FUSION TECH
Marine Equipment Repairing & Maintenance CO.LLC

FUSION -2022
AUTOMATIC SAFE LOAD INDICATOR
Operation Manual
STRUT BOOM CRANES

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Introduction

"SAFETY" COMES "FIRST". Safety is an important concern worldwide and supersedes all industry planning decisions today. Several studies in the past have proved that damages due to poor safety measures are more than to any other reasons.

The crane operator on his experience and judgment has to often carry out difficult lifts thus introducing chances of human error. This may lead to an accident or damage to the crane, surrounding equipment/property and cause serious injury to the operator or people near the vicinity of the crane.

Safe Load Indicator System is an important operational aid to the crane operator to enhance his experience and judgment by providing him "in-box", all information he needs to carryout the various lifts. The Safe Load Indicator System provides the crane operator with the information necessary to operate the crane safely within the maximum permitted loading as specified by the crane manufacturer. It helps in eliminating over-turning, overloading and reducing the down time of the crane, thus maximising productivity and improving work safety.

Electronic Safe load indicator System provides improved accuracy, faster response and very high reliability over other conventional Safe load indicator systems. Those electronic Safe load indicator systems which use the latest digital technology are far more robust, have longer life and are very easy to operate and service. No wonder today, all mission critical equipments are based on the digital technology.

SPECIAL NOTE: Safe Load Indicator system is an AID only; it can not be a substitute for a good operator and his experience. The system warns the operator about impending overload or overhoist conditions. It is operator's sole responsibility to analyse the warnings and carryout crane operations safely.

SPECIAL NOTE FOR DYNAMOMETER INSTALLATION AND USE

Please Note: Remove dynamometers during dragline and piling operations.

Dynamometers (Tensiometers / line-riders) are NOT designed for use on wire ropes performing Piling operations due to the high cycle and high speeds combined with high line pulls.

Please ensure that they are removed before commencing operations.

We will not accept responsibility for either rope or dynamometer damage resulting from this type of use.

Salient features of Mtek-2011 SLI System

- Designed keeping in mind the requirements of the crane operator provides all information simultaneously.
- Simple but versatile product.
- Suits all types of cranes, Modular design, and system can be varied to suit each customer's requirement.
- Latest technology using the Digital Signal Processing (DSP) technology.
- Robust design optimised for harsh and severe environmental conditions. All system components Encapsulated for environmental protection.
- Compact easy to read display, requires minimal cabin space.
- Site calibration facility.
- Easy to install and maintain.
- Clear audio-visual warning with on display panel describing alarm condition.
- Minimal maintenance required.
- Digital (Relay) output for interfacing motion cut off facility.
- Hooks selection (Main or Auxiliary) and Tare facility.
- Rugged power supply unit capable for varying input 10 Vdc to 36Vdc.
- Operating Temperature Range: 0°C to 60°C.

System General Description

The SLI system functions by continuously monitoring the load applied to the crane due to lifted load and other inbuilt loads, and comparing that with the maximum permitted load, at that particular crane configuration i.e. Safe Working Load (SWL). The SWL depends on the configuration of the crane i.e. boom length, boom angle, Jib length, Jib angle, outrigger position, front lifting or 360 degree lift etc. This information is either user (operator) selected or is sensed directly using high accuracy sensors placed on the crane. Sensors are usually required to sense the boom angle, boom length(in case of telescopic crane), slew angle, crane super structure angle, hook height, Jib angle, counterweight, wind speed and the outrigger positions. Number of parts of lines (falls), lattice boom length and crane mode is operator selected.

The load on the hook is continuously monitored and is compared by the calculated SWL, to get the load in terms of %SWL. This complex and tedious %SWL calculation is quickly carried out internally by the system within a fraction of a second. Using the preset limits programmed in the system, the system gives the visual, audible warnings and motion cut off signals, depending upon the value of %SWL. The system is very responsive to any changes in the crane parameters thus ensuring that the crane does not enter into an unsafe condition.

The ASLI-8048 SLI system also monitors the hooks of the crane against over Hoisting. A limit switch along with a dead weight is suspended from the boom tip, and the switch operates when the over hoisting of the hook takes place. The system instantaneously gives the visual, audible warnings and motion cut off signals.

The motion cut off can be implemented in a crane by interfacing control values in the crane drive mechanism or magnetic linkages in the pedal or lever mechanism.

