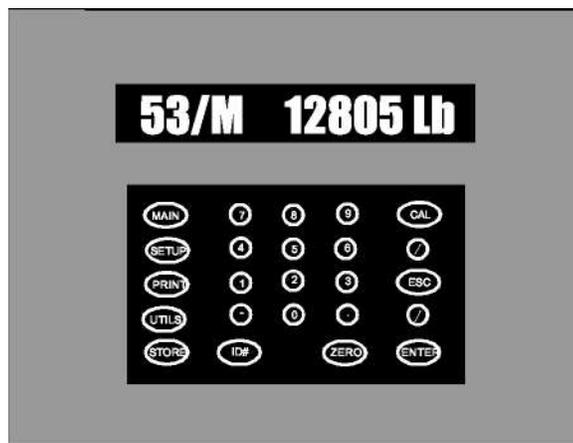


LX-5000 Digital System



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Ver. 0.4H

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- 6.0 Governing Law.** This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts.

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FORWARD

ADMET's LX-5000 Indicating Systems have been designed and constructed with great care in every phase of assembly. In order to insure reliability, both the mechanical and electrical components have been built with the best available materials. Nevertheless, it has been proven that a thorough understanding of the machine, together with proper attention, will pay big dividends. The sections of this manual provide description and instruction on the operation and maintenance of the mechanical, electrical and software components.

You as a customer are our most valued asset. We take pride in our systems and are proud that you have become an owner. We welcome your comments about our products and wish that you expressed them. It is the only way that we can continue to build the best available test systems to satisfy your needs. Thank-you for your support.

HOW TO USE THIS MANUAL

This manual is intended to educate the customer on the capabilities, operation and maintenance of the LX-5000 Indicating Systems. In addition, it is to be used as a supplement for any information supplied by the load frame manufacturer. Maintenance procedures specified by the load frame manufacturer should be followed unless specifically noted herein. Read this manual and become familiar with the operation of your test machine prior to operating the LX-5000 Indicating System.

TECHNICAL SUPPORT

If a problem should occur with your testing machine:

- First check that all external inputs are properly connected.
- Seond, call TMI's technical support at (800) 783-3227 (9AM to 5PM EST).

1.0 INTRODUCTION

The LX-5000 Load Indicator is a family of next generation indicators designed and manufactured for Test Mark Ind. for compression testing. The LX-5000 Series family features high resolution, high accuracy, and fast sampling rates, large data storage capability and is designed for high reliability and ease-of-use.

Standard Features:

- Indicate Live Load, Peak Load, Live Stress, Peak Stress, Load Rate and Stress Rate.
- Select engineering units of Lb, N, KN, and Kg
- Store up to 1,000 test results to permanent memory. Results include Date, Time, Specimen ID#, Area, Peak Load, Peak Stress plus a statistical summary of Peak Load and Stress.
- Generate a hardcopy printout of the results on a 9-pin, 24-pin or laser printer.
- Store up to six load cell calibrations for multiple load cell systems. The load calibration algorithm allows up to 10 calibration points per cell with piecewise linear fit between points. Accuracy exceeds ASTM E4 standards and in general is greater than 0.5% from 1 % to 100% of full scale.
- Activate Auto-Store to automatically store the results of each test.
- Activate Auto-Print to automatically print the results of each test.
- Define and detect the end of test with the Sample Break Detector.
- Connect full bridge strain gage, LVDT, and high level output analog transducers.

1.1 Options

- Download stored test results to a remote computer through the RS-232 port. The data format on the receiving computer is in ASCII delimited format for easy import into many common spreadsheet and database programs such as Lotus 1-2-3 and Microsoft Excel.

1.2 Test Reports

- Test reports with up to 1,000 results stored to permanent memory is standard.
- Each test report consists of: Date, Time, Specimen ID#, Specimen Type, Area, Peak Load, Peak Stress, and a Statistical Summary.

2.0 THE KEYS

2.1 The <ZERO> Key

The ZERO key performs the following functions.

- Defines a new zero load.
- Places the Indicator Test Status in Ready Mode.
- Clears out the previous test results from the test buffer and initializes the indicator for the next test.

Make sure the previous test was stored prior to pressing ZERO or it will be lost.

2.2 The <STORE> Key

The STORE key writes the current test result which consists of peak load, peak stress, date, time, Specimen ID# and Specimen Type to permanent memory. All results stored to memory can be printed or downloaded to a remote computer (if option is purchased). If BEAM 3PT Specimen Type is selected, a prompt will ask if the beam broke in the middle third (BEAM BRK>MIDDLE) or not in the middle third (BEAM BRK>NOT MI). When not middle third is selected another prompt will ask "INPUT AVERAGE DISTANCE BETWEEN LINE OF FRACTURE AND NEAREST SUPPORT". Then DISTANCE in.>xx.xxxx will be visible awaiting input in length engineering units.

2.3 The <ENTER> Key

The ENTER key performs the following functions.

- Accepts/assigns the value in a data entry field to that field.
- Initiates a menu function. For example: If the screen displays PRN CURRENT TEST, pressing <ENTER> will cause the current test results to be printed.
- Turns ON/OFF a menu option.
- When in the Live Indicating Screen, pressing <ENTER> toggles between live LOAD and STRESS and peak LOAD and STRESS.

2.4 The <ESC> Key

The ESC key performs the following functions.

