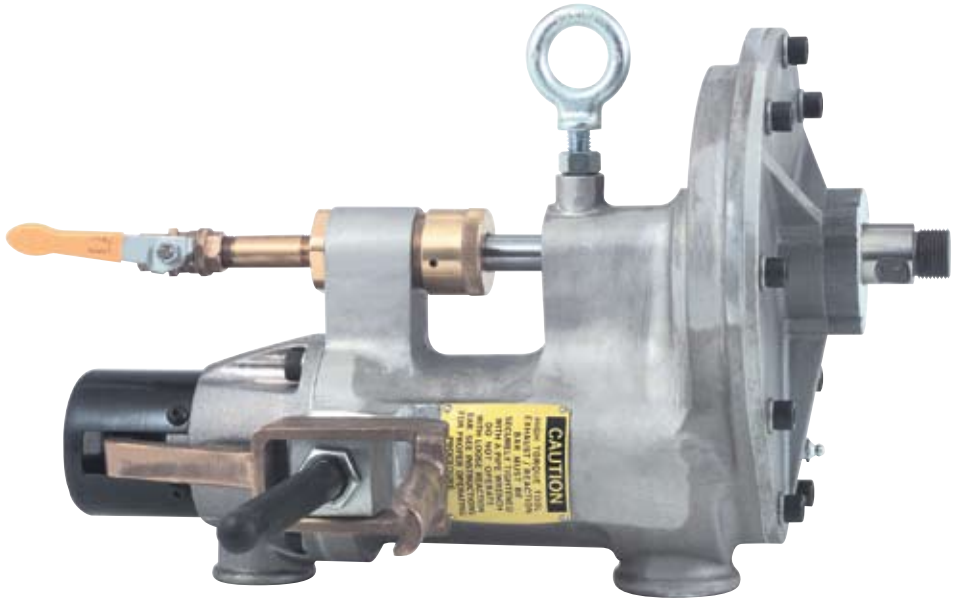
Operating & Service Manual
90093-IM
05/11/2011

Airetool®

CC-325-HP

High Pressure Water Flush Condenser Tube Cleaner

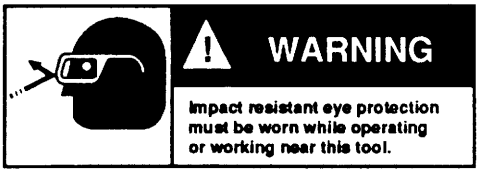


For additional product information visit our website at http://www.apextoolgroup.com

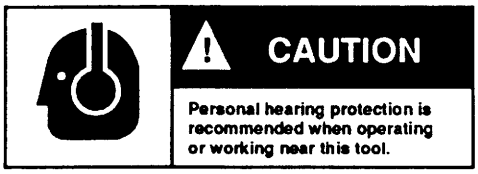
Safety Recommendations

For your safety and the safety of others, read and understand the safety recommendations and operating instructions before operating an Airetrol.

Always wear protective equipment:



For additional information on eye and face protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection, and the American National Standards Institute, ANSI A87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.



Hearing protectors are required in high noise areas, 85 dBA or greater. The operation of other tools and equipment in the area, reflective surfaces, process noises and resonant structures can substantially contribute to, and increase the noise level in an area. For additional information on hearing protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure, and American National Standards Institute, ANSI S12.6 Hearing Protectors.

Airetool Airetrols are designed to operate on 90 psig (6.2 bar) maximum air pressure. If the tool is properly sized and applied, higher air pressure is unnecessary. Excessive air pressure increases the load and stresses on the tool parts, which may result in cage, mandrel or roll breakage. Installation of a filter-regulator-lubricator in the air supply line ahead of the tool is recommended.

Before the tool is connected to the air supply, check the throttle for proper operation (i.e., throttle moves freely and returns to the closed position). Clear the air hose of accumulated dust and moisture. Be careful not to endanger adjacent personnel. Before removing a tool from service or changing sockets, make sure the air line is shut off and drained of air. This will prevent the tool from operating if the throttle is accidently engaged.

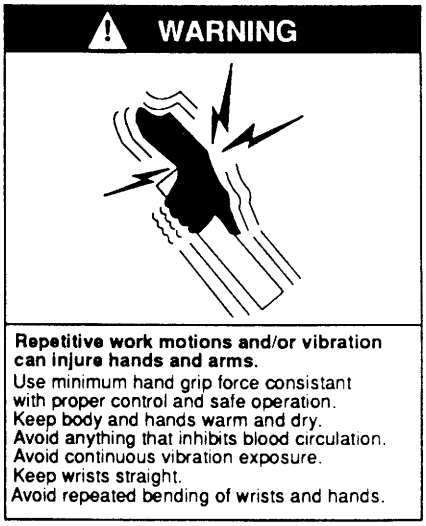
It is essential for the safe operation that the operator of an Airetrol use good balance, sure footing, and proper posture in anticipation of the torque reaction. Insure that the operator's hand will not be wedged or pinched between the work and the tool when operating.

When using right angle Airetrols, be sure the throttle is positioned relative to the angle head so that the throttle will not become wedged against an adjacent object in the "ON" position due to torque reaction. The angle head may be repositioned with respect to the lever to accomodate proper location for the task. If tool is to be reversed, locate throttle lever in a neutral position that will prevent entrapment. Refer to operating instructions for additional information.

Tools with clutches can stall rather than shut-off if adjusted over the maximum power output of the tool, or if there is a drop in air pressure. Operator must then resist the stall torque until the throttle is released.

