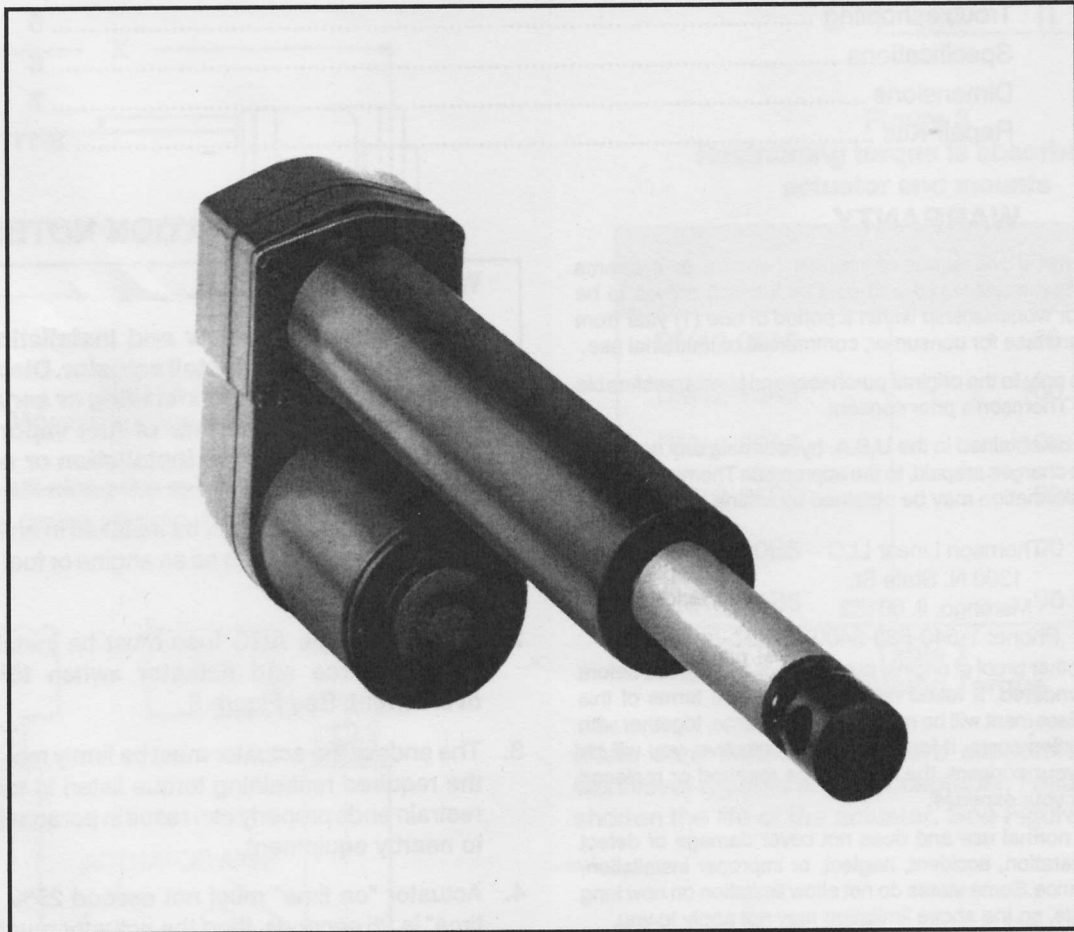


“DM” Series Electromechanical Linear Actuators for Marine Applications Acme and Ball Bearing Screw Drive Types



INTRODUCTION

This manual provides information needed to install, trouble shoot and repair the Thomson "DM" Series linear actuator listed in the specifications found on page 6. Please follow all instructions carefully to ensure safe,

reliable operation. All stated or implied manufacturers' warranties are voided if this product is not installed and operated in accordance with these instructions.

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WARRANTY

Thomson warrants that it will repair or replace (whichever it deems advisable) any product manufactured and sold by it which proves to be defective in material or workmanship within a period of one (1) year from the date of original purchase for consumer, commercial or industrial use.

This warranty extends only to the original purchaser and is not transferable or assignable without Thomson's prior consent.

Warranty service can be obtained in the U.S.A. by returning any defective product, transportation charges prepaid, to the appropriate Thomson factory. Additional warranty information may be obtained by writing the Customer Service Department:

Thomson Linear LLC
1300 N. State St.
Marengo, Il. 60152
Phone: 1-540-633-3400

A purchase receipt or other proof of original purchase will be required before warranty service is rendered. If found defective under the terms of this warranty, repair or replacement will be made, without charge, together with a refund for transportation costs. If found not to be defective, you will be notified and, without your consent, the item will be repaired or replaced and returned to you at your expense.

This warranty covers normal use and does not cover damage or defect which results from alteration, accident, neglect, or improper installation, operation, or maintenance. Some states do not allow limitation on how long an implied warrant lasts, so the above limitation may not apply to you.

Thomson's obligation under this warranty is limited to the repair or replacement of the defective product and in no event shall Thomson be liable for consequential, indirect, or incidental damages of any kind incurred by reason of the manufacturer, sale or use of any defective product. Thomson neither assumes nor authorizes any other person to give any other warranty or to assume any other obligation or liability on its behalf.

