

# **38, 48 and 54-Inch Commercial Walk-Behind Mowers**

## **TECHNICAL MANUAL**

**John Deere  
Lawn & Grounds Care Division  
TM1488 (01APR96)**

# Introduction

## FOREWORD

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

**N** This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and diagnostics. Repair sections tell how to repair the components. Diagnostic sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, other materials needed to do the job and service parts kits.

Section 10, Group 15—Repair Specifications, consist of all applicable specifications, wear tolerances and specific torque values for various components on each individual machine.

Binders, binder labels, and tab sets can be ordered by John Deere dealers direct from the John Deere Distribution Service Center.

This manual is part of a total product support program.

## FOS MANUALS—REFERENCE

### TECHNICAL MANUALS—MACHINE SERVICE

### COMPONENT MANUALS—COMPONENT SERVICE

Fundamentals of Service (FOS) Manuals cover basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes. FOS Manuals are for training new personnel and for reference by experienced technicians.

Technical Manuals are concise guides for specific machines. Technical manuals are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Component Technical Manuals are concise service guides for specific components. Component technical manuals are written as stand-alone manuals covering multiple machine applications.

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*All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.*

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# Section 10

## GENERAL INFORMATION

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## RECOGNIZE SAFETY INFORMATION

This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



DX,ALERT -19-04JUN90

T81389 -UN-07DEC88

## UNDERSTAND SIGNAL WORDS

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.



DX,SIGNAL -19-04JUN90

TS187 -19-30SEP88

## FOLLOW SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.



DX,READ -19-04JUN90

TS201 -UN-23AUG88

## HANDLE FLUIDS SAFELY—AVOID FIRES

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.



DX,FLAME

-19-04JUN90

-UN-23AUG88  
TS227

## PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



DX,SPARKS

-19-04JUN90

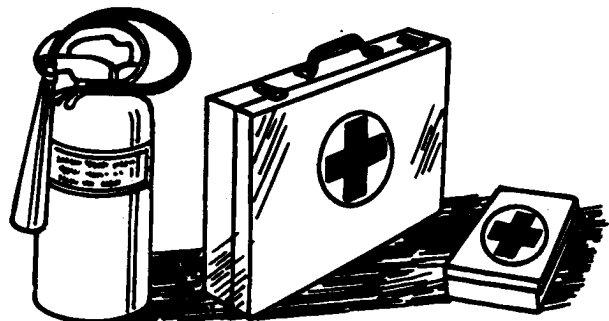
-UN-23AUG88  
TS204

## PREPARE FOR EMERGENCIES

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.



DX,FIRE2

-19-04JUN90

-UN-23AUG88  
TS291

## PREVENT ACID BURNS

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10—15 minutes. Get medical attention immediately.

If acid is swallowed:

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

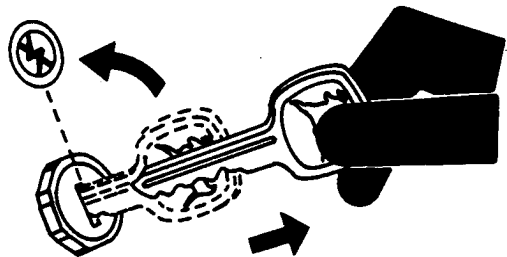


DX,POISON -19-04JUN90

## PARK MACHINE SAFELY

Before working on the machine:

- Lower all equipment to the ground.
- Stop the engine and remove the key.
- Disconnect the battery ground strap.
- Hang a "DO NOT OPERATE" tag in operator station.

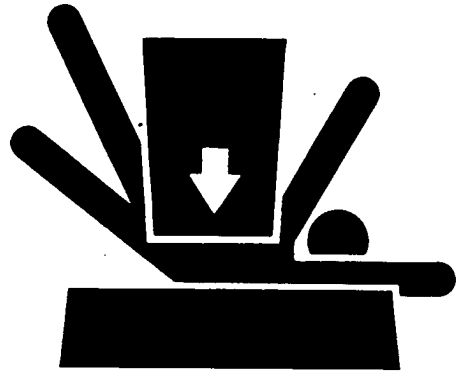


DX,PARK -19-04JUN90

## SUPPORT MACHINE PROPERLY

If you must work on a lifted machine or attachment, properly support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.



