ENGINE SPECIFICATIONS

General

Oil pressure Control Valve (Front Cover) Spring Free Length	0.24 in (6mm) Minimum
Pully Hub Protrusion (Maximum)	.0961 in (2.44mm) Maximum

Side Housings

Oil seal wear limit	0.0008 in (0.02mm)
Overlapping oil seal wear limit	0.0004 in (0.01mm)
Limit of warpage	0.0016 in (0.04mm)
Side seal and outside oil seal wear limit	0.0039 in (0.10mm)

Rotor Housing

Width	3.1485 to 3.1500 in (79.970 to 80.010mm)
Max. Permissible difference in width	0.0024 in (0.06mm)

Rotor

Width	3.142 to 3.144 in (79.80 to 79.85mm)
Clearance of side housing and Rotor	
Standard	0.0047 to 0.0083 in (0.12 to 0.21mm)
Limit	0.004 in (0.10 mm)

Apex Seal

Warpage limit	0.0024 in (0.06mm)
Width	0.0752 to 0.0763 in (1.910 to 1.939 mm)
Height	
Standard	0.315 in (8.0mm)
Limit	0.256 in (6.5mm)
Clearance of apex seal and side housing	0.0051 to 0.0067 in (0.13 to 0.17mm)
Clearance of apex seal and rotor groove	
Standard	0.0024 to 0.004 in (0.062 to 0.102mm)
Limit	0.006 in (0.15mm)

Apex Seal Spring

Free height (short)	
Standard	0.130 in (3.3mm)
Limit	0.067 in (1.7mm)
Free Height (long)	
Standard	0.246 in (6.25mm) or more
Limit	0.181 in (4.6mm)

Side Seal

Thickness	0.0260 to 0.0270 in (0.661 to 0.686 mm)
Height	0.1122 to 0.1240 in (2.85 to 3.15mm)
Clearance of side seal and rotor groove	
Standard	0.0011 to 0.0031 in (0.028 to 0.078mm)
Limit	0.0039 in (0.10mm)
Clearance of side seal and corner seal	
Standard	0.0020 to 0.0060 in (0.05 to 0.15mm)
Limit	0.016 in (0.40mm)
Side seal protrusion (minimum)	0.020 in (0.5mm)

Oil Seal

Height	0.220 to 0.228 in (5.6 to 5,8mm)
Width limit of oil seal lip (shinny area)	0.020 in (0.5mm)
Oil seal protrusion (minimum)	0.020 in (0.5mm)

Corner Seal

Outer Diameter	0.4327 to 0.4336 in (10.990 to 11.014mm)
Height	0.268 to 0.276 in (6.8 to 7.0mm)
Corner Seal Protrusion (minimum)	0.020 in (0.5mm)

Main Bearing Clearance

Standard	0.0016 to 0.0031 in (0.04 to 0.08mm)
Wear Limit	0.0039 in (0.10mm)

Rotor Bearing Clearance

Standard	0.0016 to 0.0031 in (0.04 to 0.08mm)
Wear Limit	0.0039 in (0.10mm)

Eccentric Shaft

Eccentricity of rotor Journal	0.591 in (15.0mm)
Main journal diameter	1.6918-1.6923 in (42.970 to 42.985mm)
Rotor journal diameter	2.9122 to 2.9128 in (73.970 to 73.985mm)
Max. Permissible runout	0.0047 in (0.12mm)
End play	
Standard	0.0016 to 0.0028 in (0.04 to 0.07mm)
Limit	0.0035 in (0.09mm)
Main bearing inner diameter	1.6939 to 1.6949 in (43.025 to 43.050mm)
Rotor bearing inner diameter	2.9144 to 2.9154 in (74.025 to 74.050mm)

13B OVERHAUL STEPS

DISASSEMBLY

After removing Oil pan remove Oil strainer
- Remove front Oil Pressure Regulator cap spring and Piston

