# Installation and Operations Manual

## RD301M1A

The **RD301** is a Force readout instrument. It uses two pressure transducers to measure the pressure of the piston and rod sides of a hydraulic cylinder. The pressures are multiplied by the piston area (square inches) to calculate the actual force. The difference between the rod force and the piston force determined the Net Force.

The transducer inputs are designed to receive a 4-20ma pressure signal. Pressure transducers have an operating pressure range. The hydraulic cylinder has a piston diameter and a rod diameter. The installer will need to setup the **RD301** with specific values for the following;

> a. Bore (piston) diameter (2.000" to 14.000")  0.005" increments
> b. Rod diameter  (1.000" to 7.000")  0.005" increments
> c. PSI transducer range  (500 to 20,000 psi)  50 lb. increments

By convention the bore (piston) diameter is referred to as the **A** port and the rod diameter is referred to as the **b** port. The installer needs to select the desired mathematical model;

> 1. Net force = A-b        (pushing)
> 2. Net force = b-A        (pulling)
> 3. Net force = A only    (single ended)

On the face plate of the **RD301** are 3 rows of displays. Each row has 5-digits which are 7-segment displays with a decimal point. Note; during normal operation only the top 2 rows are used. The top row reads out the calculated **NET FORCE**. The middle row shows the highest or **PEAK** force.  The bottom row is only used during the setup mode.

At the bottom are 3 momentary push-buttons. Labeled  **FCN** (function), **INC** (increase) and **DEC** (decrease). In addition to the right of the **DEC** push-button is a label **CLEAR**. Used to clear the Peak Force.

To program (set-up) the **RD301** requires using the (3) push-button switches located on the front panel. The specific key presses are described in the following sections.



> \> **FCN** key is used like a shift key
>    it provides an alternate action.

> \> **INC** key to move up thru the numbered
>    menu names also it increases a data value.

> \> **DEC** key to move down thru the numbered
>    menu names also it decreases a data value.

When the **RD301** is first powered up the front panel display will show some basic information for about 3-4 seconds, then it automatically jumps to the normal **Run** display.

The S/N or serial number is on the top display
The software Version number is on the middle display
The software Check-sum number is on the bottom display

Opening screen at power-up

**S/N**  Serial number

**Ver.**  Software version number

**CS**  Software Check-sum  (4-digit hexadecimal)
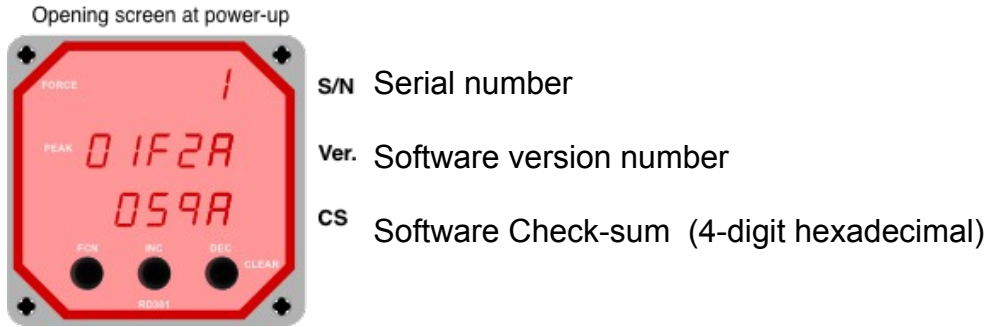
After the 3-4 second delay the screen jumps to the normal **Run** display
The top line shows the current calculated Force
The middle line shows the last recorded Peak Force
Pressing the **DEC** key (**CLEAR**) will make the Peak value equal to the current value

Normal Run screen

**Actual**
**500 lbs.**

**Actual**
**700 lbs.**

(none)
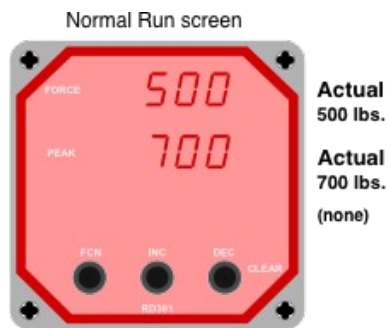
To begin the programming process starting at the **Run** display, above.
Press-n-hold the **INC** + **DEC** push-buttons for ~4 seconds.
The resulting display will briefly show:

