

PIC16F1947 Adaptor

MK-28988

December 31, 2014

IONOTRONICS Corporation

<http://www.ionotronics.com>

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1 Introduction

The MK-28988 PIC16F1947 Adaptor attaches to the Eoraptor provides the following capabilities for electronic and robotics control:

- 16 MHz PIC16F1947 SoC
- Dedicated I2C Core. Bit Banged I2C Option for secondary I2C.
- Supports Wireless (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 PIC16F1947 and Wireless Module to the PIC SoC.
- Reset Switch.
- 2x Independent UART Cores with Connections to 4 pin Hirose with RS-232 Level Shifting.
- 4 x 12 pin Hirose DF11 Series Connectors for up to 33 GPIO.
- High Speed SPI Interface Between PIC16F1947 SoC and Wireless Module (e.g. WiFi).
- Hardware Flow Control Support for Serial Interface Between PIC16F1947 and Wireless Module.
-

Using the Eoraptor you can interface sensors to the PIC16F1947 SoC and provide Wireless Access (e.g. Wireless TCP/IP) to sensors and the PIC16F1947. Visit the IONOTRONICS Web Site for blueprints of Humanoid and Rover Robots built with the 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 PIC16F1947 SoC.

2 Description

The PIC16F1947 Adaptor is shown in Figure 1.

Clock on board is 16 MHz.

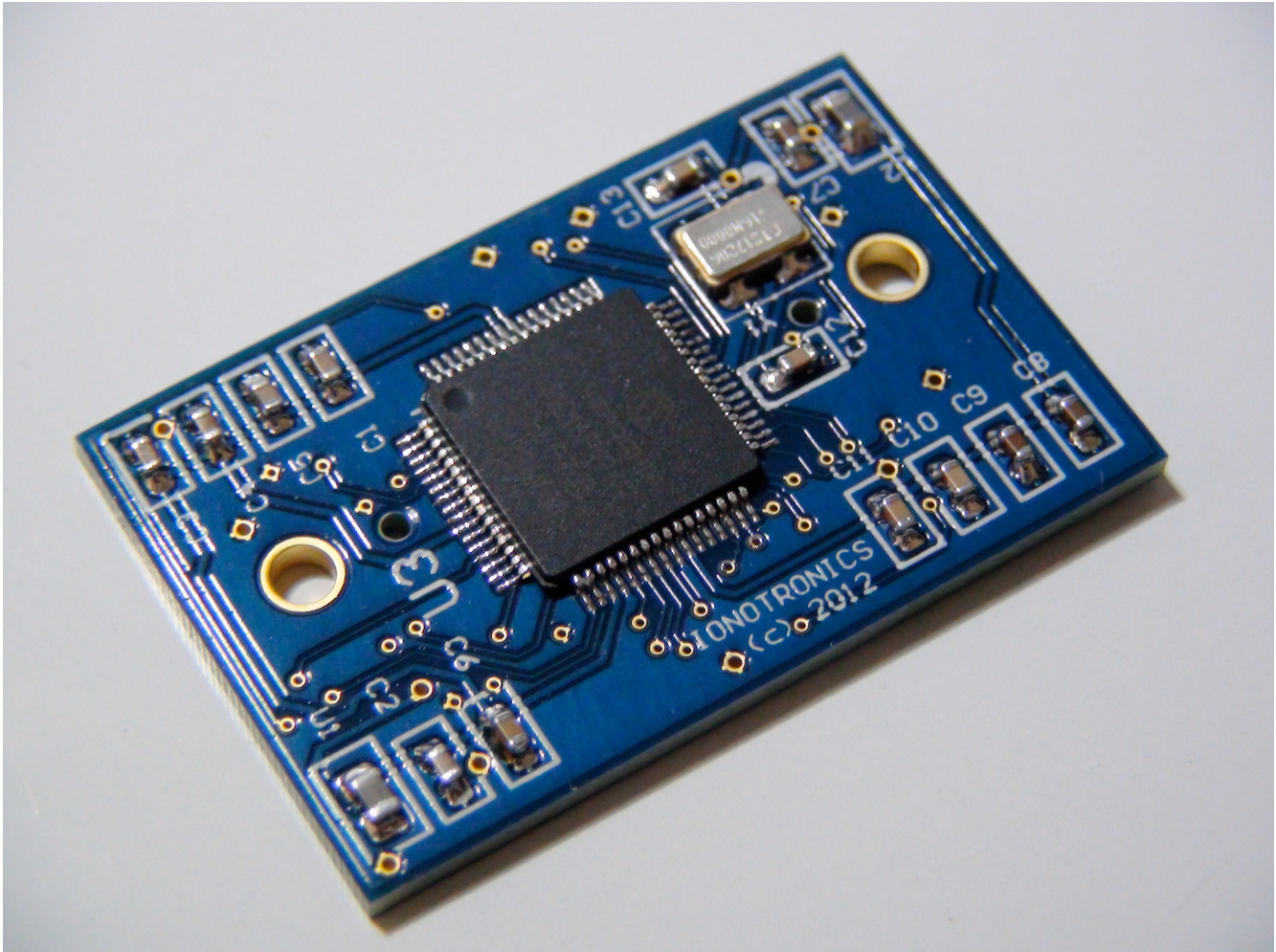


Figure 1 PIC16F1947 SoC Adaptor (MK-28988)

Figure 2 shows that the PIC16F1947 Adaptor can be attached to a platform using a 40 pin FSI series Samtec connector.