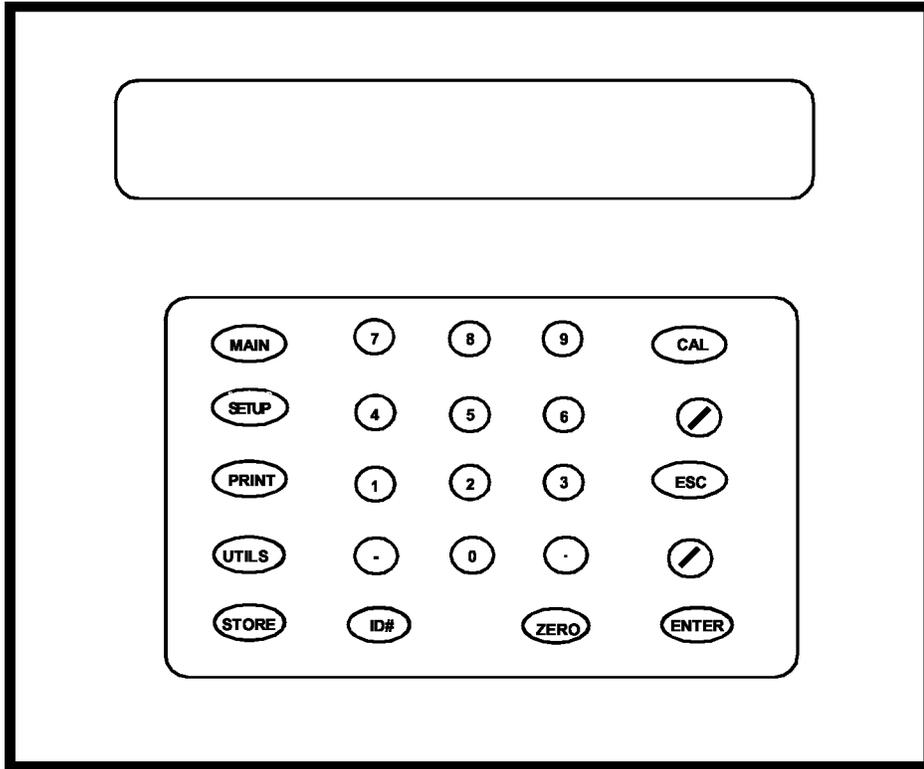
- Returns to the Live Indicating Screen from any menu.
- Clears a data entry mistake by restoring the original number in a data entry field.

2.5 The <UP & DOWN ARROW> Keys

The ARROW keys allow the operator to scroll between menu items.

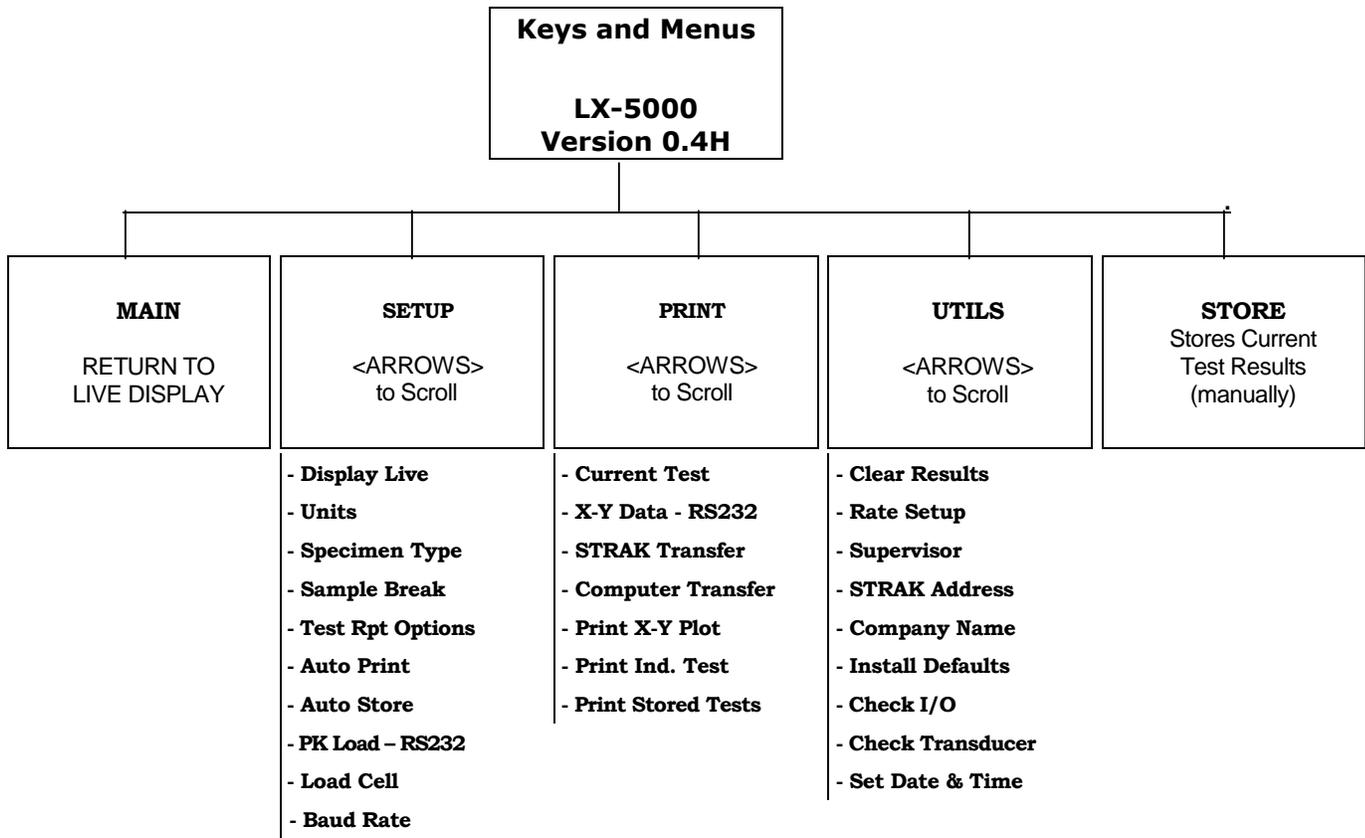
2.6 The <MAIN> Key

The MAIN key causes the indicator to return to the Live Indicating Screen from any menu.



