Inovonics is the industry leader in high performance wireless sensor networks for security and life safety applications. With more than 10 million Inovonics wireless devices deployed across the world, Inovonics is renowned for exceptional performance and reliability.

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WIRELESS SECURITY COMMUNICATIONS NETWORK

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 05 00 Common Work Results for Electronic Safety and Security

28 05 xx Security Data Communications Wireless Transmission Equipment

Notes to Specifier:

1. MasterFormat 2014 has no identified category for wireless security communications. It is the Specifier's responsibility to assign a non-reserved number, such as 28 05 30, to this category of products. This practice is permitted by CSI.
2. Where several alternative parameters or specifications exist, or where, the specifier has the option of inserting text, such choices are presented in **<bold text>**.
3. Explanatory notes and comments are presented in **colored text.**

WIRELESS SECURITY COMMUNICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes requirements for a wireless communications network for security and safety applications.

B. Products – A wireless mesh network system, operating in the 902-928 MHz range, to include receiver or gateway, end devices (sensors/transmitters), and repeaters, providing a complete wireless security communications infrastructure.

C. Related Requirements

1. 27 50 00 Distributed Communications and Monitoring Systems
2. 28 13 26.11 Wireless Access Control Devices
3. 28 16 00 Intrusion Detection
4. 28 26 00 Electronic Personal Protection Systems

1.02 REFERENCES

A. Abbreviations

1. API – Applications Programming Interface
2. EOL – End of Line
3. HTTP – Hypertext Transfer Protocol
4. NO – Normally Open
5. NC – Normally Closed
6. REST – Representational State Transfer
7. RFI – Radio Frequency Interference

B. Definitions

1. Broadcast messaging – Radio messaging where end-devices broadcast multiple, redundant rounds for each message, which are then echoed by repeaters, extending the range in all directions. Supports multiple repeater hops.
2. Directed messaging – Radio messaging using a combination of smart routing and message management to reduce RF traffic and allow larger wireless networks. Due to the two-way requirements of directed messaging, a network coordinator must be used as an RF gateway. In a network using directed messaging, repeaters use a scheme of message management and acknowledgement to provide a highly reliable network with fewer transmissions per message. Directed messaging is more suitable for large systems. Multiple repeater hops and self-healing functionality are supported.
3. RESTful API – A system interface based on the REST software architecture, providing for web-based interfaces, typically using HTTP syntax.

C. Reference Standards

1. FCC 47 C.F.R. Part 15 – Radio Frequency Devices

2. FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ESMR frequency bands
3. ISO 18000-6C - Parameters for Air Interface Communications at 860 MHz to 960 MHz, EPCglobal Class 1 Gen 2
4. UL 2560 - Emergency Call Systems for Assisted Living and Independent Living Facilities

1.03 SUBMITTALS

A. Product Data
   1. Manufacturers' printed or electronic data sheets
   2. Manufacturers' instructions and installation and operation manuals
B. Shop Drawings
C. Test and Evaluation Reports
   1. Wireless site survey

A wireless site survey with appropriate Inovonics site survey kit is highly recommended for estimating the number of repeaters for large installations or difficult RF environments.

D. Delegated Design Submittals

List required submittals for those design activities to be performed by Contractor's licensed professional, if applicable.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Contracts
B. Operation and Maintenance Data
C. Warranty Documentation
D. Test and Evaluation Reports
E. Record Documentation
   1. Annotated drawings
   2. Project manuals
   3. List of products used

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Spare parts
B. Test equipment

1.06 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer – Manufacturer shall be ISO 9001 certified with at least 5 years experience producing 900 MHZ wireless transmission equipment.

B. Testing

1. Prior to equipment procurement and installation, a wireless site survey shall be conducted to determine the optimal placement for transmitting and receiving components of the wireless security communication network.

1.07 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall transport and store the system protected from mechanical and environmental conditions as designated by the manufacturer.

1.08 WARRANTY

A. Manufacturer shall provide a limited warranty for the equipment to be free of defects in workmanship and material under normal operating conditions for a minimum period of three years.

B. Contractor shall provide a limited warranty for the system to be free of defects in workmanship and material under normal operating conditions for a minimum period of one year from the date of system acceptance by Owner.

1. Contractor shall further support manufacturers' equipment warranties during and after expiration of system warranty.

C. Any parts shown defective in workmanship or material during the warranty period shall be repaired, replaced or adjusted without charge.

