CONTROLLED ENVIRONMENTS

Critical Environments

Models 8631-HM/8631-HM-BAC 8631-HC/8631-HC-BAC

PRESSURA™
Room Pressure Monitor w/LON/BACnet®
Room Pressure Controller w/LON/BACnet®

Operation and Service Manual

1980488, Revision H
July 2011

TRUST. SCIENCE. INNOVATION.

Models 8631-HM/8631-HM-BAC
8631-HC/8631-HC-BAC

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How to Use This Manual

The PRESSURA™ Room Pressure Monitor/Controller Operation and Service Manual is divided into two parts. Part One describes how the PRESSURA™ unit functions and how to interface with the device. This section should be read by users, facilities staff, and anyone who requires a basic understanding of how the PRESSURA™ monitor operates.

Part two describes the technical aspects of the product which includes operation, calibration, configuration, maintenance, and troubleshooting. Part Two should be read by personnel programming or maintaining the unit. TSI recommends thoroughly reading this manual before changing any software items.

NOTE: This operation and service manual assumes proper PRESSURA™ monitor installation. Refer to the Installation Instructions to determine if the PRESSURA™ monitor has been properly installed.

PART ONE

User Basics

Reading product manuals should not be a difficult and time-consuming process. This section provides a brief but thorough overview of the PRESSURA™ product by maximizing information with minimal reading. These few pages explain the purpose (The Instrument), and the operation (Useful User Information, Digital Interface Module, Alarms) of the unit. Technical product information is available in Part Two of the manual. The manual focuses on hospital isolation rooms, but the product information is accurate for any room pressure application.

The Instrument

PRESSURA™ monitor measures and reports "room pressure." Proper room pressure can control airborne contaminants that can adversely affect patients and hospital staff. For example, tuberculosis (TB) isolation rooms need negative room pressure (air flowing into the room), to minimize TB exposure to staff and other patients. Conversely, surgical areas and bone marrow patient rooms need positive room pressure (air flowing out of the room), to keep out contaminants that may adversely affect the patient.

Room pressure, or pressure differential, is created when one space (hallway) is at a different pressure than an adjoining space (patient room). When a pressure differential is created between two spaces, air is forced to flow from the higher pressure space to the lower pressure space. The direction of air flow is one component of proper room pressure. The second component of room pressure is the speed or how fast is the air moving between the two spaces. The PRESSURA™ monitor provides both pieces of information by measuring whether the air is flowing into or out of a room, and the speed of the air.

Negative room pressure is present when air flows from a hallway/ante room into the patient room. If air flows from the patient room into the hallway/ante room the room is under positive pressure. Figure 1 gives a graphic example of positive and negative room pressure.

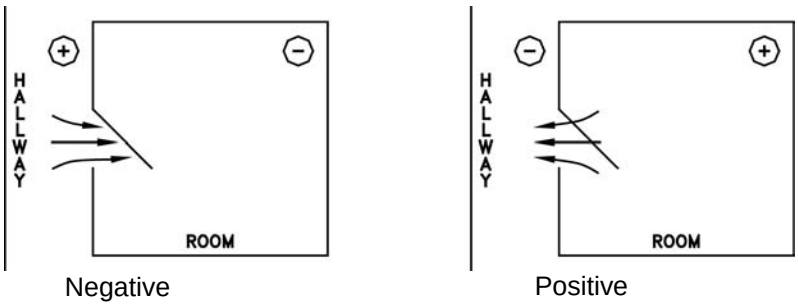

Figure 1: Room Pressure

An example of negative pressure is a bathroom with an exhaust fan. When the fan is turned on, air is exhausted out of the room creating a slight negative pressure in the bathroom compared to the hallway. This pressure differential forces air to flow from the hallway into the bathroom.

The PRESSURA™ device informs the staff when the room is under proper pressure, and provides alarms when the room pressure is inadequate. If the room pressure is in the safe range, a green light is on. If the pressure is inadequate, a red alarm light and audible alarm turn on.

The PRESSURA™ monitor consists of two pieces: a pressure sensor and a Digital Interface Module (DIM). The pressure sensor is mounted above the doorway entrance to the isolation room. Usually the DIM is mounted near the entrance to the isolation room or at the nursing station. The pressure sensor continuously measures the room pressure and provides room pressure information to the DIM. The DIM continuously reports the room pressure and activates the alarms when necessary. PRESSURA™ monitor is a continuous measuring system providing instant information on the room pressure.

Useful User Information

The DIM has a green light and red light to indicate room pressure status. The green light is on when the room has proper room pressure. The red light comes on when an alarm condition exists.

Sliding the door panel to the right reveals a digital display and keypad (Figure 2). The display shows detailed information about room pressure, alarms, etc. The keypad allows you to test the device, put the device into emergency mode, and program or change the device parameters.

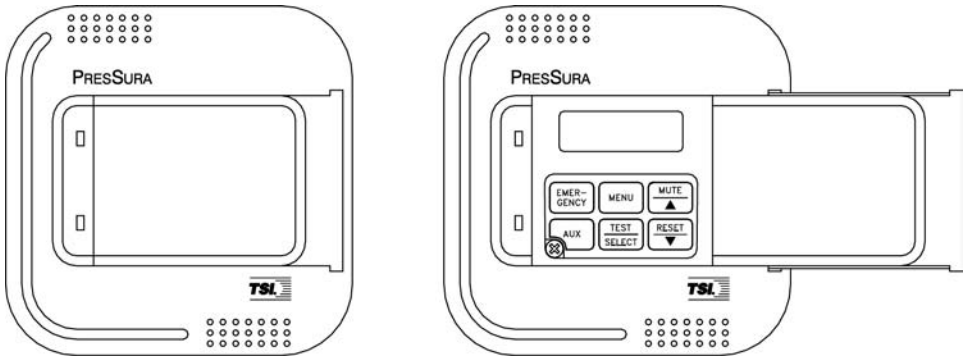

Figure 2: Digital Interface Module (DIM)

PRESSURA™ monitor has two levels of user information:

1. PRESSURA™ monitor has a red light and green light to provide continuous information on room pressure status.

2. PRESSURA™ monitor has a hidden operator panel providing detailed room status information, self-testing capabilities, and access to the software programming functions.

NOTE: The unit provides continuous room pressure status through the red and green light. The operator panel is normally closed unless further information on room pressure status is needed, or software programming is required.

Operator Panel

The DIM in Figure 3 shows the location of the digital display, keypad and lights. An explanation of the operator panel follows the figure.

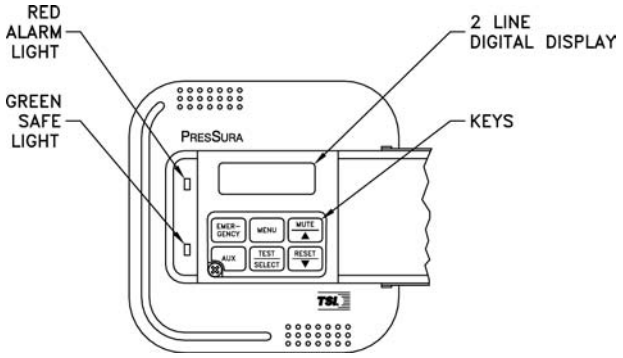

Figure 3: PRESSURA™ Operator Panel - Open

Green / Red Light

The green light is on when all the conditions for proper room pressure are adequate. This light indicates the isolation room is operating safely. If any of the room pressure conditions cannot be satisfied the green light turns off, and the red alarm light turns on.

Operator Panel

A cover hides the operator panel. Sliding the door panel to the right exposes the operator panel (Figure 2).

Digital Display

The alphanumeric digital display is a two line display that indicates actual room pressure (positive, negative or no isolation), alarm status, menu options, and error messages. In normal operation (green light is on), the display continuously scrolls information about room pressure, and other variables programmed; flow, air changes per hour, etc. The variables that scroll depend on the model of PRESSURA™ monitor purchased and options installed.

As an example, if an alarm condition occurs, the variable that normally scrolls

PRESSURE		PRESSURE
NORMAL	will change to read	ALARM = *

* will state type of alarm; low pressure, high pressure, flow

When programming the unit, the display changes and now shows menus, menu items, and current value of the item, depending on the specific programming function being performed.

Keypad

The keypad has six keys. The gray keys with black letters are user information keys. In normal operation these keys are active. Additionally, the red emergency key is active. The gray keys with blue characters are used to program the unit. A thorough description of each key is given below.

User Keys - Gray with Black Letters

The four keys with black letters provide you information without changing the operation or the function of the unit.

TEST Key

The **TEST** key initiates an instrument self-test. Pressing the **TEST** key activates a scrolling sequence on the display that shows the product model number, software version, and all setpoint and alarm values. The unit then performs a self test that tests the display, indicator lights, audible alarm, and internal electronics to ensure they are operating properly. If a problem with the unit exists, DATA ERROR is displayed. You should have qualified personnel determine the problem with the unit.

RESET Key

The **RESET** key performs three functions. 1) Resets the alarm light, alarm contacts, and audible alarm when in a latched or non automatic reset mode. The room pressure must be in the safe or normal range before the **RESET** key will operate. 2) Resets the emergency function after the emergency key has been pressed (see EMERGENCY key). 3) Clears any displayed error messages.

MUTE Key

The **MUTE** key temporarily silences the audible alarm. The time the alarm is temporarily silenced is programmable by you (see MUTE TIMEOUT). When the mute period ends, the audible alarm turns back on if the alarm condition is still present. NOTE: You can program the audible alarm to be permanently turned off (see AUDIBLE ALM).

AUX Key

The **AUX** key is active only in specialty applications and is not used on the standard PRESSURA™ monitor. If the **AUX** key is used, a separate manual supplement explains the **AUX** key function.

Programming Keys - Gray with Blue Characters

The four keys with blue print are used to program or configure the unit to fit a particular application.

WARNING: Pressing these keys will change how the unit functions, so please thoroughly review the manual before changing menu items.

MENU Key

The **MENU** key performs three functions. 1) Provides access to the menus when in the normal operating mode. 2) When the unit is being programmed, the **MENU** key acts as an escape key to remove you from an item or menu, without saving data. 3) Returns the unit to the normal operating mode. The **MENU** key is further described in the Software Programming section of this manual.

SELECT Key

The **SELECT** key performs three functions. 1) Provides access to specific menus. 2) Provides access to menu items. 3) Saves data. Pressing the key when finished with a menu item saves the data, and exits you out of the menu item.

▲/▼ Keys

The ▲/▼ keys are used to scroll through the menus, menu items, and through the range of item values that can be selected. Depending on the item type, the values may be numerical, specific properties (on / off), or a bar graph.

Emergency Key - Red with Black Letters

EMERGENCY Key

The red **EMERGENCY** key puts the controller into emergency mode. If the room is under negative room pressure control, the emergency mode will maximize the negative pressure. Conversely, if the room is under positive room pressure control the emergency mode will maximize the positive pressure.

Pressing the **EMERGENCY** key causes the display to flash "EMERGENCY", the red alarm light to flash on and off, and the audible alarm to beep intermittently. To return to control mode press the **EMERGENCY** key or the **RESET** key.

Alarms

PRESSURA™ monitor has visual (red light) and audible alarms to inform you of changing conditions. The alarm levels (setpoints) are determined by hospital personnel, which could be the infection control group, charge nurse, or a facilities group depending on the hospital organization.

The alarms, audible and visual, will activate whenever the preset alarm level is reached. Depending on the PRESSURA™ model installed, programmed alarms will activate when room pressure is low or inadequate, when room pressure is high or too great, or when the supply or exhaust air flow is insufficient. When the isolation room is operating safely, no alarms will sound.

Example: The low alarm is preset to activate when the room pressure reaches -0.001 inches H_2O. When the room pressure drops below -0.001 inches H_2O (gets closer to zero), the audible and visual alarms activate. The alarms turn off (when set to unlatched) when the unit returns to the safe range which is defined as negative pressure greater than -0.001 inches H_2O.

Visual Alarm Operation

The red light on the front of the unit indicates an alarm condition. The red light is on for all alarm conditions, low alarms, high alarms, and emergency. The light is on continuously in a low or high alarm condition, and flashes in an emergency condition.

Audible Alarm Operation- EMERGENCY key

When the **EMERGENCY** key is pressed, the audible alarm beeps intermittently until the **EMERGENCY** or **RESET** key is pressed terminating the emergency alarm. The emergency alarm cannot be silenced by pressing the **MUTE** key.

Audible Alarms - All Except Emergency

The audible alarm is continuously on in all low and high alarm conditions. The audible alarm can be temporarily silenced by pressing the **MUTE** key. The alarm will be silent for a period of time (see MUTE TIMEOUT to program time period). When the timeout period ends, the audible alarm turns back on if the alarm condition is still present.

You can program the audible alarm to be permanently turned off (see AUDIBLE ALM). The red alarm light still turns on in alarm conditions when audible alarm is turned off.

The audible and visual alarms can be programmed to either automatically turn off when the unit returns to the safe range or to stay in alarm until the **RESET** key is pressed (See ALARM RESET).

Before Calling TSI

The manual should answer most questions and resolve most problems you may encounter. If you need assistance or further explanation, contact your local TSI representative or TSI. TSI is committed to providing high quality products backed by outstanding service.

Please have the following information available prior to contacting your authorized TSI Manufacturer's Representative or TSI:

- Model number of unit* 8631-____
- Software revision level*
- Facility where unit is installed

* First two items that scroll when **TEST** key is pressed

Due to the different PRESSURA™ models available, the above information is needed to accurately answer your questions.

For the name of your local TSI representative or to talk to TSI service personnel, please call TSI at (800) 874-2811 (U.S. and Canada) or (001 651) 490-2811 (other countries).

Prior to shipping any components to TSI for service or repair, please utilize our convenient Return Material Authorization (RMA) Form, which is available online at http://service.tsi.com.

PART TWO

Technical Section

The PRESSURA™ monitor is ready to use after being properly installed. The pressure sensor is factory calibrated prior to shipping, and should not need adjustment. The Digital Interface Module (DIM) is programmed with a default configuration that can be easily modified to fit your application.

The Technical section is separated into five parts that cover all aspects of the unit. Each section is written as independently as possible to minimize flipping back and forth through the manual for an answer.

The Software Programming section explains the programming keys on the DIM. In addition, the programming sequence is described, which is the same regardless of the menu item being changed. At the end of this section is an example of how to program the DIM.

The Menu and Menu Item section lists all of the software items available to program and change. The items are grouped by menu which means all setpoints are in one menu, alarm items in another, etc. The menu items and all related information including programming name, description of menu of item, range of programmable values, and how the unit shipped from the factory (default values). This manual covers two models. The features unique to the monitor unit are detailed in Figure 5. The features unique to the controller unit are detailed in Figure 6.

The Calibration section describes the required technique to compare the pressure sensor reading to a thermal anemometer, and how to adjust the zero and span to obtain an accurate calibration. This section also describes how to zero a TSI flow station transducer.

The Maintenance and Repair Part section covers all routine maintenance of equipment, along with a list of repair parts.

The Troubleshooting section is split into two areas: Mechanical operation of the unit and system performance. Many external variables will affect how the unit functions so it is critical to first determine if the unit is having mechanical problems - i.e., no display on unit, remote alarms don't function, dampers don't modulate, etc. If problems still exist, look for performance problems (i.e., doesn't seem to read correctly, display fluctuates, etc.). The first step is to determine that the system is mechanically operating correctly, followed by modifying the configuration to eliminate the performance problems.