Front Panel

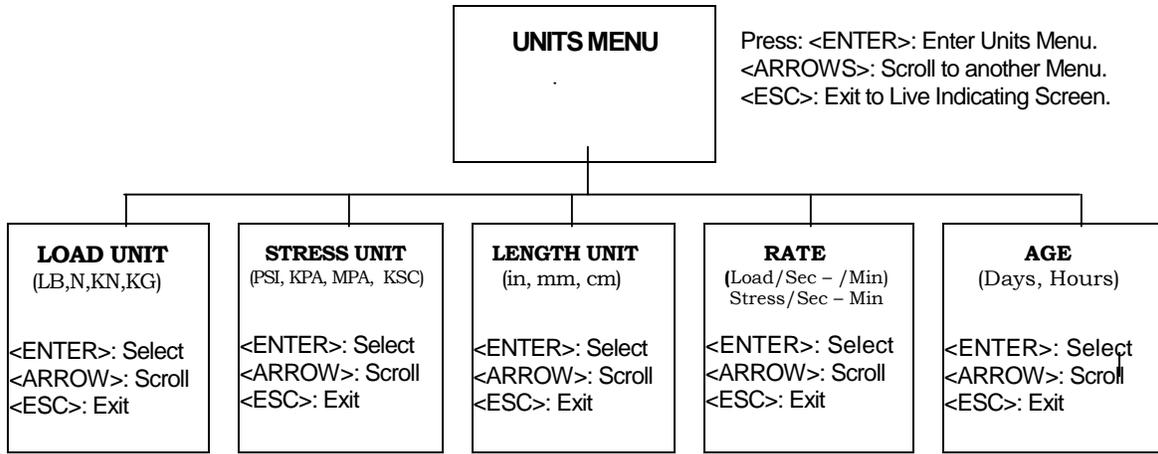
3.0 The Menus



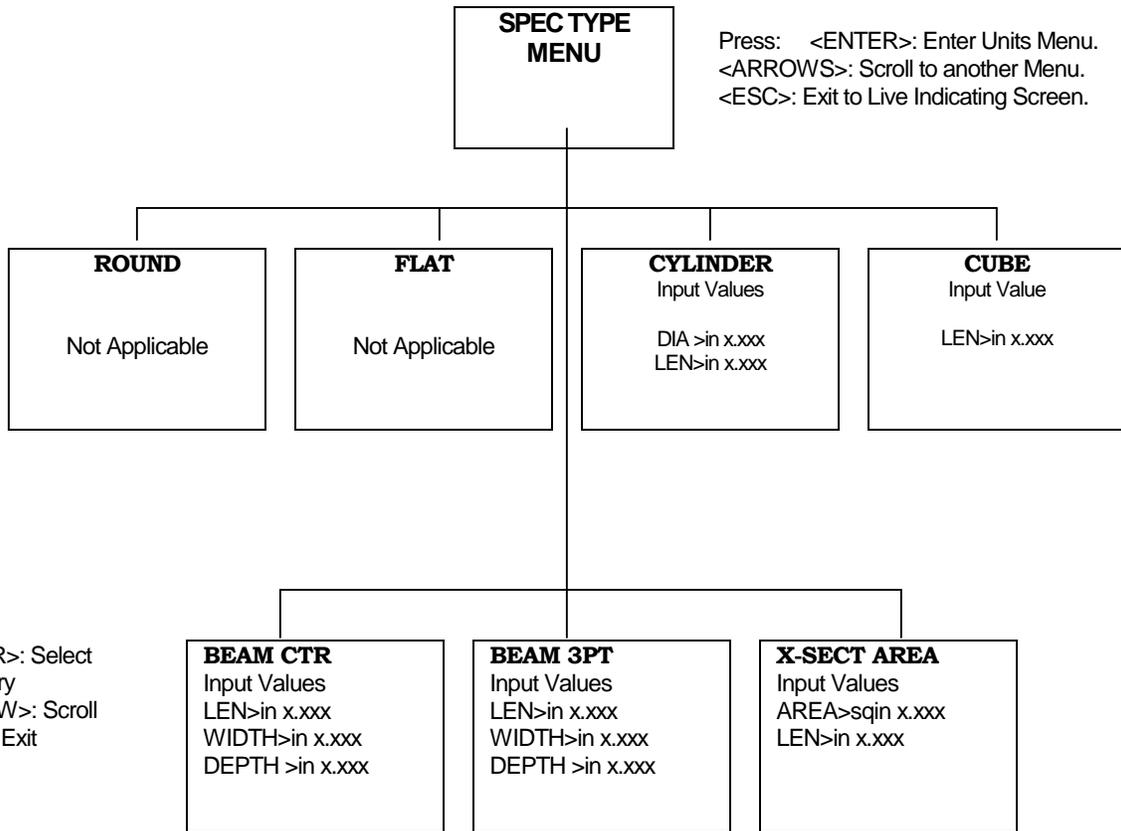
3.1 The SETUP Menu

Press the <SETUP> key from the Indicating Screen to enter the SETUP Menu. Use the <ARROW> keys to scroll through the menu items. Use the <ENTER> key to toggle between options. The following functions are provided in the SETUP Menu.

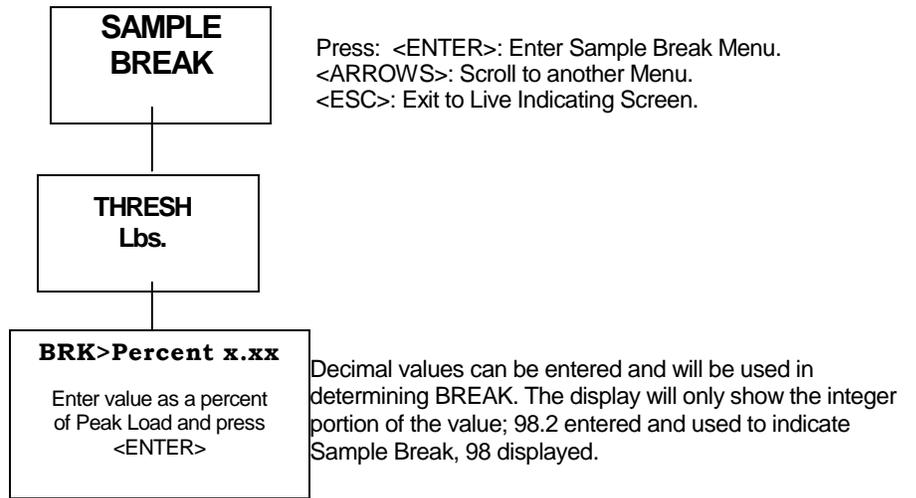
- Set Engineering Units. The LX-5000 can display LOAD in Lb, N, KN, and Kg; STRESS in PSI, KPA, MPA, and KSC; LENGTH in IN, MM and CM; and RATE in LOAD/SEC, LOAD/MIN, STRESS/SEC and STRESS/MIN. (If RATE is on a per minute basis, the displayed RATE is the measured RATE divided by 1000.)
- Set the Specimen Type to either ROUND, FLAT, CYLINDER, CUBE, BEAM CTR, BEAM 3PT or X-SECT AREA (cross sectional area). Units correspond to engineering units Set in UNITS Menu.
- Set Sample Break to define the end of test. Sample Break is defined as percentage of Peak Load. If Sample Break = 50 percent and Peak Load = 100,000 Lb, then the test will terminate when the load drops below 50,000 Lb.
- Turn the Auto Print Function ON or OFF. If Auto Print is ON, the results are automatically printed after each test. The LX-5000 will automatically print column headings at power up or when exiting the SETUP Menu, if Auto Print is ON.
- Turn the Auto Store Function ON or OFF. If Auto Store is ON, the results are automatically written to the results buffer after each test.
- Select between calibration tables if more than one Load Cell calibration has been entered.
- Activate Test Report Options specific to concrete testing for display on printed reports.



