

ALLIED

HIGH TECH PRODUCTS, INC.

MultiPrep™ System

115V AC



Operation Manual

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Version 6.1, 1/04

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Safety Precaution Sheet

Warning!

To be read carefully before operating the machine

1. The operator(s) must be properly trained in all aspects pertaining to the operation of this machine according to the operation manual.
2. The machine must be placed on a safe, suitable surface to allow for operation without hindrance to the controls.
3. Only consumables suited and compatible with the operation of a grinder/polisher should be used.
4. Any local machinery and occupational safety standards must be strictly observed.
5. The operator must ensure pieces being ground/polished are held securely during the process.
6. The operator should not wear loose clothing, ties, jewelry or other items that may get entangled in the machine during operation.

Safety Labels



Electrical

This label is located on the rear of the machine and indicates where the power cord is connected. **Remove the power cord when changing fuses or when performing any service.**



Hand Entanglement

It is possible to entangle your hands or fingers in the moving parts of this machine. Please use caution and turn off all power when reaching into the machine or when changing platens.



Protective Eyewear Recommended

It is recommended that protective eyewear be worn while operating the machine.

MultiPrep™ System Technical Data

Model: #15-2000 (115V AC), #15-2000-230 (230V AC)
Description: Precision Polishing System
Serial Number: 922 MultiPrep™
986 TechPrep™
Volts: 115 230 (check applicable)
Frequency: Factory calibrated to 60Hz (operates at 50Hz or 60Hz)
Motor: 0.25 HP/single phase/DC (TechPrep)
15 VDC (MultiPrep)
Fuse: 6A, 5mm x 20mm, 250V
Year of Manufacture: 5/11/04 mm/dd/yyyy
Dimensions: 15" (381mm) W x 26" (660mm) D x 20" (508mm) H
System Weight: 83 lbs. (37.5 kg)

Software: V 2.6

Recommended Operational Temperature Range:

50°F (10°C) to 80°F (26°C)

Humidity Range:

None Established

Special Note:

The TechPrep™ is designed to operate at either 50Hz or 60Hz frequency, however, the unit is electronically calibrated to 60Hz prior to shipping. If the unit is to be used with a supply voltage frequency of 50Hz, it will be necessary to recalibrate the system to achieve accurate speed/RPM readings and timer count. See "TechPrep™ Operation" for details.

MultiPrep™:

Vertical Travel of Arm: 2" (50.8mm)
Vertical Travel of the Spindle: 1/2" (12.7mm)
Incremental Detectable Movement of Spindle: 1µm (39.37µin.)
Voltage of Oscillation/Rotation Motors: 15V DC
Weight of Vertical Spindle (w/o fixtures): 500 g (1.10 lb.)
Sample Rotation: 8 speed settings
Sample Oscillation: 6 speed settings

Accessories/Fittings

Inside the smaller shipping container there is a box containing the following items:

	<u>Included: Y/N</u>	<u>Allied Item No.</u>
Drain Tube; 3' (92cm)	_____	
Drain Tube Hose Clamp (3)	_____	
Splash Ring	_____	#10-0113
Platen Cover	_____	#21-2115
Platen	_____	#10-1005
Power Cord	_____	#10-1224-B
Allen Wrench Set (standard)	_____	#15-SET
90° Elbow (w/ 2" drain tube)	_____	
4' (122cm) Inlet Tube (1/4" OD)	_____	
Water Filter (inlet)	_____	#10-1280 (screen) #10-1281 (housing)
Drain Screen (secured in the drain bowl)	_____	#10-1272
MultiPrep™ Positioning Device	_____	
Digital Dial Indicator (orange box)	_____	#15-2207, 15-2223, 15-2224
Accessory Case	_____	#CASE
<u>Inside accessory case:</u>		
Dial Indicator Kit	_____	
	#15-1030	
O-Rings (spare, pk/4)	_____	#15-2225
Calibration Mirror	_____	#15-1060

Upon inspection of the contents, please fill in this form and fax it to the number below to register the warranty.

Fax number: (310) 762-6808

Attention: Equipment Warranty Registration

Company Name: _____
 Name: _____ (Print)
 Phone: _____

Company Address: _____

Comments:

Installation

Place the TechPrep™ on a clean, flat surface with the control panel facing the operator.

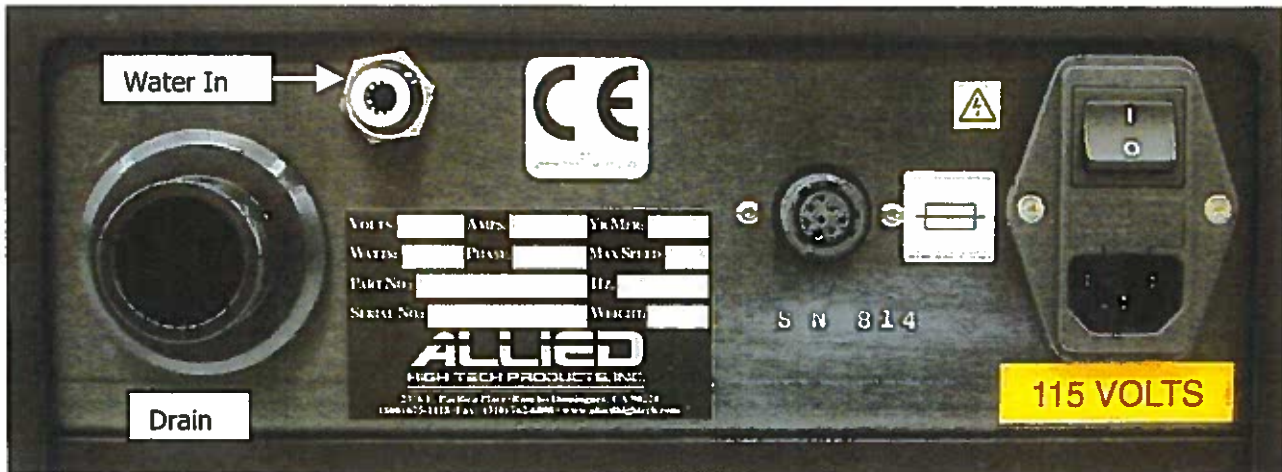
Electrical

Before installing the plumbing of the TechPrep™, all electrical functions should be tested. See page 36 for a diagram of the control panel and page 11 for an explanation of the function(s).

Plug the power cord into the machine, then into the wall socket. Turn the "main" power switch on at the rear of the machine where the power cord is connected. Activate the control panel by pressing the on/off button. The LED in the upper left corner of the button will illuminate, as will the LEDs in the display windows for the timer and RPM.

In the RPM window, a value will be displayed ranging from 5 to 350. If this is not the case, enter an RPM value in the range between 5 and 350 (5 RPM increments) and press the "enter" button, then the green "run" button. The platen will rotate in the direction selected. The direction of the platen is selected using the buttons labeled with circular arrows in both clockwise and counterclockwise directions. An illuminated LED on either button indicates which is activated. Press the "stop" button and select rotation in the opposite direction. The LED of that button will illuminate and an audible click will indicate the relay has switched the motor direction. Press the "run" button to ensure the platen rotates in the newly selected direction.

Press the button labeled "coolant" and be sure the click of the solenoid is audible. This indicates the solenoid is activating properly.



Plumbing

Flow Rate:	0.5 GPM (ideal) 1.89L/minute
Inlet Pressure:	25 psi (minimum) 1.76 kg/cm ² 50 psi (maximum) 3.52 kg/cm ²
Drainage:	1.0 GPM (recommended @ 30 psi) 3.78L/minute
Inlet Tubing:	1/4" OD (6.35 mm)
Drainage Tubing:	1¼" ID (32 mm)

Inlet

Install the supplied inlet water filter between the water source and the TechPrep™.

The inlet fitting used on the TechPrep™ only requires the tube to be inserted until it stops. No tools are required for this installation.

To remove the tubing, press the outer collar of the fitting in and pull the tubing out. **BE SURE TO TURN THE WATER OFF BEFORE REMOVING THE WATER TUBING.**

Drain

With the hose clamp on the drainage hose, position the hose onto the coupling at the rear service panel. Tighten the hose clamp so the hose does not slip from the coupling. Use the 90 degree elbow fitting to direct the drain hose if the tubing does not bend sharply enough for proper installation.

Activate the coolant solenoid by pressing the coolant button (water flow may need to be regulated or adjusted using the valve). **DO NOT USE THE VALVE AT THE WATER SPOUT TO COMPLETELY SHUT OFF THE WATER FLOW. It is rated for 30 psi and intended only to restrict the water flow during polishing.**

TechPrep™ Operation



Electronics Calibration

The TechPrep™ operates at either 50Hz or 60Hz and is calibrated to 60Hz prior to shipping. If the unit is operated at 60Hz frequency, no calibration is necessary.

Machines operating at 50Hz require calibration following installation. Failure to re-calibrate the unit to 50Hz will result in misrepresentation of the RPM and timer values.

To calibrate the electronics, press 1, 0, 0 followed by "enter". Activate the platen by pressing the start button. After approximately 30 seconds, press 3, 5, 0 then "enter" and allow it to run for another 10 seconds. With the machine running at 350 RPM, press and hold the "enter" button until two quick beeps followed by four additional beeps are heard, then release the button. This will begin calibration, storing the accurate speeds into memory. The time of the calibration process will vary but will usually be complete after about 25 to 30 minutes. When the calibration cycle is complete, the control panel will power itself off. Turn the main power off at the AC receptacle for at least five (5) seconds, and then back on for normal operation. During the procedure, only the main power switch can stop the machine.

Contact an Allied representative if there are any questions or comments.

Platens

The 8-inch aluminum platen included with the machine is precision lapped and hard anodized. The lapping ensures flatness and the anodizing hardens the aluminum, making it durable and resistant to scratches and dings. On the underside a center hole is used to help locate the platen on center with the platen base. The four smaller holes around the center hole are where the nylon drive-pins fit to drive the platen.

On the platen base, there is a letter "A" stamped (circled below in photograph). This is used as a reference when placing platens on the machine as it relates to run-out (see page 22). The platen included with the system has an "A" stamped on the underside that indicates where it should be aligned to the platen base. Additional platens, not originally purchased with the machine, will not have this "A", but can be matched for minimal run-out (see page 22).

Note: This is a precision polishing machine and care must be taken to ensure performance. **DO NOT DROP the platen onto the platen base. Repeated abuse will affect the precision. Keep the surfaces between the platen and platen base clean and dry so the platen run-out remains within specification. Excessive water and polishing suspension buildup will adversely affect run-out.**



Splash Ring

The splash ring is recommended to control splashing of abrasives and liquids during polishing. It should be cleaned regularly to eliminate contamination.

Control Panel, On/Off

This button activates and deactivates the control panel.

Platen Controls

The platen controls include buttons for: RPM, Start/Run, Stop/Pause and platen direction (clockwise and counterclockwise). Arrows mark each platen direction button; an LED, when illuminated, indicates which direction is selected. If during operation the button for the direction not selected is pressed, all functions are paused. The new direction is activated, but the machine will remain stopped until the platen is re-activated by pressing the "run" button. The Stop/Pause button stops the platen, coolant and, if activated, all MultiPrep™ controls.

Coolant

The coolant button activates and deactivates the water solenoid. When a water supply line is installed, the solenoid allows water to pass through when activated.

Keypad

The keypad is used for platen RPM selection, timer entry and speed selection for the oscillator and rotation functions of the MultiPrep™. Any value entered on the keypad defaults to the RPM value. When selecting platen speed, there are two methods: 1) using the arrow buttons to increase (up arrow) or decrease (down arrow) the speed or 2) pressing the number buttons AND pressing enter. **Note:** The "enter" button must be pressed following number entry for the RPM or timer function to activate the value.

