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KBS Incorporated
RF Only Monitoring System Project

RF Only Monitoring System Specifications

RF Only Monitoring System

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1. RF Only Monitoring System Introduction

This specification represents the technical description of the RF Only Monitoring System Project. The design must conform to current technology standards and utilize components with standard 8-16 week vendor delivery lead times. The system must be efficient to manufacture with a minimum of technical overhead required.

The remainder of this document describes the RF Only Monitoring System up to host protocol. The Host Monitoring Service software will not be described in this document.

2. RF Only Monitoring System General Description

The RF Only Monitoring System product is a desktop unit and RF transmitter specifically designed for monitoring a client's movement in and out of a defined area. The RF Only Monitoring System is designed to electronically collect the client movement as well as the system statuses. The RF Only Monitoring System contains multiple microcontrollers which perform the participant tracking, automatic system diagnostics and event reporting. The RF Only Monitoring System consists of two major components, the Monitor Unit and the Transmitter Unit.

The Monitor Unit will store and automatically report the presence or absence of the individual by virtue of an RF (radio frequency) link between the Monitor Unit and the Transmitter Unit. The RF Only Monitoring System is designed to detect if system maintenance is needed or client has tampered with the unit. This information, stored in the RF Only Monitoring System, will be made available to a Host Monitoring Service via connection over a standard telephone line. Information to and from the RF Only Monitoring System is uploaded and downloaded through modem communication over the standard telephone line in a client's home.

While the client is at home, the Monitor Unit continually supervises the confinement of the client. The Transmitter Unit, which is worn by the user, regularly transmits a unique identifier sequence for the client. The Transmitter signal is designed to discourage duplication or tracing. The Transmitter Unit is hardened, watertight and is expected to survive the harsh environment associated with securing upon the client's extremity. Yet the unit is comfortable enough to be worn for a year or more.

The RF Only Monitor System product will be low-cost. The target cost for the Monitor and Transmitter Units is \$400 in large quantities.

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3. RF Only Monitoring System Features

3.1. *The Product Feature Set*

The RF Only Monitoring System will contain the following features:

- RF link between Transmitter and Monitor
- Transmitter/receiver coding and encryption
- 150 foot transmitter/receiver range in open field
- Primary client monitoring
- Tamper switch and tamper event reporting
- Tilt switch and tilt event reporting
- AC power ON/OFF detection and event reporting
- Telephone connect/disconnect detection and event reporting
- Revolving event storage buffer of one thousand (1000) events
- Phone connection to Data Center using Modem signaling
- Battery operation of twelve (12) hours
- Standard off the shelf packaging with minimal changes
- Wall mounted "Wall wart" AC operation
- Pass FCC Part 15, FCC Part 68

3.2. *The Product Feature Set Not Included*

The RF Only Monitoring System product will **NOT** contain the following features:

- Competitor emulation mode
- Competitor transmitter compatibility
- Alcohol detection
- Telephone handset
- Verifier handset
- Touch Memory Identification on the transmitter

4. Monitor Unit

The Monitor Unit will be housed in off the shelf packaging. Telephone access to the unit is provided by a twelve foot cord with standard RJ-11 connectors, one for the telephone company line in and one for the client phone handset out. The Monitor Unit obtains power from an external class-2 desk top power supply, connected to the unit via a six foot electrical cord. The Monitor shall be easily installed in a central location in the individual's home near the telephone. System status information is provided to the user

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and/or officer on a limited basis by an LED indicator array and an audible tone generator. The Monitor Unit also contains security features to alert the Central Station of Monitor Unit tampering, disconnection from the telephone line and disconnection of AC power. Telemetry data from the Transmitter Unit provides security information to the Monitor Unit such as Transmitter Unit tampering, low battery and RF-signal simulation.

4.1. Monitor Indicators

The Monitor unit shall have a number of indicators to alert the installer and client to the unit's current operation status. These indicators include:

4.1.1. Power

The Power LED ,on solid, indicates that the power on self tests have been completed and that the AC line power level is satisfactory.

The AC indicator will flash if the unit is operating from the internal battery supply.

The LED will be green in color.

