

CX220C

Hydraulic Excavator

Service Manual

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SERVICE MANUAL

CX220C Standard model

Link Product / Engine

Product	Market Product	Engine
CX220C Modelo padrão	Latin America	F4GE9684E*J615

Contents

INTRODUCTION

Engine.....	10
[10.001] Engine and crankcase	10.1
[10.202] Air cleaners and lines	10.2
[10.216] Fuel tanks	10.3
[10.254] Intake and exhaust manifolds and muffler	10.4
[10.400] Engine cooling system	10.5
Hydraulic systems.....	35
[35.000] Hydraulic systems.....	35.1
[35.102] Pump control valves.....	35.2
[35.106] Variable displacement pump	35.3
[35.300] Reservoir, cooler, and filters.....	35.4
[35.304] Combination pump units	35.5
[35.352] Hydraulic swing system	35.6
[35.353] Hydraulic travel system	35.7
[35.354] Hydraulic central joint	35.8
[35.355] Hydraulic hand control	35.9
[35.356] Hydraulic foot control.....	35.10
[35.359] Main control valve	35.11
[35.736] Boom hydraulic system	35.12
[35.737] Dipper hydraulic system.....	35.13
[35.738] Excavator and backhoe bucket hydraulic system.....	35.14
Frames and ballasting	39
[39.101] Upper frame	39.1
[39.103] Swing ring assembly	39.2
[39.140] Ballasts and supports	39.3

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Tracks and track suspension	48
[48.130] Track frame and driving wheels	48.1
[48.100] Tracks	48.2
[48.134] Track tension units	48.3
[48.138] Track rollers	48.4
Cab climate control	50
[50.100] Heating	50.1
[50.200] Air conditioning	50.2
Electrical systems	55
[55.000] Electrical system	55.1
[55.015] Engine control system	55.2
[55.036] Hydraulic system control	55.3
[55.051] Cab Heating, Ventilation, and Air-Conditioning (HVAC) controls	55.4
[55.302] Battery	55.5
[55.640] Electronic modules	55.6
Booms, dippers, and buckets	84
[84.910] Boom	84.1
[84.100] Bucket	84.2
Platform, cab, bodywork, and decals	90
[90.116] Fenders and guards	90.1
[90.124] Pneumatically-adjusted operator seat	90.2
[90.150] Cab	90.3



INTRODUCTION

Contents

INTRODUCTION

Advice - Important notice regarding equipment servicing	3
Foreword - Ecology and the environment	4
Safety rules	5
Safety rules	6
Personal safety	8
Personal safety — Do not operate tag	9
Basic instructions	10
Torque – Bolt types	13
Basic instructions - Shop and Assembly	14
Torque — Minimum tightening torques for normal assembly	16
Torque - Standard torque data for hydraulics	19
General specification	21
Conversion factors – Units used	23

Advice - Important notice regarding equipment servicing

All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The information in this manual is up-to-date at the date of the publication. It is the policy of the manufacturer for continuous improvement. Some information could not be updated due to modifications of a technical or commercial type, or changes to the laws and regulations of different countries.

In case of questions, refer to your Sales and Service Networks.

Foreword - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

NOTE: *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

Helpful hints

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil, but should be collected and disposed of properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your CASE CONSTRUCTION dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

Safety rules

▲ DANGER

Improper operation or service of this machine can result in an accident.
Do not operate this machine or perform any lubrication, maintenance, or repair on it until you have read and understood the operation, lubrication, maintenance, and repair information.
Failure to comply will result in death or serious injury.

D0010A

▲ WARNING

Maintenance hazard!
Always perform all service procedures punctually at the intervals stated in this manual. This ensures optimum performance levels and maximum safety during machine operation.
Failure to comply could result in death or serious injury.

W0132A

▲ WARNING

Pressurized system!
Before attempting any service procedure, it is your responsibility to know the number of accumulators on the machine, and the correct procedure for releasing the pressure of each accumulator.
Failure to comply could result in death or serious injury.

