Manual Supplement

Model Number: 8682-KF1

Product/System Title: Adaptive Offset Controller with 2-Point Flow Calibration and Reheat Control

Contents of this manual supplement include:

How to Use This Manual Supplement

This supplement replaces pages 13-36, Menu and Menu Items and pages 50-51, Appendix B Wiring Information of the Model 8682 SUREFLOW Adaptive Offset Controller, Operation Service Manual (P/N 1980288).

This supplement describes the menus and menu items used to configure and program the controller and how to wire each component.

Sequence of Operation

The Model 8682-KF1 uses the standard Model 8682 pressure and tracking control algorithm. The Model 8682-KF1 also features temperature control. The temperature control scheme provides modulation of supply volume for cooling and modulation of a reheat valve for heating.

The Model 8682-KF1 laboratory control system uses a through-the-wall room pressure sensor to measure pressure differential (direct pressure measurement) between the laboratory and corridor (reference space), and receives temperature information from the thermostat (0-10 VDC, 50-85°F). The pressure sensor is located on the corridor (reference space) side of the wall. The Model 8682-KF1 laboratory controller continuously monitors the thermostat information. The Model 8682-KF1 control algorithm modulates supply and general exhaust air flows to provide adequate fume hood replacement air while maintaining room pressure differential and temperature control.

Pressure Control Sequence:

The Model 8682-KF1 receives the pressure differential signal from the pressure sensor. If pressure is at set point, the control algorithm maintains the offset. If pressure is not at set point, the offset value is changed until pressure is maintained, or the minimum or maximum offset value is reached. If the offset value:

Increases, the supply air is reduced until one of 3 events occur:

- Pressure set point is reached. The Model 8682-KF1 maintains the new offset.
- The offset range is exceeded. The offset will be at maximum attempting to reach pressure set point. An alarm will trigger to inform the user pressure differential is not being maintained.
- Supply air minimum is reached. The general exhaust begins to open (was closed) to maintain pressure differential.

Decreases, the supply air increases until one of 3 events occur:

- Pressure set point is reached. The Model 8682-KF1 maintains the new offset.
- The offset range is exceeded. The offset will be at minimum attempting to reach pressure set point. An alarm will trigger to inform the user pressure differential is not being maintained.
- Supply air maximum is reached. The alarm will trigger to inform the user pressure differential is not being maintained.

NOTE: The pressure differential is a slow secondary control loop. The system initially starts with a calculated offset value and then slowly adjusts the offset value to maintain pressure differential.

The Model 8682-KF1 continuously monitors and displays pressure differential between the laboratory and corridor (reference space). When the pressure differential is adequate, a green light indicates a safe pressure differential is being maintained. Room pressure alarm set points, configured into the controller, activate a red light and audible alarm when the room pressure becomes insufficient or too great. In addition to a local indication of room pressure, alarm contacts and RS 485 communications may be used to provide extensive information to a building management system.

Temperature Control Sequence:

The 8682-KF1 receives a temperature input from a 0-10 volt (50-85°F) thermostat. The Model 8682-KF1 controller maintains temperature control by:

(1) Controlling supply and general exhaust for ventilation and cooling
(2) Controlling the reheat coil for heating

The Model 8682-KF1 has three supply flow minimum set points. The ventilation set point is the minimum flow volume required to meet ventilation needs of the laboratory (ACPH). The temperature supply set point (TEMP MIN) is the minimum flow required to meet temperature needs of the laboratory. The unoccupied set point is the minimum flow required when the lab is not occupied. All of these set points are configurable.

The Model 8682-KF1 continuously compares the temperature set point to the actual space temperature. If set point is being maintained, no changes are made. If set point is not being maintained, and the space temperature is rising the controller will first modulate the reheat valve closed. If the reheat valve is closed the controller will then increase the supply volume to meet the cooling demand. If the space temperature is falling the controller will first reduce the supply volume. If the supply volume reaches its minimum, ventilation or hood demand, the controller will then modulate the reheat coil open to meet the heating demand.

If the general exhaust is in the closed position and fume hood loads require additional replacement air, the Model 8682-KF1 will override ventilation or temperature set points to modulate supply for pressurization control. Temperature will then be controlled by reheat in this sequence.

Menu and Menu Items

The SUREFLOW is a very versatile device that can be configured to meet your specific application. This section describes all of the menu items available to program and change. Changing any item is accomplished by using the keypad, or if communications are installed, through the RS-485 Communications port. If you are unfamiliar with the keystroke procedure please see **Programming Software** for a detailed explanation. This section provides the following information:

- Complete list of menu and all menu items.
- Gives the menu or programming name.
- Defines each menu item's function; what it does, how it does it, etc..
- Gives the range of values that can be programmed.
- Gives default item value (how it shipped from factory).

