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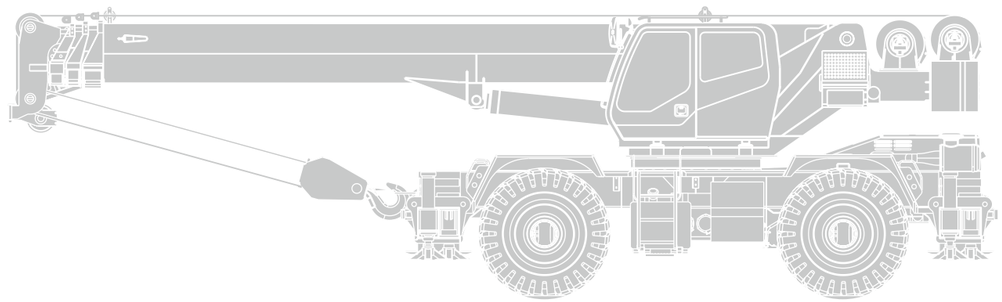
OPERATOR'S MANUAL FOR RT55 ROUGH TERRAIN CRANE



ZOOMLION HEAVY INDUSTRY SCIENCE AND TECHNOLOGY CO.,LTD

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RT55 ROUGH TERRAIN CRANE

OPERATOR'S MANUAL

Edition 1

Dec. 2013

To owners, users and operators

Zoomlion Cranes appreciates your selection of the ZOOMLION Rough Terrain Crane for your application.

The Operator's Manual for RT55 Rough Terrain Crane also covers RT60 for US market.

No one should operate the crane unless they read and understand the information in this manual.

When you follow the instructions in this manual, your crane can operate at MAXIMUM EFFICIENCY.

The operator must keep this manual in the cab of the crane.

If there is anything in the manual that you do not understand, speak with us. We (Zoomlion Cranes) are NOT responsible for damages from an operator who does not obey the instructions in the *OPERATOR'S MANUAL*.

The OPERATOR'S MANUAL is an important part of the crane. If the crane becomes the property of a different person, make sure that the manual stays in the cab of the crane.

THANK YOU!

Mobile Crane Branch Company of ZOOMLION Heavy Industry Science and Technology Co., Ltd.

Safety

Hazard Indicators

DANGER, WARNING, CAUTION, ATTENTION, NOTE, and IMPORTANT labels are on signs and decals, and as you read this manual to show important instructions. In this manual, DANGER, WARNING, and CAUTION labels are before the paragraph or item to which they apply. ATTENTION, NOTE, and IMPORTANT follow the paragraph or item they apply to. The markers are as follows:

⚠ Danger

Refers to a dangerous situation which, if you do not prevent, will cause death or injury.

⚠ Warning

Refers to a possible dangerous situation which, if you do not prevent, could cause death or injury.

⚠ Caution

Refers to a possible dangerous situation which, if you do not prevent, may cause light or moderate injury.

Attention

Refers to a situation which, if you do not prevent, may cause property or equipment damage.

Note

Refers to a tip or hint in the operation instructions.

Important

Emphasizes the importance of the data in this manual.

This symbol shows a step or procedure that is not approved and can cause a dangerous situation.

Contents

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OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 1 Foreword

The owner of this crane must know federal, state and local rules. When your equipment is in operation, the area must be safe for employees and non-employees. Do not cause damage to other equipment or local structures while you operate this crane. The rules change by location and this manual does not give that data.

ZOOMLION makes manuals for different construction and industrial equipment. It is policy to include applicable national consensus, industry standards and safety data with the manuals. Use these data to give applicable training to personnel who are to operate, do the maintenance and supervise the equipment correctly and safely.

We make equipment for heavy-duty labor. Do the periodic inspections regularly because the equipment wears. This prevents accidents, decreases downtime and helps equipment work satisfactorily. The goal of these inspections is to find worn, cracked, damaged parts and loose or missing fasteners before they cause a problem.

Correct training and inspection procedures are necessary to prevent injury to persons, property damage and high maintenance costs.

Read and understand the data that comes with this crane. Help is available from the distributors of your ZOOMLION crane and from the ZOOMLION Mobile Crane Branch Company.

This manual contains the instructions and data on the operation, maintenance, lubrication, and adjustments of the Rough Terrain Crane. Do not operate the crane before you understand the data in this manual.

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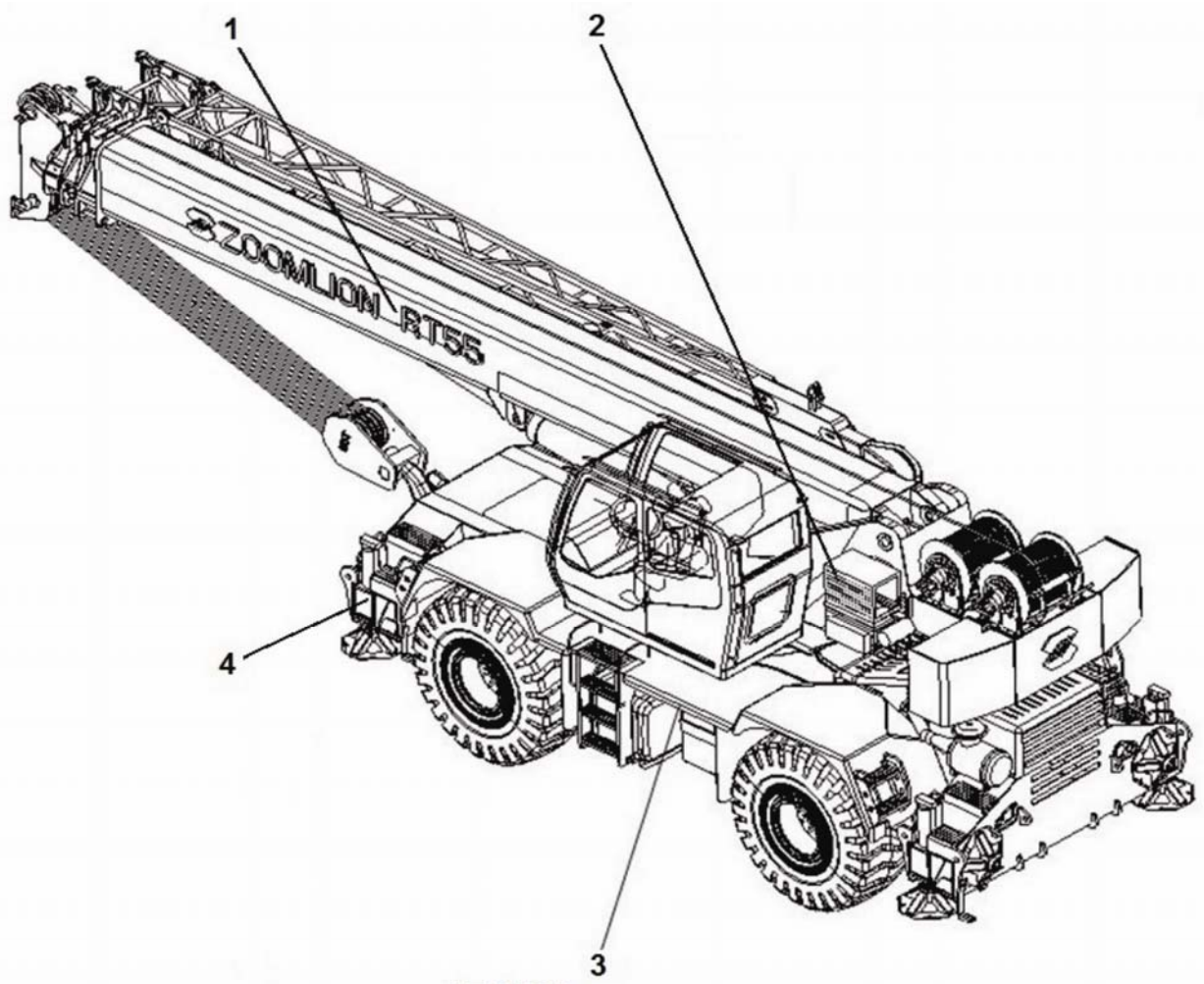
OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 2 Nomenclature

To aid in understanding the contents of this manual, refer to the figure below. Each numbered term can represent several components of the same main part.



LEGEND

1. BOOM SYSTEM = Main boom assy., jib assy., telescoping mechanism, main and auxiliary hooks, hoist rope.

2. SWING SYSTEM = Superstructure, counterweight, main and auxiliary winches, swing bearing, swing reducer, derricking cylinder, cab, airconditioning and cab heater.

3. CHASSIS = Power system, drive system, steering system, air intake system, exhaust system, cooling system, fuel supply system, chassis frame assy. and vehicle body system.

4. OUTRIGGERS = Outrigger beams, outrigger jacks, cylinders and outrigger floats.

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OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 3 Introduction

CRANE PERIODIC INSPECTION CHECKLIST

This inspection checklist provides supplementary data to facilitate the correct operation and maintenance of the crane.

Component Inspected	Interval	Function	Adjusting Condition	Maintenance condition		Component Inspected	Inspection Code	Function	Adjusting Condition	Maintenance Condition

MAINTENANCE LOG

Item	Adjusting Condition	Date

About This Manual

General

The data (data, specifications, illustrations) in this manual is for cranes in production at the time of this manuals publication. We reserve the right to make changes to this manual at any time, without obligation.

This manual contains the instructions to move and operate the RT55 Crane in the field. Follow the operation and maintenance procedures to make sure that your machine operates at MAXIMUM EFFICIENCY. Use the CRANE PERIODIC INSPECTION CHECKLIST. Keep a maintenance log to monitor all maintenance work on the machine.

An example of a *Maintenance Log and Crane Periodic Inspection Checklist* is at the beginning of this section.

Again, we appreciate your selection of our crane. User safety is most important. To complete on-site tasks safely, operators must be responsible. Obey the instructions that follow:

- **Comply –** with Occupational Safety and Health Administration (OSHA), Federal, State, and Local Regulations.
- **Read, Understand, and Follow –** the instructions in this and other manuals and documents that come with the crane.
- **Use Good, Safe Work Practices –** in a common sense way.
- **Only have trained operators –** directed by informed and knowledgeable job-site supervisors.
- **Do not use this crane –** before the portable fire extinguisher, installed in the cab, agrees with local fire protection rules.

Note

OSHA prohibits the alteration or modification of this crane without written manufacturer's approval. Use only factory approved parts to service or repair the crane.

If you make modifications/additions "which affect the safe operation of the equipment" to the crane before you use it, the crane owner must make sure that the modifications/additions agree with OSHA 1926:1412.

Speak with us if special data is necessary for the maintenance or operation of your RT55 Crane. Send your machine model and a serial number to make sure that you receive the correct data.

If there is anything in this manual that is not clear or which you think is necessary, write to the address that follows:

Rough Terrain Crane R & D Institute

Zoomlion Mobile Crane Branch Company

Quantang Industrial Park, 2nd Yuanda Road,

Economic and Technological Development Zone,

Changsha, Hunan Province, China, 410131

You can also speak to us by telephone at 0086-84671987 (international), 0731-84671987 (inside China).

Thank you!

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OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 4 Safety

4.1 HAZARD INDICATORS

DANGER, WARNING, CAUTION, ATTENTION, NOTE, and IMPORTANT labels are on signs and decals, and as you read this manual to show important instructions. In this manual, DANGER, WARNING, and CAUTION labels are before the paragraph or item to which they apply. ATTENTION, NOTE, and IMPORTANT follow the paragraph or item they apply to. The markers are as follows:

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Refers to a situation which, if you do not prevent, may cause property or equipment damage.

Note

Refers to a tip or hint in the operation instructions.

Important

Emphasizes the importance of the data in this manual.

This symbol shows a step or procedure that is not approved and can cause a dangerous situation.

4.2 SAFETY SYMBOL

The safety symbol, used on the Danger, Warning, and Caution labels, tells personnel of possible death, injury, or property damage. Obey all safety data that follows this symbol to prevent dangerous conditions.

Danger

Warning

Caution

4.3 Hazard classification

Hazard classification is a system to show different classes of possible injury levels. A safety symbol and a signal word show how dangerous the level of possible injury can be.

A signal word without a safety symbol refers to property damage, protection devices, or important data. You will find this system used in this manual and on signs on the crane to help find and prevent dangerous situations.

4.4 SAFETY

This section contains the safety rules that you must follow. You must read and understand the *Operator's Manual*. It contains the instructions for the specified machine.

All personnel must be safe at the work location.

Attention

A. Moving personnel

Only use a crane to lift personnel when it is the less dangerous mode to move them to areas that are hard to access.

B. Operator's responsibilities

- Read and understand the *Operator's Manual*.
- The operator must always think about the safety of all personnel in the area.
- Only personnel who show that they can safely control a RT55 crane can operate the crane.
- Comply with the requirements, that apply, as follows:
  - Occupational Safety and Health Administration (OSHA) standards
  - American National Standards Institute (ANSI)
  - European Committee for standardization (CEN)
  - China National Standards GB/T3811.

- Make sure that all the mechanical functions of the crane can operate.
- Make sure that the system operating gauges and indicators, and warning signals function.
- Keep all the glazed surfaces, instruments, windows, and lights clean.
- Remove all oil, grease, mud, ice, and snow from walkway surfaces.
- Read and understand all Decals and Warnings.
- Keep all tools and other necessary items in the toolbox.
- Do not lift a load without a *Load Ratings* in the cab.
- Read and understand the *Load Ratings*.
- Make sure that the load to lift is less than the capacity of the crane.
- Be in good physical condition and free from effects of alcohol, drugs and medications. Be sure to not decrease vision, hearing, or reaction time.
- Keep personnel, equipment and material that are not necessary for your task at the job-site out of the area.
- The operator must know the hand signals.
- When the view of the operator is blocked or if the task is in a dangerous area, use signal personnel to give directions.
- If a signal person is necessary, the operator must obey only the signals from the approved signal person. You must obey the STOP signal from all personnel in the area.
- Keep a fully charged fire extinguisher and first aid kit in the cab at all times. The operator must know how to use the fire extinguisher and how to apply the items in the first aid kit.
- Look for the movement of other equipment, trucks, and personnel at the job-site.
- Personnel must stay off the crane platform while the crane is in operation.
- All personnel must be in a safe area before you move the hook, boom, load, or outriggers.
- Stop and start the movement of the load smoothly and move at a speed that keeps the load in your control.
- Keep a minimum of three full wraps of wire rope on the drum.
- Use the tag lines to keep the load in control.
- Keep the load near the ground.
- Use the shortest boom possible.
- If a load is off the ground or the crane is on, you must stay in the cab.
- Always use outriggers as the *Load Ratings* and *Operator's Manual* tells.

C. Signal personnel responsibilities

- Use and understand all standard hand signals.
- Help the operator to operate safely and satisfactorily. Keep safe all personnel and property.
- Understand the work you must do.
- Stay where you can see the full operation and where personnel can see you.

D. Responsibilities of all crew members

- Correct the conditions and procedures that are not safe.
- Obey WARNING signs.
- Do your work safely and do not make dangerous conditions.
- Know and understand correct procedures for crane erection and rigging.
- Tell the operator and the signal person of dangerous conditions (power lines / cables, work surface that is not stable etc.).

E. Management responsibilities

- The operator must be competent, in good physical condition and have applicable licenses.
- The operator, signal person, and riggers must receive training in correct crane operation.
- The operator and the signal person must know all standard hand signals.
- Have a supervisor at the job-site to be responsible for safety.
- Give crew members the safety instructions and tell them to report conditions that are not safe to the supervisors.
- Supply the operator with accurate data on the load that they have to lift.
- Make sure that all personnel know applicable OSHA, ANSI B30.5 and EN 13000 requirements and the instructions in manuals.

F. Planning the job

- Understand the work that you must do.
- Think of all possible dangerous conditions/risks at the job-site.
- Know the type of personnel that is necessary.
- Give the tasks to personnel.
- Know the weight of the load that you must lift.
- Find the lift-radius, boom angle, and the rated lift limits of the crane.
- Tell the signal person how to communicate with the operator.

- Use equipment which does the work safely.
- Make a decision on how to safely move equipment to the job-site.
- Find gas lines, power lines and structures.
- Make sure that the work surface can hold the crane and load.
- Find out how to rig the load.
- If necessary, make the special safety precautions.
- Know the weather conditions.
- Keep equipment that is not necessary away from the job-site.
- Set the crane to use the shortest possible boom and radius.

G. Operator safety check

- Safety related items must be in position.
- Look at the crane logbook for maintenance and inspection records.
- Make sure to complete necessary repairs.
- Examine the wire rope for damage (kinks, broken wires etc.).
- Make sure that all field modifications are approved.
- Do an inspection for air and hydraulic oil leaks.
- Examine the control positions before you start the engine.
- After you start the engine, examine all the instruments and indicators for the correct values.
- Do a test on the controls.
- Check brakes.
- Lift and hold a load 2 inches (50 mm) off of the work surface to examine the load brakes.

H. Operator aids check

- Anti-Two Block devices
- Boom angle indicator
- Backup alarms
- Swing lockout device
- Rated capacity indicator (RCI)
- 3rd wrap indicator.

I. Operation overload prevention

- Know the weight of the load.

- Decrease radius at the start of the lift to let the load radius increase during lift.
- Know the weight of the hook and rigging.
- Know the boom length, jib length, and the area where you have to move the load.
- Use next lower rated capacity when working at the boom length or radius between the figures on the rated lifting capacity chart.
- Do not lift a load until you know if the load is less than the capacity limit of the crane.
- Only operate with the recommended counterweights. It is dangerous if you do not use the approved charts to calculate the decrease or increase in counterweight.
- Do not lift the load if winds are dangerous. If necessary, lower the boom.
- See the *Load Ratings* for possible restrictions.
- Avoid side loading.
- Do not let the load or other objects hit the boom.
- Release the load slowly, be sure the boom does not tighten against back stops.
- Put the boom point directly above the load.
- Be sure that the load hangs freely.

J. Operation setup

- Be sure the load-bearing surface can hold the weight of the crane and load.
- Make each crane level, check frequently, and re-level them when necessary.
- Assemble barricades to keep personnel out of the load move radius.

K. Power line safety

- Find power lines in the area before you start a task. Follow national and local regulations and ANSI B30.5 when you operate around power lines.
- Do not remove the material from below power lines if the boom or crane can touch the lines.
- Do not let the crane or load touch electrical lines. Do not go near the minimum permitted clearance for operation of a crane near electrical lines.
- If you touch the electrical lines, stay on the crane until the boom moves off the lines or until the power line current is off.
- Keep all personnel off the crane if it touches power lines. If you must move from the crane, JUMP, DO NOT STEP OFF. Jump with feet together.
- Use a signal person when you operate around power lines

L. Slip and fall prevention

- Make sure that you stop the crane before you move on and off the equipment. Do not jump.

- Do not use the controls and the steering-wheel as hand holds.
- Keep the equipment clean and dry.
- Replace all broken ladders.
- Keep the non-slip surfaces in good condition.
- Wear a safety harness when you climb the counterweight and attach the harness in the necessary points. Do not walk on the boom!

M. Travel

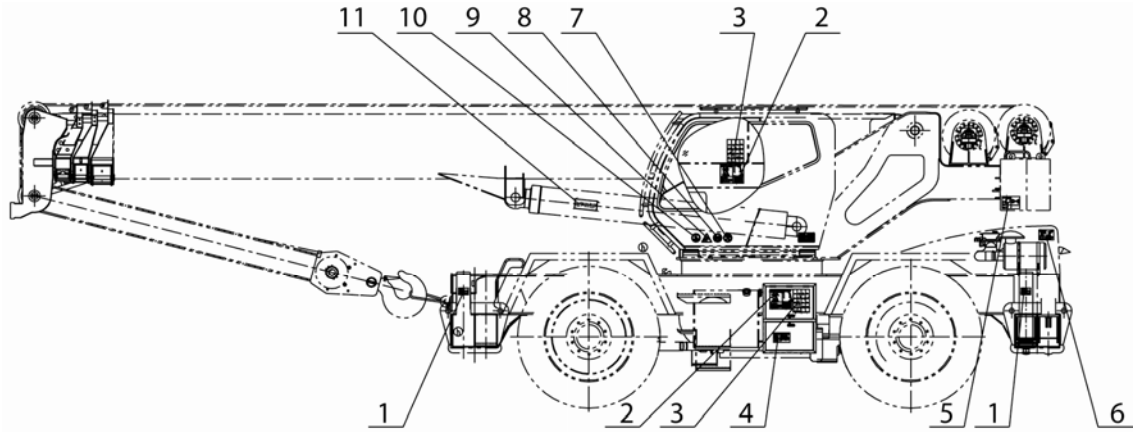
- Be careful when you move cranes on or off the job-site.
- Look for personnel, power lines, low or narrow clearance, bridge or road load limits, steep hills, or rough terrain.
- Correctly stow the boom before you move the crane.
- Inflate the tires to the specified pressure.
- Move slowly and prevent sudden movement.
- Wear seat belt correctly when you move the crane.
- Make sure that the travel surface can hold the weight of the crane and load.
- Always use the park brake when you park the crane.

N. Safety sign maintenance

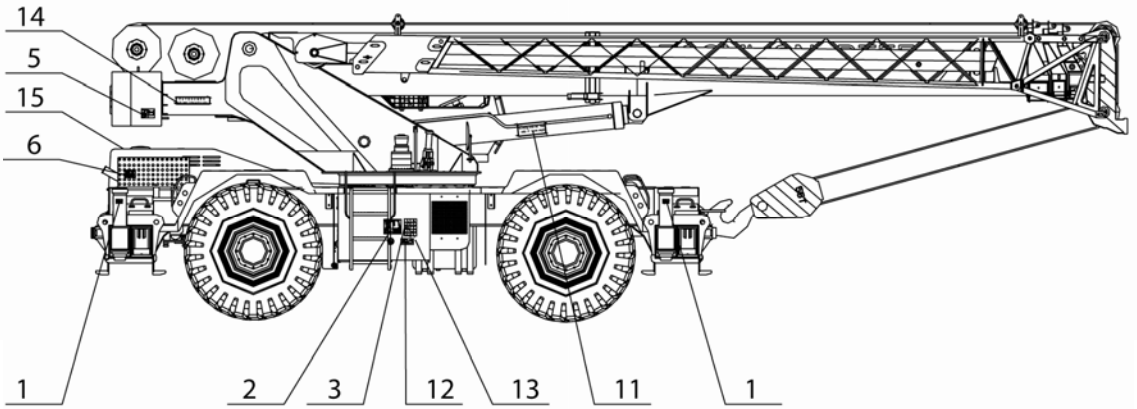
During the daily inspection, make sure that the decals show and are in good condition. Replace all missing or damaged safety signs. The safety of the operator is always important.

Use a weak soap and water to clean the safety signs. Do not use solvent-based cleaners. Solvents can cause damage to the safety sign material.

The graphics, on the pages that follow, give an example of each safety decal and its location.



Left-hand Side



Right-hand Side

Figure 04 – 1 Overview of the Safety Signs on the Machine

Figure 04 – 2 Danger – Crush Hazard

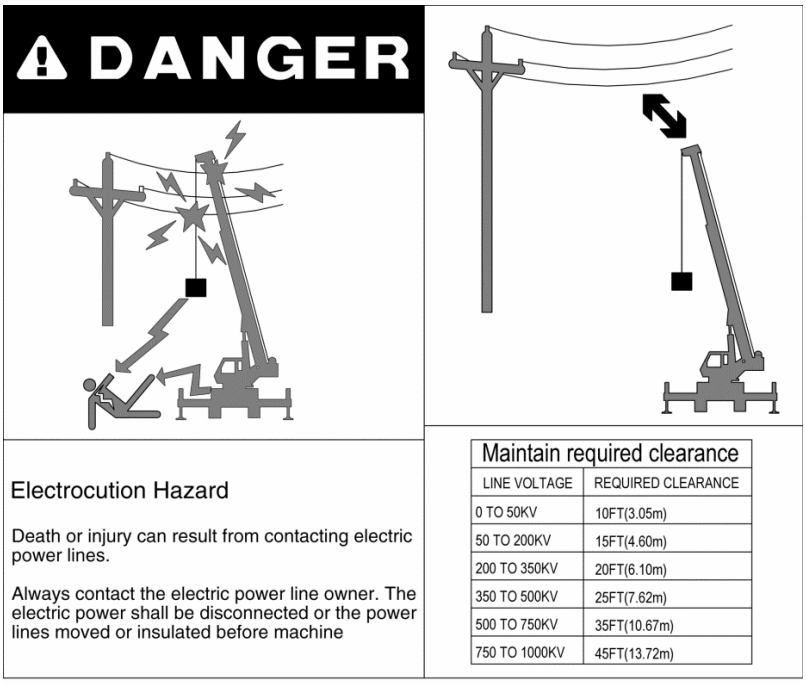


Figure 04 – 3 Danger – Electrocution Hazard

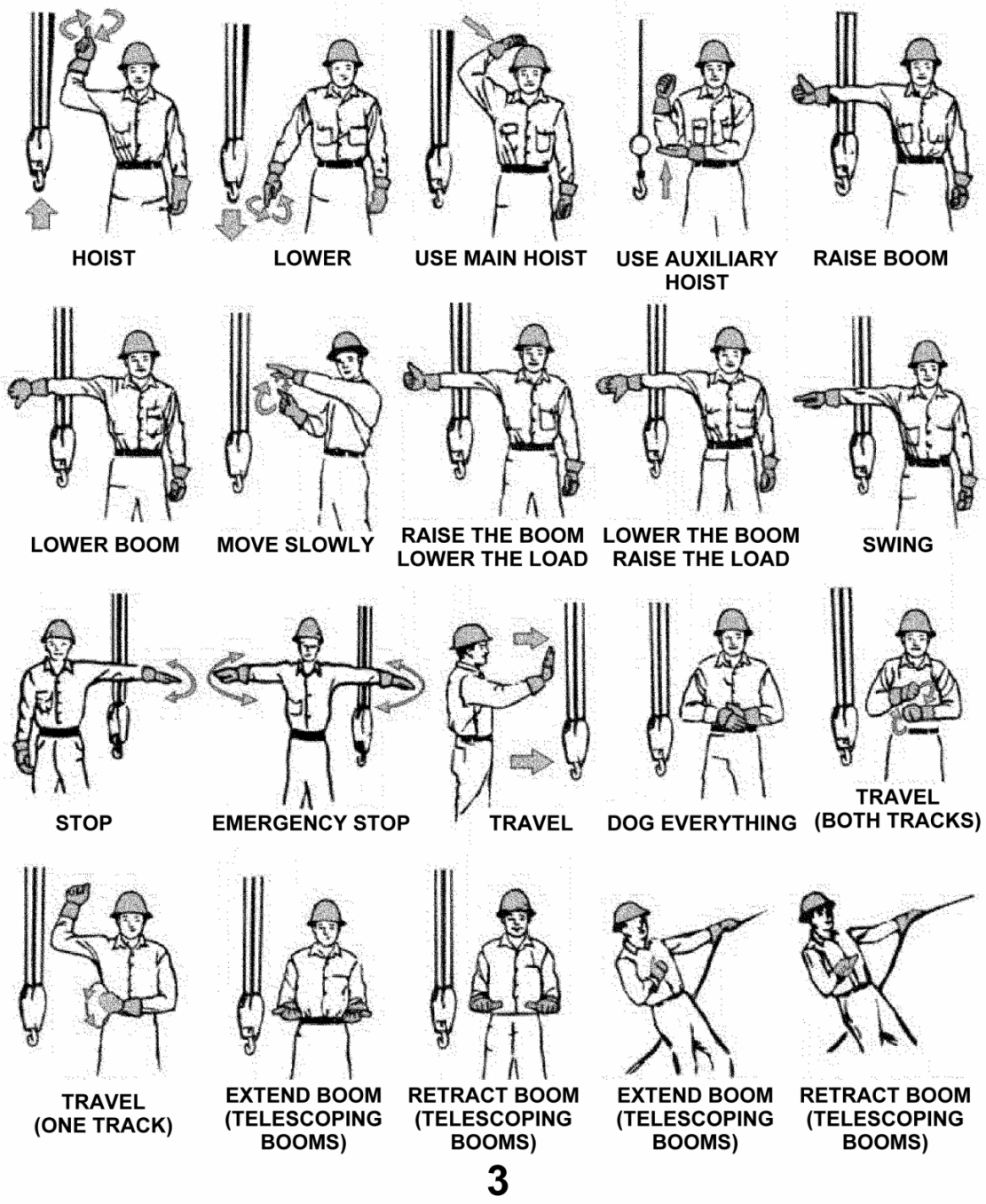


Figure 04 – 4 Hand Signals for Crane Operation

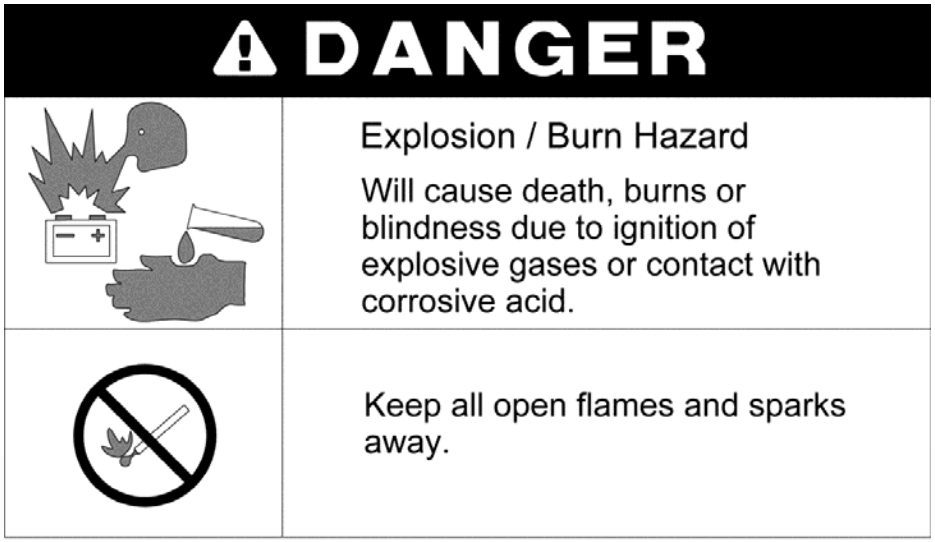


Figure 04 – 5 Danger – Explosion / Burn Hazard

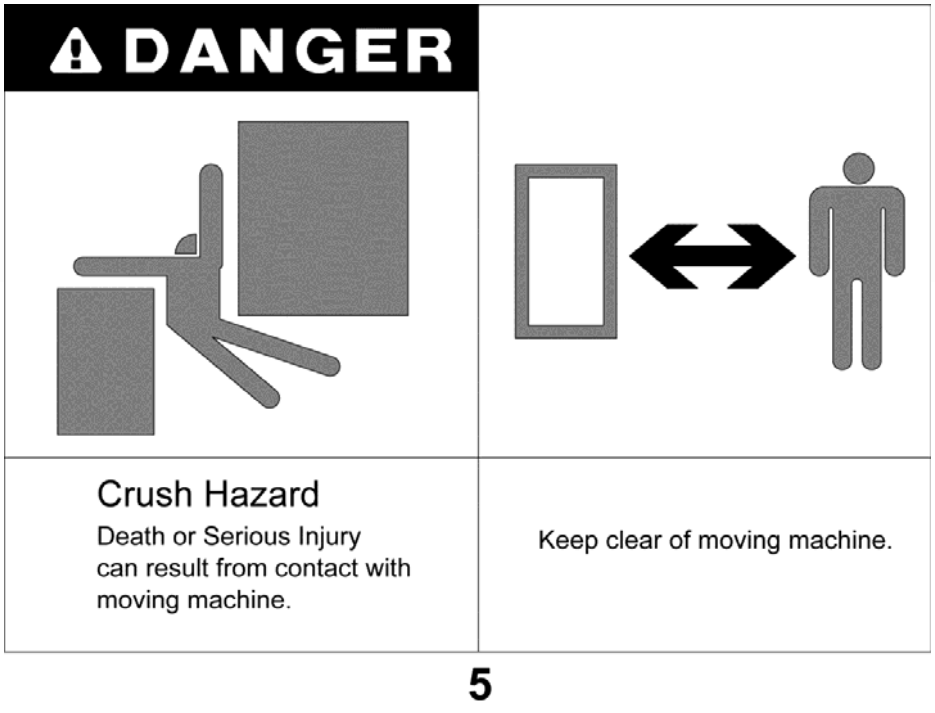


Figure 04 – 6 Danger – Crush Hazard

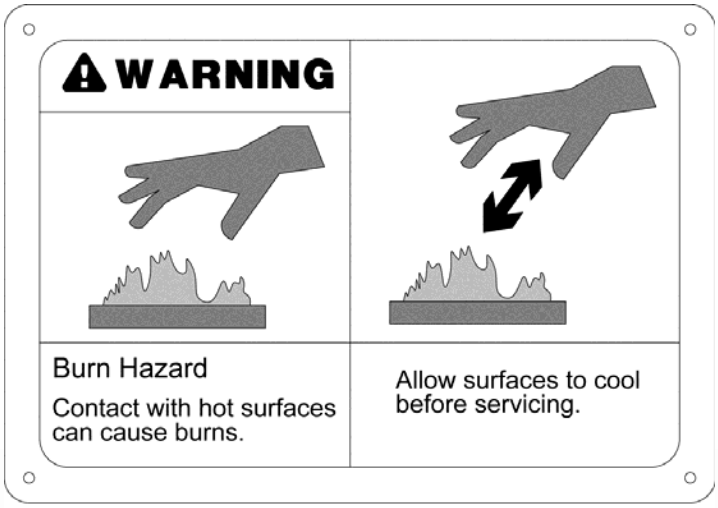


Figure 04 – 7 Danger – Burn Hazard

Figure 04 – 8 Prohibited – No Thoroughfare

Figure 04 – 9 Prohibited - No Access / Only Authorized Personnel

9

Figure 04 – 10 CAUTION - Risk of Falling

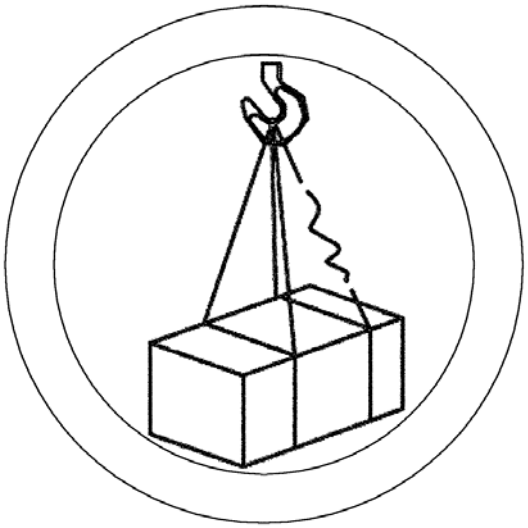


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Figure 04 – 11 CAUTION - Swinging Load

