

**SP6R Level Controller**

# **Operation Manual**



**SJE**  
**Rhombus**

[www.sjerrhombus.com](http://www.sjerrhombus.com)

# SP6R LEVEL CONTROLLER INTRODUCTION



SJE-Rhombus®, an industry leader in water and wastewater pump controls, introduces the SP6R Level Controller. This simple, easy-to-use microprocessor-based controller monitors any 4-20 mA signal. It has six programmable relay outputs that can be used for control and alarm. The transducer input zero and span are fully configurable. A simulation mode allows the user to test the set-points and relay operation.

The **standard SP6R** level controller kit contains (see **Figure 2** on **page 5** of this manual):

- one SP6R level controller
- two mounting brackets for panel mounting
- a three pin power supply connector block (P1)
- a five pin transducer connector block (P2)
- a 18 pin relay output connector block (P3)

The **SP6R-N4X** version includes a controller mounted within a NEMA 4X enclosure with a pre-wired power supply and terminal blocks.

## **WARNINGS**

Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Failure to follow these precautions could result in serious injury or death. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electrical Code, ANSI/NFPA 70 so as to prevent moisture from entering or accumulating within the controller housing. **See additional specifications on page 14 of this manual.**

### **⚠ WARNING**



#### **ELECTRICAL SHOCK HAZARD**

Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical codes.

- Do not install in area with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.
- Do not place in water or let water leak onto the controller.
- Do not allow debris to fall inside the unit during installation.
- Double-check all the wiring before turning on the power supply.
- Do not touch live wires.
- Stay as far as possible from high-voltage cables and power equipment.
- Leave a minimum of 10 mm space for ventilation between the top and bottom edges of the controller and enclosure walls.

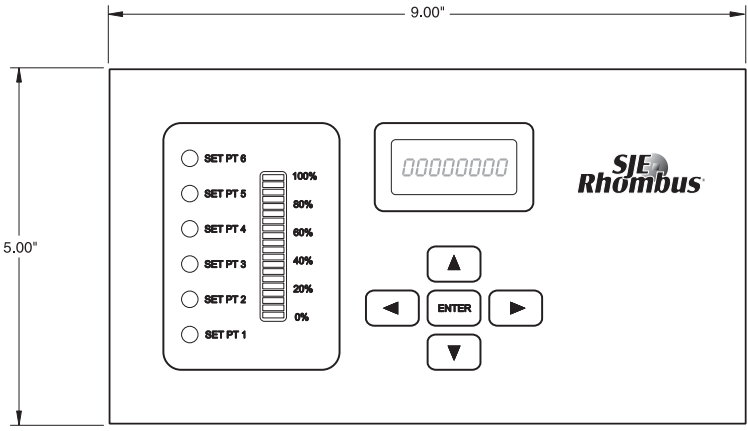
### **⚠ WARNING**



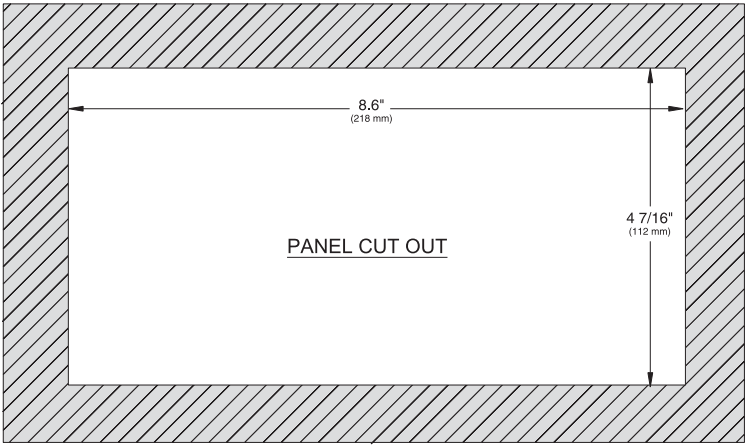
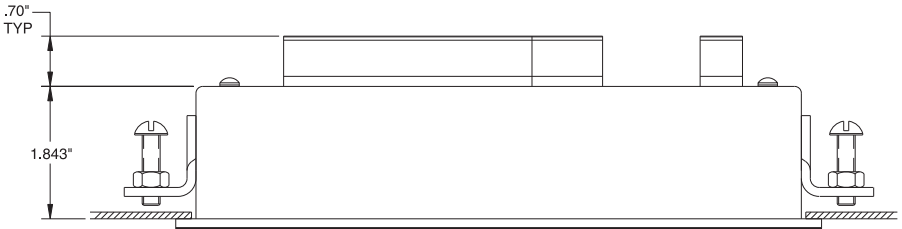
#### **EXPLOSION OR FIRE HAZARD**

Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code, ANSI/NFPA 70.

# INSTALLATION & DIMENSIONAL DATA



TOP VIEW



**FIGURE 1** Dimensions and panel cut-out. Dimensions are indicative and may be subject to change without notification.

# INSTALLATION & DIMENSIONAL DATA

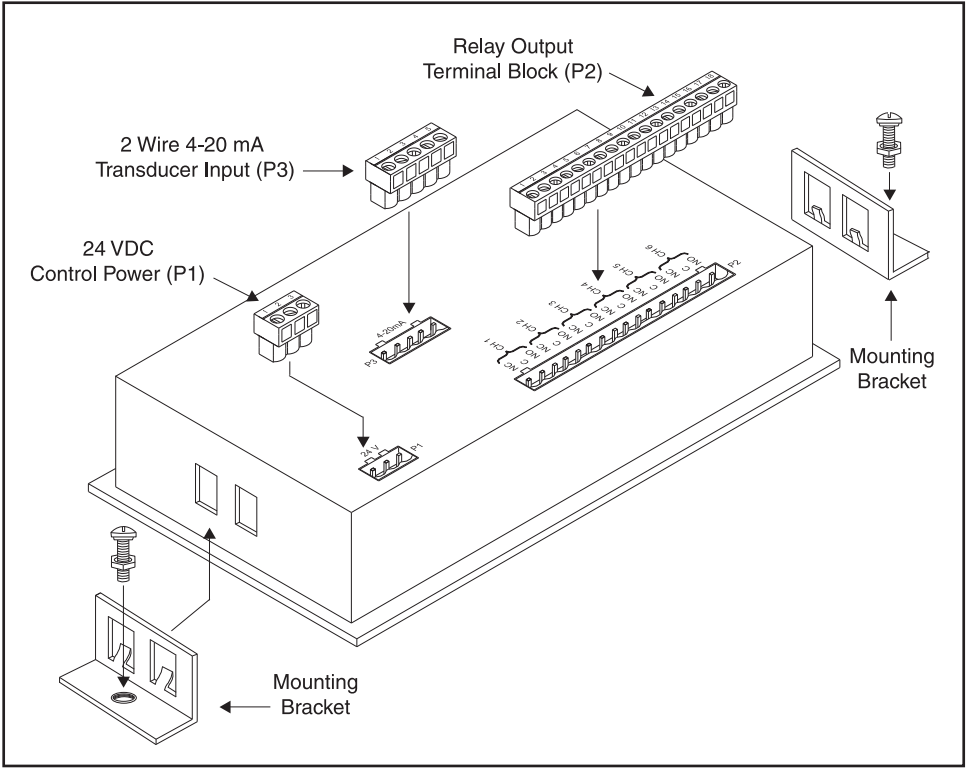
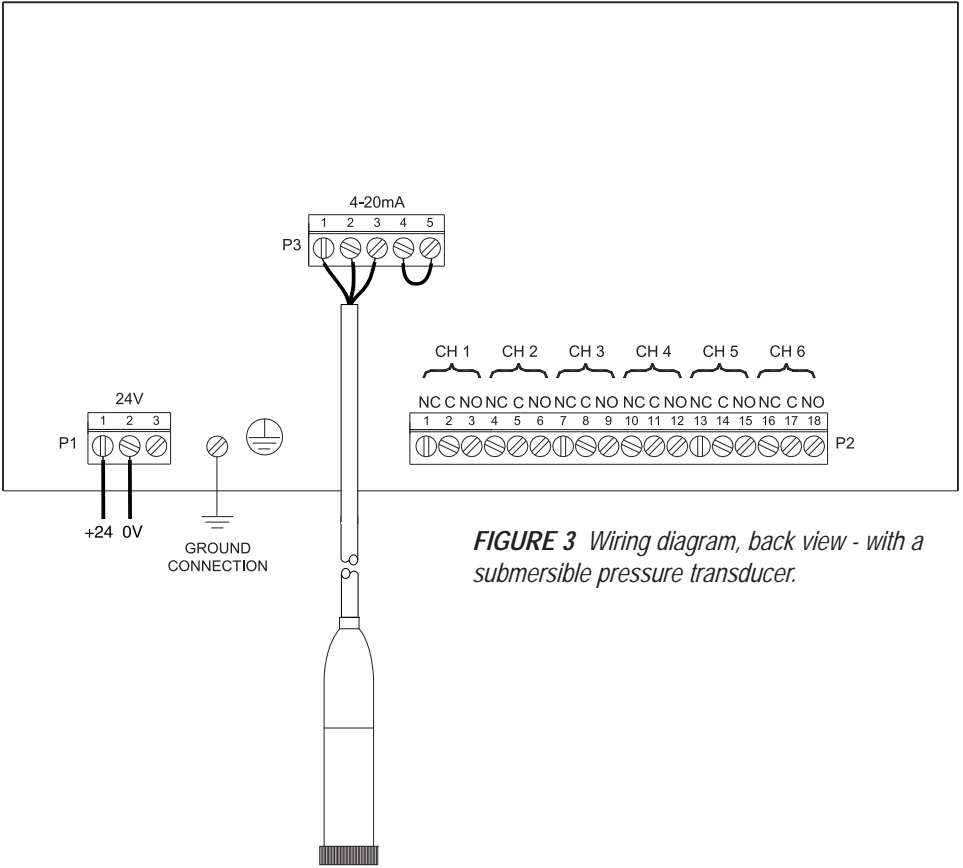


