

TSI[®] MODEL 8650 SUREFLOW[™] MODBUS[™] COMMUNICATIONS

APPLICATION NOTE LC-112

Modbus[™] communications are installed in all Model 8650 fume hood face velocity controllers. This document provides the technical information needed to communicate between the host DDC system and the Model 8650 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:

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 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 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
Face Velocity	0	Current Face Velocity	Displayed in ft/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 Sensor Error 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 Setpoint	4	Main control setpoint	Displayed in ft/min
Setback Setpoint	5	Setback control setpoint	Displayed in ft/min
Low Alarm	6	Low alarm setpoint	Displayed in ft/min
High Alarm	7	High alarm setpoint	Displayed in ft/min
No Flow Alarm	8	No flow alarm setpoint	Displayed in ft/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/min 1 m/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	13	Permanent mute enable	0 Off 1 On
Network Protocol	14	Communications Protocol	0 Modbus 1 Cimetrics
Network Address	15	Communications Address	1 to 247
Control Action	23	Action of control signal	0 Reverse 1 Direct
Set Code Enable	24	Setpoint menu access code enable	0 Off 1 On
Conf Code Enable	25	Configure menu access code enable	0 Off 1 On
Cal Code Enable	26	Calibration menu access code enable	0 Off 1 On
Control Code Enable	27	Control menu access code enable	0 Off 1 On
Diagnostic Code Enable	28	Diagnostic menu access code enable	0 Off 1 On
Min Damper	39	Minimum damper position	0 to 255 (0= 10 VDC, 255= 0 VDC)
Max Damper	40	Maximum damper position	0 to 255 (0= 10 VDC, 255= 0 VDC)
Damper Position	46	Damper position (percent closed)	0 to 100% Closed (DDC system must divide value by 100 to get percent closed value)

EXAMPLE of **16 (10 Hex) Preset Multiple Regs** function format

This example changes the low alarm setpoint to 60 ft/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 face velocity 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/min)
No. Of Registers Lo	02	Data Hi	00
Error Check (CRC)	--	Data Lo	00 (0 Normal)
		Error Check (CRC)	--



UNDERSTANDING, ACCELERATED

TSI Incorporated – Visit our website www.tsi.com for more information.

USA	Tel: +1 800 874 2811	India	Tel: +91 80 67877200
UK	Tel: +44 149 4 459200	China	Tel: +86 10 8251 6588
France	Tel: +33 4 91 11 87 64	Singapore	Tel: +65 6595 6388
Germany	Tel: +49 241 523030		