

# **Foreword**

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## **Attachment: BOM List of Nuoman IT Parts**

## FOREWORD

You are now the proud owner of a Nuoman excavator. This excavator is a product of Nuoman quality engineering and manufacturing. It is made of quickly fine materials and under rigid quality control systems. It will give you long, satisfactory service. To obtain the best use of your excavator, please read this manual carefully. It will help you become familiar with the operation of the excavator and contains many helpful hints about excavator maintenance. The immediate use of new techniques in the manufacture of products may cause some small parts of this manual.

Due to the upgrade of the machine and the special customization requirements of the customer, the machine parameters will change, and the specific interpretation rights belong to the company.

## SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

**DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING :** Indicates a potentially hazardous situation which, if not avoided could result in death or serious injury.

**CAUTION :** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**IMPORTANT :** indicates that equipment or property damage

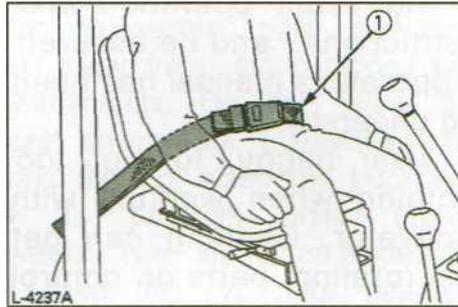
## SAFE OPERATION

The best insurance against accidents is to abide by the safety regulations. Read and understand this section carefully, before operating the excavator. Every user, however experienced, should carefully read and understand this section and those of the attachments and accessories before taking the excavator into operation. The owner is obliged to inform the operators of these instructions in detail.

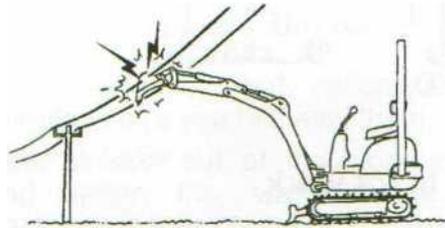
Keep this manual in the toolbox.

### 1. BEFORE OPERATION

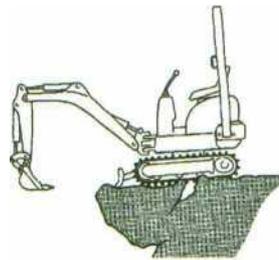
1. Make yourself acquainted with the excavator and be aware of its limits. Read this operator's manual carefully before starting the excavator.
2. Obey the danger, warning and caution labels on the machine.
3. For your safety, ROPS (Roll-Over Protective Structure) with a seat belt is installed. Always use seat belt when the machine is equipped with a ROPS.
4. Do not modify structural members of ROPS by welding, drilling, bending, grinding or cutting, as this may weaken the structure. If any component is damaged, replace it. Do not attempt repairs. If ROPS is loosened or removed for any reason, make certain all parts are reinstalled correctly. Tighten mounting bolts to proper torque.
5. The seat belt must be inspected regularly and replaced if damaged.



6. Do not use the excavator under the influence of alcohol, medication or other substances. Fatigue is also dangerous.
7. Check the surroundings carefully before using the excavator or when attachments are being attached.
  - Pay attention to the overhead clearance with electric wires.



Check for pipes and buried cables • Check for hidden holes, hindrances, soft ground and overhangs.

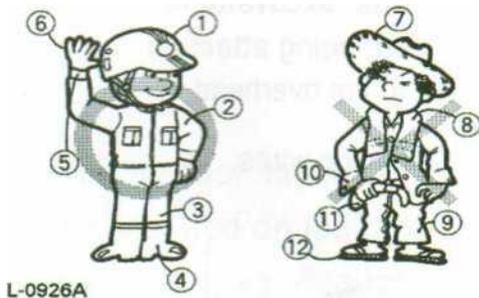


During excavator use do not allow any persons within the working range.

8. Do not allow other persons to use

the machine before having informed him on the exact operation and work instructions, and be assured that the operator's manual has been read and understood..

9. Do not wear baggy, tom or too large clothing when working with the excavator. Clothing can get caught in rotating parts or control elements which can cause accidents or injuries. Wear adequate safety clothing, e.g. safety helmet, safety shoes, eye protection, ear protection, working gloves, etc., as necessary and as prescribed by laws or statutes.



- (1) Helmet
- (2) Clothing fit for work
- (3) Tight seams
- (4) Good grip footwear
- (5) Well fitting cuffs
- (6) Working gloves
- (7) Straw hat
- (8) Towel
- (9) Baggy trousers
- (10) Loose cuffs on shirt
- (11) Baggy shirt
- (12) Rubber sandals

10. Do not allow passengers to get on any part of the excavator seat during operation.

11. Check mechanical parts for correct adjustments and wear. Exchange worn or damaged parts immediately. Check nuts and bolts regularly for tight fitment. (for details see "Care and Maintenance").

12. Keep your excavator clean. Heavy soiling, grease, dust and grass can inflame and cause accidents or injuries.

13. Before starting the excavator, be absolutely sure that the excavator has been filled with fuel, lubricated, greased and undergone other maintenance work.

14. Do not modify the excavator, otherwise it could lead to unforeseen safety problems.

## 2. STARTING OF THE EXCAVATOR

1. Get into and out of the machine safely. Always face the machine. Always use handrails and available steps and keep yourself well balanced. Do not hold any of the control levers and switches. Do not jump on or off the machine, whether stationary or in motion.
2. Start and control the excavator only from the operator's seat. The driver should not lean out of his seat when the engine is running.
3. Before starting the engine, make sure that all control levers (including auxiliary control levers) are in their neutral positions.
4. Before starting the engine, make sure that the control levers, travel lever, pedals and other control elements are not stuck and can be moved smoothly. If stuck, for example, a lever may fail to return, possibly putting you in danger. If anything wrong is found, immediately pinpoint the cause and correct it.

- Do not start the engine by jumping the starter connections. Do not try to circumvent using the starter switch, otherwise the engine could start suddenly and the excavator could move.



Be sure that the dozer is on the "left" side. (The dozer must be -2 sided.) If the swing frame has been turned 180°, i.e. the dozer is, seen from the operator, "behind", then the travel direction is opposite to the drive direction of the levers (when activating the drive lever forwards, the excavator, seen from the operator, will move backwards).



- Do not run the engine in closed or poorly ventilated rooms. Carbon monoxide is colourless, odourless and deadly.

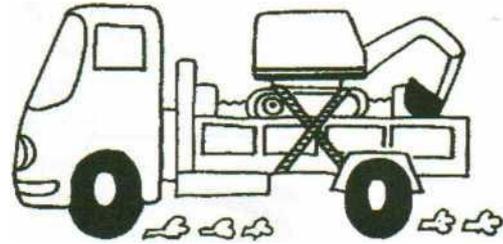


- Keep all safety equipment and devices in place. Replace damaged or missing safety devices.

- Precautions against tipping over. In order to secure safe operation, keep away from steep slopes and embankments. Do not swing the bucket downwards. Lower the dozer during digging. Keep the bucket as low as possible while driving upwards. Turn slowly on slopes. Do not keep the excavator near the edges of trenches and banks, as the earth can give way due to the weight of the excavator.
- Watch out at all times where the excavator is being moved to. Keep an eye out for hindrances.
- Keep enough distance from trench and bank edges.
  - ◆ Safety for children
 

Tragedy can occur if the operator is not alert to the presence of children. Children generally are attracted to machines and the work they do.
- Never assume that children will remain where you last saw them.
- Keep children out of the work area and under the watchful eye of another responsible adult.
- Be alert and shut your machine down if children enter the work area.
- Never carry children on your machine. There is no safe place for them to ride. They may fall off and be run over or interfere with your control of the machine.
- Never allow children to operate the machine even under adult supervision
- Never allow children to play on the machine or on the implement.
- Use extra caution when backing up, look behind and down-make sure area is clear before moving.
- When parking your machine if at all possible park on a firm, flat and

level surface; if not, park across a slope. Set the parking brake(s), lower the implements to the ground, remove the key from the ignition and lock the cab door (if equipped) and chock the crawlers or the wheels.



### 3. AFTER OPERATION

Before leaving the machine,

- Bring the excavator to hard even ground.
- Lower the attachments and the dozer blade on the ground.
- Stop the engine.
- Lock all control levers.
- Remove the key.

### 4. SAFE LOADING AND TRANSPORT OF THE EXCAVATOR

1. Observe all regulations concerning the transport of excavators on public roads.
2. Use adequately long and robust ramps when loading on a truck, (for details see "TRANSPORTING THE EXCAVATOR ON A TRUCK")
3. Do not change the running direction and to avoid a tipping over, do not try to swing the attachment crosswise to the loading ramps.
4. After loading of the excavator on a truck, engage the swing lock pin. Lower the attachment on the loading plane and release the pressure from the hydraulic system. Block the crawlers with blocks and wire down the excavator. After loading the excavator on a truck, tie down the undercarriage of the excavator with a strong steel wire on the truck.

5. Do not brake abruptly with the excavator loaded. Fatal accidents could happen.

6. If the excavator is to tow another machine, the load must be smaller than the strength of the hook.

Max. drawbar pull at coupling hook	7935 lbs. (35.3 kN)
Max. vertical load at coupling hook	922 lbs. (4.1 kN)

### 5. MAINTENANCE

Before doing maintenance work on the excavator, place the machine on even solid ground, lower the attachments on the ground, stop the engine and release the cylinder pressure by actuating the levers. When dismantling hydraulic parts, make sure that the hydraulic oil has cooled down sufficiently to avoid burns.

Start maintenance work carefully, e.g. loosen screws slowly so that oil will not squirt out.

1. Before doing work on the engine, the exhaust system, the radiator and the hydraulics, let the excavator cool down sufficiently.
2. Turn off the engine at all times when

filling with fuel. Avoid spilling and over-filling of fuel.

3. Smoking is prohibited while fuelling and handling the battery! Keep sparks and fire away from the fuel tank and battery. Flammable gases escape from the battery, especially during charging.

4 Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.

5 Read and follow "STARTING WITH AN AUXILIARY BATTERY" in "OPERATION OF THE ENGINE", when starting with an auxiliary battery.

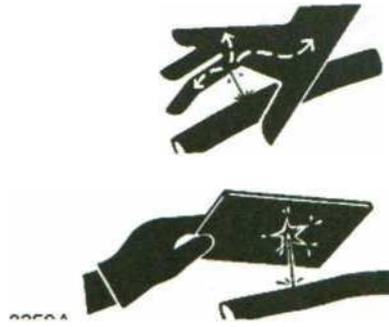
6 To avoid short-circuiting the battery, always remove the earth cable first and attach the plus cable first.

r Keep a first-aid box and a fire extinguisher at hand at all times.

: Do not open the radiator cap before the radiator has cooled down sufficiently. -\*st loosen the cap to the first stop and allow the system enough time release the remaining pressure, f en loosen the cap completely.

? \_eaking hydraulic fluid has enough ^assure to penetrate the skin and cause serious injuries. Leakages fm pin holes can be totally -.S!ble. Do not use the bare hand checking on possible leakages. Always use a piece of wood or cardboard. It is strongly recommended you use a face mask or eye protection.

Should injuries occur with leaking hydraulic fluid, contact a doctor immediately. This fluid can cause gangrene or serious allergic reactions.

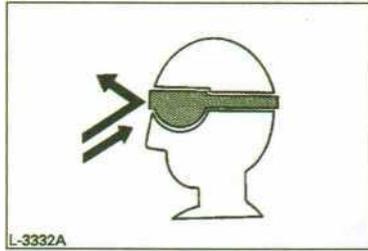


10. To avoid leakage of battery acid which contains heavy metals, do not throw the battery away.

11. Observe all laws and regulations concerning the disposal of used oil, coolants, solvents, hydraulic fluids, battery acids and batteries.

12. To avoid fire, do not heat the hydraulic components (tanks, pipes, hoses, cylinders) before they have been drained and washed.

13. Use a face mask or eye protection to protect the eyes and respiratory system against dust and other foreign particles.



14. Do not crawl under the excavator if the excavator is only supported by the boom and arm or the dozer. The excavator can tip over or lower itself due to hydraulic pressure loss. Always use safety struts or other appropriate supports.

#### 15. Fire prevention

Excavator and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcing or sparks.

The following fire prevention guidelines will help to keep your equipment up and running efficiently and keep the risk of fire to a minimum.

- , Blow off all accumulated debris near hot engine exhaust components such as turbocharger and exhaust manifold as well as exhaust pipes and muffler more frequently when working in severe conditions.
- Clean out all accumulated flammable debris such as leaves, straw, pine needles, branches, bark, small wood chips and any other

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combustible materials from inside the machine belly pans or lower unit structures as well as from area in proximity to the engine.

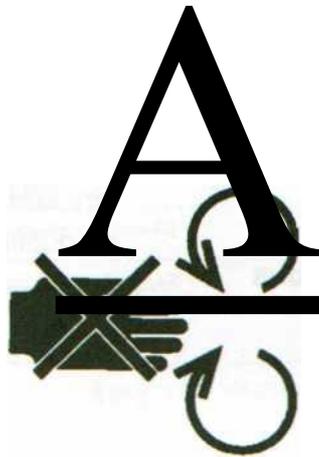
- Inspect all fuel lines and hydraulic hoses

for wear or for deterioration. Replace them immediately if they begin to leak.

- Examine electrical wiring and connectors frequently for damage. Repair any wires that are loose or frayed before operating the machine. Clean all electrical connections and tighten all electrical connections as necessary.
- Inspect the exhaust system daily for any signs of leakage. Check for broken pipes and muffler and also for loose or missing bolts, nuts and clamps. If any exhaust leaks or fractured parts are found, repairs must be completed prior to operation.
- Always keep a multipurpose fire extinguisher on or near the machine. Be familiar with the operation of the fire extinguisher.

## 6. DANGER, WARNING AND CAUTION LABELS

Do not touch hot parts such as exhaust etc Keep away from fan and fan belt.  
Be aware of the danger of burning.



### TO AVOID PERSONAL INJURY OR DEATH FROM AMACHIHE RUNAWAY.

- 1- Do not start engine by shorting across starter terminals.
2. Start engine only from operator's seat.

**Diesel fuel only No fire**



**To avoid fire, do not heat the BOOM PINCH POINTS.**

Operation of this equipment may create sparks that can start fires around dry vegetation.

A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

**BOOM PINCH POINTS:**

**Keep out of this area to avoid serious personal injury or death**



## **7. CARE OF DANGER, WARNING AND CAUTION LABELS**

- Keep danger, warning and caution labels, clean and free from obstructing material.
- Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
- Replace damaged or missing danger, warning and caution labels with new labels
- If a component with danger, warning and caution label(s) affixed is replaced with new part, make sure new label(s) is (are) attached in the same location(s) as the replaced component.
- Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

## **TROUBLESHOOTING**

If the excavator does not give the desired performance, or when problems arise, refer to the table below and take appropriate measures.