[ **#1**] Enter Passcode

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**Prog.**

-----

Press-hold
~ 4 sec.
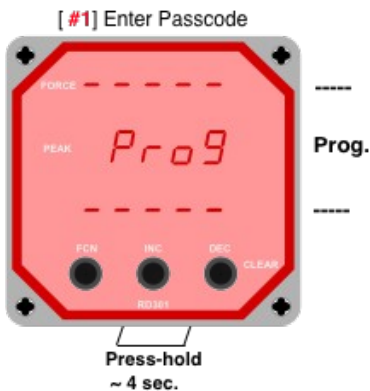
The general approach to programming is to move to a given screen you want then view or change the data viewed.

Press-n-hold the **FCN** key and then tap the **INC** or **DEC** key to move thru the list of program screens. When completed scroll back to the **Run** screen, releasing the keys will then display the current calculated Force with the last Peak value.

Releasing the **INC** & **DEC** keys will move you to the first view only screen:



Top line shows the screen number

Middle line shows the first 3-digits of the full software version name.

Bottom line shows the following 5-digits of the software version name.

Putting them together;  **RD301F2AB**

Optionally you can press the just **INC** key to view the Check-sum and the serial number. Note; this same information was shown briefly at Power Up.

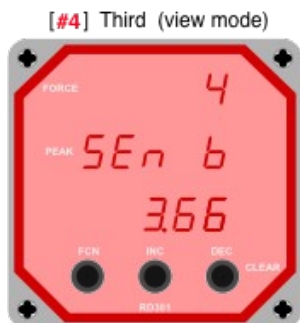Press **FCN** key followed by the **INC** key moves you to the second view only screen



Displays the milliamp output for PSI sensor on Port A

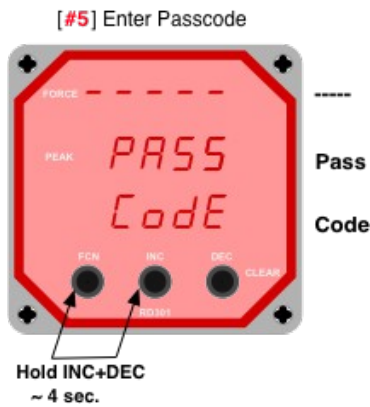Press **FCN** key followed by the **INC** key moves you to the third view only screen



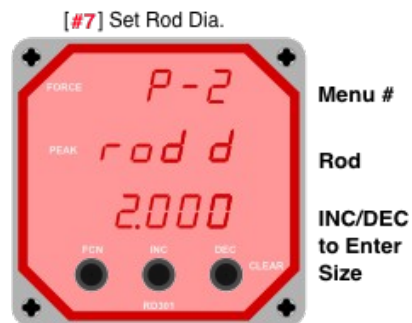Displays the milliamp output for PSI sensor on Port b

Note: This system is not using a sensor on the Rod side of the piston. No signal is typically the value of ~3.66ma.

To go further into the programmable screens a second passcode is entered.
Here you will press-n-hold both the **FCN** + **INC** keys for ~4 seconds.
The word PASS will appear and releasing the keys will show **PASS** and **CODE.**

[**#5**] Enter Passcode

FORCE — — — — —    -----

PEAK   *PASS*    **Pass**

*CodE*    **Code**
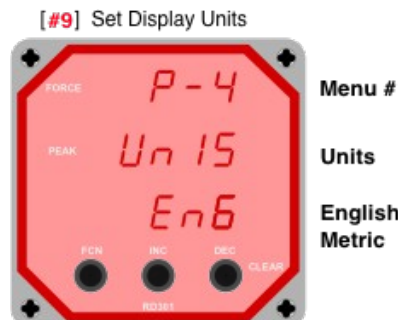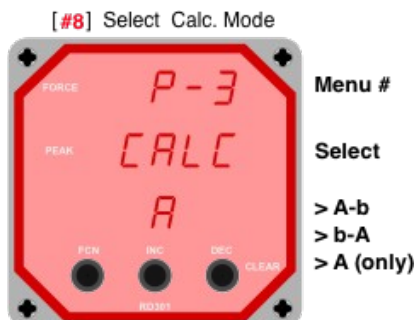
FCN   INC   DEC   CLEAR

Hold INC+DEC
~ 4 sec.

