DODGE TRUCK

B-4 SERIES

SHOP MANUAL

MODELS: B-4-B, B-4-C, B-4-D, B-4-PW, B-4-DU, B-4-EU, B-4-F, B-4-G, B-4-GA, B-4-H, B-4-HA, B-4-HM, B-4-HMA, B-4-J, B-4-JA, B-4-JM, B-4-JMA, B-4-K, B-4-KA, B-4-KMA, B-4-R, B-4-RA, B-4-T, B-4-TA, B-4-V, B-4-VA, B-4-Y, B-4-YA, B-4-YX

SECTION 8

ENGINE

DODGE DIVISION
CHRYSLER CORPORATION
DETROIT 31, MICHIGAN

LITHO IN U.S.A.
10M-CSD-3-53

D-14362

CONTENTS

SERVICE INFORMATION

CONTENTS

SERVICE INFORMATION (CONTINUED)

SERVICE DIAGNOSIS

(Continued on page 5)

ENGINE

SERVICE STANDARDS

MODEL DESIGNATION →	*B*	*C*	*D*	*PW*	*DU*	*EU*	*F, G, GA*	*H, HA, HM, HMA*	*J, JA, K, KA, JM, JMA, KMA*	*R, RA*	*T, TA, V, VA*	*Y, YA, YX*
Type	L-head	L-head	L-head	L-head	L-head	L-head	L-head	L-head	L-head	L-head	L-head	L-head
No. of cylinders	6	6	6	6	6	6	6	6	6	6	6	6
Bore and stroke	3¼ x 4⅜	3¼ x 4⅜	3¼ x 4⅝	3¼ x 4⅝	3¼ x 4⅝	3¼ x 4⅝	3 7/16 x 4½	3 7/16 x 4½	3 7/16 x 4.766	3¾ x 4⅝	3¾ x 5	4 1/16 x 5 5/16
Taxable horsepower (A.M.A.)	25.35	25.35	25.35	25.35	25.35	25.35	28.35	28.35	28.35	33.75	33.75	39.6
Piston displacement (cu. in.)	217.76	217.76	230.2	230.2	230.2	230.2	250.6	250.6	265.37	306.49	331.35	413.16
Maximum torque—Gross (ft. lbs.)	177	177	190	190	190	190	210	210—H, HA 205—HM, HMA	225—J, JA 226—K, KA with Twin Carb. 216—JM, JMA, KMA	253—R, RA 245—RS	280	343
At r.p.m.	1600	1600	1200	1200	1200	1200	1200	1200—H, HA 1600—HM, HMA	1200 1600—K, KA with Twin Carb.	1300—R, RA 1200—RS	1600	1500
Maximum torque—Net (ft. lbs.)	172	172	181	179	180	180	194	194—H, HA 193—HM, HMA	209—J, JA 215—K, KA with Twin Carb. 203—JM, JMA, KMA	243—R, RA 233—RS	269	326
At r.p.m.	1400	1400	1200	1200	1200	1200	1200	1200—H, HA 1600—HM, HMA	1200—J, JA 1600—K, KA with Twin Carb. 1800-2000—JM, JMA, KMA	1200	1600	1600
Compression ratio	7.1 to 1	7.1 to 1	7 to 1	7 to 1	7 to 1	7 to 1	6.8 to 1	6.8 to 1—H, HA 6.6 to 1—HM, HMA	6.8 to 1	6.5 to 1	6.5 to 1	6.5 to 1
Compression pressure (150 r.p.m. cranking speed) (lbs. per sq. in.)	136 to 143	120 to 150	140 to 142	140 to 142	140 to 142	140 to 142	125 to 135	125 to 135	125 to 135	104 to 115	116 to 125	135 to 140* *YX—At 170 r.p.m. cranking speed

(Continued on page 6)

CONTENTS

SERVICE DIAGNOSIS (CONTINUED)

(Continued from page 3)

TIGHTENING REFERENCE

Part Name	*Size (inch) and number of threads per inch*	*Torque (foot-pounds)*
Chain case cover cap screws	5/16—18	12 to 17
Connecting rod bolt nuts	3/8—24	45 to 50
	7/16—20	50 to 55
Starting crank jaw	(All except 1 1/8—14)	108 minimum
	1 1/8—14	110 minimum
Cylinder head cap screws	7/16—14	65 to 70
Cylinder stud nuts	7/16—20	55 to 60 (hot)
Main bearing cap screws	1 1/2—13	80 to 85
Flywheel nuts	7/16—20	55 to 60
Manifold stud nuts	3/8—24	15 to 20
Spark plugs	14 mm.	30 to 32

SERVICE STANDARDS (CONTINUED)

(Continued from page 4)

MODEL DESIGNATION →	B	C	D	PW	DU	EU	F, G, GA	H, HA, HM, HMA	J, JA, K, KA, JM, JMA, KMA	R, RA	T, TA, V, VA	Y, YA, YX
Camshaft—												
Bearing clearance	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"	.002 to .004"
End play	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"	.002 to .006"
Bearing sizes—												
No. 1	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 x 1 3/32"	2 1/4 x 1 11/16"	2 1/4 x 1 11/16"	2 1/4 x 1 11/16"
No. 2	1 31/32 x 2 7/32"	1 31/32 x 2 7/32"	1 31/32 x 3/4"	1 31/32 x 3/4"	1 31/32 x 3/4"	1 31/32 x 3/4"	1 31/32 x 1 1/32"	1 31/32 x 1 1/32"	1 31/32 x 1 1/32"	2 5/32 x 7/8"	2 5/32 x 7/8"	2 5/32 x 7/8"
No. 3	1 15/16 x 2 7/32"	1 15/16 x 2 7/32"	1 15/16 x 3/4"	1 15/16 x 3/4"	1 15/16 x 3/4"	1 15/16 x 3/4"	1 15/16 x 1 1/32"	1 15/16 x 1 1/32"	1 15/16 x 1 1/32"	2 1/8 x 7/8"	2 1/8 x 7/8"	2 1/8 x 7/8"
No. 4	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 1/4 x 1 1/4"	1 5/8 x 1 11/32"	1 5/8 x 1 11/32"	1 5/8 x 1 11/32"
Connecting rod—												
Bearing clearance	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0005 to .0015"	.0015 to .003"	.0015 to .003"	.0015 to .003"
End play	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"	.006 to .011"*
Bearing size	2 1/16 x 1"	2 1/16 x 1"	2 1/16 x 1"	2 1/16 x 1"	2 1/16 x 1"	2 1/16 x 1"	2.125 x 1.08"	2.125 x 1.08"	2 1/8 x 1 3/32"	2 5/16 x 1 11/32"	2 5/16 x 1 11/32"	2 5/16 x 1 11/32"
Crankshaft—												
Bearing clearance	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.001 to .002"	.002 to .0035"	.002 to .0035"	.002 to .0035"
End play	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .007"	.003 to .008"	.003 to .008"	.003 to .008"
Bearing sizes—												
No. 1	2 1/2 x 1.173"	2 1/2 x 1.173"	2 1/2 x 1.173"	2 1/2 x 1.173"	2 1/2 x 1.173"	2 1/2 x 1.173"	2 1/2 x 1.155"	2 1/2 x 1.155"	2 1/2 x 1.155"	3 x 1.717"	3 x 1.717"	3 x 1.717"
No. 2	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.155"	2 1/2 x 1.155"	2 1/2 x 1.155"	3 x 1.155"	3 x 1.155"	3 x 1.155"
No. 3	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.031"	2 1/2 x 1.155"	2 1/2 x 1.155"	2 1/2 x 1.155"	3 x 1.155"	3 x 1.155"	3 x 1.155"
No. 4	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	2 1/2 x 1.59"	3 x 1.967"	3 x 1.967"	3 x 1.967"
No. 5	—	—	—	—	—	—	—	—	—	3 x 1.155"	3 x 1.155"	3 x 1.155"
No. 6	—	—	—	—	—	—	—	—	—	3 x 1.155"	3 x 1.155"	3 x 1.155"
No. 7	—	—	—	—	—	—	—	—	—	3 x 2.931"	3 x 2.931"	3 x 2.931"
Shaft thrust taken by	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing	Rear bearing *YX—.005 to .011"

SERVICE STANDARDS (CONTINUED)

MODEL DESIGNATION →	B	C	D	PW	DU	EU	F, G, GA	H, HA, HM, HMA	J, JA, K, KA, JM, JMA, KMA	R, RA	T, TA, V, VA	Y, YA, YX
Cylinders—												
Maximum allowable taper	.015"	.015"	.015"	.015"	.015"	.015"	.015"	.015"	.015"	.010"	.010"	.010"
Maximum allowable out-of-round	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.005"	.003"	.003"	.003"
Reconditioning working limits	.001"	.001"	.001"	.001"	.001"	.001"	.001"	.001"	.001"	.001"	.001"	.001"
Piston—												
Clearance—top land.	.030"	.030"	.030"	.030"	.030"	.030"	.030"	.030"	.030"	.0235"	.0235"	.0235"
—¾" from bottom of skirt (thrust side)	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	.0002 to .0012"	—	—	—
Piston fit for service—												
Feeler gauge	.002"	.002"	.002"	.002"	.002"	.002"	.002"	.002"	.002"	.003"	.003"	.003"
Pounds pull	6 to 9	6 to 9	6 to 9	6 to 9	6 to 9	6 to 9	6 to 9	6 to 9	6 to 9	12 to 19	12 to 19	12 to 19
Piston pins—												
Diameter, length and wall thickness	55/64" x 2¾" x .140"	55/64" x 2¾" x .140"	55/64" x 2¾" x .140"	55/64" x 2¾" x .140"	55/64" x 2¾" x .140"	55/64" x 2¾" x .140"	55/64" x 2⅞" x .140"	55/64" x 2⅞" x .140"	55/64" x 2⅞" x .140"	1⅛" x 3¼" x .156"	1⅛" x 3¼" x .156"	1⅛" x 3 15/32" x .156"
Clearance—												
In piston	.0000 to +.0005"	.0000 to +.0005"	.0000 to +.0005"	.0000 to +.0005"	.0000 to +.0005"	.0000 to +.0005"	+.0001 to +.0004"	+.0001 to +.0004"	.0000 to +.0005"	—.0003 to +.0003"	—.0003 to +.0003"	—.0003 to +.0003"
In rod	+.0001 to +.0002"	+.0001 to +.0002"	+.0001 to +.0002"	+.0001 to +.0002"	+.0001 to +.0002"	+.0001 to +.0002"	+.0001 to +.0004"	+.0001 to +.0004"	+.0001 to +.0004"	—.0001 to +.0005"	—.0001 to +.0005"	—.0001 to +.0005"
Service fit in piston and rod	ALL MODELS — Thumb Press Fit At 70 Degrees F.											
Piston Rings—												
Oil ring (No. per piston)	2	2	2	2	2	2	2	2	2	1	1	1
Width	5/32"	5/32"	5/32"	5/32"	5/32"	.155"	5/32"	.155"	.15"	.24"	.24"	.24"
Gap width	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"	.010 to .020"
Ring to groove (side clearance)	.001 to .0025"	.001 to .0025"	.001 to .0025"	.001 to .025"	.001 to .0025"	.001 to .025"	.001 to .0025"	.001 to .025"	.001 to .025"	.0015 to .003"	.0015 to .003"	.0015 to .003"

(Continued on page 8)

SERVICE STANDARDS (CONTINUED)

(Continued from page 7)

MODEL DESIGNATION →	*B*	*C*	*D*	*PW*	*DU*	*EU*	*F, G, GA*	*H, HA, HM, HMA*	*J, JA, K, KA, JM, JMA, KMA*	*R, RA*	*T, TA, V, VA*	*Y, YA, YX*
Piston Rings (Cont'd)												
Compression rings (No. per piston)	2	2	2	2	2	2	2	2	2	3	3	3
Surface coating (upper)	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating	Chrome-plating
Width (Upper and lower)	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"
(Intermediate)	—	—	—	—	—	—	—	—	—	.123"	.123"	.123"
Gap width (Upper and lower)	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.007 to .015"	.010 to .020"	.010 to .020"	.010 to .020"
(Intermediate)	—	—	—	—	—	—	—	—	—	.007 to .015"	.007 to .015"	.007 to .015"
Ring to groove side clearance—												
Upper	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0025 to .004"	.0035 to .005"	.0035 to .005"	.0035 to .005"
Intermediate	—	—	—	—	—	—	—	—	—	.002 to .0035"	.002 to .0035"	.002 to .0035"
Lower	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.002 to .0035"	.0035 to .005"	.0035 to .005"	.0035 to .005"
Tappets—												
Type	Mushroom	Mushroom	Mushroom	Mushroom	Mushroom	Mushroom	Mushroom	Mushroom	Mushroom	Mechanical	Mechanical	Hydraulic
Adjusting screw (type)	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	Self-locking	—
Stem diameter	.623"	.623"	.623"	.623"	.623"	.623"	.623"	.623"	.623"	.717"	.717"	.717"
Head diameter	1.28"	1.28"	1.28"	1.28"	1.28"	1.28"	1.28"	1.28"	1.28"	1.4"	1.4"	1.4"
Valves—												
Type of stem—												
Intake	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Exhaust	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Sodium-filled	Sodium-filled	Sodium-filled	Sodium-filled

SERVICE STANDARDS (CONTINUED)

MODEL DESIGNATION →	B	C	D	PW	DU	EU	F, G, GA	H, HA, HM, HMA	J, JA, K, KA, JM, JMA, KMA	R, RA	T, TA, V, VA	Y, YA, YX
Valves (Cont'd)—												
Stem diameter—												
Intake	.3405"	.3405"	.3405"	.3405"	.3405"	.3405"	.3405 to .3415"	.3405"	.3405"	.3715"	.3715"	.3715"
Exhaust	.3405"	.3405"	.3405"	.3405"	.3405"	.3405"	.3395 to .3415"	.3405"	.4335"	.4335"	.4335"	.4335"
Valve lift—												
Intake	.379"	.379"	.364"	.364"	.364"	.364"	.379"	.379"	.379"	.41"	.41"	.423"
Exhaust	.378"	.379"	.364"	.364"	.364"	.364"	.379"	.379"	.379"	.379"	.379"	.40"
Hardened inserts ...	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Exhaust	Intake and Exhaust	Intake and Exhaust	Intake and Exhaust
Guides—												
Removable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Length—												
Intake	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	3 3/8"	3 3/8"	3 3/8"
Exhaust	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	2 13/16"	3 7/32"	3 7/32"	3 7/32"
Distance from top of block to top of guide—												
Intake	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	1 1/16"	1 1/16"	1 1/16"
Exhaust	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	1 1/4"	1 1/4"	1 1/4"
Clearance between valve stem and guide—												
Intake	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.001 to .003"	.002 to .0045"	.002 to .0045"	.002 to .0045"
Exhaust	.003 to .005"	.003 to .005"	.003 to .005"	.003 to .005"	.003 to .005"	.003 to .005"	.002 to .004"	.002 to .004"	.004 to .005"	.004 to .005"	.004 to .005"	.004 to .005"
Clearance (engine hot) between valve stem and tappet—												
Intake	.010"	.010"	.010"	.010"	.010"	.010"	.010"	.010"	.010"	.010"	.010"	.010"
Exhaust	.014"	.014"	.014"	.014"	.014"	.014"	.014"	.014"	.018"	.018"	.018"	.018"

(Continued on page 10)

SERVICE STANDARDS (CONTINUED)

(Continued from page 9)

MODEL DESIGNATION →	*B*	*C*	*D*	*PW*	*DU*	*EU*	*F, G, GA*	*H, HA, HM, HMA*	*J, JA, K, KA, JM, JMA, KMA*	*R, RA*	*T, TA, V, VA*	*Y, YA, YX*
Valves (Cont'd)—												
Valve spring pressure												
Valves open—												
Pressure (ft. lbs.)	107 to 115	107 to 115	107 to 115	107 to 115	107 to 115	107 to 115	107 to 115	107 to 115	107 to 115	103 to 113	103 to 113	120 to 130
Compressed to (in.)	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1⅝	1 9/32
Valves closed—												
Pressure (ft. lbs.)	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	40 to 45	67½ to 72½
Compressed to (in.)	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	2	2	2
Timing—												
Intake opens (deg.)	12 BTC	12 BTC	8 BTC	8 BTC	8 BTC	8 BTC	12 BTC	12 BTC	12 BTC	21 BTC	21 BTC	18 BTC
Intake closes (deg.)	44 ABC	44 ABC	36 ABC	36 ABC	36 ABC	36 ABC	44 ABC	44 ABC	44 ABC	47 ABC	47 ABC	54 ABC
Exhaust opens (deg.)	50 BBC	50 BBC	37 BBC	37 BBC	37 BBC	37 BBC	50 BBC	50 BBC	50 BBC	47 BBC	47 BBC	54 BBC
Exhaust closes (deg.)	6 ATC	6 ATC	7 ATC	7 ATC	7 ATC	7 ATC	6 ATC	6 ATC	6 ATC	9 ATC	9 ATC	10 ATC
Engine Lubrication—												
Type	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure	Pressure
Oil pump—												
Type	Rotor	Rotor	Rotor	Rotor	Rotor	Rotor	Rotor	Rotor	Rotor	Gear	Gear	Gear
Driven by	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear	Camshaft gear
Normal pressure—												
Pounds	40	40	40	40	40	40	40	40	40	45 to 55	45 to 55	45 to 55
At engine r.p.m.	800	800	800	800	800	800	800	800	800	1000	1000	1000
Crankcase capacity (quarts)	*5	*5	*5	*5	*5	*5	*5	*5	*5	*8	*8	*8
Crankcase ventilation	Road draft	Road draft	Road draft	Sealed, Positive Type	Road draft	Road draft	Road draft	Road draft	Road draft	Road draft	Road draft	Road draft

*When changing filter or filter element, add 1 quart

ENGINE

ENGINE TUNE-UP

Today's high compression engines require accurate settings of the ignition and fuel systems for maximum performance. And, engine performance can be kept at a high standard of efficiency by maintaining the proper setting of a few simple adjustments. The following tune-up and inspection operations are provided as a guide to easily maintain peak engine performance.

The truck owner should be informed of the importance of frequent tune-up, particularly Minor Tune-Up as outlined in the following paragraph.

1. MINOR ENGINE TUNE-UP

This tune-up procedure should be performed frequently in order to maintain the standard of performance the engine is designed to produce. If engine performance indicates the need for further inspection or adjustment, after doing the following operations, Performance Inspections should be made. These inspections will indicate the work needed. Minor Tune-Up operations are:

(1) Clean the spark plugs and adjust the gap to .035 inch, resistor type spark plugs. Use a round feeler gauge. Too wide a gap reduces speed and power, while too narrow a gap causes uneven engine idling. If other than factory recommended plugs are used, refer to the manufacturer's instructions for the proper gap setting.

(2) Adjust distributor contact points to open .020 inch. Refer to Service Standards, Electrical System section.

(3) Check distributor cap and rotor for cracks and corrosion. Inspect the small lead wires for breakage or damaged insulation.

(4) Use the timing marks on the crankshaft pulley, or a timing indicator over Number 6 cylinder, and set the timing so that the distributor contact points open at the proper time.

This timing has been established for regular grade gasoline. Refer to Ignition Timing, in the Electrical System section, for effect of higher altitudes and different grades of fuel on ignition timing.

(5) Clean and oil the carburetor air cleaner. Clean the fuel filter and bowl. Inspect the bowl gasket and replace if necessary. Then, set the carburetor idle mixture adjustment, using a vacuum gauge. Adjust the throttle stop screw so that the engine idles at not less than approximately 450 r.p.m. On some models (refer to Fuel System section), set the accelerator pump linkage according to the season of the year as follows:

Hot weather—short stroke hole.
Normal summer driving—center hole.
Cold weather—long stroke hole.

(6) Inspect primary and high tension wires for poor insulation or connections and tighten as required.

2. PERFORMANCE INSPECTIONS

When making a complete engine analysis in order to determine the cause of improper engine performance, or when performing a Major Tune-up, make the following tests using suitable testing equipment:

a. Checking Battery and Line Voltage

The amount of charge to the battery is governed by the regulator unit which functions according to the state of charge of the battery. Excessive voltage will cause distributor points to burn, hard starting, and the headlights to burn out. The voltage should be checked at the battery terminal of the voltage regulator with an accurate voltmeter.

b. Vacuum Test

The vacuum test will indicate many causes of unsatisfactory engine performance. The following conditions affect vacuum readings:

Improper carburetor adjustment.

Improper valve timing.

Burned or sticky valves.

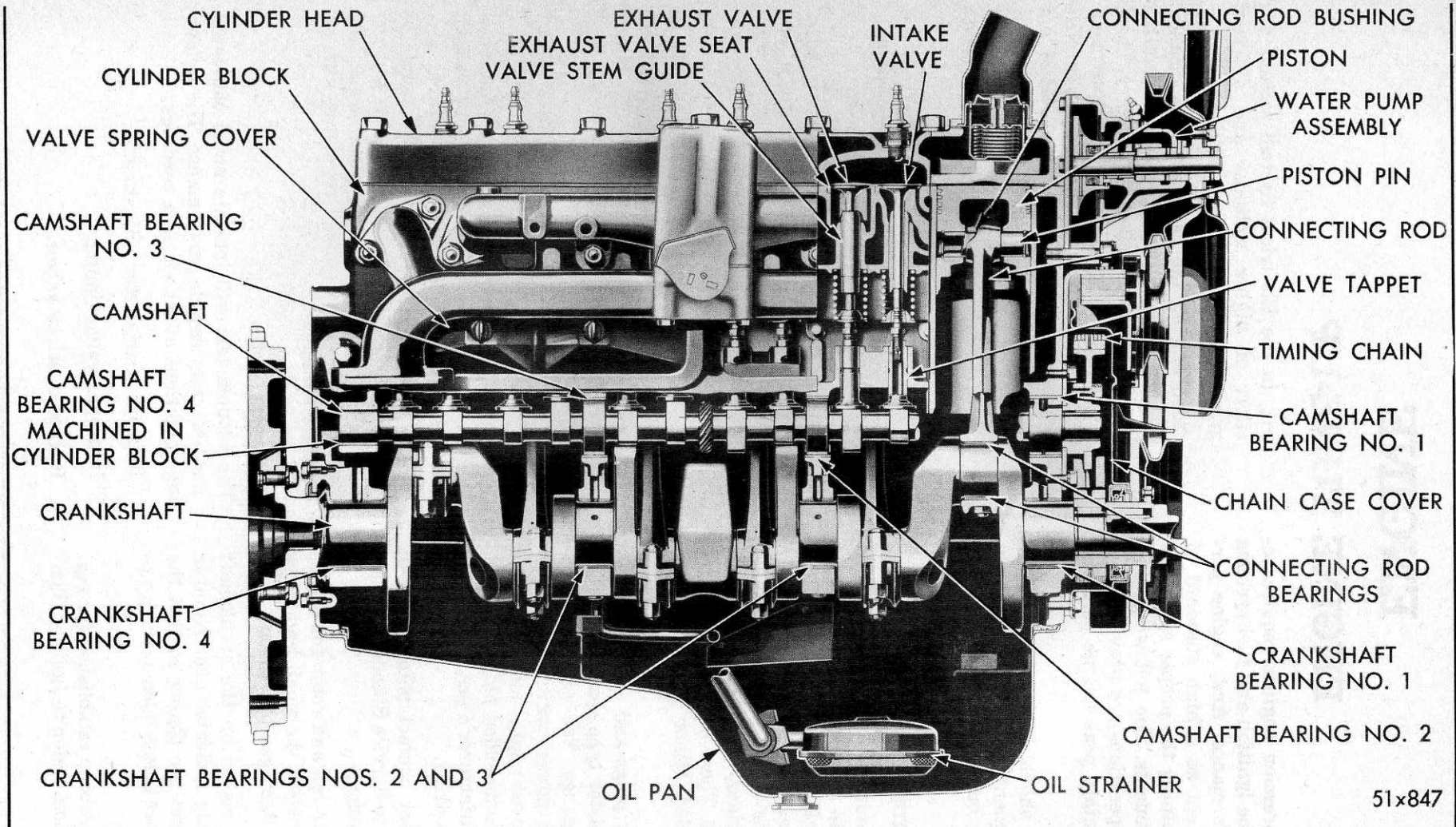


Fig. 1—Engine (Side Sectional View) (B-4-B, B-4-C, B-4-D, B-4-DU, B-4-EU)

Loose valve guides and weak springs.

Leaky intake manifold, carburetor, or cylinder head gaskets.

Improper piston ring sealing.

A steady reading of 18 to 21 inches of vacuum indicates normal performance, at idling speed.

c. Compression Test

Before testing compression, remove all spark plugs. Perform the test while cranking the engine with the throttle wide open.

Compression pressures depend upon cranking speed, engine temperature and compression ratio. If the reading is reasonably high and uniform (not varying more than 10 pounds between cylinders), the compression pressure may be considered normal. If the compression test shows an abnormal condition, it may be advisable to make an internal inspection of valves, pistons, rings, etc. An extremely low reading in two adjacent cylinders may indicate a blown out cylinder head gasket.

d. Condenser Test

The condenser may be easily tested without removing it from the truck by using an accurate condenser tester. A defective condenser may cause burning of the contact points which, in turn, will affect the performance of the engine.

e. Coil Test

In order to test the coil, an accurate coil tester is required. With most equipment, the test can be performed without removing the coil from the engine.

3. MAJOR ENGINE TUNE-UP

A Major Tune-Up, consisting of the Performance Inspections and the Minor Tune-Up, plus the following operations, may need to be performed to bring engine performance up to standard. The procedure is as follows:

(1) Clean and tighten the battery connections and add water to the battery cells if necessary. Tighten all primary and high tension wire connections, particularly at the ignition switch, ammeter and fuel gauge behind the instrument panel.

(2) Tighten cylinder head and manifold nuts. The cylinder head should be tightened while the engine is warm.

(3) Adjust valve clearance, as necessary, with the engine at normal running temperature. See Service Standards for valve clearances.

(4) Disconnect the main fuel line at the fuel pump and tank. Then, clear the line with compressed air.

(5) Check the float level. Refer to the Fuel System section for detailed instructions concerning float adjustment.

(6) Road test the truck as a final check for other mechanical difficulties which might affect performance, such as: dragging brakes, slipping clutch, etc.

REMOVAL, INSTALLATION AND MAINTENACE

4. REMOVAL AND INSTALLATION OF ENGINE (EXCEPT C.O.E. AND ROUTE VAN MODELS) (REFER TO FIGS. 1, 2, 3, 4, 5 AND 6)

NOTE

The above procedure for C.O.E. Models is outlined in Paragraph 5 and the procedure for Route Van Models is outlined in Paragraph 65.

a. Removal

(1) Remove the hood.

(2) Drain the water from the radiator and cylinder block.

(3) Remove the radiator tie rods.

(4) Remove the engine inlet and outlet hoses.

(5) Remove the radiator shell, radiator core, hood lower side panels and both front fenders as one complete assembly. Refer to Body section in this manual.

(6) Remove the mat and floor board in the driver's compartment.

