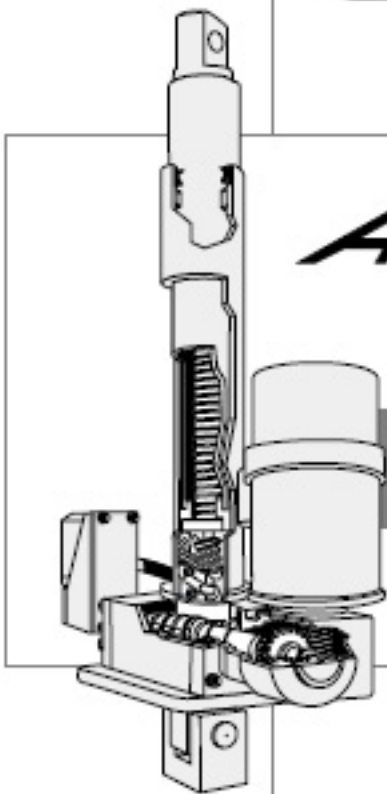
NOOK™



Actionjac®

Electric Cylinders DD, RAD, ILA And ILAK

Installation, Maintenance and Lubrication Instructions

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CAUTION: *The ActionJac™ Electric Cylinders may be self-lowering, therefore the customer must provide some means of holding the load.*

The user is responsible for providing stops at either end of travel. Limit Switches or external safety stops are recommended, since failure of brake or system components could cause self-lowering. Your Electric Cylinder is equipped with internal stops. These stops can cause damage to the cylinder because most electric motors will deliver stall torques much higher than their rated torques and motor inertia can cause severe shock loads. The stops are for over travel only. For hand operation, the internal mechanical stops can be utilized.

General Instructions

Your ActionJac™ Electric Cylinder is a high quality, sturdy unit designed to give many hours of trouble-free service. However, certain precautions and procedures must be observed in handling, installing and servicing the unit in order to obtain optimum performance.

1. Any apparent or suspected damage sustained by equipment manufactured or furnished by Nook Industries during transport from the factory to the user should be immediately reported to both Nook Industries and to the carrier.

2. Upon delivery all equipment furnished should be carefully inventoried against shipping papers to determine whether any shortages exist in delivered material. Any such shortages must immediately be reported to Nook Industries and the carrier.

3. The installation of Nook Industries ActionJac™ Electric Cylinders does not normally require the services of a factory engineer. These services are not included in the selling price of the equipment unless specifically agreed upon in writing between the seller and purchaser.

4. The Seller's warranty applies insofar as the unit is operated within the rating and service conditions which might typically include vibratory loads due to critical speeds, severe shock loading, mechanical or thermal overloads or side loads if the seller was not fully advised of their existence at time of order.

5. Adequate installation, maintenance and safety instructions must be given by the user to personnel directly responsible for the installation and operation of the equipment.

6. In the event of malfunction within the warranty period, the manufacturer must be informed within thirty days if it is intended that the warranty is to cover the incident.

Ordering Spare And Repair Parts

This booklet contains general instruction, operating, maintenance and troubleshooting instructions for your ActionJac™ Electric Cylinder. In the event spare or repair parts are

required, call your local representative or contact Nook Industries at 216-271-7900 or 800-321-7800.

Please provide the following information when requesting spare / repair parts:

- Serial Number (located on housing nameplate)
- Part Description (see pages 6-7)

CAUTION: *UNITS ARE NOT MEANT FOR PERSONNEL SUPPORT. Refer all applications for potential personnel support to the factory for review.*

General Specifications

The worm gear driven ActionJac™ Electric Cylinder incorporates an alloy steel worm gear, accurately machined to the high standards of Nook Industries for maximum load carrying capacity and uniformity of motion transmission. All shafts are mounted on heavy duty, anti-friction bearings to increase operating efficiency of the drive mechanism. Thrust bearings are provided to support the rated thrust load of each unit. Housings are made of high strength material, well proportioned to handle the rated thrust and torque loads of each size unit. Actuator tubes are ground and hard chrome plated for use in industrial environments.

The lifting screw cover along with actuator tubes are designed to keep the lifting screw threads free of foreign material.

