

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT
AND GENERAL SUPPORT MAINTENANCE MANUAL
INCLUDING REPAIR PARTS LIST
FOR

GRINDING KIT, VALVE SEAT, ELECTRIC, NO. 6335
NSN 4910-00-473-6437

(BLACK AND DECKER MFG. CO.)

TECHNICAL MANUAL }
No. 9-4910-590-14&P }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 31 October 1980

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT
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FOR**

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REPORTING OF ERRORS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA form 2028-2, located in the back of this manual direct to: Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299. A reply will be furnished direct to you.

NOTE

This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom this grinding kit is issued.

Manufactured by: The Black and Decker Mfg. Co.
Towson, MD 21204

Procured under Contract No. DAAA09-76-C-6480

This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

INSTRUCTIONS FOR REQUISITIONING PARTS

NOT IDENTIFIED BY NSN

When requisitioning parts not identified by National Stock Number, it is mandatory that the following information be furnished the supply officer.

- 1 - Manufacturer's Federal Supply Code Number - 07429
- 2 - Manufacturer's Part Number exactly as listed herein.
- 3 - Nomenclature exactly as listed herein, including dimensions, if necessary.
- 4 - Manufacturer's Model Number - Model Cat No. 6335
- 5 - Manufacturer's Serial Number (End Item)
- 6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.
- 7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows:

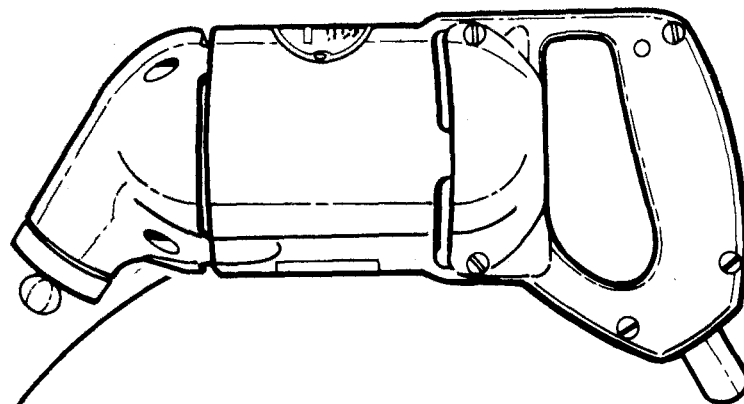
(a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number - 07429 followed by a colon, and manufacturer's Part Number for the repair part.

(b) Complete Remarks field as follows:

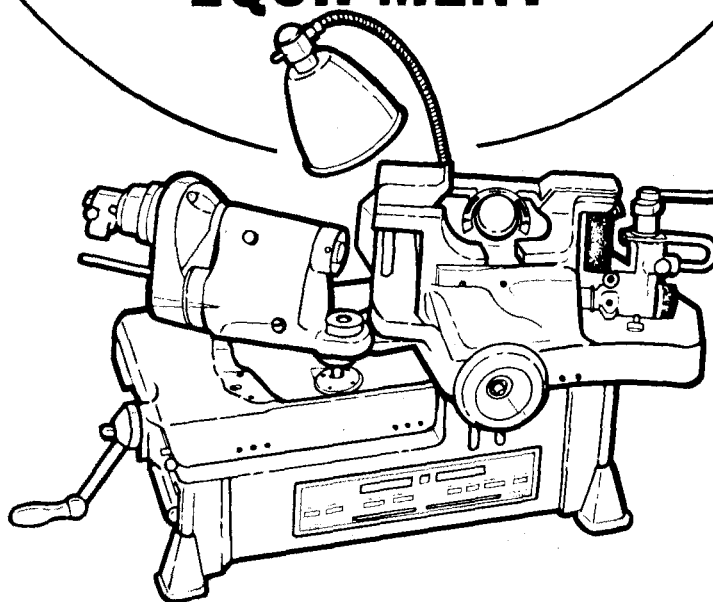
Noun: (nomenclature of repair part)
For: NSN: 4910-00-473-6437
Manufacturer: Black and Decker Mfg. Co.

Model: Cat No. 6335
Serial: (of end item)

Any other pertinent information such as Frame Number, Type, Dimensions, etc.



**USE and CARE HANDBOOK
for
VALVE RECONDITIONING
EQUIPMENT**



SAFETY RULES FOR POWER TOOLS

1. **KEEP WORK AREA CLEAN.** Cluttered areas and benches invite accidents.
2. **AVOID DANGEROUS ENVIRONMENT.** Don't expose power tools to rain. Don't use power tool in damp or wet locations. And keep work area well lit.
3. **KEEP CHILDREN AWAY.** All visitors should be kept safe distance from work area.
4. **STORE IDLE TOOLS.** When not in use, tools should be stored in dry, high or locked-up place.
5. **DON'T FORCE TOOL.** It will do the job better and safer at the rate for which it was designed.
6. **USE RIGHT TOOL.** Don't force small tool or attachment to do the job of a heavy duty tool.
7. **WEAR PROPER APPAREL.** No loose clothing or jewelry to get caught in moving parts. Rubber gloves and footwear are recommended when working outdoors.
8. **USE SAFETY GLASSES** with most tools. Also face or dust mask if cutting operation is dusty.
9. **DON'T ABUSE CORD.** Never carry tool by cord or yank it to disconnect from receptacle. Keep cord from heat, oil and sharp edges.
10. **SECURE WORK.** Use clamps or a vise to hold work. It's safer than using your hand and it frees both hands to operate tool.
11. **DON'T OVERREACH.** Keep proper footing and balance at all times.
12. **MAINTAIN TOOLS WITH CARE.** Keep tools sharp at all times, and clean for best and safest performance. Follow instructions for lubricating and changing accessories.
13. **DISCONNECT TOOLS.** When not in use, before servicing; when changing accessories such as blades, bits, cutters, etc.
14. **REMOVE ADJUSTING KEYS AND WRENCHES.** Form habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.
15. **AVOID ACCIDENTAL STARTING.** Don't carry plugged-in tool with finger on switch. Be sure switch is OFF when plugging in.
16. **OUTDOOR USE EXTENSION CORDS** - When tool is used outdoors, use only extension cords suitable for use outdoors and so marked.
17. **DO NOT OPERATE** portable electric tools in gaseous or explosive atmospheres. Motors in these tools normally spark, and the sparks might ignite fumes.

