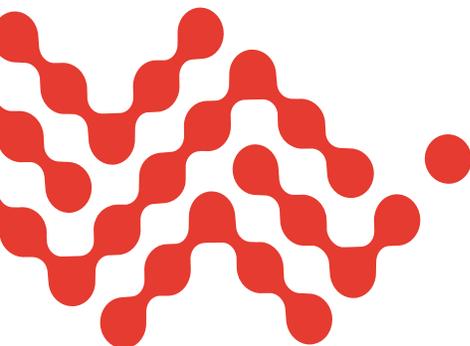


Expanding Business Opportunities for Industrial Monitoring with the Uplink 5500

Uplink, a Sierra Wireless Solution, offers a range of cellular communicator products that have historically supported alarm monitoring capabilities. Beyond this traditional use case, the 5500 can also be used for multiple industrial monitoring use cases. The 5500 device is being used by Stone Technologies, to power new business opportunities in industrial monitoring. The device can be used to remotely monitor tower lights, sewer lift stations, and industrial generators, as well as many other industrial monitoring applications.

This white paper explains how Stone Technologies integrated the Uplink 5500 universal LTE cellular communicator with sensor technology to create a new product, the RMS 704 environmental monitoring unit.





ABOUT STONE TECHNOLOGIES

Based in Salida, CO, Stone Technologies has been providing consulting services and installing alarm monitoring systems since 1965. They have been using Uplink device from Sierra Wireless since the company began selling its cellular communicators in 1996. Recently, Stone Technologies founder Art Stone decided to expand the capabilities of the Uplink device, adding new sensor components to increase the number of applications to a variety of new use cases. Since then, Stone Technologies has grown their conventional alarm monitoring business into a diverse range of areas including environmental monitoring, alternative energy, and remote monitoring of equipment and services.

ABOUT THE UPLINK 5500

The Uplink 5500 is a wireless alarm monitoring device that can communicate the status of alarm panels using both the latest LTE cellular protocols and older 3G networks. Part of the Uplink family of products, it uses four inputs to monitor alarm systems and two outputs to communicate with other equipment.



Installers use monitoring software via a secure website to define the nature of the inputs. In traditional usage, a technician might wire input 1 to monitor an alarm siren. If the siren was triggered, the unit would sense that and communicate the fact that it was active.

In addition to the inputs, the Uplink 5500 device also features the ability to send email or text alerts, and there is a built-in voltage sensor that can send an alert when the voltage falls below a certain threshold. If the voltage continues to fall, the unit can be made to shut down completely.



Benefits of using the 5500 for Industrial Monitoring

EASY, LOW COST STARTUP

The Uplink 5500 is an inexpensive unit that can support a wide variety of applications. It also installs in minutes using a simple set of dip switches providing functions that technicians can further configure via a website. The 5500 is also compatible with both Verizon and AT&T mobile networks.

TECHNOLOGY FUTURE PROOFING

The Uplink device is available under a technology protection plan that allows customers to upgrade seamlessly to the latest telecommunications technology. They pay a regular monthly subscription of \$0.99 per unit, and when Sierra Wireless upgrades the Uplink to the latest telecommunications protocols, customers get the unit upgraded for free. This enables them to take advantage of advances in technology from 2G to 3G, LTE, and beyond without worrying about capital expenses.

COMPLIANCE WITH GOVERNMENTAL REGULATIONS

Customers using Uplink-based environmental monitoring units like the RMS 704 in appropriate applications can benefit from major compliance savings. For example, a customer using it to monitor wastewater tanks could avoid a major spill that would incur substantial penalties running into thousands of dollars for a small monthly fee. This creates a clear benefit for customers that integrators can use to sell the product.

CREATING RECURRING REVENUE STREAMS

This is a benefit for both system integrators and their customers. By selling Uplink-based units as part of an environmental monitoring service offering, integrators can earn recurring revenues that are predictable and constant. Customers also get peace of mind knowing that the systems integrator is providing a reliable infrastructure that notifies their technicians when problems arise.

The Business Challenge

In the mid-nineties, Stone sold the security alarm business that he had operated for over 20 years. Instead of retiring, he decided to re-engineer the Uplink 4550 device, turning it into an environmental monitoring system. Rather than using the Uplink device as a backup communications system, he uses it as the primary reporting device, making it the sole environmental monitoring system and communications link in many remote applications. He has engineered several devices over the years as Sierra Wireless has released new versions, the latest being the 5500.