The lifting screw is made of 4100 Series steel. The threads of the lifting screw should be well lubricated and kept free of grit, dirt or other abrasive contaminates. For this reason, the actuator tubes are equipped with seals and lubrication fittings.

CAUTION: *DD and RAD Electric Cylinders should not be operated at input speeds over 1,800 RPM without consulting the factory. ILA and ILAK Electric Cylinder speeds are a function of the critical speed of the screw. Consult factory if exceeding catalog ratings.*

DD and RAD Electric Cylinders are designed for a maximum intermittent duty cycle of:

Ball Screw versions = 35%
Acme Screw versions = 25%

Housing temperature should be monitored and kept below 200°F.

Lubrication

Gear Box Enclosure

Electric Cylinders are shipped with grease in the unit. However, before operating any unit, remove the housing plug and check the condition of the lubricant. Lubrication inspection is recommended at regular intervals. Usually one month intervals are satisfactory unless experience indicates that regreasing should occur at shorter or longer intervals. Severe operating conditions will shorten the lubrication inspection interval.

Each Electric Cylinder is furnished with a grease fitting and a pipe plug

on opposite sides of the gear housing. After removing the pipe plug, fill unit with grease until lubricant seeps from the pipe plug.

Lift Shaft Enclosure

The lift shafts inside the Electric Cylinder actuator tube receive lubrication through the fittings on the outside of the housing tube. Lubrication added to the housing tube can pass to the screw regardless of the actuator tube position, but there is a guide at the bottom outside of the actuator tube which runs along the inside of the housing tube. The best way to lubricate this section of the cylinder is to add some lubricant when the cylinder is fully retracted and additional lubricant when the cylinder is extended beyond where the guide is past the lube port (see pages 6 – 7).

The type of lubricant used should not be corrosive to gears, ball or roller bearings and must be neutral in reaction. The lubricant must not contain any grit or dirt, abrasives or fillers. It should not precipitate sediment, nor separate at temperatures up to 300°F. The lubricant must also have resistance to oxidation and must be non-channeling. We recommend the following extreme pressure greases or equivalents. For operating conditions outside these limits consult factory.

Company/Trade Name	Temp. Range
Exxon / Lidok EP#1	-30 to 225°F
Mobil / Mobilux EP#1	-20 to 225°F
Gulf / Gulf Crown EP#1	0 to 300°F
Shell / Aeroshell #22	-85 to 400°F

In normal environmental range (32°F to 160°F), oil or a good grade of light bearing grease may be used. Grease containing graphite or molydisulfide should not be used. Use only enough lubricant to maintain a thin, continuous film.

All units are suitable for intermittent operation in ambient temperatures up to 200°F with proper grease.

Installation Instructions

When an Electric Cylinder is used to move a load, the actuator tube must be secured to prevent rotation. The reaction torque required to prevent rotation varies with lead of the screw and the amount of load put on the cylinder. See product specification sheets in Nook Industries Linear Motion Design Guide for appropriate reaction torque values.

Set limit switches before operating. Allow for drift when setting the position. The actuator tube can move (rotate) until the unit is installed. Turn the actuator tube in or out to get the cylinder to a known position before installation to prevent over-travel.

1. Be certain that the rating load of the Electric Cylinder exceeds the maximum load that may be imposed upon it.

2. The foundation and/or mounting bracket must be rigid enough to maintain correct alignment with connected machinery and have ample strength to carry the maximum load.

3. For flange mounted units, the foundation must have a flat mounting surface to uniformly support the Electric Cylinder.

4. It is extremely important that the Electric Cylinder be installed so that the actuator tube is exactly plumb and that any connecting shafting is aligned with the worm input shaft.

5. After precise alignment, each member must be securely bolted down. It is essential when using flange mounted units, that the electric cylinder be securely bolted down to its foundation using bolts of the proper diameter to fit mounting holes. Bolts should be S.A.E. Grade 5 or equivalent.

