GENERAL SPECIFICATIONS

ENGINE	302-4V	351-4V
Bore and Stroke (in.)	4.00 x 3.00	4.00 x 3.50
Gross Horsepower	215 @ 4400 RPM	235 @ 4200 RPM
Gross Torque (lbs.-ft.)	277 @ 3400 RPM	330 @ 3200 RPM
Fuel Requirements 1	Regular	Regular
Electrical System	12 V Negative Ground	12 V Negative Ground
Max. Intermittent Operating Speed	5000 RPM	4600 RPM

ENGINE SERVICE AND TUNEUP SPECIFICATIONS

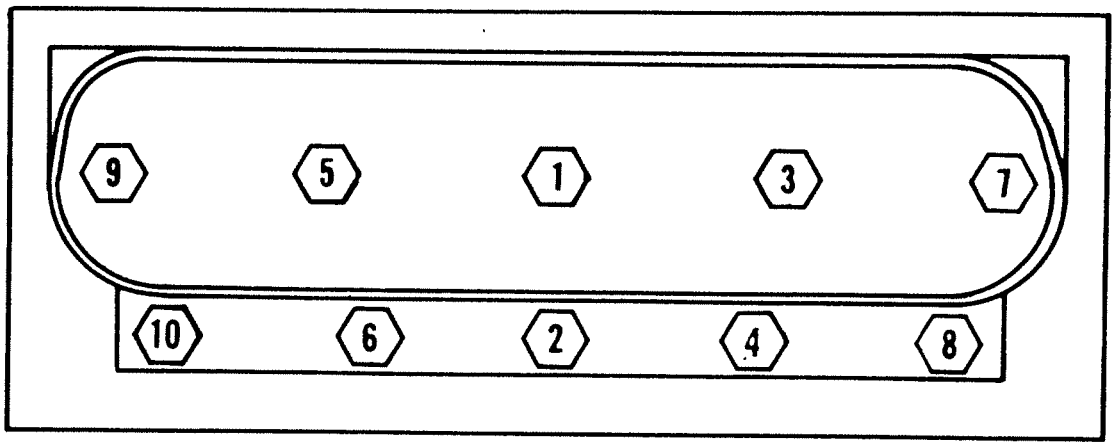
Idle RPM	600-700	600-700
Initial Ign. Timing	10° BTDC	10° BTDC
Distributor Point Gap (in.)	.019-.021	.019-.021
Spark Plug Number 2	Autolite BRF-3M	Autolite BRF-3M
Spark Plug Gap (in.)	.028-.032	.028-.032
Firing Order		
STD Rotation	1-5-4-2-6-3-7-8	1-3-7-2-6-5-4-8
OPP Rotation	1-8-7-3-6-2-4-5	1-8-4-5-6-2-7-3
Engine Idle Manifold Vacuum (in. Hg.)	16	14
Compression Pressure PSi at Cranking Speed	WHEN CHECKING COMPRESSION, MINIMUM CYLINDER READING MUST BE WITHIN 75% OF HIGHEST CYLINDER READING TAKEN.	
Oil Pressure (Hot @ 2000 RPM)	35-60 psi	35-60 psi
Engine Oil Type	SAE 10W40 New API Service SD-SE-CC Old API Service MS-DG-DM	
Engine Oil Fill Capacity 3	0°—6 qts. —5 Imp. qts. —5.68 Liters	0°—5 qts. —4¼ Imp. qts. —4.73 Liters
	12° —6 qts. —5 Imp. qts. —5.69 Liters	12° —7 qts. —6 Imp qts. —6.62 Liters

1. 94 Octane min. (Research method) recommended.
2. Installation torque 15-20 ft. lbs.
3. Includes 1 qt. for filter change.

CYLINDER HEAD

ENGINE	302-4V	351-4V
Combustion chamber volume (cc)	56.7-59.7	58.9-61.9
Valve seat width:		
Intake (in.)	0.060-0.080	0.060-0.080
Exhaust (in.)	0.060-0.080	0.060-0.080
Valve seat angle	45°	45°
Valve seat runout (in.)	.0015 max.	.0015 max.
Valve arrangement;		
Right—	I-E-I-E-I-E-I-E	I-E-I-E-I-E-I-E
Left—	E-I-E-I-E-I-E-I	E-I-E-I-E-I-E-I
Gasket surface flatness	0.003 inch in any 6 inches—0.007 overall	0.003 inch in any 6 inches—0.007 overall

CYLINDER HEAD TORQUE SPECIFICATIONS



CYLINDER HEAD BOLT TORQUE SEQUENCE

Cylinder head bolts should be tightened in the following steps.
(See torque limits on page 13)

