



500 SERIES Material Testing Machine Mk 3

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USER MANUAL

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MAY 2000

User Manual

Part No: 01/2791

Version: 3.0



International Symbols

Caution! Refer to this manual before using your
500 Series Testing Machine

CAUTION

HIGH FORCES ARE OFTEN INVOLVED WITH
THE MATERIAL TESTING PROCESSES.

THE MACHINE IS POWERED BY MAINS SUPPLY
VOLTAGE

TO MAINTAIN ALL ASPECTS OF THE SPECIFICATION,
ONLY LLOYD INSTRUMENTS APPROVED
ACCESSORIES CONNECTIONS AND COMPONENTS
SHOULD BE USED

ALL SPECIFIED SAFETY PROCEDURES SHOULD BE
STRICTLY ADHERED TO.

READ THIS MANUAL BEFORE USING THE 500 SERIES
TESTING MACHINE

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1.0 INTRODUCTION

1.1 INTRODUCTION

Welcome to your new LLOYD INSTRUMENTS materials testing machine. The 500 Series is one of a range of versatile testing systems suitable for a variety of different applications. The 500 Series includes an RS232 computer interface and is supplied with **Nexygen** Software to provide machine control and data analysis.

The 500 Series is a very flexible and sophisticated instrument. It is designed to be a modular system so it can be configured for many varied applications and environments. The 500 Series has been designed for computer control although an optional console is also available if required. When used with **nexygen** / Ondio Software re, data output is to a VDU and printer. **nexygen** software can be used to perform tests according to standards on plastics, metals, tear and peel, foams, springs and other general testing standards.

For further information on Lloyd Instruments software or accessories please contact your local distributor or Lloyd Instruments Sales Department on +44 (0) 1489 486399

1.2 SAFETY



Materials testing machines are very safe to use providing the instructions presented in this manual are followed precisely. We would like draw your attention to both the Electrical Safety and the Safe Operation/Safety Symbols, section 3.2 on page 9. Please refer to the whole of Section 3.0 for details on safe operation of this equipment.

2.0 INSTALLATION

2.1 UNPACKING

All packing material should be carefully removed from the testing machine and a visual inspection made to ensure that there is no obvious transit damage. The following items should be in this package:

Straining Frame and Power Input Cable,
Operating Instructions,
Rubber Mat,
RS232 Cable,
Knurled Load Cell Fitting Screw (NTT/0181/00),
2 x Grip Pins,
1 x Load Cell Eye End, 2 x Load Cell Eye End Locking Nuts,
1 x "C" spanner,
1 x Alignment Gauge.
Load Cell(s) (as per order),
Software Disk(s) (as per order),
Grips (as per order),
Console (if ordered)

If there is any damage or parts missing, please report this to your dealer or Lloyd Instruments without delay.

2.2 SITING YOUR MACHINE

Great care should be taken in choosing the location where the frame it is to be installed. Every effort should be made to ensure that the machine is vertical since this may affect the accuracy of results particularly at very low forces. The frame should be positioned such that the front of the machine can be easily accessed, and the emergency stop button is not obstructed in any way. Care should be taken when lifting the machine by hand. Observe safe working practices. The 500 Series machine weighs 25kg (55lb) without grips fitted.



ENSURE THAT THE EMERGENCY STOP BUTTON IS NOT OBSTRUCTED IN ANY WAY.

2.0 INSTALLATION

2.3

VOLTAGE SELECTION



The materials testing machine can be used with electricity supplies in the range of 115/230V ac $\pm 10\%$ 50-60 Hz. The power input cable is inserted in the rear of the machine. Before inserting the power cable and switching on the machine the voltage selection must be checked, this is shown on the mains input connector. There are two voltage selections, 230V and 115V. Ensure that the selection is correct for the voltage range of your power supply. To change the voltage rating, use a screwdriver to open the voltage selector. The screwdriver should then be used to move the selector from the 115V position to the 230V position as appropriate. It is also essential to check that the fuse rating is suitable for the supply voltage you are using. The fuses (live and neutral) are located inside the power input connector. The fuse ratings for 115V/230V are given in Section 8: Specification.

2.4

ASSEMBLING THE SYSTEM

When the 500 Series has been sited where it is to be used, the other component parts of the system should be fitted and connected. From the accessory kit, find the Knurled Load Cell Fitting Screw (NTT/0181/00). Fit the Load Cell to the under side of the upper (moving) cross head using the Knurled Load Cell Fitting Screw. Tighten firmly with fingers only. Fit the Load Cell Eye End and Load Cell Eye End Locking Nuts to the Load Cell.

The position of the Load Cell Eye End pin hole can be locked in a suitable orientation for the grips to be used by locking one of the Load Cell Eye End Locking Nuts up to the Load Cell. **DO NOT OVER TIGHTEN**, the load cell is a precision measuring device.

Plug the Load Cell into the socket at the rear of the 500 Series machine marked LOAD CELL.

2.0 INSTALLATION

Before carrying out any tests, check that the eye ends, load cell eye end and bottom anchor pin, are in line using the **Alignment Gauge** supplied. If the eye ends are not in line adjust the position of the bottom anchor pin. This can be achieved by loosening the mounting screws and re-positioning the bottom anchor pin by using the Alignment Gauge. Once aligned re-tighten the fixing screws.

When the grips are fitted to the top and bottom eye ends with the pins provided, they can be locked in place to taking up any slack, by tightening the locking nuts against the grips.

Place the rubber mat on the work area around the bottom anchor pin. Plug the RS232 lead into connector CN2 located at the back of the 500 Series, plug the other end of the lead into the appropriate port on your computer. Refer to your computer manual and the Lloyd Instruments software manual for help. Having checked the voltage settings as per 2.3 above, insert the mains lead into the IEC plug and then connect to your mains supply.

2.5 SOFTWARE INSTALLATION

Depending on your order, your 500 Series machine will have been delivered with at least one set of Lloyd Instruments software. Refer to the operating manuals supplied with the software for installation and operating instructions. The software manual should be read in conjunction with this manual. The software must be installed on your computer before your 500 Series machine can be operated. If your machine has an optional console installed (see section 2.9 Fitting and Installation of Optional Console), the 500 Series can perform simple tests in stand alone mode without the use of software.

