

SLIM

Load Moment Indicator Operator Manual



Rev 11 02-07-18 Software TXW0030PE



7055 Morning Dove Way, Roscoe, IL 61073 Phone 815.270.0088 www.controlsystemsw.com : waynem@controlsystemsw.com

Introduction

WARNING

The SLIM system is an LMI, with Range limiting features.

The system should be checked for the shutoff functions prior to programming the Operating mode and confirming by trying to move the boom functions to ensure the shutoff is disabled.

A full check confirming all features on the system are functioning properly prior to lifting any loads!

To obtain the optimum performance from this system we recommend that you read and understand this manual before using the system.

WARNING

For proper use of the system, carefully read and understand this page.

<u>MAINTENANCE</u> The SLIM system power cable must be disconnected when welding, battery replacement, charging or jump starting the battery. Failure to comply will result in serious damage to the system.

<u>MACHINE WASHING</u> If washing the machine with a high pressure power washer, you must protect all the system components from direct spraying to avoid damage to the components.

Failure to comply with the above warnings will result in voiding the warranty!

WARRANTY

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, MADE BY EITHER THE DISTRIBUTOR OR THE MANUFACTURER ON NEW 3B6 SYSTEMS AND COMPONENTS, EXCEPT THE MANUFACTURER'S WARRANTY AGAINST DEFECTS, MATERIAL AND WORKMANSHIP SET OUT BELOW.

NEW EQUIPMENT WARRANTY

"The manufacturer warrants each new product made by the manufacturer to be free from defects in material and workmanship, its obligation and liability under this warranty being limited to replacing free of charge at its factory any part proving defective under normal use and service within twelve (12) months from the date of initial sale, providing the product is on record with the manufacturer as being installed by the distributor. If the product is not on record as being installed by the distributor, the manufacturer will consider the date of shipment from the factory as the date of initial sale. This warranty is in lieu of all other warranties, expressed or implied and the obligation and liability of the manufacturer under this warranty shall not include any transportation or other charges or the cost of installation or any liability for direct, indirect or consequential damages or delay resulting from the defect. Any operation beyond rated capacity or the improper use of the product or the substitution upon it of parts not approved by the manufacturer shall void this warranty. This warranty covers only the products of 3B6. The products of other manufacturers are covered only by such warranties as made by their manufacturers.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATIONS OR LIABILITY OF THE PART OF THE MANUFACTURER, AND 3B6 NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH SUCH EQUIPMENT.

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System Layout



System Components



Slew potentiometer Located inside center area of turret



Main wire harness Located inside turret area



Rod side located inside turret area

Piston side located on top of the cylinder

Pressure Sensors

arm



- 1) LCD bar showing the actual load in percentage to the maximum capacity load in that working condition.
- 2) Green reference: Normal operating area 0-90% capacity.
- 3) Yellow reference: Pre-warning (Actual load is higher than 90% of maximum capacity).
- 4) Red reference: Shut-off Zone (Actual load higher than 100% of maximum capacity).
- 5) Green Led on: Normal condition 0-90% capacity
- 6) Yellow Led on: Pre-warning condition (exceeding 90% capacity Audible alarm on)
- 7) Red Led on: Shut-off condition (100% capacity or higher (Audible alarm on)

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- ACTUAL LOAD LIFTED: ACT Graphic Symbol : Indicates Actual load suspended, value x 1000 in lbs or kgs
- 9) MAXIMUM CAPACITY LOAD: MAX Symbol; Indicates Maximum allowed load value x 1000 in lbs or kgs
- 10) WORKING RADIUS: distance between the center of suspended load to center of turret rotation point. Value feet and tenths or meters and tenths.
- 11) WORKING CONFIGURATION: Operating Mode or program selected. $\underline{1}$ value in feet and tenths or meter and tenths.

