



i3000 LATTICE CRANE TOTAL MOMENT

Operator's Manual

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The purpose of this manual is to provide the customer with the operating procedures essential for the promotion of proper machine operation for its intended purpose. The importance of proper usage cannot be overstressed. All information in this manual should be read and understood before any attempt is made to operate the machine.

Since the manufacturer has no direct control over machine application and operation, conformance with good safety practice in this area is the responsibility of the user and his operating personnel.

All procedures herein are based on the use of the system under proper operating conditions, with no deviations from the original design. Alteration and/or modification of the equipment is strictly forbidden without written approval from Rayco Technology Group.

The i3000 Wylie Systems Rated Capacity Indicator (RCI) is to be regarded only as an aid to the operator. When the parameters are set correctly, the indicator will warn the crane operator of an approaching overload condition that could cause damage to equipment, property, and/or injury to the operator or site workers in the vicinity of the crane and its load.

This system must never be used, under any circumstances, as a substitute for the good judgment of a crane operator when carrying out approved crane-operating procedures. Responsibility for the safe operation of the crane lies with the crane operator. The indicator equipment will not necessarily prevent crane damage due to overloading and related causes if not set properly.

Before operating a crane equipped with a Wylie system RCI, the operator must carefully read the information in both this manual and the crane manufacturer operator's manual. He must also have read and understood the CIMA safety manual, the latest ASME B30..5 standard and the current OSHA, federal, state and local regulations applicable to his job. Correct functioning of the system depends upon routine daily inspection.

Any suspected faults or apparent damage should be immediately reported to the responsible authority before using the crane.

Since safety of personnel and proper use of the machine is of primary concern, different symbols are used throughout this manual to emphasize certain areas. The following definitions indicate the level of hazard when these symbols appear throughout this manual.

Whenever one of these symbols appears in this manual, personnel safety is a concern. Please take time to read and understand these definitions!



DANGER: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.



CAUTION: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.



IMPORTANT: INDICATES A SITUATION THAT MAY CAUSE MACHINE DAMAGE IF NOT CORRECTLY FOLLOWED.



NOTE: PROVIDES INFORMATION THAT MAY BE OF SPECIAL INTEREST.

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GENERAL DESCRIPTION OF THE SYSTEM

1.1 Introduction

The Wylie I3000 Rated Capacity Indicator (RCI) system is a length, load, angle, radius, lifting capacity and anti two-block indicator. It has been designed to provide the crane operator with the information necessary for him/her to operate the crane safely and within the maximum permitted loadings specified by the crane manufacturer.

The indicator functions by automatically monitoring the load applied to the crane and continuously comparing this load with the maximum permitted load for each crane position. The display unit of the indicator system provides continuous information relating to the crane loading and warns the operator when he/she is approaching or exceeding the limit of the crane capacity.

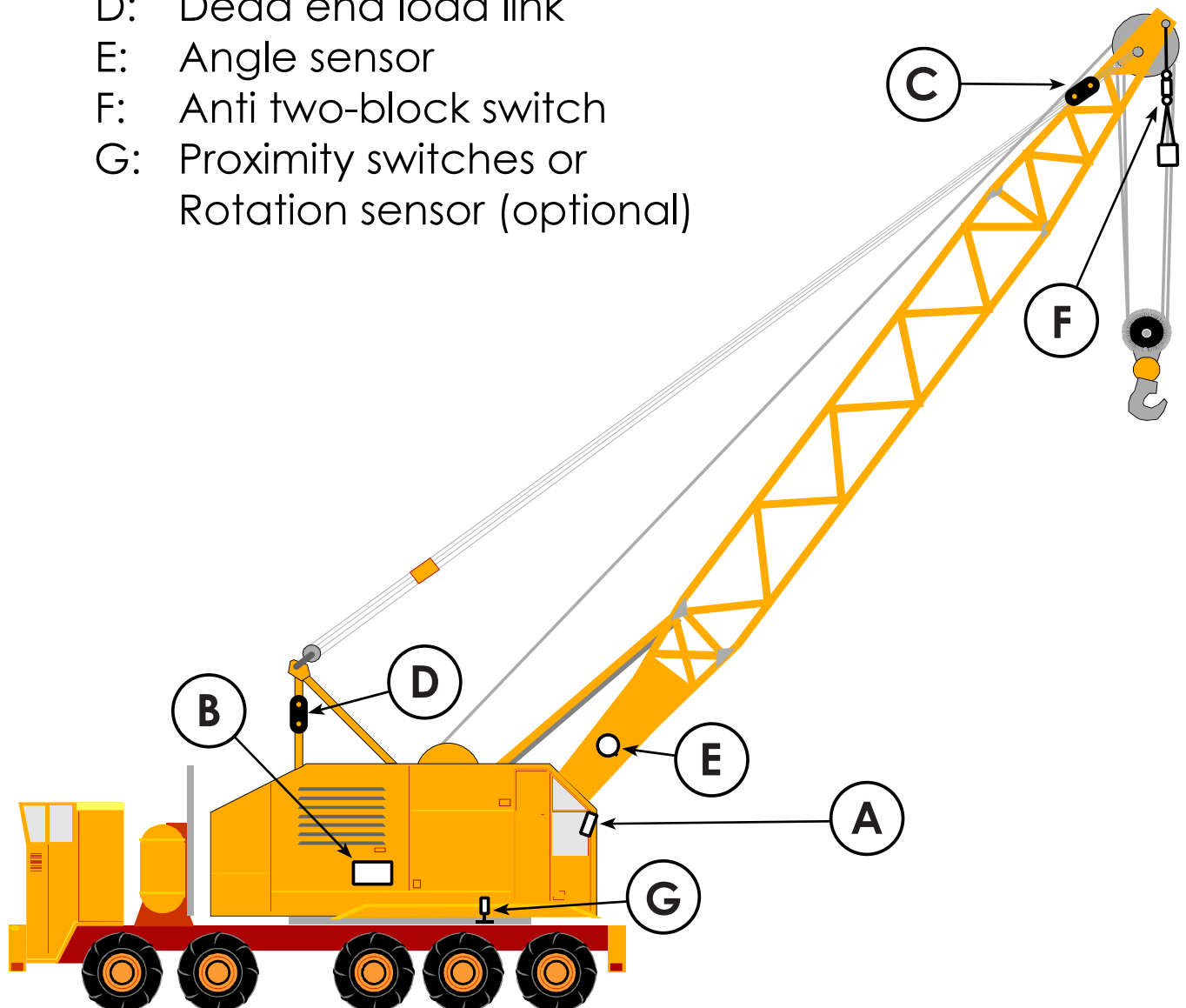
1.2 Display Overview



1.3 Typical Components Location

The system has sensors installed in specific locations on the crane to monitor boom angle, boom position (over front/over side), hook load and anti-two-block condition. The system uses this information to calculate the radius, determine the crane's current rated capacity, and to check for an overload condition. The system display is located inside the cab or near the operator's controls to allow easy access to this information.

- A: I3000 Display unit
- B: CPU Box
- C: Pendant load cell
- D: Dead end load link
- E: Angle sensor
- F: Anti two-block switch
- G: Proximity switches or Rotation sensor (optional)



1.4 Typical Components Description

In detail, the mandatory and optional items are described below. Note that sometimes, some of the items (eg external switches or motion cut) are built into the crane by the manufacturer and are therefore not supplied by Wylie Systems.

Display Unit

The display is mounted in a convenient position in front of the operator's working area. The display unit indicates the status of the crane to the operator. It is microprocessor based, meaning that there is a computer inside the box with operating software. This software has five operating modes allowing different functions:

- 1) The Normal Operating mode,
- 2) The Limits Setting mode or
The Range Limiting mode (option),
- 3) The System Set Up mode,
- 4) The Diagnostic mode,
- 5) The Calibration mode.



i Use the mode button  to choose the desired operating mode.

1) The normal mode is the normal operating status of the unit when turned on. In this mode, the operator will read the hook load, the radius, the boom angle, the boom tip height and many other important kinds of information for his/her lift. In this mode, the operator will be able to set the actual hoist in use, the parts of line and the boom configuration.

2a) In the limits setting mode, the operator can set and activate/deactivate some operational limits in addition to those automatically provided by the i3000 RCI system:

- the minimum and maximum boom angle limits,
- the maximum boom tip height limit,
- the maximum operating radius limit.

i Limits values are not active when the supply is first applied to the i3000 and they are automatically disabled if supply is removed.

i The limits setting mode is only available if the system is fitted with proximity switches to monitor the slew sector (eg. over rear/over side).

