

A-101 50-348/364-CIVP
 with 002 in. (0.05 mm). During shimming, use shims that are as thick as possible to avoid a sponginess of an excessive number of layers.

COUPLING ALIGNMENT PROCEDURE

For more accurate alignment use two sets of indicators.

1. For angular alignment, Fig. 4, clamp a dial indicator to the motor coupling, hub and secure the probe against the end of the connecting shaft or face of the coupling.

NOTE: Do not rely on magnetic clamping only. Use additional positive clamping.

Check to verify that the support arm or the probe does not deflect under its own weight when the shaft is rotated. Repeat measurements until consistent readings are obtained. Mark the shaft at the point where the probe touches it, and turn both shafts, keeping the probe on the reference mark. Shoulder shaft to end of bearing float to maintain axial position.

2. Note the dial indicator reading at 0° (starting point), 90°, 180°, 270°. The total angular misalignment should not exceed 1/2 mil (0.0005") per inch (0.0005 mm per millimeter) of coupling hub radius. For checking the coupling face or shaft runout, hold the one shaft stationary and rotate the other shaft, if possible.

MAXIMUM PERMISSIBLE = [Coupling Hub Radius in in. (mm)]
ANGULAR MISALIGNMENT X [0.0005 IN. (MM)]

3. Check for excessive shaft parallel runout by using the accurately ground or machined diameter provided on most coupling hubs. Set up a dial indicator as shown in Figure 5, with the probe mounted securely on the machined diameter. Mark the shaft at the point where the probe touches it and turn both shafts keeping the probe on the reference mark. To check the shaft or coupling diameter runout, hold one shaft stationary and rotate the other shaft, if possible.
4. Note the dial indicator reading at 0° (starting point), 90°, 180°, 270°. THE MAXIMUM PERMISSIBLE RUNOUT BETWEEN THE TWO COUPLING HUBS IS 0.002 inch (0.05 mm.)
5. Tighten the motor and driven equipment hold-down bolts, and recheck alignment. The feet must be tightened down uniformly. Check to make certain that feet are on the same plane by measuring the feet springback when a bolt is loosened. It should not exceed 0.004 inch (0.1 mm) at any feet, as the others remain tight. Repeat with two adjacent bolts loose. The shaft springback should not exceed 0.001 inch (0.025 mm).
6. In some cases it may be necessary to make a hot alignment check to compensate for thermal expansion. A compensating offset alignment should be made cold. The unit may run rough until the equipment temperatures stabilize.

CAUTION: Do not use the coupling to compensate for poor alignment. This can result in vibration, noise, coupling wear, overloaded bearings and early failure.

If for any reason the alignment of the set does not fall into line, contact the closest Reliance Electric District Office.

LUBRICATION

The lubrication system should be checked in preparation for rotating the shaft during the alignment operation.

ANTI-FRICTION BEARINGS (Grease Lubricated)

Bearing chambers are packed with grease during assembly, and do not normally need additional grease at time of installation, unless the unit has been in prolonged storage. See Maintenance Section 4 for bearing lubrication.

2/13/92
 SLEEVE BEARINGS

APCO Exhibit 101

CAUTION: Motors with sleeve bearings are shipped from the factory without oil. **CAUTION: OIL RESERVOIRS MUST BE FILLED DURING INSTALLATION.**

Lubricating oils for sleeve bearing motors should be selected as follows:

1. Viscosity in SUS (centistokes) at 100°F. (37.6°C):

Ambient Temperature Range**	Speed	
	600 RPM or Less	Over 600 RPM
0° to 120°F* (-18°C to 50°C*)	300 SUS (68 cSt)	150 SUS (32 cSt)
-20° to 60°F (-30°C to 10°C)	150 SUS (32 cSt)	90 SUS (18 cSt)

* For higher temperatures, oil coolers should be used.

** For lower temperatures, heaters should be used to assure adequately high starting temperature.

TABLE 1.

2. Pour Point: Below minimum starting temperature.
3. Quality: Use a good grade of turbine type oil, with rust, foam, and oxidation inhibitors. Avoid automotive oils or additives other than those specifically recommended by the oil manufacturer.