Timer

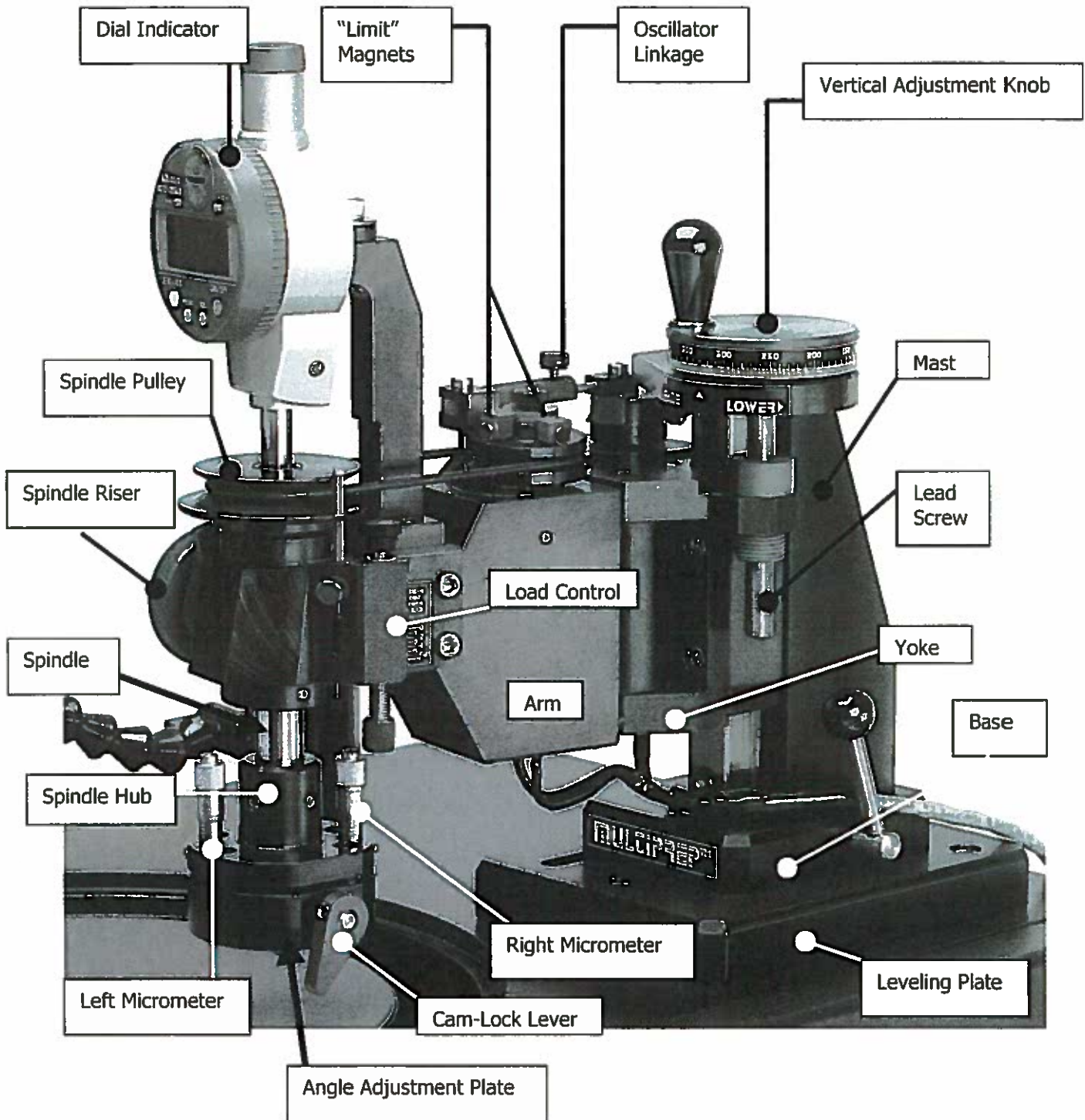
Located in the "MultiPrep Controls" box on the TechPrep™ panel is the timer. In its default mode it may be used as a counter (to characterize polishing methods) or it can be set for unattended operation.

The timer can be set before or after platen rotation is activated. If started during operation, it will begin countdown after the "enter" button is pressed. If it is set before operation, countdown will begin when the "run" button is pressed and the platen is activated. Should the machine be stopped during operation, the timer stops counting and resumes when the "run" button is pressed again.

Set the timer by pressing the "timer" button (the LED will illuminate). Enter the desired time using the keypad and press "enter". If during entry a mistake is made, press the "c" (clear) button and re-enter the correct time followed by pressing "enter".

MultiPrep™ Terminology/Identification

This photo is used to identify the components and allow the operator to associate each term used in the manual with the parts and features of the MultiPrep™.



MultiPrep™ Installation

Remove the MultiPrep™ from the packing material. It is mounted onto the **leveling plate** of the TechPrep™, using the cam-locking mechanism housed in the **base** (see "Terminology Identification", **page 12**). While looking at the bottom of the MultiPrep™, rotate the **cam-lock lever** attached to the **base**. Observe the locking mechanism (**plunger**) move in and out as the lever is rotated. Move the lever so the **plunger** is fully extended. **Note:** It is important that both the bottom of the MultiPrep™ **base** and the top of the **leveling plate** are clean. Place the MultiPrep™ onto the leveling plate so the **plunger** fits into the slot. Slide it forward so the front edge of the MultiPrep™ **base** is about 1 inch from the front edge of the **leveling plate** and tighten the lever firmly.

The **leveling plate** is mounted to the TechPrep™ with three (3) Stainless Steel Socket Head Cap Screws. These screws are used for calibrating the MultiPrep™ so the main **spindle** is perpendicular to the TechPrep™ platen.

After the MultiPrep™ is mechanically attached to the TechPrep™, electrical connections must be made. Ensure that power is off to the TechPrep™ and plug the cable from the MultiPrep™ into the receptacle located on its rear panel. The plug is keyed, so be sure to align the sockets so they match.

Mount the Digital Dial Indicator into position by securing it to the bracket mounted on the top of the arm using the screw and Teflon washer attached to the bracket. Be sure to center the shaft of the indicator in the hole of the spindle so the spindle movement is not affected. Raise the spindle with the spindle riser a few times to make sure the shaft of the dial indicator moves freely and does not touch the inside walls of the spindle.

MultiPrep™ Operation

Vertical Adjustment

The MultiPrep™ is designed to accommodate samples of variable thickness, and has two methods of vertical adjustment. Method A is with the **vertical adjustment knob** (Figure A). Method B is with the **spindle riser** (Figures B & C).

Method A: Vertical Adjustment Knob

The **vertical adjustment knob** is used to control the vertical position of the sample as defined by the **yoke/arm** assembly. It is also used to establish the downward travel stopping point for the sample, which occurs when the **spindle pulley** makes contact with the **arm**. The readout on the scale around the **knob** is in 2-micron increments. When rotated clockwise, the **arm** travels upward. When rotated counterclockwise, the **arm** travels downward.

Method B: Spindle Riser

The **spindle riser** (Figure B), located on the left side of the **arm**, is used to raise the **spindle/sample** without changing the vertical position of the arm. It will be used when it is necessary to replace platens, abrasives or cloths, or for sample inspection. To use, rotate the **knob** toward the front of the arm until the flat spot on the plastic fin is in full contact with the bottom of the **spindle pulley** (Figure C). At this point, the sample can be removed for inspection (Figure D) and/or the **arm** can be swung away to allow platen/abrasive changes. When completed, lower the sample with the **spindle riser** to continue grinding/polishing. This process returns the sample to its original vertical position, since no adjustments were made to the **vertical adjustment knob**.

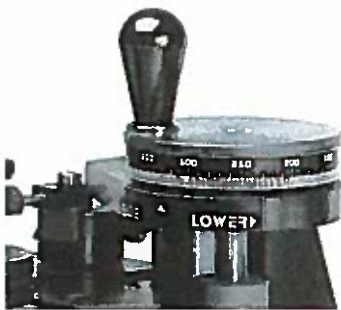


Figure A

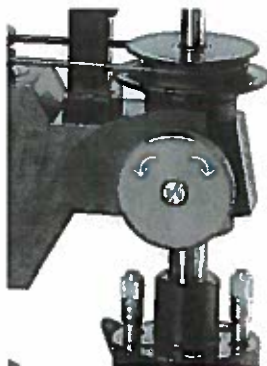


Figure B



Figure C

Note: When replacing platens/abrasives having different thicknesses, a change may be noticed on the **digital dial indicator** readout. Use the **vertical adjustment knob** to reestablish the previous setting if necessary.

Fixture Attachment

All fixtures are mounted to the bottom of the **angle adjustment plate** of the **micro-hub assembly** attached at the end/bottom of the **spindle**. Each fixture has a common U-shaped cutout. The flat edge of the fixture is referenced against the machined edge (lip) of the **angle adjustment plate**, which is located behind the **cam-lock plunger** (Figure D). **Note:** The **spindle** should be raised either using the **vertical adjustment knob** or **spindle riser** so that the sample and fixture fit without contacting the platen/abrasive.

To attach a fixture, slide it onto the plate until it makes full contact with the edge. Make sure it has engaged the **cam-lock plunger**. Rotate the **cam-lock lever** clockwise until tight. Mounting of the sample onto the fixture is usually done with wax, double-sided tape, glue or set-screws as required by the type of sample and desired sample orientation.

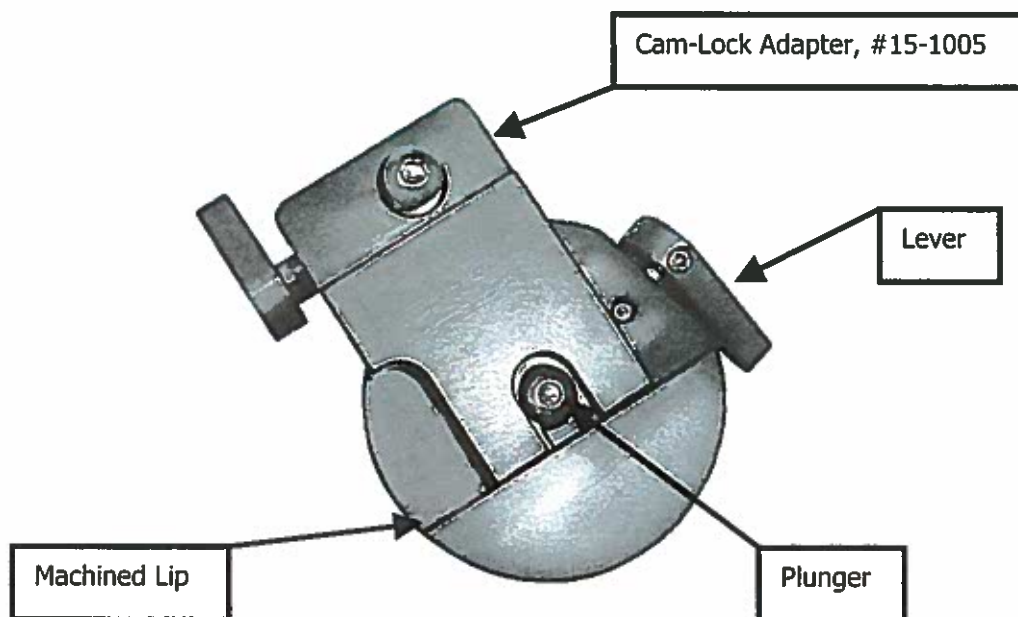
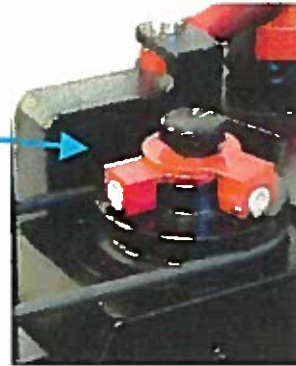


Figure D
Bottom View of Micro-Hub Assembly

Rotation

1. Full Rotation: Sample rotation is activated by pressing the "Full" button located above the connected "Rotation" keys in the "MultiPrep Controls" box of the TechPrep™ control panel. The rotation speed is variable with (8) settings. To program the speed, press the "Full" key once and then press it again and hold it until the LED turns orange and a double beep is heard. Release the key and select the desired speed using the up/down arrows. In the timer window, the number at the right indicates the current speed setting. Once that speed is selected, press the "Full" key again and the LED will turn green. The selected speed will remain the default speed until reprogrammed.
2. Limit Rotation: Limit rotation allows the sample to be rotated in an alternating direction between two points. At the top of the rotation motor pulley, where the O-ring is connected from the motor to the spindle, there is a knurled screw. When loosened, this screw allows adjustment of the two magnets used to define the range of travel. The sensor pickup is located on the left side of the arm where the oscillator link/bar is attached.

Limit Sensor Location



Oscillation

1. Range: To set the range of the sweep, loosen the horizontally oriented thumbscrew that is located on the **oscillation motor** (see "range" thumb screw, on Figure E). Slide the dovetail bar so the drive pin moves closer to or farther from the center of the hub. Moving the pin closer to the center will provide a smaller sweep (range), and moving it farther from the center will create a larger sweep.
2. Position: The oscillation position is the area over the platen where the sample will sweep and is defined by the drive linkage length. Set this position after setting the range. The linkage consists of a drive bar that is engaged into a hollow cylinder. It is adjusted by loosening the thumbscrew that is vertically oriented on the cylinder (see "position" thumbscrew on Figure E). Adjusting the engagement depth of the bar will position the sample over the desired area of the abrasive. Less engagement will position the sample toward the outer edge of the platen/abrasive, and more engagement will position it toward the center of the platen/abrasive. After adjustments are made, activate the oscillator and make sure the position selection does not cause the sample to extend over the edge of the platen.

3. Speed: The "OSC" key located on the TechPrep™ control panel in the box labeled "MultiPrep Controls" is a toggle key. Every time the key is pressed, it either activates or deactivates the power for the oscillator motor. When the motor is activated, the LED is green. The speed for the oscillator is adjustable with 6 speed settings and is programmed using the TechPrep™ keypad. To program the oscillator speed, press the "OSC" key, activating the oscillator motor, then press the "OSC" key again and hold it until the LED turns orange and a double beep is heard. Release the key and select the desired speed using the up/down arrows. Once that speed is selected, press the "OSC" key again and the LED will turn green. The selected speed will remain as the default speed until reprogrammed.

Note: When changing platens/abrasives, it may be necessary to swing the **arm** to the right of the TechPrep™ to gain access to the platen (see photo at right). To do this, loosen the "**position**" thumbscrew and move the arm to the side at its farthest position. To reconnect, simply move the **arm** left so the drive bar slides into the hollow cylinder and tighten the screw at the desired position.



