

Eoraptor Robot Control Platform

MK-36019

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IONOTRONICS Corporation

<http://www.ionotronics.com>

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1 Introduction

The Eoraptor provides the following capabilities to System on a Chip (SoC) for electronic and robotics control:

- Two I2C Busses to an SoC
- Supports SoC Through SAMTEC 40 Pin Connection
- Supports Wireless (WiFi) Through SAMTEC 40 Pin Connection
- Supports EEPROM SPI Flash with a Multiplexer for Separate Programming
- Hirose DF11 Series 16 pin Connector for Programming SoC or Firmware Download or Programming on Board EEPROM
- All Switch Based Configuration (no Jumpers Required).
- Reset Switch.
- 2xUART Connections 4 pin Hirose with RS-232 Level Shifting.
- 4 x 12 pin Hirose DF11 Series Connectors for up to 33 GPIO.
- Modular Design to Attach SoC Adaptors and Wireless Modules via Adaptors.
- Wireless Access to SoC
- Status LEDs for Wireless Module
- High Speed SPI Interface Between SoC and Wireless Module (e.g. WIFI).
- Hardware Flow Control Support for Serial Interface Between SoC and Wireless Module.
-

Using the Eoraptor you can interface sensors to the SoC and provide Wireless Access (e.g. Wireless TCP/IP) to sensors and the SoC. Visit the IONOTRONICS Web Site for blueprints of Humanoid and Rover Robots built with the 32 bit PIC or 8 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.

2 Description

The Eoraptor provides the foundation for SoC's to control Robotic systems. Figure 1 shows the Samtec

40 pin connections for attaching the SoC Adaptor and the Wireless Adaptor. It also shows the I2C and UART Serial connections as well as the 4 sets of 12 pin Hirose connectors for GPIO from the SoC. The Eoraptor can provide a Reset to the SoC using a momentary switch as indicated. The three configuration switches are key to the Eoraptor. using these switches a Robot can be controlled remotely through Wireless TCP/IP or other Wireless systems. Or, the Robot can be controlled using an RS-232 interface to the SoC. The SoC can also control devices through the second RS-232 interface. The board contains an integrated ATMEL SPI EEPROM. The SoC can access the Atmel EEPROM or it can be programmed using the 16 pin Hirose connector (using the Pyroraptor and C API for example).

External power can be provided as shown. If an on-board ATMEL SPI EEPROM is used, a 3.3V supply must be used.

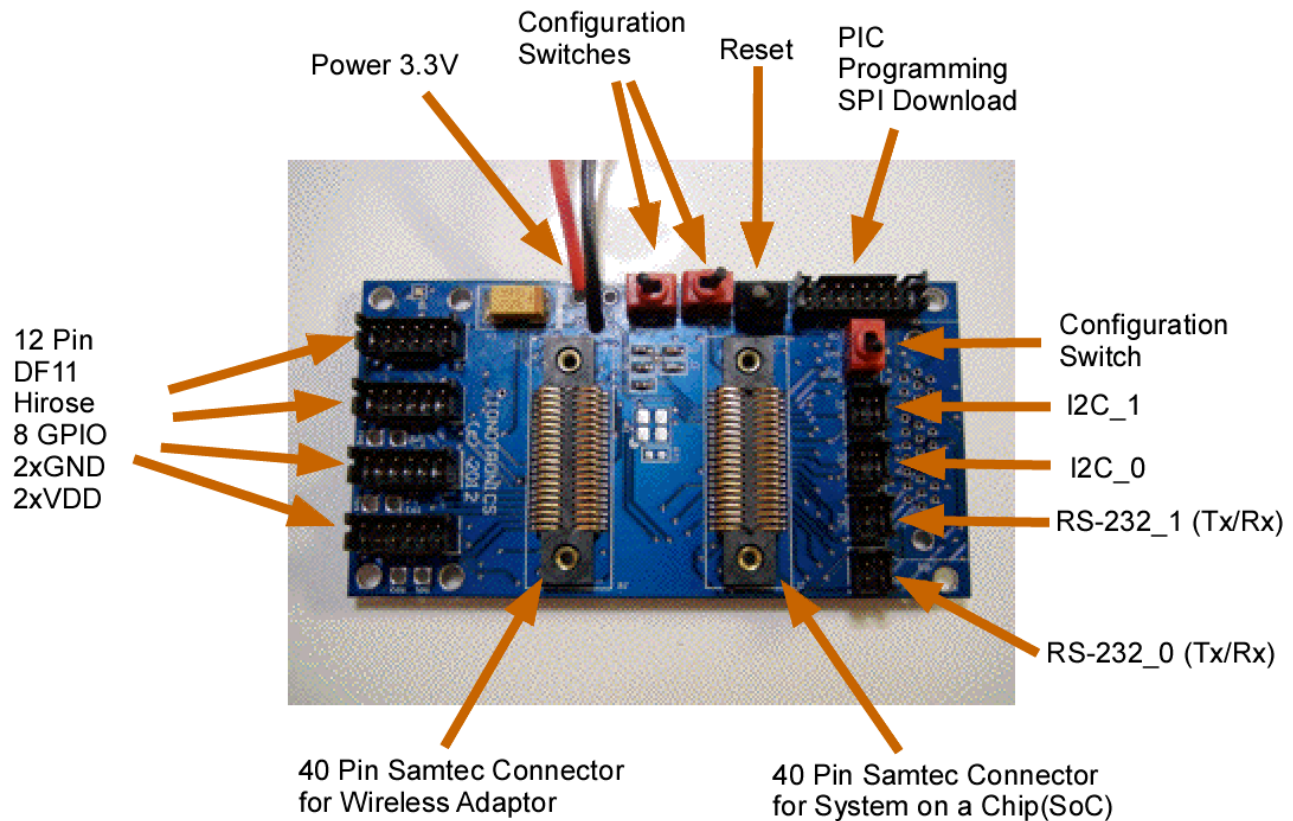


Figure 1 Eoraptor Interfaces and Connections

A system setup with an 80 MHz PIC32MX512F SoC and a USB WiFi232-T serial Wireless TCP/IP

module is shown in Figure 2.

