

PIC32MX360F612 Adaptor

MK-33856

December 31, 2014

IONOTRONICS Corporation

<http://www.ionotronics.com>

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1 Introduction

The MK-33856 PIC32MX360F512 Adaptor attaches to the Eoraptor and provides the following capabilities for electronic and robotics control:

- 80 MHz PIC32 SoC with 512K Flash
- Two Independent I2C Busses.
- Supports Wireless RS-232 Serial Communication (WiFi) Through SAMTEC 40 Pin Connection
- Interfaces to Eoraptor on-Board EEPROM SPI Flash with a Multiplexer for Separate Programming
- Hirose DF11 Series 16 pin Connector for ICD. Cable available for 16 Pin Hirose to RJ-11 or 0.1" Headers.
- All Switch Based Configuration (no Jumpers Required) for Direct Serial Access to PIC32 and Wireless Module to the PIC32 SoC.
- Reset Switch.
- 2x Independent UART Cores with Connections to 4 pin Hirose connector with RS-232 Level Shifting.
- 4 x 12 pin Hirose DF11 Series Connectors for up to 33 GPIO.
- High Speed SPI Interface Between PIC32 SoC and Wireless Module (e.g. WiFi).
- Hardware Flow Control Support for Serial Interface Between PIC32 and Wireless Module.

Using the Eoraptor you can interface sensors to the PIC32 SoC and provide Wireless Access (e.g. Wireless TCP/IP) to sensors and the PIC32. Visit the IONOTRONICS Web Site for blueprints of Humanoid and Rover Robots built with the 32 bit PIC using the Eoraptor. Besides Robotics the Eoraptor can be used for integrating sensors, control and communication via RS-232 or Wireless TCP/IP for many electronics applications controlled by the PIC32 SoC.

2 Description

The PIC32 Adaptor is shown in Figure 1 and 2.

The on-board XTAL Clock on board is 16 MHz. The on chip clock at 80 MHz is derived using the PIC32 PLL.



Figure 1 PIC32 SoC Adaptor (MK-33856)

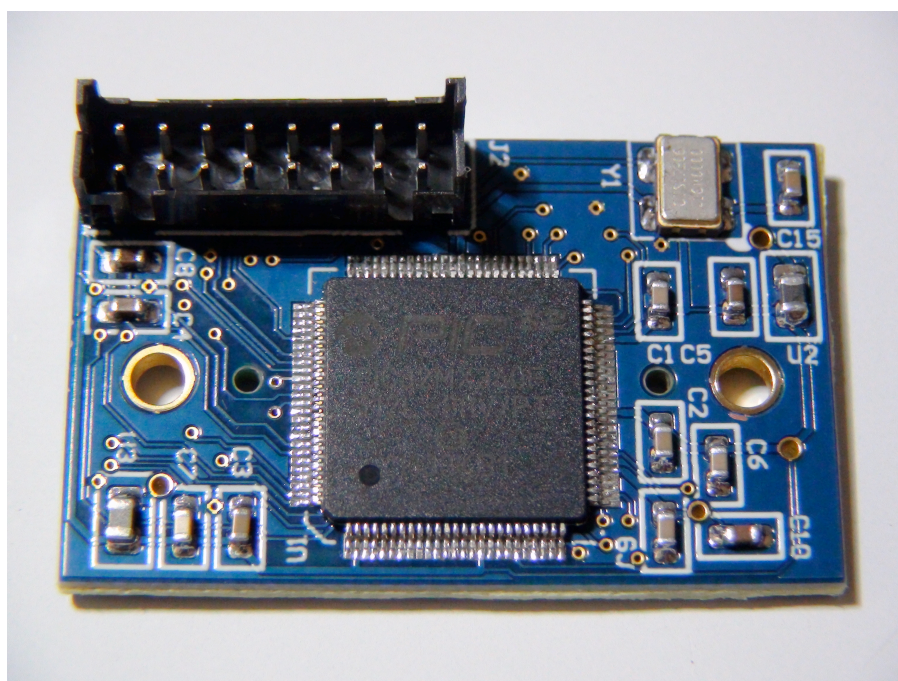


Figure 2 PIC32 SoC Adaptor (MK-33856) Top View

Figure 3 shows that the PIC32 Adaptor can be attached to a platform using a 40 pin FSI series Samtec connector.

