

## Wireless Communications - Automatic Temperature Control Specification

Section 15900 - Building Automation System/Automatic Temperature Control (pre-2004 numbering)

Section 23.09.00 – Instrumentation and Control for HVAC

Section 23.09.23 – Direct-Digital Control System for HVAC

Section 23.09.33 – Electric and Electronic Control System for HVAC

### PART 1: General:

- 1.1 The automatic temperature controls (ATC) under this section will be supplied and installed in accordance with the General Conditions, Supplementary Conditions, and all Division I General Requirements and Referenced Documents.
- 1.2 The installation of the ATC shall be in accordance with all National, State and Local codes pertaining to this type of work.
- 1.3 All work must comply with Section 15050 (pre-2004) and Section 23.05.05 - Basic Materials and Methods, and all other Division 15 (pre-2004) and Division 23 Sections, as applicable.
- 1.4 The scope shall include furnishing and installing a temperature control system to include remote control panels, temperature control devices, appurtenances, etc., to accomplish specific control sequences specified herein
- 1.5 The scope shall include all thermostats, sensors, thermostat network controllers, modems, LAN, WAN, and all other new components of the system requiring connections.

### PART 2: General Instructions:

- 2.1 The Building Automation System/Automatic Temperature Control (BAS/ATC) Contractor herein shall provide the BAS/ATC Systems as specified in their entirety. The BAS/ATC Contractor shall base the Bid on the system as specified and on the sequence of operations.
- 2.2 As part of the Bid, the BAS/ATC Contractor shall submit for review by the owner's authorized representatives a written description of his BAS/ATC systems, including block diagrams showing all major components and control panels, and required cabling between each.
- 2.3 The BAS/ATC contractor shall include manufacturer's literature for each type of panel, controller, or related device for the BAS/ATC System that may be shown on the Mechanical / Electrical / Plumbing (MEP) Diagrams.
- 2.4 The MEP Diagrams shall show schematically, the entire building system with all major components identified, including Riser Diagrams as needed.

### PART 3: Scope of Work:

- 3.1 The BAS/ATC systems shall be supplied and installed completely under the BAS/ATC Contract. Control components shall be mounted and wired by the BAS/ATC Contractor.
- 3.2 The BAS/ATC Contractor shall provide the engineering, installation, calibration, software programming and checkout necessary for complete and fully operational BAS/ATC systems, as specified hereafter.
- 3.3 Cabling in exposed areas and in mechanical rooms shall be in EMT or otherwise required by code or the MEP Engineer. Cabling in accessible concealed areas, open ceiling return air plenums or where cable penetrates any supply or return air duct shall be plenum rated cable.

### PART 4: Submittals:

- 4.1 The following data/information shall be submitted for approval:
- 4.2 Complete sequence of operation.
- 4.3 Control system drawings, including all pertinent data, shall provide a functional operating system.
- 4.4 Data sheets for all hardware control components.
- 4.5 A description of the installation materials including conduit, wire, interconnects, etc.
- 4.6 Thermostat and Sensor locations.
- 4.7 Wireless Network Coordinator and Repeater locations.
- 4.8 Network Controller locations.
- 4.9 Remote Access equipment locations, including Ethernet Network Adapters and modems.
- 4.10 Provide as part of the submittal five copies of all data and control drawings.

#### **PART 5: Qualifications:**

- 5.1 The BAS/ATC Contractor shall have an office within 100-mile radius of the job site, staffed with factory-trained personnel shall be capable of providing instruction, routine maintenance and 24-hour emergency maintenance service for all system components.
- 5.2 The BAS/ATC Contractor shall have a minimum of three years experience of installing and servicing similar microprocessor based control systems.
- 5.3 The Contractor shall be prepared to provide evidence of this history as condition of acceptance and approval prior to bidding.

#### **PART 6: Controls Manufacturer:**

- 6.1 The control system will be by NetworkThermostat of Grapevine, TX. Any substitution of the above specified control system shall require adherence to 100% of the specifications herein with no exceptions, and must be approved by the engineer. Contact NetworkThermostat at 866-563-0711 for pricing & assistance.
- 6.2 For substitution submit complete description, engineering data, names of existing installations of substitute products.
- 6.3 Be prepared to provide a field inspection by the engineer, if he so chooses to observe actual installation of proposed substitution.

#### **PART 7: Network Controllers:**

- 7.1 Each Network Controller shall have the ability to control up to 16 or more individual thermostats.
- 7.2 Each Network Controller shall have the ability to work independently or in conjunction with other Network Controllers in the same facility or other facilities, while some or all being controlled by a single application of the Net/X Command Center software.
- 7.3 Each Network Controller shall have the ability to communicate over the bi-directional thermostat communications bus in both a wired and wireless mesh-network fashion.
- 7.4 Network Controllers shall have the ability to read outdoor temperature data from one outdoor sensor connected to one thermostat and broadcast the outdoor temperature data on a periodic basis to all other thermostats connected to the Network Controller.
- 7.5 The total system shall be scalable to any size facility, and at least to 8,000 thermostats.
- 7.6 Computer interface with serial port (RS-232). 7-foot connection cable furnished.
- 7.7 Separate LAN/Modem interface with serial port (RS-232).
- 7.8 Network Controller shall allow a combination of two connections, Computer & Modem or Computer & LAN.
- 7.9 Network Controller shall be powered by 16 Volt AC transformer supplied with the Controller.
- 7.10 Network Controller shall contain real-time clock and calendar that maintains accurate time to within one minute for one week without power for a minimum of 7 days.
- 7.11 Network Controllers shall have non-volatile memory and return to normal operation after a power loss of less than seven days without human intervention.
- 7.12 Network Controllers shall have the ability to store a minimum of 1,000 independent thermostat schedules in non-volatile memory.

