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IX

IX

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OPERATION

AND

MAINTENANCE

MANUAL

FOR

IX SERIES

FOUR CYLINDER ENGINES

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IX

IX

**OPERATION AND MAINTENANCE
MANUAL**

**FOR
IX SERIES ENGINES**

SERIAL NUMBERS
400001 - 420000
1250001 - 1300000
2400001 - 2500000

FIVE GEAR MODELS

MODEL	BORE	STROKE	NACC-H.P.	PISTON DISPL.
IX	2½"	x 4"	10	79
IXA	3"	x 4"	14.4	113
IXB	3¼"	x 4"	16.94	133

THREE GEAR MODELS

IX-3	2½"	x 4"	10	79
IXF-3	2¾"	x 4"	12.1	95
IXA-3	3"	x 4"	14.4	113
IXK-3	3⅛"	x 4"	15.89	123
IXB-3	3¼"	x 4"	16.94	133

CB preceding model (CB-IXB) denotes counter-balanced crankshaft.

M or MM following model (IXAM or IXBMM) denotes Marine Engine.

C following model (IXAC-IXBC-IXBCM) denotes counter-clockwise engine.

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DESCRIPTION AND MAINTENANCE

This section covers a brief description and function of the various parts of the engine along with complete instructions covering the repair, disassembly and reassembly of these various component parts of the IX series engine.

This section has the various subjects arranged alphabetically for convenience in locating.

ACCESSORY DRIVE

The accessory drive, Illustration No. 2, is used to drive the magneto or distributor, on the IX-5 engine when no water pump is used.

This unit consists of a gear driven shaft which rotates in a bushing that is pressed into a sleeve which is fastened to the cylinder block with cap screws.

TO REMOVE FROM ENGINE

1. Remove magneto or distributor.
2. Remove accessory drive attaching screws and pull drive out to rear.

TO DISASSEMBLE

(Reference letters refer to Illustration No. 3)

1. Remove magneto drive coupling and woodruff key.
2. Pull shaft E and gear C forward out of sleeve A.
3. Press bushing F out of sleeve. A special tool (13234-A) may be purchased from Hercules Motors Corporation to remove this bushing.
4. Remove oil seal retainer I and seal H.
5. If necessary, press shaft E out of gear C.
6. Although it is seldom necessary to remove the thrust plunger from the shaft, it may

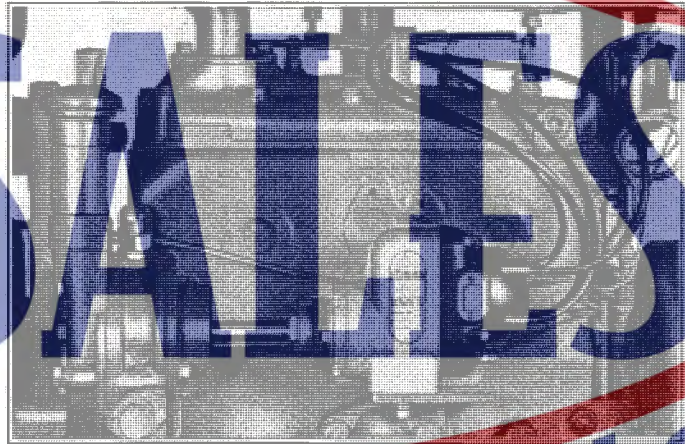


Illustration No. 2



Illustration No. 3

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be removed in the following manner. With a torch quickly heat the plunger to anneal it. Allow the plunger to cool, then drill through the plunger with a $\frac{1}{16}$ " diameter drill and tap the hole with a $\frac{3}{8}$ " - 16 tap. Using a $\frac{3}{8}$ " cap screw of suitable length the plunger may be pulled from the shaft.

TO REASSEMBLE

1. Insert seal H in retainer I and press into housing.
2. Press bushing F into housing. The same tool (13234-A) may be used to replace the bushing. These bushings are machined to provide the correct shaft clearance. However, the shaft should be tried in the bushing. See Clearance Table, Page 77.
3. Insert Woodruff key B in shaft, then press shaft into gear and press thrust plunger A into shaft.
4. Place thrust washer D on shaft, oil shaft and bushing, then insert shaft in sleeve.

TO INSTALL ON ENGINE

1. Place new gasket on sleeve and assemble sleeve to engine and fasten in place with cap screws as removed.
2. Install magneto coupling key and magneto drive coupling, if magneto is used.
3. Retime ignition system. See magneto or distributor ignition timing, Page 54, 55 or 56.