Optional rear dial indicator shown (#15-Indicator)

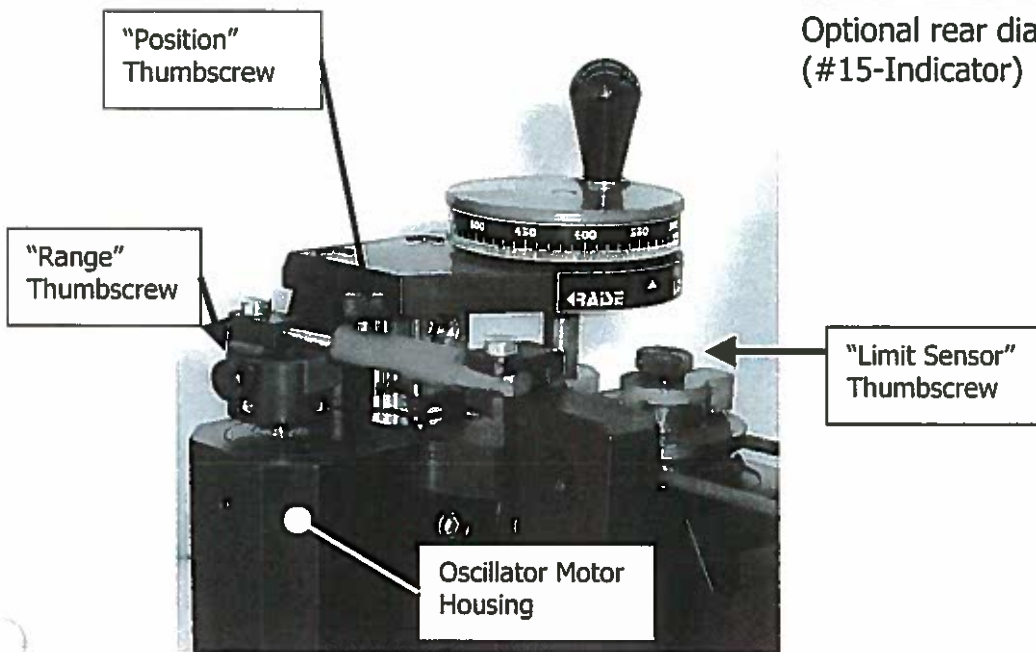


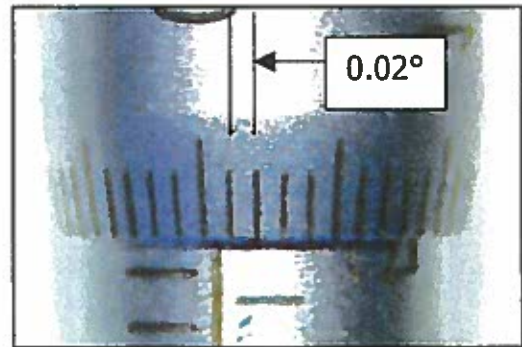
Figure E

Angular Adjustments

Angular adjustments are necessary for certain polishing procedures or to correct misalignment of samples due to fluctuations in glue, wax or other sample mounting mediums. The adjustments are made by rotating either of the micrometers located on the **micro-hub**. Both micrometers are oriented 90 degrees from the fixed pivot pin. The **spindle hub** and **angle adjustment plate** are spring-loaded. The micrometers and pivot pin are fixed in the **spindle hub** and apply constant pressure to the **angle adjustment plate**. The pivot pin creates a known distance between the two plates. The micrometers are identified as the **left front micrometer** and **right rear micrometer**.

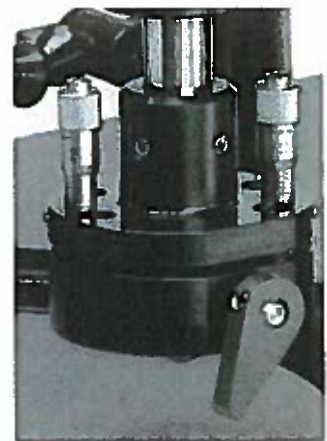
The machined lip on the underside of the angle adjustment plate is the reference for all the fixtures and must be kept clean. It is parallel with the pivot pin and the right micrometer. It is perpendicular with the pivot pin and the left micrometer. The right micrometer is used to make radial angle adjustments (left to right). The left micrometer is used to make axial angle adjustments (front to back).

- **Radial** – left-to-right adjustments are made using the micrometer located at the right rear. The left to right adjustment is also known as **Roll**.
- **Axial** – front-to-back adjustments are made using the micrometer located at the left front. The front to back adjustment is also known as **Pitch**.



Note: Each incremental adjustment on either micrometer creates a .02-degree angle on the sample.

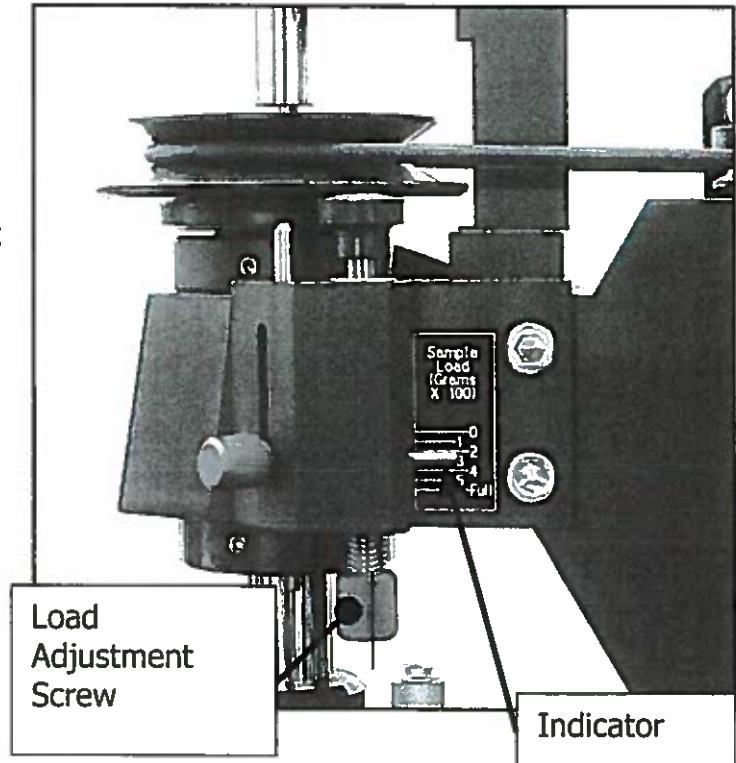
Pivot Pin - creates a gap between the **spindle hub** and the spring-loaded **angle adjustment plate**. The gap is factory set at 2032 μ m (.080 inches) allowing axial and radial adjustments of +10/-2.5 degrees. If more angular adjustment is necessary, the gap can be increased. However, a larger gap between the plates will decrease spring life.



Sample Load

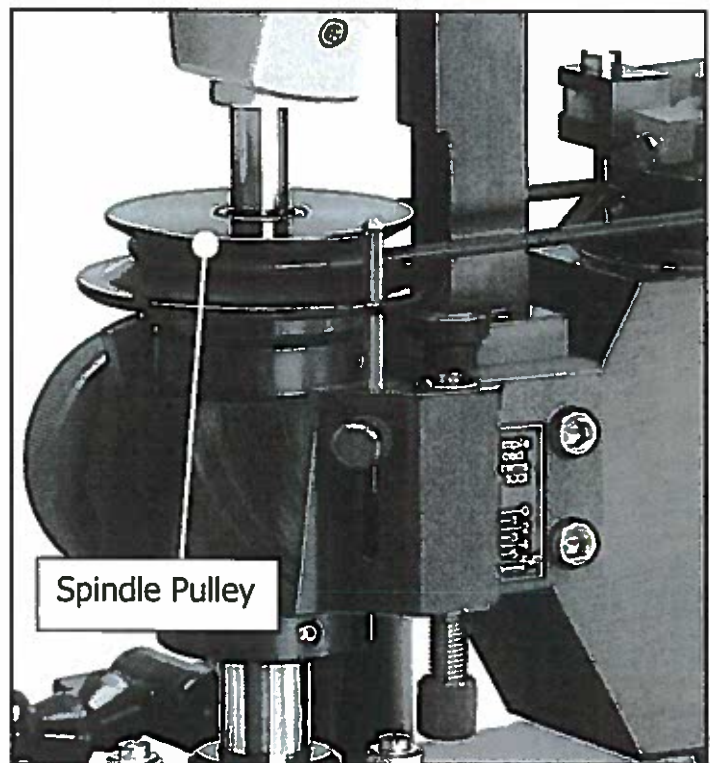
Total spindle load is approximately 500 grams. The total load with fixture will change based on the fixture that is used. For certain polishing applications (i.e., fragile specimens, TEM thinning) it may be desirable to reduce the amount of load on the sample. The load adjustment feature (right) allows load reduction from 0-600 grams in 100-gram increments.

Adjust the sample load by turning the knurled screw (load adjustment screw) until the indicator moves to the desired setting on the scale.



Spindle Lock

It may be desirable to lock the spindle, so that the sample is oriented in a certain position relative to the abrasive. The spindle pulley has four (4) holes machined around its perimeter. To lock the spindle, loosen the knurled knob and engage the pin into the desired hole, then tighten the knob (right).



Theory of Operation, MultiPrep™

The MultiPrep™ consists of a vertically mounted **mast** that is perpendicular to its **base**, a **yoke**, an **arm**, a **vertical adjustment knob**, a **lead screw**, a **vertical spindle**, a **spindle pulley**, a **spindle riser**, a **digital dial indicator**, a **cam-lock**, an **oscillation motor** and a **rotation motor**. The **yoke** holds the **arm** and allows it to pivot on a precision bearing. The entire **yoke/arm** assembly is manipulated by the **vertical adjustment knob**, which is attached to the **lead screw** that is threaded into an insert attached to the **yoke**. Rotating the **vertical adjustment knob** moves the **yoke/arm** assembly up or down. The **arm** supports the **vertical spindle** to which the sample is attached. The **spindle** travels vertically, with a downward stopping point defined by contact between the **spindle pulley** and the **arm**.

When a sample is present and attached to the **spindle** via the **cam-lock** assembly, the sample is indexed downward by counterclockwise rotation of the **vertical adjustment knob** until it makes contact with the platen/abrasive. By continuing to lower the **arm**, the **spindle pulley** is displaced farther from the **arm**. The displacement is measured in real time and is displayed on the **digital dial indicator**. This "measured distance" indicates the amount of material that will be removed from the sample plus any compression the sample makes into the abrasive before the **spindle pulley** is displaced from the **arm**. As material is being removed, the **spindle** will travel downward until the **spindle pulley** makes contact with the **arm**.

As the grinding/polishing sequence begins, the **digital dial indicator** will display the amount of material that is being removed in real time. At any time during the grinding/polishing sequence, the operator can oscillate the sample across the abrasive (sweeping along the radius of the platen) and/or rotate the sample in a limited range or 360 degrees continuously at variable speeds. A specific angle can also be set before operation, and can be altered during the polishing sequence. This angle can be set between -2.5 to +10 degrees front to back and left to right. Once the angle is set, it will remain until changed by the operator.

Calibration

The MultiPrep™ and TechPrep™ are both precision instruments and have been machined to very tight tolerances. Accuracy of calibration is dependent on the cleanliness of certain components. Because the platen and platen base of the TechPrep™ are precision surfaces, it is very important that they be cleaned and dried after every use to ensure accuracy. The MultiPrep™ is calibrated so its **vertical spindle** is perpendicular to the plane of the TechPrep™ platen.

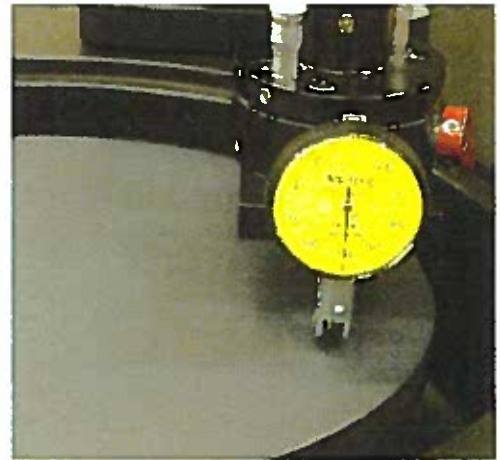
All systems are calibrated and inspected before shipping, but should be checked upon installation by the procedure described on the following pages and be calibrated on an as-needed basis. Many factors contribute to the frequency of calibration, such as number of users, hours used and number of different applications being performed on the tool.

Note: Prior to performing the following calibration procedures, adjust the load setting to "full". Use a lint-free wipe to clean any grease or oil from the bearing on the underside of the spindle pulley and the bearing cover on which the inner race of the bearing make contact.

Platen Run-out

Before calibration, it is important to make sure that the total vertical run-out (movement up and down as it rotates) of the platen is within 5 microns. Locate the **dial indicator kit** (#15-1030), which contains a **dial indicator** (readout in 2µm) and a **black adapter plate** (see photo of accessories on page 34).

Remove the splash ring. Manually adjust the tip of the **dial indicator** away from the yellow dial face to an approximate angle of 15-20 degrees (see Figure H). Raise the **spindle** with the **spindle riser**, if not already done, and attach the **dial indicator** adapter plate.

