



<b>220</b>	<b>G</b>	<b>X</b>	<b>-</b>	<b>600</b>	<b>C</b>	<b>XX</b>	<b>-</b>	<b>X</b>
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Tool Series  
**220**

Tool Style  
**G** = Grinder

Throttle Terminations  
 -- = Push-Pull  
 L = Lever

Speed Options (RPM)  
**600** = 60,000

Wheel Type  
**C** = Collet

Termination Code  
**1** = 3/32" Collet  
**2** = 1/8" Collet  
**3M** = 3mm Collet

Kit  
**K** = Kit

# Safety Recommendations

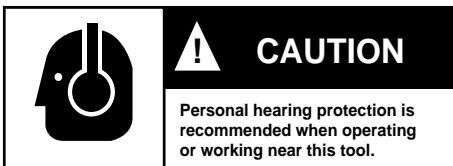
For your safety and the safety of others, read and understand the safety recommendations before operating any grinder.

## Always wear protective equipment and clothing.



**Caution:** Faceshields do not provide unlimited protection against flying particles and are not to be

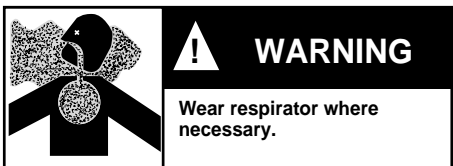
considered as sufficient eye protection. ANSI Z87.1 states that additional separate eyewear shall be used. For additional information on eye protection, refer to Federal OSHA Regulations, 29 CFR, Section 1910.133, Eye and Face Protection, and ANSI Z87.1, Occupational and Educational Eye and Face Protection. This standard is available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.



Hearing protection is recommended in high noise areas (above 85 dBA). Close proximity of

additional tools, reflective surfaces, process noises, and resonant structures can substantially contribute to the sound level experienced by the operator. Proper hearing conservation measures, including annual audiograms and training in the use and fit of hearing protection devices may be necessary. For additional information on hearing protection, refer to Federal OSHA Regulations, 29 CFR, Section 1910.95, Occupational Noise Exposure, and American National Standards Institute, ANSI S12.6, Hearing Protectors.

- **Gloves and other protective clothing should be worn as required, unless they create a greater hazard.**
- **Do not wear loose fitting clothing, or clothing that may restrict movement, become entangled or in any way interfere with the safe operation of the grinder.**



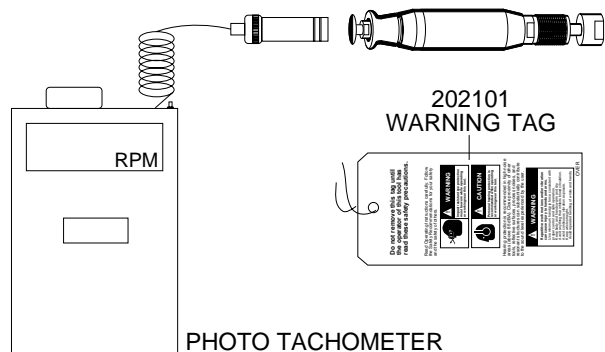
Grinding or other use of this tool may produce hazardous fumes and/or dust. To avoid adverse

health effects, utilize adequate ventilation and/or a respirator. Respirators should be selected, fitted, used and maintained in accordance with Occupational Safety and Health Administration and other applicable regulations. Read the material safety data sheet on any materials involved in the grinding process.

Cleco grinders are designed to operate on 90 psig (6.2 bar) max. air pressure. If the tool is properly sized and applied, higher air pressure is unnecessary. Excessive air pressure increases the loads and stresses on the tool parts and may result in breakage. Installation of a filter-regulator-lubricator in the air supply line is highly recommended.

Before the tool is connected to air supply, check throttle for proper operation, i.e., throttle moves freely and returns to closed position. Being careful not to endanger adjacent personnel, clear air hose of accumulated dust and moisture. Use protective barriers where necessary — hot sparks can burn. Barriers also help reduce noise levels. Before removing tool from service or changing accessories, make sure air line is shut off and drained of air. This will prevent tool from operating if throttle is accidentally engaged. Do not use tool to drain residual air from air line, instead use of a self-relieving valve located near tool is highly recommended.

