TMS 93
REFERENCE
MANUAL

LINKAM

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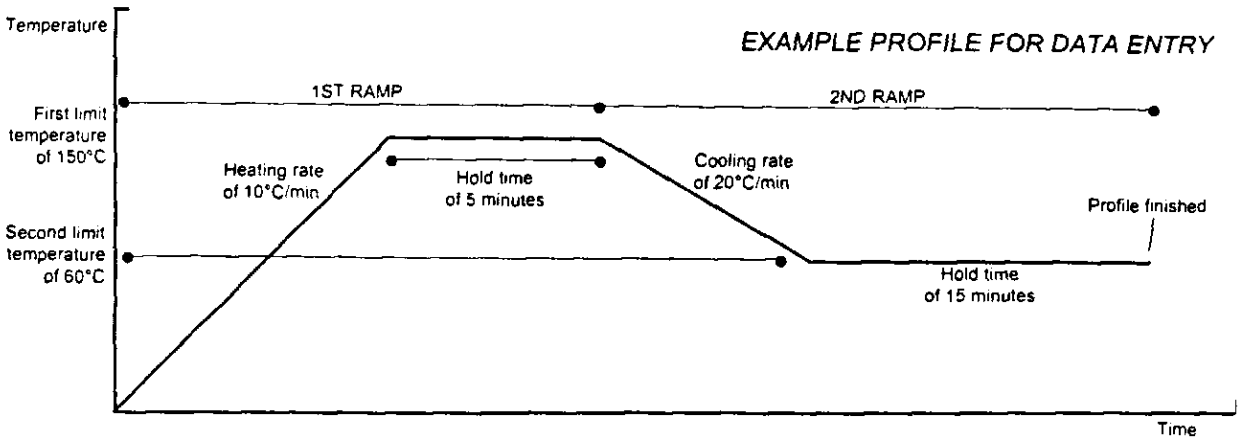
Contents

GETTING STARTED

Below is an example of how to enter a profile containing two ramps.



STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Switch TMS 93 on.		DEG 25.1
Press NEW key. The old profile will be deleted.	8 NEW	1 RATE _ DEG 25.1 LIMIT MIN
Enter the 1st rate of 10°C/min.	1 RECALL, 0 START, ENTER	1 RATE 10 DEG 25.1 LIMIT MIN
Enter the 1st limit of 150°C.	1 RECALL, 5 HOLD, 0 START, ENTER	1 RATE 10 DEG 25.1 LIMIT 150 MIN
Enter the 1st hold time of 5 minutes.	5 HOLD, ENTER	1 RATE 10 DEG 25.1 LIMIT 150 MIN 5
Enter the 2nd rate of 20°C/min.	2, 0 START, ENTER	2 RATE 20 DEG 25.1 LIMIT MIN
Enter the 2nd limit of 60°C.	6 EXIT, 0 START, ENTER	2 RATE 20 DEG 25.1 LIMIT 60 MIN
Enter the 2nd hold time of 15 minutes.	1 RECALL, 5 HOLD, ENTER	2 RATE 20 DEG 25.1 LIMIT 60 MIN 15
Press ENTER to finish data entry.	ENTER	3 RATE _ DEG 25.1 LIMIT MIN
Press start to begin profile.	0 START	

INTRODUCTION

The TMS 93 has been specifically designed to give precise temperature control of the Linkam range of heating/freezing Stages. Digital linearisation of the Stage's sensor gives accurate temperature values whilst the function keys have been carefully chosen to allow rapid changes in data values. The temperature profile is held in memory when power is switched off so an often used profile can be instantly run without re-entering the data values.

A varying d.c. signal is used to control the Stage and results in an even application of power which avoids the bursts seen with conventional burst fire a.c. techniques. Much finer control of the Stage temperature can be now be achieved over the whole range.

Automatic control of the LNP 93/2 is possible which reduces the amount of liquid nitrogen used and gives more repeatable results as the flow is continuously changed according to the set conditions.

Up to nine ramps can be entered which should allow most industrial or research processes to be copied. Any of the data values in a ramp e.g. rate, limit or time can be changed, including the values in a ramp which is not yet running.