Remove Front Hub bolt
- Attach locking bar to flywheel
- Remove Front Flange Bolt
- Taking 19 MM socket and 24 inch breaker bar
- Only turn bolt about 1/4 inch

Remove Fly wheel Nut
- Use 54mm socket (2 1/8" will do also) and 24 inch breaker bar (or Pneumatic wrench)
- Use locking bar to flywheel
- Remove nut

Remove Front Eccentric Shaft Bolt and washer
- Remove oil thermostat and spring (and spacer if installed)
- Remove six front cover bolts
- Remove Hub
- Tap on Front Cover with Dead Blow Hammer to remove

Before Removing Oil Drive Chain - Check it
- Final middle link between the two shafts
- Push link out as far as you can
- Measure distance between chain links on both sides
- Push link in as far as you can
- Measure distance between chain links on both sides
- Difference between the two measurements is chain slack
- 3/8 " slack is max limits

Removing Oil chain Drive
- Take chisel and hammer and flatten lock washer below oil pump nut
  - Remove oil pump nut
- Remove oil pump drive sprocket and eccentric shaft drive Sprocket together

Remove Front Counter Weight
- Slide front counter weight off of shaft
- Remove thrust washer and inspect for wear
- Remove thrust bearing
- Remove front key
- Remove six stationary gear bolts (set on aside for later use)

Remove center plate and inspect it for wear
Remove selective spacer note letter on its side - record
Slide up the rear thrust bearing
Remove the rear thrust washer and inspect it
Now place one stationary bolt and replace it in one of the six holes
to temporary hold stationary gear in place

Remove Front Oil Seal
Carefully pry out the old seal from front Cover
Clean and inspect seal bore and lip contact surfaces
Gently tap a new seal into place with a manner and socket (Make certain spring side is inward)
Lubricate the seal lips with engine oil when installing the hub
Ensure key way in hub and eccentric shaft are aligned

Remove Oil Pump Bolts
Remove Oil pump and internal lobes

Remove flywheel with torque wrench if you have one
Install a two-bolt puller
Protect the back of the eccentric shaft from Puller bolt
with a cover over the eccentric shaft hole
Tighten up central puller bolt to put pressure on flywheel
Then tap flywheel lightly with hammer and remove
Take out flywheel key
Take electric tape and wrap around threads of eccentric shaft
where flywheel nut goes
Remove six retaining bolts for rear stationary gear
Use a seal puller or two screwdrivers to remove stationary gear
Once loosened, then pull straight up to remove gear

Tension Bolts
Break tension bolts free with a breaker bar and 17mm socket
in a crisscross pattern
Then use torque wrench to complete loosening tension bolts
Lift bolts out of block

Remove Rear Housing
Take dead blow hammer and tap up until “O” rings release
Then pull rear housing straight up to remove
Remove dowl pins at 11 and 5 O’clock position

Remove Rear Rotor Housing
Tap with Dead Blow Hammer until housing releases
Pull rotor housing straight up

Remove Rear Rotor
Work rotor back and forth to break seals from intermediate housing

Then pull rotor straight up over eccentric shaft

Remove Center Housing
- Rotate eccentric shaft lob toward intake port
- Remove two more dowl pins at 11 and 5 O'clock position
- Tap with dead blow hammer on housing until "O" rings release
- Lift eccentric shaft approx. 1 " up
- Rock center housing over lobe and remove

Remove Front Rotor Housing
- Tap with dead blow hammer until "O" rings release
- Lift straight up and remove
- Remove eccentric shaft by pulling straight up

Remove Front Rotor
- Rotate around to release seals
- Then rotate straight up

Remove Front Stationary gear
- Remove the one bolt
- Remove Front Stationary Gear by lowering

CLEANING AND INSPECTION

Track location of identical parts of rotor using parts box or diagram
- Mineral Sprits for cleaning parts
- Gallon size of carburetor cleaner
- Hot soapy wash for cast and porous parts
- Oven Cleaner
- Scouring pad