2.0 INSTALLATION

2.6 ON-OFF SWITCH

The power ON/OFF switch is located in the top right hand corner of the cover behind the column. The switch is a 'rocker' type with positions **0** and **1**. By selecting **1** power will be supplied to the machine.

2.7 EMERGENCY STOP

The Emergency Stop switch is located next to the on-off switch. This switch is intended for emergency use only and should not be used for turning the machine on and off in normal use. **PUSH DOWN** in cases of emergency to stop the machine. **TURN CLOCKWISE** to reset and release when fault condition has been corrected.

PLEASE NOTE:-

The indicator light in the mains ON/OFF switch remains lit all the time the 500 series is connected to a live mains supply and the mains switch is in the ON position (even when the emergency switch has been operated). If the emergency switch has been operated the warning light reminds operators that the machine is still connected to a live supply and will be re-started as soon as the emergency stop button is reset.

2.8 LOAD CELL CALIBRATION & RAM DUMP

Whenever the load cell is changed, the internal memory containing the calibration information about the load cell that was connected must be cleared, and the calibration information of the new load cell entered.

Clearing the internal memory is achieved by turning the machine on for a few seconds with no load cell plugged in. This procedure (also called RAM dump) can also be used if, because of extreme electrical noise, it is feared that the calibration information may be corrupted. When the

2.0 INSTALLATION

machine is turned on for the first time after the internal memory has been cleared and load cell subsequently plugged in, the calibration factor for the load cell fitted will have to be entered. The Lloyd Instruments software will prompt you to do this with a screen dialogue box similar to the one shown below:

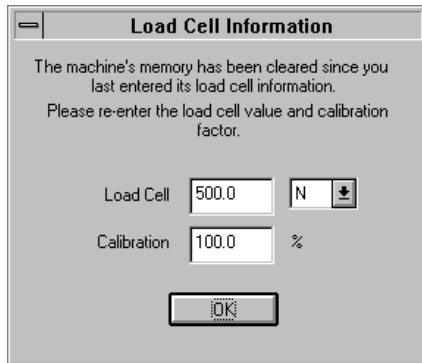


Figure 1: Load Cell Information

Enter the load cell value and calibration details for the cell you wish to use in the boxes provided then click on OK.

If the machine is being used in stand alone mode with the optional console, the console will prompt you to enter the new information after the first turn on (see section 5.0 Optional Console).

To maintain EMC compatibility, calibration and readability by the internal electronics **ONLY LLOYD INSTRUMENTS APPROVED CELLS SHOULD BE USED.**

2.9 FITTING/INSTALLATION OF OPTIONAL CONSOLE

The standard 500 Series machine is not supplied with a console. The system is designed to operate with Lloyd Instruments software and compatible PC. (see Computer Specification) However, the machine may be used in stand alone mode if the optional console is fitted.

2.0 INSTALLATION

If the optional console is ordered at the same time as the straining frame, the straining frame will have the additional socket already fitted and the console can be connected at any time. If the console has been ordered after delivery of the 500 Series, a fitting kit of looms and socket will have to be installed. Please read section 5.0 Optional Console.

3.0 PERATIONAL PRECAUTIONS

3.1 ELECTRICAL SAFETY

1. The 500 Series materials testing machines have been designed to meet the requirements of BS EN 61010-1 : 1993 Safety requirements for electrical equipment for measurement, control and laboratory use.
2. This instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and to maintain the machine in a safe condition.
3. The machine is for indoor use. only It may occasionally be subjected to temperatures between +5 degrees C and -10 degrees without degradation of its safety.
4. Before switching on the machine make sure that it is set to the voltage of the mains supply.
5. This machine complies with electrical safety grade Class 1 which means that it is an earthed apparatus and requires the mains plug to contain a protective earth terminal. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.
6. The machine must be disconnected from all the voltage sources before it is opened for any adjustments, replacement, maintenance or repair.
7. Capacitors inside the machine may still be charged even if the machine has been disconnected from all voltage sources.
8. Any adjustment, maintenance and repair of the opened machine under voltage shall be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.

3.0 OPERATIONAL PRECAUTIONS

9. Make sure that only fuses with the required rated current and of the specified types are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders is prohibited.

3.2

SAFE OPERATION / SAFETY SYMBOLS



The crosshead is marked with a caution symbol to warn users about the moving crosshead. Lloyd Instruments materials testing systems are inherently safe if used properly.

Operators must be aware that

- | |
|--|
| <ol style="list-style-type: none">1. High physical forces are involved.2. Samples under test may shatter.3. Electrical power supplies are involved |
|--|

The following must, therefore, always be brought to the attention of any operator before they are allowed to use the machine.

CAUTION!

1. Hands, fingers and other parts of the body must at all times be kept well away from the moving crosshead, and the lower parts of any grips, fixtures etc. Operators should be particularly careful when moving the crosshead to insert test samples to ensure that no part of the hand could be accidentally compressed as the crosshead and grips are jogged into position.
2. Never drive the machine from a computer when anyone else is working near the straining frame.
3. If there is any danger that liquids may be spilt during tests, operators must use a drip tray (which is available from Lloyd Instruments) to guard against the possibility of any spillage entering the machine and giving rise to electrical or other hazards.

3.0 PERATIONAL PRECAUTIONS

4. Extra care should be taken when operating in compression mode where specimens may burst, shatter or fly out from between the platens. Operators should STAND CLEAR during testing. Splinter shields are available.
5. All operators must receive adequate training in basic operation before being allowed to use the machine. Additional copies of this manual are available from Lloyd Instruments. Lloyd Instruments also offer on site training, please contact Customer Services for further information.
6. Operators must ensure that the emergency stop button is never obstructed. DO NOT use the emergency stop button in normal operation as it is intended purely for emergencies.
7. Operators must ensure that the 500 Series is regularly serviced / calibrated by Lloyd Instruments or one of their accredited service dealers.
8. Never attempt any form of repair without disconnecting the mains electrical supply.
9. Never attempt to test any samples with a type of grip or other accessories which are not designed for that particular test or to use grips or the machine for tests in excess of the stated load limits. A comprehensive range of alternative grips, together with an applications advisory service, is available from Lloyd Instruments and its accredited dealers.