The menus covered in this section are divided into groups of related items to ease programming. As an example all set points are in one menu, alarm information in another, etc. The manual follows the menus as programmed in the controller. The menu items are always grouped by menu and then listed in menu item order, not alphabetical order. Figure 1, on the next 2 pages, shows a chart of all the Model 8682-KF1 controller menu items.

SETPOINTS

SET POINT
REM SETPOINT
VENT MIN SET
TEMP MIN SET
UNOCCUPY SET
MAX SUP SET
MIN EXH SET
MIN OFFSET
MAX OFFSET
TEMP SETP
ACCESS CODE

ALARM

LOW ALARM
HIGH ALARM
REM LOW ALM
REM HIGH ALM
MIN SUP ALM
MAX EXH ALM
ALARM RESET
AUDIBLE ALM
ALARM DELAY
MUTE TIMEOUT
ACCESS CODE

CONFIGURE

DISPLAY AVG
UNITS
ROOM VOLUME
EXH CONFIG
ACCESS CODE

CALIBRATION

SENSOR ZERO
SENSOR SPAN
ELEVATION
TEMP CAL
ACCESS CODE

CONTROL

SPEED
SENSITIVITY
CONTROL SIG
TEMP CONTROL
KC VALUE
TI VALUE
KC OFFSET
TEMP KC VAL
ACCESS CODE

SYSTEM FLOW

TOT SUP FLOW
TOT EXH FLOW
OFFSET VALUE
SUP SET POINT
EXH SET POINT
ACPH
ACCESS CODE

FLOW CHECK

HD1 FLOW IN
HD2 FLOW IN
HD3 FLOW IN
HD4 FLOW IN
HD5 FLOW IN
HD6 FLOW IN
HD7 FLOW IN
EX1 FLOW IN
EX2 FLOW IN
SP1 FLOW IN
SP2 FLOW IN
SP3 FLOW IN
SP4 FLOW IN
ACCESS CODE

DIAGNOSTICS

CONTROL SUP
CONTROL EXH
CONTROL TEMP
SENSOR INPUT
SENSOR STAT
TEMP INPUT
OCCUPANT SWT
KEY SWITCH
LOW ALM REL
HIGH ALM REL
LOW SUP REL
HIGH EXH REL
PRESS AOUT
SUPPLY AOUT
EXHAUST AOUT
ACCESS CODE

INTERFACE

NET PROTOCOL
NET ADDRESS
OUTPUT RANGE
OUTPUT SIG
MAX FLOW OUT
ACCESS CODE

SUPPLY FLOW

SP1 DCT AREA
SP2 DCT AREA
SP3 DCT AREA
SP4 DCT AREA
SP1 FLO ZERO
SP2 FLO ZERO
SP3 FLO ZERO
SP4 FLO ZERO
FLO STA TYPE
XDCR OUT
TOP VELOCITY
SP LOW SETP
SP HIGH SETP
SP1 LOW CAL
SP1 HIGH CAL
SP2 LOW CAL
SP2 HIGH CAL
SP3 LOW CAL
SP3 HIGH CAL
SP4 LOW CAL
SP4 HIGH CAL
RESET CAL
ACCESS CODE

HOOD FLOW

HD1 DCT AREA
HD2 DUCT AREA
HD3 DUCT AREA
HD4 DUCT AREA
HD5 DUCT AREA
HD6 DUCT AREA
HD7 DUCT AREA
HD1 FLO ZERO
HD2 FLO ZERO
HD3 FLO ZERO
HD4 FLO ZERO
HD5 FLO ZERO
HD6 FLO ZERO
HD7 FLO ZERO
FLO STA TYPE
XDCR OUT
TOP VELOCITY
HD1 LOW CAL
HD1 HIGH CAL
HD2 LOW CAL
HD2 HIGH CAL
HD3 LOW CAL
HD3 HIGH CAL
HD4 LOW CAL
HD4 HIGH CAL
HD5 LOW CAL
HD5 HIGH CAL
HD6 LOW CAL
HD6 HIGH CAL
HD7 LOW CAL
HD7 HIGH CAL
MIN HD1 FLOW
MIN HD2 FLOW
MIN HD3 FLOW
MIN HD4 FLOW
MIN HD5 FLOW
MIN HD6 FLOW
MIN HD7 FLOW
RESET CAL
ACCESS CODE

EXHAUST FLOW

EX1 DCT AREA
EX2 DCT AREA
EX1 FLO ZERO
EX2 FLO ZERO
FLO STA TYPE
XDCR OUT
TOP VELOCITY
EX LOW SETP
EX HIGH SETP
EX1 LOW CAL
EX1 HIGH CAL
EX2 LOW CAL
EX2 HIGH CAL
RESET CAL
ACCESS CODE

Figure 1: Menu Items - Model 8682-KF1 Controller

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Software Additions

The Model 8682-KF1 has additional programmable software items. The unit works similar to a standard model, with several additions.

