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**Instruction,  
*94MB Geared AC Machine***

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## Important Precautions and Useful Information

This preface contains information that will help you understand and safely maintain MCE equipment. We strongly recommend you review this preface and read this manual before installing, adjusting, or maintaining Motion Control Engineering equipment. This preface discusses:

- Safety and Other Symbol Meanings
- Environmental Considerations
- In This Guide

## Safety and Other Symbol Meanings



### Danger

This manual symbol is used to alert you to procedures, instructions, or situations which, if not done properly, might result in personal injury or substantial equipment damage.



### Caution

This manual symbol is used to alert you to procedures, instructions, or situations which, if not done properly, might result in equipment damage.

### Note



This manual symbol is used to alert you to instructions or other immediately helpful information.

## Environmental Considerations

- Keep ambient temperature between 32 and 104 degrees F (0 to 40 degrees C).
- Prevent condensation on the equipment.
- Make certain that power line fluctuations are within plus or minus 5% of proper value.

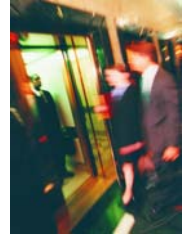
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# 94MB Geared AC Machine



## *Instruction: 94MB Machine*

### **AC Geared Machines**

MCE 94MB Geared AC Machines handle loads from 2000 to 3500 pounds at speeds to 400 feet per minute and loads up to 4000 pounds at 350 feet per minute. MCE machines are factory configured to meet the specific demands of each job. We use Imperial Electric motors known for durability and reliability coupled to heavy duty, field-proven gear units from world class manufacturer Alberto Sassi. Each machine is run in at the factory and shipped mounted on pallets and, if required, in protective crates.

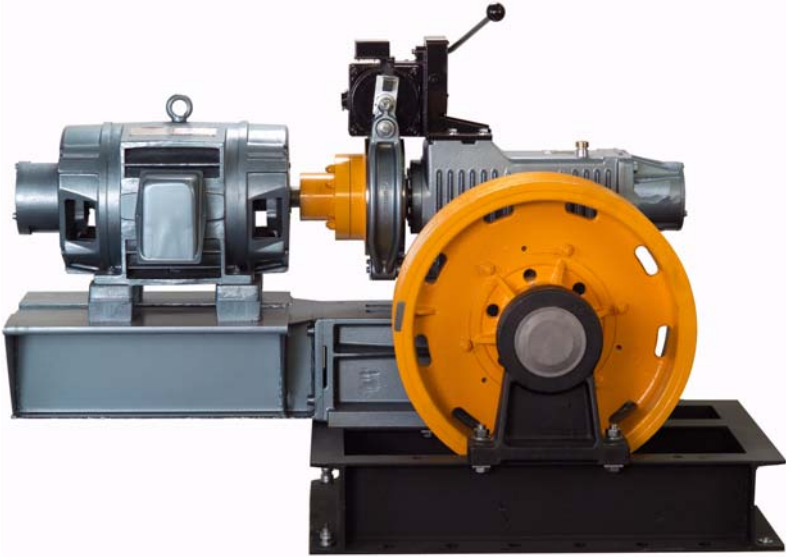
The construction of the 94MB provides multiple benefits:

- Motor and machine bases are joined using machine steel pins and calibrated bolts for superior strength and rigidity.
- Motor and gear unit are optically aligned using laser beam technology to eliminate angular distortion and ensure shaft and bearing performance over long years of service.
- Machine balance is fine-tuned by journeyman technicians to eliminate any vibration.
- The rigid, small footprint sub base levels easily and resists the twisting and distorting that affects longer sub bases.
- The 94MB is shorter and lighter than competing designs, allowing it to be easily handled and installed in smaller spaces.

# Instruction: 94MB Machine

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**Figure 1-1. 94MB Geared AC Machine**



## **Important Personnel and Document Information**

Only qualified personnel are allowed to perform any planning, installation or maintenance work. Personnel must be trained for this job and must be familiar with installing, assembling, commissioning, and operating the product. Sufficient knowledge of elevator construction is essential. Machine commissioning is prohibited until the requirements of appropriate local directives are satisfied.

Regulations concerning operation, maintenance, and inspection, in accordance with applicable safety regulations in elevator construction such as ASME A17.1, A17.5 and other relevant regulations shall be strictly observed.

The operator is responsible for proper installation of the machine with regard to safety requirements as well as for inspection and maintenance as specified in the applicable regulations. No liability can be assumed for any damage caused by improper handling or any other acts which are not in conformity with these operating instructions.

# Important Personnel and Document Information

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In this manual, the following symbols are used to mark warnings, cautions, and important notes.



**Danger:** Means that death or serious injury to persons or serious damage to property will occur unless the appropriate precautions are taken.



**Caution:** Means that injury to persons or serious damage to property may occur unless the appropriate precautions are taken.



**Note:** Highlights important information related to the task being described.

## Intended Use

The three-phase traction machine is intended for use in an enclosed, lockable machine room to which only qualified personnel and personnel authorized by the client have access.



**Danger:** Instructions in this manual or in other instructions supplied with the machine must always be observed to avoid danger or damage.

Check for proper function of the motor and brake after installing the machine. Repairs may be carried out only by the manufacturer or an authorized repair agency. Unauthorized opening and tampering may lead to injuries or damage.



**Caution:** The machines are not designed for direct connection to the three-phase system but are to be operated via a driver only. Direct connection to the system may destroy the motor.

# Instruction: 94MB Machine

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Note: High surface temperatures may occur on the external parts of the machine. No temperature-sensitive parts should be mounted in contact with hot surfaces. Protection against accidental contact should be provided if required.



Note: The twin shoe brake is designed only as a holding brake for a limited number of emergency braking operations. It must not be used as a working brake.



**Caution: High voltages are present at terminal connections during motor operation.**

## General Precautions

An example of the machine data plate is shown below.



