Load moment indicator for i4500 cranes

Instruction Manual

I4500 Load moment indicator for Tower Cranes
(Europe)

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EC Certificate of Compliance

This manual provides the client the use procedures essential for the proper operation of the equipment, in accordance with its intended use. We cannot sufficiently emphasize the fact that it is important to properly use the system. Make sure you read and understand all the information contained in this manual before operating the machine.

Since the manufacturer has no direct control over the use of the machine, it is the responsibility of the user and staff to comply with best security practices. All procedures that are discussed in this manual are based on appropriate operating conditions that do not deviate from the intended use of the system. It is strictly forbidden to alter or modify the equipment without the written permission of RaycoWylie Systems.

The i4500 system from RaycoWylie Systems (load moment indicator) is strictly an aid for the operator. When the settings are correctly configured, the indicator alerts the crane operator to a potential overload condition that could damage equipment or property, in addition to the risk of injury to the operator or workers who are near the crane and its load.

This system should not be used as a substitute for good judgment by the operator when performing hoist commands. The operator is responsible for the safe use of the hoist. If it is not configured correctly, the system will not necessarily prevent damage due to overload or other similar causes.

Before operating a crane equipped with a RaycoWylie load moment indicator, the operator must carefully read this manual, as well as the operation manual provided by the crane manufacturer. He must also know all the safety rules and regulations that apply to his work in the country, state or city where he works. The proper functioning of the system requires a daily inspection.

Any apparent failure or damage must be immediately reported to the responsible authority before using the crane.
Warning.

The screen captures shown in this document may undergo changes; in fact the software is continuously under development.
Since the safety of staff and the proper use of the equipment is a priority, a variety of symbols are used in this manual to highlight some important points. The following definitions indicate the level of risk when these symbols appear in this manual. Every time one of these symbols appears, the safety of the operator or the integrity of the equipment are at stake. Please take the time to read and understand these definitions!

DANGER: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS DAMAGE TO THE EQUIPMENT.

CAUTION: INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, MAY RESULT IN MINOR OR MODERATE DAMAGE. IT CAN BE USED TO WARN OF UNSAFE PRACTICES.

IMPORTANT: INDICATES A CONDITION WHICH COULD DAMAGE THE EQUIPMENT.

NOTE: PROVIDES INFORMATION THAT MAY BE SPECIAL INTEREST.
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1- GENERAL DESCRIPTION OF THE SYSTEM

1.1 Introduction

This manual contains information regarding the operation, troubleshooting and maintenance procedures for the i4500 system. Please ensure you follow the safety rules in force in the country where you use the i4500 system to reduce the risk of injury or damage to equipment. You must take into account all the safety measures contained in this manual when you use the i4500 system. This manual will help the qualified personnel to use the system and to perform maintenance.

1.2 Operator Expertise

The i4500 system should only be used by an operator who does not have hearing or visual problems or upper limb disability. In addition, they must be qualified to operate the machine and must have read and understood this manual. The operator must be able to read and write, as well as calculate, read and understand the load curves in the language used in the crane manufacturer's instruction manual. System maintenance should only be performed by qualified and experienced personnel.

1.3 Utility of the i4500 System

The i4500 system is designed to help the crane operator by displaying all the parameters included in the equipment's capacity chart and which require special attention. If calibrated, configured and used properly, the i4500 system should prevent the crane from lifting a load exceeding the allowable rated load as per the capacity chart of the crane or lifting cable.
1.4 Brief Description of the i4500 System

The i4500 "Load Moment Indicator" is a computerized system designed to provide the operator the information needed to safely use the crane and within the rated load limits authorized by the crane manufacturer.

The indicator works by automatically monitoring the crane load and continuously comparing this load with the rated load allowed for each lift position (equipment load curve).

The display unit of the system provides the operator continuous information regarding the current load of the crane. It also warns the operator when it approaches or exceeds the capacity of the crane.

The system uses sensors on the crane to measure or verify:
  - The jib angle (if luffing jib crane)
  - The trolley position along the jib and its direction of movement,
  - The height of the hook, its direction of movement and speed,
  - The weight of the hook,
  - Wind speed.

The system uses this information to calculate the range, the permissible crane load for this range, and thus it can check the overload conditions. A rotation sensor (optional) can also be installed to measure the position of the jib for 360 degrees and thus provide additional information to the operator. The display system is located inside the cabin close to the operator controls to allow easy access to this information. For cranes without cabin (with remote control) the display is located in the electrical cabinet, (a connection to the remote control is possible depending on the type of radio control). Some sensors are connected through a CAN (Controlled Area Network) bus network.

The actual load is expressed as a percentage of the allowable load (rated load or safe working load -% SWL). If this percentage is greater than a predetermined value, alarms and security features are enabled. The crane load curve charts are stored in a non-volatile memory and can be modified only with the approval of the crane manufacturer. The crane parameters and calibration data are stored in another non-volatile memory.
1.4.1 Audible Alarm

An intermittent audible alarm, inside the display unit, warns the crane operator that he must take measures because the rated load capacity is being approached. The approach alarm threshold has been set at 80% of rated capacity. The alarm is activated continuously when the rated capacity is reached or exceeded (≥ 105%).

The crane operator will also be informed by the internal audible alarm when a limit that is adjustable by the operator is enabled.

If you wear hearing protection or headphones during lifting operations, make sure not to impair your ability to hear the i4500 system audible alarms.

1.4.2 Visual Alarms

The display of the i4500 system was equipped with a 3 color warning light to alert the operator and indicate a specific action. The light turns flashing yellow at the same time as the audible alarm sounds when the load reaches the threshold limit for the approach alarm, which is 95% of the rated capacity.

The light turns red when the rated capacity is reached or exceeded.
External visual alarms are activated along with an external audible alarm to alert staff located in the area where the anemometer alarm thresholds have been reached. (Optional).

<table>
<thead>
<tr>
<th>Event</th>
<th>Internal Alarms</th>
<th>i4500 Light</th>
<th>External Alarms (anemometry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Load Pre-alarm</td>
<td>Blinking</td>
<td>Intermittent</td>
<td>Off</td>
</tr>
<tr>
<td>Load Alarm</td>
<td>On</td>
<td>Continuous</td>
<td>Off</td>
</tr>
<tr>
<td>Anemometer Pre-alarm</td>
<td>Off</td>
<td>Intermittent</td>
<td>On</td>
</tr>
<tr>
<td>Anemometer Alarm</td>
<td>Off</td>
<td>Continuous</td>
<td>On</td>
</tr>
<tr>
<td>Bypass</td>
<td>Off</td>
<td>Continuous</td>
<td>Off</td>
</tr>
<tr>
<td>Calibration Mode</td>
<td>Not Visible</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Sensor Loss/Error</td>
<td>Off</td>
<td>Continuous</td>
<td>Off</td>
</tr>
</tbody>
</table>
1.5 Location and Description of the Typical Components

1.5.1 Flat-top Jib

1 - The i4500 Display Unit: It is also the central unit of i4500 system. Its main features are the CAN bus communications interface and the graphical LCD screen. It is generally installed in the crane cabin.

2 - The GPIO Interface: This relay interface module is connected to individual external input and output devices controlled by the i4500 system. In this module, all the non-CAN sensors, as well as crane signals (crane in weathervane, for example), are connected. It is generally installed in the crane electrical board.