(Continued on page 19)

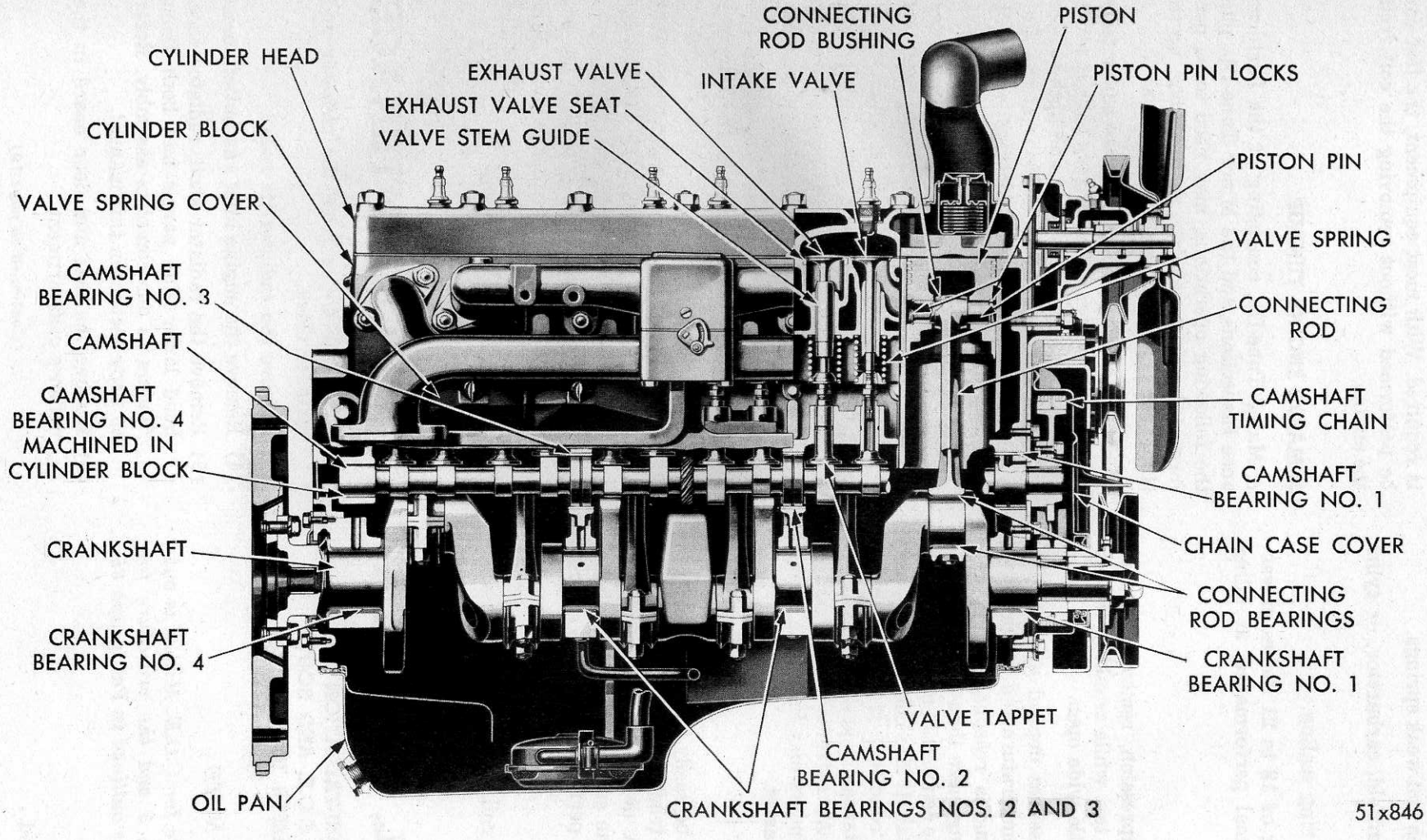


Fig. 2—Engine (Side Sectional View) (B-4-PW) (Typical View)

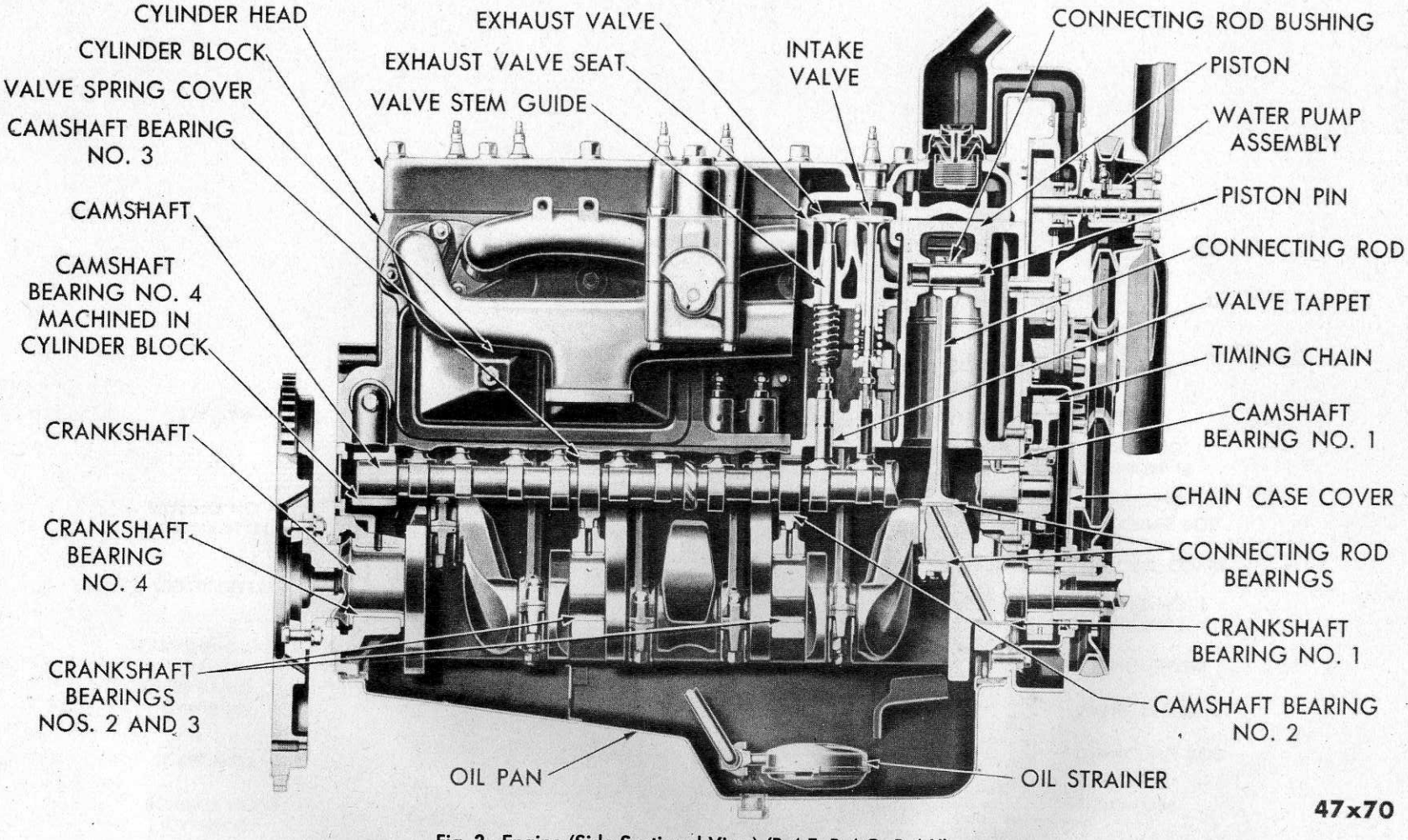


Fig. 3—Engine (Side Sectional View) (B-4-F, B-4-G, B-4-H)

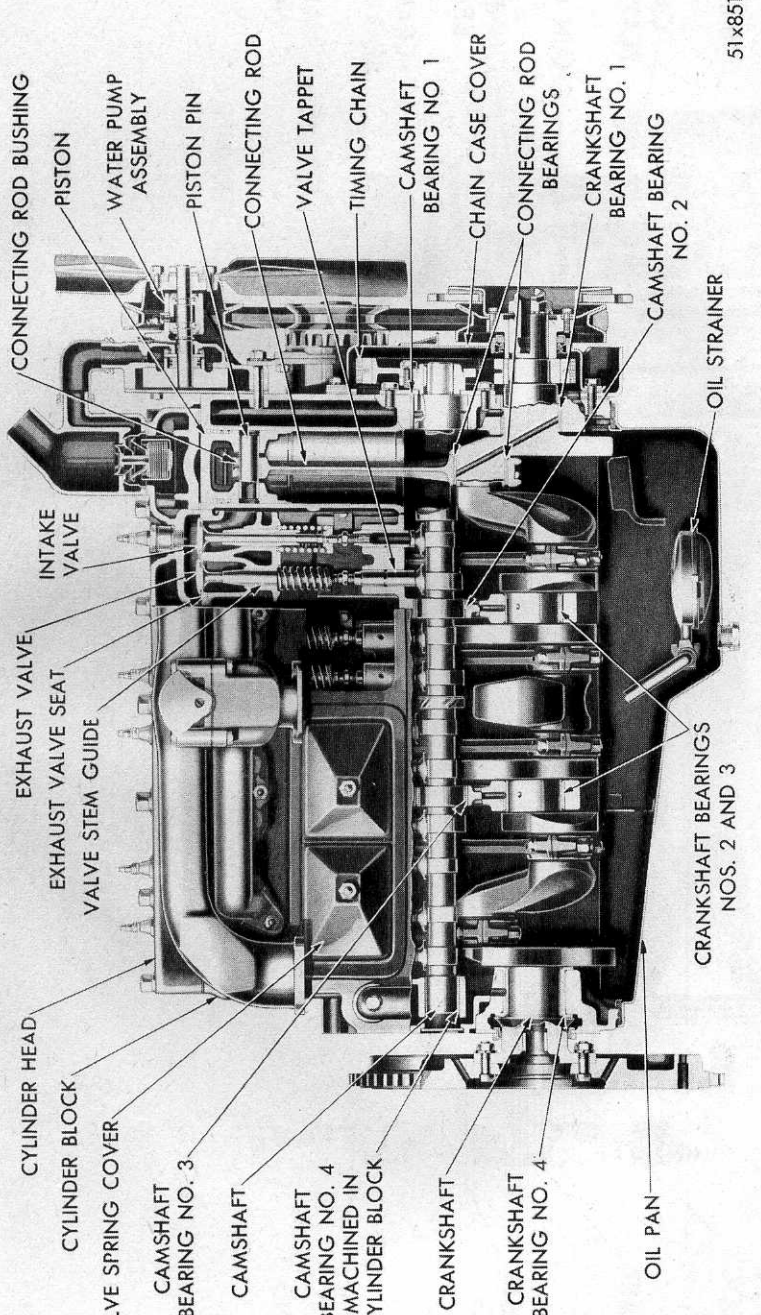


Fig. 4—Engine (Side Sectional View) (B-4-HM, B-4-JM, B-4-KMA)

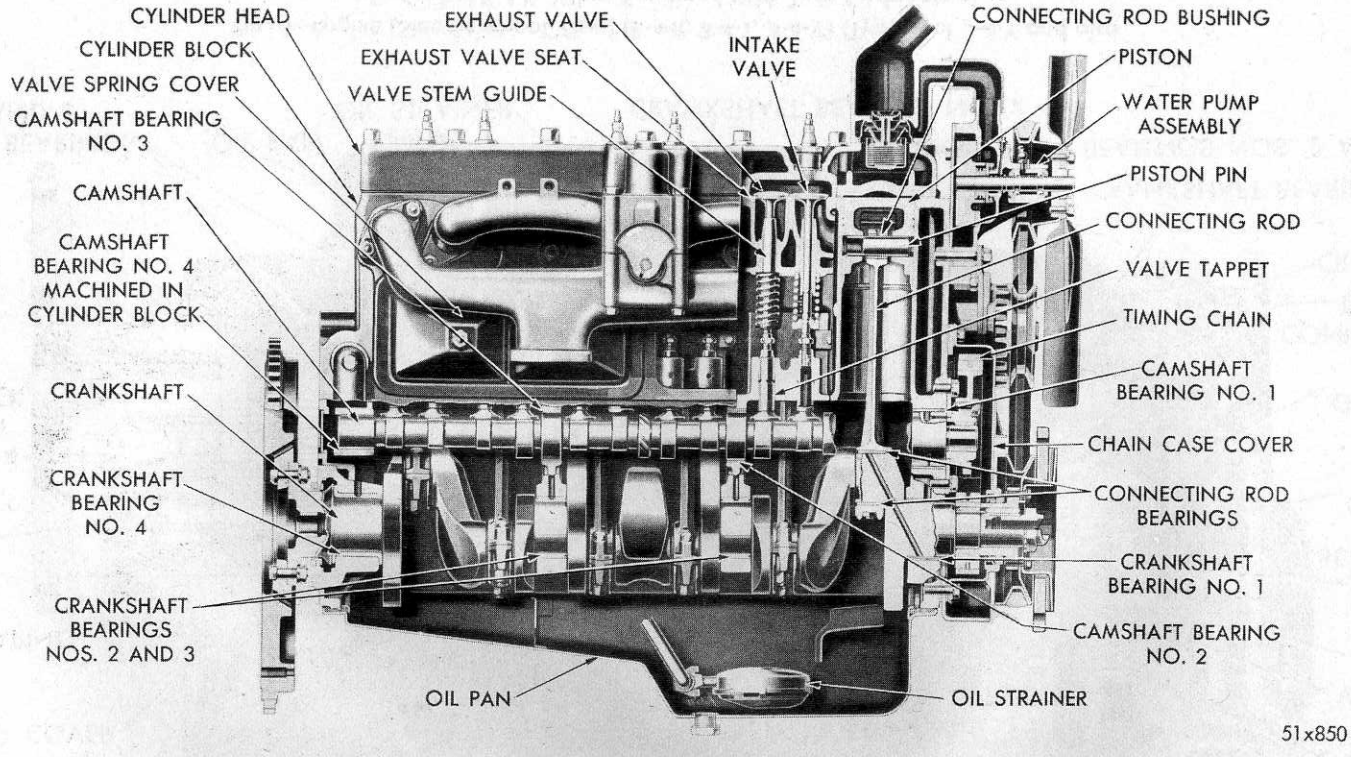


Fig. 5—Engine (Side Sectional View) (B-4-J)

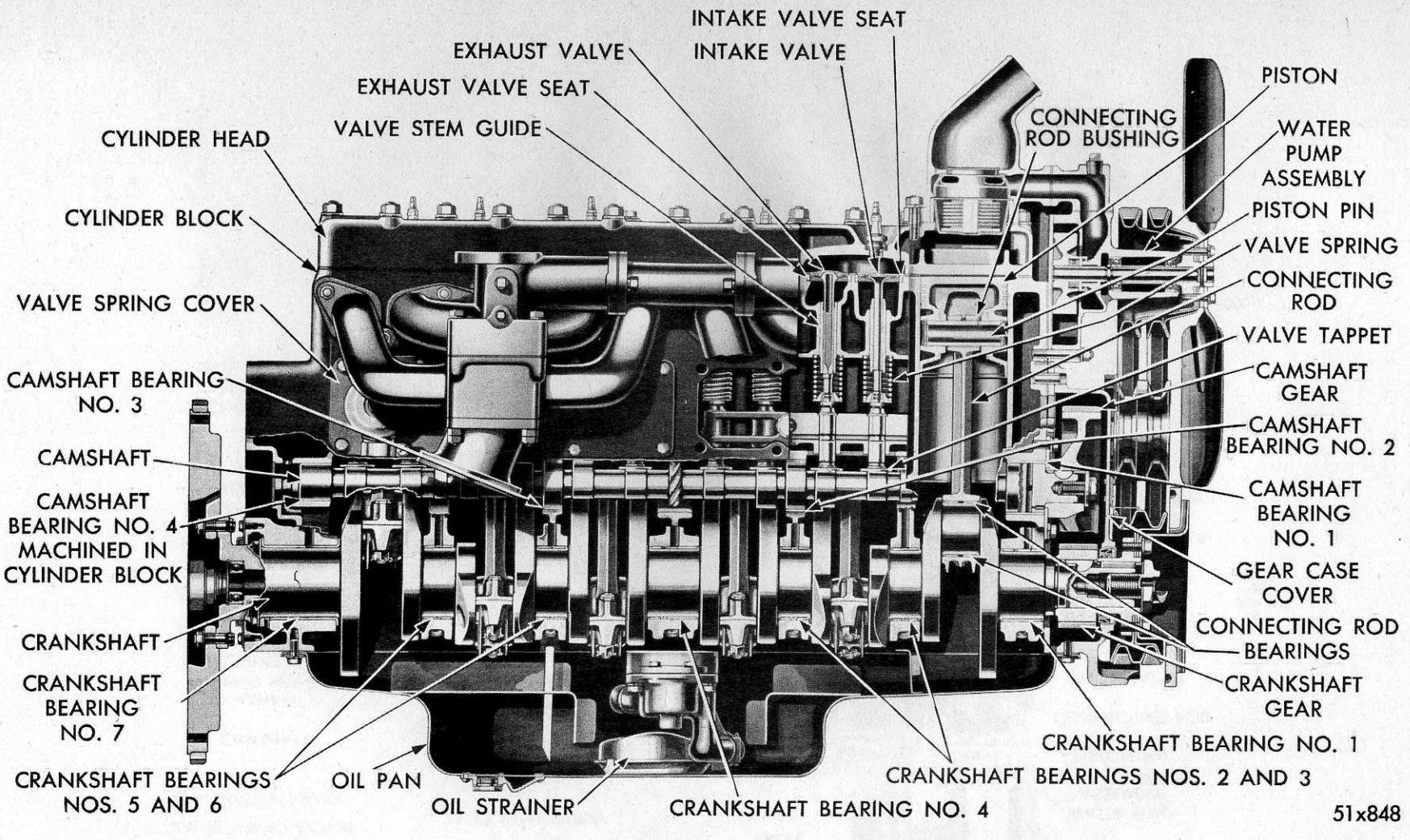


Fig. 6—Engine (Side Sectional View) (B-4-R, B-4-T, B-4-V) (Typical of B-4-Y and also Typical of B-4-K, When Equipped With Twin Carburetors)

(Continued from page 18)

(7) Disconnect propeller shaft.

(8) Remove the transmission. Refer to Transmission section in this manual.

(9) Remove the clutch pedal, bracket and brake pedal.

(10) Disconnect the following:

Battery.

Fuel pump flexible line at the fuel pump.

Exhaust pipe at the manifold.

Throttle and choke controls.

Heat indicator tube and bulb.

Oil gauge line at the oil line flexible tube.

Starter cable at starter.

High and low tension wires at the spark coil.

Windshield wiper hose (if so equipped).

Generator wires.

Starter pedal linkage (if so equipped).

Carburetor to brake booster line check valve (if equipped with brake booster).

(11) Remove the carburetor air cleaner, breather pipe, ignition coil and brake master cylinder.

(12) Remove the front and rear engine support bolts.

(13) Lift out the engine assembly.

b. Installation

When installation is completed, be sure to bleed the brake lines, aim the headlights and align the hood.

The exhaust pipe support bracket should be loosened and the engine allowed to run a few seconds before tightening engine mounting bolts and exhaust pipe support brackets. This is *extremely important* for correct alignment.

5. REMOVAL AND INSTALLATION OF POWER PLANT (C.O.E. MODELS) (FIG. 4)

On C.O.E. models, the engine (Fig. 4) and transmission assembly may be removed without removing the cab. This procedure is accomplished as follows:

(1) Drain the cooling system and disconnect battery.

(2) Remove the hood.

(3) Remove radiator, grille and front fenders as an assembly.

(4) Remove floor mat and floor boards.

(5) Disconnect the choke, throttle linkage and vacuum lines.

(6) Disconnect generator and horn wires, battery ground cable and coil wires. Remove generator.

(7) Disconnect hand brake linkage.

(8) Remove body to fender tie bar.

(9) Remove carburetor air cleaner and driver's seat.

(10) Remove crankcase filler pipe.

(11) Disconnect universal joint at rear of transmission and install a roller jack under transmission.

(12) Disconnect exhaust pipe and carburetor air cleaner pipe.

(13) Disconnect clutch and brake pedals.

(14) Disconnect oil filter lines.

(15) Disconnect oil gauge line at the engine.

(16) Disconnect brake line to master cylinder.

(17) Disconnect heat indicator tube and bulb.

(18) Disconnect speedometer cable at transmission.

(19) Disconnect shifting bar.

(20) Remove engine support bolts, left and right sides.

(21) Install engine lifting fixture.

(22) Drain engine oil and remove crankcase.

(23) Remove exhaust pipe.

(24) Remove crankcase breather pipe.

(25) Drop one end of the tie rod and swing it out of the way to permit additional travel of the roller jack.

(26) Have a helper (under the truck) push the jack forward gradually, while lifting the engine with a chain fall at the front.

When the engine has been moved ahead as far as possible, lower the chain fall so that the engine rests on the front bumper. Keep the jack in place under the transmission. The helper must steady the engine in this position. Then, reinstall the lifting hook as near to the rear of the engine as possible so that the engine and transmission will be nearly balanced. Gradually lift the engine with the chain fall. At the same time, have the helper (under the truck) push the jack forward until the engine and transmission clears the frame cross member and front bumper.

After installation is accomplished, be sure to bleed the brake lines.

6. CYLINDER BLOCK (FIG. 7)

When the engine is overhauled and the cylinder block is stripped, the block should be thoroughly cleaned and inspected for any condition that might render it unfit for further service.

The use of live steam, or a suitable degreasing tank is suggested for cleaning the block. When cleaning a cylinder block, be sure to blow out all passages with compressed air.

Inspect, particularly, the core hole plugs and replace as necessary. When installing new plugs, coat the edges of the plugs and core holes with a suitable sealer. Then, drive in place with a suitable tool.

Examine the cleaned block for cracks and all machined surfaces for burrs or scoring. Check the cylinder bores with an accurate gauge to determine out-of-round or tapered condition and recondition as required.

7. REMOVAL AND INSTALLATION OF CRANKSHAFT (ENGINE REMOVED) (ALL MODELS)

a. Removal

(1) Remove carburetor, spark plugs, etc., and any accessory that will interfere when the engine is turned upside down in a stand. Invert engine.

(2) Remove the fan belt, the vibration damper, or fan drive pulley.

(3) Remove the timing chain (or gear) case

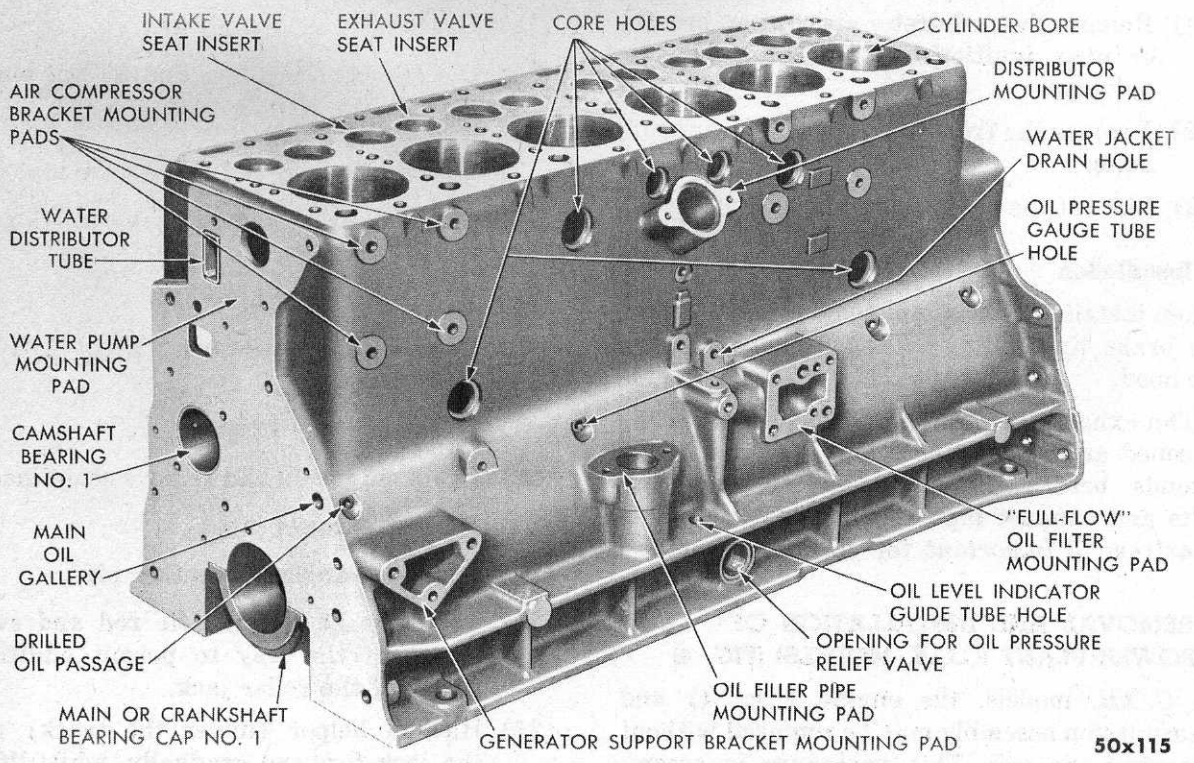


Fig. 7—Cylinder Block (Typical View)

cover and the cylinder block end plate. Remove timing chain or gear.

(4) Remove the clutch pan, clutch assembly, flywheel or fluid drive unit (if truck is so equipped).

(5) Remove oil pan.

(6) Remove oil pump and strainer assembly and the pump outlet pipe.

(7) Remove the connecting rod bearing caps.

(8) Remove the main bearing caps. Remove crankshaft.

(9) Remove the crankshaft sprocket from the crankshaft, using puller Tool, DD-888.

(10) Remove the clutch pilot shaft bearing from the end of the crankshaft, if necessary.

b. Installation

Before installation, inspect the surface of the shaft or other parts where contact is made with the seal and make certain the surface is smooth. Roughness of the contact surface (of the parts mentioned above) will cause rapid wear of the seal and result in oil leakage.

When installing the crankshaft, always use new cotter pins, lockwashers, gaskets and oil seals.

8. REMOVAL AND INSTALLATION OF MAIN BEARINGS (ENGINE INSTALLED)

On all models (except B-4-R, B-4-T, B-4-V and B-4-Y), in order to remove the front main bearing cap, it is necessary to remove the screws from timing chain case cover to oil pan front gasket oil seal plate, and the lower cap screw from the timing chain case cover. On C.O.E. models, the radiator shell and the radiator core with its supports must be removed in order to reach the chain case cover screws. On B-4-F, B-4-H, B-4-G and B-4-J, the radiator shell, fenders and core must be removed as a complete assembly.

After removal, proceed as follows:

(1) Remove the oil pan, clutch housing pan, oil suction pipe and screen assembly.

(2) Remove oil pan gasket seal plate (except on B-4-R, B-4-T, B-4-V and B-4-Y).

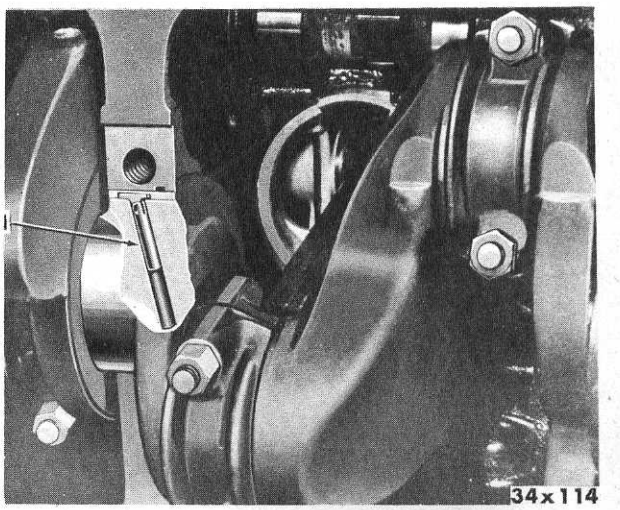


Fig. 8—Removing Upper Main Bearings

1 – Tool C-584

(3) Remove oil lines from main bearing cap to cylinder block.

(4) Remove bearing caps.

(5) Remove bearings by rotating the crankshaft.

To install, follow the above procedure in reverse order.

9. REMOVAL AND INSTALLATION OF MAIN BEARINGS (ENGINE REMOVED)

a. Removal

Drain oil pan and place engine upside down in

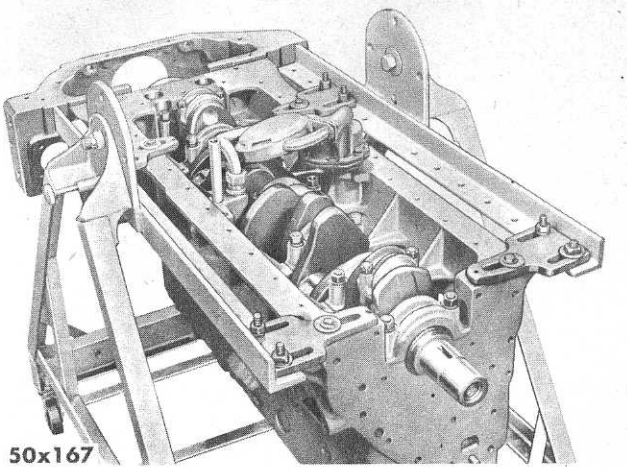


Fig. 9—Engine Mounted in Stand (B-4-R, B-4-T, B-4-V and B-4-Y)

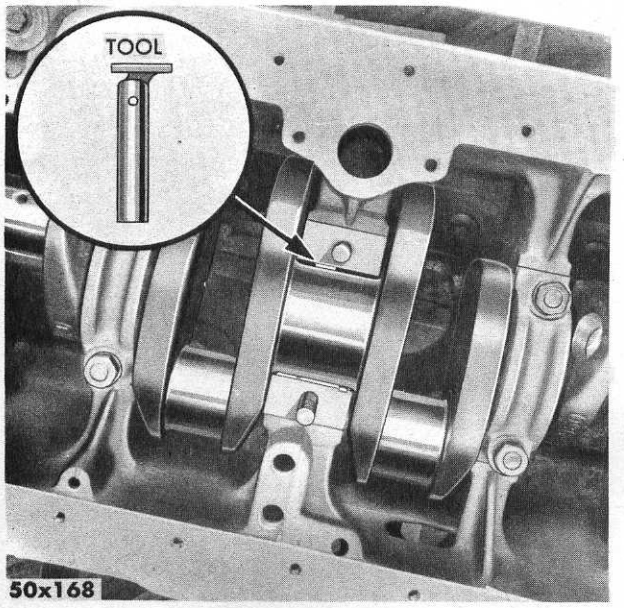


Fig. 10—Removing or Installing Upper Bearing Shells with Tool C-584

an engine stand (Fig. 9) and proceed as follows:

(1) Remove the oil pan.