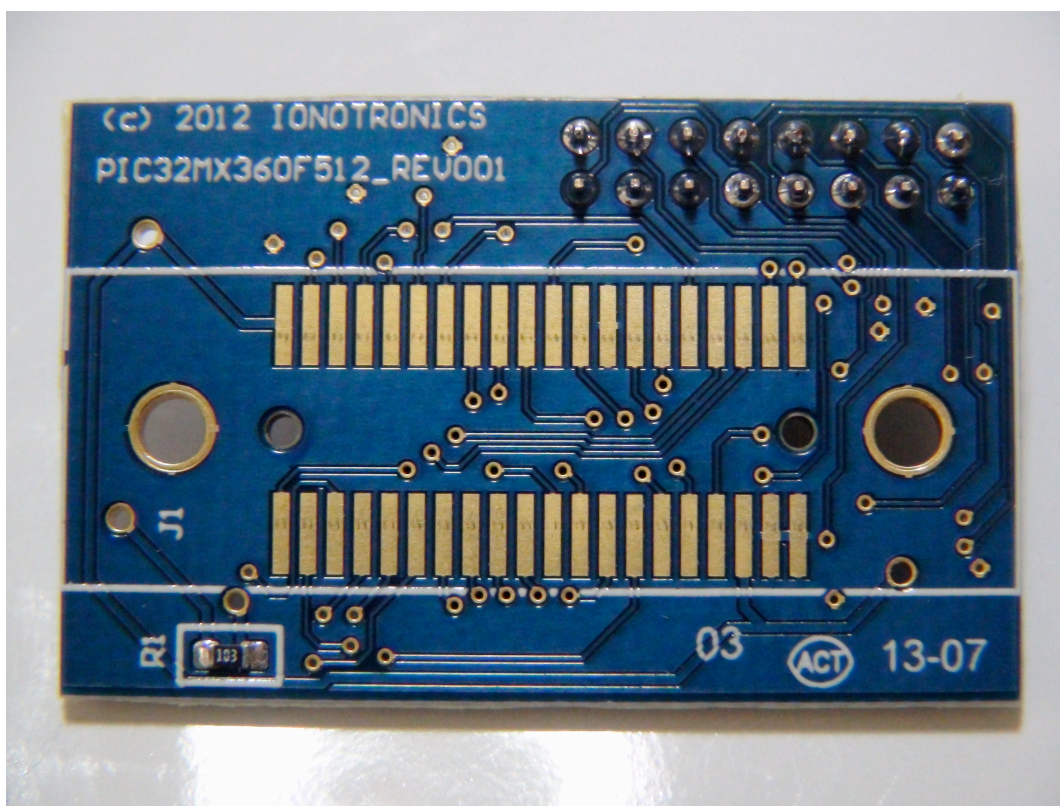


Figure 3 Adaptor Bottom View with Mating to Samtec FSI Series (1mm pitch, 40 pin Dual Row)

3 SAMTEC FSI Series 40 Pin Connector

The 40 Pin Samtec connector provides the capability to attach the PIC32 SoC to the Eoraptor or any other platform. The modules are simply screwed on to the Eoraptor or platform. See Figure 4.

For the Samtec Datasheet:

<https://www.samtec.com/products/fsi>

For the Samtec Footprint:

<http://suddendocs.samtec.com/prints/fsi-1xx-xx-xxx-d-x-xx-xx-mkt.pdf>

Part Number: FSI-120-03-G-D-AD

3mm Height, Two Rows, Each 20 Positions.

The Eoraptor provides the foundation for the PIC32 Adaptor to control Robotic systems.

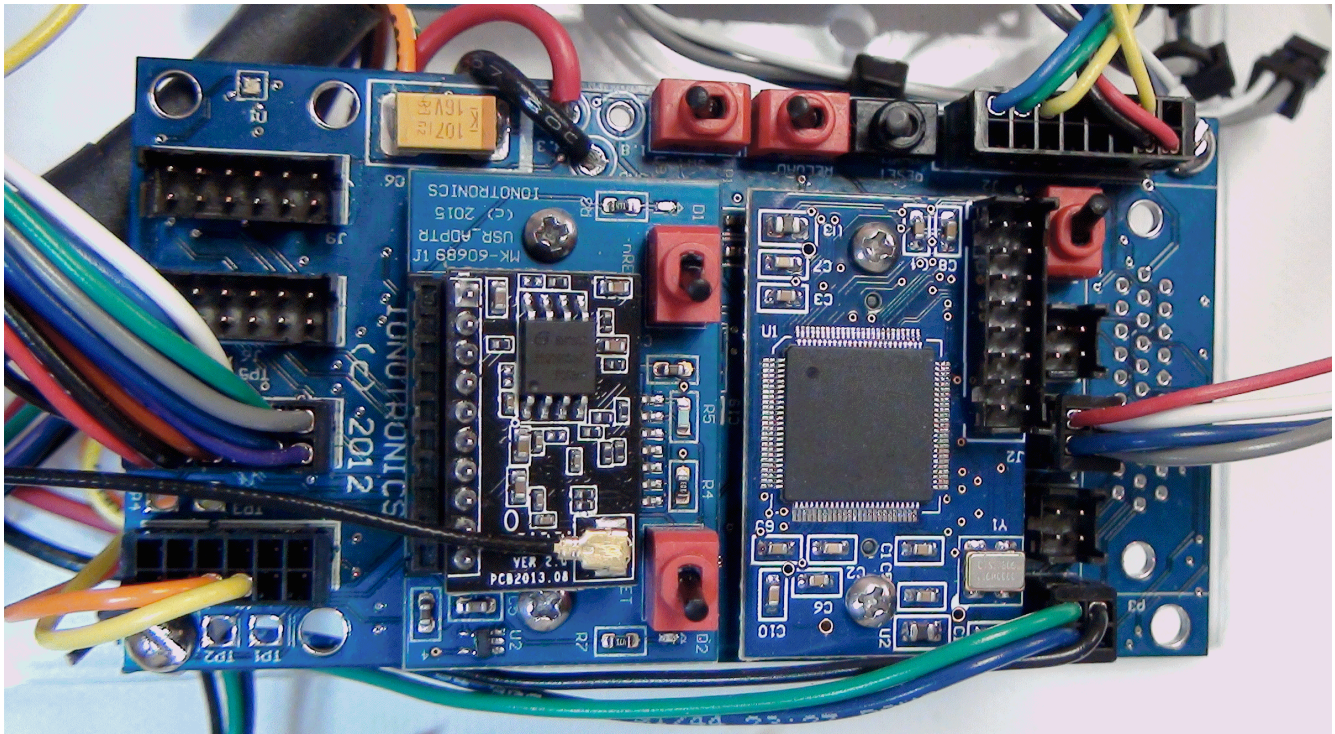


Figure 4 PIC32 Adaptor Attached to Eoraptor

By attaching the PIC32 Adaptor to the Eoraptor, The PIC32/Eoraptor combine to provide 2 RS-232 connections, two separate I2C busses and connectors supporting 33 GPIO as well as a connector for programming the PIC32 (using Microchip programmers e.g. PICKit3 or ICD3).