MX,SUPPORT,A -19-05FEB91

TS229 -UN-23AUG88

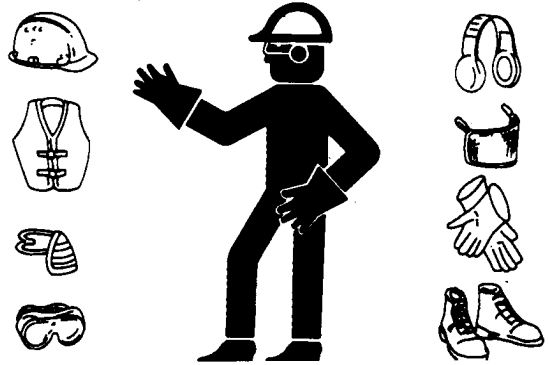
## WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to 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.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



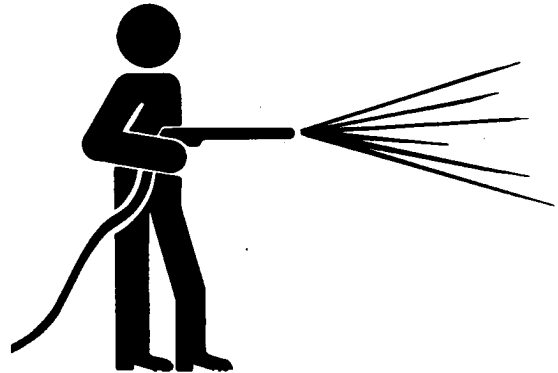
DX,WEAR -19-10SEP90

TS206 -UN-23AUG88

## WORK IN CLEAN AREA

Before starting a job:

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



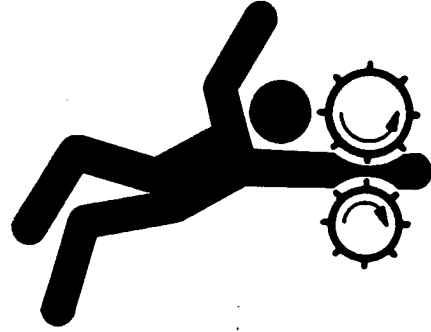
DX,CLEAN -19-04JUN90

T6642EJ -UN-18OCT88

## 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.



DX, LOOSE -19-04JUN90

TS228 -UN-23AUG88

## WORK IN VENTILATED AREA

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.



DX, AIR -19-04JUN90

TS220 -UN-23AUG88

## 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.

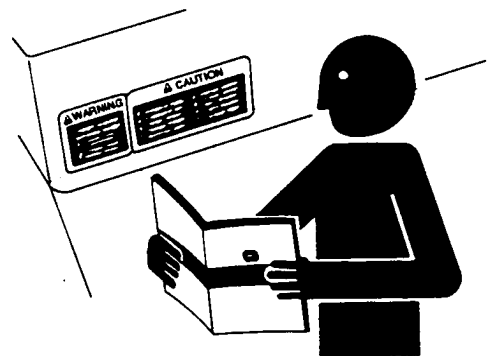


DX, LIGHT -19-04JUN90

TS223 -UN-23AUG88

## REPLACE SAFETY SIGNS

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



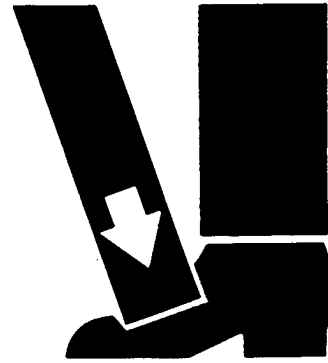
DX, SIGNS1 -19-04JUN90

TS201 -UN-23AUG88

## USE PROPER LIFTING EQUIPMENT

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



DX,LIFT

-19-04JUN90

TS226 -UN-23AUG88

## SERVICE TIRES SAFELY

Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



DX,TIRECP

-19-24AUG90

TS952 -UN-12APR90

## REMOVE PAINT BEFORE WELDING OR HEATING

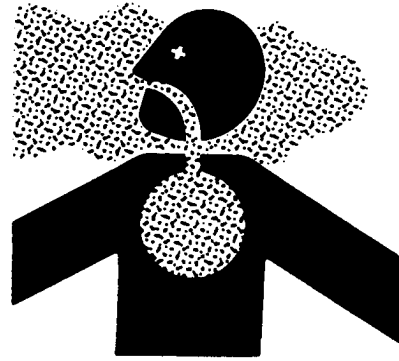
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.



