John Deere K Series Liquid-cooled Engines

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COMPONENT TECHNICAL MANUAL

John Deere
Lawn & Grounds Care Division

CTM39 (Oct93)
Replaces CTM39 (28JAN91)

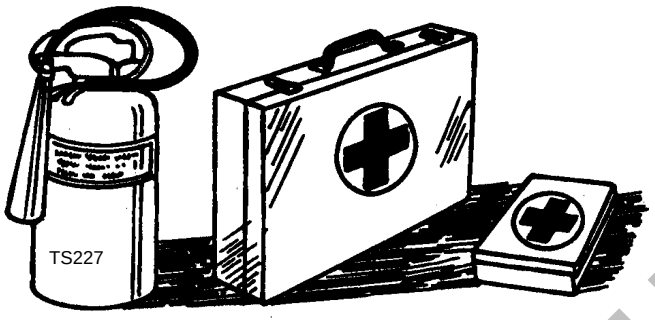
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HANDLE FLUIDS SAFELY-AVOID FIRES

- **BE PREPARED FOR EMERGENCIES**


TS291


TS227

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

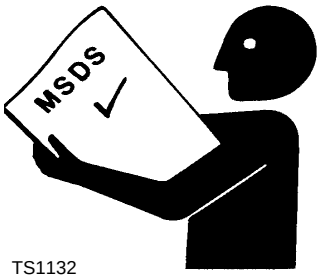
Do not store oily rags; they can ignite and burn spontaneously.

Be prepared if a fire starts.

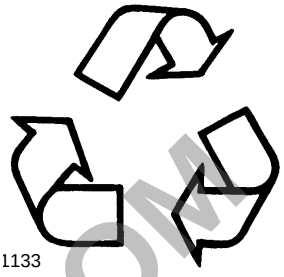
Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

HANDLE CHEMICAL PRODUCTS SAFELY



TS1132


1133

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques. Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

- **DISPOSE OF WASTE PROPERLY**

Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries. Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them. Do not pour waste onto the ground, down a drain, or into any water source. Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.

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BASIC ENGINE SPECIFICATIONS

ENGINE	FD440V AS00	FD501V AS00	FD590V-AS00/02	FD590V-AS03	FD620D AS04/11	FD620D ASO2	FD620D AS00/01
HORSEPOWER	11.1 kW (15 HP)	12.6kW (17 HP)	13.4 kW (18 HP)	14.9kW (20 HP)	13.4 kW (18 HP)	14.9kW (20 HP)	16.4 kW (22 HP)
CYLINDER	2	2	2	2	2	2	2
CYCLE	4	4	4	4	4	4	4
BORE	67 mm (2.64 in.)	67 mm (2.64 in.)	74 mm (2.90 in.)	74 mm (2.90 in.)	76 mm (2.99 in.)	76 mm (2.99 in.	76 mm (2.99 in.
STROKE	62 mm (2.44 in.)	62 mm (2.44 in.)	68 mm (2.66 in.)	68 mm (2.66 in.)	68 mm (2.66 in.)	68 mm (2.66 in.)	68 mm (2.66 in.)
DISPLACEMENT	437 cm^3 (26.7 cu. in.)	437 cm^3 (26.7 cu. in.)	585 cm^3 (35.7 cu. in.)	585 cm^3 (35.7 cu. in.)	617 cm^3 (35.7 cu. in.)	617 cm^3 (35.7 cu. in.)	617 cm^3 (35.7 cu. in.)

ENGINE APPLICATIONS

NOTE: Refer to the engine application chart to identify product-model/engine type-model relationship.

Lawn Tractors

Machine Engine Model No.