3 - Wind Speed Sensors: Send wind speed information to the display unit screen. It is generally installed at the crane's tallest point.

4 - (Optional) Jib Direction Sensor: Sends jib position information to the display unit screen. It is generally installed in contact with the crane ring.

5 - Hoisting Sensor: Sends hook height information to the display unit screen. It is generally installed in contact with the crane topping winch. Client sensor may be provided by Rayco Wylie, if necessary.

6 - Trolley Position Sensor: Sends information regarding the trolley position on the jib to the display unit screen. It is generally installed in contact with the crane trolley winch. Client sensor may be provided by Rayco Wylie, if necessary.

7 - Load Sensor: Sends information about the lifted load to the display unit screen. It is generally placed on the crane's weighing pulley. Client sensor may be provided by Rayco Wylie, if necessary.

8 - (Optional) External Anemometry Signaling: Consists of an orange light, a red light and a siren. It
is generally located outside of the crane cabin.

### 1.5.2 Luffing Jib

1 - **The i4500 Display Unit:** It is also the central unit of i4500 system. Its main features are the CAN bus communications interface and the graphical LCD screen. It is generally installed in the crane cabin.

2 - **GPIO Interface and Jib Angle Sensor:** Sends jib angle information to the display unit screen. In addition, this relay interface module is connected to individual external input and output devices controlled by the i4500 system. In this module, all the non-CAN sensors, as well as crane signals (crane in weathervane, for example), are connected. It is generally installed on the crane jib.

3 - **Wind Speed Sensors:** Send wind speed information to the display unit screen. It is generally installed at the crane’s tallest point.

4 - *(Optional)* **Jib Direction Sensor:** Sends jib position information to the display unit screen. It is generally installed in contact with the crane ring.

5 - **Hoisting Sensor:** Sends hook height information to the display unit screen. It is generally installed in contact with the crane topping winch. *Client sensor may be provided by Rayco Wylie, if necessary.*

6 - **Load Sensor:** Sends information about the lifted load to the display unit screen. It is generally placed on the crane’s weighing pulley. *Client sensor may be provided by Rayco Wylie, if necessary.*

7 - *(Optional)* **External Anemometry Signaling:** Consists of an orange light, a red light and a siren. It is generally located outside of the crane cabin.
## 1.6 Technical Data

<table>
<thead>
<tr>
<th></th>
<th>Comply with SAE J159 or EN13000: 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-20°C à +70°C</td>
</tr>
<tr>
<td><strong>Supply Voltage</strong></td>
<td>9 to 32 VDC (maximum rating)</td>
</tr>
<tr>
<td><strong>Display size</strong>:</td>
<td>Available in:</td>
</tr>
<tr>
<td></td>
<td>4.3” LCD Screen</td>
</tr>
<tr>
<td></td>
<td>7.0” LCD Screen</td>
</tr>
<tr>
<td></td>
<td>10.4” LCD Screen</td>
</tr>
<tr>
<td><strong>Display sealing</strong>:</td>
<td>IP67</td>
</tr>
<tr>
<td><strong>Memory capacity</strong>:</td>
<td>10,000 load/radius curves</td>
</tr>
</tbody>
</table>
2. DETAILED DESCRIPTION OF THE DISPLAY UNIT

2.1 Main Display Unit

2.1.1 Jacks + USB cable

A: Connecting the plug Coming from the GPIO (Power + CAN Bus)
B: Connecting the USB plug + Video
C: Connecting the video portion (Optional)

USB cable:

2.1.2 Overview of the Display Unit

DESCRIPTION OF FUNCTIONS

MULTIFUNCTIONAL KEYS

Each button selects or performs the function shown in the window that appears on the screen next to the function key. Thus, the function activated when you press a multifunctional key will vary depending on the menu or window.

GRAPHIC SCREEN
Menu interface to access various menus and options to control the i4500 system.

**WARNING LIGHT**

When working in normal conditions, the light is green. The light turns yellow to indicate that we are approaching a preprogrammed operation limit. The light turns red to want the operator of an abnormality.

2.2 Different Displays

2.2.1 Flat-top Jib Default Screen

![Flat-top Jib Default Screen Diagram]

1 - Configuration number.
2 - Number of strands.
3 - Hook height.
4 - Alarms.
5 - Jib rotation angle*.
6 - Wind speed.
7 - Range (this value corresponds to the distance between the axis of the tower and the axis of the hook).
8 - Maximum allowable range at current load.
9 - Moment (calculated).
10 - Maximum allowable load in this configuration and with this trolley distance (depending on the load curve).
11 - Currently lifted load.
12 - System error indicator.

* Optional
2.2.1.1 Range Display

We can see, in these two images that an arrow appears indicating the trolley’s direction of movement. The range corresponds to the distance between the axis of the crane tower and the axis of the hook. The two values under the crane correspond to the current range and the maximum allowable range with respect to the load curve.

2.2.1.2 Hook Height Display

We can see, in these three images that an arrow appears indicating the hook’s direction of movement, as well as its speed. A bar and a speed of 0: no movement. The value underneath corresponds to the distance between the bottom of the hook and the ground, as indicated by the arrows.
2.2.1.3 Jib Direction Display

We can see, in this image, that a circle appears in order to indicate the jib direction, the values are in degrees.

2.2.2 Luffing Jib Default Screen

1 - Configuration number.
2 - Number of strands.
3 - Hook height.
4 - Alarms.
5 - Jib tilt angle.
6 - Rotation angle*.
7 - Wind speed.
8 - Range (this value corresponds to the distance between the jib tilt axis and the axis of the hook).
9 - Maximum allowable range at current load.
10 - Moment (calculated).
11 - Maximum allowable load in this configuration and with this trolley distance (depending on the load curve).
12 - Currently lifted load.
13 - System error indicator.

* Optional
2.2.2.1 Range Display

We can see that for a luffing jib crane there is no trolley (except in very exceptional cranes). The range corresponds to the distance between the jib tilt axis and the axis of the hook. The two values under the crane correspond the current range and the maximum allowable range with respect to the load curve.

2.2.2.2 Jib Tilt Angle Display

The value of the tilt angle is displayed under the arrow. It is in degrees. Variation in this value results in variation in the range.

2.2.2.3 Hook Height Display

We can see, in these three images that an arrow appears indicating the hook’s direction of movement, as well as its speed. A bar and a speed of 0: no movement.
The value underneath corresponds to the distance between the bottom of the hook and the ground, as indicated by the arrows.

2.2.2.4 Jib Direction Angle Display

![Image of Jib Direction Angle Display]

We can see, in this image, that a circle appears in order to indicate the jib direction, the values are in degrees.

2.2.3 Digital Display

![Image of Digital Display]

This part applies to flat-top jib or luffing jib cranes. This window digitally displays the same information as the default screen. The information regarding sensor positions is not displayed:
- Radius (Range).
  - Tower axis hook axis: flat-top jib.
  - Jib tilt axis hook axis: luffing jib.
- Max Radius (Maximum Range): maximum allowable range by load curve.
- Load: Currently lifted load.
- Max load: maximum allowable load by load curve.
- Hook height: current height of the hook.
- Rotation: Current jib direction angle (optional).
- Transfer: current transfer position (not available yet).
- Anemometer: current wind speed.

