	Repair stage III mm
<u>97,010</u>	<u>97,085</u>	<u>97,135</u>	<u>97,510</u> ¹⁾	<u>98,010</u> ¹⁾	<u>98,510</u> ¹⁾
<u>96,990</u>	<u>97,065</u>	<u>97,115</u>	<u>97,490</u>	<u>97,990</u>	<u>98,490</u>
<u>97,010</u> ²⁾	—	—	<u>97,010</u> ²⁾		
<u>96,990</u>			<u>96,990</u>		
Permissible ovality			mm	0.01	
Permissible conicity			mm	0,01	
Permissible deviation of cylinder bores perpendicular to crankshaft axis, relative to 200 mm length			mm	0,04	
Peak-to-valley height of the cylinder bores			mm	0,003 up to 0,005	
Waviness of cylinder bores			mm	max. 50% of peak-to-valley height	
Wear in liner	at top reversal point of 1st piston ring		mm	max. 0,12	
	in centre of liner		mm	max. 0.05	
Bore depth for machining to the repair stages			mm	min. 250	

1) Not engine 353.959/ 977.

2) Possible repair- crankcase with dry cylinder liners may be installed. If necessary, the scope of work can be requested.

Camshaft Bearings

Basic bores in crankcase	mm	60,030
		60,000

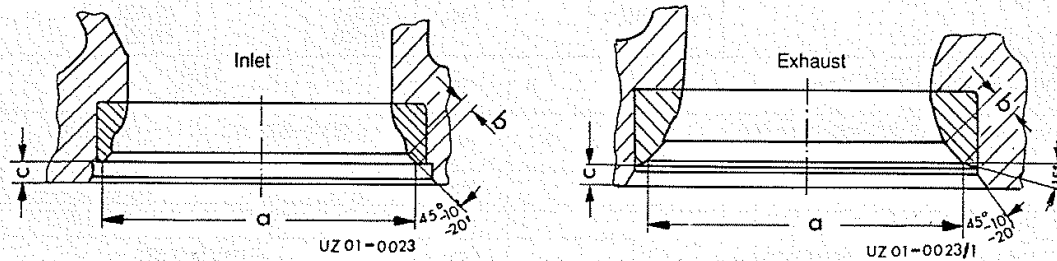
Valve tappet bores

Normal mm	Repair stage I mm	Repair stage II mm	Repair stage III mm
<u>28,033</u> 28,000	<u>28,233</u> 28,200	<u>28,533</u> 28,500	<u>28,783</u> 28,750

Cylinder head

Overall height of cylinder head	mm	92,10 91,90
Permissible material allowance	mm	1,00
Permissible roughness of mating surface	lengthwise	mm 0,05
	crosswise	mm 0,015
Permissible parallel misalignment of upper to lower mating surface	lengthwise	mm 0,10
Pressure test in water	bar	2.5
Nozzle projection relative to lower edge of cylinder head	mm	1.8 to 2.5
Peak-to-valley height of lower mating surface	mm	0,008 up to 0,016

Valve seat



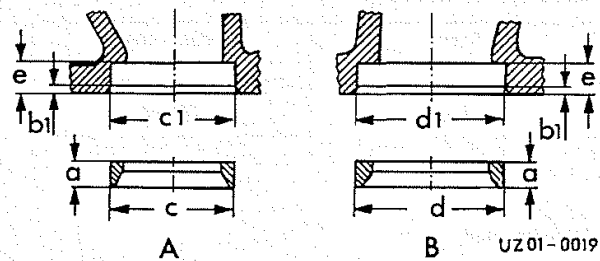
Valve seat ring diameter for new rings	a	Inlet	mm	42 ± 0,01
		Exhaust	mm	34 ± 0,01
Width	b	Inlet	mm	1,6 up to 2,0
		Exhaust	mm	2,0 up to 2,5
Reference dimension	c	Inlet	mm	2,8 + 0,2
		Exhaust	mm	2,6 + 0,2
Permissible runout of valve seat			mm	0,03
Distance between cylinder head mating surface and valve head		Inlet	mm	0,7 + 0,5
		Exhaust	mm	0,7 + 0,5
Valve seat angle		Inlet and exhaust	°	45° - 10' - 20'
Correction cut	Inside	Inlet	°	60°
		Exhaust	°	75°
	Outside	Inlet and exhaust	°	30°

Valve seat rings must be renewed if the machining limit is exceeded when remachining the valve seat.

01.8 General

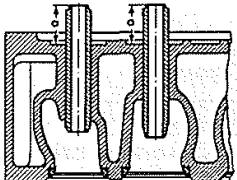
352/352 A

Valve Seat Rings



		Exhaust A 1)		Inlet B 1)	
Outside diameter valve seat ring c and d	Normal	mm	38,080 38,070	45,080 45,070	45,880 45,870
	Repair stage I	mm	38,380 38,370	45,380 45,370	46,180 46,170
	Repair stage II	mm	38,580 38,570	45,580 45,570	—
Bore diameter in cylinder head c 1 and d 1	Normal	mm	38,025 38,000	45,025 45,000	45,825 45,800
	Repair stage I	mm	38,325 38,300	45,325 45,300	46,125 46,100
	Repair stage II	mm	38,525 38,500	45,525 45,500	—
Installation depth in cylinder head	e	mm	11,20 11,10		
Distance between cylinder head face and valve seat ring	b 1	mm	2,6 + 0,2 2,8 + 0,2		
Basic bore in cylinder head		mm	38,000 + 0,025 45,000 + 0,025		
Height of valve seat rings	a	mm	8,5 – 0,1 8,3 – 0,1		
Valve seat ring overlap in cylinder head		mm	0,045 to 0,080		

Valve Guides

Distance between valve guide valve spring seat	a	mm	Exhaust	Inlet	
			24 – 0,5		
Inside diameter		mm	<u>10,022</u> 10,000	<u>9,022</u> 9,000	
Length		mm	73	78	
		Normal mm	Repair stage I mm	Repair stage II mm	Repair stage III mm
Outside diameter		<u>15,046</u> 15,028	<u>15,146</u> 15,128	<u>15,246</u> 15,228	<u>15,546</u> 15,528
Bore in cylinder head		<u>15,018</u> 15,000	<u>15,118</u> 15,100	<u>15,218</u> 15,200	<u>15,518</u> 15,500
Overlap		mm	+ 0,010 to + 0,046		

1) Engine model 353.959 from engine end No. 549 882.

Special Tools

Cons. No.	Tool	Tool No.	Tool Set
1	Ring wrench for injection lines	000 589 07 03 00	A
2	Pliers for connecting nipple of rocker shafts	312 589 01 37 00	A
3	Claw wrench for protective sleeve in cylinder head	346 589 00 07 00	B
4	30 mm socket for pressure screw in nozzle holder	000 589 75 09 00	B
5	Extractor for nozzle holder	352 589 00 33 00	B
6	Centering drift	425 589 00 61 00	B
7	Drift for removing inlet valve guide	110 589 02 15 00	C
8	Drift for removing exhaust valve guide	615 589 01 15 00	C
9	Fitting drift for valve seat rings	346 589 03 15 00	C
10	Installer for valve guide	352 589 00 43 00	C
11	Reamer, 9 mm diameter for inlet valve guide	000 589 10 53 00	C
12	Reamer, 10 mm diameter for exhaust valve guide	000 589 11 53 00	C
13	Reamer for valve guide sleeve bore in cylinder head	000 589 18 53 00	C
14	Hand cutter for valve seat rings	000 589 12 66 00	C
15	Special wrench to retighten injection lines	000 589 68 03 00	D
16	Limit plug gauge dia. 9 mm inlet valve guide	116 589 08 21 00	D
17	Connection piece for compression test	352 589 00 21 00	D
18	Limit plug gauge, 10 mm dia. for exhaust valve guide	617 589 05 23 00	D
19	Handle for cylinder head (2 necessary)	312 589 01 31 00	D
20	Rud special lifting chane	435 589 00 62 00	D

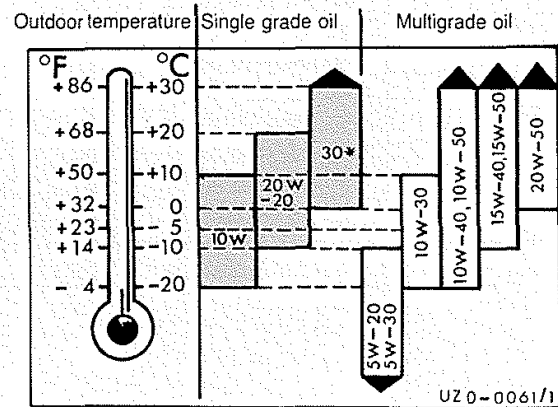
01.8 General

352/352 A

Capacities

Assembly		Service product (page No. of MB service product specification)	SAE-grade	Capacities (l)	
				352 ³⁾	352 A
Engine	With oil filter	max.	1)	14,5	15,0
		min.		11,5	12,0
	Proportion in oil filter	(227.0, 227.1) ⁵⁾		1,5	2 x 1,0
Cooling system	With heater	Coolant ⁴⁾ (325)		20	
	Antifreeze proportion	down to -25°C -13°F	Antifreeze (325)	8	
	(Standart filling)				
	Antifreeze proportion	down to -40°C -40°F	Antifreeze (325)	10,2	
And corrosion protection			Anticorrosion oil (311)	0,2	

1) Viscosity grades



- *) SAE 40 may be used if outdoor temperatures are permanently above +30°C (86°F).
- 2) To engine end No. 502 247
- 3) From engine end No. 502 248
- 4) Consisting of water, antifreeze and anticorrosion oil
- 5) For supercharged engines, only use engine oil of "S 3" quality.

Necessary material

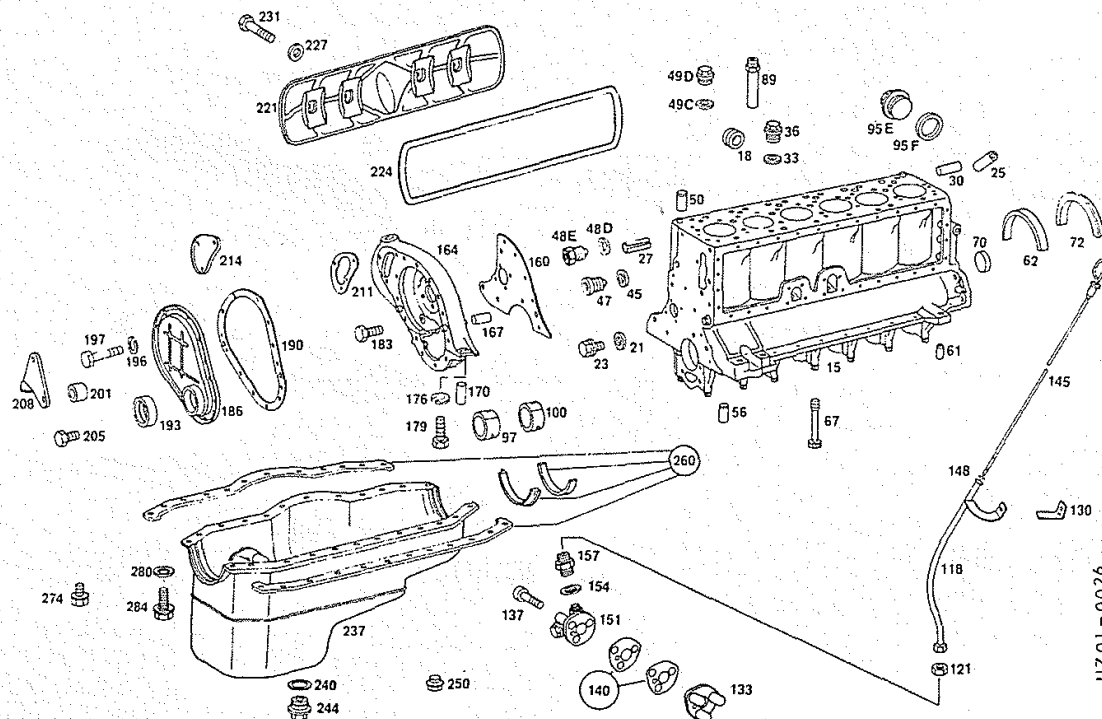
Cons. No.	Designation	Part No.
1	Loctite Nr. 241	002 989 70 71
2	Loctite Nr. 573	001 989 45 20
3	Curil T	001 989 37 20
4	Curil K 2	commercially available
5	Loctite Nr. 221	002 989 69 71

Tightening Torques

Designation	Thread	Nm	Torquing angle
Cylinder head cover	M 8	25	
Push rod cover to crankcase	M8	4 to 6	
Timing gear case cover	Casting	M 6	8
	Sheetmetal	M 6	8
Cylinder head (tightened in 3 stages according to tightening diagram)			
	1st step	M 12	60
	2nd step	M 12	90
	3rd step	M 12	110
Oil pan (sheet steel)	M 6	8	
	M 8	9	
Oil drain plug to oil pan	M 26	80 + 10	
Protective sleeve for nozzle holder in cylinder head	M 14	60	
Nozzle holder in cylinder head, thrust screw	M 34	60 to 70	
Tapered plug in cylinder head	M 30	100 to 200	
	M 24	70 to 150	
Coolant line on top of cylinder head	M 8	25	
Flywheel housing to crankcase	M 12	80	
Timing gear case to crankcase	M 10	65	
Screw plug for oil passage in crankcase	M 20	100 ± 10	
Screw plug for oil duct, front and rear	M 16	40 + 5	
Flywheel to crankshaft	Initial torque	M 12	30 + 10
	Final torque	M 12	— 90° + 20°
Rocker arm brackets assembly to cylinder head	M 12	100 up to 110	
Leakage fuel line to injection nozzle	M 8	15 up to 20	
Union nut of injection line	to injection pump	M 12	25
	to nozzle holder	M 14	25
Air compressor bracket to engine mount		75	
Exhaust manifold to cylinder head	M 10	30	
Exhaust manifold to cylinder head, 2-hole metal plate	M 10	25	
Flanged manifold to exhaust pipe	M 10	45	
Front engine mounting to frame	M 14	140 ± 20	
Rear engine mounting to frame	M 14	140 ± 20	
Front engine support to crankcase	M 14	170 ± 20	
Left engine support arm to flywheel housing	M 12	110 ± 20	



Exploded view



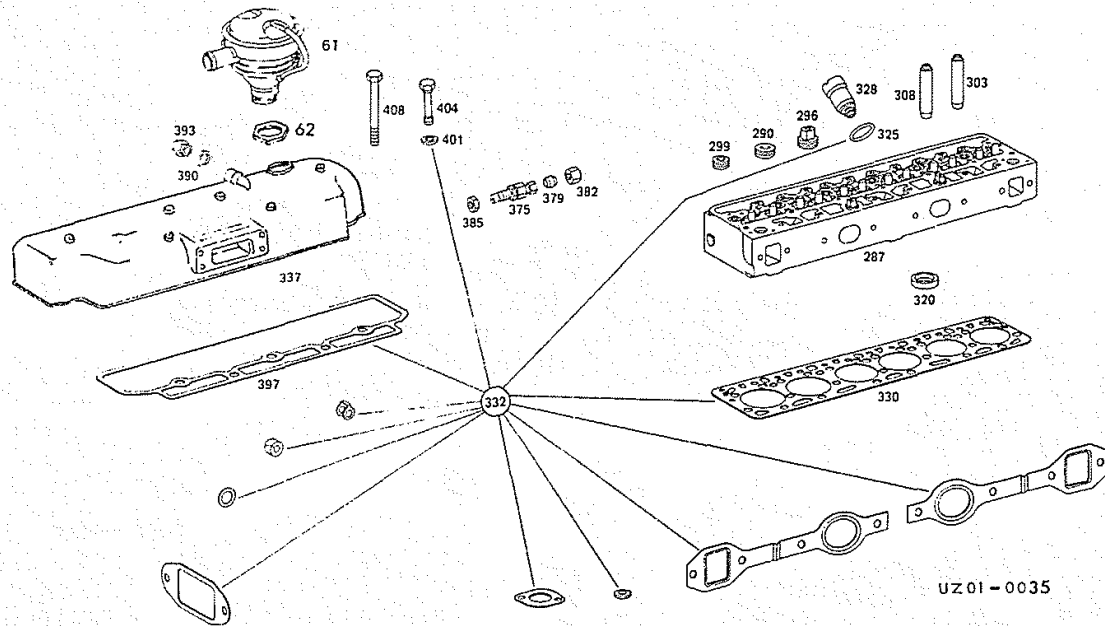
Engine housing

15	Crankcase	95E	Screw plug	186	Timing gear case cover
18	Screw plug	95F	Sealing ring	190	Gasket
21	Sealing ring	97	Camshaft bearing No. 1	193	Shaft seal
23	Screw plug	100	Camshaft bearing Nos. 2,3,4	196	Lock washer
25	Sleeve	118	Guide tube	197	Bolt
27	Sleeve	121	Cap nut	201	Spacing ring
30	Straight pin	130	Bracket	205	Bolt
33	Sealing ring	133	Flange	208	Pointer
36	Screw plug	137	Bolt	211	Gasket
45	Sealing ring	140	Gasket	214	Cover
45	Screw plug	145	Oil dipstick	221	Pushrod cover
48D	Sealing ring	148	Sealing ring	224	Gasket
48E	Screw plug	151	Flange	227	Sealing ring
49C	Sealing ring	154	Sealing ring	231	Bolt
49D	Screw plug	157	Union	237	Oil pan
56	Straight pin	160	Gasket	240	Sealing ring
61	Straight pin	164	Timing gear case	244	Screw plug
62	Fabric sealing ring	167	Straight pin	260	Repair set
67	Bolt	170	Straight pin	274	Bolt
70	Cover	176	Lock washer	280	Washer
72	Gasket	179	Bolt	284	Bolt
89	Guide tube	183	Bolt		

01.8 General

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Exploded view



Cylinder head

61	Engine breather filter	320	Valve seat ring
62	Nut	325	Sealing ring
287	Cylinder head	328	Protective bushing
290	Screw plug	330	Cylinder head gasket
296	Stopper	332	Gasket set
299	Screw plug	337	Cylinder head cover
303	Intake valve guide	339	End cover
308	Exhaust valve guide	342	Sealing ring

Cylinder bore diagnosis

Owner

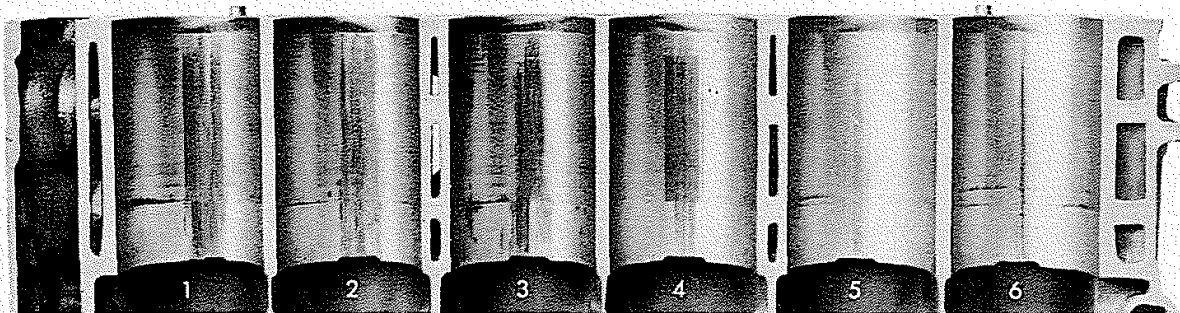


2. Branch/agents

3. Date

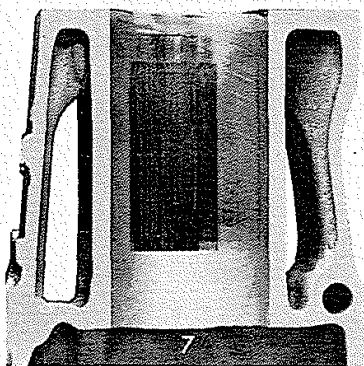
4. Repair job No.

