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MODEL 184 GRANULATOR INSTRUCTION MANUAL

Plastics Machinery

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MACHINE DATA

MODEL _____

SERIAL NUMBER _____

CUMBERLAND CUSTOM ORDER NUMBER _____

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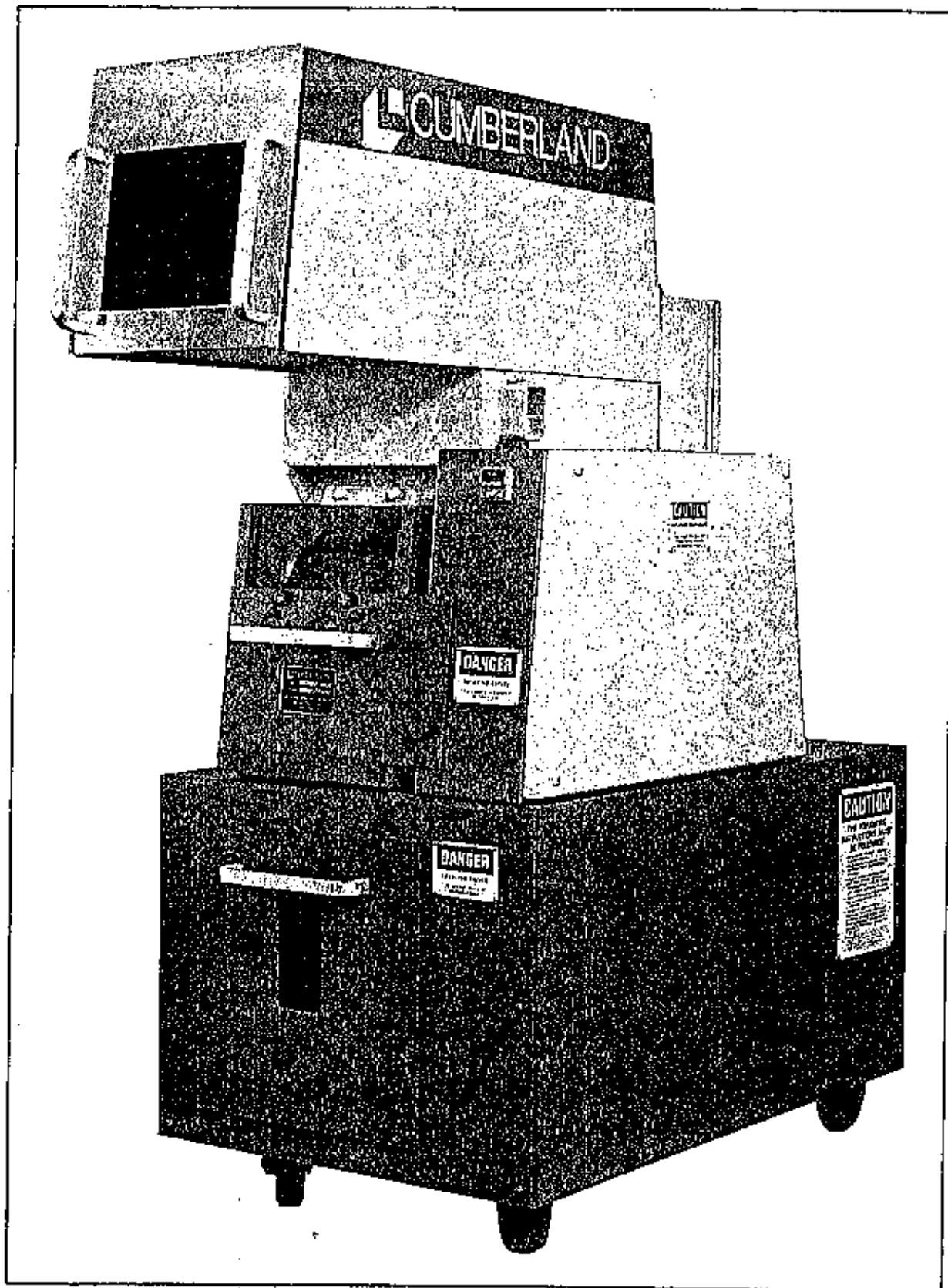
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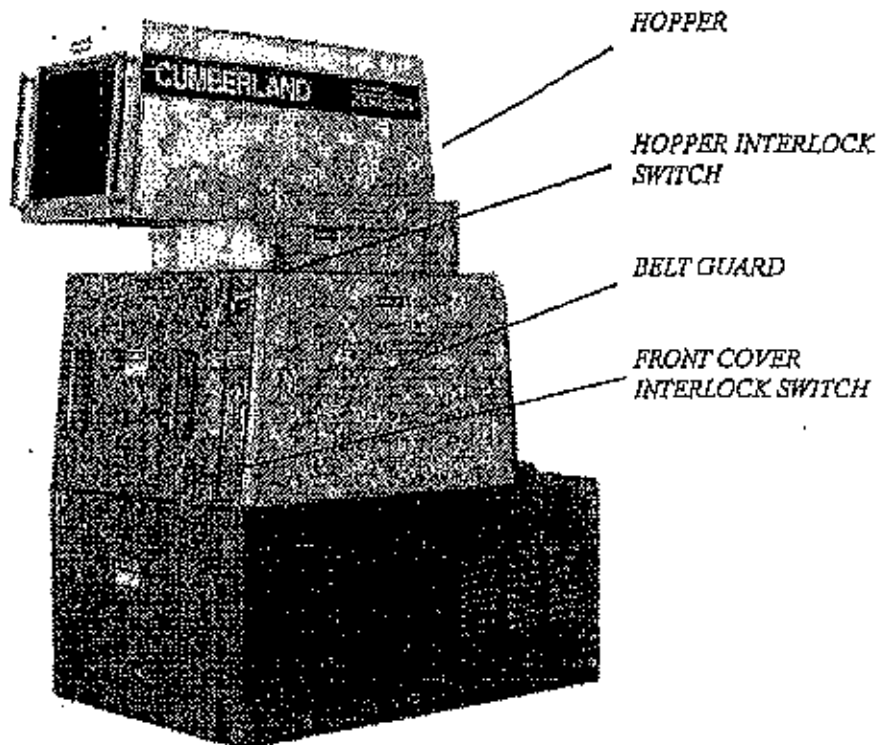
Model 184 Granulator

CUMBERLAND ENGINEERING

ATTENTION OWNERS OF CUMBERLAND SERIES 'A' GRANULATORS

UPDATED INSTRUCTIONS FOR INSURING PROPER OPERATION OF INTERLOCK SWITCHES ON SERIES 'A' GRANULATORS

GRANULATOR MODEL NUMBERS AFFECTED: 184, 190, 284, 290, 384, 390, 484, 490, 584, 590, 684, 690 AND 1426I



Typical Series A Granulator

OPERATING INSTRUCTIONS

1. Always be sure that the tapped holes for the interlock actuator bolts are free of dirt, plastic dust or particles before replacing the actuator bolt.
2. Do not use air wrenches to remove or install interlock switch actuator bolts. The time required to un-thread the actuator bolts with conventional manual wrenches should allow the rotor to come to a complete stop.

ALWAYS BE SURE THE ROTOR HAS COME TO A COMPLETE STOP BEFORE OPENING ANY COVER, GUARD OR HOPPER

An inspection port is provided on the belt guard to observe the belt movement and rotation. Depending on plant operating conditions, a flashlight may be required to observe the movement.

3. Test the proper operation of interlock switches daily, or at least weekly, depending on machine usage. It is recommended that the switch operation be tested daily for two or three shift operations.
4. Since granulate material or dust could collect or build up inside the belt guard, periodic cleaning and removal of material may be required to maintain proper operation of interlock switches and the belt drive.

INTERLOCK SWITCH TEST PROCEDURE

1. Depress the stop/start push button to shut down the granulator.
2. Disconnect and lockout the main power supply to the granulator, as required by OSHA's Lockout/Tag out requirements.
3. Using the wiring diagram supplied with your granulator or by tracing the wires from the interlock switches, locate the interlock switch wire numbers on the terminal strip in the control panel. They will usually be marked #1 & #3, #3 & #4 and #4 & 5 etc. depending on how many switches are used on your machine.
4. Connect the leads of an ohm meter across each interlock switch or across all interlock switches (wires #1 and #5). Set ohm meter on the lowest resistance scale. When the interlock actuator bolts are in place and properly activating the switch, the ohm meter will read zero resistance.
5. Loosen the actuator bolt of each interlock switch (usually about 3 or 4 turns) one at a time, until the ohm meter reads infinite resistance. If the meter reads infinity before the bolt can be completely removed, the interlock is working. If the actuator bolt can be completely removed and the resistance does not read infinity, the interlock is not working and the complete mechanism including the switch must be removed and disassembled to determine the cause of the malfunction.

If an ohm meter is not available, the interlock switches can be checked by loosening the actuator bolt while the machine is running, until the power to the motor disconnects and shuts down the machine. The indicator light on the stop/start pushbutton will go out or you may be able to hear a change in sound when the power disconnects. If the actuator bolt can be completely removed and the power does not disconnect, the interlock switch is not working and the complete mechanism needs to be removed and disassembled to determine the cause of malfunction.

If testing determines that an interlock switch is not working, **BE SURE TO SHUT DOWN THE GRANULATOR, PULL IT OUT OF SERVICE AND LOCKOUT THE MAIN POWER** before removing the front cover, opening the hopper or attempting to gain access to the interlock switches. The interlock switches and mechanisms can be accessed by removing the belt guard on the right side of the granulator. In some cases, it may be necessary to remove or slide back the flywheel to completely remove the interlock switch assemblies.

Safety Instructions

**STOP
BEFORE YOU START
IMPORTANT**

**DO NOT OPERATE OR SERVICE YOUR
GRANULATOR UNTIL YOU READ
THESE SAFETY RULES.**

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GENERAL SAFETY REGULATIONS FOR SIZE REDUCTION MACHINERY OPERATION

Cumberland exerts its best efforts to design and manufacture its equipment in compliance with generally accepted safety standards and newly enacted laws. However, under OSHA, ultimate responsibility for compliance with the provisions of that Act rests with the user of equipment covered by the Act. Also, under OSHA, some standards have not yet been defined and some standards of measurement have not been developed or agreed upon. Environmental and administrative control of the equipment, as well as local engineering adaptations and maintenance, are within the exclusive control of the user after sale. Therefore, while the equipment to be delivered hereunder may be in compliance with the provisions of the Occupational Safety and Health Act of 1970 when operated under particular environmental, maintenance and production conditions, Cumberland cannot represent that standard equipment to be delivered by it will be in compliance with the said act and expressly disclaims any responsibility for any non-compliance of this equipment with said Act.

In some cases additional costs may be involved in order to meet specific OSHA specifications.

SAFETY AND YOUR CUMBERLAND ENGINEERING GRANULATOR

These machines are constructed for maximum operator safety when used under standard operating conditions and when recommended instructions are followed in the maintenance and operation of the machine.

All personnel engaged in the use of the machine should become familiar with its operation as described in this manual. **PROPER OPERATION OF THE MACHINE PROMOTES SAFETY FOR THE OPERATOR AND ALL WORKERS IN ITS VICINITY.**

Particular attention **MUST** be paid to the appropriate pages of this manual where **WARNINGS AND CAUTIONS** are clearly written out for your protection. Also helpful as a guide, is the OSHA General Industry Safety and Health Standards (OSHA) 2206 (29 CFR 1910) Sections 1910.216 and 1910.221. Becoming familiar with materials, inspection, speed limitations, screens and guard maintenance and total user responsibility will assist you in learning potential areas in need of observation for danger.

For all repairs, replacements or servicing, turn **POWER OFF** at all sources of electrical and pneumatic systems before attempting any servicing.

In reading the following guidelines for safety, it should be recognized that it is the responsibility of each individual to observe the prescribed safety rules as outlined. **ALL WARNING** and **DANGER** signs must be observed and obeyed. **ALL ACTUAL** or **POTENTIAL** danger areas must be reported to your immediate supervisor.

This manual emphasizes instructions and descriptions where safety and precautions are recommended for the operation and maintenance of this Granulator, as described therein.

Post a conspicuous warning sign over the connector for the power source warning others not to turn power "ON" when repairs are being made.