**The speed rating and warning information on the tool should be maintained or replaced for legibility in the event of damage.** Before installing any accessory (mounted wheels, carbide burrs, etc.), after all tool repairs, and whenever a grinder is issued for use, check the free speed of the tool with a tachometer to make sure actual free speed at 90 psig does not exceed rated free speed stamped on tool. Grinders in use on the job must be checked at least once every 20 hours of operation, or once a week, whichever is most frequent.



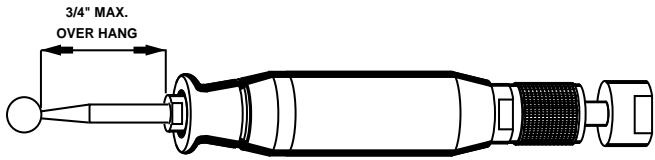
## INSPECT THE MOUNTED WHEEL OR CARBIDE BURR

**WARNING** Fragments from a mounted wheel or carbide burr that breaks or comes apart while rotating can cause serious injury or even death. Inspect mounted wheel or accessory. Check the maximum safe RPM marked on the accessory or package. Never use an accessory rated at or below actual tool speed. **Cracked, dropped, faulty, or bent accessories are dangerous.** Suspect accessories should not be used and should be disposed of. Look for cracks, chips, water stains, or signs of abuse or improper storage. Causes of accessory failures have been traced to such factors as:

- Dropping, bumping, or abuse (careless handling of the grinder)
- Improper mounting
- Imbalance
- Improper shipment or storage, or age
- Mismatched speed ratings
- Exposure to water, solvents, high humidity, freezing, and extreme temperatures

**Accessories known to have been subjected to any of the conditions above can burst violently and should be destroyed rather than risk their use by someone who may not notice that they are damaged.**

# Safety Recommendations



## ACCESSORY MOUNTING

The collet should be checked to assure it is in good operating condition and is secure to the tool. Accessories should be inserted to full depth of the collet. **Avoid excessive overhang that can result in vibration, or a bent spindle if excessive down force is used. Possible loss or ejection of accessory can result.**

**⚠ WARNING** 220G grinders are intended for use with small carbide burrs and mounted wheels only. Do not use these tools for Type 1 wheel grinding. If your application calls for a Type 1 wheel, consult your Cleco representative for a wheel grinder equipped with the proper wheel guard.

**⚠ WARNING** This is a high speed low torque tool! The speed (RPM) accomplishes the work. When using do not force tool, simply hold and guide. Small accessories used with this tool can be easily bent if forced and if so can be ejected from the collet.

## BEGINNING GRINDING OPERATION

Before using or after mounting an accessory, tool must be run for one minute in a protected enclosure to check the integrity of the accessory. During this time or any other time, no one should stand in front or in line of the accessory. When starting work with a cold wheel, apply it gradually to the workpiece until it becomes warm. **Do not continue to use a grinder if:**

- The speed rating of the accessory is less than the speed of the grinder
- It starts to vibrate
- You sense changes in tool speed or an unusual increase in noise that would indicate tool is running at excessive speed
- You notice excessive end play in spindle
- You hear any unusual sound from grinder

## RETURN THE TOOL TO THE TOOL CRIB FOR SERVICE IMMEDIATELY!

**⚠ WARNING**  
**Repetitive work motions and/or vibration may cause injury to hands and arms.**  
 Use minimum hand grip force consistent with proper control and safe operation.  
 Keep body and hands warm and dry.  
 Avoid anything that inhibits blood circulation.  
 Avoid continuous vibration exposure.  
 Keep wrists straight.  
 Avoid repeated bending of wrists and hands.

Some individuals may be susceptible to disorders of the hands and arms when performing tasks consisting of highly repetitive motions and/or exposure to extended vibration. Cumulative trauma disorders such as carpal tunnel syndrome and tendonitis may be caused or aggravated by repetitious, forceful exertions of the hands and arms. Vibra-