LX178 . . . . . FD440V - AS00
LX188 . . . . . FD501V - AS00

Lawn And Garden Tractors

285 Standard . . . . . FD590V - AS00
285 w/Fuel Injection . . . . . FD590V - AS01
320 . . . . . FD590V - AS00
425 . . . . . FD620D - AS02
445 . . . . . FD620D - AS01

Front Mowers

F911 . . . . . FD620D - AS00
F725 . . . . . FD590V - AS03

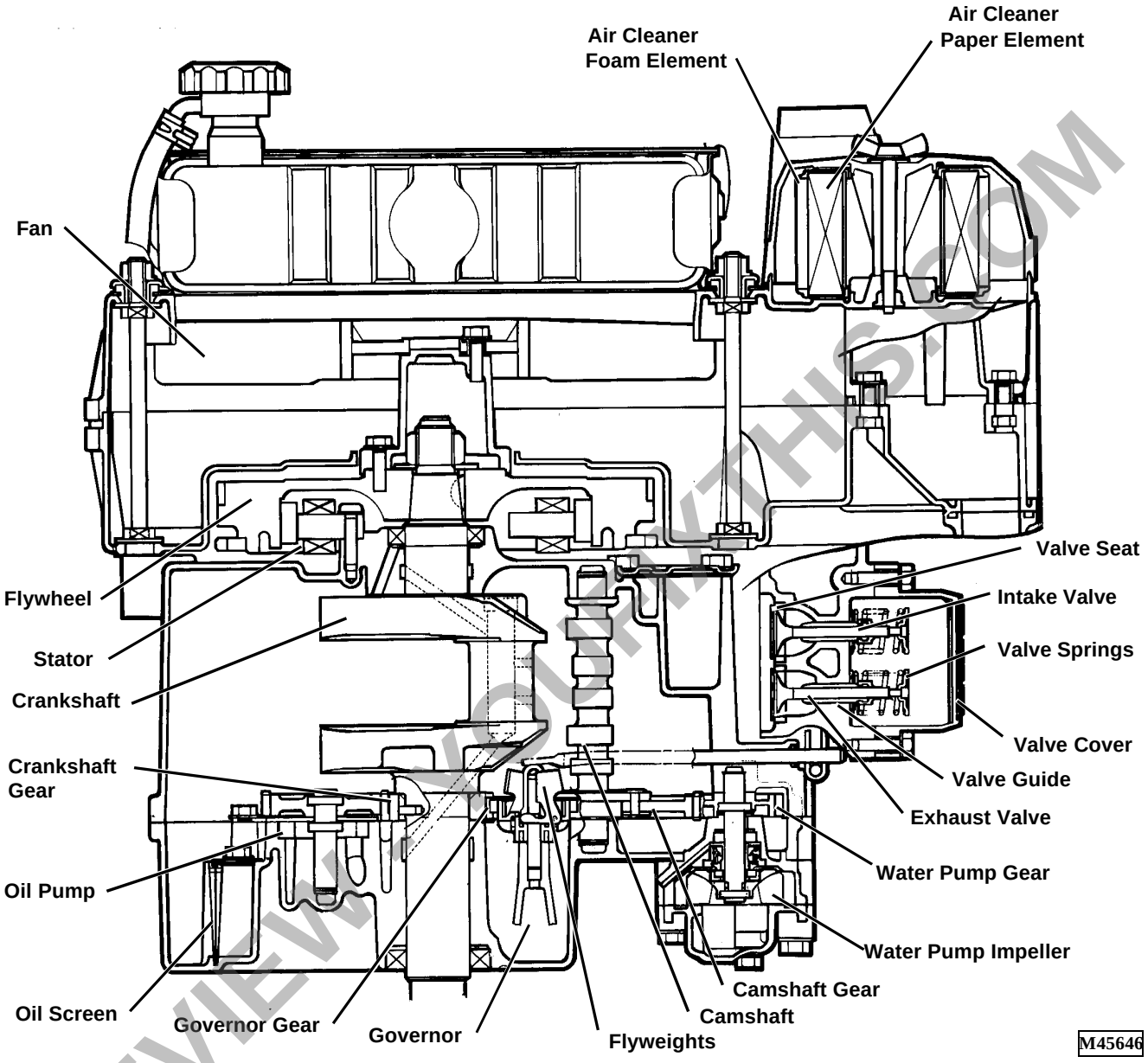
Golf And Turf Equipment

1800 Utility Vehicle . . . . . FD620D - AS04
2243 Professional Greensmower . . . . . FD590V - AS02
2653 Professional Utility Mower . . . . . FD620D - AS04
6X4 Gator Utility Vehicles . . . . . FD620D - AS11