GENERAL SAFETY RULES

1. **ABIDE BY YOUR COMPANY'S SAFETY REGULATIONS**
2. **KNOW THE WEIGHT OF THE MACHINE**
Select lift trucks, cranes, slings, and ropes of ample strength to lift this weight if necessary to place the machine where it cannot be rolled into position.
3. **USE THE LIFTING POINTS DESIGNATED**
Slings attached to small brackets, metal cabinets, hoppers or sheet metal covers may break away and drop the machine.
4. **LOCATE THE MACHINE SO THAT ACCESS IS GIVEN TO ELECTRICAL COMPONENTS, SCREEN, HOPPER, ETC.**
Safety of service and maintenance personnel is involved. Maintenance personnel should have unobstructed access to the units on which they will be working.
5. **LOCATE FOR ADEQUATE CLEARANCE (See Figure 2-1).**
To avoid squeezing people working near a machine, there should be adequate clearance maintained between machines, walls or partitions.
6. **CHECK OPEN POSITION OF DOORS**
Hinged doors and covers should have full swing. Restrictions may force work in cramped quarters. An off-balance operator with an awkward reach into a partially obscured area is unsafe.
7. **CHECK DIRECTION OF ROTATION OF MOTORS**
Test motors for rotational direction as stipulated in the manual. Wrong direction may cause damage, back off threaded fasteners, make pieces of materials being granulated fly up in unexpected directions.
8. **GROUND THE MACHINE**
This will make sure the machine will never be a "Hot Wire", a source of electrical potential.
9. **MAINTAIN A SAFE WORKING AREA**
Your working area should be clean and uncluttered. Give yourself room for a firm, well-balanced stance.
10. **BE HARD TO CATCH**
Don't wear dangling neckties, necklaces, medallions, loose fitting clothing, wrist watches, bracelets or rings, tie back long hair or wear hair net.
11. **WEAR A FACE SHIELD OR SAFETY GLASSES**
Unexpected heavy cutting or granulating may give a shower of abrasive pieces. Protect your eyes.
12. **CHECK: ARE ALL COVERS, SCREENS, AND GUARDS IN POSITION AND SECURELY FASTENED?**
Be sure all covers and guards are in position before operating the machine. Do not operate a machine with missing covers, screens, or guards. Be sure that all fasteners are being used and that all are firmly tightened.
13. **REMOVE WRENCHES, LOOSE TOOLS AND ALL LOOSE OBJECTS FROM THE MACHINE**
Free objects may walk into the machine areas and cause unexpected interferences and damage.

14. DON'T LEAN AGAINST THE MACHINE OR REST YOUR HANDS OR FEET ON IT

You may be surprised or injured by a moving part or shower of material. Don't let talking companions lean on your machine while it is running; they, too, might be surprised and injured.

15. DISCONNECT ALL POWER TO THE MACHINE BEFORE TILTING THE HOPPER BACK OR ATTEMPTING ANY INSPECTION OR SERVICING OF THE CUTTING CHAMBER

16. NEVER OPEN OR REMOVE ANY MACHINE COMPONENTS, WHICH ARE SECURED BY WRENCH-TYPE FASTENERS, UNLESS THE MOTOR IS ELECTRICALLY LOCKED OUT AND THE ROTOR IS COMPLETELY MOTIONLESS.

Section I

INTRODUCTION AND DESCRIPTION

1.0 INTRODUCTION

This manual provides the necessary instructions for the Installation, Set-Up and Maintenance of the Model 184 Granulator.

This machine is designed, engineered and manufactured by Cumberland Engineering, P.O. Box 6065, Providence, R.I. 02940, TEL. (401) 728-1600.

NOTE

This manual only covers light corrective maintenance and recommends that no other maintenance be undertaken without first contacting a Cumberland service engineer.

1.1 DESCRIPTION

The Cumberland Granulator is a rugged, rotary-cutting machine specifically designed to cut, chip, and granulate the toughest plastic materials, with a minimum expenditure of horsepower.

A massively-built, low RPM, high-inertia rotor with inclined knives accepts large parts with ease and assures long, trouble-free service.

The hopper is designed to tilt back, and the screen cradle to swing down for quick access into the cutting chamber.

Reclamation of sprues, runners and small parts for inclusion and application in any type of molding or extrusion equipment is a designed-in capability and depending on screen size used, this machine will provide pellets or chips to meet most requirements.

With no enclosures, this granulator sets the industry standard for noise reduction with 85 DBA or less in almost all applications. Traditional Cumberland ruggedness includes a heavy steel bed knife block and a cutting chamber made of thick steel plate with integral oversize bearing housings.

Safety switches prevent starting the machine with the hopper open or with the screen exposed.

1.2 FUNCTIONAL DESCRIPTION (See Figure I-1)

A. HOPPER. The hopper is a hinged, upright, tray-feed enclosure with sound dampening, that tilts completely out of the way for unobstructed access to the cutting chamber. It is designed to facilitate feeding of material to the rotary knives and to prevent chips thrown from the cutting chamber from reaching the operator.

B. CUTTING CHAMBER. The cutting chamber is a rectangular enclosure comprising the main frame, the bed knives, the bed knife shield, a balanced rotor and a screen.

The main frame of the cutting chamber carries the bed knives and the bed knife shield. Both the bed knives and shield are adjustable and the bed knives have reversible cutting edges for extended life.

The internal surfaces of the solid steel cutting chamber are machined to an exceptionally smooth finish for ease of clean-out. The scissor-type cutting action of the angled rotary knives give optimum cutting efficiency, with low power consumption.

The screen is mounted in swing-down cradle arms, positioned just below the rotor and acts as a

INTRODUCTION AND DESCRIPTION

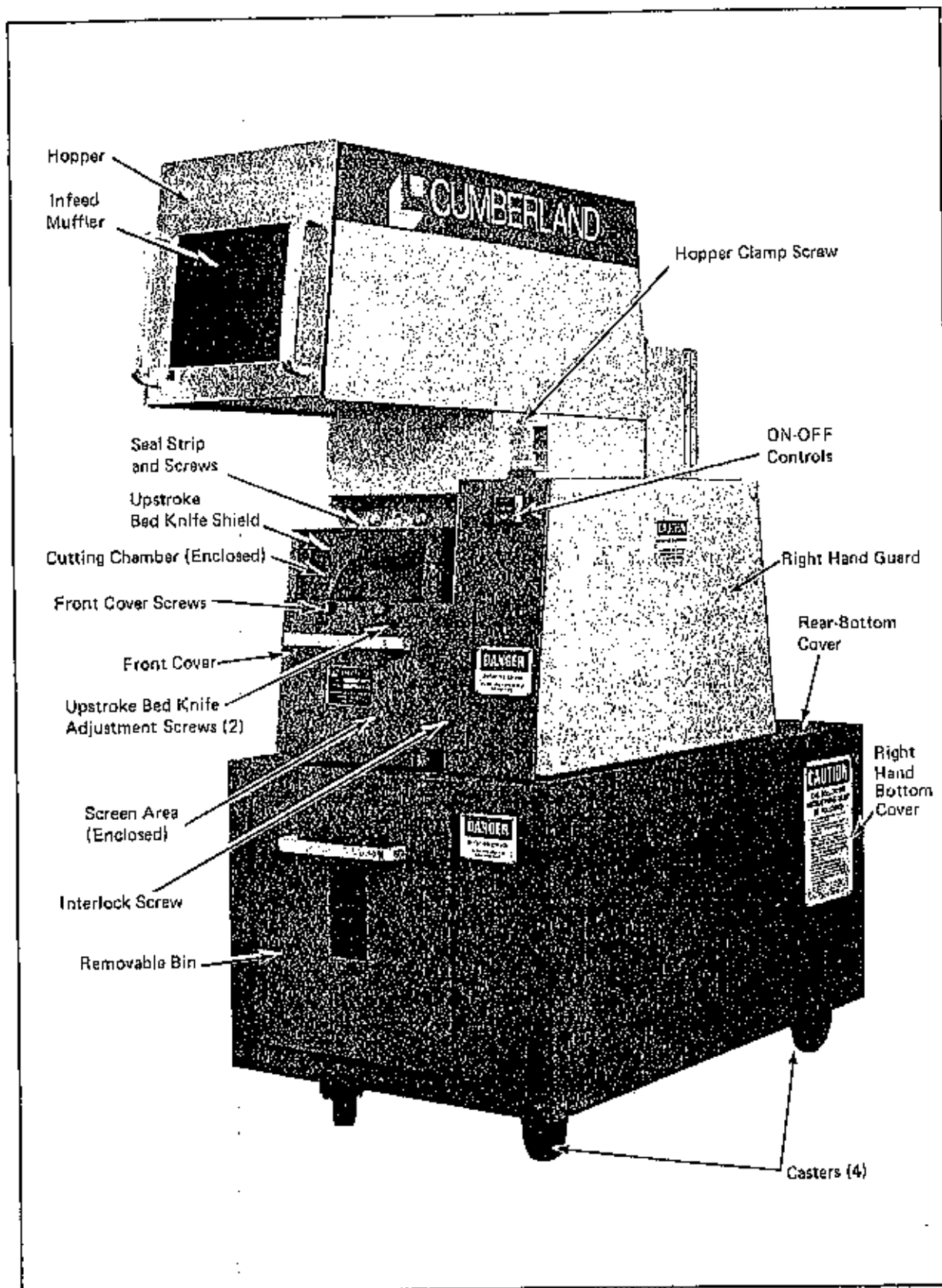


Figure 1-1. Model 184 Granulator

INTRODUCTION AND DESCRIPTION

separating barrier to the granulated material, retaining the material in the cutting chamber, until the particle size is such that it will pass through the screen holes.

The open-type, high-alloy steel rotor carries the rotary knives. High-strength alloy steel screws are used for attachment of all knives.

C. DRIVE SYSTEM. The drive system consists of a drip-proof 1800 RPM motor set on an adjustable sliding base, that is mounted below the granulator cutting chamber. The motor drives the rotor through banded V-belts for insured RPM control. Safety guards shield the motor shaft pulley, V-belts and the rotor shaft pulley for complete operator safety.

D. DISCHARGE SYSTEM. The granulated material that falls through the screen is collected by a discharge chute beneath the cutting chamber and directed into a bin. The bin can be removed from the front or left side of the granulator for emptying.

On Models fitted with an Airveying System (OPTIONAL), the granulated material which has fallen through the screen is collected in a transition piece located beneath the cutting chamber.

The transition piece is connected to a blower, on the left side, which conveys the granulated material through ducting to the cyclone separator. The cyclone separator allows the granulated material to drop out of the air stream into a container.

E. BASE. The base is a caster-mounted, bin-type construction with two fixed and two swivel casters.

Section II INSTALLATION

2.0 INTRODUCTION

This section details the Installation and Set-Up instructions for the Granulator. It does not include any special accessory or optional equipment, due to the many types presently available.

Requirements for special installations, conditions, or use with other equipment should be discussed with a Cumberland service engineer.

TABLE 2-1. SPECIFICATION SHEET

MODEL: 184	Serial No:
Type of Rotor: (2) Knife S/A	Hopper Throat Opening Size: 8" x 10" (200 mm x 250 mm)
Rotor Knives: 55° S/A Number: <u>2</u> Type: <u>HCHC</u>	Screen Hole Size: Number: _____ Type: _____
Stationary Knives: HCHC Number: <u>2</u> Type: <u>2-Edge</u>	Base Type: Casters
Drive: Belt-Driven _____ H.P.	Discharge System: <input type="checkbox"/> Bin <input type="checkbox"/> Chute
Total HP Requirement:	Motor Speed: 1800 RPM
	Rotor Speed: 450 RPM
Voltage: Phase: Hertz: _____	General Assembly: Cross Section: E-239123
Safety Switch Type: (2) Limit Switches	Wiring Diagram:
Overall Dimensions: 25½ x 51 x 60½" (650 x 1295 x 1540 mm)	
Approximate Shipping Weight:	1400 Lbs. (636 Kg)
Approximate Net Weight:	1300 Lbs. (590 Kg)
Remarks:	

2.1 EQUIPMENT SPECIFICATIONS

A. FLOOR SPACE REQUIREMENTS

Refer to Table 2-1. Specification Sheet and Figure 2-1. Floor Space and Plan Requirements.

B. ELECTRICAL REQUIREMENTS

Refer to Table 2-1. Specification Sheet and to the basic Wiring Diagram at back of manual.