11

Figure 04 – 12 No Swing over the Rear with -3°

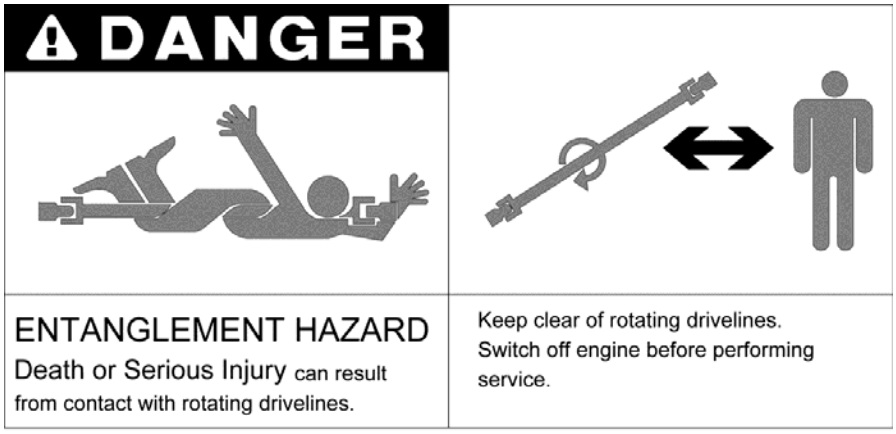

Figure 04 – 13 Entanglement Hazard

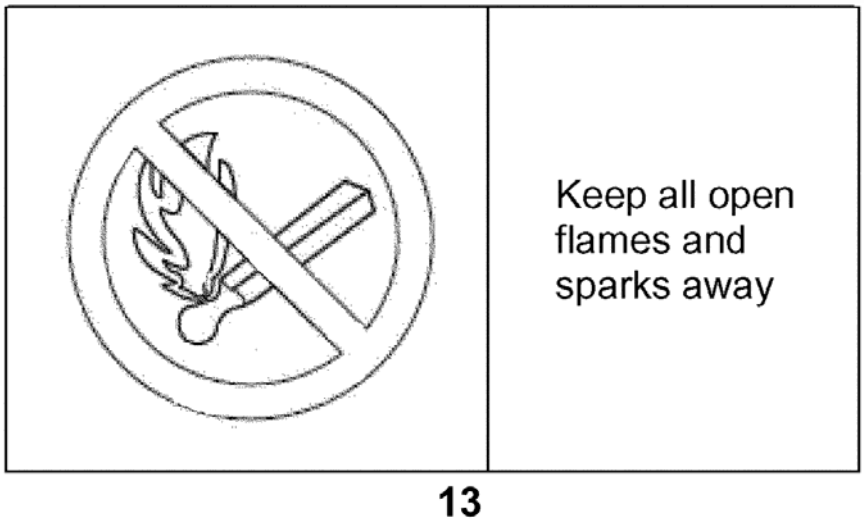

Figure 04 – 14 Keep All Open Flames and Sparks Away – RH Only

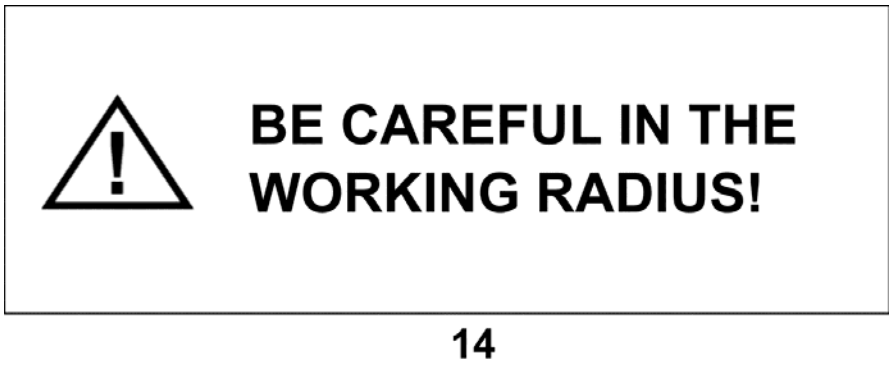

Figure 04 – 15 Be Careful in the Working Radius – RH Only

Figure 04 – 16 No Walk – RH Only

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OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 5 Operating conditions and points for attention

5.1 OPERATING CONDITIONS

A. Always use the correct light diesel fuel and engine oil. Make your selection on the lowest ambient temperature where you are to do the work. Refer to the table below for more data on diesel and engine oil. Obey the *Engine Manual* if the data in this table is incorrect.

Engine Emission	Oil Brand	Specification
According to guidelines per US EPA Tier 3 Emission Standards	Sulfur content ＜ 15 PPM, according to US EPA2007 regulations	CH – 4 stage, API classification
According to guidelines per EURO Stage III A Emission Standards	Sulfur content < 50 PPM, according to EN 590 regulations	CH – 4 stage, API classification

⚠ Warning

- **The fuel sulfur content in the fuel must be less than 15 PPM to obey US EPA Tier 3 Emission Standards.**
- **The fuel sulfur content must be less than 50 PPM to obey EURO Stage III A Emission Standards.**
- **Do not use fuel that is mixed with a lubricant or accredited additives.**

B. All mechanical components are in a break-in state during initial crane operation (less than 100 operating hours). You must follow the below instructions during this time period:

- The working load and working speed must not be too high.
- The maximum lift capacity should not be larger than 80% of the rate one.
- Do not operate the crane at a speed that is more than the maximum limits.

C. Make sure that you do all of the work on level ground that is hard. The ground must hold more than the load bearing capacity (permissible ground pressure ≥ 507.6 psi (3.5 MPa)). Use material (such as wooden timbers) below the outrigger floats if the work area is soft or not flat.

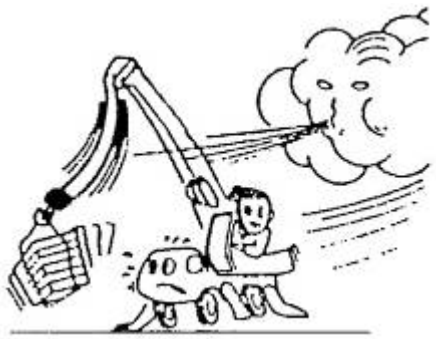
D. Before you operate the crane that is supported on outriggers, all wheels must not touch the ground. Before "On tires lifts", make sure that you align the crane wheels to the middle.

E. Do not operate the crane if the temperature at the job-site is more than -4°F to 104°F (-20°C to +40°C).

F. If wind speed is greater than the permissible value of 45 ft/s (13.8 m/s), while the crane is in operation, do the tasks that follow:

- Stop the work (safely lower the load).

- Retract the boom.
- Correctly stow the boom.



To make an estimate of the wind speed, use the table that follows:

Wind Force		Wind Speed		Effect of the wind on the land
Beaufort Scale	Description	ft-in/s	m/s	
0	Calm	0 - 8″	0 - 0.2	No wind, smoke rises vertically
1	Light Air	1′-4″ - 4′-7″	0.4 - 1.4	Wind direction shown by smoke drift but not by wind vanes
2	Light Breeze	5′-3″ - 9′-10″	1.6 - 3	Wind felt on face, leaves rustle, vanes move by wind
3	Gentle Breeze	11′-2″ - 17′-5″	3.4 - 5.3	Leaves and small twigs in constant motion, wind extends light flag
4	Moderate Breeze	18′-1″ - 25′-7″	5.5 - 7.8	Small branches move
5	Fresh Breeze	26′-3″ - 34′-9″	8 - 10.6	Small trees in leaf begin to sway
6	Strong Wind	35′-5″ - 45′-0″	10.8 - 13.7	Large branches in motion; difficult to use umbrellas, whistling heard in telegraph wires
7	Near Gale	45′-7″ - 55′-9″	13.9 - 17	Whole trees in motion, difficult to walk against the wind
8	Gale	56′-5″ - 67′-7″	17.2 - 20.6	Breaks twigs off trees, impedes progress
9	Strong Gale	68′-3″ - 80′-5″	20.8 - 24.5	Slight structural damage (roof tiles and chimney covers, etc. blown off)
10	Storm	81′-0″ - 92′-10″	24.7 - 28.3	Trees uprooted, considerable damage occurs

G. Do not operate the crane until the conditions are safe.

5.2 PRE-DEPARTURE CHECKS (TO JOB-SITE)

A. VEHICLE CHECKS (PRIOR TO ENGINE START)

(1) Do a check of the level of coolant and add more if below the cold engine level.

(2) Do a check of the fuel level and make sure that you have more than is necessary to complete the task.

(3) Make sure that the parts in the steering and brake systems are flexible, safe, and reliable.

(4) Make sure that the parts that follow are tight:

- Bolts in universal joints for steering axles
- Front and rear axles mounting bolts
- Wheel bolts
- Drive shaft mounting bolts
- Engine and transmission mounting bolts.

(5) Examine all tires for the correct pressure.

(6) Examine the items that follow for damage:

- Condition of tires
- Door locks
- Doors
- Windows
- Crane control mechanisms.

(7) Examine the fittings of oil pipes, air pipes and water pipes for leakage.

(8) Examine the air pressure tank for condensation (drain the water as necessary).

(9) Examine the battery terminals for too much corrosion and make sure that the power wires are tight.

(10) Examine the level of the battery electrolyte (adjust as necessary).

(11) Examine the air filter indicator. If the indicator is red, clean or replace the filter cartridge.

⚠ Caution

The air filter system must be clean prior to starting the engine.

(12) Examine the air filter assembly. Clean the contamination from the bottom of the air filter.

(13) Turn the ignition switch to stage "I" and examine the functions of the items that follow:

- Instrument panel
- Switches
- All lights
- Turn signals
- Wipers
- Miscellaneous displays.

(14) Adjust the mirrors for clear vision to the rear.

B. GENERAL CHECKS AT VEHICLE START UP

Caution

Before you start the vehicle on a steep slope or a muddy road, move the transmission gear selector into "F1" position.

Caution

Do not turn the power supply OFF while the engine in ON. If you turn the power supply OFF, the electrical system does not operate and you remove the data from the ECU.

(1) Examine the controls and instruments.

(a) Examine the engine oil pressure gauge.

1 The engine oil pressure must be between 240 PSI (1.7 MPa) – 310 PSI (2.1 MPa).

(b) Examine the compressed air supply.

(c) Examine the engine coolant temperature gauge.

1 After the engine has the time to warm-up, the pointer must point to the green range (between 158° F (70° C) and 203° F (95°C)).

(d) Make sure that the transmission gears shift correctly.

(e) Make sure that the 360° superstructure lock moves correctly.

(2) Make sure that each indicator operates.

(3) Make sure that the generator operates.

(4) Make sure that the park brake is not ON.

(5) Move the transmission gear selector to the "F1" position and slowly increase the speed.

C. MOVE THE CRANE TO THE JOB-SITE

Danger

Do not let the vehicle move forward when transmission is in neutral.

Warning

Do not operate a vehicle if a warning indicator illuminates. Stop the vehicle and have it repaired.

(1) If a warning indicator illuminates, decrease your speed immediately and stop at a safe location for maintenance checks.

(2) Do not skip a gear when you move through the gear cycle.

(3) During driving, if there is any abnormal sound, smell, vibration or acceleration, bring the vehicle to a standstill immediately and check. If the cause of problem is unclear or if the problem cannot be rectified, send the vehicle to the specialized repair factory.

(4) Stop the vehicle if there are unusual conditions with the items in the below list:

- Steering
- Braking
- Sounds or smells
- Vibrations
- Sudden speed increase or decrease.

If you cannot find or correct the problem, send the vehicle for repair.

(5) Check the following instruments for functions:

(6) Monitor the indicators / gauges that follow:

Caution

Stop the engine if the engine oil pressure low indicator illuminates.

Caution

The engine oil pressure low indicator illuminates if the engine oil filter screen is dirty. If this occurs, examine the engine oil pressure. If it is in the correct pressure range, check and clean the engine oil filter screen.

(a) Engine oil pressure low indicator:

1 Not illuminated.

2 When the engine runs at idle, the minimum oil pressure is 55.1 psi (0.38 MPa). When the engine runs without a load, the minimum oil pressure is 10 psi (0.069 MPa). If the pressure is less than the minimum value, the indicator illuminates. If this occurs, stop the engine. Measure the level of

the oil in the engine and check for leaks. If the oil level is at the correct level and there are no leaks, it is an unserviceable lubricating system. Send the crane to the factory for repair.

(b) Engine coolant temperature gauge

1 The coolant temperature must be between 158°F and 203° F (70°C and 95°C). Do not move the crane at high speed when the coolant temperature is less than 158°F (70°C).

2 Do not operate the engine at high speeds without a load for extended periods of time.

⚠ Caution

Do not move the crane at high speeds with a heavy load until the engine coolant temperature is a minimum 158°F (70°C).

3 When the coolant temperature is in the yellow area, between 203°F and 212°F (95°C - 100°C), the engine is too hot. Park the crane. Operate the engine at a RPM immediately above idle to help cool the engine. Or, as you move, put the transmission in a lower gear range to decrease the load on the engine.

⚠ Caution

Do not stop the engine immediately when the engine coolant temperature is above the maximum limit. If you stop the engine, the coolant temperature increases suddenly and damage to the engine occurs. Operate the engine at a RPM immediately above idle to help decrease the coolant temperature.

4 When the coolant temperature gauge points to the red area, between 212°F and 248°F (100°C - 120°C) continuously, it shows that the engine is above limits. If you stop the engine, the coolant temperature increases suddenly and damage to the engine occurs. Operate the engine at a RPM immediately above idle to help decrease the coolant temperature.

5 When the coolant temperature goes back to the green or yellow area, do the items that follow:

- Examine the engine area for leaks.
- Examine the function of the thermostat.
- Check the coolant level.
- Check the fan belt for damage.
- Make sure that the fan belt is not too loose.

⚠ Caution

Do not add a large quantity of cold water to the engine if the engine coolant

temperature is above the maximum limit. This can kill or blind you and cause damage to the engine.

(c) Low engine coolant:

⚠ Caution

Use soft water, e. g. tap water, for coolant. Do not use hard water (river water).

1 Do not add a large quantity of cold water too quickly. When it is necessary to add cold water, put the water in slowly. Follow the below instructions to add coolant:

- Put together water, antifreeze and/or anti-rust fluid in the correct ratio.
- Loosen the cap to the coolant tank with a wet rag to release the pressure in the tank. After you release the pressure, continue to remove the cap. The fluid released is hot and pressurized and can cause burns or blindness. Always keep your face away from the cap on the coolant tank.
- Add the water mix to the applicable coolant tank fill-line and then install the cap.

⚠ Caution

Do not operate the engine continuously at high speeds without a load.

(7) Put the crane in a lower gear before you move up a slope to decrease the load on the engine and drive-line.

Note

Make sure that the RPM of the engine is around maximum when you move up a slope.

⚠ Caution

Do not bypass gears when you move to a lower gear.

Slow the crane down before you change to a lower gear.

(8) Do the items that follow before you go down a long hill slope:

- Make sure that the brake system can stop the crane before you go onto the slope.
- Put the transmission in the "F1" position before you go down the slope.

(9) Know the below data while you steer the crane:

- When you go into a corner, put the transmission in a lower gear and apply a small quantity of pressure on the brakes.

- The steering wheel has a mechanical limit. Do not continue to turn the wheel when at the limit. Do not keep the wheel at the limit for long periods of time.

(10) If the engine stops because the fuel tank is empty, air can go into the fuel system. When this occurs, you remove the air from the fuel lines.

(11) When you move the crane between locations, only one person is approved to be in the cab.

D. CRANE MOVEMENT IN OFF-ROAD CONDITIONS

When the rear axle is in the mud (no traction) or on rough terrain, follow these steps:

- Put the transmission in the ”F1” position. This applies more torque to the drive system.
- Put the vehicle in the "4-wheel drive" mode.
- Tow the vehicle or put rigid materials, e.g. pieces of wood or iron plates, below the wheels.

E. PARK THE VEHICLE

⚠ Caution

Make sure that the hazard indicator illuminates when the vehicle is parked on the road at night.

(1) When you park the vehicle, follow the instructions below:

- In bad weather condition (rain, snow, ice) or on a slope, make sure that there is a lot of clearance in front and to the aft of the vehicle.
- Put the park brake switch to the "P" position and put the chocks against the wheels.
- Put the transmission in the "neutral" position.

(2) Before you stop the engine, do the items that follow:

- Push the accelerator pedal 2 or 3 times to increase the engine RPM. This makes the oil flow into each part of the engine.
- Let the engine idle while you monitor the coolant temperature.
- Stop the engine, when the coolant temperature is in the correct range.
- Put the battery master switch to the OFF position.

F. EMERGENCY STOP ON THE ROADWAY

If the crane malfunctions on the roadway, do the items that follow:

- Set the hazard lights to ON and put the safety triangles in position.
- Set the park brake if you stop because of a drive train (drive shaft, axle) failure or you make an emergency stop on a slope. Put the chocks on the wheels.

- Examine the vehicle to find the part that caused the malfunction. Be careful of the road conditions while you move around the vehicle.
- If you cannot repair the vehicle, tell the servicing and repair facility.

G. PREPARE THE CRANE FOR OPERATION

(1) Examine the items that follow:

- Engine oil for correct level and make sure that it is clean.
- Coolant for correct level.
- Fuel tank for correct level.
- Hydraulic oil tank for correct level.

(2) Start the engine and check for noises and vibrations that are not usual. If necessary, engage the PTO.

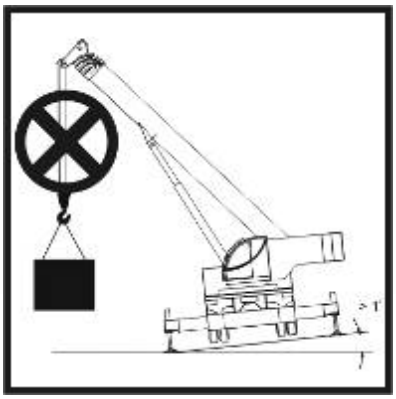
H. WHEN THE CRANE IS IN OPERATION

(1) Personnel must stay away from the area below the boom.

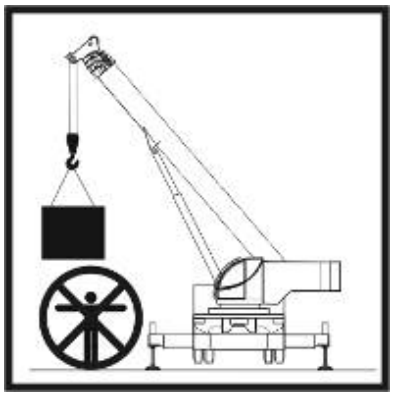
(2) Do not let personnel on the superstructure while you operate the crane.

(3) Personnel must stay away from the reach of the boom.

(4) The crane, with extended outriggers, must be on the ground with a slope of less than 1°.



(5) Do not move a load above personnel.



(6) Do not move personnel on the load or other equipment used to lift.

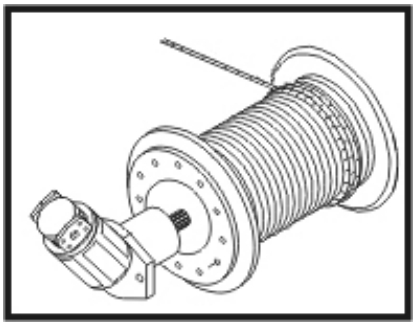
(7) Do not use the crane for the tasks that follow:

- Lift a load that is above the capacity of the crane.
- Pull a load at an angle.
- Lift a load that is not in balance.

(8) Do not try to lift a load that is buried or frozen on the ground.

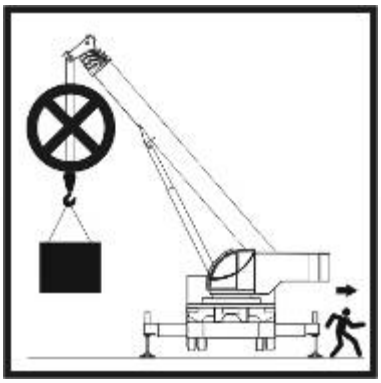
(9) Do not extend / retract the boom with a suspended load.

(10) Keep no less than 3 wraps of wire rope on the drum.

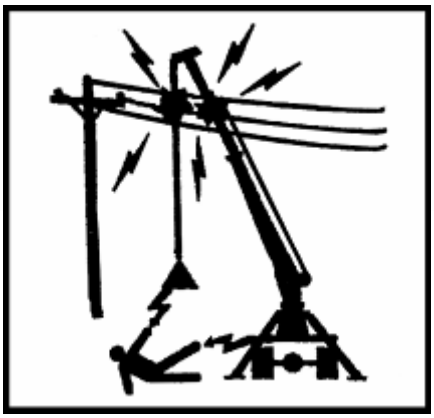


(11) When the load is off the ground, do not adjust the hoist mechanism brake.

(12) When the load is off the ground, the operator must stay in the cab.



(13) When the job-site is near live power lines, you must keep a safe distance. Make sure that the dangerous area has a cover or is fenced off.



(14) When the load is off the ground, move the load in a slow and smooth direction.

(15) Constantly monitor the system gauges and indicators, when the crane is in operation. If you find a malfunction, stop the operation.

(16) A noise sounds when the load is at 90% of the capacity of the crane. When this occurs, be careful as you continue to lift.

(17) If the crane was changed, do not operate the crane until approved personnel examine the changed part.

(18) Stop the operation or do not start to lift a load, if one of the items that follows occurs:

- An overload or if the weight of the load is unknown.
- The load lift moves out of position, the rigging becomes too loose or the load is out of balance.
- The protective material between the edges of load and wire rope is missing.
- The light level at the job-site goes below a safe work condition.
- Equipment malfunction or damage to the crane that decreases the safe operation of the crane.

ZOOMLION

OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 6 Controls and instruments

This part of the chapter is to show you the controls and instruments on the crane. This is only a small part of the data that you must know before you can safely operate the crane. Do not operate the crane until you are trained in all the other sections of this manual.

Figure 06 – 1 Upper Controls and Instruments

LEGEND

1. High / Low Speed Select Switch for Main Winch
2. Steering Switch
3. Camera Display
4. High / Low Speed Select Switch for Aux Winch
5. Air Conditioner Control Panel
6. A/C Fan Speed / Mmaster Switch
7. Cab Heater Power Switch
8. Cab Cooler Power Switch
9. Monitor Display
10. Media Player
11. Rated Capacity Indicator (RCI) Display
12. Left Front Outrigger Switch
13. Left Rear Outrigger Switch
14. Emergency Stop Button
15. Right Front Outrigger Switch
16. Right Rear Outrigger Switch
17. Work Light Switch
18. Hazard Lights Switch
19. Cigarette Lighter
20. Ignition Switch
21. Outrigger Extend / Retract Master Switch
22. Swing Lock Switch
23. 2-Wheel / 4-Wheel Drive Switch
24. Hand / Foot Throttle Select Switch
25. Bypass Switch
26. Hand Throttle

Figure 06 – 2 Left Dash

1. **LEFT REAR OUTRIGGER SWITCH –** Used to select outrigger cylinder (jack or beam) to be extended / retracted with **OUTRIGGER EXTEND / RETRACT MASTER SWITCH (21)** (See Figure 06 – 1).
2. **LEFT FRONT OUTRIGGER SWITCH –** Used to select outrigger cylinder (jack or beam) to be extended / retracted with **OUTRIGGER EXTEND / RETRACT MASTER SWITCH (21)** (See Figure 06 – 1).
3. **HIGH / LOW SPEED SELECT SWITCH FOR MAIN WINCH –** Sets the main winch speed to OFF, LOW or HIGH.
4. **RIGHT REAR OUTRIGGER SWITCH –** Used to select outrigger cylinder (jack or beam) to be extended / retracted with **OUTRIGGER EXTEND / RETRACT MASTER SWITCH (21)** (See Figure 06 – 1).
5. **RIGHT FRONT OUTRIGGER SWITCH –** Used to select outrigger cylinder (jack or beam) to be extended / retracted with **OUTRIGGER EXTEND / RETRACT MASTER SWITCH (21)** (See Figure 06 – 1).

CAUTION

Set the steering switch to crab or 4-wheel steer only when the axles are in the center position. If you do not this, the range of steering decreases and it can lock.

If the wheels lock, set the steering switch to 2-wheel steer and turn front wheels. Move the switch to crab or 4-wheel steer and then put the wheels to the center position.

Be careful when the superstructure is not in the travel position. The steering is opposite when the boom is in the rear position.

6. **STEERING SWITCH –** The 4 modes are as follows:

2-wheel steer (front wheel) 2-wheel steer (rear wheel) Crab steer 4-wheel steer

7. **HIGH / LOW SPEED SELECT SWITCH FOR AUX. WINCH –** Sets the auxiliary winch speed to OFF, LOW or HIGH.
8. **EMERGENCY STOP BUTTON –** In an emergency, push this button to immediately STOP all crane functions. Turn the button clockwise to release the button.
9. **WORK LIGHTS SWITCH –** Push down to turn on the headlights and boom work lights, up to turn off.
10. **HAZARD LIGHTS SWITCH –** Push down to turn on the rotating beacon and flash the turn signals and boom head light.
11. **CAB HEATER POWER SWITCH –** Used to turn on the cab heater. The controls to adjust heat are on the **AIR CONDITIONER CONTROL PANEL (5)** (See Figure 06 – 1).

Figure 06 – 3 Right Dash

1. **OUTRIGGER EXTEND / RETRACT MASTER SWITCH –** Used with switches (12, 13, 15, 16 in Figure 06 – 1) to extend and retract the outrigger beams and jacks. Push down to retract, up to extend.

CAUTION

You must set the swing lock switch to LOCK, when the boom is in the travel position.

2. **SWING LOCK SWITCH -** Push down to disengage swing lock, up to engage.

CAUTION

Do not use this switch until you stop the crane.

3. **2-WHEEL / 4-WHEEL DRIVE SWITCH –** Push up to engage 2-wheel drive, down to engage 4-wheel drive.
4. **HAND / FOOT THROTTLE SELECT SWITCH -** Push up to select foot throttle, down to select hand throttle.
5. **BYPASS SWITCH –** Push down to bypass the switch-off when the RCI sounds the alarm and switches off the movements. (BYPASS SWITCH ont used with Greer LMI system.)

6.1.1 AIR CONDITIONER CONTROL PANEL

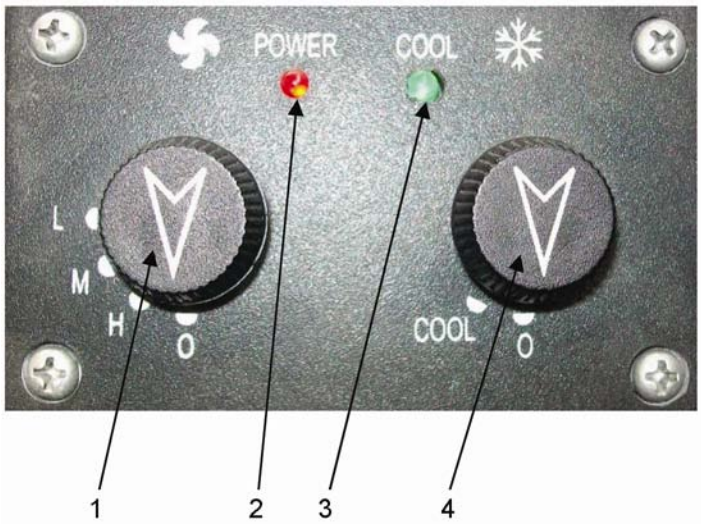


Figure 06 – 4 Air Conditioner Control Panel

FUNCTIONS

1. **A/C FAN SPEED / MASTER SWITCH –** Used to control the fan blower modes: OFF, HI, MID, LOW.
2. **FAN POWER INDICATOR**
3. **COOL MODE INDICATOR**
4. **CAB COOLER POWER SWITCH –** Refrigeration ON / OFF. Starts or stops the function of the compressor.

