

MALCOM

Solder Paste Tackiness Tester

Model TK-1

**MALCOMTECH INTERNATIONAL
26200 INDUSTRIAL BLVD.
HAYWARD, CA 94545 USA**

**TEL. (510) 293-0580
WEB. www.malcomtech.com**

**FAX. (510) 293-0940
EMAIL. Info@malcomtech.com**

SERVICE

Thank you for purchasing this Malcom product. It was manufactured using the highest quality components and was meticulously adjusted and calibrated to factory specifications. We hope that it will provide you with many years of trouble-free operation.

Should you encounter difficulty in using your instrument, or if it's performance has become abnormal, please consult the troubleshooting section of your operation manual. Should this not enable you to solve the problem, do not attempt to disassemble, lubricate or repair the unit yourself, doing so will void the warranty. Instead, contact Malcom Instruments directly at:

Tel. (510) 293-0580 Fax. (510) 293-0940
Email. info@malcomtech.com

Quite often it is possible to resolve problems over the phone. If the difficulty is such that it requires the return of the product for repair, please secure the instrument with the supplied shipping brackets and place it into its original packing. If this is not possible, use a strong tape or cord to secure the unit for shipping. Pack the device in a rugged box much larger than the actual instrument. Use plenty of packing material that is elastic, such as bubble wrap. Styrofoam, etc. Do not use material such as newspaper, popcorn or wood shavings. Damages caused by shipping is not covered by the warranty. Send the unit, postage prepaid and insured, to the address given below.

Warranty

The warranty for your Malcom product is **1 year parts, and labor**. To guarantee in-warranty service, please fill out the below sheet and return to:

Malcomtech International ., 26200 Industrial Blvd., Hayward, CA 94545

Your time in this matter is greatly appreciated.

Model: _____ Serial Number: _____

_____ *cut on this line*

Model: _____ Serial: _____ Purchase Date: _____

Company: _____

Name of Owner/Operator: _____ Tel. () _____

Company Address: _____

City/State/Zip: _____

FORWARD

Thank you for purchasing the Malcom solder paste tackiness tester, the TK-1. This product is a multi-method tester which evaluates the following solder paste characteristics:

- Tackiness
- Tackiness at Elevated Temperatures
- Component Drop Time

It can also measure the tackiness of solder mask, adhesives, etc. Please read these instructions carefully in order to take full advantage of these features.

NOTES:

1. The TK-1 heater table has the ability to become hot enough to melt solder, and hence, hot enough to cause serious burns. Other than a flashing LED and a temperature display, there is no indicator that the heater table is hot. Please use extreme caution when activating the heater table.
2. Please retain the packing material and shipping box used for when this unit will be transported. Since this unit is a precision instrument, it can be damaged if it is transported with inadequate packing material. In such case, repairs will be charged even if the nature of the damage is covered by the warranty.
3. Never disassemble the unit. If the unit is disassembled or if it appears to have been disassembled before, you will not be entitled to warranty repairs. All such repairs will be charged for.
4. Never apply unnecessary force to the probe and sensor shaft. Especially during the installation and removal of the probe. Do so with careful attention.
5. Always keep the probe clean. Clean the bottom of the probe with alcohol after each measurement.
6. The TK-1 should be installed on a flat, level, stable surface in a dry, cool, clean environment.
7. All specifications and design improvements subject to change without notice.

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A. PACKING LIST

Thank you for purchasing this Malcom TK-1 Tackiness Tester. The shipping box for your Malcom TK-1 Tackiness Tester should contain the following items. If any item is damaged or missing upon initial opening of the box, contact Malcom immediately.

1. Tackiness Tester, TK-1 Unit 1 piece
2. Power Cord 1 piece
3. Screen Printer 1 set
 stainless steel stencil 1 piece
 hard rubber squeegee 1 piece
4. Measurement Kit 1 set
 ceramic substrates, 3x1 inch 10 pieces
 stainless steel probe 1 piece
 magnetic probe 1 piece
5. Manual 1 piece
6. Warranty Card 1 piece

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Email: info@malcomtech.com

Fax: (510) 293-0940
Web: www.malcomtech.com

B. OUTLINE

I. Profile

Solder paste tackiness varies, depending on the freshness and quality of its components. This unit measures the tackiness of a solder sample, printed onto a ceramic substrate or test board. This product employs both the IPC and JIS industry accepted methods of measuring the tackiness of solder paste. Additionally, tackiness measurement can be performed at elevated temperatures, simulating behavior within the preheat stage of a reflow oven.