WITH RESPECT TO CONSUMER USE OF THE PRODUCT, ANY IMPLIED WARRANTIES WHICH THE CONSUMER MAY HAVE ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL CONSUMER PURCHASE. WITH RESPECT TO COMMERCIAL AND INDUSTRIAL USES OF THE PRODUCT, THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

APPLICATION NOTES

WARNING:

Read precautions below and installation instructions before attempting to install actuator. Disconnect battery or power source before installing or servicing actuator. Make certain area is clear of fuel vapors or explosive gases before beginning installation or service.

1. Actuator switch must not be installed in an area that requires ignition protection such as an engine or fuel storage compartment.
2. A 30 amp, type AGC fuse must be installed between the power source and actuator switch to protect against overcurrent. See Figure 5.
3. The ends of the actuator must be firmly mounted to withstand the required restraining torque listed in table #1. Failure to restrain ends properly can result in personal injury or damage to nearby equipment.
4. Actuator "on time" must not exceed 25%. Example: If "on time" is 25 seconds, then the actuator must remain off for 75 seconds before being operated again. Exceeding a 25% duty cycle can lead to overheating and may result in hazardous conditions.
5. Do not submerge or install actuator in a location that may result in the actuator becoming submerged such as the bottom of the bilge.
6. Actuator is fully weather protected; however, it is recommended, when operating in a moist environment, that the actuator be mounted with the extension tube down to prevent moisture buildup inside the unit.
7. Actuator is factory lubricated for life and no additional lubrication is required for maintenance.
8. The actuator incorporates a slip clutch to protect against overloading. The clutch is preset at the factory to slip if the load exceeds the rated load.

INSTALLATION

Mounting

Thomson actuators are quickly and easily mounted by slipping pins through the holes on each end of the unit and into brackets on the machine frame and the load.

Half inch diameter solid pins provide maximum holding strength and a retaining or cotter pin on each end will prevent the solid pin from falling out of its mounting bracket. Roll or spring type mounting pins should be avoided. The mounting pins must be parallel to each other as shown in Figure 1 below. Pins which are not parallel to each other may cause the actuator to bind.

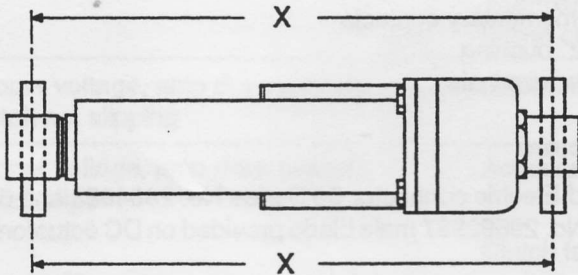


Figure 1
Mounting pins parallel

The load should act along the axis of the actuator since off center loads may cause binding. See Figure 2.

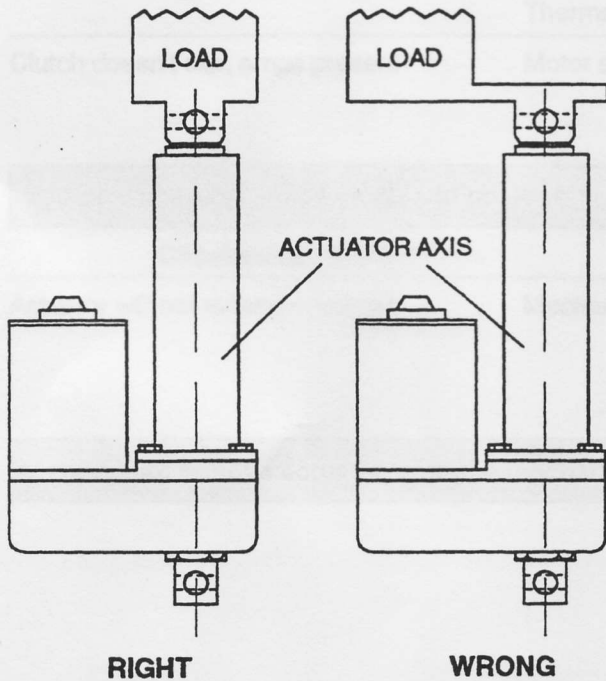


Figure 2
Load centers on actuator axis

The actuator mounting brackets must be able to withstand the torque which is developed when the unit extends or retracts. See Figure 3. Restraining torque required varies with the model being used. See Table 1.

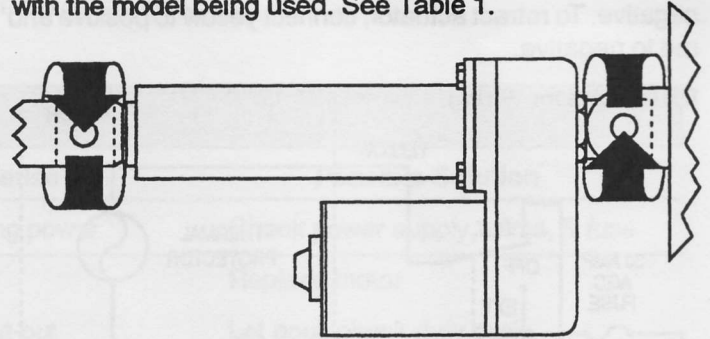


Figure 3
Restraining torque is absorbed by actuator end mounts

Actuator	Torque Required in.-lbs.
DM12-05A5	65
DM12-10A5	100
DM12-20A5	100
DM12-05B5	60
DM12-10B5	90
DM12-20B5	90

Table 1
Restraining Torque

Make sure mounting pins are supported on both ends. Cantilever mounts are unacceptable. Failure to do so could shorten the life of the actuator. See Figure 4.

