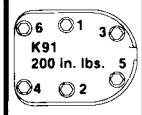
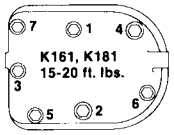
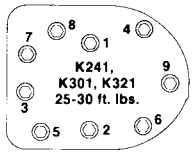
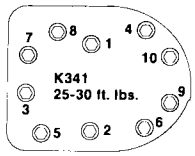
HORSEPOWER (Maximum RPM) / Engine Model			4 / K91	7 / K161*	8 / K181	10 / K241	12 / K301	14 / K321	16 / K341
GENERAL	Bore x Stroke		2.375x2.000	2.938x2.500	2.938x2.750	3.251x2.875	3.375x3.250	3.500x3.250	3.750x3.250
	Displacement Cu. In.		8.86	16.94	18.64	23.85	29.07	31.27	35.90
	Max. Operating RPM		4000	3600	3600	3600	3600	3600	3600
BALANCE GEAR	Shaft O.D.	New	—	—	—	.4998/.5001	.4998/.5001	.4998/.5001	.4998/.5001
		Maximum Wear Limit	—	—	—	.4996	.4996	.4996	.4996
	End Play		—	—	—	.002/.010	.002/.010	.002/.010	.002/.010
CAMSHAFT	Sleeve I.D. Installed		—	—	—	—	—	—	—
	End Play		.005/.020	.005/.010	.005/.010	.005/.010	.005/.010	.005/.010	.005/.010
CONNECTING ROD	Running Clearance	Rod To Crank-Pin (New)	.001/.0025	.001/.002	.001/.002	.001/.002	.001/.002	.001/.002	.001/.002
		Rod To Crank-Pin Wear Limit	.003	.0025	.0025	.0025	.0025	.0025	.0025
		Rod To Piston Pin (New)	.0007/.0008	.0006/.0011	.0006/.0011	.0003/.0008	.0003/.0008	.0003/.0008	.0003/.0008
	Small End I.D. (New)		.5630/.5633	.6255/.6258	.6255/.6258	.8596/.8599	.8757/.8760	.8757/.8760	.8757/.8760
CRANKSHAFT	MAINS PTO & Flywheel End O.D.	New	.9841/.9844	1.1811/1.1814	1.1811/1.1814	1.5745/1.5749	1.5745/1.5749	1.5745/1.5749	1.5745/1.5749
		Maximum Wear Limit	.9841	1.1811	1.1811	1.5745	1.5745	1.5745	1.5745
	MAINS Max. Out of Round (Sleeve)		—	—	—	—	—	—	—
	MAINS Max. Taper (Sleeve)		—	—	—	—	—	—	—
	MAINS Running Clearance (Sleeve)	Maximum New	—	—	—	—	—	—	—
		Wear Limit ①	—	—	—	—	—	—	—
	MAINS New Sleeve Bearing I.D. Installed		—	—	—	—	—	—	—
	CRANKPIN New		.9360/.9355	1.1860/1.1855	1.1860/1.1855	1.5000/1.4995	1.5000/1.4995	1.5000/1.4995	1.5000/1.4995
	CRANKPIN Max. Wear Limit		.9350	1.1850	1.1850	1.4990	1.4990	1.4990	1.4990
	CRANKPIN Max. Out of Round		.0005	.0005	.0005	.0005	.0005	.0005	.0005
	CRANKPIN Max. Taper		.001	.001	.001	.001	.001	.001	.001
	End Play		.004/.023	.002/.023	.002/.023	.003/.020	.003/.020	.003/.020	.003/.020
CYLINDER BORE	Inside Diameter	New	2.3755/2.3745	2.9380/2.9370	2.9380/2.9370	3.2515/3.2505	3.3755/3.3745	3.5005/3.4995	3.7505/3.7495
		Maximum Wear Limit	2.378	2.941	2.941	3.254	3.378	3.503	3.753