#### **PART 8: Wireless Communications :**

- 8.1 The system communications between the Network Controller(s) and the thermostats shall be a wireless mesh network architecture.
- 8.2 The wireless mesh network configuration must adhere to the IEEE 802.15.4 specification and operate in the band of 2.4GHz as a frequency hopping, spread spectrum network.
- 8.3 The wireless mesh network shall constitute a wireless communications path between the Wireless Coordinator(s) and Wireless Thermostat Backplates.
- 8.4 The Line of Site (L.O.S.) range from a Wireless Coordinator and the Wireless Thermostat Backplate shall be specified at 3,000 feet or greater, and the L.O.S. range from backplate to backplate shall be specified at 1,000 ft.
- 8.5 Each Wireless Thermostat Backplate shall incorporate wireless mesh network 'hopping' technology, allowing the communications to 'hop' from one backplate to the next.
- 8.6 The wireless mesh network configuration must be 'self-healing', attempting to finding alternate paths to the end destination of the communications in the event a known primary path is unavailable.

**Part 9: Thermostats:**

- 9.1 All thermostats will have LCD showing current space temperature.
- 9.2 All thermostats shall display mode of operation.
- 9.3 All thermostats shall be able to be over-ridden in unoccupied periods for one hour of occupied operation.
- 9.4 While in override mode, thermostats shall have the restricted ability of +/- 1°F and +/- 3°F override during the override period, selectable during setup of the thermostat.
- 9.5 All thermostats shall be able to display current setpoints.
- 9.6 All thermostats shall be able to display outside temperature when associated sensor is installed.
- 9.7 All thermostats shall operate with "Fuzzy Logic" for efficiency and closer temperature control.
- 9.8 All thermostats shall have a minimum of 2°F dead-band between heat and cool setpoints.
- 9.9 All thermostats shall communicate via Category5 cable (using 1 pair) with a bi-directional signal to the network controller.
- 9.10 All thermostats shall have independent addressable function for communication independently with Network Controller.
- 9.11 All thermostats shall provide automatic changeover of mode of operation.
- 9.12 All thermostats shall have three-wire digital communications remote sensor bus available for operation by one remote sensor or a series of remote sensors up to 6. When utilizing multiple remote sensors the temperature will be the average of the remote sensors. Thermostats shall employ microcontroller intelligence to automatically average the number of sensors connected and ignore the sensor internal to the thermostat when remote sensors are connected.
- 9.13 Thermostats shall have the optional ability to lock out the front panel of the thermostat to prevent tampering by area occupants.
- 9.14 Thermostats shall have the ability to change from occupied to unoccupied scheduling by the Network Controller, front panel control, and an independent contact closure.

**PART 10: Additional Remote Sensors:**

- 10.1 Remote temperature sensors shall employ a three-wire digital communications bus that shall be wired in series, starting at the associated thermostat and continuing from one sensor to the next, with a working range of up to 300 feet total for all sensors.
- 10.2 Remote temperature sensors shall be serial communication type with direct three-wire connection for data and power.
- 10.3 Remote Sensors shall be available for surface mount in conditioned spaces and for duct mount for duct sensors.
- 10.4 The outdoor sensor electronics shall be mounted in a dry environment and sensor probe be able to withstand normal exterior conditions.
- 10.5 The outdoor sensor shall be able to communicate directly with its thermostat for outdoor temperature readout at the thermostat.

**PART 11: Communication/Scheduling Software & Hardware:**

- 11.1 The communication and scheduling software shall be housed on an independent computer with a Microsoft 2000, NT, XP or Vista operating system.
- 11.2 The software shall be MS-Windows based.
- 11.3 The software shall have the ability to manage multiple projects from local or remote locations.
- 11.4 Software shall provide for event scheduling of the all thermostats.
- 11.5 The scheduling capabilities of each thermostat shall be independent of each other with a minimum one (1) and a maximum of six (6) scheduled regular events for each day of the week for each device.
- 11.6 The scheduling capabilities shall include multiple individual or system-wide event schedules.
- 11.7 The scheduling capabilities shall include Windows drag-and-drop copying capabilities to copy schedules from one thermostat to another.
- 11.8 Once the schedule delineation has been completed, schedules shall be downloadable to the Network Controllers for the system to operate those schedules.
- 11.9 After successful completion of downloading the computer shall be needed only for schedule changes, adjustment of time/date, or monitoring the system as required.
- 11.10 The computer shall communicate to the BAS/ATC network system by a bi-directional communications with RS-232 serial port connections, via optional modem or LAN (Ethernet/Internet connection.)

**END OF SECTION**