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PIC24FJ256DA210 Development Board User's Guide

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PIC24FJ256DA210 DEVELOPMENT BOARD USER'S GUIDE

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the PIC24FJ256DA210 Development Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Training and Seminars
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the PIC24FJ256DA210 Development Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. Introducing the Development Board** provides a brief overview of the PIC24FJ256DA210 Development Board, its features and its uses.
- **Chapter 2. The Demonstration Application** provides a brief overview of the interactive, touch-screen-based demo that ships with the development board.
- **Chapter 3. Programming and Debugging the Board** provides instructions for using MBLAB® IDE to create a project and program the development board.
- **Chapter 4. Development Board Hardware** provides a detailed description of the development board's features and instructions on their configuration.
- **Appendix A. Development Board Schematics** provides the schematics and other technical details.
- **Appendix B. Modifications for PICtail Plus Daughter Boards** provides specific directions for adapting the development board to interface with daughter boards.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use PIC24FJ256DA210 Development Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

PIC24FJ256DA210 Data Sheet (DS39969)

Consult this document for detailed information on the PIC24FJ256DA210 microcontroller with integrated graphics controller. Reference information found in this data sheet includes:

- Device memory map
- Device pinout and packaging details
- Device electrical specifications
- List of peripherals included on the device

PIC24F Family Reference Manual

This reference manual explains the operation of the PIC24F microcontroller family architecture and peripheral modules. The specifics of each device family are discussed in the individual family's device data sheet. This useful manual is online located in the Technical Documentation section of the Microchip web site. Refer to these for detailed information on PIC24F device operation.

MPLAB® ASM30, MPLAB® LINK30 and Utilities User's Guide (DS51317)

This document helps you use Microchip's language tools for PIC24F devices based on GNU technology. The language tools discussed are the MPLAB ASM30 Assembler, MPLAB LINK30 Linker, MPLAB LIB30 Archiver/Librarian and other 16-bit device utilities.

MPLAB® C30 C Compiler User's Guide (DS51284)

This document helps you use Microchip's MPLAB C30 C compiler to develop your application. MPLAB C30 is a GNU-based language tool, based on source code from the Free Software Foundation (FSF). For more information about FSF, see www.fsf.org.

MPLAB® IDE User's Guide (DS51519)

This document describes how to use the MPLAB Integrated Development Environment (IDE), as well as the MPLAB IDE Project Manager, MPLAB IDE Editor and MPLAB SIM Simulator. Use these development tools to help you develop and debug application code.

MPLAB® IDE Simulator, Editor User's Guide (DS51025)

Consult this document for more information pertaining to the installation and implementation of the MPLAB IDE software.

Graphics Solutions and Capacitive mTouch™ Sensing Documentation

The Microchip web site provides a wealth of information for developing microcontroller-based solutions using graphics and touch sensing. Application notes and software libraries are available to help design and implement applications. Refer to www.microchip.com/graphics and www.microchip.com/mtouch for more information.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Application and Market Support** – Specific information on Microchip's latest solutions for targeted vertical markets and hardware solutions, including ready-to-use application libraries to support the latest hardware
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

TRAINING AND SEMINARS

Microchip offers classes and training in Regional Training Centers (RTCs) conveniently located worldwide. The RTCs offer a variety of highly-targeted design topics that can help in creating new applications, adding functionality to existing applications, or taking full advantage of new and unfamiliar device peripherals on PIC devices and dsPIC® DSCs. These classes can help in keeping current in the competitive and always changing world of embedded design, and stay ahead of industry trends and design techniques. Visit the RTC web site at www.microchip.com/rtc site for details on offered classes.

In addition, Microchip also offers various a wide-ranging line of online webinars that are available at all times. For those users who may not have the ability to attend a class in person, or the time to wait for a class to be offered, these provide a convenient alternative that is available on your schedule. For more information, visit the web sites www.microchip.com/webinars.

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools. These include the MPLAB C18 and MPLAB C30 C compilers; MPASM™ and MPLAB ASM30 assemblers; MPLINK™ and MPLAB LINK30 object linkers; and MPLIB™ and MPLAB LIB30 object librarians.
- **Emulators** – The latest information on Microchip in-circuit emulators, such as the MPLAB ICE 4000.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers, MPLAB ICD 3 and MPLAB REAL ICE.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB SIM simulator, MPLAB IDE Project Manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 and PRO MATE II device programmers and the PICSTART® Plus, PICkit™ 3, MPLAB ICD 3 and MPLAB REAL ICE™ development programmers.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (June 2010)

- Initial Release of this Document.

NOTES:

Chapter 1. Introducing the Development Board

1.1 INTRODUCTION

The PIC24FJ256DA210 Development Board is an efficient, low-cost development platform to evaluate the features and performance of Microchip's PIC24FJ256DA210 microcontroller. The 16-bit microcontroller integrates a high-performance graphics controller, CTMU and USB OTG modules essential for integrated human interface applications. Supporting this is a range of user-defined interfaces, USB options and memory expansions for the maximum flexibility in developing graphics-capable solutions. A range of Microchip development tools and software environments, along with a range of application libraries, simplifies the process of software development.

Topics discussed in this chapter include:

- Development Board Features
- Power Requirements
- Companion Display Panels
- Typical Development Board Configurations
- Development Board Demonstration Programs
- Additional Software for Application Development

1.2 DEVELOPMENT BOARD FEATURES

The PIC24FJ256DA210 Development Board, shown in Figure 1-1, incorporates a range of features to enhance its usefulness as a platform for developing graphics applications. Key features are identified in Figure 1-2.