Trouble		Cause	Countermeasure
(D) 故障	Starting difficulties	Fuel is too viscous	<ul style="list-style-type: none"> <li>* Check fuel tank and filter</li> <li>* Remove impurities and water</li> <li>* If necessary, replace filter</li> </ul>
		Air or water in the fuel system	<ul style="list-style-type: none"> <li>* Remove water from the fuel tank</li> <li>* Check fuel pipe joint bolts and nuts for looseness</li> <li>* Purging of the fuel system (for fuel filter and injection pump, see "PURGING OF THE FUEL SYSTEM" in "OTHER ADJUSTMENTS AND REPLACEMENTS".)</li> </ul>
		Oil viscosity is too high so that the engine runs sluggishly in winter	* Pour hot water over the radiator
		Battery is almost dead; insufficient compression	* Recharge battery
	Insufficient engine power	Low fuel level	* Check fuel and add if necessary
		Clogged air cleaner	* Clean the air filter element
	Engine suddenly stops	Low fuel level	<ul style="list-style-type: none"> <li>* Check fuel and add if necessary</li> <li>* Purge the fuel system</li> </ul>
	Abnormal exhaust gas colour	Poor fuel	* Use high quality fuel
		Too much engine oil	* Drain engine oil to prescribed oil level
	Water temperature warning lamp ON (Temperature too high for overheating)	Worn or tom fan belt	* Adjust or replace
		Coolant level too low	* Fill to prescribed level
		Radiator grill or fins are clogged	* Clean
		Coolant is contaminated with rust from the cylinder head or crank case	* Replace coolant fluid and add anti-rust
		Defective radiator cap (Evaporation)	* Replace
		Corroded coolant pipes	* Clean
Continuous operation under full load		* Reduce load	
Engine oil level too low		* Fill to prescribed level	
Use of poor fuel	* Use prescribed fuel		

RUSHBC11		Trouble	Cause	Countermeasure
Hydraulic system	Boom, arm, bucket, drive, swing and dozer power is too low	Hydraulic oil level too low	* Add oil	
		Leakages of hoses and /orjoints	* Replace hose or joint	
	Non- function of swing motor	Swing lock pin is in lock position	* Remove swing lock pin in unlock position	
Drive system	Deviation of drive direction	Blocked through stones	* Remove	
		Crawler too loose or too tight	* Adjust accordingly	

## **OPERATION IN COLD WEATHER CONDITIONS**

### **PREPARATION FOR OPERATION**

#### **IN COLD WEATHER**

1. Replace engine oil and hydraulic oil with those of viscosities suitable for cold weather.  
 2 In cold weather, battery power drops, and the battery fluid may freeze if the battery is not sufficiently charged. To prevent the battery fluid from freezing, be sure to keep the battery charged at least 75% or more of its capacity after use. To ease next starting, it is recommended to keep the battery stored in closed or heated rooms. If the battery fluid level is too low, do not add

operation, but add with the engine  
 -----g before the next operation.

3 - anti-freeze to coolant in the radiator and reserve tank, if the ambient temperature is expected to drop below 32 F (0 C). Mixing

□ cf. water and anti-freeze depends on the expected ambient temperature, i.e. a 50/50 mix is recommended.

• : mixing ratio between water and anti-freeze

Ambient temperature (°C)	-5 (+23)	-10 (+14)	-15	-20 (-4)	-25 (-13)	-30 (-22)	-35 (-31)
Anti-freeze %	30	30	30	35	40	45	50
Water %	70	70	70	65	60	55	50

**IMPORTANT:**

- Use permanent anti-freeze or long-life coolant.
- Drain the coolant completely and clean the radiator inside then fill with the water and anti-freeze mixture.
- As the anti-freeze also acts as an anticorrosive, it is not necessary to add an additive to the water and anti-freeze mixture.
- See "Coolant check" under "DAILY CHECKS" in "MAINTENANCE" for radiator fill volumes.

**PROCEDURE AFTER WORK CARRIED OUT**

Clean the excavator thoroughly after work and wipe dry. Otherwise mud and earth on the crawlers could freeze if the temperature drops below the 32° F (0° C mark. Operation of the excavator is then not possible. Store the excavator in a dry place; if not possible, store on wooden planks or on mats. If the excavator is kept on damp or muddy ground, the crawlers could freeze overnight. Operation of the excavator is then not possible. Furthermore the reduction gear may be damaged. Additionally, the hydraulic cylinders piston rods must be rubbed dry. Otherwise severe damage could occur if dirty water seeps through the seals.

**LONG STORAGE**

**CAUTION**

To avoid personal injury:

- Do not clean the excavator with the engine running.
- To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.
- When storing, remove the key from the starter switch to avoid unauthorized persons from operating the excavator and getting injured.

## ■ Should the Excavator be Stored for a Longer Period of Time, Observe Following Procedures:

1. The whole excavator should be cleaned thoroughly and in all cases stored indoors. If the excavator has to be kept outdoors, lay out wooden planks on even ground, place the excavator on the planks and cover completely.
2. Do an oil change and grease the excavator.
3. Heavily grease the visible sections of the piston rods.
4. Remove the battery and store indoors.
5. If it is expected that the temperature will sink below the 32°F (0°C) mark, add anti-freeze or drain coolant completely.

### **IMPORTANT:**

, Wash the excavator after stopping the engine.

If you wash the excavator while running the engine, water may get into the air cleaner through the intakes causing engine problems.

Carefully, wash but do not splash water over the air cleaner.

## ■ Observe Following Procedures when the Machine is to be Operated after Long Storage.

1. Wipe off the grease from the hydraulic cylinder rods.
2. Turn on the engine and activate the attachments and the drive mechanisms without load in order to circulate the hydraulic oil. (If the machine is stored for longer than one month, undertake steps (1) and (2) once every month)

### **Periodic replacement of important component parts**

To ensure safety in operation, you are strongly requested to inspect and service the machine at regular intervals. These parts are prone to degradation in material or subject to wear and tear with time. It is difficult to judge how much they have been affected at regular inspection. It is therefore necessary to replace them with new ones, whether wear is visible or not after a specified time of use.

If any of them is found worn even before the specified use, it must be repaired or replaced the same way as other parts.

If any of the hose clamps is found deformed or cracked, the hose clamp must also be replaced.

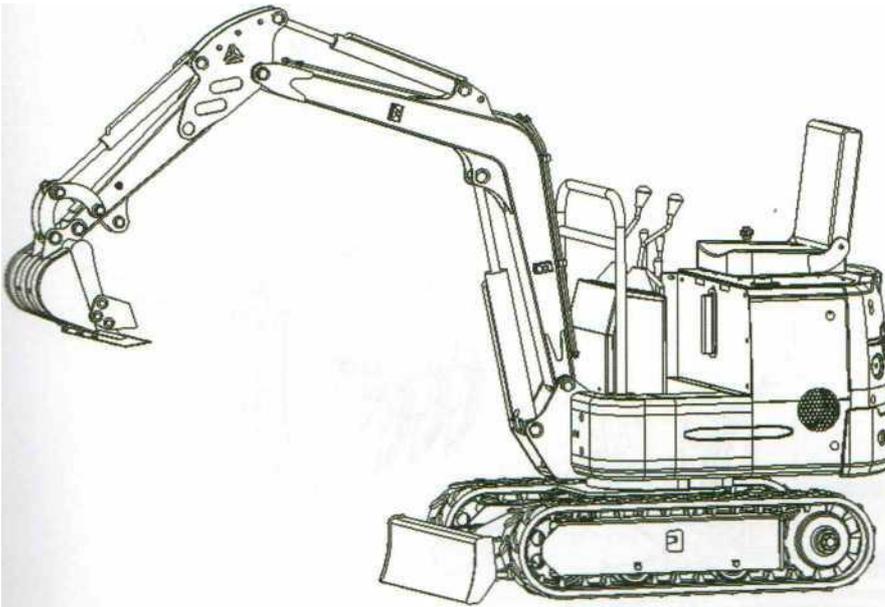
For the hydraulic hoses other than the ones to be replaced periodically, inspect them for the following points. If found unusual, tighten them up, replace them.

When replacing the hydraulic hoses, change their O rings and sealings with new ones..

# Chapter I Usage Features and Performance Parameters of Nuoman IT Excavators

## Section I Usage and features

**Nuoman IT Excavators** are provided with excavating, crushing, ditch cleaning, drilling and bulldozing, with their attachments quick hitched and thus its utilization up greatly. In addition, they are easy to operate and transport and flexible to work at narrow site.

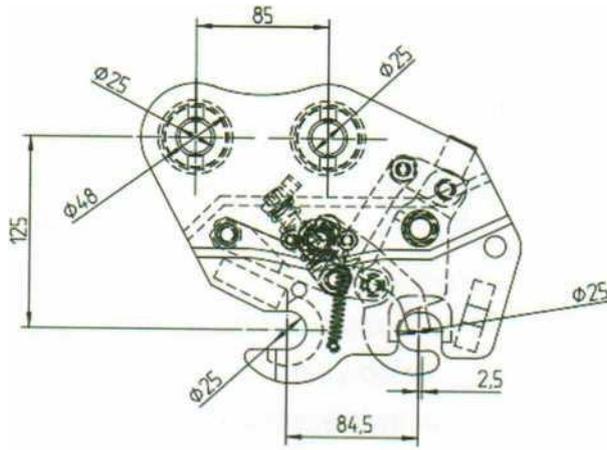


**Nuoman IT Excavators, hydraulic type with single bucket**

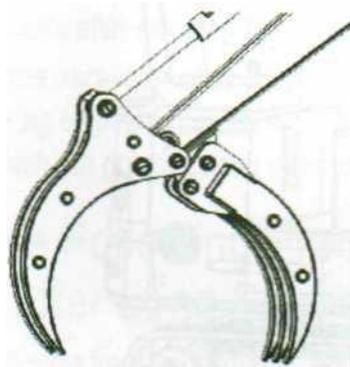
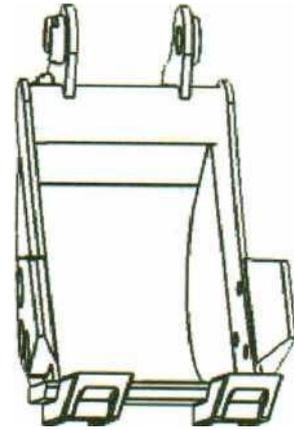
一二三 of excavators are mainly applied to: farming, landscaping, ditching and fertilization in garden, vegetable agricultural transformation, indoor demolition, small earthwork, civil engineering, road recovery, and indoor construction, concrete breaking, burying of cable, laying of water supply line, garden zur u // desilting and others.

一匠 二二 wor are equipped with Changchai diesel engines, domestic main pumps and rotary motors, Eton (USA) IT tJLz MIOT, featuring comprehensive guarantee, durability and flexibility.

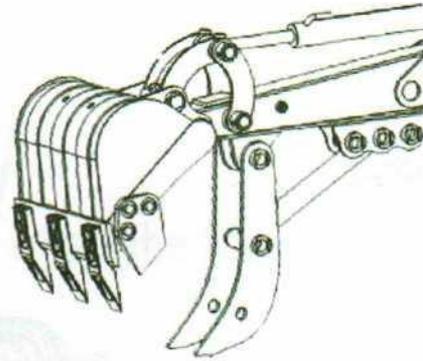
二二 are able to equipped with multiple work equipments, such as quick hitch, log grab, ripper, leveling 三荣 er and narrow bucket, as well as optional roof, radiator and others, so as to meet your needing.



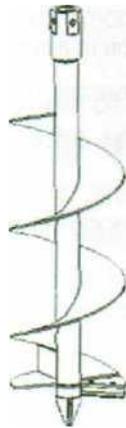
Quick hitch



Log grab



Mechanical thumb



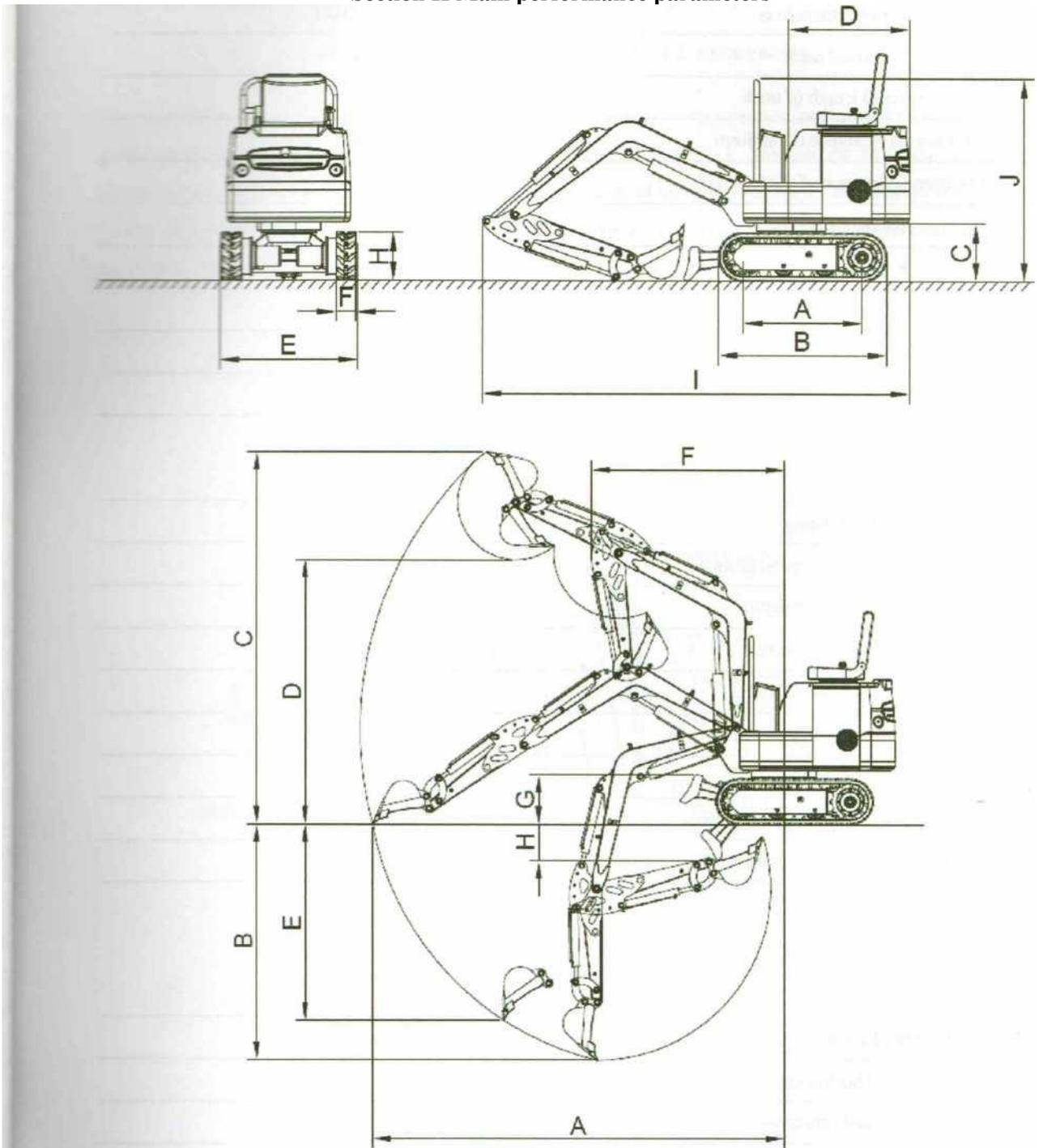
Ripper



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Section H Main performance parameters



<b>Overall dimensions</b>	<b>UNIT: MM</b>
A Wheel track	770
B Overall length of track	1090
C Ground clearance of platform	380
D Ground clearance of platform tail	733
E Chassis width	940
F Crawler width	180
H Crawler height	320
I Transportation length	2650
J Overall height	1330

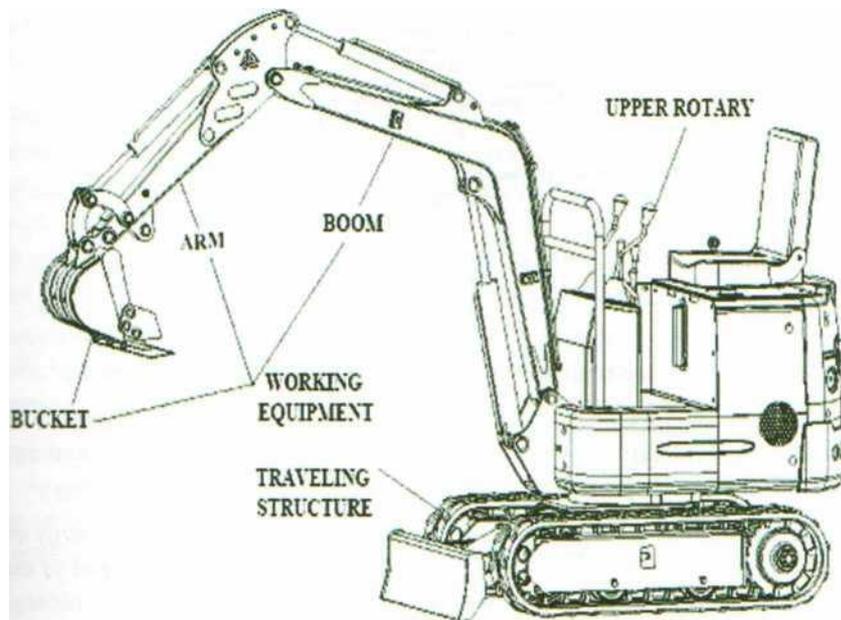
<b>Work range</b>	<b>UNIT: MM</b>
A Max. digging radius on ground	2400
B Max. digging depth	1650
C Max. digging height	2490
D Max. unloading height	1750
E Max. vertical digging depth	1320
F Min. swing radius	1190
G Max. lifting height of dozer blade	325
H Max. digging depth of dozer blade	175