The remote control can be used to instantly change up to three programmable heating/cooling rates and can also be used to store the last nine temperature readings. These readings can be recalled later using the front panel recall key. The three programmable rates are also held in memory when power is switched off.

With the remote control, the TMS 93 can function as a simple temperature controller ,thus avoiding the need to enter data values. To begin programming, only the rate key needs to be pressed followed by either the heat, cool or hold key.

To protect the TS1500 Stage from possible damage caused by too rapid a cooling the TMS 93 will not allow the user to exit from a profile whilst the temperature is above 300°C. An attempt to do so will cause a warning message to be displayed and the TMS 93 will cool the Stage to a safe temperature.

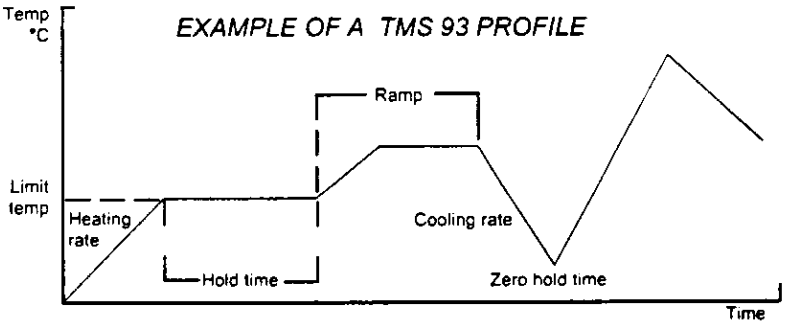
The contents of the front panel display can be superimposed onto a Video Camera Signal using a Linkam VTO232 Video Interface from the output provided.

With the remote control and the more complex profile capability the TMS 93 gives the user a very flexible instrument with which to programme the Linkam heating / freezing Stages.

A computer serial port is fitted which can be used with the **Link for Windows** software which allows the TMS 93 to be controlled from Microsoft's Windows 3.1x or above.. Details of this are available separately .

TERMS USED IN THE MANUAL

This section explains the meaning of certain words used in the manual and shown on the front panel display.



Profile

A sequence of consecutive heating or cooling rates which on reaching the specified limit temperature are followed by a period of time called the hold time. The hold time can be zero, so the subsequent rate is started immediately the current limit is reached. There can be from one to nine ramps in the profile.

Ramp

This describes a single sequence of either heating or cooling to a set temperature described here as the Limit. Once the set limit is reached the temperature is maintained for the entered hold time. The ramp number is always displayed in the top left of the display.

Start

The profile always begins at ramp one.

Cycle

The cycle function allows the entered number of ramps in the profile to be repeated indefinitely or until the exit key is pressed.
If the CYCLE function has not been selected the profile finishes at the end of the last hold time.

Remote Control Store Key

This key stores in memory, all the characters shown on the top line of the display. Up to three of these displayed values can be stored. When the key is pressed for the fourth time the new value is saved whilst the oldest value is lost.

Remote Control Recall key

Recalls the values recorded by the "Store" Key.

Hold Time

This is the period of time for which the temperature is held constant. It starts when the temperature reaches the set limit and is held until the end of the time set or until the exit key is pressed. The hold time value can be from 0 to 9999 minutes.

Exit

This key immediately terminates the profile and the power to the stage is switched off. If the Stage is a TS1500 and the temperature is greater than 300°C the power will not be switched off immediately but will first be rapidly cooled to 300°C. During this time, a warning message will alternately flash on the bottom line of the display.

	1 RATE 20 DEG 25.1 CANNOT EXIT:TEMP>300

The user is then asked if the profile should be saved. If any changes have been made during the profile (e.g. a rate or a limit has been modified) they do not have to be saved in memory thus avoiding the need to enter the original profile again which may have only been changed temporarily during the profile. If the user press's any other key than ENTER the changes will not be saved.

	DEG 25.1 SAVE PROFILE ? > ENTER

USING THE TMS 93

If the TS 1500 Stage is to be used, a TMS 93/1500 unit must be used, this unit not only functions as a programmer but also houses the power supply for the TS 1500 Stage. The TMS 93/1500 can also be used with other Stages in the Linkam range. If there is any change of Stage during the operation of either the standard TMS 93 or TMS 93/1500 units, the following message appears on the display. To reset the unit press any key on the display.