5. Place	6. Registration No.	7. Date of 1st registration	8. Model	9. Chassis No.	10. Mileage
11. Copy	12. Presented by	13. Time accepted	14. Accepted by	15. Engine No.	16. Provisional deadline

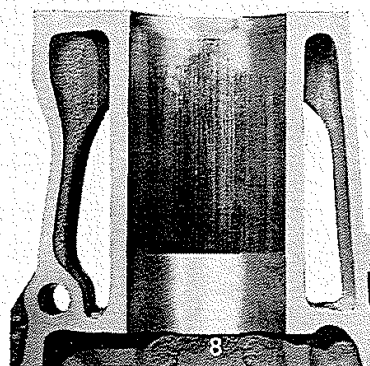


R-3083

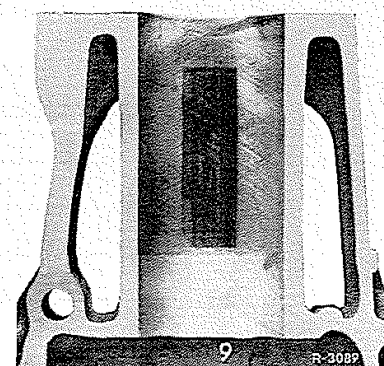
- Cyl. 1—3 Piston skirt has seized. Honing pattern destroyed. Engine has to be removed.
 Cyl. 4 Piston skirt and oil scraper ring have seized. Honing pattern destroyed. Engine has to be removed.
 Cyl. 5—6 Piston skirt cracked. Honing pattern still complete. Engine can continue working.



Ring has seized at land side, approx. 30 mm wide. Step due to oil ring is quite evident. Honing pattern destroyed. Engine has to be removed.



Oil ring seizure has extended across entire cylinder half. Honing pattern destroyed. Engine has to be removed.



R-3082

Semi-severe oil ring seizure. Honing pattern is still quite evident. Engine can continue working.

01.8 Cylinder bore diagnosis

352/352 A

OT

UT

45°

1 2 3 4

1 2 3 4 5 6 7 8

Zyl. 1

45°

1 2 3 4 5 6 7 8

2 3 4 5 6

UT

OT

Also indicate diagnosis here

Meanings

Seized
Cracked
Streaky
Bare

Z-2985

Removal and Installation of Engine 01.8

352 / 352 A

Removal

Note: Engine removal is similar for both engines No. 353.959 and 353.961.

- 1 Raise driver's cab, see 60.5-2.1/1 or 60.5-2.2/1.
- 2 Disconnect battery.

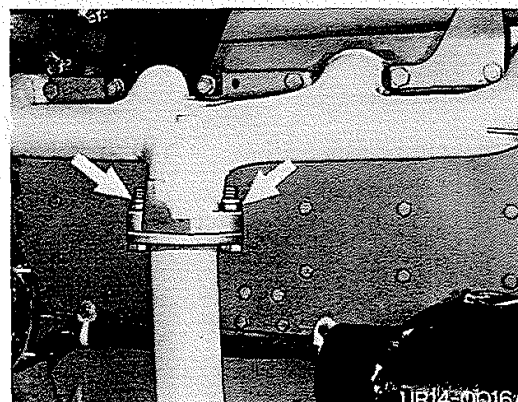
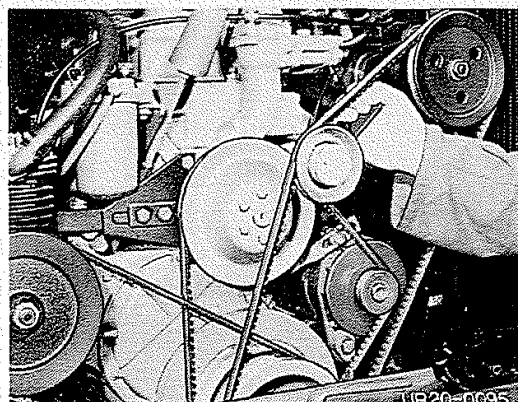
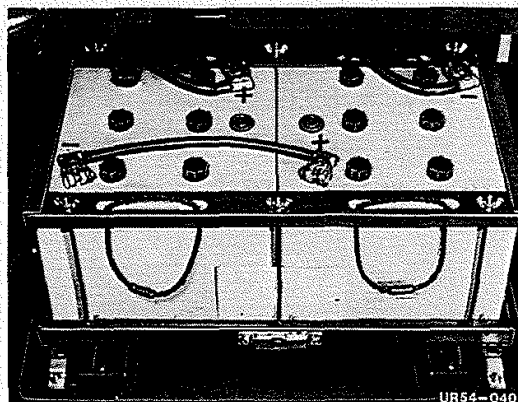
Note: Firstly disconnect (–) then (+) terminal.

- 3 Drain coolant.

- 4 Remove V-belt from intermediate fan shaft.

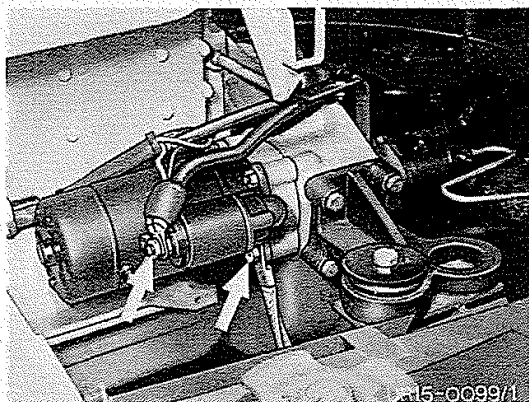
- 5 Detach exhaust pipe from exhaust manifold.

Note: For engine model 353.959, detach exhaust pipe at turbocharger.

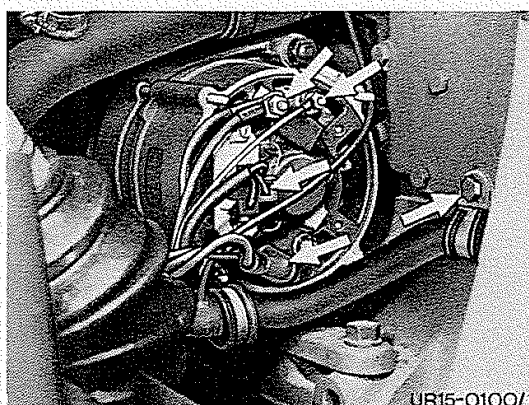


01.8 Removal and Installation of Engine

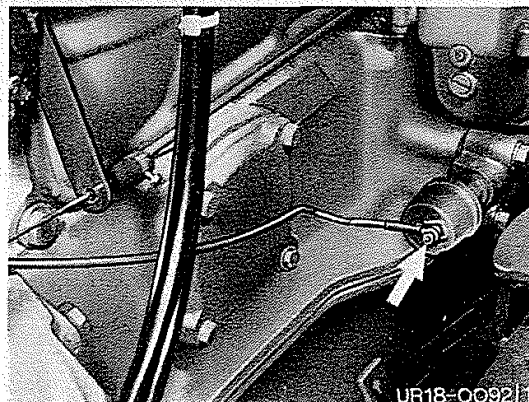
352 / 352 A



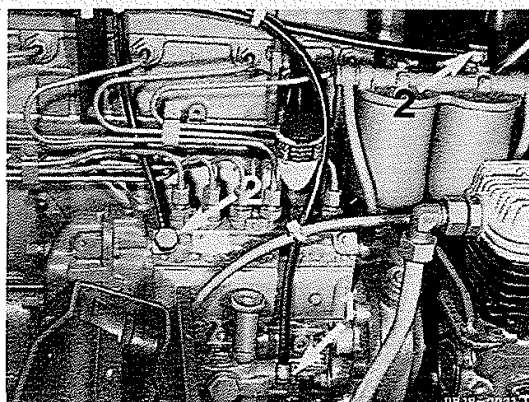
6 Disconnect electrical lines and ground strap from starter.



7 Mark and detach alternator wiring harness at oil cooler and electrical lines at the alternator.



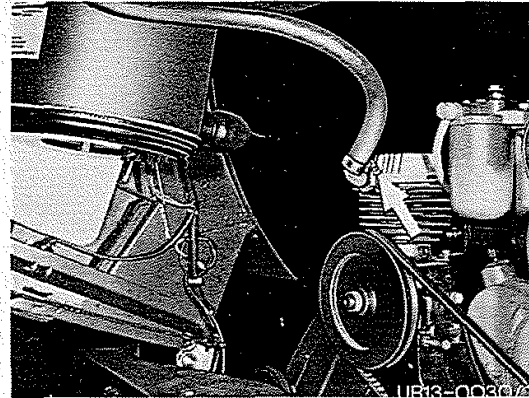
8 Detach electrical line at oil pressure pickup and coolant temperature pickup.



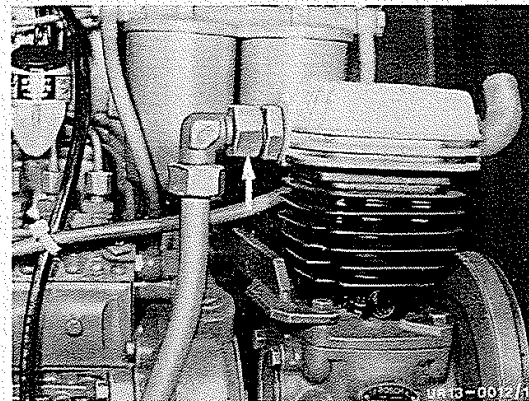
9 Remove fuel intake line (1) and return lines (2).

Note: The bleeding facility on the fuel filter is no longer fitted from chassis end No. 086 284.

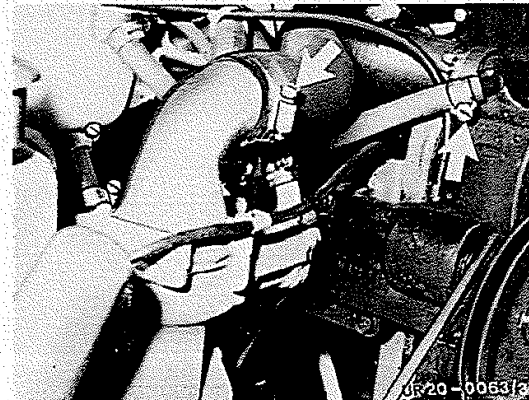
10 Detach intake line at air compressor.



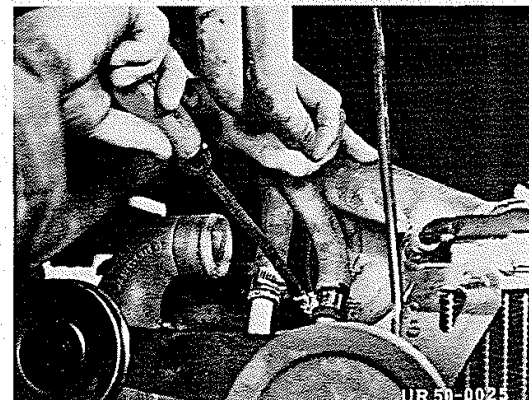
11 Detach delivery line at air compressor.



12 Detach coolant hose at thermostat body and coolant venting hose at radiator.

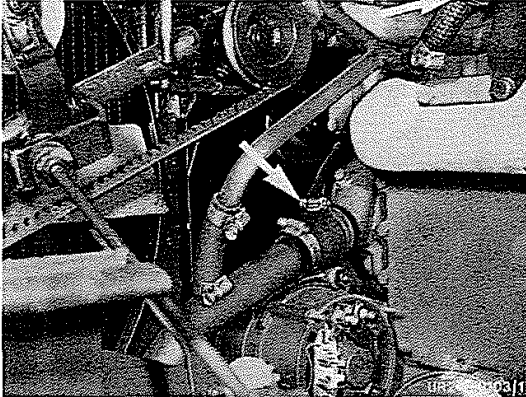


13 Detach heater hoses.

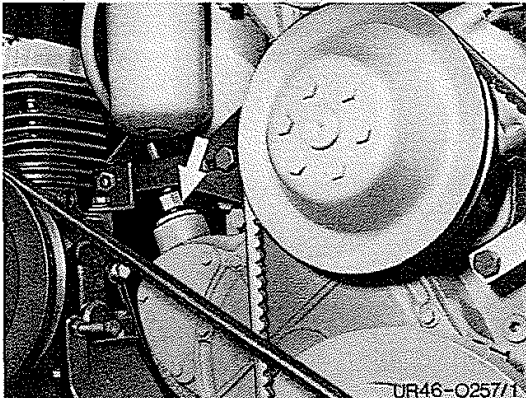


01.8 Removal and installation of engine

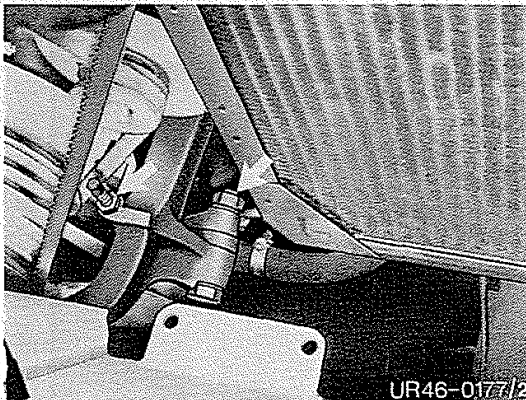
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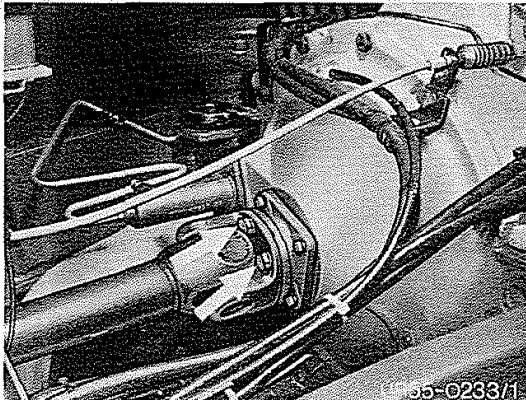
14 Detach coolant pipe at coolant pump and reservoir.



15 Detach venting line between timing gear case and steering fluid reservoir.



16 Detach hydraulic pump and bracket from engine support. Do not remove lines.

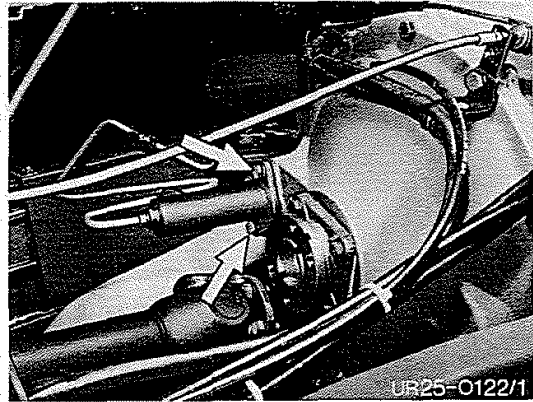


17 Detach propeller shaft from input flange.

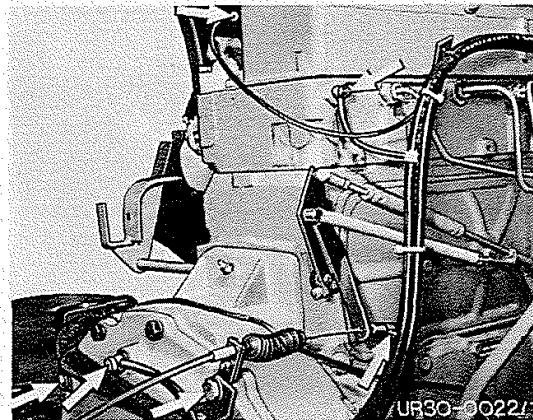
Removal and Installation of Engine 01.8

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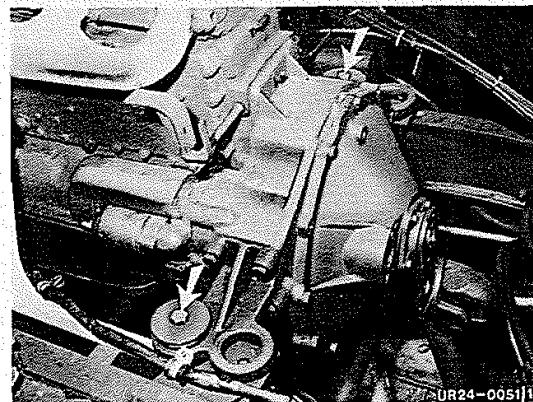
18 Remove clutch slave cylinder, do not detach line.



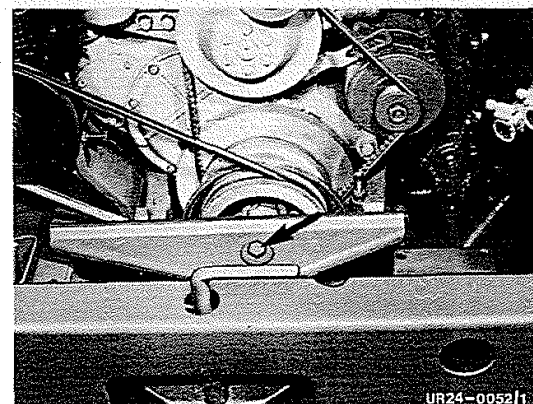
19 Detach starter wiring harness and venting line from clutch housing. Also remove fuel line, leakage oil line, cold starting line and control cable for idling if SA 35 989 installed.



20 Remove fastening bolts for rear engine mounts.

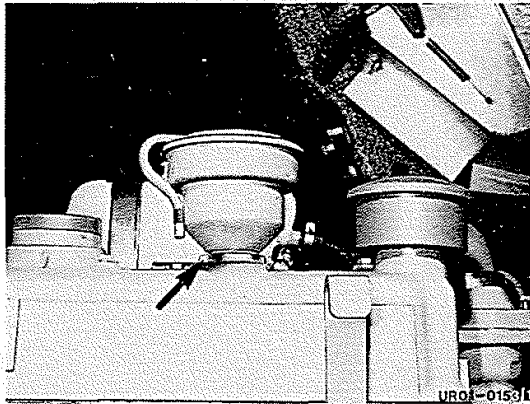


21 Remove fastening bolt at front engine mount. Detach cover.



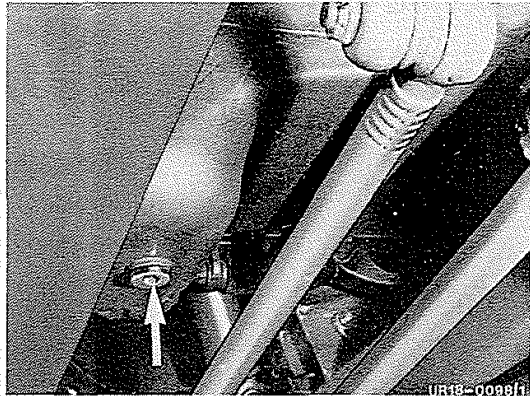
01.8 Removal and Installation of Engine

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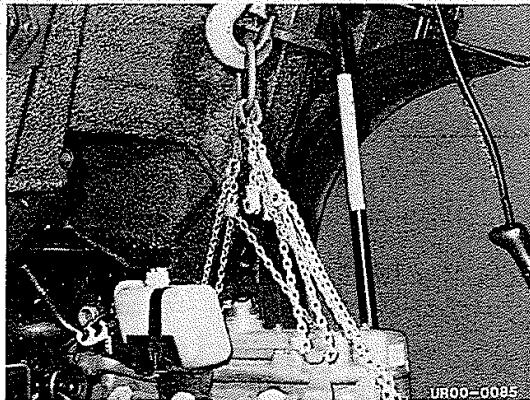


22 Detach engine breather filter.

Note: Renew engine breather filter without the code marking "E" every two years. A damaged engine breather filter must always be renewed immediately.