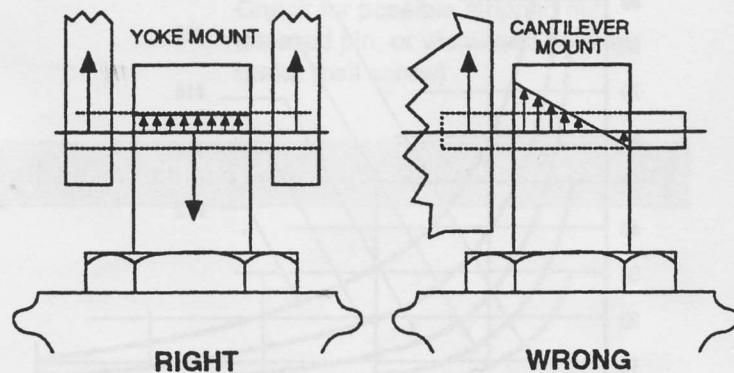


Figure 4
Proper load supports

ELECTRICAL CONNECTION

Wiring

Thomson DM12 linear actuators should be connected in accordance with the wiring diagram shown below. To extend actuator connect red to positive and yellow to negative. To retract actuator, connect yellow to positive and red to negative.

DM12 Actuator Wiring

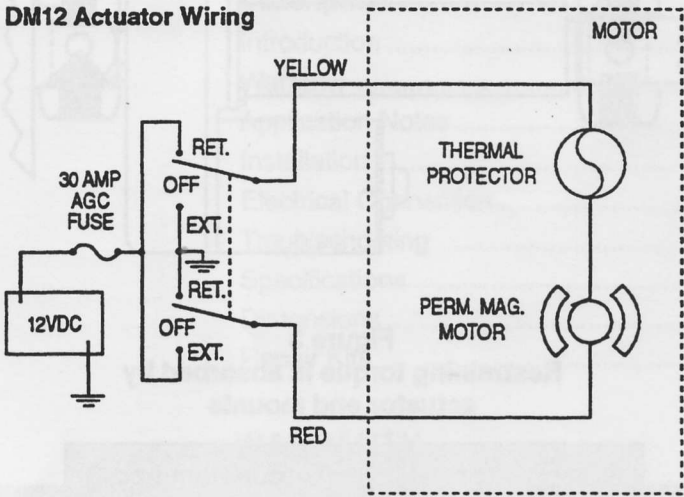
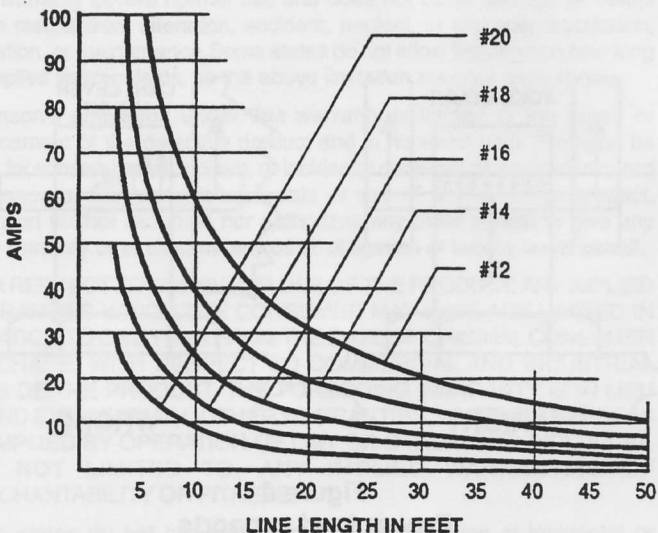


Figure 5

Wire Gauge Selection

Long lead wires between the power source and the actuator will result in a voltage drop for DM12 actuators. This voltage drop can be avoided by sizing the wires in accordance with the following wire gauge selection chart, which is based on a 12 VDC power source. In order to use the chart, find the point of intersection of the two known factors, such as amperage and distance, and read the required wire gauge from the curves on the chart. Example: DM12-20A5 actuator draws 15 amps current at rated load. The intersection of the maximum current and the distance between the actuator and power source (40 feet, for example) indicates the wire gauge required (#12).

WIRE GAUGE SELECTION CHART



Switches

Actuator direction (forward, reverse) is controlled with a double-throw switch with the center position "off."

DM12 linear actuators require double pole, double-throw switches. McGill switch no. 0111-004, Cutler Hammer switch no. 8835-K4, or equivalent are recommended and are usually available locally. The required switch can be purchased from Thomson under part number 830-8004-016. Here are the required switch parameters:

- Double-pole, double-throw
- 20 amp at 28 VDC
- Lever seal to keep out dirt and moisture
- Center "off"
- Two momentary contacts
- 15/32" bushing
- Screw terminals

Connectors

Packard Electric connector 56 Series No. 2984883 and 56 Series No. 29692987 male blade provided on DC actuators.