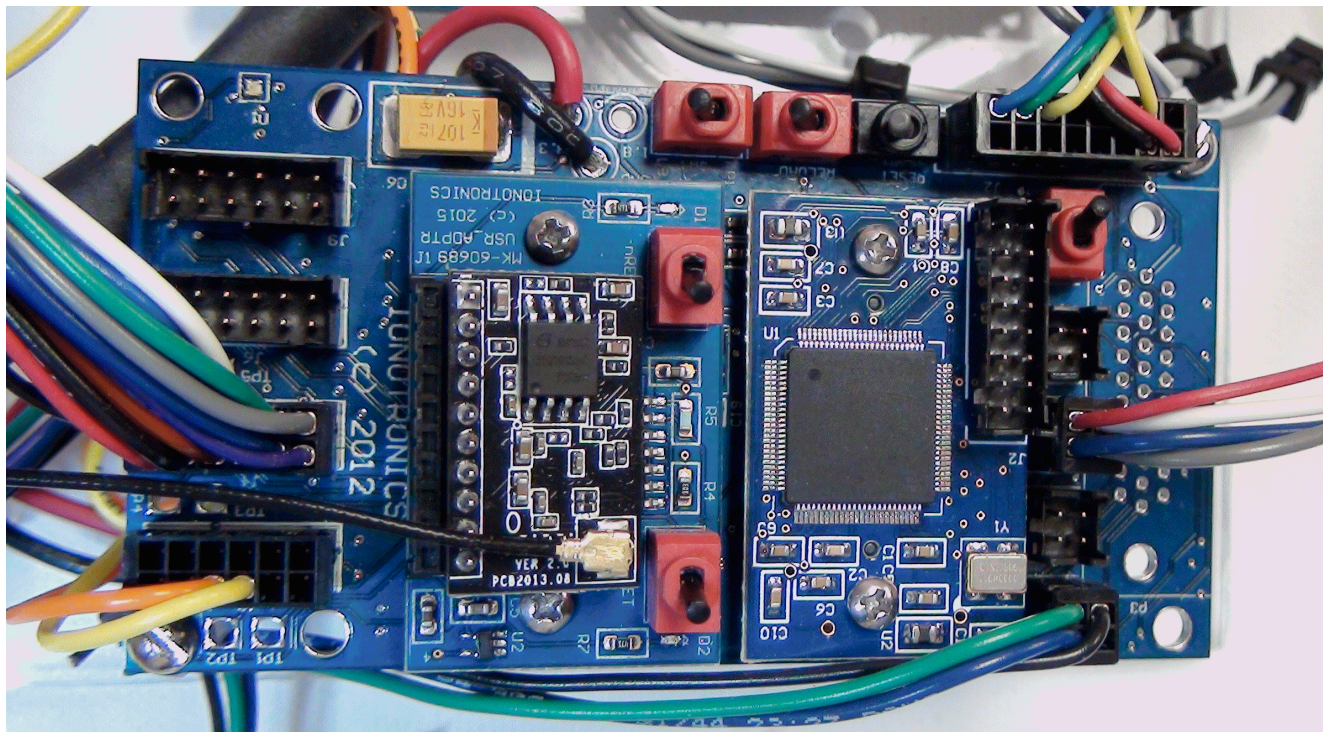


Figure 2 Eoraptor with PIC32 SoC Adaptor and Wireless TCP/IP Adaptor

The board dimensions are shown in Figure 3.

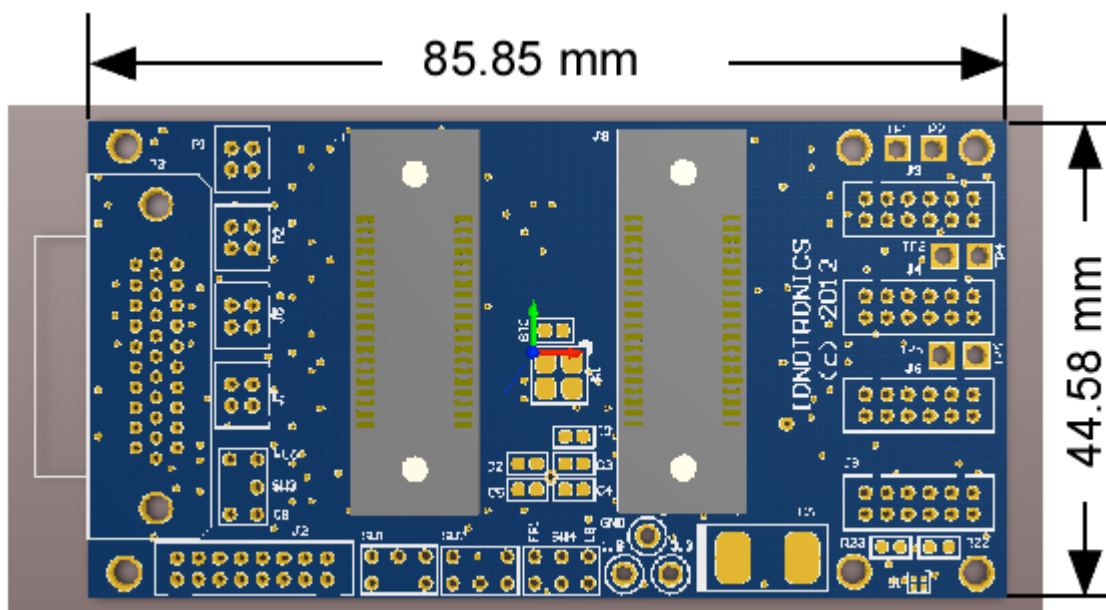


Figure 3 Eoraptor Board Dimensions

3 SAMTEC FSI Series 40 Pin Connector

Datasheet:

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

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.

