

---

# Operating and Maintenance Manual

## OWNER'S MANUAL

### MIKRO-ACM<sup>®</sup> MODEL 60

Customer:  
Serial No.:

Record the model and serial number of your equipment and always refer to them when ordering replacement parts or requesting service assistance.

For replacement parts or service, call (800) 526-4491.



**HOSOKAWA MICRON POWDER SYSTEMS**

10 Chatham Road, Summit, NJ 07901 • Tel. (908) 273-6360 • Fax (908) 273-7432



## **HOSOKAWA MICRON POWDER SYSTEMS**

10 Chatham Road, Summit, NJ 07901 • Tel. (908) 273-6360 • Fax (908) 273-7432

# Aftermarket Services

Thank you for choosing Hosokawa Micron Powder Systems as your supplier of powder processing equipment.

As a Hosokawa Micron Powder Systems customer, you receive much more than high quality equipment and spare parts. Your purchase is supported by our extensive resources and more than seventy years of applications experience, all of which are combined in our Aftermarket Services team.

We will work with your operators, engineers and managers to keep your powder processing lines up and running. When you're ready to automate, integrate, modernize or expand, call us—we're ready to help.

### **AFTERMARKET SERVICES**

For technical assistance, please call us at (908) 273-6360. You may request to speak directly to the departments listed below. Additional information about our services is available from the Aftermarket Services Department.

#### **PROCESS TECHNOLOGY**

Our Process Technology Department consists of engineers who are dedicated to providing state-of-the-art powder processing assistance.

- System optimization
- Process troubleshooting
- Technical seminars
- Installation consultation
- System upgrades

#### **MECHANICAL FIELD SERVICE**

Our Mechanical Field Service group has been through extensive training and has experience providing:

- Mechanical start-up
- Mechanical repair
- Maintenance seminars
- Mechanical inspections/evaluations

#### **ELECTRICAL DESIGN/CONTROLS**

Our Electrical Design/Controls Department designs all of our control systems, from basic relay logic to automated PLC-based systems.

- Electrical start-up assistance
- Electrical repair or troubleshooting
- Control System consultation
- Control System upgrades

#### **SPARE PARTS**

Our Spare Parts Department works closely with our Procurement and Manufacturing personnel to ensure promptness of spare parts order deliveries.

- Blanket spare parts orders
- In-house factory repair
- In-house rebuilds/refurbishing
- Quantity discounts
- 24-hour delivery of stock items

## **FOREWORD**

The MIKRO-ACM® PULVERIZER is a high speed, close tolerance mechanical impact Air Classifying Mill with exceptional grinding efficiency and output. The ACM features an integral classifying wheel (separator) mounted above grinding chamber.

The ability to regulate both the air flow through the mill and the classifier wheel speed allows the selection of the conditions required to produce the desired classification.

### **IMPORTANT:**

**Before installing, operating or maintaining this equipment, carefully read this Manual and follow the Safety recommendations in Section II.**

# TABLE OF CONTENTS

## SECTION

SECTION I	-	PROCESS DESCRIPTION
SECTION II	-	SAFETY
SECTION III	-	EQUIPMENT DESCRIPTION
SECTION IV	-	INSTALLATION
SECTION V	-	START-UP
SECTION VI	-	MAINTENANCE
SECTION VII	-	PARTS LIST & SPARE PART LIST
SECTION VIII	-	LIST OF DRAWINGS

**SECTION I**

**PROCESS DESCRIPTION**

## 1.1.- PROCESS DESCRIPTION:

Grinding and pulverizing are processes in which materials are reduced in size as they are impacted by high speed rotating hammers. The term "pulverizing" is applied to fine grinding and derives from the word "polvo" (dust).

ACM Hammer Mills are made in a number of different configurations, but consist essentially of two vertical rotating shafts, the Rotor shaft and the Separator shaft.

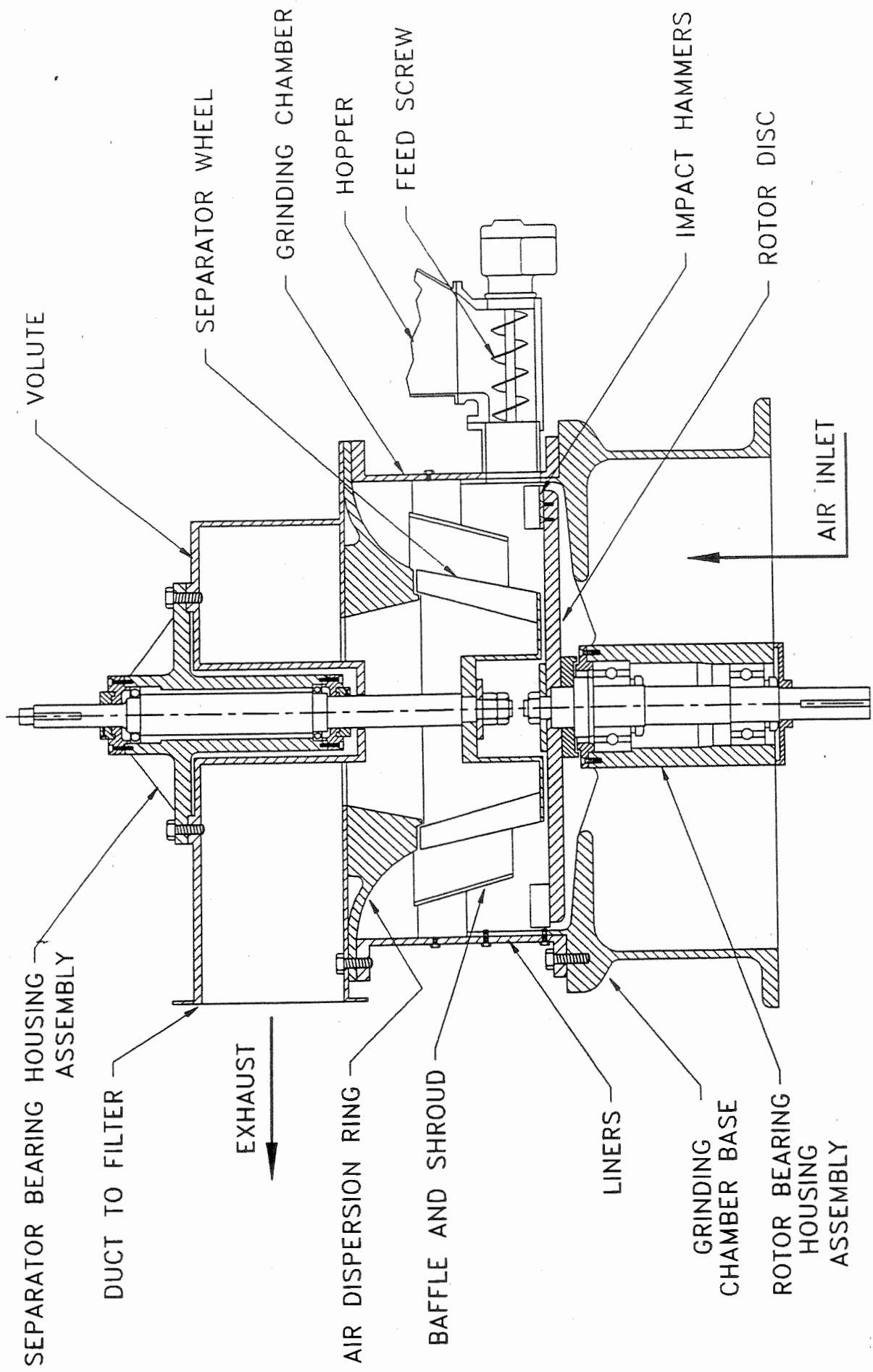
These shafts may be either "in-line" or "co-axial". The Rotor shaft turns the rotor assembly which consists of a disc and hammers that are designed in different sizes and shapes depending on the application. The Separator shaft turns the Separator Wheel or "classifier". The two shafts rotate in the same direction, but are driven by separate motors. The speed of the Rotor is usually constant, while the speed of the Separator is variable, to provide for the particle sizing capability of these mills.

The rotor and separator assemblies are attached to a common housing which contains liners or grinding tracks to form the grinding chamber. A baffle and shroud assembly guides the flow of air and material through the grinding chamber during the pulverizing process.

Movement of air through the ACM is essential for its operation. The air flow is usually provided by a fan, located at the discharge end of a suitable dust collector which "filters" the air and collects the product from the mill.

The most important variables in the pulverizing operation are:

- The size, power, and configuration of the Rotor.
- The tip speed and type of the hammers.
- The speed and configuration of the Separator wheel.
- The air flow through the mill.
- The condition of the grinding and impact surfaces.
- The characteristics of the material to be processed.



60 ACM - FIGURE 1

The size, power, and configuration of the ACM; along with the feed material size and required particle size of the finished product, determines the grinding capacity of the mill.

The speed of the hammers and separator wheel, as well as the air flow through the mill are the factors which affects the fineness of the product. Higher separator speed and lower air flow produce finer product.

Generally, the process can be summarized as follows (Refer to Fig. 1):

The material is fed into a hopper mounted above the Feed Screw. A variable speed drive conveys the material in a uniform fashion to the grinding chamber.

The hammers impact the material as it enters the grinding chamber propelling it toward the liner. This action fractures the material. The air, entering at the bottom of the mill, conveys the partially ground material around the baffle and shroud assembly, toward the separator wheel, and lets the fine particles through and rejects the coarser material. This coarser material drops back into the rotor chamber for further reduction as the material is impacted by the hammers. The material continues to be recirculated in this manner until all the particles have been reduced to a fineness that allows them to pass through the separator wheel.

After the separator wheel, the air conveys the fine material to the dust collector, where the conveying air is filtered and the product collected. The clean air is discharged to the atmosphere through the exhaust fan.

## **SECTION II**

### **SAFETY**

<b>2-1 GENERAL</b>	<b>PG. II-1</b>
<b>2-2 EQUIPMENT SAFETY FEATURES</b>	<b>PG. II-2</b>
<b>2-3 WARNING SIGNS</b>	<b>PG. II-3</b>

## 2-1.- GENERAL:

**NOTE:** Before installing, operating, or maintaining this equipment, carefully read this Manual and the following Safety recommendations.