Software Programming

Programming the PRESSURA™ monitor is quick and easy if the programming keys are understood, and the proper keystroke procedure is followed. The programming keys are defined first, followed by the required keystroke procedure. At the end of this section is a programming example.

NOTE: It is important to note that the unit is always operating (except when checking the control output) when programming. When a menu item value is changed, the new value takes effect *immediately* after saving the change, not when the unit returns to normal operating mode.

This section covers programming the instrument through the keypad and display. If programming through RS-485 communications, use the host computer's procedure. The changes take place immediately upon saving data in the instrument.

Programming Keys

The four keys with blue characters (refer to Figure 4) are used to program or configure the unit to fit your particular application. Programming the instrument will change how the unit functions, so thoroughly review the items to be changed.

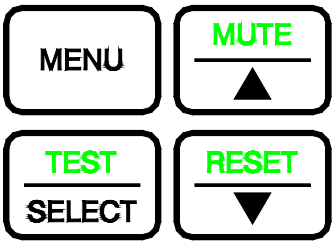

Figure 4. Programming Keys

MENU Key

The **MENU** key has three functions.

1. The **MENU** key is used to gain access to the menus when the unit is in the normal operating mode. Pressing the key once exits the normal operating mode and enter the programming mode. When the **MENU** key is first pressed, the first two menus are listed.

2. When the unit is being programmed, the **MENU** key acts like an escape key.
   - When scrolling through the main menu, pressing the **MENU** key returns the unit to standard operating mode.
   - When scrolling through the items on a menu, pressing the **MENU** key returns you to the list of menus.
   - When changing data in a menu item, pressing the **MENU** key escapes out of the item without saving changes.

3. When programming is complete, pressing the **MENU** key returns the unit to normal operating mode.

SELECT Key

The **SELECT** key has three functions.

1. The **SELECT** key is used to gain access to specific menus. To access a menu, scroll through the menus (using arrow keys) and place the flashing cursor on the desired menu. Press the **SELECT** key to select the menu. The first line on the display will now be the selected menu, and the second line shows the first menu item.

2. The **SELECT** key is used to gain access to specific menu items. To access a menu item, scroll through the menu items until item appears. Press the **SELECT** key and the menu item now appears on the first line of the display, and the second line shows the item value.

3. Pressing the **SELECT** key when finished changing an item saves the data and exits back to the menu items. An audible tone (3 beeps) and visual display ("saving data") gives confirmation data is being saved.

▲/▼ Keys

The ▲/▼ keys are used to scroll through the menus, menu items, and through the range of item values that can be selected. Depending on the item type, the values may be numerical, specific properties (on / off), or a bar graph.

NOTE: When programming a menu item, continuously pressing the arrow key scrolls through the values faster than if the arrow key is pressed and released.

Keystroke Procedure

The keystroke operation is consistent for all menus. The sequence of keystrokes to follow is the same regardless of the menu item being changed.

1. Press the **MENU** key to access the main menu.

2. Use the ▲/▼ keys to scroll through the menu choices. The blinking cursor needs to be on the first letter of the menu you want to access.

3. Press the **SELECT** key to access chosen menu.

4. The menu selected is now displayed on line one, and the first menu item is displayed on line 2. Use the ▲/▼ keys to scroll through the menu items. Scroll through the menu items until desired item is displayed.

5. Press the **SELECT** key to access chosen item. The top line of display shows menu item selected, while the second line shows current item value.

6. Use the ▲/▼ keys to change item value.

7. Save the new value by pressing the **SELECT** key (pressing the **MENU** key exits out of menu function without saving data).

8. Press the **MENU** key to exit current menu, and return to main menu.

9. Press the **MENU** key again to return to normal instrument operation.

If more than one item is to be changed, skip steps 8 and 9 until all changes are complete. If more items in the same menu are to be changed, scroll to them after saving the data (step 7). If other menus need to be accessed, press the **MENU** key once to access a list of menus. The instrument is now at step 2 of the keystroke sequence.

Programming Example

The following example demonstrates the keystroke sequence explained above. In this example the positive pressure low alarm setpoint will be changed from +0.00035 inches H_2O to +0.00050 inches H_2O.

❶ Unit is in normal operation scrolling room pressure, flows, etc. Pressure is shown in this case:

```
PRESSURE
+.00085" H2O
```

❷ Press the **MENU** key to gain access to the menus.

```
MENU
```

The first 2 menu choices are displayed.

```
SETPOINTS
ALARM
```

❸ Press the ▼ key once. Blinking cursor should be on A of Alarm. Press the **SELECT** key to access the ALARM menu.

```
SELECT
```

NOTE: Blinking cursor must be on A in Alarm.

Line 1 shows menu selected.
Line 2 shows first menu item.

```
ALARM
NEG LOW ALM
```

❹ Press the ▼ key until POS LOW ALM is shown on display.

```
▼
```

Menu selected
Item name

```
ALARM
POS LOW ALM
```

❺ Press the **SELECT** key to access the positive low alarm setpoint. The item name (POS LOW ALM) is now displayed on line 1, and the item's current value is displayed on line 2.

```
SELECT
```

Item Name
Current Value

```
POS LOW ALM
+.00035" H2O
```

❻ Press the ▲ key to change the positive low alarm setpoint to 0.00050 inches H_2O.

```
▲
```

```
POS LOW ALM
+.00050" H2O
```

❼ Press the **SELECT** key to save the new positive low alarm setpoint.

```
SELECT
```

Three short beeps sound indicating that the data is being saved.

```
POS LOW ALM
Saving Data
```

Immediately after the data is saved, the PRESSURA™ monitor returns to the menu level displaying the menu title on the top line of the display and the menu item on the bottom line (goes to step 3).

```
ALARM
POS LOW ALM
```

WARNING: If the **MENU** key was pressed instead of the **SELECT** key, the new data would not have been saved, and the PRESSURA™ monitor would have escaped back to the menu level shown in step 3.

❽ Press the **MENU** key once to return to the menu level:

MENU

```
ALARM
CONFIGURE
```

❾ Press the **MENU** key a second time to return to the normal operating level:

MENU

Unit is now back in normal operation

```
 PRESSURE
+.00085" H2O
```

Menu and Menu Items

The PRESSURA™ Room Pressure Monitor/Controller is a very versatile device which can be configured to meet your specific application. This section lists all of the menu items available to program and change (except diagnostics menu). Changing any item is accomplished by using the keypad, or if communications are installed through the LonWorks® Communications port. If you are unfamiliar with the keystroke procedure, please see Software Programming for a detailed explanation. This section provides the following information:

- Complete list of menu and all menu items
- Gives the menu or programming name
- Defines each menu item's function; what it does, how it does it, etc.
- Gives the range of values that can be programmed
- Gives default item value (how it shipped from factory)

The menus covered in this section are divided into groups of related items to ease programming. As an example, all setpoints are in one menu, alarm information in another, etc. The manual follows the menus as programmed in the controller. The menu items are always grouped by menu and then listed in menu item order, not alphabetical order. Figure 5 shows a chart of all the Model 8631-HM monitor menu items. Figure 6 shows the menu items available on the Model 8631-HC controller.

ALARM	CONFIGURE	CALIBRATION	INTERFACE
NEG LOW ALM	ROOM MODE	SENSOR SPAN	LON**
NEG HIGH ALM	DISPLAY AVG	FLO ZERO	MAC ADDRESS**
POS LOW ALM	UNITS	2SENOR SPAN	MAC ID**
POS HIGH ALM	DUCT AREA	ELEVATION	OUTPUT RANGE
MIN CFM ALM	ROOM VOLUME		OUTPUT SIG
2 LOW ALM	2 SENSOR		
2 HIGH ALM	FLO STA TYPE		
ALARM RESET	TOP VELOCITY		
AUDIBLE ALM	K FACTOR		
ALARM DELAY	ACCESS CODES		
MUTE TIMEOUT			

DIAGNOSTICS *

SENSOR INPUT
SENSOR STAT
2SENSOR IN
2SENSOR STAT
ANALOG OUT
KEY INPUT
FLOW INPUT
ALARM RELAY

* Menu items located in the Troubleshooting section.
** LON only appears as a menu option for the 8631 that includes a LonWorks® board. MAC ADDRESS and MAC ID only appear as menu options for the 8631 that includes a BACnet® board.

Figure 5: Menu Items—Model 8631-HM Monitor

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SETPOINTS	ALARM	CONFIGURE	CALIBRATION
NEG SETPOINT	NEG LOW ALM	ROOM MODE	SENSOR SPAN
POS SETPOINT	NEG HIGH ALM	DISPLAY AVG	EXH FLO ZERO
MIN EXH SET	POS LOW ALM	UNITS	2SENSOR SPAN
DAMPER SET	POS HIGH ALM	EXH DCT AREA	ELEVATION
MIN EXH DAMP	MIN EXH ALM	ROOM VOLUME	
MAX EXH DAMP	2 LOW ALM	2 SENSOR	
	2 HIGH ALM	FLO STA TYPE	
	ALARM RESET	TOP VELOCITY	
	AUDIBLE ALM	K FACTOR	
	ALARM DELAY	ACCESS CODES	
	MUTE TIMEOUT		

CONTROL	INTERFACE	DIAGNOSTICS *
SPEED	LON**	CONTROL OUT
SENSITIVITY	MAC ADDRESS**	SENSOR INPUT
CONTROL SIG	MAC ID**	SENSOR STAT
KC VALUE	OUTPUT RANGE	2SENSOR IN
TI VALUE	OUTPUT SIG	2SENSOR STAT
		ANALOG OUT
		KEY INPUT
		EXH FLOW IN
		ALARM RELAY

***** Menu items located in Troubleshooting section.

** LON only appears as a menu option for the 8631 that includes a LonWorks® board. MAC ADDRESS and MAC ID only appear as menu options for the 8631 that includes a BACnet® board.

Figure 6: Menu Items—Model 8631-HC Controller

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SETPOINTS MENU *Available on Model 8631-HC units only*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
NEGATIVE PRESSURE SETPOINT	NEG SETPOINT	The NEG SETPOINT item sets the negative pressure control setpoint. The PRESSURA™ controller will maintain the room under negative pressure when item is enabled. This item is enabled when the TSI key switch is in negative room pressure position, or when negative is selected in ROOM MODE item. A negative setpoint equal to zero will turn off the negative low pressure alarm. The control output signal will be super slow (no PID) when maintaining neutral or zero pressure.	0 to -0.19500” H_2O	**-0.00100” H_2O**
POSITIVE PRESSURE SETPOINT	POS SETPOINT	The POS SETPOINT item sets the positive pressure control setpoint. The PRESSURA™ controller will maintain the room under positive pressure when item is enabled. This item is enabled when the TSI key switch is in positive room pressure position or when positive is selected in ROOM MODE item. A positive setpoint equal to zero will turn off the positive low pressure alarm. The control output signal will be super slow (no PID) when maintaining neutral or zero pressure.	0 to +0.19500” H_2O	**+0.00100” H_2O**

SETPOINTS MENU *(continued) Available on Model 8631-HC units only*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
MINIMUM EXHAUST FLOW SETPOINT *(cont.)*	MIN EXH SET *(cont.)*	The MIN EXH SET item sets the minimum exhaust flow setpoint (CFM). This item prevents the exhaust flow from going below a preset minimum CFM. When a minimum flow setpoint is programmed, the display automatically scrolls the actual exhaust flow as part of the display scroll sequence. If a zero valve is entered, the exhaust flow will not scroll on the display. The minimum exhaust flow setpoint overrides the pressure control setpoint, so adequate or safe room pressure may not be maintained (pressure alarm turns on, if set). A TSI flow station is required to make the flow measurement and enable this function. The flow station and control damper must be mounted in the exhaust duct for this item to function properly.	0, 400 ft/min x duct area2832 ft/min x duct area. The duct area must be entered in square feet (ft^2). METRIC UNITS 0, 2.0 m/s x duct area to 14.4 m/s x duct area. The duct area must be entered in square meters (m^2).	**0**
DAMPER SETPOINT	DAMPER SET	The DAMPER SET item functions when the controller is in <u>no isolation</u> mode. This item moves the control damper to a preset position. The damper can be positioned full open, partially open, or fully closed. This item is enabled when the TSI key switch is in neutral room pressure position or when <u>no isolation</u> is selected in ROOM MODE item.	0 to 255	**150 (1/2 open)**
MINIMUM EXHAUST DAMPER POSITION	MIN EXH DAMP	The MIN EXH DAMP menu item is used to set the exhaust damper minimum opening. The damper will not close more than this setpoint.	0% OPEN to 100% OPEN	**0% OPEN**

SETPOINTS MENU *(continued) Available on Model 8631-HC units only*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
MAXIMUM EXHAUST DAMPER POSITION	MAX EXH DAMP	The MAX EXH DAMP menu item is used to set the exhaust damper maximum opening. The damper will not open more than this setpoint.	0% OPEN to 100% OPEN	**100% OPEN**
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

ALARM MENU

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
NEGATIVE LOW PRESSURE ALARM	NEG LOW ALM	The NEG LOW ALM item sets the negative low pressure alarm setpoint. A low alarm condition is defined as when the magnitude of the room pressure falls below or goes in the opposite direction of the NEG LOW ALM setpoint. This item is enabled when the TSI key switch is in negative room pressure position or when negative is selected in ROOM MODE item.	OFF, 0 to -0.19500” H_2O	**OFF**
NEGATIVE HIGH PRESSURE ALARM	NEG HIGH ALM	The NEG HIGH ALM item sets the negative high pressure alarm setpoint. A high alarm condition is defined as when the magnitude of the room pressure rises above the NEG HIGH ALM setpoint. This item is enabled when the TSI key switch is in negative room pressure position or when negative is selected in ROOM MODE item.	OFF, 0 to -0.19500” H_2O	**OFF**

ALARM MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
POSITIVE LOW PRESSURE ALARM	POS LOW ALM	The POS LOW ALM item sets the positive low pressure alarm setpoint. A low alarm condition is defined as when the magnitude of the room pressure falls below or goes in the opposite direction of the POS LOW ALM setpoint. This item is enabled when the TSI key switch is in positive room pressure position or when positive is selected in ROOM MODE item.	OFF, 0 to 0.19500” H_2O	**OFF**
POSITIVE HIGH PRESSURE ALARM	POS HIGH ALM	The POS HIGH ALM item sets the positive high pressure alarm setpoint. A high alarm condition is defined as when the magnitude of the room pressure rises above the POS HIGH ALM setpoint. This item is enabled when the TSI key switch is in positive room pressure position or when positive is selected in ROOM MODE item.	OFF, 0 to 0.19500” H_2O	**OFF**
MINIMUM DUCT FLOW ALARM *Monitor models only*	MIN CFM ALM	The MIN CFM ALM item sets the duct’s flow alarm setpoint. A minimum flow alarm is defined as when the duct flow is less than the MIN CFM ALM setpoint.	OFF, 0 to 2832 ft/MIN times the duct area in square feet (ft^2)	**OFF**
MINIMUM EXHAUST DUCT FLOW ALARM *Controller models only*	MIN EXH ALM	The MIN EXH ALM item sets the exhaust duct’s flow alarm setpoint. A minimum flow alarm is defined as when the exhaust duct flow is less than the MIN EXH ALM setpoint.	OFF, 0 to 2832 ft/MIN times the exhaust duct area in square feet (ft^2)	**OFF**

