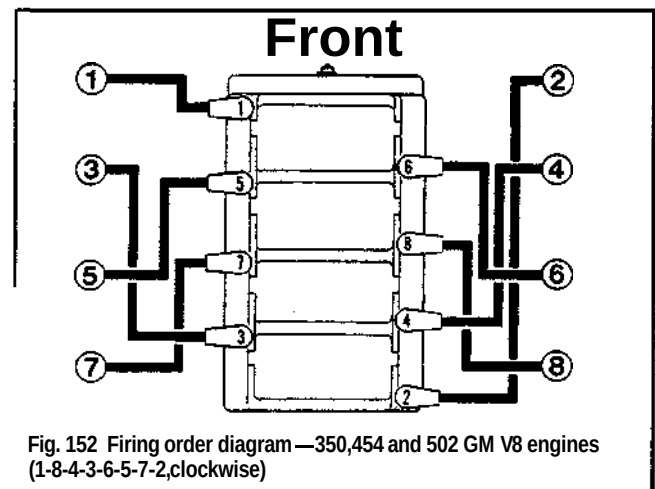
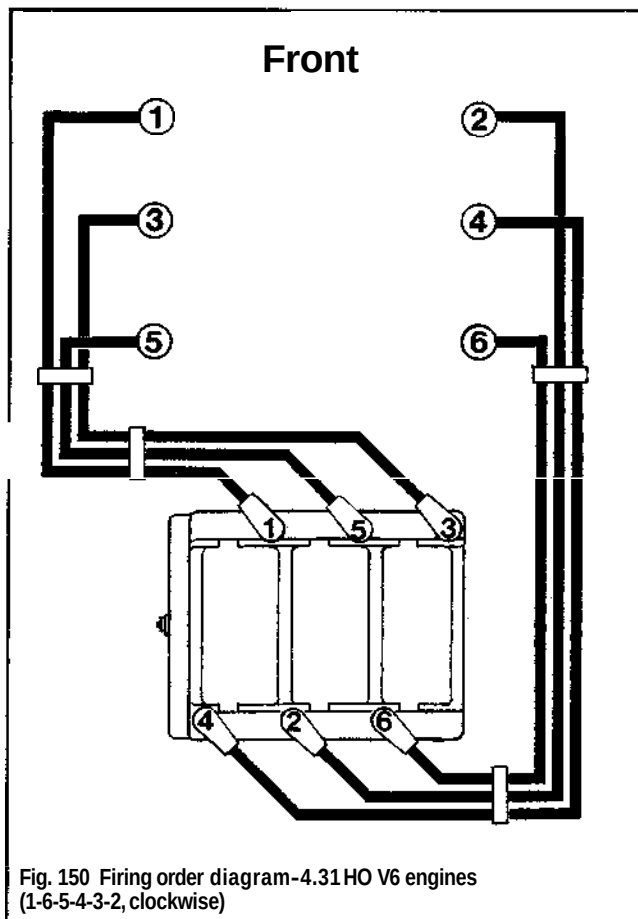
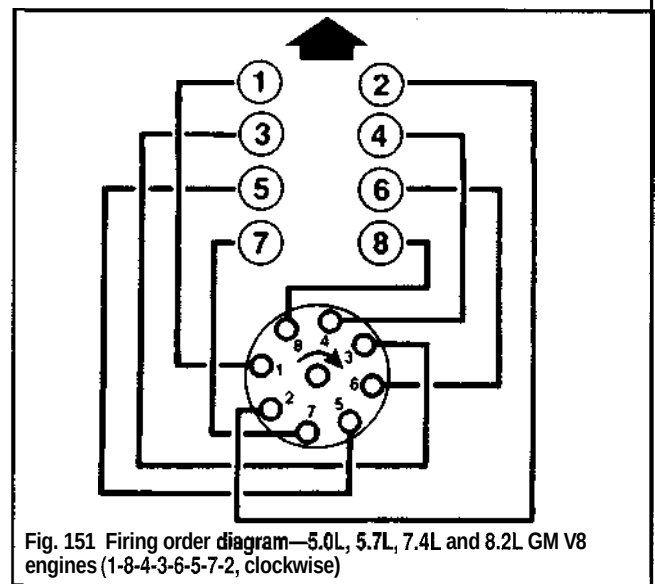
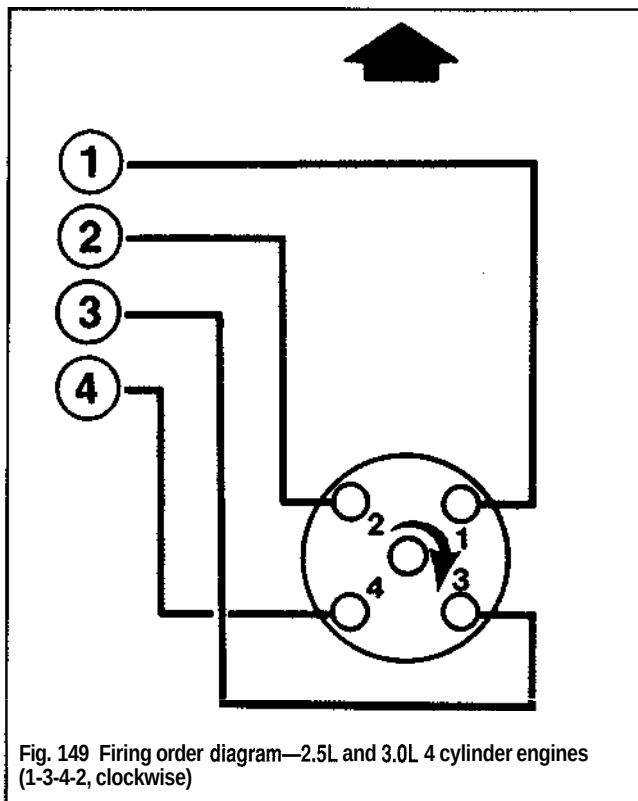
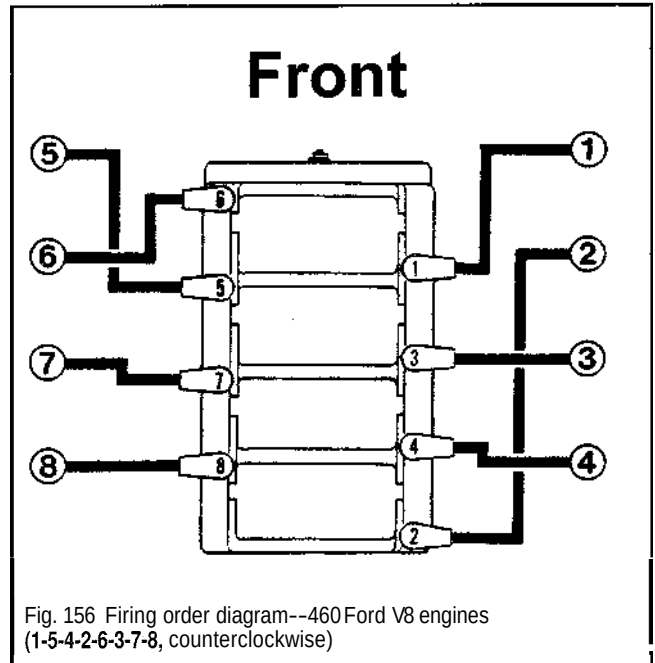
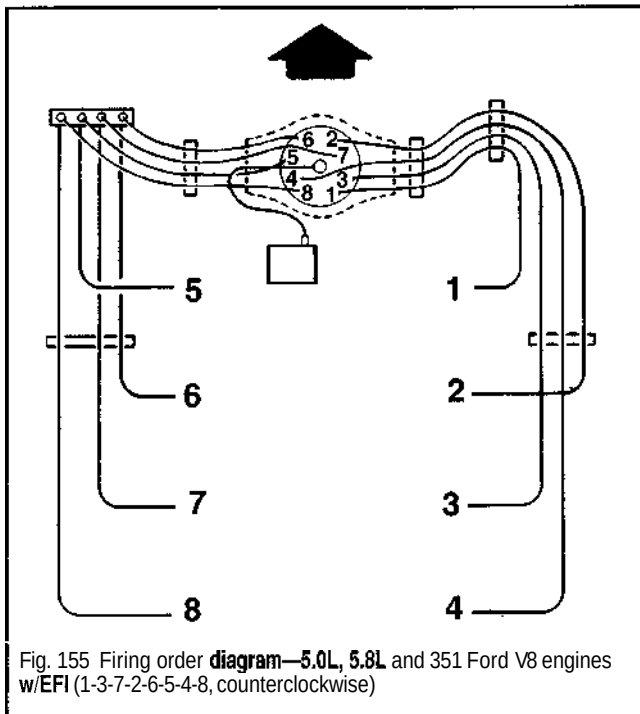
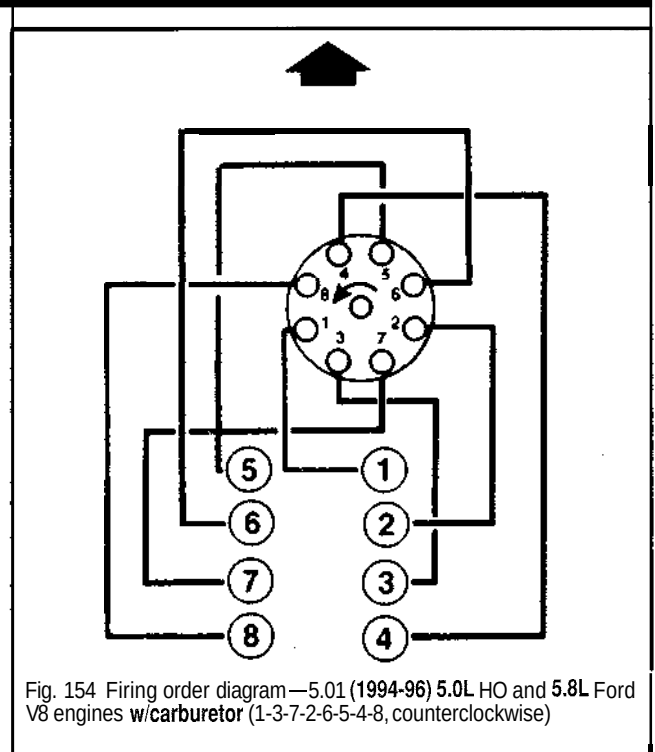
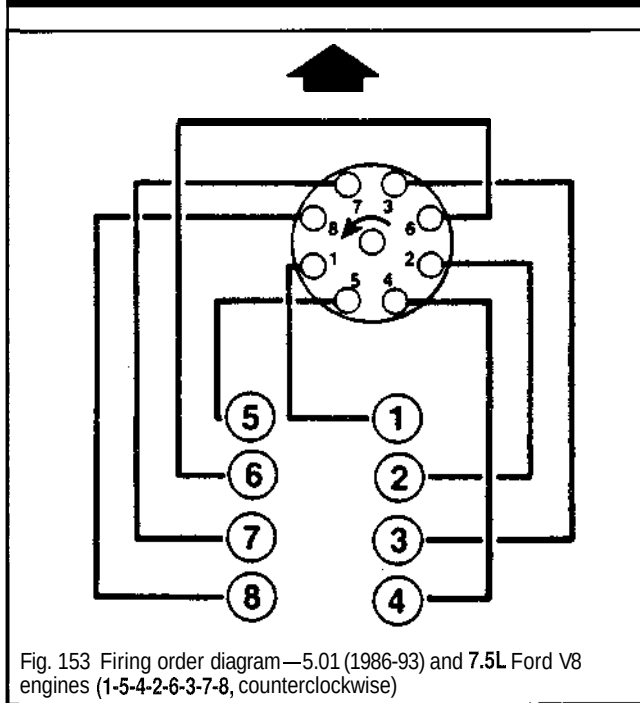




2-54 ENGINE AND DRIVE MAINTENANCE



Engine Model Applications Applications—1986-89

ENGINE MODEL APPLICATIONS

Year	Model	Model Number	Displacement L/Cu. In.	Engine Type	Horsepower (At Prop.)	Fuel Delivery	Stem Drive
1986	2.5	252AMKW5, 252APKW5	2.5/153	L4	NA	2 bbl	Cobra
	3.0	302AMKW5, 302APKW5	3.0/181	L4	NA	2 bbl	Cobra
	4.3	432AMKW5, 432AMWXS, 432APKW5, 432APWXS	4.3/262	V6	NA	2 bbl	Cobra
		434AMKW5, 434AMWXS, 434APKW5, 434APWXS	4.3/262	V6	NA	4 bbl	Cobra
	5.0	504AMKW5, 504AMWXS, 504APKW5, 504APWXS	5.0/305	V8	185	4 bbl	Cobra
	5.7	574AMKW5, 574AMWXS, 574APKW5, 574APWXS	5.7/350	V8	230	4 bbl	Cobra
	1987	2.3	232AMFTC, 232APFTC, 232APSRC	2.3/140	L4	NA	2 bbl Cobra
		3.0	302AMARJ, 302AMFTC, 302APFTC, 302APSRC, 302APSRV	3.0/181	L4	NA	2 bbl Cobra
		4.3	432AMFTC, 432AMARY, 432APFTC, 432APARY, 432APSRC, 432APSRV	4.3/262	V6	NA	2 bbl Cobra
			434AMFTC, 434AMARY, 434APFTC, 434APARY, 434APSRC, 434APSRV	4.3/262	V6	NA	4 bbl Cobra
		5.0	504AMFTC, 504AMARY, 504APFTC, 504APARY	5.0/305	V8	185	4 bbl Cobra
		5.7	574AMFTC, 574AMARY, 574APFTC, 574APARY, 574APSRC	5.7/350	V8	230	4 bbl Cobra
		7.5	754APFTC, 754APSRC, 754BPFTC, 754BPSRC	7.5/460	V8	335	4 bbl Cobra
						440	Cobra
1988	2.3	232AMRGDE, 232AMRGDP, 232APRGDE, 232APRGDP	2.3/140	L4	NA	2 bbl	Cobra
	3.0	302AMRGDP, 302APRGDP	3.0/181	L4	NA	2 bbl	Cobra
	4.3	432AMLGDP, 432APRGDE, 432APRGDP	4.3/262	V6	NA	2 bbl	Cobra
			434AMLGDP, 434APRGDP	4.3/262	V6	NA	4 bbl Cobra
		5.0	502AMLGDP, 502APRGDP	5.0/305	V8	NA	2 bbl Cobra
			504AMLGDP, 504APRGDP	5.0/305	V8	185	4 bbl Cobra
		5.7	574AMLGDP, 574APRGDP	5.7/350	V8	230	4 bbl Cobra
			574BMLGDP, 574BPLGDP				King Cobra
		7.4 454	744AMRGDP, 744APRGDP	7.4/454	V8	NA	4 bbl King Cobra
		7.5 460	754BMLGDP, 754BPRGDP	7.5/460	V8	NA	4 bbl King Cobra
1989	2.3	232BMRMED, 232BMRMEF, 232BPRMED, 232BPRMEF	2.3/140	L4	NA	2 bbl	Cobra
	3.0	302AMRMED, 302APRMED	3.0/181	L4	120	2 bbl	Cobra
	4.3	432AMLMED, 432APRMED	4.3/262	V6	160	2 bbl	Cobra
	5.0	502AMLMED, 502APRMED	5.0/302	V8	200	2 bbl	Cobra
			502BPRMED	5.0/302	V8	185	2 bbl Cobra
		5.7	574AMLMED, 574APRMED	5.7/350	V8	230	4 bbl Cobra
		5.8	584AMLMED, 584APRMED	5.8/351	V8	235	4 bbl Cobra
		262	262AMLMED, 262APRMED	4.3/262	V6	NA	4 bbl King Cobra
		350	350APRMED, 350AMLMED	5.7/350	V8	NA	4 bbl King Cobra
		460	460AMLMED, 460APRMED	7.5/460	V8	NA	4 bbl King Cobra

NA Not Available

Engine Model Applications Applications—1990-92

ENGINE MODEL APPLICATIONS

Year	Model	Model Number	Displacement L/Cu. In.	Engine Type	Horsepower (At Prop.)	Fuel Delivery	Stem Drive
1990	2.3	232BMRPWS, 232BPRPWS	2.3/140	L4	NA	2 bbl	Cobra
	3.0	302AMRPWSC, 302BMRPWS, 302BMRPWR, 302APRPWC, 302BPRPWS, 302BPRPWR	3.0/181	L4	120	2 bbl	Cobra
	3.0 HO	302CPRPWS, 302CPRPWR, 302CMLPWS, 302CMLPWR, 302CMRPWS, 302CMRPWR	3.0/181	L4	NA	2 bbl	Cobra
	4.3	432APRPWS, 432AMLPSWS	4.3/262	V6	160	2 bbl	Cobra
	4.3 HO	434APRPWS, 434AMLPSWS	4.3/262	V6	NA	4 bbl	Cobra
	5.0	502BPRPWS	5.0/302	V8	185	2 bbl	Cobra
	5.0 HO	502APRPWS, 502AMLPSWS	5.0/302	V8	200	2 bbl	Cobra
	5.7	574APRPWS, 574AMLPSWS	5.7/350	V8	230	4 bbl	Cobra
	5.7 LE	574APPWS	5.7/350	V8	NA	4 bbl	King Cobra
	5.8	584APRPWS, 584AMLPSWS	5.8/351	V8	235	4 bbl	Cobra
1991	350	574BPPWS	5.7/350	V8	NA	4 bbl	King Cobra
	454	744APPWS	7.4/454	V8	NA	4 bbl	King Cobra
	460	754APPWS	7.5/460	V8	NA	4 bbl	King Cobra
	3.0	302BMRRGD	3.0/181	L4	120	2 bbl	Cobra
	3.0 HO	302CPRRGD, 302CMRRGD	3.0/181	L4	NA	2 bbl	Cobra
	4.3	432APRRGD, 432APLRGD	4.3/262	V6	160	2 bbl	Cobra
	4.3 HO	434APRRGD, 434APLRGD	4.3/262	V6	NA	4 bbl	Cobra
	5.0	502BPRRGD	5.0/302	V8	185	2 bbl	Cobra
	5.0 HO	502APRRGD, 502APLRGD	5.0/302	V8	200	2 bbl	Cobra
	5.7	574APRRGD, 574APLRGD	5.7/350	V8	230	4 bbl	Cobra
1992	5.7 LE 350	574APERGD, 574BPERGD	5.7/350	V8	NA	4 bbl	King Cobra
	5.8	584APRRGD, 584APLRGD	5.8/351	V8	235	4 bbl	Cobra
	7.4GL, 454	744APERGD, 744BPERGF	7.4/454	V8	300	4 bbl	King Cobra
	454 HO	744APERG					
	3.0	302BMRAMH	3.0/181	L4	120	2 bbl	Cobra
	3.0 HO	302CPRAMH, 302CMRAMH	3.0/181	L4	NA	2 bbl	Cobra
	4.3	432APRAMH, 432APLAMH	4.3/262	V6	160	2 bbl	Cobra
	5.0	502BPRAMH	5.0/302	V8	185	2 bbl	Cobra
	5.0 HO	502APRAMH, 502APLAMH	5.0/302	V8	200	2 bbl	Cobra
	5.7	574APRAMH, 574APLAMH	5.7/350	V8	230	4 bbl	Cobra
1992	5.7 LE	574APEAMH, 574BPEAMH	5.7/350	V8	NA	4 bbl	King Cobra
	5.8	584APRAMH, 584APLAMH	5.8/351	V8	235	4 bbl	Cobra
	5.8 LE 351	584DPEAMH	5.8/351	V8	235	4 bbl	King Cobra
	7.4GL, 454	744CPEAMH, 744DPEAMH	7.4/454	V8	300	4 bbl	King Cobra
	454 HO	744DPPAMH					
	8.2GL, 502	824BPEAMH	8.2/502	V8	390	4 bbl	King Cobra
	NA Not Available						

Engine Model Applications Applications--1993-96

ENGINE MODEL APPLICATIONS

Year	Model	Model Number	Displacement L/Cu. In.	Engine Type	Horsepower (At Prop.)	Fuel Delivery	Stern Drive
1993	3.0	302BMRJVB	3.0/181	L4	120	2 bbl	Cobra
	3.0 HO	302CPRJVB, 302CMRJB	3.0/181	L4	130	2 bbl	Cobra
	4.3	432APRJVB, 432APLJVB, 432APRJVN, 432APLJVN	4.3/262	V6	160	2 bbl	Cobra
	4.3 HO	434APRJVB, 434APLJVB, 434APRJVN, 434APLJVN	4.3/262	V6	NA	2 bbl	Cobra
	5.0	502BPRJVB	5.0/302	V8	185	2 bbl	Cobra
	5.0 HO	502APRJVB, 502APLJVB	5.0/302	V8	200	2 bbl	Cobra
	5.0 EFI	50FAPRJVB, 50FAPLJVB, 50FAPRJVN, 50FAPLJVN	5.0/302	V8	215	EFI	Cobra
	5.8	584APRJVB, 584APLJVB	5.8/351	V8	235	4 bbl	Cobra
	5.8 EFI	58FAPRJVB, 58FAPLJVB	5.8/351	V8	240	EFI	Cobra
	5.8 LE, 351	584DPEJVB, 584DPPJVB, 58F8PEJVB, 58F8PPJVB	5.8/351	V8	NA	4 bbl	King Cobra
	7.4GL 454	744CPEJVB, 744DPEJVB	7.4/454	V8	3W	4 bbl	King Cobra
	454 HO	744DPPJVB					
	8.2GL, 502	824BPEJVB	8.2/502	V8	390	4 bbl	King Cobra
1994	3.0GL	302DCMMDA, 302DGMMDA	3.0/181	L4	120	2 bbl	Cobra
	3.0GS	302CCPMDA, 302CGPMDA	3.0/181	L4	135	2 bbl	Cobra
	4.3GL	432ACMMDA, 432ACPMDA, 432AGMMDA, 432AGPMDA	4.3/262	V6	160	2 bbl	Cobra
	5.0FL	502ACPMDA, 502AGPMDA	5.0/302	V8	190	2 bbl	Cobra
	5.0FI	50FACPMDA, 50FAGPMDA	5.0/302	V8	215	EFI	Cobra
	5.7GL	572ACPMDA, 572AGPMDA	5.7/350	V8	225	2 bbl	Cobra
	5.8FL	584ACPMDA, 584AGPMDA	5.8/351	V8	230	4 bbl	Cobra
	5.8FI	58FACPMDA, 58FAGPMDA	5.8/351	V8	255	EFI	Cobra
	351 EFI	58F8CPMDA	5.8/351	V8	285	EFI	King Cobra
	7.4GL	744CCPMDA, 744DDPMDA, 744CGPMDA, 744JPMMDA	7.4/454	V8	300	4 bbl	King Cobra
1995	3.0GS	302CMHUB, 302CPHUB	3.0/181	L4	130	2 bbl	Cobra
	4.3GL	432APHUB	4.3/262	V6	160	2 bbl	Cobra
	5.0FL	502APHUB	5.0/302	V8	190	2 bbl	Cobra
	5.0 EFI	50FAPHUB	5.0/302	V8	220	EFI	Cobra
	5.8FL	584APHUB	5.8/351	V8	235	4 bbl	Cobra
	5.8 EFI	58FAPHUB	5.8/351	V8	255	EFI	Cobra
	5.8 HO EFI	58FBPHUB	5.8/351	V8	265	EFI	Cobra
	7.4GL	744DPHUB	7.4/454	V8	300	4 bbl	King Cobra
	7.4 EFI	74FEPHUB	7.4/454	V8	330	MPI	King Cobra
1996	3.0GS	302CMNCA, 302CPNCA	3.0/181	L4	130	2 bbl	SP
	4.3GL	432APNCA	4.3/262	V6	160	2 bbl	SP/DP
	4.3GI	43FAPNCA	4.3/262	V6	180	TBI	SP/DP
	4.3GS	434APNCA	4.3/262	V6	185	4 bbl	SP/DP
	5.0FL	502APNCA	5.0/302	V8	190	2 bbl	SP/DP
	5.0FI	50FAPNCA	5.0/302	V8	220	EFI	SP/DP
	5.7GI	57FAPNCA	5.7/350	V8	250	TBI	SP/DP
	5.8FL	584APNCA	5.8/351	V8	235	4 bbl	SP/DP
	5.8FI	58FCPNCA	5.8/351	V8	255	EFI	SP/DP
	5.8FSI	58FBPNCA	5.8/351	V8	265	EFI	SP/DP
	7.4GL	744EPNCA	7.4/454	V8	300	4 bbl	SP/DP
	7.4GI	74FFPNCA	7.4/454	V8	330	MPI	SP/DP
	EFI	Electronic Fuel Injection	SP	Single Prop			
	MPI	Multi-Port Injection	DP	DuoProp			
	TBI	Throttle Body Injection	NA	Not Available			