CAUTION

MOTOR

Be sure your power supply agrees with nameplate marking. **VOLTS 50/60 Hz** means **Alternating Current** (50 to 60 cycles) **ONLY**. **VOLTS DC-60 Hz** means it will also operate on **Direct Current**. Voltage variation of more than 10% will cause loss of power and overheating.

BRUSHES

Carbon Brushes should be regularly inspected for wear if your tool has exterior Brush Inspection Caps. **UNPLUG TOOL** first. When the cap is unscrewed, the spring and brush assembly may be withdrawn from the tool.

Keep brushes clean and sliding freely in their guides. Carbon brushes have varying symbols stamped into them, and if the brush is worn down to the line closest to the spring, they must be replaced.

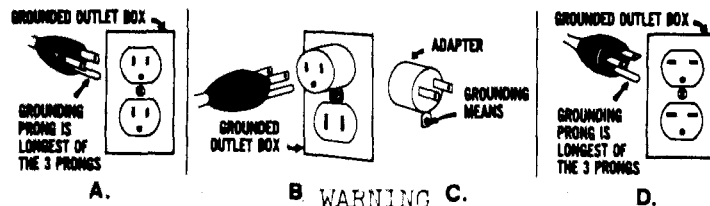
WARNING GROUNDING

This tool should be grounded while in use to protect the operator from electric shock. The tool is equipped with an approved three-conductor cord and three-prong grounding type plug to fit the proper grounding type receptacle. The green (or green and yellow) conductor in the cord is the grounding wire. Never connect the green (or green and yellow) wire to a live terminal. If your unit is for use on less than 150 volts, it has a plug like that shown in Figure A. If it is for use on 150 to 250 volts, it has a plug like that shown in Figure D. An adapter, Figures B and C, is available for connecting Figure A plugs to two-prong receptacles. The green-colored rigid ear, lug, etc., must be connected to a permanent ground such as a properly grounded outlet box. No adapter is available for a plug as shown in Figure D.

It's recommended that you NEVER disassemble the tool or try to do any rewiring in the electrical system.

Should you be determined to make a repair yourself, remember that the green colored wire is the grounding wire. Never connect this green wire to a live terminal. If you replace the plug on the power cord, be sure to connect the green wire only to the grounding (longest) prong on a 3-prong plug.

If you use an extension cord, be sure that it is a 3-conductor, grounding type cord. Grounding must be continuous from the tool plug to the grounded receptacle.



EXTENSION CORD

When using the tool at a considerable distance from power source, a 3-conductor, grounding-type extension cord of adequate size must be used for safety, and to prevent loss of power and overheating. Use the table below to determine minimum wire size required.

Use only three wire extension cords which have three-prong grounding-type plugs and three-pole receptacles which accept the tool's plug. Replace or repair damaged cords.

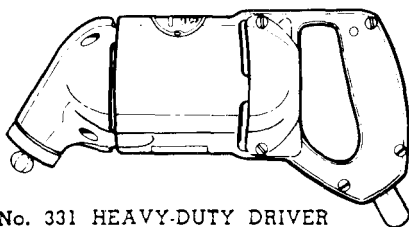
Ampere rating (on nameplate)	0 to 2.0	2.10 to 3.4	3.5 to 5.0	5.10 to 7.0	7.10 to 12.0	12.1 to 16.0
Ext. Cable length	Wire Size (A.W.G.)					
25 ft.	18	18	18	18	16	14
50 ft.	18	18	18	16	14	12
75 ft.	18	18	16	14	12	10
100 ft.	18	16	14	12	10	—
150 ft.	16	14	12	12	—	—
200 ft.	16	14	12	10	—	—

LUBRICATION

The tool is properly lubricated at the factory and is ready for use. Tools should be relubricated regularly (UNPLUG TOOL first) every sixty days to six months, depending on usage. (Tools used constantly on production or heavy-duty jobs and tools exposed to heat may require more frequent lubrication.) This lubrication should only be attempted by trained power tool repairmen.

VALVE SEAT GRINDING EQUIPMENT

WARNING: Accessories for your valve reconditioning equipment are described in this manual. Use of any other accessory might be hazardous.



No. 331 HEAVY-DUTY DRIVER

DRIVERS-

The spindle incorporates a positive vibrating action, which lifts the grinding stone from the seat once each revolution. This prevents loading the stone, speeds up grinding and reduces stone wear. All grinding is concentric, cutting the entire circumference of the seat and insuring correct alignment.

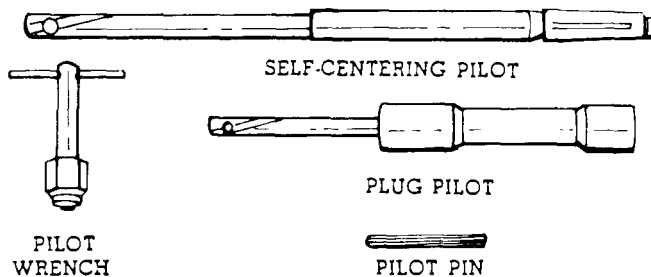
The heavy-duty driver maintains high grinding speed with a large, complete range of seat grinding stones.