(2) Remove the oil pump assembly and outlet pipe.

(3) Remove main bearing caps.

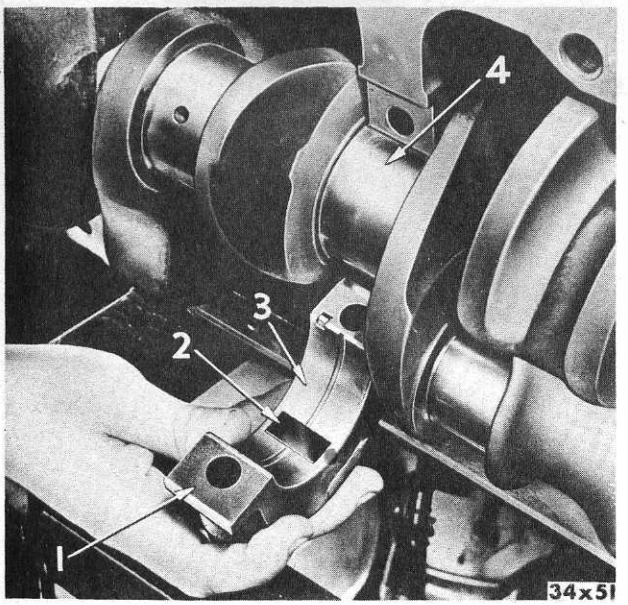


Fig. 11—Checking Main Bearing Clearance with Feeler

1 — Crankshaft main bearing cap
2 — Brass shim stock
3 — Main bearing
4 — Crankshaft

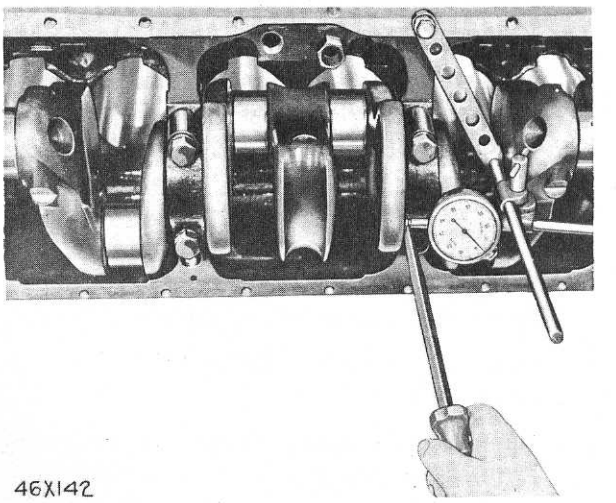


Fig. 12—Checking Crankshaft End Play, Using Dial Indicator

(4) Remove and install the upper bearing shells, one at a time, with Tool C-584 (Fig. 8, page 21). Insert the pin of the tool in the oil hole of the crankshaft (Fig. 10, page 21). Slowly rotate the crankshaft clockwise, forcing out the bearing.

b. Installation

NOTE

When installing a new upper bearing shell, slightly chamfer the sharp edge from the plain side.

Start the new bearing in place. Then, insert Tool C-584 in the oil hole in the crankshaft and slide the bearing in place. Slowly rotate the crankshaft counter-clockwise (Fig. 10).

10. CHECKING MAIN BEARING CLEARANCE

a. Inspection

Check each bearing carefully. If the bearing is scored, chipped or grooved, replacement is necessary. If the bearing is in good condition, check its clearance, as outlined below.

b. Main Bearing Clearances

The desired main bearing clearances for the various models are as follows:

All Models (Except B-4-R, B-4-T, B-4-V and B-4-Y)—.0005 to .0015 inch.

B-4-R, B-4-T, B-4-V and B-4-Y Models—.0015 to .003 inch.

c. Checking Clearance

Limits on the taper or out-of-round of any crankshaft journal should be held to .001 inch. Undersize bearings should be installed if the crankshaft journals are worn so that bearing clearance exceeds specifications. Never install an undersize bearing that will reduce the clearance below specifications.

To determine if the clearance is within the specified limits, check with the plastigage method or as follows:

Take each main bearing, one at a time, and remove the cap. Use a piece of .002 inch feeler stock (all models except B-4-R, B-4-T, B-4-V and B-4-Y, and .0035 inch feeler stock for the B-4-R, B-4-T, B-4-V, B-4-Y models) ½ inch wide and 1 inch long. Coat feeler with oil and place it between the bearing and the crankshaft journal (Fig. 11). Tighten bearing cap bolts. If a noticeable drag is present when the crankshaft is turned a full revolution by hand, with the feeler stock in the main bearing, the clearance is less than the upper limit specified for the particular truck model. If no drag is felt, the main bearing is too loose and should be fitted with an undersize bearing.

If main bearing clearance is excessive, crankshaft journals should be checked for out-of-round and taper. Then, if necessary, the crankshaft should be removed and the journals should be reground.

d. Servicing Main Bearings

With special Tool C-584, it is possible to remove and replace the upper halves of the main bearings without dropping the crankshaft.

When main bearings are replaced, examine the crankshaft journals for excessive wear or scoring. If they are scored or worn excessively, regrind the journals and install undersize bearings.

11. CHECKING CRANKSHAFT END PLAY

Refer to Figure 12. To check crankshaft end play, mount a dial indicator so that it rests against the flywheel or some vertical surface of the crankshaft. End play can be determined by prying the crankshaft back and forth.

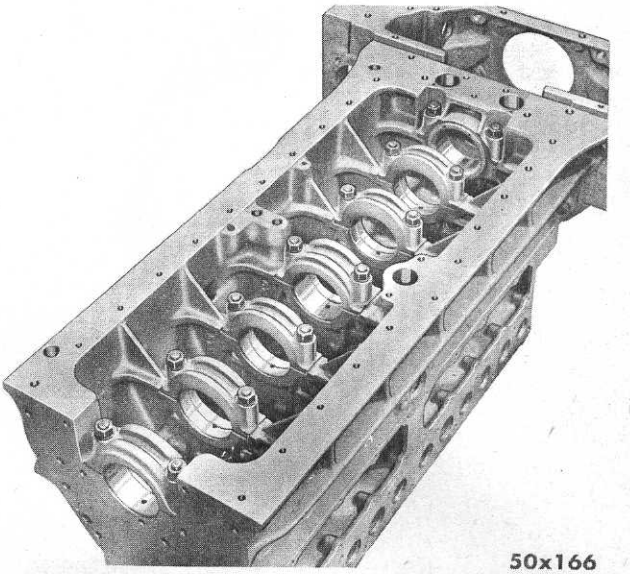


Fig. 13—Cylinder Block and Main Bearings (B-4-R, B-4-T, B-4-V and B-4-Y) (Typical of Other Models)

End play specifications are: (Except B-4-R, B-4-T, B-4-V and B-4-Y)—.003 to .007 inch; (B-4-R, B-4-T, B-4-V and B-4-Y)—.003 to .008 inch.

12. ADJUSTMENT OF MAIN BEARING CAPS

Replace main bearing caps that have become

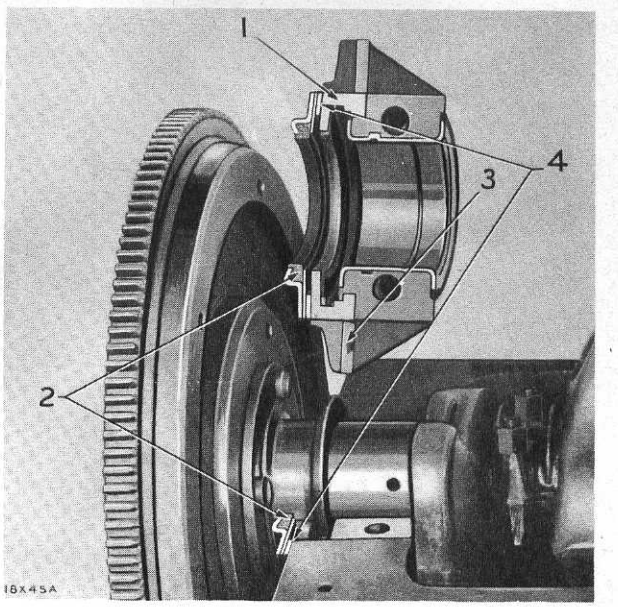
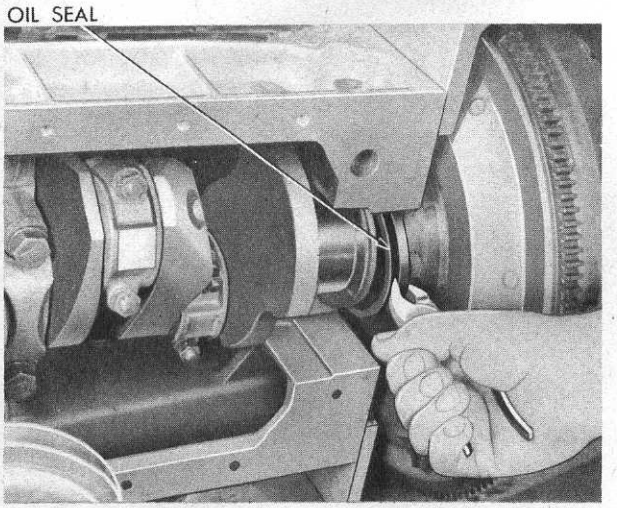


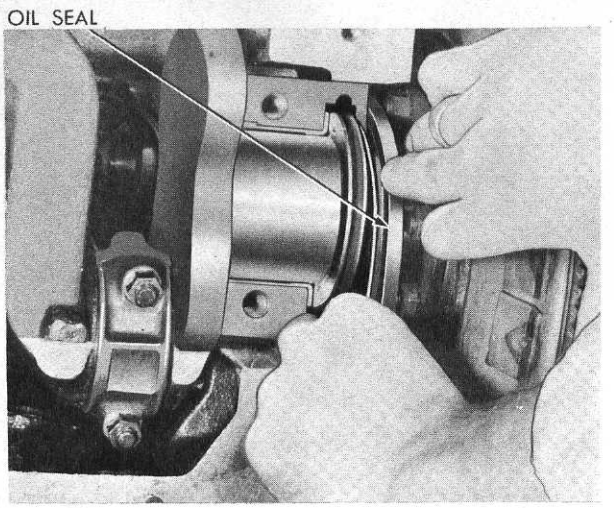
Fig. 14—Rear Main Bearing Oil Seal (Split-Type)

1 — Cap gasket—left
2 — Bearing oil seal
3 — Cap gasket—right
4 — Bearing oil seal gasket (not used on all models)

OIL SEAL



REMOVING



INSTALLING 46x124

Fig. 15—Installing Main Bearing One-Piece Oil Seal

damaged or broken in service. Main bearing caps are available through Mopar Motor Parts Corporation.

A main or connecting rod bearing cap should never be filed, dressed down, or shimmed, *except* when a replacement cap is installed and then, *only* for its original installation.

Replacement caps are similar to the original caps with these exceptions—stud holes are $\frac{1}{64}$ inch larger, and bearing cap length is $\frac{1}{64}$ inch shorter. These features permit the fitting of bearing caps by shimming or filing, in order to obtain proper bearing clearance. Fitting is necessary. Bearing caps, originally installed on the engine, are line reamed in place on the cylinder block. However, replacement caps are reamed in a master fixture, resulting in unavoidable variation which will affect bearing clearance.

13. MAINTENANCE, INSPECTION AND INSTALLATION OF CRANKSHAFT

When the crankshaft has been removed for reconditioning, or for any other reason, clean and inspect it before installation as follows:

a. Maintenance and Inspection

(1) Clean crankshaft thoroughly and blow out all oil passages with compressed air.

(2) Inspect journals for scoring, wear or cracks. If necessary, regrind and install undersize bearings.

(3) Measure main and connecting rod journals at several places to determine if the journals have become worn.

(4) If it is necessary to replace main bearing shells before setting the crankshaft in place, make certain that the bearing shells are placed, as shown in Figure 13, page 23. The oil holes in the shells must register with the oil holes in the cylinder block.

(5) After the upper bearing shells have been placed in the crankcase, apply clean engine oil to all journals and bearings. Install the crankshaft.

b. Installation

When setting the crankshaft in place with the timing chain (or gear) installed, be sure that

the timing marks align. Continue to assemble as follows:

(1) Install the transmission mainshaft pilot bearing in the end of the crankshaft, if necessary.

(2) Install timing gear or sprocket on the shaft with Tool DD-888.

(3) Install main bearing caps, lockwashers, and nuts. To seat caps, rap with a soft hammer. Tighten the caps to the specified torque. Refer to the Tightening Reference in this section.

(4) Install the connecting rod bearing caps, nuts and cotter pins. Tighten to the torque specified in the Tightening Reference in this section.

(5) Install oil pump and strainer float assembly and outlet pipe.

(6) Install oil pan with new gasket.

(7) Install fluid drive unit (if so equipped), or flywheel, clutch assembly and clutch housing lower pan. Install timing chain or gear and set valve timing.

(8) Install cylinder block end plate and timing chain (or gear) cover, using new gaskets.

(9) Install vibration damper, or fan drive pulley, and fan belt. Tighten crankshaft nut to a torque of 110 foot-pounds, minimum.

Always use new cotter pins, lockwashers, gaskets and oil seals when installing the crankshaft.

14. INSTALLATION OF MAIN BEARING OIL SEALS

a. Split-Type Oil Seal (Fig. 14, Page 23)

The rear main bearing contains oil seals and gaskets which prevent leakage of oil at this point. These oil seals should be carefully located in the cap before the cap is installed. Figure 14 illustrates the construction and location of these seals.

b. One-Piece Oil Seal (Fig. 15)

To install one-piece type oil seal, the following procedure is recommended:

(1) Remove engine oil pan.

(2) Remove lower clutch housing pan.

(3) Loosen all main bearing cap screws three turns.

(4) Remove rear main bearing cap.

(5) Remove oil seal by grasping it with pliers and pulling it down and out.

(6) Install new seal (Fig. 15) with the wiping edge forward, as follows:

Apply tire soap (or glycerine-base soap), or cup grease to one end of seal. Be careful not to get any of this lubricant between the ends of the seal in order to make sure the split can close and seal when installed. Start one end in the slot and push in until the end is near the top of the bearing. Start the other end and work into place. Work the seal into position so that the joint or split comes together near top. Wipe a little more lubricant around lip of the seal so that the bearing flange will slip into place.

(7) Inspect the rear bearing cap rear surface for sand holes. Also, check the tapped holes for the two-piece seal in order to determine if they are drilled through the oil slinger groove flange. Sand holes should be plugged by welding. Screw holes should be plugged by installing screws which have been dipped in sealing compound.

(8) Install and tighten rear bearing cap.

(9) Tighten remaining bearing cap attaching screws.

(10) Install clutch housing lower pan.

(11) Install oil pan.

(12) Refill engine with engine oil.

15. CAMSHAFT BEARINGS

All camshaft bearings (except the rear) are removable and seldom require replacement. If the bearing clearance is excessive, new bearings can be installed. Replacement bearings during manufacture are finished to such close limits that they do not require reaming, scraping or burnishing.

a. Measuring Camshaft Bearing Wear

On all B-4 Series trucks, the desired camshaft bearing clearance is .002 to .004 inch. To measure bearing wear, attach a dial indicator to the block with the plunger of the indicator resting

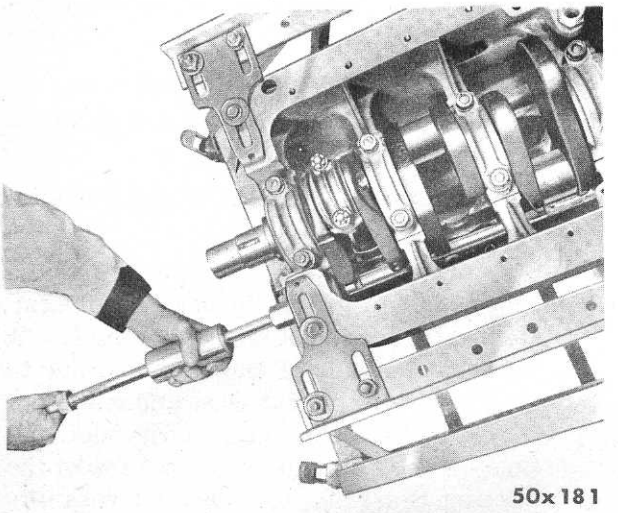


Fig. 16—Removing Camshaft Bearings

on the back of the nearest cam lobe. Pry the shaft up and down so that this movement will be shown on the indicator. Check all the bearings in the same manner. If the clearance exceeds .004 inch, install a new camshaft (for test purposes only) and recheck the clearance. With the new camshaft installed, clearance should not exceed .002 inch. If the clearance exceeds this dimension, replace the bearings. Check end play and make sure it is within the specified limits.

b. Removal of Camshaft

If bearing replacement is necessary, remove the camshaft as follows:

(1) Remove the fan drive pulley or vibration damper, using Tool C-355.

(2) Remove the timing chain (or gear) case cover. Remove the timing chain.

(3) Remove the valve tappets and guides (B-4-R, B-4-T, B-4-V and B-4-Y only). On other models, make sure they are held up—out of the way. Remove the camshaft and timing gear if so equipped.

(4) Place all of the puller bushings of Tool C-536 into the bearings. Slide the puller bar through the puller bushings. Remove the bearings—one at a time—and place the slotted washer in the slot provided in the bar at the back of the bearing to be removed. Strike the nut end of the puller bar with the sliding weight to remove the bearing, as shown in Figure 16.

Inspect the cam lobes and the oil pump drive gear for excessive wear. Measure the camshaft journals with a micrometer. If the journals are excessively worn, or if the cam lobes and the oil pump drive gear are worn or damaged, install a new camshaft.

Measure the end play, as shown in Figure 17. The end play should be from .002 to .006 inch. If the end play is excessive, install a new thrust plate, or other parts as necessary.

The standard sizes of bearing journals are as follows:

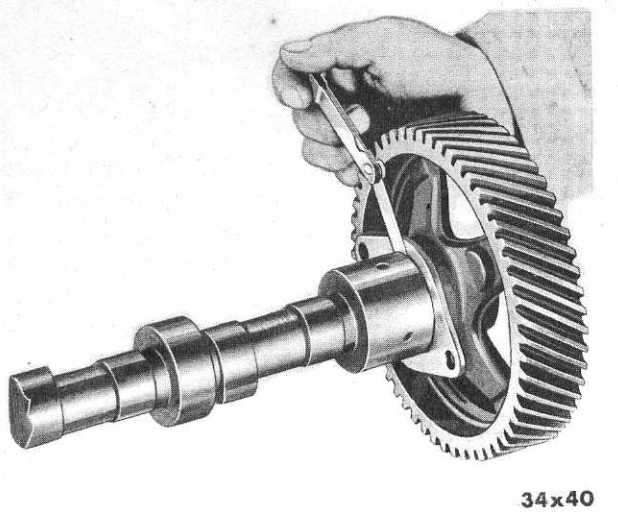


Fig. 17—Measuring Camshaft End Play (B-4-R, B-4-T, B-4-V and B-4-Y)

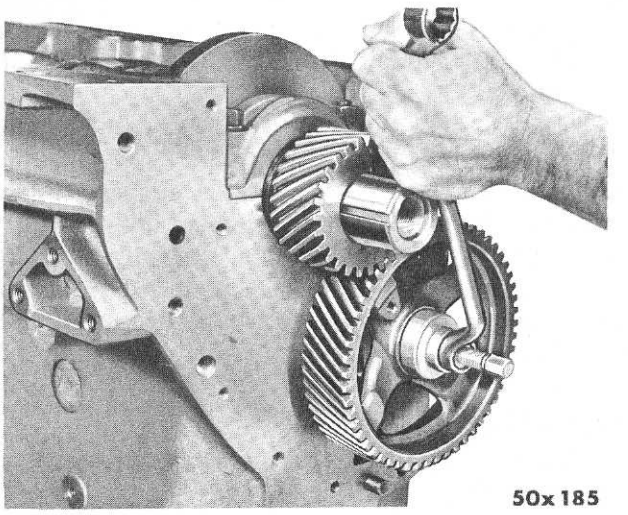


Fig. 18—Installing Camshaft Timing Gear (B-4-R, B-4-T, B-4-V and B-4-Y)

No. 1.....2.248 to 2.249 inches
No. 2.....2.1542 to 2.1552 inches
No. 3.....2.123 to 2.124 inches
No. 4.....1.623 to 1.624 inches

16. INSTALLATION OF CAMSHAFT BEARINGS

Install the camshaft bearings so that the oil hole in each bearing lines up with an oil hole in the cylinder block. The front bearing has an additional oil hole. This must line up with the hole that supplies oil to the timing chain or gear. Install the correct size adapter in each of the two intermediate bores.

Install the correct adapter in the front bearing and start the front bearing in its bore with the additional oil hole (mentioned above) to the rear. Insert the bar through all three adapters and install the horseshoe washer forward of the front adapter. With the sliding hammer of the tool, drive the front bearing into place and make certain that the oil holes are lined up. Remove the bar and leave the front and rear adapters in the bores in order to guide the bar when installing Number 2 bearing.

Place the adapter in the Number 2 bearing and start the bearing in its bore. Install the horseshoe washer forward of the Number 2 bearing and drive the bearing into place. Remove the bar adapter. Place the Number 3 bearing in the adapter and drive it into place, following the installation procedure for the other bearings. Camshaft bearings are manufactured to such close limits that no finishing or burnishing is required.

17. INSTALLATION OF CAMSHAFT

Make certain that the camshaft is thoroughly clean and that all oil holes are open. Installation is as follows:

(1) Place the thrust plate over the end of the camshaft.

(2) Install the timing sprocket on the shaft (except on B-4-R, B-4-T, B-4-V and B-4-Y). Install the timing gear on the shaft (on B-4-R, B-4-T, B-4-V and B-4-Y), using Tool DD-1064 (Fig. 18).

(3) Check camshaft end play (Fig. 17). End play should be from .002 to .006 inch.

(4) Slide the camshaft through the bearings, being careful not to damage the bearings.

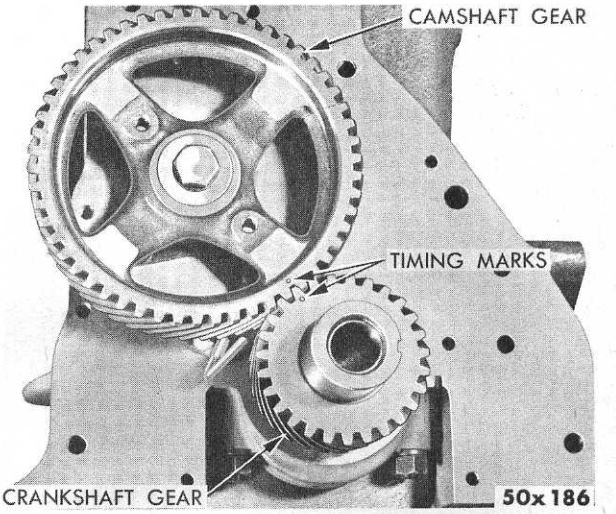


Fig. 19—Timing Gears and Index Marks (B-4-R, B-4-T, B-4-V and B-4-Y)

Align the timing marks on the sprockets and install timing chain (except on B-4-R, B-4-T, B-4-V and B-4-Y), or align the timing marks on the gears (B-4-R, B-4-T, B-4-V and B-4-Y), as shown in Figure 19. Install the thrust plate bolts and locking washers. Tighten securely.

(5) Install the case cover, using new seals. Tighten with a torque wrench from 12 to 17 foot-pounds.

(6) Install the distributor lower drive shaft assembly in the block, meshing it with the camshaft (Fig. 20). When meshing the

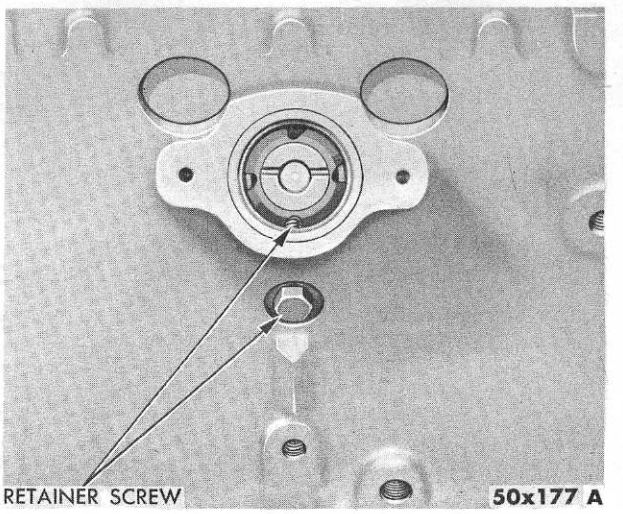


Fig. 20—Distributor Lower Drive Shaft Timing Position (B-4-R, B-4-T, B-4-V and B-4-Y)

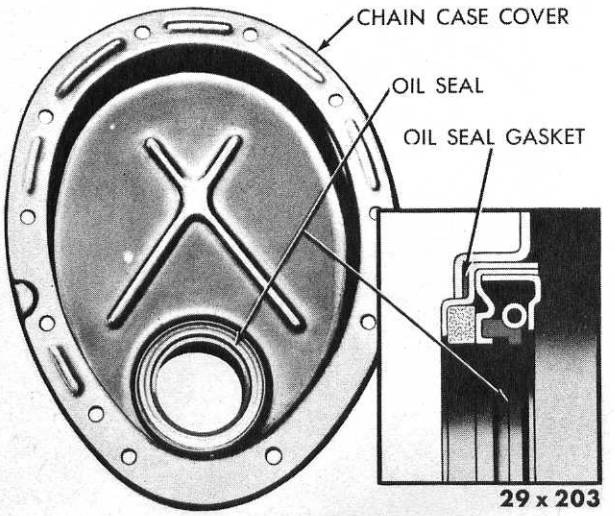


Fig. 21—Chain Case Cover Oil Seal

1 — Chain case cover and oil seal 2 — Oil seal gaske

drive gear with the camshaft, be sure that the slot in the coupling is in position.

(7) Install the set screw from the side of the block, locking the lower drive shaft in the block. (Be sure that the set screw enters a notch in the housing.)

18. REMOVAL OF CAMSHAFT OR THRUST PLATE (EXCEPT B-4-R, B-4-T, B-4-V AND B-4-Y)

To remove the camshaft, or thrust plate (with out removing the engine assembly), proceed as follows:

(1) Drain the cooling system and remove the hood.

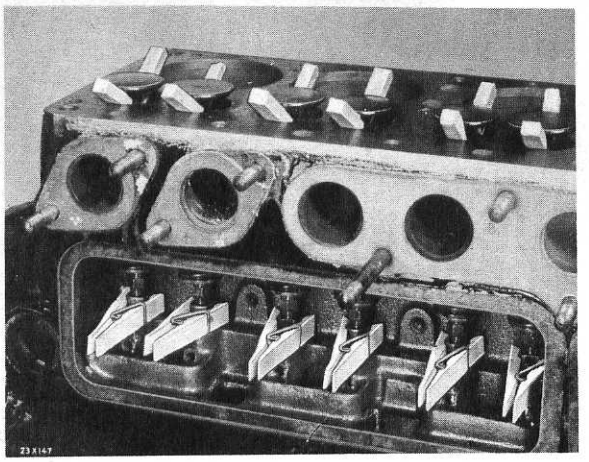


Fig. 22—Holding Up Valves and Tappets for Camshaft Removal (Except B-4-R, B-4-T, B-4-V and B-4-Y)

(2) Remove the radiator shell, core and fenders as an assembly.

(3) Remove the cylinder head.

(4) Remove the fuel pump, oil pump and valve tappet cover plates.

(5) Remove the crankshaft pulley.

(6) Support the front end of the engine. Remove the front motor support and timing chain case cover, being careful not to damage the oil seal (Fig. 21). Remove the camshaft sprocket and timing chain or gear.

(7) Raise the valves. Hold them in position by inserting two wooden wedges under each valve head (at opposite points) to prevent cocking or warping of the valve head. This operation is not required if the valves are being ground, since the valves and springs will be removed.

