Model 400 Cuber
Safety, Operations, Service, & Maintenance

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MODEL 400 CUBER
SAFETY CONSIDERATIONS

All Model 400 Cubers must have regular scheduled service and maintenance to continue to operate properly. Due to excessive pressure, wear and the rotational speeds of the 500 Cuber, the die, press plates and auger must be inspected daily. Replace or repair as noted in the Service section of this manual.

NOTICE All operators and maintenance personnel must receive training at least annually to comply with OSHAA CFR 1928.57. It is the employer's responsibility to insure that all individuals associated with the Model 400 Cuber read, understand, and comply with operating and safety instructions discussed in the OSHA standards and this manual.

⚠ WARNING **DEATH OR SEVERE INJURY CAN RESULT FROM IMPROPER OPERATION, SERVICE, OR MAINTENANCE OF THE MODEL 400 CUBER EQUIPMENT!**

⚠ WARNING **MODIFICATION OF CUBER EQUIPMENT WITHOUT AUTHORIZATION FROM COOPER EQUIPMENT MAY ALSO RESULT IN SEVERE INJURY OR DEATH!**

⚠ WARNING MODEL 400 CUBER MACHINES MUST BE FULLY STOPPED, DISCONNECTED FROM POWER, AND **LOCKED-OUT** PRIOR TO ANY SERVICE OR MAINTENANCE BEING PERFORMED ON THEM. (RE: OSHA CFR 1910.147). **FAILURE TO DO SO MAY RESULT IN SEVERE INJURY OR DEATH!**

SAFETY RULES
WIRING AND MOTOR CONTROLS

1. Wiring and motor controls for both all Cooper Cubers must be installed by a qualified electrician. The power load required for the cuber should be determined in conjunction with the local power company.

   CAUTION All electrical installations must conform to the latest edition of the "National Electric Code", NEPA No. 70, REA requirements, state and local codes.

2. The electrical supply to the cuber must have a method of power disconnect that conforms with OSHA 1910.147, **LOCK-OUT** procedures. Each person involved in the service, maintenance, or operation of the cuber should possess a key and padlock to comply with the lock-out procedure.

3. Consult your local power company prior to adding an extra motor to the cuber.

   a. Be certain that the operation of the extra motor load will not produce excess line disturbance.

   b. Input voltages must be held within 10% of the rated capacity of the motor(s) as shown on the nameplate.

   NOTICE *Electric motors produce rated output only when adequate voltage is maintained at the motor terminals. When adding an additional motor to a cuber, the existing wiring and the new wiring for the additional motor, together with the voltage regulation provided by the power company, determine the voltage available to the motor terminals. Allowable voltage variations are specified on the motor nameplate. Generally, allowable voltage is within a range of plus or minus 10 percent. A motor rated at 440 volts can be expected to operate reliably with a terminal voltage not lower than 396 volts or higher than 484 volts.*

4. Cuber installations should be protected from rain, snow, dust, and other foreign material, as well as damage that can be incurred by vehicles, falling objects, and other unsafe items. Accessibility of all switches, push buttons, or other controls should be out of the reach of children.

5. All conduits, switch enclosures, motor frames, and other metallic parts of the machinery and equipment should be electrically grounded.

6. Install a magnetic starter to provide low-voltage release. In the event of motor overload, power outage, or abnormally low voltage, it will automatically shut off

voltage to the cuber. The motor will have to be manually restarted.

a. Some motors may have built in thermal overload protectors. Only those motors that require manual reset of this overload device should be used.

INSTALLATION OF MODEL 400 CUBER

Physical Preparation

1. The cuber must be level and secured to a concrete slab prior to operation insuring proper alignment with other elements in the cubing system.

2. Dimensions of the slab must be no less than the length and width of the press plus 24".

Electrical Preparation

1. The Model 400 Cuber with one motor requires an input voltage of xx volts.

2. The dual motor version of the cuber will require an additional input of xx volts.

3. All power switches must conform to the OSHA CFR 1910.147 LOCK-OUT regulations with a key and padlock for each individual working with the machine.

4. WARNING FAILURE TO PROPERLY DISCONNECT POWER AND **LOCK-OUT** THE CUBER SYSTEM COULD RESULT IN SEVERE INJURY OR DEATH!

PREPARING FOR CUBING

Pressure and adhesion are the two necessary factors in the production of dense and durable cubes. Cubes are formed under high pressure in the die ring. A combination of high pressure and the natural adhesive in the product being cubed allow the bonding action to take place. Addition of some water may prove helpful to the bonding action.

MATERIALS THAT CAN BE CUBED

Alfalfa hay has been the main product cubed in the past. Current processes include wood, paper, and other cellulose material cubed for fuel and other uses. The basic processes for cubing hay are used in the compaction and cubing of these other materials.

PREPARATION FOR CUBING

Material to be cubed should be ground or chopped to at least 1 1/2 inches in length to obtain good cube quality. Moisture content can vary for different material, but should be in the 10 to 20% range. Moisture is generally added to the material as it enters the cuber. Too much moisture may cause the cubing process to produce unsatisfactory product. The operator will need to evaluate the cubes during the process to determine the proper moisture content required to provide an acceptable product.

Additives may be added to the cubes as they are being formed. Proportions of the additives will change from product to product and the operator will have to experiment to get the proper results.