W0136A

NOTICE: *Extreme working and environmental conditions require shortened service intervals.*

Use Case fluids, lubricants, and filters for the best protection and performance of your machine. All fluids, lubricants, and filters must be disposed of in compliance with environmental standards and regulations. Contact your dealer with any questions regarding the service and maintenance of this machine.

Read the safety decals and information decals on the machine. Read the Operator's Manual and safety manual. Understand the operation of the machine before you start any service.

Before you service the machine, put a 'Do Not Operate' tag on the steering wheel or over the key switch. Ensure the tag is at a location where everyone who might operate or service the machine may see clearly. One tag is included with your new machine. Additional tags are available from your dealer.

Plastic and resin parts

- Avoid using gasoline, paint thinner, etc. when cleaning plastic parts, console, instrument cluster, etc.
- Use only water, mild soap, and a soft cloth when you clean these parts.
- Using gasoline, thinners, etc. can cause discoloration, cracking, or deformation of the part being cleaned.

Safety rules

Standard safety precautions

Be informed and notify personnel of the laws in force regulating safety, and provide documentation available for consultation.

- Keep working areas as clean as possible.
- Ensure that working areas are provided with emergency boxes. They must be clearly visible and always contain adequate sanitary equipment.
- Fire extinguishers must be properly identified and always be clear of obstructions. Their efficiency must be checked on a regular basis and personnel must be trained on proper interventions and priorities.
- Keep all emergency exits free of obstructions and clearly marked.
- Smoking in working areas subject to fire danger must be strictly prohibited.

Prevention of injury

- Wear suitable work attire and safety glasses with no jewelry such as rings and chains when working close to engines and equipment in motion.
- Wear safety gloves and goggles when performing the following operations:
 - Topping off or changing lubrication oils.
 - Using compressed air or liquids at a pressure greater than **2 bar (29 psi)**.
- Wear a safety helmet when working close to hanging loads or equipment working at head level.
- Always wear safety shoes and fitting clothes.
- Use protection cream for hands.
- Change wet clothes as soon as possible.
- In the presence of voltages exceeding **48 - 60 V**, verify the efficiency of the ground and mass electrical connections. Ensure that hands and feet are dry and use isolating foot boards. Workers should be properly trained to work with electricity.
- Do not smoke or start an open flame close to batteries and any fuel material.
- Place soiled rags with oil, diesel fuel or solvents in specially provided anti-fire containers.
- Do not use any tool or equipment for any use other than what it was originally intended for. Serious injury may occur.
- If running an engine indoors, make sure there is a sufficient exhaust fan in use to eliminate exhaust fumes.

During maintenance

- Never open the filler cap of the cooling system when the engine is hot. High temperature liquid at operating pressure could result in serious danger and risk of burn. Wait until the temperature decreases under **50 °C (122 °F)**.
- Never add coolant to an overheated engine and use only appropriate liquids.
- Always work when the engine is turned off. Certain circumstances require maintenance on a running engine. Be aware of all the risks involved with such an operation.
- Always use adequate and safe containers for engine fluids and used oil.
- Keep engine clean of any spilled fluids such as oil, diesel fuel, and or chemical solvents.
- Use of solvents or detergents during maintenance may emit toxic vapors. Always keep working areas aerated. Wear a safety mask if necessary.
- Do not leave soiled rags that may contain any flammable substances close to the engine.
- Always use caution when starting an engine after any work has been performed. Be prepared to cut off intake air in case of engine runaway.
- Never disconnect the batteries while the engine is running.
- Disconnect the batteries prior to performing any work on the equipment.

- Disconnect the batteries to place a load on them with a load tester.
- After any work is performed, verify that the battery clamp polarity is correct and that the clamps are tight and safe from accidental short circuit and oxidation.
- Before disconnecting any pipelines (pneumatic, hydraulic, fuel pipes, etc.), verify that all pressure has been released. Take all necessary precautions bleeding and draining residual pressure. Always wear the proper safety equipment.
- Do not alter the lengths of any wires.
- Do not connect any electronic service tool to the engine electrical equipment unless specifically approved by CASE CONSTRUCTION.
- Do not modify the fuel system or hydraulic system unless approved by CASE CONSTRUCTION. Any unauthorized modification will compromise warranty assistance and may affect engine operation and life span.

