

Service Manual

ENGINE, FUEL AND
ELECTRICAL SYSTEMS
(Onan)

GSS-1484-2
September, 1983

INTERNATIONAL HARVESTER
NORTH AMERICA OPERATIONS
AGRICULTURAL EQUIPMENT GROUP
401 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS, 60611, U.S.A.

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Due to a continuous program of research and development, some procedures, specifications and parts may be altered in a constant effort to improve our products.

When changes and improvements are made in our products, periodic revisions may be made to this manual to keep it up-to-date. It is suggested that customers contact their dealer for information on the latest revision.

LIBRARY FILING INFORMATION

Agricultural Equipment Dealer Library

1. File this manual GSS-1484-2 after Divider Tab GSS-1484. Destroy manual GSS-1484-1.
2. On page 4 of the Backhoes, Loaders and Compact Loaders section of the index, change the form number under the 4130 entry to GSS-1484-2.

Outdoor Power Products Dealer Library

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2. On page 15 (Cub Cadets and Equipment) of your OPP library index, enter the manual description, form number and book filed in under the 582, 682, 782 and 982 heading.
3. On page 21 (Compact Loaders and Equipment) of your OPP library index, change the form number of GSS-1484 to GSS-1484-2.

ENGINE, FUEL AND ELECTRICAL SYSTEMS (Onan)

GSS-1484-2
September, 1983

MODEL + SPEC #

B48G-GA019.9/3707B

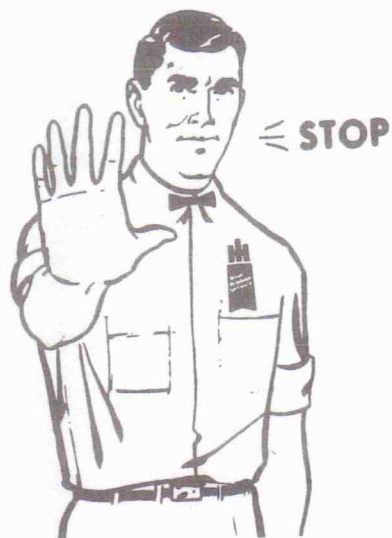
SERIAL #

L793503197

OIL CAPACITY
1.75 QUARTS

COMPLETE REVISION

ENGINE, FUEL AND
ELECTRICAL SYSTEMS
(Onan)



Replace GSS-1484-1 with GSS-1484-2.

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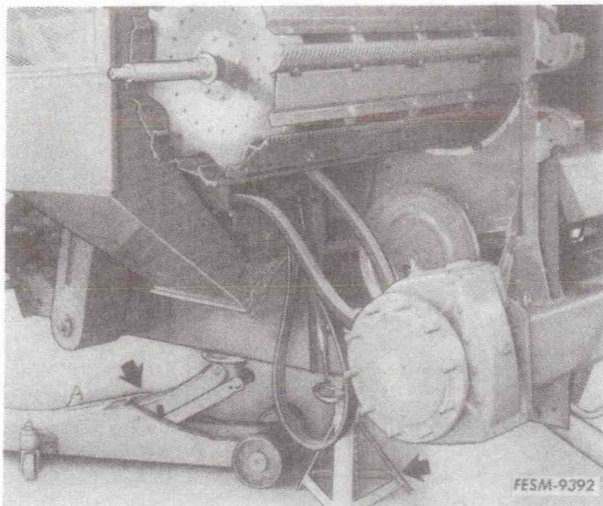
ELECTRICAL SYSTEM

WORK SAFELY – FOLLOW THESE RULES



This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions.

1. To prevent injury, do not allow children or by-standers around the machine while it is being adjusted and/or serviced.



2. Always use safety stands in conjunction with hydraulic jacks or hoists. Do not rely on the jack or hoist to carry the load, they could fail.

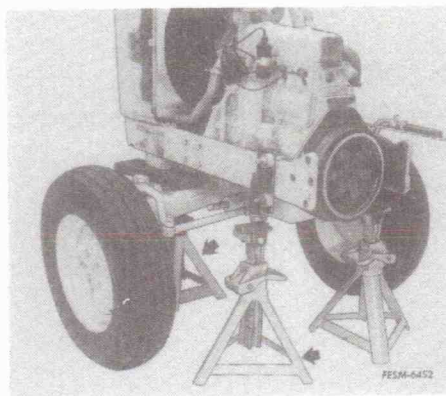


3. Always wear safety glasses when using a hammer, chisel or other tools that may cause chips to fly.

4. Keep work area organized and clean. Wipe up oil or spills of any kind. Keep tools and parts off of the floor. Eliminate the possibility of a fall which could result in a serious injury.

5. Be sure to reinstall safety devices, guards or shields after adjusting and/or servicing the machine.

6. After servicing, be sure all tools, parts, or servicing equipment are removed from the machine.



7. When splitting tractors, or disassembling machines, be sure to use safety stands and adequate supports to prevent tipping or rollover.



8. Use a safety catch on all hoist hooks. Do not take a chance, the load could slip off of the hook.



9. When using an acetylene torch always wear welding goggles and gloves. Keep a "charged" fire extinguisher within reach. Be sure the acetylene and oxygen tanks are separated by a metal shield and are chained to the cart. Do not weld or heat areas near fuel tanks or fuel lines and utilize proper shielding around hydraulic lines.



10. Always use a safety bar to block hydraulic cylinders. Never rely on the machine hydraulic system to hold when working on loaders, etc. A hydraulic line or cylinder could fail or someone could accidentally strike the control levers causing the loader to fall.

11. Electrical storage batteries give off highly inflammable hydrogen gas when charging and continue to do so for some time after receiving a steady charge. Do not under any circumstances allow an electric spark or an open flame near the battery. Always disconnect a battery cable before working on the electrical system.

12. Hydraulic fluid escaping under pressure can have enough force to penetrate the skin. Hydraulic fluid may also infect a minor cut or opening in the skin. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can result if medical treatment is not given immediately.

Do not attempt to repair or tighten hoses that are under pressure, when the boom is raised, or with the tractor engine running. Cycle all hydraulic control valves to relieve all pressure before disconnecting the lines or performing other work on the hydraulic system. Make sure all connections are tight and hoses and lines are in good condition before applying pressure to the system. To locate a leak under pressure, use a small piece of cardboard or wood. Never use hands.

13. Handle gasoline with care - it is highly flammable:

a. Use approved gasoline container.

b. Never remove the fuel tank cap or fill the fuel tank when the engine is running, is hot, or indoors. Also, do not smoke when working around flammable fuel.

c. When refueling, keep the hose and nozzle of the funnel and container in contact with the metal of the fuel tank to avoid the possibility of an electric spark igniting the fuel. Do not overfill the fuel tank - overflow creates fire hazard. Wipe up spilled gasoline.

d. Replace fuel tank cap securely.

14. Always use a protective fixture when inflating tubeless tires that have been repaired or are loose on the rim. Do not inflate over 30 psi to seat the tire bead.

15. Use pullers to remove bearings, bushings, gears, cylinder sleeves, etc. when applicable. Use hammers, punches and chisels only when absolutely necessary. Then, be sure to wear safety glasses.

16. Be careful when using compressed air to dry parts. Use approved air blow guns, do not exceed 30 psi, wear safety glasses or goggles and use proper shielding to protect everyone in the work area.

17. Do not wear rings, wrist watches or loose fitting clothing when working on machinery, they could catch on moving parts causing serious injury. Wear sturdy, rough-soled work shoes. Never adjust and/or service a machine in bare feet, sandals or sneakers.

18. Excessive or repeated skin contact with sealants or solvents may cause skin irritation. In case of skin contact, remove sealant or solvent promptly by washing with soap and water.

IMPORTANT: The above is only a partial list of safe work rules. In addition, always refer to the Operator's Manual for the specific machine for additional safe work rules regarding the machine operation.

STANDARD TORQUE DATA FOR NUTS AND BOLTS— FOOT POUNDS

Recommended torque for all Standard Application Nuts and Bolts, provided:

- A. All thread surfaces are clean and lubricated with SAE-30 engine oil. (See NOTE.)
- B. Joints are rigid, that is, no gaskets or compressible materials are used.
- C. When reusing nuts or bolts use minimum torque values.

NOTE: Multiply the standard torque by:







- .65 when finished jam nuts are used.
- .70 when Molykote, white lead or similar mixtures are used as lubricants.
- .75 when parkerized bolts or nuts are used.
- .85 when cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.
- .90 when hardened surfaces are used under the nut or bolt head.

1 FOOT POUND = 1.355 NEWTON METERS

Bolt or Stud Diameter		Type 1 Studs Only		Type 1 Bolts 6" length or less		Type 1 Bolts longer than 6"		Type 5 (all lengths)		Type 8 (all lengths)			
										Only when used† in cast (gray) iron		All other applications	
Inches	MM	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	6.4	5	6	5	6	3	3	9	10	11	13	12	14
5/16	8.0	12	13	12	13	6	7	19	21	24	27	27	30
3/8	9.5	21	24	21	24	11	13	33	37	43	47	45	50
7/16	11.1	35	38	35	38	19	21	53	60	69	76	75	85
1/2	12.7	52	58	52	58	29	32	80	90	104	117	115	130
9/16	14.3	70	80	70	80	41	46	115	130	150	170	165	185
5/8	15.9	98	110	98	110	57	63	160	180	210	230	220	250
3/4	19.0	174	195	174	195	100	112	290	320	350	390	400	450
7/8	22.2	300	330	162	181	162	181	420	470	570	630	650	730
1	25.4	420	470	250	270	250	270	630	710	850	950	970	1090
1-1/8	28.6	600	660	350	380	350	380	850	950	1200	1350	1380	1550
1-1/4	31.8	840	940	490	540	490	540	1200	1350	1700	1900	1940	2180
1-3/8	34.9	1100	1230	640	710	640	710	1570	1760	2300	2500	2600	2800
1-1/2	38.1	1470	1640	850	940	850	940	2000	2300	3000	3300	3300	3700
1-3/4	44.5	2350	2450	1330	1490	1330	1490	3300	3700	4700	5200	5300	6000
2	50.8	3500	3900	2000	2200	2000	2200	5000	5500	7000	7800	8000	9000

†When bolt penetration is 1-1/2 times the diameter of the bolt.

BOLT TYPE IDENTIFICATION CHART

IH TYPE	S.A.E. GRADE	DESCRIPTION	BOLT HEAD MARKING *
1	1 or 2 <small>Equivalent</small>	WILL HAVE A  STANDARD MONOGRAM IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	5	WILL HAVE A  AND 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	8	WILL HAVE A  AND 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

*The center marking identifies the bolt manufacturer. The  monogram is currently used. Some bolts may still have an IH or a raised dot which previously identified IH bolts.

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- .65 when finished jam nuts are used.
- .70 when Molykote, white lead or similar mixtures are used as lubricants.
- .75 when parkerized bolts or nuts are used.
- .85 when cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.
- .90 when hardened surfaces are used under the nut or bolt head.

1 NEWTON METER = 0.738 FOOT POUND

Bolt or Stud Diameter		Type 1 Studs Only		Type 1 Bolts 6" length or less		Type 1 Bolts longer than 6"		Type 5 (all lengths)		Type 8 (all lengths)			
										Only when used† in cast (gray) iron		All other applications	
Inches	MM	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	6.4	7	8	7	8	4	4	12	14	15	18	16	19
5/16	8.0	17	18	17	18	8	10	26	29	33	37	37	41
3/8	9.5	29	33	29	33	15	18	45	50	58	64	61	68
7/16	11.1	48	52	48	52	26	29	72	81	94	103	102	115
1/2	12.7	71	79	71	79	39	43	108	122	141	159	156	176
9/16	14.3	95	108	95	108	56	62	156	176	205	230	225	250
5/8	15.9	133	149	133	133	77	85	220	245	285	310	300	340
3/4	19.0	240	265	240	265	136	152	390	430	470	530	540	610
7/8	22.0	400	450	220	245	220	245	570	640	770	850	880	990
1	25.4	570	640	340	365	340	365	850	960	1150	1290	1300	1480
1-1/8	28.6	810	900	470	510	470	510	1150	1290	1630	1830	1870	2100
1-1/4	31.8	1140	1270	660	730	660	730	1600	1830	2300	2600	2600	3000
1-3/8	34.9	1490	1670	870	960	870	960	2100	2400	3100	3400	3500	3800
1-1/2	38.1	2000	2200	1150	1270	1150	1270	2700	3100	4100	4500	4500	5000
1-3/4	44.5	3200	3300	1800	2000	1800	2000	4500	5000	6400	7000	7100	8100
2	50.8	4750	5300	2700	3000	2700	3000	6800	7500	9500	10500	10800	12200

†When bolt penetration is 1-1/2 times the diameter of the bolt.

BOLT TYPE IDENTIFICATION CHART

IH TYPE	S.A.E. GRADE	DESCRIPTION	BOLT HEAD MARKING *
1	1 or 2 <small>Equivalent</small>	WILL HAVE A  STANDARD MONOGRAM IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	5	WILL HAVE A  AND 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	8	WILL HAVE A  AND 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

*The center marking identifies the bolt manufacturer. The  monogram is currently used. Some bolts may still have an IH or a raised dot which previously identified IH bolts.

CONVERSION TABLE

—inches to millimeters—

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
1	25.4	26	660.4	51	1295.4	76	1930.4
2	50.8	27	685.8	52	1320.8	77	1955.8
3	76.2	28	711.2	53	1346.2	78	1981.2
4	101.6	29	736.6	54	1371.6	79	2006.6
5	127.0	30	762.0	55	1397.0	80	2032.0
6	152.4	31	787.4	56	1422.4	81	2057.4
7	177.8	32	812.8	57	1447.8	82	2082.8
8	203.2	33	838.2	58	1473.2	83	2108.2
9	228.6	34	863.6	59	1498.6	84	2133.6
10	254.0	35	889.0	60	1524.0	85	2159.0
11	279.4	36	914.4	61	1549.4	86	2184.4
12	304.8	37	939.8	62	1574.8	87	2209.8
13	330.2	38	965.2	63	1600.2	88	2235.2
14	355.6	39	990.6	64	1625.6	89	2260.6
15	381.0	40	1016.0	65	1651.0	90	2286.0
16	406.4	41	1041.4	66	1676.4	91	2311.4
17	431.8	42	1066.8	67	1701.8	92	2336.8
18	457.2	43	1092.2	68	1727.2	93	2362.2
19	482.6	44	1117.6	69	1752.6	94	2387.6
20	508.0	45	1143.0	70	1778.0	95	2413.0
21	533.4	46	1168.4	71	1803.4	96	2438.4
22	558.8	47	1193.8	72	1828.8	97	2463.8
23	584.2	48	1219.2	73	1854.2	98	2489.2
24	609.6	49	1244.6	74	1879.6	99	2514.6
25	635.0	50	1270.0	75	1905.0	100	2540.0

1 inch = 25.4 millimeters

To convert inches to millimeters, the inch value to be converted should be written down, carried to as many decimal places as the desired accuracy requires. It should then be split into groups of not more than two figures each. The equivalent of each group should then be taken from the table, proper regard being given to the position of the decimal point in each case, and the equivalent of the inch value given.

For example, to convert 2.4635 inches to millimeters:

$$2.0000 \text{ inches} = 50.80000 \text{ millimeters}$$

$$.4600 \text{ inches} = 11.68400$$

$$.0035 \text{ inches} = .08890$$

$$2.4635 \text{ inches} = 62.57290 \text{ millimeters}$$

Correct to 3 decimal places.

$$2.4635 \text{ inches} = 62.573 \text{ millimeters}$$

CONVERSION TABLE

— millimeters to inches —

Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches
1	0.03937008	26	1.0236220	51	2.0078740	76	2.9921260
2	0.07874016	27	1.0629921	52	2.0472441	77	3.0314961
3	.11811024	28	1.1023622	53	2.0866142	78	3.0708661
4	.15748031	29	1.1417323	54	2.1259842	79	3.1102362
5	.19685039	30	1.1811024	55	2.1653543	80	3.1496063
6	.23622047	31	1.2204724	56	2.2047244	81	3.1889764
7	.27559055	32	1.2598425	57	2.2440945	82	3.2283465
8	.31496063	33	1.2992126	58	2.2834646	83	3.2677165
9	.35433071	34	1.3385827	59	2.3228346	84	3.3070866
10	.3937008	35	1.3779528	60	2.3622047	85	3.3464567
11	.4330709	36	1.4173228	61	2.4015748	86	3.3858268
12	.4724409	37	1.4566929	62	2.4409449	87	3.4251968
13	.5118110	38	1.4960630	63	2.4803150	88	3.4645669
14	.5511811	39	1.5354331	64	2.5196850	89	3.5039370
15	.5905512	40	1.5748031	65	2.5590551	90	3.5433071
16	.6299213	41	1.6141732	66	2.5984252	91	3.5826772
17	.6692913	42	1.6535433	67	2.6377953	92	3.6220472
18	.7086614	43	1.6929134	68	2.6771654	93	3.6614173
19	.7480315	44	1.7322835	69	2.7165354	94	3.7007874
20	.7874016	45	1.7716535	70	2.7559055	95	3.7401575
21	.8267717	46	1.8110236	71	2.7952756	96	3.7795276
22	.8661417	47	1.8503937	72	2.8346457	97	3.8188976
23	.9055118	48	1.8897638	73	2.8740157	98	3.8582677
24	.9448819	49	1.9291339	74	2.9133858	99	3.8976378
25	.9842520	50	1.9685039	75	2.9527559	100	3.937008

1 mm = .03937008 inches

To convert millimeters to inches the millimeter value to be converted should be written down, carried to as many decimal places as the desired accuracy requires. It should then be split up into groups of not more than two figures each. The equivalent of each group should then be taken from the table, proper regard being given to the position of the decimal point in each case, and the equivalent of the several groups found by addition. This sum will be the inch equivalent of the millimeter value given.

For example to convert 75.384 millimeters to inches:

$$\begin{aligned}
 75.000 \text{ millimeters} &= 2.9527559 \text{ inches} \\
 .380 \text{ millimeters} &= .0149606 \\
 \underline{.004 \text{ millimeters}} &= \underline{.0001574}
 \end{aligned}$$

$$\begin{aligned}
 75.384 \text{ millimeters} &= 2.9678739 \text{ inches} \\
 \text{Correct to 5 decimal places.}
 \end{aligned}$$

$$75.384 \text{ millimeters} = 2.96787 \text{ inches}$$

SPECIAL SERVICE TOOLS REQUIRED

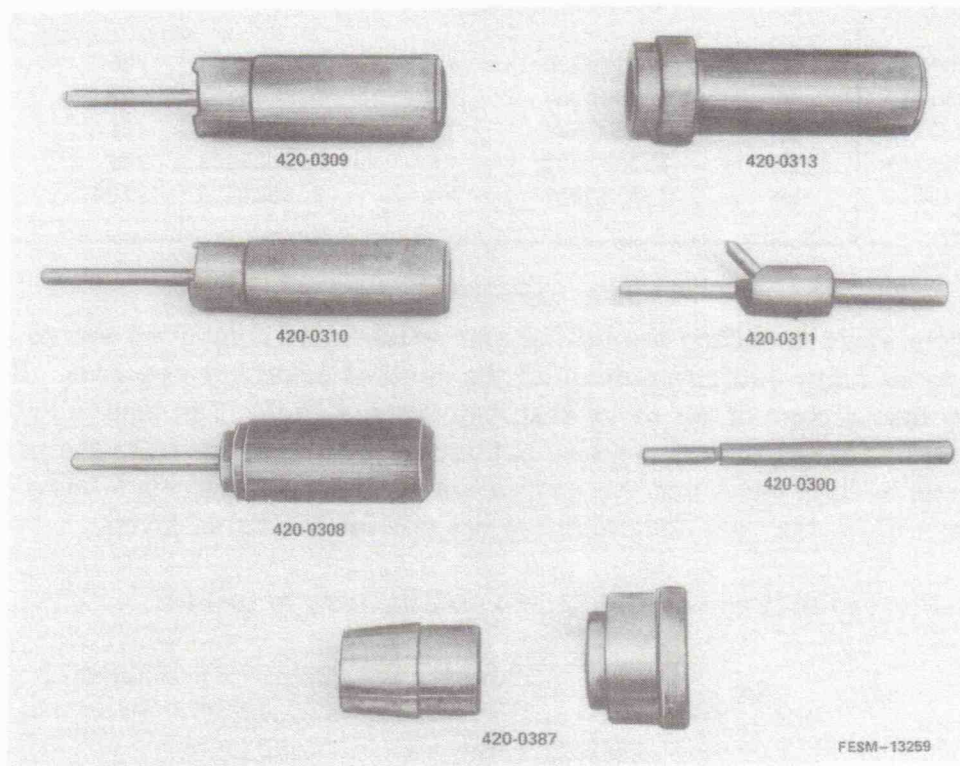
SECTION 1

IH Service Tools

04-462	Valve Spring Compressor
04-464-1	Piston Ring Compressor
04-467	Ridge Reamer Tool
16-228-2	Bearing Driver Set (Use 1-7/16" Disc, 2-3/16" Disc and Handle)
17-473-3	Two Jaw Puller
17-473-22	Puller

Onan Service Tools

*420-0248	Onan Crankshaft Gear Puller Ring
420-0300	Onan Valve Guide Driver
420-0308	Onan Valve Seat Driver
420-0309	Onan Intake Valve Seat Stakers
420-0310	Onan Exhaust Valve Seat Stakers
420-0311	Onan Valve Seat Cutter
420-0313	Onan Gear Cover Oil Seal Guide and Driver
420-0387	Onan Rear Bearing Plate Oil Seal Guide and Driver



* Required for disassembly

NOTE: Order Onan Tools from nearest Onan Distributor or write:

Onan
1400 73rd Avenue N. E.
Minneapolis, Minnesota 55423

SECTION 2

15-532-1 Vibration Tachometer

SECTION 3 None Required

Refer to Agricultural Equipment Special Service Tools and Equipment Manual PSB-11,
for prices and ordering procedure for IH Service Tools.

GENERAL SHOP PRACTICES FOR ENGINE OVERHAUL

Engine Overhaul Procedures

Engine rebuild failures can occur because of poor shop practices. The information provided under the section of "General Shop Practices for Engine Overhaul" is not to supersede, nor is it intended to be all inclusive of all information available to service personnel through other International Harvester Publications as well as this service manual. The intention of this section is to present common procedures viewed in the field and to present sound shop practices recommended for engine overhauls.