AIR CLEANER

Since dirt is the greatest enemy of any internal combustion engine, it is necessary to take every precaution to prevent it from entering the engine. Therefore one of the most essential preventative measures is proper maintenance of the carburetor air intake air filter. These units should be cleaned at least once a day or if operating in very dusty conditions it should be cleaned every six or eight hours. All connections between the air cleaner and carburetor must be air tight. It is possible, under certain conditions, for enough abrasive laden air to be drawn into the engine through a loose connection to cause rapid wear of the pistons, piston rings and upper cylinder surfaces.

The screen type air cleaner should be removed and washed in gasoline or kerosene, then dipped in clean lubricating oil and replaced on the engine.

The oil bath type air cleaner should have the oil cup removed, washed, and filled to the proper level with clean lubricating oil and replaced on the air cleaner.

Each 100 or 150 hours or until a satisfactory schedule can be worked out, depending on actual operating conditions, the complete air cleaner should be removed from the engine and thoroughly washed and cleaned. (This operation should not be necessary if the oil cup or screen has been cleaned daily.) A dirty, clogged air cleaner causes loss of power, excessive fuel consumption and dilution of the lubricating oil from the excess fuel.

Illustration No. 4 shows a typical oil bath type air cleaner installation. Illustration No. 5 shows the oil cup removed for cleaning and also shows the instructions for filling with oil when servicing the air cleaner. Illustration No. 6 shows the filtering element. This element must be clean to allow free passage of air or the air cleaner will act as a choke which would cause a rich carburetor mixture and excessive crankcase dilution and loss of power.



Illustration No. 4

BATTERY IGNITION DISTRIBUTOR DRIVE
(See Water Pump)

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BAYONET GAUGE

The bayonet gauge is used to determine the amount of oil in the oil pan and is readily accessible. See Illustration No. 7. The oil level in the oil pan should always be maintained at or near the 4/4 mark, Illustration No. 7. Never allow level to go below 2/4 mark.

BELLHOUSING OR FLYWHEEL HOUSING

The bellhousing is a casting which not only covers the rear end of the block and oil pan but also forms a housing for the flywheel and clutch. It also is the rear motor support and to it the transmission is fastened.

REMOVING BELLHOUSING

1. Drain crankcase oil.



Illustration No. 5



Illustration No. 6

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Illustration No. 7



Illustration No. 8

2. Remove clutch.
3. Remove flywheel. See Illustration No. 32.
4. If engine is in unit, place suitable supports under the rear of oil pan to support engine. Block must be large enough so that oil pan is not damaged. Do not use jack unless large block is placed between jack screw and oil pan.
5. Remove rear motor support screws.
6. Remove bellhousing attaching screws.
7. Pull bellhousing away from engine. It may be necessary to tap housing with a soft hammer to loosen from saddle or gasket sticking to block.



Illustration No. 9

INSTALLING BELLHOUSING

1. Cement new gasket to bellhousing, allowing cement to dry sufficiently so gasket will not skid.
2. Assemble bellhousing to engine. Tighten the screws so that they are almost tight.
3. With dial indicator mounted as shown in Illustration No. 8, check concentricity of bellhousing bore with crankshaft. (This should be within .010".) The bellhousing may be shifted slightly on the screws if necessary. When bellhousing is properly centered, tighten attaching screws and install rear motor support screws. Recheck after tightening, as housing may have moved during this operation.
4. Set indicator as shown in Illustration No. 9 and check face of bellhousing. This should not exceed .006", out of square.

3. A slight pressure will be exerted by the rocker arm springs while the screws are being pulled tight. However, if this pressure is excessive, remove pump and turn engine over one turn and endeavor to install the pump as outlined above. This light pressure can be noted but it should not be so excessively strong as to tend to bend the rocker arm or prevent installation.

GEAR COVER

The gear cover used on this engine is usually cast iron and covers the gear train at the front of the engine.

The governor and front support are mounted on the gear cover. The camshaft, idler shaft and water pump end thrust is controlled by suitable adjusting screws assembled in the gear cover.

TO REMOVE THE GEAR COVER

1. Assuming that the radiator has been removed, disconnect governor to carburetor control rod hooked to governor lever, Illustration No. 43.
2. Remove governor attaching screws and lift governor away from gear cover.
3. Remove starting crank grab and fan drive pulley.
4. Remove front motor support screws. If necessary to raise front of motor to release the front support, use a large block of wood under front of oil pan so jack will not damage it. The front support may be removed from the gear cover if necessary.
5. Remove gear cover attaching screws and pull gear cover forward away from the engine. The crankshaft oil seal will pull off the shaft with the gear cover. If no gasket or seals are available, use care when removing these parts.