D. The system shall be supported with service and replacement parts available for a period of 5 years from the date of product shipment.

- END OF SECTION -

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Manufacturer: Inovonics Wireless Corporation
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B. Model(s): EchoStream

C. Alternates: None

2.02 GENERAL DESCRIPTION

A. The wireless communications security network (wireless network) shall consist of wireless sensors/transmitters, compatible receiver/transceiver, and wireless repeaters as needed.

B. The wireless network shall be spread spectrum with frequency hopping, operating in the 902 - 928 MHz range.

C. The wireless network shall be a self-forming and self-healing mesh network with the capability for repeaters to pass messages to neighboring repeaters.

D. Transmission over the wireless network shall employ spread spectrum technology creating redundant messages on multiple, different channels across the approved frequency band in order to achieve radio frequency interference avoidance

E. The wireless network shall be capable of managing more than 500 transmitters and at least 25 repeaters.

F. The wireless network equipment shall be capable of supporting both broadcast messaging and directed messaging.

G. Every component in the wireless network shall have the capability to be fully supervised.

H. The wireless network shall employ UL listed components, allowing certification of the system.

2.03 TRANSMITTERS

A. Transmitters shall be available which incorporate or interface with sensors which monitor conditions and events or with manual activation devices.

B. The Manufacturer shall have the following types of transmission devices available:

1. Manually activated pendant transmitters – portable transmitters, allowing body or fixed mounting, with options for up to four buttons for activation and communication of up to four alarm conditions. Additionally, manually activated pendant transmitters shall have the option of a low powered secondary radio protocol to aid in location determination.
    a. Power: 3V lithium battery
    b. Operating environment: 32^{o} to 140^{o} F, up to 90% relative humidity (non-condensing)
2. Contact transmitters – transmitters activated by the change in state of an attached NO/NC or device output, EOL status, wall tamper or case tamper.

a. Power: 3V lithium battery
b. Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

3. Motion detectors – integrated motion sensor and transmitter employing digital signal processing technology.
   a. Motion detections shall have the following features:
      1) Case tamper protection
      2) Availability in wall or ceiling mount configurations
      3) Pet immunity
      4) Option for long range lens
      5) Option for wall tamper transmission
   b. Power: 3V lithium battery
   c. Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)
4. Specialized transmitters – dedicated purpose transmitters including the following versions:
   a. Infrared-based activity detector
      1) Operating environment: 32º to 122º F, up to 90% relative humidity (non-condensing)
   b. Smoke/heat detector, suitable for residential applications
      1) RFI immunity: 20 V/m minimum; 0-1000 MHz
      2) Operating environment: 32º to 100º F, 10 - 90% relative humidity (non-condensing)
   c. Glass break detector
      1) Range: 25 feet
      2) Degrees of coverage: 360
      3) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)
   d. Dual analog input transmitter – transmits analog values periodically or upon significant change
      1) Provide transmission of analog values in the following selectable ranges:
         a) 0 – 5 volts DC
         b) 0 – 10 volts DC
         c) 4 – 20 mA
      2) Measurement accuracy: 1%
      3) Measurement resolution: 16 bit
      4) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)
   e. Temperature/humidity transmitter – transmits values from an external or integral temperature and relative humidity sensing device
      1) Temperature accuracy: 0.5º
      2) Relative humidity accuracy: 2.0%

3) Operating environment: -4º to 140º F, up to 100% relative humidity (non-condensing)

f. Dual input binary switch transmitter
   1) Power: From attached device
   2) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

g. RS -232 serial data transmitter
   1) Maximum message size: 180 bytes
   2) Power: 3.6 – 5.5 volts DC (external)
   3) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

h. Submetering transmitter – pulse counting device for utility metering and submetering
   1) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

i. Billtrap transmitter – for cash drawers with delay option to avoid accidental activation
   1) Operating environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

2.04 RECEIVERS

A. A Receiver shall be the interface between the wireless network and the application or equipment using the information from the devices or processes connected to the transmitters.

B. Receivers shall provide antennae positioning diversity and advanced signal processing to minimize nulls (dead spots) and enhance performance in noisy RF environments.

