

# Breath Simulation Module

For use with Dual Adult Training/Test Lungs



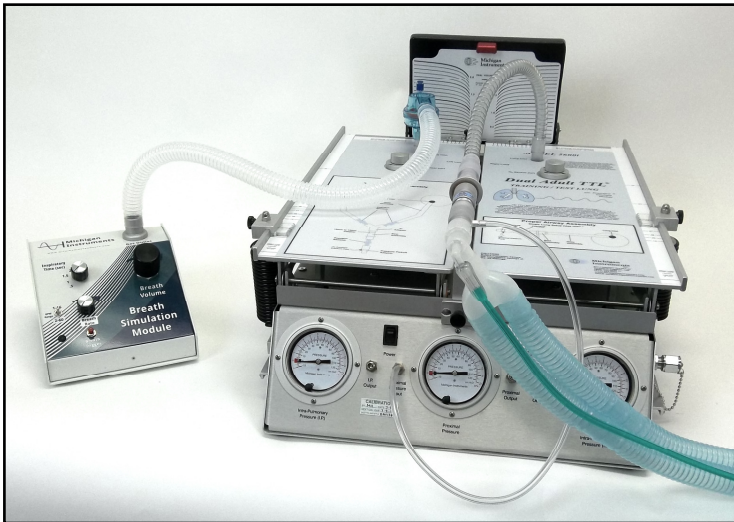
Manufactured By:



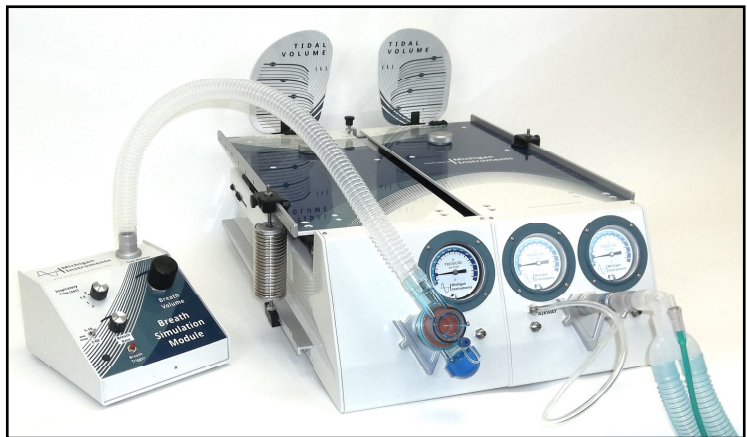
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Typical BSM Setup for  
Models 1600, 2600i or 5600i



Typical BSM Setup for  
Models DAN or DA3

## General Information

### Technical Support / Factory Service

To help ensure maximum performance and productivity from your equipment, the *Breath Simulation Module* is backed by Michigan Instruments' commitment to total customer satisfaction. If you have a question, please contact us.

If you require factory service, call us Monday through Friday between the hours of 9:00 am and 5:00 pm Eastern Time. To maintain peak performance and accuracy, factory service and recalibration is recommended every three years.

Phone: (616) 554-9696 or (800) 530-9939

E-mail: [mii@michiganinstruments.com](mailto:mii@michiganinstruments.com)

Website [www.michiganinstruments.com](http://www.michiganinstruments.com)

Mailing address:

Technical Support – *Breath Simulation Module*  
Michigan Instruments, Inc.  
4717 Talon Ct. SE  
Grand Rapids, MI 49512  
USA

Please include the following information when you contact Michigan Instruments:

- Product name, and serial number.
- Training Test Lung model that the Simulator is being used with.

### Warranty Information

The *Breath Simulation Module* is warranted by Michigan Instruments, Inc., Grand Rapids, Michigan to be free of defects in material and workmanship for a period of **One (1) year** from the date of receipt by the purchaser.

