422/M2
422T/M2
Engines

Service Manual

Bur 6-79550NA

CASE

NA North American English

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TROUBLESHOOTING

ENGINE WILL CRANK BUT DOES NOT START

CAUSE	CORRECTION
Faulty key switch	Correct the connection and/or replace switch
Fuel solenoid not operating	Check solenoid for battery voltage and correct
Insufficient charging or complete discharging of the battery	Charge or replace battery
Lack of fuel	Fill fuel tank
Air mixed in the fuel system	Bleed the air
Clogged fuel filter	Replace
Irregular and faulty fuel supply (electric fuel pump)	Check power supply; check fuse in fuse panel; check for corroded internal components (replace pump and in-line filter if corroded)
Irregular and faulty fuel supply (injection pump trouble)	Repair in an authorized service shop
Glow plug not heating	Failure of the glow plug; replace
Improper viscosity of the lubricating oil	Inspect and replace
Clogged air cleaner	Clean or replace
No Compression	Repair in a service shop

ENGINE WILL NOT CRANK OR START

CAUSE	CORRECTION
Faulty key switch	Correct the connection and/or replace switch
Insufficient charging or complete discharging of the battery	Charge or replace battery
Insufficient charging or complete discharging of the battery	Charge or replace battery

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422/M2 GENERAL ENGINE SPECIFICATIONS

Engine Model 422/M2

Type ..... Vertical in-line 4-stroke - naturally aspirated

Basic Thread and Size
- Bore ..... 84 mm (3.31 inches)
- Stroke ..... 100 mm (3.94 inches)

Combustion System ..... IDI (Indirect Injection/Special Swirl)
- Compression Ratio 22.4:1
- Swept Volume Liter (inch³) ..... 2216 L (135.3 inch³)

Firing Order 1-3-4-2

Rotation ..... Counterclockwise viewed from flywheel

Low Idle ..... 1050 ± 50 RPM

High Idle ..... 3050 ± 50 RPM

Injection Pump ..... Flange-Mounted, Bosch-type plunger and barrel

Injectors ..... Bosch-type throttle

Injector Setting ..... 147 - 157 Kilograms sq. cm kgf/cm² (2132 - 2277 Pounds per sq. inch PSI)

Turbo ..... NO

Governor ..... Mechanical all speed

Cooling System ..... Liquid with water pump and radiator

Industrial Cooling System Capacity
- (less radiator) ..... 3.5 Litres

Thermostat Operating
- Temperature degrees ..... 71°/82° C (160°/180° F)
- Oil Pressure Relief ..... 3.6 - 4.6 kgf/cm² (51 - 65 PSI)
- Oil Pressure Switch ..... 4.3 PSI

Electrical Starter
- Starter 12V
- Alternator 12V

Weight, Bare Engine (Industrial) ..... 205 kg (452 lbs)
- Height ..... 786 mm (30.9 inches)
- Length ..... 665 mm (26.2 inches)
- Width ..... 431 mm (17 inches)

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ENGINE TORQUE SPECIFICATIONS

COMPONENT	SETTING/REMARKS
Bearing holder bolts - hex hole type	24 - 30 Nm (18 - 22 pound-feet)
Bearing holder bolts - hex bolt type	49 - 54 Nm (36 - 40 pound-feet)
Rear plate bolts	14 - 18 Nm (10 - 13 pound-feet)
Flywheel housing bolts	24 - 28 Nm (18 - 21 pound-feet)
Flywheel bolts	58 - 69 Nm (43 - 51 pound-feet)
Connecting rod nuts	49 - 54 Nm (36 - 40 pound-feet)
Suction filter bolt	9 - 12 Nm (7 - 9 pound-feet)
Sump bolts	9 - 12 Nm (7 - 9 pound-feet)
Crankshaft pulley nut	275 - 333 Nm (203 - 246 pound-feet)
Cylinder head bolts	98 - 103 Nm (72 - 76 pound-feet)/oiled
Injection pump bolts	9 - 12 Nm (7 - 9 pound-feet)
Injection pump nuts	9 - 12 Nm (7 - 9 pound-feet)
Rocker arm nuts	27 - 39 Nm (20 - 29 pound-feet)/4-cylinder engines
Head cover nuts	12 - 16 Nm (9 - 12 pound-feet)/4 cylinder engines
Cooling fan bolts	9 - 12 Nm (7 - 9 pound-feet)
Oil pipe banjo bolts	9 - 12 Nm (7 - 9 pound-feet)
Oil sump drain bolt	30 - 39 Nm (22 - 29 pound-feet)
Injection nozzle	58 - 69 Nm (43 - 51 pound-feet) IDI engines
Injection pipe	15 - 24 Nm (11 - 18 pound-feet)
Thermo switch	24 - 30 Nm (18 - 22 pound-feet)
Oil pressure switch	15 - 20 Nm (11 - 15 pound-feet)
Glow plug	15 - 20 Nm (11 - 15 pound-feet)
Stop solenoid	15 - 20 Nm (11 - 15 pound-feet)
Oil relief valve	60 - 69 Nm (44 - 51 pound-feet)
Smokeset nut (max fuel)	20 - 26 Nm (15 - 19 pound-feet)
Adjusting screw nuts	12 - 16 Nm (9 - 12 pound-feet)