SET POINT MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT VALUE)
REM SETPOINT	The REM SET POINT item sets the pressure set point upon activation of a changeover switch. Pressure Differential is not maintained by direct pressure control; i.e. modulating dampers in response to pressure changes. The pressure signal is an AOC input, that is used to calculate the required air flow offset value. The calculated offset value changes the supply (or exhaust) flow volume which changes the pressure differential. When the calculated offset value is less than the MIN OFFSET or greater than the MAX OFFSET, pressure control will not be maintained.	-0.19500 "H_2O to +0.19500 " H_2O **(-0.0020 " H_2O)**
TEMP SETP	The TEMP SETP item sets the temperature set point of the space.	50 °F - 85 °F (**68 °F**)

ALARM MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT VALUE)
REM LOW ALM	The REM LOW ALM menu item sets the remote low pressure alarm set point. A low alarm condition is defined as when the room pressure falls below or goes in the opposite direction of the REM LOW ALM set point. The REM LOW ALM is only activated when the controller is at the REM SET POINT.	OFF -0.18500 " H_2O to +0.18500 " H_2O (**OFF**)
REM HIGH ALM	The REM HIGH ALM menu item sets the remote high pressure alarm set point. A high alarm condition is defined as when the room pressure exceeds (is more positive or more negative than) the REM HIGH ALM set point. The REM HIGH ALM is only activated when the controller is at the REM SET POINT.	OFF -0.18500 " H_2O to +0.18500 " H_2O (**OFF**)
MAX EXH ALM	The MAX EXH ALM sets the maximum exhaust flow alarm set point. A maximum exhaust alarm is defined as when the total exhaust exceeds the MAX EXH ALM set point. Note: The Model 8682-KF1 has a relay contact that corresponds to the MAX EXH ALM. This alarm relay replaces the LOW EXHAUST FLOW ALARM relay (Digital Alarm Output 2), (AOC, pins 56 and 57).	OFF 0 - 30,000 CFM (**OFF**)

CALIBRATION MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE
TEMP CAL	The TEMP CAL is used to enter the actual space temperature. This adjustment offsets the temperature sensor curve.	50 °F - 85 °F

CONTROL MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT VALUE)
TEMP CONTROL	The TEMP CONTROL item determines the control signal's output direction. As an example: If the control system closes the reheat valve instead of opening this valve, this option will reverse the control signal to now open the valve.	DIRECT OR REVERSE (**DIRECT**)
TEMP KC VAL	The TEMP KC VAL item provides the user with the ability to manually change the control loop speed. The TEMP KC VALUE item is used to read and change the gain control coefficient. When this item is entered, a value for Kc is indicated on the display. If the SUREFLOW is not controlling correctly, the Kc gain control coefficient may need adjusting. Decreasing Kc will slow the control system down, which will increase stability. Increasing Kc will increase the control system speed, which may cause system instability.	0 to 1000 (**100**)

FLOW CHECK MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT VALUE)
SP3 FLOW IN SP4 FLOW IN	The SP# FLOW IN menu item displays the current supply air flow. This item is a diagnostics tool used to compare the supply flow to a traverse of the duct work. If flow error is greater than 10%, adjust the SP# DUCT AREA until the error is within 10%. In addition, summing the SP# FLOW IN should equal the TOT SUP FLOW. When a volt meter is hooked to the flow station output, a voltage should be displayed. The exact voltage displayed is relatively unimportant. It is more important that the voltage is changing, which indicates the flow station is working correctly. For a 0.5 "H_2O transducer, 0 volts displayed equals zero flow 5 volts displayed equals 2832 ft/min x duct area (ft^2) - pressure based flow station 5 volts displayed equals TOP VELOCITY x duct area (ft^2) - linear based flow station	NONE: Read only value (**NONE**)

