

S-1160 SERIES

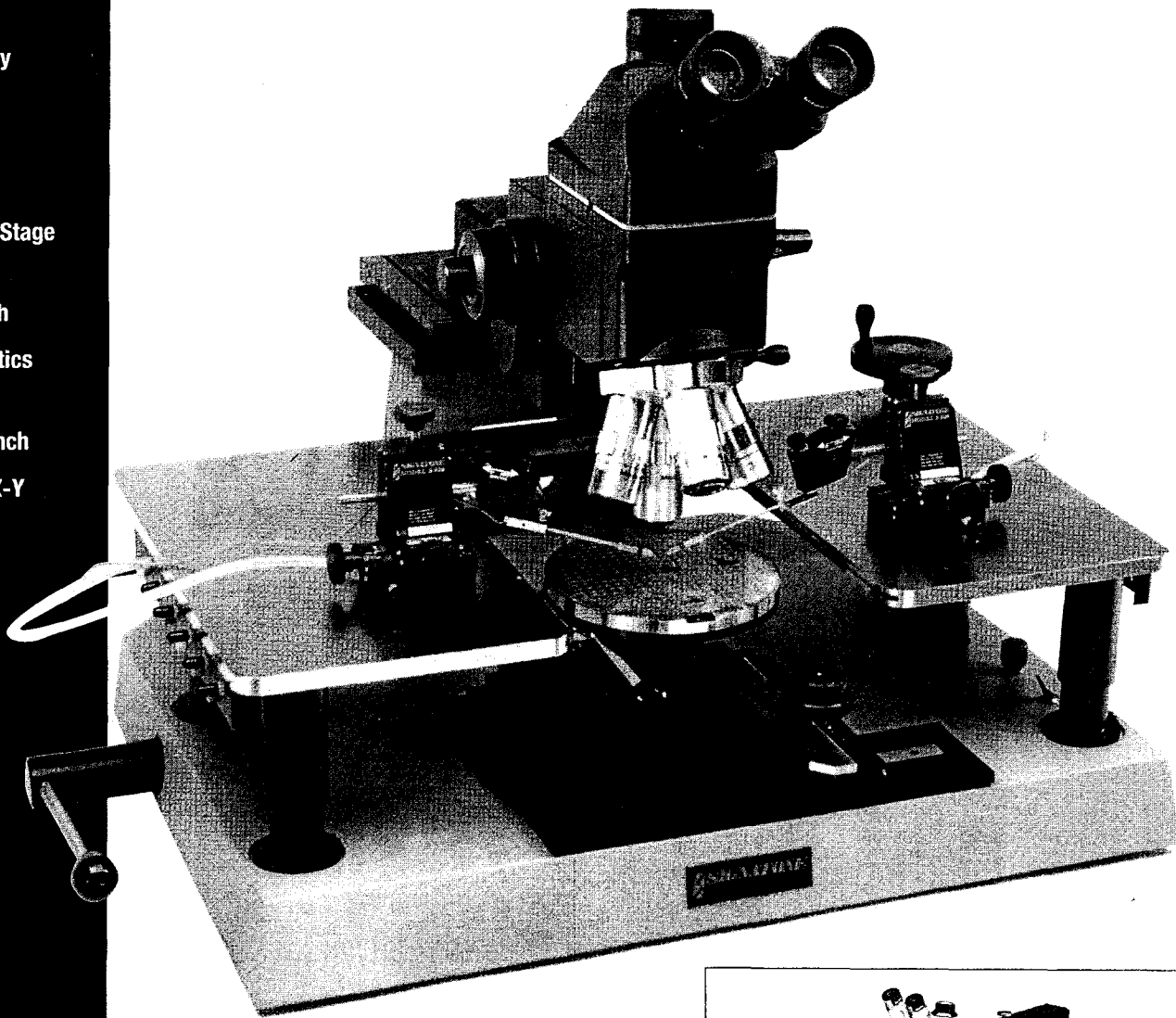
General Purpose Analytical Probe Station

