

## Millennium Simplicity Elite Parameter Points and Quirks

How to access, view and change parameter settings

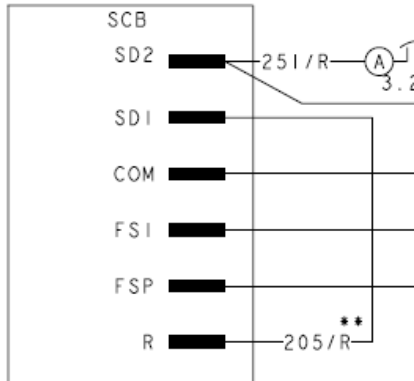


1. Push the “Program” button once. The two digit display shows “01” and the four digit display shows the current value for that parameter.
2. To scroll through the next address, push the “Test/Up” button. Scroll to the previous address, push the “Address/Down” button.
3. To change a value, locate the address desired following the instructions above. Then push the “Alarm/Advance” button once. The current value as displayed in the four-digit display will begin flashing. Use the “Test/Up” and “Address/Down” buttons to change the current value to the desired value.
4. To accept and store the new value push the “Alarm/Advance” button once. The new value is accepted, displayed and the display stops flashing.

To exit the “Program” mode and return to the normal operating mode push the “Program” button once again.

Intelli Comfort Address 1, Simplicity always Address 2 Mod Line anything but 1. Push COM {ADDRESS} 2 times and tells you which address, Push 3 times and goes back to Address 1. Push once goes to next available address.

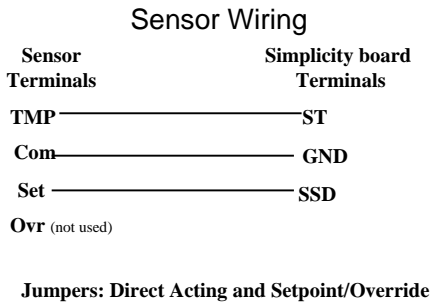
## CONNECTING A SMOKE DETECTOR



On the Simplicity Elite Control board, remove wire #205/R from between terminals SD2 and R, as shown in the diagram to the left. Place the normally closed contacts of the smoke detector between these two terminals. When the contacts open, the Simplicity Elite will be de-energized and all functions cease

## CONNECTING A SPACE SENSOR


**NOTE:** On Intelli-Comfort and VAV boards if a space sensor is used it gets connected to the blue P7 plug whose wire terminals are marked as shown here.



**Space Sensors**  
Three Types

Source One Part Numbers

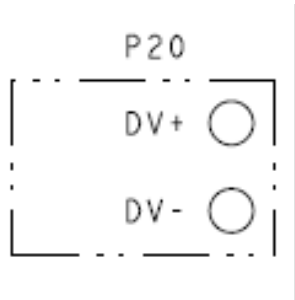
- 031-02529-006  
– Override and temperature Adj.
- 031-02529-004  
– Override Only
- 031-02529-000  
– No override or Adj.



FYI - The space sensor is a 10K type III negative coefficient thermistor. The 000 & 004 sensors require 2 wires at ST & GND. The 006 sensor requires a 3<sup>rd</sup> wire at SSD for the temp adjustment. The adjustment is 0-20K ohms. 10K ohms is zero deviation from setpoint, making 20K the max + end and 0 the max - end of the value set for space sensor offset on parameter 56 of the Elite board.

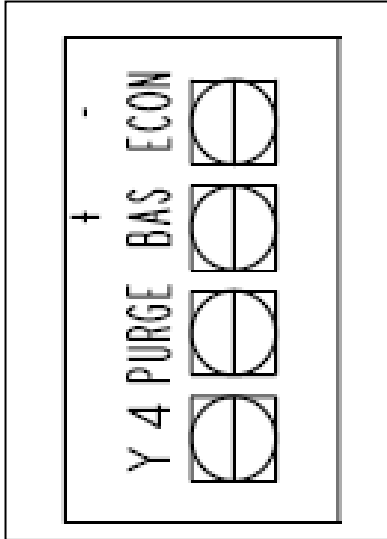
**NOTE:** The temperature adjust feature on the 006 sensor is not used with VAV units

## CONNECTING A CO2 SENSOR



A CO2 sensor must have its own power source, which is typically 24vac. It has a 0-10 vdc or 2-10 vdc output which is connected to the Simplicity Elite board at the P20 plug on DV+ and DV- terminals.