ALARM MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
SECOND SENSOR LOW ALARM	2 LOW ALM	The 2 LOW ALM item sets the second sensor's low alarm setpoint. A low alarm condition is defined as when the magnitude of the second sensor's room pressure falls below or goes in the opposite direction of the 2 LOW ALM setpoint. The alarm can be a negative or positive pressure alarm setpoint. The second sensor low and high alarms must be programmed for the same pressure direction; positive or negative. In addition, the PRESSURA™ monitor has a minimum dead band of 40 ft/min between the second sensor low and high alarms. The dead band helps prevent nuisance alarms. The second sensor monitors the room pressure of a second space (typically an ante room), and is not part of the primary sensor or control sequence. This alarm is on when the controller is in positive or negative mode. This item is enabled when the second pressure sensor item is enabled (see menu item 2 SENSOR).	OFF, 0 to +0.19500" H_2O or 0 to -0.19500" H_2O	OFF

ALARM MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
SECOND SENSOR HIGH ALARM	2 HIGH ALM	The 2 HIGH ALM item sets the second sensor's high alarm setpoint. A high alarm condition is defined as when the magnitude of the second sensor's room pressure rises above the 2 HIGH ALM setpoint. The alarm can be a negative or positive pressure alarm setpoint. The second sensor low and high alarms must be programmed for the same pressure direction; positive or negative. In addition, the PRESSURA™ monitor has a minimum dead band of 40 ft/min between the second sensor low and high alarms. The dead band helps prevent nuisance alarms. The second sensor monitors the room pressure of a second space (typically and ante room), and is not part of the primary sensor or control sequence. This alarm is on when the controller is in positive or negative mode. This item is enabled when the second pressure sensor item is enabled (see menu item 2 SENSOR).	OFF, 0 to +0.19500" H_2O or 0 to -0.19500" H_2O	OFF
ALARM RESET	ALARM RESET	The ALARM RESET item selects how the alarms terminate after the unit returns to control setpoint (pressure or flow). UNLATCHED (alarm follow) automatically resets the alarms when the unit reaches control setpoint. LATCHED requires the staff to press the **RESET** key after the unit returns to control setpoint. The ALARM RESET affects the audible alarm, visual alarm, and relay output, which means all are latched or unlatched.	LATCHED OR UNLATCHED	UNLATCHED
AUDIBLE ALARM	AUDIBLE ALM	The AUDIBLE ALM item selects whether the audible alarm is turned ON or OFF. Selecting ON requires the staff to press the **MUTE** key to silence the audible alarm. Selecting OFF permanently mutes all audible alarms, except when the **EMERGENCY** key is pressed.	ON or OFF	ON

ALARM MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
ALARM DELAY	ALARM DELAY	The ALARM DELAY determines the length of time the alarm is delayed after an alarm condition has been detected. This delay affects the visual alarm, audible alarm, and relay outputs. An ALARM DELAY prevents nuisance alarms from staff opening and closing doors, etc.	20 to 600 SECONDS	20 SECONDS
MUTE TIMEOUT	MUTE TIMEOUT	The MUTE TIMEOUT determines the length of time the audible alarm is silenced after the **MUTE** key is pressed. This delay temporarily mutes the audible alarm. **NOTE**: If the PRESSURA™ monitor is in alarm when MUTE TIMEOUT expires, the audible alarm turns on. When the PRESSURA™ monitor returns to the safe range, the MUTE TIMEOUT is canceled. If the room goes back into an alarm condition, the **MUTE** key must be pressed again to mute the audible alarm.	5 to 30 minutes	5 minutes
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

ALARM CONSTRAINTS

There are a number of constraints built into the software that prevent users from programming conflicting alarm information. These are as follows:

1. Room mode. The positive pressure alarms are only active when positive control is selected. Negative pressure alarms are only active when negative control is selected. In no isolation mode all alarms are turned off.

2. The PRESSURA™ monitor is programmed not to allow the pressure alarms to be programmed within 20 ft/min (0.00028” H_2O at 0.001” H_2O) of the control setpoint.

   Example: The control SETPOINT is set at -0.001” H_2O. The LOW ALARM setpoint cannot be set higher than -0.00072” H_2O. Conversely if your control SETPOINT is set at -0.001” H_2O, the HIGH ALARM setpoint cannot be set lower than -0.00128” H_2O.

3. The minimum flow alarms must be programmed to be at least 50 CFM *less* than the minimum flow setpoint.

4. Second sensor alarms can be programmed for positive or negative pressure. Both the second sensor low and high alarms must be programmed either positive or negative. The second sensor alarms ignore rule 1 above.

5. Alarms do not terminate until the controller returns to setpoint. The setpoint must be slightly exceeded before alarm will terminate.

6. The ALARM RESET item selects how the alarms will terminate when controller returns to the safe range. The pressure and flow alarms all terminate the same; they are either latched or unlatched. If unlatched is selected the alarms automatically turn off when the value slightly exceeds the control setpoint. If latched is selected the alarms will not terminate until the controller returns to setpoint *and* the **RESET** key is pressed.

7. There is a programmable ALARM DELAY that determines how long to delay before activating the alarms. This delay affects all alarms, pressure and flow.

8. The MUTE TIMEOUT item temporarily turns the audible alarm off for all pressure and flow alarms.

9. The display can only show one alarm message. Therefore, the controller has an alarm priority system, with the highest priority alarm being displayed. If multiple alarms exist, the lower priority alarms will not display until after the highest priority alarm has been eliminated. The alarm priority is as follows:

   Pressure sensor - low alarm
   Pressure sensor - high alarm
   Flow station - minimum exhaust flow
   Flow station - minimum supply flow
   Second pressure sensor - low alarm
   Second pressure sensor - high alarm
   Data error

10. The low and high alarms are absolute values. The chart below shows how the values must be programmed in order to operate correctly.

-0.2 inches H_2O (maximum negative)			0			+0.2 inches H_2O (maximum positive)
High Negative Alarm	Negative Setpoint	Low Negative Alarm	Zero	Low Positive Alarm	Positive Setpoint	High Positive Alarm

The value of each setpoint or alarm is unimportant (except for small dead band) in graph above. It is important to understand that the negative low alarm must be between zero (0) pressure and the negative setpoint, and that the high alarm is a greater negative (positive) value than setpoint.

CONFIGURE MENU

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
ROOM MODE	ROOM MODE	The ROOM MODE item selects the room pressure direction. This item enables all related alarms, setpoints, etc. for pressure direction selected. Selecting key switch enables a remote TSI key switch, which determines pressure direction.	KEY SWITCH, NEGATIVE, POSITIVE, NO ISOLATION	**NEGATIVE**
DISPLAY AVERAGE	DISPLAY AVG	The DISPLAY AVG item selects the display's averaging period. The display averaging period is the length of time the room pressure has been averaged before being displayed. The DISPLAY AVG item value may be set between 0.75 and 40 seconds. The higher the averaging value, the more stable the display.	0.75, 1, 2, 3, 5, 10, 20 or 40 seconds	**20 seconds**
UNITS	UNITS	The UNITS item selects the unit of measure that the controller displays all values (except calibration span). These units display for all menu items setpoints, alarms, flows, etc.	FT/MIN, m/s, "H_2O Pa, mm H_2O	**"H_2O**
DUCT AREA *Monitor models only*	DUCT AREA	The DUCT AREA item is used to input the duct size. The duct size is needed to compute the flow in/out of the room. This item requires a TSI flow station to be mounted in the duct. When a duct area is programmed, the display will automatically scroll the actual flow as part of the display sequence. If a zero value is entered, the flow value will not scroll on the display. If the PRESSURA™ monitor displays English units, area must be entered in square feet. If metric units are displayed area must be entered in square meters.	0 to 10 square feet (0 to 0.9500 square meters) The PRESSURA™ monitor does not compute area. The area must be first calculated and then entered into the unit.	**0**

CONFIGURE MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
EXHAUST DUCT AREA *Controller models only*	EXH DCT AREA	The EXH DCT AREA item is used to input the exhaust duct size. The duct size is needed to compute the flow out of the room. This item requires a TSI flow station to be mounted in the exhaust duct. When a duct area is programmed, the display will automatically scroll the actual exhaust flow as part of the display sequence. If a zero value is entered, the exhaust flow value will not scroll on the display. If the PRESSURA™ monitor displays English units, area must be entered in square feet. If metric units are displayed area must be entered in square meters.	0 to 10 square feet (0 to 0.9500 square meters) The PRESSURA™ monitor does not compute area. The area must be first calculated and then entered into the unit.	**0**
ROOM VOLUME	ROOM VOLUME	The ROOM VOLUME item is used to input the volume of the room. The room volume is required to calculate air changes per hour. Entering a value for the volume will add the air changes per hour value to the display's scrolling sequence. If a zero value is entered the air changes per hour will not scroll on the display. If the PRESSURA™ monitor displays English units, area must be entered in cubic feet. If metric units are displayed area must be entered in cubic meters. **NOTE**: The DUCT AREA or EXH DCT AREA menu items must first be programmed before the ROOM VOLUME menu item can be programmed.	0 to 20,000 cubic feet (0 to 550 cubic meters) The PRESSURA™ monitor does not compute volume. The volume must be first calculated and then entered into the unit.	**0**
SECOND SENSOR ENABLE	2 SENSOR	The 2 SENSOR item turns the second sensor on or off. This item requires a second TSI pressure sensor to be installed in order to function. Turning 2 SENSOR on adds the second sensor pressure value to the display's sequence, and enables the 2 LOW ALM and 2 HIGH ALM items. **NOTE**: The second sensor's communication address must be set to 2 in order to function. See Figures 9 and 11 to change second sensor address.	ON or OFF	**OFF**

CONFIGURE MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
FLOW STATION TYPE	FLO STA TYPE	The FLO STA TYPE item is used to select the flow station input signal. PRESSURE is selected when TSI flow stations with pressure transducers are installed. LINEAR is selected when a linear output flow station is installed (0-10 VDC): Typically a thermal anemometer based flow station.	PRESSURE or LINEAR	**PRESSURE**
MAXIMUM FLOW STATION VELOCITY	TOP VELOCITY	The TOP VELOCITY item is used to input the maximum velocity of a linear flow station output. A TOP VELOCITY must be input for the linear flow station to operate. **NOTE**: This item is disabled if a pressure based flow station is installed.	0 to 5,000 FT/MIN (0 to 25.4 m/s)	**0**
K FACTOR	K FACTOR	The K FACTOR menu item sets the "K" factor for the flow probe being used. The flow signal is multiplied by the K FACTOR so that the flow measurement matches the actual flow, usually determined with a pitot tube traverse.	0 to 10	**1**
ACCESS CODES	ACCESS CODES	The ACCESS CODE item selects whether an access code (pass code) is required to enter the menu. The ACCESS CODE item prevents unauthorized access to a menu. If the ACCESS CODE is ON a code is required before the menu can be entered. Conversely, if the ACCESS CODE is OFF no code is required to enter the menu.	ON or OFF	**OFF**
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

CALIBRATION MENU

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
SENSOR SPAN	SENSOR SPAN	The SENSOR SPAN item is used to match or calibrate the PRESSURA™ velocity sensors to the average room pressure velocity as measured by a portable air velocity meter. A sensor zero should be established prior to adjusting the sensor span (see Calibration section following menu item listing).	NONE	Unit is factory calibrated. No initial adjustment should be necessary.
FLOW ZERO *Monitor models only*	FLOW ZERO	The FLOW ZERO item is used to calibrate the PRESSURA™ flow station pressure transducer. A zero or no flow point needs to be established prior to using the flow measurement (see Calibration section following menu item listing).	NONE	Flow station pressure transducer zero must be done prior to making any flow measurements.
EXHAUST FLOW ZERO *Controller models only*	EXH FLO ZERO	The EXH FLO ZERO item is used to calibrate the PRESSURA™ flow station pressure transducer. A zero or no flow point needs to be established prior to using the exhaust flow measurement (see Calibration section following menu item listing).	NONE	Exhaust flow station pressure transducer zero must be done prior to making any flow measurements

CALIBRATION MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
SECOND SENSOR SPAN	2SENSOR SPAN	The 2SENSOR SPAN item is used to match or calibrate the second PRESSURA™ velocity sensors to the average room pressure velocity as measured by a portable air velocity meter. A second sensor span should be established prior to adjusting the second sensor span (see Calibration section following menu item listing). If menu item displays SEC SENS OFF, the second sensor must be turned on (menu item 2 SENSOR) to activate the 2SENSOR SPAN.	NONE	Unit is factory calibrated. No initial adjustment should be necessary.
ELEVATION	ELEVATION	The ELEVATION item is used to enter the elevation of the hospital above sea level. This item has a range of 0–10,000 feet in 1,000 foot increments. The pressure value needs to be corrected due to changes in air density at different elevations.	0 to 10,000 feet above sea level	0
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

CONTROL MENU *Available on Model 8631-HC units only*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
SPEED	SPEED	The SPEED item is used to select the control output speed. When this item is selected, a bar graph is shown on the display. There are 10 bars, each one representing 10% of speed. Starting from the right side (+ sign), 10 bars displayed indicates maximum speed. This is the fastest the controller will operate. 1 bar is the slowest the control output will move. The more bars shown, the faster the control output.	1 to 10 bars	5 bars
SENSITIVITY	SENSITIVITY	The SENSITIVITY item is used to select the integral dead band. The integral dead band determines when the controller uses integral control (slow control), and when the controller enters PID control (fast control). When this item is selected, a bar graph is shown on the display. There are 10 bars each representing ±10 ft/min. Starting from the right side (+ sign), 10 bars displayed indicates no dead band so the controller will always be in PID control mode. The less bars displayed, the larger the integral dead band. For example, with 8 bars displayed and an operating setpoint of 100 ft/min, the integral dead band is between 80 and 120 ft/min. When the measured room pressure velocity is within this range, integral or slow control is used. However, when the room pressure velocity falls below 80 ft/min or rises above 120 ft/min, PID control is enabled until the unit returns within the dead band. The SENSITIVITY item has a unique feature that when zero bars are displayed, the unit never goes into PID control. The control output is a slow control signal. **WARNING:** When SENSITIVITY is set for 10 bars, the system is always in PID control, which will probably cause an unstable system. It is recommended that the SENSITIVITY be set at 9 bars or less.	0 to 10 bars	5 bars

CONTROL MENU *Available on Model 8631-HC units only (continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
CONTROL SIGNAL	CONTROL SIG	The CONTROL SIG item determines the control signal's output direction. As an example; If the control system closes the exhaust damper instead of opening the damper, this option will reverse the control signal to now open the damper.	Direct or Reverse	Reverse
Kc VALUE Ti VALUE	Kc VALUE Ti VALUE	**WARNING:** The Kc VALUE and Ti VALUE items provides you with the ability to manually change the PID control loop variables. **DO NOT CHANGE THESE VALUES UNLESS YOU HAVE A THOROUGH UNDERSTANDING OF PID CONTROL LOOPS. CONTACT TSI FOR ASSISTANCE PRIOR TO CHANGING ANY VALUES.** Contact TSI for assistance in determining your control problem and for instructions on how to change a value. Incorrectly changing a value will result in poor or non existent control. Suggestion: Before changing Kc or Ti change the speed or adjust the sensitivity to try to eliminate the problem. The Kc VALUE item is used to read and change the gain control coefficient. When this item is entered, a value for Kc is indicated on the display. If the PRESSURA™ monitor is not controlling correctly; hunting, oscillating, or controlling slowly, the Kc gain control coefficient may need adjusting. The Ti VALUE item is used to read and change the integral control coefficient. When this item is entered, a value for Ti is indicated on the display. If the PRESSURA™ monitor is not controlling correctly, the unit may have an inappropriate integral control coefficient. **WARNING**: Setting Kc or Ti to zero turns the control output signal off causing the unit to act like a monitor.	Kc = 0 to 1000 Ti = 0 to 1000 The range of values is very large. Poor control will occur if values are more than twice or less than 1/2 the default value	Kc = 100 Ti = 200

CONTROL MENU *Available on Model 8631-HC units only (continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

INTERFACE MENU

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
LON**	LON	When the SERVICE PIN option is selected, the Model 8631-HM/HC sends a broadcast message containing its Neuron ID and program ID. This is required to install the Model 8631-HM/HC on the LonWorks® network, or to reinstall the Model 8631-HM/HC after using the GO UNCONFIGURED command. Selecting the GO UNCONFIGURED option resets the Model 8631-HM/HC's authentication key. This is required in the event a foreign network tool inadvertently acquires a Model 8631-HM/HC and installs it with network management authentication. The Model 8631-HM/HC's owner will then be unable to reclaim the Model 8631-HM/HC over the network.	SERVICE PIN or GO UNCONFIGURED	
MAC ADDRESS**	MAC ADDRESS	The MAC ADDRESS assigns the device an address on the MS/TP BACnet® network. This address must be unique for each device on the BACnet® network.	1 to 127	**1**
MAC ID	MAC ID	The MAC ID menu item sets the first three digits of the BACnet® device number. The BACnet® device number is the MAC ID combined with the MAC address. For example, if the MAC ID is 863 and the MAC address is 003, the device number is 863003.	1 to 999	**863**

**The LON Menu Item will only appear as a menu option on an 8631 provided with the LonWorks board.
**The MAC ADDRESS and MAC ID Menu Items will only appear as menu options on an 8631 provided with the BACnet® board.

