

# DORAN MODEL 4100 DIGITAL CHECKWEIGH SCALE

## OPERATING AND SERVICE MANUAL

Manual Revision: 2.1  
Software Revision: 3.0  
MAN001 REV. 2.1



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## I. INTRODUCTION

Congratulations! You have chosen the most advanced Digital Checkweigh Scale on the market today. The Doran Model 4100 utilizes the latest in microprocessor technology to achieve scale performance not previously possible. The 4100 is a highly accurate instrument designed to withstand the rigors of the typical industrial environment. The enclosure is all stainless steel and all joints are sealed with gaskets to prevent damage from moisture. The Doran 4100 is offered in many capacities from 2 to 1000 lbs.

Be sure to read this entire manual in order to get the most out of your Doran 4100. The scale is backed by a two year warranty. Should you encounter difficulty, contact your scale dealer or call Doran Scales direct at 630/879-1200 for assistance. Do not return a scale without factory authorization.

## II. INSTALLATION AND SET-UP

Carefully unpack the Doran 4100. Retain the shipping carton and all the packing material in case reshipment is required. Choose a suitable location for the scale. This should be a stable, flat surface, out of the way of possible damage due to bumping or vibration from nearby heavy motors or equipment. Be sure that the surface is large enough to allow all six of the rubber feet to be touching a flat surface.

The 4100 requires 115 VAC, 50/60 Hz power (220 VAC optional). Locate the scale near a suitable power outlet. Be sure that the AC power is not too noisy-this can occur if large inductive loads, like motors or solenoids, are on the same power line. The 4100 uses an internal power line filter to reduce normal line transients, but it cannot limit severe fluctuations. Noise producing devices should be suppressed to minimize their effect.

Level the scale by adjusting the six feet until the bubble in the bubble level under the platter is within the inner circle. Do this by adjusting the four corner feet first. After a level condition is achieved, adjust the inner two feet so that they firmly contact the surface, but not so much as to throw the scale out of level. Test for a stable condition by trying to tilt and rock the scale base backward and forward and side-to-side. Adjust the feet for final levelness and stability.

## III. SCALE OPERATION

Your Doran 4100 Digital Checkweigh Scale is programed to read out in either lb, oz, kg or lb and oz. It also has the capability of setting the over/under tolerance from 1 to 31 scale divisions. Before plugging in the 4100, these functions must be programed on the internal DIP switch. (If you change this programming after scale installation, be sure to unplug the scale first to avoid any shock hazard.) The rear access panel must be removed to gain access to the DIP switch. Remove the 24 screws holding the panel on. Be sure to retain all hardware and washers so that the 4100 can be properly

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re-sealed. This will expose the DIP switch—refer to the programming chart at the back of this manual for the location of the program switches.

Select the desired weight display units via the program DIP switch. You may display in lb, oz, kg or lb & oz depending on the position of SW3-1 and SW3-2 DIP switches. Refer to the DIP Switch Programming Chart at the back of the manual for settings. The selected weight unit will be shown on the front panel LED light bar and the correct decimal point will be on.

Tolerance is the number of scale divisions allowed before the "ACCEPT" LED will go out. Tolerance applies to weight above and below the target weight (see Figure 1). Weights above the target plus tolerance are indicated by the "OVER" LED. Weights below target minus tolerance are indicated by the "UNDER" LED.

The target weight is the desired ideal weight of the package or commodity being weighed. The target weight is set by placing a known correct weight on the empty platter and pressing the ZERO pushbutton on top of the scale tower—this will result in a 0000 weight display. Also, the "ACCEPT" LED will turn on.

When the weight is increased or decreased past the tolerance weight, the "OVER" or "UNDER" LED will turn on. The "ACCEPT" LED is green, "OVER" is yellow, and "UNDER" is red. The tolerance applies only to scale divisions, whether in lb, oz or kg.

|                |        |                              |
|----------------|--------|------------------------------|
| Weight Display |        |                              |
|                | OVER   |                              |
| +0.005 lb      |        | Target Weight plus Tolerance |
|                | ACCEPT |                              |
| 0.000 lb       |        | Target Weight                |
|                | ACCEPT |                              |
| -0.005 lb      |        | Target Weight plus Tolerance |
|                | UNDER  |                              |

Figure 1

Tolerance is set by the DIP switches, SW3-4, 5, 6, 7, and 8. They are coded in binary fashion, so SW3-8 is X1, SW3-7 is X2, SW3-6 is X4, SW3-5 is X8, and SW3-4 is X16. Refer to the programming chart at the back of this manual for proper DIP switch settings for a desired tolerance.

