

# OPERATING MANUAL

**Lincguard™ • TEFC • Multiguard® — 143T Thru 445T**

## RECEIVING

Uncrate the motor and check for any damage. Turn the shaft by hand to be certain that it rotates freely. Claims for any damage done in shipment must be made by the purchaser against the transportation company.

## SAFETY DEPENDS ON EVERYONE

Lincoln motors are designed and built with safety in mind. However, your overall safety can be increased by thoughtful action on your part. Carefully read and follow the safety precautions outlined below plus all the installation, operating and maintenance instructions in this manual. Most importantly, before you act, make certain it is safe.

## SAFETY PRECAUTIONS

The high voltage and rotating parts associated with motor applications can cause serious injury. It is important to observe and follow safety precautions to protect personnel from such injury. Personnel should be instructed to:

1. Have all installation, maintenance and repair work performed only by qualified people.
2. Disconnect and lock out all power sources before doing any work on the equipment.
3. Follow the procedures outlined under 'Caution When Using Lift Hooks' whenever the equipment is lifted.
4. Make the electrical installation in accordance with the National Electrical Code and local codes.
5. Properly ground the equipment in accordance with the National Electrical Code.
6. Be sure shaft key is fully captive before unit is energized.
7. Keep hands, hair, clothing and tools away from all moving parts when operating or repairing equipment.
8. Provide proper safeguards for personnel to prevent contact with rotating parts.

It is strongly recommended that all concerned personnel be familiar with and adhere to the contents of NEMA MG-2, "Safety Standard For Construction and Guide For Selection, Installation and Use of Electric Motors and Generators."

## CAUTION When Using Lift Hooks

Do not use the lift hook on the motor to lift the motor along with additional equipment, such as pumps, compressors or other driven machinery. In the case of assemblies on a common base, do not lift with the motor lift hook but rather use a sling around the base or the lifting means provided on the base. In all cases, take care to assure lifting only in the direction intended in the design of the lifting means. Also, be careful to avoid hazardous overloads due to deceleration, acceleration or shock forces.

## MECHANICAL MOUNTING

Mount the motor to a firm foundation being sure that the motor rests evenly on all feet. Shims may be required when precise alignment is required.

Use a properly designed and installed coupling system between the motor shaft and load (see "Maintenance" on page 2).

## 143T thru 256T (Aluminum) Frame Sizes

Ball bearing motors of this type may be mounted in any position. The motors have drain holes suitable for standard horizontal and vertical mountings. Other mounting positions may require either rotation of the end brackets or drilling additional holes.

To mount the conduit box, place the inner gasket and the box in place on the motor with the conduit knock-out in the

desired location. Install and tighten the two mounting studs. Install the input power conduit. After connecting and insulating the leads (see "Electrical Connections") place the outer gasket and cover on the conduit box and tighten the acorn nuts.

## 284T thru 445T (Steel) Frame Sizes

Ball bearing motors of this type may be mounted in any position. To maintain the best drip-proof protection, the end brackets and terminal box can be rotated to any of four positions 90° apart. Since the windings of the Multiguard® motors are imbedded in a moisture resistant plastic covering, this is not always necessary. When ceiling mounted, a drain hole in the top of the frame is sometimes desirable.

Before installing the conduit box on **Multiguard** motors, slip the sealing tube over the motor leads and against the winding encapsulation. Install the rubber washer over the end of the tube and against the outside of the frame. When the conduit box is mounted the tube and washer are compressed to protect the leads and the inside of the conduit box from contaminants.

Before installing the conduit box on **Lincguard** motors, slip the rubber washer over the motor leads and against the outside of the frame. When the conduit box is mounted the washer is compressed to restrict the entry of contaminants into the conduit box.

Slip the **conduit box** over the motor leads and against the frame. Rotate it until the conduit knockout is in the desired location. Install and tighten the two self-tapping screws to hold the box to the frame. Install the input power conduit. After connecting and insulating the input leads (see "Electrical Connections") place the cover on the box then install and tighten the screws supplied.