Figure 5 shows the various interfaces and GPIO connectors supported by the Eoraptor.

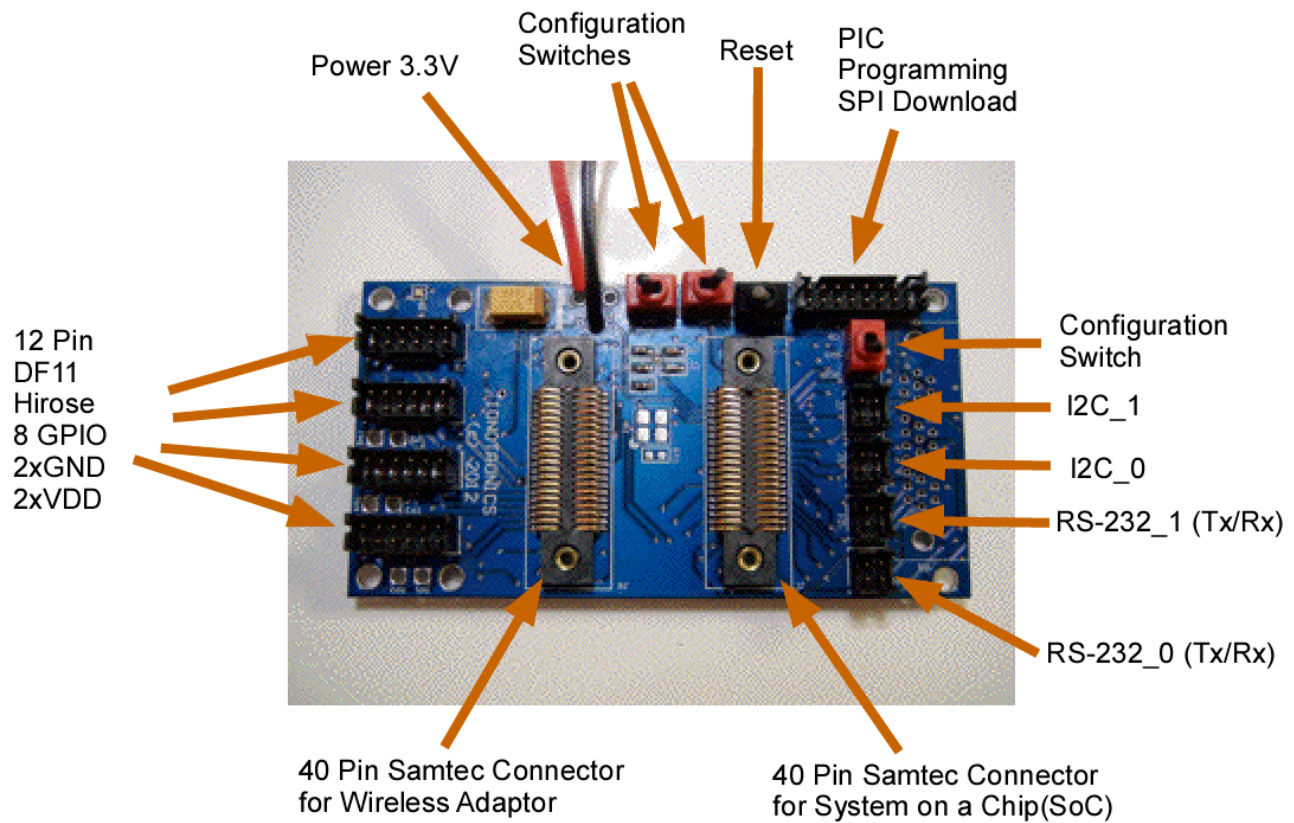


Figure 5 Eoraptor Interfaces and Connections

4 PIC32 Adaptor Dimensions

Figure 6 shows the dimensions of the PIC32 Adaptor. Figure 7 shows the dimensions of the Eoraptor.

