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# OPERATION AND INSTRUCTION MANUAL

## AIRCRAFT SCALE CALIBRATOR MODEL : 804000 60K LBF CAPACITY



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## General Specification

### 1- Scope:

This specification describes a force calibration press (calibrator), for the application of compression loads up to 60,000 lbs. The calibrator is designed to calibrate and perform corner tests on aircraft wheel platform scales with dimensions up to 38.5 inches by 38 inches by 4.625 inches.

### 2- Compatibility:

This calibrator is designed to calibrate aircraft wheel platform scales with capacities up to 60,000 lbs., using specific sizes of standard load cells.

### 3- Design Requirements:

The calibrator consists of a frame assembly with a motorized adjustable cross-head, a hydraulic force application system consisting of a hydraulic jack with a hand-pump, and mounting adapters. The calibrator is designed to apply a force through a standard load cell fastened to the hydraulic jack (load cells not included).

### 4- Performance & Product Characteristics:

#### 4.1- Functional Requirements:

The calibrator is a floor-mounted unit. Optional legs with leveling feet to raise the platen, working area, to approximately 29-inches from the floor are available. The calibrator is used for the calibration of aircraft wheel load scales from 1,000 to 60,000 lbs., using a standard Air Force calibration kit.

#### 4.2- Capacity:

The calibrator has a working (rated) capacity of 60,000 lbs.

#### 4.3- Overload:

The calibrator has been proof loaded 25% above the working capacity of 60,000 lbs. However, the working (rated) capacity of 60,000 lbs. should not be exceeded.

### 5- Details of Components:

#### 5.1 Frame Assembly:

The frame assembly consists of a mounting base with a platen, threaded tension tie bars, and a moveable crosshead. The useable area of the platen is 58 inches long by 40.5 inches wide. The platen is drilled with a 1-inch diameter center hole. The moveable crosshead adjustment range permits the hydraulic jack ram to be positioned between not less than 6 inches and 24 inches from the top of the platen. The crosshead is adjusted using the electronic on the top beam. The motor operates on 115 volts, 60 cycle, single phase power.

## 5.2- Hydraulic Force Application System:

The hydraulic force application system consists of a 60,000 lbs. capacity Morehouse hydraulic jack that is mounted on the moveable cross-head. The jack is used to apply a vertical force between the adjustable cross-head and the platen where the scale being calibrated is placed.

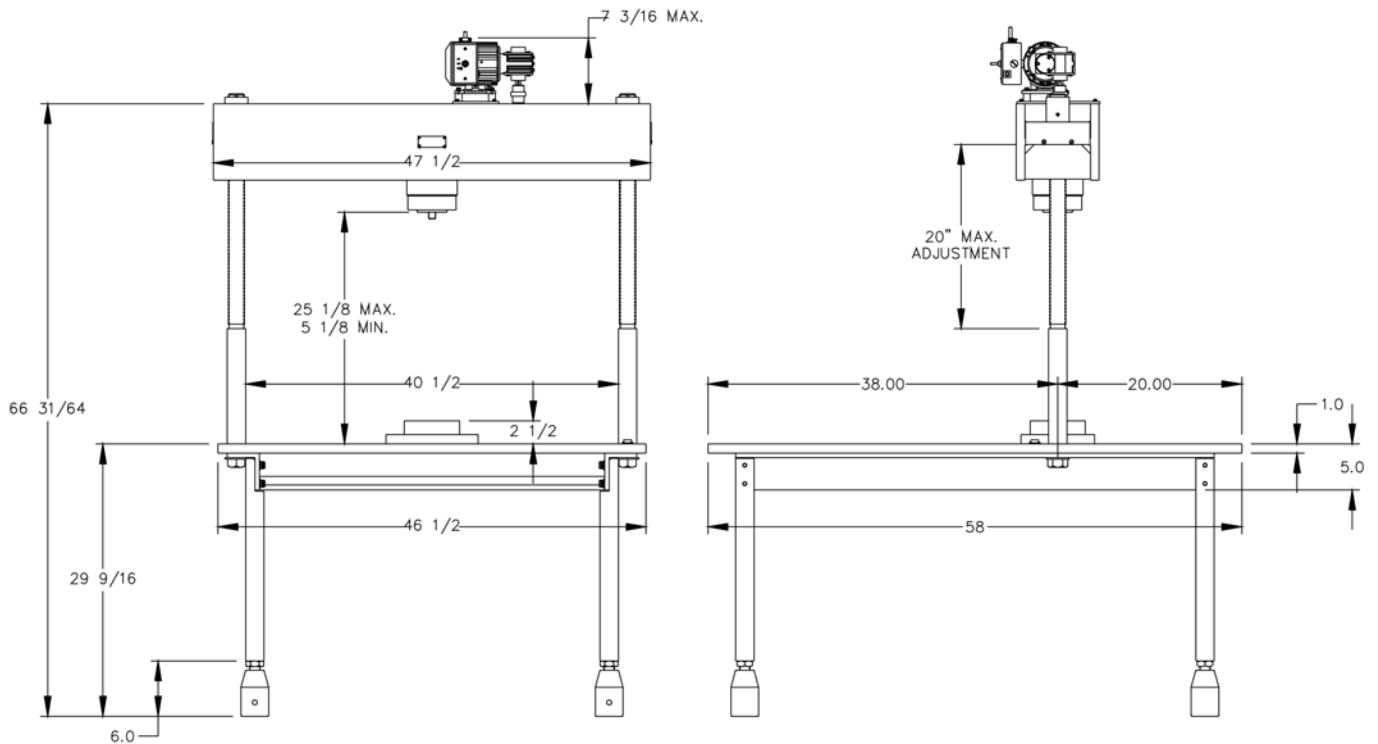
### 5.2.1- Hydraulic Jack:

The hydraulic jack has a working capacity of 60,000 lbs. It is specially designed to have the lowest possible leak rate so it is suitable for force calibration work. The jack ram is provided with threaded adapters for fastening the load cell standards to the jack ram. The jack ram has a vertical stroke of 1-inch, and will fully retract when hydraulic pressure is released.

### 5.2.2- Hand-Pump:

The hydraulic jack is activated by a two-speed hand-pump, which has a vernier screw piston. The pump is connected to the jack with a hydraulic hose that has a quick disconnect on one end.





**Figure 1: Dimensions of 60K lbf Aircraft Scale Calibrator (Drawing 804000-03a)**

## Assembly Instructions

- 1-** The calibrator is shipped fully assembled.
- 2-** Remove the calibrator from the shipping crate and move it to the desired location. The calibrator weighs approximately 1600 pounds, and is designed to sit directly on the floor .
- 3-** The hand-pump has been fastened to the machine platen for shipping. Remove the hand-pump from the platen by removing the two screws holding the hand-pump drip pan to the platen.
- 4-** The top surface of the platen, and the unthreaded portion of the tie bars, have been coated with a rust inhibitor. This is removed using mineral spirits. After the rust inhibitor has been removed, these surfaces should be coated with light oil to prevent rust and corrosion.

**5-** Before using the calibrator, the hydraulic force application system should be checked.

**5.1-** Check the hydraulic fluid in the hand-pump by removing the fill plug. The fill plug should be left open about two turns during operation. If hydraulic fluid must be added be sure to use petroleum base anti-wear hydraulic fluid with an ISO Viscosity Grade of 22 or 32. The following hydraulic fluids are recommended, but any equal hydraulic fluid may be used:

Arco.....	Dutro AW 32
Conoco.....	Super Hydraulic 32
Drydene Oil Co.....	Paradene 22AW
Exxon.....	Nuto H 32
Gulf.....	Harmony 32 AW
Mobil.....	DTE 24
Texaco.....	Rando HD 32

**5.2-** Prepare the hydraulic jack for use. The hydraulic jack is furnished with a self-sealing hose coupling and has been fully bled and checked at the factory prior to shipment. However, if the hand pump and hydraulic jack seem “spongy” during use there may be air in the system. If this occurs the system will need to be bled of entrapped air. This procedure is outlined in the Maintenance section of this manual.



## Operating Instructions

- 1-** Adjust the height of the cross head to allow space between the Calibrator's platen and the hydraulic ram for the load cell to be installed. To raise the cross-head turn the crank clockwise. To lower the cross-head turn the crank counter clockwise (An optional electric motor to control the crosshead adjustment is available. This motor makes adjustment of the crosshead very easy. The motor operates on 115 volts, 60 cycle, single phase power. Contact Morehouse Instrument Co. for details).
- 2-** Fasten the base of the load cell to the hydraulic ram using the  $\frac{3}{4}$ -16 threaded adapter. This Adapter has been screwed into the jack for shipping and should always be kept there when not in use. Be sure the load cell is turned completely into the threaded Adapter and there is no space between the base of the load cell and the hydraulic ram. The base of the load cell must be tight against the hydraulic ram.
- 3-** Raise the adjustable crosshead and place the aircraft wheel platform scale to be calibrated on the Calibration Press's platen. The scale should be centered on the platen.
- 4-** Use the appropriate loading blocks as specified by the calibration procedure for the scale to be calibrated. Center the 6-inch diameter compression pad supplied with the calibration press on the loading blocks. The side with the machined pocket should be up. Next place the load cell's load button on the 6-inch diameter compression pad. The load button should fit in the pocket machined in the 6-inch diameter compression pad.
- 5-** Adjust the height of the cross-head so there is approximately 1/8 inch clearance between the spherical radius of the load button and the mating radius on the load cell. Be sure the load button is properly positioned to mate with the spherical radius of the load cell.
- 6-** The desired forces are now applied to the Aircraft Wheel Platform Scale. The hand-pump is used to activate the hydraulic jack. This pump functions similar to other hand-pumps. With the pump connected to the hydraulic jack operating the hand lever causes hydraulic oil from the reservoir of the pump to be pumped to the hydraulic jack. During pump operation, the fill plug on the upper right side of the pump body should be open about two turns to serve as a reservoir vent. To operate the hand-pump, the relief valve (item 20- hand pump drawing) must be closed. To close the relief valve, turn the handle toward the hose connection of the pump body.
- 7-** The hand pump is a dual volume design based on a double diameter piston. On the side of the hand-pump is a valve rod (item 41-hand-pump drawing). With the rod pulled out the full diameter of the piston is effective for low pressure, high volume pumping. With the rod pushed in the reduced diameter is effective for high pressure, low volume pumping with minimum effort. **CAUTION: Before pushing the rod in, release any downward pressure applied to the hand lever.**



**8-** Adjust After the pressure has been pumped up with the hand lever to the approximate force desired use the star wheel (item 21-hand-pump drawing) of the Vernier screw piston to obtain and maintain the exact force required. **CAUTION: Do not exceed the one-inch stroke of the jack ram, or considerable damage will result.**

**9-** To release the pressure after the desired forces have been applied turn the handle of the relief valve toward the back of the pump body. This will release pressure and the jack ram will return automatically.