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INTERNAL ENGINE COMPONENTS



Side View Cutaway

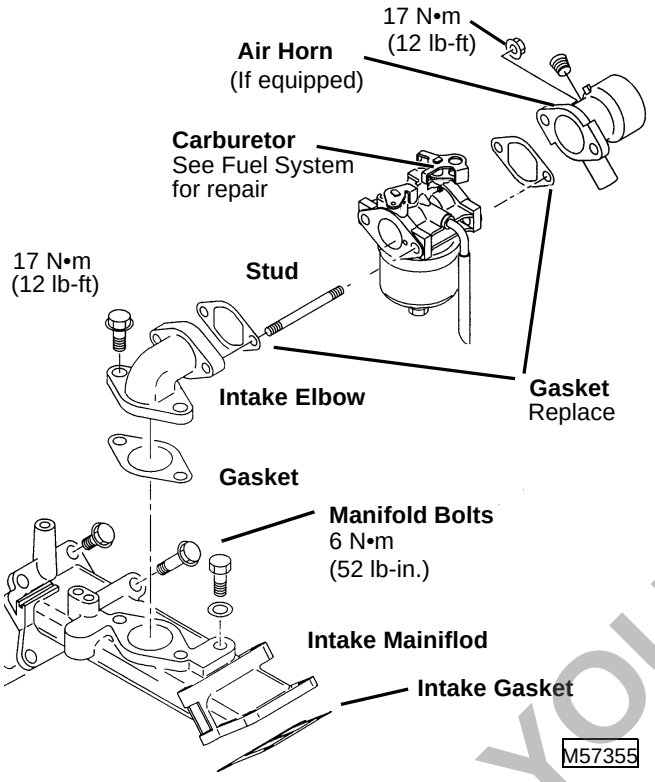
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INTAKE MANIFOLD

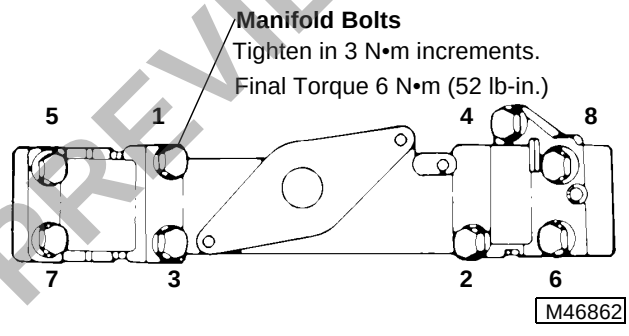
REMOVAL

1. Remove carburetor and governor control panel.



Side Draft Carburetor Configuation Shown

IMPORTANT: To prevent warpage, loosen bolts 1/4 turn at a time, in sequence, until all bolts are loose.



Torquing Sequence

2. Visually inspect manifold passages for corrosion, cracks, porous castings or deposits. Clean or replace as necessary.

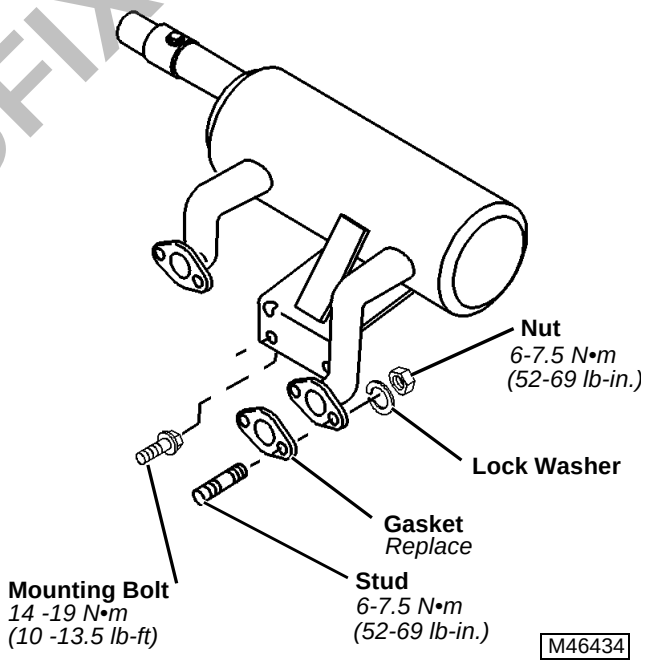
NOTE: Cracks not visible to the eye may be detected by coating suspected area with a mixture of 25% kerosene and 75% light engine oil. Wipe area dry and immediately apply a coat of zinc oxide dissolved in wood alcohol. If cracks are present, the coating will become discolored at the crack location.

