MIDAS TECHNOLOGY, INC

USERS' MANUAL

DL-4, DR-4, DL-F
de-lidder™

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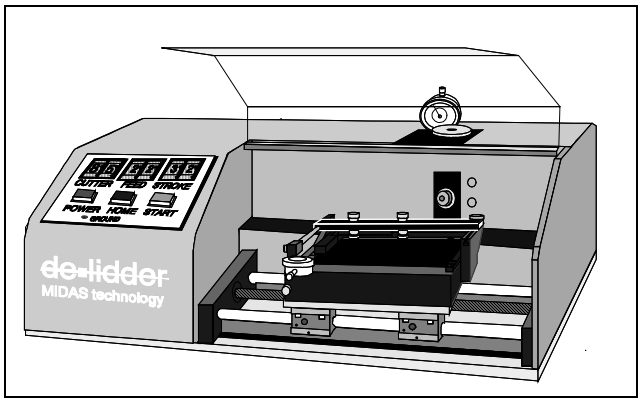
Your DL-4 solves a problem as old as hybrids - how to remove lids for rework - repeatably. Using our special starbide™ cutters, the **de-lidder™** mills cleanly through the package lid, actually re-machining the seal area.

This manual covers all basic operations. Each section has illustrated step-by-step instructions plus hints we've found useful in seventeen years and many thousands of delid operations.



The DL-4 de-lidder™

10 Steps to de-lid
(using the profile form)

The *de-lid profile* form illustrates control settings and instructions for a specific package, laid out in logical order for ease of training. Each of the settings on the form is numbered to correspond with a procedure in the manual, so you can easily look up more information In many cases filling out the form (thus referencing the manual) will establish nearly all your required documentation.

Setup & Maintenance

The **de-lidder™** is a very low maintenance machine which requires no formal calibration - only routine resetting of the zero positions of the dial indicators. This section describes how install a fresh SB-8 tool, and how to check and reestablish zero settings quickly and repeatably.

Creative Fixturing

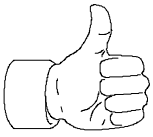
Over the years we've developed numerous techniques to handle special package types. Here are some approaches to consider.

Turntable

Here's how to remove the linear table, then install and operate the optional D4RT Turntable Module for circular parts.

Appendix

Here's a detailed DL-4 part list, together with comprehensive electrical schematics. This is also the place to keep revisions, suggestions and and operating notices which we may provide from time to time.



Helpful tips and cautions are included in these hint boxes. Please read them – we learned from mistakes so you won't have to!

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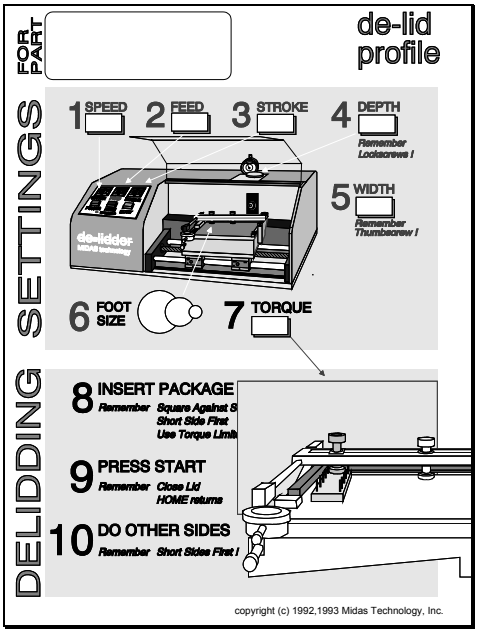
The One-Page How-To

This users' guide to the DL-4 **de-liddertm** is organized around the one page graphic form we call the de-lid profile. It looks somewhat like this (you'll find a full size, legible one on the second page following, as well as a master copy in a sleeve in the back of the manual). Here's how you can work with the form and this manual to make best use of your new DL-4 system.

There are ten numbered steps on the profile, which cover all the key settings that need to be considered in removing a package lid. Each of the following pages is numbered to correspond with the numbers on the profile; if for example you want more information on setting "Speed" (#1) just turn to Profile Page 1. When there's more than one page of information related to a particular setting, the pages will be numbered in sequence (#1.1, 1.2 etc).



Using a Completed Profile

If a process has been documented and the form filled out, using the DL-4 is simple. Just start with item #1 ("Speed") and adjust the thumbwheel shown to the number written in the box. Now the important part - if you're unsure of anything, just turn to Profile Page 1 and read up on speed settings. Then proceed to step 2 and so on.

Filling Out the Profile

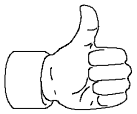
We've included a blank profile which you are encouraged to reproduce as part of your process documentation. By working through this guide as you fill in the blanks, you'll learn how to make best use of the DL-4 and have your documentation job well begun.

What's NOT on the Profile

To avoid cluttering the form, we've left out special fixtures, custom worktable inserts, vacuum lines and the non-standard cutters which are sometimes used. These items can be important and should be sketched in, or added to the back of the form whenever used.

Make Copies !

PLEASE - make some copies before the original disappears. And after you've worked with the form some, let us know how we can improve it to make your life with the DL-4 even easier.



If you don't understand something on the profile - look it up in here. It's quicker and cheaper than scrapping a unit !

de-lid profile

FOR PART

SETTINGS

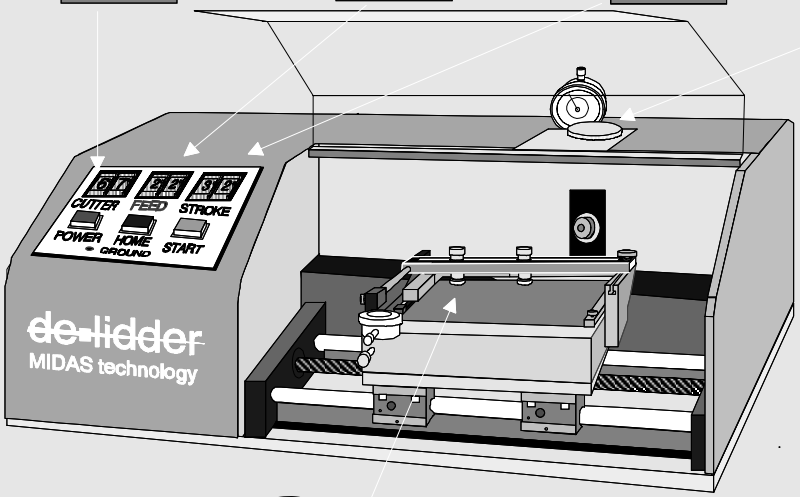
1 SPEED

2 FEED

3 STROKE

4 DEPTH

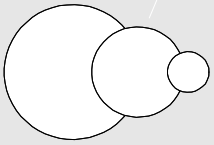
Remember Lockscrews !



5 WIDTH

Remember Thumbscrew !

6 FOOT SIZE

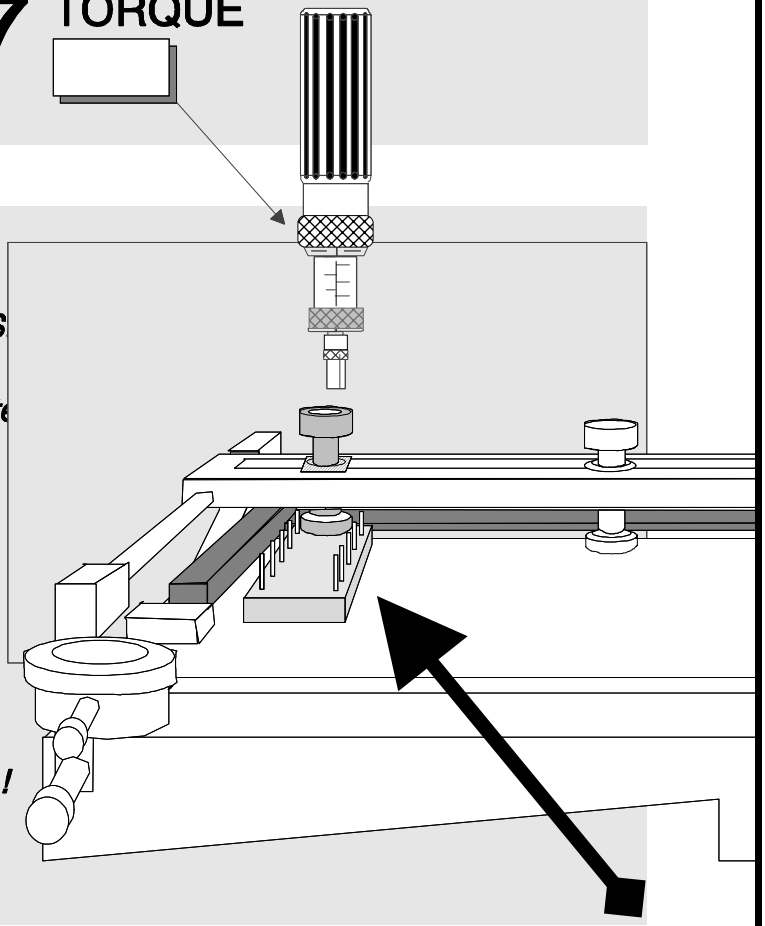


7 TORQUE

DELIDDING

8 INSERT PACKAGE

Remember Square Against S
Short Side First
Use Torque Limite



9 PRESS START

Remember Close Lid
HOME returns

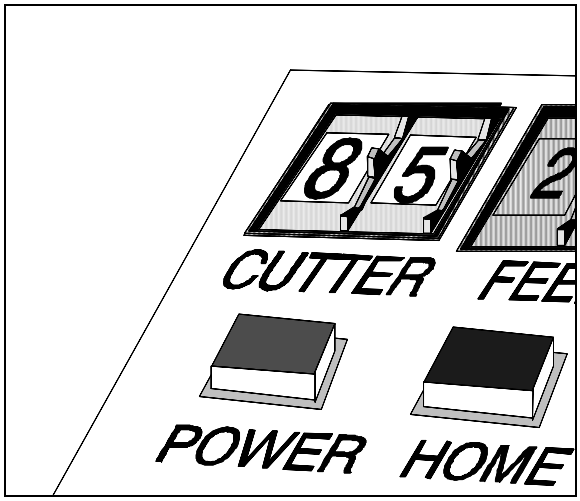
10 DO OTHER SIDES

Remember Short Sides First !

ILLUSTRATIONS

The cutter speed control is the thumbwheel control on the far left of the panel above the power switch. On DL-4 model machines it should be set between 8.0-9.0 for most materials.

Normally, once the setting that suits your seam sealer is found, there will be little need to change cutter speed. Most packages will share similar lid thicknesses and weld widths, so one common setting will usually work.



Setting Cutter Speed

Find Setting

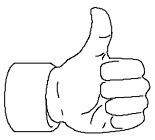
If there is any special requirement due to unusual materials a specific speed chosen for the profiled part should be marked in the speed box. Otherwise, a standard speed between 8.0-9.0 can be used.

Set Control

Click the thumbwheels until the correct number can be read in the window.

Don't Overdo It

The DL-4 is belt-driven, and has a powerful high speed motor. It is not necessary (and because of belt and idler vibration that can occur at higher speeds, counter-productive) to run at speeds above 8.0-9.0.



If in doubt, use 8.5 as a cutter speed default on 1986-1994 machines, 8.9-9.0 on later ones; if finish isn't satisfactory and replacing the cutter doesn't help, reduce your table feed rate for a better finish.

The feed rate control is on the main panel just to the right of the cutter speed control. What you dial in here determines how fast the table moves from right to left; while it's milling through the lid. Increasing the number increases the table speed, decreasing it slows it down.

Normally you won't have to change either cutter speed or table feed from one part to the next - the requirements are largely determined by the lid material and the welding schedule set on your seam sealer which nobody changes unless they absolutely have to !

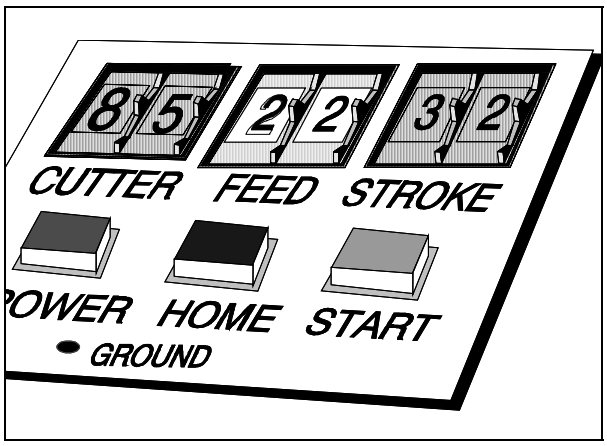


Table Feedrate Control

Find Setting

No surprises here - it's just like the cutter speed.