INSTALLATION

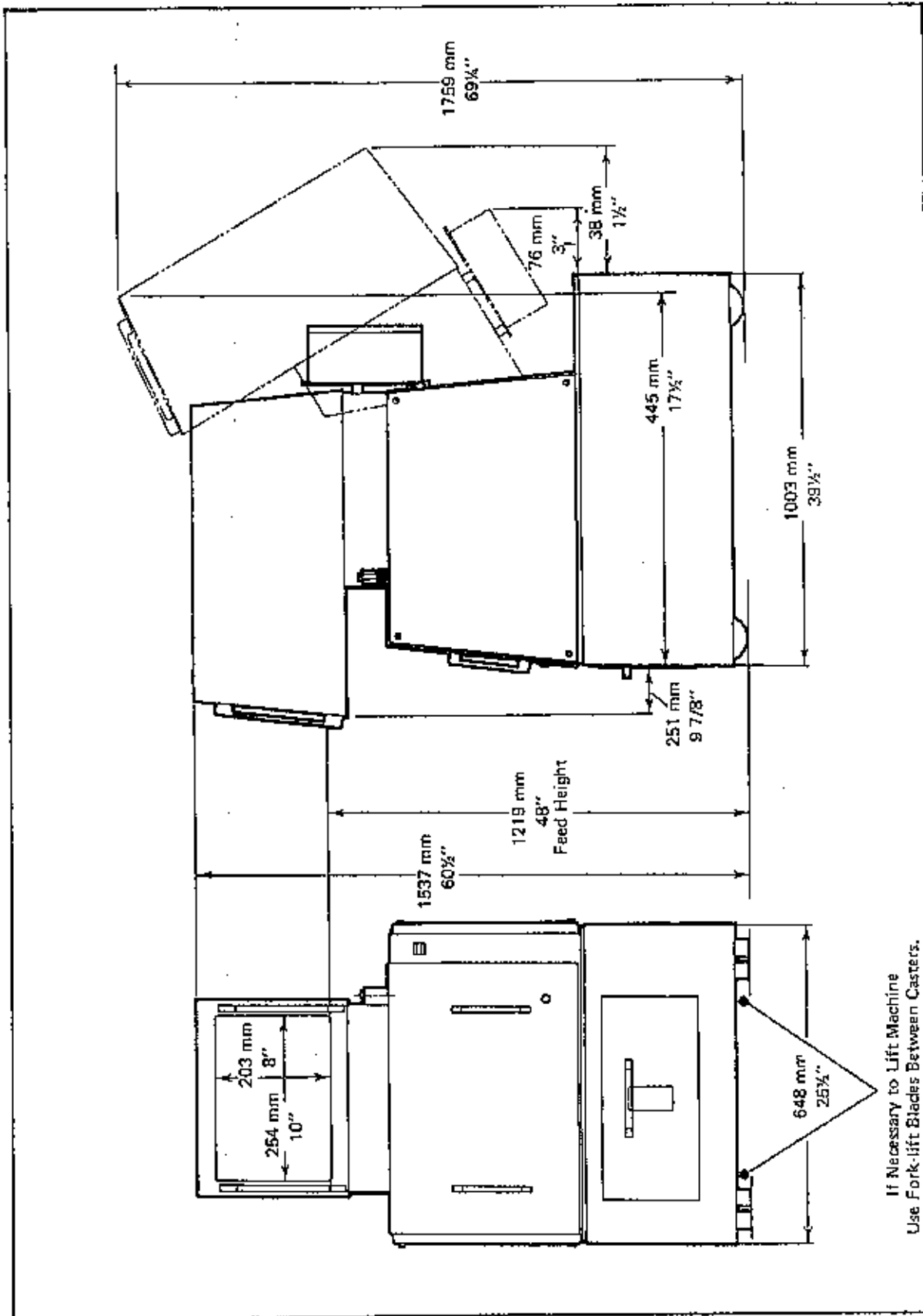


Figure 2-1 Floor Space and Plan Requirements

NOTE

It is recommended that the customer install a special *fusible disconnect switch* in the incoming power line, since none is provided by Cumberland Engineering.

C. MECHANICAL REQUIREMENTS

Refer to Section III, Settings and Adjustments, and Section V, Maintenance, for Corrective Maintenance requirements.

D. LUBRICATION REQUIREMENTS

Refer to Section V, Maintenance, for lubrication points and frequency information.

E. AIRVEYING SYSTEM (OPTIONAL EXTRA)

Refer to manufacturer's specifications at back of manual.

2.2 INSTALLATION

A. PACKING INFORMATION

The complete Granulator, including accessory and auxiliary equipment, is packed in a special skidded wooden case for shipment.

Refer to Table 2-1. Specification Sheet for detailed dimensional data and pertinent weights.

B. UNCRATING THE EQUIPMENT

Remove any strapping and all packages and parts from skid and/or inner sides of crate. Carefully remove all hold-downs, bolts, nuts, tie-downs, etc., so that Granulator can be removed from skid.

After unpacking, the Granulator should be carefully inspected for any damage sustained during transit. The carrier should be notified immediately of any suspected damage to the equipment. Check packing list to see that all accessories, auxiliary equipment, spares, etc., have been received. Notify Cumberland immediately of any shortages.

C. SETTING-UP THE EQUIPMENT

The Granulator is mounted on casters (see Figure 1-1) for ease of operating placement. Move the machine as close to final installation point as possible.

CAUTION

If necessary to lift the machine, use a fork-lift as shown in Figure 2-1 for your model machine. **DO NOT** lift machine by the hopper handles or the guards.

It is recommended that the machine be set on a concrete floor. Care must be taken when moving the machine across a hollow timber floor, otherwise the high point loading of the casters may cause damage. Machine should be moved slowly to avoid tipping if an obstruction is encountered.

D. LEVELING THE MACHINE

Make sure that the machine is resting firmly on the four casters. If necessary, use steel shims under the casters to level the machine.

INSTALLATION

E. PREPARING THE MACHINE

The machine is shipped from the factory with a heavy oil-type rust preventative coating which must be removed from the following areas, prior to making the necessary operating connections.

1. All metal surfaces that will contact the infeed materials in the hopper.
2. The cutting chamber, knives, rotor, etc.
3. The discharge system.
4. The exterior of the machine.

NOTE

DO NOT use solvent on any of the painted areas as it may affect them adversely.

5. After cleaning the machine, check the seal strips located between the hopper and the cutting chamber, to ensure that the gap has not been increased during transportation (refer to Section III, Para. 3.1.A.14 for detailed information).

NOTE

The screen must be removed (refer to Section V, Para. 5.2.B for detailed removal instructions), to be sure that nothing has fallen into the cutting chamber during transportation or set-up.

6. Check tightness of knife bolts and knife clearances before starting.

F. ELECTRICAL CONNECTIONS

1. The Granulator is pre-wired (if ordered with controls) before shipment. The customer is required to provide a suitable fused electrical supply with a disconnect switch and a cable for the incoming line to the starter (if ordered with the machine).
2. Refer to Table 2-1, Specifications, for the horsepower requirements, voltage, phase and frequency, to determine the size and rating of the supply cable required.
3. If optional controls are supplied, an electrical wiring diagram will be provided with the machine, in addition to the basic electrical diagram included in the manual.
4. When the customer is providing either the motor or the starter, the machine must be wired in accordance with the basic electrical diagram provided in the manual and the starter manufacturer's instructions.
5. Check to be certain that the starter heater elements correspond with the motor requirements. If controls are not supplied, the limit switches supplied on the machine must be wired into the circuit.

WARNING

Before operating the Granulator, it is extremely important that the machine has been *correctly* wired and assembled.

6. Check that the limit switches are *closed*.

INSTALLATION

7. Turn switch ON at main power supply.
8. Jog motor by pressing the START and then the OFF button. This starts and stops the motor.
9. With the electrical power ON, check that motor rotates in a *clockwise direction*, at the viewing port in the belt guard. If incorrect, shut power OFF and disconnect incoming power supply.
10. Reverse any two of the three power line connections to the machine.
11. Re-connect the incoming power supply line and turn ON the main power switch to re-check motor drive rotation.
12. Turn power OFF.
13. If Airveying system (OPTIONAL) is fitted, the following additional operations must be performed:
 - a. Press Airveyor START button, located at the blower motor.
 - b. Check that blower motor is rotating in a *counterclockwise* direction. If incorrect, shut power OFF and disconnect incoming power supply line.
 - c. Reverse any two of the incoming power line connections to the blower motor.
 - d. Re-connect the incoming power supply line, turn ON the power and recheck blower motor rotation.
 - e. Allow all motors to run up to speed for at least 30 seconds. The Granulator is now ready for use.

G. LUBRICATION REQUIREMENTS

1. Main Drive Motor. The drive motor bearings are prelubricated at assembly, but should be re-lubricated as stipulated in Section V, Table 5-1.
2. Rotor Bearings. The rotor bearings are pre-lubricated and sealed-for-life, therefore do not need any further lubrication.
3. Airveying System (OPTIONAL EXTRA). This should be lubricated as indicated in the literature dealing with the system (see Addenda).

Section III

SETTINGS AND ADJUSTMENTS

3.0 INTRODUCTION

This section delineates the normal adjustments and settings required to maintain and operate the Granulator. Special adjustments and settings are given where applicable, but do not cover every condition or contingency. Requirements for special conditions should be discussed with a Cumberland service engineer.

All components, sub-assemblies and assemblies have been checked, adjusted and set, and the machine operated prior to shipment. However, the machine may require readjustment and setting to meet specific work requirements.

When any malfunction of the machine causes undue strain, wear, or damage to any part, that part should be checked immediately, to see that it has not been moved out of proper adjustment or setting.

3.1 SETTINGS AND ADJUSTMENTS

WARNING

Before proceeding to do any adjustments or settings, turn the Main Power OFF, remove the line fuses and tag the machine as OUT OF SERVICE.

A. DOWNSTROKE BED KNIFE (See Figure 3-1)

1. Unscrew the hopper clamp screw. This operates a limit switch, preventing the machine from being started.
2. Tilt back the hopper to permit access to the cutting chamber.

CAUTION

AVOID ANY CONTACT WITH THE ROTOR KNIVES, AS EDGES ARE VERY SHARP.

3. At the rear section, remove the bed knife shield screws and lift off the bed knife shield.
4. Remove the screws holding the bed knife.
5. The bed knife can now be removed, repositioned, reground or replaced. Before replacing the bed knife, thoroughly clean the bed knife seat.
6. Replace the bed knife on the bed seat and tighten the screws, until they are finger-tight.

NOTE

It is recommended that the same screws and washers only be re-used when the bed knives have been repositioned or reground. When blunt knives are discarded and replaced with new knives, use new screws and washers. This will reduce the risk of screw failure due to their overstretching. Screws and washers *must* be replaced with the type specified in the Spare Parts List.

SETTINGS AND ADJUSTMENTS

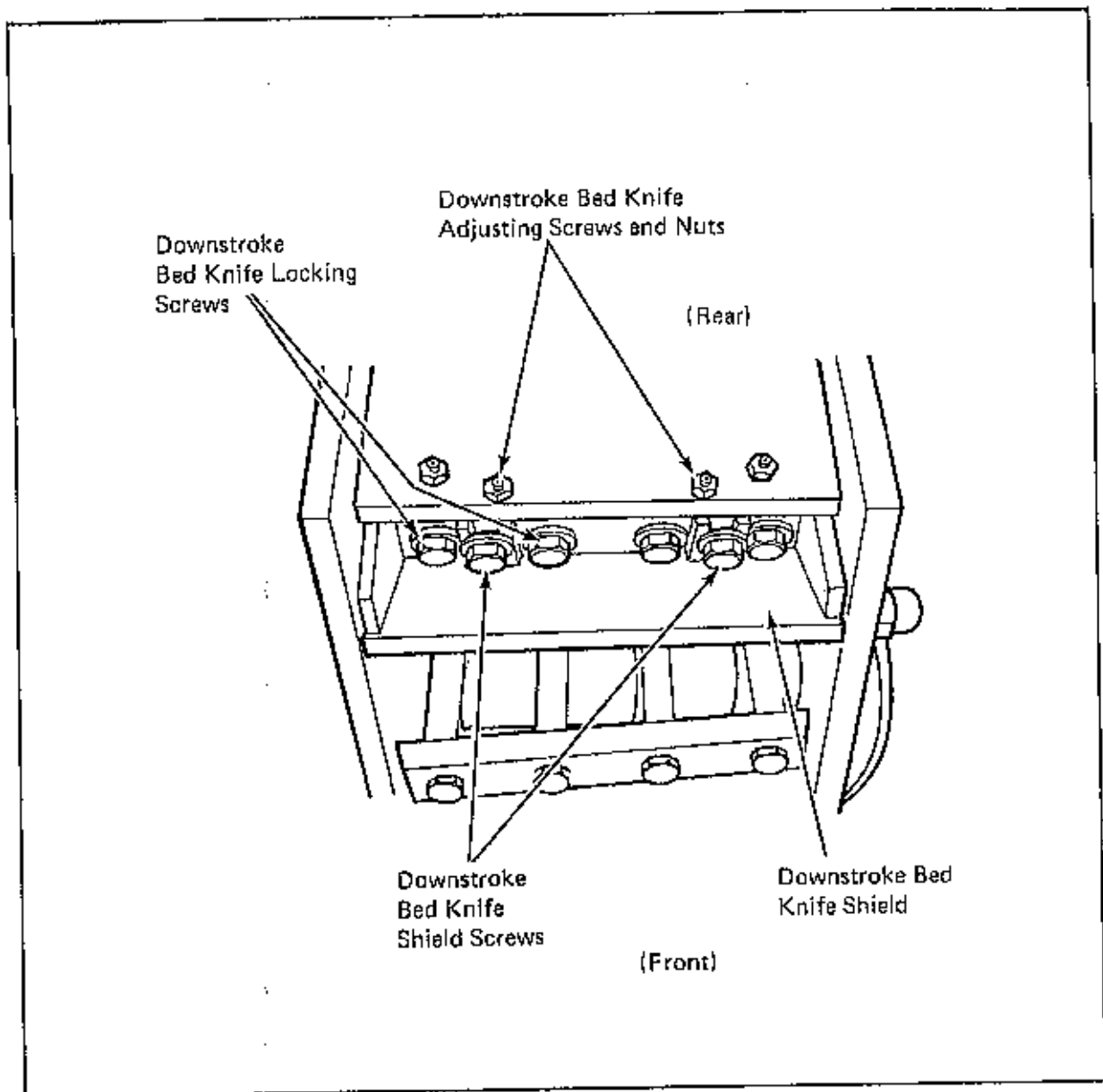


Figure 3-1. Downstroke Bed Knife Settings and Adjustments

7. Using the bed knife adjusting screws (see Figure 3-1), adjust the bed knife to the rotor knives, using a feeler gauge, until the clearance between the ends of the rotor knives and the bed knives is, 0.10 mm (0.004") to 0.15 mm (0.006"). This clearance is slightly greater at the center of the knives.