23 Drain engine oil as required.



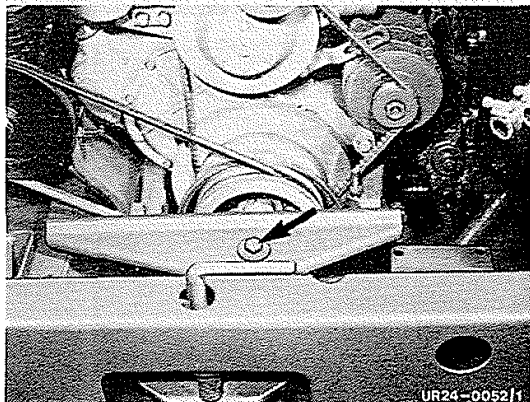
24 Lift out engine using special tool No. 19.

25 Clean all parts, check and replace if necessary.

Installation

Note: Engine installation is similar for both engine models No. 353.959 and 353.961.

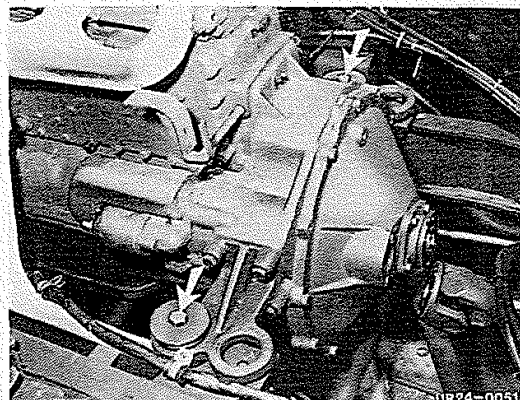
1 Slide engine into position using special tool No. 19.



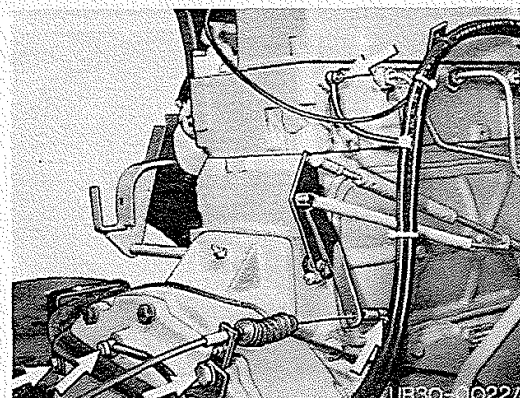
2 Fit cover and fastening bolt to front engine mount and tighten bolt.
Tightening torques, see 1.4/1.

3 Locate and tighten fastening bolts of rear engine mounts.
See 1.4/1 for tightening torque.

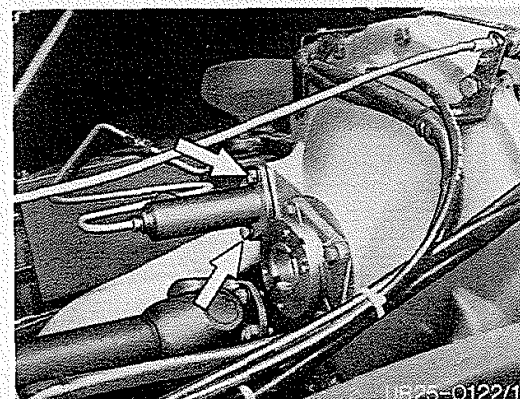
4 Lower engine and remove special tool No. 19.
Attach engine breather filter with sealant No. 2.



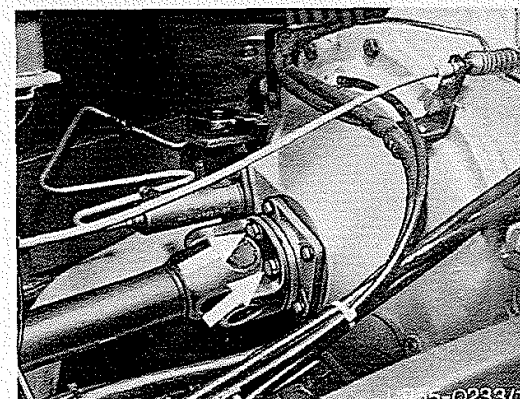
5 Remove starter wiring loom and venting line from clutch housing. Also remove fuel line, leak-off line, cold start line and idling control cable as fitted to special version 35 989.
Adjust idling setting, see 30.4-2.1/1.



6 Attach clutch slave cylinder after coating sealing surface with sealant No. 2.

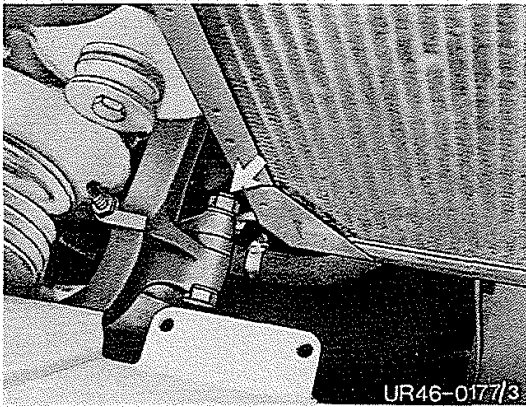


7 Attach propeller shaft to input flange.

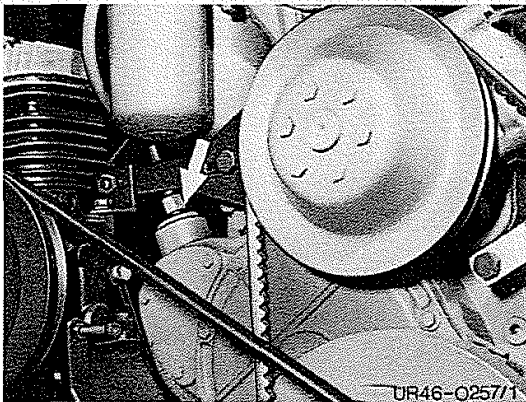


01.8 Removal and installation of engine

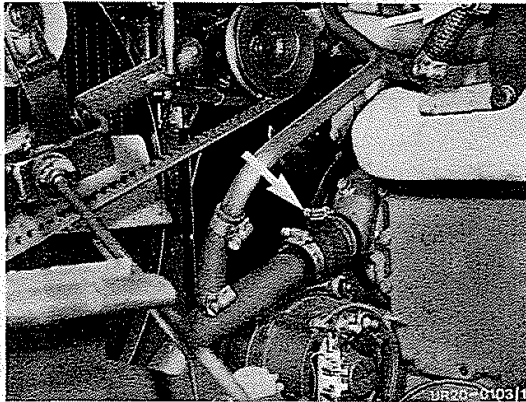
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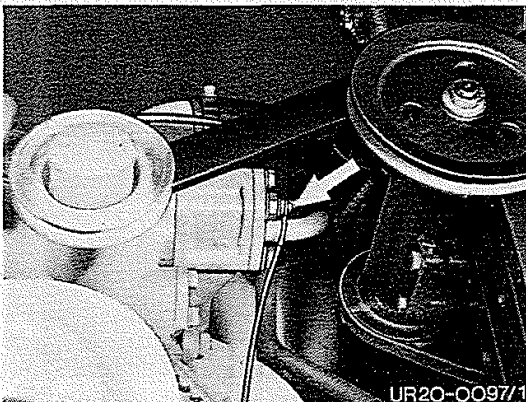
8 Attach hydraulic pump and bracket to engine support.



9 Attach venting line to timing gear case.

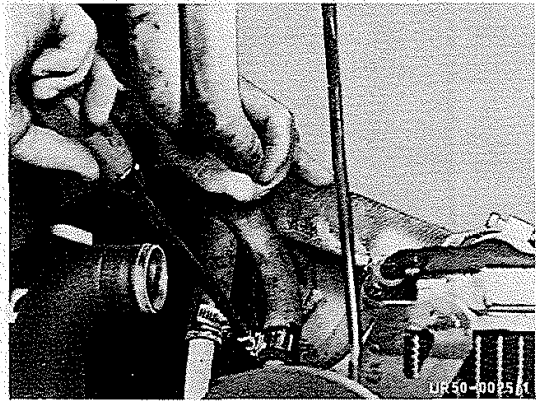


10 Attach coolant pipe to coolant pump and reservoir.

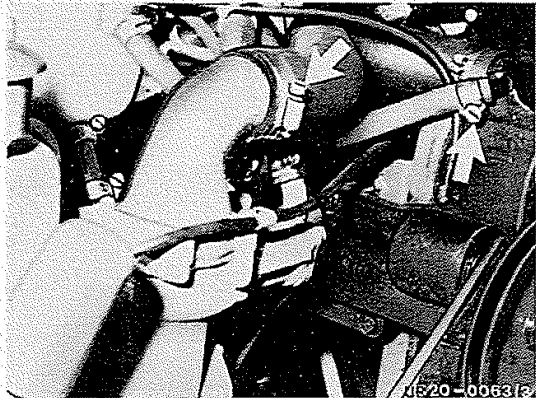


11 Attach electric line to coolant temperature pick-up.

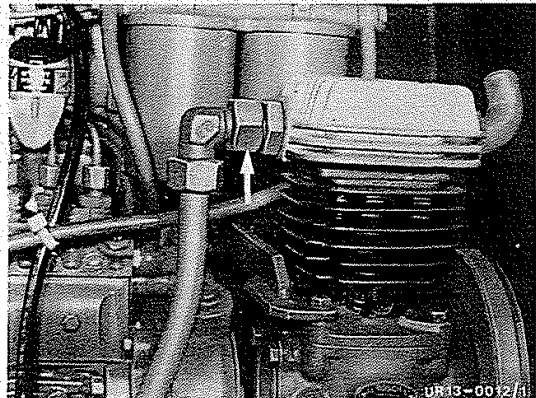
12 Connect heater hose.



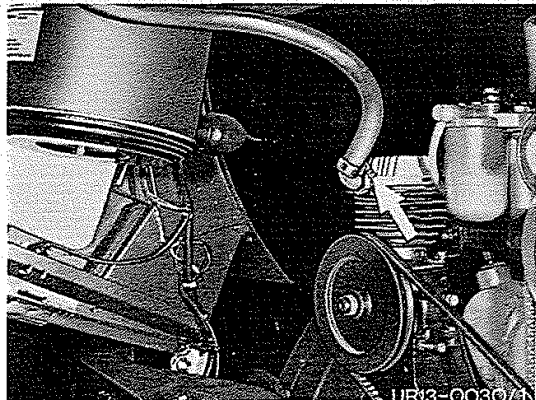
13 Attach coolant hose to thermostat housing and coolant venting hose to radiator.



14 Connect delivery line to compressor.

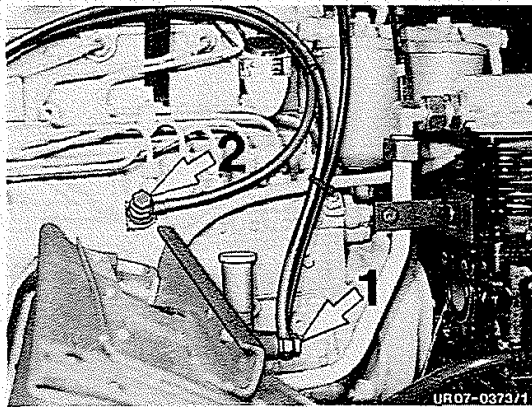


15 Attach intake line to compressor.



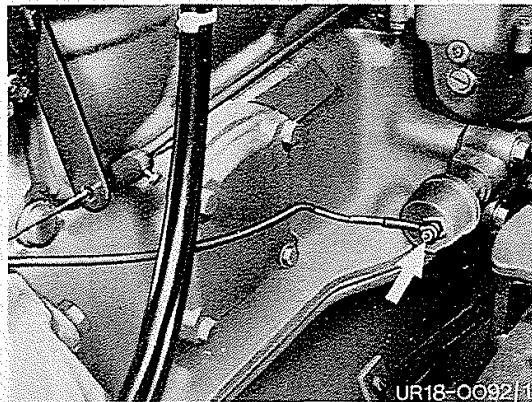
01.8 Removal and Installation of Engine

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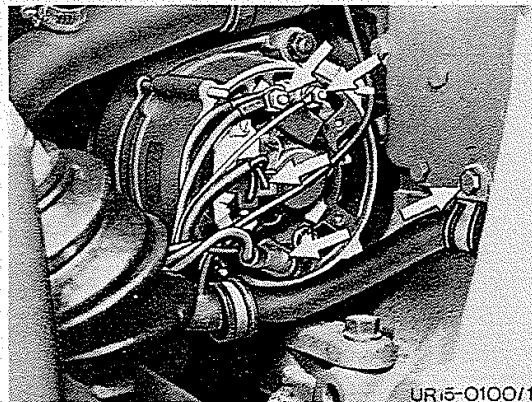


16 Attach fuel intake (1) and return lines (2).

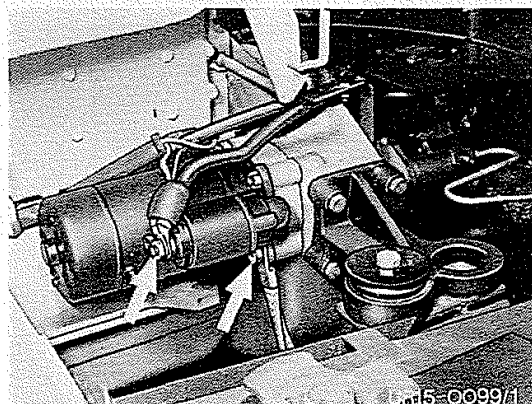
Note: The vent on the fuel filter is no longer fitted from chassis end No. 086 284.



17 Connect electrical line to oil pressure pickup.



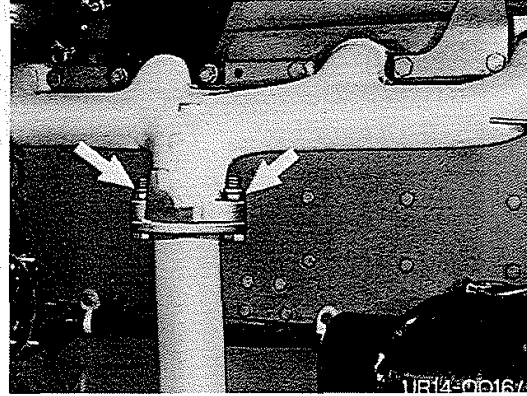
18 Referring to marks, attach electrical lines to generator and wiring harness to oil cooler.



19 Attach electrical lines and ground strap to starter.

- 20 Attach exhaust pipe to exhaust manifold.
See 1.4/1 for tightening torque.

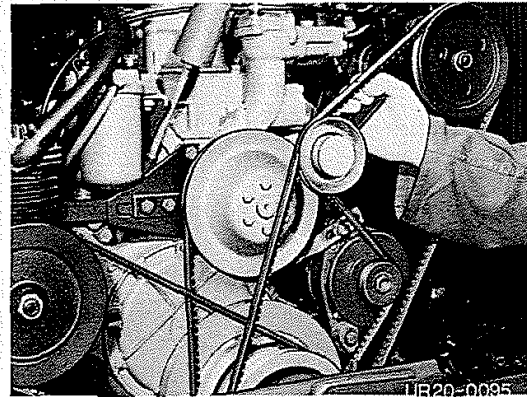
Note: For engine model 353.959, attach exhaust pipe to turbocharger.



- 21 Attach V-belt for intermediate fan shaft.

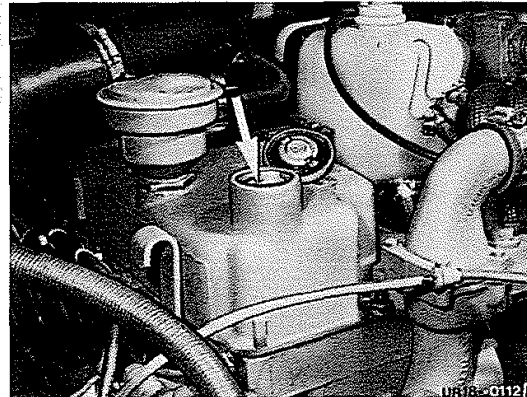
- 22 Connect battery.

- 23 Lower cab,
referring to 60.5-2.1/1 or 60.5-2.2/1.



- 24 Fill with engine oil as required.
See 1.3/2 for quantity.

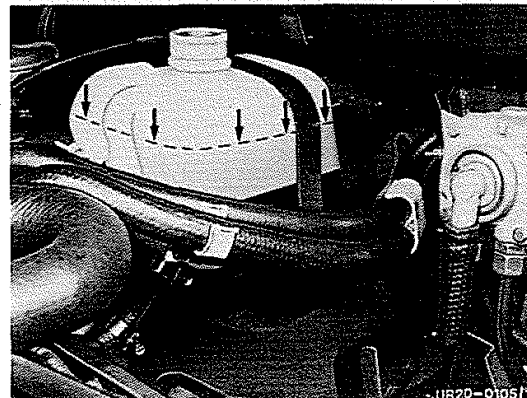
- 25 Vent fuel system, referring to 07.8-6.1/1.



- 26 Fill with coolant. Check cooling system for
leakage, referring to 20.8-5.1/1.
See 1.3/2 for quantity.

Note: The reservoir ought to be 2 thirds full.

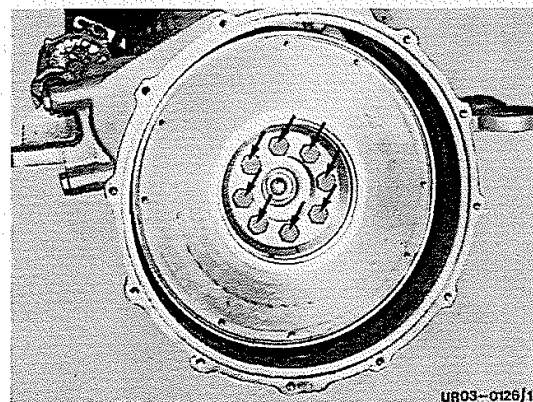
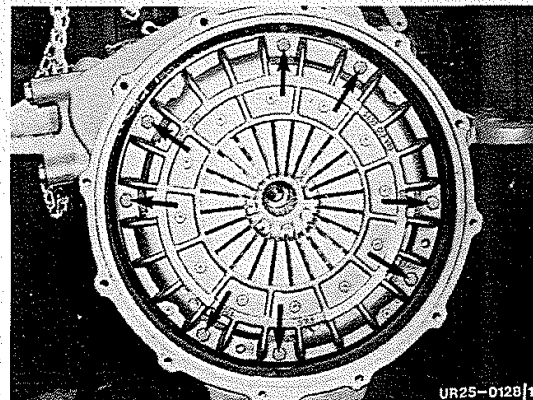
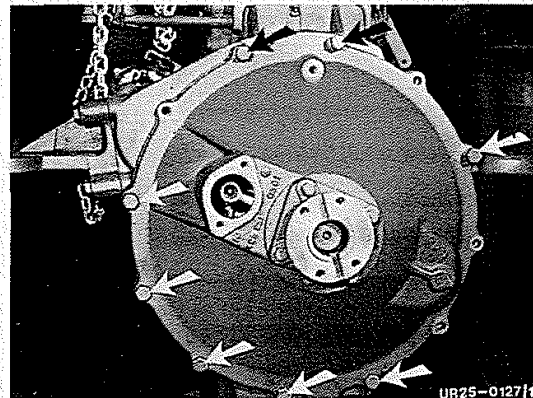
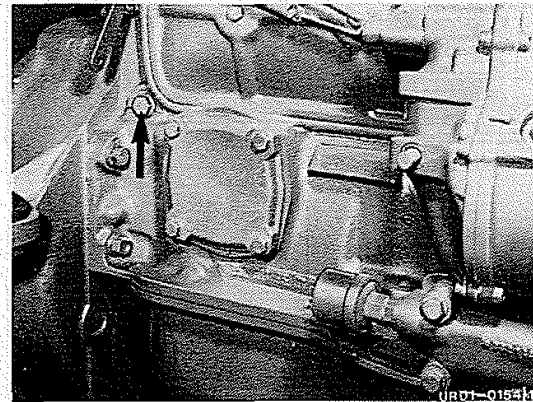
- 27 Carry out trial run.