MODIFYING THE UPLINK 5500

Stone Technologies used the Uplink remote monitoring device to create the RMS 704 Wireless Environmental Monitoring System, which features several significant enhancements that suit a variety of use cases.



ADDITIONAL INPUTS

Input 1 on the Uplink device can differentiate between a steady signal or a pulsing one. If the signal is steady, it can report that a siren has been triggered. If the signal is pulsing, it can interpret this to the central station as a fire alarm signal. Stone used this differentiation to create an extra input on the device, bringing the total number of inputs to five.

WIRING CONNECTIVITY

One goal for the company was to make a unit that was easy for technicians to install in a variety of applications. It created an interface board featuring terminal strips so that technicians didn't have to make connections to the Uplink unit's internal strips.

WEATHERPROOF CASING

The RMS 704 embeds the 5500 in a weatherproof ABS NEMA enclosure for mounting either indoors or outdoors.

ADDITIONAL RELAYS

The Uplink 5500 is designed for typical current loads in burglar and fire alarm applications. To extend the number of use cases, Stone Technologies doubled the output relays on the unit from two to four, so that it could handle things like remote generator restarts that would be outside the scope of the original unit. The additional relays draw their power from the existing relays on the Uplink device, isolating the Uplink relays from overload and giving the extra relays more power handling capability. Stone Technologies also offers external relays that will handle up to 9 amps of 120VAC power.

POWER MANAGEMENT

The relays can handle either local 12-volt DC power, or a dry contact from the two operator relays, meaning that the device could be powered from grid power, from solar, or from a backup battery. The interface board includes a 16VAC plug-in transformer that also recharges an on-board 12-volt, 7AH standby battery that will run the unit for 48 hours with no AC power. LEDs on the interface board report the unit's power status.

FLEXIBLE MONITORING

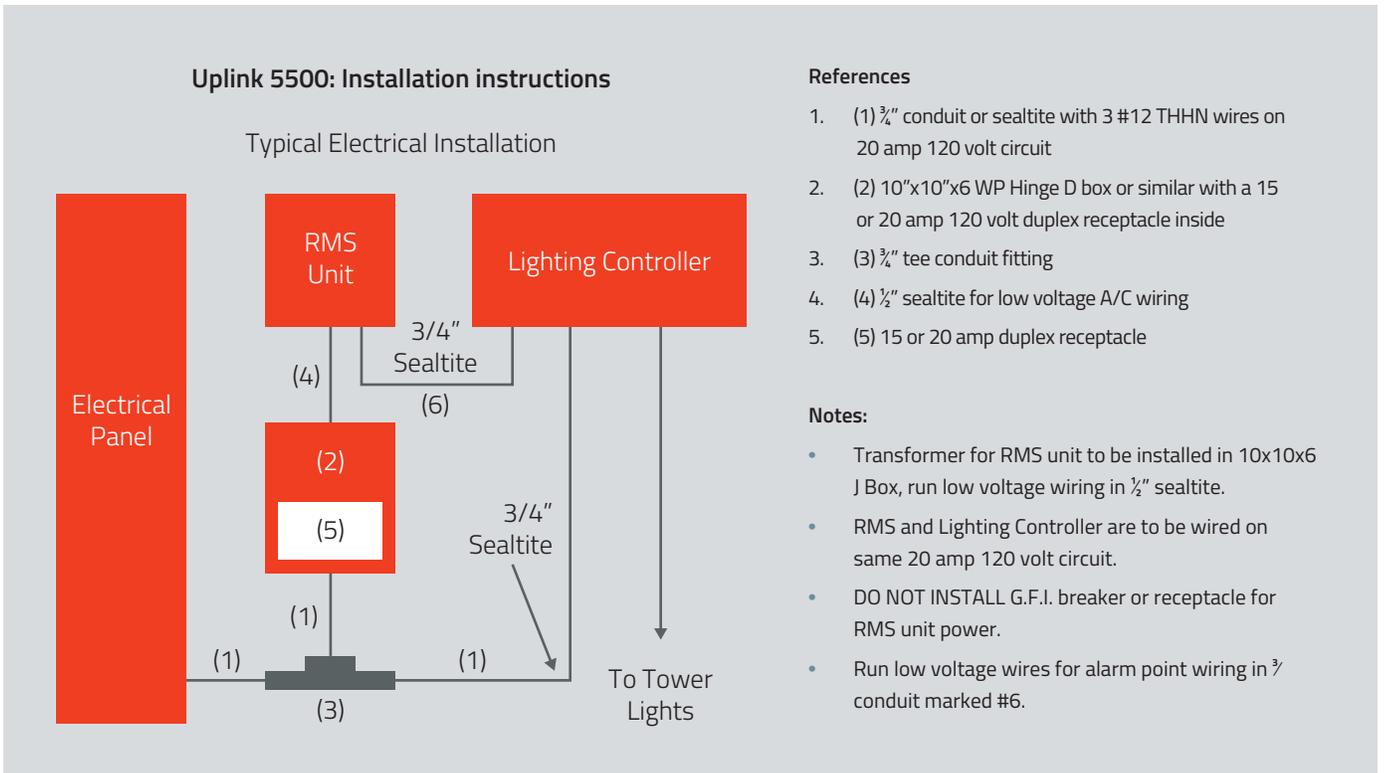
Stone Technologies made the additional relays programmable through the interface board, enabling technicians to configure the Uplink’s inputs to monitor for normally open or normally closed circuits. This is useful for monitoring inputs like grid power availability, for example.