DX,PAINT -19-04JUN90

## 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.



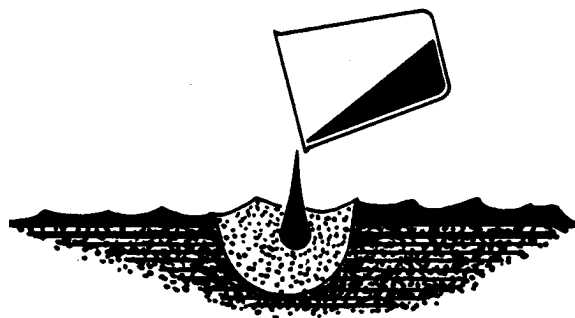
DX,REPAIR -19-04JUN90

## DISPOSE OF FLUIDS PROPERLY

Improperly disposing of fluids can harm the environment and ecology. Before draining any fluids, find out the proper way to dispose of waste from your local environmental agency.

Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.



DX,DRAIN

-19-05JUN90

TS222 -UN-23AUG88

## LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.



DX,LIVE

-19-04JUN90

TS231 -19-07OCT88

## POWER UNIT SPECIFICATIONS

|                                  | 12.5 HP                                  | 14 HP                                    | 17 HP                                    |
|----------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| <b>ENGINE</b>                    |                                          |                                          |                                          |
| Make                             | John Deere "K" Series                    | John Deere "K" Series                    | John Deere "K" Series                    |
| Type                             | OHV                                      | OHV                                      | OHV                                      |
| Model                            | FC400-AS11, AS05 and<br>FC401V-BS05      | FC420V-AS11, DS11<br>and ES11            | FC540V-AS11, DS11<br>and ES11            |
| Horsepower                       | 9.3 kW (12.5 hp)                         | 10.4 kW (14 hp)                          | 12.6 kW (17 hp)                          |
| Number of Cylinders              | 1                                        | 1                                        | 1                                        |
| Displacement                     | 404 cm <sup>3</sup> (24.6 cu in.)        | 423 cm <sup>3</sup> (25.8 cu in.)        | 535 cm <sup>3</sup> (32.6 cu in.)        |
| Bore and Stroke                  | 87 x 68 mm<br>(3.50 x 2.60 in.)          | 89 x 68 mm<br>(3.50 x 2.68 in.)          | 89 x 86 mm<br>(3.50 x 3.38 in.)          |
| Fast Idle                        | 3350 rpm                                 | 3350 rpm                                 | 3350 rpm                                 |
| Slow Idle                        | 1550 rpm                                 | 1550 rpm                                 | 1550 rpm                                 |
| Starting System                  | Recoil<br>Electric-optional              | Recoil<br>Electric-optional              | Electric only                            |
| Lubrication                      | Pressurized                              | Pressurized                              | Pressurized                              |
| Cooling System                   | Forced Air                               | Forced Air                               | Forced Air                               |
| Air Cleaner                      | Dry 2 Stage Replaceable                  | Dry 2 Stage Replaceable                  | Dry 2 Stage Replaceable                  |
| Engine Shutoff                   | Key Switch                               | Key Switch                               | Key Switch                               |
| <b>ELECTRICAL SYSTEM</b>         |                                          |                                          |                                          |
| Type                             | 12 Volt                                  | 12 Volt                                  | 12 Volt                                  |
| Battery Size                     | 160 Cold Cranking Amps<br>at -18°C (0°F) | 160 Cold Cranking Amps<br>at -18°C (0°F) | 160 Cold Cranking Amps<br>at -18°C (0°F) |
| Stator                           | 13 Amp                                   | 13 Amp                                   | 15 Amp                                   |
| <b>FUEL SYSTEM</b>               |                                          |                                          |                                          |
| Type                             | Carburetor                               | Carburetor                               | Carburetor                               |
| Fuel Delivery                    | Fuel Pump                                | Fuel Pump                                | Fuel Pump                                |
| <b>DRIVE TRAIN</b>               |                                          |                                          |                                          |
| Type                             | Gear Transaxle                           | Gear Transaxle                           | Gear Transaxle                           |
| Number of Speeds                 | 5 forward, 1 reverse                     | 5 forward, 1 reverse                     | 5 forward, 1 reverse                     |
| Travel Speeds at Full Engine RPM |                                          |                                          |                                          |
| Forward                          |                                          |                                          |                                          |
| 1st Gear                         | 2.6 km/h (1.6 mph)                       | 2.6 km/h (1.6 mph)                       | 2.6 km/h (1.6 mph)                       |
| 2nd Gear                         | 4.1 km/h (2.5 mph)                       | 4.1 km/h (2.5 mph)                       | 4.1 km/h (2.5 mph)                       |
| 3rd Gear                         | 6.1 km/h (3.8 mph)                       | 6.1 km/h (3.8 mph)                       | 6.1 km/h (3.8 mph)                       |
| 4th Gear                         | 7.8 km/h (4.8 mph)                       | 7.8 km/h (4.8 mph)                       | 7.8 km/h (4.8 mph)                       |
| 5th Gear                         | 9.5 km/h (5.9 mph)                       | 9.5 km/h (5.9 mph)                       | 9.5 km/h (5.9 mph)                       |
| Reverse                          | 1.2 km/h (0.75 mph)                      | 1.2 km/h (0.75 mph)                      | 1.2 km/h (0.75 mph)                      |
| Brakes                           | Wet Disk                                 | Wet Disk                                 | Wet Disk                                 |
| Park Brake                       | Clutch Interlock                         | Clutch Interlock                         | Clutch Interlock                         |
| Steering                         | Turn/Brake Lever<br>and Linkage          | Turn/Brake Lever<br>and Linkage          | Turn/Brake Lever<br>and Linkage          |
| PTO Clutch                       | Engine-mounted, electric                 | Engine-mounted, electric                 | Engine-mounted, electric                 |
| Clutch                           | Dual Lever, V-belt                       | Dual Lever, V-belt                       | Dual Lever, V-belt                       |