FIGURE 2 Standard SP6R level controller kit.

# ELECTRICAL CONNECTIONS



**FIGURE 3** Wiring diagram, back view - with a submersible pressure transducer.

## 1. POWER (Terminal P1)

Connect power to terminal 1 and 2: the unit requires 24 VDC (+/- 10%).

## 2. TRANSDUCER (Terminal P3)

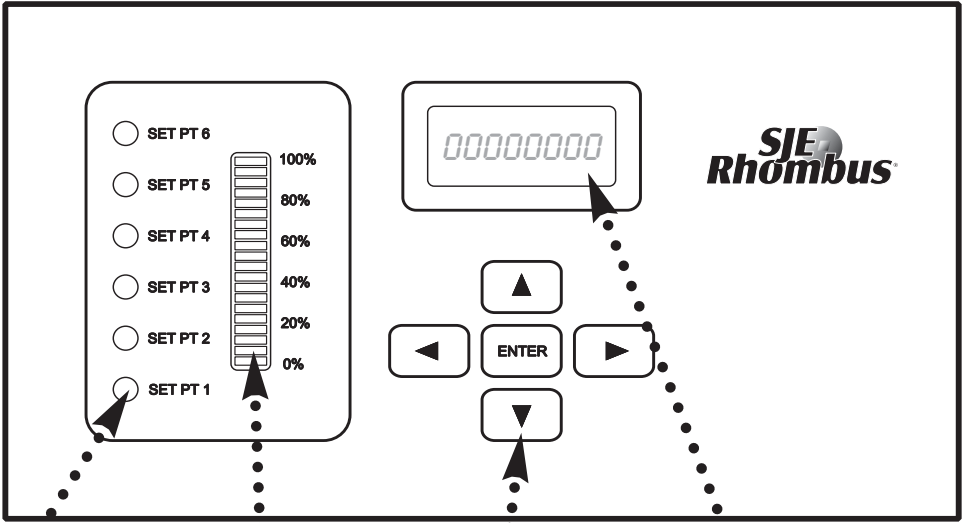
For loop powered transducers (2 wire) connect power conductor to terminal 1 and 2. If the cable is protected with an overall shield, connect the shield to terminal (3). Terminal 4 and 5 must be connected if an output follower is not required. If no valid input is present, the controller will display **SENSOR** and all outputs will be de-energized.

