

# SR Scales®

by **SR** Instruments, Inc.

**SR411i Series**



**Patient Floor Scale**

## Operating and Service Manual

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## PACKING CHECKLIST – Model SR411i Patent Floor Scale

| √ | DESCRIPTION                           | QUANTITY |
|---|---------------------------------------|----------|
|   | SCALE BASE                            | 1 ea.    |
|   | SCALE DISPLAY                         | 1 ea.    |
|   | MOUNTING HARDWARE                     | 1 ea.    |
|   | AC WALL POWER ADAPTER (UL RECOGNIZED) | 1 ea.    |
|   | CERTIFICATE OF CALIBRATION            | 1 ea.    |
|   | MANUAL                                | 1 ea.    |

| √ | OPTIONAL WALL MOUNT HEIGHT ROD   | QUANTITY |
|---|--|----------|
|   | SR8591- WALL MOUNT HEIGHT ROD<br>(STANDARD WITH SR411i-400)<br>SHIPS IN SEPARATE PACKAGE | 1 ea.    |

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## ASSEMBLY

**STEP 1:** Unpack the scale system and check parts against the **PACKING CHECKLIST**. If there are any missing or damaged parts, call the Service Hotline at: 1-800-654-6360.

**STEP 2:** Determine installation location for scale and display, keeping in mind the display cable length is six (6) feet and the display power cord length is four (4) feet. The display may lay flat on a desk or end table. If desired, provisions for wall mount have been incorporated, and can be accomplished in the manner described below.

- A. The display should be installed by qualified personnel. The mounting hardware provided will cover most wall applications.
- B. Determine a position on the wall comfortable to the user. Mark the location of the two (2) mounting holes on the wall (holes are spaced 2.5” on center apart) using the template provided on page 15.
- C. Drill the two (2) pilot holes, no larger than ¼” diameter in the locations marked. Install the two (2) self-drilling screw anchors.
- D. Install the two (2) #8 x 1” flat head screws supplied, leaving approximately ¼” projecting from the wall.

**STEP 3:** Place SR411i scale system on a flat, hard floor surface. Ensure all four corners of scale are in contact with the floor and scale does not rock.

**NOTE:** Scale should not be placed on carpet or uneven floor surfaces as this may interfere with scale accuracy.

**STEP 4:** Connect the display cable to the scale, then connect the power cable to the display and plug power adapter into wall.

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## SYSTEM DESCRIPTION and INTENDED USE

### SYSTEM DESCRIPTION

The SR411i Series Patient Floor Scale employs the latest in microprocessor and load cell technology to provide accurate and repeatable weight data. Four (4) identically matched transducers are strategically placed to ensure an accurate representation of the patient's weight.

The patient's weight is displayed on a LCD screen. With a push of a button, weight data may be viewed in either pounds or kilograms.

### INTENDED USE



The SR411i Series Patient Floor Scale is a unique lightweight, low profile stand-on scale system for weighing ambulatory patients. The wide platform is designed to easily accommodate larger patients.

The Model SR411i Series Patient Floor Scale is a preferred means of gathering patient weight data of patients weighing up to 880 pounds (400 kilograms).

The Maximum Capacity of Model SR411i -200 Patient Floor Scale is 440 pounds (200 kilograms).

The Maximum Capacity of Model SR411i -300 Patient Floor Scale is 660 pounds (300 kilograms).

The Maximum Capacity of Model SR411i -400 Patient Floor Scale is 880 pounds (400 kilograms).