*Continued on next page*

## General Specifications/Specifications

10  
10  
2

### 14 HP

### 17 HP

#### CAPACITIES

|                              |                     |                     |
|------------------------------|---------------------|---------------------|
| Fuel Tank                    | 19 L (5 U.S. gal)   | 19 L (5 U.S. gal)   |
| Engine Crankcase with Filter | 1.6 L (3.4 U.S. pt) | 1.9 L (4.0 U.S. pt) |
| Transaxle                    | 2.3 L (4.9 U.S. pt) | 2.3 L (4.9 U.S. pt) |

#### TIRES

|                    |             |             |
|--------------------|-------------|-------------|
| Standard Equipment | 13 x 6.50—6 | 13 x 6.50—6 |
|--------------------|-------------|-------------|

#### SHIPPING WEIGHT

|                   |                  |                  |
|-------------------|------------------|------------------|
| Power Unit only   | 152 kg (334 lbs) | 166 kg (365 lbs) |
| with 48 Inch Deck | 258 kg (567 lbs) | 272 kg (598 lbs) |
| with 54 Inch Deck | 262 kg (577 lbs) | 276 kg (608 lbs) |

(Specifications and design subject to change without notice.)

MX,1010FP,A2 -19-05FEB91

## MOWER DECK SPECIFICATIONS

### 48 Inch Deck

### 54 Inch Deck

|                 |                                            |                                            |
|-----------------|--------------------------------------------|--------------------------------------------|
| Deck Material   | 11 gauge (3 mm) steel<br>one-piece stamped | 11 gauge (3 mm) steel<br>one-piece stamped |
| Blades          | 3                                          | 3                                          |
| Blade Length    | 42 cm (16.6 in.)                           | 47 cm (18.6 in.)                           |
| Blade Drive     | V-belt with self-adjusting Idler           | V-belt with self-adjusting Idler           |
| Cutting Height  | 19—102 mm (0.750—4 in.)                    | 19—102 mm (0.750—4 in.)                    |
| Shipping Weight | 106 kg (233 lbs)                           | 110 kg (243 lbs)                           |

(Specifications and design subject to change without notice.)