- Follow all plant Working Rules and use recommended Safety Equipment.
- Read Operating Manual.
- The area around the ACM can be dusty. Use suitable respirator per plant policy and OSHA recommendations.
- While working around the mill, steel toe safety shoes and safety goggles or safety glasses with side shields must be worn at all times.
- The ACM produces a noise level somewhat higher than the acceptable limit of 85 dba at 1 meter from the noise source. OSHA approved ear protection must be worn while working around the mill.
- Keep hands and clothing clear of Feed Hopper, Mill openings, Air inlets or any moving parts.
- To eliminate the possibility of sparking occurring within the mill, all metallic scrap must be separated from the feed material before it enters the grinding chamber.
- Be sure the mill is electrically grounded.
- Wire motors permanently to an approved NEMA enclosure in accordance with all local codes and the National Electric Code.
- Before the mill is opened for inspection or repairs, make sure the main power is disconnected and the switch is locked out.

- When operating the mill, all safety guards must be in place.
- Should abnormal levels of vibration or noise develop, immediately shut off the equipment, investigate the problem and do not re-start the unit until the problem has been corrected. Contact MPS Service Department for assistance.

## 2-2.- EQUIPMENT SAFETY FEATURES:

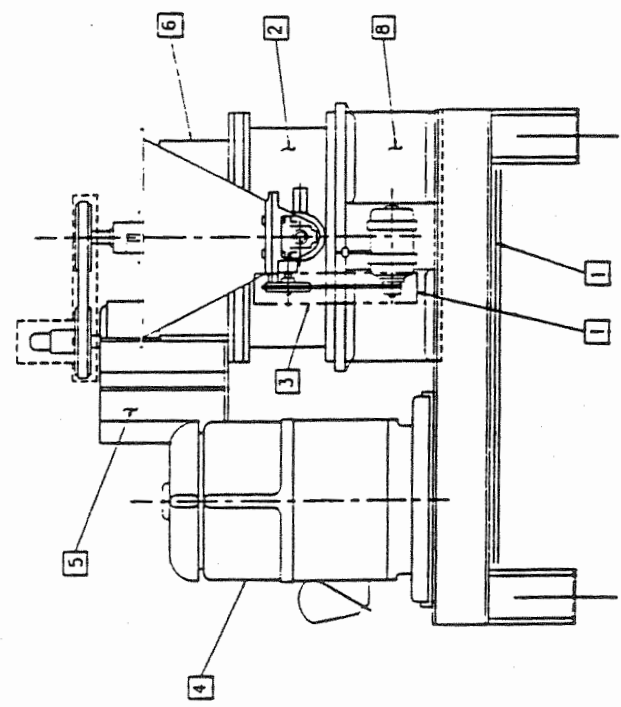
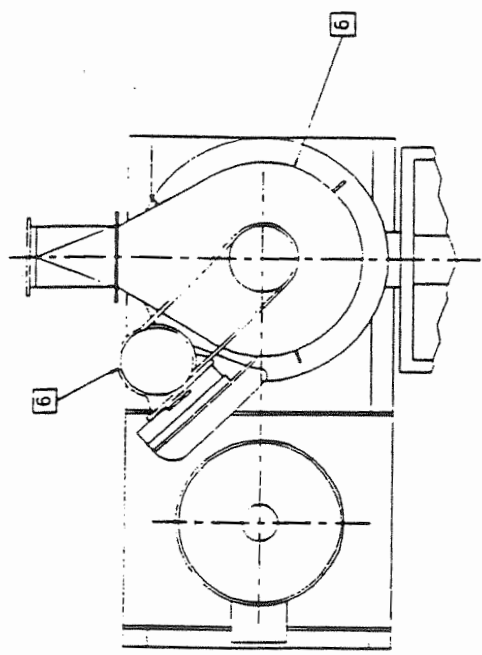
The MIKRO-ACM™ PULVERIZER incorporates the following safety features:

- **Fabrication:**  
Our mills are designed and built with safety in mind. All materials used have been carefully selected. All our mills are inspected by our Quality Control personnel during fabrication and assembly.
- **Housing Cover Limit switch:**  
This Limit Switch is interlocked with the Main Drive so that the Main Drive Motor cannot run if the Volute Assembly is not in place.
- **Electric Interlock between Motors:**  
The Main Drive Motor and Feed Screw Motor are interlocked so that the Feed Screw Motor cannot be started unless the Main Drive Motor is running.
- **V-Belt Guards:**  
All V-Belt Drives are protected with OSHA approved guards.
- **Moving Parts:**  
All moving parts are enclosed.

## 2-3.- WARNING LABELS:

The following drawing identifies potential hazards.

7  
6  
5  
4  
3  
2  
1



**NOTE**  
 LABELS AS INDICATED ARE TO BE PLACED  
 IN THE MOUNTING POSITION SHOWN.  
 VISIBILITY IS A CRITICAL FACTOR WHEN POSITIONING.  
 POSITIONING TO BE DETERMINED AT ASSEMBLY.

QTY	DESCRIPTION	UNIT	REVISION
1	NAMEPLATE		
1	ELECTRICAL HAZARD LABEL		
1	MICRON POWDER SYSTEMS IDENTIFICATION LABEL		
1	DIAPHRAGM REMOVAL WARNING LABEL		
1	POWER LOCKOUT LABEL		
1	EAR PROTECTION LABEL		
1	EYE PROTECTION LABEL		
1	WATCH HANDS LABEL		
1	BEARING		

DATE	BY	CHKD BY	APP'D BY

DESIGNED BY	REVISED BY

MANUFACTURED BY	DATE

TESTED BY	DATE

INSPECTED BY	DATE

APPROVED BY	DATE

SCALE	UNIT

PROJECT NO.	REV.

DATE	BY	CHKD BY	APP'D BY

DATE	BY	CHKD BY	APP'D BY

**MICRON POWDER SYSTEMS**  
 MODEL 60 ACM  
 SAFETY LABEL ARRANGEMENT

## SECTION III

### EQUIPMENT DESCRIPTION

3-1 FEED SYSTEM	PG. III-1
3-2 PULVERIZER	PG. III-1
3-3 PULVERIZER DRIVE	PG. III-3
3-4 PULVERIZER SUPPORT	PG. III-4
3-5 ELECTRICAL CONTROLS	PG. III-4
3-6 EQUIPMENT DATA	PG. III-5

### 3-1.- FEED SYSTEM:

(Refer to Drawings #60ACM-N641131-M1)

The Model 60 ACM FEED SYSTEM consists of the following items:

- The Hopper (A) has a nominal capacity of 0.88 cu. ft. Hopper (A) is bolted to Feed Screw Mechanism (B).
- The Feed Screw Mechanism (B) is a single screw conveyor consisting of Motor (C), driving Gear Reducer (D), Adjustable Speed Drive (E), and single Screw (F).

### 3-2.- PULVERIZER:

(Refer to Drawings #60ACM-N641131-M1)

The MILL itself consists of the following items:

- The Rotor Bearing Housing Assembly (G) supports the Rotor (H) and Hammers (I). The above assembly is enclosed by the Grinding Chamber (J), and Grinding Chamber Base (L).

The Liner (K) (4 Sections) surrounds the Rotor (H) and is bolted to the inner radius of the Grinding Chamber (J).

- The Separator Bearing Housing Assembly (M) supports the Separator Wheel (N) and is mounted inside the Volute Assembly (O), over the Grinding Chamber (J). The Air Dispersion Ring (P) is located between the Volute Assembly (O) and the Grinding Chamber (J) to deflect and guide the pulverized material to the classification area between the Separator Wheel (N) and the Baffle and Shroud Assembly (Q).

The Baffle and Shroud Assembly (Q) is bolted to the Grinding Chamber (J). It provides a path for rejected coarse particles to return to the hammers for further size reduction and directs the airflow to the separator so that it is parallel to the separator blades.

The Volute Assembly (O) can be removed from the Grinding Chamber (J), for cleaning, maintenance and disassembly of the various components.

**Notes:**

- a.- Two different Rotor assemblies are available depending on the grinding application. One utilizes **Pins** and the other utilizes **Bar hammers** to grind the product. The Pin type rotor produces a coarser particle distribution and is primarily used when grinding non-abrasive crystalline materials, such as sugar. Bar hammers are used to produce finer particle distributions and when grinding moderately abrasive materials. The bars can be faced with a variety of abrasive resistant tippings.
- b.- Two types of liners are available in a variety of materials. One is the **Multiple Deflector (MD) Liner** and the other is the **Smooth Liner**. The MD liners are used for most materials, while the smooth liner is used for gummy materials or to achieve a coarser particle distribution.
- c.- Separator Wheels are available in three configurations:  
**24 Short Blade Type**; and **24 and 48 Long Blade**. The Separator Wheels can be made from carbon steel, 304 or 316 Stainless Steel.  
  
- Different separator wheel configurations may result in slight changes in particle size distribution and/or capacity. Contact Micron Powder Systems to discuss your particular application.

**3-3- PULVERIZER DRIVE:**  
**(Refer to Drawings #60ACM-N641131-M1)**

The PULVERIZER DRIVES consist of the following items:

- The Rotor (H) is driven by **Rotor Motor (R)** by a **V-Belt drive** (not shown). **Guard (S)** covers this drive.

- The Separator Wheel (N) is driven by Motor (T) through the Variable Pitch Belt drive (U). The Separator Drive is enclosed by Safety Guard (V).

### 3-4.- PULVERIZER SUPPORT:

(Refer to Drawings #60ACM-N641131-M1)

The PULVERIZER SUPPORT consists of the following items:

- **Structural Mill Base:**  
The Grinding Chamber Base (L) and the Rotor Drive Motor (S) are bolted to a common Base (W).
- **Supporting Legs:**  
The Base (W) is bolted to four 12" long Stand Legs (X) which support the mill. These Legs (Y) must be anchored to suitable floor or foundation. (See Section IV, Par.4-1).

### 3-5.- ELECTRIC CONTROLS

Mikro-ACM Pulverizers are normally sold as part of a system that at a minimum includes a control panel and dust collector. A limit switch is provided with the ACM to prevent operation of the mill if the air dispersion ring and cover is not properly secured to the base.

