

Dynumatic®

DRIVE SOURCE INTERNATIONAL, INC.

Eddy Current Air-Cooled Brakes Model AS-703 through AS-708

INSTRUCTION MANUAL

(AS-703 –AS-708 – Revised 2019)



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*Application Engineering * Quality Products * Total Solution*

DANGER HIGH VOLTAGE



Motor control equipment and electronic controllers are connected to hazardous line voltage. When servicing drives and electronic controllers, there may be exposed components with their cases and protrusions at or above line potential. Extreme care should be taken to protect against shock. Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power whenever possible to check controllers or to perform maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on an electronic controller or electrical rotating equipment.

CAUTION:

Rototating shafts and above ground electrical potentials can be hazardous. Therefore, it is strongly recommended that all electrical work conform to National Electrical Codes and local regulations. Installation, alignment and maintenance should be performed only by qualified personnel.

Factory recommended test procedures, included in the instruction manual, should be followed. Always disconnect electrical power before working on the unit.

REFER TO OSHA RULES AND REGULATIONS, PARAGRAPH 1910.219 FOR GUARDS ON MECHANICAL POWER TRANSMISSION APPARATUS.

Note - Since improvements are continually being made to available equipment, the enclosed data is subject to change without notice. All drawings, unless certified, are for reference only. For additional information, contact DSI/Dynumatic® at 1-800/548-2169 or 262/554-7977.

IMPORTANT NOTICE

The printed contents in this instruction book are to be used for reference only. Due to periodic engineering design changes and the addition of modifications, this material is provided as a guide only.

Refer to the enclosed engineering drawings, which are furnished for your specific unit.

For additional information regarding contents of this manual, please send your request to DSI/Dynumatic®, Fax: 262-554-7041, or call: 262/554-7977, or Toll free at 1-800/548-2169.

This notice is provided to clarify the intent of the instruction book contents and to inform our customers how to obtain appropriate technical assistance from the proper source.

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SECTION 1

GENERAL INFORMATION

Introduction

This instruction manual provides general information and operating instructions for Dynamatic standard foot mounted, eddy-current air-cooled brakes, AS-703 through AS-708. However, where specific differences do exist, separate instructions and data are provided. Whether this manual is to be used for standard or special units, the exact assembly drawing and contract specifications should be considered when following these instructions. This manual can also be used for non-standard units. However, separate supplement sheets will be provided to cover any special aspects requiring instructions.

While every effort has been made to provide a complete and accurate manual, there is no substitute for trained, qualified personnel to handle unusual situations. Any questions that arise should be referred to DSI/Dynamatic®, Fax: 262-554-7041, or call: 262/554-7977, or Toll free at 1-800/548-2169.

Safety

Electrical rotating equipment and associated controls can be dangerous. Therefore, it is essential that only trained, skilled personnel be allowed to work with this equipment, under competent supervision. The danger is increased when the equipment is not handled, installed, maintained or used properly.

Read appropriate sections of this manual before beginning work. Become especially familiar with all safety instructions and procedures. Heed any hazard labels on the equipment and be sure to instruct others in their meaning and importance. The various types of labels used to alert personnel of hazards and their degree of hazard potential are as follows:

DANGER: Used to call attention to an immediate hazard, where failure to follow instructions could be fatal.

WARNING: Identifies hazards having possibilities for injury to personnel.

CAUTION: Used to warn of potential hazards and unsafe practices.

INSTRUCTION NOTE: Used where there is a need for special instruction relating to safety, proper operation or maintenance.

See Figure 1-1 on the following page for examples of the hazard labels that may appear on this equipment. Study them carefully; they are put on the unit for safety. Acquaint maintenance and operating personnel with their appearance and content.

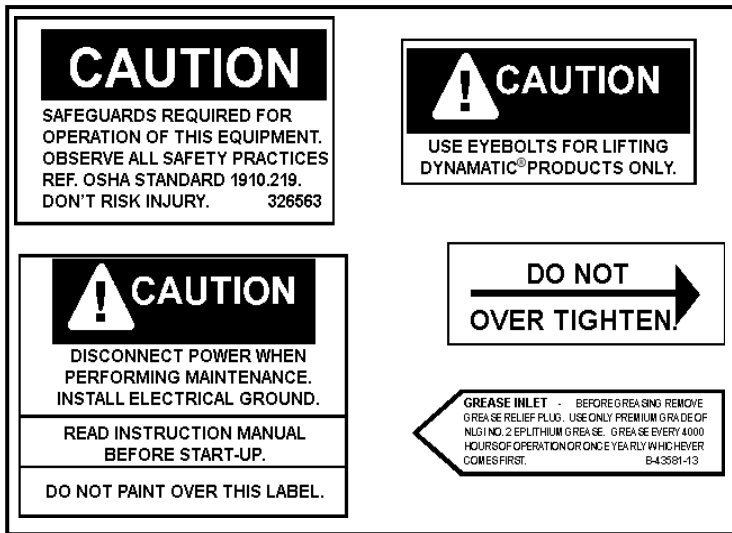
Training

Training programs are an essential part of safe and correct operation. Training provides the know-how necessary to obtain top performance from your equipment. DSI/Dynamatic® recognizes this fact and conducts training schools to educate your plant personnel in safe maintenance and operating procedures. Training schools can be scheduled by contacting DSI/Dynamatic®. There is a charge for this service. Special training schools structured around your specific equipment can also be arranged.

Receiving and Damage Claims

This equipment is assembled and tested prior to shipment to make sure it functions properly. After testing, the unit is carefully packed for shipment, using approved packaging methods. The carrier, in accepting the shipment, agrees that the packing is proper and assumes the responsibility for safe delivery.

Although every precaution is taken to assure that your equipment arrives in good condition, a careful inspection should be made on delivery. Check all items against the packing list to be sure



Hazard Labels Figure 1-1

the shipment is complete; then carefully inspect for damage. Any evidence of rough handling may be an indication of hidden damage.

Note - Shipping damages are not covered by the warranty; the carrier assumes responsibility for safe delivery. If you note damage or missing items, IMMEDIATELY file a claim with the carrier. At the same time, notify DSI/Dynamatic®. If assistance is needed to settle a claim, contact the factory. To expedite this service, refer to your equipment by purchase order, Model, Pro and Serial Numbers.

The following check list is included-to assist with the receiving inspection.

1. Inspect the packaging, covering and skid for signs of mistreatment.
2. Inspect the housing to make sure there is no damage.
3. Manually rotate shaft to be sure it is free from binding and noise.
4. Check for moisture and foreign material in the unit, especially on electrical windings, around the shaft and bearing caps and in accessories.

Handling

Only skilled personnel, following standard safety practices, should handle this equipment. Avoid jarring or pounding on shaft. Do not attempt lifting by the shaft. Handling is best accomplished with a fork lift or crane. When using a fork lift, be sure the unit is well

supported, with the forks adequately spread and centered under the skid.

The units can also be lifted by a crane. To avoid damage, attach the crane cables to all eye bolts provided on the unit.

Units mounted on a common base with other equipment may be lifted with a suitable sling under the base or by attaching cables to eye bolts designed and installed into the base for lifting the complete assembly. Refer to the certified drawings. Do not use the eye bolts on the unit if the unit is attached to another piece of machinery or gear box, unless the drawings show they were designed for lifting the assembly. When two or more cables are used, maintain a near-vertical pull on the eye bolts. If near-vertical pull is not possible, use a spreader bar to take side pull off of the eye bolts.

Storage

Whenever this unit is to be set aside in storage, a clean, dry area must be provided, and it should be kept in its original crate. If kept in an air tight material such as polyethylene, silica-gel or some other moisture absorbent should be used to prevent rust. Additional grease is not required until ready for operation. Shaft should be rotated occasionally to redistribute bearing grease and to prevent bearings from becoming brinelled.

SECTION 2

EQUIPMENT DESCRIPTION

Operation

Eddy-current brakes consist basically of a rotating member keyed to a straight through shaft and a stationary field assembly. The shaft is supported by an anti-friction bearing in each end bell. An air gap exists between the smooth surface of the rotor and the pole, or segmented surface, of the stationary field assembly.

Until the field coil is energized, the brake rotor revolves at the speed of the prime mover. When the field coil is energized, a magnetic flux is established between the poles, or teeth. As the rotor revolves, magnetic lines of force are cut in the air gap and eddy-currents are generated which in turn retard rotation at a rate determined by the amount of excitation applied to the field coil. Braking torque is a function of speed and field coil excitation. By regulating this excitation, which is infinitely adjustable with Dynamatic controllers, control of brake torque is easily accomplished. The Speed/Torque relationship, with constant excitation, is illustrated in the torque curves. Eddy-current brakes cannot be used for holding functions because there is zero torque at zero slip.

Heat resulting from the torque produced with excitation up to 30% of the hot coil amperage rating for the brake can satisfactorily be cooled. Constant excitation exceeding this value produces heat in excess of the cooling capacity of the brake, resulting in overheating and seizure of the brake rotor. Brakes operated within this limitation can be expected to provide many years of trouble-free service.

Cooling

Energy absorbed by the brake is converted to heat and dispelled by air drawn over the heat producing surfaces. Vanes on the rotating fan are designed to draw sufficient cooling air into the brakes through the screened openings to dissipate heat in accordance with the brake ratings. Fins cast into the rotor present an even greater heat-dissipating area to the flow of cooling air.

Applications

Caution When Continuous Loading

Regardless of speed, the amount of continuous torque that can be applied must not exceed a recommended safe value which is obtained with approximately 30% of the coil amperage rating of the brake. Continuous excitation in excess of this amount will cause overheating and seizure of the brake rotor. Attention to this important detail may save you expensive and time-consuming repairs.

