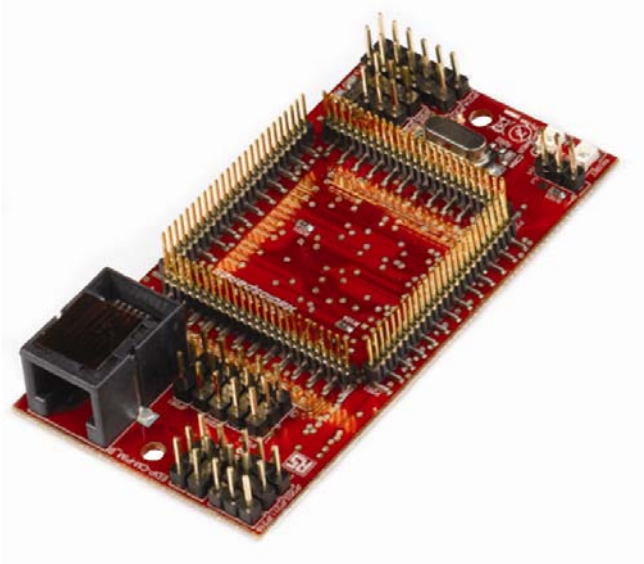
Embedded Development Platform

Getting Started Guide for Microchip PIM Carrier Module

EDP-CM-PIM



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1. Introduction

To get the most out of the EDP platform it's important to understand the concept of the EDP system correctly. This is detailed in the user manual for the Base Boards which can be downloaded as a pdf file from the RS EDP website.

RS EDP-BB-SystemBaseBoard User Manual Vx

The base boards come in both 2 position and 4 position formats and share a common user manual. Please read this manual to get an understanding of the system.

Each of the Command Modules (CM) and Application Modules (AM) has its own user manual, so again these documents must be read to get an understanding on how to use the modules.

Each of the boards comes with its own suite of software to fully exercise the EDP Application Modules and the peripherals available on the MCU device.

An EDP system usually consists of one Command Module and one or more Applications Modules plugged into a Base Board. A minimum system just has a Command module and Base Board, for example a simple web server operating through an Ethernet connection.

The Command Module dictates whether the whole system uses a supply voltage of +3.3 or +5.0V. This carrier module could have a PIM fitted which has a +5.0V or a +3.3V MCU on board. In this case the dsPIC33FJ256 PIM module uses a +3.3V device and so the user should select this voltage first using option jumper JP101 before applying power to the unit. The user can check the Vcc_CM signal on the Base Board break-out header to confirm the system voltage.

There are 100 pins on the PIM and these are connected via various link options to the Base Board. The Base Board then routes these signals to the Application Modules thereby allowing the PIM Module to communicate with the Application Modules.

As many of the MCU pins have more than one function it can make the mapping of the connections rather complex so there are additional support documents available to help you with this. The first is the Pin Allocation Spread Sheet. The one for the Microchip PIM dsPIC33FJ256 module is called:

Pin Allocation - 100 pin PIM Module - dsPIC33FJ256MC710_Rev xx

This spreadsheet also forms part of the User Manual for the PIM Carrier module. It details which pins are mapped to the Base Board backplane and the various link options which need to be configured to connect them accordingly.

To get an appreciation of how the Application Modules are mapped to the backplane and how the CPU Module can connect to them, a Mapping Aid exists. The one for the PIM carrier module is called:

Mapping Aid - dsPIC33FJ256MC710 Rev xx

This mapping aid also forms part of the User Manual for the PIM Carrier Module and at a glance you can see what resources are required to get the best out of each Application Module.

Other useful documents you will need are the circuit diagrams for the modules you wish to use. These are contained in the back of each user manual.

So before you start to use the RS EDP system make sure you have to hand the following documents:

- Base Board User Manual
- Appropriate CM module User Manual
- Application Module User Manuals (as required)

2. Prepare to run the 'Hello World' Program

Program development is performed on a PC running suitable software, with a hardware programming /debug interface between the PC and the PIM carrier module.

2.1 Software requirements

To build, download and run your first program you will need to have a suitable Integrated Development Environment (IDE) running on a PC. Microchip provide a comprehensive free-to-download IDE for all their MCU products called **MPLAB®**. Download the latest version of MPLAB from the Microchip web site and install it on your PC. The IDE handles all aspects of code production as it contains a source code editor, Flash programmer and debug tools.

