BARD MANUFACTURING COMPANY, INC.
CompleteStat BACnet
Programmable Communicating Thermostat
Engineering Specification Guide

1.1 CompleteStat™ BACnet Programmable Thermostat

A. General:

1. The CompleteStat™ shall be a flexible, intelligent temperature/humidity-sensing, wall-mounted, thermostat/humidistat controller that is native BACnet Advanced Application Controllers (B-AAC) for use in a BACnet network or self contained total energy management solution for classroom applications. Adaptive Occupancy Scheduling and adjustable delayed setback delayed setback provides required environmental control for classroom applications. Occupancy based control creates automatic scheduling allows the owner to The set-and-forget stat simplifies networked zone control for common packaged HVAC equipment, and includes inputs for independent control of factory integrated ventilation systems, 2 stage compressor bearing equipment with 3 stages of heat and 2 stages of cooling.

2. Acceptable manufacturers shall be:

a. Bard Manufacturing or other approved devices. Information must be submitted 10 days prior to deadline for consideration as an equal device.

3. Standard hardware options include a mix of output configurations (relays and analog outputs), optional on-board humidity/occupancy sensors, and inputs for additional analog and binary type remote external sensors. Optional models shall include integrated CO_2 sensors. The sensors and physical inputs shall be integrated with the standard on-board control sequences to provide for intermittent-occupancy and Adaptive Occupancy Scheduling.

4. Specifications shall identify one or more of the following models;

a. CS9B-THOA- Temperature, Humidity, Occupancy

b. CS9B-THOCA- Temperature, Humidity, Occupancy, and CO2

c. CS9BE-THOA Temperature, Humidity, Occupancy, w/ Ethernet connection

d. CS9BE-THOCA- Temperature, Humidity, Occupancy, and CO2 w/ Ethernet connection

B. Hardware Specifications

1. Memory: The operating system and the application programs shall be stored in System and programs information shall be stored in non-volatile flash memory.
2. Communication Port: Each CS9B model shall communicate via the BACnet MS/TP field bus. CS9B**E** models shall include a CAT 5 port located on the sub-base for communication control.
3. Inputs: In addition to an internal temperature sensor, the CS9 shall have at least 3 analog inputs for external sensors/switches, with a minimum of 12-bit analog to digital conversion. Each input shall have over-voltage protection.
4. Outputs: The CompleteStat™ shall have 9-relay outputs with a 12-bit digital to analog conversion.
5. Adaptive Occupancy Scheduling. Device shall automatically learn the start of first day persistent occupancy of each day of the week using the on-board motion sensor to create a 7-day start of occupancy schedule. The scheduling shall continuously adapt to changes in the arrival pattern. System shall also provide adaptive optimized space warm or cool down with respect to the learned start of occupancy for each occupied day.
6. Interface and Function:
    a. User-friendly, 64 x 128 pixel, dot-matrix LCD display and 5 buttons for data selection and entry.
    b. Six On/Off and independent heating and cooling set point periods per day.
    c. Schedules can be set uniquely for each day, 5-1-1, or 5-2 daily schedules, plus holidays.
    d. Easy copy function for rapid schedule programming in stand-alone and small network applications.
    e. Built-in, factory-tested libraries of configurable application control sequences.
    f. Integral energy management control with energy dead-band heating and cooling set points and other advanced features.
    g. Three levels of password-protected access (user/operator/administrator) to prevent disruption of operation and configuration.
    h. Integral temperature and humidity sensing for accurate operation.
    i. Integrated motion/occupancy sensor with Adaptive Occupancy Scheduling. Also included with occupancy scheduling shall be factory set 45 minute delay before setback, adjustable in 5 minute increments. Factory setting will provide occupied cooling or heating operation of 45 minutes with no sensing of occupied motion, before going into setback. This routine must be included to eliminate significant temperature drift during day time schedules.
    j. All models shall have a 72-hour power capacitor backup and a real time clock for network time synchronization or for full stand-alone operation.

7. Real Time Clock (RTC): Each CompleteStat™ shall include a capacitor-backed, real time clock for 72 hours, accurate to 1.5 minutes per month. The RTC shall provide the following: time of day, day, month, year, and day of week. The system shall automatically correct for daylight savings time and leap years.
8. Power Supply: The power supply for the CompleteStat™ shall be 24 volts AC (–15%/+20%, 3 VA or less @ 28.8 VAC) power. Line voltage below the operating range of the system shall be considered power outage.
9. Automatic Restart after Power Failure: Upon restoration of power after an outage, the CompleteStat™ shall automatically and without human intervention update all monitored functions; resume operation based on current synchronized time and status, and implement special start-up strategies as required.
10. Capacitor backup: The CompleteStat™ shall include an on-board capacitor to back up the controller's RAM memory. In the case of a power failure, the device shall first try to restart from the RAM memory. If that memory is corrupted or unusable, then the device shall restart itself from its application program stored in its FLASH memory.
11. The cooling operating temperature range shall be between 66°F and 90°F.
12. The heating operating temperature range shall be between 60° and 80°F.
13. The humidity control range shall be between 50% RH and 75% RH.
14. The CO_2 control range shall be between 500ppm and 2000ppm.

C. Software Specifications
1. General: The CompleteStat™ shall contain FLASH memory to store both the resident operating system and application programming. Each device shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function shall not be interrupted due to normal user communications including interrogation, program entry, extraction of the program for storage, system communications, etc.

D. History Logging: Each controller shall be capable of locally logging eight values (any input, output, calculated value, etc.) over user defined time intervals (1 second minimum time). Up to 256 values shall be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, COV notification or manual command.

E. Standard Features: Each CompleteStat™ shall have the following standard features:
1. The Firmware shall be upgradeable.
2. Up to 7 on-board inputs (including built-in sensors) and up to 9 on-board outputs.

3. Shall dynamically allocate memory resources to provide flexible use of its memory.
4. Shall employ at minimum a 32-bit microprocessor.
5. Shall meet or exceed the specifications in the ANSI/ASHRAE BACnet Standard 135-2008 for BACnet AACs.
6. Shall have screw terminal blocks that can accommodate wire sizes 14–22 AWG.

F. Application Support Embedded from the Factory shall include the following (where relevant):

1. 1H/1C packaged equipment
2. 1H/1C heat pumps (with aux. heat)
3. 2H/2C heat pumps (with aux. heat)
4. Other single-stage and two-stage thermostat applications
5. Occupancy-based operation
6. Dehumidification sequence
7. Ventilation sequence based on occupancy, schedule, or CO2