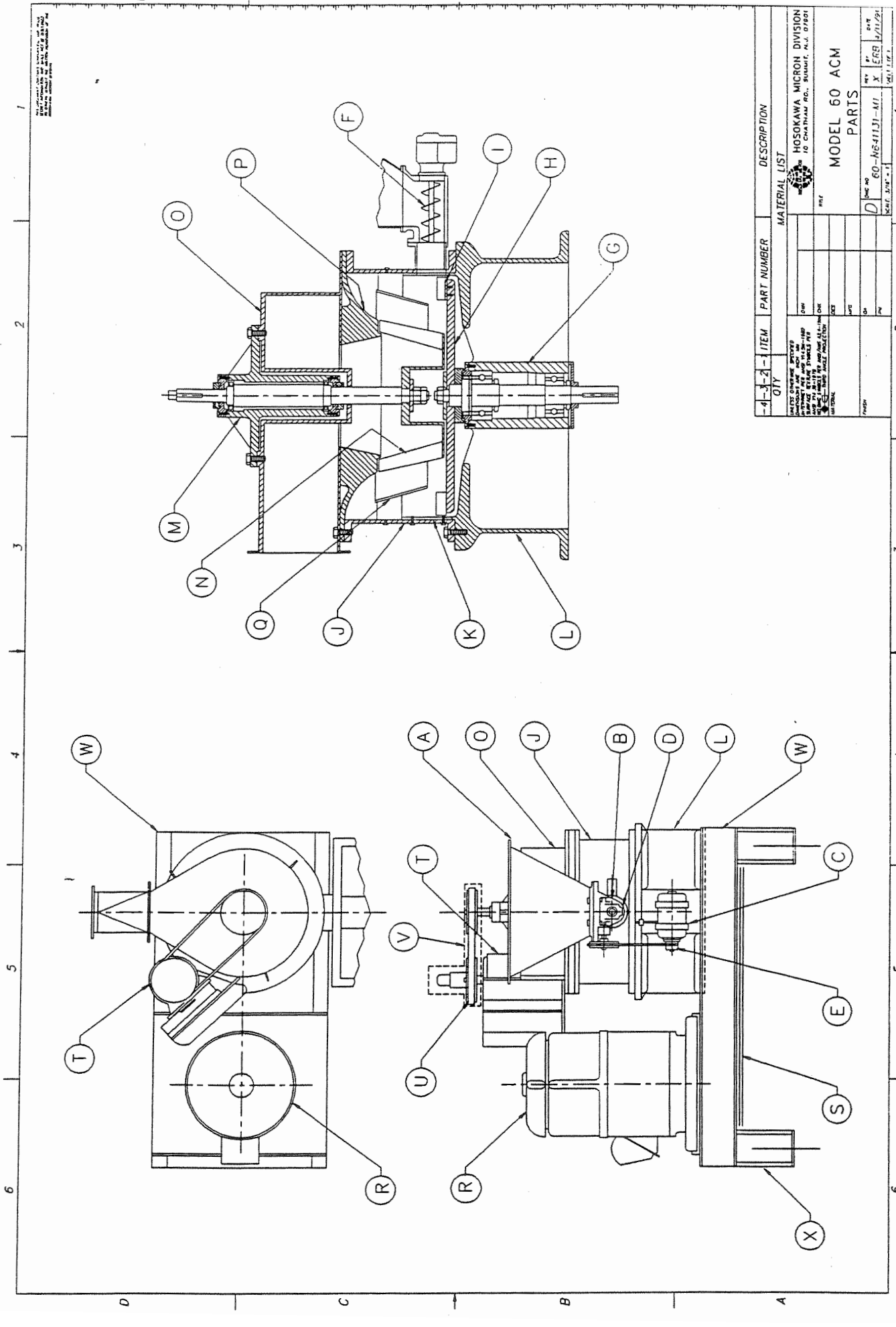
Ammeters and tachometers are recommended to monitor motor loading and the RPM of the separator and/or rotor. In addition, devices to monitor pressure differential across the mill and dust collector should be incorporated in the control panel.

If the customer elects to supply his own electrical controls, they should be designed to start the system's components in the following sequence: airlock, separator, dust collector fan and solenoid timer board, rotor, and feeder. Shutdown is in the reverse order.

### 3-6.- EQUIPMENT DATA

#### DESIGN DATA:

MAIN DRIVE MOTOR (ROTOR) .....	75 HP
ROTOR DISC SPEED (MAX) .....	3000 RPM
SEPARATOR DRIVE MOTOR .....	7.5 HP
SEPARATOR WHEEL SPEED (MAX) .....	1800 RPM
CLEARANCES BETWEEN SEPARATOR BLADES AND DISPERSION RING (MAX/MIN) .....	.065"/.055'
AIRFLOW REQUIRED (NOMINAL) .....	3500 CFM
OPERATING RANGE FOR STATIC PRESSURE LOSS ACROSS MILL .....	20" TO 30" W.G.
POWER REQUIREMENTS .....	Per Specs.
WEIGHT (APPROX.) .....	4700 LBS
FLOOR AREA REQUIRED .....	35 SQ. FT. (7' x 5')



1  
 2  
 3  
 4  
 5  
 6

A  
 B  
 C

-4-3-2-1		ITEM	PART NUMBER	DESCRIPTION
QTY				MATERIAL LIST
				HOSOKAWA MICRON DIVISION
				10 CHATHAM RD., SUMMIT, N.J. 07901
				MODEL 60 ACM
				PARTS
				REV. 1/11/79

## **SECTION IV**

### **INSTALLATION**

- 4-1 FOUNDATION REQUIREMENTS PG. IV-1**
- 4-2 CLEARANCE REQUIREMENTS PG. IV-1**
- 4-3 UNLOADING EQUIPMENT**
  - 4-3.1 Crates &  
Equipment Inspection PG. IV-1**
  - 4-3.2 Unloading PG. IV-1**
- 4-4 ASSEMBLY INSTRUCTIONS PG. IV-2**
- 4-5 INITIAL LUBRICATION PG. IV-4**

#### 4-1.- FOUNDATION REQUIREMENTS:

(For location of Supporting Legs, refer to drawing #60ACM-N64213-M)

The static load carried by the four Supporting Legs is 3,600 lbs.

The floor or foundations where the ACM is located must be level. The floor must be at least 6" reinforced concrete on firm soil base. If concrete piers are used, they must be at least one foot square and not more than 6" high.

#### 4-2.- CLEARANCE REQUIREMENTS:

There should be a minimum of six feet of clearance on all four sides of the mill once it is installed and there must be enough headroom to allow for installation of appropriate rigging to assist in routine maintenance of the mill.

#### 4-3.- UNLOADING EQUIPMENT:

##### 4-3.1 CRATES AND EQUIPMENT INSPECTION:

Inspect all the crates visually before opening them to identify any damage during transportation.

Inspect the appearance of all painted items.

Check for hardware that may have loosened during transport. Tighten any loose hardware.

##### 4-3.2 UNLOADING:

Use a 3 Ton (6,000 lb) capacity hoist for unloading and assembling the ACM.

When handling the 60 ACM, (Drawing #60ACM-N641131-M), use nylon straps around the frame and the four legs. Do not route the straps near the feed screw or feed hopper.

- NOTES:**
- 1.- DO NOT PUT SLINGS OR STRAPS AROUND THE SEPARATOR DRIVE MOTOR OR DRIVE GUARD.
  - 2.- DO NOT USE THE MAIN MOTOR EYE BOLTS TO LIFT THE ACM. THESE ARE EXCLUSIVELY FOR LIFTING THE MOTOR.
  - 3.- DO NOT BOUNCE OR HIT ASSEMBLY DURING LIFTING.
  - 4.- MAKE SURE LOAD IS WELL BALANCED.

#### **4-4.- ASSEMBLY INSTRUCTIONS:**

**NOTES:** - For assembly instructions refer also to Section III, "EQUIPMENT DESCRIPTION".

- Check Foundation level.
- Lift and locate the assembly over the Foundation, using nylon straps around Frame as indicated in Section 4-3.2. Make sure load is well balanced.
- Secure Legs to Floor or Foundation using 3/4" anchor bolts.
- Level and square Pulverizer Frame.
- Rotate the Rotor by hand to make sure that it rotates freely. If it does not, refer to Section VI "Maintenance" Par 6-3.4 to determine the cause. Call MPS Service Department if you are unable to positively identify the cause.
- Rotate the Separator by hand to make sure that it rotates freely. If it does not, refer to Section VI "Maintenance" Par 6-3.5 to determine the cause. Call MPS Service Department if you are unable to positively identify the cause.

- Check the V-Belt tension of the Rotor Motor. Correct it if necessary by adjusting the Rotor Motor on its Slide Rails and then tighten the Motor locking bolts.
- Proper V-Belt tension is a belt deflection of 3/16" when the belt is subjected to a 5 lb. load centered between the sheaves.
- Install the V-Belt Safety Guard.
- Install the Hopper over the Feed Screw Mechanism. Make sure the mating surfaces are clean. Use a gasket if necessary for a good seal.
- Connect power to the motor starters. Refer to Section III, par. 3-5.
- Check lubrication of Feed Screw Assembly. Refer to Section VI, par. 6-1 "Preventive Maintenance" for instructions and lubricant specifications.
- Make sure the machine is clear of all foreign objects and that all bolts are properly tightened.
- Switch the power ON.
- Jog the Main Motor and Separator Motor to check the direction of rotation. Both must rotate counter clockwise (See Fig.1, Section I). Change the Rotation if it is not correct.
- Jog the Feed Screw Mechanism Motor. Make sure the screw flight is turning toward the grinding chamber.
- Verify that the Safety Limit Switch operates properly (See par. 3-5).
- **DO NOT verify the limit switch operation by running the mill,** but check it according to the following procedure:
- Lock out the main power to the mill. When the volute is assembled properly, use a multimeter to measure continuity across the limit switch terminals.
- Loosen the volute mounting bolt that activates the limit switch and verify that you can no longer measure continuity across the terminals.
- Retighten the mounting bolts.
- Connect the ducting from the mill to the Dust Collector.
- Start the motors in the following sequence:  
     Airlock - Separator Wheel - Exhaust Fan - Rotor - Feeder.

- Run the ACM empty for 1/2 hour to check bearing temperature (see par. 6-1.2), and listen for any unusual noise or vibration.

Record the rotor motor and the separator motor idle load amperage readings for future reference. These two readings are used to adjust the feed rate and to maximize grinding efficiency.

Rotor idle load amperage: \_\_\_\_\_ @ \_\_\_\_\_ RPM

Separator idle load amperage: \_\_\_\_\_ @ \_\_\_\_\_ RPM

- After the run-in period, re-check all bolts and fasteners for tightness.