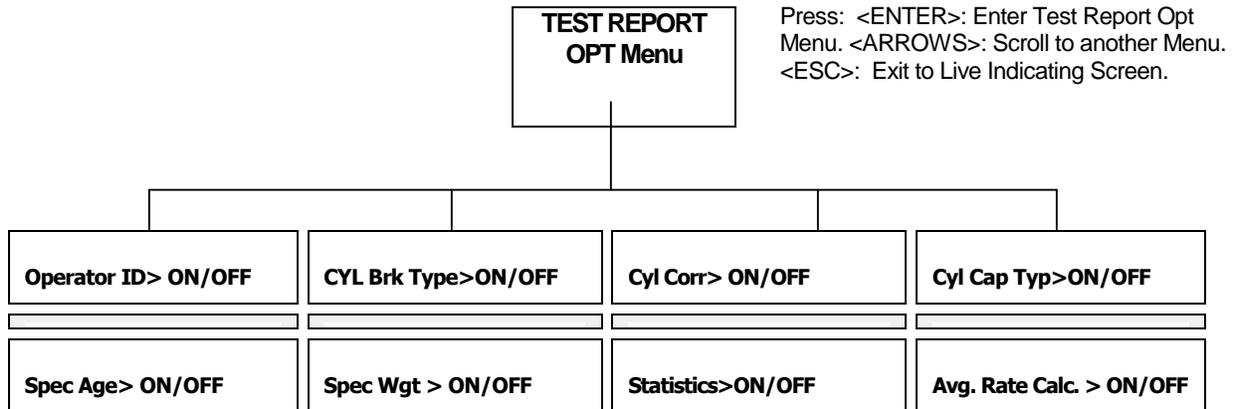
UNITS Selection Menu



SPECIMEN TYPE Selection Menu



Sample Break Menu



Press: <ENTER>: To toggle ON/OFF
 <ARROW>: To move to next item
 <ESC>: To move up one level

Note: Specimen type must be set to cylinder for these features to show on reports.

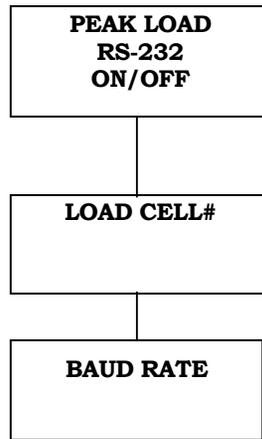


Auto Print Menu



Auto Store Menu

NOTE: This menu option will only appear if more than one load cell calibration has been stored to the LX-5000.

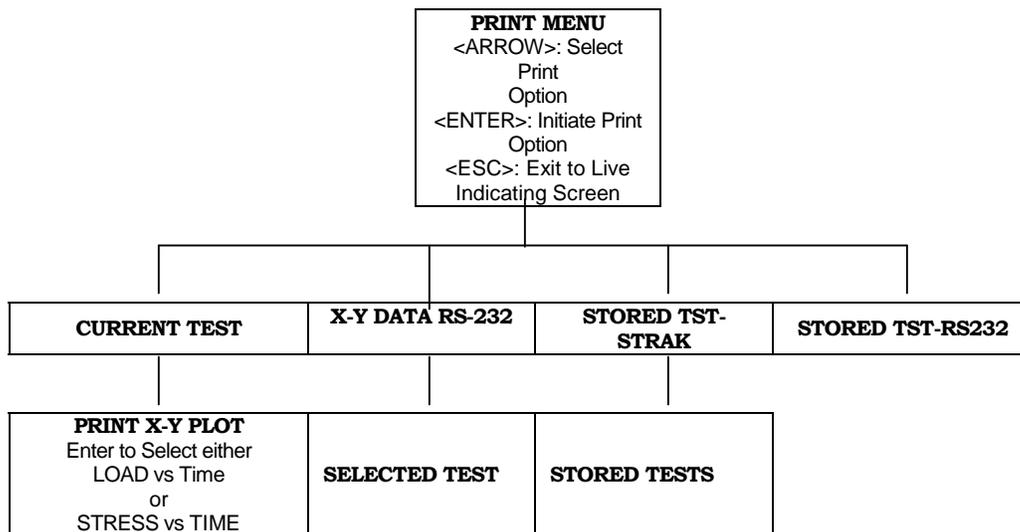


Press: <ENTER>: Type Load Cell #
 <ARROWS>: Scroll to another Menu.
 <ESC>: Exit to Live Indicating Screen.

3.2 The PRINT Menu

Press the <PRINT> key while in the Indicating Screen to enter the PRINT Menu. Use the <ARROW> keys to toggle between the menu items. Press <ENTER> to select one of the menu items. The following functions are provided in the PRINT Menu.

- Print the current test.
- Print a selected test stored in memory.
- Print all tests stored in memory.
- Transmit via the RS-232 port X-Y Data. See Section 4.4 - Requires the RS-232 Download option.
- Transmit via the RS-232 port stored tests. See Section 4.4 - Requires the RS-232 Download option.
- Transmit via the RS-232 port stored tests in STRAK format. This format is required for importing strength results into ADMET's Concrete-Traker database program. See Section 4.4 - Requires the RS-232 Download option.
- Print a X-Y Graph of either LOAD vs TIME, or STRESS vs TIME (Requires the XY Graph option and Epson LQ compatible printer).
- Print the calibration tables.