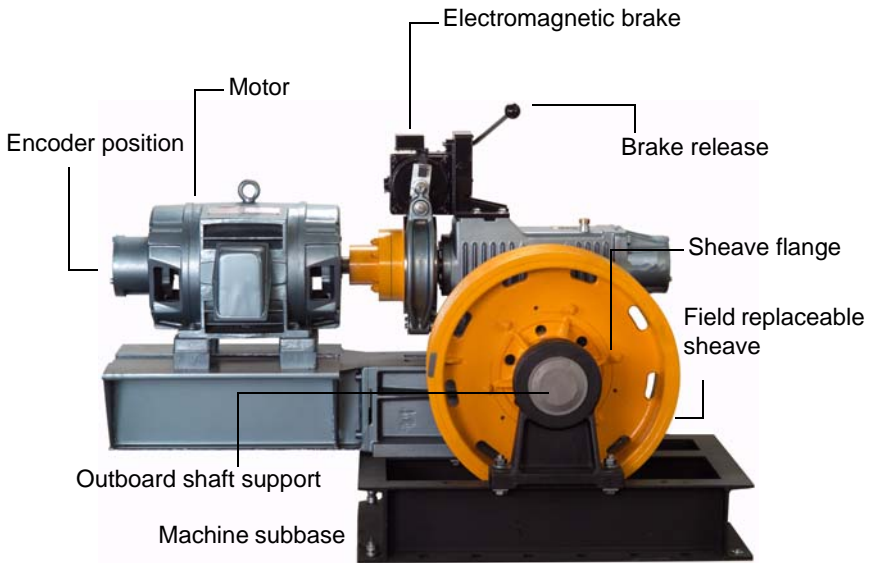
MCE must be notified of the following when ordering parts for the machine:

- Machine serial number
- Gearbox type: 94MB
- Gear ratio




Note: Pay careful attention to the information provided in this instruction for conditions and limits regarding machine use. All operations described in this instruction must be carried out by trained, authorized personnel. The machine guarantee is no longer effective if any parts are removed from the gearbox.

## General Nomenclature




## Motor and Gearbox Data Plates

Data plates attached to the machine gearbox may vary in quantity and position depending upon the configuration of the machine. General examples of commonly used data plates are provided here.



- HIGH VOLTAGE AND ROTATING PARTS CAN CAUSE FATAL OR SERIOUS INJURY.
- INSTALLATION, OPERATION, AND MAINTENANCE OF ELECTRICAL MACHINERY SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. MANUAL AVAILABLE.
- GROUND AND PROTECT MOTOR AND EQUIPMENT IN ACCORDANCE WITH INTERNATIONAL ELECTRIC AND LOCAL CODES. SEE NEMA MG-2 SAFETY STANDARDS.
- MOTOR OR GENERATOR MAY BE AT LINE VOLTAGE WHEN NOT IN OPERATION.
- TO AVOID ELECTRICAL SHOCK, BEFORE TOUCHING INTERNAL PARTS, DISCONNECT POWER TO THE MACHINE AT THE POWER UNIT, TO ACCESSORIES, AND TO DC FIELDS.

AC MOTOR DATA			
HP	30	F.L. RPM	1170
S. F.	—	DUTY	60 MIN
CODE	H	NEMA DES.	A
FR	326T	ENCL.	DP
AMB.	40 °C	INSUL. CLASS	F
Hz.	60	VOLTS	480
		AMPS	34.3
		AMPS	
DR. END BRG.		OPF. DR. END BRG.	
SERIAL NO.	24DCT06 DS-1465	CATALOG NO.	326EAV030K021
STARTS/HR			
THE IMPERIAL ELECTRIC COMPANY 			

Additional data plates are used to provide gear unit serial number, car up and car down sheave rotation direction, and fan, motor, and brake electrical connections and properties.

# Instruction: 94MB Machine

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## Receiving

The complete machine is secured to a specially built pallet and shipped as a unit. Due to safety considerations in some jurisdictions, the brake release lever is dismantled before shipment.

## Unit Weights

- 94MB Gearbox (with base, less sheave): 1180 lbs (535 kg)
- Sheave:
  - 23.62 in: 172 lbs (78 kg)
  - 25.59 in: 194 lbs (88 kg)
  - 27.56 in: 214 lbs (97 kg)
- Motor:
  - 256T: 225 lbs (102 kg)
  - 284T: 300 lbs (136 kg)
  - 286T: 325 lbs (147 kg)
  - 324T: 400 lbs (181 kg)
  - 326T: 450 lbs (204 kg)
  - 365T: 610 lbs (277 kg)

## Unpacking

If your equipment was shipped in a plywood crate, the nails must be removed in order to open the crate. Once the crate is removed, you can remove the bolts that secure the unit to the pallet.

## Hoisting Positions

Hoisting positions for the 94MB are shown below. If your machine has an extended slow shaft, you will also need to attach a chain between the central lifting ring of the hoist equipment and one of the sheave pulley slots. (The chain provides transverse balance when lifting, preventing the machine from twisting because of the off-center weight of the sheave.)



**Danger: Great care must be taken when lifting to ensure that the unit remains balanced and lifts evenly. An accident during hoisting can result in damage, personal injury, or even death.**

# Instruction: 94MB Machine

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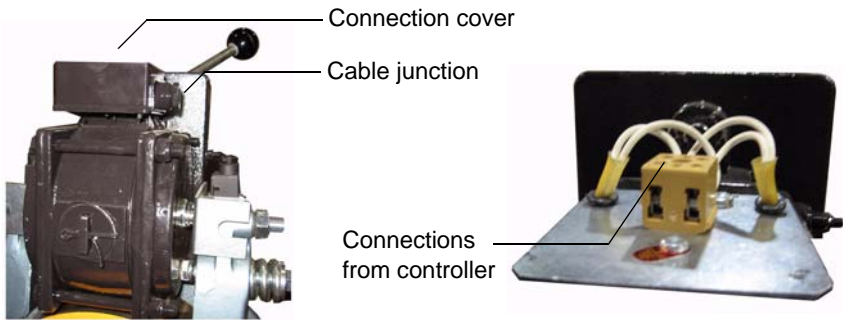
## Installation

This section describes:

- Electrical Connections
- Start Up
- Initial Brake Adjustments

## Brake Connection

- To connect the brake, remove the cover, then route wires through the cable junction and connect to the brake connector. Pick Voltage: 230 VDC.



## Imperial AC Motor Connection



Wire the L1, L2, and L3 motor connections to three-phase AC power from the elevator controller inverter drive. Imperial motors used on the 94MB are Y-Start/Delta-Run. Check that the data plate “VOLTS” on the motor match the output voltage of your drive.

## Encoder Connection

The MCE 94MB uses an IH950, 1024 ppr incremental encoder. The encoder output is shown below.

A shielded cable is provided with the encoder. The 9-pin D connector end goes to the elevator controller. Signal pin out is provided in the following table.

**Table 1-1: Encoder to Controller Pinout**

Signal	Pin #	Pulse
0 Volt	1	
+ Volt	2	
A	3	
B	4	
0	5	
A compliment	6	
B compliment	7	
0 compliment	8	



**Note:** Do not coil excess Encoder cable near high voltage components — noise may be induced.

# Instruction: 94MB Machine

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## Startup

Before machine startup, you must **check oil levels and manually turn the sheave to distribute lubricant before placing a load on the machine.**



**Caution: Failure to start the machine properly can permanently damage the gear unit.**

1. Check that the oil level reaches the center of the level window.



Oil fill cap

Oil level window

Oil drain plug

2. If you need to add oil, use Mobilgear SHC XMP 320. This is the lubricant with which the gear is shipped. If necessary, Castrol Alphasyn EP 320 or BP Enersyn EPX 320 may be used.