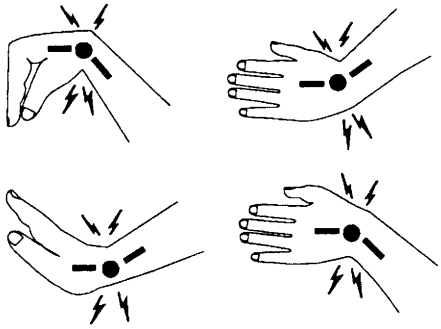
Higher torque right angle Airetrols can be equipped with spline torque reaction mounting plates which accept torque reaction bars. These bars can be braced against the work or other suitable points to absorb and relieve the operator of the torque reaction transmitted by the tool. Tool balance arms are also available to absorb the torque reaction of the tool while balancing the weight of the tool for improved ergonomic applications.

Some individuals are susceptible to disorders of the hands and arms when exposed to tasks which involve highly repetitive motions and/or vibration. Those individuals predisposed to vasculatory or circulatory problems may be particularly susceptible. Cumulative trauma disorders such as carpal tunnel syn-



drome and tendonitis can be caused or aggravated by repetitious, forceful exertions of the hands and arms. These disorders develop gradually over periods of weeks, months and years.

Safety Recommendations



*** Tasks should be performed in such 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 and can be controlled through tool selection and work location.**

Any user suffering from 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 with a physician. If it is determined that the symptoms are job related or aggravated by movements and postures indicated by the job design it may be necessary for the employer to take steps to prevent further occurrences. These steps might included, but are not limited to, repositioning the work piece or redesigning the workstation, reassigning workers to the jobs, rotating jobs, altering 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 following recommendations 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 wrists as straight as possible.

* Keep body and hands warm and dry.

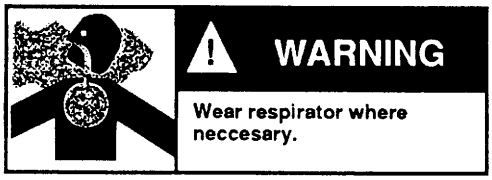
* Avoid anything that inhibits blood circulation.

  - Smoking Tobacco
  - Cold Temperatures
  - Certain Drugs

* Avoid highly repetitive movements of hands and wrists, and continuous vibration exposure.

ADDITIONAL SAFETY RECOMMENDATIONS FOR USE OF RIGHT ANGLE AIRETROLS

Follow good machine shop practices. Rotating shafts and components can entangle and enwrap, and can result in serious injures. Never wear long hair, loose-fitting clothes, gloves, ties, or jewelry when working with or near a drill or any machine with exposed rotating shaft.



Drilling or other use of this tool may produce hazardous fumes, particles, and/or dust. To avoid adverse health effects utilize adequate ventilation and/or a respirator. Read the material safety data sheet of any cutting fluids or materials involved in the drilling process.

CAUTION

* Drill bits are sharp, handle them carefully to avoid injury. The cutting tool maximum speed rating must equal or exceed the rated speed of the tool.

* Attach the mandrel and the chuck securely to the Airetrol to prevent tool from jumping off work.

* Use precautions when drilling because of the possibility of the cutting tool bending or breaking.

* High reaction torque may be experienced by the operator when reversing tool to remove the expander.

* Drill bits or accessories not centered properly in the chuck can cause excessive wobble or vibration.

Operating & Service Instructions
CC-325-HP High Pressure Water Flush Condenser Cleaner Motor

SPECIFICATIONS

Recommended Air Pressure - 90/100 psi.
Air Volume Required - 200 cfm.
Minimum Hose Size - 1" I. D.
Air Line Lubricator - 15/20 Drops Per Minute (10W Oil)
Maximum Flushing Pressure - 5000 psi (water/scavenging Agent)
Approximate Peak Power - 6 hp.

MODEL #	**CC-325-HP**
Weight	42 lbs.
Free Speed	800 rpm
Torque Capacity	63 ft-lbs.

OPERATING INSTRUCTIONS

AIR SUPPLY

To use the CC-325-HP cleaner, it is necessary to use a compressor with a capacity to supply a sustained air pressure of 90 psi at 200 cfm. It is therefore necessary to use a air supply hose with a 1" I. D. in order to be sure in having an adequate volume to the tool. It should also be noted that long hose runs, air hose quick connects, fittings, etc. can cause large pressure drops between the tool and the compressor and that is many cases, poor tool performance can be improved by minimizing these conditions and/or increasing the air line size (ID).

LUBRICATION

It is essential that an automatic (mist type) in-line filter/lubricator be used and properly maintained to achieve maximum operating efficiency and motor life with these tools. Lubricator should be set to deliver 15 to 20 drops of oil per minute injected into the air line to assure that proper lubrication is going to the motor. Application of the tool should govern how frequently it is greased. It is recommended that the drive shaft cavity be filled periodically through the Zerk fitting (51) on the side of the tool and that the gear cavity be kept about half filled through the Zerk fitting in the front cover. Use a good quality, extreme-pressure gear grease. If the tool is to be run for extended periods without using water or other scavenging agent, The packing gland nut can be temporarily loosened or the packing removed to avoid damage to the packing. The packing should be kept well lubricated.

FLUSHING AGENT

The model CC-325-HP condenser cleaner motor coupling as installed upon this machine is designed to operate with (6000 psi) pressure water or scavenging agent to assist the mechanical cleaning action of the drill bits in condenser tubing and similar applications. The water supply hose and couplings, **NOT SUPPLIED WITH THE TOOL,** should only be of a recommended type to withstand this amount of pressure. Lower pressure may also be used with this supply hose. The CC-325-HP uses standard Airetool condenser cleaner shafting and couplings but requires the use of the Airetool Model " HP" condenser cleaner drills for best results. **SEE PAGE 13 FOR SELECTION.** If the tool is to be run for extended periods without using water or other scavenging agent, The packing gland nut can be temporarily loosened or the packing removed to avoid damage to the packing. The packing should be kept well lubricated.