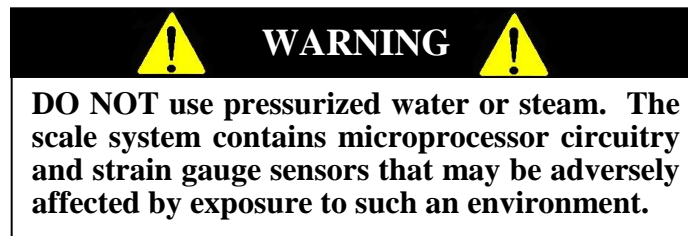
|   |
|---|
|  <b>WARNING</b>               |
| <b>DO NOT EXCEED MAXIMUM WEIGHT LIMIT</b><br><b>MODEL SR411i-200: 440 LB / 200 KG MAXIMUM</b><br><b>MODEL SR411i-300: 660 LB / 300 KG MAXIMUM</b><br><b>MODEL SR411i-400: 880 LB / 400 KG MAXIMUM</b> |

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## MAINTENANCE and CLEANING

Exercise caution when cleaning the display window as it is made of clear polyester and can be scratched by abrasive cleaners. Mild soap and water is recommended for general cleaning and disinfecting.



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## STORAGE and TRANSPORTATION

To maintain proper operation of this instrument, storage and transport conditions should not vary outside the following conditions: Relative Humidity 0% to 85%, Ambient Temperature 14°F to 122°F (-10°C to +50°C).

## SPECIFICATIONS

|                                   |   |
|-----------------------------------|---|
| <b>MAXIMUM WEIGHT CAPACITY</b>    | Model SR411i-200: 440 lb (200 kg)<br>Model SR411i-300: 660 lb (300 kg)<br>Model SR411i-400: 880 lb (400 kg)   |
| <b>DIMENSIONS</b>                 | Platform: 26.4 in x 18.3 in (67 cm x 47 cm)   |
| <b>DISPLAY TYPE</b>               | 1" Digit LCD  |
| <b>DISPLAY RESOLUTION</b>         | Model SR411i-200: +/- 0.2 lb (0.1 kg)<br>Model SR411i-300: +/- 0.1 lb (0.1 kg)<br>Model SR411i-400: +/- 0.1 lb (0.1 kg)   |
| <b>ACCURACY</b>                   | 0.1% +/- 1 digit of displayed resolution for calibrated range   |
| <b>AUTO ZERO</b>                  | One button operation  |
| <b>AUTO WEIGH</b>                 | Scale will automatically turn on and lock in on a stable weight.  |
| <b>AUTO POWER DOWN</b>            | After 1 minute  |
| <b>AVERAGING</b>                  | Automatic digital filter  |
| <b>POWER SUPPLY</b>               | AC Wall Power Supply (UL Recognized)  |
| <b>CALIBRATION</b>                | Calibration is traceable to NIST standards  |
| <b>OPERATING CONDITIONS</b>       | Normal operating conditions for this product:<br>Ambient Temperature Range: 68°F to 85°F (20°C to 30°C) Relative Humidity Range: 0% to 85%<br>Avoid exposure to high-pressure water or steam. |
| <b>TRANSPORTATION AND STORAGE</b> | Storage conditions should not vary outside the following conditions: Relative Humidity 0% to 85%, Ambient Temperature 14°F to 122°F (-10°C to +50°C)  |

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## BUTTON FUNCTIONS

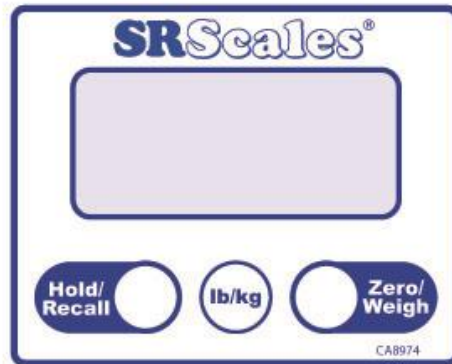


Figure 1: SR411i Button Label

### ZERO / WEIGH

To zero scale press and hold the “Zero/Weigh” button until the display reads “ZERO”. Release the “Zero/Weigh” button to display “0.0”. When the patient is in position on the scale, the weight will be displayed.

**NOTE:** When system is zeroed, the Hold/Recall memory is erased.

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### LB / KG MODE BUTTON

Press “lb/kg” button to switch weight display between pounds or kilograms.

