SERVICE MANUAL

D180C
Tier 4
Crawler Dozer

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NEW HOLLAND
CONSTRUCTION

SERVICE MANUAL

D180C

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INTRODUCTION

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Safety rules

Personal safety

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

⚠ DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation that, if not avoided, could result in machine or property damage.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: *Note indicates additional information that clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Safety rules - 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 NEW HOLLAND 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 - 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.

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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.

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.)

Safety rules

⚠ General safety rules ⚠

Use caution when operating the machine on slopes. Raised equipment, full tanks and other loads will change the center of gravity of the machine. The machine can tip or roll over when near ditches and embankments or uneven surfaces.

Never permit anyone other than the operator to ride on the machine.

Never operate the machine under the influence of alcohol, drugs, or while otherwise impaired.

When digging or using ground engaging attachments be aware of buried cables. Contact local utilities to determine the locations of services.

Pay attention to overhead power lines and hanging obstacles. High voltage lines may require significant clearance for safety.

Hydraulic oil or diesel fuel leaking under pressure can penetrate the skin, causing serious injury or infection.

- DO NOT use your hand to check for leaks. Use a piece of cardboard or paper.
- Stop engine, remove key and relieve the pressure before connecting or disconnecting fluid lines.
- Make sure all components are in good condition and tighten all connections before starting the engine or pressurizing the system.
- If hydraulic fluid or diesel fuel penetrates the skin, seek medical attention immediately.
- Continuous long term contact with hydraulic fluid may cause skin cancer. Avoid long term contact and wash the skin promptly with soap and water.

Keep clear of moving parts. Loose clothing, jewelry, watches, long hair, and other loose or hanging items can become entangled in moving parts.

Wear protective equipment when appropriate.

DO NOT attempt to remove material from any part of the machine while it is being operated or components are in motion.

Make sure all guards and shields are in good condition and properly installed before operating the machine. Never operate the machine with shields removed. Always close access doors or panels before operating the machine.

Dirty or slippery steps, ladders, walkways, and platforms can cause falls. Make sure these surfaces remain clean and clear of debris.

A person or pet within the operating area of a machine can be struck or crushed by the machine or its equipment. DO NOT allow anyone to enter the work area.

Raised equipment and/or loads can fall unexpectedly and crush persons underneath. Never allow anyone to enter the area underneath raised equipment during operation.

Never operate engine in enclosed spaces as harmful exhaust gases may build up.

Before starting the machine, be sure that all controls are in neutral or park lock position.

Start the engine only from the operator’s seat. If the safety start switch is bypassed, the engine can start with the transmission in gear. Do not connect or short across terminals on the starter solenoid. Attach jumper cables as described in the manual. Starting in gear may cause death or serious injury.

Always keep windows, mirrors, all lighting, and Slow Moving Vehicle (SMV) emblem clean to provide the best possible visibility while operating the machine.

Operate controls only when seated in the operator’s seat, except for those controls expressly intended for use from other locations.

Before leaving the machine:

1. Park machine on a firm level surface.
2. Put all controls in neutral or park lock position.
3. Engage park brake. Use wheel chocks if required.
4. Lower all hydraulic equipment — Implements, header, etc.
5. Turn off engine and remove key.

When, due to exceptional circumstances, you would decide to keep the engine running after leaving the operator's station, then the following precautions must be followed:

1. Bring the engine to low idle speed.
2. Disengage all drive systems.
3. **⚠ WARNING**

   Some components may continue to run down after disengaging drive systems.
   Make sure all drive systems are fully disengaged.
   Failure to comply could result in death or serious injury.

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   Shift the transmission into neutral.
4. Apply the parking brake.

⚠ General maintenance safety ⚠

Keep area used for servicing the machine clean and dry. Clean up spilled fluids.

Service machine on a firm level surface.

Install guards and shields after servicing the machine.

Close all access doors and install all panels after servicing the machine.

Do not attempt to clean, lubricate, clear obstructions or make adjustments to the machine while it is in motion or while the engine is running.

Always make sure working area is clear of tools, parts, other persons and pets before you start operating the machine.

Unsupported hydraulic cylinders can lose pressure and drop the equipment causing a crushing hazard. Do not leave equipment in a raised position while parked or during service, unless securely supported.

Jack or lift the machine only at jack or lift points indicated in this manual.

Incorrect towing procedures can cause accidents. When towing a disabled machine follow the procedure in this manual. Use only rigid tow bars.

Stop the engine, remove key and relieve pressure before disconnecting or connecting fluid lines.

Stop the engine and remove key before disconnecting or connecting electrical connections.

Scalding can result from incorrect removal of coolant caps. Cooling system operates under pressure. Hot coolant can spray out if a cap is removed while the system is hot. Allow system to cool before removing cap. When removing a cap turn it slowly to allow pressure to escape before completely removing the cap.

Replace damaged or worn tubes, hoses, electrical wiring, etc.

Engine, transmission, exhaust components, and hydraulic lines may become hot during operation. Take care when servicing such components. Allow surfaces to cool before handling or disconnecting hot components. Wear protective equipment when appropriate.

When welding, follow the instructions in the manual. Always disconnect the battery before welding on the machine. Always wash your hands after handling battery components.

⚠ Wheels and tires ⚠

Make sure tires are correctly inflated. Do not exceed recommended load or pressure. Follow instructions in the manual for proper tire inflation.

Tires are heavy. Handling tires without proper equipment could cause death or serious injury.