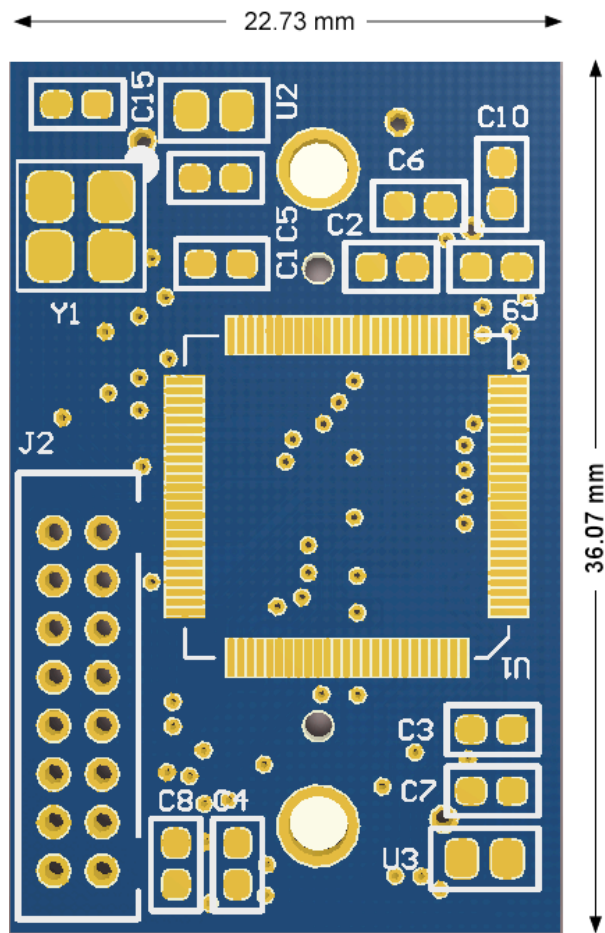


Figure 6 PIC32 Adaptor Size

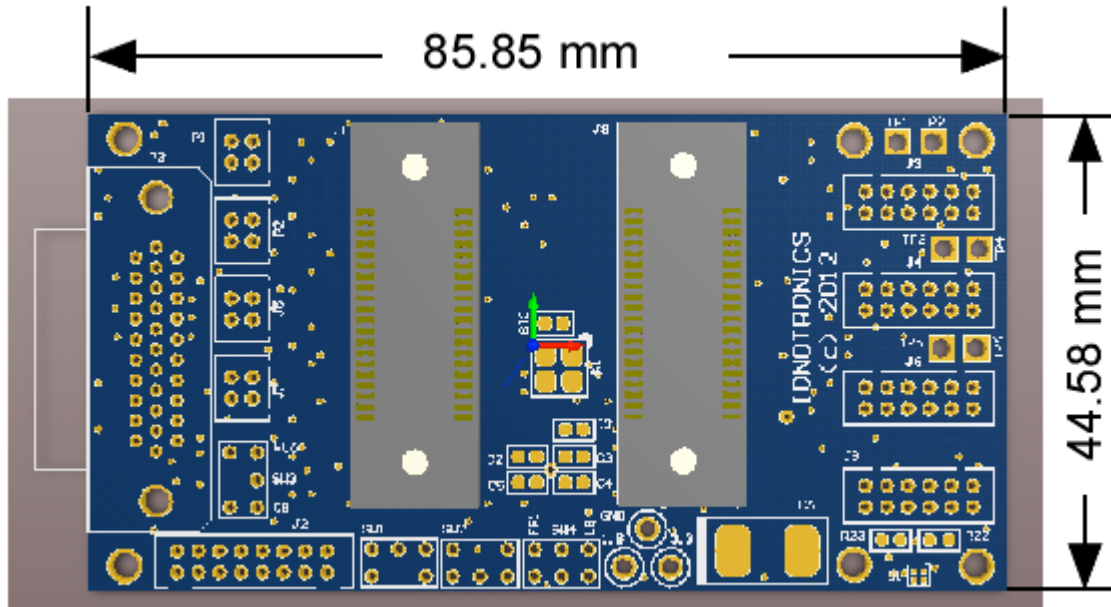


Figure 7 Eoraptor Board Dimensions

5 PIC32 Adaptor GPIO Mapping to 40-Pin Samtec Connector and Eoraptor

When the PIC32 Adaptor is attached to the Eoraptor, various PIC32 GPIO signals and programming pins are mapped to the Eoraptor set of 12 pin Hirose connectors. The PIC32 I2C signals are mapped to the separate I2C busses. GPIO signals from the two PIC32 UART cores are also mapped and level shifted to RS-232 levels. See Figures 8,9 and 10.