<b>Performance parameters</b>	
Weight of complete machine kg	1000
Standard bucket capacity m <sup>3</sup>	0.02
Rated power kw	8.6

# Chapter H Basic Structures and Work Principle of Nuoman IT Excavators

## Section I Overview on Nuoman IT excavators

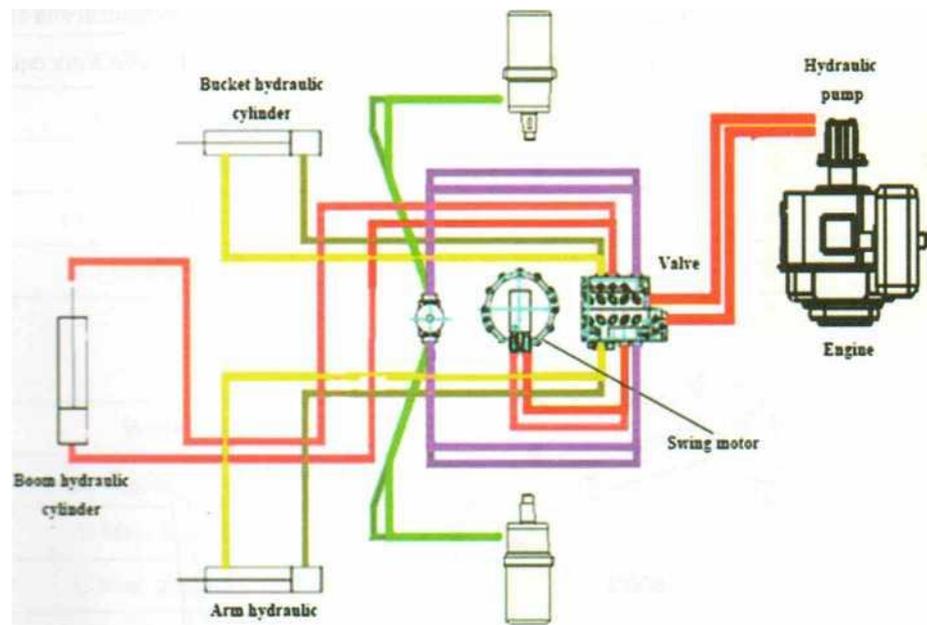
Nuoman IT excavator is composed of power train, work equipment, swing mechanism, control mechanism, drive system, traveling mechanism and auxiliary equipment, as shown in fig. 1-1. Mounted on the rotary table are the regular full-swing type hydraulic excavators, main components of drive system, swing mechanism and auxiliary devices, which are referred to as upper rotary. Therefore, a Nuoman IT excavator is divided into work equipment (er



rotary and traveling mechanism.

## Section II Work principle of excavators

Diesel engine changes the chemical energy of diesel into mechanical energy that is then altered with hydraulic gear pump to hydraulic energy that is distributed to each actuating element (such as hydraulic cylinder, swing motor and traveling motor). After that, each actuating element transform the hydraulic energy back to mechanical energy,



driving the work environment and minimizing the machine's

Traveling  
motor

### Movement and power transmission route of excavator shown below:

1. Traveling power route: diesel engine----- coupler----- hydraulic pump (mechanical energy changed to hydraulic energy)----- distributor valve-----central swing joint----- traveling motor (hydraulic energy changed to mechanical energy)----- sprocket----- rubber crawler----- starting of traveling
2. Swing power route: diesel engine----- coupler----- hydraulic pump (mechanical energy changed to hydraulic energy)----- distributor valve-----swing motor (hydraulic energy changed to mechanical energy)----- slewing bearing----- realizing of wing
3. Boom power route: diesel engine----- coupler----- hydraulic pump (mechanical energy changed to hydraulic energy) ----- distributor valve ----- boom cylinder (hydraulic energy changed to mechanical energy)----- boom movement
4. Arm power route: diesel engine----- coupler----- hydraulic pump (mechanical energy changed to hydraulic energy)----- distributor valve----- arm cylinder (hydraulic energy changed to mechanical energy) ----- arm movement
5. Bucket power route: diesel engine----- oupler----- hydraulic pump (mechanical energy changed to hydraulic energy)----- distributor valve-----bucket cylinder (hydraulic energy changed to mechanical energy)----- bucket movement

gder

Travehag

## Section III Basic structure of Nuoman IT excavators mechanical system

### 1 Power system

Nuoman IT excavator is equipped with Koop-192/Changcai single-cylinder air-cooling diesel engine.

### 2 Drive system

Nuoman IT excavator's drive system could transfer the output power from diesel engine through the hydraulic system to work equipment, swing mechanism and traveling mechanism.

### 3 Swing mechanism

Swing mechanism could turn the work equipment and upper rotary leftwards and rightwards, so as to do the loading and the unloading. Nuoman IT excavator's swing mechanism has to fix the rotary table onto frame and can swing flexibly, without any inclining risk. Therefore, Nuoman IT excavator is equipped with a slewing support (supports) and a slewing drive (power of turntable slewing), which are called by a joint name as swing mechanism.

#### ■ : Slewing support

Nuoman IT excavator has its rotary table supported with a rolling bearing, realizing the swinging of upper rotary.

#### - Rotary drive

Nuoman IT excavator adopts the direct drive type. Namely, the output shaft of low-speed high-torque hydraulic motor is mounted with a driving pinion which meshes with the slewing gear ring.

### -Traveling mechanism

Traveling mechanism supports the complete weight of excavator and drives it to run.

Nuoman IT excavator has the crawler traveling mechanism similar to other crawlers, with one hydraulic motor one track. This excavator adopts low-speed high-torque motor. When two hydraulic motors run in the same section, this machine goes straightly forward; when one motor is supplied with oil and the other is braked, machine steers around the braked track; when two motors run reversely, excavator rotates in situ.

Traveling mechanism is mounted on integral traveling frame. The pressure oil from hydraulic pump through the multi-way directional valve and the central swing joint into the hydraulic traveling motor that converts the pressure energy into output torque that then goes to sprocket, driving excavator to run.

IT excavator's sprockets are of integral castings and able to correctly engage with track, featuring smooth drive. Sprockets located at rear part of excavator, shortening the tensioner part and relieving the track wear and power consumption. Each track is equipped with a tensioner, adjusting the track tension and reducing track vibration noise, abrasion, wear and power loss.

### 5 > id equipment

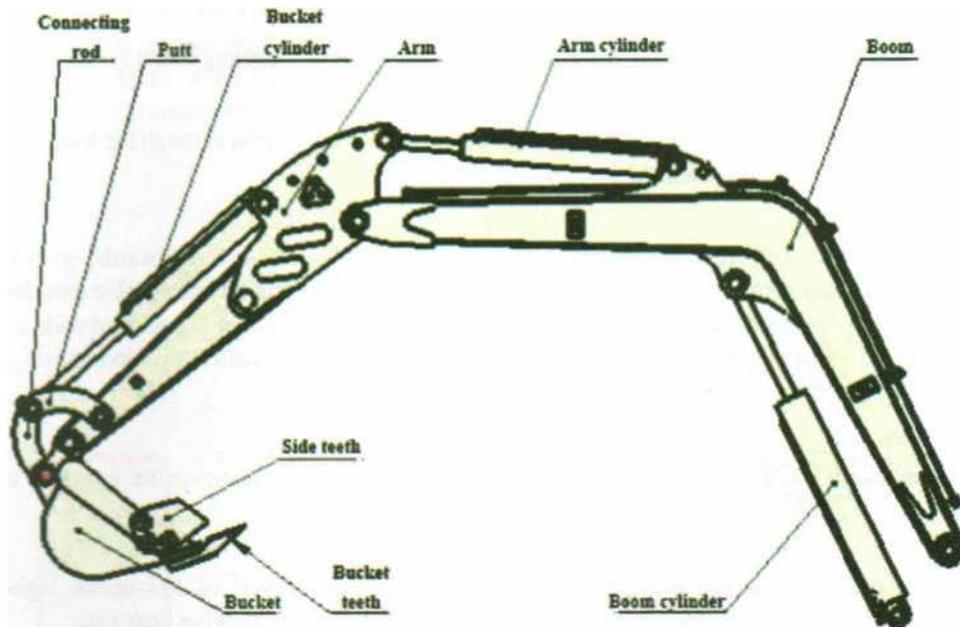
Multi-functional excavator could have multiple work equipment, up to dozens of varieties, with backhoe and ripper

**Swing arm:** IT excavator has the boom, arm and bucket articulated with each other, as shown in figure and swing arm is articulated points respectively with aid of the hydraulic cylinder, finishing the excavating, lifting and

### <2 Me

**Backhoe:** As a component of backhoe work equipment, the integrated skewed boom is adopted on Nuoman IT

**Backhoe:** The most popular type at present, skewed boom could allow excavator to dip deeper and to lower the bucket, satisfying the backhoe requirements.



由• \* Business Room, No. 7, Zhongshan West Road, GuloWhatsappAV echat:+8618266821667

## 5.2 Bucket

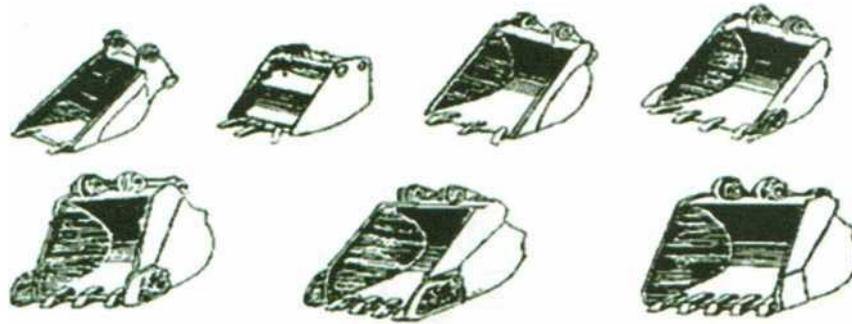
### 5.2.1 Basic requirements

- 1) The longitudinal profile of bucket meets the law of motion of various materials inside of bucket, facilitating the material flow and minimizing the loading resistance and thus fulfilling the bucket.
- 2) Bucket teeth are mounted to increase the linear specific pressure of bucket onto material, with unit cutting resistance relatively low and easing to cut in and break soil. In addition, the teeth are resistant to wear and easy to replace.
- 3) The load is easy to get off, shortening the unloading time and increasing the effective capacity of bucket

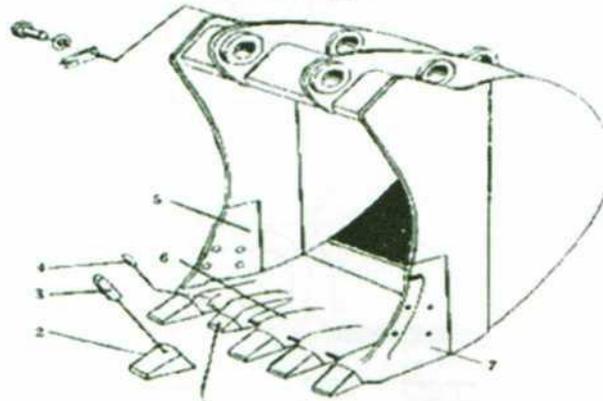
### 5.2.2 Structure

Bucket shape and size for backhoe are highly related to work objects. In order to meet various excavation, one excavator could be equipped with multiple types of buckets, with backhoe most popular. Bucket teeth could be mounted with rubber pins and bolts

Connection between bucket and hydraulic cylinder is of linkage mechanism, with bucket directly articulated with hydraulic cylinder, which drops the rotation angle of bucket but enables the work torque to change greatly..



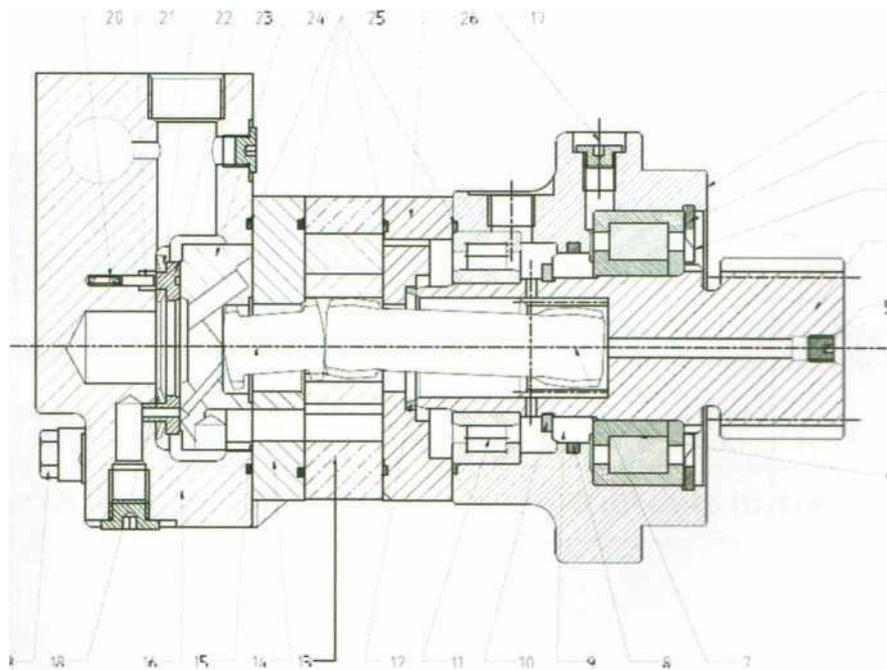
Bucket type

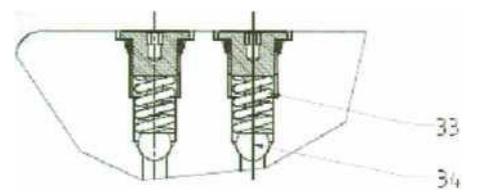
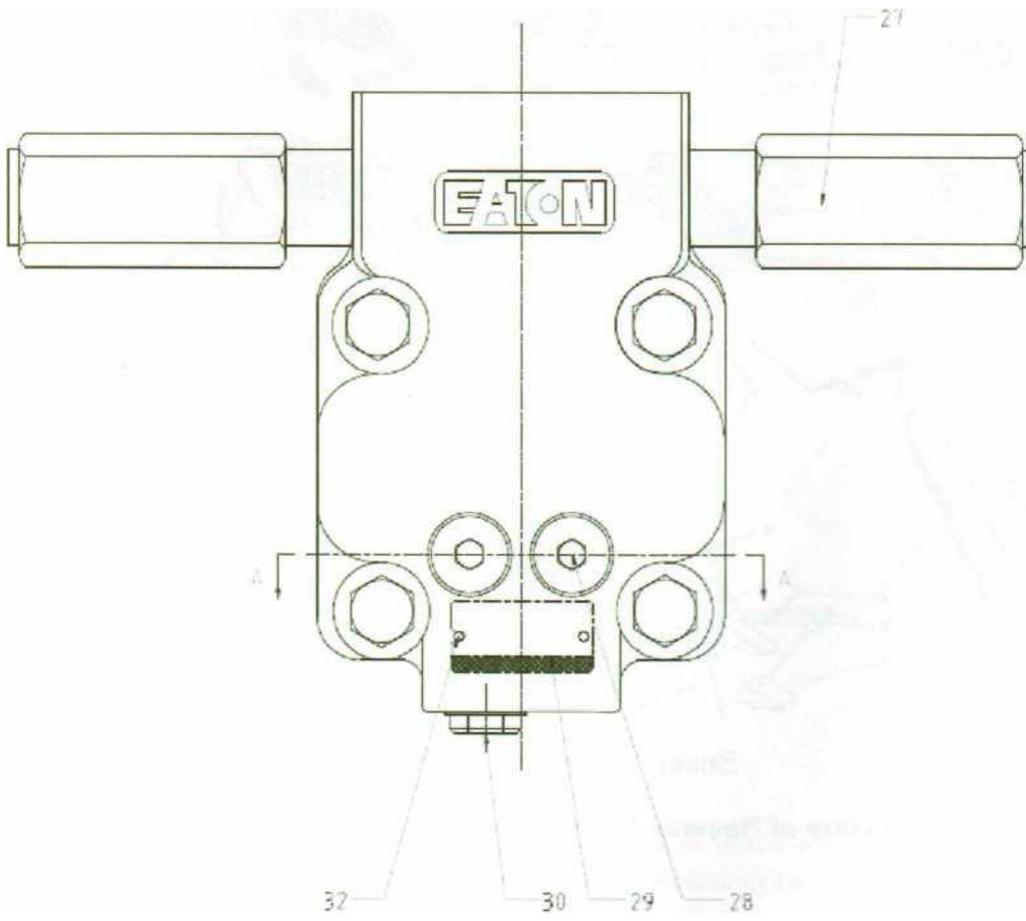