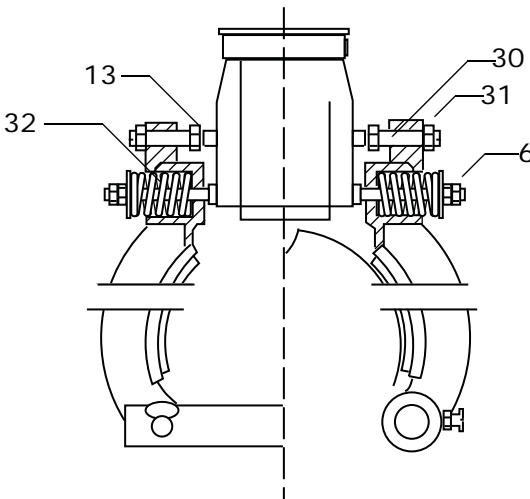
**Caution: Synthetic Mobilgear SHC XMP 320 oil is used during factory run-in and provided with the machine. Mineral and synthetic oils must never be mixed.**

3. Manually turn the sheave one complete turn, so that the ring gear is lubricated before startup. Pay special attention to the running-in phase: The first machine movements must take place before the machine is placed under load.
4. Apply and balance the load.
5. Check machine resistance in both directions. If resistance is greater in one direction than in the other, check the alignment of the external support (if present).

6. Remove the oil fill cap. With the machine under load, run for 15 to 30 minutes with a cabin load of 60% duty load while observing the oil fill hole. Check for any smoke coming from the fill hole. Stop and contact MCE immediately if any smoke is visible.
7. Load the cabin to 3/4 of its capacity and operate the machine, alternating ascent and descent, for about 30 minutes.
8. Load the cabin to full capacity and operate the machine for about 15 minutes.
9. Unload the cabin, leaving 1/4 duty load and repeat test runs.
10. Unload the cabin completely and repeat test runs.

## Brake Initial Adjustment

The brake is factory adjusted to support 125% of the full load car capacity submitted with the initial order for the machine. You will first want to check that this setting is correct:



1. Position the car at the bottom landing.
2. Load the car with 125% of full load and check that the brake does not slip. If the brake slips, complete the following steps.
3. With the machine operating (brake energized/released), loosen locking nut 31.
4. Slightly loosen adjustment screw 30 until the brake unit rubs against the brake drum.
5. Tighten screw 20 the minimum necessary until rubbing ceases between the shoes and the brake drum.
6. Re-tighten lock nut 31.
7. Repeat the procedure on the opposite brake.
8. Stop the car at the bottom landing.

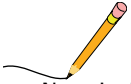
# Instruction: 94MB Machine

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9. Loosen safety locking nut 6. Tighten the lower (adjusting nut) until desired braking is achieved.
10. Tighten locking nut 6.
11. Repeat for opposite brake.



**Caution: Do not perform brake adjustment by increasing the pre-load (spring pressure) only. The entire procedure must be performed to prevent end-gap (13) misadjustment.**



Note: In the Maintenance section of this guide, there is a brake adjustment procedure used when the car is supported and more substantial brake work is necessary. (For example, when replacing linings.)

## Maintenance

This section contains information about procedures that are not usually a part of installation and startup but rather a part of ongoing machine care or repair. It is also useful as a reference to increase your knowledge of the machine. This section contains:

- Routine Maintenance
- Brake Adjustment
- Gear Oil Change

### Routine Maintenance

MCE machines are designed to reduce maintenance requirements as much as practical. However, there are a few simple operations which should be periodically addressed to ensure optimum operation.

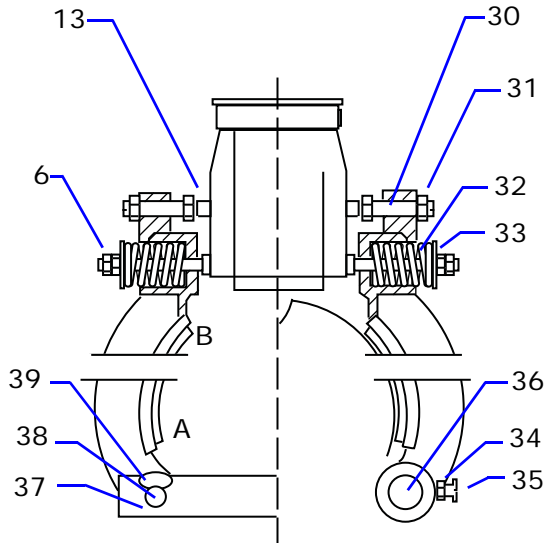
- Check gear unit oil level and viscosity every six months.
- Check brake friction lining wear every four to six months.
- Lubricate brake link pins as required
- Replace brake linings when thickness is approximately 0.060 in (1.5 mm) to 0.075 in (2 mm) at the point of maximum wear.

## Brake Adjustment



**Caution:** The car must be supported before beginning work on the brakes.

1. With the brake de-energized (applied by spring pressure), loosen locking nuts 31.
2. Loosen set screws 30 so that they are distanced by about 0.15 in (4 mm) from the end stops 13.
3. Manually check that end stops 13 are in the outside end position.
4. Loosen nuts 6, leaving washers 33 in contact with springs 32.
5. With the shoes in contact with the drum, re-tighten set screws 30, moving end stops 13 towards the brake center, leaving an end stop gap of 0.040 in (1 mm).



6. Tighten locking nuts 31.
7. Energize (release) the brake. Check that the friction lining of the shoe does not touch the brake drum and that a gap of 0.020 in (0.5 mm) to 0.030 in (0.8 mm) exists at points B between the lining and the braking surface. This gap should extend through the complete arc of the lining even if it slightly decreases up to point A.

If, and only if, the gap is not as described, is it necessary to adjust the eccentric pin that regulates the brake shoe/drum coupling.

1. De-energize the brake so that it is applied by the pressure of the springs.
2. Loosen set screws 30 so that they are distanced by about 0.15 in (4 mm) from the end stops (13).
3. Manually check that the end stops 13 are in the outside end position.
4. Loosen nuts 6, leaving washers 33 in contact with springs 32.
5. Back off screws 38.
6. Disconnect the pin connection 37 from the Belleville springs 39.