Additional information is also displayed:
- Weathercock = Vane
- Parts. = Number of reeving system strands
- Power. = Equipment on
- Moment > 130%
2.2.3.1 Weathercock

This information is provided (or not) by the manufacturer of the crane with the i4500 system. The crane is not weathervane: NO. The crane is weathervane: YES. If the crane is weathervane, the system displays a message indicating this in the middle of the screen, regardless of the screen we are displaying.

2.2.3.2 Parts

This information is provided (or not) by the manufacturer of the crane with the i4500 system. It indicates the current number of strands and whether it has an automatic or manual strand number selector.

2.2.3.3 Power

This information is provided (or not) by the manufacturer of the crane with the i4500 system. It indicates the startup of the crane. *Be careful not confuse it with the crane’s electrical power.* Indeed, the crane may be turned on but not in use.

The crane is not in use: NO. The crane is in use: YES.

2.2.3.4 Moment >130%

This information is provided (or not) by the manufacturer of the crane with the i4500 system. Each crane has a mechanical break that blocks the crane when it reaches a critical stage. This information is displayed here.

The crane has exceeded the safe operation limit and is now in an unstable situation.

The crane has not reached 130%: NO. The crane has reached 130%: YES.
2.2.4 Anemometer

This part is valid for both the flat-top jib and luffing jib cranes. The alarm thresholds are configurable (See chapter: 4.10.1.2 Anemometer Alarm 1 / Anemometer Alarm 2).

Image 1: the wind is below the first anemometer alarm threshold.
- The warning light is green (paragraph 1.4.2).
- The horizontal wind bar chart is in the green part.
- The wind value is normal.
- The exterior lights are off (optional).
- The outside audible warning is off (optional).

Image 2: the wind is above the first anemometer alarm threshold.
- The warning light is intermittent yellow (paragraph 1.4.2).
- The i4500 internal alarm is intermittent.
- The horizontal wind bar chart is in the yellow part.
- The wind value is intermittent yellow.
- The external orange light is enabled (optional).
- The outside audible warning is off (optional).

Image 3: the wind is above the second anemometer alarm threshold.
- The warning light is continuous red (paragraph 1.4.2).
- The i4500 internal alarm is on.
- The horizontal wind bar chart is in the red part.
- The wind value is blinking red.
- The exterior lights (orange and red) are activated (optional).
- The exterior audible warning is on (optional).
2.2.5 Load

This part is valid for both the flat-top jib and luffing jib cranes. The alarm thresholds are configurable (See chapter: 4.10.1.1 Load Alarm 1/Load Alarm 2) They are set by default to 80% for the pre-alarm and 105% for the alarm. Alarms trigger dry contacts, which are used by the crane manufacturer (to allow only slow movements or to interrupt movements).

**LOAD** = currently lifted load.
**MAX** = maximum allowable load.

If the first threshold is 80% then: load = 80% of 2T; which is 1.6T.
If the second threshold is 105% then: load = 105% of 2T; which is 2.1T.

In addition, the moment horizontal bar chart has nothing to do with the load thresholds.

Image 1: the load is below the first alarm threshold.
- The warning light is green (paragraph 1.4.2).
- There are no internal sirens or alarms.
- The contacts are not engaged.

Image 2: the load is above the first alarm threshold.
- The warning light is intermittent yellow (paragraph 1.4.2).
- The internal siren is intermittent.
- A first alarm is triggered.
- A contact is engaged.

Image 3: the load is above the second alarm threshold.
- The warning light is continuous red (paragraph 1.4.2).
- The internal siren is continuous.
- All alarms are triggered.
- A second contact is engaged.
2.2.6 Moment Horizontal Bar Chart

This part is valid for both the flat-top jib and luffing jib cranes. The display thresholds are configurable (see chapter: 4.10.1.1 Load Alarm 1/Load Alarm 2). They are set by default to 80% for the first moment threshold and 105% for the second. The moment is calculated; it is closely related to the crane load curve. You can be at pre-alarm or alarm load but stay in the green in the horizontal bar chart. The reverse is also true.

Image 1: the moment is below the first threshold.
- The horizontal bar chart is green.

Image 2: the moment is above the first threshold.
- The horizontal bar chart is green.

Image 3: the moment is above the second threshold.
- The horizontal bar chart is red.
2.2.7 Screen 2 - Flat-top/Luffing Jib Digital Display

1 - Represents the Range.
   • Tower axis hook axis: flat-top jib.
   • Jib tilt axis hook axis: luffing jib.
2 - Represents the maximum allowable range by load curve.
3 - Represents the lifted load.
4 - Represents the hook height.
5 - Represents the transfer (not available yet).
6 - Represents the maximum allowable load by load curve.
7 - Represents the jib direction (optional).
8 - Information on the crane weathervane.
9 - Information on the number of strands.
10 - Information regarding whether the crane is in use or not (not to be confused with the power on).
11 - Information on the crane mechanical stop.
12 - Alarms.
13 - Represents the wind speed.
2.2.8 Screen 3 - Flat-top/Luffing Jib Driving Aid

1 - Configuration number.
2 - Hook forbidden overfly zone.
3 - Logo indicating the crane safety level (see chapter 6.2.1 Warning Icons)
4 - Alarms.
5 - Currently lifted load
6 - Maximum allowable load by load curve.
7 - Moment (calculated).

2.3 Description of Operations Keys

All these portions are valid for both flat-top or luffing jib cranes.

2.3.1 MODE KEY

This button is used to select the mode of operation. Press this button to select one of these modes of operation:
- Limiter Mode.
- Config. Mode.
- Info Mode.
- Error Mode.
- Diagnostic Mode.
- Calibration Mode (password protected).
- Night Mode.
2.3.2 UP KEY
Press this button to scroll up the menu or to increase the value of variables.

2.3.3 DOWN KEY
Press this button to scroll down the menu or to decrease the value of variables.

2.3.4 EXIT KEY
Press this button to exit a menu or any program window in order to return to the previous screen without saving changes. Press repeatedly to return to the main screen.

2.3.5 CONFIRMATION KEY
Press this button to confirm your choice in any menu and accept new values in the system.
2.3.6 SAVE KEY

Press this button to save your choice in any menu where the logo appears.

2.3.7 INFO KEY

Press this button to access all the information about the crane’s current configuration. (See example below).

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Config: 0002</td>
</tr>
<tr>
<td>2</td>
<td>Longueur de flèche: 14m</td>
</tr>
<tr>
<td>3</td>
<td>Contre-poids: 5000Kg</td>
</tr>
<tr>
<td>4</td>
<td>Trolley/Block: 4 fûts</td>
</tr>
<tr>
<td>5</td>
<td>Ground Support: Config1</td>
</tr>
<tr>
<td>6</td>
<td>Height: 36.0</td>
</tr>
<tr>
<td>7</td>
<td>Générique1: Pas utilisé</td>
</tr>
</tbody>
</table>

1 - Config.: number of the selected configuration (0002 in this example). The configuration corresponds to the load curve data. The more complicated the load curve is, the more Config. there are.
2 - Jib length: jib length (14m in this example).
3 - Counterweight: crane counterweight weight (5000Kg in this example).
4 - Trolley/Block: Number of strands (4 in this example).
5 - Ground Support: type of crane ground mounting (Config1 in this example) (see chapter -9 - GROUND SUPPORT).
6 - Height: crane tower height (from the ground right up to the jib for flat-top jibs and from the ground to the jib tilt axis for the luffing jibs).
7 - Generic1: Option not used at the moment.
2.3.8 SCREENS KEY

Press this button to access 3 other types of screens.
- Default.
- Digital.
- Driving Assistance.