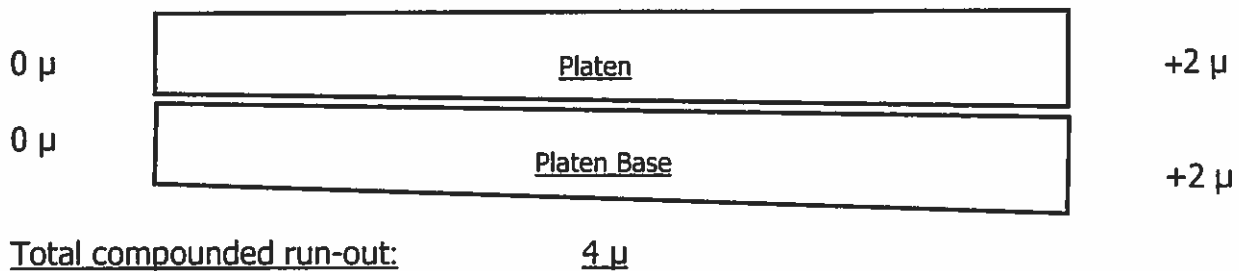


Adjust the oscillator drive linkage so the **dial indicator** is one inch from the edge of the platen (see photo above) and the face of the dial is directed to the front of the machine. Lower the spindle using the spindle riser. Rotate the **vertical adjustment knob** counterclockwise until the dial makes contact with the platen (deflection of the face needle indicates contact) and the face needle reads "100" (rotate the bezel so "100" is at the 6 o'clock position as shown in Figure I). Set the platen speed to 20 RPM counterclockwise and activate platen rotation. Observe the movement of the needle.

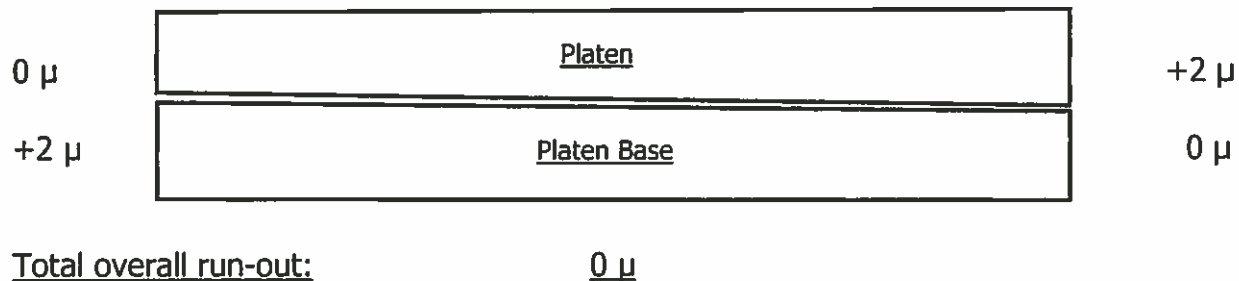
If more than 5 microns of vertical run-out is observed, check the platen and platen base contact surfaces for debris, corrosion, etc., and clean as needed.

Note: The platen and platen base are precision lapped surfaces; however, the tolerances may vary up to 2-3 microns each. The platen orientation, as it rests on the platen base, can affect the overall (compounded) run-out. For example, if the thicker side of the platen rests on the high side of the base, the run-out can be compounded up to 5-6 microns (see Diagram 1).

Diagram 1



Rotate Platen 180°



There are four (4) small holes on the underside of the platen that the drive-pins of the TechPrep™ fit into (Figure F). Rotate the platen on center until the drive-pins engage and the platen rests on the edge of the platen base. Check the run-out at each of the four (4) possible positions (90 degree rotation). For example, the run-out may be 5 microns, 4 microns, 2 microns and 2 microns. At the minimal position of run-out (i.e., 2 microns), remove and mark the corresponding platen drive hole and the nylon drive pin where the stamped "A" is located (Figure F). When different platens are used, it is recommended they be checked, marked and matched for minimal run-out. If using the platen with a polishing cloth, this is less critical as the cloth thickness will change more than 5 microns.

NOTE: Remove the platen when not in use! Dry the machined surface on the platen base and platen when changing.



Figure F

Vertical Spindle Calibration

With the **dial indicator** installed as it is for vertical run-out verification, adjust the oscillator drive linkage so that the **dial indicator** is at, or near, the center of the platen (see Figure H). Activate sample rotation at the slowest speed and make sure the tip of the dial indicator makes contact with the platen for a complete rotation. Observe the movement of the indicator as it rotates 360 degrees. If the needle stays within 2 graduations (4 microns) during a full rotation, the **spindle** is within perpendicular specification to the platen and calibration is not necessary. If the needle deflects more than 4 microns, spindle calibration should be performed. Calibration is accomplished by adjusting the screws on the leveling plate (Diagram 2 and Figure G).

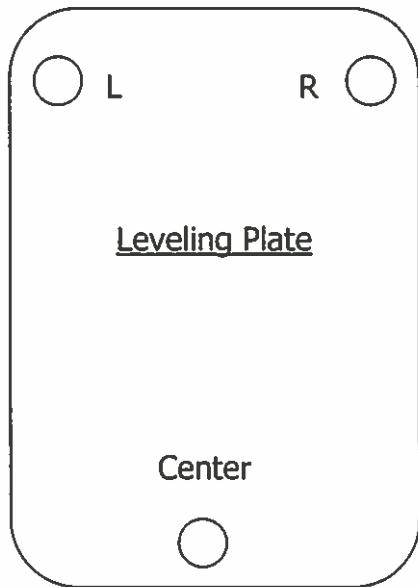


DIAGRAM 2

Front of
TechPrep
↓



Figure G

Vertical Spindle Calibration (cont'd)

Calibration is performed by adjusting the right screw of the leveling plate so the **dial indicator** shows exact readings as it contacts the platen at the 3 and 9 o'clock positions. Once the readings on both sides are equal, only the front-to-back (6 and 12 o'clock) adjustment is necessary. This will require an adjustment to be made to the center screw of the **leveling plate** (Diagram 2).

- 1) Activate sample rotation to advance the **dial indicator** to the 3 o'clock position on the platen and stop (Figure H).
- 2) Adjust the **vertical adjustment knob** to position the needle at "100" on the **indicator** (Figure I). This defines the calibration reference point.
- 3) Activate sample rotation and stop at the 9 o'clock position (180 degrees). Note the position of the needle. If it moved 2 microns or less in either direction, no left to right adjustment is necessary at this time. If the needle deflected more than 2 microns, adjustment of the **leveling plate** is necessary.
- 4) If the needle rotates clockwise, tighten the right screw until it reads "100." If it rotates counterclockwise, loosen the right screw until it reads "100."
- 5) Activate sample rotation and stop when the **dial indicator** is at the 3 o'clock position. Using the **vertical adjustment knob**, adjust until the needle reads "100." Activate sample rotation and stop at the 9 o'clock position.
- 6) Repeat steps 1 through 5 until 2 microns of deflection or less (1 graduation on the dial indicator) is observed between 9 o'clock and 3 o'clock.
- 7) Activate sample rotation and stop when the **dial indicator** is at the 12 o'clock position. Using the **vertical adjustment knob**, adjust until the needle reads "100."
- 8) Activate sample rotation and stop when the **dial indicator** is at the 6 o'clock position. If the needle moved 2 microns or less, no adjustment is necessary. If it moved more than 2 microns, adjustment of the **leveling plate** is necessary.
- 9) If the needle rotates clockwise, loosen the **center screw** until it reads "100." If the needle rotates counterclockwise, tighten the **center screw** until it reads "100."
- 10) Repeat steps 7 through 9 until less than 2 microns of deflection is observed.
- 11) Observe one full rotation to verify needle movement on the dial indicator is 4 microns or less.
- 12) If more than 4 microns is observed, repeat steps 1 through 11.

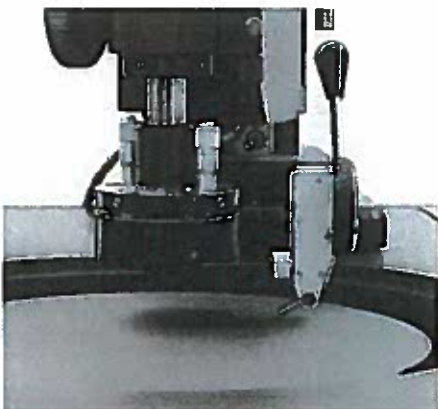


Figure H

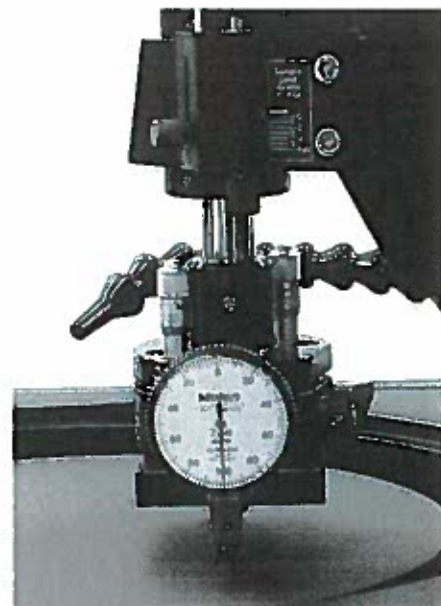


Figure I

Parallel Polishing Calibration

For micro-hub assembly calibration and precision parallel polishing, follow the calibration procedure below:

- 1) Attach a Parallel Polishing Fixture (#15-1020) to the MultiPrep™ and lower the spindle using the **spindle riser**.

Reminder: Make sure to set the load to "full".

- 2) Manually adjust the tip of the **dial indicator** so it is at approximately a 25-degree forward angle, then attach it to the **platen** using double-sided tape as shown in Figure J. Be sure the needle is positioned near the inside edge of the fixture on its underside.
- 3) Rotate the **dial indicator** bezel until the "zero" on the dial points toward the back of the machine.
- 4) Activate **full** rotation until the **fixed pivot pin** is located over the tip of the **dial indicator** shown in Figure J.
- 5) Lower the **arm** using the **vertical adjustment knob** until the bottom of the fixture makes contact with the indicator tip and the **dial indicator** reads "zero."
- 6) Activate **full** rotation until the **right micrometer** (nearest the **cam-lock lever**) is over the indicator tip, and stop rotation (Figure K).
- 7) Adjust the micrometer head so the dial indicator moves back to "zero" (Figure K).



Figure J



Figure K

Parallel Polishing Calibration (cont'd)

- 8) Activate **full** rotation until the **left micrometer** is over the indicator tip, and stop rotation (Figure L).
- 9) Adjust the micrometer so the **dial indicator** needle moves back to "zero".
- 10) Repeat steps 6-9 until less than 4 microns of deviation from "zero" is noted on the dial indicator over the 360-degree rotation.
- 11) Note the **left and right micrometer** settings to assist with future calibration.



Figure L

Micro-hub Assembly Calibration (written values from factory)

Left front micrometer: 5.08 mm
Right rear micrometer: 5.18 mm

For applications not requiring absolute parallel calibration, the values above represent the micrometer positions that accurately re-position the fixtures (within a few microns) relative to the platen surface without having to perform the entire procedure.

Note: If the micrometers are removed for repair, replacement or cleaning, recalibrate the micro-hub using a parallel polishing fixture (see Parallel Polishing Calibration) and change the settings above.

Specific Material Removal (see MultiPrep™ Procedures for specific applications)

There are two methods for removing a specific amount of material from a sample. Using Method A, the operator observes the **digital dial indicator** and monitors how much material is removed. For Method B, the operator uses the scale located on the **vertical adjustment knob** to pre-set the amount of material to be removed.

Method A: Digital Dial Indicator Observation

1. Place desired abrasive onto the platen.
2. Adjust sample load.
3. Activate platen rotation set at 10 RPM.
4. Push the "zero" button on the **digital dial indicator** so the display reads 0.000mm.
5. Lower the arm using the **vertical adjustment knob** until the sample makes contact with the abrasive and the display scrolls to at least 0.100mm over the desired amount to be removed.
6. Push the "zero" button on the **digital dial indicator** so the display reads 0.000mm.
7. Increase platen speed to desired RPM. (the indicator value will change as material is being removed)
8. Use the **spindle riser** to raise the sample off of the abrasive when the display reads desired amount removed.

Method B: Scale Adjustment (scale around vertical adjustment knob, 2µm)

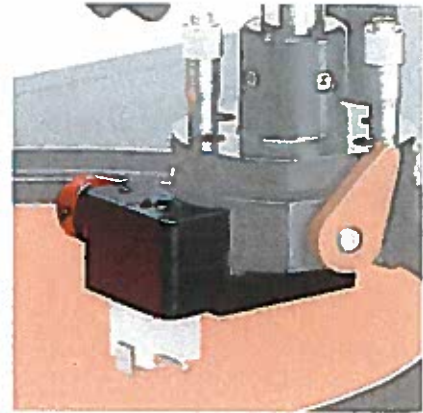
1. Place desired abrasive onto the platen.
2. Adjust sample load.
3. Activate platen rotation set at 50 RPM.
4. Lower the **arm** using the **vertical adjustment knob** until the sample makes contact with the abrasive, usually signaled either by sound or when a trail of debris is observed on the abrasive.
5. Let the sample polish until the spindle stops sample advancement when it comes to rest on the arm.
6. The scale on the **vertical adjustment knob** is in 2-micron increments. Rotate the vertical adjustment knob counterclockwise until the desired amount of material to be removed is set.
7. Let the sample polish until the spindle stops sample advancement when it comes to rest on the arm.