2b) In the optional range limiting mode, you can set the maximum boom tip height limit as in the limits setting mode and you can also set some variable limits. A variable limit is a limit with different maximum allowed values for each crane position. For instance, you can set a maximum operating radius of 35 feet over the right side of the crane and a maximum operating radius of 55 feet over the rear of this same crane.

3) The system set up mode allows the operator to change numerous parameters like: language selection, units selection and the reverse video feature.

4) The diagnostic mode allows troubleshooting of the unit without the need of a voltmeter. It can be very helpful to check the sensors' signal when calibrating the system or when a specific sensor is suspect.

5) The calibration mode allows the calibration of the sensors, the radius and many other variables. This mode is password protected and therefore it is not used in normal crane operation.

Load Sensors

Two methods are used to sense the load on strut jib cranes. Method one uses an electrical strain gauge pin or link fitted in the dead end of the boom raise (derrick) hoist rope measuring the tension. An alternative to this may be to sense via a load pin fitted in the «A» frame assembly. Method two uses the same type of devices but fitted to the boom pendant suspension ropes. Exact installation details for strut cranes are very dependant on crane model. Refer to application specific drawings.



Amplifier (optional)

Amplifiers are used when the distance between the load sensor and the cpu box exceeds 75 feet. Beyond that distance, radio waves and wire internal resistance may noticeably influence the load cell signal. The amplifier is also used when the signal wires of load sensor, or other sensors like angle or length must go through a slip ring. The amplifier simply amplifies the load cell millivolt (mV) output into a 0 to 5 volt signal, then in a second stage, it converts this signal into a 4 to 20 milliampere (mA) output. The signal is then no longer sensitive to radio interference, internal wire resistance or slip ring attenuation.

Angle Sensor

An inclinometer (angle sensor) is used to monitor the angle of the boom. Generally, the angle sensor is installed on the left side of the boom with the cable gland pointing toward the cab. This angle sensor uses a high precision one-turn potentiometer driven by a pendulum. The pendulum will keep the potentiometer knob pointing toward the ground regardless of the angle of the boom. The resulting voltage output from the potentiometer is proportional to the angle of the boom.



CPU Box

The cpu box contains the electronics and terminals for external connections, output relays, fuses and the power supply unit. It can be mounted either inside or outside the operator's cab but not farther than 15 feet from the display unit. Supply input range: 11 to 30 Volt DC.

Anti-Two-Block Switch

The anti-two-block switch is a normally closed (with weight hanging), spring loaded switch. It is attached to the boom tip on one end and to a chain leading to a weight clamped around the hoist line at the other end. When the hook block lifts the weight, the switch contacts open and the signal is cut resulting in an audible and visual alarm on the display unit. If an optional motion cut solenoid is installed, then the hoisting command will be stopped. One switch may be mounted at the head of each boom or jib. If two or more anti-two-block switches are to be monitored simultaneously, they must be connected in series. If local regulations permit, the ATB switch return may be via the crane boom, so that only one core cable would be required up the boom.





External Crane Switches

External crane status switches to monitor conditions such as slew sector or interlock detection can be installed on the crane. These can be connected to up to 18 switch inputs that may be monitored for «on» or «off» condition, or ignored, for any duty switch selection.

Rotation Sensor (optional)

An optional rotation sensor may be mounted on the crane instead of external crane switches for slew sector detection purpose. The rotation sensor is normally coupled with the main ring gear of the machine in order to always know the boom slew position. This optional device is mandatory for the use of the range limiting feature of the i3000 system.



Motion Cut Solenoid (optional)

A motion cut solenoid may be connected so that motion into danger (hoisting or booming down) are prevented when the system detects a large overload or an anti-two-block condition. Outputs available from the system are in the form of dry contact relays rated 5 AMP at 12V DC.

External Overload Warning Device (optional)

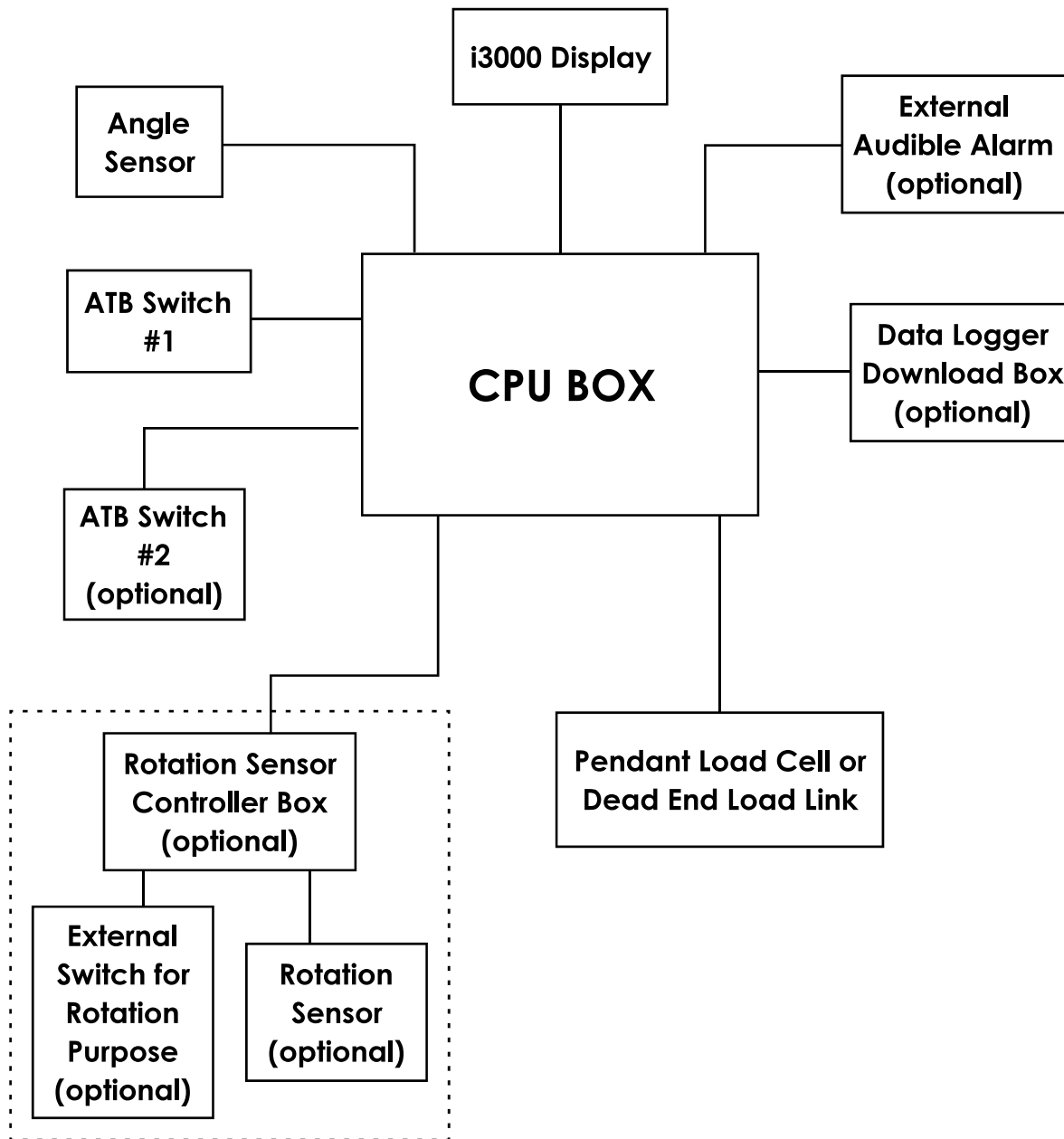
An audible electronic alarm can be installed outside the operator's cab. This gives a warning to workers around the crane that an overload condition exists.



Some sensors not listed above can be supplied by Wylie Systems for special applications. Example: a rope direction sensor for sheave friction compensation, an anemometer to decrease the crane's capacity in response to wind speed or a superstructure inclinometer (cant sensor) to ensure that the crane is correctly leveled. Contact Wylie Systems for additional details.

