TSI® MODEL 8650-CNPY SUREFLOW™ CONTROLLER MODBUS™ COMMUNICATIONS

APPLICATION NOTE LC-123

Modbus™ communications are installed in all Model 8650-CNPY fume hood face velocity controllers. This document provides the technical information needed to communicate between the host DDC system and the Model 8650-CNPY units. This document assumes the programmer is familiar with Modbus™ protocol. Further technical assistance is available from TSI if you 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 their 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 8650-CNPY 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.

All variables are outputted in English units: ft/min, and CFM. If the DDC system is to display different units, the DDC system needs to make the conversion.

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 hood 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.

8650 Variable List

Variable Name	Variable Address	Input Provided to Master System	Integer DDC System Receives
Flow Reading	0	Current Flow	Displayed in ft^3/min.
Status Index	1	Status of SUREFLOW™ device	0 Normal 1 Setback 2,3 Low Alarm 4,5 High Alarm 6,7 No Flow Alarm 8,9 Not Used 10,11 Data Error 12, 13 Emergency
Emergency Mode	2	Put unit in or out of emergency	Write only variable 0 Take unit out of emergency mode. 1 Put unit in emergency mode.
Setback Mode	3	Put unit in or out of setback	Write only variable 0 Take unit out of setback mode 1 Put unit in setback mode.
Main Set point	4	Main control set point	Displayed in ft^3/min
Setback Set point	5	Setback control set point	Displayed in ft^3/min
Low Alarm	6	Low alarm set point	Displayed in ft^3/min
High Alarm	7	High alarm set point	Displayed in ft^3/min
No Flow Alarm	8	No flow alarm set point	Displayed in ft^3/min
Averaging Index	9	Display averaging period	0 .3 sec. 1 .5 sec. 2 .75 sec. 3 1 sec. 4 2 sec. 5 3 sec. 6 5 sec. 7 10 sec. 8 20 sec. 9 40 sec.
Units	10	Units of device	0 ft^3/min 1 l/s
Alarm Mode	11	Alarm reset mode	0 Unlatched 1 Latched
Output Signal	12	Output mode	0 4 to 20 mA 1 0 to 10 Volt
Audible Disable	14	Permanent mute enable	0 Off 1 On
Network Protocol	15	Communications Protocol	0 Modbus 1 Cimetrics
Network Address	16	Communications Address	1 to 247
Duct Area	18	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Control Action	28	Action of control signal	0 Reverse 1 Direct
Set Code Enable	29	Set point menu access code enable	0 Off 1 On
Conf Code Enable	30	Configure menu access code enable	0 Off 1 On
Cal Code Enable	31	Calibration menu access code enable	0 Off 1 On
Control Code Enable	32	Control menu access code enable	0 Off 1 On
Diagnostic Code Enable	33	Diagnostic menu access code enable	0 Off 1 On

EXAMPLE of **16 (10 Hex) Preset Multiple Regs** function format:
This example changes the low alarm set point to 60 ft^3/min

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	06	Starting Address Lo	06
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)	3C		
Error Check (CRC)	--		

Example of **03 Read Holding Registers** function format:
This example reads the flow rate and status index

QUERY		**RESPONSE**	
Field Name	(Hex)	Field Name	(Hex)
Slave Address	01	Slave Address	01
Function	03	Function	03
Starting Address Hi	00	Byte Count	04
Starting Address Lo	00	Data Hi	00
No. Of Registers Hi	00	Data Lo	64 (100 ft^3/min)
No. Of Registers Lo	02	Data Hi	00
Error Check (CRC)	--	Data Lo	00 (0 Normal)
		Error Check (CRC)	--

UNDERSTANDING, ACCELERATED

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