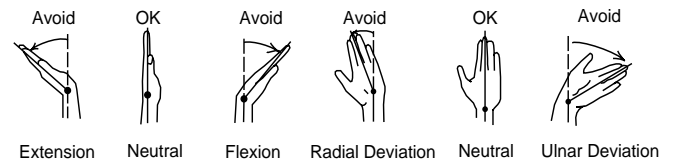
tion may contribute to a condition called Raynaud's Syndrome. These disorders develop gradually over periods of weeks, months, and years. It is presently unknown to what extent exposure to vibrations or repetitive motions may contribute to the disorders. Hereditary factors, vasculatory or circulatory problems, exposure to cold and dampness, diet, smoking and work practices are thought to contribute to the conditions. Tool operators should be aware of the following warning signs and symptoms so that a problem can be addressed before it becomes a debilitating injury. Any user suffering prolonged symptoms of tingling, numbness, blanching of fingers, clumsiness or weakened grip, nocturnal pain in the hand, or any other disorder of the shoulders, arms, wrists, or fingers is advised to consult a physician. If it is determined that the symptoms are job related or aggravated by movements and postures dictated by the job design, it may be necessary for the employer to take steps to prevent further occurrences. These steps might include, but are not limited to, repositioning the workpiece or redesigning the workstation, reassigning workers to other jobs, rotating jobs, changing work pace, and/or changing the type of tool used so as to minimize stress on the operator. Some tasks may require more than one type of tool to obtain the optimum operator/tool/task relationship.

The proper selection of the correct type of grinder is an important ergonomic consideration. Each application should be carefully considered and the tool chosen that will minimize the stresses on the operator that can lead to the onset of cumulative trauma disorders. Some tasks require more than one type of tool to obtain the optimum operator/tool/task relationship. Cleco has a complete selection of tools including vertical, straight, angle, and extended grinders that make possible the correct ergonomic match of the operator, tool, and task.

The following suggestions will help reduce or moderate the effects of repetitive work motions and/or extended vibration exposure:

The following suggestions will help reduce or moderate the effects of repetitive work motions and/or extended vibration exposure:

- Use a minimum hand grip force consistent with proper control and safe operation
- Keep body and hands warm and dry (cold weather is reported to be a major factor contributing to Raynaud's Syndrome)
- Avoid anything that inhibits blood circulation
  - Smoking Tobacco (another contributing factor)
  - Cold Temperatures
  - Certain Drugs



- Tasks should be performed in such a manner that the wrists are maintained in a neutral position, which is not flexed, hyperextended, or turned side to side
- Stressful postures should be avoided — select a tool appropriate for the job and work location

# Safety Recommendations

- Avoid highly repetitive movements of hands and wrists, and continuous vibration exposure (after each period of operation, exercise to increase blood circulation)
- **Use quality accessories** (the primary source of vibration when using a grinder is an accessory that is out of balance, out of round, untrue, or possibly any combination of all three; avoid excessive overhang of accessory in collet)
- Use carbide burrs that are sharp, as dull burrs require more force and effort to remove material
- Keep tool well maintained and replace worn parts (a preventive maintenance program with scheduled inspections is highly recommended)

Work gloves with vibration reducing liners and wrist supports are available from some manufacturers of industrial work gloves. Tool wraps and grips are also available from a number of different manufacturers. These gloves, wraps, and wrist supports are designed to reduce and moderate the effects of extended vibration exposure and repetitive wrist trauma. Since they vary widely in design, material, thickness, vibration reduction, and wrist support qualities, it is recommended that the glove, tool wrap, or wrist support manufacturer be consulted for items designed for your specific application. **WARNING! Proper fit of gloves is important. Improperly fitted gloves may restrict blood flow to the fingers and can substantially reduce grip strength.**

## USE QUALITY ACCESSORIES

The primary source of vibration when using a die grinder is an accessory that is out of balance, out of round, untrue, or possibly any combination of all three.

The use of accessories which are well balanced, round, and true is highly recommended as they have been found to significantly reduce vibration. Some accessories lose their balance, roundness, and trueness as they wear from use. Because of the abusive nature of the vibration caused by out of balance, out of round, and untrue condition of some mounted wheels and carbide burrs, it is felt that these accessories are more susceptible to failure. Excessive vibration may signal eminent wheel failure. Out of balance accessories are dangerous. Flat spotting of a mounted wheel, caused by grinding the wheel to a stop after the power has been shut off can result in changes to the balance and shape of the wheel. Be sure the mounted wheel has stopped before setting the tool down. Set the tool in a tool rest or tool holder when not in use.