DIAGNOSTICS MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE
CONTROL TEMP	The CONTROL TEMP item manually changes the control output signal to the reheat valve. When this item is entered, a number between 0 and 255 will be shown on the display indicating the control output value. Pressing the ▲/▼ keys changes the count on the display. Pressing the ▲ key increases the displayed value, while pressing the ▼ key decreases the displayed value. The reheat control valve should modulate as the number changes. Depending on the valve, 0 or 255 is full open. A count of 150 should position the valve approximately 1/2 open. **WARNING:** The CONTROL TEMP function overrides the AOC control signal. Adequate space temperature will NOT be maintained while in this item.	0 - 255
TEMP INPUT OCCUPANT SWT	The TEMP INPUT item shows the current temperature reading. The OCCUPANT SWT item shows the status of the occupancy switch input. This can be used to test the occupancy switch connection.	NORMAL UNOCCUPIED
KEY SWITCH	The KEY SWITCH item shows the status of the key switch, which selects either the main or the remote set points. If the KEY SWITCH item displays OPEN, then the main set points are in use. If the KEY SWITCH item displays CLOSED, then the remote set points are used.	OPEN CLOSED
HIGH EXH REL	The HIGH EXH REL item is used to change the state of the high exhaust relay. When the HIGH EXH REL is entered, the display will indicate either OPEN or CLOSED. The ▲/▼ keys are used to toggle the state of the relay. The ▲ key will OPEN the alarm contact. Pressing the ▼ key will CLOSE the alarm contact. When the contact is closed, the relay is in an alarm condition.	OPEN CLOSED

SUPPLY FLOW MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT)
SP3 DUCT AREA SP4 DUCT AREA	The SP# DUCT AREA item inputs the supply duct size. The duct size is needed to compute the flow out of the supply duct. This item requires a flow station to be mounted in each supply duct. If the DIM displays English units, area must be entered in square feet. If metric units are displayed, area must be entered in square meters.	0 - 10 ft^2 0 - 0.95 m^2 (**0**) The DIM does not compute duct area. The area must first be calculated and then entered into the unit.
SP3 FLO ZERO SP4 FLO ZERO	The SP# FLO ZERO item establishes the flow station zero flow point. A zero or no flow point needs to be established in order to obtain a correct flow measurement output (see **Calibration** section). All pressure based flow stations need to have a SP# FLO ZERO established on initial set up. Linear flow stations with a 1-5 VDC output also need to have a SP# FLO ZERO established. Linear flow stations with a 0-5 VDC output do not need a SP# FLO ZERO.	NONE
XDCR OUT	The XDCR OUT menu item allows the user to select the maximum range of the pressure transducer used with the flow stations.	0.1, 0.2, 0.3, 0.4, 0.5 "H_2O 25, 50, 75, 100, 125 pascals (**0.5 in H2O 125 pascals**)
SP LOW SETP	The SP LOW SETP menu item sets the supply damper position for supply low flow calibration.	0-255
SP HIGH SETP	The SP HIGH SETP menu item sets the supply damper position for the supply high flow calibration.	0-255

SUPPLY FLOW MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT)
SP1 LOW CAL SP2 LOW CAL SP3 LOW CAL SP4 LOW CAL	The SP# LOW CAL menu items display the currently measured supply flow rate and the calibrated value for that supply flow. The supply dampers will move to the SP LOW SETP damper position for the low calibration. The calibrated supply flow can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
SP1 HIGH CAL SP2 HIGH CAL SP3 HIGH CAL SP4 HIGH CAL	The SP# HIGH CAL menu items display the currently measured supply flow rate and the calibrated value for that supply flow. The supply dampers will move to the SP HIGH SETP damper position for the low calibration. The calibrated supply flow can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
RESET CAL	The RESET CAL menu item zeroes out the calibration adjustments for the 4 supply flows. When this menu item is entered, the 8682-KF1 will prompt the user to verify that they want to do this. Press the SELECT key to reset the calibrations, and the MENU key to reject it.	