All drivers have an instant-release trigger switch for safety. The switch, however, may be locked in the on position by depressing the switch locking button while the trigger switch is on and releasing the trigger before releasing the locking button.

PILOTS-

Self centering pilots provide an accurate, rigid axis for grinding with stones. Two machined tapers - at the top of the shank, to fit the top of the valve guide, and at the bottom, to expand a split sleeve in the lower end of the guide. The expanding feature compensates for worn guides and eliminates a large stock of oversize pilots, as self-centering pilots expand 0.020 to 0.030".

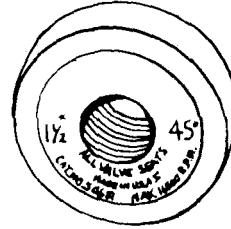
The groove locks the retainer ball in the ball-bearing stone sleeve, holding the inner sleeve stationary and preventing friction and wear between sleeve and pilot stem. These pilots also fit standard stone sleeves.



For Ford and Lincoln engines with removable valve guides, plug type automotive pilots are available. These pilots fit the valve guide opening and do not expand since there is little or no wear upon surfaces in these openings.

STONES-

Seat grinding stones are general purpose stones with 9/16"-16 thread steel inserts. Use the same stone for roughing and finishing cast iron, soft and alloy valve seats. (For rapid roughing of Stellite faced valve seats, use special 9/16"-16 thread insert stones). Diameter, angle, catalog number and bushing thread size appear on stone blotter.



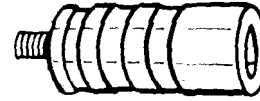
CAUTION: Never use stones rated under 12,000 RPM.

STONE SLEEVES- Any of the four automotive stone sleeves will fit any of the automotive seat grinding stones. All have 9/16"-16 threads.

The upper end of all stone sleeves contains a hexagon socket (except fig. B which can also be had with a spline socket to receive a splined driver) which forms a universal joint with hex-ball end of the driver spindle.

The standard and short standard stone sleeves have long bronze bushings accurately reamed to fit the upper shank of all pilots.

The ball-bearing stone sleeve minimizes wear and preserves accuracy for longer periods by incorporating ball-bearing races between inner and outer sleeves. The inner sleeve is held on the pilot by a retainer ball fitting in the pilot groove and does not revolve with the outer sleeve which carries the stone.



Ball-Bearing Stone Sleeve (hex socket)



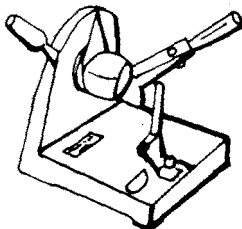
Standard Stone Sleeve



Short Standard Stone Sleeve

VALVE STONE DRESSING

STAND-Cat. No. 57646



The valve stone dressing stand accurately and safely cleans and trims all sizes and angles of stones up to 6" diameter. Equipped with an accurate diamond feed, a horizontal adjustment for various stone sizes, and an angle indicator marked from 0° to 90° in 1° steps with numbers at 15°, 30°, 45° and 90° for the most common angle settings. Stand is complete with a diamond nib and a stone sleeve mandrel. Rugged cast iron base for extra strength.

Cut-away view of Ball-Bearing Stone Sleeve, Stone and Self-Centering Pilot — in grinding position.



VALVE SEAT GRINDING OPERATIONS

WARNING: Always wear eye protection.

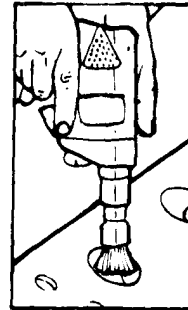
CARBON CLEANING- Use a $\frac{1}{4}$ " Drill for driving wire carbon cleaning brushes in removing carbon from the engine block and cylinder heads. The bright, burnished surface produced will retard carbon accumulation in the completed job. Kerosene will help to remove very hard carbon. Use proper brushes on aluminum heads to avoid scoring. After carbon cleaning thoroughly remove all loose carbon dust.

To sharpen carbon brushes, grind the wire ends square by holding the brush in an electric drill with the brush revolving against a running grinding wheel.

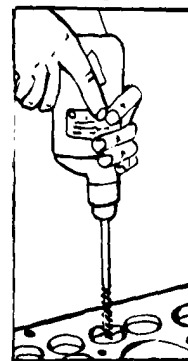
Valve guides require very careful cleaning. Carbon left in the guide will deflect the pilot, resulting in inaccurate work. With $\frac{1}{4}$ " drill, and correct size cleaner, use the following procedure. 1. Insert cleaner in guide before starting drill. 2. For better cleaning, move cleaner up and down in guide several times - be sure portion of bristles is kept within the valves guides. 3. Wipe bristles with clean cloth after cleaning each guide. 4. The bristles will not be adversely affected by oil or gasoline.



Carbon Cleaning Brushes

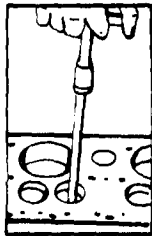


Removing Carbon



Cleaning Guide

INSERTING THE PILOT- After the proper size pilot for the valve guide has been selected, the tapered sleeve on this pilot should be run out on its thread as far as possible. Then insert this pilot until its upper taper stops on the top of the valve guide. Turn the pilot clockwise with a pilot pin or pilot wrench to draw the split sleeve against the pilot's lower taper, thus expanding the split sleeve and locking the pilot tightly in the guide. Do not overtighten - a firm fit is desirable. To remove the pilot, turn it once or twice counterclockwise and pull out.