Never weld on a wheel with a tire installed. Always remove tire completely from wheel prior to welding.

Always have a qualified tire technician service the tires and wheels. If a tire has lost all pressure, take the tire and wheel to a tire shop or your dealer for service. Explosive separation of the tire can cause serious injury.

DO NOT weld to a wheel or rim until the tire is completely removed. Inflated tires can generate a gas mixture with the air that can be ignited by high temperatures from welding procedures performed on the wheel or rim. Removing the air or loosening the tire on the rim (breaking the bead) will NOT eliminate the hazard. This condition can exist whether tires are inflated or deflated. The tire MUST be completely removed from the wheel or rim prior to welding the wheel or rim.

⚠ Driving on public roads and general transportation safety ⚠

Comply with local laws and regulations.

Use appropriate lighting to meet local regulations.

Make sure SMV emblem is visible.

Make sure brake pedal latch is engaged. Brake pedals must be locked together for road travel.

Use safety chains for trailed equipment when provided with machine or equipment.

Lift implements and attachments high enough above ground to prevent accidental contact with road.

When transporting equipment or machine on a transport trailer, make sure it is properly secured. Be sure the SMV on the equipment or machine is covered while being transported on a trailer.

Be aware of overhead structures or power lines and make sure the machine and/or attachments can pass safely under.

Travel speed should be such that complete control and machine stability is maintained at all times.

Slow down and signal before turning.

Pull over to allow faster traffic to pass.

Follow correct towing procedure for equipment with or without brakes.

Make sure the booms are locked in the cradles with the locking pins provided.

⚠ Fire and explosion prevention ⚠

Fuel or oil leaked or spilled on hot surfaces or electrical components can cause a fire.

Crop materials, trash, debris, bird nests, or flammable material can ignite on hot surfaces.

Always have a fire extinguisher on or near the machine.

Make sure the fire extinguisher(s) is maintained and serviced according to the manufacturer’s instructions.

At least once each day and at the end of the day remove all trash and debris from the machine especially around hot components such as engine, transmission, exhaust, battery, etc. More frequent cleaning of your machine may be necessary depending on the operating environment and conditions.

At least once each day, remove debris accumulation around moving components such as bearings, pulleys, belts, gears, cleaning fan, etc. More frequent cleaning of your machine may be necessary depending on the operating environment and conditions.

Inspect the electrical system for loose connections or frayed insulation. Repair or replace loose or damaged parts.

Do not store oily rags or other flammable material on the machine.

Do not weld or flame cut any items that contain flammable material. Clean items thoroughly with non-flammable solvents before welding or flame-cutting.

Do not expose the machine to flames, burning brush, or explosives.

Promptly investigate any unusual smells or odors that may occur during operation of the machine.

⚠ General battery safety ⚠

Always wear eye protection when working with batteries.

Do not create sparks or have open flame near battery.

Ventilate when charging or using in an enclosed area.

Disconnect negative (-) first and reconnect negative (-) last.

When welding on the machine, disconnect both terminals of the battery.

Do not weld, grind, or smoke near a battery.

When using auxiliary batteries or connecting jumper cables to start the engine, use the procedure shown in the operator's manual. Do not short across terminals.

Follow manufacturer's instructions when storing and handling batteries.

Battery post, terminals, and related accessories contain lead and lead compounds. Wash hands after handling. This is a California Proposition 65 warning.

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.

Keep out of reach of children and other unauthorized persons.

⚠ Instructional seat safety ⚠

Passengers are not permitted to ride on the machine.

The instructional seat is to be used only when training a new operator or when a service technician is diagnosing a problem.

When required for the purposes of training or diagnostics, only one person may accompany the operator and that person must be seated in the instructional seat.

When the instructional seat is occupied, the following precautions must be followed:

- Machine should be driven only at slow speeds and over level ground.
- Avoid driving on highways or public roads.
- Avoid quick starts or stops.
- Avoid sharp turns.
- Always wear correctly adjusted seat belts.
- Keep door closed at all times.

⚠ Operator presence system ⚠

Your machine is equipped with an operator presence system to prevent the use of some features while the operator is not in the operator's seat.

The operator presence system should never be disconnected or bypassed.

If the system is inoperable, the system must be repaired.

⚠ Reflectors and warning lights ⚠

Flashing amber warning lights must be used when operating on public roads. Refer to Chapter 5 — Transport Operations for complete identification and operating instructions.

⚠ Seat belts ⚠

Seat belts must be worn at all times.

Seat belt inspection and maintenance:

- Keep seat belts in good condition.
- Keep sharp edges and items that can cause damage away from the belts.
- Periodically check belts, buckles, retractors, tethers, slack take-up system, and mounting bolts for damage and wear.
- Replace all parts that have damage or wear.
- Replace belts that have cuts that can make the belt weak.
- Check that bolts are tight on the seat bracket or mounting.
- If belt is attached to seat, make sure seat or seat brackets are mounted securely.
- Keep seat belts clean and dry.
- Clean belts only with soap solution and warm water.
- Do not use bleach or dye on the belts because this can make the belts weak.
- Refer to Chapter 4 — Operating Instructions for proper use and adjustment of seat belts.

⚠ Air-conditioning system ⚠

The air-conditioning system is under high pressure. Do not disconnect any lines. The release of high pressure can cause serious injury.

The air-conditioning system contains gases that are harmful to the environment when released into the atmosphere. Do not attempt to service or repair the system.