FIGURE 1-1: PIC24FJ256DA210 DEVELOPMENT BOARD

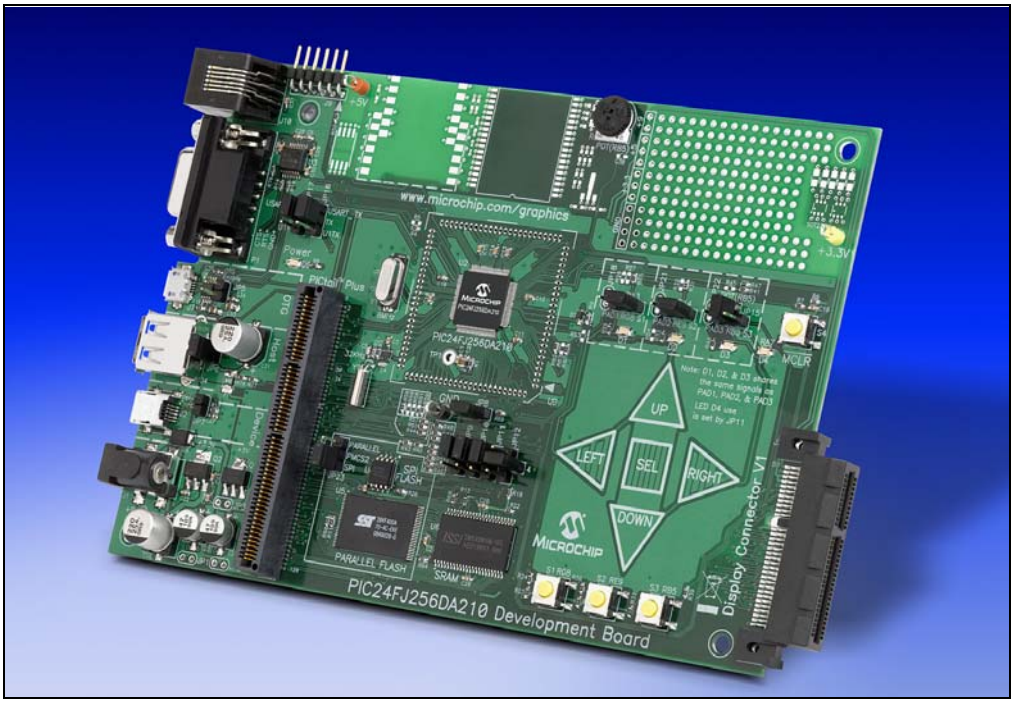
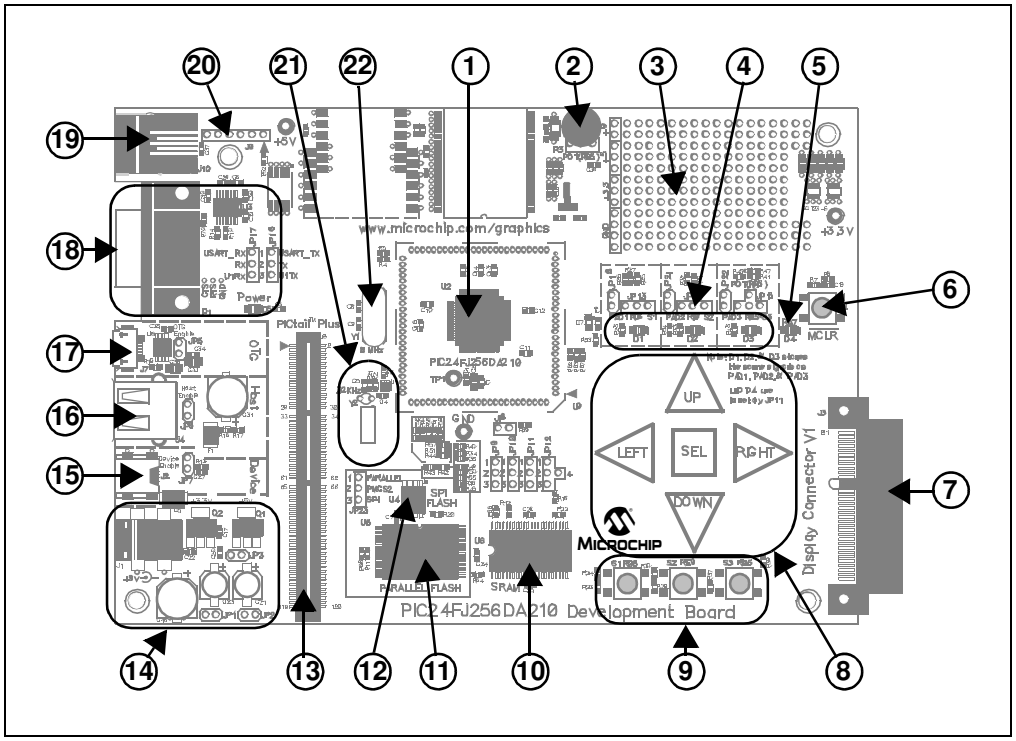


FIGURE 1-2: PIC24FJ256DA210 DEVELOPMENT BOARD LAYOUT



1. PIC24FJ256DA210 Microcontroller (U2)
2. Potentiometer for analog input (R3)
3. Prototyping area
4. Three red user-defined LEDs, multiplexed with (8) and (9) (D1, D2 and D3)
5. Red user-defined LED on PMA17 address line (D4)
6. $\overline{\text{MCLR}}$ Reset Button (S4)
7. Microchip Display Connector V1 (J3)
8. Capacitive touch pads
9. Push button switches (S1, S2 and S3)
10. On-board 512 Kbyte SRAM (U6)
11. On-board 512 Kbyte Flash Memory (U5)
12. On-board 16 Mbit (2 Mbyte) SPI Flash Memory (U4)
13. PICtail™ Plus 120-pin expansion connector (J8)
14. On board 5V and 3.3V regulators for external 9V input (Q1 and Q2), and green LED power indicator (D6)
15. USB device mode interface (J2)
16. USB Host mode interface (J4)
17. USB On-The-Go mode interface (J7)
18. RS-232 (DB-9F) serial port and associated hardware (P1)
19. RJ-11 ICD programming/debugging connector (J10)
20. PICkit™ ICSP™ programming/debugging connector (J9)
21. 32.72 kHz secondary oscillator circuit (Y2 and U1)
22. 8 MHz crystal for primary microcontroller clock (Y1)