Table 06 – 1 Air Conditioner Maintenance Requirements

Item	Requirements	Maintenance interval
Condenser fan motor	Examine and repair.	Every quarter
Evaporator fan motor	Examine and repair.	Every quarter
Condenser	Examine and clean.	Every month or increase the maintenance frequency according to the working conditions
Evaporator	Examine and clean.	Every quarter or increase the maintenance frequency according to the working conditions
Electromagnetic clutch	Make sure that it operates smoothly and is clean.	Every quarter
Connector	Make sure that the connector is set in place.	Every month

A. Component Location

- Evaporator – Air outlet in the cab
- Condenser – In front of the engine
- Condenser fan – On the front of the engine (also the radiator fan)

B. Cab Temperature Control Functions:

(1) Refrigeration

- The first time you use the COOL function, do the items that follow:

  – Start the engine.

  – Set the A/C FAN SPEED / MASTER SWITCH (1) to blow air.

  RESULT: - FAN POWER INDICATOR (2) (red) illuminates.

  – Set the CAB COOLER POWER SWITCH (4) to position "COOL".

  RESULT: - COOL MODE INDICATOR (3) (green) illuminates.

  – Turn the A/C FAN SPEED / MASTER SWITCH (1) counter-clockwise to 3 fan speed (HI, MID, LOW) to get the necessary temperature.

(2) A/C FAN SPEED / MASTER SWITCH – Used to change between the 4 fan speeds (OFF, HI, MID, LOW).

When the switch is set to blow air, the FAN POWER INDICATOR (red) illuminates.

Note

The switch is the master power to the COOL function and must be ON (HI, MID, LOW) for the COOL function to operate.

(3) HEAT mode

- Turn on the A/C FAN SPEED / MASTER SWITCH (1) after the engine is started:

  – Set the A/C FAN SPEED / MASTER SWITCH (1) to blow air.

  RESULT: - The FAN POWER INDICATOR (red) illuminates.

  – Push down the CAB HEATER POWER SWITCH on the dash.

  RESULT: - The heater is ON.

  – Turn the A/C FAN SPEED / MASTER SWITCH (1) counter-clockwise between 3 fan speed (HI, MID, LOW) to get the correct temperature.

CAUTION

Do not disassemble an A/C system that is in the Warranty Period without consent from the A/C manufacturer.

Examine the condition and tension of the compressor belt at a regular interval. If necessary, adjust the tension on the belt.

You must clean the condenser at a regular interval.

You must use the same type of refrigerant and compressor oil to complete the repairs on the A/C.

Set the FAN mode to HI when you first start to cool the cab.

Do not use the parts to repair the A/C system that are not approved by the manufacturer.

When you use the A/C function where it is cool and has a high level of humidity, examine the evaporator at a regular interval. In these conditions, the evaporator freezes and causes a blockage for the air that goes through it.

If you operate the crane in a cold area or in the winter season, set the A/C system to ON for 10 minutes each month.

CAUTION

Make sure that the A/C is in the OFF mode when the engine is OFF or at idle speed for a long time. The battery drains in these conditions.

When you move the crane a long distance at low speed, with the A/C in the ON mode, put the transmission in a low gear. This increases the engine RPM and decreases the load on the transmission.

Set the A/C to the OFF position when you do one of the items that follow:

- **Move the crane quickly.**
- **Move up a long hill slope.**

Make sure that the refrigerant in the A/C system is at the correct level at regular intervals.

If there are unusual vibrations, noises or smells during operation, stop and examine the crane immediately. Do not operate the crane that has a malfunction.

Keep the surface of the condenser clean. When you clean the condenser, do not use steam.

Before you disassemble the A/C system, correctly remove the refrigerant.

Do not disassemble the A/C system in an area with high humidity.

6.1.2 MEDIA PLAYER

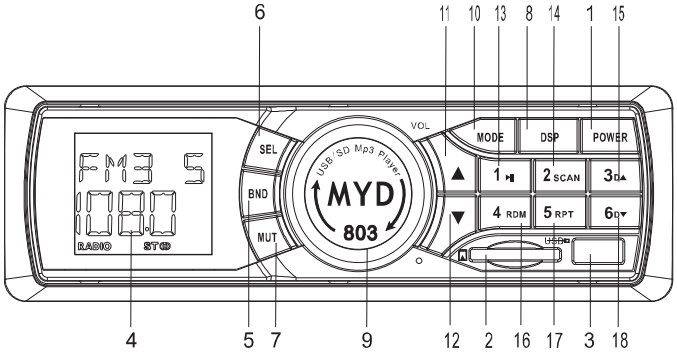


Figure 06 – 5 Media Player

LEGEND

1.	Power Button	Press power button turn on/off the Media Player
2.	SD CARD Port	
3.	USB Port	
4.	LCD Display	
5.	Band Selector	AM / FM function selection
6.	Setting Button	Sound menu function selection
7.	Mute Button	Telephone mute function
8.	Dsp Button	Time display, Short press display time; long press▲▼button for 3 seconds to adjust the time
9.	Volume/Function knob	Clockwise feature adds/counterclockwise rotation, reduced functionality
10.	Mode Button	Press mode button to select radio and SD or USB
11.	▲ Button	Low-Scan (radio) / on a (playback)
12.	▼ Button	High-end scanning (radio) / Next (playback)
13.	1 ⏯ Button	Prefabricated key 1(radio) / pause playback (playback).
14.	2 SCAN Button	Prefabricated key 2(radio)/10seconds browsing (playback)
15.	3 Button	Prefabricated key 3 (radio)/previous folder selection (Playback)
16.	4 RDM Button	Prefabricated key 4 (radio) / Shuffle (Playback)
17.	5 RPT Button	Prefabricated key 5 (radio) / Repeat Play (Playback)
18.	6 Button	Prefabricated key 6 (Broadcasting) / next folder selection (Playback)

CAUTION

Set the ignition switch to "I", when you use the CD player with the engine in the OFF position.

6.2 CONTROLS AND INSTRUMENTS

Figure 06 – 6 Controls and Instruments

1. **SWING / AUX. WINCH CONTROL –** Move the joystick forward to reel-off the aux. winch rope. Move the joystick backward to spool-up the aux. winch rope. Move the joystick to the left to move the boom to the left side. Move the joystick to the right to move the boom to the right side.

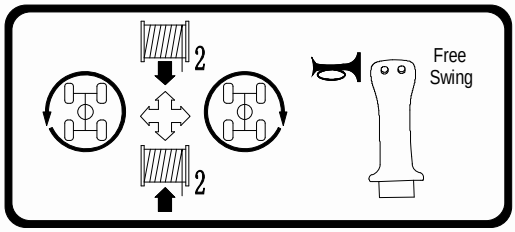


Figure 06 – 7 Left Joystick (Swing / Aux. Winch Control)

Horn – Push and hold-in to make a sound. (Located on right side of joystick)

Free swing – Push to operate the FREE SWING. Push again to release this function. (Located on left side of joystick)

Note

Only when the operator's seat is occupied and the icon  on the display lights up, the joysticks can initiate various movements.

2. BOOM EXTEND / RETRACT PEDAL

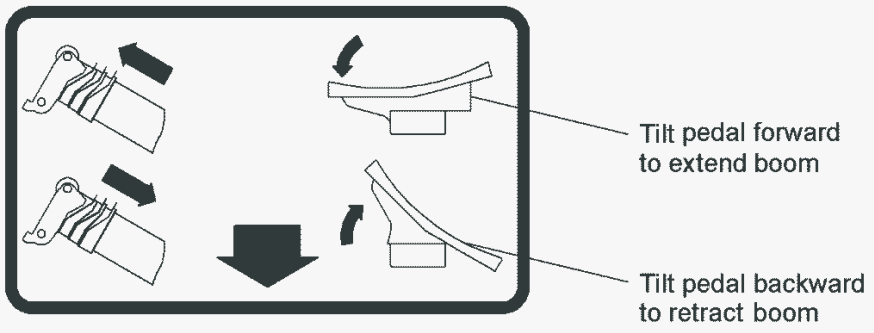


Figure 06 – 8 Boom Extend / Retract Pedal

Note

Only when the operator's seat is occupied and the icon  on the display lights up, can the boom extend / retract function be operated

3. CIGARETTE LIGHTER

Push-in the cigarette lighter for 3 to 5 sec. Pull it out to use it. After you use it, put it in its initial position.

Note

To use the cigarette lighter, the engine must be ON or the ignition must be in the "I" position.

4. STEERING WHEEL AND COMBINATION SWITCHES

The crane has a hydraulic booster system which makes it easy to turn the crane in all conditions.

You can adjust the steering wheel height and angle when you push the pedal at the bottom of the steering wheel.

⚠ CAUTION

DO NOT adjust the steering wheel while you move the crane. This can kill you. Lock the steering wheel after adjustment.

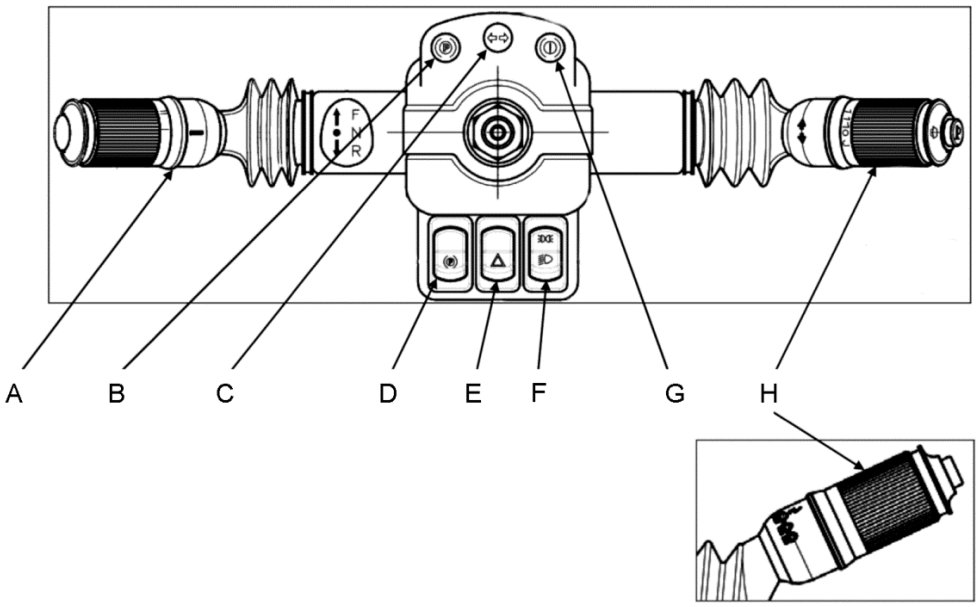


Figure 06 – 9 Combination Switches

A **GEAR SELECTOR -** Use to control the transmission gear selection. Pull in the direction of the operator for forward. Push in the direction of the dash for reverse. Turn the handle to set the speed.

B **PARKING BRAKE INDICATOR –** Not used.

C **TURN SIGNAL INDICATOR -** Not used.

D **PARKING BRAKE SWITCH -** Set the switch to the "P" position when the crane is in the correct position to operate.

Note

If you park the crane on a slope, you must put the chocks before and behind the wheels.

E **HAZARD LIGHTS SWITCH -** Push-in to set the warning hazard lights to ON. The indicator illuminates (flashes).

F **CORNER MARKER LIGHTS / LOW BEAM SWITCH -** Push the switch up, to turn ON the corner marker lights. Push the switch down, illuminate the low beam lights.

G **SERVICE BRAKE INDICATOR –** Not used.

H **WIPER CONTROL -** Windshield wiper operation (4-speed settings: J - Timed Interval (Intermittent), I - Low Speed, II - High Speed, O - OFF). Push the button, on the end of the handle, to spray washer fluid onto the window. Pull in the direction of the operator for high beam. Push in the direction of the dash for low beam.

CAUTION

The spray of washer fluid stops after 15 seconds or if the washer fluid tank is empty. Do not operate the wipers on hot sunny days unless you use spray the window with wiper fluid. When the temperature is below freezing, make sure that the wiper blades are not stuck to the window before you set the wipers to ON.

5. **BRAKE PEDAL –** Push the brake pedal to decelerate or stop the crane.
6. **IGNITION SWITCH –** The 4 positions of the switch are as follows:
   - "I" - All circuits, this does not include the starter, are ON
   - "II" - This position does not have a function
   - "III" - A temporary position, use it to operate the starter
   - "O" - All circuits are OFF.

   Note

   Make sure that you release the ignition ("III" position) when the engine starts.

   CAUTION

   You cannot remove the key from the ignition until the switch is in the "O" position (OFF).
7. **THROTTLE PEDAL –** Push the pedal to increase the engine RPM, release the pedal to decrease it. The movement of the items that follow can increase or decrease as the speed of the engine changes:
   - Boom swing
   - Increase or decrease the angle of the boom
   - Extend or retract the boom
   - Hoist movements (raise or lower a load).

   Note

   You can use the throttle pedal with the joysticks and boom extend / retract pedal to increase / decrease the speed of the items in (7).
8. **HAND THROTTLE –** You can use the hand throttle after the HAND / FOOT THROTTLE SELECT SWITCH is activated.
9. **BUBBLE LEVEL –** You use this to make sure that the crane is level.

10. **BOOM HOIST / MAIN WINCH CONTROL -** Move the joystick forward to reel-off main winch rope. Move the joystick rearward to spool-up main winch rope. Move the joystick left to lift the boom. Move the joystick right to lower the boom.

    Horn – Push and hold-in to make a sound. (Located on left side of joystick).

    Free swing – Push to operate the FREE SWING. Push again to release this function. (Located on right side of joystick)

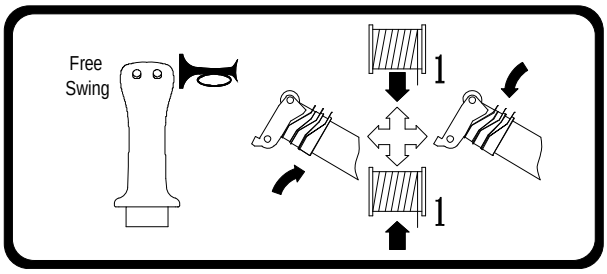


Figure 06 – 10 Right Joystick (Boom Hoist / Main Winch Control)

Note

Only when the operator's seat is occupied and the icon  on the display lights up, the joysticks can initiate various movements.

6.3 Monitor

Figure 06 – 11 Overview

Figure 06 – 12 System Start-up

After being switched on:

a) The monitor system runs up. See Figure 06 – 12.

b) The Work Mode Screen (when the parking brake is ON) or Travel Mode Screen (when the parking brake is OFF) appears on the monitor. See Figures 06 – 13 and 06 – 14 respectively.

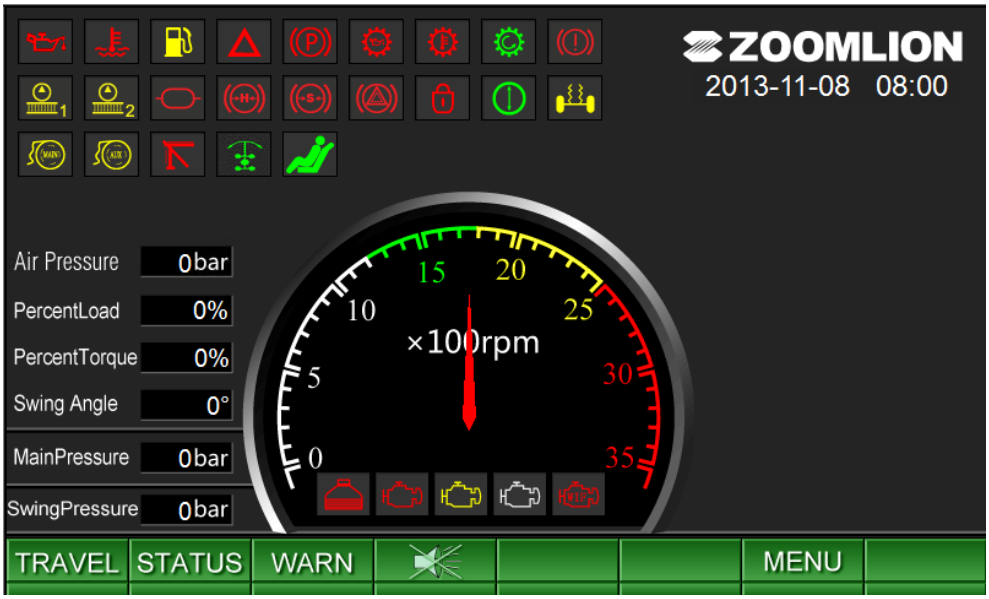


Figure 06 – 13 Work Mode

Under Work Mode Screen, the virtual tachometer will be displayed on the screen. See Table 06 – 2.

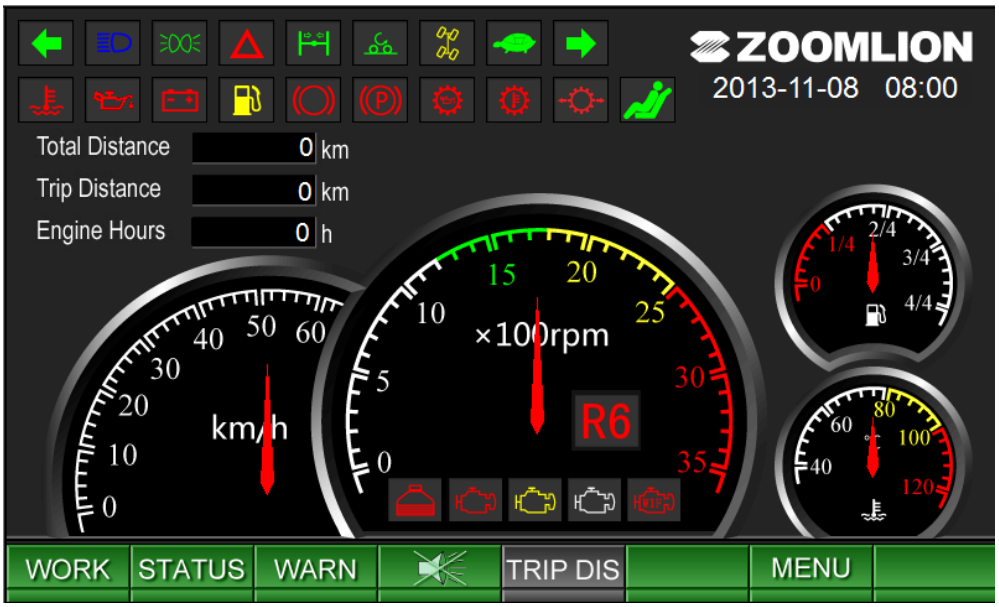


Figure 06 – 14 Travel Mode

Trip Distance is the crane travel distance from the departure place to the destination. Press the function key "TRIP DIS" to begin to record the travel distance. At this time, the key turns to grey. Press the key again to finish the travel distance recording and the key turns to green.

Under Travel Mode Screen, the virtual gauges such as odometer, tachometer, fuel gauge and engine coolant temperature gauge will be displayed on the screen. See Table 06 – 2.

Under any screen, the function keys at the bottom are available for switching between various screens.

For the icons displayed on the screen, please refer to Table 06 – 3.

Table 06 – 2 Gauges

DESCRIPTION	FUNCTION
Tachometer	Displays engine speed (RPM) and equipment operating time.
Odometer	Displays the speed of the crane in kilometers per hour (km/h) when the crane is moving.
Engine coolant temperature gauge	Displays the engine coolant temperature in degrees Celsius (C°). GREEN - normal range RED - the engine has a large load on it.
Fuel gauge	Displays, as a percent full, the amount of fuel in the tank.

CAUTION

The engine should not operate for a long interval if the coolant temperature indication is in the red area. Decrease the speed of the engine or decrease the load on the engine. If the temperature does not go down, stop the crane and examine the engine coolant system. The engine can be damaged, if you cannot find a solution to the problem.

CAUTION

Always use clean fuel.

WARNING

Before you stop the engine, operate the engine at idle for a short period of time. This helps the engine coolant temperature to be stable.

CAUTION

Do not move the crane when the indicator for the service or parking brake system illuminate.

CAUTION

Do not move the crane when the engine oil pressure low indicator illuminates. Stop the engine to prevent damage to the engine.

Table 06 – 3 Indicators – Universal Symbol Identification

INDICATOR SYMBOL	DESCRIPTION	FUNCTION
	ENGINE COOLANT LOW INDICATOR	**Illuminates:** Shows that the engine coolant level is too low.
	ENGINE OIL PRESSURE LOW INDICATOR	**Illuminates:** Shows that the engine oil pressure is too low or the oil filter screen is dirty. Stop the engine immediately to prevent damage.
	ENGINE COOLANT TEMPERATURE HIGH INDICATOR	**Illuminates:** Shows that the engine coolant temperature is high. Examine the coolant temperature indication and find the cause of the out-of-tolerance indication. Do the steps to decrease the coolant temperature.
	FUEL RESERVE LOW INDICATOR	**Illuminates:** Shows that the fuel reserve is lower than the permitted value (1/4 of the total).
	LEFT TURN SIGNAL	**Flashes:** Crane moves to the left.
	RIGHT TURN SIGNAL	**Flashes:** Crane moves to the right.
	HIGH PRESSURE FILTER DIRTY INDICATOR	**Illuminates:** Shows that the high pressure filter is dirty.
	CHARGE MONITORING INDICATOR	**Illuminates:** Battery charging system fault.
	CORNER MARKER LIGHTS INDICATOR	**Illuminates:** The corner marker lights are ON.
	LOW BEAM INDICATOR	**Illuminates:** Low beam lights are ON.
	HIGH BEAM INDICATOR	**Illuminates:** High beam lights are ON.

INDICATOR SYMBOL	DESCRIPTION	FUNCTION
	AIR CONDITIONER INDICATOR	**Illuminates:** Air conditioner is ON.
	FAULTY OUTRIGGER OPERATION INDICATOR	**Illuminates:** Shows that the outrigger system has a malfunction.
	TRANSMISSION OIL PRESSURE LOW INDICATOR	**Illuminates:** Shows that the transmission oil pressure is too low.
	SERVICE BRAKE INDICATOR	**Illuminates:** The service brake is ON.
	PARKING BRAKE INDICATOR	**Illuminates:** The parking brake is ON.
	SWING LOCKOUT DEVICE PRESSURE LOW INDICATOR	**Illuminates:** Shows that the pressure to the swing lockout device is too low.
	EMERGENCY BRAKE SYSTEM PRESSURE LOW INDICATOR	**Illuminates:** Shows that the pressure in the emergency brake system is too low. Use the service brake system to bring the crane to a stop.
	SERVICE BRAKE SYSTEM PRESSURE LOW INDICATOR	**Illuminates:** Shows that the pressure in the service brake system is too low. **DO NOT** move the crane.
	PARKING BRAKE SYSTEM PRESSURE LOW INDICATOR	**Illuminates:** Shows that the pressure in the parking brake system is too low. **DO NOT** move the crane.
	CLUTCH DISENGAGING INDICATOR	**Illuminates:** The clutch is disengaged and the service brake indicator illuminates when the service brake is applied.
	PTO INDICATOR	**Illuminates:** Shows that the PTO is engaged.

INDICATOR SYMBOL	DESCRIPTION	FUNCTION
	AXLE CENTERED INDICATOR	**Illuminates:** Shows that the rear axle is centered.
	SUPERSTRUCTURE POSITION INDICATOR	**Illuminates:** Shows that the superstructure is in the initial position.
	MAIN WINCH APPROACHING LOWER LIMIT INDICATOR	**Illuminates:** Shows that the main winch is near the minimum wire rope wrap limit (3 turns on the drum).
	AUXILIARY WINCH APPROACHING LOWER LIMIT INDICATOR	**Illuminates:** Shows that the auxiliary winch is near the minimum wire rope wrap limit (3 turns on the drum).
	2-WHEEL DRIVE INDICATOR	**Illuminates:** Shows that the crane is in the 2-wheel-drive mode.
	4-WHEEL DRIVE INDICATOR	**Illuminates:** Shows that the crane is in the 4-wheel-drive mode.
	AXLE SUSPENSION LOCKED INDICATOR	**Illuminates:** Shows that the axle suspension is locked.
	AXLE SUSPENSION SET TO SPRUNG INDICATOR	**Illuminates:** Shows that the axle suspension is not in the locked position.
	SWING LOCK INDICATOR	**Illuminates:** Shows that the swing lock is engaged.
	SWING UNLOCK INDICATOR	**Illuminates:** Shows that the swing lock is NOT engaged.
	NEUTRAL 0 POSITION INDICATOR	**Illuminates:** Shows that the transmission is in the "N0" position.
	NEUTRAL 1 POSITION INDICATOR	**Illuminates:** Shows that the transmission is in the "N 1" position.

INDICATOR SYMBOL	DESCRIPTION	FUNCTION
	NEUTRAL 2 POSITION INDICATOR	**Illuminates:** Shows that the transmission is in the "N 2" position.
	FORWARD SPEEDS INDICATOR	**Illuminates:** Shows that the gear selector is in the forward direction.
	REVERSE SPEEDS INDICATOR	**Illuminates:** Shows that the gear selector is in the reverse direction.
	CRAB-STEER INDICATOR	**Illuminates:** Shows that the Crab steer steering program is switched to ON.
	4-WHEEL STEER INDICATOR	**Illuminates:** Shows that the 4-wheel steer steering program is switched to ON.
	2-WHEEL STEER (FRONT WHEEL) INDICATOR	**Illuminates:** Shows that the 2-wheel steer (front wheel) steering program is switched to ON.
	2-WHEEL STEER (REAR WHEEL) INDICATOR	**Illuminates:** Shows that the 2-wheel steer (rear wheel) steering program is switched to ON.
	ENGINE STOP INDICATOR	**Illuminates:** ECU detects a serious failure and you must stop the engine immediately.
	ENGINE WARNING INDICATOR	**Illuminates:** Shows that the ECU detects a common failure.
	WAIT TO START INDICATOR	**Illuminates:** Shows that the engine is cool and the glow plugs must have time to heat up properly to start the engine. Shows that the glow plugs are hot enough, the light goes out.
	WATER IN FUEL INDICATOR	**Illuminates:** Shows that the fuel contains water.

INDICATOR SYMBOL	DESCRIPTION	FUNCTION
	HAZARD LIGHTS INDICATOR	**Illuminates:** Shows that the crane is in operation and the hazard lights are ON.
	HIGH-SPEED INDICATOR	**Illuminates:** Shows that the transmission high-low speed valve is connected.
	LOW-SPEED INDICATOR	**Illuminates:** Shows that the transmission high-low speed valve is disconnected.
	SEAT OCCUPIED INDICATOR	**Illuminates:** Only when the indicator lights up, can the superstructure movements be initiated.

CAUTION

When driving the crane, the joysticks and boom extend / retract pedal remain active. Crane operations can occur if either joysticks or pedal are used unintentionally .

6.3.1 VEHICLE STATUS

Under Travel Mode Screen or Work Mode Screen, press the function key “STATUS” to enter the Vehicle Status Screen. You can consult the basic information about the vehicle.

Press the key “BACK” to return the Travel Mode Screen or Work Mode Screen. Press the key “MENU" to enter the Main Menu Screen. Press the key “HOME” to return to the Travel Mode Screen.

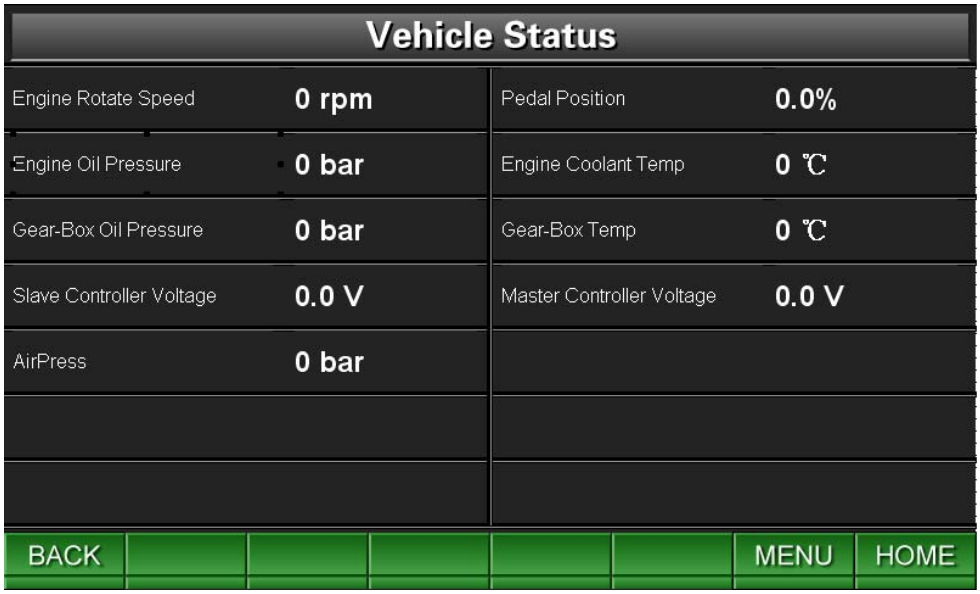


Figure 06 – 15 Vehicle Status

6.3.2 SYSTEM WARNING

Under Travel Mode Screen or Work Mode Screen, press the function key "WARN" to enter the System Warning Screen. You can consult the current warning information about the vehicle. Remedy the malfunctions immediately according the displayed information.

Press the key "BACK" to return the Travel Mode Screen or Work Mode Screen. Press the key "MENU" to enter the Main Menu Screen. Press the key "HOME" to return to the Travel Mode Screen.

Figure 06 – 16 System Warning

6.3.3 MAIN MENU

Under Travel Mode Screen or Work Mode Screen, press the function key "MENU" to enter the Main Menu Screen. Press the relevant function keys to move the cursor left and right to select the items as follows: Monitoring, Real-time warning, Parameter settings, Maintenance, 简体中文(Chinese), Information and Password etc. And then press the key "ENTER" to enter the required screen.

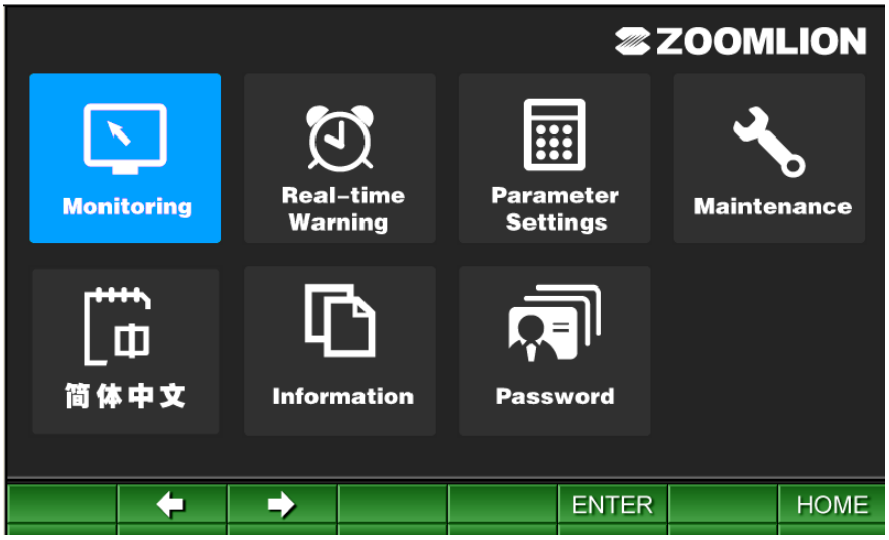


Figure 06 – 17 Main Menu

6.3.3.1 LANGUAGE SWITCHING

You can make the monitor displaying all information in English or Chinese mode under Main Menu Screen.