**NOTE:** On Intelli-Comfort and VAV boards the CO2 sensor is connected to the blue IAQ terminals



### SMOKE PURGE

With 24 vac on PURGE

- All heating and cooling de-energized
- Economizer output goes to 10 vdc
- Supply fan VFD output goes to 10 vdc
- Power exhaust output goes to 10 vdc

### BAS Economizer (2-10 vdc)

Terminals BAS ECON + and -

- BAS Economizer parameter 58 must be turned ON before applying voltage
- Allows 3rd party to take direct control of economizer damper

## TRANSDUCER AND SENSOR VALUES

### Pressure Transducer Output Voltage vs Pressure

Output Voltage	Building Pressure	Duct Pressure
0	-0.25	0.00
0.50	-0.20	0.50
1.00	-0.15	1.00
1.50	-0.10	1.50
2.00	-0.05	2.00
2.50	0.00	2.50
3.00	0.05	3.00
3.50	0.10	3.50
4.00	0.15	4.00
4.50	0.20	4.50
5.00	0.25	5.00

### Sensors NTC Resistance Value

70F	- 11832 Ohms (11.8K)
110F	- 4633 Ohms (4.64K)
120F	- 3733 Ohms (3.74K)
130F	- 3027 Ohms (3.01K)
140F	- 2470 Ohms (2.49K)
150F	- 2028 Ohms (2.05K)
160F	- 1674 Ohms (1.65K)
170F	- 1390 Ohms (1.40K)
180F	- 1160 Ohms (1.15K)



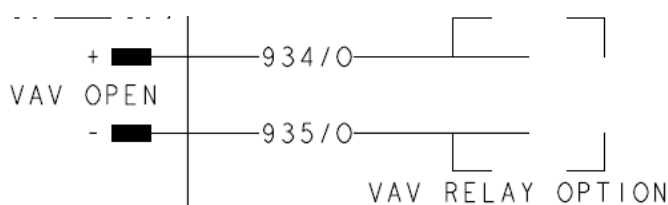
- **Third party BAS Economizer Hook up Parameter 58, 2 to 10 volts must turn on parameter before power applied or damage to the board will occur**
- **Intelli Start is automatically defaulted off when parameter #71 is turned on.**
- **Nuisance FC42: Increase minimum frequency adjustment. Factory set at 20 HZ Danfoss parameter 201 raise to 25 HZ, if still FC raise to 30 {5 HZ at a time}. Adding a 60 second time delay relay to prevent the APS closed signal from reaching the Elite board can also prevent this fault from occurring.**
- **The occupied/unoccupied network Flag can be turned on and off using the Simplicity PC software. This may prove useful at times for a service tech or commissioning person when on the roof.**
- **If the board is being controlled through the modbus network by use of any networked control (such as Simplicity Linc or YCCS) the networked control must be disconnected prior to using Simplicity PC software or the PC software will experience errors and/or locking up.**

### APS Air Proving Switch Simplicity Elite

- When the control commands the fan on, it will wait for 90 seconds for 24 VAC to be sensed. If the voltage is not sensed after 90 seconds, it will turn off all outputs. It will retry the Fan output every 30 minutes for three retries. If after three retries it still cannot qualify the Fan, it will Alarm and lock all heating and cooling operation out. When the control is a VAV unit, it will also try to qualify the fan using the static pressure sensor. If the control reads more than .05 inches of water column, it will only flag a bad APS and continue to operate the equipment. If 24 VAC is sensed after an alarm has been flagged, the control will resume normal operation and clear the active alarm. After the control has turned off the fan, it will wait 90 seconds for the switch to open. If the switch does not open after 90 seconds, the control will flag a failed switch and flash the alarm. The control will stage up equipment normally. When the control is running the fan and the APS has already been proven, and then it opens, the control will wait 2 seconds before shutting down heating, cooling, and locking out. It will alarm and retry as if it happened during start-up.

### VAV Unit with Heat

When a Simplicity Elite board configured for VAV operation turns on heat, it energizes ALL heat stages and FORCES the blower to deliver FULL AIRFLOW. It energizes an onboard relay that sends out a 24vdc signal. This signal, as it ships from the factory energizes closes a set of normally open contacts on a relay. Typically the controls contactor or installer brings a cable up from the VAV boxes and when this relay's contacts are closed, the boxes are driven to their full open position.