2.3.9 ANEMOMETER KEY

Press to test the anemometer.
By pressing this button the system will test the internal signal (and external, if available), see chapter 1.4.2 and 2.2.3.
For this purpose it makes the signal vary from 0 km/h to 130 km/h. Once at 130km/h, the system returns to normal operation.
2.3.10 HEIGHT "TARE" KEY

Press this button to create a Height "TARE". At the first press, the system goes into height "TARE" mode. At the second press, the system goes out of height "TARE" mode. Visually the only difference is the transition from the height to "0" and change of reference (it goes from the ground to the hook).

This button allows you to set a "0" virtual height. In image "1" we note that the current height is 24.5 m. After you press the height "TARE" button, we see that the height becomes 0.0 m, image "2". I lower the hook 3 m, image "3". When I re-press the height "TARE" button, the height becomes 27.5 m, image "4". The system has taken into account the 3 m displacement.
2.3.11 NUMBER OF STRANDS KEY

Press this button to change the number of strands. The logo only appears, when automatic strands change is not selected.

Once you press the manual strands change button, a sub-menu with options appears. The number of strands option depends on the load curve. In extreme cases, the system can handle up to 12 strands. Select the desired number of strands with the arrows and validate. Image 2. The system automatically returns to the default screen and the selected number appears under the arrow. The system automatically adjusts to the proper load curve (MAX = 2.7T).

2.3.12 WEIGHT "TARE" KEY

Press this button to create a weight "TARE". At the first press, the system goes into weight Tare mode. A hook logo appears at the bottom right. At the second press, the system goes out of weight Tare mode.
This button allows you to set a "0" virtual weight. In image "1" we note that the current weight is 0.2T. After pressing the weight "TARE" button, we see the logo and that the weight becomes 0T, image "2". I take on a 0.9T load, image "3". When I re-press the weight "TARE" button, the weight becomes 1.1T, image "4". The system has taken into account the 0.9T extra weight.

Note in the example, if the operator lifts 1.9T instead of 0.9T, the lifted load will then be 2.1T. So:
- If the pre-alarm is 80% of the load, meaning 1.6T then the pre-alarm will be triggered.
- If the alarm is 105% of the load, meaning 2.1T, then the alarm will be triggered. So 1.9T cannot be lifted.

We can also try to remove weight. In image "1", we note that the current weight is 1.5T. After pressing the weight "TARE" button, we see the logo and that the weight becomes 0T, image "2". I remove the 1.2T, the weight remains "0" because the system cannot display negative weight values. When I re-press the weight "TARE" button, the weight becomes 0.3T, image "3". The system has taken into account the 1.2T hanging weight.
2.3.13 SHUNT KEY

Press this button to bypass the lock-out (shunt). This button is available only when the load has exceeded the second alarm threshold (105% default). It becomes unavailable in two cases.
- The load exceeds 115%.
- Load drops below 105%.

When the button is pressed, a window appears:

2.3.14 ZONE CONFIGURATION KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

This option provides access to “Working Zone” and “Exclusion Zone”
2.3.15 WORKING ZONE KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

The working zone is used to determine an area in which the crane can work.

2.3.16 EXCLUSION ZONE KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

This button allows you to add exclusion zones within the working zone. These exclusion zones may have a predetermined height, which allows you to fly over.
2.3.16 ADD A POINT KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

Place your hook at the point you wish to create. Press the button. The point is created, image 2. The system draws a straight line between the points. If it is outside the forbidden zone, then the system shades this portion.

2.3.17 DELETE ONE OR MORE POINTS KEY

2.3.17.1 Delete zone Key

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

You have created a zone, image 1. It does not suit you, you press the DELETE ONE OR MORE POINTS button. A window appears, image 2. Press the Delete zone button. The system returns to screen 3, you must select now the zone to delete using the Up, Down and Delete buttons.
2.3.17.2 Delete All Points Key

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

You have created a zone, image 1. But the area does not suit you, you press the Delete All Points button. A window appears, image 2. Press the Delete All Points button again. The system returns to screen 3 and the zone is deleted, image 3.

2.3.18 CLOSE ZONE KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

You have created your last point, image 1. The following is the point of origin. Press the button and the zone is closed.
2.3.19 OPEN ZONE KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

You just closed the zone. You want to open to create another point. Press the button and the zone is open.

2.3.20 MAXIMUM HEIGHT OF THE EXCLUSION ZONE KEY

This button is only available in Screen 3 - Flat-top/Luffing Jib Driving Aid.

This button allows you to configure the height of an exclusion zone. To do that, after defining the points of an exclusion zone, move the hook load over aver the exclusion zone and press the button.
2.3.21 IN PROCESS LOGO

This logo appears when the system is busy (for example saving).

2.4 Location of Warning Lights and Indicators

2.5 Warning Icons

2.5.1 First Load Threshold

The icon of the first load threshold (yellow) lights up when the hook load is between 80% and 105% of load capacity (value is adjustable during calibration). The yellow light is accompanied by an audible
warning inside the display unit.

**Maneuver with caution!**
The crane is operating close to its rated load limit.

2.5.2 Second Load Threshold

The overload (red) warning icon lights up when the hook load limit is equal to or greater than 105% (value is adjustable during calibration) of the rated capacity. The red light is accompanied by an audible warning inside the display unit.

The rated capacity of the crane is reached or exceeded.

2.5.3 Locking of the Controls

The controls lock icon (red) lights up when the rated capacity reaches or exceeds 105.1% (value is adjustable during calibration). The controls lock-out is specific to each crane.

The crane has exceeded the safe operation limit and is now in an unstable situation.
2.6 MAIN MODES
-3 - INSTALLATION AND CALIBRATION

The i4500 system installation should be performed by a qualified technician. In addition, the system calibration must be performed by a Rayco Wylie technician. The Rayco Wylie technician shall perform a complete and accurate system verification before starting the calibration.

**Danger**

Improper calibration of the system can cause an overload that could cause damage to the equipment (structural failure or tipping over) causing serious injury and even death. You should always call a Rayco Wylie technician to calibrate your system.

Installation and calibration manuals are available upon request from Rayco Wylie. Please note that instructions for calibration and installation have intentionally been omitted from this manual.

-4 - OPERATING INSTRUCTIONS

4.1 Safety Instructions

Please ensure you follow the safety rules in force in the country where you use the i4500 system to reduce the risk of injury or damage to equipment. Please read the following safety instructions before attempting to operate the system.

- The i4500 load moment indicator must be configured correctly with regards to the crane configuration. Incorrect settings may affect the reliability of the system and cause dangerous situations such as overload.

- The i4500 system is strictly an aid to the operator. The latter is responsible for carefully maneuvering the crane, because the i4500 system does not necessarily prevent damage to the equipment due to overload or other causes.