1.2.1 PIC24FJ256DA210 Microcontroller

At the heart of the PIC24FJ256DA210 Development Board is the PIC24FJ256DA210 microcontroller. This microcontroller comes with a 16-bit core along with integrated graphics controller, as well as a wide range of peripherals.

The graphics controller is capable of running TFT, MSTN and CSTN display panels with resolution of up to QVGA (320x240) or WQVGA (480x272) at color depths of 16 bits per pixel (bpp), and VGA (640x480) running at 8 bpp. QVGA resolution can be run with the microcontroller's internal 96 Kbyte of RAM at 8 bpp. Refer to the "*PIC24FJ256DA210 Family Data Sheet*" (DS39969) for details.

1.2.2 Graphics Interface

The development board uses Microchip's standardized 64-pin edge connector to interface with compatible display boards. Both TFT and STN display boards can be accommodated, as well as many forms of resistive touch screen interfaces. Please refer to **Section 4.4.4 "Graphics Port"** for more details.

1.2.3 USB Options

As part of its standard peripheral set, the PIC24FJ256DA210 microcontroller supports full-speed USB operations with an on-chip controller and bus transceiver. In addition to Device mode operations, the USB controller supports Host and On-The-Go (dual-role) modes. The appropriate separate receptacles are provided for the required cable for each mode. Note, however, that only one of the USB modes can be active at any time.

1.2.4 Peripheral Options

Beyond the graphics and USB interfaces, the development board is equipped with an extensive set of additional features for hardware application development.
User-defined push button switches, CTMU-based touch sensors, LEDs, serial communications, and several varieties of external memory are provided to give the developer a full range of hardware options. Please refer to **Chapter 4. "Development Board Hardware"** for a complete discussion.

1.2.5 PICtail Plus Connector

The PICtail Plus connector makes it possible to connect to a range of PICtail Plus Daughter Boards, thus adding new functionality to an application under development. The connector can be configured for different signal routings to accommodate different daughter boards. Please refer to **Section 4.4.6 "PICtail™ Plus Card Modular Expansion Connector"** for more information.

1.3 POWER REQUIREMENTS

The PIC24FJ256DA210 Development Board can be powered from an external power supply, or by applying power directly to test points on the board itself. For simplicity, an unregulated 9V power supply is recommended (such as Microchip part number AC162039).

Care must be observed when connecting customized displays. The on-board regulators can supply up to 800 mA current combined. A separate external power supply may be needed for bigger displays. Please refer the chosen display panel power requirements for details.

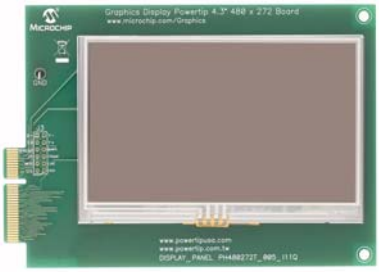
1.4 COMPANION DISPLAY BOARDS

The PIC24FJ256DA210 Development Board is compatible with all of the graphic display panels shown in Figure 1-3. The demo code that is pre-programmed onto the development board is designed to work with the Graphics Display Truly 3.2" 240x320 Board. The Graphics Display Prototype Board (AC164139) can be used to connect a different display panel.

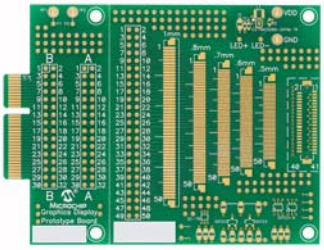
The development board has been designed to be compatible with any future Microchip display panel products. Compatible display panels will have a 64-pin edge connector that matches the RGB Display Connector (V1). The most current list of display panels is available at the Microchip web site.

FIGURE 1-3: MICROCHIP GRAPHIC DISPLAY BOARDS

Graphics Display Truly 3.2" 240x320 Board (AC164127-4)



Graphics Display Powertip 4.3" 480x272 Board (AC164127-6)



Graphics Display Prototype Board (AC164139)

1.5 TYPICAL DEVELOPMENT BOARD CONFIGURATIONS

The typical connections to use the development board as shipped from the factory are shown in Figure 1-4. To run the pre-programmed demo application:

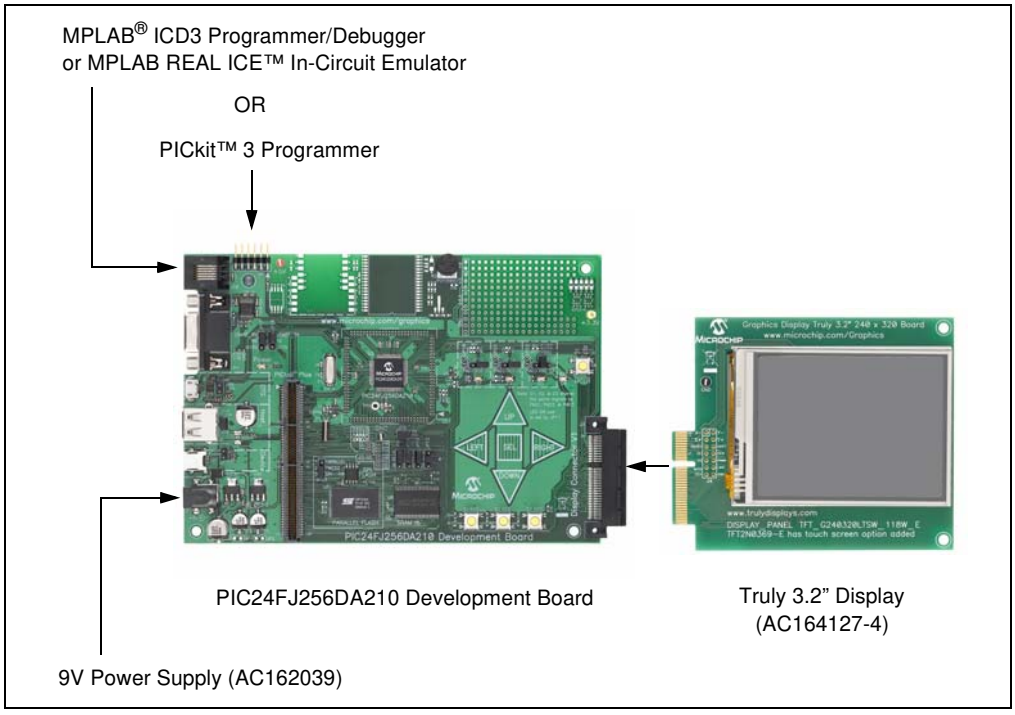
1. Connect the Truly 3.2" Display Board display into Display Connector V1 (depending on the development board kit ordered, this may or may not be included with the development board)
2. Plug a 9V power supply into J1

To program the board for application development, use one of the two programming ports provided:

- J10, a 6-wire RJ-11 jack (for use with MPLAB ICD 3 and MPLAB REAL ICE programmers)
- J9, a 6-pin riser (for use with the PICkit 3 programmer)

See **Section 4.3.5 "Programming and Debugging Interface"** for additional details on the programming ports.

FIGURE 1-4: TYPICAL BOARD CONFIGURATION



1.6 DEVELOPMENT BOARD DEMONSTRATION PROGRAMS

The development board is pre-programmed with a demo application designed for the Truly 3.2" Display Board. The application automatically runs when power is applied to the board, and shows various Microchip Application Libraries integrated into a single application. The demo is described in more detail in **Chapter 2. "The Demonstration Application"**.

The application can be reconfigured to run on other display panels. To do this, the board must be reprogrammed with the proper HEX file. For directions on reprogramming the development board, see **Section Chapter 3. "Programming and Debugging the Board"**.

Additional demonstration programs are provided with the Microchip Graphics Library, discussed in the following section. Refer to the Graphics Library Help file for details on how to download and run the additional demo applications.

1.7 ADDITIONAL SOFTWARE FOR APPLICATION DEVELOPMENT

The demo application that ships with the PIC24FJ256DA210 Development Board only demonstrates part of the microcontroller's capabilities. To take full advantage of the microcontroller and the development platform, download and install these software tools from the Microchip web site (if you don't already have them):

- A Microchip development environment, such as the latest version of MPLAB IDE
- A C compiler for PIC24 microcontrollers, such as the MPLAB C30 compiler
- One or more of the specialized Microchip Application Libraries

1.7.1 The Microchip Application Libraries

Microchip Application Libraries (MALs) provide developers the ability to quickly develop applications for their products. MALs contain different libraries and stacks supporting connectivity, communication interfacing and user interfaces.

For example, using the Microchip Graphics Library provides ready-made library objects and drivers. Adding connectivity to applications is simplified with the MCHPFSUSB Library (full-speed USB) and/or the Microchip TCP/IP Stack. All of these stacks and libraries also come with their own demo software and examples, aiding users on how to integrate these software components into their applications.

Some of the available Application Libraries that will be useful in developing applications for the development board include:

- Microchip Graphics Library
- MCHPFSUSB Library
- mTouch™ Capacitive Library
- Microchip Memory Disk Drive (MDD) File System Interface Library
- Microchip TCP/IP Stack (with the addition of optional hardware)

Refer to the individual application library web page and documentation for details.

Chapter 2. The Demonstration Application

2.1 INTRODUCTION

This chapter provides a brief overview of the pre-programmed graphics demonstration application that is provided with the PIC24FJ256DA210 Development Board.

2.2 ABOUT THE APPLICATION

The pre-programmed demonstration application has been designed as a showcase for the PIC24FJ256DA210 microcontroller. The full-color graphics and resistive touch-screen management are all handled on-chip using the microcontroller. Only a subset of the development board's other interactive features are demonstrated in this application.

The demonstration runs from two main menu screens (Figure 2-1 and Figure 2-2), with Figure 2-1 appearing on power-up as the default screen. Navigation between the two menu screens is done with the arrows in the screen's lower right corner.

A total of 10 interactive demos are provided in the application. Touching the appropriate icon invokes that demo. Touching the "Demo" button in the lower left of either menu screen runs a continuous loop of several of the demos. Touching "Exit", generally in the lower left of any of the demos, returns to the menu screen.