For example, if your scale is calibrated as follows:

5 x .001 lb  
80 x .02 oz

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2.27 kg x 0.5 g

A tolerance setting of + 5 divisions is made by setting SW3-4 open, SW3-5 open, SW3-6 closed, SW3-7 open and SW3-8 closed, as shown in the programming chart. This setting will result in actual tolerance values as follows:

± 0.005 lb  
± 0.10 oz  
± 2.5 g

Weight below zero is indicated by a minus sign, except in lb & oz when the "NEG" LED lights to indicate negative weight. Overload is indicated by the display blanking (no numbers displayed). Positive overload is set for 105% of rated capacity. These overload indications are in accordance with the latest NIST Handbook 44 requirements. The entire Doran 4100 Series of Stainless Steel Over & Under Scales are approved for use in USDA inspected food processing plants. An approval letter from USDA can be provided upon request.

The Doran 4100 incorporates a unique zero tracking technique. It is only active when the scale has been stable for 10 seconds or more. This is determined by timing the "ACCEPT" LED-if it has been on for 10 seconds, indicating no scale use, zero tracking is automatically activated. Zero tracking is released whenever the "OVER" or "UNDER" LED comes on, indicating scale activity. The 4100 tracks to + 3 internal counts of weight. There are 20,000 internal counts in all 4100 versions.

There is an internal 1.0 Amp, 3AG, fast blo fuse inside the scale. It is accessed by removing the tower back panel.

After setting the weight display units and the tolerance as described above, activate the Doran 4100 by plugging in the power cord to a suitable 115 VAC, 50/60 Hz outlet. The 4100 can be set up for 220 VAC operation at no additional charge, if specified at the time of order. When plugged in, the weight display will read "888888" for about five seconds to test the displays. The display will then read "00000", and the "ACCEPT" LED will come on and the selected weight display unit light will illuminate. The 4100 is ready to use!

## IV. MAINTENANCE

Your Doran 4100 is built to stand to stand up to years of service when certain precautions are observed. These are as follows:

1. DON'T shock load or drop the scale-there are 5 built in overload stops, but these cannot prevent damage caused by abuse or misuse.
2. DON'T pick up the scale by the platform or supporting spider-this can cause permanent damage to the load cell.

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3. DON'T spray high pressure or steam directly onto the load cell-this would cause irreparable damage.
4. DON'T scratch the shatter proof LEXAN<sup>R</sup> faceplate.
5. DON'T leave the access panel open or ajar-be sure to torque the 24 bolts securely.
6. DO select one weight unit to be displayed and the desired tolerance on the internal program DIP switch.
7. DO check calibration at least semi-annually. Use calibrated weights and follow the calibration procedure below or call your scale dealer for assistance.
8. DO train all personnel in proper scale use-remember that the 4100 is a precision instrument and should be treated as such.

Each capacity, from 2 to 1000 pounds, of the 4100 is programmed differently. A custom program chip (EPROM) is used for each capacity. The 4100 must be returned to the factory should a capacity change be required, since the microprocessor must be reprogrammed and the A/D Converter must be recalibrated.

Refer to the attached Calibration Instructions to calibrate your Doran 4100 Checkweigh Scale. We recommend that this be done semi-annually.

If it becomes necessary to return your scale to us for repair, call first to get return authorization. Many problems can be handled on the phone, thereby avoiding costly down time for repair.

Be sure to pack the scale with at least 3 inches of protective packing material all around if your original packing box is not available. Our shipping address is:

DORAN SCALES, INC.  
1315 Paramount Parkway  
Batavia, IL 60510

PHONE: 630/879-1200  
FAX: 630/879-0073

### V. CALIBRATION PROCEDURE FOR DORAN MODEL 4100 SERIES SCALES

Each 4100 is equipped with a 'ZERO' adjust pot (VR2), a SPAN dip switch (SW2), and a fine span adjust pot (VR1).