1.5

Lattice Crane with Dynamometer Block Diagram

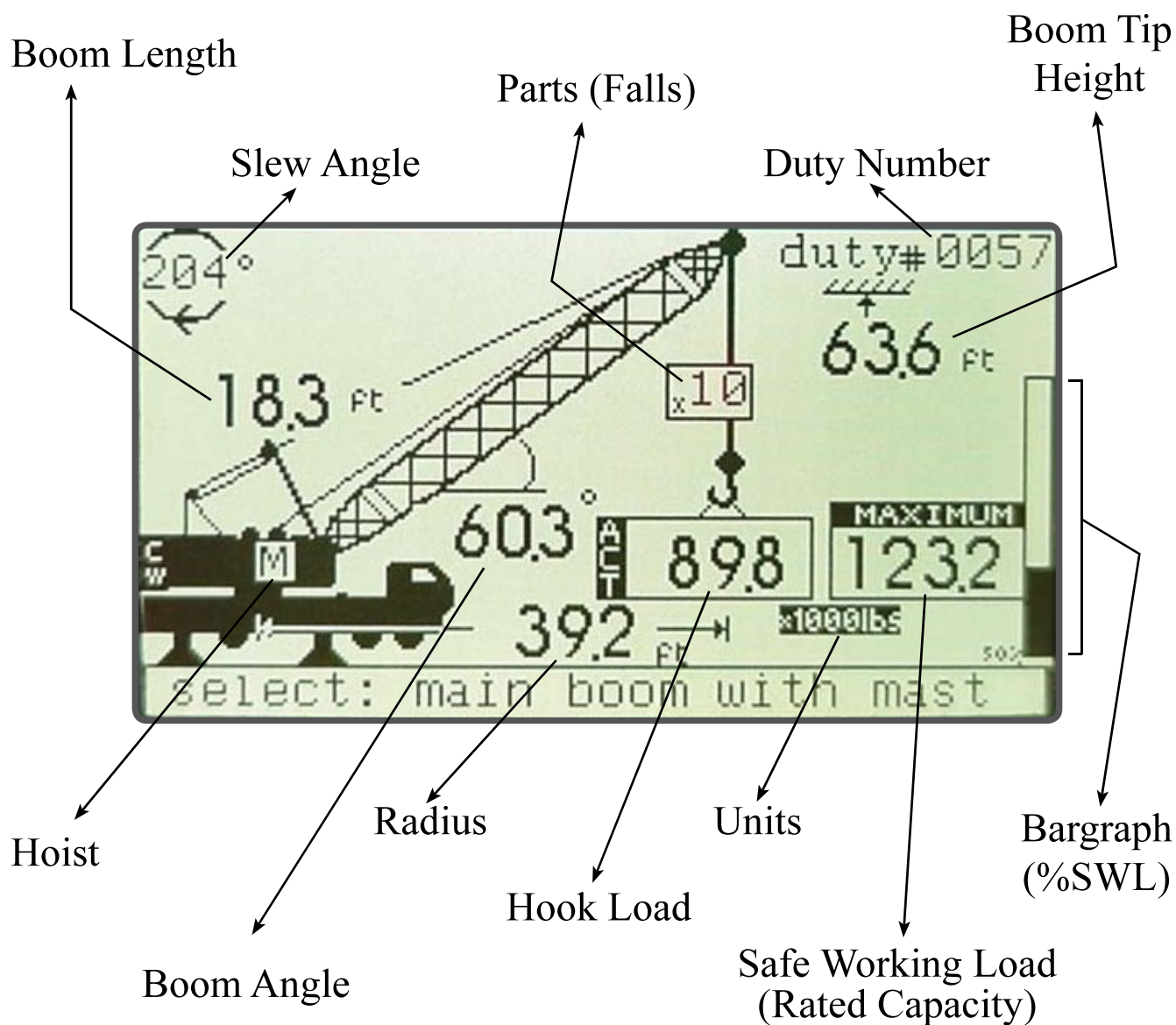


The Rotation sensor controller box, the external switch for rotation and the rotation sensor itself are mandatory for the range limiting option.

-2-

DETAILED DESCRIPTION OF THE DISPLAY UNIT

2.1 Normal Mode Display (default screen)

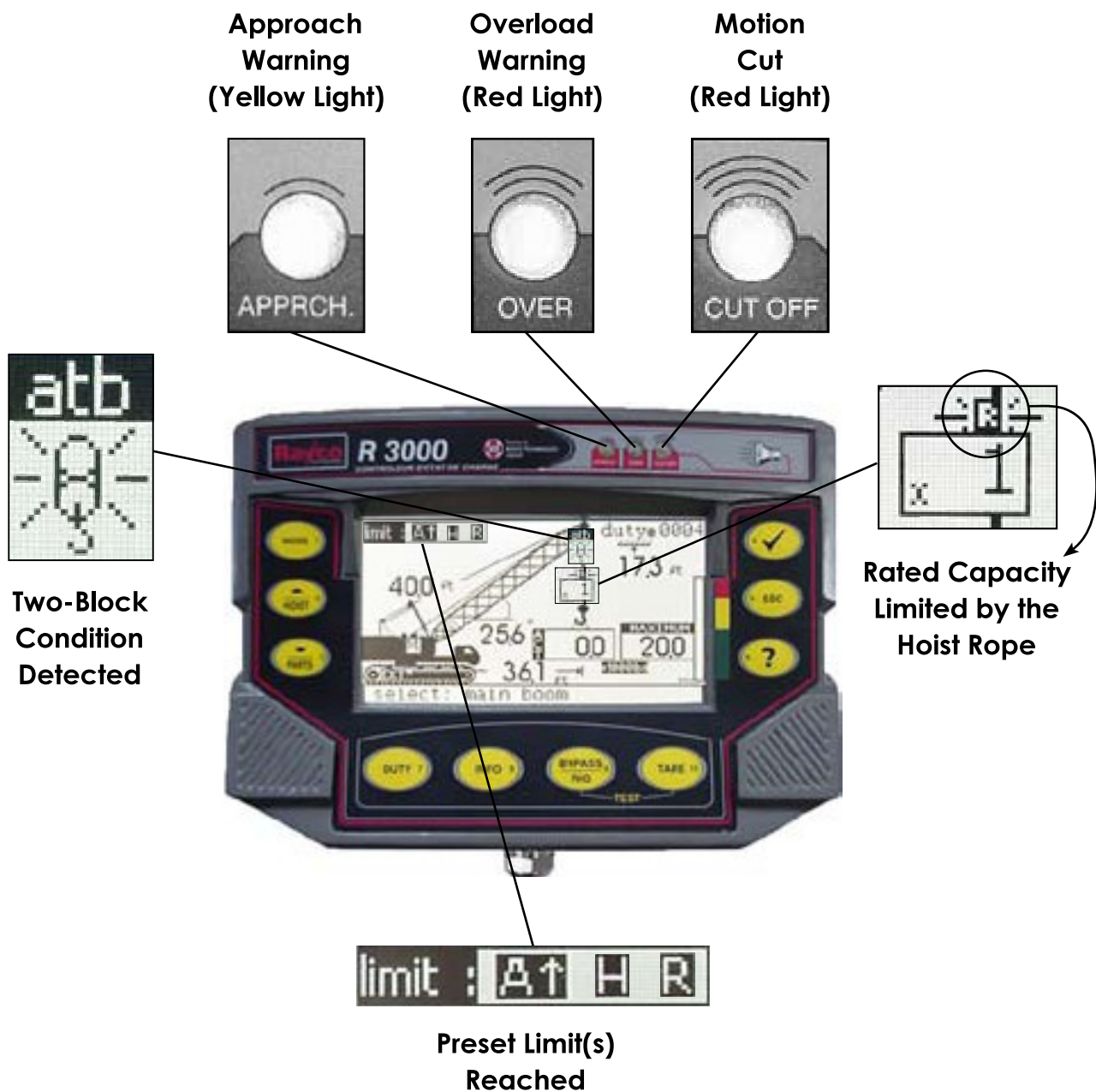


The display should be used only as a guide, NOT as an indication that the crane would or would not pass under a structure of accurately known height.



The slew angle indicator (top/left of the screen) is only present with the range limiting option is installed on the machine.

2.2 Warning Lights and Indicators Location



The i3000 must be set to the crane parameters (e.g. correct boom length, exact number of part of lines, outriggers extended or retracted etc.) before operating the crane or when changing the parameters. Wrong adjustment may cause the indicator system to show a safe condition in the event of an overload!

