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Your Norton Distributor has a large inventory of Norton wheels, abrasives, diamond tools, and grinding accessories ready for fast delivery. They also offer cost-saving advice from Norton-trained grinding specialists. These skillful application engineers are waiting to help you select the precise product for your grinding needs.

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NORTON COMPANY

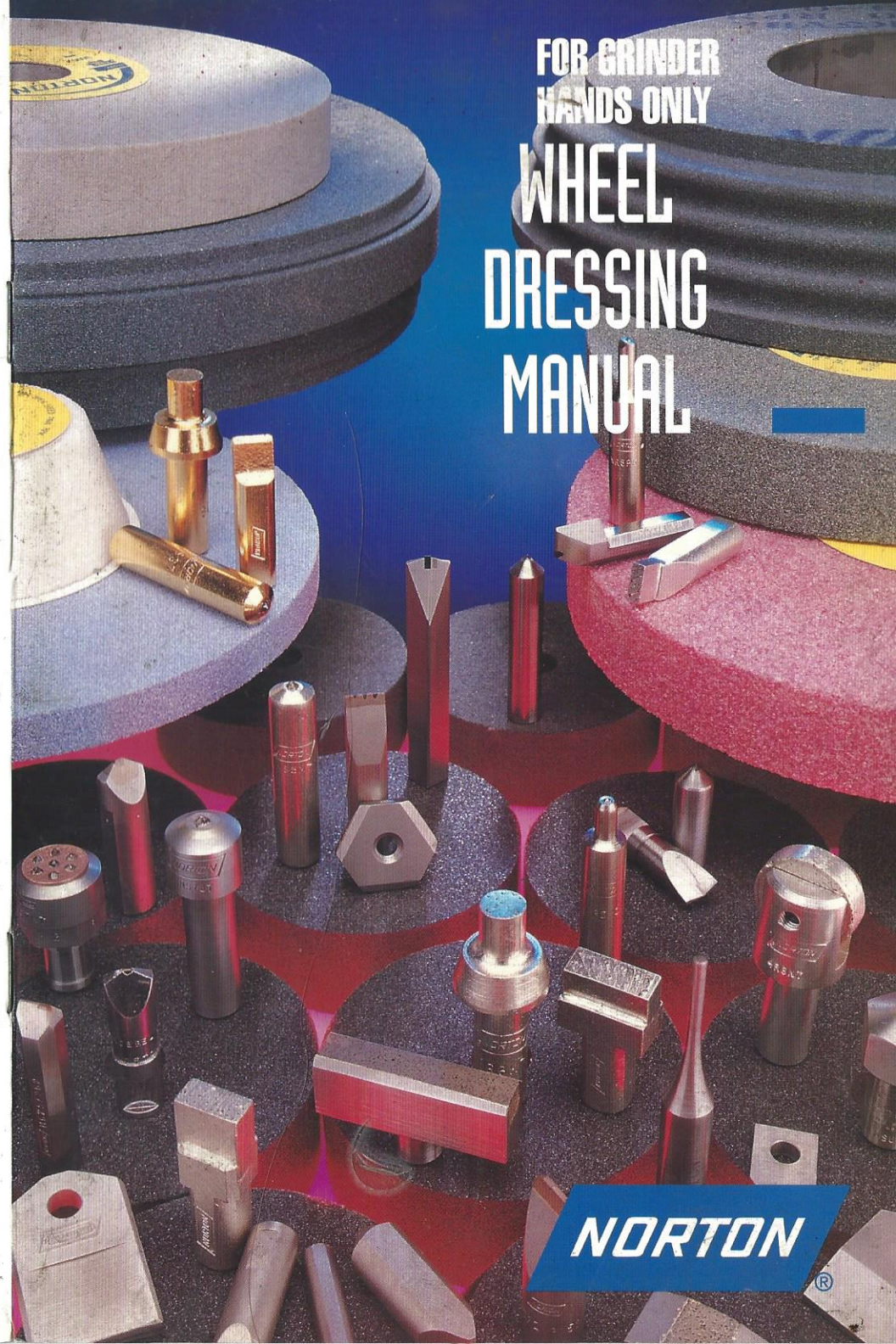
Diamond Tool

65 Beale Rd • Arden NC 28704



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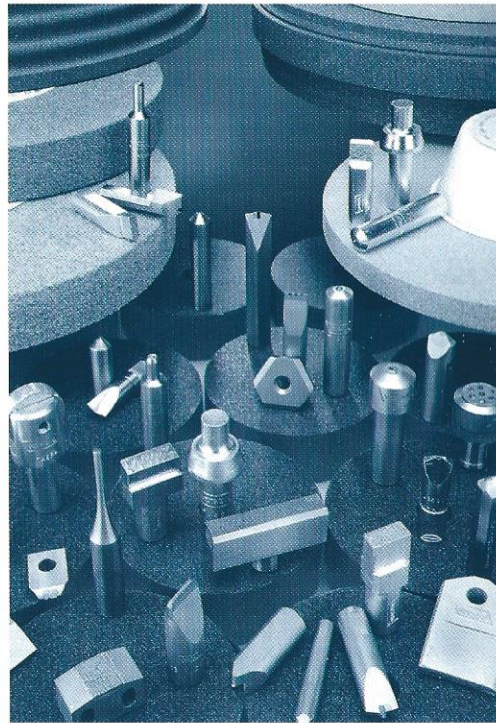
FOR GRINDER
HANDS ONLY
**WHEEL
DRESSING
MANUAL**



NORTON

Norton Diamond Dressing Tools

For more information or assistance in selection, call your nearest Norton Distributor, Norton Salesperson or Diamond Tool Application Engineer.