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### HOLD/RECALL MODE BUTTON

Scale will automatically lock a stable weight that is greater than five pounds and “MEM” will be displayed in the upper left of the display. To manually hold a weight reading at any time during the weighing process, press the “Hold/Recall” button. To recall a weight in memory, press the “Hold/Recall” button after the display has powered down or with less than five pounds on the scale.

**NOTE:** When the scale is off, pressing any of the buttons will turn on the scale. Press and hold the “Zero/Weigh” button to erase the last held weight from memory.

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## BASIC SYSTEM OPERATION

### PATIENT WEIGHING

**STEP 1:** Place scale on hard smooth floor surface to ensure accurate data.

**NOTE:** Avoid carpeting or uneven flooring surfaces.

**STEP 2:** The scale will automatically turn on when weight is detected and lock in on a stable weight.

Alternatively, press the “**Zero/Weigh**” button and wait for the display to indicate “ZERO”. Release the “**Zero/Weigh**” button and the display will read “**0.0**”. Position the patient on the platform. Weight will be displayed in a few seconds. A stable weight will automatically be stored in memory.

**STEP 3:** To manually hold a weight reading at any time during the weighing process, press the “**Hold/Recall**” button.

**NOTE:** When the scale is off, pressing any of the buttons will turn on the scale. Press and hold the “**Zero/Weigh**” button to erase the last held weight from memory. Only the last stabilized weight will be held in memory.

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### SCREEN DISPLAYED SYMBOLS



Scale is zeroed and stabilized

**MEM**

Weight is locked in memory (next stable weight will override memory).



Applied weight load has stabilized



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## THEORY OF OPERATION

SR Instruments patient weighing systems are digital scales. Strain-gauge force cells convert the force of an applied weight into an analog signal. This signal is amplified by an operational amplifier and converted to a digital signal by analog to digital converter. The digital signal is transferred to a micro-controller where it is filtered, converted to appropriate units, and displayed on a liquid crystal display.

Strain-gauge force cells each contain four strain gauges mounted in a full Whetstone-bridge configuration. These bridges convert the physical movement of the force cell, due to the applied mass on the system, into minute changes in electrical resistance. These changes in resistance produce a voltage difference across the Whetstone-bridge, which is amplified by the operational amplifier.

The output of the operational amplifier is digitized by the analog to digital converter. The converter integrates the analog signal onto the integrating capacitor over a short interval. The integrating capacitor is then discharged at a rate proportional to the reference voltage applied to the converter. The residual voltage on the integrating capacitor is then multiplied by a factor and again discharged at a rate proportional to the reference voltage. The residual voltage from this discharge is again multiplied by a factor and again discharged. The time taken to discharge the capacitor is proportional to the voltage from the operational amplifier, which is proportional to the applied load on the force cells. The time is stored as a binary number in the analog to digital converter and is transferred to the micro-controller when the conversion is complete.

The micro-controller averages and filters the digital output of the analog to digital converter, subtracts the value saved during the system zero operation and scales the filtered output, then displays the result on the liquid crystal display. The micro-controller performs a rolling average of data for continuous weigh and averages the data before locking in on the reading.

## CALIBRATION



### IMPORTANT



**CALIBRATION CHECK** Qualified service personnel only should perform this procedure. Load cells have no user serviceable components and should not be tampered with for any reason. Re-calibration is generally not required, but should be verified periodically to ensure accuracy. The recommendation for calibration check is at least once every 12 months, or as individual maintenance policy requires.



### CAUTION



The integrated circuits and semiconductors on the printed circuit boards may be damaged by electrostatic discharge (ESD). Be sure to use proper handling precautions at all times.