HOOD FLOW MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT)
XDCR OUT	The XDCR OUT menu item allows the user to select the maximum range of the pressure transducer used with the flow stations.	0.1, 0.2, 0.3, 0.4, 0.5 "H_2O 25, 50, 75, 100, 125 pascals (**0.5 in H2O 125 pascals**)
HD1 LOW CAL HD2 LOW CAL HD3 LOW CAL HD4 LOW CAL HD5 LOW CAL HD6 LOW CAL HD7 LOW CAL	The HD# LOW CAL menu items display the currently measured fume hood flow rate and the calibrated value for that fume hood flow. The calibrated hood flow can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
HD1 HIGH CAL HD2 HIGH CAL HD3 HIGH CAL HD4 HIGH CAL HD5 HIGH CAL HD6 HIGH CAL HD7 HIGH CAL	The HD# HIGH CAL menu items display the currently measured fume hood flow rate and the calibrated value for that fume hood flow. The calibrated hood flow can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
MIN HD1 FLOW MIN HD2 FLOW MIN HD3 FLOW MIN HD4 FLOW MIN HD5 FLOW MIN HD6 FLOW MIN HD7 FLOW	The MIN HD# FLOW menu items adjust the minimum flow value for each fume hood input. Use this menu item if the fume hood flow measurements are too low when the sash is closed.	
RESET CAL	The RESET CAL menu item zeroes out the calibration adjustments for the 7 hood flows. When this menu item is entered, the 8682-KF1 will prompt the user to verify that they want to do this. Press the SELECT key to reset the calibrations, and the MENU key to reject it.	

EXHAUST FLOW MENU

SOFTWARE NAME	ITEM DESCRIPTION	ITEM RANGE (DEFAULT)
XDCR OUT	The XDCR OUT menu item allows the user to select the maximum range of the pressure transducer used with the flow stations.	0.1, 0.2, 0.3, 0.4, 0.5 "H_2O 25, 50, 75, 100, 125 pascals (**0.5 in H2O 125 pascals**)
EX LOW SETP	The EX LOW SETP menu item sets the general exhaust damper position for general exhaust low flow calibration.	0-255
EX HIGH SETP	The EX HIGH SETP menu item sets the general exhaust damper position for the general exhaust high flow calibration.	0-255
EX1 LOW CAL EX2 LOW CAL	The EX LOW CAL menu items display the currently measured general exhaust flow rate and the calibrated value for that general exhaust flow. The calibrated general exhaust can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
EX1 HIGH CAL EX2 HIGH CAL	The EX HIGH CAL menu items display the currently measured general exhaust flow rate and the calibrated value for that general exhaust flow. The calibrated general exhaust flow can be adjusted using the ▲/▼ keys to make it match a reference measurement. Pressing the SELECT key will save the new calibration data.	
RESET CAL	The RESET CAL menu item zeroes out the calibration adjustments for the 7 hood flows. When this menu item is entered, the 8682-KF1 will prompt the user to verify that they want to do this. Press the SELECT key to reset the calibrations, and the MENU key to reject it.	

Software Deletions

The following menu items have been deleted from the unit:

SETPOINTS menu:	TEMP LOW
	TEMP HIGH
ALARM menu:	MIN EXH ALM
DIAGNOSTICS menu	LOW EXH REL

MODBUS Communications

Modbus communications are installed in the Model 8682-KF1 adaptive offset room pressure controllers. This document provides the technical information needed to communicate between the host DDC system and the Model 8682-KF1 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 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 8682-KF1 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, CFM, or inches H_20. The room pressure control setpoints and alarms are stored in ft/min. The DDC system must convert the value to inches of water if that is desired. The equation is given below.

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

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.