OPERATION OF THE CUBER MODEL 400

CUBER START UP

1. Remove the **LOCK-OUT** padlock.
2. Depress the start up power switch and allow the cuber to reach its full operating speed.
3. Inspect the machine and be certain all components are operating freely.
4. Adjust the metering system to its lowest rate and begin feeding material in the mixer box.
5. If the die openings are empty, add a little water to the material to begin forming cubes.
6. NOTICE If the die openings are full, DO NOT ADD WATER, BENTONITE, LIME OR ANY OTHER ADDITIVE until cubes have moved through at least two thirds of the die.

CUBER RUN-TIME PARAMETERS

1. Friction from the material will cause the die ring to heat up to approximately 175 degrees Fahrenheit or 79 degrees Celsius. This is the approximate operating temperature. It generally takes 5 to 10 minutes to reach operating temperature. This will vary depending on the material being cubed and other environmental conditions, such as air temperature.
   NOTICE **DO NOT** finalize the moisture setting until the die ring has reached its operating temperature.

2. During the warm-up period, a build up of material may occur in the dies. The build up will clear out faster and easier if moisture spray is reduced. Some fine materials can be expected during the warm-up period.

3. After operating temperature is reached, adjust the moisture until the machine forms hard, dense cubes that break off cleanly and uniformly when they contact the cube deflector.

4. Cubes containing too much water will tend to curve out from the deflector and not separate. Those requiring more water will flake off into fine particles before contacting the deflector.

5. Slowly increase the feed rate as the die rings heat up. Increase the moisture to produce the desired cube. Increase the speed until the machine is operating smoothly and efficiently.

   NOTICE *Attempting to operate too close to maximum power may result in slugging and excessive wear and load on the machine components.*

CUBE STORAGE AND HANDLING

The moisture content on properly produced cubes will range from 12 to 15 percent. Cubes will feel moist and warm as they exit the dies.

Properly produced cubes will store without problems. Excessive moisture added during the cubing process may become moldy during storage.

Cubes may be transported with a conventional belt or drag-type conveyor. Cooper Equipment does not recommend the use of screw-type conveyors due to rough handling and generation of fine particulate. Cubes should be evenly distributed over the pile to eliminate the concentration of fine particulate at the center.

SERVICE AND ADJUSTMENT OF THE MODEL 400 CUBER

End Cap Inspection Windows

WARNING To insure your safety when servicing and maintaining this equipment always disconnect the power and follow OSHA CFR 1210.147 LOCK-OUT procedures.

Five inspection windows are provided in the end cap for inspection and clean-out purposes. Each window is mounted with 5/8" bolts. Inspection windows are stamped with numbers 1 through 5. Each end cap is marked with a corresponding number to indicate the window location. Tighten the mounting bolts to 185 ft-lbs torque when replacing the windows.

NOTICE *Each inspection door must be installed in the proper opening having a matching position number.*

Lifting Lug

A lifting lug is provided for use in conjunction with a chain fall in order to remove the end cap, die ring assembly, or the inner drum assembly. Install the lifting lug by bolting it into the two tapped holes at the top of the end cap. Two 5/8” x 1 ½” bolts are required to secure the lifting lug.

Servicing End Cap, Press Wheel and Dies

WARNING To insure your safety when servicing and maintaining this equipment always disconnect the power and follow OSHA CFR 1210.147 **LOCK-OUT** procedures.

The procedure for removing and inspecting is as follows (RE: Figure 1).

1. Remove Cube Breaker

2. Install lifting lug (as direct above)

3. Attach chain fall to trolley and attach hook to lifting lug. Tighten chain to the point that there is no slack.

4. Remove bearing cover cap for end cap (part # EC1112)

5. Remove Lock Plate (part # EC42901)

6. Remove Bearing Spacer (part #EC31635MD500)

7. Remove the die bolts on the end cap side of the dies (132-5/8" bolts for the 66 die configuration or 180 - 5/8" bolts for the 90 die configuration).

8. NOTICE *Check to see that the chain fall is attached to the end cap and that the chain is snug.*

9. Use a large pry bar wedged between the lifting lug on the end cap and the trolley frame mount to break the end cap loose. Once the end cap is loose pull it toward yourself and off of the half-crank shaft. Sit the end cap down on the floor back far enough that you will have room to work on the cuber. Place end cap down in a clean spot with the wear plate side up. Cover the bearing to keep it clean.

10. After removing the end cap, remove the end cap shims (Part # E30729). These will be found in both the bearing Journal (Part # ID10010) and the rear of the end cap bearing. Collect the shims, CLEAN and COUNT them, then store in a safe place until required for reinstallation.
11. Inspect wear plates for excessive wear. Generally wear plates will be replaced when every other set of dies are replaced.