Norton has a complete line of standard single point, blade, cluster, and multi-point diamond dressing tools as well as a complete line of custom tools. This extensive selection offers the user a choice of tool for virtually every truing and dressing application from the tool room through production using straight face, shoulder, or angular face wheels.

For more information or assistance in selection, call your nearest Norton distributor or contact:

NORTON COMPANY
Diamond Tool
65 Beale Road
Arden, NC 28704



Customer Service: **1-800-438-4773**
Technical Assistance: **1-800-258-5750**
FAX: **1-704-684-1401**

Preface

The importance of proper truing and dressing of grinding wheels in precision operations cannot be too strongly emphasized. This applies to the type and condition of the dresser used, as well as the method employed.

A rounded, blunt diamond cannot be expected to produce the same condition of grinding surface as that produced by a diamond with a well-defined point. Likewise, it is not possible to produce as free a cutting surface with a light feed and slow traverse as that produced with a heavier feed and faster traverse.

Selection of the correct grinding wheel is of primary importance in the production operation, but a close second is the selection of the truing tool and its proper use. As a matter of fact, incorrect dressing will cause a satisfactory wheel to act unsatisfactorily. On the other hand, a skillful operator with a

good dressing tool can help correct the grinding action of a wheel that does not exactly fit the requirements of the work being ground. This kind of knowledge is of special importance in shops where there is such a great variety of work that it is not practical to have a special wheel for each operation.

The purpose of this booklet is to provide operators with general truing and dressing tips to improve one's grinding operation. Basic guidelines and parameters will be discussed. For additional assistance, contact your local Norton AMG salesperson, or contact Norton Diamond Tool Product Engineering at 1-800-258-5750.

Is Wheel Dressing Necessary?

The questions are often raised, "Why not use a softer wheel and thus reduce dressing?" or "Why dress a wheel, as the diamond cost is high?"

Strictly speaking, dressing is not an item of expense, but rather one of economy. A wheel that is so soft that dressing is not needed is short in life, and gives a rather rough surface. A wheel of such a

grading that requires periodic dressing will produce considerably more work per dollar, regardless of the class of work.

Diamonds are essential for dressing except in such cases where the operation is highly specialized and other types of dressing tools may be adaptable.

Examples:

Offhand Grinding
(Bench and Pedestal)

BCHD - Norton Hand Dresser
or Star Dresser

Offhand Grinding
(Organic Cup or Depressed Center)

No Dressing Needed

Vertical Spinning Surface Grinding
(Segment Grinding)

Star Dresser

In other grinding operations, diamond substitutes have **NOT** been found to be practical or cost efficient from a productivity viewpoint.

A grinding wheel actually needs to be trued **and** dressed before it touches a piece of material.

Truing is the process of making the periphery of the wheel run concentric to the axis of rotation (spindle), thus the term "running true." Truing can also include altering the face of the wheel by putting a special form or contour into it.

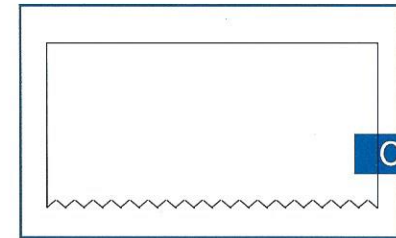
A wheel must also be dressed, which is the process of altering the cutting action of the wheel. Changing the speed of traverse across the wheelface also changes the cutting action of the wheel.

The hard diamond point in a dressing tool breaks the vitrified bond posts and fractures the grains in the wheel. The diamond removes dull abrasive grains entirely and thus produces a wheel with new, sharp abrasive particles to remove material at the desired rate.

Additionally, dressing removes tiny pieces of material from the pores of the wheelface. This "loading" action of the wheel makes it act dull, slows down the grinding process, and can result in burn and chatter marks on the workpiece.

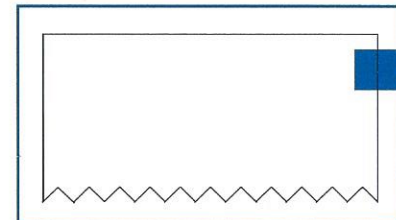
With conventional abrasive wheels, truing and dressing occurs simultaneously. In superabrasive wheel applications, truing is done with a tool or roll and dressing occurs with a vitrified dressing stick.

Why Should A Wheel Be Dressed?



SLOW TRAVERSE FOR:

- Light stock removal
- Finish grind operation
- Low RMS/Ra readings

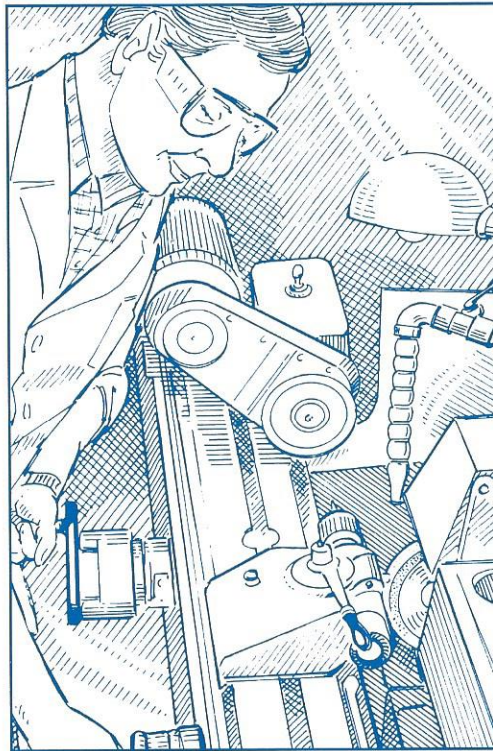


FAST TRAVERSE FOR:

- Heavy stock removal
- Medium/Rough grind operation
- High RMS/Ra readings

Take Light Cuts

Not over .001" for finishing. Roughing cuts may be slightly heavier.