II. Tests Available

- Tackiness at room temperature
- Tackiness at elevated temperature
- Prediction of component drop time

III. Specifications

Sensor Range	0 – 500 gf
Sensor Resolution	1 gf
Measurement Methods	Continuous Preload, JIS Point Preload, IPC Insertion Depth
Parameters Measured	Tackiness: 0 – 500 gf Preload: 0 – 500 g Insert Depth: 0 – 200 m Temperature: room – 270°C
Preset Ranges	Preload: 20 – 400 gf Time: 0.1 – 10.0 sec. Speed: 1.0 – 10.0 mm/sec. 1.0 – 10.0 mm/min.
Outputs	Analog: Force: 10mV/1 gf Temp: 10mV/1°C Digital: RS-232C
Power	115 or 220V VAC 50/60Hz 100W
Weight	10 kg.

Accessories	Hand Printer with 0.2mm mask Test Piece, 5.1mm dia. Probe Test Boards, 1" x 3"
Option	Strip Chart Recorder

IV. Nomenclature

- a. Main Unit
- b. Front Panel
- c. Rear Panel
- d. Part Descriptions

1. Probe: There are two types of probes: a screw type and a magnetic type with a screw base. Both probes are made of stainless steel and are attached to the shaft of the load sensor. The probe must be very clean so that it will "stick" to the solder paste. By using the heater table as a mirror, it is possible to see the cleanliness of the probe.

2. Temperature Sensor: This thermocouple is used to indicate and control the temperature of the heater table. The temperature sensor is held into position on the heater table by use of a thumbscrew.

3. Table Guides: These "L" shaped plates locate the test board in correct alignment with the probe. Do not loosen the screws which hold them to the table. The spring clamps are attached to the table guides.

4. Heater Table: This is the surface that the test board is placed upon. Because it is highly polished, its surface can act like a mirror and facilitates easy cleaning of the probe. The heater table has a built-in heater, which can be preset to very high temperatures, so as to simulate the temperatures found in the preheat stage of a reflow oven. The heater table can be raised or lowered by use of the table speed switch and the \uparrow , \downarrow buttons. Typically, it is kept in the lower position, so as to prevent accidental collision with the probe.

IMPORTANT: Because the heater table can get extremely hot, caution must be observed to prevent burns. Other than a flashing LED and a temperature display, there is no indication of the present danger of the heater table. Be very careful when using the heater table.

5. Shipping Screw: This screw is used for when the TK-1 is to be shipped or stored for a long period of time. There should never be any resistance when removing or installing the shipping screw. If there is, back the screw out and make sure the heater table is in the center detent position. Now try again.

6. Table Drag Screw: This screw applies a drag to the left/right movement of the table. Turn it clockwise to increase the drag, counter-clockwise to release. Do not over tighten the screw so that it prevents movement of the table altogether. Doing so may damage the table and render the screw's operation useless.

7. Spring Clamps: These stainless steel clamps hold the test boards down onto the heater table. The thumbscrews should be loosened, the spring clamps positioned over the test board, and then the thumbscrews tightened.

8. Front Panel: This is where the controls and displays for setting up and performing the tackiness tests are located.

9. Digital Display: This 4 digit LED display can show: the temperature, the time, the preload, the depth and the speeds preset for the tackiness test. Additionally, the display can show the current temperature, the real preload, the real insertion depth and the tackiness for a test. When not displaying any other information, the display defaults to the real-time loading upon the sensor. If while presetting a value, the display flashes "0.0.0.0.", then the value is not applicable to the particular testing method selected.

10. Select Button: This button selects which parameter is to be shown upon the digital display. Each press of the select button advances the parameter LED's one step counter-clockwise.