## Instruction: 94MB Machine

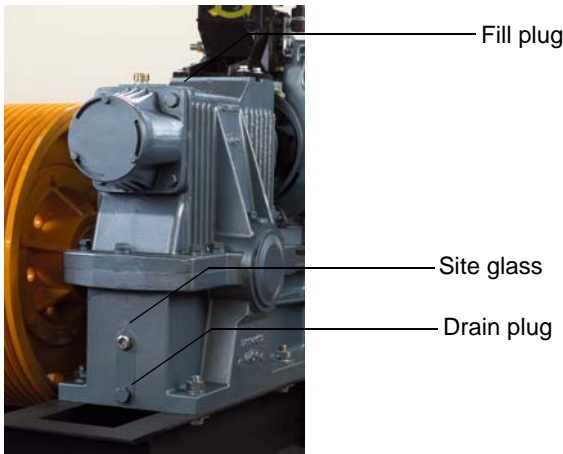
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7. Loosen the nuts 34 and screws 35.
8. Adjust the eccentric pins 36 using a wrench or screwdriver as required until the shoes fully engage with the brake drum.
9. Tighten screws 35 and nuts 34.
10. Fit the Belleville springs 39, pin connection 37, and tighten screws 38.
11. With the shoes in contact with the drum, tighten set screws 30, moving end stops 13 towards the brake center, leaving an end stop gap of 0.040 in (1 mm).
12. Loosen safety locking nut 6. Tighten the lower (adjusting nut) until desired braking is achieved.
13. Tighten locking nut 6.
14. Repeat for opposite brake.

### Gear Oil Change

After the first 700 hours (synthetic oil), an initial oil change is required. After the initial change, oil should be changed every 24 to 36 months depending upon intensity of use. If possible, change oil while the machine is warm.

1. Remove the oil filler cap.
2. Position a drain receptacle under the drain plug.
3. Remove the plug and drain the oil completely.
4. Replace the drain plug and fill the gear unit until the oil level reaches the center of the sight glass. Use Mobilgear SHC XMP 320 synthetic oil. If necessary, Castrol Alphasyn EP 320 or BP Enersyn EPX 320 may be used.
5. Replace the fill cap. Check for and clean up any lubricant spills or drops.



## Troubleshooting

Table 1-2: 94MB Troubleshooting

Symptom	Condition	Probable	Other Possibility
Noise	Noise at starting	Defective electrical conduction - rotor	Defective bearings - fast shaft
			Defective bearings - slow shaft
			Incorrect pulley fixing
	Noise at high speed		Defective bearings - fast shaft
			Incorrect pulley fixing
			Defective balancing - rotating masses
	Noise at approaching speed	Defective electrical conduction of rotor	Defective bearings - fast shaft
		Out of center between rotor and stator	Incorrect pulley fixing
	Noise at stopping		Incorrect adjustment - brake shoes
			Defective electromagnet
Vibration	Vibration at starting	Defective electrical conduction - rotor	Defective bearings - fast shaft
			Incorrect pulley fixing
	Vibration at high speed	Defective electrical conduction - rotor	Defective bearings - fast shaft
			Incorrect pulley fixing
			Defective balancing - rotating masses
	Vibration at approaching speed	Defective electrical conduction - rotor	Defective bearings - fast shaft
			Incorrect pulley fixing
	Vibration at stopping		Incorrect adjustment - brake shoes
			Defective electromagnet
Oil leakage	Oil leak - slow shaft		Too much oil inside machine
			Incorrect positioning - O-ring
	Oil leak - motor shaft		Incorrect positioning - O-ring
Smoke from gearbox	Full load applied		Incorrect balance - car/counterweight
			Incorrect procedure at first starting of machine
			Incorrect type of oils used
			Insufficient lubrication inside gear box

# Instruction: 94MB Machine

**Table 1-2: 94MB Troubleshooting**

Poor lifting capacity		Wrong motor size	Incorrect balance - car/counterweight
			Excessive friction on guides
			Incorrect brake adjustment
			Brake electromagnet defective
			Incorrect electromagnet supply voltage
			Incorrect motor supply voltage
			Incorrect motor cable connections
			Defective motor
Poor deceleration	Floor leveling errors	Wrong motor size	Incorrect balance - car/counterweight
		Incorrect encoder installation	Incorrect deceleration distance in shaft

## Reference

This section contains:

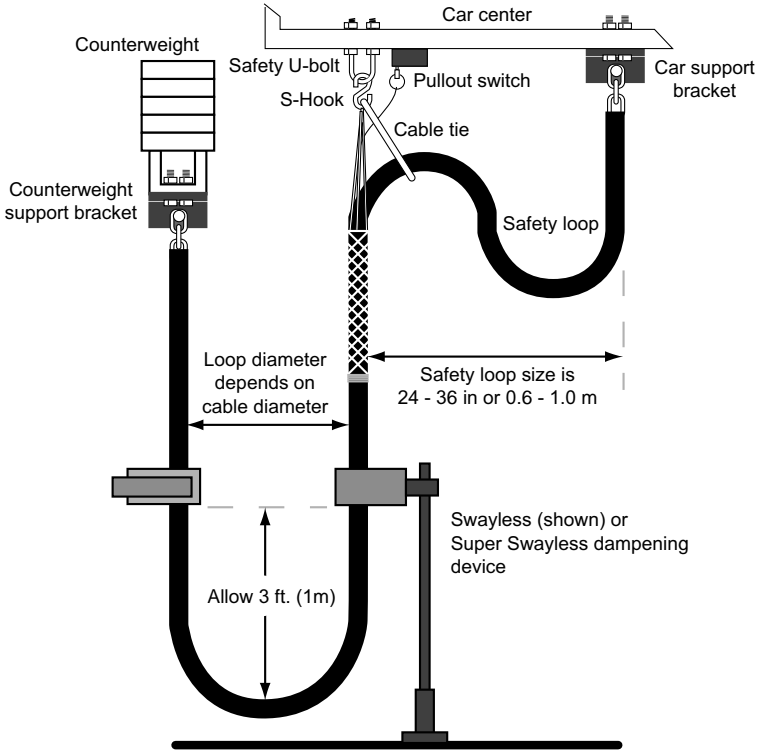
- Accessories
- Torque Values Table
- Performance Tables
- Brake Coil Replacement
- Frame Positioning and Sheave Support
- Shipping Break Down
- Motor Remove & Replace
- Short Shaft Bushing Information

## Accessories

Traditional and peripheral accessories are available for the 94MB, including but not limited to:

- Machine lifting harness
- Sheave guards
- Deflector sheaves and guards
- Rope brakes
- Compensation chains (rubberized) and installation components
- Compensation cables and installation components (standard and shallow pit)
- Hoist ropes (standard and high strength traction)
- Anti-sway devices
- Hoistway/rope mesh grips, support brackets, U-bolts, S-hooks, and couplings
- Pull-out detection switches
- Machine isolation pads

The illustration below provides an example of cable hanging and compensating components available from MCE.