Economically
Priced

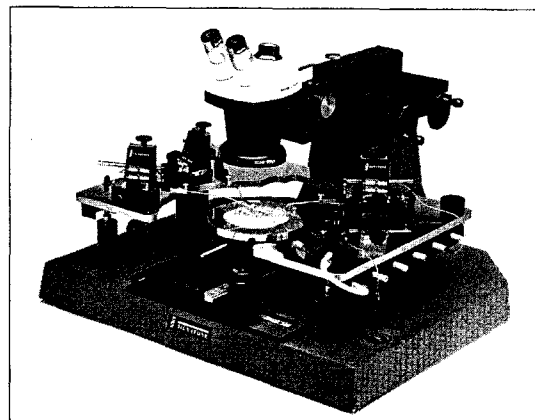
2 Inch X-Y
Microscope Stage

Accepts High
Powered Optics

4, 6, and 8 Inch
Chuck and X-Y
Stages



The S-1160 general purpose analytical probe station is designed for probing various geometries from 10 mils to 1 micron. The various options and features allow hybrids, wafers, and packaged parts to be probed with ease using probe cards or any of Signatone's family of micro-positioners. The S-1160 may be configured to accept the high powered Mitutoyo Finescope series or A-zoom Videoscope series or low powered Stereozoom microscopes.



S-1160B

1 - Linear Platen Lift

Lifts the platen 3/8 inch in a linear motion with micropositioners or probe card in place avoiding wear on probe tips. The friction stop permits pausing the platen at any point along the 3/8 inch travel thus permitting probe tips to be somewhat in focus while moving the sample.

2 - Vacuum Ports and Signal Connections

Five vacuum ports on each side of the platen support vacuum based micropositioners. Color coded signal jacks connect to the probes on the side of the platen and terminate at the rear of the station. Options for Triax, BNC and banana jacks are available.

3 - Large Steel Platen

The large steel platen is ground flat, planarized to the chuck and will accept up to 10 vacuum or magnetic based micropositioners.

4 - Microscope Mount

The S-1160 offers three types of mounts. The 'A' style accepts both the Mitutoyo Finescope series and the A-zoom series of high powered compound optics. The mounting plate may be adjusted to set up with hot or cold chucks. The 'B' and 'C' styles accept Stereozoom microscopes.

5 - X-Y Microscope Stage

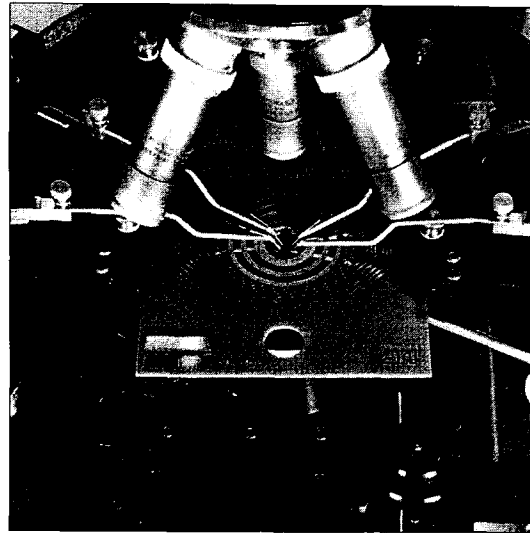
The X-Y microscope stage is easily moved with the roll knobs. 2" of X-Y movement allows scanning of large circuits or hybrids without lifting the probe tips. (not included on S-1160C)

6 - Fine Platen Adjustment

The control knob allows the platen to be adjusted to the desired height. This allows setting up for probing with probe cards, hot chucks, or probing of packaged parts and hybrids.

7 - Vacuum Chuck

The standard vacuum chuck is ground to ± 0.0005 inches and has two grooves plus a center hole. The grooves may be blocked off and the center hole used only when setting up with a small sample. Chucks are available in 4" (100 mm), 6" (150 mm) or 8" (200 mm) configurations. The chuck is electrically isolated from the base station and a binding screw allows electrical connections.



Analytical probing may be done with the probe card in place as shown here.