4 Interface to SoC via 40 pin SAMTEC Connector

The 40 Pin Samtec connector provides the capability to attach various SoC's to the Eoraptor. The modules are simply screwed on to the Eoraptor. See Figure 2. In this section the pin out for the SoC 40 pin Samtec connector is described. Designers can use this information to design their own adaptors for the SoC of interest.

IONOTRONICS has developed two SoC adaptors for the Eoraptor:

1- The PIC32MX360F512 based adaptor (80 MHz). Part number is: MK-33856. See Figure 4. Note more GPIO signals are available on 16-pin DF11 Series Hirose connector.

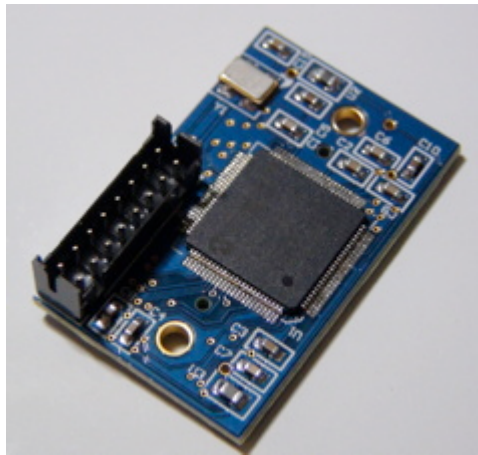


Figure 4 PIC32MX360F512 SoC Adaptor

2- The PIC16F1947 8 bit based PIC (16 MHz). Part Number is: MK-28988

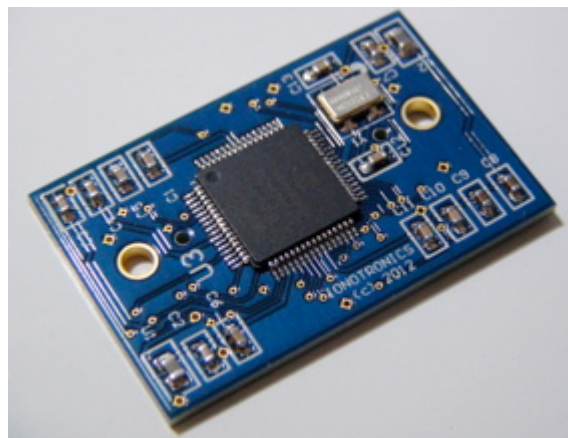


Figure 5 PIC16F1947 SoC Adaptor

The pin out for the 40-Pin Samtec connector for the SoC is shown in Figure 6.