Sources of Debris in Engines

Some types of failures may result in contamination (that is metal debris) being distributed throughout the entire engine to varying degrees. Service personnel should note that such debris may be accumulated in the oil pump assembly, oil filter base housing, oil cooler, oil pressure relief valve and/or oil supply galleys in the engine.

The degree of the failure, the size, volume, type and location of the contaminant are all factors that determine the extent of cleaning necessary. All reuseable engine parts are considered cleanable, except under certain circumstances, such as the oil cooler. The oil cooler should be replaced when a large collection of metal contaminants are found in the oil pan and/or lube system, which could have blocked or restricted its passages.

When failures such as piston scoring, rod failures, or (dusting) failure from an air induction leak occurs, it is recommended that the crankcase be steam cleaned. Failure to do so often results in very short rebuild life.

Properly Assemble and Inspect the Air Induction System

Proper assembly and servicing of the air induction system is of vital importance in preventing a dusted engine and in obtaining optimum performance testing.

The introduction of dirt through the air induction system will cause excessive wear of the rings and cylinder sleeves and premature engine failure. The air induction system, composed of an air cleaner assembly, intake pipe, hoses and clamps, must be completely sealed to prevent unfiltered air from entering the engine. The air cleaner must be the only source of air to the engine.

To insure that all air passages through the air cleaner, the air cleaner element seals and gaskets must always be in excellent condition. Hold down nuts should never be overtightened. Overtightening will cause distortion of the main element housing and filter element housing, allowing air to bypass the filter assembly.

Visually inspect element seals and canister sealing area for signs of the seal sticking. If sticking is evident, replace the element and remove all seal material from the canister. If seal material is not removed, the new filter element may not seal properly.

Check the element for damage caused by improper handling or storage. Never tap an element on a hard surface or use more than 690 kPa (100 psi) of air pressure to clean a filter element. Improper cleaning procedures can damage the element and allow the engine to be damaged in a few hours.

In addition to the air cleaner element, the remainder of the air induction system must be properly maintained.

If an engine failure indicates the ingestion of dirt into the engine, the air induction system must be thoroughly investigated from the air cleaner to the engine block including carburetor, gaskets, connections, hoses, clamps, manifolds, etc.

Cleaning Service Parts

As received in shipping packages from PDC's, service parts require cleaning prior to installation. It is essential that all contamination be removed from surfaces. The wiping of a piston with a treated pad and/or an oil soaked rag is not sufficient to clean out the minute metal particles.

It is recommended that parts as received, as well as those reinstalled, should be washed in a hot liquid detergent and water solution, rinsed and dried, then coated with a thin film of clean 30 weight engine oil to prevent rust. Detergent acts to "lift up" the metal particles. Using hot water or a steam gun will provide adequate heat for the sleeve and/or piston to evaporate the water off. Wipe repeatedly with light engine oil and clean rags until a clean white rag shows no evidence of discoloration from the part.

Pistons and Crankcase

Pistons being reused must be reinstalled in the same bore from which they were removed.

Knurling of pistons is not an approved practice. Knurling of the piston deforms the O. D. of the piston. This may cause heavy piston to sleeve contact, resulting in scoring.

Ribbon Fitting

Ribbon fitting of pistons is not recommended.

Keep Engine Components Clean at All Times

Prior to and during installation of engine components, assemblies must be covered and not exposed to contamination. Failure to provide clean parts will result in premature internal engine wear and/or high oil consumption.

After the Engine Overhaul

Do not run the engine at low or high idle speeds for long periods after installing new rings as the rings will not seat during no load operation.

Engine "Run-In"

Period	Engine RPM	Load	Remarks
5 Minutes	3/4 Rated	Light	Operate at maximum transport speed.
5 Minutes	Rated	1/2 Rated	Adjust load by reducing ground speed.
5 Minutes	Rated	3/4 Rated	Adjust load by reducing ground speed.
25 Minutes	Rated	Rated	Operate at normal application for the machine.

Section 1

ENGINE

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SPECIFICATIONS

ONAN MODEL NHCV – 4130 COMPACT LOADER

ONAN MODEL NHC – 4135 COMPACT LOADER

Cylinders	2
Bore	90.49 to 90.51 mm (3.5625 to 3.5635 in.)
Stroke	76 mm (3 in.)
Displacement . . . . .	.98 L (60 cu. in.)
Horsepower - (4130)	16.8 kW (22.5 hp) @ 3300 rpm
(4135)	18.6 kW (25.0 hp) @ 3600 rpm
Governed Speed	3300 rpm
Compression Ratio	7.0 to 1
Spark Plug Gap . . . . .	.64 mm (.025 in.)
Breaker Point Gap . . . . .	.41 mm (.016 in.)
Timing Before Top Dead Center (With Downdraft Carburetor)	25°
(With Sidedraft Carburetor)	20°
Valve Lash (Cold)	
Intake . . . . .	.08 mm (.003 in.)
Exhaust . . . . .	.30 mm (.012 in.)
Valve Stem Clearance In Guide	
Intake . . . . .	.03 to .06 mm (.001 to .0025 in.)
Exhaust . . . . .	.06 to .10 mm (.0025 to .004 in.)
Valve Spring Length	
Free	42.2 mm (1.66 in.)
Compressed	35 mm (1.38 in.)
Valve Spring Tension	
Open	32 to 36 kg (71 to 79 lbs.)
Closed	17 to 19 kg (38 to 42 lbs.)
Valve Seat Bore Diameter	
Intake	39.74 to 39.76 mm (1.5645 to 1.5655 in.)
Exhaust	31.78 to 31.80 mm (1.251 to 1.252 in.)
Valve Seat Diameter	
Intake	39.85 to 39.88 mm (1.569 to 1.570 in.)
Exhaust	31.88 to 31.90 mm (1.255 to 1.256 in.)

Valve Stem Diameter	8.70-8.71 mm (.3425-.3430 in.)
Intake	8.66-8.67 mm (.3410-.3415 in.)
Exhaust	
Valve Guide Inner Diameter	8.74-8.79 mm (.344-.346 in.)
Valve Lifter Diameter	19.00-19.24 mm (.7480-.7575 in.)
Valve Lifter Bore	19.06-19.09 mm (.7505-.7515 in.)
Valve Seat Interference Width . . . . .	.79-1.19 mm (.031-.047 in.)
Valve Face Angle	44°
Valve Seat Angle	45°
Valve Interference Angle	1°
Crankshaft Main Bearing Static Clearance . . . . .	.06-.10 mm (.0025-.0038 in.)
Crankshaft Main Bearing Diameter	50.84-50.90 mm (2.0015-2.004 in.)
Crankshaft Main Bearing Journal - Standard Size	50.78-50.80 mm (1.999-2.000 in.)
Crankshaft Rod Bearing Journal - Standard Size	41.28-41.30 mm (1.625-.1626 in.)
Crankshaft End Play . . . . .	.127-.229 mm (.005-.009 in.)
Camshaft Bearing Static Clearance . . . . .	.04-.08 mm (.0015-.0030 in.)
Camshaft Bearing Diameter	34.95-34.98 mm (1.376-1.377 in.)
Camshaft Journal Diameter	34.90-34.93 mm (1.374-1.375 in.)
Camshaft Lift	7.62 mm (.300 in.)
Camshaft End Play . . . . .	.08 mm (.003 in.)
Connecting Rod Bearing Static Clearance . . . . .	.01-.06 mm (.0005-.0023 in.)
Connecting Rod End Play . . . . .	.05-.41 mm (.002-.016 in.)
Piston Pin Diameter	19.05-19.06 mm (.7500-.7502 in.)
Piston Pin Static Clearance In Rod . . . . .	.0025-.013 mm (.0001-.0005 in.)
Piston Ring Gap In Cylinder . . . . .	.25-.51 mm (.010-.020 in.)
Piston Ring Side Clearance (top compression ring only) . . . . .	.15 mm (.006 in.)

Piston To Cylinder Static Clearance (measured below oil controlling ring - 90° from the pin) . . . . .	.04-.09 mm (.0015-.0035 in.)
Timing Gear Backlash . . . . .	.05-.08 mm (.002-.003 in.)
Oil Pump Gear Backlash . . . . .	.05-.13 mm (.002-.005 in.)
Oil Capacity W/Filter Change	4130 Compact Loader W/O Remote Engine Oil Cooler and Filter Base - 3.6 Litres (4 qt.)
Oil Capacity W/O Filter Change	4130 Compact Loader W/O Remote Engine Oil Cooler and Filter Base - 3.3 Litres (3½ qt.)
Oil Capacity W/Filter Change	4130 Compact Loader W/Remote Engine Oil Cooler and Filter Base - 4.3 Litres (4½ qt.)
Oil Capacity W/O Filter Change	4130 Compact Loader W/Remote Engine Oil Cooler and Filter Base - 3.3 Litres (3½ qt.)
Oil Capacity W/Filter Change	4135 Compact Loader - 3.6 Litres (4 qt.)
Oil Capacity W/O Filter Change	4135 Compact Loader - 3.3 Litres (3.5 qt.)

SPECIAL TORQUES

Cylinder Head Nuts	
Top Six Nuts	16 N·m (12 ft. lbs.)
Bottom Four Nuts	20 N·m (15 ft. lbs.)
Rear Bearing Plate	34-38 N·m (25-28 ft. lbs.)
Connecting Rod Bolts	37-39 N·m (27-29 ft. lbs.)
Flywheel Capscrew	48-54 N·m (35-40 ft. lbs.)
Starter Mounting Bracket to Oil Base Screws	34-38 N·m (25-28 ft. lbs.)
Gear Case Cover	11-14 N·m (8-10 ft. lbs.)
Oil Pump	10-12 N·m (7-9 ft. lbs.)
Intake Manifold	27-31 N·m (20-23 ft. lbs.)
Exhaust Manifold	14-20 N·m (10-15 ft. lbs.)
Other 3/8 Inch Cylinder Block Nuts	24-31 N·m (18-23 ft. lbs.)
Spark Plugs	20-28 N·m (15-20 ft. lbs.)

SPECIFICATIONS

ONAN MODEL B48M-GA018 – 4125 COMPACT LOADER
ONAN MODEL B48G-GA019.9 – 982 CUB CADET
 (All Dimensions and Clearances Given at 70° F)

Engine Design Four Cycle, Air-Cooled, Two Cylinder

Horse Power (3600 rpm) 4125 Compact Loader - 13.4 kW (18 hp)
 (3600 rpm) 982 Cub Cadet - 14.8 kW (19.9 hp)

Displacement 781.7 cm³ (47.7 in.³)

Bore 82.55 mm (3.25 in.)

Stroke 73 mm (2.875 in.)

Compression Ratio 4125 Compact Loader - 6.6:1
 982 Cub Cadet - 6.9:1

Crankshaft Horizontal, Ductile Iron

Valves Mechanical, Poppet

Bearings (Main and Rod) Sleeve

Oil Capacity W/Filter Change 4125 Compact Loader - 1.89 Litres (4 pt.)
 982 Cub Cadet - 1.75 Litres (3.7 pt.)

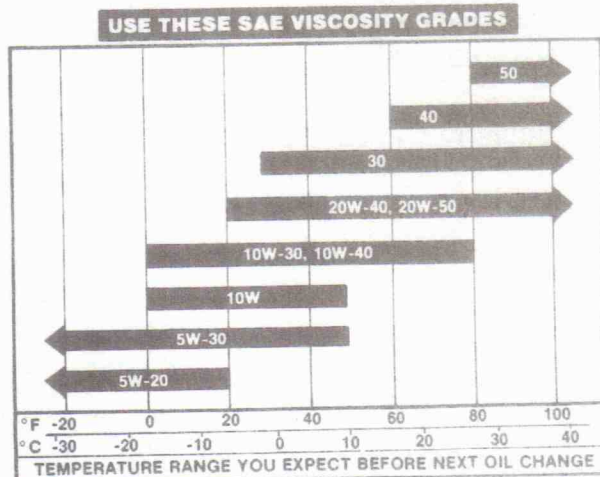
Oil Capacity W/O Filter Change 4125 Compact Loader - 1.66 Litres (3.5 pt.)
 982 Cub Cadet - 1.51 Litres (3.2 pt.)

GASOLINE ENGINES ONLY

AMBIENT TEMP. RANGE	RECOMMENDED VISCOSITIES	REQ'D QUALITY LEVELS (API CLASS)
80° F and warmer	SAE 50	SE or SE/CB or SE/CC
60° F and warmer	SAE 40	
30° F and warmer	SAE 30	
20° F and warmer	SAE 20W-40, 20W-50	
0° F to 80° F	SAE 10W-30, 10W-40	
0° F to 50° F	SAE 10W	
-25° F to 50° F	SAE 5W-30	
-25° F to 20° F	SAE 5W-20	

Refer to Chart for Celsius Temperature Conversions.

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Tune-Up

Tappet (Valve Backlash) (Cold) Intake	0.20 mm (.008 in.)
Exhaust	0.33 mm (.013 in.)
Breaker Point Gap (Full Separation, Engine Cold)	0.53 mm (.021 in.)
Spark Plug Gap	0.64 mm (.025 in.)
Ignition Timing (Cold, Static Setting)	4125 Compact Loader - 21° BTC 982 Cub Cadet - 20° BTC
Engine High Idle	3400 (+ 100) RPM

Camshaft and Crankshaft

Crankshaft Main Bearing

Journal to Bearing Clearance	0.06 to 0.10 mm (.0025 to .0038 in.)
Crankshaft End Play	0.15 to 0.3 mm (.006 to .012 in.)
Camshaft Bearing to Camshaft	0.038 to 0.076 mm (.0015 to .003 in.)
Camshaft End Play (Minimum)	0.08 mm (.003 in.)
Crankshaft Rod Journal to Rod Bearing	0.051 to 0.08 mm (.002 to .0033 in.)
Connecting Rod End Play	0.05 to 0.41 mm (.002 to .016 in.)
Timing Gear Backlash	0.05 to 0.08 mm (.002 to .003 in.)
Oil Pump Gear Backlash	0.05 to 0.13 mm (.002 to .005 in.)
Crankshaft Main Bearing Journal - Standard Size	50.78 to 50.80 mm (1.9992 to 2.00 in.)

Piston and Cylinder

Piston Pin in Piston	0.005 to 0.010 mm (.0002 to .0004 in.)
Piston Pin in Rod	0.005 to 0.018 mm (.0002 to .0007 in.)
Piston Ring Gap in Cylinder	0.25 to 0.51 mm (.010 to .020 in.)
Piston Clearance in Cylinder - Measured 2.54 mm (.10 in.) Below Oil Control Ring - 90° from Pin	0.10 to 0.15 mm (.004 to .006 in.)
Cylinder Bore - Standard Size	82.53 to 82.55 mm (3.249 to 3.250 in.)
Crankshaft Rod Bearing Journal - Standard Size	41.28 to 41.30 mm (1.6252 to 1.6260 in.)

Tappets and Valves

Valve Seat Width	0.8 to 3.2 mm (.031 to .125 in.)
Valve Face Angle	44°
Valve Seat Angle	45°
Valve Stem to Guide - Intake	0.03 to 0.06 mm (.0001 to .0025 in.)
Exhaust	0.09 to 0.10 mm (.0035 to .0040 in.)
Tappet to Cylinder Block Clearance	0.04 to 0.08 mm (.0015 to .0030 in.)

SPECIAL TORQUES

Gear Case Cover	11 to 14 N·m (8 to 10 ft. lbs.)
Cylinder Head Bolts (Cold)	16 to 19 N·m (12 to 14 ft. lbs.)
Rear Bearing Plate Screws	34 to 37 N·m (25 to 27 ft. lbs.)
Starter Mounting Bolts	24 to 27 N·m (18 to 20 ft. lbs.)
Connecting Rod Bolt	19 to 22 N·m (14 to 16 ft. lbs.)
Flywheel Capscrew	48 to 54 N·m (35 to 40 ft. lbs.)
Other 5/16 Inch Cylinder Block Studs and Nuts	11 to 14 N·m (8 to 10 ft. lbs.)
Oil Base	24 to 31 N·m (18 to 23 ft. lbs.)
Manifold (Intake)	12 to 15 N·m (9 to 11 ft. lbs.)
Oil Pump	10 to 12 N·m (7 to 9 ft. lbs.)
Valve Cover	6 to 8 N·m (4 to 8 ft. lbs.)

ENGINE TROUBLESHOOTING

GASOLINE ENGINE TROUBLESHOOTING GUIDE

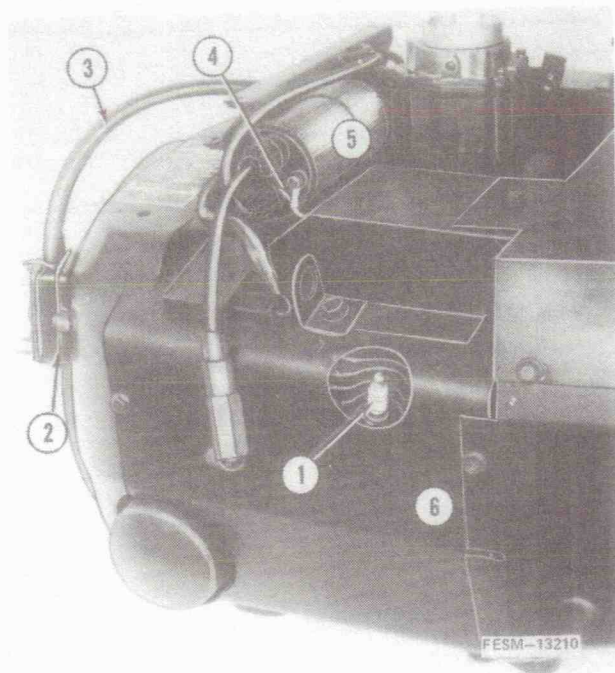
CAUSE

TROUBLE	Backfire at Carburetor	Bearing Wear	Black Exhaust	Blue Exhaust	Burned Valves	Connecting Rod Wear	Cylinder Rod Wear	Engine Slowly	Engine Stops	Failure to Start	Governor Hunting	High Oil Pressure	Loss of Coolant	Mechanical Knocks	Misfiring	Overheating (Water Cooled)	Overheating (Air Cooled)	Piston Wear	Poor Compression	Ring Wear	Sticking Valves	
STARTING SYSTEM																						
					•																	Loose or Corroded Battery Connection
					•																	Low or Discharged Battery
					•																	Faulty Starter
					•																	Faulty Start Solenoid
IGNITION SYSTEM																						
•																						Ignition Timing Wrong
	•																					Wrong Spark Plug Gap
																						Worn Points or Improper Gap Setting
																						Bad Ignition Coil or Condenser
																						Faulty Spark Plug Wires
FUEL SYSTEM																						
																						Out of Fuel - Check
																						Lean Fuel Mixture - Readjust
																						Rich Fuel Mixture or Choke Stuck
																						Engine Flooded
																						Poor Quality Fuel
																						Dirty Carburetor
																						Dirty Air Cleaner
																						Dirty Fuel Filter
																						Defective Fuel Pump
INTERNAL ENGINE																						
																						Wrong Valve Clearance
																						Broken Valve Spring
																						Valve or Valve Seal Leaking
																						Piston Rings Worn or Broken
																						Wrong Bearing Clearance
COOLING SYSTEM (AIR COOLED)																						
																						Poor Air Circulation
																						Dirty or Oily Cooling Fins
																						Blown Head Gasket
COOLING SYSTEM (WATER COOLED)																						
																						Insufficient Coolant
																						Faulty Thermostat
																						Worn Water Pump or Pump Seal
																						Water Passages Restricted
																						Defective Gaskets
																						Blown Head Gasket
LUBRICATION SYSTEM																						
																						Defective Oil Gauge
																						Relief Valve Stuck
																						Faulty Oil Pump
																						Dirty Oil or Filter
																						Oil Too Light or Diluted
																						Oil Level Low
																						Oil Too Heavy
																						Dirty Crankcase Breather Valve
THROTTLE AND GOVERNOR																						
																						Linkage Out of Adjustment
																						Linkage Worn or Disconnected
																						Governor Spring Sensitivity Too Great
																						Linkage Binding

FESM-13204

ENGINE DISASSEMBLY

4125, 4130 and 4135 Compact Loaders 982 Cub Cadet

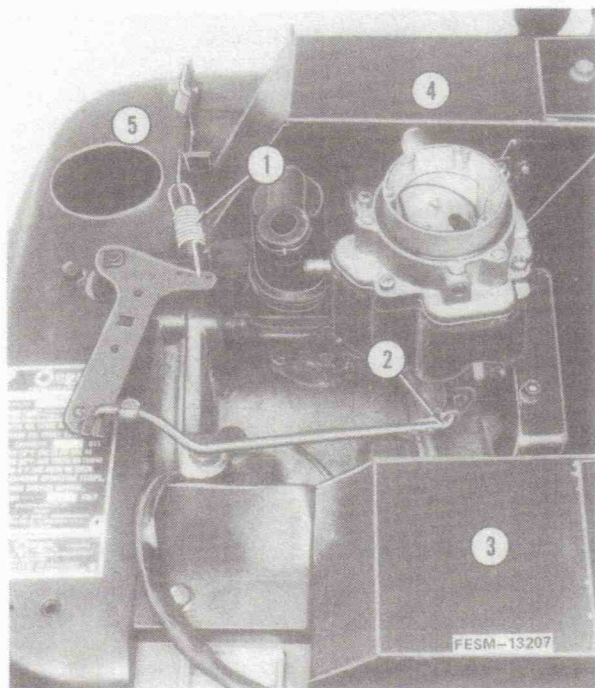


NOTE: When referring to left, right, front and rear, the flywheel is considered to be the front end of the engine.

1. Drain the oil from the engine. Remove the spark plugs.

2. Remove fuel line between the fuel pump and the carburetor. Disconnect the breaker point lead. Remove the ignition coil.

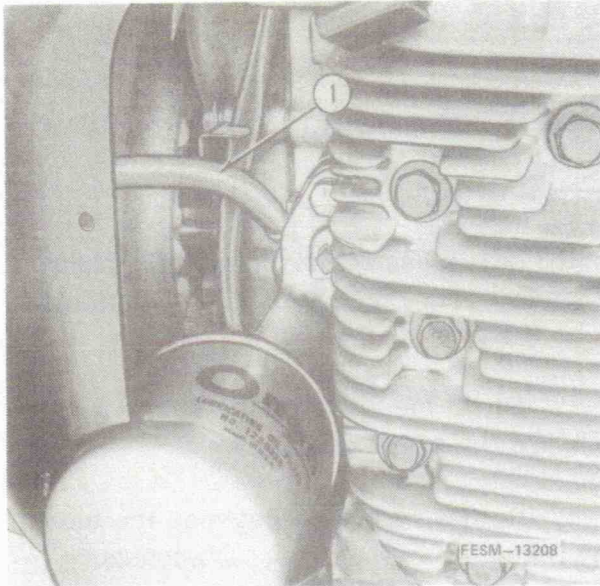
- 1. Spark plug
- 2. Fuel pump
- 3. Fuel line
- 4. Breaker point lead
- 5. Ignition coil
- 6. Right cylinder air housing



3. Remove the governor spring. Disconnect the throttle linkage from the carburetor.

4. Remove exhaust shroud and the right and left exhaust tube covers if equipped. Remove the right and left cylinder air housings.