3.3 EMERGENCY STOP

If, for any reason, the machine needs to be stopped without delay or isolated from the mains, an emergency stop mushroom is provided by the on/off switch at the right hand corner of the top cover behind the column. This switch will isolate the machine from the electricity supply. It can be

3.0 OPERATIONAL PRECAUTIONS

released by turning a quarter of a turn clockwise. The machine will then restart if the on/off switch is already on.

3.4 MACHINE SPLINTER SHIELDS

Transparent splinter shields are available as an option to enclose the test sample if there is any danger of samples shattering as a result of the test. While not mandatory for many applications and countries, Lloyd Instruments strongly recommended that users consider fitting this optional item.

4.0 PERFORMING A TEST

4.1 FITTING LOAD CELLS

The correct load cell should be fitted to the moving crosshead for the application being undertaken. Great care should be taken of these as they are precision measurement devices and can be damaged if used incorrectly.

4.2 GRIPS/ADAPTERS

It is important that the grips are fitted along the central straining axis of the machine and that no side load is applied to the load cells (internal or external) as this will affect the accuracy of the load readings. The grips should be connected to the load cell and anchor pin, using only the pins provided and care should be taken not to exceed the load rating of the grips. It is important to ensure that the grips used are suitable for the material under test. Any slippage of the material in the grips will affect both load and extension readings. Please also refer to the instructions provided with the grips/adapter.

4.3 STARTING A TEST

If you are new to Lloyd Instruments test instruments and software we recommend that at this stage you refer to the on-line help provided by the software. This can either be viewed and read directly from your monitor or printed out and kept with the operating manual for future reference. Refer to your software operating manual and start your software. The on-line help should be read in conjunction with the software operating manuals.

Once you have become familiar with the basic operation of the software and system, the crosshead can be moved to a suitable position for the grips to be fitted and your sample loaded. Move the crosshead to a suitable position by clicking on the fast up button on the software console with your left mouse button. See figure 2 opposite:

4.0 PERFORMING A TEST

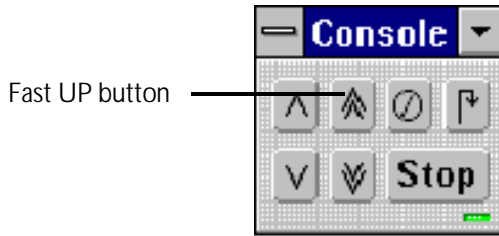


Figure 2: Software console

If the software console is not visible in the software start up screen, hold down Alt and press Tab on your keyboard until it appears. If it does not appear, it has not been started. Alt / Tab back to Program Manager and start the Console by double clicking on the icon. Click on Setup and then Test Conditions and install the test setup parameters that you require. Press <F1> or click on Help for any clarification you need.

4.4 ERROR MESSAGES

If an error condition exists the error will be shown on the software screen or on the LCD as ERROR + a number if a console is fitted. This error must be cleared before a test can be performed. See Appendix C : Error Messages for an interpretation of the error numbers.

4.5 CARE OF LOAD CELLS

All machine operators should be aware that Lloyd Instruments load cells are precision force measuring instruments which should be treated with the utmost care to avoid accidental damage. The range of low force cells that can be used with the 500 Series are easily damaged if abused or used without sufficient care. **Refer to the fitting and operating instructions supplied with low force load cells.**

Please take the following precautions:

4.0 PERFORMING A TEST

- Do not subject load cells to physical shock.
- When a load cell is removed from the machine, place it immediately in its padded case and store in a dry place.
- To install a load cell, refer and adhere to the fitting instructions supplied.
- When fitting grips to the load cells, never force the grip onto the load cell eye ends. Avoid bumping the eye ends with the grips.
- In both tension and compression tests, centre the specimen in line with the axis of the load cell and other eye end to avoid side thrust.
- In compression tests, if special lower fixtures are used, ensure that they are fixed in position so that they cannot be accidentally moved so as to block the normal downward movement of the upper fixture, e.g. where a tongue on the upper fixture must fit into a slot in the lower fixture.
- Avoid overloading beyond the rated capacity of the load cell being used. Prior to testing ensure, if possible, that the maximum force anticipated will not exceed the capacity of the cell installed. If maximum capacity is approached during a test, run the machine at slow speed in local mode and reverse the crosshead if capacity is exceeded

Note:

All Lloyd Instruments load cell systems incorporate overload protection devices which will stop the machine if capacity is exceeded in either tension or compression. However, at higher speeds, momentum may carry the crosshead far enough after shut-off to damage the cell. Cells damaged in this way are not covered by the warranty.

4.0 PERFORMING A TEST

To meet the requirements of BS EN ISO 7500-1:99, ASTM and DIN, the load measuring system on your machine should be calibrated at least annually by a qualified service organisation.

5.0 OPTIONAL CONSOLE

An optional control console is available which allows the 500 Series to be configured as a stand alone machine. The console has a very legible LCD and provides simple control via a membrane key panel. When running the machine with the console the output is displayed on the LCD as well as being transmitted across the RS232 for connection to Lloyd Instruments software if required.

5.1 CONNECTING YOUR CONSOLE

There are two slightly different procedures for connecting a console. Which procedure is used depends on whether or not the console was 1) ordered at the same time as the main frame or 2) ordered after the original machine has been delivered. The procedures are as follows:

- 1) Your console was ordered at the same time as the main frame

The console plugs into CN5 on the right hand side of the straining frame base. This is a 37 way D socket. Plug the console connecting lead into this socket and when the machine is turned on the LCD will show:

LLOYD INSTRUMENTS LTD

Materials Testing Machine

followed by

500 Series Machine

- 2) Your console was ordered after you have taken delivery of the main frame. **ENSURE THAT THE MACHINE IS DISCONNECTED FROM THE MAINS SUPPLY**

Turn the 500 Series machine on its side and remove bottom cover plate which is secured by 7 countersunk screws.