	NEW STAGE CONNECTED CALIB VALUES RESET

The unit automatically resets to the parameters of new Stage, e.g. the TS 1500 will have a temperature display of 1°C whilst other Stages such as the THMS 600 will display 0.1°C.
Each Stage is calibrated to compensate for the different sampling methods used in the setup of each Stage, this calibration is known as the Sample Calibration and is different for each Model of Stage. The Sample Calibration is automatically changed when there is a change of Stage, this is indicated on the display by the "Calib Values Reset".

NOTE: If the type of heating/freezing stage used with the TMS 93 is changed i.e. from a THMS 600 to a TS 1500 then the current profile in memory is deleted. This is to prevent any possible high limit values which have been entered for a TS 1500 stage from being used on a THMS 600 Stage and thereby causing damage from overheating.

Start key

When the start key is pressed the temperature profile currently in memory is executed. An often used profile can be entered once and then repeatedly used by simply switching the TMS 93 on, and pressing the START key. This key will have no effect if operating the Stage from a PC running Link Software or from the remote control.

Switch TMS 93 on.		DEG 25.1
Press START.	0 START	1 RATE 20 DEG 25.1 LIMIT 60 MIN 15

New key

This is used to enter a new profile which can contain up to 9 ramps. Once pressed the old profile in memory will be lost.
The following shows an example of entering a single ramp with a rate of 0.1°C/min to a limit of 37 °C followed by a hold time of 1 hour.
For a two ramp example look at the section GETTING STARTED.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Switch TMS 93 on.		DEG 25.1
Press NEW key. The old profile will be deleted.	8 NEW	1 RATE _ DEG 25.1 LIMIT MIN
Enter the rate of 0.1 °C/min.	0 START . RAMP 1 RECALL ENTER	1 RATE 0.1 DEG 25.1 LIMIT MIN
Enter the limit of 37 °C.	3 7 CYCLE ENTER	1 RATE 0.1 DEG 25.1 LIMIT 37 MIN
Enter the hold time of 1 hour.	6 EXIT 0 START ENTER	1 RATE 0.1 DEG 25.1 LIMIT 37 MIN 60
Press ENTER to finish data entry.	ENTER	1 RATE _ DEG 25.1 LIMIT MIN
Press start to begin profile.		1 RATE 0.1 DEG 25.1 LIMIT 37 MIN 60

VALID DATA RANGES

If an incorrect value is entered then the word ERROR will appear in the data field followed after a few seconds by the cursor.
Temperature range

THMS / HFS Stage	:	-196.0°C to 600.0°C
TS1500 Stage	:	0°C to 1500°C
BCS196 Stage	:	-196.0°C to 125.0°C
LTS350 Stage	:	-50.0°C to 350.0°C

Heating rate range
From 0.01 to 0.99°C/min at 0.01 degree intervals
From 1.0 to 9.9°C/min at 0.1 degree intervals
From 10 to 130°C/min at 1 degree intervals (when used with an LTS 350 the maximum is 30°C/min)
NOTE : A rate of zero is not allowed as this indicates the end of the profile.
Hold time range
From 0 to 9999 minutes.

Remote Control Recall key

This is used in conjunction with the remote control STORE key to display up to 3 rate and temperature readings. The most recent value stored can be recalled by pressing the RECALL key and will be displayed as 'LAST VALUE STORED' , by pressing the RECALL key again the value before that is displayed as 'Last Stored Value -1' the value stored before this value can be recalled by again pressing the RECALL key and is displayed as 'Last Value -2'.