12. If wear plates are to be replaced.
    a. clean hex bolt holes, so an Allen wrench can be installed to remove the bolts holding the wear plate;
    b. use a torch with a heating tip to heat the outer portion of each bolt;
    c. move in a circular motion heating the bolt to a dull red, until you have worked your way around the end cap;
    d. after allowing the bolts to cool, remove all wear plate bolts
    e. remove wear plates;
    f. with a wire wheel, clean and debur wear plate mounting area on the end cap;
    g. debur the end cap face with a sharping stone;
    h. place new wear plates on the end cap;
    i. insert and tighten wear plate bolts using blue removable lock-tight; tighten bolts to NNNN ft. pounds of torque.
    j. Holding it very flat use a 9" hand grinder to grind the new wear plate bolts flush with the wear plate surface;

13. Using a forklift, raise the end cap high enough to place a pail under the center portion of it.

14. Thoroughly clean the end cap bearing with a solvent blow gun. Catch the solvent in the pail below the bearing.

15. Inspect the bearing for wear and replace if necessary.
    a. For bearing replacement follow the same procedure for removing the wear plate bolts then remove the seal retainer ring (part #E39006);
    b. Remove front and rear seals and end cap bearing;
    c. Install new bearing, rear seal (Part# 415027) and install seal

retainer ring. NOTICE **DO NOT** install front seal at this time.

Die Replacement

1. begin at the top of the cuber;

2. remove the rear die bolt (Figure X) from 10 die by working your way around the machine.

   CAUTION *DO NOT drop die. 10 standard die weigh approximately 70 pounds. Serious injury or damage to equipment could result.*

3. After removing all die, use a wire wheel to clean the die mounting surface.

4. check for and debur the mounting surface with a sharpening stone;

5. remove half crank (part # ID10010);
   a. remove the three 1" counter-bored Allen head bolts using a ¾" Allen wrench;
   b. remove the two lock plate (part # P 42901) 5/8" flat head Allen bolts with a 3/8" Allen wrench;
   c. remove the four set screw plugs;
   d. install 5/8" X 5" hardened push off bolts.
   e. hook the overhead chain around two of the push off bolts;
   f. begin turning the push off bolts equally to remove the half crank. Keep the overhead chain snug and secure.
   g. NOTICE COUNT , CLEAN then store press wheel shims (part # 35225) on the press wheel pin;
   h. place a plate clamp to the upper, outer edge of the wheel;
   i. use the chain fall to slide the press wheel forward off of the press wheel shaft;

6. Remove the rear press wheel spacer (part #35207); clean and inspect it for wear.

7. Remove existing press wheel shims (part #35225) clean, count, and store until reinstallation.

8. Clean and inspect the press wheel shaft (part # 42413) for wear and burs. Replace if necessary and debur accordingly.

9. Replace shims removed earlier, with either the same shims or same quantity removed. The total number of shims on the press wheel shaft must always equal eight.

10. Install required number of press wheel shims (part# P35225) Replace press wheel bearing spacer (part # 35207 DOES NOT have a grease relief fitting.)

    NOTICE *To correctly set up the preload on the press wheel bearing a total of eight shims is required. These shims can be install on either or both sides of the press wheel in any combination. We recommend 4 on backside of the press wheel and 4 on the front side of the press wheel.*

11. Replace press wheel with serial numbers facing the end cap.

12. Replace press wheel bearing spacer (part # 36257). Note: DOES have a grease relief fitting.

13. Install the remaining press wheel shims (part #P35225).

14. Clean and inspect the half crank and half crank mounting surface then reinstall half crank.
    a. Torque the three 1" Allen Bolts to 675 Ft./Lb.
    b. Torque the two 5/8" flat head Allen bolts to 212 Ft/Lbs.
    c. NOTICE *Always grease the press wheel at this point. Ensure that grease is going into the press wheel and purging out the grease relief.*

15. Adjust fireguard so that the front edge of the fireguard is flush with the front edge of the press wheel. After adjusting the fireguard check to insure the fireguard bolts are securely tightened.

16. We recommend a light coat of oil or light grease be applied to the die surface of both the end cap and the slick ring on the outer drum as well as the half crank. This will aid in preventing damage caused by the corrosive action of the product being cubed.

17. Install four die at 90 degrees from each other on the die face. Install die bolts with high temperature grease on bolt thread.

18. Install the half crank bearing journal. Use the same shims or the same number of new shims as were removed during disassembly.

19. Install end cap. Install die bolts with high temperature grease on the threads. Mount the end cap to the four dies on the mounting face.

20. Install spacer (part # 31635-500) on the half crank shaft.

21. Install the Lock plate (part # EC42901) and secure with two 5/8" X 2 ½", grade 8 bolts; torque bolts to 185 Ft/Lbs.

22. Check clearances between the press wheel face and wear plates face.
    a. Clearance is not be less than .030" in order that the wheel will turn freely;
    b. if the press wheel clearance is too tight add shims (part # E30729);
    c. if press wheel clearance is excessive remove shims;

23. Loosen the front bolts in locking plate.

24. Loosen front die bolts two turns.

25. Pry end cap forward to allow clearance to re-install the die.

26. Working from the bottom to the top in both directions install die one at a time, including all the bolts as you go.
    NOTICE *Apply a high temperature grease or anti-seize compound to the die bolts.*

27. After all the die and die bolts have been installed, tighten all die bolts.
    a. Tighten all the rear die bolts, then the front bolts;
    b. Torque die bolts to approximately 185 Ft/Lbs.

28. Torque the lock plate bolts to 185 Ft/Lbs.

29. Recheck Press wheel clearances and make sure that cuber turns over freely by hand rotating the cuber via high speed end of the gearbox.

30. Replace the end cap cover, inspection doors and cube breaker.

31. Grease both the press wheel and the end cap bearings until both purge through the grease relief.

Lubrication and Regular Service

The intervals at which the various working parts of your cuber should be checked, lubricated, serviced, or adjusted are based on hours of operation. These recommendations may need to be adjusted to compensate for differences in environmental conditions.

