VEHICLE IDENTIFICATION CHART

Engine Code

Engine Series (ID/VIN)	Engine Displacement Liters (cc)	Cubic Inches	No. of Cylinders	Fuel System	Eng. Mfg.
B5234T3/53	2.3 (2319)	144	5	EFI	VOLVO
B5254S/55	2.4 (2435)	151	5	EFI	VOLVO
B5254T/56	2.4 (2435)	151	5	EFI	VOLVO
B5234T/57	2.3 (2319)	144	5	EFI	VOLVO
B5254FT/58	2.3 (2319)	144	5	EFI	VOLVO
B280F/69	2.8 (2849)	175	6	EFI	VOLVO
B230FT/87	2.3 (2316)	144	4	EFI	VOLVO
B234F/89	2.3 (2316)	144	4	EFI	VOLVO
B230F/88	2.3 (2316)	144	4	EFI	VOLVO
B6304F/95	2.9 (2922)	181	6	EFI	VOLVO
B6304S/96	2.9 (2922)	181	6	EFI	VOLVO

EFI = Electronic Fuel Injection

Model Year

Code	Year
L	1990
M	1991
N	1992
P	1993
R	1994
S	1995
T	1996
U	1997
V	1998

ENGINE IDENTIFICATION AND SPECIFICATIONS

Model	Engine ID/VIN	Engine Displacement Liters (cc)	No. of Cyl.	Engine Type	Fuel System Type	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	C Pres @
240	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
240DL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740GL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740GLE	B234F/89	2.3 (2316)	4	DOHC	EFI	153@5700	150@4450	3.78 x 3.15	10.0:1	73@
740Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	160@5300	187@2900	3.78 x 3.15	8.7:1	35-85
760GLE	B280F/69	2.8 (2849)	6	SOHC	EFI	146@5100	173@3750	3.58 x 2.86	9.5:1	57@
760Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	160@5300	187@2900	3.78 x 3.15	8.7:1	35-85
780	B280F/69	2.8 (2849)	6	SOHC	EFI	146@5100	173@3750	3.58 x 2.86	9.5:1	57@
780Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	175@5300	187@2900	3.78 x 3.15	8.7:1	35-85
240GL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
240DL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740GL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@5300	195@2900	3.78 x 3.15	8.7:1	35-85
940SE	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4000	195@3450	3.78 x 3.15	8.7:1	35-85
940Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4800	195@3450	3.78 x 3.15	8.7:1	35-85
940GLE	B234F/89	2.3 (2316)	4	DOHC	EFI	153@5700	150@4450	3.78 x 3.15	10.0:1	73@
Coupe	B230FT/87	2.3 (2316)	4	SOHC	EFI	175@5300	187@2900	3.78 x 3.15	8.7:1	35-85
240GL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
240DL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740GL	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
740Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@5300	195@2900	3.78 x 3.15	8.7:1	35-85
940SE	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4000	195@3450	3.78 x 3.15	8.7:1	35-85
940Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4800	195@3450	3.78 x 3.15	8.7:1	35-85
940GLE	B234F/89	2.3 (2316)	4	DOHC	EFI	153@5700	150@4450	3.78 x 3.15	10.0:1	73@
960	B6304F/95	2.9 (2922)	6	DOHC	EFI	201@6000	197@4300	3.27 x 3.54	10.7:1	36@
240	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
850	B5254S/55	2.4 (2435)	5	DOHC	EFI	168@6200	162@3300	3.27 x 3.54	10.5:1	49.8
940	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
940 Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4800	195@3450	3.78 x 3.15	8.7:1	35-85
960	B6304F/95	2.9 (2922)	6	DOHC	EFI	201@6000	197@4300	3.27 x 3.54	10.7:1	36@
940	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
940Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4800	195@3450	3.78 x 3.15	8.7:1	35-85
850	B5254S/55	2.4 (2435)	5	DOHC	EFI	168@6200	162@3300	3.27 x 3.54	10.5:1	49.8
850Turbo	B5234T/57	2.3 (2319)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49.8
960	B6304F/95	2.9 (2922)	6	DOHC	EFI	201@6000	197@4300	3.27 x 3.54	10.7:1	36@
940	B230F/88	2.3 (2316)	4	SOHC	EFI	114@5400	136@2750	3.78 x 3.15	9.8:1	35-85
940Turbo	B230FT/87	2.3 (2316)	4	SOHC	EFI	162@4800	195@3450	3.78 x 3.15	8.7:1	35-85
850	B5254S/55	2.4 (2435)	5	DOHC	EFI	168@6200	162@3300	3.27 x 3.54	10.5:1	49.8
850Turbo	B5234T/57	2.3 (2319)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49.8
960	B6304F/95	2.9 (2922)	6	DOHC	EFI	201@6000	197@4300	3.27 x 3.54	10.7:1	36@
850	B5254S/55	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49.8
850GLT	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	191@1800	3.27 x 3.54	10.5:1	49.8
850T-5	B5234T/57	2.3(2319)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49.8
850R	B5254FT/58	2.3(2319)	5	DOHC	EFI	240@5600	221@2100	3.19 x 3.54	8.5:1	49.8
960	B6304S/96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@

EFI = Electronic Fuel Injection

ENGINE IDENTIFICATION AND SPECIFICATIONS

Year	Model	Engine ID/VIN	Engine Displacement Liters (cc)	No. of Cyl.	Engine Type	Fuel System Type	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	Oil Pressure @ rpm
1997	850	B5254S/55	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49.8@4000
	850GLT	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	191@1800	3.27 x 3.54	10.5:1	49.8@4000
	850T-5	B5234T/57	2.3(2319)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49.8@4000
	850R	B5254FT/58	2.3(2319)	5	DOHC	EFI	240@5600	221@2100	3.19 x 3.54	8.5:1	49.8@4000
	960	B6304S/96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
1998	S70	B5254S/55	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49.8@4000
	S70GLT	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49.8@4000
	S70T-5	B5234T/57	2.3(2319)	5	DOHC	EFI	236@5100	243@2100	3.19 x 3.54	8.5:1	49.8@4000
	S90	B6304S/96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
	C70	B5234T3/53	2.3(2319)	5	DOHC	EFI	236@5100	243@2700	3.19 x 3.54	8.5:1	49.8@4000
	V70	B5254S/55	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49.8@4000
	V70GLT	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49.8@4000
	V70T-5	B5234T/57	2.3(2319)	5	DOHC	EFI	236@5100	243@2100	3.19 x 3.54	8.5:1	49.8@4000
	V70 AWD	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49.8@4000
	V70R AWD	B5234T/57	2.3(2319)	5	DOHC	EFI	236@5100	243@2700	3.19 x 3.54	8.5:1	49.8@4000
	V70XC AWD	B5254T/56	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49.8@4000
	V90	B6304S/96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000

SOHC = Single Overhead Camshaft
DOHC = Double Overhead Camshaft
EFI = Electronic Fuel Injection

CAPACITIES

Model	Engine ID/VIN	Engine Displacement Liters (cc)	Engine Oil with Filter (qts.)②	Transmission (pts.) 4-Spd	5-Spd	Auto.	Transfer Case (pts.)	Drive Axle Front (pts.)	Rear (pts.)	F Ta (q
240	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
240DL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740GLE	B-234F/89	2.3 (2316)	4.0	4.8	—	15.6 ③	—	—	①	1
740Turbo	B-230FT/87	2.3 (2316)	4.0	4.8	—	15.6 ③	—	—	①	1
760GLE	B-280F/69	2.8 (2849)	6.0	—	—	15.6 ③	—	—	①	2
760Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	
780	B-280F/69	2.8 (2849)	6.0	—	—	15.6 ③	—	—	①	2
780Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	2
240DL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
240GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940SE	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940GLE	B-234F/89	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
Coupe	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	2
240DL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
240GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
740Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940SE	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940GLE	B-234F/89	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
960	B-6304F/95	2.9 (2922)	6.0	—	—	15.6 ③	—	—	①	1
240	B-230F/88	2.3 (2316)	4.0	—	3.2	15.6 ③	—	—	①	1
940	B-230F/88	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
960	B-6304F/95	2.9 (2922)	6.0	—	—	15.6 ③	—	—	①	1
850	B-5254S/55	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
940	B-230F/88	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
850	B-5254S/55	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
850Turbo	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
960	B6304F/95	2.9 (2922)	6.0	—	—	16.4	—	—	①	2
940	B-230F/88	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.6 ③	—	—	①	1
850	B-5254S/55	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
850Turbo	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
960	B6304F/95	2.9 (2922)	6.0	—	—	16.4	—	—	①	2

CAPACITIES

Model	Engine ID/VIN	Engine Displacement Liters (cc)	Engine Oil with Filter (qts.)②	Transmission (pts.) 4-Spd	5-Spd	Auto.	Transfer Case (pts.)	Drive Axle Front (pts.)	Rear (pts.)	F Ta (g
850	B-5254S/55	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
50GLT	B-5254T/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
850T-5	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
850R	B-5254FT/58	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
960	B-6304S/96	2.9 (2922)	6.0	—	—	16.4	—	—	①	2
850	B-5254S/55	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
50GLT	B-5254T/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	1
850T-5	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
850R	B-5254FT/58	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	1
960	B-6304S/96	2.9 (2922)	6.0	—	—	16.4	—	—	①	2
S70	B5254S/55	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	1
70GLT	B-5254T/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	1
S70T-5	B-5234T/57	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	1
S90	B-6304S/95	2.9 (2922)	6.0	—	—	16.4	—	—	①	2
C70	B-5234T3/53	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	1
V70	B-5254S/55	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	1
70GLT	B-5254T/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	1
70T-5	B-5234T/57	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	1
70 AWD	B-5254T/56	2.4 (2435)	6.1	—	—	8.4	1.7	—	2.9	1
0R AWD	B-5234T/57	2.3 (2319)	6.1	—	—	8.4	1.7	—	2.9	1
XC AWD	B-5254T/56	2.4 (2435)	6.1	—	—	8.4	1.7	—	2.9	1
V90	B-6304S/96	2.9 (2922)	6.1	—	—	16.4	—	—	①	2

80 axle-2.8
81 axle-3.4
85 axle-2.9
41 axle-3.1
45 axle-2.8
55 axle-3.2
65 axle-2.9

② On turbocharged engines, add 0.7 US qts. if the cooler is drained

③ Total fluid capacity cannot be drained. 3.6 qts (3.4 liters) can be drained, the rest remains in the torque converter and control systems

④ 4 door - 21.0
5 door - 15.8

SCHEDULED MAINTENANCE INTERVALS

BE VICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)											
		5	10	20	30	40	50	60	70	80	90	100	110
ne oil & filter①	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
matic mission fluid⑥	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
levels (all)	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
e tires	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
matic mission shift ol	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
e pads & ng brake	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
eshaft boots	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ne & mission (check aks)	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ust system	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
se link arm (1994-97 850)	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
service nder①	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
eshaft, U-joints	S/I					✓	✓	✓	✓	✓	✓	✓	✓
eshaft joints	S/I							✓	✓	✓	✓	✓	✓
h	S/I			✓		✓		✓		✓		✓	
down cable 940)	S/I			✓		✓		✓		✓		✓	
e & fuel lines &	S/I					✓		✓		✓		✓	
ing & nsion	S/I					✓		✓		✓		✓	
eaner filter	R				✓			✓			✓		
plugs	R				✓			✓			✓		
ng belt (1993	R				✓			✓			✓		
ng belt (1994-0)	R						✓					✓	
ng belt (850 & -97 960)	R								✓				

SCHEDULED MAINTENANCE INTERVALS

CED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)											
		5	10	20	30	40	50	60	70	80	90	100	110
belt (B230F,	R						✓					✓	
belt (B230F,	S/I							✓					✓
belt D)	S/I		✓										✓
belt D)	R											✓	
gear belt r pivot (1993 960)	S/I				✓			✓			✓		
gear belt r pivot (1993 850)	R						✓					✓	
earance 0)	S/I				✓			✓			✓		
lt tensioner	S/I				✓			✓			✓		
lts⑤	S/I				✓			✓			✓		
filter④	R							✓					
stem	S/I							✓				✓	
ple hoses	S/I							✓				✓	
uspension ③	S/I		✓										
uid②	R												

n operation every 5000 miles on turbocharged models.
e every 2 years or 30,000 miles, whichever comes first under normal conditions, more frequently in mountainous areas or moist clima
850 shown. 850 (1993) - perform at 1500 miles.
5 shown; replace every 100,000 miles (1996-97)
0: replace at 60,000 miles.
e as follows: 1993 240/940 - every 20,000 miles; 1994 940 - every 40,000 miles.
ce S/I – Service or Inspect

UENT OPERATION MAINTENANCE (SEVERE SERVICE)

hicle is operated under any of the following conditions it is considered severe service:
ely dusty areas.
more of the vehicle operation is in 32°C (90°F) or higher temperatures, or constant operation in temperatures below 0°C
ed idling (vehicle operation in stop and go traffic).
t short running periods (engine does not warm to normal operating temperatures).
axi, delivery usage or trailer towing usage.
ilter change – (all models) change every 5000 miles.
element – service or inspect every 15,000 miles.

ENGLISH TO METRIC CONVERSION: MASS (WEIGHT)

urrent mass measurement is expressed in pounds and ounces (lbs. & ozs.). The metric unit of mass (or weight) is th
ilogram (kg). Even although this table does not show conversion of masses (weights) larger than 15 lbs, it is easy to
alculate larger units by following the data immediately below.

o convert ounces (oz.) to grams (g): multiply th number of ozs. by 28
o convert grams (g) to ounces (oz.): multiply the number of grams by .035

o convert pounds (lbs.) to kilograms (kg): multiply the number of lbs. by .45
o convert kilograms (kg) to pounds (lbs.): multiply the number of kilograms by 2.2

lbs	kg
0.1	0.04
0.2	0.09
0.3	0.14
0.4	0.18
0.5	0.23
0.6	0.27
0.7	0.32
0.8	0.36

lbs	kg
0.9	0.41
1	0.4
2	0.9
3	1.4
4	1.8
5	2.3
10	4.5
15	6.8

oz	kg
0.1	0.003
0.2	0.005
0.3	0.008
0.4	0.011
0.5	0.014
0.6	0.017
0.7	0.020
0.8	0.023

oz	kg
0.9	0.024
1	0.03
2	0.06
3	0.08
4	0.11
5	0.14
10	0.28
15	0.42

ENGLISH TO METRIC CONVERSION: TEMPERATURE

convert Fahrenheit (°F) to Celsius (°C): take number of °F and subtract 32; multiply result by 5; divide result by 9
convert Celsius (°C) to Fahrenheit (°F): take number of °C and multiply by 9; divide result by 5; add 32 to total

Fahrenheit (F)		Celsius (C)	
°F	°C	°C	°F
40	−40	−38	−36.4
35	−37.2	−36	−32.8
30	−34.4	−34	−29.2
25	−31.7	−32	−25.6
20	−28.9	−30	−22
15	−26.1	−28	−18.4
10	−23.3	−26	−14.8
-5	−20.6	−24	−11.2
0	−17.8	−22	−7.6
1	−17.2	−20	−4
2	−16.7	−18	−0.4
3	−16.1	−16	3.2
4	−15.6	−14	6.8
5	−15.0	−12	10.4
10	−12.2	−10	14
15	−9.4	−8	17.6
20	−6.7	−6	21.2
25	−3.9	−4	24.8
30	−1.1	−2	28.4
35	1.7	0	32
40	4.4	2	35.6
45	7.2	4	39.2
50	10.0	6	42.8
55	12.8	8	46.4
60	15.6	10	50
65	18.3	12	53.6
70	21.1	14	57.2
75	23.9	16	60.8

Fahrenheit (F)		Celsius (C)	
°F	°C	°C	°F
80	26.7	18	64.4
85	29.4	20	68
90	32.2	22	71.6
95	35.0	24	75.2
100	37.8	26	78.8
105	40.6	28	82.4
110	43.3	30	86
115	46.1	32	89.6
120	48.9	34	93.2
125	51.7	36	96.8
130	54.4	38	100.4
135	57.2	40	104
140	60.0	42	107.6
145	62.8	44	112.2
150	65.6	46	114.8
155	68.3	48	118.4
160	71.1	50	122
165	73.9	52	125.6
170	76.7	54	129.2
175	79.4	56	132.8
180	82.2	58	136.4
185	85.0	60	140
190	87.8	62	143.6
195	90.6	64	147.2
200	93.3	66	150.8
205	96.1	68	154.4
210	98.9	70	158
212	100.0	75	167

