



POWER JACKS

manufacturers of precision screw jacks, actuators and gearboxes

Group

IMPERIAL MACHINE SCREW JACKS

SINGLE FACE MOUNTING

(MECHANICAL LINEAR ACTUATORS)

SPARES LIST &

MAINTENANCE

INSTRUCTIONS

MANUAL : MM-IMS-E-02

SUPPLIED BY: POWER JACKS LIMITED



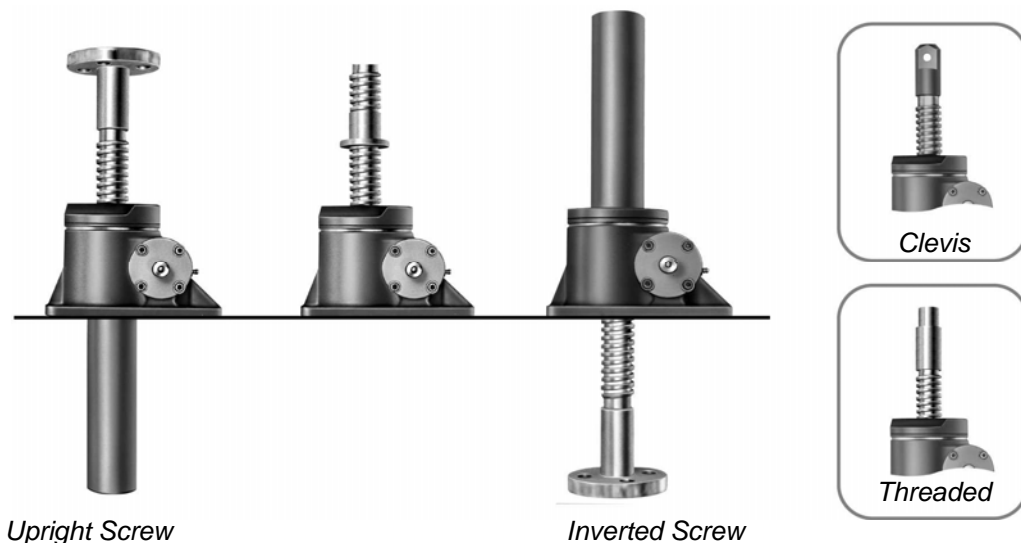
Imperial Series – Machine Screw Jacks

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1 Unit Details

Serial Number	
Model Number	
Power Jacks Sales Order Number	



Upright Screw

Inverted Screw

Rotating Screw (Upright)
Available in both upright
& inverted types



Imperial Series – Machine Screw Jacks

2 General Information

2.1 General

This manual contains maintenance instructions for Power jacks 1800, 9000, 4800 and 9800 imperial machine screw jacks. It describes and details procedures for disassembly, cleaning, inspection, rebuilding and assembly of these screw jacks.

2.2 Industrial use only

The ball screw jacks described and illustrated in this manual are intended for industrial use only and should not be used to lift, support, or otherwise transport people unless you have a written statement from Power Jacks, which authorises the specific screw jack, as used in your application, as suitable for moving people.