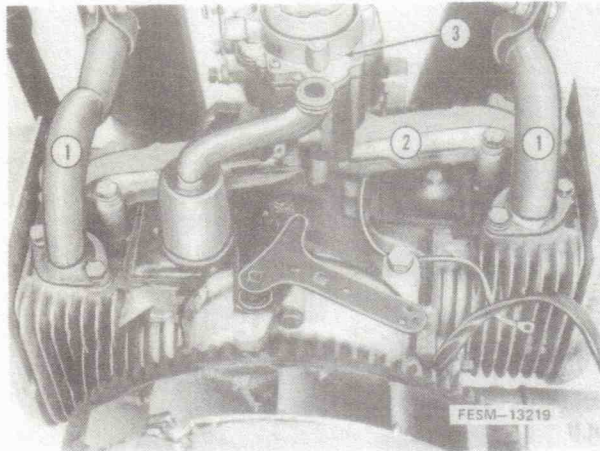
- 1. Governor spring
- 2. Throttle linkage
- 3. Left exhaust tube cover
- 4. Right exhaust tube cover
- 5. Blower housing



5. Disconnect the vacuum tube between the fuel pump and the gear case cover. Remove the flywheel guard and the blower housing.

- 1. Vacuum tube

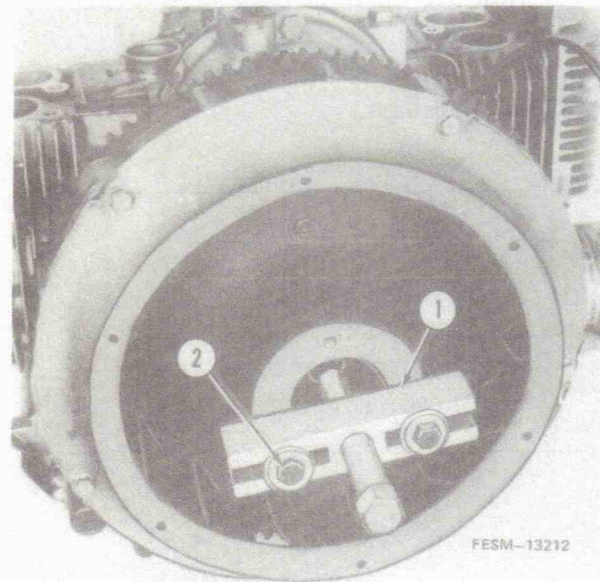
NOTE: The engine surface must be below 37.8°C (100°F) before removal of exhaust tubes. At temperatures above 37.8°C (100°F), the gasket will become gummy and difficult to remove from the surface of the block and exhaust tubes.



6. Remove the exhaust tubes and muffler(s).

7. Remove the intake manifold with the carburetor attached.

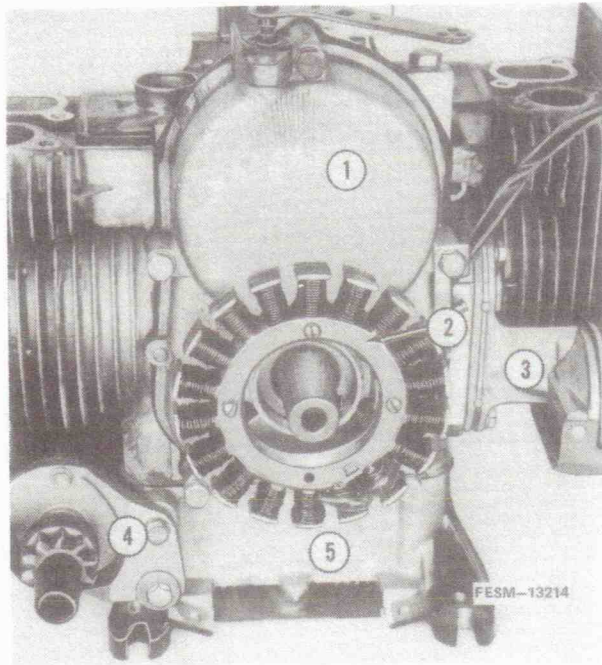
- 1. Exhaust tubes
- 2. Intake manifold
- 3. Carburetor



8. Remove the capscrew and washer securing the flywheel to the crankshaft. Reinstall the capscrew only. Using a 17-473-22 puller and two 5/16 NC x 3" bolts with washers remove the flywheel. Remove the Woodruff key from the crankshaft.

NOTE: The flywheel is fitted on a taper on the crankshaft. Hammering on the crankshaft or flywheel may damage the magnets in the flywheel.

- 1. 17-473-22 Puller
- 2. 5/16 NC x 3" Bolts



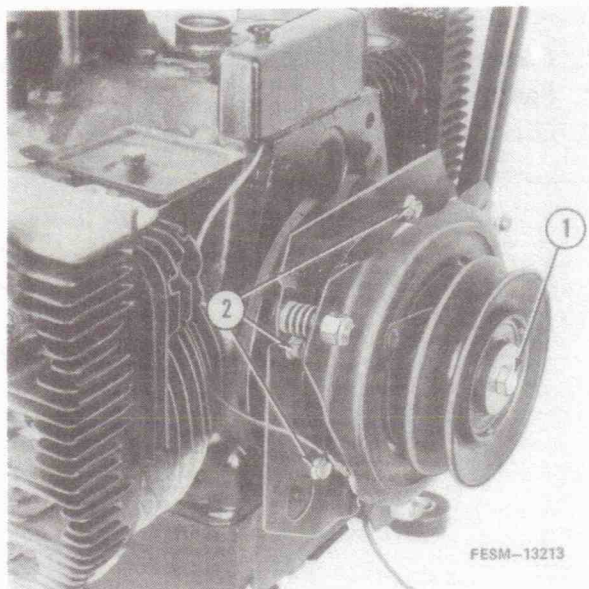
9. Remove the gear case cover.

NOTE: The stator may be left attached to the gear case cover or it may be removed separately (first).

Drive the seal from the gear case cover.

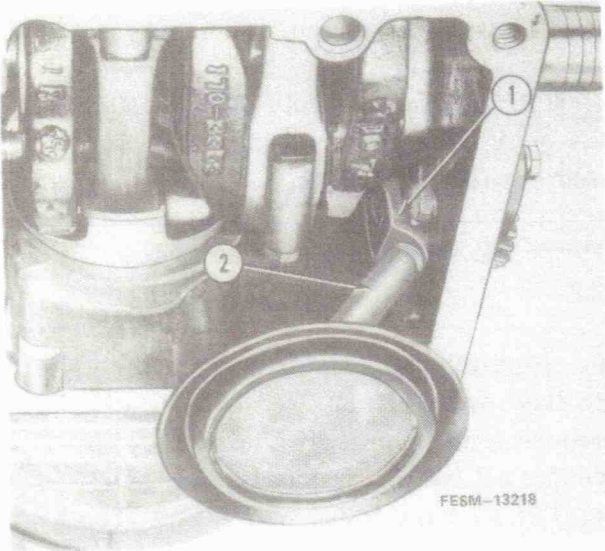
10. Remove the starter and the oil filter base with filter. Remove the oil pressure sending unit (if equipped). Remove the oil base. It may be necessary to tap the oil base loose with a soft faced hammer.

1. Gear case cover
2. Stator
3. Oil filter base w/filter
4. Starter
5. Oil base



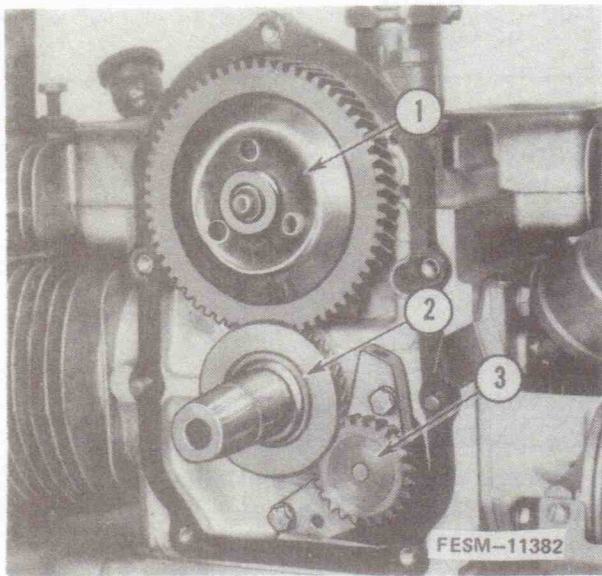
11. For the 982 Cub Cadet engine only — remove the electric PTO clutch by removing the capscrew and washer at the end of the shaft and the four mounting bolts.

1. Capscrew and washer
2. Mounting bolts



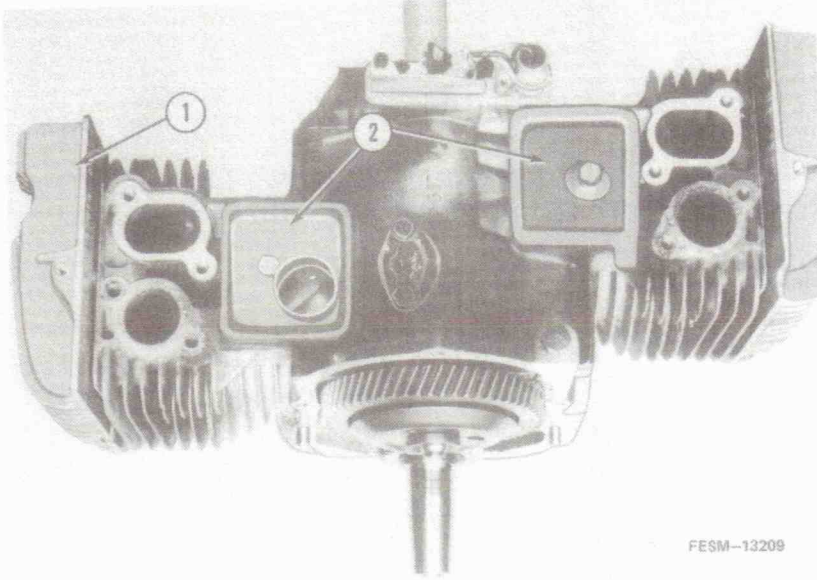
12. Grip the oil pick-up tube near the oil pump with a pair of vise grips and remove it.

- 1. Oil pump
- 2. Oil pick-up tube



13. Remove the snap ring and the retaining washer from the crankshaft. Remove the oil pump.

- 1. Governor and camshaft assembly
- 2. Snap ring and washer
- 3. Oil pump



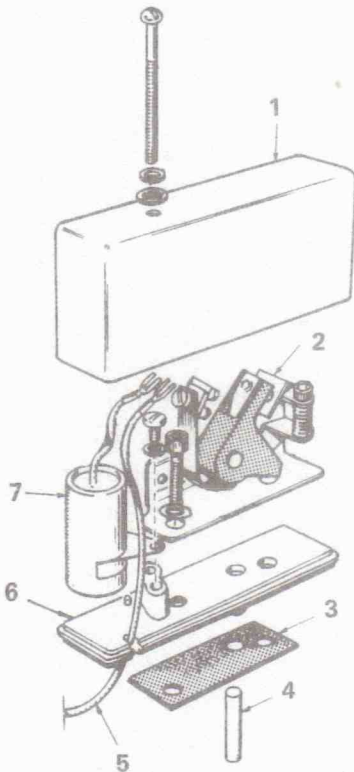
FESM-13209

- 1. Cylinder head
- 2. Valve covers

NOTE: The engine surface must be below 37.8°C (100°F) before removal of the head. At temperatures above 37.8°C (100°F), the gasket will become gummy and difficult to remove from the surface of the block and cylinder head.

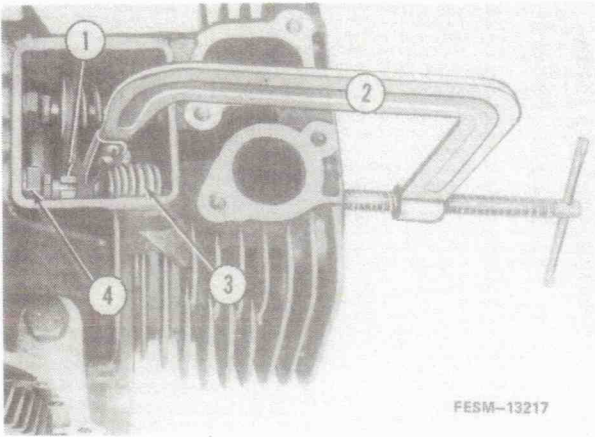
14. Mark to identify the right from the left cylinder head. Remove the cylinder heads noting the location of the various bolt lengths (or the number of washers used under the nuts).

15. Remove the left and right valve covers. Remove the breaker points cover, condenser, breaker points and breaker points plunger.



FESM-13236

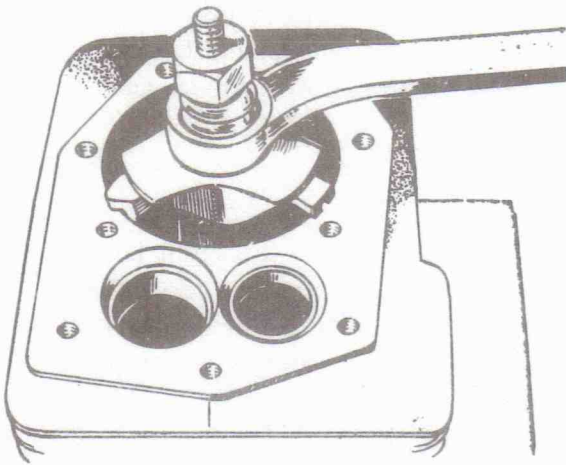
- 1. Breaker points cover
- 2. Breaker points
- 3. Gasket
- 4. Breaker points plunger
- 5. Ignition coil lead
- 6. Base
- 7. Condenser



16. Using a suitable valve spring compressor, remove both sets of valves and tappets.

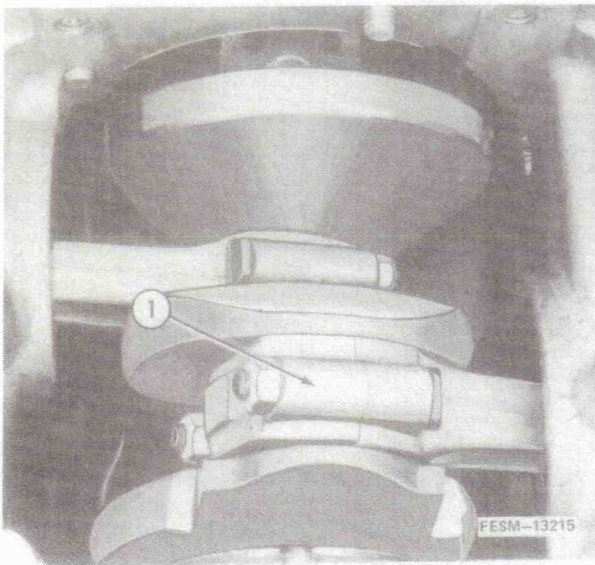
IMPORTANT: Identify the valves and tappets in some manner so they can be installed in the place from which they were removed. Never mix the valve components.

- 1. Valve spring lock
- 2. Valve spring compressor
- 3. Valve spring
- 4. Tappet



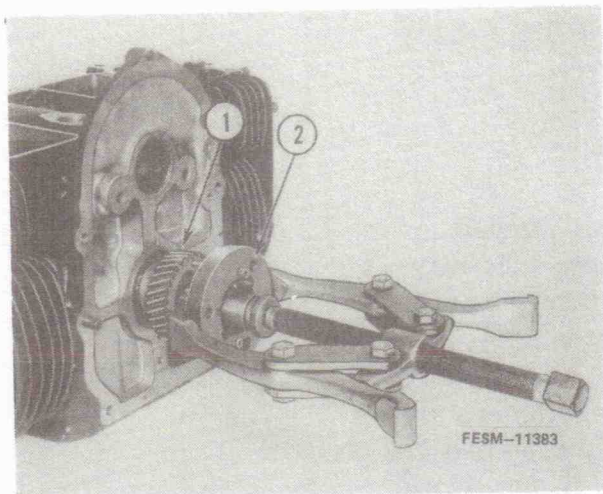
17. Remove the carbon ridge. If necessary use a ridge reamer tool.

FESM-13241



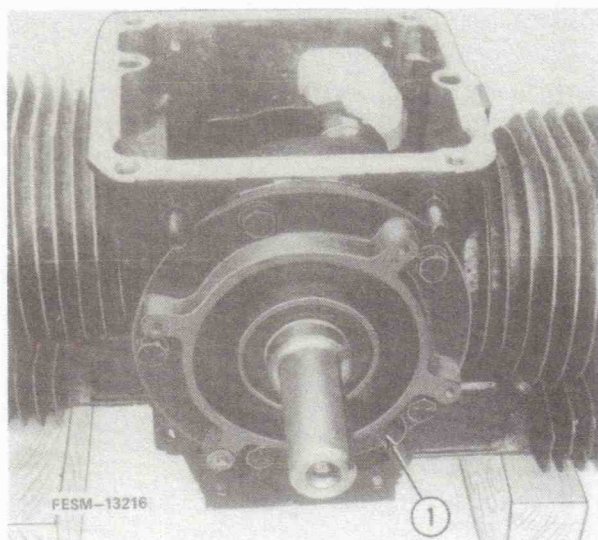
18. Mark the pistons, connecting rods and connecting rod caps prior to disassembly to assure they can be reassembled in their original location and position in the engine. Remove the connecting rod caps. Slide the piston with rod out the top of the cylinder. Avoid scratching the cylinder walls with the rod.

- 1. Connecting rod cap



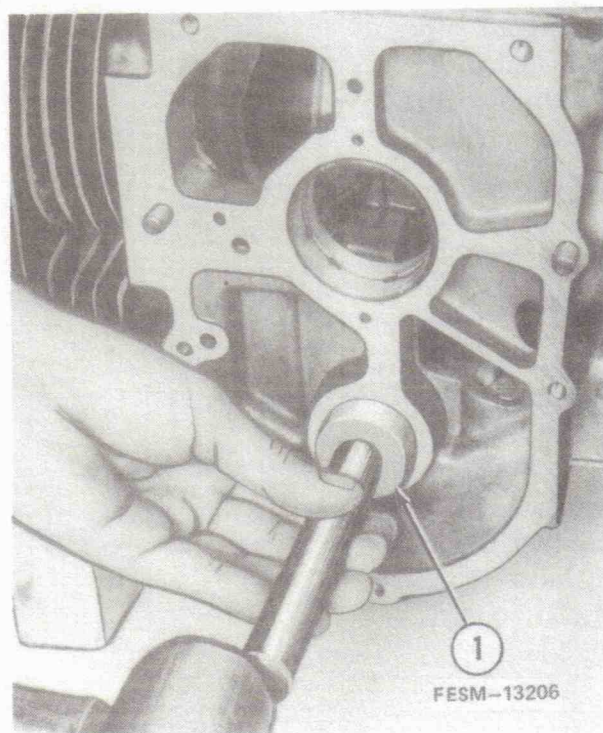
19. Using an Onan gear puller ring, tool number 420-0248 and a two or three jaw puller remove gear from the crankshaft.

1. Crankshaft gear
2. Onan gear puller ring



20. Remove the rear bearing plate cap screws. To free the bearing plate, tap the opposite end of the crankshaft with a brass hammer. Remove the bearing plate. Press out the seal and bearing from the bearing plate.

1. Rear bearing plate



21. Using a long brass drift and hammer remove the expansion plug at the rear camshaft bearing.

22. Using a 1-7/16 inch disc and the handle from 16-228-2 Bearing Driver Set tap out the camshaft bearings inward. Use the 2-3/16 inch disc to remove the crankshaft bearing inward.

23. If inspection proves it necessary, drive out the valve guides.

24. If necessary use Onan tool number 420-0311 to remove the valve seats.

1. 16-228-2 Bearing Driver Set

INSPECTION AND REPAIR

Cylinders

1. If the cylinders should become worn, scored or out of round, they may be rebored and honed to accept the available oversized ring and piston sets.

2. Rebore and hone the cylinders to accommodate 0.127, 0.254, 0.508, 0.762 or 1.02 mm (0.005, 0.010, 0.020, 0.030 or 0.040 in.) oversize ring and piston sets.

3. Clean the cylinder walls with soap and water, dry thoroughly and apply a light coat of SAE 10 motor oil to the cylinder walls.

Crankshaft

1. Inspect the rod bearing journal for wear or scoring. Minor scoring can be polished out.

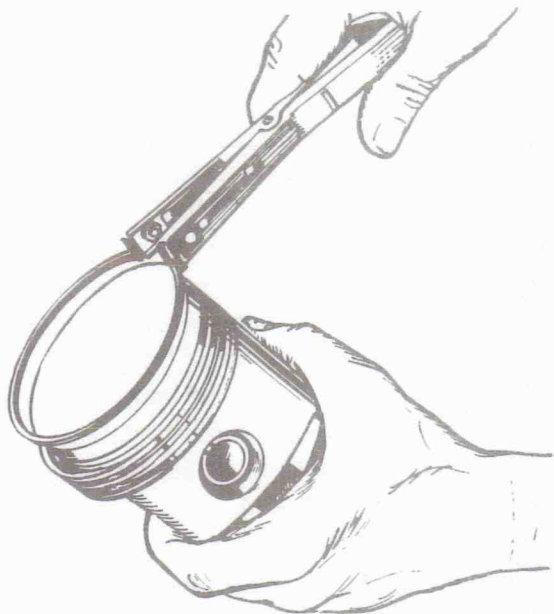
2. Check the rod bearing journal diameters, refer to specifications. The crankshaft journals can be ground to accept 0.254, 0.508 or 0.762 mm (0.010, 0.020 or 0.030 in.) undersized connecting rods.

