BLUEPRINT FOR BREATHING

Introducing the A.D.S. 1000...

An Unprecedented Breakthrough in Anesthesia Delivery

A.D.S 1000   VETERINARY ANESTHESIA DELIVERY SYSTEM

ANESTHESIA MADE SIMPLE

engler
engineering
corporation

1-800-445-8581

1099 East 47th Street • Hialeah, Florida 33013 USA
(305) 688-8581 • FAX (305) 685-7671

Web site: www.engler-USA.com
E-Mail: info@engler-USA.com

MICROPROCESSOR ELECTRONICALLY VENTILATES THE PATIENT IF SPONTANEOUS RESPIRATION DOES NOT OCCUR

- Eliminates need to monitor patients' breathing
- Frees technician for other duties

AUTOMATICALLY SETS BREATHING PARAMETERS AFTER ENTERING PATIENT'S WEIGHT INTO SYSTEM

- Delivers measured amounts of anesthesia at predetermined intervals
- May be used as a critical care ventilator or anesthesia delivery unit

ELECTRONICALLY CALCULATES AND DISPLAYS MINUTE VOLUME PER KILOGRAM

- Assures optimum oxygen and CO_2 levels
- Eliminates errors associated with conventional ventilation

A.D.S. 1000

VETERINARY
ANESTHESIA DELIVERY SYSTEM

INSTRUCTION MANUAL

TABLE OF CONTENTS

SECTION	PAGE

NOTE: The A.D.S.1000 is a sophisticated electronic device and although designed for ease of use, care must be taken in its operation. **Please read this entire manual before using the A.D.S. 1000.**

The A.D.S.1000 is **FOR VETERINARY USE ONLY.**

INTRODUCTION

Thank you for choosing the A.D.S. 1000 from Engler Engineering Corporation. We believe that this machine will change the way anesthesia and ventilation therapy is administered to veterinary patients. The A.D.S. 1000 has a Normal and Lab Mode of operation, both of these operating modes will be covered in this manual.

The A.D.S. 1000 is a microprocessor controlled anesthetic ventilator. The microprocessor serves as a command and control base for a combination of flow controlling valves, exhale valves, safety valves and electronic sensors located within the A.D.S. 1000. The microprocessor simultaneously senses the proximal airway pressure, inspiratory time, breaths per minute, flow rate, and then calculates a minute volume per kg, based upon these parameters. The A.D.S. 1000 also senses any negative proximal pressure and depending on the amplitude of this pressure determines whether or not to give an assisted breath to the patient. The microprocessor is the brain of the A.D.S. 1000, it sends and receives all information within the unit. The unit electronically controls the following parameters;

- *Flow Rate*   - *Breaths per Minute*
- *Peek Inspiratory Pressure*   - *Inspiration Assist*
- *Positive End Expiratory Pressure*

The A.D.S. 1000 has default settings for these parameters already programmed into it. All the operator need do is enter in the patients' weight and the A.D.S. 1000 will do the rest. However, if at any time the operator feels that a certain patient requires a different setting for a specific parameter then the preset value, he may change this value at any time. This feature allows the operator greater options over the way the anesthetic is delivered to the patient. With these functions, the A.D.S. 1000 may be used to safely deliver anesthesia while avoiding the risk of anesthesia related respiratory depression.

The A.D.S. 1000 may be used *without* a vaporizer as a critical care ventilator, and has a number of built-in features designed for veterinary respiratory therapy.

PLEASE READ VERY CAREFULLY

Engler Engineering Corporation makes every effort to verify that all parts for the unit along with any optional accessories shipped from our location are included in your order. It is imperative that you inspect the package and if you find any pieces missing or damaged, you must notify us immediately.

Engler Engineering Corporation will not be held liable for any damage including, but not limited to leakage caused by improper installation of our products.

If you have any questions or comments, please contact:

Engler Engineering Corporation
1099 East 47th Street, Hialeah, Florida 33013
800-445-8581 – 305-688-8581 – FAX 305-685-7671

PARTS LIST

Upon opening the carton the A.D.S. 1000 was shipped in, you will find:

{ }　　　A.D.S.1000 Unit

{ }　　　A.D.S. Instruction Manual, Which Should be Read Prior to Operating the Unit

{ }　　　A.D.S. Video

{ }　　　Breathing Circuit

{ }　　　Oxygen Hose, Green

{ }　　　To Vaporizer Hose

{ }　　　From Vaporizer Hose

{ }　　　Scavenger Tubing, Blue

{ }　　　Power Adapter

{ }　　　Mask Adapter, For Masking Procedures

{ }　　　Test Lung

NOTE: 1

Your A.D.S. 1000 has an internal battery backup. The internal battery is designed to be used only in the event of a power outage or power surge. In order to keep the battery at a proper charge always keep the power adapter plugged into the A.D.S. 1000. On a full charge, the internal battery backup should give up to twelve hours of emergency operation.

NOTE: 2

To ensure proper operation, unit must be flushed after every procedure! Please refer to page 20 "Understanding flush mode".

IMPORTANT:

Service and repairs <u>should</u> <u>only</u> be carried out by authorized Engler Engineering Corporation Service trained personnel. Service by unauthorized personnel will void the warranty.

INSTALLATION INSTRUCTIONS

1. **Connecting the Oxygen Hose** - On the back panel of the unit there is a port marked "OXYGEN IN", connect one end of the Green Oxygen Hose to this port and connect the other end of this hose to your 50 P.S.I. oxygen source. Since the oxygen fittings are universally standard, you may use your own oxygen hose if desired.

CAUTION: IT IS EXTREMELY IMPORTANT THAT THE OXYGEN BE REGULATED TO A PRESSURE OF 50 POUNDS PER SQUARE INCH (PSI), FOR THE MINUTE VOLUME PER KILOGRAM DISPLAY TO READ ACCURATELY.

2. **Connecting the Vaporizer Hose** - On the back panel of the unit there is a port marked "TO VAPORIZER", connect one end of the White, To Vaporizer Hose to this port and connect the other end to your vaporizer inlet port.

3. **Connecting the Vaporizer Hose** - On the back panel of the unit there is a port marked "FROM VAPORIZER", connect one end of the Violet, From Vaporizer Hose to this port and connect the other end to your vaporizer outlet port.

NOTE: The A.D.S. 1000 must be used with a _precision_ Halothane or Isofluorane vaporizer.

CAUTION: It is important when connecting the vaporizer to ensure that the vaporizer is mounted lower than the ADS1000.

4. **Connecting the Scavenger Tubing** - Connect one end of the Blue Scavenger tubing to the "SCAVENGER OUT" port on the back of the unit. Connect the other end to either a "passive" or "active" scavenging system. This will help to eliminate all traces of anesthetic gases used in the operating room that could pose a possible hazard to personnel. The use of a f/air anesthesia gas filter unit or active anesthesia scavenger system is highly recommended. Care must be taken to ensure that the scavenger port is not blocked by improper use of these devices as the animal's ease of expiration depends on the resistance of the scavenger line.

5. **Connecting the Power Adapter** - Connect the small male plug of the power adapter into the back of the A.D.S. 1000 at the 15 VDC @ 1.2 A outlet. Then plug the adapter into an electrical outlet. The power adapter contains electronics for the charging of the internal battery backup, while this adapter is made of sturdy material, improper treatment could result in failure of the adapter.

NOTE: On a full charge the A.D.S. 1000 has up to 12 hours of battery backup for uninterrupted operation during power failure. Complete battery recharging is accomplished in approximately 8 hours.

6. **Connecting the Breathing Circuit** - Connect the two large ends of the breathing circuit to the "BREATHING CIRCUIT" ports on the front panel of the A.D.S. 1000. You may use your own breathing circuit if you desire. The top port (inspiratory) of the ADS 1000 feeds oxygen/anesthesia into the animal's lungs. The bottom port (expiratory) is the exhaust. After the lungs have been inflated the internal exhale valve allows the natural elasticity of the animal's lungs to exhale oxygen/anesthesia through this port.