## ELECTRICAL CONNECTIONS

### Motor Voltage vs. Power System Voltage

Motor should be applied to voltage systems per the following:

NEMA Motor Nameplate Voltage	Nominal System Voltage
200	208
230	240
460	480
575	600

Do not apply: 208 volt motors on 230 volt systems  
230 volt motors on 208 volt systems

### Dual Input Voltage Connection

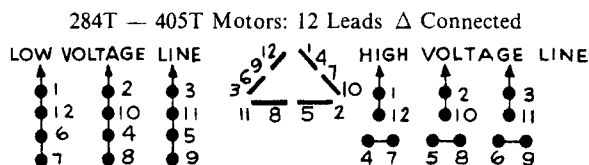
Some Lincoln motors are wired for operation on either of two input voltages. Proper connection of the motor leads for either voltage is shown on the motor nameplate. "LOW VOLTAGE" on the nameplate shows the wiring for the lower of the two possible input voltages. Each motor lead is tagged with the proper lead number.

Connection diagrams for standard dual voltage motors for across the line and auto transformer starting are reproduced below. See page 3 for Part Winding Start and Star-Delta Start connection diagrams.

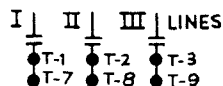
### 60 Hertz Motors

143T — 256T Motors: 9 Leads Y Connected





324T — 445T Motors: Full Winding Start, 6 Leads



Y- $\Delta$  Motors



### Connection to Power Supply

Proper branch circuit supply to a motor should include a disconnect switch, short circuit current fuse or breaker protection, motor starter (controller) and overload relay protection. Each of these should be properly sized and installed per the National Electrical Code and local codes.

Unless specifically exempted by the National Electrical Code or local codes ground the motor as specified in the codes. On 143T thru 256T (Aluminum) Frames a grounding screw and lug are provided for this purpose. A tapped hole for this screw identified by ground symbol  $\equiv$  is located in the frame and is accessible inside the mounted conduit box. On 284T thru 445T [steel] frames one of the conduit box mounting screws which is accessible inside the mounted conduit box is used for grounding purposes. It is identified by ground symbol  $\equiv$ .

Short circuit current fuses or breakers are for the protection of the branch circuit. Starter or controller overload relays are for the protection of the motor.

### Overload Relays and Trip Timer

The National Electrical code specifies an overload relay in each phase of the three phase power supply to protect the motor against excessive input current caused by the following:

**Overloading** — Overloading a motor causes excessive input current which increases motor temperatures, shortens stator life and can cause an overload burnout.

**Voltage Variation (From Nameplate)** — Excessively high voltage increases idle current by 25 to 50%. Excessively low voltage increases load current by 10% or more.

**Voltage Unbalance (Between Phases)** — A voltage unbalance of 3.5% can result in a current unbalance and temperature increase of 25%.

**Single Phasing** — When starting, single phased motors develop no torque and draw high current. Single phasing under load approximately doubles the load current.

Overload relays should be sized per the instructions of the starter manufacturer. In general, sizing of overload relays is based on a percent of motor nameplate full load current depending on the type of starter.

Under normal conditions, overload relays provide protection between 110 and 120% of their current rating. No extra allowance for service factor is necessary.

On across the line starting, the trip time for properly sized overload relays should be approximately 15 seconds under locked rotor current conditions of 600% full load current. If the starting time goes beyond 15 seconds, the overload relay should disconnect the motor from the line to prevent motor stator overload burnout. Oversizing the overload relay is NOT the way to eliminate excessive tripping. Eliminate excessive voltage drop, reduce starting time and properly sizing the motor are correct answers.

### OPERATION

After checking that the shaft key is secure, operate the motor free of load and check the direction of rotation. If the motor rotates in the wrong direction, interchange any two line leads. Couple the motor to its load and operate for a minimum of one hour. During this period, check for any unusual noise or thermal conditions. Check the actual operating current to be sure that the nameplate current times service factor is not exceeded for steady continuous loads. See "Maintenance" below for possible causes of unusual noise or heat.