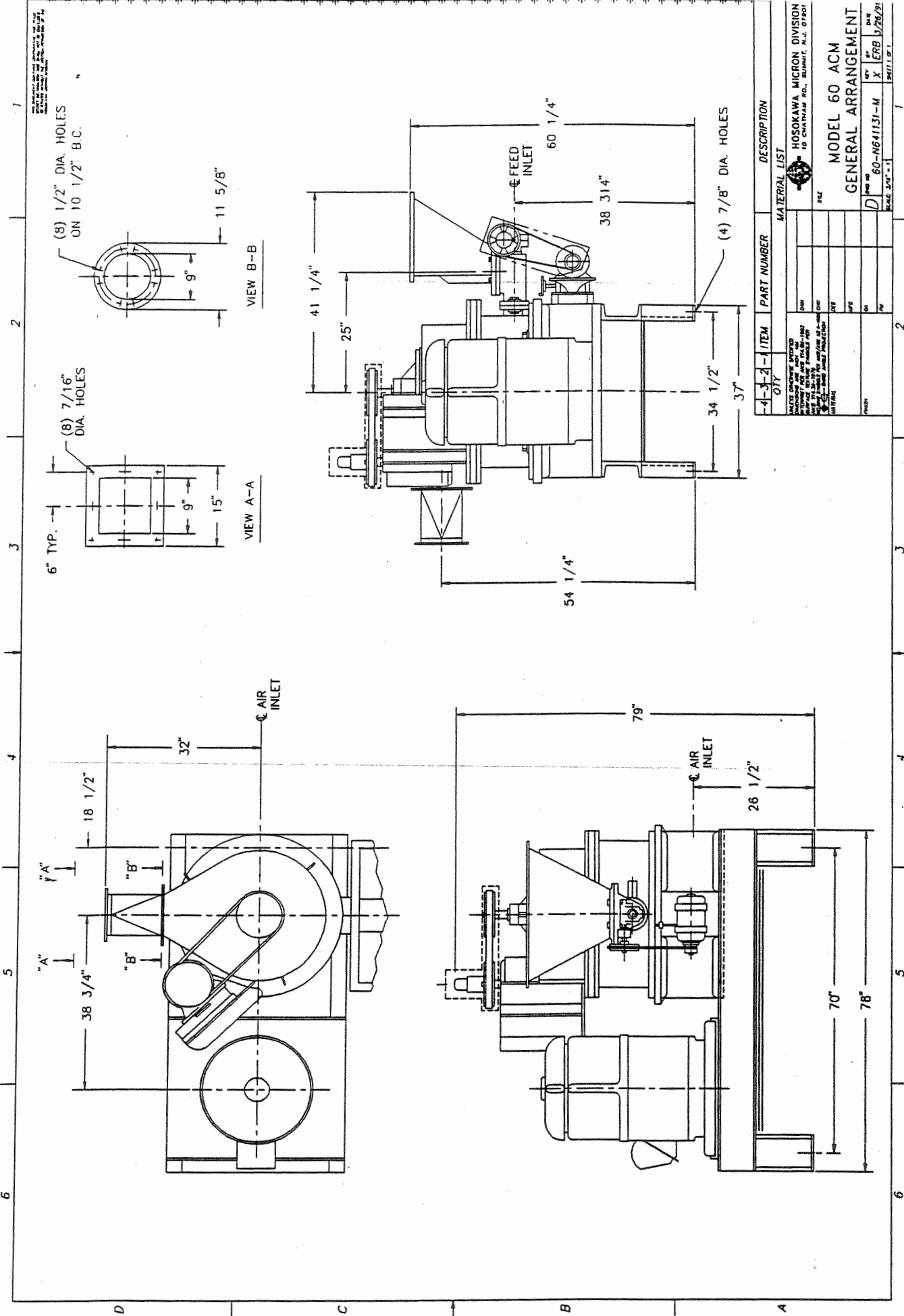
#### 4-5.- INITIAL LUBRICATION:

The Rotor and Separator assemblies are provided with sealed bearings. No further lubrication is required for the life of these bearings.

The Feed Screw assembly is equipped with an Alemite grease fitting that must be properly greased before running the unit.

For grease recommendations, see Section VI "Preventive Maintenance", par. 6-1.1 and 6-1.2 of this Manual.

All commercial items such as motors, variable speed-pulleys, etc. should be lubricated as per manufacturers specifications.



-4-3-2-1		ITEM	PART NUMBER	DESCRIPTION
CITY		MATERIAL LIST		
SALES OFFICE		HOSOKAWA MICRON DIVISION		
ADDRESS		10 CHATHAM RD., SUMMIT, N.J. 07901		
PHONE		FILE		
TELETYPE		MODEL 60 ACM		
GENERAL ARRANGEMENT		60-NG41131-M X ERB 1/26/21		
DATE		MAY 3, 1971		
BY		PHI. I. S. I.		

## SECTION V

### START UP

5-1 PRECAUTIONS BEFORE START UP	PG. V-1
5-2 START UP	PG. V-1
5-3 SHUTDOWN	PG. V-4
5-4 EMERGENCY SHUTDOWN	PG. V-5
5-5 POWER FAILURE	PG. V-5

## 5-1.- PRECAUTIONS BEFORE START-UP:

Before starting up **after** the Run-In period, make sure that:

- All bolts are properly tightened.
- The volute is properly installed and that the **Limit Switch is satisfied**.
- The Safety Limit Switch functions properly. (See page IV-4, par. 4-4)
- The Feed Screw has been greased.
- No tools have been left around the machine and drives.
- The Safety Guards are in place.
- Operators are using all the safety equipment required and are following all plant safety rules and regulations. (See Section II "Safety", for required safety equipment).
- Operators have been properly trained in the operation of the 60 ACM. Contact the MPS Service Department to request training classes.

## 5-2.- START-UP:

Note: MPS provides control panels with manual and/or automatic modes depending on customer requirements. The sequence of operation is identical in either mode.

To start a grinding cycle (Manual Mode):

- Start Airlock.
- Start the Separator Drive Motor by pushing the START Push-button for the Separator Motor.
- Adjust the Separator to the desired RPM.
- Start the Fan Motor.
- Start the Rotor Motor by pushing the START Push-button for the Rotor Motor. Adjust the rotor speed if applicable.
- Insure that all motors reach "idle load" amperage.
- Start the Feed Screw Motor with the hopper empty. The Feed Screw RPM should be initially set to its lowest speed.
- Feed raw material into the Hopper.  
**CAUTION: The unit is designed to grind dry material and the seals were selected accordingly. When cleaning the unit, water and steam should be avoided as the moisture will work past the labyrinths and other seals and cause damage to bearings and shafts.**
- Motor loading for the rotor and separator is indicated by their respective ammeter readings. The characteristics of the material being processed will determine whether rotor or separator amperage will limit the feed rate.

- Increase the feed rate according to the limiting motor load. **Recommended Maximum feed rate is determined by monitoring the Ammeter. Do not exceed 95% of name plate full load amperage for the motor.**
- Adjust the Exhaust Fan Damper to keep the static pressure drop across the mill at 28" W.C.
- Adjust Separator speed to produce the required particle size distribution. Increasing the separator speed will result in a finer product; decreasing the separator speed will result in a coarser product.

NOTE: Separator wheel speed and airflow through the mill are the two most important variables that effect particle size. High separator wheel speed and low air velocity produce a finer particle size. The primary means of controlling particle size is separator wheel speed. If the separator is running at its maximum speed, and a finer product is required, the air velocity can be reduced by closing the damper on the fan. Reducing airflow will have the undesirable effect of reducing capacity. There will also be a point where the reduced airflow will no longer convey the product through the system.

In most cases, the distribution of the grind can be changed by altering the rotor speed. Reducing the rotor speed will usually lessen the amount of ultra fine particles produced by the mill.

- Stop the system at the end of the pulverizing cycle. **Follow Shut-Down Procedure.**

### 5-3.- SHUT-DOWN:

Note: All control panels provided by MPS with automatic mode are designed to shutdown by pushing the process stop push button. Required time delays are incorporated in the panel design.

At the end of the grinding cycle or at any time during operation, the pulverizer can be stopped using the following manual mode shut down procedure.

- Stop feeding the ACM by pushing the STOP push-button of the Feed Screw Motor.
- Continue to run the ACM until ammeter readings for both the rotor and separator motors reach their idle load readings. The grinding chamber is now empty.

Note: Refer to Section 4-4, pg. IV-4 for idle load amperage readings.

- Stop the Rotor motor.
- Stop the Fan motor.  
Note: A time delay is initiated after the fan is stopped which locks out the separator stop push button and allows the airflow to stop before stopping the separator.
- Push the stop push button for the Separator motor approximately 15 seconds after the fan stop was initiated.
- The Separator motor is turned off after the fan stops to prevent oversized material from being transported through the mill by any residual air flow.

- Make sure that the Separator Wheel comes to a complete stop before attempting any disassembly or inspection.
- After all material has been discharged from the dust collector, stop the Airlock.
- The System can be restarted by following the aforementioned start-up procedure (Par. 5-2).

#### 5-4.- **EMERGENCY SHUT-DOWN:**

Control Panels supplied by MPS have emergency STOP buttons which immediately cut power in case of emergency. If the customer provides his own control panel, he must insure that there are provisions for emergency stops in the panel and in close proximity to the mill and other system components. The mill cover limit switch or mill cover proximity switch will function as an emergency stop if the mill is opened.

#### **CAUTION:**

**Before opening the Mill, make sure that the Main Power Switch is disconnected, properly tagged out and locked out.**

Before restarting, open the Mill and remove any material in the grinding chamber. The rotor should be started from an unloaded condition. Follow the aforementioned Start-Up procedure. (Par. 5-2)

When power is shut off to all components simultaneously, it is likely that some oversized material will be transported to the dust collector as the separator wheel slows down. If a small amount of oversized particles in the final product is unacceptable, the dust collector should also be emptied before the system is restarted.

#### 5-5.- POWER FAILURE:

MPS Control Panels are designed so that the equipment will not restart automatically when power is restored. Customer designed panels must be designed similarly to prevent serious injury and equipment damage.

Before attempting to restart the System, all product must be removed from the grinding chamber.