(8) Lift the valve tappets and hold them in place with spring type clothes pins (Fig. 22) or similar tools.

(9) Then, remove the camshaft, rotating it as it is drawn out so that the cams will clear any obstacles. Press off the sprocket hub and thrust plate in an arbor press. If the valve tappets are to be replaced,

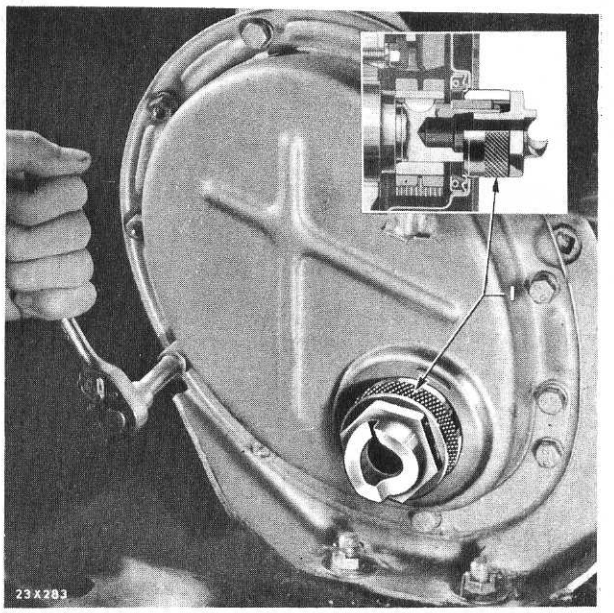


Fig. 23—Chain Case Cover Oil Seal Centering Tool

1 — Centering tool (C-522) is to be held in place by crankshaft starting jaw while tightening cover in place. Tighten jaw with fingers only.

remove the oil pan. Then, remove the clothes pins and the tappets will drop down and out.

When installing, use Centering Tool C-522, as shown in Figure 23.

19. REMOVAL OF CAMSHAFT OR THRUST PLATE (B-4-R, B-4-T, B-4-V AND B-4-Y)

(1) Drain the cooling system and remove the hood.

(2) Remove the headlights.

(3) Remove the radiator shell, core and fenders as an assembly.

(4) Remove the crankshaft pulley.

(5) Remove the oil pan.

(6) Remove the oil pump and screen.

(7) Remove the oil pump driveshaft by removing the upper support screw.

(8) Remove the distributor.

(9) Remove the distributor drive shaft by removing the bushing retainer screw. Then, remove the inspection hole cover on the right side of the engine at the center below the valve tappet cover plates. Push the shaft out through the distributor shaft opening.

(10) Remove the fuel pump.

(11) Remove the valve tappet cover plates.

(12) Turn the engine until the tappets in one of the banks are loose and remove tappets and guide assembly. Repeat this operation and remove the other valve tappet guide assembly.

(13) Place a jack under the front end of the engine and remove the timing chain case cover (engine support), camshaft sprocket and timing chain.

(14) Remove the camshaft sprocket hub thrust plate screws and withdraw the camshaft. Press off the sprocket hub with an arbor press.

20. INSTALLATION OF CONNECTING RODS

A connecting rod should always be installed with the oil metering holes (8 and 9, Fig. 24) in the connecting rod toward the valve side of engine.

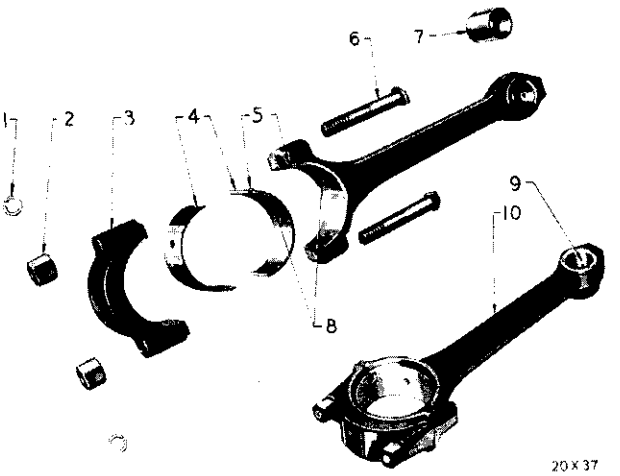


Fig. 24—Connecting Rod

1 — Cap bolt nut lock washer
2 — Cap bolt nut
3 — Cap
4 — Rod bearings
5 — Torque and groove
6 — Cap bolt
7 — Rod bushing
8 — Oil holes
9 — Oil hole
10 — Rod assembly

Always check rods for alignment each time they are installed, especially when installing new piston pins or bushings.

21. REPLACEMENT OF CONNECTING ROD BEARINGS

Connecting rod bearings can be easily replaced by removing bearing caps and bearing shells. Replacement bearings require no reaming or shaping.

Connecting rod bearing inserts must always be installed so the small boss on the insert lines up with the machined grooves in the connecting rods. This applies to both bearing halves.

22. UNDERSIZE MAIN AND CONNECTING ROD BEARINGS

Main and connecting rod bearings are furnished in .001 inch, .002 inch, .010 inch, and .012 inch undersizes.

The .002 inch undersize bearings are for standard crankshafts that are slightly worn.

The .010 inch undersize bearings are for .010 inch undersize crankshafts.

The .012 inch undersize bearings are for .010 inch undersize crankshafts that are slightly worn. Bearing inserts should be replaced in pairs; never use a new bearing half with an old

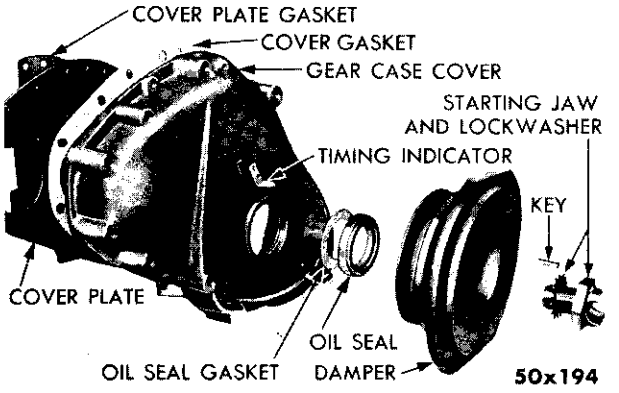


Fig. 25—Oil Seal and Gear Case Cover (Disassembled View) (B-4-R, B-4-T, B-4-V and B-4-Y)

half. When checking bearing clearance, always check one pair of halves at a time.

Checking Connecting Rod Bearing Clearance

When checking connecting rod bearing clearance, follow the procedure used in checking main bearing clearance.

23. REPLACEMENT OF WELCH PLUGS

Welch plugs are installed in various parts of an engine assembly. If a leak occurs at a welch plug installation, replace the plug.

To remove the plug, use a center punch or similar tool. Drive in the center of the plug so that it will collapse and fall out. Be extremely careful when installing a welch plug. Observe the following precautions:

(1) The plug seat should be clean, smooth, even, and free from rust and dirt.

(2) The plug should be free from burrs and irregularities.

(3) The convex side of the plug should face outward. Expand the plug in its seat by flattening it with a suitable tool.

NOTE

White lead, or similar sealing compound may be used in the plug seat before installation.

24. TIMING GEAR CASE OIL SEAL (B-4-R, B-4-T, B-4-V AND B-4-Y)

This seal prevents leakage of oil at the front of the engine. The seal is a press fit in the gear case cover and is a composition seal in a stamped steel housing, as shown in Figure 25.

When installing the gear case cover, be careful to center the seal on the crankshaft before tightening the cover bolts.

To replace the oil seal, press the old seal out of the cover with a suitable tool. Then, coat the outside of the new seal with white lead or gasket sealer. Press seal into the gear case cover with a suitable tool, after placing the new seal gasket in position.

Inspect the sealing surface on the crankshaft pulley. If worn or scored, replace the pulley or damper. The hub should measure 2.498 to 2.500 inches in diameter. The sealing surface is machined to within 7/8 inch from the inside end. Then, proceed as follows:

(1) Install gear case cover and new gasket on engine, drawing up the bolts snug enough to hold cover in place.

(2) Install and tighten cover bolts. Install the vibration damper or crankshaft pulley. Then, tighten crankshaft nut to 108 foot-pounds with a torque wrench.

25. SERVICING THE CYLINDER HEAD

Always use a new cylinder head gasket when installing the cylinder head. Coat both sides of the gasket with a light, high-temperature, non-fiber grease, or with a suitable sealing compound. Make sure the cylinder head and block are clean and that the water holes are open.

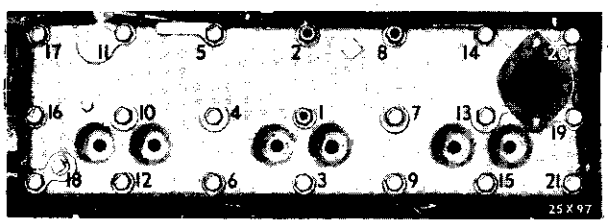


Fig. 26—Sequence for Tightening Cylinder Head Nuts (Except B-4-R, B-4-T, B-4-V and B-4-Y)

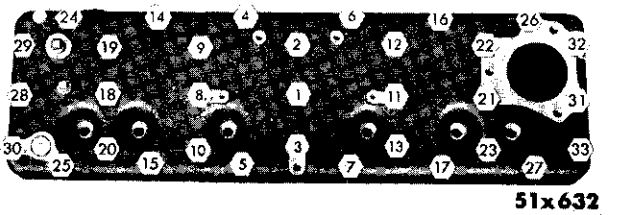


Fig. 27—Sequence for Tightening Cylinder Head Nuts (B-4-R, B-4-T, B-4-V and B-4-Y)

Tighten cylinder head nuts in sequence, as shown in Figures 26 and 27. Draw all nuts down evenly with a torque wrench from 65 to 70 foot-pounds, as shown in Figure 28.

The final tightening and checking of the tension of the cylinder head stud nuts should be made after the engine has reached its normal operating temperature. Also, check for external leaks.

26. REMOVAL AND INSTALLATION OF OIL PAN

(1) Drain the engine oil, install the drain plug and tighten securely.

(2) Remove the clutch housing pan to prevent damaging the oil pan gaskets on the clutch housing pan dust seal.

(3) Remove the oil level indicator and the oil pan.

(4) Before installing the oil pan, clean it thoroughly and install new gaskets. The lips of the end gaskets (A and B, Fig. 29) should protrude ⅛ to ¼ inch above the oil pan. These ends must not be cut off. They should be allowed to protrude while the pan is being installed. The pan will compress them into place when the pan screws are tightened.

27. RECONDITIONING CYLINDER WALLS

Cylinder walls which are not badly scored, yet need "cleaning up" to bring them within satisfactory working limits, may be reconditioned with a hone.

The cylinder bore should be checked with an accurate gauge (Fig. 30) to determine whether or not the bore is out-of-round or tapered. A good cylinder wall job should show measurements of not more than .001 inch out-of-round and .001 inch taper. Maximum allowable out-of-round is .005 inch for all truck models except B-4-R, B-4-T, B-4-V and B-4-Y, and .003 inch for B-4-R, B-4-T, B-4-V and B-4-Y. Maximum taper is .015 inch for all truck models, except B-4-R, B-4-T, B-4-V and B-4-Y, and .010 inch for B-4-R, B-4-T, B-4-V and B-4-Y.

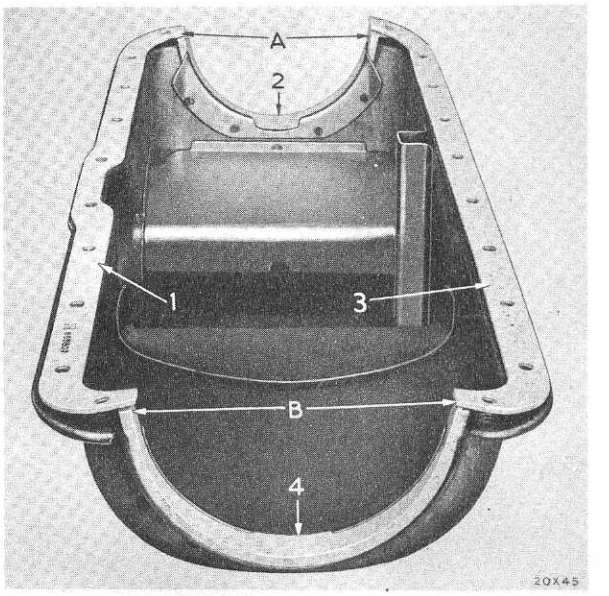


Fig. 29—Oil Pan Gaskets
(Except B-4-R, B-4-T, B-4-V and B-4-Y)

1 — Gasket—right
2 — Gasket—rear
3 — Gasket—left
4 — Gasket—front
A — Rear gasket lips
B — Front gasket lips

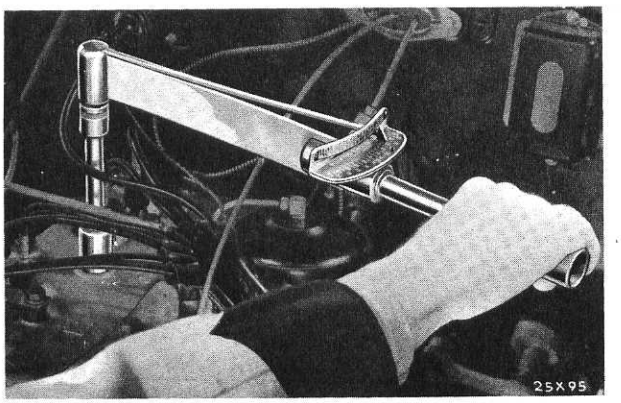


Fig. 28—Tightening Cylinder Head Nuts

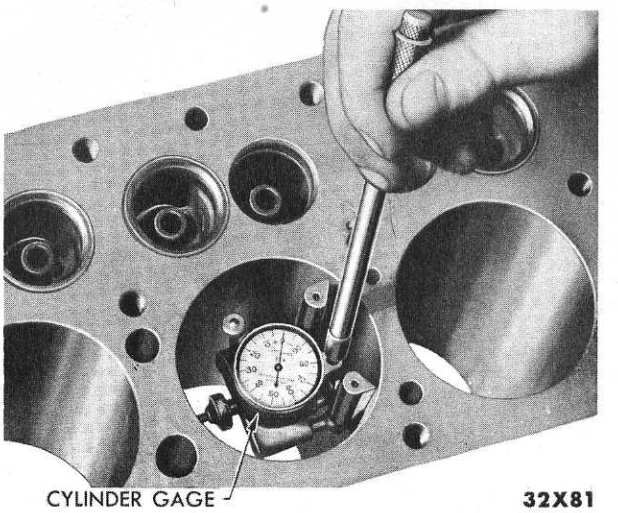


Fig. 30—Checking Cylinder Bore

1 — Tool C-119

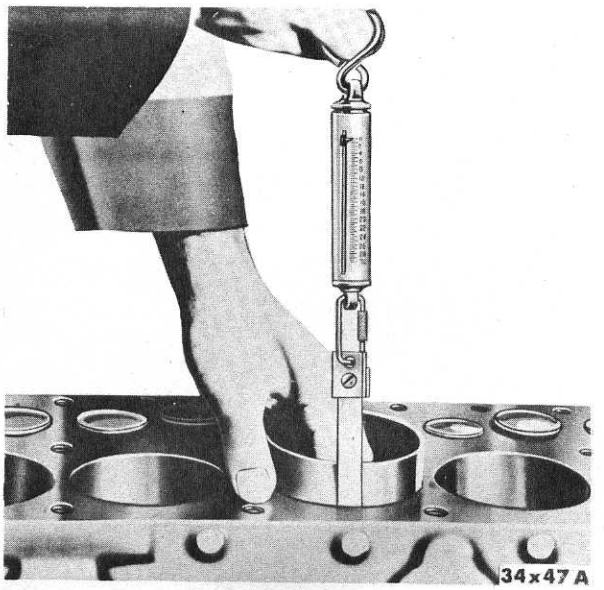


Fig. 31—Inserting Piston With Feeler Stock Attached to Spring Scale, Tool C-690

If cylinder walls are badly scored, tapered, or out-of-round, they should be bored with a reliable boring tool and polished with a hone. Use piston rings as specified in Service Standards.

When reconditioning cylinder walls, cover the crankshaft and main bearings to prevent cuttings and abrasives from getting into the bearings. After reconditioning the cylinder walls, the engine should be thoroughly cleaned before fitting pistons to remove abrasives, if present, which would cause scoring and ring and cylinder wall wear.

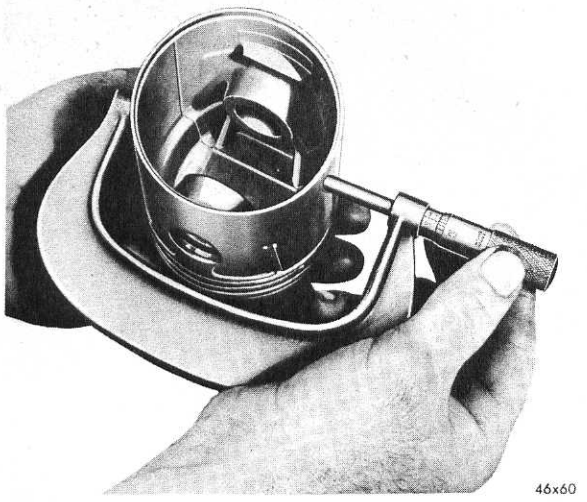


Fig. 32—Measuring Piston with Micrometer

28. FITTING PISTONS

a. Fitting Piston In Bore

Fit the piston with the pin removed. Make sure that the cylinder walls and piston are clean and dry and that all parts are at normal room temperature (70 degrees F.).

To check fit, use ½ inch wide feeler stock that is long enough to extend down into the cylinder bore the full length of the piston.

Attach the feeler stock to a spring scale, Tool C-690, and place the stock between the thrust side of the inverted piston and the cylinder wall. If this is not done, a true reading on the scale can not be obtained, due to the taper of the piston.

Turn the piston upside down and insert it to its full depth in the cylinder bore. Withdraw the feeler stock. The scale will indicate the pull required to withdraw the feeler stock (Fig. 31). The following chart indicates the proper thickness of ½ inch wide feeler stock to use and the pull required for correct piston fit for each truck model:

Truck Models	*Thickness of Feeler Stock*	*Pounds Pull on Scales*
All Models Except B-4-R, B-4-T, B-4-V and B-4-Y....	.002 in.	6 to 9
B-4-R, B-4-T, B-4-V and B-4-Y Models	.003 in.	12 to 19

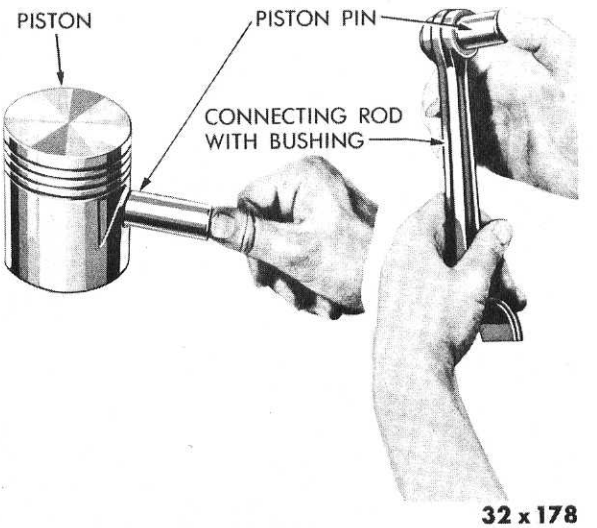


Fig. 33—Fitting Piston Pin in Piston and Connecting Rod

Aluminum pistons will contract at low temperatures. Consequently, some piston and valve noise, heard when the cold engine is started, is normal. Consequently, such noise may not be an indication of damaged parts or improper piston fit, providing the noise disappears after the engine reaches normal operating temperature.

b. Checking Piston Size

New pistons should be fittted to the cylinder bores with great accuracy and care. Check the measurements of stock pistons with micrometer calipers across the high spots of the piston skirt contour (Fig. 32).

Pistons are available through the Mopar Motor Parts Corporation in standard and the following oversizes: .005 inch, .020 inch, .030 inch, .040 inch, and .060 inch.

29. FITTING PISTON PINS

Piston pins should be installed in the piston and connecting rod with a thumb press fit at 70 degrees F. (Fig. 33).

Piston pins are available in standard and the following oversizes: .003 and .008 inch.

30. FITTING PISTON RINGS (FIGS. 34 AND 35)

Measure the piston ring gap about 2 inches from the bottom of the cylinder bore which is to be fitted. Be sure the ring is square in the cylinder before measuring the gap with the proper thickness feeler, as shown in Figure 35.

The ring gap should measure .007 to .015 inch (all models except B-4-R, B-4-T, B-4-V, B-4-Y) or .010 to .020 inch (B-4-R, B-4-T, B-4-V, B-4-Y) and with a ring groove side clearance of .0025 to .004 inch—upper compression ring (all models except B-4-R, B-4-T, B-4-V, B-4-Y), or .0035 to .005 inch (B-4-R, B-4-T, B-4-V, B-4-Y).

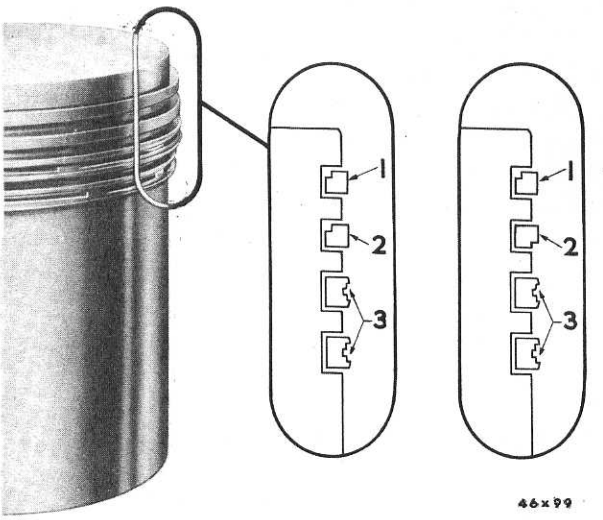


Fig. 34—Piston Rings

1 – Piston ring–upper 2 – Piston ring–intermediate
3 – Piston rings–lower

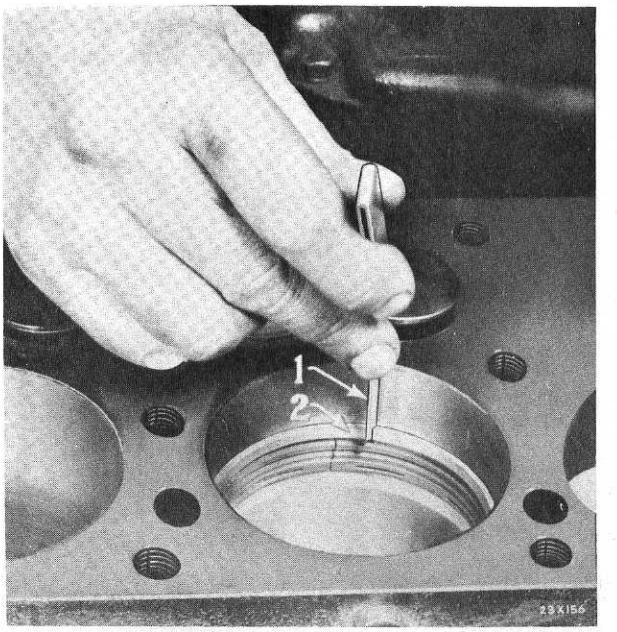


Fig. 35—Fitting Piston Rings

1 – Feeler gauge 2 – Piston ring

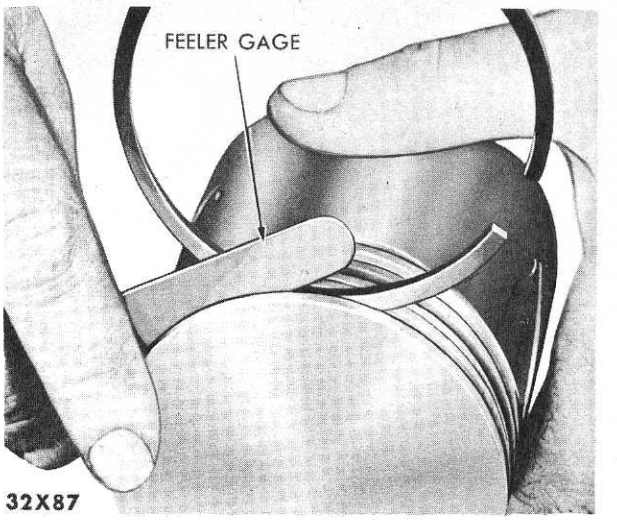


Fig. 36—Checking Side Clearance in Piston Groove

Refer to Service Standards for other specifications. Be sure the ring grooves are clean before checking.

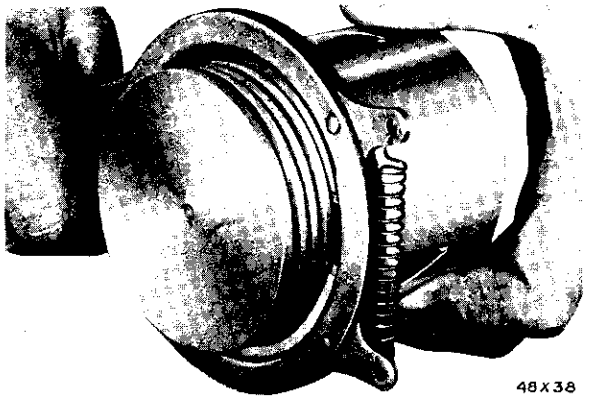


Fig. 37—Installing Piston Rings

Fig. 38—Installing Piston and Rings, Tool C-385

Measure ring side clearance, as shown in Figure 36, page 33, with a feeler gauge. After fitting rings to the cylinder and piston, install rings on piston, using piston ring installing tool, as shown in Figure 37. The rings must be installed in the grooves, as indicated in Figure 34.

When installing piston and rings in an engine (Fig. 38) without reconditioning the cylinder bores, always remove the top ridge of the bore with a reliable ridge reamer. Care must be taken not to cut below the top of the upper ring position in the bore and the ridge must be cut BEFORE removing the piston assemblies. Be sure to keep the pistons covered during this operation and clean the cylinder bores thoroughly before installing new rings.

Before installing the rod, piston and ring assemblies in the cylinder block, immerse the assemblies in clean engine oil for pre-lubrication.

NOTE

Be sure the slot in the piston is away from the valve side of the engine when installing the piston.

31. SEMI-FINISHED PISTONS

If the measurement of a reconditioned bore is such that a standard oversize finished piston of that particular size is not available, use a semi-finished piston. These are available from the Mopar Motor Parts Corporation in two sizes: (1) for cylinder bores from standard to .023 inch oversize and (2) for cylinder bores from .025 inch to .060 inch oversize.

Only the skirt and lands of semi-finished pistons require finishing. Do not use a .025 inch to .060 inch oversize semi-finished piston to make a finished piston below .025 inch oversize because the finished ring grooves will be too shallow, causing ring failure.

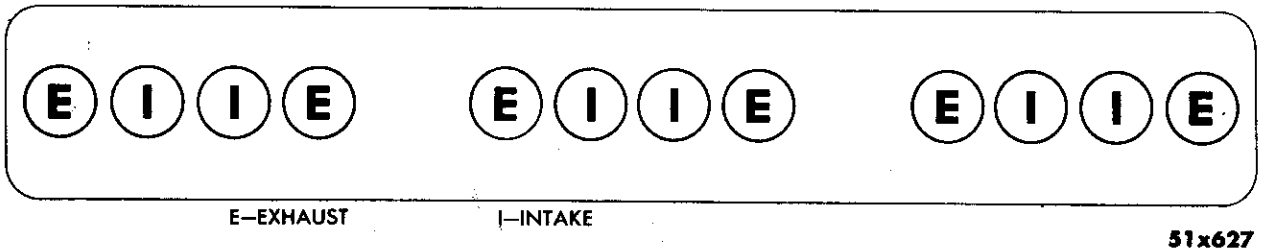


Fig. 39—Valve Arrangement (B-4-J, B-4-K, B-4-JM and B-4-KMA)

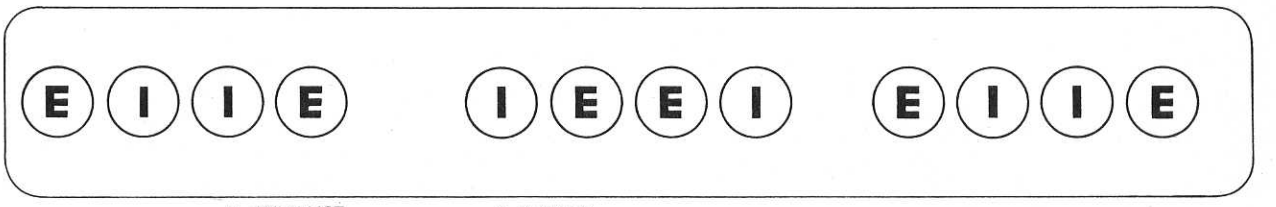


Fig. 40—Valve Arrangement (B-4-R, B-4-T, B-4-V and B-4-Y)

All finished pistons, available through the Mopar Motor Parts Corporation, are cam ground (elliptical in shape) in the various oversize measurements. A semi-finished piston should be finished elliptical in shape and tapered to correct measurements with cam grinding equipment. *These pistons must not be finished to a circular shape.*

32. VALVE ARRANGEMENT (B-4-J, B-4-K, B-4-JM, B-4-KMA, B-4-R, B-4-T, B-4-V AND B-4-Y)

Figures 39 and 40 show the location of the valves in the engines of the truck models listed above. The serviceman must know the arrangement of the four center valves before making adjustments or replacements.