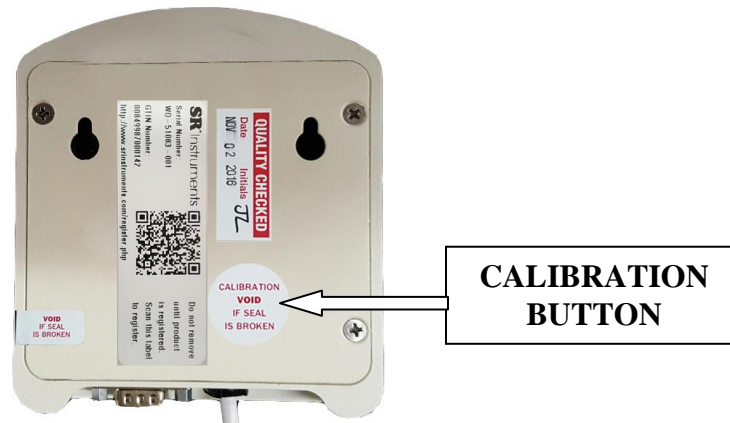


Figure 2: Calibration Button

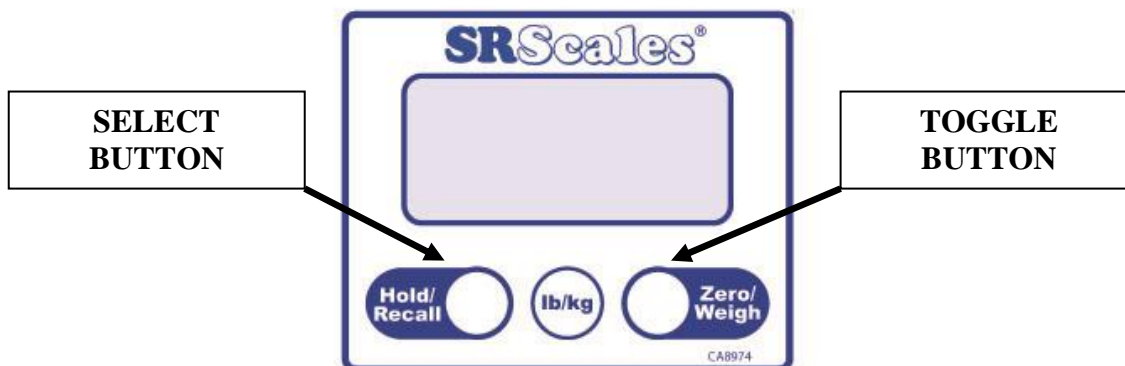


Figure 3: Select and Toggle Button

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## INITIAL SYSTEM SETUP

When initially set up, calibration is factory set and re-calibration is not needed. The Local Gravitational Acceleration may have to be re-set for the current geographical location for improved accuracy. Automatic Shut Off is shipped with a factory default of 60 seconds. If a longer period of time (up to 900 seconds) is desired, then it will need to be re-set. Both procedures are found below.

## ACCESS SYSTEM SETUP

To access all settings below, break the Calibration Seal. Press the calibration button (Figure 2) using the pointed-end of a pen or similar item. CAL mode is now active.

Refer to Figure 3. The Right Button allows you to toggle through the menus without saving any parameters. The Left Button permits a menu item to be selected or a parameter saved.

**NOTE:** Ensure that nothing is in contact with the scale system during this procedure. Remove hands from the system when noting the displayed calibration results.

## CAL MENU

- “**data**” Displays saved calibration and model information.
- “**unit**” Set the available units; lb only, kg only, or selection of lb or kg with mode button.
- “**sec**” Set Auto Power Down Timer between 15 and 900 seconds.
- “**grav**” Set Gravitational Acceleration in  $m/s^2$
- “**Full**” Applied calibrated mass at full scale.
- “**Half**” Used with three point calibration curve. Applied calibrated mass at a second point between zero and full scale, usually at half.
- “**zero**” No calibrated weight applied.
- “**2 pt**” Two-point calibration curve, zero and full scale.
- “**3 pt**” Three-point calibration curve; zero, half and full scale.
- “**save**” Saves the calibration data.
- “**quit**” Quits without saving the calibration data.

### Enter CAL Mode

To enter the CAL mode, press the calibration button (Figure 2) using the pointed-end of a pen or similar item. Toggle through the menu with Right Button (Figure 3). Select or Save data with the Left Button (Figure 3).

