

**730, 830, 930  
Series Tractors**

**Service Manual**

**9-75861**

Reprinted

**CASE III**

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# SECTION

# C

## SPECIFICATIONS FOR

730 SERIES ----- A 251 GASOLINE ENGINE

830 SERIES ----- A 284 GASOLINE ENGINE

730 SERIES ----- A 267 DIESEL ENGINE

830 SERIES ----- A 301 DIESEL ENGINE

## CASE ENGINES

The Specifications are the Same Unless Otherwise Indicated

# diesel engines

## C-2

### A267 AND A301 ENGINE SPECIFICATIONS

Type ----- CASE Full Diesel, 4 Cylinder 4 Stroke Cycle  
Valve-in-Head Engine.

Cylinder Heads----- Multiple Cylinder Heads can be removed indi-  
vidually for Servicing (2 cylinders per head).

Firing Order -----1-3-4-2

#### Bore

A267 ----- 4-1/8 Inches  
A301 ----- 4-3/8 Inches

Stroke----- 5 Inches

#### Piston Displacement

A267 ----- 267 Cubic Inches  
A301 ----- 301 Cubic Inches

Compression Ratio ----- 15 to 1

Oil Filter, Crankcase----- Replaceable Full Flow Element  
Type.

Method of Starting Diesel Engine ----- Engine Starts on Diesel Fuel  
(Electric Starting Motor).

#### Maximum Compression Pressures

ENGINE WARMED UP TO OPERATING TEMP. AND RUNNING AT 1600 RPM

Altitude	Sea Level	1000 ft.	2000 ft.	3000 ft.	4000 ft.	5000 ft.
Compression Pressure	480 to 510 PSI	455 to 485 PSI	435 to 465 PSI	415 to 445 PSI	395 to 425 PSI	375 to 405 PSI

Allowable Variance Between Cylinders - 25 Pounds Pressure at 1600 RPM

### CYLINDER SLEEVES

Type ----- Replaceable Wet Type:Two Rubber O-Ring  
Seals carried on each sleeve.

#### Inside Diameter of Sleeve Bore

A267 -----4.125 to 4.126 Inches. Replace  
Sleeve when inside Diameter below Top Ring  
Ridge Exceeds 4.133 Inches.  
A301 ----- 4.375 to 4.376 Inches. Replace  
Sleeve When Inside Diameter Below Top Ring  
Ridge Exceeds 4.333 Inches.

#### Piston Clearance in Sleeve (At Skirt)

A267 ----- .0045 to .0055 Inch  
A301 ----- .0045 to .0065 Inch

Cylinder Sleeve Out-of-Round ----- Max. .002 Inch

### PISTON AND PISTON PINS

#### Piston Material

A267 ----- Special Alloy Iron;Parco -Lubrized  
A301 ----- Aluminum

#### Piston Weight (Less Pin)

A267 ----- 4.742 to 4.758 Pounds  
A301 ----- 3.937 to 3.939 Pounds

#### Diameter of Piston at Top of Skirt (Below Oil Ring)

A267 ----- 4.106 to 4.109 Inches  
A301 ----- 4.341 to 4.345 Inches

#### Diameter of Piston at Bottom of Skirt

A267 ----- 4.1205 to 4.1215 Inches  
A301 ----- 4.3675 to 4.3685 Inches

Piston Pins----- Full Floating Type:Held in Position  
with Snap Rings in Piston. Replaceable Bronze  
Bushing in Connecting Rod.

#### Piston Pin Length

A267 ----- 3.395 to 3.405 Inches  
A301 ----- 3.670 to 3.675 Inches

#### Piston Pin Diameter

A267 ----- 1.3583 to 1.3586 Inches  
A301 ----- 1.4994 to 1.4995 Inches

#### Piston Pin Fit in Piston

A267 ----- .0003 to .0008 Inch. When Pin is lubri-  
cated with Light Engine Oil and held upright  
in Vise, Weight of Piston should allow it to slide  
slide slowly into position over Pin.

A301 ----- .0000 to .0003 Inch With Piston 50°F  
Warmer Than Pin.

#### Piston Pin Fit in Connecting Rod Bushing

A267 ----- .0004 to .0011 Inch  
A301 ----- .0005 to .0010 Inch

### PISTON RINGS

Rings Per Piston ----- 4- (3 Compression and 1 Oil) .

#### Compression Rings

Width of Ring (All 3) ----- .0930 to .0935 Inch

#### Ring End Gap(All 3)when Compressed in .

4.125 Inch Cylinder A267 ----- .013 to .023 Inch  
Ring End Gap (All 3) when Compressed in  
4.375 Inch Cylinder A301 ----- .013 to .025 Inch

#### Side Clearance in Groove of 1st(Top) Ring

A267 ----- .003 to .0045 Inch  
A301 ----- .0045 to .0060 Inch

Side Clearance in Groove of 2nd and 3rd Ring----.0025 to .004 Inch

Oil Ring-----To install Replacement Ring, Follow  
Instructions Packed with Rings.

#### Width of Rings (Original Equipment)

A267 ----- .2455 to .2485 Inch  
A301----- .2470 to .2490 Inch

Replacement Ring ----- .2441 to .2474 Inch

#### Side Clearance in Groove(Original Equipment)

A267 ----- .0025 to .0065 Inch  
A301----- .0025 to .0085 Inch

#### Replacement Ring

A267 ----- .0015 to .003 Inch  
A301 ----- .0025 to .0085 Inch

### CONNECTING RODS

Connecting Rod Bushing -----Replaceable Bronze Bushing  
Replacement Bushing must be Reamed.

A267 ----- Use 1.3590 to 1.3594 Reamer  
A301 ----- Use 1.5000 to 1.5004 Reamer

#### Piston Pin Hole Diameter in Rod (Without Bushing)

A267 ----- 1.483 to 1.485 Inches  
A301 ----- 1.686 to 1.688 Inches

#### Inside Diameter of Piston

#### Pin Bushing in Rod

A267----- 1.3590 to 1.3594 Inches; Install New Bushing  
if inside Diameter Exceeds 1.363 Inches.  
A301----- 1.500 to 1.5004 Inches; Install New Bushing  
if inside Diameter Exceeds 1.504 Inches.

Connecting Rod Bearing ----- Replaceable, Precision, Steel Backed  
Copper Lead Alloy Liners.

Connecting Rod Capscrews ----- Self Locking Type, No Lock Wires  
Required - May Be used More Than Once.