(1) Switch to English mode

In Chinese mode, under Travel Mode Screen or Work Mode Screen, press "主菜单" (MENU) to enter Main Menu Screen.

Under Main Menu Screen, press ← or → to move the cursor left or right to select the "English" item, see Figure 06 – 18, and press "确认" (ENTER). After this operating, monitor displays all information in English mode, see Figure 06 – 19.

(2) Switch to Chinese mode

In English mode, under Travel Mode Screen or Work Mode Screen, press "MENU" to enter Main Menu Screen.

Under Main Menu Screen, press ← or → to move the cursor left or right to select the "简体中文" (Chinese) item, see Figure 06 – 19, and press "ENTER". After this operating, monitor displays all information in Chinese mode, see Figure 06 – 18.

Figure 06 – 18 Main Menu (Chinese mode)

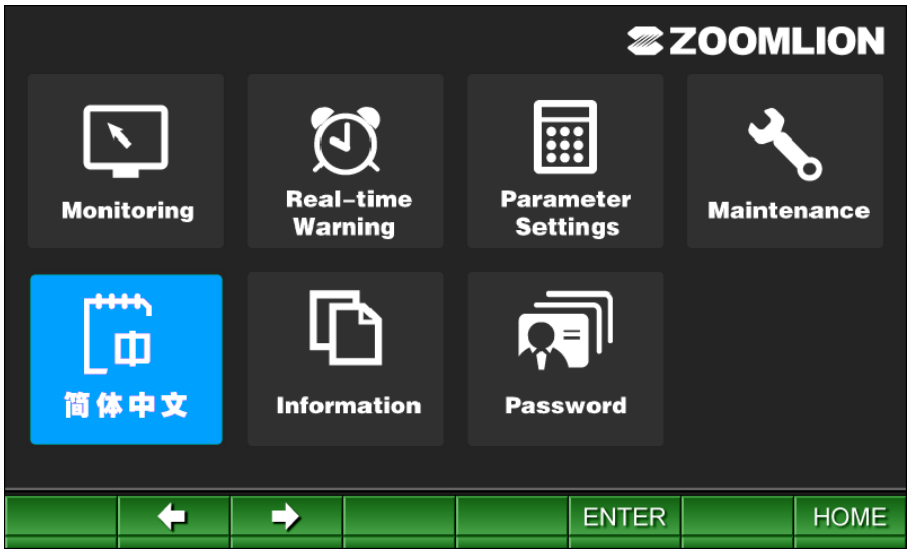


Figure 06 – 19 Main Menu (English mode)

6.3.3.2 MONITORING

In the Monitoring Screen, move the cursor left / right and press the key "ENTER" to select the items such as Travel mode, Work mode, Vehicle status and Bus status. See Figure 06 – 20.

Press the key "BACK" or "MENU" to return to the Main Menu Screen. Press the key "HOME" to enter the Travel Mode Screen.

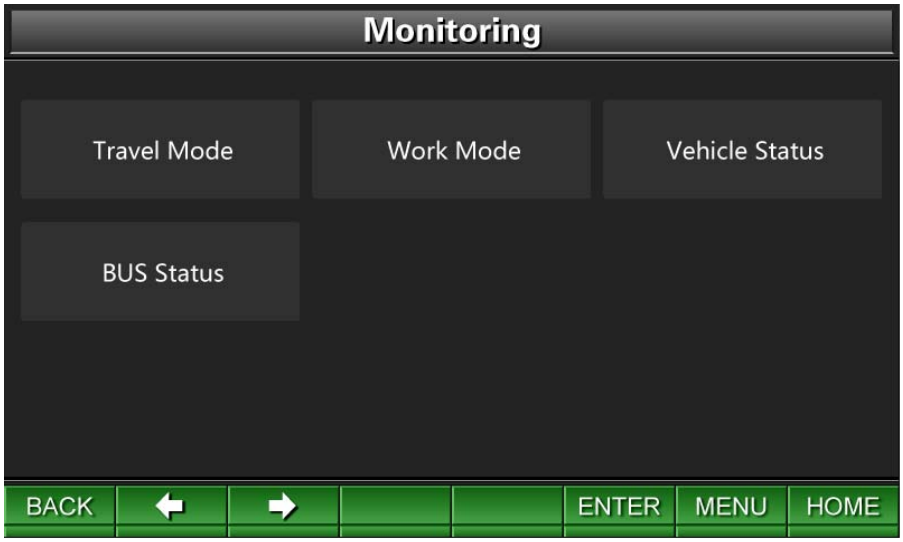


Figure 06 – 20 Monitoring

(1) Travel mode: move the cursor to select the icon "Travel mode" and press the key "ENTER" to enter the Travel Mode Screen. See Figure 06 – 13.

(2) Work mode: move the cursor to select the icon "Work mode" and press the key "ENTER" to enter the Work Mode Screen. See Figure 06 – 14.

(3) Vehicle status: move the cursor to select the icon "Vehicle status" and press the key "ENTER" to enter the Vehicle Status Screen. See Figure 06 – 15.

(4) Bus status: move the cursor to select the icon "Bus status" and press the key "ENTER" to enter the Bus Status Screen. See Figure 06 – 21. If the communication between the controllers fails, it means that the network signal between the controllers is disconnected.

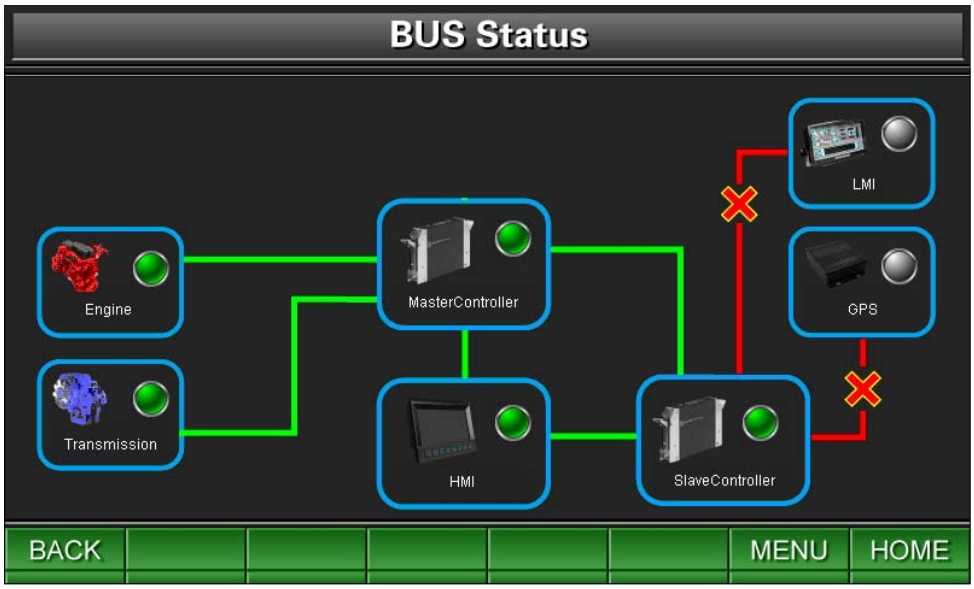


Figure 06 – 21 Bus Status

6.3.3.3 REAL-TIME WARNING

In the Real-time Warning Screen, move the cursor left / right and press the key "ENTER" to select the items such as System warning, Engine warning or Transmission warning. See Figure 06 – 22.

Press the keys "BACK" or "MENU" to return to the Main Menu Screen. Press the key "HOME" to enter the Travel Mode Screen.

Figure 06 – 22 Real-time Warning

(1) System warning: move the cursor to select the icon "System warning" and press the key "ENTER" to enter the System Warning Screen. See Figure 06 – 16.

(2) Engine warning: move the cursor to select the icon "Engine warning" and press the key "ENTER" to enter the Engine Warning Screen. See Figure 06 – 23.

(3) Transmission warning: move the cursor to select the icon "Transmission warning" and press the key "ENTER" to enter the Transmission Warning Screen. See Figure 06 – 24.

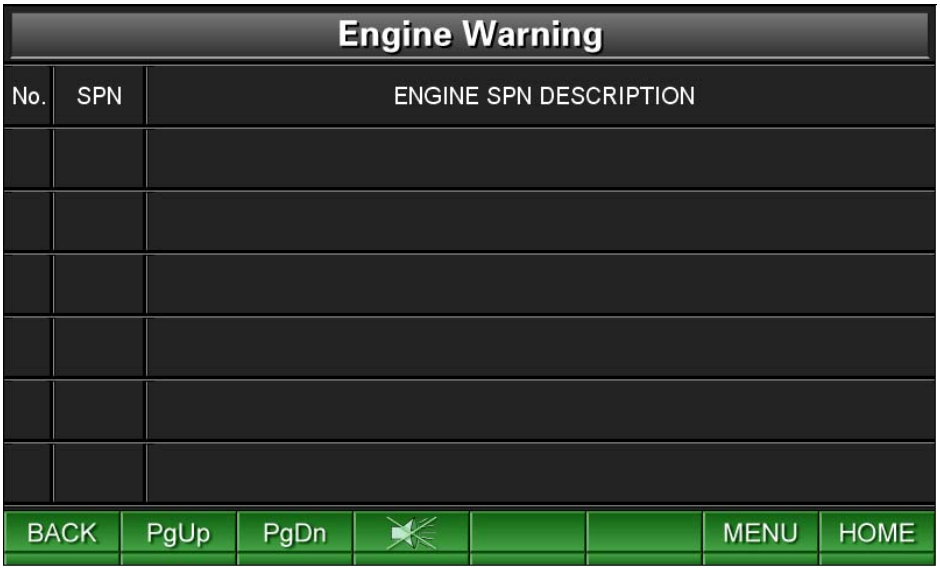


Figure 06 – 23 Engine Warning

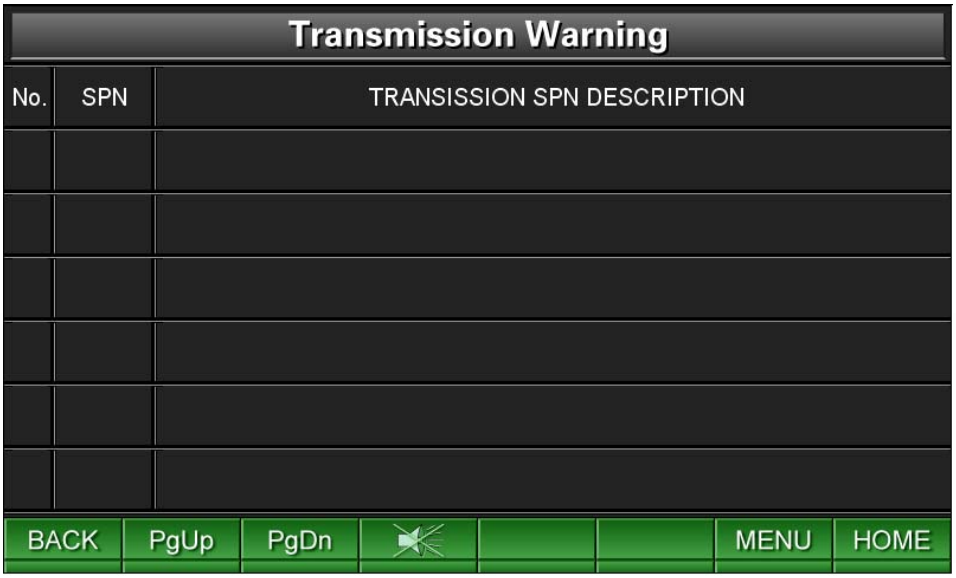


Figure 06 – 24 Transmission Warning

6.3.3.4 PARAMETER SETTINGS

The Parameter Settings Screen is shown as following. See Figure 06 – 25.

In the Parameter Settings Screen, you can adjust the brightness of the system.

Press the keys "BACK" or "MENU" to return to the Main Menu Screen. Press the key "HOME" to enter the Travel Mode Screen.

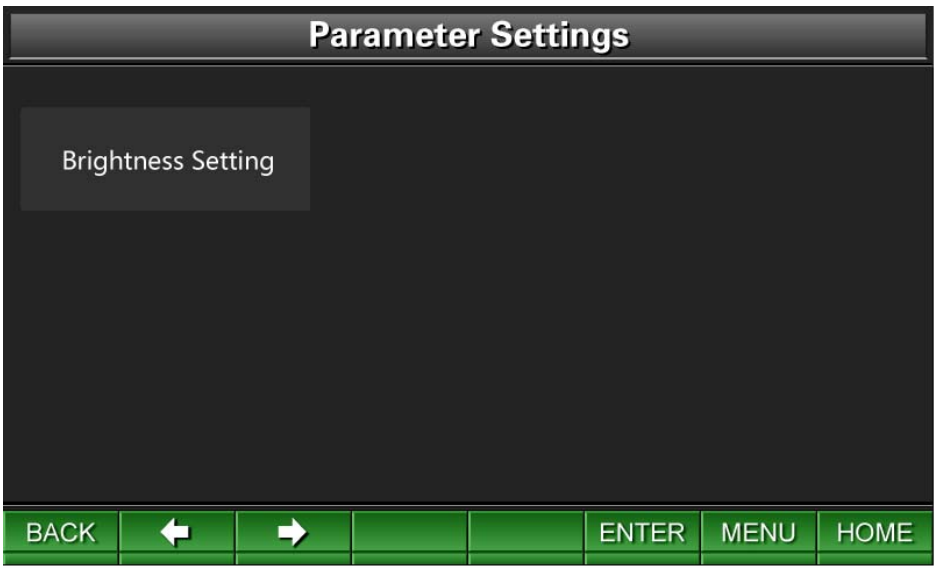


Figure 06 – 25 Parameter Settings

Brightness settings: press the key "ENTER" to enter the Brightness Settings Screen. Press the function keys "+" and "-" to adjust the brightness. See Figure 06 – 26.

Figure 06 – 26 Brightness Setting

6.3.3.5 Maintenance

The Maintenance Screen is shown as following. See Figure 6 – 27.

In the Maintenance Screen, move the cursor left / right and press the key "ENTER" to select the items such as Engine Diagnostic, Error Diagnostic or GPS Temporary Unlock according to the work requirements.

Press the keys "BACK" or "MENU" to return to the Main Menu Screen. Press the key "HOME" to enter the Travel Mode Screen.

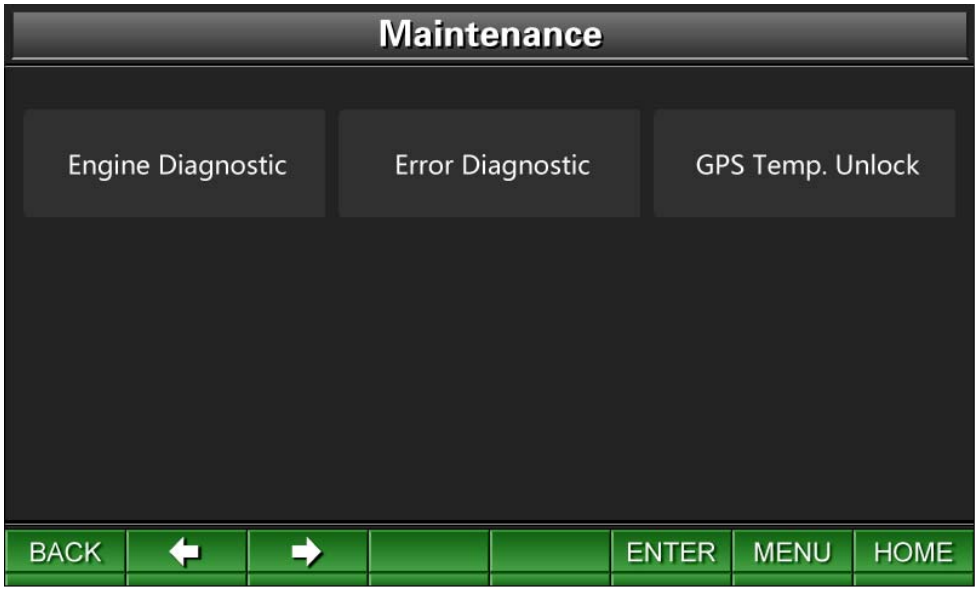


Figure 06 – 27 Maintenance

(1) Engine Diagnostic: move the cursor to select the icon "Engine diagnostic" and press the key "ENTER" to enter the Engine Diagnostic Screen. See Figure 06 – 28.

Press the function key "DIAG" and press the keys "PgUp" and "PgDn" to increase and decrease the engine idle speed by 50 rpm. The engine idle speed varies within 650 – 1200 rpm.

Figure 06 – 28 Engine Diagnostic

(2) Error Diagnostic: move the cursor to select the icon "Error diagnostic" and press the key "ENTER" to enter the Error Diagnostic Screen. See Figure 06 – 29 and Figure 06 – 30.

There are 2 pages of the error diagnostic information. Press the keys "PgUp" and "PgDn" to consult the diagnostic information.

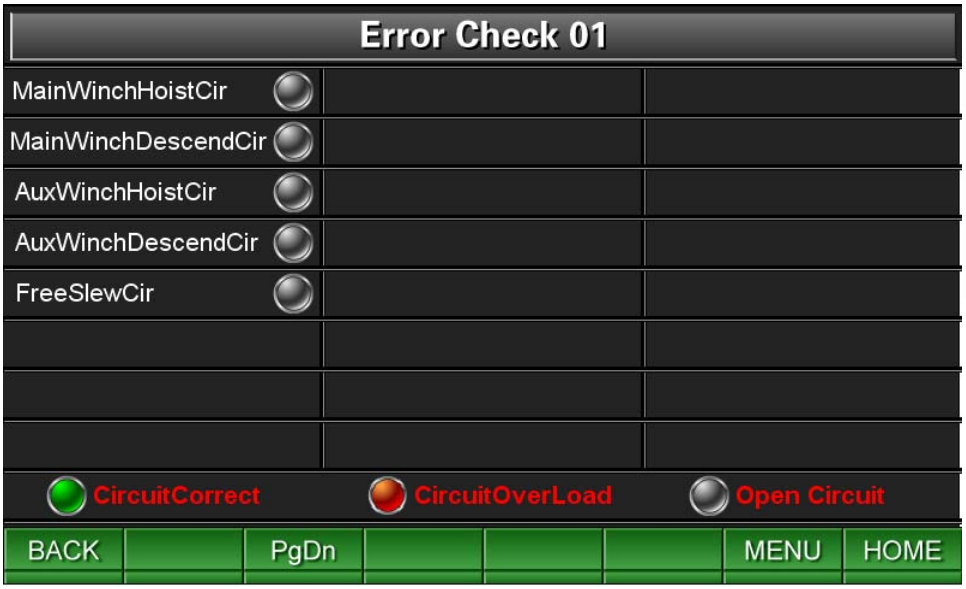


Figure 06 – 29 Error Diagnostic 1

Figure 06 – 30 Error Diagnostic 2

(3) GPS Temp. Unlock: move the cursor to select the icon "GPS Temp. unlock" and press the key "ENTER" to enter the GPS Temp. Unlock Screen. Enter the temporary password to unlock the GPS temporarily.

6.3.3.6 INFORMATION

The Information Screen is shown as following. See Figure 06 – 31.

In the Information Screen, move the cursor left / right and press the key "ENTER" to select the items such as System history warning, Engine history warning, Transmission history warning and About (about the vehicle basic parameters) according to the requirements.

Figure 06 – 31 Information

(1) System history warning: move the cursor to select the icon "System history warning" and press the key "ENTER" to enter the System History Warning Screen to consult the

system defects. See Figure 06 – 32.

(2) Engine history warning: move the cursor to select the icon "Engine history warning" and press the key "ENTER" to enter the Engine History Warning Screen to consult the engine defects. See Figure 06 – 33.

(3) Transmission history warning: move the cursor to select the icon "Transmission history warning" and press the key "ENTER" to enter the Transmission History Warning Screen to consult the transmission defects. See Figure 06 – 34.

(4) About: move the cursor to select the icon "About" and press the key "ENTER" to enter the About Screen to consult the basic information about the crane. See Figure 06 – 35.

Figure 06 – 32 System History Warning

Figure 06 – 33 Engine History Warning

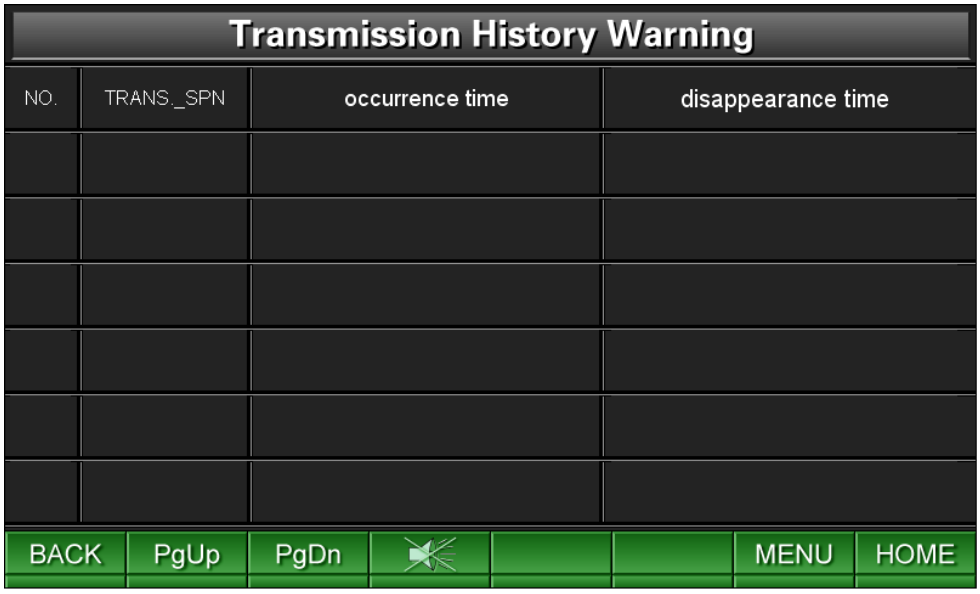


Figure 06 – 34 Transmission History Warning

Figure 06 – 35 About

6.3.3.7 PASSWORD

In the Main Menu Screen, move the cursor to select the icon "Password" and press the key "ENTER" to enter the Password Screen. See Figure 06 – 36.

Enter the correct passwords to consult more information.

Figure 06 – 36 Password

Note

The password is only available for the service technician.

All screens (except the Travel Mode Screen and Work Mode Screen) have a function key "HOME". You can press the key "HOME" to return to the Travel Mode Screen.

6.4 Vehicle Camera

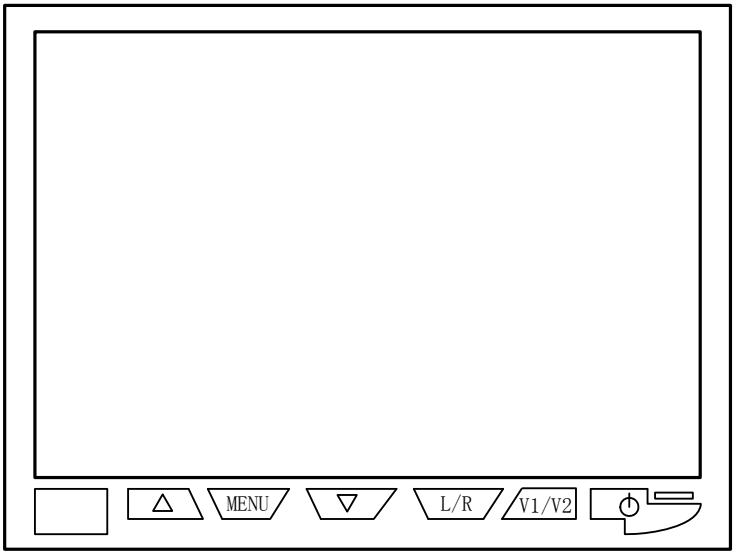


Figure 6-37 Camera Display

Manual Video control: After the vehicle power on, turn on the power supply switch of the camera display, the display will show the vision of the camera after 5 seconds.

1.  button Power control
2. V1/V2 button Switch the vision between video one and video two
3. L/R button Switch the vision to enantiomorphous status
4. MENU button Enter the brightness , contrast or color adjusting option
5. △ button Increase the brightness, contrast or adjust the color
6. ▽ button Decrease the brightness, contrast or adjust the color

ZOOMLION

OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 7 Operating instructions

7.1 SAFETY EQUIPMENT

A. Anti-Two Block System

Examine the anti-two block switches on the boom, the jib and auxiliary sheave heads for damage. Make sure that the switch weights operate correctly and they are on the lift cable in the correct position. Examine the electrical equipment and wires that attach to the cable reel. Do an inspection of the wires along the length of the cable. Look for indications of wear, damage or incorrect installation. Make sure that the tension on the spring-loaded cable reel is correct and that the reel turns freely.

Note

When you do a check of the anti-two block switch function, you must move the anti-two block weight with the hook block.

B. Rated Capacity Indicator

When the actual load is near the rated one, it sends out acoustic sound. You can only do safe crane movements that are on the screen at this time. Move the load into a permitted condition to stop alarms and continue correct crane operation. For details, please refer to *Rated Capacity Indicator Manual*.

C. Emergency Stop

(1) You can find the emergency stop button on the lower left side of the dash.

(2) When you push the button, all crane operations immediately STOP (includes the engine). Turn the button clockwise to release it and continue usual crane operation.

(3) Only use the EMERGENCY STOP BUTTON in a clear emergency!

D. 3rd Wrap

When there are only 3 wraps of wire rope remaining on the winch, the winch (main or auxiliary) does not turn. When this occurs, you can only do "Boom Retract" and "Winch up" operations.

E. Seat Occupied Indicator

(1) This indicator illuminates when the seat switch is activated by sitting in the operator seat.

(2) The seat switch controls the functions of the left and right joystick as well as the boom telescoping extend/retract foot pedal.

(3) Only when the operator's seat is occupied and the icon  on the display is lit will the crane functions be active (via joystick and telescoping pedal).

⚠ Caution

When driving the crane, the joysticks and boom extend/retract pedal remain active. Crane operations can occur if either joysticks or pedal are used unintentionally.

7.2 STARTING THE ENGINE

A. After you do an inspection, start the engine.

B. If the temperature is above 32℉(0℃), use the steps that follow to start the engine:

- Move the gear selector to the neutral position.
- Turn the park brake switch to "P".
- Turn the ignition switch to "I".
- Turn the ignition switch to stage "START" to start the engine.

C. Release the ignition switch when the engine starts. If the engine stops during the start-up procedure, make sure that the engine comes to a full stop before you try to start it again.

D. If you cannot start the engine in less than a maximum of 15 seconds, wait for 2 minutes. Then try to start the engine again.

E. After the engine starts, examine the indicators and gauges. If one of the indicators or gauges shows you an out of tolerance indication, turn the engine OFF. Correct the malfunctions before you start the engine again.

F. Do not increase the engine RPMs to a high level before the engine gets to the correct operating temperature.

7.3 AFTER THE ENGINE STARTS

A. When the engine is ON, examine the indicators and gauges, (at frequent intervals), to find an indication of an out of range condition. Also, listen for sounds that are not usual.

B. When you operate the engine at idle for a long period of time, the battery can loose power. If necessary, increase the engine idle speed to keep the battery fully charged. This is important when you start the engine.

C. When it is necessary to stop the engine, operate it at idle speed (with no load on the engine) for minimum of 5 minutes. This lets the engine coolant temperature decrease gradually before the engine stops.

Note

This cool down period is very important for a crane with a turbocharged engine. This is because the turbocharged engine makes more heat than an engine that dose not have a turbocharger.

If more data about the engine is necessary, look in the *Engine Manufacturer's Manual*.

7.4 COLD WEATHER STARTING

If you operate the crane in very low temperature areas, the engine can be hard to start. The optional flame starting device is very important for the normal engine start. Please speak with the Zoomlion Service Department if you select a flame starting device for your crane.

7.5 MOVE AND PARK THE CRANE

⚠ Warning

Make sure that the crane has a sufficient quantity of brake pressure before you try to move the crane. A dangerous condition occurs if the crane starts to move and you cannot stop it.

Begin the move.

A. Move the Crane

After you prepare the crane for driving, use the steps below to start the vehicle:

(1) Depress the brake pedal.

(2) Deactivate parking brake.

(3) Move the gear selector to the 1st gear position.

(4) Release the brake pedal gradually and start to drive.

B. Park the Crane

(1) Gradually push the brake pedal and move the gear selector to the "F1" position.

(2) When the crane is at a slow speed, push the brake pedal to stop the crane.

⚠ Caution

When the crane is on the move, do not forcefully push the brake pedal, except in a clear emergency.

⚠ Caution

When the crane is in the Crab steer or 4-wheel steer mode, make sure that you center the axles before you stop.

(3) Turn the parking brake switch to "P" and move the gear selector to the "N" position.

(4) When it is necessary to stop the engine, operate the engine at idle speed (with no load on the engine) for minimum of 5 minutes. This lets the engine coolant temperature decrease gradually before the engine stops.

Note

This cool down period is very important for a crane with a turbocharged engine. This is because the turbocharged engine makes more heat than an engine that does not have a turbocharger.

If more data about the engine is necessary, look in the *Engine Manufacturer's Manual*.

(5) Do not turn the ignition switch to "O" at this time. Stop the engine and keep electrical power applied to the engine for 30 seconds to let the engine data transfer to the ECU. Turn the ignition switch to the "O" position.

Caution

Do not keep the battery master switch in the "ON" position after you park the crane. This will cause the battery to drain, circuit breakdown or accident.

(6) When you park the crane on a slope, you must put chocks on the wheels.

Caution

When the battery and engine are not "ON", you can turn "ON" the hazard lights.

(7) To prevent an accident when you park the crane in the dark, you must turn "ON" the hazard lights.

7.6 ECONOMICAL DRIVING

You can decrease fuel use and extend the life of the tires if you follow these points:

- Develop good driving habits.
- Only idle the engine at a high speed when it is necessary. Make sure that the gear selector is always at a high gear. When more engine power is necessary, increase the engine RPM speed.
- Do not move the throttle or brake pedal quickly.
- Do not turn the crane quickly.
- Do not start to move the crane quickly.
- The most efficient speed to move the crane is at 3/4 of the maximum.
- When you move the crane, keep the engine coolant temperature between 158°F and 203°F (70°C and 95°C).

Note

When the engine coolant temperature is too low or too high, the performance of the engine decreases.

- Always make sure that the tires have the correct pressure.

Note

If the tire pressure is too low, the tires wear incorrectly and they increase the load on the engine.