2.3

Warning Lights and Indicators
Detailed Description

The approach warning light blinks when the load on the hook is between 85% and 99.9% of the rated capacity. This is accompanied by the operation of an audible warning device that is fitted inside the display unit. This light (yellow in color) will also flash on and off if you are approaching within 5 units (feet, meters or degrees) of a predetermined limit (set in the limits setting mode).



Operate with caution!

The crane is working near its maximum operating capacity.



The overload warning light (red in color) illuminates at or above 100% of the rated capacity. This light will also turn on if you are reaching a predetermined limit (set in the limits setting mode).



Danger! The crane's maximum capacity has been reached or exceeded.



The motion cut warning light (red in color) illuminates at or above 100.1% of the rated capacity. This is usually associated with, for example, booming down, telescoping out or hoisting up. The exact operation is specific to the crane model.



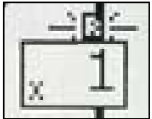
Danger! The crane has exceeded safe operational ratings and is now in an unsafe condition. Hoist up, telescope out and boom down functions will be stopped if a motion cut solenoid is connected to the system.



The default percentage levels for approach(85%), overload(100%) and motion cut(100.1%) may be changed upon request.



The Two-Block condition indicator appears near the crane boom tip on the i3000 lcd screen when such a condition is detected by the system. This may block the hoist function, depending on crane model and/or on options fitted on the machine.



The Rope Limit indicator appears just above the number of parts of line on the i3000 lcd screen. This indicates that the maximum load is limited by rated strength and the number of parts of line of the hoist rope. Increasing the number of falls (parts of line) reeved and set on the display is normally required to alleviate a rope limit.



This indicator appears on the top-left corner of the i3000 lcd screen as soon as at least one preset limit is active on the system. This is not a warning! It is just there to remind you that an angle, radius or height limit has been set in the limits setting mode.



This indicator appears on the screen when a preset minimum angle limit has been reached or is about to be reached. If you are approaching within 5 degrees of a predetermined minimum angle limit, this indicator will appear on the screen, the approach warning light will blink and the internal buzzer will sound on and off. If you have reached a predetermined minimum angle limit, the overload warning light will operate and the buzzer will sound continuously.



This indicator appears on the screen when a preset maximum angle limit has been reached or is about to be reached. If you are approaching within 5 degrees of a predetermined maximum angle limit, this indicator will appear on the screen, the approach warning light will blink and the internal buzzer will sound on and off. If you have reached a predetermined maximum angle limit, the overload warning light will operate and the buzzer will sound continuously.

This indicator appears on the screen when a preset maximum radius limit has been reached or is about to be reached. If you are approaching within 2 units (feet or meters) of a predetermined maximum radius limit, this indicator will appear on the screen, the approach warning light will blink and the internal buzzer will sound on and off. If you have reached a predetermined maximum radius limit, the overload warning light will operate and the buzzer will sound continuously.



This indicator appears on the screen when a preset maximum height limit has been reached or is about to be reached. If you are approaching within 2 units (feet or meters) of a predetermined maximum height limit, this indicator will appear on the screen, the approach warning light will blink and the internal buzzer will sound on and off. If you have reached a predetermined maximum height limit, the overload warning light will operate and the buzzer will sound continuously.



The zones where the system will warn the operator that he/she is approaching a preset limit may be changed upon request. By default these values are set to: 5 degrees for a min/max angle limit and 2 feet or meters for a height or radius limit.

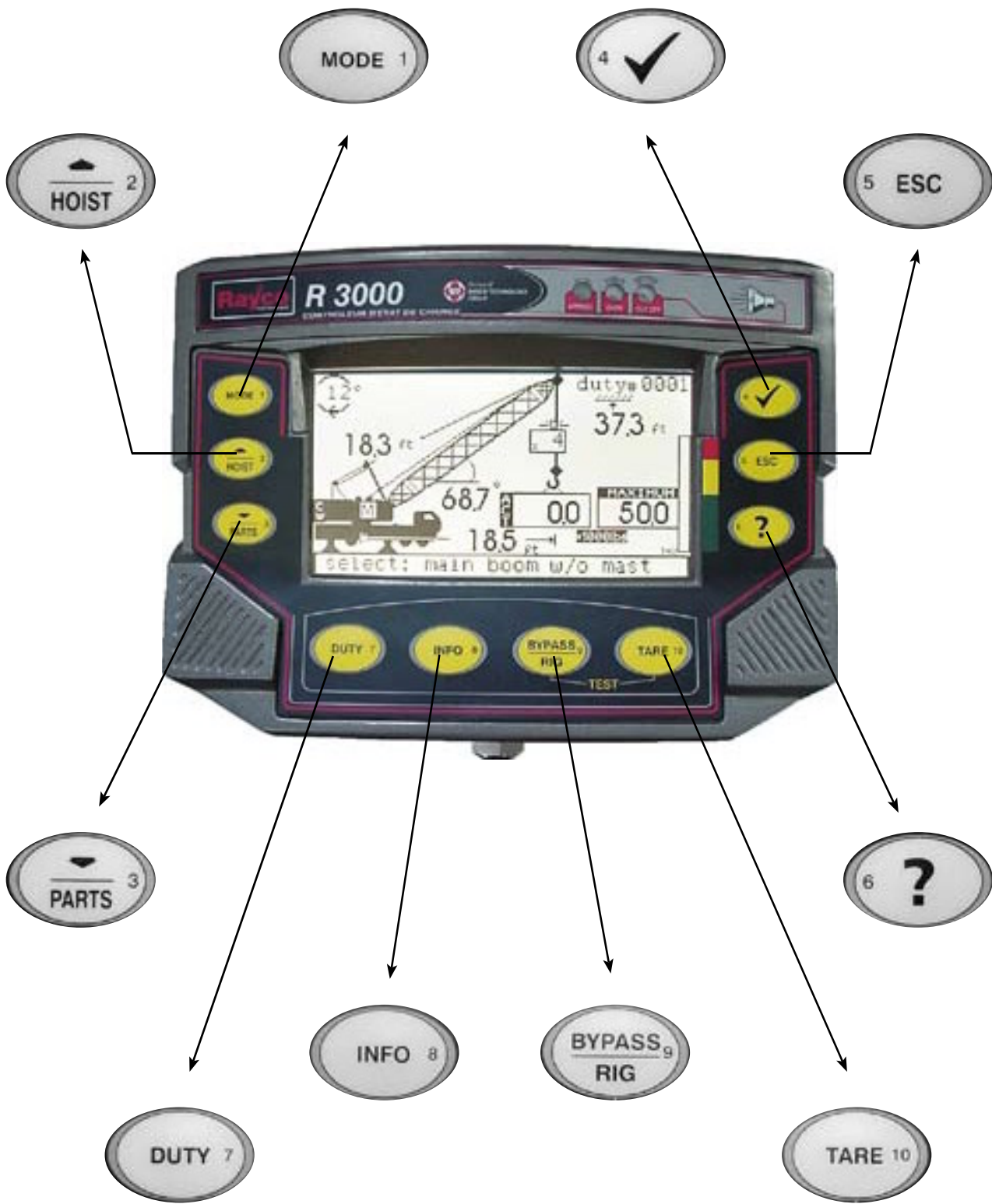


Limits values are not active when the supply is first applied to the i3000 and they are automatically disabled if supply is removed.



Reaching an operator's preset limit (set in the limits setting mode) will not result in crane motion cut-off.

2.4 Display Buttons Location and Purpose



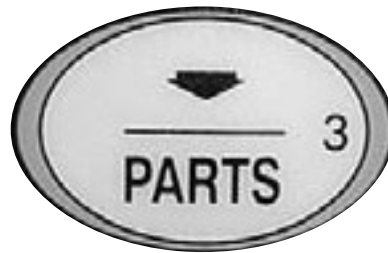


MODE BUTTON : Shows system's modes. Press this button to choose one of these operating modes:

- Normal mode
- Limits Setting or Range Limiting mode
- System Configuration mode
- Diagnostic mode
- Calibration mode (password protected).



HOIST / SCROLL UP BUTTON : Shows hoist menu for selection of the hoist actually in use. Also used to scroll up in menus or increase editable values.



PARTS / SCROLL DOWN BUTTON : Shows parts of line (falls) menu for selection of the number of parts actually in use. Also used to scroll down in menus or decrease modifiable values.



SELECT BUTTON : Used to select a highlighted item in a menu. In normal mode, use this button to select the information displayed in one of the pull down menus.

ESCAPE BUTTON : Used to close a menu or cancel the modification of a value. Push it several times to return to normal mode.