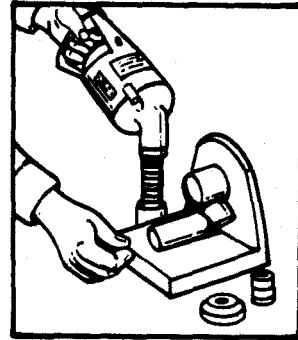
INSTALLING STONE and SLEEVE on PILOT-

Apply thin film of oil to the pilot - slide the stone sleeve down on the pilot shank until the stone rests on the valve seat.

Use two stone sleeves to facilitate seat grinding. One sleeve may carry a reconditioning valve seat grinding stone, another a 15° narrowing stone. This procedure eliminates the delay involved in changing stones on one sleeve for once the pilot is placed in a valve guide both the finishing and narrowing cuts are usually made to complete that particular valve seat before removing the pilot.

DRESSING THE STONE-

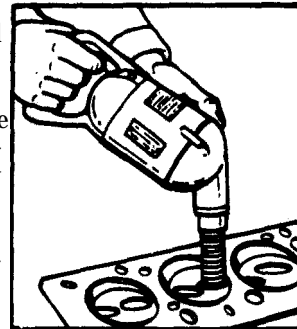
Select stone in correct size. Screw the stone tightly against collar of the sleeve. Adjust the arm of the dressing stand so the angle dressed on the stone corresponds to the angle ground on the valve face. Wipe dressing stand mandrel free of dust and grit, and put one or two drops of light oil in the stone sleeve bushing. Place the stone and sleeve over the mandrel and adjust the diamond to contact the stone by means of the knurled head on the outer end of the diamond nib. Lock diamond nib in place with handle while dressing stones. Use the driving unit to drive the stone and sleeve. Put just enough pressure on the driving unit to overcome its vibrating action. Too much pressure causes unnecessary friction. With the stone revolving, take a light cut by moving the diamond slowly across the stone by means of the feed lever. Turn the knurled head on the diamond slightly to take additional cut. Repeat until the diamond cuts the entire face of the stone, producing a true angle and a fresh cutting surface. Every new stone should be dressed for angle accuracy before being used, and should be redressed whenever it is remounted on a stone sleeve. To dress stone accurately for minimum stone run-out, stand must be clamped to a workbench.



GRINDING THE VALVE SEAT-

After the pilot has been inserted and the stone and sleeve is in place insert hex-ball spindle into the stone sleeve socket and grind for a few seconds (slightly longer for steel inserts). Stellite seats require several minutes of grinding depending on eccentricity and wear. While grinding support driver lightly to allow its vibrating mechanism to operate freely. The vibrating principle is important and pressure on the driver would overcome the action, causing the stone to load rapidly.

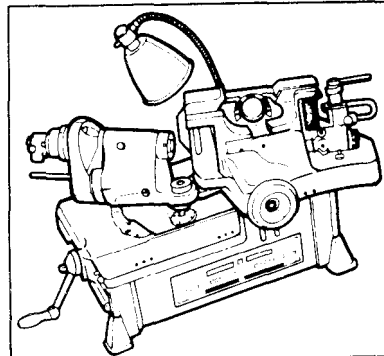
Narrow with a 15° stone any badly worn seat made too wide by the grindina (prevents the valve seat surface from becoming wider than the valve face).



The valve seat grinding stone gives an accurate, mirror-smooth face on every job. Lapping valves in their seats is unnecessary if precision equipment is correctly used and valve seat and valve face test true with prussian blue or a valve seat indicator.

VALVE REFACER

The valve refacer will produce accurate valve faces on valves up to 4" diam. Its two universal motors independently operate the work spindle and the grinding wheels. The grinding wheel spindle is double ended and extended so as to permit the use of the micrometer valve stem and rocker arm grinding attachment on the right hand end of the valve refacer without disturbing the refacing set-up. The 282, 550 and 626 machines are equipped with a 9/32"-9/16" diameter valve stem collet. A 9/16"-3/4" and 7/32"-7/16" diameter valve stem collet may also be ordered. For production grinding, an air chuck #37886 is available for extra equipment.



UNPACKING & ASSEMBLY- Carefully follow instructions packed with each refacer. It is important that you follow each step closely, since this unit is a precision grinding machine. The valve refacer should not be lifted or moved by holding onto the tables. Neither mount refacer on a workbench where another machine may be mounted **nor** place it where vibration is apparent, unless mounted on shockproof mountings.

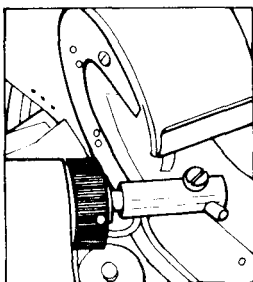
VALVE REFACING OPERATIONS

WARNING: Always wear eye protection.

TO CLEAN CARBON from VALVES- Mount a wire wheel brush on a bench grinder, and hold each valve firmly against this spinning brush. Clean all surfaces of valve head face and stem and be sure that the carbon is completely removed and not merely burnished. Polish valve stems with steel wool or, crocus-cloth to remove any scratch marks left by the wire brush. Any carbon remaining on the stem will affect accurate alignment in the valve refacer collet.

NOTE: Place valves in a numbered rack, or otherwise mark them, to keep them in proper order. Be sure to return each valve to its own guide.

DRESSING the REFACING WHEEL- Included with every valve refacer as standard equipment is a wheel dressing attachment with a diamond nib.



Place diamond dresser in collet and stabilizer in hole at front of housing under spindle. Lock dresser in place with air chuck or hand wheel. Set workhead at 45°.

Move the work table to where the diamond point is opposite the center of the face of the grinding wheel. Switch on the wheel head motor, turn on the coolant, and move the center of the wheel face slowly and carefully into the diamond. Take light cuts - traverse the diamond slowly across the full face of the grinding wheel. Any forward motion of the grinding wheel for a new cut should be made with the diamond opposite the center of the wheel face. This will prevent grinding the diamond out of its steel nib as would happen if the nib were moved against the edge of a wheel that had been advanced too far.