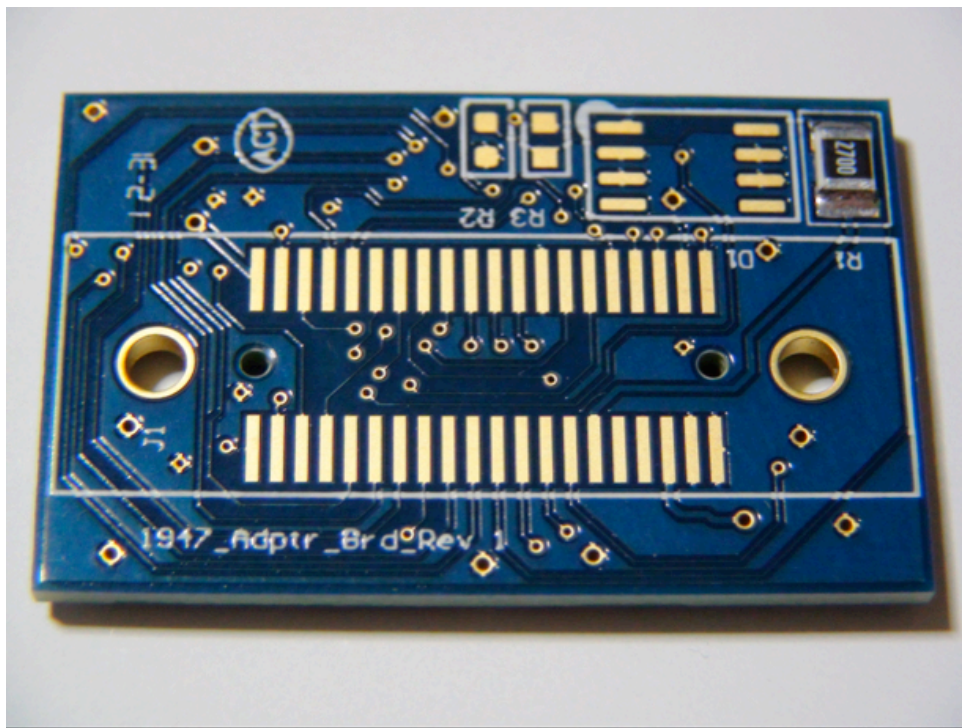


Figure 2 PIC 16F1947 Mating to Samtec FSI Series (1mm pitch, 40 pin Dual Row)