## USE A PREVENTIVE MAINTENANCE PROGRAM

Tool abuse or poor maintenance procedures can amplify and contribute to the vibration produced by a mounted wheel or carbide burr. A preventive maintenance program featuring scheduled periodic inspections and proper maintenance is the best way to assure safety in your portable grinding operations. A well managed program can, for example, detect such things as speed variations due to wear, flanges or spindles that have been damaged from abuse, or bad bearings damaged by foreign matter or lack of lubrication. Problems such as these can affect the wheel trueness when the grinder is running and contribute to the vibration. Rotor blades that are worn or

chipped can lock up the motor and damage motor components. Rotor blades should be replaced anytime the tool is disassembled for service.

Proper repair procedures and the use of original Cleco service parts and bearings, rather than substitutes, will return the tool to factory specifications of precision and balance, and minimize vibration.

## PROPER LUBRICATION

An automatic in-line filter-regulator-lubricator is recommended as it increases tool life and keeps the tool in sustained operation. The in-line lubricator should be regularly checked and filled with a good grade of 10W machine oil. Proper adjustment of in-line lubricator is performed by placing a sheet of paper next to exhaust ports and holding throttle open approximately 30 seconds. Lubricator is properly set when a light stain of oil collects on paper. Excessive amounts of oil should be avoided.

## STORAGE

In the event it becomes necessary to store tool for an extended period of time (overnight, weekend, etc.), it should receive a generous amount of lubrication at that time and run for several seconds to distribute oil before disconnecting from air supply. This will reduce corrosion and displace water that may be trapped in tool.

This information is a compilation of general safety practices obtained from various sources available at the date of production. However, our company does not represent that every acceptable safety practice is offered herein, or that abnormal or unusual circumstances may not warrant or require additional procedures. Your work may require additional specific safety procedures. Follow these procedures as required by your company. For more information, see the latest edition of ANSI B186.1, Safety Code for Portable Air Tools, and ANSI B7.1, Safety Requirements for the Use, Care, and Protection of Abrasive Wheels, available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.

## OPERATING INSTRUCTIONS

### READ SAFETY RECOMMENDATIONS BEFORE CONNECTING TOOL.

The 220G & 220GL Series Die Grinders are designed to operate on 90 psig (6.2 bar) maximum air pressure, using a 3/16" hose up to 8' in length. If additional length is required, the next larger hose size may be connected to the 8' whip hose.

### LUBRICATION

An automatic in-line filter-lubricator is recommended as it increases tool life and keeps the tool in sustained operation. The in-line lubricator should be regularly checked and filled with a good grade of 10W machine oil. Proper adjustment of the in-line lubricator is performed by placing a sheet of paper next to the exhaust ports and holding the throttle open approximately 30 seconds. The lubricator is properly set when a light stain of oil collects on the paper. Excessive amounts of oil should be avoided.

### STORAGE

In the event that it becomes necessary to store the tool for an extended period of time (overnight, weekend, etc.), it should receive a generous amount of lubrication at that time and again when returned to service. The tool should be stored in a clean and dry environment.

## SERVICE INSTRUCTIONS

### DISASSEMBLY

Unscrew the collet nut, No. 415430, and remove any burr being used from the collet spindle. The collet nut is removed using collet wrench No. 413594 and collet locking pin No. 412094.

Using a strap wrench to hold the housing, unscrew the blackhead. NOTE: Do not hold the housing with anything other than a strap wrench. Insert a pin down the center of the collet and push the complete motor unit out the rear of the housing. Using a suitable driver, drive the rotor, No. 415427, out of the rear rotor bearing, No. 843643. This will allow the removal of the rear bearing plate, No. 412077, cylinder, No. 412074, and three (3) rotor blades, No. 412082. Clamp the rotor lightly in a soft-jawed vise and unscrew the collet spindle. The front bearing plate, No. 415429, and front rotor bearing, No. 415422, may now be removed from the rotor. Remove the rotor collar, No. 415424, 415425 or 415426, at this time to avoid its being misplaced during repair of the tool.

The backhead does not need to be disassembled unless there is an indication that the seals should be replaced.

### SLIDE TYPE DISASSEMBLY

Place valve coupling, No. 412087, in the vise and using a suitable wrench, unscrew coupling, No. 412078. This will allow the valve, No. 412085, to slide off the valve stem, No. 412086. Using a suitable instrument, remove the two (2) "O" -rings, No. 844305, from the inside of the valve.