Order in which values are stored	Display when stored values are recalled
First Value Stored	Last Value Stored -2
Second Value Stored	Last Value Stored -1
Third Value Stored	Last Value Stored

Ramp key

The RAMP key adds ramps to profiles and can also be used to examine, change or delete existing ramps. By pressing the RAMP key followed by the number of a desired profile the Rate, Limit and Hold Time data in this profile is displayed. Any one of these values can be changed by pressing the corresponding key and entering the new value as described in the RATE, LIMIT & TIME sections. When changes are made to a ramp using the RAMP key the changes are stored in non-volatile memory.
A heating/cooling rate of zero in a ramp indicates the end of the profile so by entering a rate of zero followed by ENTER all the subsequent ramps in the profile are deleted. Similarly ramps can be added to profiles containing less than 9 existing ramps.
The example opposite shows how to change the data in ramp 2.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Display before RAMP key.		DEG 25.1
Press RAMP key.	RAMP	_ DEG 25.1
Enter the ramp number. e.g. 2.	2 ENTER	2 DEG 25.1
The rate, limit and time values entered for ramp 2 will be displayed.		2 RATE 0.1 DEG 25.1 LIMIT 37 MIN 60
If required the rate, limit or time can be changed by pressing either the RATE, LIMIT or TIME keys.		2 RATE 0.1 DEG 25.1 LIMIT 37 MIN 60
If other ramps are to be examined then press the RAMP key again. Otherwise press the ENTER key.	ENTER	DEG 25.1

Rate key

The rate key is used to change the rate value currently displayed. If the TMS 93 is running a profile the RATE key can be used to change the current rate, this change will not be stored in the non-volatile memory. When used in conjunction with the RAMP key, the rate in any ramp can be changed and will be stored in the non-volatile memory. Below is an example of the procedure used to change the current rate of 10°C/min. to 20°C/min.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Change the current rate from 10°C/min to 20°C min.		1 RATE 10 DEG 25.1 LIMIT 150 MIN 15
Press the RATE key. The cursor appears in the rate field ready for data entry.	RATE	1 RATE _ DEG 25.1 LIMIT 150 MIN 15
Enter the new rate of 20°C/min.	2 0 START ENTER	1 RATE 20 DEG 25.1 LIMIT 150 MIN 15

Limit key

The limit key is used to change the limit value currently displayed. If the TMS 93 is running a profile then this key may be used on its own to quickly change the current limit. This will not be stored in non-volatile memory. When used in conjunction with the RAMP key it can change the limit of any ramp in the profile and be saved in non-volatile memory. Below is an example of the procedure used to change the current limit of 150°C to 220C.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Change the current limit from 150 °C to 220°C		1 RATE 20 DEG 25.1 LIMIT - _ MIN 15
Press LIMIT key. The cursor appears in the limit field ready for data entry.	LIMIT	1 RATE 20 DEG 25.1 LIMIT 150 MIN 15
Enter new limit of 220.	2 2 0 START ENTER	1 RATE 20 DEG 25.1 LIMIT 220 MIN 15

Time key

The TIME key is used to change the hold time value currently displayed. If the TMS 93 is running a profile then this key may be used on its own to quickly change the current hold time. This will not be stored in non-volatile memory. When used in conjunction with the ramp key it can change the time of any ramp in the profile and be stored in non-volatile memory.
The example overpage shows how to change the time hold time within a ramp.

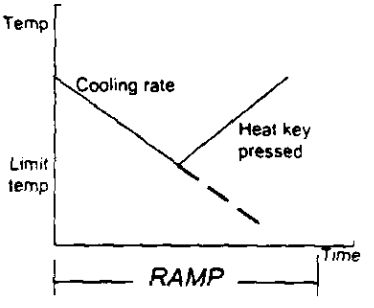
STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Change the current hold time from 15 minutes to 43 minutes.		1 RATE 20 DEG 25.1 LIMIT 220 MIN 15
Press TIME key. The cursor appears in the time field ready for data entry.	TIME	1 RATE 20 DEG 25.1 LIMIT 220 MIN -
Enter new time value of 43.	4 HEAT, 3, ENTER	1 RATE 20 DEG 25.1 LIMIT 220 MIN 43

Cycle key

The cycle key will set or reset the cycle mode. This mode is set when the CYCLE led is lighting and the TMS 93 will repeat the current profile indefinitely. If the cycle mode is already set , pressing the CYCLE key again will switch both the led and the cycle mode off.

