TSI® MODEL 8630 PRESSURA™ ROOM PRESSURE MONITOR MODBUS™ COMMUNICATIONS

Modbus™ communications are installed in all Model 8630 hospital room pressure controllers and premium monitors. This document provides the technical information needed to communicate between the host DDC system and Model 8630 units. This document assumes the programmer is familiar with Modbus protocol. Further technical assistance is available from TSI if your question is related to TSI interfacing to a DDC system. If you need further information regarding Modbus programming in general, please contact:

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The Modbus protocol utilizes the RTU format for data transfer and Error Checking. Check the Modicon Modbus Protocol Reference Guide (PI-Mbus-300) for more information on CRC generation and message structures.

The messages are sent at 9600 baud with 1 start bit, 8 data bits, and 2 stop bits. Do *not* use the parity bit. The system is set up as a master slave network. The TSI units act as slaves and respond to messages when there correct address is polled.

Blocks of data can be written or read from each device. Using a block format will speed up the access time for each device. The size of the blocks is limited to 20 bytes. This means the maximum message length that can be transferred is 20 bytes. The typical response time of the device is around 0.05 seconds with a maximum of 0.1 seconds.

Unique to TSI

The list of variable addresses shown below skips some numbers in the sequence due to internal Model 8630 functions. This information is not useful to the DDC system and is therefore deleted. Skipping numbers in the sequence will not cause any communication problems.

Occasionally an asterisk (*) will accompany a flow variable name. This designates that the flow station could be mounted in either supply or exhaust duct, but the variable name states it is the supply flow. If the flow station is located in the exhaust, the DDC system will need a name change to properly display on the DDC screen.

All variables are outputted in English units: feet per minute, CFM, or inches H_2O. If the DDC system is to display different units, the DDC system needs to make the conversion.

RAM Variables

RAM variables use the Modbus command **04 Read Input Registers**. RAM variables are read only variables, that correspond to what is shown on Digital Interface Module (DIM) display. TSI offers a number of different models, so if a feature is *not* available on a unit, the variable is set to 0.

Variable Name	Variable Address	Information Provided to Master System	Integer DDC system receives
Velocity	0	Velocity of room pressure	Displayed in feet per minute.
Pressure	1	Room pressure	Displayed in inches H_2O. Host DDC system must divide value by 100,000 to report pressure correctly.
Flow Rate	2	Flow (CFM) measured by the exhaust duct flow station	Displayed in CFM.
ACPH	3	Calculated room air changes	Displayed in number per hour. Host DDC system must divide value by 10 to report ACPH correctly.
Supply Flow Rate*	4	Flow (CFM) measured by the supply duct flow station	Displayed in CFM.
Second Velocity	5	Second sensor velocity of room pressure	Displayed in feet per minute.
Second Pressure	6	Second sensor room pressure	Displayed in inches H_2O. Host DDC system must divide value by 100,000 to report pressure correctly.
Setpoint	7	Active control setpoint	Displayed in feet per minute.
Status Index	8	Status of PRESSURA™ device	0 Normal 1 Low Alarm 2 High Alarm 3 Min Exh Alm 4 Min Sup Alm 5 Sec Low ALM 6 Sec High ALM 7 Data Error 8 Emergency
Control Mode	9	Control mode device is in	0 Negative 1 Positive 2 No Isolation
Control Output	13	Control output value	0 to 255 will be displayed.

EXAMPLE of **04 Read Input Registers** function format
This example reads variable addresses 0 and 1 (Velocity and Pressure).

QUERY		RESPONSE	
Field Name	Example # 2 (Hex)	Field Name	Example # 1 (Hex)
Slave Address	01	Slave Address	01
Function	04	Function	04
Starting Address Hi	00	Byte Count	04
Starting Address Lo	00	Data Hi Addr0	00
No. of Points Hi	00	Data Lo Addr0	64 (100 ft/min)
No. of Points Lo	02	Data Hi Addr1	00
Error Check (CRC)	--	Data Lo Addr1	64 (0.00100 "H_2O)