NOTE

This is a normal condition when the rotor knives are mounted on a slant rotor.

8. Turn the rotor backwards while checking the clearance, to avoid cutting the feeler gauge. (See Figure 3-2.)

SETTINGS AND ADJUSTMENTS

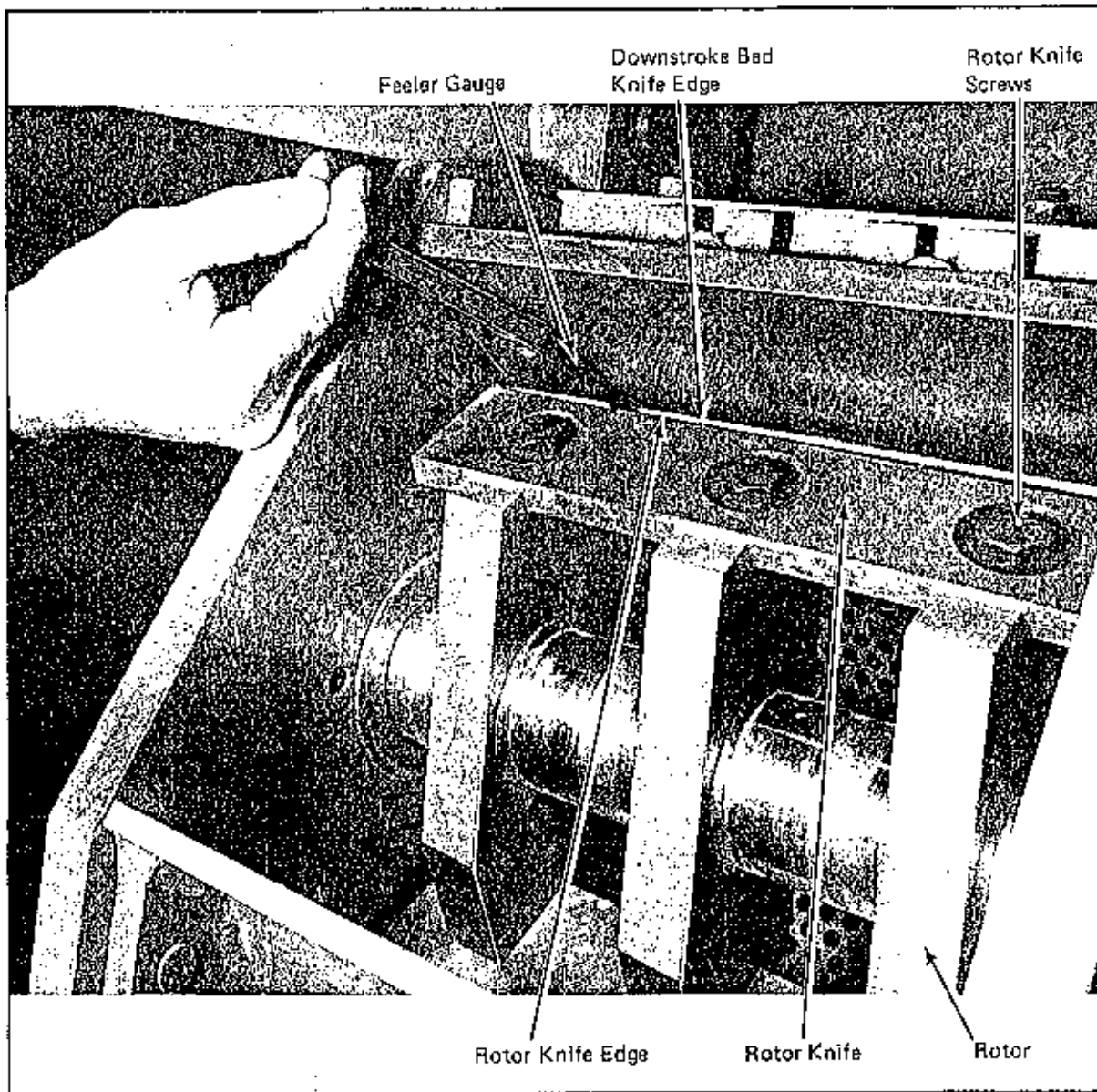


Figure 3-2. Use of Feeler Gauge for Knife Settings

9. Tighten the bed knife screws evenly and torque the 12 mm screws to 156 Nm (115 LB. FT).

NOTE

All screw tightening torque figures are for unlubricated thread conditions. Screw threads should be wiped with an oil-dampened cloth before installation, to prevent galling.

10. Recheck the clearance and re-adjust if necessary.
11. Replace the bed knife shield and tighten the screws. Refer to Paragraph 3.1.C, for bed knife shield adjustment.

SETTINGS AND ADJUSTMENTS

12. Check that cutting chamber is clear of any parts or materials.
13. Close the hopper and tighten the clamp screw.
14. Check that gaps between the seal strips (see Figure 3-3) and cutting chamber are less than 0.15 mm (0.006"). Release the screws to make any adjustment, and retighten when adjustment is complete.
15. Replace line fuses, turn power ON and remove OUT OF SERVICE tag from the machine.

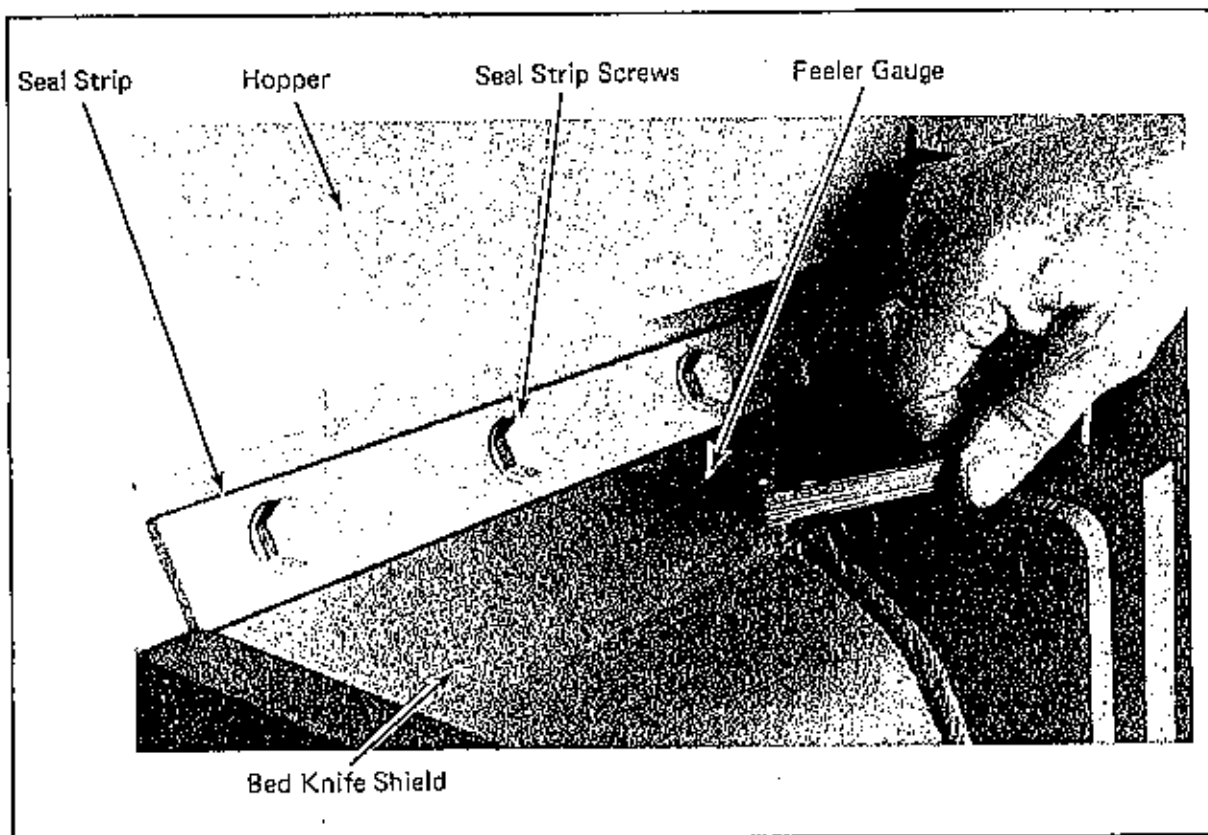


Figure 3-3. Use of Feeler Gauge For Seal Strip Settings (Typical)

B. UPSTROKE BED KNIFE (See Figure 3-4)

1. Unscrew the hopper clamp screw. This operates a limit switch, preventing the machine from being started.
2. Tilt back the hopper to permit access to the cutting chamber.
3. Unscrew the front cover interlock screw. This operates a limit switch, preventing the machine from being started.
4. Lift off the front cover to gain access to the screen and upstroke bed knife.
5. Remove the screws holding the screen cradle arms, and remove the screen through the front section.

CAUTION

AVOID ANY CONTACT WITH THE ROTOR KNIVES, AS EDGES ARE VERY SHARP.

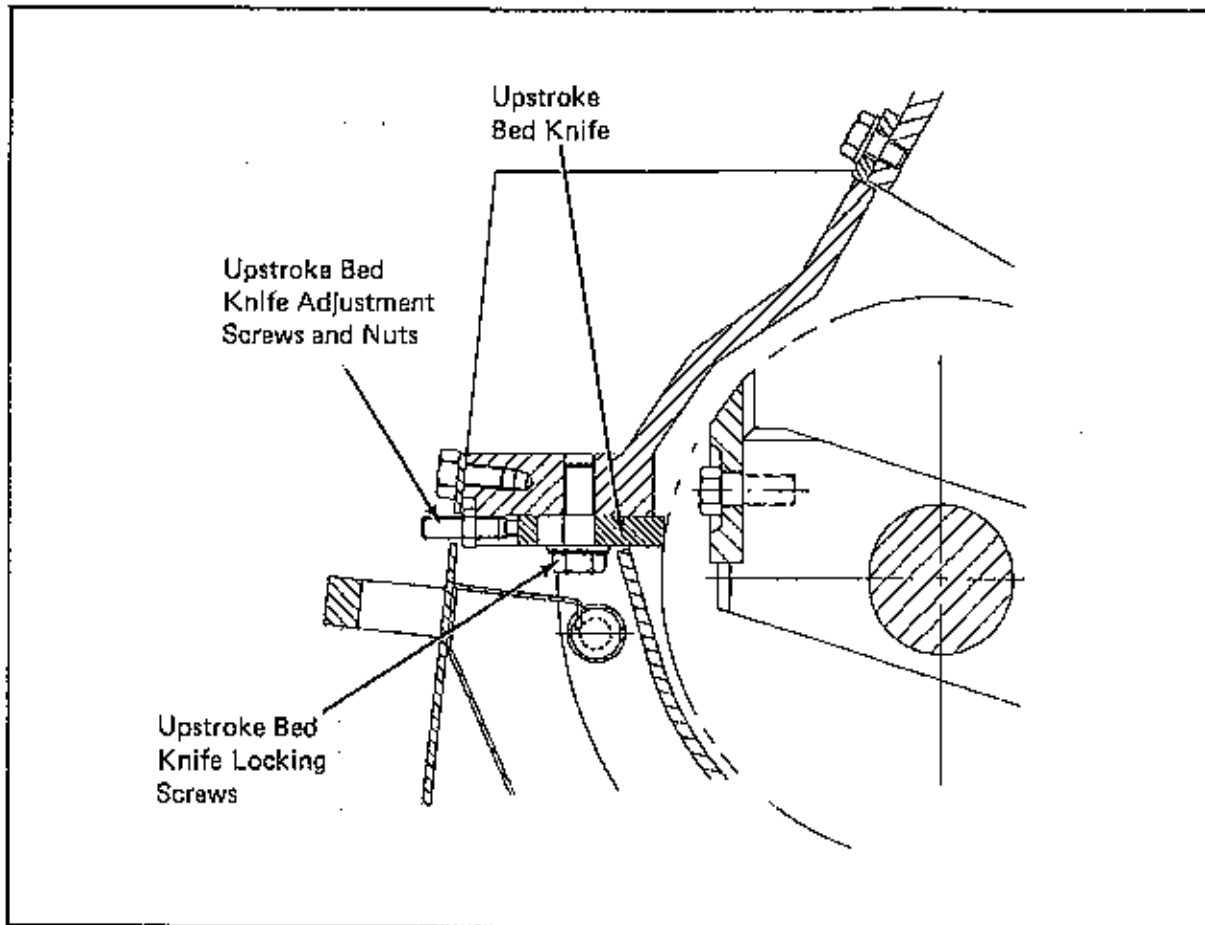


Figure 3-4. Upstroke Bed Knife Settings and Adjustments

6. Remove the screws holding the bed knife.
7. The bed knife can now be removed, repositioned, reground or replaced. Before replacing the bed knife, thoroughly clean the bed knife seat.
8. Replace the bed knife on the bed knife seat and tighten the screws, until they are finger-tight.