C. Receivers to interface via From C relay outputs with security control panels shall be available as follows, with the features indicated:

1. 4-transmitter interface, representing 4 alarm zones
   a. LED indication for each transmitter
   b. 5 Form C relay outputs, one for each transmitter and one for fault
      1) Rating: 2A @ 28 VDC or 110 VAC
   c. Configurable independent output modes:
      1) Follower
      2) Latching
      3) Momentary
      4) Toggle
   d. Built in wireless programming routine
   e. Security
      1) Case tamper protection
      2) Jam detection
      3) Internal placement of antennas
   f. Power: 10 – 14 VDC

g. Operating environment: 32º to 140º F, up to 90% relative humidity (non-condensing)

2. 16-transmitter interface
   a. Interfaces up to 16 transmitters and/or repeaters
      1) Supports single condition or multiple condition transmitters
   b. 2 line display indicating
      1) Transmitter status
      2) Event log
      3) Signal strength
   c. 6 Form C relay outputs, up to five for transmitters and at least one for faults
      1) Rating: 2A @ 28 VDC or 110 VAC
   d. Configurable independent output modes:
      1) Follower
      2) Latching
      3) Momentary
         a) Programmable output duration: 0.5 - 99.5 seconds
      4) Toggle
   e. Built in wireless programming routine
   f. Security
      1) Case tamper protection
      2) Jam detection
      3) Internal placement of antennas
   g. Power: 10 – 14 VDC
   h. Operating Environment: 32º to 140º F, up to 90% relative humidity (non-condensing)
3. 32-transmitter interface
   a. Interfaces up to 32 transmitters and/or repeaters
      1) Supports single condition or multiple condition transmitters
   b. 2 line display indicating
      1) Transmitter status
      2) Event log
      3) Signal strength
   c. 12 Form C relay outputs, up to eleven for transmitters and at least one for faults
      1) Rating: 2A @ 28 VDC or 110 VAC
   d. Configurable independent output modes:
      1) Follower
      2) Latching
      3) Momentary
         a) Programmable output duration: 0.5 - 99.5 seconds
      4) Toggle
   e. Built in wireless programming routine
   f. Security

1) Case tamper protection
2) Jam detection
3) Internal placement of antennas
4) Password protected access levels

g. Power: 10 – 14 VDC
h. Operating Environment: 32º to 140º F, up to 90% relative humidity (non-condensing)

4. Operating temperature for all receivers: 32º to 140º F

D. Serial receivers to interface with applications and control panels shall be available to provide an RS-232 based data exchange.
1. The RS-232 connection shall be supervised.
2. Operating Environment: 32º to 140º F, up to 90% relative humidity (non-condensing)

Inovonics has a large number of proven receiver integrations with panel manufacturers. Consult Inovonics Technical Support for the most recent list of supported products.

2.05 REPEATERS

A. Repeaters shall be available to amplify transmissions from transmitters in order to extend the range of the wireless network.
1. Repeaters shall receive and retransmit signals while ignoring background electrical noise.
2. The wireless network shall be capable of managing at least 25 repeaters.
3. Mesh functionality of the wireless network with repeaters shall be supported, allowing repeaters to pass messages to neighboring repeaters.
4. Repeaters shall be self-configurable and require no programming.
5. Every repeater shall have an on-board lithium-ion backup battery to provide power for up to 24 hours.
6. Power: 12 - 16.5 VAC or VDC.
7. Repeaters shall be supervised for missing device, case tamper, wall tamper, AC power loss, and low back-up battery.

B. The Manufacturer shall make repeaters available in both indoor and outdoor enclosures.
1. Operating Environment: 32º to 140º F, up to 90% relative humidity (non-condensing).

2.06 LOCATORS

A. Locators shall be available to receive low-powered transmissions from transmitters in order to determine the location of portable transmitters.
1. Locators shall receive and retransmit signals while ignoring background electrical noise.
2. Locators shall be self-configurable and require no programming.
3. Power: 12-24VAC 50/60 Hz or 12-24VDC (EN5061) 100-120VAC 50/60 Hz (EN5060)
4. Locators shall be supervised for missing device.

B. The Manufacturer shall make locators available in both indoor and outdoor enclosures, outlet, in-wall mounting.
1. Operating Environment: 20°C ~ 75°C. -4º to 167º F, up to 90% relative humidity (non-condensing)

2.07 AREA CONTROL GATEWAY

A. The Manufacturer shall provide for availability of an area control gateway receiver to serve as a bridge between the wireless network and TCP/IP communication over an Ethernet network.