3. Inspect the crankshaft ends and keyways for wear.

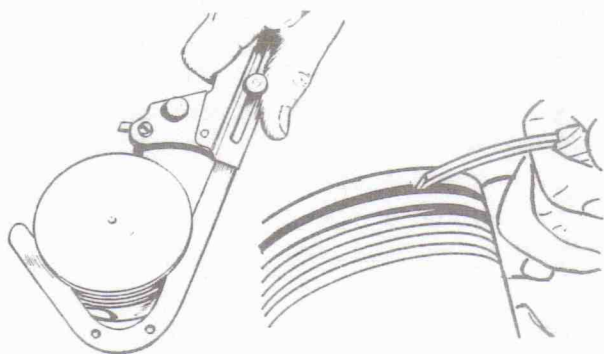
4. Check the oil seal contact surfaces of the crankshaft for wear which could cause premature wear to the oil seals.

5. Inspect the crankshaft main bearing journals for wear or scoring. Replacement main bearings are available in the standard size and also in 0.050, 0.254, 0.508 mm (0.002, 0.010, 0.020 in.) undersized bearings.

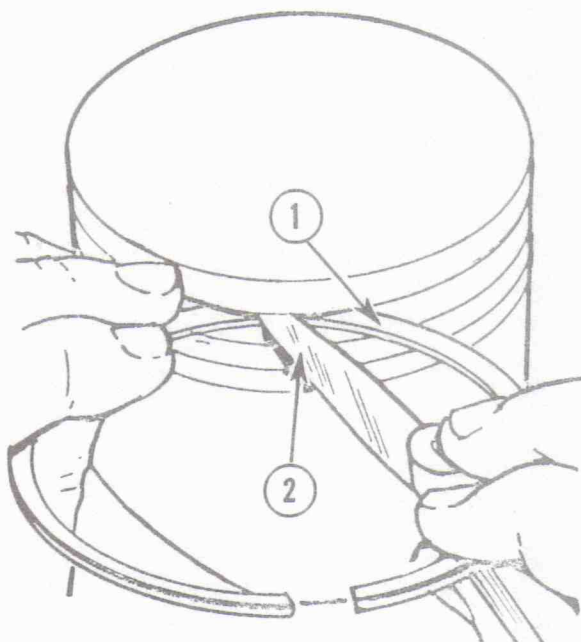
Piston Rings and Connecting Rods



FESM-13242



FESM-13243



FESM-11384

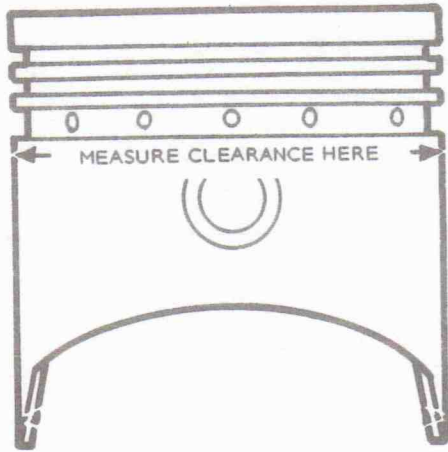
1. Remove the rings from the piston using a piston ring spreader.

2. Clean the piston ring grooves with a groove cleaner or the end of a broken ring filed to a sharp point. All passages should be cleaned with solvent. Clean the rod bore and the back of the connecting rod bearings thoroughly.

3. Mark each piston to make sure the rod will be assembled on the piston from which it was removed. Remove the piston pin retainer from each side and push the pin out.

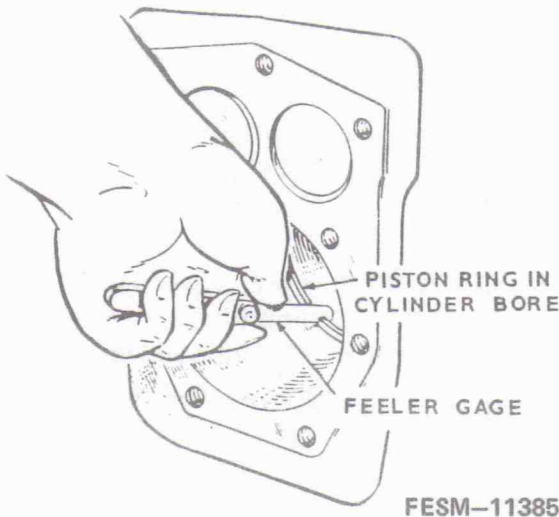
4. Inspect the pistons for fractures at the ring lands, skirts and pin bosses. Check for wear at the ring land using new rings and a feeler gauge.

- 1. New piston ring
- 2. Feeler gauge



FESM-13244

Measuring piston clearance



FESM-11385

5. Measure the piston to cylinder clearance by measuring the diameter of the piston below the oil controlling ring and 90° from the pin. Next measure the inside diameter of the cylinder at the lowest point of oil ring travel. If the difference between the two is greater than .089 mm (.0035") replace the piston.

6. Replace pistons showing signs of bad scoring or burring, excessive skirt clearance, wavy or worn ring lands, fractures or damage from detonation. Replace piston pins showing fractures, scored bores or bores out of round more than 0.05 mm (0.002 inch).

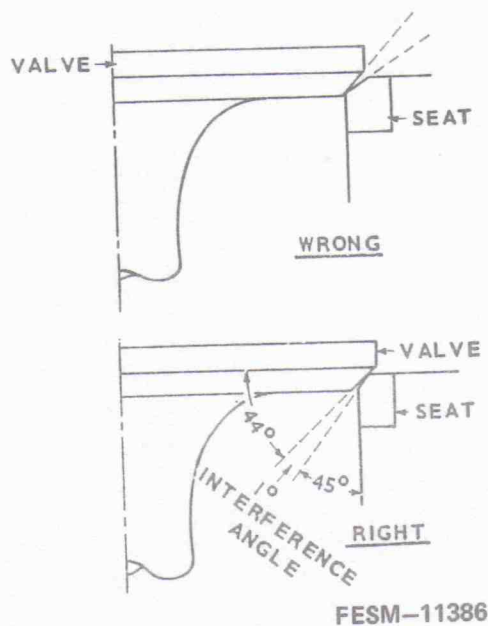
7. Before installing new rings on the piston, check the ring gap by placing each ring squarely in its cylinder, at a position corresponding to the bottom of its travel. Rings which are slightly oversized may be filed slightly to obtain the correct gap. Pistons are available in 0.127, 0.254, 0.508, 0.762 and 1.016 mm (0.005, 0.010, 0.020, 0.030 and 0.040 in.) oversize. Piston rings are available in 0.254, 0.508, 0.762, 1.016 mm (0.010, 0.020, 0.030 and 0.040 inches) oversize. Use the standard size rings on the 0.127 mm (0.005 inch) oversize. Tapered type rings are usually marked "top" on one side or identified in some other manner. These rings must be installed with this marking toward the top (closed end) of the piston.

NOTE: Engines fitted with 0.127 mm (0.005 inch) oversized pistons at the factory are identified by the letter "E" after the serial number which is stamped on the cylinder block.

8. Use a new piston pin to check for connecting rod wear.

Valve Seats and Guides

1. Clean all carbon deposits from the cylinder head, piston top, valves and guides.
2. If a valve face is burned or warped, or the stem worn, install a new valve.
3. Inspect the valve guides for wear by observing the fit of a new or unworn valve within the guide.
4. Check for correct valve spring length.
5. Inspect the valve seat inserts for wear. To remove the valve seat inserts use Onan's tool 420-0311. To assure a tight fit of the seat after installation use Onan's 420-0309 and 420-0310 valve seat stakers.



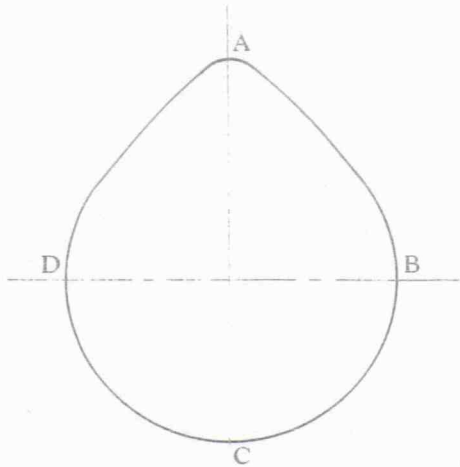
6. When grinding the valves the valve face angle is to be 44° and the valve seat angle is 45° . For the width of the seat band refer to specifications.

The valves should not be hand lapped since the sharp contact may be destroyed.

NOTE: If any of the valves need grinding, grind all the valves.

7. Inspect the valve stem ends. They must be perpendicular to the valve stem center line. If they need grinding, remove just enough to correct the situation and no more.

Camshaft

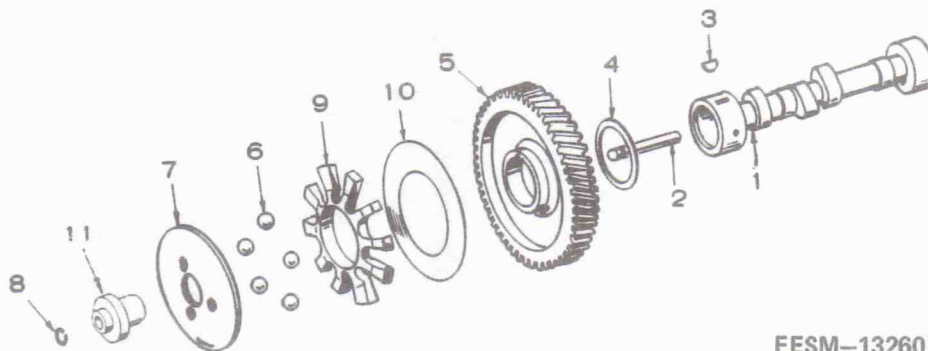


FESM-4435

1. Check the camshaft journal for proper dimension.

2. Check the camshaft lobes for wear by measuring dimensions AC and DB. The difference should be the lift of the lobes. Replace the camshaft if the lobes are not within specifications.

Governor Cup

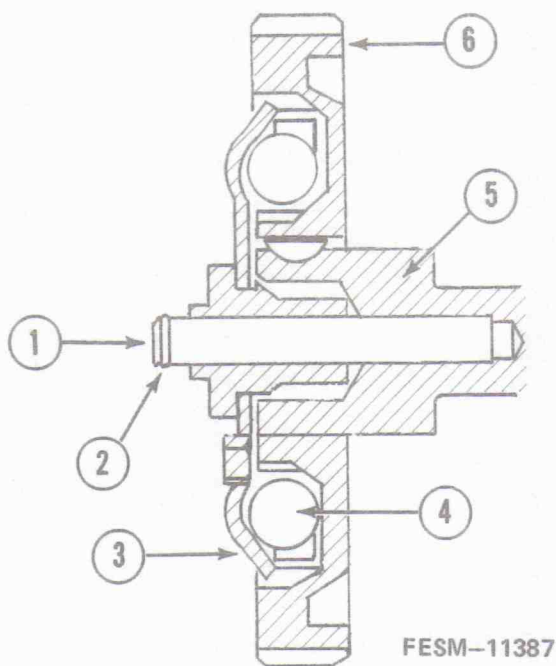


FESM-13260

1. Camshaft
2. Camshaft pin
3. Key
4. Thrust washer
5. Gear
6. Governor flyball
7. Governor cup
8. Retaining ring
9. Flyball spacer
10. Flyball plate
11. Hub

1. Replace any flyball that is grooved or has a flat spot.

2. If the arms of the spacer are worn or damaged, split the spacer with a chisel and install a new spacer.



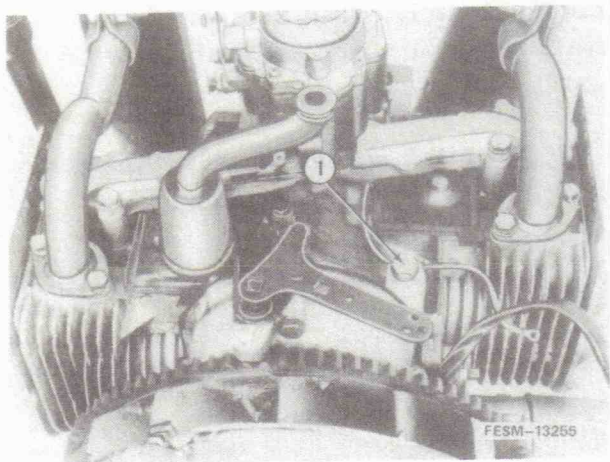
1. Center pin
2. Snap ring
3. Governor cup
4. Governor flyball
5. Camshaft
6. Camshaft gear

3. The governor cup must spin freely on the camshaft center pin without excessive looseness or wobble. If the race surface of the cup is grooved or rough, replace the cup.

4. The camshaft center pin extends out 19 mm (3/4 inch) from the end of the camshaft. This distance provides an in and out travel distance of 5.56 mm (7/32 inch) from the governor cup, as illustrated. Hold the cup against the flyballs when measuring. If the distance is less (the engine may race, especially at no load), remove the center pin and press a new pin in only the required amount. Otherwise, grind off the hub of the cup as required.

NOTE: The camshaft center pin cannot be pulled outward nor removed without damage. If the center pin extends out too far, the cup will not hold the flyballs properly.

Oil By-Pass Valve

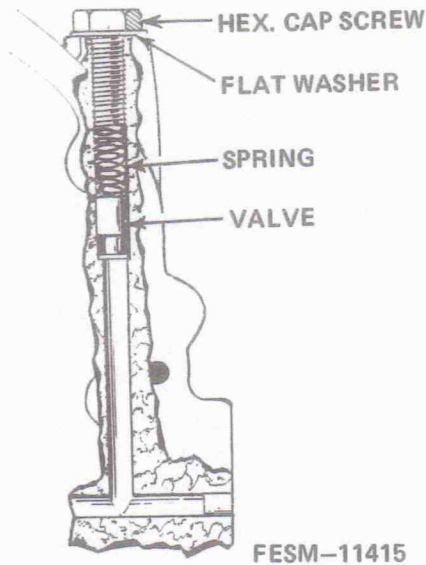


1. Oil by-pass valve capscrew

The by-pass valve (located to the right and behind gear cover) controls oil pressure by allowing excess oil to flow directly back to the crankcase. Normally the valve begins to open about 30 psi.

The valve is non-adjustable and normally needs no maintenance. To determine if abnormal (high or low) oil pressure is caused by a sticky plunger inspect as follows:

1. Remove the 3/8"-24 x 1" capscrew located behind the gear cover and under the governor arm.



FESM-11415

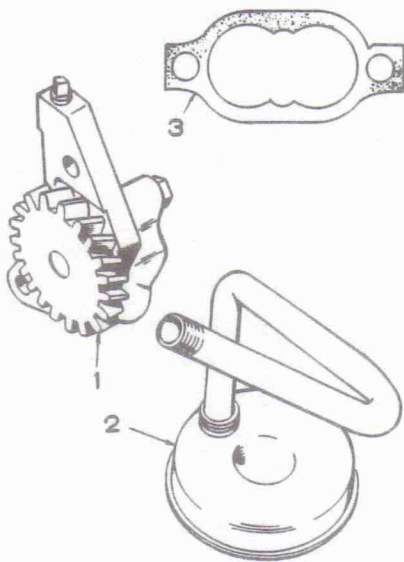
2. Remove the spring and plunger with a magnet tool. Clean the plunger and spring with a suitable solvent and reinstall.

Determine proper valve operation by checking the spring and plunger according to the following measurements:

Plunger Diameter . . . 8.55 to 8.59 mm
(.3365 to .3380 inch)

Spring
Free Length 25.4 mm
(1.0 inch)

Oil Pump



FESM-13237

1. Separate the two halves of the oil pump. Inspect thoroughly for worn or scored parts.

NOTE: Except for the gasket, the components of the oil pump are not serviced separately. The suction cup is available separately. Install a new oil pump if necessary.

2. Install a new gasket. Oil the pump to prime it before reinstalling.

- 1. Oil pump
- 2. Suction cup
- 3. Gasket

ENGINE REASSEMBLY

1. Place the crankshaft gear in Hy-Tran and heat to 177°C (350°F).



CAUTION! Do not heat the Hy-Tran any higher than 177°C (350°). Excessively high temperatures could cause the Hy-Tran to flash. Also, the gear may lose its hardness if exposed to high temperatures for too long a time.



5.6mm (7/32 in.)
FROM OUTSIDE

FESM-13234

Camshaft bearing

2. Coat the camshaft bearings with oil and press or drive the bearings into place. Then close the hole in the back of the crankcase with a welch plug.

IMPORTANT: Make sure the front bearing lubricating hole is aligned with the crankcase. Install the front bearing flush with the outside of the bearing bore. Install the rear bearing until just past the ignition plunger hole.

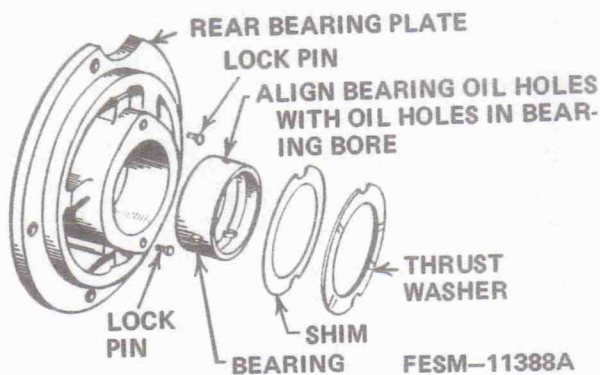
NOTE: The camshaft and main bearings are precision type. Do not line ream or bore.

3. To install the crankshaft main bearings expand the bearing bores by placing the crankcase and bearing plate in hot water or in an oven heated to 94°C (200°F). If practical, cool the bearings to shrink them.

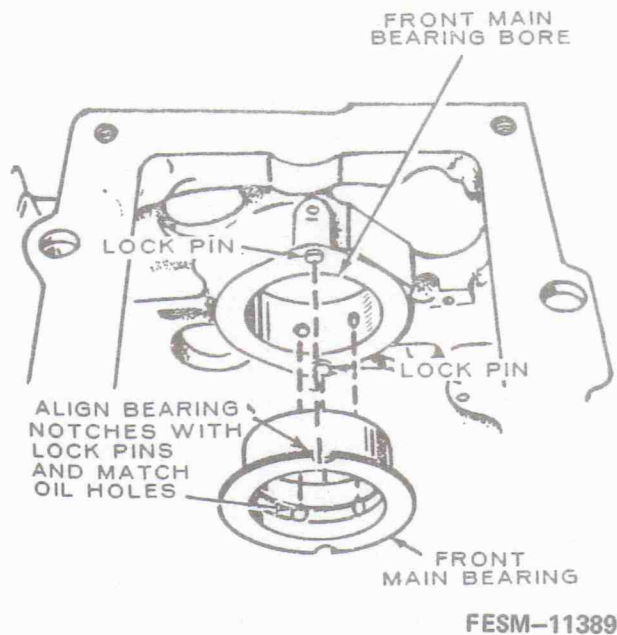
4. Using a proper bearing driver, install the rear bearing flush to .40 mm (1/64 in.) below the end of the bore.

IMPORTANT: Be certain the oil passages are aligned in the bearing bore and bearing. The passages must be at least half open.

NOTE: It may be necessary to remove the bearing lock pins with side cutters or an easy out tool in order to install the main bearings. Install new lock pins if this is the case.



FESM-11388A



5. Using the towelette available in the bearing kit, clean the outside of the front main bearing and the bearing bore in the block. If the towelette is not available use lacquer thinner to clean the surfaces.



CAUTION! Breathing the vapor from the towelette and prolonged contact with skin can be harmful. Be sure the area is well ventilated.

6. Allow three to four minutes for the surfaces to dry and apply the Loctite from the small tube to the mating surfaces of the bearing and bearing bore.

7. Install the front bearing flush with the block. Wipe off any excess Loctite and make sure the oil passages are open. Allow one hour for curing at room temperature.

NOTE: The front bearing replacement part is a one piece bearing (with attached thrust washer). Do not add an additional thrust washer to this front bearing.

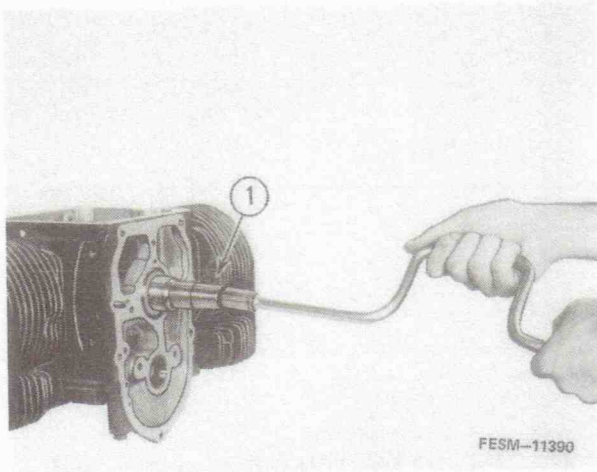
8. Lubricate the front main bearing lightly with oil and insert the crankshaft. With the rear bearing plate gasket in place and the rear plate bearing lubricated, slide the thrust washer (grooves toward crankshaft) and plate over the end of the crankshaft. Line up the notches of the thrust washer with the lock pins before tightening the end plate or the lock pins will be damaged.

NOTE: A light film of oil on the thrust washer may hold it in place while installing the crankshaft.

9. Torque the rear bearing plate nuts to 34-38 N·m (25-28 ft. lbs.).

10. Measure the crankshaft end play behind the front thrust washer. Refer to Specifications for the allowable end play. To decrease the end play, remove the rear bearing plate and add shims between the bearing plate and thrust washer to bring the end play within specifications.

11. Install a new bearing plate gasket being careful not to cover up the oil hole in the block.



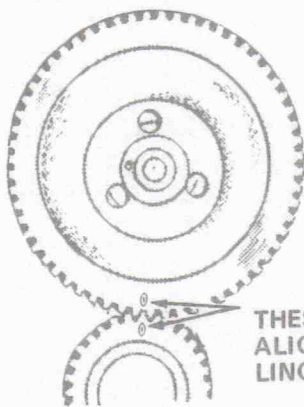
12. Fill the space between the inner and outer lip of the rear oil seal with a fibrous or stiff cup grease for improved sealing.

13. Use a seal expander or wrap shim stock around the end of the crankshaft to protect the seal. Slide the seal over the crankshaft to the rear bearing plate.

14. Tap the seal into place until it bottoms on the shoulder in the rear bearing plate.

15. Thread the flywheel bolt into the end of the crankshaft. This will be used to turn the crankshaft during reassembly of the engine components. After each component has been installed rotate the crankshaft. Should binding occur remove the last component and correct the problem.