HELP BUTTON : This button will show the problem source when a fault is detected by the system. Push it to see a description of the problem.



DUTY BUTTON : Shows the menu for the selection of the duty by number or by crane configuration. Press this button to enable the selection of crane parameters like the boom length, the head type, and the counterweight.



INFO BUTTON : Shows all the information regarding the actual crane configuration. Push it a second time to access the operating system's information screen and a third time to see the data logger screen (option).

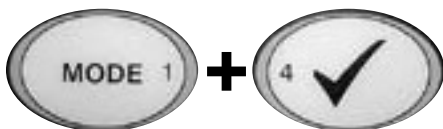




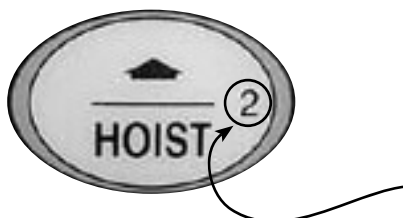
BYPASS / RIGGING BUTTON : Depress and hold this button to momentarily override a lock-out (15 sec. max). Also used to enter the rigging mode if the boom angle is under the maximum boom angle for rigging as set in calibration.



TARE BUTTON : Switch the load display between the actual load and the tare load.



NOTE 1: Press button #1 (MODE) and button #4 (SELECT) simultaneously to reset the system. This could be usefull if the system stalls or becomes unstable due to DC power supply regulation.



NOTE 2: If your i3000 RCI is fitted with a Data Logger, you will be asked to enter your personal password each time the system is powered up. Use the small numerical value printed on each button to enter your code.

-3-

OPERATING PROCEDURE



Always Remember !

That the i3000 Rated Capacity Indicator must be correctly set up in use and that wrong adjustments may cause the indicator system to show a safe condition in the event of an overload.

That the indicator system is purely an aid to the operator. Responsibility for the safe operation of the crane lies with the crane operator. The indicator equipment will not necessarily prevent crane damage due to overloading and related causes.

Proper functioning of the equipment is dependent upon proper daily inspection and observance of the operating instructions referred to in this manual.

During normal operation, the rated capacity of a crane should not be exceeded. Therefore the indication of overload should not be used as a normal operating facility.

The crane should be operated at all times so that crane motions occur smoothly and at a safe speed.

3.1 Power On

Switch on the electrical supply (ie. crane key switch) to the i3000 system. The indicator now performs a «self test» during which time (approximately 10 seconds) the audible alarm will sound, the approach, overload and motion cut lights will illuminate and the display will show the Wylie's logo on the screen. Subsequently, the indicator goes in the normal operating mode. As shown in section 2.1 of this manual, the normal mode displays the hook load, the rated capacity, the radius, the boom angle, the hoist used, the parts of line, etc.

3.2 System Configuration



In order to have the proper rated capacity and radius, the system must be configured properly. Failure to configure the system properly can cause the crane to break or tip and result in injury or death. Failure to configure properly may also cause a zero capacity if no chart is found to match the configuration set by the operator.

The operator must verify the crane configurations for each available hoist every time he/she enters the crane and every time the crane is rigged.

The system configuration is done with the following two buttons:



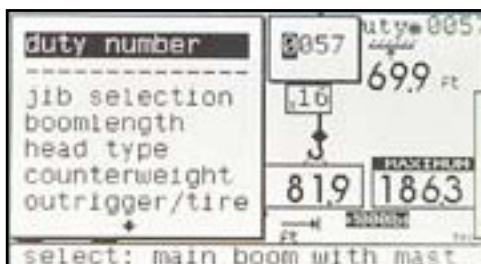
Used for parts of line (falls) selection.



Used for duty number selection.

3.2.1 Duty Number Selection

Here you can input to the system a specific duty number. For instance, if you know that the duty number 57 represent your crane rigged with a 100 feet boomlength, outriggers extended and with a 40 feet jib @ 10°, it could be more convenient to input the number 57 instead of having to choose the correct parameters individually.



Changing the crane configuration by the duty number:

1- Push the DUTY button (#7) to display the duty menu.

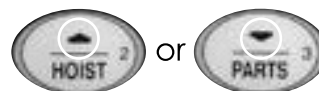
The duty number should be already highlighted



2- Push button #4 to enter the duty number menu.



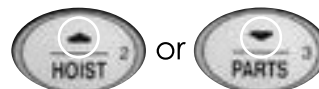
3- Scroll up or down to highlight the desired number for the first digit.



4- Push button #4 to confirm your choice.



5- Scroll up or down to highlight the desired number for the second digit.



6- Push button #4 to confirm your choice.



7- Repeat steps 5 and 6 for the last two digits.



The duty number is a four digit entry. Add some zeros (0) before your number if needed. Example: duty#65 = 0065, duty#8 = 0008.

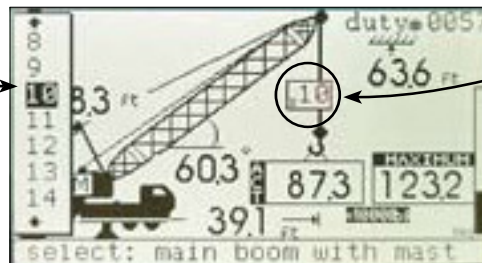
3.2.2

Parts of Line Selection



This button allows the operator to select the number of parts of line used. The operator can see the actual number of parts selected just above the hook on the on the i3000 screen.

Parts of Line
Selection
Menu



To change the parts of line selection:

1- Push the PARTS button (#3) to display the parts of line selection menu.



2- Scroll up or down with buttons #2 and #3 to highlight the desired number of parts of line.



3- Push button #4 to confirm your choice.



3.3 System Configuration Information Screen

Pushing the INFO button is a convenient way to verify the actual configuration of your crane. At a glance, you can check your settings for numerous parameters such as the outrigger state, the boom length, the jib selection etc. If all the data under the chart info screen are correct and if you had previously set the correct hoist and parts of line number, then your system should be correctly configured.



Push the INFO button to look at your crane configuration.

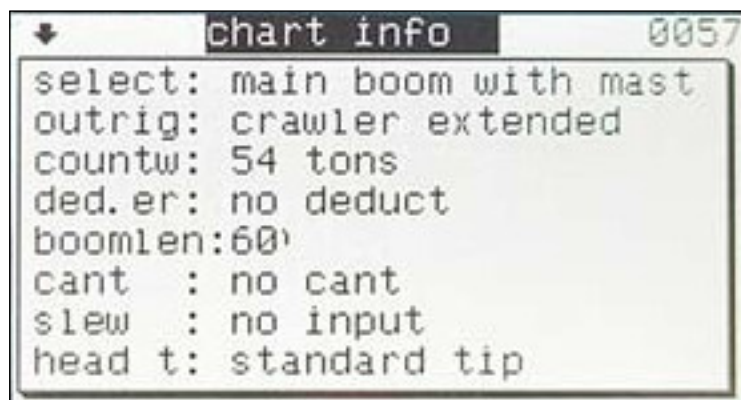


Chart Info Screen



The chart info screen will be different for each crane model. The representation above may not be identical to yours.



Press the ESCAPE button to return to the normal mode screen once you have consulted the information on the chart info menu.



Once your system is properly configured, the i3000 Rated Capacity Indicator is ready to use.

3.4 Motion Cut (lockout) Bypass



The operator can override the lockout system in the event of an emergency by pressing the BYPASS/RIG button. To bypass the motion cut, depress and hold this button. The bypass button must be re-pushed after 15 seconds.

3.5 Rigging Mode (maintenance/erection mode)



It is necessary with many cranes, when stowing or erecting the machine, to go outside the working «envelope» for which the crane manufacturer provides ratings. For example, the boom stowed position may be outside the maximum load radius or minimum boom angle specified on any load chart.

For this reason, Wylie Systems provides a maintenance/erection mode, where the boom may be lowered to or raised from horizontal without the external alarm continuously sounding or the motion cut (if fitted) operating. This is brought into operation by pressing button #9 (BYPASS/RIG) when the boom angle is below 10 degrees. In this mode, the display will show the following message:

!!! WARNING !!! RIGGING MODE
NO CUTOUT OR OVERLOAD ALARMS

Normal operation is restored by moving the boom above 10 degrees. This floor value of 10 degrees can be changed upon customer request.



Under this condition the crane is not fully protected by the i3000, so it is absolutely essential to obey the crane manufacturer's advice regarding lifting the hook block, slewing or outriggers use.