Next press-n-hold the **FCN** key, push the **INC** or **DEC** keys to scroll thru the all (14) program screens. Then use the **INC/DEC** keys to increment or decrement the data value (bottom line)
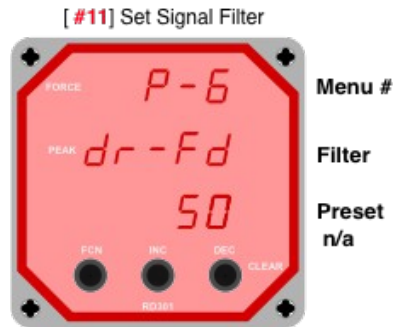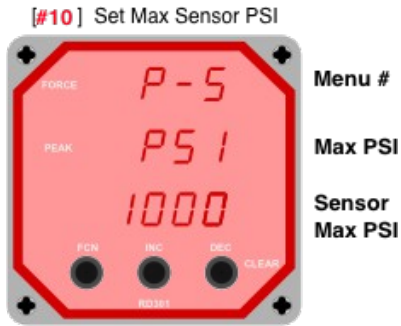
Define the hydraulic cylinder parameters, Bore diameter and the Rod diameter

[**#6**] Set Bore Dia.

FORCE   *P-1*    **Menu #**

PEAK   *borE*    **Bore**

*8.000*    **INC/DEC to Enter Size**

FCN   INC   DEC   CLEAR

[**#7**] Set Rod Dia.

FORCE   *P-2*    **Menu #**

PEAK   *rod d*    **Rod**

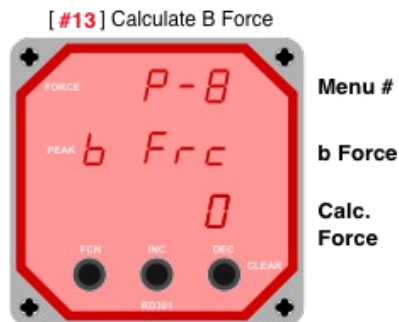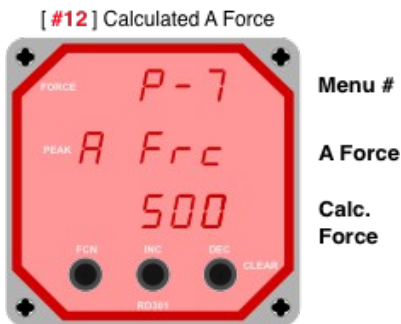*2.000*    **INC/DEC to Enter Size**

FCN   INC   DEC   CLEAR

These next two menus set how the readout operates. Pick the calculation mode
and then the display Units, English or Metric.

[**#8**] Select Calc. Mode

FORCE   *P-3*    **Menu #**

PEAK   *CALC*    **Select**

*A*    > A-b
> b-A
> A (only)

FCN   INC   DEC   CLEAR

[**#9**] Set Display Units

FORCE   *P-4*    **Menu #**

PEAK   *Un 1S*    **Units**
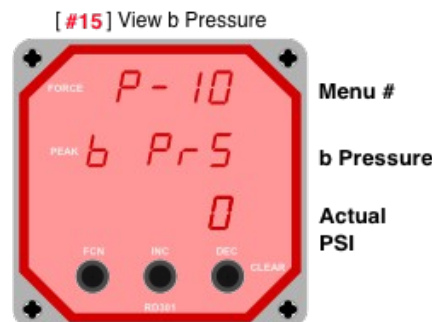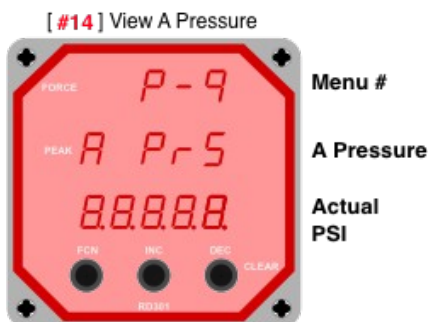
*En6*    **English Metric**