Lubricants

NOTICE Use only HIGH-TEMPERATURE Shell Aeroshell #5 grease in the locations specified to insure maximum bearing protection. Use AMGA #4, 4EP, ISO Grade 150 and SAE Grade 40 gear oil in the planetary gear box. If the planetary gear box operates under extreme conditions or is exposed to large temperature fluctuations, synthetic oil is recommended by the gear box manufacturer (Rexnord). Contact your lubrication supplier for recommendations.

CAUTION *Failure to use the specified lubricants may result in catastrophic failure of the cuber machine!*

NOTICE Synthetic lubricants must conform to the requirements of ANSI/AGMA 9005-D94.

Gearbox Lubrication Changes

Oil - For normal conditions, **change oil every six months or 2,500 hours,** whichever comes first. If operating under abnormal conditions such as high temperature, severe duty, moisture or particle contamination, oil may need to be changed more frequently.

Grease - All reducers are furnished with grease purge seals, thus minimizing entry of water or abrasive dust into the reducer. Reducers are shipped with the grease cavity filled with No. 2 grease. For normal conditions change grease every six months or 2,500 hours, whichever comes first. Under extreme conditions, grease may need to be changed more frequently.

SERVICE LOCATION	SERVICE DURING INSTALL-ATION	DAILY LUBRICATION every 10 hours of operation
Press wheel Bearing	20 ounces or until seals purge grease	10 ounces or until seals purge grease
End Cap Bearing	30 ounces or until seals purge grease	10 Ounces or until seals purge grease
Rear Bearing	30 ounces	2 ounces
Coupler	42 ounces	2 ounces or 10 ounces Weekly
Gearbox		10 ounces or until seals purge grease
Electric Motor		10 ounces or until seals purge grease

Table 1 - Lubrication Schedule

FIGURES

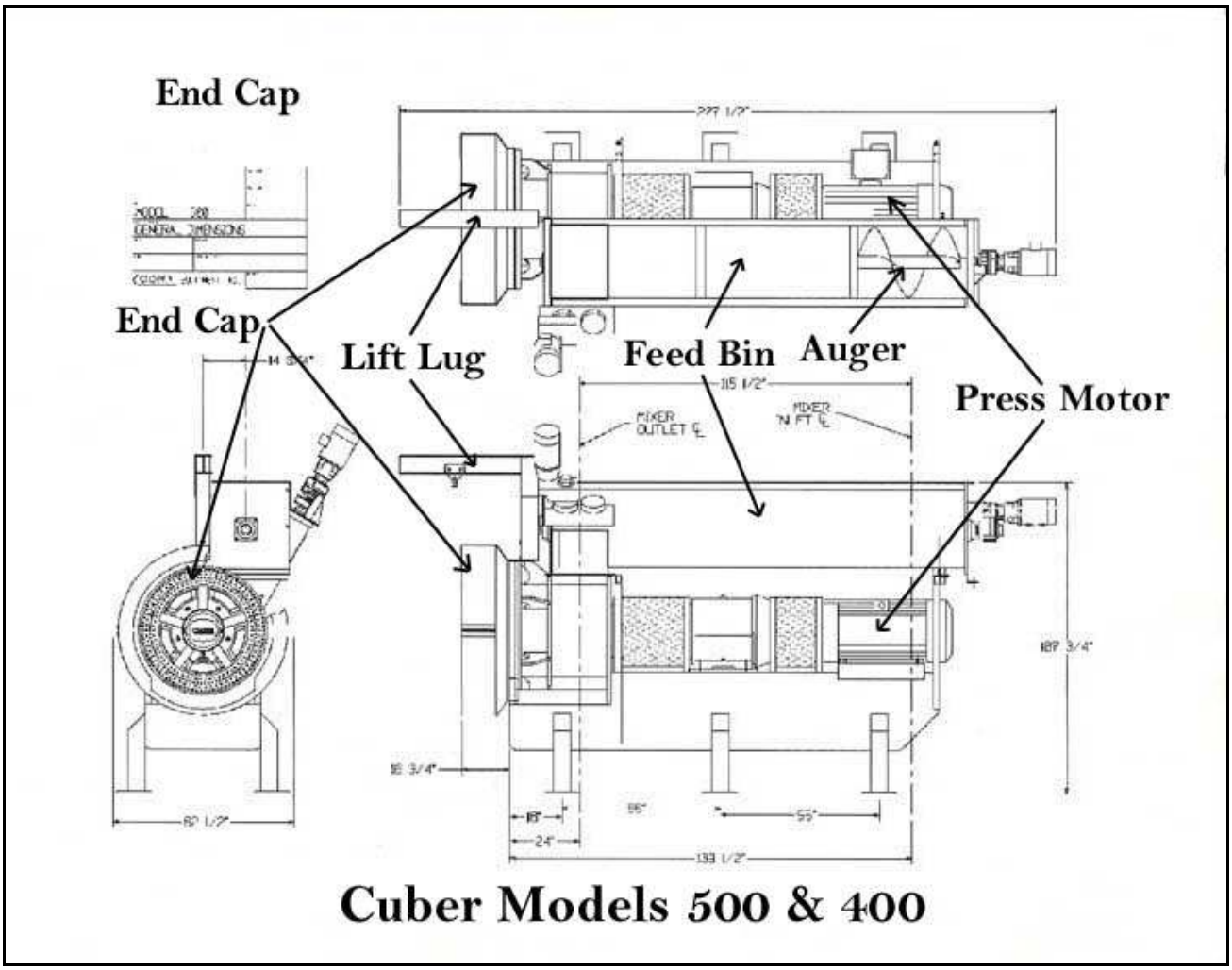
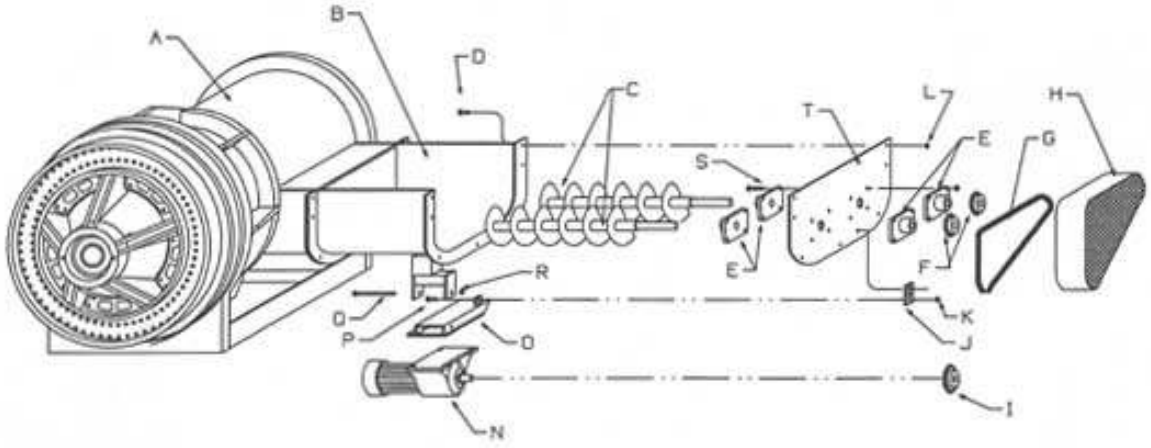