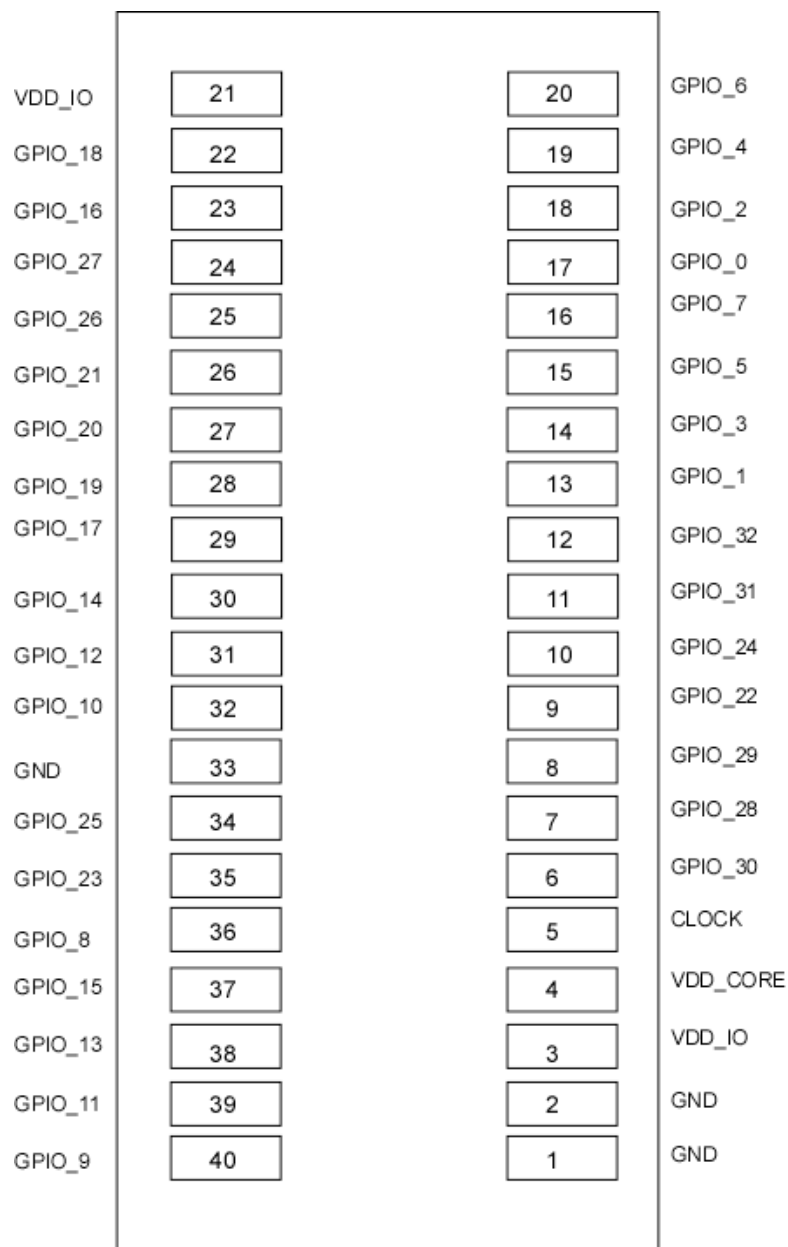


Figure 6 40 Pin Samtec Connector with GPIO Signals to the SoC. Also VDD_IO,VDD_Core and Ground.

The mapping of the GPIO pins to the 12 pin Hirose Connectors are shown below.

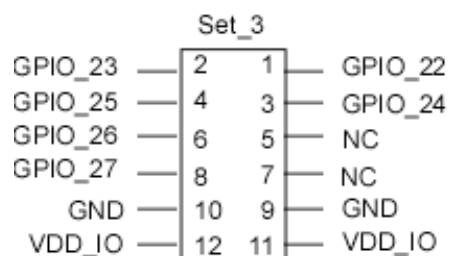
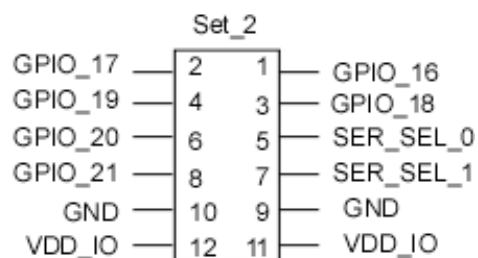
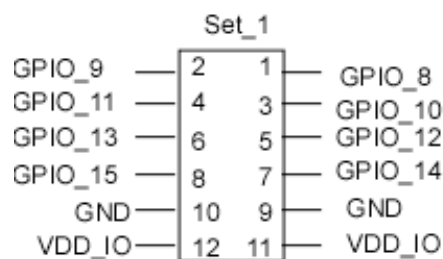
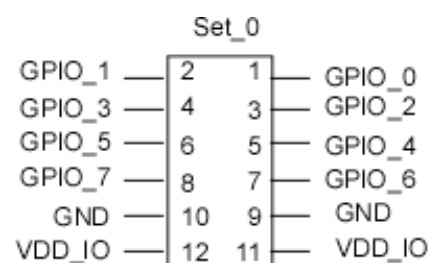