INSTALLATION

1. Before installing manifold, install cylinder heads and tighten head bolts in sequence to half the rated torque value.
2. Install intake manifold and tighten bolts in two steps to a final torque of **6 N•m (52 lb-in.).**
3. Tighten cylinder head bolts to **21 N•m (15 lb-ft.).**

MUFFLER

NOTE: Muffler design may vary between applications.



- Clean exhaust pipe flanges and install new gasket before installing muffler.
- Use medium strength, Thread Lock and Sealer on studs and nuts.
- Loosely tighten flange nuts.
- If equipped with extra supporting brackets, also loosely tighten mounting bolts.
- Tighten flange nuts first then mounting bolts.

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CARBURETOR

SPECIFICATIONS

Side Draft:

Mounting Stud Nuts . . . . . 17 N•m (12 lb-ft)
Intake Elbow. . . . . 17 N•m (12 lb-ft)
Choke & Throttle Plate Screws . . . . . 0.88 N•m (7.8 lb-in.)

Down Draft:

Throttle Shaft Retaining Screw . . . . . 2.0 N•m (17 lb-in.)
Drain Screw . . . . . 1.2 N•m (10 lb-in.)
Choke &Throttle Valve Screws. . . . . 0.88 N•m (7.8 lb-in.)
Solenoid Valve . . . . . 9.8 N•m (87 lb-in.)
Main Jet & Main Air Jet . . . . . 1.0 N•m (8.9 lb-in.)
Mounting Stud Nuts . . . . . 17 N•m (12 lb-ft)

Carburetor Repair Kits

- Gasket Kit
- Jet Kit

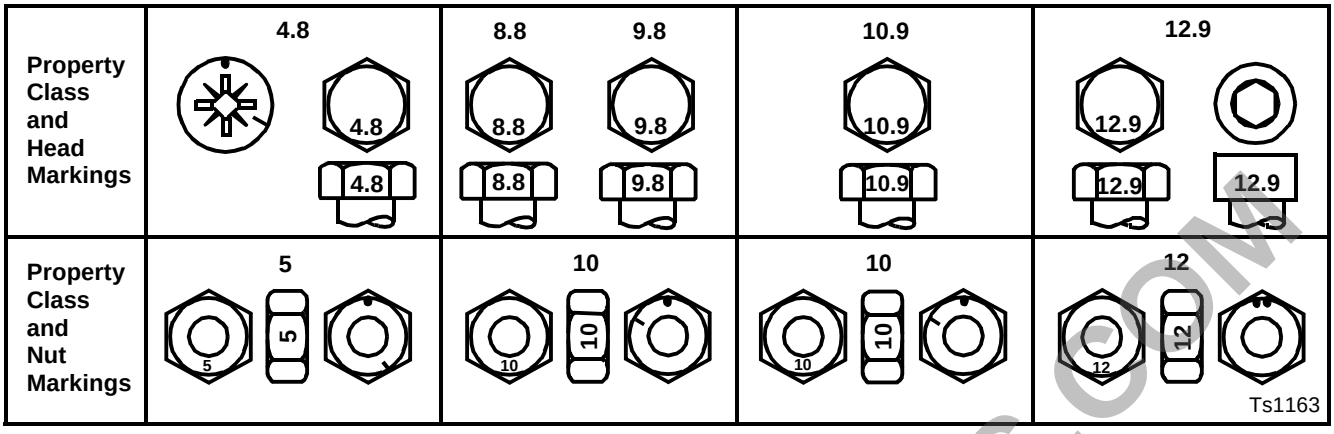
TROUBLESHOOTING

Problem or Symptom / Check or Solution	Engine is sluggish	Black smoky exhaust	Run worse when warm	Spark plug fouled black	Runs better without air cleaner	Engine will not start, plug wet	Spark plug burned white	Engine speed unstable (surging)	Loss of power	Engine overheats	Engine is hard to start when cold
Mixture too rich	●	●	●	●	●	●					●
Mixture too lean							●	●	●	●	●
Check and clean air cleaner	●	●	●	●	●				●		
Clean under engine shrouding						●	●	●		●	
Adjust Idle mixture and check engine performance.	●		●	●				●	●		
Choke is not completely open. Adjust.	●	●	●	●					●		
Inlet needle and seat leaking			●	●		●					●
Choke is not completely shut. Adjust.											●
Clean Carburetor	●					●	●	●	●		●

