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## Clearances, Lengths, and Specifications

Technical Notes by: Adam Culpepper  
August 2002

	302	351 Windsor	351 Cleveland	429/460
Bore	4.0004 - 4.0048	4.0000 - 4.0048	4.0000 - 4.0048	4.360 - 4.364
Stroke	3.00	3.500	3.500	3.59 / 3.85
Firing Order	15426378	13726548	13726548	15426378
Deck Height	8.2	9,503 / 9,480 (1969)	9.206	10.300 / 10.322
Main Journal	2.2482 - 2.249	2.9994 - 3.0002	2.7485 - 2.7493	2.9994 - 3.0002
Rod Journal	2.1228 - 2.1236	2.3103 - 2.3111	2.3102 - 2.3111	2.4995 - 2.5004
Rod Length	5.090	5.956	5.78	6.6050
Main Oil Clearance	.0005 - .0024	.0008 - .0028	.0009 - .0028	.0009 - .0027
** Note: #1 Main on 460 is .0004-.0022. Common practice also includes tighter clearance on #1 Main on a 302 -- typically .0003-.0018. **				
Rod Oil Clearance	.0008 - .0026	.0008 - .0026	.0008 - .0026	.0008 - .0026
Rod Endplay	.010 - .020	.010 - .020	.010 - .020	.010 - .020
Crank Thrust	.004 - .008	.004 - .008	.004 - .010	.004 - .008
Cam Endplay	.001 - .007	.001 - .007	.001 - .007	.001 - .009
Piston Height	1.608	1.774	1.668	1.890 / 1.756
Piston Pin	.912	.912	.912	1.0402
Ring Gap - TOP Ring	.010 - .020	.010 - .020	.010 - .020	.010 - .020
Ring Gap - 2nd Ring	.018 - .028	.010 - .025	.010 - .028	.010 - .025
Ring Gap - Oil Ring	.010 - .040	.010 - .055	.010 - .055	.010 - .055
Ring Side Clearance	.002 - .004	.002 - .004	.002 - .004	.002 - .004
** Note: Oil Ring fit is considered "Snug" **				
Piston Side Clearance	.0018 - .0026+	.0018 - .0026	.0014 - .0022	.0014 - .0022
** Note: All 302 HO engines produced after 1988 are .0030 to .0038 **				

### Notes

These clearances are for stock engines and are the clearances considered acceptable by Ford for production use. Obviously, some of these may be impractical for use in a high performance engine. Most street/strip engines maintain "loose" clearances. In a race-only engine, the clearances can be in excess of .003 on the mains and the rods.

The ring gaps, in particular, are for production engines or rebuilds. If the box of rings you have purchased doesn't have a Ford Motor Company part number on it, do not attempt to use these gap measurements. unless, of course, you are absolutely sure that these gaps are appropriate. Call the manufacturer of the rings if you are unsure. They will gladly help you, free of charge.

### Torque Specifications

302	
Main Caps	60-70 lbs
Rod Bolts	24 lbs
Head Bolts **	First Step: 55-65 lbs Second: 65-72lbs

Intake Bolts - Carbed	do not exceed 24 lbs.
Upper Intake - EFI	12-18 lbs
Lower Intake - EFI	do not exceed 24 lbs.
Exhaust Bolts	18-24 lbs.
Balancer Bolt	70 - 90 lbs
Flywheel Bolts	75 - 85 lbs
Oil Pump Mount Bolts	22 - 32 lbs
Oil Pump Pickup Bolts	10 - 18 lbs
Rocker Fulcrum Bolts	20 - 23 lbs
Valve Cover Bolts	10 -14 lbs
Oil Pan Bolts (Large)	First Step: 10-13 lbs Second: 15-18 lbs
Oil Pan Bolts (Small)	First Step: 7-9 lbs Second: 10-13 lbs
Oil Filter Insert	25 lbs
Cam Gear Bolt	40 - 45 lbs
Cam Thrust Plate Bolts	9 - 12 lbs
Timing Cover Bolts	12 - 18 lbs
** Does NOT include Torque-to-Yield Bolts	

<b>351 Windsor</b>	
Use 302 specifications for those not listed.	
Main Caps	95 - 105 lbs
Rod Bolts	40 - 45 lbs
Head Bolts	100 - 110 lbs

**Notes**

These specifications are for stock bolts with 10w30 motor oil for lubrication. Moly lubes and aftermarket bolts or studs sometimes require different torque specs. Refer to the manufacturers recommendations in these instances. All lubes and fasteners are different. Torque-to-Yield bolts are not to be fastened more than twice. Common practice involves discarding these bolts for high performance applications. Use ARP or equivalent fasteners.

