Linkam Scientific Instruments

PE95 / T95
System Controller

USER GUIDE

Contents

Safety Information

Important Notice

Please check that your Linkam equipment has not been damaged during transport.
If there is any evidence of external damage to the electrical items:-

do not connect the power cord or switch the unit on.

Contact Linkam Scientific Instruments Ltd or their appointed distributor immediately. Your warranty may be impaired if Linkam is not informed of any transport damage within 7 working days of delivery.

Requirements for Safe Use

1: Read all of this guide before using the equipment. Save these instructions for later use.
2: Follow all warnings and instructions marked on any of your Linkam equipment, or contained within the manuals.
3: If for any reason the mains fuse needs to be replaced then it must be replaced by one of the same type and rating as shown in the equipment ratings.
4: To prevent electric shock, do not remove the cover of the equipment.
5: Never use the equipment if the power cord has been damaged. Do not allow any heavy objects to rest on the power cord. Never lay the power cord on the floor.
6: Do not obstruct any ventilation holes. Do not attempt to insert anything into these openings. Provide adequate ventilation of at least 75mm all around the equipment.
7: Do not expose the equipment to water. If for any reason it gets wet, then remove the power cord from the mains outlet and contact Linkam Scientific Technical Support.
8: The equipment is not intended to be used outdoors.
9: Each product is equipped with a 3-wire grounded (earth) power plug or a free-end 3 wire power cord. The plug only fits into a grounded-type outlet. The free-end power cord should be connected to a correctly grounded 3-wire power outlet. Do not defeat the purpose of the grounded (earth) type plug. Free - end power cords are colour coded as follows:-

Colour	**Function**
Brown	Live
Blue	Neutral
Green/Yellow	Earth (Ground)

10: The power cord must be an appropriately rated and approved cord-set for the country it is being used in.
11: If any problems occur then remove the power cord from the mains outlet and contact Linkam Scientific Technical Support.
12: NO attempt should be made to repair or modify the equipment in any way, as there are no user replaceable parts. Any servicing should be carried out by qualified service personnel. Do not remove the cover from the equipment unless the power cord has been removed from the mains outlet.

Caution Labels and Indicators

This safety symbol on the back panel warns the user :

Do not to make or remove any connections while the unit is powered on.
Do not to remove the cover.
Servicing should only be done by qualified service personnel.

This safety symbol is seen on the back panel of the equipment and warns the user:

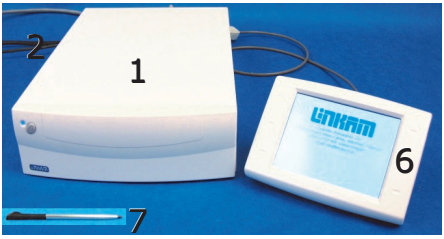
To avoid electric shock the power cord protective grounding conductor must be connected to earth or ground.

Equipment Maintenance

The equipment does not require any regular maintenance. Contact Linkam should you require any maintenance. Before cleaning the case or front panel of the equipment, remove the mains cord from the mains outlet. Use a small quantity of isopropyl alcohol (IPA) on a soft cloth and gently wipe the surface.

Introduction

Thank you for purchasing a Linkam system. Please take the time to read through all the manuals, as it will help you to fully understand the equipment.



The T95 System Controller is supplied with or without a LinkPad.

1: T95-LinkPad: a stand alone system which uses a touch screen colour display to input data to control the stage but can also be used with Linksys32. Note: when connected to the PC the LinkPad cannot be used to enter ramp parameters but continues to display all the attached sensor values.
2: T95-Linksys32: a PC interface which requires Linkys32 software to input data to control the stage.

Please check you have received the following items:-

1: T95 System Controller
2: Power cord
3: RS232 cable for PC connection
4: USB Type A to B cable for firmware upgrades
5: Manual

If you have purchased the Linkpad then please also check the following:-

6: Linkpad
7: Stylus

Before using your Equipment

Please register your products by going to www.linkam.co.uk and clicking on the product/software registration button. You will need to register your equipment with us to:

Activate your warranty and technical support.
Access the online setup videos.
Permanently unlock the Linksys32 software by use of a product key (if purchased).

To unlock the Linksys32 software a product key must be requested which is supplied by Linkam from a customers product registration number. This is generated after installing the Linksys32 software by running the register program from Start-Programs-Linkam-Register. See the Linksys32 manual for further installation instructions.

Warranty

This equipment has a warranty against defects in material and workmanship for a period of 12 months. Linkam will either repair or replace products that prove to be defective. For warranty service or repair, this product must be returned to Linkam or a designated service facility.
The warranty shall not apply to defects resulting from interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

Technical Support

Any technical questions or queries should be emailed to the Technical Support Department at
support@linkam.co.uk

Feedback

Your feedback will be greatly appreciated, please go to www.linkam.co.uk to fill in the feedback form.

T95 System Controllers

There are three types of system controller which are specific to a range of Linkam stages as some use a thermocouple sensor compared to a platinum resistor or require higher current or different voltage power supplies. The specific type can be seen on the rear panel label under the Model heading and are T95-PE, T95-HS and T95-HT.