Light cuts keep the diamond cool for longer wear and better cutting, and give a smoother and more accurately dressed wheel. As diamond wears turn the nib in holder 90° for uniform wear to obtain maximum service. Do not wear a diamond down to its steel nib. One wheel dressing is usually sufficient for a set of valves.

To test for clean, accurate dress, hold thumb lightly across running wheel. If dressed properly, the wheel will feel extremely smooth across its full face.

LOCATING the WORKHEAD-

The workhead must be located at the exact angle corresponding to the angle of the valve seat. Loosen the swivel stud with the pin wrench and move the workhead to the desired angle as indicated on its curved side.

CHUCKING the VALVE-

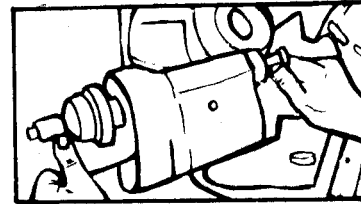
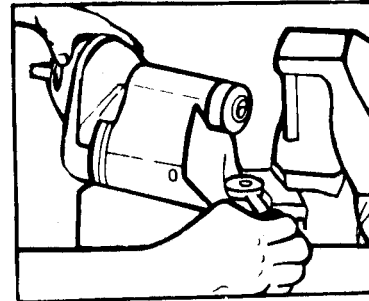
If the air chuck is used, insert the valve in the collet, so the stem is gripped on the same position that travels in the guide. Push the knob on the rotating joint to operate the air chuck.

With the standard chuck - insert valve as described above - the collet opens and closes within its range by means of the hand-wheel in the end of the spindle.

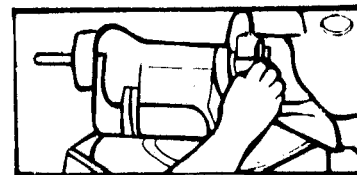
Hold knurled collar on front end of workhead to tighten valve with the hand wheel.

Be sure that the proper size collet is used. For valve stem diameters from $9/32"$ to $9/16"$ the No. 18325 collet may be used. Stem diameters in the $9/16"$ to $3/4"$ range are handled by the No. 22211 collet. For very short stem valves with $7/32"$ to $29/64"$ diameter stems use collet adapter No. 36552.

To prevent accidentally grinding the valve stem, set the work table stop to limit the travel of the work table toward the grinding wheel. This setting is made by rotating the knurled wheel under the left end of the work table in line with the feed handle.



Chucking Valve with Air Chuck



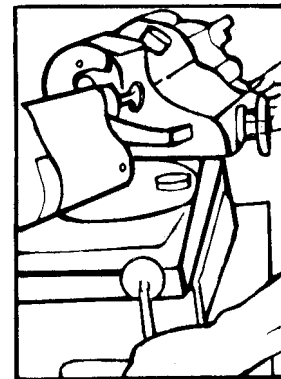
Chucking Valve with Standard Chuck

VALVE REFACTOR GRINDING OIL-

The reservoir uses 1 gallon of grinding oil. This coolant should be kept clean and checked periodically for amount of oil in reservoir. Reservoir should be kept as full as possible. The times of checking should be according to usage. When removing the reservoir on type TD, always shut off refacer. Never run refacer without oil in reservoir as this will damage the seal. The TD refacer should be primed on its initial start or if it has been stored for a period of time. The following procedure should be followed for priming. (1) Fill reservoir to center of outlet fitting. Place in machine flush with base. (2) Turn coolant valve to right side On position. (3) Turn right side feed tube outlet up. (4) Pour in 1 oz. of oil. (5) Turn feed tube down. (6) Start wheel motor.

GRINDING the VALVE FACE-

Switch on the workhead and wheelhead motors and bring valve to center of grinding wheel. Feed the wheel slowly into the valve, taking a very light cut. Move work table back and forth with short strokes using full face of wheel but always keeping valve on wheel. To make inspection or when finished grinding, back wheelhead away from valve, not valve off wheel. This grinding method adheres to accepted shop practice with precision industrial grinders for large production, and applies equally well to valve refacing for maintenance. Use rack to keep valves in same order as removed from block and be sure to return each valve to its own guide. Always lubricate valve stem with light oil before returning to guide. Oil is available for dressing the grinding wheel and grinding the valve face by turning the coolant control indicator toward that wheel. The speed of the coolant is regulated by the angular movement of the control. Coolant is available for the attachment end by turning the control indicator in that direction.



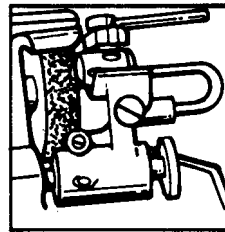
GRINDING with REFACER ATTACHMENTS

As the preliminary step, a micrometer feed bar supplied with the attachment must be assembled to the valve refacer at the right side of the wheelhead (after having first removed the plug in the wheelhead by striking it sharply with a hammer directly on center - thus causing the plug to become loose in the hole). The micrometer feed bar is then inserted into the socket of the wheelhead casting, turning the flat face of the spindle until it is facing the set screw for the spindle socket. The spindle is then slid into its socket until it bottoms; and then fastened in place with the set screw. Be sure that the spindle collar fits snugly against the bottom of the counterbore in the wheelhead housing.

DRESSING the ATTACHMENT WHEEL-

Clamp the diamond in the V-way by means of the quick-clamp.