Fahrenheit (F)		Celsius (C)	
°F	°C	°C	°F
215	101.7	80	1
220	104.4	85	1
225	107.2	90	1
230	110.0	95	2
235	112.8	100	2
240	115.6	105	2
245	118.3	110	2
250	121.1	115	2
255	123.9	120	2
260	126.6	125	2
265	129.4	130	2
270	132.2	135	2
275	135.0	140	2
280	137.8	145	2
285	140.6	150	3
290	143.3	155	3
295	146.1	160	3
300	148.9	165	3
305	151.7	170	3
310	154.4	175	3
315	157.2	180	3
320	160.0	185	3
325	162.8	190	3
330	165.6	195	3
335	168.3	200	3
340	171.1	205	4
345	173.9	210	4
350	176.7	215	4

ENGLISH TO METRIC CONVERSION: LENGTH

convert inches (ins.) to millimeters (mm): multiply number of inches by 25.4

convert millimeters (mm) to inches (ins.): multiply number of millimeters by .04

Inches	Decimals	Milli-meters	Inches to millimeters inches	mm
	1/64 0.051625	0.3969	0.0001	0.00254
1/32	0.03125	0.7937	0.0002	0.00508
	3/64 0.046875	1.1906	0.0003	0.00762
/16	0.0625	1.5875	0.0004	0.01016
	5/64 0.078125	1.9844	0.0005	0.01270
3/32	0.09375	2.3812	0.0006	0.01524
	7/64 0.109375	2.7781	0.0007	0.01778
/8	0.125	3.1750	0.0008	0.02032
	9/64 0.140625	3.5719	0.0009	0.02286
5/32	0.15625	3.9687	0.001	0.0254
	11/64 0.171875	4.3656	0.002	0.0508
/16	0.1875	4.7625	0.003	0.0762
	13/64 0.203125	5.1594	0.004	0.1016
7/32	0.21875	5.5562	0.005	0.1270
	15/64 0.234375	5.9531	0.006	0.1524
/4	0.25	6.3500	0.007	0.1778
	17/64 0.265625	6.7469	0.008	0.2032
9/32	0.28125	7.1437	0.009	0.2286
	19/64 0.296875	7.5406	0.01	0.254
/16	0.3125	7.9375	0.02	0.508
	21/64 0.328125	8.3344	0.03	0.762
11/32	0.34375	8.7312	0.04	1.016
	23/64 0.359375	9.1281	0.05	1.270
/8	0.375	9.5250	0.06	1.524
	25/64 0.390625	9.9219	0.07	1.778
13/32	0.40625	10.3187	0.08	2.032
	27/64 0.421875	10.7156	0.09	2.286
/16	0.4375	11.1125	0.1	2.54
	29/64 0.453125	11.5094	0.2	5.08
15/32	0.46875	11.9062	0.3	7.62
	31/64 0.484375	12.3031	0.4	10.16
/2	0.5	12.7000	0.5	12.70

Inches	Decimals	Milli-meters	Inches to millimeters inches	mm
	33/64 0.515625	13.0969	0.6	15.24
17/32	0.53125	13.4937	0.7	17.78
	35/64 0.546875	13.8906	0.8	20.32
9/16	0.5625	14.2875	0.9	22.86
	37/64 0.578125	14.6844	1	25.4
19/32	0.59375	15.0812	2	50.8
	39/64 0.609375	15.4781	3	76.2
5/8	0.625	15.8750	4	101.6
	41/64 0.640625	16.2719	5	127.0
21/32	0.65625	16.6687	6	152.4
	43/64 0.671875	17.0656	7	177.8
11/16	0.6875	17.4625	8	203.2
	45/64 0.703125	17.8594	9	228.6
23/32	0.71875	18.2562	10	254.0
	47/64 0.734375	18.6531	11	279.4
3/4	0.75	19.0500	12	304.8
	49/64 0.765625	19.4469	13	330.2
25/32	0.78125	19.8437	14	355.6
	51/64 0.796875	20.2406	15	381.0
13/16	0.8125	20.6375	16	406.4
	53/64 0.828125	21.0344	17	431.8
27/32	0.84375	21.4312	18	457.2
	55/64 0.859375	21.8281	19	482.6
7/8	0.875	22.2250	20	508.0
	57/64 0.890625	22.6219	21	533.4
29/32	0.90625	23.0187	22	558.8
	59/64 0.921875	23.4156	23	584.2
15/16	0.9375	23.8125	24	609.6
	61/64 0.953125	24.2094	25	635.0
31/32	0.96875	24.6062	26	660.4
	63/64 0.984375	25.0031	27	690.6

ENGLISH TO METRIC CONVERSION: TORQUE

convert foot-pounds (ft. lbs.) to Newton-meters: multiply the number of ft. lbs. by 1.3

convert inch-pounds (in. lbs.) to Newton-meters: multiply the number of in. lbs. by .11

in lbs	N-m	in lbs	N-m	in lbs	N-m	in lbs	N-m	in lbs	N-m
0.1	0.01	1	0.11	10	1.13	19	2.15	28	3.16
0.2	0.02	2	0.23	11	1.24	20	2.26	29	3.28
0.3	0.03	3	0.34	12	1.36	21	2.37	30	3.39
0.4	0.04	4	0.45	13	1.47	22	2.49	31	3.50
0.5	0.06	5	0.56	14	1.58	23	2.60	32	3.62
0.6	0.07	6	0.68	15	1.70	24	2.71	33	3.73
0.7	0.08	7	0.78	16	1.81	25	2.82	34	3.84
0.8	0.09	8	0.90	17	1.92	26	2.94	35	3.95
0.9	0.10	9	1.02	18	2.03	27	3.05	36	4.0

ENGLISH TO METRIC CONVERSION: TORQUE

now expressed as either foot-pounds (ft./lbs.) or inch-pounds (in./lbs.). The metric measurement unit for t
ewton-meter (Nm). This unit—the Nm—will be used for all SI metric torque references, both the present
nd in./lbs.

N-m	ft lbs	N-m	ft lbs	N-m	ft lbs
0.1	33	44.7	74	100.3	115
0.3	34	46.1	75	101.7	116
0.4	35	47.4	76	103.0	117
0.5	36	48.8	77	104.4	118
0.7	37	50.7	78	105.8	119
0.8	38	51.5	79	107.1	120
1.0	39	52.9	80	108.5	121
1.1	40	54.2	81	109.8	122
1.2	41	55.6	82	111.2	123
1.3	42	56.9	83	112.5	124
2.7	43	58.3	84	113.9	125
4.1	44	59.7	85	115.2	126
5.4	45	61.0	86	116.6	127
6.8	46	62.4	87	118.0	128
8.1	47	63.7	88	119.3	129
9.5	48	65.1	89	120.7	130
10.8	49	66.4	90	122.0	131
12.2	50	67.8	91	123.4	132
13.6	51	69.2	92	124.7	133
14.9	52	70.5	93	126.1	134
16.3	53	71.9	94	127.4	135
17.6	54	73.2	95	128.8	136
18.9	55	74.6	96	130.2	137
20.3	56	75.9	97	131.5	138
21.7	57	77.3	98	132.9	139
23.0	58	78.6	99	134.2	140
24.4	59	80.0	100	135.6	141
25.8	60	81.4	101	136.9	142
27.1	61	82.7	102	138.3	143
28.5	62	84.1	103	139.6	144
29.8	63	85.4	104	141.0	145
31.2	64	86.8	105	142.4	146
32.5	65	88.1	106	143.7	147
33.9	66	89.5	107	145.1	148
35.2	67	90.8	108	146.4	149
36.6	68	92.2	109	147.8	150
38.0	69	93.6	110	149.1	151
39.3	70	94.9	111	150.5	152
40.7	71	96.3	112	151.8	153
42.0	72	97.6	113	153.2	154
43.4	73	99.0	114	154.6	155

ENGLISH TO METRIC CONVERSION: FORCE

esently measured in pounds (lbs.). This type of measurement is used to measure spring pressure, specifi pounds it takes to compress a spring. Our present force unit (the pound) will be replaced in SI metric ents by the Newton (N). This term will eventually see use in specifications for electric motor brush spring valve spring pressures, etc.

pounds (lbs.) to Newton (N): multiply the number of lbs. by 4.45

N	lbs	N	lbs	N	oz
0.04	21	93.4	59	262.4	1
0.09	22	97.9	60	266.9	2
0.13	23	102.3	61	271.3	3
0.18	24	106.8	62	275.8	4
0.22	25	111.2	63	280.2	5
0.27	26	115.6	64	284.6	6
0.31	27	120.1	65	289.1	7
0.36	28	124.6	66	293.6	8
0.40	29	129.0	67	298.0	9
0.4	30	133.4	68	302.5	10
0.9	31	137.9	69	306.9	11
1.3	32	142.3	70	311.4	12
1.8	33	146.8	71	315.8	13
2.2	34	151.2	72	320.3	14
2.7	35	155.7	73	324.7	15
3.1	36	160.1	74	329.2	16
3.6	37	164.6	75	333.6	17
4.0	38	169.0	76	338.1	18
4.4	39	173.5	77	342.5	19
8.9	40	177.9	78	347.0	20
13.4	41	182.4	79	351.4	21
17.8	42	186.8	80	355.9	22
22.2	43	191.3	81	360.3	23
26.7	44	195.7	82	364.8	24
31.1	45	200.2	83	369.2	25
35.6	46	204.6	84	373.6	26
40.0	47	209.1	85	378.1	27
44.5	48	213.5	86	382.6	28
48.9	49	218.0	87	387.0	29
53.4	50	224.4	88	391.4	30
57.8	51	226.9	89	395.9	31
62.3	52	231.3	90	400.3	32
66.7	53	235.8	91	404.8	33
71.2	54	240.2	92	409.2	34
75.6	55	244.6	93	413.7	35
80.1	56	249.1	94	418.1	36
84.5	57	253.6	95	422.6	37
89.0	58	258.0	96	427.0	38

ENGLISH TO METRIC CONVERSION: LIQUID CAPACITY

or fluid capacity is presently expressed as pints, quarts or gallons, or a combination of all of these. In the metric s
er (l) will become the basic unit. Fractions of a liter would be expressed as deciliters, centiliters, or most frequen
ommonly) as milliliters.

nvert pints (pts.) to liters (l): multiply the number of pints by .47
nvert liters (l) to pints (pts.): multiply the number of liters by 2.1
nvert quarts (qts.) to liters (l): multiply the number of quarts by .95

nvert liters (l) to quarts (qts.): multiply the number of liters by 1.06
nvert gallons (gals.) to liters (l): multiply the number of gallons by 3.8
nvert liters (l) to gallons (gals.): multiply the number of liters by .26

ls	liters	qts	liters	pts	li
1	0.38	0.1	0.10	0.1	
2	0.76	0.2	0.19	0.2	
3	1.1	0.3	0.28	0.3	
4	1.5	0.4	0.38	0.4	
5	1.9	0.5	0.47	0.5	
6	2.3	0.6	0.57	0.6	
7	2.6	0.7	0.66	0.7	
8	3.0	0.8	0.76	0.8	
9	3.4	0.9	0.85	0.9	
	3.8	1	1.0	1	
	7.6	2	1.9	2	
	11.4	3	2.8	3	
	15.1	4	3.8	4	
	18.9	5	4.7	5	
	22.7	6	5.7	6	
	26.5	7	6.6	7	
	30.3	8	7.6	8	
	34.1	9	8.5	9	
	37.8	10	9.5	10	
	41.6	11	10.4	11	
	45.4	12	11.4	12	
	49.2	13	12.3	13	
	53.0	14	13.2	14	
	56.8	15	14.2	15	
	60.6	16	15.1	16	
	64.3	17	16.1	17	
	68.1	18	17.0	18	
	71.9	19	18.0	19	
	75.7	20	18.9	20	
	79.5	21	19.9	21	
	83.2	22	20.8	22	
	87.0	23	21.8	23	
	90.8	24	22.7	24	
	94.6	25	23.6	25	
	98.4	26	24.6	26	
	102.2	27	25.5	27	
	106.0	28	26.5	28	
	110.0	29	27.4	29	
	113.5	30	28.4	30	

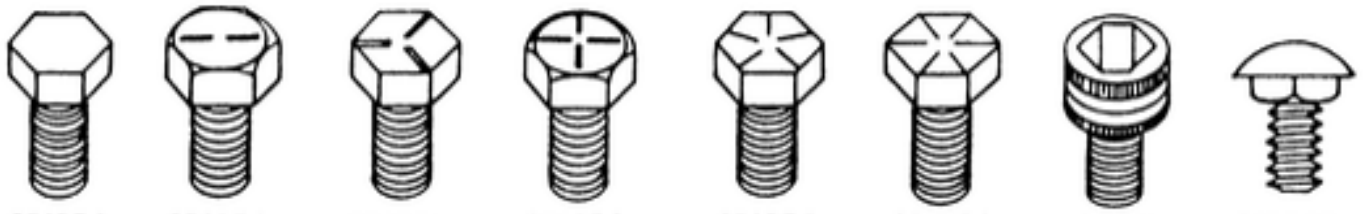
ENGLISH TO METRIC CONVERSION: PRESSURE

basic unit of pressure measurement used today is expressed as pounds per square inch (psi). The metric unit for p
be the kilopascal (kPa). This will apply to either fluid pressure or air pressure, and will be frequently seen in tire
ssure readings, oil pressure specifications, fuel pump pressure, etc.

convert pounds per square inch (psi) to kilopascals (kPa): multiply the number of psi by 6.89

Psi	kPa	Psi	kPa	Psi	kPa	Psi	kP
0.1	0.7	37	255.1	82	565.4	127	875
0.2	1.4	38	262.0	83	572.3	128	882
0.3	2.1	39	268.9	84	579.2	129	889
0.4	2.8	40	275.8	85	586.0	130	896
0.5	3.4	41	282.7	86	592.9	131	903
0.6	4.1	42	289.6	87	599.8	132	910
0.7	4.8	43	296.5	88	606.7	133	917
0.8	5.5	44	303.4	89	613.6	134	923
0.9	6.2	45	310.3	90	620.5	135	930
1	6.9	46	317.2	91	627.4	136	937
2	13.8	47	324.0	92	634.3	137	944
3	20.7	48	331.0	93	641.2	138	951
4	27.6	49	337.8	94	648.1	139	958
5	34.5	50	344.7	95	655.0	140	965
6	41.4	51	351.6	96	661.9	141	972
7	48.3	52	358.5	97	668.8	142	979
8	55.2	53	365.4	98	675.7	143	985
9	62.1	54	372.3	99	682.6	144	992
0	69.0	55	379.2	100	689.5	145	999
1	75.8	56	386.1	101	696.4	146	1006
2	82.7	57	393.0	102	703.3	147	1013
3	89.6	58	399.9	103	710.2	148	1020
4	96.5	59	406.8	104	717.0	149	1027
5	103.4	60	413.7	105	723.9	150	1034
6	110.3	61	420.6	106	730.8	151	1041
7	117.2	62	427.5	107	737.7	152	1048
8	124.1	63	434.4	108	744.6	153	1054
9	131.0	64	441.3	109	751.5	154	1061
0	137.9	65	448.2	110	758.4	155	1068
1	144.8	66	455.0	111	765.3	156	1075
2	151.7	67	461.9	112	772.2	157	1082
3	158.6	68	468.8	113	779.1	158	1089
4	165.5	69	475.7	114	786.0	159	1096
5	172.4	70	482.6	115	792.9	160	1103
6	179.3	71	489.5	116	799.8	161	1110
7	186.2	72	496.4	117	806.7	162	1117
8	193.0	73	503.3	118	813.6	163	1123
9	200.0	74	510.2	119	820.5	164	1130
0	206.8	75	517.1	120	827.4	165	1137
1	213.7	76	524.0	121	834.3	166	1144
2	220.6	77	530.9	122	841.2	167	1151
3	227.5	78	537.8	123	848.0	168	1158
4	234.4	79	544.7	124	854.9	169	1165
5	241.3	80	551.6	125	861.8	170	1172
6	248.2	81	558.5	126	868.7	171	1179

BOLTS



GRADE 0 | GRADE 2 | GRADE 5 | GRADE 6 | GRADE 7 | GRADE 8 | ALLEN | CARRIAGE

NUTS

PLAIN | JAM | CASTLE (CASTELLATED) | SELF-LOCKING | SPEED

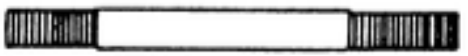
SCREWS

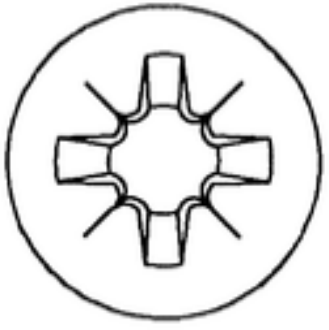
ROUND | PAN | FILLISTER | HEXAGON | SHEET METAL