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1. Locate the scale on a firm, flat surface for calibration, away from wind drafts or excessive vibration. Level the scale using the bubble level in the scale base.
2. Remove the tower back panel. Remove the 24 gasketed screws to allow removal of the back panel.
3. Plug in the power and allow the scale to warm up and stabilize for 10 to 15 minutes.

CAUTION: Lethal voltages are exposed, use extreme care!!

4. SPAN coarse calibration DIP switches are called SW2. SPAN fine calibration potentiometer is located in the lower part of the board and is labeled VR1.

ZERO calibration is adjusted by potentiometer VR2.

5. The SPAN DIP switches are arranged in a binary increasing manner; DIP-1 has the least effect and DIP-8 has the most effect. Each step up has double the effect of the preceding step.

Maximum span is attained when all eight switches are closed. Minimum span is with all switches open.

The factory preset for a 2:1 load cell ratio is SW2-8 and SW2-6 closed.

6. Initial ZERO calibration:
  - a. Remove weight from the platform.
  - b. Open SW3-3. The display will show the internal counts of the scale.
  - c. Preset SW2-8 and SW2-6 to on (closed).
  - d. Adjust VR2 until the reading on the display is -900 counts.
7. SPAN calibration:
  - a. Place 1/2 capacity on the platform.
  - b. Adjust dip switches SW2 until the internal reading is as close to +9100 as the switches will allow. If the reading is too high, then open switches for less gain. If the reading is too low, then close switches for more gain.
  - c. Remove the weight and check the ZERO reading. Readjust VR2 until display reads -900 counts.
  - d. Place full capacity on the scale and adjust VR1 for a reading of +19100 counts.
  - e. Remove weight and recheck ZERO reading.
  - f. Close SW3-3.

8. Final Span Calibration:

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- a. Install backplate onto tower and allow the scale to warm up and stabilize for one hour.
- b. Remove the calibration access cover.
- c. Place full capacity on the scale.
- d. Adjust VR1 (bottom pot) for exact scale reading.
- e. Remove the weight and zero the scale by pressing the ZERO switch.
- f. Place weights on scale and check reading. Readjust if necessary.

### 9. Final ZERO calibration:

- a. Remove weight from the scale and zero by pressing the ZERO switch.
- b. Place weight on the scale that is 105% of capacity.
- c. Scale display should blank out between 103% and 105% indicating an overload condition.
- d. Adjust VR2 (top pot) so that the scale display blanks out between 103% and 105%.
- e. Reinstall the calibration cover.

10. If you cannot obtain proper scale calibration, the scale or load cell may be defective. Contact the Doran Scales factory for further assistance in this case.

11. For 4100-RSS Remote Indicators, simply open the 4100-RSS door and proceed with the calibration.

## VI. DIP SWITCH PROGRAMMING: Dip Switch SW3.

### 1. Weight display units:

| Display Units | SW3-1 | SW3-2 |
|---------------|-------|-------|
| LB            | 0     | 0     |
| KG            | 1     | 0     |
| OZ            | 0     | 1     |
| LB & OZ       | 1     | 1     |

0 = open or off 1 = closed or on

### 2. Over and Under Tolerances:

| ± 0 div. | 0 | 0 | 0 | 0 | 0 |
|----------|---|---|---|---|---|
| ± 1 div. | 0 | 0 | 0 | 0 | 1 |
| ± 2 div. | 0 | 0 | 0 | 1 | 0 |