- The proper functioning of the equipment depends upon daily inspection and compliance with operating instructions in this manual.

- You should never exceed the rated capacity of the crane during normal operation. An overload indication should not be used as a normal operation option.

- The crane should always be handled gently and at a safe speed.

- In order to ensure rated capacity and proper operation, the system must be configured correctly. Improper configuration of the system can cause damage to the equipment or a tipping over of the crane, causing serious injury or even death.

- The operator must check the crane settings and the number of strands used whenever he enters the crane or whenever the crane is configured.
An improper configuration of the i4500 system may also cause an error if no load curve corresponds to the parameters set by the operator.

4.2 Residual Risks

Despite the implementation of all safety rules and the integration of safety devices, certain residual risks cannot be avoided. Here are some examples:

- The system does not indicate malfunction of the relay outputs that could prevent the lock-out in case of overload. This may increase the risk of breaking or tipping over the equipment, thus causing serious injury or even death.

- The system does not indicate the presence of electrical wires in the environment where the crane is operating; the crane might operate near electric cables and in case of contact may cause serious injury or even death.

- The system does not indicate whether the ballasts at the base of the crane are in place. This may increase the risk of breaking or tipping over the equipment, thus causing injury and even death.

- The system does not indicate the conditions of the crane’s safety mechanisms. This may increase the risk of breaking or tipping over the equipment, thus causing injury or even death.

- The system does not indicate whether the ground is stable. This may increase the risk of breaking or tipping over the equipment, thus causing injury or even death.

4.3 Power On

When the i4500 system is turned on, it performs a self-test during which it checks CAN network communication, as well as communication with analog sensors, and loads into its RAM information stored in its ROM. During this step, the Rayco Wylie logo is displayed on the screen. When the test is complete and the RAM is loaded, the warning light turns green (if the system does not detect an error). The i4500 system then displays the default screen for the user.
4.4 Access to the Different Modes

Repeat these steps to access the different modes of the system.

- Press the Mode Key
- Scroll through the list using the buttons to highlight the config. mode.
- Press the confirmation key to confirm your choice and access the mode.

4.5 Limiter Mode.
This mode is not available.

4.6 Config. Mode.
When we select the system configuration mode (Config.), we arrive at other modes.

4.6.1 Units
In the Units Mode, a list of measurement units appears. Select the desired unit with the arrows by highlighting it and confirming. Once confirmed the display returns to the default page.
4.6.2 Language

In the Language Mode, a list of languages appears. Select the desired language with the arrows by highlighting it and confirming. Once confirmed the display returns to the default page.

4.6.3 Anemometer Unit

In the Anemometer Unit Mode, a list of measurement units appears. Select the desired unit with the arrows by highlighting it and confirming. Once confirmed the display returns to the default page.

4.6.4 Date and Time

In the Time and Date Mode, a window appears: Time Settings.

mm = month, dd = day, yyyy = year. If you press one of the arrows, you change the format. dd = day, mm = month, yyyy = year. By pressing the confirm button you access the first value. The arrows change the value. Confirm to move to the next value. Once the year is set and confirmed, the system returns to the default page.
4.6.5 Backlight

You can change the brightness level of the night mode screen to adjust it in accordance with ambient lighting.

In the Backlight mode, another window appears: night intensity.

![Night Intensity](image)

Select the desired level of light with arrows "3" and "4" and confirm to change the digit. For the night level, a backlight between 30% and 60% is advised. Once the last digit is confirmed the display returns to the default page.

4.7 Info Mode

You can also check your crane's current configuration by simply pressing the Info button.

![Info Mode](image)

With one glance, you can check the configuration of several parameters such as the jib length, the counterweight weight, etc. (See chapter 2.3.7 Info Key). Your system is correctly configured if all the data on the information screen are correct.

4.8 Error Mode

This mode displays a list of errors detected by the system.

![Error Mode](image)
4.9 Diagnostic Mode

This mode displays a second selection window. Scroll through the list using the buttons to highlight the part you wish to diagnostic, then confirm.

4.9.1 GPIO 1

Once the GPIO1 is confirmed, you access this window. The down arrow indicates that there is a second window.

First window:

- HDout1: Anemometer pre-alarm.
- HDin1 (input signal): Crane mechanical stop due to overload.
- HDout2: Anemometer alarm.
- HDin2 (input signal): Crane activated (not to be confused with crane powered).
- HDout3: Load alarm.
- HDin3 (input signal): Movement authorization, if the load alarm is exceeded.
- HDout4: Load pre-alarm.
- HDin4 (input signal): Number of strands.
- HDin5 (input signal): Weathervane.
- HDin6 (input signal): Not used.
Second window:

- **Ain1 (bits):** Represents the trolley position (in bits).
- **Ain2 (bits):** Represents hook height (in bits).
- **Ain3 (bits):** Represents the anemometer signal (in bits).
- **Ain1:** Represents the trolley position (in meters).
- **Ain2:** Represents hook height (in meters).
- **Ain3:** Represents the anemometer signal (in km/h).
- **Ain1 Scale:** Corresponds to the trolley calibration slope.
- **Ain2 Scale:** Corresponds to the hook calibration slope.
- **Ain1 Offset:** Number of bits for the trolley position calibration.
- **Ain2 Offset:** Number of bits for the hook height calibration.
- **Ain4:** Corresponds to the signal of the load cell (in bits).
- **Ain4 Scale:** Corresponds to the load cell calibration slope.
- **Ain4 Offset:** Number of bits for the load cell height calibration.

The values in these two tables will allow the RaycoWylie technician to diagnose a problem that arises due to a sensor.

In the case of a sensor malfunction, take note of these values and communicate them to a RaycoWylie Systems technician.

Press the Exit key to return to the main screen of the diagnostics mode.

**4.9.2 Detected Address**

This diagnostic menu page displays the addresses of the various sensors on the CAN network, as detected by the i4500 system. Addresses remain in memory while the system is turned on, even if a sensor stops communicating.
### 4.9.3 System

This window regroups the general system information.

- **SCL1:** Two possibilities
  - Flat-top jib - Distance between the axis of the tower and the axis of the hook.
  - Luffing jib - Distance between the jib tilt axis and the end of the last pulley before the hook cable.
- **SCL2:** Distance between the axis of the tower and the end of the jib (only flat-top jib).
- **SCL3:** Two possibilities
  - Flat-top jib - Distance between the axis of the tower and the end of the counter jib (flat-top jib only).
  - Luffing jib - Distance between the jib tilt axis and the end of the counter jib.
- **SCL4:** Two possibilities
  - Flat-top jib - Distance between the bottom of the jib and the bottom of the trolley.
  - Luffing jib - Distance between the jib axis and the last pulley before the hook cable.
- **SCL5:** Two possibilities
  - Flat-top jib - Distance between the ground and the bottom of the jib.
  - Luffing jib - Distance between the ground and the jib tilt axis.
- **Hook weight:** Corresponds to the weight of the hook
- **Trolley weight:** Corresponds to the weight of the trolley.
- **Radius:** Two possibilities
  - Flat-top jib - Distance between the axis of the crane tower and the axis of the hook.
  - Luffing jib - Distance between the jib tilt axis and the axis of the hook.
- **Load:** Currently lifted load.
- **Direction:** 4 options for this field, which is used for friction compensation:
  - Hoisting: rising hook
  - Hoisting and stop: the hook is stopped after rising
  - Lowering: descending hook
  - Lowering and stop: the hook is stopped after descending

![Software version and name of the load curve](image-url)
4.10 Calibration Mode

This menu is protected by a code. There are two codes:
- An OEM code (reserved for builders) which gives access to all menus.
- A user code for minor modifications.