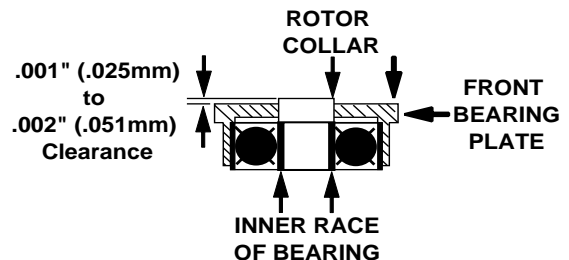
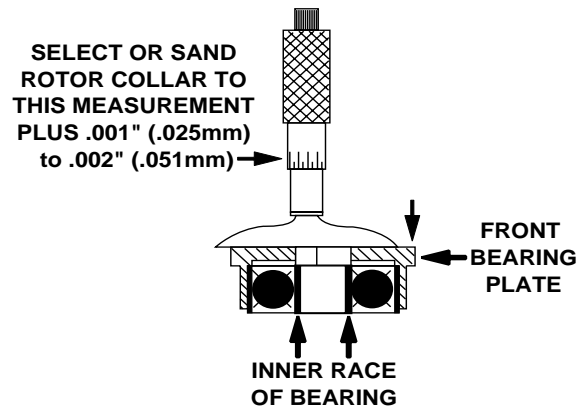
### LEVER TYPE DISASSEMBLY

Unscrewing the throttle valve cap, No. 412105, will allow the complete throttle valve mechanism to drop out of the backhead.

### REASSEMBLY

The tool is reassembled in the reverse order of disassembly. Wash all parts in a solvent and inspect for damage or wear. Check bearings for wear which can be detected by excessive end play or roughness of the bearings which indicates a brinelled condition. It is recommended that new rotor blades be installed at each repair cycle.

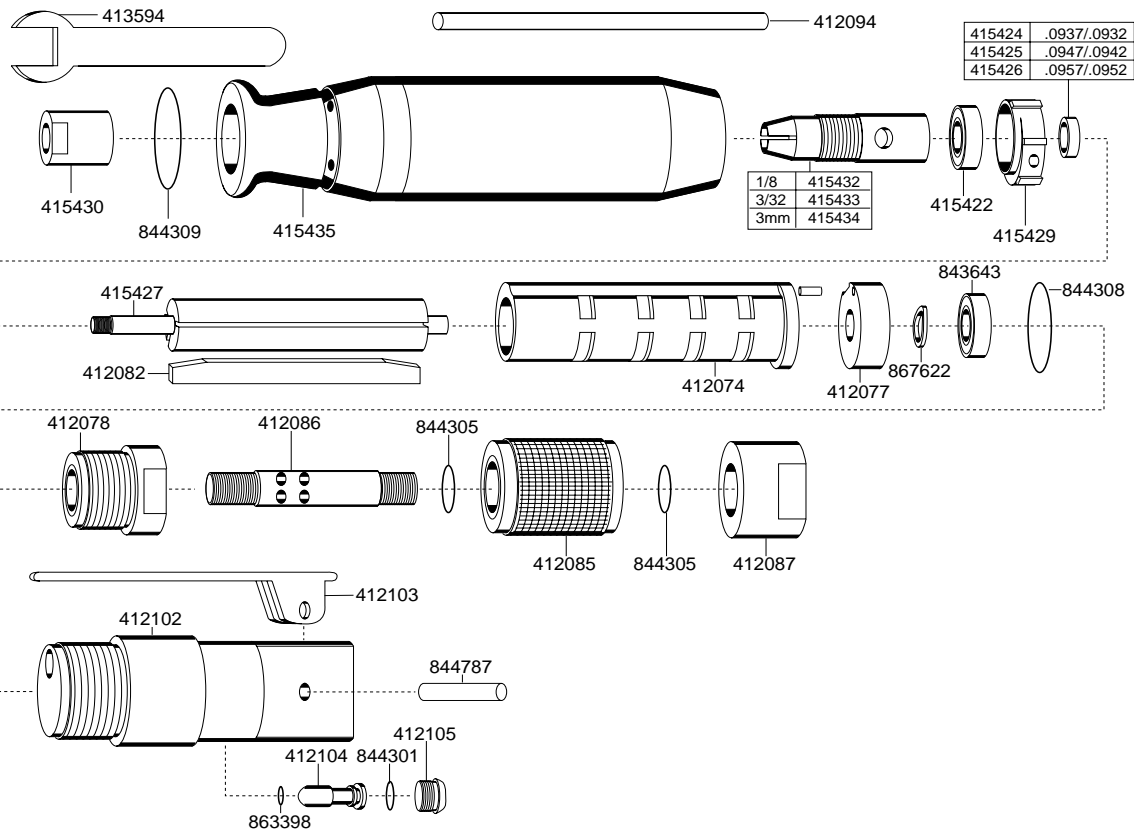
Install the front rotor bearing in the front bearing plate and measure the distance from the face of the bearing plate to the inner race of the bearing with the bearing race loaded rearward.



