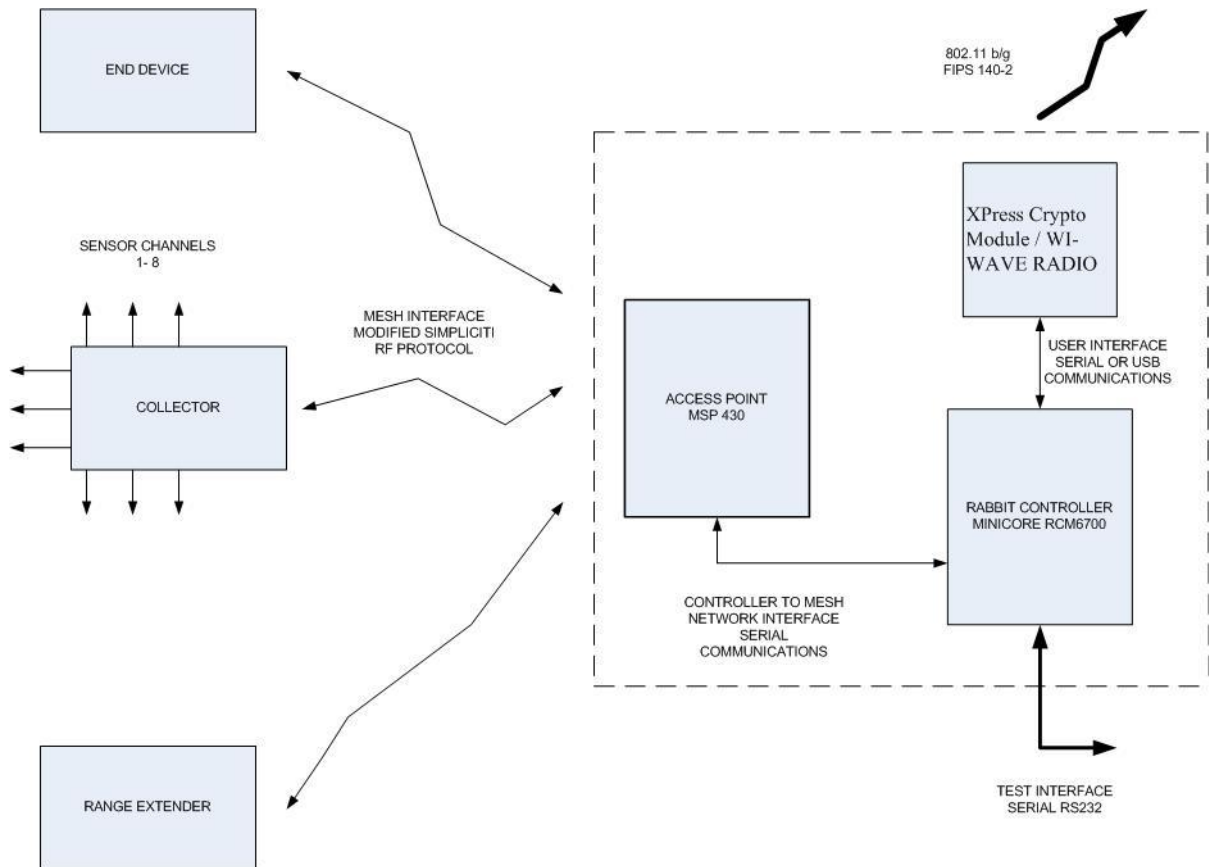


Dynasys Remote Data Collection Network

By Tomas Grajales, VP of R&D, Dynasys Technologies Inc.

Dynasys Technologies Inc. has developed a wireless data collection Network to monitor current use by critical devices in the United States Air Force C130 Aircraft. The system will be part of the Aircraft Availability Improvement Program (AAIP). The goal of the program is to improve Aircraft Availability (AA) by reducing unscheduled maintenance, increasing reliability of systems, and eliminating obsolescence from systems used on aircraft and supporting equipment. The system will provide ON / OFF time and current use of critical equipment in the aircraft. This data will be used to determine actual MTBF in the field, and make decisions on maintenance reliability. In the near future the network will also be able to solve problems in asset tracking & location, temperature logging and energy efficiency applications. The Network is composed of 3 mayor components: the Controllers, the Collectors and End Devices.



The local network is designed based on Texas Instruments Simplicity Protocol stack, chosen because of its small size and its open source. The protocol was modified to extend battery life, gain control of radio transmissions and improvements to its Link layer. The units will only transmit if the Controller starts a session and in their own time slot for added security and RF spectrum control. For the hardware we use TI's MSP430, CC2520 Transceiver and other military rated components to meet full Temperature specifications, making the product very unique in the Active RFID market.

The CC2520/ MSP430 Transceiver combination can support the IEEE 802.15.4 MAC and ZigBee® stack software in future applications that do not require all transceivers to be quiet until polled by the controller.

The Controller polls the data collectors, updates required information to a central database and updates the End Devices. The End Devices are battery powered RFID tags attached to the system that is being monitored (Mount on Metal capable). This allows the critical devices to be moved, uniquely identified and to carry their own usage data. Battery life for the End devices will be over 5 years in extreme environments.

The Collectors are battery powered units with 8 Data Collection Channels. The present configuration uses Raztec's unique current sensor, the RAZC-FLB-100. The sensor operates from a single 5 VDC source, operating temperature of -40 to 100 Deg. C, frequency response of 50 KHz, a response time better than 100 usec, 2500 volt isolation, 0.1% linearity and Transfer gain of 100 mv/A over a 20 Amp range. See Figs 1, 2, 3, 4, 5 and 6.