Connecting Rod Length (Center to Center  
Between Pin Hole and Bearing Journal Hole)-----10.499 to 10.501 Inches

Bearing Liner Width ----- 1.625 Inches

#### Diameter of Crankshaft Journal Hole

in Rod(Without Liner) ----- 2.9005 to 2.9010 Inches

#### Inside Diameter of Bearing Liner(Standard

Liner in Place in Rod and Capscrews Tight)----- 2.7503 to 2.7518 Inches

Diameter of Crankshaft Rod Journal----- 2.748 to 2.749 Inches

#### Clearance Between Rod Bearing and

Crankshaft Journal ----- .0013 to .0038 Inch; Install  
New Bearing Liners When Clearance Exceeds  
.006 Inch

#### Undersize Bearing Liners Available

for Service ----- .002,.010,.020,.030 Inch

Allowable Connecting Rod Bearing End Play ----- .005 to .012 Inch

### CRANKSHAFT AND MAIN BEARINGS

Crankshaft ----- Balanced; Drilled to Provide Pressure  
Lubrication to Main and Connecting Rod Bearings.

Type Main Bearings ----- Replaceable, Precision, Steel  
Backed Copper - Lead Alloy Liners.

Bearing Capscrews ----- Self Locking Type, No Lock Wires Required - May Be Used More Than Once.

Bearing Taking End Thrust -----Center(Two Replaceable Bronze Thrust Washers).

Crankshaft End Play(Measured at Center Main Bearing) ----- .004 to .012 Inch; Install New Thrust Washers if End Play Exceeds .020Inch.

Oversize Thrust Washers for End Play Available for Service----- .006 Inch

Connecting Rod Bearing Journal Diameter----- 2.748 to 2.749 Inches

Main Bearing Journal Diameter -----2.998 to 2.999 Inches

Crankshaft Main and Connecting Rod Journal Bearings out of Round ----- Maximum .001 Inch

Maximum Allowable Taper on Crankshaft Rod Journal ----- .002 Inch

Inside Diameter of Main Bearing Liners (In Place and Capscrews Tight) -----3.0006 to 3.0026 Inches

Clearance Between Main Bearing Liner and Journal----- .0016 to .0046 Inch;Install New Bearing Liner when Clearance Exceeds .0065 Inches.

Width of 1st, 3rd, 5th Main Bearing Liners -----2.218 Inches

Width of 2nd, 4th Bearing Liners ----- 1.156 Inches

Width Between Crankshaft Main Bearing Cheeks

A.5th ----- 2.620 to 2.630 Inches

B.2nd and 4th ----- 1.5575 to 1.5675 Inches

C.3rd(Center)----- 2.624 to 2.626 Inches

Width Between Crankshaft Rod Bearing Journal Cheeks -----1.9975 to 2.0025 Inches

Undersize Main Bearing Liners Available for Service ----- .002,.010,.020,.030 Inch

Crankshaft Main Bearing Journals Should Be  
 2.988-2.989 Inches for .010 Inch Undersize Bearing  
 2.978-2.979 Inches for .020 Inch Undersize Bearing  
 2.968-2.969 Inches for .030 Inch Undersize Bearing

Undersize Connecting Rod Bearing Shells Available for Service ----- .002,.010,.020,.030 Inch

Connecting Rod Crankshaft Journals Should Be Ground to----- 2.738-2.739 Inches for .010 Inch Undersize Bearing  
 2.728-2.729 Inches for .020 Inch Undersize Bearing  
 2.718-2.719 Inches for .030 Inch Undersize Bearing

**CAMSHAFT AND BUSHINGS**

Number of Bearing Surfaces on Camshaft ----- 4

Type Bushing ----- Replaceable, Precision, Steel Backed Babbitt

Bushing Lubrication ----- Pressure Lubricated from Oil Pump; Camshaft Drilled to Provide Pressure Lubrication to Valve Rocker Arm Assembly, and to Timing Gear Train.

Diameter of Camshaft at Each Bearing Surface-----2.246 to 2.247 Inches

Inside Diameter of Each Bushing (Measured when in Place in Block)----- 2.2484 to 2.2514 Inches

No.1(Front)Bushing Length ----- 1.656 Inches

No.2 and 3 Bushing Lengths -----1.438 Inches

No.4 Bushing Length(w/cup type Camshaft plug) -----1.156 Inches

Camshaft End Play ----- Automatically Taken Up by Spring Loaded Thrust Button in Front End of Camshaft, Camshaft Washer Provided Between Drive Gear and Front Bearing.

Camshaft Washer  
 Outside Diameter ----- 3.240 to 3.260 Inches

Inside Diameter----- 2.250 to 2.260 Inches

Thickness----- .1225 to .1275 Inch

**VALVE PUSH ROD LIFTERS**

Type -----Mushroom

Outside Diameter of End that Projects into Block--.8097 to .8102 Inches

Diameter of Bore in Block for Lifter----- .8115 to .8130 Inch

Oversize Lifter Available for Service ----- .010 In. Oversize Lifter

Bore in Block Must Be Reamed to----- .8215 to .8225 Inch for.010 Inch Oversize Lifter.

**VALVES**

**Valve Tappet Clearance**

Intake and Exhaust-----.025 Inch, Engine Cold

**Exhaust Valves**

Angle of Valve Face----- 44 Degrees

Valve Length  
 A267 ----- 6.238 Inches  
 A301 ----- 6.382 Inches

Maximum Valve Face Runout ----- .002 Inch as Determined with a Dial Indicator.

Diameter of Valve Stem --- .4000 to .401 Inch. Install New Valve if there is more than .002 Inch Difference in Diameter at any Point on Stem.

Diameter of Valve Head  
 A267----- 1.484 Inches  
 A301 ----- 1.562 Inches

Inside Diameter of Valve Guide-----.4045 to .4055 Inch(After Assembly).

Valve Stem Clearance in Guide ----- .0035 to .0055 Inch

**Exhaust Valve Seat Insert**

Seat Angle ----- 45 Degrees

Seat Contact Width ----- .073 to .084 Inch

Outside Diameter of Insert  
 A267 ----- 1.640 to 1.641 Inches  
 A301 ----- 1.722 to 1.723 Inches

Inside Diameter of Insert  
 A267 ----- 1.323 to 1.333 Inches  
 A301 -----1.401 to 1.411 Inches

Maximum Allowable Seat Runout ----- .002 Inch as Determined with a Dial Indicator.

**Intake Valves**

Angle of Valve Face----- 44 Degrees

Valve Length  
 A267 ----- 7.243 Inches  
 A301 ----- 7.368 Inches

Maximum Valve Face Runout----- .002 Inch as Determined with a Dial Indicator.

Diameter of Valve Stem ----- .402 to .403 Inch Install New Valve if there is More than .002 Inch Difference in Diameter at any Point on Stem.