The SLI system for a crane will basically consists of,

1. Display unit.
2. Load sensor (for Main and Auxiliary hook or Jib).
3. Angle transducer
4. Length transducer (For Telescopic cranes)
5. Anti two block (optional)
6. Motion over ride (optional)

Both the hooks of the cranes are independently monitored. The system has the provision to selects the hook, to which the load is applied and monitors the hook.

All lift and crane operating conditions are displayed simultaneously on the display

Unit. The operator is provided with all the information he needs to carry out a safe lift.

The display unit displays these readings:

Load

S.W.L. or Maximum Permitted Load for the actual crane condition as a bargraph

Boom Angle

Crane Radius

Boom Length

Configuration Selected includes, winch selected, part of lines (falls).

Tare Facility indicating ON or OFF

Status indication for load conditions; ‘Safe’, ‘Alert’, ‘Alarm’, ‘Stop’, ‘Over ride’, Anti-Two- Block’.

The %SWL preset limits are factory programmed and may vary depending upon each country’s safety regulation or customer safety requirements. The SLI system offers facility to users to modify these limits to suit requirements. But this modification requires a supervisory password.

System Components

1. **Display unit**
   The display unit is the most important component of the SLI system. It is the interface between the SLI system and the crane operator. The display unit has digital display modules, Indicating lights, audible alarm unit and a small keypad. The display module has a backlight for night and low light operations. The display unit simultaneously displays all information required by the operator without need for toggling any keys.

The system can be calibrated by using the four keys on the display unit. The keys have dual functions; they work differently during normal and calibration mode. The software calibration is quick and easy, and requires no external aids or equipment.

Input from all sensors is terminated at the display unit. The display unit processes these signals and gives the required output. The display unit ideally houses the control and display electronics circuitry, the power supply unit and the relay board for interfacing motion cut off facility.

The display unit has a robust power supply unit capable of handing large variation in input voltage. The power supply unit can work from 10Vdc to 36Vdc. This ranges is vast and suits power requirements for almost all types of cranes. Care must be taken at the power source to suppress any large voltage spikes and disallow over-voltage to be given to the display unit.

The display unit enclosure is made of cast aluminium with IP54 grade protection. It has gland entry for all cables coming from the sensors, power supply source and output actuators like the solenoid values. The connection of the cables is through PCB mounted connectors. Number ferules or specific colour codes are provided to each separate wire to avoid any wrong connections.

Note: Nothing inside the display unit is user serviceable. If tampered, the system may fail permanently and may need replacement. Do not open the cover when system is powered on. At power on, verify that the configuration indicated on the display is the current crane-operating configuration in use.

2. Load Sensor

The ASLI-8048 SLI System uses various types of Load sensors. The selection of the load sensor to be used depends upon the crane type, crane configuration, lifting conditions, installation ease and other conditions. All load sensors provide the same level of reliability, safety and accuracy. The load sensors are rugged and designed to handle impact loading and safe overload up-to 200% of its capacity. The ultimate overloading capacity of the load sensor is usually 300% or more. All load sensors are made of special alloy steel and coated to withstand harsh climatic conditions. The sensors incorporate a special purpose electronic circuitry to provide an output variable with the load applied.

The various load sensors used with Mtek-2011 System are

a. Dynamometer
b. Tensile Load cell
c. Pressure transducer
d. Load Pins

a. Dynamometer

The Dynamometer is suited for all types of cranes; hydraulic, mechanical or electrically operated cranes having lattice or telescopic boom. Dynamometer or the running wire tensiometer is fitted on the hoist line wire rope between the wire rope drum and the sheave pulley block. The hoist wire rope is made to deflect between a set of three pulleys in a manner to allow the force to act on the centre pulley. A component of the force in the wire rope acts on the centre pulley. This force component is measured by a load cell and is equated with the load lifted. The dynamometer is welded on to the boom, either the base section or the top section, if the hoist wire rope is running parallel to the boom, or else it is left floating on the wire rope with one end tied to the boom using articulating arm.

b. Tensile Load cell

Tensile load cell is best suited to be used in cranes having fixed boom and cranes where luffing mechanism is with wire rope. Tensile Load cell is used to measure the force in hoist wire rope, which is equated directly to the load lifted. It can also be used to measure the force in luff wire rope to calculate the load moment and then equated it with the load lifted. Tensile Load cell are connected in line with the luff or hoist wire rope and at the dead end of the wire rope, using load plates and pins.