Engine Model Applications Applications—1997-98

ENGINE MODEL APPLICATIONS

Year	Model	Model Number	Displacement L/Cu. In.	Engine Type	Horsepower (At Prop.)	Fuel Delivery	Stern Drive
1997	3.0GS	302CMILKD, 302CPLKD	3.0/181	L4	135	2 bbl	SP
	4.3GI	43FBPLKD	4.3/262	V6	205	TBI	SP/DP
	4.3GL	432BPLKD	4.3/262	V6	190	2 bbl	SP/DP
	4.3GS	434BPLKD	4.3/262	V6	205	4 bbl	SP/DP
	5.7GI	57FAPLKD	5.7/350	V8	250	TBI	SP/DP
	5.7GL	572BPLKD, 572BPLKR	5.7/350	V8	215	2 bbl	SP/DP
	5.7GS	574BPLKD	5.7/350	V8	250	4 bbl	SP/DP
	5.7GSI	57FCPLKD	5.7/350	V8	280	TBI	SP/DP
	7.4GI	74FCPLKD	7.4/454	V8	330	MPI	SP/DP
	7.4GL	744FPLKD	7.4/454	V8	300	4 bbl	SP/DP
1998	3.0GS	302CMBYC, 302CPBYC	3.0/181	L4	135	2 bbl	SP
	4.3GI	43FBPBYC	4.3/262	V6	205	TBI	SP/DP
	4.3GL	432BPBYC	4.3/262	V6	190	2 bbl	SP/DP
	4.3GS	434BPBYC	4.3/262	V6	205	4 bbl	SP/DP
	5.0GL	502BPBYC	5.0/305	V8	220	2 bbl	SP/DP
	5.7GS	572BPBYC	5.7/350	V8	250	2 bbl	SP/DP
	5.7GSI	57FCPBYC	5.7/350	V8	280	TBI	SP/DP
	7.4GI	74FJPBYC	7.4/454	V8	310	MPI	SP/DP
	7.4GSI	74FHPBYC	7.4/454	V8	385	MPI	DP
	8.2GSI	82FCPBYC	8.2/502	V8	415	MPI	DP

EFI Electronic Fuel Injection
 MPI Multi-Port Injection
 TBI Throttle Body Injection
 SP Single Prop
 DP DuoProp
 NA Not Available

TUNE-UP SPECIFICATIONS 1986-88

Year	Model	Spark Plug		Gap In. (mm)	Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT (rpm)	Idle Mixture (Turns Out)	Point Gap In. (mm)	Dwell (Deg.)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Champion	AC									
1986	2.5	RV8-C	MR43T	0.035 (0.9)	①	500-600	4200-4600	2	0.019 (0.48)	32-34	3.5-6	130
	3.0	RV8-C	MR43T	0.035 (0.9)	①	500-600	4200-4600	2	0.019 (0.48)	32-34	3.5-6	130
	4.3 (2bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4200-4600	2.5	0.019 (0.48)	37-41	5.75-7	160-175
	4.3 (4bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4400-4800	3 3/4	0.019 (0.48)	37-41	5.75-7	160-175
	5.0	RV8-C	MR44T	0.035 (0.9)	③	500-600	4200-4600	3 3/4	0.018 (0.45)	28-32	5.75-7	150-160
	5.7	RV8-C	MR43T	0.035 (0.9)	④	500-600	4200-4600	3 3/4	0.018 (0.45)	28-32	5.75-7	150-160
1987	2.3	RS12YC	AWSF-32 ⑥	0.035 (0.9)	10	600-650	5200-5600	2 1/2	0.018 (0.45)	34-38	3.5-6	165
	3.0	RV8-C	MR43T	0.035 (0.9)	①	500-600	4200-4600	2	0.019 (0.48)	31-34	3.5-6	130
	4.3 (2bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4200-4600	2.5	0.019 (0.48)	37-41	5.75-7	160-175
	4.3 (4bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4400-4800	3 3/4	0.019 (0.48)	37-41	5.75-7	160-175
	5.0	RV8-C	MR44T	0.035 (0.9)	⑥	500-600	4200-4600	3 3/4	0.018 (0.45)	28-32	5.75-7	150-160
	5.7	RV8-C	MR43T	0.035 (0.9)	⑦	500-600	4200-4600	3 3/4	0.018 (0.45)	28-32	5.75-7	150-160
	7.5	RS12YC	AWSF-32 ⑧	0.035 (0.9)	⑧	600-650	4400-4800	3 3/4	0.017 (0.43)	29-33	5.75-7	165
1988	2.3	RS12YC	AWSF-32 ⑤	0.035 (0.9)	10	600-650	5200-5600	1/2	0.018 (0.45)	34-38	3.5-6	165
	3.0	RV8-C	MR43T	0.035 (0.9)	①	500-600	4200-4600	2	0.019 (0.48)	31-34	3.5-6	130
	4.3 (2bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4200-4600	5/8	0.019 (0.48)	37-41	5.75-7	160-175
	4.3 (4bbl)	RV8-C	MR43T	0.035 (0.9)	②	500-600	4400-4800	1 1/2	0.019 (0.48)	37-41	5.75-7	160-175
	5.0	RV8-C	MR44T	0.035 (0.9)	④	500-600	4200-4600	⑥	0.017 (0.43)	27-31	5.75-7	150-160
	5.7	RV8-C	MR43T	0.035 (0.9)	⑨	500-600	4200-4600	3 3/4	0.017 (0.43)	27-31	5.75-7	150-160
	7.4 454	RV8-C	MR43T	0.035 (0.9)	⑨	500-600	4200-4600	3 3/4	0.017 (0.43)	27-31	5.75-7	150-160
	7.5 460	RV12YC	ARF-32 ⑤	0.035 (0.9)	⑨	600-650	4400-4800	1 1/2	0.017 (0.43)	29-33	5-6	165

NA Not adjustable

- ① 1 ATDC w/86 AKI octane; 4 BTDC w/89 AKI octane
- ② 1 BTDC w/86 AKI octane; 6 BTDC w/89 AKI octane
- ③ 8 BTDC w/86 AKI octane; 13 BTDC w/89 AKI octane
- ④ 5 BTDC w/86 AKI octane, 10 BTDC w/89 AKI octane
- ⑤ Motorcraft

- ⑥ 504AMFTC & 504APFTC: 8 BTDC w/86 AKI octane; 13 BTDC w/89 AKI octane
504AMARY & 504APARY: 5 BTDC w/86 AKI octane; 10 BTDC w/89 AKI octane
- ⑦ 574AMFTC & 574APFTC: 5 BTDC w/86 AKI octane; 10 BTDC w/89 AKI octane
574AMARY & 574APARY: 3 BTDC w/86 AKI octane; 8 BTDC w/89 AKI octane
- ⑧ 10 BTDC w/86 AKI octane; 15 BTDC w/89 AKI octane
- ⑧ 3 BTDC w/86 AKI octane; 8 BTDC w/89 AKI octane
- ⑨ 2 112, 4 bbl: 3 314

TUNE-UP SPECIFICATIONS 1989-90

Year	Model	Spark Plug			Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT rpm)	Idle Mixture (Turns Out)	Point Gap In. (mm)	Dwell (Deg.)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Champion	AC	Gar, In. (mm)								
1989	2.3	RS12YC	AWSF-32 ^③	0.035 (0.9)	10	600-650	5200-5600	1/2	0.019 (0.48)	34-38	5.75-7	155-165
	3.0	RV8-C	MR43T	0.035 (0.9)	①	550-600	4200-4600	2	0.019 (0.48)	31-34	5.75-7	130
	4.3 (2bbl)	RV8-C	MR43T	0.035 (0.9)	②	550-600	4200-4600	5/8	0.019 (0.48)	37-41	5.75-7	160-175
	4.3 (4bbl)	RV8-C	MR43T	0.035 (0.9)	②	550-600	4400-4800	1 1/2	0.019 (0.48)	37-41	5.75-7	160-175
	5.0	RV8-C	MR44T	0.035 (0.9)	10	550-600	4000-4400	1 1/2	0.018 (0.45)	27-31	5.75-7	145-155
	5.7	RV8-C	MR43T	0.035 (0.9)	8	550-600	4200-4600	3 3/4	0.018 (0.45)	27-31	5.75-7	150-160
	5.8	RV8-C	MR43T	0.035 (0.9)	10	550-600	4000-4400	1 1/2	0.018 (0.45)	27-31	5.75-7	145-155
	262	RV8-C	MR43T	0.035 (0.9)	②	550-600	4400-4800	1 1/2	0.019 (0.48)	37-41	5.75-7	160-175
	350	RV8-C	MR43T	0.035 (0.9)	8	550-600	4200-4600	3 3/4	0.018 (0.45)	27-31	5.75-7	150-160
	460	RV12YC	ASF-32M ^③	0.035 (0.9)	10	600-650	4400-4800	1 1/2	0.018 (0.45)	27-31	5-6	155-165
1990	2.3	RS12YC	AWSF-32 ^③	0.035 (0.9)	10	600-650	5200-5600	1/2	0.019 (0.48)	34-38	5.75-7	75% of Highest
	3.0	⑦	⑦	0.035 (0.9)	0 ⑧	550-600	4200-4600	3/4	NA	NA	5.75-7	75% of Highest
	3.0 HO	RS12YC	MR43LTS	0.035 (0.9)	0 ⑧	550-600	4200-4600	1 (Starboard) 1/2 (Port)	NA	NA	5.75-7	75% of Highest
	4.3	RV8-C	MR43T	0.035 (0.9)	②	550-600	4200-4600	5/8	0.019 (0.48)	37-41	5.75-7	75% of Highest
	4.3 HO	RV8-C	MR43T	0.035 (0.9)	NA	550-600	4400-4800	3/4	NA	NA	5.75-7	75% of Highest
	5.0	RV8-C	MR43T	0.030 (0.76)	10	550-600	4200-4600	1 1/2	0.018 (0.45)	27-31	5.75-7	75% of Highest
	5.0 HO	RV8-C	MR43T	0.030 (0.76)	10	550-600	4200-4600	1	0.018 (0.45)	27-31	5.75-7	75% of Highest
	5.7	RV8-C	MR43T	0.035 (0.9)	8	550-600	4200-4600	1/4	0.018 (0.45)	27-31	5.75-7	75% of Highest
	5.7 LE	RV8-C	MR43T	0.035 (0.9)	8	500-600	4200-4600	1	0.018 (0.45)	27-31	5.75-7	150-160
	5.8	RV8-C	MR43T	0.030 (0.76)	10	550-600	4200-4600	1 1/2	0.018 (0.45)	27-31	5.75-7	75% of Highest
	350	RV8-C	MR43T	0.035 (0.9)	NA	500-600	4200-4600	1	NA	NA	5.75-7	150-160
	454	RV8-C	MR43T	0.035 (0.9)	NA	500-600	4600-5000	1	NA	NA	5.75-7	150-160
	460	RS12YC	MR43TS	0.035 (0.9)	NA	600-650	4400-4800	1 1/2	NA	NA	5-6	155-165

NA Not adjustable

① 1 ATDC w/86-88 AKI octane; 4 BTDC w/89 AKI octane

② 1 BTDC w/86-88 AKI octane; 6 BTDC w/89 AKI octane

③ Motorcraft

④ 504AMFTC & 504APFTC: 8 BTDC w/86 AKI oct; 13 BTDC w/89 AKI oct.

504AMARY & 504APARY: 5 BTDC w/86 AKI oct.; 10 BTDC w/89 AKI oct.

⑤ 574AMFTC & 574APFTC: 5 BTDC w/86 AKI oct; 10 BTDC w/89 AKI oct.
574AMARY & 574APARY: 3 BTDC w/86 AKI oct; 8 BTDC w/89 AKI oct.

⑥ 10 BTDC w/86 AKI octane; 15 BTDC w/89 AKI octane

⑦ PWS: AC-R43TS, Champ.-RV12YC. PWC: AC-MR43T, Champ.-RV8C

⑧ Shunt required

⑨ 3 BTDC w/86-88 AKI octane; 8 BTDC w/89 AKI octane

TUNE-UP SPECIFICATIONS 1991-92

Year	Model	Spark Plug			Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT (rpm)	Distributor Sensor Air Gap In. (mm)	Idle Mixture (Turns Out)	Oil Pressure @ 2000 rpm (psi)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Champion	AC	Gap In. (mm)								
1991	3.0	RV12YC	R43TS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	3/4	40-60	5.75-7	75% of Highest
	3.0 HO	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 1/2 (Port)	40-60	5.75-7	75% of Highest
	4.3	RV8-C	MR43T	0.035 (0.9)	②	550-650	4200-4600	0.008 (0.203)	5/8	40-60	5.75-7	75% of Highest
	4.3 HO	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4400-4800	NA	3/4	40-60	5.75-7	75% of Highest
	5.0	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	1 1/8	40-60	5.75-7	75% of Highest
	5.0 HO	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.7	RV8-C	MR43T	0.035 (0.9)	③	550-650	4200-4600	0.008 (0.203)	1/4	40-60	5.75-7	75% of Highest
	5.7 LE	RV8-C	MR43T	0.035 (0.9)	③	550-650	4200-4600	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.8	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	350	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4200-4600	NA	1	40-60	5.75-7	75% of Highest
	7.4GL, 454	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4000-4400	NA	1/4	40-60	5.75-7	75% of Highest
1992	454 HO	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4600-5000	NA	1/4	40-60	5.75-7	75% of Highest
	3.0	RV12YC	R43TS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	3/4	40-60	5.75-7	75% of Highest
	3.0 HO	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 1/2 (Port)	40-60	5.75-7	75% of Highest
	4.3	RV8-C	MR43T	0.035 (0.9)	②	550-650	4200-4600	0.008 (0.203)	5/8	40-60	5.75-7	75% of Highest
	5.0	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	1 1/8	40-60	5.75-7	75% of Highest
	5.0 HO	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.7	RV8-C	MR43T	0.035 (0.9)	③	550-650	4200-4600	0.008 (0.203)	1/4	40-60	5.75-7	75% of Highest
	5.7 LE	RV8-C	MR43T	0.035 (0.9)	③	550-650	4200-4600	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.8	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	5.8 LE, 351	RS9-YC	RX2CLTS	0.045 (1.14)	NA	550-650	4600-5000	NA	7/8	40-60	5.75-7	75% of Highest
	7.4GL, 454	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4200-4600	NA	1/4	40-60	5.75-7	75% of Highest
	454 HO	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4600-5000	NA	1/4	40-60	5.75-7	75% of Highest
	8.2GL	RV8-C	MR43T	0.045 (1.14)	NA	550-650	4800-5200	NA	1/4	40-60	5.75-7	75% of Highest

NA Not adjustable

① Shunt required

② 1 BTDC w/86-88 AKI octane; 6 BTDC w/89 AKI octane

③ 3 BTDC w/86-88 AKI octane; 8 BTDC w/89 AKI octane

TUNE-UP SPECIFICATIONS 1993-94

Year	Model	Spark Plug		Gap In. (mm)	Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT (rpm)	Distributor Sensor Air Gap In. (mm)	Idle Mixture (Turns Out)	Oil Pressure @ 2000 rpm (psi)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Volvo	Champion									
1993	3.0	RV12YC	R43TS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	3/4	40-60	5.75-7	75% of Highest
	3.0 HO	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 112 (Port)	40-60	5.75-7	75% of Highest
	4.3	RV8-C	MR43T	0.035 (0.9)	②	550-650	4200-4600	0.008 (0.203)	5/8	40-60	5.75-7	75% of Highest
	4.3 HO	RV8-C	MR43T	0.035 (0.9)	②	550-650	4200-4600	0.008 (0.203)	5/8	40-60	5.75-7	75% of Highest
	5.0	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	NA	40-60		75% of Highest
	5.0 HO	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	1 1/8	40-60	5.75-7	75% of Highest
	5.0 EFI	RV8-C	MR43T	0.045 (1.14)	5	600 ④	4200-4600	NA	1 1/8	40-60	5.75-7	75% of Highest
	5.8	RV8-C	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	5.8 EFI	RS9YC	RXZCLTS	0.045 (1.14)	5	600 ④	4200-4600	NA	NA	40-60		75% of Highest
	5.8 LE, 351	RS9YC	RX2CLTS	0.045 (1.14)	10 ⑤	550-650	4600-5000	NA	7/8	40-60	5.75-7	75% of Highest
	7.4GL, 454	RV8-C	MR43T	0.045 (1.14)	10 ⑤	550-650	4200-4600	NA	1/4	40-60	5.75-7	75% of Highest
	454 HO	RV8-C	MR43T	0.045 (1.14)	10 ⑤	550-650	4600-5000	NA	1/4	40-60	5.75-7	75% of Highest
	8.2GL, 502	RV8-C	MR43T	0.045 (1.14)	10 ⑤	550-650	4800-5200	NA	1/4	40-60	5.75-7	75% of Highest
1994	3.0GL	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	3/4	40-60	5.75-7	75% of Highest
	3.0GS	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 112 (Port)	40-60	5.75-7	75% of Highest
	4.3GL	RV15YC4	MR43T	0.045 (1.14)	0 ①	550-650	4200-4600	NA	5/8	40-60	5.75-7	75% of Highest
	5.0Fi	RS12YC	R44LTS	0.045 (1.14)	5	600 ④	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.0FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4200-4600	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.7GL	RV15YC4	MR43T	0.035 (0.9)	③	550-650	4200-4600	0.008 (0.203)	3/4-1	40-60	5.75-7	75% of Highest
	5.8Fi	RS9YC	R42CLTS	0.045 (1.14)	5	600 ④	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.8FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	351 EFI	RS9YC	R42CLTS	0.045 (1.14)	5	600 ④	4600-5000	NA	NA	40-60	31-39	75% of Highest
	7.4GL	RV15YC4	MR43T	0.045 (1.14)	10 ⑤	550-650	4200-4600	NA	1/4	40-60	5.75-7	75% of Highest

NA

Not adjustable

①

Shunt required

②

1 BTDC w/86-88 AKI octane; 6 BTDC w/89 AKI octane

③

3 BTDC w/86-88 AKI octane; 8 BTDC w/89 AKI octane

④

Fixed

⑤

Not adjustable

TUNE-UP SPECIFICATIONS 1995-96

Year	Model	Spark Plug		Gap In. (mm)	Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT (rpm)	Distributor Sensor Air Gap In. (mm)	Idle Mixture (Turns Out)	Oil Pressure @ 2000 rpm (psi)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Volvo	Champion									
1995	3.0GS	RS12YC	R43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 112 (Port)	40-60	5.75-7	75% of Highest
	4.3GL	RV15YC4	MR43T	0.045 (1.14)	②	550-650	4200-4600	NA	5/8	40-60	5.75-7	75% of Highest
	5.0 EFI	RS9YC	R42CLTS	0.045 (1.14)	5	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.0FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4400-4800	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.8 EFI	RS9YC	R42CLTS	0.045 (1.14)	5	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.8FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	5.8 HO EFI	RS9YC	R42CLTS	0.045 (1.14)	5	600 ③	4600-5000	NA	NA	40-60	31-39	75% of Highest
	7.4GL	RV15YC4	MR43T	0.045 (1.14)	10 ③	550-650	4200-4600	NA	1/4	40-60	5.75-7	75% of Highest
1996	7.4 EFI	RV15YC4	MR43T	0.045 (1.14)	10 ④	600 ③	4800-5200	NA	NA	40-60	31-39	75% of Highest
	3.0GS	RS12YC	MR43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 1/2 (Port)	40-60	5.75-7	75% of Highest
	4.3Gi	RV15YC4	R43TS	0.045 (1.14)	8 ④	600 ③	4400-4800	NA	NA	40-60	31-39	75% of Highest
	4.3GL	RV15YC4	MR43T	0.045 (1.14)	⑥	550-650	4200-4600	NA	5/8	40-60	5.75-7	75% of Highest
	4.3GS	RV15YC4	MR43T	0.045 (1.14)	⑥	550-650	4400-4800	NA	3/4	40-60	5.75-7	75% of Highest
	5.0Fi	RS12YC	MR43LTS	0.045 (1.14)	5	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.0FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4200-4600	0.008 (0.203)	1	40-60	5.75-7	75% of Highest
	5.7Gi	RV15YC4	R43TS	0.045 (1.14)	8 ④	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.8Fi	RS9YC	R42CLTS	0.045 (1.14)	5	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.8FL	RV15YC4	MR43T	0.035 (0.9)	10	550-650	4000-4400	0.008 (0.203)	7/8	40-60	5.75-7	75% of Highest
	5.8FSi	RS9YC	R42CLTS	0.045 (1.14)	5	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	7.4GL	RV15YC4	MR43T	0.045 (1.14)	10 ③	550-650	4200-4600	NA	1/4	40-60	5.75-7	75% of Highest
	7.4Gi	RV15YC4	R43TS	0.045 (1.14)	10 ④	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest

NA

Not adjustable

①

Shunt required

②

5 BTDC w/86-88 AKI octane; 0 TDC w/89 AKI octane; shunt req'd

③

Not adjustable

④

Diagnostic leads shorted

TUNE-UP SPECIFICATIONS 1997-98

Year	Model	Spark Plug		Gap In. (mm)	Ignition Timing (Deg. BTDC @ rpm)	Idle Speed Rpm (In Gear)	Max. WOT (rpm)	Distributor Sensor Air Gap In. (mm)	Idle Mixture (Turns Out)	Oil Pressure @ 2000 rpm (psi)	Fuel Pressure @ Idle (psi)	Compression Pressure (psi)
		Volvo	Champion									
1997	3.0GS	RS12YC	MR43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	■ (Starboard) 1/2 (Port)	40-60	5-7	75% of Highest
	4.3Gi	RS12YC	MR43LTS	0.045 (1.14)	8 ②	600 0	4400-4800	NA	NA	40-60	31-39	75% of Highest
	4.3GL	RS12YC	MR43LTS	0.045 (1.14)	④	550-650	4200-4600	NA	5/8	40-60	5-7	75% of Highest
	4.3GS	RS12YC	MR43LTS	0.045 (1.14)	④	550-650	4400-4800	NA	3/4	40-60	5-7	75% of Highest
	5.7Gi	RV15YC4	R43TS	0.045 (1.14)	8 ②	600 0	4200-4600	NA	NA	40-60	31-39	75% of Highest
	5.7GL	RV15YC4	MR43T	0.035 (0.9)	⑤	550-650	4200-4600	0.008 (0.203)	3/4-1	40-60	5-7	75% of Highest
	5.7GS	RV15YC4	MR43T	0.035 (0.9)	⑤	550-650	4200-4600	0.008 (0.203)	3/4-1	40-60	5-7	75% of Highest
	5.7GSi	RS12YC	MR43LTS	0.045 (1.14)	8 ②	600 ③	4600-5000	NA	NA	40-60	31-39	75% of Highest
	7.4Gi	RV15YC4	R43TS	0.045 (1.14)	10 ②	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	7.4GL	RV15YC4	MR43T	0.045 (1.14)	10 ⑤	550-650	4200-4600	NA	1/4	40-60	5-7	75% of Highest
1998	3.0GS	RS12YC	MR43LTS	0.045 (1.14)	0 ①	650-750	4200-4600	NA	1 (Starboard) 1/2 (Port)	40-60	5-7	75% of Highest
	4.3Gi	RS12YC	MR43LTS	0.045 (1.14)	8 ②	600 ③	4400-4800	NA	NA	40-60	31-39	75% of Highest
	4.3GL	RS12YC	MR43LTS	0.045 (1.14)	④	550-650	4200-4600	NA	5/8	40-60	5-7	75% of Highest
	4.3GS	RS12YC	MR43LTS	0.045 (1.14)	④	550-650	4400-4800	NA	1 1/8	40-60	5-7	75% of Highest
	5.0GL	RS12YC	MR43LTS	0.035 (0.89)	⑥	550-650	4400-4800	0.008 (0.203)	3/4-1	40-60	5-7	75% of Highest
	5.7GS	RS12YC	MR43LTS	0.035 (0.89)	⑦	550-650	4400-4800	0.008 (0.203)	3/4-1	40-60	5-7	75% of Highest
	5.7GSi	RS12YC	MR43LTS	0.045 (1.14)	8 ②	600 0	4600-5000	NA	NA	40-60	31-39	75% of Highest
	7.4Gi	RS12YC	MR43LTS	0.045 (1.14)	10 ②	600 ③	4200-4600	NA	NA	40-60	31-39	75% of Highest
	7.4GSi	RV15YC4	MR43T	0.045 (1.14)	10 ②	600 ③	4800-5200	NA	NA	40-60	31-39	75% of Highest
	8.2GSi	RV15YC4	MR43T	0.045 (1.14)	10 ②	600 ③	4600-5000	NA	NA	40-60	31-39	75% of Highest

NA Not adjustable
 ① Shunt required
 ② Diagnostic leads shorted
 ③ Not adjustable

④ 1 BTDC w/86-88 AKI octane; 6 BTDC w/89 AKI octane; shunt req'd
 ⑤ 3 BTDC w/86-88 AKI octane; 8 BTDC w/89 AKI octane
 ⑥ 5 BTDC w/86-88 AKI octane; 10 BTDC w/89 AKI octane
 ⑦ 7 BTDC w/86-88 AKI octane; 12 BTDC w/89 AKI octane