Diameter of Valve Head  
 A267 ----- 1.731 Inches  
 A301 ----- 1.825 Inches

Inside Diameter of Valve Guide --- .4045 to .4055 Inch.(After Assembly)

Stem Clearance in Guide ----- .0015 to .0035 Inch

**Intake Valve Seat**

Seat Angle----- 45 Degrees

Seat Contact Width ----- .086 to .096 Inch

**C-4**

Maximum Allowable  
Seat Runout----- .002 Inch as  
Determined with a Dial Indicator

**Exhaust Valve Guides**

Length ----- 3.218 Inches  
Outside Diameter----- .7510 to .7515 Inch  
Inside Diameter ----- .4045 to .4055 Inch.(After Assembly)  
Valve Stem Clearance in Guide ----- .0035 to .0055 Inch  
Distance Above Head Guide Must Protrude ----- 1.062 Inches, Press Fit

**Intake Valve Guides**

Length ----- 4.375 Inches  
Outside Diameter ----- .7510 to .7515 Inch  
Inside Diameter ----- .4045 to .4055 Inch.(After Assembly)  
Valve Stem Clearance in Guide ----- .0015 to .0035 Inch  
Distance Above Head  
Guide Must Protrude -----1.062 Inches, Press Fit

**VALVE SPRINGS**

Free Length ----- Approximately 2.438 Inches  
Spring Pressure at Compressed Height of  
1.484 Inches(Valve Open)----- 102 Pounds; Install New Spring if  
Pressure is Less than 92 Pounds.  
Spring Pressure at Compressed Height of  
1.937 Inches(Valve Closed)----- 45 Pounds; Install New Spring if  
Pressure is Less than 41 Pounds.

**ROCKER ARM ASSEMBLY**

Rocker Arm Bushing ----- Replaceable Precision Bronze Bushing  
Number of Bushings ----- 8  
Lubrication----- Pressure Lubricated; Crankcase Oil to  
Rocker Arms Metered by Camshaft.  
Oil Holes in Rocker Arm Shaft ----- Oil Holes must Face Push Rod  
Side of Engine Only. Shaft Cannot Be Rotated.  
Positioning of Exhaust  
Valve Rocker Arms----- Spacer Washers Position Exhaust Valve  
Rocker Arm and Eliminate End Play without  
Binding.

Outside Diameter of  
Rocker Arm Shaft----- .872 to .873 Inch

Inside Diameter of Rocker  
Arm Bushing (Installed)----- .8745 to .8755 Inch

Rocker Arm Shaft Spring

Spring Pressure at Compressed Height of  
1.562 Inches ----- 10 Pounds; Install  
New Spring If Pressure is Less than 8.5 Pounds

**OIL PUMP**

Type ----- Positive Displacement, Gear Type Pump;  
Driven Off Balancer.

Pressure Relief Valve----- Maintains 40 to 45 Pounds Full Pres-  
sure(Oil Warm, Engine Operating at Full Gov-  
erned Speed) Relief Valve is Adjustable.

**WATER PUMP AND THERMOSTAT**

Type of System ----- Pressurized Thermostat - Continuous  
By-Pass Type; Forced Circulation (Pump).

Type Pump ----- Impeller Vane Type

Radiator----- Heavy Duty Fin and Tube Type

Temperature Control ----- By Pass Type Thermostat

**FUEL SYSTEM**

Injection Pump----- Robert Bosch, Type PES Multiple Plunger Pump

Direction of Pump Rotation----- Counter-Clockwise

Pump Mounting----- Right Hand Side of Engine

Pump Drive----- Gear Driven from Camshaft Gear at Camshaft Speed

Injection Pump Drive Lubrication ----- Pressure Lubricated From  
Front Camshaft Bearing.

Injection Pump Drive Shaft Diameter ----- 1.3700 to 1.3705 Inches

Normal Clearance Between  
Drive Shaft and Bushings ----- .001 to .002 Inch

Number of Drive  
Shaft Bushings ----- 2- These Bushings are Not Re-  
placeable. A Replacement Drive Housing with  
Bushings in Place, Aligned and Fine Bored is  
Provided.

Injection Pump Drive  
Shaft End Play ----- Automatically Take Up By a Spring  
Loaded Thrust Button on Front End of Drive  
Shaft.  
Thrust Washers Provided Between Front Drive  
Gear and Drive Shaft Housing.

Thrust Washer

Outside Diameter ----- 2.085 to 2.105 Inches

Inside Diameter----- 1.3725 to 1.3825 Inches

Thickness ----- .1225 to .1275 Inch

Timing Marks on Engine ----- Timing Marks Located on Crankshaft  
Pulley Flange (0 through 5 and 20 through 35  
Degrees Before Top Dead Center). Pointer  
Located on Timing Gear Cover.

Fuel Injectors ----- Robert Bosch Pintle Type; Opening Pressure  
1950 to 2100 Pounds Per Square Inch.

Governor ----- Mechanical Variable Speed Fly-Weight Centrifugal  
Type; Integral Part of Injection Pump.

Fuel Filters

Fuel Tank Breather----- Fuel Tank Cap

Fuel Tank Water Trap ----- Located in Base of Fuel Tank

1st Stage Fuel Filter ----- Replaceable Element Type

2nd Stage Fuel Filter ----- Replaceable Element Type

Final Fuel Filter----- Replaceable Sealed "Can" Type Filter.

**A251 AND A284 ENGINE SPECIFICATIONS  
Gasoline and LP Gas**

*spark ignition engines*

Type ----- CASE 4 Cylinder, 4 Stroke Cycle, Valve-  
In-Head Engine.

Cylinder Heads----- Multiple Cylinder Heads can be removed  
individually for Servicing (2 Cylinders per  
Head).

Firing Order ----- 1-3-4-2

Bore  
A251 ----- 4 Inches  
A284 -----4-1/4 Inches

Stroke----- 5 Inches

Piston Displacement  
A251-----251 Cubic Inches  
A284 ----- 284 Cubic Inches

Compression Ratio  
A251(Gasoline)----- 7.4 to 1  
(LP Gas)----- 8.5 to 1  
A284(Gasoline) ----- 7.4 to 1  
(LP Gas) ----- 8.5 to 1

Maximum Compression at Cranking Speed (150 RPM)  
Engine Warmed up to Operating Temperature ---- 140PSIat Sea Level

Allowable Variance Between Cylinders----- 15 Pounds Pressure

Oil Filter, Crankcase-----Replaceable Full Flow Element Type

Ignition----- Distributor

**CYLINDER SLEEVES**

Type ----- Replaceable Wet Type; Two Rubber O-ring  
Seals Carried on each sleeve.

Inside Diameter of Sleeve Bore  
A251----- 4.00 to 4.001 Inches, Replace  
Sleeve when Inside Diameter Below Top Ring  
Ridge Exceeds 4.008 Inches.  
A284 ----- 4.250 to 4.251 Inches. Replace Sleeve  
When Inside Diameter Below Top Ring Ridge  
Exceeds 4.258.

Piston Clearance in Sleeve (At Skirt)----- .0035 to .0045 Inches

**PISTON AND PISTON PINS**

Piston Material----- Aluminum

Piston Weight (Less Pin)  
A251----- 2.205 to 2.214 Pounds  
A284 ----- 2.788 Pounds

Diameter of Piston at Top  
A251----- 3.964 to 3.968 Inches  
A284 ----- 4.215 to 4.219 Inches

Diameter of Piston at Top of Skirt  
(Measured Immediately Below Oil  
Ring, Across Thrust Faces)  
A251 -----3.996 to 3.997 Inches  
A284 ----- 4.246 to 4.247 Inches

Piston Pins----- Full Floating Type;Held in Position with Snap  
Rings in Piston;Replaceable Bronze Bushing in  
Connecting Rods.