To fill sleeve-bearing motor oil reservoirs on motors not equipped with constant level offers, be sure that drain plugs are in place and secure, and fill through filler cap until oil level shows at top line marked on oil gauge. Oil level must never be below bottom line marked on oil gauge. For motors with constant level offers, refer to the instructions. See Accessories Section.

CAUTION: On motor equipped with circulating oil lube system and adjustable needle valve, valve must be adjusted or flooding of oil sump may occur. Disconnect valve and adjust to flow rate defined on dimension sheet. If dimension sheet is not available, set value for 0.10 GPM flow.

ELECTRICAL CONNECTION

IMPORTANT! Motor and control wiring, overload protection, and grounding should be in accordance with the National Electrical Code and consistent with local code requirements.

A conduit box may be provided for the power lines to the stator and other conduit boxes for all other electrical connections.

Provisions for grounding the frame are provided in the form of tapped holes.

WARNING

FAILURE TO PROPERLY GROUND THE MOTOR MAY CAUSE SERIOUS INJURY TO PERSONNEL.

GROUNDING

All large motors should be grounded with the grounding conductor equipped with a brazed copper terminal, or with a suitable solderless terminal fastened to the motor. Solder terminals should not be used. A washer should be used between bolt head and terminal lug. The other end should be fastened with suitable clamps or terminals to rigid metallic conduit or to the nearest available ground. Grounding conductor size should be in accordance with the following National Electrical Code Table 250-95.

Attachment to the motor should not be made under a foot bolt head.

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NUCLEAR REGULATORY COMMISSION

Docket No. 50-4234 Official Ech No. APC-10
 in the matter of APC
 Staff IDENTIFIED 2/13/92
 Applicant ✓ RECEIVED 2/13/92
 Intervenor ELIOT
 Reg'd Off'r _____
 Contractor _____ DATE _____
 Other _____ WITNESS _____
 Reporter L. Estep

SECTION IV ROUTINE MAINTENANCE

WARNING

DO NOT USE SOLVENTS CONTAINING TRI-CHLOROETHANE TO CLEAN INTERIOR OR EXTERIOR OF MOTOR.

SCHEDULED MAINTENANCE

There are two inspection periods which are important to the proper operation and maintenance of your Reliance motor. These occur every 2 months (or 500 operating hours - whichever comes first) and every six months, respectively. In addition, the following should always be observed:

- Provide adequate ventilation.
- Keep air and exhaust openings clean and free of obstructions.
- Avoid sharp blows and excessive axial thrust loads on the output shaft (particularly on sleeve bearing motors).
- Maintain proper lubricant level (check weekly on self-lubricated units).

Reliance Large Duty Master A-C Motors when properly applied, are very easy to maintain. Since clearances and fits are precisely machined, there are no periodic mechanical adjustments to make. Like any precision machine, periodic inspection and simple routine maintenance will prolong your motor's life and help spot potentially damaging conditions before they assume the proportions of a disaster. The minimal time spent performing the simple procedures below cannot begin to compare with the cost of lost productivity and time consuming major repairs incurred through neglect of routine inspection and maintenance.

PERIODIC INSPECTION

Every 2 months (or 500 operating hours, whichever comes first).

1. Listen for any abnormal noises and check cause immediately.
2. Check for excessive vibration.
3. Check to see that air filters, when used, are in place and clean, and that air passages are not blocked or clogged.
4. Check to see that all covers are in place and secure.
5. Check for proper lubrication.
6. Check bearing temperature rise.
7. Check voltage and frequency variations. Unbalanced voltage of single-phase operation of polyphase motors will cause excessive heating and ultimately failure. Only a slight unbalance of voltage applied to a polyphase motor will cause large unbalance currents and resultant overheating. Periodic check of phase, voltage, frequency, and power consumption of an operating motor are recommended. These checks can also provide an excellent indication of the load from the driven equipment. Comparison of this data with previous no-load and full load power demands will give an indication of the performance of the driven machine.