Service, repair, or recharging must be performed only by a trained service technician.

⚠ Personal Protective Equipment (PPE) ⚠

Wear Personal Protective Equipment (PPE) such as hard hat, eye protection, heavy gloves, hearing protection, protective clothing, etc.

⚠ Do Not Operate tag ⚠

Before you start servicing the machine, attach a ‘Do Not Operate’ warning tag to the machine in an area that will be visible.

⚠ Hazardous chemicals ⚠

If you are exposed to or come in contact with hazardous chemicals you can be seriously injured. The fluids, lubricants, paints, adhesives, coolant, etc. required for the function of your machine can be hazardous. They may be attractive and harmful to domestic animals as well as humans.

Material Safety Data Sheets (MSDS) provide information about the chemical substances within a product, safe handling and storage procedures, first aid measures and procedures to be taken in the event of a spill or accidental release. MSDS are available from your dealer.

Before you service your machine check the MSDS for each lubricant, fluid, etc. used in this machine. This information indicates the associated risks and will help you service the machine safely. Follow the information in the MSDS, on manufacturer containers, as well as the information in this manual when servicing the machine.

Dispose of all fluids, filters, and containers in an environmentally safe manner according to local laws and regulations. Check with local environmental and recycling centers or your dealer for correct disposal information.

Store fluids and filters in accordance with local laws and regulations. Use only appropriate containers for the storage of chemicals or petrochemical substances.

Keep out of reach or children or other unauthorized persons.

Additional precautions are required for applied chemicals. Obtain complete information from the manufacturer or distributor of the chemicals before using them.

⚠ Utility safety ⚠

When digging or using ground-engaging equipment, be aware of buried cables and other services. Contact your local utilities or authorities, as appropriate to determine the locations of services.

Make sure the machine has sufficient clearance to pass in all directions. Pay special attention to overhead power lines and hanging obstacles. High voltage lines may require significant clearance for safety. Contact local authorities or utilities to obtain safe clearance distances from high voltage power lines.

Retract raised or extended components, if necessary. Remove or lower radio antennas or other accessories. Should a contact between the machine and an electric power source occur, the following precautions must be taken:

- Stop the machine movement immediately.
- Apply the park brake, stop the engine, and remove the key.
- Check if you can safely leave the cab or your actual position without contact with electrical wires. If not, stay in your position and call for help. If you can leave your position without touching lines, jump clear of the machine to make sure you do not make contact with the ground and the machine at the same time.

- Do not permit anyone to touch the machine until power has been shut off to the power lines.

⚠ Electrical storm safety ⚠

Do not operate machine during an electrical storm.

If you are on the ground during an electrical storm, stay away from machinery and equipment. Seek shelter in a permanent, protected structure.

If an electrical storm should strike during operation, remain in the cab. Do not leave the cab or operator's platform. Do not make contact with the ground or objects outside the machine.

⚠ Mounting and dismounting ⚠

Mount and dismount the machine only at designated locations that have handholds, steps, or ladders.

Do not jump off the machine.

Make sure steps, ladders, and platforms remain clean and clear of debris and foreign substances. Injury may result from slippery surfaces.

Face the machine when mounting and dismounting.

Maintain a three-point contact with steps, ladders, and handholds.

Never mount or dismount from a moving machine.

Do not use the steering wheel or other controls or accessories as handholds when entering or exiting the cab or operator's platform.

⚠ Working at heights ⚠

When the normal use and maintenance of the machine requires working at heights:

- Correctly use installed steps, ladders, and railings.
- Never use ladders, steps, or railings while the machine is moving.
- Do not stand on surfaces which are not designated as steps or platforms.

Do not use the machine as a lift, ladder, or platform for working at heights.

⚠ Spraying ⚠

- Be sure to clean and flush all residual chemicals from the sprayer before changing to another type of chemical. On some models, it may be necessary to remove the end caps from the spray bars to thoroughly flush the boom plumbing. In some cases a decontamination solution is recommended by the chemical manufacturer.
- Always follow chemical manufacturers safety instructions when mixing and applying herbicides and chemicals to prevent serious harm to people or the environment.
- Observe all Federal and State EPA regulations and all Local, State and Federal codes and/or laws regarding licensing, handling, storage, transportation, application and waste disposal of herbicides or other chemicals.

⚠ Roll over and tip over ⚠

- Travel speed should be such that complete control and machine stability is maintained at all times. Where possible, avoid operating near ditches, embankments and holes. Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.
- Do not operate the unit on terrain outside its grade and stability limits. Operating the sprayer outside its limits may result in a roll over or tip over.
- Operating the unit on steep grades may result in a machine overturn. It is the operator's responsibility to make a judgment if weather, road or ground conditions permit safe operation on a hillside, ramp, ditch or rough ground.
- Use caution when operating the machine on slopes. Raised equipment, full tanks and other loads can change the center of gravity of the machine. The machine can tip or roll over when near ditches and embankments or uneven surfaces.
- Do not operate the unit near or on the soft shoulders of canals, brooks, other waterways or banks which are undermined by rodents. The unit may sink sideways and roll over.
- Do not operate the unit on poorly constructed or underrated ramps. The ramps may collapse and cause the sprayer to roll over. Always check the condition and rating of ramps before use.
- Do not operate the unit without using the seat restraint.
- Do not operate the unit beyond its limits of dynamic stability. High speed, abrupt maneuvers or fast and sharp cornering increase the risk of roll over.