MX,1010FP,A3 -19-18FEB91

## MACHINE REPAIR SPECIFICATIONS

### SECTION 20-ENGINE REPAIR

| Item                                                                    | Measurement         | Specification                                   |
|-------------------------------------------------------------------------|---------------------|-------------------------------------------------|
| For all repair specifications-Use CTM5                                  |                     |                                                 |
| Engine-to-Frame Cap Screw                                               | Torque              | 16 N•m (144 lb-in.)                             |
| <b>SECTION 30-FUEL AND AIR REPAIR</b>                                   |                     |                                                 |
| For all carburetor repair specifications-Use CTM5                       |                     |                                                 |
| <b>SECTION 40-ELECTRICAL SYSTEM</b>                                     |                     |                                                 |
| For all starter and engine ignition and charging system repair-Use CTM5 |                     |                                                 |
| Transaxle Neutral Start Switch-to-Case                                  | Torque              | 10 N•m (88 lb-in.)                              |
| Electric PTO Clutch-to-Engine Crankshaft                                | Torque              | 56 N•m (45 lb-ft)                               |
| <b>SECTION 50-POWER TRAIN REPAIR</b>                                    |                     |                                                 |
| Axle/Shift Shaft Assembly<br>--Miscellaneous Washers                    | Minimum Thickness   | 1.7 mm (0.067 in.)                              |
|                                                                         | Minimum Thickness   | 2.2 mm (0.087 in.)                              |
| Reduction Shaft Assembly<br>--Grooved Washer                            | Minimum Thickness   | 1.7 mm (0.067 in.)                              |
| Brake Assembly--Friction Disks                                          | Minimum Thickness   | 1.9 mm (0.075 in.)                              |
| --Friction Plates                                                       | Minimum Thickness   | 1.25 mm (0.049 in.)                             |
| Clutch Shaft Assembly                                                   |                     |                                                 |
| --Plate                                                                 | Minimum Thickness   | 4.3 mm (0.169 in.)                              |
| --Clutch Disk                                                           | Minimum Thickness   | 1.9 mm (0.075 in.)                              |
| --Eight Plates                                                          | Minimum Thickness   | 0.9 mm (0.035 in.)                              |
| --Plate                                                                 | Minimum Thickness   | 3.0 mm (0.118 in.)                              |
| --Clutch Springs (Single Spring Style)                                  | Minimum Free Length | 30.3 mm (1.193 in.)                             |
|                                                                         | Compressed Length   | 21 mm (0.827 in.) at 173-194 N (39-44 lb force) |

*Continued on next page*

**SECTION 50-POWER TRAIN REPAIR-CONTINUED**

| Item                                                         | Measurement                                 | Specification                          |
|--------------------------------------------------------------|---------------------------------------------|----------------------------------------|
| Idler Shaft Assembly-to-Case Half Cap Screw                  | Torque (New)<br>Torque (Used)               | 9 N•m (82 lb-in.)<br>6 N•m (56 lb-in.) |
| Snap Ring-to-Clutch Assembly                                 | Clearance                                   | 1-5 mm (0.039-0.197 in.)               |
| Top Edge of Cam Plate Housing -to-Top Edge of Clutch Housing | Clearance                                   | 3 -5.5 mm (0.118-0.217 in.)            |
| Input Shaft-to-Reduction Shaft                               | Backlash                                    | 0.1-0.3 mm (0.004-0.012 in.)           |
| Shift Shaft Key Spring                                       | Minimum Force                               | 13.7 N (3.1 lb force)                  |
| Input Shaft Assembly-to-Case Half Cap Screw                  | Torque (New)<br>Torque (Used)               | 29 N•m (22 lb-ft)<br>25 N•m (18 lb-ft) |
| Transaxle Case Half Cap Screw                                | Torque                                      | 16 N•m (144 lb-in.)                    |
| Neutral Start Switch-to-Case                                 | Torque                                      | 10 N•m (88 lb-in.)                     |
| Shift Arm Nut                                                | Torque                                      | 45-50 N•m (33-37 lb-ft)                |
| Brake Spring                                                 | Free Length                                 | 136 mm (5.3 in.)                       |
|                                                              | Minimum Test Length at 141 N (32 lb. force) | 90 mm (3.5 in.)                        |
|                                                              |                                             |                                        |
| <b>SECTION 80-MISCELLANEOUS REPAIR</b>                       |                                             |                                        |
| Mower Blade Cap Screw                                        | Torque                                      | 68 N•m (50 lb-ft)                      |
| Spindle Nut                                                  | Torque                                      | 26 N•m (19 lb-ft)                      |
| Sheave-to-Spindle Nut                                        | Torque                                      | 163 N•m (120 lb-ft)                    |
|                                                              |                                             |                                        |

## TUNE-UP SPECIFICATIONS

|                                                               |                     |
|---------------------------------------------------------------|---------------------|
| Spark plug gap . . . . .                                      | 0.64 mm (0.025 in.) |
| Spark plug torque . . . . .                                   | 20 N·m (177 lb-in.) |
| Slow idle setting                                             |                     |
| Throttle control lever slow idle stop screw setting . . . . . | 1500 ± 50 rpm       |
| Carburetor slow idle stop screw setting . . . . .             | 1400 ± 50 rpm       |
| Fast idle setting . . . . .                                   | 3350 ± 100 rpm      |

MX,1015FP,A2 -19-18FEB91

# 10 15 4

## METRIC FASTENER TORQUE VALUES

| Property Class and Head Markings | 4.8 | 8.8 | 9.8 | 10.9 | 12.9 |
|----------------------------------|-----|-----|-----|------|------|
| Property Class and Nut Markings  | 5   | 10  | 10  | 12   | 12   |

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|      | Class 4.8               |       |                  |       | Class 8.8 or 9.8        |       |                  |       | Class 10.9              |       |                  |       | Class 12.9              |       |                  |       |
|------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|
|      | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       |
| SIZE | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft |
| M6   | 4.8                     | 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 hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a  $\pm 10\%$  variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same class. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

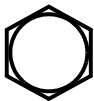
When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

<sup>a</sup> "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

Reference: JDS—G200.