When power is shut off to all components simultaneously, it is likely that some oversized material will be transported to the dust collector as the separator wheel slows down. If a small amount of oversized particles in the final product is unacceptable, the dust collector should also be emptied before the system is restarted.

#### **CAUTION:**

**Before opening the Mill, make sure that the Main Power Switch is disconnected, properly tagged out and locked out.**

Restart the mill by following the Start-up procedure (Par. 5-2).

**SECTION VI**  
**MAINTENANCE**

<b>6-1</b>	<b>PREVENTIVE MAINTENANCE</b>	<b>PG. VI-1</b>
6-1.1	Lubrication	PG. VI-1
6-1.2	Daily Preventive Maintenance	PG. VI-2
<b>6-2</b>	<b>VIBRATION</b>	<b>PG. VI-2</b>
<b>6-3</b>	<b>ASSEMBLY INSTRUCTIONS</b>	
6-3.1	Changing Liners	PG. VI-2
6-3.2	Changing Rotor & Hammers	PG. VI-4
6-3.3	Changing Separator Wheel	PG. VI-5
6-3.4	Changing Rotor Bearings	PG. VI-6
6-3.5	Changing Separator Wheel Bearings	PG. VI-7
6-3.6	Changing Feed Screw	PG. VI-8
6-3.7	Changing V-Belts	PG. VI-9
<b>6-4</b>	<b>TROUBLESHOOTING</b>	<b>PG. VI-10</b>

## 6-1.- PREVENTIVE MAINTENANCE

Maintenance of the 60 ACM is very simple and only requires a small amount of planned maintenance time.

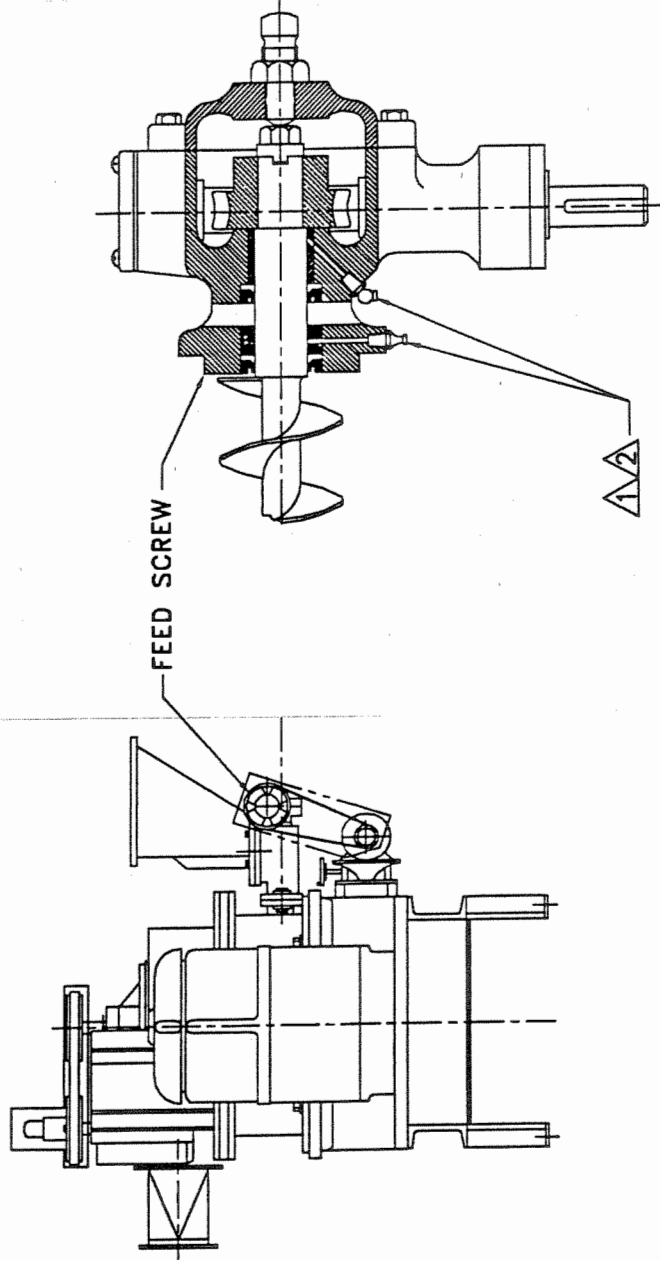
### 6-1.1 LUBRICATION:

Refer to "Lubrication Chart" and "Lubrication Graph" in this SECTION.

- Rotor Motor, Separator Motor and Feed Screw Motor:  
Follow recommendations of Motor Manufacturer.
- Rotor and Separator Bearings:  
The 60 ACM Pulverizer is equipped with sealed, lubricated bearings on both the main Rotor shaft and Separator Wheel shaft. No further lubrication is required for the life of the bearings.
- Feed Screw Motor:  
Follow recommendations of Motor Manufacturer.
- Variable Speed Pulleys:  
Follow recommendations of Pulley Manufacturer.
- Feed Screw Bearings and Gears:  
The Feed Screw is supported by two bronze bushings with Zerk fittings for greasing. The feed drive shaft has two ball bearings lubricated by grease through Zerk fittings. The gear box contains the bronze gear and steel worm which should be occasionally repacked with grease. All Zerk fittings should have grease added once a week.

**Recommended grease:** (See Lubrication Chart)

LUBRICATION GRAPH



EVERY WEEK (GREASE) - ADD  $\triangle$   
EVERY 300 HRS. (GREASE) CHANGE  $\triangle$

LUBRICATION CHART

SYSTEM: 60 ACM

Equipment Section	Parts to be Lubricated	Method of Application	Lubricant Selection	Frequency	
				Replenish	Change
MILL	Bearings		SEALED BEARINGS-NO LUBRICATION REQUIRED		
	Motors		USE MANUFACTURER SPECIFICATIONS		
FEEED SCREW	Reducer		USE MANUFACTURER SPECIFICATIONS		
	Variable Speed Pulley		USE MANUFACTURER SPECIFICATIONS		
	Feed Screw Bearings	Grease Fitting	Chevron Dura-Lith EP #2	Every Week	Every 3 mo.
			Exxon Unlrex #2		
			Mobil Mobilix #2		
			Shell Alvania Grease #2		
			Sunoco Prestige 742EP		
			Texaco Multifak #2		

## 6-1.2 DAILY PREVENTIVE MAINTENANCE:

Check Rotor and Separator Bearing Housing for any unusual noise or temperature change. The mill must be shut down to take temperature measurements. Use a surface probe or carefully touch the bearing housing. If you cannot hold your hand to the bearing housing, it is too hot (over 140°F) and requires attention.

While the unit is running under load, listen for any unusual noise. (DO NOT remove your ear plugs). If you hear any unusual noise or vibration, notify your supervisor immediately.

## 6-2.- VIBRATION:

### VIBRATION LIMITS:

The following Vibration Velocity Limits (in/sec) apply to unloaded conditions:

- 0.15 in/sec or less is NORMAL.
- 0.15 to 0.40 in/sec - Identify and correct the source of vibration.
- Greater than 0.40 in/sec - Shut down Mill. DO NOT run until the source of vibration is corrected.

## 6-3.- ASSEMBLY INSTRUCTIONS:

### 6-3.1 CHANGING LINERS (See Fig. 2):

(THIS PROCEDURE APPLIES ALSO FOR CHANGING BAFFLE AND SHROUD, AND DEFLECTOR RING.)

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect the Main Power Switch, lock it out, and tag it out.

- Secure the volute assembly to rigging equipment that is capable of lifting two tons. The volute assembly is not symmetrically balanced. Extreme care must be taken to ensure that lifting points are selected that result in a balanced lifting condition.
- Remove the Volute assembly bolts.
- Remove the Volute Assembly by using a hoist or other appropriate lifting equipment and set the entire assembly on a cradle. The grinding chamber is now exposed for disassembly.
- Secure the rigging equipment to the Baffle and Shroud.
- Loosen and remove the Baffle and Shroud bolts.
- Pull straight up on the Baffle and Shroud to remove it.
- Remove the four sections of Liners by removing the bolts from each section and lift out the liners.
- Clean the area behind the liners and all other mating surfaces.
- Align the new feed Liner section with the feed opening. Loosely install all bolts, starting with the center two.

**NOTE: When using Multiple Deflector Liners, the orientation of the scalloped deflectors is critical for efficient operation of the mill.**

- Locate the other Liner sections against the wall and install all bolts, beginning with the center two.
- Tighten all bolts securely.
- Check the Baffle and Shroud before reinstalling it. Replace it if it shows signs of wear.
- Reinstall the Volute Assembly on the grinding chamber and tighten the mounting bolts. Insure that the limit switch operates properly (See pg. IV-4, paragraph 4-4).
- Connect Power and start the unit.

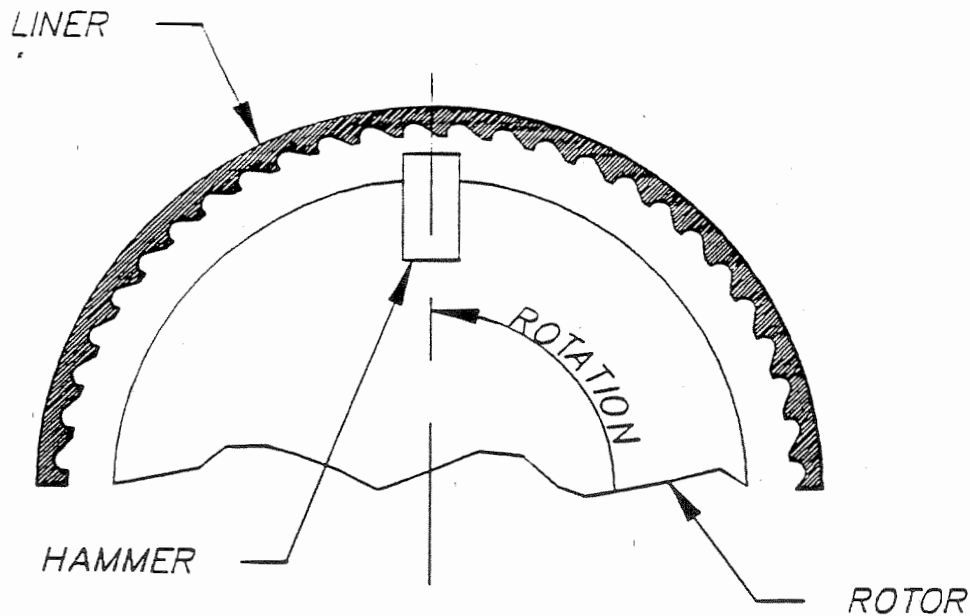


FIG. 2

### 6-3.2 CHANGING ROTOR AND HAMMERS:

**NOTE:** Worn hammers can significantly reduce output capacity. A spare set of hammers should be kept on hand in the event an unscheduled replacement is required.

