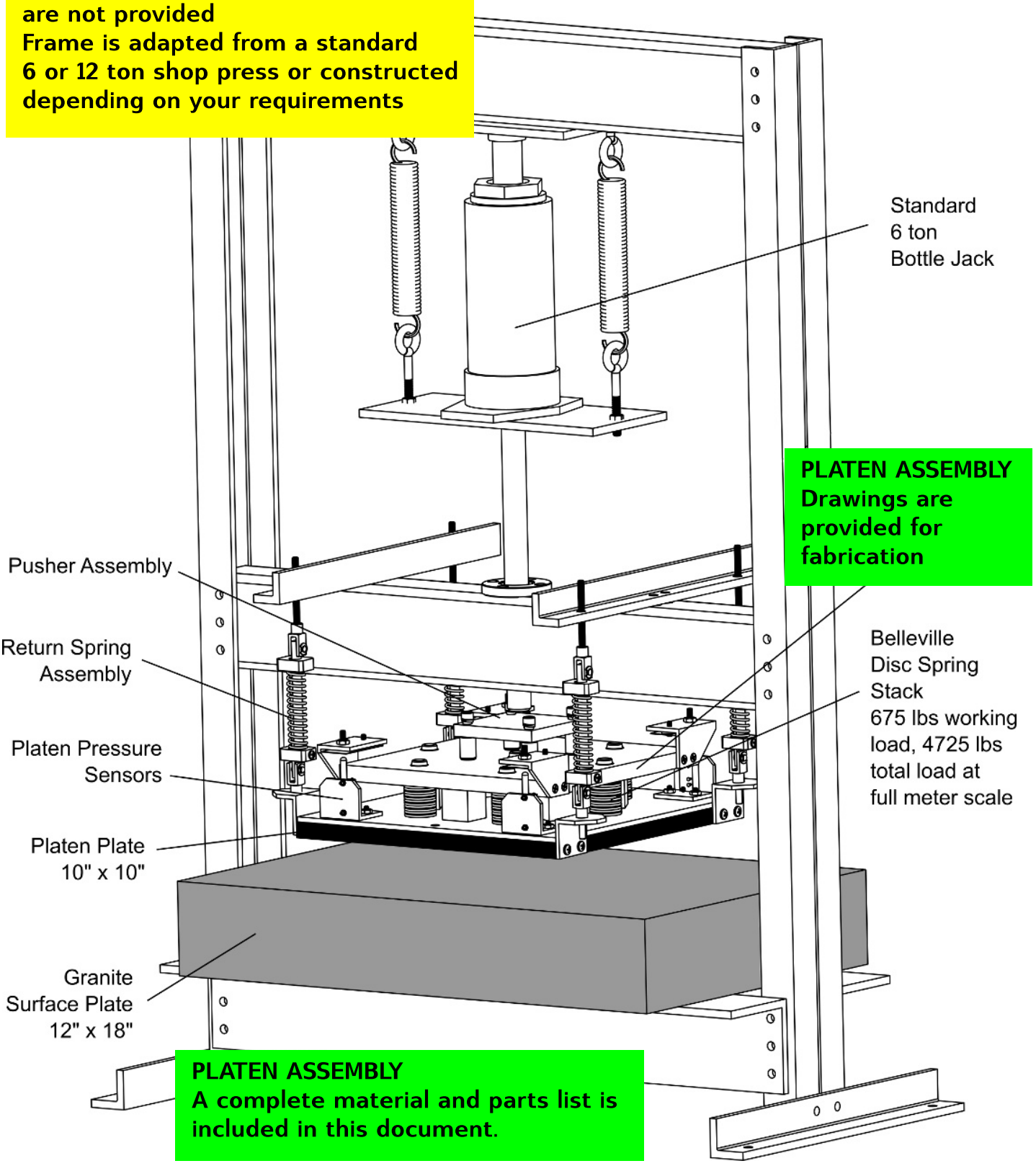
The Luminice Press 2.0

Drawings for Frame construction are not provided
Frame is adapted from a standard 6 or 12 ton shop press or constructed depending on your requirements



PLATEN ASSEMBLY
Drawings are provided for fabrication

PLATEN ASSEMBLY
A complete material and parts list is included in this document.

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The Luminice Press 2.0 Platen Assembly

October, 2018

The first version of the Luminice Press was designed and built by Thomas Parker Williams in 2013 and was used to print a number of artist books.