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### Set Auto Power Down Timer (Optional)

- a) Select the Auto Power Down Timer from the CAL menu by pressing the Left Button when the display shows “sec”.
- b) The display will show four digits <0123>.
- c) Set the desired time in seconds by selecting the first digit and toggle through the digits using the Right Button until desired value is shown. Press the Left Button and continue the same with the remaining digits. The value cannot be less than 15 nor greater than 900.
- d) Press the Left Button to save or Right Button to toggle to "quit". Select "quit" by pressing the Left Button to quit without saving changes.
- e) Press the Left Button again to save and the display will show “SAV’d”.

### Set the Gravitational Acceleration (Optional)

**NOTE:** Setting the local gravitational acceleration, “gLOC”, will not affect the calibration. The local gravitational acceleration, “gLOC”, will become the calibrated gravitational acceleration, “gCAL” only when it is recalibrated.

- a) Select the Gravitational Acceleration from the CAL menu by pressing the Left Button when the display shows “grav”.
- b) The display will show only the four digits to the right of the decimal point <9.XXXX>.
- c) Set the local gravitational acceleration in  $m/s^2$  by selecting the first digit and toggle through the digits using the Right Button until desired value is shown. Press the Left Button and continue the same with the remaining digits.
- d) Press the Left Button to save or Right Button to toggle to "quit". Select "quit" by pressing the Left Button to quit without saving changes.
- e) Press the Left Button again to save and the display will show “SAV’d”.

### Set the Full-Scale value

- a) Select the Full-Scale from the CAL menu by pressing the Left Button when the display shows “FULL”.
- b) The display will show only the five digits <XXXX.X> with the thousand-place flashing <1>. Select past to the next digit by pressing the Left Button.
- c) Once in the hundreds-place, set the full scale value (maximum load) by toggling using the Right Button through the digits until desired value is shown. Select the desired value by pressing the Left Button and continue the same with the remaining digits.
- d) Press the Left Button to save or Right Button to toggle to "quit". Select "quit" by pressing the Left Button to quit without saving changes.
- e) Press the Left Button again to save and the display will show “SAV’d”.

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### Set the Half-Scale value

**NOTE:** The Half-Scale value is used only with the three-point calibration. It is a value between zero and the Full Scale values. It is usually close to half of the Full Scale value.

- a) Select the Half-Scale from the CAL menu by pressing the Left Button when the display shows “**HALF**”.
- b) The display will show only the five digits <XXXX.X> with the thousand-place flashing <1>. Select past to the next digit by pressing the Left Button.
- c) Once in the hundreds-place, set the half scale value by toggling using the Right Button through the digits until desired value is shown. Select the desired value by pressing the Left Button and continue the same with the remaining digits.
- d) Press the Left Button to save or Right Button to toggle to "quit". Select "quit" by pressing the Left Button to quit without saving changes.
- e) Press the Left Button again to save and the display will show “**SAV’d**”.

### Calibrate using the Three-Point Calibration Curve; zero, half scale, and full scale.

**NOTE:** The scale can also be calibrated with a Two-point slope “**2Pt**”, although it will not be as accurate.

- a) Select Three-point calibration curve by pressing the Left Button when the display shows “**3Pt**”
- b) Apply no load and ensure stability. Zero the scale by pressing the Left Button when the display shows “**zero**”.
- c) Display will show “**HALF**”, apply the predetermined half scale value on the scale and press the Left Button.
- d) Display will show “**FULL**”, apply the predetermined full scale value on the scale and press the Left Button.
- e) Display will show “**SAVE**”, press the Left Button to save, display will show “**SAV’d**” or Right Button to toggle to "quit". Select "quit" by pressing the Left Button to quit without saving changes.
- f) Save the parameter changes while in the CAL mode by pressing the Left Button when the display shows “**SAVE**”. To exit the CAL mode without saving the changes press the Left Button when the display shows “**quit**”.
- g) Press the calibration button (Figure 2) using the pointed-end of a pen or similar item.
- h) Place a new calibration seal over the calibration button access hole.

**NOTE:** Calibrated weight displayed should be within tolerance as per Model being calibrated (see “**SPECIFICATIONS**” page 6).

