

4 CALIBRATION

The electronic calibration must be performed by qualified personnel. The following procedure will be completed during the annual preventative maintenance and repairs of the ARABELLA.

ELECTRONIC CALIBRATION SET UP

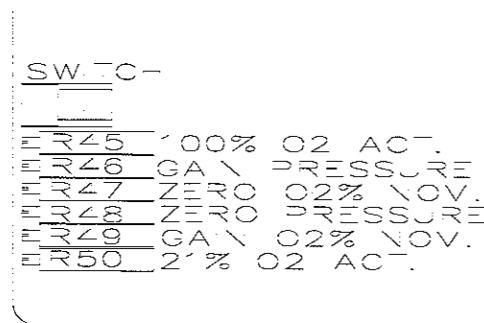
1. Disconnect AC power and Gas Sources.
2. Remove ARABELLA from the I.V. stand if attached.
3. Remove two screws at pole mount on right side of unit.
4. Remove five screws on bottom enclosure.
5. Remove top enclosure.
6. Re-secure pole mount to the right side of the unit.
7. Attach unit to I.V. stand and connect AC power.
8. With power OFF, set the test switch (TS 1) to position 1. The test switch is located on the left side of the unit, above the calibration potentiometers.
9. Press and hold the Alarm Reset Button on the front panel and turn the main power switch ON.
10. After the Software Version has been displayed on the oxygen display, release the Alarm Reset Button.
11. The ARABELLA is now in test mode.

4.1 ELECTRONIC CALIBRATION

TS1 Oxygen Cell Calibration

At position 1, the oxygen display shows the actual oxygen value x2. This value is from the ADC converter and allows the 2-point calibration of the oxygen cell.

- Connect air and oxygen. Display reads 2x oxygen value.
- Set oxygen knob to 100%, allow 1 minute to stabilize.
- Adjust 100% calibration potentiometer (100% O2 ACT.) for display of 200.
- Set oxygen knob to 21%, allow 1 minute to stabilize.
- Adjust 21% calibration potentiometer (21% O2 ACT.) for display of 42-43.
- Repeat steps until no adjustment is required.



TS2 Oxygen Blender Alarm Position Potentiometer Calibration

The blender alarm potentiometer's function is to allow the microprocessor an electronic method of determining where the gas blender is set to for comparison to the actual oxygen value. A nominal oxygen alarm would result if the values did not coincide.

At position 2, the oxygen display will show the blender alarm potentiometer value x2. This value is from the ADC converter and allows the blender potentiometer to be calibrated to the gas blender.

- Turn test switch to position 2.
- Display reads 2x the effective value.
- Set oxygen concentration to 100 %.
- Adjust gain O2 nominal potentiometer (GAIN O2%NOM.) for display of 200.
- Set oxygen concentration to 21%.
- Adjust zero O2 nominal potentiometer (ZERO O2% NOM.) for display of 42-43.
- Repeat steps until no adjustment is needed.

TS3 Pressure Manometer Calibration

At position 3, the ADC will convert the analog pressure transducer output to a digital signal for the oxygen display. The display will read x 16 the effective value. The LED display is scaled from 0 – 12 cmH₂O. A two-point calibration is required.

** The display value cannot be negative and cannot be greater than 255.**

Zero Pressure potentiometer must be calibrated at 1 cmH₂O (16 on display).

- Connect test set up in diagram 1.
- Set pressure to 10 cmH₂O.
- Adjust Gain Pressure potentiometer (GAIN PRESSURE) for a value of 160 ± 1 .
- Set pressure to 1 cmH₂O.
- Adjust zero pressure potentiometer (ZERO PRESSURE) for a value of 16 ± 1 .
- Repeat steps until no adjustment is required.

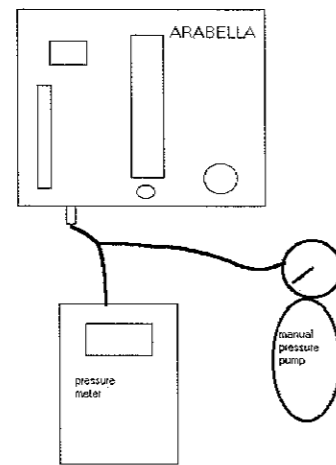


Diagram 1

TS 4 Display Auto-Dimming Check

At position 4, the digital display will show a value from the ADC indicating the brightness level of the LED displays.

- Display value above 50 = Max intensity.
- Display value below 35 = Low intensity.

TS5 + 15 Volt Analog Supply Check

At position 5, the digital display will indicate a value from the ADC. If the value is out of range for longer than 50 ms, a watchdog reset is executed.

-Display value range 189 – 231.