5.0 OPTIONAL CONSOLE

Remove the small side socket hole cover plate. Take care not to drop any of the small nuts and washers "in the works"!

Find the loom 09/0590 and fit the 37 way "D" socket in place through the side of the machine and secure it in place. Fit the 40 way socket to CN3, the 40 way connector on the main long PCB.

Replace the machine base cover plate

Proceed as in 1) above.

5.2 DATA ENTRY KEYS

<A> (Accept option A) This key is used to accept the answer to a question during the setup. It is used in conjunction with the and <C> keys.

**** (Accept option B) The key is used in conjunction with the <A> key if two options are presented. In the READY mode it can be used to return to the end of the setup mode. The setup parameter displayed will be the last option before the READY mode was entered. The JOG UP key can then be used to move backwards through the setup parameters.

<C> (Change) The <C> key is used to change a previously selected option or value.

<R> (Reset) Pressing the <R> key will return you to the beginning of the setup mode. For example, if you would like to change any of the setup parameters, press the <R> key and step through the setup sequence until meter is reached. It can also be used to return to computer control if 'local' has been selected from the software main menu.

5.0 OPTIONAL CONSOLE

Numeric Key Pad

The numeric keypad is used to enter values of load/extension, speed etc during the test setup sequence.

**kN, N, mm,
mm/min, kgf, lbf,
in, in/min.**

These keys are used after entering a numeric value. They are used select the required units for force, extension and speed. If an inappropriate units selection is made a '?' will appear on the LCD and the user should enter the correct units.

5.3 MACHINE STATUS INDICATORS

The optional console has a panel of lights, which show the current status of the machine. These are as follows:


RUNNING	This indicator will be illuminated when the test is actually in progress and the crosshead is moving.
MANUAL	This indicator will be illuminated when the machine is in Local Mode
REMOTE	This indicator is illuminated when the testing machine is under the control of a remote computer.
READY	This indicator is illuminated when all of the test parameters have been entered correctly and the testing machine is ready to perform a test.
MOTOR	This indicator will be illuminated if motor has power supplied to it. If this indicator is not lit this will signify a motor fault.


5.4 OPERATOR CONTROLS


The operator controls are found in the lower portion of the control module. These are used to control the operation of the machine while in Local Mode:

GO The <GO> button is used to start a test. The test setup sequence must have been completed before the <GO> button is operative, i.e. the machine must be in the ready state.

STOP The <STOP> button is used to end a test if the machine does not automatically stop the test or the user needs to abort the test.


JOG (Up/Down)  These two keys allow the crosshead to be moved slowly into position when loading and removing samples. They are only operative before a test and the crosshead will run at a user pre-set jog speed which is one of the setup options. They only operate when they are being pressed, i.e. momentary action. During the setup mode the jog UP key can be used to reverse through the setup parameters.

FAST (Up/Down)  The FAST switches are only operative in the ready state. They allow the crosshead to be moved at maximum speed to any desired position. They are useful when moving the crosshead large distances in a short time. They are only operative when they are being pressed, i.e. they have momentary action. It is important to realise that this will result in the crosshead moving at its highest speed and therefore it is essential to ensure there are no obstructions. This should only be used for moving large distances and not for final adjustment when the grips are close together.

ZERO  This button is used to zero the load and extension displays. This is normally at the start of a test but can be

5.0 OPTIONAL CONSOLE

used at any time in the ready state. If Auto Zero was selected in the setup routine the system will automatically be zeroed when <GO> is pressed to start the test.

RETURN  The return button is operative both during a test and in the Ready mode when used under Local control. When pressed the crosshead will return to the position when the zero button was last pressed. The crosshead will move at maximum speed until the final destination is close and will then slow into its final position.

5.5 SETUP SEQUENCE

SIGN-ON MESSAGE When switching the power on three messages will be displayed as follows:

1. Company name.
2. Machine type
3. Software version number. This message gives the version number and this should be used in all correspondence regarding the operation of your materials testing machine.

OPERATOR ACCESS CODE

The operator access code gives an option to restrict the use of your materials testing system. This option will only be given when a RAM DUMP occurs (see CLEARING THE BATTERY MEMORY, page 35). The LCD will display the message shown below:

TO ESTABLISH OPEN ACCESS OPERATE A

If A is pressed at this point the console will move on to the next option. However, if restricted access is required the user should press B or C and the following message will appear.

5.0 OPTIONAL CONSOLE

SETUP NEW ACCESS CODE

The user can then enter a four number sequence of their choice and should finish by pressing the A key. The LCD will then ask the operator to confirm the access code with the following message:

TRY OUT NEW ACCESS CODE

The user must now repeat the four figure number followed by A to accept to continue. If the wrong number is input then an error message WRONG ACCESS CODE is given and this is repeated until the correct number is used. Once this option has been selected, every time the machine is switched on it will ask for the appropriate access code before moving to the next option. The only way to remove this number is to perform a RAM DUMP. This facility is designed to stop unauthorised or unqualified personnel from using this equipment.

LOAD CELL

After the initial message screen the display will show the last load cell value fitted to the machine. The user may accept this value or change to another cell if required. CARE SHOULD BE TAKEN THAT THIS VALUE IS CORRECT AS THIS WILL AFFECT LOAD READINGS.

CELL SENSITIVITY

Each load cell has its own individual calibration sensitivity figure. This figure can be found on the load cell label, the sensitivity is measured in %. IF THE LOAD CELL IS CHANGED THEN THE SENSITIVITY MUST BE CHANGED FOR CORRECT CALIBRATION OF THE SYSTEM

5.0 OPTIONAL CONSOLE

LOCAL/REMOTE OPERATION The testing machine will give the prompt:

REMOTE B LOCAL A

If <A> is pressed then local control is achieved, i.e. operation via the console, and the machine will proceed to the next phase. If is pressed the remote operation is selected, i.e. computer control, the console will then try to establish communications across the RS232 interface for thirty seconds, after which time if communication is not achieved it will revert back to local control automatically.