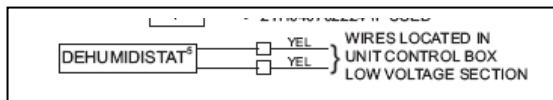
**CV/VAV Input** – The Elite board will look at the P7 plug to identify whether it should act as a constant volume unit (0-5K ohms) or if it should act as a Variable Air Volume (10K-20K). VAV units will come from the factory with a 15K resistor across these pins.

# Supplemental Simplicity Info

## Non-Elite

Although the following has no relevance to the Elite board or Millennium units it is being provided to assist with installations where multiple types of Simplicity equipped units are used on the same jobsite

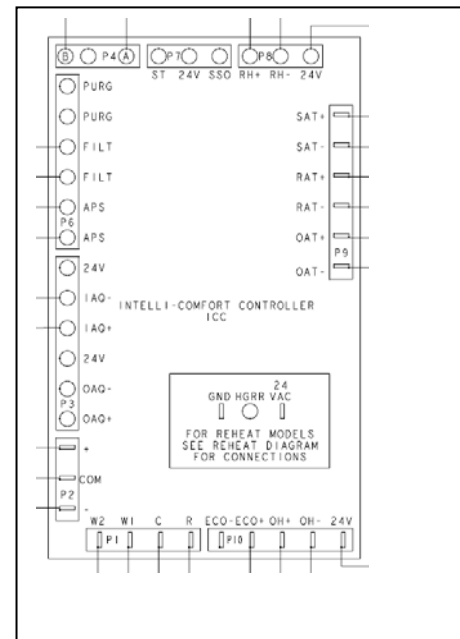
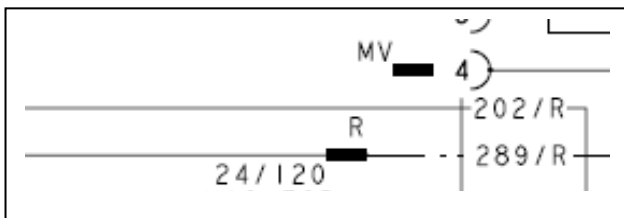
- **Intelli Comfort board will not take thermostat inputs.** It's designed for sensors only.
- All humidity sensors used with the Intelli-Comfort or VAV boards provide a 0-10 vdc signal to the board which corresponds to 0-100% RH
- All Intelli-Comfort or VAV equipped units will require some parameter modification with the Simplicity PC software, meaning the tech must have a FreeNet adapter
- All versions of Simplicity boards can be networked together using Simplicity PC software.
- Only units equipped with Intelli-Comfort, the VAV board or Elite can use the Simplicity Linc translator to communicate with BacNet MSTP.
- On units equipped with Intelli-Comfort, the space sensor connects to the P7 plug. **NOTE:** In the wiring diagram the P7 plug terminals are shown as ST-24v-SSO. The "24v" is actually "GND" on the board. See "connecting a space sensor" on page 2 of this document.
- On units equipped with Intelli-Comfort a CO2 sensor is connected to the IAQ terminals
- On units equipped with Intelli-Comfort, if "differential" demand ventilation is required, an outdoor CO2 sensor is connected to the OAQ terminals
- On single stage DR units the De-Humidistat is connected to the two yellow wires in the control box.

