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ALARMAGENT.COM® WIRELESS, WEB-BASED MONITORING EQUIPMENT AND SERVICES SPECIFICATION

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PRODUCT DESCRIPTION

Wireless, web-based alarm detection and notification system from RACO designed specifically for water and wastewater applications. Dependable alarm monitoring and detection. Highly customizable notification preferences. Around-the-clock status access from any Internet connected device.

System shall be sufficiently robust to permit direct user on demand management of the following functions via the web; administration and configuration of WRTUs (Wireless Remote Terminal Unit), system preferences, users, reporting parameters, and report generation — requiring no direct participation by the manufacturer.

The system shall be able to operate in real-time mode. If chosen, this state allows the WRTU to report in constant stream all sampled measured data that users require reported from the system. The real-time system allows users to see in real-time all local conditions at the WRTU. These conditions include; all I/O states, incoming power conditions, and battery charging states and voltage levels.

AlarmAgent.com's report generation capability is optimized for pump applications. Users can spot clogged or malfunctioning pumps in time to prevent a major disaster. And, for the first time, small pump stations can report flow data without a flow meter.

A service contract with local cellular carriers shall not be required for WRTU operation. The WRTU shall communicate with a dedicated website via wireless cellular communications.

AlarmAgent.com combines the latest in data communications and wireless technology, with the reliability and reputation of RACO's half-century of industry experience.

SECTION 1 –WRTU FIELD EQUIPMENT REQUIREMENTS

1. The WRTU shall have the following minimum complement of inputs and outputs:

A. Input Monitoring Function:

The basic unit shall continuously monitor the presence of AC power the status of (8) contact closure inputs and (2) universal inputs. AC power failure or violation of the alarm criteria at any input shall cause the unit to go into alarm status.

The unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about Normal Open versus Normally Closed inputs. Each input channel shall also be independently programmable, without the need to manipulate circuit board switches or jumpers.

B. Alarm Trip Delay: All alarm inputs, power failure alarms shall have individually assigned alarm trip delay settings. The range shall be 2 seconds – 1 hour.

C. Eight Digital Inputs: Eight (8) digital inputs monitoring dry (unpowered) contacts. These inputs shall be opto-isolated and surge protected, and shall also be drivable by five volt logic outputs. Open circuit voltage shall be 3.0 V; closed circuit current shall be 1.0 mA. All digital inputs shall use a single common return. Digital inputs may be programmed for the following functions:

- i. Normally Open, Normally Closed, or for No Alarm (Status Only).
- ii. Run Time Meter — to accumulate and report the number of hours a particular input circuit has been closed. Any channel so configured will never cause an alarm call; it will report the closed circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 999,999,999,999 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of three Run Time Meters may be programmed.
- iii. Pulse Totalizer — to count the accumulated number of pulses (momentary contact closures) occurring at the input so programmed. Up to three input channels may be programmed for a Totalizer Function. Maximum Input pulse rate is 10 Hz, with a 50% Duty Cycle. The scaled value will not “rollover” to zero until a value of 4,294,967,294 has been exceeded.

D. Two Universal Analog/Digital Inputs: Two (2) analog 4-20 mA inputs shall be provided, with 10 bit resolution (0.125%), single ended and surge protected. Absolute accuracy shall be 0.5%. Loop resistance shall be nominally 250 ohm. Universal Analog/Digital inputs may be programmed for the following functions:

- i. Independent High and Low set points shall be provided for each analog input.
- ii. The two analog inputs shall be combinable to allow High–High and Low–Low set point alarm notifications from a single sensor.
- iii. The two analog inputs shall be user-configurable to serve as additional digital inputs in lieu of analog, without need for physical settings at the WRTU.

- iv. Analog Input Report Scaling shall be configurable at the website. Scaling shall use any of these five different methods:
- Percentage (0–100%)
 - Raw converter counts (0–1023)
 - Milliampere reading (4–20 mA)
 - Custom scaling by entry of gain and offset values
 - Custom scaling by entry of two known pairs of signal level and reading values

E. Relay Contact Outputs: 2 Normally Open Output relays shall be provided.

- i. Contacts shall be rated $\frac{1}{2}$ A @ 120 VAC. These outputs shall be operable as follows:
1. On an occasional basis from the website, in either momentary or maintained mode.
 2. Or, if configured, these relays can control local action at the WRTU site to react to local alarm conditions and activate lights, or buzzers, or engage external relays to turn local pumps or machines one or off. These actions can take place automatically based on unacknowledged alarms.
- ii. WRTU shall provide the ability to automatically open and close one or both unit relays on a scheduled basis. The Relay Schedule feature shall allow one transition to open and one transition to close per day. The WRTU shall report the completion of the Relay Schedule Event to the website. If, for any reason, the WRTU unit is unable to report this event, the AlarmAgent.com website shall display the missed event on the System Dashboard. Relay Schedules shall not affect the ability to manually transition the unit relays.