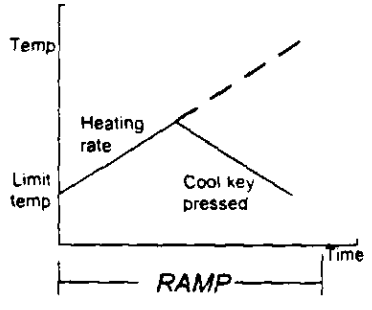
Heat key

The heat key can only be used when cooling or holding. If the TMS 93 is cooling either according to a set ramp or by use of the cool key, the HEAT key will force the TMS 93 into heating. If the TMS 93 is holding either by having reached its set limit or by the HOLD key, the HEAT key will force the TMS 93 into heating. When in use the display will show the word **HEAT** instead of the current limit value.
To cancel the heat mode press any of the following keys -HOLD, COOL, LIMIT or EXIT depending on the function required.
NOTE: If the heat function is left for too long, the internal ramp that the temperature is following will go above a maximum value and the TMS 93 will stop heating. These maximum values can be seen in the VALID DATA RANGES section.



Cool key

The cool key can only be used when heating or holding. If the TMS 93 was heating either according to a set ramp or by use of the heat key, the COOL key will force the TMS 93 to cool. If the TMS 93 is holding either by using the HOLD key or by having reached the limit, the COOL key will force the TMS93 into cooling. When in use the display will show the word **COOL** instead of the current limit value also To cancel the cool mode press any of the following keys -HOLD, COOL, LIMIT or EXIT depending on the function required.
NOTE: If the cool function is left for too long, the internal ramp that the temperature is following will go below a minimum value and the TMS 93 will stop cooling. These minimum values can be seen in the VALID DATA RANGES section.



Hold key

The hold key can be used when heating, cooling or at set limit. If heating or cooling then the HOLD key will cause the TMS 93 to hold the current temperature and the word **HOLD** will appear in place of the limit value. If holding at a limit temperature and the HOLD key is pressed the word **HOLD** will appear in place of the time value was and the time will be frozen until the hold key is pressed again.
To cancel the hold mode press any of the following keys -HOLD, COOL, RATE, LIMIT, TIME or EXIT depending on whether the TMS 93 is in limit hold or time hold.

Stage Connector

This 15 way 'D' type connector is used to connect the TMS 93 to the Stage. The THMS 600 Stages use a platinum resistor to sense the temperature which is precisely measured using a 4 wire ohm method. This prevents the resistance of the cable adding to the sensor's resistance and therefore affecting the temperature value. The TS 1500 uses this connector for the power supply but uses a seperate connector marked TS 1500 of the Thermocouple signal.

TMS93 reset

If the stage is disconnected the following message will be displayed:

NO STAGE LEAD CONNECTED

Once the Stage connector is inserted the TMS 93 is automatically reset.

REMOTE CONTROL

Connecting the remote control

The remote control plugs into a 6 pin Mini-Din connector mounted on the rear of the unit marked REMOTE . To prevent damage to the internal circuits because of static discharge switch the TMS 93 off before inserting this plug.

Using the remote control with a temperature profile

Used with a programmed profile the remote control copies the functions of the front panel heat, cool and hold keys. The store key saves the top line of the display in memory and can be recalled using remote recall key. Up to three values can be held in memory, after that. every new store value will force the oldest value to be lost.

On the remote control are three buttons marked R1,R2,R3 which when pressed change the heating or cooling rate instantly.

The user can program these instant rate keys to any valid rate and will still remain in memory when power is removed. These rates can be set as follows:-

1) Switch off the TMS 93 and wait for 5 seconds.
2) Switch on and immediately press the rate key and hold for ~3 seconds.
3) Proceed as shown below.