T95-PE

Supplied with a 15V 8A power supply and is used for all Peltier stages and small area silver block stages. Some of these include:-

Peltier		Small Area Silver block Stages	
LTS 120	LTSE 120	THMS 600	THMSE 600
LTSE 120 LC	LTS 120-Inverted	THMSG 600	THMS 600PS
PE 120	PE 120-XY	THMS 350V	BCS 196
PE 120-LI	PE 100-LI3	FDCS 196	FTIR 600
PE 100-LIL	PE 100-DMI	FTIR-600 Vertical	DSC 600
PE-NK120	PE100-NI	Ellipsometer Low T	Ellipsometer High T
PE100NIF	PE-BX120	HFS 91	HFS 91-PB4
PE100-OI	PE-ZE120	HFS 91-CAP	HFS 350V
PE100-ZI/200	PE100-ZI/100	TST350	MDS600
PE100-ZI/25	PE100-ZAL		

T95-HS

Supplied with a 24V 5.2A power supply and is used for all the large area stages. Some of these include:-

Large Area		Large Area	
LTS 420	LTSE 420	LTSE420 LQ Pro	LTSE420-Probe
LTS 350	LTSE 350		

T95-HT

Supplied with a 15V 13A power supply and is used for all high temperature stages which use a thermocouple sensor. None of these are supplied with a LNP 95 Liquid Nitrogen Pump. Some of these include:-

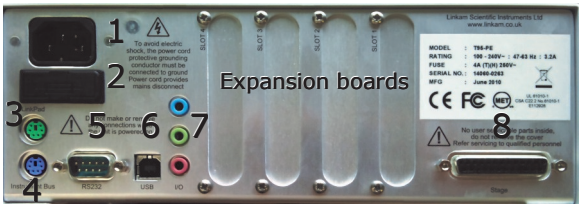
High Temperature		High Temperature	
TS1500	TS1200	TS1000	TS1400-XY
CCR1000			

Connecting Your T95 System Controller

Back Panel Cable Connections

Warning: To avoid any damage to the T95, switch the unit off before connecting or removing a connection.

1: Power socket
2: Fuse holder
3: LinkPad connector
4: Instrument Bus connector, for LNP95 Liquid Nitrogen pump System.
5: RS232 connector for PC Comm port connection.
6: USB connector (used for firmware upgrade only).
7: External input and output sockets.
8: Stage connector.



Refer to your stage manual for additional connection information.

Stage Connector

Most of the standard silver block, large area stages and the Peltier stages do not require any expansion boards and only the stage needs to be connected to the socket marked Stage (8). This supplies power to the stage and measures the temperature using a platinum resistor sensor.

LinkPad Connector

If you have purchased a LinkPad then plug it into the LinkPad connector (3). It may be necessary to pull back the sprung mounted green moulding towards the cable before inserting the connector.

Instrument Bus

This connection is only used for the LNP95 Liquid Nitrogen Pump. If your stage has been supplied with an LNP95 then a cable will have been provided which is used to connect the T95 to the LNP95.
It may be necessary to pull back the sprung mounted violet moulding towards the cable before inserting the connector.

Expansion Boards

Most of the standard silver block, large area stages and the Peltier stages do not require any expansion boards and only the stage needs to be connected to the socket marked Stage (8). If you have purchased a LinkPad then plug it into the LinkPad connector (3).
For a PC connection use the supplied RS232 **crossover** cable.

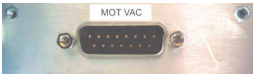
Any of the stages which use an expansion board will be marked with the same label as the T95 expansion board.
To avoid any damage to the T95, switch off before making any connections.

T95-HT

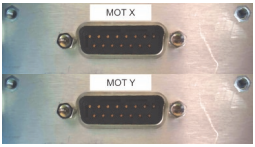
Slot 4 will be fitted with a thermocouple sensor board and has two connectors marked TCC and TCS. Connect the cable from the stage marked TCS to the connector marked TCS on the rear of the T95.
The stage lead marked T95 STAGE is connected to the T95 Stage connector (8).

Stages with Vacuum Gauge
Connect the Pirani gauge to the connector marked VAC.

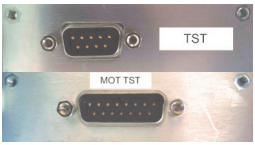
Stages with Motorised Vacuum Control (MV196)
The MV196 motorised valve connects to the MOT VAC connector usually in slot 1.



Stages with Motorised XY Movement (MDS600)
The motorised stages require two motor control boards, one for each axis and are connected to the MOTX and MOTY connectors which are usually in slots 1 and 2.

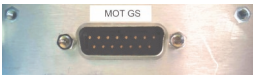


Tensile Stage
The tensile stage requires two boards, one for the distance and strain gauge connections, the other for the motor control. Connect the MOT TST and TST connectors to the boards as marked.

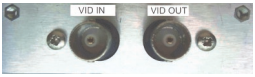


DSC600 Stage
Connect the cable from the stage marked DSC to the connector marked DSC on the rear of the T95.

Graded Stage
The graded stage needs one of the T95 controllers to have a motor control board.
Connect the cable from the stage marked MOT GS to the connector marked MOT GS on the rear of the T95.



VTO-95 Option
T95 systems shipped with a VTO-95 video overlay have an expansion slot fitted as shown. VID IN connects to the camera or video source, VID OUT connects to the video monitor, recorder or PC.



RS232 Option
An extra RS232 serial port module can be fitted in a slot and is used to communicate with the humidity controller.

External Input and Output Sockets

There are three 2.5mm jack sockets (7) on the rear of the T95 for synchronising or controlling external equipment, see page 21 for the electrical specifications.
The LinkPad is used to program the outputs on a ramp by ramp basis, see page 8 **Ramps**.

USB Connector

At present this is only used for updating the firmware in the T95.

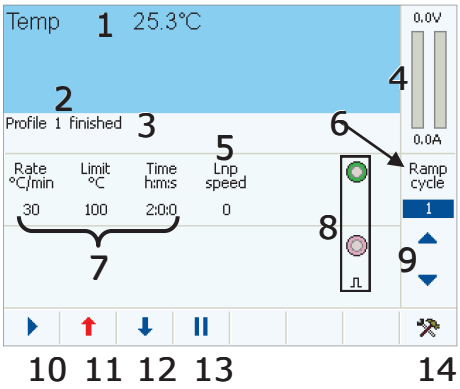
Using the Optional Linkpad

The angle of the screen is not adjustable, attempting to tilt the screen will damage the stand.