2. LED Indicators shall include, both performance and diagnostic categories

A. Performance:

- WRTU on/off
- WRTU Armed/Disarmed
- Battery charge state
- Transmitting state (in Real-time operations this LED will be constantly on, this indicates that the WRTU is in constant communication with the central system)
- Continuous Signal Strength Indicator: A 10-element bar graph shall provide continuous detailed indication of received radio signal strength without reliance upon counting LED flashes or similar schemes.

B. Diagnostic:

- Input state for each digital input
- Primary power input present

- Output Relay(s) activated
- Radio status
- Account status
- Alarm status
- Violation status (an input is in violation but has not yet tripped into alarm)
- Suspended status
- Test Button Ready status

3. Data Communications:

- A. AlarmAgent.com WRTUs shall utilize the data services of most national and regional CDMA cellular carriers in North America. Data access shall be via Mobile IP or packet-switched services. Circuit-switched services and SMS text messages shall not be used for WRTU data payloads.
- B. The CommCheck feature shall enable the WRTU to "Check-In" and verify connectivity on a frequently scheduled basis. CommCheck schedule can be configured for 1- or 2-hour reporting intervals. If a unit fails to check-in at the proper time, users are alerted by the watchdog alarm that will be escalated within 10 minutes of the missed report.

4. Test Call Button:

A Test Call Button shall be included on the WRTU. When a test call phone number has been entered by the user at the website, pressing the Test Call Button shall result in a special phone call being placed to that phone number. The call shall include indication of the signal strength as received at the local cellular tower.

5. User Configuration:

The basic WRTU configuration items shall be performable via local switch settings on the WRTU, or remotely via the website.

With all digital inputs in their non-alarm state, pressing an "accept" pushbutton on the WRTU shall automatically set the open/closed alarm criteria for each input.

The WRTU shall at the user's option be configurable from the website without need to visit the WRTU.

6. Over-the-Air Firmware Upgrade Feature:

Future firmware enhancements of the operating features of the WRTU shall be implemented via over-the-air firmware upgrades automatically sent to the WRTU by the manufacturer.

7. Wiring Connections:

All wiring connections shall be via unpluggable screw-clamp terminal blocks, which accommodate 16 to 26 AWG wire.

8. Power Requirements:

- A. The WRTU shall operate on 12 to 24 VDC power input. With 12 VDC input, current shall be 1 ampere peak 200 mA average. With 24 VDC input, current shall be 0.5 ampere peak, 100 mA average.
- B. The WRTU shall be operable in a reduced solar power mode. Average current in this mode shall be 60 mA or less. The WRTU shall not power down in the solar power mode, allowing it to be contacted by the website at all times.
- C. The WRTU shall incorporate a sealed lead-acid backup battery contained within the enclosure. The battery shall be automatically charged, providing 24 hours nominal backup time (In real-time operations this nominal back-up time is reduced due to operational demands). All enclosure options shall accommodate the battery internally.
- D. Upon power failure, the battery shall maintain WRTU operation continuously until it reaches a fixed discharge level or until power is restored. The WRTU shall not power down during power failure, allowing it to be contacted via the website at any time, even during power failures.

9. Surge Protection:

Digital inputs shall be optically isolated and rated at 5,000 V. Universal inputs shall be rated at 600 watts. Power input shall be protected to 1,500 watts peak. Surge protection shall be 1,500 watts peak. The fuse shall reset automatically.

10. Environmental:

- The operating temperature range shall be -30 to + 70 °C (-22 to +158 °F)
- The storage temperature range shall be -40 to + 85 °C (-40 to +185 °F)
- Allowable humidity shall be 0 to 95% non-condensing.

11. Physical:

- A. The WRTU shall be available in the following form factors:
 - Durable Indoor (enclosure version): 9.6" H x 4.35" W x 2.75" D
 - Open chassis (no enclosure version): 9.6" H x 4.0" W x 2.44" D
 - NEMA4X (enclosure version): 8.44" H x 6.44" W x 5.2" D
 - Solar Powered (enclosure version): 10" H x 8" W x 5.5" D
- B. All four enclosure options shall incorporate all electronics plus the backup battery.
- C. A DIN rail mounting kit shall be available for vertical mounting of the Open Chassis and Indoor Enclosure versions.
- D. For pump station monitoring, the primary signal wiring connections shall be dry contact inputs reflecting the on/off state of each pump. No other input connections shall be required to provide all the pump monitoring functions described below.