INTERFACE MENU *(continued)*

MENU ITEM	SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE	DEFAULT VALUE
ANALOG PRESSURE SIGNAL OUTPUT RANGE	OUTPUT RANGE	The OUTPUT RANGE item selects the resolution range of the linear analog pressure signal output. There are 2 choices: LOW -0.01000 to +0.01000" H_20, or -500 to 500 FPM, or -2.5 to 2.5 m/s, or -25 to 25 Pa HIGH -0.10000 to +0.10000" H_20, or -1000 to 1000 FPM, or -5.0 to 5.0 m/s, or -50 to 50 Pa 0 volt / 4 mA represents maximum negative pressure differential. 5 volts / 12 mA represents a 0 room pressure differential. 10 volts / 20 mA represents maximum positive pressure differential. If the actual pressure exceeds the range, the output remains at maximum or minimum depending on direction of flow. The AOC updates the analog output every 0.1 second. **NOTE:** The units displayed for OUTPUT RANGE values are determined by the UNITS menu item in the **CONFIGURE MENU**.	LOW or HIGH	**HIGH**
OUTPUT SIGNAL	OUTPUT SIG	The OUTPUT SIG item selects the type of analog pressure signal output. The analog output signal can either be 0-10 VDC or 4 to 20 mA.	0 to 10 VDC or 4 to 20 mA	**0 to 10 VDC**
	END OF MENU	The END OF MENU item informs you that the end of a menu has been reached. You can either scroll back up the menu to make changes, or press the **SELECT** or **MENU** key to exit out of the menu.		

Calibration

The calibration section explains how to calibrate the PRESSURA™ pressure sensor, including setting the proper elevation, and how to zero a TSI flow station pressure transducer.

NOTE: The PRESSURA™ pressure sensor is factory calibrated and normally does not need to be adjusted. However, inaccurate readings may be detected if the pressure sensor is not installed correctly, or problems with the sensor exists. First check that the sensor is installed correctly (usually only a problem on initial set up). Second, go into DIAGNOSTICS menu, SENSOR STAT item. If NORMAL is displayed, calibration can be adjusted. If an error code is displayed, eliminate error code and then verify pressure sensor needs adjustment.

Adjusting the PRESSURA™ monitor calibration may be required to eliminate errors due to convection currents, HVAC configuration, or equipment used to make the measurement. TSI recommends always taking the comparison measurement in the exact same location (i.e., under the door, middle of door, edge of door, etc.). A thermal air velocity meter is needed to make the comparison measurement. Normally the velocity is checked at the crack under the doorway, or the door is opened 1" to allow alignment of the air velocity probe making the measurement. If the crack under the door is not large enough, use the 1" open door technique.

Calibrating pressure sensor - primary sensor or second sensor

Enter calibration menu (see Software Programming if not familiar with key stroke procedure). Access code is turned on so enter proper access code. All menu items described below are found in CALIBRATION menu.

Elevation

The ELEVATION item eliminates pressure sensor error due to elevation of hospital. (See ELEVATION item in Menu and Menu items section for further information).
Enter the ELEVATION menu item. Scroll through the elevation list and select the one closest to the hospital's elevation
Press the **SELECT** key to save the data and exit back to the calibration menu.

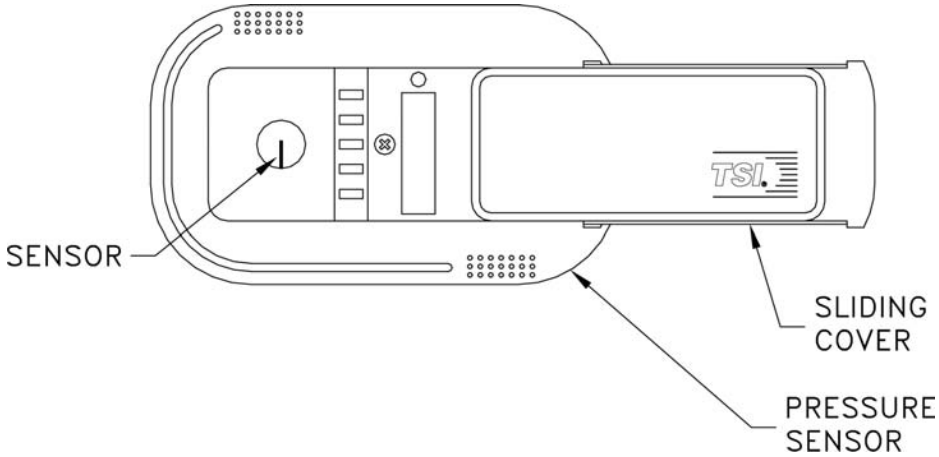


Figure 7: Pressure sensor door slid open

Sensor span

NOTE: A smoke test and a comparison measurement by an air velocity meter are required to calibrate the pressure sensor. The air velocity meter only gives a velocity reading, so a smoke test must be performed to determine pressure direction.

WARNING: The span can only be adjusted in the same direction. Adjusting span cannot cross zero pressure. Example: If unit displays +0.0001 and actual pressure is -0.0001 do not make any adjustments. Manually change the air balance, close or open dampers, or open door slightly to get both unit and actual pressure to read in same direction (both read positive or negative). This problem can only occur at very low pressures so slightly changing the balance should eliminate the problem.

Perform a smoke test to determine pressure direction.
Select SENSOR SPAN item (2SENSOR SPAN item if second sensor).
Position thermal air velocity meter in door opening to obtain velocity reading. Press ▲/▼ keys until pressure direction (+/-) and sensor span match thermal air velocity meter, and smoke test.
Press **SELECT** key to save sensor span.
Exit menu, calibration is complete.

Flow station pressure transducer zero

Disconnect tubing between pressure transducer and flow station.
Enter calibration menu. Access code is required
Select EXH FLO ZERO to take exhaust flow zero
or
Select SUP FLO ZERO to take supply flow zero (premium units only)
Press **SELECT** key. Flow zero procedure, which takes 10 seconds, is automatic.
Press **SELECT** key to save data.
Connect tubing between pressure transducer and flow station.

Maintenance and Repair Parts

The Model 8631 PRESSURA™ Room Pressure Monitor/Controller requires minimal maintenance. Periodic inspection of system components as well as an occasional pressure sensor cleaning are all that are needed to ensure that the Model 8631 is operating properly.

System Component Inspection

It is recommended that the pressure sensor be periodically inspected for accumulation of contaminants. The frequency of these inspections is dependent upon the quality of the air being drawn across the sensor. Quite simply, if the air is dirty, the sensors require more frequent inspection and cleaning.

Visually inspect the pressure sensor by sliding open the sensor housing door (Figure 8). The air flow orifice should be free of obstructions. The small ceramic coated sensors protruding from the orifice wall should be white and free of accumulated debris.

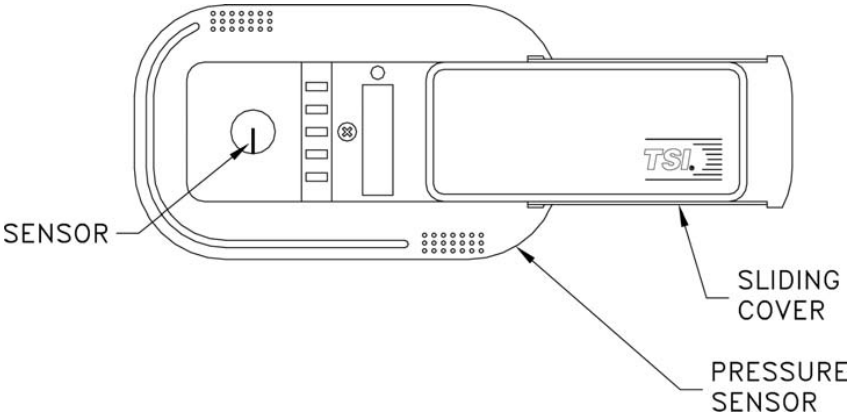


Figure 8: Pressure sensor door slid open

Periodically inspect the other system components for proper performance and physical signs of excessive wear.

Pressure Sensor Cleaning

Accumulations of dust or dirt can be removed with a dry soft-bristled brush (such as an artist's brush). If necessary, water, alcohol, acetone, or trichlorethane may be used as a solvent to remove other contaminants.

Use extreme care when cleaning the velocity sensors. The ceramic sensor may break if excessive pressure is applied, if sensor is scraped to remove contaminants, or if the cleaning apparatus abruptly impacts the sensor.

WARNING: If you are using a liquid to clean the sensor, turn off power to the Model 8631.

Do **not** use compressed air to clean the velocity sensors.

Do **not** attempt to scrape contaminants from the velocity sensors. The velocity sensors are quite durable; however, scraping may cause mechanical damage and possibly break the sensor. Mechanical damage due to scraping voids the pressure sensor warranty.

Replacement Parts

All components of the room pressure controller are field replaceable. Contact TSI HVAC Control Products at (800) 874-2811 (U.S. and Canada) or (001 651) 490-2811 (other countries) or your nearest TSI Manufacturer's Representative for replacement part pricing and delivery.

Part Number	Description
800646	Model 8631-HM Pressure Monitor
800647	Model 8631-HC Pressure Controller
863108	Model 8631-HM-BAC Pressure Monitor
863109	Model 8631-HC-BAC Pressure Controller
800243	Pressure Sensor
800248	Sensor Cable
800414	Transformer Cable
800420	Transformer
800199	Controller Output Cable
800360	Electric Actuator

Troubleshooting Section

The PRESSURA™ Room Pressure Monitor/Controller is designed to be trouble free. However, installation problems or interaction with other HVAC components may cause system problems. The PRESSURA™ system is easy to troubleshoot if an organized approach to evaluate the system is taken. Troubleshooting is broken down into hardware and software problems. Hardware problems deal with the physical installation of the device. Hardware problems include wiring problems, incorrectly installed equipment, and add-ons or non TSI equipment. Software problems include control problems, configuration problems, or interaction problems with the HVAC system.

The hardware test described in this section determines that all TSI mechanical components are functioning correctly. The hardware test requires the diagnostics menu items to be accessed. If you are unfamiliar with the PRESSURA™ monitor menus, see Software Programming for keystroke procedure. Troubleshooting the majority of problems is usually quick if the hardware test is followed.

Software and hardware problems are covered in the troubleshooting chart. Pick the problem that most closely resembles your problem and review the possible symptoms and corrective action. Software or system performance problems can and are affected by the supply air system, exhaust air system, or physical configuration of the room. Separating TSI system problems from the hospital HVAC system can sometimes be difficult. TSI recommends confirming all hardware is operating correctly before troubleshooting software problems.

Hardware Test

Three tests need to be performed in order to determine all hardware is functioning correctly. The tests are broken down into:

- Confirming wiring is correct.
- Confirming physical installation is correct.
- Verifying mechanical components.

Confirming wiring is correct.

The most common problem with installed hardware equipment is incorrect wiring. This problem usually exists on initial installation, or when modifications to the system take place. The wiring should be very closely checked to verify it exactly matches the wiring diagram. The TSI cables are all color coded to ensure proper wiring. A wiring diagram is located in Appendix C of this manual. Wiring associated with non TSI components should be closely checked for correct installation. If non TSI components are installed, consider disconnecting them for testing purposes.

Confirming physical installation is correct

All of the hardware components need to be installed properly. Review the installation instructions and verify components are installed properly at the correct location. This is easily done when the wiring is checked.

Verifying mechanical components

Verifying all TSI components are operating correctly requires following a simple procedure. The fastest procedure to confirm all equipment is operating is to first test the DIM, and then go into the diagnostic menu to test each component.

NOTE: These tests require power to the units, so if unit has no power, refer to hardware troubleshooting chart to eliminate power problem.

TEST - DIM

Press **TEST** key to verify Digital Interface Module (DIM) electronics are functioning correctly. At the end of the self test, the display shows SELF TEST - PASSED if all DIM electronics are good. If unit displays DATA ERROR at the end of the test, the electronics may be corrupted. Check all software items to determine cause of DATA ERROR.

If SELF TEST - PASSED is displayed proceed to test individual components. Enter Diagnostics menu and check the following:

- Control output. (Available on Controller models only)
- Sensor input.
- Sensor status.
- Analog output.
- Key input.

These diagnostic menu items are explained in detail in the next section (Diagnostics menu) of the manual, so their function is not reviewed here. If the PRESSURA™ system passes each of the tests, the mechanical piece parts are all functioning correctly.

TEST - Control output (Available on Controller models only)

Enter CONTROL OUT menu item in diagnostics menu. A number between 0 and 255 is displayed. Press the ▲/▼ keys until either 0 or 255 shows on the display. Note the position of the control damper. If display reads 0 press the ▲ key until 255 is shown on display. If display read 255 press ▼ key until 0 is shown on display. Note the position of the damper. The damper should have rotated either 45 or 90 degrees depending on actuator installed. If not see hardware section: *Control system is not controlling*.

TEST - Sensor input

Enter SENSOR INPUT menu item in diagnostics menu. A voltage between 0 and 10 volts DC is displayed. It is not important what the exact voltage is to pass this test. Tape over the pressure sensor (slide pressure sensor door open) and voltage should read approximately 5 volts (zero pressure). Remove tape and blow on sensor. Displayed value should change. If voltage changes, the unit passes. If voltage doesn't change, proceed to Sensor status test.