LOCKWASHERS

INTERNAL TOOTH | EXTERNAL TOOTH | SPLIT | PLAIN

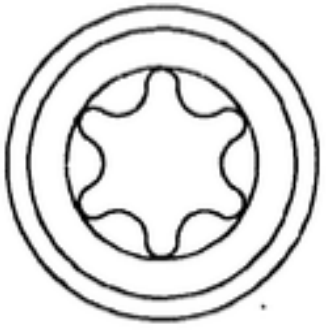
STUD



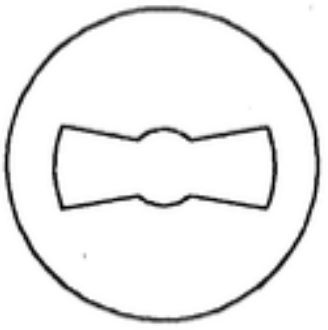


POZIDRIVE

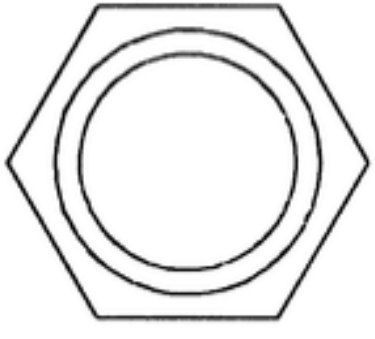
PHILLIPS RECESS



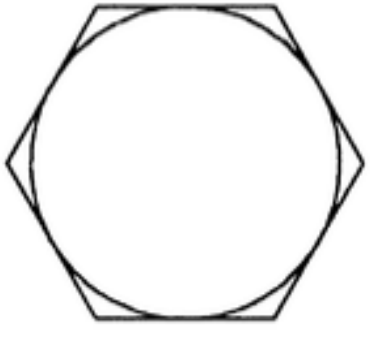
TORX®



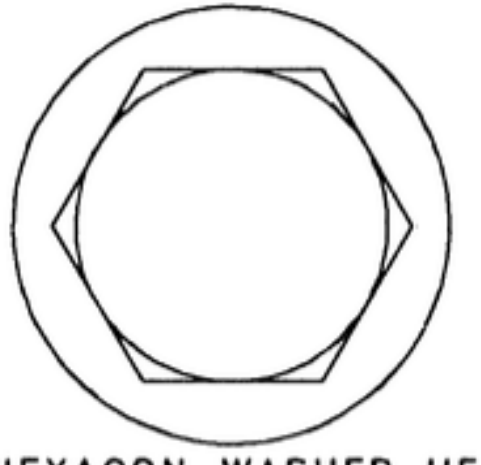
CLUTCH RECESS



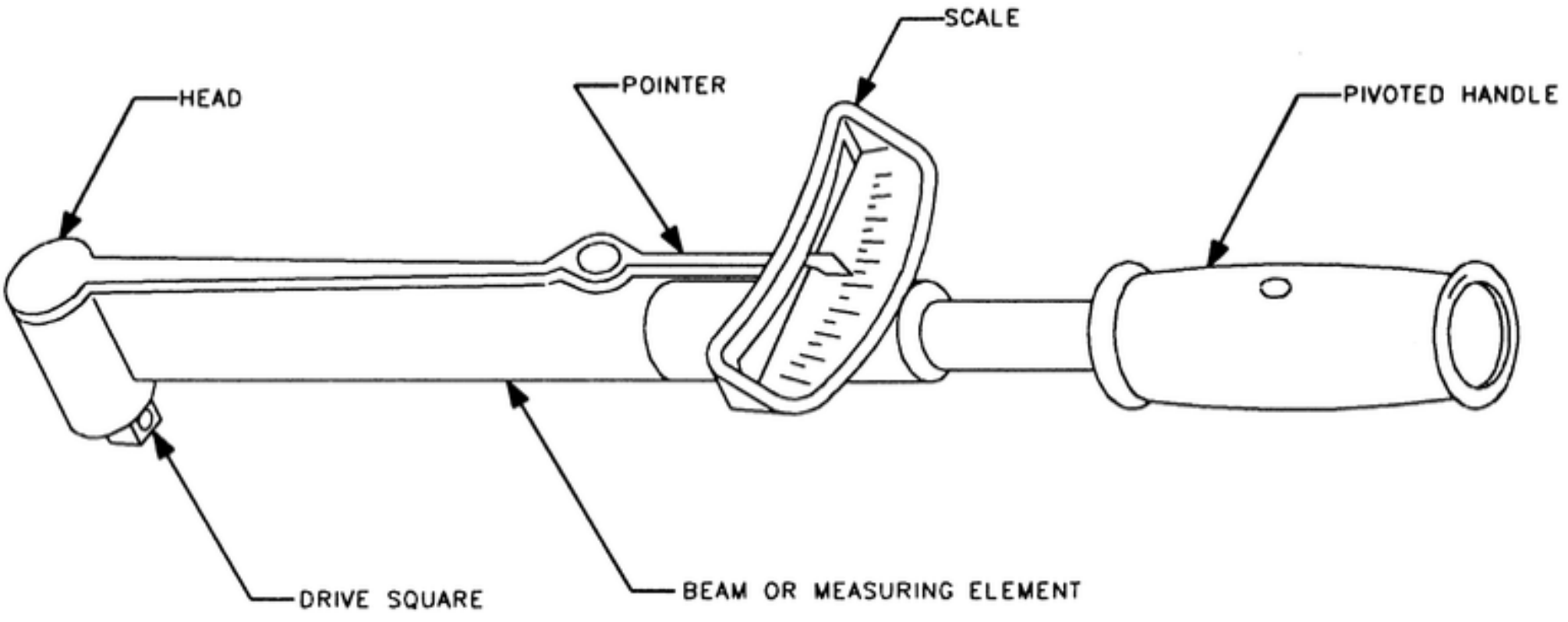
INDENTED HEXAGON



HEXAGON TRIMMED



HEXAGON WASHER HEAD


SCALE
HEAD
POINTER
PIVOTED HANDLE
DRIVE SQUARE
BEAM OR MEASURING ELEMENT

CONVERSION FACTORS

ENGTH–DISTANCE

ches (in.)	x 25.4	= Millimeters (mm)	x .0394	= Inches
eet (ft.)	x .305	= Meters (m)	x 3.281	= Feet
iles	x 1.609	= Kilometers (km)	x .0621	= Miles

OLUME

ubic Inches (in3)	x 16.387	= Cubic Centimeters	x .061	= in3
MP Pints (IMP pt.)	x .568	= Liters (L)	x 1.76	= IMP pt.
MP Quarts (IMP qt.)	x 1.137	= Liters (L)	x .88	= IMP qt.
MP Gallons (IMP gal.)	x 4.546	= Liters (L)	x .22	= IMP gal.
MP Quarts (IMP qt.)	x 1.201	= US Quarts (US qt.)	x .833	= IMP qt.
MP Gallons (IMP gal.)	x 1.201	= US Gallons (US gal.)	x .833	= IMP gal.
. Ounces	x 29.573	= Milliliters	x .034	= Ounces
S Pints (US pt.)	x .473	= Liters (L)	x 2.113	= Pints
S Quarts (US qt.)	x .946	= Liters (L)	x 1.057	= Quarts
S Gallons (US gal.)	x 3.785	= Liters (L)	x .264	= Gallons

MASS–WEIGHT

unces (oz.)	x 28.35	= Grams (g)	x .035	= Ounces
ounds (lb.)	x .454	= Kilograms (kg)	x 2.205	= Pounds

RESSURE

ounds Per Sq. In. (psi)	x 6.895	= Kilopascals (kPa)	x .145	= psi
ches of Mercury (Hg)	x .4912	= psi	x 2.036	= Hg
ches of Mercury (Hg)	x 3.377	= Kilopascals (kPa)	x .2961	= Hg
ches of Water (H_2O)	x .07355	= Inches of Mercury	x 13.783	= H_2O
ches of Water (H_2O)	x .03613	= psi	x 27.684	= H_2O
ches of Water (H_2O)	x .248	= Kilopascals (kPa)	x 4.026	= H_2O

ORQUE

ounds–Force Inches (in–lb)	x .113	= Newton Meters (N·m)	x 8.85	= in–lb
ounds–Force Feet (ft–lb)	x 1.356	= Newton Meters (N·m)	x .738	= ft–lb

ELOCITY

iles Per Hour (MPH)	x 1.609	= Kilometers Per Hour (KPH)	x .621	= MPH

OWER

orsepower (Hp)	x .745	= Kilowatts	x 1.34	= Horsepower

UEL CONSUMPTION*

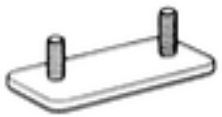
iles Per Gallon IMP (MPG)	x .354	= Kilometers Per Liter (Km/L)
ilometers Per Liter (Km/L)	x 2.352	= IMP MPG
iles Per Gallon US (MPG)	x .425	= Kilometers Per Liter (Km/L)
ilometers Per Liter (Km/L)	x 2.352	= US MPG

t is common to covert from miles per gallon (mpg) to liters/100 kilometers (1/100 km), where mpg (IMP) x 1/100 282 and mpg (US) x 1/100 km = 235.

EMPERATURE

egree Fahrenheit (°F)	= (°C x 1.8) + 32
egree Celsius (°C)	= (°F – 32) x .56

	Mark	Class
Hexagon head bolt	 4 – 4T 5 – 5T 6 – 6T 7 – 7T 8 – 8T 9 – 9T 10 – 10T 11 – 11T	
	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt		4T
		6T
Welded bolt		4T

Diameter mm	Pitch mm	Specified torque					
		Hexagon head bolt			Hexagon flange bolt		
		N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
6	1	5	55	48 in.·lbf	6	60	52 in.
8	1.25	12.5	130	9	14	145	10
10	1.25	26	260	19	29	290	21
12	1.25	47	480	35	53	540	39
14	1.5	74	760	55	84	850	61
16	1.5	115	1,150	83	—	—	—
6	1	6.5	65	56 in.·lbf	7.5	75	65 in.
8	1.25	15.5	160	12	17.5	175	13
10	1.25	32	330	24	36	360	26
12	1.25	59	600	43	65	670	48
14	1.5	91	930	67	100	1,050	76
16	1.5	140	1,400	101	—	—	—
6	1	8	80	69 in.·lbf	9	90	78 in.
8	1.25	19	195	14	21	210	15
10	1.25	39	400	29	44	440	32
12	1.25	71	730	53	80	810	59
14	1.5	110	1,100	80	125	1,250	90
16	1.5	170	1,750	127	—	—	—
6	1	10.5	110	8	12	120	9
8	1.25	25	260	19	28	290	21
10	1.25	52	530	38	58	590	43
12	1.25	95	970	70	105	1,050	76
14	1.5	145	1,500	108	165	1,700	123
16	1.5	230	2,300	166	—	—	—
8	1.25	29	300	22	33	330	24
10	1.25	61	620	45	68	690	50
12	1.25	110	1,100	80	120	1,250	90
8	1.25	34	340	25	37	380	27
10	1.25	70	710	51	78	790	57
12	1.25	125	1,300	94	140	1,450	105
8	1.25	38	390	28	42	430	31
10	1.25	78	800	58	88	890	64
12	1.25	140	1,450	105	155	1,600	116
8	1.25	42	430	31	47	480	35
10	1.25	87	890	64	97	990	72
12	1.25	155	1,600	116	175	1,800	130

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

If a flatbed is unavailable, your vehicle can be towed using a T-hook wrecker. In this case, it is best to tow with the drive axle off the ground, as this will prevent wear and tear on the drive train. Tow vehicle speed should not exceed 35 mph (56 km/h) when using this method.

WARNING
This method CANNOT be used on an AWD vehicle.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Pay attention to the instructions provided. There are 3 common mistakes in mechanical work:

1. Incorrect order of assembly, disassembly or adjustment. When taking something apart or putting it together, performing steps in the wrong order usually just costs you extra time; however, it CAN break something. Read the entire procedure before beginning disassembly. Perform everything in the order in which the instructions say you should, even if you can't immediately see a reason for it. When you're taking apart something that is very intricate, you might want to draw a picture of how it looks when assembled at one point in order to make sure you get everything back in its proper position. We will supply exploded views whenever possible. When making adjustments, perform them in the proper order. One adjustment possibly will affect another.
2. Overtorquing (or undertorquing). While it is more common for overtorquing to cause damage, undertorquing may allow a fastener to vibrate loose causing serious damage. Especially when dealing with aluminum parts, pay attention to torque specifications and utilize a torque wrench in assembly. If a torque figure is not available, remember that if you are using the right tool to perform the job, you will probably not have to strain yourself to get a fastener tight enough. The pitch of most threads is so slight that the tension you put on the wrench will be multiplied many times in actual force on what you are tightening. A good example of how critical torque is can be seen in the case of spark plug installation, especially where you are putting the plug into an aluminum cylinder head. Too little torque can fail to crush the gasket, causing leakage of combustion gases and consequent overheating of the plug and engine parts. Too much torque can damage the threads or distort the plug, changing the spark gap.

   There are many commercial products available for ensuring that fasteners won't come loose, even if they are not torqued just right (a very common brand is Loctite®). If you're worried about getting something together tight enough to hold, but loose enough to avoid mechanical damage during assembly, one of these products might offer substantial insurance. Before choosing a threadlocking compound, read the label on the package and make sure the product is compatible with the materials, fluids, etc. involved.
3. Crossthreading. This occurs when a part such as a bolt is screwed into a nut or casting at the wrong angle and forced. Crossthreading is more likely to occur if access is difficult. It helps to clean and lubricate fasteners, then to start threading the bolt, spark plug, etc. with your fingers. If you encounter resistance, unscrew the part and start over again at a different angle until it can be inserted and turned several times without much effort. Keep in mind that many parts, especially spark plugs, have tapered threads, so that gentle turning will automatically bring the part you're threading to the proper angle. Don't put a wrench on the part until it's been tightened a couple of turns by hand. If you suddenly encounter resistance, and the part has not seated fully, don't force it. Pull it back out to make sure it's clean and threading properly.

   Be sure to take your time and be patient, and always plan ahead. Allow yourself ample time to perform repairs and maintenance. You may find maintaining your car a satisfying and enjoyable experience.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Many procedures in this book require you to "label and disconnect . . . " a group of lines, hoses or wires. Don't be lulled into thinking you can remember where everything goes — you won't. If you hook up vacuum or fuel lines incorrectly, the vehicle may run poorly, if at all. If you hook up electrical wiring incorrectly, you may instantly learn a very expensive lesson.

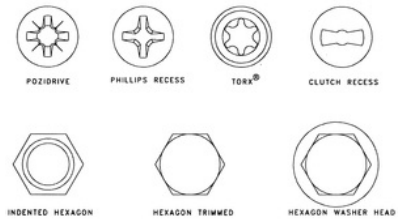
You don't need to know the official or engineering name for each hose or line. A piece of masking tape on the hose and a piece on its fitting will allow you to assign your own label such as the letter A or a short name. As long as you remember your own code, the lines can be reconnected by matching similar letters or names. Do remember that tape will dissolve in gasoline or other fluids; if a component is to be washed or cleaned, use another method of identification. A permanent felt-tipped marker or a metal scribe can be very handy for marking metal parts. Remove any tape or paper labels after assembly.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Although there are a great variety of fasteners found in the modern car or truck, the most commonly used retainer is the threaded fastener (nuts, bolts, screws, studs, etc.). Most threaded retainers may be reused, provided that they are not damaged in use or during the repair. Some retainers (such as stretch bolts or torque prevailing nuts) are designed to deform when tightened or in use and should not be reinstalled.

Fig. 1: Here are a few of the most common screw/bolt driver styles



Whenever possible, we will note any special retainers which should be replaced during a procedure. But you should always inspect the condition of a retainer when it is removed and replace any that show signs of damage. Check all threads for rust or corrosion which can increase the torque necessary to achieve the desired clamp load for which that fastener was originally selected. Additionally, be sure that the driver surface of the fastener has not been compromised by rounding or other damage. In some cases a driver surface may become only partially rounded, allowing the driver to catch in only one direction. In many of these occurrences, a fastener may be installed and tightened, but the driver would not be able to grip and loosen the fastener again. (This could lead to frustration down the line should that component ever need to be disassembled again).

