Remote Control Using RF E-block

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Abstract

Matrix's new RF E-block has opened up a world of possibilities for any project that requires remote control. In this article Sean demonstrates the RF capabilities by designing a buggy which is controlled remotely using the new RF E-block. Attached is the Flowcode file he used so you can build your own working buggy!

Requirements

Software:

- Professional licence of Flowcode v4 for PIC16 or AVR.
- Update for RF component

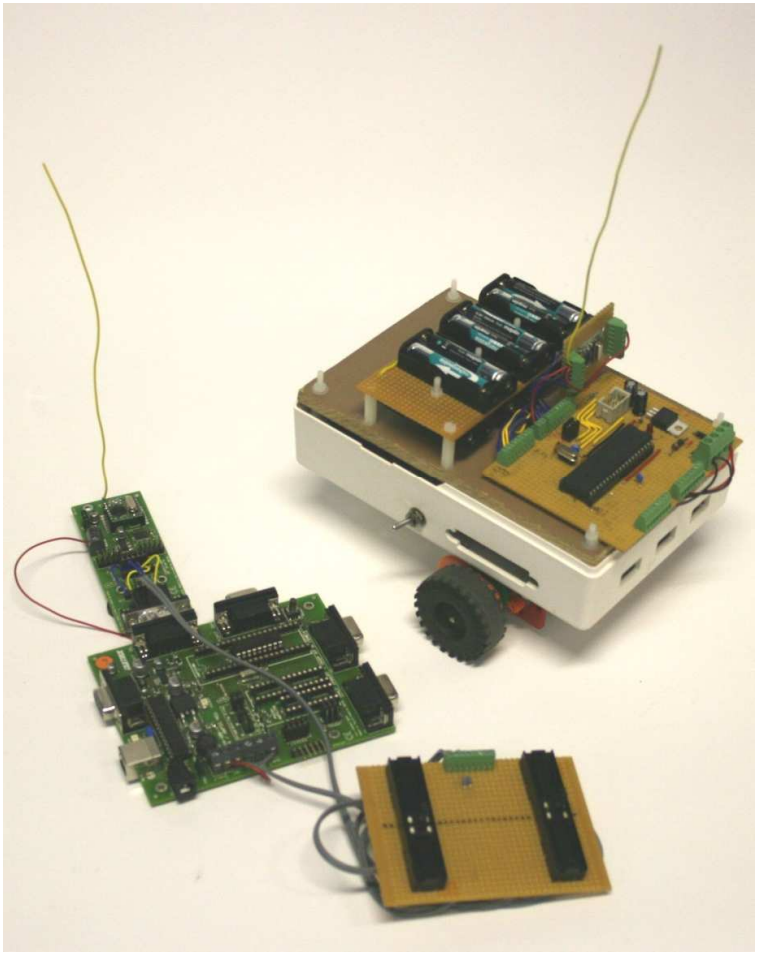
Hardware:

- EB063 RF Board
- EB064 dsPIC/PIC24 Multiprogrammer
- Custom hardware

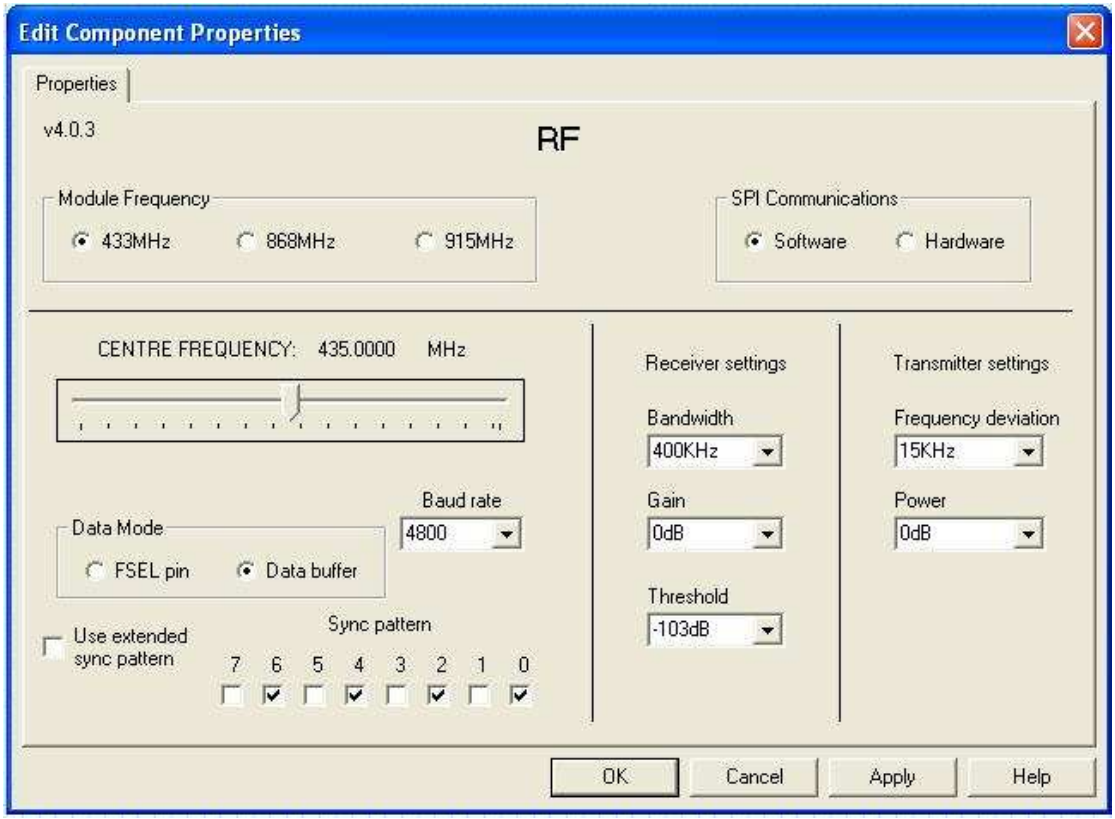
Introduction

The new RF E-Block (EB063) and Flowcode RF component are now available. The E-Block is available in one of three ISM (license free Industrial, Scientific, Medical) frequency bands. Regional radio frequency regulations may dictate which bands can be used in specific locations (please check if you are unsure).

The RF E-Block contains a transceiver module that can be switched between transmitter and receiver operation using the macros provided by the Flowcode RF component.



The picture on the right shows the setup of the E-blocks and buggy.



Note: The Module frequency setting must match the frequency band of the module being used. The module frequency band can not be re-programmed.

RF module

The RF module transmits and receives binary data using Frequency Shift Keying (FSK). This uses two different frequencies, either side of a centre frequency, to represent a '1' or a '0'. The receiver, tuned to the same centre frequency, detects whether the received frequency is above or below the centre frequency to determine the transmitted logic level.

The modules can be configured to handle data in one of two ways, selected using the Flowcode component properties and macros.

In the simple mode (FSEL option) the modules directly transmit/receive logic levels using a single control pin.

In the more advanced mode (Data option) the modules operate with bytes of data using internal shift registers accessed via an SPI bus. In this mode there are several additional features that help to ensure reliable data transmission in the noisy ISM environment. In particular, the Sync pattern (accessible via the Flowcode component) is transmitted at the start of each data transmission, and must be successfully received, at the programmed Baud rate, by a receiver with the same Sync pattern, before any data is shifted into the receiver's shift register. The message following the sync pattern can consist of multiple data bytes.

Flowcode component

The Flowcode RF component and macros provides access to a wide range of module settings relating to data format, frequency selection, transmitter power, receiver sensitivity and bandwidth.

The macros supplied with the RF component allow data to be transmitted/received in four different formats:

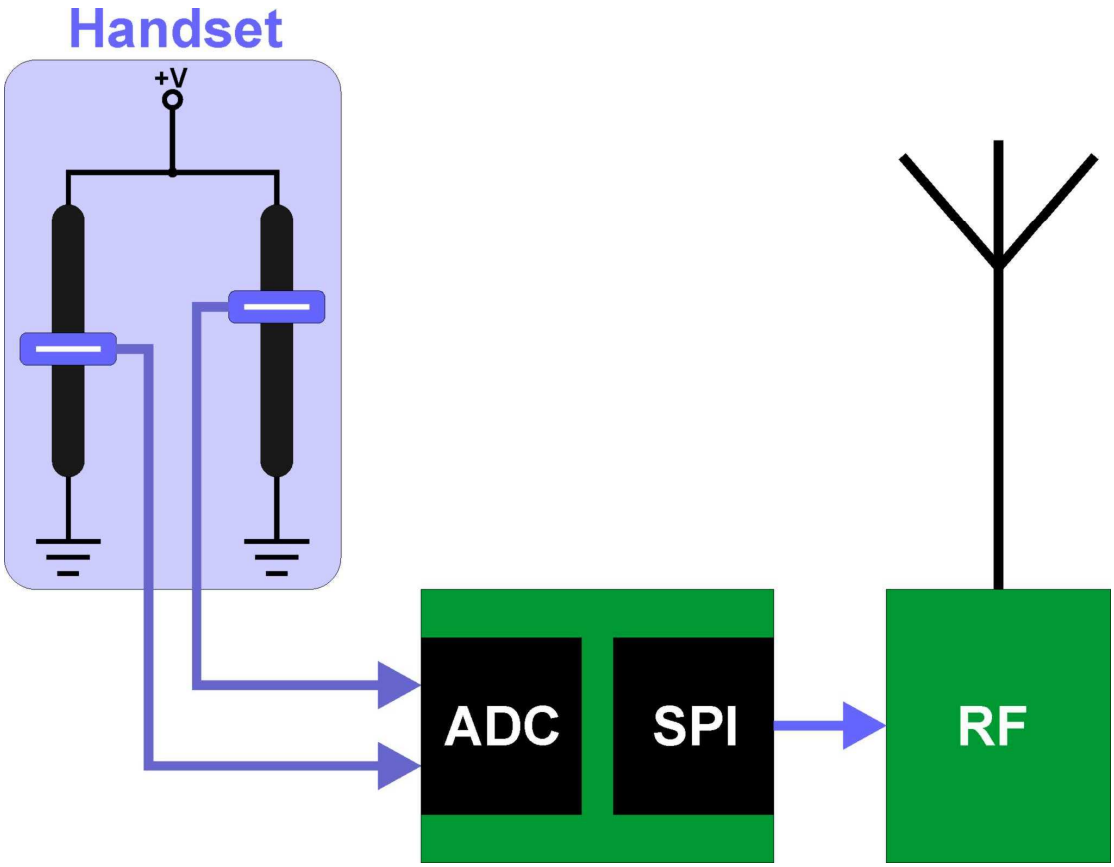
FSK - Direct access to the transmitted logic state.
Byte - Transmission/reception of a single data byte.
String - Transmission/reception of a Flowcode compatible text string.
Data/Buffer - Transmission/reception of an array of bytes.