11. Presetting Buttons: These buttons are labeled, Up, , and Down. The up button increments the preset value. The down button decrements the preset value. The button enters the preset value into the TK-1's memory.

7. Spring Clamps: These stainless steel clamps hold the test boards down onto the heater table. The thumbscrews should be loosened, the spring clamps positioned over the test board, and then the thumbscrews tightened.

8. Front Panel: This is where the controls and displays for setting up and performing the tackiness tests are located.

9. Digital Display: This 4 digit LED display can show: the temperature, the time, the pre-load, the depth and the speeds preset for the tackiness test. Additionally, the display can show the current temperature, the real pre-load, the real insertion depth and the tackiness for a test. When not displaying any other information, the display defaults to the real-time loading upon the sensor. If while presetting a value, the display flashes "0.0.0.0.", then the value is not applicable to the particular testing method selected.

10. Select Button: This button selects which parameter is to be shown upon the digital display. Each press of the select button advances the parameter LEDs one step counter-clockwise.

11. Presetting Buttons: These buttons are labeled, Up, \uparrow and Down. The up button increments the preset value. The down button decrements the preset value. The \leftarrow button enters the preset value into the TK-1's memory.

12. Insertion Method Switch: This toggle switch selects the method of measuring tackiness. It has positions for: Press Insertion method, the JIS standard, Insertion Depth method, or the Point Insertion method, the IPC standard. Changing the switch during measurement will invoke a hybrid, and consequently, invalid test.

13. Table Speed Switch: This toggle switch selects the speed at which the heater table will either raise or lower. Use the fast speed when moving the table a large distance. Flip the switch down to slow when moving the table in close clearances.

14. \uparrow , \downarrow Buttons: These buttons, in conjunction with the table speed switch, enable the user to lower or raise the heater table. Pressing both buttons together will cause the table to rise. The table has automatic limits preset, and cannot be overrun. However, it is possible to crash the table into the probe, so care must be exercised when using these buttons.

15. Parameter LED's: These red LED's indicate what parameter is being shown on the digital display. Pressing the select button cycles through them in a counter-clockwise fashion.

HEATER: This is the temperature of the heater table, in degrees centigrade.

TIME: This is the time that the pre-load is exerted against the sample, in seconds.

PRE-LOAD: This is the pre-load exerted against the sample, in grams force.

DEPTH: This is the distance that the probe penetrates into the sample, in micrometers.

SPEED1: This is the insertion and retraction speed for the IPC, Point Insertion Method, test, in millimeters per minute.

SPEED2: This is the retraction speed for JIS, Press Insertion Method, test and the Insertion Depth Method, in millimeters per second.

16. Start/Stop Button: This button initiates the measurement procedure. The green LED within the button glows during the test. Pressing this button a second time while performing an IPC method of tackiness test, will prematurely end the measurement sequence.

17. Record Button: Press this button when you wish to send tackiness data, processed by a fast four transform filter, to the rear panel output terminals.

18. Line Button: This button enables data communication at the RS-232C port on the back panel of the TK-1.

19. Heater On/Off Button: Pressing this button on activates temperature control of the heater table. The heater LED will flash to indicate that temperature control is on. If the heater table is in its lowest position, an error may occur. Make sure the heater table is at least 5 mm above its lowest position before turning on the heater. Pressing this button a second time will turn the heater off and the flashing will cease.

Important: This flashing is the only indicator that the heater is on. When turned off, the heater still retains its heat for up to 30 minutes. Pay careful, close attention that you are not burned by the heater table.

20. Power Button: This press on, press off button turns on the main power. A red light within the button will illuminate. Allow a few seconds for the TK-1 to initialize upon power up. Additionally, the red light may take a few seconds to extinguish when powering off.