## INCH FASTENER TORQUE VALUES

|                             |                                                                                                                   |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                  |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAE Grade and Head Markings | 1 or 2 <sup>b</sup><br>No Marks  | 5 5.1 5.2<br>   | 8 8.2<br>  |
| SAE Grade and Nut Markings  | 2<br>No Marks                    | 5<br>                                                                                            | 8<br>      |

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|       | Grade 1                 |       |                  |       | Grade 2 <sup>b</sup>    |       |                  |       | Grade 5, 5.1 or 5.2     |       |                  |       | Grade 8 or 8.2          |       |                  |       |
|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|
|       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       |
| SIZE  | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft | N•m                     | lb-ft | N•m              | lb-ft |
| 1/4   | 3.7                     | 2.8   | 4.7              | 3.5   | 6                       | 4.5   | 7.5              | 5.5   | 9.5                     | 7     | 12               | 9     | 13.5                    | 10    | 17               | 12.5  |
| 5/16  | 7.7                     | 5.5   | 10               | 7     | 12                      | 9     | 15               | 11    | 20                      | 15    | 25               | 18    | 28                      | 21    | 35               | 26    |
| 3/8   | 14                      | 10    | 17               | 13    | 22                      | 16    | 27               | 20    | 35                      | 26    | 44               | 33    | 50                      | 36    | 63               | 46    |
| 7/16  | 22                      | 16    | 28               | 20    | 35                      | 26    | 44               | 32    | 55                      | 41    | 70               | 52    | 80                      | 58    | 100              | 75    |
| 1/2   | 33                      | 25    | 42               | 31    | 53                      | 39    | 67               | 50    | 85                      | 63    | 110              | 80    | 120                     | 90    | 150              | 115   |
| 9/16  | 48                      | 36    | 60               | 45    | 75                      | 56    | 95               | 70    | 125                     | 90    | 155              | 115   | 175                     | 130   | 225              | 160   |
| 5/8   | 67                      | 50    | 85               | 62    | 105                     | 78    | 135              | 100   | 170                     | 125   | 215              | 160   | 215                     | 160   | 300              | 225   |
| 3/4   | 120                     | 87    | 150              | 110   | 190                     | 140   | 240              | 175   | 300                     | 225   | 375              | 280   | 425                     | 310   | 550              | 400   |
| 7/8   | 190                     | 140   | 240              | 175   | 190                     | 140   | 240              | 175   | 490                     | 360   | 625              | 450   | 700                     | 500   | 875              | 650   |
| 1     | 290                     | 210   | 360              | 270   | 290                     | 210   | 360              | 270   | 725                     | 540   | 925              | 675   | 1050                    | 750   | 1300             | 975   |
| 1-1/8 | 470                     | 300   | 510              | 375   | 470                     | 300   | 510              | 375   | 900                     | 675   | 1150             | 850   | 1450                    | 1075  | 1850             | 1350  |
| 1-1/4 | 570                     | 425   | 725              | 530   | 570                     | 425   | 725              | 530   | 1300                    | 950   | 1650             | 1200  | 2050                    | 1500  | 2600             | 1950  |
| 1-3/8 | 750                     | 550   | 950              | 700   | 750                     | 550   | 950              | 700   | 1700                    | 1250  | 2150             | 1550  | 2700                    | 2000  | 3400             | 2550  |
| 1-1/2 | 1000                    | 725   | 1250             | 925   | 990                     | 725   | 1250             | 930   | 2250                    | 1650  | 2850             | 2100  | 3600                    | 2650  | 4550             | 3350  |

DO NOT use these hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a  $\pm 10\%$  variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

<sup>a</sup> "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

<sup>b</sup> "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.

Reference: JDS—G200.