8 - Rotation Lever

The rotation lever will rotate the chuck 360° making it very easy to align with probe cards in place. An optional rotation lock (model SRL-160) is available for locking the sample in place once properly aligned. The SRL is required when used in conjunction with a temperature chuck.

9 - Vacuum Port Damper Knob

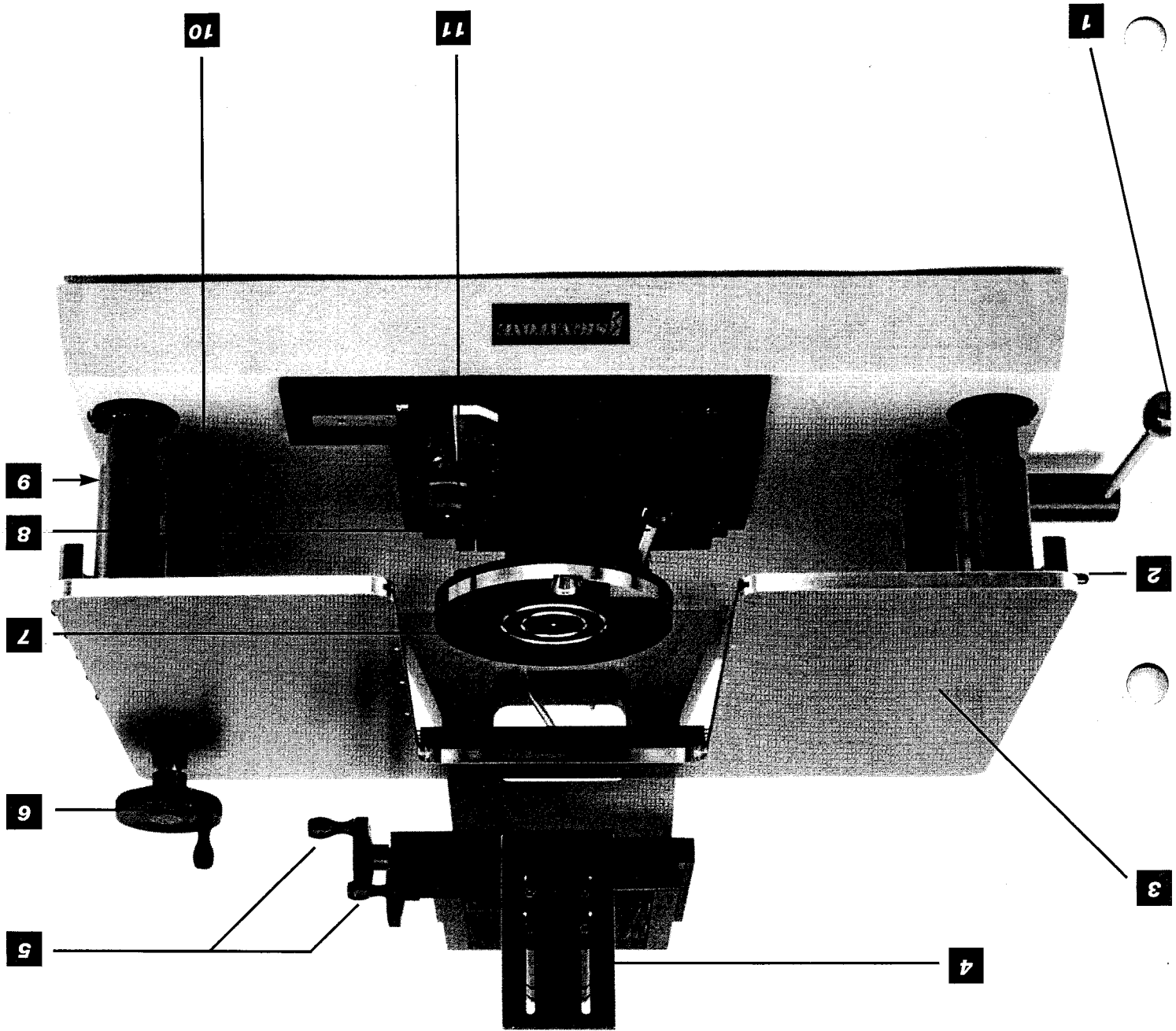
This knob allows the user to set the amount of vacuum being supplied to the micropositioners thus adjusting the drag on positioners to the user's desired feel.