8682-KF1 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	1	Controller Model Number	8682
Emergency Mode	2	Emergency Mode Control **Write only variable.**	0 Leave emergency mode 1 Enter emergency mode
Control Mode	3	Control mode of device.	0 Normal 1 Unoccupied (Setback)
Status Index	4	Status of SUREFLOW device	0 Normal 1 Dim Data Error 2 Alarm = Low Pressure 3 Alarm = High Pressure 4 Alarm = Min Supply 5 Alarm = Max Exhaust 6 Data Error 7 Cal Error 8 Emergency Mode
Room Velocity	5	Velocity of room pressure	Displayed in ft/min.
Room Pressure	6	Room Pressure	Displayed in inches H2O. Host DDC system must divide by 100,000 to report pressure correctly
Total Supply Flow	7	Total supply into laboratory	Displayed in CFM.
Total Exhaust Flow	8	Total exhaust out of laboratory	Displayed in CFM.
Offset Setpoint	9	Current offset setpoint	Displayed in CFM.
Air changes per hour	10	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	11	Flow measured by flow station connected to hood input #1.	Displayed in CFM.
Fume Hood 2 Flow	12	Flow measured by flow station connected to hood input #2.	Displayed in CFM.
Fume Hood 3 Flow	13	Flow measured by flow station connected to hood input #3.	Displayed in CFM.
Fume Hood 4 Flow	14	Flow measured by flow station connected to hood input #4.	Displayed in CFM.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Fume Hood 5 Flow	15	Flow measured by flow station connected to hood input #5.	Displayed in CFM.
Fume Hood 6 Flow	16	Flow measured by flow station connected to hood input #6.	Displayed in CFM.
Fume Hood 7 Flow	17	Flow measured by flow station connected to hood input #7.	Displayed in CFM.
Exhaust 1 Flow	18	Flow measured by flow station connected to general exhaust input #1.	Displayed in CFM.
Exhaust 2 Flow	19	Flow measured by flow station connected to general exhaust input #2.	Displayed in CFM.
Supply 1 Flow	20	Flow measured by flow station connected to supply flow input #1	Displayed in CFM.
Supply 2 Flow	21	Flow measured by flow station connected to supply flow input #2	Displayed in CFM.
Supply 3 Flow	22	Flow measured by flow station connected to supply flow input #3	Displayed in CFM.
Supply 4 Flow	23	Flow measured by flow station connected to supply flow input #4	Displayed in CFM.
Pressure Setpoint	24	Pressure control setpoint	Displayed in ft/min.
Min Vent Setpoint	25	Minimum flow setpoint for ventilation.	Displayed in CFM.
Min Temp Setpoint	26	Minimum flow setpoint for temperature control.	Displayed in CFM.
Unoccupied Min Setpoint	27	Unoccupied (Setback) minimum flow setpoint.	Displayed in CFM.
Low Alarm	28	Low pressure alarm setpoint	Displayed in ft/min.
High Alarm	29	High pressure alarm setpoint	Displayed in ft/min.
Min Supply Alarm	30	Minimum supply flow alarm	Displayed in CFM.
Max Exhaust Alarm	31	Maximum general exhaust alarm	Displayed in CFM.
Min Offset Setpoint	32	Minimum offset setpoint	Displayed in CFM.
Max Offset Setpoint	33	Maximum offset setpoint	Displayed in CFM.
Max Supply Setpoint	34	Maximum supply setpoint	Displayed in CFM.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Min Exhaust Setpoint	35	Minimum exhaust setpoint	Displayed in CFM.
Temp Setpoint	36	Temperature setpoint	Displayed in °F
Output Range	38	Room pressure analog output range	0 Low 1 High
Output Mode	39	Analog output signal	0 4-20 ma 1 0-10 volt
Elevation	40	Elevation above sea level	0-10,000 feet. Displayed in 1,000 feet increments.
Hood 1 Duct Area	41	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 2 Duct Area	42	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 3 Duct Area	43	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 4 Duct Area	44	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 5 Duct Area	45	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 6 Duct Area	46	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Hood 7 Duct Area	47	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Exhaust 1 Duct Area	48	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Exhaust 2 Duct Area	49	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Supply 1 Duct Area	50	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Supply 2 Duct Area	51	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Room Volume	52	Room volume in cubic feet (needed or ACPH calculation)	Displayed in cubic feet.
Supply 3 Duct Area	53	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Control Action	56	Control output signal direction	0 Reverse 1 Direct
Supply 4 Duct Area	60	Duct area in square feet	Host DDC system must divide value by 1,000 to report duct area correctly.
Network Protocol	61	Network protocol for RS485 communications	0 Modbus 1 Cimetrics
Network Address	62	Communication address of device	Range is 1-247
Flow Output Range	87	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	96	Type of flow station being used in fume hoods.	0 Pressure based 1 Linear
Exhaust Flow Station Type	97	Type of flow station being used in general exhaust.	0 Pressure based 1 Linear
Supply Flow Station Type	98	Type of flow station being used in supply.	0 Pressure based 1 Linear
Hood Top Velocity	99	Fume hood maximum velocity range of flow station.	0-5,000 ft/min
Exhaust Top Velocity	100	General exhaust maximum velocity range of flow station.	0-5,000 ft/min
Supply Top Velocity	101	Supply maximum velocity range of flow station.	0-5,000 ft/min
Exhaust Configuration	102	Configuration of exhaust duct work.	0 Unganged 1 Ganged
Alarm Mode	103	Latched or unlatched alarms	0 Unlatched 1 Latched