## INCH CAP SCREW TORQUE VALUES

| SAE Grade                  | Head Markings                                                                                | SAE Grade | Nut Markings                                                                                 | SAE Grade                                     | Head Markings                                                                                                                                                                                                                                               | SAE Grade                                                                                               | SAE Grade                    | Nut Markings                                                                                                                                                               | SAE Grade                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| SAE GRADE 1<br>SAE GRADE 2 | <br>No Mark | 2         | <br>No Mark | SAE GRADE 5<br>SAE GRADE 5.1<br>SAE GRADE 5.2 | <br><br> | 5<br>Nut Markings<br> | SAE GRADE 8<br>SAE GRADE 8.2 | <br> | 8<br>Nut Markings<br> |

| DIA.                                                                                                    | WRENCH SIZE                                                                                                            | SAE GRADE 1                                                                                                                                            |                                                                                                                                                       | *SAE GRADE 2                                                                                                                                          |                                                                                                                                                        | SAE GRADE 5                                                                                                                                                  |                                                                                                                                                                   | SAE GRADE 8                                                                                                                                                         |                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                         |                                                                                                                        | OIL                                                                                                                                                    | DRY                                                                                                                                                   | OIL                                                                                                                                                   | DRY                                                                                                                                                    | OIL                                                                                                                                                          | DRY                                                                                                                                                               | OIL                                                                                                                                                                 | DRY                                                                                                                                                                   |
|                                                                                                         |                                                                                                                        | N•m(lb-in)                                                                                                                                             | N•m(lb-in)                                                                                                                                            | N•m(lb-in)                                                                                                                                            | N•m(lb-in)                                                                                                                                             | N•m(lb-in)                                                                                                                                                   | N•m(lb-in)                                                                                                                                                        | N•m(lb-in)                                                                                                                                                          | N•m(lb-in)                                                                                                                                                            |
| #6<br>#8<br>#10<br>#12                                                                                  |                                                                                                                        | 0.5(4.5)<br>0.9(8)<br>1.4(12)<br>2(19)                                                                                                                 | 0.7(6)<br>1.2(11)<br>1.8(16)<br>2.8(25)                                                                                                               |                                                                                                                                                       |                                                                                                                                                        | 1.4(12)<br>2.4(21)<br>3.4(30)<br>5.4(48)                                                                                                                     | 1.7(15)<br>3.2(28)<br>4.6(41)<br>7.3(65)                                                                                                                          |                                                                                                                                                                     |                                                                                                                                                                       |
|                                                                                                         |                                                                                                                        | N•m(lb-ft)                                                                                                                                             | N•m(lb-ft)                                                                                                                                            | N•m(lb-ft)                                                                                                                                            | N•m(lb-ft)                                                                                                                                             | N•m(lb-ft)                                                                                                                                                   | N•m(lb-ft)                                                                                                                                                        | N•m(lb-ft)                                                                                                                                                          | N•m(lb-ft)                                                                                                                                                            |
| 1/4<br>5/16<br>3/8<br>7/16<br>1/2<br>9/16<br>5/8<br>3/4<br>7/8<br>1<br>1-1/8<br>1-1/4<br>1-3/8<br>1-1/2 | 7/16<br>1/2<br>9/16<br>5/8<br>3/4<br>13/16<br>1-1/8<br>1-1/4<br>1-5/16<br>1-1/2<br>1-11/16<br>1-7/8<br>2-1/16<br>2-1/4 | 3.5(2.5)<br>7(5)<br>12(8.5)<br>19(14)<br>24(21)<br>41(30)<br>54(40)<br>102(75)<br>163(120)<br>244(180)<br>346(255)<br>488(360)<br>637(470)<br>848(625) | 4(3)<br>9(6.5)<br>16(12)<br>26(19)<br>41(30)<br>54(40)<br>75(55)<br>136(100)<br>244(165)<br>332(245)<br>468(345)<br>664(490)<br>868(640)<br>1153(850) | 5(4)<br>10(7.5)<br>19(14)<br>30(22)<br>47(35)<br>68(50)<br>88(65)<br>163(120)<br>224(165)<br>332(245)<br>346(255)<br>488(360)<br>637(470)<br>848(625) | 7(5)<br>14(10)<br>24(18)<br>41(30)<br>61(45)<br>88(65)<br>122(90)<br>217(160)<br>224(165)<br>332(245)<br>468(345)<br>665(490)<br>868(640)<br>1153(850) | 8(6)<br>16(12)<br>30(22)<br>47(35)<br>75(55)<br>108(80)<br>149(110)<br>258(190)<br>414(305)<br>624(460)<br>780(575)<br>1098(810)<br>1438(1061)<br>1912(1410) | 11(8)<br>23(17)<br>41(30)<br>68(50)<br>102(75)<br>142(105)<br>197(145)<br>353(260)<br>563(415)<br>848(625)<br>1058(780)<br>1492(1100)<br>1953(1440)<br>2590(1910) | 12(8.5)<br>24(18)<br>41(30)<br>68(50)<br>102(75)<br>149(110)<br>203(150)<br>366(270)<br>590(435)<br>881(650)<br>1248(920)<br>1763(1300)<br>2312(1705)<br>3065(2260) | 16(12)<br>33(24)<br>54(40)<br>95(70)<br>142(105)<br>203(150)<br>278(205)<br>495(365)<br>800(590)<br>1193(880)<br>1695(1250)<br>2393(1765)<br>3140(2315)<br>4163(3070) |