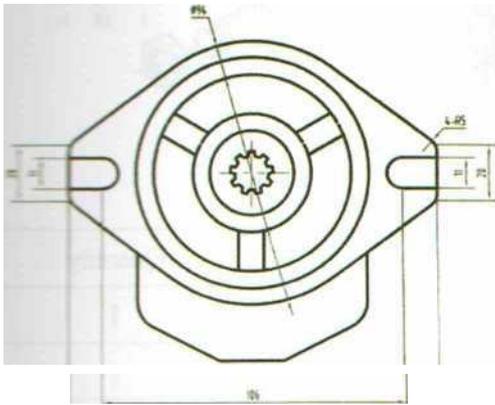
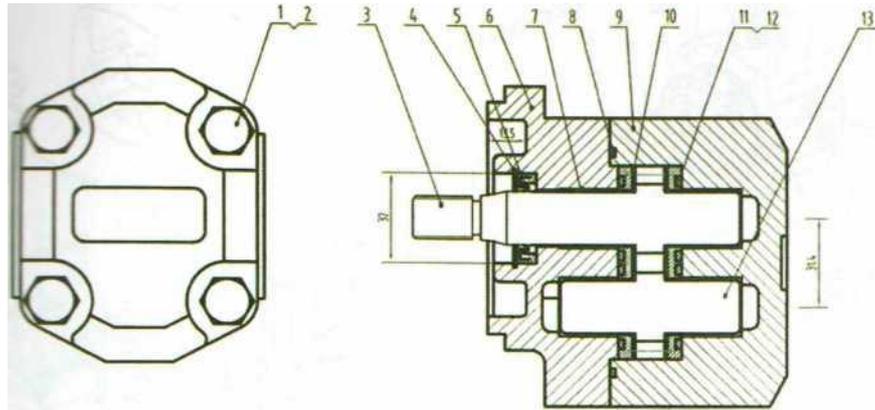
Bucket structure

**Hydraulic system structure of Nuoman IT excavators**

1 Rotary motor







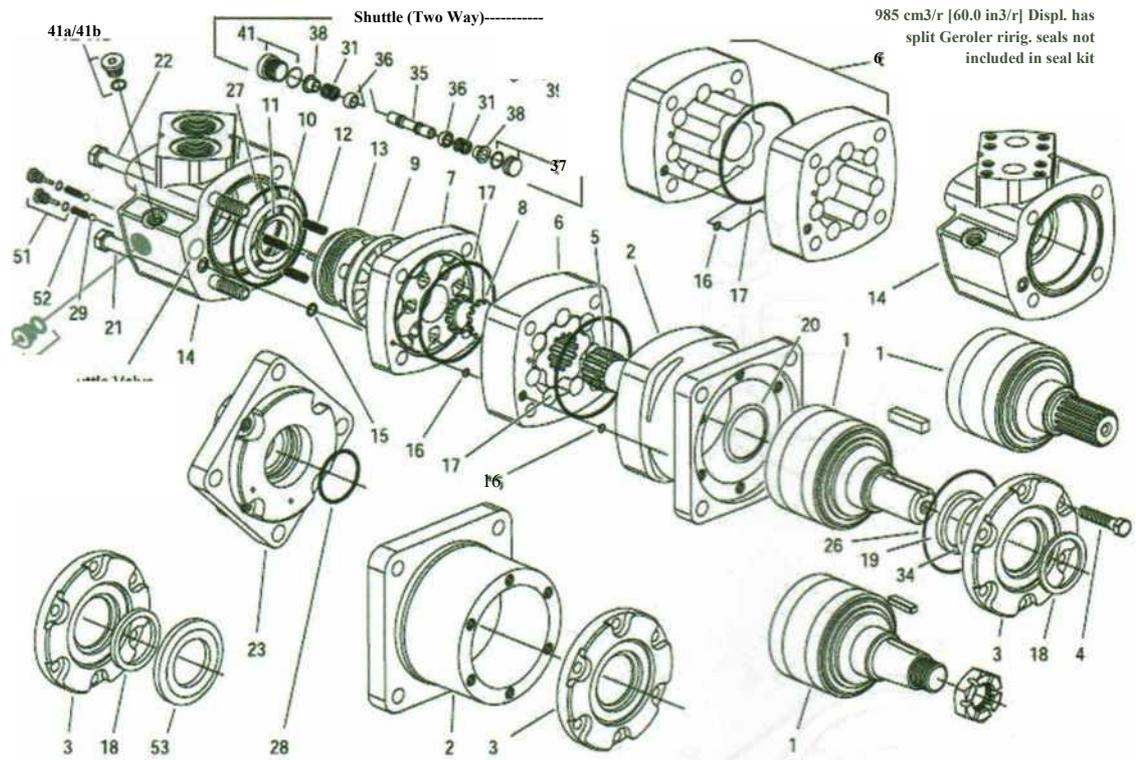
13	CH	16-C8	Driven gear	1	ZOCrNnTi
12	眼	06-07	Lug-shaped baffle		Nylon
11	iOHP	06-06	Lug-shaped gasket		Rubber L-4
10	溯	16-GS	Side plate		QT450-10
9	浦		Pump body		QT450-10
8	CH	26-03	Rectangular seal ring	1	Rubber L-4
7			CD Bearing		Combine parts
6	PHP	Qb *52	Front cover	1	ORSQ-19
			Oil seal NY19x32x7	1	Combine parts
			Retainer 32	1	
			Driving gear shaft	1	ZOCrMnI
			Radler 10	1	6.5 冶
			Screw M10x65-10.9	1	螺

IL

### Traveling motor

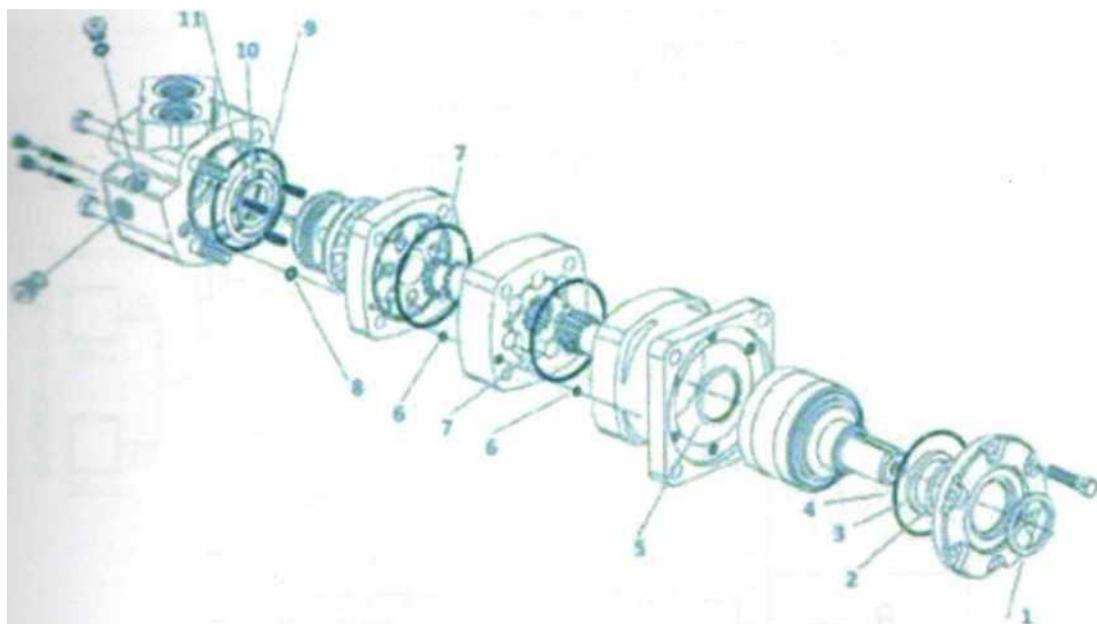
Disc Valve Motors...6000 series -005 and -006

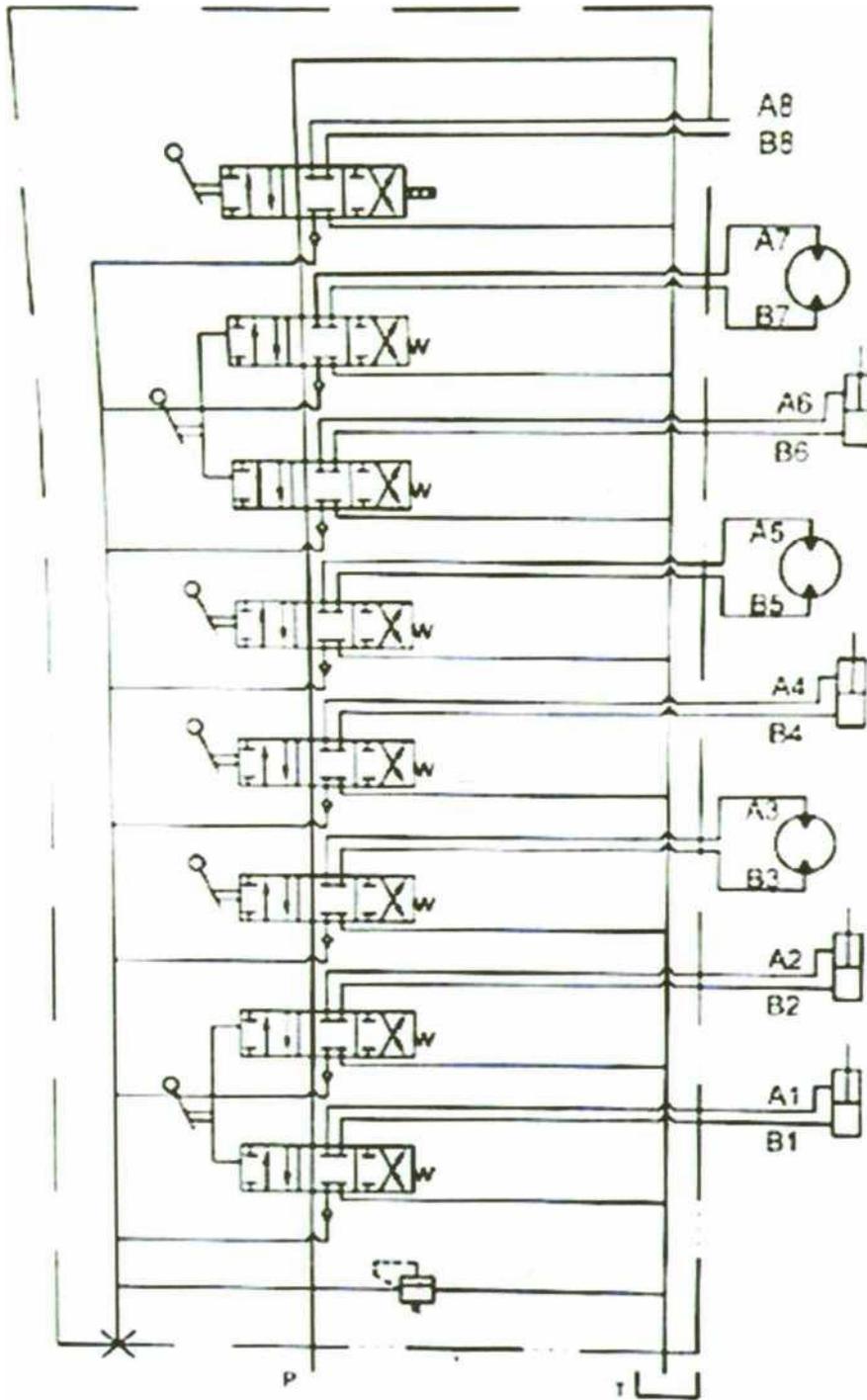
Cement n3/r)	Drive, Main Item No.5—Part No /Length	Geroler Item No.6—Part No /Width	Screw, Cap Item No.6—Part No /Length	Screw, Cap Item No.6—Part No /Length
	Part No mm(inch)	Part No mm(inch)	Part No mm(inch)	Part No mm(inch)
<b>310(19.0)</b>	21373-003 118.1(4.65)	8507-003 34.6(1.36)	14409-003 138.4(5.45)	14409-007172.4(6.79)



#### Seal package

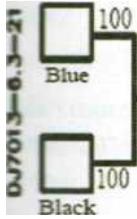
Code	Name (reference dimensions mm)	Quantity
1	Dust cover (OD 50.9)	1
2	Copper sheet (OD 60.45)	1
3	Seal ring of output shaft (OD 63.56)	1
4	O-ring (ID92.87, Shore hardness70)	1
5	End seal ring (ID 45.72)	1
6	O-ring (ID 6.07)	1
7	O-ring (ID 94.97)	1
8	O-ring (ID 11.2)	1
9	Front-type seal ring (ID 62.23)	1
10	Front-type seal ring (ID 35.82)	1
11	O-ring (ID 92.33, Shore hardness 90)	1





Section IV Schematics of main valve

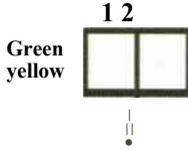
# Section V. Electrical system diagram



200

M?1

Headlights  
DJ7021-1.5-



IX

BR (With high pressure cap)  
DM3MB

9...

150



U431-10  
B

Blue

Green yellow

Yellow

un.5-3

Headlights  
switch

## Chapter in Service Technologies of Nuoman IT Excavators

Being of high temperature and pressure, the Nuoman IT excavator could have the hydraulic oil temperature as high as 85°C, the engine silencer temperature as high as 700°C and pressure as high as 16-18MPa. Therefore, the operators should be specially trained to obtain the proper certificates and to be familiar with the contents in this manual before the operations. In addition, maintenance and repair of excavator should be strictly in line with regulations to avoid any accident.

### Section I Basic construction knowledge

There are four basic movements: bucket rotation, arm stretching / backing, boom lifting / lowering and turntable swinging.

In general, pulling/pushing of hydraulic cylinder and rotation of hydraulic motor is controlled with three-way axial slide valve through the oil-flow direction and the work speed is controlled by operator or auxiliary devices according to the quantitative system and the valve openness.

#### 1.1 Basic requirements on control system

Basic requirements on control system include:

- 1) Control system should be centralized in the driving area of upper rotary and satisfy the man - machine requirements. For example, controllers and driver seat should be designed according to 160-180 cm for males and 150-170 cm for females.
- 2) Startup and stop should be steady, with its speed and strength in control. At the same time, the combine actions should be also in control.
- 3) Easy, handy and visual operations In general, the operational force on handle does not exceed 40~60 N and handle travel does not exceed 17cm.
- 4) Control mechanism should minimize the deformation of its lever, as well as the inside clearance and the idle travel.
- 5) Ensure the operational performance does not change in -40~50°C.