**ARP 190,000 PSI Tensile Strength Fastener Optimal Preload**

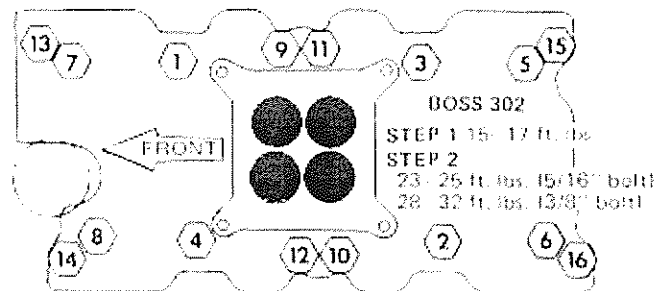
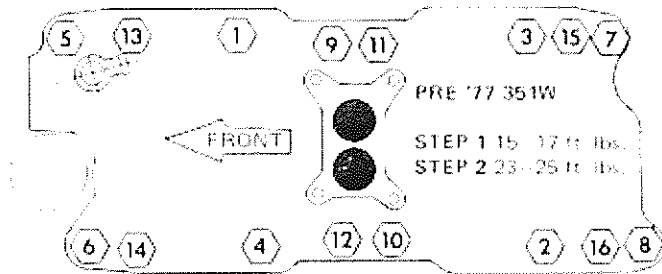
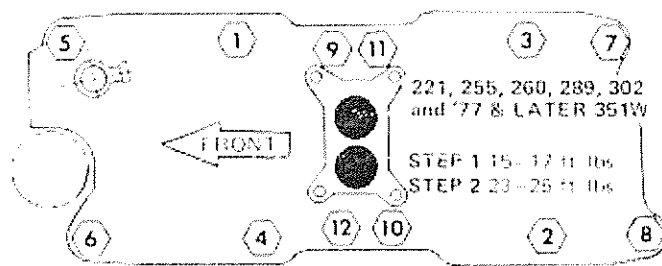
Fastner	Torque with Oil	Moly Lube
1/4" Stud	15	10
1/4" x 20	15	10
1/4" x 28	20	15
5/16" Stud	30	20
5/16" x 20	30	20
5/16" x 24	35	25
3/8" Stud	60	40
3/8" x 16	55	35
3/8" x 24	60	40
7/16" Stud	85	70
7/16" x 14	90	75
7/16" x 20	95	75
1/2" Stud	130	90
1/2" x 13	140	95
1/2" x 20	150	95
9/16" Stud	180	115
9/16" x 12	195	130
9/16" x 18	208	130
5/8" x 11	270	175
5/8" x 18	300	190
10mm Stud	60	40
11mm Stud	90	75
12mm Stud	120	80

### Notes

These are specs for general purpose applications, such as suspension or chassis fastening. These do not necessarily apply to internal engine components. Always use manufacturers recommendations or Ford Service Manuals when torquing engine fasteners.

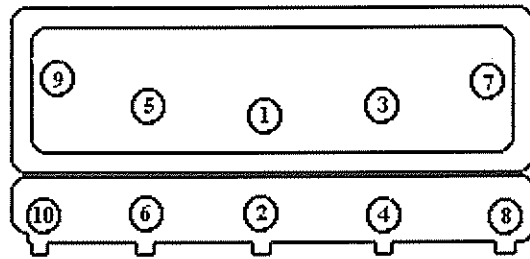
### Intake Manifold and Head Bolt Bolt Torque Pattern

#### Intake Manifold Torque Sequences



#### Cylinder Head Torque Sequence

### Intake Manifold



## Exhaust Manifold

### Notes

Follow this order for both the first and the second stages of torquing. Intake manifold bolts and cylinder head bolts/studs should be retorqued after the engine is broken in.



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