SET LOAD RANGE

This option is used to set the full scale load required and the prompt is as shown:

LOAD RANGE 0 - 500N ACCEPT A/CHANGE C

The accept and change option shown at the end of this line alternates every four seconds. To accept the suggested load range press the <A> key. To change the load range press the <C> key. Having pressed the <C> key, you are required to enter a numeric value which represents the maximum load required. Once the value has been input then a units key (N, kN, Kgf, lbf must be pressed and this new value of load may be accepted by pressing <A>. Until the <A> key has been pressed the value entered can be removed by pressing the <C> key and a new value entered.

Note:

It is not possible to accept a value greater than the value of the load cell fitted or the maximum capacity of the testing machine. The value that you enter will be rounded off to the nearest 1% of the load cell value. The minimum value that can be entered is 2% of the load cell value.

5.0 OPTIONAL CONSOLE

The load reading is Single Range and Fixed Resolution. The purpose of this option is to stop the machine exceeding the chosen load limit. If the load limit is reached during a test, an error message will be displayed and the test will be terminated.

SET EXTENSION RANGE

This option is to set the full scale extension required and the prompt is:

EXTENSION RANGE 450MM ACCEPT A/CHANGE C

The accept and change option shown at the end of the display alternates every four seconds. The resolution of the extension reading for a chart recorder is adjusted by this option automatically to give the maximum resolution possible for the test. If the extension limit is reached during a test an error message will be displayed and the test will be terminated. To accept the currently selected range press the <A> key. To change the extension range press the <C> key. If the <C> key is pressed the maximum extension will be cleared from the display and a numeric value representing the new maximum extension range should be entered. This number must be followed by an appropriate units key (mm or in). This value may now be accepted by pressing the <A> key. Until the <A> key is pressed the value entered may be cleared at any time by pressing the <C> key. The maximum allowed extension is 450 mm.

SET TEST SPEED

This option is used to set the required test speed and the prompt is as shown:

5.0 OPTIONAL CONSOLE

**CROSSHEAD SPEED 10MM/MIN
ACCEPT A CHANGE C**

The accept and change option shown at the end of the display alternates every four seconds. If the <A> key is pressed the currently selected speed will be the new test speed. To change the test speed, press the <C> key. The currently selected speed will be cleared from the display and the new speed value can be entered. The new speed value must be a number followed by pressing the appropriate units key (mm/min or in/min). The speed value can be changed at any time by pressing the <C> key and finally accepted by pressing the <A> key.

DISPLAY TEST OPTIONS

This option gives the operator the choice of looking at further test parameters or accepting all parameters and moving onto Ready Mode. The prompt given is:

DISPLAY OPTIONS B ACCEPT OPTIONS A

If <A> is pressed the machine will move to the Ready Mode ready to perform a test. However, if is selected it will move onto the next phase of the setup.

TEST TYPE

This option prompts for the type of test required. The options available are tension, the crosshead will move in an upward direction, or compression, the crosshead will move in a downward direction. The options may be selected by pressing the <A> or keys as appropriate.

5.0 OPTIONAL CONSOLE

CYCLE ON CYCLE OFF

This option allows the machine to be used in the cycle mode. Using <A> or will select cycle on or off depending on previous settings.

NUMBER OF CYCLES

This allows the user to select the number of cycles to be carried out during test. Use numerical key pad to input number of counts then <A> to accept. At the end of a test, if no break is detected, the final display will be (if the number of cycles specified was 50) CYCLE 50 EXTENSION 0MM. If during a test a break is detected, then the final display will be (if the break occurred at the 23rd cycle) CYCLE 23 EXTENSION 10MM.

CYCLE ON LOAD OR EXTENSION

This allows the user to specify whether the machine will cycle between two load limits or two extension limits. Depending on the option selected, the user will be prompted to enter maximum and minimum values between which it will cycle.

DISPLAY LOAD OR EXTENSION

During a cycle test the display will show the current cycle number and either the load or extension value depending on the setting of this option.

LOAD UNITS

This option allows the user to select whether load or stress is displayed. If stress is selected, the load value will be displayed in MPa or PSI, depending on whether the sample

5.0 OPTIONAL CONSOLE

area is entered in mm² or inches². Before entering the Ready Mode, the sample area must also be entered to enable the calculation of stress to be made. This must be entered in mm² or inches². To enter the sample area in mm², type in the value required and press the mm key. For inches² press the inches key. When in the Ready Mode the sample area can be changed by pressing either the mm or inches key. When pressed, the display will prompt the user to accept the previous value or to type in a new sample area. When the entered value is accepted, the system returns to the Ready Mode and the display is updated to show stress readings calculated using the new sample area.

EXTENSION UNITS

This option allows the operator to select the required extension units that are to be displayed. If you have previously entered the maximum extension range in metric units (mm) you will be prompted for the extension to be displayed in mm or % strain. Alternatively, if you previously entered the maximum extension range in imperial units (in) you will be prompted for the extension to be displayed in inches or % strain. If the % strain option is taken a further message will be given to select the gauge length in either mm or in. The extension displayed will then be a percentage of gauge length.

PRELOAD

This option gives the user the choice of whether a preload should be applied or not. If a preload is applied, the user will be prompted to enter a preload value. During the test, when the load value reaches the preload value set, the extension reading is zeroed. The user may specify that the load reading is also zeroed.

5.0 OPTIONAL CONSOLE

UPPER MOVEMENT LIMITS

It is possible to enter either a tension or compression movement limit depending on the type of test set. When this limit is reached during a test, the test will be terminated in the same way as if the stop key had been operated or if a sample break had been detected. The crosshead will remain stationary or return to zero if the automatic return is selected. The value entered cannot be greater than the extension range selected. The main purpose of this option is to allow the user to do an automatic return before the sample breaks.

AUTO RETURN

(SEE ALSO BREAK DETECTOR) This option allows the crosshead to return to its original position automatically after sample break or on termination of the test. If rigid specimens are being tested in tension it is suggested that Auto Return should NOT be used as the ends of the broken specimen will possibly crunch together. We recommend that when the crosshead stops, remove the upper half of the specimen and then press <Return> manually.