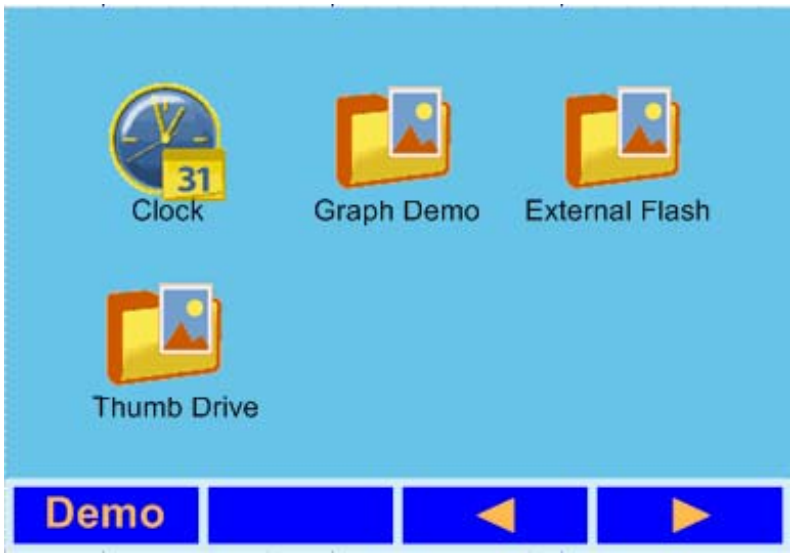
FIGURE 2-1: DEMO APPLICATION, FIRST MENU SCREEN

The demos available on the first screen are:

- Lighting: this demonstrates a lighting control terminal application. Using the touch screen, sliders and buttons are provided to vary the red, green and blue lighting colors.

- Language: this shows how multiple languages can be integrated into one application. Text examples in Roman, Cyrillic, simplified Chinese, Japanese and Korean alphabets are shown.
- Game: this is a simple, interactive adaptation of a "snake" video game. Its operation is self-explanatory.
- Animation: this shows animation of stored graphics, along with image scaling and interactivity.
- Drawing: this demo implements free-hand drawing with a selectable color palette using the touch screen.
- ECG: this simulates an electrocardiogram display, demonstrating how analog data can be used to produce a graphic output. The "Ext" option switches between the fixed ECG display and a graphing display based on the potentiometer's position.

FIGURE 2-2: DEMO APPLICATION, SECOND MENU SCREEN



The demos available from the second screen are:

- Clock: this is a simple numeric date and time display, based on the microcontroller's RTCC.
- Graph Demo: this demo uses the Chart widget from the Microchip Graphics Library to generate a wide range of bar and pie charts based on a fixed set of data.
- External Flash: this demo shows images or pictures stored in the on-board Flash memory.
- Thumb Drive: this uses the USB Host interface to read a thumb drive connected to J4 and scan it for graphics files (JPEG or BMP formats only). The application then produces a directory of graphics images, and displays the corresponding file when selected.

2.2.1 Other Considerations

The demonstration application described here is the most current version as of the date of original publication of the user's guide. Microchip Technology reserves the right to update this application and its appearance in future releases of the development board kit.

Chapter 3. Programming and Debugging the Board

3.1 INTRODUCTION

The PIC24FJ256DA210 Development Board may be used with MPLAB IDE, the free integrated development environment available on Microchip's website. MPLAB IDE with Microchip's compatible programming/debugging hardware allows the development board to be programmed and/or debugged.

For more information on how to use the MPLAB IDE, please refer to the following documentation:

- MPLAB IDE User's Guide (DS51519)
- MPLAB IDE Quick Start Guide (DS51281)
- MPLAB IDE Online Help

This chapter includes the following:

- Tutorial Overview
- Loading the Project
- Building the Code
- Programming the PIC24FJ256DA210
- Running the Code
- Debugging the Code

3.2 TUTORIAL OVERVIEW

Creating projects with the Microchip Graphics Library requires that a number of files be included in the project. It is much more efficient to start a new project based on an existing demo application release with the Microchip Graphics Library. The tutorial in this chapter uses that route to guide development of new applications. All demo applications are written in C for MPLAB C30.

Note: This tutorial was developed using MPLAB IDE v8.40 and MPLAB C30 Compiler v3.30 as the software tools, and the Microchip Graphics Applications Library v2.10. Before proceeding, verify that you have at least these revision levels.

The Demonstration Applications are provided with the Microchip Applications Library downloadable from http://www.microchip.com/mal. When installed in a specified `path` (for example, `C:\Microchip Solutions\`), the help file `Graphics Library Help.chm` is located in the path `C:\Microchip Solutions\Microchip\Help\Graphics Library Help.chm`. The help file contains the Graphics Library release notes and description of the API. It also contains useful information on the demo applications that can run on the development board.

Upon completing this tutorial, you should be able to:

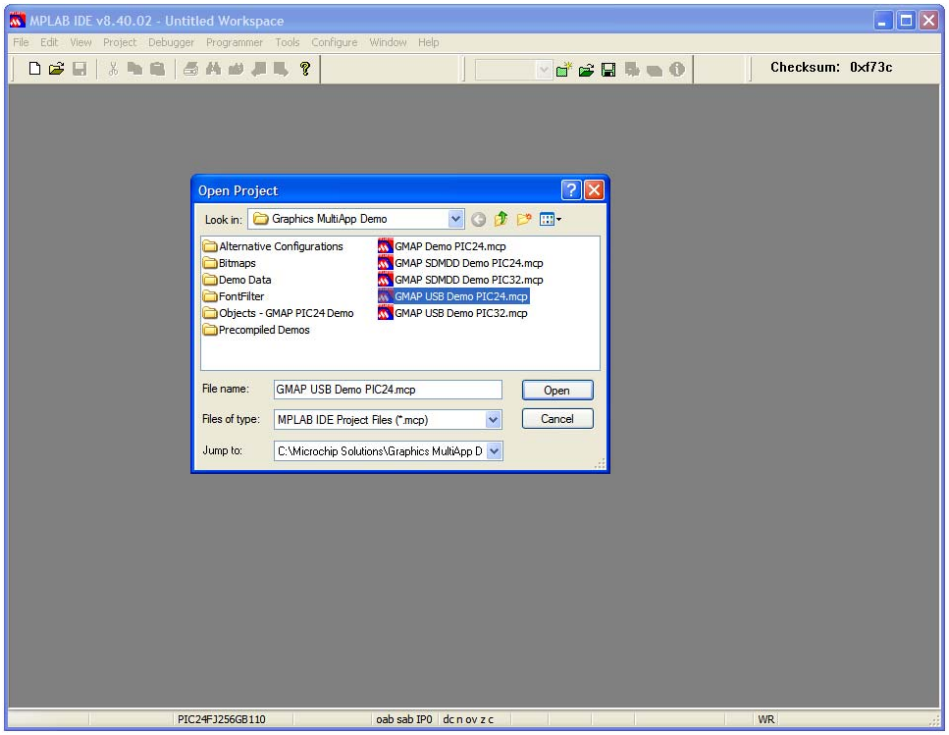
- Load an existing project in MPLAB IDE
- Assemble and link the loaded project
- Debug the loaded project
- Program the PIC24FJ256DA210 with MPLAB REAL ICE in-circuit emulator or MPLAB ICD 3.