10 - Chuck Vacuum Switch

This toggle switch toggles the chuck vacuum on and off for holding the sample or fixture to the chuck.

11 - X-Y Stage Control Knobs

The X-Y stage is a rack and pinion gear assembly with high resolution positioning. The compound knob permits easy moving of the chuck in both directions simultaneously. Available in 4", 6", and 8" ranges.



RECOMMENDED OPTIONS & ACCESSORIES

S-6710 Probe Card Adapter for 4.5 inch wide probe cards.

SRL-160 Rotation lock; required when using a temperature chuck. This option locks the chuck rotation in place, allowing fine adjustment.

FS-160 Fine stage; a 0.5" high resolution stage for fine movement of chuck.

MY Mitutoyo Finescope microscope complete with 10X eyepieces, 2X, 10X, 20X objectives, 2:1 zoom, and fiber optic coaxial illumination. Allows 20X to 400X magnification.

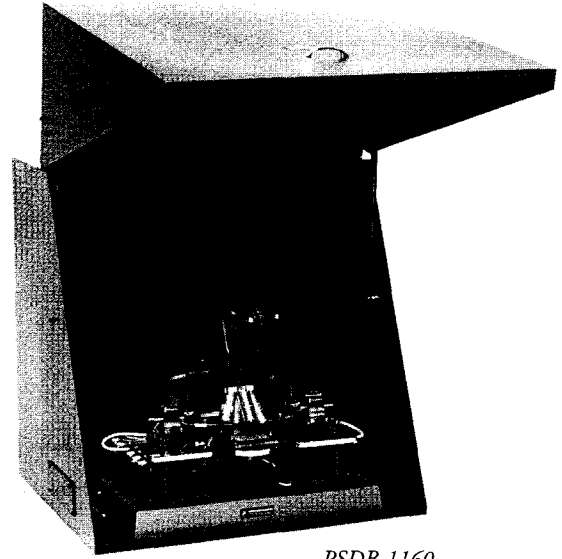
A-zoom Videoscope Complete with built-in color CCD camera and 40:1 motorized zoom, the A-zoom videoscope also offers optional 10X eyepieces and Mitutoyo objectives.

EV-1070X Leica Stereozoom microscope complete with 10X eyepieces, coaxial illumination, 7:1 zoom and focus mount. Allows magnification of 10X to 70X.

Micropositioners Depending on the magnification and microscope selected, Signatone offers a variety of micropositioners to choose from. Most popular for use with the high powered microscopes are the S-926 series. With lower powered microscopes, the S-725 series is the best choice.

PSDB-1160 Light tight box for enclosing the entire probe station. A shock assisted lift door and utility feed throughs for the S-1160 are provided. Removable connector panels allow users to configure their own signal jacks or Signatone offers a variety of pre-assembled panels as well.

Hot Chucks Signatone offers a variety of hot chucks and controllers. The 'T', 'Q' and 'X' series are designed to work well with the S-1160.



PSDB-1160

SPECIFICATIONS

Width	27 inches
Depth	22 inches
Height (with microscope)	19.5-22 inches
Shipping Weight	125 pounds
Vacuum Chuck	4", 6", or 8" diameter, accepts 3" to 8" wafers
X-Y Stage Resolution ...	X motion @ 1.125" per knob revolution Y motion @ 1.6" per knob revolution
Coarse Platen Lift	3/8" linear with continuous friction stop
Fine Platen Lift	1 1/3" @ .025" per knob revolution
X-Y Microscope Stage ..	2" X motion @ .1" per knob revolution 1.8" Y motion @ .1" per knob revolution
Facilities Required	Vacuum 20" Hg @ .1 CFM Power for Microscope, 120V AC, 20 Watts