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Alarm Delay	104	Time delay before alarm activates	Host DDC system must divide value by 10 to report alarm delay correctly.
Averaging Index	105	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	106	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	107	Audible alarm indication	0 Off 1 On
Mute Delay	108	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	113	Setpoint menu access code enable	0 Off 1 On
Alarm Code Enable	114	Alarm menu access code enable	0 Off 1 On
Configure igure Code Enable	115	Configure menu access code enable.	0 Off 1 On
Cal Code Enable	116	Calibration menu access code enable.	0 Off 1 On
Control Code Enable	117	Control menu access code enable.	0 Off 1 On
System Code Enable	118	System menu access code enable.	0 Off 1 On
Flow Code Enable	119	Flow menu access code enable.	0 Off 1 On
Diag Code Enable	120	Diagnostic menu access code enable.	0 Off 1 On
Inter Code Enable	121	Interface menu access code enable	0 Off 1 On
Hood Code Enable	122	Hood menu access code enable	0 Off 1 On
Exh Code Enable	123	Exhaust menu access code enable	0 Off 1 On

Variable Name	Variable Address	Input Provided to Master System	Integer DDC system receives
Sup Code Enable	124	Supply menu access code enable	0 Off 1 On
Temperature	337	Current temperature value	°F

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

EXAMPLE of **16 (10 Hex) Preset Multiple Regs** function format:
This example changes the minimum ventilation setpoint to 1000 CFM

QUERY

Field Name	(Hex)
Slave Address	01
Function	10
Starting Address Hi	00
Starting Address Lo	19
No. Of Registers Hi	00
No. Of Registers Lo	01
Data Value (High)	03
Data Value (Low)	E8
Error Check (CRC)	--

RESPONSE

Field Name	(Hex)
Slave Address	01
Function	10
Starting Address Hi	00
Starting Address Lo	19
No. of Registers Hi	00
No. of Registers Lo	01
Error Check (CRC)	--

Example of **03 Read Holding Registers** function format:
This example reads the total supply and total exhaust.

QUERY

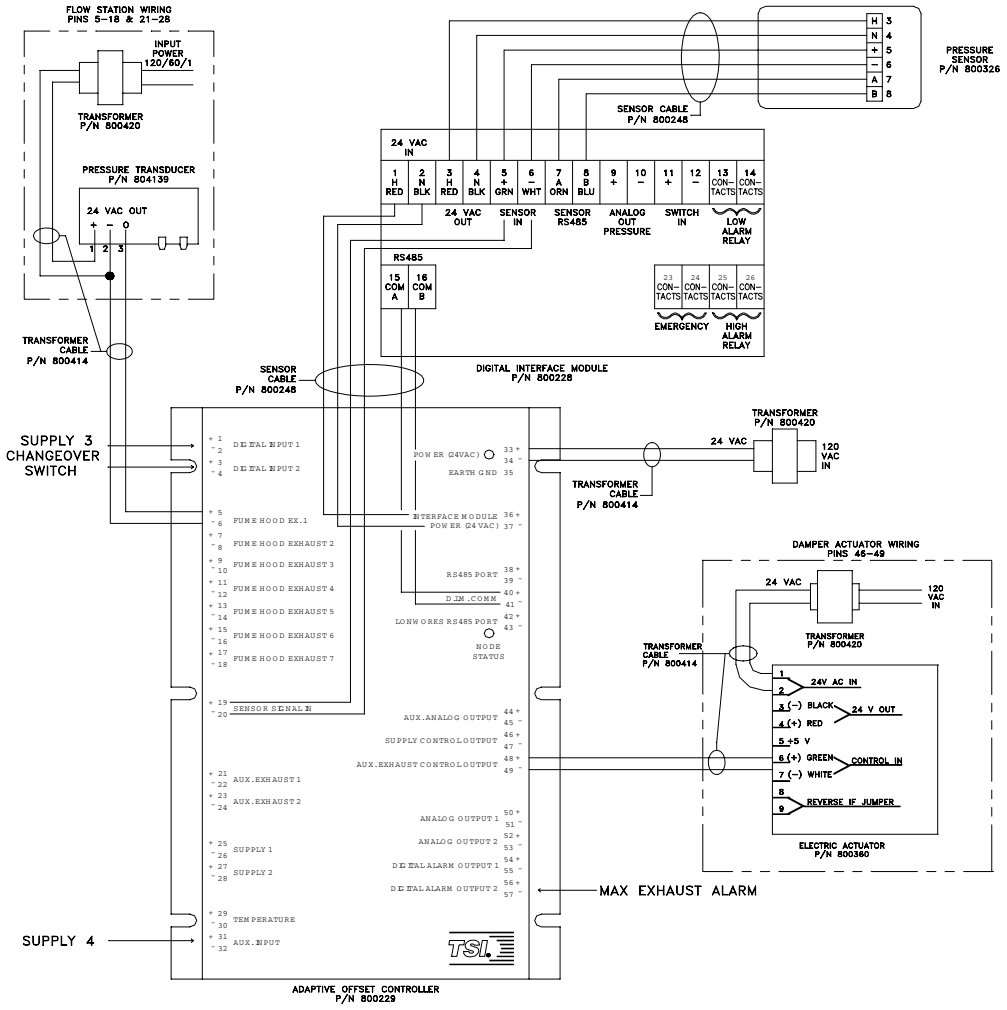
Field Name	(Hex)
Slave Address	01
Function	03
Starting Address Hi	00
Starting Address Lo	07
No. Of Registers Hi	00
No. Of Registers Lo	02
Error Check (CRC)	--