Note: When using Method B, the value displayed on the **digital dial indicator** will not always correlate to the pre-set measurement on the **vertical adjustment knob**. This is due to compression that occurs when the sample makes contact with paper, plastic or cloth-backed abrasives. There is a distance the sample travels after making contact with the abrasive until the **spindle pulley** separates from its resting point (compression). The only time the two values would correlate is when the abrasive surface is "non-compressible" (i.e., metal-bonded discs, lapping plates, etc.).

Fixture Description

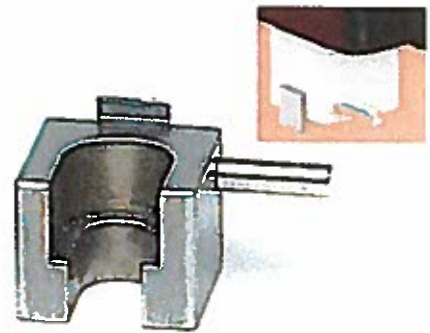
#15-1005, Cam-Lock Adapter

This adapter is used with fixtures #15-1010 and #15-1013 to allow easy attachment to the Micro-Hub assembly. It also positions the fixture so the sample makes contact nearest to the center of the platen to allow maximum abrasive usage.



#15-1010, Cross-Section Paddle

This fixture is used to secure samples perpendicular to the platen for cross-sectioning. Samples are attached/secured to the front face using hot mounting wax (#71-10040). The aluminum construction offers a conductive media for placement into a SEM and is corrosion resistant. The removable pin on the side is 3.1mm in diameter and can be located to the top so the paddle can be placed into the SEM without having to remove the sample.



#15-1013, TEM/Pyrex Fixture

The Pyrex insert is secured permanently to the aluminum body and is ideal for preparing TEM wedge samples in cross-section and plan-view orientation. The pin on the side allows for easy placement of the paddle into the adapter (#15-1005) and when removing the sample for inspection. During the thinning operation, the Pyrex allows light to pass through the sample for thickness determination (when working with silicon).



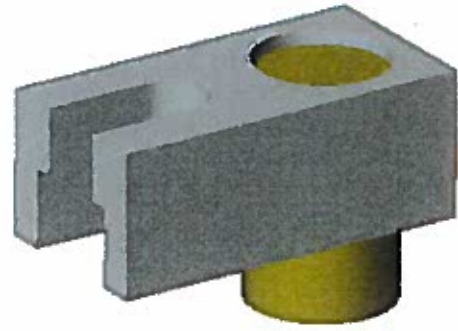
#15-1014, TEM/Pre-FIB Thinning Fixture

With a larger Pyrex insert than #15-1013, many small samples or one large sample can be polished at one time. The half-inch diameter Pyrex is interchangeable and four (4) pieces are supplied with this fixture, which can be purchased separately (#69-40015). The Pyrex can be planarized and made parallel to the platen using abrasives (diamond lapping film works the best). This provides a "zero" reference plane to the platen so that angular adjustments can be made using the micrometer heads. Samples can be secured using wax or glue.



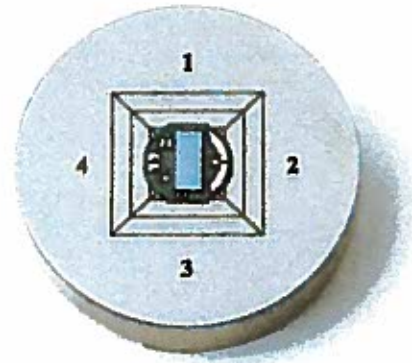
#15-1018 SIMS Pyrex Fixture

This fixture features a 1/2" round Pyrex glass insert secured to an aluminum body that allows light to pass through the Pyrex for transmitted light observation of sample thickness when thinning silicon based devices from the backside for SIMS analysis. Samples are secured to a square glass microscope slide using EpoxyBond 110 and then secured to the Pyrex of this fixture, once it is planarized, using wax.



#15-1020, Parallel Polishing Fixture

Both sides of this fixture are lapped, providing a smooth, flat surface on which to secure samples for parallel lapping/delaying, substrate thinning, backside thinning of flip-chip/C4 devices and many other applications. The stainless steel resists corrosion and warpage from the heating and cooling cycles necessary to melt the wax used for securing samples. The grid provides alignment assistance and reference points for sample orientation.



#15-1025, Mount Holder

The mount holder is used to secure encapsulated samples up to 1-1/2" diameter. The stainless steel construction resists corrosion and provides extra weight for grinding larger samples.



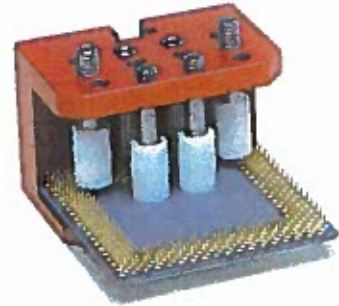
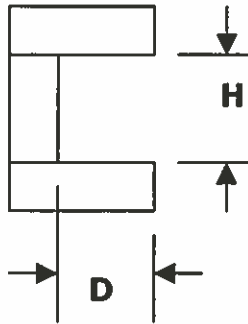
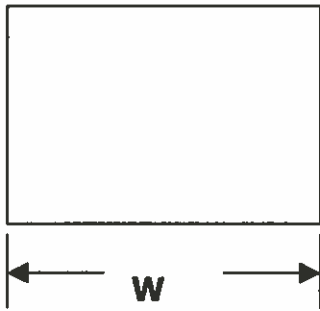
#15-1035, Weight Kit

A complete set of brass weights comes with this kit. The slotted weights are applied to the top of the spindle below the dial indicator. The rod and barrel weights are positioned above the spindle once the dial indicator has been removed. Slide the rod into the spindle to secure it into place. For specific material removal, the rear dial indicator (#15-Indicator) option is available.



#15-1045/1046/47/48, Multi-Purpose Fixture(s)

Each of these fixtures is designed to mechanically secure samples that cannot be waxed or secured well enough using #15-1010. Fixtures #15-1046/48 orient microelectronic packages/devices diagonally (45 degrees) to the platen. Fixtures #15-1045/47 provide sample orientation parallel to the platen. The screws are adjusted to fit various shapes and size samples and feature Teflon tips to prevent damage to the devices/sample.

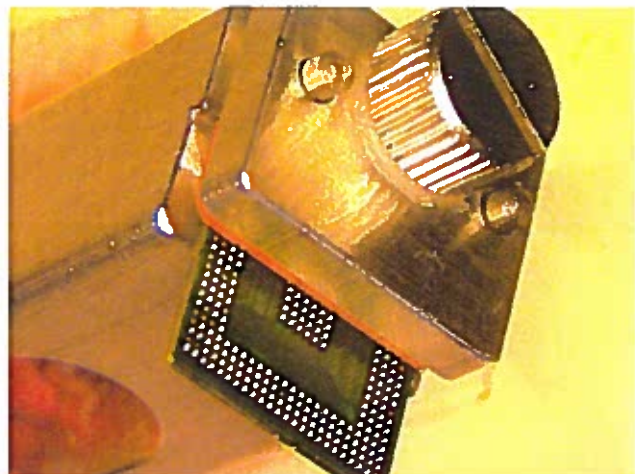
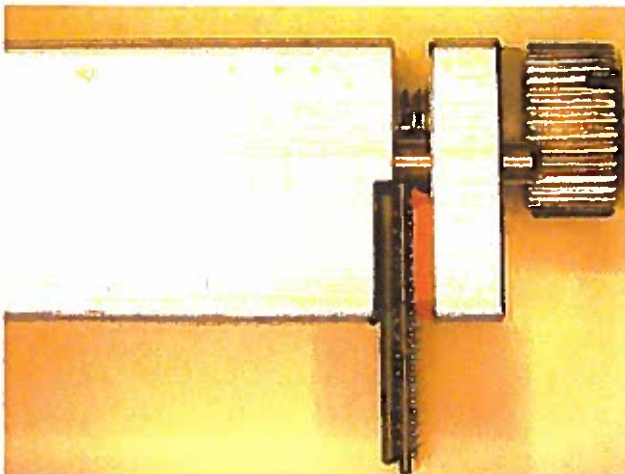


Dimensions:

	<u>W x H x D</u>
15-1045	2.0" x 1.0" x 0.800"
15-1046	2.0" x 1.0" x 0.800" (diagonal orientation)
15-1047	1.0" x 0.4" x 0.5"
15-1048	1.0" x 0.4" x 0.5" (diagonal orientation)

#15-1050/51, Cross-Sectioning Paddle, Clamp Style

This fixture is used to secure small package devices or other samples when wax cannot be used (the heat required to melt the wax could create problems with heat sensitive samples or material). It can also be used as a substitute when waxing is troublesome. Fixture #15-1051 offers diagonal orientation of the sample.



Maintenance

Cleaning the Platen Base and Platen Storage

Vertical run-out of the TechPrep™ platen must be kept at a minimum in order to optimize precision of the MultiPrep™. To prevent oxidation from water and polishing suspensions on the ground surface of the platen base, it is very important to clean and dry this surface after each use of the machine. Warm soapy water or a mild solvent is recommended. Platens should be removed immediately after use and kept dry (i.e. between two paper towels). If colloidal silica dries on the rim of the platen base, it can be removed using diamond lapping film. To clean, run the platen base without the platen at 150 RPM while running water directly onto the edge. Place a piece of 30µm diamond film onto the exposed rim, and apply pressure against the back of the film with a finger, pressing the abrasive against the rim. Hold it in place for at least 30 seconds, and then move the film to expose another area and repeat the process. Once finished, check the vertical run-out of the platen as it rests on the platen base. Repeat the cleaning if necessary to achieve minimal run-out (less than 5µm total). Keep in mind that debris from grinding must be cleaned thoroughly, and lint from any cloth used to dry the platen base must be wiped away so as not to hinder contact between the platen and platen base.

Safe Cleaning Solutions and Methods

The entire exterior of the TechPrep™ is coated with an epoxy-based paint. Although it is mainly resistant to solvents, acetone will remove the paint if left exposed too long. Mild soapy water or detergent (such as Formula 409®) will work well to clean most areas of the machine. On the MultiPrep™, most parts are either stainless steel or anodized aluminum for corrosion resistance. The micrometer head and MultiPrep™ spindles are steel, which corrode when exposed to water and not dried immediately. Micrometer heads should be cleaned as directed below. No oil or lubrications should be used on the MultiPrep™ spindle as it will collect dust and debris that will prematurely wear the surface and degrade performance.

Removing Colloidal Silica

Colloidal silica dries very quickly and is very difficult to clean once dried. A solution of Micro Organic Soap (#148-10000) and warm water will clean dried colloidal silica from most surfaces. A soft, mild brush or scrubbing pad may need to be used.

Micrometer Heads and Replacement (#15-2218-SS)

It is difficult to recommend when the micrometer heads need replacement due to such factors as frequency of use, water exposure, etc. They should move effortlessly as the thimble is rotated. Each set-screw should be snug against the base of the micrometer head it secures, but not so tight that it hinders movement. Removing the micrometer

heads every few months to coat the steel hub with either Vaseline® or grease will help prevent corrosion and freezing of the spindle.

Spring Replacement (#15-2206)

There are two springs that hold together the two plates of the MultiPrep™ spindle hub. Over a period of time, depending on frequency of use, the springs will fatigue. Closely observe the tension of these springs and replace them at your discretion.

Vertical Spindle

The vertical spindle travels up and down in a steel bushing in the arm of the MultiPrep™. This is a precision steel guide that will rust if exposed to water. At no time should water directly splash onto the spindle. Light contact with water is normal and will not cause damage if properly dried.

Rotation Belt (#15-2225)

An O-ring made of Viton rubber is used to connect the rotation motor to the vertical spindle pulley. It should be replaced if slipping, wearing or cracking.

Drain Screen (#10-1272)

Proper orientation of the drain screen is with the narrow end up, like a volcano. This enables the water to flow over the top, yet still allows the screen to catch a sample that has fallen from the holder into the drain bowl. It should be cleaned regularly.

