Safe - Aid Crane Safe Load Indicator

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Topics covered by this manual :

System use

This manual will describe the use of the *LM700, LM750* and *LM800* units. All units appear the same to the operator so all descriptions will apply all units unless mention is made in the manual of one unit excluding the other. The *LM SERIES* units have been designed with ease of operation in mind.
On system startup confirmation of program and reeving settings are asked and once this is done the system continues with normal monitoring, requiring no further input from the crane operator.
If any error or pre-warning conditions occur during crane operation the operator is alerted to the condition by means of an audible alarm, LED indicator lights on the display unit and error message display on the system screen, on some error conditions the buzzer may be temporally silenced by pressing the ***BUZZER OVERRIDE*** key.

Operator input to the system is via the eight keys on the front panel of the display unit. All keyboard commands end with the ***ENTER*** key to pass the command to the system. If an incorrect key was pushed or the bottom line of the display must be cleared press the ***CLEAR*** key.

System Startup

Each time the crane is started the system goes into a startup mode where the system operating parameters are confirmed before use. In this mode the crane dump circuit will be operational, the system buzzer will sound intermittently and all LED indicators on the display will light. The system will recall the last used program and reeving settings but these must be confirmed by the operator in case they have been changed since the crane was last used.
The first parameter to be confirmed is the the program selection for example:

MAIN BOOM OUTRIGGERS - (Hydraulic crane)
or
120m MAIN / 30m FLY@ 5° - (Lattice crane)

Program Selection

The *LM SERIES* indicators contains different programs for the various modes of crane operation that the crane can operate in. These programs have different rated capacities, it is therefore important that the system is set for the correct crane operating mode, if not the system could be monitoring a rated capacity much higher than it should be.

A program is selected by scrolling through the available programs using the ***PROGRAM +*** and ***PROGRAM -*** keys, as each program is scrolled through it's name will be displayed on the bottom line of the display. Lattice cranes tend to have many programs so once the ***PROGRAM +*** or **-** key is pressed using the ***CLEAR*** key will decrement the programs by 10 and the ***RESET*** key will increment the programs by 10, ***REEVING*** and ***TARE*** will decrement and increment the programs by 50 respectively. While no program is selected or on initial power up all LED indicators on the front panel will light up and the buzzer will buzz intermittently, to accept a program press the ***ENTER*** key and the system will now confirm the reeving selection. On power up the system will require that a program is selected and verified by pressing enter before the system will work.

Reeving selection

The *LM SERIES* has provision for a reeving of 1 to 20 parts of line [for some large lattice cranes selection up to 30 parts is allowed], this must be entered into the system to enable the correct Lifted Load to be displayed for the current reeving of the crane. To enter the reeving value into the system follow the keyboard sequences shown below. Reeving selection is also requested during system startup.

KEYBOARD ENTRY	DISPLAY RESPONSE	ACTION REQUIRED
REEVING ENTER	REEVING = _ 01	Use the [*PROGRAM* +] and [*PROGRAM* -] keys to scroll through the avaliable reeving values until the required value is displayed and then press [*ENTER*] .
REEVING RESET ENTER	REEVING = _ 01	This sets the reeving value to minimum, a reeving of '1' displays the same lifted load value on the display.

On startup the system will always confirm the reeving selection after the operating program is selected or confirmed.

Buzzer Overriding and Alarm Conditions

Once a program is selected and the reeving set, the system will monitor the loading of the crane and continuously compare the loading against the current rated capacity of the crane. Warnings are given when the loading is above 90 percent of the cranes capacity. Warnings between 90 and 99 percent are intermittent buzzer and overload LED flashing, once the loading equals or exceeds 100 percent a relay cutout comes in, continious buzzer and overload LED lights. Anti-2-Block alarm is also given with the same alarming as 100 percent overload. During these alarm conditions the buzzer may be silenced by pressing [***BUZZER OVERRIDE***] key, this will clear the buzzer but not the LED's and relay.

Alarm Condition	LED Status	Relay Status	Buzzer	Display Message
ANTI-2-BLOCK	A-2-B ON	ON	ON	ANTI-2-BLOCK *
90-99% LOADING	OVERLOAD FLASHING	OFF	INTERMITTENT	>90% LOADING !
>100% LOADING	OVERLOAD ON	ON	ON	>100% LOADING *

All other alarm conditions, listed below, cannot have the buzzer overridden as no crane should be used in those conditions.

LENGTH EXCEEDED	OVERLOAD ON	ON	ON	LENGTH EXCEEDED*
LOW ANGLE	LOW ANGLE ON	ON	ON	LOW ANGLE *
SLEW ERROR	OVERLOAD ON	ON	ON	SLEW ERROR *
ROPE OVERLOAD	OVERLOAD ON	ON	ON	ROPE OVERLOAD *

Messages are scrolled on the bottom line of the display if more than one error condition occurs. If a message ends with a '*' it shows that the error condition has caused the cutout relay to energize, a '!' means a warning condition with no relay cutout.