Set Control

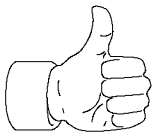
Adjust the thumbwheels as required.

Don't Overdo It *(Again)*

The precision SB-8 starbide^{tm} cutter has multiple flutes and clearing slots to do a good job on Kovar's tough, "gummy" surfaces. It works best when you move the table slowly, so more flutes can come into play.

Deeper Means Slower

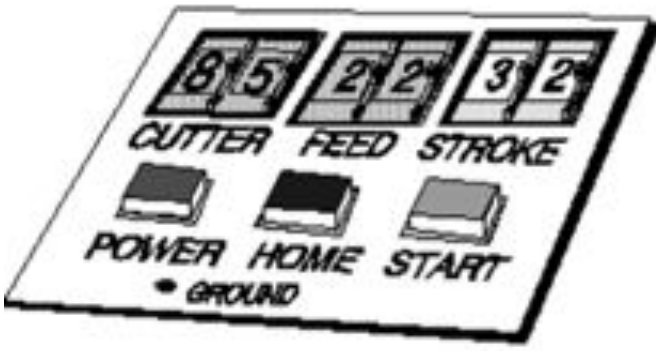
If your depth of cut is set at over .005"-.007" (the normal thickness of kovar lid flanges), you should consider slowing down the table movement to avoid cutter clogging and surface scouring.



For most Kovar parts, you'll get the best results with feedrates from 1.5 to 3. We don't recommend higher speeds because the slight increase in throughput isn't worth the measureable drop in finish quality.

The stroke size control determines how far to the left the worktable moves from its "home" (rightmost) position before automatically returning. It allows the D4 to complete a cutting stroke without operator intervention.

The thumbwheel settings are proportional between 1 and 9.9; with a little trial and error you'll find the settings that cover your packages. The maximum 9.9 setting is normally only used to move the cutter to the cutter removal slot on the far right.



Stroke Length Control

Set Control *(Or Not)*

In many cases (see the hint, below) operators don't bother with the stroke size setting. If it isn't filled in on the profile sheet, just check to make sure that, when doing the long side, the right edge of the package is carried well past the cutter before the table returns.

"HOME" Override

The HOME button temporarily overrides the stroke control, so you can have the table return home whenever the cutter stops cutting. Using this feature doesn't change the setting, so you can use HOME to return after a short side, while completing the long sides on automatic.

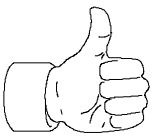
Using Your "LID"

The machine logic is usually set so the table will stop when the lid is opened. While it is open you can press the HOME button (so it will reverse and go back when the lid is closed) or leave the machine in its START mode so it will continue cutting. These options are useful when using a complex fixture with multiple positions. (Naturally, fixtures like this from Midas Technology will come with their own illustrated instructions).

The lid logic can also be changed so that the cutter will stop (as always) when the lid opens, but the table will automatically HOME rather than stopping. This option was provided for the convenience of DL-3 and earlier model users who were accustomed to this

"POWER" Override

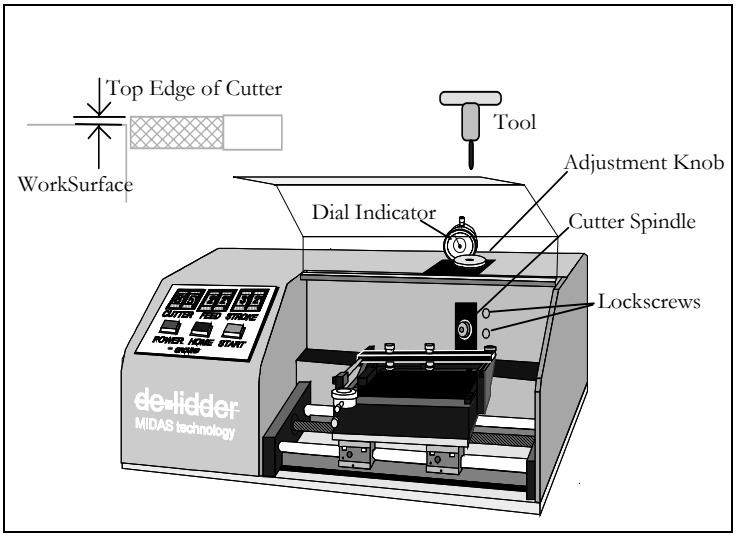
Turning POWER off before the table returns resets the table drive logic. This is a complicated way of saying you can stop the table by turning off the power when it reaches the end of one package, then turn it on again and start cutting a second package fixtured to its right..



IF YOU "[HOME]" - PLEASE NOTE ! Solid-state controls on 1995-on DL4s change table direction much faster than before. Allow the cutter to move clear of the work before HOMING, so it won't hit the part on the return stroke.

Packages on the de-lidder[tm] normally rest lid down on the black **worksurface.** The **dial indicator** on top of the machine should read "0" when the top of the cutter is exactly even with the worksurface (if it isn't, see *Zeroing Depth of Cut* in the SETUP & MAINTENANCE section before going further).

When you turn the **depth adjustment knob** clockwise, the cutter is raised up past the edge of the worksurface so it can cut into the lid. The depth is perfect when you mill through the thickness of the lid flange without removing any of the original package.



Depth Adjustment

Adjust the Knob

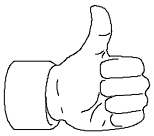
Turn the knob counterclockwise until the indicator reads LESS than your desired setting, then turn it clockwise (lifting the cutter) until the correct setting is reached. This procedure helps to keep any backlash in the assembly from affecting your setting. The knob should take some effort to turn (see below) so you can use the blue tee-handled tool to make life easier.

About the lockscrews.

On older machines, two of three total headstock lockscrews were accessible on the cutter wall to the right of the spindle. Newer machines only provide access to the center one, so users aren't tempted to overtighten them or adjust the headstock out of vertical. Normally they require no adjustment, but if you find the depth-of-cut knob turns very easily, you can tighten the vertical slide assembly by gently tightening the one just to the right of the normal cutter position with the yellow-handled ball driver.

In case of a "step"...

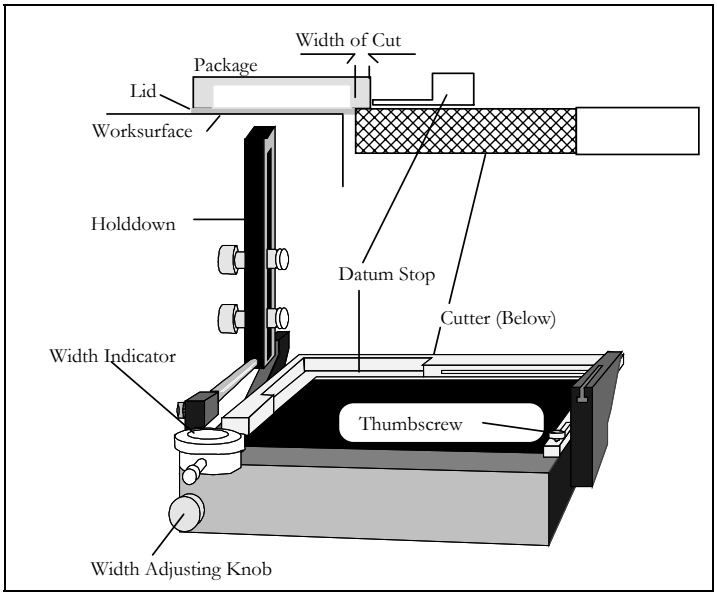
If the entire outside edge is cut below the original height of the package (so you can see a significant step) your depth is set too high. Most seam sealers handle steps up to .0005"+ without difficulty - much more than that is cause for readjustment.



Some lid flanges may vary in thickness from .0005" to .0015". Check this possibility if you consistently have one side still attached after the others are fully released.

When you fixture a package on the de-lidder™, it rests lid down against a datum stop. This stop lines the package up squarely with the cutter, and limits how far out over the cutter the package extends. To increase the width of cut, we move the datum stop bracket out (away from you) so the positioned package will stick farther out over the cutter.

Changing the width of cut to the setting marked on the delid profile is a simple matter of loosening one thumbscrew, dialing in the desired number, and retightening the thumbscrew.



Width Adjustment

What to Do

Loosen the thumbscrew, then dial in the correct setting (#5 on the profile) using the **adjustment knob**. This works like most machine tool controls; you'll get more consistent results if you "back off" the setting first (by turning the knob clockwise) then turn it clockwise until you reach the setting you want on the **dial indicator**.

Don't forget the thumbscrew !

The thumbscrew keeps the datum stop in position. Loosen this thumbscrew before you change the setting - or the bracket can be pushed "out of square" with the table and you won't get a straight, even cut on your package. Tighten it to maintain your setting.

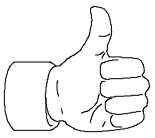
If the width is uneven...

If the cut is wider at one end than the other, you most likely allowed one end of the package to shift away from the datum stop while torquing it down. Try cutting that side again. If you still have an uneven width of cut, check to see if the datum stop edge is parallel with the edge of the table. It may have been distorted by someone who forgot the thumbscrew (see above!).

If the cut is even, but doesn't remove the inside corner welds, the width needs to be increased - or you need to cut the corners separately (see below).

If the lid falls in..

If the lid falls in, the cut is too wide - it's gone all the way through the wall and must be reduced. Remember - the package needs SOME flange to rest on while you're delidding. If the lid pushes in, at least one side will cut too deeply and you'll see a step in the corner.

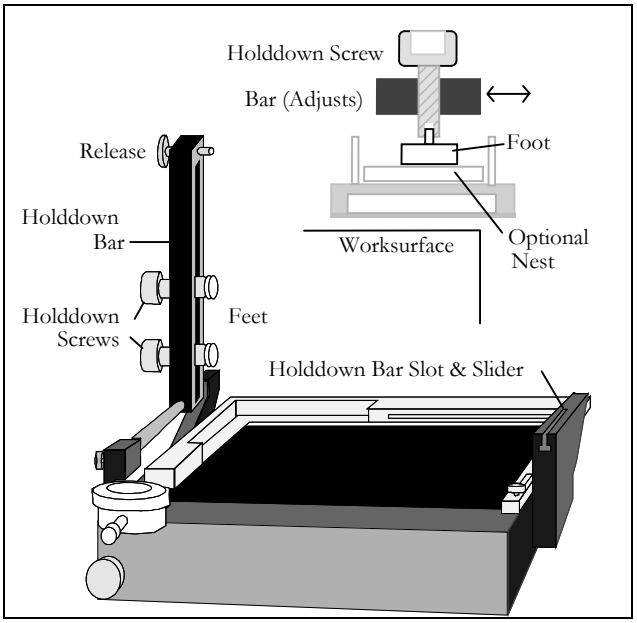


Packages with large corner radii, or sealed by machines that double-hit corners, may delid easier if you first mill the corners – just insert the package against the datum stop at a 45 degree angle. Then do the straight sides – the lid should come off much more easily!

Packages must be fixtured to sit flat on the de-lidder™ worksurface in order for you to get an even cut on all four sides. The machine has a built-in holddown system that works fine as is for nearly all common package types.

Holddown screws slide left -right in a slotted bar, so you can apply one on each end of a long package. To avoid scratching the package finish, and to spread the holddown force evenly, delrin feet fit on the bottoms of the screws as shown. On large, flexible packages you may also use delrin or metal nests to avoid cracking the substrates inside.

The holddown bar itself slides forward and back, so you can position the screws close to the worktable edge for best results.



Feet & Fixturing

Choose a Foot

In general, you'll use the largest foot that will fit easily on the back of the package (between any pins there may be) while still allowing you to see and grasp the edge of the package.

Install Foot on Screw

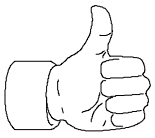
The delrin feet are press fit into the holddown screws - that's so the screw can rotate against the foot as it's torqued down (see the following page). If the fit is too loose, simply tap the shaft of the foot onto the worktable to create a small bulge at the end.

Position the Bar

Lower the holddown bar so the release screw fits into the sliding nut in the right hand slot. Before you tighten the release screw, adjust the bar forward or back until the holddown screws are close to the edge, but not overhanging it (if they do, the package may be tilted over the edge and your cuts will be too deep).

Hard to Hold ?

Small packages can be very tough to keep from turning. Often the easiest way to handle them is with custom slots in the datum stop - let us know if you have a problem.