# Instruction: 94MB Machine

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## Torque Table

Class 8.8, Large Pitch ISO Threading	Torque
M10	37 ft lbs (50.1 Nm)
M12	62.5 ft lbs (84.8 Nm)
M14	100.0 ft lbs (135 Nm)
M16	151.0 ft lbs (205 Nm)
M18	209.0 ft lbs (283 Nm)
M20	295 ft lbs (400 Nm)
M22	392 ft lbs (532 Nm)
M24	510 ft lbs (691 Nm)

## Performance Tables

Information in the duty tables is predicated on operational assumptions as follows:

- Operating cycle: 8 hours per day
- Life expectancy: 30000 hours (20 years)
- Starts per hour: 240
- Machine is properly maintained

## Startup Assertions

Gear/motor attachment to supporting steel structure must be precise, especially with regard to the alignment of the external outboard bearing. The fast speed shaft between the motor and the gear unit must be exact and the motor must be mounted to the support plate correctly to avoid stress on the fast axis of the machine.

Application of a load to an improperly installed machine can cause serious damage to the gear unit. Adhere to all instructions and recommendations in this guide.

## Motor Specifications

Motor Frame	256T	284T	284T	286T	324T	326T	365T	365T
Motor Poles	6	6	6	6	6	6	6	6
Rated Horsepower	10	12.5	15	20	25	30	40	50
Rated Torque (ft-lbs)	45	56	67	90	112	135	179	224
Maximum torque (250% Full Load)	250	250	250	250	250	250	250	250
Rated Current Amperes	13.3	14.2	18	23.8	29.3	34.3	47.7	57.1
Rated Voltage	480	480	480	480	480	480	480	480
BTU/HR	1042	1192	1416	1754	2240	2322	3395	4056
Encoder Pulses	1024	1024	1024	1024	1024	1024	1024	1024

## Duty Tables

The following duty table data were derived using Imperial, 6-pole VVVF motors, 40% counterweighting, and 1:1 roping.

Table 1-3: 94MB Duty Table

Live Load Lbs.	FPM	Sheave Diameter	Rtd Torque FtLbs	Acc Torque FtLbs	Total Torque FtLb	Sheave HP	RPM	Gear Ratio	Gearbox Efficiency	Motor RPM	Reqd Motor Torque	Rated Mtr Torque	Reqd motor HP	Motor Frame	Motor HP @ 1170	Rated HZ	Rtd Motor Volts	Rated Amps	Car Wt. Lbs.	T1 Lbs.	T2 Lbs.	Shaft load	# Cables	Cable Size (in)
2000	100	25.59	1421	2983	4404	4.0	15	65.00	0.604	970	36.2	44.9	6.7	256T	10.0	49.8	398	13.3	6300	8300	7100	15400	5	5/8
	150	25.59	1599	3068	4667	6.8	22	53.00	0.628	1187	48.0	56.1	10.9	284T	12.5	60.9	487	14.2	6300	8300	7100	15400	5	5/8
	200	25.59	1421	2103	3524	8.1	30	35.50	0.708	1060	56.5	56.1	11.4	284T	12.5	54.3	435	14.2	6300	8300	7100	15400	5	5/8
	250	25.59	1421	2889	4310	10.1	37	26.50	0.725	989	74.0	89.7	13.9	286T	20.0	50.7	406	23.8	6300	8300	7100	15400	5	5/8
	300	27.56	1530	2780	4310	12.1	42	26.50	0.725	1102	79.7	89.7	16.7	286T	20.0	56.5	452	23.8	6300	8300	7100	15400	5	5/8
	350	25.59	1421	2262	3683	14.1	52	16.75	0.784	875	108.2	112.2	18.0	324T	25.0	44.9	359	29.3	6300	8300	7100	15400	5	5/8
	400	25.59	1421	2262	3683	16.2	60	16.75	0.784	1000	108.2	112.2	20.6	324T	25.0	51.3	410	29.3	6300	8300	7100	15400	5	5/8
2500	100	25.59	1776	2628	4404	5.1	15	65.00	0.604	970	45.2	44.9	8.4	256T	10.0	49.8	398	13.3	6350	8850	7350	16200	5	5/8
	150	27.56	1913	2754	4667	7.6	21	53.00	0.628	1102	57.5	56.1	12.1	284T	12.5	56.5	452	14.2	6350	8850	7350	16200	5	5/8
	200	25.59	1776	3863	5639	10.1	30	35.50	0.708	1060	70.7	89.7	14.3	286T	20.0	54.3	435	23.8	6350	8850	7350	16200	5	5/8
	250	25.59	1776	2534	4310	12.6	37	26.50	0.725	989	92.5	89.7	17.4	286T	20.0	50.7	406	23.8	6350	8850	7350	16200	5	5/8
	300	27.56	1913	3475	5388	15.2	42	26.50	0.725	1102	99.6	112.2	20.9	324T	25.0	56.5	452	29.3	6350	8850	7350	16200	5	5/8
	350	31.50	2187	3202	5388	17.7	42	26.50	0.725	1125	113.8	112.2	24.4	324T	25.0	57.7	461	29.3	6350	8850	7350	16200	5	5/8
	400	25.59	1776	2643	4419	20.2	60	16.75	0.784	1000	135.3	134.6	25.8	326T	30.0	51.3	410	34.3	6350	8850	7350	16200	5	5/8
3000	100	25.59	2132	3374	5505	6.1	15	65.00	0.604	970	54.3	56.1	10.0	284T	12.5	49.8	398	14.2	6400	9400	7600	17000	5	5/8
	150	25.59	2132	3469	5601	9.1	22	53.00	0.628	1187	64.0	67.3	14.5	284T	15.0	60.9	487	14.2	6400	9400	7600	17000	5	5/8
	200	25.59	2132	3643	5774	12.1	30	35.50	0.725	1060	82.8	89.7	16.7	286T	20.0	54.3	435	23.8	6400	9400	7600	17000	5	5/8
	250	25.59	2132	3256	5388	15.2	37	26.50	0.725	989	111.0	112.2	20.9	324T	25.0	50.7	406	29.3	6400	9400	7600	17000	5	5/8
	300	25.59	2132	3256	5388	18.2	45	26.50	0.725	1187	111.0	112.2	25.1	324T	25.0	60.9	487	29.3	6400	9400	7600	17000	5	5/8
	350	31.50	2624	3842	6466	21.2	42	26.50	0.725	1125	136.6	134.6	29.3	326T	30.0	57.7	461	34.3	6400	9400	7600	17000	5	5/8
	400	25.59	2132	3761	5893	24.2	60	16.75	0.784	1000	162.3	179.5	30.9	365T	40.0	51.3	410	47.7	6400	9400	7600	17000	5	5/8
3500	100	25.59	2487	4119	6606	7.1	15	65.00	0.604	970	63.3	67.3	11.7	284T	15.0	49.8	398	14.2	6550	10050	7950	18000	5	5/8
	150	27.56	2678	4314	6992	10.6	21	53.00	0.784	1102	64.5	67.3	13.5	284T	15.0	56.5	452	14.2	6550	10050	7950	18000	5	5/8
	200	25.59	2487	4731	7218	14.1	30	35.50	0.725	1060	96.6	112.2	19.5	324T	25.0	54.3	435	29.3	6550	10050	7950	18000	5	5/8
	250	29.52	2869	4349	7218	17.7	32	35.50	0.725	1148	111.5	112.2	24.4	324T	25.0	58.9	471	29.3	6550	10050	7950	18000	5	5/8
	300	25.59	2487	3979	6466	21.2	45	26.50	0.725	1187	129.4	134.6	29.3	326T	30.0	60.9	487	34.3	6550	10050	7950	18000	5	5/8
	350	31.50	3061	5560	8621	24.7	42	26.50	0.725	1125	159.3	179.5	34.1	365T	40.0	57.7	461	47.7	6550	10050	7950	18000	5	5/8
	400	25.59	2487	4879	7366	28.3	60	16.75	0.784	1000	189.4	224.4	36.1	365T	50.0	51.3	410	51.7	6550	10050	7950	18000	5	5/8
4000	100	25.59	2842	5966	8808	8.1	15	65.00	0.604	970	72.4	89.7	13.4	286T	20.0	49.8	398	23.8	6700	10700	8300	19000	6	5/8
	150	27.56	3061	6262	9323	12.1	21	53.00	0.784	1102	73.7	89.7	15.5	286T	20.0	56.5	452	23.8	6700	10700	8300	19000	6	5/8
	200	25.59	2842	4376	7218	16.2	30	35.50	0.725	1060	110.4	112.2	22.3	324T	25.0	54.3	435	29.3	6700	10700	8300	19000	6	5/8
	250	25.59	2842	5779	8621	20.2	37	26.50	0.725	989	147.9	179.5	27.9	365T	40.0	50.7	406	47.7	6700	10700	8300	19000	6	5/8
	300	27.56	3061	5560	8621	24.2	42	26.50	0.725	1102	159.3	179.5	33.4	365T	40.0	56.5	452	47.7	6700	10700	8300	19000	6	5/8
	350	31.50	3499	5122	8621	28.3	42	26.50	0.725	1125	182.1	179.5	39.0	365T	40.0	57.7	461	47.7	6700	10700	8300	19000	6	5/8