In wheel dressing and truing, there is always the temptation to take too deep a cut in an effort to speed up the dressing operation. This is false economy from every viewpoint. Use the correct amount of infeed. Too heavy an infeed can damage the diamond tool and waste valuable grinding wheel abrasive. Dress the minimum

amount necessary to restore the wheel's geometry and cutting action.

Excessive infeed rates can also damage the bond post in the grinding wheel and dull the abrasive particles. The net result of both is a wheel that acts "closed" and cannot remove metal at the desired rate.

Suggested Infeed Amount Per Pass

Single Point and Cone Point Tools	.001" maximum
Chisel, HPB Blade Tools	.002" maximum
Multi-Point (Nib) and Cluster Tools	.005" maximum

NOTE: When truing and dressing ceramic (SG) wheels, normal infeed amounts should be reduced by half.

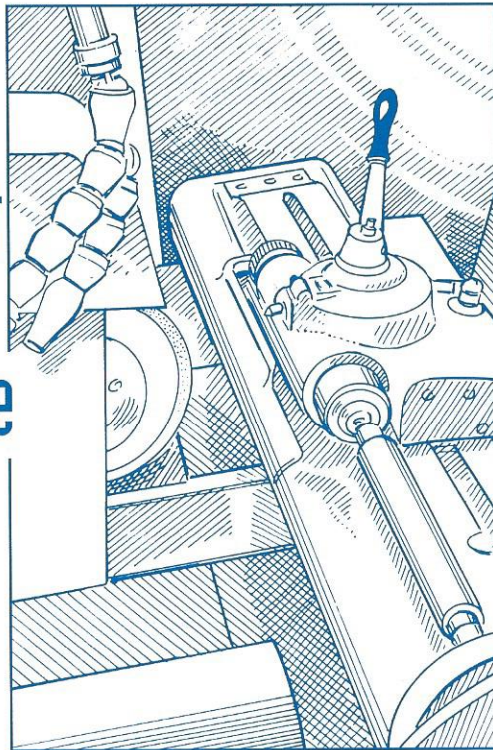
Be Sure Wheel Spindle Bearings Are Warmed Before Dressing



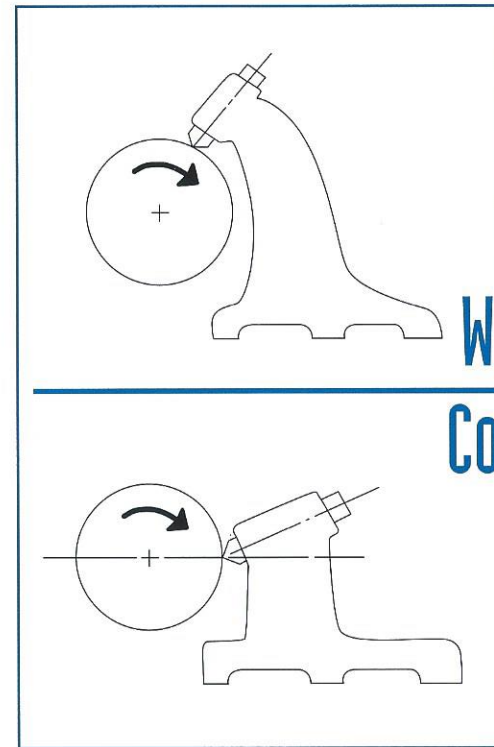
When the grinding wheel spindle bearings are cold, wheel position and balance may be considerably different than when the bearings are warm. Grinding and dressing before adequate "warm-up" can result in loss of part geometry and abnormal wear in the tool and the wheel. This makes it essential to wait until the bearings are warm, as under normal grinding conditions, before starting to dress.

Correct Position Is Important For A Straight Face

As nearly as possible, adjust the dressing tool so the diamond touches the "work-wheel" point of contact.



Most cylindrical grinders are arranged so that the work and the grinding wheel are on the same horizontal line. The point at which the circumference of the work touches the circumference of the wheel is called the "work/wheel contact." The diamond tool should dress the wheel as nearly as possible to this point. Why? Because the tableways will wear in the grinding position and the dressing is generally done with the table in a different position.



If the diamond is located here, with one end of the table on the worn portion and the other end on the unworn portion, the wheel face will be tapered.

Wrong Position Correct Position

But if the diamond is located at or near the horizontal center of the wheel, the wear in the ways will not cause trouble.

On internal grinders, the relation of the diamond to the "work/wheel contact" is of considerably greater importance than on external grinders. In these cases, a close study should be made of the literature furnished by the manufacturer.

TOOLS WITH WELL-DEFINED POINTS GET BETTER RESULTS

Turn diamond frequently to insure a sharp point.

