

WIRELESS CLOCK SYSTEM

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS & SCOPE

- A. Furnish and install a complete new wireless clock system using Sapling, Inc. wireless system.
- B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of Sapling, Inc. The specifying authority must approve any alternate system.
- C. Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least ten (10) days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six (6) installations of the identical system proposed which have been in operation for a period of two (2) years.
- D. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the “precise functional equivalent” shall result in the removal of the alternate system at the contractor’s expense.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Requirements of the following apply to this Section:
 - 1. Basic Electrical Requirements
 - 2. Basic Electrical Materials and Methods

1.3 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. Master Clock with Wireless Transceiver
 - 2. Wireless Repeater
 - 3. Elapsed Timer
 - 4. Secondary Analog Clock
 - 5. Secondary Digital Clock

1.4 SYSTEM DESCRIPTION

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.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract Sections:
 - 1. Submit equipment prints, full electronic wiring diagrams and specifications sheets for each item specified herein. Provide a tabulation of the specification clearly comparing the submitted item with the specified item, being able to refer to all written expressed functions and capabilities. Specification sheets shall be submitted on all items.
 - a. Shop drawings detailing wireless clock
 - 2. Wiring diagrams, detailing wiring for power, signal, and control.
 - 3. Submit wiring diagrams showing typical connections for all equipment.
 - 4. Submit a certificate of completion of installation and service training.

1.6 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.
- 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" including, but not limited to:
 - 1. Article 250, Grounding.
 - 2. Article 300, Part A. Wiring Method.
 - 3. Article 310, Conductors for General Wiring.
 - 4. Article 725, Remote Control, Signaling Circuits.
 - 5. Article 800, Communication Systems.
- E. Installation and start up 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 guarantee availability of local service by factory-trained personnel of all specified equipment from an authorized distributor of all equipment specified under this section. Maintenance shall be provided at no cost to the purchaser for a period of one (1) year (parts and labor) from date of acceptance unless damage or failure is caused by misuse, abuse, neglect, or accident. Additionally, all manufacturer supplied products must be covered by three (3) year (parts only) limited warranty from the date of acceptance. The warranty period shall begin on the date of purchase by the owner/engineer.
- H. 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.
- I. The supplier shall visit the sites and familiarize himself with the existing conditions and field requirements prior to submitting a proposal.
- J. The contractor is responsible for all cost associated with proper installation, termination, configuration, programming, impedance and load matching of all system components.
- K. 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.

1.7 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.

1.8 IN-SERVICE TRAINING

- A. The contractor shall provide training with this system. These sessions shall be broken into segments that will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The manufacturer shall be:

Sapling, Inc.
1633 Republic Road
Huntingdon Valley, PA 19006
Phone: 215.322.6063
Fax: 215.322.8498
Web: www.Sapling-Inc.com
- B. The new wireless clock systems shall each be a Sapling Wireless Clock System.
- C. The intent of this specification is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- D. The functions and features specified are vital to the operation of this facility, therefore, the acceptance of alternate manufacturers does not release the contractor from strict compliance with the requirements of this specification.
- E. The Contractor for this work shall be held to have read all of the Bidding Requirements, the General Requirements, and Contract Proposal Forms; and in the execution of this work, he will be bound by all of the conditions and requirements therein.
- F. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.
- G. In preparing the bid, the bidder should consider the following:
 - 1. No claim will be made against the owner for any costs incurred by the bidder for any equipment demonstrations which the owner requests.
- H. Any prior approval of an alternate system does not automatically exempt the supplier from the intent of these specifications. Failure to comply with the operational and functional intent of these specifications may result in the total removal of the alternate system at the expense of the contractor.
- I. Alternate equipment shall be considered if submitted to the specifying authority at least ten (10) days prior to bid date. Submission of an alternate shall contain an original draft point by point comparison of the submitted product relative to the requirements of this specification, engineering drawings of the system, and specification sheets covering all components of the system as well as all items of Section 1 "SUBMITTALS". The system and equipment drawings and specification sheet shall meet all items of the specification.
- J. Proposed alternate equipment shall be accompanied by a letter from the manufacturer clearly stating that they have read the specifications, have listed differences between their product and the specified product, and commit to meet or exceed the specified requirements herein.
- K. All proposed alternate systems must comply with Section 2.1, letters H and I above. Submissions failing to comply with the aforementioned requirement shall be deemed as non-compliant.

2.2 SYSTEM REQUIREMENTS

- A. Wireless analog and/or digital 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 stand alone 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 designed to work in an environment where cabling options are not available. The system shall be capable of working in 915-928 MHz 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.