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect the Main Power Switch, lock it out, and tag it out.
- Secure the volute assembly to rigging equipment that is capable of lifting two tons. The volute assembly is not symmetrically balanced. Extreme care must be taken to ensure that lifting points are selected that result in a balanced lifting condition.
- Remove Volute assembly bolts.
- Remove the Volute Assembly by using a hoist or other appropriate lifting equipment and set the entire assembly on a cradle. The grinding chamber is now exposed.
- Secure the rigging equipment to the Baffle and Shroud.
- Loosen and remove the bolts of the Baffle and Shroud.

- Pull straight up on the Baffle and Shroud to remove it.
- If Bar-type Hammers are to be replaced, it is not necessary to remove the Rotor Disc. To remove the hammers, simply loosen and remove the two Allen screws from each hammer. New self locking hardware must be used each time the hammers are replaced.
- **Do not replace individual hammers.** Make sure that they are replaced in opposing balanced pairs or complete balanced sets.
- When Pin-type Hammers become worn, the entire pin rotor assembly must be removed to change the pins.
- Remove the Cotter Pin from the Rotor shaft Castellated nut. Use a wooden wedge to fix the rotor in place.
- Loosen and remove the Castellated nut.
- Remove the Clamp Washer and the Rotor Disc from the Rotor Shaft.
- Remove the worn pins by unbolting the pins from the underside of the rotor disc.
- Apply loctite, install the new Pins and tighten the bolts.
- Balance the Rotor.
- Reverse the above procedure to reassemble the mill.
- Restore Power and start the unit.

### 6-3.3 CHANGING SEPARATOR WHEEL:

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect Main Power Switch, lock it out, and tag it out.
- Secure the volute assembly to rigging equipment that is capable of lifting two tons. The volute assembly is not symmetrically balanced. Extreme care must be taken to ensure that lifting points are selected that result in a balanced lifting condition.
- Remove Volute assembly bolts.

- Remove the Volute Assembly by using a hoist or other appropriate lifting equipment and set the entire assembly on a cradle so that the separator wheel can be removed. **DO NOT DISCONNECT** the lifting equipment. It must remain in place to serve as a safety device to support the weight of the volute assembly.
- To remove the Separator Wheel from its shaft, loosen the lower jam nut at the end of the Separator Shaft by holding the top one with a wrench.
- Remove both jam nuts and the Washer.
- Remove the Separator Wheel.
- **NOTE: There are a number of hub shims (thin washers) behind the Separator which serve to adjust the gap between the Separator Wheel and the Air Dispersion Ring.**
- Install the new Separator Wheel, Separator Wheel Washer, and jam nut.
- Using a feeler gauge, check the clearance between the Separator Wheel and the Air Dispersion Ring. It should be between 0.055" and 0.065". Adjust the clearance, if necessary, by adding or removing shims behind the Separator Wheel.
- Reverse above procedure reassemble the mill.
- Connect Power and start the unit.

#### 6-3.4 CHANGING ROTOR BEARINGS:

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect the Main Power Switch, lock it out, and tag it out.
- Secure the volute assembly to rigging equipment that is capable of lifting two tons. The volute assembly is not symmetrically balanced. Extreme care must be taken to ensure that lifting points are selected that result in a balanced lifting condition.
- Remove Volute assembly bolts.
- Remove the Volute Assembly by using a hoist or other appropriate lifting equipment and set the entire assembly on a cradle. The grinding chamber is now exposed.

- Secure the rigging equipment to the Baffle and Shroud.
- Loosen and remove the bolts of the Baffle and Shroud.
- Pull straight up on the Baffle and Shroud to remove it.
- Remove the Cotter Pin from the Rotor Shaft Castellated nut.  
Use a wooden wedge to fix the rotor in place.
- Loosen and remove the Castellated nut.
- Remove the Clamp Washer and the Rotor Disc from the Rotor Shaft.
- Loosen the locking hardware for the Rotor Motor Base so that the Rotor V-belts can be removed.
- Remove the V-Belts and the Driven Pulley.
- Loosen Socket Headed Screws and remove the top impact rotor bearing flinger.
- Loosen Socket Headed Screws and remove Upper End Bearing Cap.
- Remove Lower End Bearing Cap.
- Pull out the complete shaft with bearings from the bearing housing.
- Protect the Rotor Bearing Housing Bore from contamination.
- Loosen and remove the locknut and lockwashers.
- Use a bearing puller behind the inner race of the bearing to remove it. The shaft journal should be inspected to determine proper dimensions. Should the bearing become seized on the shaft, other methods of removal may be necessary. If this becomes necessary, the shaft journals should be inspected prior to installing new bearings. Contact MPS Service Department for assistance.
- Once the shaft journal has been determined to provide a proper fit, the new bearing must be pressed onto the shaft after it is heated to a maximum of 250°F using an appropriate bearing heating device. The shoulder on the shaft should make contact with the inner race of the bearing.
- Clean all components before assembling the bearing housing.
- Reverse above procedure to reassemble the mill.
- Connect Power and start the unit.
- Verify that the rotation of the separator is correct.

### 6-3.5 CHANGING SEPARATOR WHEEL BEARINGS:

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect Main Power Switch, lock it out, and tag it out.
- Secure the volute assembly to rigging equipment that is capable of lifting two tons. The volute assembly is not symmetrically balanced. Extreme care must be taken to ensure that lifting points are selected that result in a balanced lifting condition.
- Remove Volute assembly bolts.
- Remove the Volute Assembly by using a hoist or other appropriate lifting equipment and set the entire assembly on a cradle so that the separator wheel and shaft can be removed. **DO NOT DISCONNECT** the lifting equipment. It must remain in place to serve as a safety device to support the weight of the volute assembly.
- To remove the Separator Wheel from its shaft, loosen the lower jam nut at the end of the Separator Shaft by holding the top one with a wrench.
- Remove both jam nuts and the Washer.
- Remove the Separator Wheel.  
**NOTE: There are a number of shims (thin washers) behind the Separator which serve to adjust the gap between the Separator Wheel and the Air Dispersion Ring.**
- Loosen the Set Screws and remove the Upper Flinger.
- Loosen and remove the drive belts by adjusting the Separator Motor.
- Remove the flat face pulley from the Separator Shaft.
- Loosen the Bolts holding the Separator Bearing Housing to the Volute Assembly.
- Pull the Separator Bearing Assembly up and out of the Volute.
- Loosen the Set Screw and Remove the Flinger at the other end of the shaft.
- Remove the Held Bearing Retainer.
- Pull out the shaft from the bearing housing.

- Remove bearings using same procedure described under paragraph 6-3.4.
- Clean all components before reassembling the bearing housing.
- Once it has been determined that the shaft journal provides a proper fit, the new bearing may be installed using a press and sleeve or a sleeve and hammer. In either case, the sleeve must fit against the outside wall of the inner race. A film of light oil will aid in the installation. This applies only to bearings with an O.D. of four inches or less. The shoulder on the shaft should make contact with the inner race of the bearing.
- Reverse above procedure to reassemble the mill
- Connect Power and start the mill.
- Verify that the rotation of the Separator is correct.

#### 6-3.6 CHANGING FEED SCREW:

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3.
- Disconnect the Main Power Switch, lock it out, and tag it out.
- Remove the Belt on the Feeder Adjustable Speed Drive.
- Loosen and remove the bolts between the Feed Trough and the Feed Screw Mechanism.
- Remove the Feed Screw Mechanism from the Feed Trough.
- Clean base pads and install a new Feed Screw Assembly.
- If bearings are to be checked and/or replaced, place the Feed Screw Mechanism on a clean bench.
- Remove the Driven Pulley.
- Remove the two bolts securing the gear box cover.
- Loosen and remove the cap screw and key washer.
- Loosen bolts and remove Bearing Retaining Plate.
- Pull Feed Screw Shaft out of the Feed Screw Bearing Housing.
- Remove bearings (Ball bearing and Bronze Bushing) and inspect and replace them, if required.
- Clean all components before reassembling.
- Reverse above procedure to assemble the Feeder.
- Connect Power and start the unit.

### 6-3.7 CHANGING V-BELTS:

- Shut down the mill following the procedure in paragraph 5-3, pg. V-3..
- Disconnect the Main Power Switch, lock it out, and tag it out.
- Loosen the Belts by sliding the Rotor Motor on rails.
- Remove the Belts and install a new **matched** set.
- Adjust the Belt tension. See Section 4.4.

6-4 TROUBLESHOOTING CHART

SYSTEM: 60 ACM

PAGE: 1 OF 3

Equipment Section	Symptoms	Possible Cause	Remedy
MILL	Mill stops - Starter heaters overload	a.- Feed rate too high b.- Rotation backwards c.- Foreign object jamming rotor d.- Separator wheel too fast	Slow Feeder Reverse rotation Remove object Decrease wheel speed
	Mill product not discharging	a.- Separator wheel too fast b.- Exhaust fan malfunction c.- Insufficient Airflow	Decrease wheel speed Check/start fan Adjust damper for 28" W.G.
	Material is blowing out of the mill	a.- Exhaust fan malfunction b.- Duct and/or Dust Collector is clogged or blinded. c.- Incorrect rotation	Check/start fan Clean duct. Service dust collector. Reverse rotation
	Change in product particle size	a.- Feed material has changed (in composition or size) b.- Separator speed has changed	Adjust classifier speed Check drive/adjust speed

6-4 TROUBLESHOOTING CHART

SYSTEM: 60 ACM

Equipment Section	Symptoms	Possible Cause	Remedy
MILL	Premature bearing failure	a.- Wrong bearing b.- Rotor imbalance c.- Improper hammer installation	Procure correct bearing Balance rotor Install hammers per instructions
		d.- Heavy and/or inconsistent feed material e.- Excessive V-belt tension	Adjust feed mechanism to deliver material at a slower rate Adjust to proper tension
		f.- Possible contamination by material and/or water during washdown	Avoid water contact near shaft area
	Variation in Mill Motor load (amperage)	a.- V-belts slipping b.- Feed rate varying c.- Inconsistent feed material	Adjust belt tension (Sect. 4-4) 1. Check feed supply 2. Check feeder operation Modify preparation of feed material
	Reduced capacity	a.- Worn hammers b.- Worn liners c.- Reduced rotor speed	Replace with new set Replace with new liners Check drive for worn or loose V-belts. Replace belts with matched set.
		d.- Feed rate too slow	Increase feed screw speed to max. 95% of motor full load (See Section 5-2.)