In late 2016 I created a new design, 2.0, to correct some of the issues that were experienced with the original press. This design has been constructed and tested and used to print my latest artist books. I am offering the design, free of charge, to any printer interested in constructing a relatively inexpensive but very versatile press.

A ZIP archive - Luminice-Press-2p0-21-fabrication-drawings.zip - provides a complete set of working drawings to manufacture the platen assembly which is the critical component in this design. It also contains an outline drawing of a typical frame with critical dimensions highlighted. The only tools required to fabricate the platen assembly are:

1. A drill press with a 1/2" capacity chuck
2. Hack saw or metal cutting chop saw and files for finishing.
3. 82 degree countersink, 6-32 and 8-32 taps and the following drills: .106, .136, .141, .171, .190, .209, .255, .390 and .562 (with a 1/2" shank.)

A list of raw material and hardware is provided in this document.

The actual frame of the press can be made from an inexpensive 6 or 12 ton shop press or fabricated from steel structural channel pieces. A strong wood frame would also work.

Granite surface plate 9" x 12" or 12" x 18" - Available from metal working tool supplier - less than $150
Jack, 6 ton bottle type - Available from auto store - less than $60
Chase, forms and inking rollers are dependent on application.

Total press weight is approx. 200 lbs depending on frame construction.

Press design description - Luminice Press 2.0

This press operates like a traditional iron hand press but with two major differences.

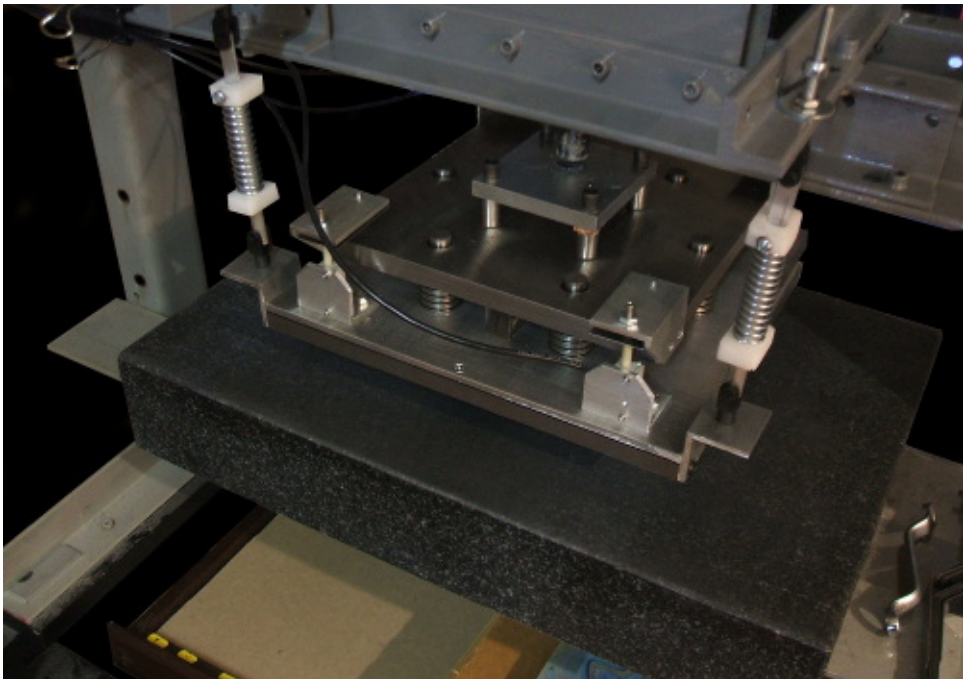
1. A central power source, a hydraulic bottle jack, applies pressure to the platen assembly. The force is not transferred directly but is applied to seven, equally spaced, stacks of Belleville disc springs through a precision ground flat plate that contacts all of the springs.
As the springs are compressed they transfer force to the precision ground steel platen plate. This allows a variable force that can be repeatedly applied.

2. The press is equipped with, a Platen Pressure Indicator Meter, an electronic pressure sensing circuit that shows the relative force being applied to the platen at all four corners. This feature helps in determining the balance of pressure over the form as well as producing a repeatable impression. See page 5.