The user code is: 5 6 7 8 9

Once the code is entered, another window is displayed.
In this window there are several options.
Scroll through the list using the buttons to highlight the part you wish to select, then confirm.

4.10.1 Adjusting Alarms

Once confirmed, another window is displayed.
In this window there are several options.
Scroll through the list using the buttons to highlight the part you wish to select, then confirm.

Confirm to access digits.
Use arrows to change the value.
Confirm to move to the next digit. After having entered the last digit, save with the Save button.
The values may only be lower than those programmed by the OEM.
- Load Alarm 1: Corresponds to the first load alarm threshold (in %, maximum 80%).
- Load Alarm 2: Corresponds to the second load alarm threshold (in %, maximum 105%).
- Anemometer Alarm 1: Corresponds to the first wind alarm threshold (in km/h, maximum 50 km/h).
- Anemometer Alarm 2: Corresponds to the second wind alarm threshold (in km/h, maximum 72 km/h).
- Trolley Approach Limit: limits the distance between the axis of the hook and the beginning of the forbidden zone on a trolley displacement (in m, maximum 600m).
- Rotation Approach Limit: limits the distance between the hook position and the beginning of the forbidden zone on a change of direction (in °, maximum 10°).
- Buzzer for Load Alarm 1: Validates or not the i4500 siren for the first load alarm threshold.
- Buzzer for Wind Speed Alarm 1: Validates or not the i4500 siren for the first wind alarm threshold.

4.10.1.1 Load Alarm 1/Load Alarm 2.

The values in Values Adjustments under the "user" code will never be higher than those under the "OEM" code.
- Alarm 1 Load can never greater than Alarm 2 Load.
- Alarm 1 Load can at most be equal to Alarm 2 Load.
- Alarm 1 Load can be set to a maximum of 120% of the load (only if Alarm 2 Load is greater than 120%)
- Alarm 2 Load can never lower than Alarm 1 Load.
- Alarm 2 Load can at most be equal to Alarm 1 Load.
- Alarm 2 Load can be set to a maximum of 160% of the load.

Changes in load alarm thresholds cause a change in the moment horizontal bar chart.
4.10.1.2 Anemometer Alarm 1 / Anemometer Alarm 2.

The values in Values Adjustments under the "user" code will never be higher than those under the "OEM" code.

Anemometer Alarm 1 can never greater than Anemometer Alarm 2.
Anemometer Alarm 1 can be set to a maximum of 50km/h (only if Anemometer Alarm 2 is equal to or greater than 50km/h)
Anemometer Alarm 2 can never lower than Anemometer Alarm 1.
Anemometer Alarm 2 can be set to a maximum 72km/h.
Anemometer Alarm 1 may be set equal to Anemometer Alarm 2 (only if Anemometer Alarm 2 is lower than or equal to 50km/h)

If the values of Anemometer Alarm 1 and the Anemometer Alarm 2 are changed, the anemometer horizontal bar chart on the default display also changes.
4.10.2 Transfer

In Transfer, you access another menu: System transfer to USB key (Copy).

In this menu you copy certain data to a USB key. If you have not connected the USB cable and a USB key, an error message appears asking you to insert a USB stick.

Transfers can be very long, especially for the Datalogger and BlackBox.

- Calibration → USB key: Allows saving the performed calibration on a USB stick.
- Capacity chart → USB key: Allows saving a load curve onto a USB stick.
- Data logger → USB key: Allows saving the data from the data logger onto a USB stick.
- Black box → USB key: Allows saving the data from the Black Box onto a USB stick.

During the Transfer, a logo appears. At the end of the transfer, a confirmation window appears.

4.10.3 Saving Errors

In Saving Errors a list of errors appears.

The Delete all points button "XX" allows erasing errors.
GPio 1 Map is highlighted and by confirming we access the list.

- Dout1 error: Output 1 error: Anemometer pre-alarm.
- Dout2 error: Output 2 error: anemometer alarm.
- Dout3 error: Output 3 error: load alarm.
- Dout4 error: Output 4 error: Load pre-alarm.
- Ain1 error: Input 1 error: trolley sensor signal.
- Ain2 error: Input 2 error: hook height sensor signal.
- Ain3 error: Input 3 error: anemometer sensor signal.
- Ain4 error: Input 4 error: load sensor signal.
- DR+ error: No power.
- ATB1 NO/NC error: Not used.
- ATB2 NO/NC error: Not used.
- ATB3 NO/NC error: Not used.
- Inter. Config. error: Internal GPio not correctly positioned.
- Comm. Error: Lack of communication from the GPio card.

4.10.4 Event Recorder

In this menu events are saved. The hoisting cycles and others. The hoisting cycle includes:
- A load is lifted.
- The load is displaced: the trolley or the direction or both.
- The load is paused.

The Delete all points button "XX" point allows erasing events.
- Lifting > 20%: Cycle with a load greater than 20% of the crane capacity
- The same up to 120%
- Atb: Not used.
- Workaround: Number of times the system was set to shunt.
4.11 Night/Day Mode

This menu provides access to the pre-configured screen brightness. Select a mode that corresponds to the ambient lighting. Please note that the screen brightness level in night mode is set in the Backlight menu (see chapter 4.6.5 Backlight).

To change the backlight mode, follow these steps:
1. Press the Mode button.
2. Scroll with the "down" key to highlight the day or night mode line.
3. Press the "confirm" button to change the backlight mode (to switch from day to night mode or vice versa).

4.12 DRIVING ASSISTANCE

Attention, the direction sensor is essential for this part.

4.12.1 Creating a Working Zone point by point.

Here is an example of creating a Working Zone. This part applies to flat-top and luffing cranes, as well.

- Image 1 Place the hook at the first point.
- Image 1 Press on the Add a point "+" button.
- Image 2 Place the hook at the second point.
- Image 3 Press on the Add a point "+" button. The system begins to shade the outside of the area.
- Image 4 Place the hook at the third point.
- Image 5 Press on the Add a point "+" button.
- Image 6-12, the process is repeated.
- Image 13 Press on the Add a point "+" button. The system proposes closing the area.
The Working zone has been created.
To remove the zone see chapter 2.3.17 Delete One or More Points Key.

4.12.2 Creating an Exclusion Zone point by point.

Here is an example of creating an Exclusion Zone. This part applies to flat-top and luffing cranes, as well.

1. Place the hook at the first point.
2. Press the Add a point "+" button.
3. Place the hook at the second point.
4. Press on the Add a point "+" button.
5. Place the hook at the third point.
6. Press on the Add a point "+" button. The system begins to shade the Zone.
7. Move the hook load over the exclusion zone and press the button Height of the Exclusion zone to record the height.
8. Press the button Height of the Exclusion zone to record the height.
9. Press the Enter button to finish the programming.