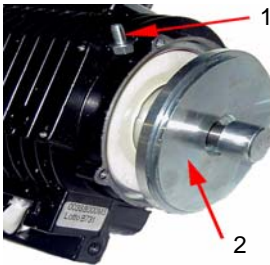
Note: Shaft load calculated without ropes and compensation cables.

# Instruction: 94MB Machine

## Brake Coil Replacement

This procedure references a 30B0 brake. However, it is typical of the brake type used on the 94MB.

1. Before beginning, switch off power at the mains and support the counterweight.
2. Disconnect the brake from the terminal box and remove the brake from the machine.
3. Unscrew the four M5 bolts (1) and extract the flange with its nucleus.

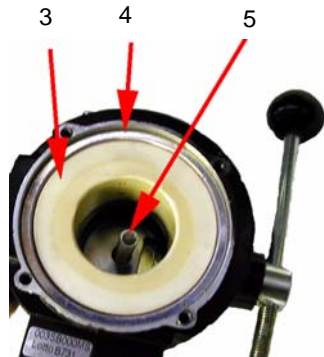


4. Extract the coil (3) and the internal ring (4) taking care not to damage the nucleus spring (5) present inside the brake. During this phase, let the electric wires which connect the coil to the terminal box pass through the protective sheet.



Note: Some brakes are easier to disassemble because the coil and the flange of the nucleus are extracted together as a single part.

Reverse this procedure for reassembly.



## Frame Positioning and Sheave Support

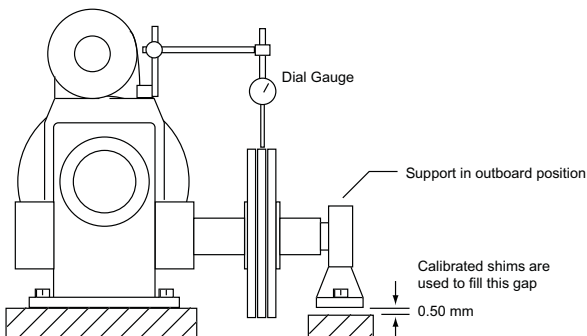
The machine is precisely aligned and fully mounted to the sub base at the factory. The following descriptions are for use should it become necessary to replace the sheave or sheave support at some point in the future.

## Positioning on the Frame

The operations described here are standard practice with all machines mounted on a frame and serve to keep the slow shaft perfectly horizontal once the plant is in traction.

## External Support, Ropes Extending Down

1. Refer to the illustration below.
2. Set the gearbox on the mounting surface or frame.
3. Check to see that a space exceeding 0.020 in (0.5 mm) remains between the base of the external support and its mounting surface. If not, raise the machine using calibrated shims until the required height is attained.
4. Once the height is obtained, fit and completely tighten the bolts to fix the machine in place. Check to ensure that the proper space remains between the base of the support and its mounting surface.
5. Mount a dial gauge with magnetic base as shown in the drawing below. Zero the gauge.
6. Insert calibrated shims between the support and its mounting surface so that the dial gauge indicates a change in height of approximately 0.0012 in (0.03 mm) to 0.0020 in (0.05 mm).
7. Fit the fixing bolts for the external support and completely tighten to 100 ft lbs (136 Nm).
8. The dial gauge must show a change in height of approximately 0.0 to 0.0020 in (0.05 mm). If not, add or remove shims under the external support until achieving the correct value.