Buzzer overriding is needed for each alarm condition, this means that if the buzzer is overriden for the greater than 90 percent loading condition and an Anti-2-Block condition occurs the buzzer will sound for that error until overriden again or the error condition falls away. A list of all messages and warnings are listed at the end of this manual.

Zeroing the displayed hook load (Lifted Load)

The *LM SERIES* has provision for taring the displayed lifted load, this function does not however affect the calculation of crane utilisation percentage. The tared mass is limited to a value entered into the maximum tare value during calibration, the tared mass can also be zeroed at any stage.

KEYBOARD ENTRY	DISPLAY RESPONSE	ACTION TAKEN
TARE	None	The Lifted Load should now flash 0,0 - with each flash the system will beep.
	or	
	Invalid Tare !	The hook load exceeds the maximum tare value, tare procedure not carried out.

To cancel the *TARED* display value follow key press below.

TARE	None	Lifted load now reads total mass on the hook.

Error messages

Various messages are displayed on the bottom line of the display during operation of the crane, some of these messages are warning messages and others alarm messages. Warning messages end in '!' and alarm messages end with '*!'. Alarm conditions cause the relay cutout to energise while warning messages cause the buzzer to sound and a message to display, except in the case of > 90% loading where the overload LED flashes. Relay cutout is automatically released once the condition causing the alarm is removed and the message in the scrolling queue has been cleared. Warning messages fall into three categories:

1. Operational warnings
2. System warnings
3. Calibration Messages

These are covered in the calibration manual. Operational warnings are caused by crane operational conditions while system warnings are caused by faults within the electronics, incorrect keyboard entry or electronic system information displays.

Operational messages

DISPLAYED MESSAGE	ERROR CONDITION	ACTION REQUIRED
Anti-2-Block	Anti 2 block condition	Lower the hook block.
> 90% Loading	Crane loaded to more than 90% of it's capacity	Increase boom angle, reduce boom length or slew to an increased loading area.
> 100% Loading	Crane loaded to more than 100% of it's capacity	Increase boom angle, reduce boom length or slew to an increased loading area.
Length Exceeded	Boom extended beyond it's length limit for the crane's current selected duty	Reduce boom length.
Low Angle	Boom is lowered beyond the minimum angle limit	Increase the boom angle.
ROPE OVERLOAD	Maximum line pull exceeded	Add extra reeving or use a bigger crane.
Slew Error	Boom is over an area not covered by the current duty selected	Slew the boom into a safe working area.

System messages

DISPLAYED MESSAGE	ERROR CONDITION	ACTION REQUIRED / REASON
Ain OverRange	Analog channel fault	Analog channel is returning an over range reading. Fault with wiring, loadcell or electronics. (not on ***LM750***)
Ain UnderRange	Analog channel fault	Analog channel is returning an under range reading. Fault with wiring, loadcell or electronics. (not on ***LM750***)
CalBat Failure	System memory fault	Calibration memory has lost it's stored values. If this error occurs the system needs to be recalibrated. (not on ***LM750***)
CalLock Failure	System memory fault	Memory fault and the system cannot access the calibration values.
Command Error	Incorrect keyboard entry	Re-enter your command into the system.
Invalid Tare	Operational error	Operator tried to tare a weight larger than the maximum allowed by the max. tared value set during calibration.
Power Failure	System information	System has just been powered up.

Additional LM750 Messages

DISPLAYED MESSAGE	ERROR CONDITION	ACTION REQUIRED / REASON
Load TXD under	Transducer Error	The signal from the load transducer is lower than the calibration value. Less 500
Load TXD over	Transducer Error	The signal from the load transducer exceeds the calibration value. Over 3950
Load TXD Cal.	Calibration or Transducer Error	The signal from the load transducer is out of the calibration range.
Angle TXD under	Transducer Error	The signal from the angle transducer is lower than 100 counts.
Angle TXD over	Transducer Error	The signal from the angle transducer exceeds 3950 counts.
Angle TXD Cal.	Calibration or Transducer Error	The signal from the angle transducer is out of the calibration range.
Length TXD under	Transducer Error	The signal from the length transducer is lower than 100 counts.
Length TXD over	Transducer Error	The signal from the length transducer exceeds 3950 counts.
Length TXD Cal.	Calibration or Transducer Error	The signal from the length transducer is out of the calibration range.
Comms Error	System Error	Data signal from the junction box is not begin received by the display unit.
Tele Sequence Er	Operation Error	The boom sections are being telescoped in the incorrect sequence.
Dual Hook Load	Operation Error	The system is set for Auto program selection and a load on both hooks is registered

Additional LM800 Messages

DISPLAYED MESSAGE	ERROR CONDITION	ACTION REQUIRED / REASON
Timeout Junction	System Error	The display unit is not communicating with the junction box unit. Check for a cable fault between the display and junction box.
Timeout Main	System Error	The display unit is not communicating with the main boom amplifier unit. Check for a cable fault or the plug connection between the display and main amplifier unit.
Timeout Aux	System Error	The display unit is not communicating with the fly amplifier unit. Check for a cable fault or the plug connection between the display and fly amplifier unit.