For engine equipped with an electronic control unit

- Do not weld on any part of the equipment without removing the control unit.
- Remove the in case of work requiring heating over **80 °C (176 °F)**.
- Do not paint the components and the electronic connections.
- Do not alter any data filed in the electronic control unit driving the engine. Any manipulation or alteration of electronic components will void engine warranty assistance and may affect the correct working order and life span of the engine.

Respect of the Environment

- Respect of the environment should be of primary importance. Take all necessary precautions to ensure personnel's safety and health.
- Inform the personnel of the laws regarding the dispensing of used engine fluids.
- Handle batteries with care, storing them in a well ventilated environment and within anti-acid container.

Personal safety

Safety precautions

- Before servicing an air conditioning system, read and comply with the following safety precautions. Make sure that any repairs are performed by duly trained and skilled personnel only.
- Never attempt to remove the air conditioning system. Refrigerant leaks can cause serious burns to the eyes and hands.
- The refrigerant must always be handled very carefully in order to avoid accidents.
- Keep the refrigerant packaging as well as the air conditioning system away from flames or heat sources, as the resulting increase in pressure may cause the package or system to explode.
- If there is direct contact with naked flames or heated metal surfaces, the refrigerant will decompose and will produce toxic products and acids.
- Never discharge refrigerant into the atmosphere. A certified refrigerant recovery unit operated by a technician should be used to repair air conditioning units.
- When discharging the refrigerant in the system, do so in a well-ventilated area with perfect air circulation and away from naked flames.
- When charging or discharging the system, always wear safety goggles and take adequate precautions to protect the face in general and the eyes in particular, in case of accidental refrigerant spillage.
- The refrigerant and oil mixture inside the air conditioning system is pressurised. Because of this, never loosen the joints or work with the tubes without first depressurising the system.
- Before loosening any connector, cover it with a thick rag and use goggles and gloves to prevent the refrigerant from coming into contact with the skin or eyes.
If an accident does happen, proceed as follows:
 - If refrigerant gets into the eyes, wash immediately with copious amounts of distilled or tap water, and take the victim to hospital for specialist medical care.
 - If refrigerant comes into contact with the skin, wash with cold water and seek medical assistance immediately at a hospital.

Personal safety — Do not operate tag

⚠ WARNING

Maintenance hazard!

Before you start servicing the machine, attach a DO NOT OPERATE warning tag to the machine in a visible area.

Failure to comply could result in death or serious injury.

W0004A

Attach a DO NOT OPERATE (TAG) to the machine in an area that is clearly visible whenever the machine is not operating properly and/or requires service.

Complete the tag information for the "REASON" the tag is attached by describing the malfunction or service required. Validate the reason for attaching the tag by signing your name in the designated area on the tag.

The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.

(A)		(D)
(B)		(E)
(C)		(F)

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Tag Components

- A. DO NOT REMOVE THIS TAG! - (Warning) The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.
- B. See Other Side - (Reference to additional information on opposite side of the tag.)
- C. CNH Part Number - (Request this part number from you Service Parts Dealer to obtain this DO NOT OPERATE tag.)
- D. DO NOT OPERATE - (Warning!)
- E. REASON - (Area for describing malfunction or service required before operation.)
- F. Signed by - (Signature area - to be signed by the person validating the reason for installation of the tag.)