USING THE CC-325-HP CONDENSER CLEANER

The CC-325-HP condenser cleaner can be used with lower pressure on the scavenging agent satisfactorily, however, maximum cleaning is done with pressure at 5000 psi. When connecting the water connections and the shafting to the cleaner, **CAUTION** should be taken to make sure that all joints are tightened properly to prevent the possibility of leakage of the high pressure. It is recommended that the water be shut off when the drill bit is not inside the tube to prevent the possibility of contacting someone with the high pressure water spray. Therefore, it is recommended that first the bit be placed in a tube, the water flush be turned on and then the motor be started to drill each individual tube. It should also be stated that the cleaner should not be run for extended periods of time without the scavenging fluid going through the coupling due to the close fit of the coupling. It will overheat if no fluid is present to help cool the parts. Periodically, the thrust bearing No. 16 as shown on the parts list page 7, should be checked to see that there is proper lubrication on this bearing.

Operating & Service Instructions - continued

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STORAGE

Before storage of the tool, blow all water out of the tool and blow in a generous amount of 10W machine oil to deter corrosion.

CAUTION: **Before operating these tools, always make sure that the handles (41) are threaded fully and securely into the motor case and that the operator is fully prepared to safely absorb the full stall torque of the tool in the event that the drill hangs up during operation.**

SERVICE INSTRUCTIONS

SERVICING THE HIGH PRESSURE COUPLING

If after some usage, it is found that the high pressure coupling begins to leak excessively, it may be necessary to replace the "O" rings and back-up rings on the seal support. By removing the coupling retainer No. 22, it will be possible to grasp part No. 23 and by slightly twisting back and forth, pull the seal support from the shaft. It is suggested that anytime the support is removed for servicing, that new "O" ring and back-up rings be installed on the seal support. The back-up ring is installed in the groove first with the radius portion of the back-up ring facing the small end of the support. Install in the same groove beside the back-up ring, one of the "O" rings as furnished. These "O" rings are of special durometer hardness to stand the 5000 psi pressure. Standard "O" rings and back-up rings **should never be used** as they will as they will have a tendency to extrude from the groove and deteriorate very rapidly. After installation of the back-up ring and"O" ring in each groove, three in number, liberally lubricate the seal support and "O" rings with grease and placing in the shaft and rocking the seal support back and forth, push the support into the shaft. Push on the support until it touches the bronze bearing. Reinstall the coupling retainer No. 22 and tighten securely. This will normally repair the coupling and stop the leakage.

REPLACING THE DRIVE SHAFT

If after considerable usage, it is found necessary to replace the drive shaft because of wear to the seal area, remove the socket head cap screws No. 8 that hold the case cover in place. This will allow removal of the case cover at this point. With the proper size Allen wrench, reach down through the thrust nut No. 14, in one of the elongated slots and loosen the two set screws that are in the thrust nut. Rotate the shaft until the set screws appear. After loosening the set screws, use a wrench and rotate the spindle in a counterclockwise rotation which will unthread the thrust nut from the shaft. Once the thrust nut has been unthreaded, it will be possible then to remove the shaft from the machine. At this point it is advantageous to remove the thrust nut No. 14, which will allow servicing of the thrust bearing and allow inspection of this part to make sure that the thrust bearing is in good condition before replacement in the machine. Also, at this point, the bronze bearing No. 21 can be inspected to make sure that it is not worn to allow excess wobble of the shaft in this area. To install the new shaft, it will be necessary to press the old shaft from the gear by resting the gear on the inner diameter and pushing the large threaded end of the shaft. This will allow the spindle to be pressed from the gear in this direction. Install the drive key in the new shaft and replace the large drive gear on the new shaft by pressing it until the diameter of the shaft is flush with the back of the large gear. At this point, it would be advantageous to run the shaft between centers to make sure that the gear has been pressed on square to prevent problems in operation of the machine after assembly. If it is found that the gear does not run true, the gear should be realigned by pressing on the proper spot for seating the gear squarely on the shaft. If other bearings or seals are excessively worn, they should be replaced in this area before reinstalling the shaft. To reinstall the shaft, feed the shaft down through the housing until the small diameter of the shaft protrudes from the front portion of the case. At this point, place on the shaft the thrust nut along with the thrust bearing washers, thrust bearing and adjusting nut. The shaft can then be pushed father into the motor to allow the shaft to start entering into the rear bronze bearing. As soon as this is done, the thrust nut No. 14 should be tightened into position and again placing an Allen wrench down through one of the crescent shaped holes in the side of the thrust nut, the adjusting nut can be screwed on the shaft. Continue to thread the adjusting nut on the shaft while the shaft is being rotated and also being pushed rearward as this operation is being performed. As soon as possible, the front gear cover should be reinstalled and the cap screws tightened. By continuing rotating the shaft, adjust the thrust adjusting nut until a slight resistance is felt on the Allen wrench when the shaft is rotated. At this point, turn the shaft and wrench together until it touches the right-hand side of the crescent shaped opening until the wrench reaches the end. Then rotate the nut back the entire length of the opening and at this point, tighten the set screw. Ro-

Operating & Service Instructions

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tate the shaft 180 degrees and tighten the other set screw. This adjustment should be adequate to allow the bearing to absorb the hydraulic thrust from the high pressure but should not induce preloading on the bearing during assembly. With the seal support installed, the shaft should rotate freely without binding.