3.6

Limits Setting

In the limits setting mode, the operator can set and activate/deactivate four (4) operational limits in addition to those automatically provided by the i3000 RCI system. These are as follows:

- 1) the minimum boom angle limit,
- 2) the maximum boom angle limit,
- 3) the maximum boom tip height limit,
- 4) the maximum operating radius limit.

Accessing the limits setting mode:

- 1- Push the Mode button (#1) to display the mode selection menu.



- 2- Scroll down with button #3 once to highlight the limits setting mode.



- 3- Push button #4 to enter the limits setting menu.



limits setting			
min angle	0.0	off	A↓
max angle	90.0	off	A↑
max radius	100.0	off	R
max height	100.0	off	H

Limits setting Menu

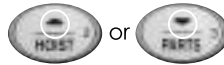


Remember that limits are not active when the supply is first applied to the i3000 and they are automatically disabled if supply is removed.

3.6.1 Limit Value Adjustment

1- Access the range limiting mode (see section 3.5 for details).

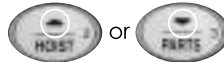
2- Use the up (#2) and down (#3) buttons to highlight the limit you want to edit.



3- Push button #4 to confirm your choice.



4- Use the up (#2) and down (#3) buttons to select the desired value for this particular limit.



5- Push button #4 to confirm the selected value.



6- Push escape (button #5) to return to the normal operating mode.



limits setting			
min angle	00	OFF	AL
max angle	900	OFF	AT
max radius	1000	OFF	R
max height	1000	OFF	H

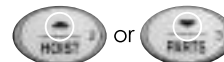
3.6.2 Activate/Deactivate a Limit

1- Access the range limiting mode (see section 3.5 for details).

2- Push the down (#3) button until the highlighted area moves to the first line of the second row of the limits setting screen.



3- Use the up (#2) and down (#3) buttons to highlight the current state (ON or OFF) of the limit you want to activate or deactivate.



4- Push button #4 to toggle between the ON and OFF state of the limit.



5- Push escape (button #5) to return to the normal operating mode.



limits setting			
min angle	00	OFF	AL
max angle	900	OFF	AT
max radius	1000	OFF	R
max height	1000	OFF	H



If you change a limit value (section 3.6.1) then this limit will become automatically active.

3.7 System Set Up

Numerous display parameters can be configured by the operator. These parameters are grouped in the system set up mode and they include :

- Language Selection,
- Units Selection,
- Reverse Video,
- Faults Enable or Disable.

To modify one or more of these options, you must access the system set up mode:

1- Push the MODE button (#1).



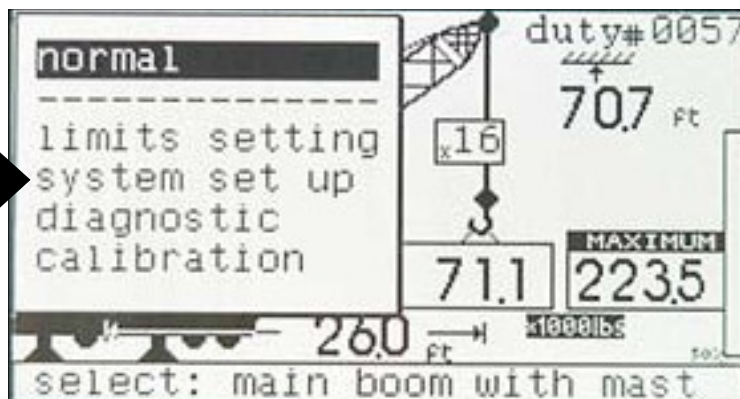
2- Scroll down with the down button (#3) to highlight the «system set up» line.



3- Push the select button (#4) to confirm your choice and enter the menu.










Choose the
System Set Up
mode



Operating Mode Selection Menu









3.7.1 Language Selection

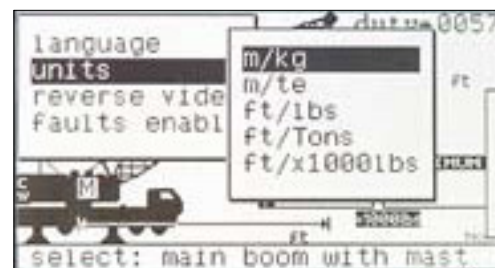
All of the i3000's text can be displayed in two languages: English (default) and another as specified in the order. To change the language proceed as follows:

- 1- Push the MODE button. 
- 2- Scroll down with the down button  to highlight the «system set up» line.
- 3- Push the select button to  confirm your choice.
- 4- The «language» line should be highlighted. If not, scroll up or down to highlight it.
- 5- Push select button  to enter the language menu.
- 6- Scroll up or down  or  to highlight the desired language.
- 7- Push the select button  to confirm your choice.

3.7.2 Units Selection

It is possible to choose between 5 unit combinations. Each measure of length and load will be displayed on the main display. Proceed as follows to change these units:

- 1- Push the MODE  button.
- 2- Scroll down with the down button  to highlight the «system set up» line.
- 3- Push the select button  to confirm your choice.
- 4- Scroll down  to highlight the «units» line.
- 5- Push the select button  to enter the units menu.
- 6- Scroll up or down to highlight the desired unit combination.  or 
- 7- Push the select button  to confirm your choice.



3.7.3 Reverse Video

You can invert the colors (black and white) to aid in viewing the display in various lighting conditions.

1- Push the MODE button.



2- Scroll down with the down button to highlight the «system set up» line.



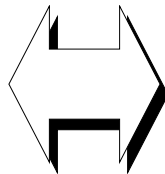
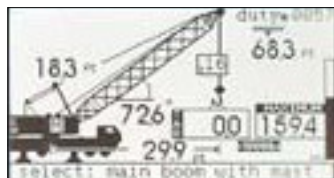
3- Push the select button to confirm your choice.



4- Scroll down to highlight the «reverse video» line.



5- Push the select button to inverse the colors.



3.7.4 Faults Enabled/Disabled

In the normal operating mode, when there is a fault, the state display (bottom part of the screen) will show «1 fault detected ! press ?» as long as the fault exists. If you don't want the state display to warn you when a fault is detected, you may disable it as follows:

1- Push the MODE button.



2- Scroll down with the down button to highlight the «system set up» line.



3- Push the select button to confirm your choice.



4- Scroll down to highlight the «faults enabl.» line.



5- Push the select button to switch to «faults disab.».



6- Push the ESC button to return to the normal mode.

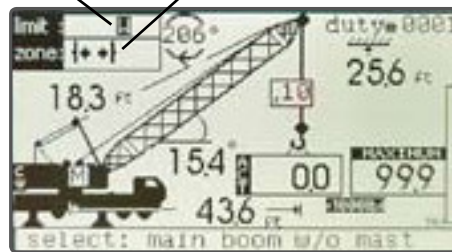


To enable the faults again, repeat steps 1-6.

3.8 Range Limiting Option

Shows which limit is reached:

- radius
- height
- wall



Shows which zone is programmed:

- limit high (roof)
- variable limit height
- variable limit radius
- free zone (two walls)

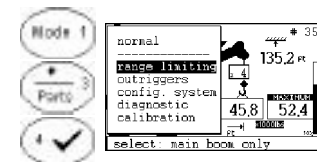
Alarms: Approach warning of the limit Zone reached Cut-off condition

Limit Programming:

There are 4 types of limits that can be programmed: LIMIT HIGH, FREE ZONE, VARIABLE LIMIT HEIGHT and VARIABLE LIMIT RADIUS. Because only one limit may be programmed at a time, you will need to delete any previously programmed limit. When a limit is programmed, the associated icon will be displayed in the area «zone». When you program a zone, just follow the instructions at the bottom of the screen.

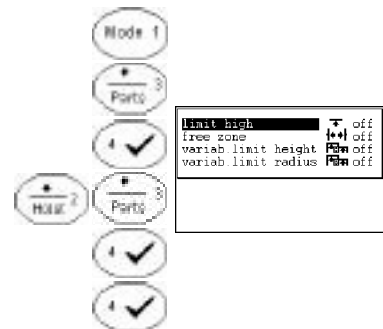
► ACCESSING THE RANGE LIMITING MODE:

- 1- Push the Mode button (#1) to display the mode menu.
- 2- Scroll down with button #3 once to highlight the range limiting option.
- 3- Push button #4 to enter the range limiting menu.