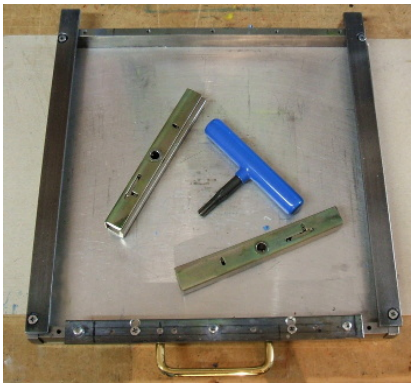
The maximum variable force for this press is determined by the working load of the seven stacks of Belleville springs. Each stack supplies 675 lbs of pressure at the working load of the springs. At full scale on the Platen Pressure Indicator meter the actual force on the platen is near 5000 lbs. This maximum force can be exceeded without damage to the press. The meter will remain at full scale as the jack pressure is increased. Steel stops on the platen assembly prevent damage to the springs.

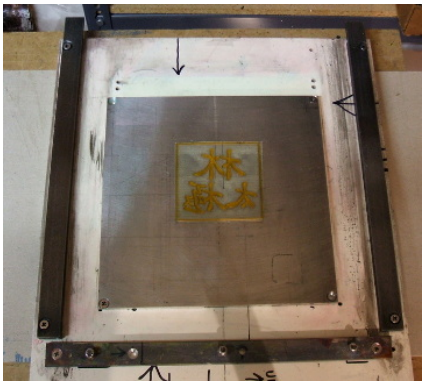
You will find that most forms will print very well without dampening the paper within the range of the Platen Pressure Indicator meter. In some cases, for example large areas of ink coverage, additional pressure may be needed. In this case you will have to judge the force.

This press, since it is not dependent on forms that require type height, can be used for all forms of relief printing. The distance from the granite surface plate that forms the printing base and the platen is adjustable. Two examples of chases are shown on the following pages.

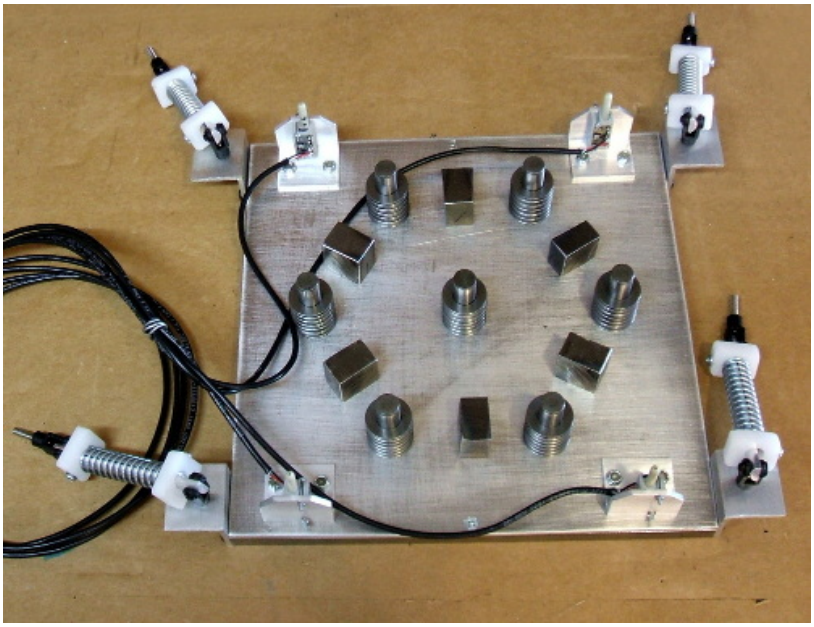


The Platen Assembly mounted on the press





Two chases with inking rails, left for metal type - right for polymer plates



Platen Assembly showing Belleville Spring Stacks, Return Spring Assemblies and Platen Pressure Indicator Sensors

Raw Material - prices 10/2018

Steel AISI 1018 Blanchard Ground Flat +/- .003 Tolerance 10 x 10 x .500 thick - Online Metals	$107.51
Steel AISI 1018 Blanchard Ground Flat +/- .003 Tolerance 8 x 8 x .500 thick - Online Metals	$81.07
Steel AISI 1018 3 x 3 x 3/8" AISI 1018 - McMaster Carr (MMC) 1388k202	$15.41
Steel 25mm x 25mm +/- .016mm (.0062) 1ft long- McMaster Carr 6775t28	$21.05
Aluminum Sheet 6061-t6 .160 thk 12 x 12 - McMaster Carr 89015k94	$32.21
Aluminum Angle 6063 1.25 x 1.25 x .125 - 4f t - McMaster Carr 88805k78	$16.76
Aluminum Half Round 6061 .188 Rad - 3ft- McMaster Carr 8242T31	$5.39
Steel Shim Stock .012 thk - 8 x 10 5 pack - McMaster Carr 9011k281	$16.18
Delrin Sheet 6 x 6 x 3/8 McMaster Carr 8573k122	$12.39