Capacities—1986-91

CAPACITIES

Year	Model	Crankcase (With Filter)	Stern Drive Oz. (ml)				Power Trim Reservoir Oz. (ml)
		Qts. (L)	Cobra	King Cobra	SP	DP	Oz. (ml)
1986	2.5, 3.0	4.0 (3.8)	60 (1774)	X	X	X	54 (1587)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
1987	2.3	5.0 (4.7)	60 (1774)	X	X	X	54 (1597)
	3.0	4.0 (3.8)	60 (1774)	X	X	X	54 (1597)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	64 (1601)
	5.0	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	7.5	6.8 (6.4)	108 (3194)	X	X	X	54 (1597)
1988	2.3	5.0 (4.7)	60 (1774)	X	X	X	54 (1597)
	3.0	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7	6.0 (5.7)	64 (1892)	64 (1892) ①	X	X	54 (1597)
	7.4 454	7.0 (6.6)	X	108 (3194)	X	X	54 (1597)
1989	2.3	5.0 (4.7)	60 (1774)	X	X	X	54 (1597)
	3.0	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.8	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	262	4.5 (4.3)	X	64 (1892) ①	X	X	54 (1597)
1990	350	6.0 (5.7)	X	64 (1892) ①	X	X	54 (1597)
	460	6.0 (5.7)	X	108 (3194)	X	X	54 (1597)
	2.3	5.0 (4.7)	60 (1774)	X	X	X	54 (1597)
	3.0, 3.0 HO	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3, 4.3 HO	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.0 HO	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
1991	5.7	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7 LE	6.0 (5.7)	X	103 (3050)	X	X	54 (1597)
	5.8	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	350	6.0 (5.7)	X	103 (3050)	X	X	54 (1597)
	454	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
	460	6.0 (5.7)	X	103 (3050)	X	X	54 (1597)
	3.0, 3.0 HO	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	4.3 HO	5.5 (5.2)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.0 HO	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
1992	5.7	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7 LE, 351	6.0 (5.7)	X	103 (3050)	X	X	54 (1597)
	454, 454 HO, 502	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
	3.0, 3.0 HO	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
1993	4.3, 4.3 HO	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.0 HO, 5.0 EFI	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.8, 5.8 EFI	5.0 (4.7)	64 (1892)	X	X	X	54 (1597)
	5.8 LE, 351	5.0 (4.7)	X	103 (3050)	X	X	54 (1597)
	454, 454 HO, 502	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
	3.0GL, 3.0GS	4.0 (3.8)	71 (2100)	X	X	X	54 (1597)
1994	4.3GL	4.5 (4.3)	71 (2100)	X	X	X	54 (1597)
	5.0FL, 5.0Fi	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.7GL	5.0 (4.7)	71 (2100)	X	X	X	54 (1597)
	5.8FL, 5.8Fi	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	351 EFI	5.0 (4.7)	X	103 (3050)	X	X	54 (1597)
	7.4GL	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
1995	3.0GS	4.0 (3.8)	71 (2100)	X	X	X	54 (1597)
	4.3GL	4.5 (4.3)	71 (2100)	X	X	X	54 (1597)
	5.0FL, 5.0 EFI	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.8FL	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.8 EFI, 5.8 HO EFI	5.0 (4.7)	71 (2100)	X	X	X	54 (1597)
	7.4GL, 7.4 EFI	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
1996	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.0Fi, 5.0FL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7Gi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.8FL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.8Fi, 5.8FSi	5.0 (4.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4GL	7.0 (6.6)	X	X	71 (2100)	81 (2400)	54 (1597)
	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
1997	5.7GL, 5.7 GS	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7Gi, 5.7GSi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi, 7.4GL	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.0GL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
1998	5.7GS, 5.7 GSi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4GSi, 8.2GSi	9.0 (8.5)	X	X	X	81 (2400)	54 (1597)

① Although badged as King Cobras, the 262 and 350 are actually Cobras

Capacities—1992-98

CAPACITIES

Year	Model	Crankcase (With Filter)	Stern Drive Oz. (ml)				Power Trim Reservoir Oz. (ml)
		Qts. (L)	Cobra	King Cobra	SP	DP	Oz. (ml)
1992	3.0, 3.0 HO	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.0 HO	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7, 5.8	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.7 LE, 351	6.0 (5.7)	X	103 (3050)	X	X	54 (1597)
	454, 454 HO, 502	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
1993	3.0, 3.0 HO	4.0 (3.8)	64 (1892)	X	X	X	54 (1597)
	4.3, 4.3 HO	4.5 (4.3)	64 (1892)	X	X	X	54 (1597)
	5.0, 5.0 HO, 5.0 EFI	6.0 (5.7)	64 (1892)	X	X	X	54 (1597)
	5.8, 5.8 EFI	5.0 (4.7)	64 (1892)	X	X	X	54 (1597)
	5.8 LE, 351	5.0 (4.7)	X	103 (3050)	X	X	54 (1597)
	454, 454 HO, 502	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
1994	3.0GL, 3.0GS	4.0 (3.8)	71 (2100)	X	X	X	54 (1597)
	4.3GL	4.5 (4.3)	71 (2100)	X	X	X	54 (1597)
	5.0FL, 5.0Fi	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.7GL	5.0 (4.7)	71 (2100)	X	X	X	54 (1597)
	5.8FL, 5.8Fi	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	351 EFI	5.0 (4.7)	X	103 (3050)	X	X	54 (1597)
1995	7.4GL	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
	3.0GS	4.0 (3.8)	71 (2100)	X	X	X	54 (1597)
	4.3GL	4.5 (4.3)	71 (2100)	X	X	X	54 (1597)
	5.0FL, 5.0 EFI	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.8FL	6.0 (5.7)	71 (2100)	X	X	X	54 (1597)
	5.8 EFI, 5.8 HO EFI	5.0 (4.7)	71 (2100)	X	X	X	54 (1597)
1996	7.4GL, 7.4 EFI	7.0 (6.6)	X	103 (3050)	X	X	54 (1597)
	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.0Fi, 5.0FL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7Gi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.8FL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.8Fi, 5.8FSi	5.0 (4.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4GL	7.0 (6.6)	X	X	71 (2100)	81 (2400)	54 (1597)
	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
1997	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7GL, 5.7 GS	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7Gi, 5.7GSi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi, 7.4GL	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	3.0GS	4.0 (3.8)	X	X	71 (2100)	X	54 (1597)
	4.3Gi, 4.3GL, 4.3GS	4.5 (4.3)	X	X	71 (2100)	81 (2400)	54 (1597)
1998	5.0GL	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	5.7GS, 5.7 GSi	6.0 (5.7)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4Gi	9.0 (8.5)	X	X	71 (2100)	81 (2400)	54 (1597)
	7.4GSi, 8.2GSi	9.0 (8.5)	X	X	X	81 (2400)	54 (1597)

All capacities are approximate. Always use the dipstick or fill/drain hole to determine the exact quantity of lubricant required.

MAINTENANCE INTERVALS

Component	Procedure	Daily/ Before Use	Weekly	25 Hrs.	50 Hrs./ 60 Days	50 Hrs./ 120 Days	100 Hrs./ 120 Days	50 Hrs./ Season	100 Hrs./ Season	Once A Season
Anodes	Inspect		X							
Battery	Check Fluid									
	Level		X							
	Inspect		X							
Bilge	Inspect	X								
Carburetor	Inspect									X
Cooling System	Check Level									
	Closed System	X								
	Check									
	Pressure Cap								X	
	Flush Sea									
	Water	X		X						
	Inspect Hoses									
	& Clamps:									
	Freshwater						X			
	Saltwater				X					
	Replace									
	Coolant									X
Drive Belts	Inspect					X				
Electrical System	Check Wiring:									
	Freshwater						X			
	Saltwater				X					
Engine Alignment	Check									X
Flame Arrestor	Clean/Inspect									
	1986-90								X	
	1991-98							X		
Fuel Filter	Replace							X		
Fuel Pump - Mechanical	Check Vent Tube			X						

MAINTENANCE INTERVALS

Component	Procedure	Daily/ Before Use	Weekly	25 Hrs.	50 Hrs./ 60 Days	50 Hrs./ 120 Days	100 Hrs./ 120 Days	50 Hrs./ Season	100 Hrs./ Season	Once A Season
Fuel System	Inspect/Adjust System									X
	Replace Filter									X
Fuel Tank	Check For									
	Water				X					
Gimbal Bearing	Lubricate								X	
Ignition System	Clean/Inspect								X	
	Adjust Timing									X
Oil	Check Level:									
	Crankcase	X								
	Power Steering		X							
	Stern Drive							X		
	Trim Pump								X	
	Change:									
	Crankcase								X	
	Power Steering								X	
	Stern Drive								X	
	Trim Pump									X
Oil Filter	Change								X	
PCV Valve	Inspect/Replace								X	
Shift/Throttle Cable	Inspect/Adjust/ Lubricate:									
	Freshwater						X			
	Saltwater				X					
Spark Plugs	Check				X					
	Gap/Replace									X
Spark Plug Wires	Inspect									X
Steering System	Check Fluid									
	Level		X							
	Inspect/Adjust/ Lubricate:				X					

2-66 ENGINE AND DRIVE MAINTENANCE

MAINTENANCE INTERVALS

[illegible]

TROUBLESHOOTING

SYMPTOM/CONDITION	SYSTEM/QUESTIONS	CHECK
Engine - Cranks, But Won't Start	Engine	Compression
	Fuel System	Fuel quantity/condition Anti-siphon valve Fuel tank vent: unrestricted Fuel tank pick-up screen: clean/unrestricted Fuel lines Fuel shut-off valve Fuel tank valves Fuel pump: component/relay/circuit breaker Carburetor: accelerator pump Wiring from ignition switch to coil/module Wiring from ignition coil to spark plug Spark plugs: gap, fouling EEC power lead Circuit breaker Battery voltage Drive unit: internal damage Oil pressure gauge Crankcase: oil level Temperature gauge Cooling system Internal components Fuel gauge Fuel level Fuel: water/dirt contamination Fuel pick-up tube/screen: dirt obstruction Fuel tank vent: unrestricted Fuel filters Fuel system: air leak on suction side Fuel system: fuel leak on pressure side Anti-siphon valve Fuel lines Fuel pump: pressure Carburetor Wiring from ignition switch to coil/module Wiring from ignition coil to spark plug Ignition switch: shorts or opens Circuit breakers Wiring: between engine and dash Main harness
Engine - Dies	Engine seizure	
	Fuel System	
	Ignition System	

TROUBLESHOOTING

SYMPTOM/CONDITION	SYSTEM/QUESTIONS	CHECK
Engine - Lubrication System	Engine	Oil filter: clogged or incorrect type Oil filter: bad bypass grommet Oil pump: worn gears, cover or shaft Oil pump: relief valve spring Oil pump: relief valve: plunger loose Oil pump pick-up: clogged screen or broken tube Oil galleries: blocked Hydraulic filters: dirty/defective Push rods: clogged oil passages Oil: low/poor quality/wrong viscosity Remote filters: wrong hose routing Crankcase: water contamination Gauge: operation/wiring Warning horn: operation/wiring Engine: temperature Sensors: operation/wiring Loose pulley Worn bearings Belt too tight Loose mounting bolts Raw water pump Belts/pulleys: loose/adjustment Loose bolts U-joints Gimbal bearing Damaged internal components Propeller: hub/blades Engine coupler: loose/worn/damaged Engine mounts: loose/broken/worn Engine stringer: loose lag screws Turns-up Spark plug wires: incorrect routing Fuel: octane rating too low Valve tap on start only: wrong/dirty oil, lifter varnish Intermittent tap: after check ball leaking Tap at idle: leak down rate, bad check ball seat Tapping in general: too much oil, lifter plunger stuck Loud noise at normal temp.: scored lifter plunger, fast leak down rate, oil too light for temperature Engine temperature: known good thermometer Temperature gauge Sending unit: operation/circuit
Engine - Noise/Vibration	Alternator	
	Cooling system	
	Crankshaft Balancer/Flywheel Drive Unit	
	Engine mountings	
	Ignition system - ping or knock	
	Valves/Lifters	
Engine - Overheats	Overheating	

TROUBLESHOOTING

SYMPTOM/CONDITION	SYSTEM/QUESTIONS	CHECK
Engine - Won't Reach Temperature (cont'd)	Runs too cool	Fuel pump: pressure/vacuum Boat: overloaded Engine: overheating Ignition timing Ignition system Cables/linkage: connections/adjustment
Hard Start - Engine Cold	Always been this way?	Choke: operation/adjustment Fuel lines
	Not used for a long time?	Fuel filters
	Just begun to happen?	Carburetor: empty float bowl Fuel: water/dirt contamination Choke: operation/adjustment Carburetor: accelerator pump Fuel system: leaks, dirt, obstructions Ignition system Ignition timing
Hard Start - Engine Hot	Always been this way?	Choke: operation/adjustment
	Just begun to happen?	Fuel: condition, brand, type, octane Spark plugs: gap, fouling Fuel: water/dirt contamination Battery: charge/condition Starter Wiring from ignition switch to coil/module
Low Battery After Short Storage	Engine/Boat	Ignition coil/module Ignition timing Choke: operation/adjustment Electrical accessories: all Ignition circuit cutoff Battery: disconnected negative cable Battery cables: current draw Main harness connector

TROUBLESHOOTING

SYMPTOM/CONDITION	SYSTEM/QUESTIONS	CHECK
Engine - Overheats (cont'd)	Overheating	Water pump: raw water/engine circulating Water intake screen: dirt/obstructions Thermostat Water supply hoses: leaks/cracks/obstructions Ignition timing Raw water pump: leaks on pressure side Raw water pump: air leaks on suction side Engine: compression
Engine - Runs Rough	At slow speed?	Idle speed/mixture Ignition timing Spark plugs: gap, fouling Fuel pump: pressure Fuel: water/dirt contamination Carburetor: vacuum leak Carburetor: internal fuel leak Intake manifold: vacuum leak Fuel system: air leak on suction side Fuel: too low an octane rating Wiring from ignition coil to spark plug Ignition timing Carburetor: model, jets, vacuum diaphragm Fuel filters Fuel pump: pressure Engine: compression Fuel: water/dirt contamination
Engine - Will Not Crank	Starter Circuit	Battery condition: charge Battery cables: loose/dirty connections Ignition switch: shorts or opens Starter motor: shorts, grounds, opens Starter solenoid/delay Circuit breaker Wiring: battery to ignition switch
Engine - Won't Reach Temperature	Runs too cool	Fuel: type/octane Propeller: pitch/hub/blades Crankcase: oil level Hull: marine growth Drive unit: marine growth Drive unit: gear ratio Altitude: too high for fuel system Carburetor: air intake restricted Exhaust outlets: restrictions in engine/drivetrain Engine: compression Carburetor

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ENGINE MECHANICAL FORD 4 CYLINDER ENGINES

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3-2 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

ENGINE MECHANICAL

General Information

The OMC 2.3L 140 cubic inch displacement engine is manufactured by Ford and has been a favorite combination when mated to the OMC Cobra stern drives.

✖✖ CAUTION

This in-line four-cylinder overhead camshaft power plant uses a full pressure lubrication system with a disposable flow-thru oil filter cartridge. Oil pressure is furnished by a gear-type oil pump, driven by the auxiliary shaft, which is driven, via the timing belt, by the crankshaft. A regulator on the oil pump controls the amount of oil pressure output. The oil pump scavenges oil from the bottom of the oil pan and feeds it through the oil filter and then to the main oil gallery in the block. Drilled passages in the block and crankshaft distribute oil to the camshaft and crankshaft to lubricate the rod, main and camshaft bearings.

The camshaft runs in 4 bearings and is driven by the crankshaft via the timing belt. The auxiliary shaft, also driven by the crankshaft via the timing belt, drives the fuel pump and distributor in addition to the oil pump. The crankshaft runs in 5 main bearings with the middle bearing (#3) providing thrust.

Cylinder numbering and firing orders are identified in the illustrations at the end of the Maintenance section.

✖✖ CAUTION

NEVER, NEVER attempt to use standard automotive parts when replacing anything on your engine. Due to the uniqueness of the environment in which they are operated in, and the levels at which they are operated at, marine engines require different versions of the same part; even if they look the same. Stock and most aftermarket automotive parts will not hold up for prolonged periods of time under such conditions. Automotive parts may appear identical to marine parts, but be assured, OMC marine parts are specially manufactured to meet OMC marine specifications. Most marine items are super heavy-duty units or are made from special metal alloy to combat against a corrosive salt water atmosphere.

OMC marine electrical and ignition parts are extremely critical. In the United States, all electrical and ignition parts manufactured for marine application must conform to stringent U.S. Coast Guard requirements for spark or flame suppression. A spark from a non-marine cranking motor solenoid could ignite an explosive atmosphere of gasoline vapors in an enclosed engine compartment.

Engine Identification

ENGINE

† See Figure 1

The engine serial numbers are the manufacturer's key to engine changes. These alpha-numeric codes identify the year of manufacture, the horsepower rating and various model/option differences. If any correspondence or parts are required, the engine serial number must be used for proper identification.

Remember that the serial number establishes the year in which the engine was produced, which is often not the year of first installation.

The engine specifications decal contains information such as the model number or code, the serial number (a unique sequential identifier given ONLY to that one engine) as well as other useful information.

An engine specifications decal can generally be found on top of the flame arrestor or on the side of the rocker arm cover - all pertinent serial number information can be found here—engine and drive designations, serial numbers and model numbers. Unfortunately this decal is not always legible on older boats and it's also quite difficult to find, so please refer to the following procedures for each individual unit's serial number location.

❑ Serial numbers tags are frequently difficult to see when the engine is installed in the boat; a mirror can be a handy way to read all the numbers.

The engine serial/model number is sometimes also stamped on the port rear side of the engine where it attaches to the bell housing; although on most later models it may instead be a metal plate attached in the same location. If your engine has a stamped number it will simply be the serial number; if you have a plate (and you should), it will always show a Model number and then the actual Serial number. Additionally, most models will also have this plate or sticker on the transom bracket.

- The first two characters identify the engine size in liters (L); 23 represents the 2.3L, 30 represents the 3.0L and so forth.
- The third character identifies the fuel delivery system; 2 designates a 2 bbl carburetor, 4 is a 4 bbl carburetor, and F is a fuel injected engine.
- The fourth character designates a major engine or horsepower change—it doesn't let you know what the change was, just that there was some sort of change. A means it is the first model released, B would be the second, and so forth
- The fifth character designates what type of steering system was used; M would be manual steering and P would be power steering.
- Now here's where it gets interesting; on 1987 engines, the sixth, seventh and eighth characters designate the model year. The sixth and seventh actually show the model year, while the eighth is a random model year version code. ARJ, ARF, FTC, SRC or SRY show 1987.
- On 1988-90 engines, the sixth character designates the direction of propeller rotation. R is right hand, L is left hand and E is either.
- Also on 1988-90 engines, the seventh, eighth and ninth characters designate the model year. The seventh and eighth actually show the model year, while the ninth is a random model year version code. GDE or GDP is 1988, MED or MEF is 1989, PWC, PWR or PWS is 1990.

Any remaining characters are proprietary. So in example, a Model number on the ID plate that reads **232AMFTC** would designate a 1987 2.3L engine with a 2 bbl carburetor and manual steering, first model released.

Engine Model Designations

All engines covered here utilize unique identifiers assigned by OMC; surnames if you will—2.3, 3.0GL, 3.0GS, etc. Obviously the first two characters designate the engine size in litres (L). The second letter, a G or and F designate the engine manufacturer; General Motors (G) or Ford (F). The third through fifth letters can be found in different combinations, but the individual letter designates the same thing regardless of position. L designates limited output. S and X designate superior output—a 3.0GL will always have a lesser horsepower rating than a 3.0GS in a given model year; a 5.7GL will be less than a 5.7GS. i designates that the engine is fuel injected, if there is no i then you know the engine uses a carburetor.

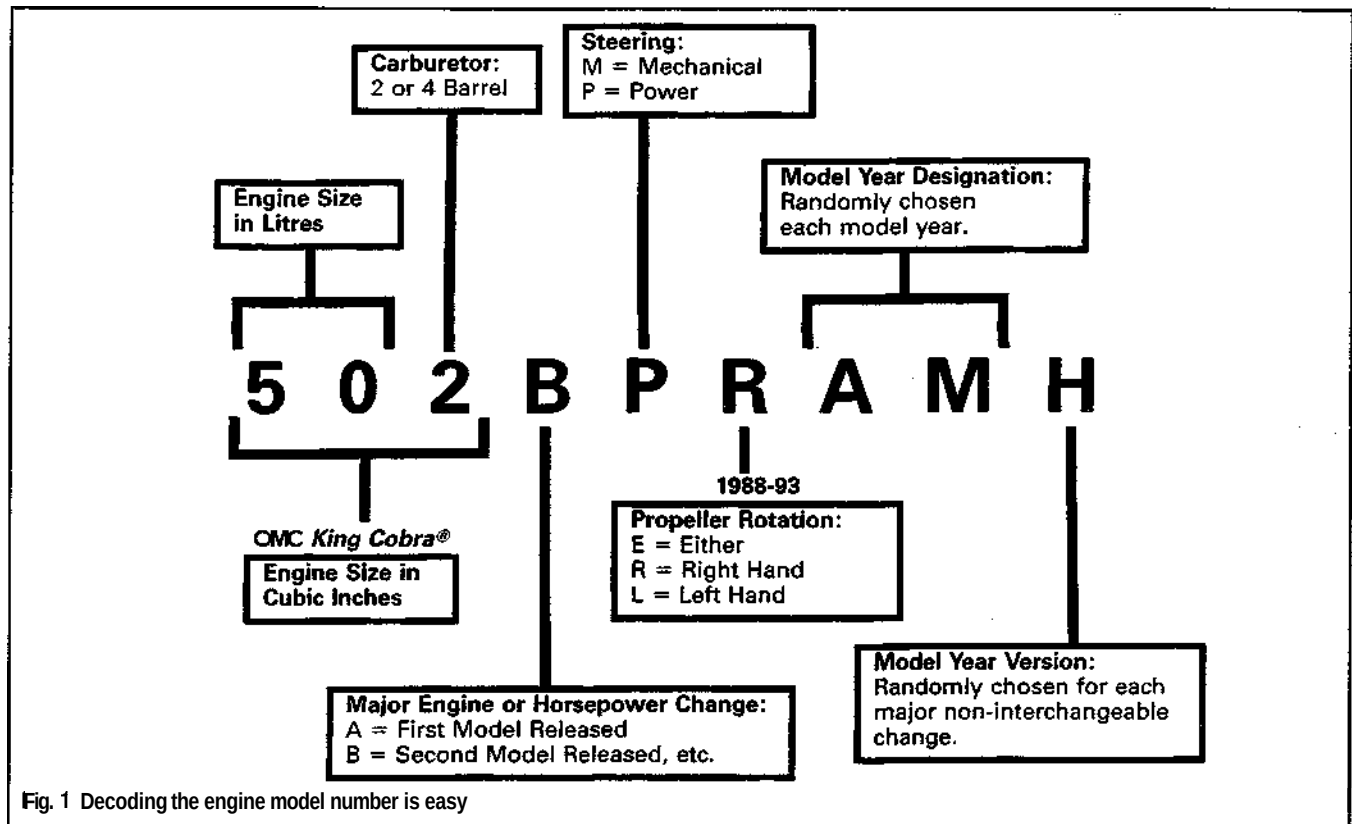
Engine

REMOVAL & INSTALLATION



◆ See Figures 2,3 and 4

1. Check the clearance between the front of the engine and the inside edge of the engine compartment bulkhead. If clearance is less than 6 in. (15.2mm), you will need to remove the stern drive unit because there won't be enough room to disengage the driveshaft from the engine coupler. More than 6 in. will provide enough working room to get the engine out without removing the drive, BUT, we recommend removing the drive anyway. If you intend on doing anything to the mounts or stringers, you will need to re-align the engine as detailed in the Engine Alignment section—which requires removing the drive, so remove the drive!
2. Remove the stern drive unit as detailed in the Drive Systems section.
3. Open or remove the engine hatch cover.



4. Disconnect the battery cables (negative first) at the battery and then disconnect them from the engine block and starter.

❖❖ CAUTION

Make sure that all switches and systems are OFF before disconnecting the battery cables.

5. Disconnect the two power steering hydraulic lines at the steering cylinder (models w/power steering). Carefully plug them and then tie them off somewhere on the engine, making sure that they are higher than the pump to minimize any leakage.

6. Disconnect the fuel inlet line at the fuel pump or filter (whichever comes first on your particular engine) and quickly plug it and the inlet—a clean golf tee and some tape works well in this situation. Make sure you have rags handy, as there will be some spillage.

7. Tag and disconnect the two-wire trim/tilt connector.

8. Pop the two-wire trim/tilt sender connector out of the retainer and then disconnect it. You may have to cut the plastic tie securing the cable in order to move it out of the way.

9. Locate the large rubber coated instrument cable connector (should be on the starboard side), loosen the hose clamp and then disconnect it from the bracket. Move it away from the engine and secure it. On most models, you will also need to unplug the three-wire trim/tilt cable connector just above it.

Take note of your throttle arm attachment stud— is it a “push-to-close” or a “pull-to-close”?