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## TROUBLESHOOTING

| SYMPTOM  | REASON/CORRECTIVE ACTION  |
|--|---|
| Weight reading is much lower than expected.  | Check that the platform is clean underneath, stand on each of the four corners to see if one corner is not weighing correctly.  |
| System fails to perform correctly  | Check power supply connections.<br>Make sure patient is clear of any obstacles and that nothing, including the caregiver, is touching the patient or scale.<br>Set scale on smooth, hard floor surface. |
| <b>For additional information or assistance, telephone our Service Hotline: 1-800-654-6360<br/>or e-mail: <a href="mailto:sri@srinstruments.com">sri@srinstruments.com</a></b> |   |

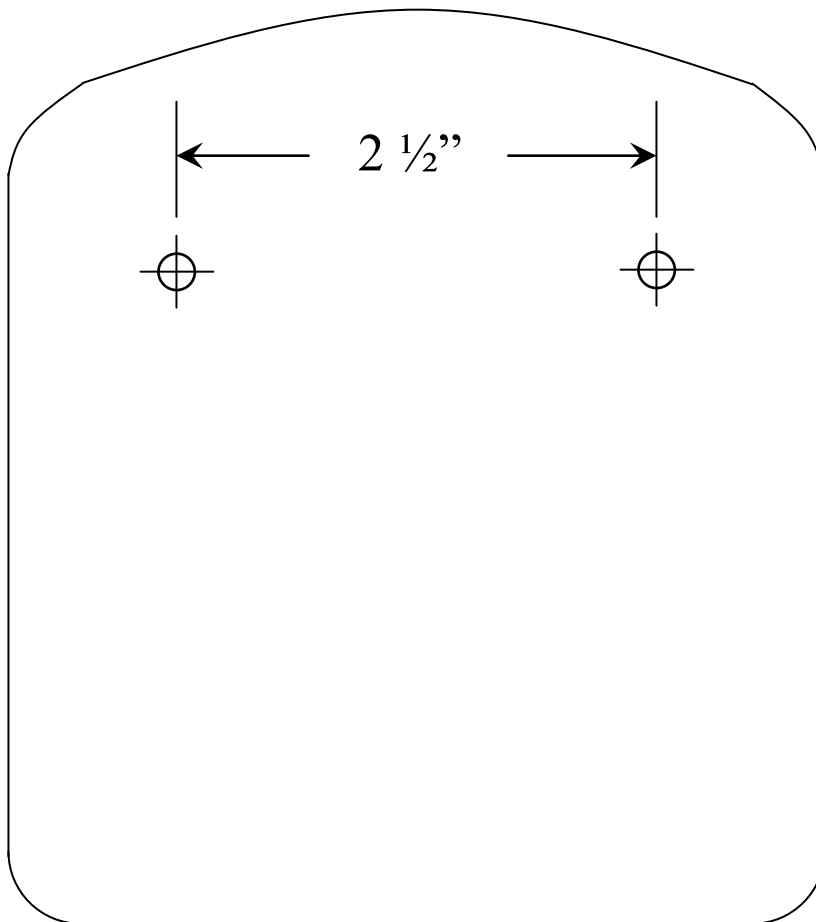
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## DISPLAY MOUNTING TEMPLATE

Determine installation location for scale and display, keeping in mind the display cable length is six (6) feet and the display power cord length is four (4) feet. The display may lay flat on a desk or end table. If desired, provisions for wall mount have been incorporated, and can be accomplished in the manner described below.

- A. The display should be installed by qualified personnel. The mounting hardware provided will cover most wall applications.
- B. Determine a position on the wall comfortable to the user. Mark the location of the two (2) mounting holes on the wall (holes are spaced 2.5" on center apart) using the template provide below.
- C. Drill the two (2) pilot holes, no larger than 1/4" diameter in the locations marked. Install the two (2) self-drilling screw anchors.
- D. Install the two (2) #8 x 1" flat head screws supplied, leaving approximately 1/4" projecting from the wall.





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