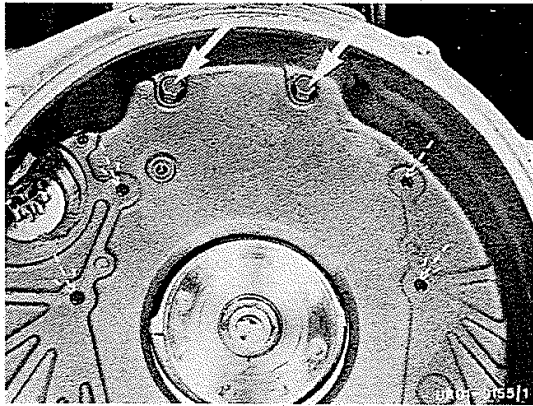
Removal

- 1 Remove engine, referring to 2.1/1.
- 2 Drain coolant at crankcase.
- 3 Detach clutch casing and input shaft.
- 4 Detach and remove clutch.
- 5 Detach flywheel.

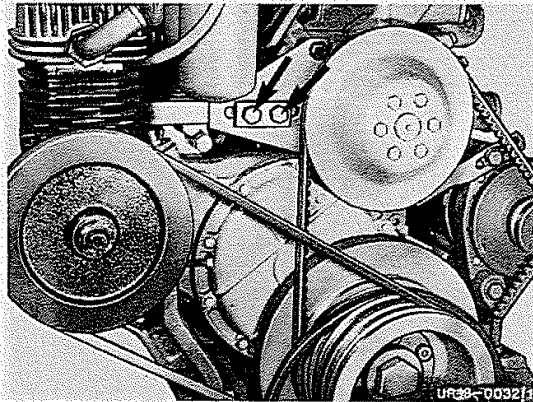


01.8 Removal and installation of engine parts

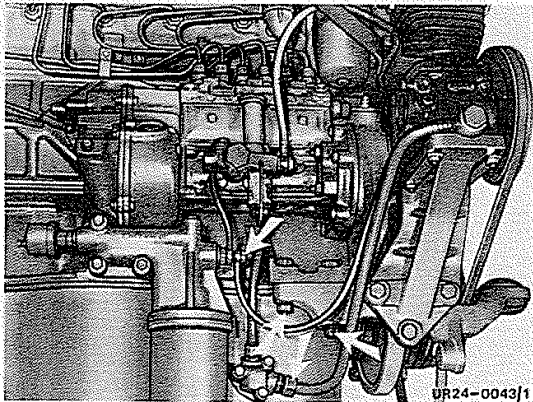
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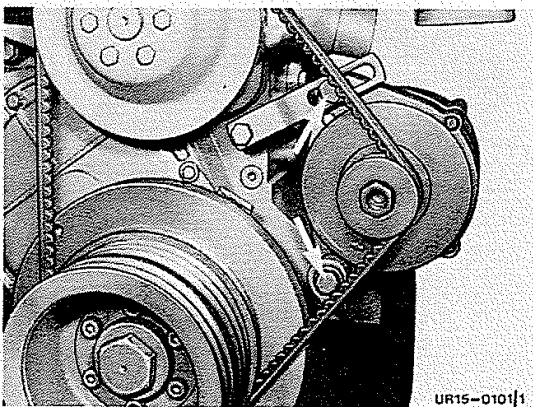
6 Detach flywheel housing.



7 Unscrew air compressor at bracket.

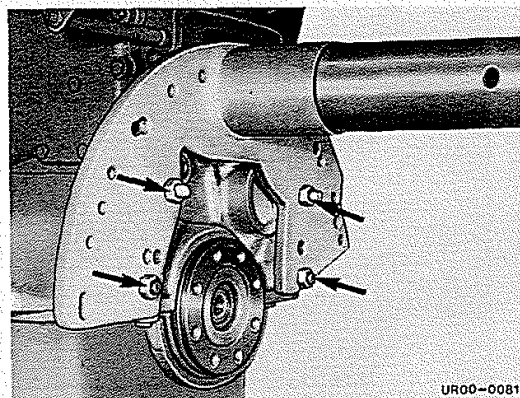


8 Detach air compressor lube lines and front engine support.

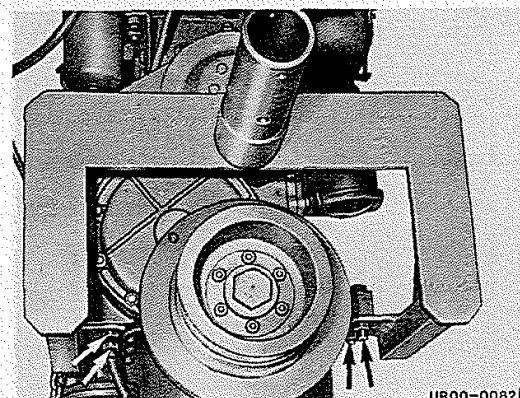


9 Detach generator.

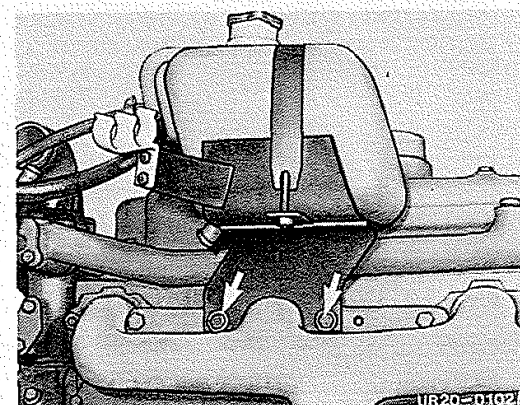
- 10 Attach assembling fixture to rear end of crank-case.



- 11 Attach assembling fixture to front end of crank-case. Position engine in trestle.

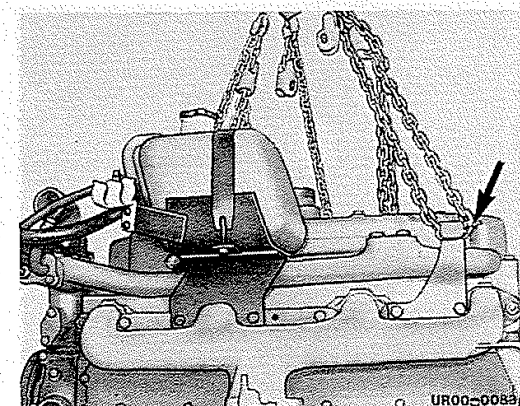


- 12 Detach coolant reservoir.



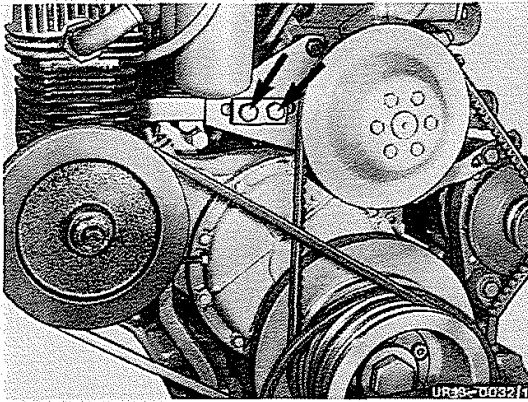
Installation

- 1 Attach and tighten coolant reservoir.
- 2 Attach engine to special tool No. 19 and remove assembling fixture at front and rear.
- 3 Attach generator.
- 4 Attach and tighten front engine support, referring to 1.4/1.

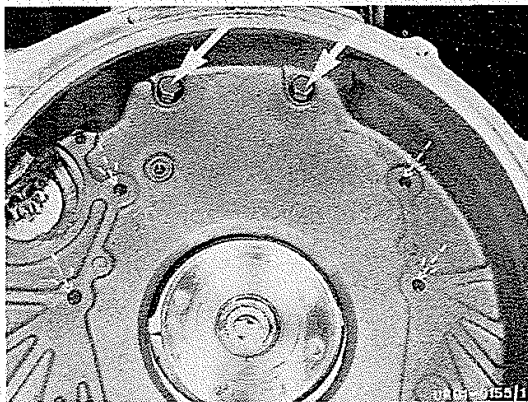


01.8 Removal and installation of engine parts

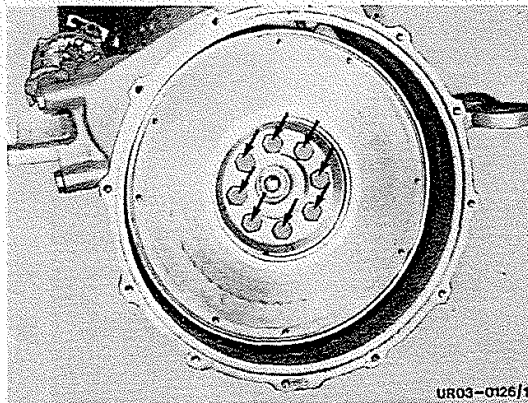
352/352 A



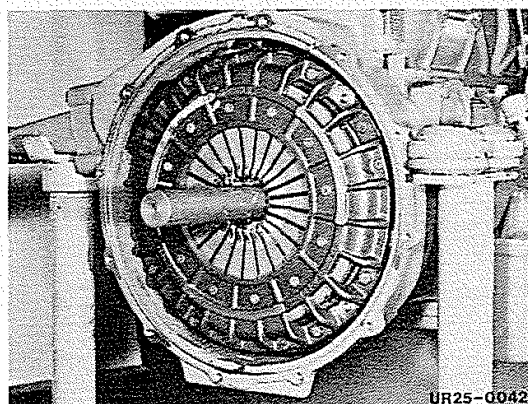
5 Attach lube lines to air compressor and air compressor to bracket. Tighten with reference to 1.4/1 for tightening torque.



6 Coat flywheel housing with sealant No. 3 apply sealant No. 4 to bolts and then tighten. See 1.4/1 for tightening torque.



7 Attach and tighten flywheel, referring to 1.4/1 for tightening torque.



8 Using special tool No. 6 attach and tighten clutch. See 25.10—1.4/1 for tightening torque.

9 Coat clutch housing with sealant No. 2, apply locking fluid No. 1 to bolts and then tighten. See 25.10—1.4/1 for tightening torque.

10 Install engine, referring to 2.1/1.

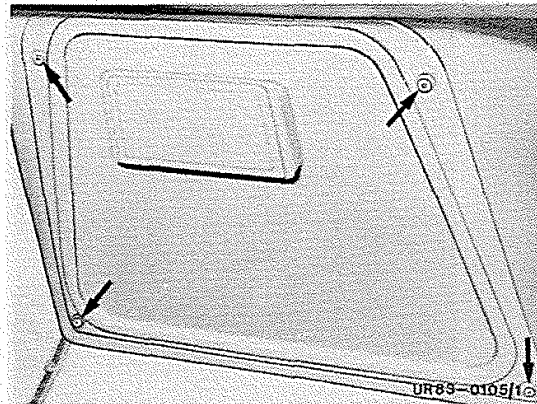
Removal and Installation of Cylinder Head Cover 01.8

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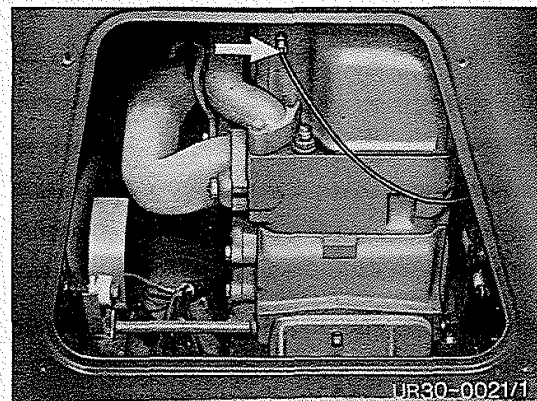
Removal

Note: Removal is similar for both engine models No. 353.959 and 353.961.

- 1 Unscrew engine hood at inside.

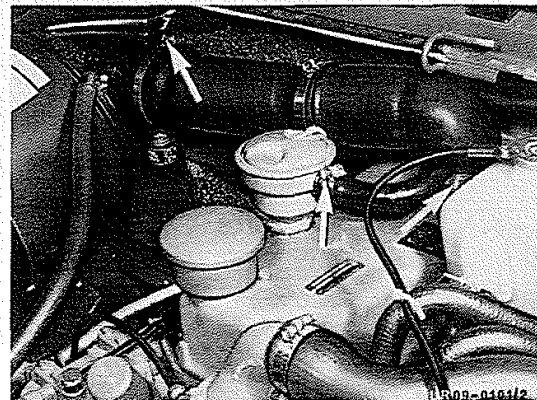


- 2 Unscrew injection line at cold start nozzle.



- 3 Detach engine hood and remove intake hose.

Note: For engine model 353.959, detach connection for manifold pressure compensator at cylinder head cover, intake hose at engine breather filter as well as the connection to the turbocharger.



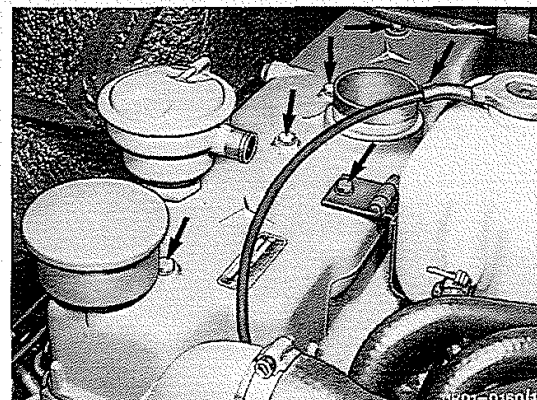
- 4 Unscrew and remove cylinder head cover.

- 5 Clean sealing surface on cylinder head and cylinder head cover.

- 6 Install in reverse order, using new gasket. Tightening torques, see 1.4/1.

Note: The fastening bolts of the cylinder head cover must be fully screwed in so that the head of the bolt makes contact with the cover while ensuring that the bracket for the coolant equalization tank is secured with a long bolt.

- 7 Start engine and check for leaks.



1. Introduction

The purpose of this manual is to provide information on the operation and maintenance of the vehicle.

2. Safety

Read the safety instructions carefully before operating the vehicle.

3. Operation

Before starting the engine, check the oil level and the battery charge.

Do not drink and drive. It is illegal and dangerous.

4. Maintenance

Check the oil level regularly and change the oil at the recommended intervals.

Check the tire pressure and the tread depth regularly.

Check the brake system and the suspension regularly.

Check the lights and the horn regularly.

Check the windshield wipers and the defogger regularly.

Check the coolant level and the antifreeze regularly.

Check the air filter and the fuel filter regularly.

Check the battery and the charging system regularly.

Check the overall condition of the vehicle regularly.

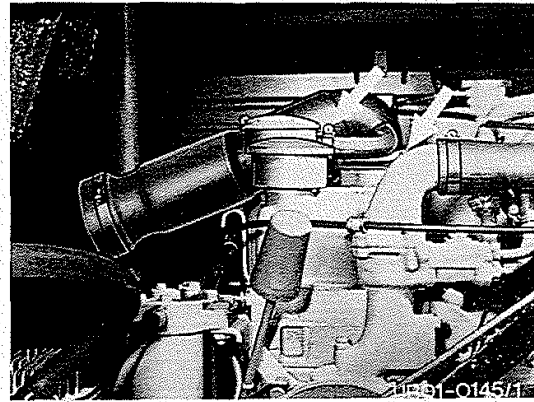
Removal

Note: Make sure that engine is cold.

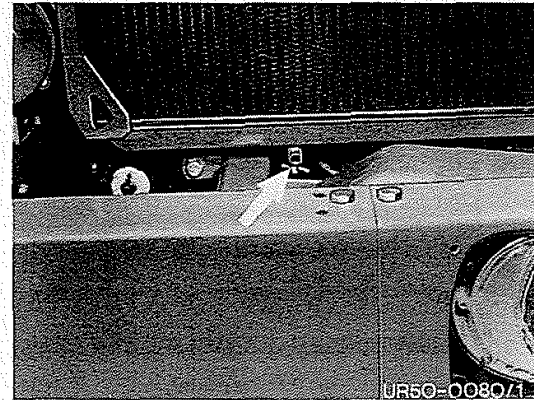
Removal is similar for both engine model No. 353.959 and No. 353.961.

1 Prop up cab and clean upper parts of engine. See 60.5-2.1/1, or 60.5-2.2/1.

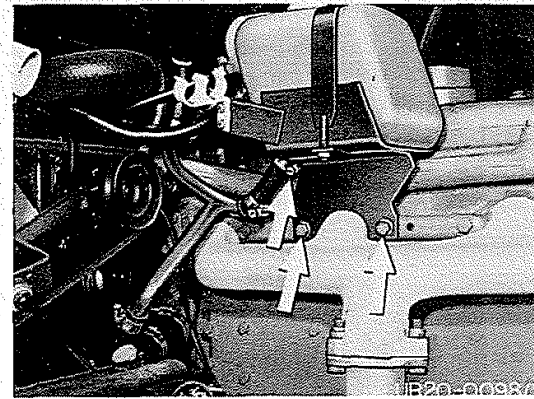
2 Detach intake pipe.



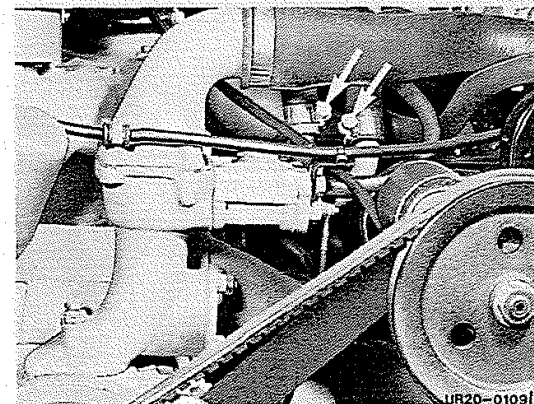
3 Drain coolant.