CAUTION: *For proper alignment and prevention of Cylinder failure, the load should be attached to the actuator tube mount only when the load is in the position of travel closest to the housing tube (closed position).*

Torque values for bolting are as follows:

Bolt Size Inches	Approx. Torque Value Foot Pounds
1/4	6
3/8	20
1/2	50
5/8	100
3/4	165
7/8	265
1	400
1-1/4	830
1-1/2	1350
1-3/4	2500
2	3650

IMPORTANT: *Tighten mounting bolts evenly to avoid damaging the housing.*

6. After the Electric Cylinders, mitre boxes, couplings, etc. are installed and aligned; there should be no signs of binding or misalignment.

7. Shaft coupling guards are the responsibility of the customer and are not provided by Nook Industries unless specifically quoted to and ordered by the customer.

8. Caution must be taken when operating your Electric Cylinder at either extreme of travel. If possible, limit switches or hard external stops should be provided.

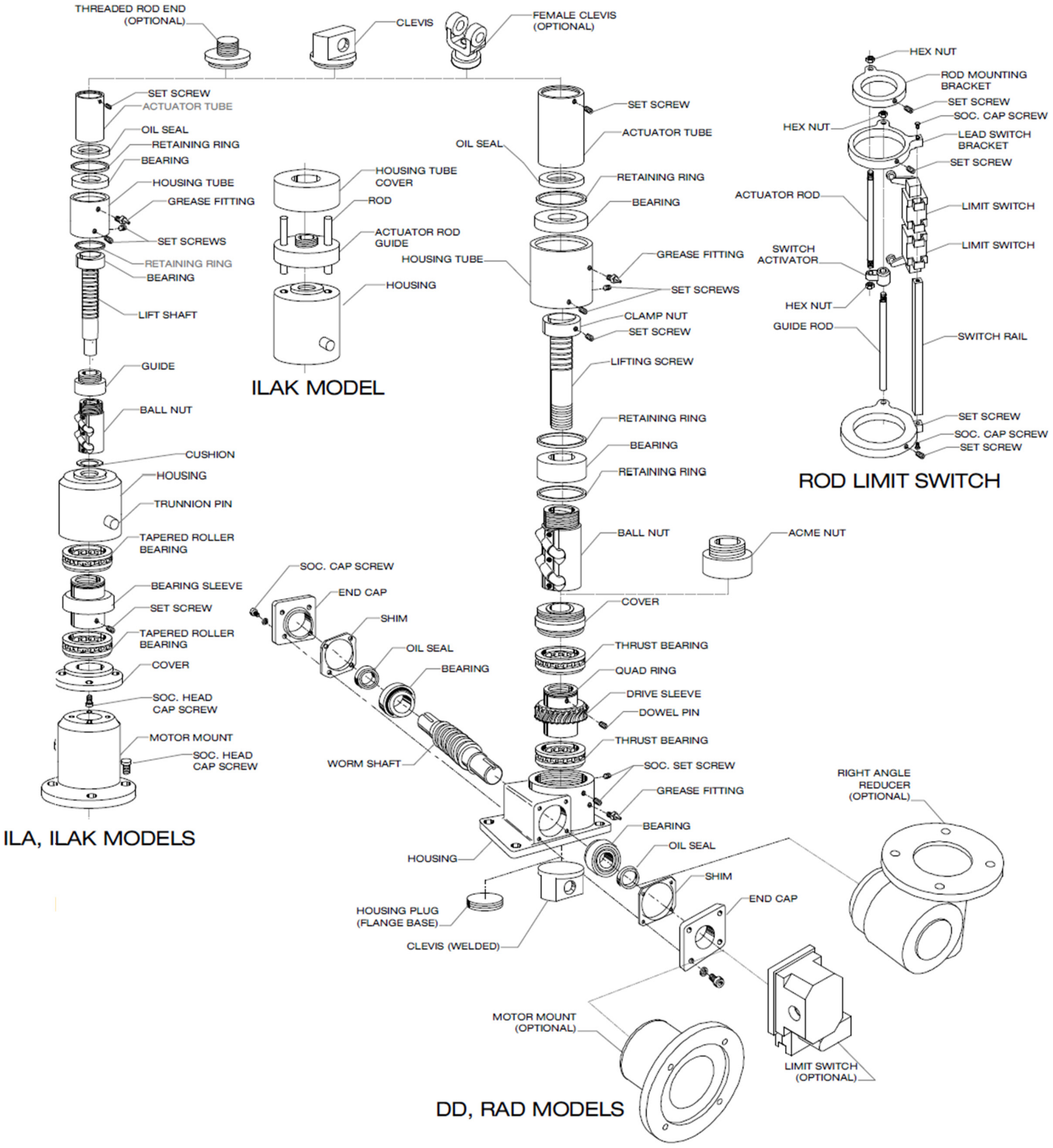
9. Travel Stops are not standard. A limit switch and a brake should be used to stop the motor. Mechanical stops can cause damage to the cylinders because most electric motors will deliver stall torques much higher than their rated torques and motor inertia can cause severe shock loads. For hand operation, mechanical stops can be provided.