c. Pressure Transducer

Pressure transducer can be used only for hydraulic telescopic cranes having luffing cylinders. The pressure transducers measure the pressure in the luffing cylinder(s), to calculate the load moment and then equate it with the load lifted. Usually two pressure transducers are used to measure the differential pressure of the luffing cylinder.

d. Instrumented Load Pin

The load pin of the sheave pulleys can be replaced by an instrumented load pins as a load sensor. Usually used in a single pulley system, instrumented load pins are usually used in monitoring the load on Auxiliary or Jib hook. Since they replace the existing load pin they have to be customised.

3. Angle Transducer

Angle transducer is used to measure the boom angle of the crane. The measured boom angle is used in the calculation of the crane radius. The Angle transducer is usually mounted at the base section of the boom, close to the boom foot pin. The Angle transducer has an electronic high precision sensor. The change in the angle of the boom produces electrical signal. This signal is input to the display unit. The angle transducer is designed to measures angle from 0 degree to 90 degree. The angle transducer has internally dampening techniques to avoid vibration.

4. Anti-two-block unit

Anti two-block unit or over hoist limit switch is used to monitor the hooks of the crane against over hoisting. The unit consists of a limit switch along with a dead weight, which is suspended from the boom tip over the wire rope. When the hook is over hoisted the hook raises the dead weight operating the limit switch. The anti two block signals are directly sent to the control unit in a lattice boom crane or through a length transducer in a telescopic crane.

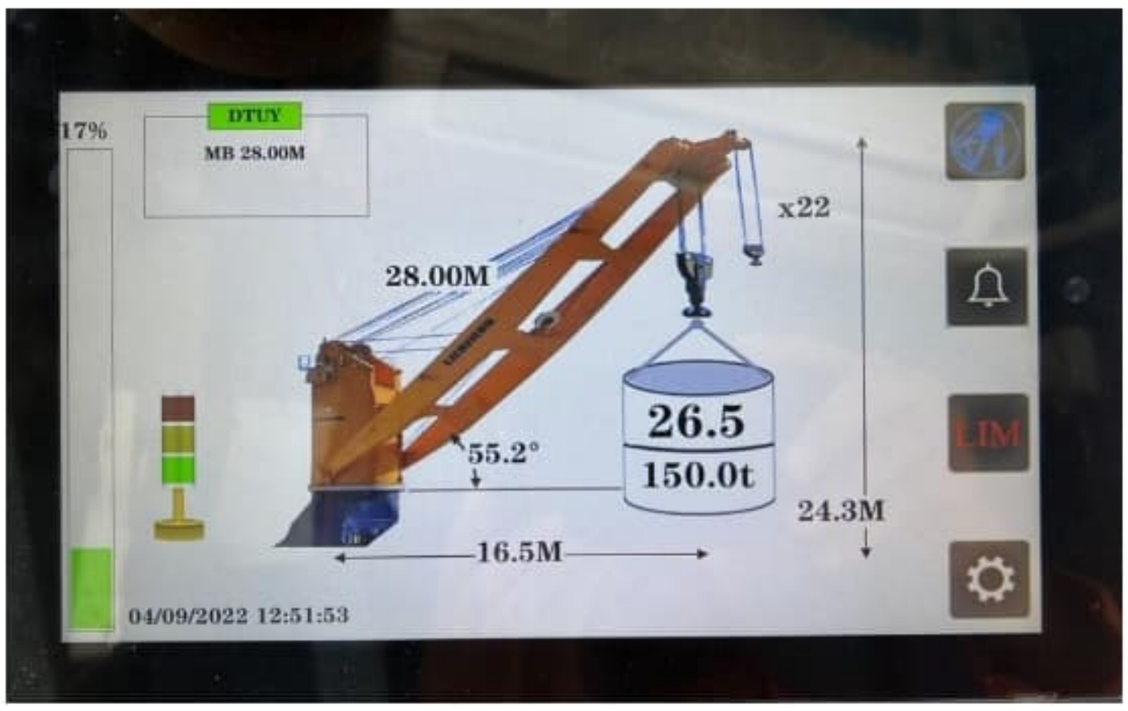
5. Motion cut off unit

Motion cut off interfaces are used to stop the unsafe motion of the crane in case the crane moves in an unsafe condition. The unsafe motions usually are boom luff down, hoist up and telescope out. The system provides relay contacts and these can be interfaced with the motion cut off unit. The motion cut off unit and motion cut off methodology varies from crane to crane. Crane manufacturers permission should be seek before implementing a motion cut off. Motion cut off unit may include hydraulic or pneumatic solenoid values, contactors or magnetic linkages. Implementation of motion cut off is done entirely on the risk of the crane owner.