1. Crankshaft with flywheel bolt



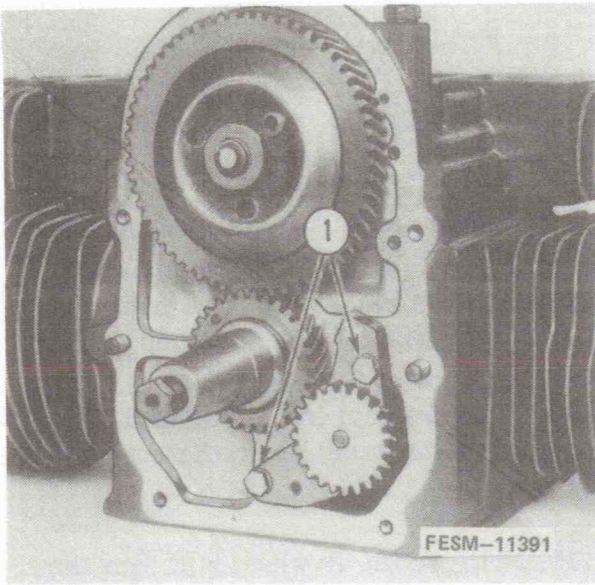
THESE MARKS MUST ALIGN WHEN INSTALLING TIMING GEARS

FESM-13235

16. Set the engine so that the crankshaft is against a solid base and drive the heat-treated gear onto the crankshaft. Make sure the keyway and key are aligned.

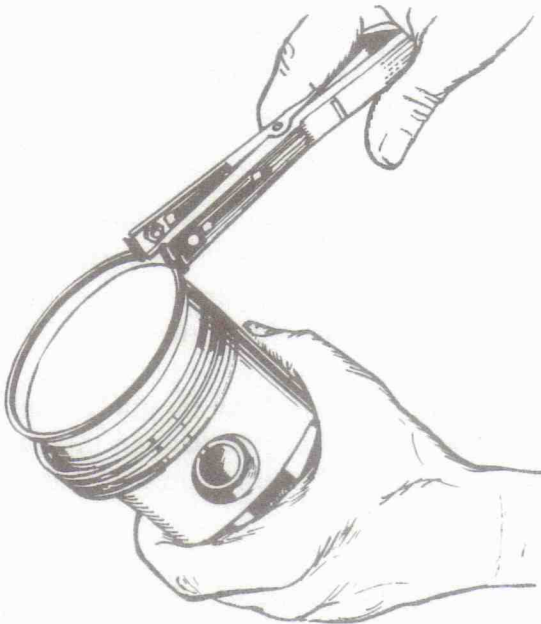
NOTE: The driver can be made from any piece of pipe with the proper inside diameter and a cap welded on one end of it.

17. Turn the crankshaft so the timing mark on the crank gear is up toward the camshaft. Place the thrust washer behind the camshaft gear and install the camshaft. Make sure the timing marks on the two gears align.



18. Install the oil pump. Allow .127 mm (.005 in.) backlash in the pump and crankshaft gears. The mounting bolt holes have enough room to obtain this clearance.

1. Oil pump mounting bolts



19. Install the retaining washer and snap ring on the end of the crankshaft.

20. Using a ring spreader, install the piston rings.

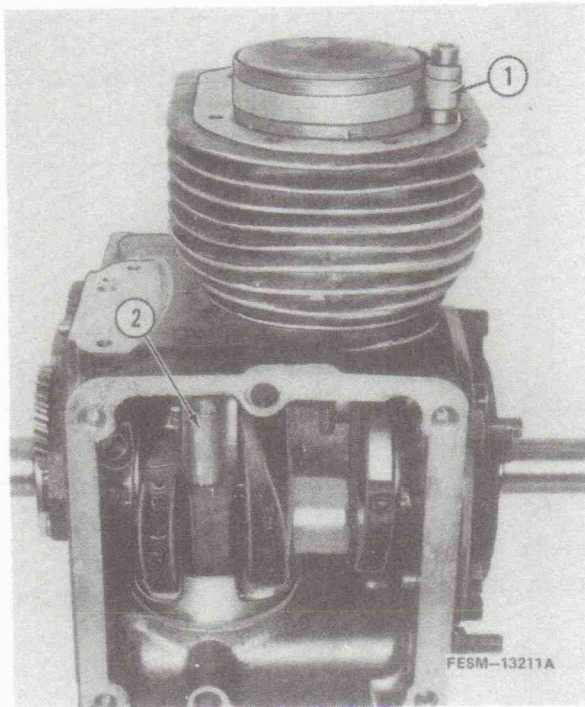
IMPORTANT: Space each ring gap one third of the way around the piston from the preceding one with no gap directly in line with the piston pin.



21. Be sure the piston pin lock rings are properly in place.

22. Prepare to install the piston and connecting rod by turning the crankshaft so that the rod throw is as far as possible from the cylinder bore.

1. Piston pin lock ring



23. Lubricate the piston and rings, cylinder walls and crankshaft bearing journals with a heavy engine oil.

24. Use a ring compressor and install the piston assembly into the cylinder.

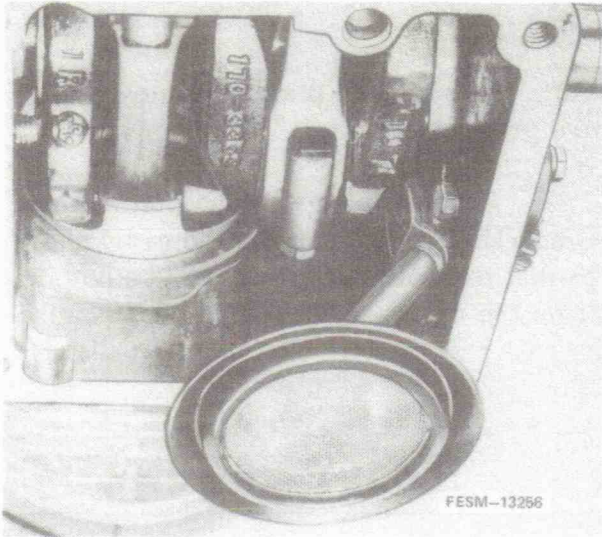
NOTE: Install the pistons so the connecting rod bolts are offset toward outsides of the engine block.

IMPORTANT: The rod caps must face the oil base. The rod and cap numbered 2 fits on the crankshaft journal nearest the bearing plate.

25. Crank the engine by hand to see that the rods are free. If necessary, rap the connecting rods with a soft hammer to set the rod squarely on the journal.

1. 04-464-1 Ring Compressor
2. Rod bolt offsets

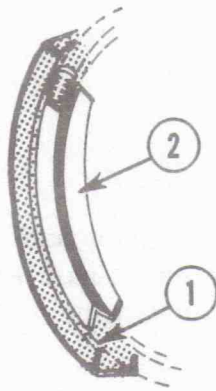
26. Tighten the connecting rod bolts. Refer to Specifications for the proper torque.



27. Install the oil pump intake tube.

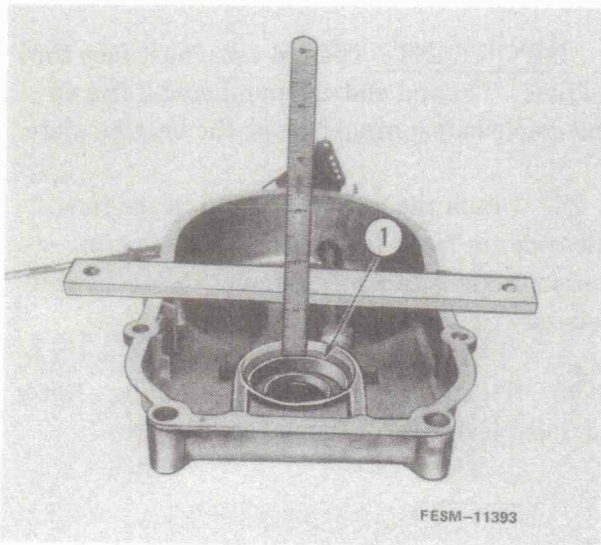
NOTE: Do not exert pressure on the pick-up cup during installation. Apply pressure only to the tube.

28. Using a new gasket mount the crankcase to the oil base. Torque the mounting bolts to 24-31 N·m (18-23 ft. lbs.).



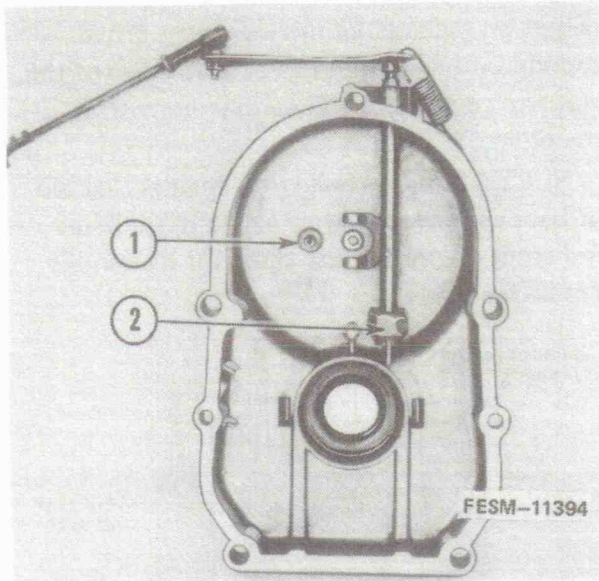
29. Fill the groove in the rubber seal of the front crankshaft oil seal with a fibrous or stiff cup grease for improved sealing.

- 1. Outside metal edge of seal
- 2. Groove in rubber seal



30. Insert the oil seal into the gear cover until it is 26 mm (1-1/32 inch) from the mounting face of the gear cover.

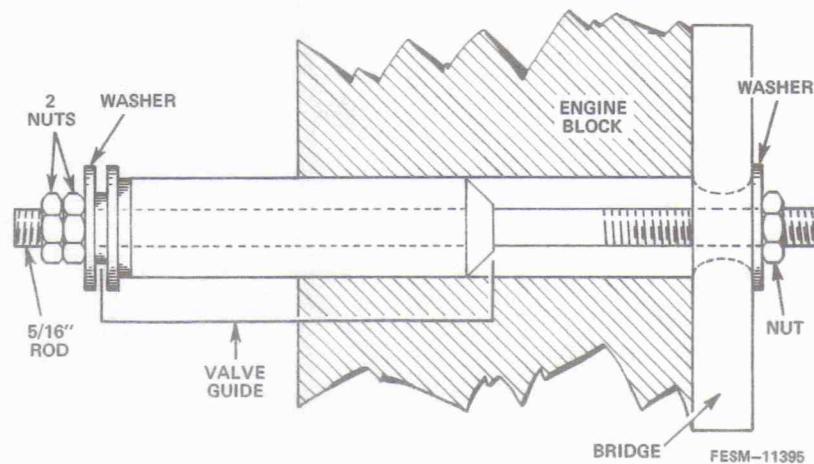
- 1. Oil seal recessed 26 mm (1-1/32 inch)



1. Roll pin
2. Governor shaft pivot ball
(not shown)

31. Turn the engine to the normal up-right position. Place the governor cup bushed hole at the 3 o'clock position. Install a new gear cover gasket on the engine block. Place the gear cover in position. The gear cover should go flush against the block indicating the roll pin in the gear cover has entered the bushed hole in the governor cup. Torque the gear cover screws to 11 to 14 N·m (8 to 10 ft. lbs.).

NOTE: Be sure the governor shaft pivot ball is in place before installing the gear cover. Use Loctite Thread Sealer #592 (IH 634 016 C1) to seal bolt threads on the bolt at the 3 o'clock position (with the wire harness clip).



Valve Guide Installing Tool

32. If new valve guides are to be installed it will be necessary to make a tool in the following manner.

a. Obtain a 178 mm (7 in.) portion of unthreaded 5/16 in. rod.

b. Cut threads on one end of the rod for a distance of 19 mm (3/4 in.). Use any convenient thread size.

c. Cut threads on other end for a distance of 51 mm (2 in.).

NOTE: The unthreaded portion of the rod is necessary to prevent damage to the inside of the valve guide.

IMPORTANT: Be sure the gasket is in place on the intake valve guide before installing the guide.

33. Start the valve guide into the block by hand. Insert the rod into the valve guide so that the short threaded end extends into the valve chamber. Place a washer on the short threaded portion against the valve guide and double nut this end also. Make sure the nuts and washer are run all the way to the end of the threads.

34. Place a bridge over the rod and against the valve surface of the crankcase. Install a washer and nut and run them down against the bridge.

35. Place a wrench on the double nuts and pull the valve guide into the block by turning the single nut and washer against the bridge.

36. Place the tappets in the appropriate holes and the valves into the guides. Put the springs and retainers into position and compress the springs with valve spring compressor. Install the valve locks, use grease to hold the locks in place while releasing the valve spring compressor. Adjust the valves. Refer to Valve Adjustment.

37. Install the cylinder heads with new head gaskets.

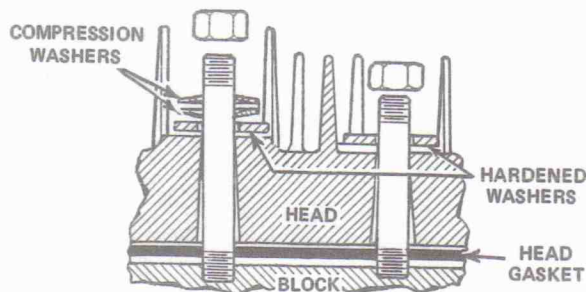
NOTE: Do not attempt to slide the gasket over studs (on engines so equipped) without the cylinder head behind it or the gasket may tear. Place head gasket on the cylinder head. (Do not use cement to hold the gasket in place.) Align the stud holes in the gasket with the stud holes in the cylinder head. While holding the gasket against the cylinder head, carefully install the cylinder head on the block.

Tighten the heads as follows:

4130 and 4135 Compact Loaders

Install a flat washer and two compression washers on each of the top six studs. When properly installed, only the outside edges of the compression washers will be in contact with each other.

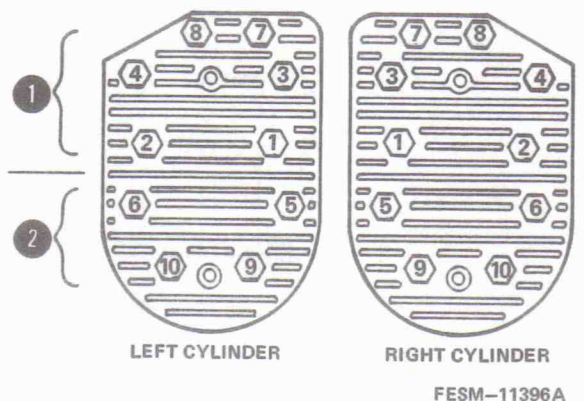
NOTE: Earlier production engines that did not have compression washers on the cylinder head studs do not require them for reassembly of cylinder heads.



FESM-11416A

Install a flat washer on each of the four bottom studs.

Do not substitute flat washers or nuts as both are heat treated parts.



FESM-11396A

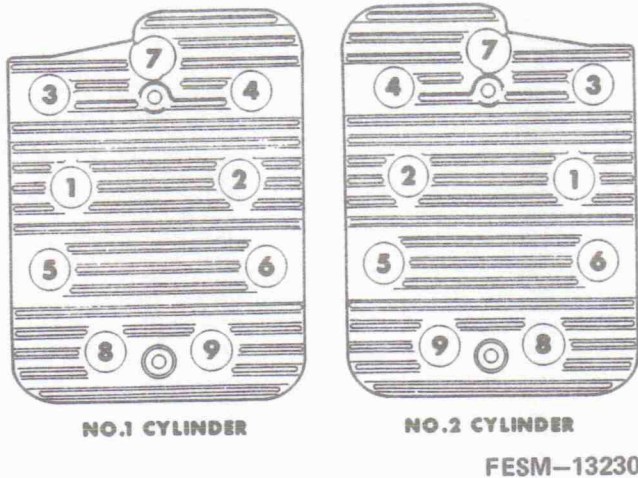
1. Top (long) studs
2. Bottom (short) studs

Follow the head torque sequence shown. First tighten all nuts to 7 N·m (5 ft. lbs.), then to 14 N·m (10 ft. lbs.), then to specified torque, still using the sequence method. Specified torque for the top six studs is 16 N·m (12 ft. lbs.). Specified torque for the bottom four studs is 20 N·m (15 ft. lbs.).

NOTE: 12 ft. lbs. equals 144 in. lbs. 15 ft. lbs. equals 180 in. lbs.

38. Recheck the torque before the engine has run a total of 50 hours.

4125 Compact Loader and 982 Cub Cadet



Follow the head torque sequence as shown. First tighten all bolts to 8 N·m (5 ft. lbs.), then to 14 N·m (10 ft. lbs.) and finally to 16 to 19 N·m (12 to 14 ft. lbs.).

NOTE: 12 to 14 ft. lbs. equals 144 to 168 in. lbs.

38. Recheck torque before the engine has run a total of 25 hours.

39. Install the valve covers and the camshaft inspection cover if equipped.

40. Install the oil filter base and oil sending unit. Mount the starter to the engine.

NOTE: Use Loctite Thread Sealer #592 (IH 634 016 C1) on top filter base mounting bolt.

41. Install the engine governing mechanism. Refer to the Fuel System section for the proper adjustment procedure.

42. Install the breaker point assembly. Refer to the Electrical section to check for proper timing of the engine.

43. Install the carburetor and intake manifold and the crankcase breather assembly.

44. Install the stator. Install the flywheel.

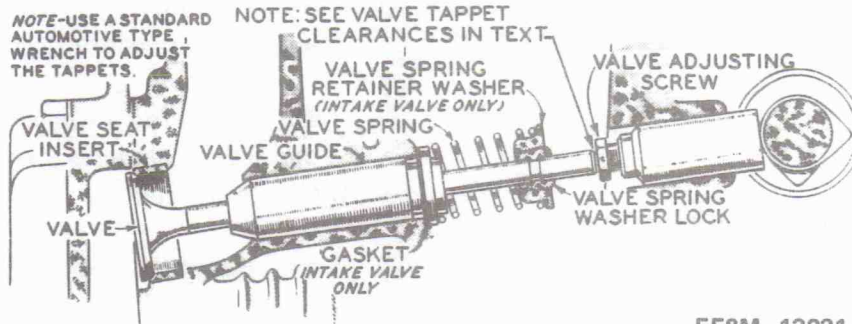
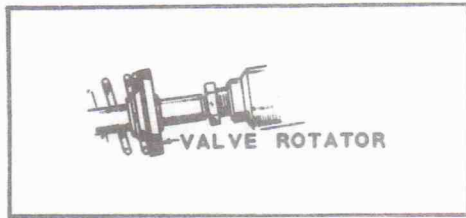
NOTE: Make sure the crankshaft tapered end is clean and dry. Use Loctite Thread Sealer #592 (IH 634 016 C1) on the threads of the flywheel bolt.

45. Install the exhaust tubes.

46. Mount the voltage regulator and rectifier. Connect all electrical leads.


47. Install the engine into the machine.

VALVE ADJUSTMENT



FESM-13231

1. Turn the engine in the direction of rotation and place the piston of the side to be adjusted on top dead center of the compression stroke.

 **CAUTION:** Be sure the coil is disconnected from the spark plug and source of electricity before turning the crankshaft.

2. To be sure the piston is at TDC check the valves of the other cylinder. They should be overlapped, meaning both valves will be at equal height but one will be just closing and the other just opening.

3. Turn the valve clearance adjusting screw the appropriate direction until proper clearance is obtained.

Models 4130 & 4135

Intake 0.076 mm (.003 in.)
Exhaust 0.305 mm (.012 in.)

Models 4125 & 982 Cub Cadet

Intake 0.20 mm (.008 in.)
Exhaust 0.33 mm (.013 in.)

4. Turn the flywheel one complete revolution in the direction of rotation and adjust the valves on the other side.

Section 2

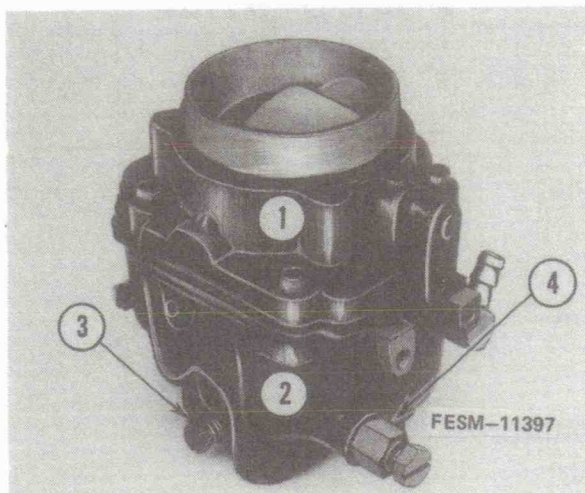
FUEL SYSTEM

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DOWNDRAFT CARBURETOR

Disassembly



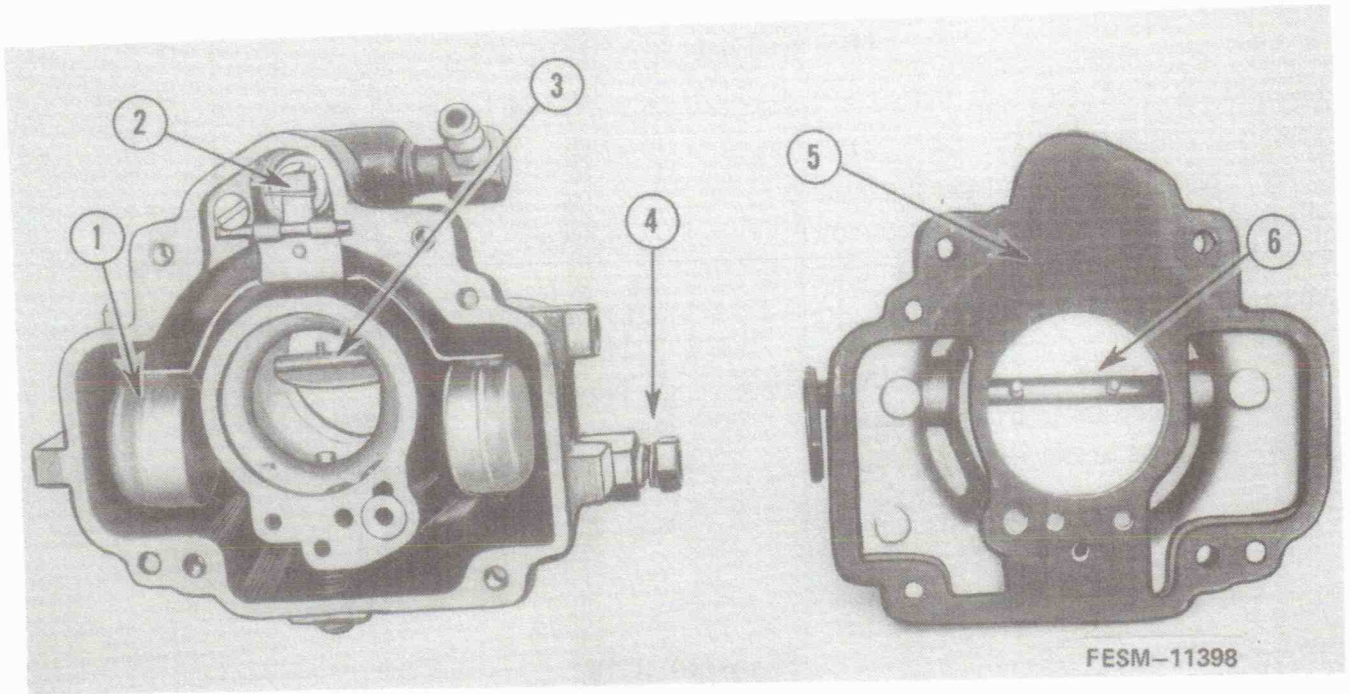
1. Air intake
2. Main carburetor body
3. Idle adjustment needle
4. Power adjustment needle

1. Disconnect the fuel line and linkages from the carburetor.

2. Remove the intake manifold from the engine.

3. Unbolt the carburetor from the intake manifold.

4. Unbolt the air intake from the main carburetor body.



- 1. Float
- 2. Float valve and seat
- 3. Throttle plate and shaft
- 4. Power adjusting needle

- 5. Gasket
 - 6. Choke plate and shaft
5. Remove the fuel bowl gasket.
- NOTE: Upon reassembly install a new gasket kit.
6. Remove the float and float valve and seat assembly.
7. Remove the power and idle adjusting needles. Also remove the power jet.
8. Remove the screws for the throttle and choke plates and remove the plates.
9. Pull out the throttle and choke shafts.