4 Detach coolant reservoir and bracket.

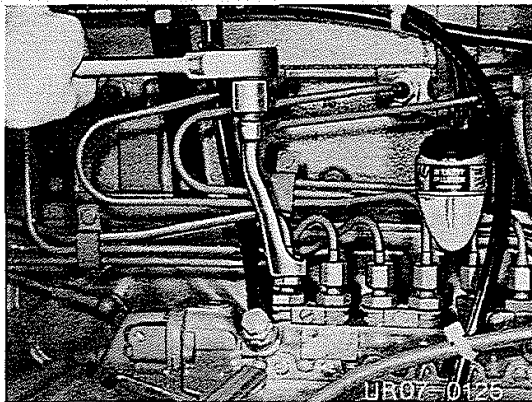


5 Detach heater hoses.

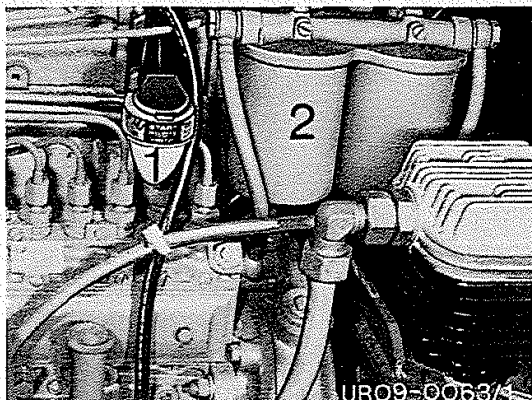


01.8 Removal and installation of cylinder head

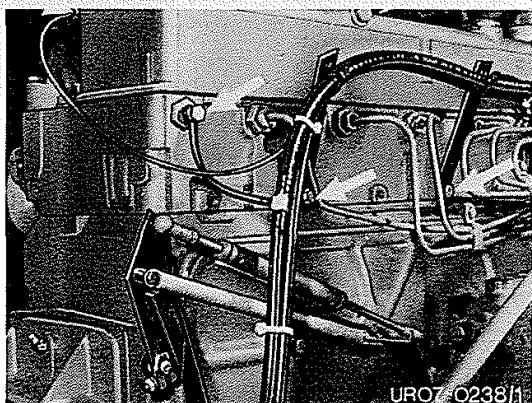
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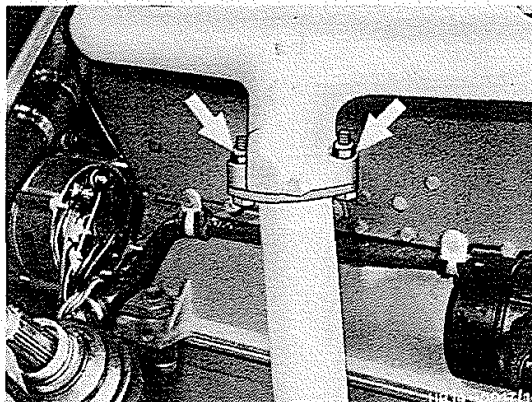
6 Using special tool No.14 , detach injection lines at injection pump.



7 Detach cold starting reservoir (1) and double fuel filter (2).

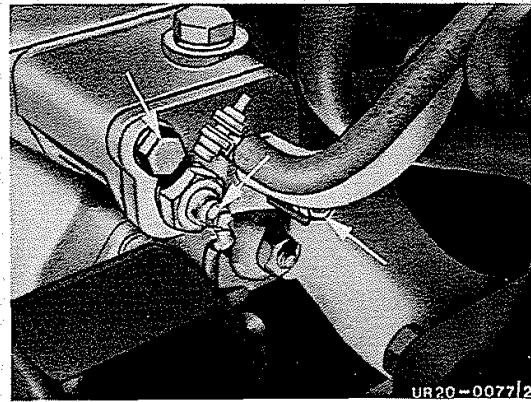


8 Detach cold starting line, leak-off line and bracket for fuel lines at cylinder head. Tie up at one side.

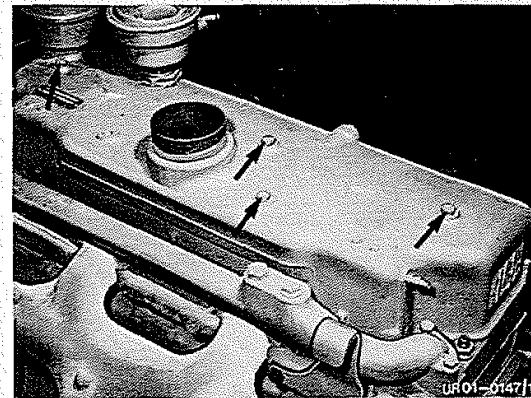


9 Detach exhaust pipe from exhaust manifold.

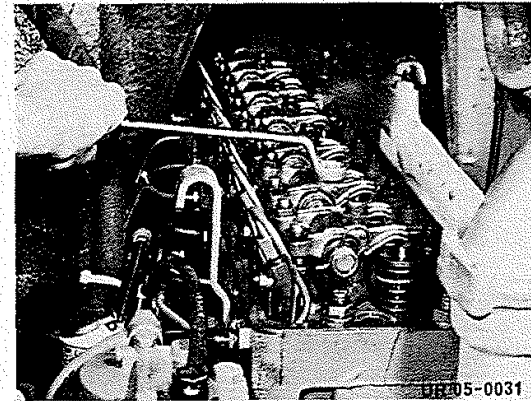
- 10 Disconnect coolant temperature pickup and detach coolant pipe at coolant thermostat body.



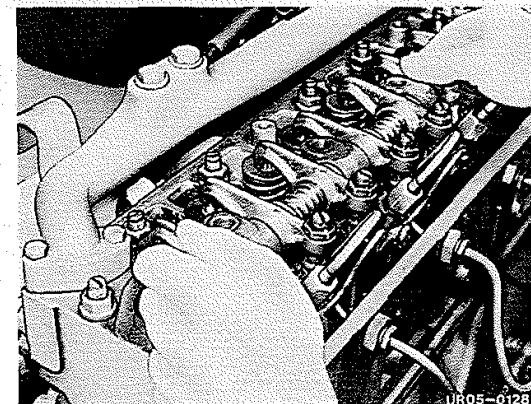
- 11 Remove cylinder head cover.



- 12 Remove bolts holding rocker arm brackets.

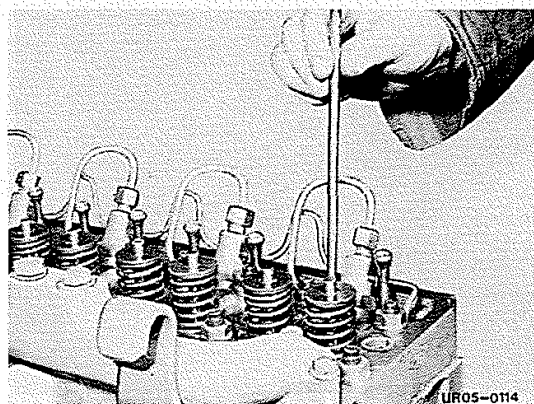


- 13 Remove rocker arm brackets with rocker shafts, connecting nipples and rocker arms.



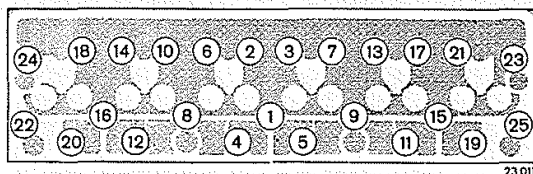
01.8 Removal and installation of cylinder head

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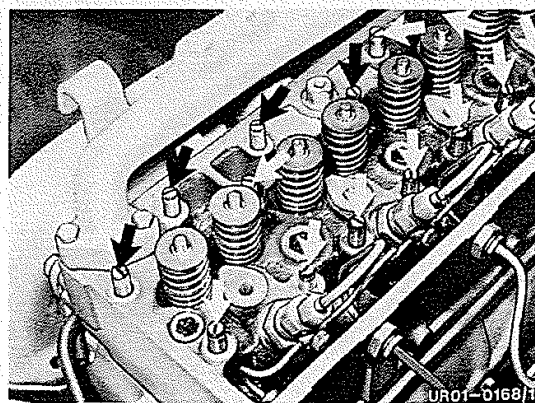


14 Carefully withdraw pushrods.

Note: To avoid withdrawing the tappets from their guides, the tappets must previously be loosened by a short, sharp up and down movement of the pushrods.

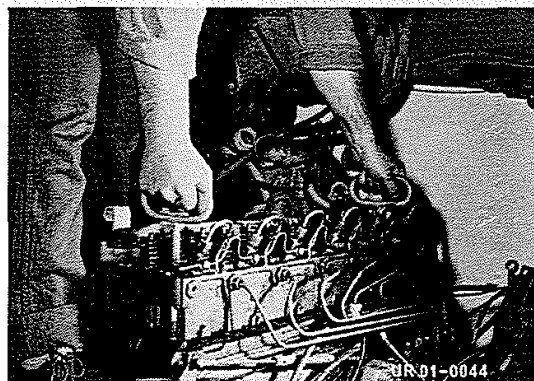


15 Undo all the cylinder head nuts or cylinder head bolts in the reverse order to the tightening chart.



16 Remove studs.

Note: The studs and cylinder head nuts fitted previously were replaced as from engine end No. 678 155 by cylinder head bolts which can be exchanged in reverse.



17 Using special tool No. 18, lift up cylinder head and remove gasket.

Important!

Deposit cylinder head so that no damage is done to injection nozzles.

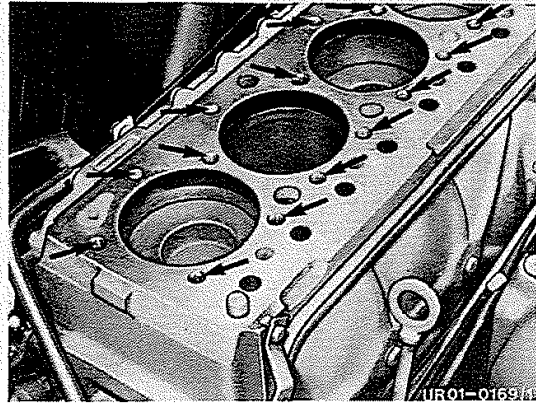
Removal and Installation of Cylinder Head 01.8

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18 Clean cylinder head and crankcase parting surfaces

Important!

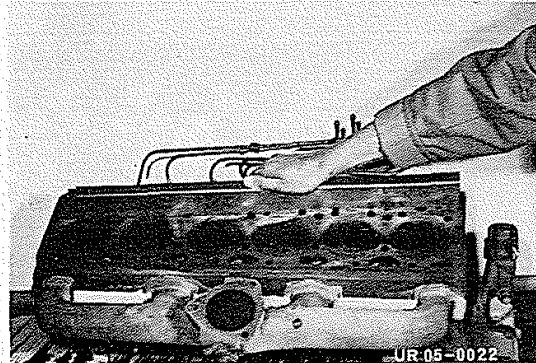
Blind holes in the crankcase **must not** show any signs of dirt or oil.



19 Check parting surfaces with straight edge.

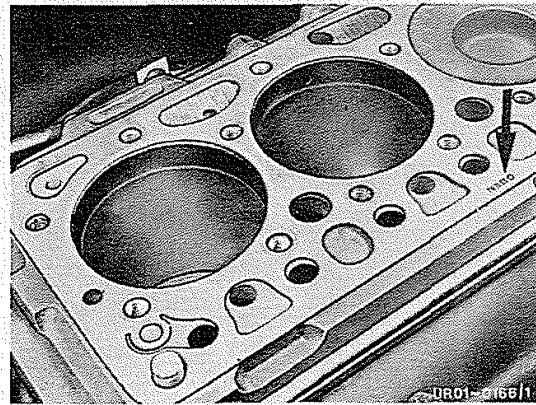
See table on page 1.2/3 for permissible unevenness.

Note: Distorted or damaged parting surfaces should be refaced to the necessary peak-to-valley height. See table on page 1.2/2 and 1.2/3 for permissible peak-to-valley height.



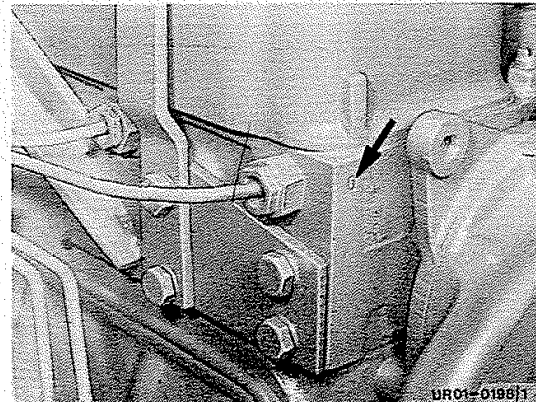
Installation

1 Position new cylinder gasket on crankcase with lettering facing upwards



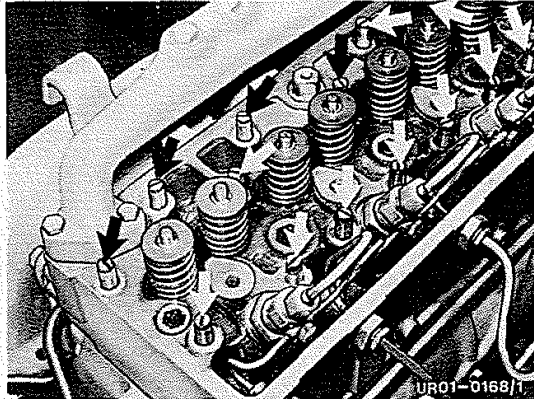
2 Using special tool No. 18, position cylinder head on crankcase.

Note: For engine model No. 353.959, a modified cylinder head marked with "O" has been installed from engine end No. 691 150. The modified cylinder head **cannot** be retrofitted on previous models.



01.8 Removal and Installation of Cylinder Head

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To Engine End No. 678 154

3 Oil threads of stud bolts and screw in.

Important! Do not pour oil into the threaded holes.

4 Fit cylinder head nuts and tighten referring to tightening diagram.

- 1st tightening stage 60 Nm
- 2nd tightening stage 90 Nm
- 3rd tightening stage 110 Nm

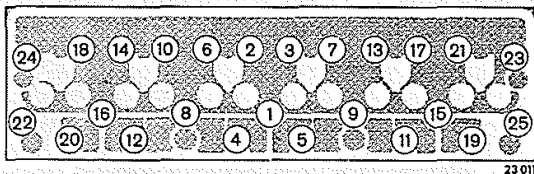
Note: Tighten cylinder head nuts for the first time to 120 Nm at the 3rd tightening stage.

From Engine End No. 678 155

5 Oil cylinder head bolts at the thread and at the head contact surface and screw in,

Important! Do not pour oil into the threaded holes.

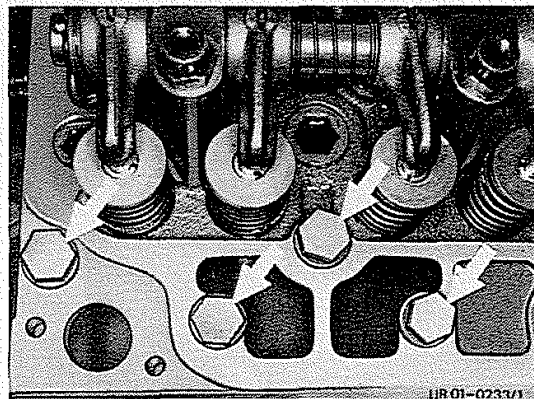
Note: Only cylinder head bolts are stocked in the spare parts store. The cylinder head bolts can be installed in engines with a lower engine end number.



6 Tighten cylinder head bolts according to tightening diagram.

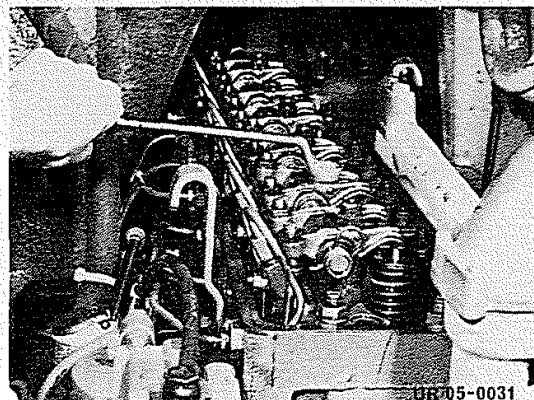
- 1st tightening stage 60 Nm
- 2nd tightening stage 90 Nm
- 3rd tightening stage 110 Nm

Note: Tighten cylinder head bolts for the first time to 120 Nm at the 3rd tightening stage.



7 Install push rods.

8 Attach rocker arm brackets together with rocker arm shafts and rocker arms. Turn back valve adjusting screws and tighten rocker arm brackets. Tightening torques see 1.4/1.



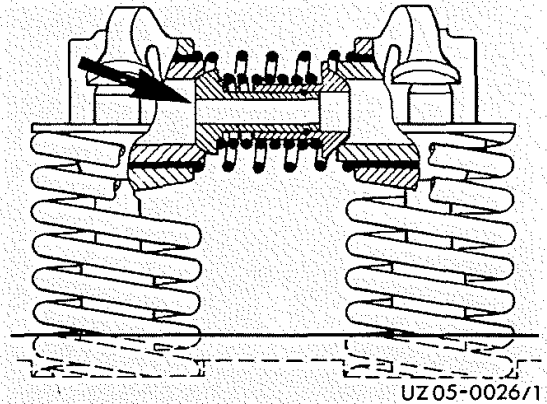
Removal and Installation of Cylinder Head 01.8

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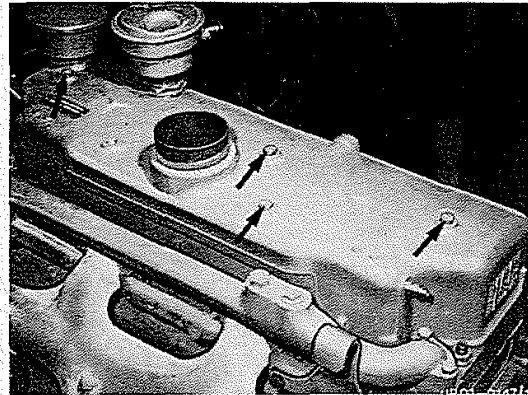
- 9 Using special tool No. 2, install connecting nipple and spring.

Note: Install the connecting nipple with the **small** inside diameter in the **direction of driving**. Ensure it is correctly seated.

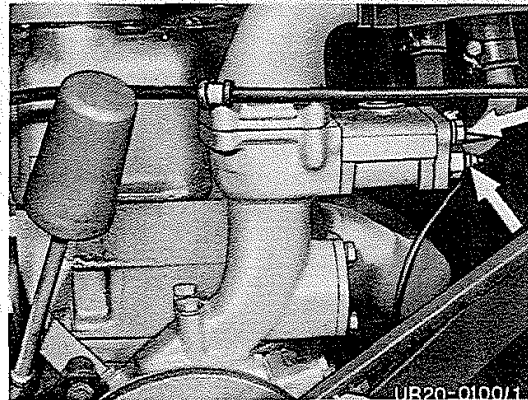
- 10 Adjust valve clearance, refer to 05.8 - 2.1/1.



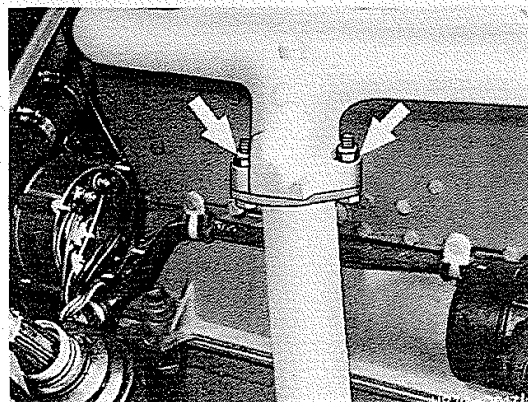
- 11 Install cylinder head cover.
For tightening torques, see 1.4/1.