Display Function

The display unit simultaneously displays all the information required by the crane operator to operate the crane safely. The display unit is compact in size and uses very little cabin space.

Five tactile keys keypad and one Key switch for Bypass Operation.



Operating Keys

The keypad is multifunction and software controlled keys i.e. their functions can be inhibited by software. The five keys function differently during normal operation and that during the calibration process.

During normal operation the keys function as:

1	HOOK	Operator can select Hook (Main in normal operation
2	TARE	Toggle between the tare status. ON and OFF. TARE ON : The load displayed is without the hook weight and slings. Displays the net weight of the load TARE OFF: The load displayed is with the hook weight and slings. Displays the gross weight of the load
3	ACK	Mutes the audible alarm signal till next warning
4	TEST	Forces test of all components of the system. It displays the counts of all the channels.
5	F	Crane Parameters can be altered.

During calibration process the keys function as:

1	Esc	Exits from settings without saving data
2	Decr	Decrements the values displayed
3	Incr	Increments the values displayed
4	Enter	Stores the value displayed
5	F	SETUP Parameters can be altered

The calibration mode is password protected to disallow unauthorised access to the system. The details of system operation and system calibration are discussed in further chapters.

System Installation

This chapter includes procedure for installing the ASLI-8048 SLI system on the crane. The procedure is common for lattice boom and telescopic boom crane.

Display unit

The display unit is to be mounted inside the cabin in front of the crane operator in a position from where the operator will have clear view of the readings and can operate the system. The display unit is supplied with a U frame for mounting. The U frame has mounting blocks which is to be welded to the cabin. To change the viewing angle of the display unit, loosen the screws and adjust the display unit and tighten the screws.

Load Sensor

Dynamometer

Preferably, the dynamometer should be placed close to the boom tip, away from the winch drum, either welded on the boom or fixed to the boom using the articulating arm. Alternatively it can also be placed down close to the boom foot pin, tied to the base section of the boom using articulating arm. The later arrangement is usually not preferred since the dynamometer will be subjected to lots of movements.

To install the dynamometer first remove the upper two pulleys. Hold the wire rope through the center pulley and then fit the upper pulleys. The dynamometer should be mounted such that the arrow on the load cell should be facing towards the tip of the boom. The articulating arm is welded towards the tip of the boom. The hook joint of the articulating arm is to be welded on the box boom in case of telescopic crane else to a plate in case of lattice boom. The plate then has to be bolted to the lattice interlacing close to the tip of the base section. Bolt another plate to let the dynamometer rest on the lattice boom.

Connect the dynamometer cable to the preamp. Carefully route the cable along the boom member, then from the boom butt to the crane cabin. Use cable tie to tie the cable firmly to the boom. Keep the cable loose around the boom hinge pin; this area is most prone to cable damage. Connect the load cell cable to the display unit.

Pressure Transducer

Pressure sensors are mounted on the control valve of the luffing cylinder to the rod end and piston end. Connect the Pressure sensor cables to the display unit. Use cables tie to tie the cable firmly to the base.

Angle Transducer

Angle Transducer Unit is to be mounted on the boom close to the cabin. It can be mounted on the right or the left side of the boom. The mounting position acceptable for the angle sensor unit is with its connector side facing down. This ensures the correct positioning of the electronic angle sensor unit. To mount the angle sensor unit, first mount the frame supplied. The frame is to be welded to the boom base section.

Then mount the angle transducer unit on the frame with the four screws supplied. Connect the angle transducer cable to the angle transducer unit. Carefully route the cable along the boom member, then from the boom butt to the crane cabin. Use cable tie to tie the cable firmly to the boom. In case of box boom section a pipe of appropriate internal diameter has to be welded on the boom for cable routing. Keep the cable loose around the boom hinge pin, this area is most prone to cable damage. Connect the angle transducer cable to the control unit.