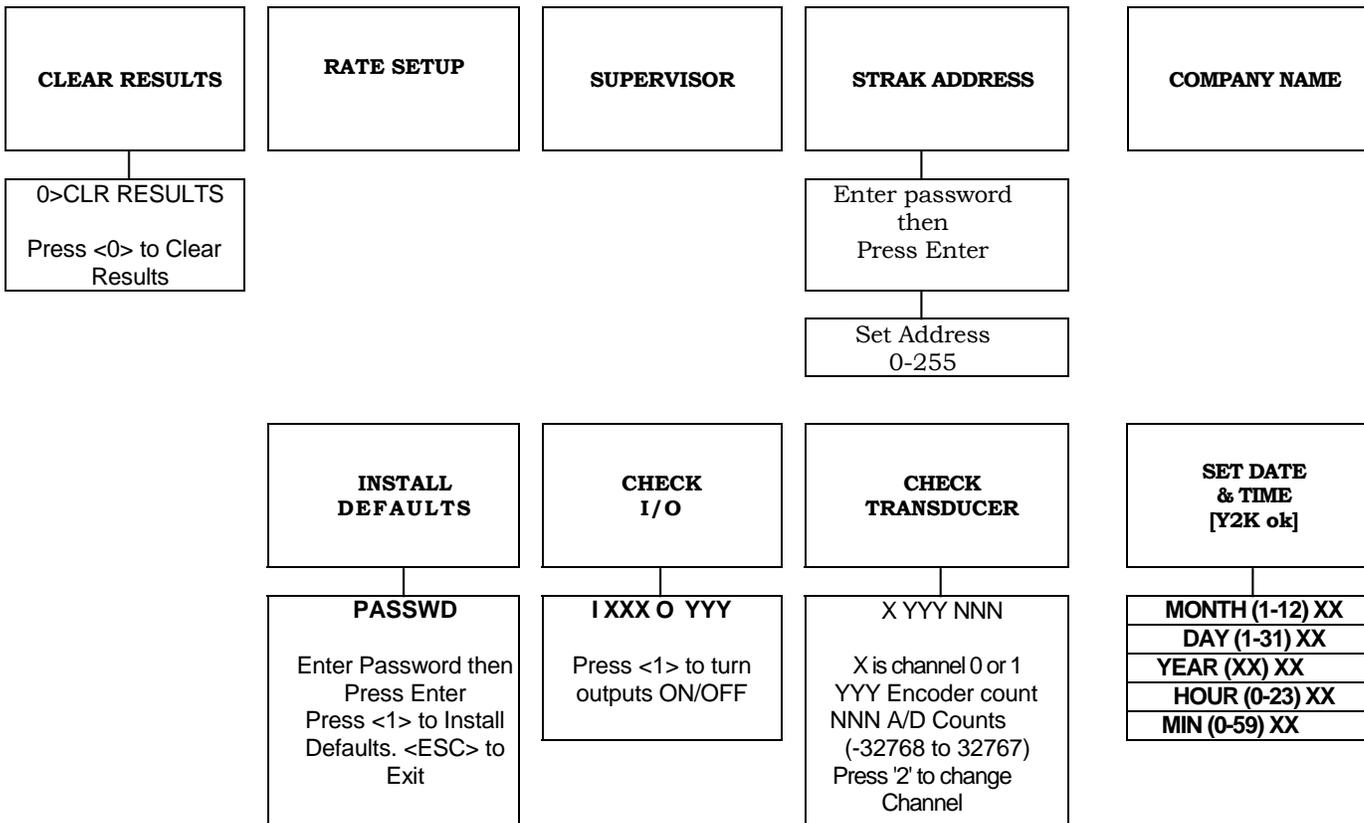


3.3 The UTILS Menu

Press the <UTILS> key from the Indicating Screen to enter the UTILS Menu. Use the <ARROW> keys to scroll through the menu items. The following items are found in the UTILS Menu.

- Clear Stored Test Results from memory.
- Set Date and Time.
- Check Transducer diagnostic. The Transducer diagnostic displays the A/D counts, which have a range From 125 to 32767.
- Check Digital I/O diagnostic. The Digital I/O diagnostic displays the status of all input and output bits. The outputs can be turned ON/OFF by pressing < 1 >. The display of the I/O is binary coded.
- Install system defaults. **Installing defaults DOES NOT effect any of the calibration information.**
- Set STRAK Address. Required if you are using the LX-5000 with ADMET's Concrete Traker database.
- Set Control Gains. Only present if the MegaForce Control option is installed.

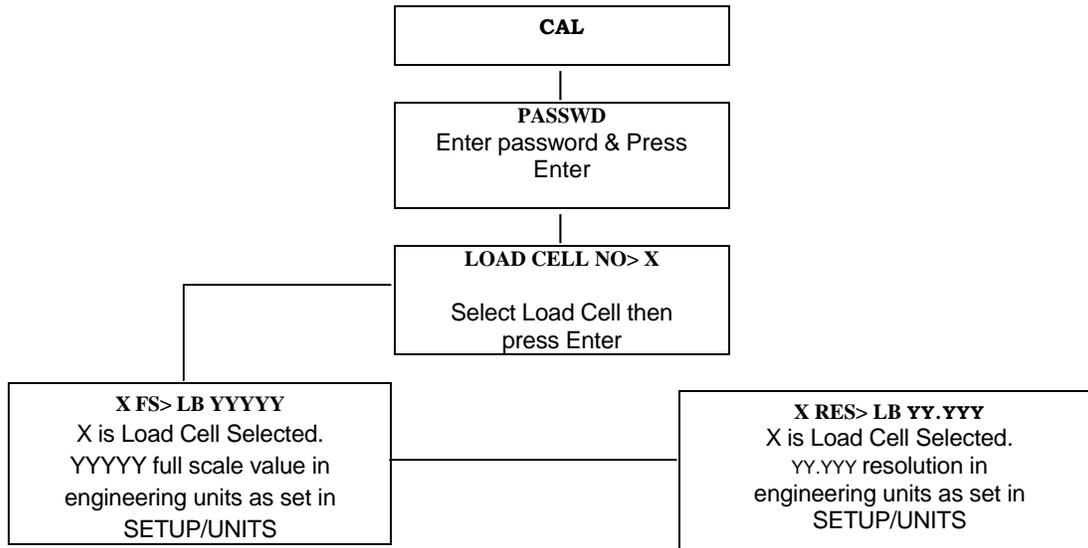
UTILS MENU Press: <ENTER>: Enter Select Menu Option.
 <ARROWS>: Scroll to another Menu Option.
 <ESC>: Exit to Live Indicating Screen.