Select or fit by sanding a rotor collar .001" (.25mm) to .002" (.51mm) longer than this measurement. Install the rotor blades, cylinder, rear bearing plate, wavy washer and rear bearing on the rotor. Install collet nut finger tight to the collet, then stand motor in an upright position with rear facing upwards. Using a suitable driver that fits the inner race of rear bearing, lightly seat the bearing and rear bearing on the rotor. After final assembly of the motor unit, the cylinder should be held securely but not tightly between the two (2) bearing plates. The rotor should not rub either bearing plate. Use Locktite #271 to secure the collet to the rotor shaft.

Tighten all joints securely during reassembly. Place a few drops of 10W machine oil in the inlet to ensure positive lubrication of all motor parts as soon as air is applied.

CAUTION: After the grinder is reassembled, be sure to check the free speed (R.P.M.) for proper speed with a dependable tachometer before returning the grinder to service.



PART NO.	NAME OF PART	QTY.
412074	Cylinder	1
412077	Rear Bearing Plate	1
412078	Coupling (Slide Type Only)	1
412082	Rotor Blade	3
412085	Valve Sleeve (Slide Type Only)	1
412086	Valve Stem (Slide Type Only)	1
412087	Valve Coupling (Slide Type Only)	1
412094	Collet Locking Pin	1
412102	Backhead Lever Model Only	1
412103	Valve Lever (Lever Model Only)	1
412104	Valve (Lever Model Only)	1
412105	Valve Plug (Lever Model Only)	1
413594	Collet Wrench	1
415422	Front Rotor Bearing	1
415424	Rotor Collar (.093)	1
415425	Rotor Collar (.094)	1
415426	Rotor Collar (.095)	1
415427	Rotor	1
415429	Front Bearing Plate	1
415430	Collet Nut	1
415432	Collet (1/8")	1
415433	Collet (3/32")	1
415434	Collet (3mm)	1
415435	Housing	1
843643	Rear Rotor Bearing	1
844301	"O"-Ring (1/8" x 1/4") (Lever Model Only)	1
844305	"O"-Ring (1/4" x 3/8") (Slide Type Model Only)	2
844308	"O"-Ring (3/8" x 9/16")	1
844309	"O"-Ring (27/64" x 5/8")	1
844787	Lever Roll Pin	1
863398	"O"-Ring (1/16" x 3/16") (Lever Model Only)	1
867622	Wavy Washer	1

**SUBASSEMBLIES**

- 411098 Slide Type Backhead — Includes 412078, 412085, 412086, 412087, 844305, 844308.  
 411099 Lever Backhead — Includes 412102, 412103, 412104, 412105, 844301, 844308, 844787, 863398.



## Sales & Service Centers

**Note:** All locations may not service all products. Please contact the nearest Sales & Service Center for the appropriate facility to handle your service requirements.

Dallas, TX  
**Apex Tool Group  
Sales & Service Center**  
1470 Post & Paddock  
Grand Prairie, TX 75050  
Tel: 972-641-9563  
Fax: 972-641-9674

Detroit, MI  
**Apex Tool Group  
Sales & Service Center**  
2630 Superior Court  
Auburn Hills, MI 48326  
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Fax: 248-391-7824

Houston, TX  
**Apex Tool Group  
Sales & Service Center**  
6550 West Sam Houston  
Parkway North, Suite 200  
Houston, TX 77041  
Tel: 713-849-2364  
Fax: 713-849-2047

Lexington, SC  
**Apex Tool Group**  
670 Industrial Drive  
Lexington, SC 29072  
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Tel: 803-951-7544  
Fax: 803-358-7681

Los Angeles, CA  
**Apex Tool Group  
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15503 Blackburn Avenue  
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Tel: 562-623-4457  
Fax: 562-802-1718

Seattle, WA  
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Fax: 717-757-5063

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