Cables

All Cables are braided, screen type and have quality MS connectors at both the ends and metal gland at one end (except the power supply cable, one end of this cable is without glands and has to be interfaced with the crane electrical supply). The Cables are labeled as per the type.

Calibration

Mtek-2011 system operates in two modes.

Normal mode : system works as a safe load indicator.

Calibration mode : system can be calibrated.

Mtek-2011 system is calibrated with the use of only four keys. Most of the parameters are factory set; only few parameters are required to be set on-site during installation. However once the system is calibrated it does not require any setting till there is any change of sensor in the system. In case the load cell has to be replaced, system needs to be re-calibrated for better accuracy. The Calibration process is simple and is assisted by on line help from the system. It would take on an average 10-15 minutes to complete the calibration procedure.

The calibration process though simple cannot be accessed easily. This is done to avoid any accidental calibration leading to wrong output or malfunction of the system. Calibration mode is password protected by 4 digits password. Turning the **BYPASS key On** and pressing **F & ENTER** key enters the calibration mode. The user is prompted to enter the 4 digit password. One can feed the password (who knows it), with the help of up & down keys and enter it to have calibration mode. It is required to press the enter key after feeding each digit. Password protected calibration helps in avoiding tampering of the system and to ensure that only authorized personnel carry out the calibration procedure.

Calibration is done using only the front tactile keys on the display facial. These keys have different functions in normal and calibration mode. During calibration these keys function as:

Esc	Exits from the selected function
Enter	Saves data and exits from the selected function
▲(Incr.)	Increments the value of the selected function
▼(Decr.)	Decrements the value of the selected function

The calibration setup parameters have the following functions:

Para No	FUNC ENTER	▲ ▼
0	EXIT CALIBRATION MODE	
1	CAL LIGHT MAIN LOAD	Incr & Decr values in tons/Klbs
2	CAL HEAVY MAIN LOAD	Incr & Decr values in tons/Klbs
3	CAL LIGHT AUX LOAD	Incr & Decr values in tons/Klbs
4	CAL HEAVY AUX LOAD	Incr & Decr values in tons/Klbs
5	CAL LOW ANGLE	Incr & Decr values in degrees
6	CAL HIGH ANGLE	Incr & Decr values in degrees
7	CAL SHORT BOOM LENGTH	Incr & Decr values in meters/ feet
8	CAL LONG BOOM LENGTH	Incr & Decr values in meters/ feet
9	SET NO. OF SAMPLES	Incr & Decr values
10	SET ALERT %-SWL	Incr & Decr values in %
11	SET ALARM %-SWL	Incr & Decr values in %
12	SET MOTION CUTOFF%SWL	Incr & Decr values in %
13	SET SLEW OFFSET	Incr & Decr values in meters / feet

14	SET BOOM HEAD OFFSET	Incr & Decr values inmeters/ feet
15	MAX.MAINPULL/FALL	Incr & Decr values intones/Klbs
16	MAX MAIN FALLS	Incr & Decr values
17	MAX AUXPULL/FALL	Incr & Decr values in tons/ Klbs
18	MAX AUX FALLS	Incr & Decr values
19	SET LO ANGLE LIMIT	Incr & Decr values in degrees
20	SET HI ANGLE LIMIT	Incr & Decr values in degrees
21	SET TIME&DATE	
24	DOWNLOAD DATA TO PC	

To start the system calibration, press **F & ENTER** key with the BYPASS key turned ON. The display will prompt for password entry. The password is 4 digit. Once the correct password is keyed in, the display will display the message “SETUP PARAMETERS” followed by parameters in next lines. The line just below the “SETUP PARAMETERS” the first option of the calibration menu will be displayed. Using the Incr / Decr key the parameter sequence can be changed.

CAUTION: VERIFY THAT THE NUMBER OF FALLS SELECTED IS CORRECT; OTHERWISE IT CAN BE A BIG OBSTACLE IN THE PROCESS OF CALIBRATION.

CAL LIGHT MAIN LOAD

Raise the boom approximately 45 degrees without any load on the hook and suspend the hook in air. Select the parameter setting for ‘**CAL LIGHT MAIN LOAD’.** Adjust the value equal to the value of hook weight with the help of Incr. & Decr. Keys and store it with the help of “ENTER” key. Simultaneously you can see counts related to the zero.