Piston Pin Length  
A251 ----- 3.395 to 3.405 Inches  
A284 ----- 3.613 to 3.618 Inches

Piston Pin Diameter  
A251 ----- 1.3583 to 1.3586 Inches  
A284 ----- 1.3584 to 1.3585 Inches

Piston Pin Fit in Piston  
A251 ----- .0001 to .0003 Inch  
A284 ----- .0001 to .0004 Inch

Piston Pin Fit in Connecting Rod Bushing  
A251 ----- .0004 to .0011 Inch  
A284 ----- .0005 to .0011 Inch

**PISTON RINGS**

Rings Per Piston----- 4 - (3 Compression and 1 Oil)

Compression Rings (Top 3)

**C-5**

1st(Top)Ring-----Chromium Plated;Relief Indicates Top Side

2nd and 3rd Rings----- Tapered Face, Top Marked

Width of Rings (All 3)----- .0930 to .0935 Inch

Ring End Gap(All 3) When Compressed  
in 4.000 Inch Cylinder  
A251 ----- .013 to .023 Inch  
Ring End Gap (All 3 ) When Compressed  
in 4.250 Inch Cylinder  
A284 ----- .013 to .025 Inch

Side Clearance in Groove of 1st(top)Ring----- .0025 to .0040 Inch

Side Clearance in Groove of 2nd and 3rd Ring  
A251 ----- .0020 to .0040 Inch  
A284 ----- .0020 to .0035 Inch

Oil Ring----- To install Replacement Ring, Follow  
Instructions Packed with Rings.

Width of Ring(Both Original and Replacement)  
A251 ----- .2485 to .2490 Inch  
A284 ----- .2480 to .2590 Inch

Ring End Gap When Compressed in  
4.00 Inch Cylinder  
A251 ----- .002 to .0035  
Ring End Gap When Compressed in  
4.250 Inch Cylinder  
A284 ----- .015 to .055

Side Clearance in Groove (Original Equipment)---- .0015 to .0085 Inch  
(Replacement Ring)----- .0031 to .0074 Inch

**CONNECTING RODS**

Piston Pin Bushing ----- Replacement Bronze Bushing,  
Ream in place. Use 1.3590 to 1.3594 Reamer.

Piston Pin Hole Diameter in  
Rod(Without Bushing) ----- 1.483 to 1.485 Inches

Inside Diameter of Piston  
Pin Bushing in Rod-----1.3590 to 1.3594 Inches; Install New  
Bushing if Inside Diameter Exceeds 1.363.

Connecting Rod Bearing----- Replaceable, Precision Steel Backed,  
Copper Lead Alloy Liners.

Connecting Rod Capscrews ----- Self Locking Type, No Lock Wire  
Required-May be Used More Than Once.

Connecting Rod Length(Center to Center Between  
Pin Hole and Bearing Journal Hole -----10.499 to 10.501 Inches

Bearing Liner Width ----- 1.625 Inch

Diameter of Crankshaft Journal Hole  
in Rod(Without Liner)----- 2.9005 to 2.9010 Inches

Inside Diameter of Bearing Liner(Standard  
Liner in Place in Rod and Capscrews Tight)---- 2.7503 to 2.7518 Inches

Diameter of Crankshaft Rod Journal ----- 2.748 to 2.749 Inches

Clearance Between Rod Bearing  
and Crankshaft Journal ----- .0015 to .0036 Inch;Install New Bearing  
Liners When Clearance Exceeds .006 Inch.

Undersize Bearing Liners  
Available for Service----- .002, .010, .020,.030 Inch

Allowable Connecting  
Rod Bearing End Play ----- .005 to .012 Inch

**CRANKSHAFT AND MAIN BEARINGS**

Crankshaft ----- Balanced Drilled to Provide Pressure  
Lubrication to Main and Connecting Rod Bear-  
ings.

Type Main Bearings----- Replaceable Precision, Steel Backed,  
Copper Lead Alloy Liners

Bearing Capscrews----- Self Locking Type, No Lock Wires  
Required - May Be Used More Than Once

Bearing Taking End Thrust--- Center(Two Replaceable Bronze Thrust  
Washers).

**C-6**

Crankshaft End Play (Measured At Center Main Bearing) ----- .004 to .012 Inch; Install New Thrust Washers if End Play Exceeds .020 Inch

Oversize Thrust Washers for End Play Available for Service ----- .006 Inch

Connecting Rod Bearing Journal Diameter ----- 2.748 to 2.749 Inches

Main Bearing Journal Diameter ----- 2.998 to 2.999 Inches

Crankshaft Main and Connecting Rod Journal Bearing Out of Round ----- Maximum .001 Inch

Inside Diameter of Main Bearing Liners (In Place and Capscrews Tight) ----- 3.0006 to 3.0026 Inches

Clearance Between Main Bearing Liner and Journal ----- .0020 to .0046 Inch; Install New Bearing Liner when Clearance Exceeds .0065 Inches.

Width of 1st, 3rd and 5th Main Bearing Liners ----- 2.218 Inches

Width of 2nd and 4th Main Bearing Liners ----- 1.156 Inches

Width Between Crankshaft Main Bearing Cheeks:  
A. 5th ----- 2.620 to 2.630 Inches

B. 2nd and 4th ----- 1.5575 to 1.5675 Inches

C. 3rd (Center) ----- 2.624 to 2.626 Inches

Width Between Crankshaft Rod Bearing Journal Cheeks ----- 1.9975 to 2.0025 Inches

Undersize Main Bearing Liners Available for Service ----- .002, .010, .020, .030 Inch

Crankshaft Main Bearing Journals should be ground to ----- 2.988-2.989 Inches for .010 Inch Undersize Bearing  
2.978-2.979 Inches for .020 Inch Undersize Bearing  
2.968-2.969 Inches for .030 Inch Undersize Bearing

Undersize Connecting Rod Bearing Shells Available for Service ----- .002, .010, .020, .030 Inch

Connecting Rod Crankshaft Journals Should be ground to ----- 2.738-2.739 Inches for .010 Inch Undersize Bearing  
2.728-2.729 Inches for .020 Inch Undersize Bearing  
2.718-2.719 Inches for .030 Inch Undersize Bearing

**CAMSHAFT AND BUSHINGS**

Number of Bearing Surfaces on Camshaft ----- 4

Type Bushing ----- Replaceable, Precision, Steel Backed Babbitt

Bushing Lubrication ----- Pressure Lubricated from Oil Pump; Camshaft Drilled to Provide Pressure Lubrication to Valve Rocker Arm Assembly, and to Timing Gear Train.