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|           |   |   |   |   |   |
|-----------|---|---|---|---|---|
| ± 3 div.  | 0 | 0 | 0 | 1 | 1 |
| ± 4 div.  | 0 | 0 | 1 | 0 | 0 |
| ± 5 div.  | 0 | 0 | 1 | 0 | 1 |
| ± 6 div.  | 0 | 0 | 1 | 1 | 0 |
| ± 7 div.  | 0 | 0 | 1 | 1 | 1 |
| ± 8 div.  | 0 | 1 | 0 | 0 | 0 |
| ± 9 div.  | 0 | 1 | 0 | 0 | 1 |
| ± 10 div. | 0 | 1 | 0 | 1 | 0 |
| ± 11 div. | 0 | 1 | 0 | 1 | 1 |
| ± 12 div. | 0 | 1 | 1 | 0 | 0 |
| ± 13 div. | 0 | 1 | 1 | 0 | 1 |
| ± 14 div. | 0 | 1 | 1 | 1 | 0 |
| ± 15 div. | 0 | 1 | 1 | 1 | 1 |
| ± 16 div. | 1 | 0 | 0 | 0 | 0 |
| ± 17 div. | 1 | 0 | 0 | 0 | 1 |
| ± 18 div. | 1 | 0 | 0 | 1 | 0 |
| ± 19 div. | 1 | 0 | 0 | 1 | 1 |
| ± 20 div. | 1 | 0 | 1 | 0 | 0 |
| ± 21 div. | 1 | 0 | 1 | 0 | 1 |
| ± 22 div. | 1 | 0 | 1 | 1 | 0 |
| ± 23 div. | 1 | 0 | 1 | 1 | 1 |
| ± 24 div. | 1 | 1 | 0 | 0 | 0 |
| ± 25 div. | 1 | 1 | 0 | 0 | 1 |
| ± 26 div. | 1 | 1 | 0 | 1 | 0 |
| ± 27 div. | 1 | 1 | 0 | 1 | 1 |
| ± 28 div. | 1 | 1 | 1 | 0 | 0 |
| ± 29 div. | 1 | 1 | 1 | 0 | 1 |
| ± 30 div. | 1 | 1 | 1 | 1 | 0 |
| ± 31 div. | 1 | 1 | 1 | 1 | 1 |

0 = open or off 1 = closed or on

3. Internal count display: SW3-3

| SW3-3  | Function               |
|--------|------------------------|
| Open   | Internal Count Display |
| Closed | Normal Display         |

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## VII. Super Precision Version Features:

Special features for 2, 5, and 10 lb super precision capacities:

1. Current software revision is Revision 3.1.

|           |          |          |          |
|-----------|----------|----------|----------|
| TITLE:    | M41ARB   | M41BRB   | M41CRB   |
| CAPACITY: | 2 lb     | 5 lb     | 10 lb    |
| REVISION: | Rev. 3.1 | Rev. 3.1 | Rev. 3.1 |
| DATE:     | 1/96     | 11/96    | 11/96    |

2. These capacities have the capability to select whether the auto zero maintenance (AZM) is active or not.

This is determined by the setting of dip switch SW3-4.

| SW3-4 Setting | Function    |
|---------------|-------------|
| Open          | AZM is off. |
| Closed        | AZM is on.  |

The AZM bandwidth at zero is  $\pm 2.5$  scale divisions.

3. 2,5, and 10 lb super precision capacities do not have the LBS-OZ display.
4. Tolerance switch ( SW3, 5-8 ) settings is from 0 to 15 divisions.

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### VII. Model 4100 Series General Specifications:

#### 1. Model Selection Chart:

| Model No.    | Platform  | Capacity (lb)               |
|--------------|-----------|-----------------------------|
| 4100         | 10" x 10" | 5,10,30                     |
| 4102         | 8" X 10"  | 2                           |
| 4100/12s     | 12" x 12" | 10,30,50,100                |
| DSP4100      | 12" x 16" | 10,30,50,100,150,200        |
| DSP4100/18s  | 18" x 18" | 50,100,150,200,300          |
| DSP4100/1824 | 18" x 24" | 50,100,150,200,300,500,1000 |
| DSP4100/2424 | 24" X 24" | 50,100,150,200,300,500,1000 |

#### 2. Capacity and Resolution Chart:

| Capacity (lb) | Standard | Precision | Super Precision |
|---------------|----------|-----------|-----------------|
| 2             | 0.001    | 0.0005    | 0.0002          |
| 5             | 0.002    | 0.001     | 0.0005          |
| 10            | 0.005    | 0.002     | 0.001           |
| 30            | 0.01     | 0.005     | 0.002*          |
| 50            | 0.02     | 0.01      | 0.005           |
| 100           | 0.05     | 0.02      | 0.01            |
| 300           | 0.1      | 0.05      | 0.02**          |
| 500           | 0.2      | 0.1       | 0.05            |
| 1000          | 0.5      | 0.2       | 0.1             |

\* Capacity reduced to 20 lb. \*\* Capacity reduced to 200 lb.

