

SECTION 27 53 13 – WIRELESS CLOCK SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish and install a complete new wireless clock system.
- B. Provide training as listed in part 3.

1.2 SUMMARY

- A. This Section addresses the needs and requirements of the wireless clock system. It includes requirements for the wireless clock system components including, but not limited to, the following:
 - 1. Wireless Transceiver.
 - 2. Wireless Repeater.
 - 3. Secondary Analog Clock.
 - 4. Master Clock and Network Synchronization Module.

1.3 SYSTEM DESCRIPTION

- A. General: Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating wireless clock system.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract:
 - 1. Sections:
 - a. Submit equipment prints, full electronic wiring diagrams and specifications sheets for each item specified herein. Specification sheets shall be submitted on all items.
 - b. Shop drawings detailing wireless clock.
 - c. Wiring diagrams, detailing wiring for power, signal, and control.
 - d. Submit wiring diagrams showing typical connections for all equipment.
 - e. Submit a certificate of completion of installation and service training.

1.5 QUALITY ASSURANCE

- A. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least three (3) years. The contractor shall utilize a duly authorized distributor of the equipment supplied for this project location with full manufacturer's warranty privileges.

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- C. The contractor shall show satisfactory evidence, upon request, that the supplier maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The supplier shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.
- D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."
- E. Installation and startup of all systems shall be under the direct supervision of a local agency regularly engaged in installation, repair, and maintenance of such systems. The supplier shall be accredited by the proposed equipment manufacturers.
- F. The agency providing equipment shall be responsible for providing all specified equipment and mentioned services for all equipment as specified herein. The agency must be a local authorized distributor of all specified equipment for single source of responsibility and shall provide documents proving such. The agency must provide written proof that the agency is adequately staffed with factory-trained technicians for all of the specified equipment. The agency must have established business for and currently be providing all services for the equipment.
- G. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of the system after the initial warranty period.
- H. The supplier shall visit the sites and familiarize himself with the existing conditions and field requirements prior to submitting a proposal.
- I. The contractor is responsible for all cost associated with proper installation, termination, configuration, programming, impedance and load matching of all system components.
- J. The contractor shall provide all necessary masonry, covering, patching, and painting work in order to render any residue of the existing central equipment invisible. All finished surfaces shall be chosen in consultation with the Owner, to assure that the Owner's aesthetic preferences have been adhered to.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory boxes. Store in clean, dry space in original boxes. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Sapling, Inc. (Basis of Design).
 - a. If the intercom manufacturer uses Sapling clocks, provide documentation stating this.
- B. The intent of this specification is to establish a standard of quality, function and features. It is the responsibility of the bidder to ensure that the proposed product meets or exceeds every standard set forth in these specifications.

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- C. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.

2.2 SYSTEM REQUIREMENTS

- A. Wireless clock system with interface capability to GPS, network, internet and existing systems such as: 58-minute, 59-minute, National Time & Rauland sync-wire, once a day reset, 2-wire digital communication and RS485 communication.

2.3 SYSTEM

- A. The system can work as a standalone system or in conjunction with an existing wired system and the system shall have interface capability to GPS, network, Internet and existing systems such as: 58-minute, 59-minute, National Time & Rauland sync-wire, once a day reset, 2-wire digital communication and RS485 communication.
- B. The system shall be capable of working in 915-928 MHz or 2.4 GHz frequency-hopping technology. The system shall be capable of automatic transmission of data along 51 alternating frequencies that allows for an enhanced signal, even if there is interference in one of the frequencies.
 - 1. System shall be supplied at 900 MHz, unless coordinated otherwise with the owner to match other clocks in the district.
- C. Each clock in the system shall be capable of receiving and transmitting the wireless signal which allows it to be used as a repeater while boosting the data stream and sending along the system. With this dual capability there shall be no limit on the number of clocks that can be used in the installation. The clock shall be designed to automatically work together without interference with each other. The system shall be capable of increasing the quality of the signal while increasing the quantity of the clocks.
 - 1. The use of satellite transmitters required to extend the range of the main transmitter shall be acceptable. These satellite transmitters, and all required interface equipment, including, but not limited to, wireless receiver switches, receptacles wired to nearest receptacle circuit with (2) #12 with (1) #12 ground in ¾" conduit, power packs, etc. shall be included with the system, and not be an additional charge to the owner.
- D. The analog clocks shall be capable of working in the following manner
 - 1. 110 volts AC; the clock receives and transmits time every one (1) minute.
- E. The analog clock shall include automatic digital calibration for time base to minimize deviation from each other.
- F. The analog clock shall have a built-in close-loop system that will allow the clock to detect the position of the hands and bring the clock to the right time even if the clock were manually or forcefully altered.
- G. The analog clock shall have the capability for diagnostic function that will allow the user to view the quality of the signal, how long since the last time the clock received a signal, as well as functional tests of the electronics and the gears.
- H. The system shall operate in a license-free frequency range where no license is required.