MultiPrep™ Spare Parts

Part #	Description
15-2202	DC Motor for oscillation with side terminal connectors
15-2203	DC Motor for rotation with rear terminal connectors
15-2205	Shoulder Screw for drive pin on oscillator
15-2206	Spring (used between spindle hub and angle adjustment plate)
15-2207	Digital Dial Indicator (use flat tip on existing dial indicator)
15-SR44	Battery for digital dial indicator
15-2218-SS	Stainless Steel Micrometer Head (thimble reads 0-5)
15-2225	O-rings (Pk/4) for sample rotation pulley
15-2145	Threaded Insert for lead screw on yoke/arm assembly

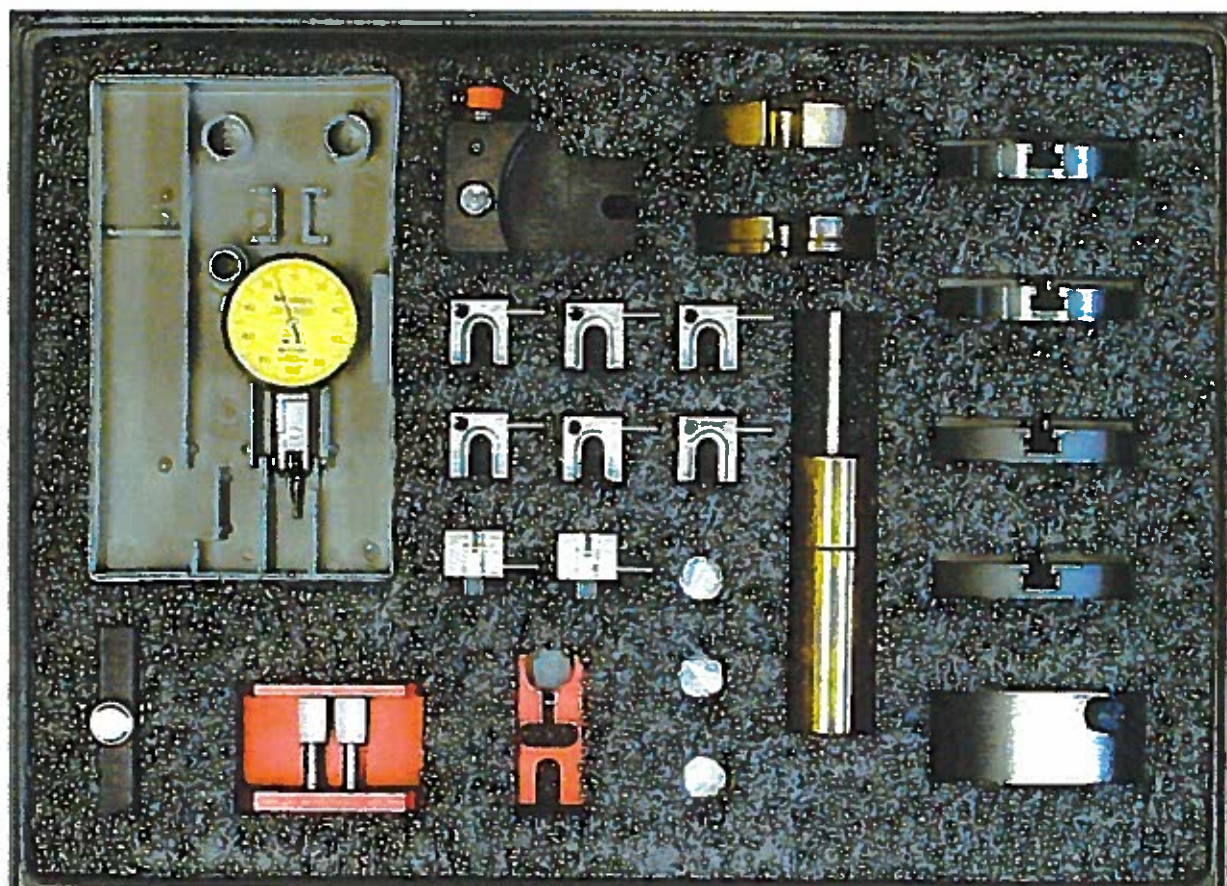
Warranty

This product is under warranty by **Allied High Tech Products, Inc.** to be free of defective material and workmanship for **TWO** years from the date of original purchase. This warranty does not cover damage from abuse, negligence, accidental breakage, improper use or failure to exercise reasonable care and maintenance in accordance with the instructions accompanying this product. If the product fails to conform with this warranty, **Allied** will, at its cost, repair or replace, at **Allied's** option, the defective material and workmanship. To obtain performance of the warranty, the product must be returned to **Allied** within the two-year warranty period. A Returned Authorization (RA) number must be obtained from an Allied representative at (310) 635-2466 before returning any equipment. A letter discussing the defect, part number and serial number must be sent with the machine. Please contact an **Allied** representative if there are any questions.

What is not covered

Corrosion and oxidization as a result of negligent cleaning practices that affect the performance of the MultiPrep™ System and components will not be covered under warranty. This includes, but is not limited to: Micrometer Heads, Run-Out of platen base and/or platen, and MultiPrep™ vertical spindle. In addition, abuse and/or damaged parts from mishandling (such as dropping a platen on the platen base) are not covered.

Options/Accessories

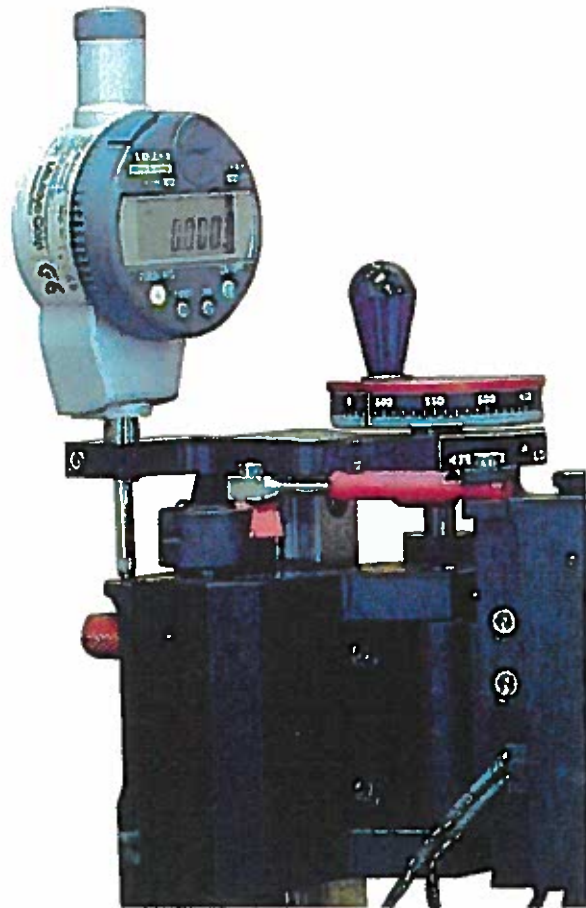


Part #	Description
15-1005	Cam-Lock Adapter (used to secure #15-1010 and #15-1013 to the MultiPrep Spindle)
15-1010	Cross-Sectioning Paddle
15-1013	TEM Wedge/FIB Thinning Paddle w/ Pyrex (5mm x 3.5mm)
15-1014	TEM/FIB Thinning Fixture w/ (4) 1/2" Diameter Interchangeable Pyrex Inserts
15-1018	SIMS/Backside Pyrex Fixture (not pictured)
15-1020	Parallel Polishing Fixture, 2.25" Diameter, Stainless Steel
15-1025	Mount Holder, 1.5" Capacity
15-1030	Dial Calibration Kit (included with purchase of MultiPrep System)
15-1035	Weight Kit, 650 Grams of Total Weight
15-1045	Multi-Purpose Fixture
15-1046	Multi-Purpose Fixture, Diagonal Orientation (not pictured, see catalog)
15-1047	Multi-Purpose Fixture (not pictured)
15-1048	Multi-Purpose Fixture, Diagonal Orientation (not pictured)
15-1050	Cross-Sectioning Paddle, Clamp Style (not pictured)
15-1051	Cross-Sectioning Paddle, Clamp Style, Diagonal Orientation (not pictured)
15-Indicator	Rear Dial Indicator (see "Additional MultiPrep™ Options")

Additional MultiPrep™ Options

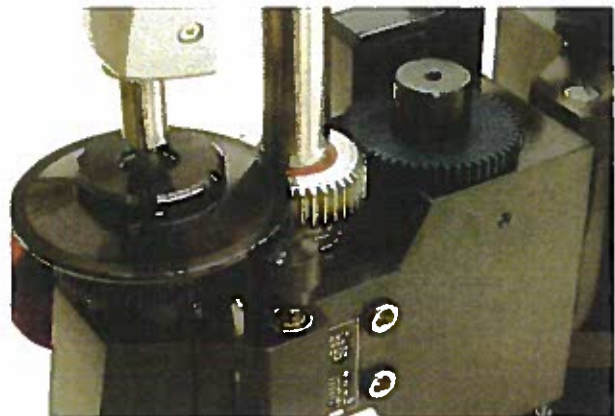
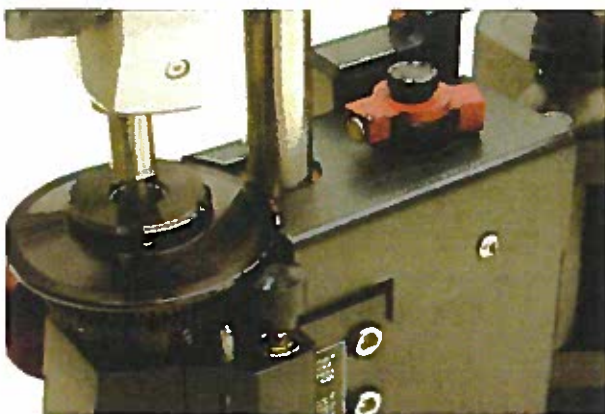
15-Indicator

The rear dial indicator provides 1µm incremental measurement of the vertical movement of the arm. Instead of relying on the scale wrapped around the vertical adjustment knob, the digital dial indicator will enable the user to more precisely position the arm when polishing samples. It is highly recommended for backside thinning applications, TEM and Pre-FIB preparation. It is also excellent for cross-sectioning.