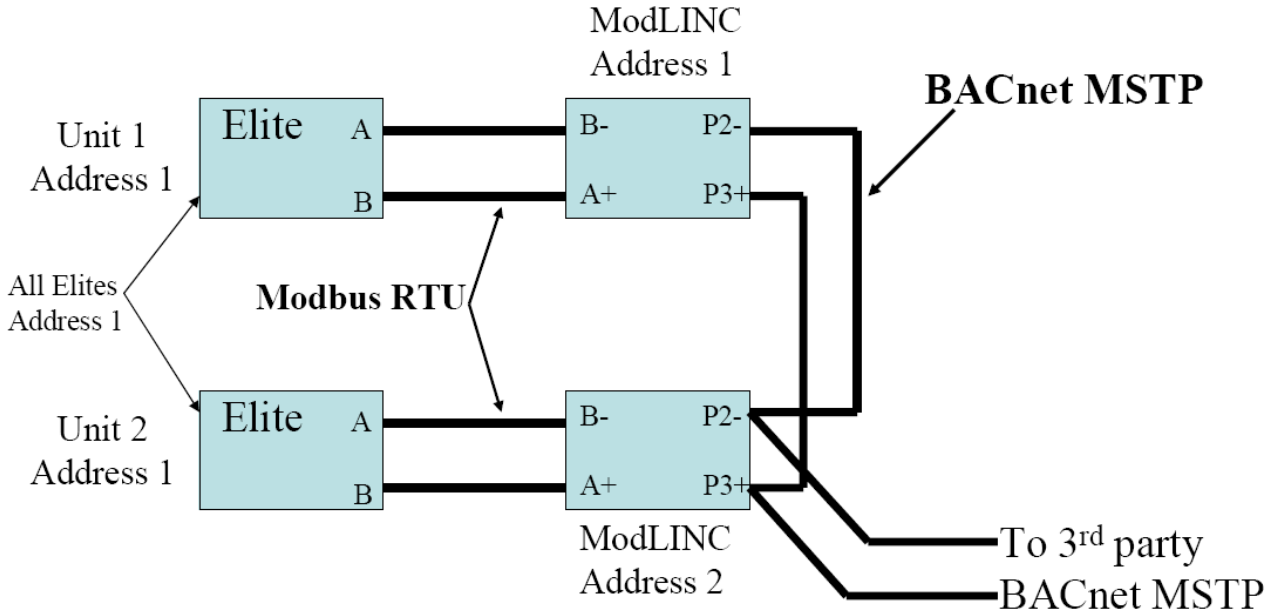


- On two stage DR units the De-Humidistat is connected to terminals 1 & 2 on the RHTB terminal Block



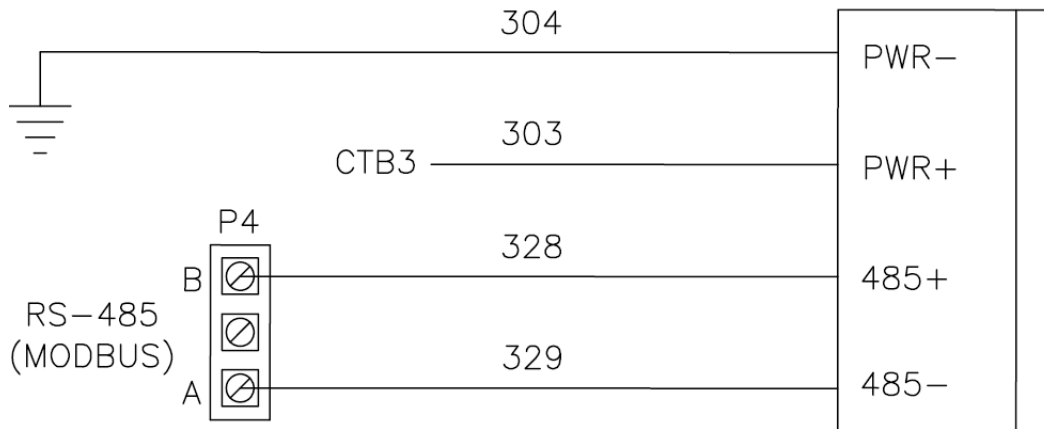
- On standard Simplicity units, a CO2 sensor would be connected to the IAQ/AQ terminals on the economizer logic module.
- On standard Simplicity units, if a field installed smoke detector is installed, a set of normally closed contacts should be put in series with the factory installed wire connected to the "R" terminal on the board. In the example shown below, it would be wire #289/R.





Note that with a Modline the polarity is reversed between the Modline and the Simplicity board

