



Application Note

TSI MODEL 8630-PC-BP PRESSURA™ MODBUS™ COMMUNICATIONS

Modbus communications are installed in all Model 8630-PC-BP hospital room pressure controllers. This document provides the technical information needed to communicate between the host DDC system and Model 8630-PC-BP 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.

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-PC-BP 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.



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
If TSI sensor: Average Velocity If Non-TSI sensor: Average Pressure	0	Velocity of room pressure Room Pressure	Displayed in feet per minute. Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
Average Pressure	1	Room pressure	If TSI sensor: If std. units, host system must divide by 100,000 to get correct value in inches H ₂ O If metric units, host system must divide by 1000 to get value in Pa If Non-TSI sensor: Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
If TSI sensor: Sens 1 Velocity If Non-TSI sensor: Sens 1 Pressure	2	Velocity of air through sensor 1 Pressure signal from sensor 1	Displayed in feet per minute. Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
If TSI sensor: Sens 2 Velocity If Non-TSI sensor: Sens 2 Pressure	3	Velocity of air through sensor 2 Pressure signal from sensor 2	Displayed in feet per minute. Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000



Variable Name	Variable Address	Information Provided to Master System	Integer DDC System Receives
If TSI sensor: Sens 3 Velocity If Non-TSI sensor: Sens 3 Pressure	4	Velocity of air through sensor 3 Pressure signal from sensor 3	Displayed in feet per minute. Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
If TSI sensor: Sens 4 Velocity If Non-TSI sensor: Sens 4 Pressure	5	Velocity of air through sensor 4 Pressure signal from sensor 4	Displayed in feet per minute. Displayed with pressure units that are set on the controller: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
If TSI sensor: Sens 1 Pressure If Non-TSI sensor: see point #2	6	Sensor 1 Pressure Signal	Displayed in inches H ₂ O. Host DDC system must divide value by 100,000 to report pressure correctly.
If TSI sensor: Sens 2 Pressure If Non-TSI sensor: see point #3	7	Sensor 2 Pressure Signal	Displayed in inches H ₂ O. Host DDC system must divide value by 100,000 to report pressure correctly.
If TSI sensor: Sens 3 Pressure If Non-TSI sensor: see point #4	8	Sensor 3 Pressure Signal	Displayed in inches H ₂ O. Host DDC system must divide value by 100,000 to report pressure correctly.
If TSI sensor: Sens 4 Pressure If Non-TSI sensor: see point #5	9	Sensor 4 Pressure Signal	Displayed in inches H ₂ O. Host DDC system must divide value by 100,000 to report pressure correctly.
Setpoint	10	Active control setpoint	If TSI sensor: Displayed in feet per minute. If Non-TSI sensor: If Pa, host system must divide by 10 If inches H ₂ O, host system must divide by 1000
Status Index	11	Status of PRESSURA device	0 Normal 1 Door Alarm 2 Low Alarm 3 High Alarm 4 Data Error 5 Emergency
Control Output	13	Control output value	0 - 255 will be displayed.



EXAMPLE of 04 Read Input Registers function format

This example reads variable addresses 0 and 1 (Velocity and Pressure).

QUERY

Field Name	Example # 2 (Hex)
Slave Address	01
Function	04
Starting Address Hi	00
Starting Address Lo	00
No. of Points Hi	00
No. of Points Lo	02
Error Check (CRC)	--

RESPONSE

Field Name	Example # 1 (Hex)
Slave Address	01
Function	04
Byte Count	04
Data Hi Addr0	00
Data Lo Addr0	7F (127 ft/min)
Data Hi Addr1	00
Data Lo Addr1	64 (0.00100 “H ₂ O)



XRAM Variables

These variables can be read using Modbus command **03 Read Holding Registers**. They can be written 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
Negative Setpoint	3	Negative pressure control setpoint	Displayed in feet per minute.
Positive Setpoint	4	Positive pressure control setpoint	Displayed in feet per minute.
Negative Low Alarm	6	Negative low pressure alarm setpoint	Displayed in feet per minute.
Negative High Alarm	7	Negative high pressure alarm setpoint	Displayed in feet per minute.
Positive Low Alarm	8	Positive low pressure alarm setpoint	Displayed in feet per minute.
Positive High Alarm	9	Positive high pressure alarm setpoint	Displayed in feet per minute.
Filter Index	10	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	11	Current pressure units displayed	0 Feet per minute 1 meters per second 2 inches of H ₂ O 3 Pascal
Alarm Mode	12	Latched or unlatched alarms	0 Unlatched 1 Latched
Audible Alarm	13	Audible alarm indication	0 OFF 1 On
Alarm Delay	14	Time delay before audible alarm sounds	Host DDC system must divide value by 10 to report alarm delay correctly.
Mute Delay	15	Length of time alarm is muted when mute key is pressed	Host DDC system must divide value by 600 to report alarm delay correctly.
Output Mode	17	Analog output signal	0 4-20 mA 1 0-10 Volt
Room Mode	20	Changes room pressure control mode	0 Negative 2 No Isolation 1 Positive
Control Action	23	Control output signal direction	0 Reverse 1 Direct
Positive Door Alarm	68	Positive door alarm setpoint	Displayed in feet per minute
Negative Door Alarm	69	Negative door alarm setpoint	Displayed in feet per minute

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



QUERY

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

RESPONSE

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