4.1.2. Tamper

The tamper status indicator will be combined with the receive indicator, and will be labeled "status".

If enabled, by the programmer, the light will be on when in range and off when out of range, after the leave delay has expired.

Enabled or disabled, the LED will flash intermittently if either the transmitter or the unit case is in a tamper condition.

If enabled, client home and tampered, the LED will be on and flash off every two seconds.

If enabled, client away and tampered, the LED will be off and flash on every two seconds.

The status indicator will be amber in color

4.1.3. Busy

The Busy indicator illuminates when the unit is in the process of calling the Central Monitoring Station or phone line is in use by the client. The busy lamp will come on and remain on until the phone is placed back on hook by the base unit or the client.

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The busy indicator will flash if the unit has detected a problem with the telephone line. A disconnected telephone connection or multiple phones off hook can cause the Busy indicator to flash.

4.2. *Monitor Telephone Interface*

The Monitor shall be able to transmit offender status and tamper information immediately to the Host Computer via standard RJ11 modular telephone connector jack or plug. The Monitor shall be capable of accessing a telephone line when not in use and to deliver courtesy annoyance tones on a line in use, in order to request communications with the Host Computer system. The unit must continue to attempt communications until the messages are acknowledged as received by the Host Computer

Communication with the Central Station is accomplished using modem communication at 110 or 300 baud over standard U.S. telephone lines. The communication protocol between the Monitor Unit and the Central Station is not included here and will be covered in another document entitled: Central Station to Monitor Unit Protocol.

4.3. *Monitor Functions*

The Monitor shall automatically report to the central computer if it detects any system malfunctions. These malfunctions shall include, but not be limited to battery failure, power failure, system checksum error and stuck RSSI indication (radio failure).

4.3.1. *Tamper*

The Monitor shall detect and immediately report to the central computer any attempts to tamper with the receiver itself, as well as report telephone line and power failures and restoration. The Monitor shall also detect and report detected attempts to simulate or duplicate the radio frequency signal.

The base unit will have security screws for all exposed screws.

4.3.2. *Transaction Buffer*

The Monitor shall contain memory to store and time stamp data in the event that telephone communication with the central computer is disrupted. The message buffer of the Monitor shall be able to

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contain a minimum of 1000 messages in the event of a loss of communications with the Host Computer.

4.3.3. Auto Report

The Monitor shall report at programmable 1 hour intervals up to 24 hours. If the monitor has not reported in to the Host Computer for this programmable interval, then the monitoring unit will initiate a call in event - client in range or client out of range.

4.3.4. Adjustable Range

The Monitor shall be capable of receiving the radio signal from the participant's transmitter within the specific preset range without undue obstruction from metallic objects or interference from household electronic equipment. The Monitor shall have an adjustable range for receiving transmitter signals. The Transmitter Monitor pair has an adjustable range of low (approximately 35 feet), medium1 (approximately 75 feet), medium2 (approximately 115 feet) and max (150 feet or more).

4.3.5. Field Configuration

Each Monitor shall be able to be matched to a transmitter either in the field by authorized personnel or by manufacturer at the factory by using only the programming device.

4.3.6. Built in Diagnostics

The Monitor shall be able to detect and report communication systems failures. These failures include system checksum, telephone faults, line power problems and poor radio operation.

5. Monitor Unit Modes

The RF Only Monitor System has three modes of operation, Off, Diagnostics and On. These modes will be selected by the Programming Station via telephone line communication or by changing the key switch position.

5.1. Monitor Unit Off Mode

When the RF Only Monitoring System changes to the OFF mode, the system will clear all stored events, and log an ENTERED OFF MODE EVENT with the code of BA11. There are two different states

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the system can be in while in the OFF mode. When the phone line is disconnected, no functions are enabled, the operational battery back-up is disabled, and the memory battery back-up is operational. When the phone line is connected, the state is as above, except the system waits for a mode change event to occur.

5.2. *Monitor Unit Diagnostic Mode*

When the RF Only Monitoring System changes to the Diagnostic Mode, the unit will log an ENTERED DIAGNOSTIC MODE in the event log. The RF Only Monitoring System will function as if in the ON mode. The unit will also display the current status with the LED's on the front panel and will generate an audible tone when the client's RF transmission is received.