- 12 Attach coolant pipe, with new gasket on coolant regulator housing, connect coolant temperature sensor cable.
For tightening torques, see 1.4/1.

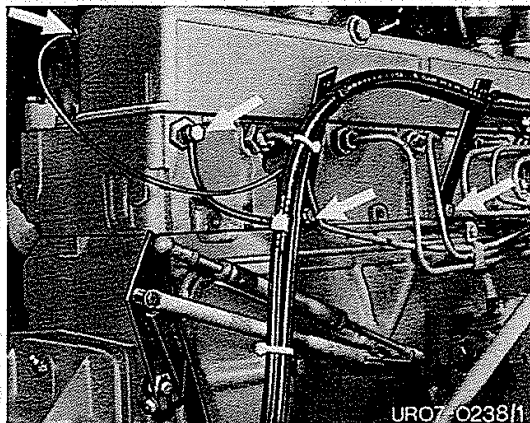


- 13 Attach exhaust pipe with gasket to exhaust manifold.
For tightening torques, see 1.4/1.

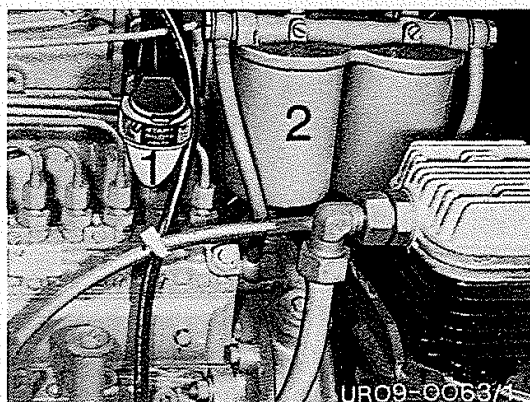


01.8 Removal and Installation of Cylinder Head

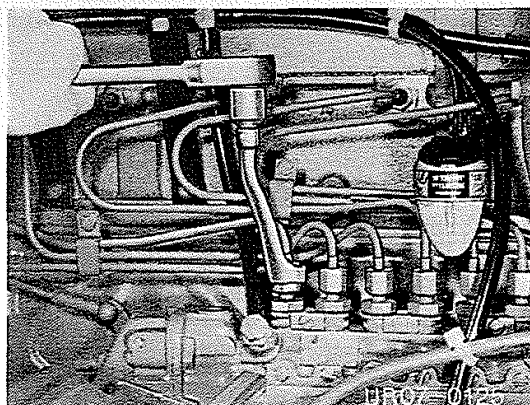
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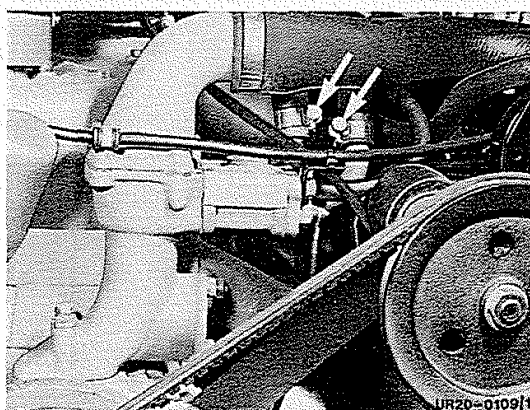
14 Attach cold starting line, leakage fuel line and brackets for fuel lines to cylinder head.



15 Install cold start reservoir (1) and double fuel filter (2).



16 Using special tool No. 1, connect injection lines to injection pump and tighten with special tool No. 15. For tightening torques, see 1.4/1.

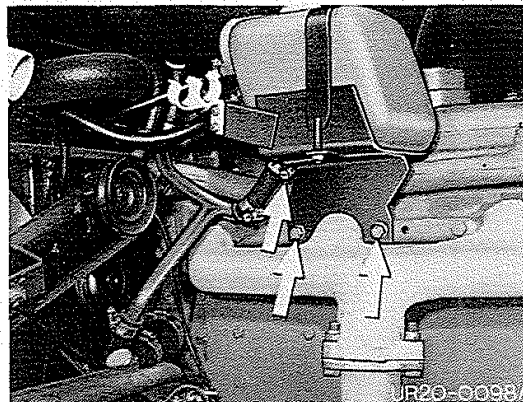


17 Attach heater hoses.

Removal and Installation of Cylinder Head 01.8

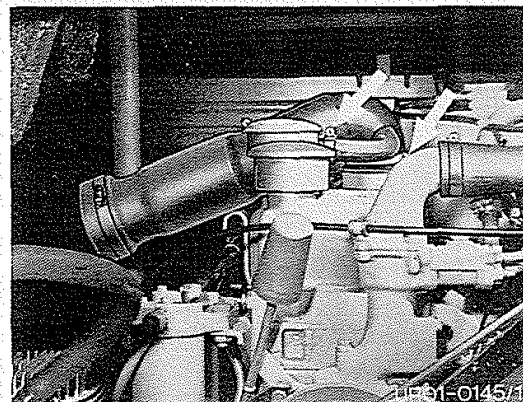
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18 Attach coolant equalization tank with bracket.



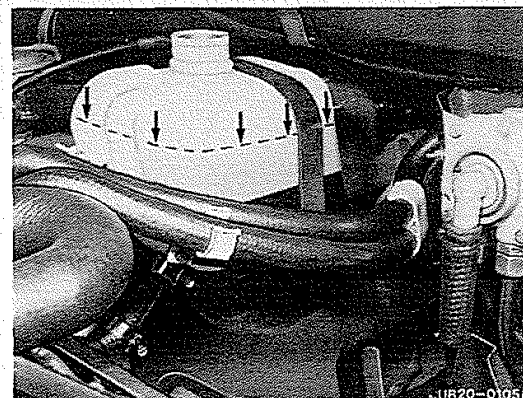
19 Attach intake pipe.

20 Lower driver's cab, see 60.5-2.1/1 or 60.5-2.2/1.



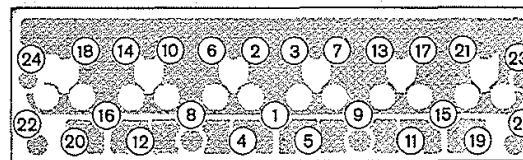
21 Fill with coolant, check cooling system for leaks. For capacities see 1.3/2.

Note: The equalization tank should be two-thirds full.



Important!

Upon completion of the installation, warm up engine, loosen each nut individually in sequence shown in the tightening diagram and then finally tighten to a torque of 110 Nm. On no account must all nuts be loosened simultaneously before final torque is applied. Readjust valve clearance. After 500 km, retighten the cylinder head nuts and readjust the valves.



23 011

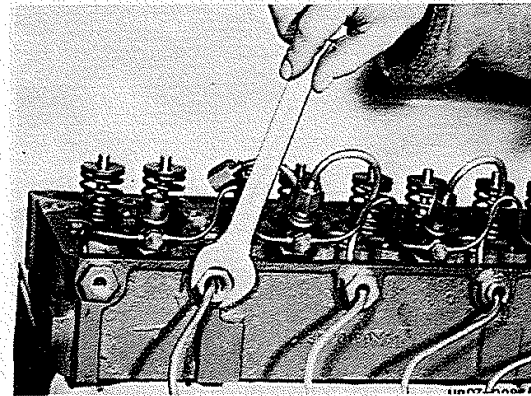
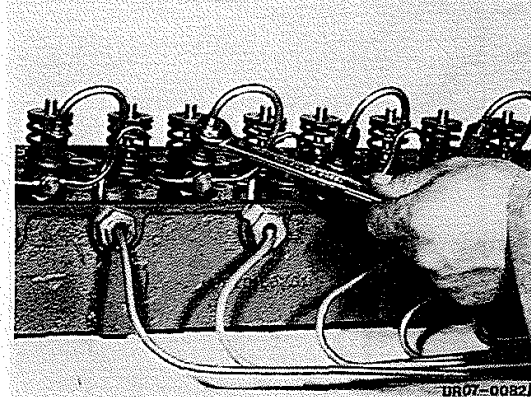
Disassembly

- 1 Remove cylinder head, see 4,1/1.
- 2 Lay cylinder head on a support.

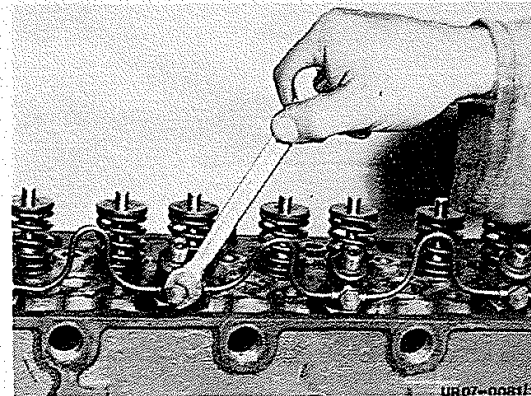
Important!

The cylinder head must not rest on the injector nozzles.

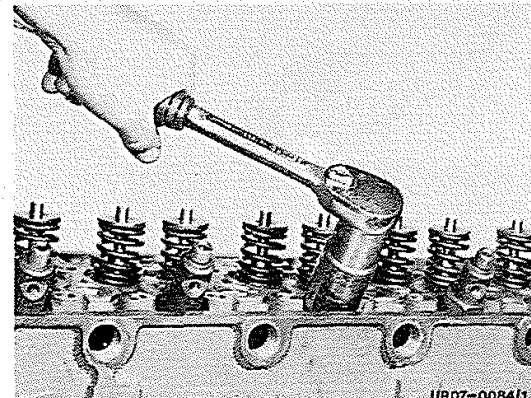
- 3 Remove exhaust manifold and coolant rail from cylinder head.
- 4 Remove injector pipes from injectors with special tool No. 1.
- 5 Release injector pipes from cylinder head and remove. Do not bend injector pipes.



- 6 Remove leak-off pipes.

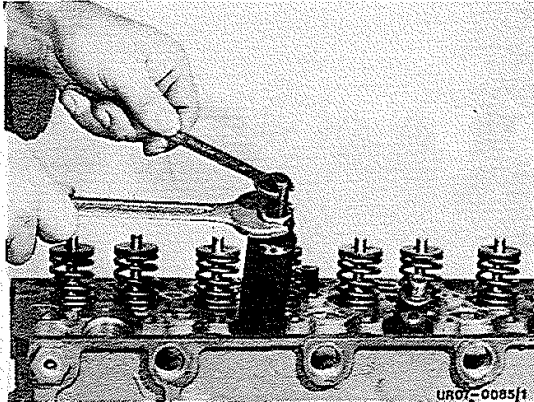


- 7 Remove thrust screw for nozzle holder with special tool No. 4.

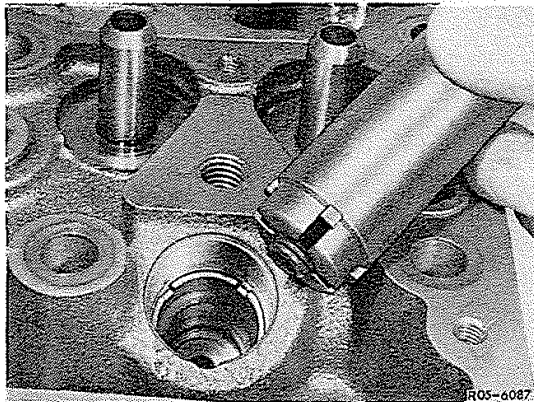


01.8 Disassembly and assembly of cylinder head

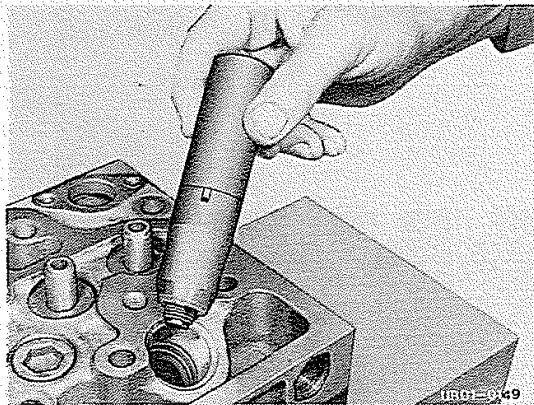
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- 8 Remove nozzle holder with special tool No. 5.
- 9 Remove valves, see 05.8-2.2/1.

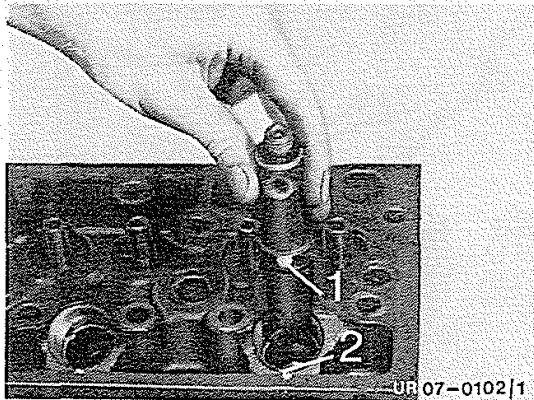


- 10 Remove protective sleeve with special tool No. 3.
- 11 Clean all parts, check and change if necessary.
- 12 Check valve guides and change if necessary, see 6.1/1.
- 13 Check valve seats and reface or renew if necessary. See 6.2/1 or 6.3/1.
- 14 Check injector nozzles, see 07.8-4.2/1.



Assembly

- 1 Insert new sealing ring for the protective sleeve into cylinder head.
 - 2 Insert protective sleeve and tighten with special tool No. 3.
- Tightening torque, see 1.4/1.



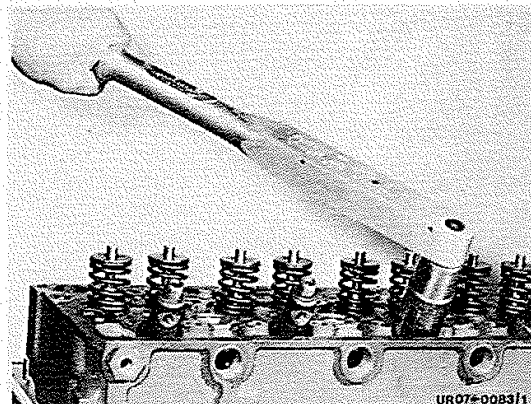
- 3 Insert new sealing ring into the protective sleeve
- 4 Fit nozzle holder with nozzle into cylinder head observing lock on the nozzle holder (1) and groove (2) in the cylinder head.

Important!
Do not knock nozzle.

5 Fit valves, see 05.8-2.2/1.

6 Tighten thrust screw for injector nozzle with special tool No. 4.

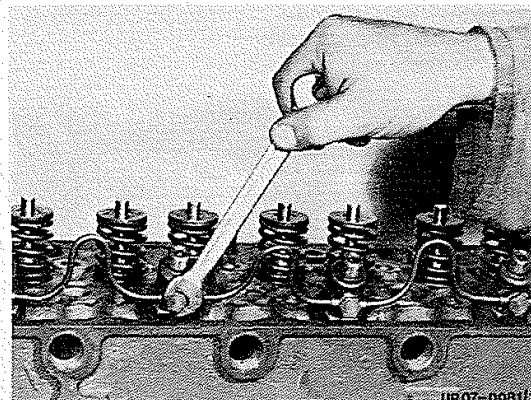
Tightening torque, see 1.4/1.



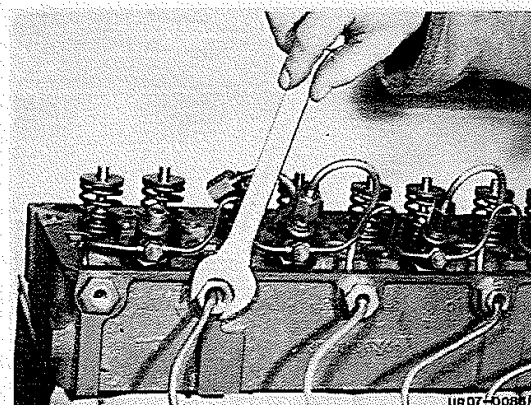
7 Fit leak-off pipes with new sealing pieces.

Tightening torque, see 1.4/1.

Note: Fit locking bolt (24 mm) with sealant No. 5.



8 Fit injector pipes, fit locking bolt (24 mm) with sealant No. 5, renew rubber seals at the bushings and tighten locking bolt (17 mm).



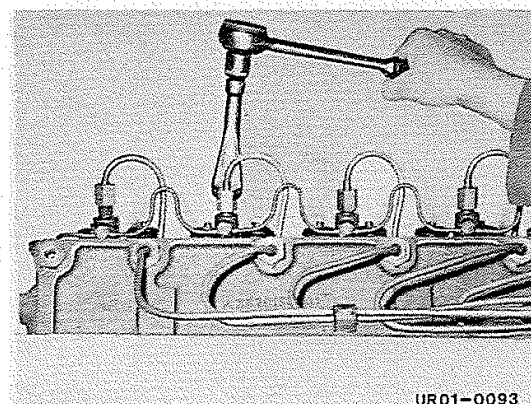
9 Tighten without tensioning the injector pipes using special tool No. 15.

Tightening torque, see 1.4/1.

10 Fit exhaust manifold and coolant rail with new gaskets.

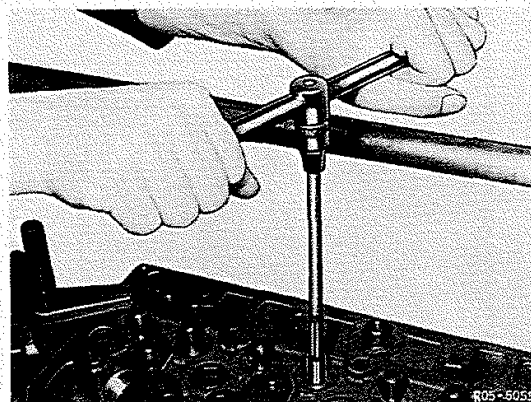
Tightening torque, see 1.4/1.

11 Install cylinder head, referring to 4.1/1.

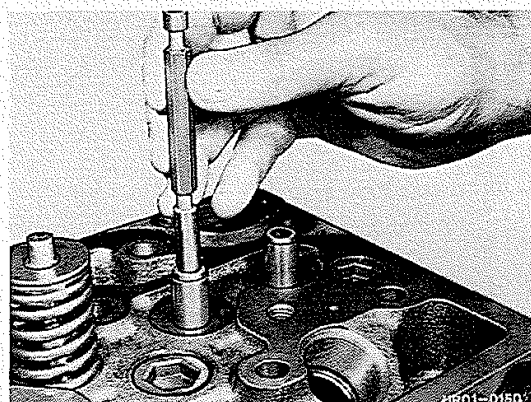


Checking

- 1 Disassemble cylinder head, referring to 5.1/1.
- 2 Clean valve guide, removing carbon deposits with special tool No. 11 or No. 12.

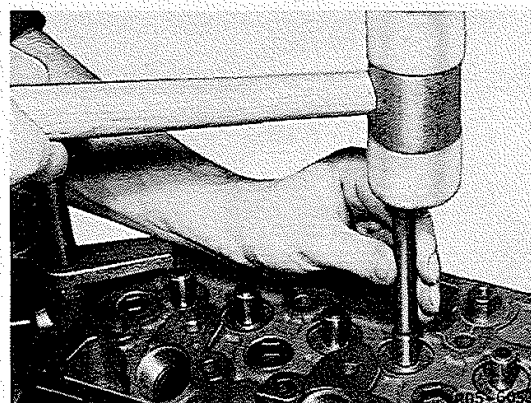


- 3 Check bore using special tool No. 16 or No. 18.

