Braving the elements

GB Electronics UK (GBE) has selected Datakey RUGGEDrive UFX tokens and IP67-rated UR4410IM receptacles for use in harsh environment data logging applications. Here we find out why...

Environmental monitoring plays an essential role in modern life and, in many applications, data is often acquired in extremely remote locations. As the monitoring systems are exposed to the elements, the same model of data logger could therefore experience the high temperatures and dusts of deserts, the heat and humidity of rain forests, and the low temperatures and high winds of mountain tops.

At the forefront of environmental monitoring equipment, Surrey-based Van Walt supplies a variety of technologies for use in environmental and groundwater monitoring. One of its leading products is the vanwaltDataHub, a solar-powered data-logger and hub for a wide variety of sensor types (see image, right).

Vincent van Walt, director, said: "We developed the vanwaltDataHub in response to our customers' growing needs for a data collection system that was sensor agnostic and which could communicate over different platforms depending on the site location and availability of a GSM signal. We wanted a system that was flexible, accessible and most importantly reliable."

Packaged in an IP-rated, rugged enclosure, the unit organises collected data for distribution or sharing through radio frequency, GPRS or satellite portals. Following the completion of a recent upgrade programme, the DataHub can also copy data to a removable memory device. This is beneficial as sometimes wireless data transfer is impossible.

The vanwaltDataHub

In addition, wireless connectivity draws extra power – which needs to be managed well on a battery- and solar-powered system.

For this upgrade, Van Walt turned to electronics design company, GBE. Renowned for its embedded systems design capabilities, contract equipment manufacturing (CEM) services and project management skills, the company is active in many sectors including automotive, medical and industrial electronics.

Mark Bullen, managing director of GBE, commented: "DataHubs often have to operate in harsh environment remote locations, so unit reliability is a high priority. It was therefore essential that the introduction of the removable memory devices feature did not compromise that reliability."

The use of a standard USB port was immediately ruled out. Drives and receptacles are not generally available as rugged/industrial versions nor do they offer sufficient security. However, it was recognised that the USB comms protocol was safe enough to use from an embedded systems perspective.

RELIABLE CONNECTIONS

GBE turned to Nexus Industrial Memory, ATEK's appointed distributor in the UK, Ireland, Germany, Switzerland, Austria and Scandinavia, for its Datakey range of products. Matthew Wilson, GBE's technical director, recalled: "As we mapped out the features for the new vanwaltDataHub, I knew that a bespoke 'data key' and a weather- and tamper-proof receptacle would be needed."

Based on GBE's requirements, Nexus recommended the Datakey RUGGEDrive UFX token and the IP67-rated UR4410IM receptacle (see image, above right). The token provides USB (NAND) flash drive functionality through a USB 2.0 hi-speed interface, and is of a solid over-moulded construction, making it impervious to liquids and virtually crush-proof. As for the UR4410IM receptacle, it has a standard 5-pin motherboard header and custom mounting features and details to provide enhanced water protection. The receptacle body has a 2-piece construction, comprising a field-proven frame/contact system on the inside and a tough outer shell that provides additional strength and environmental protection.

The UR4410IM is mounted on the side of the DataHub's enclosure panel and, though IP67-rated, for extra protection the receptacle's opening is beneath a rubber-backed plate.

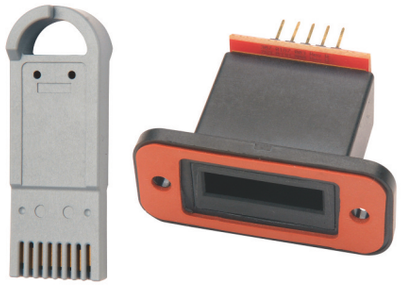
AN INNOVATIVE SOLUTION

The frequency with which data from the units can be retrieved via the Datakey device depends on the deployment, the environment, and sensor and data types. Wilson went on to explain that the new vanwaltDataHub was designed such that inserting a Datakey token into the unit's

receptacle wakes up the system. "We based this part of our design around the USB specification requirement that a device must indicate its presence and speed with a pull-up resistor on the USB D+ data line. We use a low power microcontroller to watch for such an event and as that is its only responsibility where USB is concerned, we did not have to implement a full USB stack."

When the microcontroller detects the USB Datakey pull-up, it boots the computer module and relinquishes control of the USB D+ line to the computer module (which does have the full USB stack).

Once booted, the computer module then enumerates the USB Datakey, just like a PC recognising a new device being inserted into a port. If the device is valid – i.e. the expected vendor and product IDs are present – the computer module will then automatically transfer data.



On the left, the UFX RUGGEDrive token recommended to GB Electronics and, on the right, the IP67-rated UR4410IM

Wilson went on to explain that configuration files can also be transferred automatically as part of the wake-up. "This gives us a relatively straight-forward method of reconfiguring a Datahub in the field without any additional equipment. Configuration data might include an alarm limit on a channel, or you may wish an action to be taken. For example, DataHubs can be used in greenhouses. If it gets too hot, signals can be provided to drive electronics for opening windows."

At the end of the transfer the computer module signals the microcontroller, and the DataHub sounds its internal sounder to inform the user that the token can be removed. The system then drops back into its low power data logging mode.

DEPLOYED AROUND THE WORLD

The first vanwaltDataHub unit with the ability to transfer data to and from a RUGGEDrive token was supplied to Van Walt in 2017. Since then many more have followed and, at the time of writing, several hundred are deployed for environmental monitoring applications around the world.

GBE's engineers created a rugged, reliable and versatile platform when they designed the new DataHub, and the addition of new features (implemented largely through software upgrades) is always possible. Such revisions might include the setting of alarms and/or taking actions based on the live data on multiple channels; individually or collectively.

Bullen said: "Nexus provided more than just the physical hardware on this project. They have lots of experience with the USB protocol, helped us get up to speed with host-to-drive communications and added real value to the entire project, which is important to us because it's how we like to be seen by Van Walt."

Most recently, GBE and Van Walt have co-operated to produce the Van Walt USB Data Compiler. This is bespoke software that makes sense of the downloaded data from the token and concatenation of the strings so that the data presentation becomes more fluid and more easily readable for customers.

"The support from Nexus has been exemplary throughout the entire process and we see them as more of a partner than a supplier," Bullen concluded.

Van Walt
www.vanwalt.com
GB Electronics
www.gbelectronics.uk
Nexus Industrial Memory
www.nexusindustrialmemory.com