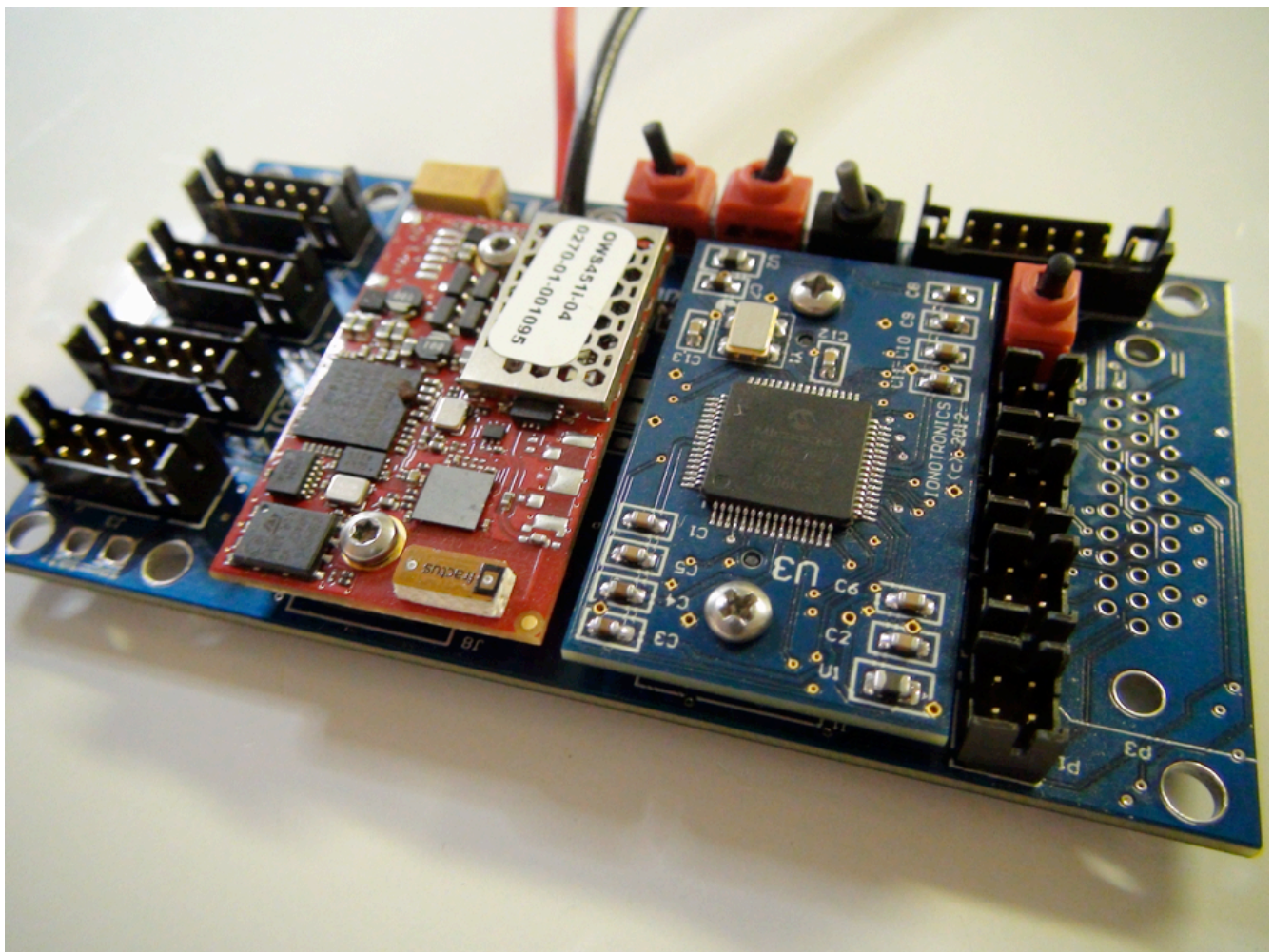


Figure 3 PIC16F1947 Adaptor Attached to Eoraptor

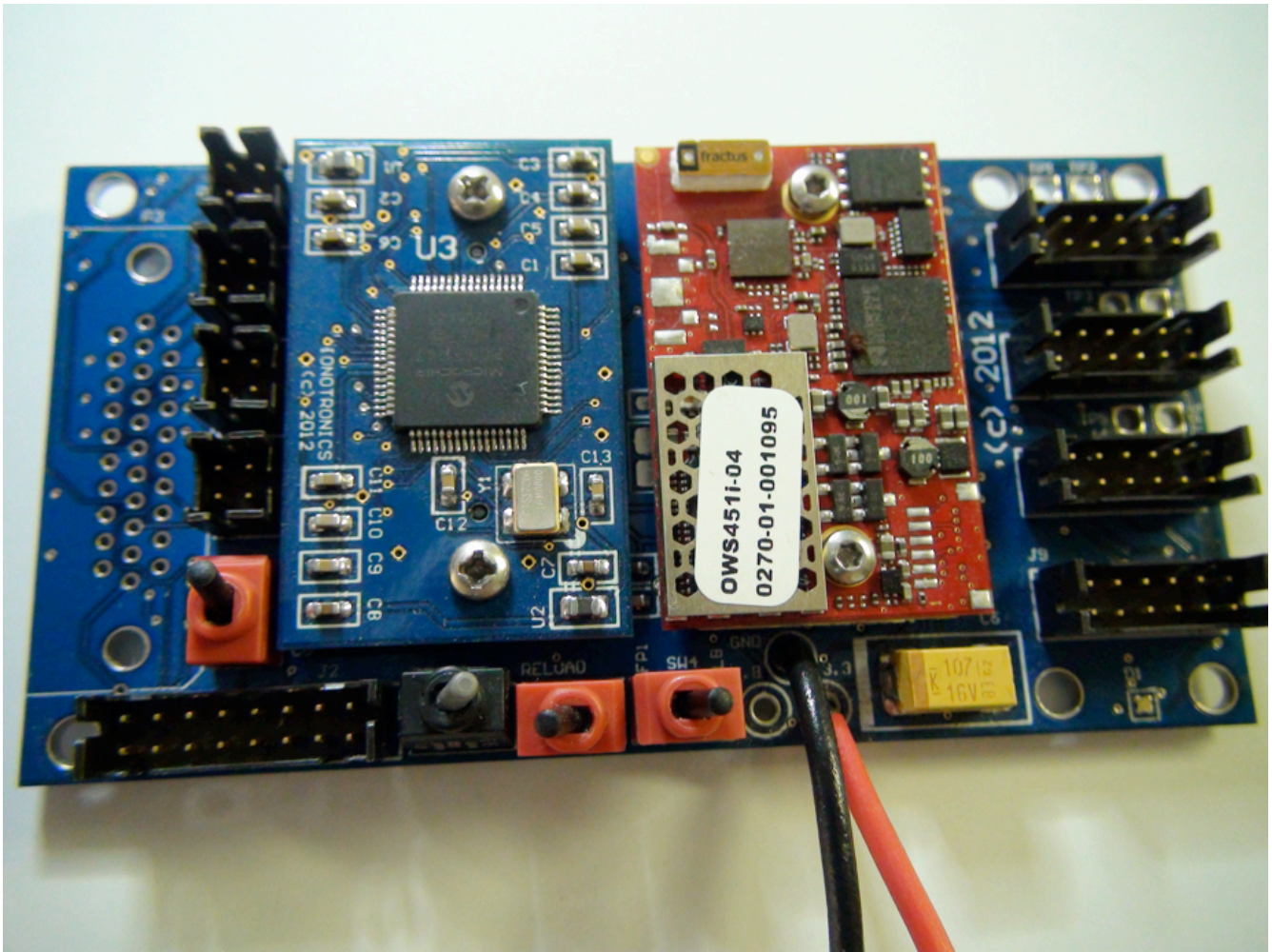


Figure 4 PIC16F1947 Adaptor Attached to Eoraptor Another View

3 SAMTEC FSI Series 40 Pin Connector

The 40 Pin Samtec connector provides the capability to attach the PIC16F1947 SoC to the Eoraptor. The modules are simply screwed on to the Eoraptor. 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 PIC16F1947 Adaptor to control Robotic systems.

4 Eoraptor Robotics Platform

By attaching the PIC16F1947 Adaptor to the Eoraptor, The PIC16F1947/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 PIC (using CCS tool or PICKIT 3).