AUTO ZERO

This option allows the user to automatically zero load and extension when the test is started, i.e. when <GO> is pressed. If conducting large batches of samples it is recommended that this option is set to Manual Zero. The reason for this is that on any mechanical system there will always be a finite error on return. With auto zero selected, every time <GO> is pressed the error will be zeroed and this error will gradually compound and may be significant if testing batches in excess of one hundred samples. With Manual Zero selected the error will never be worse than the resolution of the machine return to zero accuracy, normally

5.0 OPTIONAL CONSOLE

better than 10 microns on LLOYD INSTRUMENTS 500 Series Mk 3 machines.

BREAK DETECTOR

This option allows the Internal Break Detector to be switched on or off. If the break detector is switched on, the crosshead will stop moving when the load measuring system detects a sample break, i.e. a sudden drop in load. The sensitivity of the break detector can be set in two ways, Automatic or Manual - press <A> or to select your required option.

1. **Automatic.** If automatic is selected the break detector will start when the load reaches 7% of the load range and a break will be detected when the load drops to 3% of the load range or when the software detects 3 consecutive drops of 7% of the maximum load value detected. If 3 consecutive drops are detected, the break point is taken as the start of the first 7% drop. The load is sampled every 100 msec. If the load never exceeds 7% of load range, a break will never be detected. This means care must be taken to chose a sensible value for the load range.
2. **Manual.** Manual is selected you will be prompted to enter a value for the break sensitivity as follows:

%Break of Peak (3 - 97%) 30% ACCEPT A

The break sensitivity is defined as the percentage of peak load. The peak value of load is continually updated throughout the test and the break will be detected when the actual load value drops below this percentage of peak load. For example, if the load range was 100N but the peak load of the test was 50N, with a % break of peak set to 90% the test would terminate at a load of 45N, i.e. a drop in load of 10%.

5.0 OPTIONAL CONSOLE

PRINTER

(T5130L, OPTIONAL). The control module will automatically detect the presence of the optional printer. If a printer is fitted the testing machine will prompt you for the printing of test results or no printing. If the printing of test results is selected you will be further prompted for the printing of extension at peak and at break. You will then be prompted to select either a batch ticket or a ticket at the end of each test. Before proceeding to Ready Mode you will be prompted to enter the date, batch number and a reference number which will be printed on the test ticket. The printer is connected to the RS232 socket. No printer message will be displayed if printer is not connected.

HOLD PEAK

The load and extension displays will normally follow the actual values whether they increase or decrease. It is possible to remember the peak during a test by selecting this option. If you choose to hold the peak you will be further prompted to hold either the extension at maximum load or the extension at sample break. You will also be prompted to hold either maximum load or load at break. The maximum or break load and extension readings will be held after a successful test until a key is pressed. The machine will then return to the ready mode for the start of a new test.

JOG SPEED SELECT

This option prompts the user to select a speed for the Jog/Inching buttons. This will be used when setting up a sample or loading grips and the speed required will vary depending on the type of sample under test. The jog speed can be set in integer values between 2 and 100 mm/min.

5.0 OPTIONAL CONSOLE

CHANGING OPTIONS

The above test sequences can now be repeated by pressing the <R> key if you are unhappy with any of your choices. In order to simplify the setting of test options the accept key will be tagged to the last selected option, e.g. if the machine was set to external extensometer, and the last time you went through the setup sequence you selected the internal extensometer the next time through the setup sequence the internal extensometer will be selected using the <A> key. This makes it very easy to step through the setup sequence by only pressing the <A> key until you reach the option that you would like to change. This feature can also be used to quickly step through if you want to check which options you have selected. To reverse through the options list whilst still displaying another setup option, press the JOG UP key. This is useful if you accidentally passed the option you were looking for when pressing the <A> key. From the Ready mode, pressing will jump to the last setup option entered. Pressing the JOG UP key will then reverse through the previously entered options list.

5.6 CONNECTING A COMPUTER WITH THE CONSOLE FITTED

A computer can be connected to the 500 Series at any time. If remote operation is set on the optional console the control will then be handed over to the computer as appropriate. Please refer to section 4.3, your software manual or on-line help for further details of software operation. The information that follows is to be used in conjunction with the optional console.

5.7 PERFORMING A TEST USING THE OPTIONAL CONSOLE

5.7.1 Entering the Ready Mode

The user can enter the Ready Mode in one of two ways:

5.0 OPTIONAL CONSOLE

1. Ready Mode is automatically selected if the four basic machine parameters have been entered and Accept Options is selected. The four basic machine parameters are:
 - Local/Remote Operation
 - Load Range
 - Extension Range
 - Test Speed
2. The Ready Mode will also be automatically selected when all set up options have been viewed. The control console contains a battery backed up memory so that the previous test options will always be remembered even if the machine has been switched off. The user can simply accept the previous options if the machine is being used for the same test or modify the options to set a new test. The console display will always show the last selected option on the right side of the display, i.e. option A, where two options are given and, therefore, the user can simply proceed with the original parameters by continually pressing the key until the Ready Mode is reached.

5.7.2 READY MODE

Once the user has entered the Ready Mode the Ready Mode status indicator will illuminate indicating that the machine is ready to perform a test. In this mode the LCD display will alternate between three messages which are as follows:

```
LOAD 0.00 EXTENSION 50.0mm  
OPERATE [GO] FOR TENSION TEST  
OPERATE [R] TO CHANGE THE TEST CONDITIONS
```

5.0 OPTIONAL CONSOLE

Each of these messages will be displayed in rotation at four second intervals. Pressing any key on the console will always return the LCD to the load and extension display.

5.7.3 SETTING THE CROSSHEAD

The main purpose of the Ready Mode is to allow the user to prepare the materials testing system to perform a test. In this mode, and only in this mode, the bottom part of the console becomes active.

JOG UP - JOG DOWN

These keys allow the user to move the crosshead at its pre-set speed and are used to set the sample into position. Great care should be used in this operation to ensure the grips are not 'driven' together and that any obstacles are removed. These keys are only active whilst being pressed and the crosshead will stop as soon as the key is released (i.e. momentary action).