FIGURE 3

INFORMATION ON CAMSHAFT AND VALVE TRAIN

Intake valve head dia. — 1.843-1.849 in.
Exhaust valve head dia. — 1.533-1.548 in.
Valve spring specs — (Loaded)
79-87 lb. @1.79 in.
204-226 lb.@1.34 in.
Free length — approximate — 2.07 in.
Assembled height — pad to retainer — 1¾ - 1-13/16 in.
Camshaft timing and lift
Lobe lift — Int. — .260 in.
Exh.—.278 in.
Valve lift — Theoretical — Int. 0.448 in.
Exh. 0.456 in.
Timing — Int. Opening .004 lift @ 18° BTDC
Closing .006 lift @ 72° ABDC
Duration 270°
Exh. Opening .004 lift @ 82° BBDC
Closing .006 lift @ 28° ATDC
Duration 290°
Valve face angle — intake and exhaust — 44° 1
Rocker arm lift ratio — 1.61:1
Valve pushrod max, runout — 0.020 in.
Camshaft drive mechanism
Maximum timing chain deflection — 0.500 in.

CYLINDER BLOCK

	302—4V	**351—4V**
Cylinder bore diameter (Standard spreads for 8 grades) 2	4.0004-4.0028 in.	4.000-4.0024 in.
Cylinder bore diameter 0.003 O.S.	4.0028-4.0040 in.	4.0024-4.0036 in.
Head gasket surface flatness 3	0.003 inch in any 6 inches or 0.006 inch overall	0.003 inch in any 6 inches or 0.006 inch overall

CRANKSHAFT AND FLYWHEEL

Main bearing journal dia. 4	2.2482-2.2490 in.	2.9994-3.0002 in.
Main bearing journal runout (Maximum)	0.002 in.	0.002 in.
Main bearing journal thrust face runout	0.005 in.	0.005 in.
Main bearing journal taper (Maximum)	0.0003 per in.	0.0003 per in.
Thrust bearing journal length	1.137-1.139 in.	1.137-1.139 in.

1. Valve face runout—max. — 0.0020 in.
2. Max. out of round — 0.001 in.
   Wear limit — 0.005 in.
   Cylinder bore surface finish R.M.S. — 15-35
3. Head gasket surface finish R.M.S. — 90-150
4. Connecting rod and main bearing journal out-of-round 0.0004 in. (maximum)

CRANKSHAFT AND FLYWHEEL (continued)

ENGINE	302-4V	351-4V
Connecting rod journal dia. 1	2.1228-2.1236 in.	2.3103-2.311 in.
Connecting rod bearing journal max. taper	0.0004 per in.	0.0004 per in.
Crankshaft to rear face of block runout T.I.R. max.	0.010 in.	0.010 in.
Crankshaft free end play	0.004-0.008 in.	0.004-0.008 in.
Flywheel face runout	0.010 in.	0.010 in.

CRANKSHAFT BEARINGS

Connecting rod bearings to crankshaft clearance		
Desired	0.0008-0.0015 in.	0.0008-0.0015 in.
Allowable	0.0008-0.0026 in.	0.0008-0.0026 in.
Main bearing to crankshaft clearance	(2)	
Desired	0.0005-0.0015 in.	0.0008-0.0015 in.
Allowable	0.0005-.0024 in.	0.0008-.0026 in.

CONNECTING RODS

Piston Pin bore or bushing I.D.	0.9104-0.9112 in.	0.9104-0.9112 in.
Connecting rod length center to center	5.9545-5.9575 in.	5.0885-5.0915 in.
Connecting rod alignment max. total difference (3)		
Twist	0.012 in.	0.012 in.
Bend	0.004 in.	0.004 in.
Connecting rod assy (Assembled to crankshaft)		
Side clearance	0.010-0.020 in.	0.010-0.020 in.
Wear limit	0.023 in.	0.023 in.

1. Connecting rod and main bearing journal out of round max. — 0.0004 in.
2. Number 1 bearing desired 0.0001 in. allowable 0.0001-0.0020 in.
3. Pin bushing and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8 in. long bar measured 4 inches on each side of rod.

PISTON PIN

ENGINE	302-4V	351-4V
Length	3.010-3.040 in.	3.010-3.040 in.
Diameter		
Standard	0.9120-0.9123 in.	0.9120-.9123 in.
0.001 oversize	0.9130-0.9133 in.	0.9130-0.9133 in.
To piston clearance	0.0002-0.0004 in.	0.0003-0.0005 in.
To connecting rod bushing clearance	Interference fit	Interference fit

PISTON RINGS

Ring width		
Compression ring		
Top	0.077-0.078 in.	0.077-0.078 in.
Bottom	0.077-0.078 in.	0.077-0.078 in.
Side clearance		
Compression ring		
Top	0.002-0.004 in.	0.002-0.004 in.
Bottom	0.002-0.004 in.	0.002-0.004 in.
Oil Ring	Snug	Snug
Ring gap width		
Compression ring		
Top	0.010-0.020 in.	0.010-0.020 in.
Bottom	0.010-0.020 in.	0.010-0.020 in.
Oil ring (steel rail)	0.015-0.055 in.	0.015-0.085 in.