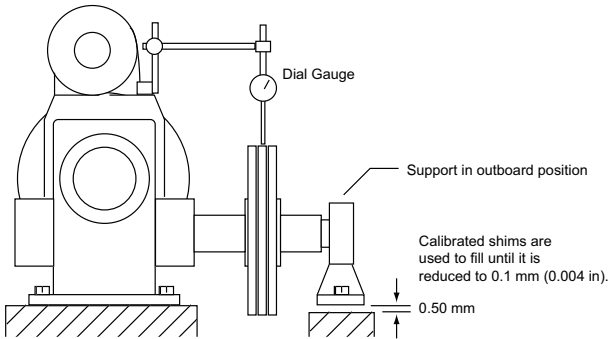


Case A: Slow shaft with external support, ropes extending downwards

# Instruction: 94MB Machine

## External Support, Ropes extending Up (Basement Installations)

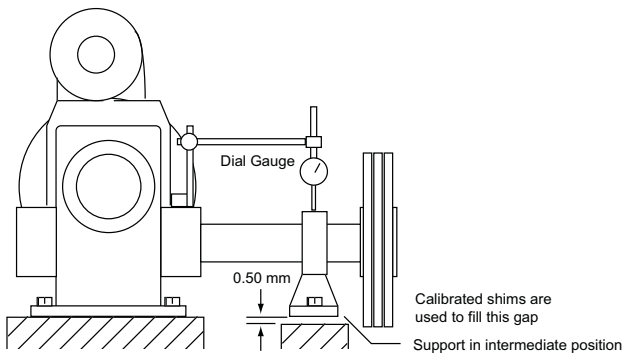
1. Refer to the illustration below.
2. Set the gearbox on the mounting surface or frame.
3. Check to see that a space exceeding 0.020 in (0.5 mm) remains between the base of the external support and its mounting surface. If not, raise the machine using calibrated shims until the required height is attained.
4. Once the height is obtained, fit and completely tighten the bolts to fix the machine in place. Check to ensure that the proper space remains between the base of the support and its mounting surface.
5. Mount a dial gauge with magnetic base as shown in the drawing below. Zero the gauge.
6. Insert calibrated shims between the support and its mounting surface until a gap remains of approximately 0.004 in (0.1 mm).
7. Fit the fixing bolts for the external support and completely tighten to 100 ft lbs (136 Nm).
8. The dial gauge must show a lowering in height of approximately 0.0 to 0.0020 in (0.05 mm). If not, add or remove shims under the external support until achieving the correct value.



Case B: Slow shaft with external support, ropes extending upwards

## Intermediate Support, Ropes Down

1. Refer to the illustration below.
2. Set the gearbox on the mounting surface or frame.
3. Check to see that a space exceeding 0.020 in (0.5 mm) remains between the base of the external support and its mounting surface. If not, raise the machine using calibrated shims until the required height is attained.
4. Once the height is obtained, fit and completely tighten the bolts to fix the machine in place. Check to ensure that the proper space remains between the base of the support and its mounting surface.
5. Mount a dial gauge with magnetic base as shown in the drawing below. Zero the gauge.
6. Insert calibrated shims between the support and its mounting surface so that the dial gauge indicates a change in height of approximately 0.0012 in (0.03 mm) to 0.0031 in (0.08 mm).
7. Fit the fixing bolts for the external support and completely tighten to 100 ft lbs (136 Nm).
8. The dial gauge must show a change in height of approximately 0.0 in to 0.0031 in (0.08 mm). If not, add or remove shims under the external support until achieving the correct value.

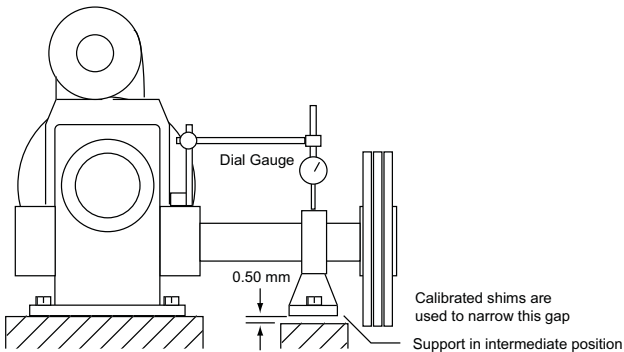


Case C: Slow shaft with intermediate support, ropes extending downwards

# Instruction: 94MB Machine

## Intermediate Support, Ropes Up (Basement Installations)

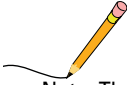
1. Refer to the illustration below.
2. Set the gearbox on the mounting surface or frame.
3. Check to see that a space exceeding 0.020 in (0.5 mm) remains between the base of the external support and its mounting surface. If not, raise the machine using calibrated shims until the required height is attained.
4. Once the height is obtained, fit and completely tighten the bolts to fix the machine in place. Check to ensure that the proper space remains between the base of the support and its mounting surface.
5. Mount a dial gauge with magnetic base as shown in the drawing below. Zero the gauge.
6. Insert calibrated shims between the support and its mounting surface until a gap remains of approximately 0.004 in (0.1 mm).
7. Fit the fixing bolts for the external support and completely tighten to 100 ft lbs (136 Nm).
8. The dial gauge must show a lowering in height of approximately 0.012 in (0.03 mm) to 0.0031 in (0.08 mm). If not, add or remove shims under the external support until achieving the correct value.



Case D: Slow shaft with intermediate support, ropes extending upwards

## Break Down for Shipping

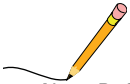
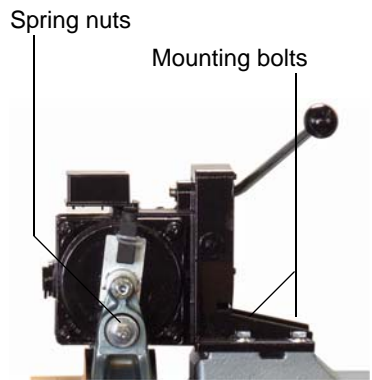
If required, the machine may be partially disassembled to facilitate shipping or installation. Break down includes brake removal, motor removal, and sheave removal.



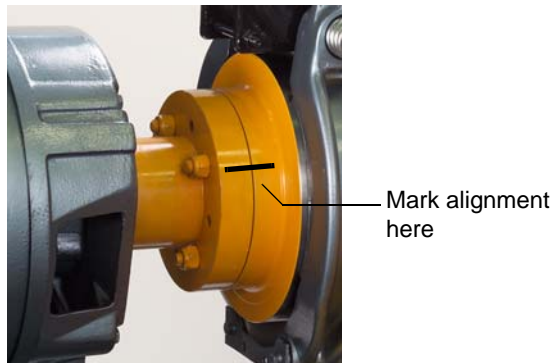
**Note:** The motor in particular must be replaced in precisely the spot from which it was removed, using the same spacers in exactly the same positions. Motor to gearbox alignment is critical to long-term, dependable machine performance.

## Remove the Brake, Motor, and Motor Base

1. Loosen the nuts compressing the brake springs until tension is completely removed. Next, remove the bolts securing the brake unit to the machine and remove the brake unit.