7. <u>Connecting the gas sampling system</u> - To connect the external gas sampling system perform the following steps:

1) Insert the Luer lock connector to the gas sampling input and rotate it clockwise one half turn.
2) Connect the two breathing circuits ends to the breathing circuit ports.
3) Now insert the gas sampling elbow into the end of the breathing circuit as shown.
4) Insert the Luer lock connector to the gas sampling elbow and rotate it clockwise one half turn.
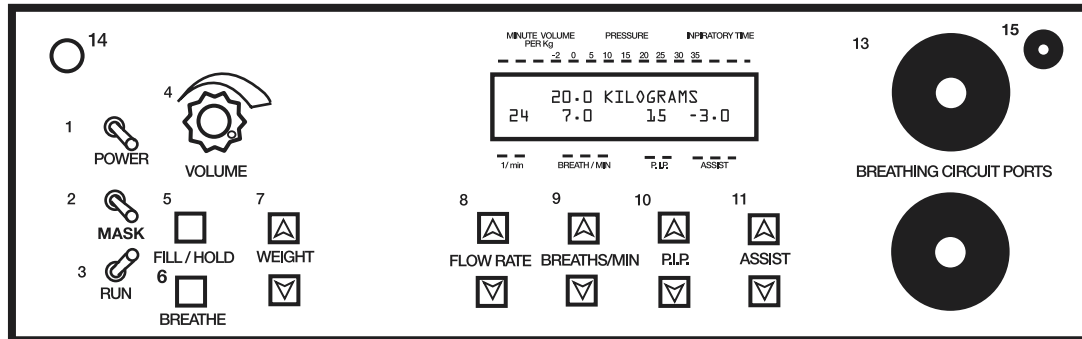5) Connect breathing circuit to the gas sampling elbow.
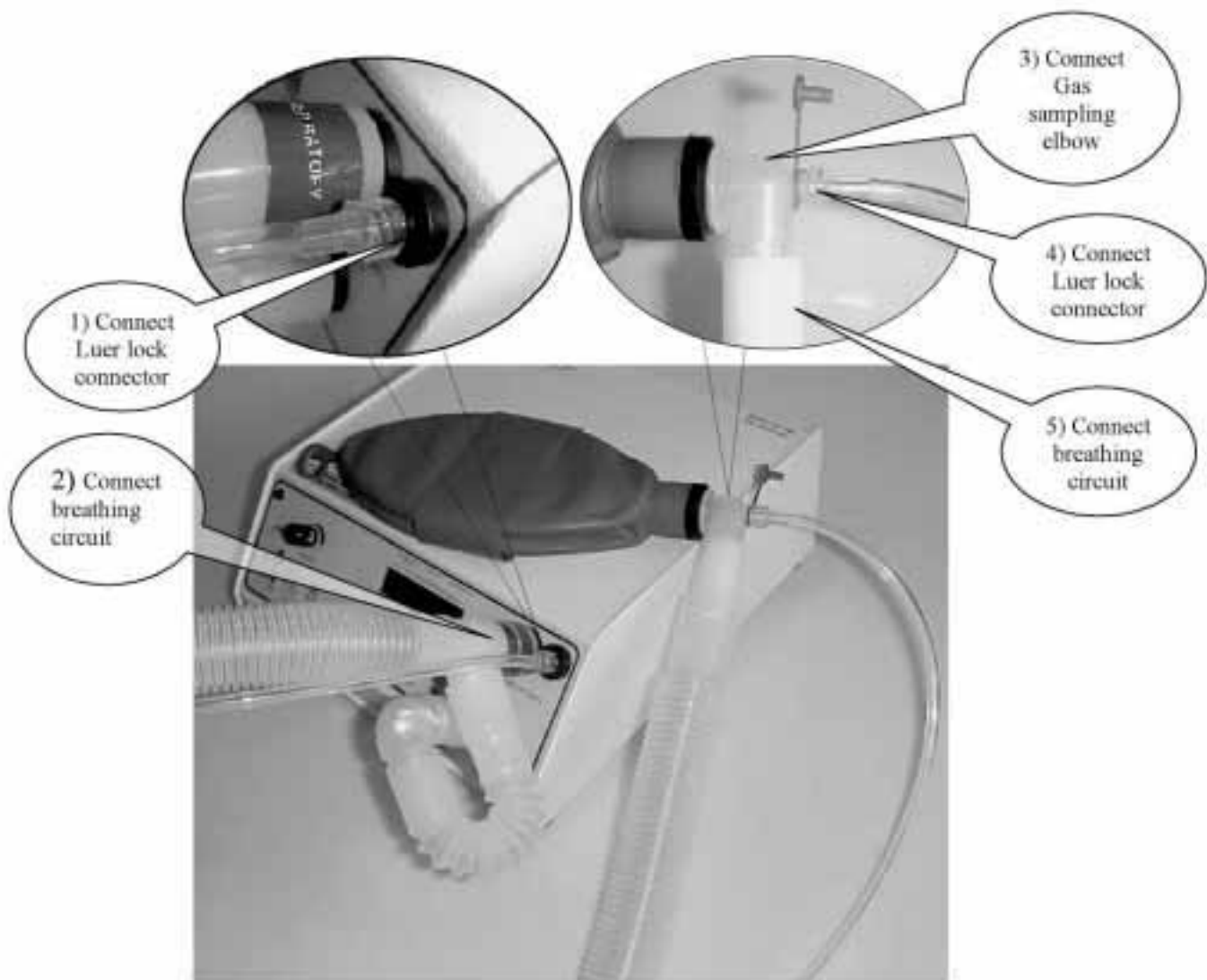
Note: Do not connect test lung until unit has been properly initiated.

GETTING FAMILIAR WITH THE A.D.S. 1000

In order to operate the A.D.S. 1000 properly, you need know its controls.
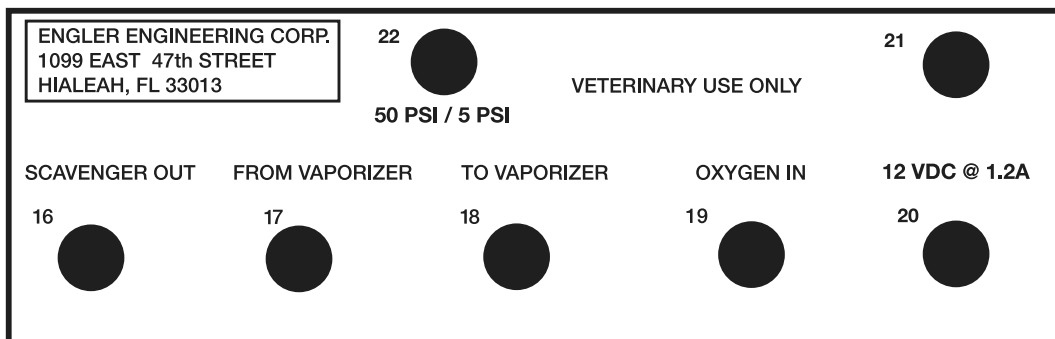**Front View:**

[1]   **POWER Switch** - This switch turns the power to the A.D.S. 1000 ON and OFF.

[2]   **MASK Switch** - This switch is used for enabling and disabling the mask mode

[3]   **SET / RUN Switch** - When in the SET position this switch allows the operator to enter in the patients' weight. When switched to RUN the A.D.S. 1000 starts to ventilate the patient.

[4]   **VOLUME Knob** - This knob controls the loudness of the audible warning alarm. We suggest that you start with it turned fully Clockwise, i.e. full volume and adjust it as necessary.

[5]   **FILL / HOLD Button** - When this button is pressed, the A.D.S. 1000 will fill the lungs of the patient to the indicated peak inspiratory pressure and hold it until the button is released.

[6]   **BREATHE Button** - When this button is pressed, the A.D.S. 1000 will initiate a breath to the patient.

[7]   **WEIGHT UP / DOWN Buttons** - When the A.D.S. 1000 is in the SET mode these buttons allow the operator to enter in the weight of the patient.

[8]   **FLOW RATE UP / DOWN** Buttons - Depressing these buttons cause the flow rate to increase or decrease.

[9]   **BREATHS PER MINUTE UP / DOWN** Buttons - These buttons control the minimal amount of times that the A.D.S. 1000 will breath per minute.

[10]   **P.I.P. UP / DOWN Buttons** - These buttons control the Peek Inspiratory Pressure in cm. of H_2O, that the A.D.S. 1000 will deliver to the patient.

[11]   **ASSIST UP / DOWN Buttons** - These buttons set the sensitivity of inspiratory effort necessary for the A.D.S. 1000 to facilitate an assisted breath. They also allow the assist feature to be turned off.

[12]   **LCD DISPLAY** - Displays minute volume, inspiratory time, proximal airway pressure, flow rate, breaths per minute, peek inspiratory pressure, and assist pressure.

[13]   **BREATHING CIRCUIT PORTS** - Connect the breathing circuit to these ports.

[14]   **BATTERY LOW INDICATOR** - The red led on the front panel of the A.D.S. 1000 is a warning indicator that the battery power is low, and that the unit

should be placed on charge immediately. When the unit is first powered up the led will self test by flashing on and then should remain off. When the battery is nearly discharged the led will remain on indicating that the unit should be charged immediately.

[15]   **GAS SAMPLING INPUT** - To connect the external sensor input, insert the Luer lock connector to the gas sampling input and rotate it clockwise one half turn. The Luer lock connector is located at the end of the 1/8" clear tube.

Rear View:

[16]   **SCAVENGER OUT** - Connect one end of the blue "Scavenger" tubing to this port and connect the other end to a scavenging filter canister or other scavenging device, either active or passive.

[17]   **FROM VAPORIZER** - Connect one end of the "From Vaporizer" tubing to this port and connect the other end to the outlet port of your precision vaporizer.

[18]   **TO VAPORIZER** - Connect one end of the "To Vaporizer" tubing to this port and connect the other end to the inlet port or your precision vaporizer.

[19]   **OXYGEN IN** - Connect one end of the green "Oxygen" tubing to this port and connect the other end to an oxygen source that is set to a pressure of 50 P.S.I. (pounds per square inch).

[20]   **POWER INLET** - Connect your power cord to this port.

[21]   **ALARM** - This is the alarm speaker.

[22]   **50 P.S.I. / 5 P.S.I.** - This is the manual control switch to go between the 50 P.S.I. normal operating mode and the 5 P.S.I. for lab mode.