The display screen is touch sensitive, so you can use either your finger or the stylus to operate the LinkPad.
If you are using the LinkPad with Linksys32 and a PC connection, only sensor data such as temperature will be shown. The power indicators still operate as does the Setup button.

Main screen display:

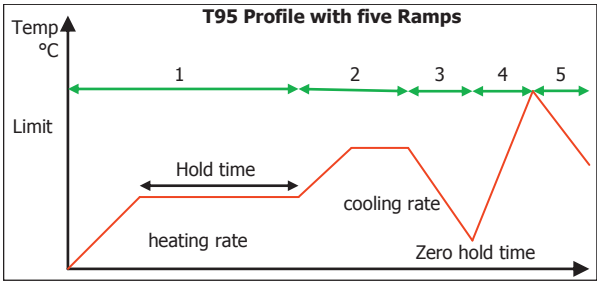
1: Temperature reading of stage (ºC)
2: Profile selected (1-3)
3: Ramp status
4: Power consumption of stage bar graph
5: Liquid Nitrogen Pump Speed (1 to 100). If LNP95 is connected for cooling, see page 18
6: Shows ramp cycle mode on/off and ramp number
7: Programmable parameters (**Rate**, temperature **Limit** and hold **Time**)
8: Optional switched outputs, see **Ramps** below
9: Display next ramp up/down button
10: Start/stop button
11: Override heat button
12: Override cool button
13: Pause button
14: Setup button



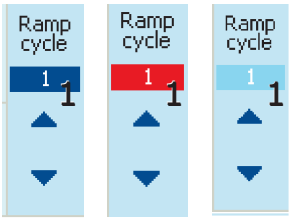
Profiles and Ramps

Profiles

The T95 can store and recall up to three profiles. A typical example of a five ramp profile is shown here. Normally the start ramp is 1 and the end ramp is 100 but it is possible to run a small section of a profile by changing these two values—see page 10.



The start ramp is indicated by a dark blue background around the ramp number (1) which changes to a red background for the stop ramp. The active row of the profile when heating/cooling is shown with a cyan coloured background.



Ramps

A profile can have up to 100 different ramps, each ramp with it's own heating/cooling rate, limit and hold time. In addition the optional outputs on the back of the T95 can be used to switch external signals either at the beginning of a ramp (green connector) or at the beginning of a hold time (pink connector).

To change the ramp number (8) by one, simply touch the up or down arrows. For more functions such as changing the profile, copying and pasting rows see page 10.

Cycle

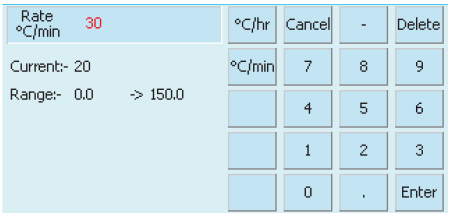
A profile or a section of a profile can be cycled continuously which if selected is shown by the word cycle under the Ramp (8). See page 10 for more details of how to set the cycle function on or off.

Profile Data Entry

Rate

To change the heating / cooling rate in the selected ramp number, touch the area of the rate value. A new data entry screen will appear.

The current rate value in °C/min or °C/hr and the range of rates permissible for the stage, are displayed together with a numeric keypad. To change from °C/min to °C/hr or vice- versa touch the **°C/min** or **°C/hr** button. Use the keypad to type in the new rate value and touch **Enter.**

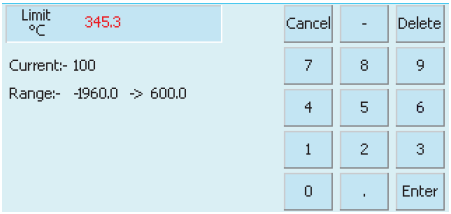


Touch **Cancel** to go back to the main screen without changing the rate value.
If a number is incorrect then simply touch **Delete** and then re-enter it.

Limit

To change the limit in the selected ramp number, touch the area of the limit value. A new data entry screen will appear.

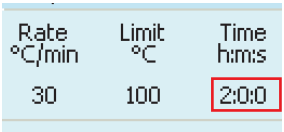
The current limit value and the range of limits permissible for the stage, are displayed together with a numeric keypad. Use the keypad to type in the new limit value and touch **Enter.**



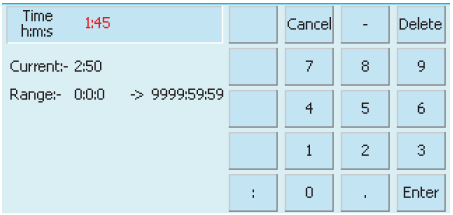
Touch **Cancel** to go back to the main screen without changing the limit value.
If a number is incorrect then simply touch **Delete** and then re-enter it.

Hold Time

To change the hold time in the selected ramp number, touch the area of the time value. A new data entry screen will appear.



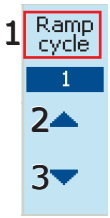
The current time value and the range of time values permissible are displayed together with a numeric keypad. Use the keypad to type in the new time value, with a colon (**:**) as a field separator between the hours minutes and seconds value, and then touch **Enter**.
To enter just minutes and seconds then enter **m:s**. For minutes only, just enter **m:**.



Touch **Cancel** to go back to the main screen without changing the hold time value.
If a number is incorrect then simply touch **Delete** and then re-enter it.

Changing the Profile

Up to three profiles can be stored, used or recalled. The default profile is one.
To change the values in a profile ramp, simply touch the up/down (2&3) buttons until the ramp number is displayed.
To change to a different profile or to make changes in the operation of the existing profile touch the area around the Ramp display (1) and a new popup screen will appear.



Touch the button (6) and a new screen will appear showing the current profile, the range of profiles and a numeric keypad. Use the keypad to enter the required profile and touch **Enter**.
Touch **Cancel** to go back without selecting a different profile
If a number is incorrect then simply touch **Delete** and then re-enter it.