TEST - Sensor status

Enter SENSOR STAT menu item in diagnostics menu. If NORMAL is displayed, the unit passes test. If an error message is displayed, go to diagnostics menu section of the manual, SENSOR STAT menu item for explanation of error message.

TEST - Analog output

NOTE: This test is only performed if analog output feature is being used.

Enter ANALOG OUT menu item in diagnostics menu. A value between 0 and 255 is displayed. Hook up a DC voltmeter to pins 9 and 10. Press the ▲/▼ keys to change output from 0 to 255. Voltage should change from 10 volts to zero volts (20 mA to 0 mA if current output).

TEST - Key input

NOTE: This test is only performed if system has a TSI key switch installed.

Enter ROOM MODE item in control menu. Verify KEY SWITCH option is selected. Exit menu item and enter KEY INPUT item in diagnostics menu. Note the position of the key switch. Verify that key switch position and key input match. Rotate key switch to verify key input works for all positions.

If unit passed all tests, the mechanical components are physically working. If problems still exist, go to troubleshooting chart for additional information, on both hardware and software symptoms.

Diagnostics Menu

The items in the diagnostic menu (listed below) aid in identifying problems the staff may encounter. The items in this menu temporarily change the function by pressing the ▲/▼ keys. No permanent change occurs with these menu items. Items are exited by pressing the **MENU** key. When an item is exited the PRESSURA™ monitor returns to its normal state.

Control Output

Menu Item - CONTROL OUT (Available on Controller models only)

The CONTROL OUT item is used to change the control output signal to the actuator/damper (or motor speed drive). When this item is entered, a number is shown on the display indicating the last control output value. The range of values displayed is 0 to 255. Pressing the ▲/▼ keys change the count on the display. Pressing the ▲ key should increase the displayed value, while pressing the ▼ key decreases the displayed value. The control device should change as the number changes. Depending on the jumper location on the actuator, 0 or 255 is full open on damper. Conversely 255 or 0 will be full closed. A count of 150 should open the damper approximately 1/2 open. On units controlling variable frequency drives, fan speed should increase or decrease as numbers change.

WARNING: The CONTROL OUT function overrides the pressure control signal. Adequate room pressure will NOT be maintained while in this item.

Sensor Input

Menu Item - SENSOR INPUT / 2SENSOR IN

The SENSOR INPUT (2SENSOR IN) item is used to verify that the DIM or controller electronics is receiving a signal from the sensor. When this item is entered, a voltage will be indicated on the display. The exact voltage displayed is relatively unimportant. It is more important that the voltage is changing which indicates the sensor is working correctly.

0 volts represents a negative pressure of -0.2 inches H_2O.
5 volts represents 0 pressure
10 volts represents a positive pressure of +0.2 inches H_2O.

Sensor Communications

Menu Item - SENSOR STAT / 2SENSOR STAT

The SENSOR STAT (2SENSOR STAT) item verifies that the RS-485 communications between the pressure sensor and DIM is working correctly. Sensor error messages do not display on DIM except when SENSOR STAT item is selected. The item displays NORMAL if communications are established correctly. If problems exist, one of four error messages will display:

COMM ERROR	-	DIM cannot communicate with sensor. Check all wiring and the pressure sensor address. Address must be 1 or 2 (Figure 9).
SENS ERROR	-	Problem with sensor bridge. Physical damage to pressure sensor or sensor circuitry. Unit is not field repairable. Send to TSI for repair.
CAL ERROR	-	Calibration data lost. Sensor must be returned to TSI to be calibrated.
DATA ERROR	-	Problem with EEPROM, field calibration, or analog output calibration lost. Check all data programmed and confirm unit is function correctly.

Analog Output

Menu Item - ANALOG OUT

The ANALOG OUT item is used to vary the analog output from the PRESSURA™ unit. When this item is entered, a number is shown on the display indicating the last analog output value. The value displayed ranges from 0 to 255. The value 255 corresponds to the lowest voltage (current) output and 0 corresponds to the highest voltage (current) output. Pressing the ▲ key decreases the analog output and increase the value displayed. Pressing the ▼ key increases the analog output and decrease the value displayed.

The ANALOG OUT function can be used in conjunction with a volt meter to verify the analog output is correct.

Key Switch Input

Menu Item - KEY INPUT

The KEY INPUT item reads the position of the TSI key switch. When this item is entered, the display indicates either POSITIVE, NEGATIVE, or NO ISOLATION. If the display indicates POSITIVE, the TSI key switch has the PRESSURA™ monitor in positive pressure mode. If the display indicates NEGATIVE, the TSI key switch has the PRESSURA™ monitor in the negative pressure mode. If the display indicates NO ISOLATION, the TSI key switch has the PRESSURA™ monitor in no isolation mode (damper goes to preset position).

In normal operation, the key switch is not enabled unless ROOM MODE item has KEY SWITCH selected.

Flow Input

Menu Item - FLOW IN (Available on Monitor models only)

The FLOW IN item is used to read the input from the flow station. When this item is entered, a voltage is indicated on the display. The exact voltage displayed is relatively unimportant. It is more important that the voltage is changing which indicates the flow station is working correctly.

0 VDC displayed equals zero flow.
10 VDC displayed equals maximum flow.

Menu Item – EXH FLOW IN (Available on Controller models only)

The EXH FLOW IN item is used to read the input from the exhaust flow station. When this item is entered, a voltage is indicated on the display. The exact voltage displayed is relatively unimportant. It is more important that the voltage is changing which indicates the flow station is working correctly.

0 VDC displayed equals zero flow.
10 VDC displayed equals maximum flow.

Alarm Relay

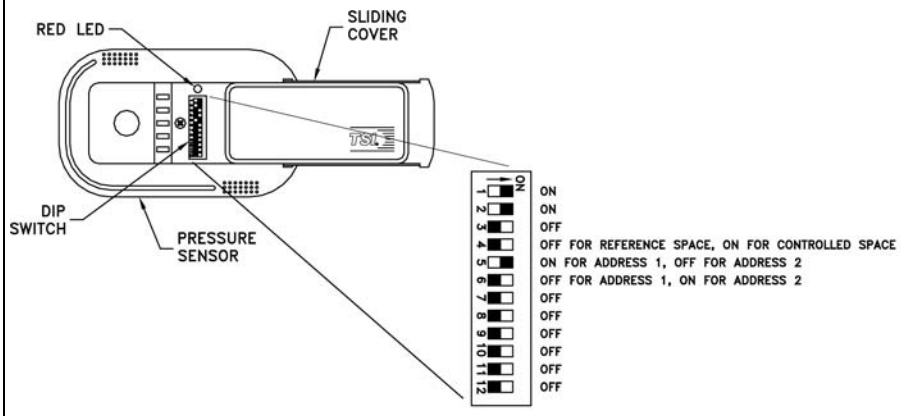
Menu Item - ALARM RELAY

The ALARM RELAY item is used to change the state of the alarm relay. When this item is entered, the display indicates either OPEN or CLOSED. The ▲/▼ keys are used to toggle the state of the relay. The ▲ key is used to OPEN the alarm contact. The ▼ key is used to CLOSE the alarm contact. When the contact is closed, the ALARM RELAY should be in an alarm condition.

Troubleshooting Chart

Symptom	Possible Cause	Corrective Action
Display is blank.	Fuse is blown.	Measure voltage at pins 1 and 2 on DIM. The voltage should nominally be; 24 to 40 VDC when using TSI electric actuators 24 to 30 VAC when using TSI pneumatic actuators 24 to 30 VAC when using motor speed drives. If correct voltage is measured, internal DIM fuse is probably blown. Unplug 14-pin connector from DIM for 2 minutes. The internal fuse automatically resets. Plug unit back in and check display. If display is still blank, check all wiring, etc. If no problems are found, replace DIM. If approximately 5 volts is measured, the fuse in the electric actuator or E/P is blown. Disconnect power to the electric actuator or E/P for two minutes to reset fuse. Disconnecting power requires either shutting off circuit breaker or disconnecting the wires on pins 1 and 2 on the electric actuator or E/P. If zero volts are measured, see *No power to DIM*.
	No power to DIM.	Verify circuit breaker is on. Verify transformer primary measures 110 VAC. Verify transformer secondary measures 24 - 30 VAC. Verify electric actuator or E/P interface is receiving 24 - 30 volts between pins 1 and 2. Verify 24 to 40 VDC is found between pins 3 and 4 of the electric actuator. Verify 24 to 30 VAC between pins 3 and 4 of the E/P interface. Verify voltage on pins 1 and 2 of DIM is 24 - 30 VAC for pneumatic systems and VFDs, or 24 - 40 VDC on electric actuators.
	DIM is defective.	If proper voltage is found between pins 1 and 2 of the DIM, all wiring has been checked, fuses have been reset, and screen is still blank, the DIM is probably defective. Replace DIM.
Control system is not controlling.	Incorrect wiring.	Verify correct wiring (see wiring diagram, Appendix C). DIM must be wired exactly as shown.
	DIM is in no isolation mode.	Slide open cover on DIM and see what mode DIM is in. If in no isolation is displayed, damper goes to preset position (see SETPOINT menu, DAMPER SET item) and no control is possible.

Symptom	Possible Cause	Corrective Action
Control system is not controlling *(cont.)*.	No control output signal.	Go into DIAGNOSTICS menu, CONTROL OUT item. A number between 0 and 255 is displayed. Pressing the ▲ key increases the number. Pressing the ▼ key decreases the number. Measure the DC voltage between pins 17 and 18 on the controller. Change the CONTROL OUT value about 100 numbers. The voltage output should change approximately 4 volts. Change the CONTROL OUT value to 150. The voltage should read approximately 5 VDC. If no change occurs, disconnect control wires on pins 17 and 18 and repeat test. If DIM still fails to change voltage output, DIM is probably defective.
	Bad actuator or E/P (damper doesn't move).	Go into DIAGNOSTICS menu, CONTROL OUT item. A number between 0 and 255 is displayed. Pressing the ▲ key increases the number. Pressing the ▼ key decreases the number. Change the CONTROL OUT value to read 0 or 255. Note damper position. Press an arrow key to change 0 to 255 or 255 to 0. Note position of damper. Damper should have rotated 45 or 90 degrees depending on actuator system installed. If damper rotated 45 or 90 degrees, actuator is installed and operating correctly. If damper did not rotate, check that: • Jumper is installed on actuator or E/P. • Damper is not physically stuck (screws, etc.). • Wiring is correct between actuators and controller. Check that voltage varies between 0 and 10 volts on pins 5 and 6 on electric actuator or E/P (see *No control output signal*). • Electric actuator is not over torqued. The electric actuator has current limiting protection. If damper is physically stuck or actuator is over current, the actuator shuts down. To restart either kill power to actuator or move damper in opposite direction it was trying to rotate (CONTROL OUT menu item).
	Defective variable frequency drive (VFD).	Perform test described in *Control system is not controlling*. If CONTROL OUT is functioning, verify wiring to VFD by confirming CONTROL OUT voltage changes at VFD. If voltage changes, a problem with VFD exists. See VFD manual for further troubleshooting.
	Damper rotating opposite direction.	If damper is full open when it should be closed or full closed when it should be open, go into CONTROL menu CONTROL SIG menu item. Change direct to reverse or reverse to direct to change control output direction.
	Damper is full open or full closed, won't move.	Actuator jumper is missing or loose. Verify jumper is installed correctly.

Symptom	Possible Cause	Corrective Action
Control system is not controlling *(cont.).*		Control wires are loose. Check wires and verify control output is working (see *no control output signal*). If control output test passes, verify damper is rotating correct direction (see *damper rotating opposite direction*). If damper is rotating correctly and setpoint cannot be reached, DIM fully rotates damper to get as close to setpoint as possible. Air balance needs to be adjusted.
Sensor does not calibrate.	Incorrect pressure sensor address.	Primary pressure sensor must have address of 1. Second sensor must have address of 2. Check pressure sensor DIP switches 1 & 2 and verify address is correct (7-12 must be OFF).
		 **Figure 9: Pressure sensor DIP switch**
	Sensor communications not working.	Check SENSOR STAT item in diagnostics menu. If NORMAL is displayed, sensor is okay. If COMM ERROR is displayed, check wiring, pressure sensor address, and that DIP switch 1 & 2 are ON (Figures 9 and 11).
Pressure sensor red LED is blinking (Figure 9).	Problem with sensor (slow uniform blink).	Check SENSOR STAT and confirm NORMAL is displayed. If ERROR is displayed, correct error.
	Communication (fast burst of non-uniform blinking).	Unit is communicating with DIM. This is normal.
	Red LED is constantly on.	This is normal when no problems exist or when no communication is occurring.
DIM always displays 0.200 inches H_2O.	Incorrect pressure sensor output.	Pressure sensor must be set for 0 to 10 volt output, not 4 to 20 mA (do ***not*** confuse this output with DIM analog output). Check pressure sensor DIP switch 3 and make sure it is OFF (see Figure 9).

Symptom	Possible Cause	Corrective Action
Positive/negative/ neutral key switch doesn't work.	Incorrect wiring. Room mode is incorrect.	Verify wiring is correct between key switch and DIM. Go into CONFIGURE menu, ROOM MODE item. Verify ROOM MODE is in key switch position.
	Defective switch / defective DIM.	Verify ROOM MODE is in key switch position. Go into DIAGNOSTICS menu, KEY INPUT item. Display should read negative in negative position, positive in positive position, and no isolation in neutral position. If display changes correctly, switch and switch input is good. If display does not change: Disconnect key switch wires from DIM pins 11 and 12. Measure the resistance of the switch: • Negative position should be open (infinite). • Neutral position should read approximately 273 K Ohms. • Positive position should be closed (short). If room mode is correct and resistance check is good, DIM key input is probably defective. Replace DIM.
DIM does not respond to LonWorks® communications.	Device has not identified itself to the network. . Device has been acquired by foreign network tool. Incompatible software.	Go into INTERFACE menu, LON item. Select **SERVICE PIN**. Go into INTERFACE menu, LON item. Select **GO UNCONFIGURED.** Data sent to DIM may be in form that the PRESSURA™ monitor cannot recognize.
DIM does not respond to BACnet® communications.	Device is sharing MAC address with other device on the network. RS485 wiring polarity backwards.	Go into INTERFACE menu, MAC ADDRESS item. Change to a unique address on the network. Swap the polarity on terminals 27,28 on the back of the DIM.
DIM displays opposite pressure signal.	Sensor direction is incorrect.	Pressure sensor must have DIP switch correctly set for proper sign display. Verify DIP switch 4 is ON when sensor is mounted in isolation room (controlled space), and OFF when sensor is mounted in reference space (see Figure 9).