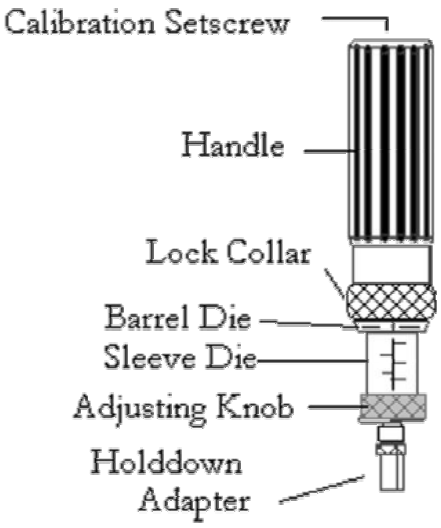


Check the bottom side of the feet each time you have the bar raised. Change them if they're dirty or have metal chips showing to avoid scratching packages !

The amount of pressure you use on packages during de-lid is important. Obviously, you must limit the force enough to prevent cracking substrates or deforming the package, but you need enough to keep the package from lifting or turning as it is cut. In addition, you need consistent force from one side to the next for best results.

We provide an adjustable, precision torque driver with each **de-lidder^{tm}**. The adapter that comes with the driver fits into the top of the holddown screws, so once you've set the correct number on the torque driver, all you need to do is insert it into the holddown screw socket and turn gently until it clicks then turns freely.

During demonstrations, we usually begin with 45 inch ounces which is often satisfactory; but you should feel free to experiment.



ADJUSTABLE TORQUE DRIVER

Setting the Driver

(Utica TS-100)

Pull the lock collar toward the handle, and turn the adjusting knob to the desired setting. The setting is established by the major scale (20-40-60-80) on the sleeve die, plus the minor scale (0-4-8-12-16) on the barrel die.

How Much Torque ?

(45-50 in.ozs typical)

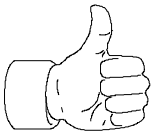
The ideal force depends on lots of factors - how big the package is, how flat it sits on the worksurface, how much material is being removed, and whether or not you can get two (or more) holddown screws into position to hold it. In general, use enough force to keep the package from shifting - if that force is enough to damage the package, use larger feet (previous page) or custom nests to spread the load more evenly. If that doesn't work, you'll need a custom datum stop or bracket with slots to hold the part in place.

Take It Easy…

The adapter has a spring-loaded ball, but you don't need to push it all the way into the holddown screw socket. Just let it sit in the socket while you turn – it'll be easier and quicker to remove.

Calibration

Instructions are provided with the tool - however, variations over time are not generally significant to de-lid operation. What is more important is consistency from one package side to the next.

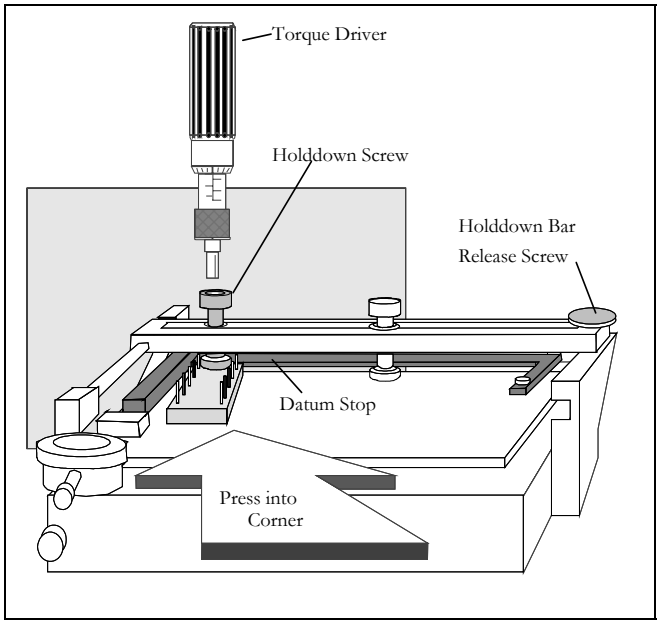


If you store the torque driver for any length of time, turn the setting down as far as possible. This will help keep it from loosing calibration.

Mounting packages on the DL-4 will soon become second nature. In most cases you just place the package lid down onto the worksurface, slide it into position against the corner of the datum stop, then tighten the holddown screw to keep it in place.

The **torque driver** is used to apply consistent force on each package side. Simply insert it lightly into the socket on the holddown screw and turn it (clockwise) until it clicks and turns.

The key idea is to keep the package squarely against the datum stop while you torque the holddown. It's usually a good idea to push it into the corner with one thumb (as shown by the arrow) while turning the driver with the other hand. Here are a few things to watch out for:



Placing the Package

Against - Not ON the Datum Stop

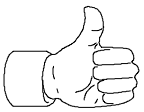
First-time operators sometimes let the package ride up onto the datum stop ledge. This ledge is there to give clearance for side leads - not to hold the package. If you let the package sit on the ledge, you'll push the datum stop down against the cutter - and you'll soon hear about it when the cutter starts.

Be Careful of Leads

The DL-4 can be fixtured for butterfly style packages (with side leads) as well as DIP-style packages with bottom leads. Just take care that the leads on your package are clear of the holddown screws and fit over, not under the datum stop.

Short Sides First

Doing the SHORT SIDES FIRST provides the maximum lid width and stability; on some packages the improvement is measurable.

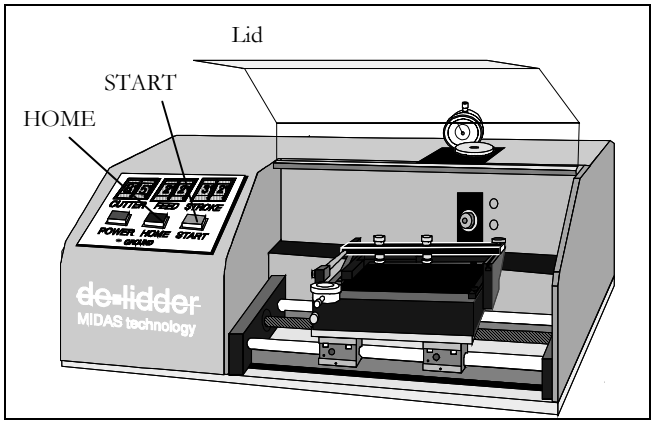


Before you torque the holddown screws, be sure the holddown bar is tightened down. If not, you'll just lift the bar – and risk crushing the package if you then tighten the bar down – there's a lot of leverage working with you then!

Once you have a package fixtured, close the lid and hit start. Here's what happens:

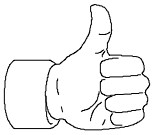
First, you'll hear the cutter motor start turning. There's a short delay before the table starts moving -designed to give the cutter time to get up to speed. If you have a vacuum attached to the back panel outlet, it will start at the same time.

You'll hear clearly when the cutter begins milling the package - and when it stops. Then press HOME.



Starting the Cut

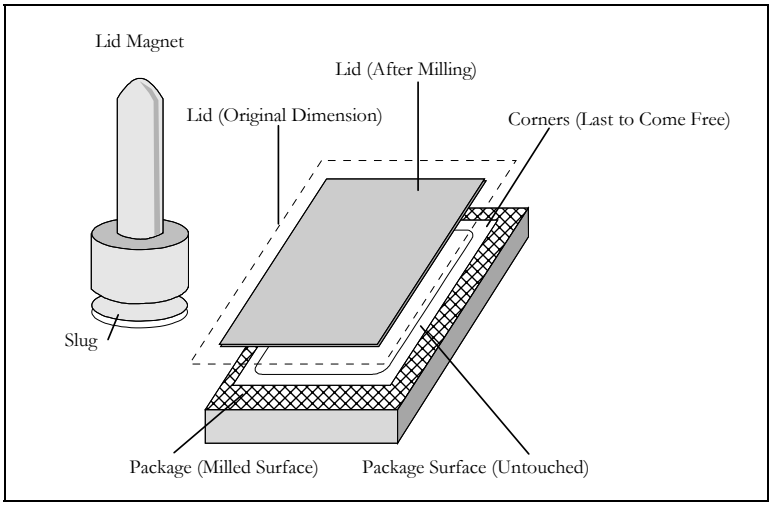
Close Lid	The cutter won't turn unless the lid is closed.
Press Start	If your machine's table is switched to allow movement with the lid open, be sure you don't press start with a part in place. If the lid is left open you could drag the part across a stationary cutter and damage both.
Press Home	When the milling sound ends, press home to start the table back. (If you don't, it will continue until reaching the end of the stroke then return)
Reset Part	Experienced users can open the lid and loosen the holddown screw while the table is returning to save time. This is only possible when the logic card is adjusted to allow table movement with the lid open. After the first side (remember you should do the short sides first) turn the part around and do the other short side.
On Long Sides.....	If you're delidding long DIP packages, you may find it quickest to loosen, then slide the holddown screws sideways free of the part so you can switch it around. You'll soon learn the fastest way to handle eacjh part.



Remember - for your safety the cutter will stop whenever you open the lid. The table may also stop - this depends on the interlock selection (see Setup).

After completing four cuts, the lid should be ready to come off with almost no effort. You should be able to flex the lid with your thumb and confirm that the long sides are free, except for the inside corners.

The ideal is not to have the lid fall off in the machine, but to leave the lid attached by a micro-thin layer of braze which is easily removed but helps seal out particles until you have it clear of the machine.



Removing the Lid

Is it Ready ?

A lid ready to come off sounds distinctly different when you tap it - more hollow and resonant than a sealed unit. The corners may not be loose yet - they're normally the last part to work free because the seam sealer "double hits" in the corners making the weld bead wider.

Pop It Off with the Magnet

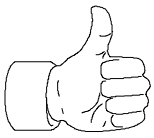
The **de-lidder™** comes with a very powerful magnet. You'll need to slide the metal slug off, then bring the magnet head close to the lid. Sometimes it will jump off the package to the magnet (which means your setup is ideal); most times you'll need to "work" the lid off by bringing the magnet into contact and pulling away two or three times.

Checking your Setup

When the lid comes off, take a quick look at the package to confirm your depth and width of cut settings. It should look like the illustration, with an flat, evenly-milled outside edge, and a thin but visible original package surface (typically gold-plated) running all the way around the cavity.

Danger Signs

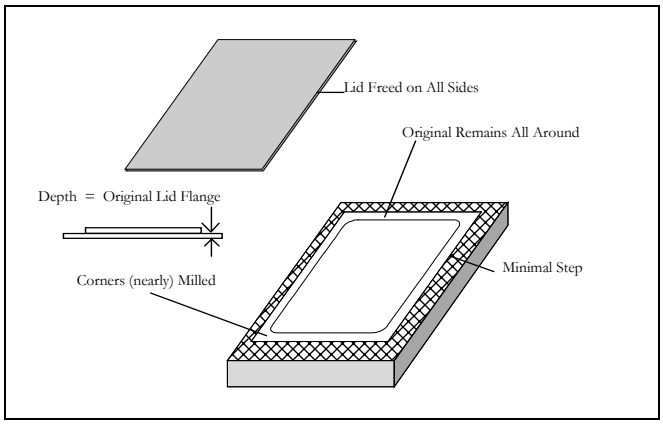
If you've cut all the way into the cavity on any side, the width is set too high. If there's a distinct (more than .001") step between the milled surface and the original flange, the depth of cut is excessive.



CAUTION: the edges of the milled lid are sharp - people who use fingernails to pop lids off regret it. Blades aren't much better - you shouldn't need them with the DL-4 !

If you've read this far, you know pretty well how to remove lids. This section is designed to recap the process from the engineer's perspective, and show you some of the approaches and options we've developed over the years when faced with special circumstances.

There isn't much to add regarding the panel controls - the profile section discusses their default settings, which we recommend you stick to unless there's a problem. But width and depth settings can be confusing at first. Here's help.



A Good De-Lid

Target Depth

Ideally, we'd like to mill through the original lid flange without touching the package. At any rate, it's a safe starting point. If the part is fixtured flat, you shouldn't cut into the package. If you do, especially on one end, check a few sample lids for variation in flange thickness. Most welders will have no problem with the minor steps resulting from lid variation.

Target Width

You should know how wide the walls are under the lid. You NEVER want to set width of cut so wide you cut into the cavity, or the lid will fall in (technically, the package will drop further onto the cutter). Usually, settings of .025"-.035" will cover most weld beads; with the higher settings required to release the thicker weld in double-hit corners.

How About Torque ?