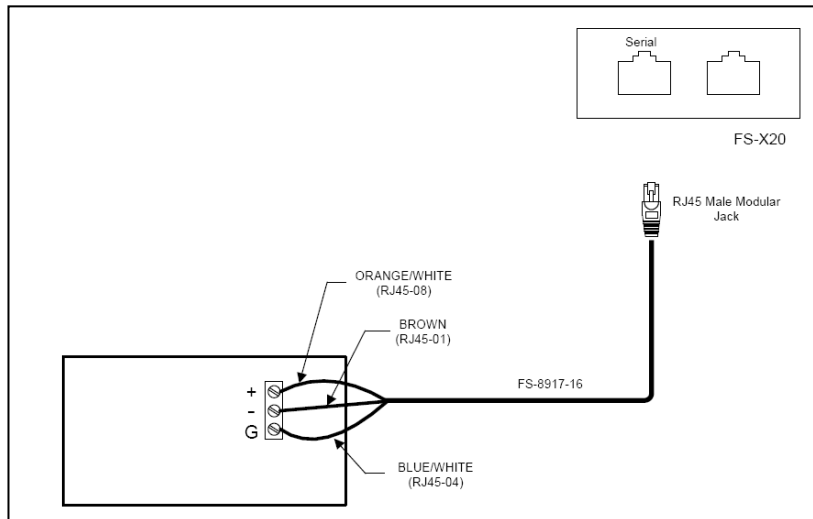
### OPTIONAL SIMPLICITY LINC CONTROL



- If using Simplicity Linc with Intelli-Comfort using will run continuously unless the *Occupied Thermostat Input Enabled* parameter is turned ON (Systems Options Tab)
- If using Simplicity Linc any Simplicity board connected to the Linc must use address 1

### Field Server Gateway

When using a Field Server Gateway to connect a Simplicity Modbus RTU network with a Lon network you must connect the RJ45 wire to the Modbus RS-485 cable using the wire colors shown above. The Simplicity boards are marked “A” which equals -, “B” which equals + and “GND” which equals G.



## Com Chip Checkout

With network wires removed from the board

- **All Simplicity boards (RS485)**
  - Both A to G and B to G should read between .5vdc and 3vdc
  - Measured voltage between B & G should be **at least** ¼ vdc greater than the voltage measured between A & G
- **On the MODBUS side of the MODLINC:**
  - Both A to G and B to G should read between .5vdc and 3vdc
  - Measured voltage between A & G should be **at least** ¼ vdc greater than the voltage measured between B & G
- **On the BacNet side of the MODLINC:**
  - Both P2- to ground and P3+ to ground should read between .5vdc and 3vdc
  - Measured voltage between P3+ & ground should be **at least** ¼ vdc greater than the voltage measured between P2- and ground
- If measured values do not match above, replace com chip when possible
- On all three, the difference will most likely be greater (depending on application)
- A defective com chip would likely show:
  - A&G = 0 vdc
  - B&G = 5 vdc
- Multiple defective com chips are a sure sign of high voltage having been applied to the com loop

### Troubleshooting

The ModLINC is equipped with three LEDs on the top cover. The STATUS LED indicates the operational status of the ModLINC. The STATUS LED flashes at varying rates to indicate additional information concerning the operating status of the ModLINC. One flash approximately every 3 seconds indicates normal operation.

The LAN LED indicates the status of the BACnet communications and the Modbus LED indicates the status of the communications between the ModLINC and the UPG controller. These 2 LEDs will illuminate red when transmitting data and green when receiving data.

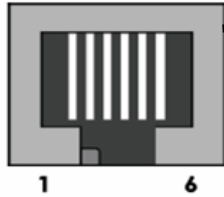


**NOTE:** *The flashes can occur fast enough to cause the LEDs to appear amber.*

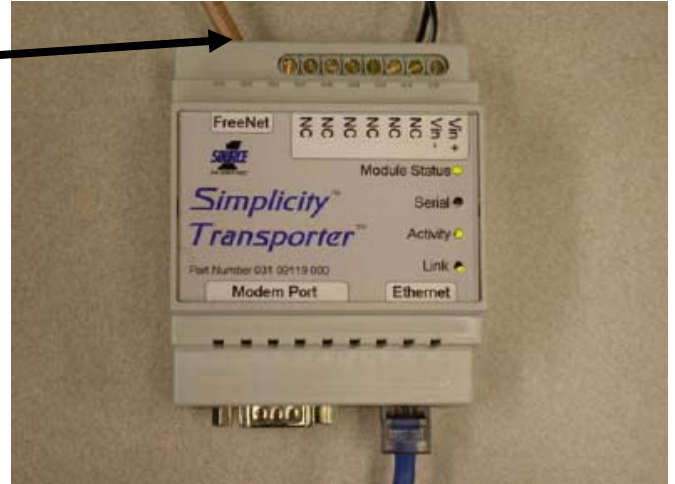




## Wiring Setup for Simplicity Transporter



Pin 1 connects to "B" from Modbus Network Cable  
 Pin 2 connects to "A" from Modbus Network Cable  
**Pins 3-6 are not used**