10. Disconnect the remote control shift cable and the transom bracket shift cable from the engine shift bracket. Remove the cables from the anchor pockets and the shift lever. Tape the trunnions to the cables so that the adjustment does not get knocked out of kilter.

11. Remove the cotter pin and washer from the throttle arm. Loosen the anchor block retaining nut and then spin the retainer away from the cable trunnion. Remove the throttle cable from the arm and anchor bracket. Be sure to mark the position of the holes that the anchor block was attached to.

12. Loosen the hose clamps (4) and disconnect the exhaust elbow bellows from elbow. You may want to spray some WD-40 around the lip of the hose where it connects to the elbow, grasp it with both hands and wiggle it back and forth while pulling down on it.

13. Drain the **cooling system** as detailed in the Maintenance section.

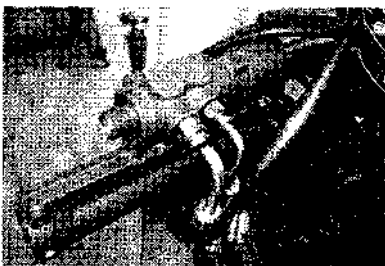


Fig. 2 Disconnect the power steering lines at the cylinder

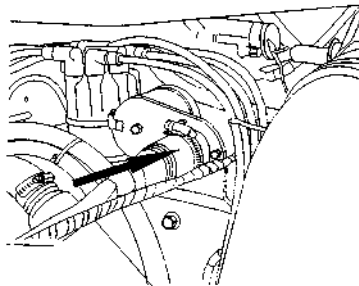


Fig. 3 Disconnect the instrument cable connector

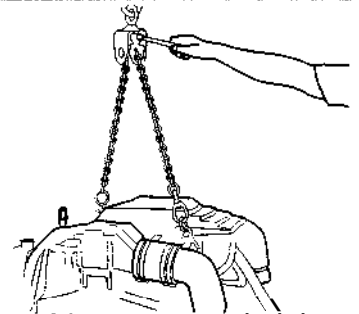


Fig. 4 ...and then connect an engine hoist

3-4 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

14. Loosen the hose clamp on the water supply hose at the transom bracket and carefully slide it off the water tube. Attach the hose to the engine.
15. Disconnect the shift cables and position them out of the way.
16. Tag and disconnect any remaining lines, wires or hoses at the engine.
17. Attach a suitable engine hoist to the lifting eyes (usually front starboard side, rear port side) and take up any line slack until it is just taught.

The engine hoist should have a capacity of at least 1500 lbs. (680 kg).

18. Locate the rear engine mounts and remove both lock nuts and flat washers.
19. Locate the front engine mounts and remove the two lag bolts.
20. If you listened to us at the beginning of the procedure, the drive unit should be removed. If so, slowly and carefully, lift out the engine. Try not to hit the power steering control valve, or any other accessories, while removing it from the engine compartment. If you didn't listen to us, and you had sufficient clearance in the engine compartment, the drive unit is probably still installed. Raise the hoist slightly until the weight is removed from the mounts and then carefully pull the engine forward until the driveshaft disengages from the coupler, now raise the engine out of the compartment.

To install:

21. Apply Engine Coupler grease to the splines of the coupler.
22. Slowly lower the engine into the compartment. If the drive unit was not removed, AND the crankshaft has not been rotated, insert the driveshaft into the coupler as you push the engine backwards until they engage completely and then lower the engine into position over the rear mounts until the front mounts just touch the stringers. If the shaft and coupler will not align completely, turn the crankshaft or driveshaft slightly until they mate correctly. If the drive was removed, or the mounts were disturbed in any way, lower the engine into position over the rear mounts until the front mount just touches the stringer.

23. Install the two flat washers into the recess in the engine bracket side of the rear mounts and then install the two lock nuts. Tighten them to 28-30 ft. lbs. (38-40 Nm).

✖✖ CAUTION

Never use an impact wrench or power driver to tighten the locknuts.

24. Install the lag bolts into their holes on the front mounts and tighten each bolt securely.
25. If the drive was removed, the mounts were disturbed or the driveshaft/coupler didn't mate correctly, perform the engine alignment procedure detailed in this section. We think it's a good idea to do this regardless! After you've performed the alignment procedure, make sure that you hold the top adjusting nut and tighten the lower nut on the mount to 100-120 ft. lbs. (136-163 Nm).
26. Reconnect the exhaust bellows by sliding it up and over the elbow, position the clamps between the ribs in the hose and then tighten the clamps securely. Make sure you don't position the clamps into the expanding area.
27. Reconnect the water inlet hose. Lubricate the inside of the hose and wiggle it onto the inlet tube. Slide the clamp over the ridge and tighten it securely. This sounds like an easy step, but it is very important—if the hose, particularly the underside, is not installed correctly the hose itself may collapse or come off. Either scenario will cause severe damage to your engine, so make sure you do this correctly!
28. Carefully, and quickly, remove the tape and plugs so you can connect the power steering lines. Tighten the large fitting to 15-17 ft. lbs. (20-23 Nm) and the small fitting to 10-12 ft. lbs. (14-16 Nm). Don't forget to check the fluid level and bleed the system when you are finished with the installation.
29. Reconnect the trim/tilt connector so the two halves lock together.
30. Reconnect the trim position sender leads, the instrument cable, the engine ground wire, the battery cables and all other wires, lines of hoses that were disconnected during removal. Make sure you swab a light coat of grease around the fitting for the large engine/instrument cable plug.

✖✖ CAUTION

Always make certain that all switches and systems are turned OFF before reconnecting the battery cables.

Make sure all cables, wires and hoses are routed correctly before initially starting the engine.

31. Unplug the fuel line and pump/filter fitting and reconnect them. Remember to check for leaks as soon as you start the engine.
32. Install and adjust the throttle cable. For complete details, please refer to the Fuel System section:
 - a. Remember we asked you to determine if you had a "push-to-close" or "pull-to-open" throttle cable (the throttle arm stud)? Position the remote control handle in Neutral—the propeller should rotate freely.
 - b. Turn the propeller shaft and the shifter into the forward gear detent position and then move the shifter back toward the Neutral position halfway.
 - c. Position the trunnion over the groove in the throttle cable so the internal bosses align and then snap it into the groove until it is fully seated.
 - d. Install the trunnion/cable into the anchor block so the open side of the trunnion is against the block. Position the assembly onto the bracket over the original holes (they should be the lower two of the four holes) and then install the retaining bolt and nut. When the nut is securely against the back of the bracket, tighten the bolt securely.
 - e. Install the connector onto the throttle cable and then pull the connector until all end play is removed from the cable. Turn it sideways until the hole is in alignment with the correct stud on the throttle arm. Slide it over the stud and install the washer and a new cotter pin. Make sure the cable is on the same stud that it was removed from. Tighten the jam nut against the connector.
33. Install and adjust the shift cables. Please refer to the Drive Systems section for further details.
34. Check and refill all fluids. Start the engine and check for any fuel or coolant leaks. Go have fun!

ENGINE ALIGNMENT

◆ See Figure 5



Engine alignment is imperative for correct engine installation and also for continued engine and drive operation. It is a good idea to ensure proper alignment every time that the drive or engine have been removed. Engine alignment is checked by using OMC alignment tool #912273 and handle #311880 (Volvo #3851083-0 and #3850609-31). Engine alignment is adjusted by raising or lowering the front engine mount(s).

1. With the drive unit off the vessel, slide the alignment tool through the gimbal bearing and into the engine coupler. It should slide easily, with no binding or force. If not, check the gimbal bearing alignment as detailed in the Drive Systems section. If bearing alignment is correct, move to the next step.
2. If your engine utilizes a jam nut on the bottom of the mount bolt, loosen it and back it off at least 112 in.
3. Loosen the lock nut and back it off.
4. Now, determine if the engine requires raising or lowering to facilitate alignment—remember, the alignment tool should still be in position. Tighten or loosen the adjusting nut until the new engine height allows the alignment tool to slide freely.

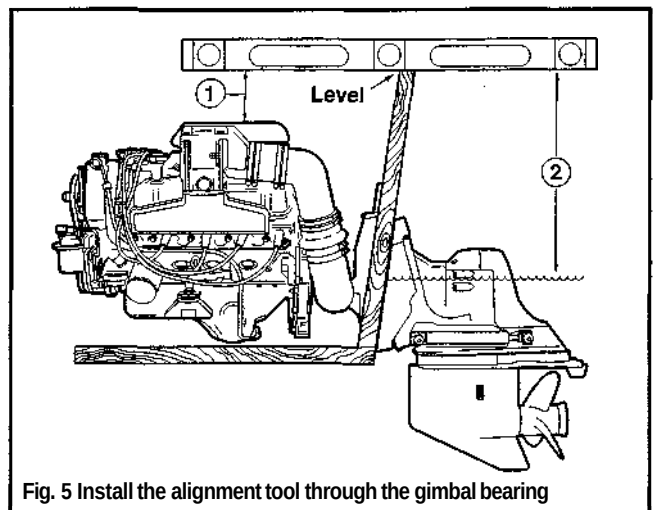


Fig. 5 Install the alignment tool through the gimbal bearing

5. Hold the adjusting nut with a wrench and then tighten the lock nut to 100-120 ft. lbs. (136-163 Nm). If your engine uses a jam nut, cinch it up against the lock nut.

6. Remove the alignment tool and handle.

Front Engine Mounts

REMOVAL & INSTALLATION

◆ See Figures 6 and 7



1. Position an engine hoist over the engine and hook it up to the two engine lifting.
2. Remove the two lag screws/bolts on each side of the mount where it rests on the stringer.
3. Raise the engine just enough to allow working room for removing the mount.
4. Remove the 3 mount-to-engine mounting bolts with their lock washers and lift out the mount.
5. Measure the distance between the top of the large washer on the mount and the flat on the lower side of the mounting bracket. Record it.
6. Position a wrench over the bottom nut on the adjusting bolt, just underneath the mount to, hold the shaft and then remove the top nut. Lift off the bracket.
7. Remove the two lock nuts from the bolt and slide out the adjusting bolt. Remember which washer goes where. The rubber mount and lower foot are serviced as an assembly

To install:

8. Slide the adjusting bolt up through the mount and then position the small and large washers over the bolt—large over small.
9. Spin on the first (lower) lock nut and tighten it to 60-75 ft. lbs. (81-102 Nm).
10. Screw on the upper lock nut and then position the mount bracket over the bolt. Install the washer and adjusting nut and check the measurement taken in Step 5. Move the upper lock nut up or down until the correct specification is achieved and then tighten the adjusting nut to 100-120 ft. lbs. (136-163 Nm).
11. Spray the 3 mounting bolts with Loctite Primer N and allow them to air dry. Once dry, coat the bolts with Loctite or OMC Thread Sealing Agent and attach the mount to the engine. Tighten the bolts to 32-40 ft. lbs. (43-54 Nm).
12. Position the mount over the lag screw holes and then slowly lower the engine until all weight is off the hoist. Install and tighten the lag screws securely.
13. If you're confident that your measurements and subsequent adjustment place the engine exactly where it was prior to removal, then you are through. If you're like us though, you may want to check the engine alignment before you fire up the engine.

Rear Engine Mounts

REMOVAL & INSTALLATION

† See Figure 8



1. Remove the engine as previously detailed.
2. Loosen the two bolts and remove the mount from the transom plate.
3. Hold the square nut with a wrench and remove the shaft bolt. Be sure to take note of the style and positioning of the two mount washers as you are removing the bolt. Mark them, lay them out, or write it down, but don't forget their orientation!!

To install:

4. Slide the lower of the two washers onto the mount bolt, exactly as it came off (this should be the thin one).
5. Slide the bolt into the flat side of the rubber mount, install the remaining washer (as it came off!) and then spin on the square nut. Do not tighten it yet.

Incorrect washer installation will cause excessive vibration during engine operation.

6. Turn the assembly upside down and clamp the nut in a vise. Spin the assembly until the holes in the mounting plate are directly opposite any two of the flat sides on the nut. This is important, otherwise the slot on the engine pad will not engage the mount correctly. Secure the mount in this position and tighten the bolt to 18-20 ft. lbs. (24-27 Nm) on 1987-88 engines, or 44-52 ft. lbs. (60-71 Nm) on 1989-90 engines.

7. Remove the mount from the vise and position it on the transom plate. Install the bolts and washers and tighten each to 20-25 ft. lbs. (27-34 Nm).

8. Install the engine, making sure that the slot in the engine pad engages the square nut correctly. Install the two washers and locknut and tighten it to 28-30 ft. lbs. (38-41 Nm).

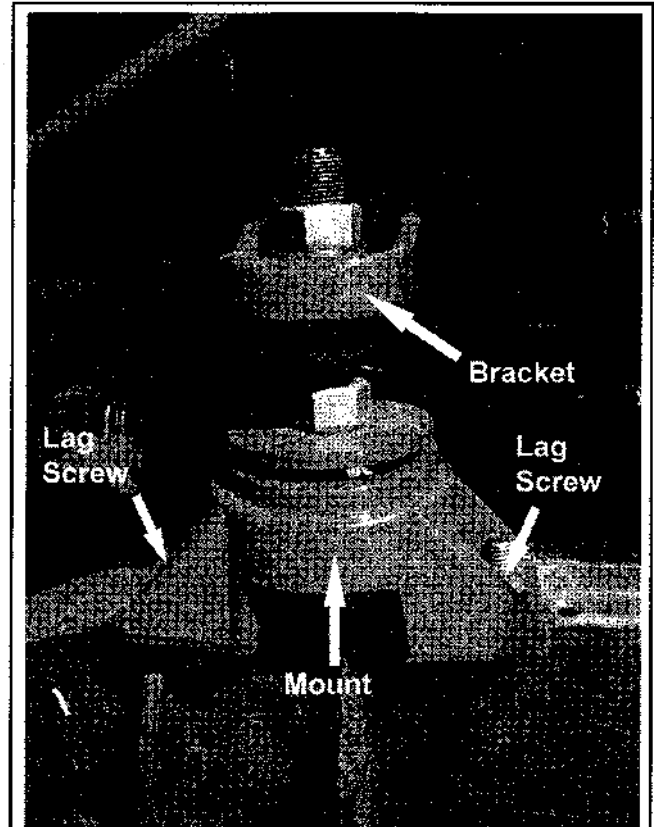


Fig. 6 A good view of the front mount..

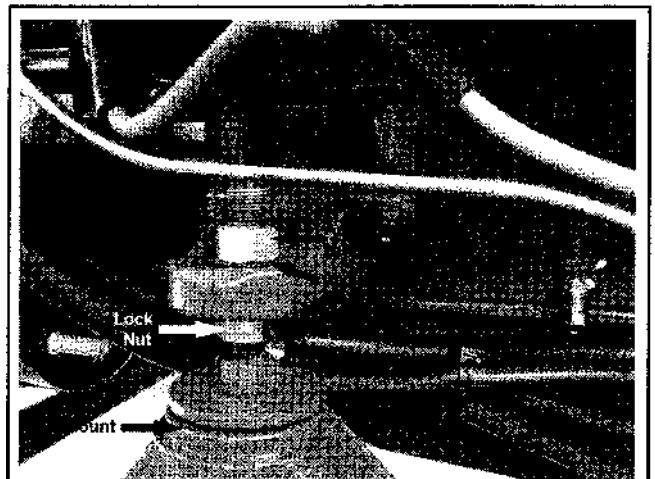


Fig. 7 ...and a closer view

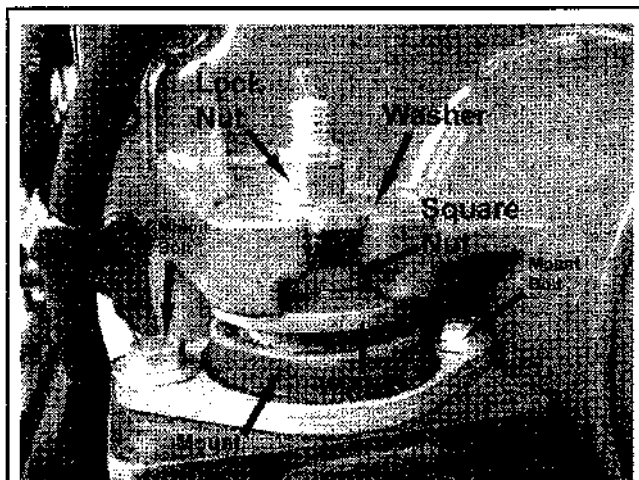


Fig. 8 A good view of the rear mount

Cylinder Head (Camshaft) Cover

REMOVAL & INSTALLATION



1. Open or remove the engine compartment hatch. Disconnect the negative battery cable.
2. Loosen the clamp and remove the crankcase ventilation hose at the cover (if equipped). Carefully move it out of the way.
3. If your engine has a spark plug wire retainer attached to the cover, unclip the wires or remove the retainer.
4. Loosen the cover mounting bolts (8) and lift off the cylinder head cover. Take note of any harness or hose retainers and clips that might be attached to certain of the mounting bolts; you need to make sure they go back in the same place.
- To install:
5. Clean the cylinder head and cover mounting surfaces of any residual gasket material with a scraper or putty knife.
6. Coat the cylinder head mounting surface with high temperature, oil resistant sealer.
7. Position a new gasket on the cylinder head and then position the cover. Tighten the mounting bolts to 48-84 inch lbs. (5.4-9.5 Nm). Make sure any retainers or clips that were removed are back in their original positions.
8. Reconnect the spark plug wires.
9. Connect the crankcase ventilation hose. Check that there were no other wires or hoses you may have repositioned in order to gain access to the cover.
10. Connect the battery cables.

Rocker Arms and Hydraulic Adjusters

REMOVAL & INSTALLATION



- ◆ See Figures 9 and 10
1. Open or remove the engine hatch cover and disconnect the negative battery cable. Remove the cylinder head cover as detailed previously.
 2. Rotate the camshaft until the tip of the camshaft lobe over the rocker is facing upward—the heel is resting on the rocker arm.
 3. Install the valve tool (4T74P-6565-A) over the valve spring and depress the spring until the rocker arm is released and you can lift it out.
 4. Remove the hydraulic valve adjuster.
 5. Repeat this procedure for each remaining rocker arm and adjuster.
 - To install:
 6. Clean and inspect the rocker assemblies for nicks, scratches or signs of undue wear. If the pad at the valve end of the arm shows a groove, replace the arm.
 7. Coat all bearing surfaces of the rocker assembly and adjuster with engine oil.

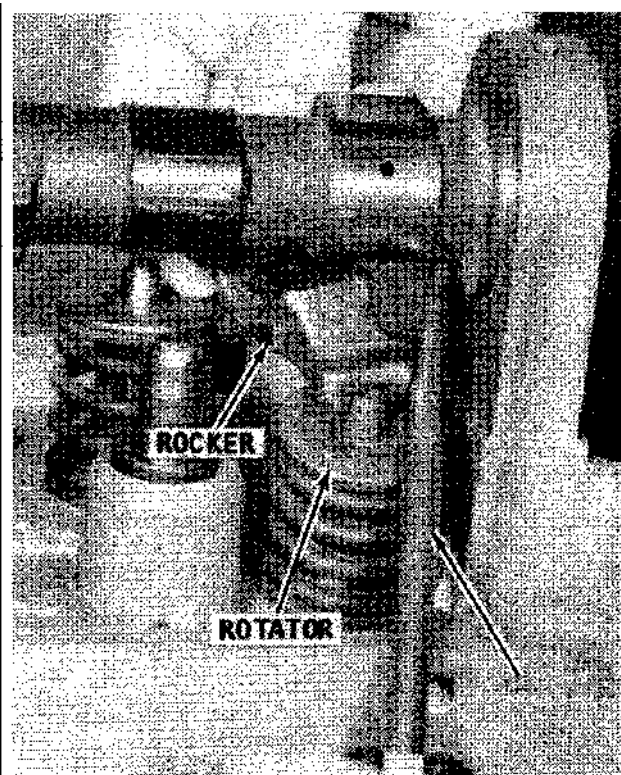


Fig. 9 If the special tool is not available, you can usually compress the spring with a small prybar

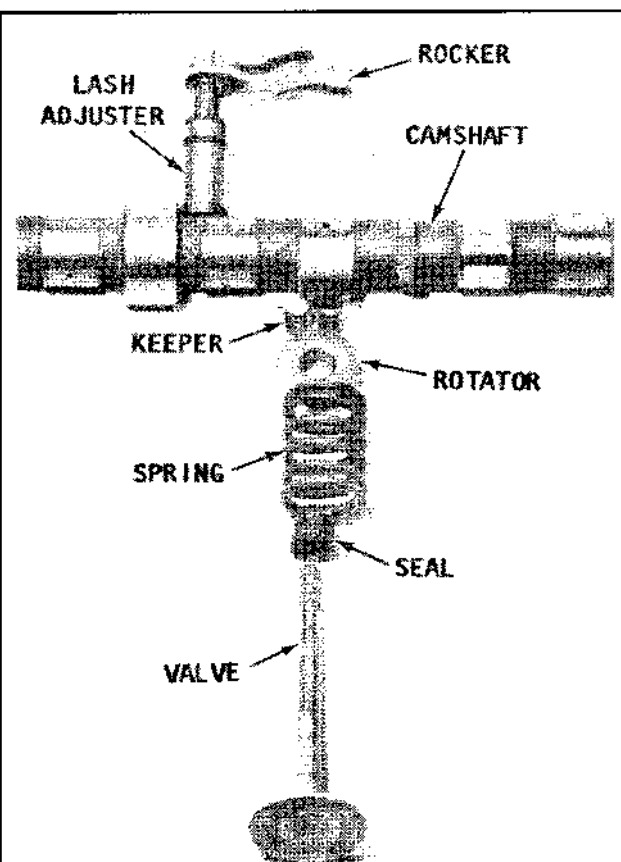


Fig. 10 A good look at the valve train

8. Rotate the camshaft until the lobe is pointing up on the cylinder that you are working on.
9. Depress the valve spring with the special tool again and insert the rocker arm into position.
10. Repeat this procedure for each remaining rocker arm and adjuster, making sure that the spring has been released and the tool removed before moving on to the next arm.
11. Adjust the valves and install the cylinder head cover.
12. Connect the battery cable and check the idle speed.

VALVE ADJUSTMENT



These engines utilize hydraulic valve lifters, although there is no need for periodic valve adjustment, it is necessary to perform a preliminary adjustment after any work on the valve train/rocker assembly. All adjustment should be undertaken while the lifter is on the base circle of the camshaft lobe for that particular cylinder. This means the opposite side of the pointy part of each lobe.

1. Rotate the camshaft by hand until the base circle (heel) of the camshaft lobe is resting on the cam follower at the valve you intend to adjust; the lobe will be pointing straight up.
2. Install the valve tool (#T74P-6565-A) into position and slowly apply pressure to the handle until the cam follower has collapsed the hydraulic lash adjuster completely.
3. While using the tool to hold the adjuster in the collapsed position, insert a feeler gauge between the base of the camshaft lobe and the follower. Clearance should be 0.040-0.050 in. (1-1.3mm), although 0.035-0.055 in. (0.89-1.4mm) is acceptable.
4. If clearance is out of range, remove the cam follower again and inspect it for any signs of damage. If the follower appears to be OK and not showing signs of excessive wear, measure the valve spring height between the pad and the retainer—if not within 1 17/32-1 19/32 in., replace the spring.
5. If the valve spring installed height was within specifications, check that the camshaft is within specifications. If the camshaft checks out OK, install a new adjuster and recheck the lash a final time.

Exhaust Manifold

REMOVAL & INSTALLATION



1. Open or remove the engine compartment hatch. Disconnect the negative battery cable.
2. Drain all water from the engine, manifold and exhaust elbow as detailed in the Maintenance section.
3. Loosen the 4 clamps holding the exhaust hose bellows to the high-rise elbow and wiggle the bellows off of the elbow.
4. Disconnect the 2 shift cables at the shift bracket on the manifold. Remove the 2 locknuts and the bolt attaching the bracket to the manifold and lift off the bracket, positioning it on the engine out of the way.
5. Remove the 4 mounting bolts and their lock washers and then lift off the high-rise elbow—you may have to persuade it with a few taps from a rubber mallet.
6. On models with power steering, loosen the drive belt and then remove the pump and bracket from the thermostat housing on the leading edge of the manifold.
7. Disconnect the small water line coming off the starboard side of the thermostat housing. Have a rag handy, because there will probably be some water spillage even though you've already drained the system.
8. Remove the 2 mounting bolts and lock washers securing the thermostat housing to the manifold. Tap the housing a few times lightly with a rubber mallet until it separates from the manifold and then lift it off and position it out of the way with the remaining hoses still attached. Remove the gasket and thermostat.
9. On models equipped with power steering, remove the oil cooler mounting bolts and pull it away from the bottom of the manifold. You should not have to disconnect the hydraulic lines or remove the cooler completely.
10. Remove the 3 remaining locknuts and the upper bolt and then lift off the manifold. Remove the gasket. Once again, you may have to give the manifold a few friendly taps with a rubber mallet.