SERVICING THE AIR MOTOR

To service the air motor assembly, remove the large cap screws in back of the motor coupling and remove the coupling No. 27. This will allow the entire motor to be removed from the tool for servicing. Upon replacement of worn parts, the motor can be reassembled and slid back into the motor case. **Rotor blades should always be replaced when the motor is serviced.** Reinstall the coupling and the large cap screws and the motor should be ready for operation. It is important when servicing the motor and gear package, that lubrication be used on all bearing surfaces and the gear case should be packed with a semi-solid grease. The unit should be ready for operation upon the completion of the above mentioned service.

SERVICING THE THROTTLE VALVE

To service the throttle valve, unscrew the valve retainer (320 and remove the valve (29), valve spring (42). washer (30), gasket (31) and valve seat (28). **Take care to avoid damaging the valve seat.** Clean and inspect all parts and replace if worn or damaged.

REASSEMBLY

All parts should be cleaned and lubricated before reassembly. Gears, bearings and grease retainers should be packed with grease. Essentially, reassembly of all the various subassemblies should be in the reverse order of disassembly, with particular attention paid to the following points.

1. When assembling the motor, the cylinder pins must go into the proper holes in the thrust plates and the motor assembly must be inserted into the case oriented such that the front cylinder pin goes into the proper hole in the motor case.

2. If replacing the drive shaft (3) or the drive gear (39) is required, the gear should be supported on its inner flange and care be taken to avoid damage to the key when pressing the drive shaft into the drive gear. It is recommended that the assembly be checked between centers and trued up if required before assembly into the tool.

3. Care should be taken when pushing the shaft through the grease retainer (13) and while installing the front cap (36) with grease retainer (34) over the drive shaft to avoid damaging the seals.

4. The valve retainer (32) is dimpled for its retaining set screw (48). The set screw should be secured in place with Loctite 242 or equivalent.

5. The valve nut (49) should be adjusted so that there is still a small amount of play in the valve lever (48) to insure that the valve (29) seals off when the lever is released. Secure the nut in position with a 1/16” x 1” cotter pin (50).

Parts List For
Model CC-325-HP Condenser Cleaner Motor With High Pressure Water Flush

ITEM #	PART #	DESCRIPTION	QUANTITY
1	8010619	CD-11 Cap 1 1/4"	1
2	1715657	CC32519-HP Gasket	1
3	1715320	CC-32511-HP Drive Shaft	1
4	1235700	CC-35027-1 Bearing	1
5	1234500	CC-32501-A-1 Cover	1
6	8010024	3/8" Medium Lock Washer	15
7	1228900	CC-121 Bearing	1
8	8010075	3/8"-16 x 3/4" Socket Head Cap Screw	6
9	1228800	CC-120 Bearing	1
10	1228100	CC-112 Bearing	1
11	8010001	Hex Nut	1
12	1228700	CC-119 Support Ring	1
13	1238300	CC-37538 Retainer	1
14	1715340	CC-32513-HP Thrust Nut	1
15	3229500	1000-66 Washer	2
16	3229400	1000-65 Bearing	1
17	8000800	10-32 x 1/4" Socket Set Screw	2
18	1715360	CC-32515-HP Thrust Adjusting Nut	1
19	3167600	500-31 "O" Ring	3
20	1715390	CC-32518-HP Back Up Ring	3
21	1715330	CC-32512-HP Bearing	1
22	1715370	CC-32516-HP Coupling Retainer	1
23	1715350	CC-32514-HP Seal Support	1
24	1236200	CC-37503 Rear Head	1
25	1147500	33009 Bearing	1
26	1030700	713 Rear Head Cap	1
27	1236300	CC-37504 Coupling	1
28	1237600	CC-37530 Valve Seat	1
29	1237200	CC-37526 Valve	1
30	1237500	CC-37529 Washer	1
31	1237400	CC-37528 Gasket	1
32	1236900	CC-37523 Valve Retainer	1
33	1238200	CC-37537 Valve Cover	1
34	1235500	CC-35017 Retainer	1
35	8010023	1/4"-20 x 3/4" Socket Head Cap Screw	1

NOTE: See Parts List Drawing on Page 9.