STRAK Address: The STRAK serial download is used for importing strength results into ADMET's Concrete Traker Database program. The STRAK Address can be set to any number between 0 and 255. However, if more than one ADMET Indicating System is transmitting results into the Concrete Traker Database program, each indicator must have a unique address.

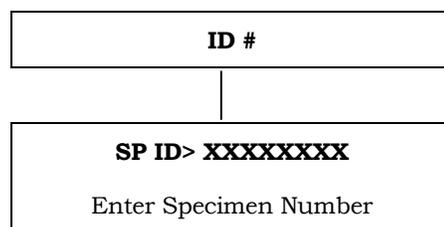
3.4 The CALIBRATION Menu

Press the <CAL> key from the Indicating Screen to enter the CALIBRATION Menu. The CALIBRATION Menu is password protected. Contact Test Mark Industries if the password is not available. The CALIBRATION Menu is used to define Full Scale Load, Load Resolution and to span the load. See Section 5.1-How to Calibrate Analog Transducers for more details.



3.5 The ID# Menu

Press the <ID#> key from the Indicating Screen to input the Specimen ID#. The Specimen ID# can be 8 characters long. Input the Specimen ID#. Press <ENTER> to accept the ID# and Enter the Dimensional Submenu. The type and number of selections listed in the Dimensional Submenu corresponds to the Specimen Type selected under the SETUP Menu. The Specimen ID# and Specimen Type are displayed on all test reports.



4.0 OPERATION

Section 4.1 describes how to setup for a test for a manually operated machine. Section 4.2 describes how to perform a test on a manually operated machine and store the results to memory. Section 4.3 describes how to setup for a test for a MegaForce controlled machine. Section 4.4 describes how to perform a test on a MegaForce controlled machine and store the results to memory. Section 4.5 describes how to generate test reports. Section 4.6 describes how to download the stored test results to a remote PC.

4.1 How to Setup a Test for Manually Operated Machines

Step 1: Press <SETUP> from the Indicating Screen. From the SETUP Menu select the following:

Engineering Units: Lb, N, KN, Kg.
 Spec Type: sample type and dimensions.
 Sample Break: Defines end of each test.
 Test Report Options
 Auto Print: ON/OFF
 Auto Store: ON/OFF
 Load Cell #

See Section 3.0 for more information.

Step 2: Press <UTILS> from the Indicating Screen. Clear results from memory. Note: If the stored results are important, print before clearing. See Section 3.3 for more information.

Step 3: Press the <ID#> from the Indicating Screen. Input the Specimen ID# and Specimen Dimensions.

4.2 How to Perform a Test on Manually Operated Machines and Save Results

If the steps in Section 4.1 were followed, you are now ready to perform a test. The current test settings are saved in permanent memory and will not change unless the operator modifies them.

Step 1: Insert the specimen in the machine and move the crosshead/piston to the desired starting position. Press the <ZERO> key to remove and residual load on the indicator.

Note: Earlier versions of the LX-5000 required that the <ZERO> key be pressed before each test. In version 0.4E and later pressing the <ZERO> key before each test is not required. The indicator will automatically reset itself after the previous test is complete. If the <ZERO> key is pressed the rate units will appear in the left hand portion of the screen. If the <ZERO> key has not been pressed then the left portion of the screen will indicate whether the value displayed is the live (LV) value or the peak (PK) value.

Step 2: Begin loading the specimen. Once the load exceeds 0.3% of full scale: a) either the load rate units will disappear and the load rate value will remain or the LV/PK label will be replaced with the load rate value depending if <ZERO> was pressed or not and b) the Sample Break detector is armed.

Step 3: Once sample break is detected the test is complete and the LV/ PK label will replace the load rate value. Press the <ENTER> key to toggle between the live and peak values. If Auto Store or Auto Print are turned ON, the results will either be saved to memory or printed automatically. If Auto Store is turned OFF, press <STORE> to save the current test results. Note: If you do not press <STORE> before initiating a new test the results will be lost. To continue running tests, repeat Steps 1-3.

4.2.1 The Indicator Status

READY, TESTING and DONE are the three possible Indicator Status Modes. Below is a schematic of the Live Indicating Screen. Press <ENTER> to toggle between Load and Stress.

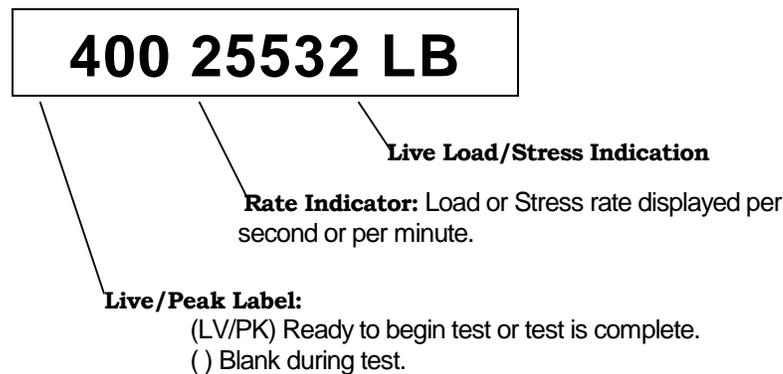
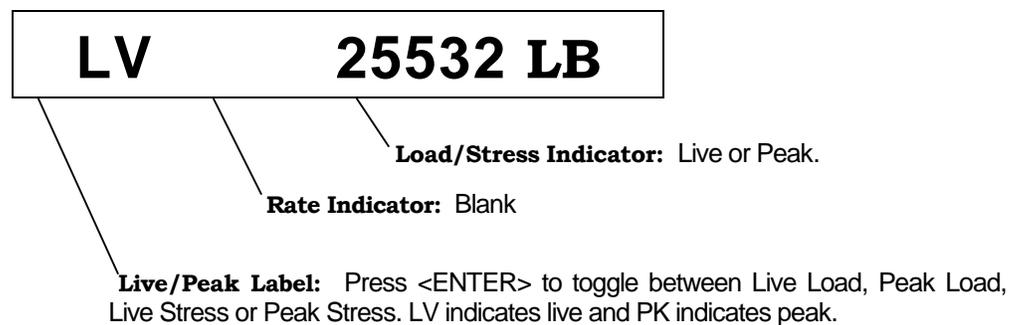


Figure 4.2.1 - The Live Indicating Screen during test.



Note: Store and/or Print each test result before pressing <ZERO> or the results will be lost.