ENGLER ENGINEERING CORP.
1099 EAST 47th STREET
HIALEAH, FL 33013

22
50 PSI / 5 PSI

VETERINARY USE ONLY

21

SCAVENGER OUT   FROM VAPORIZER   TO VAPORIZER   OXYGEN IN   12 VDC @ 1.2A

16   17   18   19   20

POUNDS TO KILOGRAM CONVERSION

In order for the A.D.S. 1000 to operate properly you must enter in the correct patient weight. The A.D.S. 1000 requires that the patients weight be entered in kilograms, therefore if the patients weight in pounds is known then the following formula will help in determining the patients weight in kilograms.

Kg = P x 0.454

Where:

Kg = patients' weight in kilograms
P = patients' weight in pounds

Example: You have a 40 pound patient and need to find out its' weight in kilograms.

Kg = 40 x 0.454

Kg = 18.2 Kilograms or just 18 Kilograms

Conversion from kilograms to pounds			
Kilograms	Pounds	Kilograms	Pounds
1	2.205	35	77.160
2	4.409	36	79.365
3	6.614	37	81.570
4	8.818	38	83.774
5	11.023	39	85.979
6	13.228	40	88.183
7	15.432	41	90.388
8	17.637	42	92.593
9	19.841	43	94.797
10	22.046	44	97.002
11	24.250	45	99.206
12	26.455	46	101.411
13	28.660	47	103.616
14	30.864	48	105.820
15	33.069	49	108.025
16	35.273	50	110.229
17	37.478	51	112.434
18	39.683	52	114.638
19	41.887	53	116.843
20	44.092	54	119.048
21	46.296	55	121.252
22	48.501	56	123.457
23	50.705	57	125.661
24	52.910	58	127.866
25	55.115	59	130.071
26	57.319	60	132.275
27	59.524	61	134.480
28	61.728	62	136.684
29	63.933	63	138.889
30	66.128	64	141.093
31	68.342	65	143.298
32	70.547	66	145.503
33	72.751	67	147.707
34	74.956	68	149.912

TURNING ON THE A.D.S. 1000

1. Turn on or connect the oxygen supply to the A.D.S. 1000. The oxygen supply must be regulated to 50 P.S.I. Make sure that the vaporizer (if in circuit) is in the "OFF" position.

2. Place the "POWER" and "MASK" switches into the "O" position. Place the "SET / RUN" switch into the "SET" position. Check that the normal 50 P.S.I. / Lab 5 P.S.I. switch located at the rear of the case is set to normal 50 P.S.I. position.

3. Place your thumb over the open end of the gas-sampling elbow that is connected to the end of the the breathing circuit.
Note: By placing your thumb over the gas-sampling elbow you are creating a closed circuit for the A.D.S. 1000's built in self-test feature.

4. While still holding your thumb over the sampling elbow, place the Power switch into the "I" or"On" position. The A.D.S. 1000 will now perform a self-test. This will be indicated by the LCD display as shown in Figure 1. Continue to hold your thumb over the end of the sampling elbow until this test is complete.
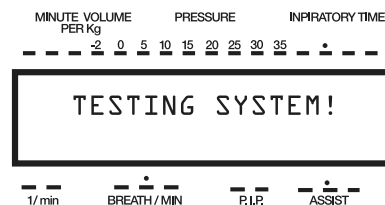
```
      MINUTE VOLUME        PRESSURE        INPIRATORY TIME
          PER Kg
            -2  0  5  10  15  20  25  30  35

         ┌──────────────────────────────┐
         │       TESTING SYSTEM!         │
         │                              │
         └──────────────────────────────┘          Fig.1

          1/min      BREATH/MIN    P.I.P.   ASSIST
```

5. As shown in Figure 2, at the end of the self-test you will be prompted by one of the following messages in the LCD display.

```
A.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME     B.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME     C.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME
       PER Kg                                           PER Kg                                           PER Kg
     -2 0 5 10 15 20 25 30 35                          -2 0 5 10 15 20 25 30 35                          -2 0 5 10 15 20 25 30 35
   ┌─────────────────────────┐                      ┌─────────────────────────┐                      ┌─────────────────────────┐
   │     20.0 KILOGRAMS       │                      │     SWITCH TO SET        │                      │    SWITCH MASK OFF       │
   │   24      7.0    15  -3.0 │                      │                          │                      │                          │
   └─────────────────────────┘                      └─────────────────────────┘                      └─────────────────────────┘
    1/min  BREATH/MIN  P.I.P.  ASSIST                 1/min  BREATH/MIN  P.I.P.  ASSIST                 1/min  BREATH/MIN  P.I.P.  ASSIST

D.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME     E.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME     F.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME
       PER Kg                                           PER Kg                                           PER Kg
     -2 0 5 10 15 20 25 30 35                          -2 0 5 10 15 20 25 30 35                          -2 0 5 10 15 20 25 30 35
   ┌─────────────────────────┐                      ┌─────────────────────────┐                      ┌─────────────────────────┐
   │   1- SAFETY FAILED       │                      │   2- OXYGEN IS OFF       │                      │   3- LEAK IN SYSTEM      │
   │   WT DOWN TO RETRY       │                      │   WT DOWN TO RETRY       │                      │   WT DOWN TO RETRY       │
   └─────────────────────────┘                      └─────────────────────────┘                      └─────────────────────────┘
    1/min  BREATH/MIN  P.I.P.  ASSIST                 1/min  BREATH/MIN  P.I.P.  ASSIST                 1/min  BREATH/MIN  P.I.P.  ASSIST

G.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME     H.  MINUTE VOLUME  PRESSURE  INPIRATORY TIME
       PER Kg                                           PER Kg
     -2 0 5 10 15 20 25 30 35                          -2 0 5 10 15 20 25 30 35
   ┌─────────────────────────┐                      ┌─────────────────────────┐
   │   4- LEAK / SAFETY LO    │                      │   5- EXHALE ERROR        │
   │   WT DOWN TO RETRY       │                      │   WT DOWN TO RETRY       │
   └─────────────────────────┘                      └─────────────────────────┘          Fig.2
    1/min  BREATH/MIN  P.I.P.  ASSIST                 1/min  BREATH/MIN  P.I.P.  ASSIST
```
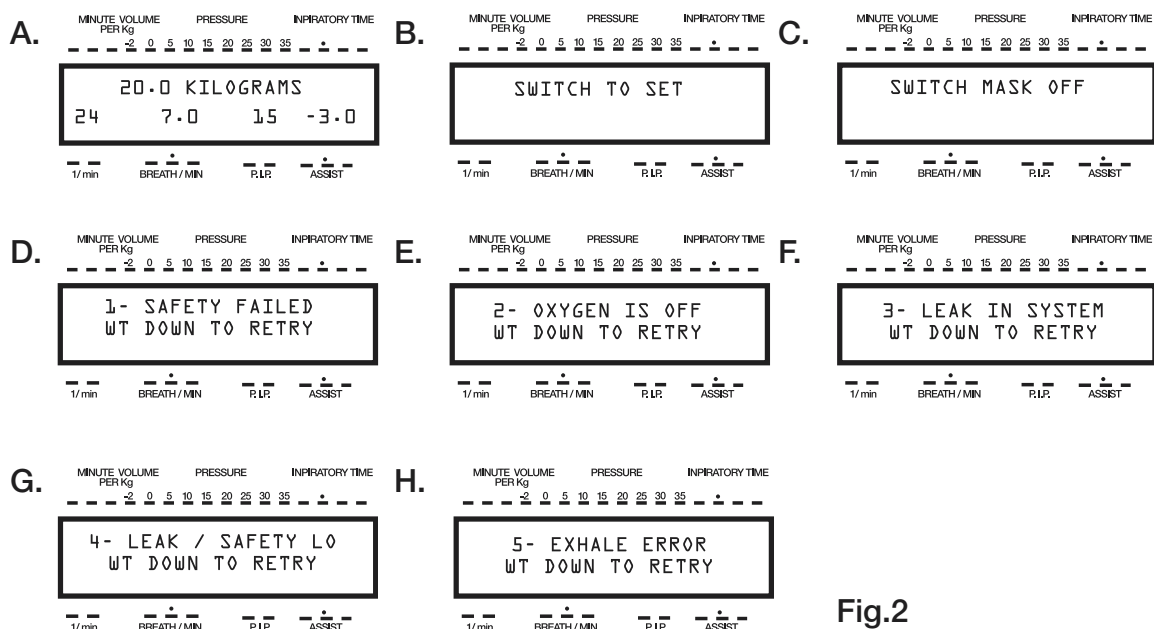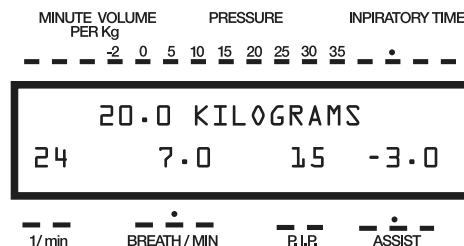
TURNING ON THE A.D.S. 1000 (cont.)