STEP	PRESS KEY	DISPLAY BEFORE ENTER
Press the rate key as soon as this message appears.	RATE	LINKAM SCIENTIFIC INSTRUMENTS
The cursor indicates that the rate key number should be entered.		- DEG 25.1 REMOTE CONTROL RATES
E.g. change the value for the R2 key.	2 ENTER	2 RATE _ DEG 25.1 REMOTE CONTROL RATES
The rate for the R2 key is displayed.		2 RATE 10 DEG 25.1 REMOTE CONTROL RATES
Press ENTER to finish examining the rate value for R2.	ENTER	2 RATE 10 DEG 25.1 REMOTE CONTROL RATES
Press the RAMP key followed by a number to examine another rate key value.	RAMP	_ DEG 25.1 REMOTE CONTROL RATES
Press the RATE key followed by the new rate to change the rate value for R2.	RATE	2 RATE _ DEG 25.1 REMOTE CONTROL RATES

SELECT ONE OF THESE THREE POSSIBLE KEY OPTIONS

Using the remote control without a profile

The TMS 93 can be made into a simple temperature controller with three programmable rates and instant heat, cool and hold functions without entering a profile. The controller mode is started by pressing one of the three rate keys after the TMS 93 is switched on. When operating in the remote only mode none of the front panel keys will function, so to stop programming the remote control EXIT key must be pressed.

NOTE: When the temperature reaches the maximum value for the particular stage being used it stop programming and the power to the stage will be switched off.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Press R1 on the remote control. In this example the preset rate for R1 is10°C/min.	R1	RATE 10 DEG 25.1
To start heating/cooling press the heat, cool or hold keys on the remote control.	HEAT	RATE 10 DEG 25.1 LIMIT HEAT

TMS 93/1500 for use with the TS 1500 High Temperature Stage

The power supply for the TS 1500 is housed within the TMS 93/1500 unit. The controller/power supply is connected to the Stage with banana leads supplied and fitted with 4mm plugs these are connected to the socket mark Stage connector. The Thermocouple is connected to the Stage through the connector marked TS 1500.

If a fault occurs with the TS 1500 stage or if a large sample is dropped into the cup at high temperatures, causing a power surge in the transformer the power to the stage will automatically be turned off and the following message will be displayed. Press any key to reset.

	DEG 25.1 PWR SURGE:SEE MANUAL

TMS 93 CONNECTIONS TO OTHER UNITS IN THE LINKAM RANGE

The TMS 93 and all the other units in the LINKAM range connect together using I^2C connectors and cables. The TMS 93 itself has one I^2C connector at the rear of the unit, all other units in the range have two connectors. Using I^2C connectors all units in the Linkam range can be simply 'Daisy Chained' together in any configuration as all the connectors are common and each unit has an individual pre-set 'address'.

COMPUTER SERIAL PORT

Typical pin connections for Personal Computer

TMS 93 to 9 way 'D' type

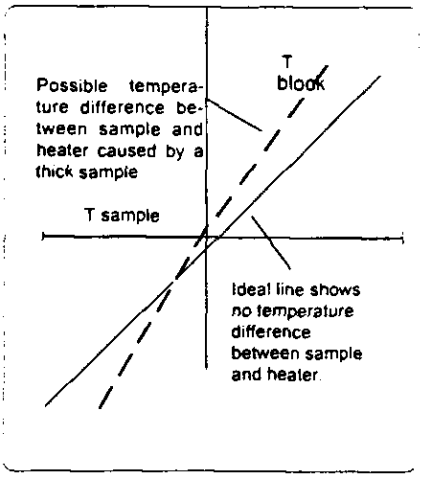
TMS 93			PC	
TX	pin 3	---------- RX		pin 2
RX	pin 2	---------- TX		pin 3
RTS	pin 7	---------- CTS		pin 8
CTS	pin 8	---------- RTS		pin 7
GND	pin 5	---------- GND		pin 5
		--------- DSR		pin 6
		--------- DTR		pin 4

TMS 93 to 25 way 'D' type

TMS 93			PC	
TX	pin 3	---------- RX		pin 3
RX	pin 2	---------- TX		pin 2
RTS	pin 7	---------- CTS		pin 5
CTS	pin 8	---------- RTS		pin 4
GND	pin 5	---------- GND		pin 7
		---------- DSR		pin 6
		---------- DTR		pin 20

SAMPLE CALIBRATION

The output from the platinum resistor in the Stage is accurately converted to temperature in the TMS 93 to better than 0.1°C. The platinum resistor is mounted as near to the top surface of the silver block as possible, which due to it's high thermal conductivity gives very little temperature difference between the top surface and the platinum resistor. However, when the sample is thick or if the sample is placed on a cover slip or crucible, it is possible that some temperature gradient can appear, causing the known temperature characteristics of a material to change. For further information see section SAMPLE CALIBRATION in the stage manual.