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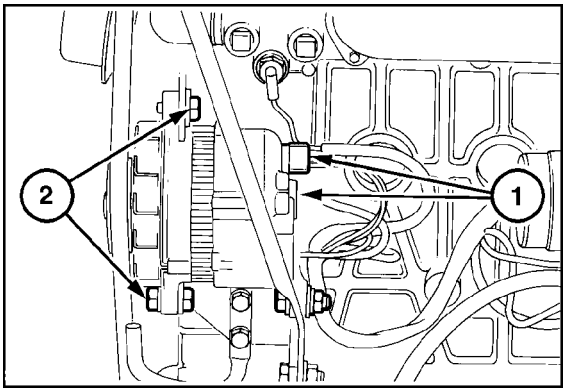
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ENGINE DISASSEMBLY

Alternator

Disconnect the alternator wire harness and wires, 1.

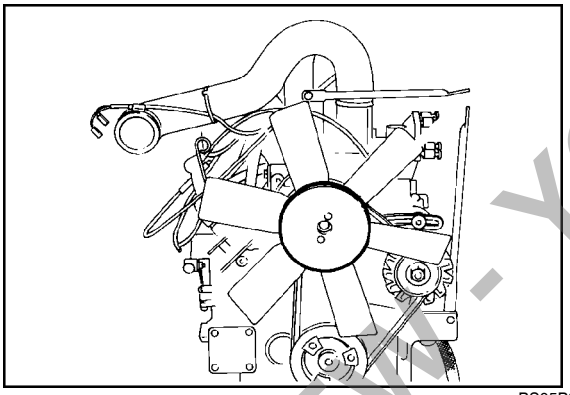
Remove the alternator pivot and adjusting bracket, hardware 2.



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Remove Cooling Fan and Pulley

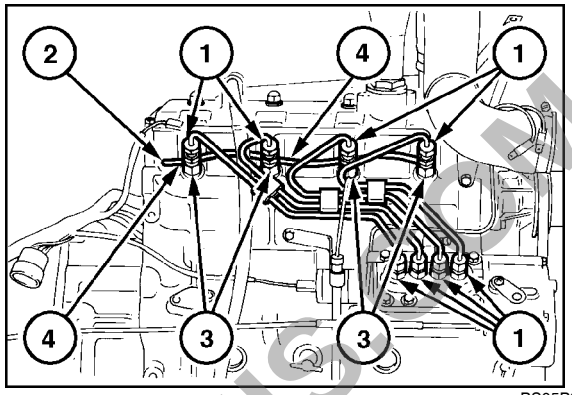
Remove the fan retaining hardware and spacers.



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Fuel Injection Pipe

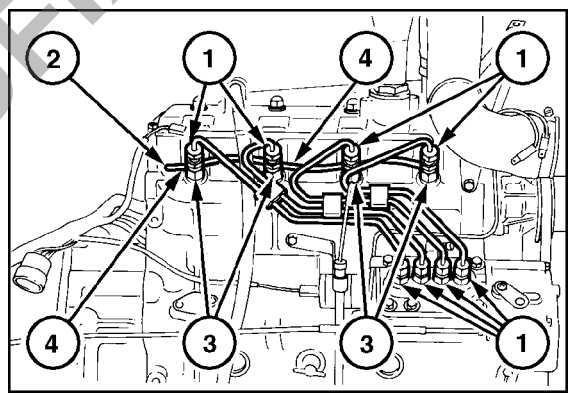
1. Loosen the fuel pipe nuts from the fuel injection pump and injectors, 1. Remove the pipes as an assembly.
2. Remove the spring clamp and fuel return hose, 2.