- 21. Outputs:** This terminal block has the positive and negative outputs of the tackiness signal and the temperature from the heater table. The tackiness output is 10 mV / gramf. The range is from -5 volts to +5 volts. The temperature output is 10 mV / °C. The range is from 0 volts to 2.7 volts.
- 22. Fuse:** When blown, unscrew and replace with only a 4A 125VAC fuse.
- 23. Receptacle:** Plug the appropriate power cable into this receptacle. Supply 115 VAC.
- 24. Circuit Breaker:** This safety device prevents an over draw of current by the TK-1. Up is on, down is off. If the heater is set at too high of a temperature for too long, the breaker may trip. If it does, all power to the TK-1 will be lost, and the subsequent measurement must be preset and repeated. The circuit breaker's operation can be checked by pushing on the green button with a pencil.
- 25. RS-232C Port:** This 25 pin sub D connector enables serial communications to and from the TK-1. Connect only a Malcom approved serial cable to this port.
- 26. Dip Switches:** These dip switches have been preset at the factory. It is not necessary for the user to ever change their positions.
- 27. Screen Printer:** This is the device which puts solder paste onto the test boards. It is hand sized and constructed of aluminum. The stainless steel stencil is fitted to the upper half of the screen printer, and a squeegee is supplied to spread the paste out across the stencil.
- 28. Stencil:** This stainless steel plate is the mask for the printed solder paste. It slides into the upper half of the screen printer.
- 29. Test Board:** This ceramic substrate is test surface where solder paste is screen printed. It is then transferred to the table guides and held in place by the spring clamps during testing.
- 30. Receiver:** This is the lower half of the screen printer. There is a channel cut into the receiver so that the test boards will slide in perfectly.

31. Squeegee: This is the device which spreads out the solder paste over the stencil. It is made of a hard rubber and is tethered to the screen printer so that it is not lost. When using the squeegee, apply an even force and draw it slowly across the stencil. Do not pause during the stroke.

C. PROCEDURES

I. Printing Solder Paste

- [1] Allow the solder paste to come to room temperature, then stir for 2-3 minutes to even consistency. To expedite this process, the Malcom SPS-1 solder paste softener is recommended.
- [2] Prepare a test board by cleaning it with alcohol.
- [3] Open the printer and set the test board onto the receiver.
- [4] Close the printer and place 1cc of paste onto the edge of the stencil.
- [5] Draw the paste across the stencil with the squeegee. Try to maintain a downward force of 1 kgf, a speed of 10mm / sec. And a squeegee angle of 45°C.
- [6] The thickness of the paste on the substrate should be equivalent to that of the stencil, about 0.2 mm. If it is different, there will be inaccuracy in the measurement of tackiness.
- [7] Remember to clean the printer with alcohol when finished with use.

II. Tackiness Testing

A. Setup

- [1] Plug the power cable into the receptacle at the rear panel.
- [2] Plug the other end of the cable into an appropriate power source.
- [3] Install the probe into the sensor. If you are using the magnetic probe, attach the magnetic tip to the base and twist the tip to thread the base into the sensor. Finger tighten, do not torque the sensor.
- [4] Select the mode of tackiness test. There are three methods of measuring tackiness. The JIS standard, the Press Insertion Method, which has a constant pre-load during the pre-load time. The Insertion Depth Method which does not pre-load, rather presets the insertion depth. And the IPC standard, the Point Insertion Method, which removes the pre-load after initial pre-loading. Each method already has default values preset into the TK-1's memory. If you wish to change these defaults, refer to "e. Presetting the Parameters".

[5] Default settings for each method.

Press, JIS Method	Pre-Load: 50 gf	Pre-Load Time: 0.2 sec.	Retraction Speed: 10 mm/sec.
Insertion Depth Method	Depth: 50 μ m	Pre-Load Time: 0.2 sec.	Retraction Speed: 10 mm/sec.
Point, IPC Method	Pre-Load: 300 gf	Pre-Load Time: 5 sec.	Retraction Speed: 2.5mm/min.