Figure 1 – Model 400 Cuber

(Parts for Model 500 Cuber and Model 400 Cuber are identical except for the material feeder.)

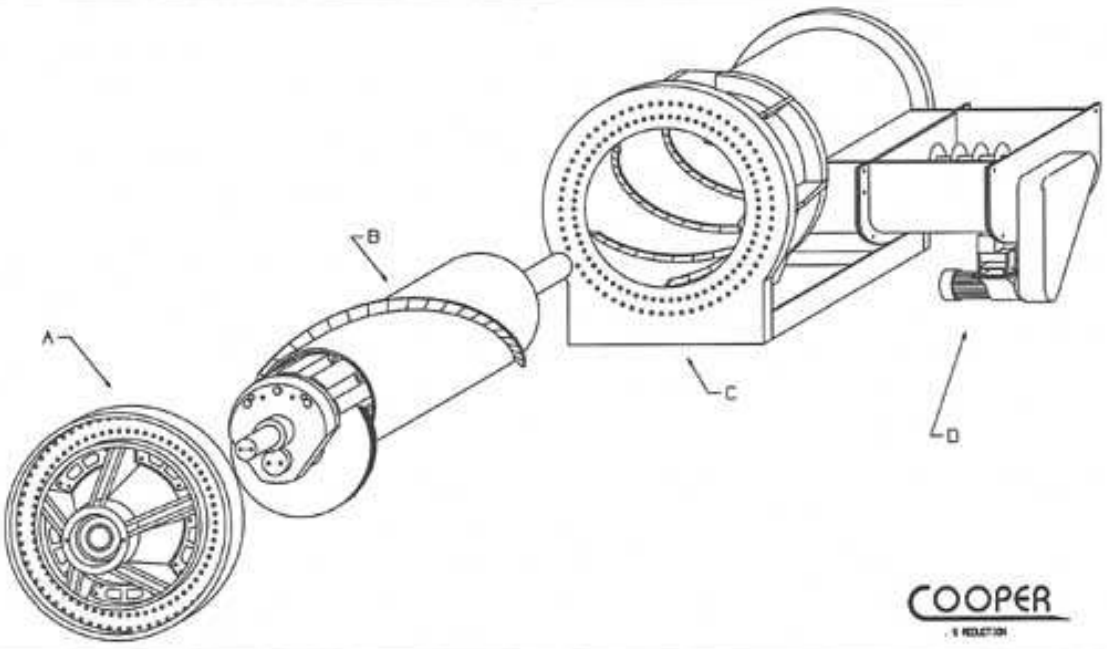


COOPER

Key	Part Number	Description
A	91400	CUBER
B	BF7501	AUGER TROUGH
C	BF7010	INFEED AUGER (2 USED)
D	BT5200	BOLTS (1/2" X 2") 2 USED
E	VCJ150	BEARING (4 USED)
F	60B18	SPROCKET (2 USED)
G	CHN600	DRIVE CHAIN
H	BF7555	GUARD
I	60B22	SPROKET
	PRIOR TO 1993	1 1/2" BORE
	1993 AND LATER	1 5/8" BORE
J	BF8010	TENSION BRACKET
K	NT500	1/2" NUT (1 USED)
L	NT500	1/2" NUT (7 USED)
M	NT500	1/2" NUT (8 USED)
N	BF9000	2 HORSEPOWER GEARMOTOR (PRIOR TO 1993)
		5 HORSEPOWER GEARMOTOR (1993 AND LATER)
O	BF8000	MOTOR BRACKET
P	BT1750	BOLT (1/2" X 1 3/4")
Q	BT2700	BOLT (1/2" X 7")
R	NT500	1/2" NUT
S	BT5275	BOLTS (1/2" X 2 3/4") (8 USED)
T	BF7502	BEARING SUPPORT PLATE