TROUBLESHOOTING

General: The chart below will be helpful for isolating malfunctions in the control system, countering difficulties with system start-up, and in troubleshooting for worn or broken mechanical or electrical components in units which have

been operating for some time. For correct diagnosis, it is important to do all tests before disassembling the actuator. Electrical checks should be measured at the actuator electrical connection.

Symptom: Actuator will not extend/retract

Checkpoint	Probable Cause	Possible Solution
No voltage or amp draw	Actuator not receiving power	Check power supply, wires, & fuse
Proper voltage, no amp draw	Dead motor	Replace motor
	Thermal overload cut-out (when overheated)	Let cool, check duty cycle
Proper voltage, amp draw present, clutch not slipping	Mechanical failure	Check for possible stripped nut or gears or sheared drive pin or key
Proper voltage, amp draw present, clutch slips	Actuator overloaded	Check rated load versus actual load
	Clutch failure (excessive ratcheting)	Replace clutch

Symptom: Actuator stops in mid-stroke

Checkpoint	Probable Cause	Possible Solution
Clutch slips	Actuator overloaded	Check rated load versus actual load
Clutch doesn't slip, no amps	Blown fuse (customer provided)	Replace fuse
	Thermal cut-out	Let cool, check duty cycle
Clutch doesn't slip, amps present	Motor stalled	Check voltage (too low)

Symptom: Actuator does not hold position

Checkpoint	Probable Cause	Possible Solution
Actuator will not extend or retract	Mechanical failure	Check for possible stripped nut, sheared pin, or worn load holding brake (ball screw)

At this point remove actuator from the mechanism to run by itself. Watch and listen for any changes in behavior.

SPECIFICATIONS

The specifications listed below apply to all actuator models covered in this manual.

- Stroke Length:** 4, 6, 8, 12, 18, and 24"
- Duty Cycle:** 25% "on" time at 75°F and 30 amps (lower duty cycle at higher temperatures and amp draws)
- Motor Protection:** Automatically reset thermal overload protection
- Temperature Range:** -15 °F to +150°F
- End Play:** .070" Maximum
- Static Loads:** 1000 lbs. maximum for acme and 3000 lb. maximum for ball screw
- Overload Protection:** Mechanical load limit clutch on standard units
- Mounting:** Actuator ends must be restrained from rotating (to counter 100 in. lb. max. torque developed) and mounted with parallel pins equally supported on both ends.
- Lead Wires:** 16 AWG ignition protected insulation
- Recognition:** Actuator is an Underwriter's Laboratories, Inc. recognized component per UL 1500 and marked accordingly under File MQ939 (PEQZ 2)

The following specifications apply to individual actuator models by drive type:

Acme Screw Drive

Model	Volts	Max. Load	Max. Amps	Speed at Max. Load
DM12-05A5	12VDC	200#	30	1.10 in/sec
DM12-10A5	12VDC	500#	28	.67 in/sec
DM12-20A5	12VDC	500#	15	.45 in/sec