Fig. 2: There are many different types of threaded retainers found on vehicles

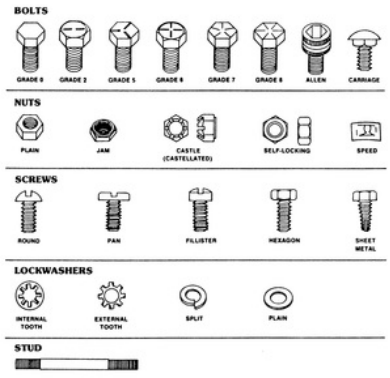


Fig. 3: Threaded retainer sizes are determined using these measurements

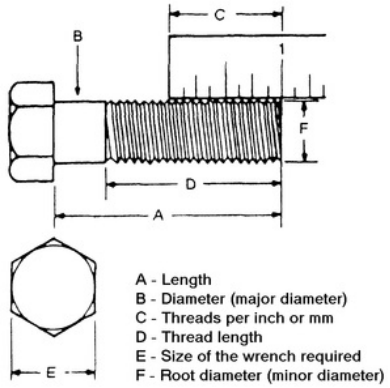
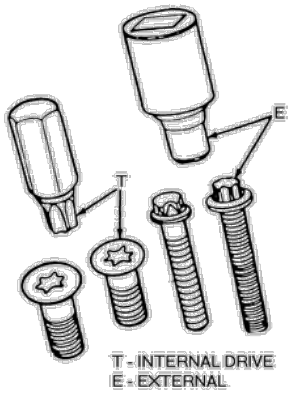


Fig. 4: Special fasteners such as these Torx(r) head bolts are used by manufacturers to discourage people from working on vehicles without the proper tools



If you must replace a fastener, whether due to design or damage, you must ALWAYS be sure to use the proper replacement. In all cases, a retainer of the same design, material and strength should be used. Markings on the heads of most bolts will help determine the proper strength of the fastener. The same material, thread and pitch must be selected to assure proper installation and safe operation of the vehicle afterwards.

Thread gauges are available to help measure a bolt or stud's thread. Most automotive and hardware stores keep gauges available to help you select the proper size. In a pinch, you can use another nut or bolt for a thread gauge. If the bolt you are replacing is not too badly damaged, you can select a match by finding another bolt which will thread in its place. If you find a nut which threads properly onto the damaged bolt, then use that nut to help select the replacement bolt. If however, the bolt you are replacing is so badly damaged (broken or drilled out) that its threads cannot be used as a gauge, you might start by looking for another bolt (from the same assembly or a similar location on your vehicle) which will thread into the damaged bolt's mounting. If so, the other bolt can be used to select a nut; the nut can then be used to select the replacement bolt.

In all cases, be absolutely sure you have selected the proper replacement. Don't be shy, you can always ask the store clerk for help.

WARNING

Be aware that when you find a bolt with damaged threads, you may also find the nut or drilled hole it was threaded into has also been damaged. If this is the case, you may have to drill and tap the hole, replace the nut or otherwise repair the threads. NEVER try to force a replacement bolt to fit into the damaged threads.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

- Don't run the engine in a garage or anywhere else without proper ventilation — EVER! Carbon monoxide is poisonous; it takes a long time to leave the human body and you can build up a deadly supply of it in your system by simply breathing in a little every day. You may not realize you are slowly poisoning yourself. Always use power vents, windows, fans and/or open the garage door.
- Don't work around moving parts while wearing loose clothing. Short sleeves are much safer than long, loose sleeves. Hard-toed shoes with neoprene soles protect your toes and give a better grip on slippery surfaces. Jewelry such as watches, fancy belt buckles, beads or body adornment of any kind is not safe working around a vehicle. Long hair should be tied back under a hat or cap.
- Don't use pockets for toolboxes. A fall or bump can drive a screwdriver deep into your body. Even a rag hanging from your back pocket can wrap around a spinning shaft or fan.
- Don't smoke when working around gasoline, cleaning solvent or other flammable material.
- Don't smoke when working around the battery. When the battery is being charged, it gives off explosive hydrogen gas.
- Don't use gasoline to wash your hands; there are excellent soaps available. Gasoline contains dangerous additives which can enter the body through a cut or through your pores. Gasoline also removes all the natural oils from the skin so that bone dry hands will suck up oil and grease.
- Don't service the air conditioning system unless you are equipped with the necessary tools and training. When liquid or compressed gas refrigerant is released to atmospheric pressure it will absorb heat from whatever it contacts. This will chill or freeze anything it touches.
- Don't use screwdrivers for anything other than driving screws! A screwdriver used as an prying tool can snap when you least expect it, causing injuries. At the very least, you'll ruin a good screwdriver.
- Don't use an emergency jack (that little ratchet, scissors, or pantograph jack supplied with the vehicle) for anything other than changing a flat! These jacks are only intended for emergency use out on the road; they are NOT designed as a maintenance tool. If you are serious about maintaining your vehicle yourself, invest in a hydraulic floor jack of at least a $1\ ^{1}/_{2}$ ton capacity, and at least two sturdy jackstands.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

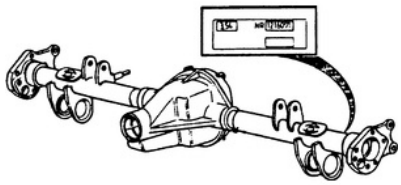
- Do keep a fire extinguisher and first aid kit handy.
- Do wear safety glasses or goggles when cutting, drilling, grinding or prying, even if you have 20–20 vision. If you wear glasses for the sake of vision, wear safety goggles over your regular glasses.
- Do shield your eyes whenever you work around the battery. Batteries contain sulfuric acid. In case of contact with the eyes or skin, flush the area with water or a mixture of water and baking soda, then seek immediate medical attention.
- Do use safety stands (jackstands) for any undervehicle service. Jacks are for raising vehicles; jackstands are for making sure the vehicle stays raised until you want it to come down. Whenever the vehicle is raised, block the wheels remaining on the ground and set the parking brake.
- Do use adequate ventilation when working with any chemicals or hazardous materials. Like carbon monoxide, the asbestos dust resulting from some brake lining wear can be hazardous in sufficient quantities.
- Do disconnect the negative battery cable when working on the electrical system. The secondary ignition system contains EXTREMELY HIGH VOLTAGE. In some cases it can even exceed 50,000 volts.
- Do follow manufacturer's directions whenever working with potentially hazardous materials. Most chemicals and fluids are poisonous if taken internally.
- Do properly maintain your tools. Loose hammerheads, mushroomed punches and chisels, frayed or poorly grounded electrical cords, excessively worn screwdrivers, spread wrenches (open end), cracked sockets, slipping ratchets, or faulty droplight sockets can cause accidents.
- Likewise, keep your tools clean; a greasy wrench can slip off a bolt head, ruining the bolt and often harming your knuckles in the process.
- Do use the proper size and type of tool for the job at hand. Do select a wrench or socket that fits the nut or bolt. The wrench or socket should sit straight, not cocked.
- Do, when possible, pull on a wrench handle rather than push on it, and adjust your stance to prevent a fall.
- Do be sure that adjustable wrenches are tightly closed on the nut or bolt and pulled so that the force is on the side of the fixed jaw.
- Do strike squarely with a hammer; avoid glancing blows.
- Do set the parking brake and block the drive wheels if the work requires a running engine.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The rear axle ratio and identification number (part number) are found on a label, located on the left-hand side of the axle housing.

Fig. 7: Rear axle ID tag location — heavy duty version shown



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

One of the most common, if not THE most common, problems associated with trailer towing is engine overheating. If you have a cooling system without an expansion tank, you'll definitely need to get an aftermarket expansion tank kit, preferably one with at least a 2 quart capacity. These kits are easily installed on the radiator's overflow hose, and come with a pressure cap designed for expansion tanks.

Aftermarket engine oil coolers are helpful for prolonging engine oil life and reducing overall engine temperatures. Both of these factors increase engine life. While not absolutely necessary in towing Class I and some Class II trailers, they are recommended for heavier Class II and all Class III towing. Engine oil cooler systems usually consist of an adapter, screwed on in place of the oil filter, a remote filter mounting and a multi-tube, finned heat exchanger, which is mounted in front of the radiator or air conditioning condenser.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The engine serial number is stamped onto the engine block on the driver's side, just below the cylinder head. An identification tag or plate is also affixed to the timing cover. The engine size can also be identified by reading the sixth and seventh digits of the VIN and using charts in this manual or other similar information to decode the VIN.

Fig. 4: Engine ID tag location — B230F, B230FT and B234F engines

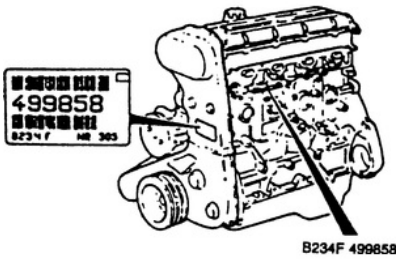


Fig. 5: Engine ID tag location — B280F engine

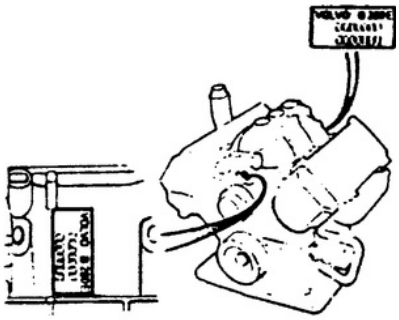
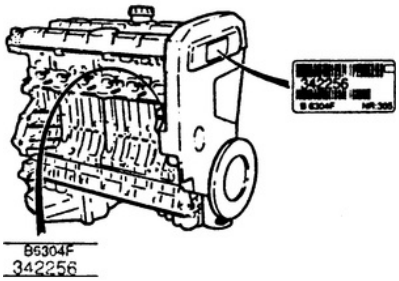


Fig. 6: Engine ID tag location — B6304F engine



ENGINE IDENTIFICATION AND SPECIFICATIONS

Year	Model	Engine ID/VIN	Engine Displacement Liters (cc)	No. of Cyl.	Engine Type	Fuel System Type	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	Oil Pressure @ rpm
1992	240	B230F1B5	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65 @ 2000
	240TL	B230F1B6	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65 @ 2000
	740GL	B230F1B7	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740GL	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740GLE	B230F1B9	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740GLE	B230F1BA	2.3 (2316)	4	SOHC	EFI	105@5700	152@4400	3.78 x 3.13	10.0:1	7@1000
	740T-turbo	B230F1BC	2.3 (2316)	4	SOHC	EFI	162@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
	760GLE	B28OF1B9	2.8 (2849)	6	SOHC	EFI	140@5100	173@3750	3.59 x 2.95	8.5:1	57@5000
	760T-turbo	B230F1BF	2.3 (2316)	4	SOHC	EFI	162@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
	780	B28OF1BA	2.8 (2849)	6	SOHC	EFI	140@5100	173@3750	3.59 x 2.95	8.5:1	57@5000
	780T-turbo	B230F1BF	2.3 (2316)	4	SOHC	EFI	175@5400	197@3600	3.78 x 3.13	8.7:1	25-65@2000
1993	240GL	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	240GL	B230F1B9	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740GL	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740T-turbo	B230F1BF	2.3 (2316)	4	SOHC	EFI	162@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
	940GE	B230F1B7	2.3 (2316)	4	SOHC	EFI	162@4800	185@4800	3.78 x 3.13	8.7:1	25-65@2000
	940T-turbo	B230F1B7	2.3 (2316)	4	SOHC	EFI	162@4800	185@4800	3.78 x 3.13	8.7:1	25-65@2000
	940GLE	B230F1B9	2.3 (2316)	4	SOHC	EFI	150@5100	150@4400	3.78 x 3.13	10.0:1	7@1000
	Coupe	B230F1B7	2.3 (2316)	4	SOHC	EFI	175@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
1994	240GL	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	240GL	B230F1B9	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740GL	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	740T-turbo	B230F1BF	2.3 (2316)	4	SOHC	EFI	162@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
	940GE	B230F1B7	2.3 (2316)	4	SOHC	EFI	162@4800	185@4800	3.78 x 3.13	8.7:1	25-65@2000
	940T-turbo	B230F1B7	2.3 (2316)	4	SOHC	EFI	162@4800	185@4800	3.78 x 3.13	8.7:1	25-65@2000
	940GLE	B230F1B9	2.3 (2316)	4	SOHC	EFI	150@5100	150@4400	3.78 x 3.13	10.0:1	7@1000
	Coupe	B230F1B7	2.3 (2316)	4	SOHC	EFI	175@5500	197@3600	3.78 x 3.13	8.7:1	25-65@2000
1995	240	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	850	B5254S1B	2.4 (2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	940	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	940 Turbo	B230F1B7	2.3 (2316)	4	SOHC	EFI	162@4800	185@4800	3.78 x 3.13	8.7:1	25-65@2000
	960	B6304F1B	3.0 (2922)	6	DOHC	EFI	201@6000	197@4000	3.27 x 3.54	10.7:1	36@2000
1996	840	B230F1B8	2.3 (2316)	4	SOHC	EFI	114@5400	134@2750	3.78 x 3.13	8.8:1	25-65@2000
	850	B5254S1B	2.4 (2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	850T-u/bo	B5254T5T	2.3 (2311)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49-84@4000
	960	B6304F1B	3.0 (2922)	6	DOHC	EFI	201@6000	197@4000	3.27 x 3.54	10.7:1	36@2000
1997	850	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	850GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	191@1800	3.27 x 3.54	10.5:1	49-84@4000
	850T-T	B5254T5T	2.3(2311)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49-84@4000
	850R	B5254T5B	2.3(2319)	5	DOHC	EFI	240@6000	221@2100	3.19 x 3.54	8.5:1	49-84@4000
	960	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
1998	S70	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	S70GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	S70T-T	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2100	3.19 x 3.54	8.5:1	49-84@4000
	S90	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
	C70	B5254T3/5/3	2.3(2319)	5	DOHC	EFI	236@6100	243@2700	3.19 x 3.54	8.5:1	49-84@4000
	V70	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	V70GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V70T-5	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2100	3.19 x 3.54	8.5:1	49-84@4000
	V70 AWD	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V70R AWD	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2700	3.19 x 3.54	8.5:1	49-84@4000
	V70XC AWD	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V90	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000

EFI = Electronic Fuel Injection

ENGINE IDENTIFICATION AND SPECIFICATIONS

Year	Model	Engine ID/VIN	Engine Displacement Liters (cc)	No. of Cyl.	Engine Type	Fuel System Type	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	Oil Pressure @ rpm
1997	850	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	850GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	191@1800	3.27 x 3.54	10.5:1	49-84@4000
	850T-T	B5254T5T	2.3(2319)	5	DOHC	EFI	222@5200	221@2100	3.19 x 3.54	8.5:1	49-84@4000
	850R	B5254T5B	2.3(2319)	5	DOHC	EFI	240@6000	221@2100	3.19 x 3.54	8.5:1	49-84@4000
	960	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
1998	S70	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	S70GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	S70T-T	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2100	3.19 x 3.54	8.5:1	49-84@4000
	S90	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000
	C70	B5254T3/5/3	2.3(2319)	5	DOHC	EFI	236@6100	243@2700	3.19 x 3.54	8.5:1	49-84@4000
	V70	B5254S1B5	2.4(2435)	5	DOHC	EFI	168@6100	162@4700	3.27 x 3.54	10.5:1	49-84@4000
	V70GLT	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V70T-5	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2100	3.19 x 3.54	8.5:1	49-84@4000
	V70 AWD	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V70R AWD	B5254T5T	2.3(2319)	5	DOHC	EFI	236@6100	243@2700	3.19 x 3.54	8.5:1	49-84@4000
	V70XC AWD	B5254T5B	2.4(2435)	5	DOHC	EFI	190@5200	199@1800	3.27 x 3.54	10.5:1	49-84@4000
	V90	B6304S96	2.9(2922)	6	DOHC	EFI	181@5200	199@4100	3.27 x 3.54	10.7:1	36@2000

SOHC = Single Overhead Camshaft
DOHC = Double Overhead Camshaft
EFI = Electronic Fuel Injection

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Your vehicle was primarily designed to carry passengers and cargo. It is important to remember that towing a trailer will place additional loads on your vehicle's engine, drive train, steering, braking and other systems. However, if you decide to tow a trailer, using the prior equipment is a must.