- [6] If you are going to be testing at an elevated temperature, and it is different than the default value of 100 degrees centigrade, refer to "e. Presetting the Parameters".
- [7] If you are going to be using a strip chart recorder, attach it to the rear panel output terminals. The second and third screws from the left are + and - force output. The fourth and fifth screws from the left are + and - temperature output.
- [8] Set the strip chart recorder for the appropriate scale. The force output is 10 mV per gram force, so there is a maximum deflection of \approx 5 Volts. The temperature output is 10 mV per degree centigrade, so there is a maximum deflection of 2.7 volts.
- [9] If you are going to be using the RS-232C port, attach a Malcom approved cable to the 25 pin sub-D connector.
- [10] Connect the other end to your personal computer and run the appropriate software. See the software manual for proper operating procedures.

b. Tackiness Test

- [1] Print the paste onto a test board.
- [2] Remove the probe and clean it's bottom surface with alcohol. Carefully replace it back onto the base or screw it lightly into the sensor shaft.
- [3] Put the test board onto the heater table against the table guides.
- [4] Slide the right and left spring clamps onto the test board. Finger tighten the thumbscrews.
- [5] Use the \uparrow \downarrow buttons to position the heater table so that there is a 2 - 3 millimeter gap between the bottom of the probe and the surface of the solder paste.
- [6] Move the heater table right and left in order to center the probe immediately

above the printed test surface. If right/left movement is difficult, it may be necessary to loosen the drag screw. Do so very carefully.

- [7] Press the start/stop button to begin measurement. The green LED inside of the button will light.
- [8] The heater table will rise, hold for a moment, and then lower. It may lower to a point below the starting point at the beginning of the test. The green LED will go out.
- [9] During the test, the display will show several numbers. The majority of these numbers will be the real-time loading of the sensor. Data calculation by the internal micro-computer takes from about 1 - 40 seconds, this is in proportion to the speed of the probe. During this time, the display flashes. This behavior is most evident for the IPC method of tackiness testing. When the calculations are finished, the final display will be the tackiness in grams force.
- [10] When the test is over, the green LED in the start/stop button will go out.
- [11] By pushing the select button it is possible to have the digital display cycle through the following measured values: the tackiness, the current temperature, the real preload, and the real insertion depth. The heater LED, preload LED, and depth LED will light respectively. The time LED, speed1 LED, and speed2 LED will also light, but their displayed values will be "0.0.0.0."

[12] Recorder

If a strip chart recorder is connected to the output terminals of the rear panel, you will have a real-time output of the load cell and temperature sensor during the test. After the test, push the record button so that the calculated tackiness data can be output to the strip chart recorder. This data has been filtered by a fast four transform, and therefore the signal noise is reduced.

[13] RS-232C Output

If a Malcom approved serial cable is attached to the 25 pin sub-D connector at the rear panel, then it is possible to send the tackiness data to a PC, using Malcom software. Refer to the software manual for more details.

- [14] Gently clean the probe tip with a swab, or rag, or towel moistened with alcohol.
- [15] Loosen the thumbscrews and swing the spring clamps out of the way.
- [16] Remove the test board from the table and table guides.
- [17] Clean up the screen printer and squeegee with alcohol.

c. Tackiness at Elevated Temperature Test

1. Outline: As a solder paste is heated, its tackiness decreases. It is important to know this loss of tackiness, if component dropping is found to be happening within the reflow oven. Additionally, by using the heating function of the TK-1, it is possible to determine sufficient curing times of adhesives.

2. Measurement: The procedure is the same as that for a tackiness test, however the heater table is preheated before the test. Because of the very high temperatures achieved by the heater table, serious burns can occur upon contact. Exercise extreme caution around the heater table, even after it is turned off. It is recommended that a pair of gloves and tweezers be used when handling the heated probe, test board, spring clamps, etc.

- [1] Print the solder paste or adhesive sample onto a test board.
- [2] Remove the probe and clean its bottom surface with alcohol. Carefully replace it back onto the base or screw it lightly into the sensor shaft.
- [3] Put the test board onto the heater table against the table guides
- [4] Slide the right and left spring clamps onto the test board. Finger tighten the thumbscrews.
- [5] Position the temperature sensor onto a vacant area of the test board, close to the printed paste or sample. Finger tighten the thumbscrew.
- [6] Use the __ buttons to position the heater table so that there is a 2 - 3 millimeter gap between the bottom of the probe and the surface of the solder paste or sample.
- [7] Move the heater table right and left in order to center the probe immediately above the printed test surface. If right/left movement is difficult, it may be necessary to loosen the drag screw. Do so very carefully.
- [8] Press the heater on/off button to turn on the heater. The heater LED will flash.
- [9] If you wish to see the heater table temperature increase, push the select button once. The heater LED will still flash.
- [10] When the heater table has achieved the proper temperature, press the heater on/off button a second time. The heater LED will stop flashing.