Basic instructions - 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 NEW HOLLAND CONSTRUCTION Sales and Service Networks.

Basic instructions - Shop and assembly

Shimming

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

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

1. Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
2. Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
3. Position the sealing lip facing the fluid.

   NOTE: *With hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will move the fluid towards the inner side of the seal.*
4. 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.
5. 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.
6. While you insert the seal, check that the seal is perpendicular to the seat. When the seal settles, make sure that the seal makes contact with the thrust element, if required.
7. 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 the O-ring seals from overturning and twisting, which would jeopardize sealing efficiency.

Sealing compounds

Apply a sealing compound on the mating surfaces when specified by the procedure. Before you apply the sealing compound, prepare the surfaces as directed by the product container.

Spare parts

Only use CNH Original Parts or NEW HOLLAND CONSTRUCTION Original 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 NEW HOLLAND CONSTRUCTION Original Parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and Product Identification Number (PIN)
- Part number of the ordered part, which can be found in the parts catalog

Protecting the electronic and/or electrical systems during charging and welding

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

1. Never make or break any of the charging circuit connections when the engine is running, including the battery connections.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the machine or on any machine attachment.
   - Position the welder ground clamp as close to the welding area as possible.
   - If you weld in close proximity to a computer module, then you should remove the module from the machine.
   - Never allow welding cables to lie on, near, or across any electrical wiring or electronic component while you weld.
4. Always disconnect the negative cable from the battery when charging the battery in the machine with a battery charger.

   NOTICE: *If you must weld on the unit, you must disconnect the battery ground cable from the machine battery. The electronic monitoring system and charging system will be damaged if this is not done.*
5. Remove the battery ground cable. Reconnect the cable when you complete welding.

⚠ WARNING

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 could result in death or serious injury.

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Special tools

The special tools that NEW HOLLAND CONSTRUCTION suggests and illustrate in this manual have been specifically researched and designed for use with NEW HOLLAND CONSTRUCTION machines. The special tools are essential for reliable repair operations. The special tools are accurately built and rigorously tested to offer efficient and long-lasting operation.

By using these tools, repair personnel will benefit from:

- Operating in optimal technical conditions
- Obtaining the best results
- Saving time and effort
- Working in safe conditions

Torque

Ripper

Component	Torque
Ripper mounting bolts	**1016 - 1375 N·m** (**749 - 1014 lb ft**)
Ripper pin retaining and tube cover bolts	**301 - 407 N·m** (**222 - 300 lb ft**)

Fuse and Relay Blocks

Component	Torque
Fuse block mounting	**6.5 N·m** (**4.8 lb ft**)

Pumps and Motors

Component	Torque
Pump mount bolts to cover	**587 - 690 N·m** (**433 - 509 lb ft**)
Motor mount bolts to final drives	**250 - 280 N·m** (**184 - 207 lb ft**)
Pump to motor hoses spit flange clamps	**90 - 100 Nm** (**66 - 74 lb ft**)
Inlet hose clamps	**6.5 - 7.6 Nm** (**58 - 68 lb in**)

Rear Frame Cover

Component	Torque
M24 hex bolts	**449 - 725 N·m** (**331 - 535 lb ft**)
M16 hex bolts	**230 - 371 N·m** (**170 - 274 lb ft**)

Track

Component	Torque
Master link bolts (Use **LOCTITE® 242** on master link bolts.)	**610 - 670 N·m** (**450 - 494 lb ft**)
Standard link shoe bolts	**610 - 670 N·m** (**450 - 494 lb ft**)

Final Drives

Component	Torque
Drive Hub Rolling Torque	**10 - 24 N·m** (**7 - 18 lb ft**)
Input Shaft Bearing Retainer Plate Mounting Bolts	**77 - 87 N·m** (**57 - 64 lb ft**)
Park Brake Housing Plate	**77 - 87 N·m** (**57 - 64 lb ft**)
Brake Housing Cover - M20 X 50 12 pnt	**650 - 730 N·m** (**479 - 538 lb ft**)
Brake Line Fitting	**55 - 60 N·m** (**41 - 44 lb ft**)
Brake Bleeder Fitting	**24 - 30 N·m** (**18 - 22 lb ft**)
Counter Shaft Bearing Retainer Plate Mounting Bolts	**135 - 150 N·m** (**100 - 111 lb ft**)
Spindle Housing	**335 - 375 N·m** (**247 - 277 lb ft**)
Ring Gear Retaining Plate	**335 - 375 N·m** (**247 - 277 lb ft**)
Sun Gear Shaft Retaining Plate	**135 - 150 N·m** (**100 - 111 lb ft**)
Output Gear Bearing Retainer Plate Mounting Bolts	**135 - 150 N·m** (**100 - 111 lb ft**)
Planetary Carrier to Drive Hub	**335 - 375 N·m** (**247 - 277 lb ft**)
Final Drive Housing to Frame Mounting Bolts	**656 - 725 N·m** (**484 - 535 lb ft**)
Fill Check Plug	**24 - 30 N·m** (**18 - 22 lb ft**)
Drain Plug	**24 - 30 N·m** (**18 - 22 lb ft**)

Cab Mounting

Component	Torque
Support mount bolts	**733 - 854 N·m** (**541 - 630 lb ft**)
Brush guard mount bolts (if equipped)	**587 - 794 N·m** (**433 - 586 lb ft**)