12. Alarm and Return to Normal Reporting:

The WRTU shall transmit both alarms and returns to normal to the website. Website settings shall determine whether actual notifications are delivered to users upon return to normal.

13. Alarm Suppression:

The WRTU shall incorporate means to suppress alarm reports arising from any given input going in and out of alarm repeatedly. Such suspensions shall apply only to the input involved. Notification shall be provided when such suspensions occur. Such suspensions will automatically clear upon receipt of template reports or when manually cleared at the WRTU.

14. Pumping Station Performance Reports:

The WRTU shall automatically generate daily reports of the following pumping station performance parameters, presented at the website, in tabular and visual/graphic formats:

- Runtime for each pump, both daily and cumulative
- Runtime ratio between pumps
- Number of starts for each pump
- Starts Ratio between pumps
- GPM output for each pump
- Total station flow without need for flow meters.
- Hours with two pumps running simultaneously (two pump stations only)
- Hours to maintenance based upon cumulative run times (two tracks per pump)

15. Pump Performance Alarm:

Independent of the daily reports, the WRTU shall promptly and automatically generate Alarm Notifications upon sudden sustained drop in GPM performance of any pump. The sensitivity of this alarm function shall be user configurable to allow for variation in conditions between pumping stations.

16. Pump Performance Application Templates:

To simplify configuration, the WRTU shall provide the following Application Template settings according to the pumping station setup:

Template No.	No. Of Pumps Monitored	Reports Pulse Flow Meter* Totals	Reports Hours With 2 Or 3 Pumps Running	Additional Digital Inputs Available	Analog/ Digital Inputs Available
1	2	No	Yes	6	2
2	2	Yes	Yes	5	2
3	3	No	No	5	2
4	3	Yes	No	4	2

*Alternatively, rain gauge pulses may be reported. The maximum pulse input rate shall be 10 Hz at 50% duty cycle. The minimum pulse closure time shall be 50 milliseconds.

17. Other General Purpose Application Templates:

Other Application Templates shall also be selectable for general purpose monitoring applications, incorporating various configurations of pulse-counting, time accumulation, digital and analog inputs.

18. Limited Warranty:

The Manufacturer shall provide a three year limited warranty on all equipment provided covering parts and labor performed at the factory.

19. Equipment Destination:

The WRTU shall be an AlarmAgent.com WRTU as provided by RACO Manufacturing and Engineering, Emeryville, CA 94608 (510) 658-6713.

SECTION 2 – ALARMAGENT.COM WEBSITE, SERVER AND NOTIFICATION REQUIREMENTS

The website associated with the WRTU shall be implemented on a secure, access-controlled colocation or cloud-based server system. Customer data shall be stored redundantly in physically separate data centers, with automatic immediate failover. Monitoring tools shall be implemented to notify IT administrators of any system outage.

1. The Co-Location Facility or Cloud Hosting Facility:

Shall include; 24/7/365 power, cooling, connectivity, and security capabilities to ensure mission-critical operations and business continuity. Customer Support Technicians shall provide support 24/7/365 to assist with technical projects, respond to service requests and ensure business continuity for AlarmAgent.com customers.

- A. Power: In case of a power interruption from the local utility, the facility shall maintain multiple generators to deliver continuous power up to N+2 redundancy.
- B. Connectivity: Fully redundant connectivity shall be maintained to provide outage-proof telecommunications solutions.
- C. Fire Suppression: Data center shall be equipped with state of the art pre-action laser-based particulate sampling VEDSA (Very Early Smoke Detection Alarms) systems to provide smoke and fire detection before an incident begins. Data center shall feature pre-action dry pipe sprinkler systems to extinguish a fire should one develop.
- D. Security: Physical security for systems and networks shall consist of security guards, authorized access, CCTV surveillance, alarm systems, and multiple traps throughout the building
- E. Seismic Safety: The facilities shall be located in seismically safe environments. Facility shall employ friction-pendulum base isolators allowing significant horizontal motion without damage. Data centers shall be built to withstand a “once-in-a 1,000 year earthquake.”

2. Private Information:

Shall be protected over the Internet. All pages shall be encrypted with 128-bit encryption and SHA256 hash algorithm, utilizing SSL (Secure Sockets Layer) with an SSL Certificate from a major Certificate Authority (CA). Additionally, RACO shall not sell any information collected by the website to any third parties nor shall RACO display advertisements of any kind within customer company web areas.