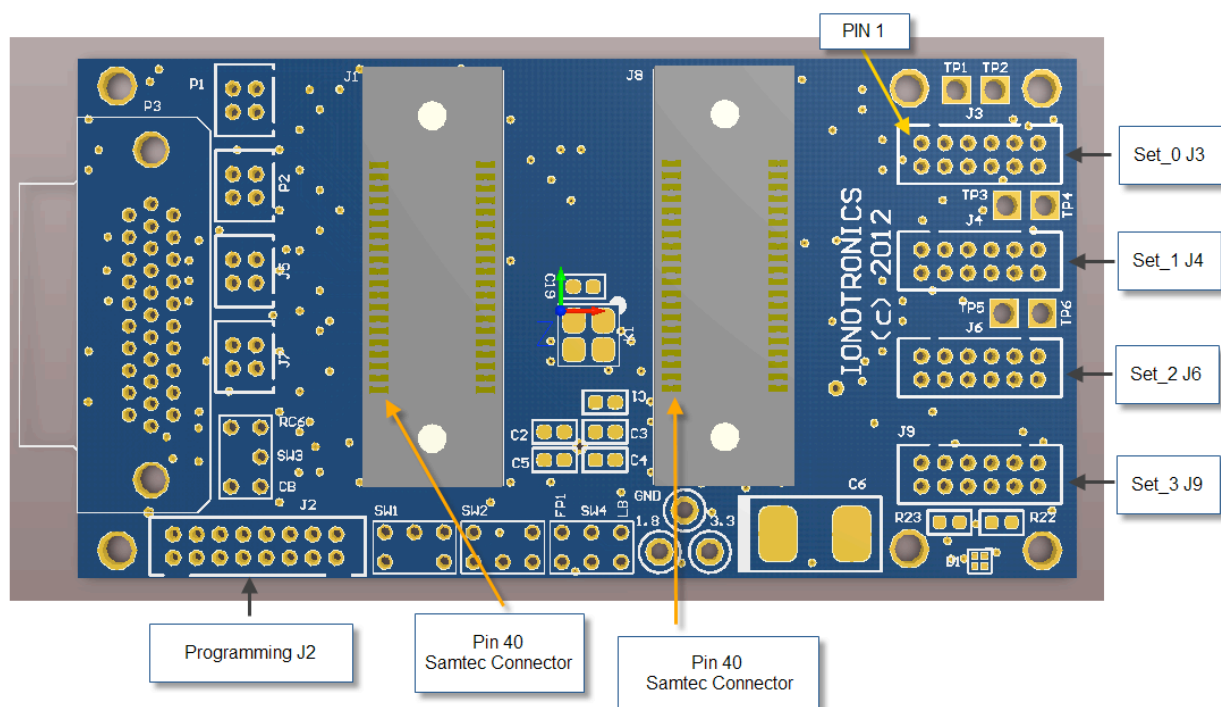


Figure 8 Eoraptor GPIO Connections

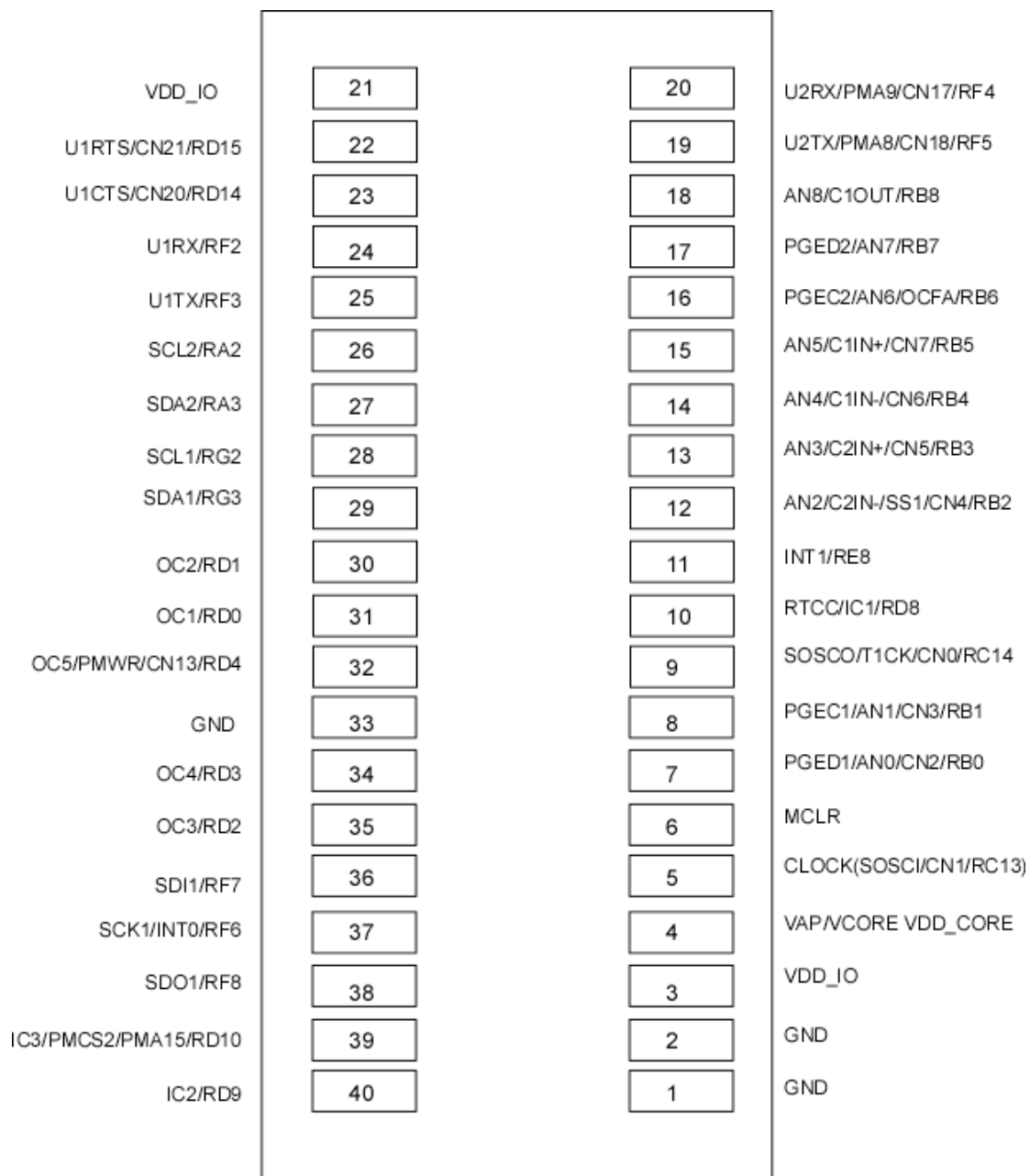


Figure 9 PIC32 Adaptor GPIO Mapping to 40- Pin Samtec Connector

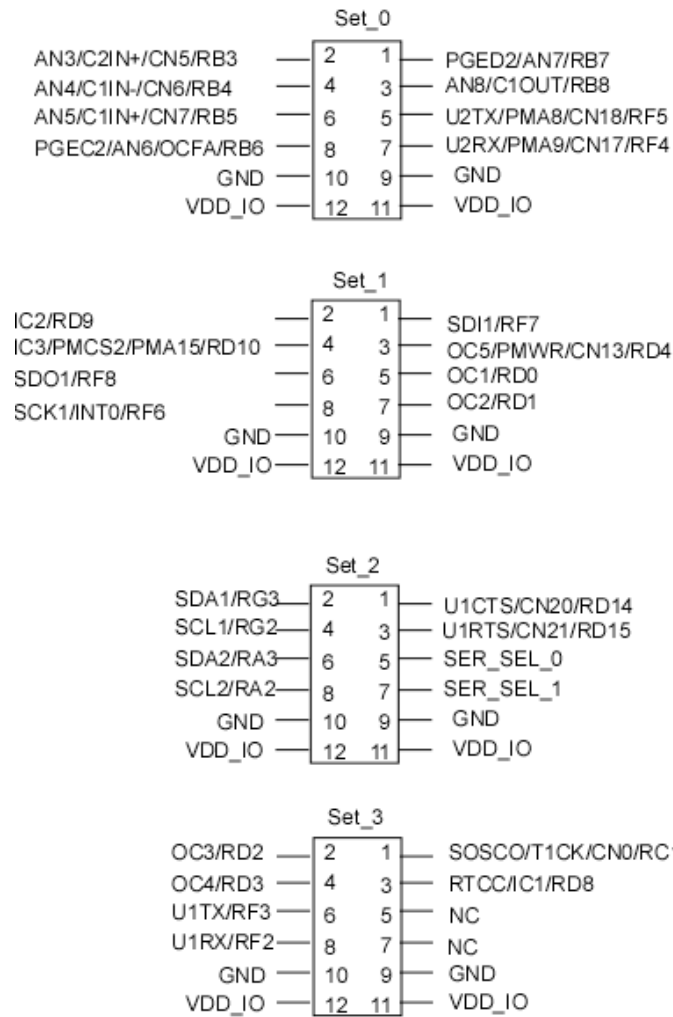


Figure 10 PIC32 GPIO Mapping to Eoraptor 12 pin Hirose Connectors

The PIC32 ICD Programming Pins are mapped to a 16 pin Hirose connector. A cable from the 16 pin connector to a header allows the PIC32 to be programmed using Microchips USB programmers (PICKIT 3 or ICD 3 for example). See Figure 11 for the pin out of the 16 pin programming connector.