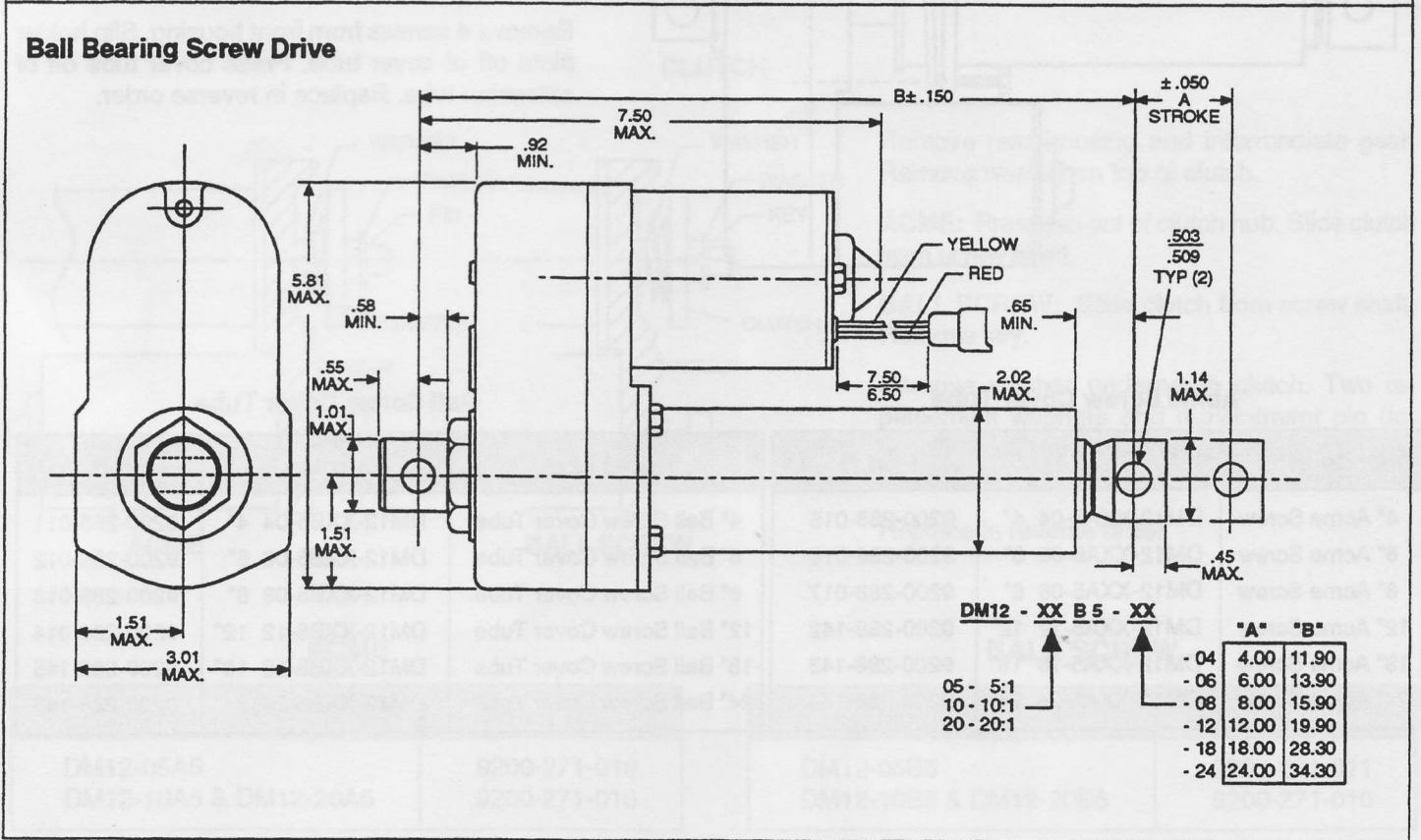
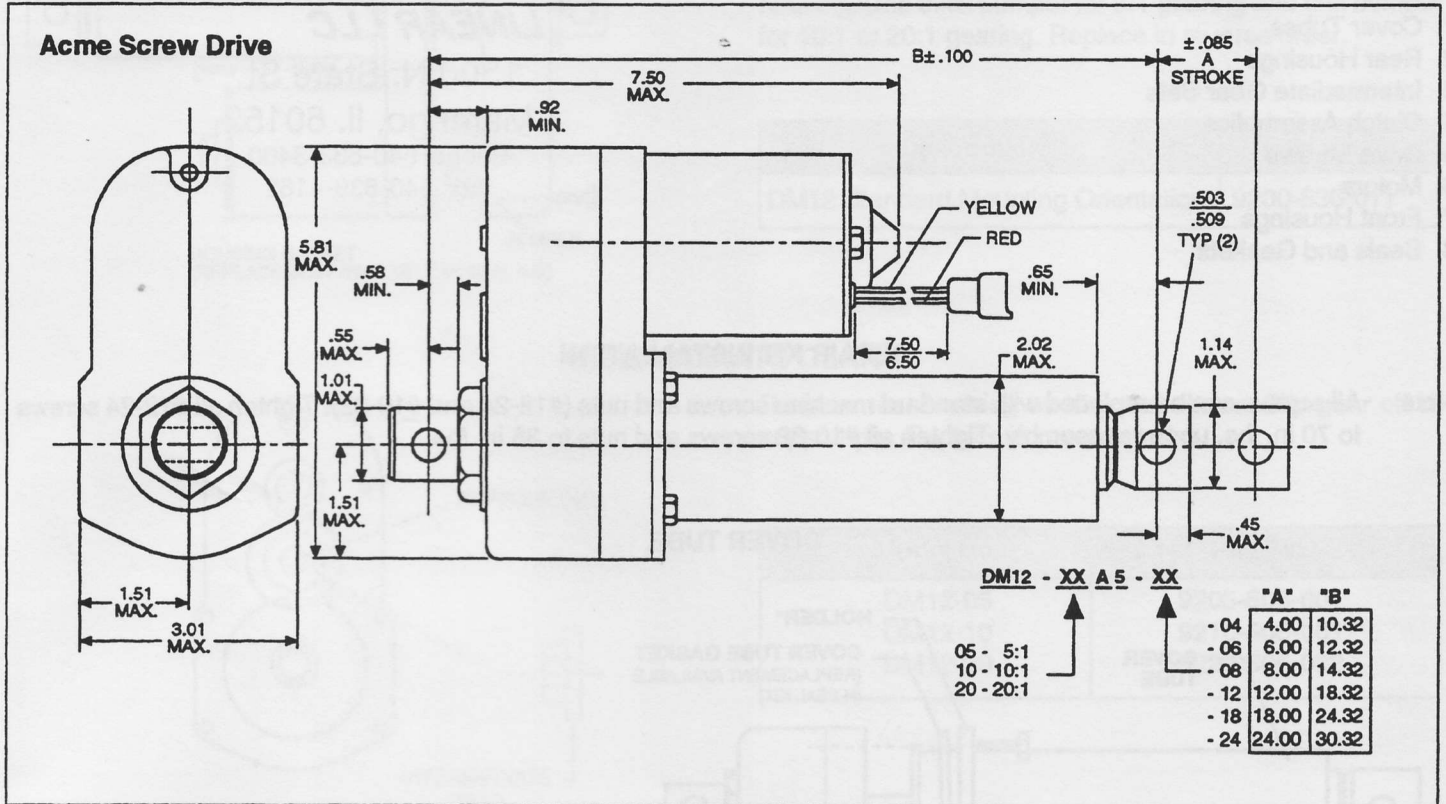
Ball Bearing Screw Drive