Basic instructions

Maintenance standards

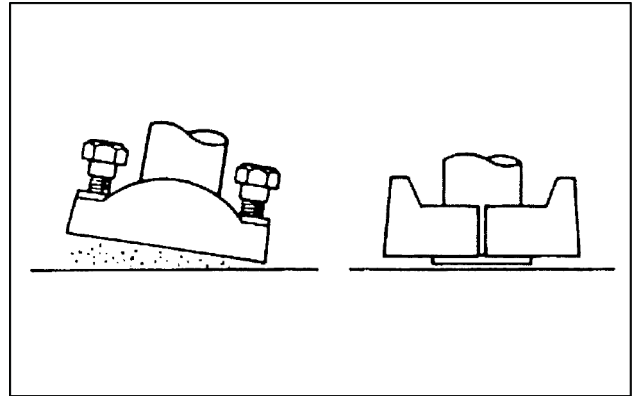
Inspection of components

Part name	Inspection item	Criterion and remedy
Casing	Check for scratches, rust, and corrosion.	<p>If any part is damaged, replace the housing.</p> <ul style="list-style-type: none"> The sliding parts of the hole in the housing and the spool, especially the outer circumference, to which the holding pressure is applied. Area of the sealing part that is in contact with the O-ring. Sealing and seating parts of the main relief valve or the overload relief valve. Sealing part of the plug. Defects in other parts that may prevent normal function.
Spool	Check for scratches, abrasions, rust, and corrosion.	If any defect can be detected by running a fingernail over the sliding surface of the outer circumference, replace the spool.
	Install the spool by turning the spool in the hole in the housing.	If the spool damages the O-ring and does not move smoothly, repair or replace the spool.
Needle	Check the needle and the spring for signs of damage.	If spring is damaged, replace it. If the seat of the needle or the spring are damaged, replace the seat of the needle or the spring.
	Insert the needle in the housing. Move the needle.	If the needle moves smoothly without
Spring and related parts	Check for rust, corrosion, deformation, and breakage of the spring, spring seat, stop, spacer bolt, and cover.	Replace if heavily damaged.
Main relief valve, orifice relief valve, by-pass cut valve.	Check for rust and damage on the outer surface.	Replace.
	Inspect the contact face of the valve seat.	Replace if damaged.
	Inspect the O-ring, thrust ring, and seal.	As a general rule, replace all with new ones. (Between the housing and the seal)

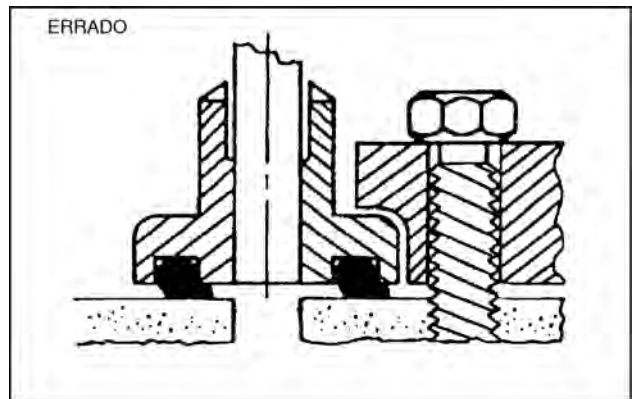
Service recommendations for split flange

NOTICE:

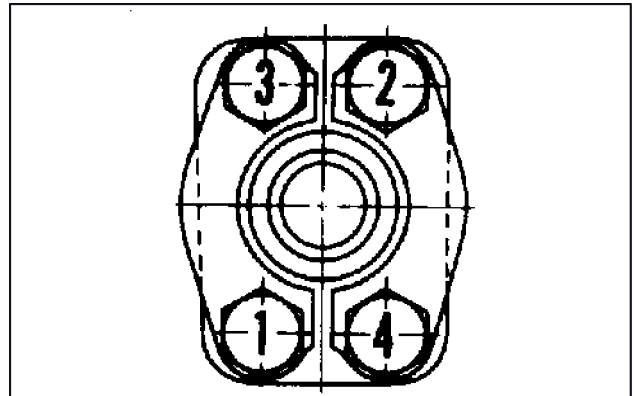
1. Clean and inspect the sealing surfaces. Scratches and roughness cause leaks and wear of the seals. Not being level causes extrusion of the seals. If the defects cannot be corrected, replace the components.
2. Always use specified O-rings. Inspect the O-rings for any damage. Be careful not to scratch the O-rings. When installing an O-ring into a groove, use grease to hold the O-ring in place.
3. Loosely assemble halves of the split flange. Ensure that the slot is centrally located and perpendicular to the orifice. Tighten the bolts by hand to secure the parts in place. Be careful not to crush the O-ring.
4. Tighten the bolts alternately and diagonally, as shown, to assure a uniform tightness.
5. Do not use pneumatic wrenches. Pneumatic wrenches often fully tighten one bolt before tightening the others, resulting in damage to the O-rings and uneven tightening of the bolts.