1. Interface: 10/100 Ethernet (RJ-45)

B. A RESTful API shall be available for the Manufacturer to allow third party integration with standard web development tools.

C. Area control gateway setup, configuration, and management tasks shall be achievable through a web browser interface.

1. Supported browsers: Mozilla Firefox, v35 or later; Internet Explorer, v 11 or later

D. The area control gateway shall log up to 3000 alarm, trouble, and system events.

E. The area control gateway shall manage directed messaging signals throughout each affected link in the wireless network.

F. Number of supported devices:

1. Transmitters: 3000
2. Repeaters: 500

G. Power options

1. 12 – 24 VDC, 500 mA
2. PoE, IEEE 802.3at compliant

H. Operating Environment: -4° to 140° F, up to 90% relative humidity (non-condensing)

2.08 MOBILE DURESS GATEWAY

A. The Manufacturer shall provide for availability of a mobile duress IP gateway to serve as a bridge between the wireless network and a cloud service to process and locate alarms.

1. Interface: 10/100 Ethernet (RJ-45)
2. Internet: DHCP (lease >30 sec); outbound connections allowed on: DNS (53/TCP+UDP), HTTPS (443/TCP), NTP (123/UDP), OTA (9000/TCP)
3. In the case of an Internet connectivity outage received wireless messages are buffered and sent automatically to the cloud upon end of the outage. Able to store messages for 150 transmitters for 30 days reporting at 15 minute interval, or equivalent.

B. Mobile duress gateway setup, configuration, and management tasks shall be achievable through a web browser by logging into the Mobile Duress Application.

1. Static IP configuration possible via file loaded directly from a USB stick.
2. Configuration for directed networks possible via file loaded directly from a USB stick, by default only supports broadcast networks. Requires a network coordinator to be present as well for directed network support.
3. Firmware updates are pushed to the gateway over the Internet by the manufacturer.

C. Power options

1. 12 – 15 VDC or 12-14V AC, 16W
2. PoE, IEEE 802.3af-2003 compliant

D. Operating Environment: 32º to 140º F, up to 90% relative humidity (non-condensing)

2.09 NETWORK COORDINATOR

A. The network coordinator shall manage directed messaging signals throughout each affected link in the wireless network.

B. The network coordinator shall support unidirectional and bidirectional device transmissions.

C. Application interface: RS-232 serial

D. Operating Environment: -4º to 140º F, up to 90% relative humidity (non-condensing)

2.010 MOBILE DURESS CLOUD SERVICE

A. API Integrations shall be used to receive system health, device health, and location messages related to alarm events.

1. MQTT integrations shall be used for allowing third party monitoring systems to receive messages.

2.011 SYSTEM TOOLS

A. The Manufacturer shall have available survey tools to allow determination of best locations for transmitters and repeaters, anticipated performance, system range, emulation of background noise.

- END OF SECTION –

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions – The Contractor shall verify that, during the construction process, there have been no changes which will adversely affect the performance of the wireless network.

B. Pre-installation testing – The Contractor shall perform suitable tests to confirm the RF environment, prior to installation of any equipment. Such testing shall be intended to provide confirmation of placement of transmitters, repeaters, and receiving devices.

1. The Contractor shall provide a written report of results for these tests to the owner upon completion.
2. Any discrepancies between device placement between the designed environment and pre-installation testing which would adversely affect the performance of the wireless network shall be brought to the attention of the Owner.

3.02 INSTALLATION

A. The Contractor shall follow all Manufacturer's published installation procedures and guidelines.

B. Testing – The wireless network shall be tested to insure performance consistent with product and project specifications.

1. A written report of results shall be provided to the Owner.

C. Adjusting – Remedial action shall be proposed to correct any degradation of any link in the installed systems.

1. Contractor shall correct any degradation for which he is judged by the Owner to be responsible.
2. Contractor shall recommend solutions to areas where performance degradation has been caused by factors not of his making.

3.03 CLOSEOUT ACTIVITIES

A. Demonstration – The Contractor shall demonstrate the proper operation of the wireless network.

B. Training – The Contractor shall provide for training f the Owner's personnel on proper operation and maintenance of each system and piece of installed equipment.

- END OF SECTION -