Diameter of Camshaft at Each Bearing Surface ----- 2.246 to 2.247 Inches

Inside Diameter of Each Bushing (Measured when in Place in Block) ----- 2.2484 to 2.2514 Inches

No. 1 (Front) Bushing Length ----- 1.656 Inches

No. 2, and 3 Bushing Lengths ----- 1.438 Inches

No. 4 Bushing Length ----- 1.156 Inches

Camshaft End Play ----- Automatically Taken up by Spring Loaded Thrust Button in Front End of Camshaft. Bronze Washer Provided Between Drive Gear and Front Bearing.

Camshaft Washer

Outside Diameter ----- 3.240 to 3.260 Inches

Inside Diameter ----- 2.250 to 2.260 Inches

Thickness ----- .1225 to .1275 Inch

**VALVE PUSH ROD LIFTERS**

Type ----- Mushroom Type

Outside Diameter of End That Projects into Block ----- .8097 to .8102 Inches

Diameter of Bore in Block for Lifter ----- .8115 to .8130 Inches

Oversize Lifter Available for Service ----- .010 Inch Oversize Lifter

Bore in Block Must be Reamed to ----- .8215 to .8225 Inch for .010 Inch Oversize Lifter.

**VALVES****Valve Tappet Clearance**

Intake ----- .015 Inch, Engine Cold  
Exhaust ----- .025 Inch, Engine Cold

**Exhaust Valves**

Angle of Valve Face ----- 44 Degrees

Valve Length  
A251 ----- 6.537 Inches  
A284 ----- 6.604 Inches

Maximum Valve Face Runout ----- .002 Inch as Determined with a Dial Indicator.

Diameter of Valve Stem ----- .400 to .401 Inch; Install New Valve if there is More Than .002 Inch Difference in Diameter at any Point on Stem.

Diameter of Valve Head  
A251 ----- 1.545 Inches  
A284 ----- 1.676 Inches

Inside Diameter of Valve Guide ----- .4045 to .4055 Inch

Valve Stem Clearance in Guide ----- .0035 to .0055 Inch

Valve Rotators ----- Positive Type

**Exhaust Valve Seat Insert**

Seat Angle ----- 45 Degrees

Seat Width ----- .073 to .084

Insert Height ----- .250 to .255 Inch

Outside Diameter of Insert  
A251 ----- 1.630 to 1.631 Inches  
A284 ----- 1.761 to 1.762 Inches

Inside Diameter of Insert  
A251 ----- 1.370 to 1.380 Inches  
A284 ----- 1.501 to 1.511 Inches

Maximum Allowable Seat Runout ----- .002 Inch as Determined with a Dial Indicator.

**Intake Valves**

Angle of Valve Face ----- 44 Degrees

Valve Length  
A251 ----- 6.695 Inches  
A284 ----- 6.593 Inches

Maximum Valve Face Runout ----- .002 Inch as Determined With a Dial Indicator.

Diameter of Valve Stem ----- .402 to .403 Inch; Install New Valve if there is More than .002 Inch Difference in Diameter at any Point on Stem.

Diameter of Valve Head  
A251 ----- 1.720 Inches  
A284 ----- 1.825 Inches

Inside Diameter of Valve Guide --- .4045 to .4055 Inch (After Assembly)

Stem Clearance in Guide ----- .0015 to .0035 Inch

**Intake Valve Seat**

Seat Angle ----- 45 Degrees

Seat Width ----- .070 to .086 Inch

**Exhaust Valve Guides**

Length ----- 3.625 Inches

Outside Diameter ----- .7510 to .7515 Inch

Inside Diameter ----- .4045 to .4055 Inch

Valve Stem Clearance in Guide----- .0035 to .0055 Inch  
Distance Above Head Guide Must Protrude -----1.062 Inch Press Fit

**Intake Valve Guides**

Length ----- 3.625 Inches  
Outside Diameter ----- .7510 to .7515 Inch  
Inside Diameter ----- .4045 to .4055 Inch  
Valve Stem Clearance in Guide ----- .0015 to .0035 Inch  
Distance Above Head Guide Must Protrude -----1.062 Inch Press Fit

**VALVE SPRINGS**

Free Length ----- Approx. 2.438 Inches  
Spring Pressure at Compressed Height of  
1.531 Inches(Valve Open)----- 95.5 Pounds; Install New Spring if  
Pressure is Less Than 86 Pounds.  
Spring Pressure at Compressed Height of  
1.938 Inches(Valve Closed) ----- 45 Pounds; Install New Spring if  
Pressure is Less Than 41 Pounds.

**ROCKER ARM ASSEMBLY**

Rocker Arm Bushings ----- Replaceable Precision Bronze Bushing  
Number of Bushings -----8  
Lubrication ----- Pressure Lubricated; Crankcase Oil to Rocker  
Arms Metered by Camshaft.  
Oil Holes in Rocker Arm Shaft ----Oil Holes Must Face Push Rod Side of  
of Engine Only. Shaft Cannot Be Rotated.  
Positioning of Exhaust Valve  
Rocker Arms -----Spacer Washers Position Exhaust  
Valve Rocker Arm and Eliminates End Play  
Without Binding.  
Outside Diameter of Rocker Arm Shaft----- .872 to .873 Inch  
Inside Diameter of Rocker Arm Bushing-----.8745 to .8755 Inch  
Rocker Arm Shaft Spring  
Spring Pressure at Compressed Height of  
1.562 -----10 Pounds;Install New Spring if  
Pressure is Less than 8.500 Pounds

**OIL PUMP**

Type ----- Positive Displacement, Gear Type Pump  
Driven off Camshaft.  
Pressure Relief Valve ----- Maintains 40 to 45 Pounds Full Pressure  
(Oil Warm, Engine Operating at Full Governed  
Speed) Relief Valve is Adjustable.

**WATER PUMP AND THERMOSTAT**

Type of System -----Pressurized Thermostat Continuous  
By-Pass Type;Forced Circulation (Pump).  
Type Pump ----- Impeller Vane Type  
Temperature Control-----By-Pass Type Thermostat

**FUEL SYSTEM  
Gasoline**

Type of System ----- Gravity Flow  
Carburetor  
Except Grove----- Marvel Schebler Model TSX 863  
Grove -----Marvel Schebler Model TSX 785-SL  
Flange ----- SAE 1.250 Inch  
Load Jet ----- Adjustable  
Venturi Size ----- 1.062 Inch Dia. Throat

**LP Gas**

Type of System ----- Pressure Flow  
Regulator ----- Model RDG  
Carburetor  
Except Grove----- Model CBX  
Grove----- Model XG

Flange ----- SAE 1.250 Inch  
Load Jet ----- Adjustable  
Venturi Size ----- 1.062 Inch Dia. Throat