Figure 7 GPIO 12 pin DF11 Series Hirose Connectors for GPIO

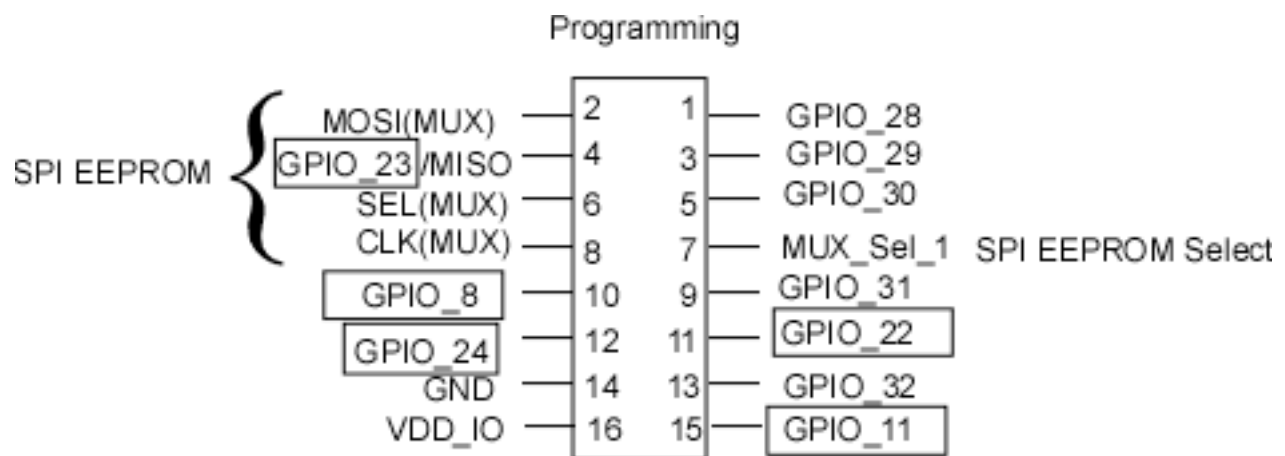


Figure 8 Programming Connector (J2). Some GPIO Used for ICD in PIC SoC's

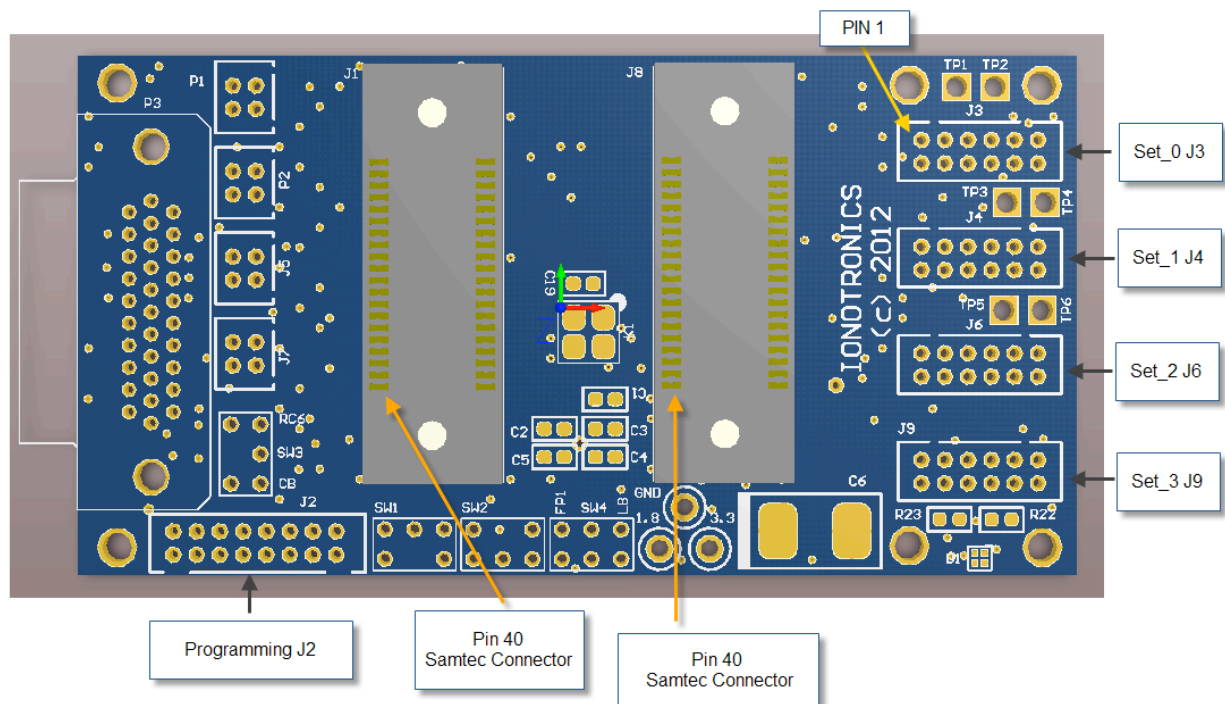


Figure 9 GPIO Connections

5 Configuration Switches

There are three configuration switches that setup the Eoraptor to operate in 3 Modes.

5.1 Direct Serial Connection to the SoC

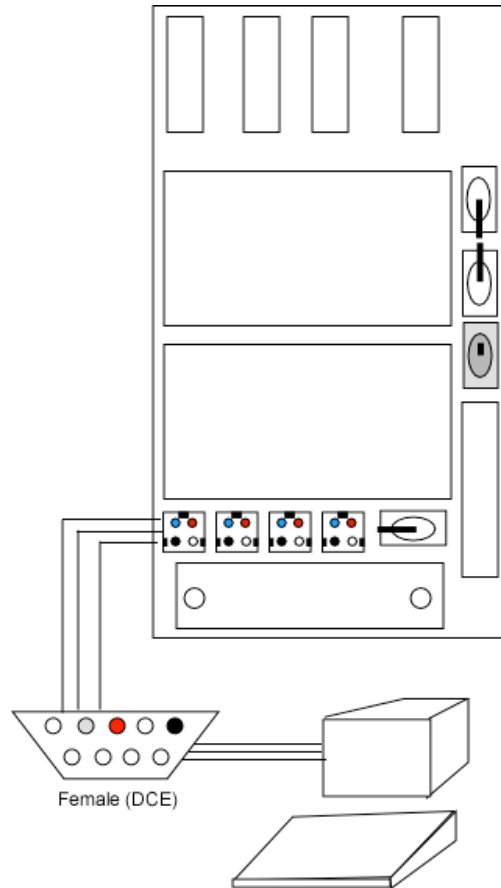


Figure 10 Workstation Direct Serial to SoC (e.g. PC to PIC32)

5.2 Direct Serial to the Wireless Adaptor

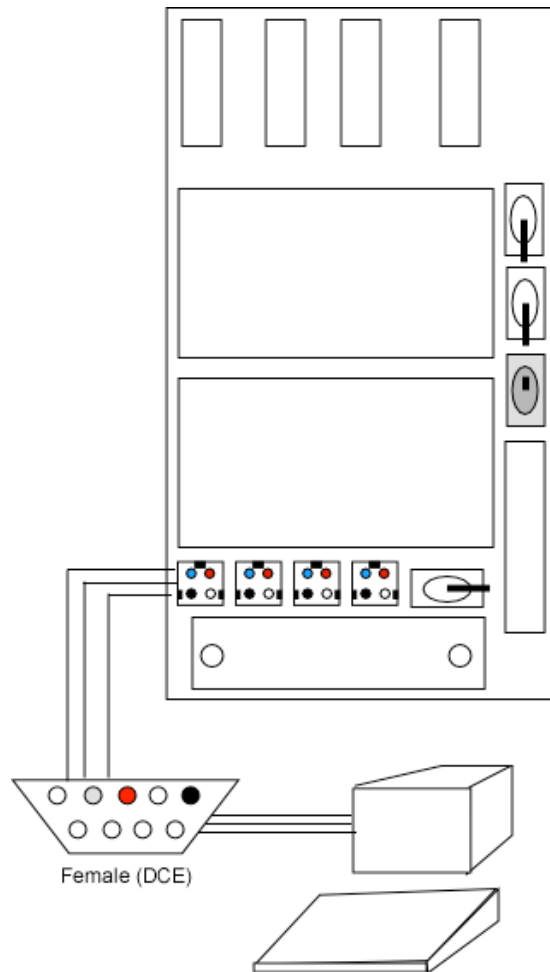


Figure 11 Workstation to Wireless Module (Configuring WiFi Using AT Command Set)