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2.4 FCC APPROVAL

- A. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
1. Reorient or relocate the receiving antenna.
 2. Increase the separation between the equipment and receiver.
 3. Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
 4. Consult the dealer or an experienced radio/TV technician.

2.5 PRODUCT

A. Transmitter/Transceiver

1. The Master Clock shall be the Sapling SMA 3000 Series. The master clock shall have an LED display, as well as a backlit, two row by twenty-character LCD display. It shall also have a 16-button rubber tactile keypad next to the displays that shall allow a user to program the master clock. The master clock shall have up to ten pre-programmed NTP servers which will be accessible for modification over a network interface. The master clock will be capable of receiving signals from existing master clocks via RS485, 59-minute correction, 58-minute correction, National Time and Rauland transmission protocol, or Dukane transmission protocol. The master clock (when a wireless transmitter is attached) shall be capable of translating a wired synchronization signal into Sapling's wireless signal, and then broadcasting the wireless signal to Sapling SAL(G) and SBL(G) secondary clocks. The master clock shall contain two clock circuits that have the capability to run synchronous wire systems such as 59-minute correction, 58-minute correction, National Time/Rauland or a once-a-day pulse for intercom systems. The master clock shall be capable of interfacing with the SAM Series analog clock via the Converter Box. It shall also be capable of interfacing with the SRM Series analog clock and any of Sapling's 3200 or 3300 series digital clocks via RS485 communication protocol. The master clock shall be powered by 115VAC/60 Hz or 230VAC/50 Hz. The master clock will be capable of acting as a repeater for another master clock. The master clock shall contain the necessary circuitry and programs so that a typical web browser, like Internet Explorer, can access the clock over a local area network. When accessed this way, the clock settings can be modified through a graphic user interface. The interface shall allow the user to program all of the display features for secondary clocks, the IP settings of the master clock, and any system setting that the master clock has.
2. Provide rack mount to install in intercom rack. If intercom is not specified, provide surface mount.
3. Provide with transmitter to be used with wireless clocks.
4. Provide with (S)NTP Server option.
5. Provide with four (4) auxiliary zones.

B. Repeater

1. The repeater shall be a Sapling Wireless Repeater. It shall receive and transmit wireless data using Sapling's proprietary wireless protocol. The repeater shall receive and transmit data on a frequency of either 915-928MHz, or 2.4GHz, depending on the hardware that was ordered. This will allow it to communicate with wireless SAL(G) Analog and SBL(G) Digital clocks operating on the same frequency range using frequency-hopping technology. The repeater shall have a maximum antenna

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size of seven (7) inches, an RF input sensitivity of -103dbm , a power output of 27 dBm, and shall be FCC approved. The voltage input for the repeater shall be 115V/60Hz or 230V/50Hz.