Local laws may require specific equipment such as trailer brakes or fender mounted mirrors. Check your local laws.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

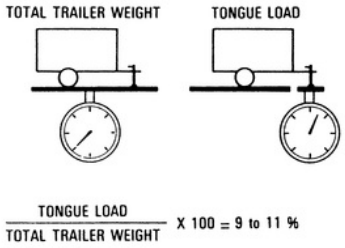
Towing a trailer with ease and safety requires a certain amount of experience. It's a good idea to learn the feel of a trailer by practicing turning, stopping and backing in an open area such as an empty parking lot.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Calculate the hitch weight in order to select a proper hitch. The weight of the hitch is usually 9–11% of the trailer gross weight and should be measured with the trailer loaded. Hitches fall into various categories: those that mount on the frame and rear bumper, the bolt-on type, or the weld-on distribution type used for larger trailers. Axle mounted or clamp-on bumper hitches should never be used.

Fig. 1: Calculating proper tongue weight for your trailer



Check the gross weight rating of your trailer. Tongue weight is usually figured as 10% of gross trailer weight. Therefore, a trailer with a maximum gross weight of 2000 lbs. will have a maximum tongue weight of 200 lbs. Class I trailers fall into this category. Class II trailers are those with a gross weight rating of 2000–3000 lbs., while Class III trailers fall into the 3500 –6000 lbs. category. Class IV trailers are those over 6000 lbs. and are for use with fifth wheel trucks, only.

When you've determined the hitch that you'll need, follow the manufacturer's installation instructions, exactly, especially when it comes to fastener torque. The hitch will subjected to a lot of stress and good hitches come with hardened bolts. Never substitute an inferior bolt for a hardened bolt.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

This manual for 1990–98 Volvo cars is intended to help you learn more about the inner workings of your vehicle while saving you money on its upkeep and operation.

The beginning of the book will likely be referred to the most, since that is where you will find information for maintenance and tune-up. The other sections deal with the more complex systems of your vehicle. Operating systems from engine through brakes are covered to the extent that the average do-it-yourselfer becomes mechanically involved. This book will not explain such things as rebuilding a differential for the simple reason that the expertise required and the investment in special tools make this task uneconomical. It will, however, give you detailed instructions to help you change your own brake pads and shoes, replace spark plugs, and perform many more jobs that can save you money, give you personal satisfaction and help you avoid expensive problems.

A secondary purpose of this book is a reference for owners who want to understand their vehicle and/or their mechanics better. In this case, no tools at all are required.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Your vehicle was supplied with a jack for emergency road repairs. This jack is fine for changing a flat tire or other short term procedures not requiring you to go beneath the vehicle. If it is used in an emergency situation, carefully follow the instructions provided either with the jack or in your owner's manual. Do not attempt to use the jack on any portions of the vehicle other than specified by the vehicle manufacturer. Always block the diagonally opposite wheel when using a jack.

A more convenient way of jacking is the use of a garage or floor jack. You may use the floor jack at the illustrated jacking locations.

Never place the jack under the radiator, engine or transmission components. Severe and expensive damage will result when the jack is raised. Additionally, never jack under the floorpan or bodywork; the metal will deform.

When raising the vehicle with a floor jack, position the jack under the crossmember at the front of the vehicle or under the differential case (if equipped) of the rear axle at the rear. When jacking at the front of the vehicle, do not position the jack under the gravel shield or the engine oil pan or you will damage these components.

Do not position the support stands under lower control arms or other slanted surfaces as they might slip and allow the vehicle to fall. The support stands can be placed beneath the rear axle tubes at the rear of the vehicle and beneath the reinforced areas of the rocker panels or front frame members. The vehicle's weight should push vertically (downward) on the stands; the stands should be on a level and solid base.

Whenever you plan to work under the vehicle, you must support it on jackstands or ramps. Never use cinder blocks or stacks of wood to support the vehicle, even if you're only going to be under it for a few minutes. Never crawl under the vehicle when it is supported only by the tire-changing jack or other floor jack.

NOTE: Always position a block of wood or small rubber pad on top of the jack or jackstand to protect the lifting point's finish when lifting or supporting the vehicle.

Small hydraulic, screw, or scissors jacks are satisfactory for raising the vehicle. Drive-on trestles or ramps are also a handy and safe way to both raise and support the vehicle. Be careful though, some ramps may be too steep to drive your vehicle onto without scraping the front bottom panels. Never support the vehicle on any suspension member (unless specifically instructed to do so by a repair manual) or by an underbody panel.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The following safety points cannot be overemphasized:

- Always block the opposite wheel or wheels to keep the vehicle from rolling off the jack.
- When raising the front of the vehicle, firmly apply the parking brake.
- When the drive wheels are to remain on the ground, leave the vehicle in gear to help prevent it from rolling.
- Always use jackstands to support the vehicle when you are working underneath. Place the stands beneath the vehicle's jacking brackets. Before climbing underneath, rock the vehicle a bit to make sure it is firmly supported.

Fig. 1: Position the jack in the middle to raise both wheels, and jack up the front of the vehicle by its subframe

Fig. 2: Place the jackstands beneath the rear end of the subframe to support the front of the vehicle

Fig. 3: Raise the rear by jacking at the rear spring perch, then place the jackstand under the frame rail; raise only one side at a time

SCHEDULED MAINTENANCE INTERVALS

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)											
		5	10	20	30	40	50	60	70	80	90	100	110	120
Engine oil & filter①	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Automatic transmission fluid②	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fluid levels (all)	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brake lines	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Automatic transmission shift control	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brake pads & parking brake	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Driveshaft boots (RWD)	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Engine & transmission (check for leaks)	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Exhaust system	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grease fitt. axle stops (1984-87 850)	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Road service reminder⑦	S/I		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Driveshaft, U-joints	S/I					✓	✓	✓	✓	✓	✓	✓	✓	✓
Driveshaft joints (850)	S/I							✓	✓	✓	✓	✓	✓	✓
Clutch	S/I			✓		✓		✓		✓		✓		✓
Kickdown cable (240/940)	S/I			✓		✓		✓		✓		✓		✓
Brake & fuel lines & hoses	S/I					✓		✓		✓		✓		✓
Steering & suspension	S/I					✓		✓		✓		✓		✓
Air cleaner filter	R				✓			✓			✓			✓
Spark plugs	R				✓			✓			✓			✓
Timing belt (1993 940)	R				✓			✓			✓			✓
Timing belt (1994-95 960)	R						✓					✓		
Timing belt (850 & 1996-97 960)	R									✓				

SCHEDULED MAINTENANCE INTERVALS

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)											
		5	10	20	30	40	50	60	70	80	90	100	110	120
Timing belt (B230F, FT)	R						✓					✓		
Timing belt (B230F, FT	S/I							✓					✓	
Timing belt (B230FD)	S/I		✓										✓	
Timing belt (B230FD)	R											✓		
Timing gear belt tensioner pivot bearing (1993 960)	S/I				✓			✓			✓			✓
Timing gear belt tensioner pivot bearing (1993 850)	R						✓					✓		
Valve clearance (240/740)	S/I				✓			✓			✓			✓
Drive belt tensioner (B5))	S/I				✓			✓			✓			✓
Drive belts⑧	S/I				✓			✓			✓			✓
Fuel line filter⑨	R							✓						✓
EGR system	S/I							✓				✓		
PCV nipple (orifice)/hoses	S/I							✓				✓		
Check suspension torques⑩	S/I		✓											
Brake fluid⑪	R													

① Perform operation every 5000 miles on turbocharged models.
② Replace every 2 years or 30,000 miles, whichever comes first under normal conditions, more frequently in mountainous areas or moist climates.
③ Except B5) shown. B5) (1993) - perform at 1700 miles.
④ (1993-95 shown, replace every 100,000 miles (1996-97)
⑤ B5), 960: replace at 60,000 miles
⑥ Replace as follows: 1993 240/940 - every 30,000 miles, 1994 940 - every 60,000 miles.
R = Replace S/I = Service or Inspect

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:
- Extremely dusty areas.
- Trailer towing or police. Vehicle operation is in 32°C (90°F) or higher temperatures, or constant operation in temperatures below 0°C (32°F).
- Prolonged idling (vehicle operation in stop and go traffic).
- Frequent short running periods (engine does not warm to normal operating temperatures).
- Police, taxi, delivery usage or trailer towing usage.

Oil & oil filter change - (all models) change every 5000 miles.
Air filter element - service or inspect every 15,000 miles.

CAPACITIES

Year	Model	Engine ID/VIN	Engine Displacement Liters (cc)	Engine Oil with Filter (qts.) ①	Transmission (qts.) M46	Transmission (qts.) M47	Transmission (qts.) A240	Transfer Case (pts.)	Drive Axle Front (pts.)	Drive Axle Rear (pts.)	Fuel Tank (gal.)	Cooling System (qts.)
1990	240	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	240DL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740GLE	B-234F/89	2.3 (2316)	4.0	4.8	—	15.8 ②	—	—	③	15.8	10.0
	740Turbo	B-230FT/87	2.3 (2316)	4.0	4.8	—	15.8 ②	—	—	③	15.8	10.0
	760GLE	B-280F/89	2.8 (2849)	6.0	—	—	15.8 ②	—	—	③	21.0	10.5
	780Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	④	10.0
	780	B-280F/89	2.8 (2849)	6.0	—	—	15.8 ②	—	—	③	21.0	10.5
	780Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	④	10.5
1991	240DL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	240GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940SE	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940GLE	B-234F/89	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.5
	Coupe	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	21.0	10.5
1992	240GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	240GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740GL	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	740Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940SE	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.0
	940GLE	B-234F/89	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	15.8	10.5
	960	B-6304F/96	2.9 (2922)	6.0	—	—	16.4 ②	—	—	③	19.8	11.3
1993	240	B-230F/88	2.3 (2316)	4.0	—	3.2	15.8 ②	—	—	③	15.8	10.0
	940	B-230F/88	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	960	B-6304F/96	2.9 (2922)	6.0	—	—	15.8 ②	—	—	③	19.8	11.3
	850	B-5254/5/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
1994	940	B-230F/88	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	850	B-5254/5/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850Turbo	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	960	B6304F/96	2.9 (2922)	6.0	—	—	16.4	—	—	⑤	21.8	10.0
1995	940	B-230F/88	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	940Turbo	B-230FT/87	2.3 (2316)	4.0	—	—	15.8 ②	—	—	③	19.8	10.0
	850	B-5254/5/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850Turbo	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	960	B6304F/96	2.9 (2922)	6.0	—	—	16.4	—	—	⑤	21.8	10.0

CAPACITIES

Year	Model	Engine ID/VIN	Engine Displacement Liters (cc)	Engine Oil with Filter (qts.) ①	Transmission (qts.) M46	Transmission (qts.) M47	Transmission (qts.) A240	Transfer Case (pts.)	Drive Axle Front (pts.)	Drive Axle Rear (pts.)	Fuel Tank (gal.)	Cooling System (qts.)
1996	850	B-5254/5/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850GLT	B-5254T/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850T-5	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850R	B-5254FT/58	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	960	B-6304S/96	2.9 (2922)	6.0	—	—	16.4	—	—	⑤	21.8	10.0
1997	850	B-5254/5/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850GLT	B-5254T/56	2.4 (2435)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850T-5	B-5234T/57	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	850R	B-5254FT/58	2.3 (2319)	5.6	—	4.4	8.4	—	—	—	19.3	7.6
	960	B6304F/96	2.9 (2922)	6.0	—	—	16.4	—	—	⑤	21.8	10.0
1998	S70	B5254/5/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	S70GLT	B-5254T/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	S70T-5	B-5234T/57	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	S90	B-6304S/96	2.9 (2922)	6.0	—	—	16.4	—	—	⑤	21.8	10.0
	C70	B-5234T/5/57	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	V70	B-5254/5/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	V70XLT	B-5254T/56	2.4 (2435)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	V70T-5	B-5234T/57	2.3 (2319)	6.1	—	4.4	8.4	—	—	—	18.5	7.6
	V70 AWD	B-5254T/56	2.4 (2435)	6.1	—	—	8.4	1.7	—	2.9	18.5	7.6
	V70R AWD	B-5234T/57	2.3 (2319)	6.1	—	—	8.4	1.7	—	2.9	18.5	7.6
	V70XC AWD	B-5254T/56	2.4 (2435)	6.1	—	—	8.4	1.7	—	2.9	18.5	7.6
	V90	B-6304S/96	2.9 (2922)	6.1	—	—	16.4	—	—	⑤	21.8	10.0

① 1030 axle-2.8
1031 axle-3.4
1035 axle-2.9
1041 axle-3.1
1045 axle-2.8
1055 axle-3.2
1065 axle-2.9

② On turbocharged engines, add 0.7 US qts. if the cooler is drained

③ Total fluid capacity cannot be drained. 3.6 qts (3.4 liters) can be drained, the rest remains in the torque converter and control systems

④ 4 door - 21.0
5 door - 15.8

ENGLISH TO METRIC CONVERSION: MASS (WEIGHT)

Current mass measurement is expressed in pounds and ounces (lbs. & ozs.). The metric unit of mass (or weight) is the kilogram (kg). Even although this table does not show conversion of masses (weights) larger than 15 lbs., it is easy to calculate larger units by following the data immediately below.

To convert ounces (oz.) to grams (g): multiply th number of ozs. by 28
To convert grams (g) to ounces (oz.): multiply the number of grams by .035

To convert pounds (lbs.) to kilograms (kg): multiply the number of lbs. by .45
To convert kilograms (kg) to pounds (lbs.): multiply the number of kilograms by 2.2

lbs	kg	lbs	kg	oz	kg	oz	lbs
0.1	0.04	9.0	4.05	0.1	0.003	0.5	0.024
0.2	0.09	1	0.4	0.2	0.005	1	0.03
0.3	0.14	2	0.9	0.3	0.008	2	0.06
0.4	0.18	3	1.4	0.4	0.011	3	0.08
0.5	0.23	4	1.8	0.5	0.014	4	0.11
0.6	0.27	5	2.3	0.6	0.017	5	0.14
0.7	0.32	10	4.5	0.7	0.020	10	0.28
0.8	0.36	15	6.8	0.8	0.023	15	0.42

ENGLISH TO METRIC CONVERSION: TEMPERATURE

To convert Fahrenheit (° F) to Celsius (°C): take number of °F and subtract 32; multiply result by 5; divide result by 9
To convert Celsius (° C) to Fahrenheit (° F): take number of °C and multiply by 9; divide result by 5; add 32 to total

Fahrenheit (F) °F	Celsius (C) °C	°F	°C
−40	−40	−30	−34.4
−35	−37.2	−34	−32.8
−30	−34.4	−34	−29.2
−25	−31.7	−36	−25.6
−20	−28.9	−40	−23
−15	−26.1	−39	−18.4
−10	−23.3	−34	−14.8
−5	−20.6	−24	−11.2
0	−17.8	−22	−7.6
1	−17.2	−20	−4
2	−16.7	−19	−0.4
3	−16.1	−18	3.2
4	−15.6	−14	6.8
5	−15.0	−12	10.4
10	−12.2	−10	14
15	−9.4	−8	17.6
20	−6.7	−6	21.2
25	−3.9	−4	24.8
30	−1.1	−2	28.4
35	1.7	0	32
40	4.4	2	35.6
45	7.2	4	39.2
50	10.0	6	42.8
55	12.8	8	46.4
60	15.5	10	50
65	18.3	12	53.6
70	21.1	14	57.2
75	23.9	16	60.8

Fahrenheit (F) °F	Celsius (C) °C	°F	°C
80	26.7	18	64.4
85	29.4	20	68
90	32.2	22	71.6
95	35.0	24	75.2
100	37.8	26	78.8
105	40.6	28	82.4
110	43.3	30	86
115	46.1	32	89.6
120	48.9	34	93.2
125	51.7	36	96.8
130	54.4	38	100.4
135	57.2	40	104
140	60.0	42	107.6
145	62.8	44	112.7
150	65.6	46	114.8
155	68.3	48	118.4
160	71.1	50	122
165	73.9	52	125.6
170	76.7	54	129.2
175	79.4	56	132.8
180	82.2	58	136.4
185	85.0	60	140
190	87.8	62	143.6
195	90.6	64	147.2
200	93.3	66	150.8
205	96.1	68	154.4
210	98.9	70	158
212	100.0	75	167

Fahrenheit (F) °F	Celsius (C) °C	°F	°C
205	101.7	80	176
210	104.6	85	185
220	107.2	90	194
225	110.0	95	203
230	112.8	100	212
240	115.6	105	221
245	118.3	110	230
250	121.1	115	239
255	123.9	120	248
260	126.6	125	257
265	129.4	130	266
270	132.2	135	275
275	135.0	140	284
280	137.8	145	293
285	140.6	150	302
290	143.3	155	311
295	146.1	160	320
300	148.9	165	329
305	151.7	170	338
310	154.4	175	347
315	157.2	180	356
320	160.0	185	365
325	162.8	190	374
330	165.6	195	383
335	168.3	200	392
340	171.1	205	401
345	173.9	210	410
350	176.7	215	414