### LUBRICATION

Your motor is equipped with double-shield ball bearings\* having sufficient grease to last indefinitely under normal service. Where the motor is used constantly in dirty, wet or corrosive atmospheres, it is advisable to add one quarter ounce of grease per bearing every three months. Use a good quality rust inhibited polyurea based grease, such as Chevron SRI.

When greasing the bearings, keep all dirt out of the area. Wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

\*The blower end bearings of 143T and 145T sizes are sealed bearings and need no greasing.

### MAINTENANCE

Periodically inspect your motor for excessive dirt, friction or vibration. Dust may be blown from inaccessible locations using compressed air. Keep the ventilation openings clear to allow free passage of air. Be sure the drain holes in the motors are kept open and the shaft slinger is positioned against the end bracket.

Grease or oil can be wiped up using a petroleum solvent. Overheating of the bearing caused by excessive friction is usually caused by one of the following factors:

1. Bent shaft.
2. Excessive belt tension.
3. Excessive end or side thrust from the gearing, flexible coupling, etc.
4. Poor alignment.

Damaging vibrations can be caused by loose motor mountings, by misalignment resulting from the settling or distortion of the foundation, or it may be transmitted from the driven machine. Vibration may also be caused by excessive belt or chain tension.

### GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new motors and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions.

If the Buyer gives the Seller written notice of any defects in equipment within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without written

authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth there are no guarantees or warranties with respect to accessories or equipment, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

Lincoln Motors with Standard Windings are suitable for PWS or Y  $\Delta$  Starting per the following table:  
Table II

MOTOR			Typical 60 Hertz Winding Voltage	Number Leads Out	Suitability of Standard* Motors For PWS	PWS Connection Diagram Number (pg. 4)	Suitability of Standard † Motors for Y $\Delta$ On Either Voltage	Y $\Delta$ Connection Diagram Number (pg. 4)
HP	Speed RPM	T Frame						
15- 20	1200	284T-286T	230/460	12	No**	—	Yes	Y $\Delta$ - A
25- 50	1200	324T-365T	230/460	12	Yes - 230V only	PWS - A	Yes	Y $\Delta$ - A
60- 75	1200	404T-405T	230/460	12	No*	*	Yes	Y $\Delta$ - A
25-125	1800	284T-405T	230/460	12	No*	*	Yes	Y $\Delta$ - A
30-150	3600	284T-405T	230/460	12	No**	—	Yes	Y $\Delta$ - A
100-125	1200	444T-445T	460	6	Yes	PWS - B	Not	†
150-200	1800	444T-445T	460	6	Yes	PWS - B	Not	†

Lincoln Motor Bulletin D2T provides complete information about the various starting means applicable to Lincoln motors in current production.

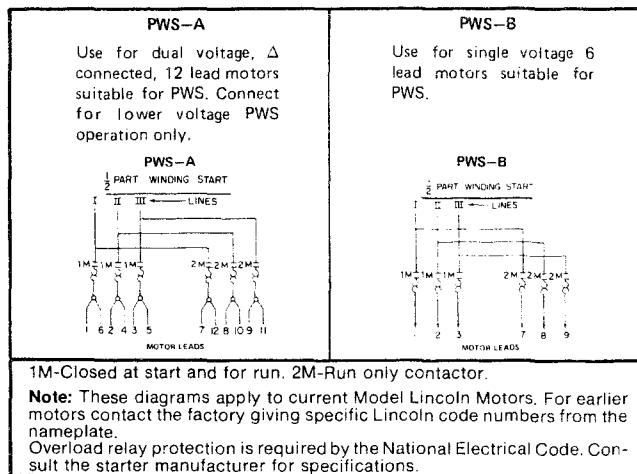
\* When part winding starting is required and standard motors are not suitable per Table II, single voltage motors specially wound for PWS at that voltage must be ordered. They will have 6 leads out and are connected per diagram PWS-B.

\*\* 284T and 286T frame sizes and 3600 RPM motors of all frame sizes are not available for PWS.

† When star-delta starting is required and standard motors are not suitable, single voltage motors specially wound for star-delta starting at that voltage must be ordered. They will have 6 leads out and are to be connected per diagram Y  $\Delta$  - B.