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

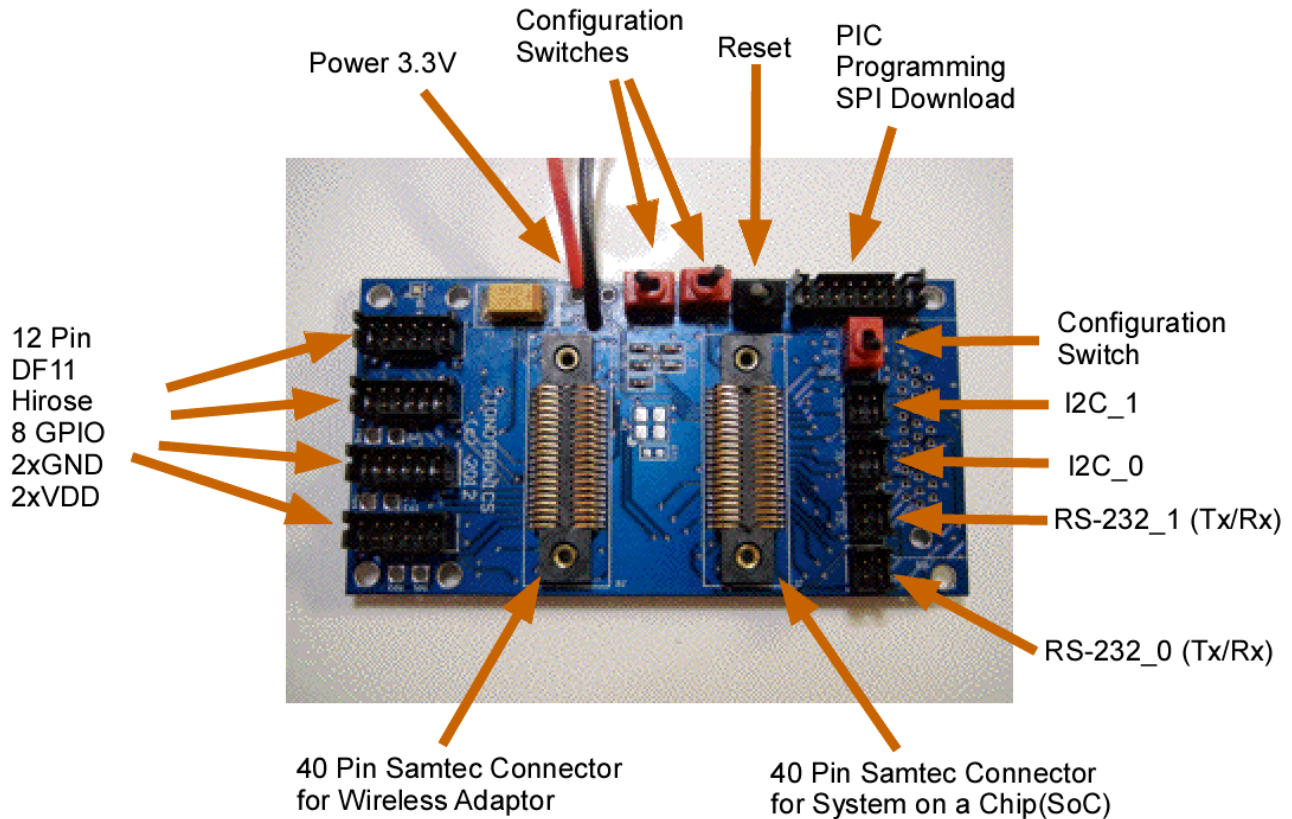


Figure 5 Eoraptor Interfaces and Connections

5 PIC16F1947 Adaptor Dimensions

Figure 6 shows the dimensions of the PIC16F1947 Adaptor. Figure 7 shows the dimensions of the Eoraptor.