All repairs necessitated by a malfunction of this equipment during the warranty period, when used in accordance with the instructions provided, will be accomplished at Michigan Instruments, Inc. without charge other than the cost of transportation to the factory. Michigan Instruments, Inc. undertakes no liability for special or consequential damages, or any other expense or liability beyond furnishing the materials and labor for the repairs covered under this warranty. The warranty does not cover marks, blemishes, scratches etc. which may result from normal use of this equipment, or malfunctions due to mishandling or damaging accidents. This warranty is VOID unless the equipment to be repaired is returned in the original factory carton. If unavailable, the carton may be obtained from Michigan Instruments, Inc.

If the warranty registration card is not returned, the warranty period will begin the date the system was shipped from the factory.

This warranty is in lieu of all other warranties expressed or implied, and shall be void for any products which have been altered or repaired by others, or have been subjected to misuse or abuse. The buyer agrees that this written warranty constitutes the entire agreement as to warranties between the parties. Any prior or contemporaneous oral statements, which have not been written into this agreement, are not binding and this contract shall not be rescinded or modified except by a signed agreement.

## Introduction

The purpose of this manual is to familiarize the user with the function, care, and maintenance of the Michigan Instruments, Inc. Breath Simulation Module. Please read it thoroughly before attempting to use your system.

## Features

The Breath Simulation Module (BSM) is designed to be used with the Dual Adult Training Test Lung (TTL), Models 1600, 2600i, 5600i, DAN or DA3. The addition of the Breath Simulation Module makes the Test Lung a spontaneously breathing lung simulation system.

Although the BSM was developed as an accessory for the TTL, it can be used as a stand-alone breath generating device for different applications. Contact us if you have questions.

## Specifications

Breath Rate: 1 – 60 Breaths per Minute

Inspiratory Time: User selectable – .5, 1, 1.5, and 2 seconds ( $\pm 0.15$  seconds)

Breath Volume: 50 – 2000 mL

Manual Mode (Breath Trigger): Push-button control of individual breaths.

## Gas Adaptor

Attached to the *Gas Input Hose* included with the BSM, is a pressure checked, male adaptor with 1/8 female threads. It is included, for convenience, so it can be attached to a 1/8 male threaded air or Oxygen pipeline adaptor (not included) to connect the BSM to the air or Oxygen source that will be used.



Remove the adaptor by first pulling back on the connector to release it and pull it outward. It is recommended to use Teflon tape on the male threads of the pipeline adaptor to provide a leak-free seal. Attach the male adaptor to the pipeline adaptor and tighten snugly. Check for leaks.



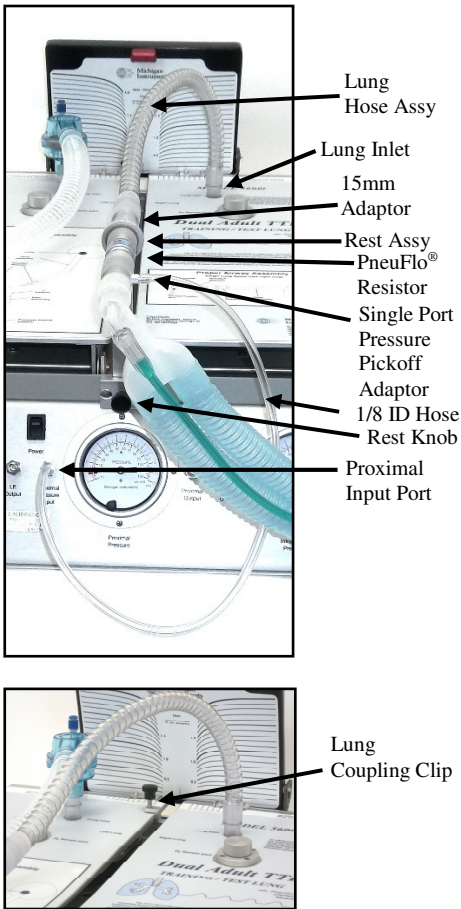
Shown here are a couple examples of an Ohio and DISS Oxygen pipeline adaptors with the connector attached.