3.3 LOADING THE PROJECT

After installing the Microchip Graphics Library and the Demo Applications that are released with the library, load one of the demo applications to MPLAB IDE:

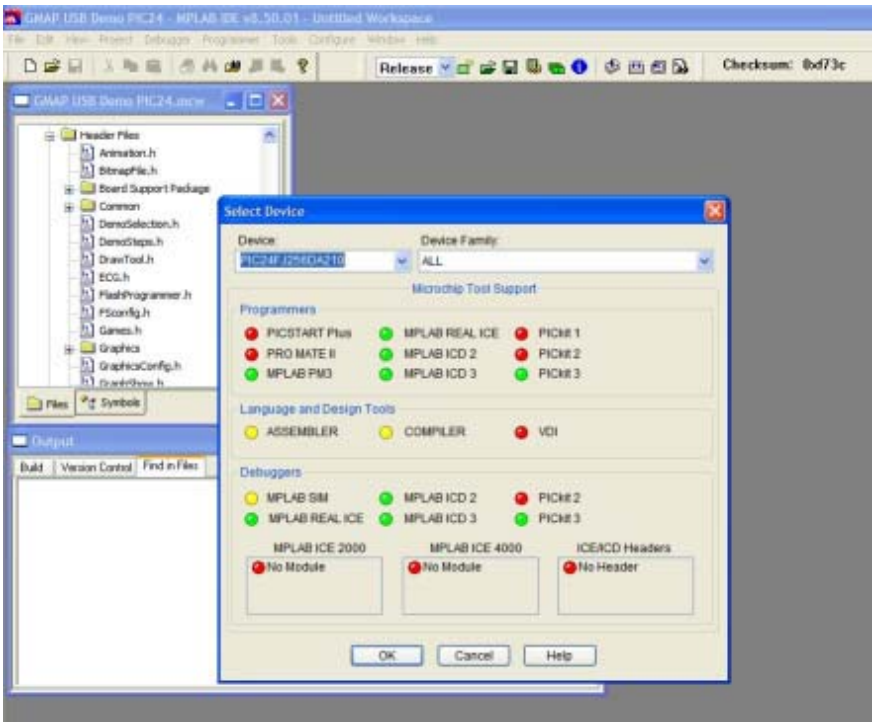
1. Launch MPLAB IDE.
2. Close any workspace that might be open (*File > Close Workspace*).
3. From the *Project* menu, select *Open*.
4. Browse through the directories to get to one of the several demo applications. The factory pre-programmed application is located in the path: `C:\Microchip Solutions\Graphics MultiApp Demo\GMAP USB Demo PIC24.mcp`. Click **Open**.

FIGURE 3-1: LOADING THE PROJECT



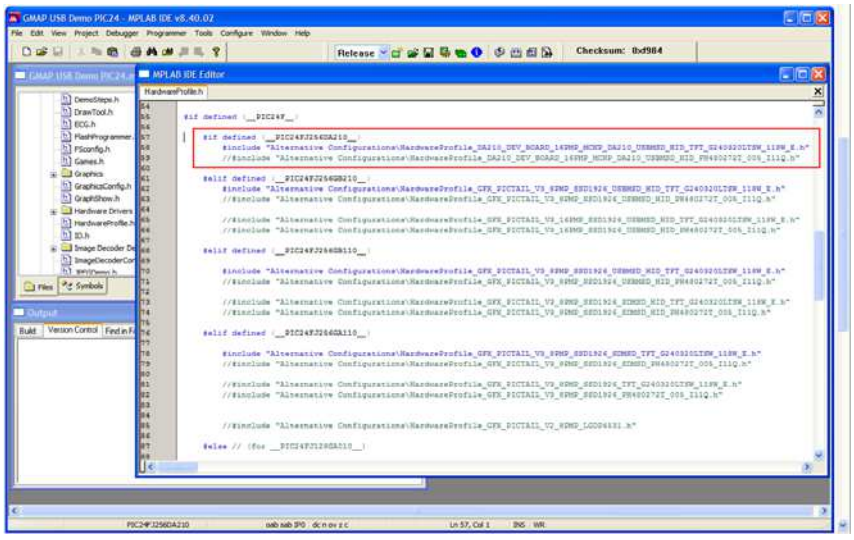
5. From the *Configure* menu, choose *Select Device*.
6. From the **Device** drop down list, select "PIC24FJ256DA210" (Figure 3-2). Click **OK** to select the device. The loaded project will be set to use MPLAB C30 compiler.