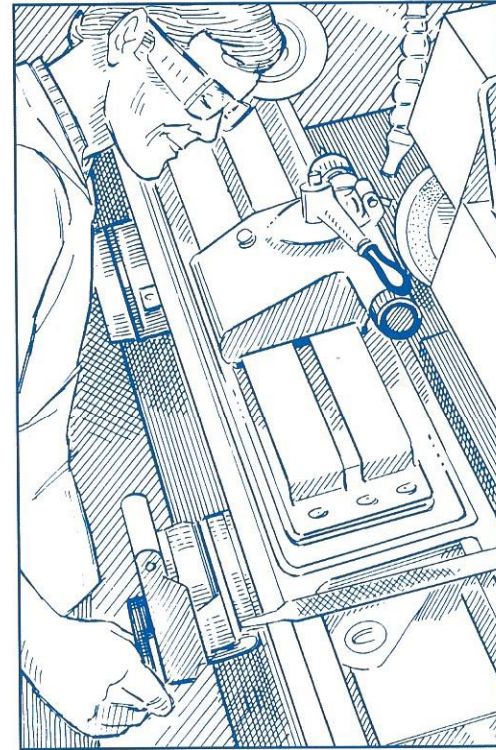


The diamond dresser is a cutting tool and, like all cutting tools, its usefulness is in direct proportion to the definition of its point. Dull diamonds force worn abrasive particles into the wheel pores, glaze the wheel face producing a dull wheel. To insure a well-defined cutting point at all times, longer wheel life, and greater wheel efficiency, turn the single point diamond 1/4 turn at regular intervals. The frequency depends upon use — some operations need diamonds turned at a certain amount of dress infeed rate, whereas some may be hourly. Single point diamonds should be rotated a minimum of once a day.

The U-Dex-It® and Mini-Dex™ single point tools are designed for easier turning. These patented tools are indexable with an open end wrench to keep the diamond free-cutting longer. These tools eliminate the need for loosening the set screw to turn the diamond tool.

U-Dex-It® 5/8" head

Mini-Dex™ 7/16" head



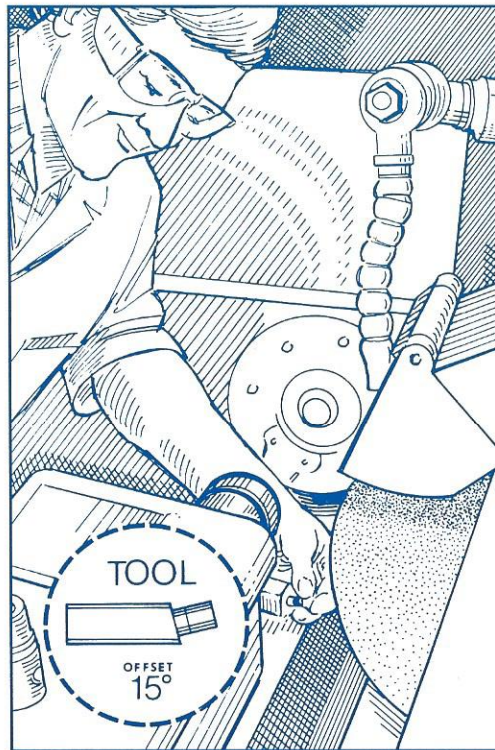
Handle Diamond Tools Carefully

Do not bump them against wheel.

Diamond dressers are precision tools and should be treated accordingly, both in the interests of diamond economy and grinding efficiency. Care should be taken not to bump the tool against the wheel as such shocks may result in flattening the diamond point or fracturing part of the diamond. Although diamond is extremely hard, it is also brittle and is easily damaged when subjected to a sudden shock or blow.

Correct Angle Is Important

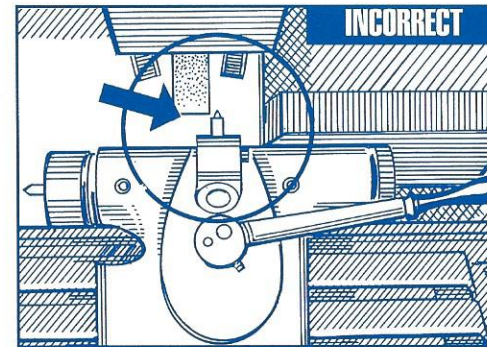
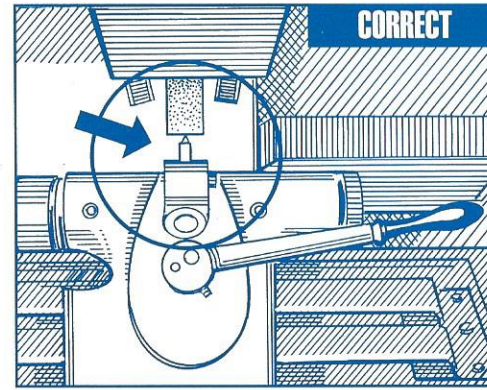
Be sure to use a "drag angle".



Single point tools should approach the grinding wheel at a 10° to 15° "drag" angle as shown above. This will create a "sharpening" effect for the tool.

Multi-Point (impregnated) tools, on the other hand, do not require "sharpening" as they are used. They should approach the wheel with "full face" contact (as shown above).

A shank with a corresponding offset will be required when utilizing a multi-point tool in a machine designed for a single point tool. This will insure "full face" contact.



Approach Face From The Center

An approach from the side may ruin the diamond.

