Understanding Hydraulic cylinders ram pressure

How to convert this pressure to Tons.
How to program a 'Programmable Digital Gauge' to produce a value in 'Tons' rather than a PSI value.

A hydraulic pump produces pressure. This pressure is measured in pounds per square inch (PSI).
If a pump produces 100 Lbs/square inch then a Ram with a Bore <u>surface area</u> equal to 1 inch will produce 100 Lbs of force.

If we use the same pump on a cylinder with a Bore <u>surface area</u> of 2 inches then the cylinder will produce 200 lbs of force. And so on.

Force = Pump Pressure × Surface Area
Where F = Force applied by the Ram
Where PSI is the pressure applied by the Pump
Where A = surface area of the cylinders bore

The Math:
How to find the surface area of a ram.
We measure the selected Cylinders Bore. This Bore dimension is also the Diameter. ½ of the Diameter is the Radius.

The formula for finding the selected Cylinders surface area is:
$A = (\pi r^2)$
Where A = surface area of the cylinders Bore
Where π = Pi is known as an empirical number equal to 3.14
Where r = Radius

Example:
Let's say we have a cylinder with a bore of 5 inches (this is also the diameter of the cylinder).
Lets say the pump will produce 5000 psi
Once we find the radius, we have everything we need to know to calculate the force applied to the ram
We know that ½ the diameter is the Radius. A 5 inch diameter Bore, divided by 2, is a 2.5 inch radius.
Let's plug this into our formula.
Solve for Surface Area.
$A = (\pi r^2)$
$A = (3.14 \times 2.5^2)$
$A = 3.14 \times 6.25$
A = 19.625 inches

Solve for Force.
Force=Pump Pressure × Surface Area
F = 5000PSI × 19.625 inches
F = 98,125lbs of force generated by the Ram
Thus, a pump with a maximum pressure of 5000lbs applied to a 5 inch diameter bore will produce 98,125lbs of force to the ram.

Solve for Tons:

To convert pounds of force to tons. We know there are 2000lbs per ton. We simply divide Pounds of force by 2000. In the example above, we have 98,125lbs of force. We divide this by 2000. Tons = 49.0625 or 49 Tons.

To calculate the multiplier for your Programmable Digital Gauge to read out in Tons:

Let's say the gauge we choose has a maximum reading of 5000.

We know the maximum force applied by or cylinder is 49 tons.

Divide the maximum force applied by our cylinder by the maximum number our gauge will read at full scale.

49÷5000 = .0098

Enter the .0098 number into the custom multiplier screen on the digital gauge and your gauge will now read accurately in terms of tons.