Example programs

The example programs attached to this article allow two RF linked systems to provide remote control of a wheeled robot chassis.

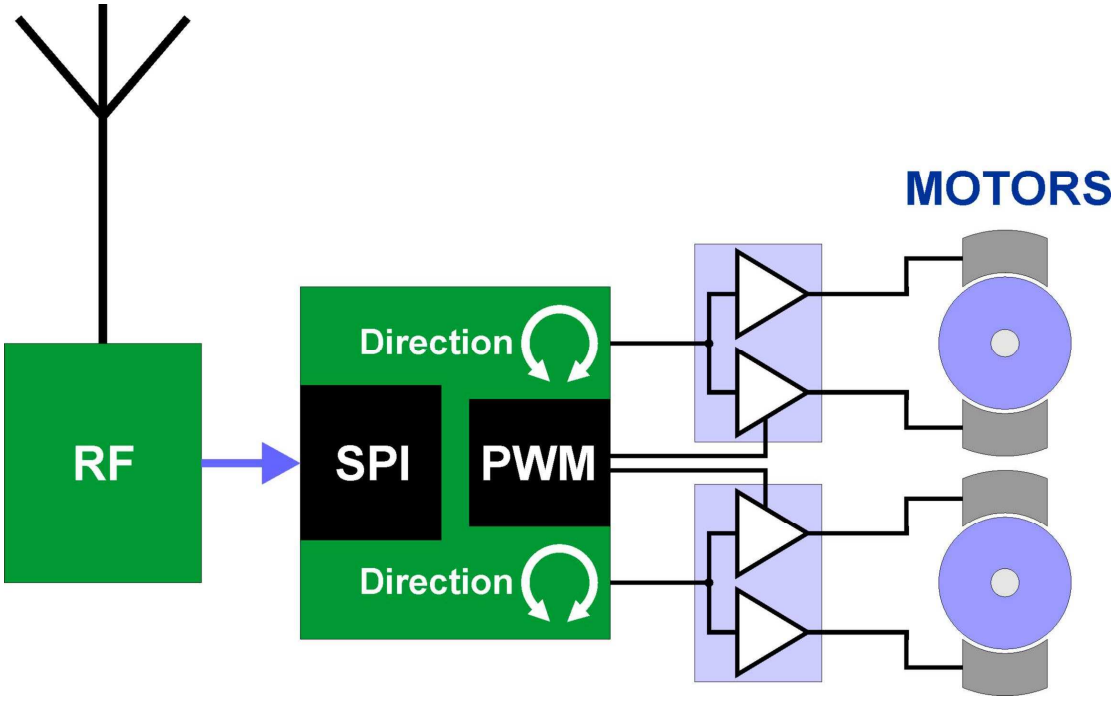
The Data/Buffer format is used to transmit 4 bytes of data per message.

The transmitter system consists of the EB064 dsPIC multi-programmer with the supplied dsPIC30F2011 chip, an EB063 RF board, and a simple prototype handset using two slider potentiometers.



The first two bytes of the transmitted message contain the sampled values from the ADC channels connected to the handset potentiometers (the other two bytes are for future expansion).

The receiver is a prototype system based on an AVR ATmega324P (running at 3.3V), the same RF module as used on the EB063, a dual motor controller, batteries and regulators, and a motorized chassis.



The two ADC channel readings sent by the transmitter are used to independently control the speed and direction of the two motors, allowing skid steering of the chassis.

Further development of this project should allow additional actuators to be controlled by the transmitter, and telemetry to be returned from the chassis.

Further reading

Below are some links to other resources and articles on related subjects, and technical documentation relating to the hardware used for this project...

Flowcode:	http://www.matrixmultimedia.com/flowcode.php
MIAC:	http://www.matrixmultimedia.com/miac.php
Learning Centre:	http://www.matrixmultimedia.com/lc_index.php
User Forums:	http://www.matrixmultimedia.com/mmforums
Product Support:	http://www.matrixmultimedia.com/sup_menu.php