ENGLISH TO METRIC CONVERSION: LENGTH

To convert inches (ins.) to millimeters (mm): multiply number of inches by 25.4
To convert millimeters (mm) to inches (ins.): multiply number of millimeters by .04

Inches	Decimals	Millimeters	Inches to millimeters mm
1/64	0.015625	0.3969	0.0001 – 0.00254
	0.03125	0.7937	0.0002 – 0.00508
3/64	0.046875	1.1906	0.0003 – 0.00762
1/16	0.0625	1.5875	0.0004 – 0.01016
5/64	0.078125	1.9844	0.0005 – 0.01270
3/32	0.09375	2.3812	0.0006 – 0.01524
7/64	0.109375	2.7781	0.0007 – 0.01778
1/8	0.125	3.1750	0.0008 – 0.02032
9/64	0.140625	3.5719	0.0009 – 0.02286
5/32	0.1562	3.9687	0.001 – 0.0254
11/64	0.171875	4.3656	0.002 – 0.0508
3/16	0.1875	4.7625	0.003 – 0.0762
13/64	0.203125	5.1594	0.004 – 0.1016
7/32	0.21875	5.5562	0.005 – 0.1270
15/64	0.234375	5.9531	0.006 – 0.1524
1/4	0.25	6.3500	0.007 – 0.1778
17/64	0.265625	6.7469	0.008 – 0.2032
9/32	0.28125	7.1437	0.009 – 0.2286
19/64	0.296875	7.5406	0.01 – 0.254
5/16	0.3125	7.9375	0.02 – 0.508
21/64	0.328125	8.3344	0.03 – 0.762
11/32	0.3437	8.7312	0.04 – 1.016
23/64	0.359375	9.1281	0.05 – 1.270
3/8	0.375	9.5250	0.06 – 1.524
25/64	0.390625	9.9219	0.07 – 1.778
13/32	0.40625	10.3187	0.08 – 2.032
27/64	0.421875	10.7156	0.09 – 2.286
7/16	0.4375	11.1125	0.1 – 2.54
29/64	0.453125	11.5094	0.2 – 5.08
15/32	0.4687	11.9062	0.3 – 7.62
31/64	0.484375	12.3031	0.4 – 10.16
1/2	0.5	12.7000	0.5 – 12.70

Inches	Decimals	Millimeters	Inches to millimeters mm
33/64	0.515625	13.0969	0.6 – 15.24
17/32	0.5312	13.4937	0.7 – 17.78
35/64	0.546875	13.8906	0.8 – 20.32
9/16	0.5625	14.2875	0.9 – 22.86
37/64	0.578125	14.6844	1 – 25.4
19/32	0.5937	15.0812	2 – 50.8
39/64	0.609375	15.4781	3 – 76.2
5/8	0.625	15.8750	4 – 101.6
41/64	0.640625	16.2719	5 – 127.0
21/32	0.6562	16.6687	6 – 152.4
43/64	0.671875	17.0656	7 – 177.8
11/16	0.6875	17.4625	8 – 203.2
45/64	0.703125	17.8594	9 – 228.6
23/32	0.7187	18.2562	10 – 254.0
47/64	0.734375	18.6531	11 – 279.4
3/4	0.75	19.0500	12 – 304.8
49/64	0.765625	19.4469	13 – 330.2
25/32	0.7812	19.8437	14 – 355.6
51/64	0.796875	20.2406	15 – 381.0
13/16	0.8125	20.6375	16 – 406.4
53/64	0.828125	21.0344	17 – 431.8
27/32	0.8437	21.4312	18 – 457.2
55/64	0.859375	21.8281	19 – 482.6
7/8	0.875	22.2250	20 – 508.0
57/64	0.890625	22.6219	21 – 533.4
29/32	0.9062	23.0187	22 – 558.8
59/64	0.921875	23.4156	23 – 584.2
15/16	0.9375	23.8125	24 – 609.6
61/64	0.953125	24.2094	25 – 635.0
31/32	0.9687	24.6062	26 – 660.4
63/64	0.984375	25.0031	27 – 690.6

ENGLISH TO METRIC CONVERSION: TORQUE

To convert foot-pounds (ft. lbs.) to Newton-meters: multiply the number of ft. lbs. by 1.3
To convert inch-pounds (in. lbs.) to Newton-meters: multiply the number of in. lbs. by .11

in lbs	N-m	in lbs	N-m	in lbs	N-m	in lbs	N-m	in lbs	N-m
0.1	0.01	5	0.11	10	1.13	19	2.15	28	3.16
0.2	0.02	2	0.23	11	1.24	20	2.26	29	3.28
0.3	0.03	3	0.34	12	1.36	21	2.37	30	3.39
0.4	0.04	4	0.45	13	1.47	22	2.49	31	3.50
0.5	0.06	5	0.56	14	1.58	23	2.60	32	3.62
0.6	0.07	6	0.68	15	1.70	24	2.71	33	3.73
0.7	0.08	7	0.79	16	1.81	25	2.82	34	3.84
0.8	0.09	8	0.90	17	1.92	26	2.94	35	3.95
0.9	0.10	9	1.02	18	2.03	27	3.05	36	4.0

ENGLISH TO METRIC CONVERSION: TORQUE

Torque is now expressed as either foot-pounds (ft. lbs.) or inch pounds (in. lbs.). The metric measurement unit for torque is the Newton-meter (Nm). This unit—the Nm—will be used for all SI metric torque references, both the present ft. lbs. and in. lbs.

ft lbs	N-m	ft lbs	N-m	ft lbs	N-m	ft lbs	N-m
0.1	0.1	33	44.7	74	100.3	115	155.9
0.2	0.3	34	46.1	75	101.7	116	157.3
0.3	0.4	35	47.4	76	103.0	117	158.6
0.4	0.5	36	48.8	77	104.4	118	160.0
0.5	0.7	37	50.2	78	105.8	119	161.3
0.6	0.8	38	51.5	79	107.1	120	162.7
0.7	1.0	39	52.9	80	108.5	121	164.0
0.8	1.1	40	54.2	81	109.8	122	165.4
0.9	1.2	41	55.6	82	111.2	123	166.8
1	1.3	42	56.9	83	112.5	124	168.1
2	2.7	43	58.3	84	113.9	125	169.5
3	4.1	44	59.7	85	115.2	126	170.8
4	5.4	45	61.0	86	116.6	127	172.2
5	6.8	46	62.4	87	118.0	128	173.5
6	8.1	47	63.7	88	119.3	129	174.9
7	9.5	48	65.1	89	120.7	130	176.2
8	10.8	49	66.4	90	122.0	131	177.6
9	12.2	50	67.8	91	123.4	132	179.0
10	13.6	51	69.2	92	124.7	133	180.3
11	14.9	52	70.5	93	126.1	134	181.7
12	16.3	53	71.9	94	127.4	135	183.0
13	17.6	54	73.2	95	128.8	136	184.4
14	18.9	55	74.6	96	130.2	137	185.7
15	20.3	56	75.9	97	131.5	138	187.1
16	21.7	57	77.3	98	132.9	139	188.5
17	23.0	58	78.6	99	134.2	140	189.8
18	24.4	59	80.0	100	135.6	141	191.2
19	25.8	60	81.4	101	136.9	142	192.5
20	27.1	61	82.7	102	138.3	143	193.9
21	28.5	62	84.1	103	139.6	144	195.2
22	29.8	63	85.4	104	141.0	145	196.6
23	31.2	64	86.8	105	142.4	146	198.0
24	32.5	65	88.1	106	143.7	147	199.3
25	33.9	66	89.5	107	145.1	148	200.7
26	35.2	67	90.8	108	146.4	149	202.0
27	36.6	68	92.2	109	147.8	150	203.4
28	38.0	69	93.6	110	149.1	151	204.7
29	39.3	70	94.9	111	150.5	152	206.1
30	40.7	71	96.3	112	151.8	153	207.4
31	42.0	72	97.6	113	153.2	154	208.8
32	43.4	73	99.0	114	154.6	155	210.2

ENGLISH TO METRIC CONVERSION: FORCE

Force is presently measured in pounds (lbs.). This type of measurement is used to measure spring pressure, specifically how many pounds it takes to compress a spring. Our present force unit (the pound) will be replaced in SI metric measurements by the Newton (N). This term will eventually see use in specifications for electric motor brush spring pressures, valve spring pressures, etc.

To convert pounds (lbs.) to Newton (N): multiply the number of lbs. by 4.45

lbs	N	lbs	N	lbs	N	oz	N
0.01	0.04	21	93.4	59	262.4	1	0.3
0.02	0.09	22	97.9	60	266.9	2	0.6
0.03	0.13	23	102.3	61	271.3	3	0.8
0.04	0.18	24	106.8	62	275.8	4	1.1
0.05	0.22	25	111.2	63	280.2	5	1.4
0.06	0.27	26	115.6	64	284.6	6	1.7
0.07	0.31	27	120.1	65	289.1	7	2.0
0.08	0.36	28	124.6	66	293.6	8	2.2
0.09	0.40	29	129.0	67	298.0	9	2.5
0.1	0.4	30	133.4	68	302.5	10	2.8
0.2	0.9	31	137.9	69	306.9	11	3.1
0.3	1.3	32	142.3	70	311.4	12	3.3
0.4	1.8	33	146.8	71	315.8	13	3.6
0.5	2.2	34	151.2	72	320.3	14	3.9
0.6	2.7	35	155.7	73	324.7	15	4.2
0.7	3.1	36	160.1	74	329.2	16	4.4
0.8	3.6	37	164.6	75	333.6	17	4.7
0.9	4.0	38	169.0	76	338.1	18	5.0
1	4.4	39	173.5	77	342.5	19	5.3
2	8.9	40	177.9	78	347.0	20	5.6
3	13.4	41	182.4	79	351.4	21	5.8
4	17.8	42	186.8	80	355.9	22	6.1
5	22.2	43	191.3	81	360.3	23	6.4
6	26.7	44	195.7	82	364.8	24	6.7
7	31.1	45	200.2	83	369.2	25	7.0
8	35.6	46	204.6	84	373.6	26	7.2
9	40.0	47	209.1	85	378.1	27	7.5
10	44.5	48	213.5	86	382.6	28	7.8
11	48.9	49	218.0	87	387.0	29	8.1
12	53.4	50	224.4	88	391.4	30	8.3
13	57.8	51	226.9	89	395.9	31	8.6
14	62.3	52	231.3	90	400.3	32	8.9
15	66.7	53	235.8	91	404.8	33	9.2
16	71.2	54	240.2	92	409.2	34	9.4
17	75.6	55	244.6	93	413.7	35	9.7
18	80.1	56	249.1	94	418.1	36	10.0
19	84.5	57	253.6	95	422.6	37	10.3
20	89.0	58	258.0	96	427.0	38	10.6

ENGLISH TO METRIC CONVERSION: LIQUID CAPACITY

Liquid or fluid capacity is presently expressed as pints, quarts or gallons, or a combination of all of these. In the metric system the liter (l) will become the basic unit. Fractions of a liter would be expressed as deciliters, centiliters, or most frequently (and commonly) as milliliters.

To convert pints (pts.) to liters (l): multiply the number of pints by .47
To convert liters (l) to pints (pts.): multiply the number of liters by 2.1
To convert quarts (qts.) to liters (l): multiply the number of quarts by .95

To convert liters (l) to quarts (qts.): multiply the number of liters by 1.06
To convert gallons (gals.) to liters (l): multiply the number of gallons by 3.8
To convert liters (l) to gallons (gals.): multiply the number of liters by .26

gals	liters	qts	liters	pts	liters
0.1	0.38	0.1	0.10	0.1	0.05
0.2	0.76	0.2	0.19	0.2	0.10
0.3	1.1	0.3	0.28	0.3	0.14
0.4	1.5	0.4	0.38	0.4	0.19
0.5	1.9	0.5	0.47	0.5	0.24
0.6	2.3	0.6	0.57	0.6	0.28
0.7	2.6	0.7	0.66	0.7	0.33
0.8	3.0	0.8	0.76	0.8	0.38
0.9	3.4	0.9	0.85	0.9	0.43
1	3.8	1	1.0	1	0.5
2	7.6	2	1.9	2	1.0
3	11.4	3	2.8	3	1.4
4	15.1	4	3.8	4	1.9
5	18.9	5	4.7	5	2.4
6	22.7	6	5.7	6	2.8
7	26.5	7	6.6	7	3.3
8	30.3	8	7.6	8	3.8
9	34.1	9	8.5	9	4.3
10	37.8	10	9.5	10	4.7
11	41.6	11	10.4	11	5.2
12	45.4	12	11.4	12	5.7
13	49.2	13	12.3	13	6.2
14	53.0	14	13.2	14	6.6
15	56.8	15	14.2	15	7.1
16	60.6	16	15.1	16	7.6
17	64.3	17	16.1	17	8.0
18	68.1	18	17.0	18	8.5
19	71.9	19	18.0	19	9.0
20	75.7	20	18.9	20	9.5
21	79.5	21	19.9	21	9.9
22	83.2	22	20.8	22	10.4
23	87.0	23	21.8	23	10.9
24	90.8	24	22.7	24	11.4
25	94.6	25	23.6	25	11.8
26	98.4	26	24.6	26	12.3
27	102.2	27	25.5	27	12.8
28	106.0	28	26.5	28	13.2
29	110.0	29	27.4	29	13.7
30	113.5	30	28.4	30	14.2

ENGLISH TO METRIC CONVERSION: PRESSURE

The basic unit of pressure measurement used today is expressed as pounds per square inch (psi). The metric unit for psi will be the kilopascal (kPa). This will apply to either fluid pressure or air pressure, and will be frequently seen in tire pressure readings, oil pressure specifications, fuel pump pressure, etc.

To convert pounds per square inch (psi) to kilopascals (kPa): multiply the number of psi by 6.89

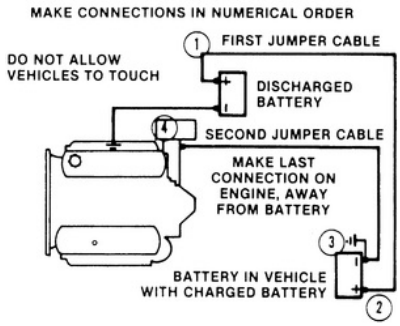
Psi	kPa	Psi	kPa	Psi	kPa	Psi	kPa
0.1	0.7	37	255.1	82	565.4	127	875.6
0.2	1.4	38	262.0	83	572.3	128	882.5
0.3	2.1	39	268.9	84	579.2	129	889.4
0.4	2.8	40	275.8	85	586.0	130	896.3
0.5	3.4	41	282.7	86	592.9	131	903.2
0.6	4.1	42	289.6	87	599.8	132	910.1
0.7	4.8	43	296.5	88	606.7	133	917.0
0.8	5.5	44	303.4	89	613.6	134	923.9
0.9	6.2	45	310.3	90	620.5	135	930.8
1	6.9	46	317.2	91	627.4	136	937.7
2	13.8	47	324.0	92	634.3	137	944.6
3	20.7	48	331.0	93	641.2	138	951.5
4	27.6	49	337.8	94	648.1	139	958.4
5	34.5	50	344.7	95	655.0	140	965.2
6	41.4	51	351.6	96	661.9	141	972.2
7	48.3	52	358.5	97	668.8	142	979.0
8	55.2	53	365.4	98	675.7	143	985.9
9	62.1	54	372.3	99	682.6	144	992.8
10	69.0	55	379.2	100	689.5	145	999.7
11	75.8	56	386.1	101	696.4	146	1006.6
12	82.7	57	393.0	102	703.3	147	1013.5
13	89.6	58	399.9	103	710.2	148	1020.4
14	96.5	59	406.8	104	717.0	149	1027.3
15	103.4	60	413.7	105	723.9	150	1034.2
16	110.3	61	420.6	106	730.8	151	1041.1
17	117.2	62	427.5	107	737.7	152	1048.0
18	124.1	63	434.4	108	744.6	153	1054.9
19	131.0	64	441.3	109	751.5	154	1061.8
20	137.9	65	448.2	110	758.4	155	1068.7
21	144.8	66	455.0	111	765.3	156	1075.6
22	151.7	67	461.9	112	772.2	157	1082.5
23	158.6	68	468.8	113	779.1	158	1089.4
24	165.5	69	475.7	114	786.0	159	1096.3
25	172.4	70	482.6	115	792.9	160	1103.2
26	179.3	71	489.5	116	799.8	161	1110.0
27	186.2	72	496.4	117	806.7	162	1116.9
28	193.0	73	503.3	118	813.6	163	1123.8
29	200.0	74	510.2	119	820.5	164	1130.7
30	206.8	75	517.1	120	827.4	165	1137.6
31	213.7	76	524.0	121	834.3	166	1144.5
32	220.6	77	530.9	122	841.2	167	1151.4
33	227.5	78	537.8	123	848.0	168	1158.3
34	234.4	79	544.7	124	854.9	169	1165.2
35	241.3	80	551.6	125	861.8	170	1172.1
36	248.2	81	558.5	126	868.7	171	1179.0

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Whenever a vehicle is jump started, precautions must be followed in order to prevent the possibility of personal injury. Remember that batteries contain a small amount of explosive hydrogen gas which is a by-product of battery charging. Sparks should always be avoided when working around batteries, especially when attaching jumper cables. To minimize the possibility of accidental sparks, follow the procedure carefully.