To install:

11. Clean all gasket and mating surfaces thoroughly (elbow, manifold and thermostat housing) and inspect the components for cracks, undue wear or other signs of damage.
12. Position a new manifold gasket over the studs so the connecting bar is on the bottom and push it up against the block. No sealer or adhesive is necessary.
13. Position the manifold over the studs and into position. Thread on the lock nuts (use new washers) and tighten them to 30-35 ft. lbs. (41-47 Nm). Install the upper bolt and tighten it to 20-25 ft. lbs. (27-34 Nm).
14. Install the elbow with a new gasket and tighten the 4 bolts securely.
15. Reposition the oil cooler if you removed it and tighten the mounting bolt securely.
16. Slide a new cork gasket over the element end of the thermostat and install them into the housing. Coat both sides of a new housing-to-manifold gasket with OMC Sealing Compound, position it on the manifold and then move the housing into place. Slide in the mounting bolts (the longer one goes on the inside) and tighten them to 20-25 ft. lbs. (27-34 Nm). Reconnect the small water line and tighten the clamp securely, being careful not to pinch the hose.
17. Position the shift bracket and tighten the 2 nuts (use new washers if possible) and tighten to 30-35 ft. lbs. (41-47 Nm). Thread in the bolt to the elbow and tighten it to 12-14 ft. lbs. (16-19 Nm). Connect the shift cables.
18. Install the power steering pump, if removed, and adjust the belt tension.
19. Coat the elbow outlet with a bit of soapy water and then wiggle the bellows up and into position. Tighten the hose clamps securely.
20. Reconnect the battery cables and run the engine. Check for any water leaks.

High-Rise Exhaust Elbow

REMOVAL & INSTALLATION



1. Drain the cooling system.
 2. Loosen the hose clamps and slide off the exhaust hose (bellows). Lubricating the elbow-to-bellows connection with a bit of soapy water will help break the hose loose.
 3. Loosen the 2 shift bracket lock nuts and unscrew them as far as you can without removing the nut from the stud.
 4. Remove the 4 elbow mounting bolts on the elbow mating flange and swing the shift cable anchor bracket out of the way.
 5. Lift it off the elbow. A little friendly persuasion with a soft rubber mallet may be necessary! Be careful though, no need to take out all your aggressions on the poor thing.
 6. Remove the gasket(s) and restrictor plate (if equipped). You can throw away the gasket(s), but keep the plate if your engine uses it.
- To install:**
7. Clean the mating surfaces of the manifold and elbow thoroughly, coat both sides of a new gasket with Gasket Sealing compound and position it onto the manifold flange.
 8. If your engine was so equipped, position the restrictor plate and/or second gasket onto the manifold. Don't forget to coat the gasket with sealing compound.
 9. Position the elbow on the manifold, position the anchor bracket and screw the bolts in finger tight. Tighten all four to 12-14 ft. lbs. (16-19 Nm).
 10. Tighten the 2 lower nuts on the shift bracket to 30-35 ft. lbs. (41-47 Nm).
 11. Slide the exhaust hose, while wiggling it, all the way onto the elbow and tighten the clamp screws securely. Make sure that the 2 upper clamps are riding in the channels on the upper side of the bellows.

3-8 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

Exhaust Hose (Bellows)

REMOVAL & INSTALLATION

◆ See Figures 11 and 12



1. Loosen all four hose clamps, two on top of the hose and two on the bottom.
2. Drizzle a soapy water solution over the top of hose where it mates with the exhaust elbow and let it sit for a minute.
3. Grasp the hose with both hands and wiggle it side-to-side while pulling down on it until it separates from the elbow.
4. Now wiggle it while pulling upwards until it pops off the exhaust pipe. Make sure that you secure the exhaust pipe while pulling off the hose.
5. Check the hose for wear, cracks and deterioration.
6. Coat the inside of the lower end of the hose with soapy water and wiggle it into position on the pipe. Remember to install the two clamps before sliding it over the end of the pipe.

There are usually two ribs on one end of the hose—this is the side that attaches to the exhaust elbow. Do not position this end onto the exhaust pipe.

7. Slide two clamps over the upper end (the side with two ribs!), lubricate the inside with soapy water and wiggle the hose over the elbow until it is in position.
8. Tighten all four clamps securely.

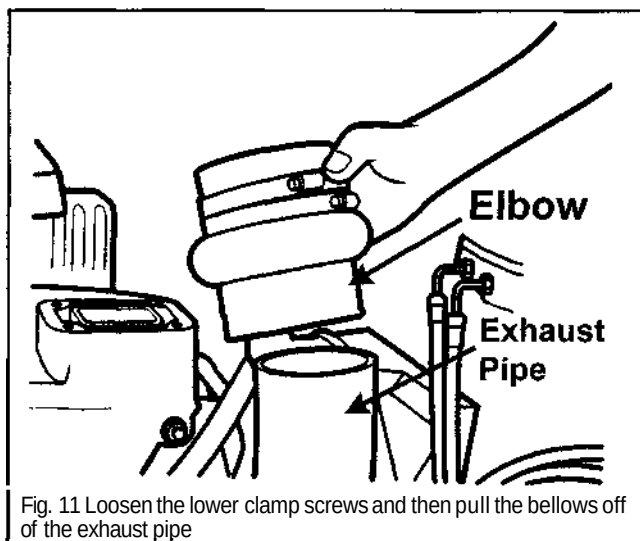


Fig. 11 Loosen the lower clamp screws and then pull the bellows off of the exhaust pipe

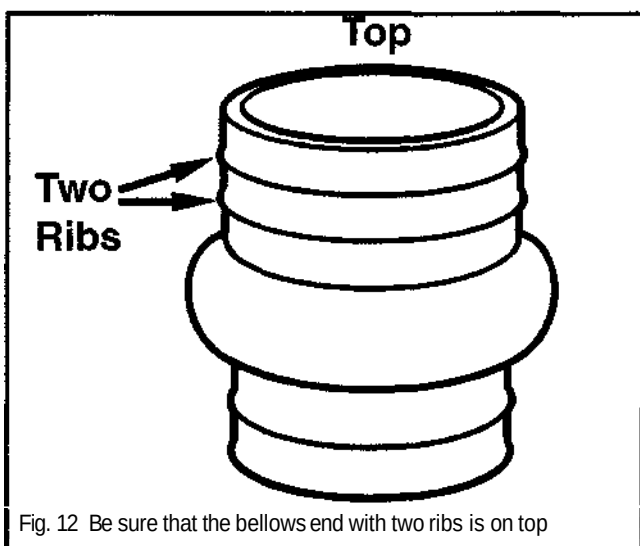


Fig. 12 Be sure that the bellows end with two ribs is on top

Exhaust Pipe

REMOVAL & INSTALLATION



1. It is unlikely you will be able to get the pipe off without removing the engine, so remove the engine as previously detailed.
2. Loosen the four retaining bolts at the transom shield and then remove the exhaust pipe. Carefully scrape any remnants of the seal from the pipe and transom mounting surfaces.

The pipe mounting holes in the transom shield utilize **Heli-Coil®** locking inserts. NEVER clean the holes or threads with a tapping tool or you risk damaging the locking feature of the threads.

3. Coat a new seal with OMC Adhesive M or 3M Scotch Grip Rubber Adhesive and position it into the groove on the transom shield mating surface.
4. Coat the mounting bolts with Gasket Sealing Adhesive. Position the exhaust pipe, insert the bolts and tighten them to 10-12 A. lbs. (14-16 Nm) on 1987-89 engines; or 20-25 ft. lbs. (27-34 Nm) on 1990 engines.

Make sure that the trim/tilt lines are routed correctly (above and behind) before tightening the pipe to the transom.

5. Install the engine.

EXHAUST VALVE (FLAPPER) REPLACEMENT



1. Remove the exhaust hose from the elbow and exhaust pipe. The flapper is located in the upper end of the pipe.
2. The valve is held in place by means of a pin running through two bushings in the sides of the pipe. Position a small punch over one end of the pin and carefully press the pin out of the pipe.

Make sure you secure the valve while removing the retaining pin so it doesn't fall down into the exhaust pipe.

3. Press out the two bushings and discard them. Coat two new bushings with Scotch Grip Rubber Adhesive and press them back into the sides of the pipe.
4. Position the new valve into the pipe with the long side DOWN. When looking at the valve, the molded retaining rings are off-center—the side with the rings should face the top of the pipe. When the valve is in place, coat the pin lightly with engine oil and slowly slide it through one of the bushings, through the two retaining holes on the valve and then through the opposite bushing. Make sure the pin ends are flush with the sides of the pipe on both sides.
5. Install the exhaust hose.

Intake Manifold

REMOVAL & INSTALLATION

◆ See Figure 13



1. Open the engine covers/hatch and disconnect the **battery** cables. Drain all water from the engine as detailed in the Maintenance section.
2. Disconnect the throttle cable at the bellcrank and anchor block. Disconnect the swivel linkage at the throttle arm on the carburetor.
3. Carefully disconnect the fuel lines at the carburetor and fuel filter. Plug the lines and be careful to wipe up any spilled fuel.
4. Remove the fuel line clamp bracket at the intake manifold and then disconnect the fuel lines at the fuel pump. Remove the lines. Pull the fuel pump vent tube from the nipple on the carburetor and position it out of the way.
5. Loosen the hose clamp and then wiggle the water line off of the nipple on the end of the manifold. Tie the line back and out of the way with the open end facing upward.

6. Remove the fuel filter mounting bolts and then pull the filter off of the manifold and sit it down somewhere so that it is supported in the upright position. It is not necessary to remove the clamp from the oil dipstick.
7. Remove the plastic cover and then the flame arrestor.
8. Tag and disconnect the electrical lead to the choke at the housing.
9. Remove the 4 mounting nuts and lift off the carburetor and gasket.
10. Disconnect the distributor lead at the ignition coil and then remove the distributor cap, with the leads still attached, and position it out of the way. Pull out the rotor and then cover the top of the distributor with a clean rag.
11. Pop the PCV valve out, with the hose still connected, and position it out of the way.
12. Remove the 2 upper rear manifold bolts and move the throttle cable bracket out of the way.
13. Remove the 2 upper front manifold bolts and move the lifting bracket out of the way.
14. Remove the 4 lower manifold bolts, keeping them separate from the longer upper bolts. Don't forget the clamps on the 2 end bolts when you are removing them.
15. Tap the manifold lightly a few times with a rubber mallet until it breaks loose from the engine and then remove the manifold and gasket.

To install:

16. Clean all mating surfaces thoroughly so that there is no residual gasket material. Inspect the components carefully for cracks, burrs and other signs of wear or damage.
17. Insert a bolt (one of the longer ones) through the upper hole on each end of the manifold and then position the gasket over the bolts and onto the manifold. Position the manifold onto the block and tighten the 2 bolts finger-tight.
18. Thread in the 4 lower bolts (the short ones) until they are finger-tight—don't forget the clamps on the 2 outside bolts.
19. Position the lifting and throttle cable brackets and then install the 2 remaining upper bolts through the brackets and manifold.
20. Tighten the manifold bolts, in the sequence illustrated, to 60-84 inch lbs. (6.8-9.5 Nm). Follow the same sequence and then tighten them once more to 14-18 ft. lbs. (19-24 Nm).
21. Push the PCV valve back in place. Install the rotor and distributor cap. Connect the lead to the ignition coil.
22. Position a new carburetor gasket onto the manifold so that the 2 rounded nubs are facing the engine and then install the carburetor. Tighten the nuts to 12-14 ft. lbs. (16-19 Nm).
23. Connect the electrical lead at the choke housing and the snap the swivel linkage onto the ball stud at the throttle arm.
24. Install the flame arrestor and plastic cover. Install the vent hose bracket.
25. Position the fuel filter and thread in the bolts so the dipstick tube clamp is under the inner bolt. Tighten both bolts securely.
26. Push the water line over the manifold nipple and tighten the clamp securely without pinching the hose.
27. Remove the plugs and connect the fuel lines to the carburetor and filter. Attach the fuel line bracket and reconnect the vent hose at the carburetor.
28. Connect both fuel lines to the fuel pump and tighten the nuts securely.

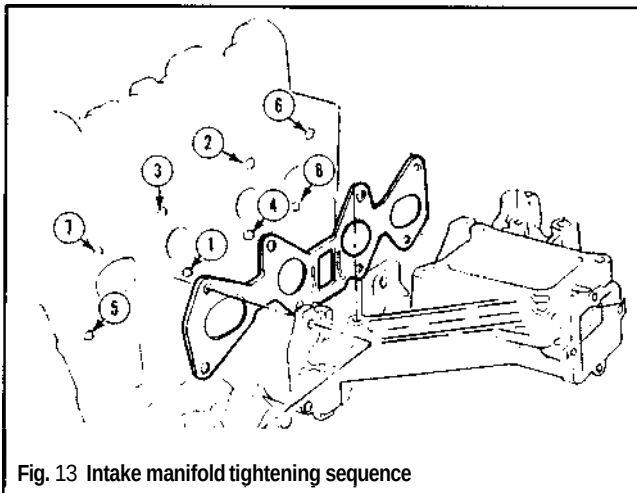


Fig. 13 Intake manifold tightening sequence

29. Connect the throttle cable at the bellcrank; position the flat washer and then insert a new cotter pin. Pivot the retainer down until you can get the trunnion into the anchor block and then tighten the nut securely.
30. Connect the battery cables, start the engine and check for any fuel or water leaks.

Oil Pan

REMOVAL & INSTALLATION

◆ See Figures 14 and 15



More times than not this procedure will require the removal of the engine. Your boat and its unique engine installation will determine this, but the procedure is almost always easier with the engine removed from the boat.

1. Remove the engine as previously detailed in this section.
2. If you haven't already drained the engine oil, do it now. Make sure you have a container and lots of rags available.
3. Remove the starter motor as detailed in the Electrical section. Although not absolutely necessary, this step will make the job much easier.
4. Remove the oil withdrawal tube from the oil drain plug fitting.
5. Loosen and remove the oil pan retaining bolts and (22 on 1987-89 engines and 20 on 1990 engines), starting with the center bolts and working out toward the pan ends. Lightly tap the pan with a rubber mallet to break the seal and then lift it off the cylinder block. If your engine stand will allow for rotating the engine, you'll find that this will be easier with the pan facing up.
6. Lift the reinforcement strips off of the pan flange on 1990 engines.

To install:

Clean the pan mating surfaces of any residual gasket material with a scraper or putty knife. Make sure that no old gasket material has been pressed into the retaining bolt holes in the pan, block or front cover. Clean the pan itself thoroughly with solvent.

1987-89 Engines:

7. Apply a 0.125 in. (3.18mm) bead of RTV sealant to the joint where the front cover and block meet. Install new front and rear seals into the front cover and over rear bearing cap—move quickly here as the sealant sets up very quickly. Make sure that you press the tabs on each seal completely into the cylinder block.
8. Apply gasket adhesive to the oil pan flange and also to 2 new side gaskets. Allow the adhesive to set up until it is tacky and then install the gaskets onto the flange on each side of the pan.
9. Insert a guide pin into a hole on each side of the cylinder block mounting surface and then position the oil pan onto the block. Install 4 M8 bolts (two front and two rear) and tighten them to 96-120 inch lbs. (10.8-13.6 Nm).
10. Install the remaining 18 M6 bolts and tighten them to 72-96 inch lbs. (8.1-10.8 Nm), working clockwise around the pan from.
11. Coat a new gasket with RTV sealant and then position the gasket onto the pan being very careful to line up all the holes.

1990 Engines:

12. Apply a 0.125 in. (3.18mm) bead of RTV sealant to the two joints (A) where the front cover meets the pan and the four joints where the oil pan meets the block (B).
13. Apply gasket adhesive to a new oil pan gasket and allow it to set up until tacky. Position the gasket onto the oil pan flange making sure that all the holes line up correctly.
14. Insert a guide pin into a hole on each side of the cylinder block mounting surface and then position the oil pan onto the block. Position the reinforcing strips on each side of the pan and then install 18 M6 bolts finger-tight.
15. Remove the 2 guide pins and thread in the remaining two M6 bolts. Tighten all bolts to 72-96 inch lbs. (8.1-10.8 Nm) in a clockwise pattern working around the pan.
16. Install the oil drain fitting and finger tighten the bolt. Rotate the fitting and then attach the withdrawal tube. Tighten the fitting bolt and flare nut to 15-18 ft. lbs. (20-24 Nm).
17. Install the starter motor and then install the engine (if removed). Run the engine up to normal operating temperature, shut it off and check the pan for any leaks.

3-10 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

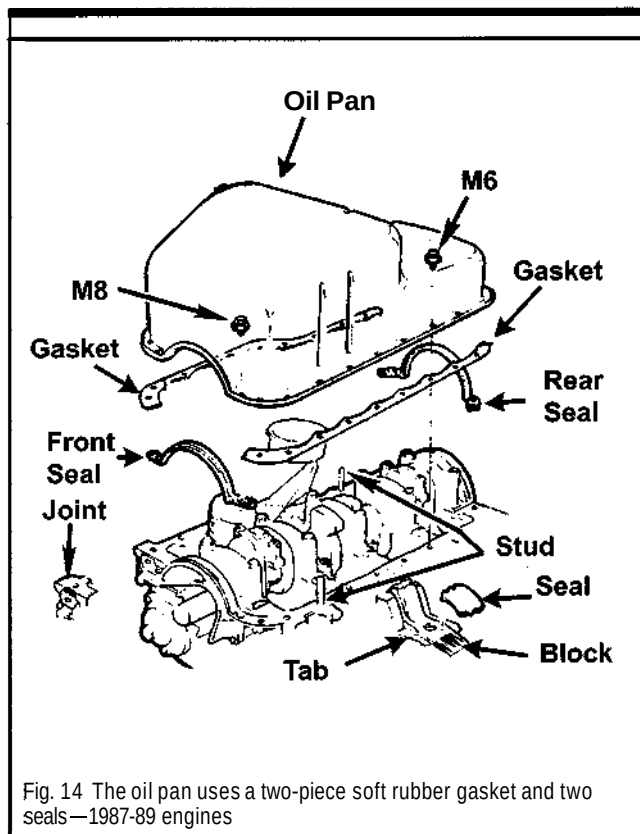


Fig. 14 The oil pan uses a two-piece soft rubber gasket and two seals—1987-89 engines

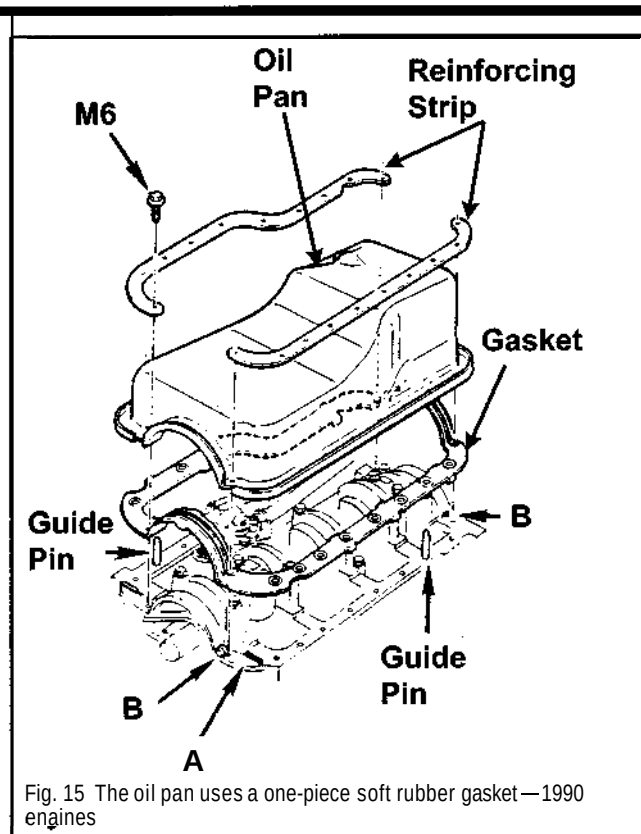


Fig. 15 The oil pan uses a one-piece soft rubber gasket—1990 engines

Oil Pump

The two-piece oil pump utilizes an inner and outer rotor and a pressure relief valve. A baffled pick-up tube is bolted to the body of the pump. The pump is driven via the auxiliary shaft which is itself driven by the crankshaft via a timing belt.

REMOVAL & INSTALLATION

◆ See Figures 16 and 17



1. Remove the oil pan as previously detailed. Remember that you probably need to remove the engine for this procedure.
2. Loosen and remove the pump pick-up tube brace bolt.
3. Loosen and remove the two pump mounting bolts and lift off the pump assembly. Pull out the pump shaft and take note of its orientation in the bore.
4. Insert the pump shaft in the same manner in which it came out.
5. Check that the pump and block mating surfaces are clean and then position the pump over the block so that the pump shaft slot is aligned correctly. Do not use a gasket or RTV sealant.
6. Tighten the pump mounting bolts to 14-21 ft. lbs. (19-28 Nm).
7. Position the pick-up tube brace and tighten the bolt to 60 inch lbs. (7 Nm).
8. Install the oil pan and engine.

DISASSEMBLY & ASSEMBLY

◆ See Figure 17



1. Remove the oil pan and oil pump.
2. Remove the mounting bolts (2) and pull off the pick-up tube.
3. Remove the 4 cover screws and lift off the cover.
4. Lift out the two rotors and sit them down carefully as they break very easily.

The pump body, relief valve and spring are serviced as an assembly.

To assemble:

5. Clean all components thoroughly in solvent and allow them to air dry completely—compressed air will speed the process if available. Clean the inside of the housing with a small toothbrush if necessary.
6. Check the cover, inner housing and both rotors for scratching, nicks or any other signs of wear. Replace as necessary.
7. Install the rotors so that the ID marks on each component are facing each other.
8. Measure the clearance between the outer rotor race and the inner bore of the housing. Clearance should be 0.001-0.0013 in. (0.03-0.033mm).
9. With the rotors still installed in the housing, lay a straight edge across the top of the assembly. Use a flat feeler gauge and measure the clearance between the straight edge and the rotors. Endplay must be 0.001-0.004 in. (0.03-0.10mm).
10. Check the bearing clearance by measuring the outer diameter of the pump shaft with a micrometer and then subtracting that figure from the inner diameter of the housing bearing. Clearance should be 0.0015-0.0029 in. (0.04-0.07mm).
11. Measurements outside of the specifications on any of the preceding steps will dictate replacement of the associated component.
12. Install the housing cover and tighten the screws to 72-120 inch lbs. (8.1-13.6 Nm).
13. Connect the pick-up tube to the housing and tighten the 2 bolts to 14-21 ft. lbs. (19-28 Nm).
14. Install the oil pump and pan.

Engine Coupler And Flywheel

REMOVAL & INSTALLATION

◆ See Figures 18, 19 and 20



1. Remove the engine from the boat as detailed previously in this section.
2. Although not strictly necessary, we recommend removing the starter.
3. Cut the plastic tie that secures the housing drain hose (if equipped) and the pull the hose out of the fitting.

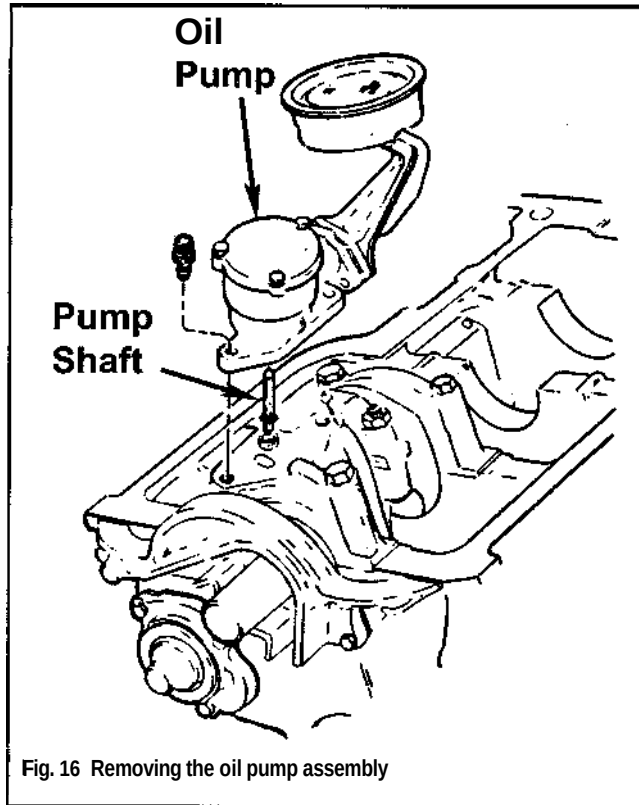


Fig. 16 Removing the oil pump assembly

4. Remove the 4 or 5 mounting bolts and slide out the lower flywheel housing cover.
 5. Loosen and remove any connections attached to either of the ground studs on each side of the flywheel. Move the electrical leads out of the way.
 6. Loosen the remaining retaining bolts (some of which were already removed with the shift bracket) for the flywheel housing and remove it. Take note of the positioning of any clamps so they may be installed in the same position.
 7. Slide a wrench behind the coupler and loosen the six flywheel mounting nuts gradually and as you would the lug nuts on your car or truck—that is, in a diagonal star pattern.
 8. Remove the coupler and then the flywheel.
- To install:**
9. Thoroughly clean the flywheel mating surface and check it for any nicks, cracks or gouges. Check for any broken teeth.
 10. Install the flywheel over the dowel on the crankshaft.