Air Conditioning Compressor

Component	Torque
Compressor rotor shaft nut	**15 - 20 Nm** (**11 - 15 lb ft**)
Oil filler plug	**15 - 24 Nm** (**11 - 18 lb ft**)
Dust cover screws	**7 - 11 Nm** (**5 - 8 lb ft**)

Lift Cylinder

Component	Torque
Piston bolt	**2160 - 2450 N·m** (**1593 - 1807 lb ft**)
Gland	**135 - 542 Nm** (**100 - 400 lb ft**)

Tilt Cylinder

Component	Torque
Piston bolt	**2160 - 2450 N·m** (**1593 - 1807 lb ft**)
Gland	**135 - 542 Nm** (**100 - 400 lb ft**)

Angle Cylinder

Component	Torque
Piston bolt	**2160 - 2450 N·m** (**1593 - 1807 lb ft**)
Gland	**135 - 542 Nm** (**100 - 400 lb ft**)

Ripper Cylinder

Component	Torque
Piston bolt	**2830 - 3210 N·m** (**2087 - 2368 lb ft**)
Gland	**135 - 542 Nm** (**100 - 400 lb ft**)

Starter

Component	Torque
Mounting bolts	**68 - 77 Nm** (**50 - 57 lb ft**)
Battery terminal nut	**17.7 - 24.5 Nm** (**13 - 18 lb ft**)
Solenoid + screw	**2.6 - 4.5 Nm** (**23 - 40 lb in**)

Multifunction valve

Component	Torque
Brake valve	**3 - 4 N·m** (**2 - 3 lb ft**)
Brake valve screws	**3 - 4 N·m** (**2 - 3 lb ft**)
Cartridge valve	**32.6 - 35.4 N·m** (**24.0 - 26.1 lb ft**)
Check valve	**150 - 177 N·m** (**111 - 131 lb ft**)

Powertrain specifications

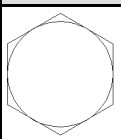
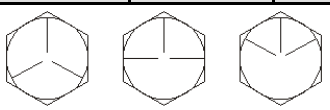
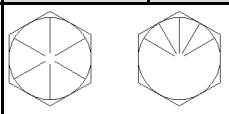
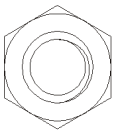
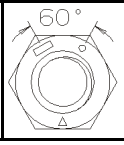
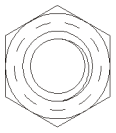
Component	Torque
Cradle to chassis front	**185 - 200 N·m** (**136 - 148 lb ft**)
Cradle to chassis rear	**70 - 80 N·m** (**52 - 59 lb ft**)
Hydrostatic motor mounting bolts to park brake housing	**250 - 280 N·m** (**184 - 207 lb ft**)
Engine to coupler	**41 - 50 N·m** (**30 - 37 lb ft**)
Tandem pump to cradle rear mounting bracket	**265 - 305 N·m** (**195 - 225 lb ft**)
Hydrostatic pump to pump mounting plate	**587 - 690 N·m** (**433 - 509 lb ft**)
Pump coupler retainer plate	**136 - 156 N·m** (**100 - 115 lb ft**)
Cradle mid mount	**225 - 305 N·m** (**166 - 225 lb ft**)
Engine to cradle front	**107 - 123 N·m** (**79 - 91 lb ft**)

General specification

Bolt torque information

Decimal Hardware

1. Replace the fasteners with the same or higher grade. If you use a higher grade fastener, tighten to the strength of the original.
2. Clean the threads of the fasteners and start the thread engagement. This will prevent failure of the fasteners when you tighten them.
3. Tighten the plastic insert or the crimped steel-type lock nuts to approximately **50 %** of the dry torque, applied to the nut, not to the bolt head. Tighten the toothed or the serrated-type lock nuts to the full torque value.
4. The L9 (Alloy) fasteners torque values are for a bolt, nut, and two washers.
   When you use the L9 (Alloy) fasteners, do not use the values in this table for tapped holes.

	Grade						
	1 or 2	**5**	**5.1**	**5.2**	**8**	**8.2**	**L9 (Alloy)**
SAE markings for bolts and cap screws							
	2	5			8		L9 (Alloy)
SAE markings for hex nuts							

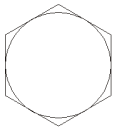
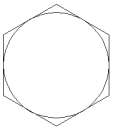
	Grade 2 *				**Grade 5, 5.1 or 5.2**				**Grade 8 or 8.2**				**Grade L9 (Alloy)**			
	Dry **		**Lubricated ****		**Dry****		**Lubricated ****		**Dry****		**Lubricated ****		**Head**		**Nut**	
Size	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**	**Nm**	**lb/ft**
1/4 UNF	7.5	5.5	5.7	4.2	10.8	8	8.5	6.3	16.3	12	12.2	9	13.6	10	14.9	11
1/4 UNC	8.5	6.3	6.4	4.7	13.6	10	9.8	7.2	19	14	13.6	10	16.3	12	17.6	13
5/16 UNF	15	11	11	8	23	17	18	13	33	24	24	18	26	19	28	21
5/16 UNC	16	12	12	9	26	19	19	14	37	27	27	20	27	20	31	23
3/8 UNF	27	20	20	15	41	30	31	23	61	45	47	35	41	30	45	33
3/8 UNC	31	23	23	17	47	35	34	25	68	50	47	35	47	35	52	38
7/16 UNF	43	32	33	24	68	50	47	35	95	70	68	50	75	55	81	60
7/16 UNC	49	36	37	27	75	55	54	40	108	80	81	60	81	60	88	65
1/2 UNF	68	50	47	35	102	75	75	55	149	110	108	80	115	85	129	95
1/2 UNC	75	55	54	40	115	85	88	65	163	120	122	90	129	95	142	105
9/16 UNF	95	70	75	55	149	110	108	80	203	150	149	110	163	120	190	140
9/16 UNC	108	80	81	60	163	120	122	90	231	170	176	130	183	135	203	150
5/8 UNF	136	100	102	75	203	150	149	110	285	210	217	160	231	170	251	185