CAL HEAVY MAIN LOAD

Keep the boom in the similar position as in ‘LIGHT LOAD’ and lift the known weight less than maximum capacity (SWL) of the crane. This lifted load must be sufficient to subject the hoist wire

rope to at least 75% of its maximum line pull. Adjust the load displaying in front of '**CAL HEAVY MAIN LOAD'** to the lifted load with the help of Incr. & Decr. Keys and store it with the help of "ENTER" key. Simultaneously you can see counts related to the load.

NOTE: In case of pressure sensor the above two settings are not required.

CAL LIGHT AUX LOAD

Raise the boom approximately 45 degrees without any load on the hook and suspend the hook in air. Select the parameter setting for '**CAL LIGHT AUX LOAD'.** Adjust the value equal to the weight of the hook with the help of Incr. & Decr. Keys and store it with the help of "ENTER" key. Simultaneously you can see counts related to the zero.

CAL HEAVY AUX LOAD

Keep the boom in the similar position as in 'LIGHT LOAD' and lift the known weight less than maximum capacity (SWL) of the crane. This lifted load must be sufficient to subject the hoist wire rope to at least 75% of its maximum line pull. Adjust the load displaying in front of '**CAL HEAVY AUX LOAD'** to the lifted load with the help of Incr. & Decr. Keys and store it with the help of "ENTER" key. Simultaneously you can see counts related to the load.

CAL LOW ANGLE

For this setting first confirm that the crane is on a level ground. Lower the boom and set it perfectly horizontal with the help of water level. Select the parameter of 'CAL LOW ANGLE'. Adjust the value to 00.0 with the help of Incr. & Decr. Keys and store it with the help of "ENTER" key. Simultaneously you can see counts related to the zero angles.

CAL HIGH ANGLE

Set the boom angle to maximum permissible degrees using a magnetic inclinometer. Adjust the angle displaying in front of 'CAL HIGH ANGLE' to the raised degrees with the help of Incr. & Decr. Keys and store it with the help of "ENTER" key. Simultaneously you can see counts related to the angle.

SET No. OF SAMPLES

Set this value such that the ADC counts displayed are almost steady. This is actually the averaging factor. Using the Incr & Decr keys, the value should be set such that the system acquisition will not become too slow. [By default set to 16]

SET ALERT %-SWL

The value is already preset from the factory. If any alteration required, it can be carried out using the Incr & Decr keys.

SET ALARM %-SWL

The value is already preset from the factory. If any alteration is to be made, it can be modified using the Incr & Decr keys.

SET MOTION-CUT %-SWL

The value is already preset from the factory. This value can be modified using the Incr & Decr keys.

SET SLEW OFFSET

Measure the distance between slew centre and the boom foot pin. Select the parameter to be set. Using the Incr & Decr keys set the value measured.

(NEGATIVE - IF BOOM FOOT-PIN AND MAIN BOOM SHEAVE ARE ON OPPOSITE SIDE OF SLEW CENTRE).

SET BOOM HEAD OFFSET

Measure the distance between the boom centerline and the main boom sheave. Select the parameter to be set and using Incr & Decr

(NEGATIVE IF MAIN BOOM SHEAVE IS ABOVE BOOM CENTRE LINE)

MAX MAIN PULL/FALL

This parameter determines the maximum line pull subjected to the wire rope in the crane. If the line pull exceeds the set value, a cutoff signal is generated.

MAX MAIN FALLS

This parameter determines the maximum number of falls that can be reeved.

MAX AUX PULL/FALL

This parameter determines the maximum line pull subjected to the wire rope in the crane. If the line pull exceeds the set value, a cutoff signal is generated.

MAX AUX FALLS

This parameter determines the maximum number of falls that canbe reeved.

SET LO ANGLE LIMIT

This setting overrides the low boom angle setting in the crane capacity chart. An alarm is generated if the boom angle goes below this value.

SET HI ANGLE LIMIT

This setting overrides the high boom angle setting in the crane capacity chart. An alarm is generated if the boom angle goes above this value.

SET TIME & DATE

The RTC can be set in this mode. Using Incr & Decr the values can be set and pressing ENTER will shift the digit.

HH : MM : SS DD / MM / YY

DOWNLOAD DATA TO PC

Connect to data cable to the 9 pin D connector of the PC com port. Run the terminal software. Select this option and press ENTER Key. The logged data will get downloaded.

