Application Note

TSI MODEL 8635-ST SUREFLOW™ MODBUS™ COMMUNICATIONS

Modbus communications are installed in all Model 8635-ST laboratory room pressure controllers. This document provides the technical information needed to communicate between the host DDC system and the Model 8635-ST 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 time for the data transfer. 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 8635-ST 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 the 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
Pressure	1	Duct Pressure	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Setpoint	7	Active control setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Status Index	8	Status of SUREFLOW device	0 Normal 1 Low Alarm 2 High Alarm 7 Data Error 8 Emergency
Control Mode	9	Control mode device is in	0 Main 1 Remote
Control Output Value	12	Control output value	0 - 255 will be displayed.

EXAMPLE of **04 Read Input Registers** function format.
This example read variable addresses 0 (Pressure from 8635).

QUERY

Field Name	(Hex)
Slave Address	01
Function	04
Starting Address Hi	00
Starting Address Lo	00
No. Of Points Hi	00
No. Of Points Lo	01
Error Check (CRC)	--

RESPONSE

Field Name	(Hex)
Slave Address	01
Function	04
Byte Count	04
Data Hi Addr0	00
Data Lo Addr0	64 (1.00 "H_2O)

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**. Many of these variables are the same "menu items" that are configured from the SUREFLOW 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
Emergency Mode	2	Emergency Mode Control	0 Leave emergency mode 1 Enter emergency mode Value will return a 2 when read
Setpoint	3	Pressure control setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Remote Setpoint	4	Remote pressure control setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Low Alarm	7	Low pressure alarm setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
High Alarm	8	High pressure alarm setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Remote Low Alarm	9	Remote mode low pressure alarm setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Remote High Alarm	10	Remote mode high pressure alarm setpoint	If standard units: Host DDC system must divide value by 100 to get inches H_2O. If metric units: Value will be displayed in Pascals.
Min Setpoint	11	Minimum damper position or VFD drive, set as a percentage	If control action = Direct: Value will be 0-255, where 0 = 100% of Max, and 255 = 0% of Max If control action = Reverse: Value will be 0-255, where 0 = 0% of Max, and 255 = 100% of Max
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	2 inches H_2O 3 Pascals
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 (in seconds).
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 (in minutes).
Program Control Mode	29	Changes room pressure control mode	0 Main 1 Remote

EXAMPLE of **16 (10 Hex) Preset Multiple Regs** function format:
This example changes the remote set point to 0.5 in H_2O.

QUERY		RESPONSE	
Field Name	(Hex)	Field Name	(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 Value (High)	00	Error Check (CRC)	--
Data Value (Low)	32		
Error Check (CRC)	--		

Example of **03 Read Holding Registers** function format:
This example reads the minimum setpoint.

QUERY		RESPONSE	
Field Name	(Hex)	Field Name	(Hex)
Slave Address	01	Slave Address	01
Function	03	Function	03
Starting Address Hi	00	Byte Count	02
Starting Address Lo	0B	Data Hi	00
No. Of Registers Hi	00	Data Lo	14 (20%)
No. Of Registers Lo	01	Error Check (CRC)	
Error Check (CRC)	--		