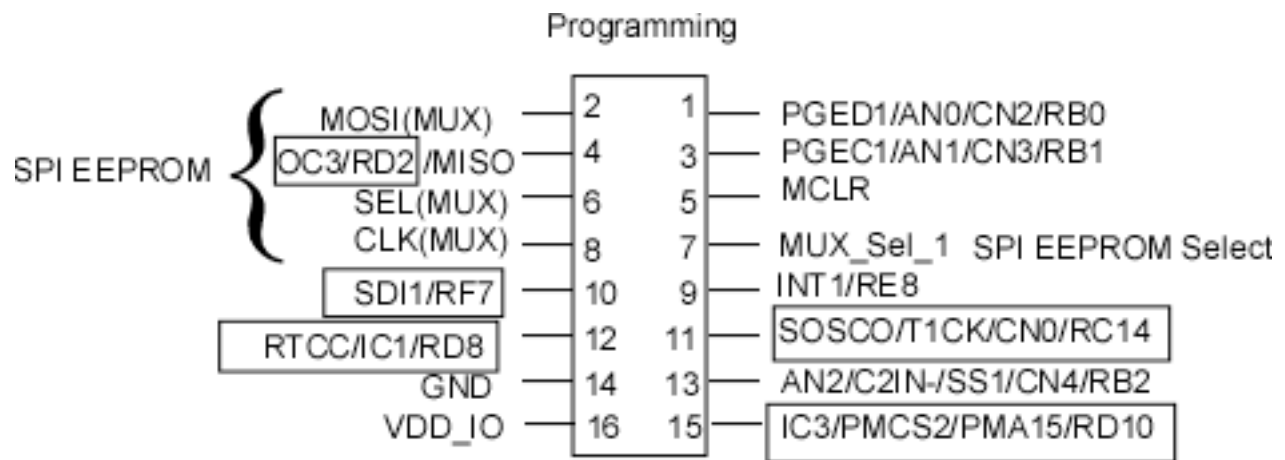


Figure 11 PIC32 Mapping to Eoraptor 16 pin Hirose Programming 16 pin Connector

6 Eoraptor Configuration Switches

There are three configuration switches that setup the Eoraptor to operate in 3 Modes to support serial connections to the PIC32 Adaptor and Wireless Module.

6.1 Direct Serial Connection to the SoC

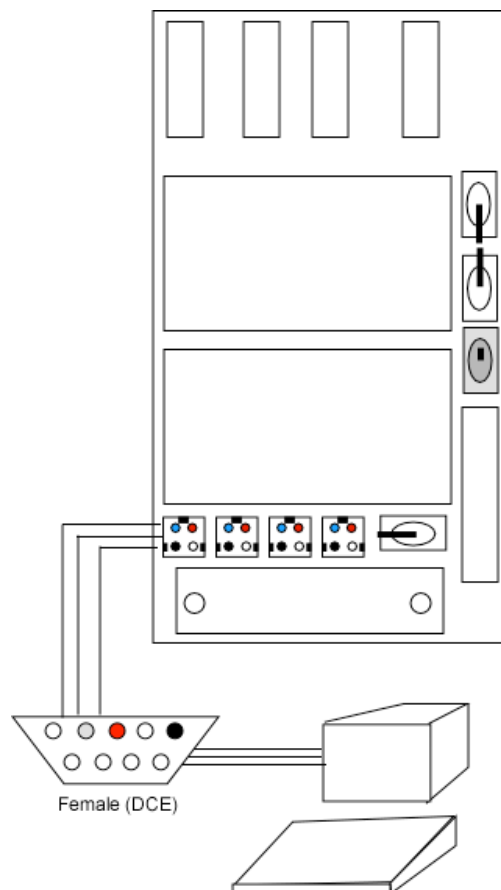


Figure 12 Mode Switch Setting for Workstation Direct Serial to SoC (e.g. PC to PIC32)