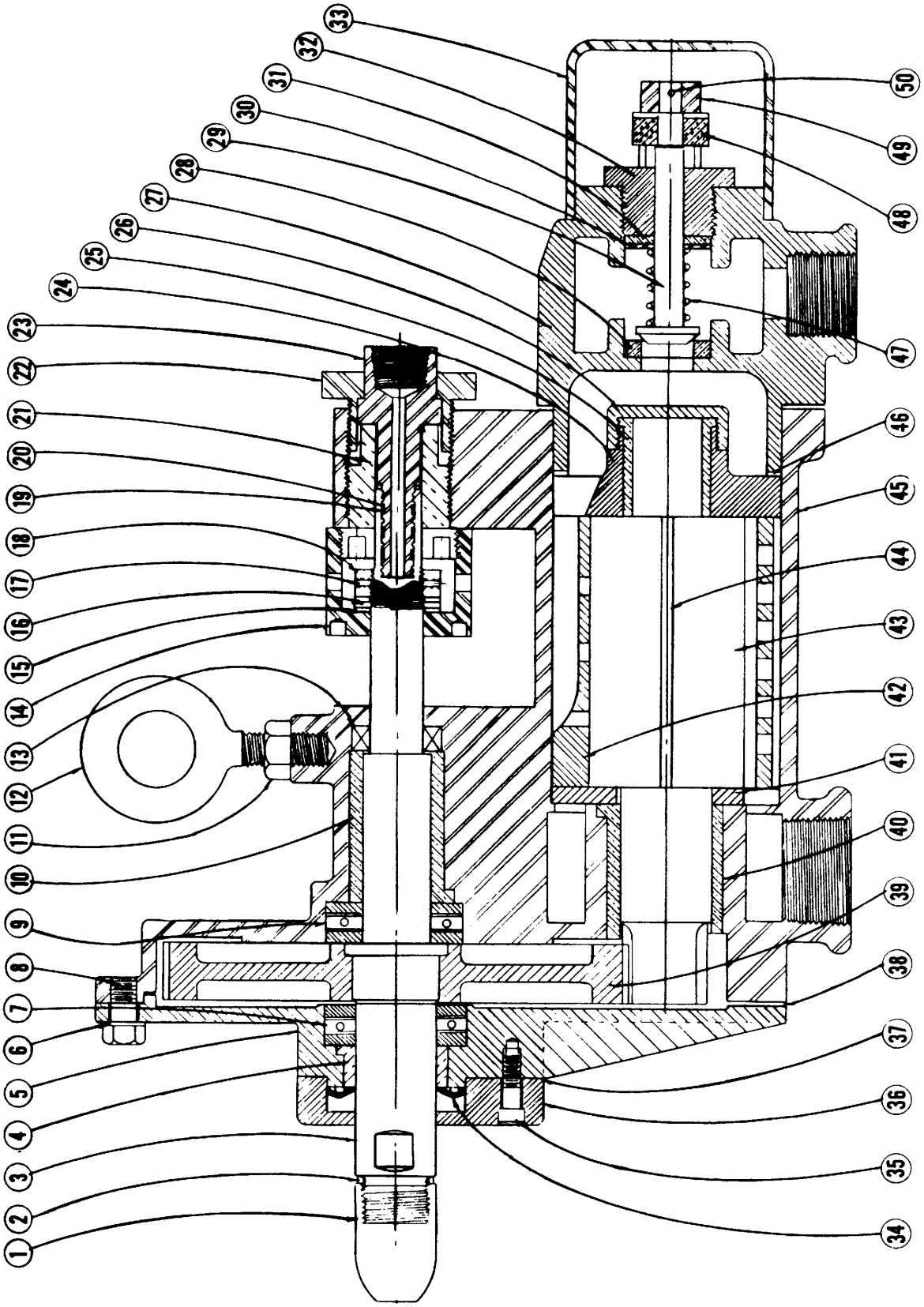
Parts List For
Model CC-325-HP Condenser Cleaner Motor With High Pressure Water Flush

ITEM #	PART #	DESCRIPTION	QUANTITY
36	1236100	CC-37501-B-1 Front Cap	1
37	1237900	CC-37533 Front Cap Gasket	1
38	1234700	CC-32532 Case Cover Gasket	1
39	1234600	CC-32510 Drive Gear	1
40	1236400	CC-37508 Bearing	1
41	1235100	CC-35007-F Thrust Plate	1
42	1234800	CC-35002 Cylinder	1
43	1234900	CC-35005 Rotor	1
44	1181100	63506-F Blade	5
45	1234400	CC-32501-1 Case	1
46	1238000	CC-37534 Gasket	1
47	1238100	CC-37536 Spring	1
48	1237000	CC-37524 Valve Lever	1
49	1237300	CC-37527 Valve Nut	1
50	8005600	1/16" x 1" Cotter Pin	1
NS	3241600	1100-100 Wrench 1"	1
NS	1228600	CC-118 Handle	2
NS	1236600	CC-37520 Pivot Screw	1
NS	1715661	Socket Head Cap Screw	9
NS	2996558	MU-100 Muffler	1
NS	2996559	1 1/4" x 1" Pipe Reducer	1
NS	1716357	5000 - 1 1/8" Zerk Fitting	2
NS	8010318	#2 x 1/8" Drive Screw	4
NS	8566880	1650-CT-P Caution Tag	1

NOTE: See Parts Drawing on Page 9.

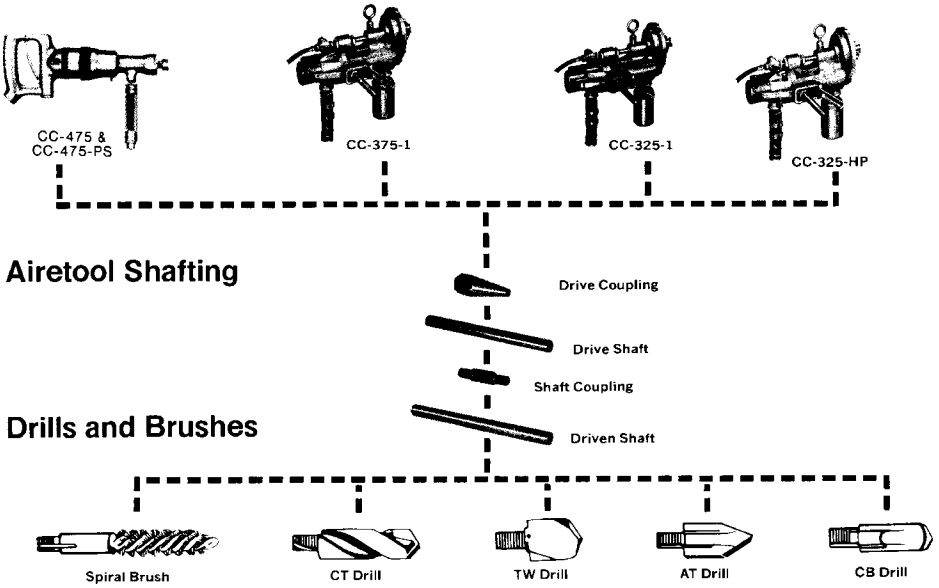
Parts Drawing For

Model CC-325-HP Condenser Cleaner Motor With High Pressure Water Flush



Airetool Shafting

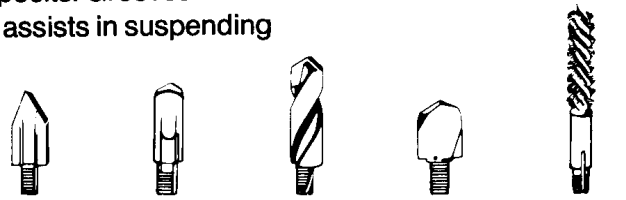
Airetool Shafting is available in various lengths and various couplings for maximum convenience and efficient operation. Sections of shafting are available in one foot increments up to 18'.