**NOTE:** To avoid ground loops, the shield of the signal cable must only be grounded at one end.

## 3. OUTPUT RELAY CONNECTIONS

The relay outputs are rated up to 10 A (resistive) at 240 VAC, fuse protection is required individually or as a group.

# FUNCTION KEYS / DISPLAYS



## ● SET POINTS

6 programmable set points status LED. Form C (SPDT) contacts: rated at 10A at 240 VAC.

## ● BAR GRAPH

20 segment bar graph display for process value. Each bar represents 5% of full scale.

## ● KEYPAD

Arrow keys are used to navigate through the configuration and used for adjusting set points.

## ● LEVEL DISPLAY

Eight character alphanumeric LED for process value display and program parameters.



## LEFT AND RIGHT ARROW KEYS

are used to navigate through the menu items. These arrow keys can also be used to back out when in editing and simulation mode.



## ENTER KEY

is used for selecting a menu item for editing. This key is also used after a value has been edited to store in memory.



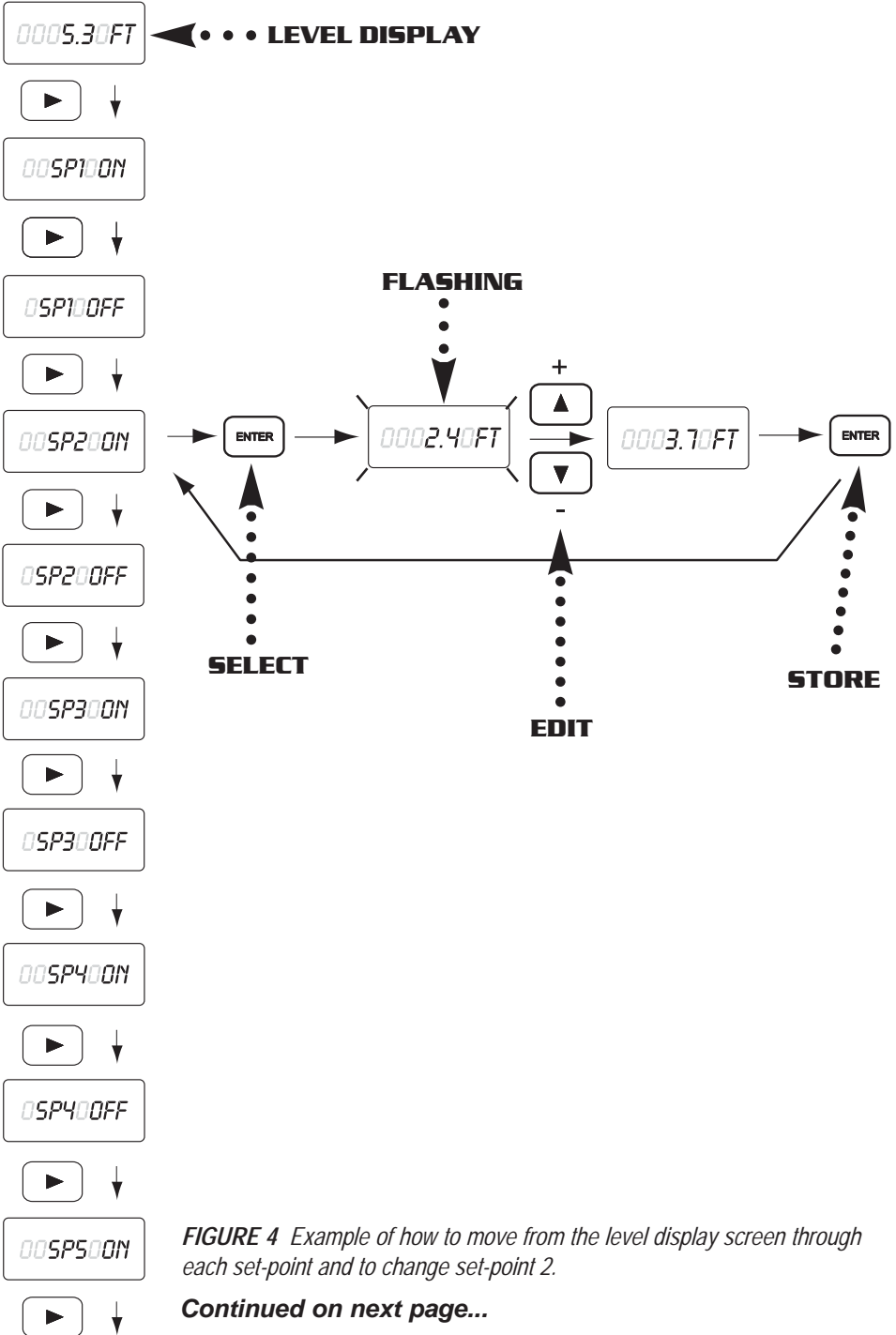
## UP AND DOWN ARROW KEYS

is used to increase or decrease the current value being edited.

**NOTE:** The display automatically returns to “level” after 20 seconds of inactivity, regardless of where it was left.

**Pressing once** will increment the current value by **one** unit. Pressing and holding will begin repeatedly incrementing after a short delay. If the operator continues to hold the key, the value continues to increment at a faster rate.