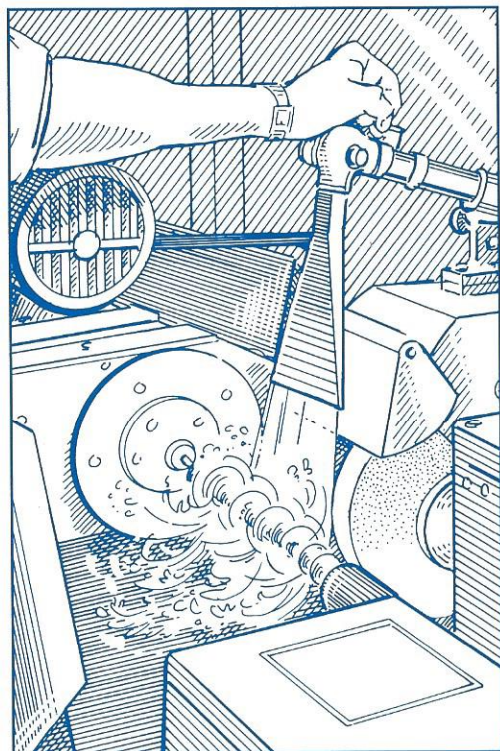
It is not uncommon on external grinding to find the wheelface worn .015" to .020" on the edges and a high spot in the center. It is best in these cases to contact the highest point before traversing, thus preventing excessive penetration and possible damage to the diamond.

For high finish grinding, however, do not make contact without traverse, as the diamond may leave a mark on the wheel which will take a lot of dressing to remove. In such cases, it is best to bring the

diamond almost in contact with the high spot - start the coolant, then the traverse, and feed in .001" to .002" at the end of each pass until contact is made. Then proceed in the usual way.

Use Plenty of Grinding Fluid

This is very **IMPORTANT!**



Wheels may be dressed either wet or dry, but the dressing operation should always be carried on under the same conditions as when grinding. *If grinding wet - dress wet.*

The coolant nozzle should be arranged to flood the entire wheelface or should follow the diamond across.

It is best to filter the coolant, as dirt or chips carried to the work not only affect the quality of finish, but also tend to load the wheel, thus necessitating frequent redressing.

When grinding dry - dress dry. But allow frequent intervals for the diamond to cool, otherwise burning or fracture will result.

When quitting work for the day, always run the wheel idle for a few minutes after the fluid has been shut off, so that all coolant is removed from the pores of the wheel. This will prevent the wheel from being out of balance the next workday.

The traverse rate you select is critical to obtaining the desired part finish and metal removal rate. A slow traverse rate tends to "close up" a wheel allowing better part finishes but lower metal removal rates. Too slow a traverse rate can close a wheel too much, causing parts to be burned.

A faster traverse rate creates a more "open" wheelface which allows better metal removal rates and less chance of burn. Fast traverse rates will generally contribute to rougher part finishes also.

Listed below are some suggested traverse rates.

Correct Speed Is Important

Use the optimum traverse rate for the application.

TOOL TYPE	TRAVERSE RATE
Single Point, Cone Point, Chisel, and Multi-Cut (Blade Type)	.002" (Fine Finish) to .010" (Coarse Finish) Per Wheel Revolution
Multi-Point (Impregnated) and Cluster Type	.006" (Fine Finish) to .030" (Coarse Finish) Per Wheel Revolution

How to Calculate

$$\text{Speed of Wheel (RPM)} \times \text{Choice for Traverse Wheel Revolution} = \text{Traverse Rate per minute}$$

Example #1

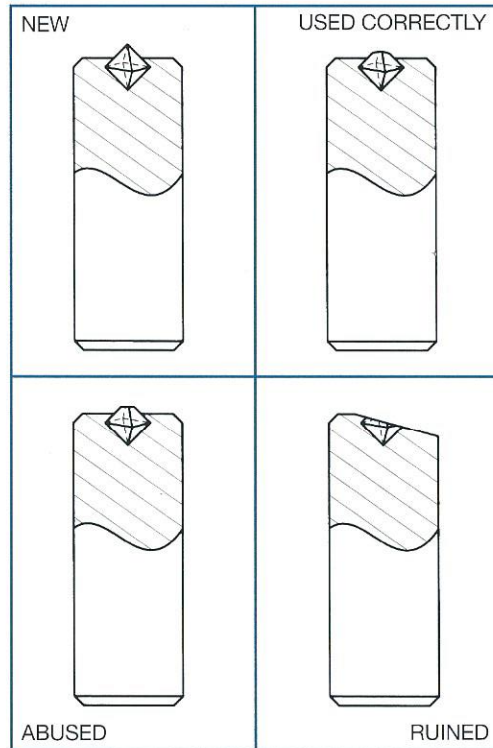
Wheel: 14 x 1-1/2 x 5" 5SG60-KVS
 Tool: SG5M7 (1/2 carat Single Point)
 Wheel Speed: 6500 SFPM = 1773 RPM
 Stock Removal/Finish: Medium/32RMS
 Selection: .007" per Wheel Revolution Traverse
 1773 x .007" = 12.4" per Minute Traverse

Example #2

Wheel: 3 x 1 x 1" 32A60-K5VBE
 Tool: NS2M6 (1/4 carat Single Point)
 Wheel Speed: 10,000 SFPM = 12,730 RPM
 Stock Removal/Finish: Light/10RMS
 Selection: .004" per Wheel Revolution Traverse
 12,730 x .004" = 50.9" per Minute Traverse