5.3 Operation Mode Wireless to SoC Serial Connection

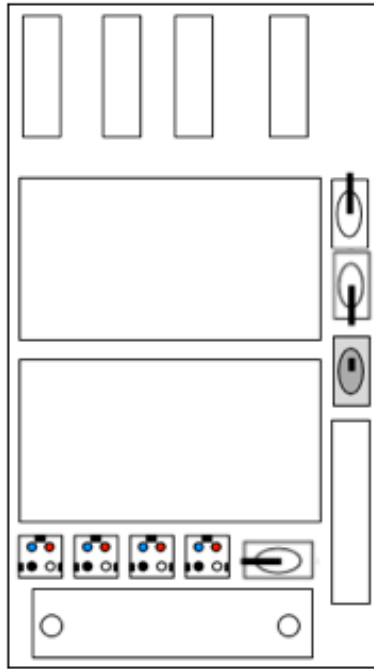


Figure 12 Operational Mode Wireless Module Serial to SoC e.g. Wireless TCP/IP Serial to Wireless Module. Wireless Module to PIC32 SoC

6 Wireless Module 40 Pin Hirose Connections

The Eoraptor provides for the attachment of a Wireless Adaptor to the Platform. Figure 13 shows the connections to the 40 pin Samtec connector. The Wireless module can provide a serial connection to the SoC Adaptor. It can also support a direct Serial connection from the RS-232_0 connection. This can be used to configure the Wireless device with AT command set. Using the direct connection to the SoC, using wireless TCP/IP applications can communicate with the SoC. See the Configuration Switches in Section 3.

The Eoraptor provides support for three LED's for status indicators for the Wireless module. They can include "Ready" and "Associated with AP" for example.

To support full Hardware flow control between the SoC and the Wireless Module, the Hardware Flow Control signals are available as Test Points. Wires from the Test Points can be soldered and then connected to appropriate GPIO to the SoC using the Set_0 through Set_3 or other means to get to the SoC. Typically only Rx/Tx are used. For example, we can use Software Flow Control (XON/XOFF). However, as indicated full Hardware Flow Control is supported.