## Non-Rebreathing Valve (NRV)

The NRV supplied with the BSM is an angled, lip-valve type. If using a straight, flapper-valve type, depending on manufacturer, adaptors may be needed to fit the NRV/Breathing Hose to the BSM and the lung inlet.



## Setup (Models 1600, 2600i or 5600i)

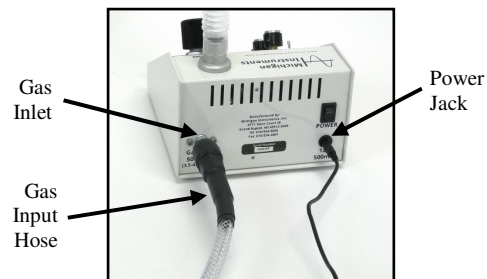
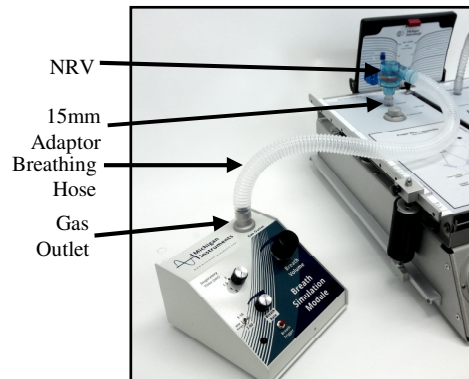


### Lung Setup

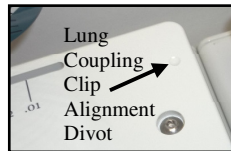
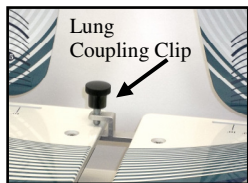
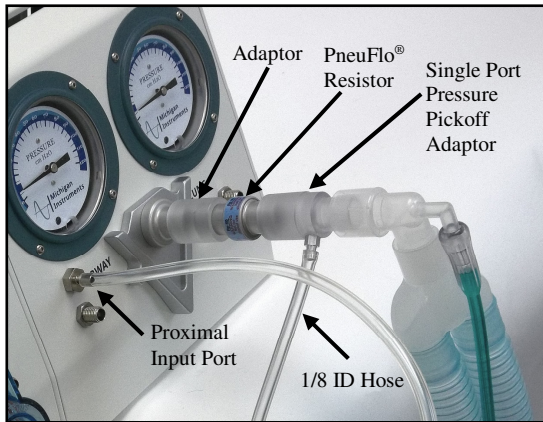
1. Loosen the *Rest Knob* on the front of the TTL and insert the *Rest Assy* into the holder. Lock it in place by tightening the knob.
2. Select the desired *PneuFlo® Resistor* to simulate airway resistance and connect it to the proximal (outward facing) opening on the rest assy.
3. Attach a *Single Port Pressure Pickoff Adaptor* to the resistor.
4. Use the *1/8 ID Hose* to connect the pickoff adaptor to the *Proximal Input Port* located to the left of the center gauge.
5. Insert a *15mm Adaptor* into the opposite opening on the rest assy.
6. Insert the 15mm ID end of the *Lung Hose Assy* onto the 15mm adaptor on the rest assy. Insert the 15mm OD end of the lung hose assy into the *Lung Inlet Port* in the top plate of the **right** lung. (*Note: the Breath Simulation Module must be connected to the left lung.*)
7. Set lung compliance for the right lung as desired (per the Test Lung manual.)
8. Attach the *Lung Coupling Clip* to the left lung and under the right lung. This will allow the left lung to drive the right lung when a breath is delivered from the Breath Simulation Module.

### Breath Simulation Module Setup

1. Connect one end of the *Breathing Hose* to the inlet of the *Non-Rebreathing Valve (NRV)* and the other end to the *Gas Outlet*.
2. Insert the *15mm Adaptor* into the outlet of the *NRV*. Insert into the lung inlet on the left lung.
3. Slide the compliance spring for the left lung to the .01 setting.
4. Connect the *Gas Input Hose* to a source of air (or Oxygen) at 50 – 60 psi (3.5 – 4.2 Kg/cm). Connect the other end to the *Gas Inlet* on the back of the Breath Simulation Module.
5. Connect the power supply to the *Power Jack*.