Clearing the Profile to defaults

To clear a profile touch (7) and confirm the delete by touching the tick button. This will clear all the ramps in the profile to zero except for ramp one which will be set with a rate of 1°C/min and a limit of 25°C.

Copying and pasting a profile row (4 & 5)

Select the ramp for copying or pasting by touching the up/down keys (2) and (3). Touch the area around the Ramp display (1), then select (4) to paste a row or (5) to copy a row.

Clearing a profile row (8)

Touch the area around the Ramp display (1), then select (8) to set the rows values to zero. Note that a rate of zero marks the end of a profile, so clearing a row and then attempting to start from that row will do nothing.

Changing the start row (9)

The default start row is one, but can be changed by touching the up/down keys (2) and (3) to select a row, then touching (1) and then (9).
If the start row is greater than the stop row then a warning message will de displayed.

Changing the stop row (10)

The default stop row is 100, but can be changed by touching the up/down keys (2) and (3) to select a row, then touching (1) and then (10).
If the stop row is less than the start row then a warning message will de displayed.

Cycling or repeating a profile or a section of a profile (11)

Touch the area around the Ramp display (1) and then touch the cycle on/off (11). If cycle is selected the word cycle will appear under the Ramp display. In cycle mode, the ramps from the start to the end row will be repeated continuously.

Close Profile change window (12)

Touch the tick button (12) to close the profile change window.

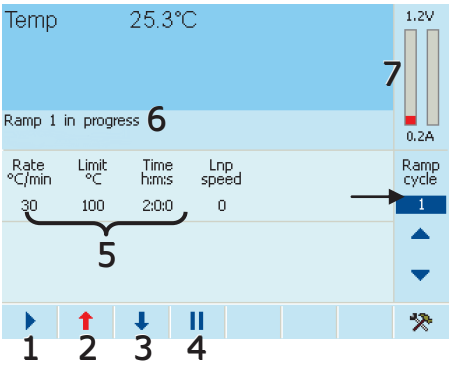
Running the profile

Starting

Once the profile value(s) are entered, simply touch the start button (1) to begin the heating or freezing of the stage.

The ramp status (6) will change to show which ramp is in progress and the power indicator (7) will show a red bar which rises and falls with the amount of power fed to the stage. If selected the current and voltage will also be displayed.

At any time the rate limit or time may be changed by simply touching on any of the displayed values (5) and entering a new value.



Pause heating/cooling or the hold time

Touching the pause button (4) during the profile will stop the rate of heating/cooling until either the heat (2) or cool (3) button is pressed or the limit is changed.

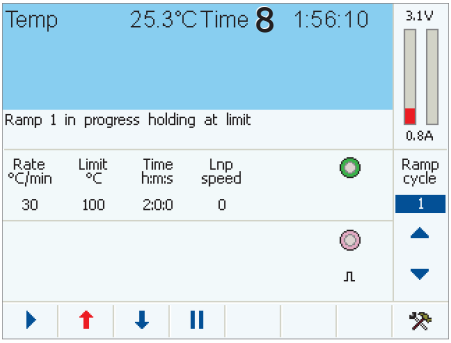
If the limit has been reached, touching the pause will stop the time countdown. Touching the pause or changing the hold time will begin the countdown.

Touching the heat, cool buttons or changing the limit will exit the hold time and the time value will disappear.

Limit reached

When the limit is reached, the hold time (8) if set will be shown and will begin to count down. If a hold time is zero then the next ramp will be started.

If the next rate value is zero or the stop ramp is reached then the profile will stop.



Heat and Cool buttons

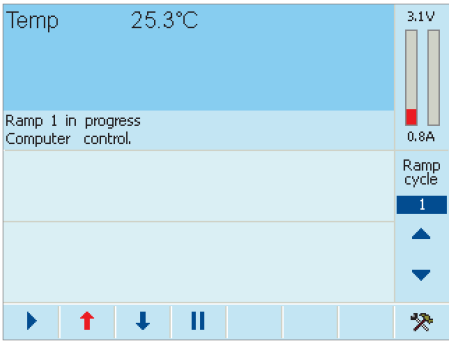
The heat (2) and cool (3) buttons are used to override the profile settings e.g. if heating to a limit of 200 and an event occurs you can quickly cool by simply touch the cool button (3).

Linksys32 or Computer Control

When the T95 and LinkPad are used with a serially connection e.g. Linksys32 then the LinkPad operation is limited to the start, stop and setup buttons only.

The profile table will not be shown and the ramp status (4) will show Computer control.

To renable the LinkPad, close the serial connection and wait for five seconds.

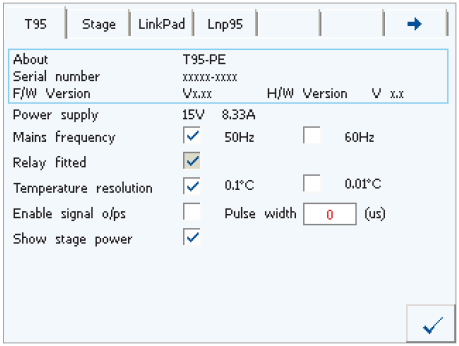


Setup and Information

Touch the Setup button to display the set of screens which show the T95 System Information and allow the user to select and change various options. The information is presented under a set of tabs shown at the top of the screen.
Check boxes with a white background indicate an option which can be changed by the user and are simply changed by touching the required check box.

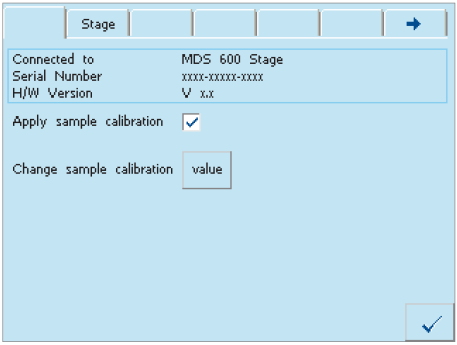
T95 Tab

Shows the serial number and firmware version of the T95 system controller. For the best performance in any one country the Mains frequency should be correctly checked.
Temperature resolution can also be changed depending on the stage.
Enabling the signal outputs bring up a representation of the green and purple rear panel connectors on the main running display.