6. If everything has checked out OK. the LCD Display should give readout "**A.**", if it does, then proceed to Step 10.

7. If you get readout "**B. SWITCH TO SET**", then place the SET/RUN switch into the "SET" position. The display should now give readout "**A.**" or "**C.**", if you get readout "**A.**" then proceed to Step 10.

8. If you get readout "**C. SWITCH MASK OFF**" then place the "MASK" switch into the "O" or "OFF" position. The display should now give readout "**A.**", if it does, then proceed to Step 10.

9. If you get any one of the error messages "**D.**" through "**H.**" Then go to the **TROUBLESHOOTING THE A.D.S. 1000,** section of this manual.

10. The A.D.S.1000 has just completed the self-test and it has found nothing wrong

<p align="center">**The A.D.S.1000 is ready for operation!**</p>

11. In the next section you will learn how to understand and set up the parameters of the A.D.S. 1000 in the "SET MODE". The "SET MODE" is the resting or static mode for the A.D.S. 1000. The "SET MODE" is the mode in which you will enter the patients' weight in kilograms and from that input the A.D.S. 1000 will select all of the rest of the parameters for you. Of course the A.D.S. 1000 will only select values based on an average, if at any time you wish to change any parameter, you may do so.

THE LCD DISPLAY in SET MODE

```
MINUTE VOLUME        PRESSURE          INPIRATORY TIME
  PER Kg
       -2  0  5  10  15  20  25  30  35       •
─  ─  ─  ─  ─  ─  ─  ─  ─  ─  ─  ─  ─  ─
┌──────────────────────────────────────┐
│          20.0 KILOGRAMS                │
│   24        7.0        15     -3.0      │
└──────────────────────────────────────┘
─  ─         ─  •  ─        ─  ─     ─  •  ─
1/ min       BREATH / MIN     P. I. P.   ASSIST
```

1. Make sure that the switch is in the "SET MODE" position.

2. Take a look at the display above. From this display we can see the following:

      a. Patient weight is selected at 20 Kilograms.

      b. The flow rate for this patient has been preselected to a value of 24 liters per minute.

      c. The patient will be ventilated at a preselected <u>minimum</u> of 7.0 breaths per minute.

THE LCD DISPLAY in SET MODE (cont.)

      d. The peak inspiratory pressure for this patient has been preselected to a value of 15 cm of H_2O.

      e. The ASSIST feature is on, at a preselected value of -3.0 cm of H_2O.

Every time you turn on the A.D.S. 1000, these are the values that will be displayed on the LCD after a successful self test.

3. To enter in a different weight all you need to do is press either the WEIGHT UP or WEIGHT DOWN buttons on the front of the A.D.S. 1000 until the upper line of the LCD displays the desired weight.

NOTE: Weights under 10 Kilograms are set to the nearest 0.5 Kilograms, while weights over 10 Kilograms are set to the nearest 1 Kilogram.

NOTE: It is important to set the unit for the correct weight for each patient so that the MINUTE VOLUME PER KILOGRAM delivered will be calculated correctly.

4. As you select different weights the A.D.S. 1000 automatically provides Default ventilation parameters for those weights. If, at any time **before** or **during** a procedure, you desire to change any parameters you may do so. The parameters that you can override are the following:

      a. **LITERS PER MINUTE** - To adjust the flow rate to the patient, simply press the FLOW RATE UP or FLOW RATE DOWN buttons on the front of the A.D.S. 1000.

      b. **BREATHS PER MINUTE** - To adjust the amount of breaths per minute delivered to the patient, simply press the BREATHS PER MINUTE UP or BREATHS PER MINUTE DOWN buttons on the front of the A.D.S.1000.

      c. **PEAK INSPIRATORY PRESSURE** - To adjust the peak inspiratory pressure delivered to the patient, press either the P.I.P. UP or P.I.P. DOWN buttons on the front of the A.D.S. 1000.

      d. **ASSIST** - To adjust the amount of inspiratory effort needed to initiate a breath by the patient, press either the ASSIST UP or ASSIST DOWN buttons on the front of the A.D.S. 1000.

      NOTE: To turn the ASSIST feature Off, press the and hold ASSIST DOWN button until the LCD displays "OFF" where the Assist value was located.

THE LCD DISPLAY in RUN MODE

NOTE: We suggest that you practice with the provided test lung. Until you feel confident that you fully understand the proper operation of the A.D.S. 1000. Throughout the manual whenever the word "patient(s)" is used, you will also see the words (TEST LUNG), this means that you should first familiarize yourself with this function by using the "TEST LUNG".

NOTE: When using the TEST LUNG you should always keep the vaporizer in the OFF position.

1. Now that you have entered in the patients' weight (the TEST LUNG simulates a 20 Kilogram patient), you are ready to begin delivering anesthesia or ventilating your patient (TEST LUNG).

2. If you haven't done so already, connect the end of the Breathing Circuit to your patient (TEST LUNG).

3. Place the SET/RUN switch into the "RUN" position. The patients' (TEST LUNG) chest should begin to fill up to the preset P.I.P.

4. After the patient (TEST LUNG) has reached the preset P.I.P. the exhale valve will open and the patients' (TEST LUNG) chest will exhale. The LCD display should look similar to the display below.
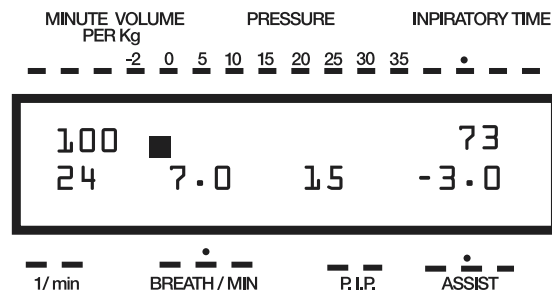
NOTE: Numbers used in section 5 and 6 of pages 11 and 12 are examples only.

5. The upper line of the LCD readout is now displaying, from left to right, the following information:

> a: **Minute Volume Per Kilogram,** (100 in this case). This number will be updated upon each inspiration.

> b. **Peak Inspiratory Pressure Graph,** (A square black cursor moving across a white background).

> **NOTE:** The cursor starts at 0 cm of H_2O and moves up to the selected Peak Inspiratory Pressure (15 cm of H_2O in this case).

THE LCD DISPLAY in RUN MODE (cont.)

NOTE: A square BLACK cursor moving across a WHITE background indicates that the breath was initiated by the A.D.S. 1000. Whereas a square WHITE cursor moving across a BLACK background indicates that the breath was initiated by the patient.

        c. **Inspiratory Time,** (.73 seconds in this case)

6. The bottom line of the LCD readout is shows the following parameters:

        a. **Flow Rate,** (24 Liters Per Minute in this case).

        b. **Breaths Per Minute,** (7 Breaths per minute in this case).

        c. **Peak Inspiratory Pressure,** (15 cm of H2O in this case).

        d. **Assist (Inspiratory Effort),** (-3.0 cm of H20 in this case).

7. The A.D.S. 1000 will now wait until either the patient initiates a breath, either by giving an inspiratory effort of equal or greater to the ASSIST value (-3.0 in this case), or until it is time to give the next breath (computed by the A.D.S. 1000's microprocessor) and repeat this cycle.

NOTE: If pressure in the system increases between breaths, a built in safety feature will cause the A.D.S. 1000 to allow an "exhale", i.e. the exhale valve opens to allow pressure to escape. This would happen, for instance, if the surgeon leaned on the patient's chest. It can also happen if the patient tries to exhale after he has already exhaled a tidal volume. You will hear the exhale valve open and close rapidly. *This is normal.*

8. To temporarily stop the A.D.S. during a procedure, place the SET/RUN switch into the "SET" position. By doing so the current parameters will be held, the current breath will be completed and the machine will stop. To continue ventilation, switch back to the "RUN" position.

UNDERSTANDING THE MINUTE VOLUME NUMBER

1. Since a blood gas analysis is not always available, we provide a minute volume number as a guide, to know if you are properly ventilating the patient. A properly ventilated patient should require from 150 to 250 ml. / minute / Kg. The 150 ml. / minute / Kg number is appropriate for larger patients and the 250 ml. / minute/ Kg number for smaller patients. In general, it is better to overventilate rather than underventilate a patient.

NOTE: The Minute Volume per Kilogram number becomes useful after the patient has stabilized. It will take a few breaths for this stabilization to take place, then you will see fluctuations of the Minute Volume per Kilogram number between breaths.

2. There are two ways to change the Minute Volume per Kilogram number:

> a. Since Minute Volume number is directly proportional to Breaths Per Minute, the most direct way to change the Minute Volume number is to change the amount of Breaths Per Minute.

> b. Changing the Peak Inspiratory Pressure (P.I.P.) will change the Tidal Volume and therefore change Minute Volume number as well. Obese patients with low thoracic compliance and patients with restrictive lung conditions will often need a higher Peak Inspiratory Pressure. The best method is to observe the chest and adjust the Peak Inspiratory Pressure for a "reasonable" amount of filling.

THE PEAK INSPIRATORY PRESSURE GRAPH

1.   The Peak Inspiratory Pressure of the patient is indicated by a cursor moving across the middle of the LCD display.

2.   The cursor starts at 0 cm of H_2O and moves up to the selected Peak Inspiratory Pressure.

3.   A square BLACK cursor moving across a WHITE background indicates that the breath was initiated by the A.D.S. 1000. Whereas a square WHITE cursor moving across a BLACK background indicates that the breath was initiated by the patient.