- [11] Press the start/stop button to begin measurement. The green LED inside of the button will light.
- [12] The heater table will rise, hold for a moment, and then lower. It may lower to a point below the starting point at the beginning of the test. The green LED will go out.
- [13] During the test, the display will show several numbers. The majority of these numbers will be the real-time loading of the sensor. Data calculation by the internal micro-computer takes from about 1 - 40 seconds, this is in proportion to the speed of the probe. During this time, the display flashes. This behavior is most evident for the IPC method of tackiness testing. When the calculations are finished, the final display will be the tackiness in grams force.
- [14] When the test is over, the green LED in the start/stop button will go out.
- [15] By pushing the select button it is possible to have the digital display cycle through the following measured values: the tackiness, the current temperature, the real pre-load, and the real insertion depth. The heater LED, preload LED, and depth LED will light respectively. The time LED, speed1 LED, and speed2 LED will also light, but their displayed values will be "0.0.0.0."
- [16] Recorder: If a strip chart recorder is connected to the output terminals of the rear panel, you will have a real-time output of the load cell and temperature sensor during the test. After the test, push the record button so that the calculated tackiness data can be output to the strip chart recorder. This data has been filtered by a fast four transform, and therefore the signal noise is reduced.
- [17] RS-232C output: If a Malcom approved serial cable is attached to the 25 pin sub-D connector at the rear panel, then it is possible to send the tackiness data to a PC, using Malcom software. Refer to the software manual for more details.
- [18] Gently clean the probe tip with a swab, or rag, or towel moistened with alcohol. Remember that the probe is very hot, so use the tweezers or gloves.
- [19] Loosen the thumbscrews and swing the spring clamps and the temperature sensor out of the way. These are hot and gloves are recommended.
- [20] Remove the test board from the table and table guides. This will be hot too. Use the tweezers to pickup and set down the test board onto a burn-proof surface.
- [21] The heater table will be the hottest of all. It will stay hot for as long as 30 minutes. Use the select button to display the heater table temperature.

[22] Clean up the screen printer and squeegee with alcohol.

d. Component Drop Time Test

1. Outline: Solder paste, right after printing, is soft and moist with solvent. But in time, the paste vehicle will dry out, causing a loss of tackiness between the solder paste and the chip component. This results in the component dropping after mounting. The purpose of this test is to demonstrate the decrease in paste tackiness as a function of time, and the phenomenon of component dropping.

2. Measurement: The procedure is the same as for a tackiness test, however the average of five patterns on a test board makes up one time sample. Considering that this test is time dependent and the number of samples which are going to be taken, it is recommended that the same persons perform the test through it's entirety. This means from printing to the last test board tested. It is suggested that 7 ceramic boards be screen printed and that they be tested at the following intervals. 1 minute, 10 minutes, 20 minutes, 50 minutes, 100 minutes, 200 minutes, and 500 minutes. The data samples collected can then be used to make a tackiness vs. log time graph.

- [1] Print the paste onto seven test boards. Label them for the appropriate time intervals.
- [2] Clean the screen printer and squeegee with alcohol.
- [3] Remove the probe and clean it's bottom surface with alcohol. Carefully replace it back onto the base or screw it lightly into the sensor shaft.
- [4] Put the first test board onto the heater table against the table guides.
- [5] Slide the right and left spring clamps onto the test board. Finger tighten the thumbscrews.
- [6] Use the \uparrow , \downarrow buttons to position the heater table so that there is a 2 - 3 millimeter gap between the bottom of the probe and the surface of the solder paste.
- [7] Move the heater table right and left in order to center the probe immediately above the printed test surface. If right/left movement is difficult, it may be necessary to loosen the drag screw.