NOTE: During calibration, do not press the ENTER key unless you are prompted for a value. When prompted you MUST store by pressing ENTER key. In case of doubt, you can press ESC to come out of the current, and then once again start afresh without altering current calibration settings. After re-calibration of any function, always verify that the changes were recorded.

Operating procedure

Power On

To power on the system switch on the supply to the system. Indicator will run through 'self test' routine (for five seconds). Self-test routine checks all internal circuitry, display, output devices, memory and all sensors. Any faults or malfunctions reported are displayed on the display. During Self-test the audible alarm will sound, the light display will illuminate.

After Self-test routine is completed the systems goes into normal operation. The displays indicate the current values of the crane parameters.

Tare Selection

The Tare status can be ON or OFF as per crane operator's requirement. If TARE is OFF, the gross weight (total weight including hook block & lifting attachments) is displayed. If TARE is ON, the net weight (weight excluding hook block & lifting attachments) is displayed. The ON or OFF condition is indicated by the LED turning On or OFF on the display panel.

Acknowledge Function

ACK key is used to mute the audible alarm at the time of occurrence of the any exception condition. Once this key is pressed the visual indication will remain flashing but the audible indication will stop. Once corrective action is taken then at the occurrence of next exception condition the audible indication will be indicated.

Test Mode

The Test key forces the system to go into test mode. In test mode, the audible alarm sounds continuously. The display displays the counts of the ADC channels. Thus reading the counts user can understand if the channel is working.

Operation

During normal use of the crane, the display will display the current load, radius, length and crane parameters. At power on the indicator go through the self test conditions for few seconds. After the self-test is over, the display switches over to the normal, display indicating load, radius SWL and various crane parameters.

If the **F & ENTER** key is pressed with the BYPASS key OFF, the display reverts to Crane Parameter Setting Mode. In this mode the display will show the message "CRANE PARAMETER" followed by parameters in next line.

Using the Incr & Decr keys the different crane parameters can be displayed. Pressing ENTER key will invoke that particular parameter setting.

The following parameters are available for setting:

1. Configuration Code
2. Main Falls
3. Aux Falls
4. Display Date & Time

Set Configuration Code

Selecting this parameter will start the crane configuration selection mode. In this mode the different crane configurations can be seen using the Incr & Decr keys. When the appropriate crane configuration is displayed, pressing ENTER key will store the configuration.

Main Falls

This parameter is used to select the number of falls for the main hook for lifting. The value should be selected properly otherwise wrong load readings will be displayed.

Aux Falls

This parameter is used to select the number of falls for the aux hook for lifting. The value should be selected properly otherwise wrong load readings will be displayed.

Display Date & Time

This parameter displays the current date and time of the system.

Pressing F key will exit this mode and switch to normal mode.

Trouble shooting

The system is designed in such a way that isolating the source of error is not very difficult. It is important to understand the system fault indication to find out the source of error and take remedial action.

The Mtek-2011 system has a self-test feature, which continuously monitors the signal from the sensors. If any fault occurs it gives proper message indicating the fault.

A faultfinding table is given below:

Symptom	Possible Cause	Action
Mtek-2011 not working	No power from crane	Check supply voltage to the system
	Power Supply unit is faulty	Replace the ASLI-8048 board
Audible alarm do not sound	Faulty buzzer in the display unit	Replace the buzzer
LCD became dark or damaged	Faulty LCD in the display unit	Replace the display facial board
Some or any keys not working	Faulty keypad cable	Replace keypad cable
	Faulty keypad in display unit	Replace the display facial board
Incorrect Output	Lose of calibration data in display unit	Recalibrate the load indicator
System malfunctions	Component failure in display unit	Replace the display unit circuit board
Load indication displays incorrect values	Cable faulty or broken	Replace the load cell cable
	Faulty Load cell unit	Replace the load cell unit

Electrical Specifications

Power Supply Input (VDC)

Range: 10VDC – 36VDC (< 500mA in full alarm condition)

Digital Inputs

Total of 2 digital inputs

1) For connecting slew/ proximity switches for monitoring different zones of operation, And / Or

2) For connecting other types of switches.

Motion Cut Relay Output

Three standard motion cut relay output available for wiring to crane lockout solenoids to inhibit crane motion when on overload/alarm condition. The relays fitted in the ASLI unit are rated for 5A @ 24VDC.