2.3 Table of specifications

Model Number	Upright	1802 & 9002	1805	1810	1815	1820	1825	9035	1850	1899	18150
	Inverted	1801 & 9001	1804	1809	1814	1819	1824	9034	1849	1898	8149
Rated Load (Tons)		2	5	10	15	20	25	35	50	100	150
Diameter of Lifting Screw (ins)		1 .20 Pitch Acme	1½ .375 Pitch Square	2 .500 Pitch Square	2¼ .500 Pitch Square	2½ .500 Pitch Square	3¾ .666 Pitch Square	3¾ .666 Pitch Square	4½ .666 Pitch Square	6 .750 Pitch Square	7 .1 Pitch Square
Closed Height ** (in)		5¼	7	7¼	8	9¼	11	12	13	24	24
Base Size (in)		3½ x 7 4½ x 6¼	6 x 8	7½ x 8¼	7¾ x 9¼	8¼ x 11	10¼x13 ¾	10¼ x 15 ½	9¼ x 19¼	20¼ x 27½	20¼ x 24½
Worm Gear Ratios	Std. Ratio	6:1	6:1	8:1	8:1	8:1	10 2/3:1	10 2/3:1	10 2/3:1	12:1	12:1
	Optional	24:1	24	24:1	24:1	24:1	10 2/3:1	10 2/3:1	10 2/3:1	36:1	36:1
Turns of worm for 1" raise	Std. Ratio	24	16	16	16	16	16	16	16	16	12
	Optional	96	64	48	48	48	48	48	48	48	36
Maximum HP per actuator	Std. Ratio	2	4	5	5	5	8	8	15	25	25
	Optional	½		1½	1½	1½	2½	2½	6	11	11
Torque at Full Load* (in.lb)	Std. Ratio	120	450	950	1,430	2,050	3,360	4,600	7,500	16,000	28,100
	Optional	50	185	490	820	1,170	1,900	2,750	4,200	8,600	15,500
Jack efficiency	Std. Ratio	23.2	22.1	22.0	20.2	18.2	16.4	15.2	13.8	13.0	14.1
Rating (%)	Optional	13.3	12.1	14.0	12.9	20.2	9.2	8.5	8.3	8.0	8.6
Weight with Base Raise of 6" (lbs)		17	35	52	66	93	181	240	410	1,200	1,350
Weight for each additional 1" Raise (lbs)		.33	.85	1.4	1.5	2.6	3.5	4.1	5.5	9.0	12.6

* For loads of from 25% to 100% of jack load rating. Torque requirements are approximately proportional to the load.

** Closed heights are for standard upright models and may vary with different screw ends, inverted models, or when bellows boot is used

TABLE 2. 4800 AND 9400 SERIES

Actuator No		4802 & 9402	4805	4810	4815	4820	4825	9435	4850	4899	48150
Rated load (tons)		2	5	10	15	20	25	35	50	100	150
Torque at full load (in-lbs)	Std Ratio	135	500	1005	1658	2261	3712	5060	8022	17004	31330
	Optional	56	228	526	904	1228	1947	3025	4542	9210	17225
Jack efficiency rating %		19.6	19.9	19.8	18.0	16.9	14.8	13.7	12.4	11.7	12.7
		11.9	10.9	12.6	11.7	10.8	8.3	7.7	7.3	7.2	7.7
Closed Height (in)		5¼	7	7¼	8	9¼	12	13	14	26½	26¼
Weight with Base raise of 6" (lb)		18	37	55	70	101	197	250	440	1325	1475

NOTE: Additional specifications are same as for Series 1800 and 9000. See Table 1.

Model Number	Upright	1802 & 9002	9005	9010	9015	9020	9025
	Inverted	1801 & 9001	9004	9009	9014	9019	9024
Rated Load (tons)		2	5	10	15	20	25
Lifting Screw		1" dia .250 Pitch Acme	1½" dia .250 Pitch Acme	2" dia .250 Pitch Acme	2¼" dia .250 Pitch Acme	2½" dia .250 Pitch Acme	3¾" dia .250 Pitch Acme
Worm Gear Ratio		25:1	25:1	25:1	25:1	25:1	25:1
Turns of Worm for 1" Raise		100	100	100	100	100	100
Torque at Full Load (in-lbs)		48	175	270	640	925	1500
Actuator efficiency Rating %		13.2	9.1	8.6	7.5	6.9	5.3
Maximum H.P per Screw Jack		½	¾	1½	1½	1½	2½

Note: All other data for these models same as shown in Table 1



Imperial Series – Machine Screw Jacks

2.4 Important precautions

In order to ensure that Power Jacks machine screw jacks provide good service over a period of years the following precautions should be taken:

1. Select a screw jack that has a rated capacity greater than the maximum load that may be imposed on it.
2. The structure on which the jacks are mounted should have ample strength to carry the maximum load, and should be rigid enough to prevent undue deflection or distortion of the jacks supporting members.
3. It is essential that the screw jacks be carefully aligned during installation so that the lifting screws are perfectly plumb and the connecting shafts are exactly in line with the worm shafts. After the jacks, shafting, gear boxes etc., are coupled together, it should be possible to turn the main drive shaft by hand. If there are no signs of binding or misalignment, the jacking system is then ready for normal operation.
4. The machine screw jacks should have a greater raise than is needed in the actual installation. Should it be necessary to operate the jacks at the extreme limits of travel, it should be done cautiously.

Caution: Do not allow screw jack to go beyond specified (catalog) closed height of actuator or serious damage to internal jack mechanism may result. Refer to table of specifications (par 1-3) for closed height of respective units.