Figure 4.2.2 - The Live Indicating Screen after a test is completed.

4.3 Test Reports Generated from Stored Data

If the steps in Section 4.4 were followed, a test report containing all of the results stored to memory can be obtained.

Step 1: Press <PRINT> from the Indicating Screen.

Step 2: Use the <ARROW> keys to scroll through the PRINT Menu options until STORED TESTS is displayed.

Step 3: Turn on your printer and press <ENTER> to print all stored tests.

4.4 How to Download Stored Test Results to a Remote PC

Firmware Versions Up to 0.2Z:

A data transfer cable and program diskette manufactured by ADMET is required to download test results to a remote PC.

- Step 1:** Connect the data transfer cable to the RS232 serial port on the LX-5000 Indicator. See Section 6.1 for the RS232 serial port location.
- Step 2:** Copy the transfer.exe program from the program diskette to the hard disk of the receiving computer. The computer should be running DOS 3.3 or higher and have either a COM1 and/or COM2 serial port.
- Step 3:** Connect the other end of the transfer cable to COM1 or COM2 on the receiving computer.
- Step 4:** Start the transfer program on the receiving computer by typing "transfer" at the DOS prompt in the directory where the program was copied.
- Step 5:** Select which port the transfer cable is connected to on the receiving computer.
- Step 6:** Input the file name to store the transferred data. The receiving computer is ready to accept data from the LX-5000 Indicator. The downloaded data is stored in ASCII tab delimited format for easy import into many spreadsheet and data base programs.
- Step 7:** Press <Print> from the Indicating Screen on the LX-5000. Use the <ARROW> keys to scroll through the PRINT Menu options until STORED TST TO 232 is displayed on the screen.
- Step 8:** Press <ENTER> to download the stored test results.

Firmware Versions above 0.3:

- Step 1:** Connect the data transfer cable to the RS232 serial port on the LX-5000 Indicator. See Section 6.1 for the RS232 serial port location.
- Step 2:** Install and setup **WinCom** on your receiving computer. Refer to the **WinCom** manual for details.
- Step 3:** Press <Print> from the Indicating Screen on the LX-5000. Use the <ARROW> keys to scroll through the PRINT Menu options until STORED TST TO 232 is displayed on the screen.
- Step 4:** Press <ENTER> to download the stored test results. Step 3:

Note: Data is transferred over an RS232 port. RS232 is specified for transfer distances of approximately 50 ft. Cable runs over 200 ft. have been installed and have worked successfully. Much of this is dependent on the equipment's environment.

5.0 CALIBRATION

Refer to the Section 6.1 to learn how to connect each transducer to the LX-5000 Indicator.

5.1 How to Calibrate Analog Transducers on Manually Operated Machines

- Step 1:** Turn on the system and allow it to run for 10 minutes before calibrating.
- Step 2:** Select the Engineering Units for calibration from the SETUP Menu. See Section 3.1 for more information.
- Step 3:** Press <CAL> from the Indicating Screen.
- Step 4:** Enter the password. Call Test Mark Industries if you have lost the password.
- Step 5:** Input the Full Scale Range or the capacity of the machine. The range should be input in the currently active engineering units.
- Step 6:** Input the Resolution or minimum load increment.
- Step 7:** Press <CAL> to enter the measure mode, <1> to edit the current calibration points or <ESC> to exit.
If you decide to exit the Calibration Menu at this time the values entered for Full Scale and Resolution will be saved.

Required Information Before Continuing Calibration

The program will enter the measurement mode if <CAL> is pressed in Step 7. During this mode, the technician can take up to 10 calibration point readings (a minimum of 2 points is required). **The first calibration point must be at zero.** It may be beneficial to take a few more calibration readings in areas of greatest inaccuracy. The left side of the display will indicate how many calibration readings have been taken. As the calibration points are entered, write down the corresponding load or displacement value. After all 10 calibration points have been taken, or you press the <STORE> key when using less than 10 points, the LX-5000 automatically switches to engineering load value input mode. Input the load or displacement value corresponding to each calibration point stored. The calibration points are stored sequentially, in order, i.e. the first point (zero) is followed by the second, third and so forth. Once an engineering unit load value has been entered for each calibration point stored, the unit will automatically save the calibration.

- Step 8:** Unload the machine or place the transducer at its zero point. Press <ENTER> to take the zero reading. The left side of the display will indicate PT1 has been read.
- Step 9:** Load the machine to a desired position or load and press <ENTER> to set the calibration point (voltage load value measurement). The voltage value is NOT displayed but it has been saved to non-volatile memory. Write down the corresponding engineering unit load value for each calibration point. Repeat this step until all readings are taken.
- Step 10:** Press <STORE> to exit the measurement mode if fewer than ten calibration points is used. The program will automatically proceed from Step 9 to Step 11 after the tenth reading.
- Step 11:** Input the corresponding engineering unit load value for each measurement point. After all values have been entered, the program will automatically generate the corresponding scale factors and store them to permanent memory.

DONE! READY TO VERIFY CALIBRATION

- Step 12:** To verify the calibration, exit out to the Indicating Screen and apply specific loads to the machine and compare the reading on the indicator with the standard. In versions 0.4E or later, there is the ability to edit the calibration points in order to make a span adjustment without having to repeat steps 8-11. To edit the calibration points follow steps 1-7 above. When step 7 is reached, press the <1> key to edit the calibration points.

5.2 Problems with the Calibration

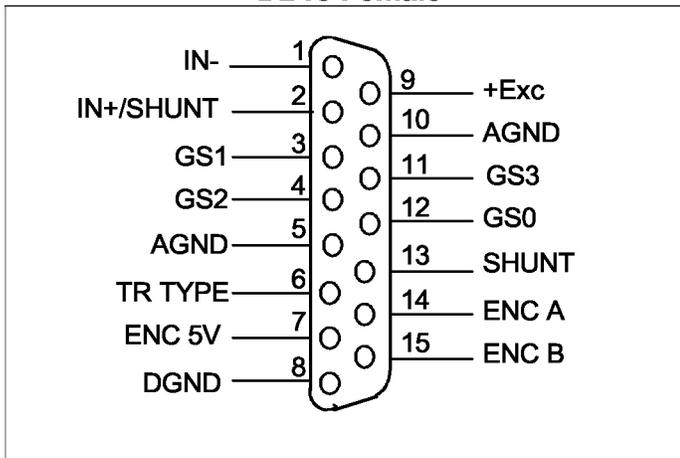
The calibration will have to be repeated if there is a mistake (i.e. incorrect number input) made during the measurement mode. Contact the factory if any of the voltage readings exceed the capacity of the indicator.