91-400 CUBER

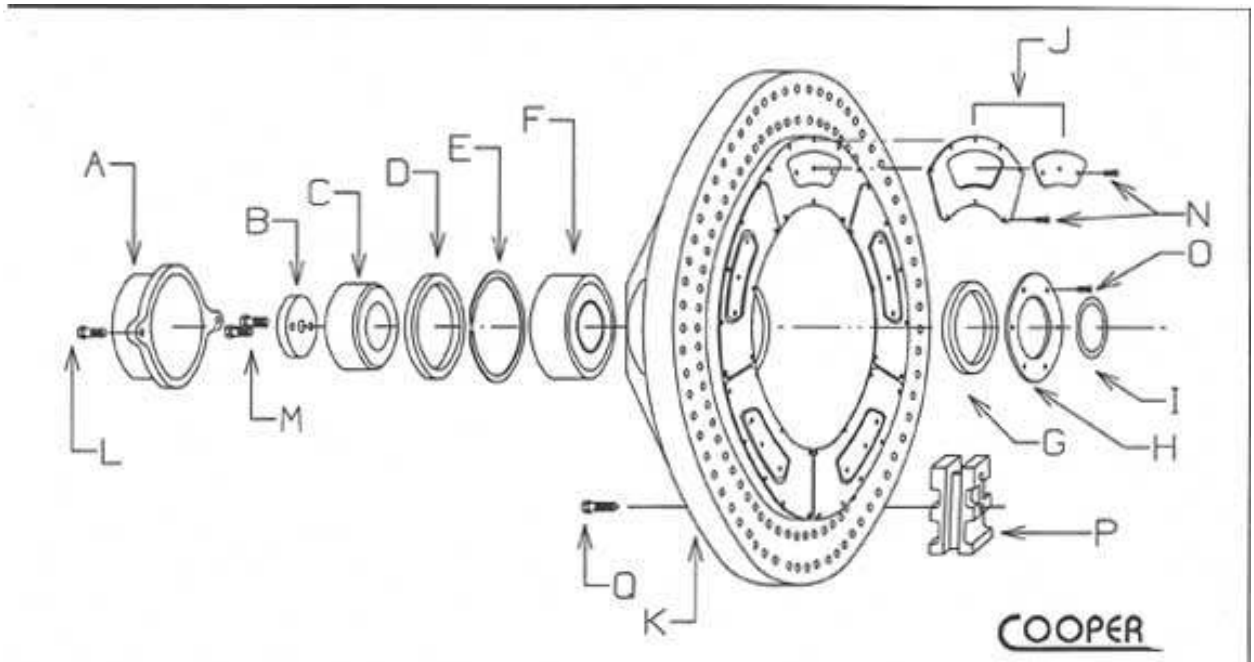
BOTFED ** SZ14



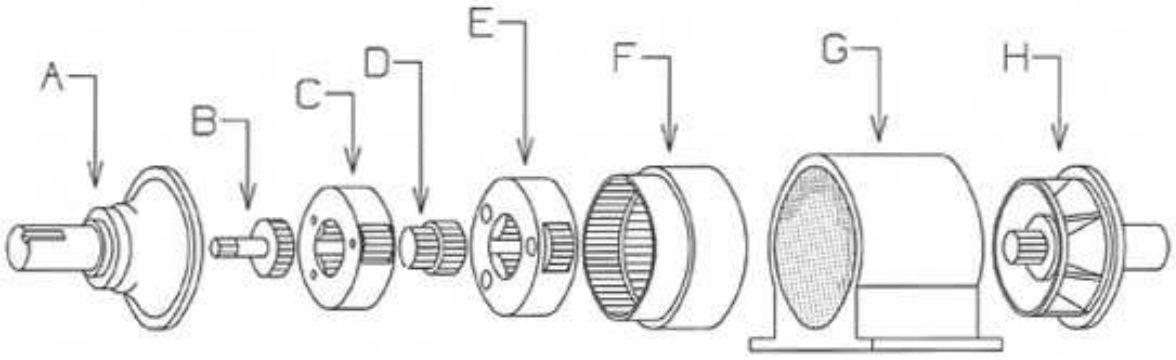
Key	Part Number	Description
A	EC26414A	END CAP ASSEMBLY
B	IN6000	AUGER TUBE ASSEMBLY
C	OT6010	OUTER DRUM ASSEMBLY
D	BT6000	BUTTOM FEED SYSTEM