## Maintenance Instructions

**1-** The top surface of the platen, the unthreaded portion of the tie bars, and the face of the jack ram should be kept coated with a light oil to prevent rust and corrosion. It is suggested these areas be wiped with light oil after each use.

**2-** The Calibration Press should be given a routine service inspection at regular intervals, the frequency of which depends upon how often and under what circumstances it is used. During this inspection, check the equipment for rust, leaking hydraulic fluid, and other visible signs of deterioration or damage. The inspection should include a visible inspection of all welds on the upper frame beam. Be sure to check all nuts, bolts, and screws to be sure they are tight. In addition, check the oil level in the pump reservoir, and examine the O-ring seals. Replace any ring that is split, cut, or otherwise damaged. Also, after an extended period of heavy service, it is advisable to disassemble and clean the pump. Cleaning the pump consists simply of washing or blowing out the body casting and washing the parts. Refer to Paragraph 6 for disassembly instructions.

**3-** Routine maintenance of the machine usually is limited to replacing O-ring seals in the pump assembly, adding hydraulic fluid if required, removing rust, dirt and corrosion from all assemblies, touching up paint damage, tightening any nuts or set screws which have loosened, and re-leveling. If the pump and jack assembly fail to develop or hold pressure, corrective maintenance may be necessary (All numbers in parenthesis refer to items on the hand-pump drawing).

**3.1-** If the hand lever is operated and the pump fails to develop pressure, be sure the relief valve is closed and there is sufficient fluid in the reservoir. If failure continues one or both of the check valves (33 and 38) may be leaking. Replace both O-rings to be sure.

**3.2-** If the pump builds up pressure but the pressure drops, examine all joints for leakage; a very small amount of leakage will result in considerable loss of pressure. As the pressure drops, watch the hand lever. If it rises, the discharge check valve (33) is leaking. Replace the O-ring (29). If the hand lever does not rise as the pressure drops, then the relief valve is leaking. A foreign particle may be lodged on the seat, but more likely the O-ring (39) has failed and must be replaced.





**3.3-** The outlet in the pump body is tapped with 1/2" x 20 NF thread and machined for o-ring seals (15). A firm joint will prevent leakage. If leakage develops do not tighten the fitting excessively; replace the O-ring seal. **CAUTION: Do not screw pipe threads directly into the pump body outlet. The special adapter (53) is provided with pipe threads for making connections.**

**4-** Routine lubrication consists of adding a few drops of oil to the chain drive on the upper frame and applying grease to any grease fitting. The grease used should conform to NLGI 2 specifications.

**5-** If the hand-pump and hydraulic jack seem rather "spongy" during use there may be air in the system. If this occurs the system will need to be bled of entrapped air. To bleed the hydraulic jack, remove it from the calibration press and place it on its side on a suitable work surface, then proceed as follows:

**5.1-** Check the supply of fluid in the pump reservoir by removing the fill plug (item 30). The fill plug must be left open about two turns during operation to serve as a reservoir vent. If hydraulic fluid must be added be sure to use petroleum base anti-wear hydraulic fluid with an ISO Viscosity Grade of 22 or 32 as recommended in the Assembly Instructions.

**5.2-** With the hydraulic hose disconnected from the hydraulic jack, and connected only to the hand-pump, pump the hydraulic hose full of hydraulic fluid. The poppet of the hose half of the self-sealing quick-disconnect coupling must be depressed to accomplish this.

**5.3-** Connect the hydraulic hose to the jack cylinder fitting, and pump the jack ram out to full stroke, approximately 1-inch.

**5.4-** Roll the jack to bring the air bleed location to the highest point.

**5.5-** Alternately open the air bleed and roll the jack back and forth. The ram return spring will keep sufficient pressure on the fluid to purge the air.

**5.6-** After the jack has been bled of all entrapped air, tighten the air bleed securely, and return the jack to its original position on the Calibration Press.

**6-** Servicing the hand-pump includes replacing the O-rings, seals, and cleaning. When changing O-rings, always lubricate the O-rings, and all contacting metal parts before attempting assembly. For a lubricant, use the same fluid as will be used in the system.

The high pressure valve poppet and retaining parts are held in place by the retaining plug (57). To reassemble, screw the retaining plug (57) into the body until all parts are solid, then back it off about two turns. This provides sufficient travel for the poppet.