6-4 TROUBLESHOOTING CHART

SYSTEM: 60 ACM

Equipment Section	Symptoms	Possible Cause	Remedy
MILL	Reduced Capacity	e.- Low air flow	Increase airflow to produce a 28" water S.P. across the mill
FEED SCREW	Feed screw jammed	Foreign object jamming screw	Clear object from feed screws
	Feeds too fast	Too much suction at feed	Check that the hopper air inlet chamber is clear.
<b>NOTE: FOR ANY PROBLEMS NOT IDENTIFIED HERE, PLEASE CONTACT MPS SERVICE DEPARTMENT</b>			

## SECTION VII

### PARTS LIST

7-1 60 ACM MILL CROSS SECTION

7-2 MILL CROSS SECT. BILL OF MATERIAL

7-3 60 ACM SEPARATOR BEARING HOUSING  
AND SEPARATOR WHEEL

7-4 SEPARATOR HOUSING BILL OF MATERIAL

7-5 60 ACM ROTOR BEARING HOUSING  
AND ROTOR

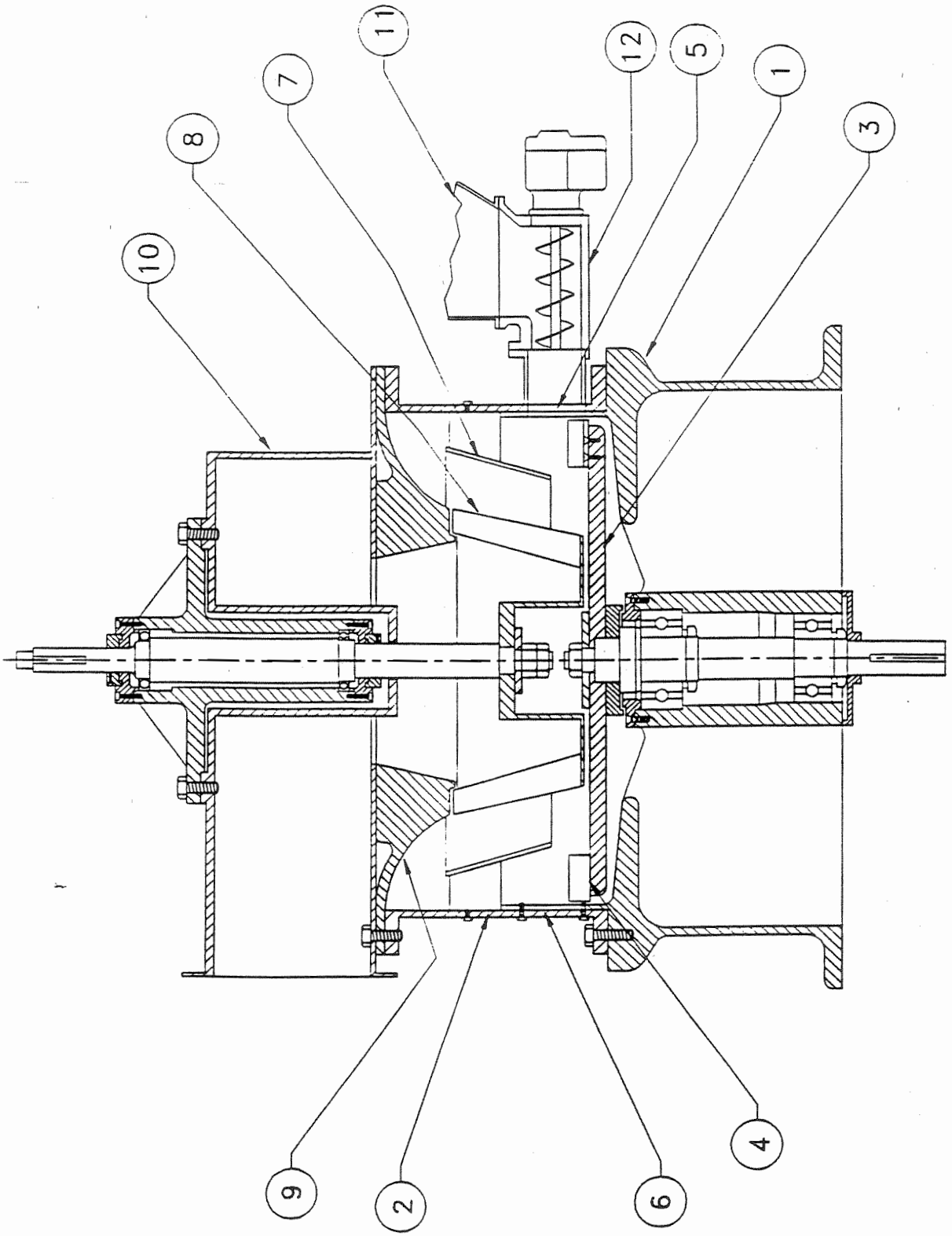
7-6 ROTOR HOUSING BILL OF MATERIAL

7-7 60 ACM FEED SCREW ASSEMBLY

7-8 FEED SCREW ASSEMBLY  
BILL OF MATERIAL

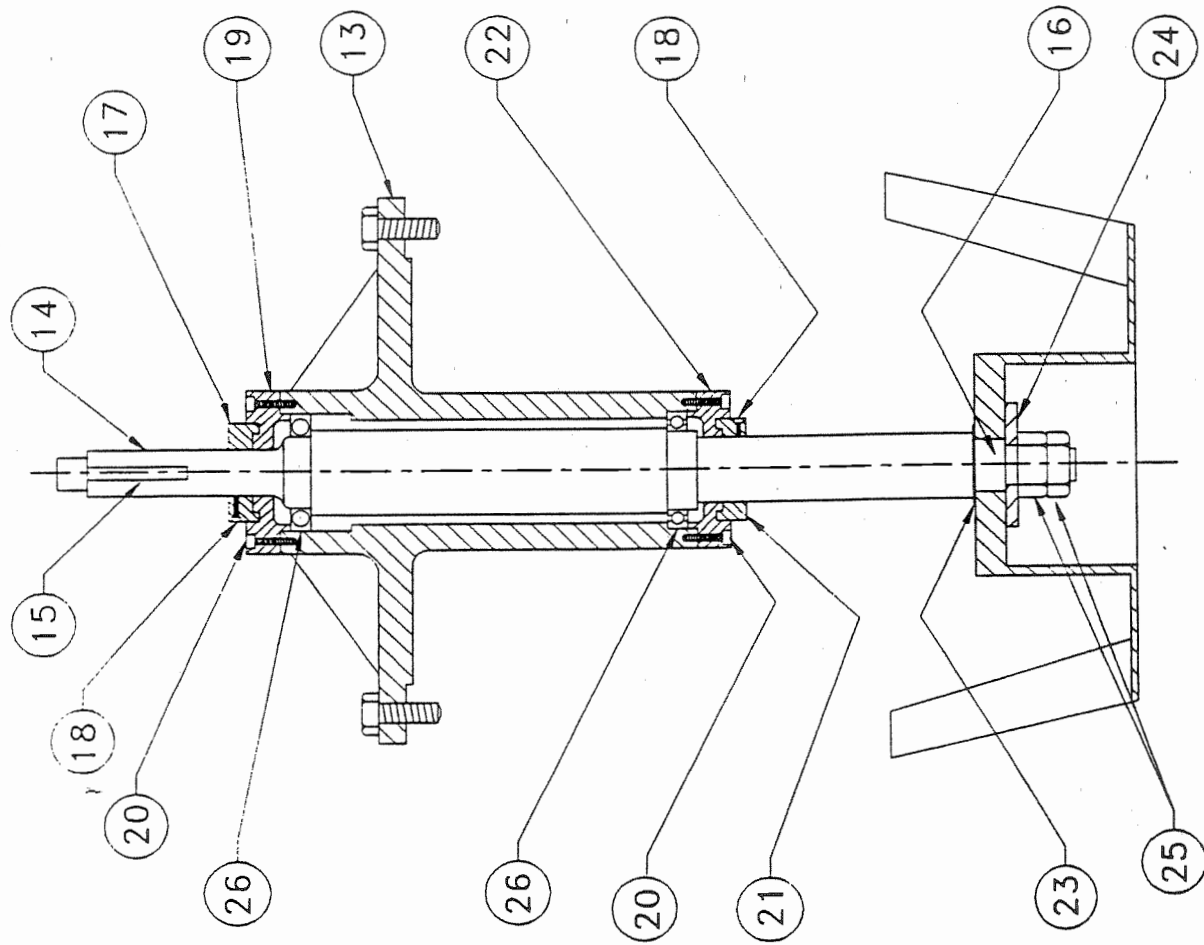
AND

SPARE PARTS LIST



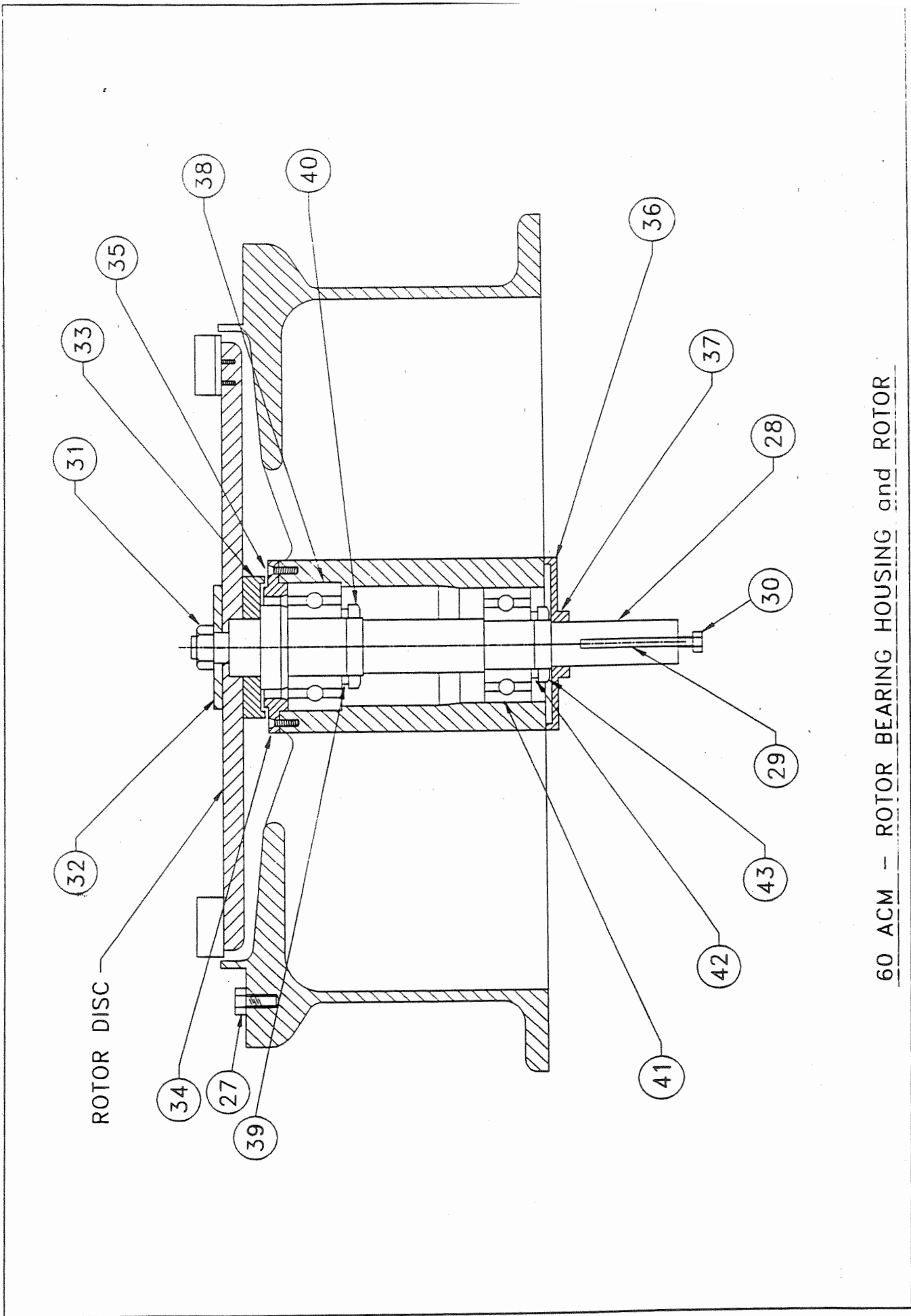
60 ACM - MILL CROSS SECTION





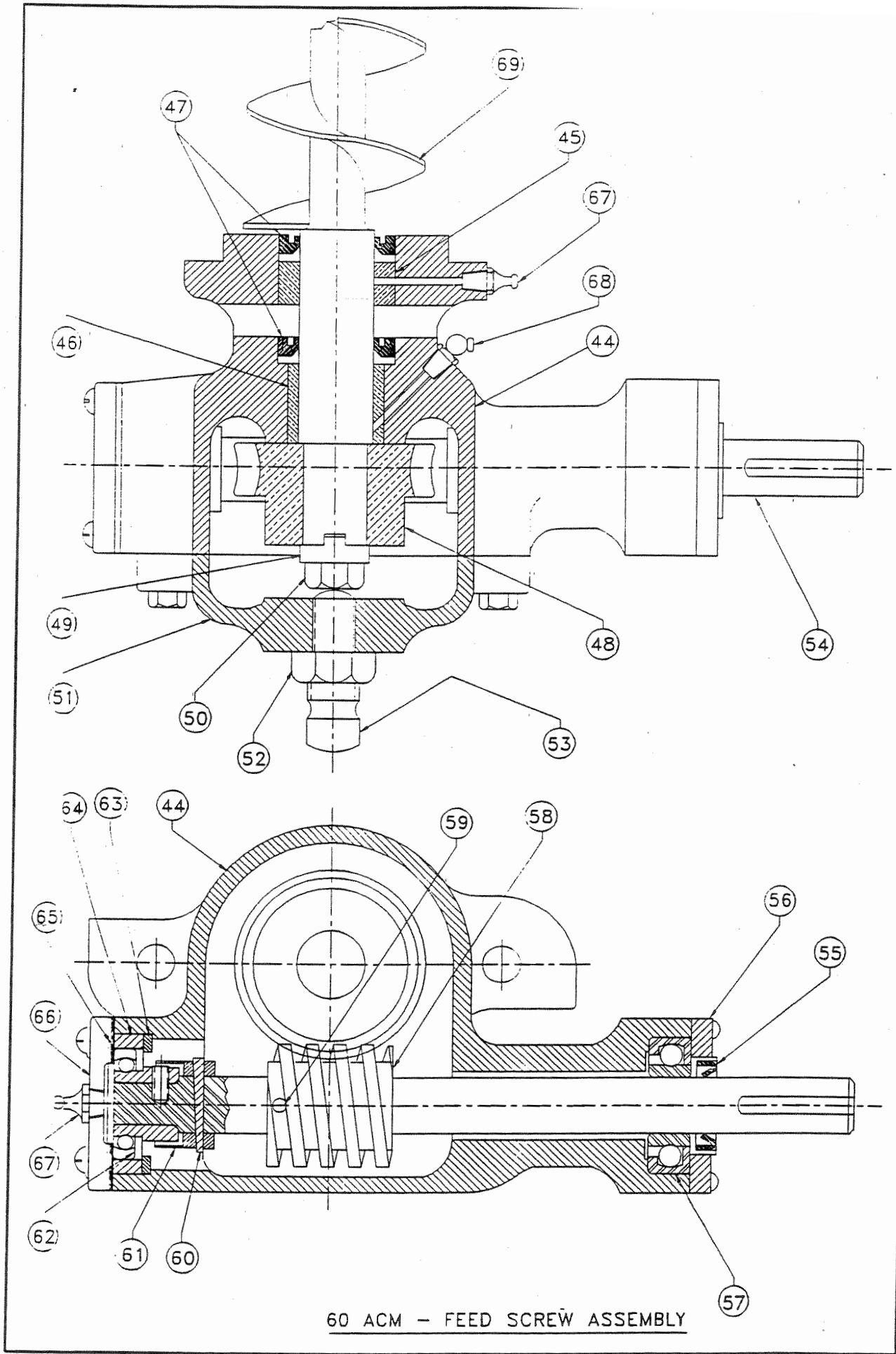
60 ACM - SEPARATOR BEARING HOUSING and SEPARATOR WHEEL

Equipment Section	Assembly Type	Ref. Number	Part Description/Name	Qty. Req'd.	Stock Number
MILL	Separator Hsng.	13	Separator Bearing Housing		
		14	Separator Shaft		
		15	Key (3" Lg.)		
		16	Key (3/4" Lg.)		
		17	Flinger (Drive End)		
		18	Allen Set Screw (1/4-20)		
		19	End Cover (Drive End)		
		20	Allen Socket Head Screw		
		21	Flinger (Opp. Drive End)		
		22	End Cover (Opp. Drive End)		
		23	Hub Shims		
		24	Flat Washer		
		25	Nut (L.H. Thread)		
		26	Bearing		



60 ACM - ROTOR BEARING HOUSING and ROTOR





60 ACM - FEED SCREW ASSEMBLY

7-8 BILL OF MATERIAL

SYSTEM: 60 ACM

PAGE: 4 OF 5