Use of the Dynamatic brake to impose a controlled load on a wound rotor motor is an ideal means of accurately controlling the lifting and lowering functions of cranes and hoists. The combination of Dynamatic brake and wound rotor motor can also be the solution to other applications requiring closely controlled speed. Simulating test loads for drive line components is another application. They can also be used for conveyor brakes & controller.

Application Data

Table 2-1

Data	Slip RPM	Brake Model No.					
		AS-703	AS-704	AS-705	AS-706	AS-707	AS-708
Maximum Torque Lb. Ft.	1800	53	110	210	420	-	-
	1200	49	99	204	410	870	1740
	900	43	90	195	388	870	1740
Dissipation Maximum Continuous Horsepower	3600	10	20				
	1800	7.5	15	20	35	60	100
	1200	5	10	15	25	45	75
	900	3.5	7.5	11.5	17.5	34	56
Inertia - Lb. Ft.		0.82	1.64	8.0	16.0	50	100
Size controller		1	2	2	3	3	7
Approximate Shipping		108	205	265	430	1010	1200

Maximum Torque Transmitted Through Shaft (Standard Brakes Only)

AB-703 - 340 lbs. ft. AB-
704 - 563 lbs. ft. AB-705 -
860 lbs. ft. AB-706 - 1258
lbs. ft. AB-707 - 1749 lbs.
ft. AB-708 - 3103 lbs. ft.

Note - Numbers apply only when there is no overhung load - consult factory for data with overhung load.



Typical Brake Cutaway

Figure 2-1

Construction

A single field and rotor type brake as illustrated in Figure 2-1 is representative of Models AS-703, AS-705, and AS707. Models AS-704, AS-706 and AB-708 are of the double field and rotor

type which include two rotors, fans and field assemblies.

Tachometer Generator (optional)

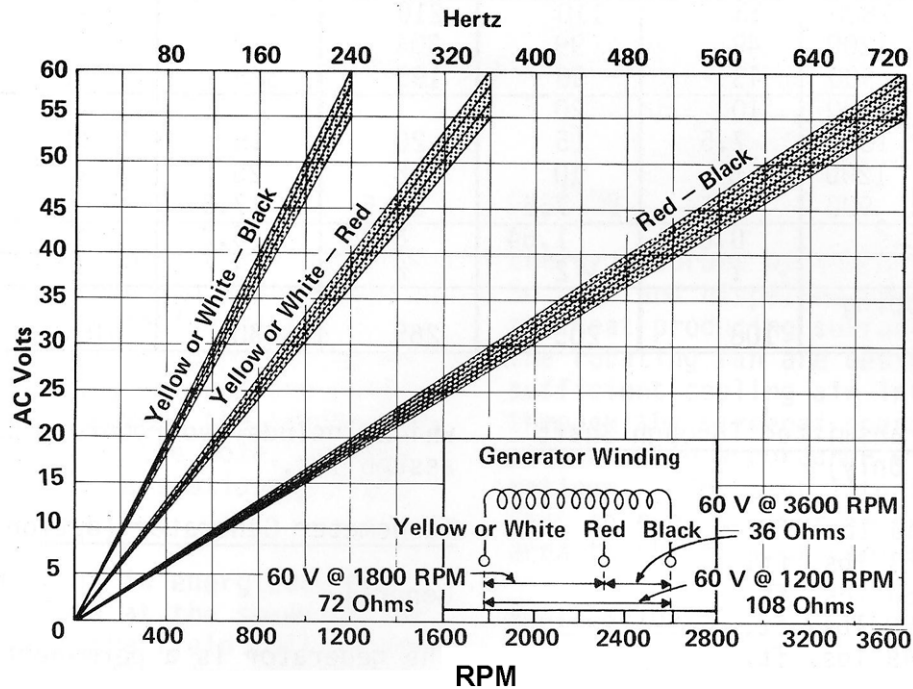
General

The generator is a permanent-magnet, alternating-current device that produces a linear voltage in direct proportion to the speed at which it is driven. In the governing circuit of the control system, the voltage produced by the generator represents the actual speed of the unit. This voltage is amplified and compared with a constant voltage in the reference circuit, representing the desired speed of the unit, to effect speed control.

As shown in Figure 2-2, the maximum output speed of the generator is approximately 55 to 60 volts. Frequency varies with the speed to a maximum of 500 to 600 Hz. This generator is designed to operate with equal output and efficiency in either direction of rotation.

The use of an AC tachometer generator eliminates rotating windings and consequently no maintenance of brushes, slip rings, or commutator is required.

The Alnico magnet employed in this unit (Figure 2-3) retains its field strength over a long period of time, assuring a constant generator output at a given speed. This magnet should not be subjected to sharp impacts, abuse, or temperatures higher than the maximum operating temperature of the unit, as this will result in a weakening of the field strength. Should removal of



G-2 Generator Specifications

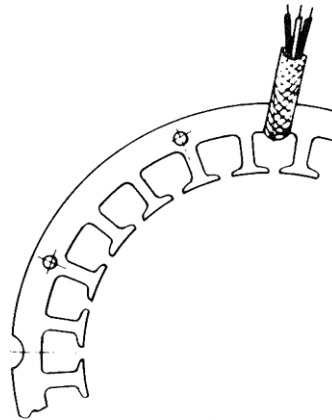
Figure 2-2

the magnet be necessary for remagnetization or repairs, the entire operator assembly should be returned to the factory.

Description

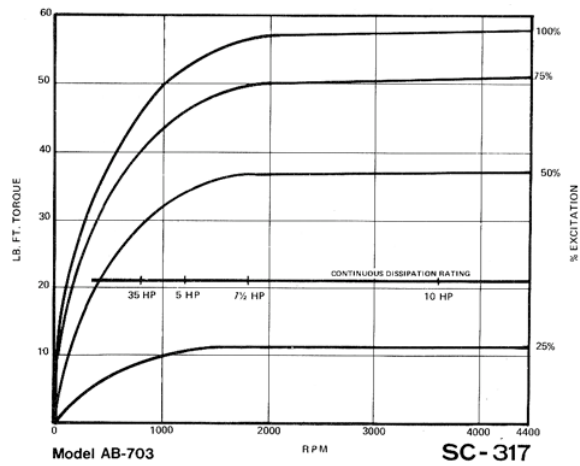
The generator if used, is a separately mounted type generator that is contained within its own housing and is driven by appropriate pulleys and belts from the shaft.

A specific volts per RPM is not essential. Correct adjustment of the controller (see your operating instructions) Alnico Stator will compensate for wide variance in generator output.



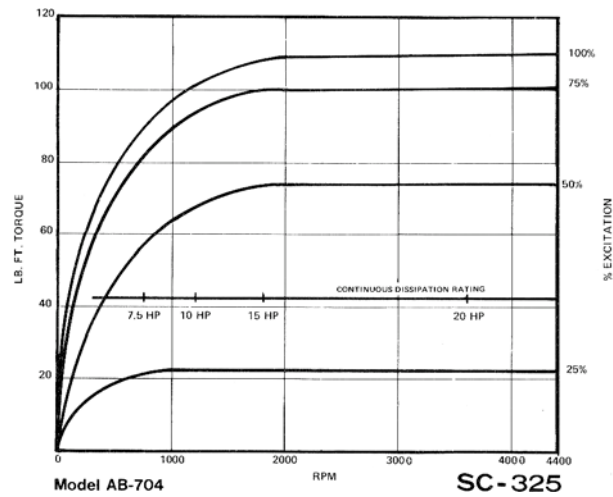
Alnico Stator Lamination Assy.