- A. Access to the website shall be secured by individual user log-on names and passwords. The user may optionally establish individual user pins which, if implemented, will be required to acknowledge alarm notifications and to access the AlarmAgent.com system by call-in to a toll free telephone number.
- B. The website shall provide support for mobile devices, such as smart phones that use micro browsers.
- C. User passwords shall be required to meet a minimum complexity requirement, including a minimum of 8 characters and containing at least one uppercase character, one symbol, and one number. Passwords shall be stored as a salted BCrypt hash.

3. Three Customer Access Levels:

The website shall allow three customer access levels: Users, Customer System Administrators (CSAs), and Super CSAs.

- A. Users Level: The website shall allow all users to do the following:
 - i. View a "System Dashboard" which provides an overview of any alarms, acknowledged alarms and other special status conditions of all WRTUs in the system. This shall include a list of any WRTUs, which are off-line, disarmed, expired service and recent events. Recent events area shall also contain any missed confirmation of relay events.
 - ii. Generate and view reports for each WRTU in the system. Available reports for all users shall include pump performance, analog reading, status history and arm/ disarm reports. Report ranges shall be user selectable, for arbitrary date ranges, by start and end dates using a calendar format.
 - iii. Historical data for report generation shall be retained one year.
 - iv. Pump Performance Reports shall present critical pump performance data for each selected WRTU over a selected span of time in both tabular and graphic form. The data presented shall include:
 - Daily and cumulative runtime for each pump
 - Ratios of daily runtimes
 - Daily number of starts for each pump
 - Ratios of number of starts
 - Calculated GPM performance of each pump
 - Calculated station flow without need for flow meters at the pump station
 - Grand totals for all applicable report columns

- Time Until Maintenance Due (based upon cumulative run times, two tracks)
 - Daily Hours with two pumps running (two pump stations only)
 - The graphs shall be designed such that any significant emerging anomalies in pump operation (GPM, starts, etc.) shall stand out visually at a glance.
 - The website shall provide "Next WRTU" functionality so that the user can view these key graphs in immediate succession for all WRTUs in the system.
- v. WRTU Status reports shall present all relevant status details for each selected WRTU, including but not limited to the state of each channel. Indications shall be color-coded for rapid review.
 - vi. Event Logs shall include all events related to the website and each WRTU, including a time and date stamped log of user website call-ins and logins, alarm events, notifications, acknowledgements, configuration changes by user.
 - vii. User defined Maintenance Schedule Enter the number of hours required before maintenance is required. When the number of hours updates to zero or less than zero hours, an email notification is sent to CSAs.
 - viii. Emailed reports any user generated report or event log can be emailed to selected users or to any ad hoc email address from the website.

B. CSA Functions:

Users designated as Customer System Administrator (CSA,) may perform the following advanced functions:

- i. Establish, edit and maintain a list of system users who will be eligible to access the website and receive alarm notifications.
- ii. Establish and edit notification data (phone numbers, email, etc) and optional PINs for each user.
- iii. Assign selected users into Notification Groups, which can then be linked to specific selected alarm channels on specific selected WRTUs.
- iv. Establish a Notification Sequence for each Notification Group, designating which group members are to be notified in which order, when a linked alarm event occurs. This shall include the ability to configure the time interval between each successive notification in the sequence. In addition to the standard notification group type, CSA can select "Notify Once" group, and "Blasting" group types. Notify once group shall notify users configured in notification sequence only once. Blasting group shall notify all users configured in notification sequence simultaneously. Notification is limited to text only. Voice and SMS notification types cannot be used within this group type.
- v. Configure alarm trip delays, relay output states and the time of day for daily scheduled reports from the WRTU.