NOTE

It is recommended that the same screws and washers only be re-used when the bed knives have been repositioned or reground. When blunt knives are discarded and replaced with new knives, use new screws and washers. This will reduce the risk of screw failure due to their overstretching. Screws and washers *must* be replaced with the type specified in the Spare Parts List.

9. Using the bed knife adjusting screws, adjust the bed knife to the rotor knives, using a feeler gauge, until the clearance between the ends of the rotor knives and the bed knives is, 0.10 mm (0.004") to 0.15 mm (0.006"). This clearance is slightly greater at the center of the knives.

SETTINGS AND ADJUSTMENTS

NOTE

This is a normal condition when the rotor knives are mounted on a slant rotor.

10. Turn the rotor backwards while checking the clearance, to avoid cutting the feeler gauge.
11. Tighten the bed knife screws evenly and torque the 12 mm screws to 156 Nm (115 LB. FT).

NOTE

All screw tightening torque figures are for unlubricated thread conditions. Screw threads should be wiped with an oil-dampened cloth before installation to prevent galling.

12. Recheck the clearance and re-adjust if necessary.
13. Replace the screen (avoiding contact with the knives) in the cradle arms, making sure that the far edge is trapped beneath the downstroke bed knife block. Tighten the cradle arm screws.
14. Check that cutting chamber is clear of any parts or materials.
15. Replace the front cover and tighten interlock screw.
16. Close the hopper and tighten the clamp screw.
17. Check that the gaps between the seal strips and cutting chamber are less than 0.15 mm (0.006"). Release the screws to make any adjustment, and retighten when adjustment is complete.
18. Replace line fuses, turn power ON and remove OUT OF SERVICE tag from machine.

C. BED KNIFE SHIELD (See Figure 3-1)

1. Turn the Main Power OFF, remove the line fuses and tag the machine as OUT OF SERVICE.
2. Unscrew the hopper clamp screw. This operates a limit switch, preventing the machine from being started.
3. Tilt back the hopper to permit access to the cutting chamber.
4. At the rear section, loosen the bed knife shield screws until about finger-tight.
5. Now adjust the bed knife shield until the knife exposure is 1.6 mm (0.062"). If strip material is to be cut, reduce the knife exposure to less than the strip thickness to prevent any material build-up on the bed knife.
6. Tighten the bed knife shield screws.
7. Check that the cutting chamber is clear of any parts or materials.
8. Close the hopper and tighten the clamp screw.
9. Check that the gaps between the seal strips and cutting chamber are less than 0.15 mm (0.006"). Release the screws to adjust, if necessary, and retighten when finished.
10. Replace line fuses, turn power ON and remove OUT OF SERVICE tag from machine.

SETTINGS AND ADJUSTMENTS

D. ROTOR KNIFE (See Figures 3-1 and 3-4)

1. Turn the Main Power OFF, remove the line fuses and tag the machine as OUT OF SERVICE.
2. Unscrew the hopper clamp screw. This operates a limit switch, preventing the machine from being started.
3. Tilt back the hopper to permit access to the cutting chamber.

NOTE

Under normal operating use, the cutting edge of the rotor knives will eventually become dulled, thereby resulting in reduced cutting efficiency. The blunt knives may either be replaced with new knives, when re-grinding is not possible, or re-ground to restore the cutting edge.

4. Remove the screws holding the knives to the rotor and remove the knives. If new rotor knives are being fitted, set back the bed knife (refer to Para. 3.1.A, and 3.1.B, above) to clear the rotor knives so that the rotor can revolve freely.
5. Clean the knife seats and replace the knives. Make certain that they are seated correctly before proceeding further.
6. Lightly tighten the screws and check that a 0.04 mm (0.0015") feeler gauge *will not* pass between the back of the knife and knife seat. Tap the knife gently with a rawhide hammer, if necessary to close the gap.

NOTE

The knives must be replaced in complete sets, otherwise it will not be possible to obtain even clearance between the rotor knives and bed knife.

7. Tighten the screws evenly and torque the high tensile 12 mm screws to 156 Nm (115 LB. FT).
8. Check that a 0.04 mm (0.0015") feeler gauge *will not* pass between the back of the knife and the knife seat. If necessary, readjust the knife.

NOTE

All screw tightening torque figures are for unlubricated thread conditions. Screw threads should be wiped with an oil-dampened cloth before installation to prevent galling.

NOTE

It is recommended that the rotor knife screws be replaced with new screws every sixth knife change to reduce the risk of screw failure due to overstretching. Screws must be replaced with the type specified in the Spare Parts List.

9. Adjust the clearance between the bed knives and rotor knives, as detailed in Paragraph 3.1.A and 3.1.B.

SETTINGS AND ADJUSTMENTS

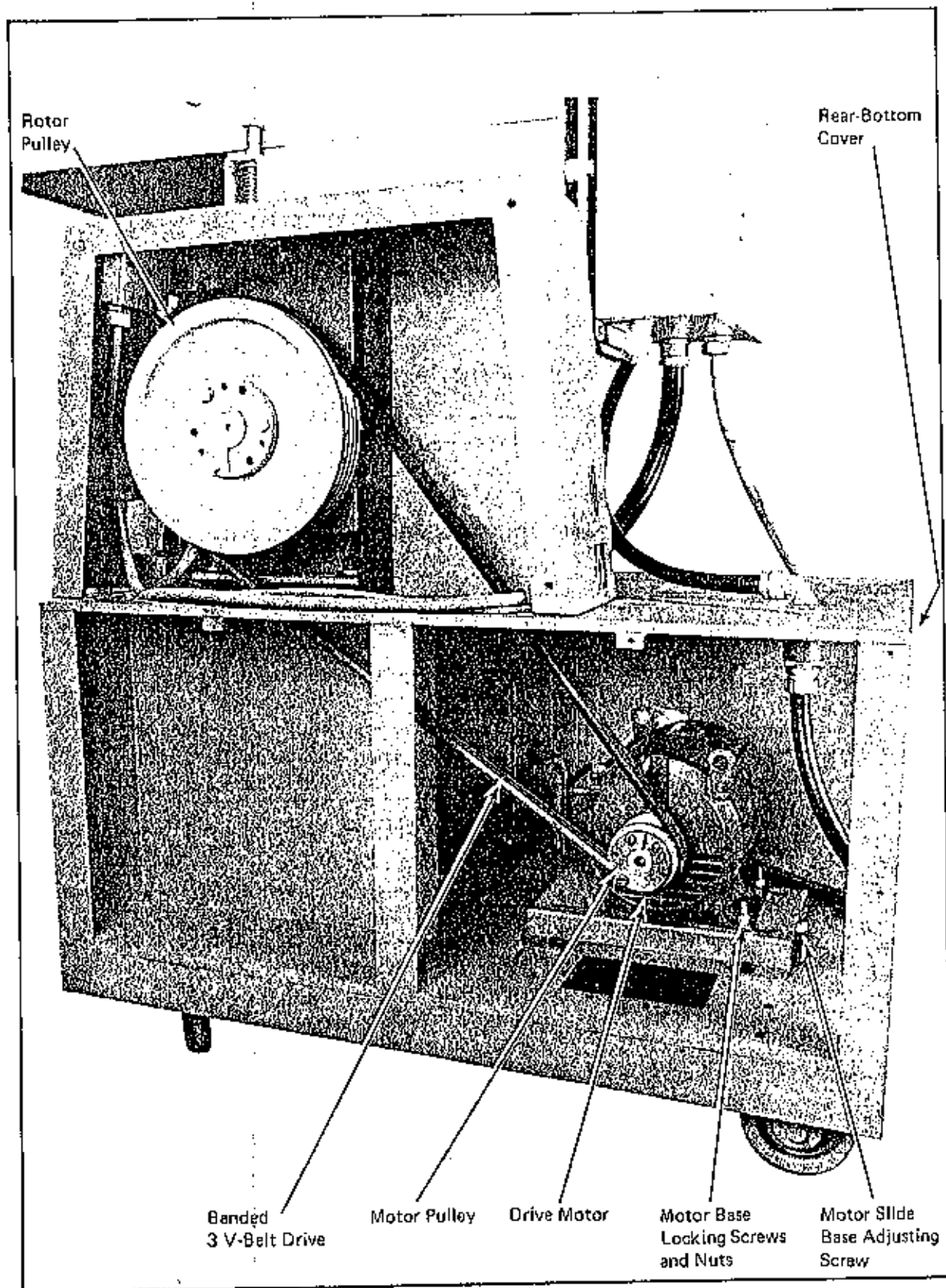


Figure 3-5. Drive Belt Tension Settings and Adjustments (Typical)

SETTINGS AND ADJUSTMENTS

10. Upon completion of all adjustments and settings, check that cutting chamber is clear of any parts or materials.
11. Close the hopper and tighten the clamp screw.
12. Check that the gaps between the seal strips (see Figure 3-3) and cutting chamber are less than 0.15 mm (0.006"). Release the screws to adjust, if necessary, and retighten when finished.
13. Replace line fuses, turn power ON and remove OUT OF SERVICE tag from machine.

E. DRIVE BELT TENSION (See Figure 3-5)

For continuing reliable operation of the Granulator, it is of the utmost importance that the motor drive belt tension is correct. Correct tension reduces wear on rotor and motor bearings and reduces belt slip to a minimum.

To set the drive belt tension, proceed as follows:

1. Turn Main Power switch to OFF position, and remove the line fuses.
2. Remove the right hand guard and bottom cover, to gain access to the belts.
3. Determine the type of belt required from the Recommended Spares List. Refer to Figure 3-6 and Para. 3.1.F below, for details on how to check belt tension and the correct tensioning to be applied to the belts.
4. Remove the rear base cover to gain access to the motor base.
5. Turn the adjusting screw on the motor slide base to tension the belts as required. (Refer to Figure 3-6, Belt Tensioning Chart.)
6. Re-tighten the screws. Make certain that the pulleys are in correct alignment.
7. Replace the guard and covers previously removed.
8. Replace the line fuses and turn the Main Power switch ON.

F. REQUIRED BELT TENSIONING (See Figure 3-6)

Belt drives must be tensioned at the "Run-In" recommended force. Check the tension at least twice during the first two days operation. After the belts have seated themselves in the sheave grooves and the initial stretch is removed, retension the belts to "Normal Running". Check periodically to maintain tension at the recommended value.

A gauge is available from Cumberland Engineering, or the belt manufacturer, which facilitates the measurement of belt deflection and force.

The Belt Tensioning Chart shown in Figure 3-6, gives the recommended force required to deflect each belt by an amount equal to the belt span divided by 64.

The Deflection Force Value shown must be multiplied by the number of V-belt elements.

SETTINGS AND ADJUSTMENTS

Belt Cross Section	Small O.D. Range	*Deflection Force LBS/V-Belt Element	
		Run-In	Normal Running
3 V	2.65 - 4.0	6	4
Banded	4.12 - 7.0	8-1/4	6-3/4

*This deflection force value relates to a single V-belt element. Therefore, if the belt is a 3-V element (3V-Banded) this value must be multiplied by 3.