Motors wound for 200/400 volts (and other dual voltage systems where the high voltage is twice the low voltage) have the same PWS or Y  $\Delta$  starting characteristics as the 230/460 volt designs.

## PART WINDING START CONNECTIONS



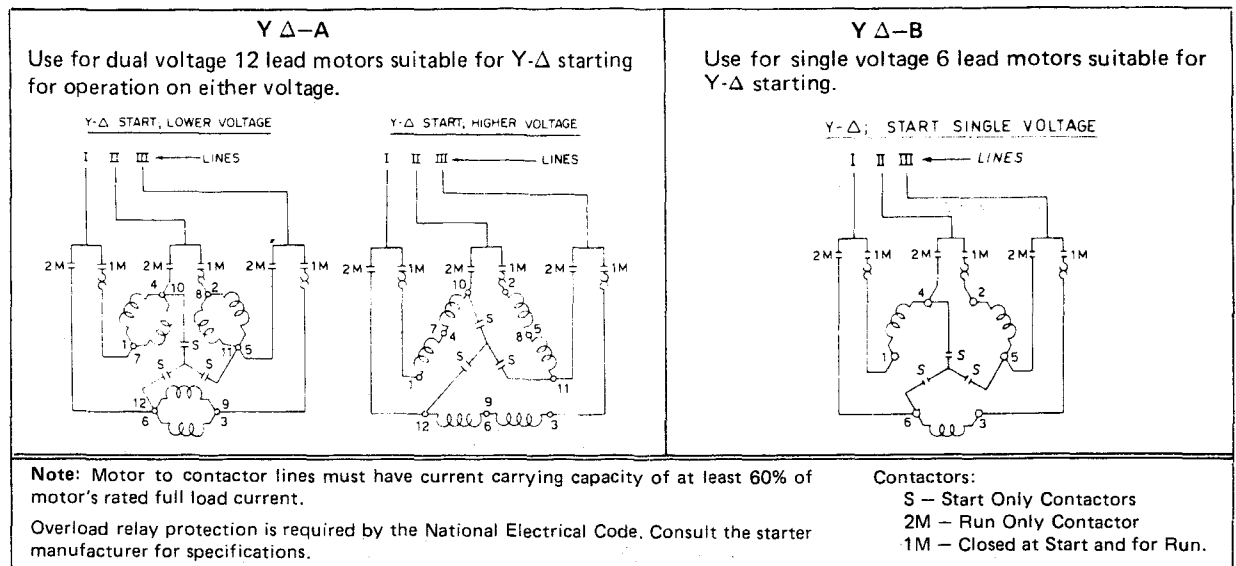
## BEARING SIZE TABLE

Frame	Shaft Extension End	Opposite Shaft Extension End
140T	205	203*
180T	207	205
210T	208	206
250T	309	307
280T	310	309
320T	311	309
360T	313	311
400T	315	313
440T	318*	315

\* All bearings except the 318 are single-row radial deep-groove type ball bearings. The 318 size is a single-row maximum capacity type ball bearing. All are double shielded except the 203 size which is double sealed. Frame 280T through 405T double shaft extension motors have both bearings of the size listed under "Shaft Extension End."

Original Lincoln quality is maintained by replacement per Lincoln parts lists P-90-A and P-99-A. This table is provided as information only.

## STAR-DELTA (Y- $\Delta$ ) CONNECTIONS

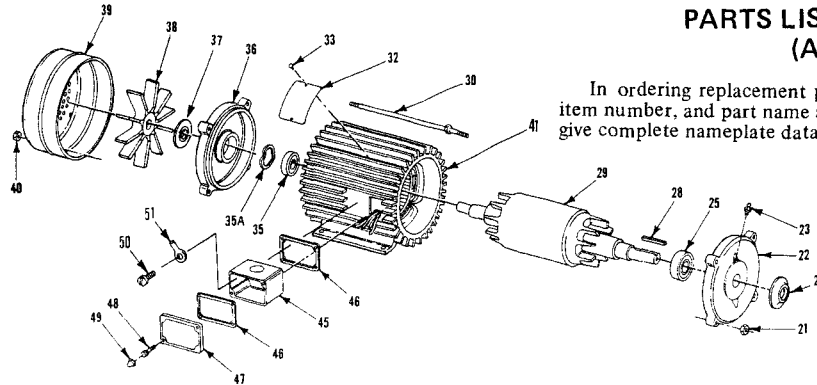


The above diagrams apply to current model Lincoln motors. For other models contact the factory giving specific Lincoln code numbers from the nameplate.