91-400 CUBER

CUBER1 ** SZ14



Key	Part Number	Description
A	EC11112	BEARING COVER
B	EC42981	LOCK PLATE
C	E31635	SPACER
D	E416239	OIL SEAL
E	E31927	SNAP RING
F	E22328	ROLLER BEARING
G	E415827	OIL SEAL
H	E39286	OIL SEAL RETAINER
I	E38729	SHIM (USE AS REQUIRED)
J	E48973	WEARPLATES (5 REQUIRED)
K	EC26414	RIGHT END CAP
L	CH6125	SOCKET HEAD CAP SCREWS (2 USED) 5/8" X 1 1/4"
M	BT6125	BOLTS (2 USED) 5/8" X 1/14" GRADE 8
N	SW2358	5/16" X 3/4" FLAT HEAD ALLEN SWREWS (55 USED)
O	SH2358	5/16" X 3/4" FLAT HEAD ALLEN SCREWS (6 USED)
P	D49913	DIE (66 USED)
Q	BT6200	BOLTS (132 USED) 5/8" X 2" GRADE 8



SATURN DOUBLE REDUCTION

NOMINAL RATIO = 13.85

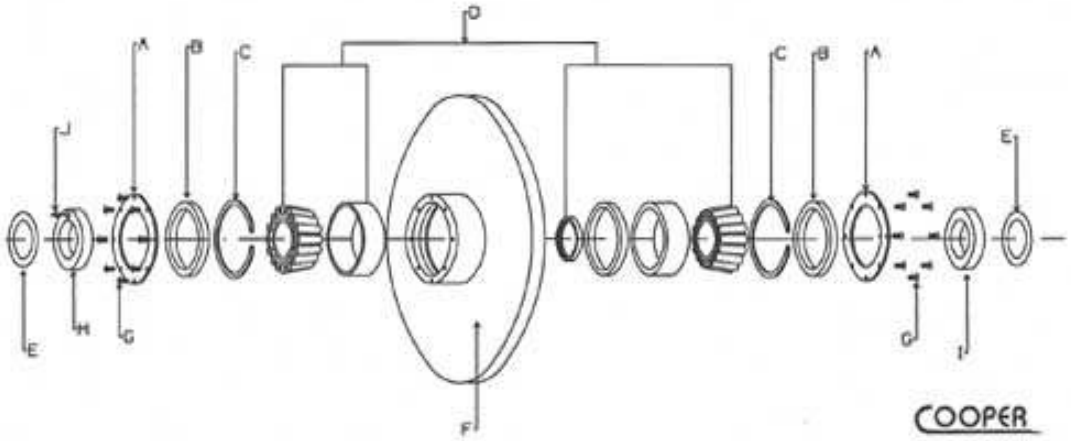
COOPER

Key	Part Number	Description
A	SR5100103A	INPUT SUB ASSEMBLY
B	SR5100135A	INPUT GEAR
C	SR3200537A	CARRIER SUB ASSEMBLY
D	SRF100047A	SUB GEAR
E	SRF200531A	CARRIER SUB ASSEMBLY
F	SR5400004A	RING GEAR
G	SR5400401	MAINCASE
H	SR5500106A	OUTPUT SUB ASSEMBLY