Total metal cost $307.97

DRAWING LIST

Luminice-Press-2p0-21-fabrication-drawings.zip

Platen plate assembly
- Spring Carrier Plate Assembly
  - Sensor Assembly
  - Sensor Actuator Bracket Assembly Right
  - Sensor Actuator Bracket Assembly Left
    - Platen Plate
    - Spring Carrier
    - Series Spring Stack
    - Ram Plate
    - Stop
    - Sensor Bracket
    - Sensor Actuator Bracket Right
    - Sensor Actuator Bracket Left
    - Sensor Actuator Plate
    - Reatiner Spring Angle

Pusher Plate Assembly
- Pusher Plate

Return Spring Assembly
- Return Spring Rod
- Return Spring Cap

Total Press Assembly - Outline Drawing

HARDWARE

Dowell Pin .5 x 1.75 pull out type (7) MMC 97175a381

Dowell Pin .5 x .75 pull out type (4) MMC 97175a376

Belleville disc spring .505 id 1.000 od
675 lb working load (7 packs of 12) MMC 9712k77
Cost about $80

Compression Spring 2.5 long .072 wd
Spring rate 21 ln/inch MMC 9657k421 (4)

Clevis Rod End Non-Metalic 10-32 thd MMC 2449k11 (4)

SCREWS, NUTS, WASHERS

Flat head 6-32 x 3/8 long (8) - Flat head 6-32 x 1/2 long (16)
Flat head 1/4-20 x 3/4 long (7) - Pan head 6-32 x 3/8 (2)
Pan head 6-32 x 1/2 long (8) - Pan head 8-32 x 5/8 long (8)
Pan head M 2.4 x 16mm - SET Allen 10-32 x 1 long (4)
Socket head cap 1/4-20 1 long (4) - Split Lockwasher 1/4 (4)
Flat washer .156 id .500 od (4) - SET Allen 8-32 x 5/8 long (4)
Flat washer No. 10 (4) - Nut M2.4 (8) - Nut 6-32 (8) - Nut 8-32 (4)
Nut 10-32 (12) - Threaded Stud 10-32 x 2.5 long (4)

Luminice Press 2.0 Platen Pressure Indicator Assembly

The electronic Platen Pressure Indicator Assembly accurately and repeatedly measures relative force applied to the form by the platen.

As the jack is actuated, force is applied by the ram plate to the 7 Belleville series spring stacks. When the jack is actuated until the ram plate contacts the steel stops, full compression of the series spring stacks occurs and the springs reach their working load of 675 pounds per stack.
This condition applies almost 5000 pounds of force to the 10 inch square platen or 50 pounds per square inch if you were printing a solid ink area 10 by 10 inches square.