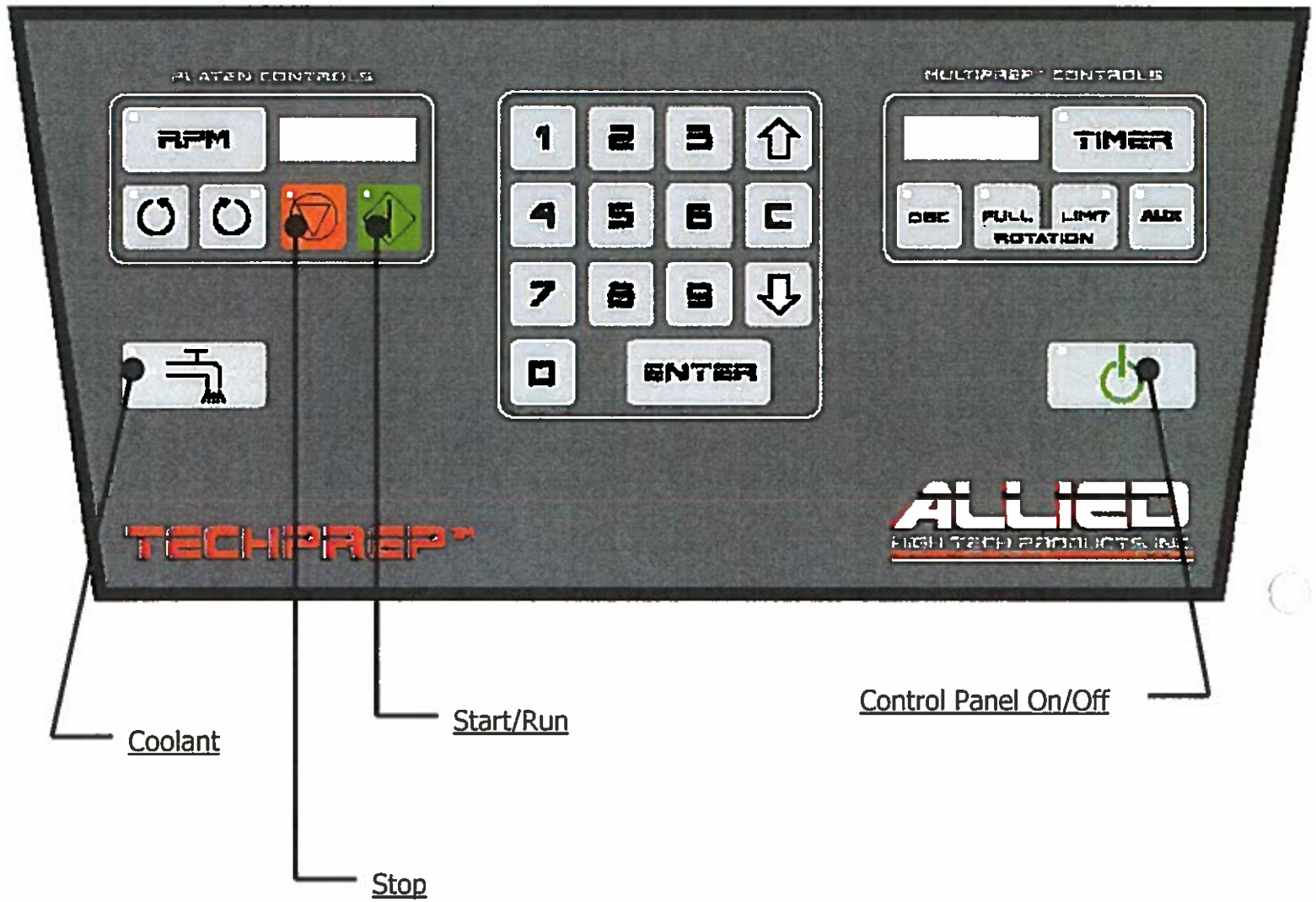


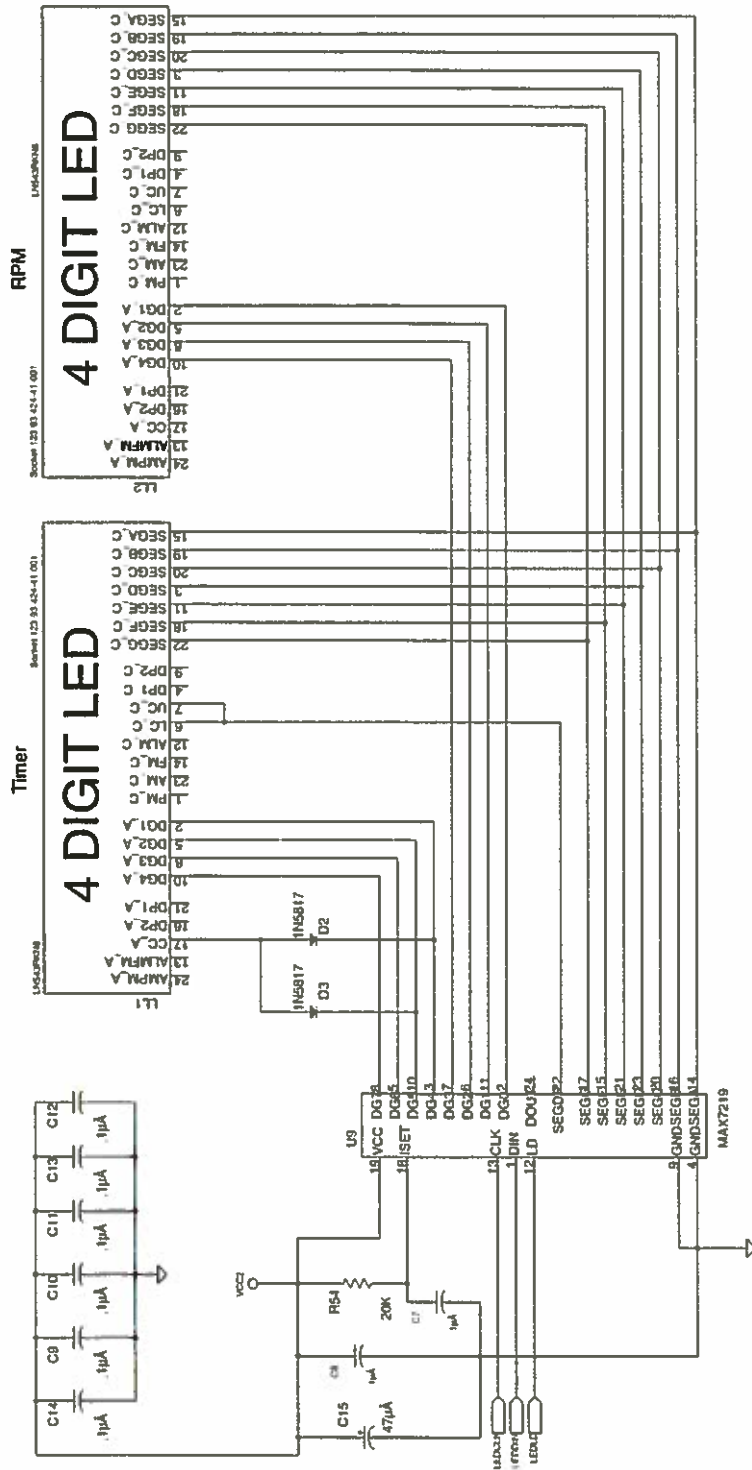
#15-Geardrive

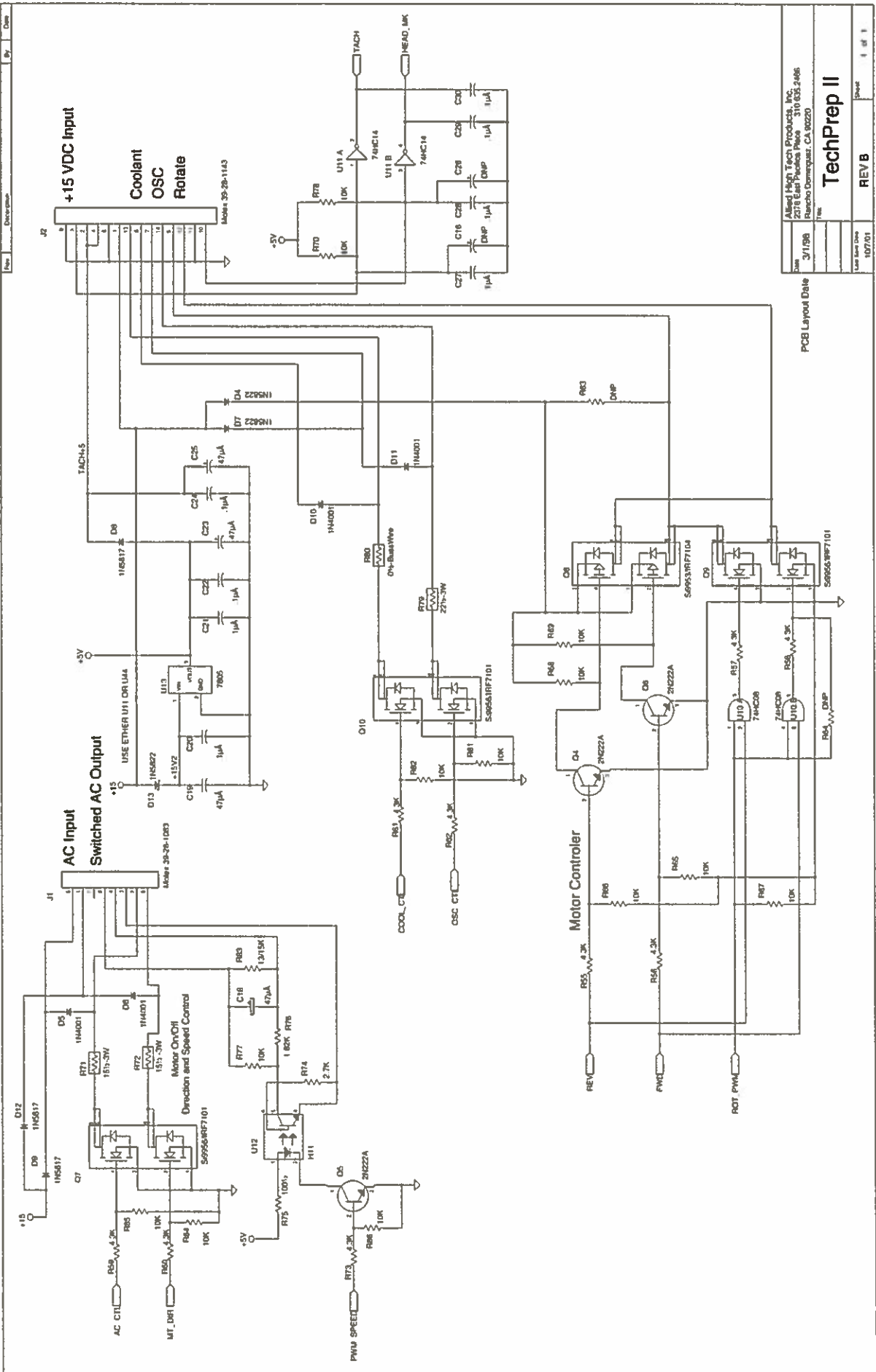
The geardrive is an option that can be ordered separately to replace the O-ring drive system used in the standard MultiPrep™ System. When grinding larger samples and surface areas, the gear drive offers improved rotational torque to the spindle and will not slip during rotation. Any machine can be retrofitted for this option. Below are photos showing the gear mechanism and the covered unit as it would be supplied.



Faceplate Diagram







PCB Layout Date

REV B

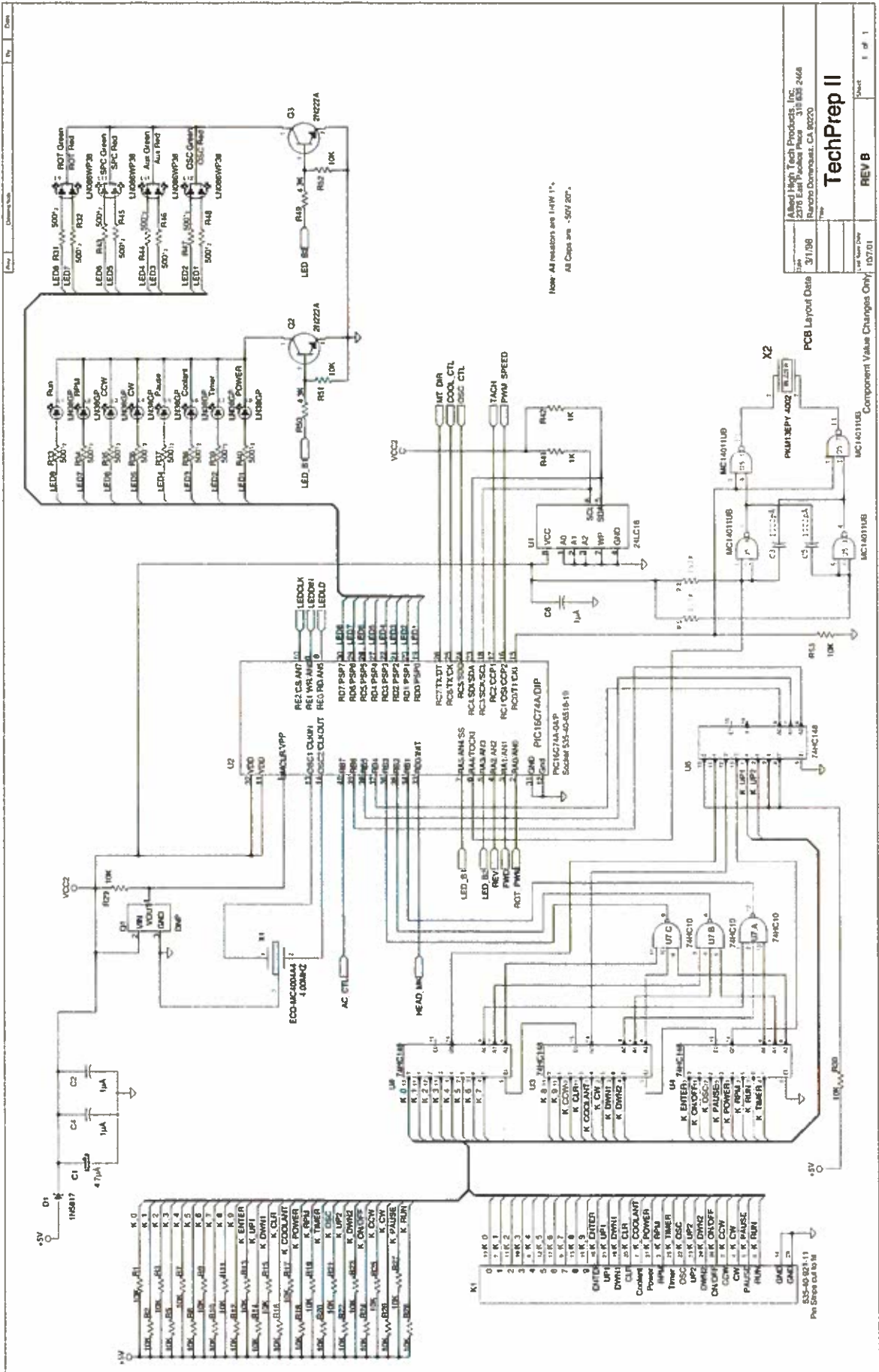
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Sheet 1 of 1

TechPrep II

Allied High Tech Products, Inc.
 231 East Pacific Avenue, Suite 310
 San Jose, CA 95128
 408/291-1143

Date: 3/1/98
 Rev: 10/7/01
 File: 107701



Now All resistors are 1/4W 1%.
All Caps are .50V 20%.