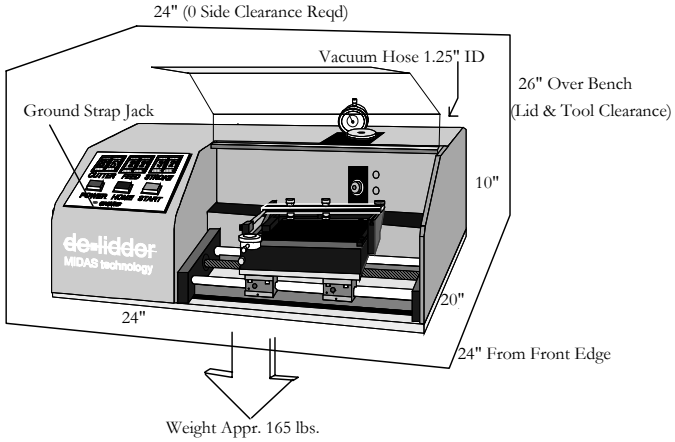
Excessive pressure on the package is unlikely to improve results. As noted earlier, you can use both holddown screws on large packages, as well as nests to spread the force. As long as the package can't lift, or swivel when the cutter contacts it, the torque is adequate.

How About Flatness ?

Some thin-walled packages (and almost all ceramics) are bowed toward the cavity side. The holddown screws will tend to straighten the package out (the table flatness exceeds milspec for package flatness considerably) but you may still find the depth of cut greater at the ends than in the middle of the long sides where the package lifts up. If the package can be flattened without damage, a metal nest may be your answer. If not, you'll need to go deeper than usual - the good news is the rework will give you a flatter package on the next go-around.

The DL-4 **de-lidder**[tm] weighs about 165 pounds, and should be placed on a well-supported workbench. Its power cord connects to a three-prong 110VAC outlet on a clean line.*

There is a cutter-on-switched outlet on the back panel for a 110VAC accessory; usually a shop vac or house vac solenoid valve. Vacuum is used only for particle removal, and a remotely-located shop vac can be plugged directly into the 1.25" ID flexible hose on the back panel.



Installation Requirements

SAFETY ISSUES

In seventeen years of operation, DL-series **de-lidder**[tm] equipment has proven easy to use and safe in typical microelectronic facility conditions .

Lid Interlock

The DL-4 is equipped with an interlock which cuts power to the cutter motor whenever the lid is opened.

Spindle Interlock

The spindle is locked mechanically during cutter replacement. The tool used also activates an electrical interlock interrupting power to the cutter motor. Please insure that only this tool (rather than screwdrivers or other items) is used to replace cutters.

Table Interlock & Auto-Home

The table drive by default is interlocked to prevent movement when the lid is opened. Many prefer the table to move with the lid open, as few operators have difficulty releasing holddowns as the table returns. Select LID-UP TABLE: GO or STOP on the logic board. Change the LID-UP HOME switch to YES to have the table begin its home stroke on lid opening.

Particulates

Milling generates particulates from your product. Make sure operators are equipped with safety equipment (such as gloves and masks where necessary) and apply vacuuum when appropriate to materials in use. Midas Technology now offers Particle Control Systems including ULPA filtration.

- USA Models Only

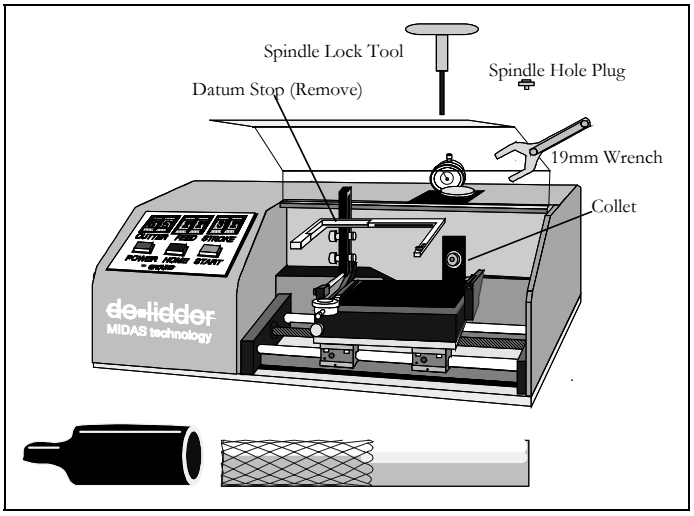
Machines will be prepared to export specifications for voltage, shutoffs, and other requirements at customer request. In most cases there is no additional charge for this service other than changes and testing as required by local certifications.

The BIGGEST DANGER anywhere around the DL-4 comes from the razor blades people use to pry off lids when the machine isn't set up correctly ! This should not be necessary.

To avoid downtime and to help maintain "like-new" finished surfaces on every hybrid package you delid, the DL-4 was designed to allow quick and easy cutter changes.

The following section describes when to change tools and why – here's how:

Except as noted below, you should have power OFF during this procedure. The cutter is held in a "collet chuck" which works much like the one on an electric drill. To change cutters, all you need to do is keep the spindle from turning and loosen the chuck with a wrench.



Changing Cutters

Lift Holddown, Remove Datum

For easy access, we recommend lifting the holddown bar (just unscrew the release) and take out the datum stop. Release the thumbscrew on the datum right leg, and unscrew the two socket caps securing the stop to the rail.

Move Table Slot to Cutter

Most worktable inserts have a cutter slot near their right edge, to avoid the need to raise the spindle. Set feed rate and stroke size to 9.9 (this provides inertia to get maximum travel), power ON, press Start, then just before the table slot reaches the cutter, lift the lid to stop it. If you overshoot, you can lower and lift the lid just enough to "bump" the table into position as it homes. You may find a stroke setting of 9.7-9.8 stops the table in the perfect position.

Insert Spindle Lock

The blue T-handled tool fits into a hole on top of the DL-4 (on early -4 models a plug was supplied, but with improved bearing seals it is no longer necessary). As you insert the tool, turn the spindle by hand until you feel the tool slide into the hole in the spindle. Be sure it's all the way in to engage a safety interlock inside.

Remove Cutter ***With Caution!***

Use the 19mm wrench to loosen the collet (counterclockwise). Slide the used cutter out through the table slot. It's sometimes difficult to see cutter wear without a microscope so to avoid confusion – DISCARD the used tool OR MARK IT AS USED ! One way is to slip the rubber cap over the shank end. These tools are MUCH sharper than you expect – don't handle the flutes!

Install New Cutter

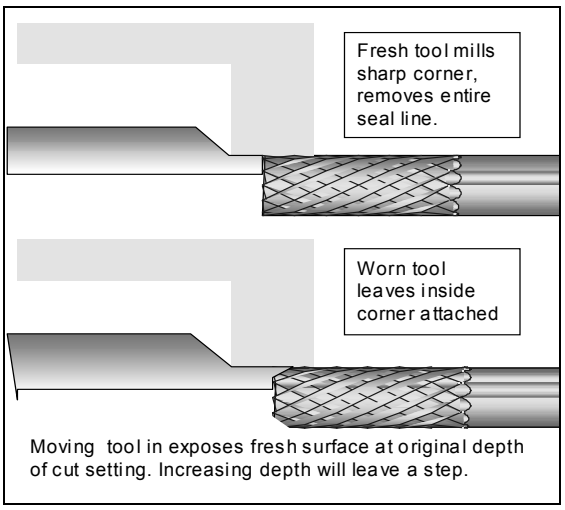
Carefully slide a new cutter into the collet. Finger tighten snug, then slide the cutter in or out until the front face is approximately .010" from the table (a business card or feeler gauge is handy. Tighten the collet – *about two finger pressure is enough for this precision machinery*. Now we'll need to check the indicators for accurate zeros.

PLEASE REMEMBER: to reset the feed rate to your normal setting. You don't want to mess up a good package with it set to maximum speed!

The clean, smooth surface finish you can achieve with the DL-4 and DL-F models depends on your using a sharp, square SB-8 tool. As the tip of the tool wears through use, the tool's diameter is reduced slightly, and the end becomes rounded.

This wear will eventually affect the surface finish of your part, but only after long use will it become serious enough to affect resealing. The important point to understand is how tool wear affects width of cut, and how you should respond when normal settings don't appear to get lids off as they once did.

Incorrect adjustments as a result of wear are the most likely cause of delid problems.



It's Time to Change the Cutter

Settings Aren't Working

The first sign of cutter wear is a lid that can't be popped off using normal settings for width and depth of cut. This can occur after 40-50 typical packages. What's happening is that the tip of the tool has become worn enough that the inside corner of the seal remains intact – see the illustration above and note that much of the tool surface is NOT worn at all (Wear *is exaggerated for purposes of illustration).*

If you Increase Depth

Unfortunately, the first reaction of most operators is to increase the depth of cut setting to get the lid to come off. When this is done, the less worn portion of the tool cuts deeper into the outside edge of the package, so that there will be a step formed between the inside and outside edge.

Increase Width Instead

Instead, in most cases you will be better off increasing the width of cut to compensate for the tip wear. As you can see from the illustration, because the tip is worn, it won't breach the cavity even if it is moved quite close to the edge - you just have to leave enough lid flange to support the package.

How Far In Can You Go ?

Because the package must be supported on the inside edge of the lid flange, we never want the front face of the tool to be moved in as far as the cavity. In common circumstances, we like to leave at least .003" inches clear – *for example if the package wall is .040", and .025" worked with a new tool, we'd suggest a limit of .037" with a worn tool. Remember to return to your "new tool" setting when the tool is replaced.*

The Wiser Solution

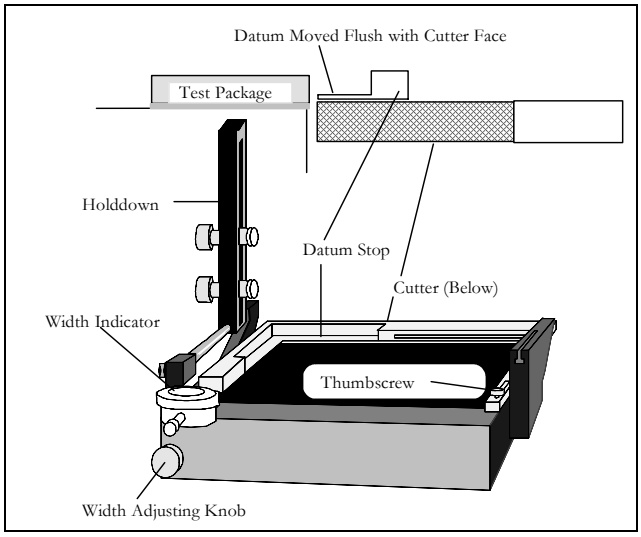
We suggest changing tools before operators must make major changes in settings. Many facilities find they save money and time by changing tools every 40-50 packages, avoiding the need for frequent readjustments, and also preventing damage to packages caused by excessive depth settings.

The yellow-handled ball driver adjusts headstock slide tightness and can be used to lock the depth of cut setting. Snug up the bolt accessible to the right of the spindle, and placard the adjustment knob so operators don't try to turn it. Do not adjust the upper and lower bolt (accessible on older models) as you may lose horizontal spindle alignment.

For the **datum stop** to accurately position your package, its indicator needs to be set to read zero when the front face of the cutter is even with the front edge of the datum stop.

This procedure takes just a minute, but it should be done carefully each time a cutter is installed.

The routine shown here doesn't require any tools and can be done quickly by operators. Another options described later uses test packages and aluminum test blocks with a optional depth tester for more precision.



Zeroing Width Indicator

Raise Cutter

Raise the cutter about .010", so its top edge is above the worksurface.

Loosen thumbscrew

Loosen the thumbscrew on the right datum leg, then turn the width adjusting knob counter clockwise until the front edge of the datum stop is visibly farther back than the cutter face.

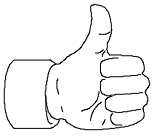
Align Datum with Cutter Face

Turn the knob counterclockwise bringing the datum stop forward until its edge is flush with the cutter. You can use a test block or fresh package (*not a milled one !*) held against the cutter while you turn the spindle by hand to find the exact point where contact ceases.

Another way is to use a business card. Usually cutters are installed using a card or feeler gauge, leaving the front face of the tool about .010" from the table edge. With the datum stop moved back, you can slide a card between the cutter and the table. It should fit snugly. Now if you adjust the datum toward zero, as it reaches the face of the cutter it will start to bend the card making it much harder to pull out.