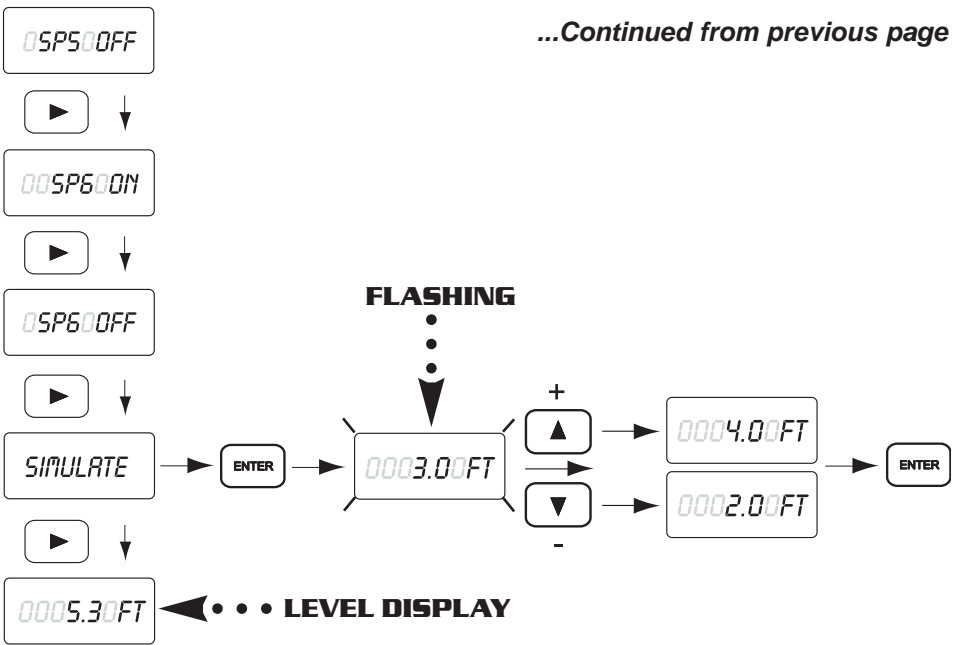
# SETTING UP LEVELS AND SIMULATION



**FIGURE 4** Example of how to move from the level display screen through each set-point and to change set-point 2.

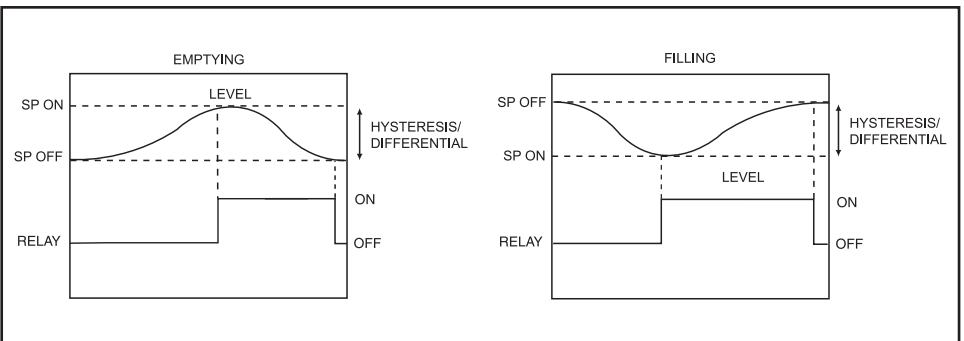
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The adjustable **ON and OFF** function allows for an individual hysteresis or differential setting of each set-point. For an **emptying** application, the **ON** set-point must be **greater** than the **OFF** set-point. For a **filling** application, the **ON** set-point must be **less** than the **OFF** set-point (Refer to **FIGURE 5**).

**NOTE:** For proper operation of the SP6R controller, the **ON and OFF** set-points must not be set to the same value.



**FIGURE 5**

# CONFIGURATION

To enter the configuration mode, simultaneously press the **LEFT** and **RIGHT** arrow key and hold for three (3) seconds with the unit powered **ON**. **NOTE:** Eight (8) seconds of inactivity (no keys pressed) will terminate the configuration menu and exit back to the run menu.