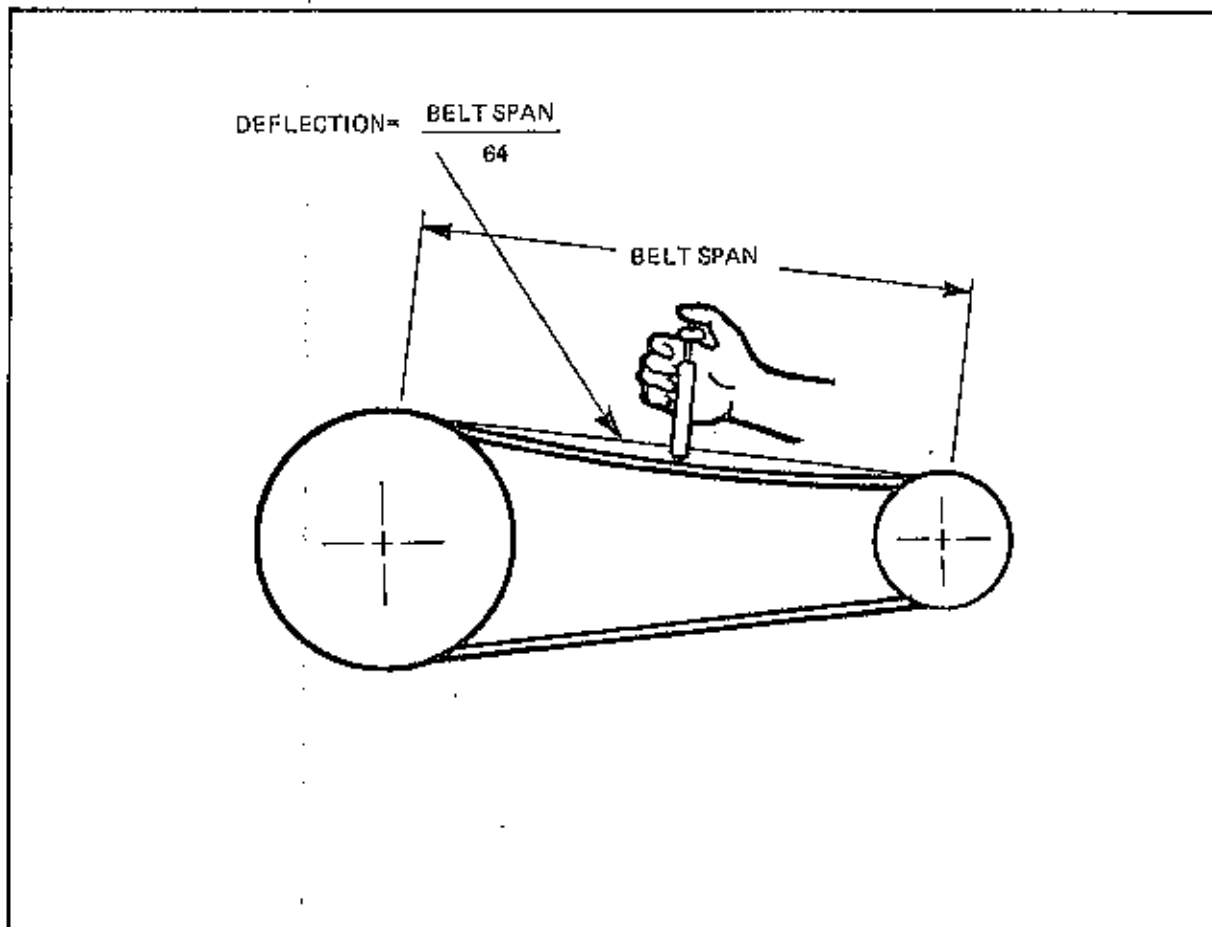


Figure 3-6. Belt Tensioning Chart

Section IV OPERATION

4.0 INTRODUCTION

This machine has been run under power and tested at the factory.

The necessary settings and adjustments have been made so that, in starting up the machine in its new location, a minimum amount of setting up or re-adjustment is required.

With all electrical, mechanical connections and lubrication requirements having been attended to as stipulated in Section II, the following start-up should be carefully carried out before attempting to place any material into the hopper.

WARNING

Before operating the Granulator, it is important to ensure that the Granulator has been correctly assembled and wired.

4.1 START-UP PROCEDURES (See Figure 1-1)

- a. Turn the Main Power switch to the ON position.
- b. Press the motor START button. This starts the rotor drive motor.

When the Airveying System (OPTIONAL) is fitted to the machine, the following additional operations must be performed to ready the Granulator for operation.

- c. Press the Airveyor START button (if provided with separate pushbuttons), located at the blower motor, *BEFORE* pressing the *GRANULATOR START* button.
- d. Check for direction of rotation (refer to Para. 2.2.F.13).
- e. Allow all motors to run up to speed for at least 30 seconds. The Granulator is now ready for operation.

4.2 FEEDING THE GRANULATOR (See Figure 1-1)

WARNING

UNDER NO CIRCUMSTANCES should the operator attempt to reach into the hopper to dislodge any bridged or jammed material while the Granulator is in operation. To clear the hopper of bridged or jammed material, the machine Main Power must be turned OFF and the machine isolated.

Feeding the Granulator is via the opening in the hopper. The method of feeding the Granulator depends upon the physical form and nature of the material to be processed.

For maximum efficiency, the Granulator should be fed at a rate that is consistent with its capacity; i.e. If the Granulator is rated at 60 Kg/Hr (132 LB/Hr), then the general feed rate is 1 Kg/min. (2.2 LB/min). Under these operating conditions, the correct proportions of cut and uncut particles will be present in the cutting chamber.

OPERATION

NOTE

If feeding or granulating problems occur, contact a Cumberland engineer immediately.

4.3 MACHINE SHUT-DOWN (See Figure 1-1)

Before commencing shut-down procedures:

- a. Stop all feeding of material to the Granulator.
- b. Allow the Granulator to continue running until the cutting chamber is completely empty.
- c. Press the motor STOP button. This shuts off the rotor drive motor.
- d. If Airveyor system is fitted, press Airveyor STOP button located at the blower motor after the Granulator has stopped.
- e. Turn the Main Power switch to OFF position.

Section V MAINTENANCE

5.0 INTRODUCTION

This section covers the Lubricants, Lubrication Points, and their Frequencies of Application. The use of proper lubricants will help reduce wear and down time. This section also delineates the Preventive and Corrective Maintenance Procedures required to ensure proper functioning of the machine.

Where possible, tabular presentation has been used for clarity and ready reference. Illustrations are referenced for most procedures and to locate individual maintenance points.

5.1 PREVENTIVE MAINTENANCE

A. LUBRICATION

The following parts of the Granulator should be lubricated:

1. **Drive Motor.** The bearings are pre-lubricated at assembly, but should be lubricated Monthly. Refer Table 5-1. Periodic Maintenance Chart.
2. **Rotor Bearings.** These bearings are pre-lubricated and sealed-for-life, and therefore do not require further lubrication.
3. **Airveying System (OPTIONAL EXTRA).** This system should be lubricated as indicated in the literature dealing with this system. See literature in the Manual Addenda.

B. PERIODIC MAINTENANCE

TABLE 5-1. PERIODIC MAINTENANCE CHART

CHECK	REFERENCE	FREQUENCY
1. Knife Clearance and Wear	Refer to Para. 3.1.A.7.	Weekly
2. Knife Retaining Screws for Tightness	Refer to Para. 3.1.A.9.	Weekly
3. Knife Exposure	Refer to Para. 3.1.C.5.	Weekly
4. Shield Retaining Screws for tightness	Refer to Para. 3.1.A.9.	Weekly
5. Lubrication of Drive Motor Bearings	Refer to Para. 5.1 and Fig. 3-6.	Monthly
6. Belt Tension	Refer to Para. 3.1.E and Fig. 3-6.	Monthly

5.2 CORRECTIVE MAINTENANCE

A. MOTOR DRIVE BELT REPLACEMENT (See Figure 3-5)

To replace belts proceed as follows:

1. Turn OFF Main Power and remove fuses.

MAINTENANCE

2. Remove the right hand guard, bottom cover and the back cover, to gain access to the belts and pulley.
3. Turn the adjusting screw on the motor slide base to release all tension from the belts.
4. Remove the belts.
5. Install the banded V-belt(s) and proceed to adjust the belt tension as instructed in Para. 3.1.E and 3.1.F.
6. Replace the back cover and right hand covers removed in step 2 above.
7. Replace the line fuses and turn Main Power ON.

B. SCREEN REPLACEMENT (See Figure 5-1)

1. Turn the Main Power switch to OFF and remove line fuses.
2. Unscrew the front cover interlock screw and remove the front cover.
3. Remove the screws holding the cradle arms and lower the arms and screen.
4. Remove the screen avoiding contact with the rotor knives.
5. Replace the screen (avoiding any hand contact with the rotor knives) and making sure that the far edge of the screen is "trapped" beneath the bed knife block. Tighten cradle arm screws.
6. Replace the front cover and tighten the interlock screw.
7. Check that cutting chamber is clear of any parts or materials.
8. Replace the line fuses and turn the Main Power switch ON.

C. BED KNIFE WEAR

During normal use the cutting edge of the bed knife will eventually become dulled, resulting in reduced efficiency. The bed knife is provided with two cutting edges. Therefore, when one edge becomes blunt, the knife can be positioned to present a new cutting edge to the material.

The knives can also be reground when both cutting edges become blunt. When further regrinding of the edges is no longer possible, the blunt knife must be replaced.

To remove the knives for grinding, re-use or replacement, follow the detailed instructions given in Para. 3.1.A to ensure correct dimensional placement.

D. ROTOR KNIFE CLEARANCE

During use, the clearance between the rotor knives and the bed knife will increase due to wear. This is a normal condition that requires re-setting this clearance once or twice before it is necessary to remove the knives for re-grinding.

When new knives are fitted to the machine, adjustment after eight hours of running time may be required. If adjustment is required, proceed as detailed in Para. 3.1.A.

Check for wear and clearance of rotor knives at this time and if required, adjust in accordance with the instructions given in Para. 3.1.D.