Illustration No. 41

TO ASSEMBLE GEAR COVER TO THE ENGINE

1. Wash and clean the gear cover and fasten a new gasket to the gear cover with gasket cement. Loosen thrust screw lock nuts and back screws out two or three turns.
2. Carefully install the oil seal on the crankshaft and slide the seal about one inch back on the shaft. If available, use new seal and ring.
3. Assemble the gear cover on the seal. Use care that the seal is properly sealed in the groove provided for it in the gear cover.
4. In order to avoid any difficulty with the oil seal sleeve when pushing the gear cover back in place, loosen the oil pan and allow the front end of the oil pan to drop $\frac{1}{8}$ " to $\frac{1}{4}$ ". Then push the gear cover back into place. (To do this, relocate jack supporting engine.)
5. Check to see that the oil seal sleeve is properly located in the oil pan.
6. Start the gear cover attaching screws and with some tension on the lockwashers of the gear cover to cylinder block screws, tighten the oil pan screws, also the oil pan to gear cover screws. After these are tight, draw up the gear cover screws. Keep seal concentric with crankshaft.
7. Assemble front motor support.



Illustration No. 42



Illustration No. 43

8. Assemble fan drive pulley and starting crank grab.
9. Assemble governor to gear cover and fasten in place with cap screws.
10. Connect governor to carburetor control rod.
11. Adjust camshaft, idler shaft and water pump thrust screws. To adjust these screws, loosen the lock nut and turn the screw until it contacts the thrust plugs in their respective shafts, then turn the screw out approximately $\frac{1}{8}$ th turn and tighten the locknut. See Illustration No. 44.

GENERATOR

A periodic inspection should be made of the charging circuit. The intervals between these checks will vary depending upon the type of service. Dirt, dust and high speed operation are factors which contribute to increased wear of the bearings, brushes, et cetera. Under normal conditions an inspection of the generator should be made every 100 hours.

1. **Wiring**—A visual inspection should be made of all wiring to insure that there are no broken wires and that all connections are clean and tight. Special attention should be paid to the ground connections at the battery and generator.
2. **Commutator**—If the commutator is dirty or discolored it can be cleaned by holding a piece of 00 sandpaper against it while turning the armature slowly. Blow the sand out of the generator after cleaning the commutator. If the commutator is rough or worn the generator should be removed from the engine, the armature removed and the commutator turned down.
3. **Brushes**—The brushes should slide freely in their holders. If the brushes are oil soaked or if they are worn to less than one-half of their original length they should be replaced.
4. **Lubrication**—Add 3 to 5 drops of medium engine oil to the oilers in the end heads every 100 hours of operation.

If the generator does not function properly after the above checks, the generator and the regulator or circuit breaker should be taken to an authorized service station for inspection and repairs.



Illustration No. 44



Illustration No. 45

TABLE OF CLEARANCES

TABLE OF CLEARANCES

(All Dimensions In Inches)

	Min.	Max.
Valve tappet clearance, intake (Hot) .....	.006	
Valve tappet clearance, exhaust (Hot) .....	.008	
Valve seat width, intake .....	.125	
Valve seat width, exhaust .....	.125	
Valve stem clearance in guide, exh. & int. ....	.001	.0015
Valve stem clearance in guide, fire and marine, exhaust ..	.0025	.003
Push rod or tappet clearance in guide .....	.00075	.001
Idler bearing clearance .....	.001	.0015
Cam bearing clearance .....	.0015	.0025
Crankshaft main bearing clearance .....	.002	.0025
Crankshaft end thrust .....	.002	.004
Bellhousing on chamfer .....	.014	.020
Connecting rod bearing .....	.001	.0015
Connecting rod side clearance .....	.005	.010
Accessory drive bearing clearance .....	.0015	.002
Accessory drive shaft end clearance .....	.002	.003
Water pump bearing clearance .....	.0015	.002
Water pump shaft end clearance .....	.002	.005
Gear cover clearance around crankshaft .....	.008	.015
Oil pan clearance around crankshaft .....	.008	.015
Accessory drive gear back lash .....	.002	.004
Crankshaft gear back lash .....	.000	.002
Idler gear back lash .....	.002	.004
Oil pump gear back lash .....	.008	.010
Piston clearance, C.I. or Alum.—“IX & IXF” .....	.002	.0025
Piston clearance, C.I. or Alum.—“IXA” .....	.0025	.003
Piston clearance, Cast Iron—“IXB” .....	.003	.0035
Piston clearance, Aluminum “IXB” .....	.0025	.003
Piston ring clearance in groove (Alum.) .....	.0015	.0035
Piston ring clearance in groove (Cast Iron) .....	.0015	.0025
Piston ring gap .....	.015	.020
Piston pin clearance (Cast Iron piston)0005	
Piston pin clearance (Aluminum piston)0001	.0002

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WRENCH TENSION

	Inch	Pounds
Cylinder Head		420
Connecting Rod		504
Main Bearings		924

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