Using the sample calibration features of the TMS 93, these known values and the experimental values can be used by the TMS 93 to draw a new temperature curve. A positive and a negative temperature as well as a value for zero can be entered, although it is not necessary to enter all three sets of data. For instance the zero value can be left at zero and just a positive or negative value determined and entered.

The following procedure outlines the entry of three sets of data points. These values are entered as six temperatures in the following order: actual negative value, measured negative value, actual zero value, measured zero value, actual positive value and finally the measured positive value. If only one pair of values is to be changed the other values can be left the same by pressing the ENTER key. When the temperature value is asked for, the old value will be displayed until one of the number keys is pressed. When the instrument is delivered or if an instrument calibration is carried out the values are set to factory defaults. This effectively means that there are no calibration factors set, as the actual and measured values are the same.

Before a set of calibration temperatures can be determined on the stage, the existing calibration factors must be removed. This ensures that the TMS 93 read the sensor's resistance directly and converts it to temperature without using the calibration factors. This procedure is outlined below and will set the existing measured and actual values for the end points to be the same. The zero value will be reset..

Removing the existing calibration values

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Switch on and press key 3 when LINKAM SCIENTIFIC INSTRUMENTS appears.	3	LINKAM SCIENTIFIC INSTRUMENTS
The following message will appear for a few seconds.		TMS 93 SAMPLE CALIBRATION
Press the exit key to reset the calibration values.	6 EXIT	RESET CAL:PRESS EXIT NEW CAL:PRESS ENTER

New calibration values

The TMS 93 and Stage may now be used in the normal way to determine the melting points which are then entered as shown below. In this example we will assume that the preset values are set and will be displayed before each new entry.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Switch on and press key 3 when LINKAM SCIENTIFIC INSTRUMENTS appears.	3	LINKAM SCIENTIFIC INSTRUMENTS
The following message will appear for a few seconds.		TMS 93 SAMPLE CALIBRATION
Press the exit key to reset the calibration values. Press the enter key to enter new calibration temperatures.	ENTER	RESET CAL:PRESS EXIT NEW CAL:PRESS ENTER
Enter actual negative calibration temperature. Previous value will be displayed. Press enter for no change.	- COOL, 4 HEAT, 5 HOLD, ENTER	ENTER TEMPERATURE VALUE 1 ? -45
Enter measured negative calibration temperature. Previous value will be displayed. Press enter for no change.	4 HEAT, 6 EXIT, ENTER	ENTER TEMPERATURE VALUE 2 ? -46

On completion the TMS 93 will reset and will now show the temperature modified by the calibration factor.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
Enter actual zero calibration temperature. Previous value will be displayed. Press enter for no change.	0 START, ENTER	ENTER TEMPERATURE VALUE 3 ? 0
Enter measured zero calibration temperature. Previous value will be displayed. Press enter for no change.	0 START, . RAMP, 7 CYCLE	ENTER TEMPERATURE VALUE 4 ? 0.7
Enter actual positive calibration temperature. Previous value will be displayed. Press enter for no change.	3, 3, 7 CYCLE, ENTER	ENTER TEMPERATURE VALUE 5 ? 337
Enter measured positive calibration temperature. Previous value will be displayed. Press enter for no change.	3, 3, 9, ENTER	ENTER TEMPERATURE VALUE 6 ? 339

INSTRUMENT CALIBRATION

This calibration which can be carried out from the front of the panel should only be necessary if the unit has been repaired or if the user has fitted a new EPROM as an update.