3. HOUSING: 304 Stainless Steel Washdown Design for platform, base, platter and tower.
4. DISPLAY: 4 digit, red LED, 0.43" high OVER, UNDER, ACCEPT LED's Weight units (lb, kg, oz, lb & oz are user selectable)
5. TOLERANCE: Over & Under user selectable from  $\pm 1$  to  $\pm 15$  scale divisions
6. CONTROLS: One button for "ZERO" to zero the scale at the desired target weight.

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7. ACCURACY: Designed to meet or exceed NIST Handbook 44 requirements
8. OPERATING TEMP.: + 14 degrees F to + 104 degrees F
9. POWER: 115 VAC, 50/60 Hz. 220 VAC optional.
10. MECHANICAL:
- |    |                 |                            |
|----|-----------------|----------------------------|
| a. | 4100, 10" x 10" | 18 1/2"H x 10"W x 14"D     |
| b. | 4100, 12" x 12" | 18 1/2"H x 12"W x 17 "D    |
| c. | DSP4100         | 19"H x 16 1/2"W x 17"D     |
| d. | DSP4100/18S     | 24 1/2"H x 18"W x 24 1/2"D |
| e. | DSP4100/1824    | 24 1/2"H x 24"W x 24 1/2"D |
| f. | DSP4100/2424    | 24 1/2"H x 24"W x 30 1/2"D |

### VIII. OPTIONS FOR THE MODEL 4100

Type 1: Tower Extension: 6" or 12" higher. 6" extension is standard on Models DSP4100/18S, DSP4100/1824, and DSP4100/2424.

Type 2: External Rotary Tolerance Switch: 16 position switch mounted on the rear panel to provide external control of Over/Under tolerance.

Type 3: External Weight Display Selector: Pushbutton switch mounted next to ZERO switch to change of weight display units externally.

Type 3A: Print request pushbutton: Option Type 6 required.

Type 4A: Remote Tower Platform: Used to separate tower and base. Tower is mounted on a footed base and can stand alone.

Type 4B: Remote Tower-Wall Mount: Used to separate tower and base. Tower has flanged bracket for wall mounting.

Type 5: Solid State Relay Output: Provides 1.0 amp/115VAC normally off SSR output coincident with OVER, UNDER, and ACCEPT indicators.

Type 6: Serial Data Output: RS232 or 20 ma current loop

Type 7: Parallel BCD Data output

Type 11: Brine %-Pump Software: Allows for calculation of % added weight for brine pumping operations.

Type 13: Audible Alarms: Audible beepers for OVER and UNDER.

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Type 15: Keyboard Data Entry: Sealed neoprene keypad for entry of Tare, 8 Setpoints, and Over and Under tolerance values.

Type 16: Remote Tare/Print Switch: Remote switch for ZERO or Print request.

Type 18: Accumulator: Accumulate weight data. Recall subtotal and total weight.

Type 20: Mounting Feet: Mounting feet for 4100RSS to table mounting of 4100RSS.

Type 21: Grading Option: Provides capability for eight weight grade ranges. Values are entered via sealed keypad.

Type 23: Stainless Steel Load Cell: Potted Stainless load cell for harsh environments. For 4100, 410012S, and DSP4100 only.

Type 24: Stainless Pushbutton Cover: A stainless steel cover to replace neoprene rubber boot for maximum durability.

Type 25: 230 VAC Operation: Special transformer and fuse for 230 VAC, 50/60 HZ operation.

Type 26: Heat Resistant Platter: Insulates platter and load cell from excessive heat (1200° F) encountered in glass manufacturing.

Contact Doran for more information and pricing and availability of options.