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- 12) MAIN BOOM LENG<u>TH:</u> Distance from Boom rotation pin to boom sheave pin. Value in percentage 0-100 %.
- 13) MAIN BOOM ANGLE: boom angle in degrees relative to the ground value in degrees.
- 14) BOOM HEIGHT: Distance from boom tip to ground value in feet and tenths or meters and tenths.
- 15) PARTS of LINE : Number of wire rope rigging



System Start Up

The SLIM is equipped with multiple pushbutton functions and display pages to indicate the crane condition information such as, LMI and Auto Diagnostics. The SLIM display will automatically power up once the machine is started. The unit will indicate the software version, date, crane model number and perform a self test.



The display will change to the LMI SET-UP screen for Configuring the crane setup. The system will store the last operating mode selected that was confirmed. See page 11 for all programs available. Use the UP or DOWN pushbutton to scroll to a different operating mode or press and release the ENTER pushbutton to confirm the indicated operating mode. The system will be in an inactive mode and audible/ visual alarms enabled until the system is setup and confirmed.



The display will change to the ROPE selection (Parts of Line) Using the UP or DOWN pushbuttons select the proper parts of line and press and release the ENTER pushbutton to confirm. The system will be in an inactive mode and audible/visual alarm enabled until the system is setup and confirmed.



NOTE: Start up screen SAE chart is V3.1. Metric chart is V4.

System Start Up

The display will change to the normal operating screen (if no faults or conditions are present.) The system will be in an active mode (working). All machine geometry should be indicated. The system is fully operational.



To Silence the audible alarm: press and release the INDEX/HORN pushbutton. This feature is inoperable in the RIGGING & TRAVEL MODE!



To Change the program or parts of line press and release the UP arrow pushbutton. Then use the UP Arrow pushbutton to scroll to the new program and press and release the ENTER pushbutton to confirm the program. The display will ask then to confirm the parts of line. Change the parts of line using the UP Arrow pushbutton and press and release the ENTER pushbutton to confirm. The system will be operational then.

Operating Modes



Program number and Description

- 0 Main Boom
- 1 Jib 30 ft 0 degree
- 2 Jib 30 ft 15 degree
- 3 Jib 30 ft 30 degree
- 4 Jib 47 ft 0 degree
- 5 Jib 47 ft 15 degree
- 6 Jib 47 ft 30 degree
- 8 Rigging & Travel
- 16 Main boom SR (SR is Spin resistant cable)
- 17 Jib 30ft 0 degree SR
- 18 Jib 30ft 15 degree SR
- 19 Jib 30ft 30 degree SR
- 20 Jib 47ft 0 degree SR
- 21 Jib 47ft 15 degree SR
- 22 Jib 47ft 30 degree SR

Rigging and Travel Mode

The unit is equipped with a rigging and travel mode, when selected the audible alarm sounds every 5 seconds to warn the operator the program is selected. This program enables the (shutoff) lock out valves all the time and it is used for rigging and travel only. It is not intended to be used to operate the crane for normal operation. The audible alarm can not be silenced in this mode. If the cylinder is topped and an overload condition is present, rigging and travel mode is selected in order to over ride and allow the boom to be lowered. Then select the proper program for operation.

The range limiting feature is disabled with this program and will not stop the rotation in the event the rotation values and angle of the boom is below the 10 degree range when swinging towards the outriggers. See page 12.

Range Limiting feature limit

The system is equipped with a preset range limiting feature, which will stop the crane rotation to avoid contact with the outriggers. The lowest angle is 10 degrees, which will stop the rotation in the contact direction, but allow the machine to swing back in the opposite direction unless the angle is increased to enable the rotation to continue in that direction. This feature is bypassed in Rigging and Travel mode only. The lowest angle over the front is 10 degrees.

Warning 8 will flash on the display when the pre-warning alarm is enabled 2-3 degrees prior to the shut-off point of rotation. Then **Warning 9** will flash on the display when the rotation is stopped. This mean the rotation feature is enable and stops the crane rotation in the contact direction, but allows the crane to rotate back in the non- contact direction.