- Keep the operation of the air conditioner system at a minimum.
- Always use the correct type of fuel and engine lubricants.
- Keep to the preventive maintenance schedule.

7.7 STEERING OPERATION

A. The crane has a hydraulic booster system which makes it easy to turn the crane in all conditions.

B. You can adjust the steering-wheel height and angle when you push the pedal at the bottom of the steering-wheel.

C. When you move the crane, follow these points:

- Look around before you turn the steering-wheel. Turn the steering-wheel after you make sure that it is safe to move.
- When necessary, set the transmission to a lower gear to decrease the speed of the crane as you turn.
- Decrease the speed slowly while you turn the steering-wheel in the same direction as the turn.
- If you over-steer, decrease the speed while you turn the steering-wheel in the opposite direction of the turn.

⚠ Caution

Do not turn the steering-wheel quickly in one direction unless it is an emergency. Make your turns smoothly to keep the crane laterally stable. When you complete the turn, lightly and immediately turn the steering-wheel to the neutral position to prevent an unstable condition.

- Decrease the speed of the vehicle and move down one transmission gear if you have a sharp turn.

7.8 BRAKING OPERATION

A. Service Brake

When it is necessary to stop the crane, follow these items:

- Start to apply the service brake in a sufficient amount of time to let you bring the crane to a full stop.
- Adjust the pressure on the brake pedal according to the weight and speed of the crane.
- When the crane is at a slow speed, push and hold the pedal down to fully stop the crane.

B. Emergency Brake

(1) In an emergency, push the brake pedal quickly and fully stop the crane immediately. For a short interval of time, you can have a hard time with the control of the crane. You must use caution.

⚠ Caution

When you make many hard brake stops, the tire and the brake linings wear prematurely.

Use more caution when the roads are wet or frozen.

Note

If the service brake indicator does not illuminate when you push the brake pedal, stop the crane immediately. The crane can have a leak in the hydraulic oil system. Contact the repair facility.

(2) The crane has dual-circuit brake system. If one side of the systems has a malfunction, the other side stops the crane.

⚠ Warning

If the tire blows out suddenly during the move, do not push the brake pedal immediately. Hold the steering-wheel tightly with two hands, decrease the speed, and move the crane to a safe area.

7.9 TRANSMISSION OPERATION

The transmission is hydraulically driven and power shifted. To step through the gears in the transmission, follow these points:

- The transmission has two gear range levels: low and high. The low gear range is a manual shift mode. Usually you use the 1st gear position when you start to move the crane. The high gear range is an automatic shift mode.

Note

When you start the engine in 2-wheel steer mode, the gear selector can be in any position.

- If it is necessary to manually shift the transmission, the gear selector must be in the low mode.
- When you hear an unusual noise in the transmission or it is hard to move the steering-wheel, stop the crane immediately. Correct the malfunction if you can refer to the *Transmission Maintenance and Service Manual*.
- When you park the crane, move the gear selector to the "N" position.
- To measure the quantity of oil in the transmission, park the crane and operate the engine at idle speed.

⚠ Caution

The transmission oil temperature must be between 180℉ and 200℉ (82℃ and 93℃).

When the oil temperature is more than 250℉ (121.1℃), stop the crane immediately. To decrease the temperature: move the gear selector to the "N" position. Operate the engine at an RPM range between 1000 to 1200 rpm. The oil temperature decreases in a short interval of time immediately.

DO NOT stop the engine when the transmission oil temperature is too high.

⚠ Caution

DO NOT move the crane when the transmission oil pressure is lower than 240 psi.

⚠ Warning

DO NOT move the crane with the gear selector in the "N" position.

7.10 TOWING

Caution

When the crane is in-tow, do not make sudden changes in speed. This can damage the tow coupling.

Warning

If the engine cannot operate, do not tow the crane.

To prepare the crane to be towed, do the items that follow:

- Operate the engine at idle (keeps the transmission oils in motion)
- Disconnect the forward axle
- Disconnect the aft axle.

7.11 PTO OPERATION

A. The function of PTO is to transmit the engine power to the hydraulic system oil pump.

Caution

When the engine is cold, make sure that the engine is at the correct temperature before you begin a lift operation.

B. Prepare to engage the PTO.

(1) Do the steps below before you operate the PTO:

a) Make sure that the engine is at the correct operating temperature.

b) Set the joysticks in the neutral position.

c) Make sure that the outrigger switches are in the neutral position.

d) Set the gear selector to the neutral position.

e) Make sure that the crane parking brake is "ON".

(2) Engage the PTO.

a) Open the shutoff gate valve of the hydraulic oil tank. When this valve opens, hydraulic oil from the tank flows through hydraulic lines.

b) Turn the handle of the shutoff gate valve on the hydraulic oil tank in the direction shown.

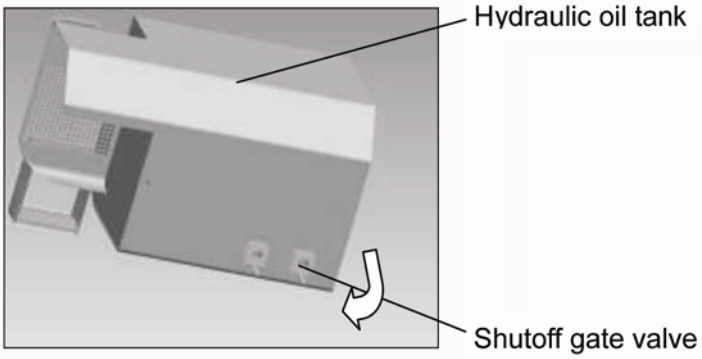


Figure 07 – 1 Hydraulic Oil Tank

⚠ Warning

You must open the shutoff gate valve before you engage the PTO. You can cause damage the hydraulic system if the valve is closed when you engage the PTO.

c) Engage the PTO.

d) The PTO handle is located near the superstructure. Pull the handle up to engage the PTO.

Figure 07 – 2 Engage PTO Handle

(3) Disengage the PTO.

a) Push down the PTO handle to disengage the PTO.

Figure 07 – 3 Disengage PTO Handle

7.12 OUTRIGGER OPERATION

A. The outrigger switches and bubble level indicator are in the cab. The outrigger switches, control the movements for all the outriggers. Refer to Figure 07 – 4.

The outrigger switches are shown below:

Figure 07 – 4 Outrigger Switches

⚠ Warning

Make sure that the RCI is set to match the outrigger configuration. It is dangerous to set the RCI incorrectly.

Make sure that you do all of the work on level ground that is hard. The ground must hold more than the load bearing capacity (permissible ground pressure ≥ 507.6 psi (3.5 MPa)). Use material (such as wooden timbers) below the outrigger floats if the work area is soft or not flat.

(1) Extend the outrigger.

a) Remove the outrigger beam retaining pin.

b) Push and hold 2 or 4 outrigger switches to the "BEAM" position.

1 Push and hold the outrigger extend / retract master switch to the "EXTEND" position.

2 After the outriggers move to the "FULLY" or "INTERMEDIATELY" marks, release the master switch. The switch moves to the neutral position automatically.

c) After the 4 outrigger beams extend to the correct positions, push and hold

the 2 front (or rear) outrigger switches to the "JACK" position.

1 Push and hold the outrigger extend / retract master switch to the "EXTEND" position.

2 After the 4 outriggers hold the weight of the crane (wheels off the ground), release the master switch. The switch moves to the neutral position automatically.

d) Make the crane level.

1 Look at the bubble level to tell if the crane is at level.

2 If the bubble indicator does not show a level indication, you can move each outrigger to make the crane level.

e) For example:

If the crane is low on the right front, do the steps that follow:

1 Push the right front outrigger switch to the "JACK" position.

2 Push the outrigger extend / retract master switch to the "EXTEND" position at the same time.

3 Monitor the bubble indictor. When the bubble is at the correct position, release the switches.

f) Install the outrigger retaining pins.

(2) Retract the outrigger.

⚠ Warning

Retract the boom and attach it to the support before you retract the outriggers.

a) Remove the outrigger beam retaining pins.

b) Push and hold 2 front (or rear) outrigger switches to the "JACK" position.

1 Push the outrigger extend / retract master switch to the "RETRACT" position at the same time.

2 After the 2 front (or rear) outrigger jacks fully retract, release the master switch. The switch moves to the neutral position automatically.

3 Do this step until all 2 front (or rear) outrigger jacks are retracted.

c) Push an outrigger switch (1 of 4) to the "BEAM" position.

1 Push the outrigger extend / retract master switch to the "RETRACT" position at the same time.

2 After the outrigger retracts fully, release the master switch. The switch moves to the neutral position automatically.

3 Do this step until all 4 outriggers are retracted.

d) Install the outrigger retaining pins.

(3) Install and remove the outrigger floats.

a) Installation

Before you extend the outriggers, remove the socket pin from the outrigger floats and pull out the outrigger floats. When the hole aligns with the vertical cylinder, install the socket pin.

b) Removal

After you fully retract the outriggers, remove the socket pin and push in the outrigger float until it in the correct position. Install the socket pins.

⚠ Caution

- **Before you move the outriggers, make sure that there is clearance to prevent injury to personnel or damage to the crane and other objects.**
- **Do not move the outriggers if you have a load off the ground.**
- **You can adjust the speed (slow or fast) of the outriggers movement (extend or retract) by the engine RPM (increase or decrease).**
- **Make sure that you install the outrigger floats before you move the outriggers.**
- **Make sure that you remove the retaining pins before you extend or retract the outrigger beams. After the outrigger beams are in position, install the retaining pins.**
- **Before you extend or retract the outriggers, make sure that the floats are clear from all objects.**
- **Make sure that all the tires are off the ground (crane weight held up by the outriggers) before you start to lift a load.**
- **When the crane is on a level area, examine the bubble indicator. The bubble shows in the middle of the indicator. If not, adjust the nuts below the indicator.**

7.13 HOIST OPERATION

The hoist mechanism consists of the hydraulic motor, winch reducer, brake, rope guider, anti-two block system, 3rd wrap, hoist rope and main hook and auxiliary hook.

The winch mechanism mainly includes two parts - main winch and auxiliary winch.

Note

Always refer to the "Lift Chart" and the "Lift Height Chart" before you start to lift a load.

A. Lift Chart Interpretation

(1) Lift Chart and Lift Height Chart

(a) Lift Chart

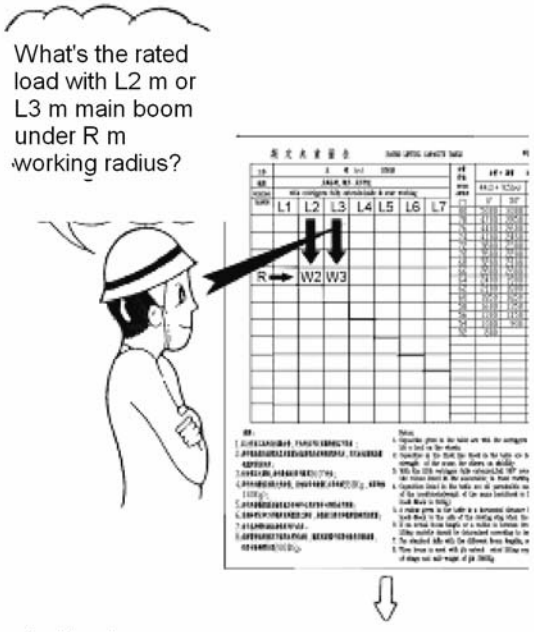
1 How to look up rated lift capacity.

2 Use the *Lift Height Chart* to find out the boom length and working radius. Use the *Rating Chart* to find out the rated lifting capacity.

Note

Use the *Rating Chart* to find out the rated lifting capacity if you lift a load with jib assembled at the main boom head.

3 Use the below figure to find out the rated load if the outrigger beams are fully extended and the main boom is over side or over rear.



The rated load:
If the main boom length is L2 m, the rated **load** is W_2 kg.
If the main boom length is L3 m, the rated **load** is W_3 kg.

Figure 07 – 5 Rated Load

⚠ Caution

Use working conditions to find the rated lifting capacity.

(b) Lift Height Chart.

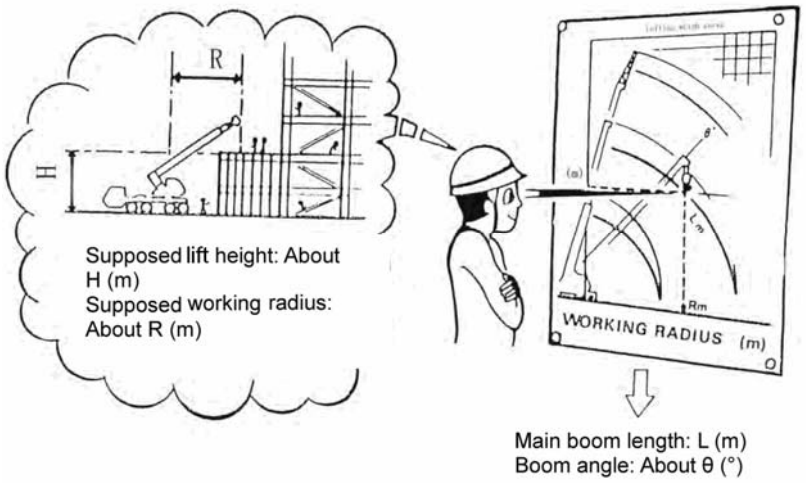


Figure 07 – 6 Lift Height

⚠ Caution

The data in the Lift Height Chart does not include the bend of the main boom.

(c) Working Radius.

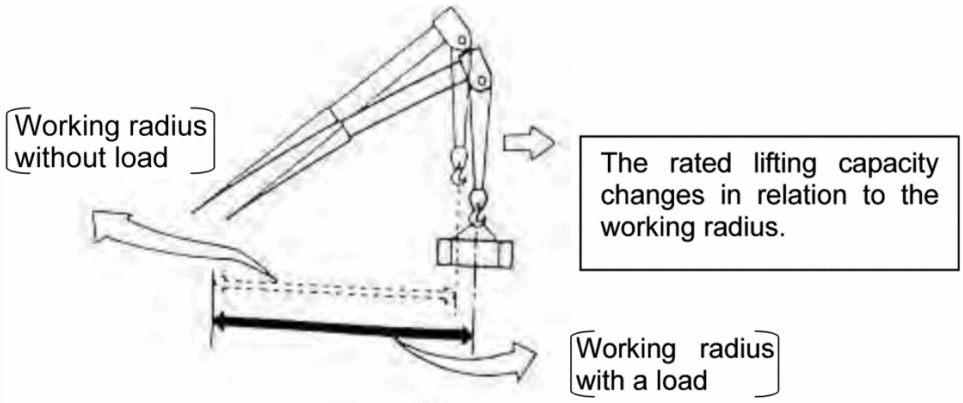


Figure 07 – 7 Working Radius

1 The balance valve in the hoist mechanism makes sure that the movement of the hoist is stable. It also makes the load stop at the necessary location.

2 When you increase the boom length and height, you must increase the length of the hoist rope. You can change the line parts to get a longer rope. You must install the anti-two block weight before you change the parts.

B. Main Winch

(1) The right joystick controls the main winch. Push the joystick forward to reel-off to move the load down. Pull it to the rear to spool-up to move the load up.

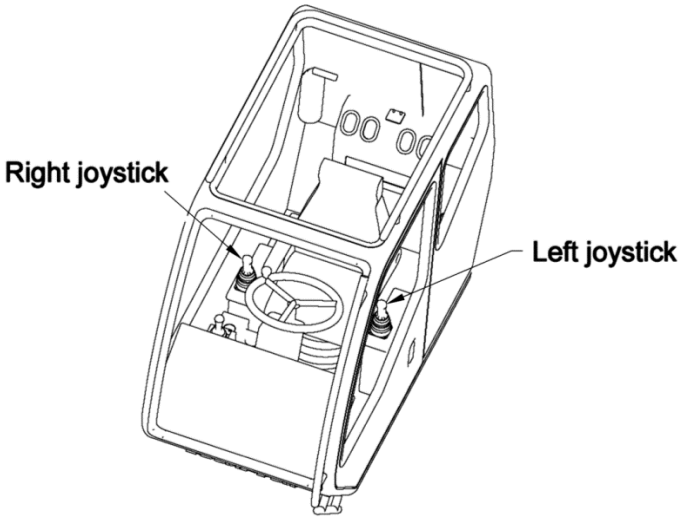


Figure 07 – 8 Joystick Locations

Note

Only when the operator's seat is occupied and the icon  on the display lights up,can the right joystick initiate various movement.

(2) If the end of the boom is not directly above the load lift point when you lift a load, do the steps that follow:

(a) Push the FREE SWING button. The FREE SWING indicator illuminates and the free swing is active.

(b) Let the boom automatically align the end of the boom above the load.

(c) Push FREE SWING button again to disengage free swing. The FREE SWING indicator goes off.

(d) The Main Winch Control is on the dash. Set it for the necessary winch speed (high or low).

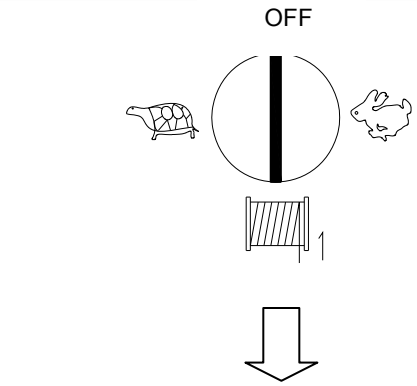


Figure 07 – 9 Main Winch - Right Joystick

C. Auxiliary Winch

(1) The left joystick controls the auxiliary winch. Push the joystick forward to reel-off to move the load down. Pull it to the rear to spool-up to move the load up.

Note

Only when the operator's seat is occupied and the icon  on the display lights up,can the joysticks initiate various movement.

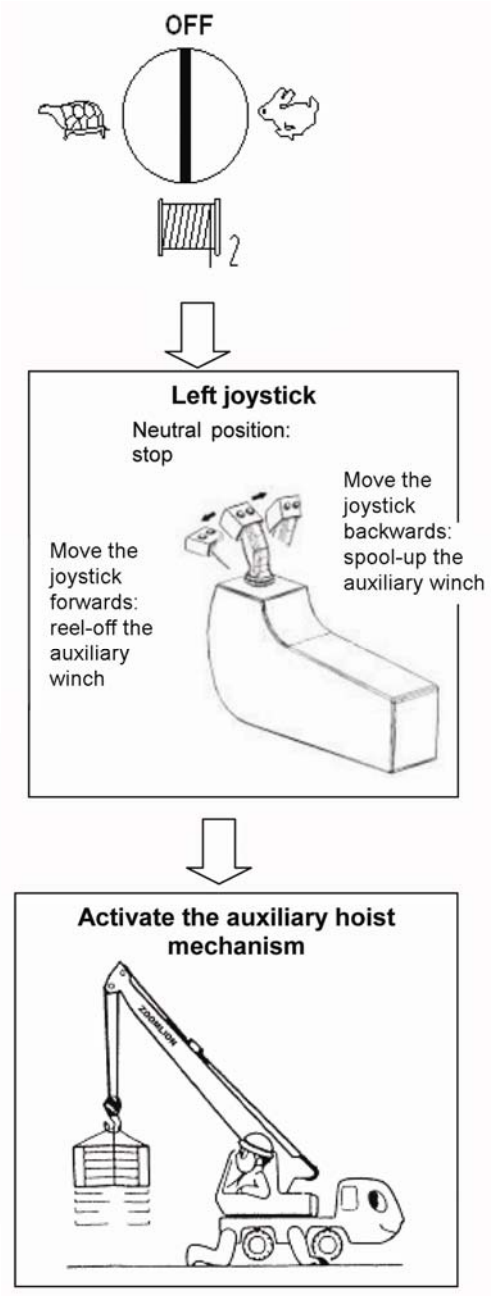


Figure 07 – 10 Auxiliary Winch - Left Joystick

(a) After you complete the movement, move the joystick to the neutral position slowly to stop the movements.

(b) The two winches (main and auxiliary) have a speed selector switch. You can set a slow or high speed for the winch movements (reel-off or spool-up). The speed at which you move the load increases or decreases by the pressure put on the throttle pedal. When you increase the engine idle speed, the load moves more quickly.

(c) The joystick travel distance is the third procedure to adjust how fast the winch moves. When you push the joystick a short distance, the winch moves are slow. When you push the joystick fully forward, the winch moves are fast. You have the same results when you pull back on the joystick.

Note

The speed adjustments operate the same for the left and right joysticks.

(d) When the main or aux. winch is in the spool-up mode and the hook block touches the anti-two block weight, the items below occur:

- A warning noise sounds.
- A warning light illuminates.

(e) When the warning occurs, the function of the items below stop:

- Winch spool-up
- Boom extension
- Derrick boom down.

(f) When the crane sensor senses that the load weight is more than the load weight in the system, the items below occur:

- A warning noise sounds
- A warning light illuminates.

(g) When the warning occurs, the function of the items below stop:

- Winch spool-up
- Boom extension
- Boom derrick down.

(h) When the sensor senses that the main or aux. winch has 3 wraps of wire-rope on it, the reel-off function stops.

(i) If necessary, this switch-off can be bypassed by the bypass key switch in cab. When the maintenance personnel repair or check out the functions on the crane, they can turn the bypass key switch.

(j) Do bypassed movement with maximum precaution and minimum speed.

Warning

Do not use the bypass key switch when you do usual crane operations.

Caution

- **Choose the correct line parts for the boom length and load weights. If the hook turns because of the rope, put the load on the ground. Do not lift the load until the rope is straight.**
- **When you lift a load to a height that is more than usual, monitor the number of wire-rope wraps remaining on the winch. If the load is lowered down a hole that is deep, monitor the wire-rope. Keep a minimum of 3 wraps of rope on the winch while you operate the crane.**
- **Lift the load vertically. Do not try to lift the load diagonally. Do not pull a load across the ground.**
- **Monitor the area as you lift a load. Do not move a load unless the conditions are safe.**
- **Do not derrick the boom up and extend the boom at the same time if:**
  - **The crane has a part of the load weight**
  - **The crane is connects to a load on the ground.**
- **Do not change quickly between reel-off and spool-up. Let the winch stop before you continue to move the hook.**
- **Do not try to lift a load that weighs more than the lift capacity of the crane.**
- **Do not use the crane to lift personnel.**

D. Hoist Line Reeving

(1) Before you start to change the wire-rope parts, fully retract the boom and move it to the front of the crane.

(2) Change the wire-rope parts as follows:

(a) Derrick the boom down to put the hook on the ground.

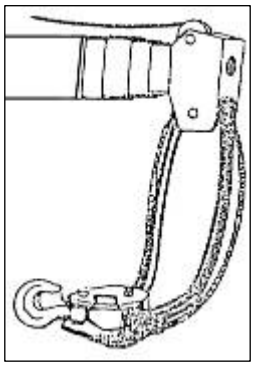


Figure 07 – 11 Down Boom Position

(b) Remove the pins on the hook block and boom head to let the wire rope unreeve.

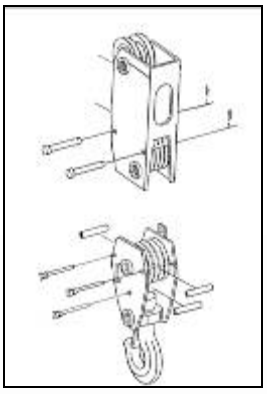


Figure 07 – 12 Hook Assembly

(c) Remove the anti-two block weight.

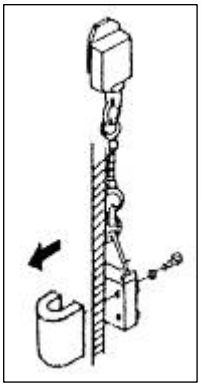


Figure 07 – 13 Anti-Two Block Weight

(d) Remove the wedge and socket assembly (beckett).

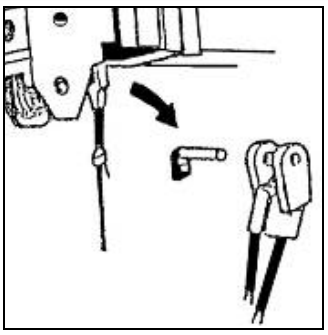


Figure 07 – 14 Even Line Parts

Note

Dead end the rope on the hook block for an odd number of parts, and on the boom head for an even number of parts.

(e) Change the line parts.

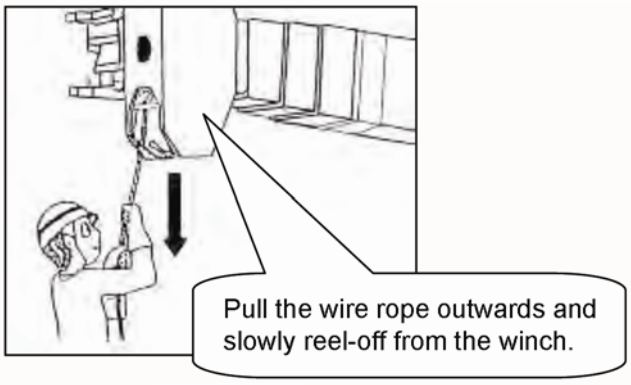


Figure 07 – 15 Line Part Change

Note

You must change the location of the anti-two block weight if you have a different number of wire-rope wraps.

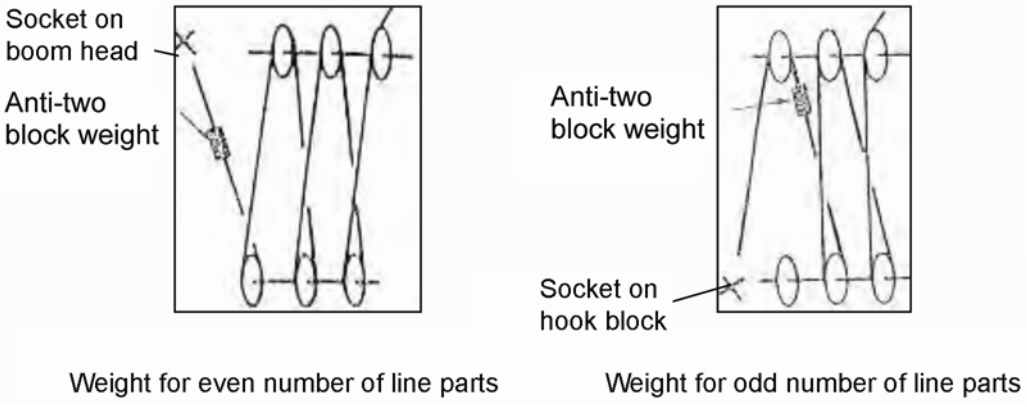


Figure 07 – 16 Even and Odd Line Parts

(f) Put the wire-rope on the winch spool smoothly and in sequence.

(g) Install the socket and wire-rope clamp. Refer to Figure 07 – 17.

(h) Do not install the wire rope clamp on the live side of the wire rope.

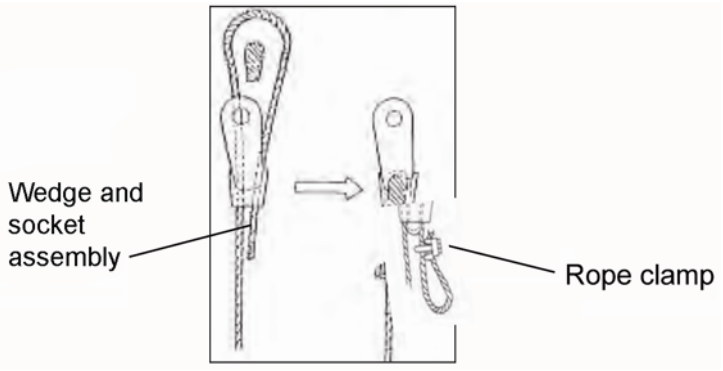


Figure 07 – 17 Rope Clamp

7.14 MAIN BOOM EXTEND / RETRACT FUNCTION OPERATION

A. The boom has four parts to it: a basic boom and three telescopic sections. The basic boom section attaches to the superstructure with a pivot connection. The three telescopic sections move together to increase the length / range of the boom. Refer to Figure 7 – 18.

B. To extend and retract the boom, a telescoping mechanism is attached in the boom structure. The components of the telescoping mechanism are as follows:

- Telescoping cylinder
- Boom extension wire-rope
- Boom retraction wire-rope.

C. The figure below shows the telescoping principle:

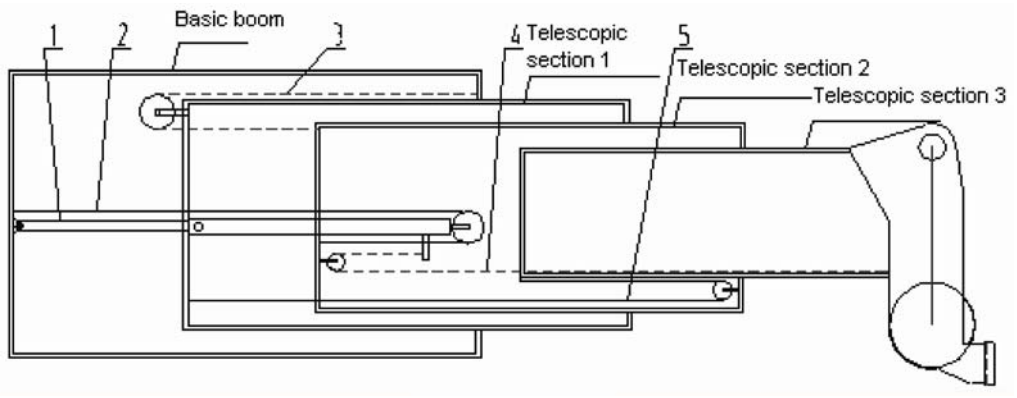


Figure 07 – 18 Telescoping Principle

1. Telescoping Cylinder
2. Boom Extension Wire-Rope
3. Boom Retraction Wire-Rope
4. Boom Retraction Wire-Rope
5. Boom Extension Wire-Rope

D. The balance valve, in the hydraulic system, helps the telescoping components move smoothly. When the boom is set the correct length, the valve causes a blockage of the hydraulic oil flow out of the cylinder. This helps to lock the boom in position.

E. The length detector (in the main boom, on the left side) measures the boom length and transmits the data to the rated capacity indicator. The boom length data is calculated then the boom configuration shows on the screen.

F. Operate - extend the boom.

(1) Pull the PTO handle up to the engage position.

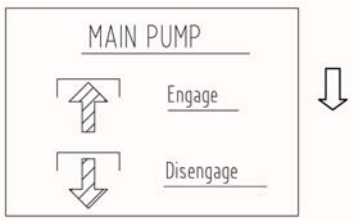


Figure 07 – 19 PTO Handle Engage Position

(2) To extend the boom, activate the deadman switch to use this function.

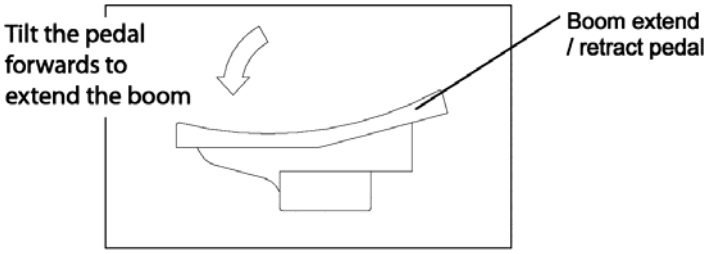


Figure 07 – 20 Extend / Retract Pedal Forward

Note

Only when the operator's seat is occupied and the icon on the display lights up,can the joysticks initiate various movement.