6.2 Direct Serial to the Wireless Adaptor

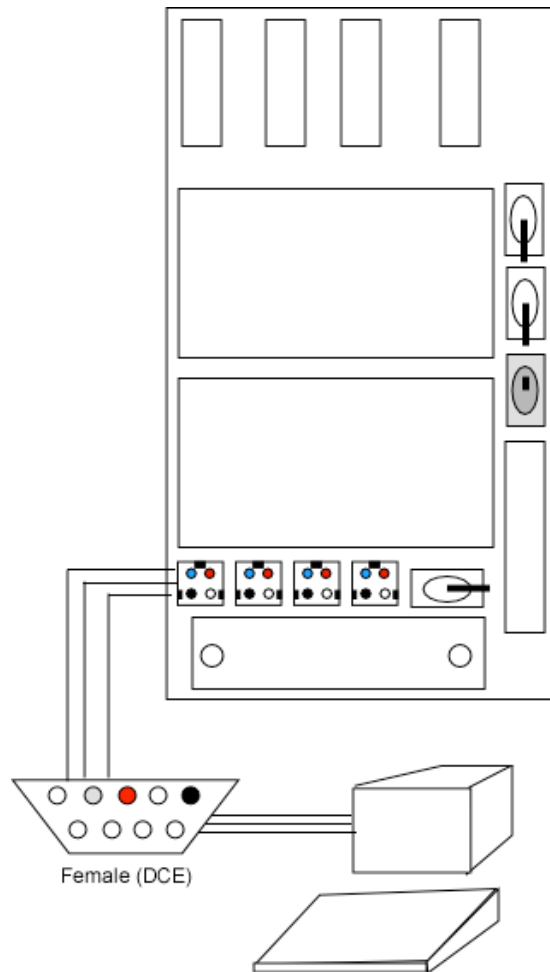


Figure 13 Mode Switch Setting Workstation to Wireless Module (Configuring WiFi Using AT Command Set)

6.3 Operation Mode Wireless to SoC Serial Connection

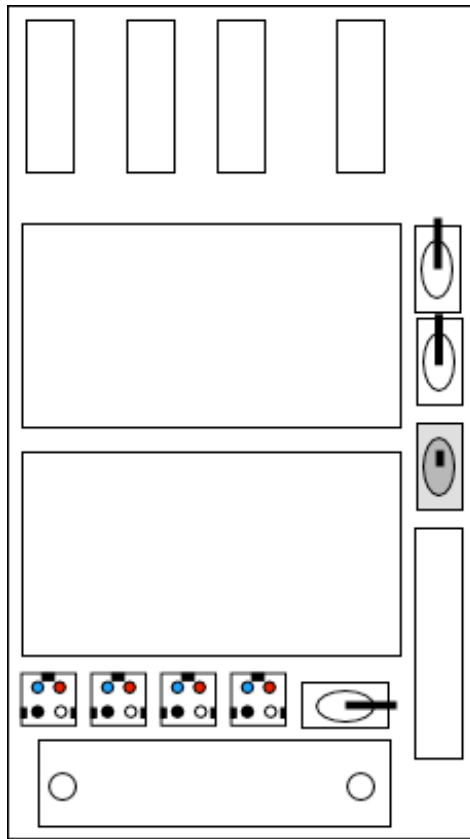


Figure 14 Mode Switch Setting Operational Mode Wireless Module Serial to SoC e.g. Wireless TCP/IP Serial to Wireless Module. Wireless Module to PIC32 SoC

7 Eoraptor On-Board SPI EEPROM with PIC32 Interface

The Eoraptor supports an on-Board SPI EEPROM (ATMEL 8 Mbit). The SoC can access the SPI EEPROM through the GPIO pins shown in Figure 15.

SDO1/RF8	MOSI
OC3/RD2	MISO
OC4/RD3	Chip_Select
SCK1/INT0/RF6	Clock

Figure 15 GPIO to On Board SPI EEPROM

Eoraptor has an on-board mux that allows the SPI EEPROM to be either accessed externally (for example with the Pyraptor USB/I2C/SPI Bridge) or by the SoC. The Programming connector (Figure 11) has a MUX_SEL pin. It is tied to ground through a 10 KOhm resistor. Therefore, by default the SoC has access to the SPI EEPROM. By driving this signal HIGH (tie it to VDD), the external programmer has control over the SPI EEPROM.

This setup allows for the SoC (non PIC32) to be booted up from the SPI EEPROM while an external programmer (Pyraptor) can be used to burn in the Bootup code and other data into the EEPROM. Or the PIC 32 SoC can access data stored in the EEPROM after burning using the Pyraptor.

8 I2C Interfaces

Two separate I2C busses are provided. See Figure 16. Each would normally be connected to I2C Cores in the SoC. For example, the PIC32M360F512 supports two independent I2C cores. The PIC32 GPIO supporting the I2C Cores are shown in Figure 17.

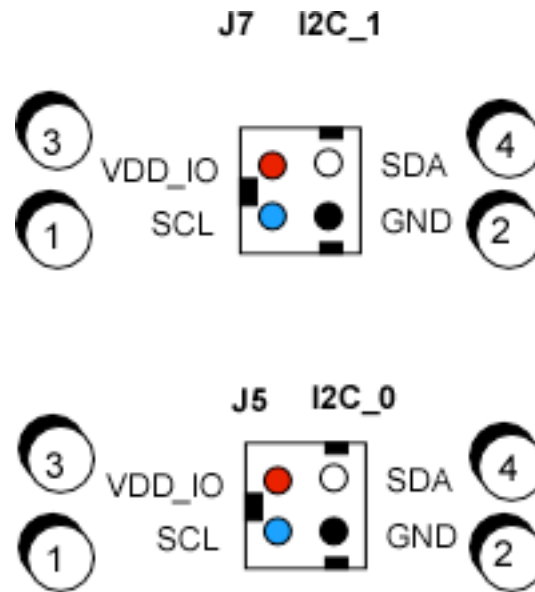


Figure 16 4 Pin Hirose DF11 Series I2C Connections

I2C_0 (J5)		I2C_1 (J7)	
SCL	SCL2/RA2	SCL	SCL1/RG2
SDA	SDA2/RA3	SDA	SDA1/RG3

Figure 17 PIC32 GPIO Mapping to I2C Busses

9 RS-232 Interfaces

The RS-232 Interface connections are shown in Figure 18. The GPIO signals, shown in Figure 19, from the UART Cores are level shifted to support RS-232.