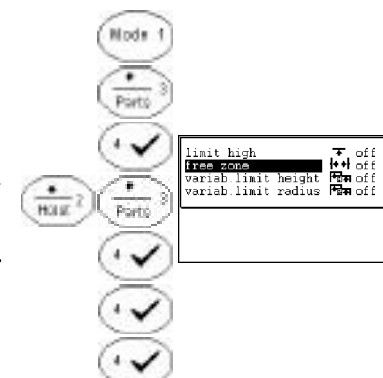
1) Limit high:

- 1- Access the range limiting mode.
- 2- Use the up (#2) and down (#3) buttons to highlight «limit high».
- 3- Push button #4 to confirm your choice.
- 4- Boom up to the desired boom tip height limit.
- 5- Push button #4 to confirm the maximum boom tip height position. As you release button #4, an 8 second countdown will allow you to boom down before your programmed height limit becomes active.
- 6- The display will automatically return to the normal mode.



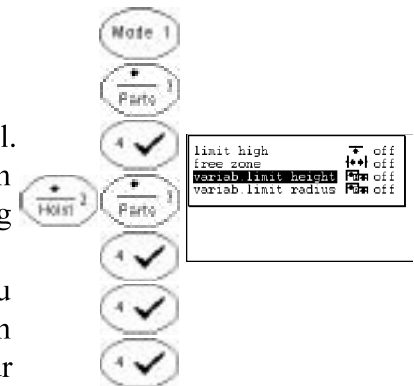
2) Free zone:

- 1- Access the range limiting mode.
- 2- Use the up (#2) and down (#3) buttons to highlight «free zone».
- 3- Push button #4 to confirm your choice.
- 4- Rotate the crane to the first limit position (first wall).
- 5- Push button #4 to confirm that this will be the position of the first wall.
- 6- Rotate the crane to the second limit position (second wall).
- 7- Push button #4 to confirm. This will be the position of the second wall. As you release button #4, an 8 second countdown will allow you to rotate the crane between the two walls before your programmed free zone limit becomes active.
- 8- The display will automatically return to the normal mode.

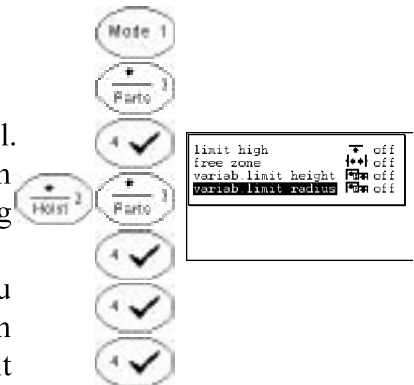


3) Variable limit height:

- 1- Access the range limiting mode.
- 2- Use the up and down buttons to highlight «variab.limit height».
- 3- Push button #4 to confirm your choice.
- 4- Rotate the crane to the first limit position (first wall).
- 5- Push button #4 to confirm that this will be the position of the first wall.
- 6- Rotate the crane toward the second limit position (second wall) with the boom tip always at the maximum height permitted by the surrounding environment.
- 7- Push button #4 to confirm the position of the second wall. As you release button #4, an 8 second countdown will allow you to return between the two walls and boom down below the height limit before your programmed variable height limit becomes active.
- 8- The display will automatically return to the normal mode.

**4) Variable limit radius:**

- 1- Access the range limiting mode.
- 2- Use the up and down buttons to highlight «variab.limit radius».
- 3- Push button #4 to confirm your choice.
- 4- Rotate the crane to the first limit position (first wall).
- 5- Push button #4 to confirm that this will be the position of the first wall.
- 6- Rotate the crane toward the second limit position (second wall) with the boom tip always at the maximum radius permitted by the surrounding environment.
- 7- Push button #4 to confirm the position of the second wall. As you release button #4, an 8 second countdown will allow you to return between the two walls and boom up within the allowed radius limit before your programmed variable radius limit becomes active.
- 8- The display will automatically return to the normal mode.

**Deleting a programmed limit:**

- 1- Access the range limiting mode.
- 2- Push button #4 to display the delete limit menu.
- 3- Scroll down to highlight «yes».
- 4- Push button #4 to confirm that you want to delete the limit.
- 5- Push the ESC button (#5) to return to the normal mode.



-4-**TROUBLESHOOTING**

If the alarm sounds (the display internal buzzer is active and the overload warning light illuminates), it is probably caused by:

- 1) an operator adjustable limit exceeded,
- 2) an overload,
- 3) an invalid configuration selection,
- 4) a sensor failure.

1) If an operator adjustable limit is exceeded, it will be displayed on the normal operating mode screen. See the limits setting section of this manual for details.

2) Once you're sure that the alarm is not operator adjustable limit related, the next step is to verify if the alarm is caused by an overload. Check the hook load and the rated capacity and if the crane is overloading, lower the load or reduce the operating radius.

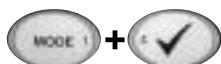
3) If the alarm still sounds, make sure that the hoist, parts of lines, jib selection and others parameters under the duty button are correctly adjusted. See the system configuration section of this manual for additional details. Also verify that the capacity displayed on the display screen matches with the capacity according to the load chart.

4) If the alarm still sounds, it is probably caused by a sensor failure.

Refer to section 4.1- *faults information* screen and section 4.2- *the diagnostic mode* to pinpoint the problem's location.

If the i3000 is not functioning, check the supply voltage to the CPU BOX. It should be between 11 and 30 VDC. If supply voltage is ok, then check the fuses inside the CPU BOX (on the large bottom board) and replace with correctly rated fuses if blown.

If the system **stalls** or **fail to function properly**, Press button #1 (MODE) and button #4 (SELECT) simultaneously to reset the system. If the fault, problem or malfunction persists, remove supply to the i3000 for a few seconds then power it back again. If the problem is still there, consult the fault information screen or the diagnostic mode.

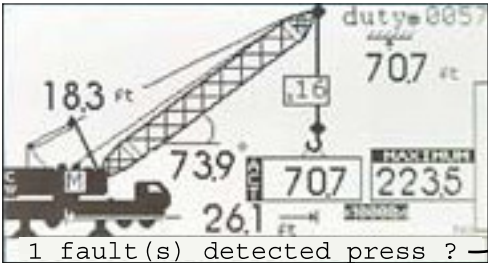


Pressing those two buttons button simultaneously reset the system.

4.1 Fault Information Screen



The i3000 will identify failures in the operation of software or hardware. Should a failure occur, the display will show: «X fault(s) detected press ?» in the normal operating mode. Push button «help» (#6) to display which fault(s) is detected by the system. You will see a short description of the problem. If no fault is detected and you press button #6, the «no fault detected» message will appear on the screen. Press the escape button(#5) to leave the fault info screen.



If you see this message, press button  for details.







However, if a fault exists in your system, you would have a description of the problem instead of the «no fault detected» message. Below is a listing of possible fault messages with their respective definition.

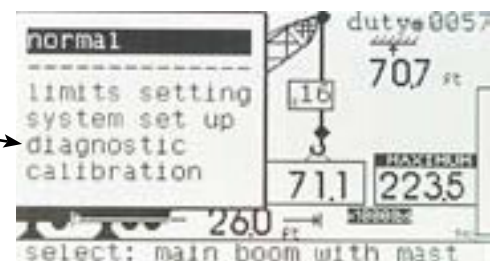
Failure Type	Fault Message	Fault Description
Failure due to sensor	ain1	-Failure in sensor ain1 (boom angle sensor)
	ain2	-Failure in sensor ain2 (luffing angle sensor)
	ain3	-Failure in sensor ain3 (rope direction sensor)
	ain4	-Failure in sensor ain4
	aig1	-Failure in sensor aig1
	aig2	-Failure in sensor aig2
	tx0	-Failure in sensor tx0 (load sensor #1)
	tx1	-Failure in sensor tx1 (load sensor #2)
	tx2	-Failure in sensor tx2 (load sensor #3)
	tx3	-Failure in sensor tx3 (load sensor #4)
Failure due to board	rotation encodeur	-Failure in rotation sensor
	dr+	-Failure in sensors reference supply
	rotation communication	-Communication failure to rotation sensor controller box
	ram	-Failure in internal operational memory

Failure Type	Fault Message	Fault Description
Failure due to memory	memory a	-Memory bank A (calibration data) corrupted
	memory b	-Memory bank B (calibration data backup) corrupted
	memory c	-Memory bank C (user preference data) corrupted
	rotation ratio	-Mismatch between memory bank A value and rotation controller board memory value
	prox switch position	-Mismatch between memory bank A value and rotation controller board memory value
Failure due to chart	no duty	-There is no chart matching your actual system configuration
	calib status	-Your actual jib selection (under the duty button) is not calibrated
Other	low battery on datalogger	-The data logger battery needs to be replaced

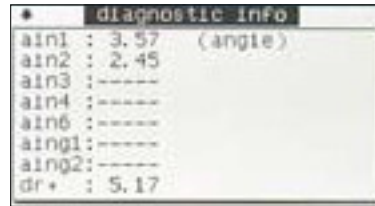
4.2 The Diagnostic Mode

If you have determined that the system has faults, you can access the diagnostic mode. The diagnostic mode can be very helpful to verify the sensor's signals. To enter this mode proceed as follows:

- 1- Push the MODE button. 
- 2- Scroll down with the down button  to highlight the «diagnostic» line.
- 3- Push the select button  to enter into the diagnostic info menu.
- 4- Scroll up and down  or  to visualize all pages.
- 5- Push the ESC button to  go back to the normal mode.