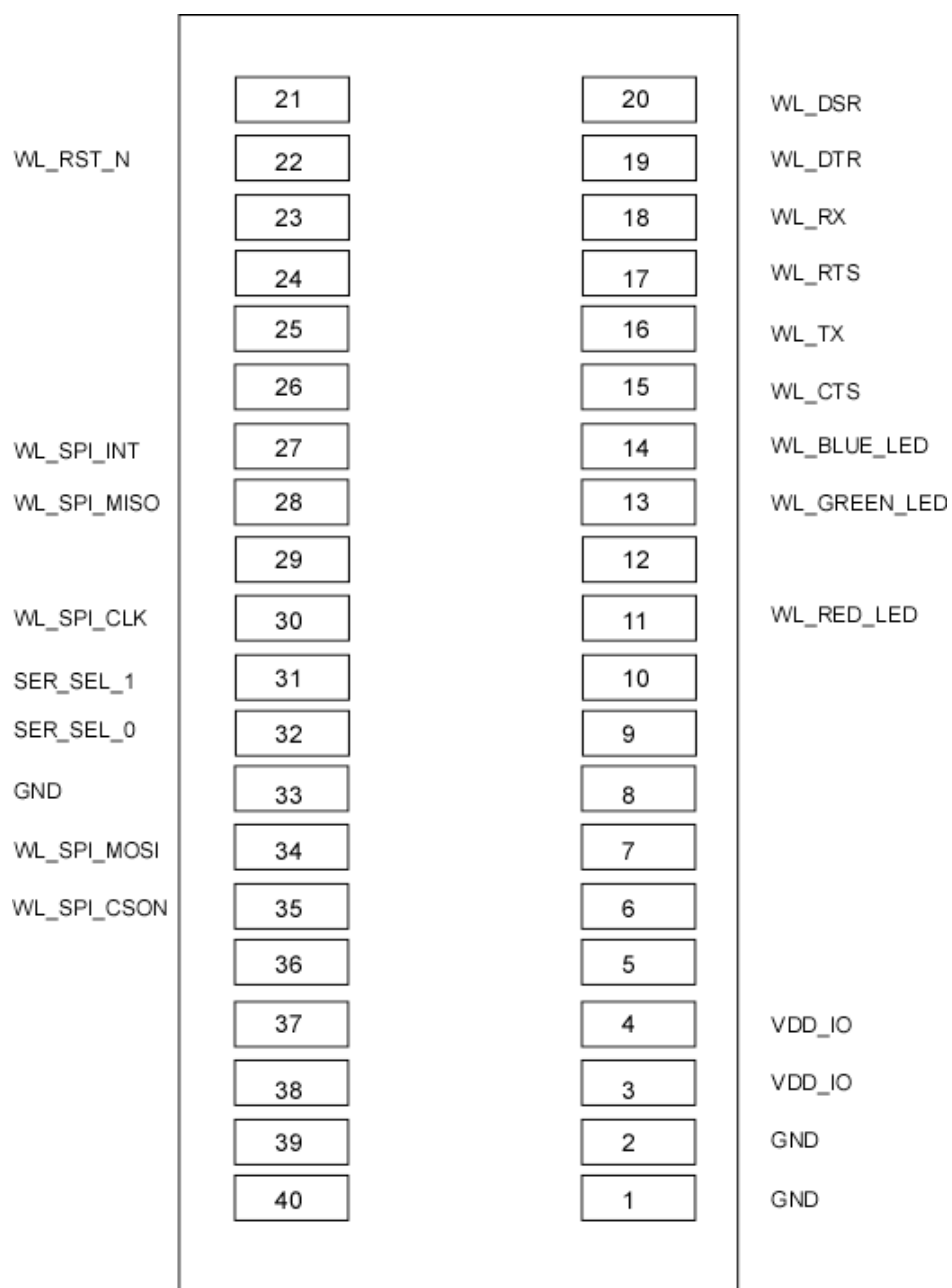


Figure 13 Wireless Module 40 Pin Samtec Connections

WL_DSR	TP_1
WL_DTR	TP_2
WL_RX	TP_3
WL_RTS	TP_4
WL_TX	TP_5
WL_CTS	TP_6

Figure 14 Hardware Flow Control Test Points

In addition, for very high speed communication between the Wireless Module and the SoC, a SPI interface is supported. See Figure 15.

WL_SPI_MOSI	GPIO_13
WL_SPI_CLK	GPIO_15
WL_SPI_MISO	GPIO_8
WL_SPI_CSON	GPIO_14
WL_SPI_INT	GPIO_18

Figure 15 High Speed SPI Interface Between SoC and Wireless module

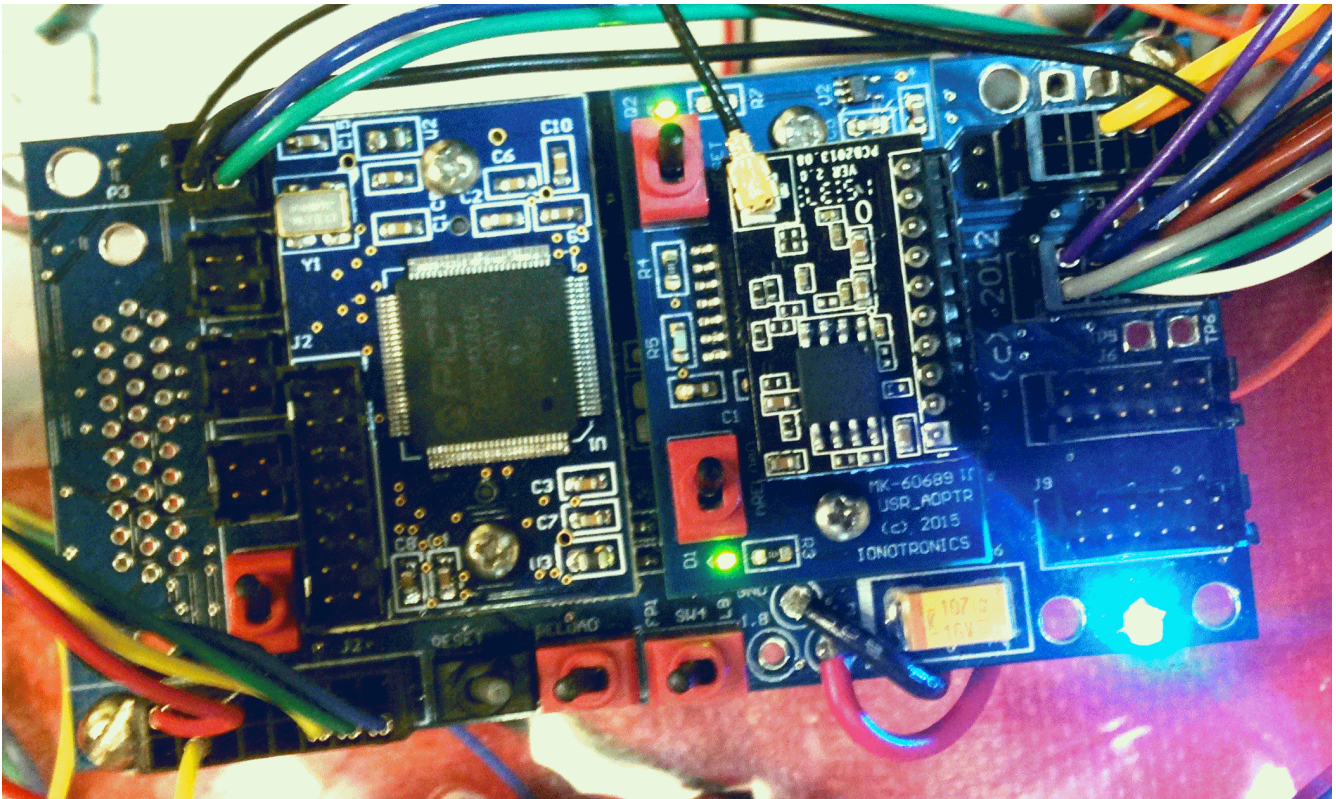


Figure 16 WiFi Wireless Adaptor with Association with AP Shown with Blue LED On (Eoraptor).

7 Eoraptor On-Board SPI EEPROM

Eoraptor supports an on-Board SPI EEPROM (ATMEL 8 Mbit). The SoC can access the SPI EEPROM through the GPIO pins shown in Figure 17.

GPIO_13	MOSI
GPIO_23	MISO
GPIO_25	Chip_Select
GPIO_15	Clock

Figure 17 GPIO to On Board SPI EEPROM

Eoraptor has a on-board mux that allows the SPI EEPROM to be either accessed externally (for example with Pyraptor USB/I2C/SPI Bridge) or by the SoC. The Programming connector (Figure 8)

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 to be booted up from the SPI EEPROM while an external programmer (Pyroraptor) can be used to burn in the Bootup code and other data into the EEPROM.