3/1/98
Allied High Tech Products, Inc.
2076 East Pucallia Place
Pacifica, CA 94024

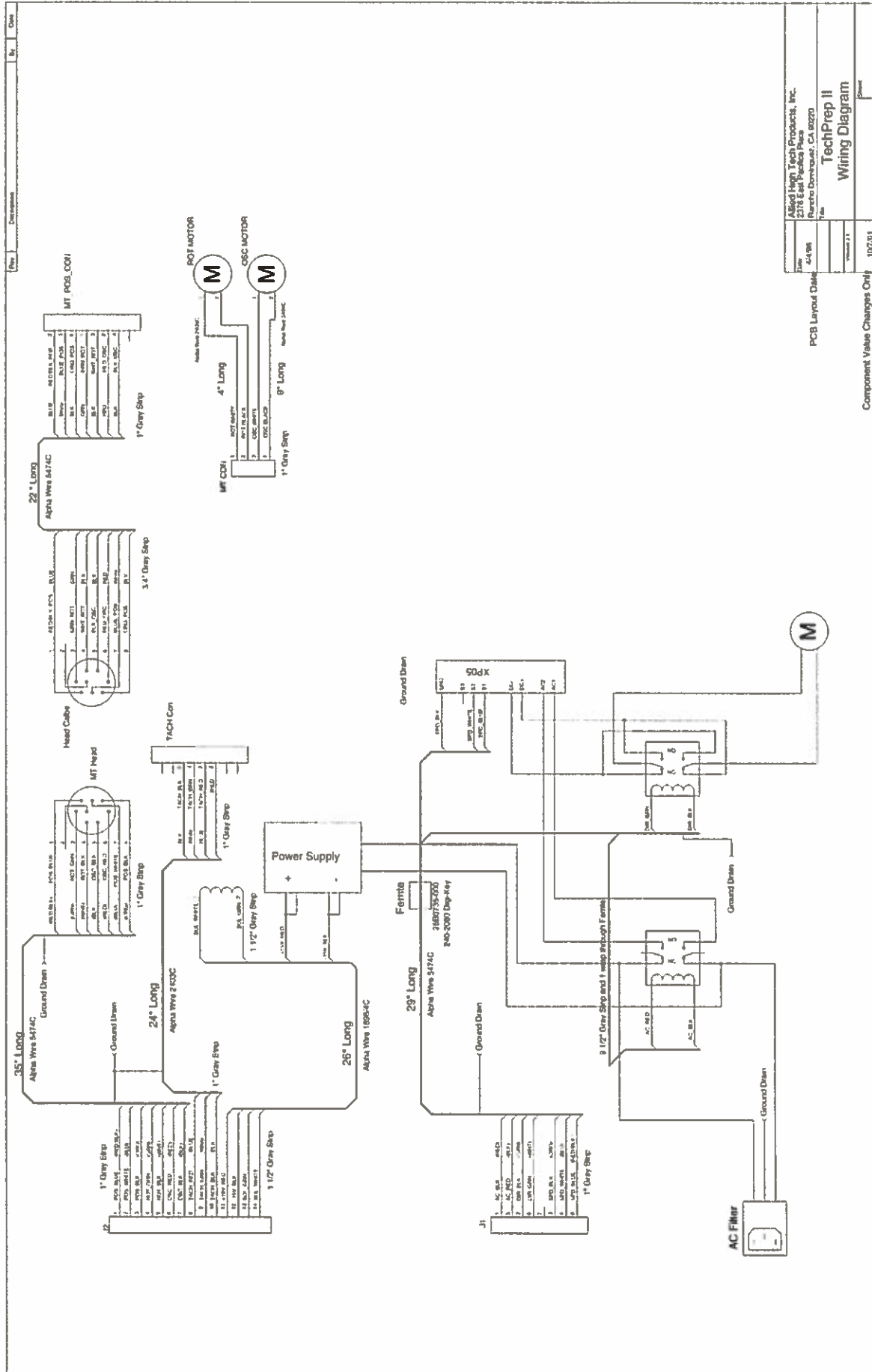
TechPrep II

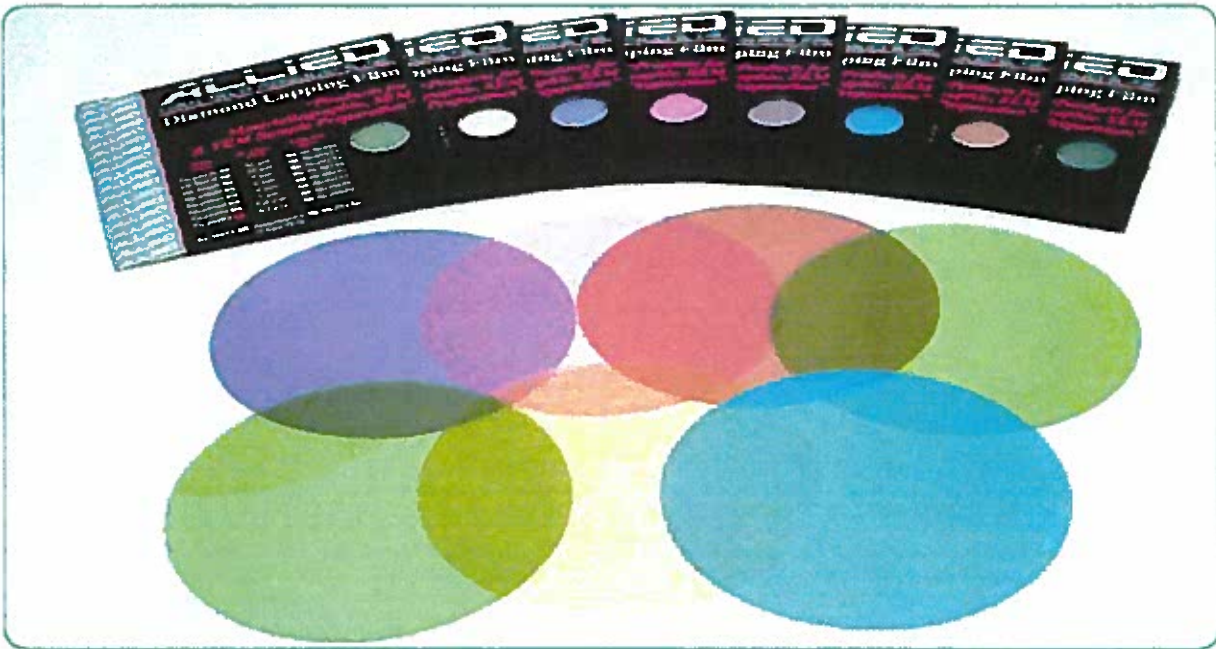
REV B

1 of 1

PCB Layout Date 03/20/91

Component Value Changes Only





DIAMOND LAPPING FILM

DIAMOND LAPPING FILM consists of precision graded diamond particles resin bonded to a flat, uniform polyester film backing. It provides excellent edge retention and maintains coplanarity regardless of varying materials or hardness within the sample. Typically it is used for unencapsulated cross-sectioning, TEM wedge/plan-view polishing, backside polishing and FIB sample thinning. Allied's unique packaging allows for quick and easy identification of color-coded micron grades.

EXCELLENT FOR:

- ❖ IC Cross-sectioning
- ❖ TEM/FIB Thinning
- ❖ 10 and 12 inch diameter discs also available
- ❖ Fiber optic polishing (4 and 5 inch discs also available)



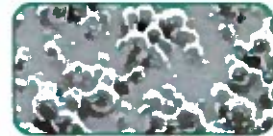
SEM photo, 8um Diamond Lapping Film (150X)

8" (203mm) Discs (Pk/5)

PLAIN BACK	MICRON	ADHESIVE BACK
50-30040	30	50-30120
50-30045	15	50-30125
50-30050	9	50-30130
50-30055	6	50-30135
50-30060	3	50-30140
50-30065	1	50-30145
50-30070	0.5	50-30150
50-30075	0.1	50-30155
50-30076	Assortment (1 each 30-0.1µm, Pk/8)	50-30156

TYPE B DISCS (Pk/5)

DIAMOND LAPPING FILM TYPE B has diamond particles contained in ceramic beads which are then resin bonded to the film. As the beads wear away, new diamond particles are exposed to allow continuous, aggressive material removal. Type B Film is longer lasting and provides a coarser finish grade-for-grade compared with regular diamond lapping film.

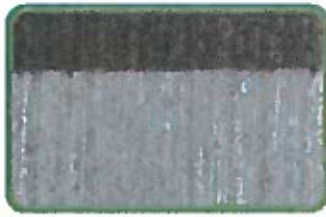


	8"	8"	12"
MICRON	PLAIN BACK	ADHESIVE BACK	ADHESIVE BACK
9	50-30050B	50-30130B	50-30170B
6	50-30055B	50-30135B	50-30175B
3	50-30060B	50-30140B	50-30180B
1	50-30065B	50-30145B	50-30185B
0.5	50-30070B	50-30150B	50-30190B



SHEETS (EACH)

MICRON	6" x 6" PLAIN BACK
30	50-30245
15	50-30250
9	50-30255
6	50-30260
3	50-30265
1	50-30270
0.5	50-30275
0.1	50-30280



30 µm @ 100X (20 seconds)



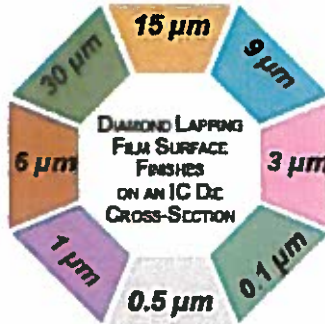
15 µm @ 100X (20 seconds)



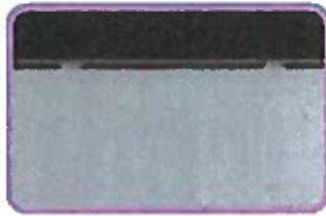
9 µm @ 100X (20 seconds)



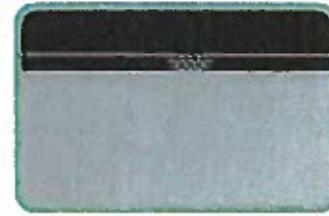
6 µm @ 100X (20 seconds)



3 µm @ 100X (20 seconds)



1 µm @ 500X (20 seconds)



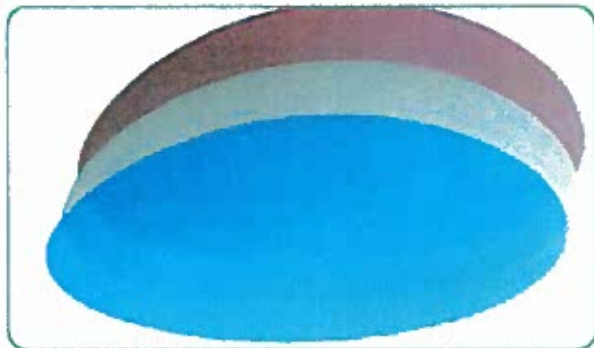
0.1 µm @ 1,000X (20 seconds)

LAPPING FILM

Lapping film consists of a mylar film coated with resin containing either aluminum oxide or silicon carbide abrasive. It is recommended for fine grinding and lapping applications where edge retention is important. Use aluminum oxide for ferrous metals and silicon carbide for non-ferrous metals and polymers.

FEATURES:

- ❖ Micron graded premium abrasives to produce precise finishes in grades 30 micron to 0.05 micron
- ❖ Precision backing for uniformity and planarity of sample
- ❖ Resists water, oil and most solvents
- ❖ Color-coded for quick identification



8" (203mm) ALUMINUM OXIDE DISCS (Pk/50)

PLAIN BACK	MICRON	ADHESIVE BACK
50-20040	30	50-20110
50-20045	12	50-20115
50-20050	9	50-20120
50-20052	5	
50-20055	3	50-20125
50-20060	1	50-20130
50-20065	0.3	50-20135
50-20067	0.05	50-20138
50-20070	Assortment (10 each micron)	50-20140

8" (203mm) SILICON CARBIDE DISCS (Pk/50)

PLAIN BACK	MICRON	ADHESIVE BACK
50-20075	30	50-20145
50-20080	15	50-20150
50-20085	9	50-20155
50-20090	5	50-20160
50-20095	1	
50-20105	Assortment (10 each micron)	50-20175

TEHCUT 4™ LOW SPEED SAW New!

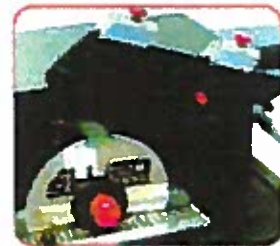
A low speed saw excellent for cutting smaller, delicate samples that cannot tolerate excessive friction and heat caused by high speed sectioning. The gravity-fed cutting system uses adjustable weights to apply or counterbalance downward force to the sample during sectioning. With a 3 to 6 inch blade range, samples up to 2 inches thick can be sectioned.

FEATURES:

- ❖ Touch pad switches control all functions
- ❖ Variable blade speed 10-500 RPM with LED display
- ❖ Blade range from 3 to 6 inches
- ❖ Sample cutting capacity up to 2 inches thick
- ❖ Precision micrometer sample indexing with 1-micron resolution
- ❖ Spacious work platform
- ❖ Spring-retractable dressing stick attachment allows dressing while sectioning
- ❖ Removable coolant reservoir
- ❖ Automatic shut-off sensor with adjustable stop to set depth of cut
- ❖ Sliding weight system provides variable sample load from 0-300 grams
- ❖ Ergonomic splash shield (not shown)
- ❖ Removable sample catch screen prevents sectioned pieces from falling into coolant reservoir
- ❖ Precision machined aluminum and stainless steel construction offers maximum corrosion-resistance and durability
- ❖ Designed & manufactured in the USA 



Unique spring-loaded dressing stick attachment



Typical sectioning configuration

ITEM NO.	DESCRIPTION
5-5000	TEHCUT 4™ Low Speed Saw Includes 1½" Flanges, Mount Holder, V-Block Fixture, Single Saddle Clamp, 5" Diamond Blade and Cutting Fluid 115V 60Hz 1 Phase
5-5000-230	TEHCUT 4™ 230V 50/60Hz 1 Phase

ACCESSORIES:

5-5005	Mount Holder, 1½" Diameter Capacity	A
5-5010	V-Block Fixture, 1" Capacity	B
5-5015	Bone Fixture	C
5-5020	Single Saddle Clamp	D
5-5025	Glass Slide/Thin Section Fixture, Vacuum Type	E
5-5030	Irregular Shaped Sample Fixture	F
5-5035	Dual Saddle Clamp	G
5-5040	Swivel Attachment (to adapt other fixtures for specific angle cutting)	H
5-5045	2½" Flange Set	



An assortment of clamps and fixtures are available to assist your sectioning needs

TECHNICAL DATA:

Geared Motor	1/24 HP (30W)
RPM	10-500
Blade Range	3-6 inch (75-150mm) diameter
Arbor	½ inch (12.7mm)
Dimensions	12" W x 17" D x 12" H (305 X 432 X 305mm)
Shipping Weight	40 lbs. (18kg)

(800) 675-1118 (USA & Canada) • (310) 635-2466 (Worldwide) • Fax (310) 762-6808 • www.alliedhightech.com

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