10. Due to the inherently high translational efficiency of the Ball Screw Electric Cylinders, caution must be taken to prevent the load from lowering. Some means should be taken to secure the load while installing or removing the Electric Cylinder.

CAUTION: *Limit switches furnished by Nook Industries are NOT factory set. Limit switches should be set by carefully moving to the set position by hand or jogging the*

ActionJac™ Electric Cylinder
DD, RAD, ILA, ILAK Models
Exploded View Of A Typical Assembly

Views are illustrative only. See page 2 for ordering spare/repair parts.



unit. Care must be taken to avoid running lifting screws out of the unit.

General Maintenance

- The actuator tube should be kept free of dirt. If possible, the actuator should be returned to retracted position when not in use.
- For Acme Cylinders, lash between the lift shaft and travel nut greater than 1/4 the screw pitch indicates the need for replacement of the cylinder lift shaft components.
- For machine screw or ball screw worm gear Electric Cylinders, check for excessive backlash between the worm and worm gear. Lash in excess of 30° for ratios 5:1 to 8:1 and 60° for ratios 20:1 to 24:1 indicates the need to replace the worm and worm gear.

Tips For Disassembly And Reassembly

CAUTION: *Never perform any work on the Electric Cylinder or associated transmission equipment (mitre boxes, couplings, etc.) until absolutely certain that the cylinder motor cannot be remotely or automatically started (Power Lockout). Also make certain that load cannot affect personnel or machinery when the Electric Cylinder, brake or other holding devices are removed. Be sure disassembly area is relatively clean to prevent contamination of parts. Store all machined parts to prevent damage to machined surfaces.*

Before starting disassembly, carefully review a typical parts list or certified assembly drawing of the unit.

When removing end caps, be sure to tape shaft extension keyways and other sharp edges to avoid damaging oil seals.

Notes

1. Be sure to clean and dry all parts before rebuilding.

2. It is advisable to replace old seals when the unit is rebuilt.

3. Remove any protective coatings on replacement parts before installing.

4. On Electric Cylinders with Tapered Roller Bearings, removal of the bearings from the drive sleeve may result in damage.

Disassembly Instructions

Refer to typical parts assembly, pages 6 – 7.

These instructions are necessarily general, and as such, cannot provide for minor details of construction, which may vary from unit to unit.

For specific questions, consult factory giving order number and serial number from housing nameplate.

1. Remove setscrews from housing tube.

2. Unscrew housing tube and carefully remove.

3. Remove end caps on worm shaft assembly.

CAUTION: *Handle shims carefully to avoid damage.*

4. While tapping one end of the

worm shaft with a wooden mallet, rotate the worm shaft. This will loosen the bearing cup to facilitate removal.

5. Remove the worm shaft bearing cups.

6. Drive sleeve and gear, along with the ball nut, lifting screw and actuator tube can now be removed from the housing.

7. For ball nut disassembly, consult factory.

Reassembly Instructions

Your Electric Cylinder can easily be reassembled by reversing the disassembly procedure as previously outline. In reversing disassembly procedure, be sure to pack worm, worm gear and all bearings with grease. Also coat all seal areas with grease. After unit is reassembled, fill with grease, see page 3 for lubrication details.

Trouble Shooting Tips

Your ActionJac™ Electric Cylinder will perform satisfactory if suggestions described in this booklet are carefully followed. It is estimated that approximately 98 percent of Ball Screw or Machine Screw Cylinder failures can be attributed to improper lubrication, misapplication and misalignment.