The 2.3L engine uses a completely different coupler than other OMC engines—make sure that you have the correct part if replacing with a new one.

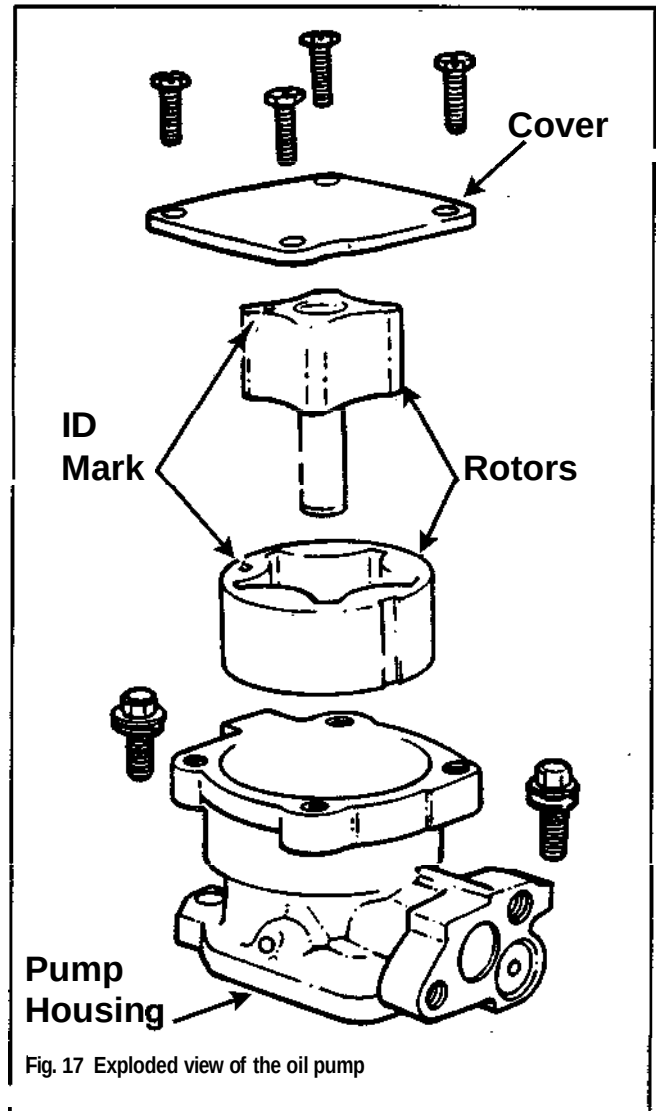


Fig. 17 Exploded view of the oil pump

11. Slide the coupler over the studs so that it sits in the recess on the flywheel. Install new lock washers and tighten the mounting bolts to 14-17 ft. lbs. (19-23 Nm). Once again use the star pattern while tightening the bolts.
12. Position the flywheel housing and the shift bracket. Make sure that the clamps are in their original positions and insert the mounting bolts. Tighten them to 28-36 ft. lbs. (38-49 Nm).

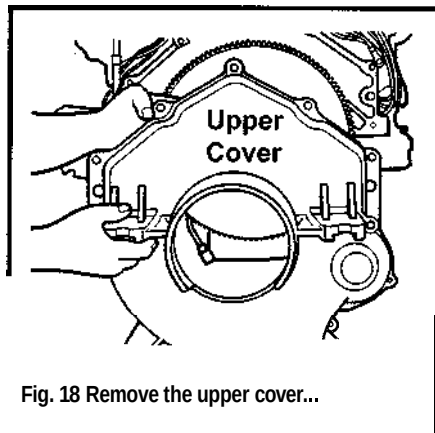


Fig. 18 Remove the upper cover...

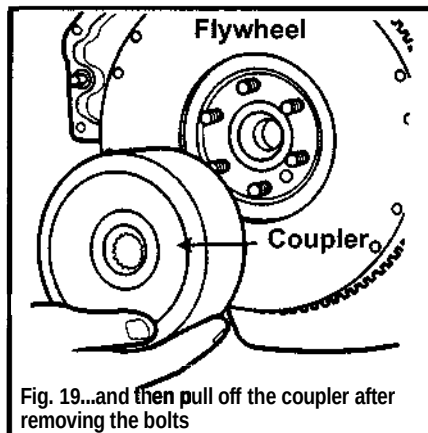


Fig. 19...and then pull off the coupler after removing the bolts

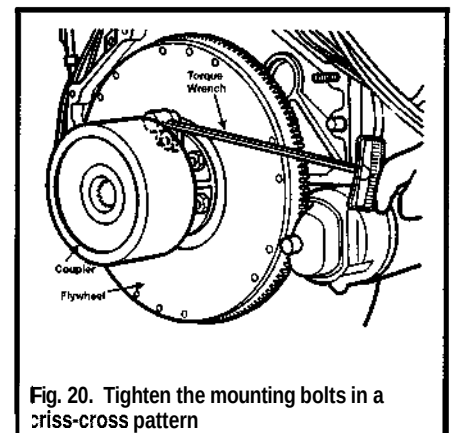


Fig. 20. Tighten the mounting bolts in a criss-cross pattern

3-12 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

13. Install the washer, lock washer and inner nut on the ground stud and tighten it to 20-25 ft. lbs. (27-34 Nm). Attach the electrical leads, install another lock washer and then tighten the outer nut securely.

14. Slide the lower flywheel cover into place and tighten the bolts to 60-84 inch lbs. (7-9 Nm).

15. Attach the drain hose with a new plastic tie.

16. Install the starter and engine.

Rear Main Oil Seal

REMOVAL & INSTALLATION

Two Piece Oil Seal

◆ See Figures 21, 22, 23 and 24

These engines utilize a two-piece rear main seal. The seal can be removed without removing the crankshaft. You will need to remove the engine for this procedure though.

1. Remove the engine as detailed previously in this section.

2. Remove the oil pan and pump as detailed previously in this section.

3. Loosen the retaining bolts and remove the rear main bearing cap. Carefully insert a small prybar or awl and remove the lower half of the seal from the cap. Do not damage the seal seating surface.

4. Loosen the remaining bearing bolts just enough so that the crankshaft drops down 1116 in. at the rear.

5. Using a hammer and a small drift or punch, tap on the end of the upper seal until it starts to protrude from the other side of the race. Grab the protruding end with pliers and pull out the remaining seal half.

□ Upper and lower seals must be replaced as a pair. Never replace only one seal.

6. Clean the seal grooves thoroughly with a small bottle brush.



Fig. 22 Drive out the old upper seal with a small drift

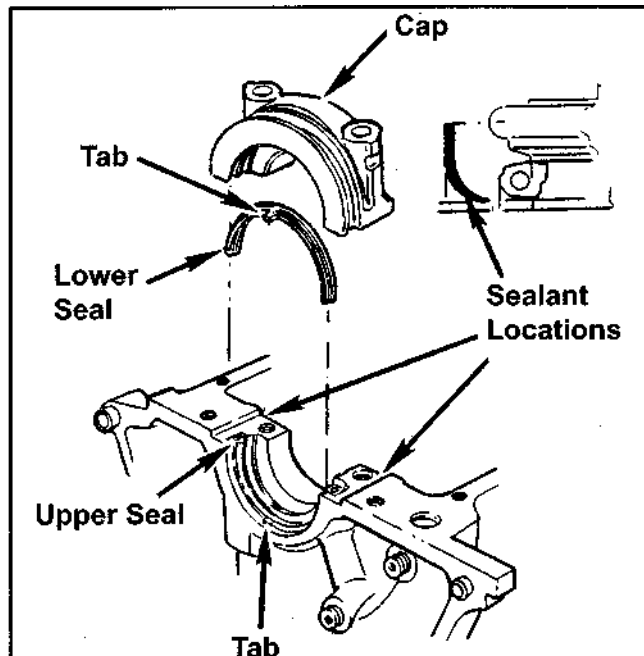


Fig. 21 Exploded view of the rear seal

7. Check that you have the correct new seal. Seals with a hatched inner surface can only be used on left hand rotation engines, smooth seals can be used on any engine. Coat the lip and bead thoroughly with motor oil, but keep oil away from the seal parting surfaces.

8. Your seal kit should come with an installation tool, if not, take a 0.004 in. feeler gauge and cut each side back about a half inch so that you're left with an 11164 inch point. Bend the tool into the gap between the crankshaft and the seal seating surface. This will be your "shoe horn".

9. Position the upper half of the seal (lip facing the engine) between the crank and the tool so that the seal's bead is in contact with the tool tip. Roll the seal around the crankshaft using the tool as a guide until each end is flush with the cylinder block. Remove the tool.

Make sure that the tab on the seal is facing the rear.

10. Tighten up all bearing cap bolts (except the rear) to bring the crankshaft back up into position.

11. Insert the lower seal half into the main bearing cap with the lip facing the cap and the tab facing the rear. Start it so that one end is slightly below the edge of the cap and then use the tool to shimmy the seal all the way in until both edges are flush with the edge of the cap. Remove the tool.

12. Make sure that the capblock mating surfaces and the seal ends are free of any oil and then apply a small amount of Perfect Seal to the block just behind where the upper seal ends are.

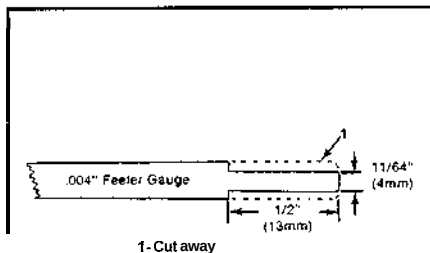


Fig. 23 Fabricate a seal installation tool out of an old feeler gauge...

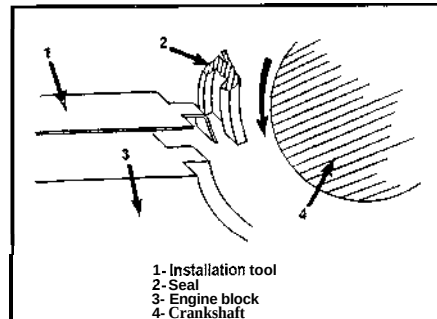


Fig. 24 ...and then use the tool to feed the seal around the crankshaft

✱✱ CAUTION

Do not get sealant on the seal ends.

13. Install the bearing cap and tighten the bolts on all caps to 80-90 ft. lbs. (109-122 Nm).
14. Install the oil pump and pan.
15. Install the engine.

One Piece Oil Seal

◆ See Figure 25



1. Remove the flywheel housing and cover as detailed in this section.
2. Remove the engine coupler and flywheel from the engine as detailed in this section.
3. Remove the engine and then the oil pan.
4. Using an awl, punch a hole into the metal surface of the seal between the inner lip and the cylinder block.
5. Install the threaded end of a slide hammer tool (# T77L-9533-B) into the end of the crankshaft and remove the seal.
6. Thoroughly clean the seal and mating surface with clean engine oil.
7. Position the seal on the installer tool (# T82L-6701-A) so that the spring side is facing the engine. Position the tool into place on the crankshaft, install the bolts and gradually (and alternately) tighten the bolts until the seal seats itself. The rear (outer) edge of the seal must be within 0.005 in. (0.13mm) of the rear edge of the cylinder block.

■ If the bolts supplied with the installation tool are not available, flywheel/coupler bolts may be used.

8. Remove the tool and install the oil pan.
9. Install the engine, flywheel and coupler.

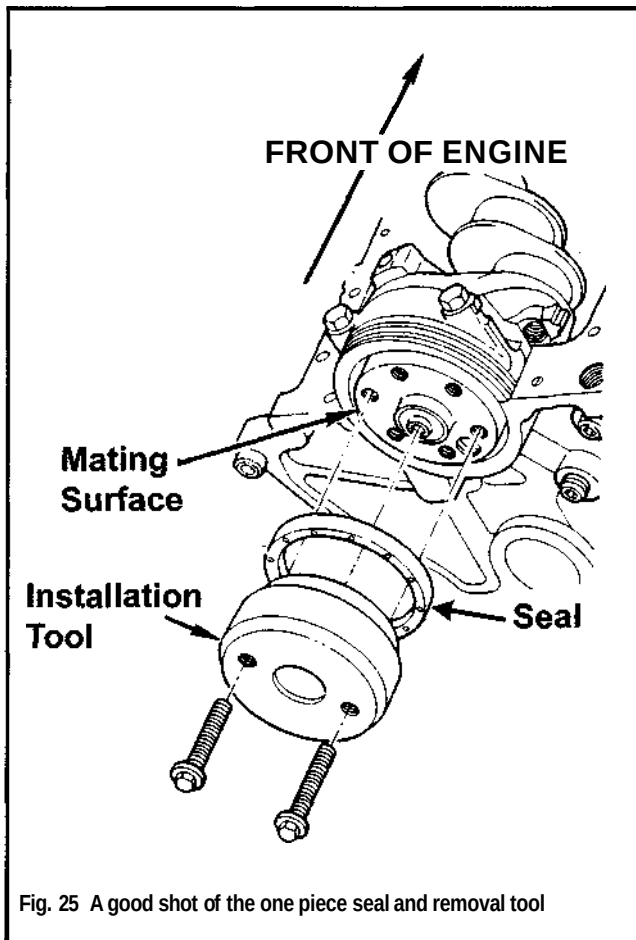


Fig. 25 A good shot of the one piece seal and removal tool

Front Cover

REMOVAL & INSTALLATION

◆ See Figure 26



Any time the timing cover is removed, the timing belt should be inspected for wear or damage to determine if it should be replaced.

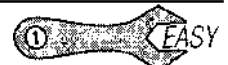
1. Disconnect the negative battery cables.
2. Drain all water from the system as detailed in the Maintenance section.
3. Loosen the 4 water pump pulley bolts, but do not remove the pulley.
4. Remove the power steering pump and alternator drive belt.
5. Now remove the 4 bolts and pull off the water pump pulley.
6. Remove the crankshaft pulley bolt and pulley. If difficulty is encountered, you may need to obtain a flywheel holding tool to keep the crankshaft from turning while loosening the bolt. Another method is to presoak the area with penetrating lubricant and allow it to sit overnight. A bolt which has been pretreated in this fashion will usually break loose easier.
7. Remove the front cover retaining bolts (usually 4 Allen bolts and a Phillips screw) and remove the cover. Please note that the upper Allen bolt on the starboard side is longer than the others and must be installed in the same position.

To install:

8. Position the front cover on the engine. Install the retaining bolts/screw and tighten to 72-108 inch lbs. (8-12 Nm). Don't forget that the longer bolt goes in the top hole.
9. Install the crankshaft damper pulley and retaining bolt. Tighten the bolt to 100-120 ft. lbs. (136-163 Nm). It's not a bad idea to use a new washer here.
10. Install the water pump pulley and tighten the bolts to 14-21 ft. lbs. (19-28 Nm).
11. Install the drive belts and adjust the tension.
12. Connect the battery cables. Run the engine, check for leaks and check the ignition timing.

Timing Belt and Tensioner

CHECKING



1. Crank the engine without starting it until the timing mark on the crankshaft pulley lines up with the TC mark on the timing grid.
2. Pop out the rubber inspection plug found in the upper front cover and check that the camshaft sprocket timing marks are aligned. If not, rotate the engine another full turn and recheck it.

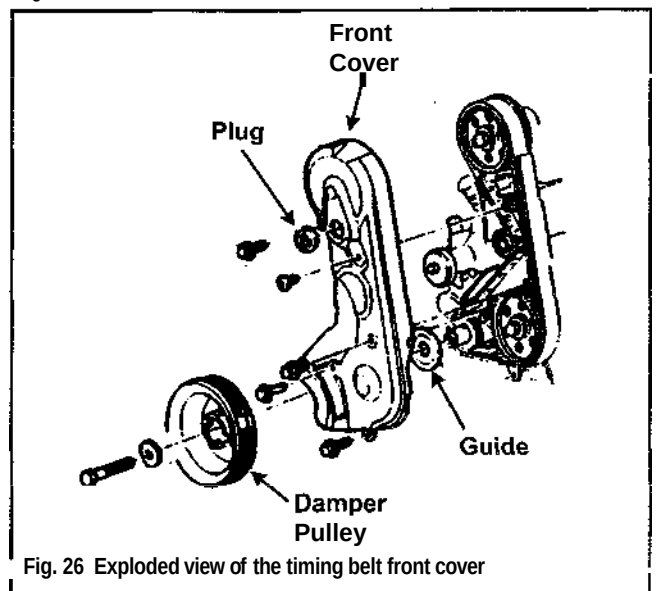


Fig. 26 Exploded view of the timing belt front cover

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3. If the marks are aligned in the previous step, remove the distributor cap and confirm that the rotor is pointing to the No. 1 cylinder lead.
4. If the belt fails any of these quick check, you will need to remove it and retune the engine.

CORRECTING AN OUT-OF-TIME ENGINE



If the crankshaft pulley and camshaft sprocket timing marks were aligned in the Checking procedures, but the distributor rotor was not pointing at the No. 1 cylinder:

1. Scribe a mark on the side of the distributor housing indicating the exact positioning of the cap tower for the No. 1 cylinder's spark plug lead.
2. Pull out the high tension lead running from the ignition coil and ground it. Remove the distributor cap.
3. Remove the distributor hold-down clamp bolt and then slowly pull up on the distributor until you feel it disengage from the auxiliary shaft.
4. Rotate the rotor until it is 116th of a turn PAST the No. 1 position. Insert the distributor back into the block until it is fully seated and engaged with the auxiliary shaft; you may have to wiggle the housing slightly to get everything to engage.
5. When the distributor is fully seated in the block, you should notice that the rotor rotated back around to the No. 1 position. If it did not, repeat this procedure again until it does.
6. Tighten the clamp bolt, install the cap and coil lead, and then start the engine. Check the ignition timing.

If, in the Checking procedure, you were unable to get the crankshaft and camshaft sprocket timing marks to align properly (and simultaneously), the timing is off. Refer to Removal & Installation procedure to perform the steps.

REMOVAL & INSTALLATION



◆ See Figures 27, 28 and 29

1. Disconnect the negative battery cables.
2. Remove the front cover.
3. Slide the retaining washer for the belt off of the crankshaft—remember that the concave side faces outward.
4. Loosen the timing belt tensioner adjustment screw, position belt tensioner tool (# T74P-6254-A, or equivalent), on the tension spring roll pin and release the belt tensioner. Tighten the adjustment screw to hold the tensioner in the released position.

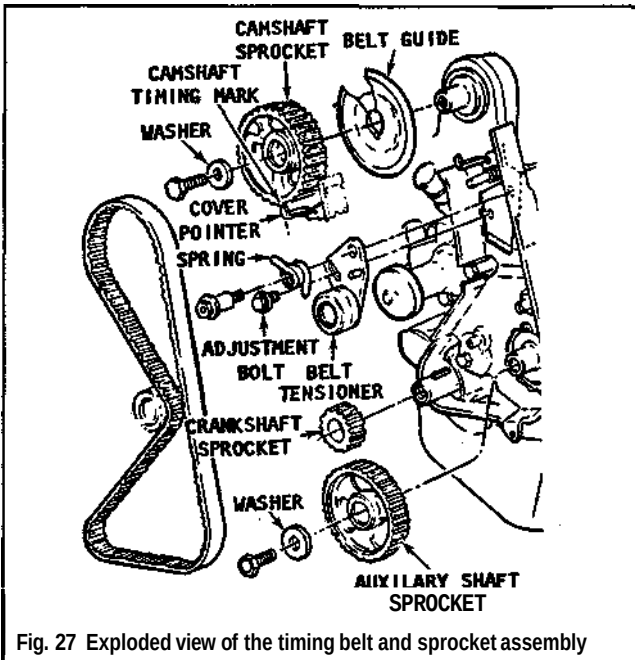


Fig. 27 Exploded view of the timing belt and sprocket assembly

5. Remove the crankshaft pulley, hub and belt guide.
6. Remove the timing belt. If the belt is to be reused, mark the direction of rotation so it may be reinstalled in the same direction.

If the belt is to be reused, inspect it for wear or damage.

To install:

Removing the spark plugs will make rotating the crankshaft easier.

7. Rotate the engine and position the crankshaft sprocket to align the triangular mark on the sprocket with the TDC notch on the block.
8. Position camshaft sprocket so that the timing mark aligns with the camshaft timing pointer grid.
9. Remove the distributor cap and set the rotor to the No. 1 firing position by turning the auxiliary shaft.
10. Install the timing belt over the crankshaft sprocket and then counterclockwise over the auxiliary and camshaft sprockets. Align the belt fore-and-aft on the sprockets, but be very careful not to disturb any of the timing marks alignments.
11. Loosen the tensioner adjustment bolt to allow the tensioner to move against the belt. If the spring does not have enough tension to move the roller against the belt, it may be necessary to manually push the roller against the belt and tighten the bolt.
12. If you haven't already done so, remove a spark plug from each cylinder in order to relieve engine compression and to make sure the belt does not jump time during rotation in the next step.
13. Rotate the crankshaft two complete turns in the direction of normal rotation (clockwise when viewed from the front of the engine) to remove the slack from the belt.
14. Tighten the tensioner adjustment bolt to 28-40 ft. lbs. (40-55 Nm) and bracket bolt to 14-22 ft. lbs. (20-30 Nm).
15. Recheck the alignment of the timing marks. Rotate the engine two complete revolutions again and then make sure that the timing marks are all still in alignment.
16. Install the retaining washer (concave side out) and slide it onto the crankshaft. The washer is keyed to the shaft.
17. Install the front cover.
18. Install the crankshaft damper pulley and tighten the retaining bolt to 100-120 ft. lbs. (136-163 Nm).
19. Install the water pump pulley and tighten the bolts to 14-21 ft. lbs. (19-28 Nm).
20. Install the spark plugs.
21. Connect the battery cables.
22. Start the engine and check the ignition timing.

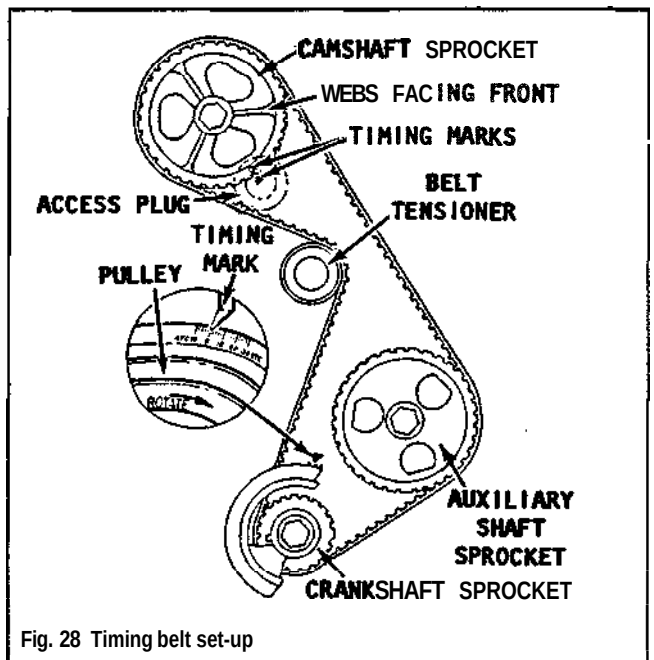


Fig. 28 Timing belt set-up

Timing Sprockets

REMOVAL & INSTALLATION



◆ See Figures 27 and 30

1. Disconnect the battery cables.
2. Remove the front cover and the timing belt.
3. Remove the camshaft and auxiliary shaft sprocket retaining bolts, as necessary. A holding tool (# T74P-6256-B) is extremely helpful here.
4. Remove the crankshaft, camshaft and auxiliary shaft sprockets, as necessary, using a suitable puller.

To install:

5. Install the crankshaft, camshaft and/or auxiliary shaft sprockets, as necessary.
6. While holding the sprocket from turning (using the holding tool), tighten the camshaft sprocket retaining bolt to 80-90 ft. lbs. (108-122 Nm) and/or the auxiliary sprocket retaining bolt to 28-40 ft. lbs. (38-54 Nm).
7. Install the timing belt and front cover.
8. Connect the battery cables.