Figure 2-3



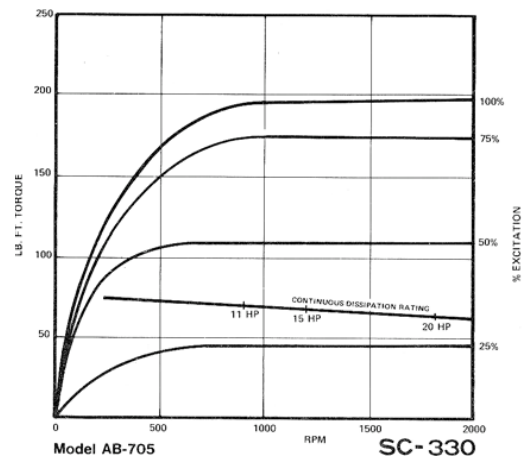
Speed/Torque Curve – Model AS-703

Figure 2-4



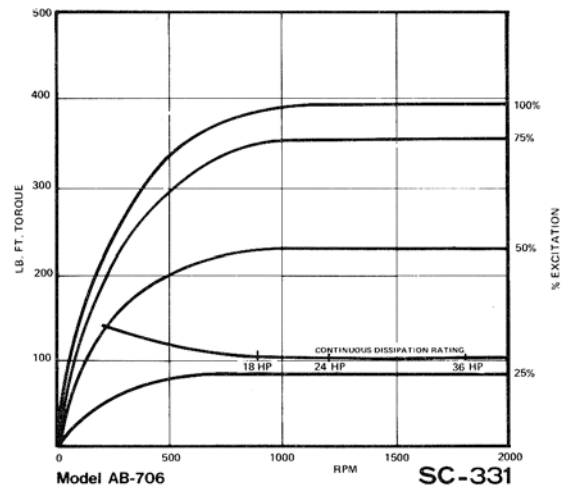
Speed/Torque Curve – Model AS-704

Figure 2-5



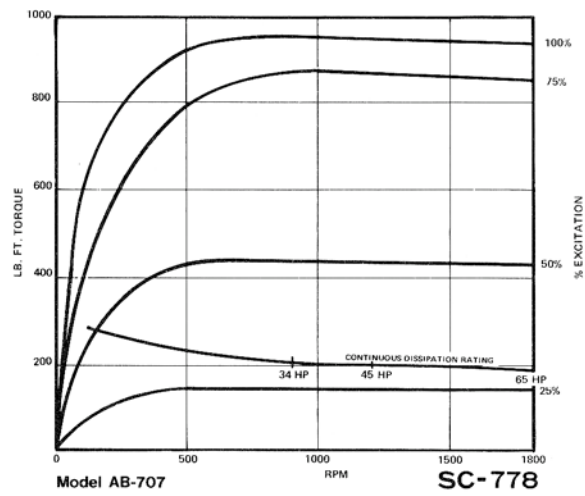
Speed/Torque Curve – Model AS-705

Figure 2-6



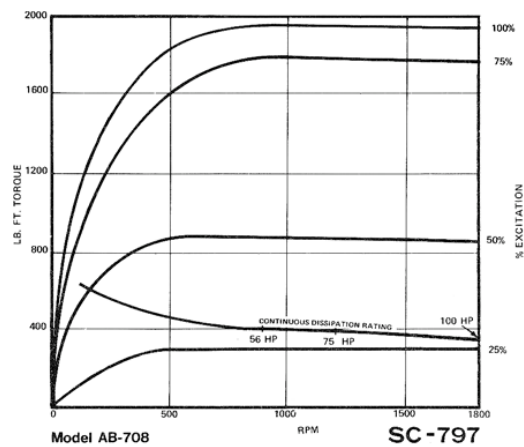
Speed/Torque Curve – Model AS-706

Figure 2-7



Speed/Torque Curve – Model AS-707

Figure 2-8



Speed/Torque Curve – Model AS-708

Figure 2-9

SECTION 3

INSTALLATION

Location

Select a permanent location affording an unobstructed flow of clean cooling air to permit the unit to perform according to its ratings. Locate the unit at least 12 inches away from walls and similar obstructions to ensure sufficient air for cooling. The ambient temperature of input air must not exceed 40°C. (104°F.). Higher ambient temperatures reduce the thermal rating by 20 percent for every 7°C. (20°F.) ambient increase. Maximum ambient must not exceed 66°C. (150°F.).

Mounting

The unit should be mounted directly to a bed, base or platform to ensure that it is rigid. Even if it is purchased mounted on a base, the base must still be aligned and secured.

CAUTION: Failure to properly mount and level this unit may result in distortion to the housing, mechanical failure, misalignment and rapid bearing wear.

Mount the unit as follows:

1. One or more mounting feet of the unit may not contact their mounting pads. With a feeler gauge, find and measure gap between each foot and its pad.
2. Place slotted shim, equal in thickness to measured gap, under each high mounting foot.
3. Install mounting bolts or nuts finger tight.
4. Proceed with alignment as described below under "Alignment".
5. Alternately tighten bolts.
6. Recheck alignment and change shims as required.
7. Dowel all directly connected units to prevent creeping and future misalignment.

Alignment

General

Proper installation and alignment of this unit, as specified herein, is a condition of the Manufacturer's warranty.

Angular misalignment and Offset misalignment between directly connected shafts will cause increased bearing loads and vibration, even when the connection is made by means of a flexible coupling. Shaft alignment becomes especially critical if operated at high speeds. For this reason, the alignment of directly connected shafts must be checked with a dial indicator after coupling hubs have been installed.

Flexible Couplings

A flexible coupling should be used to connect inline shafts in order to avoid undue bearing stresses. It should never be forced onto a shaft by pounding, or serious damage to the bearings is risked. Moderate heat can be applied to the hubs to locate them in place on the shafts. If the hubs must be pressed on, use the threaded hole in the end of the shaft in order to avoid bearing damage. Be careful to start it true, not cocked, otherwise it is possible to burr the shaft. A light film of oil or other lubricant on the shaft will prove an aid to mounting. Be sure that the shafts are well cleaned before the coupling hubs are installed. When pressed over a considerable length of shaft, it may be necessary to expand the coupling hubs by heating.

CAUTION: DO NOT drive or force the coupling hubs onto the shafts.

If a key is used in a coupling, be sure that the key fits snugly in the shaft and coupling but does not fill the space on top of the key. Some clearance must be left at this point.

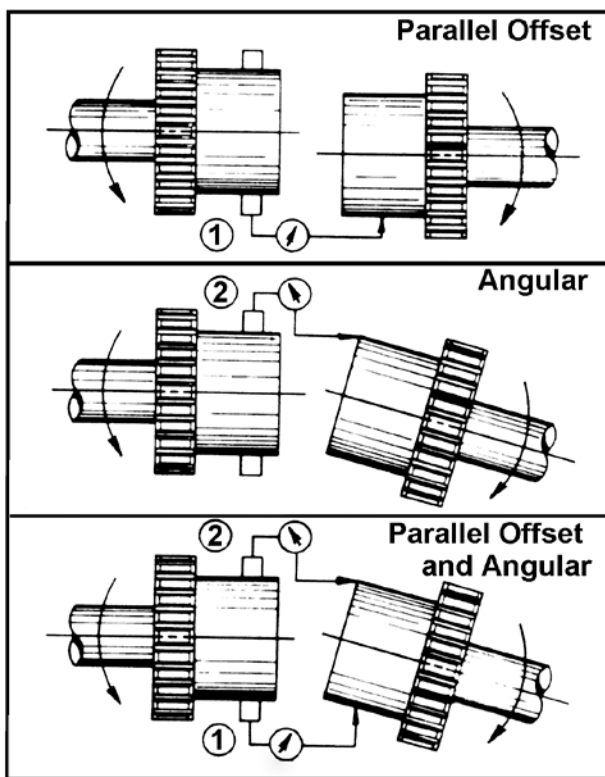
Note - Although flexible couplings are designed to accommodate parallel and angular misalignment, care should be taken to align the driving and driven machinery as accurately as possible when the coupling is installed. Even when the original alignment has been very accurate, misalignment

may occur later because of settling foundation, wear of bearings, etc., and it is well to make periodic checks to see that such misalignment does not become excessive.

Parallel Offset Alignment

Offset misalignment is illustrated in Figure 3-1. Also shown is the location of the dial indicator. Offset alignment can be accomplished as follows:

1. Clamp the dial indicator on the hub and position the finger on the ground or machined diameter of the other hub (Figure 3-1, Item 1).
2. Scribe a mark on the surface of the hub where the finger is located.
3. Rotate both shafts simultaneously while keeping the finger on the scribe mark. Note the readings at each 1/4 revolution.



Misalignments

Figure 3-1

Note - Refer to Table 3-1 for permissible parallel offset misalignment.

Angular Alignment

Angular misalignment is illustrated in Figure 3-1. Also shown is the location of a dial indicator. Angular alignment can be accomplished as follows:

1. Clamp the dial indicator on the hub and position the finger on the other hub face (Figure 3-1, Item 2).
2. Scribe a mark on the face of the hub where the finger is located.
3. Rotate the shaft and note the dial indicator reading for a measurement of the angular misalignment per Table 3-1.

Note - Refer to Table 3-1 for permissible angular misalignment.

For One Rotating Shaft

If it is impossible to rotate both shafts, the dial indicator should still be used by following this procedure for both angular and offset alignment:

1. Clamp the dial indicator to the rotating shaft.
2. Position the finger against the face of the other hub (Figure 3-1).
3. Rotate the shaft and note the dial indicator reading for a measurement of the angular misalignment per Table 3-1.
4. Position the finger against the diameter of the other hub.
5. Rotate the shaft and note the dial indicator reading for a measurement of offset misalignment per Table 3-1.

Permissible Operating Misalignment*

Table 3-1

Model AS-	Basic Coupling Size In.	Parallel Offset ① X, In.	Angular ② Y, In./In. Radius	Maximum Angular with a Measured Parallel Offset In./In. Radius**
703	1.50	.0050	.0040	Y ② = .0040- .8 X ①
704	2.00	.0100	.0058	Y ② = .0058- .6 X ①
705	2.00	.0100	.0058	Y ② = .0058- .6 X ①
706	2.50	.0100	.0052	Y ② = .0052- .5 X ①
707	2.50	.0100	.0052	Y ② = .0052- .5 X ①
708	3.00	.0120	.0064	Y ② = .0064- .5 X ①

*Operating misalignment depends on the following factors: Initial misalignment, temperature growth and foundation settlement. Initial alignment should allow for the effects of temperature growth and foundation settlement. All above values are (TIR) Total Indicator Runout. To avoid errors in readings due to shaft magnetism, non-magnetic indicators should be used.

**Maximum value for either must not exceed those given in columns 3 and 4.

Allowable Overhung Load at Center of Standard Shaft Keyway¹

Table 3-2

RPM	Brake Model No					
	AS-703	AS-704	AS-705	AS-706	AS-707	AS-708
3600	360	410	-	-	-	-
1800	460	525	570	640	1720	1810
1200	530	605	655	750	2000	2130
900	585	660	720	825	2200	2360

¹The overhung load values are pounds of weight at the center of a standard shaft keyway and perpendicular to the shaft axis. The calculations are based on a minimum of 15,000 hours of bearing life for 90% of the bearings. For 20,000 hours of bearing life, use 91% of the loads given.

Rough Check

The unit can be roughly aligned without the use of a dial indicator, but alignment as such is not recommended for permanent installations. The degree of angular misalignment can be roughly determined by inserting feeler gauges between faces of the coupling hubs. The amount of offset misalignment can be roughly determined by positioning a straight edge across the machined diameter of the hubs.

Allowable Overhung Load

If this unit is to be belt or chain driven, reference must be made to the allowable overhung load, per Table 3-2.