TUBE I.D. Inch. (mm)	SHAFT DIAMETER Inch. (mm)	DRIVE SHAFT	DRIVE SHAFT THREAD	DRIVEN SHAFT	DRIVEN SHAFT THREAD	SHAFT COUPLING	SHAFT COUPLING THREAD	DRIVE COUPLING for CC-475 CC-475-PS & WF-100	DRIVE COUPLING THREAD	DRIVE COUPLING for CC-325-1 CC-325-HP CC-375-1	DRIVE COUPLING THREAD
.291"-.358" 7.39-9.09 mm	1/4" 6.35 mm	CC-336	1/4" NFM X 10-32 F	CC-335	10-32 F X 10-32 F	CC-334	10-32 M	AT-337-A	5/8" NFF X 1/4" NFF	NA	NA
.359"-.420" 9.09-10.67mm	5/16" 7.94 mm	CC-332	5/16" NFM X 1/4" NFF	CC-331	1/4" NFF X 1/4" NFF	CC-330	1/4" NFM	AT-333-A	5/8" NFF X 5/16" NFF	AT-333	1" NF X 5/16" NF
.421"-.483" 10.67-12.27 mm	3/8" 9.52 mm	CC-324	3/8" NFM X 1/4" NFF	CC-323	1/4" NFF X 1/4" NFF	CC-322	1/4" NFM	AT-321-A	5/8" NFF X 3/8" NFF	AT-352	1" NF X 3/8" NF
.484"-.608" 12.27-15.44 mm	7/16" 11.11 mm	CC-316	7/16" NFM X 5/16" NFF	CC-315	5/16" NFF X 5/16" NFF	CC-314	5/16" NFM	AT-313-A	5/8" NFF X 7/16" NFF	AT-353	1" NF X 7/16" NF
.609"-.737" 15.44-18.72 mm	1/2" 12.7 mm	CC-312	1/2" NFM X 3/8" NFF	CC-311	3/8" NFF X 3/8" NFF	CC-310	3/8" NFM	AT-309-A	5/8" NFF X 1/2" NFF	AT-359	1" NF X 1/2" NF
.738"-.831" 18.72-21.11 mm	9/16" 14.29 mm	CC-308	9/16" NFM X 3/8" NFF	CC-307	3/8" NFF X 3/8" NFF	CC-306	3/8" NFM	AT-305-A	5/8" NFF X 9/16" NFF	AT-355	1" NF X 9/16" NF
.832"-1.055" 21.11-26.80 mm	5/8" 15.88 mm	CC-304	5/8" NFM X 3/8" NFF	CC-303	3/8" NFF X 3/8" NFF	CC-302	3/8" NFM	AT-301-A	5/8" NFF X 5/8" NFF	AT-351	1" NF X 5/8" NF
1.056"-1.561 26.80-39.65 mm	3/4" 19.05 mm	CC-320	3/4" NFM X 7/16" NFF	CC-319	7/16" NFF X 7/16" NFF	CC-318	7/16" NFM	AT-317-A	5/8" NFF X 3/4" NFF	AT-357	1" NF X 3/4" NF
1/650"-2.374" 39.65-60.30 mm	1" 25.40 mm	CC-328	1" NFM X 7/16" NFF	CC-327	7/16" NFF X 7/16" NFF	CC-326	7/16" NFM	AT-325-A	5/8" NFF X 1" NFF	AT-354	1" NF X 1" NF

Selection Guide
Condenser Cleaner Drills and Brushes

AIRETOOL drills are designed especially to prevent damage to the tube ID, and are available in a variety of shapes to remove all types of scale deposits. Grooves in drill shaft enable flushing fluid to reach drill cutting edge, and fluid assists in suspending shafting throughout tube length.