FAST UP - FAST DOWN

These keys allow the crosshead to be moved at the FULL SPEED of the machine to allow large movements quickly. Great care should be used in this operation to ensure there are no obstacles in the path of the crosshead / grips / load cell etc as damage can be incurred with improper use. These keys are only active whilst being pressed and the crosshead will stop as soon as the key is released (i.e. momentary action).

Note: When using the Down Jog keys in the Ready Mode there will be a force limit of 50N. This is a safety feature to reduce the risk of damage to the load cells if they are accidentally driven together.

5.0 OPTIONAL CONSOLE

ZERO Ø

The <Zero> key will zero both load and extension values while the crosshead is stationary. This will determine the point at which the crosshead will return on completion of a test (if Auto Return has been selected) or when the Return key is pressed.

RETURN

This key will cause the crosshead to return to its zero position. Care should be taken to ensure that all obstacles have been removed (such as broken samples etc) as the crosshead will return at full speed until it approaches the final position.

START TEST [GO]

This key will start a test according to the setup of the parameters selected.

STOP [STOP]

This key will stop the crosshead if it is moving and can be used at any time either in Ready Mode or during a test.

5.7.4 SAMPLE PREPARATION

The Ready Mode is used to prepare the sample for a test. The accessories being used will be dependent on the type of test being conducted.

5.0 OPTIONAL CONSOLE

5.7.5 LOAD CELLS

The correct load cells should be fitted in the machine for the application being undertaken. Great care should be taken of these as they are precision measurement devices and can be damaged if used incorrectly. Use the Alignment Gauge supplied to align the top and bottom eye ends.

5.7.6 GRIPS / ADAPTERS

It is important that grips are fitted along the central straining axis of the machine and that no side loads are applied to the load cells as this will affect the accuracy of the load readings. The grips should be connected to the load cell and the anchor pin using only the pins provided and care should be taken not to exceed the load rating of the grips. It is important to ensure that the grips used are suitable for the material under test. Any slippage of the material in the grips will affect both load and extension readings.

5.7.7 STARTING A TEST

Once the sample has been positioned and the necessary accessories have been installed, the ZERO button may be pressed (if required) to zero the load and extension readings (this is not necessary if Auto Zero was selected during test options). The test may now be started by pressing the GO button. The crosshead will move according to the set-up and the load and the extension values will be displayed on the LCD during the test. If the hold peak option has been selected the display will show the maximum load reached during a test. **THE TEST MAY BE STOPPED AT ANY TIME BY PRESSING THE <STOP> key.**

5.0 OPTIONAL CONSOLE

5.7.8 CLEARING THE BATTERY MEMORY

(RAM DUMP) This memory is used to store machine setup parameters and options when the power has been switched off. The parameters for the last test done prior to shut off will, therefore, be re-displayed when the machine is turned on. One of the options stored in the battery is the operator access code. A new access code can only be entered when the memory is empty. The battery memory can be cleared by removing the connector to the load cell before switching on. When the machine is now powered up it will check to see if the load cell is connected, and if not, the battery memory will be cleared. Mains interference can cause this memory to be corrupted. Should unusual functions occur the memory should be cleared.

6.0 CLEANING YOUR MACHINE

6.1 EXTERNAL FINISH AND TRIM

The finish and appearance of your machine can be maintained by regular cleaning with a damp cloth containing a small amount of mild detergent. The machine must be turned OFF and disconnected from the mains supply whilst cleaning is taking place. Strong proprietary cleaners and petroleum based or other solvents should not be used.

CAUTION: Take care to use only a damp cloth. NO moisture must ever be allowed to enter the machine. Wipe the machine dry before connecting to the mains supply and restarting.

6.2 CALIBRATION AND SERVICE

To maintain the performance and accuracy of the 500 Series It should be serviced and calibrated annually by Lloyd Instruments Ltd. trained and approved engineers.

THERE ARE NO USER SERVICEABLE PARTS WITHIN THE MACHINE

Any servicing and adjustments should be entrusted to Lloyd Instruments Service Engineers or their appointed agents.

7.0 SPECIFICATION

7.1 SPECIFICATION

TECHNICAL SPECIFICATION: 500 SERIES MACHINE Mk3	
Force Accuracy	Exceeds the requirements of, BSEN ISO 7500-1:99 1992 Class 0.5, ASTM E4, DIN 51221
Maximum load - compression or tension	500N
Standard Load Cell Ranges	10 - 500N plus additional special options
Load Resolution	Maximum resolution 0.01% of load cell rating
Range Between Eye Ends	40 - 490mm, (60 - 510 between pin. centre lines.)
Range Setting Without Grips	1-450mm
Speed Range	0.1-1020mm/min
Speed Accuracy (running, steady state)	Better than 0.2%
Computer Interface	RS232 25 way D connector
Console	Optional
Cycling	Cycling between load and extension limits available when the machine is used in Local mode (with the optional console). When used in conjunction with some data analysis programs a wide variety of cycling tests are available.
Accessories (optional)	A range of grips to meet national and international and industrial standards is available.
Service and Support	Qualified calibration and service engineers provide a prompt and efficient service world-wide.
Supply Voltage	115/230Vac \pm 10%, 50 -60Hz
Power Consumption	65 VA (max)
Fuses	1A (T)
Temperature	Operating: 5°C to 35°C (40 °F to 90 °F) Storage: -20 °C to 55 °C (-4 °F to 130 °F)
Atmospheric	Normal industrial and laboratory conditions
Dimensions	Width: 250mm Depth: 470mm Height: 871mm
Weight	Unpacked: 25kg (with standard accessories) Packed: 40kg (approx. with standard packing)

7.0 SPECIFICATION

TECHNICAL SPECIFICATION: 500 SERIES MACHINE Mk3 (cont.)	
Mounting	All systems are bench mounted
Input and Output Connections	CN1 - IEC Plug Mains In CN2 - 25 way D socket RS232 interface CN4 - Load Cell Socket (labelled LOAD CELL) CN5 - Console Connector 37 way D socket (optional)