Warning 8 (Pre-warning)



Warning 9 (Shutoff rotation)



Virtual wall feature (ISAAC) (Activate)

The system is equipped with a virtual wall feature ,which allows the operator to set the angle, radius or height limits. This is performed by putting the boom in that position and then selecting the function and confirming. **These features are audible and visual** warning only. See below for setting.

To activate the feature press and hold the INDEX pushbutton for 3 seconds the display will indicate ;

71 Angle set; position the boom at the proper angle to set and press and release the ENTER pushbutton to activate that setting, then press and release the INDEX pushbutton to confirm or press and release the UP arrow pushbutton to activate the;

72 Radius set; position the boom at the proper radius to set and press and release the ENTER pushbutton to activate that setting, then press and release the INDEX pushbutton to confirm or press and release the UP arrow pushbutton to activate the;

73 Height set position the boom at the proper height to set and press and release the ENTER pushbutton to activate that setting, then press and release the INDEX pushbutton to confirm or press and release the UP arrow pushbutton to activate the;

76 Rot. Max Set position the boom at the min (left side) rotation angle to set and press and release the ENTER pushbutton, then press and release the INDEX to confirm or press and release the UP pushbutton to activate the;

77 Rot. Min Set position the boom at the (right side) max rotation angle to set and press and release the ENTER pushbutton, then press and release the INDEX to confirm or press and release the UP pushbutton to scroll to the next setting.



ACTIVE WARNING CODES Warning 11 indicates Angle preset has been exceeded Warning 12 indicates Radius preset has been exceeded Warning 13 indicates Height preset has been exceeded Warning 15 indicates Rot Min preset has been exceeded Warning 16 indicates Rot Max preset has been exceeded

Virtual wall feature (ISSAC) (Deactivate)

If the UP or DOWN arrow pushbutton is pressed and released again the display will indicate;

81 Angle Reset : Resets the value to a default value to deactivate the feature, press and release the UP arrow pushbutton the display indicates;

82 Radius Reset : Resets the value to a default value to deactivate the feature, press and release the UP arrow pushbutton the display indicates;

83 Height Reset : Resets the value to a default value to deactivate the feature, press and release the UP arrow pushbutton the display indicates;

86 Rot. Max Reset : Resets the value to default value to deactivate the feature, press and release the UP arrow pushbutton the display indicates;

87 Rot Min Reset : Resets the value to default value and deactivates the feature, press and release the UP arrow pushbutton the display indicates;

89 Disable All : Resets all values of the Virtual wall settings to the default value and deactivates all features. press and release the UP arrow pushbutton the display indicates;



To exit this feature press and release the INDEX pushbutton to return to the LMI working screen

Contrast adjustment

To adjust the contrast from the LMI page, press and release the DOWN/MINUS pushbutton the display will indicate;



The displayed will automatically start to change the contrast adjustment values on the display they will increase and decrease the contrast. Once the desired contrast is reached press and release the ENTER pushbutton to confirm this setting. Values will range from 100-130, in 5 point value changes. Example 100 to 105 to 110, etc

Once you have confirmed the setting the display will change back to the LMI screen.

Language/Unit of measurement

The display language and unit of measurement must be set by the installer prior to shipping the unit. A high level password must be inserted to access this feature.