- 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.
- D. The *analog* clocks shall be capable of working in one (1) of the following options:
 - 1. Two (2) D cell batteries; the clock receives and transmits time every two (2) or four (4) hours, as selected by the user.
 - 2. 110 volts AC; the clock receives and transmits time every one (1) minute.
 - 3. 24 volts AC/DC; the clock receives and transmits time every one (1) minute.

The *digital* clocks shall be capable of working in one (1) of the following options:

- 1. 110 volts AC; the clock receives and transmits time every one (1) minute.
- 2. 24 volts AC/DC; the clock receives and transmits time every one (1) minute.

The *elapsed timer* shall be capable of working in conjunction with either the four (4) digit or six (6) digit digital clocks and shall have the ability to count down or count up.

- E. The analog and the digital 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.

3.0 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.

4.0 PRODUCT

- A. Master Clock/Transceiver/Transmitter – There are two versions of master clocks/transmitters that can be selected. Please make a selection based on the following information.

- 1. SMA 3000 Master Clock/Transceiver/Transmitter

The Master Clock / Transmitter shall be the Sapling SMA 3000 Series. The master clock shall have a LED display, as well as a backlit, two row by twenty character LCD display. The transmitter shall be capable of transmitting data to the SAL wireless analog clock and the SBL wireless digital clock. The master clock shall be capable of receiving a signal from any SNTP time server via the Internet. The master clock shall have up to ten pre-programmed SNTP servers to use in case the clock does not receive time from one of the servers via a web interface. The transmitter will be capable of receiving signals from all Sapling Master Clocks

via RS485, as well as 59 minute correction, 58 minute correction, National Time and Rauland, and Dukane. The transmitter shall have the capability of transferring a wired system into a wireless system. The transmitter 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 transmitter shall be capable of acting as a repeater while receiving a signal wired or wirelessly from the main transmitter. The master clock shall be programmed via the 16 button rubber tactile keypad. The transmitter shall be capable of interfacing with the SAM Series analog clock via the Converter Box, and the SRM Series analog clock and SBD 1000 digital clock via RS485. The transmitter shall utilize 915–928 MHz frequency–hopping technology. The master clock shall be powered by 110VAC/60 Hz or 220VAC/50 Hz. The transmitter is pending FCC approval.

a. SMA 3000 upgrade options

1. Optional Relays (zones) - The master clock shall be capable of utilizing four or eight zones that can be used for bell scheduling, lights, etc. The zones shall be capable of being programmed via the 16 button rubber tactile keypad and LCD display.
2. GPS – The master clock shall have the option of having a GPS receiver built into the unit for synchronization from the satellites via UTC.
3. Web Interface – The master clock shall be able to be programmed completely from a web interface that can be accessed through any typical web browser such as Microsoft Internet Explorer or Mozilla FireFox. The interface shall allow the user to program all bell schedules, events, display features, IP settings of the master clock and any system setting that the master clock has.
4. SNTP Server – The master clock shall have the capability to act as a SNTP server that other devices can point to in order to receive the time through SNTP protocol.
5. Countdown for Digital Clocks – The master clock shall be able to set the countdown time between events and have the digital clocks count down

2. SMA 2000 Master Clock/Transceiver/Transmitter

The Master Clock / Transmitter shall be the Sapling SMA 2000 Series. The master clock shall have a LED display and two push switches. The transmitter shall be capable of transmitting data to the SAL wireless analog clock and the SBL wireless digital clock. The master clock shall be capable of receiving a signal from any SNTP time server via the Internet. The master clock shall have up to ten pre-programmed SNTP servers to use in case the clock does not receive time from one of the servers via a web interface. The transmitter will be capable of receiving signals from all Sapling Master Clocks via RS485, as well as 59 minute correction, 58 minute correction, National Time and Rauland, and Dukane. The transmitter shall have the capability of transferring a wired system into a wireless system. The transmitter 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 transmitter shall be capable of acting as a repeater while receiving a signal wired or wirelessly from the main transmitter. The master clock shall be programmed via the two push switches on the front panel. The transmitter shall be capable of interfacing with the SAM Series analog clock via the Converter Box, and the SRM Series analog clock and SBD 1000 digital clock via RS485. The transmitter shall utilize 915–928 MHz frequency–hopping technology. The master clock shall be powered by 110VAC/60 Hz or 220VAC/50 Hz. The transmitter is pending FCC approval.

b. SMA 2000 upgrade options

1. GPS – The master clock shall have the option of having a GPS receiver built into the unit for synchronization from the satellites via UTC.
2. Web Interface – The master clock shall be able to be programmed completely from a web interface that can be accessed through any typical web browser such as Microsoft Internet Explorer or Mozilla FireFox. The

interface shall allow the user to program all display features, IP settings of the master clock and any system setting that the master clock has.