WARNING

HIGH VOLTAGE. ELECTRIC SHOCK MAY CAUSE SERIOUS OR FATAL INJURY. DISCONNECT POWER BEFORE TOUCHING ANY INTERNAL PART. HIGH VOLTAGE MAY BE PRESENT EVEN WHEN THE MACHINE IS NOT ROTATING.

8. TURN OFF INPUT POWER and check to see that all electrical connections are tight.
9. Check for frayed points on interconnecting wiring, especially at points where it contacts the motor frame.

SEMI-ANNUAL MAINTENANCE

1. Inspect and clean rotor ends, windings and fan blades.
2. Check electrical connections for tightness and absence of corrosion.

BEARING LUBRICATION

Depending upon the application and ratings, your motor is equipped with either anti-friction or sleeve type bearings. When properly cared for (i.e., inspection and lubrication) bearings will provide years of uninterrupted service. Use one of the following lubrication procedures, depending on the type of bearings with which your motor is equipped.

LUBRICATION OF ANTI-FRICTION BEARINGS

Grease Lubricated Motors

This motor has been properly lubricated at the time of manufacture and it is not necessary to lubricate at time of installation. When the motor has been in storage for a period of six months or more, lubricate before starting.

Lubrication of anti-friction bearings should be done as a part of a planned maintenance schedule. The Recommended Lubrication Interval should be used as a guide to establish this schedule.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarly, care should be taken to properly clean the grease inlet area of the motor to prevent grease contamination.

Recommended Lubricant

For motors operating in ambient temperatures shown below, use the following lubricant or its equal:

OPERATING TEMP. -25°C (-15°F) to 50°C (120°F)	
CHEVRON OIL	SRI NO. 2
EXXON	UNIREX 2
SHELL OIL CO.	DOLIUM R
TEXACO INC.	PREMIUM RB
MINIMUM STARTING TEMPERATURE -75°C (-100°F)	
SHELL OIL CO.	AEROSHELL #7

Lubrication Procedure

Reliance anti-friction bearings may be lubricated with the motor running or stationary. Stationary with the motor warm is recommended.

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting. If the motor is not equipped with grease fittings.
2. Remove relief plug. If grease is caked around the plug, clean with a wooden stick or suitable tool. If severe caking appears at the plug, run the motor until the bearing housing is warm, permitting a free flow of grease through the housing.
3. Add the Recommended Volume of the Recommended Lubricant using a hand operated grease gun.
4. Run the motor for 1/2 hour with relief plug removed.
5. Replace the pipe plugs and wipe off excess grease.

Lubrication Instructions

1. Select Service Condition from Table IV.
2. Select Lubrication Frequency from Table V.
3. Select Lubrication Volume from Table VI.
4. Lubricate the motor at the required frequency with the required lubricant volume in accordance with LUBRICATION PROCEDURE.

NOTE: Mixing lubricants is not recommended due to possible incompatibility. If it is desired to change lubricant, follow instructions for lubrication and repeat lubrication a second time after 100 hours of service. Care must be taken to look for signs of lubricant incompatibility, such as extreme soapiness visible from the grease relief area.

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SERVICE CONDITIONS

Standard Conditions:	Eight hours per day, normal or light loading, clean, @ 40°C (100°F) maximum ambient.
Severe Conditions:	Twenty-four hour per day operation or shock loading, vibration, or in dirt or dust @ 40-50°C (100-120°F) ambient.
Extreme Conditions:	Heavy shock or vibration, or dust.

TABLE IV.

LUBRICATION FREQUENCY

BALL BEARINGS			
Speed	Standard Conditions	Severe Conditions	Extreme Conditions
1100 RPM And Slower	6 Months	3 Months	2 Months
3600 RPM	6 Months	3 Months	1 Month
ROLLER BEARINGS			
For Roller Bearings divide the time period above by 2.			

TABLE V.

