TSI® MODEL 8682 SUREFLOW™ CONTROLLER CIMETRICS™ COMMUNICATIONS

APPLICATION NOTE LC-117

Cimetrics™ communications are installed in all Model 8682 adaptive offset room pressure controllers. This document provides the technical information needed to communicate between the host DDC system and Model 8682 units. This document assumes the programmer is familiar with Cimetrics™ 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 Cimetrics™ programming in general, please contact:

Cimetrics Inc.
141 Tremont St., Fl. 11
Boston, MA 02111-1300
Phone: (617) 350-7550
Fax: (617) 350-7552
Website: http://www.cimetrics.com

The Cimetrics™ protocol utilizes TINY-NSP Nine Bit Serial Protocol for data transfer and error checking. Check the Cimetrics Inc. TINY-NSP User's Manual for additional information.

Blocks of data can be 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 15 bytes. This means the maximum message length that can be transferred is 15 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 8682 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.

Occasionally an asterisk (*) will accompany a flow variable name. This designates that the flow station could be mounted in either supply or exhaust duct, but the variable name states it is the supply flow. If the flow station is located in the exhaust, the DDC system will need a name change to properly display on the DDC screen.

All variables are outputted in English units: feet per minute, CFM, or inches H_2O. If the DDC system is to display different units, the DDC system needs to make the conversion. All pressure setpoint and alarms are in ft/min values. These values must be converted to inches H_2O or other pressure units as desired by the host DDC system. The equation is given below.

$$\text{Pressure in Inches } H_2O = 6.2*10^{-8}*(\text{Velocity in ft/min} / .836)^2$$

RAM Variables

These variables can be read using Cimetrics command **07 Read_From_Slave_Ext_Ram**. They can be written to using Cimetrics command **04 Write_To_Slave_Ext_Ram.** 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.

8682 Variable List

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Software Version	0	Current Software Version	1.00 = 100
Controller Type	2	Controller Model Number	8682
Emergency Mode	4	Emergency Mode Control **Write only variable.**	0 Leave emergency mode 1 Enter emergency mode
Control Mode	6	Control mode of device.	0 Normal 1 Unoccupied (Setback)
Status Index	8	Status of SUREFLOW™ device	0 Normal 1 Dim Data Error 2 Alarm = Low Pressure 3 Alarm= High Pressure 4 Alarm=Min Supply 5 Alarm=Min Exhaust 6 Data Error 7 Cal Error 8 Emergency Mode
Room Velocity	10	Velocity of room pressure	Displayed in ft/min.
Room Pressure	12	Room Pressure	Displayed in inches H_2O. Host DDC system must divide by 100,000 to report pressure correctly
Total Supply Flow	14	Total supply into laboratory	Displayed in CFM.
Total Exhaust Flow	16	Total exhaust out of laboratory	Displayed in CFM.
Offset Setpoint	18	Current offset setpoint	Displayed in CFM.
Air changes per hour	20	Calculated room air changes	Displayed in number per hour. Host DDC system must divide value by 10 to report ACPH correctly.
Fume Hood 1 Flow	22	Flow measured by flow station connected to hood input #1.	Displayed in CFM.
Fume Hood 2 Flow	24	Flow measured by flow station connected to hood input #2.	Displayed in CFM.
Fume Hood 3 Flow	26	Flow measured by flow station connected to hood input #3.	Displayed in CFM.
Fume Hood 4 Flow	28	Flow measured by flow station connected to hood input #4.	Displayed in CFM.
Fume Hood 5 Flow	30	Flow measured by flow station connected to hood input #5.	Displayed in CFM.
Fume Hood 6 Flow	32	Flow measured by flow station connected to hood input #6.	Displayed in CFM.
Fume Hood 7 Flow	34	Flow measured by flow station connected to hood input #7.	Displayed in CFM.
Exhaust 1 Flow	36	Flow measured by flow station connected to general exhaust input #1.	Displayed in CFM.
Exhaust 2 Flow	38	Flow measured by flow station connected to general exhaust input #2.	Displayed in CFM.
Supply 1 Flow	40	Flow measured by flow station connected to supply flow input #1	Displayed in CFM.
Supply 2 Flow	42	Flow measured by flow station connected to supply flow input #2	Displayed in CFM.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Temperature Input	44	Signal connected to the temperature input.	Voltage input. Host DDC system must divide by 10 to report input voltage correctly.
Auxiliary Input	46	Signal connected to auxiliary input channel.	Voltage input. Host DDC system must divide by 10 to report input voltage correctly.
Pressure Setpoint	48	Pressure control setpoint	Displayed in ft/min.
Min Vent Setpoint	50	Minimum flow setpoint for ventilation.	Displayed in CFM.
Min Temp Setpoint	52	Minimum flow setpoint for temperature control.	Displayed in CFM.
Unoccupied Min Setpoint	54	Unoccupied (Setback) minimum flow setpoint.	Displayed in CFM.
Low Alarm	56	Low pressure alarm setpoint	Displayed in ft/min.
High Alarm	58	High pressure alarm setpoint	Displayed in ft/min.
Min Supply Alarm	60	Minimum supply flow alarm	Displayed in CFM.
Min Exhaust Alarm	62	Minimum general exhaust alarm	Displayed in CFM.
Min Offset Setpoint	64	Minimum offset setpoint	Displayed in CFM.
Max Offset Setpoint	66	Maximum offset setpoint	Displayed in CFM.
Max Supply Setpoint	68	Maximum supply setpoint	Displayed in CFM.
Min Exhaust Setpoint	70	Minimum exhaust setpoint	Displayed in CFM.
Temp Low Setpoint	72	Low limit to switch into temperature mode	Voltage signal from thermostat. Host DDC system must divide by 10 to report correctly.
Temp High Setpoint	74	High limit to switch into temperature mode	Voltage signal from thermostat. Host DDC system must divide by 10 to report correctly.
Output Range	76	Room pressure analog output range	0 Low 1 High
Output Mode	78	Analog output signal	0 4 to 20 mA 1 0 to 10 volt
Elevation	80	Elevation above sea level	0-10,000 feet. Displayed in 1,000 feet increments.
Hood 1 Duct Area	82	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 2 Duct Area	84	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 3 Duct Area	86	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 4 Duct Area	88	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 5 Duct Area	90	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 6 Duct Area	92	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 7 Duct Area	94	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Exhaust 1 Duct Area	96	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Exhaust 2 Duct Area	98	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Supply 1 Duct Area	100	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Supply 2 Duct Area	102	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Room Volume	104	Room volume in cubic feet (needed or ACPH calculation)	Displayed in cubic feet.
Control Action	106	Control output signal direction	0 Reverse 1 Direct