**TIGHTENING TORQUE SPECIFICATIONS**







Engine	Torque in Ft. Lbs.	Size	Threads per In.	Type
Camshaft Nut -----	125	1-1/8	12	NF*
Connecting Rod Bearing Capscrews-----	95 to 105	1/2	20	NF
Crankshaft Pulley Bolt----	100	5/8	18	NF
Cylinder Head Cover (Valve Cover)Stud Nuts----	5 Max	7/16	20	NF
Cylinder Head Bolts (Grade 8)-----	145 to 150	9/16	18	NF
Flywheel to Crankshaft Capscrews -----	100	5/8 9/16	18 18	NF NF
Crankshaft Rear Oil Seal Retainer Capscrews-----	25	3/8	16	NC**
Generator Mounting Capscrews -----	15	5/16	18	NC
Injectors, Diesel Fuel Clamp Stud Nuts, Injector to Cylinder Head (Diesel)-----	14 to 17	3/8	24	NF
Injector Nozzle Cap Nut (Diesel) -----	50 to 55			
Powrcel Clamp Screws (Diesel)-----	100	1-1/8	16	NC
Mainbearing Capscrews--	145 to 155	5/8	11	NC
<b>Manifolds</b>				
Manifold Clamp Stud Nuts -----	25	7/16	20	NF
Water Manifold Hold Down Capscrews-----	15	5/16	18	NC
Oil Filter Mounting Capscrews-----	25	3/8	16	NC
Oil Pan Capscrews-----	40	3/8	16	NC
Oil Pump Cover Capscrews-----	25	1/4	20	NC
Rocker Arm Bracket Studs and Capscrews -----	40	7/16	14	NC
Water Pump and Fan Shaft Nut -----	60	5/8	18	NF
Water Pump Mounting Capscrews -----	25	3/8	16	NC
Maximum Backlash at Tightest Point(All Timing Gears)-----				.002 to .005 Inch
Maximum Backlash at Loosest Point(All Timing Gears)-----				.006 Inch

National Fine\*  
National Coarse\*\*

## GENERAL TORQUE SPECIFICATION TABLE (Revised 5-64)

**USE THE FOLLOWING TORQUES WHEN SPECIAL TORQUES ARE NOT GIVEN**

**NOTE:** These values apply to fasteners as received from supplier, dry, or when lubricated with normal engine oil. They do not apply if special graphited or moly-disulphide greases or other extreme pressure lubricants are used. This applies to both UNF and UNC threads.

SAE Grade No.	5		8 *			
Bolt head identification marks as per grade Note: Manufacturing Marks Will Vary						
	Torque Foot Pounds			Torque Foot Pounds		
Bolt Size	Min.	Max.	Min.	Max.		
1/4"	9	11	12	15		
5/16	15	18	24	28		
3/8	35	40	45	50		
7/16	54	60	70	80		
1/2	80	90	110	125		
9/16	110	120	160	180		
5/8	150	165	220	240		
3/4	260	280	380	420		
7/8	360	400	600	660		
1"	540	600	900	1000		
1-1/8	720	800	1280	1440		
1-1/4	1000	1100	1800	2000		
1-3/8	1460	1680	2380	2720		
1-1/2	1940	2200	3160	3560		

\* Thick nuts must be used with Grade 8 bolts

## TIMING CHART

ENGINE	FULL LOAD GOVERNED ENGINE SPEED	NUMBER OF DEGREES
A 267D	1700 RPM	33° BTDC
A 267D	1900 RPM	33° BTDC
A 301D	1900 RPM	29° BTDC
Static Timing		
CASE-O-MATIC		STANDARD CLUTCH
SERIES	GASOLINE	LP GAS
730	5° ATDC	5° ATDC
830	2° ATDC	TDC
Running Timing (Full Load Engine Speed)		
730	27° BTDC	27° BTDC
830	30° BTDC	32° BTDC

## VALVE TIMING

With valve clearances set correctly, dial indicator mounted above valve stem, reading taken with valve .040" off its seat.

A267D and A301D Inlet Opening (No. 1 Cyl.) ----- 3° BTDC

A251G and A284G Inlet Opening (No. 1 Cyl.) ----- 6° ATC

**NOTE** "Inlet opening" is the only position on these engines that can be checked by the crankshaft pulley marks. Since the crankshaft pulley is only marked to 5° ATC, the 6° ATC mark will have to be measured and scribed on the pulley. Use the degree marks already on the pulley for measurement. If this position is correct, it can be assumed that the timing gears are correctly marked and properly assembled.

**SECTION**

**CC**

**SPECIFICATIONS FOR**

**CASE A401 DIESEL**

**CASE A377 GASOLINE AND LP GAS**

**ENGINES**

# diesel engines

## CC-2

### A401 ENGINE SPECIFICATIONS

Type ----- CASE Full Diesel, 6 Cylinder 4 Stroke Cycle Valve - in - Head Engine.

Cylinder Heads----- Multiple Cylinder Heads can be removed individually for Servicing (2 cylinders per head).

Firing Order ----- 1-5-3-6-2-4

Bore  
A401----- 4-1/8 Inches

Stroke ----- 5 Inches

Piston Displacement  
A401 ----- 401 Cubic Inches

Compression Ratio ----- 15 to 1

Oil Filter, Crankcase----- Replaceable Full Flow Element Type.

Method of Starting Diesel Engine ----- Engine Starts on Diesel Fuel (Electric Starting Motor).

#### Maximum Compression Pressures

ENGINE WARMED UP TO OPERATING TEMP. AND RUNNING AT 1600 RPM

Altitude	Sea Level	1000 ft.	2000 ft.	3000 ft.	4000 ft.	5000 ft.
Compression Pressure	480 to 510 PSI	455 to 485 PSI	435 to 465 PSI	415 to 445 PSI	395 to 425 PSI	375 to 405 PSI

Allowable Variance Between Cylinders - 25 Pounds Pressure at 1600 RPM

#### CYLINDER SLEEVES

Type ----- Replaceable Wet Type:Two Rubber O-Ring Seals carried on each sleeve.

Inside Diameter of Sleeve Bore  
A401----- 4.125 to 4.126 Inches. Replace Sleeve when inside Diameter below Top Ring Ridge Exceeds 4.133.

Piston Clearance in Sleeve (At Skirt)  
A401 ----- .0045 to .0055 Inch

Cylinder Sleeve Out-of-Round ----- Max. .002 Inch

#### PISTON AND PISTON PINS

Piston Material  
A401 ----- Special Alloy Iron;Parco-Lubrized

Piston Weight (Less Pin)  
A401----- 4.742 to 4.758 Pounds

Diameter of Piston at Top of Skirt (Below Oil Ring)  
A401----- 4.106 to 4.109 Inches

Diameter of Piston at Bottom of Skirt  
A401----- 4.1205 to 4.1215 Inches

Piston Pins----- Full Floating Type:Held in Position with Snap Rings in Piston. Replaceable Bronze Bushing in Connecting Rod.

Piston Pin Length  
A401----- 3.395 to 3.405 Inches

Piston Pin Diameter  
A401----- 1.3583 to 1.3586 Inches

Piston Pin Fit in Piston  
A401 ----- .0007 to .0012 Inch. When Pin is lubricated with Light Engine Oil and held upright in Vise, Weight of Piston should allow it to slide slowly into position over Pin.