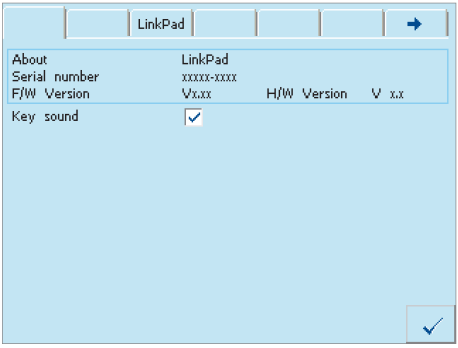
Stage Tab

Touching the Stage tab shows information about the connected stage and allow a sample calibration of the stage to be used or new values to be entered or cleared. The values are stored in the stage lead. See section Sample Calibration on page 15.



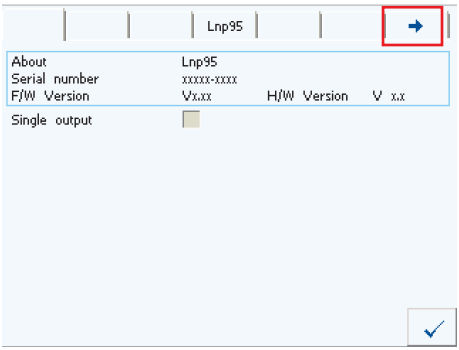
LinkPad Tab

Shows information about the connected LinkPad and allows the user to enable or disable the Key sound.



Lnp95 Tab

Shows information about the connected Lnp95 which should always be switched on before the T95 Sytem Controller. The firmware version of the Lnp95 is displayed and may be required for any support calls.

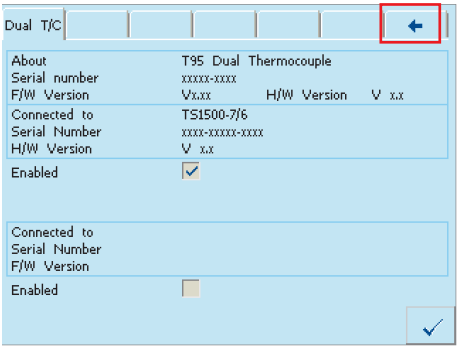


Option Board Information

To get to the option board information touch the blue right arrow tab and to go back to the T95 system controller information touch the blue left arrow tab.

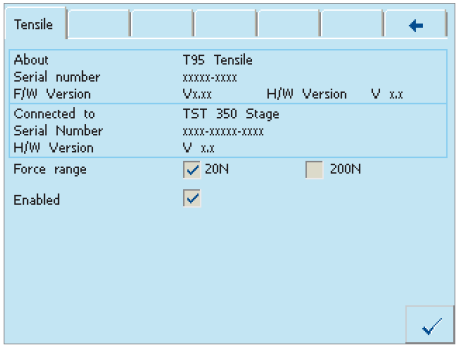
Dual T/C Tab

T95 System Controllers connected to a high temperature stage require a dual thermocouple option board. This tab shows which stage is connected and it's serial number. The other input of the dual card will show blanks.



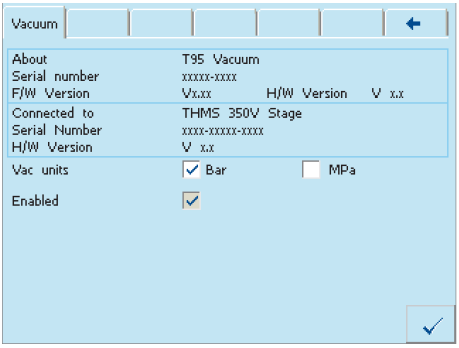
Tensile Tab

T95 System Controllers setup for a tensile stage require a signal conditioning option board. The 20N or 200N check box indicate which beam is connected on the tensile stage.



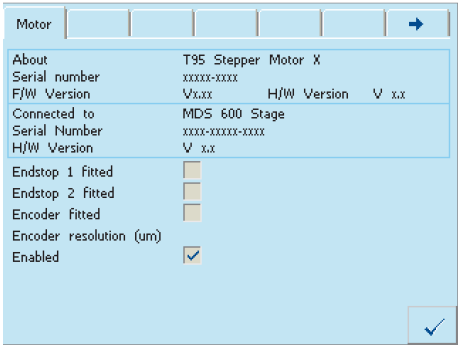
Vacuum Tab

T95 System Controllers setup for a Pirani vacuum gauge require a signal conditioning option board.
To change the displayed vacuum value from Bar to MPa simply touch the desire check box.



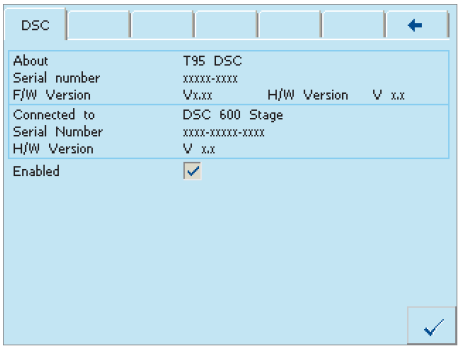
Motor Tab

T95 System Controllers connected to stages which have motorised movement, such as the MDS600, TST350 or the GS350 require a number of motor drive option boards, one for each motor.
Each motor tab will show the detail of the board and how it is configured and which stage is connected.
Extra information about the end stops and encoders are also detailed.