	Grade 2 *				Grade 5, 5.1 or 5.2				Grade 8 or 8.2				Grade L9 (Alloy)			
	Dry **		Lubricated **		Dry**		Lubricated **		Dry**		Lubricated **		Head		Nut	
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
5/8 UNC	149	110	115	85	231	170	176	130	325	240	244	180	258	190	278	205
3/4 UNF	237	175	176	130	353	260	271	200	515	380	380	280	359	265	393	290
3/4 UNC	271	200	190	140	407	300	298	220	570	420	420	310	447	330	481	355
7/8 UNF	231	170	170	125	583	430	434	320	814	600	610	450	644	475	685	505
7/8 UNC	244	180	190	140	637	470	475	350	909	670	678	500	705	520	793	585
1 UNF	339	250	258	190	868	640	651	480	1234	910	922	680	746	550	1051	775
1 UNC	380	280	285	210	976	720	732	540	1383	1020	1031	760	949	700	1220	900
1-1/8 UNF	475	350	366	270	1071	790	800	590	1749	1290	1315	970	1390	1025	1559	1150
1-1/8 UNC	542	400	407	300	1207	890	909	670	1953	1440	1464	1080	1559	1150	1797	1325
1-1/4 UNF	678	500	515	380	1519	1120	1139	840	2468	1820	1844	1360	1898	1400	2170	1600
1-1/4 UNC	746	550	570	420	1681	1240	1261	930	2726	2010	2048	1510	2170	1600	2373	1750
1-1/2 UNF	1180	870	881	650	2644	1950	1980	1460	4285	3160	3214	2370	3932	2900	4407	3250
1-1/2 UNC	1329	980	990	730	2983	2200	2224	1640	4827	3560	3621	2670	4475	3300	4949	3650

NOTICE: *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 the shear bolts with the identical grade.*

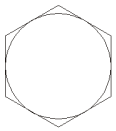
- * - Grade 2 applies for hex caps (not hex bolts) up to **152 mm** (**6 in**) long. Grade 1 applies for hex cap screws over **152 mm** (**6 in**) long, and for all other types of bolts and screws of any length.
- ** - "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

Torque specifications- Metric Hardware

Grade 8.8 Bolts, Nuts and Studs				Grade 10.9 Bolts, Nuts and Studs		
Dry				Dry		
Size	Nm	lb/in	lb/ft	Nm	lb/in	lb/ft
						
M4	3 to 4	31 to 35		5 to 6	44 to 49	
M5	5 to 6	49 to 55		8 to 9	71 to 79	
M6	10 to 11	84 to 94		14 to 15	120 to 136	
M8	23 to 26	229 to 277		33 to 37	293 to 329	
M10	46 to 51	408 to 460		65 to 74		48 to 54
M12	80 to 90		59 to 66	114 to 128		85 to 94
M14	128 to 145		94 to 106	183 to 205		136 to 153
M16	200 to 220		149 to 161	285 to 320		208 to 235
M20	400 to 450		293 to 330	555 to 620		406 to 460
M24	690 to 780		510 to 575	955 to 1075		705 to 790
M30	1375 to 1545		1010 to 1140	1900 to 2140		1400 to 1580

Grade 8.8 Bolts, Nuts and Studs				Grade 10.9 Bolts, Nuts and Studs		
Dry				Dry		
Size	Nm	lb/in	lb/ft	Nm	lb/in	lb/ft
M36	2400 to 2700		1770 to 1990	3315 to 3730		2445 to 2750

Use the above torques when specifications are not given.
These values apply to fasteners with both coarse and fine threads as received from the supplier, plated or unplated, or when lubricated with engine oil. These values do not apply if graphite or Molydisulfide grease or oil is used. Use of a click type torque wrench, or better is required.

Grade 12.9 Bolts, Nuts, and Studs


Usually torque values specified to grade 10.9 fasteners can be used satisfactorily on grade 12.9 fasteners.

- **Torque specifications - Steel hydraulic fittings**

37 Degree flare fitting						
Nom. SAE dash size	Tube OD/Hose ID		Thread size	Newton metres	lb/in	lb/ft
-2			5/16 - 24	8 to 9	72 to 84	
-3			3/8 - 24	11 to 12	96 to 108	
-4	6.4 mm	1/4 inch	7/16 - 20	14 to 16	120 to 144	
-5	7.9 mm	5/16 inch	1/2 - 20	18 to 21	156 to 192	
-6	9.5 mm	3/8 inch	9/16 - 18	27 to 33	240 to 300	
-8	12.7 mm	1/2 inch	3/4 - 16	46 - 56	408 to 504	
-10	15.9 mm	5/8 inch	7/8 - 14	77 to 85	684 to 756	
-12	19.0 mm	3/4 inch	1-1/16 - 12	107 to 119		79 to 88
-14	22.2 mm	7/8 inch	1-3/16 -12	127 to 140		94 to 103
-16	25.4 mm	1.0 inch	1-5/16 - 12	131 to 156		97 to 117
-20	31.8 mm	1-1/4 inch	1-5/8 - 12	197 to 223		145 to 165
-24	38.1 mm	1-1/2 inch	1-7/8 - 12	312 to 338		230 to 250