5. The worm shaft speed for these jacks should not exceed 500 RPM for light loads of one-fourth (or less) of the jack load rating.
6. The lifting screw should not be permitted to accumulate dust and grit on the threads. If possible, lifting screws should be returned to closed position when not in use.

Caution: Where lifting screws are not protected from airborne dirt, dust, etc., bellows boots should be used. Inspect frequently at regular intervals to be certain that a lubricating film is present. Lifting screws should never be run dry.

7. When using an 1800 or 9000 Series screw jacks periodic check of backlash of the lifting screw thread is recommended to check wear of the worm gear internal threads. The normal backlash on a new unit of this type is approximately .010 inch. **Backlash of 50% or more of the thread thickness indicates the need to replace the worm gear.** The 4800 and 9400 Series anti-backlash jacks are designed to be adjusted for minimum backlash, approximately .002 inch. The worm gear and anti-backlash nut faces of $\frac{1}{2}$ the thread thickness. **When adjustments have been made to the point where all this clearance is gone, 50% of the thread thickness is gone and replacement is necessary.** (Refer Section 3.8 for a detailed explanation of how the anti-backlash nut functions).

Note: For loads from 25% to 100% of screw jack capacity, torque requirements are approximately proportioned to the load, except for very light loads.

8. The lubrication procedures for normal and severe service conditions, (refer Section 3.1) should be closely followed.



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3 Maintenance

3.1 Lubrication

Unless otherwise specified, screw jacks are shipped packed with grease which should be sufficient for one month of normal operation. For normal operation the screw jack and gear boxes should be lubricated once a month, using one of the following Extreme Pressure greases or their equivalent.

Socony Mobile Oil Co	Mobilplex E.P. #1
Texaco	Texaco E.P. #1
Gulf Oil Corp	Gulf Crown E.P #1
Shell Oil Co	Shell Alvania E.P #1

For severe service conditions, the jacks should be lubricated more frequently using one of the above greases (daily to weekly depending on conditions). If duty is heavy, an automatic lubrication system is strongly recommended. If ambient temperatures exceed 200°F, consult lubricant manufacturers.

Caution: Where lifting screws are not protected from airborne dirt, dust, etc., bellows boots should be used. Inspect frequently at regular intervals to be certain that a lubricating film is present. Lifting screws should never be run dry.

3.2 Rebuild Procedure

Power Jacks recommend the following procedures for assembly and disassembly of machine screw jacks.

1. Tag critical parts to facilitate re-assembly.
2. Mark mating surfaces to insure proper meshing.
3. Clean and lubricate all parts as required.
4. All seals must be replaced when rebuilding.
5. All screws, washers and other small common parts must be replaced if damaged in any way.
6. Replace damaged or frozen lubrication fittings with new ones.

3.3 Required Tools

A bearing puller and press, and common hand tools are necessary for proper assembly and disassembly.

3.4 Disassembly

(Refer to Section 4.3)

1. Remove lifting screw (5) from jack.
2. Remove bottom pipe (4) from shell (3) (upright models) or shell cap (2) (inverted models) or base plate as applicable.
3. **FOR ALL MODELS EXCEPT 100 & 150 TON –**
Loosen and remove set screws (1) in cap (2) and remove cap from shell (3)
FOR 100 & 150-TON MODELS –
Loosen the lock screw in the shell and unscrew (Counterclockwise) the base plate from the shell.

Note: It may be necessary to break shell cap or base plate loose with a hammer.

4. Remove gear (6A) or worm gear and nut assembly (6B) from shell (3)

Note: To facilitate removal of the gear from the shell on models with 50-ton or higher load ratings, partially reassemble the lifting screw into the worm gear (or worm gear and nut assembly) and use a hoist or pulley block to lift on the screw.



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5. Remove the top load bearing (7) which may be attached to either the shell cap (2) or worm gear (6A) or anti-backlash nut.

Caution: Use only a wooden mallet to tap bearings loose.