33. SODIUM-FILLED EXHAUST VALVES (B-4-J, B-4-JM, B-4-KMA, B-4-R, B-4-T, B-4-V AND B-4-Y)

The sodium-filled exhaust valves used on the above truck models, have great resistance to burning, pitting and warping. Exhaust valve tappet clearance is .018 inch and should never be set less than this limit. Intake valve clearance is .010 inch. Adjust valves only after the engine has reached its normal operating temperature.

NOTE

Follow these precautions when replacing sodium-filled exhaust valves:

(1) Never cut open an old valve and be extremely careful when removing a broken valve from an engine. Otherwise, the metallic sodium in the valve may contact and burn the skin.

(2) Bury discarded sodium-filled valves in some inaccessible place to prevent other persons from handling them. This is an important safety measure!

34. SERVICING VALVES AND MECHANISM

a. Except C.O.E. Models

The valves, guides and springs can be replaced or reconditioned with the engine in the truck and are accessible by removing the cylinder head and valve chamber tappet covers. Whenever the cylinder head has been removed, it is advisable to check the condition of the valves, and to make necessary repairs.

To remove valve assembly, turn the engine until a valve is all the way down. Then, raise the valve spring with the valve spring lifter (Fig. 41) and remove the valve locks. Remove the compressor and take out the valve, valve spring and retainer. Remove the other valves in the same manner. Place the valves in position, so that they can be identified for installation in the same ports from which they were removed.

b. C.O.E. Models

In order to remove or grind valves on C.O.E. models, it is necessary to remove the following parts: floor boards, radiator shell, core and sup-

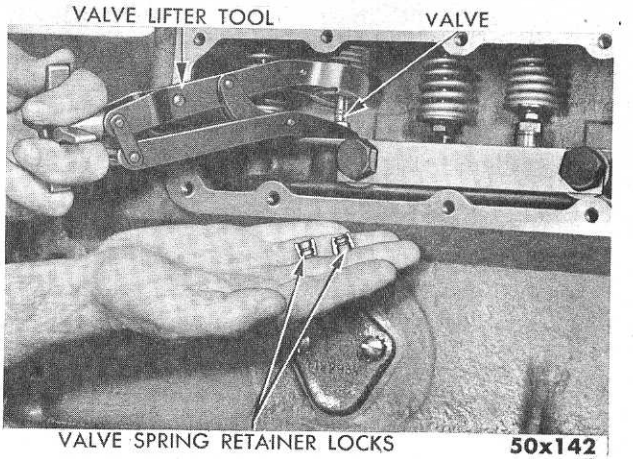


Fig. 41—Compressing Valve Springs with Tool C-482

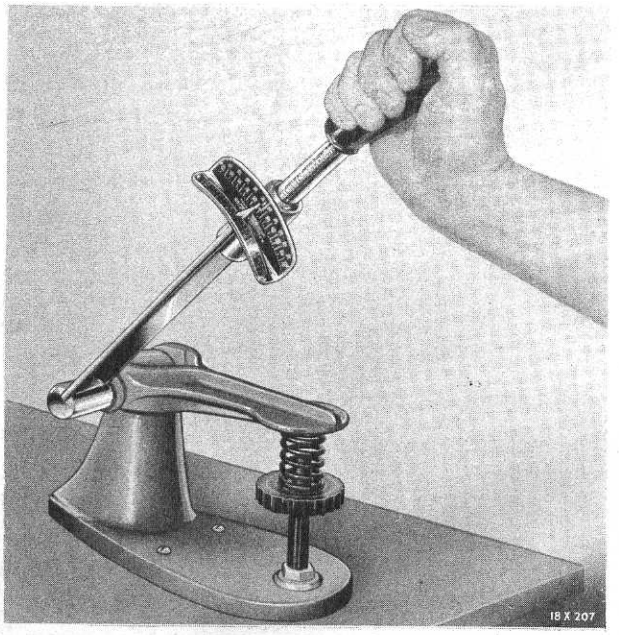


Fig. 42—Testing Valve Springs

port assembly, fender and body tie bar, fender inspection shields, air cleaner and air cleaner tube. Then, proceed as follows:

(1) Drain water from cylinder block.

(2) Remove cylinder head and gasket.

(3) Remove right front wheel and lower wheel housing panel.

(4) Remove valve cover plates. Be careful when removing valve locks in order to make sure that they do not fall into the oil pan through the oil drain holes in cylinder block around the valve tappets.

(5) Remove valve locks after compressing the valve springs with the valve spring lifter. Then, lift out valves.

The valve locks can easily be installed with a valve lock installing tool after compressing the springs.

c. Cleaning and Inspection of Valves

Check valves for cracking, warping or excessive burning and replace if such conditions exist. Valves with scored stems should be replaced.

Measure the valve stem with a micrometer in several places. Refer to the Service Standards for diameters of intake and exhaust valves, all models.

IMPORTANT

The exhaust valve stems (B-4-J, B-4-K, B-4-JM, B-4-KMA, B-4-R, B-4-T, B-4-V and B-4-Y models) are filled with metallic sodium which is inflammable when exposed to the moisture in the air. Do not allow the sodium to contact the skin, otherwise a bad burn may result.

35. TESTING VALVE SPRINGS

Whenever valves are removed for inspection, reconditioning, or replacement, test the valve springs. To check, place the valve spring on the seat of Tool C-647 (Fig. 42). Attach a torque wrench and check the tension. Valve spring tension is as follows: 107 to 115 foot-pounds when compressed to 1⅜ inches (except B-4-R, B-4-T, B-4-V), or 103 to 133 foot-pounds when compressed to 1⅝ inches (B-4-R, B-4-T, B-4-V), or 120 to 130 foot-pounds when compressed to 1 19/32 inches (B-4-Y), with valves open. For spring tension specifications with valves closed, refer to the Service Standards. Discard a spring that does not meet minimum requirements.

36. REPLACEMENT OF VALVE GUIDES (EXCEPT WITH HYDRAULIC TAPPETS)

If inspection indicates that the clearance between the valve stems and the valve guides is excessive, or if the underside of any intake valve head is oily (especially if oil is in intake valve port), replace the guides.

To determine the amount of clearance between the valve stem and guide, place the valve

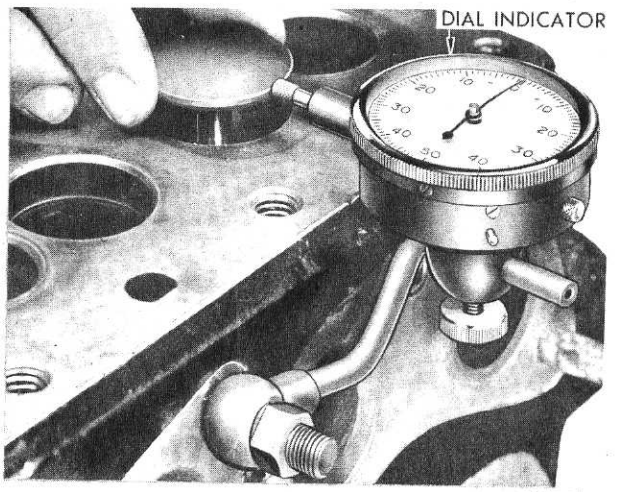


Fig. 43—Measuring Valve Stem to Guide Clearance

in the guide, after cleaning the stem and guide to remove carbon deposits. Attach a dial indicator to a convenient stud on the cylinder block and adjust the plunger of the indicator against the edge of the valve head (Fig. 43).

Hold the valve so that it will not turn. Then, move it to and from the indicator. The clearance between the stem and guide will be ½ the amount shown on the indicator. The amount of wear in the guide will be the clearance above standard—intake valves: .001 to .003 inch, except B-4-R, B-4-T, B-4-V and B-4-Y; and .002 to .0045 inch for B-4-R, B-4-T, B-4-V and B-4-Y.

Valve guides which have more than the allowable clearance must be replaced in order to stop excessive oil consumption.

To replace, drive the worn intake and exhaust valve guides down into the tappet chamber, using Tool DD-915 for exhaust valve guides, and Tool DD-883 for intake valve guides (Fig. 44), after removing the tappet assemblies.

To install, insert the exhaust valve guide in position at the top side of the block and drive into place. The exhaust valve guide should be installed in block to depth specified in Service Standards. Install intake valve guide in the same manner. It should also be installed in block to depth specified in Service Standards.

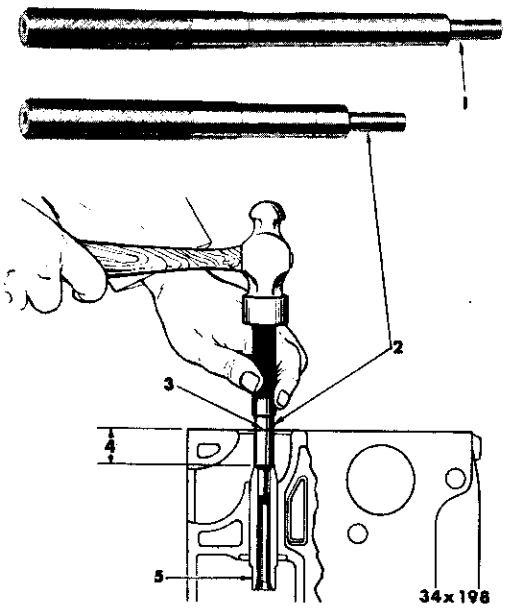


Fig. 44—Removing Or Installing Valve Guides

1 — Exhaust valve stem guide removing and installing tool
2 — Intake valve stem guide removing and installing tool
3 — Gauge mark
4 — See Service Standards for dimensions
5 — Valve stem guide

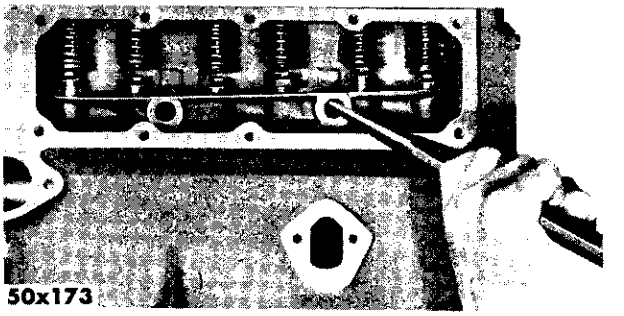


Fig. 45—Removing Tappet Guide and Tappets

NOTE

Install the intake valve guide with the counterbore DOWN. This is important!

Bronze valve guides should be used for replacement in engines equipped with sodium-filled valves and each should be installed with the tapered end toward the bottom.

After installing the new guides, ream the intake guides with Tool C-743 from .437 to .438 inch.

37. REPLACEMENT OF VALVE TAPPETS (EXCEPT HYDRAULIC TAPPETS)

If the valve tappet guides are excessively worn, the tappets should be removed, guides reamed and oversize tappets installed. Tappets are available in standard and the following oversizes: .001, .008 and .030 inch.

When removing tappets (except B-4-R, B-4-T, B-4-V), raise the tappets out of the way of the camshaft lobes (Fig. 46) when pulling camshaft. Be sure to rotate the camshaft when removing in order to clear the tappets.

To remove valve tappets on the B-4-R, B-4-T and B-4-V models, proceed as follows:

(1) Remove the right front wheel and inspection shield.

(2) Remove the carburetor.

(3) Remove the valve tappet cover plates.

(4) Turn the engine until the tappets (in one of the banks) are loose and remove tappet and guide assembly (Fig. 45). Repeat this

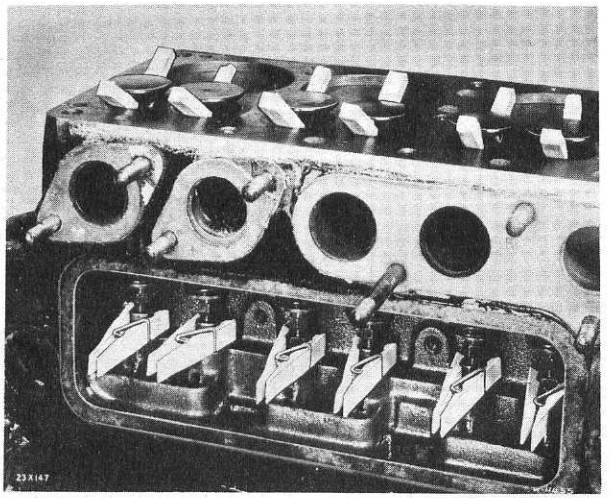


Fig. 46—Holding Up Valves and Tappets for Removal of Camshaft

operation and remove the other valve tappet guide assembly. To do this, insert a suitable bar into one of the attaching bolt holes of the tappet guide assembly and pry down and out to release the tappets from valve stems (Fig. 45). Repeat this operation and remove the other valve tappet guide assembly.

Check the mushroom faces of the tappets for pits or scratches and replace as required. Inspect the cam lobes for signs of roughness and chipping. Also, make sure that the tappets rotate when installed.

To check tappet clearance (except B-4-R, B-4-T, B-4-V models), clean and dry the tappets and

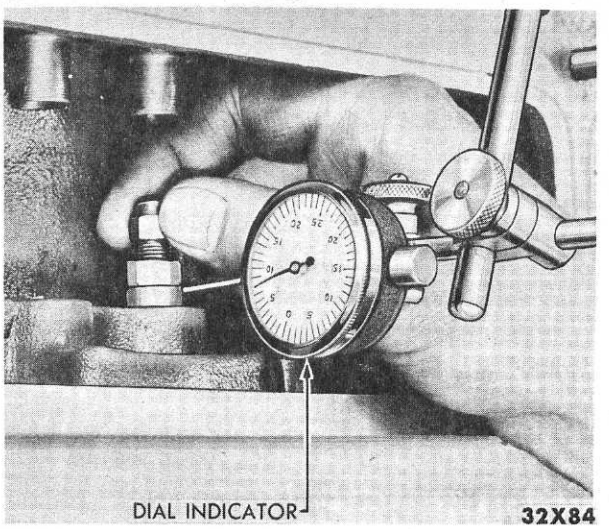


Fig. 47—Measuring Tappet Clearance in Block

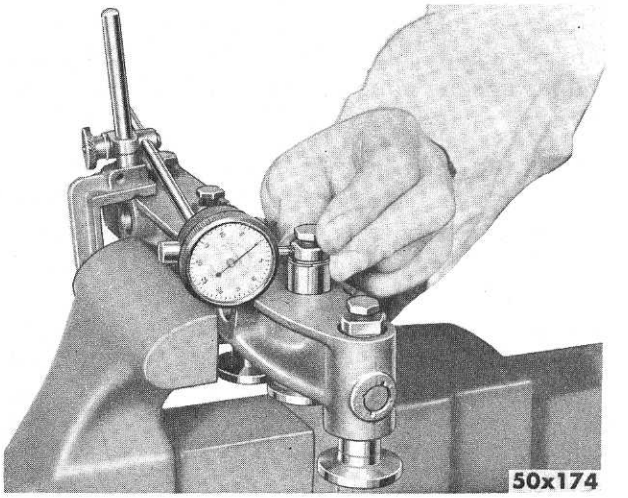


Fig. 48—Measuring Tappet Clearance in Guide

guides, and insert tappet in its guide. Attach a dial indicator to a manifold stud, raise tappet slightly above the lower end of its normal travel and place the dial plunger against the upper end of tappet, as shown in Figure 47. Move the tappet "in" and "out" against the plunger (crosswise of engine). If the clearance is greater than the clearance specified in Service Standards, ream tappet guide and install new oversize tappets.

To check tappet clearance (B-4-R, B-4-T, B-4-V models), first clean and dry the tappets and guides. Insert the tappet in the guide and place in a vise. Attach a dial indicator to a guide. Then, raise the tappet slightly above the lower

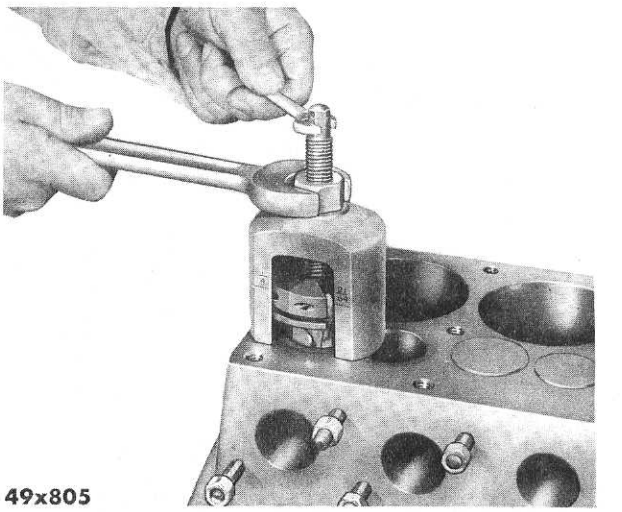


Fig. 49—Removing Exhaust and Intake Valve Seat Inserts

end of its normal travel. Place the dial plunger against the upper end of the tappet (Fig. 48). Move the tappet in and out against the plunger (crosswise of engine). If the clearance is greater than the clearance specified in Service Standards, replace the tappet and the guide.

38. REMOVAL AND INSTALLATION OF VALVE SEAT INSERTS

NOTE

Hardened exhaust valve seat inserts are used in the engines of all B-4 Series models except B-4-R, B-4-T, B-4-V and B-4-Y. Hardened intake and exhaust valve seat inserts are used in the engines of B-4-R, B-4-T, B-4-V and B-4-Y models.

Hardened intake and exhaust valve seat inserts are shrunk into the cylinder block. To avoid damaging the block, remove the inserts with a suitable tool. Also, unless the inserts are installed carefully and according to approved methods, the results of operation will be unsatisfactory.

When reconditioning valves, the inserts in the cylinder block should be inspected. If they are in unsatisfactory condition, remove, replace and grind for proper valve seating, as described below:

a. Removing Valve Seat Inserts

The valve seat inserts may be removed with Tool C-372 (Fig. 49).

To remove, force the jaws of Tool C-732 beneath the insert (about 1/8 inch). Then, tighten the main puller nut. Best results will be obtained by tightening main puller nut slightly, while forcing the jaws under the insert. Continue to turn the puller nut until the valve seat insert has been pulled out of the block.

b. Installing Valve Seat Inserts

Be particularly careful when replacing valve seat inserts. The inserts are installed in the block with a .002 to .004 inch press fit and must be started into place, true with the counterbore in the block. The following procedure is recommended:

(1) Place the inserts to be installed in a container of dry ice for about 10 minutes.

(2) Make certain that the cylinder block surface is clean, especially the counterbore, for the inserts.

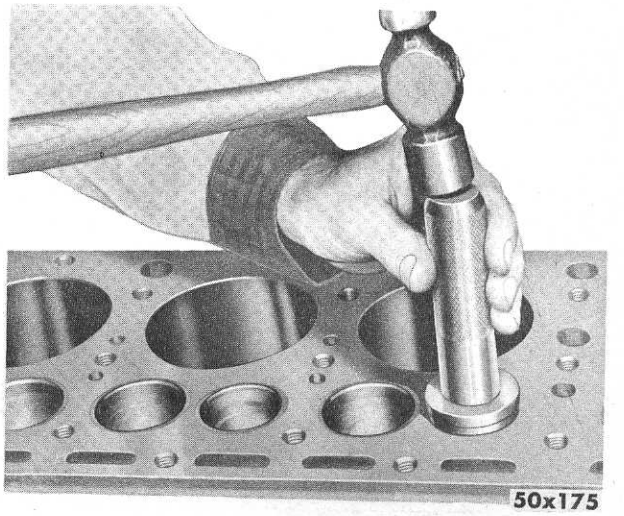


Fig. 50—Installing Valve Seat Insert

(3) Place a chilled insert in the counterbore —*valve side up.*

(4) Using Tool from Kit C-768 (Fig. 50), drive the insert down tightly into the counterbore.

NOTE

This operation must be done quickly while the insert is cold.

(5) Check the valve seat for concentricity with valve guide (Fig. 51) and if necessary, recondition the seat as outlined below:

If a standard seat is too loose, a .010 inch oversize insert is available. In which case, the cylinder block will need to be cut to fit the oversize insert.

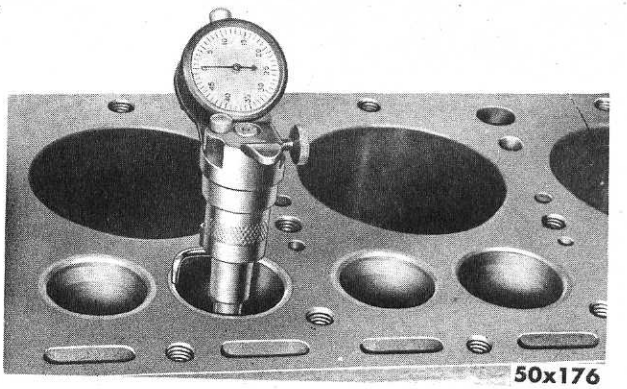


Fig. 51—Checking Valve Seat for Concentricity

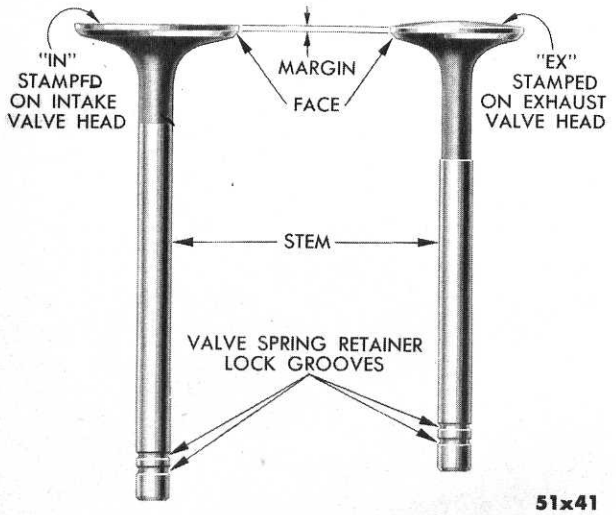


Fig. 52—Intake and Exhaust Valve Nomenclature

Cut the counterbore .0035 inch smaller than the insert that is to be installed. Run the cutter down until it bottoms in the original counterbore.

Be sure to clean the cuttings from the counterbore and the valve port. Then, install the seat insert as described previously.

39. REFACING VALVES AND SEATS

To insure a positive sealing of the valve to the seat, the grinding wheel of the valve refacer, and the stones of the seat grinder should be carefully refaced. In each case, the set up should be such that the finished angle of both the valve and the seat are identical.

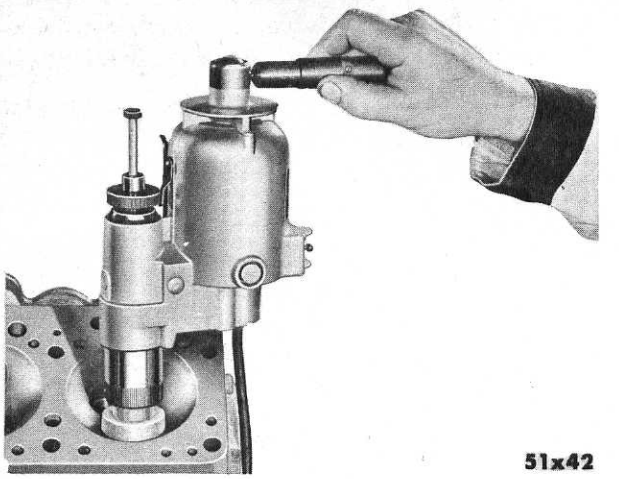


Fig. 53—Grinding Valve Seats with Tool MTH-JB-41

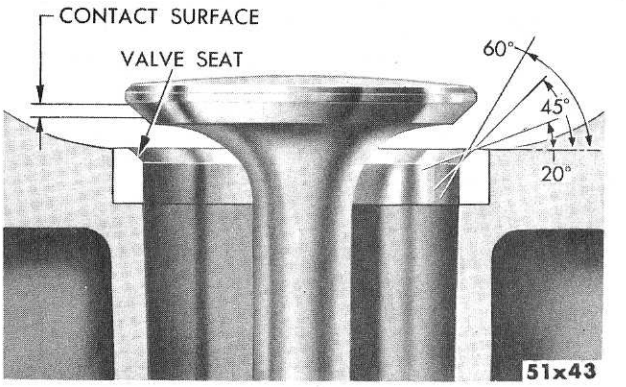


Fig. 54—Valve Seat Reconditioning Angles

When refacing the valves with Tool MTH-80, remove only a small amount of metal at a time to insure a smooth, accurate surface on the valve face. After the valves have been refaced, check the valve head margin of each valve (Fig. 52). The margin must be at least $\frac{3}{64}$ inch. Otherwise, the valve should be discarded.

When refacing the valve seats, it is essential that the correct size valve guide pilot be used for the reseating stones.

Grind the seats with Tool MTH-JB-41, as shown in Figure 53. A true and complete surface must be obtained. Check the concentricity of the seat, using dial indicator No. 9320. The total runout should not exceed .002 inch (total indicator reading). Check the valve seat with Prussian Blue to determine where the valve contacts the seat. It is important that this contact be centralized on the valve face. If this contact surface is not properly centralized, the

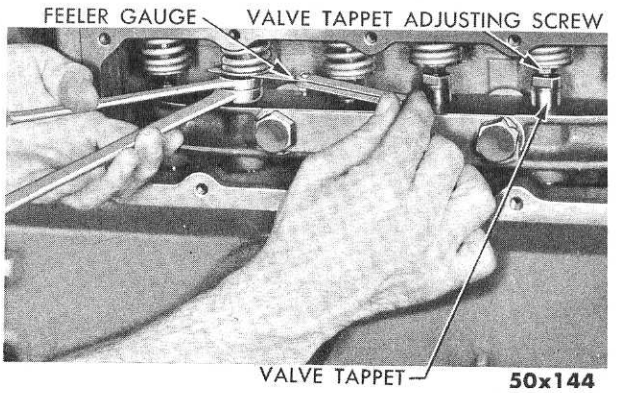


Fig. 55—Adjusting Valve Tappets

seat should be relocated by using a 20 degree stone at the top, or a 60 degree stone at the bottom, whichever is necessary. Refer to Figure 54. When the seat is properly positioned, the width of intake seats should be a liberal $\frac{1}{16}$ inch, but not more than $\frac{3}{32}$ inch in any case.

The width of the exhaust seats should be $\frac{3}{64}$ inch to a liberal $\frac{1}{16}$ inch.

40. ADJUSTING VALVE TAPPETS (EXCEPT HYDRAULIC TYPE)

The tappets should be adjusted (Fig. 55) with the engine running at normal operating temperature. The valve tappet screws are the self-locking type (without lock nuts). Adjust the intake valve tappets to .010 inch clearance and the exhaust valve tappets to .014 inch clearance, except B-4-J, B-4-K, B-4-JM, B-4-KMA, B-4-R, B-4-T, B-4-V. On B-4-J, B-4-K, B-4-JM, B-4-KMA, B-4-R, B-4-T and B-4-V models, adjust intake valve tappets to .010 inch clearance and the exhaust valve tappets to .018 inch clearance. Hydraulic valve tappets on B-4-Y models do not require adjustment.

It is important that the clearance be maintained to insure satisfactory engine operation. If the engine is to be operated at continuous high speeds, an additional .002 inch clearance for exhaust tappets is desirable.

41. CHECKING VALVE TIMING (CYLINDER HEAD INSTALLED) (EXCEPT B-4-Y MODELS WITH HYDRAULIC TAPPETS)

To check valve timing, first adjust Number 6 intake valve tappet to .014 inch with engine cold.