ORDERING INFORMATION Select the S-1160 station best for your needs:

S-1160 [] - []

Microscope Mount Type

- A = High Powered Optics Mount, A-zoom & MY
- B = Stereozoom Optics Mount
- C = Stereozoom Optics Mount
(does not include 2" X-Y microscope stage)

Chuck and X-Y Stage Range

- 4 = 4 inch (100 mm)
- 6 = 6 inch (150mm)
- 8 = 8 inch (200 mm)



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S-1160 Series

*General Purpose
Analytical Probe Station*

S-1160 OPERATION MANUAL

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LETTER FROM THE PRESIDENT

Dear Customer:

Congratulations; You have purchased a SIGNATONE S-1160 series, 1 micron, Analytical Probe Station. We have taken extra care to design, manufacture, test, and ship this Prober to you in such a manner that it will give long and quality service.

This manual includes a number to picture description of the function of the controls for the Prober, and a discussion of the use of the many accessory parts available to assist you. If you find the Prober does not function per specification upon receipt at your facility, or the instructions are unclear, please call me personally at (408) 848-2851. I am anxious to help ensure you get the service you deserve from this product. If I am not immediately available, please leave a message so I can return your call, or ask for one of our qualified service technicians.

In addition to the accessories discussed in this manual, SIGNATONE will announce, in the next year, several new products to assist in detailed analytical probing. I plan to send a description of the new products to you as soon as the announcement comes. If you have a need for accessories or features not presently available, please let me know. We are always interested in new ideas from our customers.

Thank you again for purchasing from SIGNATONE. We are truly anxious to give you good service.

Sincerely,



L. Brent Dickson
President

WARRANTY

SIGNATONE CORPORATION warrants against defects in material and labor for the period of one year on most products.

All products manufactured by SIGNATONE, (except Probe-tips and Probe tip Holders) will be serviced at the SIGNATONE factory if the need arises. The warranty is for one full year from the date of the invoice.

To make a warranty claim, please call the factory with your model number, serial number, and date of purchase. Please be prepared to describe the problem in detail. Most warranty repairs are simple and may be done by the customer in the field. However, in the event the material needs to be returned, it is the customer's responsibility to pay the charges for shipping to the factory. SIGNATONE CORPORATION will pay the charges to return the product to the customer.

II. UNPACKING AND SET-UP

A. UNPACKING / SPACE

After the crate has been opened, carefully lift the Prober by the base. **DO NOT LIFT BY PLATEN OR BY THE CHUCK.** Lift by the base casting and the base of microscope. Clear a space on a solid table which will hold the 125 pound weight of the Prober. The actual dimensions of the Prober are: 20.5" Deep, X 26.5" Wide, X 22" High, with the microscope in place. Approximately 2" extra is required in depth direction to allow for Microscope "Y" travel & cables, and approximately 6" extra in width to allow for easy use.

If the system is to be used with a High Powered microscope at high magnification, the table should be placed on a solid, vibration-free floor. At high magnifications, all microscopes are sensitive to room vibration, therefore, if the Prober is placed in an environment where vibrations occur, such as an upper floor of a building, etc., a vibration table may be required

B. UTILITIES

The only outside utilities required for the Prober is a vacuum source through a 1/4" line of plastic or metal. The vacuum is used to hold the wafer, optional vacuum-base micropositioners, and the socket-card adapter in place, so the flow of vacuum is extremely small. We have specified 20" mercury pressure at .1CFM.

The microscope light requires 175 Watts at 120V (Fuse = 2.0 AMP SLO-BLO). Please check the rating on the microscope power box to be sure of proper voltage.

C. MOUNTING MICROSCOPE

If you have purchased a High Powered microscope (Mitutoyo Fine Scope or Leica Microzoom-2) from SIGNATONE, a portion of the mounting bracket is fixed to the back of the focus mechanism. Remove the 4 ea. 6/32X1/2" socket-cap screws from the microscope mount. Hold the microscope against the front part of the microscope mount, and carefully screw in the 4 screws. Tighten snugly with an Allen wrench. Plug the microscope light cord into a power supply. Turn on the light and adjust focus under LOWEST power until a clear image of the wafer chuck is obtained.

