

# Interfacing Telos to XSM

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## 1 Introduction

The Extreme Scaling Mote (XSM) has been designed as part of the DARPA NEST program. Since over 10,000 of these nodes will be manufactured, we are interested in leveraging the sensors to connect to new platforms. In this document we describe how to interface the XSM mote to Telos, a new IEEE 802.15.4-compliant mote with a Texas Instruments MSP430 microcontroller. Telos may interface with the Atmel ATmega128 on XSM directly as a co-processor or it may bypass the ATmega128 and directly drive the sensors.

## 2 Design and Mappings

Telos is a new generation of mote design featuring a new connector specification and on-board sensors. The essential functions are exposed through 10-pin and 2-pin IDC headers. By using an I<sup>2</sup>C switch, we can achieve the same functionality as having a larger connector through the use of a digital bus. The Telos-XSM adapter takes advantage of an ADG715 I<sup>2</sup>C 8x8 switch. This switch is used to power each of the components on XSM and switch between UART mode and interrupt mode. The schematic of the Telos-XSM adapter is at the end of this document.

Table 1 shows the pin mappings between Telos and XSM and their functions. It is critical that the pins defined in the XSM column are brought out through the 51-pin connector such that Telos has the option to drive each of the sensors directly.

## 3 XSM as a Co-processor

In the simplest setup, XSM may be loaded with an application that accepts commands via the UART. Telos and XSM may communicate via the UART to collect and report data. This mode allows the Telos-XSM adapter to act as a bridge between CC1000 433MHz network and the 2.4GHz IEEE 802.15.4 networks.

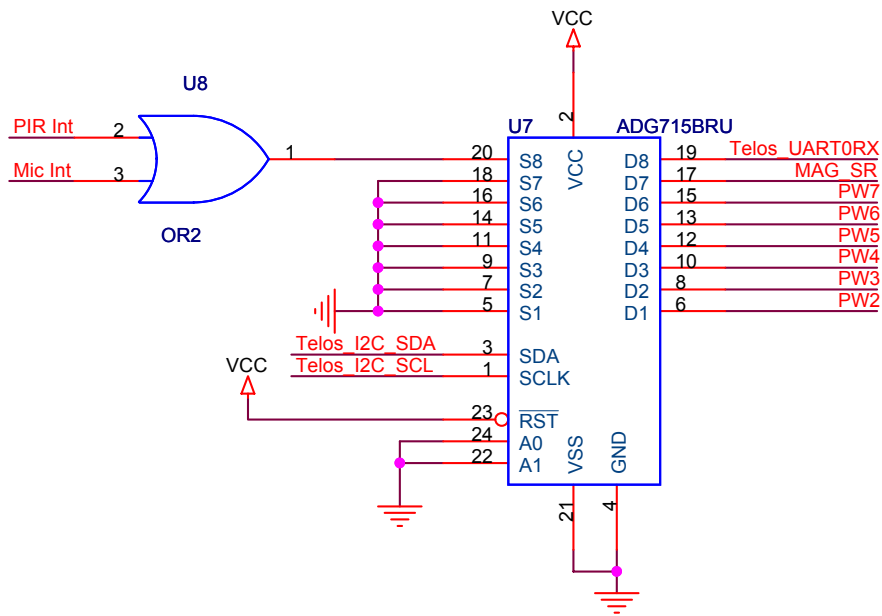
## 4 XSM as a sensor board

If low power operation is critical, the ATmega128 may be removed or placed into its lowest power state and Telos' TI MSP430 ultra low power microcontroller may drive the XSM's sensors. This permits direct interfacing with the sensors while leveraging the advancements in data rate and low power operation provided by the Telos platform.