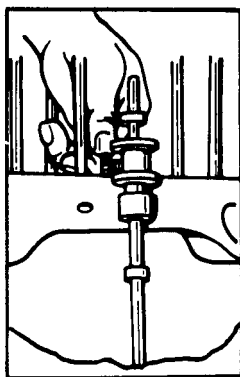
The flat, recessed side of the wheel is dressed by feeding the diamond forward to contact this face through means of the nut; and, with wheel running, moving the bracket back and forth (fast swing for rough, slow swing for smooth surfaces). The dressing cuts should be about .002" deep and are controlled by calibrations in thousands of an inch on the nut. The wheel should be dressed until the entire face has been trued.



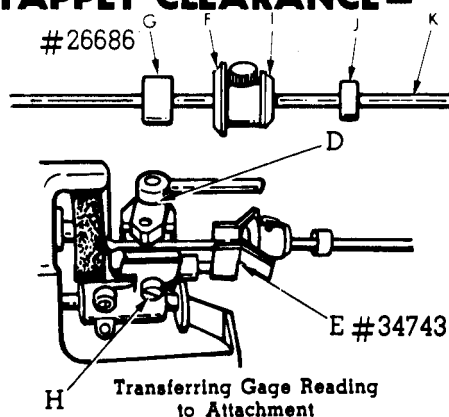
MICROMETER VALVE STEM GRINDING-

Avoids hit or miss grinding - to give this operation the same precision used in the valve reconditioning work itself, and to save valuable time - use the Valve Stem Grinding Attachment, which accurately measures (in thousandths) the amount to be ground from each valve stem, and then just as accurately measures (in thousandths) the grinding operation itself.

MEASURING TAPPET CLEARANCE-



Depth Gage in Block



Transferring Gage Reading to Attachment

Square tappets before measuring for tappet clearance with Depth Gage. The universal depth gage is equipped with correct size valve-head patterns and bushings for Ford removable guide engines. Valve-head (F) is for Ford A and V8-85; bushing (G) is for Ford V8-85 valve - guide housing;

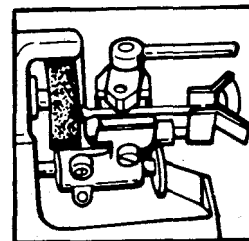
ing; valve head (I) is for Ford V8-60 valve seat; and bushing (J) is for V8-60 valve-guide housing. The valve-guide bushings are, of course, removed from

MEASURING TAPPET CLEARANCE- (CONTINUED)

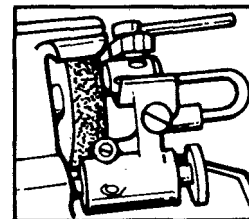
the block when depth gage is used. Turn engine until the tappet being gaged is at lowest point. With proper bushing and beveled head fitted snugly in place, loosen knurled nut and slide stem (K) down to contact tappet. Clamp tightly in this position with knurled nut. Remove the depth gage from engine and place in V-way of attachment, with stem close to flat grinding face of wheel. Clamp stem securely in place with quick-clamp (D). Adjust V-stop (E) to contact beveled head and lock V-stop with knurled screw (H). Adjust micrometer feed nut until stem just touches grinding face of wheel. Move calibrated dial to 0 setting and the dial will move independently of the knurled nut at the end of the micrometer spindle. It is now possible to grind definite clearances on the valve stem by turning the knurled nut. The dial will move with the knurled nut and each calibration is 0.001". Do not grind end of depth gage

GRINDING the VALVE STEM-

Swing the V-block arm toward you, free of the wheel, and remove the depth gage by loosening quick-clamp (D). Do not change setting of V-stop(E). Insert valve stem in V-way, with valve head firmly seated in V-stop, and clamp in position with quick-clamp. Turn back the micrometer feed nut until valve stem just clears grinding wheel. Start the wheel motor. Advance the micrometer feed not more than .004" and rock the V-Block arm slowly toward and across the flat grinding face. Continue to rock back and forth until the wheel stops grinding; swing the attachment toward you free of the wheel, advance the feed another 0.004 and again rock the attachment back and forth until the wheel stops grinding. Repeat this operation, advancing the feed slowly until you reach the reading noted above as the grinding limit. This will give you the correct tapped clearance, and the valve stem end will be polished and squared.



Grinding Valve Stem



Grinding Tappet

It is important to dress the flat face of the grinding wheel frequently with the diamond point, to insure fast, clean grinding and a square valve stem-end. If the wheel is removed from spindle, it should be dressed again when replaced, to insure proper alignment.

As a final finishing touch to any job all valve stem ends should be squared and polished - even on engines with adjustable tappets. This is easily and quickly done on the micrometer attachment, using the V-way to position the valve stem, but not using either the V-stop or the micrometer feed. A very light grind is usually sufficient to square the stem.

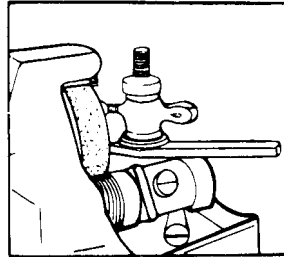
SQUARING and TRUING TAPPETS-

Clamp tappets in the V-way of the attachment. Feed tappet up to contact the flat side of wheel. Swing attachment toward you, free of wheel and start wheel motor. Advance micrometer feed only .002" or 0.003" and swing, back and forth across flat face of wheel until the tappet end is square and polished. By using stop provided, tappets can be ground to the same length if desired.

GRINDING with REFACER ATTACHMENTS

ROCKER ARM GRINDING-

The rocker arm is held firmly between two removable cones. The upper cone may be assembled very rapidly by aligning the inscribed line with the flat on the stem of the lower cone. Push upper cone down until it contacts rocker arm bushing, then turn clockwise until rocker arm is clamped firmly between the cones. The cone and rocker arm assembly drops over the spindle which slides on the swivel arm. For wheel dressing, see page 8. For grinding, lock the attachment bracket in a convenient position by means of the knurled head aluminum screw.