FIGURE 3-2: SET DEVICE



7. Before you build the project, verify that the display panel to be used is the same one included in the code project:
   a) On the Project Window select and open the file `HardwareProfile.h`. (Figure 3-3).
   b) Select the appropriate header file for the display board to be used. Refer to the Graphics Library help file for more information on selecting the hardware profile. Refer to the “Demo Compatibility Guide” under the “Demo Projects” section.

FIGURE 3-3: SET CORRECT DISPLAY BOARD



3.4 BUILDING THE CODE

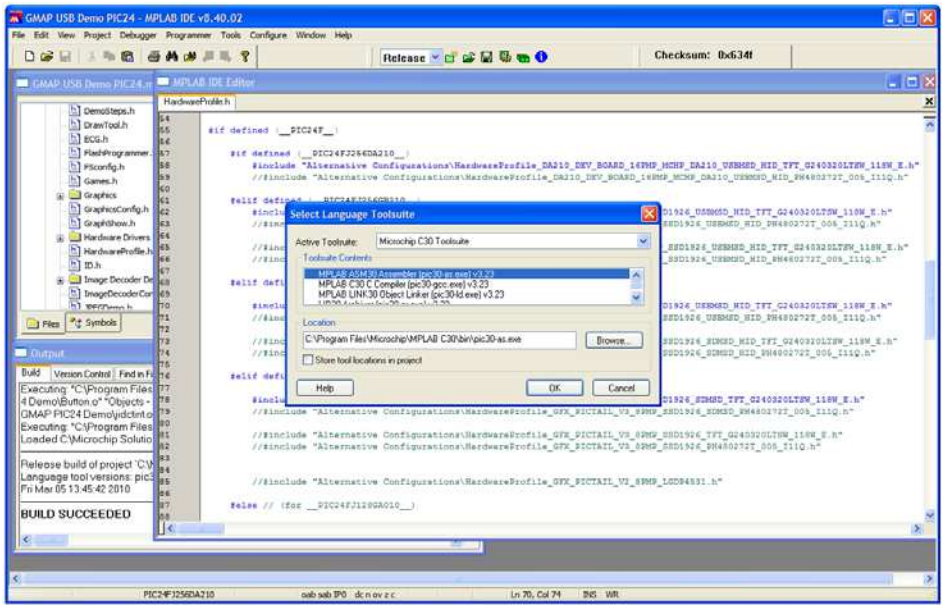
For the loaded project, building the code consists of compiling the source files to create an object file, `GMAP USB Demo PIC24.o`, then linking the object file to create the output files `GMAP USB Demo PIC24.hex` and `GMAP USB Demo PIC24.cof`. The HEX file contains the data necessary to program the device, and the `.cof` file contains additional information that lets you debug the code at the source code level.

3.4.1 Verifying the Compiler Path

Before building the project, check that the path of the MPLAB C30 compiler is set to the correct path. The path must be consistent with the location of the compiler when you installed it.

1. At the *Project* menu, click on *Select Language Tool Suite…* . This opens the Select Language Toolsuite dialog (Figure 3-4).
2. Verify that the C30 Toolsuite is selected in the **Active Toolsuite** list. In the **Toolsuite Contents** list, select each item, then verify the path for that item in the **Location** box. If necessary, modify the path by clicking on **Browse**, then browsing to and selecting the correct location in the dialog that follows.
3. After verifying and/or modifying the paths, click **OK** to exit.

FIGURE 3-4: SELECT LANGUAGE TOOLSUITE



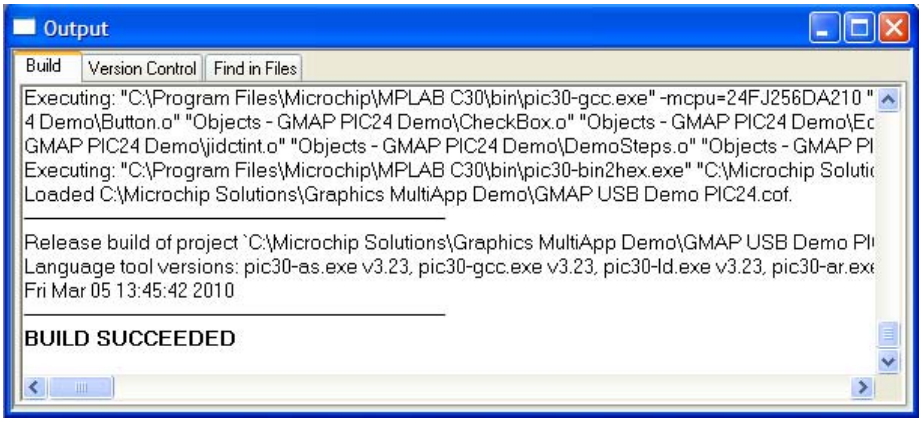
3.4.2 Building the Project

Before building the project, set the build for a release version. From the menu bar of the main MPLAB IDE window, select *Project > Build Configuration*, then select **Release**.

To build the project in the main MPLAB IDE window, select *Project > Make*. The Build Output window appears (Figure 3-5).

Observe the progress of the build. When the "BUILD SUCCEEDED" message displays, you are ready to program the device.

FIGURE 3-5: BUILD OUTPUT



3.5 PROGRAMMING THE PIC24FJ256DA210

Programming the PIC24FJ256DA210 is possible through any one of the following development hardware:

- MPLAB REAL ICE in-circuit emulator
- MPLAB ICD 2 or MPLAB ICD 3
- PICkit 3
- The MPLAB PM3 Universal Device Programmer

For this example, MPLAB REAL ICE in-circuit emulator is assumed to be used.