WARNING CODES

| WARNING 5 | Exceeded single line pull of wire rope | Increase reeving |
|--------------------------|--|--------------------------------------|
| Rope overload | | Reduce weight |
| WARNING 6 | Suspended load when changing | Lower load to ground to change |
| Exceeded load | program | program |
| program change | | |
| WARNING 7 | Rigging & Travel mode selected | N/A |
| Rigging & Travel | | |
| WARNING 8 | Rotation approaching limit range | Increase Boom angle above 10 |
| Pre-warning | | degrees |
| rotation | | |
| WARNING 9 | Exceeded rotation limits | Increase Boom angle above 10 |
| Rotation limit stop | | degrees |
| | | Rotate opposite direction |
| WARNING 10 | 5vdc supply is low to rotation pot | Check wiring |
| 5 vdc supply | | Check harness to pot |
| rotation pot fault | | Replace pot |
| WARNING 11 | Preset for virtual wall exceeded | Increase boom angle |
| Virtual wall Angle | | Reset ISAAC angle setting, page |
| preset limit | | 14 |
| WARNING 12 | Preset for Virtual wall exceeded | Decrease radius |
| Virtual wall radius | | Reset ISAAC radius setting, page |
| exceeded | | 14 |
| WARNING 13 | Preset for Virtual wall exceeded | Decrease height |
| Virtual wall | | Reset ISAAC height setting, page |
| Height exceeded | | 14 |
| | | |
| WARNING 15 | Preset for Virtual wall exceeded | Increase Rotation min (swing left) |
| Virtual Wall | | Reset ISAAC ROT MIN setting, |
| KOIAIION MIN exceeded | | see page 14 operator manual |
| eneccucu | | |
| WARNING 16 | Preset for Virtual wall exceeded | Decrease Rotation Max (swing |
| Virtual Wall | | ngiu) Pasat ISAAC DOT MAY setting |
| Kotation min | | See page 14 operator manual |
| ελιεεμεμ | | |
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Alarm/Fault codes

| MESSAGE | CAUSE | SOLUTION |
|--|---|--|
| ALARM 1 Memory Data Fault | Internal memory fault | Cycle system power, if continued Contact Service |
| ALARM 2 Angle sensor 1 reading lower than minimum | Potentiometer inside Reel is faulty. Possible lack of continuity in wires carrying the signals Fault in Display unit connector Angle out of adjustment | Check Wiring from cable reel to Display Unit Check 12vdc supply to angle pot in cable reel Replace pot if damaged Check CAN BUS lines Call service |
| ALARM 3 Angle sensor 1 reading higher than maximum | Potentiometer inside reel is faulty. Lack of continuity in wiring Fault in display unit connector Angle out of adjustment | Check Wiring from cable reel to display unit Check 12vdc supply to angle sensor Replace pot if damaged Check CAN BUS lines Call Service |
| ALARM 4 Length Sensor 1 reading lower than minimum | Potentiometer inside reel is faulty. Lack of continuity in wiring Fault in display unit connector Length out of adjustment | Check Wiring from cable reel to display unit Check 5 vdc supply to length sensor Replace pot if damaged Adjust length pot values fully retracted 0.250vdc Check CAN BUS lines Call Service |
| ALARM 5 Length Sensor 1 reading higher than maximum | Potentiometer inside reel is faulty. • Lack of continuity in wiring • Fault in display unit connector • Length out of adjustment | Check Wiring from cable reel to display unit Check 5 vdc supply to length sensor Replace pot if damaged Adjust length pot values fully retracted 0.250 vdc Check CAN BUS lines Call Service |