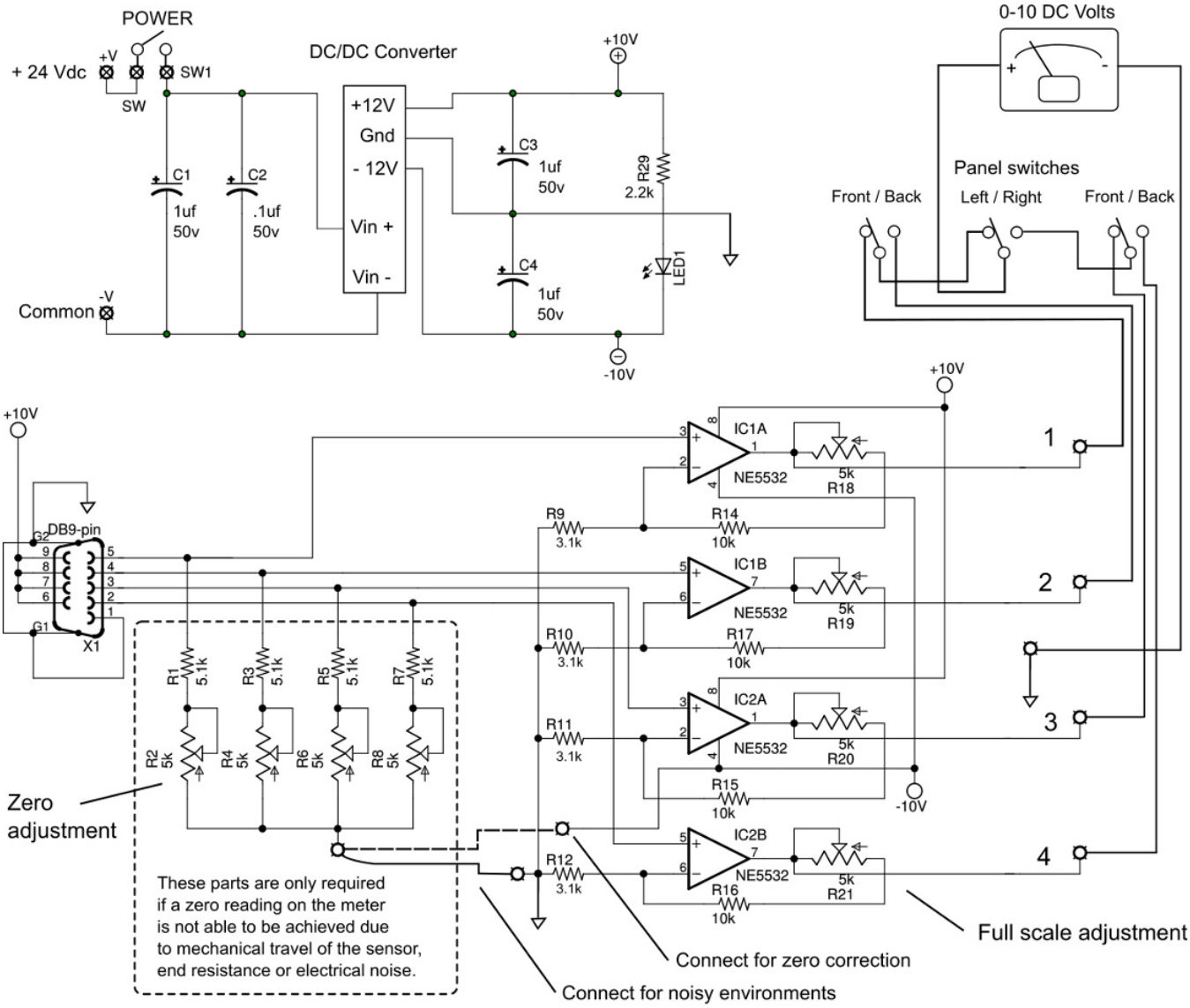
The Platen Pressure Indicator Assembly meter will show full scale or 10 volts with springs fully compressed. Since the spring compression rate is linear, each volt indicated on the 10 volt full scale meter is equivalent to 500 pounds of force applied to the paper. By testing with a make-ready sheet and reading the force indicated on the meter you can determine desired impression and proper ink coverage. You can accurately repeat this force by advancing the jack up to the correct number on the meter.

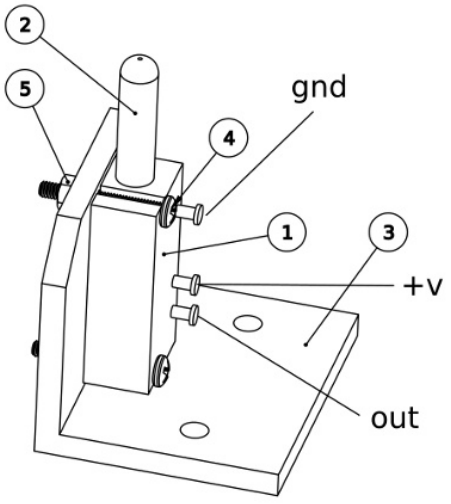
This 0 to 5000 pound range is acceptable for almost anything you will print on a 10 inch by 10 inch form, but you are not limited to this range. The entire 12000 pound force can be applied by the jack without damaging the springs because the steel stops prevent the springs from being overloaded. You are only limited by the strength of your frame. It has been determined that dry printing requires between 100 and 400 pounds per square inch on the actual inked area. With a 10 inch by 10 inch form full of metal type, the actual inked area would be much less than the size of the form. I have printed small forms with as little as 1 volt or 500 pounds on the meter and mostly solid large ink areas at 8 to 10 volts on the meter.