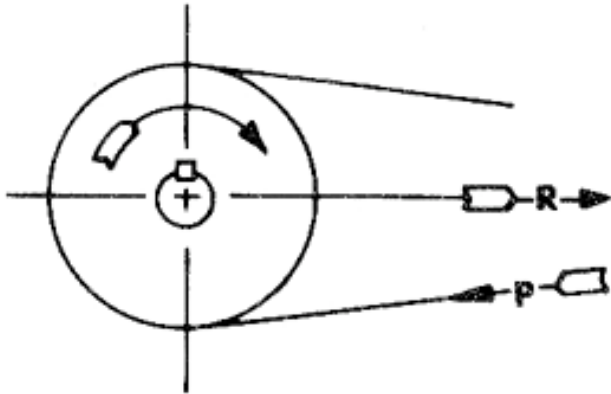
Table 3-2 lists the maximum force in pounds that may be applied radially at the center of the output shaft keyway. If a sheave or sprocket is to be

installed on a new shaft the resultant load which is imposed by the belt or chain must not exceed the allowable limit at the speeds specified in the Table.

"P" in Figure 3-2 represents the pull produced in a chain or belt and is a direct function of the torque of the driving sprocket or sheave. "R" represents the normal, reactive force imposed on the shaft and is equal to "P" plus the tension required to prevent slipping of the belt.

When chain and sprocket drives are used, the reactive force "R" will be approximately equal to "P", since no additional tension is required in a chain for an effective transmission of power. However, if "V" belts are used, the reactive force "R" will be approximately 1.5 times the value of "P" because of the belt tension required to prevent the belts and sheaves from slipping. With flat belts and sheaves, "R" will be 2.5 to 3 times

"P", depending on the size of the sheaves, since smaller sheaves require tighter belting. Belting strains imposed on the shaft of this unit should never be greater than the amount required to prevent slipping of the sheaves.



Reactive Force

Figure 3-2

V-Belt Drive Formulas

In cases where tensioning of a drive affects belt pull and bearing loads, the following formulas may be used for calculations.

$$T_1 - T_2 = 33,000 \frac{(HP)}{V}$$

Where: T_1 = tight side tension, lbs.
 T_2 = slack side tension, lbs.
 HP = design horsepower
 V = belt speed, FPM

$$T_1 + T_2 = 33,000 (2.5 - G) \frac{(HP)}{GV}$$

Where: T_1 = tight side tension, lbs.
 T_2 = slack side tension, lbs.
 HP = design horsepower
 V = belt speed, FPM
 G = arc of contact correction factor*

$$T_1/T_2 = \frac{1}{1 - 0.8 G}$$

(Also, $T_1/T_2 = eKO$)

Where: T_1 = tight side tension, lbs.
 T_2 = slack side tension, lbs.
 G = arc of contact correction factor*
 e = base of natural logarithms
 K = .51230, a constant for V-belt drive design
 O = arc of contact in radians

$$T_1 = 41,250 \frac{(HP)}{GV}$$

Where: T_1 = tight side tension, lbs.
 HP = design horsepower
 V = belt speed, FPM
 G = arc of contact correction factor*

$$T_2 = 33,000 (1.25 - G) \frac{(HP)}{GV}$$

Where: T_2 = slack side tension, lbs.
 HP = design horsepower
 V = belt speed, FPM
 G = arc of contact correction factor*

$$V = \frac{(PD)(rpm)}{3.82} = (PD)(rpm)(.262)$$

Where: V = belt speed, FPM
 PD = pitch diameter on sheave or pulley
 rpm = revolutions per minute of the same sheave or pulley

*Arc of contact correction factor G and R ; see Table 3-3.

Arc of Contact Correction Factors G and R

Table 3-3

$\frac{D-d}{C^*}$	Small Sheave Arc of Contact	Factor G	Factor R	$\frac{D-d}{C^*}$	Small Sheave Arc of Contact	Factor G	Factor R
.00	180°	1.00	1.000	.80	133°	.87	.917
.10	174°	.99	.999	.90	127°	.85	.893
.20	169°	.97	.995	1.00	120°	.82	.866
.30	163°	.96	.989	1.10	113°	.80	.835
.40	157°	.94	.980	1.20	106°	.77	.800
.50	151°	.93	.968	1.30	99°	.73	.760
.60	145°	.91	.964	1.40	91°	.70	.714
.70	139°	.89	.937	1.50	83°	.65	.661

*D = diameter of large sheave; d = diameter of small sheave; C = center distance.

Bearing Load Calculations

To find actual bearing loads it is necessary to know machine component weights and values of all other forces contributing to the load. Sometimes it becomes desirable to know the bearing load imposed by the V-belt drive alone. This can be done if you know bearing spacing with respect to the sheave center and shaft load (see Figure 3-3) and apply it to the following formulae:

$$\text{Load at B, Lbs.} = \frac{\text{Shaft Load (a+b)}}{A}$$

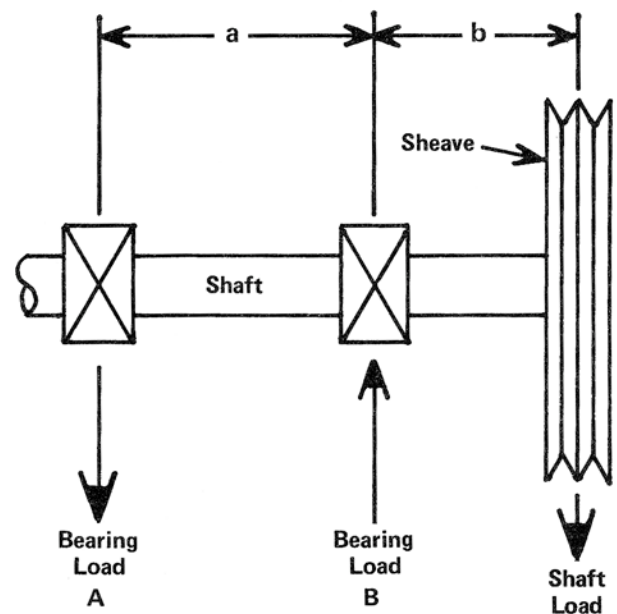
$$\text{Load at A, Lbs.} = \frac{\text{Shaft Load (b)}}{a}$$

Where: a and b = spacing, inches

Allowable Sheave Rim Speed* **Table 3-4**

Sheave Material	Rim speed in feet per minute
Cast iron	6,500
Ductile Iron	8,000
Steel	10,000

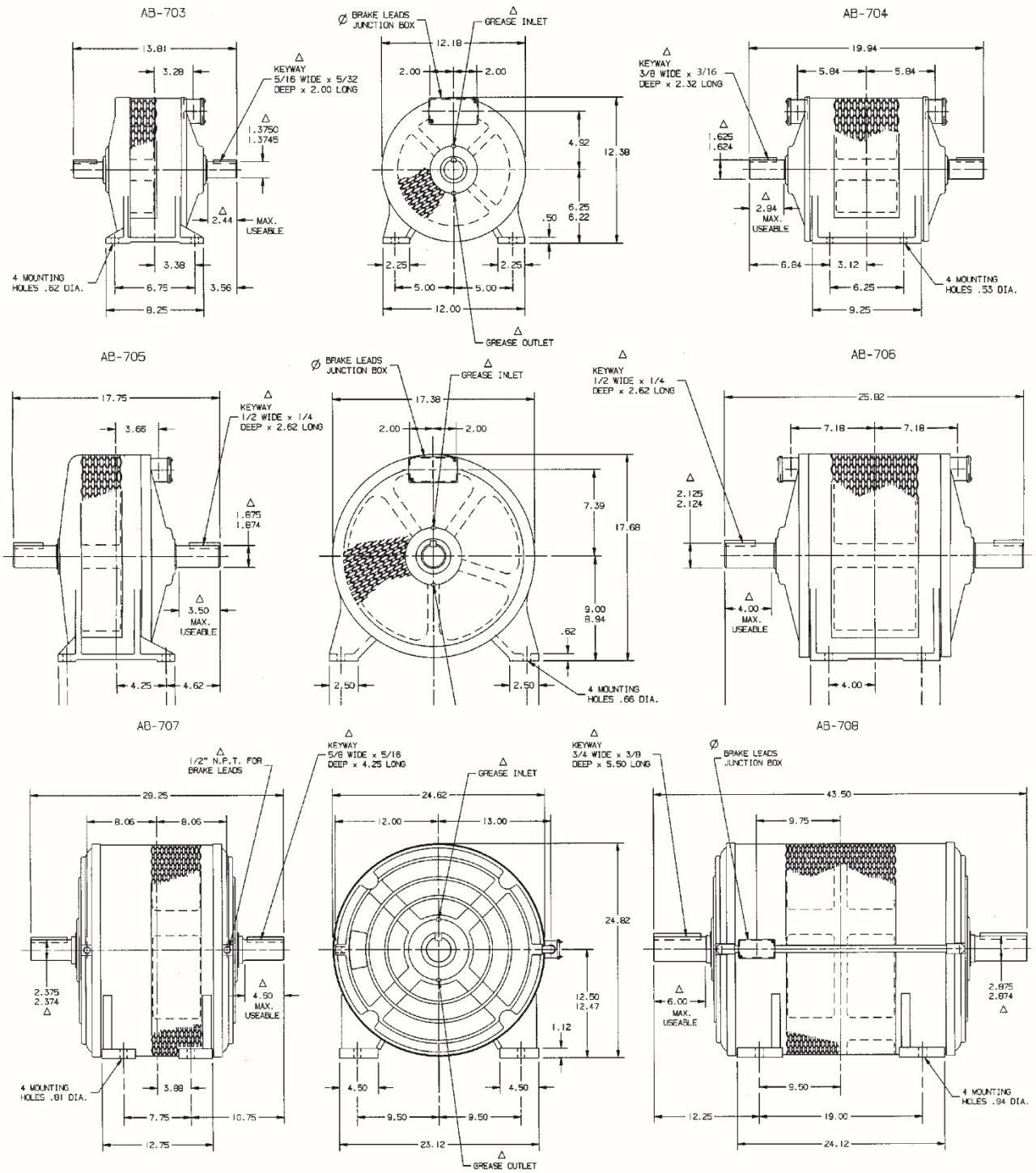
*These rim speed values are maximum for normal considerations. In some cases, these values may be exceeded. Consult factory and include complete details of proposed application.