DELAYED AND BATCHED ALERTS

The 5500 unit provides immediate alerting, which is appropriate for its original purpose, but this could cause problems in other use cases. If a unit detects several momentary disruptions in an always-on input that quickly correct themselves, a customer’s monitoring staff might not need the alert. The company built a jumper onto the interface board allowing for a time delay in signal alerting. With this set, the RMS 704 will only send an alert if a condition lasts longer than 60 seconds. This feature alone stops erroneous alerts and reduces the traffic load for most installations by 75%.

ADDING SENSORS

The Uplink doesn’t have sensors off the shelf, so Stone Technologies built in the ability to connect with sensors via the unit’s inputs. The RMS 704 is restricted to open and closed contacts rather than linear sensors, so it works with sensors that trip when they reach a preset threshold. This makes the unit easy to install while still fitting a variety of use cases including anything from temperature input to snow monitoring.





The RMS 704 also includes a pulse counting function that counts the number of times a sensor is tripped and sends that data as a batch for end-of-day reporting. That's useful for applications ranging from counting cars entering a parking lot to the magnet tripping of an irrigation pump.

Integrators should understand the many sensor possibilities available to them. Stone Technologies has already built various relay packages for different sensors, and it has a recommended list of sensors for specific applications, including;

- Single-phase and three-phase power failure
- Pressure sensing
- Temperature
- Float switches
- Magnetic close switches
- Vibration measurements (typically for bearing failures)



REPORTING

Stone Technologies created its own infrastructure for reporting and alerting. If input 2 on the RMS 704 is tripped, the device uses the 5500's inherent ability to send an alert email to a predefined address. The integrator hired a contractor to write a Python-based software program that would accept alerts from the unit and forward them to a maximum of 99 email addresses. By serving multiple destinations, the RMS 704 and the accompanying software service can alert multiple technicians on a site, which helps customers service units quickly.

The program, which took a week to write and has under 2,000 lines of code, also lets the customer select which types of signals are sent to which destinations, enabling customers to block test signals for example.

Finally, it can send alerts as text messages using an email-to-text capability, and over 150 companies are using this capability to send text message-based alerts to their technicians.

Use Cases

Stone Technologies concentrates on three primary use cases with the 5500 and industrial monitoring with the RMS 704.

LIGHT MONITORING ON CELL TOWERS

This was the first market that Stone identified for a product based on the Uplink device, and now accounts for 80% of Stone Technologies business. The FCC's Wireless Telecommunications Bureau maintains strict rules about lighting on cellphone towers.



Under its rules, the owners of towers subject to lighting regulations must monitor the lights for outages at least once each day, either by directly looking at the tower or by checking equipment designed to monitor it.¹ They must report the outage to the FAA if it cannot be fixed within 30 minutes of the first observation.