Fig. 1: Connect the jumper cables to the batteries and engine in the order shown



CAUTION
NEVER hook the batteries up in a series circuit or the entire electrical system will go up in smoke, including the starter!

Vehicles equipped with a diesel engine may utilize two 12 volt batteries. If so, the batteries are connected in a parallel circuit (positive terminal to positive terminal, negative terminal to negative terminal). Hooking the batteries up in parallel circuit increases battery cranking power without increasing total battery voltage output. Output remains at 12 volts. On the other hand, hooking two 12 volt batteries up in a series circuit (positive terminal to negative terminal, positive terminal to negative terminal) increases total battery output to 24 volts (12 volts plus 12 volts).

- Be sure that both batteries are of the same voltage. Vehicles covered by this manual and most vehicles on the road today utilize a 12 volt charging system.
- Be sure that both batteries are of the same polarity (have the same terminal, in most cases NEGATIVE grounded).
- Be sure that the vehicles are not touching or a short could occur.
- On serviceable batteries, be sure the vent cap holes are not obstructed.
- Do not smoke or allow sparks anywhere near the batteries.
- In cold weather, make sure the battery electrolyte is not frozen. This can occur more readily in a battery that has been in a state of discharge.
- Do not allow electrolyte to contact your skin or clothing.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

1. Make sure that the voltages of the 2 batteries are the same. Most batteries and charging systems are of the 12 volt variety.
2. Pull the jumping vehicle (with the good battery) into a position so the jumper cables can reach the dead battery and that vehicle's engine. Make sure that the vehicles do NOT touch.
3. Place the transmissions of both vehicles in **Neutral** (MT) or **P** (AT), as applicable, then firmly set their parking brakes.

   NOTE: If necessary for safety reasons, the hazard lights on both vehicles may be operated throughout the entire procedure without significantly increasing the difficulty of jumping the dead battery.
4. Turn all lights and accessories OFF on both vehicles. Make sure the ignition switches on both vehicles are turned to the **OFF** position.
5. Cover the battery cell caps with a rag, but do not cover the terminals.
6. Make sure the terminals on both batteries are clean and free of corrosion or proper electrical connection will be impeded. If necessary, clean the battery terminals before proceeding.
7. Identify the positive (+) and negative (-) terminals on both batteries.
8. Connect the first jumper cable to the positive (+) terminal of the dead battery, then connect the other end of that cable to the positive (+) terminal of the booster (good) battery.
9. Connect one end of the other jumper cable to the negative (-) terminal on the booster battery and the final cable clamp to an engine bolt head, alternator bracket or other solid, metallic point on the engine with the dead battery. Try to pick a ground on the engine that is positioned away from the battery in order to minimize the possibility of the 2 clamps touching should one loosen during the procedure. DO NOT connect this clamp to the negative (-) terminal of the bad battery.

   CAUTION
   Be very careful to keep the jumper cables away from moving parts (cooling fan, belts, etc.) on both engines.
10. Check to make sure that the cables are routed away from any moving parts, then start the donor vehicle's engine. Run the engine at moderate speed for several minutes to allow the dead battery a chance to receive some initial charge.
11. With the donor vehicle's engine still running slightly above idle, try to start the vehicle with the dead battery. Crank the engine for no more than 10 seconds at a time and let the starter cool for at least 20 seconds between tries. If the vehicle does not start in 3 tries, it is likely that something else is also wrong or that the battery needs additional time to charge.
12. Once the vehicle is started, allow it to run at idle for a few seconds to make sure that it is operating properly.
13. Turn ON the headlights, heater blower and, if equipped, the rear defroster of both vehicles in order to reduce the severity of voltage spikes and subsequent risk of damage to the vehicles' electrical systems when the cables are disconnected. This step is especially important to any vehicle equipped with computer control modules.
14. Carefully disconnect the cables in the reverse order of connection. Start with the negative cable that is attached to the engine ground, then the negative cable on the donor battery. Disconnect the positive cable from the donor battery and finally, disconnect the positive cable from the formerly dead battery. Be careful when disconnecting the cables from the positive terminals not to allow the alligator clips to touch any metal on either vehicle or a short and sparks will occur.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

If absolutely necessary, you can tow your vehicle with either the front or rear wheels on a dolly. Again, the preferred method would be to have the drive axle on the dolly, so the drive train is not turning. All conditions which apply to the T-hook method also apply for the dolly method.

WARNING
This method CANNOT be used on an AWD vehicle.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

It's necessary to mention the difference between maintenance and repair. Maintenance includes routine inspections, adjustments, and replacement of parts which show signs of normal wear. Maintenance compensates for wear or deterioration. Repair implies that something has broken or is not working. A need for repair is often caused by lack of maintenance. Example: draining and refilling the automatic transmission fluid is maintenance recommended by the manufacturer at specific mileage intervals. Failure to do this can shorten the life of the transmission/transaxle, requiring very expensive repairs. While no maintenance program can prevent items from breaking or wearing out, a general rule can be stated: MAINTENANCE IS CHEAPER THAN REPAIR.

Two basic mechanic's rules should be mentioned here. First, whenever the left side of the vehicle or engine is referred to, it is meant to specify the driver's side. Conversely, the right side of the vehicle means the passenger's side. Second, screws and bolts are removed by turning counterclockwise, and tightened by turning clockwise unless specifically noted.

Safety is always the most important rule. Constantly be aware of the dangers involved in working on an automobile and take the proper precautions. See the information in this section regarding SERVICING YOUR VEHICLE SAFELY and the SAFETY NOTICE on the acknowledgment page.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

For maximum safety to the components of your drive train and chassis, it is most desirable to have your vehicle towed on a flatbed or whole vehicle trailer. The only way to properly place the vehicle on a flatbed is to have it pulled on from the front.

Fig. 1: Towing hooks are provided; they are exposed when the trim cover is removed

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

It is virtually impossible to anticipate all of the hazards involved with automotive maintenance and service, but care and common sense will prevent most accidents.

The rules of safety for mechanics range from "don't smoke around gasoline," to "use the proper tool(s) for the job." The trick to avoiding injuries is to develop safe work habits and to take every possible precaution.

Fig. 1: Screwdrivers should be kept in good condition to prevent injury or damage which could result if the blade slips from the screw

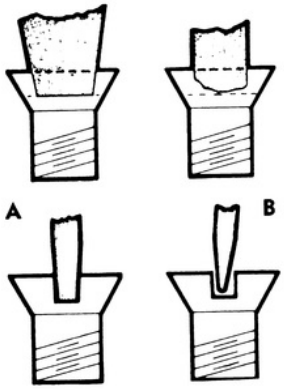


Fig. 2: Power tools should always be properly grounded

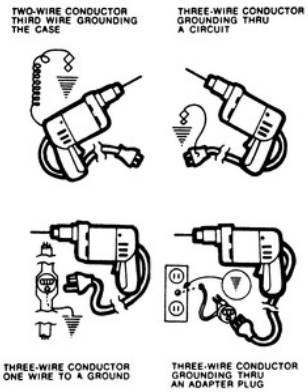


Fig. 3: Using the correct size wrench will help prevent the possibility of rounding off a nut

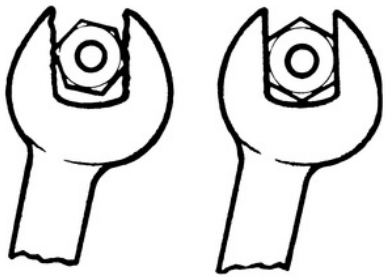
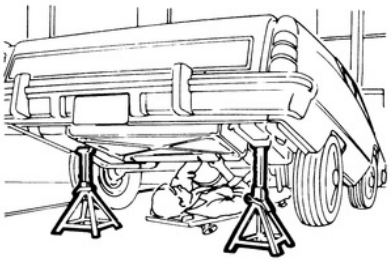


Fig. 4: NEVER work under a vehicle unless it is supported using safety stands (jackstands)



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Normally, the use of special factory tools is avoided for repair procedures, since these are not readily available for the do-it-yourself mechanic. When it is possible to perform the job with more commonly available tools, it will be pointed out, but occasionally, a special tool was designed to perform a specific function and should be used. Before substituting another tool, you should be convinced that neither your safety nor the performance of the vehicle will be compromised.

Special tools can usually be purchased from an automotive parts store or from your dealer. In some cases special tools may be available directly from the tool manufacturer.

1993 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3
Fuel Delivery: FI | Fuel: GAS

Throughout this manual, specifications are given to help you determine the condition of various components on your vehicle, or to assist you in their installation. Some of the most common measurements include length (in. or cm/mm), torque (ft. lbs., inch lbs. or Nm) and pressure (psi, in. Hg, kPa or mm Hg). In most cases, we strive to provide the proper measurement as determined by the manufacturer's engineers.

Though, in some cases, that value may not be conveniently measured with what is available in your toolbox. Luckily, many of the measuring devices which are available today will have two scales so the Standard or Metric measurements may easily be taken. If any of the various measuring tools which are available to you do not contain the same scale as listed in the specifications, use the accompanying conversion factors to determine the proper value.

The conversion factor chart is used by taking the given specification and multiplying it by the necessary conversion factor. For instance, looking at the first line, if you have a measurement in inches such as "free-play should be 2 in." but your ruler reads only in millimeters, multiply 2 in. by the conversion factor of 25.4 to get the metric equivalent of 50.8mm. Likewise, if the specification was given only in a Metric measurement, for example in Newton Meters (Nm), then look at the center column first. If the measurement is 100 Nm, multiply it by the conversion factor of 0.738 to get 73.8 ft. lbs.

Fig. 2: Standard and metric conversion factors chart

CONVERSION FACTORS

LENGTH-DISTANCE					
Inches (in.)	x 25.4	= Millimeters (mm)	x .0394	= Inches
Feet (ft.)	x .305	= Meters (m)	x 3.281	= Feet
Miles	x 1.609	= Kilometers (km)	x .0621	= Miles
VOLUME				
Cubic Inches (in3)	x 16.387	= Cubic Centimeters	x .061	= in3
IMP Pints (IMP pt.)	x .568	= Liters (L)	x 1.76	= IMP pt.
IMP Quarts (IMP qt.)	x 1.137	= Liters (L)	x .88	= IMP qt.
IMP Gallons (IMP gal.)	x 4.546	= Liters (L)	x .22	= IMP gal.
IMP Quarts (IMP qt.)	x 1.201	= US Quarts (US qt.)	x .833	= IMP qt.
IMP Gallons (IMP gal.)	x 1.201	= US Gallons (US gal.)	x .833	= IMP gal.
Fl. Ounces	x 29.573	= Milliliters	x .034	= Ounces
US Pints (US pt.)	x .473	= Liters (L)	x 2.113	= Pints
US Quarts (US qt.)	x .946	= Liters (L)	x 1.057	= Quarts
US Gallons (US gal.)	x 3.785	= Liters (L)	x .264	= Gallons
MASS-WEIGHT				
Ounces (oz.)	x 28.35	= Grams (g)	x .035	= Ounces
Pounds (lb.)	x .454	= Kilograms (kg)	x 2.205	= Pounds
PRESSURE				
Pounds Per Sq. In. (psi)	x 6.895	= Kilopascals (kPa)	x .145	= psi
Inches of Mercury (Hg)	x .4912	= psi	x 2.036	= Hg
Inches of Mercury (Hg)	x 3.377	= Kilopascals (kPa)	x .2961	= Hg
Inches of Water (H2O)	x .07355	= Inches of Mercury	x 13.783	= H2O
Inches of Water (H2O)	x .0361 5	= psi	x 27.684	= H2O
Inches of Water (H2O)	x .248	= Kilopascals (kPa)	x 4.026	= H2O
TORQUE				
Pounds-Force Inches (in-lb)	x .113	= Newton Meters (N-m)	x 8.85	= in-lb
Pounds-Force Feet (ft-lb)	x 1.356	= Newton Meters (N-m)	x .738	= ft-lb
VELOCITY				
Miles Per Hour (MPH)	x 1.609	= Kilometers Per Hour (KPH)	x .621	= MPH
POWER				
Horsepower (Hp)	x .745	= Kilowatts	x 1.34	= Horsepower
FUEL CONSUMPTION*				
Miles Per Gallon IMP (MPG)	x .354	= Kilometers Per Liter (Km/L)		
Kilometers Per Liter (Km/L)	x 2.352	= IMP MPG		
Miles Per Gallon US (MPG)	x .425	= Kilometers Per Liter (Km/L)		
Kilometers Per Liter (Km/L)	x 2.352	= US MPG		

*It is common to convert from miles per gallon (mpg) to liters/100 kilometers (1/100 km), where mpg (IMP) x 1/100 km = 282 and mpg (US) x 1/100 km = 235.

TEMPERATURE		
Degree Fahrenheit (°F)	= (°C x 1.8) + 32	
Degree Celsius (°C)	= (°F - 32) x .56	

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Naturally, without the proper tools and equipment it is impossible to properly service your vehicle. It would also be virtually impossible to catalog every tool that you would need to perform all of the operations in this book. Of course, It would be unwise for the amateur to rush out and buy an expensive set of tools on the theory that he/she may need one or more of them at some time.

The best approach is to proceed slowly, gathering a good quality set of those tools that are used most frequently. Don't be misled by the low cost of bargain tools. It is far better to spend a little more for better quality. Forged wrenches, 6 or 12-point sockets and fine tooth ratchets are by far preferable to their less expensive counterparts. As any good mechanic can tell you, there are few worse experiences than trying to work on a vehicle with bad tools. Your monetary savings will be far outweighed by frustration and mangled knuckles.

Begin accumulating those tools that are used most frequently: those associated with routine maintenance and tune-up. In addition to the normal assortment of screwdrivers and pliers, you should have the following tools:

- Wrenches/sockets and combination open end/box end wrenches in sizes 3mm–19mm $^{13}/_{16}$ in. or $^{5}/_{8}$ in. spark plug socket (depending on plug type).

NOTE: If possible, buy various length socket drive extensions. Universal-joint and wobble extensions can be extremely useful, but be careful when using them, as they can change the amount of torque applied to the socket.

- Jackstands for support.
- Oil filter wrench.
- Spout or funnel for pouring fluids.
- Grease gun for chassis lubrication (unless your vehicle is not equipped with any grease fittings — for details, please refer to information on Fluids and Lubricants, later in this section).
- Hydrometer for checking the battery (unless equipped with a sealed, maintenance-free battery).
- A container for draining oil and other fluids.
- Rags for wiping up the inevitable mess.

Fig. 1: All but the most basic procedures will require an assortment of ratchets and sockets

Fig. 2: In addition to ratchets, a good set of wrenches and hex keys will be necessary

Fig. 3: A hydraulic floor jack and a set of jackstands are essential for lifting and supporting the vehicle

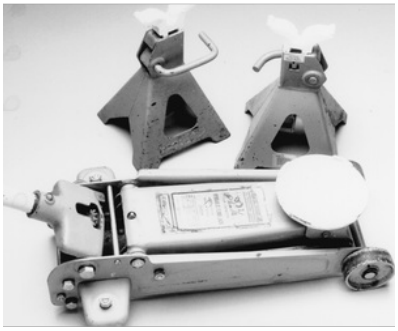
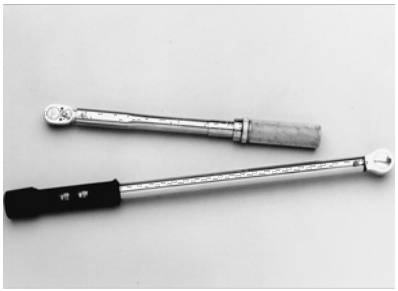


Fig. 4: An assortment of pliers, grippers and cutters will be handy for old rusted parts and stripped bolt heads

Fig. 5: Various drivers, chisels and prybars are great tools to have in your toolbox

Fig. 6: Many repairs will require the use of a torque wrench to assure the components are properly fastened



In addition to the above items there are several others that are not absolutely necessary, but handy to have around. These include Oil Dry((or an equivalent oil absorbent gravel — such as cat litter) and the usual supply of lubricants, antifreeze and fluids, although these can be purchased as needed. This is a basic list for routine maintenance, but only your personal needs and desire can accurately determine your list of tools.