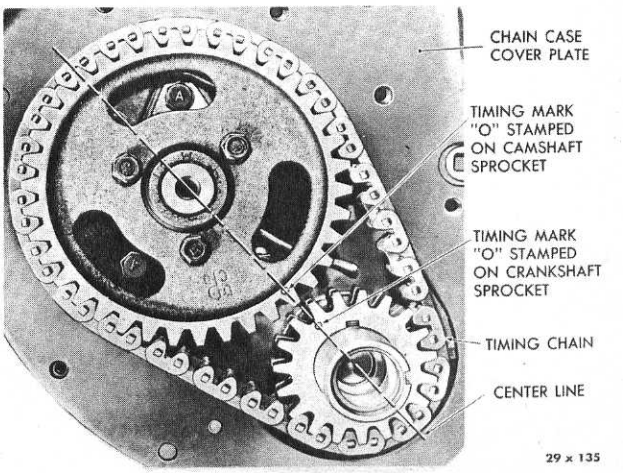


Fig. 56—Marks on Timing Sprockets (Except B-4-R, B-4-T, B-4-V and B-4-Y)

Locate top dead center position of the Number 6 piston.

Rotate the crankshaft until the rear intake valve tappet just makes contact with the valve stem. At this point, the piston should be within specified range, as specified in Service Standards. Position of piston and crankshaft can be taken from the fan drive pulley and pointer. If timing indicator is available, it may be used in hole over Number 6 piston. On C.O.E. models, it is necessary to remove the center floor board to install the timing indicator.

If the timing chain or sprockets have been removed, they should be assembled so that the marks line up, as shown in Figure 56.

The firing order on all models is 1-5-3-6-2-4.

HYDRAULIC VALVE TAPPETS (B-4-Y MODELS)

42. OPERATION OF HYDRAULIC VALVE TAPPETS (FIGS. 57 AND 59)

The hydraulic valve tappet (Fig. 59) is a simple, positive-acting device which, through the medium of oil from the engine lubricating system, automatically adjusts its own length during each revolution of the camshaft to compensate for expansion or contraction in the valve train (cam, tappets and valve stems).

In operation, the plunger (6, Fig. 57) is held constantly against the valve stem tip by the plunger return spring (5). The oil in the small chamber below the plunger in the cylinder (7) is replenished as necessary with the oil from the reservoir in the lower portion of the tappet body (9).

The oil from the engine lubricating system enters the tappet at the inlet passage (2), and goes up through the inlet tube (1), past the ball check valve (3) and through the oil passage (4) into the small chamber below the plunger.

When the ball check valve is closed, the non-compressible oil in the small chamber lifts the valve stem when the hydraulic tappet assembly

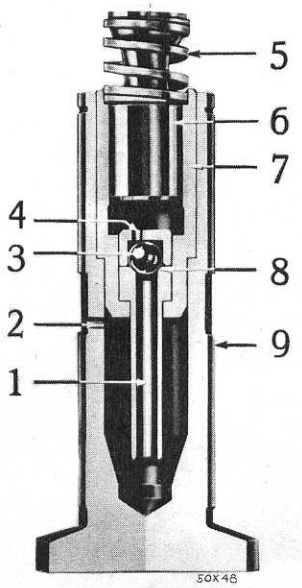


Fig. 57—Hydraulic Valve Tappet (Cross Sectional View) (B-4-Y, B-4-YA, B-4-YX)

1 — Oil inlet tube
2 — Oil inlet passage
3 — Ball check valve
4 — Oil passage
5 — Plunger return spring
6 — Plunger assembly
7 — Cylinder
8 — Valve seat
9 — Tappet body

moves. *Accurate clearance is provided between the plunger (6) and the cylinder wall (7),* which permits the escape (or "leak-down") of a small amount of oil from the small chamber.

The oil lost above the ball check valve (3) that occurs because of leakage ("leak-down") between the plunger (6) and the cylinder wall

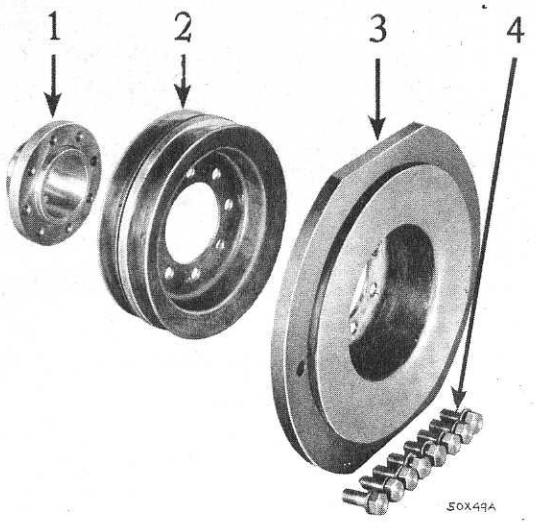


Fig. 58—Crankshaft Vibration Damper Assembly

1 — Vibration damper hub
2 — Lower fan drive pulley assembly
3 — Inertia member
4 — Inertia flange screws

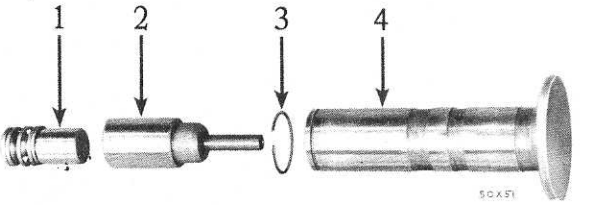


Fig. 59—Hydraulic Valve Tappet (Disassembled View)

1 — Plunger and spring
2 — Cylinder assembly
3 — Retaining ring
4 — Tappet body

(7) while the tappet is lifting the valve, is always replenished from the reservoir in the lower portion of the tappet body (9), when the valve seats. Thus, the tappet length is corrected to maintain zero clearance each time the valve closes.

43. CRANKSHAFT VIBRATION DAMPER

A crankshaft vibration damper (Fig. 58) is provided to insure smooth engine operation and protect the valve train from the effects of torsional vibration at high engine speeds.

The vibration damper parts are balanced as an assembly. The flange screw holes are staggered to insure correct assembly of the parts.

44. CAMSHAFT FOR HYDRAULIC VALVE TAPPETS

Different cam contours are required with hy-

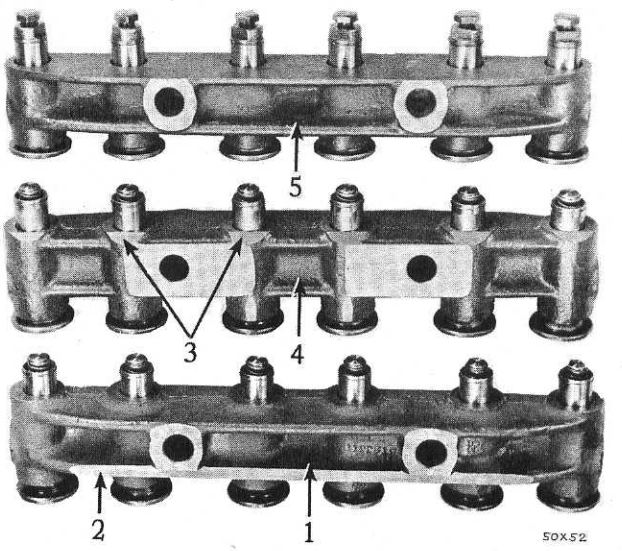


Fig. 60—Valve Tappet Guide Assemblies

1 — Hydraulic tappets and guide—outer view
2 — Clearance chamfers
3 — Clearance chamfers
4 — Hydraulic tappets and guide—inner view
5 — Standard tappets and guide

draulic valve tappets. Therefore, be sure to install the correct camshaft if replacement is necessary. The camshafts for use with the adjustable and hydraulic valve tappets are identical in appearance. The camshaft for use with hydraulic valve tappets is marked with a "Yellow" stripe which is on either side of the oil pump and ignition distributor drive gear.

45. REMOVAL OF HYDRAULIC VALVE TAPPET AND GUIDE ASSEMBLIES (FIG. 60)

To remove either of the hydraulic valve tappet and guide assemblies from the engine, proceed as follows:

(1) Remove valve cover plates.

(2) Turn crankshaft until all tappets in the tappet guide concerned are in the lowest position.

(3) Bend locking plate tabs away from valve tappet guide attaching bolts and remove bolts.

(4) Make certain that the small wire retaining rings are in place on each tappet to prevent tappets from dropping out of the guide.

(5) Insert a suitable bar into one of the attaching bolt holes of the tappet guide assembly and pry down and out to release the tappets from the valve stems.

(6) After the tappets are free from the valve stems, carefully work the tappet guide assembly out of the engine.

CAUTION

Do not spill the plungers, or cylinders from tappets by holding guide assembly inverted.

46. DISASSEMBLY AND ASSEMBLY OF HYDRAULIC VALVE TAPPET AND GUIDE ASSEMBLIES

Absolute cleanliness is essential in handling any part of the hydraulic valve tappet assembly (Fig. 60). The tappet consists of the following parts:

(a) Tappet body

(b) Cylinder

(c) Plunger

The plunger is a select fit in a particular cylinder and *must never* be used in any other cylinder since the "leak-down" rate (metering of oil through the tappet) is controlled by the clearance between these parts.

To properly handle hydraulic valve tappets and guides, construct a rack with holes in it large enough to hold the various parts. Then, place the parts in the rack, as they are removed, so that each valve tappet can be reassembled exactly as it was originally installed.

(1) *On a CLEAN bench,* remove the retaining rings (3, Fig. 59) from the tappets, and remove the tappets complete from the guides. Insert each tappet in a suitable rack so it may be reinstalled in its original position.

(2) Taking each tappet in turn, remove the cylinder (2, Fig. 59) by drawing it out of the tappet body.

(3) Remove the plunger (1, Fig. 59) by pulling outward and twisting in a clockwise direction. This will detach the spring from the recess in the cylinder body.

(4) Thoroughly wash the parts in CLEAN solvent and dry with compressed air.

(5) Examine parts for wear at the following points:

(a) Tappet face

(b) Tappet body

(c) Plunger

(d) Cylinder

If any of these parts show evidence of looseness, damage or wear, *the complete tappet assembly should be replaced.*

(6) To test the ball check valve, suck on the oil inlet tube (1, Fig. 57) and seat the ball. If no leakage exists, the vacuum created will keep the tube attached to the tongue. If vacuum in tube disappears, the complete *tappet assembly* must be renewed as the ball check valve is leaking.

(7) With plunger and cylinder clean and dry, place the plunger into the cylinder and squeeze them together between thumb and forefinger. The plunger should be springy and riding on a cushion of trapped air. If leakage is evident, clearance is too great and the complete *tappet assembly* should be renewed. Make certain the ball check valve is seated, while making this test.

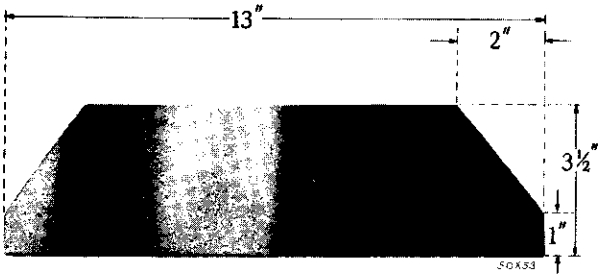


Fig. 61—Valve Tappet Guide Installing Plate

(8) Reassemble each tappet assembly. Insert the plunger into the cylinder (dry), and turn clockwise, while pushing in until the spring seats in counterbored recess in the cylinder. At the same time, release trapped air by inserting a tooth pick or wood match into the oil inlet tube to unseat the ball check valve.

(9) Insert the plunger and the cylinder assembly into the tappet body.

(10) Install tappet assemblies into the proper location in the tappet guide, and install the retaining rings (Fig. 62).

(11) Service each individual tappet assembly in accordance with Steps (1) through (10), and keep the tappet guide assemblies dry before installation in the engine.

CAUTION

If the assemblies are to be stored for any length of time, oil them lightly to prevent rusting of polished parts.

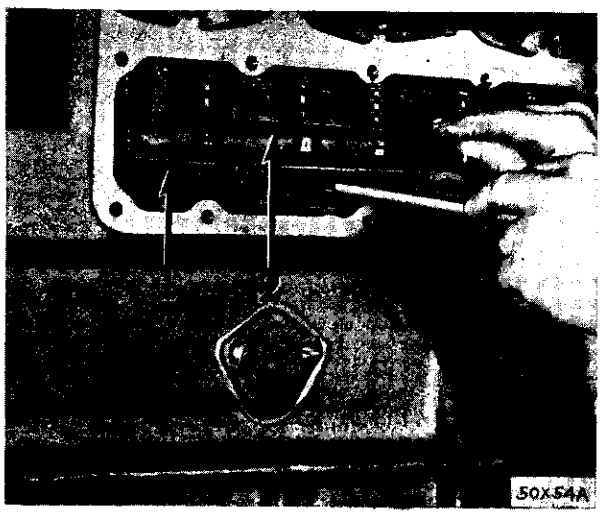


Fig. 62—Installation of Vave Tappet Guide Assembly

1 — Valve tappet guide assembly
2 — Installing plate

The tappet guides have been designed for the hydraulic tappets. Therefore, it is important that the correct part be installed whenever a replacement is necessary. The standard guide for the adjustable tappet *is not interchangeable* because of dimensional and chamfer variations.

47. INSTALLATION OF TAPPET GUIDE ASSEMBLIES

(1) Make certain the camshaft cams are positioned so that all tappets for a particular assembly will be in the lowest possible position. This will facilitate the installation of the tappet guide assemblies.

(2) Make an installing plate, as illustrated in Figure 61, from smooth sheet metal to facilitate the installation of the tappet guide assembly.

(3) Place the tappet guide assembly in the engine and position the installing plate on top of tappets and under the valve stems.

(4) Push the tappet guide assembly into place and align the guide assembly and cylinder block bolt holes. Remove the installing plate.

(5) Install bolts and lock in position by bending up the corners of the locking plate.

If the servicing procedure has been carefully followed, and strict cleanliness of parts has been maintained, all tappets should function without noticeable plunger spring action a few minutes after the oil pressure reaches them.

(6) Start engine and make sure that oil is reaching all tappets and that each tappet is functioning properly.

(7) Install the valve cover plates, using new gaskets, and make certain that there are no oil leaks.

48. INSTALLATION OF CAMSHAFT GEAR

(1) Turn the crankshaft until the timing mark on the crankshaft gear is in line with the camshaft.

(2) Turn the camshaft until the key for the timing gear hub is at the top and slightly before the center line.

(3) Install the timing gear assembly on the camshaft, making certain that the timing marks on the cam and crankshaft gears match.

The timing gear assembly may be installed on the camshaft with Installing Tool DD-1064. It is also possible to tap the timing gear on the camshaft with a composition hammer, if the installing tool is not available. However, this latter practice is not recommended as it may result in damage to the camshaft, or some of the tappets, if the gear hub is a tight fit on the shaft.

(4) When the timing gear assembly is installed on the camshaft, *remove the temporary alignment screws from the camshaft gear.*

If it is necessary to remove and replace the camshaft timing gear assembly and suitable removing and installing tools are not available, it is recommended that the camshaft be removed, as outlined on Page 138, of the Dodge Truck Shop Manual, D-12146.

(5) The camshaft gear assembly can be removed from the camshaft in the same manner as the standard gear. This operation can be facilitated with the use of camshaft gear removing Tool DD-1063, or a suitable puller. Temporary alignment cap screws should be installed before the gear assembly is removed from the camshaft.

(6) Servicing of the crankshaft gear can be facilitated by the use of crankshaft gear removing and installing Tool DD-888 since the gear is generally a very tight fit on the shaft.

(7) Install all attaching parts and assemble on the engine.

49. CHECKING VALVE TIMING (B-4-Y MODELS WITH HYDRAULIC TAPPETS)

For engines with hydraulic tappets, the standard valve timing check procedure is not applicable. Therefore, the following procedure should be followed:

With all spark plugs removed, turn the crankshaft until Number 6 intake valve is closed. Lift Number 6 intake valve with a valve spring lifter and insert a ⅛ inch spacer (or stack of shims) between the tappet and the tip of the valve stem. Then, release the valve and spring. This will cause the oil to be forced out of the hydraulic unit due to the valve spring pressure, giving, in effect, a solid tappet. Using a special adaptor, install a timing indicator in Number 6 spark plug hole so that it contacts the intake valve head. Wait for the tappet to leak down completely (until the indicator holds its reading) before continuing the check. Also, place a standard timing indicator, Tool C-435, in the special hole over Number 6 piston and adjust it to indicate piston height.

Turn the crankshaft slowly in the normal direction of rotation until the dial indicator over the intake valve registers .077 inch valve lift. At this point, the Number 6 piston should be in the position specified in Service Standards.

NOTE

If the timing marks on the crankshaft pulley are calibrated accurately with Number 6 piston, the piston height indicator is not necessary and the allowable variation becomes plus or minus 5 degrees from the position specified in Service Standards.

CAUTION

After the timing check is completed, the crankshaft must be turned backward until the valve is again in its lowest position, or damage will result. See Note below.

NOTE

With the spacer in place, the valve and indicator will be damaged if the valve is lifted much farther. Remove the ⅛ inch spacer from between the tappet and valve stem.

50. VALVE MAINTENANCE

If, with proper clearance, the valve tappets are noisy, check for the following conditions:

(1) Tappets loose in their guides.

(2) Tappets not properly rotating, causing uneven wear on tappet faces.

(3) Weak valve springs.

(4) Valve sticking in valve guide.

(5) Valve loose in valve guide.

(6) Valve springs cocked or not seating properly.

(7) Warped valve.

(8) Valve seat and guide not in alignment.

51. RECONDITIONING VALVE SEAT INSERTS

Because of the hardness of the special inserts used in the exhaust valve seats, it is impossible to recut them. They must be reground with a suitable valve seat grinder, or Tool MH-JB-41.

When reconditioning valve seat inserts, make certain that:

(1) Valve guides are clean.

(2) The valve guide pilot fits snugly in the valve guide and is tightened securely in place.

(3) The grinding stone is trued for concentricity on a diamond dressing tool.

(4) The finished seats do not exceed .002 inch runout, when checked with an indicator.

(5) Valve grinding compound is not used on valve seat inserts.

52. REPLACING VALVE SEAT INSERTS

After removing valves, proceed as follows:

(1) Remove valve seat inserts.

(2) Remove burrs and rough edges.

(3) Install new valve seat inserts after chilling in dry ice.

(4) Regrind valve seat.

NOTE

Valve seats are fitted very tightly and can be installed by first chilling with dry ice to obtain maximum contraction, permitting the valve seat to be readily installed. If a standard seat insert is too loose, a .010 inch oversize can be used. In which case, the cylinder block will have to be cut to fit the oversize valve seat insert. Tool Kit MH-N-1 can be obtained for this purpose.

Valve seat inserts of .010 inch oversize are available for service replacements.

ENGINE OILING SYSTEM

53. REMOVAL AND INSTALLATION OF OIL PUMP (EXCEPT B-4-R, B-4-T, B-4-V AND B-4-Y)

The oil pump (Fig. 63) is simple in construction and easy to service. The rotors are designed for long life and quiet operation. To remove and install the oil pump, proceed as follows:

(1) Lift off distributor cap and rotate the

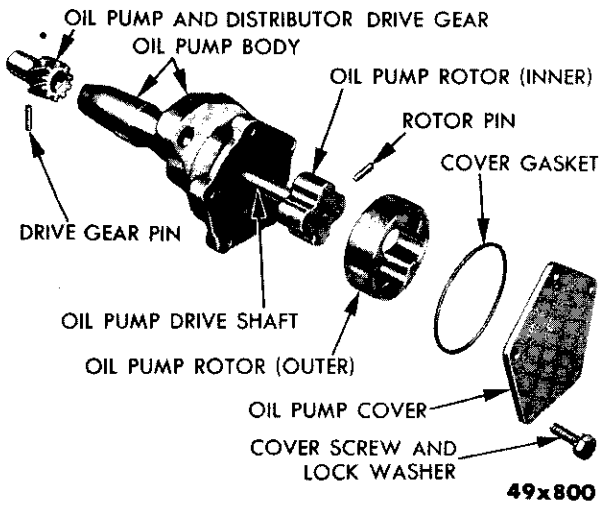


Fig. 63—Rotary Oil Pump (Disassembled View) (Except B-4-R, B-4-T, B-4-V and B-4-Y)

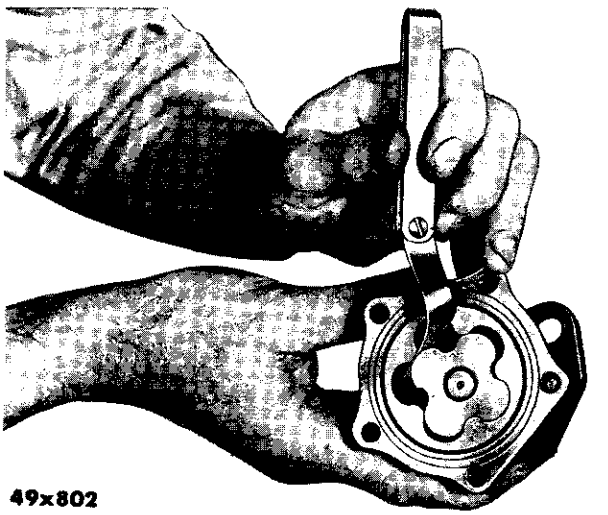


Fig. 64—Measuring Clearance Between Inner and Outer Rotors

crankshaft until the distributor rotor is in firing position for Number 1 cylinder. Keep the engine in this position while the pump is removed.

(2) Remove the cap screws from the pump body.

Use a new gasket when installing the pump. If the engine crankshaft was moved while the pump was off, rotate the engine until Number 1 cylinder is in firing position. Then, set the distributor rotor in the Number 1 firing position and install the oil pump. Be sure the distributor rotor remains in the correct position. Use a timing light and reset the ignition timing.

54. DISASSEMBLY AND INSPECTION OF OIL PUMP (EXCEPT B-4-R, B-4-T, B-4-V AND B-4-Y)

(1) Remove cover and cover gasket.

(2) Hold hand over cover opening and, with pump upside down, turn drive shaft until the outer rotor slips out.

(3) Drive out the straight pin which holds the pump drive gear to shaft.

(4) Press the shaft out of the gear and slide the shaft and inner rotor assembly out of the pump body.

(5) Wash all parts in dry cleaning solvent and dry with compressed air.

(6) Match rotors together similar to way they would be in the pump, with one lobe of the inner rotor pushed as far as possible into one of the corresponding notches in outer rotor (Fig. 65). Then, measure the clearance between opposite lobe of inner rotor and outer rotor (Fig. 64). It should be .010 inch or less. If the clearance is more than this dimension, replace both rotors.

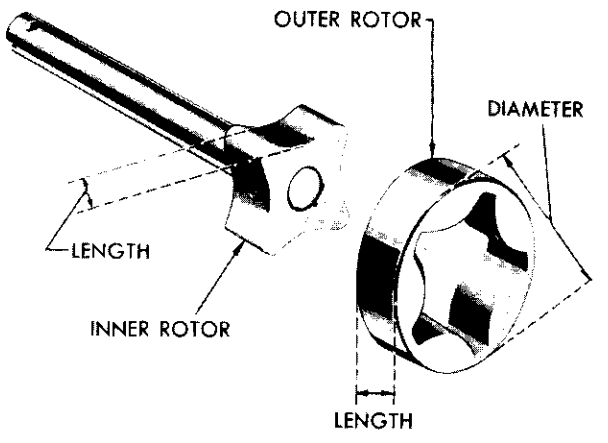


Fig. 65—Rotor Nomenclature
(Old Type. New Type Is Similar to that Shown Above)

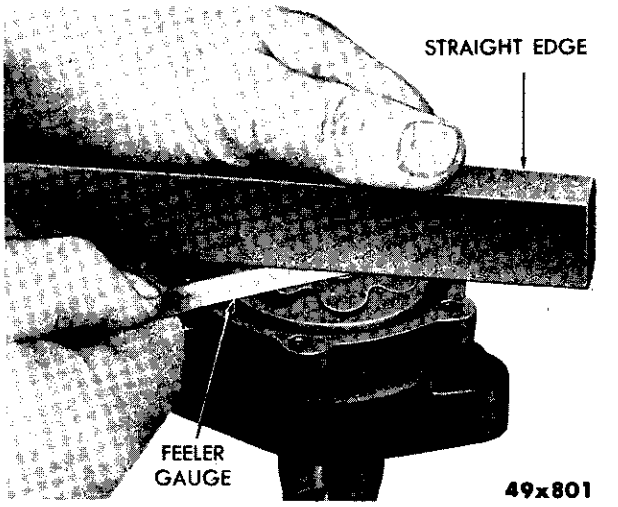


Fig. 66—Measuring Clearance Over Rotors

(7) Measure thickness and diameter of the outer rotor with a micrometer. If the thickness is .748 inch or more, and if diameter is 2.244 inches or more, the rotor is satisfactory. However, if the rotor measures less than these dimensions, replace the rotor.

(8) Measure thickness of the inner rotor with a micrometer. If thickness is .748 inch or more, rotor is satisfactory. However, if thickness is less than this dimension, remove rotor from shaft, discard it and assemble new rotor to shaft.

(9) Slide rotors into pump body.

(10) Place a straightedge across the pump body between the screw holes. With a feeler, measure the clearance between the top of rotors and the straightedge (Fig. 66). Clearance should be .004 inch or less. If clearance is more, discard pump body and use a new one.

(11) Press the outer rotor to one side against the pump body and measure the clearance between the rotor and body at the

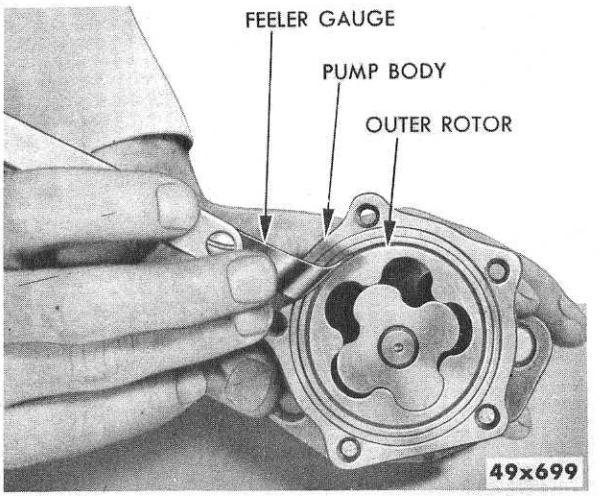


Fig. 67—Measuring Clearance Between Outer Rotor and Body

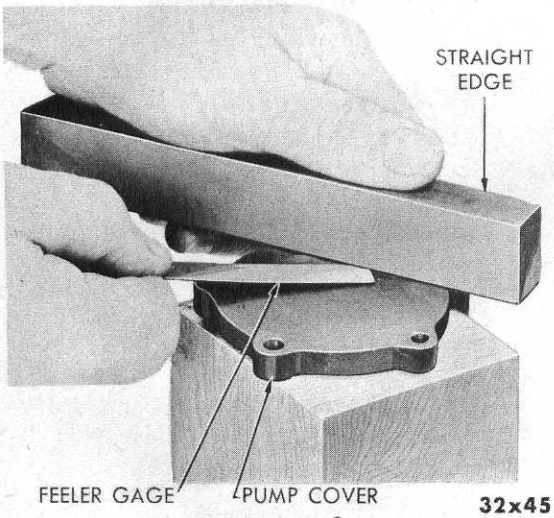


Fig. 68—Checking Body Cover

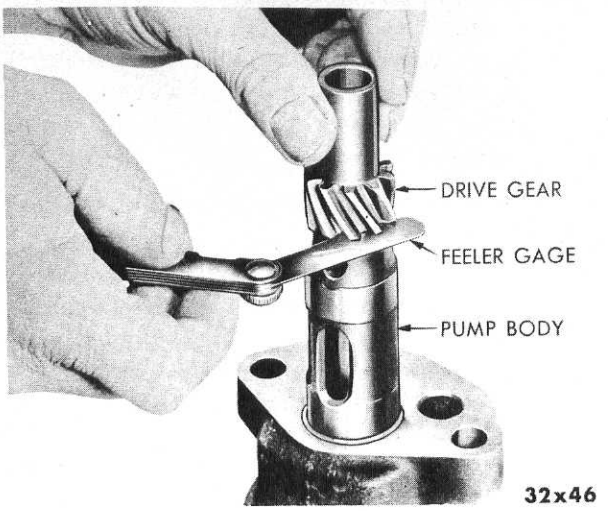


Fig. 69—Measuring End Play

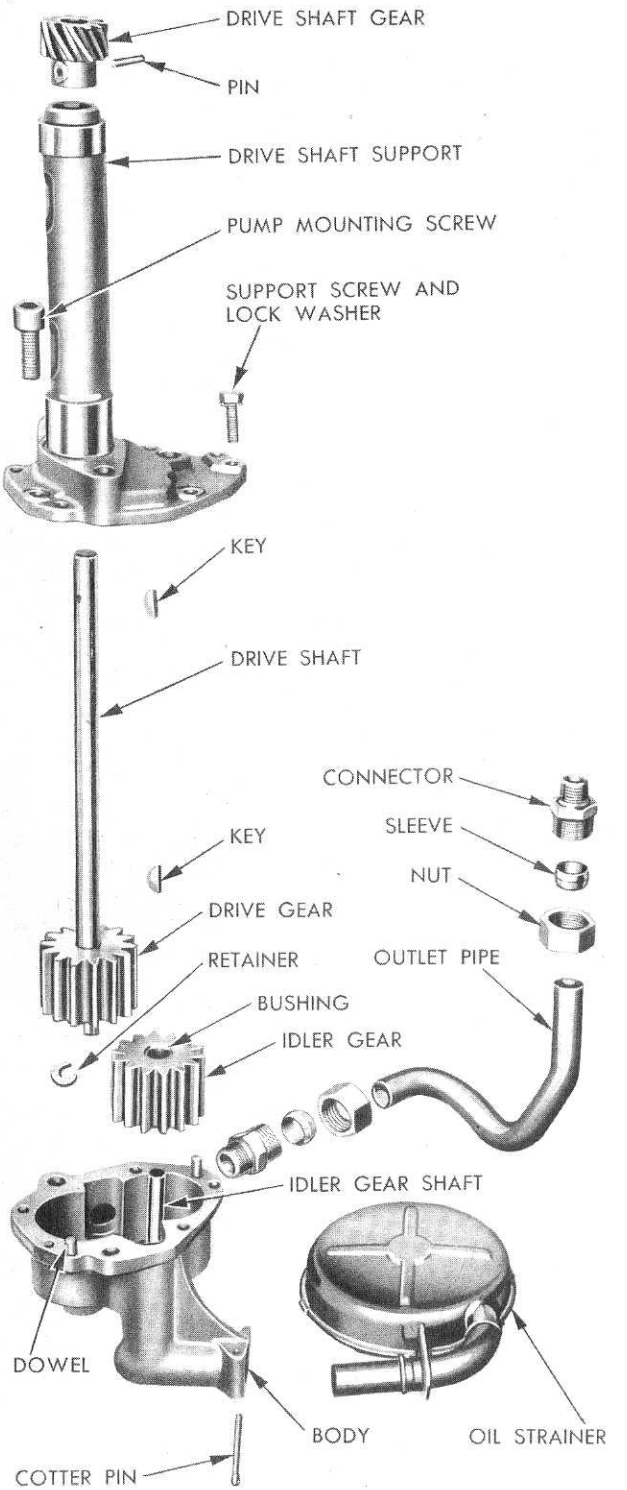


Fig. 70—Oil Pump (Disassembled View) (B-4-R, B-4-T, B-4-V and B-4-Y)

opposite side (Fig. 67). Clearance should measure .012 inch or less. If clearance is more, discard the pump body and use a new one.