## HOW TO ORDER REPLACEMENT PARTS

All parts should be ordered from Authorized Field Service Shops or branch offices. The "Field Service Directory" listing all Authorized Field Service Shops geographically is available upon request. These shops stock GENUINE replacement parts and have factory trained men to service your machine.

### PARTS LIST P-90-A: 143 Thru 256T (Aluminum Frame)

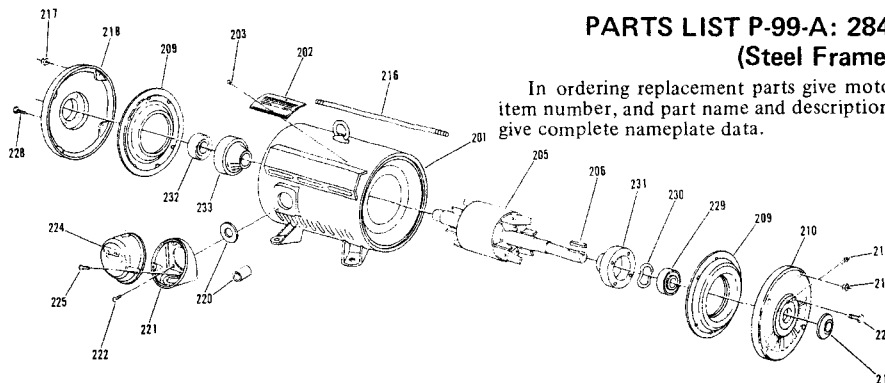


In ordering replacement parts give motor code, frame size, part item number, and part name and description. When ordering a stator give complete nameplate data.

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
21	Nut	4
22	End Bracket (Shaft End)	1
23	Grease Fitting	2
25	Bearing (Shaft End)	1
26	Rubber Slinger	1
28	Key	1
29	Rotor	1
30	Through Bolt	4
32	Nameplate	1
33	Drive Screw, Nameplate Mounting	1
35	Bearing (Blower End)	1
35A	Spring Washer (Blower End)	2

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
36	End Bracket (Blind End)	1
37	Rubber Slinger - except 143T & 145T	1
38	Fan	1
39	Fan Shroud	1
40	Nut	4
41	Stator	1
45	Conduit Box Kit, Include Items 45-51	1
46	Conduit Box Gasket	2
47	Conduit Box Cover	1
48	Stud, Conduit Box Mounting	2
49	Acorn Nut	2
50	Grounding Screw	1
51	Grounding Lug	1

### PARTS LIST P-99-A: 284T Thru 445T (Steel Frame)



In ordering replacement parts give motor code, frame size, part item number, and part name and description. When ordering a stator give complete nameplate data.

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
201	Stator	1
202	Nameplate	1
203	Drive Screw, Nameplate Mounting	2
205	Rotor	1
206	Key	1
209	Air Baffle	2
210	End Bracket, Shaft End	1
212	Grease Fitting	2
214	Slinger	1
216	Through Bolts	4
217	Hex Nuts	8
218	End Bracket, Opposite End	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
221	Conduit Box Kit, Includes Items 220-225	1
220	Washer, Box to Frame, Lincguard & Multiguard	1
220	Sleeve, Box to Stator, Multiguard Only	1
222	Self Tapping Screw, Conduit Box to Frames	2
224	Conduit Box Cover	1
225	Screws, Cover Mounting	2
228	Hex Head Bolts	6
229	Bearing, Shaft End	1
230	Thrust Washer	1
231	Cast Iron Cartridges, Shaft End	1
232	Bearing, Opposite End	1
233	Cast Iron Cartridge, Opposite End	1

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