### Section II Preparation for work

#### 1. Inspection before startup

In order to prolong its service span, check the following before startup

- ① .Check if there is dirt around or below machine, bolts loosened, any oil leaked and if any part damaged or worn.
- ② . Check if all switches, lamps and fuse box could work normally.
- ③ . Check if the work equipment and hydraulic parts could work normally.
- ④ .Check if all engine oil levels and fuel level are proper.

The above should be checked normal; otherwise engine cannot be started up until they are checked normal after troubleshooting.

#### 2. Maintenance before startup

Before startup each shift, it is needed to grease the work equipment and the slewing bearing.

#### 3. Preheating of machine on cold days

If it is cold, engine is difficult to start up, fuel may be frozen and hydraulic oil may increase its viscosity. Therefore, selection of fuel should be dependent on environment temperature.

ten hydraulic oil is less than 25°C, it is needed to preheat the machine before any work; otherwise may not respond or react very quickly, leading to severe accident

it is needed to preheat machine if it is cold:

二 二 二 k the manual accelerator to have engine run at medium speed, and then slowly move bucket forth and 危 for 5min.

**:M&n do not operate other actuators than the bucket.**

二 二 二 m the manual accelerator to have engine run at high speed, and then move the boom, the arm and the ^jcKerfOT5-10min.

二 mt 二 e: operations are merely limited on boom, arm and bucket, instead of any slewing or traveling.

EJAZT complete action of excavator should be carried out for a few times, completing the preheating and ready ■work.

### Section III Operational essentials

云 r^ . eling handles.

A > 二 backward move the handle, running the machine forwards or backwards.

- .. \_

JL 二 in situ: backward shift the left handle and meanwhile forward push the right handle.

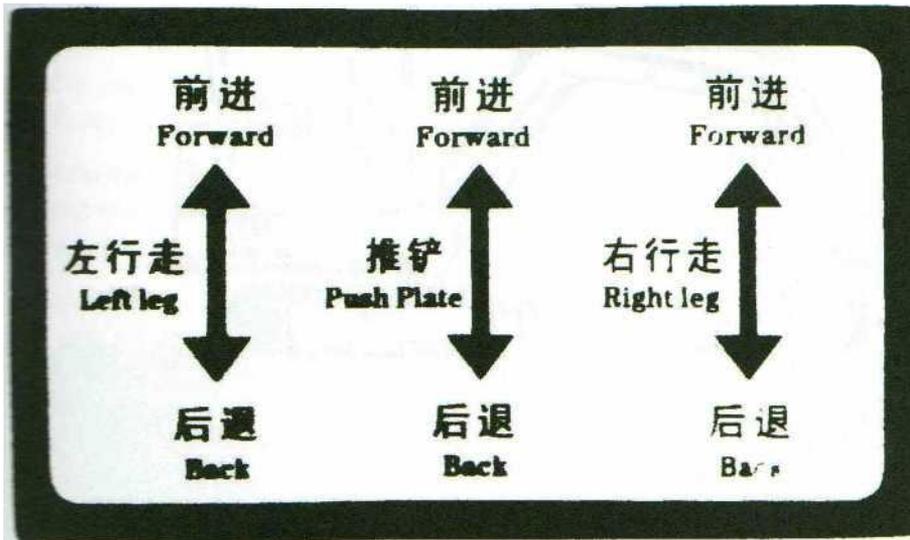
It , 一项 (7\_ im in situ: backward shift right handle and meanwhile forward push the left handle.

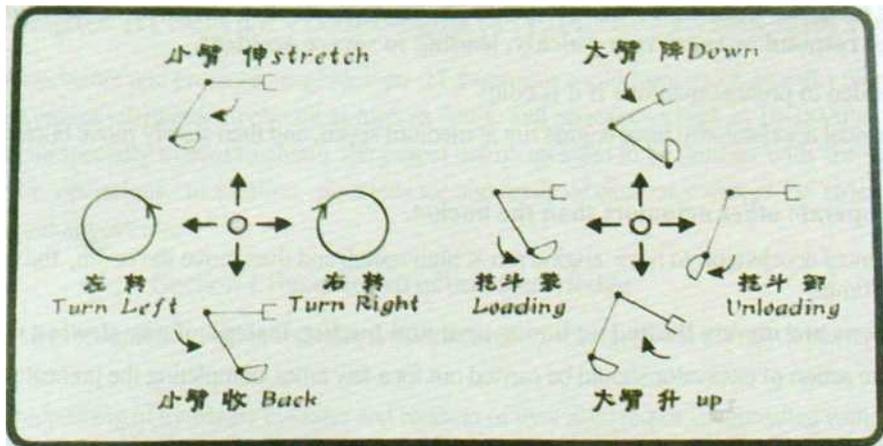
工 \_三 with left track as axis: forward move the right handle

mm with right track as axis: forward move the left handle

### LXsETNation

二 excavator slewing and the work equipment are respectively controlled with two handles, with mm:二 s shown below:





## 2.2 Basic excavation

1. Before excavation, the arm cylinder should have angle with the arm as  $90^\circ$ , bucket with ground to be excavated as  $30^\circ$ . Only in such case, can each cylinder have the max. excavating force. It is suitable for relatively hard soil, so as to decrease the excavating resistance.
2. To excavate any soft soil, bucket should be angled with the soil to be  $60^\circ$ , increasing the work efficiency.

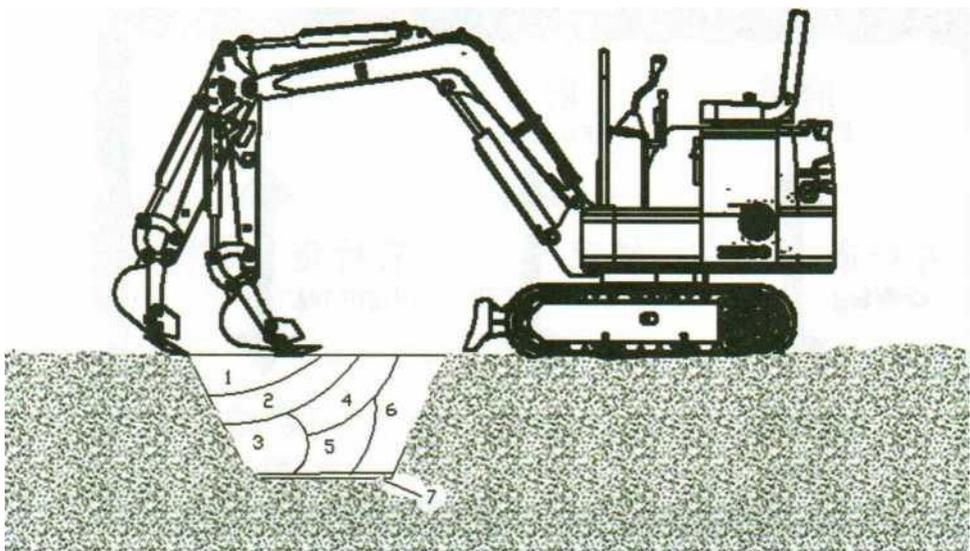
## 2.3 Lower excavation

Keep the angle between bucket base and the bevel at  $30^\circ$ , and retract the arm to start work

## 2.4 Upper excavation

Keep the bucket blade vertical to the ground, and retract the arm to start work.

2.5 Ditching is carried out in 7 steps, as shown in figure.



## Section IV Operational Precautions

Precautions and precautions for hydraulic excavators

1. Avoid the landsliding and the stone falling.

2. Avoid any striking of work equipment.

3. Avoid the bucket from colliding with other vehicle body, the loaded bucket crossing over other vehicle cab windows.

4.4 "Avoid the excavator from sinking into soft ground or wetland.

5.2.1.1 Avoid any large obstacles such as large stone.

5.2.1.2 Avoid to work with water depth exceeding the allowable limit.

5.2.1.3. When the machine is unloaded or loaded, the large stones should be handled carefully not to fall down.

5.2.1.4. In winter days, park the machine on solid ground to avoid the track being frozen. Remove any scrap away from the track and its frame. If track is iced onto ground, use boom to lift track and carefully move the machine, do not damage the sprocket and the track.

5.2.1.5. When moving the machine, make sure the traveling direction is consistent with its handle. When traveling backwards, push the rear part, forward push the traveling handle, to drive machine forwards.

5.2.1.6. When long-distance traveling, please rest for 5min every running for 20min, so as not to damage the traveling mechanism.

5.2.3.1. Avoid to cross over a slope of more than 15 degree, so as to avoid the machine from overturning.

5.2.3.2. Avoid accidents occurring during machine reversing or slewing.

5.2.3.3. Do not completely dig the soil out of bottom of machine.

5.2.3.4. Avoid machine collapse: never run on high dam or slope, which otherwise may have the machine collapsed or overturned, leading to severe accident.

5.3.1.1. Be aware of underground facilities: unexpected cutoff the underground cables or gas pipe may lead to fire or even personal casualty.

5.3.1.2. Be aware of overhead facilities such as bridge: if work equipment or other parts collides with over-bridge or power lines, it may result in personal injury; care must be taken to prevent the boom or the arm from colliding with elevated item.

5.3.1.3. Be aware of distance from overhead power line: in work around power line, do not have any part of machine or operator move to 3m distance away from the power insulation. Strictly abide by the local related safety rules. Wetland may have the range of electric shock enlarged. Therefore, the operator should be far away from work area.

# Chapter VI Maintenance of Nuoman IT Excavators

## Section I Daily inspection and maintenance

S/N	Item	Quantity	Interval (h)		Remark
			10	50	
	Check the engine oil level in sump	1	★		
	Check the hydraulic oil level in hydraulic oil tank	1	★		
	Check the fuel level in tank	1		★	
	Check the oil-water separator to completely drain any water or sediment out.	1		★	
	Check if the fuel pipe is leaked or cracked.	—	★		
	Check if the fuel pipe is cracked or bent	—	★		
	Check the work equipment pivots	—	★		
	Check if the hydraulic hose and the pipeline leak	—	★		
	Check if the bucket teeth is worn or loosened.	4		★	
	Check the seatbelt	1	★		
	Check the bolts and nuts for tightening torque	—		•	
	Check the bolts and nuts for tightening torque	—	Aperiodically		

Note: ★: Maintenance interval under normal conditions •: Maintenance needed at the first inspection ♦: Initial 100h

## Section II Periods of overhaul, medium and minor repair

S/N	Item	Quantity	Interval (h)								Remark
			100	250	500	1000	1500	2000	2500	4000	
1	Greasing of slewing bearing			★							
2	Greasing of slewing bearing gears		★								
-	Change the engine oil		•	▲	★						
-	Change the hydraulic oil						△	★	△		
	Change the hydraulic oil suction filter elements					★					
6	Check if the fuel pipe is cracked or bent.			★							
-	Change the oil-water separator				★						
g	Check the fuel hose for leakage / crack			★							
19	Check the fuel hose for crack / leakage			★							
	Change the bucket										
	Connection of bucket										
	Remove the traveling handle										
	Replace the seatbelt										
A	Check the deflection of track				★						
≡	Maintenance of tensioner					★ ★					

□ ★: Maintenance interval under normal conditions

▲: Maintenance interval of engine oil

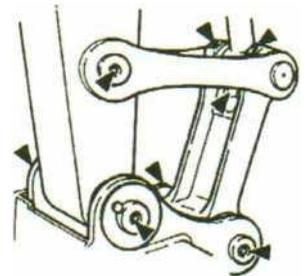
—: Change interval of hydraulic oil is dependent on the work oil type. 女: Under the dusty environment, shorten the maintenance interval.

## Technical maintenance

A Grease										
Parts		Quantity	Interval (h)							
			10	50	100	250	500	1000	2000	
1. Lubrication of work equipment pins	Pivot at base of boom Pivot at base of boom cylinder Pivots of bucket and connecting rod	10	★							
	Others:	6	★							
2. Lubrication of slewing bearing		2				★				
3. Lubrication of external meshing gear of slewing bearing		1					★			
<p>Note: it is recommended to use the lithium grease.</p> <p>★ Maintenance interval under normal conditions</p>										

### 1. Maintenance and lubrication of work equipment pivots

. Pivot between bucket and connecting rod



• Pivot at base of boom

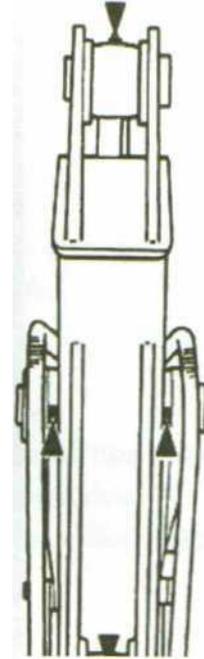


• Pivot at base of boom cylinder



. Others

—X betw een boom and arm; pivot of arm cylinder plunger; pivot at Hse :bucket cylinder.



二 Sieving bearing - every 250h

L 三 c machine on the flat ground.

二 the bucket onto ground.

.jde engine at low speed for 5min.

4 Tjm zhe ignition switch to OFF and then take off the key.

5 ■二 nc upper-structure standing still, add the grease into the two grease nipples.

6 三 engine to lift the bucket free from the ground, and then swing the upper-structure by 45 degree \* I S cycle).

- er rhe bucket onto ground.

X External meshing gear 45 of slewing bearing — every 500h

工 ±e bucket onto the ground

一 = 7: the engine

L machine on the flat ground.

二 一 m er rhe bucket onto ground.

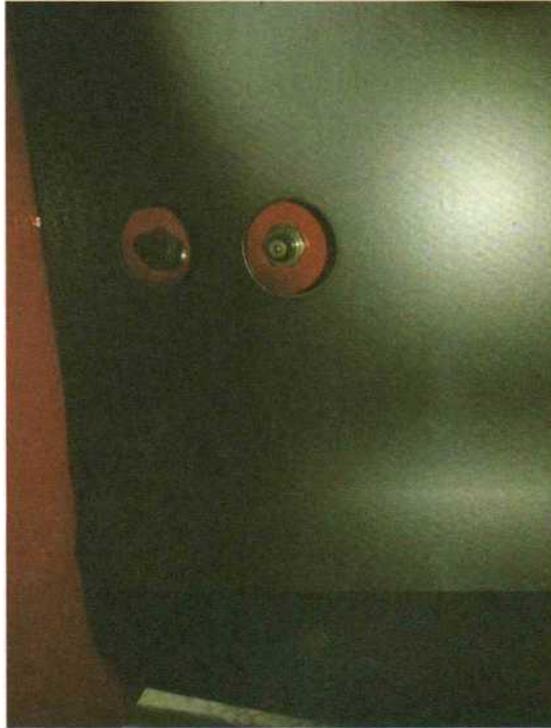
玉 Ide engine at low speed for 5min.

±e ignition switch to OFF and then take off the key.

—grease has to be stored on the top of external meshing gear of slewing bearing, free of any pollution. 土工

approximate 0.5kg of grease if needed.

二一- 3olluted grease should be replaced with new one.



### B. Engine oil

Parts	Quantity	Interval (h)						
		10	50	100	250	500	1000	2000
Engine oil	1			•	▲	★		
Engine oil filter	1			•	▲	★		

According to the temperature range during the interval, select the viscosity of oil listed in the table below:

Recommended engine oil brand: 15W~40 engine oil



Check engine oil level-----each day

-----: engine oil every 500 h

-----engine oil filter-----every 500 h

Run engine to preheat up engine oil properly.

1. Place vehicle on the flat ground.

2. Place 2L bucket onto the ground.

3. Run at low speed for 5min.

4. Turn ignition switch to OFF and then take off the key.

5. Remove drain plug to have oil pass through clean cloth into the 2L container.

6. After 2 min, check if there is metal scrap or others left on cloth.

7. Reinstall drain plug back on and tighten it

8. Remove drain plug to have oil flow through the filter cylinder into a container.

9. Remove screws fixing the engine oil filter elements with a screwdriver to take the filter element out

10. Install the new filter and tighten the screws fixing the new element with a screwdriver.

11. Remove filler cap to add the recommended oil into engine. After 15 min, check if the oil level is in the circle markers.

12. Reinstall filler cap back on.

13. Turn engine Unplug the ignition key.

14. Check if the drain plug is leaking.

15. Check oil level on dipstick.

## A

Precaution: keep your body and face away from the breather. When gear oil is still hot, please wait until it is cooled and then slowly release the breather pressure!