Symptom	Possible Cause	Corrective Action
Alarm relay doesn't work.	Alarms are turned off.	Press **TEST** key. The individual alarm setpoints will display. If all alarm setpoints are zero, alarm relay is not active, so relay will not be required to change state.
	Incorrect wiring.	Check the wiring from PRESSURA™ monitor relay's output to the device that is connected to the relays.
	Relay may be defective.	Disconnect the wiring from relay contact pins 13 and 14 for low alarm relay and pins 25 and 26 for high alarm relay. Go into DIAGNOSTICS menu, LOW ALM REL or HIGH ALM REL. Connect an ohmmeter to relay terminals to verify contact open and closes. Press the ▼/▲ key to manually trip the relay. If relay responds (contact opens and closes), the device connected is incompatible or defective. If relay doesn't respond, relay is defective (may be caused by incompatible device). Replace DIM.
"DATA ERROR" flashing on display.	DIM was hit by electrical disturbance.	All data may be lost or changed. Review all configuration parameters. DATA ERROR is removed by pressing the **RESET** key.
Actuator hunting. Display indicates steady pressure.	Control system is unstable.	Go into CONTROL menu, SPEED item. Turn speed down until hunting is eliminated. If speed is too slow review CONTROL menu items and adjust accordingly to eliminate hunting.
Displayed pressure wildly fluctuating.	Exhaust system unstable.	Turn DIM to emergency. If pressure stabilizes, this is not the problem. Verify reference pressure is not fluctuating.
	Supply or exhaust air is affecting the sensor.	Check location of supply air diffusers and exhaust grilles. They should be as far from pressure sensor as is realistic, 6 feet preferred, 2½ feet minimum. Supply diffuser terminal throw velocity must be less than 10 ft/min at the sensor. Relocate supply or exhaust as needed.

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Appendix A

Specifications

Room Pressure Module

Display

Range	-0.20000 to +0.20000 inches H_2O
Resolution	5% of reading
Display Update	0.5 sec

Inputs

Switch in	SPST (N.O.) Switch. Closing switch initiates condition.
Flow in	0 to 10 VDC

Outputs

Low Alarm Range	-0.19500 to +0.19500 inches H_2O
High Alarm Range	-0.19500 to +0.19500 inches H_2O
Alarm Contacts	SPST (N.O.) Max current 5A, max voltage 150 VDC, 250 VAC. Maximum switch load 10 mA, 5 VDC. Contacts close in alarm condition.
Analog Output	
Type	0 to 10 VDC or 4 to 20 mA
Range	High -0.100 to +0.100 inches H_2O Low -0.0100 to +0.0100 inches H_2O
Resolution	1.0% of range for 0 to 10 VDC 1.2% of range for 4 to 20 mA
RS-485	Yes

Operating Temperature	32 to 120°F
Input Power	24 VAC, 5 watts max
Dimensions	4.9 in. x 4.9 in. x 1.35 in.
Weight	0.7 lb.

Pressure Sensor

Temperature Compensation Range	55 to 95°F
Power Dissipation	0.16 watts at 0 inches H_2O, 0.20 watts at 0.00088 inches H_2O
Dimensions (D x H)	5.58 in. x 3.34 in. x 1.94 in.
Weight	0.2 lb.

Damper/Actuator

Types of Actuators	Electric or pneumatic
Input Power	Electric: 24 VAC, 7.5 watts max.
Time for 90° Rotation	Electric: 1.5 seconds

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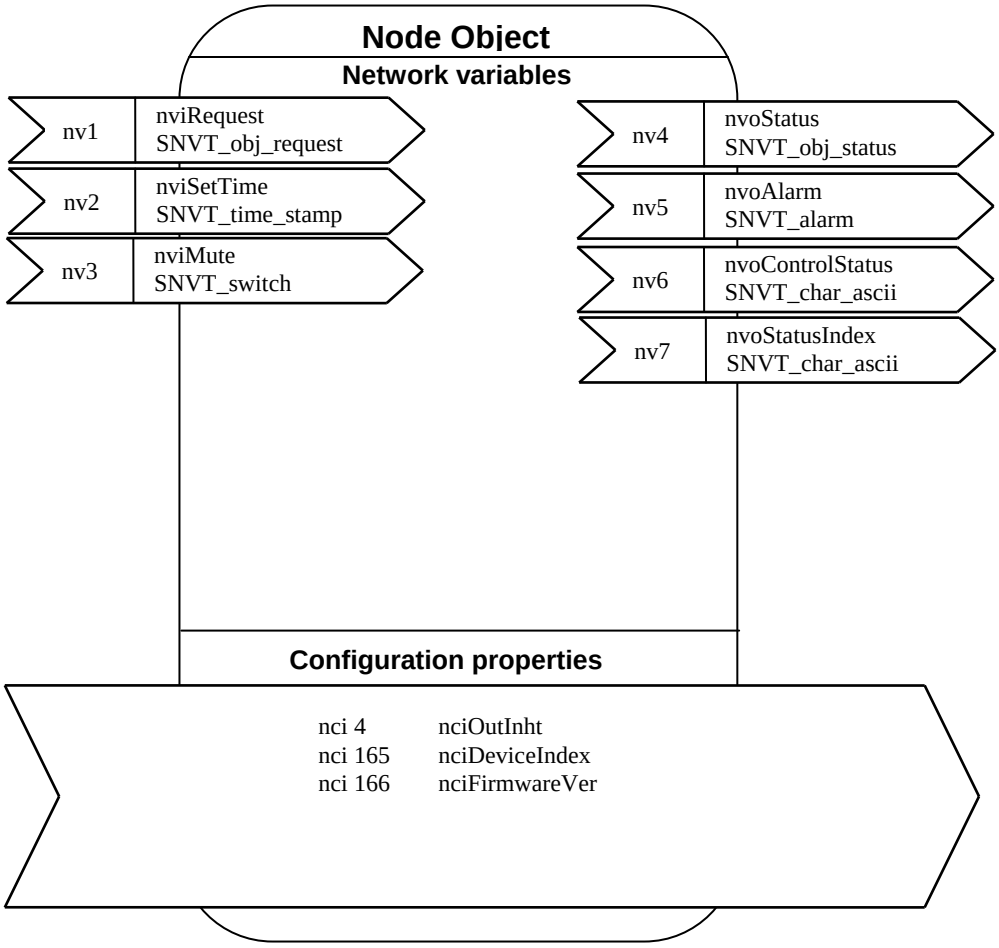
Appendix B

Network Communications

Network communications are available on the Model 8631-HM/HC. The Model 8631-HM/HC can communicate with a building management system through LonWorks® or BACnet® MSTP protocols. Please refer to the sections below for more detailed information.

Model 8631-HM LonWorks® Node Object



LonWorks® Room Monitor Status Definitions

nvoControlStatus

Bit	Description
0	Negative Mode
1	Positive Mode
2	No Isolation Mode

Setting nviRequest.object_request to RQ_CLEAR_ALM clears the current alarm from the controller and the BAS

nvoStatusIndex

Bit	Description
0	Normal
1	Low Alarm
2	High Alarm
3	Minimum Flow Alarm
4	Data Error

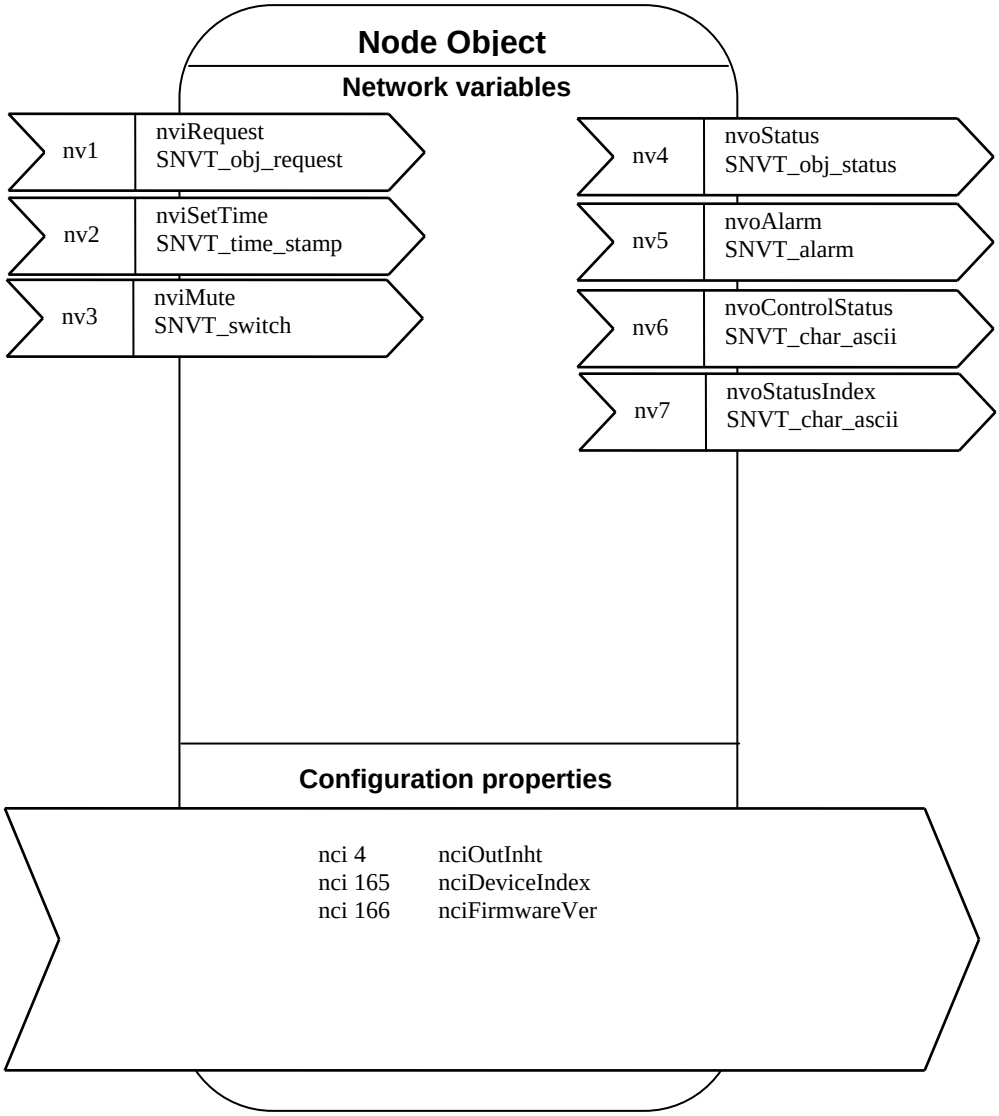
8631-HM LonWorks® Object

LonWorks® Room Monitor Room Mode Definition

nviRoomMode

Bit	Description
0	Negative Mode
1	Positive Mode
2	No Isolation Mode

Model 8631-HC LonWorks® Node Object



LonWorks® Room Controller Status Definitions

nvoControlStatus

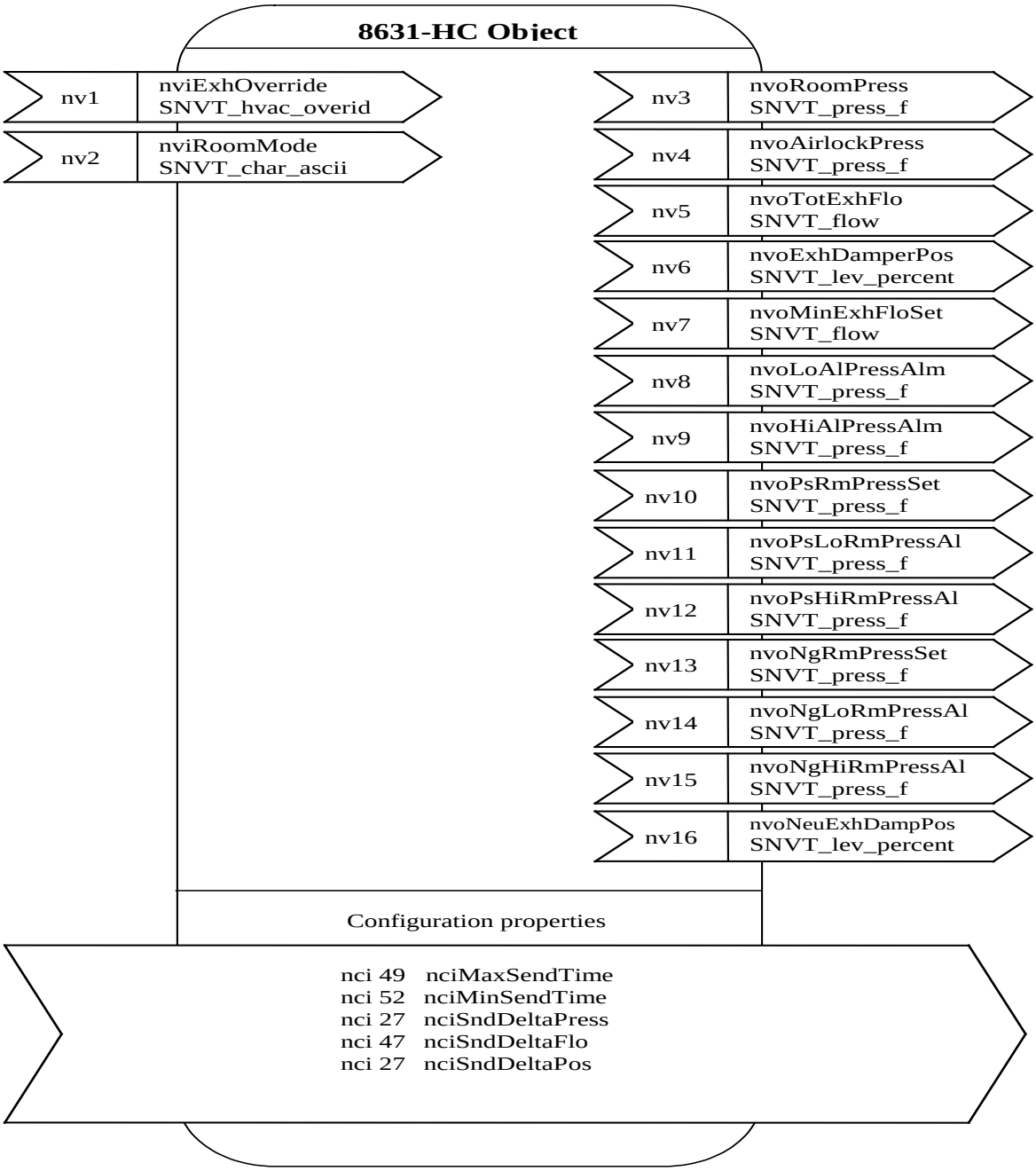
Bit	Description
0	Negative Mode
1	Positive Mode
2	No Isolation Mode

Setting nviRequest.object_request to RQ_CLEAR_ALM clears the current alarm from the controller and the BAS

nvoStatusIndex

Bit	Description
0	Normal
1	Low Alarm
2	High Alarm
3	Minimum Exhaust Alarm
4	Second Sensor Low Alarm
5	Second Sensor High Alarm
6	Data Error
7	Emergency
8	LON Override

8631-HC LonWorks® Object



LonWorks® Room Controller Room Mode Definition

nviRoomMode

Bit	Description
0	Negative Mode
1	Positive Mode
2	No Isolation Mode

8631 BACnet® MS/TP Protocol Implementation Conformance Statement

Date: March 19, 2007
Vendor Name: TSI Inc.
Product Name: PRESSURA™ Room Pressure Monitor/Controller
Product Model Number: 8631-HM(HC)-BAC
Applications Software Version: 1.0
Firmware Revision: 1.0
BACnet Protocol Revision: 2

Product Description:

TSI's PRESSURA™ Room Pressure Monitors accurately measure the actual room pressure differential, verifying the proper operation of your HVAC system to help you maintain patient safety. The PRESSURA™ Room Pressure Controllers, however, go a step beyond simple monitoring; they can adjust the airflow rates to correct problems as they occur, reducing incidents when the room pressure differential goes out of control. This model monitor/controller is capable of acting as a stand-alone device or as part of a building automation system via BACnet MS/TP protocol.