91-400 CUBER

GEARBOX ** SZ14

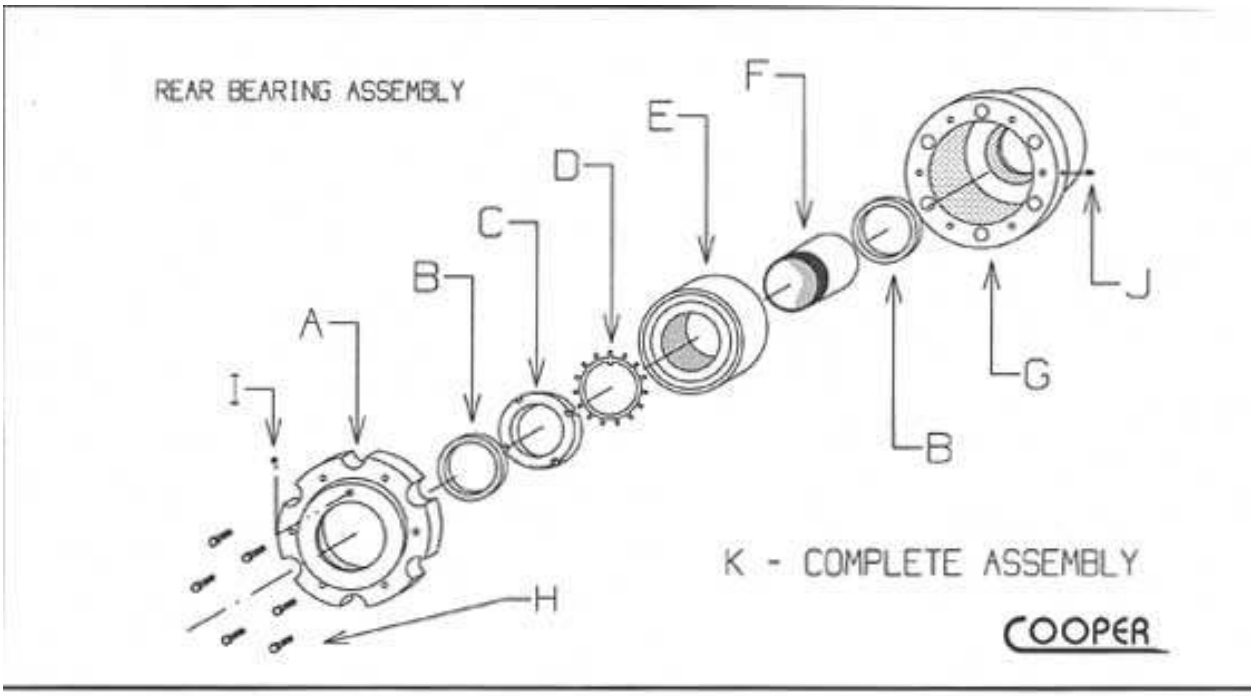
PRESSWHEEL ASSEMBLY



COOPER

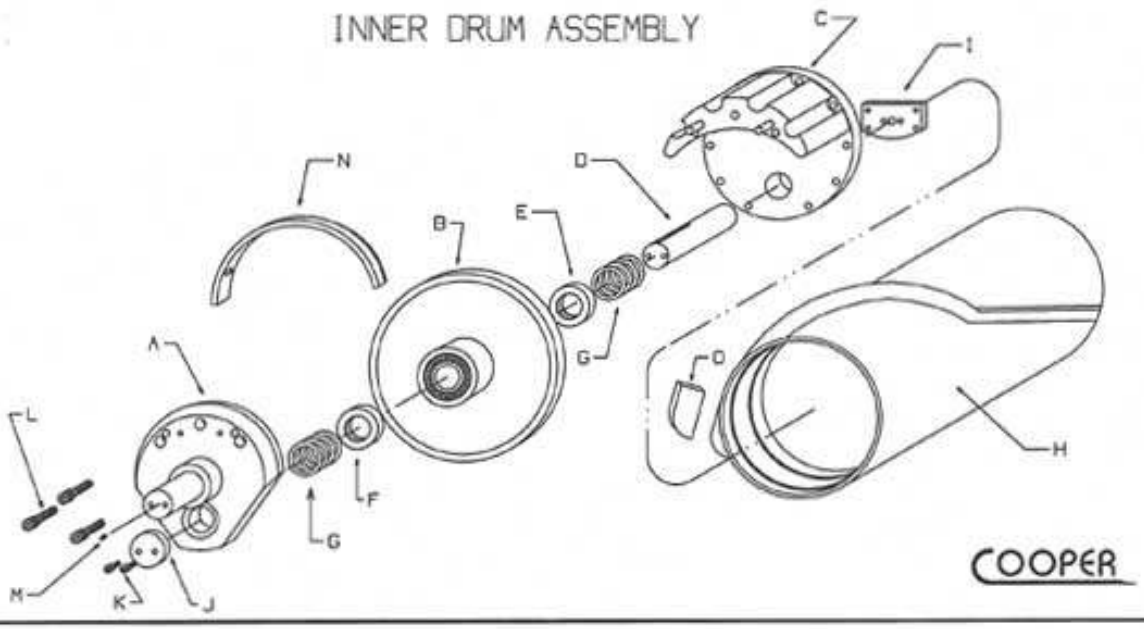
Key	Part Number	Description
A	P39005	SEAL RETAINER (2 USED)
B	P43217	OIL SEAL (2 USED)
C	P42405	SNAP RING .187 USED AS REQUIRED
	P42406	SNAP RING .177 USED AS REQUIRED
	P42407	SNAP RING .167 USED AS REQUIRED
	P31919	SNAP RING .156 USED AS REQUIRED
	P42409	SNAP RING .147 USED AS REQUIRED
D	P25830	ROLLER BEARING ASSEMBLY
E	P35225	SHIM (8 USED)
F	P25511	PRESSWHEEL (ASSEMBLY #P42412)
G	P11379	FLAT HEAD SOCKET SCREW (16 USED) 5/16" X 5/8"
H	P36257	BEARING SPACER RIGHT HAND
I	P35207	BEARING SPACER LEFT HAND
J	P14814	GREASE RELIEF FITTING

91-400 CUBER
PWHEEL ** SZ14



Key	Part Number	Description
A	BH400	BEARING HOUSING COVER
B	BH5057	OIL SEAL (2 USED)
C	BH6002	ADJUSTING NUT
D	BH6001	LOCK PLATE
E	BH22228	SHHERICAL SELF ALIGNING BEARING
F	BHS000	TAPERED BEARING ADAPTER
G	BH401	BEARING HOUSING
H	BT5125	BOLTS (6 USED) 1/2" X 1 1/2"
I	P14814	GREASE RELIEF FITTING .125 NPT
J	P14518	GREASE ZERK .125 NPT
K	BH40012	REAR BEARING HOUSING ASSEMBLY

INNER DRUM ASSEMBLY



COOPER

Key	Part Number	Description
A	ID12018	HALF CRANK
B	P42412	PRESSWHEEL ASSEMBLY (PG. 5)
C	ID12011	HALF CRANK WEB
D	P42413	PRESSWHEEL SHAFT
E	P35207	BEARING SPACER LEFT HAND
F	P36257	BEARING SPACER LEFT HAND
G	P35225	SHIMS (8 USED)
H	ID10000	AUGER TUBE
I	P42900	REAR SHAFT LOCK
J	P42901	LOCK PLATE
K	BT6175	BOLTS (2 USED) 5/8" X 1 3/4" GRADE 8
L	CH0103	SOCKET HEAD CAP SCREWS (3 USED) 1" X 3" GRADE 8
M	P14518	GREASE ZERK .125 NPT
N	P25732	FIRE GUARD
O	CA30078	WEAR PAD AUGER END
P	IN6000	COMPLETE AUGER ASSEMBLY

91-400 CUBER
INNRDRUM '' SZ14