EMERGENCY GENERATOR MONITORING

Another 10% of the company's business comes from monitoring emergency generators, which often operate in remote, unstaffed sites. The 5500 unit not only monitors the generator but can also remotely start it using an external relay.

One of the inputs on the device monitors the generator to see if it is running, and another monitors the power from the grid. A third input monitors the transfer switch that switches the power from the grid to the generator, while a fourth monitors an abnormal shutdown circuit on the generator that signals it is about to turn off.

Finally, the unit can monitor fuel levels in a generator if there is a fuel probe in its tank. This is beneficial both to Stone Technologies customers and to the fuel companies that supply them.

In a conventional situation, a diesel company would make the trip to a generator at predefined periods to check fuel levels and refuel where necessary. That often meant a wasted trip when the generator hadn't been used. It could also lead to generator failure if all the fuel had been used before the next scheduled trip. By reporting on the available fuel, the customer can schedule refueling trips on demand with the diesel company, which is guaranteed a sale. The customer enjoys guaranteed fuel levels and a more reliable generator.

WASTEWATER MANAGEMENT FOR SEWER LIFT STATIONS

Measuring liquid levels is the basis for the other 10% of Stone Technologies industrial monitoring business with the 5500 unit, particularly water and wastewater lift station monitoring. This use case monitors pumping stations and sewer lift stations that transfer wastewater to higher areas so that they can gradually flow down to the processing plant. The unit can ensure that wastewater is not escaping and contaminating the environment.

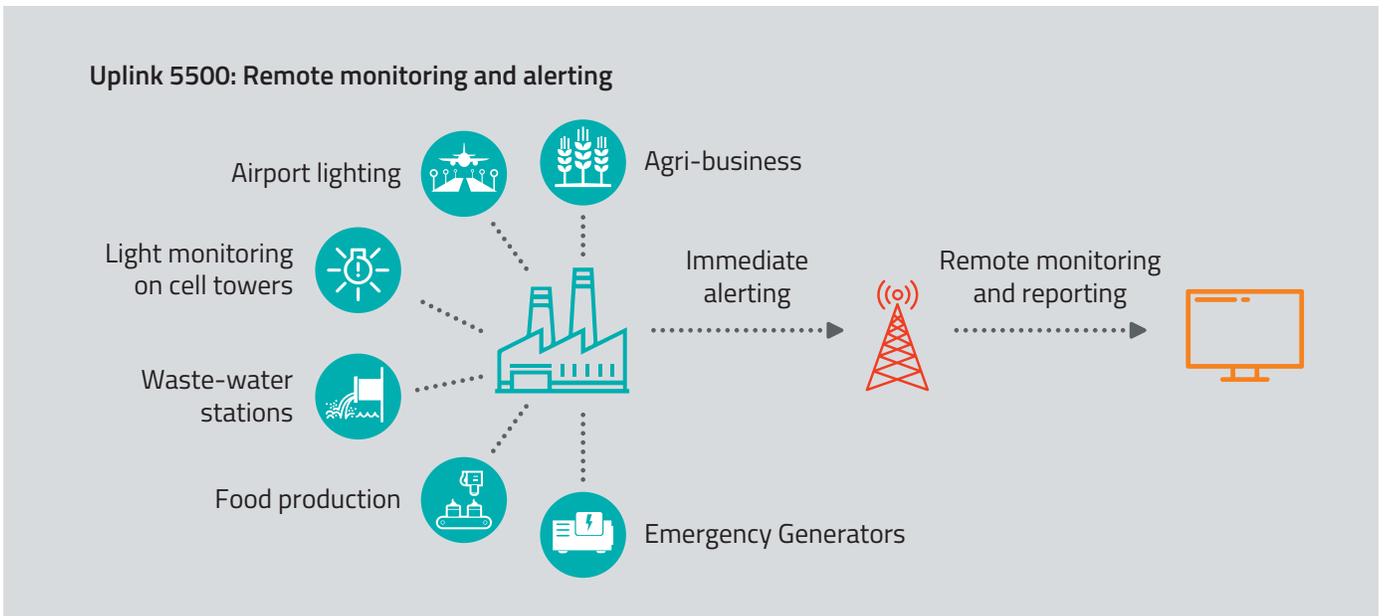
In this application, Stone Technologies uses float-based sensors to measure the levels in water storage tanks. When the water level hits a low point, the 5500 unit can send a signal to alert the customer.