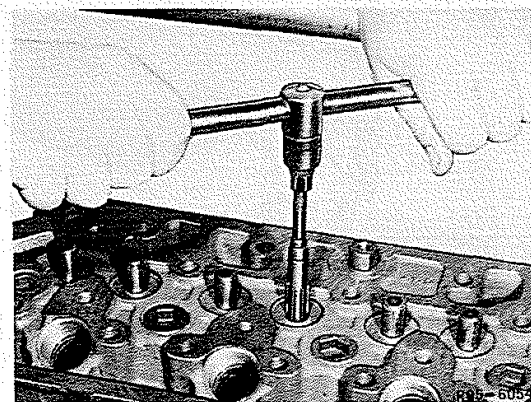


Exchanging

- 1 Drive out valve guide using special tool No. 7 or No. 8.
- 2 Clean and check basic bore in cylinder head. See 1.2/4 for table.

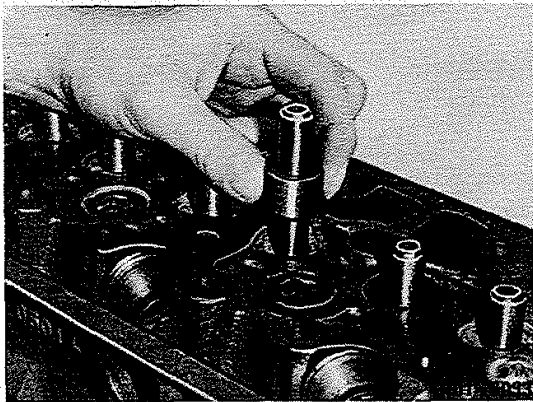


- 3 If "repair stage" valve guides are to be fitted, ream basic bore to next higher repair stage, using special tool No.13 . See 1.2/4 for repair stages.



01.8 Checking, exchanging valve guides

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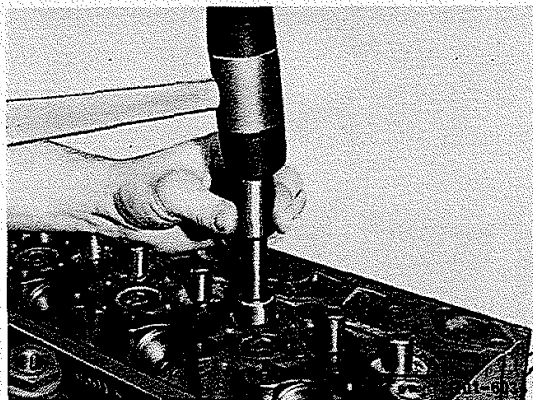
4 Select valve guide so that overlap specification is met.

See table on page 1.2/4.

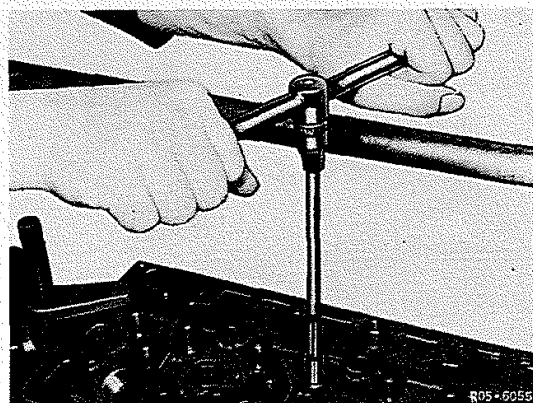
5 Heat cylinder head.

6 Coat new valve guide with graphite oil and position in cylinder head bore.

7 Slip spacing sleeve of special tool No. 10 over valve guide.

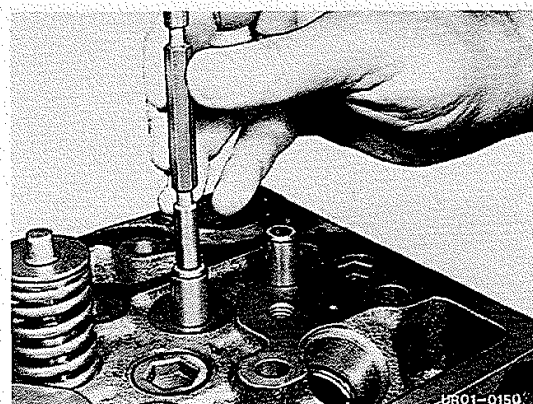


8 Knock valve guide into position, using special tool No. 10.



9 Check valve guide for firm fit, either by knocking with hammer or by applying test pressure. Loose valve guides are to be knocked out again and replaced by valve guides of larger outside diameter.

10 Ream inside diameter of valve guide, using special tool No. 11 or No. 12.



11 Check inside diameter of valve guide, using special tool No. 16 or No. 18.

12 Re-assemble cylinder head, referring to 5.1/1.

Refacing

- 1 Disassemble cylinder head, referring to 5.1/1.
- 2 Check valve guides and exchange if necessary, referring to 6.1/1.
- 3 Clamp cylinder head in jig.
- 4 Check valve seat.

Note: If valve seats show only slight traces of wear, they can be refaced without necessitating replacement of valve seat rings, provided they are not machined below their bottom limit.

See 1.2/4 for repair size.

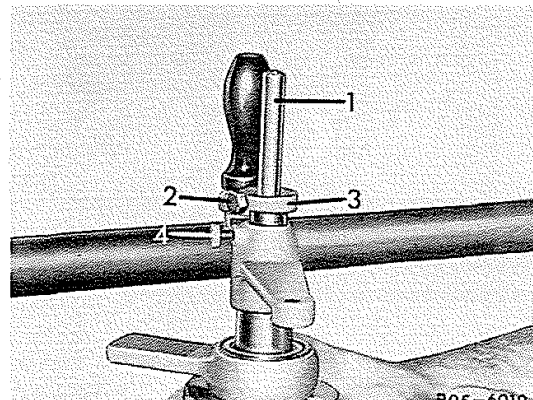
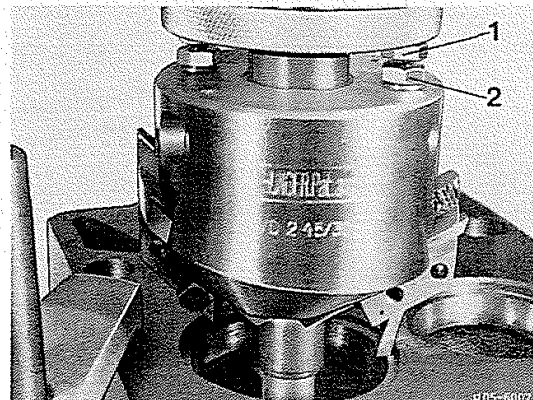
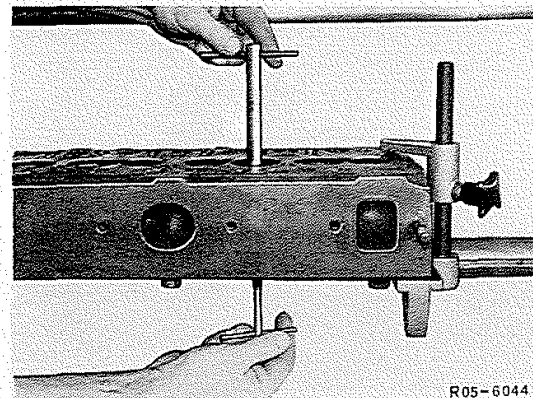
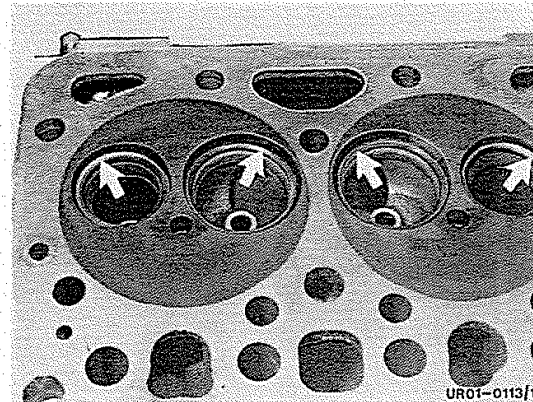
- 5 Introduce pilot into valve guide so that stop of slotted rod rests on valve guide. If necessary, press slotted rod downwards using screwdriver, and tighten pilot.

- 6 Fasten cutting tool to slide rest.

Note: Make sure that cutting tool is positioned correctly on slide rest. Release coupling nut to stop free slide rest. Attach crank handle to arm marked 45°.

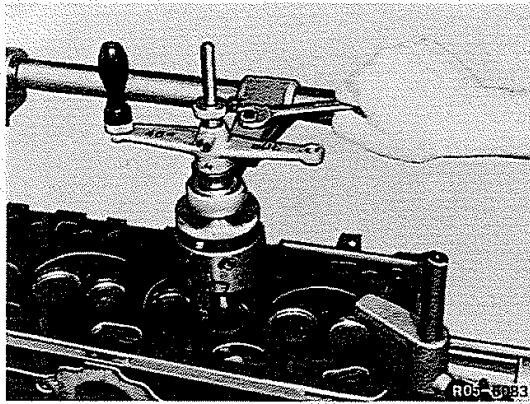
- 7 Release coupling nut (2), slip cutter over pilot and turn screw (1) until cutting tool is positioned in center of valve seat.

- 8 Press pilot support (1) downward onto pilot, and clamp with screw (2), making sure that knurled ring (3) is screwed down and locking screw (4) is tight

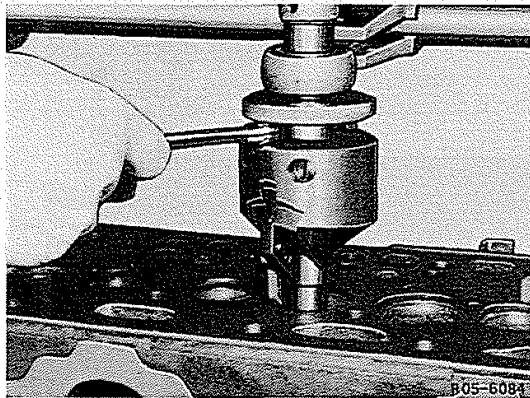


01.8 Refacing valve seats with valve seat cutter

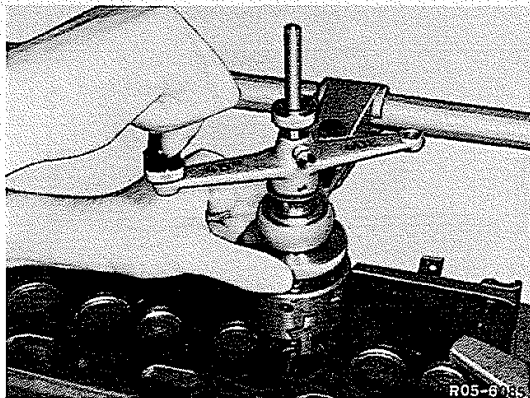
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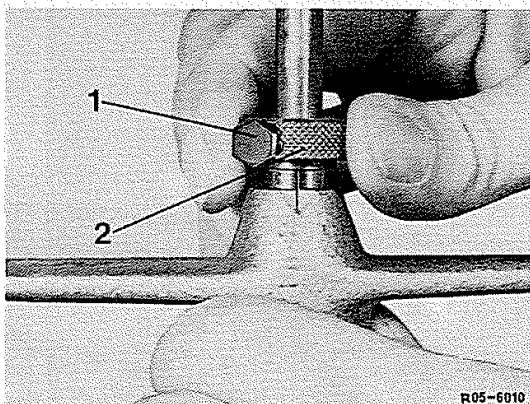
9 Turning hand crank, move steady bar to correct position. Floating guide is to be locked horizontally in roughly the center of the guide with the aid of steady clamp. Cutter must turn just as smoothly as before.



10 Turning the quick-action adjuster sets cutting tool to inner seat edge. Tighten coupling nut now, but do not start chip feed yet.



11 Turn crank while holding feed screw. Cutting is normally irregular at this position. After turning once release coupling nut of quick-action adjuster and move tool back to inner setting.



12 Release locking screw (1) and turn knurled collar (2) anti-clockwise by about 1/2 to 2 divisions (1 division = 0.1 mm). Retighten locking screw (1) and coupling nut, then beginning to turn again.

13 Hold feed screw and turn crank until cutting tip has reached outer position.

14 Chip feed is to be continued until seat is fully refaced (do not go below machining limit). Then turn once again without chip feed. Newly fitted valve seat rings must show values given in table. See 1.2/4 for repair sizes.

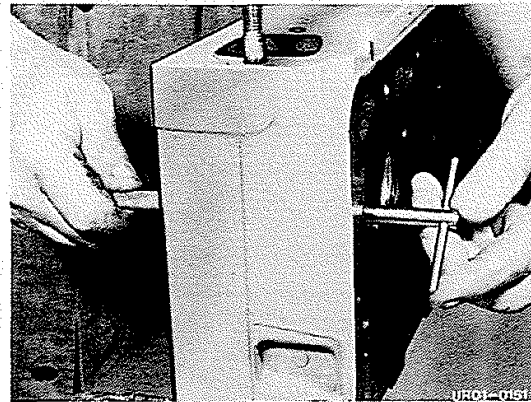
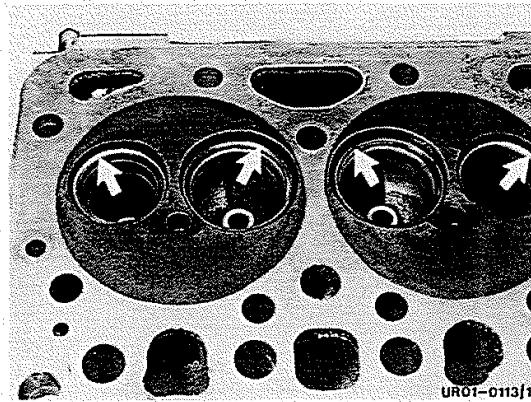
15 Re-assemble cylinder head, referring to 5.1/1.

Refacing

- 1 Disassemble cylinder head, referring to 5.1/1.
- 2 Check valve guides and exchange if necessary, referring to 6.1/1.
- 3 Check valve seat.

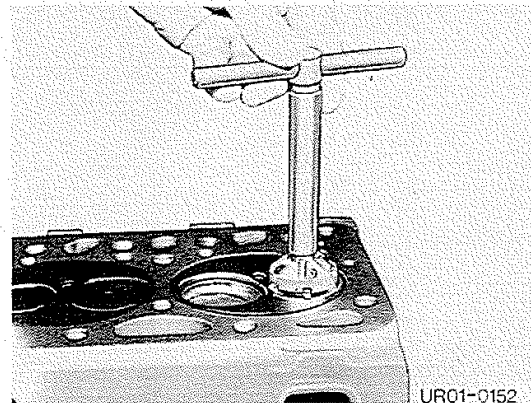
Note: If valve seats show only slight traces of wear, they can be refaced without necessitating replacement of valve seat rings, provided they are not machined below their bottom limit. See 1.2/4 for repair size.

- 4 Introduce special tool No. 14 into valve guide.



- 5 Position special tool No. 14 and adjust cutter to seat diameter. See table on page 1.2/3.

Note: For valve seats with 45° seat angles the 45° side of the cutter head is for cutting the seat whereas the 30° side is for the clearing cut. For valve seats with 30° angles, the two sides are to be reversed.



- 6 Reface valve seat, applying gentle pressure.

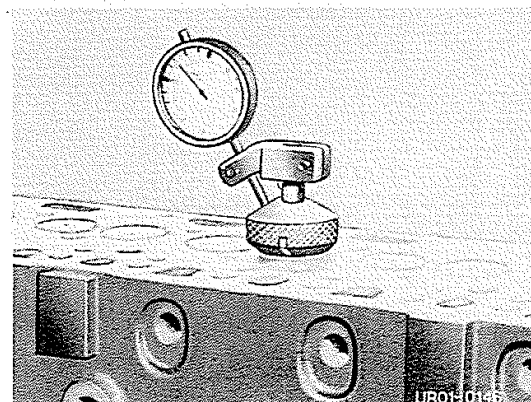
- 7 Measure valve seat runout. See table on page 1.2/3.

Important:

Check directly after finishing the valve seat. The guide drift must not be released or withdrawn beforehand.

- 8 Measure valve seat width; if necessary, correct to 70° at top and bottom. See table on page 1.2/3.

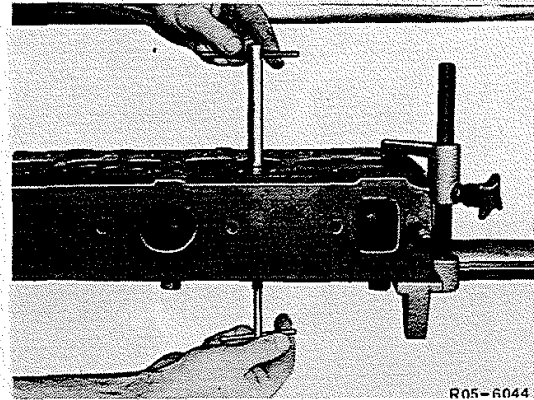
- 9 Re-assembly cylinder head, referring to 5.1/1.



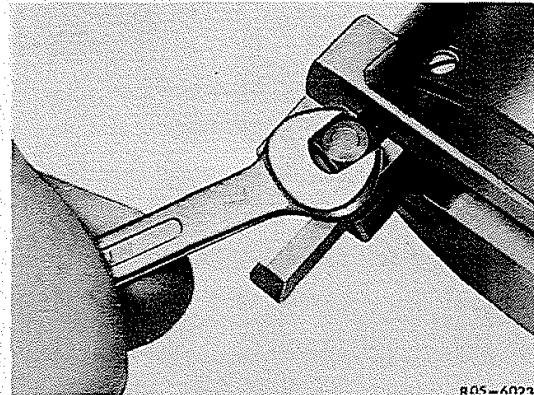


Removal

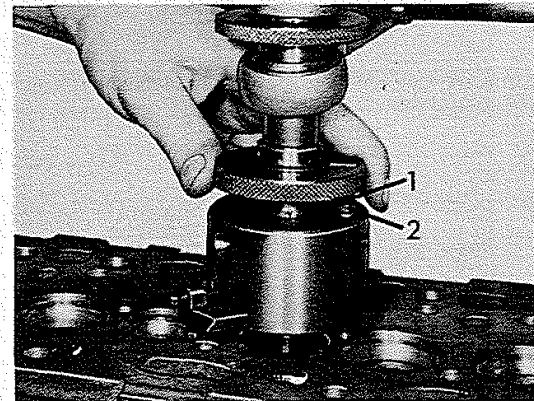
- 1 Disassemble cylinder head, referring to 5.1/1.
- 2 Check valve guides and renew if necessary, referring to 6.1/1.
- 3 Clamp cylinder head in jig.
- 4 Introduce pilot into valve guide until stop on slotted rod rests on valve guide. If necessary, force slotted rod downwards using screwdriver. Tighten with drift, inserting into pilot from above and below.



- 5 Clamp groove cutter in slide rest.