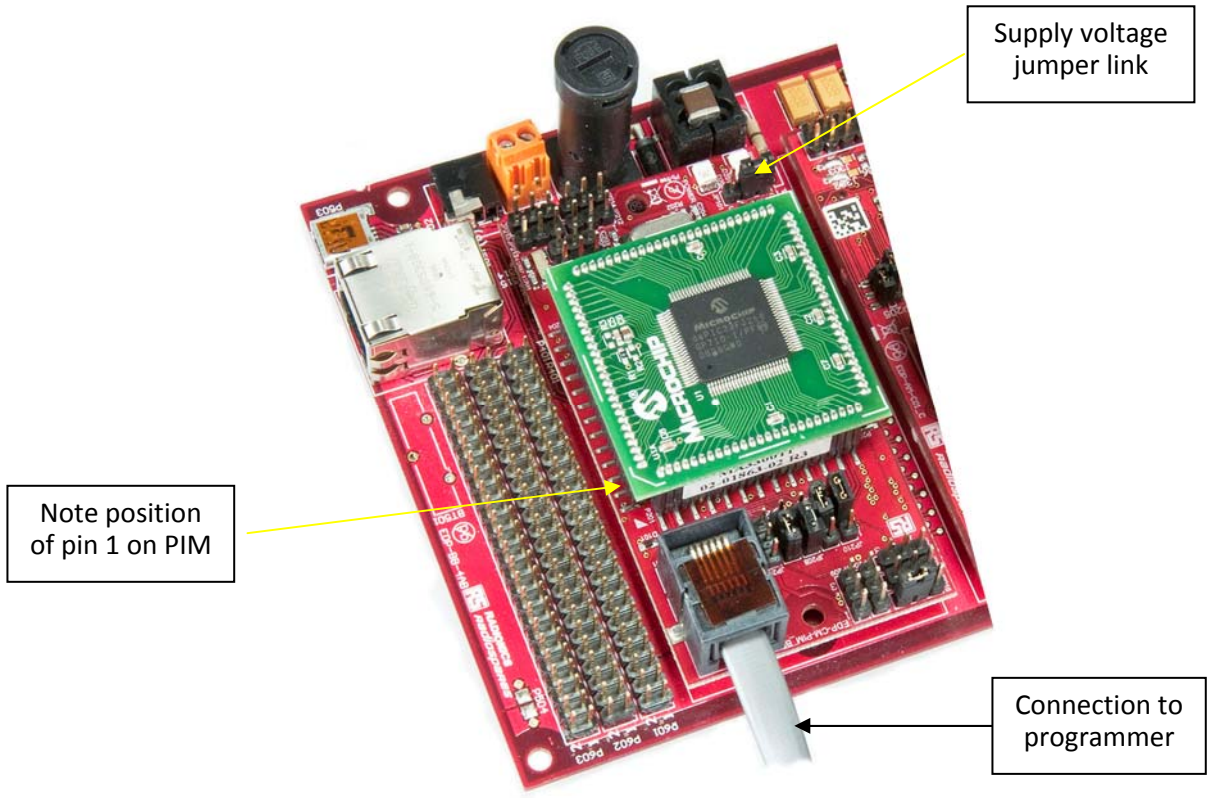
Also required is a terminal emulation program for the PC. Windows HyperTerminal is just about suitable, but one of the free third-party programs such as **TeraTerm** is recommended.

2.2 Hardware requirements

The minimum EDP components needed to run the 'Hello World' project are: a **BaseBoard**, an **EDP-CM-PIM** carrier module with a Microchip dsPIC33FJ256GP710 PIM (RS Stock No. 564-002) fitted and an **EDP-AM-CO1** communications module. The EDP will require a +12V power supply.

The PIM carrier module is fitted with an RJ-11 socket to take a connection to Microchip **REAL ICE™**, **ICD2** or **ICD3** hardware programming / debug interfaces. You will need one of these to program and debug the PIM module.