Alarm/Fault codes

| MESSAGE | CAUSE | SOLUTION |
|---|---|--|
| ALARM 8 Piston pressure sensor output lower than minimum | Piston Pressure sensor faulty. Lack of continuity in wiring Moisture in connector. Sensor broken or disconnected | Check for15vdc supply Check for output 0.5 vdc min Check for moisture or fluid. Check connector and wiring Replace Transducer if faulty |
| ALARM 9 Piston pressure sensor output higher than maximum | Piston Pressure sensor faulty. Lack of continuity in wiring Moisture in connector. Sensor broken or disconnected | Check for 15vdc supply Check for output 0.5 vdc min Check for moisture or fluid. Check connector and wiring Replace Transducer if faulty |
| ALARM 10 Rod pressure sensor output lower than minimum | Rod Pressure sensor faulty. Lack of continuity in wiring Moisture in connector. Sensor broken or disconnected | Check for 15vdc supply Check for output 0.5 vdc min Check for moisture or fluid. Check connector and wiring Replace Transducer if faulty |
| ALARM 11 Rod pressure sensor output higher than maximum | Rod Pressure sensor faulty. Lack of continuity in wiring Moisture in connector. Sensor broken or disconnected | Check for 15vdc supply Check for output 5.5 vdc max Check for moisture or fluid. Check connector and wiring Replace Transducer if faulty |
| ALARM 16 Shutoff output fault. | Lack of continuity in wiring Fault internal SLIM Shutoff solenoid | Check for12vdc supply Check connector and wiring |
| ALARM 22 Internal WDO fault | • Faulty display | • Check wiring of display and harness |
| ALARM 41 CRC Error EPROM SW | Internal fault SLIM display | Cycle power on SLIM display Call Service |
| ALARM 42 CRC Error in program | Internal fault SLIM display | Cycle power on SLIM display Call Service |
| ALARM 43 CRC Error in Load chart | Internal fault SLIM display | <i>Cycle power on SLIM display</i> <i>Call Service</i> |
| ALARM 50 Cable reel CANBUS | Faulty wiring from display to cable reel | Check wiring and CAN line for 120 ohm resistor. |

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| Alarm/Fault | codes |
|-------------|-------|
|-------------|-------|

| ALARM 60 A2B condition | Approaching A2B condition | Lower hook block. Check A2B switch cable |
|--|--|--|
| ALARM 61 Overload SWL 110% | Exceeded 110% SWL | Reduce SWL |
| ALARM 62 Overload SWL 115% | Exceeded 115% SWL | Reduce SWL |
| ALARM 63 Overload SWL 120% | Exceeded 120% SWL | Reduce SWL |
| ALARM 64 Bypass enabled | Faulty wiring System bypassed | Check wiring from harness to bypass |
| ALARM 70 Rotation pot ADC value | Faulty wiring Internal fault rotation pot | Check wiring from harness to rotation pot Call Service |
| ALARM 71 Rotation prox switch | • Faulty mechanical hardware | • Check wiring from harness to rotation pot Check pot hardware |
| ALARM 72 Rotation sensor malfunction | Faulty wiring Defective rotation sensor | Check wiring from harness to rotation sensor Call Service |
| | | |

AUTO DIAGNOSTIC Geometrical data

Starting from the LMI screen, press and release the **ENTER pushbutton**. The display will change to



All pages are displayed for 30 seconds; after which, it returns to the normal working condition page.

The displayed parameters are as follows:

- P : Main cylinder differential pressure in Bar;
- W : Lifted load weight in Tonnes (Pounds/1000 if Imperial Measurement System is used);
- *M* : Maximum admitted load in present position in Tonnes (Pounds/1000 if Imperial Measurement System is used)
- A : Actual angle in Degrees:
- L : Actual boom length in Meters (in Feet if Imperial Measurement System is used);
- *R* : Radius from turret rotation centre in Meters (in Feet if Imperial Measurement System is used)

If you continue to press and release the ENTER pushbutton the following diagnostics page are displayed.

AUTO DIAGNOSTIC Hydraulic data



The displayed parameters are as follows: Upper row:

- P : Main cylinder differential pressure in Bar;
- L : Main cylinder piston side pressure in Bar;
- *H* : Main cylinder rod side pressure in Bar; Lower row:
- p : Compensation cylinder differential pressure in Bar;
- I : Compensation cylinder bottom side pressure in Bar;
- h :Compensation cylinder rod side pressure in Bar;

AUTO DIAGNOSTIC Angle and Length Data



The displayed parameters are as follows: Upper row:

- A : Angle1 value ;
- Angle 2 (N/A)
- Difference between angle1 value and angle2 value;

Lower row:

- L : Extension1 value;
- Extension2 value (N/A)
- Difference between extension1 value and extension2 value;

