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# Application Note

## TSI MODEL 8630-PC-CRC PRESSURA™ MODBUS™ COMMUNICATIONS

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

Modicon Incorporated  
One High Street  
North Andover, MA 01845  
Phone (508) 794-0800

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 their 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-PC-CRC 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: Velocity  If Non-TSI sensor: Pressure	0	Velocity of room pressure  Room pressure	Displayed in feet per minute  Displayed in pressure units that are set on the controller: If standard units, host system must divide by 1000 to get correct value in inches H <sub>2</sub> O. If metric units, host system must divide by 10 to get Pa.
Pressure	1	Room pressure	If TSI sensor: Host system must divide by 100,000 to get correct value in inches H <sub>2</sub> O.  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 <sub>2</sub> O, host system must divide by 1000.
ACPH	2	Calculated room air changes	Displayed in number per hour. Host DDC system must divide value by 10 to report ACPH correctly.
Supply 1 Flow Rate	3	Flow (CFM) measured by the supply duct flow station	Displayed in CFM.
Supply 2 Flow Rate	4	Flow (CFM) measured by the supply duct flow station	Displayed in CFM.
Total Supply Flow	5	Summation of Supply 1 Flow (CFM) and Supply 2 Flow (CFM)	Displayed in CFM.
If TSI sensor: 2 <sup>nd</sup> Velocity  If Non-TSI sensor: 2 <sup>nd</sup> Pressure	6	Velocity of 2 <sup>nd</sup> room pressure  2 <sup>nd</sup> Room pressure	Displayed in feet per minute  Displayed in pressure units that are set on the controller: If standard units, host system must divide by 1000 to get correct value in inches H <sub>2</sub> O. If metric units, host system must divide by 10 to get Pa.



Variable Name	Variable Address	Information Provided to Master System	Integer DDC System Receives
2 <sup>nd</sup> Pressure	7	2 <sup>nd</sup> Room pressure	If TSI sensor: Host system must divide by 100,000 to get correct value in inches H <sub>2</sub> O.  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 <sub>2</sub> O, host system must divide by 1000.
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

**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	64 (100 ft/min)
Data Hi Addr1	00
Data Lo Addr1	64 (0.00100 “H <sub>2</sub> 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	100 = 1.00
Setpoint	3	Pressure 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 <sub>2</sub> O, host system must divide by 1000
Averaging Index	4	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	5	Current pressure units displayed	0 Feet per minute 1 meters per second 2 inches of H <sub>2</sub> O 3 Pascal
Low Alarm	6	Low pressure alarm set point	If TSI sensor: Displayed in feet per minute  If Non-TSI sensor: If Pa, host system must divide by 10 If inches H <sub>2</sub> O, host system must divide by 1000
High Alarm	7	High pressure alarm setpoint	If TSI sensor: Displayed in feet per minute  If Non-TSI sensor: If Pa, host system must divide by 10 If inches H <sub>2</sub> O, host system must divide by 1000



Variable Name	Variable Address	Input Provided to Master System	Integer DDC System Receives
Second Low Alarm	8	Second low pressure alarm setpoint	If TSI sensor: Displayed in feet per minute  If Non-TSI sensor: If Pa, host system must divide by 10 If inches H <sub>2</sub> O, host system must divide by 1000
Second High Alarm	9	Second high pressure alarm setpoint	If TSI sensor: Displayed in feet per minute  If Non-TSI sensor: If Pa, host system must divide by 10 If inches H <sub>2</sub> O, host system must divide by 1000
Minimum Supply Alarm	10	Supply duct minimum flow alarm set point.	Displayed in CFM or l/s.
Alarm Mode	11	Latched or unlatched alarms	0 Unlatched 1 Latched
Audible Alarm	12	Audible alarm indication	0 OFF 1 On
Alarm Delay	13	Time delay before audible alarm sounds	Host DDC system must divide value by 10 to report alarm delay correctly (in seconds).
Mute Delay	14	Length of time alarm is muted when mute key is pressed	Host DDC system must divide value by 600 to report alarm delay correctly (in minutes).
Supply Flow Setpoint	33	Supply Flow Setpoint	Displayed in CFM

**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)	--