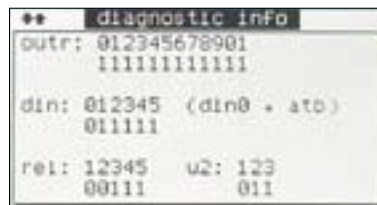


Diagnostic Mode Screen #1



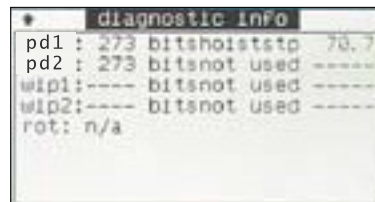
- AIN0 Position of the main boom angle sensor in volts (0.5-4.25V). As the boom raises the voltage should increase. As the boom is lowered the voltage should decrease.
- AIN1 Position of the optional luffing jib angle sensor in volts (0.5-4.25V). As the luffing jib raises the voltage should increase. As the luffing jib is lowered the voltage should decrease.
- DR+ The sensors supply voltage. It should remain at about 5.17V ($\pm 0.05V$).

Diagnostic Mode Screen #2



- OUT Value of digital inputs, OUT0 to OUT11.
- DIN Value of digital inputs, DINO to DIN5.
- REL Actual state of the output relay.

Diagnostic Mode Screen #3



- PD1 This value represents the first load input converted in a 10 bits digital signal. This should range between 50 and 950 when functioning correctly.
- PD2 This value represents the second (if fitted) hoist load input converted in a 10 bits digital signal. This should range between 50 and 950 when functioning correctly.



These are the default screens. It can be different on your system.

4.3

The I3000 I/O Board

4 Strain Gages Inputs:

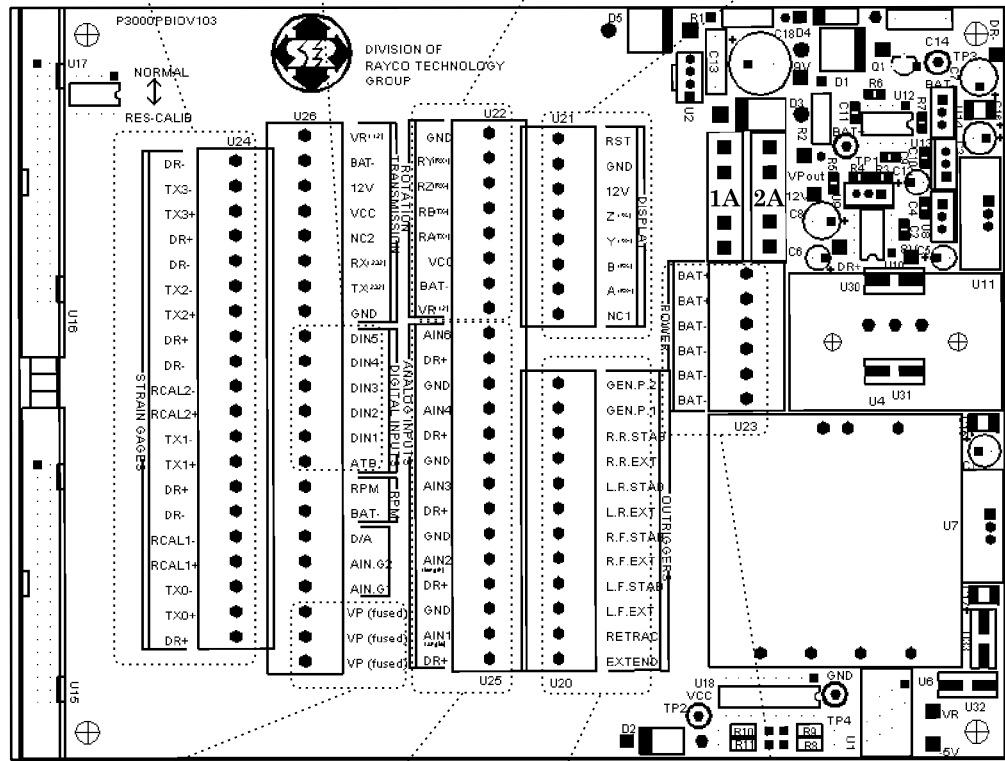
- Referenced to DR- (-5 volts).
- Unusable below 50 bits and above 963 bits.

Absolute Rotation Controller
Board Connections.

6 Digital Inputs:

- Referenced to BAT-.
- Active on a low signal.

i3000 Display Connections.



3 Fused BAT+ Outputs:

- Referenced to BAT-.
- Usually 0.8 volt less than BAT+.
- Fused 1A total.

Power Input:

- 11 to 30 volts DC.
- Connect it to the machine's accessories.
- The crane's frame must be negative.

12 Digital Inputs:

- Referenced to BAT-.
- Active on a high signal.

5 Analog Inputs:

- Referenced to GND.
- Fully linear between 0.40 and 4.65 volts (80 to 950 bits).
- Unusable below 0.16 volt (50 bits) and above 4.70 volts (963 bits).



This drawing represents an i3000 i/o board version 103. This board is located in the bottom part of the i3000 cpu box.

-5-

MAINTENANCE RECOMMENDATIONS

5.1 Routine Maintenance

CLEANING

Do not pressure steam the cpu box, junction boxes, angle sensor, load cells or any connectors. This could result in moisture in the connectors and cause sensor failure later on. To clean the display's surface, use mild soap or mild window cleaners. Use a clean, soft cloth.

If cleaning the dynamometer, dismantle the load cell and wipe clean with a cloth. Use of a solvent is not recommended on a load cell. The dynamometer can be soaked in solvent. Change the bearings if contaminated or clean thoroughly and re-grease. The bearings are standard 6005 or 6006 and are relatively easy to replace.

WIRES

Check all wires for cuts or damage. Replace if needed.

DISPLAY

If condensation appears in the screen of the display unit, open the cover in a dry place and let it air dry for a day. Apply silicone grease to the cover seal and re-tighten the cover.

5.2 Performance Check

DAILY

Before or at the beginning of every shift, configure the system properly and verify the weight of the hook block, the radius with the boom selection used and the capacity. Refer to the section below for tolerances.

EVERY 6 MONTHS

Perform a complete periodical test. Position and level the machine. Testing personnel must be familiar with the machine and the system. The crane and the system must be configured properly. The load chart must be respected.

A known weight accurate to $\pm 1\%$ and equal to the maximum capacity at near maximum radius should be used to test the alarm and the accuracy of load indication.

Another known weight accurate to $\pm 1\%$ and equal to the maximum capacity at near minimum radius should be used to test the alarm and the accuracy of load indication.

Rig with enough parts of line to lift a large weight. Measure and record the radius and the hook weight. Note the displayed radius, length, hook weight, parts of line and capacity on the i3000 display unit. Lift the large weight. Record the actual weight with the hook and rigging attachment. Note the average, the low and the high value. Perform a hoist up and stop and note the same data. Note the actual and displayed radius. Lower the load.

RADIUS

The displayed radius must be between 0 and 10% greater than the actual radius or in accordance with current regulations.

LOAD

The displayed weight with a load on hook must be between 0 and 10% greater than the actual load or in accordance with current regulations.

ANGLE

Verify the exact boom angle using a precision angle indicator against the boom. The angle displayed on the i3000 display screen must be between 0 degree and 2 degrees below the actual angle or in accordance with current regulations.

5.3

Notes

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