If you purchased a microscope from another source, both halves of the microscope mount have been shipped. Please remove the 4 ea. 6/32X1/2" socket-cap screws, freeing the post of the mount which attaches directly to the microscope. Mount the post on the back of the microscope using the 4 socket-cap screws furnished, then proceed as described above.

In the event that the microscope cannot be focused on the chuck surface due to the setting of the microscope mount, remove the microscope and loosen the 4 socket-cap screws in the long slots on the microscope mount, adjust the position of the microscope mount appropriately and re-attach the microscope.

If you have purchased the Stereozoom type microscope, the mounting plates described above are absent, and in their place is a block with a 1/2" diameter hole and a large thumb-screw. Insert the post of the focus section of the microscope into the hole and tighten the thumb-screw.

III. Operation

A. USE OF CONTROLS

Figure 1: shows the S-1160 Prober with the controls identified as follows.

1. **Linear Platen Lift.** This lever raises and lowers the platen up to 1/2" in a linear motion. This is a coarse motion for making contact or removing contact of probe tips with wafer surface. The probe tips are held either by a micropositioner or a probe card, both of which are mounted to the platen. A friction stop allows for continual vertical positioning of the platen. The platen lift is used for lifting the probe tip and indexing the wafer being probed to a new position, then lowering the probe tip.
2. **Vacuum Ports and Signal Connections.** Five vacuum ports on each side of the platen connect to vacuum based micropositioners. The signal jacks are color-coded phone tip jacks & or BNC'S with a coaxial wire connected to the banana jack/binding post or corresponding BNC at the rear of the Probe station.
3. **Large Steel Platen.** The steel platen is ground flat and planerized to the chuck and will accept up to 10 vacuum base or magnetic base micropositioners and a probe card adapter.
4. **Microscope Mount.** This mount is adjustable and permits easy modification for mounting hot or cold chucks.
5. **X-Y Microscope Stage.** This stage is easily moved with a Course & Fine X-Y motion. 6" of X-Y Course movement allows scanning of large areas without lifting the probe tips. 2" of X-Y fine adjust is excellent for positioning the microscope over small geometry's.
6. **Fine Platen Adjustment.** The control knob, in conjunction with the linear platen lift (Item 1) controls the vertical position of the platen, and therefore, controls the probe tips. The fine adjust allows for careful overdrive of probe tips, and is particularly useful when probing with a probe card. In addition, the adjust knob will raise and lower the platen approximately 2" in height to allow for probing samples of various thickness' on the chuck surface without changing probe tip holders,

micropositioner settings, etc. For instance, to change from probing a 20 mil thick wafer to probing a packaged device with a socket card, one should note that the surface of the packaged device is approximately 1/2" higher than the wafer surface. The necessary adjustment then, is made by first raising the microscope, turning knob #6 to raise the platen and probe tips prior to inserting the sample.

7. Vacuum Chuck. The 6" vacuum chuck permits 3" to 6" wafers to be held and probed. The 8" Vacuum chuck permits 4" to 8" wafers to be held and probed. The chuck is nickel plated brass.
8. Rotation Lever. This lever will rotate the chuck 360 degrees, making it very easy to align, with probe cards in place.
9. Vacuum Port Damper Knob. When the micropositioner vacuum-hold button is released, the micropositioner may be moved. However, there should still be some drag. This knob controls the amount of drag, and may be set to the users desired feel.
10. Chuck Vacuum Switch. The toggle switch toggles the chuck vacuum on and off, for holding the sample or fixture to the chuck.
11. X-Y Stage Control Knobs. The X-Y stage is a rack-and-pinion gear assembly with high resolution positioning. The compound knob permits easy moving of the chuck in both directions at the same time. The X motion stage travels 1.125" per knob revolution, and the Y motion stage travels 1.6" per knob revolution. There should not be any noticeable X or Y backlash, or play, in the controls.