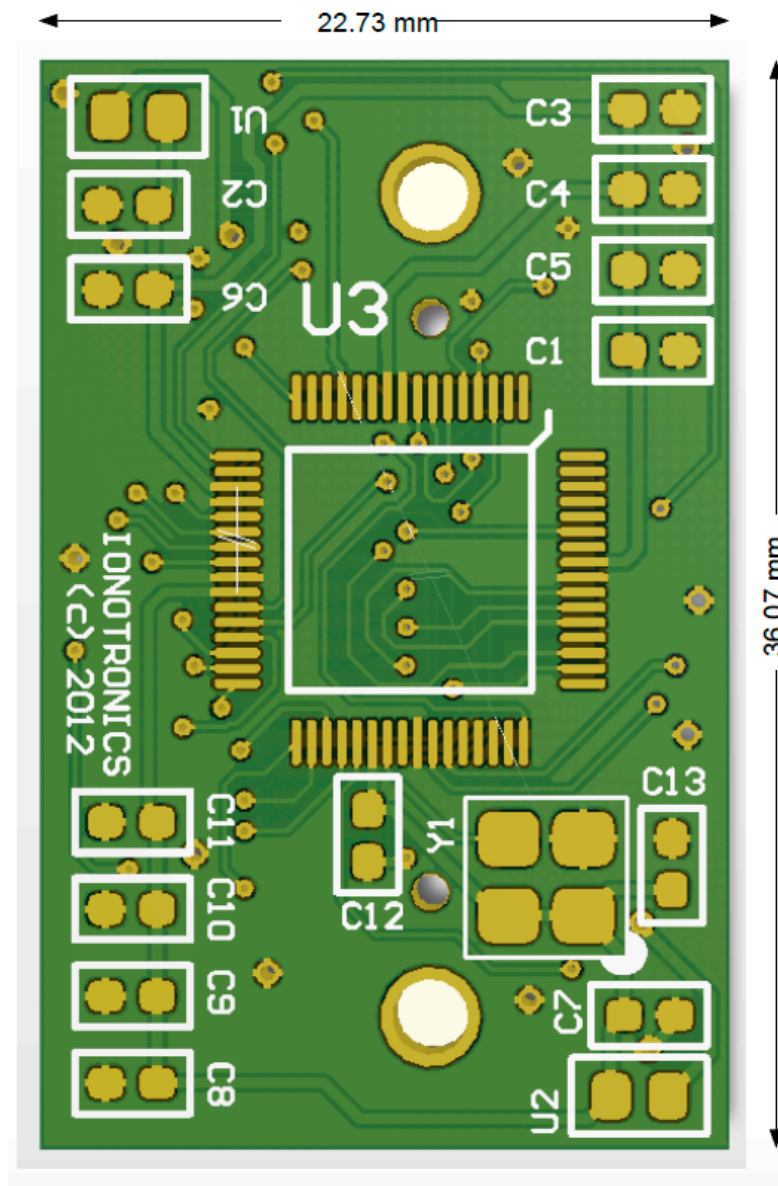


Figure 6 Adaptor Dimension

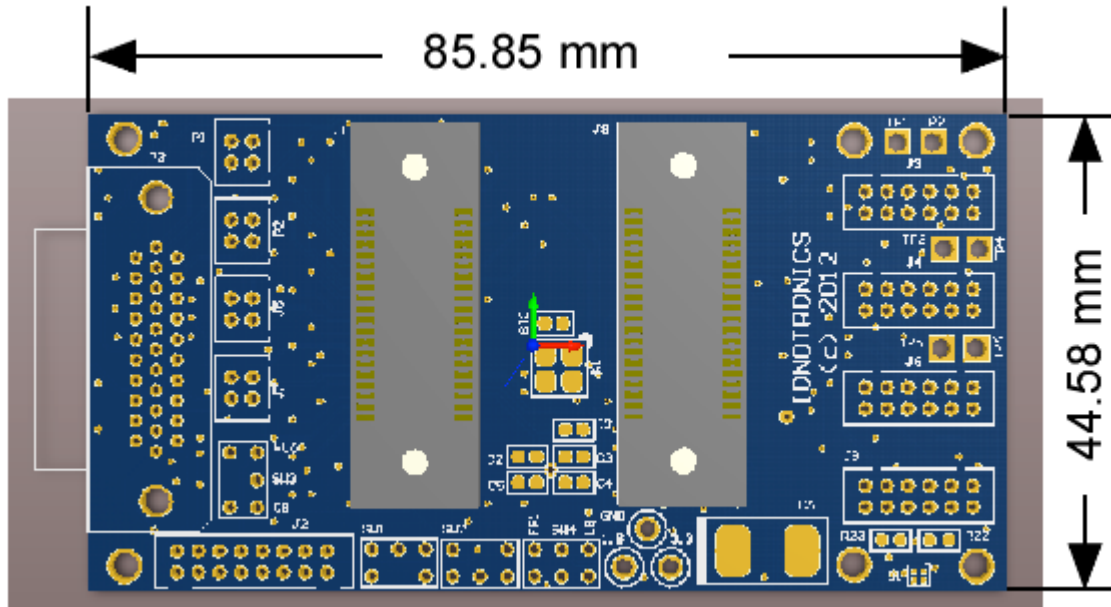


Figure 7 Eoraptor Board Dimensions

6 PIC16F1947 Adaptor GPIO Mapping to 40-Pin Samtec Connector and Euroraptor

When the PIC16F1947 Adaptor is attached to the Eoraptor, various PIC16F1947 GPIO signals and programming pins are mapped to the Eoraptor set of 12 pin Hirose connectors. The PIC16F1947 I2C signals are mapped to the separate I2C busses. GPIO signals from the two PIC16F1947 UART cores are also mapped and level shifted to RS-232 levels. See Figures 8,9 and 10.