(3) When you tilt the pedal forward, the telescopic sections 1, 2 and 3 move out at the same time.

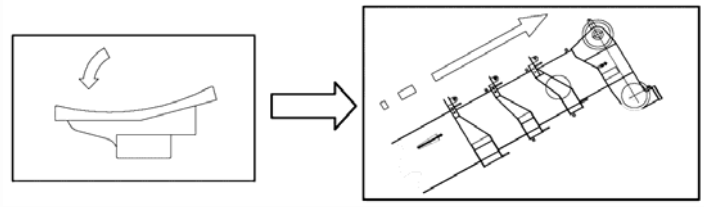


Figure 07 – 21 Telescopic Sections - Extend

(4) Release the pedal slowly to the neutral position to stop the telescoping movement. The boom stops at that point.

⚠ Caution

When you extend the boom and the hook block touches the anti-two block weight, the items below occur:

- **A warning noise sounds**
- **A warning light illuminates.**

When the warning occurs, the function of the items below, stop:

- **Winch spool-up**
- **Boom extension**

- **Derrick boom down.**

If you must extend the boom more, use the reel-off function (right joystick forward) to lower the hook block.

The crane has a bypass key switch that prevents the warning indications. When the maintenance personnel repair or check out the functions on the crane, they can turn the bypass key switch.

G. Operate -retract the boom.

(1) Make sure the seat occupied and activate the pedal to retract the boom.

(2) Tilt the pedal backward to retract the telescopic sections 1, 2 and 3.

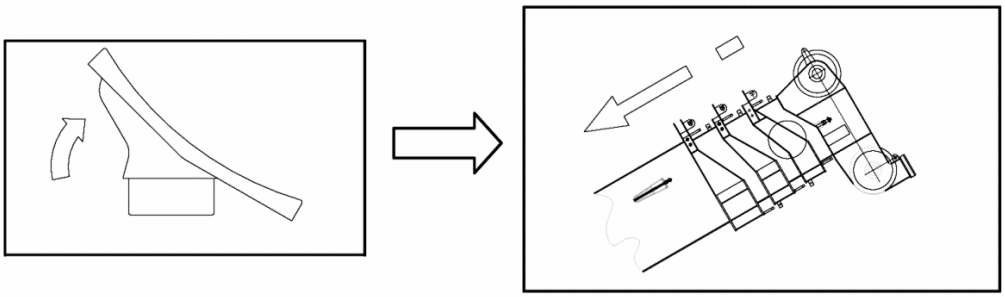


Figure 07 – 22 Telescopic Sections - Retract

(3) Release the pedal slowly to the neutral position to stop the telescoping movement. The boom stops at that point.

⚠ Caution

- **When you extend and retract the boom, the hook block moves up and down. Make sure that you adjust the length of the hoist wire-rope when you adjust the length of the boom. Do not extend the boom too quickly.**
- **The speed of the extend and retract movements change by:**
  - **The extend / retract pedal - how far you tilt it**
  - **Throttle pedal - increase or decrease the engine RPMs.**
- **When the boom is fully retracted, it can be two seconds before the boom starts to move.**
- **Lift the load vertically. Do not try to lift the load diagonally. Do not pull a load across the ground.**
- **Do not use the bypass key switch when you do usual crane operations.**
- **An extended boom can retract a short distance if the boom is extended for a long period of time. The items that follow are a possible cause for the movement:**
  - **A change in the hydraulic oil temperature**
  - **A change in the angle of the boom**
  - **Lubrication status.**

Solutions:

- **Make sure that the hydraulic oil temperature does not increase too high.**
- **Extend the boom to the correct length.**

- **Do not extend / retract the boom with a suspended load.**

7.15 BOOM DERRICK OPERATION

A. To move the boom up or down (derricking), hydraulic oil is pumped in or vented out of the derricking cylinder.

B. The boom angle (boom derricking) is adjusted from -3°- 78°, by telescoping derricking cylinder. When the boom is in the front at a -3°angle, jib assembly, line parts and boom head parts maintenance can be carried out easily.

C. The derricking cylinder has a balance valve. The balance valve, in the hydraulic system, helps the telescoping components move smoothly. When the boom is set at the correct length, the valve stops the hydraulic oil flow out of the derricking cylinder. This helps to lock the boom in position.

D. The right joystick controls the derricking movements. The seat must be occupied to use this function.

E. The speed of the derricking up / down movements change by:

- Joystick - how far you move the joystick left or right
- Throttle pedal - increase or decrease the engine RPMs.

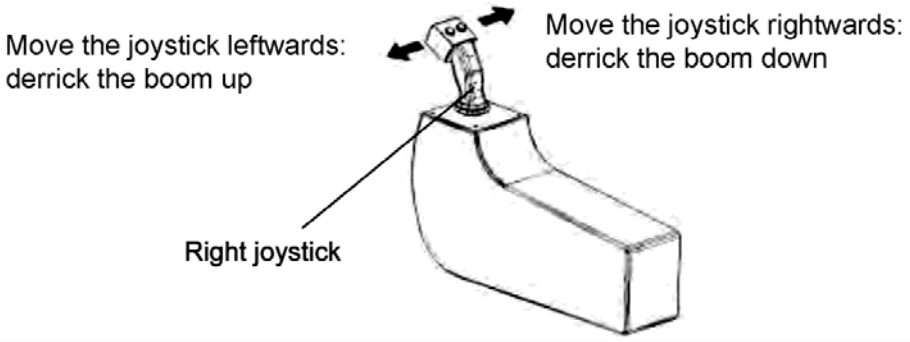


Figure 07 – 23 Derricking Operation

F. The boom angle indicator and the angle detector attach to the side of the main boom. Refer to Figure 07 – 24. The operator can see the angle indicator from the cab of the crane. The angle detector is an electronic device that sends the boom angle data to the RCI (Rated Capacity Indicator). The boom angle shows on the display screen.

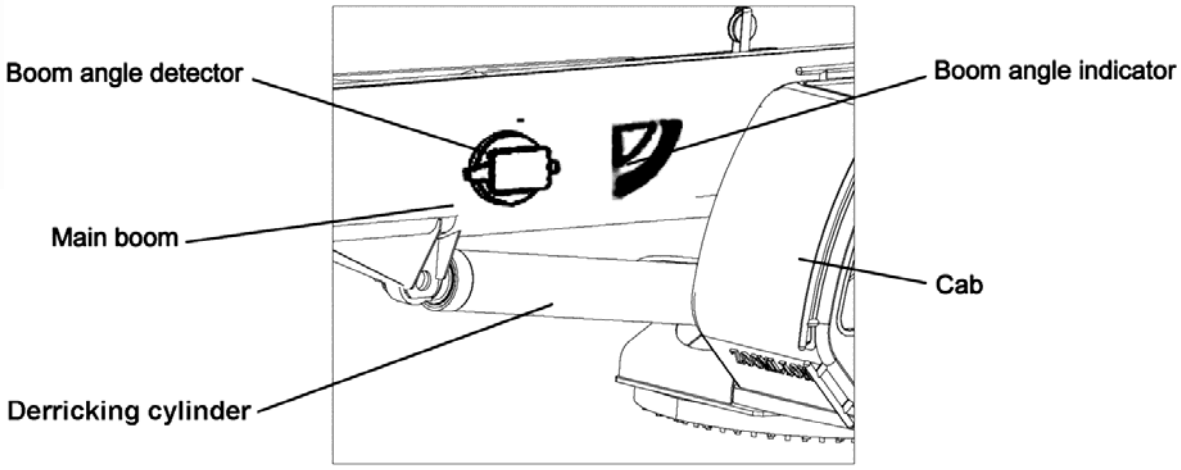


Figure 07 – 24 Boom Angle Indicator / Detector

Warning

Do all derricking movements smoothly. You can cause damage to the crane if you move the load up or down with quick stops.

You can cause a dangerous condition if you try to lift a heavy load with the boom at a low angle. Make sure that you follow the *Load Rating Chart*.

7.16 SWING OPERATION

A. Swing Mechanism

The superstructure, which includes the cab, moves around a full 360° range by the swing mechanism. The components that make up the swing mechanism are as follows:

- Hydraulic Motor
- Planetary Gear Reducer
- Swing Cushion Valve
- Drive Gear
- Swing Bearing
- Swing Lockout Device.

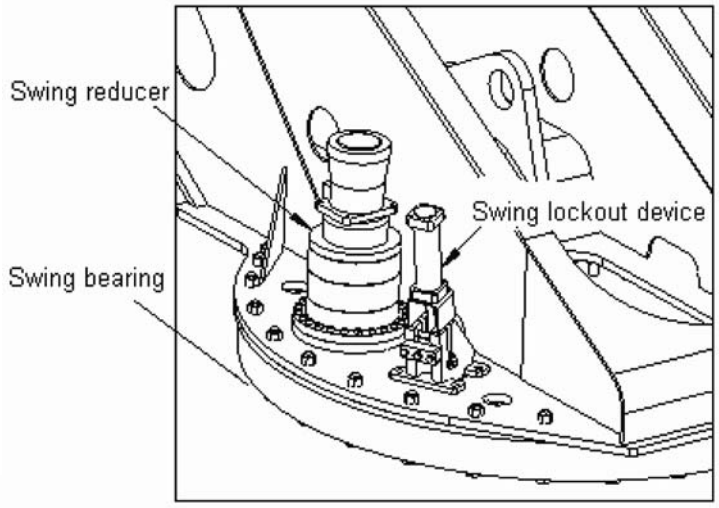


Figure 07 – 25 Swing Mechanism

B. Swing Lockout Device

The swing lockout device attaches on the right side of the superstructure. It can lock the superstructure in the 360° range. You use the swing lock switch (on the cab dash panel) to engage or disengage the swing lockout device. When the swing lock switch is in the LOCK position, the superstructure cannot move left or right.

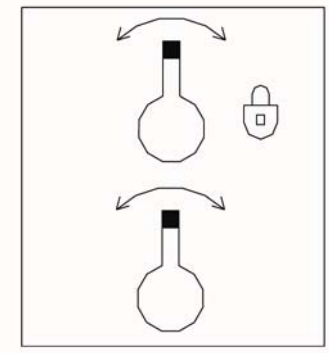


Figure 07 – 26 Swing Lock Switch

Caution

When you turn the crane, your view to the rear and side can be blocked. Be careful. Make sure that work-site personnel and equipment are clear from the area of travel. Send out a short warning sound (horn) before you move the crane. The aft end of the crane extends out 12 ft (3780 mm) from the superstructure center point.

C. Operate - Swing During a Lift

(1) Disengage the swing lockout device with the swing lock switch. The swing lock indicator changes on the cab dash panel. Refer to Figure 07 – 27.

Figure 07 – 27 Unlock Indicator

(2) To swing the superstructure, push the left joystick to the left or right. The seat must be occupied to use this function. The speed of the swing movement changes by:

- Joystick - how far you move the joystick left or right
- Throttle pedal - increase or decrease the engine RPMs.

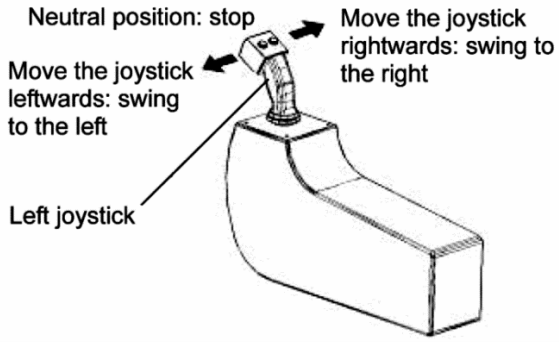


Figure 07 – 28 Left Joystick

Caution

- **Make sure that you do not make fast movements or suddenly stop the turn.**
- **When you operate a new crane, make sure that you do a check of the Maintenance Log. The swing bearing bolts must be examined at these intervals: 100, 500, 1000 hours of operation.**
  - **The torque on the bolts must be 700 ft·lbs (950 N·m).**
- **The crane can turn with a load above the ground. Do not try to lift the load diagonally. Do not pull a load across the ground.**

- **Make sure that the outriggers are in the correct position and RCI is set to the proper configuration before you swing the superstructure with a load on the boom.**
- **Monitor the area as you move a load. Do not move a load unless the conditions are safe.**
- **Before you swing the superstructure, make sure that the swing lockout device is in the UNLOCK position. When crane movements stop, lock the superstructure and ensure the swing lock indicator illuminates.**

⚠ Danger

Before you lift and move a load, make sure that the wind and weather conditions are safe to operate.

7.17 MULTIFUNCTIONS

A. The crane can do two operations or more at the same time. This increases the quantity of work that the crane can do.

B. Before you start, make sure that you examine or do the items that follow:

- The hydraulic system works correctly and gives a sufficient flow for multifunctioning.
- Do not move the joysticks to their limit positions.
- Easy, smooth movements are necessary when you do an operation for multifunctioning.
- Make sure that you increase the engine RPMs.
- Monitor the area as you operate. Do not move a load unless the conditions are safe.

⚠ Warning

You can only use crane movements that operate at the same time when there is no load (or when you lift the load away from the ground).

C. Main Winch + Extend or Retract the Boom

You can move the main hook up or down and extend or retract the boom, at the same time. To do this, push or pull the right joystick and push the left pedal. Refer to Figure 07 - 29.

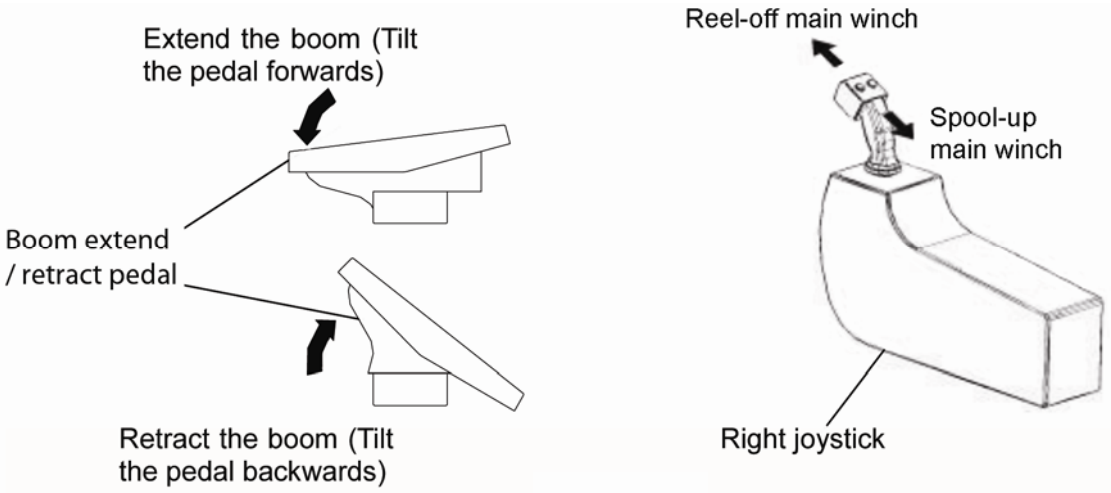


Figure 07 – 29 Main Winch + Boom Extend or Retract

D. Main Winch + Auxiliary Winch

To move the main winch and the auxiliary winch at the same time, move (push and/or pull) the left and right joysticks. The main hook and auxiliary hook move up and/or down. Refer to Figure 07 – 30.

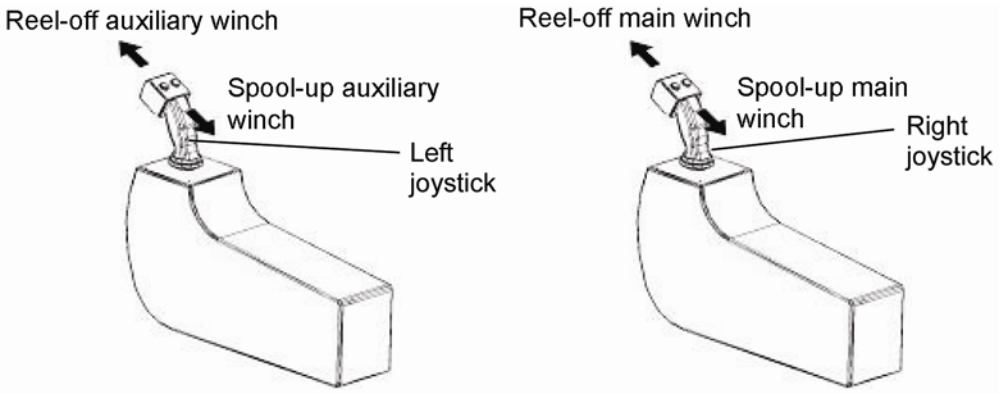


Figure 07 – 30 Main Winch + Auxiliary Winch

E. Derrick + Extend or Retract the Boom

You can move the boom up or down and extend or retract the boom at the same time. To do this, move the right joystick left or right and push the left pedal. The boom moves up or down and the boom extends or retracts. Refer to Figure 07 – 31.

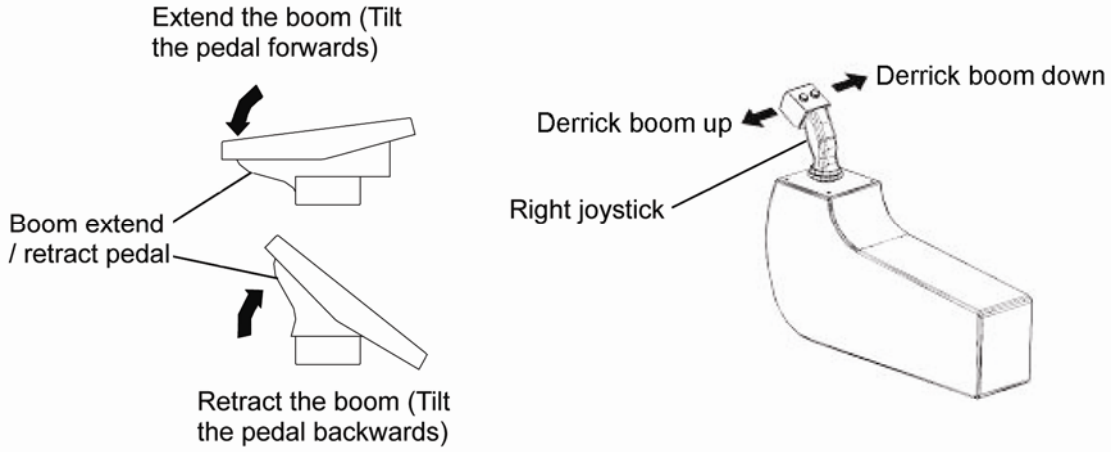


Figure 07 – 31 Derrick + Boom Extend or Retract

F. Derrick + Auxiliary Winch

You can move the boom up or down and move the auxiliary hook up or down at the same time. To do this, push or pull the left joystick and move the right joystick left or right. Refer to Figure 07 – 32.

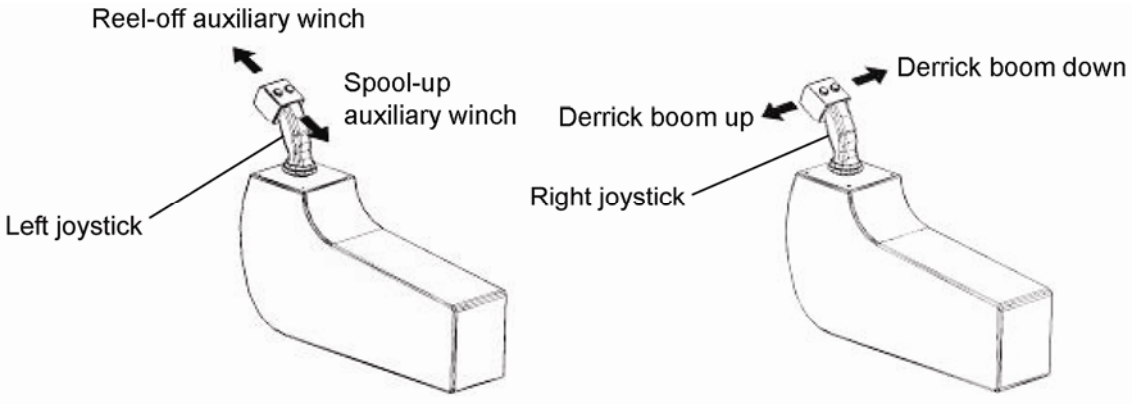


Figure 07 – 32 Derrick + Auxiliary Winch

G. Swing + Derrick

You can swing the superstructure to the left or right and move the boom up or down at the same time. To do this, move the left joystick left or right and move the right joystick left or right. Refer to Figure 07 – 33.

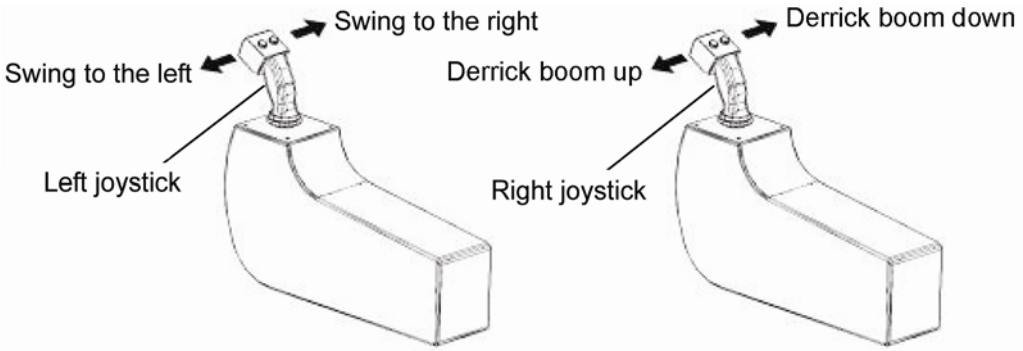


Figure 07 – 33 Swing + Derrick

⚠ Caution

When you lift the load, it moves. Be careful not to touch the outriggers with the load.

Monitor the area as you move the load. The outriggers move in the path of travel. Do not move a load unless the conditions are safe.

H. Swing + Main Winch

You can swing the superstructure to the left or right and move the main hook up or down at the same time. To do this, move the left joystick left or right and push or pull the right joystick. Refer to Figure 07 – 34.

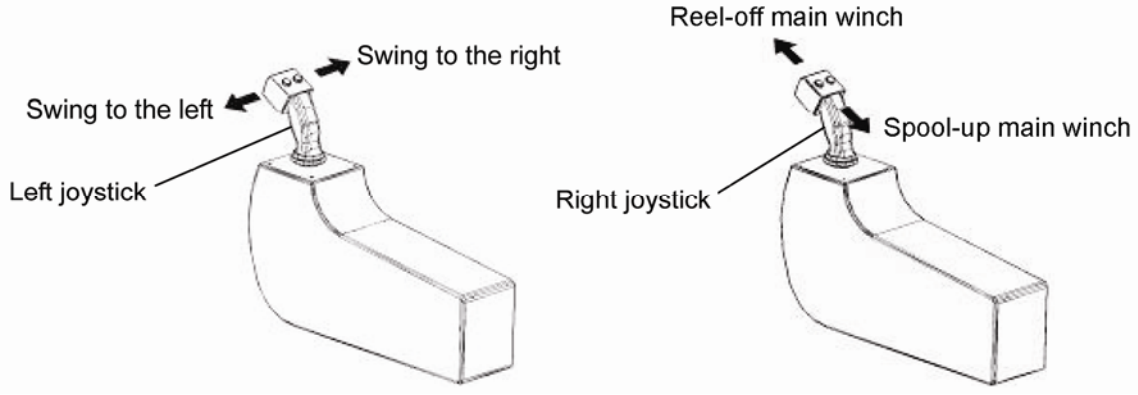


Figure 07 – 34 Swing + Main Winch

I. Derrick + Main Winch

(1) You can move the boom up or down and move the main hook up or down at the same time. For this type of move, it is necessary for the operator to move the joystick two adjacent directions. For example, to move the boom and main hook down, push the right joystick up and to the right (1:30 clock position). Refer to Figure 07 – 35. The other movements on the right joystick are as follows:

(2) Push up and to the left (10:30 clock position) - the boom moves up and the main hook moves down.

(3) Pull aft and to the right (4:30 clock position) - the boom moves down and the main hook moves up.

(4) Pull aft and to the left (7:30 clock position) - the boom moves up and the main hook moves down.

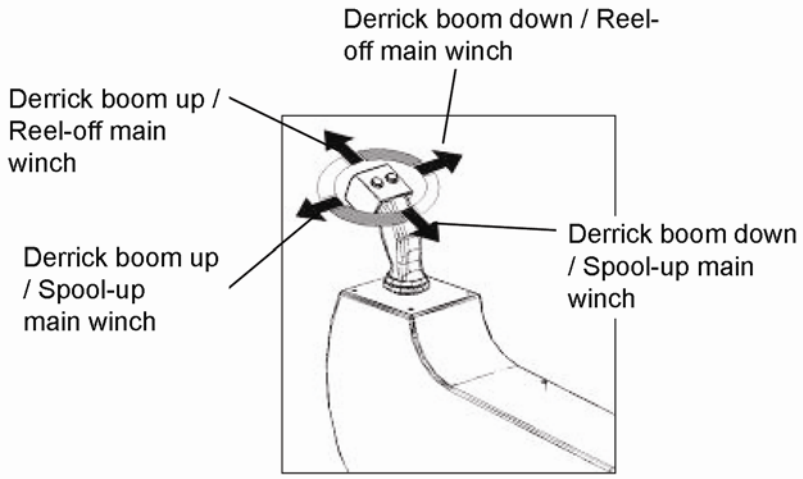


Figure 07 – 35 Derrick + Main Winch

J. Swing + Auxiliary Winch

(1) You can swing the superstructure to the left or right and move the auxiliary hook up or down at the same time. For this type of move, it is necessary for the operator to move the joystick two adjacent directions. For example, to swing the superstructure to the right and move the auxiliary hook down, push the left joystick up and to the right (1:30 clock position). Refer to Figure 07 – 36. The other movements on the left joystick are as follows:

(2) Push up and to the left (10:30 clock position) - the superstructure swings to the left the auxiliary hook moves down.

(3) Pull aft and to the right (4:30 clock position) - the superstructure swings to the right and the auxiliary hook moves up.

(4) Pull aft and to the left (7:30 clock position) the superstructure to the left and the auxiliary hook moves up.

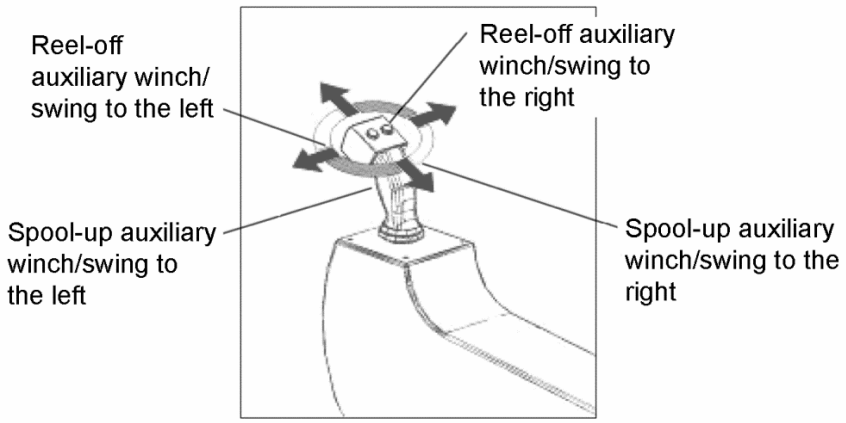


Figure 07 – 36 Swing + Auxiliary Winch

K. Swing + Extend or Retract the Boom

You can extend or retract the boom and to swing the superstructure to the left or right at the same time. To do this, push the left pedal and move the left joystick left or right. Refer to Figure 07 – 37.

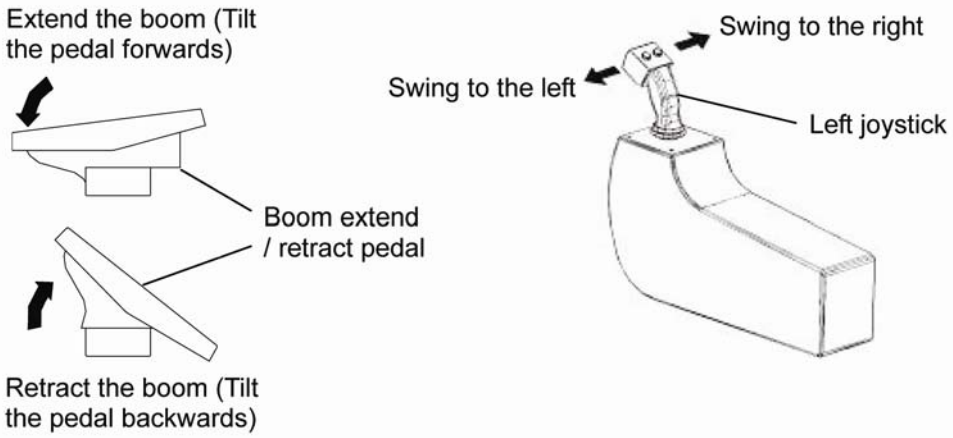


Figure 07 – 37 Swing + Boom Extend or Retract

Note

To add a third or fourth multifunction operation, lightly apply the correct controls. If you do another operation, some or all of the crane functions in operation can decrease. Carefully make smooth crane operations.

7.18 JIB OPERATION

A. The crane has a 2-section jib. Section 1 is a lattice structure and section 2 is a box-shaped structure.

B. When the operation does not use the jib, it is installed on the right side of the boom. It connects to boom by pins.

C. You can assemble the jib at an angle of 0°, 20° or 40° to the telescopic boom according to working requirements.

⚠ Warning

You cannot use the jib when you lift a load if the outriggers are not in the correct position.

D. Assemble the jib. Refer to Figure 07 – 38 to Figure 07 – 45.

(1) Extend the outriggers and make the crane level.

(2) Retract the boom fully.

(3) Move the boom to the front of the crane and position it to -3°.

(4) Extend the intermediate bracket and remove the pin (1).