TUBE I. .D		DIAMETER of DRILL or BRUSH		STUD	"AT" Tool Steel Straight	"CB" Carbide Straight	"CT" Carbide Twist	"TW" Tool Steel Twist	"B" Steel Wire
inch	mm	inch	mm	THREAD	DRILL #	DRILL #	DRILL #	DRILL #	BRUSH #
.291-.306	7.39-7.77	.281 "	7.14	10-32	AT-199	CB-199			199-B
.307-.321	7.77-8.15	.296 "	7.52	10-32	AT-199-5	CB-199-5			199-5-B
.322-.337	8.18-8.56	.312 "	7.92	10-32	AT-200	CB-200			200-B
.338-.353	8.59-8.97	.328 "	8.33	10-32	AT-200-5	CB-200-5			200-5-B
.359-.389	9.12-9.88	.343 "	8.71	1/4" NF	AT-201	CB-201		TW-201	201-B
.390-.420	9.91-10.67	.375 "	9.52	1/4" NF	AT-202	CB-202		TW-202	202-B
.421-.452	10.69-11.48	.406 "	10.31	1/4" NF	AT-203	CB-203		TW-203	203-B
.453-.483	11.48-12.27	.437 "	11.10	1/4" NF	AT-204	CB-204		TW-204	204-B
.484-.514	12.29-13.06	.468 "	11.89	5/16" NF	AT-205	CB-205	CT-205	TW-205	205-B
.515-.545	13.08-13.84	.500 "	12.70	5/16" NF	AT-206	CB-206	CT-206	TW-206	206-B
.546-.577	13.87-14.66	.531 "	13.49	5/16" NF	AT-207	CB-207	CT-207	TW-207	207-B
.578-.608	14.68-15.44	.562 "	14.27	5/16" NF	AT-208	CB-208	CT-208	TW-208	208-B
.578-.608	14.68-15.44	.562 "	14.27	3/8' NF	AT-108	CB-108	CT-108	TW-108	108-B
.609-.639	15.47-16.23	.593 "	15.06	3/8' NF	AT209	CB-209	CT-209	TW-209	209-B
.640-.675	16.26-17.15	.625 "	15.88	3/8' NF	AT-210	CB-210	CT-210	TW-210	210-B
.676-.706	17.17-17.93	.656 "	16.66	3/8' NF	AT-211	CB-211	CT-211	TW-211	211-B
.707-.737	17.96-18.72	.687 "	17.45	3/8' NF	AT-212	CB-212	CT-212	TW-212	212-B
.738-.769	18.75-19.53	.718 "	18.24	3/8' NF	AT-213	CB-213	CT-213	TW-213	213-B
.770-.800	19.56-20.32	.750 "	19.05	3/8' NF	AT214	CB-214	CT-214	TW-214	214-B
.801-.831	20.35-21.11	.781 "	19.84	3/8' NF	AT-215	CB-215	CT-215	TW-215	215-B
.832-.862	21.13-21.89	.812 "	20.62	3/8' NF	AT-216	CB-216	CT-216	TW-216	216-B
.863-.894	21.92-22.71	.843 "	21.41	3/8' NF	AT-217	CB-217	CT-217	TW-217	217-B
.895-.925	22.73-23.50	.875 "	22.23	3/8' NF	AT-218	CB-218	CT-218	TW-218	218-B
.926-.956	23.52-24.28	.906 "	23.01	3/8' NF	AT-219	CB-219	CT-219	TW-219	219-B
.957-.987	24.31-25.07	.937 "	23.80	3/8' NF	AT-220	CB-220	CT-220	TW-220	220-B
.988-1.024	25.35-26.01	.968 "	24.59	3/8' NF	AT-221	CB-221	CT-221	TW-221	221-B
1.025-1.055	26.04-26.80	1.000 "	25.40	3/8' NF	AT-222	CB-222	CT-222	TW-222	222-B
1.056-1.086	26.82-27.58	1.031 "	26.19	7/16" NF	AT-223	CB-223	CT-223	TW-223	223-B
1.087-1.117	27.61-28.37	1.062 "	26.97	7/16" NF	AT-224	CB-224	CT-224	TW-224	224-B
1.118-1.149	28.40-29.18	1.093 "	27.76	7/16" NF	AT-225	CB-225	CT-225	TW-225	225-B
1.150-1.180	29.21-29.97	1.125 "	28.58	7/16" NF	AT-226	CB-226	CT-226	TW-226	226-B
1.181-1.211	30.0-30.76	1.156 "	29.36	7/16" NF	AT-227	CB-227	CT-227	TW-227	227-B
1.212-1.242	30.78-31.55	1.187 "	30.15	7/16" NF	AT-228	CB-228	CT-228	TW-228	228-B
1.243-1.280	31.57-32.51	1.218 "	30.94	7/16" NF	AT-229	CB-229	CT-229	TW-229	229-B
1.281-1.311	32.54-33.30	1.250 "	31.75	7/16" NF	AT-230	CB-230	CT-230	TW-230	230-B