### CL system

Parts	Quantity	Interval (h)								
		10	50	100	250	500	1000	1500	2500	4000
Check the hydraulic oil level	1	★								
Remove the drain pipe of the oil reservoir	1				★					
Fill the hydraulic oil.	16.5L								★	
Change the hydraulic oil SJCZE filter elements	1						★			
Change the oil and filter	—	★								
	—				★					
Change the hose	39									★

\* normal maintenance interval

## Inspection and maintenance of hydraulic system

**Caution:** in work, the hydraulic system may become very hot. Please cool the machine down before inspection or maintenance!

1. Before maintenance of hydraulic system, make sure the machine stands on flat and solid ground.
2. Lower the bucket onto ground and shut down engine.
3. Do not start any maintenance until the systems, hydraulic oil and lubricant completely cool down, as the hydraulic system may be still hot and pressurized as soon as work is over.
  - a. Drain the air out of hydraulic oil reservoir to release inside pressure.
  - b. Cool the machine down.

**Caution:** inspection and maintenance of hot and pressure parts may cause them or hydraulic oil to spray out, leading to personal injury!

- c. While removing tie bolts or nuts, do not have your body facing them, as the hydraulic parts, even if they cool down, still have pressure.
  - d. Never try to check the traveling or slewing motor circuits on slope, as they may have pressure due to their dead weight..
4. While connecting the hydraulic hoses and pipeline, keep the seal surface free of any dirt and damage. Keep the above mentioned in mind:
  - a. Clean the hose, the pipeline and inside of hydraulic oil tank with detergent, and then thoroughly dry them.
  - b. Use the O-ring free of any damage or defect.
  - c. While connecting the pressure hose, do not twist it; otherwise its service span will be shortened..
  - d. Carefully tighten the low-pressure hose clamp.
5. The hydraulic oil to be added should have the same grade. Namely, do not mix the oil with different grades. The hydraulic oil has been added before delivery, and therefore, please use the recommended oil. All oil in system should be changed at once.
6. With no hydraulic oil, never start up engine.

## L Inspection of hydraulic oil level --- each day

A

**Important:** With no hydraulic oil, never start up engine!

L machine on the flat ground.

二 2 :f- rLetely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine. S —er ±e bucket onto the ground.

AL jde at low speed for 5min.

A. STLZ x engine Unplug the ignition key.

# : the oil level in hydraulic oil tank between the markers on dipstick, and add it if needed...

MHBK 三? draulic oil tank has pressure, and therefore slowly open its cap to release pressure before adding of

C—• \* hx draulic oil tank to add oil and then ±e oil level again..

• 二 e 二 ip back on hydraulic oil tank



### III. Change the hydraulic oil —2000 h

#### Replace the hydraulic oil suction filter element — every 1000 h

**Caution:** do not do so until the hydraulic oil cools down as it may be very hot.

1. Park machine on the flat ground.
2. Completely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine.
3. Lower the bucket onto the ground.
4. Idle engine at low speed for 5min.
5. Shut down engine Unplug the ignition key.
6. Dismantle the covers
7. Clean the top of hydraulic oil reservoir to avoid any dirt into its system.
8. Slowly open the hydraulic oil cap to release the pressure.
9. Loosen and take down the oil-pickup filter element cap.
10. Loosen and take down the drain plug at bottom of hydraulic oil tank to drain the oil out of tank.
11. Take out the oil-pickup filter and the levers.

**^^caution:** the hydraulic oil tank has pressure.Slowly open the hydraulic oil cap to release the pressure before taking off the cap!

12. Clean the filter and inside of hydraulic tank.
13. Use oil -pickup pump to suck the oil residue out of bottom of hydraulic oil tank.
14. Put on the filter and the levers to make sure the filter is correctly fixed onto the outlet.
15. Clean and re-install the drain plug onto the bottom of tank.
16. Add the oil until between markers on oil dipstick.
17. Put on the oil-pickup filter element cap to make sure the filter and the levers are at correct position and then tighten the bolts to 49N.m.

**Important:** with no oil in hydraulic pump, starting up of engine may damage to hydraulic pump!

18. Tighten the oil tank cap.
19. With engine idling at low speed, slowly and steadily control the lever for 15min to drain the air out of hydraulic system.
20. Completely retract the arm cylinder and extend out the bucket cylinder, so as to locate the machine.



二 the hydraulic oil level in hydraulic oil tank and add it if needed..

■ 2r\*c-c<Tk)n of hose and pipeline

—Each day

—every 250 h

■th-

CMboD: any sprayed fluid could penetrate your skin, leading to personal casualty!

~aere:~re. use a paperboard to check for leakage.

x IOZZ^OIL care must be taken to keep your hands and body away from pressure oil.

'IT of accident, please immediately go to doctor with trauma experience. Any fluid into skin has to be ed in a few hours, which otherwise may lead to gangrene.

r linn: leaked hydraulic oil and lubricant may lead to fire or personal casualty!

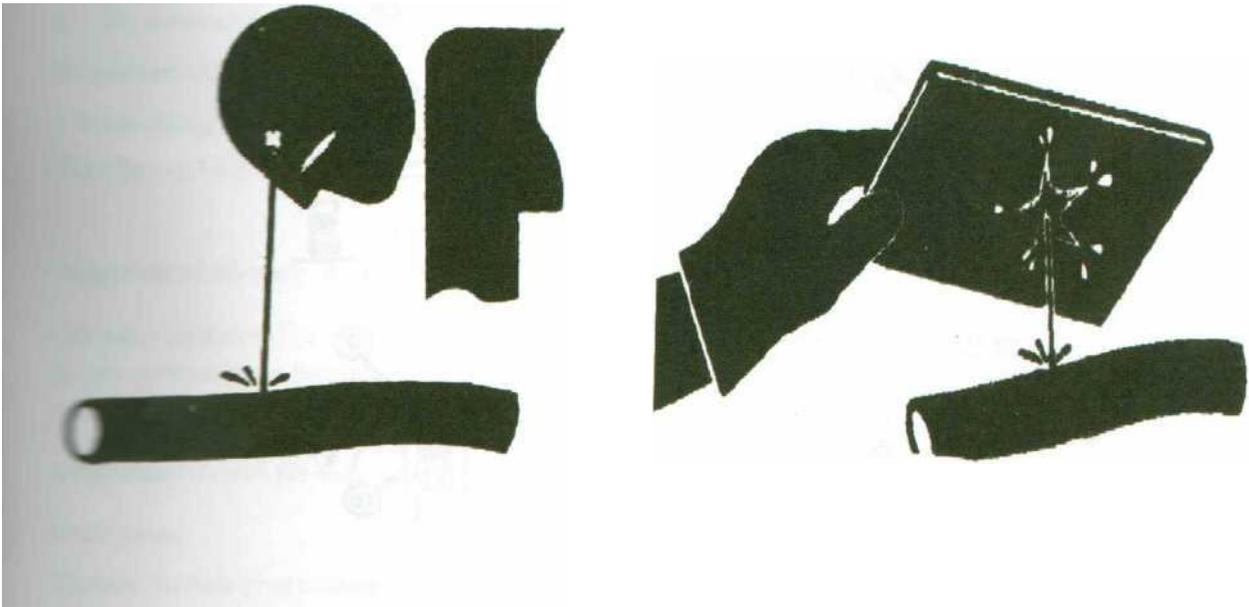
fn nLine on the flat ground. Lower the bucket onto the ground. Shift the pilot switch to Lock Turn off Ik: Unplug the ignition key.

OCCA /:here is lost part, loosened pipe clamps, twisted hose, pipeline or hose rubbing with each other, ti 二-any abnormal, please replace or tighten it according to table 1-3.

repair or replace any loosened, damaged or lost pipe clamps, hoses, pipes, oil cooler and flange bolts. ?r impact any pressure pipeline.

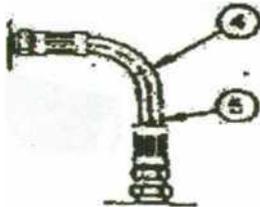
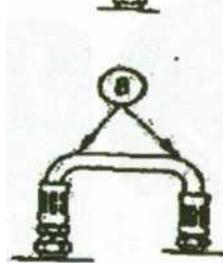
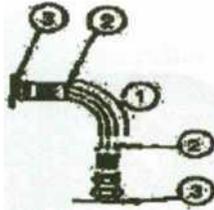
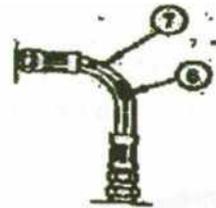
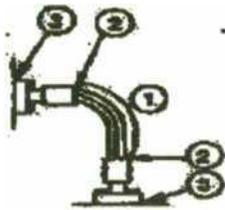
! ■tear bent or damaged hose or pipeline.

positions of check points and the abnormalities



Please use the genuine Rhinoceros excavator parts

Interval(h)	Check points	Abnormal	Measures
Every day	Hose surface Hose end Connector body	Leakage 1 Leakage 2 Leakage 3	Replace it Replace it Tighten or replace the hose or O-ring
Every 250h	Hose surface Hose end Hose surface Hose surface Hose Hose Hose end and joint body	Crack 4 Crack 5 Reinforcing material protruded 6 Local part protruded 7 Bend 8 Bend 9 Deformation or corrosion 10	Replace it Replace it Replace it Replace it Replace it Change it (proper bending radius) Replace it



## Fuel system

capacity of fuel tank: 7L

Parts	Quantity	Interval (h)						
		10	50	100	250	500	1000	2000
Z>zin dirt out of collector of fuel tank	1	★						
Check, die oil-water separator	1		★					
the oil-water separator	1					★		
Leakage		★			★			
Crack /twist /others		★			★			

\* Xf^mtenance interval under normal conditions

Jeccrrznended fuel:

use the quality diesel (selection of fuel grade should be dependent on environmental temperature).

### \*H. ip the fuel

, ?zrk machine on the flat ground.

二 er the bucket onto ground.

4l Lde sigine at low speed fbr 5min.

苦 Six down engine Unplug the ignition key.

蚰 dbg. 湖 55。 闕施。 施 55 亦. 5 皿吳

Siniz 注] or with fuel system working.

❶ F \*~ention to the fuel scale. Add the fuel if needed.

■paroot: keep any dirt, dust, water or other foreign material from getting into fuel system!

Z>'We 三 of fuel tank, make sure the fuel is not sprayed on machine and added properly.

lae cap back on fuel filler to avoid any lost or damage.

### of oil-water separator ...every 200h

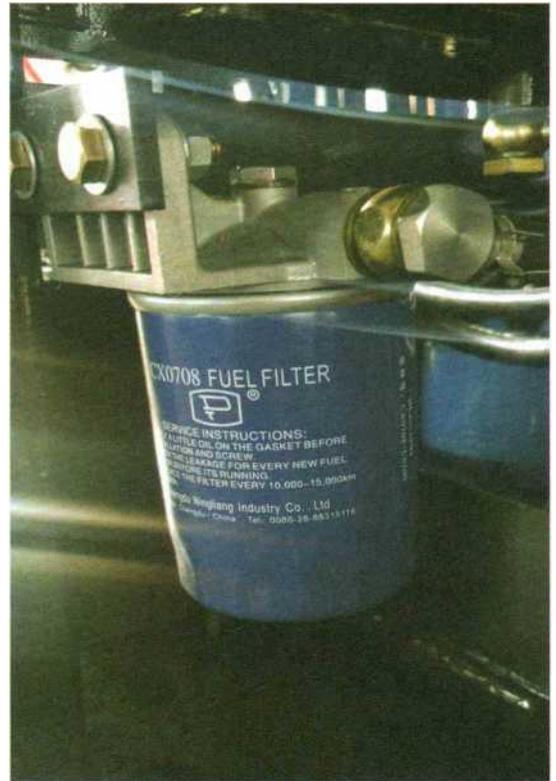
separator ① is used to separate the water or sediment from fuel. Oil-water separator ① has a float able Hfepmir ■- 二 en water becomes full. When there is water or sediment in the collector of oil-water separator, please separator ①.

shorten the inspection interval of oil-water separator ① if there is excessive water in the fuel!

CBUKIL 二 e drain plug is designed to be counter - thread type and should be turned with hands, instead of vise and wneK3: protection of threads.

1. Manually loosen the drain plug at bottom of oilwater separator.
2. After the draining, manually tighten the drain to ensure no leakage of oil or air.

Caution: after the draining, make sure air is drained out of fuel system to make sure the engine could start up normally.



## Electrical system - battery

- I. Check the battery electrolyte level and the terminals.

**Caution:** gas inside of battery may explode it.

Therefore, keep any spark and flame away from battery. Use a flashlight to check the electrolyte level. In addition, the sulphuric acid in battery electrolyte is as toxic as to burn your skin or your clothes or to blind your eyes...

Therefore, take the following methods to avoid any risk:

1. Refilling of battery should be done at well-ventilated site.
2. Put on goggles and plastic gloves.
3. Care must be taken not to spray out the electrolyte.
4. Use the proper measures to assist battery startup.

If touched with acid:

1. Rinse the skin
2. Use the soda or the lime to neutralize the acid.
3. Rinse eyes for 10 -15 min and then go to doctor.

### Caution:

a. Always firstly disconnect the battery clips (-) away from the ground and then lastly connect it.

b. Always keep the terminals at top to battery and the breather clean, to avoid the battery from discharging. Check if the battery terminal is loosened or rusted. Coat the terminals with

vaseline to avoid any corrosion.

**the battery**

We-r 3 i 12V battery with one negative pole (-) grounded.

cannot be charged or store any electricity, replace the battery with same model.

**the fuse.**

IR'BE ± erTcal device does not work, please firstly check the fuse.

hwai tXBt: please install the fuse with correct amperage, so as to prevent against burning of electrical system OKX r-erloading!

Parts	Quantity	Interval (h)							
		10	50	100	250	500	1000	2000	4000
Check the bucket teeth is worn or loosened.		★							
Change the bucket	—	If needed							
Replace bucket and connect the —one to machine.	—	If needed, replace the bucket and connect the new one to machine.							
Check connecting rod of bucket	1	If needed							
Adjust the traveling lever	2	If needed							
Check and replace the fuse	1	★	Every 3 years						
Check the track deflection	2					★			
Check the tensioner	2						★		
Check the injection timing	—	If needed							
Check the compression pressure of engine	—								
Check the starter and the A/C generator	—						X		
Check the bolts and nuts for tightening torque	—		to		★				

interval under normal conditions ≡ Mee needed at the first inspection VCmar dealers or Rhinoceros.

\* ticket teeth —each day

OKL: ≡ m bucket teeth is worn or loosened.

■ - r r-e- K the service limit, the bucket teeth may be replaced. Bucket tooth dimensions mm

Service limit

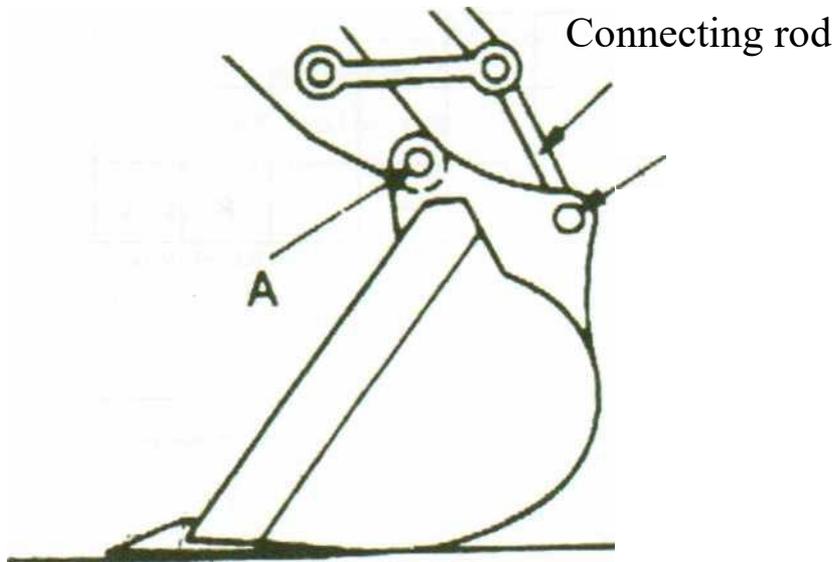
New

**Caution:** care must be taken to avoid the metal scrap from flying out, leading to personal injury. Wear the goggles or the safe glasses or safe devices suitable for operations!