8 I2C Interfaces

Two separate I2C busses are provided. Each would normally be connected to I2C Cores in the SoC. For example, the PIC32M360F512 supports two independent I2C cores.

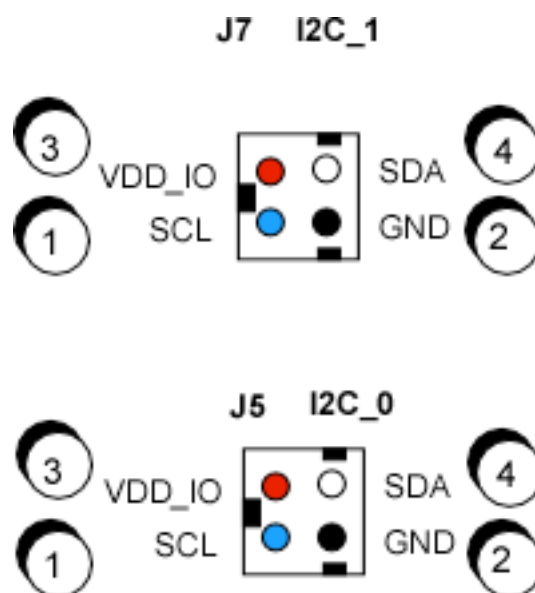


Figure 18 4 Pin Hirose DF11 Series I2C Connections

I2C_0 (J5)	I2C_1 (J7)
SCL GPIO_21	SCL GPIO_19
SDA GPIO_20	SDA GPIO_17

Figure 19 GPIO Mapping to I2C Busses

9 RS-232 Interfaces

The RS-232 Interface connections are shown in Figure 20. The GPIO signals shown in Figure 21 are level shifted to support RS-232.

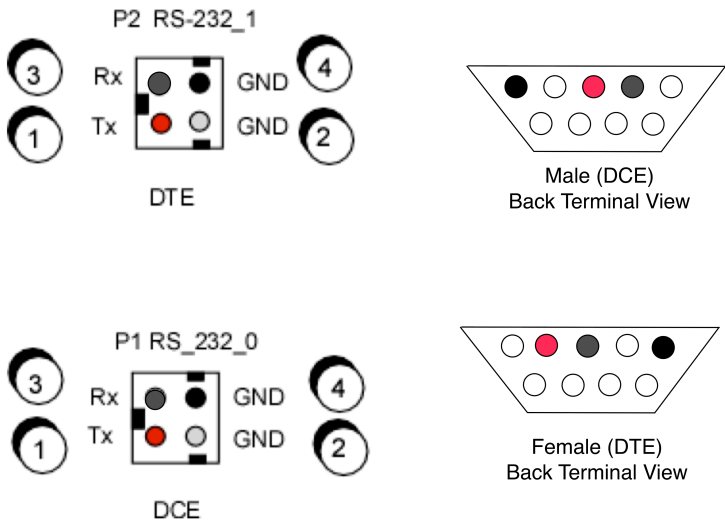


Figure 20 RS-232 4 Pin Hirose DF11 Series Connectors

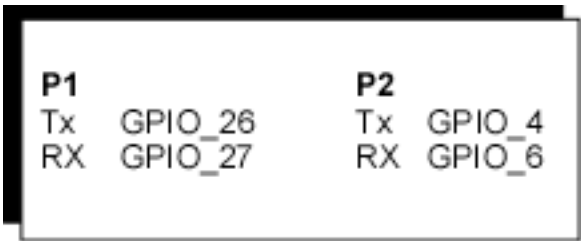


Figure 21 GPIO Mapping to RS-232 Ports

10 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.

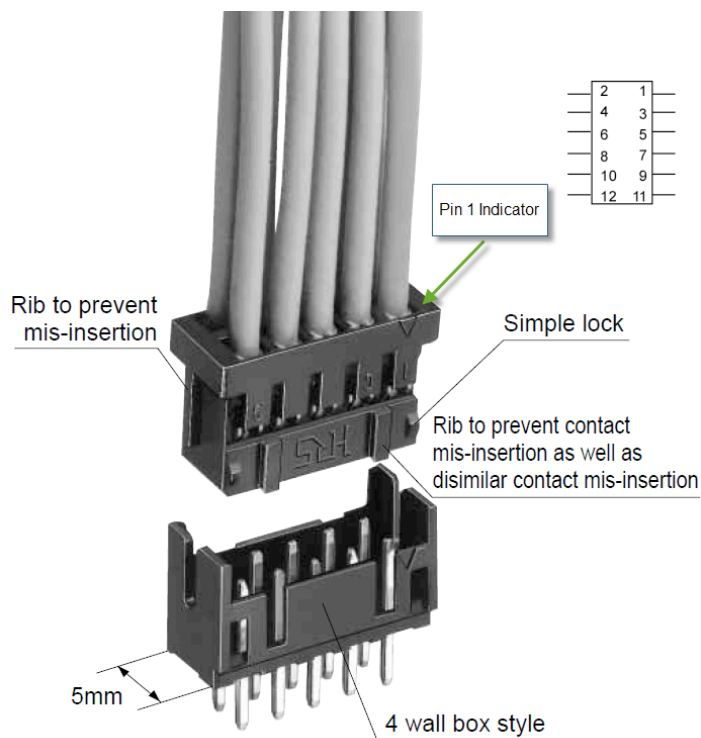


Figure 22 Guide to the Hirose DF11 series connector

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