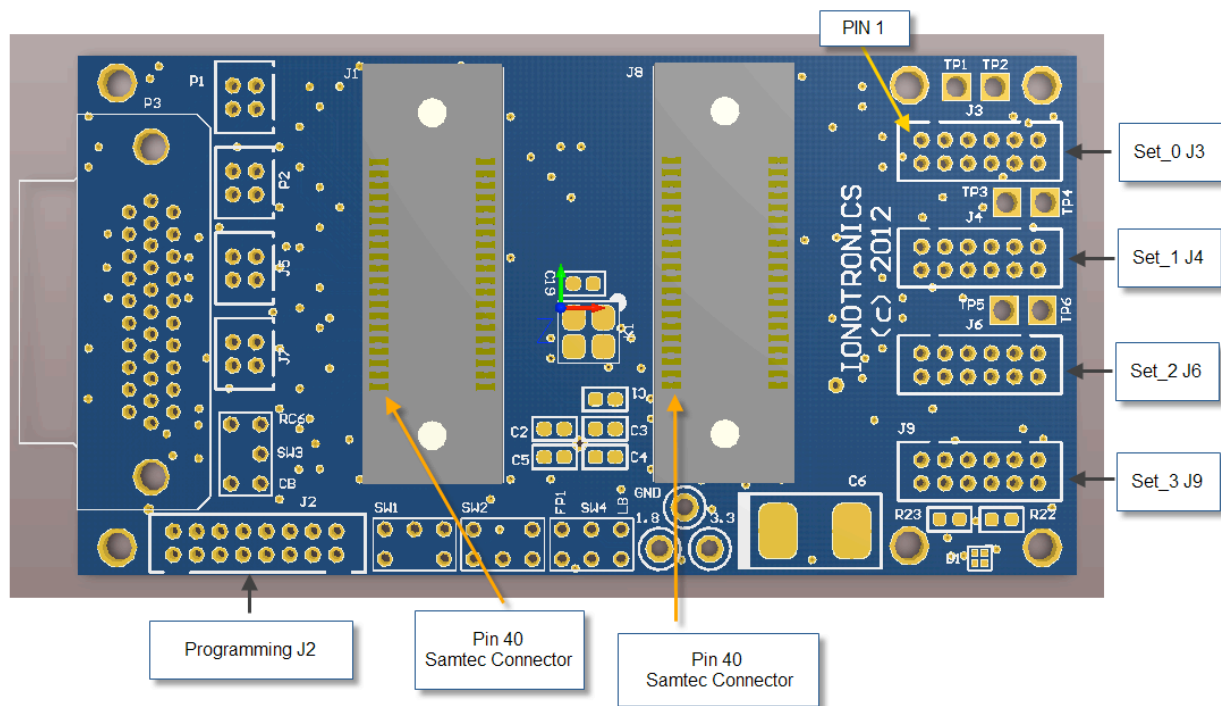


Figure 8 GPIO Connections

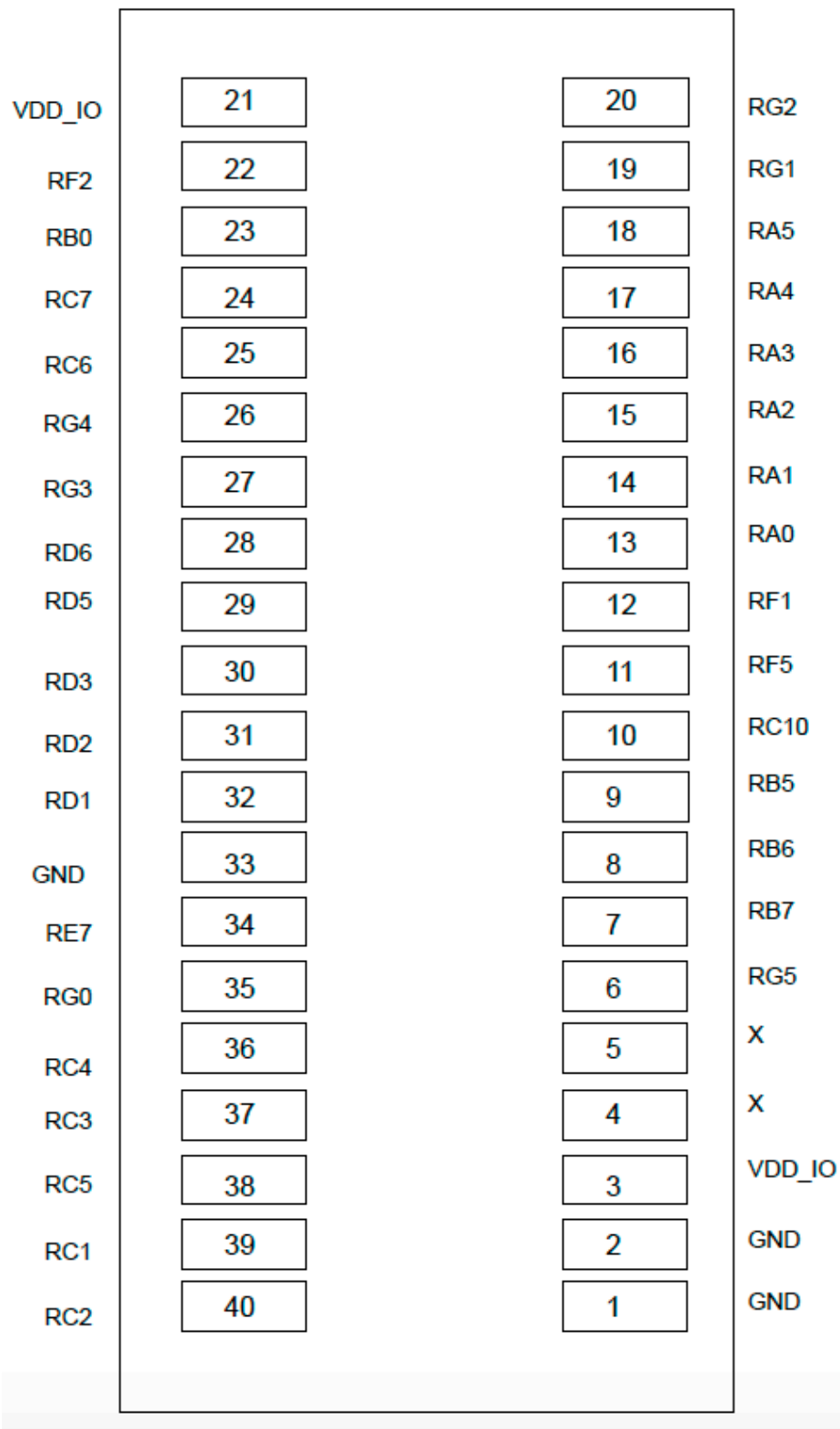


Figure 9 Adaptor GPIO Mapping to 40- Pin Samtec Connector

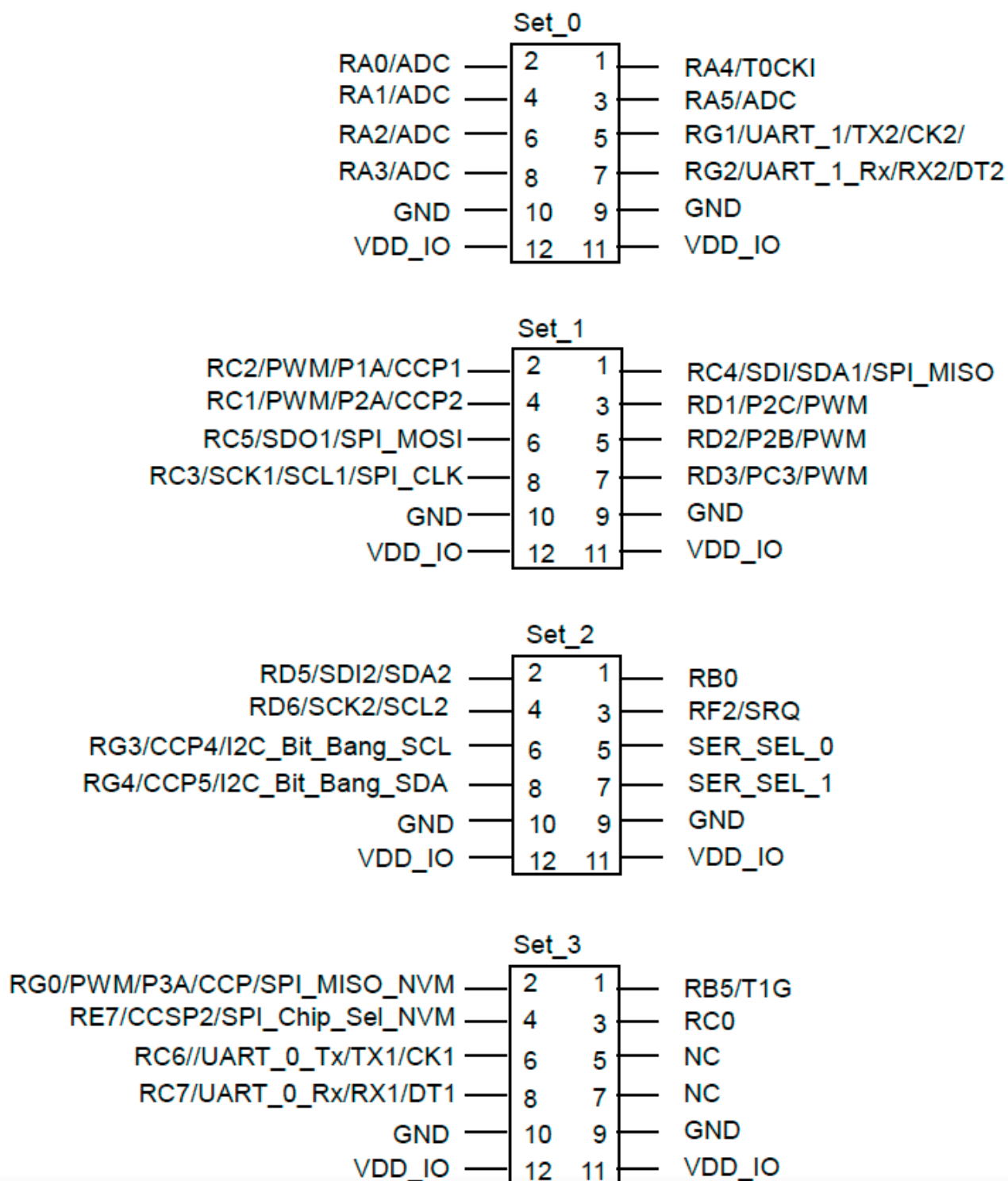


Figure 10 PIC16F1947 GPIO Mapping to Eoraptor 12 pin Hirose Connectors

The PIC16F1947 ICD Programming Pins are mapped to a 16 pin Hirose connector. A cable from the 16 pin connector to a header allows the PIC16F1947 to be programmed using Microchips USB programers (PICKIT 3 or ICD 3 for example) or CCS's Programmer. See Figure 11 for the pin out of the 16 pin programming connector.