Overhung Sheave

Figure 3-3

Outline Dimensions



Outline Drawings

Figure 3-4

All models, except AB-707, are furnished with a water-tight junction box; customer must drill opening where desired.

Tolerance for 1.50 in. and smaller shafts is +1000/-0.0005; for more than 1.50 in. it is +000/-0.001

SECTION 4

MAINTENANCE

Cleaning

Cleaning should be performed as often as dictated by the environment of the unit. The more severe (dirty or hot) the conditions are, the more often these tasks must be performed. Before doing any work, be sure the unit is turned OFF and the AC power is locked out.

Clean accumulated dust and dirt from the unit and immediate area. Pay special attention to air intake areas in end bells. Dirt allowed to accumulate there can easily obstruct air flow or be drawn into the unit to cause overheating or mechanical binding.

Since the brake is open, internal cleaning may occasionally be required. The frequency depends on existing conditions. Oil or coolants in the air are drawn into the unit. If this occurs, disassemble brake. Solidly packed dirt, grease and oil should be cleaned using a high-flash safety solvent. Wipe with solvent dampened cloth or use a soft bristled brush. Do not soak the electrical windings. Oven dry electrical windings at 65°C. (150°F.).

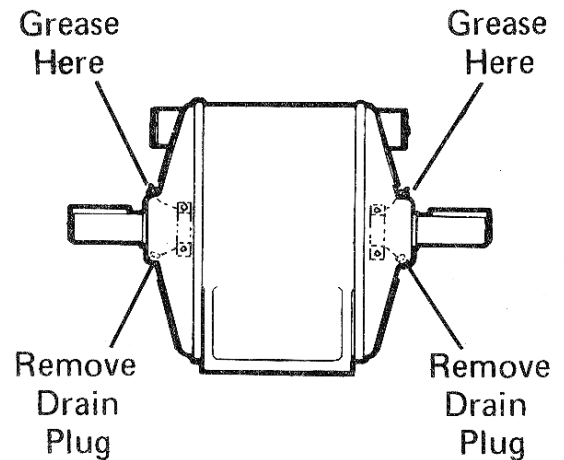
Lubrication

Units equipped with ball bearings were sufficiently lubricated at the factory to require no further lubrication for 2,000 hours, if operated under reasonably normal conditions in an area free of acid fumes, excessive humidity, dust, dirt or any foreign matter harmful to bearings and lubricant. Operating conditions and atmospheric conditions existing in the area of installation must be considered when determining how often lubrication is necessary. If operating under favorable conditions that do not warrant frequent lubrication, the grease inlets would be equipped with plugs that are replaced with grease fittings only during lubrication. Refer to Figure 4-1.

Allow only experienced maintenance personnel to lubricate this unit. Before lubricating refer to your specific assembly drawing to determine the specific type and location of bearings that are used. The following steps constitute the procedure for lubricating ball bearings:

grease and drain plugs.

2. Remove the drain plugs and if grease holes are plugged, remove the plugs and install grease fittings in their place.
3. Slowly introduce grease into the bearings until clean grease appears at the drain holes.
4. Before replacing the drain plugs operate the unit for approximately 15 minutes to expel any excess grease from the bearing chambers. Then wipe off all grease from around drain holes and grease fittings. Replace the drain plugs.
5. If the unit is being operated under reasonably normal conditions, and does not require frequent lubrication, replace grease fittings with plugs as a precaution against personnel over-lubricating bearings.



Grease Locations

Figure 4-1

Recommended Greases

The grease specification is per DSI/Dynomatic® Engineering Standards MML 4-1.2. This is a general-purpose industrial grease, NLG1 #2 grade, mineral oil in a lithium-based carrier.

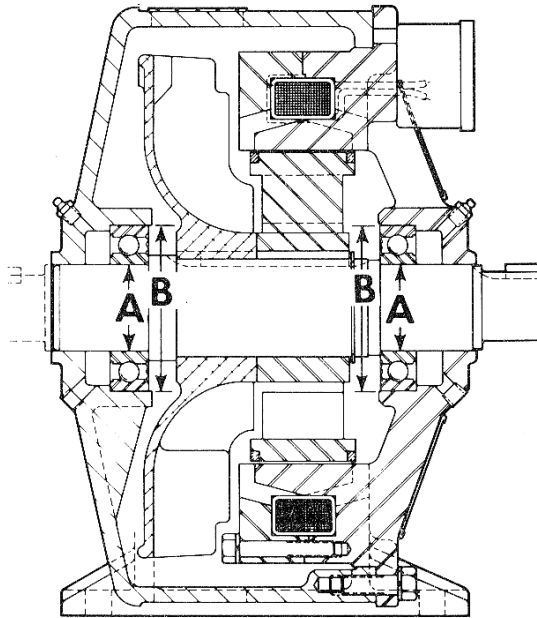
Table 4-1 is a list of products that comply with the Dynomatic specifications.

1. Clean the exterior of the unit around the

Recommended Greases

Table 4-1

Company	Grease
Shell	Alvania #2
Gulf	Gulfcrown #2
Texaco	Multifak #2, Premium RB, Regal AFB 2
Mobil	Mobilux #2



Bearing Dimensions

Figure 4-2

Bearing Dimensions

Dimensions – Inches

Table 4-2

Bearing	AB-703, AB-704	AB-705, AB-706	AB-707, AB-708
A Shaft O.D.	<u>1.7722</u> 1.7717	<u>2.1660</u> 2.1654	<u>3.1502</u> 3.1497
B End Bell Bore	<u>3.3465</u> 3.3473	<u>3.9370</u> 3.9378	<u>6.6929</u> 6.6939

SECTION 5

OVERHAUL

Disassembly/Reassembly

General

Read these instructions carefully and check the appropriate typical Cross Section Drawing with your own assembly drawing to determine the extent of disassembly that is necessary to remove bearings, applying force only to the inner race when removing from a shaft.

Match mark all parts before removing to aid in reassembly.

When reassembling the unit, the use of new bearings is recommended. After all machine fits have been checked, repaired or replaced, proceed with reassembly.

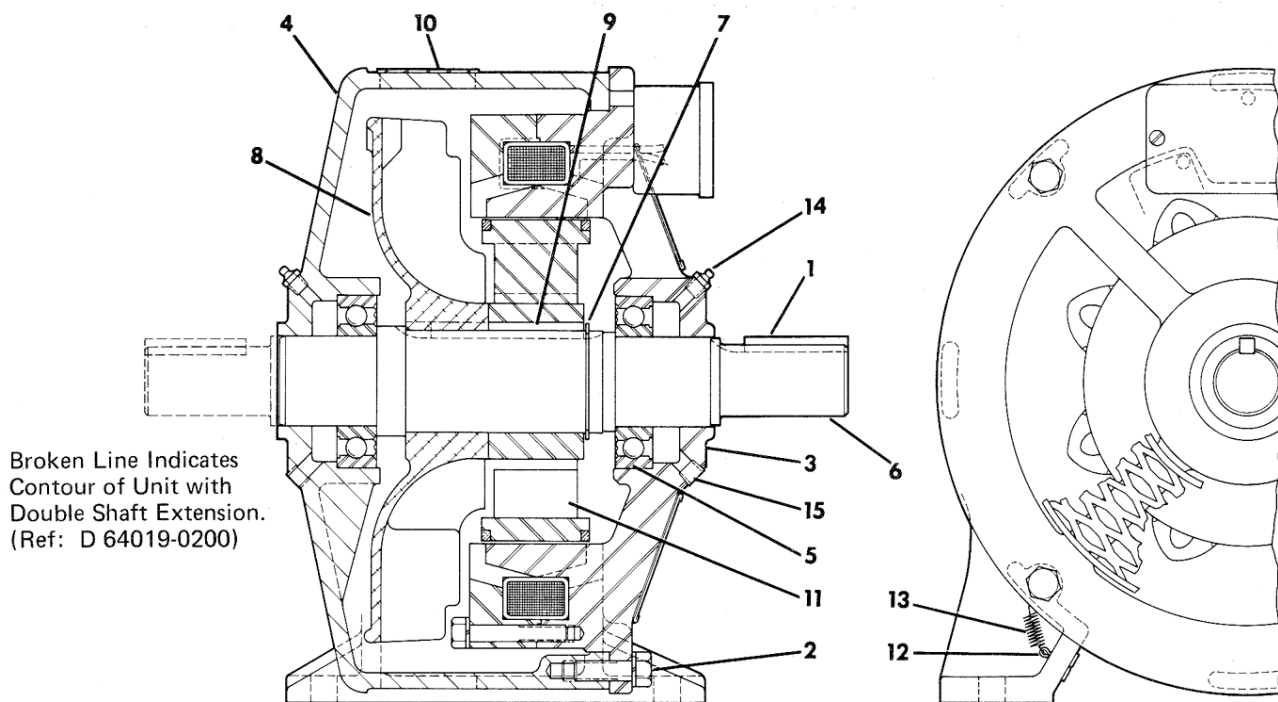
Installation of Bearings

Bearings should never be forced onto a shaft or into a housing by blows applied to either race. To do so is to risk serious damage to the bearings. Use either an arbor press, or a jack and a piece of soft metal tubing squared on both ends, if necessary. Be careful to start the bearing true, not cocked; otherwise it is possible to burr the shaft. A light film of oil or other lubricant on the shaft will prove an aid to mounting. Be sure that the shaft and bearing bores are well cleaned before the bearing is installed. Also, the mechanic doing the work should be careful that particles of metal or other foreign matter do not enter the bearing during installation. Do not unwrap bearings until ready for installation.