B. PROBING WITH MICROPOSITIONERS

The SIGNATONE micropositioners are described in section IV (accessories). Vacuum-hold or magnetic-hold micropositioners are available. Vacuum-hold is preferable because the vacuum can be released, allowing gross movements without over correcting the strong force of the magnetic-hold type. Either hold-down method will give a stable and firm platform for the micropositioner. The choice of probe holder and probe tip type is a matter of customer preference, and the options are described in section D. Probing at high magnifications requires that the sharp probe tip be placed under a microscope objective which is approximately 1/2" above the silicon wafer. The objective will be pivoted to change the magnifications of the microscope. Therefore, the probe holder should be bent to provide a low profile, and a "Z" type probe tip should also be used.

Probing is straight forward if the following guidelines are used:

1. Center the sample on the wafer chuck and adjust the platen and microscope height

such that the probe tips are out of contact slightly above the sample.

2. Center the microscope stage and the area of interest of the sample under the microscope.
3. Turn the microscope to the lowest magnification. With the gross movement, bring probe tip into center of field-of-view. The micropositioner drives should also be centered.
4. Bring the probe tip down to a near proximity of the surface of the sample so that it will remain visible at higher magnifications.
5. Increase the magnification by either the zoom method or by rotating the turret, changing the objectives, then re-center the probe tip in your field-of-view.
6. Repeat step 5 until the probe tip is visible at the desired magnification, then carefully position the probe tip over the area of interest and lower it for contact. Contact can be determined when the probe tip slides laterally. Care should be taken
NOT to overdrive sharp probe tips because they will either bend or damage the wafer.

C. PROBE CARDS AND MICROPOSITIONERS

The S-1160 is designed to use a probe card adapter, S-4710. The probe card adapter is mounted to the upper surface of the platen and holds the probe card above the chuck, such that the probe tips protrude underneath the platen. Care should be taken when mounting the probe card to ensure adequate vertical clearance is allowed above the sample surface, by adjusting the 'fine' platen knob #6. The probe card is mounted by loosening the screws on the probe card adapter and then sliding the probe card in the under side of the adapter, above the wafer surface, on rails provided. The probe card should be seated in the socket in the back of the adapter, and then the screws re-tightened. Because the S-1160 is a manual Prober, no probe card rotation is required. The microscope should be centered above the hole in the probe card at low magnification, and the wafer rotated, using the rotation lever, until it is aligned with the probe card. At this point the platen and probe card are carefully lowered to make contact with the wafer by using the 'fine adjustment knob #6. Standard probe cards are designed to have approximately .003" of overdrive.

Many probe cards have a large number of probes. Therefore, one needs to be careful to align all probes with the appropriate contact pads. The alignment can be checked by focusing on the contact pads at high magnification and moving the microscope around to check each pad. If a Stereozoom microscope is used, a Ring Illuminator is recommended (SEE section IV) to eliminate confusing shadows. With the probe card in contact with the wafer surface, the device may be activated. Additional probes can be used to analyze the operation of the circuit by following the procedure described in using

micropositioners. Generally, an active probe (SEE section IV G) would be used so that the presence of the Prober does not effect (the electrical loading) the operation of the device. Care must be taken in placement of additional probe tips so that damage to the probe card or probe tips is prevented.. Additionally, care must be taken when raising the probe tips or probe card above the wafer surface, to prevent collision with the microscope objective.

IV. ACCESSORIES

Included in this section are brochures and written discussions to assist you in selecting and using the various accessories available for the S-1160 Prober.

A. MICROPOSITIONERS

S-926/S-931
S-725
S-600
S-750

B. PROBE HOLDERS AND PROBE TIPS

The probe holder is the brass connector between the micropositioner and probe tip. It is made of brass to be malleable, and a good electrical conductor. Several lengths and configurations are available as described in this section.