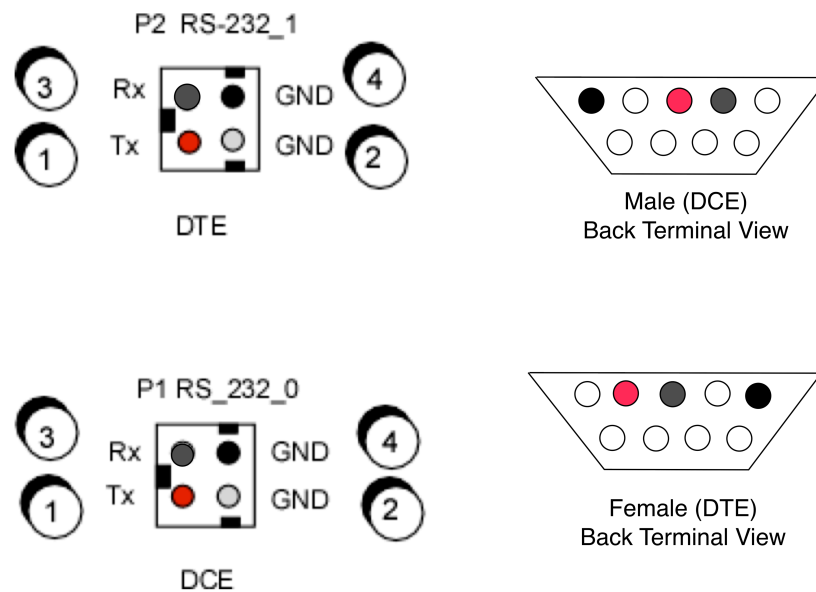
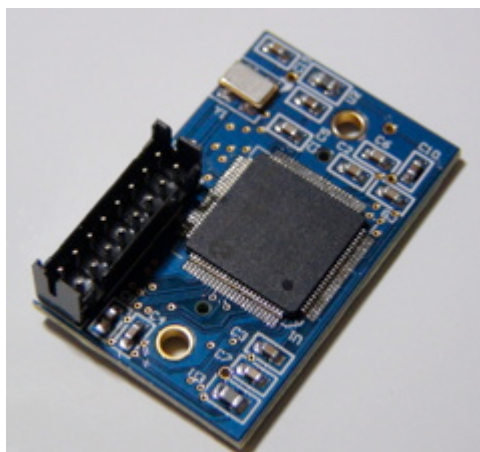


Figure 18 RS-232 4 Pin Hirose DF11 Series Connectors

P1		P2	
Tx	U1TX/RF3	Tx	U2TX/PMA8/CN18/RF5
RX	U1RX/RF2	RX	U2RX/PMA9/CN17/RF4

Figure 19 GPIO Mapping to RS-232 Ports

10 Adaptor 16 pin DF-11 Connector GPIO



PMD0/RE0	15	16	VDD
PMD1/RE1	13	14	GND
PMD3/RE3	11	12	PMD2/RE2
PMD3/RE5	9	10	PMD4/RE4
PMD7/RE7	7	8	PMD6/RE6
PMD10/RF1	5	6	PMD11/RF0
PMD13/CN19/RD13	3	4	PMD14/CN15/RD6
PMD15/CN16/RD7	1	2	PMRD/CN14/RD5

Figure 20 PIC32 Adaptor 16 pin DF-11 Connector GPIO

11 Appendix Hirose DF11 Series Connectors

Figure 11 shows a 12 pin Hirose DF11 Series connector. This is useful when building cabling systems. Note pin 1 marker and numbering scheme.

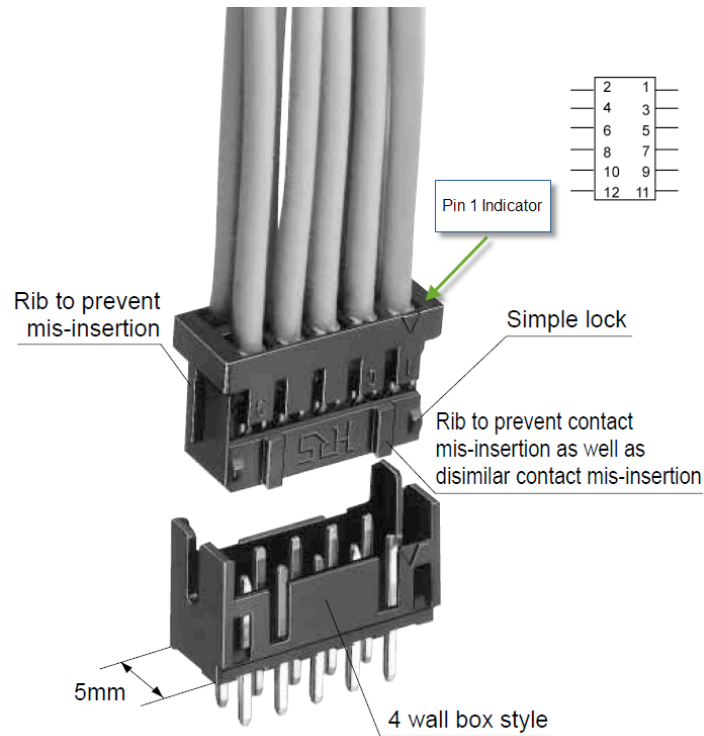


Figure 21 Guide to the Hirose DF11 series connector

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