Equipment Section	Assembly Type	Ref. Number	Part Description/Name	Qty. Req'd.	Stock Number
FEEDER	Feed Screw Assembly	44	Gear Box Casting with Bushings		
		45	Bushing 1-1/8" ID x 1-5/8" OD x 5/8" Lg.		
		46	Bushing 1-1/8" ID x 1-3/8" OD x 1" Lg.		
		47	J.M. Packing Ring		
		48	Bronze Worm Gear w/1/4" Keyway		
		49	Key Washer		
		50	Hardened Cap Screw 1/2" x 1" Lg.		
		51	Gear Box Cover		
		52	3/4" Hex. Nut		
		53	Hardened Set Screw 3/4" x 2-1/4" Lg.		
		54	Feed Drive Shaft		
		55	J.M. Packing Ring		
		56	Garlock Mounting Plate		
		57	Bearing		
		58	Steel Worm		
		59	#3 Taper Pin		
		60	#2 Taper Pin		
		61	Set Screw Retainer		
		62	Bearing		
		63	Bushing 1-1/2" ID x 2" OD x 1/8" Lg.		



**SPARE PARTS**

**SYSTEM: 60 ACM**

Equipment Section	Drawing Number	Ref. Number	Part Description/Name	Qty. Req'd.	Cost	Lead Time	Stock Number
Mill			Hammers				
			Liners				
			Separator Bearings				
			Rotor Bearings				
			Rotor Disc				
			Separator Wheel				
			Dispersion Ring				
			Set of Seals				
			Baffle and Shroud				
	Feeder			Feed Screw Bearings (all)			
			Feed Screw Shaft				
			Bronze Gear				
			Worm				
			Seals (all)				
Drive (All)			V-Belts				

---

**SECTION VII**

**DRAWINGS LIST**

**DRAWING LIST**

**SYSTEM: 60 ACM**

**PAGE: 1 OF 1**

Manual Section	Drawing Number	Drawing Title	Revision	Latest Date/Revision
I	FIG. 1	60 ACM-FIGURE 1 (Mill Cross Section)		
III	60-N641131-M1	60 ACM-GENERAL ARRANGEMENT (Description)		
IV	60-N641131-M	60 ACM-GENERAL ARRANGEMENT (Main Dimensions)		
VI		60 ACM-LUBRICATION GRAPH		
VI	Fig. 2	LINER ORIENTATION		
VII		60 ACM-CROSS SECTION		
VII		60 ACM-SEPARATOR BEARING HOUSING AND SEPARATOR WHEEL		
VII		60 ACM-ROTOR BEARING HOUSING AND ROTOR		
VII		60 ACM-FEED SCREW ASSEMBLY		