**Note:** Before beginning to remove the motor, use a felt-tip pen or paint to mark the alignment of the coupling between the gearbox joint and the motor flywheel-bearing hub (MPV). Also mark the location of each spacer used between the motor feet and the mounting plate so that they may later be replaced in the correct locations.



2. Remove the nuts that couple the motor to the gear unit.
3. Remove the bolts securing the motor to the base.
4. Slide the motor back to decouple it from the gear unit then remove it from the base.

## Instruction: 94MB Machine

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5. Unscrew the 4 fixing bolts between the motor base and gearbox. Remove the motor base.

We have now separated the main elements of the machine to facilitate transport and handling. If further reduction is required, continue with the following procedure.



### Sheave Removal

1. Remove the outboard bearing cover carefully using a hammer and chisel.



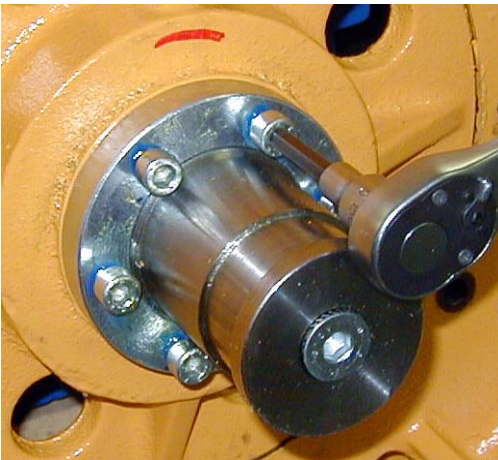
2. Remove the fixing bolt to the outboard bearing.



- Using a properly sized gear puller, remove the outboard bearing.



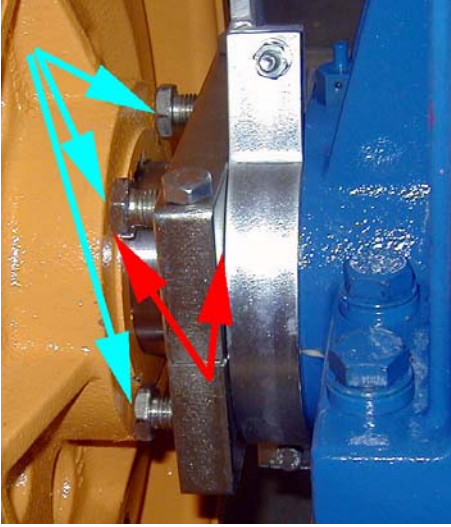
- Loosen all sheave ring bolts slightly to release potential pressure. Then, remove the bolts from the sheave ring as shown below. Do not remove the ring from the shaft yet as it may aid in preventing the hub from coming off the shaft too violently if pressure remains. (The hub is fitted onto the tapered shaft.)



## Instruction: 94MB Machine

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5. Position the extracting tool (see photo below) so that it exerts force on both the traction sheave hub and gearbox.
6. Unscrew the bolts (blue arrows) until the hub comes off the shaft.



Bolts	Torque
Traction sheave to hub: 6, M16 x 60	151 ft lbs (205 Nm)
Slow shaft ring: 6, M12	63 ft lbs (85Nm)

For reassembly, please refer to:

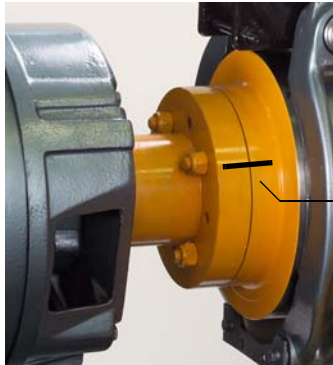
- “Motor Remove and Replace” on page 29
- “Frame Positioning and Sheave Support” on page 21
- “Brake Adjustment” on page 13

### Motor Remove and Replace

Should it become necessary to remove the AC motor, follow these instructions with great care.



**Note:** Before beginning to remove the motor, use a felt-tip pen or paint to mark the alignment of the coupling between the gearbox joint and the motor flywheel-bearing hub (MPV). Also mark the location of each spacer used between the motor feet and the mounting plate so that they may later be replaced in the correct locations.



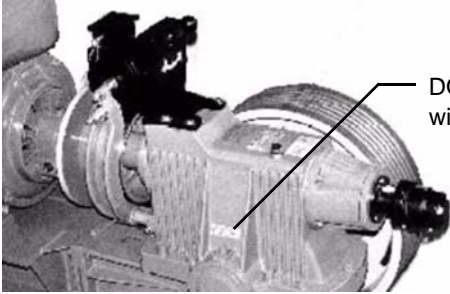
Mark alignment here

1. Support the car and lift the ropes off the sheave.
2. Shut off power at the mains.
3. Disconnect brake and motor wiring.
4. Open/release the brake.
5. Remove the nuts that couple the motor to the gear unit.
6. Remove the bolts securing the motor to the base.
7. Slide the motor back to decouple it from the gear unit then remove it from the base.
8. Move the coupling hub from the old motor to the new.
9. Ensure that spacers between the motor and the base are exactly in their former positions. (Even the thickness of a layer of paint can negatively affect alignment.)
10. Install the new motor, ensuring that the aligning mark between motor and gear unit couplings is correctly aligned.
11. Turn the sheave and use a dial gauge to make sure the horizontal and vertical deflection of the motor shaft with relation to the gear unit varies by no more than  $\pm 0.001$  inch (0.02 mm). Adjust to achieve proper alignment.
12. Return the car to running order and make several short and long test runs to ensure correct operation within acceptable temperature and noise ranges.

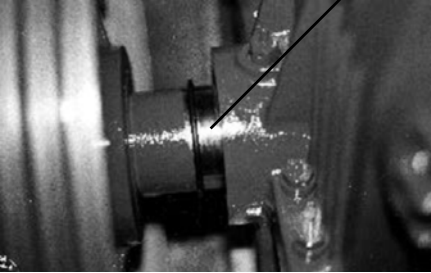
# Instruction: 94MB Machine

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## Slow Shaft Bushing Information



DO NOT LOOSEN or REMOVE the pin without authorization from MCE.



The O-RING visible on the slow shaft serves as a "spare" for the primary o-ring and must not be moved unless the gear unit is leaking. Leaking may be caused by grossly overfilling the gear unit with oil or by deterioration of the primary o-ring. If the unit has been overfilled, simply drain the excess until the oil level is again in the middle of the sight glass.

If the unit is not overfilled, but long service has caused the primary o-ring to deteriorate, move the spare o-ring in until it is in contact with the edge of the sleeve bushing.