Inspection and Repair

1. Soak the carburetor parts in cleaner. Clean all carbon from the carburetor bowl especially in the throttle plate area. Blow out clogged passages with compressed air.

2. Inspect the power and adjusting needles for wear. If they are grooved or otherwise worn, they must be replaced.

3. Inspect the fuel inlet valve and seat for wear.

4. Inspect the carburetor body for cracks, clogged passages and leakage around the Welch plugs.

5. Inspect the throttle and choke plates for wear.

Reassembly

1. Install the throttle shaft and plate using new screws and lock washers. Be sure the beveled edge of the plate is mated to the carburetor body.

2. To center the plate, back off the screws, close the throttle lever and tap the plate with a small screw driver. Tighten down the screws.

3. Install the choke shaft and plate. Center the plate in the same manner as the throttle plate.

4. Install the power jet and adjustment needles. Be sure to use new gaskets.

5. Install the float valve and float. To check for proper float adjustment, invert the carburetor. In this position the float should be parallel with the bottom of the carburetor body.

6. Install a new fuel bowl gasket and attach the carburetor air intake to the carburetor body.

7. Install the carburetor and intake manifold. Connect the fuel line and linkages.

8. Refer to carburetor adjustment to properly adjust the carburetor.

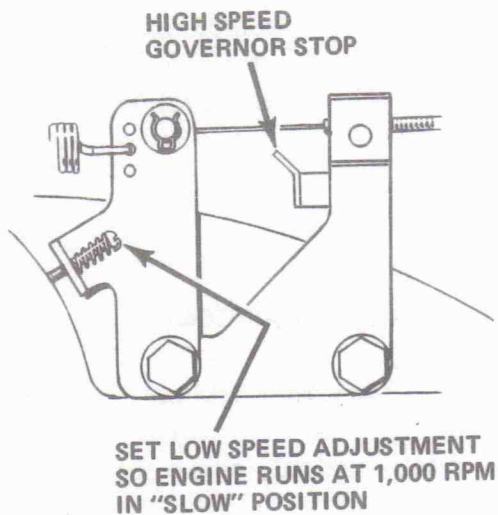
DOWNDRAFT CARBURETOR ADJUSTMENT

4130 and 4135 Compact Loaders

Carburetor Adjustment

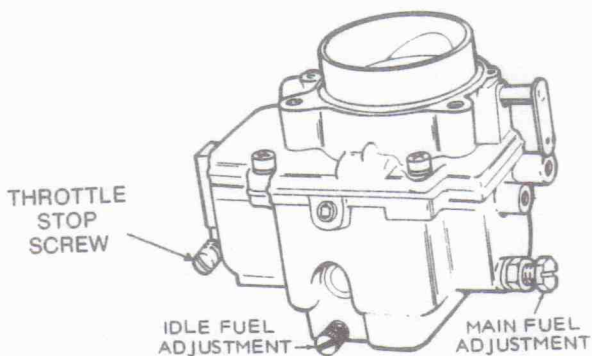
If the adjustments have been disturbed so engine will not run, turn idle needle 1-1/2 to 1-3/4 turns open (off of needle seat). Then start engine and readjust for smooth operation.

IMPORTANT: Do not force the needle against its seat; doing so will damage it.



FESM-13238

Low speed adjustment



FESM-13245

Carburetor adjustments

Carburetor Idle Adjustment

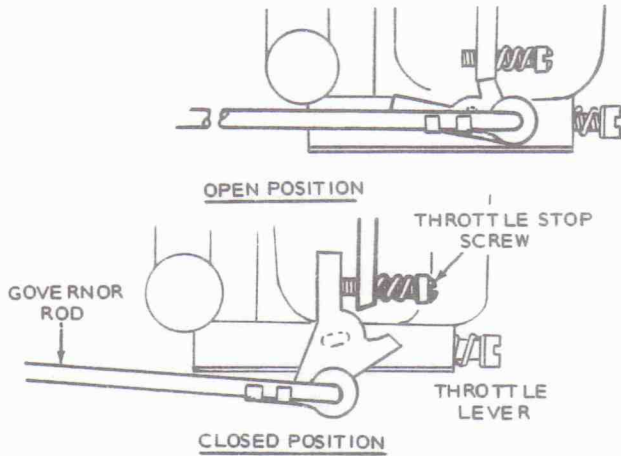
1. Allow the engine to run at least 10 minutes to warm up.
2. Set low speed adjustment. Move engine speed control to SLOW position. The engine should run at about 1000 rpm.
3. Turn the idle needle out (counter-clockwise) until engine begins to slow down or run unevenly. Remember this position.
4. Turn needle in (clockwise) past the position where the engine runs smoothly until it begins to slow down or run unevenly.
5. Back the needle out to a position approximately halfway between the two positions. This should provide a smooth running idle.

Carburetor Main Fuel Adjustment Under Load

If engine runs unevenly at half or full load due to faulty carburetion, the main fuel needle needs adjustment. Be sure engine is at normal operating temperature and the idle adjustment performed.

1. Push on the governor rod so the throttle lever contacts the throttle stop screw (about 1000 rpm).

2. Release governor mechanism to allow engine to accelerate. If engine accelerates evenly and without hesitation, main adjustment is correct. If not, turn needle outward about one half turn and again slow the engine down and release the mechanism. Continue until the engine accelerates evenly and without a hesitation after releasing the governor.



FESM-13239

Throttle stop screw setting

3. If engine tends to hunt (alternate increase and decrease of speed), open the main adjusting needle a little more. Do not open more than one half turn beyond the maximum power point.

Throttle Stop Screw

The throttle stop screw is located on the base of the carburetor (opposite side from main power adjustment needle) near the crankcase breather valve. It must be adjusted for desired idle speed at no load with the throttle closed as far as possible (throttle shaft lever touching adjustment screw).

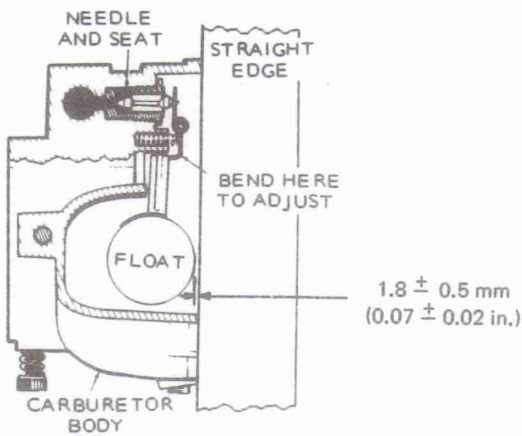
Carburetor Float Adjustment

1. Normal operation seldom requires any adjustment of the float level. Disconnect throttle control, choke leads, air cleaner inlet hose and fuel line from carburetor.

2. Remove the four bolts that hold the intake manifold assembly in place and remove the complete carburetor and intake manifold assembly as one unit. Then remove carburetor from intake manifold for easier handling when checking float level.

3. Remove the four Phillips head screws on the top of the carburetor and lift it off.

4. Invert the carburetor and check the float setting. The float should have a 1.8 to 0.5 mm (0.07 to 0.02 inch) clearance from the machined mating surface (without gasket). Bend the float tab as required.



FESM-13246

Float level adjustment

5. If it is necessary to reset the float level, loosen the screw near float valve axle (pin) and bend the float arm near float valve axle (pin) to position float flush with top edge of carburetor float bowl.

IMPORTANT: If float adjustment is necessary, be careful not to lose the buoyancy spring or the tension spring on the viton tip float needle and seat assembly.

6. Reassemble carburetor and reinstall carburetor on intake manifold assembly and then replace complete assembly on the engine.

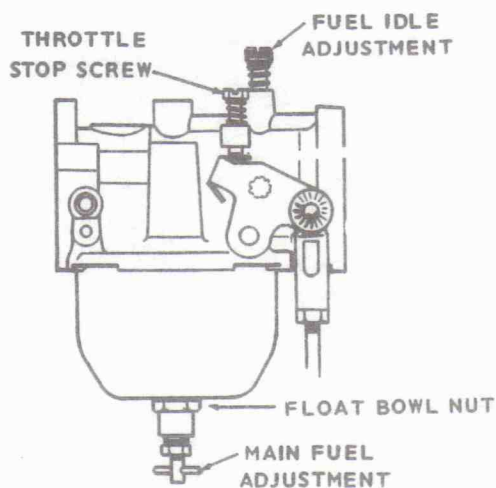
7. Check carburetor for proper operation.

SIDEDRAFT CARBURETOR ADJUSTMENT

4130 Compact Loader

If carburetor adjustments have been disturbed so engine will not run, open both valves 1 to 1-1/2 turns off their seats to permit starting. Then readjust for smooth operation.

IMPORTANT: Do not force the needle against its seat; doing so will damage it.



FESM-13247

Carburetor adjustments

Carburetor Adjustment

1. Start engine and allow it to warm up.

2. Check to see that ignition and governor operation is normal.

3. With no load on engine, turn idle adjustment slowly in then out until best normal idle speed (2400 rpm) is achieved (1 to 1-1/2 turns open is normal).

4. Push on the governor rod so the throttle lever contacts the throttle stop screw (about 1000 rpm).

5. Release governor linkage to allow engine to accelerate. The main adjustment is correct if engine accelerates without a lag. If not, turn main adjustment out about 1/4 turn and repeat check until engine accelerates evenly without a lag.

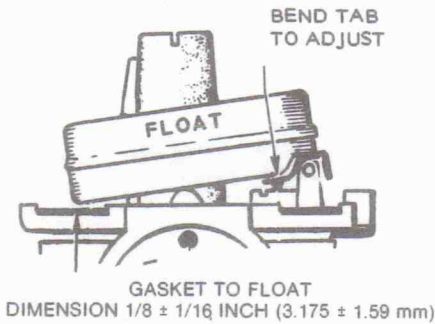
6. Set throttle stop at desired speed.

7. With full load applied, turn main adjustment slowly in then out until best normal speed is achieved.

Float Level Check

If the carburetor adjustment fails to provide satisfactory operation, remove the carburetor and check the float level as follows:

1. Remove the fuel line, air cleaner hose, governor linkage and choke wires.



FESM-13248

Float level adjustment

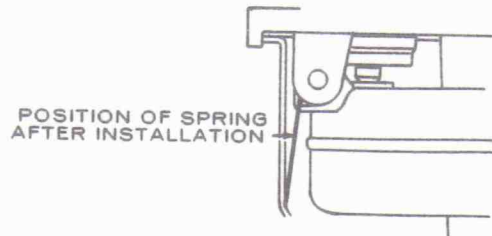
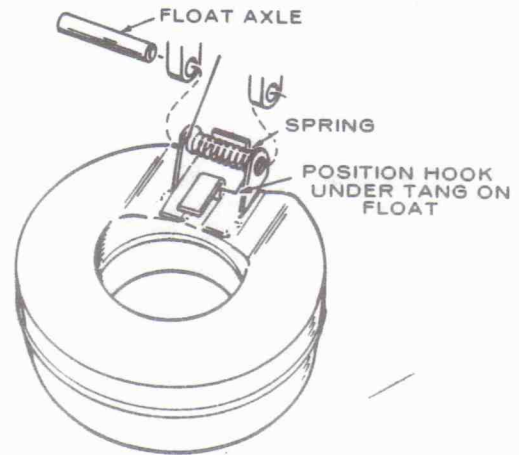
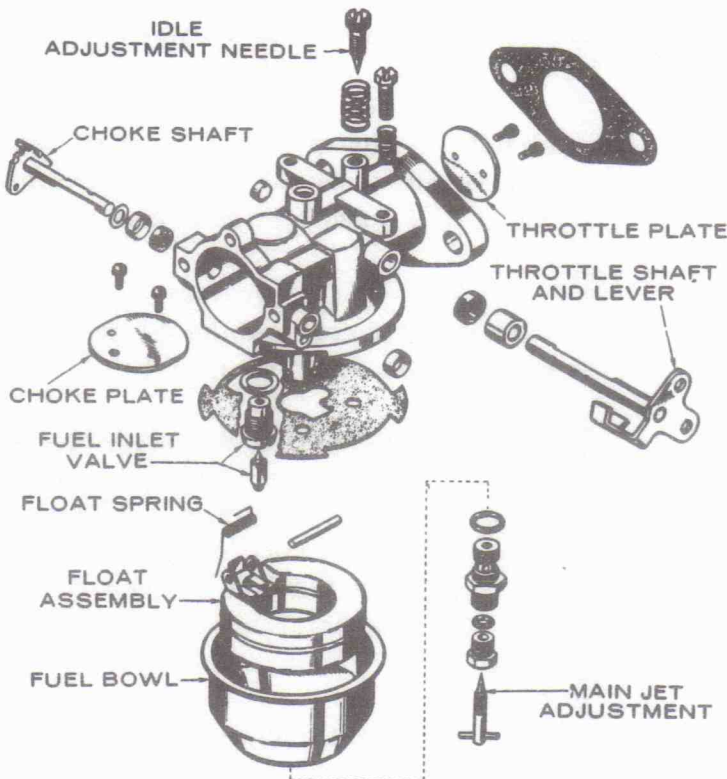
2. Remove the two carburetor mounting nuts and remove the carburetor.

3. Unscrew the float bowl nut and remove the entire main fuel adjustment assembly from the float bowl.

4. Invert the carburetor and check that the float surface nearest the gasket is 3.175 to 1.59 mm (1/8 to 1/16 inch) from the gasket. Bend the float tab as required to produce this spacing.

If the carburetor utilizes an internally spring loaded fuel inlet valve, the float surface should be (3.175 to 1.59 mm (1/8 to 1/16 inch) from the gasket with the full weight of the float compressing the spring in the needle.

5. Reassemble, install and test. Refer to the illustration below.

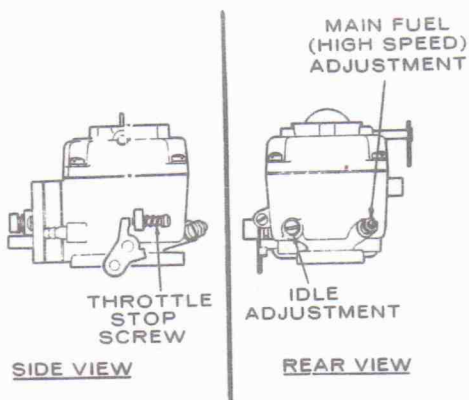


FESM-13249

Carburetor assembly

CARBURETOR ADJUSTMENT 4125 COMPACT LOADER

The carburetor has a main fuel valve adjusting screw and an idle valve adjusting screw. A low speed adjustment screw is shown below.



FESM-13250

Main fuel and idle valve adjustment

Initial Adjustment

1. Turn main fuel valve clockwise until it just closes.

IMPORTANT: Do not open main fuel jet more than 1/2 turn beyond the maximum power point as this could cause spark plug fouling, etc.

2. Now open main fuel valve 1-1/4 turn counterclockwise from seat.

3. Close idle valve in same manner and open it one turn (counterclockwise).

4. This adjustment will permit engine to start and warm prior to final adjustment.

Final Adjustment

1. Turn main fuel valve in until engine misses (lean mixture), then turn it out past the point where engine runs unevenly (rich mixture). Turn valve to mid-point between lean and rich so engine runs smoothly. (This should be 1-1/4 to 1-1/2 from seat.)

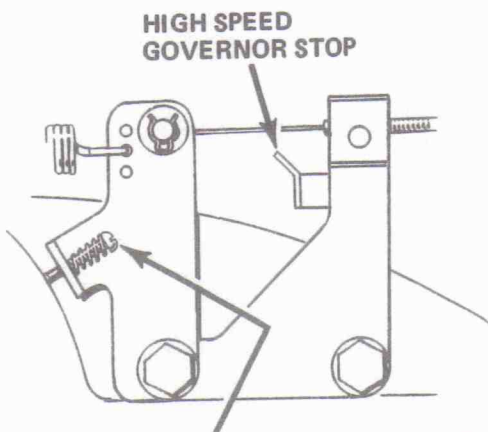
2. Hold engine at idle position and set low speed adjustment screw until a low idle is obtained (1000).

3. Hold throttle in idle position and turn idle adjustment valve in (lean) and out (rich) until engine idles smoothly.

4. Reset low speed adjustment screw so engine idles at 1000 rpm.

5. Release throttle - engine should accelerate without hesitation. If engine does not accelerate properly, readjust main fuel valve by turning out slightly.

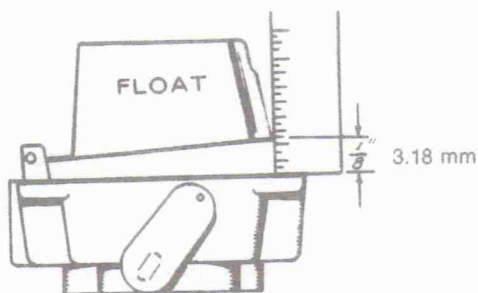
NOTE: Do not open more than 1/2 turn beyond maximum power point.



SET LOW SPEED ADJUSTMENT
SO ENGINE RUNS AT 1,000 RPM
IN "SLOW" POSITION

FESM-13238

Carburetor Float Adjustment



FESM-13252

Float adjustment

1. Invert float assembly and casting.
2. With the float resting lightly against the needle and seat, there should be 3.18 mm (1/8 inch) clearance between the bowl cover gasket and the free end of float.
3. If it is necessary to reset the float level, bend float tangs near pin to obtain a 3.18 mm (1/8 inch) clearance.

CARBURETOR ADJUSTMENT 982 CUB CADET

The carburetor has a power (high speed) adjustment and an idle fuel adjustment. The main adjustment affects operation under heavy load conditions. Idle adjustment affects operation under light or no load conditions. Under normal circumstances, factory carburetor adjustments should not be disturbed. If the adjustments have been disturbed, turn idle needle 1-1/8 turns open and main jet (power needle) 1-1/4 to 1-1/2 turns open (off of needle seat). Then readjust them for smooth operation.

IMPORTANT: Do not force the needle against its seat; doing so will damage it.

Carburetor Idle Adjustment

1. Allow the engine to run at least 10 minutes to warm up.

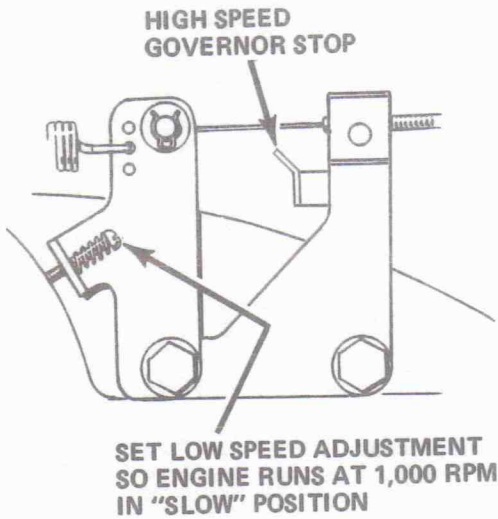
2. Move engine speed control to slow position. Back out low speed governor adjusting screw so throttle stop screw controls engine speed. Adjust throttle stop screw for 1000 rpm idle.

3. Turn the idle needle out (counterclockwise) until engine begins to slow down or run unevenly. Remember this position.

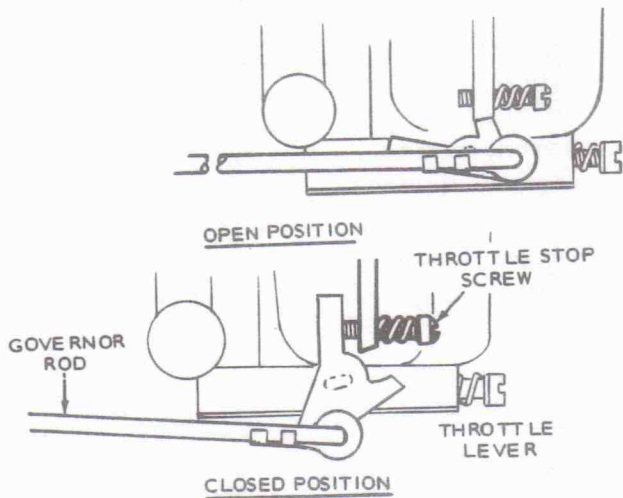
4. Turn needle in (clockwise) past the position where the engine runs smoothly until it begins to slow down or run unevenly.

5. Back the needle out to a position approximately halfway between the two positions. This should provide a smooth running idle.