When a bearing is to be pressed over a considerable length of shaft, or over a tight-fitting seat, it may be necessary to expand the bearing by heating in oil. When a bearing is heated in oil, the temperature of the oil should not exceed 93°C. (200°F.) and the bearing should not be kept in the bath longer than necessary to bring the entire bearing to the required temperature.

AB-703 & AB-705 Disassembly

1. Remove unit from operation and pull off shaft coupling hubs, or sheaves, with approved bearing puller and remove shaft key(s) (1).
2. Remove junction box cover by removing two screws. Disconnect brake leads inside of junction box.
3. Remove four cap screws and lockwashers (2) from field assembly (3) and slide entire field and shaft assembly out of housing (4). Slide field assembly off of bearing.
4. Using an approved bearing puller, remove bearing (5) from each end of shaft (6). Force should be applied only to the inner race when removing bearing.
5. If necessary, remove bolts holding the coil to the field assembly after match marking, being careful not to scrape insulation off of coil leads.
6. If necessary, remove snap ring (7), fan (8) and key (9) from the shaft; heat hub of fan if necessary.
7. Clean all pieces of grease and dirt before reassembly.



Typical Cross Section Drawing – AS-703

Figure 5-1

Model AS-703 Parts List

Table 5-1

Item No.	Description	Part Number
1	Key	DY-373
2	Cap Screw, Lockwasher	DY-10311, DY-4771
3	Field Assembly	B-64018-(See Master Bill)
4	Housing	D-64027-0100
5	Bearing	DY-12814
6	Shaft (double shaft extension) (single shaft extension)	C-32295 C-34901
7	Retaining Ring	DY-1476
8	Fan	C-32296
9	Key	DY-1186
10	Screen	A-32306-0100
11	Rotor	B-32297
12	Cotter Pin	DY-340
13	Spring	A-18973
14	Grease Fitting	DY-82
15	Pipe Plug	DY-1472

Ref.: D-64019

AS-703 & AS-705 Reassembly

1. If fan (8) was removed, install key (9) into shaft; heat hub of the fan and press it over the key onto the shaft flush against shoulder of the shaft. Install snap ring (7).
2. Align match marks and bolt coil and field assembly (3) together with brake leads routed into the junction box.
3. Press bearings (5) into each end of shaft with an approved pusher device. Apply pressure only to the inner race until bearings are flush against shoulders of the shaft.
4. Pack bearing cavity in both ends with recommended grease. Slide field assembly (6) over bearing and slide entire shaft assembly into housing to position bearing into the thoroughly cleaned chamber of housing.
5. Align holes of field assembly (3) with holes in housing (4) and secure with four cap screws and lockwashers (2). Rotate shaft to ensure that no binding exists.
6. Replace key(s) (1), connect brake leads in junction box and replace cover. Brake is ready for return to operation.

AS-704 & AS-706 Disassembly

1. Remove unit from operation and pull off shaft coupling hubs, or sheaves, with approved bearing puller and remove shaft key(s) (1).
2. Remove junction box cover at each end of brake by removing two screws. Disconnect brake leads inside of both junction boxes.
3. Remove cap screws and lockwashers (2) from both field assemblies (3) and slide one field assembly off of the shaft.
4. Slide the entire shaft assembly out of the other end of housing (4). Slide second field assembly off of bearing. field assembly off of bearing.
5. Using an approved bearing puller, remove bearing (5) from each end of shaft (6). Force should be applied only to the inner race when removing bearing.

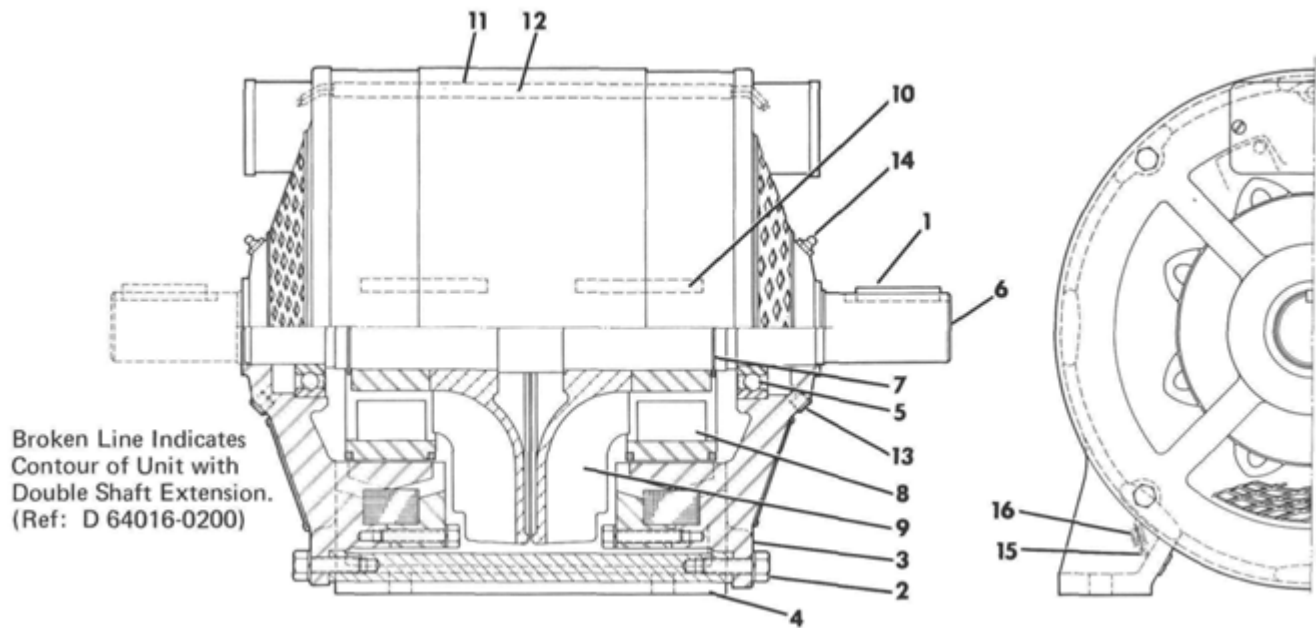
6. Remove bolts holding the coil to the field assembly at each end, after match marking, being careful not to scrape insulation off of coil leads.
7. If necessary, remove snap rings (7), rotors (8) fans (9) and keys (10) from the shaft; heat hub of fan if necessary.
8. Clean all pieces of grease and dirt before reassembly.

AS-704 & AS-706 Reassembly

1. Slide the entire shaft assembly out of the other end of housing (4). Slide second field assembly off of bearing.
2. Using an approved bearing puller, remove bearing (5) from each end of shaft (6). Force should be applied only to the inner race when removing bearings.
3. Remove bolts holding the coil to the field assembly at each end, after match marking, being careful not to scrape insulation off of coil leads.
4. If necessary, remove snap rings (7), rotors (8), fans (9) and keys (10) from the shaft; heat hub of rotors if necessary.
5. Clean all pieces of grease and dirt before reassembly.

Reassembly

1. If fans (9) and rotors (8) were removed, install keys (10) into shaft; heat hub of fans if necessary and press them over the key onto the shaft flush against shoulders of shaft. Install snap rings (7)
2. Align match marks and bolt both coil and field assemblies (3) together with brake leads routed into their respective junction box.



Typical Cross Section Drawing – AS-704

Figure 5-2

Model AS-704 Parts List

Table 5-2

Item No.	Description	Part Number
1	Key	DY-1641
2	Cap Screw, Lockwasher	DY-132, DY-77
3	Field Assembly	B-64018-(See Master Bill)
4	Housing	D-32304
5	Bearing	DY-12814
6	Shaft (double shaft extension) (single shaft extension)	C-32303 C-53395
7	Snap Ring	DY-1476
8	Rotor	C-32297
9	Fan	C-32296
10	Key	DY-1186
11	Screen	A-32306-0200
12	Tube Insulator	A-71605-0100
13	Pipe Plug	DY-1472
14	Grease Fitting	DY-1336
15	Cotter Pin	DY-340
16	Spring	A-18973

Ref.: D-64016

3. Press bearing (5) into each end of shaft with an approved pusher device. Apply pressure only to the inner race until bearings are flush against shoulders of the shaft.
4. Pack bearing cavity in both end bells with recommended grease. Slide one field assembly (6) over bearing and slide entire shaft assembly into housing.
5. Slide second field assembly (6) over bearing and position both field assemblies against housing (4).
6. Align holes of both field assemblies (3) with holes in housing (4) and secure with cap screws and lockwashers (2). Rotate shaft to ensure that no binding exists.
7. Replace key(s) (1), connect brake leads in junction boxes and replace covers. Brake is ready for return to operation.