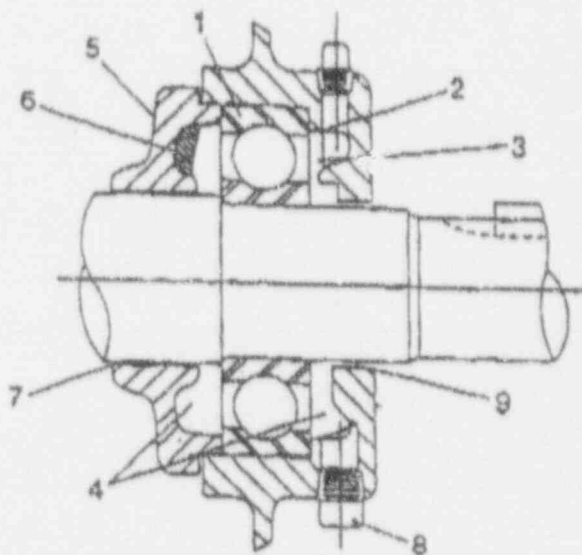
LUBRICATION VOLUME

FRAME SIZE	VOLUME IN CUBIC INCHES	
	1800 RPM And Slower	3600 RPM
5000	2.5	1.5
5800	3.0	1.8

TABLE VI.

OIL MIST LUBRICATION

Refer to Oil Mist Instruction Manual B-3654.



PLS® CONSTRUCTION PROVIDES LONG LIFE FOR BEARINGS AND MOTOR

Cooler Bearing Operating Temperatures - Open bearing (non-shielded) construction (1) minimizes friction, allowing cooler bearing operations.

Positive Lubrication/Relubrication in any Mounting Position - Exclusive grease channeling window (2), with minimum grease path entry (3), channels grease directly into

drain plug.

Minimizes Corrosion - Small clearance on either side of grease window uniformly distributes grease to both inboard and outboard reservoirs (4) to protect bearing surfaces during motor storage, long idle times and start-up. Bearing system is completely greased during motor assembly.

Restricts Inboard Contaminants - Inner bearing cap (5) with anti-churning vanes (6) and close running shaft tolerance (7) minimizes contaminant entry into bearings, and grease migration into motor.

Prohibits Overgreasing During Lubrication/Relubrication - Grease relief port (8) accurately indicates completion of lubrication/relubrication. (If port is plugged during lubrication, PLS® Positive Lubrication System design will relieve grease along the shaft (9)).

REPLACEMENT BEARINGS

Your maintenance program will not be complete without including spare bearings. It must be remembered that the bearing is a wearable component and therefore must eventually be replaced. To insure that you are able to maintain original operation, we recommend the purchase of spares directly from Reliance Electric.

All bearings used in Reliance motors are subject to exact specifications. Markings on the bearing do not indicate complete specifications.

Sleeve Bearings

Oil should be changed periodically (at least 6 months), or immediately if discolored or contaminated. Follow the schedule on the motor nameplate, or if not shown, use the following schedule:

LUBRICATION SCHEDULE

SPEED RPM	SERVICE CONDITIONS*	CHANGE OIL
3600	Standard Severe	Every 6 mos. 2000 Hrs.
1800 & Lower	Standard Severe	Every 6 mos. 2000 Hrs.

TABLE VII.

Service Conditions:

Standard Conditions:

Normal or light loading, clean 0°F (-18°C) to 104°F (40°C) ambient air temperature.

Severe Conditions:

Medium shock, vibrant, dirt dust, -20°F (-30°C) to 120°F (50°C) ambient air temperature.

Lubricating oils for sleeve bearing motors should be selected as follows:

1. Viscosity in SUS (centistokes) @ 100°F (37.8°C):

Ambient Temp. Range	Speed 600 RPM or Less	Over 600 RPM
0°F to 120°F (-18°C** to 50°C*)	300 SUS (58 cSt)	150 SUS (32 cSt)
-20°F to 50°F (-30°C** to 10°C)	150 SUS (32 cSt)	90 SUS (16 cSt)

TABLE VIII.

- * For higher temperatures, oil coolers should be used.
- ** For lower temperatures, heaters should be used to assure adequately high starting temperature.
- 2. Pour point: Below minimum starting temperature.
- 3. Quality: Use a good grade turbine type oil, rust, foam, and oxidation inhibited. Avoid automotive oils or additives other than those specifically recommended by the oil manufacturer.

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