## Setup (Models DAN or DA3)

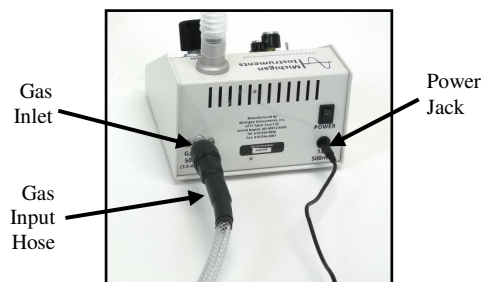
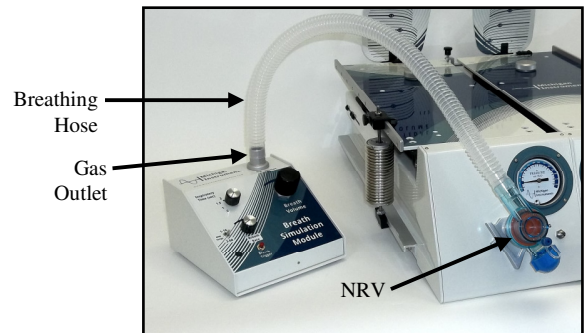


### Lung Setup

1. Place an *Adaptor* onto the inlet on the right lung. (*Note: the Breath Simulation Module must be connected to the left lung.*)
2. Select the desired *PneuFlo® Resistor* to simulate airway resistance and connect it to the adaptor.
3. Attach a *Single Port Pressure Pickoff Adaptor* to the resistor.
4. Use the *1/8 ID Hose* to connect the pickoff adaptor to the *Proximal Input Port* located to the left of the center gauge.
5. Set lung compliance for the right lung as desired (per the Test Lung manual.)
6. Attach the *Lung Coupling Clip* to the left lung and under the right lung. This will allow the left lung to drive the right lung when a breath is delivered from the Breath Simulation Module. A divot is provided on the left lung's top plate to align the lung coupling clip to.

### Breath Simulation Module Setup

1. Connect one end of the *Breathing Hose* to the inlet of the *Non-Rebreathing Valve (NRV)* and the other end to the *Gas Outlet*.
2. Connect the outlet of the *NRV* to the lung inlet on the left lung.
3. Slide the compliance spring for the left lung to the .01 setting.
4. Connect the *Gas Input Hose* to a source of air (or Oxygen) at 50 – 60 psi (3.5 – 4.2 Kg/cm). Connect the other end to the *Gas Inlet* on the back of the Breath Simulation Module.
5. Connect the power supply to the *Power Jack*.



## Operation

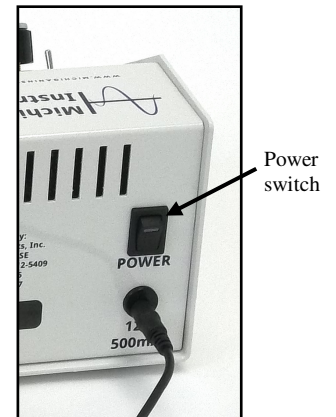
1. Press the *Power switch* to turn the unit on. An LED in the switch will light indicating that the system is turned on.

**(CAUTION: To avoid over pressurizing the lung, verify that the Breath Volume knob is turned fully counterclockwise before turning the unit on).**

2. Choose the desired inspiratory time using the *Inspiratory Time* knob.

**(Note: When the BSM is operating, the Breath Volume knob should be turned fully counterclockwise before changing the inspiratory time).**

3. The breath rate is continuously adjustable using the *Breath Rate* knob. Turning the *Breath Rate* knob clockwise increases the breath rate.