AB-707

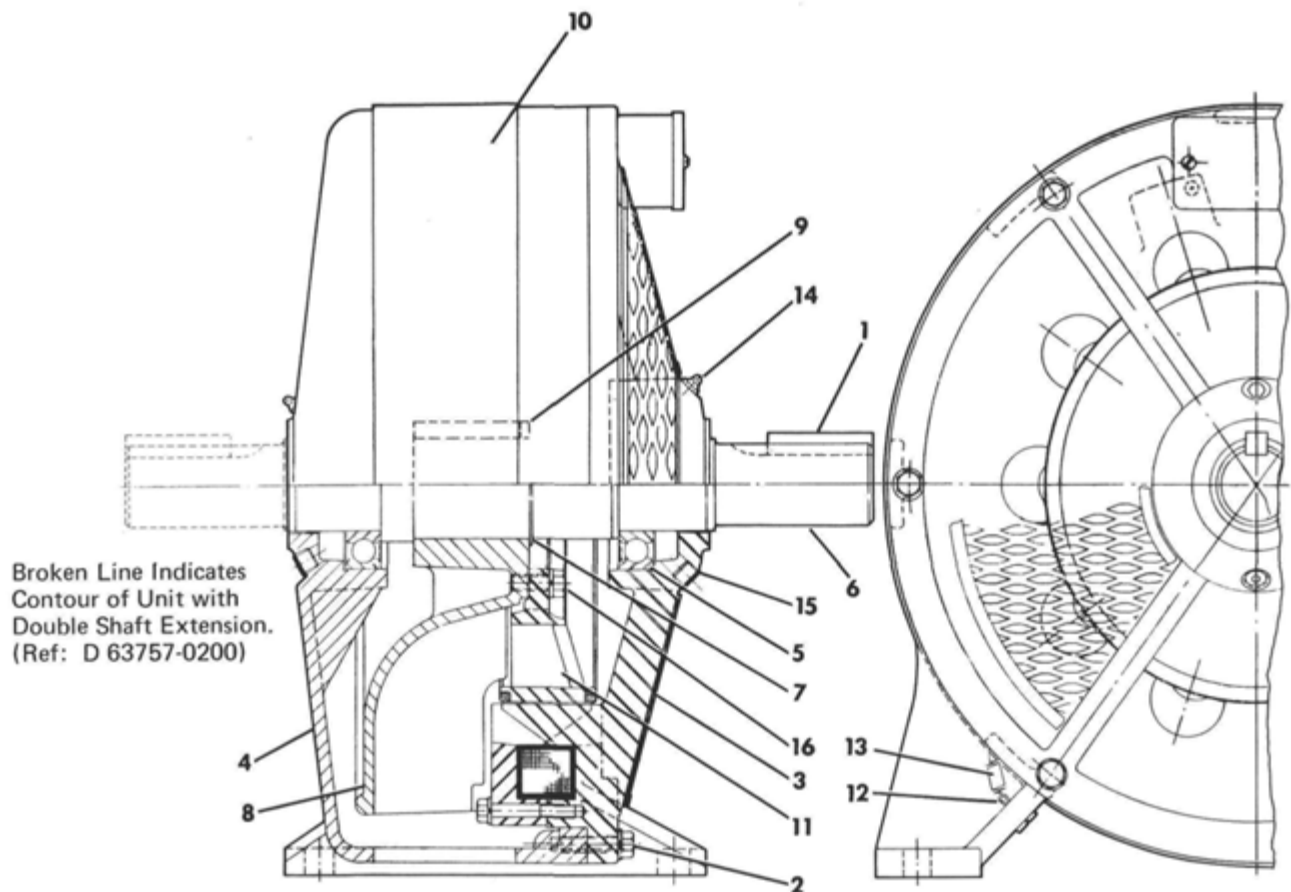
Disassembly

1. Remove unit from operation and pull off shaft coupling hubs, or sheave, with approved bearing puller, and remove shaft key(s)(1).
2. Remove junction box cover (2) by removing two machine screws and lockwashers (3). Disconnect brake leads inside of junction box.
3. Remove four cap screws and lockwashers (4) from each end bell.
4. Slide end bell (5) - Field Side - off of bearing and shaft assembly. Remove entire shaft assembly out of housing (6) from the other end. Separate second end bell (5) from shaft.
5. Using an approved bearing puller, remove bearing (7) from each end of shaft (8). Force should be applied only to the inner race when removing bearings.
6. To remove field assembly from housing, match mark and remove the pins that hold it in place.
7. If necessary, remove snap ring (9), fan (10) and key (11); heat hub of fan if necessary.

8. Clean all pieces of grease and dirt before reassembly.

Reassembly

1. If fan (10) was removed, install key (11) into shaft; heat hub of fan and press it over the key onto the shaft flush against shoulder of the shaft. Install snap ring (9).
2. Install field assembly into housing and secure with pins.
3. Press bearing (7) onto each end of shaft with an approved pusher device. Apply pressure only to the inner race until bearings are flush against shoulders of the shaft.
4. Pack bearing cavity in both end bells with recommended grease. Slide end bell (5) - Fan Side - over bearing. Slide entire shaft assembly into housing (6).
5. Slide second end bell (5) over bearing and position both end bells against housing.
6. Align holes in each end bell with holes in housing and install four cap screws and lockwashers (4). Rotate shaft to ensure that no binding exists.
7. Replace key(s)(1), connect brake leads in junction box and replace cover (2). Brake is ready for return to operation.



Typical Cross Section Drawing – AS-705

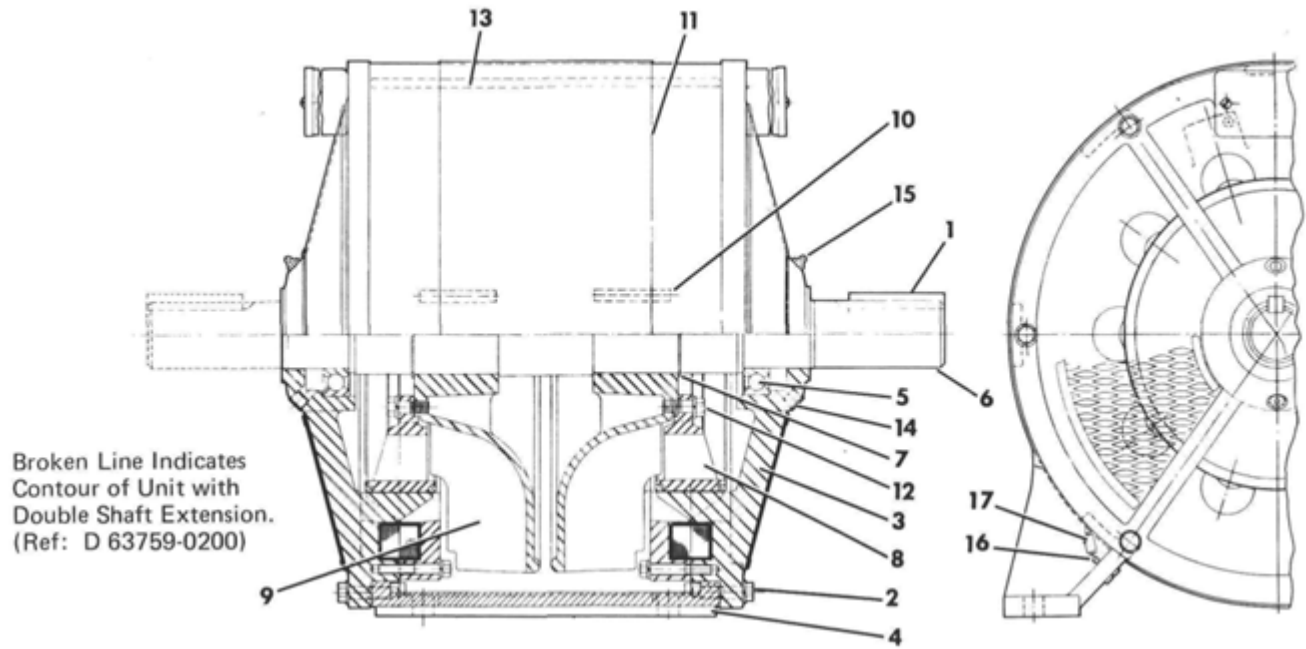
Figure 5-3

Model AS-705 Parts List

Table 5-3

Item No.	Description	Part Number
1	Key	DY-216
2	Cap Screw, Lockwasher	DY-187, DY-4771
3	Field Assembly	C-63755-(See Master Bill)
4	Housing	D-63756-0100
5	Bearing	DY-196
6	Shaft (double shaft extension) (single shaft extension)	C-32284 C-34902
7	Retaining Ring	DY-6297
8	Fan	D-32283
9	Key	DY-272
10	Screen	A-32309-0300
11	Rotor	D-27379-0100
12	Cotter Pin	DY-340
13	Spring	A-18973
14	Grease Fitting	DY-1336
15	Pipe Plug	DY-4525
16	Cap screw, Lockwasher	DY-17, DY-18