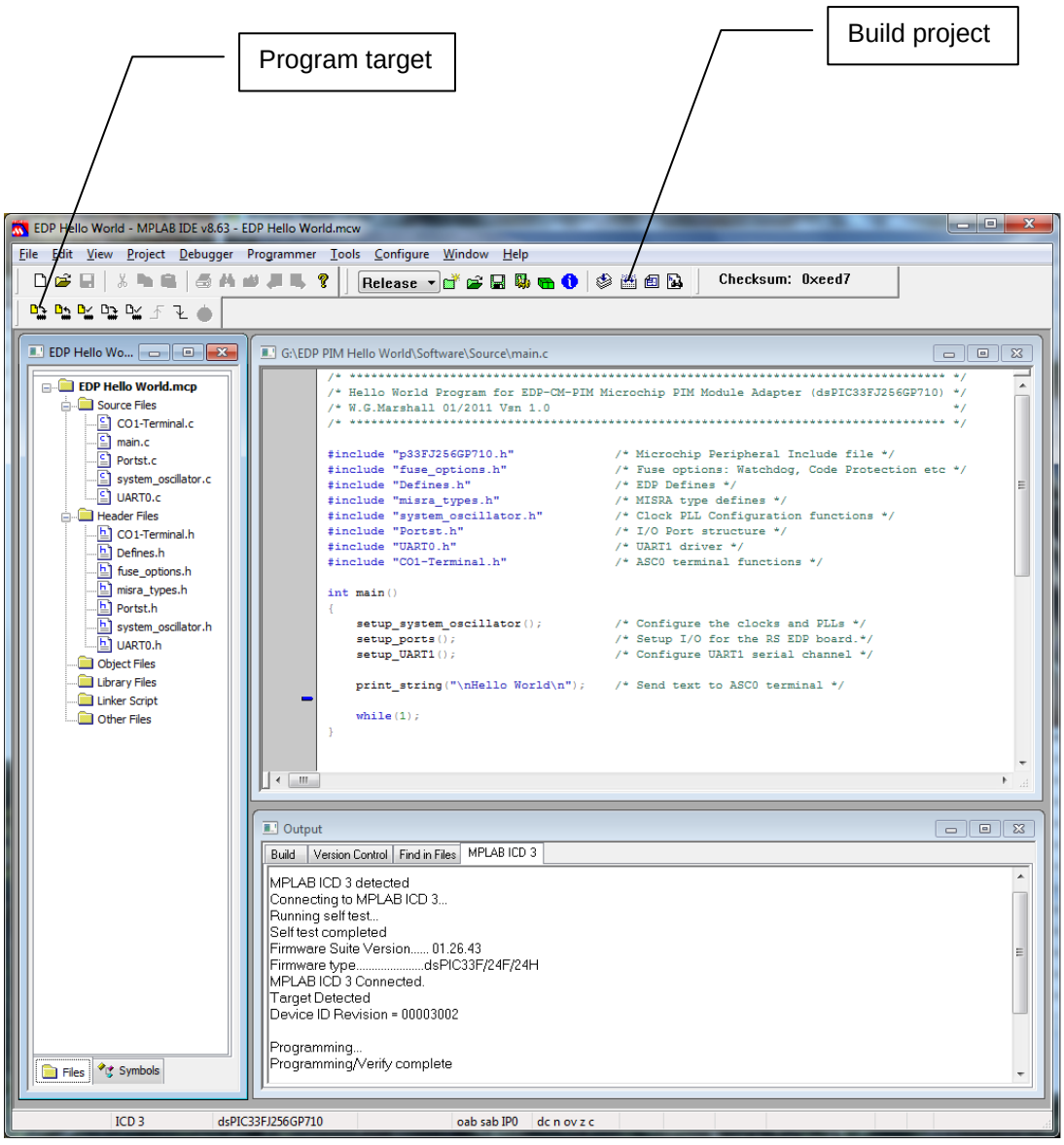
The 'Hello World' test program sends a text message to a terminal display via the RS-232 ASC0 connector (J305) on the EDP Communications module. If your PC has a D-type COM socket then all that is needed is a suitable cable. If not, then an RS-232 to USB converter cable will be needed to connect the EDP to a spare USB port.



2.3 Setting link Options

The PIC PIM adapter board has a series of link options which allow the debug interface to be connected to a variety of pins. This allows for flexibility in the choice of debug port and helps in some cases free up other pins which can be used in the application. The PIM carrier User Manual describes in detail how the emulation jumpers should be arranged and how the software for the fuse options needs to be configured. The fuse options for the dsPIC for example, determine which of the debug pins on the MCU are active.

The picture above shows the default jumper settings for the dsPIC33FJ256GP710 PIM Module and the software that is provided. If you use a different PIM module other than the one shown, you will have to determine which of the jumpers are relevant and set the fuse options in your software accordingly if appropriate.



3. Run ‘Hello World’

The ‘Hello World’ project files are located in a compressed folder, **EDP PIM Hello World**, which may be downloaded onto the host PC from the RS EDP or DesignSpark web sites.