**7-** All parts of the Calibration Press (except O-rings and seals) are designed to last indefinitely in normal use. Inadvertent misuse or accidental damage may occur in which case repair may best be effected by replacing the damaged parts.

**8-** Parts lists, included in this manual, illustrate replacement parts available for the standard hand-pump, hydraulic jack, and the Calibration Press. When ordering repair parts, please include the serial number of the Calibration Press (as engraved on the nameplate) and state the part number, name, and quantity required. Order parts from:

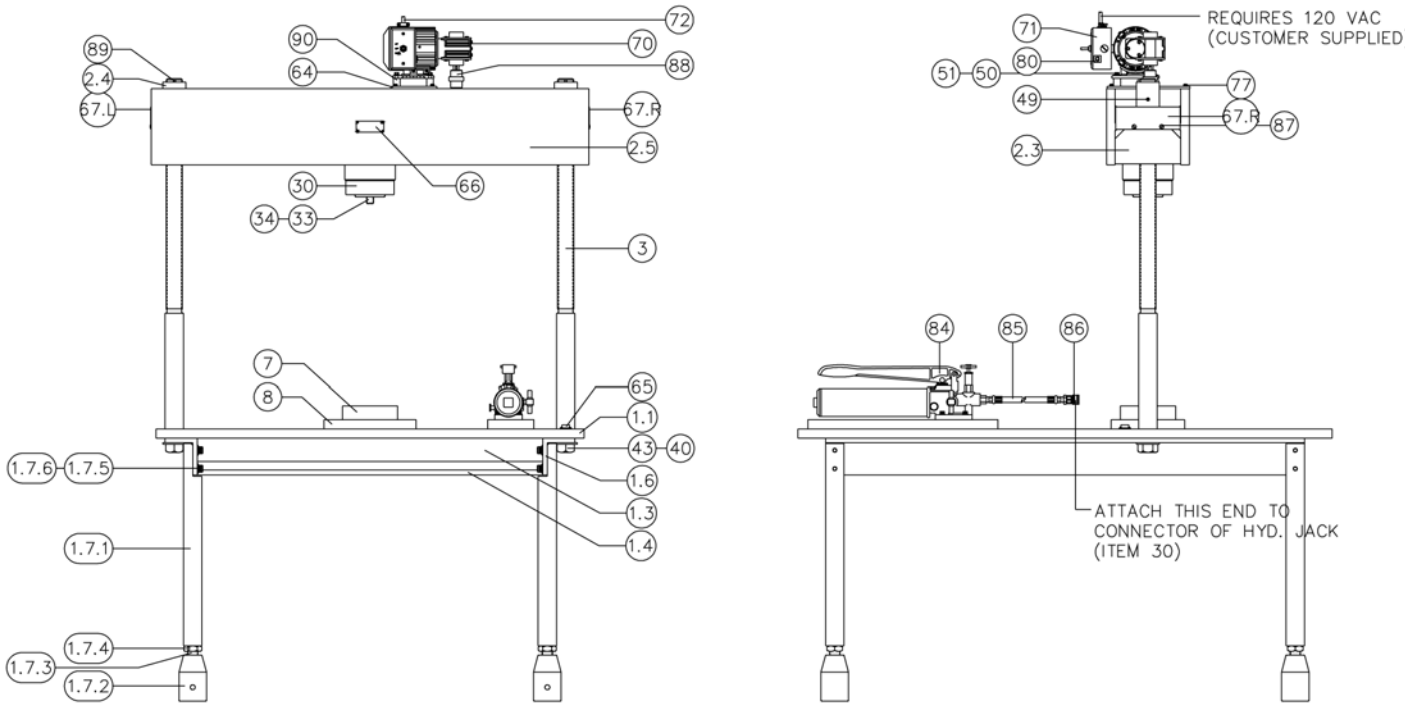
Service Department  
Morehouse Instrument Company  
1742 Sixth Avenue  
York, Pennsylvania 17403-2675 U.S.A.

## Certificate of Capacity Load Test and Overload

This certifies the aircraft scale force calibration press was tested for capacity and overload.

The aircraft scale force calibration press was loaded to its rated working capacity of 60,000 lbf, and held for five minutes.

The press was also proof loaded to 75,000 lbf, 25% above its working capacity.