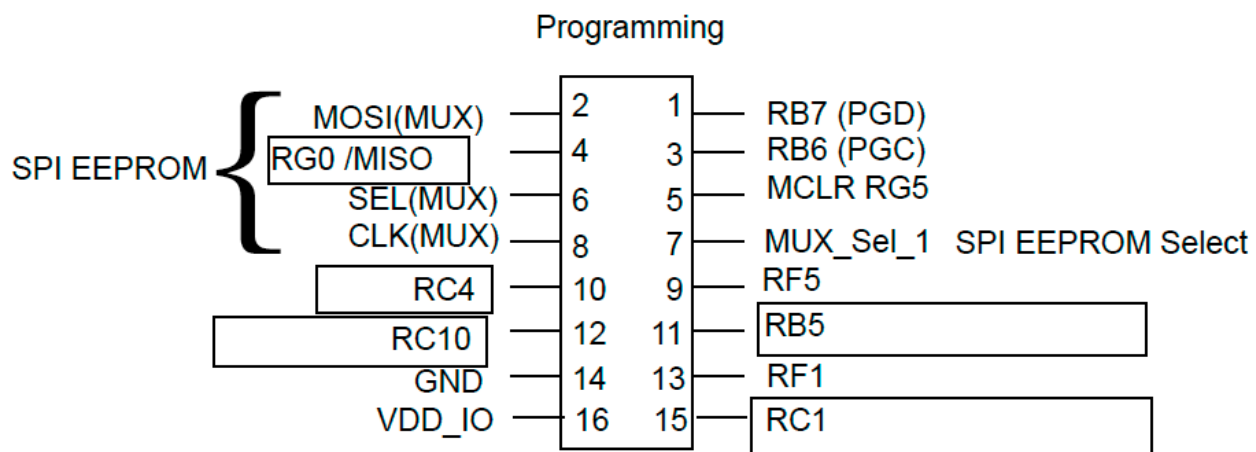


Figure 11 Mapping to Eoraptor 16 pin Hirose Programming 16 pin Connector

7 Configuration Switches

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

7.1 Direct Serial Connection to the SoC

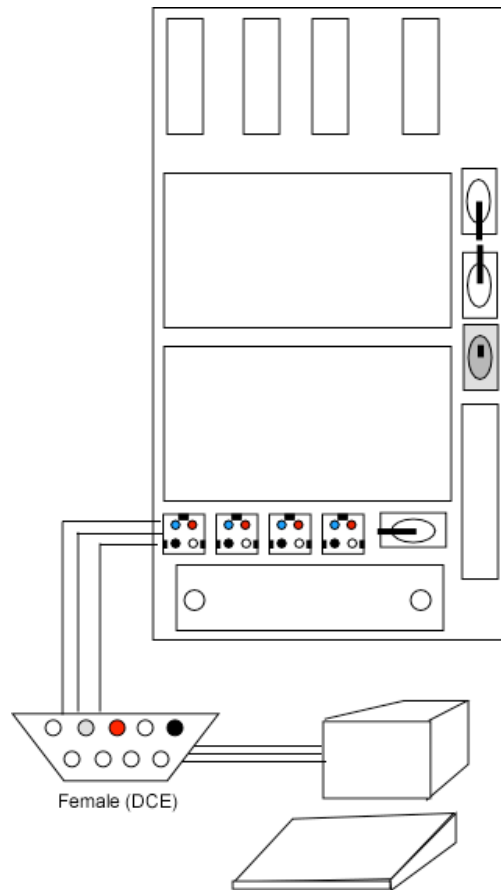


Figure 12 Workstation Direct Serial to SoC (e.g. PC to PIC16F1947)

7.2 Direct Serial to the Wireless Adaptor

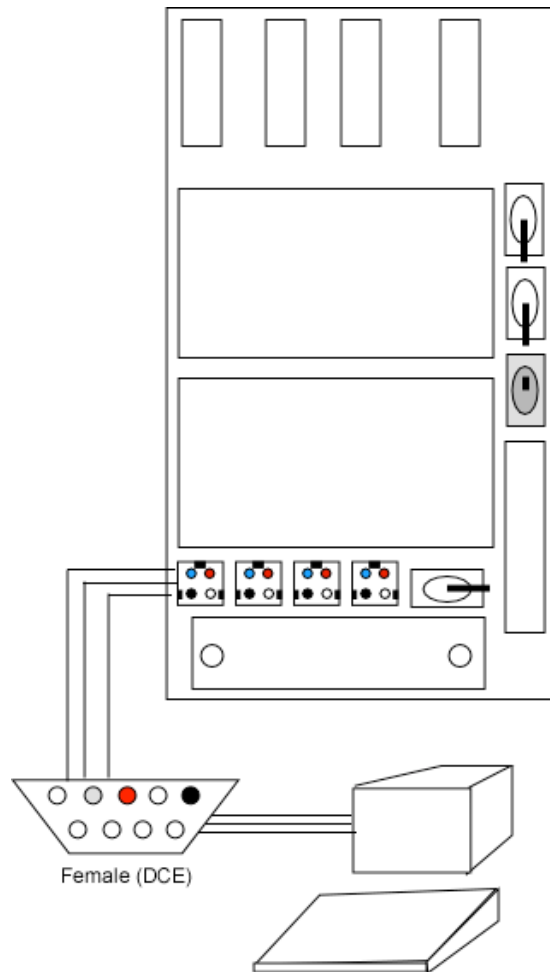


Figure 13 Workstation to Wireless Module (Configuring WiFi Using AT Command Set)

7.3 Operation Mode Wireless to SoC Serial Connection

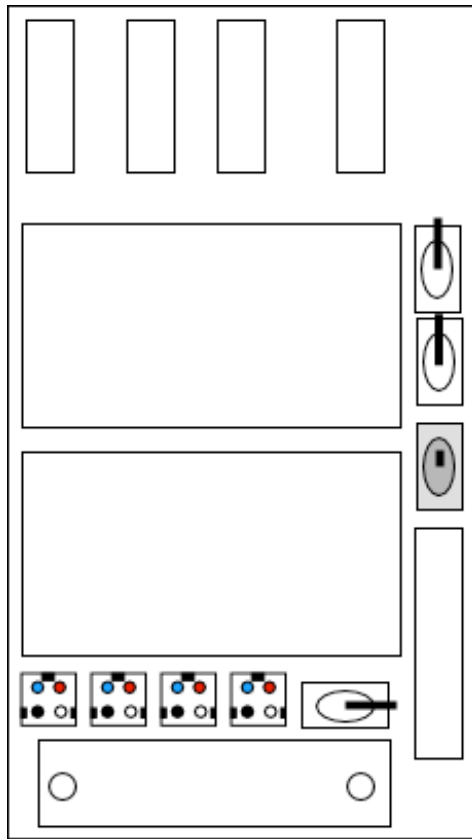


Figure 14 Operational Mode Wireless Module Serial to SoC e.g. Wireless TCP/IP Serial to Wireless Module. Wireless Module to PIC16F1947SoC

8 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.