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METRIC TORQUE VALUES



	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
SIZE	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
M6	48	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	109
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original. Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

a *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

b *Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.*

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USE SAFE SERVICE PROCEDURES

• WEAR PROTECTIVE CLOTHING

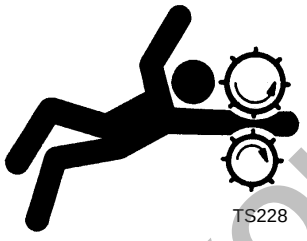
Wear close fitting clothing and safety equipment appropriate for the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

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TS206



TS228

• SERVICE MACHINES SAFELY

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

• USE PROPER TOOLS

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards. Use power tools only to loosen threaded parts and fasteners. For loosening and tightening hardware, use the correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches. Use only service parts meeting John Deere specifications.

• WORK IN CLEAN AREA

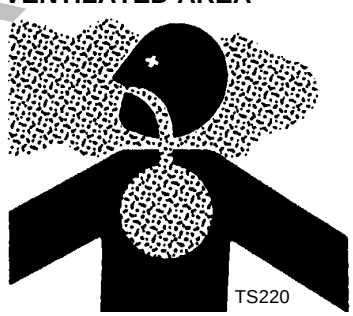
• Before starting a job

1. Clean work area and machine:
2. Make sure you have all necessary tools to do your job.
3. Have the right parts on hand.
4. Read all instructions thoroughly; do not attempt shortcuts.

• ILLUMINATE WORK AREA SAFELY

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

• WORK IN VENTILATED AREA



TS220

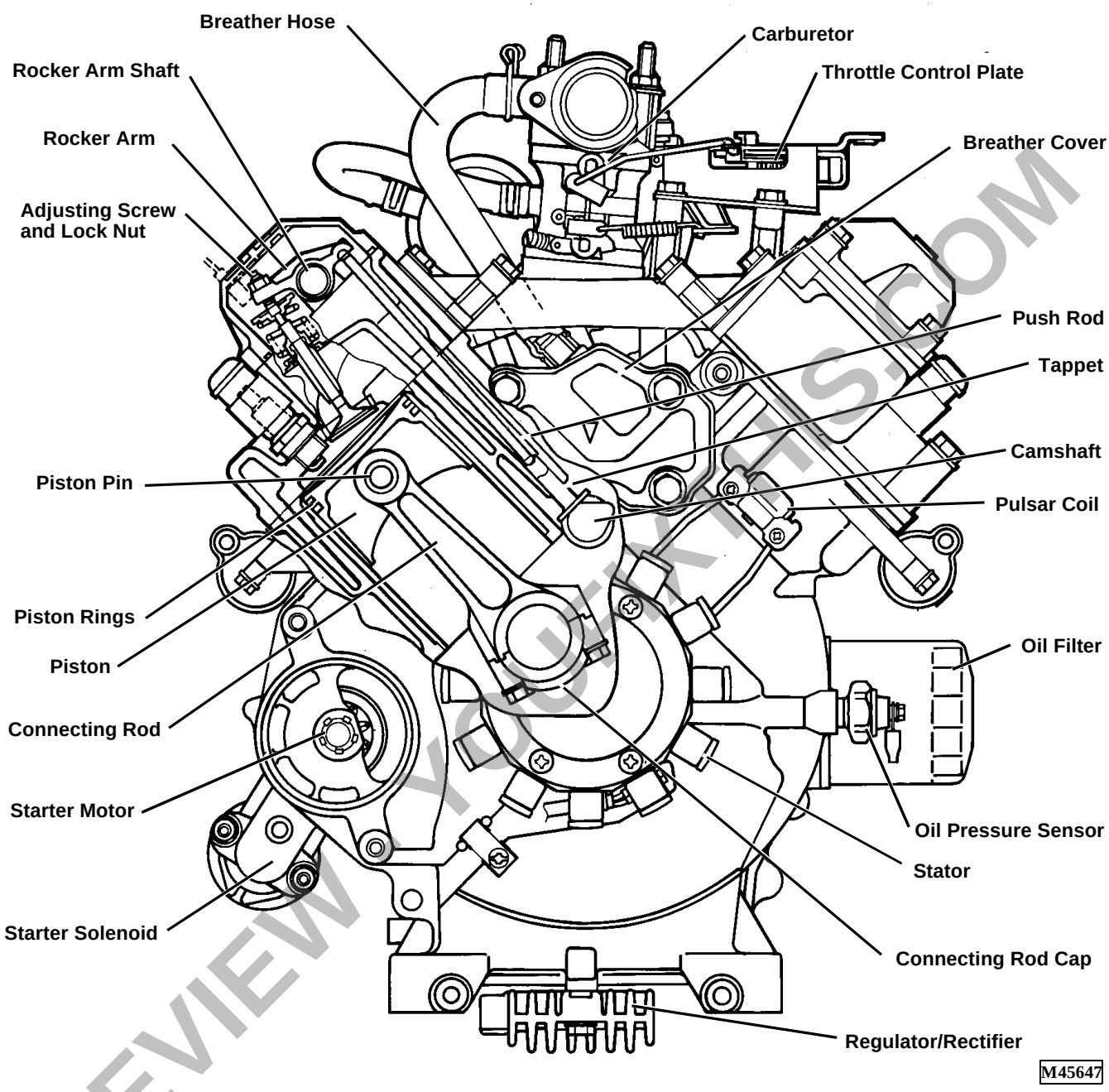
Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