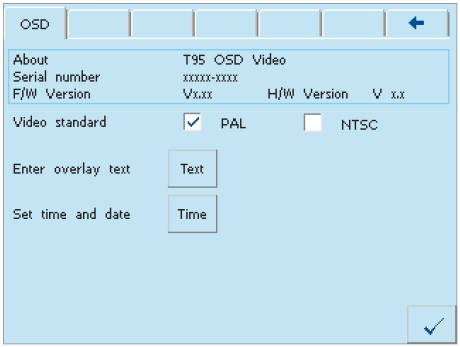
DSC Tab

The DSC600 stage requires an option board with further signal conditioning circuitry for the highly sensitive DSC signal. This tab does not have any settings a user may change and only details the stage it is connected to and also details of the option boards hardware.

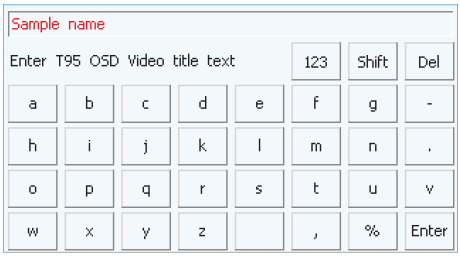


OSD Tab

The OSD (on screen display) or video text overlay is used to superimpose the temperature, time and data onto a composite video signal. The user can change the video standard from PAL (Europe) to NTSC (USA and Japan) simply by touching the area around the check box.



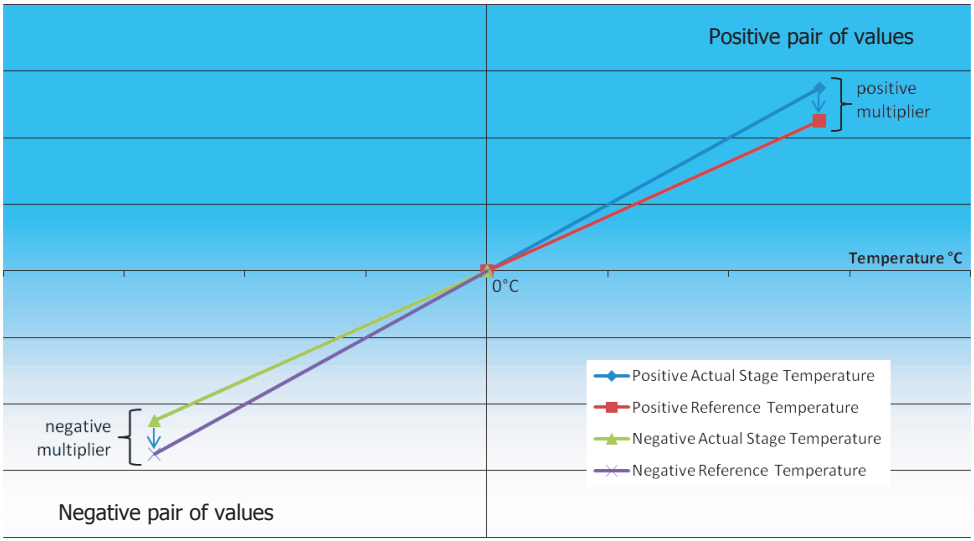
Touching the Text button brings up an alphanumeric keypad which allows the user to enter a 28 character string for display on a video line of the screen display.
Touch the 123 button to show the numeric keypad and the abc button to return to the alphanumeric keypad.



Sample Calibration

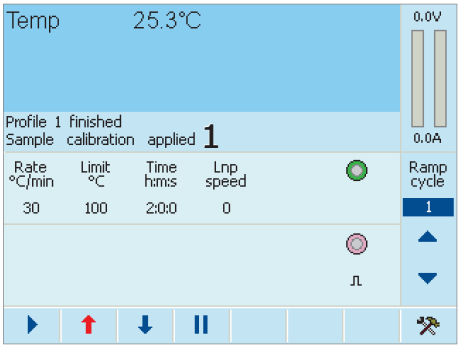
Allows the T95 system to change the displayed temperature in order to match the temperature measured under a given sample arrangement. This is designed to remove any ***small errors*** that may be introduced.
Note from the graph, that a straight line is drawn from the new measured value to zero, allowing one negative and one positive calibration point. Therefore, setting large sample calibration values at values near to zero will result in extreme errors at much higher temperatures.
In practice there ***should be no errors in excess of a few °C*** and in nearly all applications should be unnecessary.

Measurement of new sample calibration values must be done without an existing sample calibration in place.



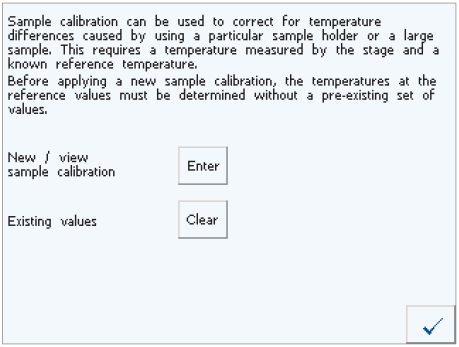
Applying Sample Calibration

If sample calibration is on then the main running screen will show the message Sample calibration applied (1).
Go to the Stage tab (see page 12) and use the check box to turn this on or off.
Before using the T95 system always check that you have this set the correct way for the current application or sample arrangement.



Change Sample Calibration Value

When the Change sample calibration value button is touched from the Stage tab on page 12 the following screen is displayed.



Existing values Clear

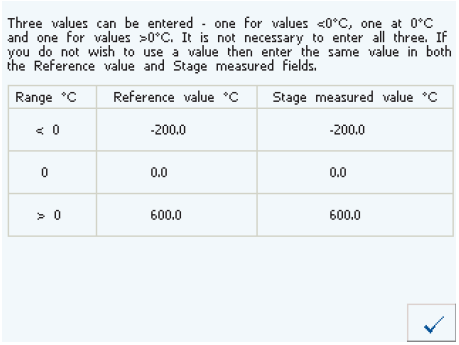
Touch the button to clear the existing values back to the stage defaults i.e. The two negative values are set to the minimum limit of the stage, the two zero values to zero and the two positive values to the maximum limit of the stage.