Fig 1. Sensor

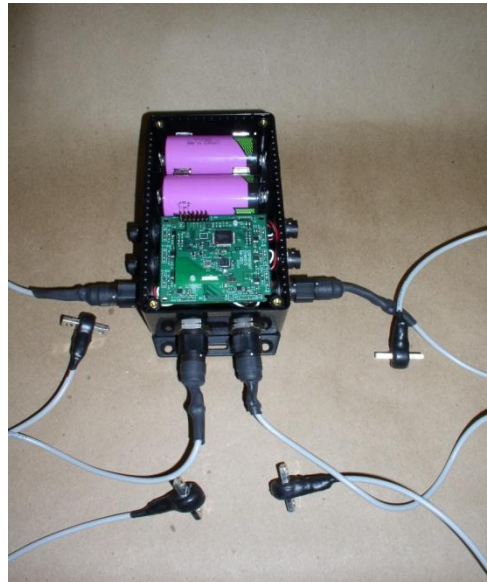


Fig 2 Collector with 4 sensors

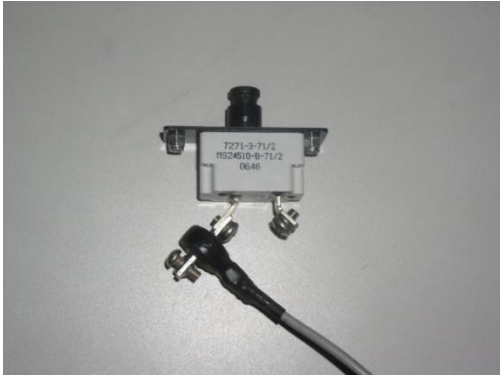


Fig 3 Sensor attached to Breaker



Fig 4. End Device

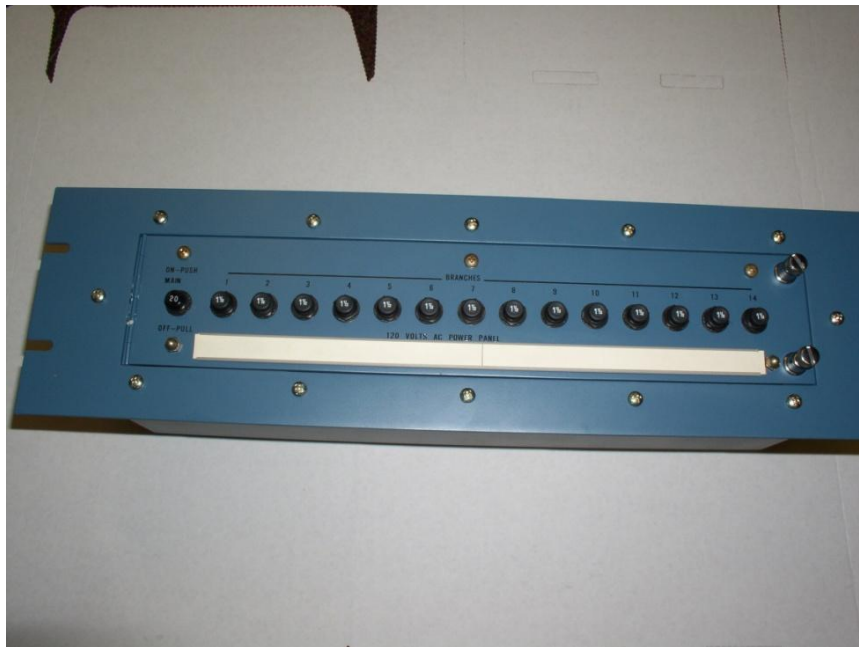


Fig 5. Aircraft Breaker Panel

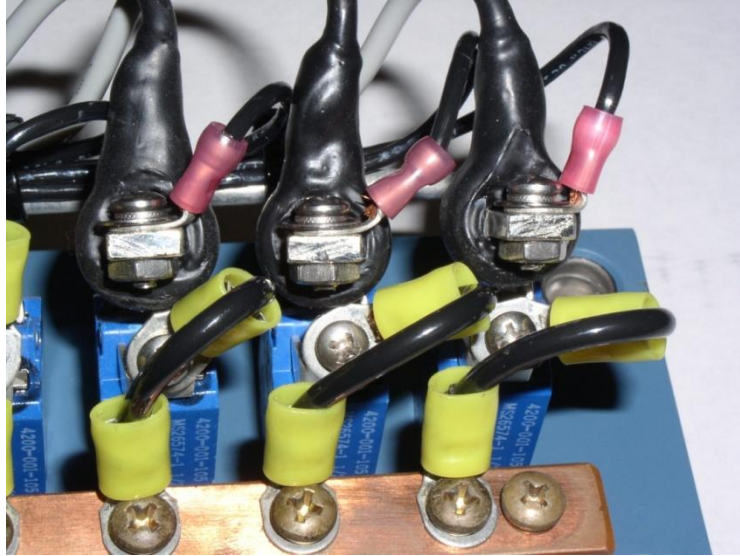


Fig 6. Mounted Sensors

The current sensors fast response time and special design allows us to collect data from all 8 channels (AC or DC currents) in less than 4 msec., every minute for an average battery current use of less than 6 uAmps.

Encrypted data transfers from the Collectors and End devices occur in less than 25 msec, average of 15 msec. , and the Controller controls the rate of transfer. For example, updates could happen every minute, or every 5 minutes for large battery savings.

Range Extenders are used to enhance coverage for noisy environments, signal bounce cancellation and blockage.

To separate the application from the local network controller we are using the RCM6700 Rabbit controller. It offers us various communication interfaces like RS-232, USB, Ethernet, I2C and plenty of RAM and Flash. For the data uploads we can use Quratech's ABDG-SE-IN5410 WiFi radio for local area networking or Iridium's Short Burst satellite modem for satellite communications. Different levels of data security and encryption will be available.

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