(12) The cover should be smooth. If the cover is scratched or grooved, replace it. Lay a straightedge across inner surface, as shown in Figure 68, and try to insert a .001 inch feeler between cover and straightedge. If it can be inserted, replace the cover.

55. ASSEMBLY OF OIL PUMP

(1) When installing a new inner rotor on the drive shaft, press the rotor on until the end of the shaft is flush with face of the gear. When pressing the rotor on the shaft, be sure it is square with shaft. Drill a pin hole, using a $\frac{5}{32}$ inch drill and install pin.

(2) Slide shaft and rotor assembly into pump body.

(3) Press the drive gear on the shaft until end play of the shaft is from .003 to .005 inch. Press the rotor down in the body with the hand and measure clearance with a feeler (Fig. 69). Install pin and peen over both ends. If pin holes do not line up, drill a new pin hole through gear and shaft, using a $\frac{5}{32}$ inch drill. (Drill the hole at right angles to other holes.)

(4) Install the outer rotor in pump body.

(5) Install a new cover gasket.

(6) Install the cover and tighten screws evenly.

56. SERVICING THE OIL PUMP (B-4-R, B-4-T, B-4-V AND B-4-Y)

Due to its design and rugged construction, the oil pump seldom requires servicing. However, if it should require attention, the following procedures are recommended:

a. Removal and Disassembly

To remove the oil pump, refer to Figure 70, and proceed as follows:

(1) Drain the oil and remove the oil pan.

(2) Remove the oil pump outlet pipe and connections.

(3) Remove the bolt holding the pump assembly to the block and lift out the pump.

NOTE

Before disassembling the oil pump, clean it in a suitable solvent to remove all sludge and dirt.

(4) After cleaning the pump, as described in the Note above, refer to Figure 70. Then, separate the drive shaft support and the pump body to expose the gears.

(5) Attach a dial indicator to the drive shaft support so that the dial indicator button contacts the pump drive shaft. Move the drive shaft up and down to indicate the amount of end play on indicator. If end play exceeds .005 inch, replace the drive shaft support.

(6) Remove the pin that secures the drive gear to the oil pump drive shaft.

(7) Using a suitable drift, drive out the pump shaft.

CAUTION

When driving the pump shaft out of the gear, do not allow the woodruff key to enter the support housing. Otherwise, damage to the bearing surface will result.

(8) Remove the pump drive gear from the shaft after pressing the gear on the shaft to expose the retainer clip. Then, press the shaft out of the gear.

b. Inspection and Repair

The gears are the principal wearing parts of the oil pump. If the oil has been kept clean, the wear on the parts will be very slow. But, if dirt and sludge have been allowed to accumulate, wear on these parts may be evident in a short time.

Examine the pump idler and driven gear teeth for excessive wear or damage. Install new gears if the teeth are worn or scored. If the gears do not appear to be worn, check the pump body for wear as described below:

Wear Between Gears and Body

If the gears have worn, or have scored a de-

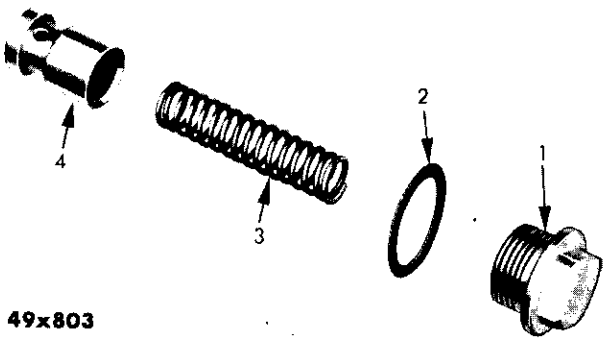


Fig. 71—Oil Pressure Relief Valve (Disassembled View) (Except B-4-R, B-4-T, B-4-V and B-4-Y)

1 — Plug
2 — Plug gasket
3 — Spring
4 — Valve

pression in the face of the body, install a new body assembly.

Next, position the gears in the body. Place a straightedge across the body of the pump. Measure the space between the straightedge and the faces of the gears. The gear face should not be more than .004 inch below the body flange. If this measurement is more than .004 inch, the difference is the amount of wear between the gears and the body.

Pump Gears

Measure the overall width of the gears. If the width is less than 1.4955 inches, the gears are worn and should be replaced.

Gear Clearance In Body

Insert a feeler gauge between the pump body and the tips of the gear teeth. If this radial clearance measures more than .0075 inch, install a new shaft, gears, or both.

If inspection of the various parts indicates extensive wear, it is recommended that the complete pump assembly be replaced.

c. Assembly

After inspection and repair, assemble the pump as follows:

(1) Install the key in the shaft and press the drive gear on the shaft until the retainer clip groove is exposed. Then, install the clip. Press the gear off the shaft until the retainer clip seats in the recess of the gear.

(2) Insert the shaft and drive gear in the support.

(3) Install the woodruff key in the shaft and press the pump drive gear on the shaft until a .005 to .010 inch clearance has been obtained. Then, install the retaining pin.

NOTE

If a new drive shaft has been used, drill the gear and shaft with a Number 22 drill. Then, install a new pin.

(4) Install the idler gear on the stub shaft.

(5) Secure the body to the support with bolts. Then, turn the drive shaft to be sure there is no bind.

(6) Install the pump in the cylinder block and connect the outlet pipe.

(7) Install the pump to block bolts and tighten securely.

(8) Install the oil pan, using new gaskets. Tighten pan bolts securely.

57. OIL PRESSURE

Oil pressure should be checked with the proper viscosity oil in the crankcase and with the engine at normal operating temperature. The correct pressure is from 30 to 45 pounds at speeds above 30 miles per hour.

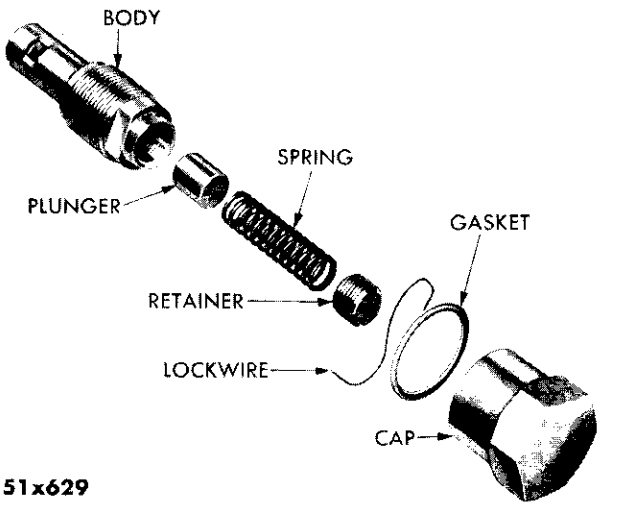


Fig. 72—Oil Pressure Relief Valve (Disassembled View) (B-4-R, B-4-T, B-4-V and B-4-Y)

Some of the causes of improper oil pressure are as follows:

(1) Broken oil lines or tubes.

(2) Leaky connection in oil tube or lines.

(3) Defective oil gauge.

(4) Clogged oil pump or oil strainer screen.

(5) Worn oil pump gears or rotor.

(6) Loose main or connecting rod bearings.

(7) Improper viscosity of oil.

(8) Thick pump cover gasket.

58. OIL PRESSURE RELIEF VALVE

On all except B-4-R, B-4-T, B-4-V and B-4-Y models, different colored springs are used in the oil pressure relief valve (Fig. 71). The standard spring is not painted. Springs lighter than standard are painted red, while springs heavier than standard are painted green. If the spring must be replaced, use a new spring of the same color.

On B-4-R, B-4-T, B-4-V and B-4-Y models, an adjustable relief valve (Fig. 72) is used.

Correct adjustment of the relief valve is made at the factory. It is seldom necessary to change it.

a. Adjustment

Remove the cap and gasket and unfasten the spring retainer lock wire. Turn the spring retainer clockwise to increase the pressure, or counter-clockwise to decrease the pressure. Install the lock wire, cap gasket and cap.

b. Replacement

Remove the cap and screw the relief valve assembly from the cylinder block. Make sure the seat in the block is clean. Then, tighten the assembly firmly against its seat. If necessary, adjust the spring retainer and install the cap with a new gasket.

59. OIL FILTER

The function of the oil filter on the engine is to remove dirt and foreign material from the oil. This "oil cleaning" is a continuous process. The filter element will continue to trap dirt until it becomes clogged. Due to the manner of connecting the oil filter to the oiling system, clogging of the filter will not stop the circulation of oil to the bearings. However, when the oil filter becomes clogged, it ceases to filter the oil. So, it is advisable to install a new MOPAR oil filter or oil filter element (depending on the type of filter used) approximately every 5,000 miles, under normal conditions, and then at the time of an oil change. In dusty areas, or under severe operating conditions, check the oil and service the filter more frequently, or service the filter whenever the oil appears to be excessively dirty. After replacing the oil filter or oil filter element, run the engine for five minutes and check for possible oil leaks. Refer to Lubrication section.

60. OIL PRESSURE GAUGE

An accumulation of sludge sometimes plugs the small hole in the oil gauge connection. This hole can be cleared with a fine wire to restore the original efficiency of the gauge. The gauge line should be free from oil when installed.

61. CRANKCASE VENTILATION (EXCEPT B-4-PW)

The crankcase ventilation system is designed to remove harmful fumes from the crankcase which might condense and dilute the oil.

Ventilation is accomplished by drawing off the fumes or vapors through the crankcase ventilator pipe at the rear of the engine. Fresh air enters through the oil filter pipe, which is equipped with an air cleaner that removes dirt and dust from the air. Lubricate the crankcase ventilator outlet pipe air cleaner as recommended in the Lubrication section.

62. CRANKCASE VENTILATION (B-4-PW)

On the B-4-PW models, clean, fresh air is piped into the crankcase from the carburetor air cleaner. When leaving the crankcase, this air, carrying moisture and vapor, is drawn into the manifold. By this means, the crankcase is freed of moisture.

It is necessary to keep the filler pipe cap tight, as unfiltered air entering the crankcase will impair the efficiency of this type of ventilating system.

To prevent clogging of the crankcase ventilator valve, disassemble and clean the valve every 5,000 miles. This valve is in the vent line near the center of the intake manifold.

NOTE

The valve should be installed in a vertical position, as indicated by the arrow on the side of the valve.

63. ENGINE LUBRICATION

Oil used in the engine should always be a high-grade, well-refined oil. The recommendations made in the Lubrication section are based on the SAE viscosity numbering system. The numbers used indicate the viscosity of the oil only and do not take into consideration the quality of the oil. In this numbering system, the higher numbers indicate the heavier oil, and the lower numbers indicate the lighter oil.

ROUTE VAN ENGINE SERVICE

64. DESCRIPTION OF ENGINE (FIG. 1, PAGE 12)

The engine used in both Route Van Models is similar to the engine used in the B-4-D truck. It is mounted on a rubber cushion in front and two rubber cushions at the clutch housing in the rear, as shown in Figure 74.

The crankcase oil filler neck and oil level gauge are easily accessible from the front of the truck with the grille open (Fig. 73). The air cleaner and the oil filter may be reached from inside the truck (Fig. 75). The valves may be reached for adjustment by removing the right front wheel, wheel housing pan and valve covers.

With the exception of re-boring the cylinders, most of the major operations can be performed without removing the engine.

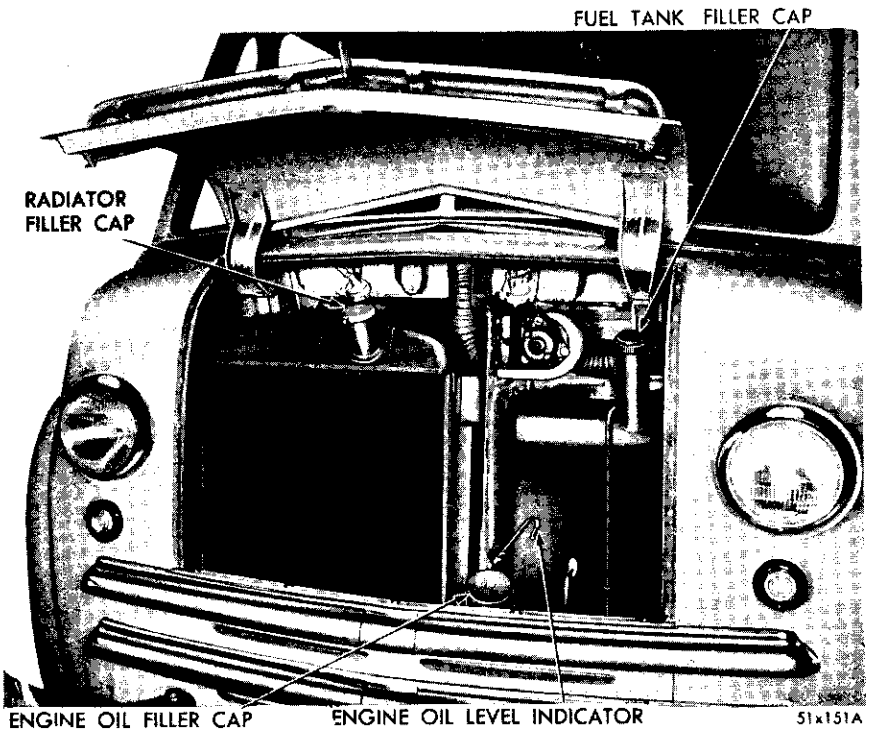


Fig. 73—Front of Truck with Grille Open

65. REMOVAL AND INSTALLATION OF ENGINE

(1) Drain the radiator and gasoline tank.

(2) Remove the cowl upper grille assembly by removing the cap screws from inside each hinge. Remove the grille and leave the hinges mounted to the body.

(3) Remove the cowl lower grille assembly (Fig. 76).

(4) Remove the front bumper bar from the frame.

(5) Remove the fuel line running from the tank to the flexible hose.

(6) Disconnect the brake line at each side of the cross member.

(7) From inside the cab, raise the engine compartment lid and remove the engine compartment rear panel, engine compartment side panel, transmission floor cover and lower toe board assembly.

(8) Disconnect the accelerator pedal control, hand brake cable and speedometer cable.

(9) Disconnect front universal joint and lower the propeller shaft to the floor.

(10) Remove the transmission.

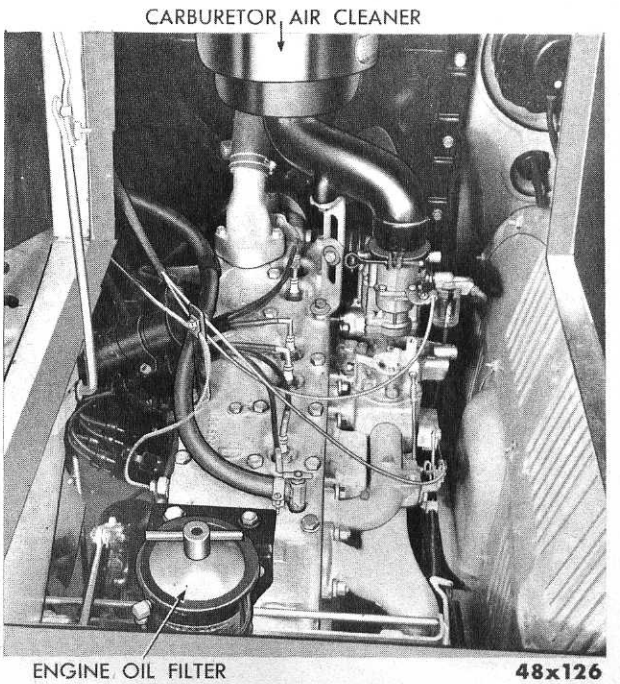


Fig. 75—Oil Filter and Air Cleaner

(11) Remove the bolts holding the removable cross member section immediately in front of the engine. It is bolted to the right side rail, the intermediate side rail and the other half of the cross member.

(12) Disconnect the exhaust pipe at the manifold.

(13) Disconnect the electrical wiring, carbu-

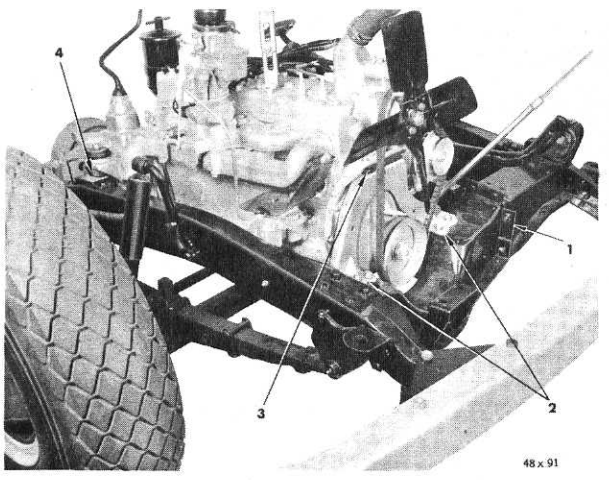


Fig. 74—Method of Engine Mounting

1 — Front right frame cross member
2 — Mounting bolts
3 — Front mounting cushion
4 — Rear engine mount

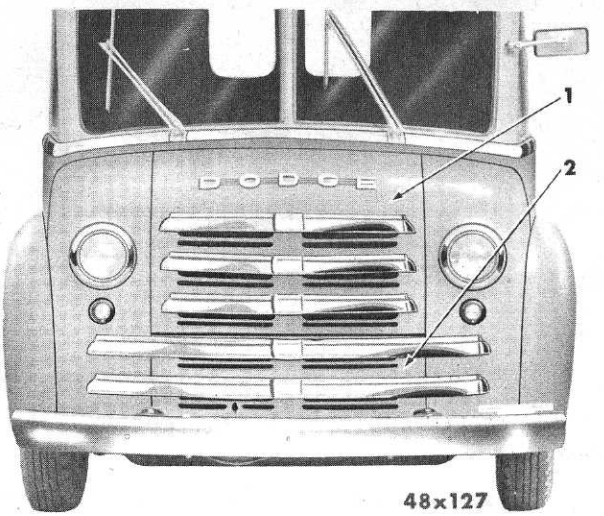


Fig. 76—Front View of Truck

1 — Cowl upper grille
2 — Cowl lower grille

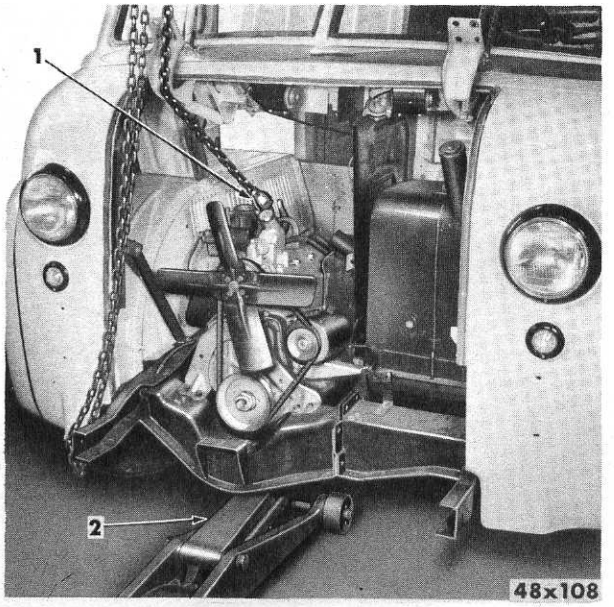


Fig. 77—Position of Chain Hoist for Engine Removal

1 — Chain hoist 2 — Jack

retor controls, temperature gland unit and oil line.

(14) Place a suitable lifting hook on the block between the Number 3 and 4 spark plugs.

(15) Place a jack under the pan and use a block of wood over the jack to prevent damage to the pan. Be careful not to put too much strain on the pan.

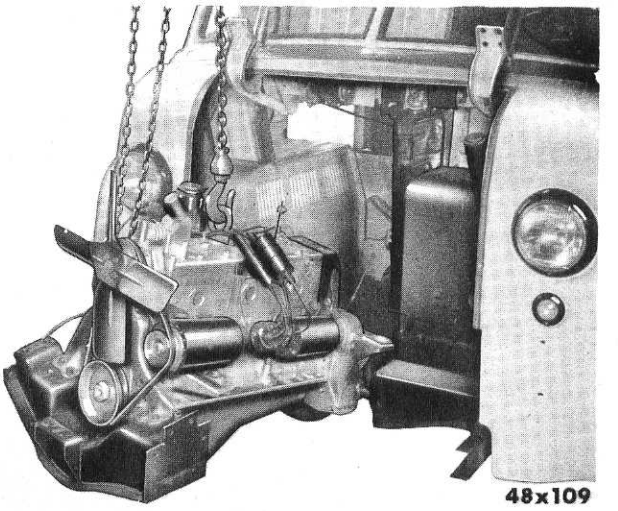


Fig. 78—Engine Removed

(16) Insert the hoist chain through the channel of the grille hinges and attach it to the lifting hook, as shown in Figure 77.

(17) Raise the engine a short distance and ease it forward, gradually putting more weight on the chain.

(18) When the engine is clear (Fig. 78), roll the chassis back out of the way.

When the engine is ready for replacement, roll the truck into position, install the engine, bleed the brake system, fill the cooling system, fuel tank and crankcase.

SERVICE DIAGNOSIS

CONDITIONS — POSSIBLE CAUSES — REMEDIES

ENGINE PERFORMANCE

66. ENGINE WILL NOT START

Possible Causes

a. Weak battery.

b. Corroded or loose battery terminal connections.

c. Dirty or corroded distributor contact points.

d. Weak coil.

e. Broken or loose ignition wires.

f. Moisture on ignition wires, cap or plugs

g. Fouled spark plugs.

h. Improper spark plug gap.

i. Improper timing (ignition).

j. Dirt or water in gas line or carburetor.

k. Carburetor flooded.

l. Fuel level in carburetor bowl not correct.

m. Supply of fuel insufficient.

n. Defective fuel pump.

o. Vapor lock.

p. Defective starting motor.

q. Burned resistor on Truck-O-Matic transmission (if truck is so equipped).

Remedies

a. Recharge and test battery, using Open Circuit Battery Tester. Refer to Electrical section. If necessary, replace battery.

b. Clean, inspect and tighten battery terminals and clamps. Replace battery cables and clamps if badly corroded.

c. Clean and inspect contact points. If badly burned or pitted, replace points and condenser. Adjust gap to .020 inch and check timing.

d. Replace weak coil. Then, check condition of contact points and replace if necessary. See *c* above.

e. Replace broken ignition wires or those with cracked insulation. Tighten all connections at distributor, coil, ammeter and ignition switch. Be sure the spark plug wires are secure in distributor cap and coil tower.

f. Dry the wet ignition system with compressed air, or with a clean dry cloth. Remove the individual spark plug wires from cap. Dry cavity and wire ends thoroughly. Inspect inside of cap and remove all traces of moisture and dirt.

g. Clean and tighten spark plugs. Adjust gaps to .035 inch.

h. Clean spark plugs and adjust gaps to .035 inch.

i. Check ignition timing.

j. Disconnect lines and clear with compressed air. Remove and clean carburetor. Drain tank and refill.

k. Check carburetor float level and needle seat assembly. Check float for leaks and replace parts as necessary.

l. Refer to Fuel System section for correction of this condition.

m. Refill fuel tank and then check gauge.

n. Replace defective fuel pump.

o. Check for air and fuel restrictions around fuel pump and check for a misplacement of heat shield. Repair as necessary.

p. Repair or replace defective starting motor. If repairing, test, as outlined in Electrical System section. Replace worn or damaged parts as required.

q. Refer to Transmission section for ignition interruptor resistor check. Replace resistor if burned.

67. ENGINE STALLS

Possible Causes

a. Idling speed too low.

b. Idle mixture too lean or too rich.

c. Dirt or water in fuel line or carburetor.

d. Incorrect carburetor float level.

e. Leak in intake manifold.

f. Defective accelerator pump (stalls on acceleration).

g. Improper use of choke.

h. Carburetor icing (cold, wet weather).

i. Dash pot ineffective.

j. Corroded battery terminals.

k. Weak battery.

l. Spark plugs dirty, damp, or gaps incorrectly set.

m. Coil or condenser defective.

n. Distributor points dirty, burned or incorrectly spaced.

o. Trailing edge of rotor worn.

p. Leaks in ignition wiring.

q. Incorrect valve tappet clearance.

r. Burned or pitted valves.

s. Engine overheating.

Remedies

a. Reset throttle adjustment screw until engine idles at approximately 450 to 500 r.p.m.

b. Reset idle adjustment screw ½ to 1½ turns open for correct idle mixture. For richer mixture, turn screw out and for leaner mixture, turn screw in.

c. Disconnect lines and clear with compressed air. Remove and clean carburetor, as outlined in Fuel System section. Drain tank and refill.

d. Refer to Fuel System section for correction of this condition.

e. Check intake manifold, gasket and heat riser gasket. Replace parts as required. Tighten manifold stud nuts to proper torque.

f. Replace or repair defective accelerator pump. Refer to Fuel System section. Replace parts as required.

g. Instruct truck operator in proper use of choke.

h. Open throttle by pressing against accelerator pedal as engine starts to stall. Keep motor at fast idle until condition clears.

i. Check carburetor dash pot piston, leather and valve. Replace parts as required. Check piston travel. Make sure it comes within specifications. Refer to Fuel System section.

j. Clean battery terminal posts and inspect and tighten the clamps. Replace battery cables and clamps if badly corroded.

k. Recharge and test battery. If necessary, install a new battery of the same type and capacity.

l. Clean and tighten spark plugs. Adjust plug gaps to .035 inch.

m. Replace defective coil and condenser. Then, check condition of distributor points and replace if necessary. Adjust gap to .020 inch.

n. Replace distributor points and condenser. Set gap at .020 inch.

o. Replace worn rotor. Check contacts in cap for burning or pitting. If necessary, replace cap.

p. Replace broken ignition wires or wires with cracked insulation. Tighten all connections at coil, distributor, ammeter and ignition switch. Be sure the spark plug wires are secure in distributor cap and coil tower.

q. Adjust valve tappet clearance. Refer to Service Standards for proper clearances.

r. Replace or reface and grind valves.

s. Refer to Cooling System section for various causes of engine overheating. Correct as indicated in remedies.