New / view sample calibration

Touch the button and the existing values will be shown in a table as shown here for a THMS 600 Stage.

To change a values simply touch it and enter a new value using the numeric keypad.

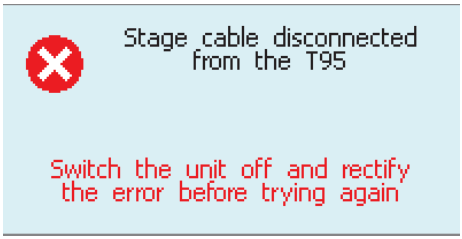
Although the value have been entered they are not used unless the Apply sample calibration check box is ticked (see **Stage Tab** on page 12).



Troubleshooting

Error Messages

When the error message window appears, follow the given suggestion to see if it solves the problem.
Many of these messages relate to the option boards and the item connected. The T95 system recognises the option boards and also the cable connected via a programmable device.



Stage cable disconnected from the T95
The 25 way 'D' type connector from the stage is not connected to the T95.

Stage cable identifier error
The connected stage cannot be recognised (possible firmware update needed) or has not been programmed.

Stage temperature sensor open circuit or overrange
The platinum stage sensor or the thermocouple is broken.

Load power supply is incorrect for the stage type"
This indicates the T95 has the wrong power supply for the connected stage. E.g. A THMS600 stage connected to a T95-HT which is for use with a high temperature stage.

The stage requires a relay fitted in the T95
The Peltier based range of stages such as the PE60 require a T95 fitted with a relay.

The T95 has the wrong combination of option boards
A stage such as the TS1500V require two boards to be fitted in the expansion slots, one for the thermocouple conditioning and the other for the vacuum Piranhi gauge. If one is missing but the stage requires it then this error message is shown.

Cable disconnected from one of the option boards
A stage such as the TS1500V which requires two boards also need their inputs to be connected. If in this example the vacuum gauge or vacuum simulation plug was missing then this error message is shown.

Incorrect cable connected to one of the option boards
This will be shown if the wrong cable is connected to an option board.

Sensor open circuit or overrange on one of the option boards
An input signal to one of the option boards is out of range.

The LNP95 is reporting an error
The LNP95 pump has an error and needs attention.

There has been a communications error
Problem on the RS232 serial port with either the data or the communications format.

For any other problems:-
Contact Linkam support by visiting the website on http://www.linkam.co.uk and selecting the Technical Support link.

LNP 95 Liquid Nitrogen Pump

Only read the following if the LNP95 Liquid Nitrogen Cooling Pump System is supplied with your system.
The LNP95 System uses liquid nitrogen to cool the stage from ambient to -196ºC. The speed of the LNP95 is automatically controlled from 1 to 100 by the T95. **Note**: refer to the LNP95 manual for more information

Handling Liquid Nitrogen

To cool samples below room temperature an LNP95 liquid nitrogen pump system is required. Always use liquid nitrogen in a well ventilated room as there is a danger of asphyxiation.
Refer to your health and safety officer regarding instructions on how to handle liquid nitrogen safely and ensure that you have the correct safety equipment including gloves and safety goggles.

Filling the Dewar

Fill the Dewar approximately 2/3 full and replace the lid with the siphon attached, but ***do not fasten the catches.*** Wait for the liquid nitrogen to stop bubbling before fastening.
When the lid is removed always ensure you place it with the black capillary tube pointing upwards. It is easily damaged or creased which will impair N_2 flow and the performance of the system.

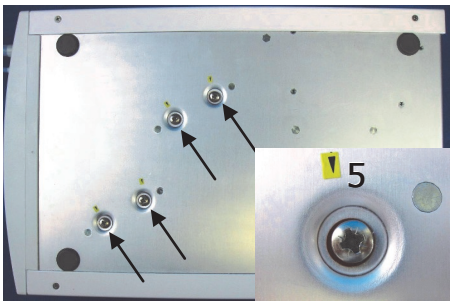
Introduction

Please check that all of the following parts have been supplied with the LNP95 System.

1. LNP 95 Liquid Nitrogen Pump
2. 2L Dewar (7L or 25L Dewar is available)
3. Power cord
4. Instrument Bus Cable for connection to the T95

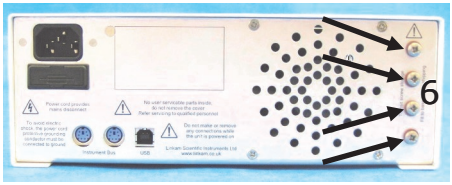
Remove Transit Screws

Before using the LNP95 Liquid Nitrogen Pump System, remove the 4 transit screws marked by small yellow labels (5), from the base of the LNP95. These screws hold the pumps in place to avoid any damage in transit.



Keep the screws safe by storing them in the holes (6) on the back panel as shown by the arrows.

Should the LNP 95 be returned for service or repair, the screws must be removed from the storage holes and used to secure the pumps for transit (5).



Back Panel Cable Connection

Connect the Instrument Bus cable (7) between the LNP95 and T95 as shown.

Note: either of the purple coloured Instrument Bus sockets on the LNP95 can be used for this purpose

THE LNP95 MUST BE SWITCHED ON BEFORE THE T95.

This enables the T95 System Controller to recognise the LNP95.