Do so very carefully.

- [8] Press the start/stop button to begin measurement. The green LED inside of

the button will light.

- [9] The heater table will rise, hold for a moment, and then lower. It may lower to a point below the starting point at the beginning of the test. The green LED will go out.
- [10] During the test, the display will show several numbers. The majority of these numbers will be the real-time loading of the sensor. Data calculation by the internal micro-computer takes from about 1 - 40 seconds, this is in proportion to the speed of the probe. This behavior is most evident for the IPC method of tackiness testing. During this time, the display flashes. When the calculations are finished, the final display will be the tackiness in grams force.
- [11] When the test is over, the green LED in the start/stop button will go out. Write down the tackiness value.
- [12] Clean the probe tip with a swab, or rag, or towel moistened with alcohol.
- [13] The process is repeated from step 5, but the probe is centered over a different test surface.
- [14] After 5 samples have been taken, loosen the thumbscrews and swing the spring clamps out of the way.
- [15] Remove the test board and replace it with the next one in chronological sequence.
- [16] Wait for the next interval to elapse. Now repeat from step 4.
- [17] When the last test board is removed from the table, clean the probe with alcohol.
- [18] Collate the data and make a graph of tackiness vs log of time.
- [19] Fit a curve to the data points.
- [20] An approximation of drop time is the time lapse from when the test boards were printed to when the tackiness falls to less than 20gf.

e. Presetting the Parameters

Often, the default parameters may be inappropriate for the particular testing you wish to conduct. It is possible to change the testing parameters to values within the specified ranges. Setting the parameters outside of these ranges will yield the default parameters.

- [1] Select the mode of tackiness testing with the insertion method switch. If you change the method while setting the parameters, they will return to their

default values.

- [2] Push the select button to illuminate the heater LED. The temperature displayed is the current temperature of the heater table, in degrees centigrade. Push the button and the set temperature will flash. Use the up button to increment the temperature and the down button to decrement the temperature. Holding either the up or down button will cause the numbers to change rapidly. Push the button to enter the desired temperature into the TK-1's memory. The display will now return to the current heater table temperature. Though it is possible to set the temperature anywhere from 20 °C to 270 °C, it is recommended that the temperature be set for greater than room temperature and less than 180 °C.
- [3] Push the select button again to light the time LED. The display will show "0.0.0.0." seconds. Push the button and the default preload time for the selected insertion method will flash. Use the up, down and buttons to set your desired preload time. The display will return to "0.0.0.0." It is possible to set the time to a maximum of 100 seconds, however no test would ever realistically need this much time. Practically, ten seconds is the most time an IPC test would ever need.
- [4] Push the select button a third time and the preload LED is illuminated. The displayed preload is in grams force. It is the most recent force applied to the solder paste by the probe. Push the button and the default preload for the selected insertion method will flash. If you have previously selected the insertion depth method of tackiness testing, then the display will flash "0.0.0.0." and the preload is not settable. Use the up, down and buttons to set your desired preload. The display will return to the most recent preload force. Though the preload can be set as low as 1 gram force, the accuracy of a value this low is not reliable. It is recommended that the minimum preload be no less than 20 grams force.
- [5] Push the select button again to illuminate the depth LED. The displayed depth is in micrometers. It is the most recent depth penetrated by the probe into the solder paste. Push the button and the default depth for the

insertion depth method will flash. If you have not selected the insertion depth method of tackiness testing, then the display will flash "0.0.0.0." and the depth cannot be set. Use the up, down and buttons to set your desired insertion depth. The display will return to the most recent depth penetrated. The depth can be set to a minimum of 1 micrometer penetration. However, to achieve accurate results, the depth penetration should be no less than 20 micrometers. Additionally, never set the depth for a value greater than the actual thickness of the printed paste. Example, if the printed solder paste is only 0.15 millimeters thick, set the depth with a number less than 150.