Reset Dial Indicator

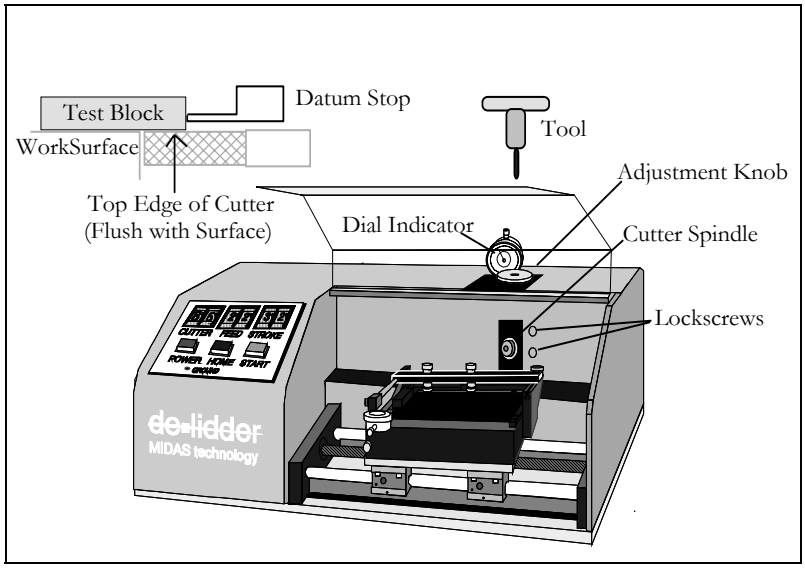
Adjust the bezel on the width dial indicator (loosen the clamp to turn) so zero is at 12:00. (always having zero in the same place helps operators avoid setting errors). Now note where the indicator stem pushes against a small slotted block (the width of cut anvil). Adjust the anvil forward or back until the dial reads exactly zero.



Set width of cut to .040" and tighten the thumbscrew before continuing with the zero depth procedure.

The **dial indicator** on top of the machine should read "0" when the top of the cutter is exactly even with the worksurface.

This procedure uses a fresh package or test block to manually determine at what point the cutter flutes just reach the worksurface level. At that point, you reset the indicator to zero.



Finding Zero Depth

Position Cutter

For best results, do this procedure with the cutter in the middle of its normal travel using your packages. For many users this will be 1 1/2" from the left edge. Press [START] then power [OFF] when there.

Lower Cutter

Using the knob or the spindle lock tool, turn the adjustment knob counterclockwise until the top edge of the cutter is visibly below the worksurface. Confirm that the datum stop is moved back so at least .030-.040" of cutter flutes are exposed.

Position Block

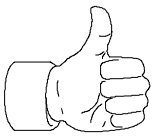
Slide a test block or unmilled package against the datum stop over the cutter. You'll want to hold this lightly with your fingers - that's the most precise way to tell when the first flute contacts it.

Raise the Cutter (take tiny steps)

Bring the cutter up to .001-.002" below the surface (using the previous setting on the indicator is usually OK for this). Now while holding the block down lightly, turn the cutter spindle through a complete revolution with your other hand - while trying to feel the slightest contact between the block and the highest cutting flute.

Set the Indicator

The point where you first feel contact is approximately .00025" (this depends on the sensitivity in your fingertips - *don't use cots !*). Loosen the bezel clamp and turn the indicator to read just above zero.



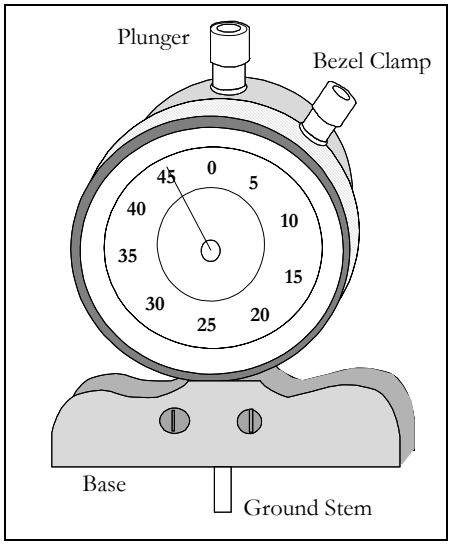
A specialized depth micrometer with flat-ground stem is available to determine settings with even more precision - but this simple "field procedure" allows users to check settings quickly and successfully.

(see *"Using the Optional Tester"* second page following)

For many applications, the precision provided by manually zeroing the depth and width of cut is perfectly adequate. However some customers have expressed interest on more rigorously defining the process specifications.

For such customers, we've developed a custom depth tester with edge-ground stem especially suitable for repeatably measuring the very fine edges left by a typical delid pass. (Most calipers, especially those with rounded stems for area accuracy, can't do the job on the small edges available).

After zeroing depth and width as called for in the manual, run the long side of a test block at your most common depth and width settings. Then check it as described below to ensure your indicators are set as precisely as possible.



Optional Cut Micrometer

Zero the Tester

With the base held flat on your test block or other machined surface (the worksurface of the DL-4 is fine) press the plunger and check that the indicator reads exactly zero as the plunger bottoms out. If it doesn't, loosen the bezel clamp and set the bezel to zero.

Check Depth

Holding the base flat on the test block, position the stem over the milled edge. Press the plunger until it hits and read the depth in .001".

Check Width

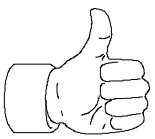
Hold the base flat on the side of the block, and position the stem to slide across the width of cut and hit the inside edge. Take three readings (middle and each end) and average them if they are different.

Adjust Depth Indicator

If your depth reading doesn't match the setting on the machine, readjust the machine to your actual reading - just loosen the bezel clamp and rotate the top indicator as required.

Adjust Width Indicator

If the width reading differs from the machine's, readjust the indicator as required. Once again - you can move the anvil to keep the zero position where you want it; just make sure the indicator ends up reading what you found with the tester.

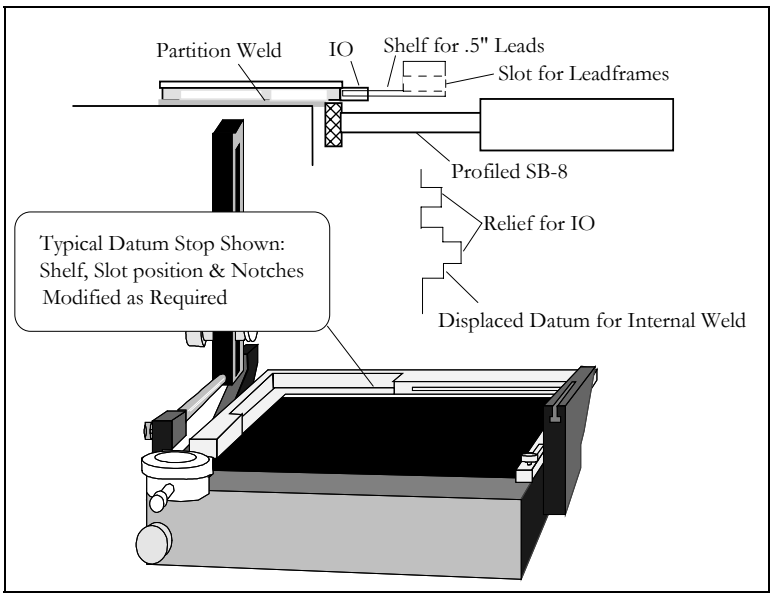


Order items D4MSTL21 Milled Test Block, $110 for 10;

D4MSTL13 Cut Depth Tester, $255.

Normally, packages mount on the de-lidder™ lid-down against the datum stop. For packages that have extensions like IO connectors or mounting lugs, or unusual configurations like partition welds, the datum stop and cutter may need modifications.

Illustrated here are several common modifications; explained in detail below. Some combination should accommodate almost any package - if you've run into one of those rare situations that doesn't appear to fit - please get in touch with us and we'll try to work out something new !



Custom Datums

Profiled SB-8

For partition welds and clearing power leads that extend past the lid plane, we remove part of the cutting surface of the cutter as shown. The part number for these cutters is SB-8-6-NN, where NN indicates the length of the remaining cutting area in 1/100" (SB-8-6-050 and SB-8-6-100 are common sizes).

Lead Slot

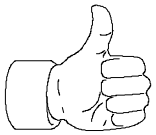
The standard datum includes a lead slot (or "cove"), allowing leads longer than .5" to extend through. This cove can be positioned wherever required; our datum designed for Multichip Modules (MCM) has a cove extending nearly the full width.

IO Reliefs

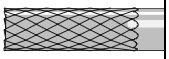
If a connector or lug sticks out anywhere on the package, too close to the lid plane to clear the datum ledge, the ledge must be machined to provide clearance.

Displaced Datum

For Partition Welds and other situations where a seal line is displaced from the package side, we add a *displaced datum* edge - a relief wide enough to fit the package in, far enough so the cutter mills the seal line at the same width of cut as the other sides.



We've fixtured thousands of packages, and can usually draw up and fabricate what you need in days. Give us a call !

Part Number	Description & Delivery	Unit Price	Lot Size
SB-8	Starbide[tm] Cutter; *8mm diameter micrograin dual-helix pattern tool optimized for low vibration and particulate control in Kovar and other soft or gumming materials.* Normally available from stock. 	$50 (add $5 each for break lot)	10* *Blanket Order Discount Available
SB-8-6-050 *(specify -050 or -100, flute length in .000")*	Profiled SB-8; *with all but .050" (or .100") of flute length ground down to a 6mm shank to provide clearance for leads, mounting lugs or other protrusions above lid surface. Also available with extended shanks to reach partition welds on large hybrid packages.* Del. 1-2 weeks ARO 	$70 (add $20 for extended shank)	5
SD-6-250-220B/D *(specify B-orazon or D-iamond)*	Abrasive Shaft; *6mm diameter with .250" abrasive coating ; either 220 Grit Borazon (220B) or industrial diamond (220D). For grinding of ceramic lids. Requires 6mm collet.* Del. appr. 2 weeks ARO 	$45	5

CUSTOM PRODUCTS

We can modify standard products or, as shown below, create custom tools and fixtures for your application. And after six years and thousands of delid operations, we have many proven approaches "on the shelf". Please call to discuss your particular requirements.

SD-6-310-220D	Diamond Disk (typical); *.310" diameter disk mounted on 6mm shank, coated with 220 Grit industrial diamond (220D). For special, deep-cut ceramic applications.* 	$150	3

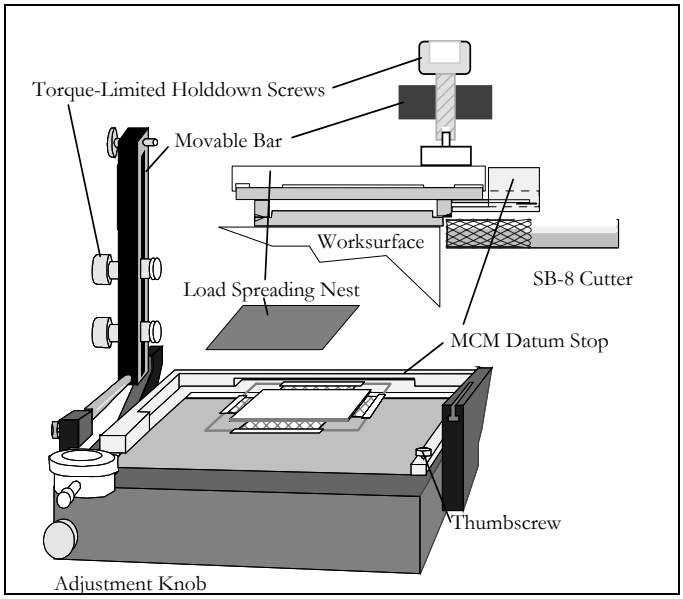
Due to continuing product improvement, all prices and specifications subject to change without notice.

Note: Use this approach for most header-ring designs

Removing MCM Lids

Seam-sealed MCM's can often be processed lid down against a datum stop that has appropriate slots and shelving to protect their leads. The shelf on the datum stop lines the header ring up squarely with the cutter. To increase the width of cut, we move the datum stop out (away from you) so the positioned package will stick farther out over the cutter.

The goal of the process is to mill away the braze between the header ring and the lid, without milling across the entire width of the header ring. As you can see from the cross section, the remaining inside edge of the header ring supports the package throughout the process, allowing all four sides to be milled evenly for optimal resealing.



MCM Fixturing

What to Do

Loosen the thumbscrew, then referring to the indicator, dial in the desired width of cut setting using the adjustment knob. (This will range from .025"-.035" for most seam sealing processes). Tighten the thumbscrew after each change in setting.

Install the Nest

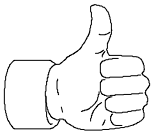
A **nest** can be used as a load spreader on flexible MCM packages, to ensure that holddown force is applied directly onto the header ring.

Tighten Holddowns

With the holddown bar in place and the MCM sitting flat against the datum stop, tighten each of the holddown screws onto the package nest, using the standard torque limiter.

Mill Each Side.