RC5	MOSI
RG0	MISO
RE7	Chip_Select
RC3	Clock

Figure 15 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 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 PIC16F1947) 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 PIC16F1947SoC can access data stored in the EEPROM after burning using the Pyraptor.

9 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 PIC16F1947 supports one I2C core. The PIC16F1947 GPIO supporting the I2C Cores and Bit Bang are shown in Figure 17.

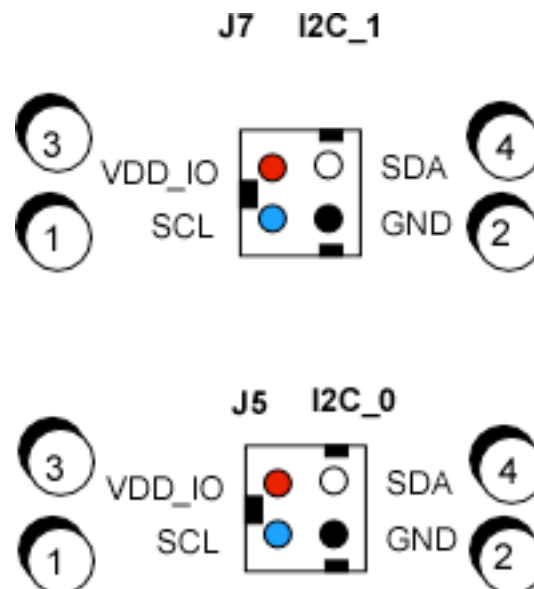


Figure 16 4 Pin Hirose DF11 Series I2C Connections

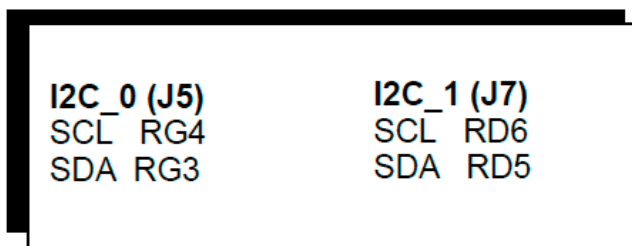


Figure 17 GPIO Mapping to I2C Busses

10 RS-232 Interfaces

The RS-232 Interface connections are shown in Figure 18. The GPIO signals shown in Figure 19 are level shifted to support RS-232.

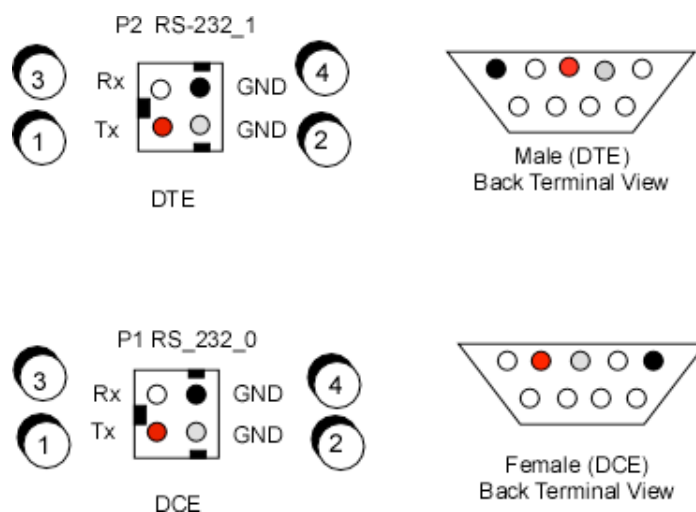


Figure 18 RS-232 4 Pin Hirose DF11 Series Connectors

P1		P2	
Tx	RC6	Tx	RG1
RX	RC7	RX	RG2

Figure 19 GPIO Mapping to RS-232 Ports

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.

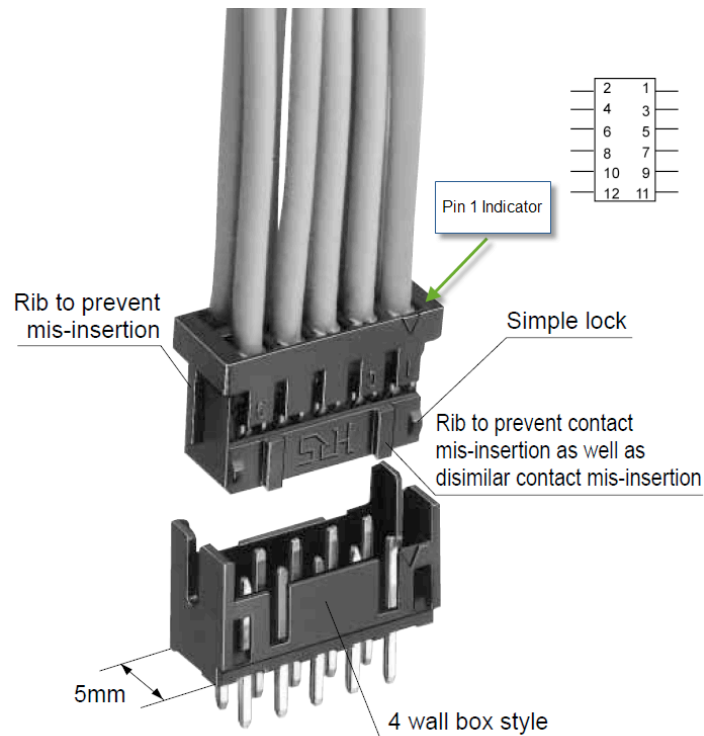


Figure 20 Guide to the Hirose DF11 series connector

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