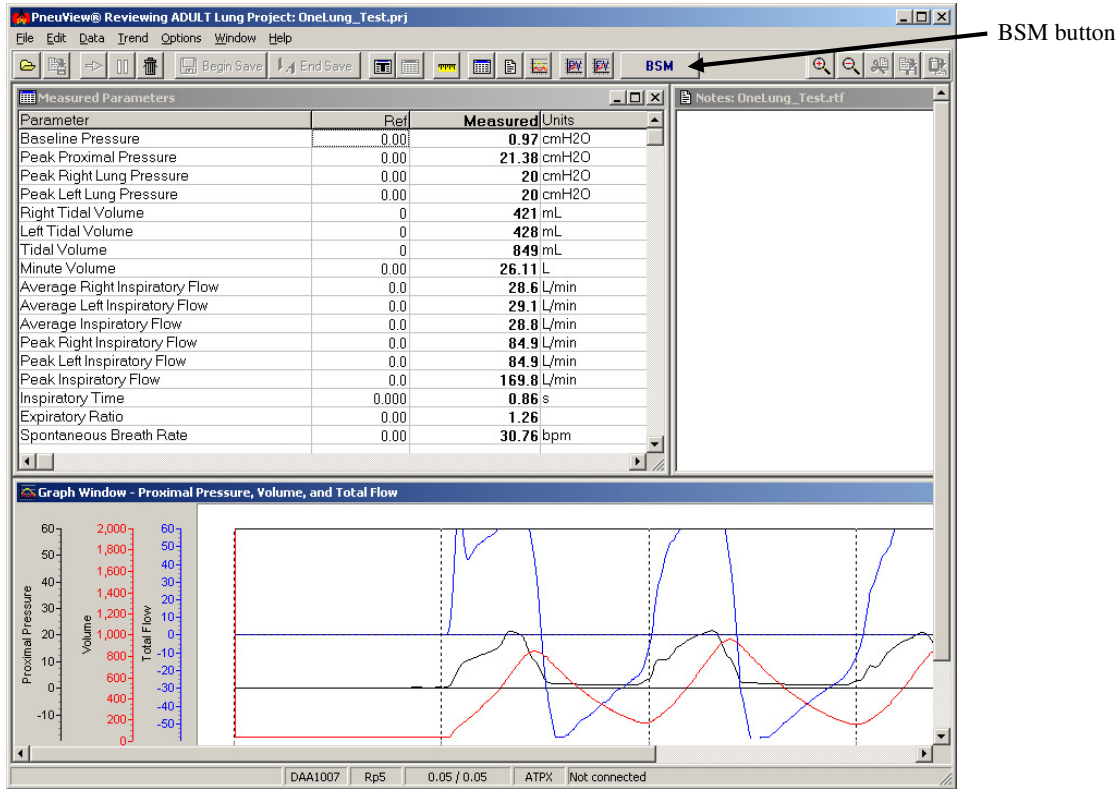
4. The breaths per minute (BPM) range is selectable using the *BPM Range* switch to the left of the *Breath Rate* knob.

Breath rates from 1 – 16 BPM are available with the switch in the up position and from 2 – 60 BPM in the down position.

5. Breath volume is adjustable using the *Breath Volume* knob. Turning the knob clockwise increases the breath volume and turning it counterclockwise reduces the breath volume.
6. Pressing the *Breath Trigger* button will immediately deliver a breath at the current BSM settings.
7. A green LED located to the left of the *Breath Trigger* button will remain lit for the duration of the breath being delivered.

## Using the BSM with PneuView® Software. (Model 5600i only)

1. Set up the PneuView® /TTL system as described in the Model 5600i manual.
2. Set up the BSM as described previously in this manual.
3. Press the *BSM* button found on the toolbar of the “New Projects” screen.



4. With the *BSM* button activated, pressing F6 on the keyboard will display the “Direct Measurement” dialog box. This screen displays the following Spontaneous Breath measurements:

Differential Pressure  
Airway Pressure  
“Trigger” Pressure

5. The *Reset Trigger Pressure* button can be pressed to reset the display.