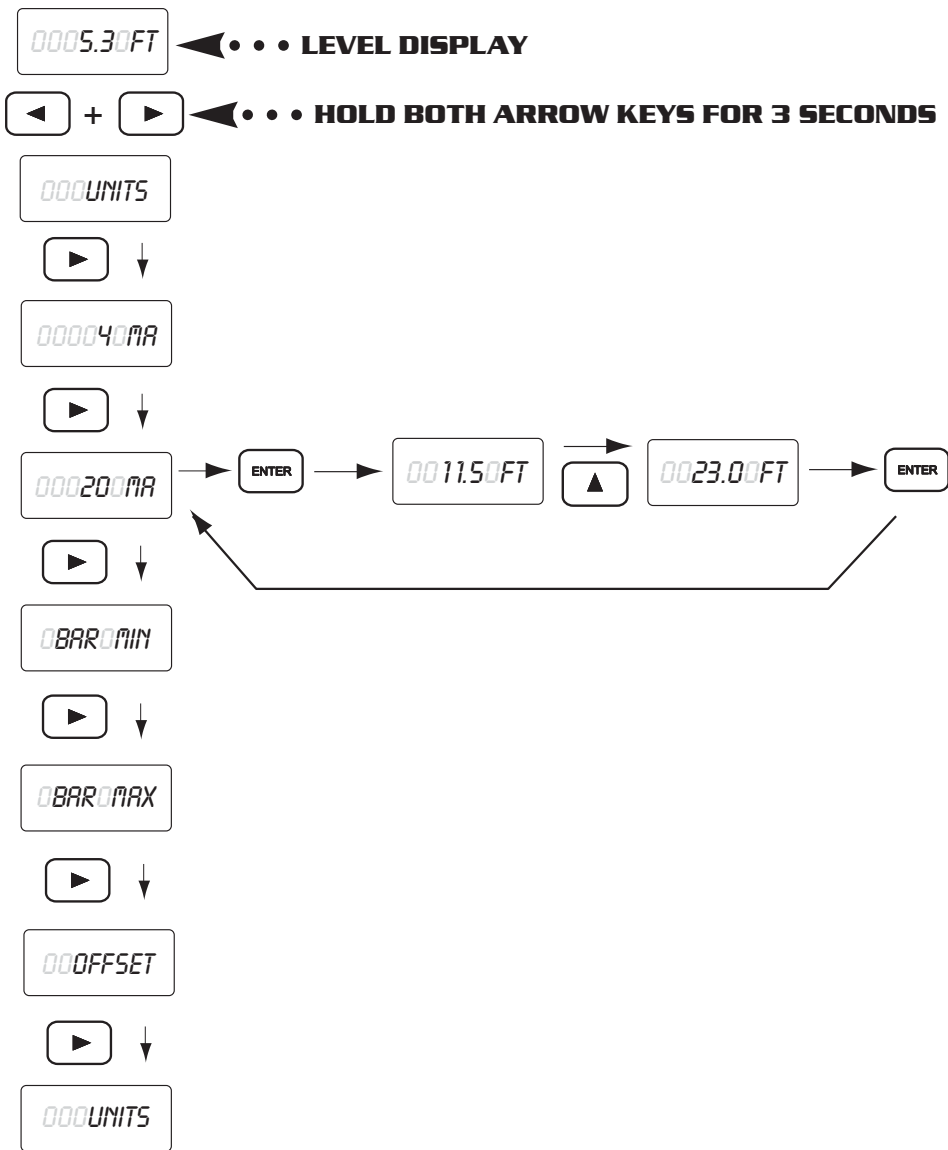
The first item in the configuration menu is the **UNITS** selection. Use the **LEFT** or **RIGHT** arrow keys to navigate through all the items in this menu.

- UNITS**      Select the unit of measure display after the process value.
- FT** = Feet
  - IN** = Inches
  - CM** = Centimeters
  - %** = Percentage
  - °C** = Degrees Celsius
  - °F** = Degrees Fahrenheit
  - PS** = Pound Per Square Inch (PSI)
  - BR** = Bar
  - NONE** = Blank, No Units Displayed

When you are at the item you wish to edit, press the **ENTER** key and the original value for the item selected will flash. Use the **UP** and **DOWN** arrow keys to change to your desired value and press **ENTER**.

**NOTE:** The edited value will not be saved until the **ENTER** key is pressed.

- 4 mA**      Set the value displayed when the signal value is equal to 4 mA (zero). The default value is zero.
- 20 mA**     Set the value displayed when the signal value is equal to 20 mA (span). The default value is 10.0.
- BAR MIN**   This value set the level for which all bars on the bar graph will turn OFF.
- BAR MAX**   This value set the level for which all bars on the bar graph will turn ON.
- OFFSET**     An offset value can be added or subtracted to bring the display value to zero at atmospheric pressure. If you are using a submersible pressure transducer, the level readout at atmospheric pressure (out of the wet well) should be zero. If it is not, add or subtract (negative) a value to bring the display to zero. Check the level readout to verify it is zero. If not, try changing the offset again.



**FIGURE 6** Use the right or left arrow keys to navigate through these menu items. Begin with UNITS, 4 mA, 20 mA, BAR MIN, BAR MAX, OFFSET, and back to UNITS.

**NOTE:** Eight (8) seconds of inactivity (no keys pressed) will terminate the configuration menu and exit back to the run menu.