5.3 What Occurs During Calibration

The calibration procedure allows up to ten calibration points to be entered. Each successive pair of points is connected by a straight line and the slope of each line is the calibration scale factor used for that region. This results in a piecewise linear function which maximizes accuracy.

6.0 ELECTRICAL/MECHANICAL DATA

DB15 Female



Analog Transducer Pin Designation.

Load/Position Channel Connections

Analog-Load Input

Analog Excitation:

pins 9 & 10 (+Exc & AGND)
 9 Vdc (standard)
 4.5 Vdc (option)

Analog Inputs:

pins 1 & 2 (+/- IN)

Analog Input Range:

up to 2.5 mv/v Tie pin 3 to pin 12
 up to 4.5 mv/v Tie pin 4 to pin 12
 +/- 5 V No Connection
 User definable Tie <25 ppm/C resistor
 between pin 11 & pin 12.
 Gain = 1 + 50000/Rg.

Analog shield connects to AGND.

Encoder-Position Input (optional)

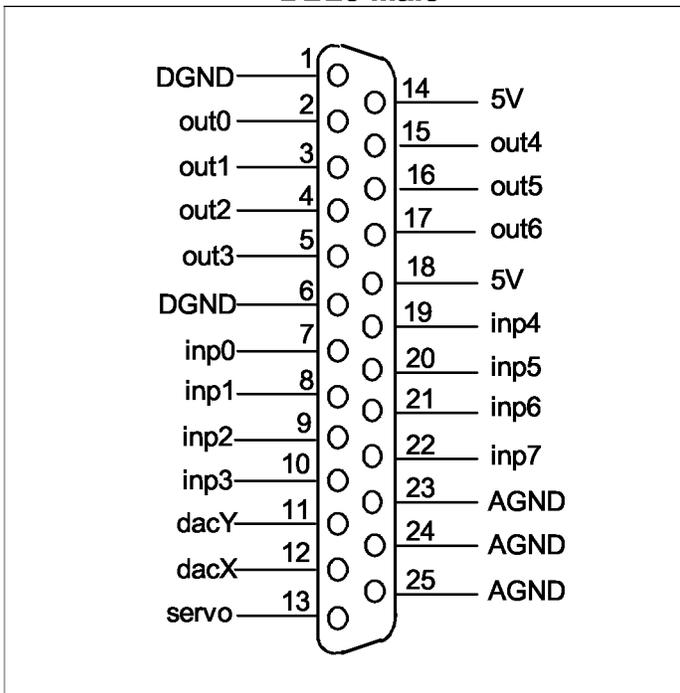
Encoder Excitation: pins 7 & 8

Encoder Input: pins 14 & 15

Encoder shield connects to DGND.

Transducer Identification (Contact Factory)

DB25 Male



Digital I/O Port Pin Designation.

I/O Port Pin Designations

Digital Inputs: inp0-inp7. Normally High. To activate short to DGND

Digital Outputs: out0-out6. Connect positive terminal to 5V. Connect the negative terminal of device to digital output. Output is active when pulled low.

Dual Analog Output option for X-Y Recorder (dacX & daxY)

Resolution: 14 bits
 Range: 0-10V @ 5ma max.
 Reference to AGND.

Servo Control Output option (servo)

Resolution: 12 bits
 Range: +/- 10V @ 5 ma max.
 Reference to AGND.

6.1.1 Digital Input Definitions

- Computability: TTL - Pulled high through 10K resistors. Short to DGND for actuation.
- Input Assignments: inp0 - None.
inp1 - None.
inp2 - None.
inp3 - None.
inp4 - None.
inp5 - None.
inp6 - None.
inp7 - None.

6.1.2 Digital Output Definitions

- Computability: 5V floated high, pulled low to actuate. Connect between 5V and output number.
- Output Assignments: out0 - Normally On, Turned Off on Over Range.
out1 - None.
out2 - None.
out3 - None.
All other outputs undefined.

6.2 Printer Port

The printer port requires a standard male DB25 connector. Any 9-pin, 24-pin, Bubble Jet or Laser Jet printer with a standard parallel port interface may be used.

6.3 RS232 Serial Port

The RS232 Serial Port is used to download test results to a remote AT compatible computer. This port requires a female DB9 connector. The cable and software used on the remote computer is proprietary and must be purchased from the factory.

6.4 Power (AC) Input

The LX-5000 features a 25-watt universal input power supply with an input voltage range from 85 - 265 (40 - 440Hz) VAC. Since the supply automatically regulates the output for 85 - 265 VAC inputs, there are no switches required to select the input voltage. There is a fuse internal to the LX-5000 module. Consult the factory if the fuse needs to be replaced.

7.0 TROUBLESHOOTING

CORRECTING MINOR PROBLEMS

Some of the most common minor problems and their remedies are listed:

PROBLEM	CAUSE	REMEDY

STATEMENT OF WARRANTY

Test Mark Industries warrants all new testing machines, testing apparatus and supplies manufactured by Test Mark Industries against defects in workmanship and materials for a period of 24 months from the original date of shipment, provided the equipment has been properly installed, maintained and operated in accordance with installation and operating instructions. This limited and exclusive remedy does not cover normal wear and tear. The Test Mark Industries manufactured product must be free from accident, damage by fire, water or act of God to be eligible for warranty.

Test Mark Industries will repair, replace or credit at Test Mark Industries' option defective product or component parts. When repair can be accomplished by exchange of a component part, the customer may be required to remove the part of modular component and install the exchanged part.

Warranty does not cover expenses, either direct or indirect, that may arise from the use or the inability to use Test Mark Industries products, or the secondary owner in the event of resale.

Products not manufactured by Test Mark Industries will carry the warranty of the original manufacturer. Under no circumstances shall Test Mark Industries be liable for any injury, loss, or damages, whether direct or indirect, incidental or consequential, arising out of the use of, or inability to use the products described herein.

This exclusion of liability for loss or damages, whether direct or indirect, incidental or consequential, shall apply to all claims whether sounding in contract, warranty, tort including both negligence and strict liability, or any other basis of liability.