6. Remove bottom load bearing (8) which may be attached to either the shell (3) (base plate for 100 and 150-ton models) or worm gear (6A).
7. Remove four cap screws (9) from each of the two worm flanges (11) and remove flanges.
8. Press oil seal (13) out of flange (11).
9. Remove worm (14 and worm bearings (15) from shell (3) by striking one end of wooden or lead mallet.
10. Remove worm bearings (15) from worm (14) with bearing puller or press. (NOTE: this step will not be necessary if worm and worm bearings are not damaged.)
11. If screw jack is keyed, remove screw in shell cap (shell on 100 and 150-ton models) and tap key out of keyway.

3.5 Cleaning

1. Use degreasing solvent, to remove grease or oil from all parts.

Caution: Remove grease from unit and do not reuse old grease.

Warning: Provide adequate ventilation during the use of cleaning agents; avoid prolonged breathing of fumes and contact with skin.

2. Use clean water or soap solution for general cleaning of painted surfaces.
3. Dry parts thoroughly after cleaning

Note: Before installing new parts, remove any rust preventive protection grease etc.

3.6 Inspection

(Refer to Section 4.3)

1. Make a visual inspection of shell (3) for broken, cracked or distorted areas. Check threads of all bores for burrs or broken threads.
2. Check shell cap (2), base plate, bottom pipe (4), lifting screw (5), worm gear (6A) or worm gear and nut assembly (6B) for burrs or scratches on their working or mating surfaces.
3. Check fit between lifting screw thread and internal thread in worm gear. If fit is excessively loose, replace worm gear or lifting screw as required. Replace worm gear and nut assembly as a set (4800 & 9400 Series).
4. Check small common components (screws, etc.) and replace as required.
5. Check bearings (7, (8) and (15) for seizure, galling or play and replace as required.

3.7 Assembly

(Refer to Section 4-3)

1. Press worm bearings (15) onto worm shaft (14) making sure that bearings are seated properly against shoulder.
Note: When tapered roller bearings are used, the small end of the cone should point to the worm end.
2. Position worm shaft end (14) in shell (3).
Note: If tapered roller bearings are used, tap worm bearing cups into place in the shell.
3. Press oil seals (13) into worm flange (11).
Note: The sealing element should point inward
4. Position worm flanges (11) with shims (12) and bolt in place.
5. Position bottom load bearing (8) (bearing cup on 5-ton and 35-ton models, top load bearing on 100 and 150-ton models) in shell (3).



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- 5a **On 5-ton and 35-ton models**, press load bearing cones onto worm gear (6A) or worm gear nut assembly (6B). Small end of bearing cone should face away from gear teeth.
6. Install worm gear (6A) or worm gear and nut assembly (6B) in shell (3).

Caution: Strike each end of worm shaft sharply with a wooden mallet to seat bearing properly. Recheck flange bolts for tightness. Worm should turn freely with minimum drag and end play. If too much end play is present, remove shims as required. If worm does not turn freely, add shims as required.

7. Install top load bearing (7) (bottom load bearing (8) for 100 and 150-ton models on worm gear (6A) or worm gear and nut assembly (6B).
8. Fill housing fully with grease.
9. **FOR ALL MODELS EXCEPT 100 AND 150-TON** – Install shell cap (2) and screw down until tight.

Note: Shell cap flange does not necessarily have to bear against top shell, there will usually be a gap. This will put a slight drag on worm. If worm is hard to turn, back off slightly on shell cap.

FOR 100 AND 150-TON MODELS – Install base plate and screw down base plate until tight.

Note: This should put a slight drag on the worm. If the worm is hard to turn, back off slightly on the base plate. Be sure base plate does not project past base surface of housing.

10. Lock shell cap in place with set screws (lock screw on 100 and 150-ton models)
11. **FOR ALL MODELS EXCEPT 100 AND 150-TON** – Screw bottom pipe (4) into shell (3) (upright models) or into shell cap (2) (inverted models)
FOR 100 AND 150-TON MODELS – Screw bottom pipe into base plate (upright models) or into shell (inverted models)
12. Brush lifting screw (5) with a light film of grease and install in actuator. On inverted models, install guide bushing (16) and then install lifting screw (5).
13. If screw jack is keyed, install key in shell cap (2) (shell for 100 and 150-ton models) and bolt in place.
14. Operate unit to ensure proper functioning of all components prior to reinstallation.

3.8 Anti-Backlash Nut Function

As shown in Figure 3-1, the worm gear (2) and anti-backlash nut (3) are printed together with guide pins. The threads in the anti-backlash nut work in opposition to the threads in the worm gear as they engage the threads of the lifting screw (1). Adjustment of backlash is made by running down on the shell cap of the screw jack. This forces the anti-backlash nut threads into closer contact, reducing clearance and thus reducing backlash.