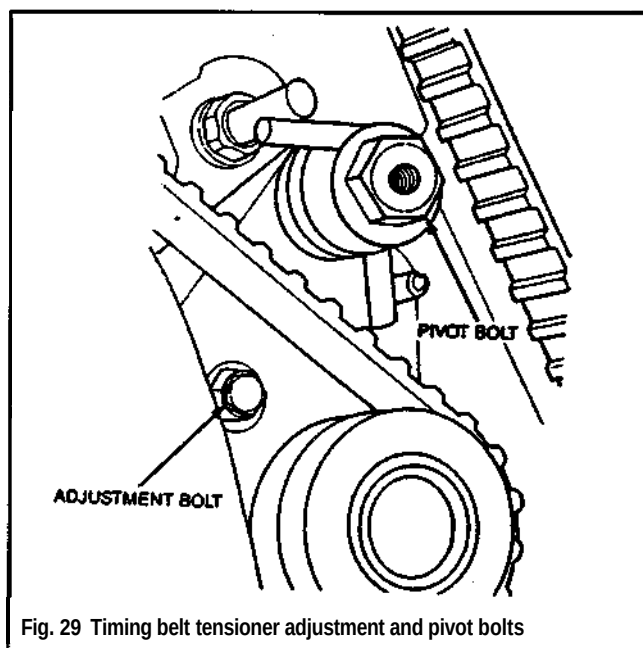
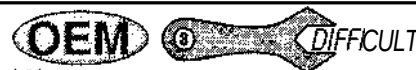


Fig. 29 Timing belt tensioner adjustment and pivot bolts

Front Oil Seals

REMOVAL & INSTALLATION



◆ See Figures 31, 32 and 33

1. Disconnect the battery cables.
2. Remove the front cover and timing belt.
3. Remove the timing sprocket (crankshaft, camshaft and/or auxiliary shaft) under which the seal is being replaced.
4. Use seal remover tool (#T74P-6700-B, or an equivalent jawed seal puller), to remove the crankshaft, camshaft and/or auxiliary shaft seal(s). Position the tool so that the jaws are gripping the thin edge of the seal very tightly. Operate the jackscrew on the tool to remove the seal.

To install:

5. Lubricate the lips of the new seals with clean engine oil.
6. Use a threaded seal installer tool (# T74P-6150-A, or equivalent), to install the seals.
7. Install the timing sprocket(s).
8. Install the timing belt and front cover.
9. Connect the battery cables.

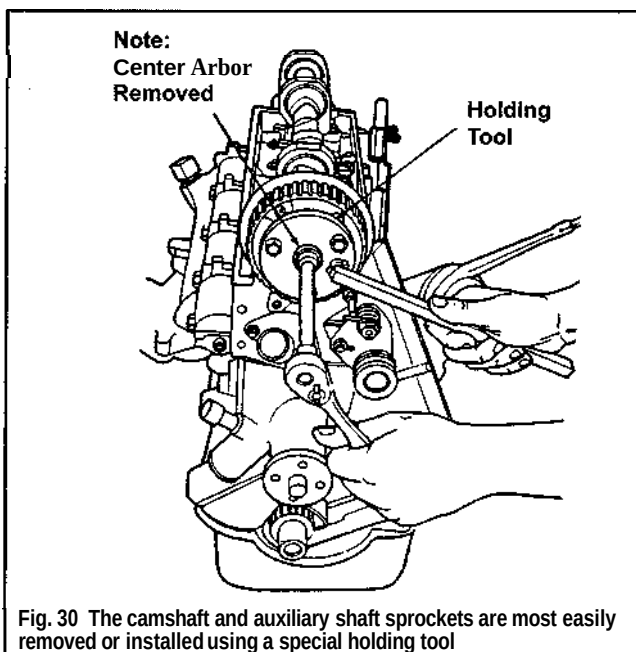


Fig. 30 The camshaft and auxiliary shaft sprockets are most easily removed or installed using a special holding tool

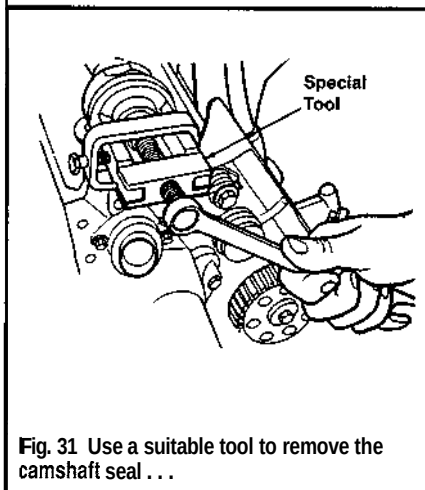


Fig. 31 Use a suitable tool to remove the camshaft seal ...

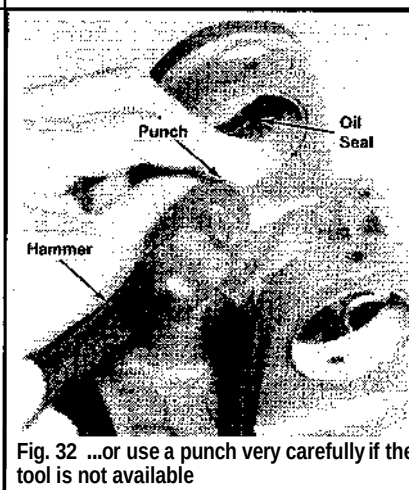


Fig. 32 ...or use a punch very carefully if the tool is not available

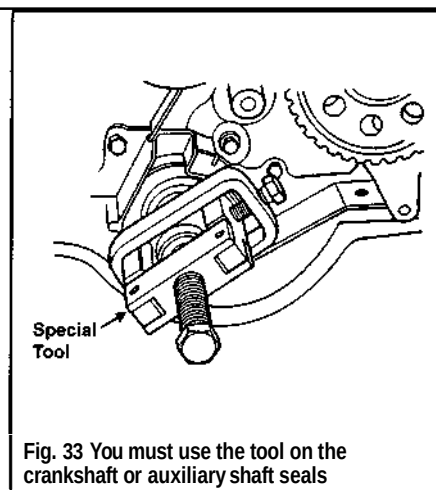


Fig. 33 You must use the tool on the crankshaft or auxiliary shaft seals

3-16 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

REMOVAL & INSTALLATION

† See Figures 32 thru 36

■ Depending on the available room/clearance in the engine compartment, it may be necessary to raise the engine or remove it entirely in order to gain sufficient clearance when pulling out the camshaft.

We recommend checking the camshaft lift prior to removing it from the cylinder block.

1. Disconnect the negative battery cable and drain the cooling system.
2. Remove the cylinder head cover.
3. Remove the front cover and the timing belt.
4. Compress the valve springs using valve spring compressor lever (# T47P-6565-A), or equivalent, and remove the cam followers (rocker arms).
5. Remove the camshaft sprocket retaining bolt and then remove the camshaft sprocket using a suitable puller.
6. Remove the camshaft seal using a seal removal tool.
7. Remove the two bolts pry off the camshaft rear retainer.
8. Remove the camshaft slowly and carefully to prevent damage to the lobes, journals or bearings.
9. Inspect the lobes and bearings for damage or wear. Replace the camshaft and bearings, as necessary.

To install:

10. If camshaft bearing replacement is necessary, you will have to rent or buy a bearing removal and installation tool. Essentially the tool is a threaded rod with a pulling plate and nut, along with various size drivers to push the bearings out of or pull the bearings into position.
11. Make sure the threaded plug is in the rear of the camshaft. If you are replacing the camshaft, you may have to remove the plug from the old camshaft and install it in the new one.

12. Coat the camshaft lobes with multi-purpose grease and lubricate the journals with heavy engine oil before installation. An engine assembly lube can also be used. Carefully slide the camshaft through the bearings.

13. Install the camshaft rear retainer and tighten the two bolts to 6-9 ft. lbs. (8-12 Nm).

14. Install a new camshaft seal using a suitable seal installer.

15. Install the camshaft sprocket and tighten the retaining bolt to 80-90 ft. lbs. (108-122 Nm).

16. Install the timing belt and front cover.

17. Install the cylinder head cover.

18. Connect the negative battery cable, then properly refill the engine cooling system.

19. Run the engine and check for leaks. Check the ignition timing.

Auxiliary Shaft

REMOVAL & INSTALLATION

◆ See Figure 37

1. Disconnect the battery cables.
2. Remove the front belt cover and the timing belt.
3. Remove the auxiliary shaft sprocket retaining bolt. Remove the sprocket using a puller.
4. Remove the distributor.
5. Remove the auxiliary shaft cover and the thrust plate.
6. Withdraw the auxiliary shaft from the block being careful not to damage the bearings.

To install:

7. Dip the auxiliary shaft in engine oil before installing. Slide the auxiliary shaft into the cylinder block, being careful not to damage the bearings.
8. Install the thrust plate and tighten the bolts to 6-9 ft. lbs. (8-12 Nm).
9. Position a new gasket and then install the auxiliary shaft cover. Tighten the cover screws to 6-9 ft. lbs. (8-12 Nm).

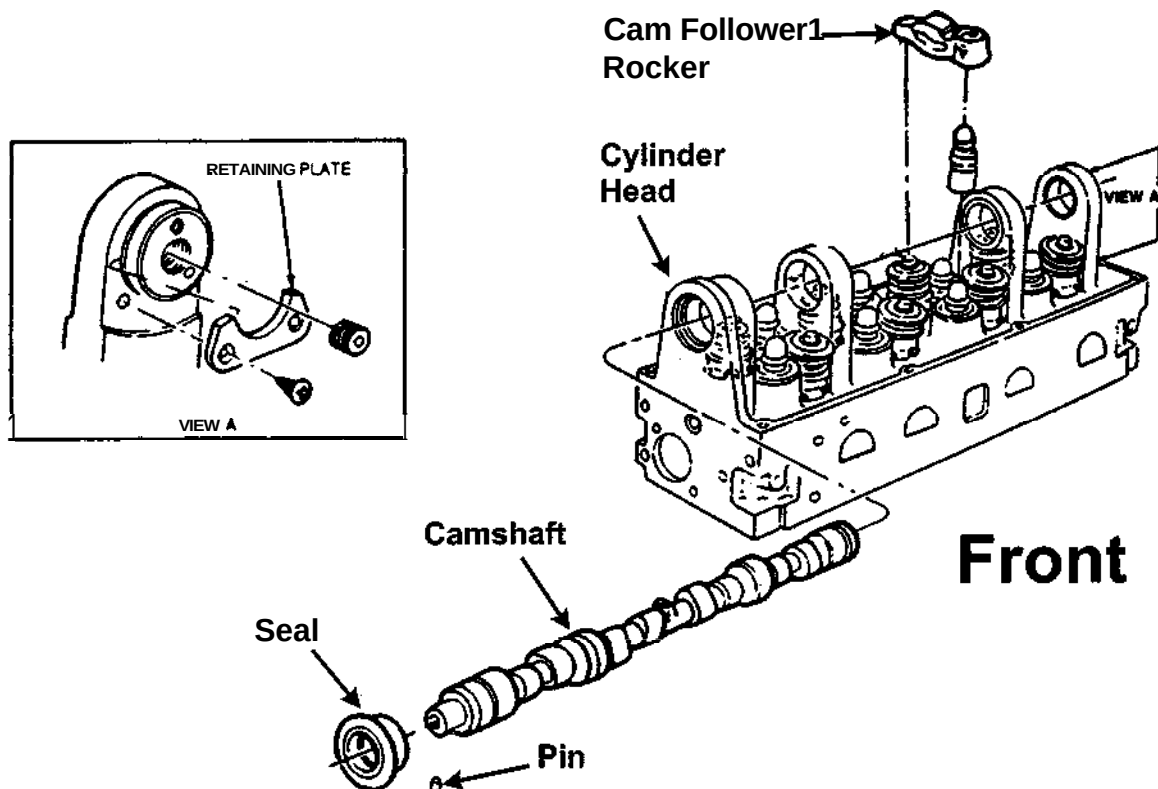


Fig. 34 Exploded view of the camshaft

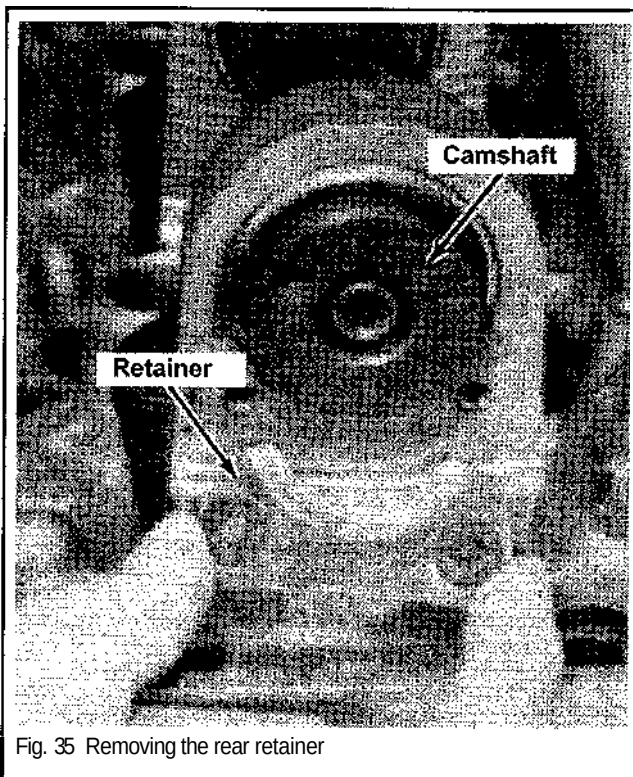


Fig. 35 Removing the rear retainer

The auxiliary shaft cover and cylinder front cover share a common gasket. Cut off the old gasket around the cylinder cover and use half of the new gasket on the auxiliary shaft cover.

10. Install the distributor.
11. Install the auxiliary shaft sprocket and tighten the bolt to 28-40 ft. lbs. (38-54 Nm).
12. Align the timing marks and install the timing belt and front cover.
13. Connect the battery cables.
14. Check the ignition timing.

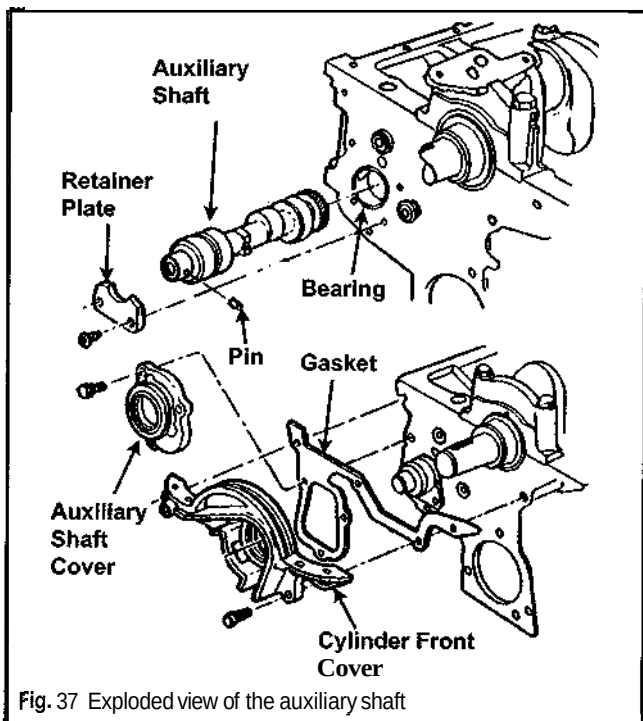


Fig. 37 Exploded view of the auxiliary shaft

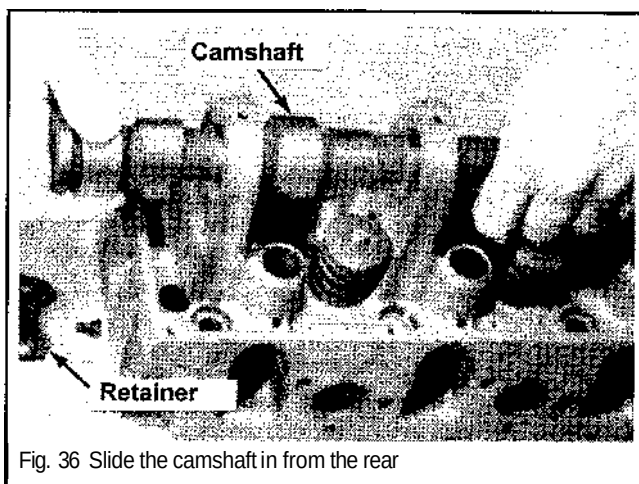


Fig. 36 Slide the camshaft in from the rear

Cylinder Head

REMOVAL & INSTALLATION

- ◆ See Figures 38, 39 and 40



1. Disconnect the battery cables and drain the cooling system
2. Remove the flame arrestor.

■ Before removing the spark plug wires, check the configuration of your engine against the firing order diagrams found in the Maintenance section. If your engine is different in any way, make notations to the diagrams to assure proper installation. Also, be sure to tag all of the spark plug wires and the distributor cap or ignition coil terminals, as applicable.

3. Tag and remove the spark plug wires. Remove the spark plugs.
4. Remove the distributor assembly.
5. Tag and disconnect any vacuum hoses or electrical leads in the way of head removal.
6. Remove the intake manifold assembly.
7. Remove the camshaft cover from the cylinder head.
8. Remove the front cover retaining bolt(s) and remove the cover.
9. Remove the timing belt from the camshaft pulley and the auxiliary pulley. Refer to the Timing Belts section. If the belt is not going to be replaced, be sure to mark the current direction of rotation on the belt to assure proper installation.

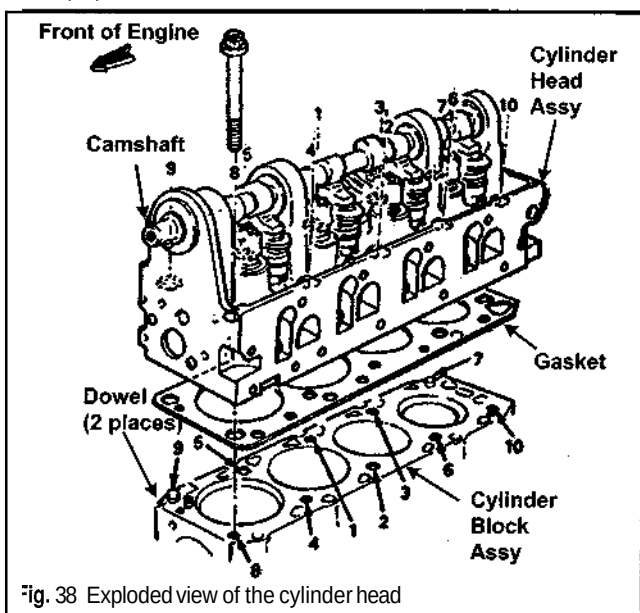


Fig. 38 Exploded view of the cylinder head

3-18 ENGINE MECHANICAL – FORD 4 CYLINDER ENGINES

10. Remove the exhaust manifold.
11. Remove the timing belt idler and two bracket bolts. Remove the timing belt idler spring stop from the cylinder head.
12. Tag and disconnect the oil sending unit wire.
13. Remove the cylinder head bolts, then break the gasket seal and remove the cylinder head.

** WARNING

Do not pry the cylinder head to break the gasket seal unless it is absolutely necessary. Prying the cylinder head can deform the soft metal and compromise the gasket mating surfaces.

To install:

14. Clean all gasket mating surfaces and blow the oil out of the cylinder head bolt block holes.
15. Check the cylinder head for flatness using a straightedge and a feeler gauge. If the head gasket surface is warped greater than 0.006 in. (0.152mm), it must be resurfaced. Do not grind off more than 0.010 in. (0.254mm) from the cylinder head.
16. Position a new cylinder head gasket on the engine. Rotate the camshaft so that the locating pin is approximately 30 degrees to the right of the 6 o'clock position when facing the front of the cylinder head (this places the pin about at the five o'clock position) to avoid damage to the valves and pistons.
17. If they are available, cut the heads off of two old cylinder head bolts to use as guide studs. Thread the studs into the engine block at opposite corners to use as guides.
18. Make sure the gasket is properly fit to the block and then set the head into position. Apply a non-hardening gasket sealer to the bolt threads and install the bolts finger-tight.
19. Tighten the head bolts using 2 passes of the sequence as illustrated, first to 50-60 ft. lbs. (68-81 Nm) and then to 80-90 ft. lbs. (108-122 Nm).

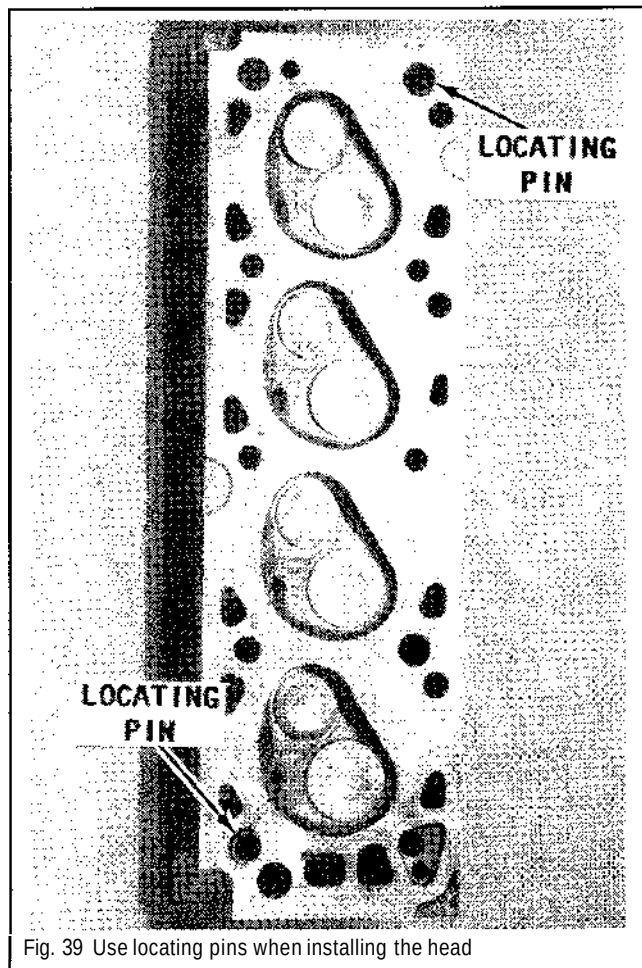


Fig. 39 Use locating pins when installing the head

20. Connect the oil sending unit wire.
21. Install the timing belt tensioner spring stop to the cylinder head.
22. Position the timing belt tensioner and tensioner spring to the cylinder head and install the retaining bolts. Rotate the tensioner against the spring with belt tensioner tool (# T74P-6254-A, or equivalent), and temporarily tighten.
23. Install the exhaust manifold using a new gasket. For details, please refer to the Exhaust Manifold procedure found earlier in this section.
24. Align the distributor rotor with the No. 1 plug location on the distributor cap and install it.
25. Install the timing belt over the sprockets. If the belt is not being replaced, make sure you have installed it in the same direction of rotation as it was before removal. Complete timing belt installation as detailed under the Timing Belt procedures located in this section. Be sure to check belt tension and alignment, then to properly tighten the tensioner and pivot bolts.
26. Install the front cover and tighten the retaining bolt(s) to 6-9 ft. lbs. (8-12 Nm).
27. Install the rocker arm cover and tighten the retaining bolts to 48-84 inch lbs. (5.5-9.5 Nm).
28. Install the intake manifold assembly. Tighten the bolts, in sequence, to 60-84 inch lbs. (6.8-9.5 Nm) and then retighten them all to 14-18 ft. lbs. (19-25 Nm).
29. Connect all remaining vacuum hoses and electrical leads as tagged during removal.
30. Position the alternator and install the drive belt.
31. Install the spark plugs, then install the spark plug wires as tagged and noted during removal.
32. Install the flame arrestor.
33. Connect the battery cables.
34. Bring the engine to normal operating temperature and check for leaks.
35. Check the ignition timing