Model	Volts	Max. Load	Max. Amps	Speed at Max. Load
DM12-05B5	12VDC	500#	29	1.30 in/sec
DM12-10B5	12VDC	1000#	26	.70 in/sec
DM12-20B5	12VDC	1000#	14	.45 in/sec

DIMENSIONS

The outline drawings shown below describe acme and ball bearing screw driven actuators. All dimensions for each type are identical except for stroke and retracted lengths. The

tabulated dimension charts show these lengths for each model and also describe the model numbers.



REPAIR KITS

Replacement parts are available for Thomson linear actuators in kit form. Descriptions of the kits, installation instructions and diagrams, and part numbers are found on the next 4 pages. Kits are available for:

1. Cover Tubes
2. Rear Housings
3. Intermediate Gear Sets
4. Clutch Assemblies
5. Drive Screws
6. Motors
7. Front Housings
8. Seals and Gaskets

In order to obtain replacements, please contact:

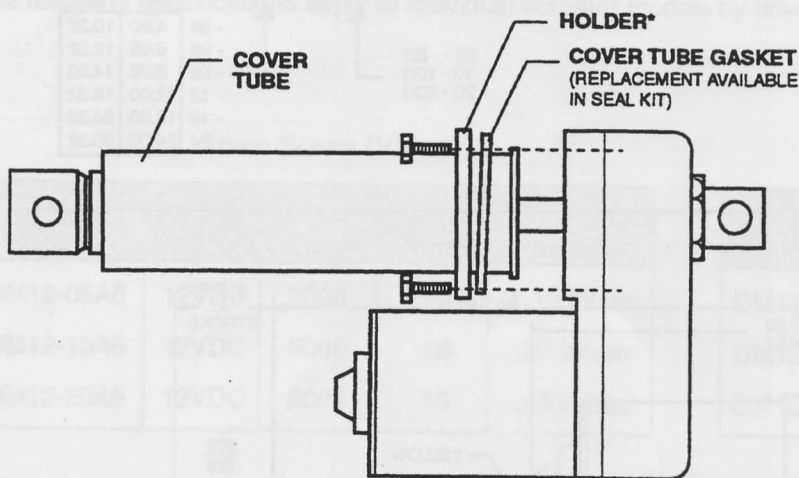
THOMSON
LINEAR LLC

1300 N. State St.
Marengo, Il. 60152
Phone: 540-633-3400
Fax: 540-639-4162

REPAIR KIT INSTALLATION

Note: All screws can be replaced with standard machine screws and nuts (#12-24 and #10-32). Tighten all #12-24 screws to 70 in. lbs. upon reassembly. Tighten all #10-32 screws and nuts to 35 in. lbs.

COVER TUBE



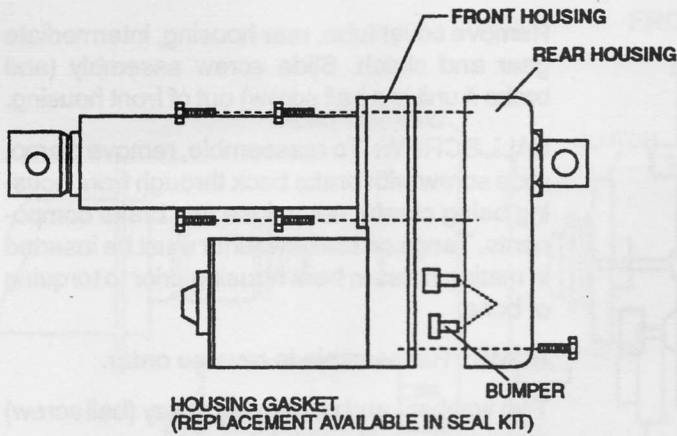
Remove 4 screws from front housing. Slip holder plate off of cover tube. Press cover tube off of extension tube. Replace in reverse order.

Acme Screw Cover Tube

Ball Screw Cover Tube

Model No.	Stroke	Part No.	Model No.	Stroke	Part No.
4" Acme Screw	DM12-XXA5-04 4"	9200-288-015	4" Ball Screw Cover Tube	DM12-XXB5-04 4"	9200-288-011
6" Acme Screw	DM12-XXA5-06 6"	9200-288-016	6" Ball Screw Cover Tube	DM12-XXB5-06 6"	9200-288-012
8" Acme Screw	DM12-XXA5-08 8"	9200-288-017	8" Ball Screw Cover Tube	DM12-XXB5-08 8"	9200-288-013
12" Acme Screw	DM12-XXA5-12 12"	9200-288-142	12" Ball Screw Cover Tube	DM12-XXB5-12 12"	9200-288-014
18" Acme Screw	DM12-XXA5-18 18"	9200-288-143	18" Ball Screw Cover Tube	DM12-XXB5-18 18"	9200-288-145
24" Acme Screw	DM12-XXA5-24 24"	9200-288-144	24" Ball Screw Cover Tube	DM12-XXB5-24 24"	9200-288-146