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

\*For SAE Grade 2 fasteners 152 mm (6 in.) or less in length, use torque values for SAE Grade 2. For fasteners longer than 152 mm (6 in.), use SAE Grade 1 torque values.

Make sure fastener threads are clean and 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 amount shown in chart. Tighten toothed or serrated-type lock nuts to full torque value.



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## GASOLINE 4-CYCLE ENGINES - NORTH AMERICA

### CAUTION

Gasoline is **HIGHLY FLAMMABLE**, handle it with care.

**DO NOT** refuel machine while:

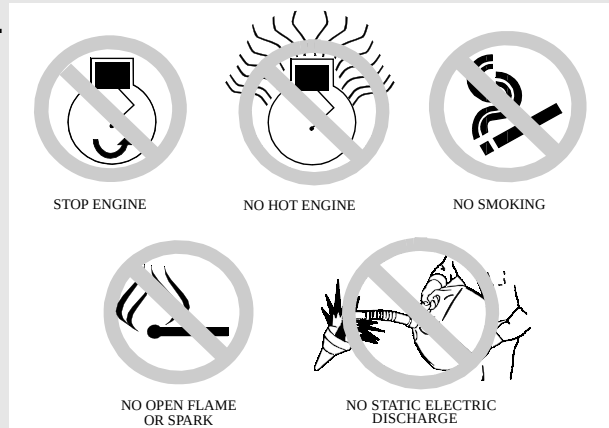
- indoors, always fill gas tank outdoors;
- machine is near an open flame or sparks;
- engine is running, **STOP** engine;
- engine is hot, allow it to cool sufficiently first;
- smoking.

**Help prevent fires:**

- fill gas tank to bottom of filler neck only;
- be sure fill cap is tight after fueling;
- clean up any gas spills **IMMEDIATELY**;
- keep machine clean and in good repair—free of excess grease, oil, debris, and faulty or damaged parts;
- any storage of machines with gas left in tank should be in an area that is well ventilated to prevent possible igniting of fumes by an open flame or spark, this includes any appliance with a pilot light.

**To prevent fire or explosion caused by STATIC ELECTRIC DISCHARGE during fueling:**

- **ONLY** use a clean, approved **POLYETHYLENE PLASTIC** fuel container and funnel **WITHOUT** any metal screen or filter.



**To avoid engine damage:**

- **DO NOT** mix oil with gasoline;
- **ONLY** use clean, fresh unleaded gasoline with an octane rating (anti-knock index) of 87 or higher;
- fill gas tank at the end of each day's operation to help prevent condensation from forming inside a partially filled tank;
- keep up with specified service intervals.

Use of alternative oxygenated, gasohol blended, unleaded gasoline is acceptable as long as:

- the ethyl or grain alcohol blends **DO NOT** exceed 10% by volume or
- methyl tertiary butyl ether (MTBE) blends **DO NOT** exceed 15% by volume.



**IMPORTANT: DO NOT** use **METHANOL** gasolines because **METHANOL** is harmful to the environment and to your health.

### WARNING

**California Proposition 65 Warning:** Gasoline engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

## GASOLINE STORAGE

**IMPORTANT: Keep all dirt, scale, water or other foreign material out of gasoline.**

Keep gasoline stored in a safe, protected area. Storage of gasoline in a clean, properly marked ("**UNLEADED GASOLINE**") **POLYETHYLENE PLASTIC** container **WITHOUT** any metal screen or filter is recommended. **DO NOT** use de-icers to attempt to remove water from gasoline or depend on fuel filters to remove water from gasoline. Use a water separator installed in the storage tank outlet. **BE SURE** to properly discard unstable or contaminated gasoline. When storing unit or gasoline, it is recommended that you add **John Deere Gasoline Conditioner and Stabilizer (TY15977)** or an equivalent to the gasoline. **BE SURE** to follow directions on container and to properly discard empty container.

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