5.3. *Monitor Unit On Mode*

When the RF Only Monitoring System is in the ON mode it is operating in its normal mode. The unit will log an ENTERED ON MODE event. The unit will monitor all transmissions, perform all system status checks and detect all events. The Monitor Unit will log the events according to the programmed event control table.

6. RF Only Monitoring System Normal Operation

6.1. *Event Control*

All events will be transmitted real time. In the event of phone line loss, the events will be stored and transmitted when the phone line is restored.

6.2. *Client Transmitter Monitoring*

The RF Only Monitoring System must continually monitor for the presence of the Client Transmitter Units by virtue of its receiver.

6.2.1. *Client Transmitter Out Of Range*

If the Monitor Unit does not detect a valid transmission from the primary Transmitter Unit for a programmable period of time, called the Out Of Range Time (OORT), the unit must log an OUT OF RANGE event.

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6.2.2. Client Transmitter Returned Home

If the Monitor Unit detects a valid transmission after logging an OUT OF RANGE event, a CLIENT RETURNED HOME event must be logged when a valid transmission is detected. Subsequent valid transmission must not log CLIENT RETURNED HOME events until an OUT OF RANGE event is again logged.

6.2.3. Monitor Unit Routine Call Back

If the Monitor Unit has not communicated with the Central Station and the check in time has been reached, the unit must log a SCHEDULED CALL CLIENT HOME or a SCHEDULED CALL CLIENT NOT HOME event depending on the presence or absence of the Transmitter Unit. The Programming Unit sets the desired automatic call back interval.

The Monitoring Unit will also detect statuses of the Transmitter Unit. If the Transmitter Unit is tampered by cutting the strap or body removal, the Monitoring Unit will log a TRANSMITTER TAMPER event. When a primary Transmitter Unit is reset by any means, a TAMPER RESET event is logged by the Monitoring Unit. The transmitter Unit will also report its battery status in every transmission. On a change of battery status the Monitoring Unit will log a GOOD BATTERY or LOW BATTERY event.

6.3. *Spurious Transmission Monitoring*

The Monitor Unit will detect if there is another transmission occurring spuriously in the same frequency as the Transmitter Unit. If the transmission detected can interfere with the Transmitter Unit then the Monitoring Unit will log a JAM DETECTION. In order for a spurious transmission to be considered a problem, the length of the output must be at least the length of three (3) Transmitter Unit transmissions.

6.4. *AC Power Monitoring*

The Monitor Unit will detect changes in the AC power connection to itself. If the AC power supply has been lost for a programmable period the Monitor Unit will log an AC POWER LOST event. Once this event occurs, the Monitor Unit will check for the AC power to be restored. As soon as the restoration of power has been detected for the same programmable power loss interval, an AC POWER

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RESTORED event will be logged by the Monitor Unit. The programming unit sets the desired power loss interval.

6.5. *Battery Charging*

The Monitor Unit must properly recharge the operational battery backup and log a LOW MONITOR BATTERY event if the battery can not be properly charged. If the Monitor Unit is operating under battery backup, the unit must log a MONITOR SHUTDOWN event if the battery life is near exhaustion. When a MONITOR SHUTDOWN event is logged the unit will have five (5) minutes to report the event to the Central Station before the actual shutdown process is performed.

When the unit is in the OFF mode, the operational battery backup must be disconnected from the circuit to preserve the integrity of the battery.

6.6. *Monitor Unit Tilt Monitoring*

The Monitor Unit will detect if the client tampers or moves the box through a mercury balanced circuit. If the level of the box changes by a defined degree, the mercury circuit will change states. The state change will be detected by the Monitor Unit and a MONITOR TILT event will be logged. Once this event occurs the Monitor Unit must return to a non-tilt state for more than five (5) minutes before a MONITOR TILT event can be logged again.

6.7. *Telephone Line Monitoring*

The Monitor Unit will detect changes in the telephone connection to itself. If the telephone voltage has dropped below 1.0 VDC for a period of two (2) minutes, the Monitor Unit will log a TELEPHONE DISCONNECT event. Once this event occurs the Monitor Unit will check for the telephone voltage to rise above 1.0 VDC. As soon as the restoration of the voltage has been detected a TELEPHONE CONNECT event will be logged by the Monitor Unit.