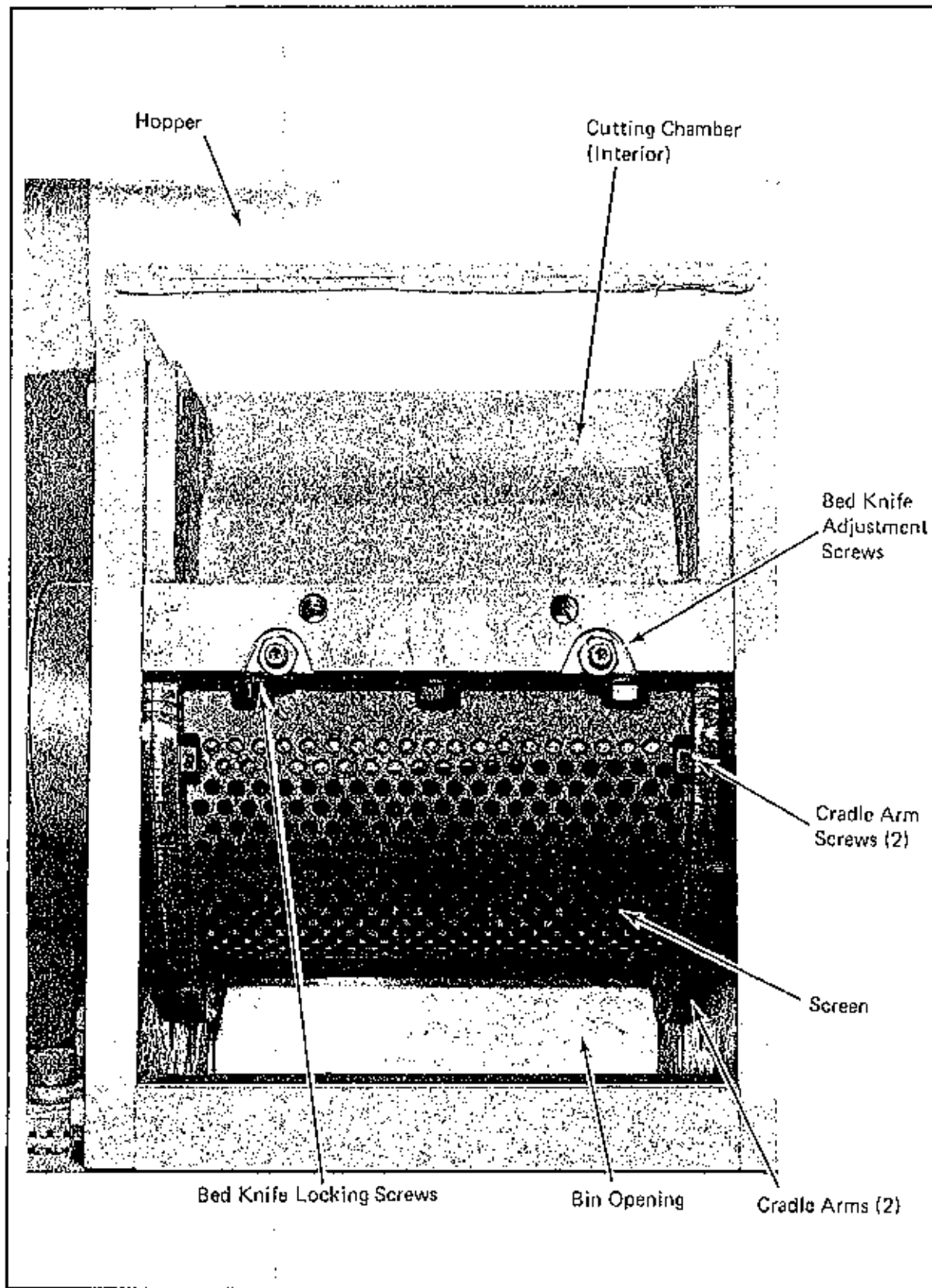


Figure S-1. Screen Replacement

MAINTENANCE

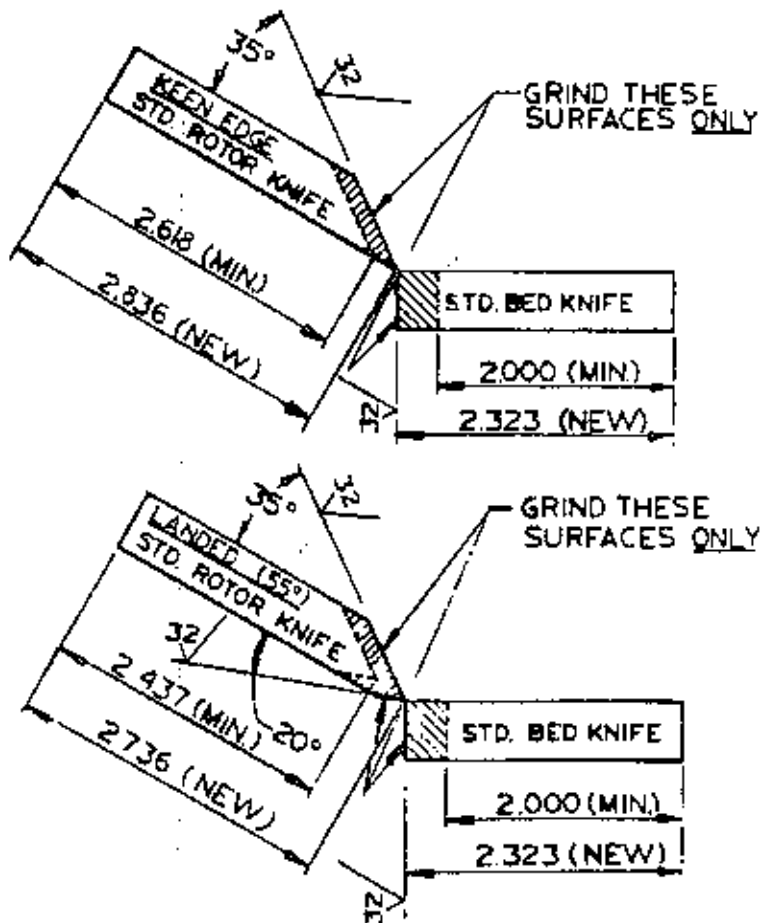
1. Rotor Knife Sharpening. The rotor knife can be re-sharpened to the diagram below. The three knives must be sharpened to within 0.076mm (0.003") of each other. Greater dimensional variations will cause difficulty when setting the knife gap and create other serious complications.

When sharpening, it is not harmful to allow a few small nicks to remain in the cutting edge. Grinding the cutting edge until perfectly clean can sometimes be wasteful.

Do not install rotor knives which are smaller than the minimum dimension shown, because the fasteners which secure these knives will interfere with the cutting circle. The rotor cannot turn, the bed knives will be damaged.

2. Bed Knife Sharpening. Each bed knife is provided with two cutting edges. When the exposed edges become blunt, the knives can be turned and repositioned to present the new cutting edges. When resharpening is necessary, refer to the diagram below.

It is not necessary to grind bed knives to the closely matched tolerance of rotor knives and as with the rotor knives small nicks in the cutting edges will not seriously affect knife cutting efficiency. Bed knives smaller than the minimum dimension shown must be replaced along with the fasteners which secure them.



Section VI

TROUBLE SHOOTING

6.0 INTRODUCTION

Part failure of a mechanical or electrical component may occur, therefore, this section has been prepared to serve as a guide to trouble-shooting possible malfunctions.

6.1 SAFETY

The utmost in safety precautions should be observed, at all times, when working on or around the machine and the electrical components. All normal trouble-shooting must be accomplished with the Power OFF, line fuses removed, and whenever possible with the machine tagged as OUT OF SERVICE.

6.2 TEST EQUIPMENT

The use of good quality test equipment cannot be over-emphasized, when trouble-shooting is indicated. Secure a good ammeter that can measure at least twice the AC and DC current that can be encountered for the machine. Be sure that the voltmeter has at least a minimum impedance of 5,000 OHMS-per-volt on AC and 20,000 OHMS-per-volt on DC scales. Popular combination meters, VOM and VTVM, can be selected to provide the necessary functions.

6.3 LOCATING THE TROUBLE

Before making haphazard substitutions and repairs when defective electrical components are malfunctioning, it is recommended that you check the associated circuitry, and assemblies for other defective devices. It is not too uncommon to replace the obviously damaged component without actually locating the real cause of trouble. Such hasty substitutions will only destroy the "new" component. Refer to wiring diagrams and schematics.

Locating of mechanical problems, should they occur, are relatively straightforward. When necessary, refer to the Parts Catalog section.

6.4 TROUBLE-SHOOTING CHART

Trouble-shooting procedures are listed in tabular form in Table 6-1. The first column lists the apparent problem or symptom, the second column contains the probable cause, and the suggested remedy is listed in the third column.

TABLE 6-1. TROUBLE-SHOOTING CHART

PROBLEM	PROBABLE CAUSE	REMEDY
Processing Faults		
A. Stalling	1. Overfeeding.	1. Reduce feed rate.
	2. Partial or complete screen blockage.	2. Remove screen, clear, and inspect for damage.
	3. Insufficient tension on V-belt drive causing belt slippage and burning.	3. Check tension of belt and adjust as necessary. Check that motor slide base screws are secure.

TROUBLE SHOOTING

PROBLEM

Processing Faults (contd.)

A. Stalling (contd.)

PROBABLE CAUSE

4. Badly blunted or damaged knives.
5. Knife setting too wide.
6. Installation fault, motor running in reverse direction.
7. Safety switch cut out where fitted.

REMEDY

4. Fit re-sharpened or new knives as required.
5. Check clearances given and adjust as required.
6. Remove right hand cover, check with directional arrow and reset electrical connections to give correct rotational direction.
7. Tighten safety switch setting screw.

B. Material Overheating

1. Check items 1, 2, 4, 5 and 6 under "Stalling".
2. Overfeeding:-Refer to item 1 under "Stalling".
3. Screen size too small.
4. (When feeding sheet material) – Bed knife shield on rotor down-stroke incorrectly set.
5. When granulating rubber, insufficient talc causing freshly cut surfaces to re-adhere.
6. (Where fitted) – Blockage is in Airykeying.

1. Remedy as given for those items.
2. Do not allow a head of material to build up in a hopper.
3. Increase screen size.
4. Check bed knife projection beyond shield. Set as necessary.
5. Increase talc percentage rate of infeed.
6. Check direction of fan rotation. Check venturi and line/or transition piece for blockage.

Mechanical Faults

A. Bearing Overheating

1. Excessive tension on V-belt drive.

1. Check tension of belt and adjust as necessary. Check lubrication frequency and the recommended lubricant (except pre-packed bearings).

TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Mechanical Faults (contd.)		
B. Visible Cracks in knives	1. This is a sign of incorrect grinding procedure or that incorrect grinding wheels are being used.	1. Check method of grinding and contact a Cumberland service engineer.
C. Knives moving on knife seats	1. Uneven knife seat surfaces. 2. Loose knife screws. 3. Stretched knife screws.	1. Clean up to provide maximum bearing surface. 2. Tighten to correct torque. 3. Knife screws should not be used more than six times. Renew if there is evidence of stretching.
D. Knives Breaking	1. Due to cracks caused by incorrect grinding. 2. Abnormally heavy material.	1. See under B, "Visible Cracks in Knives" above. 2. Contact a Cumberland service engineer.
E. Excessive Knife Wear	1. Open knife setting. 2. Abrasive materials.	1. Reset as detailed in Section III. 2. Contact a Cumberland service engineer for an alternate.
F. Screens Wearing	1. Incorrectly seated.	1. Check that screen is seated correctly and fully on its cradle.
Electrical Faults		
A. Motor Fails to Start	1. Power supply failure. 2. Starter inoperative. 3. Starter overloads cut out. 4. Safety switches inoperative.	1. Check fuses. 2. Check Mains Supply. Check starter contacts for burning, replace if necessary. 3. Check motor requirements and adjust accordingly. 4. Check and adjust as needed.

TROUBLE SHOOTING

PROBLEM

Electrical Faults (contd.)

B. Motor Starts But Will Not Take Loads

PROBABLE CAUSE

1. Too much belt tension.
2. Incorrectly connected motor.
3. Defective Starter Winding.

REMEDY

1. Check belt tension and adjust as necessary.
2. Check terminal connection with Manufacturer's connection diagram and adjust as necessary.
3. Check current in each phase with an Ammeter. If there is marked difference in current in any one phase, contact the motor Manufacturer.

C. Motor Will Start When Disconnected From Load But Not When Connected

1. Worn bearings.

1. Check and replace if necessary, in accordance with Manufacturer's literature.

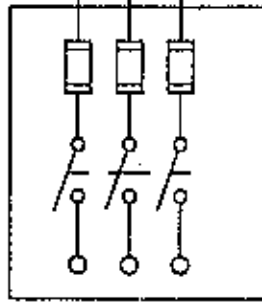
Section VII RECOMMENDED SPARES

7.0 RECOMMENDED SPARES LIST

When alternative items or quantities are listed, consult the Specification Sheet in SECTION II, to determine the exact item or quantity required.

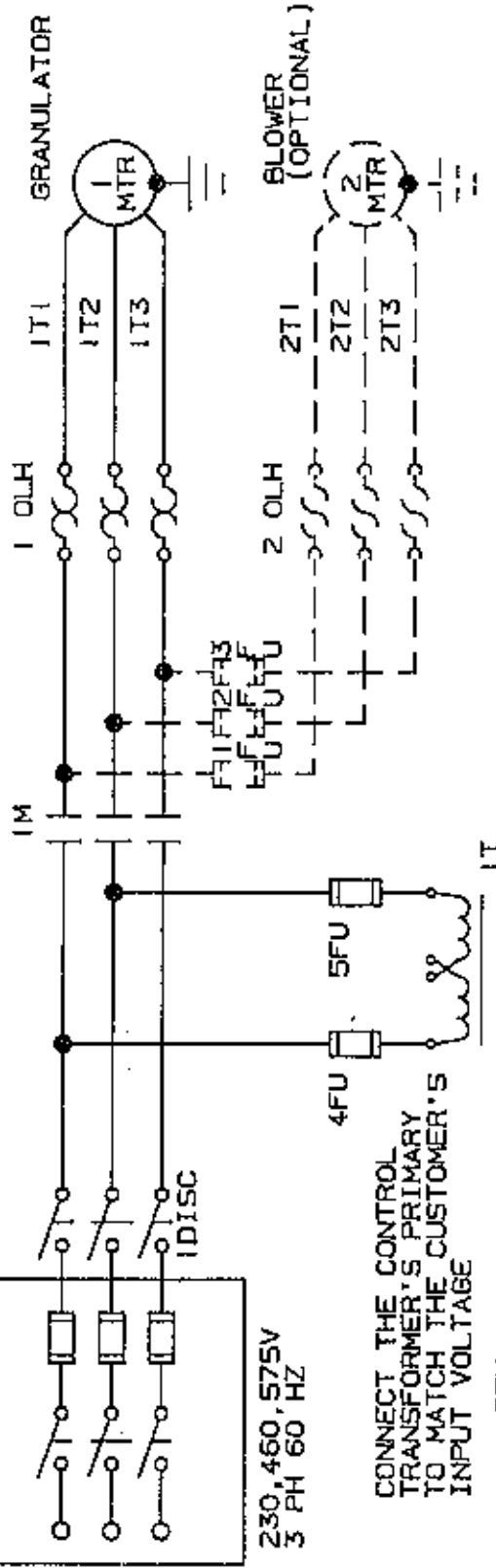
ITEM	QTY	DIMENSIONS	MATERIAL SPECIFICATIONS	PART NUMBER
Rotor Knives -55°	2	Standard	HCHC	B-239135
Bed Knives	2	Standard	HCHC	B-239104
Rotor Knife Screws	6		Heat Treated	15030-115
Bed Knife Screws	6		Heat Treated	15030-115
Bed Knife Washers	6			C-39940
Screens	1		Mild Steel or Stainless Steel	A-239098 + Hole Size
Rotor Bearings	2			12391-15
Drive Belts				

FUSIBLE DISCONNECT
(BY OTHERS)