3. **SNTP Server** – The master clock shall have the capability to act as a SNTP server that other devices can point to in order to receive the time through SNTP protocol.

B. **Repeaters** – There are two types of repeaters that are available for the wireless system. Please select the repeater based on the information below.

1. **SMA 1000 Wireless Repeater**

The repeater shall be a Sapling Wireless Repeater. The repeater shall wirelessly transmit and receive data. The repeater shall be capable of transmitting to the SAL wireless analog clock and the SBL wireless digital clock. The repeater shall work on 915–928 MHz frequency–hopping technology. The repeater shall wirelessly transmit and receive data. The repeater is to have a maximum antenna size of seven (7) inches. The repeater shall have an RF input sensitivity of –103 dbm. The repeater is to have a RF power output of 27 dbm. The voltage input for the repeater shall be 110 volts/60 Hz or 220 volts/50 Hz. The repeater is pending FCC approval.

2. **SMA 1000 Network Repeater**

The repeater shall be a Sapling Network Repeater. The repeater shall receive its time via TCP/IP from the main SMA 2000 or 3000 master clock in the application. The repeater shall be capable of transmitting to the SAL wireless analog clock and the SBL wireless digital clock. The repeater shall work on 915–928 MHz frequency–hopping technology. The repeater shall wirelessly transmit and receive data. The repeater is to have a maximum antenna size of seven (7) inches. The repeater shall have an RF input sensitivity of –103 dbm. The repeater is to have a RF power output of 27 dbm. The voltage input for the repeater shall be 110 volts/60 Hz or 220 volts/50 Hz. The repeater is pending FCC approval.

C. **Analog Clock**

The secondary clock shall be Sapling SAL-2 Series wireless clock. The clock will be capable of receiving a signal from multiple clocks. The clock shall receive and transmit with 915–928 MHz frequency–hopping technology. The clock is to be capable of transmitting the time simultaneously without interfering with each other. The clocks shall include automatic 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, a gearbox test and a comprehensive analysis of the entire clock. The clock shall have a maximum correction time of five (5) minutes. The clock shall be capable of receiving a signal every 2 or 4 hours (battery model) or every minute (24V, 110V or 220V) option. It shall be designed to be used with the Sapling SMA Series Master Clock (with transmitter option) or the Sapling Repeater, which can be regulated via Sapling wireless communication protocol. Upon receipt of the wireless signal, the clock will immediately self–correct. The clock shall have a semi–flush smooth surface ABS case. The dial is to be made of durable polystyrene material. The crystal is to be shatterproof, side molded polycarbonate. Glass and visible molding marks are unacceptable. The clock shall have black hour and minute hands as well as a red second hand. The clock shall be FCC compliant, part 15 Section 15,247.

D. **Digital Clock**

The clock shall be a Sapling SBL 1000 wireless digital clock and shall have either a full 2.5" or 4.0" high efficiency red or blue LED numeral display. The clock will operate as a wireless digital slave clock. The clock shall receive signals from other clocks in the surrounding area or from the transceiver. The clock shall receive and transmit with 915–928MHz frequency–hopping technology. The clocks will be capable of transmitting and receiving the time without interfering with each other. The clock shall have data LEDs on the board to display the receiving of data. It shall have a 12 or 24 hour display format. The clock will have two (2) levels of adjustable brightness and will feature immediate correction for time changes. The digital clock shall be capable of being installed either surface or double mount. When the input is lost, the colon on the display of the clock shall flash. The clock shall have an anti–glare red or blue bezel with a smooth surface. No external screws shall be visible on the bezel or clock housing. The clock shall be FCC compliant, part 15 Section 15,247.

E. Elapsed Timer

The Sapling Elapsed Timer (Control Box) is designed for use with the SBD or SBL 2000 Series digital clock. The control box can perform all programming commands for the digital clock, as well as additional functions using the display as a timer. The chronograph functions of the digital clock includes count up in Hour:Minute (HH:MM) mode or Minute:Second (MM:SS) mode. It also has count down mode which can be displayed in either HH:MM or MM:SS mode. Counting up and down can be interrupted and resumed, or reset. The Elapsed Timer (Control Box) also allows the digital clock to display the time as either hours and minutes, or minutes and seconds.

5.1 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.

5.2 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.
 - 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 after school hours, 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.

6.0 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.

6.1 COMMISSIONING

- 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.

6.2 CLEANING AND PROTECTION

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