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Locking the nuts and bolts

- Lock plate

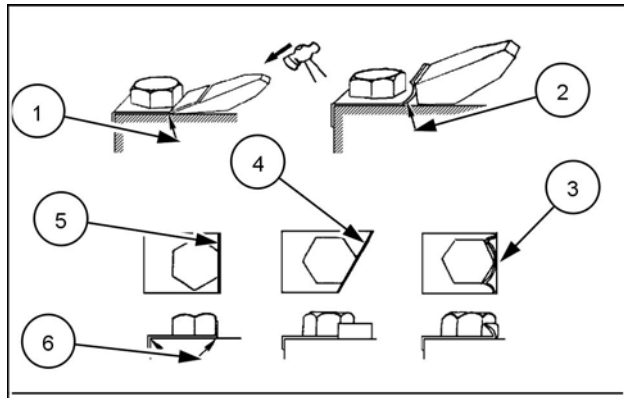
NOTICE: Do not reuse the removed lock plates. Do not try to bend the same point twice.

- Cotter pin

NOTICE: Do not reuse the removed cotter pins. Align the localized holes during tightening, not when loosening.

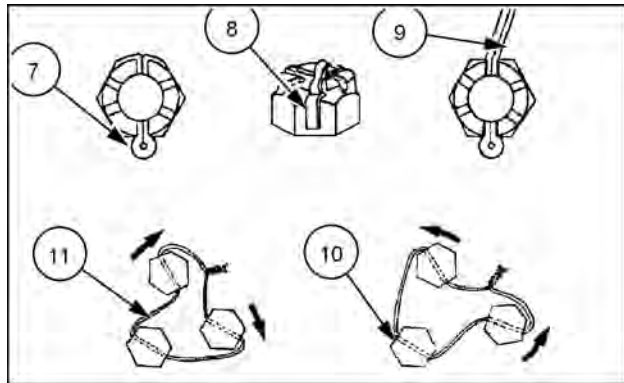
- Lock Wire

NOTICE: Apply the wire to the bolts in the direction of tightening, not in the direction of loosening.



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- (1) –Correct=Bend along the sharp edge
- (2) –INCORRECT = Do not bend rounded
- (3) –INCORRECT
- (4) –CORRECT
- (5) –CORRECT
- (6) –Bend along the sharp edge
- (7) –CORRECT
- (8) –CORRECT
- (9) –INCORRECT
- (10) –INCORRECT TIGHTEN
- (11) –CORRECT LOOSEN

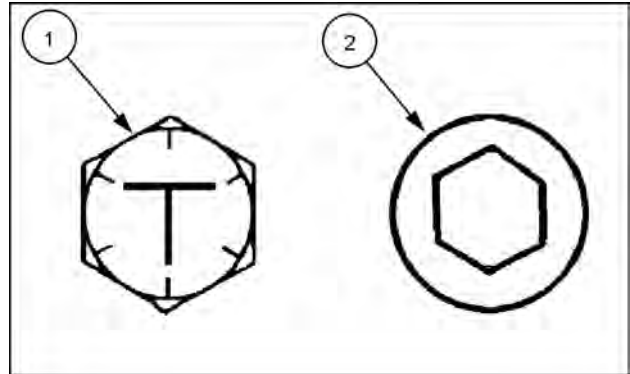


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Torque – Bolt types

Correctly tighten the nuts and bolts according to the torque specifications. There are two types used of bolts, hexagon T bolt and socket bolt (Allen), each made of different material. During the assembly of the machine or the components, ensure that you use the correct bolts. Ensure that you tighten them to the specifications.