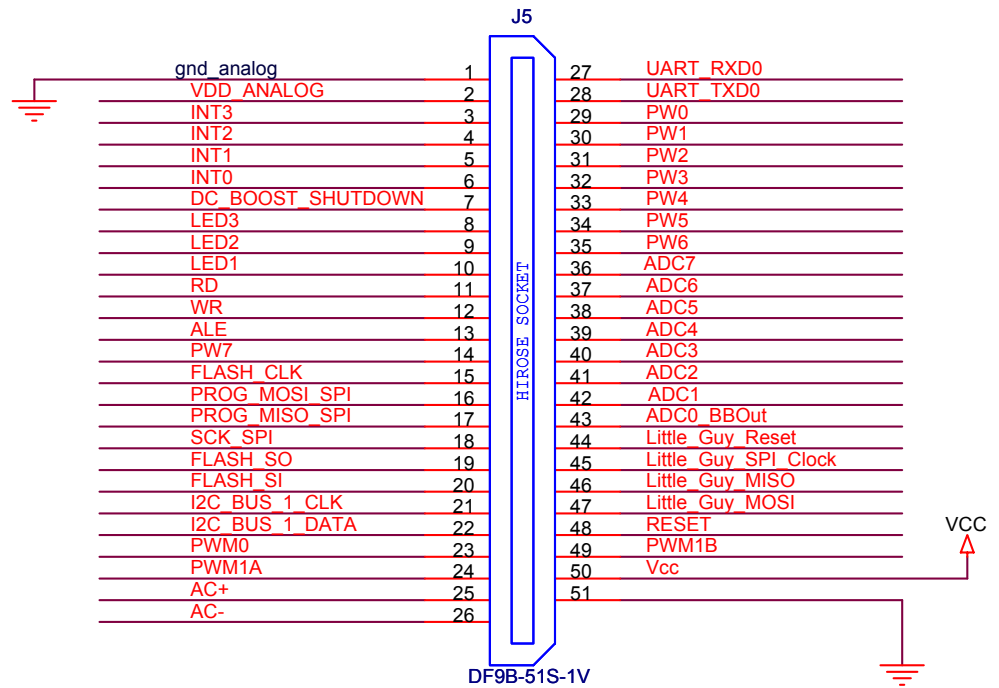
Sensor	Telos	XSM	Function
Accelerometer	I <sup>2</sup> C ADC1 ADC2	PW4 ADC3 ADC4	Power x-axis analog output y-axis analog output
Magnetometer	I <sup>2</sup> C I <sup>2</sup> C I <sup>2</sup> C ADC3 ADC4	PW5 I <sup>2</sup> C MAG_SR ADC5 ADC6	Power Gain control Set-Reset x-axis analog output y-axis analog output
Microphone	I <sup>2</sup> C I <sup>2</sup> C UARTRX0 ADC0	PW3 PW7 AC- ADC2	Audio receive power Low pass filter power Microphone interrupt Microphone analog output
Sounder	I <sup>2</sup> C	PW2	Power
PIR	I <sup>2</sup> C UARTRX0 ADC5	PW6 AC+ ADC7	PIR Power PIR interrupt PIR analog output
ATmega128	I <sup>2</sup> C UARTRX0 UARTTX0	I <sup>2</sup> C UART_RXD0 UART_TXD0	I <sup>2</sup> C Bus UART receive UART transmit

Table 1: Pin mappings from Telos to XSM enabling the use of XSM as either a co-processor or a sensor board

# Power & I/O Switches



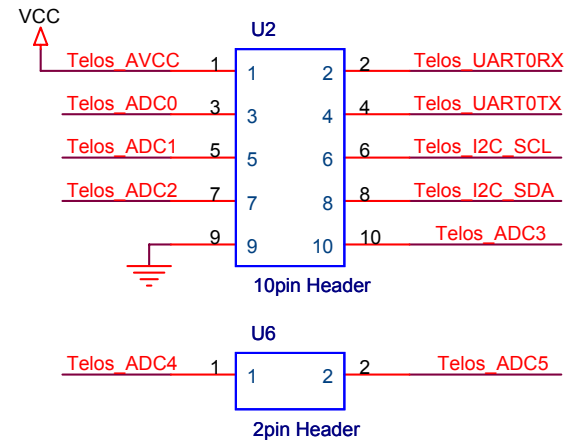
# Connector to XSM



# Pin Mappings

Telos ADC0	ADC2
Telos ADC1	ADC3
Telos ADC2	ADC4
Telos ADC3	ADC5
Telos ADC4	ADC6
Telos ADC5	ADC7
Telos UART0TX	UART_RXD0
Telos UART0RX	UART_TXD0
Telos I2C_SCL	I2C_BUS_1_CLK
Telos I2C_SDA	I2C_BUS_1_DATA

# Connector to Telos



Title		
<b>Telos XSM Adapter Board</b>		
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A	(c) Copyright 2004: UC Berkeley	1
Date:	Thursday, April 29, 2004	Sheet 1 of 1