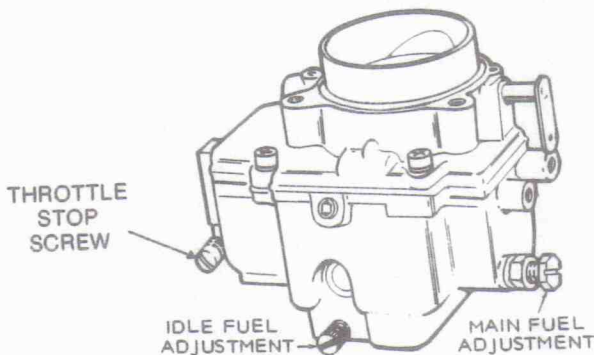
6. For good governor control during engine deceleration, adjust throttle stop screw for 800-900 rpm idle. Then adjust low speed governor adjusting screw for 1000 rpm idle. Engine will then idle at 1000 rpm under governor control.



FESM-13238



FESM-13239



FESM-13245

Carburetor adjustments

Carburetor Main (Load) Adjustment

If engine runs unevenly at half or full load due to faulty carburetion, the main adjusting needle needs readjustment.

1. Start engine and allow it to warm up.
2. Set idle adjustment.
3. Move engine speed control to fast position. Check engine speed with a tachometer for specified 3600 rpm. Bend high speed governor stop, if required, to adjust high idle. Turn main fuel adjustment in until engine loses speed and runs unevenly, then turn out 1/2 to 3/4 turn.
4. Push in on governor mechanism to slow engine down to idle speed. Release governor mechanism to allow engine to accelerate (alternate method is to use vehicles governor control). If engine accelerates evenly and without hesitation, main fuel adjustment is correct. If not, adjust main fuel needle in 1/8 turn increments outward until engine accelerates evenly and without hesitation after releasing the governor.
5. If engine tends to hunt (alternate increase and decrease of speed), open the main adjusting needle a little more. Do not open more than one half turn beyond position set in step 3.

GOVERNOR ADJUSTMENT

4130 and 4135 Compact Loaders

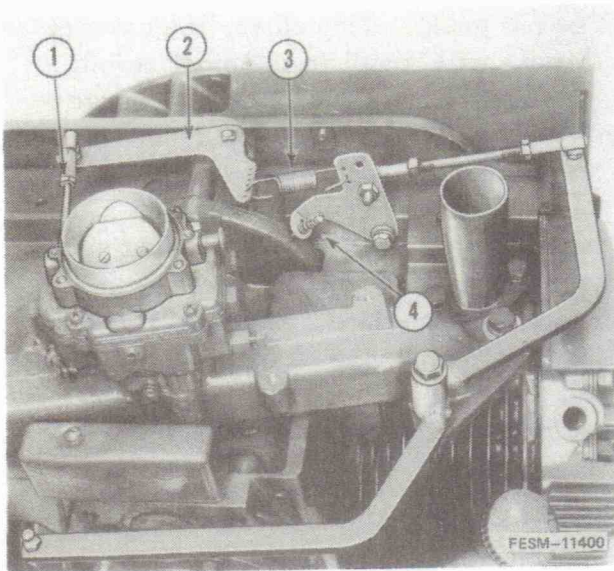
Before making governor adjustment, run the engine about 15 minutes to reach normal operating temperature.

It is difficult to determine if, after long usage, the governor spring has become fatigued. If after properly making all other adjustments, the regulation is still erratic, install a new spring.

A tachometer for checking engine speed is required for accurate adjustment.

Check the governor arm, linkage throttle shaft and lever for binding or excessive wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor.

Excessive looseness will cause a hunting condition and regulation will be erratic. Work the arm back and forth several times by hand while the engine idles. If either of these conditions exist, determine the cause and adjust or replace parts as needed.



1. Governor linkage
2. Governor arm
3. Governor spring
4. Spring tension screw

1. Adjust the carburetor main jet for the best fuel mixture at full load operation.

2. Adjust the carburetor idle needle with no load connected.

3. Adjust the length of the governor linkage.

Linkage: The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle arm is adjusted by rotating the ball joint housing. Adjust the length so that with the engine stopped and tension on the governor spring, the stop on the carburetor throttle lever is 0.794 mm (1/32 inch) from the carburetor stop boss. This setting allows immediate control by the governor after starting and synchronizes travel of the governor arm and the throttle shaft.

4. Check the governor linkage and throttle shaft for binding or excessive looseness.

5. Adjust the governor spring tension for nominal engine speed at no load operation.

Speed Adjustment: The speed at which the engine operates is determined by the tension applied to the governor spring. Increasing spring tension increases engine speed. Decreasing spring tension decreases engine speed.

If a speed adjustment is needed, turn the spring tension screw in to increase the speed or out to decrease the speed.

6. Check the rpm drop between no load and full load operation and adjust the governor sensitivity as needed.

Sensitivity Adjustment: The engine speed drop from no load to full load should be not less than 100 rpm. Check the engine speed with no load connected and again after connecting full load. Do not exceed 4000 rpm at no load.

The sensitivity of the governor depends upon the position of the arm end of the governor spring. A series of holes in the governor arm provides for adjustment. To increase sensitivity, move the spring toward the governor shaft. To decrease sensitivity, move the spring toward the linkage end of the governor arm.

If the setting is too sensitive, a hunting condition (alternate increase and decrease in engine speed) will result. If the setting is not sensitive enough, the speed variation between no load and full load conditions will be too great. Therefore, the correct sensitivity will result in the most stable speed regulation without causing a surge condition.

7. Recheck the speed adjustment after a sensitivity adjustment. Increasing sensitivity will cause a slight decrease in speed and will require a slight increase in the governor spring tension.

8. Set the carburetor throttle stop screw.

4125 Compact Loader and 982 Cub Cadet

Governor

These engines are adapted for use where a wide range of speed settings is desired. Engine speed is controlled at any given point between minimum and maximum by simple shifting the throttle lever on the dash panel until the desired speed is reached.

The variable speed governor give an automatic decrease in sensitivity when the speed is increased. The result is good stability at all speeds.

A reliable instrument for checking engine speed is required for accurate governor adjustment. Engine speed can be checked with a tachometer.

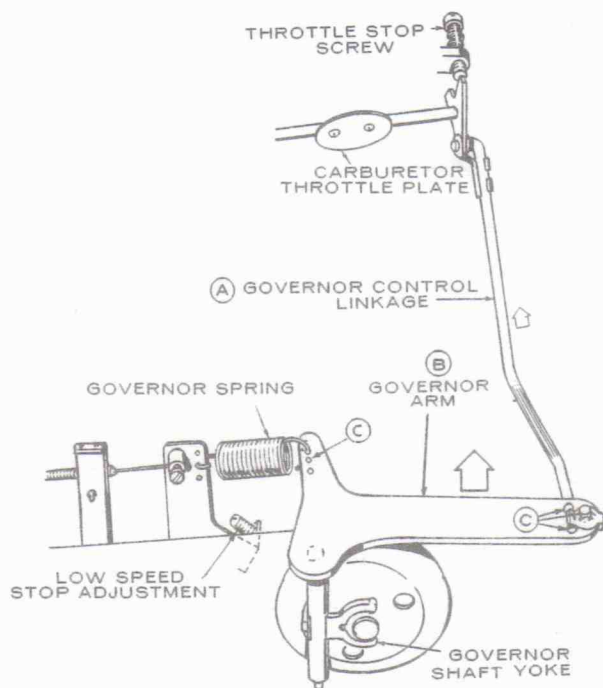
Check the governor arm, linkage, throttle shaft, and lever for binding condition or excessive slack and wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor. Excessive looseness may cause a hunting condition and regulation could be erratic. Work the arm back and forth several times by hand while the engine is idling to check for above conditions.

If the governor is hunting or not operating properly, adjust as follows and as shown in illustration.

1. Disconnect linkage (A) from one of holes (C).

2. Push linkage (A) and governor arm (B) as far back (toward carburetor) as they will go.

3. Holding linkage and governor arm toward direction of carburetor, insert end of linkage into whichever hole (C) in governor arm lines up the closest. If between two holes, insert in next hole out.

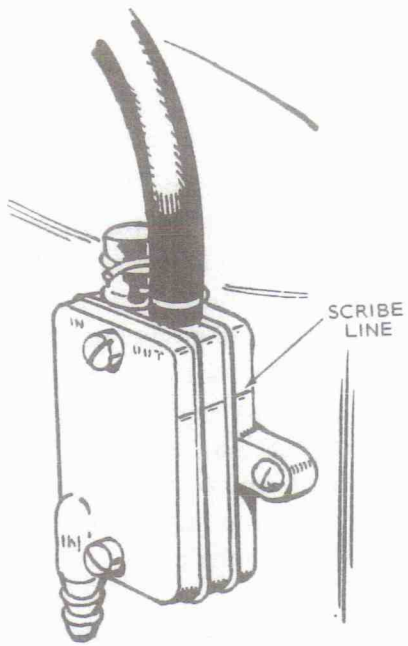


FESM-13251

Variable speed governor adjustments

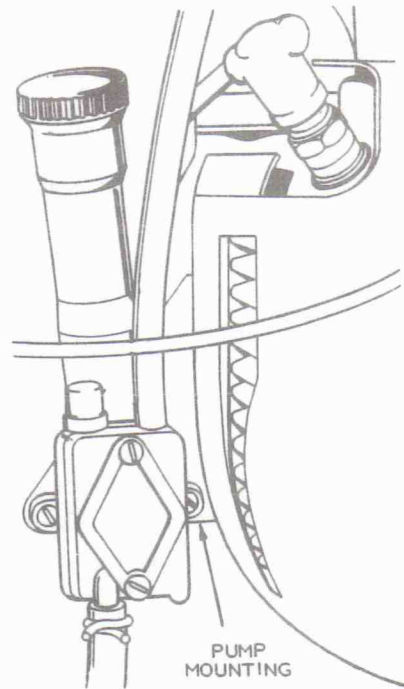
The governor control spring is factory set in the third hole of the governor arm (farthest from pivot). To increase sensitivity, move spring loop into hole nearest the pivot point or shaft. To decrease sensitivity, move spring outward. After the sensitivity has been set, adjust the low speed with adjustment screw on the control wire bracket. The spring will normally be in third hole from pivot.

FUEL PUMP



FESM-13253

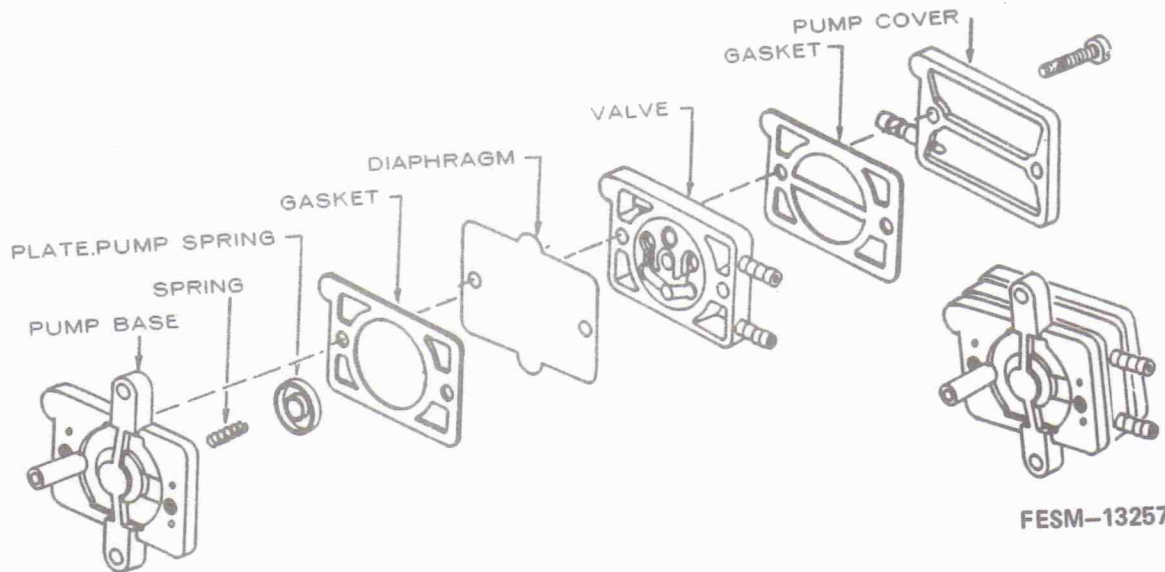
Models 982 Cub Cadet, 4125
& 4135 Compact Loader



FESM-13254

Model 4130 Compact Loader Pump
Mounts on Rear Engine Housing

1. Remove the vacuum and fuel lines.
Inspect the lines for cracks and wear.
2. Scribe a line across the pump parts
for easier reassembly.
3. Remove the fuel pump attaching
screws.



FESM-13257

4. Carefully pull the sections of the pump apart. The diaphragm, plunger, spring, pump plate, pump body and gaskets will not be loose.

5. Check parts for wear and damage. Replace with new parts as necessary.

6. The pump air bleed hole in the pump base must open (unclogged) to allow free movement of the pump diaphragm.



CAUTION! Carefully assemble the pump. All parts must be perfectly aligned or the pump may leak creating a fire hazard.

7. Replace gaskets with new one. Re-assemble pump, refer to the illustration.

8. Install the pump and the lines. Make sure fuel line clamps are installed on the fuel lines.

Section 3

ELECTRICAL SYSTEM

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STARTER

4125, 4130 and 4135 Compact Loaders

Disassembly

1. Remove the necessary shrouding and unbolt the starter assembly from the engine.

2. Disconnect the starter connector from the M terminal of the magnetic switch.

3. Unscrew the mounting screws and remove the magnetic switch.

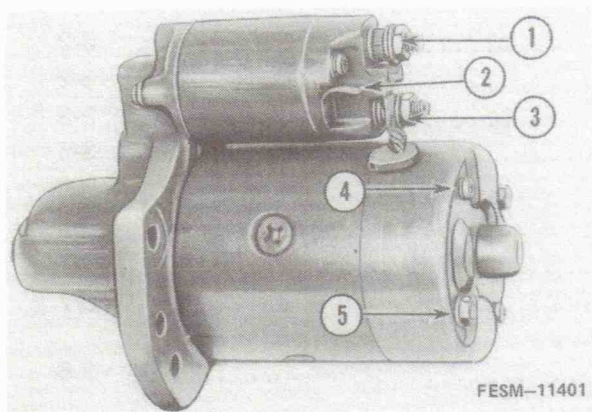
4. Remove the through bolts and brush holder mounting screws. This will allow separation of the front bracket, housing and rear bracket.

5. Pull the armature from the front bracket. The shift lever, plate and set spring will come out with the armature.

NOTE: Be careful not to lose the small steel armature washer located in the front bracket.

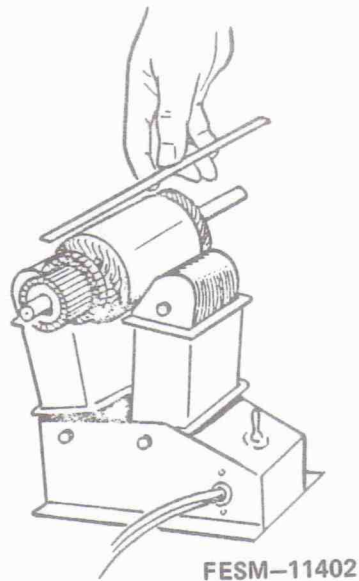
6. Drive the armature pinion stop pin toward the pinion gear with an appropriate size cylindrical tool such as a socket. Remove the retainer ring.

7. Pull the pinion drive and pinion stop pin from the armature.

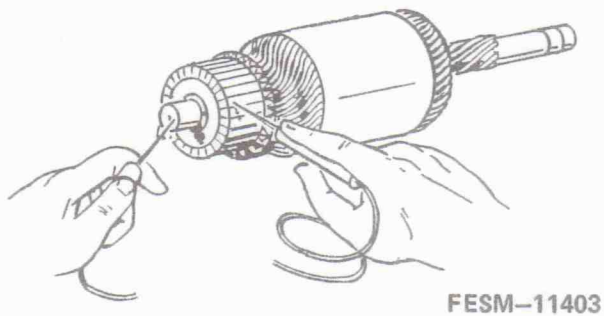


1. Battery terminal
2. Starter switch terminal
3. Motor terminal
4. Brush holder mounting screws
5. Through bolts

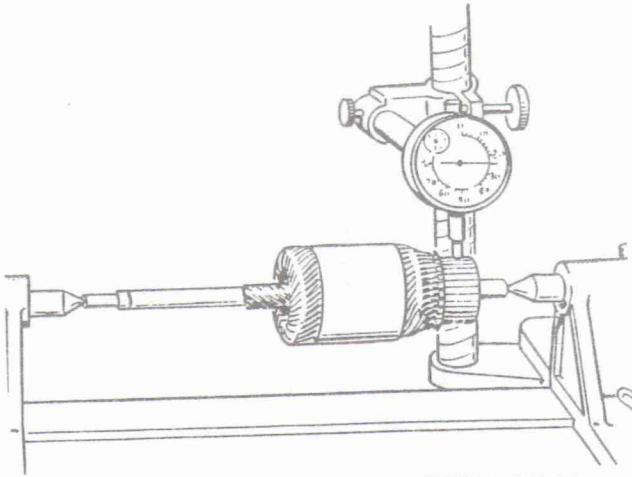
Inspection and Repair



1. Testing the Armature for Short Circuits - Place the armature in a growler and hold a thin steel blade parallel to the core and just above it while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace shorted armature.



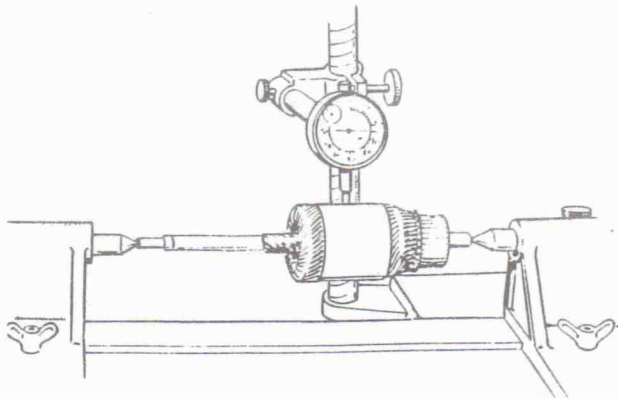
2. Test the Armature for Grounds - Touch the armature shaft or core and the end of each commutator bar with a pair of ohmmeter leads. If the ohmmeter reading is low, it indicates a grounded armature. Replace grounded armature.



FESM-11404

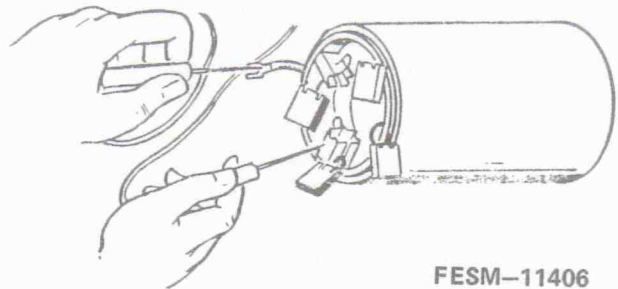
3. Test the Armature for an Open Circuit - Place one ohmmeter lead on any commutator bar. With the other lead, touch each commutator bar one after the other. Continuity should be present. If not, one or more commutator bars are disconnected and the armature should be replaced.

4. Test the Commutator Runout - Place the armature in a test bench and check runout with a dial indicator. When commutator runout exceeds .10 mm (.004 inch) commutator should be refaced.



FESM-11405

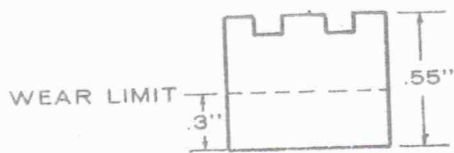
5. Test the Armature Shaft Runout - The armature shaft as well as the commutator may be checked. A bent armature often may be straightened, but if the shaft is worn, a new armature is required.



FESM-11406

6. Grounded field coils can not be detected.

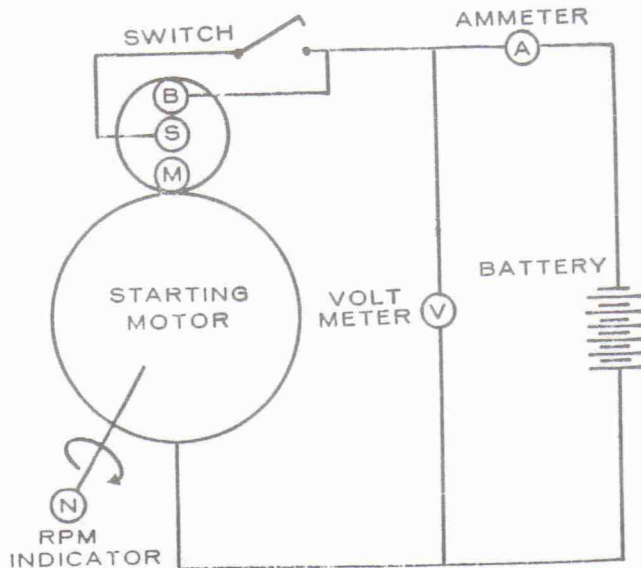
7. Test the Field Coils for an Open Circuit - Place one lead on the connector and the other on a clean spot on the brushholder. If the ohmmeter reading is high, the field coil is open. Check the other three brushholders in the same manner.



FESM-11407

8. Inspection of the Brushes - Replace the brushes when they are worn to less than 7.62 mm (.3 inches). See that all brushes move freely in their holders.

Inspection after Repair



FESM-11408

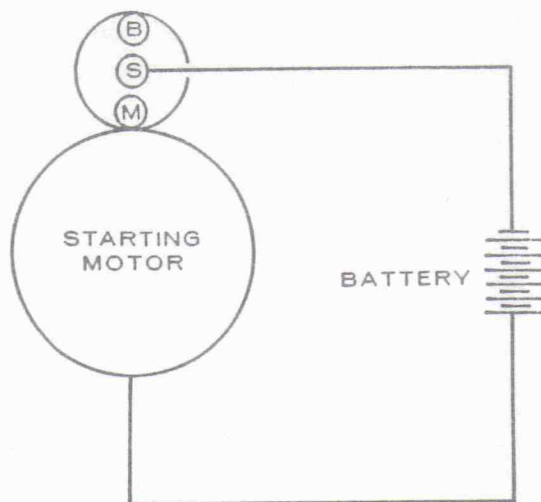
1. For no load test, the starting motor is wired as shown and revolved. The meter readings for this test should be:

Voltage	11.5 volt
Speed	3700 rpm minimum
Current Draw	60 amp maximum

NOTE: The conductor for this test should be large enough to carry 60 amps and as short as possible.