Locate the cone spindle in position where the full radius of the rocker arm face is ground by swinging the swivel arm. Lock the cone spindle in place with the knurled nut that forms its base. With one hand swinging the swivel arm, the other hand keeps the rocker arm in contact with the wheel. Grind lightly and remove only enough material to restore new face over entire radius.

LUBRICATING the REFACER-

Valve refacer requires a few drops of high grade light oil in the oil cups, which are located in the work table, wheel housing workhead and under the belt guard. Add oil after every 50 hours of use, or oftener, depending on usage. In the TYPE T WORKHEAD, oil cups should be filled with SAE 10 oil after every 30 hours of usage.

REPLACING V-BELT on WHEEL SPINDLE-

The attachment wheel is removed exposing the spindle sheave, this sheave is split and clamped together by three screws. Remove these three screws and remove one-half of sheave. The belt then may be removed through the large opening. The new belt can then be slipped into position and the half of sheave and attachment wheel replaced.

V-BELT ADJUSTMENT for TYPE T WORKHEAD

Remove belt guard by removing three screws #366-10-32x1" lg. Loosen two set screws #36885 in the large pulley. Adjust the outer pulley flange by the three self-locking screws to obtain proper belt tension. Replace the belt guard.

ACCESSORIES

Accessories for valve reconditioning equipment are described in this manual.
WARNING: The use of any other accessory might be hazardous.

Special POINTERS on VALVE RECONDITIONING

Valve Head Margin

Scrap and replace any valve that cannot be entirely refaced with definite margin maintained. The amount of grinding necessary to true valve face is an indication of the head warpage from axis or centerline of its stem. With excessive warpage, a knife edge will be ground on part or all of valve head due to the considerable amount of metal that must be removed to completely reface. Heavy valve heads are required for strength and to dissipate heat. Knife edges lead to breakage and burning, and to pre-ignition due to heat localizing on edge.

Width of Seat

The tendency is usually to grind seats too wide when reconditioning. The seat width in many engines should be less than $\frac{1}{8}$ ". Always have seat narrower than valve face. Follow engine manufacturer's recommendations in this as in all other technical matters. If necessary to narrow seat, use 15° stone. Seats too wide tend to collect carbon. Seats too narrow prevent valve head from rapidly dissipating its heat to block. If new insert seat is installed, regrind to make concentric to guide.

Sticking Valves

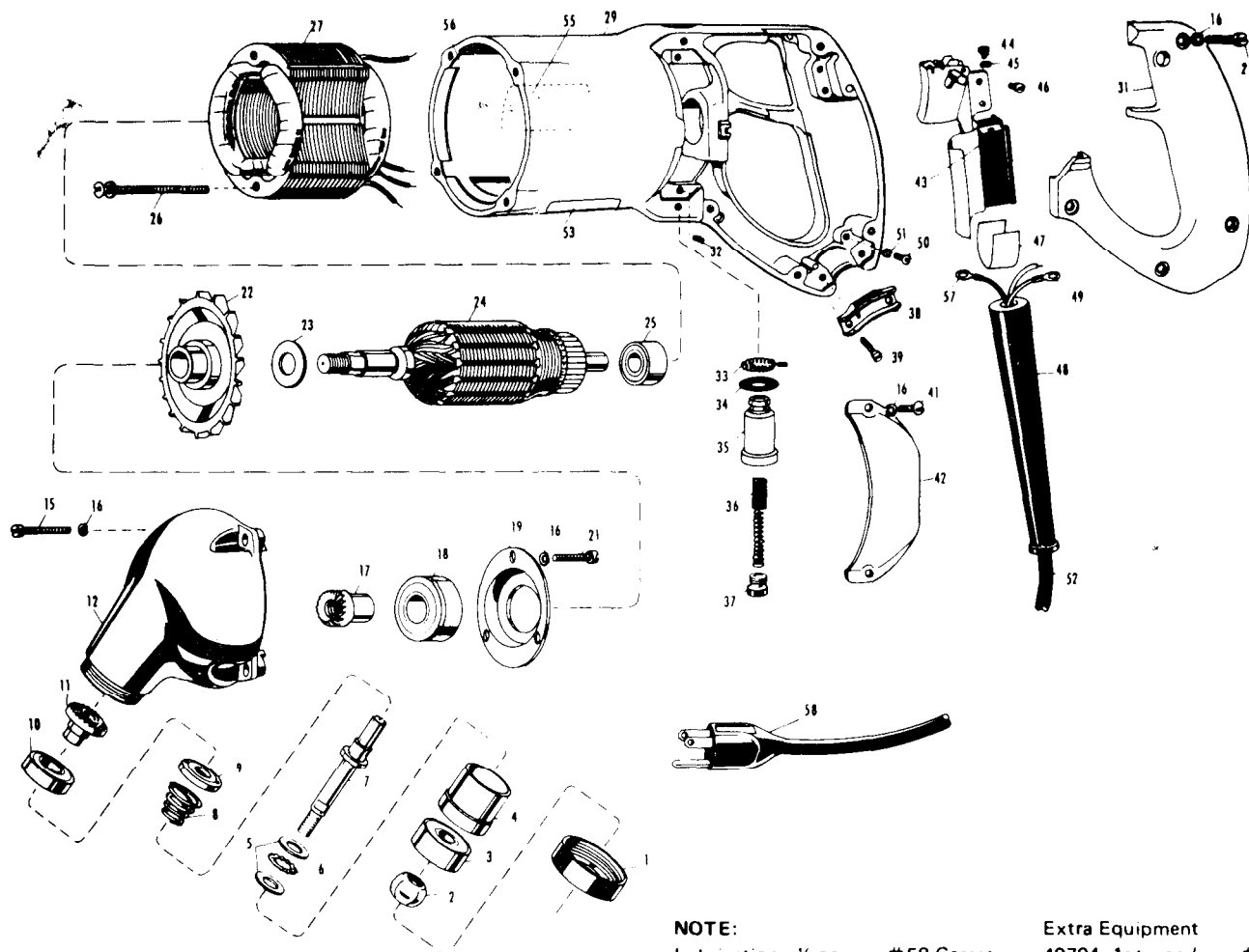
When conditions such as carbon, misalignment and excessive wear have been corrected, and valves persist in sticking, it is a satisfactory remedy with most engine designs to cut guide off flush with block. Use drill bit slightly larger than outside diameter of guide with point ground to 20° angle. Remove with small scraper any burr left on inner diameter of guide. Other methods are to counterbore guide or grind relief on valve stem.