## RUN MODE PARAMETERS

	MIN	MAX	DEFAULT	USER FUNCTION	USER VALUE
LEVEL DISPLAY	-99.9	999.9	SENSOR on invalid input signal		
<i>00SP100N</i>	0.0	999.9	1.5 FT		
<i>0SP100FF</i>	0.0	999.9	1.0 FT		
<i>00SP200N</i>	0.0	999.9	2.5 FT		
<i>0SP200FF</i>	0.0	999.9	2.0 FT		
<i>00SP300N</i>	0.0	999.9	4.5 FT		
<i>0SP300FF</i>	0.0	999.9	4.0 FT		
<i>00SP400N</i>	0.0	999.9	6.5 FT		
<i>0SP400FF</i>	0.0	999.9	6.0 FT		
<i>00SP500N</i>	0.0	999.9	8.5 FT		
<i>0SP500FF</i>	0.0	999.9	8.0 FT		
<i>00SP600N</i>	0.0	999.9	9.5 FT		
<i>0SP600FF</i>	0.0	999.9	9.0 FT		
<i>SIMULATE</i>	4 mA value in configuration	20 mA value in configuration			

# SPECIFICATIONS

## INPUT TYPE

4-20 mA signal.

## INPUT IMPEDANCE

100 ohms.

## INPUT RESOLUTION

12 - bits, 0.1% of full scale.

## SAMPLING CYCLE TIME

100 mS.

## AVERAGING

8 consecutive samples.

## ACCURACY

0.5% of full scale.

## EXCITATION VOLTAGE

24 VDC, 30 mA available for loop powered transducers.

## RELAY OUTPUTS

Six programmable relay outputs with LED indication. "Form C" (SPDT) contacts: rated at 10A at 240 VAC.

## LEVEL DISPLAY

Eight character alpha-numeric LED for process value and program parameters. The display is avionics grade and is sharp and clear, even in direct sunlight from 10 feet away.

## POWER

24 VDC (+/- 10%). 200 mA nominal, 400 mA max.

## OPERATING TEMPERATURE

-15°C to 70°C (0°F to 150°F) at up to 0-90% RH non-condensing.

## ENCLOSURE RATING

**Front Panel:** IEC Standard IP54 (with additional gasket) for indoor use.

**Rear Case:** IEC Standard IP20.

## BAR GRAPH

20 segment bar graph display for process value. Each bar represents 5% of full scale.

## ONE-YEAR LIMITED WARRANTY

SJE-RHOMBUS® warrants to the original consumer that this product shall be free of manufacturing defects for one year after the date of manufacture. During that time period and subject to the conditions set forth below, SJE-RHOMBUS will repair or replace, for the original consumer, any component which proves to be defective due to defective materials or workmanship of SJE-RHOMBUS.

ELECTRICAL WIRING AND SERVICING OF THIS PRODUCT MUST BE PERFORMED BY A LICENSED ELECTRICIAN.

THIS WARRANTY DOES NOT APPLY: (A) to damage due to lightning or conditions beyond the control of SJE-RHOMBUS; (B) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit; (C) to failures resulting from abuse, misuse, accident, or negligence; (D) to units which are not installed in accordance with applicable local codes, ordinances, or accepted trade practices, and (E) to units repaired and/or modified without prior authorization from SJE-RHOMBUS.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

TO OBTAIN WARRANTY SERVICE: The consumer shall assume all responsibility and expense for removal, reinstallation and freight of controller deemed defective. Any controller to be repaired or replaced under this warranty must be returned to SJE-RHOMBUS, or such place as designated by SJE-RHOMBUS.

ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS ARE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. SJE-RHOMBUS SHALL NOT, IN ANY MANNER, BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES AS A RESULT OF A BREACH OF THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY.

Warranty void if back cover of this product is removed. Call factory with servicing questions: **1-800-RHOMBUS** (1-800-746-6287).

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