6.8. *Telephone Line Control*

Before initiating communications, the unit must determine the status of the telephone line (on-hook, off-hook, ringing or disconnected). If the line is on-hook, the unit must seize the line, dial the Central Station and wait for a handshake tone. If no handshake tone is

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detected for a period of time equal to the HCT (Host Connect Time), the unit must terminate the communication attempt by entering a recall cycle and release the phone line. If the unit detects an unusable phone line, the unit must sound a 3 tone audible indicator and enter a recall cycle in which attempts are made at periodic intervals until the communication is successful.

<u>Number of Attempts</u>	<u>Recall Period</u>
0-10 Attempts	2 Minutes (Short Interval)
> 30 Attempts	30 Minutes (Long Interval)

If communications are not successful after a predetermined number of attempts, a secondary phone number must be used in an attempt to complete the communications. If communications are successful via the secondary phone number, the primary number must be used on the next communication of events. *Note: The secondary number must not be attempted if the source of the communication failure is an off-hook handset.*

A third phone number associated with location verification shall be stored and used for this feature. The programming unit sets the desired phone number for this feature.

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7. Transmitter Unit

The primary purpose of the Transmitter Unit is to provide telemetry data to the Monitor Unit. The Transmitter Unit embodies a reusable interlocking strap assembly which provides physical security and electronic tamper detection by means of a completed circuit from the transmitter through the strap. The Transmitter Unit main housing contains the RF transmitter. A separate clasp contains the field replaceable battery. The Transmitter Unit is designed to be worn at all times, it is therefore waterproof and shock resistant.

7.1. *Transmitter Functions*

The transmitter shall send an individually-coded signal. The Transmitter Monitor pair has an adjustable range of low (approximately 35 feet), medium1 (approximately 75 feet), medium2 (approximately 115 feet) and max (150 feet or more). The range will be adjustable by the programming unit.

7.1.1. Transmitter Tamper

The strap and circuitry within the transmitter must enable the transmitter to immediately notify the Host Computer (when in range of the receiver) of any tamper attempt or removal from the offender's ankle. This would include severing the strap or removal of the transmitter without severing the strap. If tampered out of range of the receiver, the transmitter's tamper signal must still be present and recorded by the receiver when the transmitter returns within range of the receiver. The tamper alert signal shall be sent when a client enters the range of the Monitor and when a tamper occurred while the client was out of range. If the transmitter is in range when a tamper occurs, notification must be immediate. The transmitter may be configured so that tamper conditions shall only be reset by authorized personnel using the Spotchecker. The transmitter may also be configured for automatic tamper reset signaling if the tamper condition is restored. In this case, the tamper reset signal must be present for 72 hours after the tamper condition is reset to allow reporting when the client comes back in range. This signal consists of a count that can be used to estimate the time of the tamper occurrence. This signal will be instantaneous if the tamper condition is reset while in range. The transmitter shall be designed to discourage tracing or duplication of the signal. The transmitter must feature a redundant tamper detection scheme. The programming unit sets the manual or automatic tamper mode.

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7.1.2. Transmitter Configuration

Each receiver/monitor must be able to be electronically matched to any transmitter in the field.

The transmitter shall emit a signal at random intervals of between 15 and 30 seconds on a continuous basis during the life of the battery.

7.1.3. Transmitter Power

The batteries powering the transmitter shall be lithium and shall not require replacement of either the transmitter or the Monitor. The batteries must have a two-year operating life. Tx will transmit a low battery signal.

7.1.4. Transmitter Compliance

Transmitter must comply with all applicable Federal Communications Commission (FCC) regulations (Part 15) and shall be registered with the FCC.

7.1.5. Transmitter Physical Features

The transmitter shall attach around the wrist or ankle of the offender. The strap, which attaches the transmitter to the offender, must be an integral part of the case, and have adequate adjustment range to fit most individuals. The strap and any required fasteners must not be available to the general public either commercially or through any mail order outlets. The connecting strap must be Hypo-Allergenic.