Sensors

Load Sensor/s

Linearity:	0.15% nominal
Repeatability:	>0.10%
Hysteresis:	<0.10%
Creep:	<0.10%
Zero Balance:	+/- 1%
Output:	3.00 mv / V @ FS.
Excitation:	15 V DC rec. Max.

Overload:

No Electrical Damage	200%
Ultimate	>400%

Temperature Effects:

On Zero	<0.005% / degree C.

On Span	<0.005% / degree C.
Compensated Range:	-10 to +70 degree C.
Sealing:	IP 68 Fully Encapsulated.

Pin/Wire Connections (5-Way Connector)

Pin A	Black	Negative Excitation
Pin B	White	Negative Signal
Pin C	Red	Positive Excitation
Pin D	Green	Positive Signal
Pin E	Screen	Screen

Expected Resistances (for a standard 350-E cell)

Red-Black	300 - 600E
Red-Green	200 – 400E
Red – White	200 – 400E
Black – Green	200 – 400E
Black – White	200 – 400E
White – Green	350E +/- 2E

Shield/ Screen to any other wire must be open circuit.

ELECTRONIC ANGLE SENSOR

12.0V DC input provided by Display unit. Internally converted to 5.0VDC. Analogue signal out.

Operating range:	+/- 45 degrees. (Offset mounted to accommodate 0-90)
Accuracy:	+/- 0.2 degrees.
Dimensions:	Height -100mm, Width -80mm, Depth -80mm

Cable entry:	3 pin Military Spec. plug/socket.
Mounting:	via mild steel plated weld backplate bracket.
Weight:	0.5 kg

Pin/ Wire Connections (7-Way connector, joined with Length Sensor)

Pin A	Red	Positive Excitation
Pin E	White	Angle Signal
Pin C	Black	Negative Excitation

Anti-Two-Block Switch

Type : IP67 sealed

Contact Rating : 250VAC/ 5A

Electrical Life : 100000 operations

Operating Force : 0.6N (max)

Release Force : 0.08N (min)

Cables

General : 2-, 4-, 6- & 10- core braided, UV stabilized, PVC sheathed Cables

DC Resistance : 38.2 ohms/km @ 20 degC

Core Insulation : V90-HT PVC

Cable Integrity : All cores tested for insulation resistance @ test voltage of 500V

Sheath : Overall 5V90 UV stabilized

System Maintenance

Dos and don’ts (Instructions to Operator)

Operations

Start-up

For a crane having multiple configurations, the operator should select the correct configuration, otherwise the crane will be operating in a dangerous zone.

BYPASS switch

Bypass switch inhibits the motion cut off facility. Bypass switch is to be used only when the operator is sure of the operations and knows that they are safe. The system will give audible and visual alarm but will not cut off a crane motion.

General

The *Mtek-2011* system is designed to provide service with little routine maintenance. The following maintenance procedure will extend the life of the system and assure continued performance to the specification.

The Display unit should be kept free of accumulated dust, dirt, grease etc. It should be kept clean and away from any solvent, acid or alkali. Do not use abrasives or stiff bristle brushes; it may damage the display facial. If the display facial becomes dirty, clean it by a non-abrasive cloth dampened with isopropyl alcohol or methyl spirit. Be careful not to press the display window unduly. Ensure the display cable connector is proper / tight.

The dynamometer is designed for heavy-duty use. Check that the cable and connector on the load sensor are in proper condition.

Check all cables external and internal to the cabin. Check cables against damages particularly on the boom. Check for tightness and bonding on cable glands. Ensure that all cables are tied to the

articulating arms and booms. Check the places were the cable is entering the cabin. Check the accuracy of the load indicator by lifting a load of known weight.

The system should be isolated from both terminals of the crane battery before any welding is carried out on the crane.

Check the load pins / Dynamometer for security, particularly the split pins and washers.

Periodically (Preferably once in four months), check the accuracy of the system.

- Position the boom in two or three different position with the load suspended and accurately measure the hook radius. Compare with the display radius.
- Check the accuracy of the load lifted by lifting a load (duly calibrated) by a known weight.
- If an Anti-Two-block system is fitted, it should be checked by slowly lifting the hook block close to but not up to the boom tip and checking that the display signal is activated.

Press the test switch and check for any erratic data being displayed.