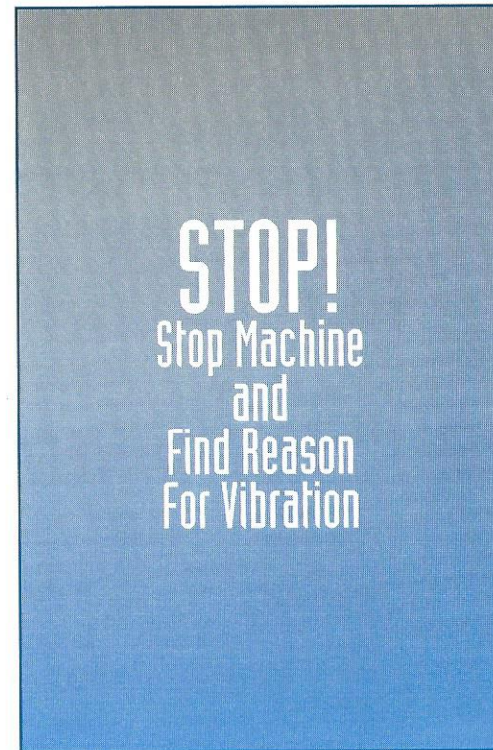
Get The Right Number Of Pieces

...That is, an economical number of pieces per dressing



Every time you dress a wheel it consumes production time and frequent dressing wastes grinding wheel abrasive. A well-defined diamond, properly set, will provide more dresses than a large flat diamond or substitutes, which glaze the wheel. What appear as variations in the characteristics of a wheel are often caused by inconsistent dressing.

Sometimes, however, it will shorten the dressing time and lengthen the wheel life to stop just a little short (approximately 10%) of the maximum number of pieces possible before dressing. Make this your standard and dress on a regular schedule, whether the wheel shows signs of dulling or not.



Look Out For Vibration!

Be sure the tool is tight in its holder and is rigidly supported with a minimum amount of overhang. If the diamond tool is not securely held, vibration will cause chatter, diamond marks, gouging, and often breakage.

But the diamond is not the only source of chatter. If the tool is properly mounted and you still get chatter - then check for:

1. Belt seams or idler pulley balance
2. Spindle bearing adjustment
3. Wheel head gibs
4. Motor balance
5. Wheel grade, grain, balance, etc.
6. Geared drive accuracy
7. Centers and steady rests
8. On internal grinders, use a shorter wheel quill or heavy metal quills
9. On centerless grinders, check truing device gibs, and location of work rest blade
10. Surrounding machinery shocks
11. Machine foundations

Do's & Don'ts For Using Norton Diamond Dressing Tools

DO's

1. Before inserting a new dresser, back off from the previous feed. Many diamonds are damaged when first being put in the holder.
2. Set diamond point at a 10° to 15° angle, pointing toward direction of wheel rotation.
3. Tighten tool solidly in holder without unnecessary tool overhang.
4. Flood tool with coolant at the point of contact at all times.
5. Start dress at the highest point of the wheel, usually the center.
6. Take light cuts.

Maximum Depth

Roughing .001" - .002"
Finishing .0005" - .001"

7. The slower the crossfeed, the finer the finish. Use the correct traverse (cross) feed:

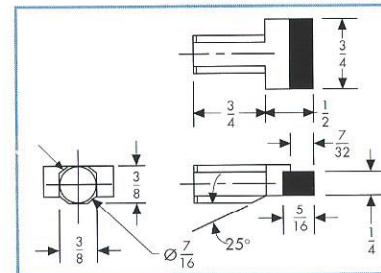
Roughing .005" - .010"
Traverse Per Wheel Revolution
Finishing .002" - .005"
Traverse Per Wheel Revolution

CAUTION: Too slow a crossfeed may glaze the wheel.

8. Dress wheel at regular intervals to prevent loading the surface.
9. Turn tool in holder 60° to 90° at regular intervals to maintain a sharp point.
10. When the stone wears dull and visibly flat, have it reset. If using a disposable tool, have it replaced.

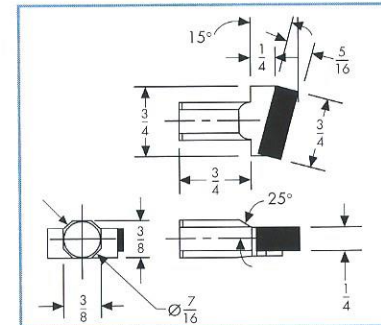
DON'Ts

1. Don't hit the wheel with the diamond when placing it in the holder.
2. Don't set the diamond point at 90° on center (always at 10° to 15° below it).
3. Don't quench a hot tool — it can crack the diamond. Allow diamonds adequate time to cool when dressing dry.
4. Don't assume a wheel is perfectly flat — look for its highest point.
5. Don't take more than .001" cut — you could generate a premature flat on the stone. Excessive infeed can also fracture the stone.
6. Don't over or underfeed.
7. Don't leave the tool in one position too long; you'll wear a flat which will glaze the wheel, overheat, and damage the stone.
8. Don't continue using a tool that has worn a visible flat; have it reset. If the tool is disposable, replace it.
9. Don't start your traverse on the side of the wheel. You can gouge the wheel with the tool which may grind away the supporting matrix and cause the stone to fall out. Start your traverse at the center of the wheel.