The transmitter shall be lightweight and weigh no more than four ounces. The case of the transmitter shall be sealed and be shock and water resistant. The transmitter shall be easily installed on the offender with minimal training and experience of the installer. The transmitter must not pose either a health or safety hazard nor unduly restrict the activities of the participant.

The transmitter shall operate at temperatures experienced in a typical client environment.

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8. Central Station Communication

See Central Station Specification entitled: SIA 2 Protocol.

The following are a list of all events produced by the monitoring unit and the associated SIA 2 Protocol event code mappings.

CLIENT TRANSMITTER EVENTS		
Transmitter Strap Tamper Reset	TR01	The unit has detected a valid client transmission with the STRAP TAMPER bit changed to the NON-TAMPER state.
Transmitter Strap Tamper	TA01	The unit has detected a valid client transmission with the STRAP TAMPER bit changed to the TAMPER state.
Transmitter Body Tamper Reset	TR02	The unit has detected a valid client transmission with the BODY TAMPER bit changed to the NON-TAMPER state.
Transmitter Body Tamper	TA02	The unit has detected a valid client transmission with the BODY TAMPER bit changed to the TAMPER state.
Low Transmitter Battery	XT	The unit has received a client transmission with the LOW BATTERY bit SET, and is a change from the last transmission.
Good Transmitter Battery	XR	The unit has received a client transmission with the LOW BATTERY bit CLEAR, and is a change from the last transmission.
Client Out of Range	OP	The unit has not detected a valid client transmission for a period equal to the programmable Out-Bound Response Time (ORT).
Client Returned Home	CL	The unit has detected a valid client transmission and the unit has not detected a valid transmission for a period longer than the ORT
MONITOR UNIT EVENTS		
Radio Interference	BA04	The unit has detected a constant RSSI signal interfering with a normal transmitter signal.
Jam Detection	BA05	The unit has detected multiple transmitted messages where someone is trying to duplicate the RF message format

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AC Power Lost	AT	The unit has detected a constant loss of AC power for a programmable period.
AC Power Restored	AR	The unit has detected an uninterrupted supply of AC power for a programmable period.
Phone Disconnect	LT	The unit has detected a loss of connection to the telephone line for a period of one minute. (phone line voltage below 1 VDC)
Phone Connect	LR	The unit has detected a reconnection to the telephone line for a period of one minute. (phone line voltage above 1 VDC)
Case Tamper	TA03	The unit has detected its enclosure has been opened.
Case Restore	TR03	The unit has detected its enclosure has been closed.
Monitor Shutdown	BA06	The unit will shutdown within the next five minutes due to a failing battery backup while operating from the battery backup.
Monitor Tilt	BA07	The unit has detected a constant TILT condition for over two seconds. The unit must be level for 5 minutes before another TILT condition can occur.
Unit In OFF Mode	BA11	The unit has detected a mode transition into the OFF state.
Unit In DIAG Mode	TX	The unit has detected a mode transition into the DIAG state.
Unit In ON Mode	BA10	The unit has detected a mode transition into the ON state.
Check In - Client In Range	BA08	The unit has had no contact with the Central Station for a programmable period of time. A "KEEP-ALIVE" call is made to report that the client is at home.
Check In - Client Out of Range	BA09	The unit has had no contact with the Central Station for a programmable period of time. A "KEEP-ALIVE" call is made to report that the client is not at home.
System Low Battery	YT	The unit has detected that the standby battery backup is not properly charged.
System Battery Restore	YR	The unit has detected that the standby battery backup has been restored to a good voltage level
Host No Answer / Busy	BA02	Monitoring unit has tried to call the host for a programmable number of times and the host has been busy or not answering.

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Line In Use	BA03	Monitoring unit has tried to call the host, a programmable number of attempts, but the client has the phone off the hook.
Power Up	RR	Monitoring unit has been power up and ran it's power-up reset routine.
Log Overflow	JO	The 1000 event log has been exceed. The oldest events will be lost and this event is reported.
Programming Call Ended	LX	A connection was made to the monitoring unit which the unit did not initiate. This should only be from the programming unit
Communications Trouble	YS	The monitoring unit was interrupted, due to some error, while reporting events to the Central Host.