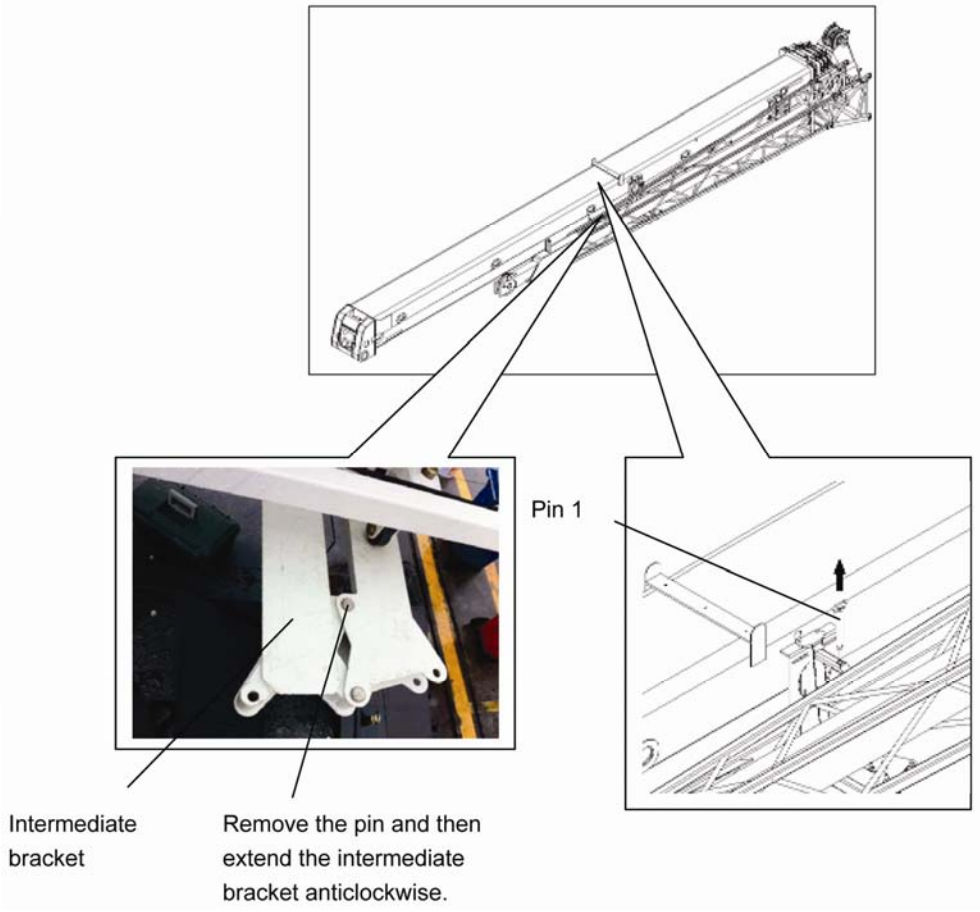


Figure 07 – 38 Pin (1) Removal

(5) Move front of the jib away from the main boom (jib pivots at pin 2).

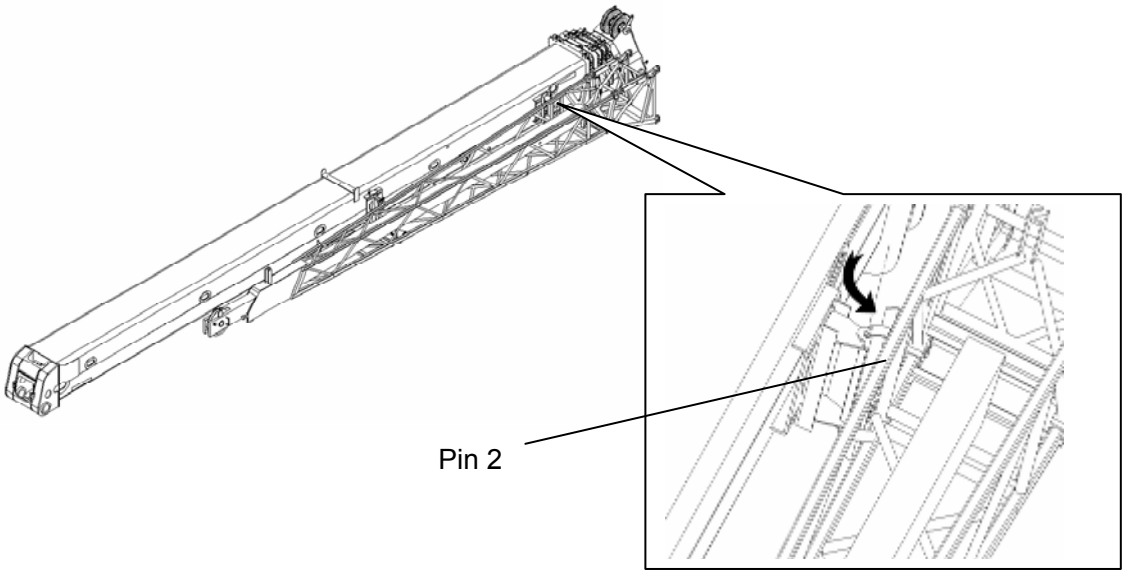


Figure 07 – 39 Pin (2) Location

(6) Align the end of the jib with the connection points on the end of the boom. Install the pin (3) and pin (4) and retaining clip.

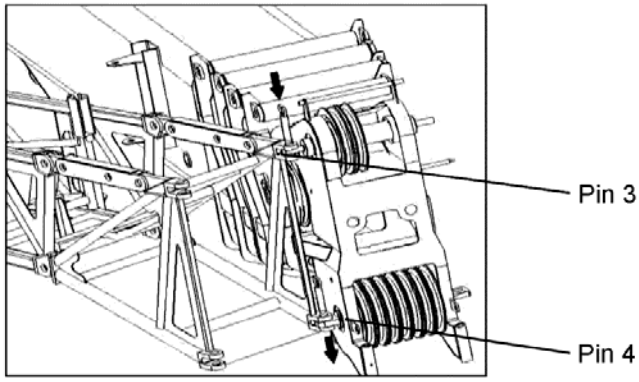


Figure 07 – 40 Pin (3) and Pin (4) Installation

(7) Remove the pin 2.

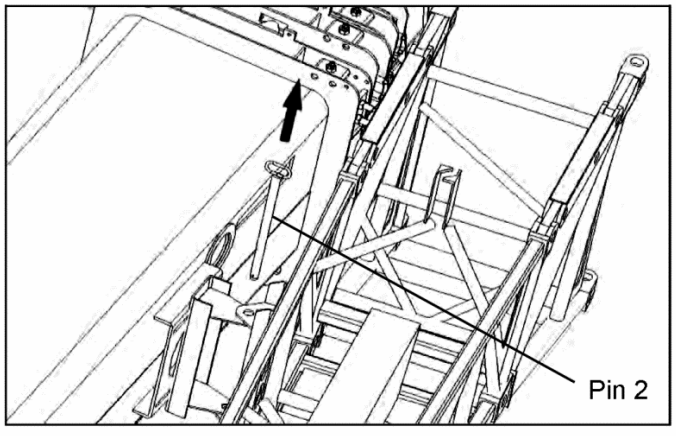


Figure 07 – 41 Pin (2) Removal

(8) Move the jib (pivots on pin 3 and pin 4) to the front of the main boom.

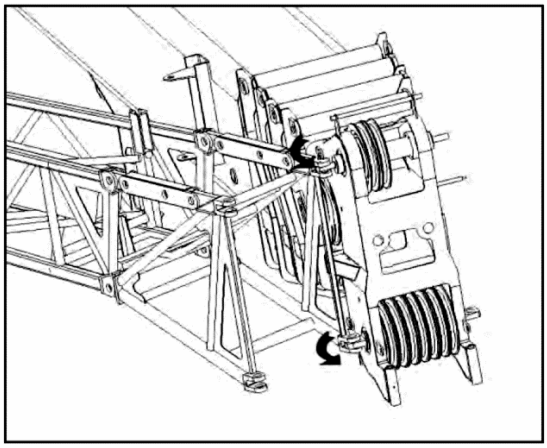


Figure 07 – 42 Move the Jib

(9) Align the end of the jib with connection points on the main boom. Install the pin (5) and pin (6) and the retaining clip.

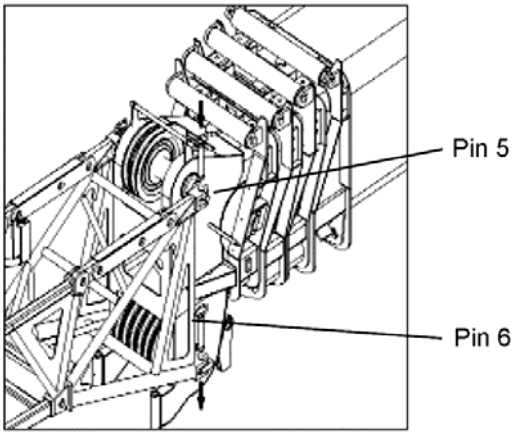


Figure 07 – 43 Pin (5) and Pin (6) Installation

(10) Remove the pin (7) and retaining clip from jib section 2.

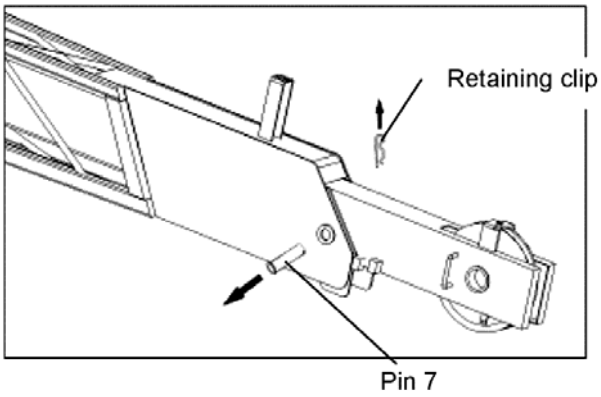


Figure 07 – 44 Pin (7) Removal

(11) Pull out the section 2, and stop when it touches the limit stop. Align the holes and install the pin (7) and the retaining clip.

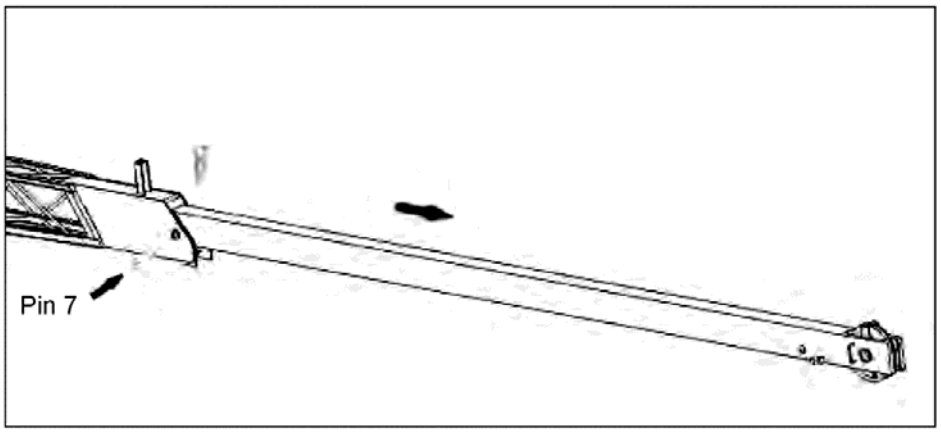


Figure 07 – 45 Pin (7) Installation

(12) Reeve the wire-rope from the auxiliary winch through the end of the jib. Install the auxiliary hook and the anti-two block switch.

E. Change the jib offset from 0° to 20° or 40°. Refer to Figures 07 – 46 and 07 – 47.

(1) Fully retract the boom.

(2) Make sure that the outriggers are fully extended.

(3) Derrick the boom to 0° position.

(4) Reeve the hoist wire-rope through the jib sheave.

(5) Remove the pins and the retaining clips at point A from the pull bracket. Put the pins and retaining clips at point B for the 20° position or point C for the 40° position.

(6) Pay out the hoist rope and derrick the boom up slowly until the pin at point B or point C touches pin A.

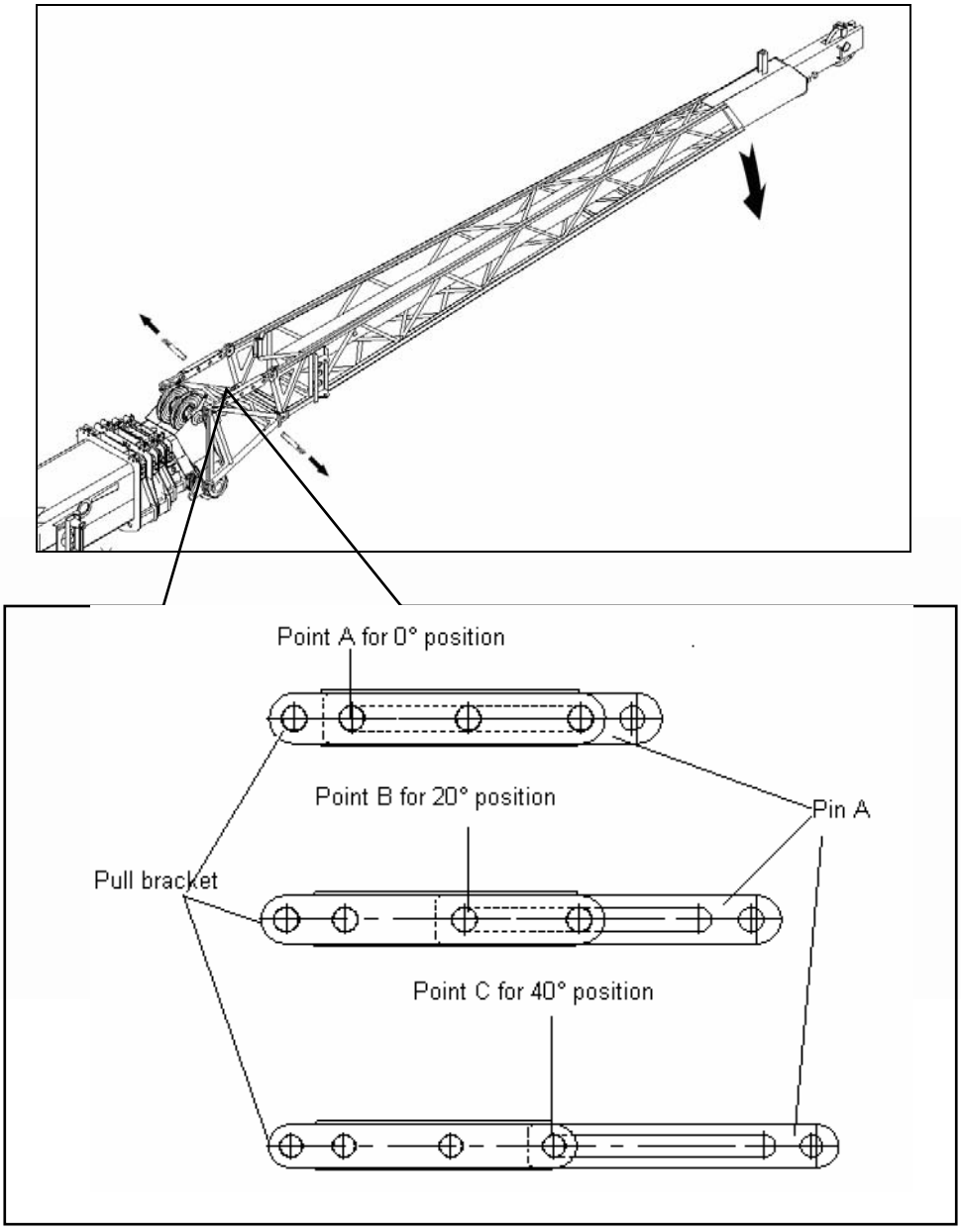


Figure 07 – 46 Offset Positions

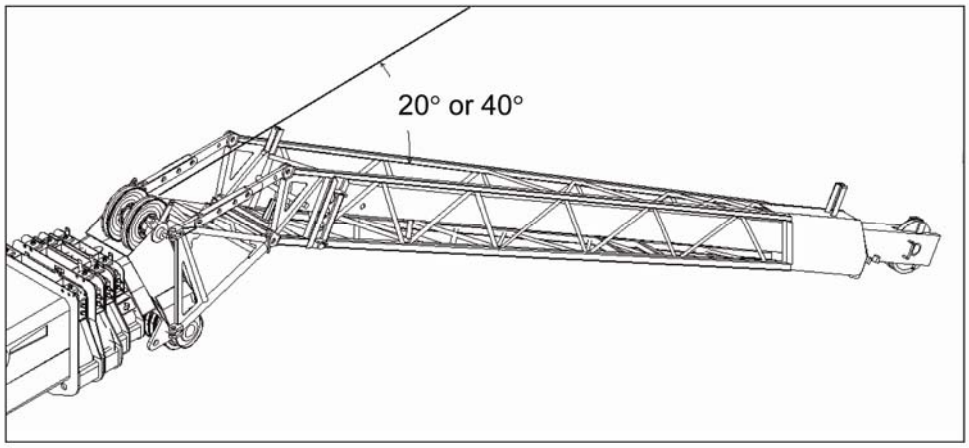


Figure 07 – 47 Offset

F. Disassemble the Jib

After you complete the jib operation, disassemble the jib in reverse order of the assemble steps.

⚠ Caution

- **Make sure that the area is clear of personnel and equipment before you move the boom around.**

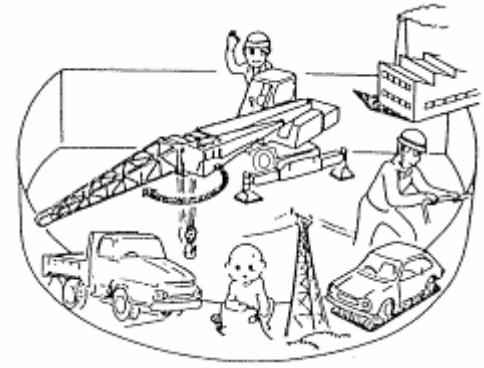


Figure 07 – 48 Hazard Area – Boom Swing

- **The outriggers must be fully extended before you assemble or disassemble the jib.**
- **When you install the jib to the side of the boom, you must install all the pins. Do not move the crane until all the jib pins are in position.**
- **When you use the jib in a lift operation, put the High / Low Speed Select Switch for Aux. winch in the high or low position.**
- **Fully retract the boom. Move the jib to the front of the crane and set the boom to the -3° position. You must use the correct work stands (ladders, stairs, etc.) when you assemble or disassemble the jib.**

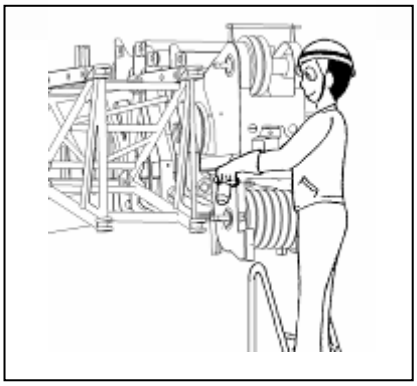


Figure 07 – 49 Use a Stand

- **When you remove the jib, carefully attach it to the side of the boom.**
- **When you remove the auxiliary hook and put it in the stow position, obey the hand signals from the signal personnel.**

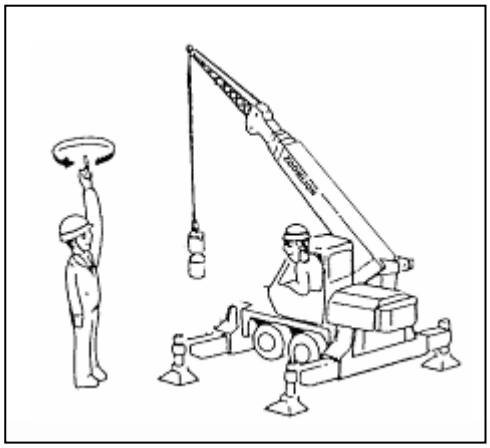


Figure 07 – 50 Signal Personnel

7.19 ROOSTER SHEAVE

A. The components of the rooster sheave are as follows:

- Bracket
- Sheave Spindle
- Sheave
- Pins.

B. When it is not necessary to use the rooster sheave, make sure that it is attached to the side of the boom.

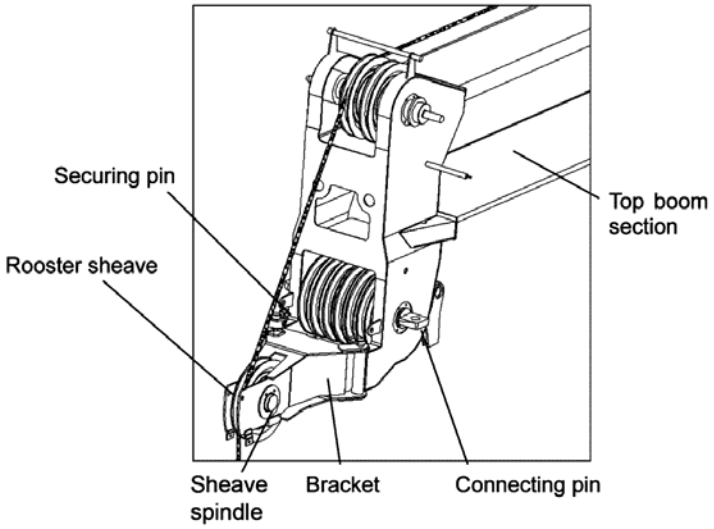


Figure 07 – 51 Rooster Sheave

C. When the crane is to lift a light load (≤ 5.5T), use the rooster sheave. It is the most efficient procedure to move a lighter object.

(1) Assembly

(a) Fully retract the boom.

(b) Move the jib over front or over side and set the boom to the -3° position.

(c) Remove the securing pin and move the bracket to the front of the boom. Align the connection points. Install the connecting pin.

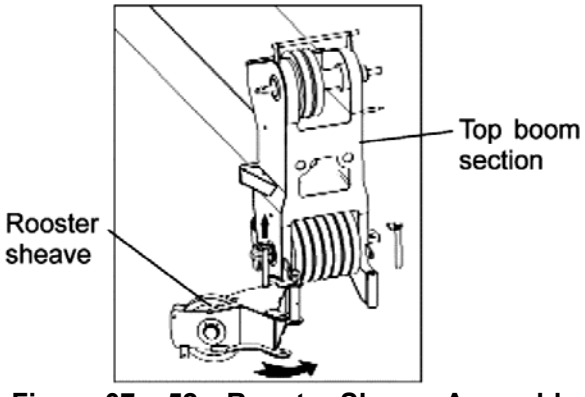


Figure 07 – 52 Rooster Sheave Assembly

(d) Reeve the auxiliary wire-rope through the rooster sheave. Install the auxiliary hook and the anti-two block switch. Make sure that all connections are tight.

(2) Disassembly

When it is not necessary to use the rooster sheave, make sure that it is attached to the side of the boom. Disassemble it in the reverse order of the assemble procedure.

⚠ Caution

When it is not necessary to use the jib, make sure that it is attached to the side of the boom. You cannot use rooster sheave when the jib is attached to the front of the boom.

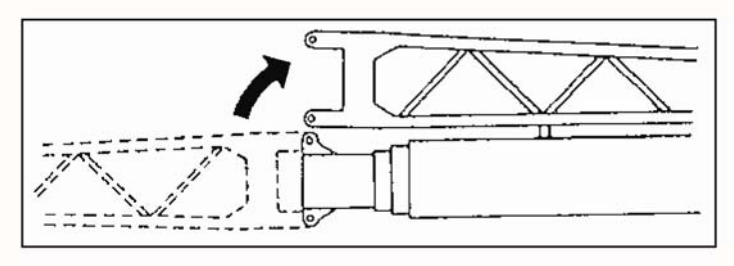


Figure 07 – 53 Attach the Jib to the Side of the Boom

⚠ Caution

When you remove the auxiliary hook and put it in the stow position, obey the hand signals from the signal personnel.

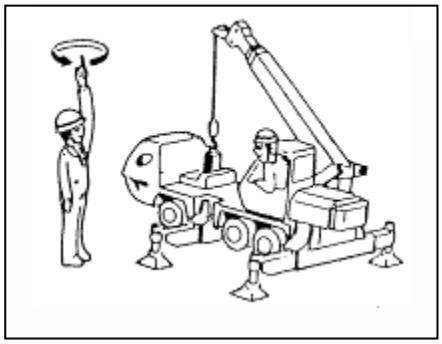


Figure 07 – 54 Hand Signal – Stow Position

7.20 VEHICULAR OPERATION

A. The Rough Terrain Crane can move off-road and a short distance of on-road travel.

B. Before you move the crane, think about the distance and type of terrain that you must move on. Plan your moves carefully to prevent all dangerous conditions.

C. Pre-Move Checklist

(1) Before you move the crane to and from the job-site, make sure that you do the safety items that follow:

⚠ Caution

Set the parking brake. Always put chocks before and behind on the wheels when you park on a slope.

(a) Engage the swing lock.

⚠ Caution

Do not move the anti-two block weight when it is near the head of the crane. You can cause damage to the boom head, rooster sheave and anti-two block switch.

(b) Attach the main hook block to the front of the crane. If you cannot do this, align the anti-two block weight 1" (30 mm) from the boom head by applying the by-pass key switch. The crane can be damaged if you let the anti-two block weight move side-to-side when you move the crane.

(c) Make sure that the outriggers are fully retracted and the retaining pins are installed.

(d) When you move the crane more than 2 mi. (3.22 km), make sure that the main pump and PTO is disengaged.

(e) If necessary, put the transmission into the high-speed range, 2-wheel drive mode.

(f) Make sure that tire pressure is correct.

(g) Before you move the crane, adjust the seat and mirrors.

⚠ Caution

Do not move the crane if the transmission oil pressure is less than 250 psi (17.2 bar). You can cause damage to the transmission.

(h) Make sure that the transmission oil pressure (250 to 300 psi (17.2 to 20.7 bar)) and oil temperature (180°F to 200°F (82.2°C to 93.3°C)) are in the correct range.

D. Move the Crane to a Job-Site

(1) Do the items that follow before you move the crane:

(a) Start the engine.

(b) Idle the engine for a short interval to let the air pressure increase to the correct level.

(c) Engage the swing lock.

(d) Apply the service brake.

(e) Release the parking brake.

(f) Move the gear selector to the "F1" position.

Note

Make sure that you use the correct transmission gear when you move on rough terrain.

(2) The crane operates in the off-road conditions. If necessary, you can move the crane on general roadways. The crane must hold the items that follow:

- Lights
- Flares
- Flags
- Safety equipment.

⚠ Caution

When you move the crane on hard surfaces, shift the transmission to high-speed range. If not, the crane can be damaged.

⚠ Caution

When you move the crane, make sure that you are in the correct gear for the type of travel. When you use the incorrect gear, you put too much load on the crane. When the oil temperature is more than 250°F (121.1°C), stop the crane immediately. To decrease the temperature: move the gear selector to the "N" position. Operate the engine at an RPM range between 1000 to 1200 rpm. The oil temperature decreases in a short interval of time immediately. If it does not, you must examine the crane for a different malfunction.

DO NOT stop the engine at this time.

⚠ Caution

Do not move the gear selector between forward and reverse when the crane is in motion.

(3) Full power shifts, with a load, are permitted. Damage to the transmission or drive components is not likely to occur. When you move the crane at a high speed, do not

move the gear selector to a lower gear. This can cause the transmission to go too fast and can cause damage to the drive train.

(4) Obey the items in the table. Stop the crane when you are at one of the limits in the table.

Table 07 – 1 Limits

Running Interval	4 Hours	2 Hours
Cooling Time	1 Hour	30 Minutes

E. Charge the Battery Before You Stop the Engine

Before you stop the engine, idle the engine for an interval of time. Stop the engine when the battery has a full charge.

F. Stopping the Engine

When it is necessary to stop the engine, operate the engine at idle speed (with no load on the engine), for minimum 5 minutes. This lets the engine coolant temperature decrease gradually before the engine stops. This cool down period is very important for a crane with a turbocharged engine. This is because the turbocharged engine makes more heat than an engine that does not have a turbocharger. When the engine indicators and gages are at the correct level, stop the engine. Move the ignition switch to the "OFF" position.

G. Move the Crane at the Job-Site

Before you move the crane on the job-site, make sure that there is clearance to prevent injury to personnel or damage to the crane and other objects. Obey the items that follow before you move the crane:

(1) The boom must be in the front of the crane.

(2) Engage the swing lock.

(3) Secure the main hook to the bumper loop or put the hook block near the boom head sheaves.

(4) Make sure that you fully retract the outriggers.

(5) Do not move with the boom above horizontal unless the surface is hard, level and smooth.

(6) Look for overhead blockages such as trees, power lines or bridges.

(7) When the terrain is not smooth, move at a slow speed.

(8) Do not side move the crane on a slope that is more than 15°.

(9) Can be done within permissible angles with caution.

- The engine and transmission lubricant in the tanks moves to one side. You can cause damage to the engine or transmission.
- You can tip over.

Caution

You can side move the crane on hard surfaces with a slope less than 15°. When on rough terrain surfaces, the slope angle must not be more than 5°. The boom must in the front, at 0° to -3°.

Caution

Refer to the ON TIRES LIFTS procedure when you move a load.

7.21 ON TIRES LIFTS (CREEPING A LOAD)

A. Special precautions for On Tires lifts when moving a load.

(1) The boom must be in the forward position.

(2) Move the load at a slow speed.

(3) Make sure that the tire pressure is at the correct level.

(4) Do not make sudden stops or starts.

(5) Use tag lines. Do not let the load move around.

(6) Keep the load near the ground.

(7) Engage the swing lock.

(8) You must only move the travel on a hard surface. It must hold the weight of the crane and the load. The travel surface must also be free of holes or unwanted material that can cause the crane to tilt.

Note

These precautions are necessary to prevent the pendulum effect. This can cause the crane to tilt.

Caution

- **Obey all the safety precautions. Do not move a load in the "ON TIRE" mode if the pressure in the tires is not correct. When the pressure in the tires is low, you must decrease the load. You can cause damage to the tires and wheels, or tilt the crane, if you try to lift a load that is too heavy.**
- **Hydraulic oil temperatures that are too high cause rubber components (hose, O-rings, etc.) to fail. If hydraulic oil in the tank temperature increases to 176℉ (80℃), decrease the time of the lift. Stop the operation to prevent a rise in the hydraulic oil temperature.**
- **When you move a load in the "Creep" mode, the maximum speed is 0.6 mph (1.6 km/h). Stop and wait for 30 minutes after you move 60 ft. (18 m) to prevent overheating the tires.**

7.22 UNUSUAL OPERATING CONDITIONS

A. You must use caution when you operate in the conditions that follow:

- Extreme Cold
- Extreme Heat
- Sandy or Dusty Job-Sites
- High Humidity and Saltwater
- High Altitudes
- Storms.

B. Extreme Cold

(1) If you operate in very cold areas, lubrication and battery malfunctions are usual. Make sure that the crane is winterized by the service facility.

(2) Before you operate the crane, you should use fluid and oil of recommended brand, type and quantity.

(3) Keep the battery fully charged. Keep the battery in the building, if necessary.

(4) Drain the water from the cooling system.

(5) Remove the moisture in the air brake system.

⚠ Caution

Do not engage the PTO until the hydraulic oil is warm. If the oil is too cold it does not flow correctly.

(6) You must know that the hydraulic oil becomes thick when you operate in very cold weather. If you operate the crane and the hydraulic oil does not flow correctly, you can damage the system. When the oil is warm, you can slowly move parts of the crane to help increase the temperature of the oil. Do not try to operate the cylinders quickly.

(7) At the end of the work period, park the crane in an area where it cannot freeze to the ground (wood, concrete, asphalt, or mat).

C. Extreme Heat

When you operate in an area that is too hot, examine the indicators and gauges frequently. Follow these precautions:

(1) Examine the engine oil frequently. If the engine is too low on the oil level, the engine cannot cool correctly. If it is necessary to add oil to the engine, make sure that you add the correct type of oil.

(2) Make sure that the engine coolant is at the correct level. Do not try to add water in the coolant if the engine is hot. Do not add salt water to the coolant system.

(3) If the engine becomes too hot because of coolant loss, slowly add coolant while the engine operates at fast idle.