PISTON

Diameter (3)		
Coded RED	3.9984-3.9990 in.	3.9978-3.9984 in.
Coded BLUE	3.9996-4.0002 in.	3.9990-3.9996 in.
0.003 oversize	4.0008-4.0014 in.	4.0002-4.0008 in.
Piston to cylinder bore clearance	0.0018-0.0026 in.	0.0018-0.0026 in.
Piston pin bore diameter	0.9123-0.9126 in.	0.9124-0.9127 in.
Ring groove width		
Upper compression ring	0.080-0.081 in.	0.080-0.081 in.
Lower compression ring	0.080-0.081 in.	0.080-0.081 in.
Oil ring	0.1880-0.1890 in.	0.1880-0.1890 in.

1. Measured at the piston pin bore centerline at 90° to the pin bore.

CARBURETOR SPECIFICATIONS

302-4V (HOLMAN and MOODY part number DOHM-9510-MDI)
- Throttle bore. 1.500 inch
- Air flow capacity — 480 CFM
- Fuel level — Lower edge of sight plug
- Main jet sizes — Primary #58/Secondary — Drill plate 0.0635 inch
- Power valve number — 85
- Accel. pump — Pump cam position — #2 hole.
  Cam color ident. — black
  Override spring — .015 in.
- Electric choke — 0 (Zero) Index

351-4V (HOLMAN and MOODY part number C7HM-9510-1)
- Throttle bore — 1.562 inch
- Air flow capacity — 600 CFM
- Fuel level — Lower edge of sight plug
- Main jet sizes — Primary — #64 Secondary — Drill plate 0.0595 inch
- Power valve number — #85
- Accel. pump — Pump cam position — #2 hole
  Cam color ident. — Red
  Override spring — .015 in.
- Electric choke — 0 (Zero) Index

FUEL PUMP SPECIFICATIONS

Minimum volume flow @ 500 RPM — 1 pint/20 seconds
Static pressure @ 500 RPM — 4.5-6.5 PSI
Total eccentric lift — .690-.710 in.

DISTRIBUTOR ADVANCE SPECIFICATIONS

302-4V

Distributor RPM Advance (Distributor or camshaft degrees) ±1°

550	0°
900	9°
2000	12°

351-4V

Distributor RPM Advance (Distributor or camshaft degrees) ±1°

550	0°
900	6¼°
2000	12°

TORQUE LIMITS IN FT. LBS.

ENGINE	302-4V	351-4V
Cylinder head bolts		
Step 1	50	85
Step 2	60	95
Step 3	65-72	105-112
Oil pan to cylinder block	9-11	9-11
Manifolds to cylinder head		
Intake	23-25	23-25
Exhaust	18-24	18-24
Water outlet housing	12-15	12-15
Flywheel to crankshaft	75-85	75-85
Main bearing cap bolts	60-70	95-105
Oil pan drain plug	15-20	15-20
Oil pump to cylinder block	22-32	22-32
Oil pump cover plate	6-9	6-9
Oil Filter to cylinder block	With oil on the gasket surface, hand tighten until gasket contacts adapter face, then tighten 1/2 turn more.	
Cylinder front cover	12-15	12-15
Camshaft sprocket to camshaft	40-45	40-45
Camshaft thrust plate to block	9-12	9-12
Damper to crankshaft	70-90	100-130
Connecting rod nuts	19-24	40-45
Valve rocker arm cover	3-5	3-5
Oil inlet tube to oil pump	10-15	10-15
Fuel pump to front cover	17-27	17-27
Valve rocker arm adjusting after nut contacts shoulder	17-23	17-23
Alternator Pivot Bolt	45-57	45-57

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

CAUTION: If any of the torque limits listed in this table disagree with any of those listed in the preceding table, the limits listed in the preceding tables prevail

Size of fastener	Torque in ft. lbs.
1/4-20	6-9
1/4-28	6-9
5/16-18	12-15
5/16-24	15-18
3/8-16	23-28
3/8-24	30-35
3/8-24	30-35
7/16-14	45-50
7/16-20	50-60
1/2-13	60-70
1/2-20	70-80
9/16-18	85-95
5/8-18	130-145

TRANSMISSION

In installations where a Borg-Warner Velvet Drive Transmission is used, check to assure proper oil level in the transmission. These transmissions use Type A Hydraulic Fluid. Transmission should be filled to the full mark on the dip stick then started and run at low speed for a short time to fill the hydraulic lines and oil cooler.

Fluid level should be rechecked and additional oil added to bring the level to the full mark on the dip stick. Engine idle should be at 700 rpm or less before shifting. It is necessary to check the control cable setting to be sure that the travel in forward and reverse on the clutch lever is at maximum setting. Do not remove the detent from the actuator arm. Holman and Moody Marine cannot be responsible for damage resulting from shifting at high rpm.

INBOARD/OUTDRIVE DRIVE

Refer To Inboard/Outdrive Owners Manual