Table 1 -- Monitor System Events

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9. RF Only Monitoring System Temperature Range

9.1. Transmitter Unit

Operating Temperature Range	0 to +50 °C
Storage Temperature Range	-20 to +60 °C

9.2. Monitor Unit

Operating Temperature Range	0 to +40°C
Storage Temperature Range	-15 to +40 °C

10. RF Only Monitoring System Mechanical Design

10.1. General

10.1.1.Exterior Color

Exterior color of the Transmitter Unit and the Monitor Unit shall be gray in color.

10.1.2.Exterior Texture

Exterior texture of the Transmitter Unit and the Monitor Unit shall be fine, matching Mold-Tech^R number MT-11020.

10.1.3.Decorative Surfaces

Decorative finishes on molded plastic parts shall be free of surfaces imperfections attributable to ejection pins, parting lines, etc. Painted surfaces shall meet the criteria of KBS, Inc. Process Instruction No. 960901E0.

10.1.4.Housing Material

Plastic material used in enclosure designs shall be injection molded ABS or equivalent.

10.1.5.Contamination Infiltration

Housing shall resist infiltration by common insects.

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10.2. Dimensions

10.2.1.Transmitter Unit

The size of the transmitter shall be minimized and shaped so that it can be worn around the ankle of the client for the duration of the surveillance period without causing undue personal discomfort or impairment of normal daily physical activities.

10.2.2. Monitor Unit

The monitor unit shall be designed as a vertically mounted table or desktop device having dimensions of not to exceed 9.0" height X 3.0" width X 8.0" depth.

10.3. Monitor Unit Features

10.3.1.LED Status Lights

Recessed area and holes for LED status indicators.

10.3.2.RJ-11 Jacks

Access opening for two RJ-11 jacks to accommodate two phone cords.

10.3.3.Location for Company Name and Logo

Provision for printed company name and logo on the top or front of the enclosure.

10.3.4.Labeling

Recessed area for required system labels.

10.4. Graphic Printing

10.4.1.Process

Tampo printing or similar process shall be used on the top housing identifying the LED lights.

10.4.2.Font Style

Font style shall be Helvetica, white in color and sized as required.

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10.5. 3-Position Key Switch

An administrator key switch shall be incorporated in the monitor housing to activate a 3-position electrical switch.

10.5.1.Material

Key switch shall be a high security type of drill-proof and pick-proof design.

10.5.2.Color and Texture

Switch shall have an exterior bezel of satin chrome finish.

10.6. Feet

The base of the monitor shall have four resilient, non marring feet for stability and prevention of the unit from sliding on a desktop or similar surface during operation.

The feet must not fall off of the unit when exposed to the tests described in the reliability requirements of this specification.

10.6.1.Size and Location

Size and location of feet shall be optimized so as to insure maximum stability of the monitor unit.

10.6.2.Color

Color of the feet shall be black unless otherwise specified.

10.7. Phone Cord

One telephone cord shall be supplied with the RF Only Monitoring System for connection of the unit to a wall outlet.

10.7.1.Connection

Cord shall have an RJ-11 jack at both ends. Adequate cord strain relief shall be provided to allow the unit to meet the reliability requirements of this specification (drop test).

10.7.2.Length

Cord length shall be 12 feet.

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10.7.3.Color

Cord shall be of a standard color (black).

11. RF Only Monitoring System Electrical

The monitoring unit will be powered by a standard AC power with the supplied transformer and power cord.

The unit will have a self contained rechargeable system battery which keeps the unit powered-up during AC power outages.

The unit will also have a lithium battery to hold all configurable memory and keep the real-time clock running.

11.1. Unit Power

In the off state the RF Only Monitoring System will be off drawing minimal current.

11.2. Memory

Sufficient memory is provided to store no less than 1000 client /Monitor transactions at the Monitoring unit.

11.3. Antenna

The Receiver will have two antennas contained within the Monitor housing. These antennas will provide diversity in receiving the signal from the transmitter. Antenna diversity will operate continuously to provide the best possible reception at all times.