### Change the bucket

**Caution:** while hitting out or into the connecting pin, care must be taken to prevent against any personal injury due to out-flied metal scrap. Wear the goggles or the safe glasses or safe devices suitable for operations!

1. Park the machine on flat ground and lower the flat surface of bucket onto ground to make sure the bucket does not move after the removal of pin.
2. Slide the O-ring out, as shown in the figure.
3. Remove the bucket pins A and B to separate the bucket and the arm. Clean the pin and its pin hole and then properly grease them.
4. Adjust the arm and the new bucket correctly, and make sure the bucket does not roll away..
5. Install the bucket pins A and B.
6. Put the locker and ring onto pins A and B.
7. Adjust the connection clearance of bucket at pin A. Refer to the way to adjust the bucket connection clearance.
8. Grease the pins A and B.
9. Start up engine and run it at low speed. Slowly rotate the bucket to two directions to check if there is any interference to movement of bucket. Do not use any machine with interference, which should be solved immediately.



## Check the bolts and nuts for tightening torque

— every 250 h (initially at 50 h)

□ K o ±e tightness at initial 50h and then every 250 h. Tighten it to the set torque if needed. Replace it with bolts with same or higher grade.

**A**

**Important:** please use the torque wrench to check the torques of bolts and nuts!

Metric bolts and nuts			
—wid dimensions	Standard torque (N.m)	Thread dimensions	Standard torque (N.m)
M6	12±3	M14	160±30
M8	28±7	M16	240±40
M10	55±10	M20	460±60
M12	100±20	M30	1600±200

H. ✓ of main components: (N.m)

Thread dimensions	Recommended torque
M16 bolts fixing the traveling motor	252±39.2
M16 bolts fixing the sprocket	252±39.2
SCO bolts fixing the slewing bearing	570±60
气□ bolts fixing the swing mechanism	570±60

**important:**

installed, the bolts and nuts should be cleaned.

Z Cruise ±e bolts and the nuts (such as the white zinc b able to be dissolved to lubricant), so as to stabilize •fier irration coefficient.

Tie □ Amterweight bolts should be kept tightened up.

■ML □: the tightening torques should be expressed with kgfm.

ssrcie: use a wrench with 1m long to tighten the bolts and nuts, and apply 12kgf of force to the end of ■EL 芹 erating the following torque:

$$1 \text{ m} \times 12 \text{ kg} = 12 \text{ kgf.m}$$

■ the same torque with 0.25m wrench:

$$BD \& n ; = : 2 \text{ kgf.m} \text{ Needed force: } y = 12 \text{ kgf.m} / 0.25 \text{ m} = 48 \text{ kgf}$$

## Maintenance under the special cases

Operational conditions	Precautions for maintenance
Moor land, rainy or snowy	Before operation, check all the drain plugs are tightened up. After operation, clean machine and check bolts and nuts for break, damage, looseness or loss. Lubricate all parts to be lubricated on time.
On beach	Before operation, check all the drain plugs are tightened up. After work, thoroughly clean the clean to remove the salt. Frequently maintain the electrical system from being corroded.
Dusty environment	Air filter: clean the filter element periodically or at shorter interval Radiator: clean the oil cooler screen to avoid any blockage. Fuel system: clean the filter and its element periodically or at shorter interval. : Electrical devices: periodically clean it, specially the AC generator and starter's ) rectifier.
Stony roads	Track: careful operations Frequently check if bolts and nuts are broken, damaged or lost. Loosen the track a little than the usual. Work equipment: parts may be damaged on stony roads, and therefore please use the reinforced bucket or heavy-duty bucket..
Freezing cold	Fuel: use the high fuel suitable for low temperature Lubricant: hydraulic oil and engine oil with dry quality and low viscosity. Battery: keep the battery fully charged and maintain it at shorter interval. The electrolyte may be frozen if it is not fully charged. Track: keep the track clean. Park the machine on solid ground to avoid the track frozen.
Falling stone	Roof at driver seat: add the protective for cab roof if needed to prevent the machine from being damaged with falling stone.

## Storage of machine

1. Repair any worn or damaged parts, and put the new one if needed..
2. Clean the primary air filter elements.
3. If possible, retract all the hydraulic cylinders. If not, grease all the plungers exposed out of cylinder.
4. Lubricate all the grease points.
5. Put the track on the solid and long pad.
6. Cleaning of machine especially in winter, clean each part of excavator, especially the track.
7. Fully charged, the battery should be stored at dry and safe site. If battery cannot be taken down, separate the battery negative pole from (-) pole.
8. Painting if needed to avoid rusting.
9. Store the machine at dry and safe site. If outdoors, it should be covered with water-proof cloth.
10. If machine is to be stored for long time, run it at least once each month.

# Chapter XII Troubleshooting

## Section I General

excellent performance of Rhinoceros excavator, all components and parts are of high quality. Machine's life and service life are determined not only by manufacturing quality and assembling quality, but also Earned quality.

The representative and service engineer shall remind the user that preventive maintenance is the easiest and most economical one among various ways of maintenance.

Perform daily inspection and long-, medium- and short-term maintenance according to maintenance frequency.

## Section II Troubleshooting of mechanism system

Symptom	Possible causes	How to solve
structural components	1. The loose fasteners make noise. 2. Aggravated abrasion between bucket and end face of bucket rod	1. Inspect and tighten 2. Adjust the clearance to less than 1mm
Bucket teeth have dropped during operation	1. Deformed spring and weakened elasticity of bucket tooth pin 2. Unmatched bucket tooth pin and seat	Change the bucket tooth pin
Crawler has tangled up	1. Loose crawler 2. The driving wheel moves fast in front on rugged road.	1. Tighten the crawler 2. The guide wheel shall move slowly in front on rugged road

## Section III Troubleshooting of hydraulic system

Symptom	Possible causes	How to solve
FK excavator :move	Low oil level of hydraulic oil tank that the main pump sucks no oil	Add enough hydraulic oil
	Oil filter is blocked	Change the filter and clean the system
	Engine coupling is damaged (such as plastic plate, elastic plate)	Change
	The main pump is damaged	Change or repair the main pump
	The servo system pressure is low or zero	Adjust to regular pressure. If it fails to increase the pressure of servo overflow valve, disassemble to wash; if the spring is fatigue, add a washer or change the spring.
	The safety valve is set at low pressure or stuck.	Adjust to regular pressure. If it fails to increase the pressure, disassemble and wash. If the spring is fatigued, add a washer or change the spring.
Oil suction pipe of main pump explodes or comes off	Change with a new one	

Symptom	Possible causes	How to solve
The unilateral crawler fails to move	The main pump supplying fuel to unilateral crawler is damaged.	Change
	The main valve rod is stuck and the spring is broken	Repair or change
	Traveling motor is damaged	Change
	The upper and lower chambers of swivel joint are connected	Change the oil seal or clean the assembly
	Fuel pipe of traveling system explodes.	Change
The whole excavator moves slowly or powerless	Less oil in hydraulic oil tank	Add enough hydraulic oil
	Low engine rpm	Adjust engine rpm
	Low system safety valve pressure	Adjust to specified pressure
	Serious leak inside the main pump	Change or repair the pump
	The traveling motor, rotation motor and cylinder are worn of different degree, which causes internal leak.	Change or repair the worn parts
	The aged sealing components, worn hydraulic elements, degraded oil of old excavator cause the operation speed becomes powerless along with the increase of temperature.	Change hydraulic oil, change sealing components of the whole machine, adjust the fit clearance and pressure of hydraulic components.
	The blocked engine filter causes serious decrease of loaded rpm and even flames out.	Change the element
	The blocked hydraulic filter accelerates abrasion of pump, motor and valve and leads to internal leak.	Clean and change the element according to the maintenance schedule.
The right and left traveling systems do not move (no other abnormalities)	Serious between main valve rod and valve hole causes serious internal leak	Repair the valve rod
	Central rotation connector is damaged.	Change the oil seal and change the groove if it is damaged
	The high pressure chamber and low pressure chamber of traveling operation valve is connected.	Change
	Serious leak inside the traveling operation valve	Change
	Low overloaded pressure of traveling valve of main valve or the valve rod is stuck.	Adjust and grind
	The left and right traveling reducers fail	Repair
	The left and right traveling motors fail	Repair
The oil pipe explodes	Change	
Deviation during traveling (no other abnormalities)	Wrong adjustment of variable point of main valve or serious internal leak of a pump	Adjust or repair
	Internal or external spring of one traveling valve core of main valve is damaged or tightened	Change
	The traveling motor leaks inside due to abrasion.	Repair or change

Symptom	Possible causes	How to solve
	The sealing component of central rotation connector is aged and damaged.	Change the sealing component
	The left and right crawlers are of different tightening.	Adjust
1? Seen bucket rod and , move to one ^eation only.	Main valve core is stuck or valve rod spring breaks.	Repair or change
I ShKrz tucket rod and I'feKL^ 5oes not move.	Boom valve rod is stuck or of low overloaded pressure	Repair
	Fuel supply pipe leaks, detached, O ring damaged or pipe fitting is loose	Change the damaged component
	Sandstone in main valve or the low pressure chamber is connected to the high pressure chamber	Change
T _cket rod and Kps too quick nder drops at a -zh: even it is MBaoeTHiec due to dead wei^it	Low overloaded valve pressure	Adjust
	Serious internal leak of cylinder	Change the sealing component, repair the inner wall or groove of cylinder or change the cylinder.
	Loose oil pipe fitting, damaged O ring	Change
- , jdiert rod and s □ eriously	Serious internal leak of multiway valve or sandstone inside it	Change
	Low overloaded pressure	Adjust
	Serious internal leak of oil cylinder	Change the oil seal
	The main valve is disabled due to internal leak.	Repair or change
Fxxet rod and f xeraied even it is	Multiway valve core is stuck or serious internal leak	Grind or change
	Multiway valve rod spring breaks	Change
	Leak of working cylinder, or the working device drops due to dead weight	Change the oil seal
	Low pressure of overload overflow valve or the spring breaks	Adjust to specified pressure. Change the spring if it is broken.
初繕 r =--oil	Wrong grade of hydraulic oil for excavator	Change the hydraulic oil
	Hydraulic oil cooler surface is polluted by oil and dirt, which blocks the air hole.	Wash
	Low oil level of hydraulic oil tank	Add enough hydraulic oil
	The hydraulic components such as motor, main valve and oil cylinder or sealing components are seriously worn and cause internal leak, which increases the oil temperature. Traveling rotation and working device are delayed and powerless. The hot temperature degrades the hydraulic oil. The safety valve is of poor air tightness, which leads to overflow.	Change the elements in time
^■uni if -Nation (no	Hydraulic oil pipe breaks	Change

Symptom	Possible causes	How to solve
other abnormalities)	Rotary valve rod on main valve is stuck.	Repair
	Rotary motor is damaged	Repair or change
	The rotation support is damaged.	Change
Indifferent left and right rotation speed (no other abnormalities)	The right and left rotation of multiway valve is of different overloaded pressure	Adjust
	Rotation valve rod of multiway valve is slightly stuck.	
Delayed or powered rotation (no other abnormalities)	Serious external leak of hydraulic oil pipe	Change pipe fitting and sealing components
	Low overloaded pressure for rotation of multiway valve	Adjust
	Serious internal leak of rotary motor	Repair or change
	The high and low pressure chambers of multiway valve are connected, sand hole on valve body due to casting, which causes one-way action or linked actions	Change
The rotation mechanism moves even it is operated	Main valve rod spring breaks	Change
The excavator makes abnormal noise and shakes during operation.	Low oil level of hydraulic oil tank	Add oil
	The oil contains too much moisture and air	Change
	Safety valve of multiway valve makes noise	Adjust
	Damaged coupling	Change
	Vibration caused by loose pipe clamp	Adjust
	Blocked filter	Change
	Air exists in oil suction hose	Release the air
	Uneven engine rpm	Adjust
	The bearing of working device is not lubricated or scraped	Apply lubrication oil or change the shaft or sleeve
Powerless oil cylinder or oil leak	Damaged sealing components	Change the sealing components
	A groove is found on the piston rod due to abrasion or detachment of chromium coating of piston rod, which causes oil leak.	Coat, paint, repair or change
	The air in the cylinder causes shaking noise during operation	Release the air

## Section IV Troubleshooting of electrical control system

Farz : cdes of electrical control system of excavator engine fails to start

— engine flames out during operation

engine fails to flame out

slow-down does not work

: engine g and traveling of all working devices.

w diagram

— engine fails to start

Fault description	• The engine fails to star	
* pump system does not work or supply less fuel	Low engine rpm	Adjust to regular rpm
	Pump fault	Change
	Less fuel in the tank	Add fuel
	Fuel tube breaks, tube connector is loose and O ring is damaged	Change

^ dble causes	Standard value in regular condition and reference value of fault diagnosis		
Low battery	Battery voltage	Color of charge state densimeter	
	Above 12V	Green (if it is white, change the battery)	
m FI and FI 1 fail	In case the fuse is burnt, the GND fail may happen. If the monitoring indicator on the monitor panel is not illuminated, inspect the circuit between battery and specified fuse.		
f	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
	Ignition switch	Position	Resistance
	Between 30 and 17	OFF	1MQ
		Start	Below IQ
Engine ignition switch fault	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
	Pin		Resistance
	85-86		200-400Q
	87-30		Above 1MQ
lock switch ie" open circuit (inside)	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Lock rod	Resistance

Possible causes		Standard value in regular condition and reference value of fault diagnosis		
		Between 105 and GND	Unlocked	1MQ
			Locked	Below IQ
6	Low battery Fuse F1 and F1 1 fail	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis. If all PS, GND, signals and engine start input are correct while engine start output is abnormal, the engine starter relay fails.		
		Engine or start motor	Engine start switch	Voltage
		PS; terminal B and GND	Start	20~30V
		Input of engine start, terminal C and GND		20 ~30V
7	Engine ignition switch fault	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
				Voltage
				Below IV
8		★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		—	Resistance	Below 1
9		★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		—	Resistance	Above IM
10		★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
			Voltage	Below IV

## 2. Engine flames out during operation

Symptom		• Engine flames out during operation		
	Causes	Standard value in regular condition and reference value of fault diagnosis		
1	Disconnected wire harness (disconnect from connector or poor contact)	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Between CN-12T ② and CN-132F ⑥	Resistance	Below 1
2	Poor GND of wire harness (contact with earth circuit)	★ Turn the start switch of engine to OFF as preparation and keep it at OFF during diagnosis.		
		Between CN-12T ② and CN-132F ⑥	Resistance	Above IM

## Section V Troubleshooting of diesel engine

### 1. Symptoms of failed startup of engine:

When starting the engine, the starter drives the engine but the engine fails to be started.

Possible causes:

- (1) Low battery;
- (2) Battery terminal is rusted or loose;
- (3) Battery earth wire is rusted or loose or poor GND of engine;
- (4) Starter relay armature fails to disengage.
- (5) Ignition switch fault or starter fault;

How to solve

- (1) Low battery is caused by electrical appliances that are not powered off in previous day. Next time, do not forget to power off all electrical appliances at the end of the day. If you have well charged the battery during driving the day before, the battery shall be on a full charge at the end of the day. For failed start-up caused by low battery, change the battery pack or connect to another battery pack in parallel to start the engine.
- (2) Clean the battery terminal, tighten the PS wire clip to contact the PS wire with battery terminal reliably.
- (3) Clean the battery earth wire terminal to ensure reliable GND; ensure reliable GND of engine;
- (4) Repair or change starter relay;
- (5) Inspect and repair ignition switch and inspect and repair the starter;
- (6) Long period operation of battery may increase the internal resistance; therefore, it is necessary to repair the battery and connect charge the battery and change with new battery pack if necessary; the battery shall be fully charged to ensure successful start-up of engine.