3.9 Anti-Backlash Nut Adjustment

1. To minimise backlash remove the two set screws (4) and tighten down on shell cap until the desired backlash is obtained. Spot drill top of shell through set screw holes, then replace set screws and tighten to prevent shell cap backing off.
2. To avoid binding and excessive wear, do not adjust lifting screw backlash to less than 0.002 inch.
3. The clearance (A) designed into the worm gear and anti-backlash nut is set one-half the thread thickness. When adjustments have been made to use all this clearance replace the worm gear and anti-backlash nut as a set.

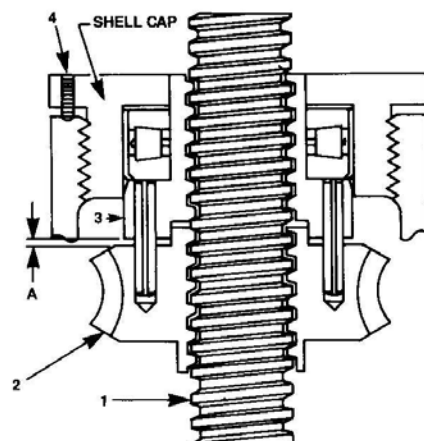


Figure 3-1 Anti-backlash Nut Adjustment



Imperial Series – Machine Screw Jacks

4 Parts List

4.1 General

This section contains an exploded illustration of the M1800, M9000, M4800 and M9400 Series machine screw jack. The number adjacent to each part on the illustration is the index number. Keyed to this index number on the parts list is the part name

When ordering parts be sure to include:

1. The nameplate model of your unit
2. Index number and name of part

4.2 Parts List for M1800, M9000, M4800 & M9400 Series Machine Screw Jacks

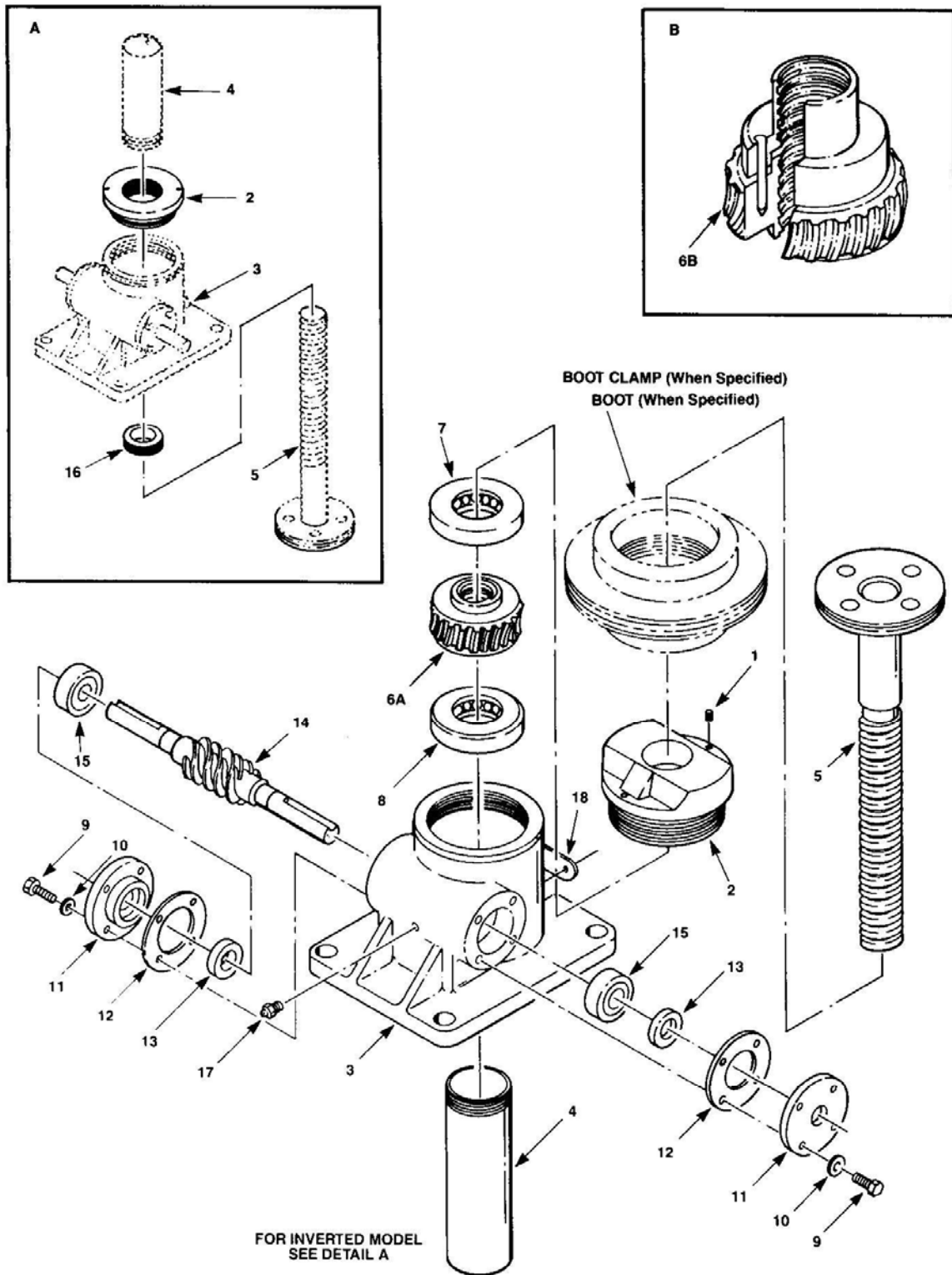
Index No	Part Name	Qty Req
1	Screw, Set (All models except 100 & 150-ton)	2
2	Cap Shell (All models except 100 & 150-ton)	1
3	Shell, Jack	1
4	Pipe, Bottom	1
5	Screw Assembly, Lifting	1
6A	Worm Gear	1
6B	Worm Gear & Anti-backlash Nut Assembly Mfg'd & sold in sets only)	1
7	Bearing, Top Load	1
8	Bearing, Bottom Load	1
9	Screw, Cap	8
10	Washer, Lock	8
11	Flange, Worm	2
12	Shim, Flange	2
13	Seal, Oil	2
14	Worm	1
15	Bearing, Worm	2
16	Bushing, Guide (inverted model only)	1
18	Name plate	1
19	Screw, Lock (100 & 150-ton only)	1*
20	Plate, Base (100 & 150-ton only)	1*