Trouble Shooting Guide

Trouble: Housing Failure

What To Inspect	Action
1. Unit Overload	Reduce load or replace with unit of sufficient capacity.
2. Improper Support	Unit should be supported over entire base area, not just at bolthole locations.
3. High Shock	Select different material.
4. Uneven Bolting Torque	Take up evenly on mounting bolts.

Trouble: Worm Shaft Failure

What To Inspect	Action
1. Type of Coupling	Rigid Couplings can cause shaft failure. Replace with coupling that will provide adequate flexibility and lateral float.
2. Coupling Alignment	Realign as required.
3. Presence of Excessive Overhung Load	Check Electric Cylinder for allowable loads.
4. Unit Overload	See Housing Failure No. 1.
5. Shock Loading	Apply coupling capable of absorbing shock and, if necessary, replace with unit of sufficient capacity. Shock loads can significantly increase apparent dead weight loads.
6. "Ganging Units"	If several units are "in-line", the worm shaft of the first unit can assume 300% of the rated input torque. If this value is exceeded, you must replace with a larger unit.

Trouble: Bearing Failure

What To Inspect	Action
1. Unit Overload	See Housing Failure No. 1.
2. Excessive Overhung Load	See Worm Shaft Failure No. 3.
3. Coupling Alignment	See Worm Shaft Failure No. 2.
4. Coupling Lateral Alignment	Adjust spacing between connecting shafts to relieve end pressure.
5. Bearing Adjustment	Bearings must not be pinched. Adjustable tapered bearings must be set at proper lateral clearance. All shafts should turn freely when disconnected from the load.

(continued) Trouble: Bearing Failure

What To Inspect	Action
6. Bearing Lubrication	Add Lubricant as necessary.
7. Shock Loading	See Worm Shaft Failure No. 5.

Trouble: Drive Sleeve and Worm Gear Wear

What To Inspect	Action
1. Unit Overload	See Housing Failure No. 1.
2. Bearing Adjustment	See Bearing Failure No. 6.
3. Lubrication	Proper levels and grade must be maintained. See lubrication page.

Trouble: Nut Failure

What To Inspect	Action
1. Unit Overload	See Housing Failure No. 1.
2. Alignment	Lifting shafts must be perfectly plumb.
3. Lubrication	See Gear wear No. 3.
4. Improper Selection	Refer to load/life predictability chart in Nook Industries Linear Motion Design Guide.

Trouble: Lifting Screw Failure

What To Inspect	Action
1. Unit Overload	See Housing Failure No. 1.
2. Alignment	See Nut Failure No. 2.
3. Side Load	Check with Nook Industries Engineering Department for allowable side load.
4. Improper Selection	See Nut Failure No. 4.

Statement of Assurance

Thank you for purchasing another quality product from Nook Industries, Inc. Every effort has been taken to assure this product was manufactured to the highest industry standards of quality, precision and performance.

Warranty

Unless otherwise stated herein, Seller will repair or replace, without charge, f.o.b. point of shipment, any parts proven to Seller's satisfaction and upon Seller's examination to have been defective in material or workmanship when furnished, provided claim is made within one year after date of shipment. Deterioration or wear occasioned by abuse, severe eccentric loading, overloading, chemical or abrasive action or excessive heat shall not constitute defects. Equipment and accessories not of the Seller's manufacture are warranted only to the extent that they are warranted by the manufacturers, and this warranty is applicable only if the defect was the result of normal use, application and service, and is void if the product or any part hereof was tampered with, repaired or altered by any person other than the factory or authorized repair station. THERE ARE NO OTHER WARRANTIES, EXPRESS, STATUTORY, OR IMPLIED, INCLUDING THAT OF MERCHANTABILITY AND OF FITNESS.

Authorization for return must be received from Nook Industries before returning any equipment for inspection or warranty repair.

WARNING

The equipment shown in this bulletin is intended for industrial use only and should not be used to lift, support, or otherwise transport human cargo, unless you have a written statement from Nook Industries, Inc. that the Jac unit as used in your application is suitable for lifting human cargo.

NOOK

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