THE INSPIRATORY TIME

1.   The right four digits display the Inspiratory Time in seconds, e.g., 1.20. this number is updated with **EACH** breath. The exact length of inspiration is not critical, but it should allow an INSPIRATORY: EXPIRATORY RATIO of at least 1:2. This means at 10 breaths per minute, the inspiratory time should be no longer than two seconds. Generally, intervals of 0.75 to 2 seconds are suggested, the shorter time intervals being best for smaller patients.

2.   The easiest way to adjust the Inspiratory Time is to adjust the Flow Rate, i.e. the higher the flow rate the quicker the lungs will be brought up to the preset Peak Inspiratory Pressure, thus a quicker Inspiratory Time. Generally set the FLOW RATE so that the patient's chest rises in a reasonable time.

IMPORTANT: Very short inspiratory times may indicate a very high FLOW RATE into a very small patient. Under these circumstances, the narrowness of the tube and the resistance of the trachea and other air passageways causes the pressure to build up without inflating the lungs. It is usually very obvious when this occurs because the pressure will rise extremely rapidly, but the chest will not fill. DO NOT LET THIS CONDITION GO UNCORRECTED. Lower the flow rate to 2 or 4 LPM and let the chest fill slowly. Once the chest is filling normally, raise the flow rate back up to a reasonable inspiratory time.

3. If the Inspiratory Time exceeds 3 seconds, the ALARM will sound. This may be due to a too low FLOW RATE, but is usually caused by a leak in the system. Most of the time the problem will be a leaking endotracheal tube cuff. This can almost always be detected by carefully listening for a leak during inhalation .

DISPLAYING TIDAL VOLUME

1. Tidal Volume can be displayed instead of Minute Volume Per Kilogram. This option can only be done upon start-up of the A.D.S. 1000. In order to have the A.D.S. 1000 display the Tidal Volume, depress the LPM UP button and hold it then turn the A.D.S. 1000 ON. To exit this mode, you must turn the A.D.S.1000 OFF and restart the unit.

UNDERSTANDING FLOW RATE

1. The Flow Rate displayed on the A.D.S. 1000 is an instantaneous value, i.e. if the A.D.S. 1000 was set to 24 L.P.M. then if the unit were to have a inspiratory time of 1 minute then 24 liters of gas would have been used. In reality, the A.D.S. 1000 only allows gas to flow for whatever the Inspiratory Time is. In order to determine the "Actual Flow Rate" a simple calculation can be performed. This calculation is as follows:

$$F_{ave.} = (F_{ins} \times T_{on} \times B) / 60$$

Where:

$F_{ave.}$ = Actual Flow Rate

$F_{ins.}$ = Flow Rate on L.C.D. Display

T_{on} = Inspiratory Time

B = Actual Breaths Per Minute

UNDERSTANDING BREATHS PER MINUTE

1. The Breaths Per Minute displayed is the exact Breaths Per Minute only when the ASSIST is in the OFF setting. If the ASSIST in ON, the displayed value is the minimum Breaths Per Minute, i.e. the A.D.S. will initiate a breath only if the patient does not do so in the allotted time. The A.D.S. 1000 correctly updates and displays the Minute Volume per Kilogram after each breath, regardless of if the patient or the machine initiated the breath.

NOTE: If the ASSIST is in the OFF position and the Breaths Per Minute is set at 6.0, then the patient (TEST LUNG) will only have six inspiratory/expiratory cycles each minute.

NOTE: If in the above case, the ASSIST was in the -2.0 setting and the Breaths Per Minute remained at 6.0, and the patient gave a single inspiratory effort of -2.0 cm of H_2O, then the patient will have seven inspiratory/expiratory cycles for that minute.

HOW TO SET P.I.P.

1. To adjust the Peak Inspiratory Pressure, simply depress either the P.I.P. UP or P.I.P. DOWN buttons on the front of the A.D.S. 1000.

NOTE: To see how the P.I.P. graph works, press the P.I.P. DOWN button until it displays 5.0, place the SET/RUN switch into the "RUN" position. The patients' (TEST LUNG) chest should begin to fill up to the preset P.I.P. Notice that the patients' chest (TEST LUNG) does not inflate as much as it did when the P.I.P. was set at 15.

UNDERSTANDING ASSIST

1. The default setting for ASSIST i.e. assisted respiration is set at -3.0 cm of H_2O. This setting allows for a breath to be initiated by the patient. If you wish to allow the patient to initiate its own breath, use the ASSIST buttons on the far right to set the amount of NEGATIVE PRESSURE, i.e. VACUUM the patient has to produce in order to initiate a breath.

2. You would usually select the lowest possible absolute number that does not cause false breaths. When in ASSIST mode the A.D.S. 1000 will wait for the patient to initiate a breath. If the patient does not spontaneously INITIATE a breath, the A.D.S. 1000 will automatically begin the breathing cycle for the patient at the set parameters.

3. If you prefer not to allow the patient to initiate it's own breath, you may do so by pressing the ASSIST DOWN button until the display reads "OFF".

USING THE FILL / HOLD FEATURE

1. FILL / HOLD fills the chest to the selected pressure and then maintains that pressure, i.e., it does not allow exhalation until the button is released. FILL and HOLD can be used to induce a patient as described below in the section **BUCKING THE A.D.S.** It can also help during closure of thoracotomy incisions. Simply press the FILL and HOLD and hold it until the lungs are filled. The lungs will fill to the preset parameter and will remain inflated AT THAT PRESSURE until the button is released. There is some hysteresis, i.e. the pressure is allowed to fall 3 CM before the chest is refilled. Overzealous hyperinflation of previously collapsed areas of the lungs can cause pulmonary damage.

For this reason it is best to inflate the lungs at the lowest possible P.I.P. value, (around 10 cm of H_2O) and for the shortest time necessary (a few seconds) when the chest is open.

BUCKING THE A.D.S.

1. If the patient is not in a deep enough plane of anesthesia he will attempt to buck the A.D.S. 1000. You will see very short inspiration times and violent attempts to inhale and exhale. There are several practical solutions to this problem.

    a. Patient may require additional medication, on Doctors orders. (For example intravenous drugs).

    b. Set the vaporizer to 4 or 5 percent. Then press FILL & HOLD and keep the button depressed for a second or two. Release, then repeat. Do this until the patient relaxes, then reset the vaporizer and allow the A.D.S. 1000 to take over.

    c. Set the ASSIST value to a more sensitive value (i.e. a smaller negative number, -2.0 is more sensitive than -4.0), turn the vaporizer to 3 or 4 percent. The patient will usually ventilate himself down. The Minute Volume number may go up for a few breaths.

    2. Once the patient is stabilized, the settings can be adjusted (if necessary).

USING THE BREATHE FEATURE

1. The BREATHE button can be pressed at any time between cycles to initiate a breath, overriding both timed and assisted respiration.

NOTE: To test the BREATHE function, turn ON the A.D.S. 1000, install the TEST LUNG onto the end of the Breathing Circuit, place the SET/RUN switch into the "RUN" position. In between a machine controlled breath press the BREATHE button, the TEST LUNG should inflate and deflate.

USING THE MASK MODE

1. Masking a patient down requires an adapter which is supplied with the unit.

2. As shown below, connect the "Mask Adapter" to the end of the breathing circuit.

3. Attach the mask and the "Blue Scavenger Tubing" to the "Mask Adapter.
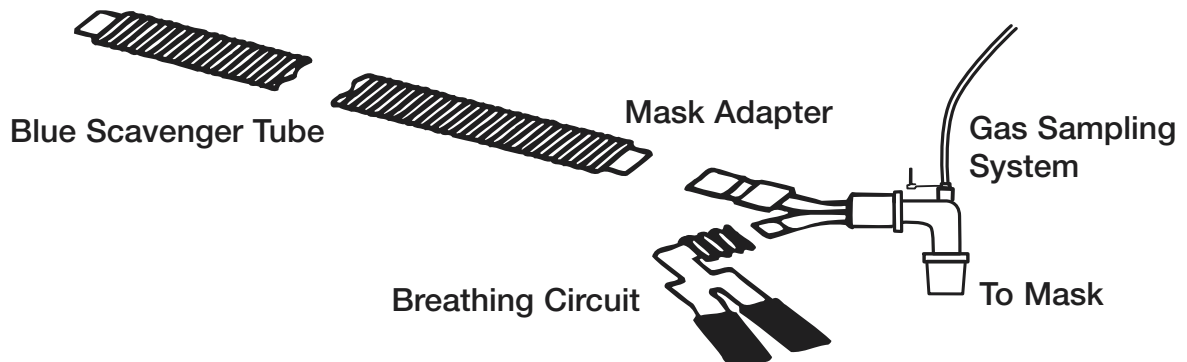
4. Connect the external sensor input - insert the Luer lock connector to the gas sampling input and rotate it clockwise one half turn. Now insert the gas sampling elbow into the end of the mask adapter.