- (1) Hexagon T Bolt.
- (2) Socket bolt (Allen)



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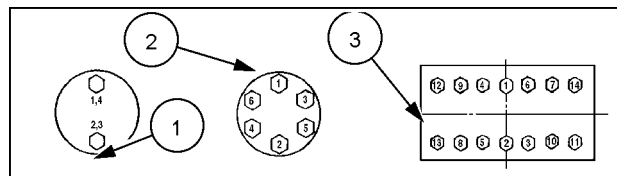
Table of specified tightening torque

Bolt diameter	Wrench size	Hexagon Wrench Size	T bolt, socket bolt
M8	13	6	29.5 N·m
M10	17	8	64 N·m
M12	19	10	108 N·m
M14	22	12	175 N·m
M16	24	14	265 N·m
M18	27	14	390 N·m
M20	30	17	540 N·m
M22	32	17	740 N·m
M24	36	19	930 N·m
M27	41	19	1370 N·m
M30	46	22	1910 N·m
M33	50	24	2550 N·m
M36	55	27	3140 N·m

1. Apply lubricant (i.e., white zinc B dissolved in bearing oil) to the bolts and nuts to stabilize their coefficient of friction.
2. Torque tolerance is $\pm 10\%$.
3. Make sure that you are using correct length bolts. Bolts that are too long cannot be tightened, since their tip comes into contact with the bottom of the hole. Bolts that are too short cannot develop enough tightening force.
4. The torques presented in the table are for general use only. Do not use these torques if a different torque is given for a specific application.
5. Make sure that the threads of the nuts and bolts are clean before installing them. Remove the dirt or corrosion, if any.

Bolts tightening sequence

When tightening two or more bolts, tighten the bolts alternately, as shown, to ensure a uniform tightening.



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- (1) Uniformly tighten the upper and the lower, alternately. (2) Tighten diagonally. (3) Tighten from center and diagonally.

Basic instructions - Shop and Assembly

SHIMS

For each adjustment operation, select adjusting shims and measure separately with a micrometer. Then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect. Do not rely on the rated value on each shim.

ROTATING SHAFT SEALS

For correct rotating shaft seal installation, proceed as follows:

- before assembly, allow the seal to soak for at least thirty minutes in the oil that it will seal.
- thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
- position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal.
- coat the sealing lip with a thin layer of lubricant (use oil rather than grease). Fill the gap between the sealing lip and the dust lip on double lip seals with grease
- insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
- while you insert the seal, check that the seal is perpendicular to the seat. Once the seal is in place, make sure that the seal makes contact with the thrust element, if required.
- to prevent damage to the seal lip on the shaft, position a protective guard during installation operations.

O-RING SEALS

Lubricate the O-ring seals before you insert them in the seats. This will prevent overturning and twisting, which would jeopardize sealing efficiency.

SEALING COMPOUNDS

Apply one of the following sealing compounds on the mating surfaces when specified: SILMATE® RTV1473, or LOCTITE® RTV 598™ or LOCTITE® INSTANT GASKET 587 BLUE. Before you apply the sealing compound, prepare the surfaces as directed on product container or as follows:

- remove any deposits with a wire brush
- thoroughly de-grease the surfaces using a locally-approved cleaning agent such as safety solvent or brake parts cleaner.

SPARE PARTS

Only use "CNH Original Parts" or " CASE CONSTRUCTION Parts".

Only genuine spare parts guarantee the same quality, duration and safety as original parts, as they are the same parts that are assembled during standard production. Only "CNH Original Parts" or " CASE CONSTRUCTION Parts" can offer this guarantee.

When you order spare parts, always provide the following information:

- machine model (commercial name) and serial number
- part number of the ordered part, which can be found in the "Microfiches" or the "Spare Parts Catalogue", used to process orders

PROCEDURE TO PROTECT THE ELECTRONIC SYSTEMS AND ELECTRICAL SYSTEMS DURING CHARGING OPERATIONS OR WELDING OPERATIONS

▲ DANGER

Battery acid causes burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately. Failure to comply will result in death or serious injury.

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To avoid damage to the electronic systems and electrical systems, always observe the following:

1. Never connect or disconnect any part of the charging circuit, including the battery connections, when the engine is running.
2. Never short any of the charging components to earth.
3. Always disconnect the battery ground cable before you perform arc welding operations or on any attached header on the combine.
 - position the welder ground clamp as close to the welding area as possible
 - if you perform welding operations in close proximity to a computer module, you should remove the computer module
 - never allow welding cables to lay on, near or across any electrical wiring or electronic component while you perform welding operations
4. Always disconnect the negative battery cable when you charge the battery with a battery charger.