Thrust Washers and Bearings
- Fore and aft thrust washers and bearings and thrust plate
- Visually check for wear pitting grooves
- End play clearance range between .001 and .003

Oil Pump
- Disassemble by removing set screw
- Take out rear outer rotor (dot faces open end of pump)
- Remove main shaft with two inner rotors and spacer
- Remove front outer rotor (dot of rotor faces open end of pump)
- Check clearance of front outer rotor and front lobes <0.008"
- Check clearance of front outer rotor and housing <.008"
- Place front outer rotor in housing (dot to open end of housing)
- Place main shaft in housing with slot in center rotor
- Align slot with setscrew
- Insert set screw with red loctite
- Slide rear rotor clearance rotor/housing <.008"

Place straight edge on top and check clearance between it and rear rotor face<. 0019”

Front Pressure Regulator Inspection

Inspect piston for any deep gauges that you can catch finger nail in
Some scuffing is normal
Take magnet and stick in side piston
Place piston in bore and side back and forth to see that it moves freely

Rear Pressure Regulator

Check through discharge port at piston for dirt or gouge
Place upside down; place screwdriver on piston and push down several times
if action if free then pressure regulator is OK

Tension Bolts

While washing tension bolts remove sealing washer and discard
Clean thread and head on wire brush
Get 10x1mm die put WD40 on it and put die on bolt threads and run it down with about a 1/4” sticking above the die

Stationary Gears

Look at gear teeth for chipping gauging or excessive wear
Check bearing surface for any significant wear
Mic main bearing
Measure on top (teeth end) at four points 90deg apart
with telescoping gauge
Do same at other end of bearing
Record readings
Use largest figure to calculate bearing clearance

Eccentric Shaft

Remove the two oil jets with large bladed screwdriver and unscrew jet
Remove spring and check ball with magnet
Inspect flywheel end of eccentric shaft threads
Inspect pilot bearing by rotating it - if bad - replace
Blow compressed air in every oil hold
Visually inspect for scratches or scars anything you can catch fingernail on is not good
Mic eccentric shaft for bearing and journals and each end of journal length
Rotate eccentric shaft 90 deg and measure again
Use smallest measurement to calculate oil clearance
A good shaft will not vary more than 0.0003

Clean Side Housings

Dig out inner water jacket “O” ring
Use specially ground screwdrivers to remove “O” and scrape grove
Combustion “O” ring has two liners and rubber center section make certain you get out liners
Scrape water jacket area with blade
Scrub with scouring pad or scotch brite pad in air drill
Baked on grease and grime use house hold oven cleaner

Scrub and let set for two hours then wash in hot soapy water
Blow dry with air and rescrape grooves

Chase bolt holes with thread taps
Use 6x1 use for oil pump and oil pump pick up
Use 8x1.25 stationary gears , front cover, and intake boltholes
Use 10x1 to chase tension boltholes
Use 10 x 1.25 for bell housing bolts holes
Use WD40 for lubricating hose to be chased

End and Intermediate Housings Inspection
Check for rust on housing and pitting
Check for roughness
Check outer wall of inner wall on casting for cracks
Land Thickness >.061

3520 Flatness
Slip feeler gauge under straight edge
Pull on feeler gauge - if it moves straight edge then surface is flat
Use .0015 feeler gauge and check all four sides at three places

Side seal wear
Use dial indicator gauges and set to zero on surface
Step <.004

3570 Rotor Oil Seal Wear
Inner Oil seal
Check “football” area
Rock back and froth over wear area
Outer Oil seal wear

3730 Clean out side of rotor housings in parts cleaner
Scrub with toothbrush
Scotch brite pad to clean carbon
3780 Remove all water jacket residue and oil ring stuff
Scrape sides with utility blade held perpendicular to housing
Use 400 grit sanding block to clean up sides further
Keep area lubricated and use long even strokes

3835 “O” Ring Area Check
Check “O” ring area of rotor housing for pitting
If minor pitting then hylamyer will handle it
If heavy pitting is found use JB Weld to repair