C. MICROSCOPES

1. Two general types of microscopes are used for probing. At magnifications higher than 105X, the compound, Leica Microzoom or Mitutoyo Finescope or A-Zoom. The Leica & Mitutoyo microscopes are characterized by having several objectives mounted on a turret. The magnification is changed by changing objectives. The magnification can be calculated by multiplying the objective magnification by the body (including any zoom magnification) by the eyepiece magnification. Each objective has a numerical aperture which is related to its resolving power. AS a general rule, images of magnifications more than 1500 times the NA of the objective tend to "wash-out" or become empty; meaning, in general, a bigger image, but little more detail is seen. As an example, the Leica Microzoom standard 50X objective has a NA of .45. Images at 500X magnification are fairly crisp, but in the range of 700X the image becomes very soft. Therefore, the use of high magnification eyepieces to increase the magnification gives limited results. The A-Zoom (offered by ready Products) includes one objective with a 40-1 Zoom capability. This allows a large range of magnification without moving

or turning the objective position.

SIGNATONE offers the Leica Microzoom, Mitutoyo Finescope, compound microscopes, and the Ready products A-Zoom.

2. The Stereozoom microscope is characterized by having long working distances, approximately 3 inches, and a zoom capability which gives magnifications of the zoom power times the eyepieces used. The lower priced Stereozoom microscopes have indirect illumination, and therefore, you see a dark filled image

with no color at magnifications from 8X to 80X. The Leica Stereozoom 7 has a coaxial light source which gives a light filled image and magnifies between 15X and 105X if 15X eyepieces are used.

3. In addition to the coaxial light source built into the Stereozoom 7 or compound microscopes, both incandescent Nicolas Illuminators and fluorescent Ring Illuminators are available. The ring illuminator mounts directly to the bottom of the microscope and presents a ring of light to the probing area which eliminates shadows. (Highly recommended for use with probe cards.)

D. S-4710 PROBE CARD ADAPTER

The probe card adapter is used to mount all standard 4 1/2" and 5 1/2" wide probe cards to the platen of the S-1160 Prober. Standard models are available in 5" or 6" lengths with 48 to 72 pin connectors. Please call the factory for probe card adapters of wider dimensions, or double ended connectors, etc.

E. S-2715 SOCKET CARD ADAPTER

The socket card adapter consists of a frame mounted on a flat circular disk. The disk can be held on the wafer chuck surface by vacuum, in the same manner that a wafer is held. The frame accepts any standard 3 1/2" socket cards. SIGNATONE offers standard socket cards of 14 pins to 60 pines with textool easy insert sockets. The socket card adapter and socket card is used to analyze operational I.C.'s with lids removed. The operational signals pass through a connector in the rear of the S-2715.

F. TRANSFERABLE HOT CHUCK SYSTEM

The transferable Hot Chuck System combines SIGNATONE's intelligent Temperature Controllers with our 4,6, or 8" Thin/Transferable Hot Chucks to create a quick and simple way to probe wafers at elevated temperatures on your existing probe station. The chuck will typically heat from 30C to 300C in 6-10 minutes (cooling time dependent on chuck Size), and cool from 300C to 30C in 6-10 minutes.

The gold or nickel plated hot chuck is held by vacuum onto the probe station and requires no mounting hardware(Vacuum Hold Down). This unique hot chuck can easily be

transferred from one probe station to another. A continuous cooling line at the base of the chuck prevents heat transfer to the probe station. These hot chucks are available with a variety of controller packages (see hot chuck Brochure)

G. ACTIVE PROBE SYSTEM

This system, made by Picoprobe, is most popular. It includes the following: SP-12 active probe arm, power supply, a 1 micron, a 3 micron, and a 5 micron active probe tips, and a choice of micropositioner mounting. The high input impedance amplifier is placed approximately 1/4" from the probe tip to reduce circuit loading by stray capacitance, leakage, etc..

H. VIDEO SYSTEMS

1. A 14" color monitor system includes a 14" Sony color monitor , color camera and focal tube adapter for the microscope.
2. A 20" color monitor system includes a 20" Sony color monitor, color camera and focal tube adapter for the microscope.

I. VIBRATION TABLES

SIGNATONE offers vibration tables made by Kinetic Systems Corp., plus various table top vibration feet, etc. Please call the factory for information.