2. Provide repeaters as necessary to accommodate building. Locate in storage and janitor closets.

C. Analog Clock

1. The secondary clock shall be a Sapling SAL(G) Series wireless clock. It shall be an analog clock with a black hour hand, a black minute hand, and a red second hand. The clock will be capable of receiving and then re-transmitting a signal from any other Sapling device that transmits data using Sapling's wireless protocol. The clock shall use frequency-hopping technology to receive time data on a frequency range of either 915–928 MHz or 2.4GHz, depending on the type of transmitter that was ordered. The clock shall also be able to retransmit time data on the same frequencies: either 915-928MHz or 2.4GHz, depending on the type of transmitter that was ordered. The frequency-hopping technology shall allow the clock to transmit time data without causing interference to other wireless devices that may be transmitting at the same time. The clock shall be designed to be used with the Sapling SMA Series Master Clock (with the transmitter option installed) or the Sapling Repeater. Time data shall be transmitted and received by the clock via Sapling's wireless communication protocol. The clock shall also be designed to receive and retransmit time data to Sapling's SBL(G) Series clocks and other SAL(G) Series clocks. Upon receipt of the wireless signal, the clock will immediately self-correct. The clock's transmitter shall be able to successfully transmit data over a line-of-sight, unobstructed distance of up to 1320 feet (402 meters). The clock shall include an executable method for automatic hand calibration, as well as a diagnostic function that allows the user to view the quality of the signal, the last time the clock received a correction signal, the performance and results of a gearbox test, and a comprehensive analysis of the entire clock movement. These diagnostic functions shall be enabled by pressing a button on the clock movement. The clock shall require fewer than five (5) minutes to perform a correction of the hand positions. The battery-powered model of the clock shall be capable of receiving a signal every two (2) or four (4) hours. The 24V, 115VAC or 230VAC models of the clock shall be capable of receiving a signal every minute. The clock shall have a smooth surface ABS case which can be attached either directly to the wall, or to a standard-sized gang box. The round versions of the case shall be designed such that they will fit within Sapling's wood or aluminum round clock housings. The clock case shall be produced in round cases with diameters of 9, 12, or 16 inches, or square cases with widths of 9 or 12 inches. The dial is to be made of durable polystyrene material. The crystal is to be made of shatterproof, side molded polycarbonate. The clock shall be FCC compliant, in accordance with part 15 Section 15.247.
2. Project shall be supplied with round, 120V black clocks.
 - a. Provide 9" dial size in private offices and small conference rooms, as indicated.
 - b. Provide 16" dial size in large spaces, including, but not limited to cafeteria, gymnasium, auxiliary gymnasium, auditorium/theatre, natatorium, library/media center, and where indicated on the drawings.
 - c. Provide 12" dial size in all other locations. Provide double faced clocks in corridors, where indicated.
3. Clocks shall be supplied with mounting brackets to be installed where indicated.
4. Provide clocks with compatible wire guard in gymnasium and where indicated.

D. Network Synchronization Module

1. Provide synchronization module as required to interface with the intercommunications system. The module shall also provide secondary clock correction for analog and digital secondary clocks. Using an Ethernet connection to the internet, the module shall synchronize its time with the Atomic Time from the NIST (National Institute of Standards and Time). In turn, the module shall synchronize the associated systems and/or secondary clocks. As an option, in one-minute increments, the module can be offset by \pm fifteen (15) minutes from the Atomic Time, based on the requirements of the

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- facility. The module shall be configured and modified by a PC using a USB (1.0 or later) or LAN connection and the module configuration software application.
2. The module shall be installed in the intercom rack with a rack mount kit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the wireless clock system.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 1. Install system in accordance with applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Wiring Methods:
 1. Conceal wiring except in unfinished spaces.
 2. All new wiring on this project must be properly rated for the application. All low voltage wiring in ceiling cavity shall be plenum rated, or in conduit.
 3. Cable to the new devices at new locations shall be installed in a neat and workmanlike manner, following the standard procedures used in the electrical contracting trade.
 4. Exposed wiring will not be permitted under any circumstances on this project.
 5. Any wiring, which is considered sloppy by the Engineer, shall be strictly unacceptable.
 6. Upon installation completion, a room-by-room test shall be conducted for every device in the system. A technician shall perform the test, and repairs shall be performed as needed at no cost to the Owner to any devices, which do not function correctly, including cable. A written room-by-room report following testing and repairs shall be prepared and submitted to the Engineer.
- C. Provide necessary receptacle and connection to 120-volt clocks and repeaters from nearest unswitched receptacle.

3.3 FIELD QUALITY CONTROL

- A. Contractor Field Service:
 1. Provide services of a service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Inspection:
 1. Make observations to verify that units and controls are properly labeled.

C. Testing:

1. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at the Contractor's expense. Verify by the system test that the total system meets the specifications and complies with applicable standards.

3.4 TRAINING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Operators Manuals and Users Guides shall be provided at the time of this training.
- B. Schedule training with Owner through the Architect, with at least seven (7) days advance notice.

3.5 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 27 53 13