68. ENGINE HAS NO POWER

Possible Causes

a. Incorrect ignition timing.

b. Coil or condenser defective.

c. Trailing edge of rotor worn.

d. Defective mechanical or vacuum advance (distributor).

e. Excessive play in distributor shaft.

f. Distributor cam worn.

g. Spark plugs dirty or gap incorrectly set.

h. Improper spark plugs.

i. Low grade of fuel.

j. Carburetor in poor condition.

k. Dirt or water in gas line or carburetor.

l. Improper carburetor float level.

m. Defective fuel pump.

n. Valve timing incorrect.

o. Incorrect valve tappet clearance.

p. Blown cylinder head gasket.

q. Low compression.

r. Burned, warped or pitted valves.

s. Plugged or restricted muffler or tail pipe.

t. Brakes dragging.

u. Clutch slipping.

v. Engine overheating.

Remedies

a. Check and reset ignition timing, as outlined in Electric System section. Replace parts as necessary.

b. Replace defective coil and condenser. Check condition of contact points and replace if necessary. Adjust gap to .020 inch.

c. Replace worn rotor. Check contacts in gap for burning or pitting. If necessary, replace distributor cap.

d. Check vacuum advance mechanism. Make adjustments or replace parts as necessary.

e. Check distributor shaft play. Replace parts as required.

f. Replace worn distributor cam.

g. Clean and tighten spark plugs. Adjust spark plug gaps to .035 inch.

h. Replace with spark plugs of the correct type. Refer to Service Standards, Electrical System section.

i. Drain fuel tank and refill with fuel that will give more complete combustion.

j. Remove and recondition carburetor. Replace parts as required.

k. Disconnect lines and clear with compressed air. Remove and clean carburetor. Drain tank and refill.

l. Refer to Fuel System section for correction of this condition.

m. Replace defective fuel pump. Fuel pump pressure should be as recommended in Service Standards, Fuel System section.

n. Reset valve timing.

o. Adjust valve tappet clearance. Refer to Service Standards for proper clearance.

p. Replace blown cylinder head gasket. Tighten cylinder head stud nuts to proper torque.

q. Perform vacuum test or compression test to determine mechanical condition of engine.

r. Replace, or reface and grind valves.

s. Remove plugged or restricted muffler or tail pipe and replace. Check for excessive carbon in combustion chamber.

t. Refer to Brakes section for possible causes and remedies. Correct as indicated.

u. Refer to Clutch section for possible causes and remedies. Correct as indicated.

v. Refer to Cooling System section for possible causes and remedies. Correct as indicated.

69. ENGINE "LOPES" OR MISSES

Possible Causes

a. Incorrect carburetor idle adjustment.

b. Dirt or water in gas line or carburetor.

c. Dirty jets or plugged passages in carburetor.

d. Incorrect valve tappet clearance.

e. Burned, warped or pitted valves.

f. Incorrect ignition timing.

g. Leaks in ignition wiring.

h. Moisture on ignition wires, cap or plugs.

i. Defective spark advance mechanism.

j. Excessive play in distributor shaft.

k. Distributor cam worn.

l. Spark plugs dirty, damp, or gaps set too close.

m. Weak battery.

n. Uneven compression.

o. Low grade of fuel.

Remedies

a. Reset idle adjustment screw ½ to 1½ turns open for correct idle mixture. For richer mixture, turn screw out and for leaner mixture, turn screw in.

b. Disconnect lines and clear with compressed air. Remove and clean carburetor. Drain tank and refill.

c. Remove carburetor and recondition. Replace parts as necessary. Refer to the Fuel System section.

d. Adjust valve tappet clearance. Refer to Service Standards for proper clearance.

e. Replace, or reface and grind valves.

f. Check and reset ignition timing.

g. Replace broken ignition wires or wires with cracked insulation. Tighten all connections at distributor, coil, ammeter and ignition switch. Be sure the spark plug wires are secure in distributor cap and coil tower.

h. Dry the wet ignition system with com-

pressed air or with a clean, dry cloth. Remove each spark plug wire from cap. Dry the cavity and wire ends thoroughly. Inspect inside of cap and remove all traces of moisture and dirt.

i. Check vacuum advance mechanism. Make adjustments or replace parts as required.

j. Check distributor shaft play. Replace parts as required.

k. Replace worn distributor cam. Replace parts as required.

l. Clean and tighten spark plugs. Adjust plug gaps to .035 inch.

m. Recharge and test battery. If necessary, install a new battery of the same type and capacity.

n. Perform vacuum test or compression test to determine the mechanical condition of the engine.

o. Drain fuel tank and refill with fuel that will give more complete combustion.

70. ENGINE MISSES WHILE IDLING

Possible Causes

a. Spark plugs dirty, damp, or gap incorrectly set.

b. Broken or loose ignition wires.

c. Burned or pitted contact points, or set with insufficient gap.

d. Coil or condenser defective.

e. Weak battery.

f. Distributor cap cracked.

g. Trailing edge of rotor worn.

h. Moisture on ignition wires, cap or plugs.

i. Excessive play in distributor shaft.

j. Distributor shaft cam worn.

k. Burned, warped or pitted valves.

l. Incorrect valve tappet clearance.

m. Incorrect carburetor idle adjustment.

n. Improper carburetor float level.

o. Low compression.

Remedies

a. Clean and tighten spark plugs. Adjust plug gaps to .035 inch.

b. Replace broken ignition wires or wires with cracked insulation. Tighten all connections at distributor, coil, ammeter and ignition switch. Be sure the spark plug wires are secure in distributor cap and coil tower.

c. Clean and inspect contact points. If badly burned or pitted, replace points and condenser. Adjust gap to .020 inch and check timing.

d. Replace defective coil and condenser. Check the condition of contact points and replace if necessary. Adjust gap to .020 inch.

e. Recharge and test battery. If necessary, install a new battery of the same type and capacity.

f. Replace cracked distributor cap. Then, check rotor for burned conductor. Replace if necessary.

g. Replace worn rotor. Check contacts in cap for burning or pitting. If necessary, replace distributor cap.

h. Dry the wet ignition system with compressed air or a clean, dry cloth. Remove each spark plug wire from cap. Dry the cavity and wire ends thoroughly. Inspect inside of cap and remove all traces of moisture and dirt.

i. Check distributor cam play. Replace parts as required.

j. Replace worn distributor shaft.

k. Replace, or reface and grind valves.

l. Adjust valve tappet clearance. Refer to Service Standards for proper clearance.

m. Reset idle adjustment screw ½ to 1½ turns open for correct idle mixture. For richer mixture, turn screw out and for leaner mixture, turn screw in.

n. Refer to Fuel System section for correction of this condition.

o. Perform vacuum test or compression test to determine the mechanical condition of the engine.

71. ENGINE MISSES ON ACCELERATION

Possible Causes

a. Distributor points dirty or incorrectly spaced.

b. Coil or condenser defective.

c. Incorrect ignition timing.

d. Spark plugs dirty, damp, or gap set too wide.

e. Abnormal resistance in spark plugs.

f. Dirty jets in carburetor, especially economizer jet or accelerator pump operating improperly.

g. Burned or pitted valves.

h. Low grade of fuel.

Remedies

a. Clean and inspect contact points. If badly burned or pitted, replace points and condenser. Adjust point gap to .020 inch and check timing.

b. Replace defective coil and condenser. Check condition of contact points and replace if necessary. Adjust gap to .020 inch.

c. Check and reset ignition timing.

d. Clean and tighten spark plugs. Adjust plug gaps to .035 inch.

e. Install new spark plugs. Before installing, check gaps and if necessary, adjust to .035 inch. Clean seats, install new gaskets, and tighten with a torque wrench from 30 to 32 foot-pounds.

f. Remove carburetor and recondition. Replace parts as required.

g. Replace, or reface and grind valves.

h. Drain fuel tank and refill with a fuel that will give more complete combustion.

72. ENGINE MISSES AT HIGH SPEED

Possible Causes

a. Dirt or water in gas line or carburetor.

b. Dirty jets in carburetor, espcially the economizer jet.

c. Coil or condenser defective.

d. Incorrect ignition timing.

e. Distributor points dirty or incorrectly spaced.

f. Trailing edge of rotor worn.

g. Loose ignition wiring.

h. Excssive play in distributor shaft.

i. Spark plugs dirty, damp, or gaps too wide.

j. Abnormal resistance in spark plugs.

k. Distributor shaft cam worn.

l. Engine overheating.

m. Low grade of fuel.

Remedies

a. Disconnect lines and clear with compressed air. Remove and clean carburetor. Drain tank and refill.

b. Remove carburetor and recondition. Replace parts as necessary.

c. Replace defective coil and condenser. Check condition of contact points and replace if necessary. Adjust gap to .020 inch.

d. Check and reset ignition timing.

e. Clean and inspect contact points. If badly burned or pitted, replace points and condenser. Adjust point gap to .020 inch and then check timing.

f. Replace worn rotor. Check contacts in cap for burning or pitting. If necessary, replace distributor cap.

g. Replace broken ignition wires or wires with cracked insulation. Tighten all connections and be sure the spark plug wires are secure in distributor cap.

h. Check distributor shaft play. Replace as required.

i. Clean and tighten spark plugs. Adjust plug gaps to .035 inch.

j. Install new spark plugs. Before installing, check gaps and, if necessary, adjust to .035 inch. Clean seats, install new gaskets and tighten with a torque wrench to 30 to 32 foot-pounds.

k. Replace worn distributor shaft and/or bushings. Replace parts as required.

l. Refer to Cooling System section for possible causes and remedies. Correct as indicated.

m. Drain fuel tank and refill with fuel that will give more complete combustion.

HIGH OIL CONSUMPTION

73. EXTERNAL OIL LEAKAGE

Possible Causes

a. Outside oil lines.

b. Timing gear case cover oil seal.

c. Rear main bearing oil seal.

d. Oil pan gaskets.

e. Oil pan drain plug.

f. Oil filter gasket.

g. Clogged rear camshaft bearing drain hole.

h. Tappet cover gaskets.

i. Fuel pump or gasket.

j. Timing chain cover gasket.

Remedies

a. Check for oil leaks at filter tubes and oil gauge lines. Replace tubing or fittings as necessary. Be sure filter mounting bracket is fastened directly next to the cylinder head.

b. Replace chain case cover oil seal. Use a new cover gasket.

c. Replace rear main bearing oil seal. Be sure seal and gaskets are in correct location in the cap before installation.

d. Replace faulty oil pan gaskets.

e. Replace worn oil pan plug and use new gasket.

f. Clean filter and cover, removing all traces of old gasket. Install new gasket and make sure gasket is centered. Tighten and run engine for five minutes. Inspect for leakage.

g. Remove rear tappet chamber cover and open drain hole. Check gasket on cover and replace if necessary.

h. Remove gaskets from tappet chamber covers and replace. Before installing, be sure all traces of old gaskets have been removed from the machined faces of block. Wipe surfaces dry and install covers.

i. Replace fuel pump to block gasket. Check fuel pump for oil leaks. Correct as necessary.

j. Replace timing chain cover gasket. Inspect oil seal and, if necessary, replace.

74. OIL PUMPING AT RINGS

Possible Causes

a. Worn, scuffed or broken rings.

b. Incorrect size rings.

c. Out-of-round rings.

d. Rings fitted too tight in grooves.

e. Carbon in oil ring slots.

f. Insufficient tension in rings.

g. Stuck rings.

h. Compression rings installed incorrectly.

Remedies

a. Replace worn or scuffed rings after careful inspection of cylinder walls. Worn, wavy or scored walls are a contributing factor to high oil consumption. Recondition walls as necessary.

b. Replace incorrect size rings with new rings of proper type.

c. Replace out-of-round rings, after checking cylinder bore.

d. Replace improperly fitted rings. Refer to Service Standards for clearance of oil ring in groove.

e. Remove rings and clean piston ring slots with a suitable cleaning tool. Check cylinder bore and, if necessary, recondition before installing new rings.

f. Replace weak rings after checking condition of cylinder walls.

g. Free up sticking rings by disassembly or with a suitable "upper lubricant." If necessary, replace rings.

h. Remove and replace incorrectly installed rings.

75. OIL PUMPING AT VALVES

Possible Causes

a. Worn valve stems or guides.

b. Too much oil spray in tappet chamber.

c. Intake valve stem guide in inverted position.

Remedies

a. Replace worn valves and guides as necessary.

b. Reduce main and connecting rod clearances.

c. Replace valve guide if condition is evident.

76. HIGH OIL CONSUMPTION DUE TO LUBRICATING OIL CONDITIONS

Possible Causes

a. Oil level too high.

b. Contaminated oil.

c. Poor grade of oil.

d. Thin, diluted oil.

e. Oil pressure too high.

f. Sludge in engine.

Remedies

a. Add oil only when level reaches add oil mark. If oil level is above the "full" mark, drain sufficient oil to obtain correct level.

b. Drain and refill crankcase with a good quality oil of the proper type and grade. Refer to Lubrication section. Replace oil filter or filter element.

c. Drain and refill crankcase with a good quality oil. Replace oil filter or filter element.

d. Drain and refill crankcase with a good quality oil. Replace oil filter or filter element. Check operation of choke.

e. Replace oil pressure relief valve spring.

f. Drain, flush engine and refill crankcase with a good quality oil. Replace oil filter or filter element. Check thermostat. A thermostat that remains in the open position allows the engine to operate below normal temperatures. This promotes sludge formation.

77. HIGH OIL CONSUMPTION — MISCELLANEOUS

Possible Causes

a. Overheated engine.

b. Sustained high speeds.

c. Improperly positioned breather cap, causing excessive crankcase ventilation.

Remedies

a. Refer to the Cooling System section for correction of this condition.

b. Avoid sustained high speeds at wide open throttle whenever possible.

c. Check breather for correct position and readjust if necessary. Inspect crankcase ventilator outlet tube and oil drain passage in block for restriction correction. Clean or repair as required.

VALVE CONDITIONS

78. BROKEN VALVES

Possible Causes

a. Weak valve springs.

b. Worn valve guides.

c. Excessive tappet clearance.

d. Cocked springs or retainers.

e. Out-of-round block seats.

f. Defective valve forgings.

g. Excessive engine speeds.

Remedies

a. Remove valves and springs and test springs. Discard springs that do not have the proper tension. Refer to Service Standards.

b. Remove valves, springs and guides and install new guides. Check valve seat faces for burning or pitting. Recondition as required.

c. Replace valves as needed. Readjust valves with engine hot. Refer to Service Standards for proper clearances.

d. Remove valves as needed. Then, test valve springs. At reassembly, be sure springs and retainers are in correct positions.

e. Replace broken valves after reconditioning valve seat faces.

f. Replace broken valves.

g. Avoid sustained high speeds at wide open throttle whenever possible.

79. BURNED OR STICKING VALVES

Possible Causes

a. Close tappet clearance.

b. Weak valve springs.

c. Gum formations on stem or guide.

d. Eccentric valve face or seat.

e. Deposits on valve seats.

f. Incorrect valve seat width.

g. Improper valve guide clearance.

h. Warped valves.

i. Improper block cooling.

j. Exhaust back pressure.

k. Improper spark timing.

l. Out-of-round valve seat.

Remedies

a. Replace valves as required. Readjust tappets with engine hot. Refer to Service Standards for proper clearance.

b. Remove valves as required. Then, test valve springs. Refer to Service Standards for tension specifications.

c. Remove valves as required. Clean valves and guides with suitable tool to remove gum and carbon deposits.

d. Replace valves as required after reconditioning valve seats.

e. Remove valves as required. Clean or reface valve seats and valves as necessary. See *f* below.

f. Replace valves as required.

g. Remove valves as required. Replace, clean or ream guides to required specifications.

NOTE

When replacing valve guides, be sure the counterbore in guide is up for exhaust and down for intake.

h. Replace valves as required. Clean and reface valve seats.

i. Replace valves as required. Refer to the Cooling System section for correction of this condition.

j. Replace valves as required. Check exhaust system for restrictions. Replace parts as necessary.

k. Replace valves as required. Check ignition timing, as outlined in the Electrical System section. Make adjustments or repairs as necessary.

l. Replace valves if required. Grind valve seats.

80. NOISY VALVES

Possible Causes

a. Incorrect tappet clearance.

b. Worn tappets or adjusting screws.

c. Worn cam lobes.

d. Worn valve guides.

e. Excessive runout of valve seat or valve face.

Remedies

a. Readjust valve tappets with engine hot.

b. Replace worn tappets and adjusting screws as required.

c. Replace camshaft. Check tappets for excessive wear and replace as required.

d. Replace worn valve guides as required.

e. Reface valve seat and valve face as required.

81. BROKEN VALVE SPRINGS

Possible Causes

a. Valve flutter at high speed.

b. Improper crankcase ventilation.

c. Worn timing gear or chain.

Remedies

a. Replace valve springs as required. Test remaining springs. Refer to Service Standards for tension specifications.

b. Check crankcase breather tubes and filters for restrictions. Clean or replace parts as required.

c. Replace valve springs as required. Check timing chain or gear for excessive wear and backlash. Replace parts as needed.

82. VALVE DEPOSITS

Possible Causes

a. Quality of fuel.

b. Quality of lubricating oil.

c. Valve stem wear.

d. Improper cooling of block.

e. Sludged engine.

f. Worn valve guides.

g. Improper lubrication of valve stem.

h. Excessive engine idling.

i. Rich carburetor setting.

Remedies

a. Clean valves, stems, guides and remove carbon from head, top of block and valve ports. Use a good, "regular" grade of fuel.

b. Clean valves, stems, guides and remove carbon from head, top of block and valve ports. Drain crankcase and refill with oil of the proper type and grade. Refer to Lubrication section.

c. Clean valves and guides as required. Then, check for excessive wear in guides. Replace parts as necessary.

d. Clean valves and guides as required. Then, refer to the Cooling System section for correction of this condition.

e. Clean valves and guides as required. Then, test thermostat.

f. Clean valves and stems. Then, replace worn valve guides as required.

g. Clean valves and guides as required. Coat valve stems with engine oil before installation. Check for restriction of oil spray in valve tappet chamber and correct as necessary.

h. Clean valves and guides as required and avoid excessive engine idling when possible.

i. Readjust carburetor. Clean valves and guides as required.

ENGINE NOISES

83. PISTON RING NOISE

Possible Causes

a. Broken ring or rings.

b. Top ring striking cylinder ridge.

c. Broken ring lands.

Remedies

a. Replace broken ring, or rings as required. Check to determine cause of breakage and correct as necessary.

b. Remove ridge at top of cylinders, as required, using suitable ridge reamer. Check rings and piston for possible damage and replace parts as necessary.

c. Replace pistons as needed. Check for ridge at top of cylinder wall and remove, using suitable ridge reamer. Replace parts as required.

84. PISTON NOISE

Possible Causes

a. Piston pin fit too tight.

b. Excessive piston to cylinder wall clearance.

c. Carbon accumulations in head.

d. Collapsed piston skirt.

e. Insufficient clearance at top ring land.

f. Broken piston, skirt or ring land.

Remedies

a. Refit piston pins as required. Fit pins at normal room temperature, 70 degrees F. Use a thumb press fit.

b. Replace pistons as required. Check cylinder walls for excessive wear. If necessary, recondition cylinder walls and install new pistons and rings.

c. Remove cylinder head and clean carbon from chamber, pistons, and valves. Drain and refill crankcase with a good grade of lubricating oil.

d. Replace pistons as required. Check cylinder walls for possible scoring, and recondition as necessary.

e. Check piston clearance. If necessary, refit pistons.

f. Remove pistons as required. Check cylinder walls for possible scoring or damage. Recondition walls, if necessary, and install new pistons.

85. BROKEN PISTON RINGS

Possible Causes

a. Wrong type or size.

b. Undersize pistons.

c. Ring striking top ridge.

d. Worn ring grooves.

e. Broken ring lands.

f. Insufficient gap clearance.

g. Excessive side clearance in groove.

h. Uneven cylinder walls (particularly due to a previous ring breakage in same cylinder).

Remedies

a. Replace rings as required, after checking cylinder walls for possible scoring or grooving. When replacing rings, use only those that are of the correct type and size for the particular engine.

b. Fit new pistons and rings. Check cylinder walls for possible scoring or grooving. Recondition walls as required.

c. Replace rings, as required, after checking cylinder walls for possible scoring or grooving. Remove ridge and recondition walls, if necessary.

d. Fit new pistons and rings, after checking cylinder walls for possible scoring or grooving. Recondition cylinder walls as required.

e. Fit new pistons and rings as required, after checking cylinder walls for possible scoring or grooving. Recondition cylinder walls if necessary.

f. Replace rings as required. Check walls for damage and recondition if necessary.

g. Replace broken rings as required. Inspect cylinder walls for damage and recondition if necessary.

h. Fit new pistons and rings, after reconditioning cylinder walls.

86. BROKEN PISTONS

Possible Causes

a. Undersize pistons.

b. Excessively tapered cylinders.

c. Misaligned connecting rods.

d. Engine overheating.

e. Cracks at expansion slots (excess engine speed with no load).

f. Water or fuel leakage into combustion chamber.

g. Detonation.

h. Resizing of pistons.

Remedies

a. Recondition cylinder walls if necessary. Then, "mike" walls and fit new pistons and rings.

b. Recondition cylinder walls and fit new pistons and rings.

c. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Realign connecting rods.

d. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Refer to Cooling System section for possible causes and remedies of engine overheating.

e. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Avoid the practice of "racing" the engine during the warm-up period or afterwards.

f. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Check cylinder head, gasket and cylinder block for leaks. Repair as necessary.

g. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Check for excessive spark knock and pre-ignition or detonation. Then, adjust as required.

h. Recondition cylinder walls if necessary. Then, fit new pistons and rings. Avoid the use of resized pistons.

87. NOISY VALVES

Possible Causes

a. Incorrect tappet clearance.

b. Worn tappets or adjusting screws.

c. Wear in cam lobes.

d. Worn valve guides.

e. Excessive runout of valve seat or valve face.

Remedies

Refer to Paragraph 80 of this section for noisy valve remedies.

88. CONNECTING ROD NOISE

Possible Causes

a. Low oil pressure.

b. Insufficient oil supply.

c. Thin or diluted oil.

d. Misaligned rods.

e. Excessive bearing clearance.

f. Eccentric or out-of-round crank pin journal.

Remedies

a. Refer to Paragraph 91 for possible causes of low oil pressure. Correct as indicated in remedies.

b. Check oil level in crankcase. If necessary, add oil to obtain correct level, or drain and refill. Test for possible loose or damaged rod bearings.

c. Drain and refill crankcase. Then, test for possible loose or damaged rod bearings.

d. Check rods for alignment. If necessary, straighten rod or install new one. Check bearings and journals for excessive wear. Replace parts as required.

e. Replace worn bearings as required. Fit connecting rod bearings to the desired clearance. Refer to Service Standards.

f. Replace or regrind crankcase as necessary. Replace with new undersize bearings after grinding operation is completed.

89. MAIN BEARING NOISE

Possible Causes

a. Low oil pressure.

b. Insufficient oil supply.

c. Thin or diluted oil.

d. Loose flywheel or fluid coupling (if truck is so equipped).

e. Excessive bearing clearance.

f. Excessive end play.

g. Eccentric or out-of-round journals.

h. Sprung crankshaft.

Remedies

a. Refer to Paragraph 91 for possible causes for low oil pressure. Correct as indicated in remedies.

b. Check oil level in crankcase. If necessary, add oil to obtain correct level, or drain and refill. Test for possible loose or damaged main bearings.

c. Drain and refill crankcase. Then, test for possible loose or damaged main bearings.

d. Tighten fly wheel or fluid coupling bolts (if truck is so equipped) to specified torque.

e. Replace worn bearings as required. Fit main bearings to the desired clearance. Refer to Service Standards.

f. Refer to remedy *e* above for correction of this condition.

g. Replace crankshaft or regrind journals as necessary. Replace with new undersize bearings when grinding operation is completed.

h. Replace or straighten crankshaft as necessary. Then, check condition of bearings and replace as required.

90. HYDRAULIC VALVE TAPPETS — NOISE

When unusual noises are believed to originate in the hydraulic valve tappet mechanism, check for the following conditions:

a. Dull Knock, Engine Idling:

Solid camshaft timing gear substituted for anti-backlash gear.

b. Pronounced Valve Tappet Noise:

Dirt in hydraulic tappet.

Ball check in tappet not seating.

"Leak down" rate excessive due to worn plunger in tappet assembly.

Worn or chipped tappet face.

No engine oil pressure.

91. LOW OIL PRESSURE

Possible Causes

a. Thin or diluted oil.

b. Worn or damaged oil pump rotors.

c. Inaccurate oil pressure gauge.

d. Loose oil pump cover.

e. Oil relief valve spring broken or weak.

f. Plugged oil pump screen.

g. Excessive clearance at main bearings.

h. Excessive clearance at rod bearings.

i. Excessive clearance at camshaft bearings.

j. Low oil level.

k. Loose connections or restricted lines.

Remedies

a. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Check for cause of dilution and correct as necessary.

b. Remove oil pump and recondition as necessary.

c. Test oil pressure gauge and replace if it does not meet specifications.

d. Remove oil pump cover and replace cover gasket. Replace cover and tighten cover bolts securely.

e. Replace broken or damaged relief valve spring.

f. Check oil strainer for freeness. Then, remove and clean with a suitable solvent. Refill crankcase with a good grade of motor oil of the correct viscosity.

g. Check amount of oil leakage at main bearings. Replace main bearings as required.

h. Check amount of oil leakage at rod bearings. Replace rod bearings as required.

i. Check amount of oil leakage at camshaft bearings. Replace camshaft bearings as required.

j. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity.

k. Clear all lines with air pressure. Then, tighten connections securely. Replace parts as necessary.

92. HIGH OIL PRESSURE

Possible Causes

a. Heavy engine oil.

b. Relief valve stuck.

c. Stiff relief valve spring.

d. Inaccurate pressure gauge.

e. Restricted or partially clogged passage at relief valve.

Remedies

a. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity.

b. Service the relief valve to eliminate sticking.

c. Replace relief valve spring.

d. Test oil pressure gauge and replace if it does not meet specifications.

e. Remove relief valve plug, spring and valve plunger. Then, clear passage with air pressure.

93. OIL PUMP NOISE

Possible Causes

a. End play in pump shaft.

b. Damaged or worn driven gear.

c. Damaged or worn camshaft gear.

d. Improper mesh of driving and driven gears.

e. Oil pump not securely mounted.

Remedies

a. Refer to Service Standards for proper end play specifications. Recondition as necessary to correct this condition.

b. Replace worn or damaged driven gear. Check mating gear on camshaft. If necessary, replace camshaft.

c. Refer to *b* above for correction of this condition.

d. Check for burrs, dirt or buckled gasket where oil pump seats in block. Check driving and driven gears for excessive wear or damage. Replace parts as necessary.

e. Remove pump and inspect for possible damage. Tighten oil pump mounting bolts to proper torque.

94. CONTAMINATED OR DILUTED OIL

Possible Causes

a. Infrequent oil change.

b. Failure to service oil filter.

c. Incomplete combustion.

d. Low engine temperature.

e. Poor grade of oil.

f. Internal leak from cooling system.

g. Frequent stop and go service.

h. Inadequate crankcase ventilation.

Remedies

a. Drain and refill crankcase, at the proper time or mileage, using a good grade of motor oil of the correct viscosity. Refer to Lubrication section.

b. Oil filter, or oil filter element, should be changed every 5,000 miles, or more often, depending upon conditions. Refer to Lubrication section.

c. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Check ignition system, as outlined in Electrical System section.

d. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Check and test thermostat, as outlined in Cooling System section. Replace parts as required.

e. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Refer to Lubrication section. Check and determine cause of contamination and correct as required.

f. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Check cooling system, as outlined in Cooling System section.

g. Drain and refill crankcase, using a good grade of motor oil of the correct viscosity. Frequent stop and go driving does not allow the engine to operate at the proper operating temperature that will permit vaporization of moisture accumulated in the crankcase.

h. Drain and refill crankcase, using a good grade of oil of the correct viscosity. Refer to Lubrication section. Also, refer to Crankcase Ventilation, Paragraphs 61 and 62, in this section and correct the condition.

SECTION 8

ENGINE

SERVICE BULLETIN REFERENCE

NUMBER	DATE	SUBJECT	CHANGES