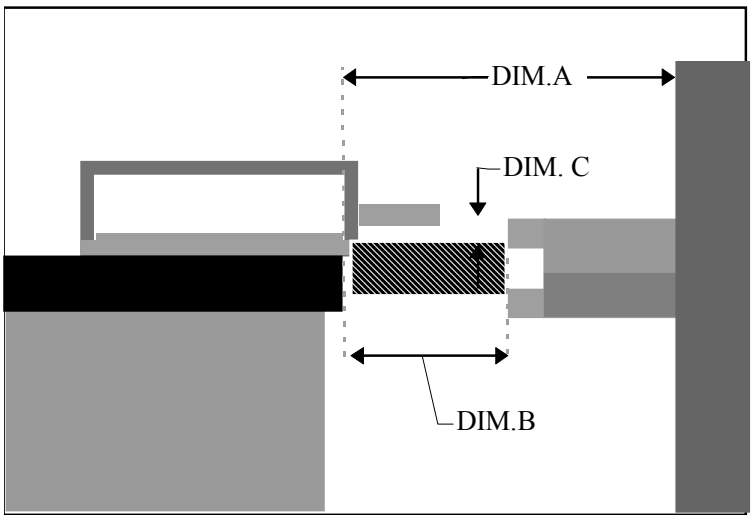
Press [START] to mill the first edge. If you have set stroke length for this package, the table will return automatically. Turn the MCM 90 degrees and repeat until all four sides are done.



Holddown pressure along the header ring helps seal the cavity from particulates until the lid is actually removed !

The DL-4 has successfully been fixtured to de-lid a much wider variety of packages than originally intended. One increasingly requested application involved packages with long flexible leads, such as fiber optics or power cables.

Since we normally do all four sides similarly, the side with the long lead needs special attention. Often we can bend the lead and secure it where it won't run into the tool collet or wall. This sheet illustrates how much clearance there is, to help decide if this approach will work.



Critical Clearance Dimensions - DL-4

Table - Wall Clearance {A}

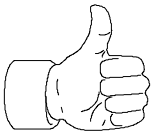
The standard worksurface face is 2.47" (62) mm from the cutter wall. Allowing for width of cut (the amount the package extends past the cutter face) and app. .010"(.25mm) tool/table clearance, leads with a bend radius of 2" (50mm) or less should be able to route clear of the wall. *We can also mill the front face back a further 5mm, realizing that a few more particles may escape the vacuum tray.*

Table - Nut Clearance {B}

There is normally 1.10" (28 mm) between the table face and the collet nut. This dimension can be significant if you have a long and/or rigid strain relief bringing the lead close to the nut. *We can grind the nut .080" (2mm) leaving thinner flats for tightening. We can also relocate the headstock app. ½" (12mm) back further in the machine and provide extended shank (SB-8E) tools to restore tool reach, at the cost of a slight degradation in surface finish.*

Tool - Nut Clearance {C}

The top edge of the SB-8 tool is .260" (6.5mm) from the top of the collet nut. Subtract this plus your depth of cut (flange height) from the lead to lid dimension to see how much the lead must bend in the first 1.10"(28mm). *We can provide 10mm tools (and an easily installed 10mm collet) which will give 1mm more space here.*

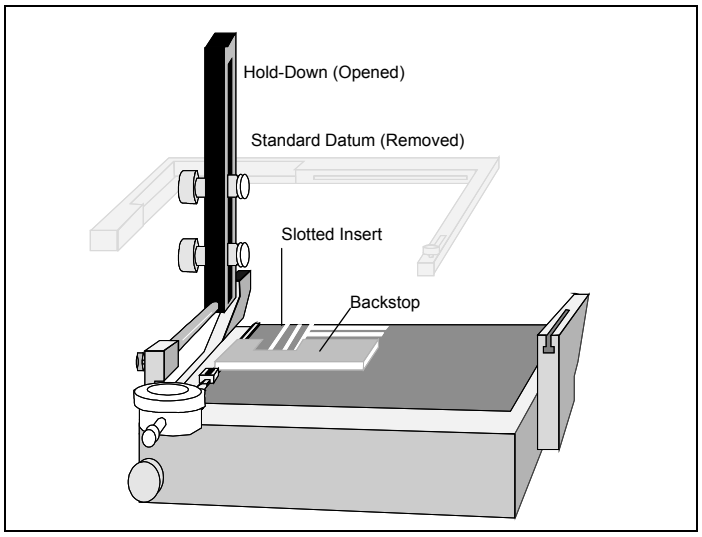


When leads require more room than the DL-4 provides, remember we have several larger models available. Call for information on our DL-F (for fiber optics), DB-F (for oversize fiber modules) and DL-B.

Note: For Ceramic DIPS & Coined Lid *Lid-Up Fixturing*

By raising the DL-4's cutter above the worksurface, it's possible to process packages lid up. This is especially useful when working with ceramic-lidded DIPs and solder-sealed packages.

The standard worksurface is replaced by an insert machined-out for package pins as shown. The package is fixtured squarely against a special "backstop" datum which adjusts short and long side width of cut simultaneously. For ceramic lids, the SB-8 tool is replaced by a 220 grit diamond or borazon abrasive tool.



Worktable with Slotted Insert & Backstop Datum

Set Width of Cut

The cut width on ceramics done lid-up can be as close to the cavity as your process allows.You may need to physically remove the final lid segment with a blade if you can't breach the cavity but once the right process parameters are learned, it should not be difficult.

Set Depth of Cut

For clean results on thick lids, we recommend grinding through no more than .012-.015" depth at one time. The depth indicator should be zeroed with the lower cutter edge at the worksurface. Raise the headstock to within .012-.015" of the package height to start.

Cut Short Sides

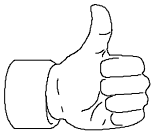
Insert part pins-down into the first set of slots, and slide it back squarely against the datum backstop. Clamp the part with the torque limiter. Close the lid and press [START] to make the first cut. Then turn the package around to complete the next at the same depth of cut

Cut Long Sides

After the first two cuts, move the part over to the long-side slots, and fixture it squarely against the adjoining edge of the datum backstop. Cut both long sides to the same depth as the short sides.

Reset Depth and Repeat

After each set of four cuts (once for each side) lower the headstock no more than .012" until the desired depth is reached. If the width is adequate, once you're at the adhesive layer, the remaining lid should be removable.

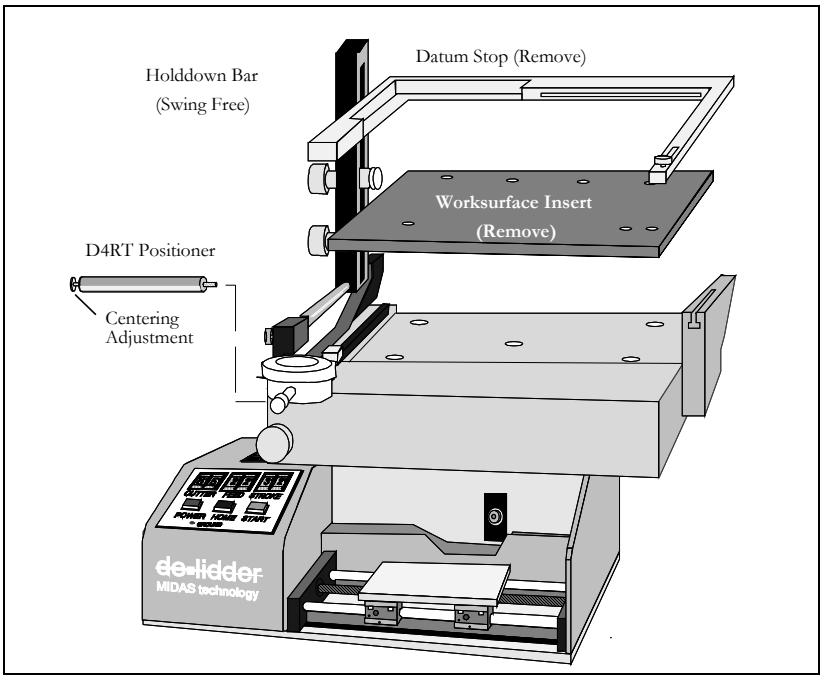


Similarily slotted fixture plates with adjustable backstops can accommodate a variety of packages, and avoid the setup time required to change the worksurface. Ask us !

The D4RT Turntable mounts on the same carriage plate as the linear table assembly. Since the horizontal location of the cutter spindle is fixed, the carriage must be accurately positioned to center the turntable under the spindle centerline. An adjustable positioner rod does this by contacting a limit switch built into the machine wall.

From this position, the table mounting bolts can be accessed by removing the datum stop and worksurface insert.

Here's how:



DL4 LINEAR TABLE REMOVAL

CENTER CARRIAGE

[HOME] the linear table, then screw the D4RT Positioner into the left hand side, aligned with the **limit switch** on the center wall. Press [START] to move the table left. It will stop when the limit switch is contacted - turn [POWER] off to leave it in position. Remove the holddown bar thumbscrew and swing the bar clear.

REMOVE DATUM

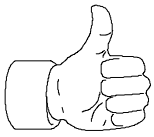
Unscrew the right hand side **datum lock thumbscrew**, and the two socket **capscrews** that hold the datum to the **sliding rail.** Gently work the datum free of the rail (it has to be a tight fit to ensure squareness).

REMOVE INSERT

Loosen and remove all the 4mm insert mounting socket capscrews. Lift the insert straight up to remove - it also is a snug fit. You may need to grasp the front right corner just ahead of the right holddown support to work the insert free. A note to remember: when replacing the insert - pull it to you and to the left when tightening it down.

REMOVE TABLE

Loosen and remove the five 6mm socket capscrews that hold the table block to the carriage. Lift the table block up (to clear the table guides) and clear of the carriage.

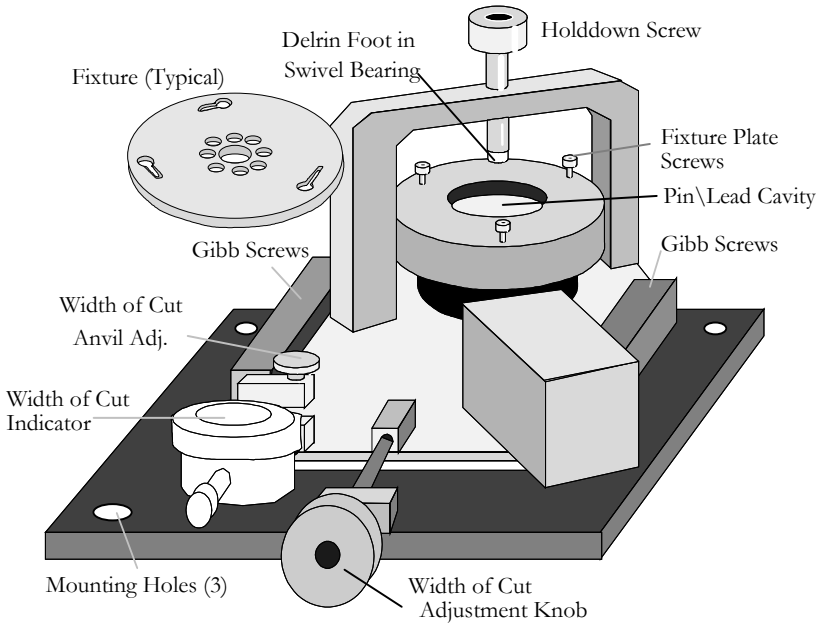


DON'T MOVE THE TABLE GUIDES ON THE FRONT CORNERS OF THE CARRIAGE - THEY'RE PRECISION-FIT TO KEEP THE TABLE SQUARE.

The D4RT Turntable Module allows precision milling of circular lids up to 3" diameter.

It uses the high speed, de-lidder™ cutter, and adds a variable-speed worm-driven turntable, width-of-cut adjustment, and a flexible fixturing system with easily removed platters for all types of circular headers.

Once the linear table is removed (see *Linear Table Removal*) setting up and using the D4RT is easy.



D4RT Turntable Module

(not shown: swing-out holddown assembly standard from 1995-on)

Mount Module

Make sure horizontal carriage plate is free of particles, then place module on the carriage with the turntable towards the cutter. Slide it back snug against the carriage plate's alignment blocks. Secure with three capscrews.

Connect Cable

Insert motor connector into socket at upper right corner of cutter wall, and tighten to activate turntable and disconnect linear drive - DON'T OPERATE DISCONNECTED or you'll move the turntable and may damage it.

Install Fixture

Install a fixture plate by slipping slotted holes over three platter screws, then turn clockwise. Tighten the three screws to secure the fixture.

Set Speeds LOW

For best results on Kovar, set turntable speed thumbwheel to 2.0, and cutter speed to 8.0. (Since turntable cycles are longer, tool and system temperatures will climb undesireably if typical linear cutter speeds of 8.8 - 9.0 are used).

Zero Depth

Pick a repeatable reference (Given lid tolerances, the fixture surface is often best). Lower cutter with the depth adjustment knob until it barely contacts the reference as you turn the spindle by hand. Set the indicator just above zero.