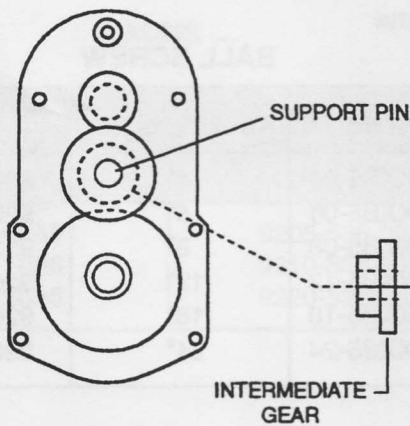
REAR HOUSING



Remove 4 screws from front housing and 1 screw from rear housing. Pull housing free. Insert bumper into hole in rear housing. Use thick bumper for 5:1 gearing and thin bumper for 10:1 or 20:1 gearing. Replace in reverse order.

Description	Part No.
DM12 Standard Mounting Orientation	9200-536-011

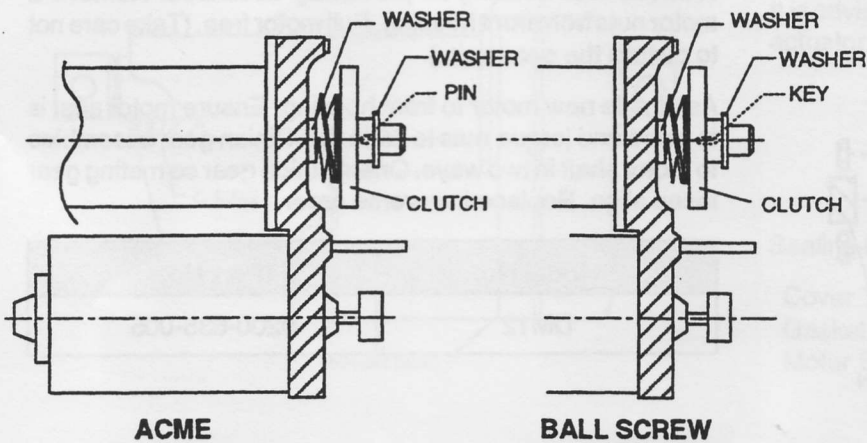
INTERMEDIATE GEAR



Remove rear housing as directed above. Slip gear off of support pin. Replace in reverse order.

Model No.	Part No.
DM12-05	9205-505-001
DM12-10	9210-505-001
DM12-20	9220-505-002

CLUTCH



Remove rear housing and intermediate gear. Remove washer on top of clutch.

ACME: Press pin out of clutch hub. Slide clutch from screw shaft.

BALL SCREW: Slide clutch from screw shaft. Remove key.

Remove washer underneath clutch. Two replacement washers and replacement pin (for acme) or key (for ball screw) are supplied with each kit.

Replace in reverse order.

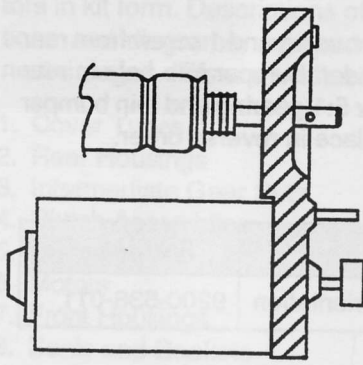
ACME

Model No.	Part No.
DM12-05A5 DM12-10A5 & DM12-20A5	9200-271-018 9200-271-016

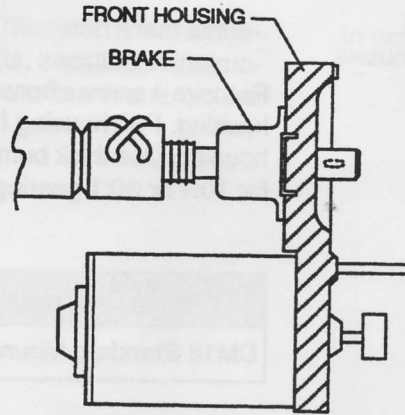
BALL SCREW

Model No.	Part No.
DM12-05B5 DM12-10B5 & DM12-20B5	9200-271-011 9200-271-010

DRIVE SCREW ASSEMBLY



ACME



BALL SCREW

Remove cover tube, rear housing, intermediate gear and clutch. Slide screw assembly (and brake if unit is a ball screw) out of front housing.

BALL SCREW: To reassemble, remove clamp, slide screw with brake back through front housing being careful not to lose any brake components. Tangs on brake washer must be inserted in mating holes in front housing prior to torquing of bolts.

ACME: Reassemble in reverse order.

Two washers and pin (acme) or key (ball screw) are supplied with each kit.