Piston Pin Fit in Connecting Rod Bushing  
A401 ----- .0004 to .0011 Inch

#### PISTON RINGS

Rings Per Piston ----- 4- (3 Compression and 1 Oil) .

Compression Rings  
Width of Ring (All 3) ----- .0930 to .0935 Inch

Ring End Gap(All 3)when Compressed in .  
4.125 Inch Cylinder A401----- .013 to .023 Inch

Side Clearance in Groove of 1st(Top) Ring  
A401 ----- .003 to .0045 Inch

Side Clearance in Groove of 2nd and 3rd Ring----- .0025 to .004 Inch

Oil Ring-----To install Replacement Ring, Follow Instructions Packed with Rings.

Width of Rings (Original Equipment)  
A401 ----- .2455 to .2485 Inch

Replacement Ring ----- .2441 to .2474 Inch

Side Clearance in Groove(Original Equipment)  
A401----- .0025 to .0065 Inch

Replacement Ring  
A401 ----- .0036 to .0079 Inch

#### CONNECTING RODS

Connecting Rod Bushing -----Replaceable Bronze Bushing Replacement Bushing must be Reamed.  
A401 ----- Use 1.3590 to 1.3594 Reamer

Piston Pin Hole Diameter in Rod (Without Bushing)  
A401----- 1.483 to 1.485 Inches

Inside Diameter of Piston Pin Bushing in Rod  
1.3590 to 1.3594 Inches: Install New Bushing if inside Diameter Exceeds 1.363 Inches.

Connecting Rod Bearing ----- Replaceable, Precision, Steel Backed Copper Lead Alloy Liners.

Connecting Rod Capscrews ----- Self Locking Type, No Lock Wires Required - May Be used More Than Once.

Connecting Rod Length (Center to Center Between Pin Hole and Bearing Journal Hole)-----10.499 to 10.501 Inches

Bearing Liner Width ----- 1.625 Inches

Diameter of Crankshaft Journal Hole in Rod(Without Liner) ----- 2.9005 to 2.9010 Inches

Inside Diameter of Bearing Liner(Standard Liner in Place in Rod and Capscrews Tight)----- 2.7503 to 2.7518 Inches

Diameter of Crankshaft Rod Journal -----2.748 to 2.749

Clearance Between Rod Bearing and Crankshaft Journal ----- .0013 to .0038 Inch; Install New Bearing Liners When Clearance Exceeds .006 Inch

Undersize Bearing Liners Available for Service ----- .002,.010,.020,.030 Inch

Allowable Connecting Rod Bearing End Play ----- .005 to .012 Inch

#### CRANKSHAFT AND MAIN BEARINGS

Crankshaft ----- Balanced; Drilled to Provide Pressure Lubrication to Main and Connecting Rod Bearings.

Type Main Bearings----- Replaceable, Precision, Steel Backed Copper - Lead Alloy Liners.

Bearing Capscrews ----- Self Locking Type, No Lock Wires Required - May Be Used More Than Once.

Bearing Taking End Thrust -----5th(Two Replaceable Bronze Thrust Washers).

Crankshaft End Play(Measured at No. 5 Main Bearing)----- .004 to .012 Inch;Install New Thrust Washers if End Play Exceeds .020 Inch.

Oversize Thrust Washers for End Play Available for Service----- .006 Inch

Connecting Rod Bearing Journal Diameter ----- 2.748 to 2.749 Inches

Main Bearing Journal Diameter ----- 2.998 to 2.999 Inches

Crankshaft Main and Connecting Rod Journal Bearings out of Round ----- Maximum .001 Inch

Maximum Allowable Taper on  
Crankshaft Rod Journal ----- .002 Inch

Inside Diameter of Main Bearing Liners  
(In Place and Capscrews Tight) ----- 3.0006 to 3.0026 Inches

Clearance Between Main  
Bearing Liner and Journal ----- .0016 to .0046 Inch; Install  
New Bearing Liner when Clearance Exceeds  
.0065 Inches.

Width of 1st, 3rd, 5th and 7th  
Main Bearing Liners ----- 2.218 Inches

Width of 2nd, 4th and 6th Main  
Bearing Liners ----- 1.156 Inches

Width Between Crankshaft Main Bearing Cheeks

A. 3rd, 7th ----- 2.620 to 2.630 Inches

B. 2nd, 4th and 6th ----- 1.5575 to 1.5675 Inches

C. 5th ----- 2.624 to 2.626 Inches

Width Between Crankshaft Rod  
Bearing Journal Cheeks ----- 1.9975 to 2.0025 Inches

Undersize Main Bearing Liners  
Available for Service ----- .002, .010, .020, .030 Inch

Crankshaft Main Bearing  
Journals Should Be  
2.988-2.989 Inches for .010 Inch Undersize Bearing  
2.978-2.979 Inches for .020 Inch Undersize Bearing  
2.968-2.969 Inches for .030 Inch Undersize Bearing

Undersize Connecting Rod Bearing  
Shells Available for Service ----- .002, .010, .020, .030 Inch

Connecting Rod Crankshaft Journals Should  
Be Ground to ----- 2.738-2.739 Inches for .010 Inch Undersize Bearing  
2.728-2.729 Inches for .020 Inch Undersize Bearing  
2.718-2.719 Inches for .030 Inch Undersize Bearing

#### CAMSHAFT AND BUSHINGS

Number of Bearing Surfaces on Camshaft ----- 5

Type Bushing ----- Replaceable, Precision, Steel Backed Babbitt

Bushing Lubrication ----- Pressure Lubricated from Oil Pump; Cam-  
shaft Drilled to Provide Pressure Lubrication to  
Valve Rocker Arm Assembly, and to Timing Gear  
Train.

Diameter of Camshaft at Each Bearing Surface ---- 2.246 to 2.247 Inches

Inside Diameter of Each Bushing  
(Measured when in Place in Block) ----- 2.2484 to 2.2514 Inches

No. 1 (Front) Bushing Length ----- 1.656 Inches

No. 2, 3 and 4 Bushing Lengths ----- 1.438 Inches

No. 5 Bushing Length (w/cup type Camshaft plug) ----- 1.156 Inches

Camshaft End Play ----- Automatically Taken Up by Spring  
Loaded Thrust Button in Front End of Camshaft,  
Camshaft Washer Provided Between Drive  
Gear and Front Bearing.

Camshaft Washer

Outside Diameter ----- 3.240 to 3.260 Inches

Inside Diameter ----- 2.250 to 2.260 Inches

Thickness ----- .1225 to .1275 Inch

#### VALVE PUSH ROD LIFTERS

Type ----- Mushroom

Outside Diameter of End that  
Projects into Block ----- .8097 to .8102 Inches

Diameter of Bore in Block for Lifter ----- .8115 to .8130 Inch

Oversize Lifter Available for Service ----- .010 In. Oversize Lifter

Bore in Block Must Be Reamed to ----- .8215 to .8225 Inch for .010 Inch  
Oversize Lifter.