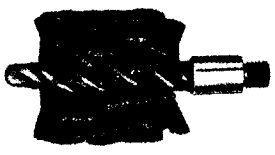
Selection Guide - continued





TUBE I. D.		DIAMETER of DRILL or BRUSH		STUD	"AT" Tool Steel Straight	"CB" Carbide Straight	"CT" Carbide Twist	"TW" Tool Steel Twist	"B" Steel Wire
inch	mm	inch	mm	THREAD	DRILL #	DRILL #	DRILL #	DRILL #	BRUSH #
.291-.306	7.39-7.77	**.281 "**	7.14	**10-32**	AT-199	**CB-199**			199-B
.307-.321	7.77-8.15	**.296 "**	7.52	**10-32**	AT-199-5	**CB-199-5**			199-5-B
.322-.337	8.18-8.56	**.312 "**	7.92	**10-32**	AT-200	**CB-200**			200-B
.338-.353	8.59-8.97	**.328 "**	8.33	**10-32**	AT-200-5	**CB-200-5**			200-5-B
.359-.389	9.12-9.88	**.343 "**	8.71	**1/4" NF**	AT-201	**CB-201**		**TW-201**	201-B
.390-.420	9.91-10.67	**.375 "**	9.52	**1/4" NF**	AT-202	**CB-202**		**TW-202**	202-B
.421-.452	10.69-11.48	**.406 "**	10.31	**1/4" NF**	AT-203	**CB-203**		**TW-203**	203-B
.453-.483	11.48-12.27	**.437 "**	11.10	**1/4" NF**	AT-204	**CB-204**		**TW-204**	204-B
.484-.514	12.29-13.06	**.468 "**	11.89	**5/16" NF**	AT-205	**CB-205**	CT-205	**TW-205**	205-B
.515-.545	13.08-13.84	**.500 "**	12.70	**5/16" NF**	AT-206	**CB-206**	CT-206	**TW-206**	206-B
.546-.577	13.87-14.66	**.531 "**	13.49	**5/16" NF**	AT-207	**CB-207**	CT-207	**TW-207**	207-B
.578-.608	14.68-15.44	**.562 "**	14.27	**5/16" NF**	AT-208	**CB-208**	CT-208	**TW-208**	208-B
.578-.608	14.68-15.44	**.562 "**	14.27	**3/8' NF**	AT-108	**CB-108**	CT-108	**TW-108**	108-B
.609-.639	15.47-16.23	**.593 "**	15.06	**3/8' NF**	AT209	**CB-209**	CT-209	**TW-209**	209-B
.640-.675	16.26-17.15	**.625 "**	15.88	**3/8' NF**	AT-210	**CB-210**	CT-210	**TW-210**	210-B
.676-.706	17.17-17.93	**.656 "**	16.66	**3/8' NF**	AT-211	**CB-211**	CT-211	**TW-211**	211-B
.707-.737	17.96-18.72	**.687 "**	17.45	**3/8' NF**	AT-212	**CB-212**	CT-212	**TW-212**	212-B
.738-.769	18.75-19.53	**.718 "**	18.24	**3/8' NF**	AT-213	**CB-213**	CT-213	**TW-213**	213-B
.770-.800	19.56-20.32	**.750 "**	19.05	**3/8' NF**	AT214	**CB-214**	CT-214	**TW-214**	214-B
.801-.831	20.35-21.11	**.781 "**	19.84	**3/8' NF**	AT-215	**CB-215**	CT-215	**TW-215**	215-B
.832-.862	21.13-21.89	**.812 "**	20.62	**3/8' NF**	AT-216	**CB-216**	CT-216	**TW-216**	216-B
.863-.894	21.92-22.71	**.843 "**	21.41	**3/8' NF**	AT-217	**CB-217**	CT-217	**TW-217**	217-B
.895-.925	22.73-23.50	**.875 "**	22.23	**3/8' NF**	AT-218	**CB-218**	CT-218	**TW-218**	218-B
.926-.956	23.52-24.28	**.906 "**	23.01	**3/8' NF**	AT-219	**CB-219**	CT-219	**TW-219**	219-B
.957-.987	24.31-25.07	**.937 "**	23.80	**3/8' NF**	AT-220	**CB-220**	CT-220	**TW-220**	220-B
.988-1.024	25.35-26.01	**.968 "**	24.59	**3/8' NF**	AT-221	**CB-221**	CT-221	**TW-221**	221-B
1.025-1.055	26.04-26.80	**1.000 "**	25.40	**3/8' NF**	AT-222	**CB-222**	CT-222	**TW-222**	222-B
1.056-1.086	26.82-27.58	**1.031 "**	26.19	**7/16" NF**	AT-223	**CB-223**	CT-223	**TW-223**	223-B
1.087-1.117	27.61-28.37	**1.062 "**	26.97	**7/16" NF**	AT-224	**CB-224**	CT-224	**TW-224**	224-B
1.118-1.149	28.40-29.18	**1.093 "**	27.76	**7/16" NF**	AT-225	**CB-225**	CT-225	**TW-225**	225-B
1.150-1.180	29.21-29.97	**1.125 "**	28.58	**7/16" NF**	AT-226	**CB-226**	CT-226	**TW-226**	226-B
1.181-1.211	30.0-30.76	**1.156 "**	29.36	**7/16" NF**	AT-227	**CB-227**	CT-227	**TW-227**	227-B
1.212-1.242	30.78-31.55	**1.187 "**	30.15	**7/16" NF**	AT-228	**CB-228**	CT-228	**TW-228**	228-B
1.243-1.280	31.57-32.51	**1.218 "**	30.94	**7/16" NF**	AT-229	**CB-229**	CT-229	**TW-229**	229-B
1.281-1.311	32.54-33.30	**1.250 "**	31.75	**7/16" NF**	AT-230	**CB-230**	CT-230	**TW-230**	230-B

LARGE DIAMETER TWIST BRUSHES



DIAMETER OF BRUSH	DESCRIPTION	STUD THREAD	PART NO.	DIAMETER OF BRUSH	DESCRIPTION	STUD THREAD	PART NO.
1/1/2 "	Brush LDTB-1500	5/8 " NC	1003700	2 3/4 "	Brush LDTB-2750	5/8 " NC	1005900
1 5/8"	Brush LDTB-1625	5/8 " NC	1004500	2 7/8 "	Brush LDTB-2875	5/8 " NC	1006200
1 3/4"	Brush LDTB-1750	5/8 " NC	1004300	3 "	Brush LDTB-3000	5/8 " NC	1006500
1 7/8"	Brush LDTB-1875	5/8 " NC	1004600	3 1/4 "	Brush LDTB-3250	5/8 " NC	1007100
2 "	Brush LDTB-2000	5/8 " NC	1004900	3 1/2 "	Brush LDTB-3500	5/8 " NC	1006900
2 1/8 "	Brush LDTB-2125	5/8 " NC	1005800	3 3/4 "	Brush LDTB-3750	5/8 " NC	1007200
2 1/4 "	Brush LDTB-2250	5/8 " NC	1005700	4 "	Brush LDTB-4000	5/8 " NC	1007300
2 1/2 "	Brush LDTB-2500	5/8 " NC	1005400				

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
Tel: 248-391-3700
Fax: 248-391-7824

Houston, TX
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Sales & Service Center
6550 West Sam Houston
Parkway North, Suite 200
Houston, TX 77041
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Fax: 713-849-2047

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

Los Angeles, CA
Apex Tool Group
Sales & Service Center
15503 Blackburn Avenue
Norwalk, CA 90650
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Fax: 562-802-1718

Seattle, WA
Apex Tool Group
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2865 152nd Avenue N.E.
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