TS6 - 15 Volt Analog Supply Check

At position 6, the digital display will indicate a value from the ADC. If the value is out of range for longer than 50 ms, a watchdog reset is executed.

-Display value range 59 – 113.

4.1.1 Trouble Shooting Tests

TS7 – TSC Oxygen and Pressure Alarm Set Points and Low/High Alarm Points.

The sequence of tests 7 – C will check the alarm set points programmed by holding the ALARM RESET button for 3 seconds. In clinical application this point is set after proper patient setup. In calibration mode it allows the technician to verify the pressure and oxygen set point as well as the low and high alarm points.

Oxygen Alarm Test

- Set test switch to position 2.
- Set oxygen to 100 on the digital display .
- Press alarm reset button for 3 seconds. (Audio alarm)
- Return to position 7.
- The displayed value is the *set point*.
- Position 8 is the High Limit value. This value must be 9 higher than the *set point*.
- Position 9 is the Low Limit value. This value must be 9 lower than the *set point*.

Pressure Alarm Test

- Set test switch to position 3
- Apply 5 cmH₂O to the proximal pressure port. The digital display will indicate 16 x the pressure of 5 cmH₂O (80).
- Press the alarm reset button for 3 seconds. (Audio alarm).
- Return test switch to position "A". This is the *set point* .
The *set point* cannot be >128.
- Set test switch to position "B".
The displayed value is the high alarm limit. It should read 48 higher than the *set point*. The high limit cannot be > 176.
- Set the test switch to position "C".
- The displayed value is the low alarm limit. It should read 32 lower than the *set point* .
The low limit cannot be < 16.

TS"C" Watch Dog Reset

- Place test switch in position "C".
- Press the alarm reset button. This creates a stop function at the microprocessor causing a watch dog reset. The device will go through it's start up sequence. (lamp test, audio alarm and the software revision display)

TS"D" Circuit Over Pressure Solenoid Test

- Place test switch in position "D". Turn the unit OFF and ON (Back into test software).
- The over pressure solenoid will cycle 3 seconds ON, 3 seconds OFF.

TS"E" Display, Buzzer & Photo Cell Tests

- Place test switch in position "E".
- The digital display will count from 0-255.

NOTE: The display will start the count at some point > 0.

1 Digital Display Test

- Press the alarm reset button.
The digital display will count the 1's digit 0-9 (9 will remain displayed).
The 10's digit will count from 0-9. (9 will remain displayed)
The 100's digit will count from 0-9.
The test will repeat.

2 Bar Graph Test

- Press the alarm reset button.
0 cmH₂O – 12 cmH₂O will illuminate individually, then all together.
Test will repeat.

3 LED test

- Press alarm reset button.
Digital display not illuminated, all individual LED's ON.

4 Seven Segment LED Test

- Press the alarm reset button.
Digital display will be illuminated, all individual LED's will be OFF.

5 Display Test

- Press the alarm reset button.
The digital display and the individual LED's will be ON.

6 Display Test II

- Press the alarm reset button.
The digital display and individual LED's will be OFF.

7 Photo Cell Test

- Press the alarm reset button.
Oxygen display shows the brightness value.
All alarm LED's ON and the bar graph is OFF.
Remark: Bright light 255 / no light 0.

8 Alarm LED Test

- Press the alarm reset button.
Oxygen display shows 8 and Oxygen High Alarm LED is ON.
- Press the alarm reset button.
Oxygen display shows 9 and Oxygen Low Alarm LED is ON.
- Press the alarm reset button.
Oxygen display shows 10 and Alarm Reset LED is ON.
- Press the alarm reset button.
Oxygen display shows 11 and High Pressure Alarm LED is ON.
- Press the alarm reset button.
Oxygen display shows 12 and Low Pressure Alarm LED is ON.
- Press the alarm reset button.
Oxygen display shows 13 and Audio alarm is activated.
- Press the alarm reset button.
Oxygen display shows 14 and Audio alarm is OFF.

- Press the alarm reset button.
Oxygen display shows 15 and Over pressure valve cycles ON / OFF.
(10 second interval)
- Press the alarm reset button.
Oxygen display shows 16 and Over Pressure Valve cycling stops.
- Press the alarm reset button.
Oxygen display shows .17.
- Press the alarm reset button.
Oxygen display counts from 0 up to 255 and back to zero. Every 16 counts the
bar graph is increased by one respectively decreased by one.
Remark: 208 - 255 -208 the bar graph is completely illuminated.

TS"F" SYSTEM Reset

- Place test switch in position "F".
- Press the alarm reset button.
Watch dog reset occurs and unit will complete start up sequence.

→ Return to position "0"