5. Set the vaporizer to the desired concentration.

6. Place the "MASK" switch into the ON or "I" position. The LCD display will look like Figure 6, and a continual flow of oxygen with anesthetic gas will flow through the mask at a preselected flow rate.

7. USING A MASK WHILE IN LAB MODE
When using a mask in lab mode (low flow) do not use the mask adapter. Instead, connect the mask directly to the breathing circuit. The blue scavenger tube should be connected to the scavenger port at the back of the unit.

USING THE MASK MODE (cont.)

NOTE: An adequate MASK flow is calculated as in the formula below:

$$F_{MASK} = 3 \times M_V$$

Where: F_{MASK} = Mask Flow Rate
M_V = Minute Volume per Kilogram

The A.D.S. 1000 automatically selects a Mask Flow Rate of at least 3 times Minute Volume based on the patients' weight entered.

NOTE: The scavenger system must be able to hold at least one Tidal Volume for the mask function to work properly.

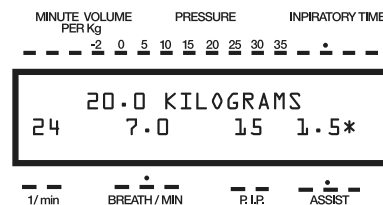**NOTE:** In the MASK mode there is a built in pressure safety that stops the flow to the patient and causes an audible alarm if the pressure exceeds 35cm of H_2O. This pressure can build up if the MASK ADAPTER is not used, i.e. the mask is connected directly to the Breathing Circuit.

8. To end a MASK procedure, simply place the "MASK" switch into the OFF or "O" position. The A.D.S. 1000 then reverts back to normal operation.

UNDERSTANDING PEEP MODE

1. The A.D.S. 1000 has a built in PEEP (Positive End Expiratory Pressure) mode. To activate the PEEP mode perform the following:

> a. Turn OFF the A.D.S. 1000.

> b. Place and hold your thumb over the end of the breathing circuit.

> c. Press the ASSIST UP button and hold it down while turning ON the A.D.S. 1000.

> d. As shown below, the LCD display will now show a PEEP value instead of an ASSIST number

```
        MINUTE VOLUME          PRESSURE            INPIRATORY TIME
            PER Kg
                -2  0  5  10  15  20  25  30  35
    ┌─────────────────────────────────────────┐
    │          20.0 KILOGRAMS                  │
    │    24        7.0        15   1.5*        │
    └─────────────────────────────────────────┘
         1/ min      BREATH / MIN      P. I.P.    ASSIST
```

NOTE: An "*" is displayed as an indication that the A.D.S. 1000 is in the PEEP mode.

NOTE: The ASSIST mode will not function when the A.D.S. 1000 is in PEEP mode.

NOTE: PEEP pressures range from 0 to 9 cm of H_2O. Adjust the PEEP pressure by using the ASSIST UP and ASSIST DOWN buttons.

> e. To exit the PEEP mode you must first turn OFF and then restart the A.D.S. 1000.

UNDERSTANDING THE FLUSH MODE

1. It is recommended that the unit be flushed at the end of each surgery. In order to flush out any debris or condensation that may build up in the A.D.S. 1000's internal lines, the A.D.S. 1000 comes with a FLUSH mode.
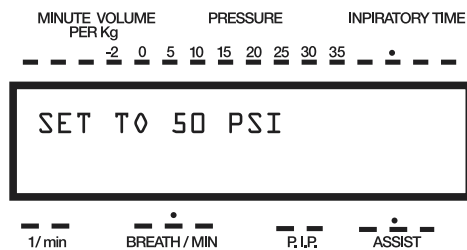
2. To enter the FLUSH mode perform the following:

a. Turn OFF the A.D.S. 1000, turn the vaporizer to the off position, and ensure the 5 PSI / 50 PSI switch is set to 50 PSI.

b. Place and hold your thumb over the end of the breathing circuit.

c. Press the FILL & HOLD button and hold it down while turning ON the A.D.S. 1000.

d. The LCD will now look like the display below. The A.D.S. 1000 is now in the FLUSH mode and a full 60 LPM flow of oxygen is passing through the A.D.S.1000.

MINUTE VOLUME   PRESSURE   INPIRATORY TIME
PER Kg
-2 0 5 10 15 20 25 30 35

```
SET TO 50 PSI
```

1/ min   BREATH / MIN   P. I.P.   ASSIST

e. To exit this mode, simply release the FILL & HOLD button and the unit will go through the self test.

NOTE: As a method of preventative maintenance the Flush mode should be done after every procedure. This will insure that the internal lines and valves are kept clean and dry.

ENDOTRACHEAL TUBES and the A.D.S. 1000

1. The proper function of any ventilator depends on a good seal between the trachea and the tube cuff. Small leaks will cause the Minute Volume Per Kilogram to be off, while larger leaks will not allow the peak inspiratory pressure to be reached in a reasonable time if at all.

2. Small tubes should have the adapter on the OUTSIDE, rather than the inside of the tube. When they are on the inside, the adapter narrows the opening significantly and can seriously interfere with respiration. This is, of course, true whether positive pressure ventilation is used or not. In fact, it is even more important for "regular" anesthesia systems. The adapter can be glued onto the outside of the tube.

3. The cuff should be tested to be sure there are no leaks. Fill and cap the cuff, then submerge in water to check for leaks.

4. A good seal must be made to the patient, but care should be used not to put too much pressure on the trachea since excessive pressure can cause damage to the tissue.
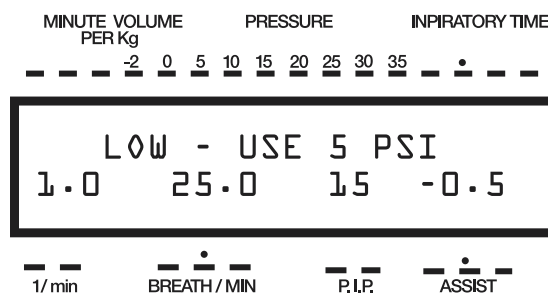
USING THE A.D.S. 1000 in LAB MODE

In order to facilitate the ventilation of very small patients the A.D.S. 1000 has a low pressure LAB mode. This mode does not have any preset default parameters by weight, therefore it is advised that you have experience operating the A.D.S. 1000 before using this mode. To enter this mode perform the following.

1. Turn ON the A.D.S. 1000 as usual and allow it to go through the self-test procedure. The LCD should display the initial default 20 Kilograms readout.

NOTE: The start-up self-test may show an error if you attempt to start the A.D.S. 1000 with the input pressure set at 5 P.S.I., therefore, always start the A.D.S. 1000 in the NORMAL mode at 50 P.S.I. and set the 50 P.S.I. / 5 P.S.I. switch to the 5 P.S.I. setting. (to the right)

2. Now press the WEIGHT DOWN button until the LCD displays looks like the one below.

```
       MINUTE VOLUME          PRESSURE           INPIRATORY TIME
          PER Kg
               -2   0   5  10  15  20  25  30  35
  ┌──────────────────────────────────────────────┐
  │                                                │
  │        LOW - USE 5 PSI                         │
  │     1.0    25.0      15    -0.5                │
  │                                                │
  └──────────────────────────────────────────────┘

       1/ min        BREATH / MIN       P.I.P.      ASSIST
```

3. On the back panel of the A.D.S. 1000 you will find a toggle switch to select the pressure - 50 P.S.I. for normal operation (and to start up self test) and 5 P.S.I.for lab mode. Set switch to 5 P.S.I.
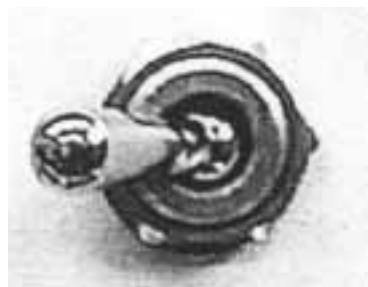
50 PSI / 5 PSI

This A.D.S has an internal regulator for Lab Mode.

Always operate with an input pressure of 50 P.S.I.

4. In LAB mode the Tidal Volume, rather than the Minute Volume per Kilogram, is displayed.

USING THE A.D.S. 1000 in LAB MODE (cont.)

5. In LAB mode the Flow Rates are adjustable between 0.2 to 6.0 Liters per Minute.

6. The Breaths per Minute in LAB mode are adjustable between 1 and 95.

NOTE: The Breaths per Minute are in increments of 0.5 for 1 - 12 BPM
       1.0 for 13 - 50 BPM
       2.0 for 50 - 70 BPM
       5.0 for 70 - 95 BPM

7. The MASK function in LAB mode does not require the use of a Mask Adapter.

USE OF EXTERNAL EQUIPMENT WITH THE A.D.S. 1000

Connecting any external apparatus to the ADS 1000 may adversely affect the operation of the unit.

Always test for correct operation on the test lung prior to using it on a patient.

CAUTION:

Electromagnetic interference from Electro-cauterization (Electro- surgical) units may interrupt the normal operation of the microprocessor within this medical device. Suggestion: While using Electro cauterization unplug the A.D.S. 1000's power supply adapter and run the A.D.S. 1000 on its internal battery. This may help stop the interference disrupting the operation of the microprocessor. When using the A.D.S. 1000 in this manner the A.D.S. 1000 must be monitored closely for any abnormalities in operation.