NOTICE: *if you need to perform welding operations on the unit or on the header (if connected), you must disconnect the battery ground cable from the battery. The electronic monitoring system and charging system will incur damage if you do not disconnect the battery ground cable from the battery.*

Remove the battery ground cable. Reconnect the cable when welding operations are complete.

TOOLS

The tools that CASE CONSTRUCTION suggests and illustrated in this manual have been:

- specifically researched and designed for use with CASE CONSTRUCTION machines
- essential for reliable repair operations
- accurately built and rigorously tested so as to offer efficient and long-lasting operation

If Repair Personnel use these tools, they will be able to:

- operate in optimal technical conditions
- obtain the best results
- save time and effort
- work in safe conditions

NOTE: *You should interpret the terms "front", "rear", "right-hand" and "left-hand" (when you refer to different parts) from the rear, while you face in the direction of travel of the machine during operation.*

Torque — Minimum tightening torques for normal assembly

Decimal hardware

Grade 5 bolts, nuts and studs

Size	Nm	lb in/lb ft
1/4 in	12 - 15 Nm	108 - 132 lb in
5/16 in	23 - 28 Nm	204 - 252 lb in
3/8 in	48 - 57 Nm	420 - 504 lb in
7/16 in	73 - 87 Nm	54 - 64 lb ft
1/2 in	109 - 130 Nm	80 - 96 lb ft
9/16 in	149 - 179 Nm	110 - 132 lb ft
5/8 in	203 - 244 Nm	150 - 180 lb ft
3/4 in	366 - 439 Nm	270 - 324 lb ft
7/8 in	542 - 651 Nm	400 - 480 lb ft
1 in	787 - 944 Nm	580 - 696 lb ft
1-1/8 in	1085 - 1193 Nm	800 - 880 lb ft
1-1/4 in	1519 - 1681 Nm	1120 - 1240 lb ft
1-3/8 in	1980 - 2278 Nm	1460 - 1680 lb ft
1-1/2 in	2631 - 2983 Nm	1940 - 2200 lb ft

Grade 8 bolts, nuts and studs

Size	Nm	lb in/lb ft
1/4 in	16 - 20 Nm	144 - 180 lb in
5/16 in	33 - 39 Nm	288 - 348 lb in
3/8 in	61 - 73 Nm	540 - 648 lb in
7/16 in	95 - 114 Nm	70 - 84 lb ft
1/2 in	149 - 179 Nm	110 - 132 lb ft
9/16 in	217 - 260 Nm	160 - 192 lb ft
5/8 in	298 - 358 Nm	220 - 264 lb ft
3/4 in	515 - 618 Nm	380 - 456 lb ft
7/8 in	814 - 976 Nm	600 - 720 lb ft
1 in	1220 - 1465 Nm	900 - 1080 lb ft
1-1/8 in	1736 - 1953 Nm	1280 - 1440 lb ft
1-1/4 in	2468 - 2712 Nm	1820 - 2000 lb ft
1-3/8 in	3227 - 3688 Nm	2380 - 2720 lb ft
1-1/2 in	4285 - 4827 Nm	3160 - 3560 lb ft

NOTE: Use thick nuts with Grade 8 bolts.

Metric hardware

Grade 8.8 bolts, nuts and studs

Size	Nm	lb in/lb ft
4 mm	3 - 4 Nm	24 - 36 lb in
5 mm	7 - 8 Nm	60 - 72 lb in
6 mm	11 - 12 Nm	96 - 108 lb in
8 mm	26 - 31 Nm	228 - 276 lb in
10 mm	52 - 61 Nm	456 - 540 lb in
12 mm	90 - 107 Nm	66 - 79 lb ft
14 mm	144 - 172 Nm	106 - 127 lb ft
16 mm	217 - 271 Nm	160 - 200 lb ft
20 mm	434 - 515 Nm	320 - 380 lb ft
24 mm	675 - 815 Nm	500 - 600 lb ft
30 mm	1250 - 1500 Nm	920 - 1100 lb ft
36 mm	2175 - 2600 Nm	1600 - 1950 lb ft