2. If anything is wrong in the above test, inspect the following items:

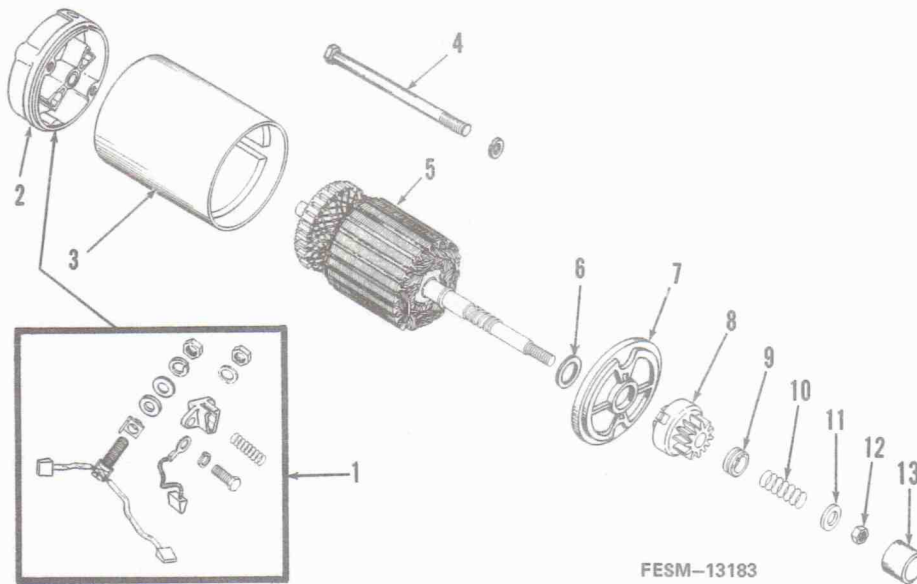
- Annealed brush springs
- Improperly seated brushes
- Insufficient armature end play
- Shorted, open or grounded armature
- Grounded or open field coil
- Poor electrical connection
- Dirty commutator



FESM-11409

3. Adjusting Pinion Clearance - Connect the battery to the starting motor as shown. This will allow the pinion of the starting motor to slide and stop. In this state, measure the clearance between the end of the pinion and pinion stopper when the pinion is pushed lightly toward the commutator end. Clearance should be 0.51 to 1.52 mm (.02 to .06 inches). Adjust for proper clearance by removing the magnetic switch attaching screws and selecting the proper thickness of fiber packings.

982 Cub Cadet



FESM-13183

1. Brush assembly
2. End cap
3. Frame
4. Thru bolt
5. Armature
6. Washer
7. Mounting plate
8. Drive pinion
9. Shield retainer
10. Spring
11. Washer
12. Stop nut
13. Dust shield

Disassembly

1. Remove the thru bolts and the end cap. The brushes and springs may fall out of the end cap.

2. Slide the armature frame off the armature.

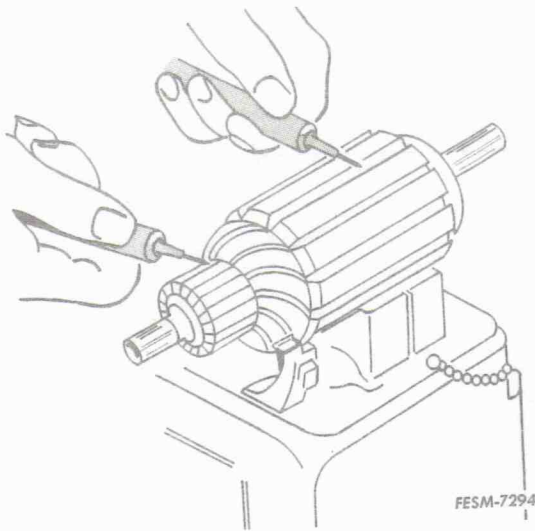
3. Wrap the armature in clean rags and carefully clamp it in a soft jawed vise.

4. Remove the dust shield, the pinion stop not, shield retainer, spring and drive pinion.

Inspection and Repair

1. Replace brushes if worn to less than 5/16 inch or worn unevenly or damaged.

2. Check the armature for open circuit or short circuits. Open circuits are usually obvious because the open circuited commutator bars will arc each time they pass under the brushes so that they soon become burned. Use the test prods on the growler to check for openings. Replace armature if an open circuit is found and/or if the commutator is burnt.



Checking armature for open circuit

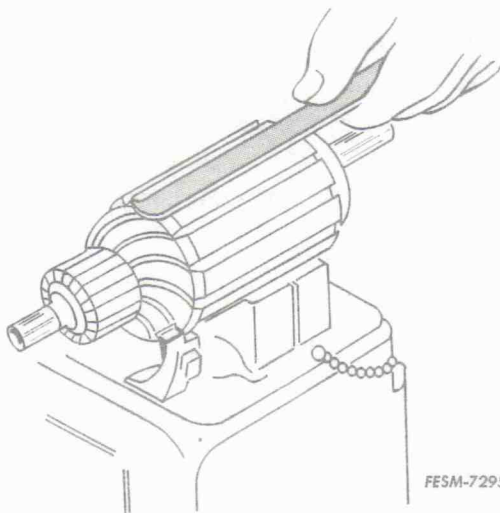
FESM-7294

Use a growler to locate short circuits in the armature. Rotate the armature in the growler while holding a steel strip over the armature so that it passes over each armature core slot. If a coil is shorted, the strip will vibrate.

Clean the commutator with a coarse, lintless cloth. Replace the armature if the commutator is worn or badly grooved.

3. Inspect the drive pinion for wear and broken teeth. Replace if necessary.

4. Inspect all other parts and replace as necessary.



Checking armature for short circuit

FESM-7295

Reassembly

1. Place the washer, mounting plate, drive pinion, shield retainer, spring washer on the armature shaft. Use Loctite Thread Locker #262 (IH 634 017 C1) on the armature shaft threads. Install the stop nut and torque to 18 N-m (160 in. lbs.). Install the dust shield.

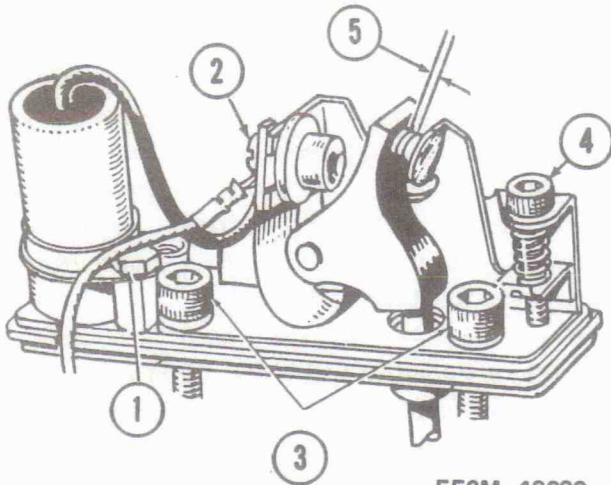
2. Slide the armature assembly into the frame.

3. Install the springs and brushes in the end cap. Hold the brushes in place and set the armature in the end cap.

4. Install the thru bolts.

BREAKER POINTS

Timing and Adjustment



FESM-13232

1. Condenser mounting bolt
2. Condenser and coil lead screw
3. Breaker assembly mounting bolts
4. Point gap adjusting screw
5. Point gap

DISCONNECT BATTERY GROUND WIRE

1. Remove the breaker point cover.
2. Remove the spark plugs, this will make engine easy to turn.
3. Turn engine in the direction of rotation until the points open.
4. Continue turning the engine in the direction of rotation until the points close. Then turn the engine back (opposite rotation) slightly until the points are fully open.
5. Set gap at specified dimension by turning adjusting screw in or out while holding a feeler gauge between breaker point contacts.
6. Reassemble.
7. Check ignition timing.

IGNITION COIL

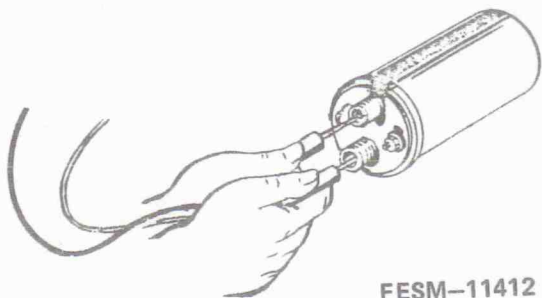
To test the primary and secondary windings within the ignition coil proceed as follows:

1. Use the Simpson 260 VOM or equivalent.

2. Place the back lead on the ground (-) terminal of the coil and the red lead to the positive (+) terminal. Primary resistance should read 3.87 to 4.73 ohms @ 21°C (70°F).

3. Change the resistance setting on the ohmmeter. Place the ohmmeter leads inside of the spark plug cable holes. The secondary resistance should read 12,600 to 15,400 ohms @ 21°C (70°F).

4. If any of the above conditions are not met, replace the coil.



Testing secondary resistance

SPARK PLUGS

Remove both spark plugs and install new ones every 100 hours. Check to be sure the spark plug gap is correct.

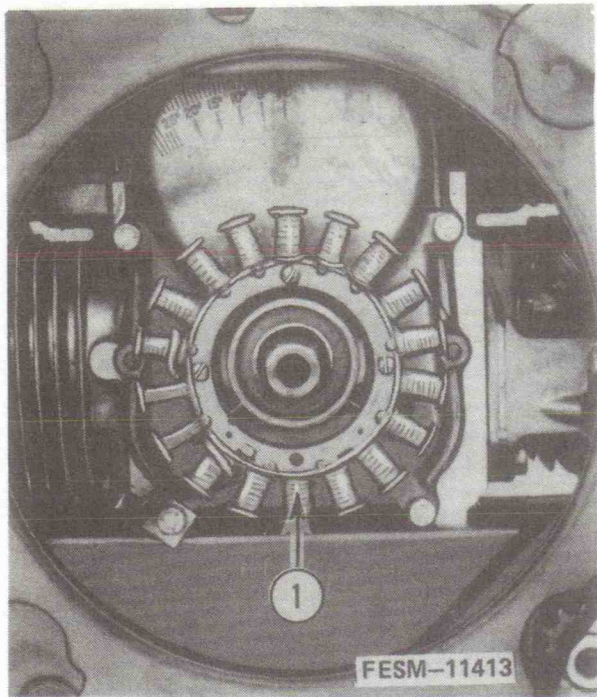
BATTERY

1. Check battery cells with a hydrometer. The specific gravity reading should be approximately 1.280 at 27°C (80°F).

2. If one or more cells are low on water, add distilled water and recharge.

3. After attaching the battery cables coat the terminals with a light application of petroleum jelly or grease to retard corrosion.

BATTERY CHARGING SYSTEM



With the engine running between 1800-2600 rpm, observe the panel ammeter (if not already equipped, connect a test ammeter). If no charging is evident, proceed with the NO CHARGE TEST. If ammeter shows a constant higher charge rate, follow the HIGH CHARGE RATE TEST procedure.

1. Stator

No Charge Test

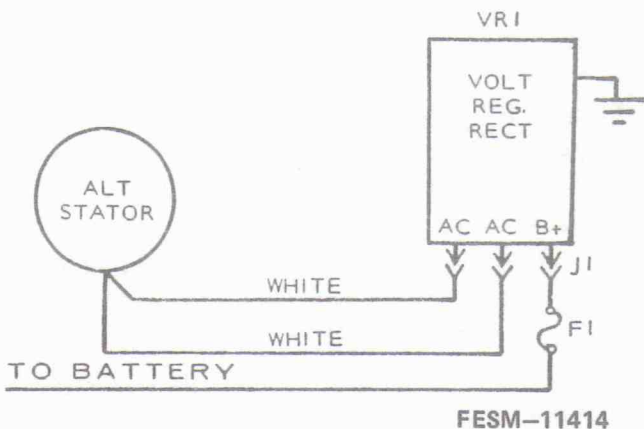
1. Check the B+ to ground voltage using a DC voltmeter.

2. If the voltmeter reads 13.8 volts or higher, add a load to the system (e.g. headlights) to reduce the battery voltage to below 13.6 volts.

3. Observe the ammeter. If charge rate increases, consider the system as satisfactory. If the charge rate does not increase, proceed with testing.

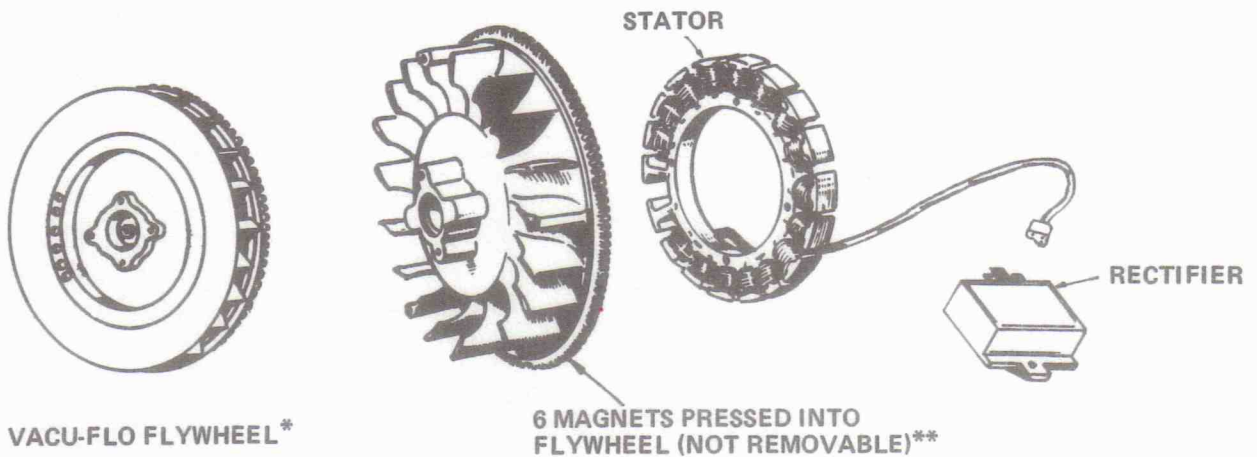
4. For 15 amp system: Disconnect the plug from the regulator-rectifier and test the AC voltage at the plug with the engine running near 3600 rpm. If the AC voltage reads less than 28 volts, replace the stator. If the AC voltage is more than 28 volts, replace the regulator-rectifier assembly.

5. For 20 amp system: Follow step 4 substituting 41 volts AC for 28 volts.



Testing 15 Amp and 20 Amp System

BASIC TEST	PROCEDURE	TEST VALUES	
		20 AMP	15 AMP
1. Battery	Battery Voltage – unit not running	12 VDC	12 VDC
2. Regulator	Battery Voltage after unit is running 3 to 5 minutes	13.6 to 14.7 VDC	13.6 to 14.7 VDC
3. Alternator Stator and Wiring with Fully Charged battery.	Ohmmeter reading from stator output – unit not running. Check at plug.	0.3 to 0.5 ohms	0.1 to 0.2 ohms
4. Alternator and Wiring	Measure AC open circuit stator voltage with unit running. Measure between two stator leads with plug disconnected and unit running at approximately 3600 rpm.	41 VAC	28 VAC



FESM-13258

* 4130 Flywheel

** 982, 4125, 4135 Flywheel

High Charging Rate Test

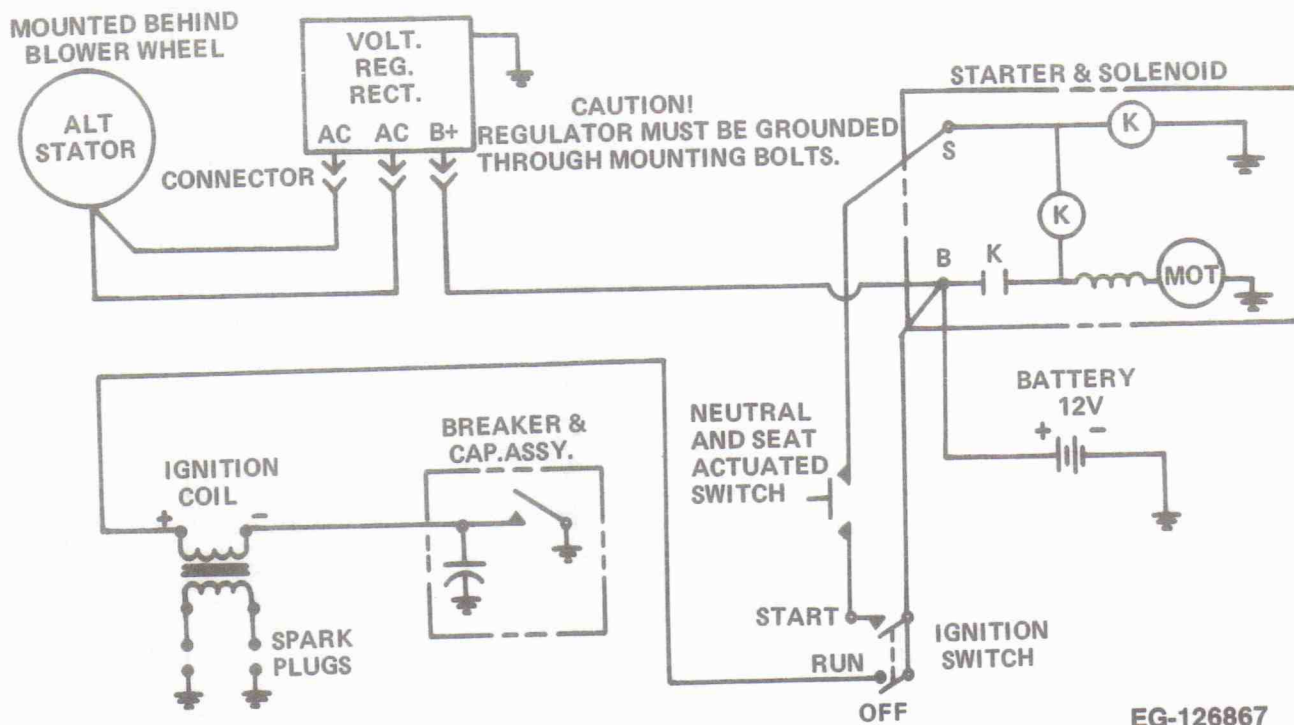
1. Check the B+ to ground voltage with a DC voltmeter.

2. If the voltmeter reads over 14.7 volts, replace the regulator-rectifier assembly.

3. If the reading is under 14.7 volts the system is serviceable. Recheck the battery and connections. If the battery does have a low charge, but accepts recharging, the system is serviceable.

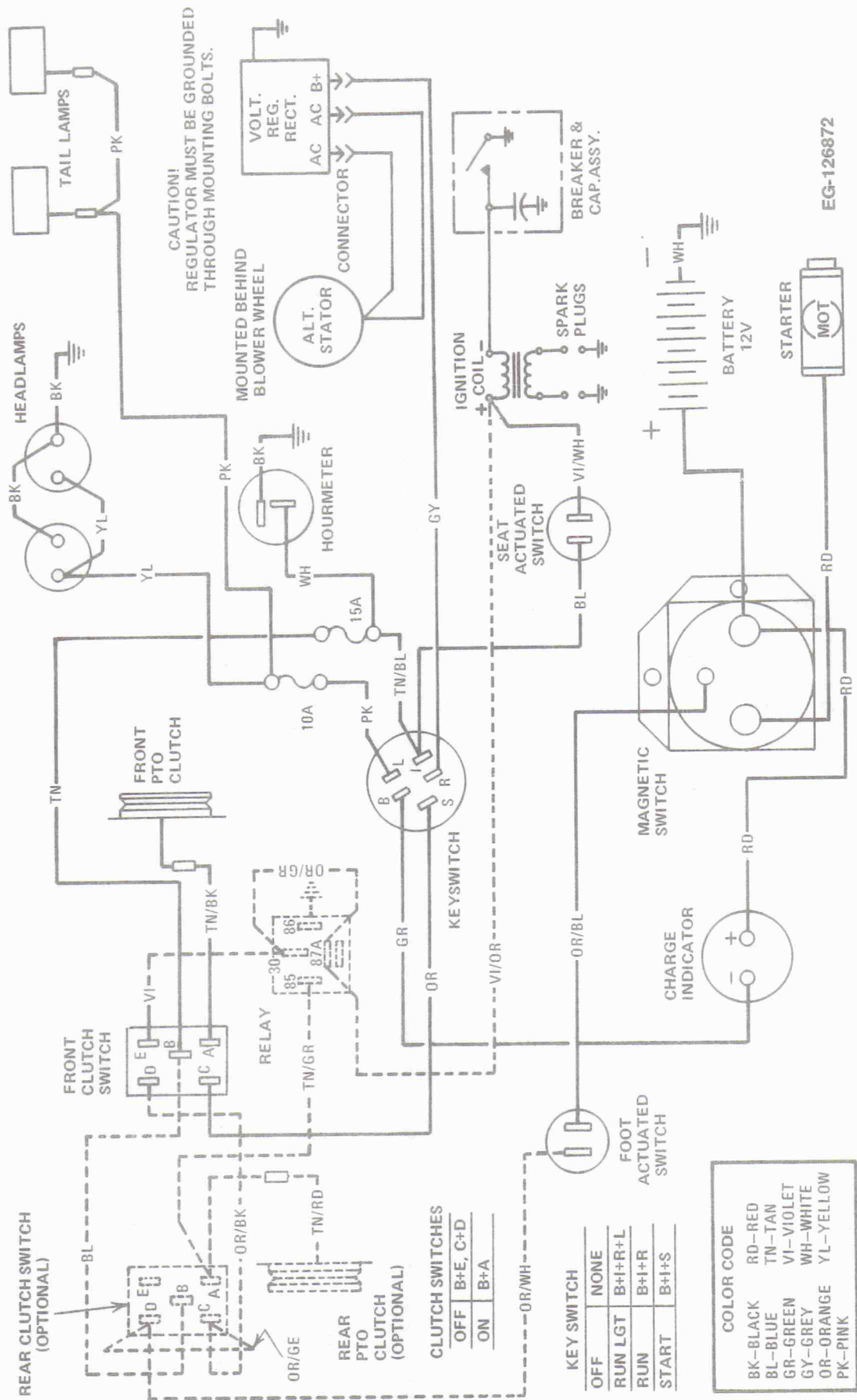
ENGINE WIRING DIAGRAMS

4125, 4130 and 4135 Compact Loaders

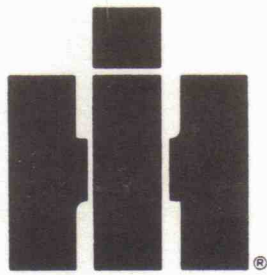


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