(4) Make sure that the air flow around the engine and battery is not blocked.

(5) Keep the engine clean. Dirt, grease and other materials can prevent the heat dissipation.

(6) Use sound judgment in operating the engine. Avoid the two extremes of racing and lugging.

(7) Do not operate the crane at a high level if it is not necessary.

(8) Do not operate the crane engine too slowly. The engine fan speed cannot be too slow.

D. Sandy or Dusty Job-Sites

You must keep the air filter clean at all times. A large quantity of sand and/or dust at the job-site can increase wear on the components. Make sure that the lubrication schedule increases to a more frequent interval.

(1) Make sure that all filler caps (fuel, oil, coolant, hydraulic oil) are in position and tight.

(2) When you lubricate the crane fittings, make sure that you clean all the fittings. Add a large quantity of grease to all points.

(3) Make sure that the outrigger floats are on a stable surface.

(4) Make sure that the scheduled servicing intervals are adjusted when the job-site conditions are not usual.

E. High Humidity or Saltwater

When you operate the crane near the coast, salt and moisture can change the operation of the crane. Follow these precautions:

(1) Examine all metal surfaces for corrosion. Remove the moisture when you can. Make sure that all exposed areas are lubricated and/or painted.

(2) Make sure that the bearing and bearing surfaces are lubricated.

(3) Make sure that you clean and lubricate the wire-rope.

F. High Altitudes

When you operate the crane in a high altitude, the mixture of fuel-air can change. There is a decrease in the oxygen for the engine to burn.

(1) Examine the air filter frequently. Make sure that the air to the filter is not blocked.

(2) Examine the engine temperature gauge frequently. The engine can get too hot.

G. Storms

If there is a bad weather condition, do the items that follow:

(1) Set the load on the ground and retract the boom.

(2) Stop the crane and go into a shelter if conditions are dangerous because of lightning.

(3) If lightning hits the crane, make sure that it is safe to operate before you try to start it.

(4) Always be aware for a quick change in the weather.

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Chapter 8 Transportation and storage

8. 1 TRANSPORTATION

Transport the Crane

(1) Train or Ship

(a) You can move the crane by its power for a short distance or by other carriers for a long distance (train or ship). If you move the crane, chock the wheels and make the crane safe with wire-ropes. Fully close the windows and door to keep rain and moisture out of the cab. Lock the door and windows. Follow the protection procedures to prevent corrosion and rust if you move the crane by sea.

(b) The positions to lift the crane are in the Figure 08 – 1. Follow applicable rules while you lift.

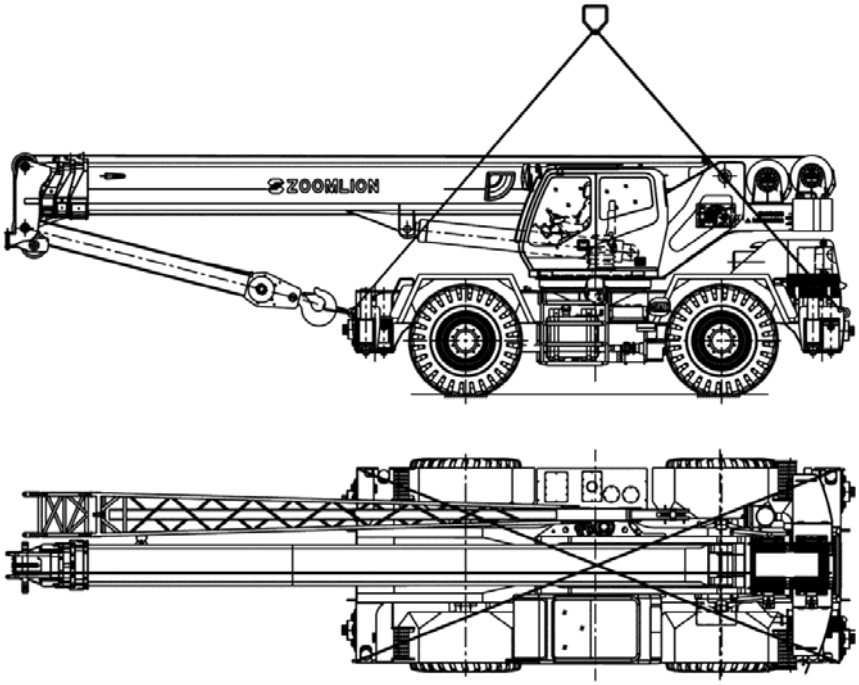

Figure 08 – 1 Crane Lift Points

⚠ Warning

Before you lift, make sure that the slings have sufficient strength to hold the crane.

(2) Trailer

(a) You can move the crane on a trailer for long distances.

⚠ Caution

Before you operate the crane, read the manuals that come with the crane. Read and follow all general safety rules.

(b) Prepare Trailer.

Make sure that ramps are in position and the path of travel is clear while you load.

(c) Pre-Start Inspection

Refer to the *Operator's Manual* for a Pre-Start Inspection procedure.

(d) Pre-Move Checklist

Refer to the *Operator's Manual* for a Pre-Move Inspection procedure.

(e) Load the Crane.

1 Use the reverse gear if you back the equipment onto the trailer. Use the forward gear if you move forward onto the trailer.

2 If the crane has a "4-wheel drive" mode, use the low range to engage it.

3 To move the crane onto the trailer, apply the service brake and then set the park brake switch to OFF. Move the gear selector to the F1 position. Slowly release the service brake. Use the throttle pedal to increase speed. When you move up the ramp, keep the speed of the crane slow. Use the steering-wheel to control the direction of the front tires. Push the service brake to stop.

4 When the crane is in position, move the front tires to the middle position. Move the gear selector to the neutral position. Apply the parking brake and release the service brake. Turn the engine to OFF.

(f) Secure the Crane.

To prevent the crane from movements, make sure that the tires are chocked and attach the chains.

(g) Unload the Crane.

To unload the crane, do the "Load the Crane" task in the opposite sequence.

8. 2 STORAGE

Do the steps that follow if you do not use the crane for more than 6 months:

(1) Clean contamination off of the crane.

(2) Fully retract all the cylinder pistons.

(3) Fully extend the outriggers to lift the tires away from the ground. Inflate the tires to specified pressure and put wooden wedges below the tires.

⚠ Caution

The "wooden wedges" cannot touch the tires.

(4) Remove the battery and keep it in a dry location with good airflow.

Charge it (once every half month) and discharge it (every three months) in regular intervals.

(5) Fill the fuel tank with oil.

(6) Fill the coolant tank.

(7) You must lubricate the surfaces of all the exposed metal components to prevent corrosion.

(8) Remove all contamination (dust and sand) from the wire-ropes and lubricate them with ZG-3 (a calcium based graphite grease).

(9) Keep the crane in a garage. If not, put a water-proof cloth on it to prevent corrosion. In rainy season areas, examine the crane frequently to prevent corrosion. Protect the crane from very cold weather conditions.

(10) Operate the engine for 15 to 30 minutes each month. Examine the mechanisms at idle speed to make sure that they operate correctly.

(11) Make sure that one person keeps the crane prepared for operation.

(12) If you do not operate the crane for more than three months:

Operate the engine at idle speed for one hour in the three month interval.

(13) If you do not operate the crane for more than 18 months:

- Keep the crane clean and do the usual maintenance.
- Replace aged seal components.
- Do a general inspection of the engine to see if you must replace the coolant, diesel oil, and air / fuel filters.

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OPERATOR’S MANUAL FOR ROUGH TERRAIN CRANE

Chapter 9 Specifications

9.1 CONVERSION TABLES

Table 09 – 1 Decimal and Metric Equivalents of Fractions of an Inch

Fractions of an inch	Decimals of an inch	Millimeters	Fractions of an inch	Decimals of an inch	Millimeters
1/64	.0156	0.397	33/64	.5156	13.097
1/32	.0313	0.794	17/32	.5313	13.494
3/64	.0469	1.191	35/64	.5469	13.891
1/16	.0625	1.588	9/16	.5625	14.287
5/64	.0781	1.985	37/64	.5781	14.684
3/32	.0938	2.381	19/32	.5938	15.081
7/64	.1094	2.778	39/64	.6094	15.478
1/8	.1250	3.175	5/8	.6250	15.875
9/64	.0406	3.572	41/64	.6406	16.272
5/32	.1563	3.969	21/32	.6563	16.688
11/64	.1719	4.366	43/64	.6719	17.085
3/16	.1875	4.762	11/16	.6875	17.462
13/64	.2031	5.159	45/64	.7031	17.859
7/32	.2188	5.556	23/32	.7188	18.256
15/64	.2344	5.953	47/64	.7344	18.653
1/4	.2500	6.350	3/4	.7500	19.050
17/64	.2656	6.747	49/64	.7656	19.447
9/32	.2813	7.144	25/32	.7813	19.843
19/64	.2969	7.541	51/64	.7969	20.240
5/16	.3135	7.937	13/16	.8125	20.637
21/64	.3281	8.334	53/64	.8281	21.034
11/32	.3438	8.731	27/32	.8438	21/430
23/64	.3594	9.128	55/64	.8594	21/827
3/8	.3750	9.525	7/8	.8750	22.224
25/64	.3906	9.922	57/64	.8906	22.621
13/32	.4063	10.319	29/32	.9063	23.018
27/64	.4219	10.716	59/64	.9219	23.415
7/16	.4375	11.12	15/16	.9375	23.812
29/64	.4531	11.509	61/64	.9531	24.209
15/32	.4688	11.906	31/32	.9688	24.606
31/64	.4844	12.303	63/64	.9844	25.003
1/2	.5000	12.700	1	1.0000	25.400

Table 09 – 2 Liquid Weights and Measures

LIQUID MEASURE		
4 gills	equals	1 pint
2 pints	"	1 quart
4 quarts	"	1 gallon
7.48 gallons	"	1 cu. ft.
240 gallons of water	"	1 Ton
340 gallons of gasoline	"	1 Ton

MEASURES OF WEIGHTS		
16 ounces	equals	1 pound
2000 pounds	"	1 short ton
2240 pounds	"	1 long ton
100 cu. feet	"	1 register ton
40 cu. feet	"	1 U.S. shipping ton

CIRCULAR MEASURE		
60 seconds	equals	1 minute
60 minutes	"	1 degree
90 degrees	"	1 quadrant
360 degrees	"	circumference

SURVEYOR'S MEASURE		
7.92 inches	equals	1 link
100 links	"	66 feet or 4 rods or 1 chain
80 chains	"	1 mile

Table 09 – 3 Metric Equivalents

LIQUID MEASURE		
1 litre	equals	.0353 cu. ft.
1 litre	"	.2642 gallon
1 litre	"	61.023 cu. in.
1 litre	"	2.202 lbs. of water(62°F.)
1 cu. foot	"	28.32 litres
1 gallon	"	3.785 litres
1 cu. inch	"	.0164 litre

MEASURE OF WEIGHTS		
1 gram	equals	.0353 ounce
1 kilogram	"	2.205 lbs.
1 ounce	"	28.35 grams
1 pound	"	.454 kilogram
1 ton	"	.907 metric ton

ELECTRICAL UNITS		
1 kilowatt	equals	1.34 H.P.
1 horsepower	"	746 watts

9.2 AVERAGE WEIGHT OF MATERIALS

Average Weight Of Materials

(Kilogram Per Cubic Meter)

METALS, ALLOYS, ORES

Aluminum, cast-hammered	2675.31
Brass, cast-rolled	8658.276
Bronze	8252.926
Copper, cast-rolled	9014.984
Gold, cast-hammered	19537.87-
Iron, gray-cast	7166.588
Iron slag	2788.808
Lead	11511.94
Manganese	7701.65
Mercury	13733.258
Nickel	8706.918
Steel	7798.934 - 7928.646
Tin, cast-hammered	7442.226
Tungsten	19456.8
Zinc, cast-rolled	7134.1

MASONRY

Ashlar masonry*	2318.602 - 2626.668
Rubble masonry*	2221.318 - 2529.384
Dry rubble masonry*	1783.54 - 2107.82
Granite, Syenite, Gneiss, Limestone, Sandstone, Bluestone	
Brick Masonry	1670.042 - 2075.392
Concrete masonry	1621.4 - 2075.392
Portland cement	3177.944
Portland cement, loose	1524.116
Lime, gypsum, loose	859.342 - 1037.696
Mortar, lime, set	1670.042

EARTH

Clay, dry	1021.482
Clay, damp, plastic	1783.54
Clay & gravel, dry	1621.4
Earth, dry loose	1232.264
Earth, dry packed	1540.3395
Earth, moist loose	1264.692
Earth, moist packed	1556.544
Earth, mud flowing	1751.112
Earth, mud packed	1864.61
Riprap, limestone, sandstone & shale	1297.12 -1702.47
Sand, gravel, dry loose	1459.26-1702.47
Sand, gravel, dry packed	1621.4-1945.68
Sand, gravel, wet	2042.964

EXCAVATIONS IN WATER

Sand or gravel	972.84
Sand or gravel & clay	1053.91
Clay	1297.12
River mud	1459.26
Soil	1134.98
Stone riprap	1053.91

STONE, QUARRIED, PILED

Basalt, granite, gneiss	1556.544
Limestone, marble, quartz	1540.33
Sandstone	1329.548
Shale	1491.688
Greenstone, hornblende	1734.898

WOOD	
Cedar	356.708
Fir, Douglas	518.848
Oak	680.988 - 875.556
Pine, Oregon	518.848
Pine, southern	616.132 - 680.988
Spruce	453.992
Black walnut	599.918

MISCELLANEOUS	
Water, 4°C	1011.7536
Water, 100°C	969.5972
Paper	940.412
Glass, common	2626.668
Petroleum	729.63 -875.556
Coal, anthracite	762.058 -875.556
Coal, bituminous	648.5-875.556
Coal, coke	372.922-518.848

9.3 TORQUE VALUES

Table 09 – 4 Torque Values for Dry – Uncoated Fasteners

Torque Values to be within ± 5%

All Figures in N·m

Note

This table does not apply to hydraulic connections.

Normal diameter (mm)	Grade 5.6	Grade 8.8	Grade 10.9	Grade 12.9
6	3.3	7	9.9	11.8
8	8.5	18	25.4	30.4
10	16.5	35	49.4	59.2
12	28.7	61	86	103
16	70	149	210	252
20	136.3	290	409	490
24	235	500	705	845
30	472	1004	1416	1697
36	822	1749	2466	2956
42	1319	2806	3957	4742
48	1991	4236	5973	7159
56	3192	6791	9575	11477
64	4769	10147	14307	17148
72	6904	14689	20712	24824

Note

The table includes bolts with "coarse threads".

The torque tolerance is ± 5%.

The friction factor is 0.7 times the yield point value.

The above values are suitable for the bolts lubricated. For the bolts without lubrication, the tightening torque is 133% of the corresponding one shown in the above table.

9.4 TECHNICAL SPECIFICATIONS

A. RT55 rough terrain crane has the qualities below:

- Wide Tread
- Short Wheelbase
- Very Stable
- Small Turn Radius
- 360° Swing Movement.

B. It can do "On Tires" lifts in areas where there is a small area of space for movement and can lift and move loads.

C. You can use the crane at the below locations to lift heavy items short distances.

- Construction Sites
- Oil Fields
- Warehouses
- Freight Yards
- Logistics Bases.

D. RT55 rough terrain crane has the components below:

- Upperstructure
- Power System
- Drive System
- Suspension System
- Steering System
- Brake System
- Hoist Mechanism
- Derricking Mechanism
- Swing Mechanism
- Boom System
- Superstructure
- Chassis Frame
- Outriggers
- Hydraulic System
- Electrical System
- Cab

E. Characteristics:

(1) Four steering modes: 2-wheel steer (front wheel), 2-wheel steer (rear wheel), 4-wheel steer and Crab steer

(2) Max. rated lift capacity: 60.6 tn at 9.8 ft. (55 t at 3 m) radius

(3) Max. lift height: 114 ft. (34.8 m)

(4) Max. travel speed: 24.23 mph (39 km/h)

(5) Overall dimensions: 43 ft. x 10.8 ft. x 12.3 (13110 × 3300 × 3750 mm) (Refer to Figure 09 – 1)

(6) Deadweight: 44.4 tn (40.26 t)

(7) Ability to pick-and-carry loads

(8) Rough terrain travel performance.

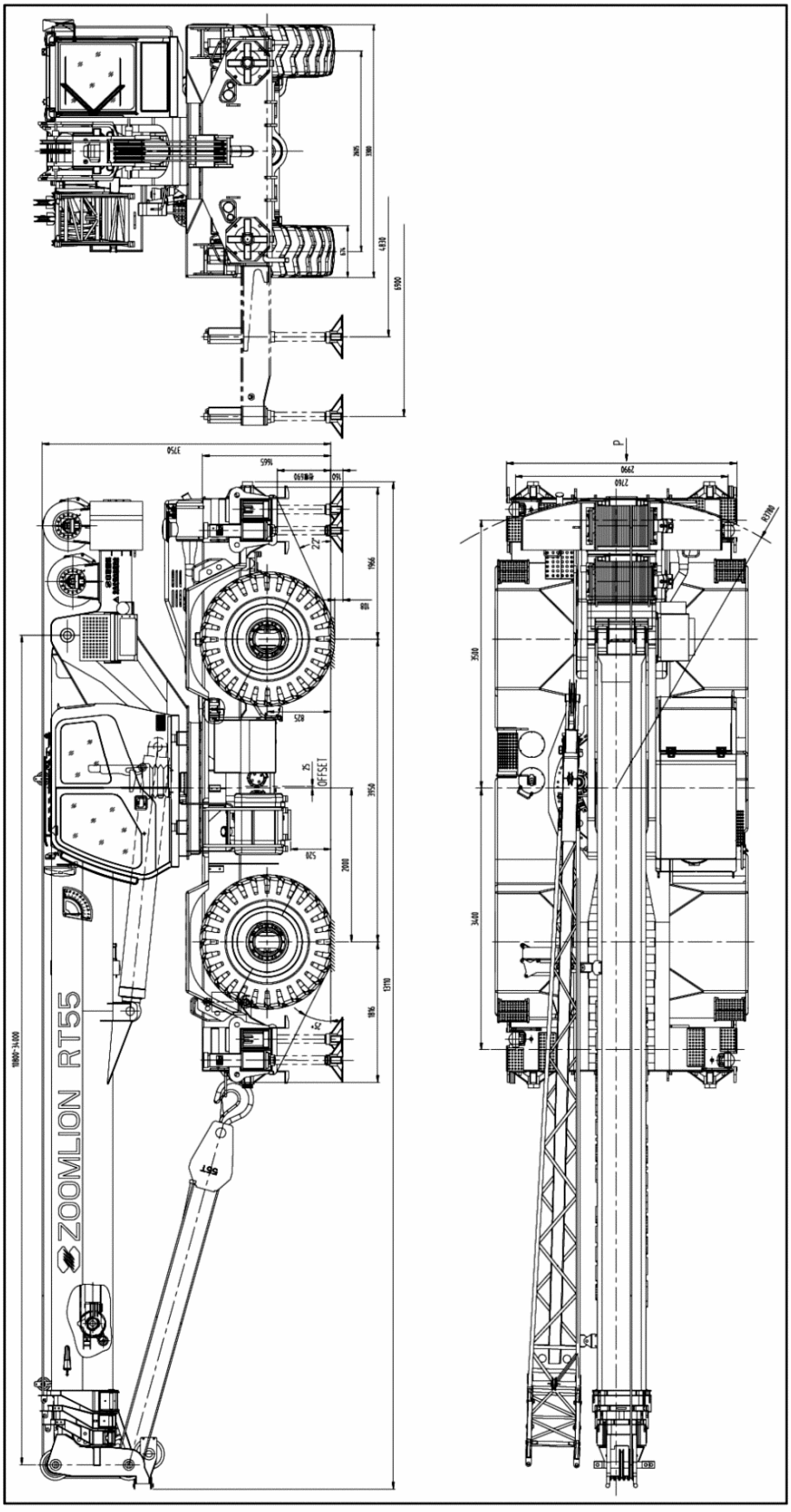

Figure 09 – 1 Overall View – RT55 Rough Terrain Crane

Table 09 – 5 Main Technical Data

Type	Ser. No.	Item	Unit	Value
Work Performance	1	Max. rated lift capacity× work radius	lb×ft kg×m	121254×9.8 55000×3.0
	2	Max. load moment of basic boom	lbf.ft kN·m	1451056 1967
	3	Max. load moment of max. length main boom	lbf.ft kN·m	830650 1126
	4	Max. lift height of max. length main boom	ft m	114.2 34.8
	5	Max. lifting height of jib	ft m	171.9 52.4
Dimensions	6	Overall dimensions (L × W × H)	in mm	516×130×148 13110×3300×3750
	7	Distance between outriggers (Longitudinal × transversal)	in mm	272×272 6900×6900
	8	Main boom length (Fully retracted – completely extended)	in mm	425×1339 10800- 34000
	9	Jib length (jib section 1, sections 1+2)	in mm	394, 669 10000, 17000
	10	Boom angle	°	-3-78
	11	Swing range		360°unlimitedswing (Full range)
Work speeds	12	Max. hoist rope speed (Main winch)	ft/min m/min	492 150
	13	Min. boom extend time	s	100
	14	Min. boom retract time	s	80
	15	Min. boom derrick up time	s	56
	16	Min. boom derrick down time	s	63
	17	Swing speed	r/min	0-2.5
Hydraulic system	18	Rated work pressure	psi MPa	3916 27
	19	Rated work oil flow	gal./min L/min	106 400
	20	Hydraulic oil tank capacity	gal. L	185 700
Mass	21	Complete vehicle mass	lbs kg	88758 40260
	22	Front axle load	lbs kg	47223 21420
	23	Rear axle load	lbs kg	41535 18840

Type	Ser. No.	Item	Unit	Value
Travel	24	Max. travel speed (Forwards/backwards)	mph km/h	24.23 39
	25	Wheelbase	in mm	156 3950
	26	Treads (Front/ rear)	in mm	103 2605
	27	Max. gradeability	%	75

SPECIFICATIONS, UPPERSTRUCTURE

A. Main boom and extend / retract mechanism

(1) The main boom 4 box-shape and hexagon boom sections made of high strength steel.

(2) The main boom head has 5 sheaves. You do not have to remove wedges when you change line parts. A rooster sheave is mounted at the boom head.

(3) The boom sections extend / retract by a hydraulic cylinder and two sets of boom extension / retraction ropes. The cylinder has a balance valve.

Min. main boom length (with sections fully retracted): 35 ft. (10800 mm)
Max. main boom length (with sections fully extended): 111.6 ft. (34000 mm)
Min. extend time: 100 s

B. Jib

(1) It consists of two jib sections. Jib section I is lattice structure 32.8 ft (10 m)long and jib section II is box-shaped structure 23 ft (7 m) long. The jib section II is secured into jib section I, and the whole jib is secured onto the right side of main boom via moveable pins during traveling.

(2) A sheave is assembled at the jib head.

Offset: 0°, 20° and 40°
Jib length: 32.8 ft – 55.8 ft (10 m – 17 m)

C. Derricking mechanism

(1) Rear-mounted single derricking cylinder with two-way balance valve

Derrick angle: -3° - 78°
Derrick speed (-3° - 78°): 56 sec.

D. Hoist mechanism

(1) Main and auxiliary winches

(a) Main and auxiliary winches have the same parts, which include:

- Variable displacement hydraulic motor, with axial plunger
- Planetary reducer

(b) The hydraulic motor drives the winch with a planetary reducer. When the winch turns (rotates), the wire-rope reels off or spools on to the winch.

Winch Speed Table	
Layer	Rope speed (m/min)
1	117
2	128
3	139
4	150

(2) Wire-rope

a) Torsion resistant hoist rope

Max. hoist rope strength:	15737 lbf (70 kN)
Max. hoist rope speed:	492 ft/min (150 m/min) (At the 4th layer)
Rope diameter:	Φ 0.75 in (Φ19 mm)
Rope length:	607 ft (185 m)

(3) Hook block

(a) Rotatable main hook: 60 tn (55 t), with 5 sheaves and hook latch, attached at the chassis frame in front of the superstructure.

(b) Rotatable auxiliary hook: 6.1 tn (5.5 t), with hook latch, used for with the rooster sheave and jib, attaches to the auxiliary hook holder.

E. Swing mechanism

(1) The swing mechanism includes these components:

- Hydraulic Motor
- Planetary Gear Reducer
- Pinion Gear
- Swing Bearing.

(2) Through the planetary gear reducer, the hydraulic motor causes the pinion gear to turn. This causes the swing bearing outer ring to turn around its inner toothed ring which sets on the chassis frame of the crane. This makes a superstructure with 360° unlimited swing.

(3) Hydraulically controlled usually-closed brake, with a swing function that you can control and a pneumatic swing lockout device.

Swing speed: 0 – 2.5 r/min

F. Superstructure

A high strength steel structure with integral mounting for two winches and bolt on counterweight.

G. Hydraulic system

(1) Oil pump

Two dual gear pumps

One supplies oil for the below uses:

- Boom Extend / Retract
- Derrick
- Hoist

The other supplies oil for the below uses:

- Outriggers
- Swing Mechanism
- Steering System
- Optional Equipment (such as air conditioning)

(2) Control valve

Quadruple pilot-operated proportional valve, with adjustable relief valve.

(3) Hydraulic lines

Tubes and hoses make up the hydraulic lines. The hydraulic lines go through a central rotating joint. You can find the oil cooler in the chassis.

(4) Hydraulic oil tank

Capacity: 185 gal (700 L)

(5) Filter

Return line filters supply can give 10 micron filtration.

H. Crane controls

(1) The two hydraulic, pilot-operated joysticks (on the sides of the seat of the operator) control the superstructure movements (comply with ISO standard requirements). The left joystick controls the swing and auxiliary winch movements. The right joystick controls the derricking and main winch movements. The boom extend / retract pedal controls the boom extension and retraction.

(2) The joysticks and the boom extend / retract pedal allow for combinations of multifunction operations for any of the items that follow:

- Spool-up / reel-off
- Derrick
- Boom Extend / Retract
- Swing.

(3) The switches found on the dash control the outriggers movements.

I. Cab

(1) There is one cab on the RT55 rough terrain crane. You can use it as the cab for the operator and for the driver. The cab attaches on the left side of the crane and has a seat for the operator.

(2) The crane uses an EATON (Ji'ning) hydraulic steering gear. It uses Yuxin (He'nan) special air conditioning and a Jingwei (Beijing) special cab heater for the vehicle.

(3) The heater emission complies with the Europe Environment Protection Agency.

(4) There are two joystick control boxes on either side of operator seat. The left side control box pivots up to allow for easy entry / egress from the cab. The controls of the superstructure are set to agree with ASME B30.5-2007 standard and with ISO (International Organization for Standardization) standards.

(5) Cab dimensions:

Length:	90.6 in ± 0.2 (2300 mm ± 5 mm)
Width:	41.7 in ± 0.2 (1060 mm ± 5 mm)
Height:	65.6 in ± 0.2 (1665 mm ± 5 mm)

J. Rated capacity indicator (RCI)

(1) RCI is a computer system. Refer to Manual supplied with the crane to understand the operation, maintenance and troubleshooting.

(2) If the actual load comes near the rated one, the buzzer sends out a warning that you can see and hear.

(3) If the actual load reaches the rated one, all dangerous movements switch OFF automatically.

(4) The rated capacity indicator also can control the working range (including work radius, boom angle, lift height and swing range etc.).

(5) The data below displays on the screen:

- Boom angle or moment ratio
- Boom length or default hook weight
- Actual work radius or swing angle
- Actual lift capacity
- Max. permitted lift capacity
- Offset or line parts
- Boom status indication
- Outrigger status (fully extended, intermediately extended, or fully retracted or "On Tires" indication)
- A bar graph.

Note

The bar graph shows the percentage of actual lift capacity to the rated one or the hydraulic system pressure.

K. Outriggers

(1) You can operate the H-type outriggers (hydraulic control) in the cab at the same time or independently.

(2) Each vertical jack cylinder has a two-way hydraulic lock to make sure that

outriggers attach safely while you do the work and move.

(3) Outrigger boxes are directly welded onto the crane chassis.

(4) You can fully and intermediately extend and fully retract the outriggers for crane operation.

Outrigger spread (L): 22.6 ft (6900 mm)

Outrigger spread (W) :

Fully extend:	22.6 ft (6900 mm)
Intermediately extend:	15.8 ft (4830 mm)
Fully retract:	9.1 ft (2760 mm)

SPECIFICATIONS - SPECIAL PURPOSE CHASSIS FOR ROUGH TERRAIN CRANE

A. Type

(1) Rear-mounted engine, left-hand drive type

(2) Drive mode: 4 x 2 and 4 x 4

B. Chassis Frame

High-tensile steel, welded integral box-type construction

C. Engine

(1) Model

CUMMINS QSB6.7Tier 3 EPA Compliant

(2) Type

Four stroke cycles, 6-cylinder in-line, electron jet, water-cooled, turbocharged

(3) Performance

Max. output power:	160 KW / 2500 RPM
Max. output torque:	649 ft.lb (880 N·m) / 1500 RPM

D. Drive system

(1) Electrically controlled automatic hydraulic transmission, with two modes: 2-wheel drive and 4-wheel drive.

(2) Six forward and reverse gears, electro-hydraulic power shift, and automatic locking mechanism.

(3) The engine and transmission supply the power to drive the hydraulic oil pump and steering system.

E. Axle

(1) Front axle

Steer and drive axle, rigidly attach to the chassis frame, with planetary reducer and brakes.

(2) Rear axle

Full-float steer and drive axle, with planetary reducer and brakes.

F. Steering system

(1) Full hydraulic power steering gear

(2) The steering-wheel controls the cylinder to turn the wheels.

(3) Four steering modes:

2-wheel steer – front wheel steer

2-wheel steer – rear wheel steer

4-wheel steer – all-wheel steer (all wheels turn at the same angle)

4-wheel steer – crab steer (front and back wheels turn in opposite directions).

G. Suspension system

(1) Front axle: rigidly mounted to the crane chassis

(2) Rear axle: Oscillation automatically locks if superstructure is swung more than 3 degrees past boom over the front. Oscillation also locks when parking brake is engaged.

H. Brake system

(1) Service brake

Hydraulically controlled disc brakes on four wheels

(2) Parking brake

Spring applied, hydraulically released parking brake is mounted to the input shaft of the front axle.

I. Electrical system

24 Volt DC

2 batteries with 12 V rated voltage and 120 Ah rated current.

J. Fuel tank

Capacity: 79 gal (300 L)

K. Tire

RECOMMENDED TIRE PRESSURE

TIRE SIZE	STATIONARY	CREEP 21/2MPH (1.6 km/h)	TRAVEL
26.50-25-32PR	85 PSI (580 kpa)	85 PSI (580 kpa)	65 PSI (450 kpa)

SAFETY DEVICES

- Rated Capacity Indicator (RCI)
- Rotating Beacon and Horn
- Anti-Two Block Devices
- 3rd Wrap
- Balance Valve
- Hydraulic Lock
- Hydraulic Safety Valve
- Swing Brake
- Swing Lockout Device
- Boom Angle Indicator
- Outrigger Beam Retaining Pin
- Emergency Stop Button
- Winch Speed Sensor