FCN   INC   DEC   CLEAR

Use these next menus to set the Max PSI for the sensor used. The signal filter has been set by the factory and usually does not need to be changed.

[#10] Set Max Sensor PSI

P-5 — Menu #
PSI — Max PSI
1000 — Sensor Max PSI

[#11] Set Signal Filter

P-6 — Menu #
dr-Fd — Filter
50 — Preset n/a

The next two menus are view only. Used to verify the Force of the A and b sides of the piston.

[#12] Calculated A Force

P-7 — Menu #
A Frc — A Force
500 — Calc. Force

[#13] Calculate B Force

P-8 — Menu #
b Frc — b Force
0 — Calc. Force

The next two menus are view only. Used to verify the PSI of the A and b sides of the piston.

[#14] View A Pressure

P-9 — Menu #
A PrS — A Pressure
8.8.8.8.8. — Actual PSI

[#15] View b Pressure

P-10 — Menu #
b PrS — b Pressure
0 — Actual PSI

Note; this system does not use a Rod side sensor, thus a value of zero

There are two levels of calibration for each sensor. The first level is done in hardware and set at the factory. The second level is by software. These next (4) menus allow you to modify the calibration. The RD301 uses the standard slope and offset method. Slope is labeled **GAn** (gain) and Offset is labeled **OFS**. These have been set at the factory to be zero.

[ **#16** ] Set A Gain

| | |
|---|---|
| P - 11 | Menu # |
| A GAn | A Gain |
| 0 | Preset (zero) |

[ **#17** ] Set A Offset

| | |
|---|---|
| P - 12 | Menu # |
| A OFS | A Offset |
| 0 | Preset (zero) |

[ **#18** ] Set b Gain

| | |
|---|---|
| P - 13 | Menu # |
| b GAn | b Gain |
| 0 | Preset (zero) |

[ **#19** ] Set b Offset

| | |
|---|---|
| P - 14 | Menu # |
| b OFS | b Offset |
| 0 | Preset (zero) |
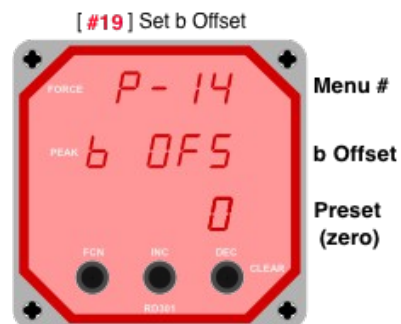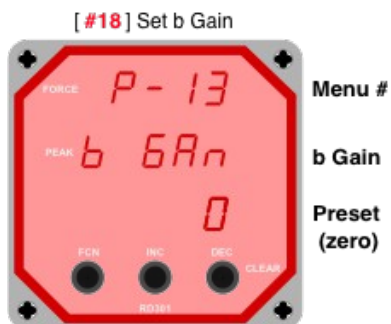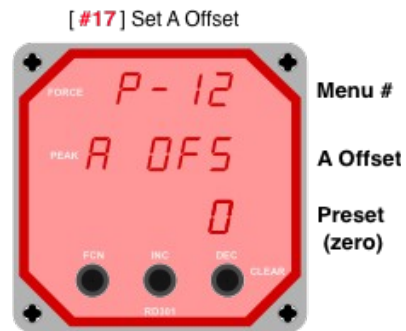
This concludes the programming menus. Use **FCN** and **DEC** to scroll back to the **Run** menu. Releasing the keys will exit the programming mode put the **RD301** back into the normal operation mode.