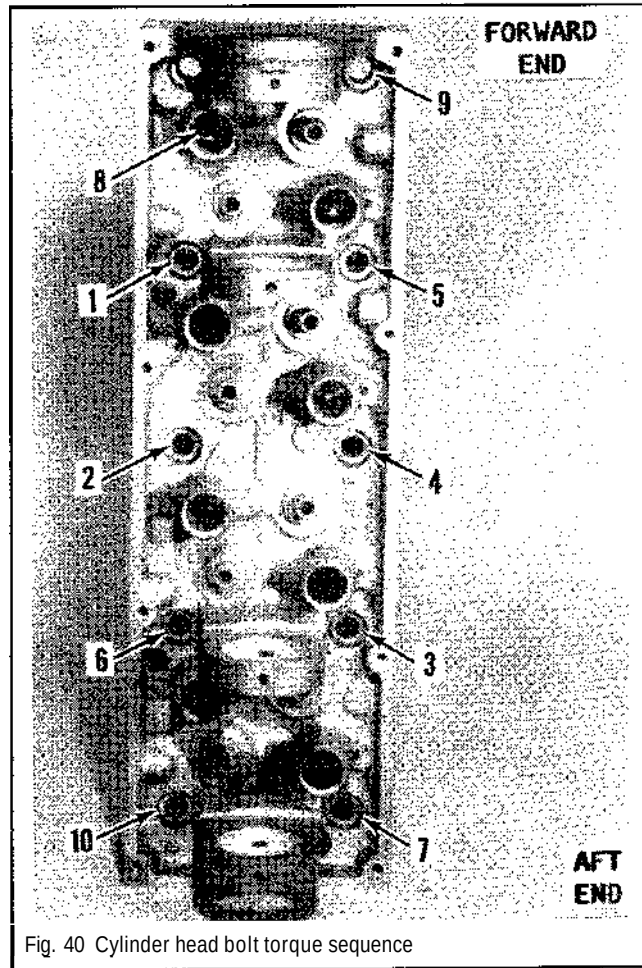


Fig. 40 Cylinder head bolt torque sequence

SPECIFICATIONS

TORQUE SPECIFICATIONS

Component		ft. lbs.	inch lbs.	Nm
Auxiliary shaft	Sprocket bolt	28-40		38-54
	Thrust plate bolts		72-108	8-12
Camshaft	Cover		48-84	5.5-9.5
	Sprocket bolt	80-90		108-122
	Thrust plate (retainer)		72-108	8-12
Connectingrod cap		30-36		40-49
Crankshaft	Damper pulley bolt	100-120		136-163
	Main bearing cap	80-90		108-122
Cylinder head	Step 1	50-60		68-91
	Step 2	80-90		108-122
Cylinder head cover			48-84	5.5-9.5
Distributor clamp bolt		14-21		19-28
Engine coupler	Flywheel	54-64		73-87
	Flywheel housing	28-36		38-49
	Coupler nut	14-17		19-23
	Coupler ground stud	20-25		27-34
	Cover		60-84	7-9
Engine mounts	Front			
		Adjusting nut	100-120	136-163
		Bracket bolts	32-40	43-54
		Lower nut	60-75	81-102
	Rear			
		Center bolt	1987-88 11-21 1989-90 44-52	24-27 60-71
		Lock nut	28-30	38-40
		Mounting bolts	20-25	27-34
			12-14	16-19
			20-25	27-34
Exhaust Elbow				41-47
Exhaust Manifold	Bolt	20-25	-	27-34
	Nuts	30-35	-	41-47
Exhaust Pipe	1987-89	10-12		14-16
	1990	27-34		27-34
Flywheel	Bolt	54-64		73-87
	Cover		60-84	7-9
	Housing	28-36		38-49
Front cover			72-108	8-12
Fuel pump		14-21		19-28
Intake manifold	Step 1		60-84	7-9
	Step 2	14-18		19-25
Main bearing cap		80-90		108-122
Oil pan	M6 bolts		72-96	8-12
	M8 bolts		96-120	11-14
Oil pump	Cover bolts		72-120	8-14
	Mounting bolts	14-21		19-28
	Pick-up Tube	14-21		19-28
Oil pressure sender		12-16		16-22
Oil withdrawal tube (flare)		15-18		20-24
Spark plug		5-10		6.8-13.6
Timing belt	Idler pulley	14-21		19-28
	Tensioner pivot	28-40		38-54
Valve cover			48-84	5.5-9.5
Water pump (circulating pump)		14-21		19-28
Water temperature sender		12-16		16-22

ENGINE SPECIFICATIONS

Component		Standard (in.) ①	Metric (mm) ①
Camshaft	Clearance	0.001-0.003	0.025-0.076
	Wear limit	0.006	0.152
	End Play	0.001-0.007	0.025-0.178
	Wear limit	0.009	0.229
	Journal Diameter	1.7713-1.7720	44.99-45
	Lobe Lift	0.2381 +/- 0.005	6.05 +/- 0.13
	Out or Round	0.005	0.127
	Runout	0.005	0.127
Connecting Rod	Diameter	2.1720-2.1728	55.17-55.19
	Out or Round	0.004	0.102
	Piston pin bore	0.9104-0.9112	23.12-23.14
	Side Clearance	0.0035-0.0105	0.089-0.267
	Wear limit	0.015	0.38
	Out or Round	0.004	0.102
	Taper (max)	0.004	0.102
Crankshaft	Connecting rod journal diameter	2.0464-2.0472	51.98-52
	Crankshaft End Play	0.004-0.008	0.102-0.203
	Main Bearing		
	Journal Diameter	2.3982-2.3990	60.91-60.94
	Out or round	0.0006	0.015
	Runout	0.002	0.05
Piston	Wear limit	0.005	0.127
	Taper (max)	0.0006	0.015
	Clearance	0.0014-0.0022	0.036
	Diameter		
	Red	3.7780-3.7786	95.96-95.98
Piston Pin	Blue	3.7792-3.7798	95.99-96
	clearance	0.0002-0.0004	0.005
	Diameter	0.9119-0.9124	23.16-23.18
	Interference fit	Yes	Yes
	Length	3.010-3.040	76.45-77.22
Piston Rings	Compression		
	Gap	0.010-0.020	0.254
	Clearance	0.002-0.004	0.05-0.10
	Oil		
	Gap	0.015-0.055	0.38-1.40
	Width	Snug	Snug

① Unless otherwise noted

ENGINE SPECIFICATIONS

Component		Standard (in.) ①	Metric (mm) ①
Valve system	Face Angle	44 deg.	
	Lifter	Hydraulic	Hydraulic
	Rocker arm ratio	1.64:1	
	Runout (max)	0.002	0.05
	Seat Angle	45 deg.	
	Seat Width		
	Intake	0.060-0.080	1.52-2.03
	Exhaust	0.070-0.090	1.78-2.29
	Spring (Outer)		
	Free length	1.89	48
	Pressure		
	Intake	71-79 lbs. @ 1.56	316-351 N @ 39.62
Stem Clearance	Exhaust	159-175 lbs. @ 1.16	707-778 N @ 29.46
	Intake	0.0010-0.0027	0.025-0.069
	Exhaust	0.0015-0.0032	0.038-0.081

① Unless otherwise noted

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4

ENGINE MECHANICAL GM 4 CYLINDER ENGINES

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4-2 ENGINE MECHANICAL – GM 4 CYLINDER ENGINES

ENGINE MECHANICAL

General Information

The OMC 2.5L 153 cubic inch displacement engine and the 3.0L 181 cubic inch engine are manufactured by GMC and have been a favorite combination when mated to the OMC Cobra and SP stern drives.

This in-line four-cylinder powerplant uses a full pressure lubrication system with a disposable flow-thru oil filter cartridge. Oil pressure is furnished by a gear-type oil pump, driven by the distributor, which is driven by a helical gear on the camshaft. A regulator on the oil pump controls the amount of oil pressure output. The oil pump scavenges oil from the bottom of the oil pan and feeds it through the oil filter and then to the main oil gallery in the block. Drilled passages in the block and crankshaft distribute oil to the camshaft and crankshaft to lubricate the rod, main and camshaft bearings. The main oil gallery also feeds oil to the valve lifters, which pump oil up through the hollow pushrods to the rocker arms to lubricate the valve train in the cylinder head. Cylinder numbering and firing orders are identified in the illustrations at the end of the Maintenance section.

** CAUTION

NEVER, NEVER attempt to use standard automotive parts when replacing anything on your engine. Due to the uniqueness of the environment in which they are operated in, and the levels at which they are operated at, marine engines require different versions of the same part; even if they look the same. Stock and most aftermarket automotive parts will not hold up for prolonged periods of time under such conditions. Automotive parts may appear identical to marine parts, but be assured, OMC marine parts are specially manufactured to meet OMC marine specifications. Most marine items are super heavy-duty units or are made from special metal alloy to combat against a corrosive salt water atmosphere.

OMC marine electrical and ignition parts are extremely critical. In the United States, all electrical and ignition parts manufactured for marine application must conform to stringent U.S. Coast Guard requirements for spark or flame suppression. A spark from a non-marine cranking motor solenoid could ignite an explosive atmosphere of gasoline vapors in an enclosed engine compartment.

Engine Identification

ENGINE

◆ See Figures 1, 2 and 3

The engine serial numbers are the manufacturer's key to engine changes. These alpha-numeric codes identify the year of manufacture, the horsepower rating and various model/option differences. If any correspondence or parts are required, the engine serial number must be used for proper identification.

Remember that the serial number establishes the year in which the engine was produced, which is often not the year of first installation.

The engine specifications decal contains information such as the model number or code, the serial number (a unique sequential identifier given ONLY to that one engine) as well as other useful information.

An engine specifications decal can generally be found on top of the flame arrester or on the side of the rocker arm cover - all pertinent serial number information can be found here—engine and drive designations, serial numbers and model numbers. Unfortunately this decal is not always legible on older boats and it's also quite difficult to find, so please refer to the following procedures for each individual's unit's serial number location.

■ **Serial numbers tags are frequently difficult to see when the engine is installed in the boat; a mirror can be a handy way to read all the numbers.**

The engine serial/model number is sometimes also stamped on the port rear side of the engine where it attaches to the bell housing; although on most later models it may instead be a metal plate attached in the same location. If your engine has a stamped number it will simply be the serial number; if you have a plate (and you should), it will always show a Model number and then the actual Serial number. Additionally, most models will also have this plate or sticker on the transom bracket.

- The first two characters identify the engine size in liters (L); **30** represents the 3.0L, **25** represents the 2.5L and so forth.
- The third character identifies the fuel delivery system; **2** designates a 2 bbl carburetor, **4** is a 4 bbl carburetor, and **F** is a fuel injected engine.
- The fourth character designates a major engine or horsepower change—it doesn't let you know what the change was, just that there was some sort of change. **A** means it is the first model released, **B** would be the second, and so forth
- The fifth character designates what type of steering system was used; **M** would be manual steering and **P** would be power steering.
- Now here's where it gets interesting; on 1986-87 engines and 1994-98 engines, the sixth, seventh and eighth characters designate the model year. The sixth and seventh actually show the model year, while the eighth is a random model year version code. **KWB** and **WXS** represent 1986; and **ARJ**, **ARF**, **FTC**, **SRC** or **SRY** show 1987. **MDA** is 1994, **HUB** is 1995, **NCA** is 1996, **LKD** is 1997 and **BYC** is 1998.
- On 1988-93 engines, the sixth character designates the direction of propeller rotation. **R** is right hand, **L** is left hand and **E** is either.
- Also on 1988-93 engines, the seventh, eighth and ninth characters designate the model year. The seventh and eighth actually show the model year, while the ninth is a random model year version code. **GDE** or **GDP** is 1988, **MED** or **MEF** is 1989, **PWC**, **PWR** or **PWS** is 1990, **RGD** or **RGF** is 1991, **AMH** or **AMK** is 1992 and **JVB** or **JVN** is 1993.

Any remaining characters are proprietary. So in example, a Model number on the ID plate that reads **302AMFTC** would designate a 1987 3.0L engine with a 2 bbl carburetor and manual steering, first model released.

Engine Model Designations

All engines covered here utilize unique identifiers assigned by OMC; surnames if you will—2.3, 3.0GL, 3.0GS, etc. Obviously the first two characters designate the engine size in litres (L). The second letter, a **G** or **F** designate the engine manufacturer; General Motors (G) or Ford (F). The third through fifth letters can be found in different combinations, but the individual letter designates the same thing regardless of position. **L** designates limited output. **S** and **X** designate superior output—a 3.0GL will always have a lesser horsepower rating than a 3.0GS in a given model year; a 5.7GL will be less than a 5.7GS. **i** designates that the engine is fuel injected, if there is no **i** then you know the engine uses a carburetor.

Engine

REMOVAL & INSTALLATION

+See Figures 4 thru 10

□ **Prior to removing the engine from your vessel, it is imperative to measure the engine height as detailed in the Determining Minimum Engine Height section on 1995-98 engines. DO NOT remove the engine until you have completed this procedure!**

1. Check the clearance between the front of the engine and the inside edge of the engine compartment bulkhead. If clearance is less than 6 in. (152mm), you will need to remove the stern drive unit because there won't be enough room to disengage the driveshaft from the engine coupler. More than 6 in. will provide enough working room to get the engine out without removing the drive, BUT, we recommend removing the drive anyway. If you intend on doing anything to the mounts or stringers, you will need to re-align the engine as detailed in the Engine Alignment section—which requires removing the drive, so remove the drive!
2. Remove the stern drive unit as detailed in the Drive Systems section.
3. Open or remove the engine hatch cover.
4. Disconnect the battery cables (negative first) at the battery and then disconnect them from the engine block and starter.

** CAUTION

Make sure that all switches and systems are OFF before disconnecting the battery cables.



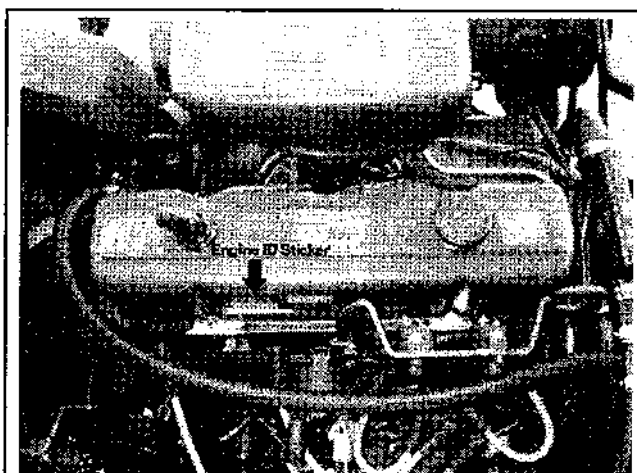
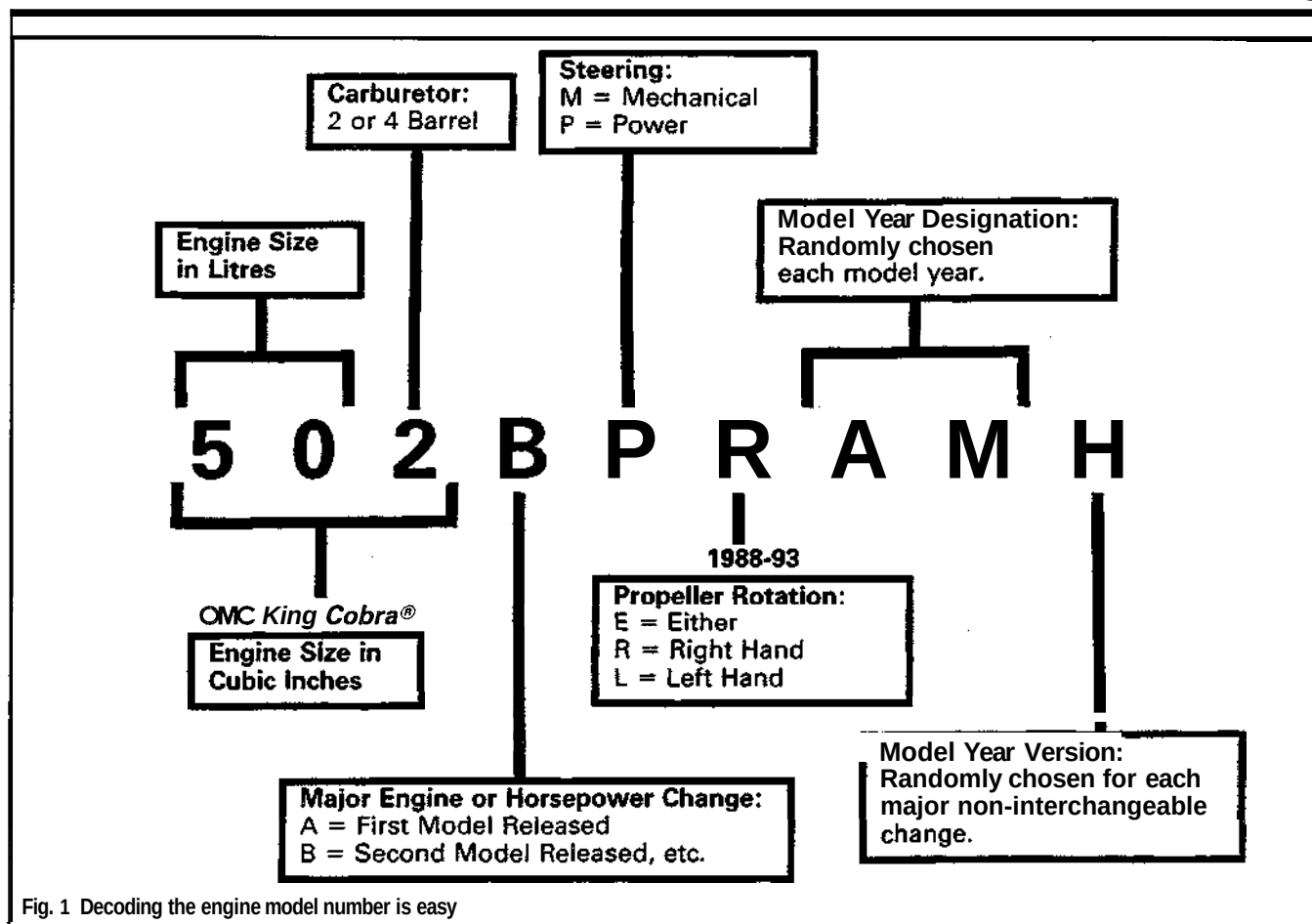


Fig. 2 Engine serial number sticker—3.0L engines (2.5L engine similar)



Fig. 3 You should also be able to find a plate on the transom bracket

5. Disconnect the two power steering hydraulic lines at the steering cylinder (models w/power steering). Carefully plug them and then tie them off somewhere on the engine, making sure that they are higher than the pump to minimize any leakage.

6. Disconnect the fuel inlet line at the fuel pump or filter (whichever comes first on your particular engine) and quickly plug it and the inlet—a clean golf tee and some tape works well in this situation. Make sure you have rags handy, as there will be some spillage.

7. Tag and disconnect the two-wire trim/tilt connector.

8. Pop the two-wire trim/tilt sender connector out of the retainer and then disconnect it. You may have to cut the plastic tie securing the cable in order to move it out of the way.

9. Locate the large rubber coated instrument cable connector (should be on the starboard side), loosen the hose clamp and then disconnect it from the bracket. Move it away from the engine and secure it. On early models, you will also need to unplug the three-wire trim/tilt cable connector just above it.

■ Take note of your throttle arm attachment stud— is it a “push-to-close” or a “pull-to-close”?

10. Remove the cotter pin and washer from the throttle arm. Loosen the anchor block retaining nut and then spin the retainer away from the cable trunnion. Remove the throttle cable from the arm and anchor bracket. Be sure to mark the position of the holes that the anchor block was attached to.

4-4 ENGINE MECHANICAL – GM 4 CYLINDER ENGINES

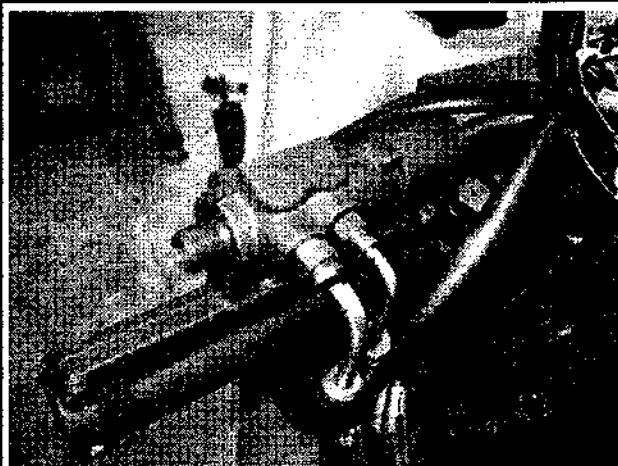


Fig. 4 Disconnect the power steering lines at the cylinder

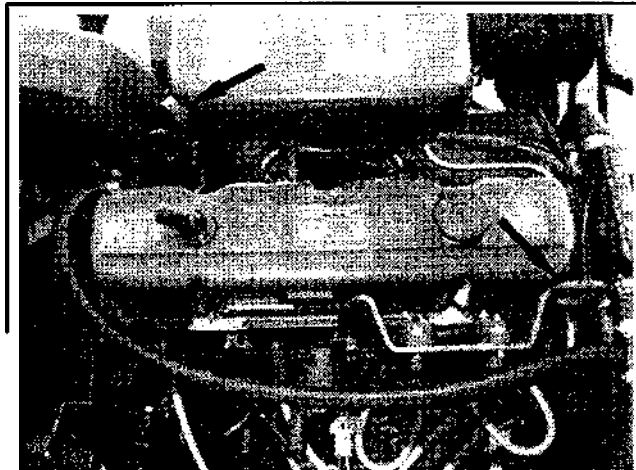


Fig. 5 Locate the engine lifting brackets...

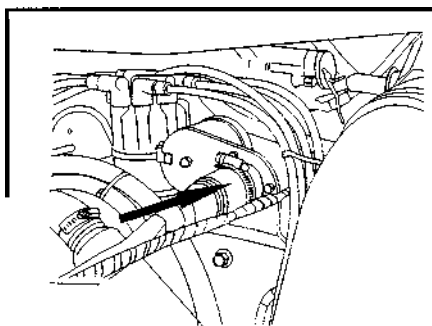


Fig. 6 Disconnect the instrument cable connector

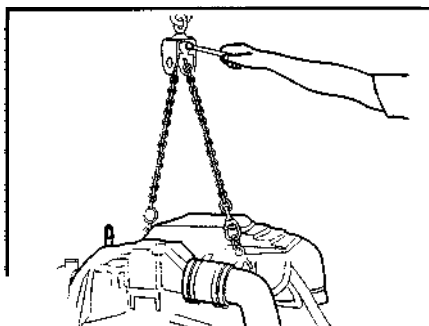


Fig. 7 ...and then connect and engine hoist

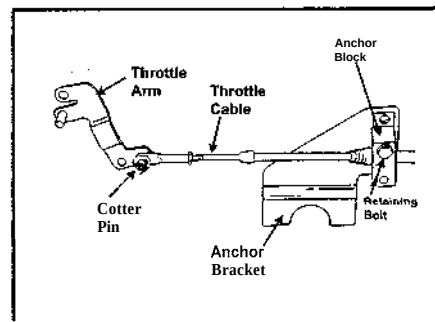


Fig. 8 Details of the throttle cable assembly

11. Loosen the hose clamps (4) and disconnect the exhaust elbow bellows from elbow. You may want to spray some WD-40 around the lip of the hose where it connects to the elbow, grasp it with both hands and wiggle it back and forth while pulling down on it.

12. Drain the cooling system as detailed in the Maintenance section.

13. Loosen the hose clamp on the water supply hose at the transom bracket and carefully slide it off the water tube. Attach the hose to the engine.

14. Disconnect the shift cables and position them out of the way.

15. Tag and disconnect any remaining lines, wires or hoses at the engine.

16. Attach a suitable engine hoist to the lifting eyes (usually front starboard side, rear port side) and take up any line slack until it is just taut.

■ **The engine hoist should have a capacity of at least 1500 lbs. (680 kg).**

17. Locate the rear engine mounts and remove both lock nuts and flat washers.

18. Locate the front engine mount and remove the two lag bolts.

19. If you listened to us at the beginning of the procedure, the drive unit should be removed. If so, slowly and carefully, lift out the engine. Try not to hit the power steering control valve, or any other accessories, while removing it from the engine compartment. If you didn't listen to us, and you had sufficient clearance in the engine compartment, the drive unit is probably still installed. Raise the hoist slightly until the weight is removed from the mounts and then carefully pull the engine forward until the driveshaft disengages from the coupler, now raise the engine out of the compartment.

To install:

20. Apply Engine Coupler grease to the splines of the coupler.

21. Slowly lower the engine into the compartment. If the drive unit was not removed, AND the crankshaft has not been rotated, insert the driveshaft into the coupler as you push the engine backwards until they engage completely and then lower the engine into position over the rear mounts until the front mounts just touch the stringers. If the shaft and coupler will not align completely, turn the crankshaft or driveshaft slightly until they mate correctly.

If the drive was removed, or the mounts were disturbed in any way, lower the engine into position over the rear mounts until the front mount just touches the stringer.

22. Install the two flat washers into the recess in the engine bracket side of the rear mounts and then install the two lock nuts. Tighten them to 28-30 ft. lbs. (38-40 Nm).

✖ ✖ CAUTION

Never use an impact wrench or power driver to tighten the locknuts.

23. Install the lag bolts into their holes on the front mounts and tighten each bolt securely.

24. If the drive was removed, the mounts were disturbed or the driveshaft/coupler didn't mate correctly, perform the engine alignment procedure detailed in this section. We think it's a good idea to do this regardless! After you've performed the alignment procedure, make sure that you hold the top adjusting nut and tighten the lower nut on the mount to 115-140 ft. lbs. (156-190 Nm).

25. Reconnect the exhaust bellows by sliding it up and over the elbow, position the clamps between the ribs in the hose and then tighten the clamps securely. Make sure you don't position the clamps into the expanding area.

26. Reconnect the water inlet hose. Lubricate the inside of the hose and wiggle it onto the inlet tube. Slide the clamp over the ridge and tighten it securely. This sounds like an easy step, but it is very important—if the hose, particularly the underside, is not installed correctly the hose itself may collapse or come off. Either scenario will cause severe damage to your engine, so make sure you do this correctly!

27. Carefully, and quickly, remove the tape and plugs so you can connect the power steering lines. Tighten the large fitting to 15-17 ft. lbs. (20-23 Nm) and the small fitting to 10-12 ft. lbs. (14-16 Nm). Don't forget to check the fluid level and bleed the system when you are finished with the installation.

28. Reconnect the trim/tilt connector so the two halves lock together.

29. Reconnect the trim position sender leads, the instrument cable, the engine ground wire, the battery cables and all other wires, lines of hoses that were disconnected during removal. Make sure you swab a light coat of grease around the fitting for the large engine/instrument cable plug.