

Application Note



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

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 ₂ 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 ₂ 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 ₂ 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 nd Velocity If Non-TSI sensor: 2 nd Pressure | 6 | Velocity of 2 nd room pressure 2 nd 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 ₂ 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 nd Pressure | 7 | 2 nd Room pressure | If TSI sensor: Host system must divide by 100,000 to get correct value in inches H ₂ 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 ₂ 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 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 | 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 ₂ 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 ₂ 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 ₂ 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 ₂ 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 ₂ 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 ₂ 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) | -- |