**Figure 2: Frame Assembly Drawing of 60K lbf Aircraft Scale Calibrator (Drawing 804000-04)**



**Parts List for 60K lbf Aircraft Scale Calibrator (1-84)**

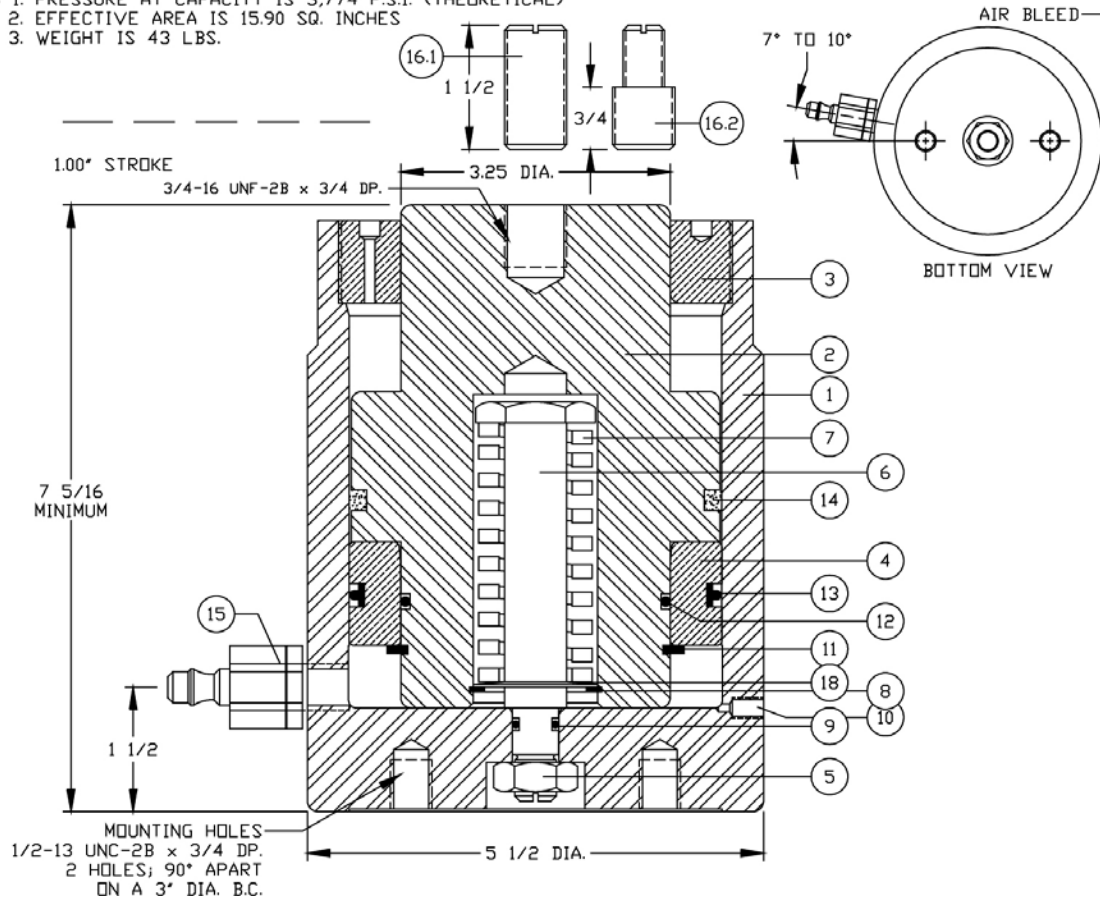
Item	Part No.	Nomenclature
1.1	804001-01	Base Plate-Platen
1.3	804001.01	Base Plate-Reinforcement
1.4	804001.01	Base Plate-Reinforcement
1.6	804001-06	Tension Tie Bar Support
1.7.1	654001-07b	Leg Kit
1.7.2	654001.07b	Foot Pad
1.7.3	654001.07b	1.25"-12 x 5" Threaded Rod
1.7.4	***	1.25"-12 Hex Jam Nut
1.7.5	***	1/2"-13 x 1" Soc. Head Cap Screw
1.7.6	***	1/2" S.A.E. Washer
2.3	654002.03	Upper Frame-Gusset
2.4	654002.04	Upper Frame-Sprocket Retainer
2.5	654002	Upper Frame-Beam
3	654003	Tension Tie Bars
7	654007	Compression Pad (6" Dia.)
8	654008	Compression Block (1" x 10" x 8")
20	654020	Roller Chain (Not Shown)
30	654030	60,000 Lbs. Hydraulic Jack
33	654033	3/4"-16 Threaded Adapter
34	654034	3/4"-16 To 1/2"-20 Threaded Adapter
40	654040	1.25" Hardened Flat Washer
43	654043	1.25"-12 x 2.5" Hex Head Bolt
49	***	Grease Fitting
50	***	1/4"-20 x 1.5" Hex Head Cap Screw
51	***	1/4" S.A.E. Washer
64	99937-01a	Motor Mounting Plate
65	***	Circular Level
66	***	Name Plate
67.L	99937-03a	Left Hand Chain Guard
67.R	99937-03a	Right Hand Chain Guard
70	***	120volt/60 Hz Motor
71	***	Switch Box
72	***	Power Cable
77	***	1/4"-20 x 1" Soc. Head Cap Screw
80	***	3 Amp Circuit Breaker
84	***	Hydraulic Hand-Pump



**Parts List for 60K lbf Aircraft Scale Calibrator (85-90)**

Item	Part No.	Nomenclature
85	***	Hydraulic Hose
86	***	Hydraulic Coupling
87	***	1/4"-20 x 1/4" Pan Head Screw
88	99937-00-01	5/8" to 3/4" Flex Coupling
89	***	Tie Bar Roll Pin Stop
90	99937-02	Motor Spacers

- NOTES: 1. PRESSURE AT CAPACITY IS 3,774 P.S.I. (THEORETICAL)  
2. EFFECTIVE AREA IS 15.90 SQ. INCHES  
3. WEIGHT IS 43 LBS.