Straight thread with O-ring						
Nom. SAE dash size	Tube OD/Hose ID		Thread Size	Newton metres	lb/in	lb/ft
-2			5/16 - 24	8 to 9	72 to 84	
-3			3/8 - 24	11 to 12	96 to 108	
-4	6.4 mm	1/4 inch	7/16 - 20	20 to 25	180 to 228	
-5	7.9 mm	5/16 inch	1/2 - 20	27 to 33	240 to 300	
-6	9.5 mm	3/8 inch	9/16 - 18	43 to 54	384 to 480	
-8	12.7 mm	1/2 inch	3/4 - 16	73 to 90	648 to 804	
-10	15.9 mm	5/8 inch	7/8 - 14	100 to 124		74 to 92
-12	19.0 mm	3/4 inch	1-1/16 - 12	138 to 173		102 to 128
-14	22.2 mm	7/8 inch	1-3/16 - 12	173 to 216		128 to 160
-16	25.4 mm	1.0 inch	1-5/16 - 12	203 to 253		150 to 187
-20	31.8 mm	1-1/4 inch	1-5/8 - 12	308 to 357		227 to 264
-24	38.1 mm	1-1/2 inch	1-7/8 - 12	492 to 542		363 to 400

Split flange mounting bolts			
Size	Newton metres	lb/in	lb/ft
5/16 - 18	20 to 27	180 to 240	
3/8 - 16	27 to 34	240 to 300	
7/16 - 14	47 to 61	420 to 540	
1/2 - 13	74 to 88		55 to 65
5/8 - 11	190 to 203		140 to 150

O-ring face seal end						
Nom. SAE dash size	**Tube OD**		**Thread size**	**Newton metres**	**lb/in**	**lb/ft**
-4	6.4 mm	1/4 inch	9/16 - 18	23 to 26	204 to 228	
-6	9.5 mm	3/8 inch	11/16 - 16	34 to 40	300 to 348	
-8	12.7 mm	1/2 inch	13/16 - 16	52 to 57	456 to 504	
-10	15.9 mm	5/8 inch	1-14	81 to 90	720 to 792	
-12	19.0 mm	3/4 inch	1-3/16 - 12	117 to 128		86 to 94
-16	25.4 mm	1.0 inch	1-7/16 - 12	152 to 174		112 to 128
-20	31.8 mm	1-1/4 inch	1-11/16 - 12	179 to 201		132 to 148
-24	38.1 mm	1-1/2 inch	2 - 12	213 to 235		157 to 173

O-ring boss end fitting or lock nut				
Nom. SAE dash size	**Thread size**	**Newton metres**	**lb/in**	**lb/ft**
-6	9/16 - 18	48 to 54	432 to 480	
-8	3/4 - 16	70 to 78	612 to 684	
-10	7/8 - 14	102 to 114		75 to 84
-12	1-1/16 - 12	142 to 160		105 to 117
-16	1-5/16 - 12	237 to 254		175 to 187

Pipe fitting		
Non. SAE dash size	**Thread size**	**TFFT (Turns For Finger Tight)**
-2	1/8 - 27	2.0 - 3.0
-3	1/8 - 27	2.0 - 3.0
-4	1/8 - 27	2.0 - 3.0
-5	1/8 - 27	2.0 - 3.0
-6	1/4 - 18	1.5 - 3.0
-8	3/8 - 18	2.0 - 3.0
-10	1/2 - 14	2.0 - 3.0
-12	3/4 - 14	2.0 - 3.0
-14	3/4 - 14	2.0 - 3.0
-16	1 - 11-1/2	1.5 - 2.5
-20	1-1/4 - 11-1/2	1.5 - 2.5
-24	1-1/2 - 11-1/2	1.5 - 2.5
-32	2 - 11-1/2	1.5 - 2.5

NOTE: *Apply a sealant/lubricant to the male pipe threads. The first two threads should be left uncovered to avoid system contamination. Screw the pipe fitting into the female pipe port to the finger tight position. Wrench tighten the fitting to the appropriate turns from finger tight (TFFT) shown in the able above. Make sure the tube end of an elbow or tee fitting is aligned to receive the incoming tube or hose fitting.*

Conversion factors

Metric to U.S.			
	MULTIPLY	**BY**	**TO OBTAIN**
AREA:	square meter hectare	10.763 91 2.471 05	square foot acre
FORCE:	newton newton	3.596 942 2.224 809	ounce force pound force
LENGTH:	millimeter meter kilometer	0.039 370 3.280 840 0.621 371	inch foot mile
MASS:	kilogram	2.204 622	pound
MASS/AREA:	kilogram/hectare	0.000 466	ton/acre
MASS/ENERGY:	gr/kW/hr.	0.001 644	lbs/hp/hr.
MASS/VOLUME:	kg/cubic meter	1.685 555	lb/cubic yd.
POWER:	kilowatt	1.341 02	horsepower
PRESSURE:	kilopascal bar	0.145 038 14.50385	lb/sq. inch lb/sq. inch
TEMPERATURE:	degree C	1.8 x C +32	degree F
TORQUE:	newton meter newton meter	8.850 748 0.737 562	lb/inch lb/foot
VELOCITY:	kilometer/hr.	0.621 371	miles/hr.
VOLUME:	cubic centimeter cubic meter cubic meter milliliter litre litre litre litre	0.061 024 35.314 66 1.307 950 0.033 814 1.056 814 0.879 877 0.264 172 0.219 969	cubic inch cubic foot cubic yd. ounce (US fluid) quart (US liquid) quart (Imperial) gallon (US liquid) gallon (Imperial)
VOLUME/TIME:	litre/min. litre/min.	0.264 172 0.219 969	gallon/min. (US liquid) gallon/min. (Imperial)