	Max. Out of Round		.003	.003	.003	.003	.003	.003	.003
	Max. Taper		.003	.003	.003	.002	.002	.002	.002
CYLINDER HD.	Max. Out of Flatness		.003	.003	.003	.003	.003	.003	.003
IGNITION	Spark Plug Type & Gap	Type⑥	RCJ-8	RCJ-8	RCJ-8	RH-10	RH-10	RH-10	RH-10
		Battery	.025	.025	.025	.035	.035	.035	.035
		Magneto	.025	.025	.025	.025	.025	.025	.025
		Gaseous Fuels	.018	.018	.018	.018	.018	.018	.018
	Nominal Point Gap		.020	.020	.020	.020	.020	.020	.020
PISTON ⑦	Service Replacement Sizes		.003 — .010 — .020 — .030						
	Thrust Face O.D.⑦	New	2.371/2.369	2.9297/2.9281	2.9297/2.9281	3.2432/3.2413	3.368/3.365	3.4941/3.4925	3.7425/3.7410⑨
		Maximum Wear Limit	2.366	2.925	2.925	3.238	3.363	3.491	3.738⑨
	Thrust Face To Bore Clearance (New)①⑦		.0035/.006	.007/.010	.007/.010	.007/.010	.007/.010	.007/.010	.007/.010⑨
	Ring End Gap	New Bore	.007/.017	.007/.017	.007/.017	.010/.020	.010/.020	.010/.020	.010/.020
		Used Bore (Max.)	.027	.027	.027	.030	.030	.030	.030
	Max. Ring Side Clearance		.006	.006	.006	.006	.006	.006	.006
PISTON ⑨	Service Replacement Sizes		.003 — .010 — .020 — .030						
	Thrust Face O.D.⑨	New	—	—	2.9329/2.9336	—	3.3700/3.3693	3.4945/3.4938	3.7465/3.7455
		Maximum Wear Limit	—	—	2.931	—	3.367	3.492	3.744
	Thrust Face To Bore Clearance (New)①⑨		—	—	.0034/.0051	—	.0045/.0062	.0050/.0067	.0030/.0050
	Ring End Gap	New Bore⑩	—	—	.010/.023	—	.010/.020	.010/.020	.010/.020
		Used Bore⑩ (Max.)	—	—	.032	—	.030	.030	.030
	Max. Ring Side Clearance		—	—	.006	—	.006	.006	.006
PISTON PIN	Outside Diameter		.5623/.5625	.6247/.6249	.6247/.6249	.8591/.8593	.8752/.8754	.8752/.8754	.8752/.8754
VALVES	Guide Reamer Size		.250	.3125	.3125	.3125	.3125	.3125	.3125
	Tappet Clearance (Cold)	Intake	.005/.009	.006/.008	.006/.008	.008/.010	.008/.010	.008/.010	.008/.010⑧
		Exhaust	.011/.015	.017/.019	.017/.019	.017/.019	.017/.019	.017/.019	.017/.019
	Minimum Lift (Zero Lash)	Intake	.2035	.2718	.2718	.318	.318	.318	.318
		Exhaust	.1768	.2482	.2482	.318	.318	.318	.318
	Minimum Valve Stem O.D.	Intake	.2478	.3103	.3103	.3103	.3103	.3103	.3103
		Exhaust	.2458	.3088	.3088	.3074	.3074	.3074	.3074
	Nominal Angle Valve Seat		45°	45°	45°	45°	45°	45°	45°
	Guide I.D. Maximum Wear Limit①	Intake	.005	.005	.005	.006	.006	.006	.006
		Exhaust	.007	.007	.007	.008	.008	.008	.008