**Figure 3: 60,000 lbf Capacity Hydraulic Jack with 1" Stroke (Drawing 654030)**



Parts List for 60,000 lbf Capacity Hydraulic Jack			
Item No.	DWG. No.	Quantity	Description
1	654031	1	Cylinder
2	654032	1	Ram
3	139003	1	Cylinder Gland
4	139004	1	Ram Sleeve
5		1	Hex Nut
6	139007	1	Tie Rod
7		1	Die Spring
8		1	Retaining Ring
9		1	O-Ring Seal
10	137012	1	Air Bleed Plug
11		1	Retaining Ring
12		1	O-Ring Seal
13		1	T-Ring Packing
14		1	Lubricator / Wiper
15		1	Hydraulic Coupling
16.1	654033	1	3/4-16 UNF-2A Threaded Adapter
16.2	654034	1	1/2-20 UNF to 3/4-16 UNF-2A Threaded Adapter
17		2	Mounting Screws (Not Shown)
18		1	Belleville Washer

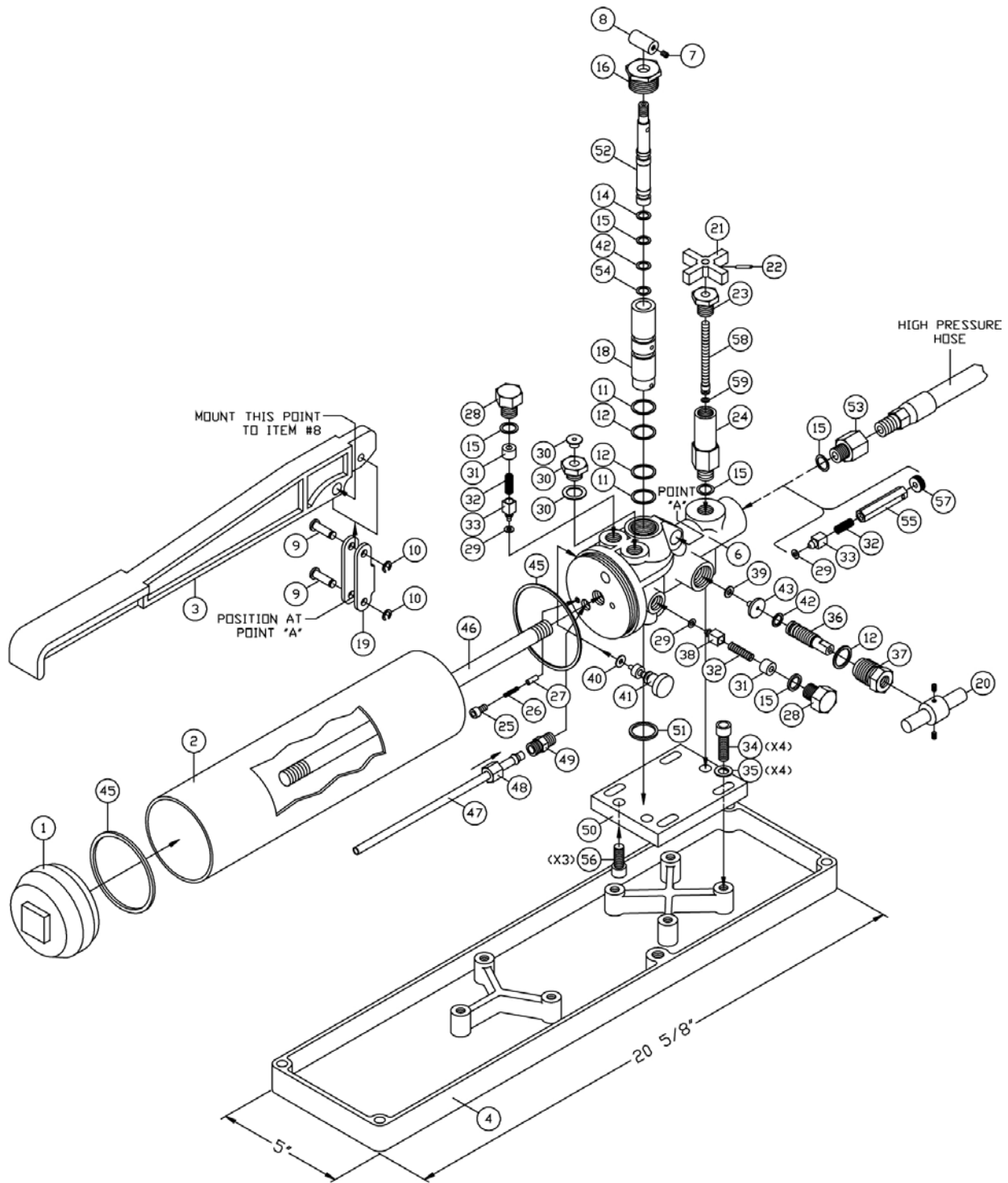


Figure 4: Hand Pump Assembly (Drawing 214000A-01)