RESPONSE

Field Name	(Hex)
Slave Address	01
Function	03
Byte Count	04
Data Hi	03
Data Lo	8E (1000 CFM)
Data Hi	04
Data Lo	B0 (1200 CFM)
Error Check (CRC)	

Wiring Diagrams

MODEL 8682-KF1
WIRING DIAGRAM - ELECTRIC



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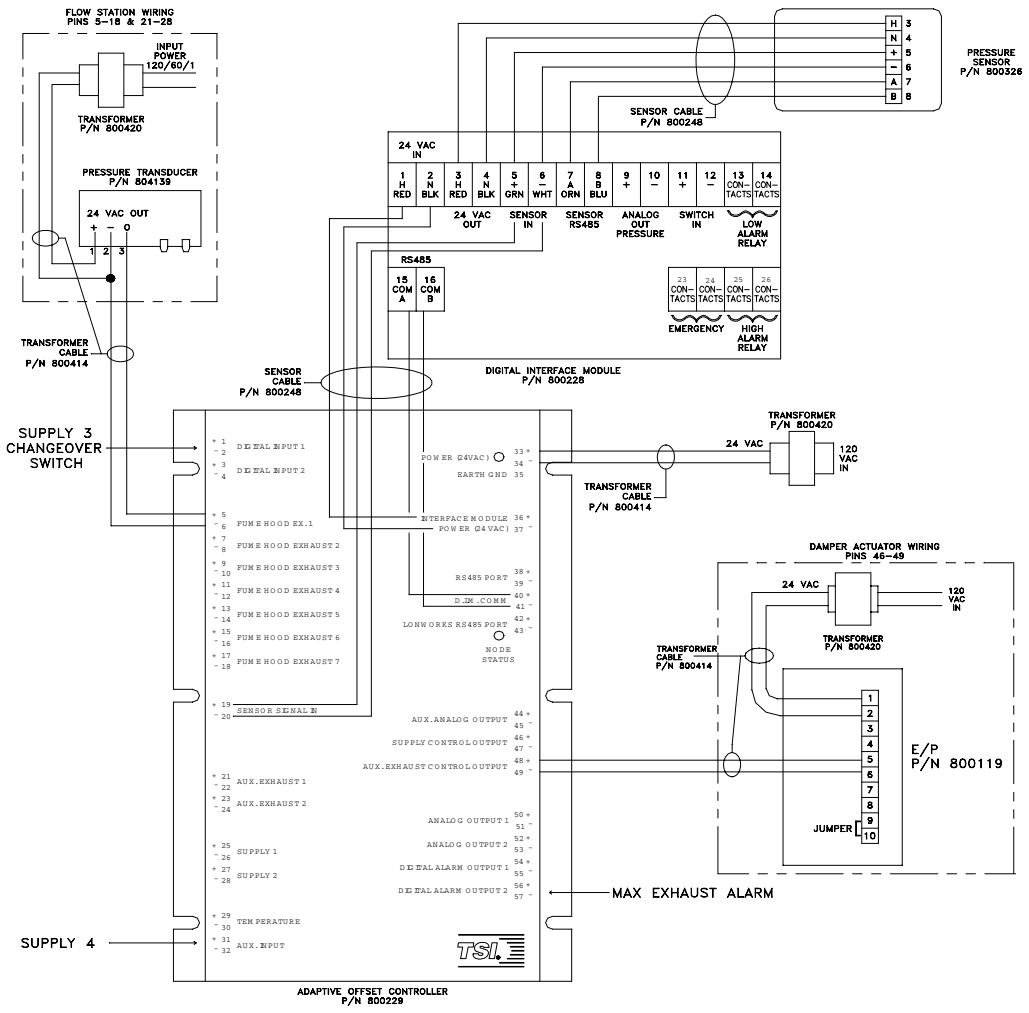
MODEL 8682-KF1
WIRING DIAGRAM - PNEUMATIC



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