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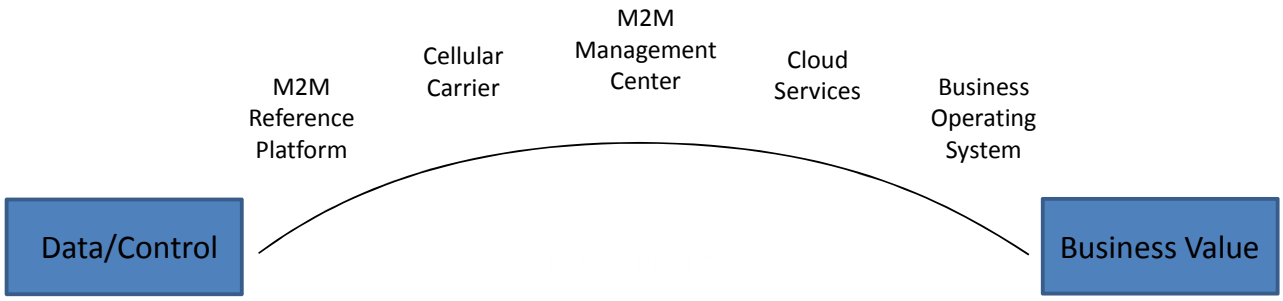
Operating Instructions

This device is designed to enable remote connection of sensors and machines to cloud services via a cellular carrier. This device is based on a PIC32 micro controller from Microchip (http://www.microchip.com/) running FreeRTOS. A variety of inputs and outputs are included to facilitate electrical connections to a wide variety of devices, including RS232, RS485, CAN, Ethernet, USB, ZigBee , 802.15.4, and general purpose analog/digital inputs.

After the firmware has been developed and validated, operation of the device will be limited to properly connecting the device to the desired sensor interfaces and applying power. The operating parameters for the device will be supplied and monitored by the cloud component of the system.



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Technical Operating Description

The device contains three radio interfaces:

1. Cellular M2M module

(FCC certified module from Novatel HS3001 http://www.m2msearch.com/node/501)

2. IEEE 802.15.4 transceiver operating in the 2.4GHz ISM band.

3. GPS receiver module

(uBlox MAX-6Q - http://www.u-blox.com/en/gps-modules/pvt-modules/max-6.html)

The antenna and ground solution for the radios are contained on the pcb.

Provisions have also been made to use optional external antennas for the GPS receiver and the 802.15.4 radio.

The output levels and frequencies of the M2M module are controlled by the module itself. The module operation is managed by the microcontroller using a UART based AT command interface.

The output levels and frequencies of the 802.15.4 transceiver are controlled by the microcontroller via an SPI interface. The radio is FCC compliant at full power (using the integrated pcb antenna) with the exception of channel 26. Operation of the radio on that channel triggers the firmware to reduce the power output slightly in order maintain compliance.

Antenna List

The cellular module antenna is a pcb mounted dual band antenna from Taoglas. The part number is PA-25A.

The GPS receiver antenna is a pcb mounted antenna from Antenova. The part number is A10204.

The 802.15.4 transceiver antenna is a custom slot antenna which is part of the pcb artwork. The radiation pattern of this antenna is similar to a dipole.