AUTO DIAGNOSTIC

Status of Digital inputs



The displayed parameters are as follows:

- 0 XXXX : Main cylinder bottom side pressure value in Bits; between 0 and 1023 (*)
- 1 XXXX : Main cylinder rod side pressure value in Bits; between 0 and 1023 (*)
- 2 XXXX : Angle value in Bits; between 0 and 1023 (*)
- 3 XXXX : Boom Length value in Bits; between 0 and 1023 (*)

AUTO DIAGNOSTIC Analog Sensor Signals



The displayed parameters are as follows:

- 4 XXXX : Main cylinder piston side pressure value in Bits; between 0 and 1023 (*)
- 5 XXXX : Main cylinder rod side pressure value in Bits; between 0 and 1023 (*)
- 6 XXXX : Angle value in Bits; between 0 and 1023 (*)
- 7 XXXX : Boom Length value in Bits; between 0 and 1023 (*)

AUTO DIAGNOSTIC External Digital Input Signals



Digital Inputs (I)

The upper row indicates the Input number, while the lower row indicates its status. The symbol "*" means **active Input**, the symbol "-" means **non active Input**.

- *A*2*B* = 4
- Bypass key switch = 6
- *Proximity* switch = 7

NOTE : The combination of the Inputs status automatically selects the proper Operating Mode (OM) and the corresponding load Table, depending on the machine model.

AUTO DIAGNOSTIC

Digital Output Signals



Digital Outputs (O)

The upper row indicates the Output number, while the lower row indicates its status. The symbol "*" means **active Output**, the symbol "-" means **non active Output**. 0:LMI SHUT-OFF: "*" It happens when overload, or an alarm are active.

1: EXTERNAL BUZZER "*" Active when overload or alarm/warning condition is active 2: RIGHT SHUT-OFF : "*" It happens when the rotation clockwise is not allowed 3: LEFT SHUT-OFF: "*" It happens when the rotation counter-clockwise is not allowed

4: N/A

5: N/A







Value from Cable Reel

The displayed parameters are as follows:

A XXXX : Value of the angle sensor (A channel) in Bits; between 0 and 1023 (*)

L XXXX : Value of the length sensor (A channel) in Bits; between 0 and 1023 (*)

a XXXX : Value of the angle sensor (B channel) in Bits; between 0 and 1023 (*)

I XXXX : Value of the length sensor (B channel) in Bits; between 0 and 1023 (*)

AUTO DIAGNOSTIC Rotation sensor



The displayed parameters are as follows:

- R1 : Channel 1 or A of rotation pot values between 0 to 360 degrees
- R2 : Channel 2 or B of rotation pot values between 0 to 360 degrees

AUTO DIAGNOSTIC

Status Master

To check the status of Flag, Temporary Variable, Inputs, Outputs, System Variables, parameters and variables.



Press and release the INDEX pushbutton to activate. The display will indicate and asterisk above the M:



If you select the 1st column, "M" for example, if you press the button UP/ PLUS pushbutton you'll switch to the other type of variables, if you press the button DOWN/MINUS pushbutton, you'll switch to the previous one.

The list of the possible type of variables are: P = (parameter) Q = (variables) M = (flag) T = (temporary variables) I = (input) O = (output)S = (system variables)

AUTO DIAGNOSTIC Status Master



The 2nd column represents the index of the selected variable. With the button "+" increase the index With the button "-" decrease the

The text "ON" or "OFF" is used only for the following types: *M*, *I*, and O ON means that the value of the selected item is 1, OFF means that the value is 0. The value is also represented in the 3rd column the special page P (parameter) and S (system variables) is possible to insert value (for example to change parameter or give the command to save the parameters to the proper system variable). To make a modification is necessary to put a password (level 3) If you try to make a change, the display will show the text ACCESS DENIED.



Wiring Diagram



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3B6

Operator Manual





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