The 4 sensor assemblies, one on each corner, can be switched to the meter to allow balancing the impression across the form. The small Pusher Plate Assembly can be moved around on the Ram Plate to direct force toward or away areas on the form.

This press design can be used without the Platen Pressure Indicator Assembly, but you will have the same problems of gauging pressure as you do on a historic press.

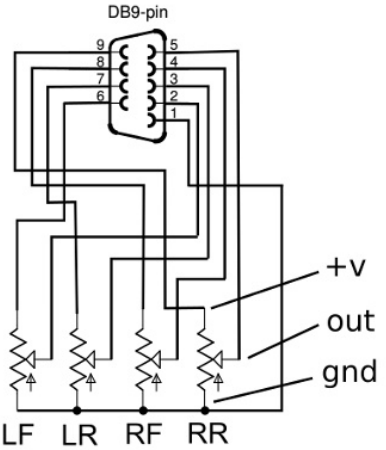
Below is an electronic schematic and PC board assembly drawing of the Platen Pressure Indicator Assembly. If you are familiar with electronic construction, you may build your own version from the schematic and parts list provided. I have a limited number of PC boards available for this purpose.





Sensor Assembly

Position Sensor
Harness



404 series spring return
linear actuators 10k
.500 travel

Luminice Press 2.0 Platen Pressure Indicator Assembly

Parts List 4 channel Sensor circuit
IA24125 - DC to DC converter (XPpower) 24Vdc in +/- 12 vdc out. Any converter in this form factor would work as long as it produces +/- 12vdc output at about 40-50ma (1)
AC/DC adaptor with voltage compatible with the DC/DC converter input (1)
Power entry receptacle (1)
Switch SPDT (3)
Switch SPST (1)
Dual Op Amp NE5532 or equivalent (2)
Trim Pot 5k 12 turn (Bourns top adjust) (4)* or (8)*
DB9 connector PC board mount and cable mount.
Capacitors - 1uf 50v tant. (3) .1uf 50v tant (1)
Resistors 5% 1/4w - 5.1K (4)* 3.1K (4) 10K (4)
Linear Motion Spring Return Position Sensor (Model 404 series) 404 R 10K L1.0 BI Technologies available from Newark Electronics no. 15m2426 (4) cost about $20 each
0-10v panel meter (1)
Shielded cable 2 conductor plus ground shield (as required)

4 Channel Sensor Circuitry Overview
The 4 Channel Sensor circuit is simply a 4 channel DC amplifier that receives a voltages from the four Linear Action Position Sensors, amplifies these voltages independently, and sends them to a series of switches connected to DC panel meter to be read as indications of platen force at each corner of the platen.

The four Linear Action Position Sensors are calibrated in the following way. First, with the platen completely assembled with no jack force applied adjust the set screws on the Sensor Actuator Brackets so that each sensor reads 0 on the meter. Next remove the Ram Plate, with the Sensor Actuator Brackets attached, and remove the Spring Stacks. Replace the Ram Plate so it rest on the stops, This condition simulates full working load spring compression.

The actual spring compression distance at full working load is .108. This displacement uses about 1/5 of the electrical travel of the Linear Action Position Sensors. Typical voltage output of the sensors at full compression is about 2.4 volts. Potentiometers R18 through R21 are used to bring the meter reading up to full scale (10 volts) for each channel. After this calibration, replace the spring stacks and the press is ready for use.

Zero adjustment issues. If the sensors will not allow a zero adjustment when the Actuator brackets are adjusted due to mechanical placement or end resistance in the sensor a negative voltage can be applied to the sensor output through the resistor/ potentiometer chains R1 through R8. In this case connect pad LSP8 to pad LSP11 or -12V and adjust the four potentiometers to zero the meters. In extremely electrically noisy locations it may be necessary to tie terminate the inputs of the sensor circuitry. In this case tie pad LSP8 to ground or pad LSP10 and adjust all potentiometers for zero and full scale.

This is a brief overview of the operation of this circuitry. It is a simple and straightforward design and construction is not critical. My first version was hand wired. The Linear Actuation Position Sensor has a life of 5 million actuations and is intended for rapid movement. In this application it should work for the life of the press.
If you have any questions you may contact me at tpwilliams89@gmail.com. Please put Luminice Press in the subject line. There is a short video of the press in operation at my website
http://thomasparkerwilliams.com/luminice_press_vid.htm