TROUBLESHOOTING CHECK LIST.

1. **Check the unit's calibration:**

To enter the calibration mode perform the following:

a. Turn OFF the A.D.S. 1000, turn the vaporizer to the off position.
b. Disconnect the breathing circuit and the gas sampling system (if available).
c. Disconnect the scavenger port.
d. Press the PIP buttons up and down at the same time and hold them down while turning ON the A.D.S. 1000.
e. A single number will be displayed in the LCD screen; this number must be between 25 and 27 for the unit to function properly. If the calibration number is not between 25 and 27, the unit is out of calibration. To have the unit calibrated, fill the repair form in the back of this manual and send it with the unit to Engler Engineering Corporation for recalibration.

2. **Make sure that the unit has been flushed at the end of each procedure:**

To enter the FLUSH mode perform the following:

a. Turn OFF the A.D.S. 1000, turn the vaporizer to the off position, and ensure the 5 PSI / 50 PSI switch is set to 50 PSI.
b. Place and hold your thumb over the end of the breathing circuit.
c. Press the FILL & HOLD button and hold it down while turning ON the A.D.S. 1000.
d. The LCD will display "SET TO 50 PSI". The A.D.S. 1000 is now in the FLUSH mode and a full 60 LPM flow of oxygen is passing through the A.D.S. 1000.

3. **Make sure oxygen is on and the oxygen line pressure is 50 PSI.**
4. **Check for cracks and leaks on the breathing circuit. If any damage is found replace breathing circuit.**
5. **Ensure that unit is connected to power and that the battery low LED is not on. If battery low LED is on the unit must be charged.**

If battery low LED continues to be on after the unit has been powered you may have one of the following problems:

a. There is no power in the wall socket that you are connecting the unit to.
b. The wall adapter is damaged.
c. The battery has expired and needs to be replaced. To have the battery replaced, complete the repair form in the back of this manual and send it with the unit to Engler Engineering Corporation for repair.
d. The power socket in the back of the A.D.S. 1000 has been damaged and need's to be repaired. To have the unit repaired, complete the repair form in the back of this manual and send it with the unit to Engler Engineering Corporation for repair.

6. <u>Make sure that the gas sampling system is connected.</u>

To connect the external sensor input, insert the Luer lock connector to the gas sampling input and rotate it clockwise one half turn. Now insert the gas-sampling elbow into the end of the breathing circuit.

7. <u>Observe the vaporizer hoses and make sure that they are properly connected.</u>

TROUBLESHOOTING THE A.D.S. 1000

NOTE: The use of certain types of electrosurge cauterizing units can cause severe radio interference resulting in locking up of the microprocessor. It is suggested to experiment with the supplied test lung to see which cauterizing units are compatible with the ADS 1000.

NOTE: The power supply that is supplied with the ADS 1000 can sometimes act as an antenna for receiving the interference from the electrosurge, sometimes unplugging the power supply (running in battery mode) aids in isolating the ADS 1000 from the electrosurges interference.

If you encounter any unusual difficulties with the A.D.S. 1000 call Engler Engineering at 1-800 445-8581. Engler Engineering Corporation warrants the A.D.S. 1000 to be free from material or manufacturing defects for two years. <u>Do not attempt to repair the A.D.S 1000 on your own. Doing so will invalidate your warranty.</u>

1. If upon Self-Test you get the following display:
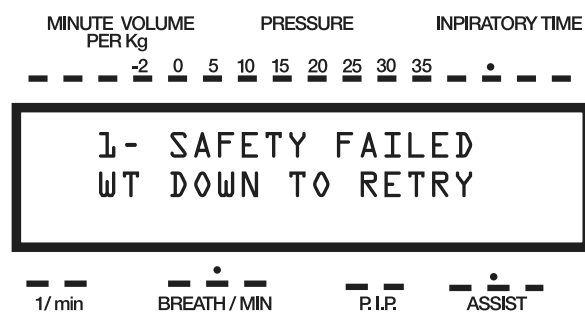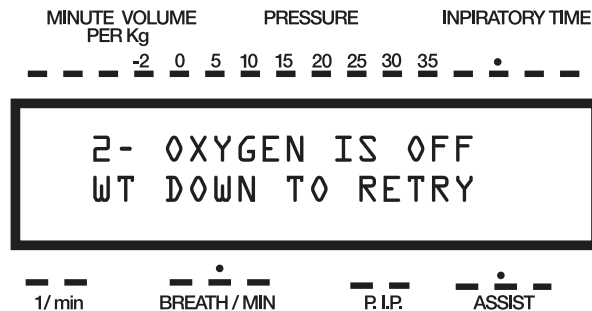

This indicates that the mechanical Safety pop-off valve inside the unit is dirty or it has failed.

    a. There is debris or condensation trapped inside the exhale valve, perform a FLUSH of the unit by following the instructions in the UNDERSTANDING THE FLUSH MODE section of this manual. Then Press WEIGHT DOWN button to retry.

    b. Call Engler's assistance hot line. 1-800 445-8581.

TROUBLESHOOTING THE A.D.S. 1000 (cont.)

2. If upon Self-Test you get the following display:

```
   MINUTE VOLUME          PRESSURE          INPIRATORY TIME
       PER Kg
              -2   0   5  10  15  20  25  30  35        •
   _  _  _  _  _   _   _   _   _   _   _   _   _    _   _  _  _
  ┌─────────────────────────────────────────────────────────┐
  │                                                           │
  │         2- OXYGEN IS OFF                                  │
  │         WT DOWN TO RETRY                                  │
  │                                                           │
  └─────────────────────────────────────────────────────────┘
                         •                         •
   _  _           _  _  _           _  _       _  _  _
    1/ min         BREATH / MIN       P. I.P.      ASSIST
```
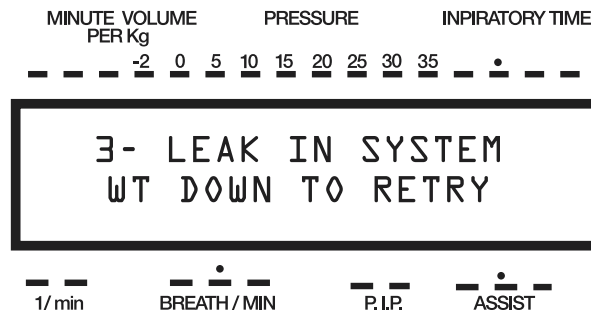
This may indicate a number of problems. In order to test all internal lines and valves the A.D.S.1000 attempts to pressurize itself and then checks for leaks. If it cannot pressurize itself then it will give the above readout. The causes for the error are as follows:

a. No oxygen or very low oxygen pressure, check to insure that there is 50 P.S.I. of oxygen in the Green oxygen tubing that runs to the back of the A.D.S. 1000. Press WEIGHT DOWN button to retry.

b. The "To Vaporizer" and / or "From Vaporizer" connectors are loose, check all vaporizer hoses and connectors, make sure they are secure and that they have no leaks. Press WEIGHT DOWN button to retry.

c. The vaporizer has a leak internally, to eliminate this problem connect the "To Vaporizer" hose directly to the "From Vaporizer" hose, and Press WEIGHT DOWN button to retry.

d. You are not placing you thumb over the gas-sampling elbow that is connected to the the end of the breathing circuit during start-up. Place your thumb over the end of the gas-sampling elbow and press WEIGHT DOWN button to retry.

e. Low battery recharge unit.

f. If the problem persists call Engler's assistance hot line. 1-800-445-8581

TROUBLESHOOTING THE A.D.S. 1000 (cont.)

3. If upon Self-Test you get the following display:

```
        MINUTE VOLUME          PRESSURE          INPIRATORY TIME
           PER Kg
                    -2  0  5  10 15  20 25  30 35    •
  _  _  _  _  _  _  _  _  _  _  _  _  _  _  _
  ┌─────────────────────────────────────┐
  │                                       │
  │    ∃- LEAK IN SYSTEM                  │
  │    WT DOWN TO RETRY                   │
  │                                       │
  └─────────────────────────────────────┘
        •               •
  _  _       _  _      _  _     _  _
  1/ min      BREATH / MIN      P. I.P.     ASSIST
```

This indicates that there is leak somewhere in the system.

     a. There is debris or condensation trapped inside the exhale valve, perform a FLUSH of the unit by following the instructions in the **_UNDERSTANDING THE FLUSH MODE_** section of this manual. Then Press WEIGHT DOWN button to retry.

     b. One of the tubes coming out of the back of the unit is loose, check all connections and Press WEIGHT DOWN button to retry.

     c. The Breathing Circuit has a leak in it, check the Breathing Circuit for leaks and check to see if it is securely connected to the Breathing Circuit Ports on the front of the unit. Press WEIGHT DOWN button to retry.

     d. Vaporizer has a leak.

     e. Pop off valve adjustment needed. This must be completed by Engler Engineering as specialized tools and test equipment is required.

     f. If the problem persists call Engler's assistance hot line. 1-800-445-8581

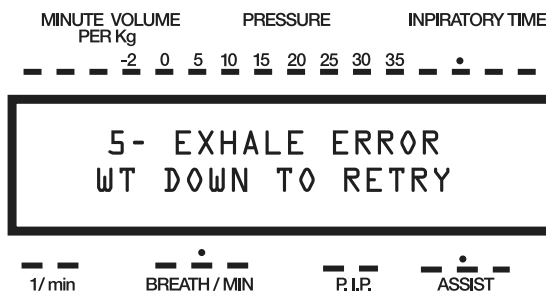4. If upon Self-Test you get the following display:

```
        MINUTE VOLUME          PRESSURE          INPIRATORY TIME
           PER Kg
                    -2  0  5  10 15  20 25  30 35    •
  _  _  _  _  _  _  _  _  _  _  _  _  _  _  _
  ┌─────────────────────────────────────┐
  │                                       │
  │    4- LEAK / SAFETY LO               │
  │     WT DOWN TO RETRY                 │
  │                                       │
  └─────────────────────────────────────┘
        •               •
  _  _       _  _      _  _     _  _
  1/ min      BREATH / MIN      P. I.P.     ASSIST
```

This display indicates that there is a minor leak or the Safety pop-off is releasing at too low a pressure.