**Parts List for Hand Pump (1-38)**

Item	Part No.	Nomenclature
1	T-575	Reservoir Cap
2	T-421	Reservoir Tube
3	T-165	Pump Handle
4	T-118	Drip Pan
6	T-402	Pump Body
7	T-160	Piston Pin Screw
8	T-161	Piston Pin Shoe
9	T-142	Clevis Pin
10	T-144	Cotter Hair Pin
11	10-90020	Cylinder Back-Up Ring (T-112)
12	10-90013	O-Ring (T-153)
14	10-90019	Piston Back-Up Ring (T-158)
15	10-90006	O-Ring
16	T-108	Cylinder Retaining Plug
17	T-145	Piston Pin
18	T-236	Cylinder Pump
19	T-143	Clevis
20	T-773	Relief Valve Handle
21	P-17-33	Star Wheel
22	P-17-32	Star Wheel Pin
23	1GT-33	Piston Cap
24	1GT-32	Piston Body
25	T-405	Screw
26	T-116	Valve Rod Spring
27	T-133	Valve Rod Detent Pin
28	T-117	Pump Body Plug
29	10-90001	O-Ring (T-152)
30	IGT-302	Fill & Vent Plug
31	T-127	Check Valve Spacer
32	CV-1-5	Check Valve Spring
33	T-147	High Pressure Valve Poppet
34	T-406	Drip Pan Attaching Screw
35	T-167	Drip Pan Attaching Washer
36	T-110	Relief Valve Stem
37	T-109	Relief Valve Body
38	T-194	Poppet Valve



**Parts List for Hand Pump (39-59)**

Item	Part No.	Nomenclature
39	10-90002	Relief Valve O-Ring (T-175)
40	10-90004	Valve Rod O-Ring (T-155)
41	T-115	Valve Rod
42	10-90005	O-Ring (T-151)
43	T-111	Relief Valve Seat
45	10-90010	Reservoir O-Ring (T-156)
46	T-130	Reservoir Stud
47	P-17-29	Inlet Tube
48	P-17-7	Inlet Tube Fitting
49	T-250	Inlet Tube Nipple
50	T-408	Body Plate
51	10-90012	Cylinder O-Ring (T-164)
52	T-106	Piston
53	CV2SS2	Special Adapter
54	10-90018	Piston Back-Up Ring (T-159)
55	T-107	Guide Rod
56	01-90003	Body Attaching Screw
57	IGT-10	Retaining Plug
58	IGT-34	Vernier Piston
59	10-90048	Seal Ring Piston

Motor capacitor is not required for this model

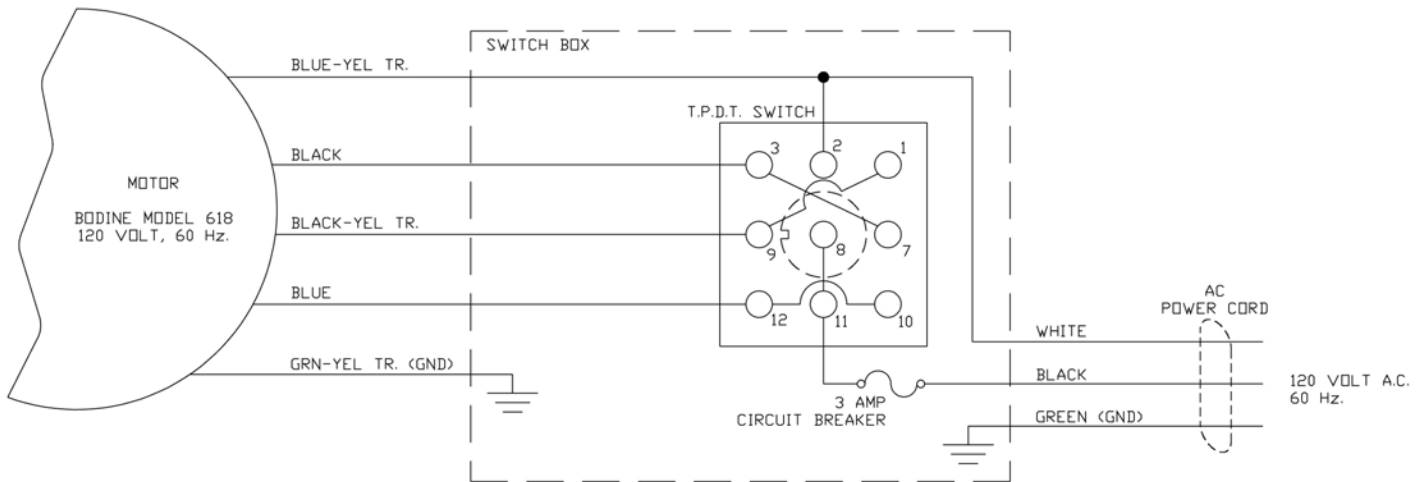
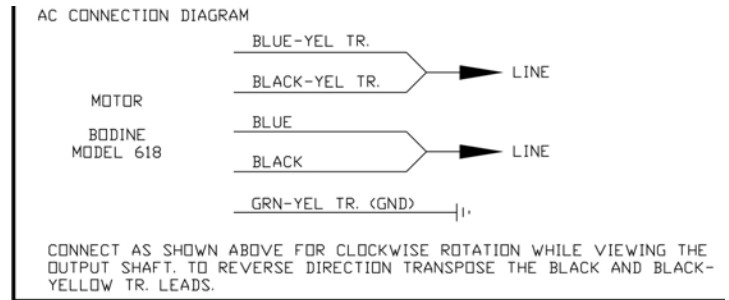