Ref.: D-63757



Typical Cross Section Drawing – AS-706

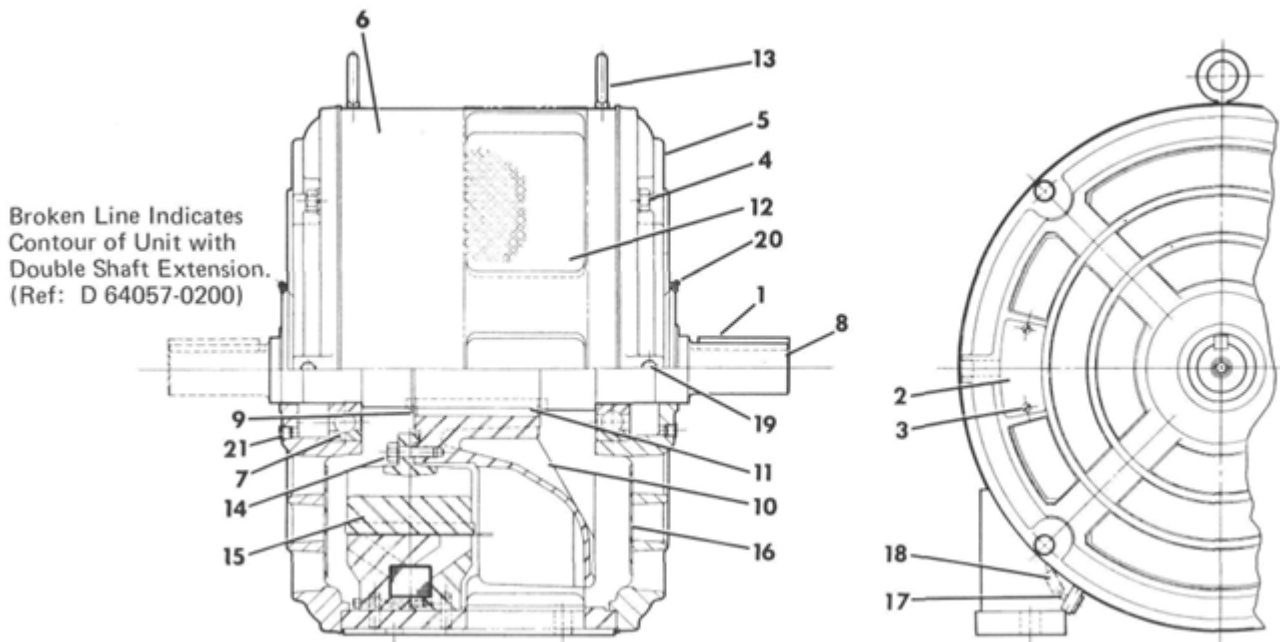
Figure 5-4

Model AS-706 Parts List

Table 5-4

Item No.	Description	Part Number
1	Key	DY-216
2	Cap Screw, Lockwasher	DY-187, DY-4771
3	Field Assembly	C-63755-(See Master Bill)
4	Housing	D-32317
5	Bearing	DY-196
6	Shaft (double shaft extension) (single shaft extension)	C-32316 C-36796
7	Retaining Ring	DY-6297
8	Rotor	D-27379-0100
9	Fan	D-32283
10	Key	DY-272
11	Screen, Guard	A-32306-0400
12	Cap Screw, Lockwasher	DY-17, DY-18
13	Tube Insulator	A-71605-0200
14	Pipe Plug	DY-4525
15	Grease Fitting	DY-1336
16	Cotter Pin	DY-340
17	Spring	A-18973

Ref.: D-63759



Typical Cross Section Drawing – AS-707

Figure 5-5

Model AS-707 Parts List

Table 5-5

Item No.	Description	Part Number
1	Key	DY-7755
2	Cover, Junction Box	A-36607
3	Machine screw, Lockwasher	DY-169, DY-15
4	Cap screw, Lockwasher	DY-96, DY-106
5	End bell	D-64058-0100
6	Field and housing assembly	D-36621-(See Master Bill)
7	Bearing	DY-5001
8	Shaft (double shaft extension) (single shaft extension)	D-36616 D-38175
9	Snap ring	DY-7759
10	Fan	D-36619
11	Key	DY-7766
12	Screen	A-32306-0500
13	Eyebolt	DY-341
14	Cap screw, Lockwasher	DY-209, DY-106
15	Rotor	D-36618
16	Self-tapping screw, Flatwasher, Screen	DY-5072, DY-388, B-36608
17	Cotter pin	DY-340
18	Spring	A-18973
19	Pipe plug	DY-1465
20	Grease fitting	DY-221
21	Pipe plug	DY-4525

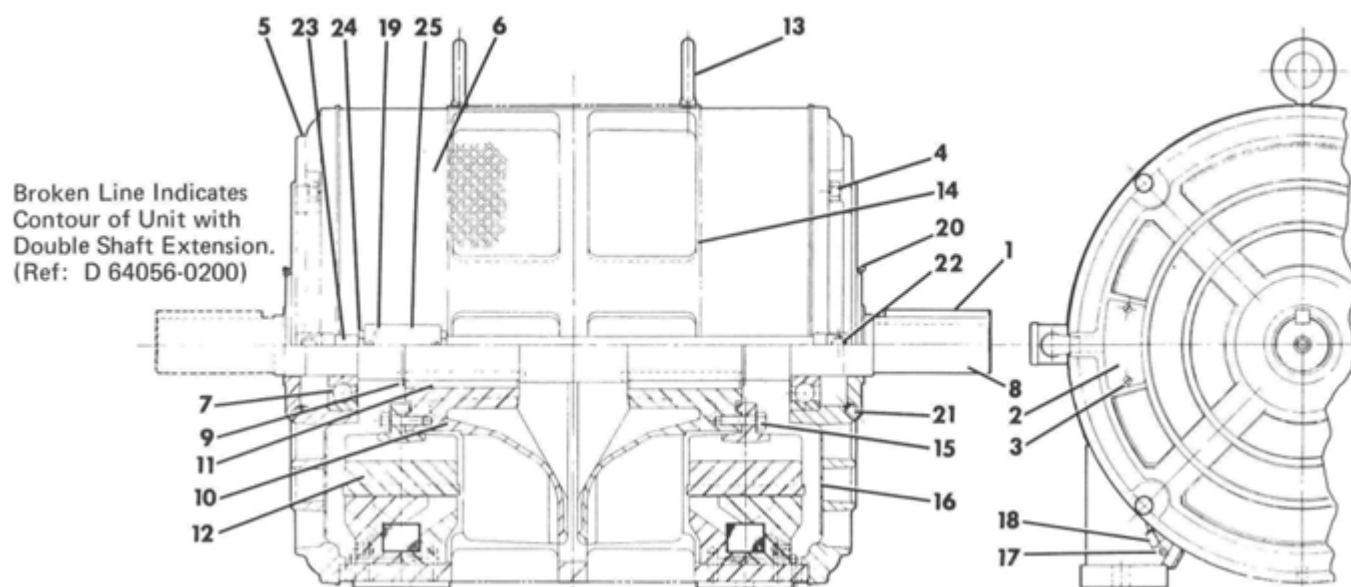
Ref.: D-64057

Disassembly

1. Remove unit from operation and pull off shaft coupling hubs, or sheaves, with approved bearing puller and remove shaft key(s)(1).
2. Remove junction box cover (2) from both end bells by removing two machine screws and lockwashers (3). Disconnect brake leads inside of both junction boxes.
3. Remove four cap screws and lockwashers (4) from each end bell. Slide both end bells (5) off of bearings and shaft assembly.
4. To remove both field assemblies from housing (6) match mark and remove the pins that hold them in place. At least one field assembly must be removed in order to remove the shaft assembly. Slide entire shaft assembly out of housing.
5. Using an approved bearing puller, remove bearing (7) from each end of shaft (8). Force should be applied only to the inner race when removing bearings.
6. If necessary remove snap rings (9), fans (10) and keys (11) from the shaft; heat hub of fan if necessary.
7. Clean all pieces of grease and dirt before reassembly.

Reassembly

1. If fans (10) were removed, install keys (11) into shaft; heat hub of fans and press them over the keys onto the shaft flush against shoulders of the shaft. Install snap rings (9).
2. Press bearing (7) onto each end of shaft with an approved pusher device. Apply pressure only to the inner race until bearings are flush against shoulders of the shaft.
3. Pack bearing cavity in both end bells with recommended grease. Slide entire shaft assembly into housing (6). Install field assemblies into housing and secure with pins.
4. Slide both end bells (5) over bearing until flush with housing (6).
5. Align holes in each end bell with holes in housing and install four cap screws and lockwashers (4). Rotate shaft to ensure that no binding exists.
6. Replace key(s)(1), connect brake leads in junction boxes and replace covers. Brake is ready for return to operation.



Typical Cross Section Drawing – AS-708

Figure 5-6

Model AS-707 Parts List

Table 5-6

Item No.	Description	Part Number
1	Key	DY-3778
2	Cover, Junction Box	A-36607
3	Machine screw, Lockwasher	DY-169, DY-15
4	Cap screw, Lockwasher	DY-96, DY-106
5	End bell	D-64058-0100
6	Field and housing assembly	D-36628-(See Master Bill)
7	Bearing	DY-5001
8	Shaft (double shaft extension) (single shaft extension)	D-36623 D-38176
9	Snap ring	DY-7759
10	Fan	D-36619
11	Key	DY-7766
12	Rotor	D-36618
13	Eyebolt	DY-183
14	Screen	A-36622
15	Cap screw, Lockwasher	DY-209, DY-106
16	Self-tapping screw, Flatwasher, Screen	DY-5072, DY-388, B-36608
17	Cotter pin	DY-340
18	Spring	A-18973
19	Machine screw, Lockwasher	DY-170, DY-32
20	Grease fitting	DY-221
21	Pipe plug	DY-4525
22	Conduit elbow	DY-6405
23	Conduit nipple	DY-469
24	Conduit locknut, Bushing	DY-10583, DY-10582
25	Junction box	A-65495-0100

Ref.: D-64057

Bearing Replacement

Bearing Numbers

Table 5-7

Model No. AB-	Part No.	Description
703	DY-12814	Ball bearing (1) shield
704	DY-12814	Ball bearing (1) shield
705	DY-196	Ball bearing (1) shield
706	DY-196	Ball bearing (1) shield
707	DY-5001	Ball bearing (1) shield
708	DY-5001	Ball bearing (1) shield

Recommended Bearing Manufacturers

Table 5-8

Dynatomic Bearing No.	Fafnir	TRW	N.D. Hyatt	FAG	SKF	NTN	Hoover
DY-196	P211-KD	211-SF	7511	6211Z/C3	6211Z/C3	6211Z/C3	-
DY-5001	P316-KD	-	-	6316Z/C3	6316Z/C3	6316Z/C3	7316Z/C3
DY-12814	P209-KD	209-SF	7509LR1	6209Z/C3	6209Z/C3	6209Z/C3	-

Internal Looseness Specifications:

All anti-friction bearings installed in Dynatomic machines require *AFBMA Class 3 Internal Fit-up.

Reference: Nameplate bearing identification (1) and (2).

Per Specification ST-2801. Greased per MML-4-1.2.

Refer to Page 19 for recommended grease specification.

*AFBMA – Anti-Friction Bearing Manufacturers Association.

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