3.5.1 Set Up the Device Configuration

The device configuration for the PIC24F devices can be set by two methods:

- Using configuration macros in the source code
- Using the Configuration Bits window in MPLAB IDE

To display the Configuration Bits window, select *Configure > Configuration Bits* from the menu bar (Figure 3-6).

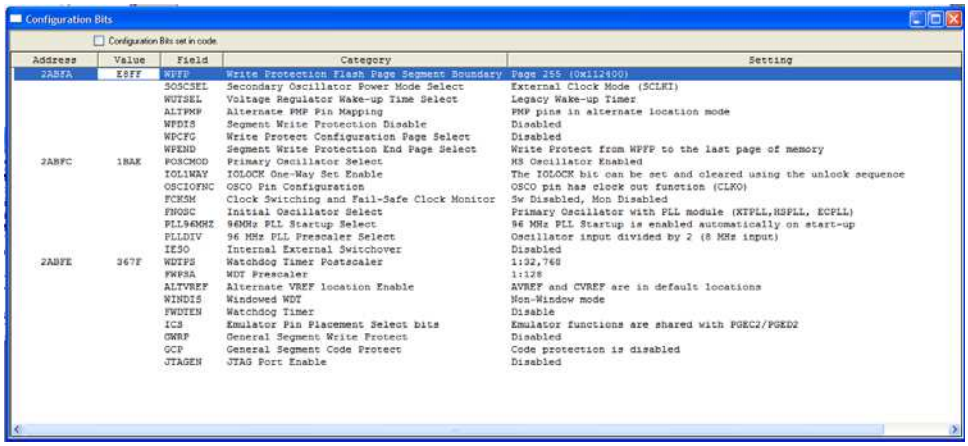
All demos that come with the Microchip Application Libraries include the configuration macros in the code. It is recommended to use these configuration settings in the code. To do this:

1. Open the Configuration Bits window.
2. Select the check box **Configuration Bits set in code**, located at the top of the window, to enable the use of the configuration in code.

For building applications that do not include configuration macros, it is possible to set the device configuration by using the Configuration Bits window. To do this:

1. Open the Configuration Bits window.
2. Set the Configuration bits by clicking on each line item and selecting an option from the drop-down menu that appears. The Configuration bits for the PIC24F device on the PIC24FJ256DA210 Development Board should be set as shown in Figure 3-6.

FIGURE 3-6: PIC24FJ256DA210 DEVELOPMENT BOARD CONFIGURATION BITS



Note: Do not use the Configuration Bits window to set device configuration if configuration macros are already used in the source code. To do this, check the "Configuration Bits set in code" checkbox at the top of the Configuration bits window. Refer to the *"MPLAB IDE Simulator, Editor User's Guide"* (DS51025) for additional information.

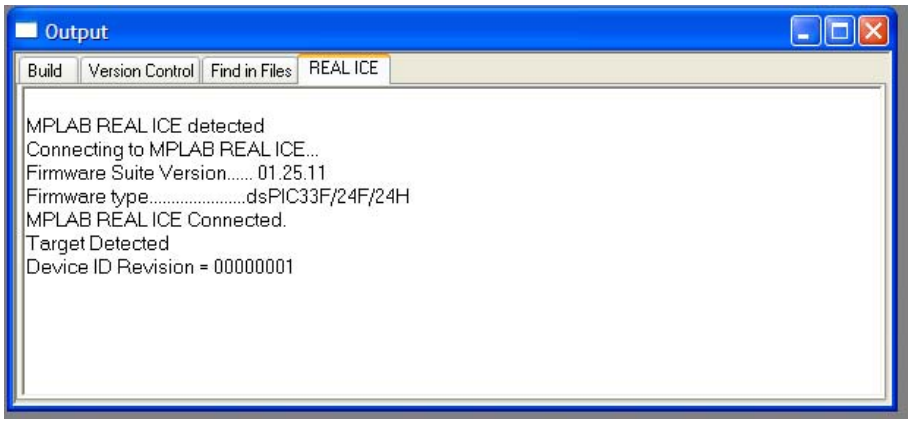
3.5.2 Connect and Enable MPLAB REAL ICE In-Circuit Emulator

1. Connect the MPLAB REAL ICE in-circuit emulator module to the PC with the USB cable.
2. Connect the MPLAB REAL ICE in-circuit emulator to the PIC24FJ256DA210 Development Board with the short RJ-11 cable.
3. Apply power to the development board.
4. From the Debugger menu, choose *Select Tool > REAL ICE* to set MPLAB REAL ICE in-circuit emulator as the debug tool in MPLAB IDE.

Once selected, MPLAB IDE will connect to the MPLAB REAL ICE in-circuit emulator and report that it has detected the module (Figure 3-7). Then it connects to the MPLAB REAL ICE in-circuit emulator verifying the firmware loaded on the module is appropriate for the selected device (PIC24FJ256DA210). If not, it will load the necessary firmware. Once the firmware is verified to be correct it connects to the development board and determines if the target device (i.e., the PIC24FJ256DA210) is present or not.

Note: Upon first connection to the PIC24FJ256DA210 Development Board, MPLAB IDE may need to download new firmware. Allow it to do so. If any errors are shown, double click the error message to get more information.

FIGURE 3-7: ENABLING MPLAB® REAL ICE™ IN-CIRCUIT EMULATOR



3.5.3 Program the Device

From the Debugger menu, select *Program* to program the part. The Output window (Figure 3-8) displays the program steps as they occur.

Observe the results of the programming. When the “Programming/Verify complete” message appears, the device is programmed and ready to run.

FIGURE 3-8: PROGRAMMING THE DEVICE