- vi. Configure return to normal action, whether returns to normal will cause notifications to users, and whether returns to normal shall clear the status of the related alarm. Return to normal alarm behavior shall be settable either globally or by notification group.
- vii. Configure whether Snooze Alarms will be enabled and the number of hours for the alarm to be re-notified if the alarm condition still exists. If enabled, recipients of voice notifications may choose between regular acknowledgement or acknowledgement with snooze.
- viii. Configure alarm criteria, notification and report messages and Notification Group linkages for each input channel on the WRTU, as well as analog alarm set points for analog channels.
- ix. Configure Real-time Operational Parameters: Decisions of the real-time levels of operations such as the number of channels that are configured for real-time data sampling, the frequency of data acquisition and reporting, the sensitivity and threshold levels are configured at the following default levels: (deviations from these default settings are identified and configured at initial system configuration and setup).
 - Template Reports per Day (4)
 - Analog Reports per Day (4)
 - Channels Time Sampled (5)
 - Time Sampling Samples per Day (144)
 - Channels in Event Mode (2)
 - Events, Each Channel per Day (50)
 - Number of Pumps Event Mode (3)
 - Pump Events Each Pump Per Day (500)
 - CommCheck/Health Per Day (24)
 - Suspension Threshold (11)
 - Pump Runtime Report (1)
 - Analog Reading Reports (1)
 - WRTU Commands (15)
 - Pump Station Flow Report (1)
 - Pump GPM Report (1)
 - Pump Performance Alarms (1)
 - Return to Normal Notification — no limit
 - Power Failure Alarm — no limit
 - Watchdog Alarms — no limit
 - Digital Input Alarms — no limit

- Pump Starts Ratio Report (1)
 - Local Alarm Relay Output (configured local control)
- x. Configure the report scaling for analog inputs using any of five different methods:
- Percentage (0-100%)
 - Raw converter counts (0-1023)
 - Milliampere reading (4-20 mA)
 - Custom scaling by entry of gain and offset values
 - Custom scaling by entry of two known pairs of signal level and reading values
- xi. Notifications: Notifications shall be selectable by the CSA in any combination of voice phone call to landline phone, 2nd landline phone, cellular phone, SMS text message, alpha-numeric pagers, or primary and secondary emails.
- xii. Voice notifications shall use a high-quality text-to-voice functionality so that the name of each WRTU station and specific messages entered for each input channel for each WRTU shall be included in voice notification calls.
- xiii. Command Sessions: A session is defined as the online connection during the time the WRTU is connected to the website servers. **Sessions** contain **multiple commands**. Each new Command Session will result in the reduction of the number of Commands Sessions available for the remainder of the month. Command Sessions (configuration changes, relay commands or polling) persists a minimum of five minutes and may also be extended indefinitely by sending additional Commands within the five minute interval. In real-time operations Command Sessions starts at 15 Command sessions per month (see real-time default settings in this document)
- xiv. Establish Notifications methods: Sequences shall be settable as: Notify-until-acknowledged, snooze-alarm, notify-once (informational), or simultaneous-notify (blast).
- xv. Enter GPS mapping of each WRTU's location via latitude and longitude coordinates with street, terrain and satellite views.

D. Super CSA Functions:

Users designated as Super CSAs may perform the following advanced functions:

- i. Perform all the above listed CSA functions
- ii. Establish a hierarchy of companies beneath their parent company (very useful for rental companies). Users and CSAs of child companies shall have all standard functionality and properties of parent companies but shall be restricted to the child company.
- iii. Switch easily between all companies in the hierarchy.

- iv. Move WRTUs among all the companies in the hierarchy, as necessary.

SECTION 3 – MANUFACTURER REQUIREMENTS

The manufacturer of the equipment and provider of related services shall provide evidence of, and warrant compliance with, substantially all below listed requirements.

1. The manufacturer/service provider shall have been in business providing remote monitoring systems to the water distribution/wastewater collection industry or a substantially similar industry for at least 25 years.
2. The submitting company shall have, on staff, engineering and operational personnel with at least twenty years of combined experience in designing, manufacturing and operating wide area monitoring and alarm products for remote facilities in the water and wastewater marketplace.
3. Technical/Customer Support:

All users shall be provided and/or shall have access to the following support resources.

- A. Free Live Chat support on RACO's website staffed with trained technicians shall be available during manufacturer's normal working day.
 - B. Free comprehensive web-based support center with over 550 FAQ's shall be available for customers to retrieve copies of all available technical information directly into his own computer. The support center shall have an optimized user interface for smart phones at ***racomobilesupport.com***, allowing users to quickly navigate to the desired support topics. This service shall be available on a 24-hour basis.
 - C. A toll free 800 number shall be available during manufacturer's normal working day to permit users to talk directly with technical service personnel and resolve problems not solved by the RACO web based Support Center.
4. Manufacturer Requirements: System equipment shall be in compliance with the American Recovery and Reinvestment Act of 2009 section 1605.
 5. Manufacturer shall be classified as a Small Business Enterprise.
 6. Equipment Designation:

The website shall be an AlarmAgent.com as provided by RACO Manufacturing and Engineering, Emeryville, CA 94608 (510) 658-6713.

Specifications subject to change without notice