12. RF Only Monitoring System Regulatory Requirements

The System will meet the Federal Communications Commission (FCC) Part 15 class B and Part 68 telephone interconnect specifications and carry the appropriate certification license numbering and labeling.

13. RF Only Monitoring System Reliability Requirements

The RF Only Monitoring System will pass accelerated life test. Below are some reliability guidelines that are required for the unit to meet the reliability quality standards.

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13.1. Elevated Temperature Operation

The RF Only Monitoring System will be tested in an environment which satisfies the operating temperature specification extremes. Units will be immersed for an extended period of time at each operating temperature extremes (0°C and +40°C) while hooked to the phone line.

13.2. Storage Temperature Cycling

The RF Only Monitoring System will be tested, after being in an environment which satisfies temperature variations that could occur during shipment of the unit. Cycle the RF Only Monitoring System from one extreme (-15°C) to the other (+40°C) for an extended period of time. The unit is not powered or operating during the cycling. When the unit returns to room temperature, perform functional testing. The RF Only Monitoring System unit's switches and electronics should function normally without any failures.

13.3. Humidity

The RF Only Monitoring System will be tested in an environment which satisfies the hot and high humidity operating specification. The unit will be soaked for an extended period of time at +40°C and 90% humidity while hooked to the phone line. The RF Only Monitoring System shall operate normally under these conditions.

13.4. Drop

The RF Only Monitoring System will be tested after consecutive drops simulating those that may occur when handling or operating the unit. The RF Only Monitoring System should withstand 7 countertop height (30 inch) drops on to a rigid surface without structural damage or loss of functionality. The unit should be dropped on all planes plus 1 corner. Several drops should also be performed with the phone cord attached, where the entire weight of the unit is transferred to the cord. The unit does not hit the ground, but is caught by the cord just before impact. This will test the durability of the cord and its connection to the RF Only Monitoring System.

13.5. Vibration

The RF Only Monitoring System will be tested, after being in an environment which satisfies vibration that could occur during

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shipment of the unit. The RF Only Monitoring System should pass 30 minutes of random vibration in packaging without structural or component failure or loss of normal functionality.

13.6. Electrostatic Discharge

The RF Only Monitoring System will be tested in an environment which simulates a dry static-prone condition. The unit will be subject to discharges of +/-10kV to all possible points that accept discharges. All discharges must not cause any soft failures (memory loss, corrupted EEPROM, or unit resets) or hard failures (permanent damage) to the unit after several occurrences to each point, including phone connectors.

13.7. Ink Wear

The RF Only Monitoring System will be tested in an environment which simulates prolonged exposure of any surface that has been hot stamped, printed or painted, to human wear and tear and periodic cleaning. Any ink that is hot stamped, printed, or painted on to the housing or buttons must not wear off when repeatedly rubbed with an eraser or scraped with a fingernail. Printed labels must not fade or wear off with repeated wipings using a common household cleaning solution.

13.8. Flammability

The RF Only Monitoring System must pass the UL specification UL94-v2.

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Table 2 - Physical & Electrical Specifications

Compliance Tested	FCC Part 68, FCC Part 15 Class B telephone interconnect specifications
Operating Voltage	105 to 130 VAC
DTMF Signaling	100ms ON, 100ms OFF
Memory	Sufficient to record 1000 client-monitor transactions
Case Dimensions	Not to exceed 9x8x3 inches
Weight	Transmitter: 4.0 oz., max. Monitor: 5.0 lbs., max.
Color	Grey
Material	ABS molded plastic
Switch Interface	3-Position key switch
Telephone Interface	RJ-11
Telephone Line Interface	RJ-11
Operating Temperature	0 to +40 °C
Storage Temperature	-15 to +40 °C
Humidity	Operate normally at +40 °C and 90% humidity
Dust	Extreme dust conditions (TBD)
Drop	30" drop 7 times with no damage or loss of functionality
Vibration	30 minutes of random vibration
Electrostatic Discharge	Discharge +/- 10kV with no damage or loss of functionality
Ink Wear	No fading due to human wear and tear and periodic cleaning
Flammability	UL94-v2
Packaging	Protect from damage due to shipping within U.S.