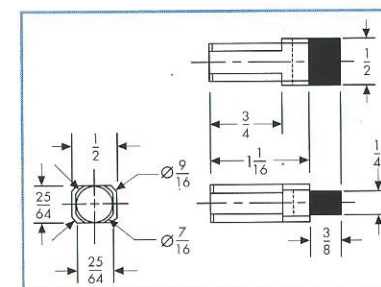
Shape 1A

Shank A



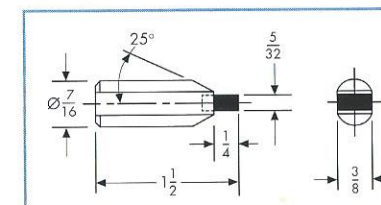
Shape 1A

Shank B



Shape 2A

Shank D



Shape 3A

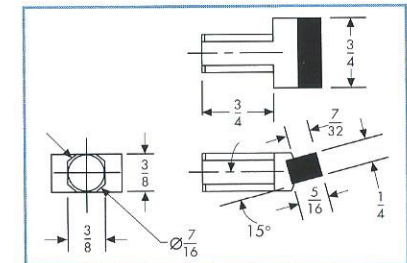
Shank F

Norton Diamond Dressing Tools

Available Shapes Multi-Point Diamond Tools*

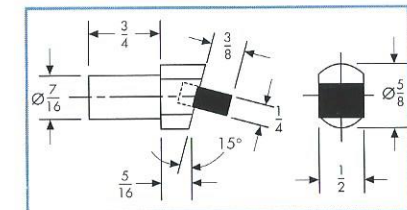
Also commonly referred to as

- "Grit" Tools
- "Nibs."