There are 3 connections to be made on a simplicity transporter

1. **Power** (9-32 VAC/DC , 1.5W) - This connection is made between the **Vin+** and the **Vin-** terminals. The transporter **does not ship with a power supply so this must be obtained locally**. Radio Shack is a reliable source.
2. **Ethernet connection** – This is a standard 8 pin RJ45 connection that should be connected to the local area network at the facility (this gives the transporter the connection to the Internet). This cable should not exceed 300 feet in length.
3. **Modbus / Freenet connection to the equipment** – You will need to obtain a RJ11 (standard telephone connection that has at least the first 2 wires punched down, you can purchase an RJ11 cable with all 6 wires punched down at Radio Shack (**cable is not shipped with the transporter**) or you can build one with wires only in pins 1 & 2. The illustration below shows the pin out of the Simplicity transporter's RJ11 jack used to connect to the Modbus network cable. You will connect Pin 1 to the wire coming from the "B" terminal of the Modbus network and connect Pin 2 to the wire coming from the "A" terminal of the Modbus network. Tinning the wire connections will reduce possible network interference.

## Decimal Addressing for Registers



A full register is 16 bits as in the example below. The bits are identified as follows:

( HIGH ) ( LOW )  
**76143210 76543210**

To send an occupied flag to the board, register 215H, bit #4 must be set to 1. If all other options in that register are off (or zero), the decimal number sent to the board is 4096. See the following:

( HIGH )( LOW )  
**7614321076543210**  
**0001000000000000**

**The number directly above is the binary number which converts to 4096 in decimal**

Address (Hex)	Address (Dec)	Bit	Initial/Default value (HEX)	Min Value	Max Value	Description
D6 H	214 H		-	0	100	Economizer Damper Output Status, 0-100% (2 – 10 VDC)
D7 H	215 H	NA	0	-	-	Option Byte #6
		0				1 = Comfort ventilation for cooling enabled
		1				1 = Comfort ventilation for heating enabled
		2				1 = Temperature / Humidity control enabled
		3				1 = Hot gas reheat alternate operation enabled
		4				1 = Network Occupied flag: OCC is On
		5				NA
		6				1 = Differential enthalpy mode enabled
D7L	215 L	NA	0	-	-	Option Byte #7
		0				1 = ERV enabled
		1				1 = ERV Unoccupied fan enabled
		2-7				NA

## Modbus Communications

The mode of transmission for all Simplicity controls is Modbus RTU. The physical communication layer is RS-485. The serial characteristics for communications with Simplicity controls are:

Baud Rate: 19,200  
 Start Bits: 1  
 Data Bits: 8  
 Stop Bits: 2  
 Parity: None

## Data Transmission



All communicated Simplicity Modbus data can be considered to reside as Modbus Holding Register data beginning at the address 40,001. Therefore, the data map decimal register address of 0 is what is actually transmitted when referring to address 40,001. The offset of 40,001 may exist in some software implementations, but it does not exist in the transmission of the data itself. If your Modbus implementation requires this 40,001 address as the beginning of the Holding Register Data, just add 40,001 to the Data Map addresses to access the appropriate register.

All Modbus data is communicated in Registers. Two bytes of data are transmitted within one Register. Within the Simplicity Data Map, each Register contains a High Byte and a Low Byte. The High Byte contains the high order bits and the Low Byte contains the low order bits. The Data Map identifies 8 bits within each byte of the Register. The bits are numbered 0 to 7 with 0 being the least significant. The transmitted binary data within any register would be defined as follows:

	High Byte								Low Byte							
Bit#	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Bit Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

The transmitted 2 byte binary value can be converted to a decimal value by adding the binary weights for each bit that is ON (displayed as a 1)

Example: 2 byte binary value of 0000010000100011 would equal a decimal value of 1059 (1024 + 32 + 2 + 1)

Simplicity data is considered to be either Register data (represented by the entire 16 bit register), Byte data (represented by 1/2 of the register, either the high byte or low byte), or Bit data (represented by an individual bit with the register).

For Register data, only the register number is necessary to identify the data address. There may be an offset or scaling value associated with the Register data in order to make it more accurately represent the true value. An example of this would be the temperature sensor readings which have a scaling value of 1/10 and an offset of -40.