3860 Rotor Housing Minimum Width Measurements
Measure inside nearest rotor at six places

Record smallest measurement you get
Maximum rotor width is subtracted from this smallest measurement of rotor housing to get rotor clearance = .0001"

3920 Rotor Housing Inspections
Beveling on edges OK if taper of bevel does not exceed .0020
Flaking chrome OK if less than 3/16
Scratches at exhaust rotor
Edge Groove
Scratches between spark plugs

4025 Marking Rotors
"F" for front rotor
A, B, C for Apexes
"R" for Rear rotor
Gear side or Open side
Front rotor has corner section of apex seal on open side
Rear rotor has corner section of apex seal on gear side
Label rotors, face and apex corner on diagram
Mark rotor and apex corners with alpha stamp

4138 Remove Inner Oil Seal from Rotor
Discard old "O" Rings
Keep Oil Seal Springs and Oil Seals together

4196 Remove corner seal with Magnet
Remove corner seal spring
Remove and discard old rubber plug

4220 Remove side seal with Magnet
Remove Side Seal Springs with xcato knife (carbon make it necessary to soak first)

4248 All Rotor Parts Remove
No need to track corner seal and side seal springs, as they will be replaced

4280 Clean small rotor parts in jar with carburetor cleaner

4304 Rotor Part Washing Fixture

4388 Clean Rotors
Use blade to scrape carbon off combustion area
Next brush brass brush to clean same area
Rinse hollow section thoroughly as they tend to hold lot of oil
Put hanging wire on rotor but not through bearing area

4462 Decarbonizing Grooves of Rotors
- Flattened xacto knife blade
- Special Ground screw driver
- Spray groove with Carburetor cleaner and clean with tool (screwdriver)
- Clean rotor oil grooves the same way

4550 Clean Corner Seal Pockets
- Get wet with Carb Cleaner
- Scrape carbon with screwdriver

4570 clean apex seal groves

4580 Soak rotor in cleaning solution again

4590 Inspection of Rotor
- Look for obvious damage on thrust service of stationary gear or open side thrust
- Check apex seal groove for not burs
- Check face for damage

4605 Measure Rotor Width at Thrust Surfaces
- Flat spot on stationary gear
- Large inner ring on open side
- Measure six places
  - Below each apex seal
  - Midway between each apex seal
- Record readings
- Compare with maximum rotor housing width = 0.001
- If measurements differ considerably, stationary gear may have slipped out
- Can tap it back in with soft hammer

4680 Measure Rotor Bearing dimensions
- Measure 4 places 90deg apart and at each end of bearing

4719 Spring inspection
- Check free high of apex spring
- Small spring max height .130", min height .067"
- Check free height of large apex spring
- Max .246", Min .181"

4780 Rotor Oil Seal Spring
- Check each end and is bent up at least 45 deg from leading flat
- Very important to put correct springs on correct rotor face
  - With round tap facing down rectangular taps pointing up
  - Front rotor open side gets rectangular tabs points to the left
  - Front rotor gear side gets rectangular tabs points to the right
  - Rear rotor open side gets rectangular tabs points to the right
  - Rear rotor gear side gets rectangular tabs points to the left

4830 Side Seal Springs

Check each peak on each spring to make certain none are flat and likely break
Lay together and make certain the hold a uniform shape

4850 Twist corner seal spring to reduce flatness

4854 Check Corner Seal

Inspect for damage
Measure outside dia corner seal .432 -.433
Measure height .268 -.276

4883 Check side seal

Check for damage
Measure thickness .026-.027”
Measure width .112 - .124”

4905 Measure shinny side of oil seal keeper

Separate jaws of dial caliper by .20"
If shinny area is wider oil seal keeper is worn

4932 Rotor Dry Assembly

Install springs and check clearances
Install corner seal springs
Push down to bottom

Install correct corner seal
Push down and make sure it moves up and down on spring
Corner seal protrusion min .020”