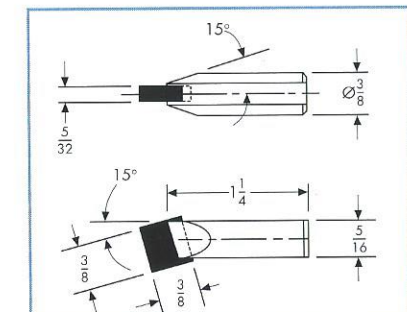
Shape 1A

Shank C



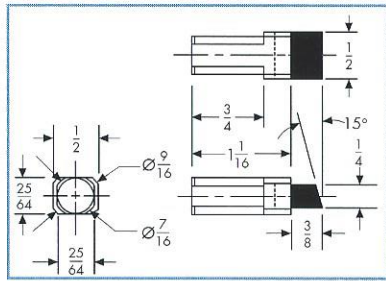
Shape 2A

Shank E



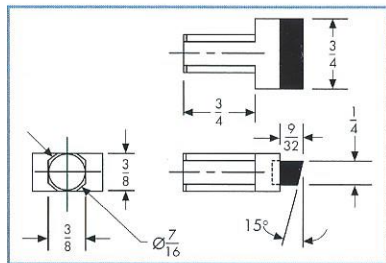
Shape 3A

Shank G



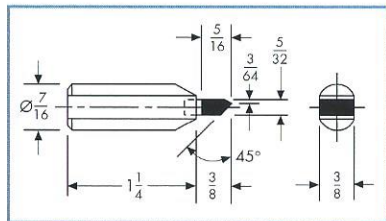
Shape 1B

Shank D



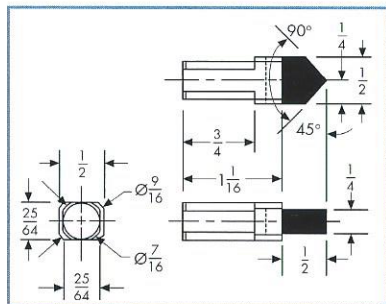
Shape 2B

Shank A



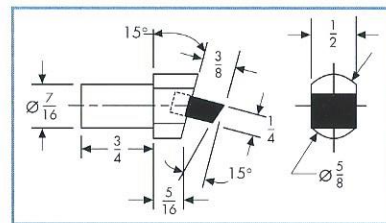
Shape 1E

Shank F



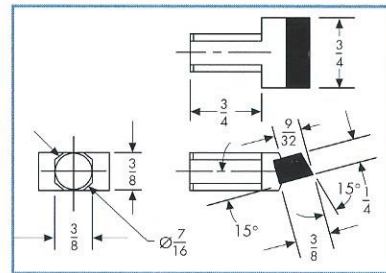
Shape 2E

Shank D



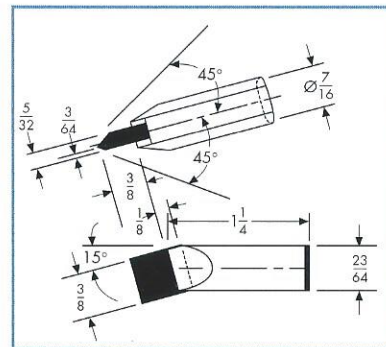
Shape 1B

Shank E



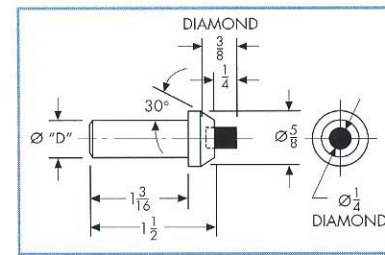
Shape 2B

Shank C



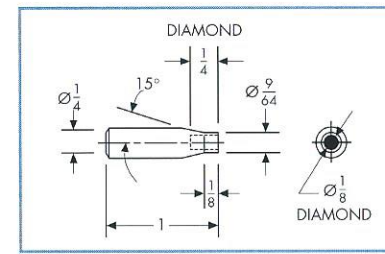
Shape 1E

Shank G



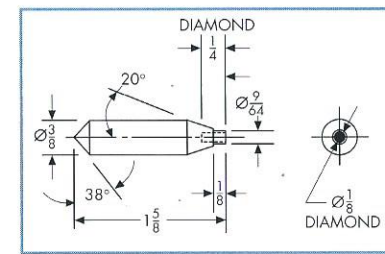
Shape 1R

Shank J



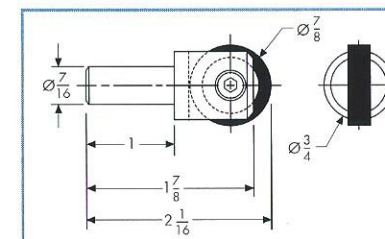
Shape 3R

Shank L



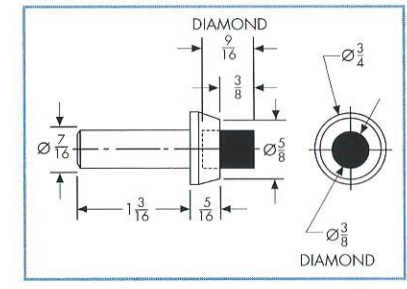
Shape 3R

Shank O



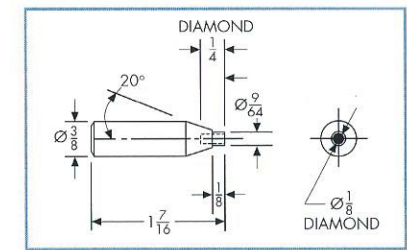
Shape 4R

Shank N



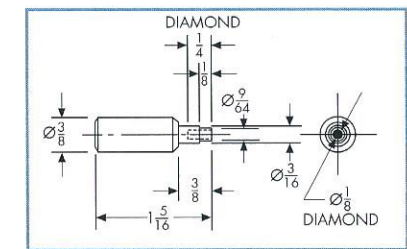
Shape 2R

Shank K



Shape 3R

Shank M



Shape 3R

Shank P

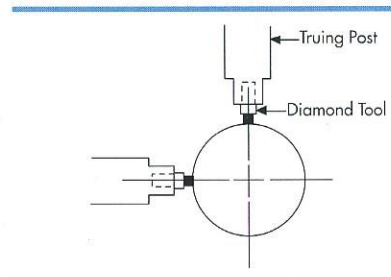
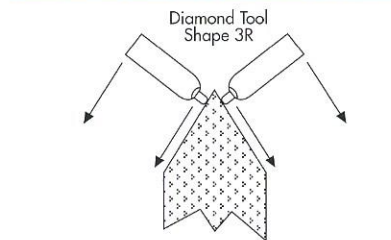
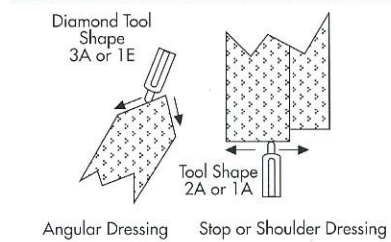
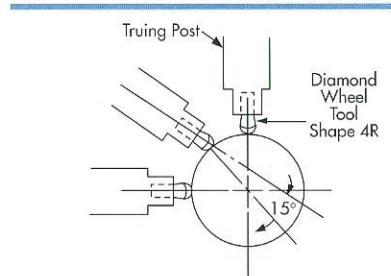
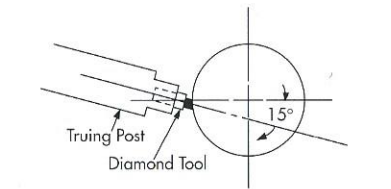
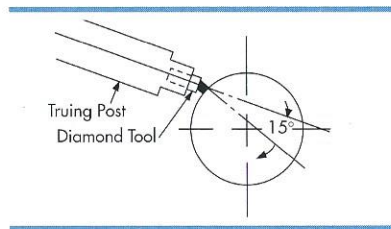
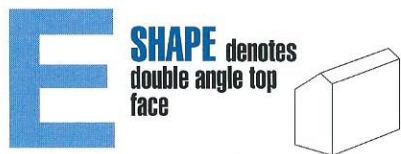
Mounting

Multi-point Tools

Mount so that the diamond tool face will be in complete contact with wheel when dressing. All Norton Diamond Multi-Point Tools have diamonds exposed for immediate use

Diamond Section Shapes

Diamonds are uniformly dispersed throughout the diamond containing section.



How To Use Norton Multi-Point Dressing Tools

1. To assure optimum performance, full face contact of the tool with the grinding wheel is absolutely essential. To achieve this, on initial installation, four to five passes at .005" infeed is recommended. This high infeed exposes the diamond particles in the matrix.
2. Apply coolant generously at the wheel/tool point of contact at all times during the dressing cycle. Coolant lines become clogged or misdirected; particularly on older machines, resulting in excessive wear or damage to the diamond.
3. To obtain normal rate of wear of both the wheel and the tool, no more than .002" infeed for rough grinding should be taken. For finish grind, .0005" per pass with no infeed on the last dressing pass for extremely fine finishes.
4. For finer finish requirements, dress at a traverse rate of .006" to .015" per wheel revolution.
5. For an open free-cutting wheel face, use a traverse rate of .016" to .030" per wheel revolution.
6. When dressing a badly worn or new wheel face, locate the high point by manual infeed then use mechanical infeed.
7. Make certain wheel bearings are warm before dressing.
8. Standard multi-point tools are available for both 0° and 15° tool posts. Use the proper tool for each type.