① Maximum limits combination of I.D. and O.D. measurements
② Ball bearing 1.3779/1.3784, Maximum Wear 1.3779
③ Ball bearing 1.7716/1.7721, Maximum Wear 1.7716
④ Pre Series II 1.3733/1.3738, Maximum Wear 1.3728
⑤ Ball bearing .002/.023
⑥ Champion spark plugs or equivalent
⑦ Measure just below oil ring groove and at right angles to piston pin
⑧ 1800 RPM generator sets .005/.007
⑨ Measure ½" above the bottom of the piston skirt.
⑩ Top and center compression rings.

* Includes K141

Figure 1-5. Engine Specifications And Tolerances.

HORSEPOWER (Max. RPM) Engine Model		4 K91	7 * K161	8 K181	10 K241	12 K301	14 K321	16 K341
CONNECTING RODS①	Posi-lock②	—	—	New 140 in. lbs. Used 100 in. lbs.	New 260 in. lbs. Used 200 in. lbs.			
	Capscrew③	140 in. lbs.	200 in. lbs.		285 in. lbs.			
SPARK PLUGS		18-22 ft. lbs.	18-22 ft. lbs.		18-22 ft. lbs.			
CYLINDER HEAD①								
FLYWHEEL RETAINING	NUT	40-50 ft. lbs.	85-90 ft. lbs.⑥		50-60 ft. lbs.			
	SCREW	250 in. lbs.	—		22-27 ft. lbs.			
GOVERNOR BUSHING		70-90 in. lbs.	130-150 in. lbs.		100-120 in. lbs.			
GRASS SCREEN	Metal	—	70-140 in. lbs.		70-140 in. lbs.			
	Plastic	—	—		20-30 in. lbs.			
OIL PAN	Aluminum	—	—		—			
	Cast Iron	250 in. lbs.	Grade 5–250 in. lbs. Grade 8–350 in. lbs.		35 ft. lbs.			
	Sheet Metal④	—	—		200 in. lbs.			
MANIFOLD SCREW/NUT		—	—		—			
CAMSHAFT NUT		—	—		—			
NON METALLIC FUEL PUMP MOUNTING SCREWS		—	37-45 in. lbs.		37-45 in. lbs.			

USE STANDARD TORQUE SETTINGS WHEN SPECIFIC VALUES ARE NOT SPECIFIED.

Cast Iron or Steel

Size	Grade 2	Grade 5*	Grade 8
8-32	20 in. lb.	25 in. lb.	
10-24	32 in. lb.	40 in. lb.	
10-32	32 in. lb.	40 in. lb.	
1/4-20	70 in. lb.	115 in. lb.	165 in. lb.
1/4-28	85 in. lb.	140 in. lb.	200 in. lb.
5/16-18	150 in. lb.	250 in. lb.	350 in. lb.
5/16-24	165 in. lb.	270 in. lb.	30 ft. lb.
3/8-16	260 in. lb.	35 ft. lb.	50 ft. lb.
3/8-24	300 in. lb.	40 ft. lb.	60 ft. lb.
7/16-14	35 ft. lb.	55 ft. lb.	80 ft. lb.
7/16-20	45 ft. lb.	75 ft. lb.	105 ft. lb.
1/2-13	50 ft. lb.	80 ft. lb.	115 ft. lb.
1/2-20	70 ft. lb.	105 ft. lb.	165 ft. lb.
9/16-12	75 ft. lb.	125 ft. lb.	175 ft. lb.
9/16-18	100 ft. lb.	165 ft. lb.	230 ft. lb.
5/8-11	110 ft. lb.	180 ft. lb.	260 ft. lb.
5/8-18	140 ft. lb.	230 ft. lb.	330 ft. lb.
3/4-10	150 ft. lb.	245 ft. lb.	350 ft. lb.
3/4-16	200 ft. lb.	325 ft. lb.	470 ft. lb.

Aluminum

8-32	20 in. lb.	20 in. lb.	20 in. lb.
10-24	32 in. lb.	32 in. lb.	32 in. lb.
1/4-20	70 in. lb.	70 in. lb.	70 in. lb.
5/16-18	150 in. lb.	150 in. lb.	150 in. lb.

*Also Self Tapping Screws

Conversions
in. lbs. x .083 = ft. lbs.
ft. lbs. x 12 = in. lbs.
ft. lbs. x .1383 = kgm
ft. lbs. x 1.3558 = N m

OIL DRAIN PLUGS (Oil at Assembly)

Size	Tightening Torque Cast Iron Pans	Aluminum Pans
1/4"	150 in. lb.	100 in. lb.
3/8"	180 in. lb.	120 in. lb.
1/2"	20 ft. lbs.	13 ft. lbs.
3/4"	25 ft. lbs.	16 ft. lbs.
X-708-1⑤	20-25 ft. lbs.	20-25 ft. lbs.

① Lubricate with engine oil
② DO NOT overtorque — loosen — and retorque the hex nuts on Posi-Lock connecting rods.
NEW — Component directly from stock.
USED — Component that was in a running engine.
③ Overtorque 20%, loosen below torque value and retorque to final torque value
④ Torque twice with minimum of one minute interval
⑤ 3/8-16 thread with hex head nut and fibre gasket
⑥ Prior to Ser. #23209832 45-55 ft. lbs.

* Includes K141

Figure 1-6. Torque Values & Sequences For Fasteners.