Example: Transmitted temperature value of 900 is equal to 50.0 degrees  
 $(900/10) - 40 = 50$

For Byte data, both the Register number and the High or Low designation are needed to identify the data that is requested. The first transmitted byte of the register contains the high order bits (High Byte) and the second transmitted byte contains the low order bits (Low Byte). Once the High and Low Bytes have been individually identified, the Low Byte value should be a true representation of the data, however, the High Byte value must be divided by 256 to be a true value.

Bit data is used to represent values that are On/Off, Yes/No, or True/False. Up to 16 values of this type can be represented within a single Register. Three items are needed to identify the appropriate bit data:

1. The Register number
2. The High or Low Byte designation of the byte
3. The Bit number within the byte



Typical uses for bit data in the Simplicity controls are input/output status and function enable/disable.

To make changes to any data, the entire Register must be read, revised, and then written to. If a single bit is to be changed, the entire Register must be read, the appropriate bit changed, and then the entire Register must be sent back as a write value.

The only Modbus Function Codes used by Simplicity controls are 03 (Read holding registers, 06 (Write to a single holding register), and 16 (Write to multiple holding registers). The Simplicity controls dictates that no more than 13 registers can be addressed (read or written to) with a single command.

### Handling of Individual Status Bits

Status of inputs and outputs are identified by bit data. This means that to monitor the status of any input or output, you must be able to identify changes to the bit data that represents that input or output. First you must identify the byte in which the particular bit is located. Within each Byte, Bit 0 is always the least significant, Bit 7 is always the most significant bit, identified as follows:

	Value	Binary Value
Bit 0	1	00000001
Bit 1	2	00000010
Bit 2	4	00000100
Bit 3	8	00001000
Bit 4	16	00010000
Bit 5	32	00100000
Bit 6	64	01000000
Bit 7	128	10000000

The value, or status, of an individual bit is determined by performing an AND function. The AND function works on each bit individually. For example, when Byte\_1 and Byte\_2 are ANDed together, Bit 0 of Byte\_1 is ANDed with Bit 0 of Byte\_2, with the result stored in Bit 0 of the Result\_Byte. Bit 1 of Byte\_1 is ANDed with Bit 1 of Byte\_2, with the result stored in Bit 1 of the Result\_Byte. The remaining six bits are ANDed in the same fashion.

For the result of an AND function to be 1, or true, the value of both bits being ANDed must be 1, or true. If either of the individual bits is 0, or false, the result is 0, or false.

The AND function is normally used to determine the status of an individual bit, so the AND function must be performed for each status bit that is to be monitored.

As an example, to get the Bit 4 value of a Status Byte, the byte is ANDed with 16 (00010000 Binary). Since all bits other than Bit 4 are 0, the result of the AND function on those bits will be 0, or false. However, since the value of Bit 4 is 1, or true, the result of the status of Bit 4 is dependent on the value of Bit 4 in the Status Byte. If the value of Bit 4 in the Status Byte is 1, or true, then the Result Bit will 1, or true, and the entire Result Byte will be a value of 16, or 00010000 Binary. If the value of Bit 4 in the Status Byte is 0, or false, the Result Byte will be a value of 0, or 00000000 Binary.

By performing AND functions in this manner, status of the inputs and outputs can be monitored.



### **Addressing for Modbus Applications**

All Simplicity controls that can be connected on a Modbus application can be addressed using a button on the control. The button is identified as either **COMM SETUP** or **ADDRESS**. When shipped from the factory, Simplicity controls are programmed to have a Modbus address of 1. When the network cabling is completed, the Simplicity controls can be re-addressed by pushing the **COMM SETUP** or **ADDRESS** button one time. This forces the Simplicity control to seek a new address for itself. It will find the next available address on the network and assign it as its own address.

The current address of any Simplicity control can be found by pressing the **COMM SETUP** or **ADDRESS** button twice within 5 seconds. After a short pause, the on-board LED will flash the number of times that represents the address.

The address of any Simplicity control can also be reset to 1 by pressing the **COMM SETUP** or **ADDRESS** button 3 times within 5 seconds.

When the Simplicity Intelli-Comfort is part of the unit controls, it is the control that will be on the communication network and the network address will reside on the Intelli-Comfort control. A Simplicity 1A control will also be included and will be connected to the Intelli-Comfort control. The Simplicity 1A control, in this case, must be set to address 2.