U.S. to Metric			
	MULTIPLY	**BY**	**TO OBTAIN**
AREA:	square foot acre	0.092 903 0.404 686	square meter hectare
FORCE:	ounce force pound force	0.278 014 4.448 222	newton newton
LENGTH:	inch foot mile	25.4 * 0.304 8 * 1.609 344 *	millimeter meter kilometer
MASS:	pound ounce	0.453 592 28.35	kilogram gram
MASS/AREA:	ton/acre	2241 702	kilogram/hectare
MASS/ENERGY:	lb/hp/hr	608.277 4	gr/kW/hr
MASS/VOLUME:	lb/cubic yd.	0.593 276	kg/cubic meter
POWER:	horsepower	0.745 700	kilowatt
PRESSURE:	lbs/sq. in lbs/sq. in lbs/sq. in	6.894 757 0.069 0.070 303	kilopascal bar kg/sq. cm
TEMPERATURE:	degree F	1.8 F - 32	degree C
TORQUE:	pound/inch pound/foot	0.112 985 1.355 818	newton meter newton meter
VELOCITY:	miles/hr.	1.609 344 *	kilometer/hr.

U.S. to Metric			
	MULTIPLY	**BY**	**TO OBTAIN**
VOLUME:	cubic inch	16.387 06	cubic centimeter
	cubic foot	0.028 317	cubic meter
	cubic yard	0.764.555	cubic meter
	ounce (US fluid)	29.573 53	milliliter
	quart (US liquid)	0.946 353	litre
	quart (Imperial)	1.136 523	litre
	gallon (US)	3.785 412	litre
	gallon (Imperial)	4.546 092	litre
VOLUME/TIME:	gallon/min.	3.785 412	litre/min.

Consumables Loctite® Product Chart

Bonding Adhesives					
Product	**Color**	**Strength**	**Fixture/Full Cure (Steel/ Steel) Time**	**Recommended Primer or Activator**	**Description**
312	Clear	**9.8 - 17.2 MPa** (**1421 - 2495 psi**)	2 min/24 hrs	736	Typical applications include bonding dissimilar materials such as metals, glass or ceramics and where fast fixturing is required between close fitting parts.
324	Light amber	**34 - 614 MPa** (**4932 - 89061 psi**)	30 min/24 hrs	7075	Is used to bond flat parts together. Especially suitable for joining dissimilar materials, e.g. ferrite to plated materials in electric motors, loudspeakers, etc. This product is specifically formulated for toughness and impact strength.
326	Yellow to light amber	**34 - 300 MPa** (**4932 - 43515 psi**)	3 min/6 hrs	7649 on one surface	Typical applications include bonding ferrites to plated materials in electric motors, loudspeaker hardware and jewelry where fast fixturing is required.
380	Black	**26 MPa** (**3770 psi**)	2 min/24 hrs	none	Is a rubber toughened adhesive with increased flexibility and peel strength along with enhanced resistance to shock.
409	Clear to slightly cloudy	**18 - 26 MPa** (**2611 - 3771 psi**)	2 min/24 hrs	none	Is a general purpose cyanoacrylate adhesive gel. The gel consistency prevents adhesive flow even on vertical surfaces.
426	Black	**4.8 - 20.7 MPa** (**696 - 3003 psi**)	10 sec/40 sec.	none	Is an adhesive gel toughened with elastomers for impact and peel strength along with improved resistance to heat and humidity.
454	Clear to slightly cloudy	**19 - 28 MPa** (**2756 - 4061 psi**)	1 min/72 hrs	none	Is particularly suited for bonding porous or absorbent materials such as wood, paper, leather and fabric.
455	Clear to light yellow	**9.7 MPa** (**1407 psi**)	30 sec/24 hrs	none	Is a general purpose cyanoacrylate adhesive gel with low odor and low blooming properties and is particularly suitable for applications where vapor control is difficult.
480	Black	**22 - 30 MPa** (**3191 - 4352 psi**)	2 min/24 hrs	none	Is a rubber toughened adhesive with increased flexibility and peel strength along with enhanced resistance to shock.
495	Clear to straw colored	**12 - 26 MPa** (**1741 - 3771 psi**)	10 sec/30 sec.	none	Is a general purpose cyanoacrylate instant adhesive.
E60HP	Pale yellow	**29.8 MPa** (**4322 psi**)	3 hrs/24 hrs	none	Is a toughened, mediumviscosity, industrial grade epoxy adhesive with extended work life. Once mixed, the two-component epoxy cures at room temperature to form a tough, off-white, bond line which provides high peel resistance and high shear strengths. The fully cured epoxy is resistant to a wide range of chemicals and solvents, and acts as an excellent electrical insulator.