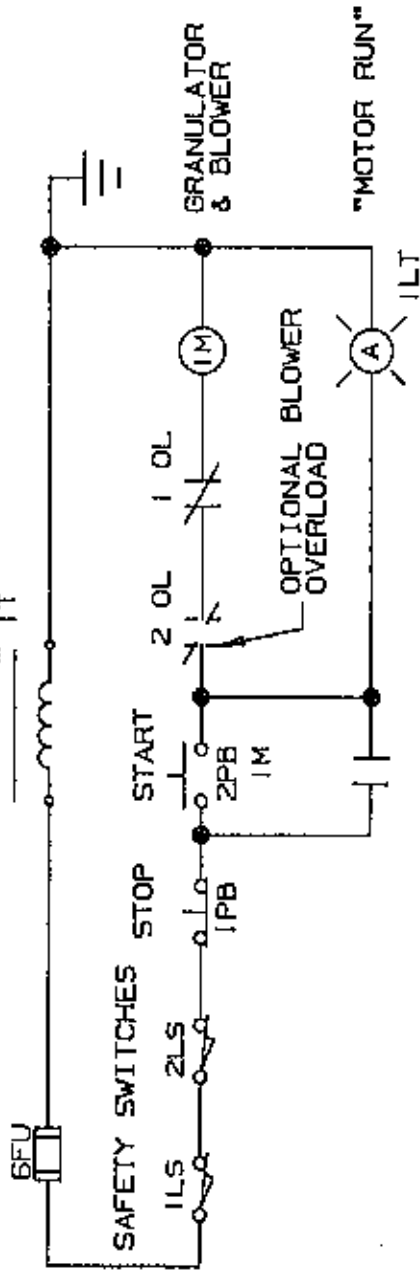


230, 460, 575V
3 PH 60 HZ

CUSTOMER MUST COMPLY WITH THE LATEST NATIONAL ELECTRIC
CODE AND ANY LOCAL CODES WHEN WIRING TO THIS MACHINE

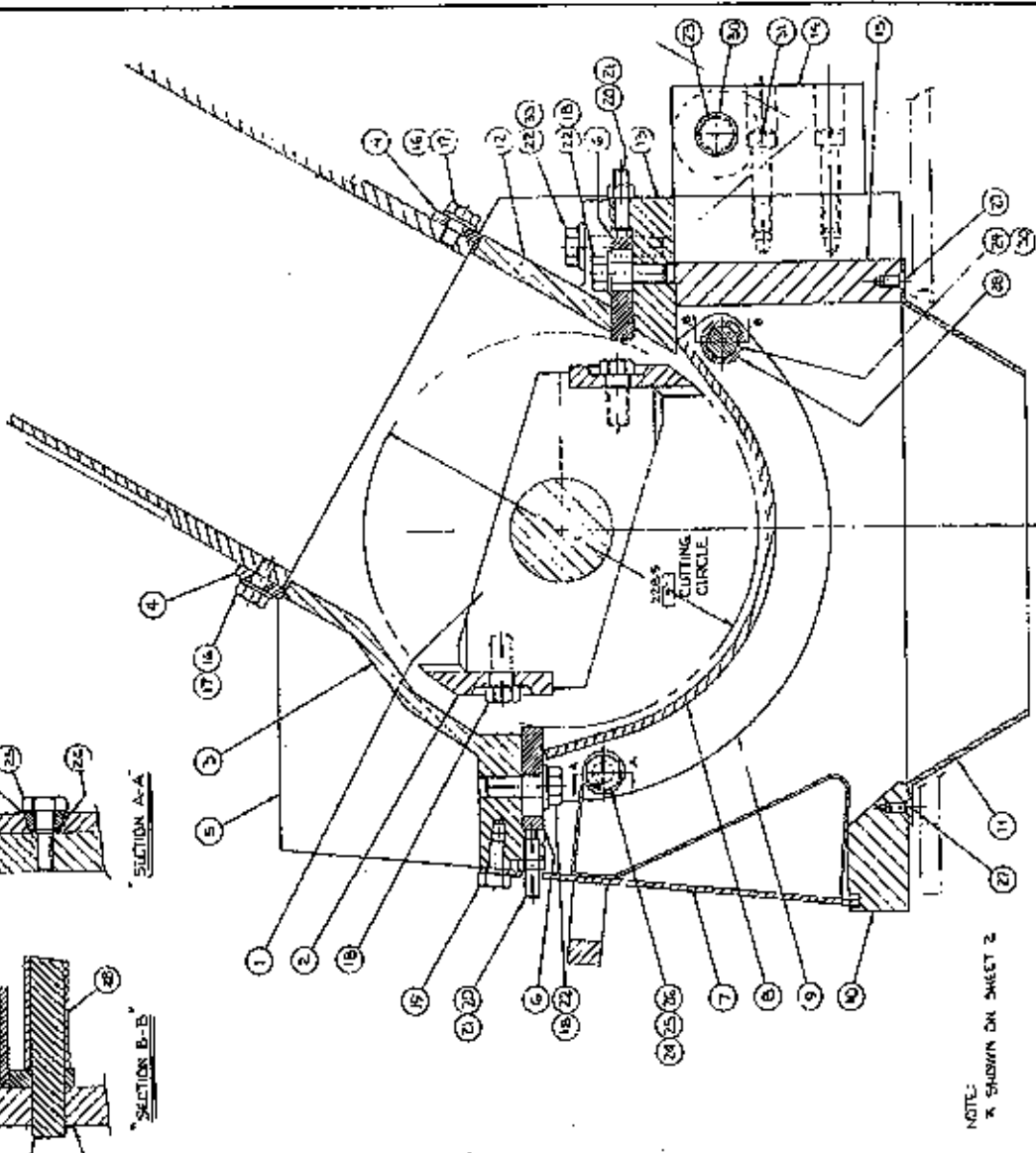
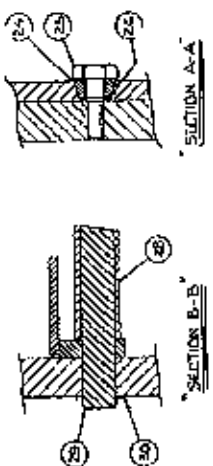


CONNECT THE CONTROL
TRANSFORMER'S PRIMARY
TO MATCH THE CUSTOMER'S
INPUT VOLTAGE



SECTION IX WIRING DIAGRAM

ITEM QTY	PART NO.	DESCRIPTION	REMARKS
1	BA-239151	ROTOR - 2 HIRE SA	
2	OPTIONAL	HINGE-ROTOR	
3	A-239096	ROPE BUCKLE & SHIELD	
4	D-339072	SEAL STRIP	
5	A-239087	SIDE PLATE - L.H.	
6	OPTIONAL	RED KNIFE	
7	A-239107	FRONT COVER ASSEMBLY	HOLES REGULATED TO SUIT.
8	A-239098	SCREEN-NUT.	
9	A-239099	CRADLE ARM - L.H.	
10	B-239071	LOWER BUCKLE-FRONT	
11	A-239121	CAUTION DISCHARGE	
12	A-239086	REAR SHIELD	
13	B-239092	ROPE BUCKLE-REAR	
14	B-399992	PIVOT BUCKLE-HOPPER	
15	B-239098	LOWER BUCKLE-REAR	MID-15 - 5/8" x 20 Lg.
16	15029-29	SCREW-NUT-C	M10
17	15-141-9	WASHER-PLANK	
18	15020-112	SCREW-NUT-C, INT.	M12-1.75 - 5/8" x 25 Lg.
19	15033-279	SCREW-NUT-C	M10-1.5 - 5/8" x 20 Lg.
20	15085-5	SCREW-6HS FULL DOK.	M10-1.5 - 5/8" x 35 Lg.
21	15-115-15	NUT-HEX	M10-1.5
22	15-39945-12	WASHER-HARDENED	M12
23	D-399915	PIN-HOPPER PIVOT	
24	15-229102	LOCATING WASHER	
25	D-229-31	ALTERNATE PIN-229-31	
26	15-26-25	SPACERS EXT. RING	TRU-ARC 5-1/2" x 4"
27	15-073-3	SCREW-2H.S.C.	M10-1.5 - 5/8" x 15 Lg.
28	C-239102	SPACER TUBE	
29	15-239129	PIVOT SHIRT	
30	15-673-75	SOFT LINDING RING	TRU-ARC 5-1/2" x 75
31	15-213-24	SCREW-S.H.C. AS. FRONT	M10-1.5 - 5/8" x 20 Lg.
32	D-3252-44	DEC-ALTERNATION	
33	15-133-143	SCREW-NUT-C, INT.	M12-1.75 - 5/8" x 20 Lg.
34	A-239058	SIDE PLATE - R.H.	
35	B-239059	BEARING HOUSING	
36	15-033-242	SCREW-NUT-C	M12-1.75 - 5/8" x 25 Lg.
37	15-04-11	WASHER-LOCK	M12
38	C-239291	BEARING CAP- END	
39	12391-15	BEARING	M12, 2-98510
40	A-239101	GRADLE ARM - RM	
41	15-48-14	WASHER-SPRING	M15
42	15-2-487	SCREW-NUT-C	M15-2-1/2" x 35 Lg.
43	15-08-189	SCREW-S.H.C.	M16-2-1/2" x 20 Lg.
44	C-38915	ANGLE MOUNTING, L.H.	
45	C-38929	PAD-VIBRATION	REAR
46	C-38934	ANGLE MOUNTING, R.H.	
47	C-42100	SPACER-ROLLING	
48	D-42103	BUSHING-MOUNTING	
49	D-42101	WASHER	M10-1.5 - 5/8" x 20 Lg.
50	A-42102	SEAL PLATE-BULLETPROOF	M10
51	12392-5	RETAINING RING	TRU-ARC 5100-196
52	B-37894	SHOULDER-FLYWHEEL	
53	C-239115	BUSHING - 4.0 BORE	
54	15033-161	SCREW-NUT-C	M10-1.5 - 5/8" x 20 Lg.
55	15134-9	WASHER-1.00K	M10
56	15332-261	BEARING-NUT-C	M12-1.25 - 5/8" x 26 Lg.
57	C-239070	BEARING CAP-R.H.	
58	D-239100	KEY-BUSHING	



NOTE:
X SHOWN ON SHEET 2

Section X VERTICAL CROSS SECTION

RECOMMENDED GRANULATOR MOTOR BRANCH-CIRCUIT SHORT-CIRCUIT PROTECTION PER THE
1996 NEC CODE BOOK RULES
FOR STANDARD EFFICIENCY MOTORS* (NEMA DESIGN B,C,&D)

HORSEPOWER	VOLTAGE	TIME DELAY FUSES	CIRCUIT BREAKER		MOTOR CIRCUIT PROT.	
			AUTO TRANS	ACROSS THE LINE	AMP RATING	TRIP RANGE
50	200	300A	400A	400A	400A	875-1750A
	208	250A	400A	400A	400A	875-1750A
	230	250A	350A	350A	250A	625-1250A
	460	125A	175A	175A	100A	300-1000A
	575	100A	150A	150A	100A	300-1000A
60	200	350A	450A	450A	400A	875-1750A
	208	300A	450A	450A	400A	875-1750A
	230	300A	400A	400A	400A	875-1750A
	460	150A	200A	200A	150A	450-1550A
	575	125A	175A	175A	100A	300-1000A
75	200	400A	600A	600A	NOT RECOMMENDED	
	208	400A	500A	500A	NOT RECOMMENDED	
	230	350A	500A	500A	NOT RECOMMENDED	
	460	175A	250A	250A	250A	500-1000A
	575	150A	200A	200A	150A	450-1550A
100	200	500A	800A	800A	NOT RECOMMENDED	
	208	500A	700A	700A	NOT RECOMMENDED	
	230	500A	600A	600A	NOT RECOMMENDED	
	460	225A	350A	350A	400A	625-1250A
	575	200A	250A	250A	150A	450-1550A
125	200	600A	800A	800A	NOT RECOMMENDED	
	208	600A	800A	800A	NOT RECOMMENDED	
	230	500A	800A	800A	NOT RECOMMENDED	
	460	300A	400A	400A	400A	875-1750A
	575	225A	300A	300A	400A	625-1250A
150	200	800A	1200A	1200A	NOT RECOMMENDED	
	208	800A	1000A	1000A	NOT RECOMMENDED	
	230	700A	1000A	1000A	NOT RECOMMENDED	
	460	350A	500A	500A	400A	1000-2000A
	575	300A	400A	400A	400A	625-1250A
200	200	1000A	1400A	1400A	NOT RECOMMENDED	
	208	1000A	1400A	1400A	NOT RECOMMENDED	
	230	800A	1200A	1200A	NOT RECOMMENDED	
	460	450A	600A	600A	NOT RECOMMENDED	
	575	350A	500A	500A	NOT RECOMMENDED	
250	200	1200A	2000A	2000A	NOT RECOMMENDED	
	208	1200A	2000A	2000A	NOT RECOMMENDED	
	230	1200A	1600A	1600A	NOT RECOMMENDED	
	460	500A	800A	800A	NOT RECOMMENDED	
	575	400A	600A	600A	NOT RECOMMENDED	
300	200	1500A	2000A	2000A	NOT RECOMMENDED	
	208	1500A	2000A	2000A	NOT RECOMMENDED	
	230	1200A	2000A	2000A	NOT RECOMMENDED	
	460	650A	1000A	1000A	NOT RECOMMENDED	
	575	500A	800A	800A	NOT RECOMMENDED	

* FOR ENERGY EFFICIENT MOTORS AND OTHER SPECIAL TYPES OF MOTORS CONSULT FACTORY FOR PROPER SIZING OF DISCONNECTS SWITCHES.

WHEN CONTROLS ARE FURNISHED BY THE CUSTOMER, CUMBERLAND BEARS NO RESPONSIBILITY OF IMPROPER SIZING OF DISCONNECT SWITCHES AND STARTERS UNLESS THE CUSTOMER REQUESTS MOTOR INFORMATION AND/OR ASKS FOR ENGINEERING ASSISTANCE IN SELECTING THE PROPER DISCONNECTS AND STARTERS.