Zero Width

Position the turntable so the cutter face just contacts the edge of an installed part. Adjust anvil pin for the range of motion needed, and zero the indicator. The depth/width adjustment tool fits hrough a hole in the lid to allow adjustments on-the-fly so you can hear where contact begins.

Complete Cut

Press START. With the turntable and cutter moving, gradually adjust width to the desired cut using the dial indicator as reference, and bring cutter down to desired depth. Allow turntable to complete full rotation at final width and depth.

Remove Part

Back the cutter away with the depth and width adjustments, then press HOME to stop the turntable and cutter. Open lid and remove part (and optionally, platter)

WE WANT TO MAKE THIS MANUAL AS USEFUL TO YOU AS POSSIBLE – PLEASE CALL WITH ANY SUGGESTIONS !

Ken Towl
Marketing & Sales
Midas Technology Inc.
400 West Cummings Park
Woburn, MA 01801

kentowl@midastechnology.com

Part List

Reprinted directly from the assembly database used to kit your machine, with part numbers current as of the date of shipment. This report is filtered to excluded miscellaneous hardware and common fasteners.

Schematics

Chassis Wiring, Logic Board Wiring and Logic Board Layout are provided. For any electrical problems please service @ (781) 938-8579.

Setup Information

This manual now includes the initial settings & procedures we use to set up and adjust the logic card, table drive card and cutter drive card. Please call our service line (781 938-8569) if you feel you need to reset these cards and are not familiar or comfortable with the necessary procedures. OEM motor driver card instructions are in the binder.

Maintenance Tips

The primary maintenance task is changing cutters on a regular basis. Facilities doing lots of delidding have often found it most efficient to change tools after a certain number of parts, before tool wear requires significant changes to width and depth of cut. For 14-pin butterfly packages used in telecommunications, many facilities settled on 40-60 parts as a good target number.

The next task is simple – keep the machine cleaned of particles. When our vacuum system is installed, very few particulates will make their way onto the worksurface, carriage rails or leadscrew – those that do should be cleaned out with the magnet or the wand supplied with the vacuum.

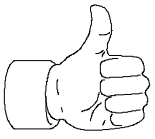
Lubrication

We have provided a syringe of leadscrew lube in the toolkit. A copy of the Material Safety Data Sheet (MSD) for this lube is in the binder for your facility records.

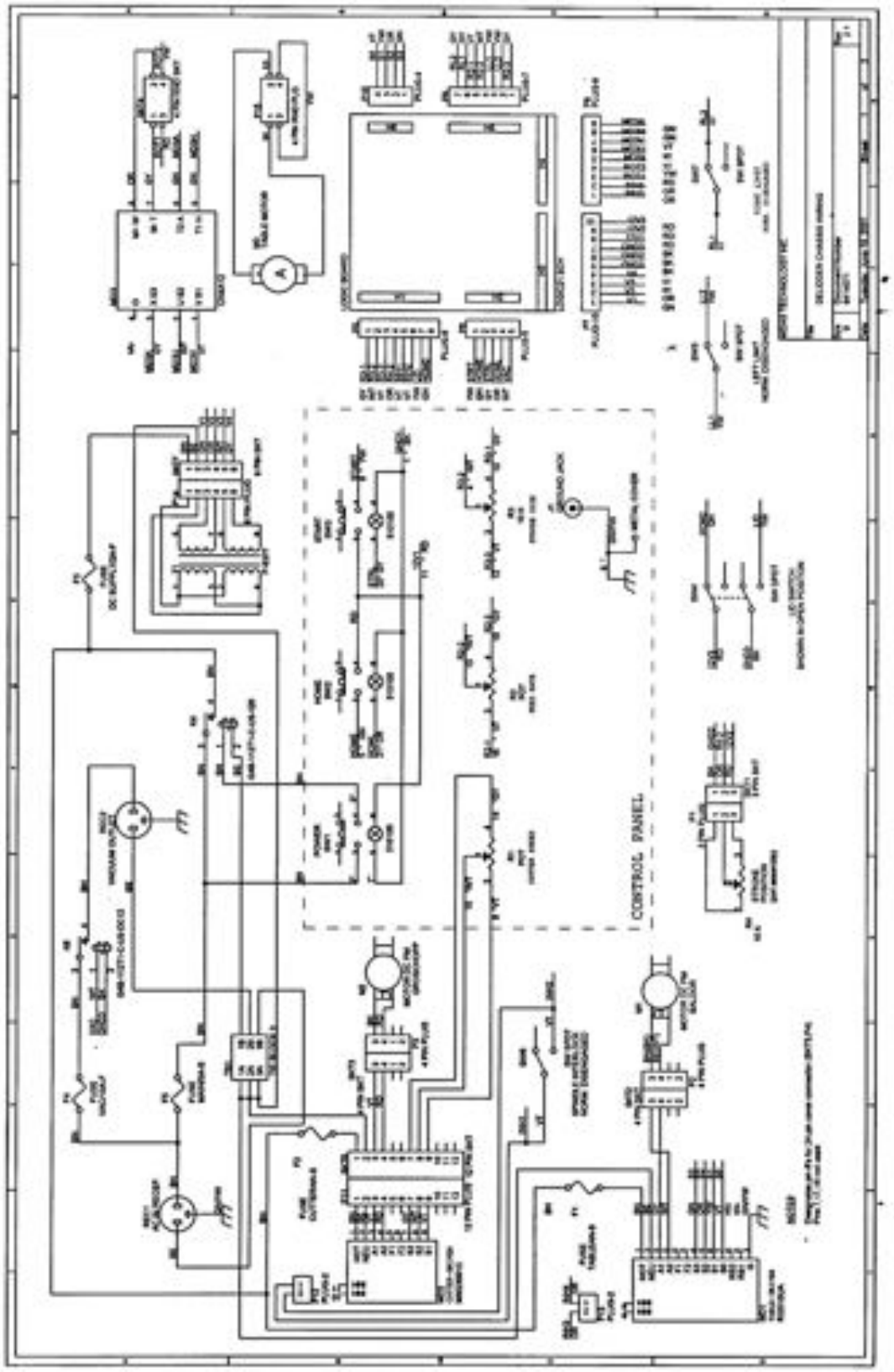
We recommend applying only as much lubrication to the leadscrew as is necessary to prevent squeaking (which may occur when the carriage nut completely dries out). With the table at HOME, apply a 1-2" strip of lube just to the left of the nut (under the table) and run the table to its leftmost position. Lift the lid to stop the table there, and apply another strip of lube just to the right of the nut. Close the lid and let the table return HOME. This application should last 2-3 months of normal use.

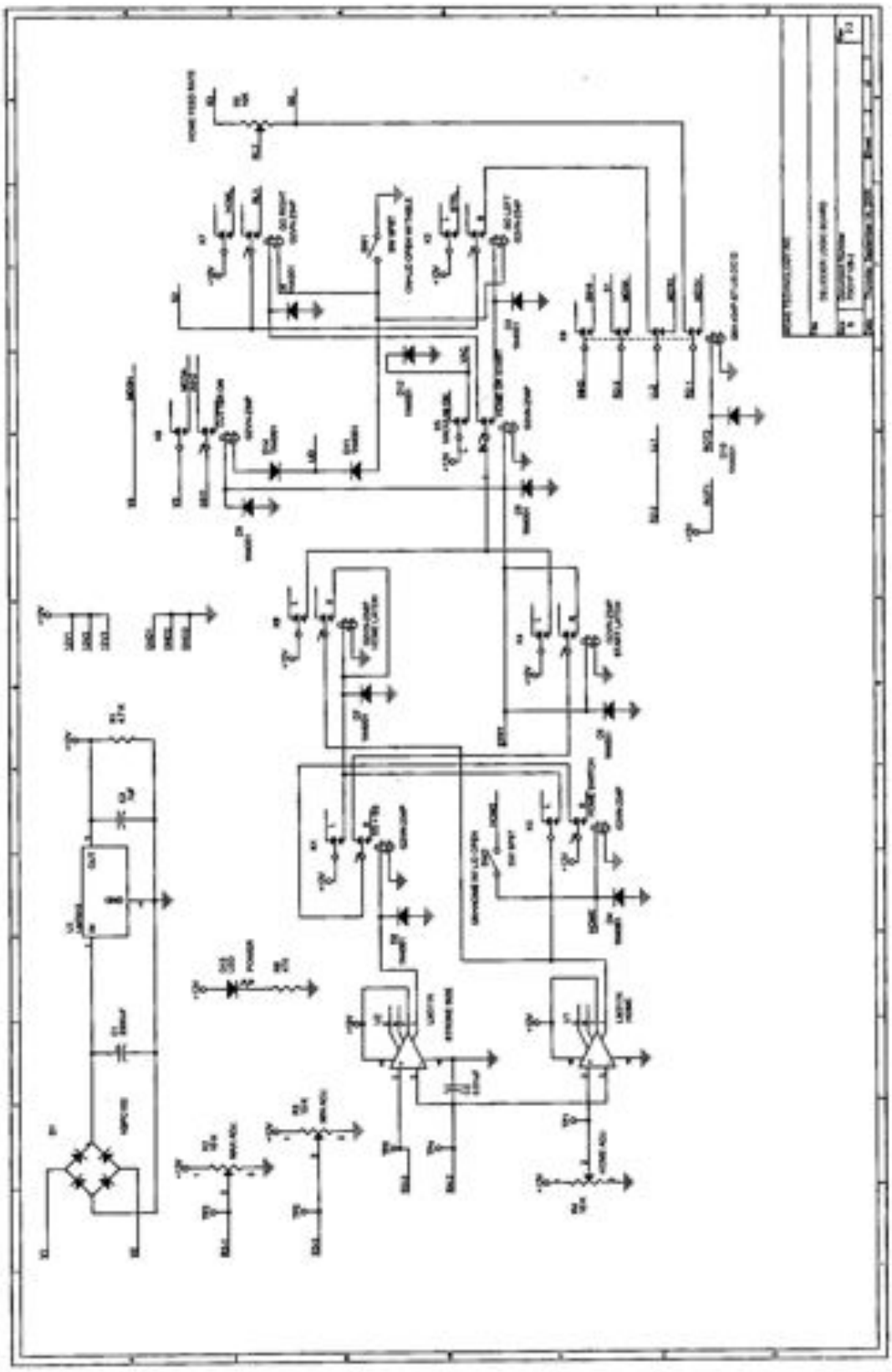
Addenda

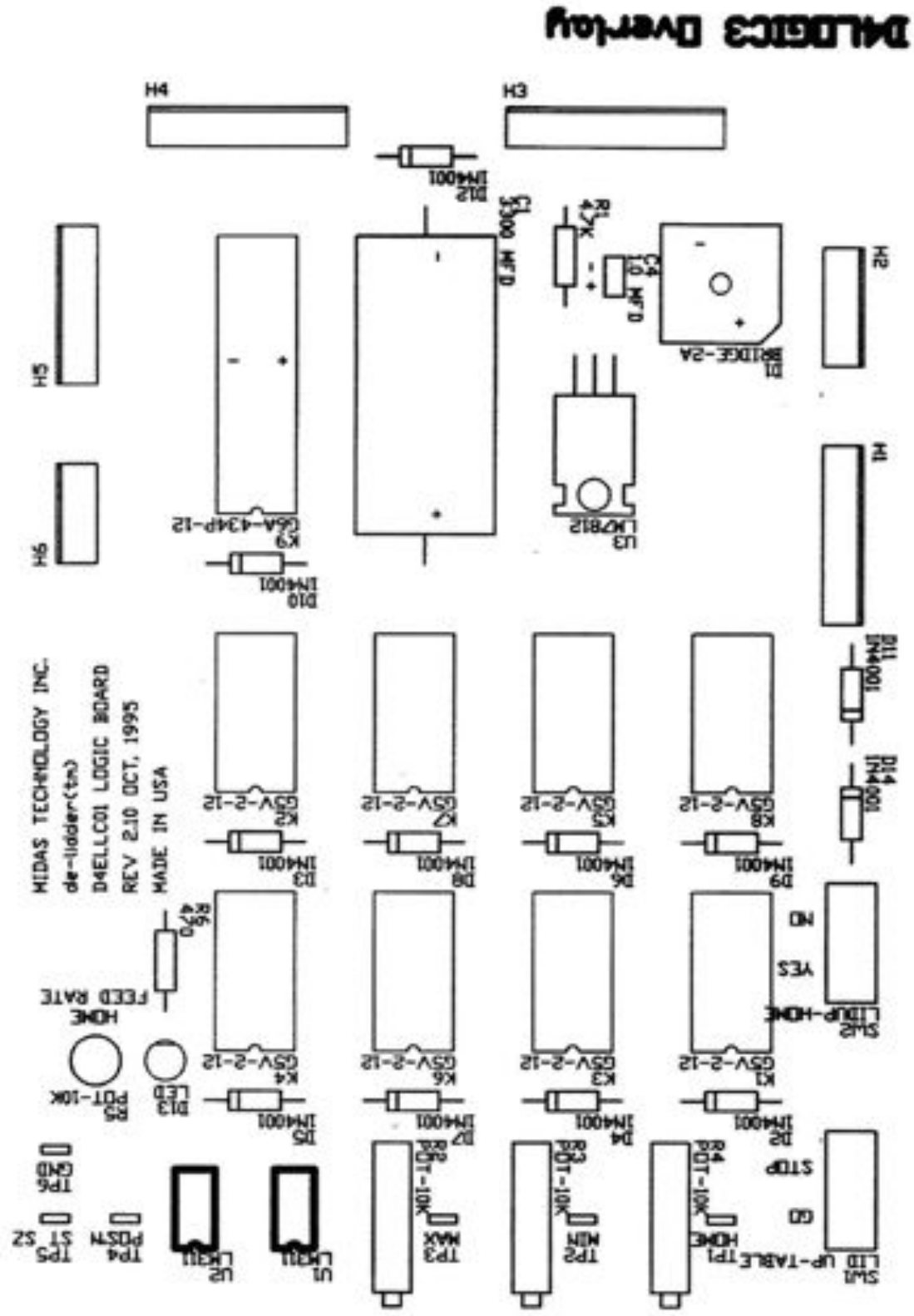
These sheets cover any custom tooling or fixturing provided with this machine, as well as any technical addenda we've created that are not yet incorporated into the standard manual. Call us if you have additional requirements ! (781-938-0069)