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Injector Assembly

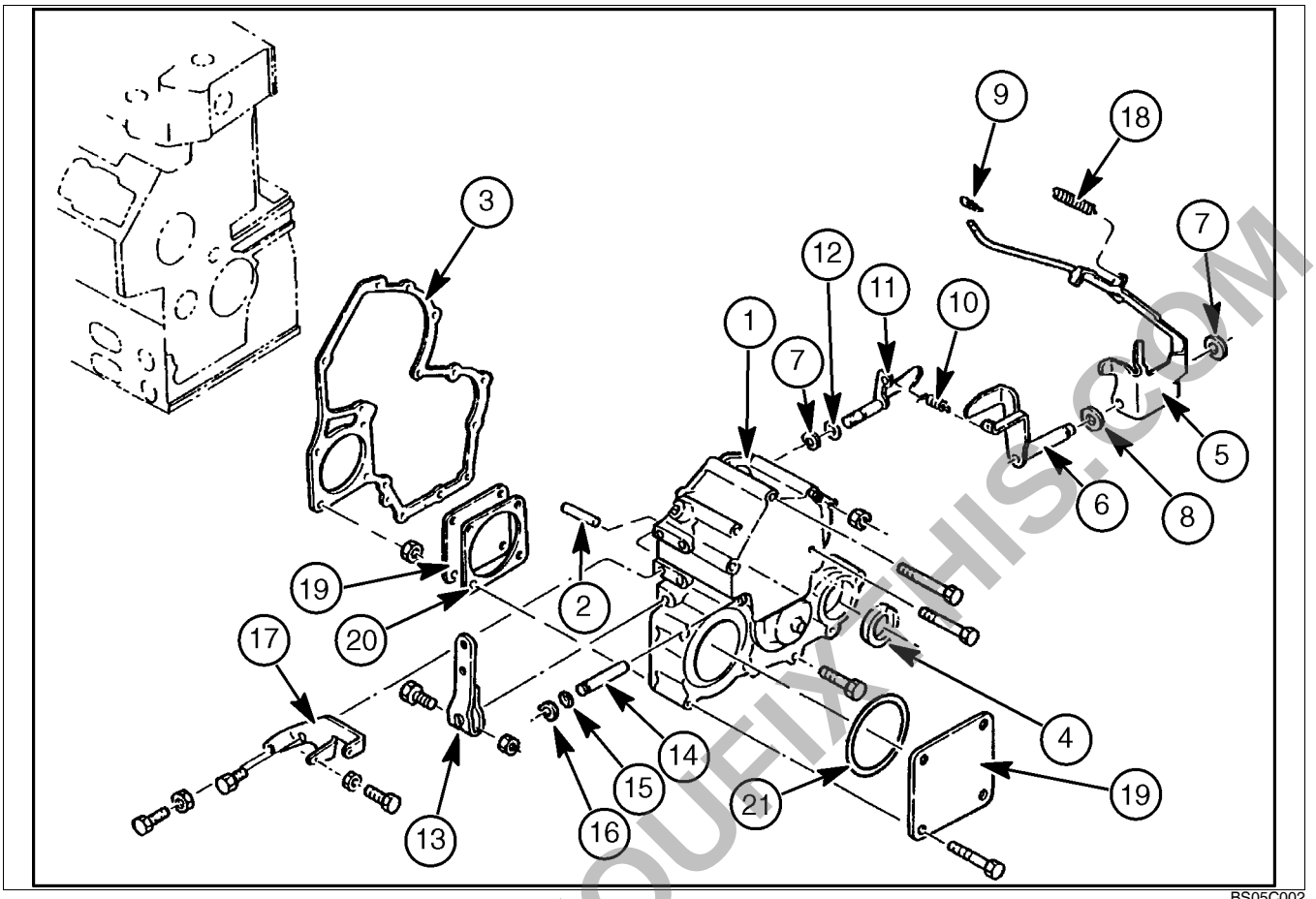
Loosen and remove the securing nuts, 3. Remove the leak-off rail, 4. Remove the aluminum washers and discard. Remove the injectors tagging or marking with the cylinder they were removed from.



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1. TIMING GEAR COVER
2. PIN
3. GASKET
4. OIL SEAL
5. ARM ASSEMBLY
6. SPRING HOLDER ARM
7. SNAP RING
8. WASHER
9. SNAP PIN
10. GOVERNOR SPRING
11. THROTTLE ARM
12. O-RING
13. THROTTLE LEVER
14. PIVOT SHAFT
15. O-RING
16. SNAP RING
17. THROTTLE STAY
18. DAMPENER SPRING
19. COVER
20. GASKET
21. O-RING

ENGINE GOVERNOR ASSEMBLY

Engine Governor Assembly

Reassembly

Precautions Before Assembling

Wash parts before assembling (especially oil gallery, bearings, piston, and cylinder bores should be washed thoroughly).

Apply new oil to sliding and rotating surfaces of cylinder bores, piston, and bearings, etc.

Replace gasket, packing, etc. Use liquid gasket to prevent oil leakage where necessary.

Never over-tighten bolts and nuts used on aluminum alloy. Tighten to specified tightening torques.

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