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INTERNAL ENGINE COMPONENTS - Continued



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SPECIFICATION

Crankshaft - FD440/501V

Minimum Side Journal O.D.	29.92 mm (1.178 in.)
Minimum Connecting Rod Journal	30.93 mm (1.218 in.)
Maximum T.I.R. (Total Indicated Runout)	0.05 mm (0.002 in.)

Crankshaft - FD590V/FD620D

Minimum Side Journal O.D.	33.91 mm (1.335 in.)
Minimum Connecting Rod Journal	33.93 mm (1.336 in.)
Maximum T.I.R.	0.05 mm (0.002 in.)

Block and Crankcase Plain Bearings

Maximum Crankcase Cover I.D.	34.07 mm (1.341 in.)
Maximum Crankcase I.D.	34.11 mm (1.343 in.)

Camshaft

Bearing Journals

FD440/501V	13.91 mm (0.548 in.)
FD590V/FD620D	15.91 mm (0.626 in.)

Lobes Journal

FD440/501V	24.43 mm (0.962 in.)
FD590V	25.23 mm (0.993 in.)
FD620D	
Intake	25.21 (0.993 in.)
Exhaust	25.46 mm (1.002 in.)
Fuel Pump Lobe	19.50 mm (0.760 in.)

Connecting Rod Cap Bolt Torque

FD440/501V	12 N•m (106 lb-in.)
FD590V/FD620D	21 N•m (186 lb-in.)

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SPECIFICATION

CHARGING SYSTEM

Capacity
FD440/501/590V . . . . . 15 Amps
FD620D . . . . . 20 Amps
Stator Output . . . . . 26 VAC @ 3000 RPM

INJECTOR

FD590D
Resistance at 20°C (68°F) . . . . . 11.1 - 12.9 Ohms
FD620D
Resistance at 20°C (68°F) . . . . . 13.8 Ohms

IGNITION SYSTEM

Pulser Output . . . . . 0.1 - 1.0 VAC

ELECTRIC STARTER

Minimum Brush Length . . . . . 6 mm (0.240 in.)

Maximum No Load Starter Draw

FD440/501 . . . . . 50 amps at 6000 rpm (min)
FD590/FD620D . . . . . 30 amps at 6000 rpm (min)

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