Figure 5: Wiring Diagram for Bodine Motor Model 618 (Drawing 47000-07)

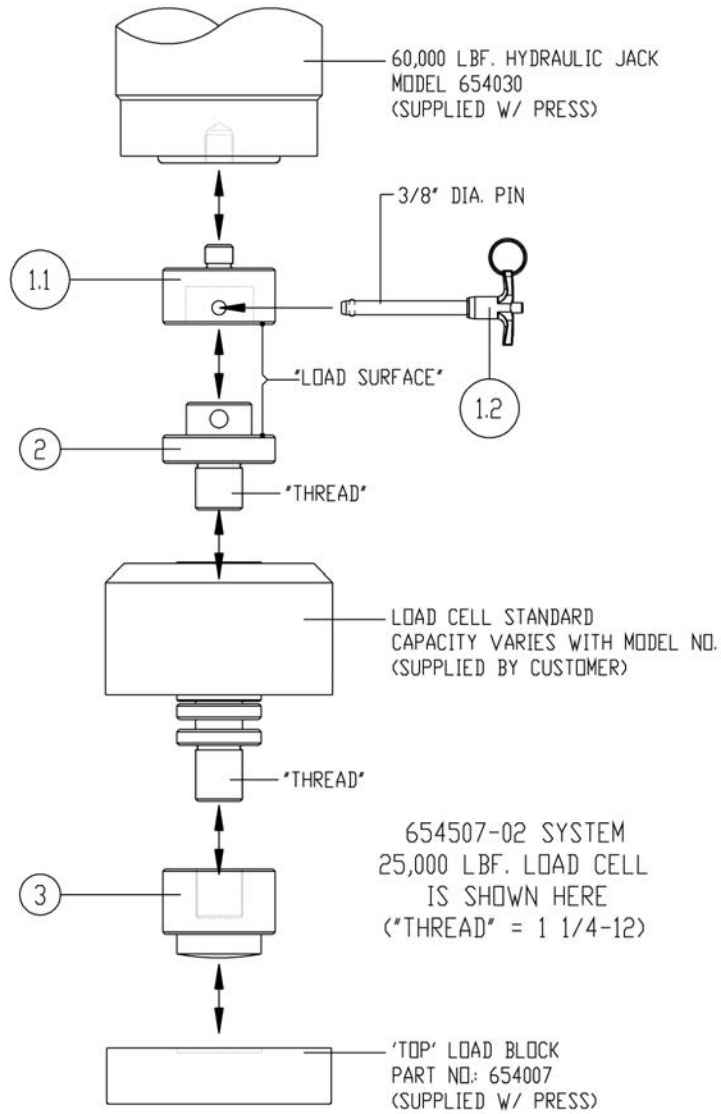


Figure 6: Compression Load Cell / Hydraulic Jack Fixture Assemblies (Drawing 654507)



## Recommended Mounting Adapters

The following parts and systems are designed around Morehouse Shear Web Load Cells. Capacities of approximately 2K lbf, 25K lbf, and 100K lbf.  
Note: The 100K load cell can only be used to 60,000 lbf capacity.

<b>Recommended Mounting Adapters</b>			
<b>Item No.</b>	<b>System No.: 654507-01</b>	<b>System No.: 654507-02</b>	<b>System No.: 654507-03</b>
	<b>Load Cell 2K lbf (5/8-18 Thread)</b>	<b>Load Cell 25K lbf (1 1/4-12 Thread)</b>	<b>Load Cell 100K lbf (1 3/4-12 Thread)</b>
1.1	654505-01	654505-01	654505-01
1.2	MH#: 600028-43, Carr Lane Pin No#: CL-6-BLPT-3.00	MH#: 600028-43, Carr Lane Pin No#: CL-6-BLPT-3.00	MH#: 600028-43, Carr Lane Pin No#: CL-6-BLPT-3.00
2	654506-01	654506-02	654506-03
3	654508-01	654508-02	654508-03

The following parts and systems are designed around HBM 'Z4A' Load Cells. Capacities of approximately 20K lbf, 100K lbf, and 500K lbf.  
Note: The load cells can only be used to 266,893.2 N. capacity.

<b>Recommended Mounting Adapters</b>			
<b>Item No.</b>	<b>System No.: 654507-04</b>	<b>System No.: 654507-05</b>	<b>System No.: 654507-06</b>
	<b>Load Cell 20K N. (M16 x 1.5 Thread)</b>	<b>Load Cell 100K N. (M30 x 2 Thread)</b>	<b>Load Cell 500K N. (M72 x 4 Thread)</b>
1.1	654505-01	654505-01	654505-02
1.2	MH#: 600028-43, Carr Lane Pin No#: CL-6-BLPT-3.00	MH#: 600028-43, Carr Lane Pin No#: CL-6-BLPT-3.00	MH#: 600028-46, Carr Lane Pin No#: CL-6-BLPT-3.50
2	654506-04	654506-05	654506-06
3	654508-04	654508-05	654508-06