The unit can also monitor the power supply to the pump, so that it can detect pump failure, along with operation of a second pump used for backup and for handling high volume. The 5500 can also monitor an emergency generator on the site to ensure that it activated properly to power the pumps during a grid failure.

Stone has identified several other use cases that are perfect for an environmental monitoring unit based on the Uplink 5500 unit:

OTHER USE CASES FOR INTEGRATORS

Stone technologies has spent decades engineering environmental monitoring devices based on the Sierra Wireless Uplink family of monitoring devices. While it has carved out a niche for itself in cell phone tower monitoring, emergency generators, and waste water management, the company has a key piece of advice for other integrators that want to either use its RMS 704 device or build their own based on the Uplink 5500, be creative with use cases.





Integrators that have focused on alarm systems have a variety of use cases to choose from. Developing a generic device that serves a wide variety of applications will let you choose from various businesses. Examples include:

- **POULTRY HOUSE MONITORING**

Large agribusinesses run dozens of large chicken houses that are sensitive to temperature fluctuation. A three-degree shift in temperature can affect egg production. By monitoring that temperature and activating heating and cooling units appropriately, an environmental monitoring unit can save thousands in revenues.

- **COMMERCIAL BUILDING HVAC SYSTEM MONITORING**

Large buildings heat and cool slowly. It can take as much as seven hours to cool a ten-story building to acceptable levels for the occupants. A monitoring device could spot the imminent failure of a chiller by monitoring the vibration of its bearings and alert repair staff as quickly as possible, saving valuable repair time and keeping the building habitable.

- **INDUSTRIAL PUMP MONITORING FOR PREDICTIVE MAINTENANCE**

Another use case is in monitoring industrial pumps. An environmental unit could monitor phases on a pump, cutting power instantly to stop it burning out. With pumps costing tens of thousands of dollars, monitoring translates directly into added value for the customer.

- **FOOD PRODUCTION AND PROCESSING**

Sometimes, a simple open-close switch connected to an environmental monitoring unit like the RMS 704 can drive compelling business outcomes. One food production company had a problem with employees leaving doors open in large refrigerators. This risked product spoilage that could have cost the company thousands of dollars. Worse still, sustained rises in temperature that went unreported could create salmonella in the product, leading to liability issues. Monitoring for open doors could prevent this issue. A temperature monitor could also alert managers when the ambient temperature around perishable products rises too high, enabling them to take action in a time-sensitive situation.



Conclusion

The Stone Technologies RMS 704 board design with Uplink 5500 industrial monitoring device represents a fast, easy way for integrators to expand beyond traditional alarm monitoring services and explore new business opportunities. Stone Technologies has built upon Sierra Wireless's reliable, time-tested designs, adding new functionality that supports installation in a wide variety of new applications.

By following the company's example, integrators can enjoy not only expanded business revenue opportunities but also new business models. Recurring revenue from environmental monitoring applications leads to more predictable cash flows.

For more information on expanding your services to industrial monitoring use cases, download the Stone Technologies Industrial Monitoring case study at www.uplink.com/industrialmonitoring.

To access the user manual, please see here:

http://www.stonetechology.com/pdf_Files/704%20Specifications%20Sheet.pdf

Reference

1. Electronic Code of Federal Regulations Title 47 §17.48: Notification of extinguishment or improper functioning of lights. <https://www.ecfr.gov/cgi-bin/text-idx?SID=5b54cf4c9372c822cc14ac551a457f17&node=pt47.1.17&rgn=div5>

About Sierra Wireless

Sierra Wireless (NASDAQ: SWIR) (TSX: SW) is the leading IoT solutions provider that combines devices, network and software to unlock value in the connected economy. Companies globally are adopting IoT to improve operational efficiency, create better customer experiences, improve their business models and create new revenue streams. Whether it's a solution to help a business securely connect edge devices to the cloud, or a software/API solution to help manage processes associated with billions of connected assets, or a platform to extract real-time data to make the best business decisions, Sierra Wireless will work with you to create the right industry-specific solution for your next IoT endeavor. Sierra Wireless has more than 1,300 employees globally and operates R&D centers in North America, Europe and Asia.

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