The Exclusion zone has been created.
To remove the zone see chapter 2.3.17 Delete One or More Points Key.
4.12.2 Using the Driving Assistance

Applies to flat-top jib or luffing jib cranes.
There are three parameters to be set for the approach limit. These settings are located in the Menus "Orientation Data" menu. These are:
- Trolley Approach Limit
- Rotation Approach Limit.
- Height Approach Limit

The i4500 has a crane driving assistance system, but the operator is fully responsible for the operation thereof. The system does not have lock-out or slowdown features, it simply gives the operator indications for safer working conditions. Improper operating limits settings may cause the equipment to collide with obstacles and cause serious injury or death.

Rayco Wylie notes that operating a crane near power lines or equipment is an extremely dangerous practice that requires extra care. To avoid the risk of electrocution, it is essential to operate the crane outside the minimum allowable distances so there is no chance that the crane, the hoisting cable or load become an electrically conductive path. The crane should not be used to move materials stored below power lines, except in cases where no combination of jib, hoist cable and load can enter the forbidden zone. Driving assistance option offered by the i4500 system should not be used to define the forbidden zone. Refer to the safety standards of the country, state or city in which you work to learn more about operating cranes near power lines.

4.12.2.1 Warning Icons

Working in safe conditions.

Approach limit reached.
The hook is arriving to the selected zone (see chapter 4.10.1 Adjusting Alarms).

Forbidden zone reached.
The hook is entering the forbidden zone.
4.12.2.2 Trolley Approach Limit

It is forbidden to work in the shaded area.
- Image 1: the hook works inside the area, the icons are green.
- Image 2: the hook works within the trolley approach limit, the icon is yellow.
- Image 3: the hook works within the no fly area, the icons are red.

4.12.2.3 Rotation Approach Limit
It is forbidden to work in the shaded area.
- Image 1: the hook works inside the area, the icons are green.
- Image 2: the hook works within the trolley approach limit, the icon is yellow.
- Image 3: the hook works within the no fly area, the icon is red.

4.12.2.3 Height Approach Limit

It is forbidden to work in the shaded area.
- Image 1: the hook works inside the area and over the exclusion zone, the icons are green.
- Image 2: the hook approach of the maximum height of the exclusion zone, the icon is yellow.
- Image 3: the hook is under the maximum height of the exclusion zone, the icons are red. In this situation the only option is to hoist up the hook.
-5 - ERROR MESSAGES

At start-up and during the operation of other processes, the i4500 system analyzes all interactions between internal devices (memories, controllers, expansion cards, etc.) and external devices (sensors and physical maps connected to the CAN bus network). The system error indicator will appear on the main screen if an error is detected.

5.1 Internal Devices

If you have any questions or if you need assistance, please contact the Rayco Wylie technical support department.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Execution process</th>
<th>Cause of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration' data memory is</td>
<td>When starting system, there is a verification (writing / reading) of the whole</td>
<td>There is a problem with the flash on the Motherboard located in the i4500 Display.</td>
</tr>
<tr>
<td>defective, or</td>
<td>flash memory on the Motherboard</td>
<td>Contact the Technical Service Department at RaycoWylie</td>
</tr>
<tr>
<td>Operator's data memory is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>defective, or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load chart data memory is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>defective, or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flash data memory is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>defective, or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Logger memory is</td>
<td></td>
<td></td>
</tr>
<tr>
<td>defective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAM memory is defective</td>
<td>When starting system, there is a verification (writing / reading) of the RAM</td>
<td>There is a problem with the RAM memory on the Motherboard located in the i4500 Display.</td>
</tr>
<tr>
<td></td>
<td>memory on the Motherboard</td>
<td>Contact the Technical Service Department at RaycoWylie</td>
</tr>
<tr>
<td>Clock is defective</td>
<td>The system regularly verifies if the seconds change. If time does not change</td>
<td>1) Verify if the battery on the Motherboard is well inserted.</td>
</tr>
<tr>
<td></td>
<td>then there is a problem</td>
<td>2) The clock is defective on the Motherboard.</td>
</tr>
<tr>
<td>Low battery</td>
<td>The system detected that the Lithium battery is low. This may cause clock to stop</td>
<td>The lithium battery is out. Replace the battery on the Motherboard.</td>
</tr>
<tr>
<td>Canbus 1 is defective, or</td>
<td>The CAN Bus controller verification has failed</td>
<td>There is a problem with the CAN Bus controller on the Motherboard.</td>
</tr>
<tr>
<td>Canbus 2 is defective.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Not Calibrated | No calibration has been found for the selected duty. | There is no calibration for the selected duty. A calibration must be done for the selected duty.
---|---|---
No valid duty | When a new duty is selected, the system verifies if all conditions are present before to use the new duty. | The duty selected doesn’t meet all conditions to be a valid duty. Check if all conditions are enable
No Parameter | The crane dimensions must be entered into the system. The load value will be null or wrong. | CL3, CL4 and CL7 values should Not be at zero

5.2 External Device

**A) Angle / Length and ATB interface circuit boards**

The i4500 system can support up to 5 angle / length interfaces. Activation of every angle sensor is done in the calibration menu section “Enable/Disable IO”

<table>
<thead>
<tr>
<th>Error message</th>
<th>Execution process</th>
<th>Cause of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle sensor X is defective</td>
<td>The angle sensor value in volts is not valid (1 volt to 4 volts).</td>
<td>1) The accelerometer or the 12 bits converter is defective.</td>
</tr>
<tr>
<td>Length X is out of range</td>
<td>A 0xFFFF code is sent by angle/length card to indicate that length sensor is not present.</td>
<td>The length sensor is not installed, or A wire is cut between length sensor and circuit board</td>
</tr>
<tr>
<td>Angle X is in Pre-calibration</td>
<td>Indicates that angle/length card is in pre-calibration mode.</td>
<td>1) In normal operation mode, the “Cal” jumper must be taken out from the circuit board. 2) Verify that the calibration value of the accelerometer is valid.</td>
</tr>
<tr>
<td>Lost communication with angle X, or Lost communication with length X</td>
<td>The i4500 system has not received data from angle/length interface If “time out” delay is reached, then a communication error is displayed.</td>
<td>1) The angle/length interface is defective, 2) The cable that links the interface to the canbus network is defective.</td>
</tr>
<tr>
<td>Length X is not calibrated</td>
<td></td>
<td>Length sensor is not calibrated</td>
</tr>
<tr>
<td>Angle /Length X DR+ is defective</td>
<td>The 5 volts reference voltage is not valid (if &lt; 4.5 volts or 5.5 volts).</td>
<td>1) The angle/length interface board is defective.</td>
</tr>
</tbody>
</table>
B) Load Interface

The i4500 system can support up to 4 load circuit boards. angle / length interfaces. Activation of every load sensor is done in the calibration menu section “Enable/Disable IO”.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Execution process</th>
<th>Cause of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load X is out of range</td>
<td>A 0xFFFF code is sent by load card to indicate that load sensor is not present.</td>
<td>The load sensor is not installed, or A wire is cut between load sensor and circuit board</td>
</tr>
<tr>
<td>Load X is not calibrated</td>
<td></td>
<td>The load sensor is not calibrated</td>
</tr>
<tr>
<td>Load X DR+ is defective</td>
<td>The 5 volts reference voltage is not valid (if &lt; 4.5 volts or 5.5 volts).</td>
<td>The load board is defective</td>
</tr>
<tr>
<td>Lost communication with Load X</td>
<td>The i4500 system has not received data from Load interface If “time out” delay is reached, then a communication error is displayed.</td>
<td>1) The load interface is defective, 2) The cable that links the interface to the canbus network is defective.</td>
</tr>
</tbody>
</table>