### 2. Check if it is low fuel level that makes hard to start the diesel engine

Symptom:

When starting the engine, the starter runs at acceptable rpm; however, it fails to start the engine.

Possible causes:

- (1) Fuel tank is empty;
- (2) Fuel supply system channel fault;
- (3) Air, water or foreign matter exist in fuel system, which block the system;
- (4) Fuel pump fault;
- (5) Engine fault;

How to solve:

- (1) Fill the fuel tank with standard fuel, start the engine and run the engine to deliver the fuel to carburetor;
- (2) Inspect pipeline of fuel supply system, fuel filter and fuel pump; change blocked and damaged assembly if necessary to ensure unobstructed fuel supply.
- (3) Release air in fuel system. If the engine can not be started due to air blockage, decrease the temperature properly.
- (4) Inspect the fuel pump. Only when the fuel pump works well can the fuel supply be unobstructed- Fuel supply seldom fails and air blockage and water blockage seldom happen when the fuel supply of fuel pump is large

(5) Inspect and repair the engine. Only when the engine works well can the start-up fail never or seldom happen.

### **3. Check if it is hard to start the engine**

Symptom:

- (1) Starter runs at correct rpm and drives the engine; however, it is hard to start the engine.
- (2) It is hard to start the engine when it is cold.
- (3) It is hard to start the engine when it is hot.

Possible causes:

- (1) Fuel filter is blocked;
- (2) Fuel pump fault;
- (3) Wrong injection timing;
- (4) Low temperature of oil and intake air;
- (5) Intake air filter is blocked.
- (6) Leak of fuel tube;
- (7) Starter fault;
- (8) Improper start operation;
- (9) Wrong fuel grade;
- (10) Engine fault;

How to solve:

- (1) Inspect and change the fuel filter;
- (2) Inspect and change the air filter element;
- (3) Inspect and adjust the fuel pump;
- (4) Inspect the fuel tube and oil channel to ensure unblocked oil supply;
- (5) Inspect the starter and start control device for reliable operation.
- (6) Start the engine in correct ways.
- (7) Add fuel of correct grade and discharge the water in fuel in the low part of fuel tank if necessary;
- (8) Repair the engine.

### **4. Check if the starter fails to start the engine**

Symptoms:

- (1) Turn the ignition switch to ON, the starter does not work.
- (2) The driving gears of starter do not engage.
- (3) The driving gears of starter fail to disengage.
- (4) Low engine rpm and uneven engine rpm;

Possible causes:

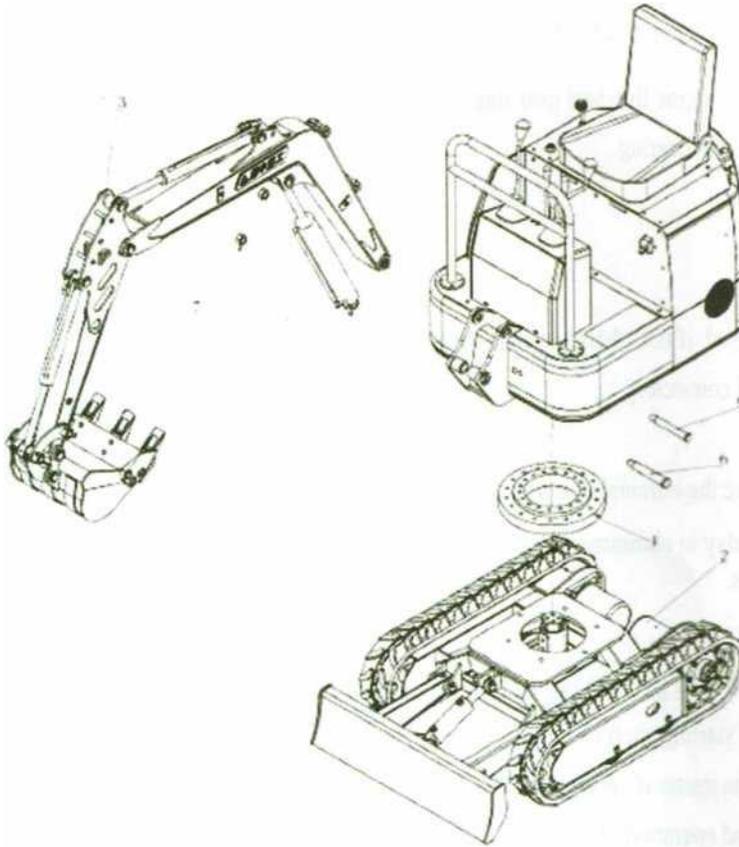
- (1) The battery is not fully charged.
- (2) Terminals of battery are loose.
- (3) Battery earth wire is loose.

- (4) Start circuit is disabled.
- (5) Electromagnetic relay armature is adherent;
- (6) Starter fault
- (7) Driving gear of starter is stuck by engine flywheel gear ring;
- (8) Driving gear of starter adheres to the bearing.
- (9) The starter fails to drive the engine;
- (10) Engine fault;

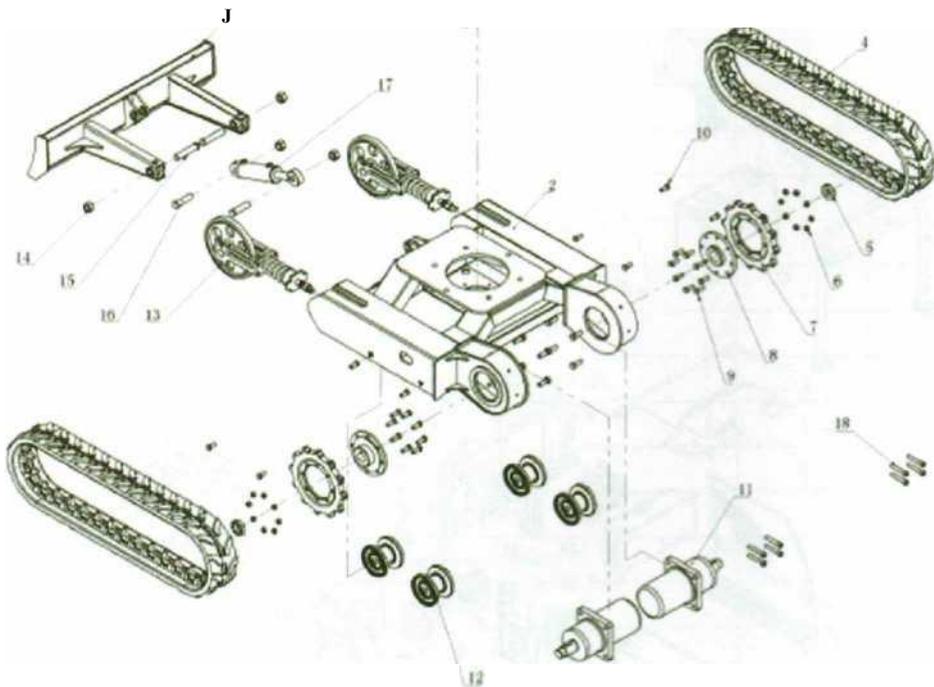
How to solve:

- (1) Check if the battery is fully charged; if not, charge it; change the battery if necessary.
- (2) Connect the battery terminal and connector;
- (3) Repair the battery earth wire.
- (4) Inspect the start circuit and ensure the terminal of starter shall be live.
- (5) Inspect starter electromagnetic relay to eliminate fault of electromagnetic relay; it shall obvious to hear the sound making by the relay when it sucks and separates.
- (6) Inspect and repair the starter.
- (7) Start again to engage the starter driving gear and engine flywheel gear.
- (8) Inspect the bearing on the end of starting shaft of starter;
- (9) Small torque of starter, change the starter if necessary.
- (10) Repair the engine to ensure sound operation of engine.

## Attachment: BOM of vehicle parts

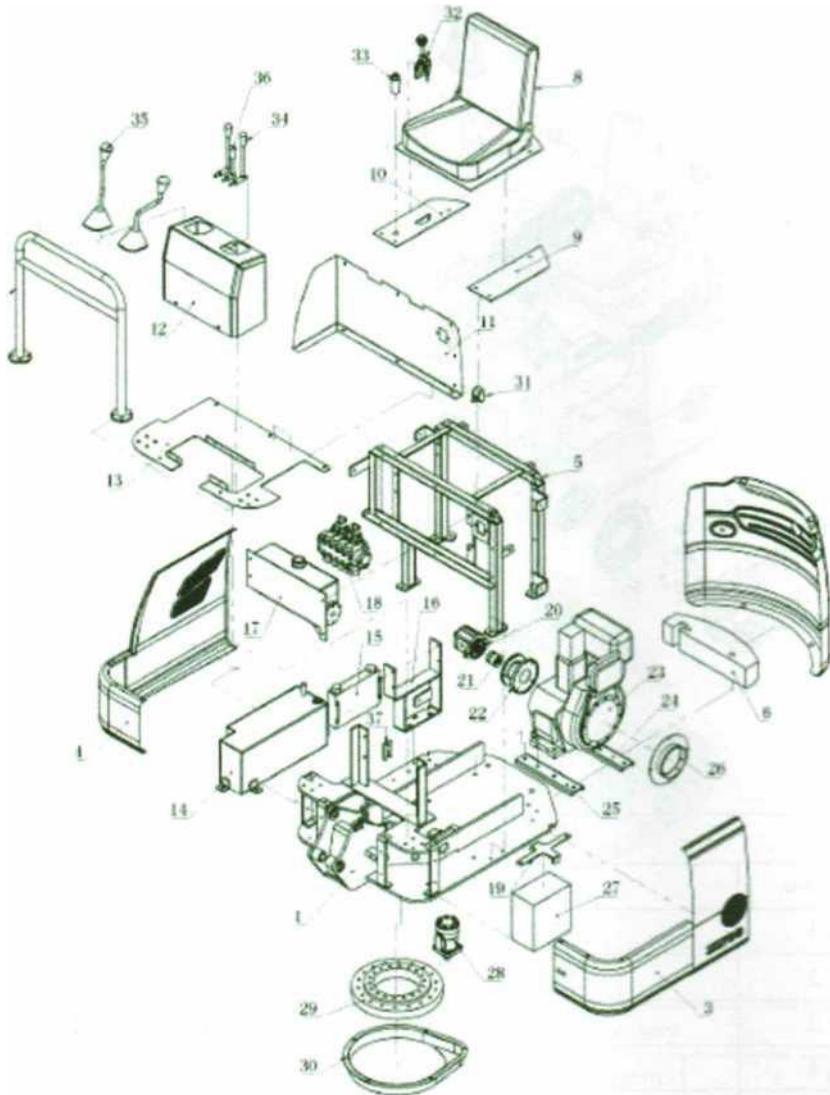


Exploded drawing of 0.8T excavator assembly			
S/N	Name	Quantity	Remark
1	Upper frame assembly	1	
2	Lower frame assembly	1	
3	Front work equipment assembly	1	
4	Slewing bearing assembly	1	
5	Connecting shaft between boom and upper frame	1	
6	Connecting shaft between boom and upper frame	1	
7	Pivot sleeve	2	



1 Lower frame

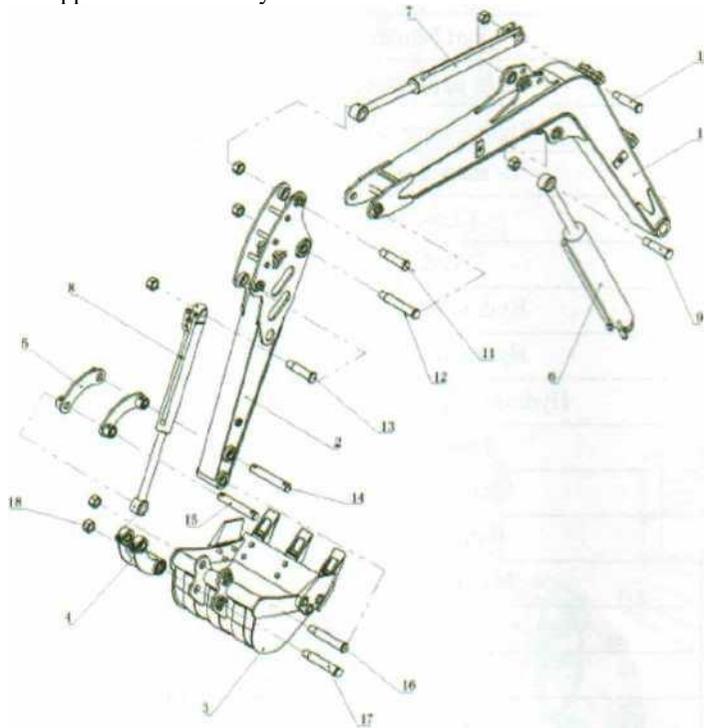
S/N	Part No.	Part Name	Quantity	Remark
1	1.1	Welded dozer shovel	1	
2	1.2	Welded lower frame	1	
3	1.3	Slewing joint	1	
4	1.4	Rubber crawler	2	
5	1.5	Lock nut	2	
6	1.6	Sprocket nuts	16	
7	1.7	Drive wheel	2	
8	1.8	Connecting disc	2	
9	1.9	Sprocket bolts	16	
10	1.10	Bolts fixing the track roller	8	
	L11	Traveling motor	2	
	1.12	Track roller	4	
	1.13	Idler assembly	2	
-	1 14	Pivot nuts	4	
-		Connecting shaft of dozer shovel	2	
X	L16	Connecting shaft of cylinder	2	
	—	Cylinder of dozer shovel	1	
11	L18	Bchs femg idler assembly	g	



2 Upper frame assembly				
S/N	Part No.	Part Name	Quantity	Remark
1	2.1	Welded upper frame	1	
2	2.2	Covers of rear housing	1	
3	2.3	Covers of left housing	1	
4	2.4	Covers of right housing	1	
5	2.5	Welded inside support frame	1	
6	2.6	Rear counterweight plate	1 set	
7	2.7	Armrest	1	
8	2.8	Seat and supports	1	

S/N	Part No.	Part Name	Quantity	Remark
9	2.9	Left- upper cover	1	
10	2.10	Right - upper cover	1	
11	2.11	L- shaped covers	1	
12	2.12	Console	1	
13	2.13	Pedal	1	
14	2.14	Hydraulic oil tank	1	
15	2.15	Hydraulic oil tank	1	
16	2.16	Hydraulic oil tank support	1	
17	2.17	Diesel tank	1	
18	2.18	Multiway valve	1	
19	2.19	Battery platen	1	
20	2.20	Master cylinder	1	
22	2.21	Coupler	1	
21	2.22	Pump disc	1	
23	2.23	Engine	1	
24	2.24	Rear bracket base of engine	1	
25	2.25	Front bracket base of engine	1	
26	2.26	Intake cover	1	
27	2.27	Battery	1	
28	2.28	Rotary motor	1	
29	2.29	Slewing bearing	1	
30	2.30	Dust cover	1	
31	2.31	Main power switch	1	
32	2.32	Manual accelerator	1	
33	2.33	Key starter	1	
34	2.34	Traveling handle	2	
35	2.35	Work handle	2	
36	2.36	Front shovel handle	1	
37	2.37	Slewing joint pallet	1	

## 2 Upper frame assembly



### 3. Front work equipment

S/N	Part No.	Part Name	Quantity	Remark
1	3.1	Boom	1	
2	3.2	Arm	1	
3	3.3	Bucket	1	
4	3.4	Connecting rod	1	
5	3.5	Push rod	i	
6	3.6	Boom cylinder	1	
7	3.7	Arm cylinder	1	
8	3.8	Bucket cylinder	1	
9	3.9	Medium shaft of boom	1	
10	3.10	Rear shaft of arm cylinder	1	
11	3.11	Front shaft of arm cylinder	1	
12	3.12	Front shaft of boom	1	
13	3.13	Rear shaft of bucket cylinder	1	
14	3.14	Medium shaft of arm	1	
15	3.15	Front shaft of bucket cylinder	1	
16	3.16	Front shaft of arm	1	
17	3.17	Connecting shaft between bucket and connecting rod	1	
18	3.18	Shaft locker sleeve	7	