3.1 Load the Project

- Make all the connections between the EDP, interface module and the host PC and power up.
- On the host PC run the terminal emulator, select the required serial port and set it up for 115200 baud, 8 data bits, one stop bit, no parity.
- Run **MPLAB** on the host PC.
- Select **Project** on the menu and click on **Open…**
- Navigate to the EDP PIM Hello World folder and double-click on the EDP Hello World project file (.mcp).
- Make sure the **Release** mode is selected and not **Debug** on MPLAB.

3.2 Download and program target Flash memory

- Select **Programmer** on the menu, then **Select Programmer** and then **MPLAB ICD 3** (or whatever tool you are using).
- Click the programmer button to download the binary file into the target processor's Flash memory.
- After programming, the code will execute. Pressing the EDP baseboard Reset button will re-run the program.

If all has gone correctly, once the program execution has started, a message will appear in the terminal emulator window.

4. Build your own Project

The MPLAB IDE contains an editor for producing source files, but a Compiler will need to be added to produce code suitable for downloading to the target processor. A suitable C Compiler for the dsPIC family, C30, can be downloaded from the Microchip web site in full, limited-trial or free limited-function form. The latter is good for most simple projects. Obviously you will need a different compiler for PIC32 or PIC24 PIM modules.

4.1 Creating a new Project

- Create a project folder on your PC using Windows Explorer. Copy required driver files (source and header) into the folder, along with the Main program file if the latter has been created outside the IDE.
- Run **MPLAB**.
- Select **Project** on the menu and click on **New…**
- Browse to the project folder, and type in a new project name.
- Select **Configure** from the menu and click on **Select Device….**
- Select a device from the list. It is important that this setting matches the PIM module so that the Programmer uses the correct supply voltage.
- Make sure the **Release** mode is selected and not **Debug** on MPLAB.
- If all the source and header files are ready then click on the **Build All** button.

5. Conclusion

The example files and drivers provided are designed for the dsPIC33 series of processors. Appropriate drivers will need to be obtained for other processor families such as PIC24 and PIC32.

6. Appendix 1 EDP I²C Bus Device Addresses

8-bit address format is used: the LSB is reserved as the read-write bit. These addresses are defined in file: I2C-Directory.h

BaseBoard

BB_DIP = 0x40

8-bit DIP Switch

Address set by jumper link JP501 providing possible range of addresses: 0x40 (default), 0x42.

BB_EEPROM = 0xA2

Serial 4KB EEPROM memory

Address set by jumper links J601 to J603 providing possible range of addresses: 0xA0, 0xA2 (default), 0xA4, 0xA6, 0xA8, 0xAA, 0xAC, 0xAE.

Communications Module EDP-AM-CO1

CO1_RTC = 0xA0

Real-Time Clock and SRAM

Address set by jumper link J304 providing possible range of addresses: 0xA0 (default), 0xA2.

Digital I/O Module EDP-AM-DIO54

DIO54_Out = 0x46

Digital output latch

Address set by jumper links B305 to B307 providing possible range of addresses: 0x40, 0x42, 0x44, 0x46 (default), 0x48, 0x4A, 0x4C, 0x4E.

DIO54_In = 0x44

Digital input latch

Address set by jumper links B302 to B304 providing possible range of addresses: 0x40, 0x42, 0x44 (default), 0x46, 0x48, 0x4A, 0x4C, 0x4E.

Analogue Input Module EDP-AM-AN16

AN16_ADC = 0x6A

12-channel 10-bit Analogue to Digital Converter

AN16_Pot = 0x58

Digital Potentiometer for setting filter cut-off frequency of channels AN0 and AN1

Address set by jumper links J305 & J306 providing possible range of addresses: 0x58 (default), 0x5A, 0x5C, 0x5E.

Note that jumper links J204 & J205 select between CTRL_I2C (default) and I2C_GEN0 bus channels.

Dual BLDC Motor Module EDP-AM-MC2

MICROCHIP_MOTOR_DRIVER_BASE = 0x80

dsPIC U201

Address set by jumper links J201 to J203 providing possible range of addresses: 0x80 (default), 0x82, 0x84, 0x86, 0x88, 0x8A, 0x8C, 0x8E.

dsPIC U202

Address set by jumper links J205 to J207 providing possible range of addresses: 0x80, 0x82 (default), 0x84, 0x86, 0x88, 0x8A, 0x8C, 0x8E.

Note that spare addresses allow up to four MC2 modules per base board

Miscellaneous

SRF08 = 0xE0

Daventech SRF08 Ultrasonic Rangefinder module