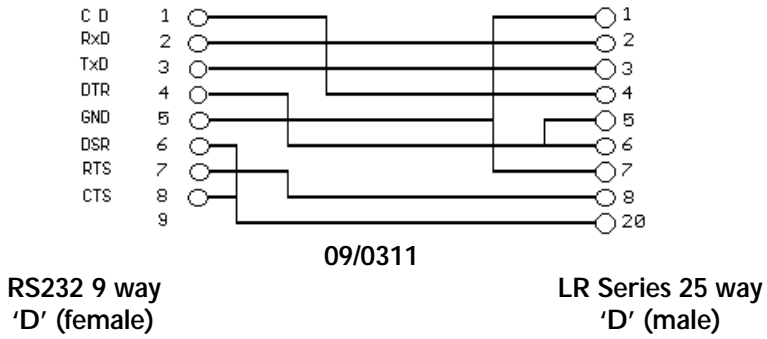
APPENDIX A : COMPUTER SPECIFICATION

A.1 RECOMMENDED COMPUTER SPECIFICATION

- 200 MHz Pentium II Processor
- 32MB RAM
- More memory may be required for some tests of very long duration.
- 1 Free COM Port, with a 16550 UART
- CDROM for installation
- Windows 95 or NT4 installed.

Lloyd Instruments Ltd cannot accept any responsibility for problems caused due to incompatible computer systems. If the computer is purchased from Lloyd Instruments the computer will have all relevant software installed and will be system tested to ensure correct operation.

APPENDIX B : RS232 CONNECTIONS



APPENDIX C : ERROR MESSAGES

- ERROR 1 Upper crosshead limit stop. Go DOWN only. This signifies that the upper software limit has been reached. Note if it is not possible to drive down,, the crosshead may have reached the hardware stop which implies that the slidewire is not set correctly.
- ERROR 2 Tension overload stop. Go DOWN only. This means that the full 10 volts has been reached by the load cell. If this occurs on clearing the RAM it implies that the load cell is damaged.
- ERROR 3 Tension invalid stop. Go DOWN only. This means that the load cell amplifier is reading eight volts which is equivalent to 100% load and is designed to prevent damage of the load cell.
- ERROR 5 Lower crosshead limit stop. Go UP only. This is the software crash stop and is designed to prevent damage to the grips. It should always be set so the grips cannot come into contact. If this occurs when out of limit it will be due to either a faulty console or noise on the extension readings.
- ERROR 6 Compression overload stop. Go UP only. This works on the same principles as Error 2,, although in compression.
- ERROR 7 Compression invalid stop. Go UP only. The same as Error 3 but in compression.
- ERROR 8 Wrong access code. This will occur only when not operating in open access. It means that the pass code has not been input correctly and can be removed by clearing the battery backup RAM.
- ERROR 9 Load cell supports tension only. This occurs when using small load cells (less than 5N) and is designed to prevent compression overloads on small cells.
- ERROR 10 Watchdog timeout. This means the internal timer has timed out which signifies the software has lost control for more than 200ms. Possible causes are:(i) RS232 hangs up,, excess commands; (ii) Short power failure; (iii) Power supply rises too slowly; iv) Software failure.
- ERROR 11 Load range exceeded. This error only occurs in the test state and stops the test when the user input load range has been reached.
- ERROR 12 Extension range exceeded. This error only occurs in the test state and stops the test when the user input extension value has been reached.
- ERROR 13 Guard not closed. This informs the user that the plastic guard doors are not closed. If doors are not fitted check micro switch.
- ERROR 14 Drive fault. Switch off power. This signifies that a motor fault signal has been detected. The software will beep continuously and the machine must be reset.

APPENDIX C : ERROR MESSAGES

ERROR 15	Printer fault. This indicates a fault in the printer address. It is usually due to a fault in the printer buffer chip and if no printer is fitted this chip may be removed. (Refer to Service Manual).
ERROR 16	RS232 Tx buffer overflow. Indicates that the console has filled its output buffer. This implies that the PC is not clearing the buffer fast enough (ensure that you are using a computer with a 286/386 CPU).
ERROR 17	RS232 Rx buffer overflow. Indicates that the internal buffer is full and implies that the machine is not acting on incoming command fast enough. Not common due to high clock speed.
ERROR 18	Keyboard buffer overflow. This error implies keyboard buffer full. This is almost impossible under normal conditions and probably would only be caused by a bad or intermittent connection.
ERROR 19	Unknown interrupt. Only occurs if the interrupt address given is invalid.
ERROR 20	RS232 Rx parity*. Will occur if the sending computer is using the wrong parity. The RS232 port in the sending computer is initialised by the R Control software.
ERROR 21	RS232 Rx overrun. This occurs when the embedded software does not see a stop bit after the first eight data bits. Can be caused by an incorrect baud rate.
ERROR 22	RS232 Rx parity/overrun. Combination of Errors 20 and 21.
ERROR 23	RS232 Rx framing *
ERROR 24	RS232 Rx parity/framing *
ERROR 25	RS232 Rx overrun/framing *
ERROR 26	RS232 Rx parity/overrun/framing *
ERROR 27	Unauthorised link to PC
ERROR 28	Compression safety switch
ERROR 29	Crosshead on limit switch.
ERROR 28	Compression safety switch
ERROR 29	Crosshead on limit switch

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(Sales & Service) www.WDTurner.com

ERROR 30 Interrupt failure – critical.

ERROR 31 Safe Line Open.

This can occur if any of the following switches are open:

1. Adjustable crosshead limit switches.
Action: Move the switch away and reset safe line.
2. Final/crash switches top or bottom.
Action: Ring Technical Support.
3. Software operated.
Action: No action possible, automatically reset by software.

APPENDIX C : ERROR MESSAGES

4. Motor switch.
Action: Ring Technical Support.
5. Motor drive thermal switches.
Action: Ring Technical Support.

Note: The Technical Support Telephone number is
+ 44 (0) 1489 486422.
Or Email:- techsupport@lloyd-instruments.co.uk

ERROR 32 Load Cell not connected

Lloyd Instruments Ltd has an on-going programme of design and development, which may alter product specification. Therefore Lloyd Instruments Ltd. reserve the right to change the specification at any time without notice.

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