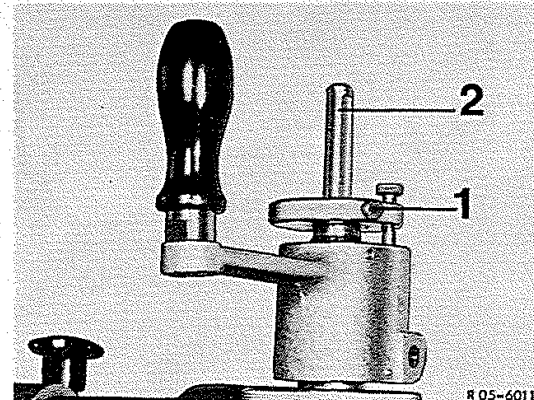


- 6 Release lock-nut (2). Moisten pilot with oil, slip cutter over pilot, turn screw (1, quick-action adjustment) until tool contacts pilot and then slide cutter downwards until tool is located in center of valve seat ring.



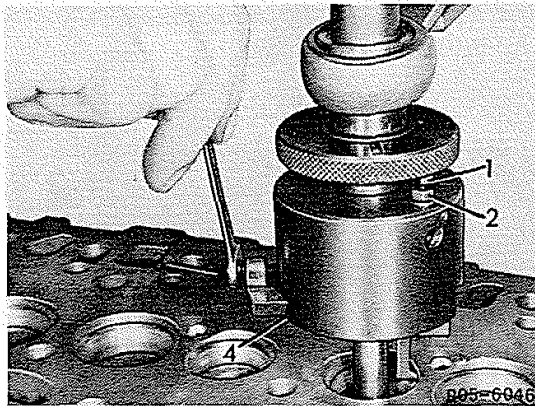
- 7 Hold cutter at this position. Release locking screw (1) of pilot support, and press pilot support (2) downwards until it contacts pilot. Retighten locking screw (1).

- 8 Turning hand crank, move steady bar to suitable position relative to work. Lock floating guide horizontally in roughly center of guide with aid of steady clamp. Cutter must now turn just as smoothly as before.



01.8 Removal and installation of valve seat rings

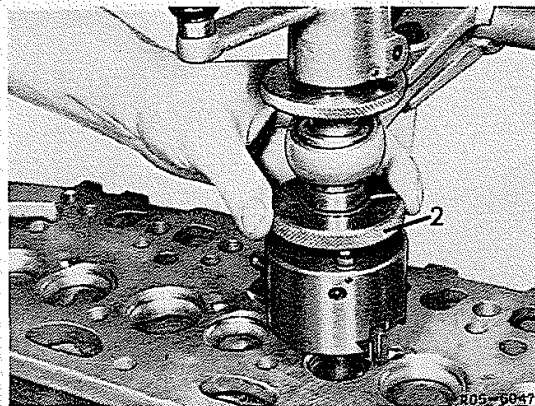
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9 Slacken screw of quick-action adjuster (1) until tool has reached, yet does not yet touch valve seat ring. Tighten lock-nut (2). Turn horizontal stop screw (3) fully home against body and then slacken by 2 to 3 mm. Tighten clamping screw (4) beneath.

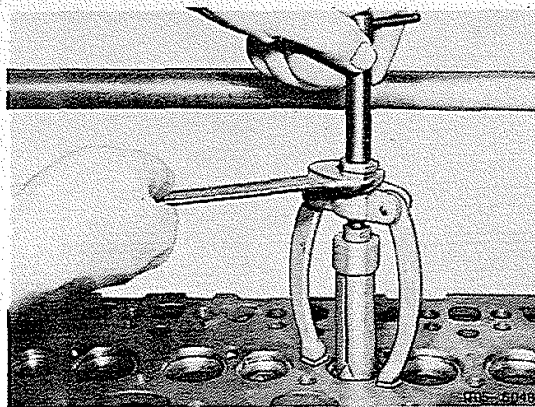
10 Adjust tool height so that about 1 mm metal is left on valve seat ring at bottom after machining.

Note: Hold knurled collar (2) and turn cutter crank clockwise, so moving tool downwards. Turning anti-clockwise serves to raise tool.



11 Turn tool and simultaneously hold knurled collar (2) which has to be briefly released as torsion increases slightly. This serves to turn groove in valve seat ring to depth of about 2 to 3 mm.

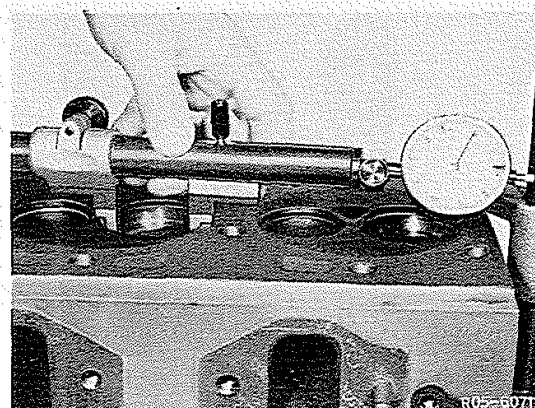
Note: Avoid coarse cuts. Cutter must always turn easily, this being achieved by briefly releasing knurled collar (2).



12 Remove cutter.

13 Fit internal remover in annular groove, tighten nut and draw out using counter-support.

Note: Place copper strips beneath counter-support to avoid damaging cylinder head face.



14 Adjust internal measuring instrument using micrometer.

15 Measure bores for valve seat rings in cylinder head, using internal measuring instrument.

Note: Holes are to be bored to next step should table values not be reached.

See 1.2/4 for repair stages.

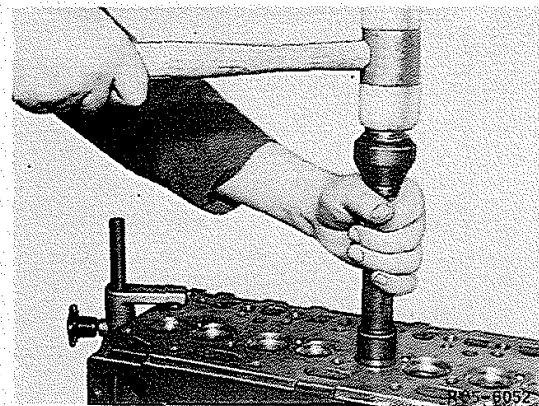
16 Remachine basic bore, referring to 6.5/1.

Installation

- 1 Place valve seat rings in container full of liquid oxygen, allowing rings to shrink for about 20 to 30 minutes.
- 2 Heat cylinder head to 80°C.
- 3 Take valve seat rings out of liquid oxygen and place on bore of heated cylinder head.

- 4 Knock valve seat rings into position, using special tool No. 9.

Note: Do not delay in fitting the valve seat rings. Do not touch liquid oxygen or come into contact with freezing valve seat ring.



1. The first step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

2. The second step is to check the oil pressure. The oil pressure should be checked when the engine is running. The oil pressure should be checked by looking at the oil pressure gauge. The oil pressure should be at least 10 psi.

3. The third step is to check the oil filter. The oil filter should be checked when the engine is running. The oil filter should be checked by looking at the oil filter. The oil filter should be replaced if it is dirty or clogged.

4. The fourth step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

5. The fifth step is to check the oil pressure. The oil pressure should be checked when the engine is running. The oil pressure should be checked by looking at the oil pressure gauge. The oil pressure should be at least 10 psi.

6. The sixth step is to check the oil filter. The oil filter should be checked when the engine is running. The oil filter should be checked by looking at the oil filter. The oil filter should be replaced if it is dirty or clogged.

7. The seventh step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

8. The eighth step is to check the oil pressure. The oil pressure should be checked when the engine is running. The oil pressure should be checked by looking at the oil pressure gauge. The oil pressure should be at least 10 psi.

9. The ninth step is to check the oil filter. The oil filter should be checked when the engine is running. The oil filter should be checked by looking at the oil filter. The oil filter should be replaced if it is dirty or clogged.

10. The tenth step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

11. The eleventh step is to check the oil pressure. The oil pressure should be checked when the engine is running. The oil pressure should be checked by looking at the oil pressure gauge. The oil pressure should be at least 10 psi.

12. The twelfth step is to check the oil filter. The oil filter should be checked when the engine is running. The oil filter should be checked by looking at the oil filter. The oil filter should be replaced if it is dirty or clogged.

13. The thirteenth step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

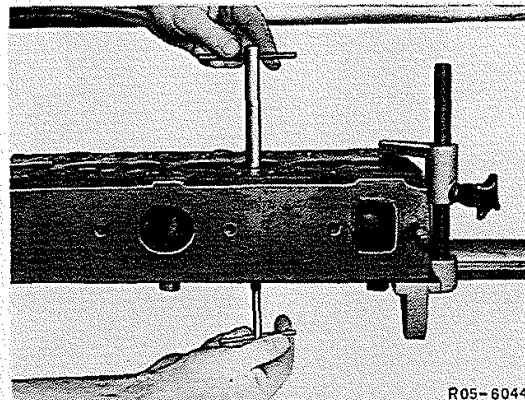
14. The fourteenth step is to check the oil pressure. The oil pressure should be checked when the engine is running. The oil pressure should be checked by looking at the oil pressure gauge. The oil pressure should be at least 10 psi.

15. The fifteenth step is to check the oil filter. The oil filter should be checked when the engine is running. The oil filter should be checked by looking at the oil filter. The oil filter should be replaced if it is dirty or clogged.

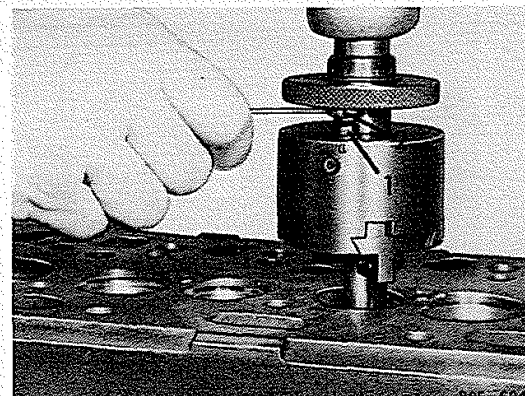
16. The sixteenth step is to check the oil level. The oil level should be checked when the engine is cold and the truck is on a level surface. The oil level should be checked by pulling out the dipstick and looking at the oil level. The oil level should be at the top of the dipstick.

Remachining basic bore

- 1 Clamp tool in slide rest.
- 2 Introduce pilot into valve guide until stop on slotted rod rests on valve guide. If necessary, force slotted rod downwards using screwdriver. Tighten with drift, introducing into pilot from above and below.

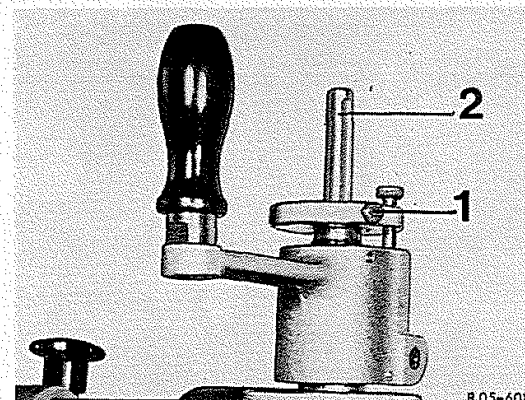


- 3 Release lock-nut (1), moisten pilot with oil, slip slip cutter over pilot, turn quick-action adjusting screw (2) until tool moves horizontally beyond bore, and then slide cutter downwards until tool rests on cylinder head.

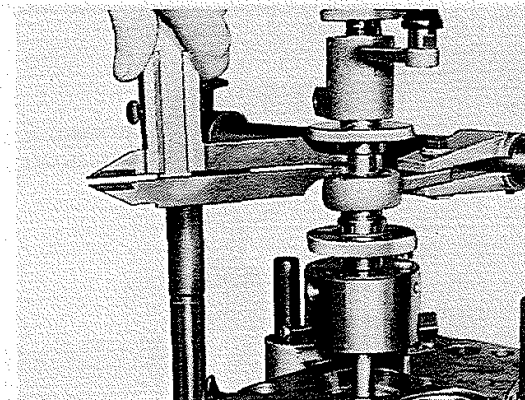


Important:
Fit tools carefully so as not to damage carbide tip.

- 4 Release locking screw (1), force pilot support (2) downwards until it contacts pilot, and then re-tighten locking screw (1).
- 5 Turning the knurled collar serves to adjust tool height to point where it is just clear.

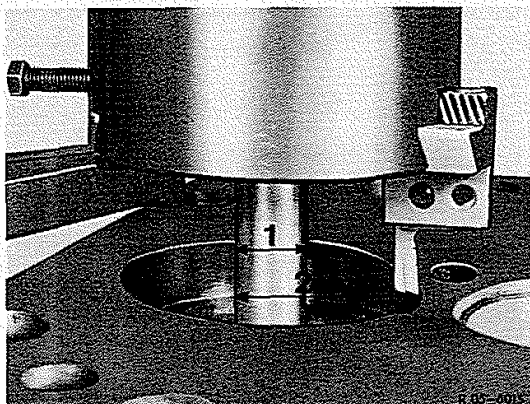


- 6 Lock floating guide horizontally with aid of steady clamp, making sure to set working depth between adjusting ring and floating guide. See 1.2/4 for working depth.



01.8 Remachining basic bore for valve seat rings

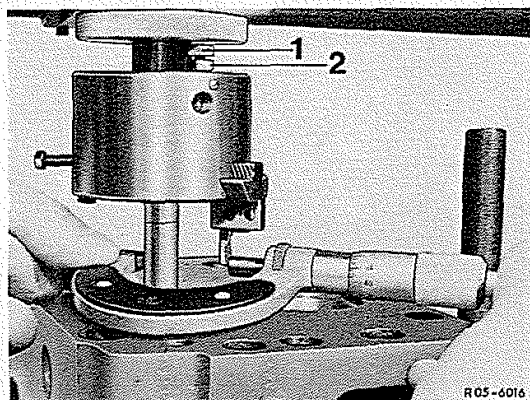
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7 Calculate adjustment "2":

$$\text{"2"} = \frac{\text{Basic bore "c" or "d" + pilot dia. "1"}}{2}$$

See table 1.2/4 for "c" and "d"

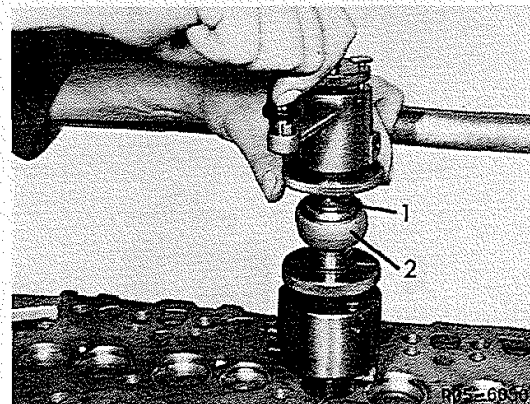


8 Release coupling nut, set micrometer to "2", slightly lift cutter, attach micrometer to pilot, and exactly adjust tool to size "2" using quick-action adjuster (1). Tighten coupling nut (2).

Note: You are advised to reduce tool setting by 0.1 mm in diameter for first cut.



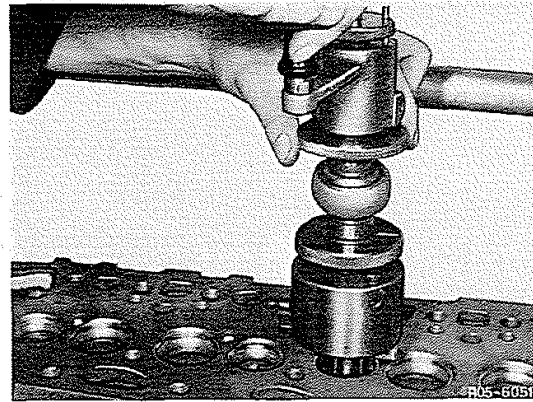
9 Turn horizontal stop screw (1) fully home against body and tighten screw (2) beneath, so preventing stop screw from turning.



10 Turn hand crank and simultaneously hold upper knurled collar for vertical feed. Cut bore for valve seat ring until adjusting ring (1) contacts steady bearing (2).

Note: Keep adjusting tool until adjustment calculated in job No. 7 is reached. Then turn once without chip feed to obtain peak-to-valley height of max. 0.006 mm.

- 11 Release coupling nut and draw back tool at quick-action screw, while slightly raising cutter.
- 12 Turn hand crank and simultaneously hold lower knurled collar for horizontal feed. Reface bottom end surface until stop screw contacts body.
- 13 Remove cutter, and measure bore (be sure to obtain valve seat ring/bore overlap).
See 1.2/4 for bore dimensions.



WALK-BEHIND PNEUMATIC TIRE TRUCK

Model 100

1. The first wheel on the left side of the truck is the front wheel. It is the wheel that is closest to the front of the truck.

2. The second wheel on the left side of the truck is the rear wheel. It is the wheel that is closest to the rear of the truck.

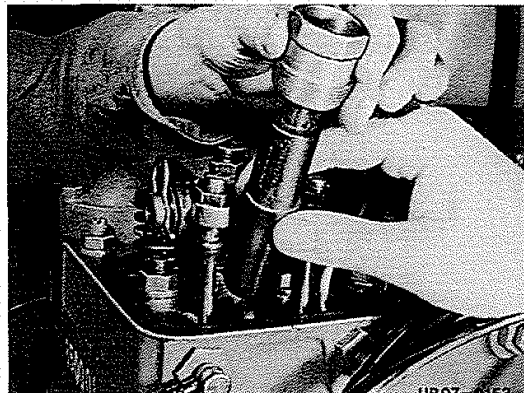
3. The third wheel on the left side of the truck is the middle wheel. It is the wheel that is in the middle of the truck.

Checking

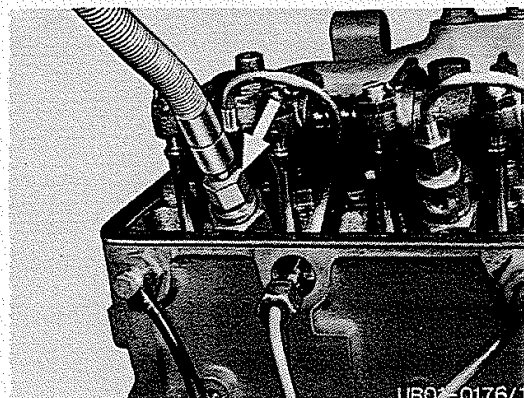
Note: Engine temperature is to be +50°C to 80°C.

1 Remove injection nozzle without protective bushing. See 07.8—4.1/1.

2 Introduce special tool No. 17 into protective bushing and tighten with thrust screw from nozzle holder.

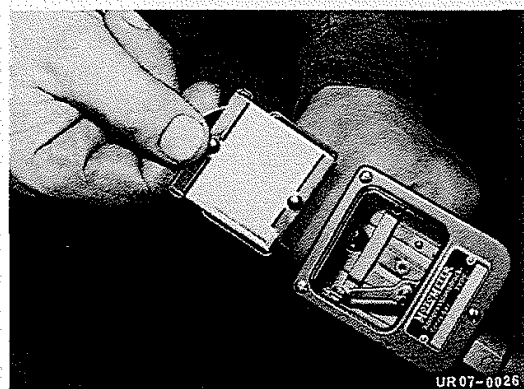


3 Attach compression pressure tester to special tool No. 17.



4 Place recording card in tester and set appropriate cylinder.

5 Move hand throttle to stop position and start engine several times.



6 Note pressure reading on recording card. See 1.2/1 for compression pressure.

7 Detach compression pressure tester and special tool No. 17.

8 Install injection nozzle, referring to 07.8—4.1/1.