## VALVES

### Valve Tappet Clearance

Intake and Exhaust ----- .025 Inch, Engine Cold

### Exhaust Valves

Angle of Valve Face ----- 44 Degrees

Valve Length ----- 6.238 Inches

Maximum Valve Face Runout ----- .002 Inch as Determined with a Dial  
Indicator.

Diameter of Valve Stem --- .4000 to .401 Inch. Install New Valve if there  
is more than .002 Inch Difference in Diameter at  
any Point on Stem.

Diameter of Valve Head ----- 1.484 Inches

Inside Diameter of Valve Guide ----- .4045 to .4055 Inch (After Assembly).

Valve Stem Clearance in Guide ----- .0035 to .0055 Inch

### Exhaust Valve Seat Insert

Seat Angle ----- 45 Degrees

Seat Contact Width ----- .073 to .084 Inch

Outside Diameter of Insert  
A401 ----- 1.640 to 1.641 Inches

Inside Diameter of Insert  
A401 ----- 1.323 to 1.333 Inches

Maximum Allowable Seat Runout ----- .002 Inch as Determined  
with a Dial Indicator.

### Intake Valves

Angle of Valve Face ----- 44 Degrees

Valve Length ----- 7.243 Inches

Maximum Valve Face Runout ----- .002 Inch as Determined  
with a Dial Indicator.

Diameter of Valve Stem ----- .402 to .403 Inch Install New Valve  
if there is More than .002 Inch Difference in  
Diameter at any Point on Stem.

Diameter of Valve Head ----- 1.731 Inches

Inside Diameter of Valve Guide --- .4045 to .4055 Inch. (After Assembly)

Stem Clearance in Guide ----- .0015 to .0035 Inch

### Intake Valve Seat

Seat Angle ----- 45 Degrees

Seat Contact Width  
A401 ----- .086 to .096 Inch

Maximum Allowable  
Seat Runout ----- .002 Inch as  
Determined with a Dial Indicator

### Exhaust Valve Guides

Length ----- 3.218 Inches

Outside Diameter ----- .7510 to .7515 Inch

Inside Diameter ----- .4045 to .4055 Inch. (After Assembly)

Valve Stem Clearance in Guide ----- .0035 to .0055 Inch

Distance Above Head Guide Must Protrude ----- 1.062 Inches, Press Fit

### Intake Valve Guides

Length ----- 4.375 Inches

Outside Diameter ----- .7510 to .7515 Inch

Inside Diameter ----- .4045 to .4055 Inch (After Assembly)

Valve Stem Clearance in Guide ----- .0015 to .0035 Inch

Distance Above Head  
Guide Must Protrude ----- 1.062 Inches, Press Fit



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**VALVE SPRINGS**

Free Length ----- Approximately 2.438 Inches  
 Spring Pressure at Compressed Height of  
 1.484 Inches(Valve Open)----- 102 Pounds; Install New Spring if  
 Pressure is Less than 92 Pounds.  
 Spring Pressure at Compressed Height of  
 1.937 Inches(Valve Closed)----- 45 Pounds; Install New Spring if  
 Pressure is Less than 41 Pounds.

**ROCKER ARM ASSEMBLY**

Rocker Arm Bushing ----- Replaceable Precision Bronze Bushing  
 Number of Bushings ----- 12  
 Lubrication----- Pressure Lubricated; Crankcase Oil to  
 Rocker Arms Metered by Camshaft.  
 Oil Holes in Rocker Arm Shaft ----- Oil Holes must Face Push Rod  
 Side of Engine Only. Shaft Cannot Be Rotated.  
 Positioning of Exhaust  
 Valve Rocker Arms----- Spacer Washers Position Exhaust Valve  
 Rocker Arm and Eliminate End Play without  
 Binding.  
 Outside Diameter of  
 Rocker Arm Shaft----- .872 to .873 Inch  
 Inside Diameter of Rocker  
 Arm Bushing (Installed)----- .8745 to .8755 Inch  
 Rocker Arm Shaft Spring  
 Spring Pressure at Compressed Height of  
 1.562 Inches ----- 10 Pounds; Install  
 New Spring If Pressure is Less than 8.5 Pounds

**OIL PUMP**

Type ----- Positive Displacement, Gear Type Pump;  
 Driven Off Camshaft.  
 Pressure Relief Valve----- Maintains 40 to 45 Pounds Full Pres-  
 sure(Oil Warm,Engine Operating at Full Gov-  
 erned Speed) Relief Valve is Adjustable.

**WATER PUMP AND THERMOSTAT**

Type of System -----Pressurized Thermostat - Continuous  
 By-Pass Type; Forced Circulation (Pump).  
 Type Pump -----Impeller Vane Type  
 Radiator----- Heavy Duty Fin and Tube Type  
 Temperature Control----- By-Pass Type Thermostats

**FUEL SYSTEM**

Injection Pump ----- Robert Bosch,Type PES Multiple Plunger Pump  
 Direction of Pump Rotation-----Counter-Clockwise  
 Pump Mounting----- Right Hand Side of Engine  
 Pump Drive----- Gear Driven from Camshaft Gear at Camshaft Speed  
 Injection Pump Drive Lubrication ----- Pressure Lubricated From  
 Front Camshaft Bearing.  
 Injection Pump Drive Shaft Diameter ----- 1.3700 to 1.3705 Inches  
 Normal Clearance Between  
 Drive Shaft and Bushings ----- .001 to .002 Inch  
 Number of Drive  
 Shaft Bushings ----- 2- These Bushings are Not Re-  
 placeable. A Replacement Drive Housing with  
 Bushings in Place, Aligned and Fine Bored is  
 Provided.  
 Injection Pump Drive  
 Shaft End Play ----- Automatically Take Up By a Spring  
 Loaded Thrust Button on Front End of Drive  
 Shaft.  
 Thrust Washers Provided Between Front Drive  
 Gear and Drive Shaft Housing.

**Thrust Washer**

Outside Diameter ----- 2.085 to 2.105 Inches  
 Inside Diameter ----- 1.3725 to 1.3825 Inches  
 Thickness ----- .1225 to .1275 Inch  
 Timing Marks on Engine ----- Timing Marks Located on Crankshaft  
 Pulley Flange (0 through 5 and 20 through 35  
 Degrees Before Top Dead Center). Pointer  
 Located on Timing Gear Cover.

Fuel Injectors ----- Robert Bosch Pintle Type;Opening Pressure  
 1950 to 2100 Pounds Per Square Inch.

Governor ----- Mechanical Variable Speed Fly-Weight Centrifugal  
 Type; Integral Part of Injection Pump.

**Fuel Filters**

Fuel Tank Breather -----Fuel Tank Cap  
 Fuel Tank Water Trap ----- Located in Base of Fuel Tank  
 1st Stage Fuel Filter ----- Replaceable Element Type  
 2nd Stage Fuel Filter ----- Replaceable Element Type  
 Final Fuel Filter----- Replaceable Sealed"Can" Type Filter.

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