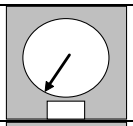
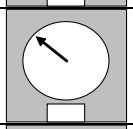
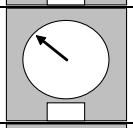
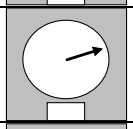
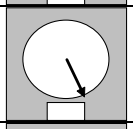
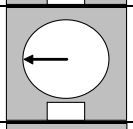
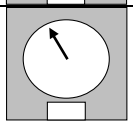
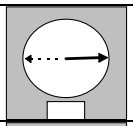
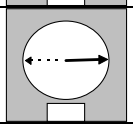


We regularily prepare new application notes based on customer experiences. Let us know what your priorities are !







STEP	Instructions	Setting	Illustration
NOTE	FWD ACCEL: ramps acceleration to left, deceleration to right		Viewed
	REV ACCEL: ramps acceleration to right, deceleration to left. Setting higher allows more time for cutter to stop, but allows table to coast farther after home signal is received, requiring reduction in D4ELLC MAX POT setting (7.53->7.2)		
1	MINSPD pot arrow set to MIN, full counterclockwise	MINSPD CCW	
2	FWDTQ Pot Arrow set to 10:30	FWDTQ 10:30	
3	REVTQ Pot Arrow set to 10:30	REVTQ 10:30	
4	IRCOMP Pot Arrow set to 2:45	IRCOMP 2:45	
5	MAXSPD Pot set to Maximum (full clockwise)	MAXSPD MAX	
6	FWD ACC Pot set to 9:00 position	FWDACC 9:00	
7	REV ACC Pot set to 11:00 position NOTE: 9:00 position (very little ramping) allows for maximum table travel, but requires delaying activation of HOME function to allow time for cutter to stop turning. See D4ELLC setup.	REVACC 11:00	
8	DB Pot Set to 3:00 (For 60Hz), 9:00 (for 50Hz)	DB FOR 60 HZ (Dotted for 50Hz)	
9	TACH Pot set to 3:00 (For 60Hz), 9:00 (for 50Hz)	TACH FOR 60 HZ (Dotted for 50Hz)	
10	ARMATURE SWITCH Set to 90V	90V	
11	FEEDBACK SWITCH Set to ARM	ARM	
12	115-230 SWITCHES (Set to Supply Voltage, 2 Places)	115 OR 230V	

REVISION NOTES: Change to REV ACC Pot setting to provide more delay for cutter to stop before homing. Requires change in D4ELLC settings to prevent table/wall contact.

STEP	Instructions	Setting	Illustration
NOTE	FWD ACCEL: ramps acceleration to left, deceleration to right		
	REV ACCEL: ramps acceleration to right, deceleration to left		
1	ACCEL pot arrow set to 9:00	ACCEL 9:00	
2	DECEL Pot Arrow set to 0 (Full Counterclockwise)	DECEL 0	
3	MAXSPD Pot Arrow set to Max (Full Clockwise)	MAXSPD MAX	
4	MINSPD Pot Arrow set to 0+	MINSPD 0+	
5	TORQUE Pot set to 10:15	TORQUE 10:15	
6	IRCOMP Pot set to 10:30 position	IRCOMP 10:30	
7	ARMATURE 90-180V Switch Set to 90V	90V	
	FOLLOWING FOR 60Hz MODEL		
8 - 60Hz	115-230V Switch Set to 115V	115V	
	FOLLOWING FOR 50Hz MODELS (RG410U)	D4ELCD01E	RG410U
8 - 50Hz	115-230V Switch Set to 230V	230V	

Step	Instructions (*Viewed from Operator Position*)	Note	Normal	Max
1	Remove cover screws, and rotate cover forward toward you, leaving control panel connector attached. By sliding the left front edge of the cover under the machine, it will stay in place while you:	These settings are for >	Delay for Tool Stop on HOME	No Delay: Max Table Travel
2	Confirm Table Drive Card pot settings are correct per Setup	See	D4ELTC	D4ELTC
3	Unplug Table Drive Motor electrical connector.			
4	Identify Tie Points TP1,TP2,TP3 and TP6 on logic card mounted on left wall. Connect TP6 to digital multimeter ground reference.	See Attached	D4LOGIC2	D4LOGIC2
5	Connect machine to AC Power, and switch AC Power [ON]	[ON]		
6	Confirm right edge of table base (the base, not the holddown support bolted to it) is flush with the right side of right rail support - this is standard HOME position. IF DISPLACED, unbolt and separate motor from leadscrew. HOME table by turning leadscrew. Reassemble, but leave motor bolts loosened for following steps.	Table	@ HOME	@ HOME
7	SET TABLE POTS (Repeat in sequence until all are close to nominal, and record actual readings here for future reference)			Nominal/ Actual
7A	MIN POT (R3 adjacent to TP2) determines tool acceleration zone, from home to point where tool centerline makes initial contact with fixtured part.	MIN	1.27V/	1.28V/
7B	MAX POT (R2 adjacent to TP3) determines extreme travel limit, when stroke control is 9.9. *LIMIT 7.1V for DL-F with Vacuum Cowl Installed. For DL-4 only, use Max column, and see step 7F for fine tuning if max travel is required.*	MAX	7.2V/ **7.1V DL-F**	7.40V/
7C	HOME POT (R4 adjacent to TP1) This voltage determines where power to table motor is cut on return (rightward) stroke. Table momentum should take it to correct HOME position.	HOME	1.21V/	1.21V/
7D	Loosen Table Motor Bolts as necessary to lift worm clear of pot gear assembly. Rotate pot gear until TP4 (POSN) reads 1.00V. Tighten motor bolts and reconnect table motor connector.	POSN	1.00V/	1.00V/
7E	Set FEED RATE to 3.0, STROKE to 9.9, and press [START]. Confirm that table stops, pauses and homes before left side of left holddown support contacts left limit plunger switch on center wall.			
7F	Set FEED RATE to 9.9, and repeat 7E, increasing R2 setting as required until table just contacts (without engaging) limit switch before homing. Final setting should be approximately 7.50V, and should be at least enough so that tool will reach center of tool removal slot when feed rate is 9.9.	MAX	7.20/	7.53/
7G	Confirm HOME position, and reset FEED RATE control to default.	FEED	2.5	2.5
8	TABLE MOTION / INTERLOCK SETTINGS ***SAFETY CAUTION - CHANGE ONLY WITH CAUSE.***			
8A	LID-UP TABLE SW1. Setting SW1=GO allows the table to move in the current direction with lid interlock is open. Unless special fixturing is involved, SW1 should always be STOP, especially unless SW2 is YES. **INSTALL CAUTIONARY STICKER ON LID IF SW1 IS GO.**	LID UP GO/ STOP	STOP	STOP
8B	LID UP HOME SW2. Setting SW2 to YES automatically switches the DL-4 to HOME mode whenever the lid is opened.	LIDUP HOME	NO	NO
9	Replace cover			

CHRISTO-LUBE MCG 200
Page 1 of 2

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY *(As Used on Label and List)*	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space is marked to indicate that.
CHRISTO-LUBE MCG 200	

Section I

Manufacturer's Name:	Lubrication Technology Inc.	**Emergency Telephone Number:**	(740) 286-2644
Street Address:	310 Morton St	**Telephone Number for Information:**	(740) 286-2644
City and State:	Jackson, Ohio	**Date Prepared**	9/14/1998
ZIP Code:	45640	**Signature of Preparer (optional)**	

Section II - Hazard Ingredients/Identity Information

Hazardous Components (Chemical Identity; Common Name(s))	**OSHA PEL**	**ACGIH TLV**	**Other Limits Recommended**	**%(optional)**	**CAS NO.**
Contains no toxic materials. Product does not contain any known carcinogens. No special label or hazard warnings are required under OSHA CFR 1910. Free of ozone depleting compounds. Contains: Fluorinated polysiloxane, CAS 69430-43-9, NSTA #1, Greater than 50% Sb-dialkyldithiocarbamate, CAS 64742-52-5, NSTA #1, Less than 7% Polytetrafluoroethylene, CAS 9002-84-0, NSTA #1, Less than 50%					

Section III - Physical/Chemical Characteristics

Boiling Point	N/A	**Specific Gravity (H_2O = 1)**	1.5600
Vapor Pressure (mm Hg.)	less than 5 mm @ 20°C	**Melting Point**	Above 500°F
Vapor Density (AIR = 1)	N/A	**Evaporation Rate(Butyl Acetate = 1)**	N/A
Solubility in Water	Nil	**Appearance and Odor**	Yellow, faint odor

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	N/A	**Flammable Limits :** no data available	**LEL**	N/A	**UEL** N/A
Extinguishing Media CO_2, dry chemical, foam, water spray					
Special Fire Fighting Procedures: Wear NIOSH approved self contained breathing apparatus. Use water to cool containers and flush spills. Avoid breathing smoke.					
Unusual Fire and Explosion Hazards: Toxic fluorine gases may evolve if heated above 600°F					

(Reproduce locally) OSHA 174, Sept. 1985

CHRISTO-LUBE MCG 200

Section V - Reactivity Data

Stability: **Unstable**___ **Conditions to Avoid:** N/A **Stable** XX
Incompatibility (Materials to Avoid): Oxidizing materials can cause a reaction
Hazardous Decomposition or Byproducts: Fluorine products, silicon dioxide, CO_2, traces of incompletely burned carbon
Hazardous Polymerization: **May Occur** **Conditions to avoid:** N/A **Will Not Occur** XX

Section VI - Health Hazard Data

Route(s) of Entry: N/A	**Inhalation:** Remove to fresh air, give artificial respiration if breathing has stopped.	**Skin:** Wash with soap and water. If irritation occurs, consult physician.	**Ingestion:** Give milk or water. Do not induce vomiting. Consult physician.
Health Hazards *(Acute and Chronic)* None			
Carcinogenicity: none	**NTP?** no	**IARC Monographs?** no	**OSHA Regulated?** no
Signs and Symptoms of Exposure: Prolonged exposure causes no known adverse effects.			
Medical Conditions Generally Aggravated by Exposure: none known			
Emergency and First Aid Procedures: N/A			

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled: Use absorbent material to collect and contain for salvage and disposal.
Waste Disposal Method: Dispose of in accordance with Federal, state, and local regulations.
Precautions to Be taken in Handling and Storing: Do not store near flammables, explosives, strong oxidizers or at high temperatures. Avoid breathing vapors. Use self contained breathing apparatus if over 1000 ppm TLV.
Other Precautions: Toxic vapors may be evolved above 550°F. Provide adequate ventilation if product is heated to this temperature.

Section VIII - Control Measures

Respiratory Protection *(Specify Type)*: Not required.
Ventilation: Not **required** **Local Exhaust:** N/A **Mechanical (General):** recommended **Special:** N/A **Other:** N/A
Protective Gloves: Plastic disposal recommended **Eye Protection:** Safety glasses or goggles or face shield recommended
Other Protective Clothing or Equipment: Plastic disposable apron or coveralls recommended
Work/Hygienic Practices: Do not contaminate food or smoking materials. Wash hands after exposure.