After performing a few projects on the vehicle, you'll be amazed at the other tools and non-tools on your workbench. Some useful household items are: a large turkey baster or siphon, empty coffee cans and ice trays (to store parts), ball of twine, electrical tape for wiring, small rolls of colored tape for tagging lines or hoses, markers and pens, a note pad, golf tees (for plugging vacuum lines), metal coat hangers or a roll of mechanic's wire (to hold things out of the way), dental pick or similar long, pointed probe, a strong magnet, and a small mirror (to see into recesses and under manifolds).

Fig. 7: Although not always necessary, using specialized brake tools will save time

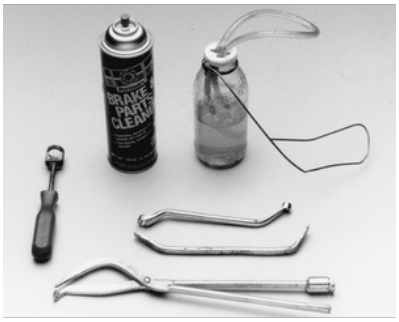


Fig. 8: A few inexpensive lubrication tools will make maintenance easier

Fig. 9: Various pullers, clamps and separator tools are needed for many larger, more complicated repairs

Fig. 10: A variety of tools and gauges should be used for spark plug gapping and installation

Fig. 11: Inductive type timing light

Fig. 12: A screw-in type compression gauge is recommended for compression testing

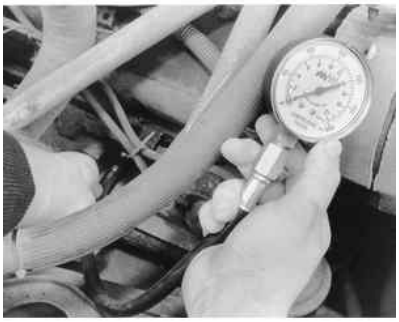


Fig. 13: A vacuum/pressure tester is necessary for many testing procedures

Fig. 14: Most modern automotive multimeters incorporate many helpful features

A more advanced set of tools, suitable for tune-up work, can be drawn up easily. While the tools are slightly more sophisticated, they need not be outrageously expensive. There are several inexpensive tach/dwell meters on the market that are every bit as good for the average mechanic as a professional model. Just be sure that it goes to a least 1200–1500 rpm on the tach scale and that it works on 4, 6 and 8-cylinder engines. The key to these purchases is to make them with an eye towards adaptability and wide range. A basic list of tune-up tools could include:

- Tach/dwell meter
- Spark plug wrench and gapping tool

- Feeler gauges for valve adjustment
- Timing light

The choice of a timing light should be made carefully. A light which works on the DC current supplied by the vehicle's battery is the best choice; it should have a xenon tube for brightness. On any vehicle with an electronic ignition system, a timing light with an inductive pickup that clamps around the No. 1 spark plug cable is preferred.

In addition to these basic tools, there are several other tools and gauges you may find useful. These include:

- Compression gauge. The screw-in type is slower to use, but eliminates the possibility of a faulty reading due to escaping pressure.
- Manifold vacuum gauge
- 12V test light
- Combination volt/ohmmeter
- Induction Ammeter. This is used for determining whether or not there is current in a wire. These are handy for use if a wire is broken somewhere in a wiring harness.

As a final note, you will probably find a torque wrench necessary for all but the most basic work. The beam type models are perfectly adequate, although the newer click types (breakaway) are easier to use. The click type torque wrenches tend to be more expensive. Also keep in mind that all types of torque wrenches should be periodically checked and/or recalibrated. You will have to decide for yourself which better fits your pocketbook, and purpose.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

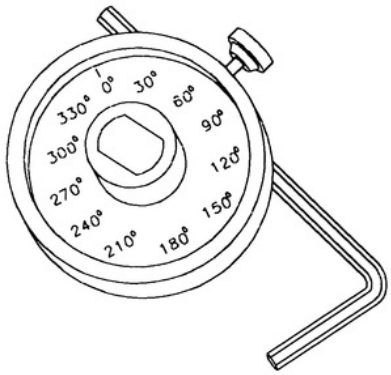
Torque is defined as the measurement of resistance to turning or rotating. It tends to twist a body about an axis of rotation. A common example of this would be tightening a threaded retainer such as a nut, bolt or screw. Measuring torque is one of the most common ways to help assure that a threaded retainer has been properly fastened.

When tightening a threaded fastener, torque is applied in three distinct areas, the head, the bearing surface and the clamp load. About 50 percent of the measured torque is used in overcoming bearing friction. This is the friction between the bearing surface of the bolt head, screw head or nut face and the base material or washer (the surface on which the fastener is rotating). Approximately 40 percent of the applied torque is used in overcoming thread friction. This leaves only about 10 percent of the applied torque to develop a useful clamp load (the force which holds a joint together). This means that friction can account for as much as 90 percent of the applied torque on a fastener.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Fig. 1: Some specifications require the use of a torque angle meter (mechanical protractor)



Because the frictional characteristics of each fastener or threaded hole will vary, clamp loads which are based strictly on torque will vary as well. In most applications, this variance is not significant enough to cause worry. But, in certain applications, a manufacturer's engineers may determine that more precise clamp loads are necessary (such is the case with many aluminum cylinder heads). In these cases, a torque angle method of installation would be specified. When installing fasteners which are torque angle tightened, a predetermined seating torque and standard torque wrench are usually used first to remove any compliance from the joint. The fastener is then tightened the specified additional portion of a turn measured in degrees. A torque angle gauge (mechanical protractor) is used for these applications.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Fig. 1: Various styles of torque wrenches are usually available at your local automotive supply store

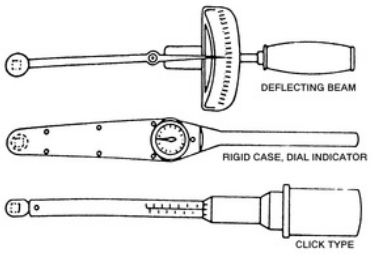


Fig. 2: Determining bolt strength of metric fasteners — NOTE: this is a typical bolt marking system, but there is not a worldwide standard

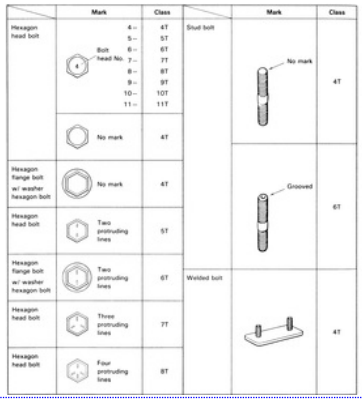
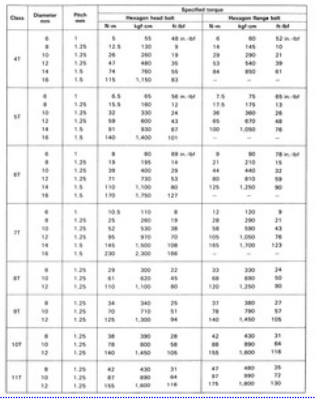


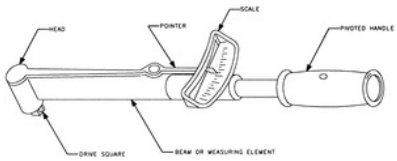
Fig. 3: Typical bolt torque for metric fasteners — WARNING: use only as a guide



In most applications, a torque wrench can be used to assure proper installation of a fastener. Torque wrenches come in various designs and most automotive supply stores will carry a variety to suit your needs. A torque wrench should be used any time we supply a specific torque value for a fastener. A torque wrench can also be used if you are following the general guidelines in the accompanying charts. Keep in mind that because there is no worldwide standardization of fasteners, the charts are a general guideline and should be used with caution. Again, the general rule of "if you are using the right tool for the job, you should not have to strain to tighten a fastener" applies here.

Beam Type

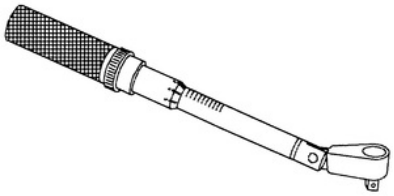
Fig. 4: Example of a beam type torque wrench



The beam type torque wrench is one of the most popular types. It consists of a pointer attached to the head that runs the length of the flexible beam (shaft) to a scale located near the handle. As the wrench is pulled, the beam bends and the pointer indicates the torque using the scale.

Click (Breakaway) Type

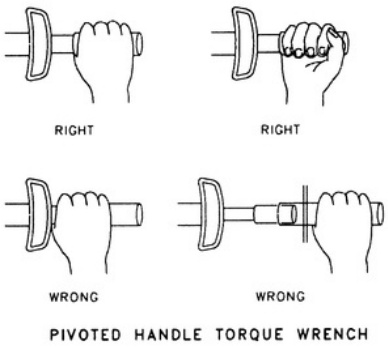
Fig. 5: A click type or breakaway torque wrench — note that this one has a pivoting head



Another popular design of torque wrench is the click type. To use the click type wrench you pre-adjust it to a torque setting. Once the torque is reached, the wrench has a reflex signaling feature that causes a momentary breakaway of the torque wrench body, sending an impulse to the operator's hand.

Pivot Head Type

Fig. 6: Torque wrenches with pivoting heads must be grasped and used properly to prevent an incorrect reading

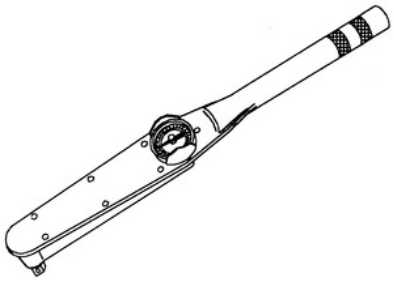


Some torque wrenches (usually of the click type) may be equipped with a pivot head which can allow it to be used in areas of limited access. BUT, it must be used properly. To hold a pivot head wrench, grasp the handle lightly, and as you pull on the handle, it should be floated on the pivot point. If the handle comes in contact with the yoke extension during the process of pulling, there is a very good chance the torque readings will be inaccurate because this could alter the wrench loading point. The design of the handle is usually such as to make it inconvenient to deliberately misuse the wrench.

NOTE: It should be mentioned that the use of any U-joint, wobble or extension will have an effect on the torque readings, no matter what type of wrench you are using. For the most accurate readings, install the socket directly on the wrench driver. If necessary, straight extensions (which hold a socket directly under the wrench driver) will have the least effect on the torque reading. Avoid any extension that alters the length of the wrench from the handle to the head/driving point (such as a crow's foot). U-joint or wobble extensions can greatly affect the readings; avoid their use at all times.

Rigid Case (Direct Reading)

Fig. 7: The rigid case (direct reading) torque wrench uses a dial indicator to show torque



A rigid case or direct reading torque wrench is equipped with a dial indicator to show torque values. One advantage of these wrenches is that they can be held at any position on the wrench without affecting accuracy. These wrenches are often preferred because they tend to be compact, easy to read and have a great degree of accuracy.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The weight of the trailer is the most important factor. A good weight-to-horsepower ratio is about 35:1, 35 lbs. of Gross Combined Weight (GCW) for every horsepower your engine develops. Multiply the engine's rated horsepower by 35 and subtract the weight of the vehicle passengers and luggage. The number remaining is the approximate ideal maximum weight you should tow, although a numerically higher axle ratio can help compensate for heavier weight.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The transfer case or bevel gear as Volvo refers to it, has a stamped steel tag attached on the side.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

An automatic transmission/transaxle is usually recommended for trailer towing. Modern automatics have proven reliable and, of course, easy to operate, in trailer towing. The increased load of a trailer, however, causes an increase in the temperature of the automatic transmission fluid. Heat is the worst enemy of an automatic transmission. As the temperature of the fluid increases, the life of the fluid decreases.

It is essential, therefore, that you install an automatic transmission cooler. The cooler, which consists of a multi-tube, finned heat exchanger, is usually installed in front of the radiator or air conditioning compressor, and hooked in-line with the transmission cooler tank inlet line. Follow the cooler manufacturer's installation instructions.

Select a cooler of at least adequate capacity, based upon the combined gross weights of the vehicle and trailer.

Cooler manufacturers recommend that you use an aftermarket cooler in addition to, and not instead of, the present cooling tank in your radiator. If you do want to use it in place of the radiator cooling tank, get a cooler at least two sizes larger than normally necessary.

NOTE: A transmission cooler can, sometimes, cause slow or harsh shifting in the transmission during cold weather, until the fluid has a chance to come up to normal operating temperature. Some coolers can be purchased with or retrofitted with a temperature bypass valve which will allow fluid flow through the cooler only when the fluid has reached above a certain operating temperature.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The transmission type designation, serial number and part number appear on a metal plate affix to the left-hand side of the transmission, just above the transmission pan on automatic transmissions/transaxles.

The manual transmission can be identified by referring to the Service Designation Number plate, found on the upper right side radiator support. A 10-digit Vehicle Identification Code (VIC), located in the upper right-hand corner of the Service Designation Number plate, contains information on the type of transmission used. The 9th digit of the VIC designates the transmission type.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The Vehicle Identification Number (VIN) is an identification code comprised of a seventeen-digit combination of numbers and letters. Each letter, number or combination represents different items, such as manufacturer, type of restraint system, line, series and body type, engine, model year and consecutive unit number.

The VIN plate is located at the top left corner of the dashboard, just under the bottom of the windshield. The VIN number is also stamped on the right door pillar, on the certification label located on the driver's door, and on the emission control label located on the underside of the hood. On some models, there is a vehicle plate on the passenger side shock tower or the driver's side fender in the engine compartment that includes the VIN number, engine type, emission equipment, vehicle weights, and color codes.

Fig. 1: The VIN plate as located on the dash panel

Fig. 2: This plate, located on the driver's side fender in the engine compartment, also contains the VIN number

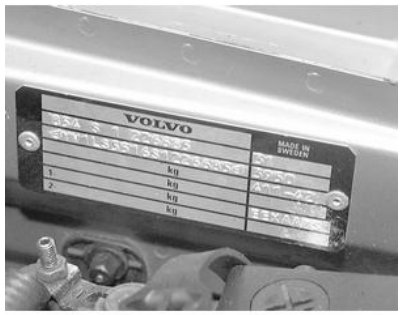


Fig. 3: The certification label located on the driver's door also contains the VIN number

VEHICLE IDENTIFICATION CHART

Engine Code

Engine Series (ID/VIN)	Engine Displacement Liters (cc)	Cubic Inches	No. of Cylinders	Fuel System	Eng. Mfg.
B23AT3/53	2.3 (2316)	144	5	EFI	VOLVO
B25AS/55	2.4 (2435)	151	5	EFI	VOLVO
B25AT/56	2.4 (2435)	151	5	EFI	VOLVO
B23AT/57	2.3 (2316)	144	5	EFI	VOLVO
B25AT/58	2.3 (2316)	144	5	EFI	VOLVO
B280F/69	2.8 (2849)	175	6	EFI	VOLVO
B230FT/87	2.3 (2316)	144	4	EFI	VOLVO
B234F/89	2.3 (2316)	144	4	EFI	VOLVO
B230F/88	2.3 (2316)	144	4	EFI	VOLVO
B6304F/95	2.9 (2922)	181	6	EFI	VOLVO
B6304S/96	2.9 (2922)	181	6	EFI	VOLVO

Model Year

Code	Year
L	1990
M	1991
N	1992
P	1993
R	1994
S	1995
T	1996
U	1997
V	1998

EFI = Electronic Fuel Injection

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Before removing any bolts, read through the entire procedure. This will give you the overall view of what tools and supplies will be required. There is nothing more frustrating than having to walk to the bus stop on Monday morning because you were short one bolt on Sunday afternoon. So read ahead and plan ahead. Each operation should be approached logically and all procedures thoroughly understood before attempting any work.

All sections contain adjustments, maintenance, removal and installation procedures, and in some cases, repair or overhaul procedures. When repair is not considered practical, we tell you how to remove the part and then how to install the new or rebuilt replacement. In this way, you at least save labor costs. "Backyard" repair of some components is just not practical.