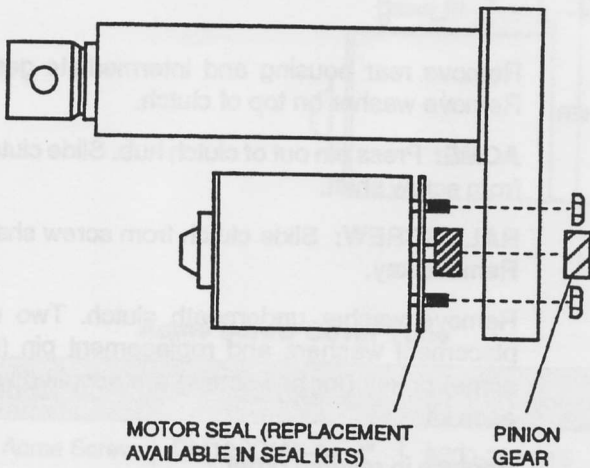
ACME

Model No.	Stroke Length	Part No.
DM12-XXA5-04	4"	9200-799-012
DM12-XXA5-06	6"	9200-799-013
DM12-XXA5-08	8"	9200-799-014
DM12-XXA5-12	12"	9200-799-015
DM12-XXA5-18	18"	9200-799-155
DM12-XXA5-24	24"	9200-799-156

BALL SCREW

Model No.	Stroke Length	Part No.
DM12-XXB5-04	4"	9200-191-012
DM12-XXB5-06	6"	9200-191-013
DM12-XXB5-08	8"	9200-191-014
DM12-XXB5-12	12"	9200-191-015
DM12-XXB5-18	18"	9200-191-074
DM12-XXB5-24	24"	9200-191-075

MOTOR



MOTOR SEAL (REPLACEMENT AVAILABLE IN SEAL KITS)

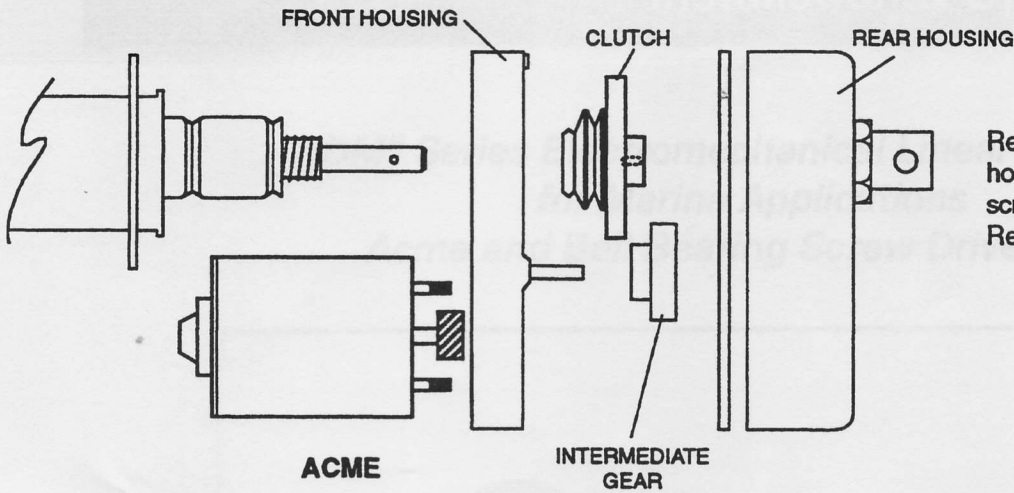
PINION GEAR

Remove rear housing as previously described. Remove 2 motor nuts from front housing. Pull motor free. (Take care not to disturb the gear train.)

Assemble new motor to front housing. Ensure motor seal is in place and torque nuts to 35 in-lbs. Pinion gear assembles to motor shaft in two ways. Orient pinion gear so mating gear faces align. Replace in reverse order.

Model No.	Part No.
DM12	9200-635-005

FRONT HOUSING



Remove cover tube and holder, rear housing, intermediate gear, clutch, drive screw and motor as previously described. Reassemble in reverse order.

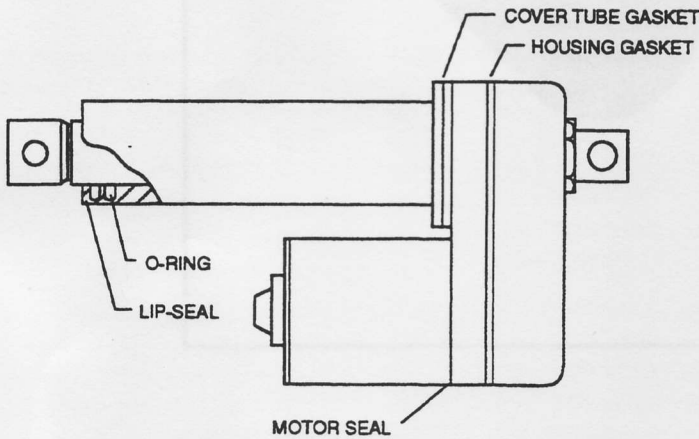
Acme

Model No.	Part No.
DM12-05A5	9205-536-003
DM12-10A5	9210-536-003
DM12-20A5	9220-536-003

BALL SCREW

Model No.	Part No.
DM12-05B5	9205-536-005
DM12-10B5	9210-536-005
DM12-20B5	9220-536-005

SEAL KIT



It is advisable to replace the appropriate seals whenever the actuator is disassembled.

Part Number

9200-795-001

Sealing Kit consists of:

Cover Tube Seal	O-Ring
Gasket between Housings	Lip Seal
Motor Seal	