- [6] Push the select button a fifth time and the speed1 LED will light. The display will show "0.0.0.0." Push the button and the speed of probe insertion and retraction for the IPC, point insertion method, test will flash. If you have not selected the IPC, point insertion method, test, then the display will flash "0.0.0.0." and the speed is not settable. Use the up, down and buttons to set your desired speed. While it is possible to set the speed as high as 100 millimeters per minute, a tackiness test conducted at this rate would no longer follow the criteria of the IPC test.
- [7] Push the select button again to illuminate the speed2 LED. The display will show "0.0.0.0." Push the button and the default retraction speed for the selected insertion method will flash. If you have selected the IPC, point insertion method, test, then the display will flash "0.0.0.0." and the speed is not settable. Use the up, down and buttons to set your desired speed. It is possible to set the retraction speed as low as 0.1 millimeters per second, however measurement accuracy decreases at speeds less than 1 millimeter per second.
- [8] Push the select button a final time and the presetting process is complete.

Simplifying the constraints of the methods of tackiness testing:

	HEATER	TIME	PRELOAD	DEPTH	SPEED1	SPEED2
Press, JIS Method	settable	settable	settable	not	not	settable

Insertion Depth Method	settable	settable	not	settable	not	settable
Point, IPC Method	settable	settable	settable	not	settable	not

Remember that changing the insertion method switch will reset the parameters to their default values. Additionally, the parameters are reset to their default values upon power up of the TK-1.

D. MAINTENANCE

I. Replacing the Probe

When you exchange the probe between measurements, handle the sensor shaft with great care. It is the most important part of the TK-1. Please remember that even a little excessive force might cause damage to the unit.

II. Cleaning the Probe After Testing

- [1] Gently remove the probe.
- [2] Clean the probe tip and the circumference thoroughly with alcohol.
- [3] Clean the areas where the screw is threaded or where it makes contact with the base.

III. Storing the TK-1

Should the TK-1 need to be stored for a prolonged time, please follow these guidelines

- [1] Carefully remove the probe from the sensor shaft.
- [2] Back off the drag screw by turning it two revolutions counter-clockwise.
- [3] Align the heater table so that the shipping screw can be installed.
- [4] Screw the shipping screw all the way in. If there is resistance, then the shipping screw is not aligned with the heater table. Back out and try again.
- [5] Loosen the thumbscrews one revolution counter-clockwise.
- [6] Turn on the power and lower the table until it stops on its own. Raise the table 2 millimeters and turn off the power.
- [7] Disconnect the power cable and any other cables if connected.
- [8] Store the TK-1, the probe, and the power cable in a cool, dark, dry, clean environment.

IV. Repair and Calibration

To maintain reliable and accurate operation of the TK-1, proper care, handling and storage are necessary. Additionally, periodic calibrations and inspections are needed to guarantee continued accuracy of measurement. Past experience has indicated that factory calibration is required on an annual basis. Contact Malcom for assistance with this service.

E. DIMENSIONS

Solder Paste Tackiness Tester Model TK-1

- SOFTWARE MANUAL -

Thumbscrews

This is my suggestion of how the Automatic High-Temperature Tackiness Test should be programmed. The example given below is for the JIS standard test. The FUTURE method will much closer simulate the mounting and reflow process. For these examples, the set temperature is 100°C and COMPENSATION means temperature compensation of preload.

APPENDIX

TK-1 WEIGHT ADJUSTMENT

TK-1 Load Transducer
Wires and CB

	Color	Letter
4	Blue	B
3	Green	D
2	White	C
1	Red	A

Adjustment of Sensor

- Attach the magnet probe to the tip of the sensor and turn **ON** the **Power**.
- Adjust V1 of the VAS-1A circuit board to show 0gf on the force display panel
- Remove the probe from the sensor chuck and attach the weight holder jig.

- Select the PIC mode, press the **START/STOP** button once, wait for the force display to show 0gm, then press the **START/STOP** button again.
- Put two 100 gram weights evenly on both sides of the weight holder jig and adjust V2 of the VAS-1A circuit board, to show 200 gram on the force display.
- Turn the **Power OFF** and remove the weight holder jig, reinstall the magnet probe
- Turn the **Power ON**. If necessary, adjust V1 of the VAS-1A circuit board to show 0gm on the force display.

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