C) Relay and digital input interface errors

The i4500 system can support up to 4 relay cards. Activation of every relay card is done in the calibration menu section “Enable/Disable IO”.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Execution process</th>
<th>Cause of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost communication with Relay board X</td>
<td>The i4500 system has not received data from Relay interface If “time out” delay is reached, then a communication error is displayed.</td>
<td>1) The Relay interface is defective, 2) The cable that links the interface to the canbus network is defective.</td>
</tr>
</tbody>
</table>

There is no automatic test for the relay contacts on the relay circuit board. Therefore, there may not be a warning if a relay becomes defective. The operator should test the lockout system periodically.
D) Generic interface errors

The i4500 system can support up to 4 generic interfaces. Each one having feature to support wind speed sensor, inclination level sensor and absolute encoder. Activation of every generic card is done in the calibration menu section "Enable/Disable IO".

<table>
<thead>
<tr>
<th>Error message</th>
<th>Execution process</th>
<th>Cause of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost communication with generic card 1</td>
<td>The i4500 system has not received data from generic card If “time out” delay is reached, then a communication error is displayed.</td>
<td>1) The generic card is defective, 2) The cable that links the generic to the canbus network is defective.</td>
</tr>
<tr>
<td>Generic DR+ is defective</td>
<td>The 5 volts reference voltage is not valid (if &lt; 4.5 volts or 5.5 volts).</td>
<td>The Generic card is defective</td>
</tr>
<tr>
<td>AIN 1 on generic X</td>
<td>Waiting for a valid value of the AIN1 input from interface</td>
<td>1) The AIN1 input of generic interface is not calibrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) A wire is cut between the sensor connected to ANI 1 input and the interface</td>
</tr>
<tr>
<td>AIN 2 on generic X</td>
<td>Waiting for a valid value of the AIN2 input from interface</td>
<td>1) The AIN2 input of generic interface is not calibrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) A wire is cut between the sensor connected to ANI 1 input and the interface</td>
</tr>
<tr>
<td>Absolute rotation encoder</td>
<td>Waiting for a valid signal from the absolute interface</td>
<td>Absolute encoder is defective</td>
</tr>
</tbody>
</table>
6.1 Frequent Inspections
(to be performed whenever we wish to use the crane)

- Make sure the system has been configured correctly.
- Check clock accuracy.
- Make sure that no error has been detected by the system.
- Check that the displayed capacity is consistent with the crane manufacturer's load curve.

Warning! You must note any imperfections and assess whether this defect can have serious consequences before using the machine.

6.2 Periodic Inspection
(Every six months)

Please regularly inspect:

- Cables (check that there are no nicks or damage), as well as the connectors (check that the contacts are not corroded).
- The mounting for each system part.

6.3 Inspection of the Displayed Load

- Check equipment level.
- The person performing the test must be qualified to operate the crane and the i4500 system.
- The crane and the system must be configured correctly.
- The load curve should be respected.
- A known weight, accurate within ± 1%, and equal to the maximum capacity close to the maximum range will be used to test the alarms and the accuracy of the load indicator.
- Another known weight, accurate within ± 1%, and equal to the maximum capacity close to the maximum range should be used to test the alarm and the accuracy of the load indicator.
- Note the range, length, hook load, the number of strands and the capacity displayed on the display screen.
- Check ranges and hook heights.
- Check the actual weight including the hook and accessories.

RaycoWylie recommends that all tests be signed and dated and a copy of the latest test be available at all times.

6.4 Maintenance

Unless otherwise notified by a Rayco Wylie technician, all parts (original and replacement) must come from Rayco Wylie.
Preventive Maintenance

Your i4500 system was designed to operate for long periods of time, requiring minimum maintenance. However, the system needs to be maintained and cleaned to function properly.

**Important:** Do not wash the i4500 display box, junction boxes, the angle sensor using high pressure steam. This could create mold in the connectors and cause the eventual failure of sensors.

To wash the surface of the display case, use a mild soap (or window cleaner) and a soft cloth.

**Important:** If you see condensation form on the screen of the display box, open the lid and let it dry in a dry place for a day.

Replace any cables that appear damaged. Check plug contacts so they are not too corroded.

To ensure that the i4500 display case maintains its water resistance, make sure the screws on the back are tightened in an "x" shape. Your i4500 system does not require additional lubrication.

6.5 Adjustments and Repairs

Unsafe conditions identified during the inspection should be corrected before the crane is used again.

**Important:** Only qualified personnel should make adjustments and repairs.

Any adjustment must be made in compliance with the tolerances specified by Rayco Wylie in order to ensure the proper functioning of each system component.

If you need spare parts for maintenance or repairs, please contact the technical support department at RaycoWylie.

If you have any questions or need technical assistance, please contact our technical support department with the serial number of your i4500 system at hand.
Appendix A - Basic Types

Applies to flat-top jib or luffing jib cranes.

Config 1
Cranes fixed to the ground in concrete and having at least one tower.

Config 2
Cranes not fixed to the ground or moving and having at least one tower.

Config 3
Cranes not fixed to the ground and without a tower.
Appendix B - MACHINE DIMENSIONS

1 Flat-top Jib

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground support</td>
<td>Type of floor fixing</td>
<td></td>
</tr>
<tr>
<td>Trolley/Block</td>
<td>Number of strands</td>
<td></td>
</tr>
<tr>
<td>SCL1</td>
<td>Total trolley displacement distance</td>
<td></td>
</tr>
<tr>
<td>SCL2</td>
<td>Total jib length</td>
<td></td>
</tr>
<tr>
<td>SCL3</td>
<td>Total counter jib length</td>
<td></td>
</tr>
<tr>
<td>SCL4</td>
<td>Distance between the bottom of the jib and the bottom of the trolley</td>
<td></td>
</tr>
<tr>
<td>SCL5</td>
<td>Total mast length</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Trolley weight</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hook weight</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Distance between the ground and the bottom of the jib</td>
<td></td>
</tr>
</tbody>
</table>
### 2 Luffing Jib

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground support</td>
<td>Type of floor fixing</td>
<td></td>
</tr>
<tr>
<td>Trolley/Block</td>
<td>Number of strands</td>
<td></td>
</tr>
<tr>
<td>SCL1</td>
<td>Distance between the jib tilt axis and the last pulley before the hook cable</td>
<td></td>
</tr>
<tr>
<td>SCL3</td>
<td>Total counter jib length</td>
<td></td>
</tr>
<tr>
<td>SCL4</td>
<td>Distance between the jib axis and the last pulley before the hook cable</td>
<td></td>
</tr>
<tr>
<td>SCL5</td>
<td>Distance between the ground and the jib tilt axis.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Hook weight</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Counterweights weight</td>
<td></td>
</tr>
</tbody>
</table>