TROUBLESHOOTING THE A.D.S. 1000 (cont.)

a. There is a loose connection to the A.D.S. 1000 or to the vaporizer, check all of the connections and secure them if necessary. Press WEIGHT DOWN button to retry.

b. There is debris or condensation trapped inside the exhale valve, perform a FLUSH of the unit by following the instructions in the **_UNDERSTANDING THE FLUSH MODE_** section of this manual. Then Press WEIGHT DOWN button to retry.

c. If the problem persists call Engler's assistance hot line. 1-800-445-8581

5. If upon Self-Test you get the following display:

```
MINUTE VOLUME        PRESSURE         INPIRATORY TIME
    PER Kg
            -2   0   5  10  15  20  25  30  35
── ── ──  ── ── ── ── ── ── ── ── ──  ── •── ── ──
┌─────────────────────────────────────────┐
│                                         │
│         5- EXHALE ERROR                 │
│        WT DOWN TO RETRY                 │
│                                         │
└─────────────────────────────────────────┘
    ── ──        ── •── ──      ── •── ──    ── •── ──
    1/ min       BREATH / MIN      P. I.P.      ASSIST
```

This display indicates that there is an obstruction to the exhale valve or that the exhale valve did not open. This error can be caused by the following.

a. There is an obstruction in the scavenging system, check to insure that a free flow of exhaust gas can pass through the scavenging system. Then Press WEIGHT DOWN button to retry.

b. An active scavenging system is being used and the active scavenger valve is in the CLOSED or SHUT position. Open the active scavenger valve and then Press WEIGHT DOWN button to retry.

c. Battery is too low – recharge unit

d. If the problem persists call Engler's assistance hot line. 1-800-445-8581

COMMONLY ASKED QUESTIONS:

Q. The Flow Rate indicated on my LCD readout seems to be a very high number, in my rebreathing system I never used flow rates like 32 or 44 liters per minute, is this normal?

A. Absolutely, the LCD readout on the A.D.S. 1000 gives the Flow Rate if the unit were left on for an inspiratory time of 60 seconds (1 minute). An example would be as follows; say the A.D.S. 1000 was set to 24 L.P.M. and we let the unit have an inspiratory time of 1 minute, then 24 liters of gas would have been used. In reality, the A.D.S. 1000 only allows gas to flow for whatever the Inspiratory Time is. In order to determine the "Actual Flow Rate" a simple calculation can be performed. This calculation is as follows:

$$F_{ave.} = (F_{ins} \times T_{on} \times B) / 60$$

Where:

$F_{ave.}$ = Actual Flow Rate

$F_{ins.}$ = Flow Rate on L.C.D. Display

T_{on} = Inspiratory Time

B = Actual Breaths Per Minute

Q. How does the A.D.S. 1000 calculate the Minute Volume per Kilogram?

A. The formula for calculating minute volume is:

$$M_V = (T_V \times B) / W$$

Where: M_V = Minute Volume per Kilogram
Tv = Tidal Volume
B = Breaths Per Minute
W = Weight in Kilograms

The A.D.S. has a built in computer which determines this number and updates the display after each inspiration has ended.

Q. What is proper value for the Minute Volume per Kilogram number?

A. A properly ventilated patient should require from 150 to 250 ml. / minute / Kg. The 150 ml. / minute / Kg number is appropriate for larger patients and the 250 ml. / minute/ Kg number for smaller patients.

COMMONLY ASKED QUESTIONS (cont.):

Q. How do I add additional anesthesia liquid to my vaporizer during a procedure?

A. To fill the vaporizer during a procedure, place the SET/RUN switch into the "SET" position, wait for the A.D.S. 1000 to complete the last breath cycle. Fill the vaporizer as usual, then switch back to "RUN" and continue.

Q. How do I change my oxygen tank when it is low?

A. As with any anesthesia system, be sure to check your oxygen supply before starting any procedure. To replace the tank, shut off the valve on the top of the oxygen tank, then depressurize the GREEN, "Oxygen In" line running to the A.D.S. 1000. The pressure may be released in the line by slightly loosening the GREEN, hose for a few seconds to bleed the line.

Q. I have just successfully completed several procedures, but when I turn the A.D.S. 1000 back ON and it goes through the SELF-TEST, the LCD display gives me Error 4 - LEAK/SAFETY LO, is this normal?

A. Yes, this Error is usually caused by a build up of condensation in the exhale valve of the A.D.S. 1000. To remove this condensation simply perform the following procedure:

       a. Turn OFF the A.D.S. 1000

       b. Place and hold your thumb over the end of the gas sampling elbow breathing circuit.

       c. Press the FILL & HOLD button and hold it down while turning ON the A.D.S. 1000.

       d. The unit is now in the FLUSH mode and a full 60 LPM flow of oxygen is passing through the A.D.S. 1000.

       e. To exit this mode, simply release the FILL & HOLD button and the unit will go through the self test.

COMMONLY ASKED QUESTIONS (cont.):

Q. Can I use the A.D.S. 1000 with my induction chamber?

A. Of course, if you put the A.D.S. 1000 into the MASK mode it will allow a continuous flow of anesthetic gas to exit through the breathing circuit. All you have to do is connect the mask adapter to the unit as described in the section **USING THE MASK MODE,** but instead of connecting the output to a mask, connect it to your induction chamber.

Q. Can I use my vaporizer at the same settings that I am used to using on my rebreathing system?

A. Since the A.D.S. 1000 delivers a constant plane of anesthesia on each breath, you may find that you can actually turn your vaporizer settings to about one-half of what you had been using with your rebreathing system.

Q. Why doesn't the A.D.S.1000 use a Lime Canister or Breathing Bag?

A. Since the A.D.S. 1000 is a positive pressure type of ventilator it only allows the oxygen and / or anesthetic to flow during the inspiration phase of the respiratory cycle i.e. only for the inspiratory time. Since the A.D.S. 1000 fills up the lungs for each breath there is no need for a breathing bag. The A.D.S. 1000 does not recycle the exhaled gas, it delivers the waste gas to the scavenger system.

Q. What happens if the electronic safety fails?

A. To prevent the over-inflation of the lungs, the A.D.S. 1000 incorporates both an electronic and mechanical safety mechanism.

COMPANY INFORMATION

Engler Engineering Corp., has been in business since 1964, in Hialeah, Florida, building and maintaining dental units and parts for not only our ultrasonic scalers, polishers, and anesthesia machine, but for many others on the market today. As a leader in the field, we would appreciate a minute of your time to let us know how we can better serve you.

You can mail all comments, suggestions and questions to us at the following address.

<div align="center">

Engler Engineering Corp.
1099 East 47 Street
Hialeah, FL 33013

</div>

If you wish to fax to us, please use 305-685-7671.

For your convenience, the following names are listed for your correspondence:

President	Eva Engler
VP Sales & Marketing	Steven Menaged
Operations Manager	Joel Katz
Customer Service	Raya Engler
Cust. Service/Repair	Harvey Meinstein

<div align="center">

**If you have any questions or concerns, please call us.
ENGLER ENGINEERING CORP 800-445-8581.**

</div>

RETURN FOR EVALUATION / REPAIR FORM

PLEASE PHOTOCOPY AND INCLUDE A COMPLETED COPY WHENEVER SENDING UNITS IN TO US FOR EVALUATION AND / OR REPAIR.

CONTACT PERSON _____

CLINIC PHONE NUMBER: _____FAX #_____

CLINIC NAME: _____

SHIPPING ADDRESS: _____

CITY: _____   STATE: _____   ZIP: _____

ITEM BEING SENT: _____

Please describe what is happening or why you are sending in this unit:

_____

_____

_____

_____

_____

_____

PLEASE NOTE:

Whenever returning any products for evaluation and / or repair, we strongly suggest you send in the complete unit with all attachments so that a correct evaluation can be made.

It is suggested that you ship all returns to us by Federal Express, UPS or DHL. If using US Mail, it is suggested that you track and insure the package.

Address all returns as follows:

**ENGLER ENGINEERING CORP.
REPAIR DEPARTMENT
1099 EAST 47 STREET
HIALEAH, FL 33013**

Notes