Declaration of Conformity

Manufacturers Name: Linkam Scientific Instruments Ltd

Manufacturers Address:

8 Epsom Downs Metro Centre
Waterfield
Tadworth
Surrey
KT20 5LR
UK

Declares that the products as originally delivered:

Product Name: Temperature Programmer,Liquid Nitrogen Cooling System
Product Numbers: T95-HS, T95-PE, T95-HT, LNP 95

has been independently tested and found to comply with the following applicable European Directives, and carries the CE marking accordingly:

EMC Directive 2004/108/EC using product standard EN 61326-1:2006
Low Voltage Directive 2006/95/EC using product standard EN 61010-1:2001

and also carries the additional certification:

EMC: FCC CFR47 Part 15

Safety: CB IEC 61010-1/ EN 61010-1
MET UL 61010-1/ CSA C22.2 No.61010-1 under listing E112928

Date: 28th August 2009

R&D Manager: Peter Grocutt

Peter Grocutt

Technical Specifications

T95 System Controller

Dimensions:	376L x 243W x 87H (mm)
Weight:	2.6Kg (excluding cables)
Operating Environment:	5~40°C, 80% relative humidity at 31°C decreasing linearly to 50% at 40°C (without condensation)
Temperature Sensor:	Supplied with platinum resistor input as standard
Temperature Range:	-196°C to 750°C (dependent on Stage)
Temperature Resolution:	0.01°C resolution (dependent on Stage)
Temperature Accuracy:	0.05°C
Temperature Stability:	0.05°C
Set Point Resolution:	0.1°C

RS232 Computer Interface

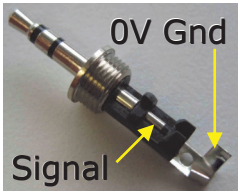
Standard RS232 levels supplied with a cross over RS232 cable.
Set to 19200 baud with 1 stop and no parity.

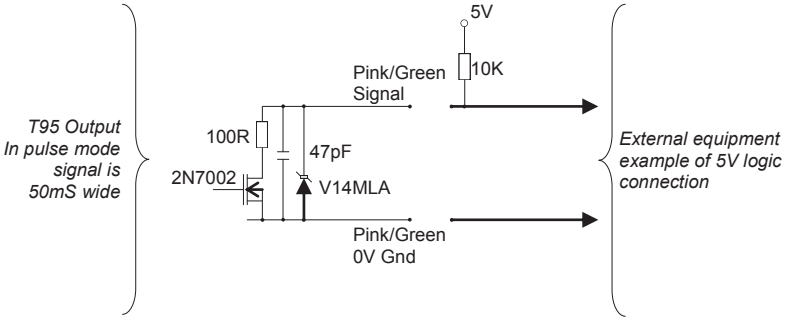
USB Interface

USB Type B connector:	Currently only used for firmware updates.

External input and output sockets

Green 2.5mm stereo jack socket.	Open drain output. Will sink up to 50mA at 12V.
Pink 2.5mm stereo jack socket.	Open drain output. Will sink up to 50mA at 12V.
Blue 2.5mm stereo jack socket.	Logic level input from 3.3V to 5V.





Optional LinkPad

Dimensions:	125L x 172W x 80H (mm)
Weight:	0.75Kg (excluding cables)
Operating environment:	5~40°C, 80% relative humidity at 31°C decreasing linearly to 50% at 40°C (without condensation)
Display Resolution:	320 X 240 pixels
Display Size:	5.7 inch
User Interface:	Touch screen

Optional T95 Dual Thermocouple board

Thermocouple:	Type S
Temperature Range:	0°C to 1750°C
Temperature Resolution:	1°C resolution (dependent on Stage)
Temperature Accuracy:	1°C
Temperature Stability:	1°C
Set Point Resolution:	1°C

Optional T95 Tensile board

20N Beam	Resolution:	0.001N
200N Beam	Resolution:	0.01N

Optional T95 Vacuum board

Gauge:	Edwards APG100-XLC
Vacuum Range:	$1x10^{-4}$mB to 1268mB

Configured for pressure sensor

Sensor:	PX309 Omega
Output:	0 to 5V dc
Pressure Ranges:	0-20 bar 0-200 bar Other ranges may be possible
Accuracy:	Combined linearity, hysteresis and repeatability +/-0.25% BSL

Optional T95 DSC board

Counts:	+/- 32767
Noise:	+/- 3 counts

Optional T95 Stepper Motor board

Motor Type:	Bipolar Stepper Motor
Motor Current:	Programmable up to 1.2A
Motor Resolution:	64 uSteps
Digital Encoder:	24 bit
End Stops:	2

Optional T95 OSD Video board

Video System:	PAL/NTSC
Clock Format:	DD-MM-YY HH:MM:SS
Character Grid:	16 Rows X 30 Characters (PAL) 13 Rows X 30 Characters (NTSC)

Optional T95 RS232 Extension board

Baud Rate:	115.2 KBaud
Interface:	8 bit, 1 stop, no parity
Useage:	Interfaces to the Linkam humidity controller

LNP95 Liquid Nitrogen Pump

Dimensions:	376L x 243W x 87H (mm)
Weight:	3.6Kg (excluding cables)
Operating Environment:	5~40°C, 80% relative humidity at 31°C decreasing linearly to 50% at 40°C (without condensation)
Tubing	Silicon Rubber

Equipment Ratings

T95-HS

A.C. Mains Supply:	100-240V at 47-63Hz	
Max current:	3.2A	
Fuse:	Current rating	4A
	Characteristic	T
	Voltage rating	250V~
	Breaking capacity	H

T95-PE

A.C. Mains Supply:	100-240V at 47-63Hz	
Max current:	3.2A	
Fuse:	Current rating	4A
	Characteristic	T
	Voltage rating	250V~
	Breaking capacity	H

T95-HT

A.C. Mains Supply:	100-240V at 47-63Hz	
Max current:	3.7A	
Fuse:	Current rating	4A
	Characteristic	T
	Voltage rating	250V~
	Breaking capacity	H

LinkPad

D.C Voltage:	12V
Max Current:	550mA

Lnp 95

A.C. Mains Supply:	100-240V at 47-63Hz	
Max current:	1.7A	
Fuse:	Current rating	2A
	Characteristic	T
	Voltage rating	250V~
	Breaking capacity	H

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www.linkam.co.uk

Version: 1 .0 Date.19-08-2010
Version: 1 .1 Date.29-09-2010 Added output circuit details