* Not shown



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4.3 Assembly Drawing



Exploded Illustration M1800, M9000, M4800 & M9400 Series Machine Screw Jacks



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5 Warranty Information

5.1 Limitation of Responsibility

The ratings given in this manual were compiled using standard engineering procedures. The ratings are designed to guide the customer in the selection of a unit. We do not guarantee the ratings in specific applications. Prototype testing of every application is recommended before production. Our engineering facilities are available for consultation at all times. Please ask us for assistance with linear motion and drive application problems. This manual is designed to assist in the selection of a suitable linear motion or power transmission product for economical, long and trouble free service.

Due to Power Jacks policy of continuous improvement designs may be subject to change without notice. Please ask for certified drawings.

5.2 Warranty

Subject to the condition stated herein, Power Jacks will repair or replace, without charge, any parts proven to Power Jacks satisfaction to have been defective in material or workmanship. Claims must be made within one year after date of shipment. Power Jacks will not repair or replace any parts that have become inoperative because of improper maintenance, eccentric loading, overloading, chemical or abrasive action, excessive heat, or other abuse. Equipment which has been altered or modified by anyone without Power Jacks authorisation, is not warranted by Power Jacks. EXCEPT AS STATED HEREIN, POWER JACKS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

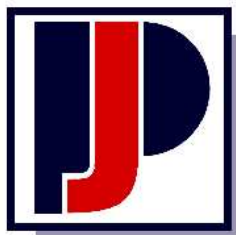
WARNING: The equipment shown in this manual is intended for industrial use only and should not be used to lift support, or otherwise transport people unless you have a written statement from Power Jacks Limited which authorises the specific unit as used in your application suitable for moving people.

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We reserve the right to alter details and specifications without notice.

Since special circumstances may affect the equipment's operation, users should consult **POWER JACKS LIMITED** at the address shown, or take other skilled engineering advice. It is recommended that the application design load is conspicuously displayed.

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