XRAM Variables

These variables can be <u>read</u> using Modbus command **03 Read Holding Registers**. They can be <u>written</u> to using Modbus command **16 Preset Multiple Regs.** These variables are the same "menu items" that are configured from the PRESSURA™ keypad. The calibration and control items are not accessible from the DDC system. This is for safety reasons, since each room is individually setup for maximum performance. TSI offers a number of different models, so if a feature is not available on a unit, the variable is set to 0.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Software Version (read only)	0	Current software version	1.00 = 100
Hospital Device (read only)	1	PRESSURA™ Model	1 8630-SM 3 8630-SC 2 8630-PM 4 8630-PC
Emergency Mode	2	Emergency Mode Control	0 Leave emergency mode 1 Enter emergency mode Value will return a 2 when read
Negative Setpoint	3	Negative pressure control setpoint	Displayed in feet per minute.
Positive Setpoint	4	Positive pressure control setpoint	Displayed in feet per minute.
Min Flow Setpoint	5	Minimum flow exhaust control setpoint	Displayed in CFM.
Damper Position	6	Damper position when DIM is in no isolation mode	0 to 255 will be displayed. 150 is approximately 1/2 open.
Negative Low Alarm	7	Negative low pressure alarm setpoint	Displayed in feet per minute.
Negative High Alarm	8	Negative high pressure alarm setpoint	Displayed in feet per minute.
Positive Low Alarm	9	Positive low pressure alarm setpoint	Displayed in feet per minute.
Positive High Alarm	10	Positive high pressure alarm setpoint	Displayed in feet per minute.
Min Flow Alarm	11	Minimum exhaust flow alarm	Displayed in CFM.
Min Supply Alarm	12	Minimum supply flow alarm	Displayed in CFM.
Sec Low Alarm	13	Second sensor low alarm	Displayed in feet per minute.
Sec High Alarm	14	Second sensor high alarm	Displayed in feet per minute.
Averaging Index	15	Display averaging period	0 .75 sec. 4 5 Sec. 1 1 Sec. 5 10 Sec. 2 2 Sec. 6 20 Sec. 3 3 Sec. 7 40 Sec.
Units Value	16	Current pressure units displayed	0 Feet per minute 1 meters per second 2 inches of H_2O 3 Pascal 4 millimeters H_2O
Alarm Mode	17	Latched or unlatched alarms	0 Unlatched 1 Latched
Audible Alarm	18	Audible alarm indication	0 OFF 1 On
Alarm Delay	19	Time delay before audible alarm sounds	Host DDC system must divide value by 10 to report alarm delay correctly.
Mute Delay	20	Length of time alarm is muted when mute key is pressed	Host DDC system must divide value by 600 to report alarm delay correctly.

XRAM Variables (cont.)

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Output Range	21	Room pressure analog output range	0 Low 1 High
Output Mode	22	Analog output signal	0 4 to 20 mA 1 0 to 10 Volt
Elevation	23	Elevation above sea level	0 to 10,000 feet. Displayed in 1,000 feet increments.
Duct Area	24	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Room Volume	25	Room volume in cubic feet (needed for ACPH calculation)	0 to 20,000 cubic feet. Displayed in 10 cubic foot increments.
Supply Duct Area*	26	Supply duct area in square feet	Host DDC system must divide value by 1,000 to report supply duct area correctly.
Second Sensor Enable	27	Enables second room pressure sensor	0 Off 1 On
ACPH Flow Channel	28	Set ACPH flow calculation	0 Exhaust 1 Supply
Program Control Mode	29	Changes room pressure control mode	0 Negative 2 No Isolation 1 Positive 3 Key switch
Control Action	32	Control output signal direction	0 Reverse 1 Direct
Network Protocol	36	Network Protocol for RS-485 Communications	0 Modbus 1 Cimetrics
Network Address	37	Communication address of device	Range is 1 to 247
Set Code Enable	48	Setpoint menu access code enable	0 Off 1 On
Alarm Code Enable	49	Alarm menu access code enable	0 Off 1 On
Conf Code Enable	50	Configure menu access code enable	0 Off 1 On
Cal Code Enable	51	Calibration menu access code enable	0 Off 1 On
Control Code Enable	52	Control menu access code enable	1 On 0 Off
Interface Code Enable	53	Interface menu access code enable	0 Off 1 On
Diagnostic Code Enable	54	Diagnostic menu access code enable	0 Off 1 On

EXAMPLE of **16 (10 Hex)** **Preset Multiple Regs** function Format
This example changes the positive set point to 100 ft/min.

QUERY		RESPONSE	
Field Name	Example # 2 (Hex)	Field Name	Example # 2 (Hex)
Slave Address	01	Slave Address	01
Function	10	Function	10
Starting Address Hi	00	Starting Address Hi	00
Starting Address Lo	04	Starting Address Lo	04
No. of Registers Hi	00	No of Registers Hi	00
No. of Registers Lo	01	No of Registers Lo	01
Data Hi	00	Error Check (CRC)	--
Data Lo	64		
Error Check (CRC)	--		

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