BACnet Standardized Device Profile (Annex L):

☐ **BACnet Operator Workstation (B-OWS)**
☐ **BACnet Building Controller (B-BC)**
☐ **BACnet Advanced Application Controller (B-AAC)**
☑ **BACnet Application Specific Controller (B-ASC)**
☐ **BACnet Smart Sensor (B-SS)**
☐ **BACnet Smart Actuator (B-SA)**

List all BACnet Interoperability Building Blocks Supported (Annex K):

DS-RP-B	**DM-DDB-B**
DS-WP-B	**DM-DOB-B**
DS-RPM-B	**DM-DCC-B**

Segmentation Capability:

Segmented requests not supported
Segmented responses not supported

Standard Object Types Supported:

	Dynamically Createable	Dynamically Deletable	Optional Properties Supported	Writable Properties (Data Type)
Analog Input	**No**	**No**		
Analog Value	**No**	**No**		**Present_Value (Real)**
Binary Input	**No**	**No**	**Active_Text, Inactive_Text**	
Binary Value	**No**	**No**	**Active_Text, Inactive_Text**	**Present_Value (Enumerated)**
Multi-state Input	**No**	**No**	**State_Text**	
Multi-state Value	**No**	**No**	**State_Text**	**Present_Value (Unsigned Int)**
Device Object	**No**	**No**		**Object Name (Char String) Max Master (Unsigned Int)**

Data Link Layer Options:
☐ BACnet IP, (Annex J)
☐ BACnet IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s)
☑ MS/TP master (Clause 9), baud rate(s): 76.8k 38.4k, 19.2k, 9600 bps
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐ Point-To-Point, modem, (Clause 10), baud rate(s):
☐ LonTalk, (Clause 11), medium:
☐ Other:

Device Address Binding:
Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐Yes ☑ No

Networking Options:
☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP
☐ BACnet/IP Broadcast Management Device (BBMD)

Character Sets Supported:
Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☑ ANSI X3.4 ☐ IBM®/Microsoft® DBCS ☐ ISO 8859-1
☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:
Not Applicable

Model 8631-HM BACnet® MS/TP Object Set

Feature	Object Type	Device Instance	*Units	
Room Pressure	Analog Input	1	ft/min, m/s, “H_2O, Pa	
Sec Sens Pressure	Analog Input	2	ft/min, m/s, “H_2O, Pa	
Flow Rate	Analog Input	3	cfm, l/s	
Air Changes Per Hour	Analog Input	4		
MAC Address**	Analog Value	1		1 to 127
Neg Low Alarm	Analog Value	2	ft/min, m/s, “H_2O, Pa	0 to -0.19500 “H_2O
Neg High Alarm	Analog Value	3	ft/min, m/s, “H_2O, Pa	0 to -0.19500 “H_2O
Pos Low Alarm	Analog Value	4	ft/min, m/s, “H_2O, Pa	0 to 0.19500 “H_2O
Pos High Alarm	Analog Value	5	ft/min, m/s, “H_2O, Pa	0 to 0.19500 “H_2O
Sec Low Alarm	Analog Value	6	ft/min, m/s, “H_2O, Pa	-0.19500 to 0.19500 “H_2O
Sec High Alarm	Analog Value	7	ft/min, m/s, “H_2O, Pa	-0.19500 to 0.19500 “H_2O
Min Supply Alarm	Analog Value	8	cfm, l/s	0 to 30,000 cfm
MAC ID**	Analog Value	9		1 to 999
Status Index	Multi-State Input	1		1 Normal 2 Low Alarm 3 High Alarm 4 Min Flow Alarm 5 Sec Sens Low Alarm 6 Sec Sens High Alarm 7 Data Error
Control Mode	Multi-State Value	2		1 Negative 2 Positive 3 No Isolation
Units Value	Multi-State Value	3		1 ft/min 2 m/s 3 “H_2O 4 Pa

* The units are based on the value of the Units Value object. When the Units Value is set to 1 or 3 the units are in English form. When the Units Value is set to 2 or 4 the units are metric. English is the default value.

** The MAC ID defaults to 863. The device index is the MAC ID multiplied by 1000, summed with the MAC Address of the device. The default device index is therefore 863001.

Model 8631-HC BACnet® MS/TP Object Set

Description	Object Type	Device Instance	*Units	
Room Pressure	Analog Input	1	ft/min, m/s, “H_2O, Pa	
Sec Sens Pressure	Analog Input	2	ft/min, m/s, “H_2O, Pa	
Current Pressure Setpoint	Analog Input	3	ft/min, m/s, “H_2O, Pa	
Flow Rate	Analog Input	4	cfm, l/s	
Air Changes Per Hour	Analog Input	5		
Damper Position	Analog Input	6	%	
MAC Address**	Analog Value	1		1 to 127
Neg Pressure Setpoint	Analog Value	2	ft/min, m/s, “H_2O, Pa	0 to -0.19500 “H_2O
Pos Pressure Setpoint	Analog Value	3	ft/min, m/s, “H_2O, Pa	0 to 0.19500 “H_2O
Neg Low Alarm	Analog Value	4	ft/min, m/s, “H_2O, Pa	0 to -0.19500 “H_2O
Neg High Alarm	Analog Value	5	ft/min, m/s, “H_2O, Pa	0 to -0.19500 “H_2O
Pos Low Alarm	Analog Value	6	ft/min, m/s, “H_2O, Pa	0 to 0.19500 “H_2O
Pos High Alarm	Analog Value	7	ft/min, m/s, “H_2O, Pa	0 to 0.19500 “H_2O
Sec Low Alarm	Analog Value	8	ft/min, m/s, “H_2O, Pa	-0.19500 to 0.19500 “H_2O
Sec High Alarm	Analog Value	9	ft/min, m/s, “H_2O, Pa	-0.19500 to 0.19500 “H_2O
Min Exhaust Setpoint	Analog Value	10	cfm, l/s	0 to 30,000 cfm
Min Exhaust Alarm	Analog Value	11	cfm, l/s	0 to 30,000 cfm
MAC ID**	Analog Value	12		1 to 999
Status Index	Multi-State Input	1		1 Normal 2 Low Alarm 3 High Alarm 4 Min Exhaust Alarm 5 Sec Sens Low Alarm 6 Sec Sens High Alarm 7 Data Error 8 Emergency
Control Mode	Multi-State Value	2		1 Negative 2 Positive 3 No Isolation
Units Value	Multi-State Value	3		1 ft/min 2 m/s 3 “H_2O 4 Pa

Description	Object Type	Device Instance	*Units	
Emergency Mode	Multi-State Value	4		1 Exit Emergency Mode 2 Enter Emergency Mode 3 Normal

* The units are based on the value of the Units Value object. When the Units Value is set to 1 or 3 the units are in English form. When the Units Value is set to 2 or 4 the units are metric. English is the default value.

** The MAC ID defaults to 863. The device index is the MAC ID multiplied by 1000, summed with the MAC Address of the device. The default device index is therefore 863001.

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Appendix C

Wiring Diagrams

8631-HM Back Panel Wiring

PIN #	DIM Input / Output / Communication	Description
1, 2	Input	24 VAC to power Digital Interface Module (DIM) and sensor. **NOTE**: 24 VAC becomes polarized when connected to DIM.
3, 4	Output	24 VAC power for Pressure Sensor
5, 6	Input	0 to 10 VDC pressure sensor signal
7, 8	Communications	RS-485 communications between DIM and pressure sensor
9, 10	Not Used	
11, 12	Input	Non powered switch input See menu item ROOM MODE. When ROOM MODE menu item is in the KEY SWITCH mode a TSI Model 8694-XX key switch can switch the room mode. Open contacts from the Model 8694-XX key switch make the room mode POSITIVE. Closed contacts from the Model 8694-XX key switch make the room mode NEGATIVE. A resistance value of 270 kΩ make the room mode NEUTRAL (NO ISOLATION).
13, 14	Output	Alarm relay - N.O., closes in alarm condition. See menu items: NEG LOW ALM, NEG HIGH ALM, POS LOW ALM, POS HIGH ALM, MIN CFM ALM, 2 LOW ALM and 2 HIGH ALM.
15, 16	Not Used	
17, 18	Not Used	
19, 20	Input	0 to 10 VDC pressure sensor signal (second sensor)
21, 22	Input	0 to 10 VDC flow station signal
23, 24	Not Used	
25, 26	Output	0 to 10 VDC pressure differential signal. See menu item OUTPUT SIG
27, 28	Communications	LonWorks® or BACnet® MSTP communications to building management system.

WARNING: The wiring diagram shows polarity on many pairs of pins: + / -, H / N, A / B. Damage to the DIM may occur if polarity is not observed.

8631-HC Back Panel Wiring

PIN #	DIM Input / Output / Communication	Description
1, 2	Input	24 VAC to power Digital Interface Module (DIM) and sensor. **NOTE**: 24 VAC becomes polarized when connected to DIM.
3, 4	Output	24 VAC power for Pressure Sensor
5, 6	Input	0 to 10 VDC pressure sensor signal
7, 8	Communications	RS-485 communications between DIM and pressure sensor
9, 10	Not Used	
11, 12	Input	Non powered switch input See menu item ROOM MODE. When ROOM MODE menu item is in the KEY SWITCH mode a TSI Model 8694-XX key switch can switch the room mode. Open contacts from the Model 8694-XX key switch make the room mode POSITIVE. Closed contacts from the Model 8694-XX key switch make the room mode NEGATIVE. A resistance value of 270 kΩ make the room mode NEUTRAL (NO ISOLATION).
13, 14	Output	Alarm relay - N.O., closes in alarm condition. See menu items: NEG LOW ALM, NEG HIGH ALM, POS LOW ALM, POS HIGH ALM, MIN CFM ALM, 2 LOW ALM and 2 HIGH ALM.
15, 16	Not Used	
17, 18	Output	0 to 10 VDC control signal. 10 VDC = open (n.o. damper). See menu item CONTROL SIG.
19, 20	Input	0 to 10 VDC pressure sensor signal (second sensor)
21, 22	Input	0 to 10 VDC flow station signal
23, 24	Not Used	
25, 26	Output	0 to 10 VDC pressure differential signal. See menu item OUTPUT SIG
27, 28	Communications	LonWorks® or BACnet® MSTP communications to building management system.

WARNING: The wiring diagram shows polarity on many pairs of pins: + / -, H / N, A / B. Damage to the DIM may occur if polarity is not observed.

Jumper Wiring Information - Damper systems

The Model 8631 PRESSURA™ Room Pressure Controller modulates electric actuated dampers mounted in the exhaust or supply ducts. The TSI damper / actuators are shipped configured to be mounted in the exhaust duct. The actuators have a jumper installed to meet the exhaust duct configuration. If the damper is mounted in the supply duct, the damper will probably rotate in the opposite direction. The menu item CONTROL SIG (CONTROL menu) reverses the control output to eliminate the problem. Changing the jumper on the actuator is not normally required.

Table B1. DIP Switch Configurations

Electric Actuator P/N 800370

Damper Location	Dip Switch
Supply Air	On (reverse)
Exhaust Air	Off (direct)