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Network Protocol	122	Network protocol for RS485 communications	0 Modbus 1 Cimetrics
Network Address	124	Communication address of device	Range is 1 to 247
Flow Output Range	174	Flow analog output range setting	0 1,000 CFM 1 5,000 CFM 2 10,000 CFM 3 20,000 CFM 5 50,000 CFM
Hood Flow Station Type	192	Type of flow station being used in fume hoods.	0 Pressure based 1 Linear
Exhaust Flow Station Type	194	Type of flow station being used in general exhaust.	0 Pressure based 1 Linear
Supply Flow Station Type	196	Type of flow station being used in supply.	0 Pressure based 1 Linear
Hood Top Velocity	198	Fume hood maximum velocity range of flow station.	0 to 5,000 ft/min
Exhaust Top Velocity	200	General exhaust maximum velocity range of flow station.	0 to 5,000 ft/min
Supply Top Velocity	202	Supply maximum velocity range of flow station.	0 to 5,000 ft/min
Exhaust Configuration	204	Configuration of exhaust duct work.	0 Unganged 1 Ganged
Alarm Mode	206	Latched or unlatched alarms	0 Unlatched 1 Latched
Alarm Delay	208	Time delay before alarm activates	Host DDC system must divide value by 10 to report alarm delay correctly.
Averaging Index	210	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	212	Current pressure units displayed	0 Feet per minute 1 meters per second 2 inches of H_2O 3 Pascal 4 millimeters H_2O
Audible Alarm	214	Audible alarm indication	0 Off 1 On
Mute Delay	216	Length of time alarm is muted when mute key is pressed	Host DDC system must divide value by 600 to report mute delay correctly.
Set Code Enable	226	Setpoint menu access code enable	0 Off 1 On
Alarm Code Enable	228	Alarm menu access code enable	0 Off 1 On
Configure Code Enable	230	Configure menu access code enable.	0 Off 1 On
Cal Code Enable	232	Calibration menu access code enable.	0 Off 1 On
Control Code Enable	234	Control menu access code enable.	0 Off 1 On
System Code Enable	236	System menu access code enable.	0 Off 1 On
Flow Code Enable	238	Flow menu access code enable.	0 Off 1 On
Diag Code Enable	240	Diagnostic menu access code enable.	0 Off 1 On
Inter Code Enable	242	Interface menu access code enable	0 Off 1 On
Hood Code Enable	244	Hood menu access code enable	0 Off 1 On

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Exh Code Enable	246	Exhaust menu access code enable	0 Off 1 On
Sup Code Enable	248	Supply menu access code enable	0 Off 1 On

*__Note__: Items in *italics* are **read only** variables.

EXAMPLE of **04 Write_To_Slave_Ext_Ram** function Format
This example changes the minimum ventilation setpoint to 1000 CFM

QUERY	
Field Name	(Hex)
Target Node Address	01
Message Length	09
Eight-Bit Checksum	**
Source Node Address	00
Command Opcode	04
Data Address (Low)	32
Data Address (High)	00
Data Value (High)	03
Data Value (Low)	E8

RESPONSE	
Field Name	(Hex)
Target Node Address	00
Message Length	05
Eight-Bit Checksum	**
Source Node Address	01
Command Opcode	11

Example of **07 Read_From_Slave_Ext_Ram** function format:
This example reads the total supply and total exhaust.

QUERY	
Field Name	(Hex)
Target Node Address	01
Message Length	08
Eight-Bit Checksum	**
Source Node Address	00
Command Opcode	07
Data Address (Low)	0E
Data Address (High)	00
Data Number Bytes	04

RESPONSE	
Field Name	(Hex)
Target Node Address	00
Message Length	09
Eight-Bit Checksum	**
Source Node Address	01
Command Opcode	12
Data (High Byte)	03
Data (Low Byte)	8E (1,000 CFM)
Data (High Byte)	04
Data (Low Byte)	B0 (1,200 CFM)

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		

LC-117 Rev. C Printed in U.S.A.