Stems and Guides

Always check valve stems and guides for wear. Use go and no go gages, if available. Scrap and replace valves and guides worn excessively. Too much clearance in the intake guide admits air and oil into combustion chamber, upsetting carburetion, increasing oil consumption, and making heavy carbon deposits. Sloppy exhaust guide clearance causes misalignment and bad seating, resulting in fast valve and seat wear. When clearance with stem exceeds original clearance by 0.002", generally speaking, replace either valve or guide or both, as may be necessary. Always regrind seat to make concentric to newly installed guide.

Valve Springs

Test valve springs for uniform strength. Use regular valve spring tester for accurate check - or place springs on end upon level surface (see that spring ends are flat) and use any straight edge to determine irregularity in height. Unequal or cocked valve springs will undo in the assembled job all the precision that has been put into it. Spring tension too weak allows valves to flutter. Spring tension too heavy causes stretched valves. Either condition aggravates wear on valve and seat with possible valve breakage.



NOTE:

Lubrication - ¼ oz

58 Grease

Extra Equipment

49794 1pt. can (# 58)

Index No.	Part No.	Description	Qty.	Index No.	Part No.	Description	Qty.	Index No.	Part No.	Description	Qty.
1	24439	Bearing Cap	1	27	72340-71	Field, 115V (Cat. No. 6320)	1	51	418	# 8 Lockwasher	1
2	23856	Spindle Ball	1		72340-75	Field, 220V (Cat. No. 6320-01)	1	52	36480-98	Cord & Plug, 115V (18-3SJ, 10ft.) (Cat. No. 6320)	1
3	23866	Ball Bearing	1						37142-98	Cord & Plug, 220V (18-3SJ, 10 ft.) (Cat. No. 6320-01)	1
4	23848	Spacer	1	29	23479-04	Field & Switch Case (Includes 16, 21, 31)	1	53	68825	Instruction Plate	1
5	23471	Ball Thrust Washer	2	31	23462-01	Switch Handle Cover	1	55	72415-02	Nameplate	1
6		Thrust Ball Retainer	1	32	58058	# 10-32 x 5/16 Set Screw	2	56	3041	# 2 x 3/16 Drive Screw	2
7	72057	Spindle	1	33	3353	Brush Lead Terminal	2	57	33315	Terminal	4
8	23470	Spindle Spring	1	34	87212	Insulating Washer	2	58	99586-01	Attachment Plug, 115V (Cat. No. 6320)	1
9	23852	Lock Nut	1	35	7642	Brush Holder	2		99586-04	Attachment Plug, 220V (Cat. No. 6320-01)	1
10	19824	Ball Bearing	1	36	19890	Brush Assembly	2	PARTS NOT SHOWN 61532 Connection Diagram			
11	93754	Gear & Pinion Set (Incl. 11 & 17)	1	37	7441	Brush Holder Plug	2				
12	86915	Gear Case	1	38	3618	Cord Clamp	1	55° HD VIBRO-CENTRIC DRIVER			
15	366	# 10-32 x 1 Fill H.M. Screw	4	39	1789	# 8 32 x ½ Fill. H.M. Screw	2				
16	417	# 10 Lockwasher	15	41	375	# 10-32 x ¾ R.H.M. Screw	4	Cat. No.	Volts	Type	Amps.
17	74854-01	Armature Pinion	1	42	21235	Brush Cover	2				
18	50706	Ball Bearing	1	43	14818	Switch	1	6320	120	2	7.0
19	16280	Bearing Plate	1	44	20405	# 5-40 x ¼ Terminal Screw	4	6320-01	220	2	3.6
21	367	# 10-32 x ¾ Fill H.M. Screw	7	45	1991	# 6 Lockwasher	4	R.P.M. 12000			
22	72393	Fan	1	46	1988	# 8-32 x ¼ R. H.M.S. & Washer	2				
23	50578	Washer	1	47	66076	Switch Insulator	1				
24	72339-31	Armature, 115V (Cat. No. 6320)	1	48	22328	Cord Protector	1				
	72339-35	Armature, 220V (Cat. No. 6320-01)	1	49	34289	Lead Terminal	1				
25	14328	Ball Bearing	1	50	7895	# 8-32 x ¼ R.H.M. Screw	1				
26	6125	# 10-32 x 2¼ R. H.M.S. & Washer	2								

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Major General, United States Army
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Callouts for plug pilot and
pilot pin are switched.

There is no part number
for #8 lockwasher, index
No. 51.

SAMPLE

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366/XXXX

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Thomas A. Gary

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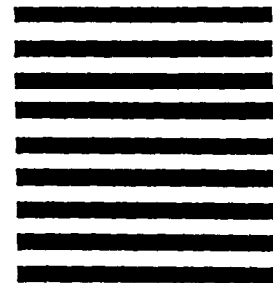
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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 deciliter = 10 centiliters = 3.38 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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