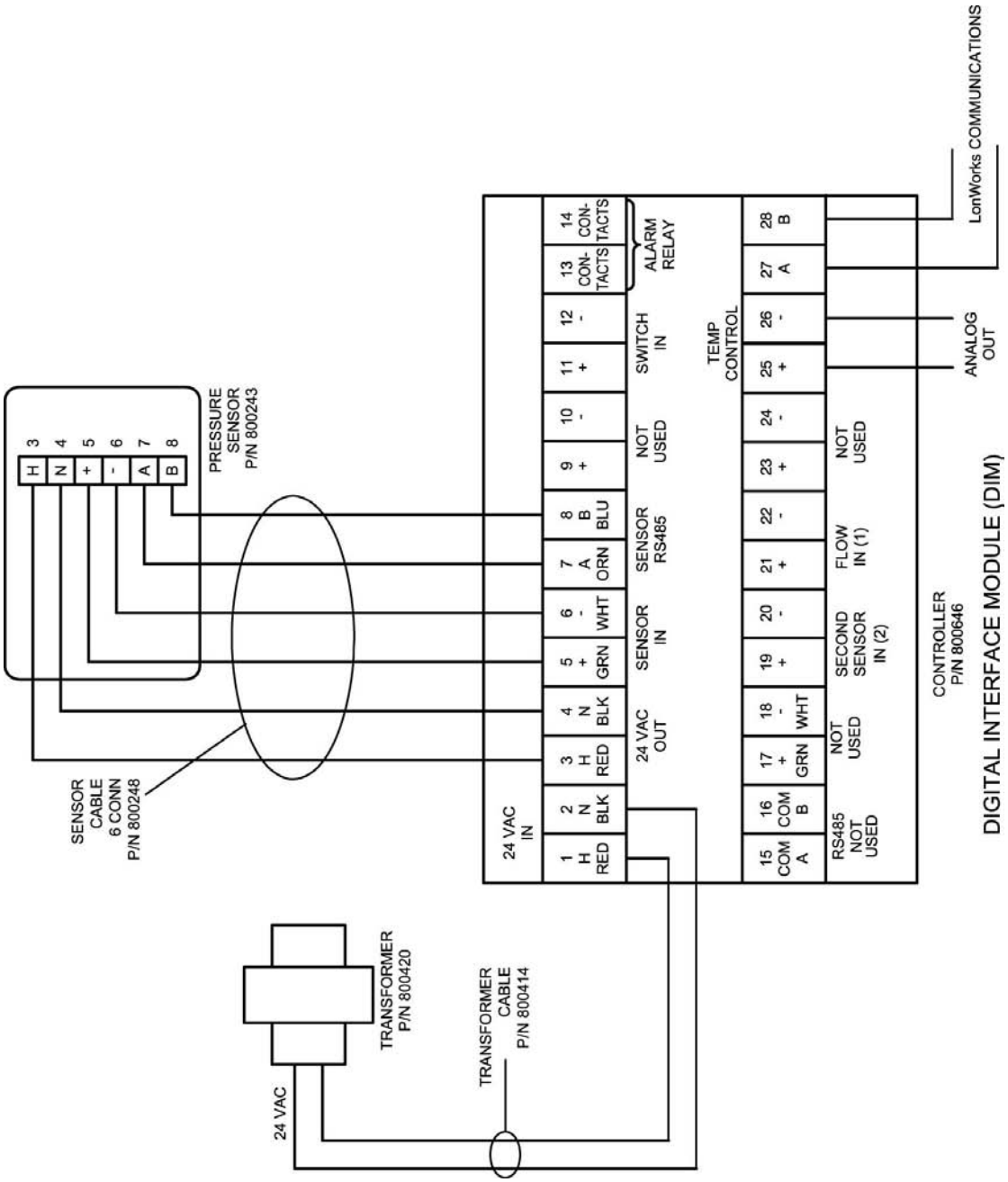

Figure 10: Wiring Diagram – 8631-HM Monitor

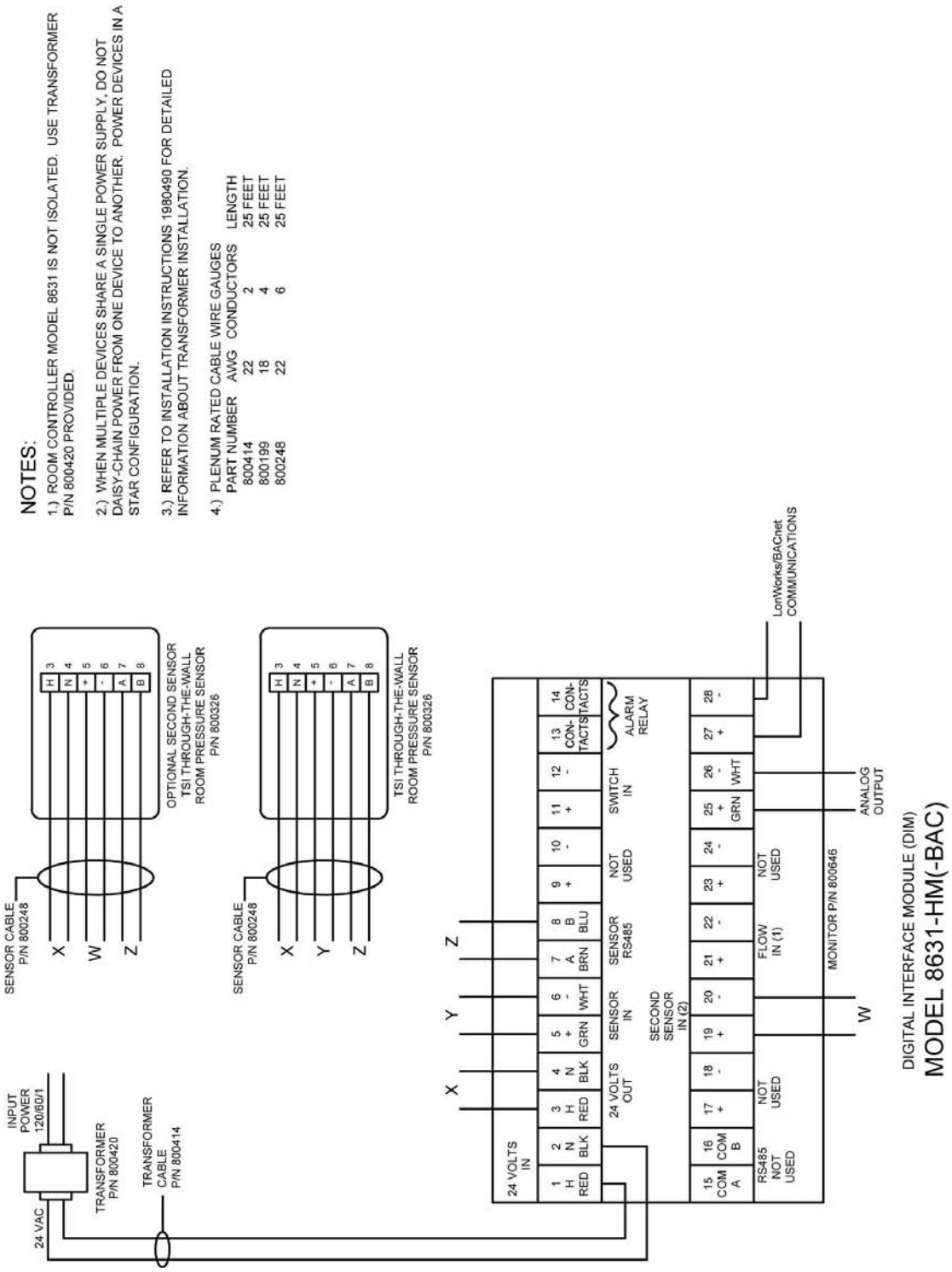

Figure 11: Wiring Diagram – 8631-HM(-BAC) Optional Second Sensor

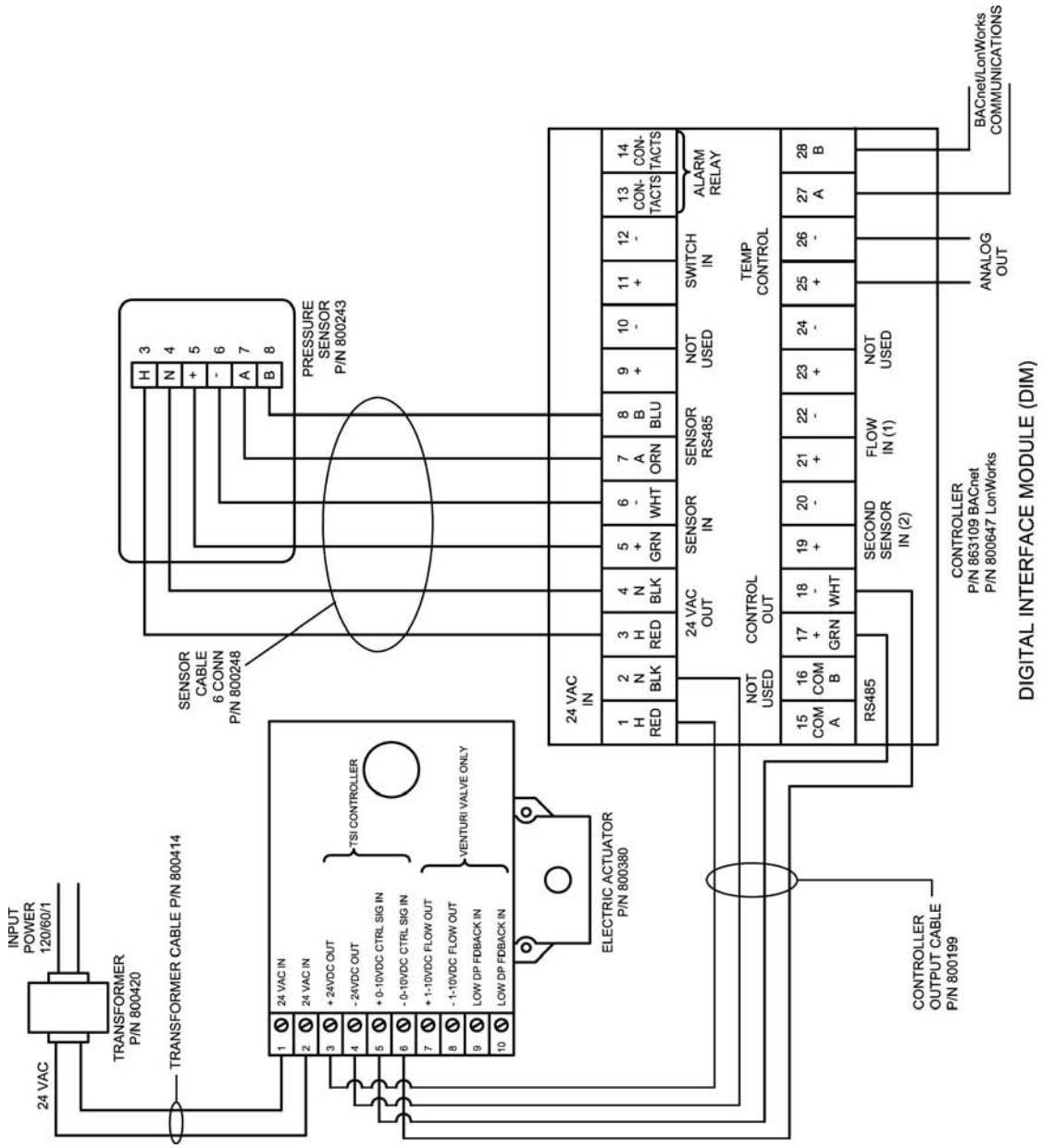

Figure 12: Wiring Diagram- 8631-HC Controller with Electric Actuator

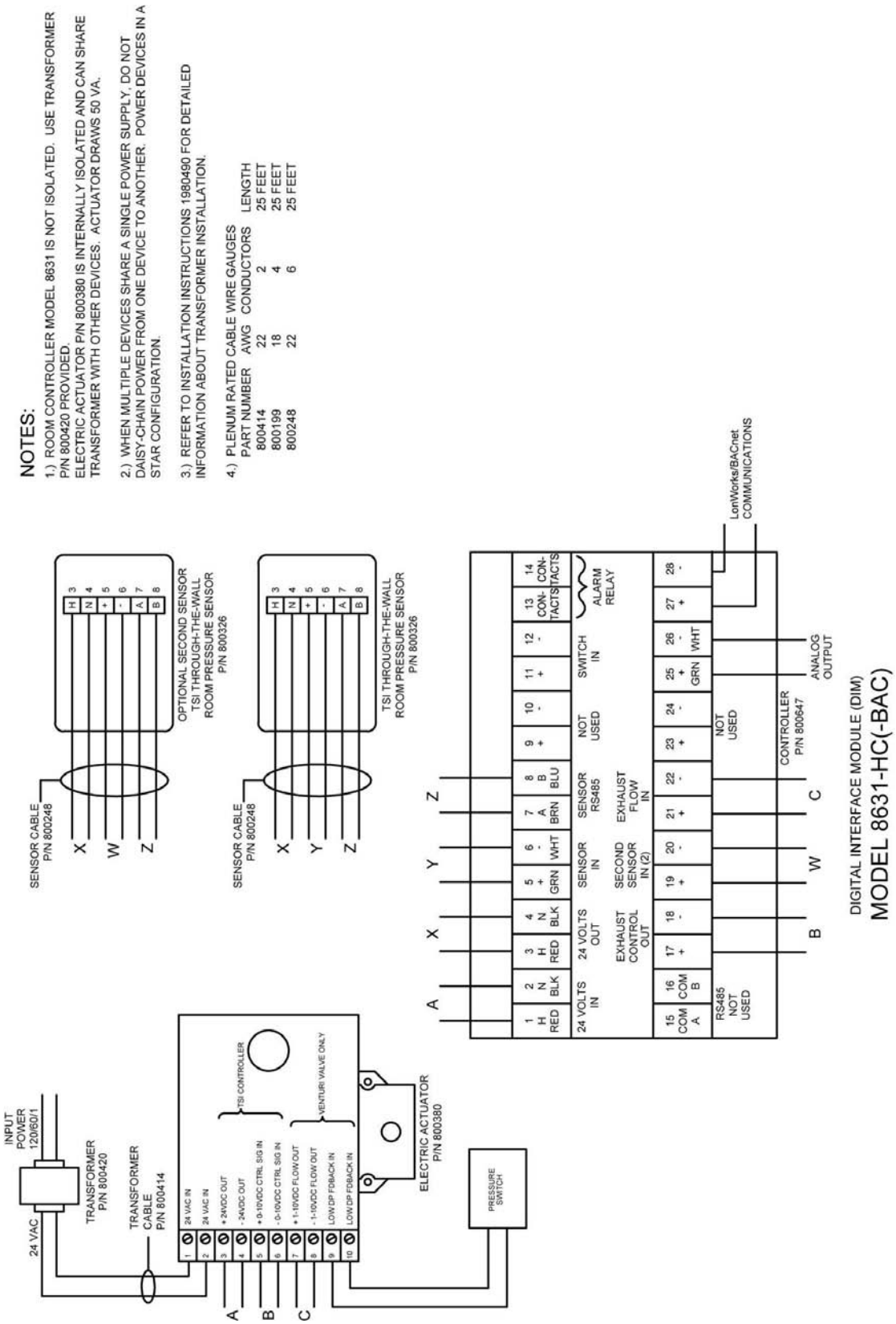

Figure 13: Wiring Diagram – 8631-HC(-BAC) Optional Second Sensor

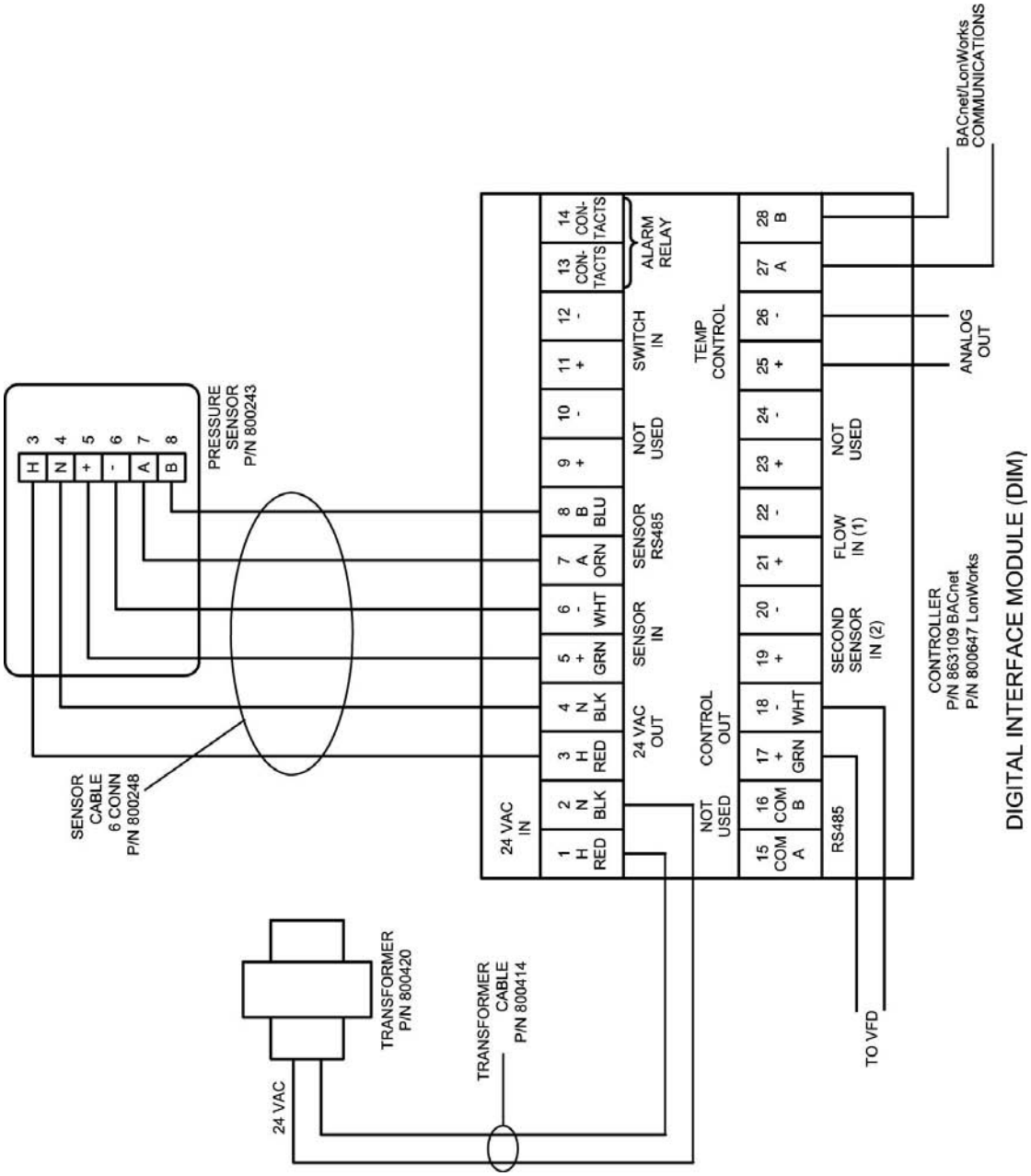

Figure 14: Wiring Diagram – 8631-HC Controller with VFD

Appendix D

Access Codes

There is an access code to the different menus of the PRESSURA™. Room Pressure Monitor/Controller When an access code is required, pressing the following key sequence provides access to the menus.

Key #	Configure
1	EMERGENCY
2	MUTE
3	MUTE
4	MENU
5	AUX

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