STEP	PRESS KEYS	DISPLAY BEFORE ENTER
1) Switch on and press the ENTER key when LINKAM SCIENTIFIC INSTRUMENTS appears.	ENTER	LINKAM SCIENTIFIC INSTRUMENTS
2) The following message will appear for a few seconds.		TMS 93 LINEARISER CALIBRATION
3) If the instrument calibration is not required press the EXIT key. To continue press ENTER.	ENTER	PRESS EXIT TO FINISH OR ENTER TO CONTINUE
4) The following message will appear for about 6 seconds and then the TMS 93 will reset.		CALIBRATION IN PROGRESS

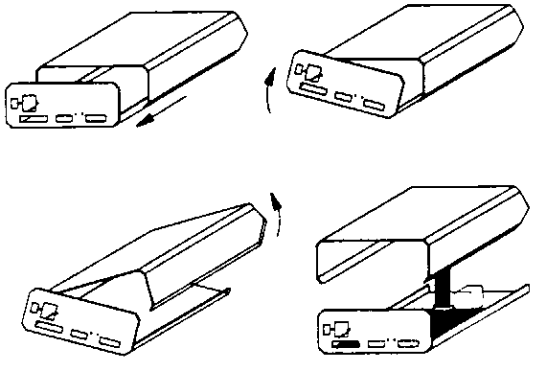
IOTE:
NSTRUMENT CALIBRATION WILL RESET THE SAMPLE CALIBRATION VALUES TO THE DEFAULT 'EMPERATURES. THE REMOTE RATES WILL BE PRESET TO 5,10 & 20°C/MIN.

LINKSYS AND TMS93 SOFTWARE UPDATE INSTRUCTIONS

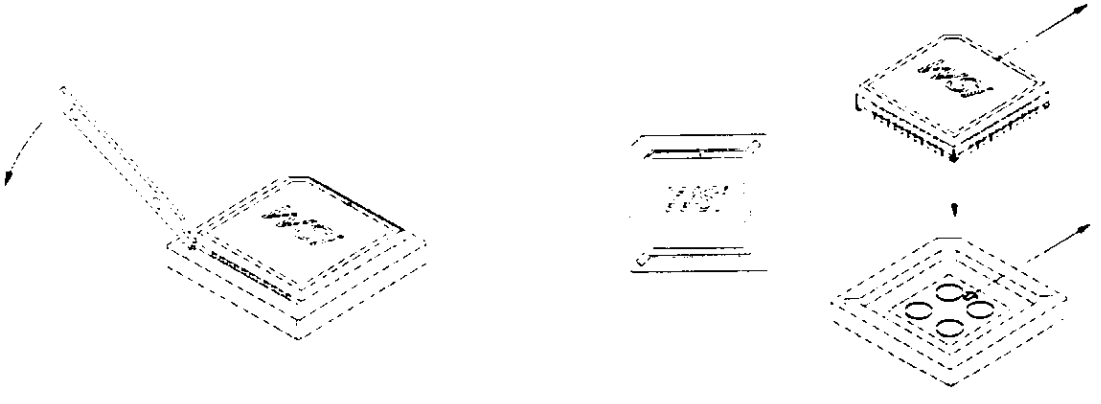
1) Contact Richard Lloyd at Linkam quoting the serial number of your TMS93 and he will tell you the calibration resistor and calibration voltage values for the unit.

2) INSTALL THE NEW SOFTWARE IN THE TMS93 UNIT.

A) Remove the mains power and the stage from the unit. Take out the four screws that hold the case sleeve on and remove the sleeve as shown below :



B) Inside the unit there will be one chip with a white handwritten label on it, look at the diagram below and then using the extraction tool replace this chip with the one supplied.



C) Reassemble the case, plug the stage and the mains back in and switch the unit on.

2) INSTALL THE LINKSYS SOFTWARE ON YOUR COMPUTER.

A) Insert disk one and run the file install.exe.
B) Put the dongle on your computers printer port, LPT1, and connect the RS232 cable between the spare serial port on the computer and the RS232 interface port on the back of the TMS93 unit.
C) Run the LINKSYS software, under the setup menu select, "COMM PORT", and select the one being used.
D) Under the file menu select, "RESET SERIAL INTERFACE", and the temperature should be displayed.
E) Under the calibration menu select, "SAMPLE", and then click on the exclamation mark.
F) Enter the password, "93C46P", and enter the calibration values.
G) Press the calibration button.