MICROCHIP

PIC16F19197 LCD Plug-in Module (PIM) User's Guide

Note the following details of the code protection feature on Microchip devices:

• Microchip products meet the specification contained in their particular Microchip Data Sheet.

• Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.

• There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.

• Microchip is willing to work with the customer who is concerned about the integrity of their code.

• Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

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 website (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 online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the PIC16F19197 LCD PIM. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Development Systems Customer Change Notification Service
- Customer Support
- Revision History

DOCUMENT LAYOUT

This document describes how to use the PIC16F19197 LCD PIM as a development tool to emulate and debug firmware on a target board, as well as how to program devices. The document is organized as follows:

- "Overview" – This section gives a general description of using the PIC16F19197 LCD PIM
- "Pin Mapping" – This section describes general PIM pin mapping exceptions.
- "Running the Demo" – This section gives a description of how to run the demo.
- "Equipment Required"– This section describes the items needed to run the demo.
- "Instructions"– This section describes general instructions on how to set-up the demo.
- "Modes"– This section describes the modes available.
- "Optional" – This section describes other set-up options.
- "Schematic" – PIC16F1919X LCD PIM.

Preface

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
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
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 PIC16F19197 LCD PIM. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

Release Notes for MPLAB ICD 3 In-Circuit Debugger

For the latest information on using PIC16F19197 LCD PIM, read the "`Readme for PIC16F19197 LCD PIM.htm`" file (an HTML file) in the Readmes subdirectory of the MPLAB IDE installation directory. The release notes (Readme) contains update information and known issues that may not be included in this user's guide.

THE MICROCHIP WEBSITE

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

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 website 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, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators. This includes the MPLAB REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **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 IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART® Plus and PICkit 2 and 3.

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 website at:

http://www.microchip.com/support.

REVISION HISTORY

Revision A (01/2018)

This is the initial release of this document.

Using the PIC16F19197 LCD PIM

OVERVIEW

The PIC16F19197 Plug-in Module (PIM) is designed to demonstrate the capabilities of the PIC16F19197 device family using the LCD Explorer XLP Development Board (DM240314). Most of the pins of the device are mapped directly to the PIM connector (100 pin ICE). The exceptions are those pins that provide the connections to the secondary oscillator and pins on the PIM that do not correspond to pins on the device.

PIN MAPPING

There are several PIM ICE pins that do not have a one-to-one connection to the PIC16F19197. Table 1 below shows these exceptions. There are two pins (RC0 and RC1) on the PIC16F19197 that do not connect to the PIM ICE connector, instead they are connected to the secondary oscillator on the PIM.

TABLE 1: PIM PIN MAPPING EXCEPTIONS (NO DIRECT CONNECTION TO PIC16F19197)

PIM Pin Function	PIM Pin	PIM Pin Function	PIM Pin	PIM Pin Function	PIM Pin
VCC	2	VCC	30	OSCI	63
LCDBIAS0	5	GND	31	OSCO	64
RC4	9	GND	36	RD8	68
VLCAP1	11	VCC	37	RC13	73
VLCAP2	12	RB12/PMPA11	41	RC14	74
RE8/INT1	18	GND	45	GDN	75
RE9/INT2	19	RF3/U1TX	51	VCAP	85
RB3/AN3	22	RF2/U1RX	52	RF0	87
RB2/SS1/AN2	23	RF8/SDO1	53	RF1	88
RB1/AN1	24	RF7/SDI1	54	RG1	89
RB0/AN0	25	RF6/SCK1	55	RG0	90

RUNNING THE DEMO

This demo has six operating modes: Power-on Self-Test (POST), Scrolling Text, Potentiometer (POT) Voltage Reference, Battery Voltage, the Temperature in Degrees Celsius, and Temperature in Degrees Fahrenheit. The PIM and LCD Explorer can be powered from two AAA batteries or from the standard Microchip 9V wall mounted power supply.

EQUIPMENT REQUIRED

- PIC16F19197 LCD PIM (MA160019)
- LCD Explorer Development Board (DM240314)
- 9V Wall Mount Power Supply (optional - AC002014)
- Two AAA Batteries (optional)
- Coin Cell CR2032 Battery (optional)

INSTRUCTIONS

1. Plug the PIM into the LCD Explorer board, taking note of PIN 1 orientation.
2. Either put two AAA batteries in the battery holders (B1 and B2 noting orientation) or plug in the 9V wall mount power supply into J5.
3. Turn the board on with SW2, located near B2.

MODES

Mode 1: POST – turns on all the LCD segments for two seconds to verify the functionality of the LCD and PIM. Once that is complete, the demo goes directly into Mode 2.

Mode 2: Scrolling Text – displays a message that lists features of the PIC16(L)F19197 family. Pressing S6 near the LCD will change to the next mode.

Mode 3: POT Voltage Ref– displays the scrolling message **"POT R20 Voltage"**. Then, the display shows the voltage dropped across POT R20, located near the USB jack. Adjust R20 to see the change in voltage. Pressing S6 near the LCD will change to the next mode.

Mode 4: Battery Voltage– if the batteries are installed, then the battery voltage is displayed. As the batteries get depleted the voltage will decrease. Pressing S6 near the LCD will change to the next mode.

Mode 5: Temp in Celsius – the current temperature in degrees Celsius will be displayed. The temperature sensor, located near R20, can be cooled or heated to show a change in temperature. Pressing S6 near the LCD will change to the next mode.

Mode 6: Temp in Fahrenheit – the current temperature in degrees Fahrenheit will be displayed. The temperature sensor, located near R20, can be cooled or heated to show a change in temperature. Pressing S6 near the LCD will return to Mode 1.
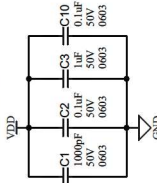
OPTIONAL

- The PIM can be reprogrammed using the onboard PICkit 3 header or ICD 3 jack.
- A coin cell battery (CR2032) can be installed into the BT1 on the back side of the LCD Explorer board. This battery is tied into VBAT pin on the PIM. This will assist in the development of Real-Time Clock Calendar (RTCC) applications.
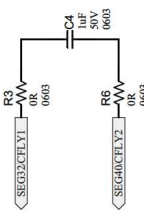
SCHEMATIC
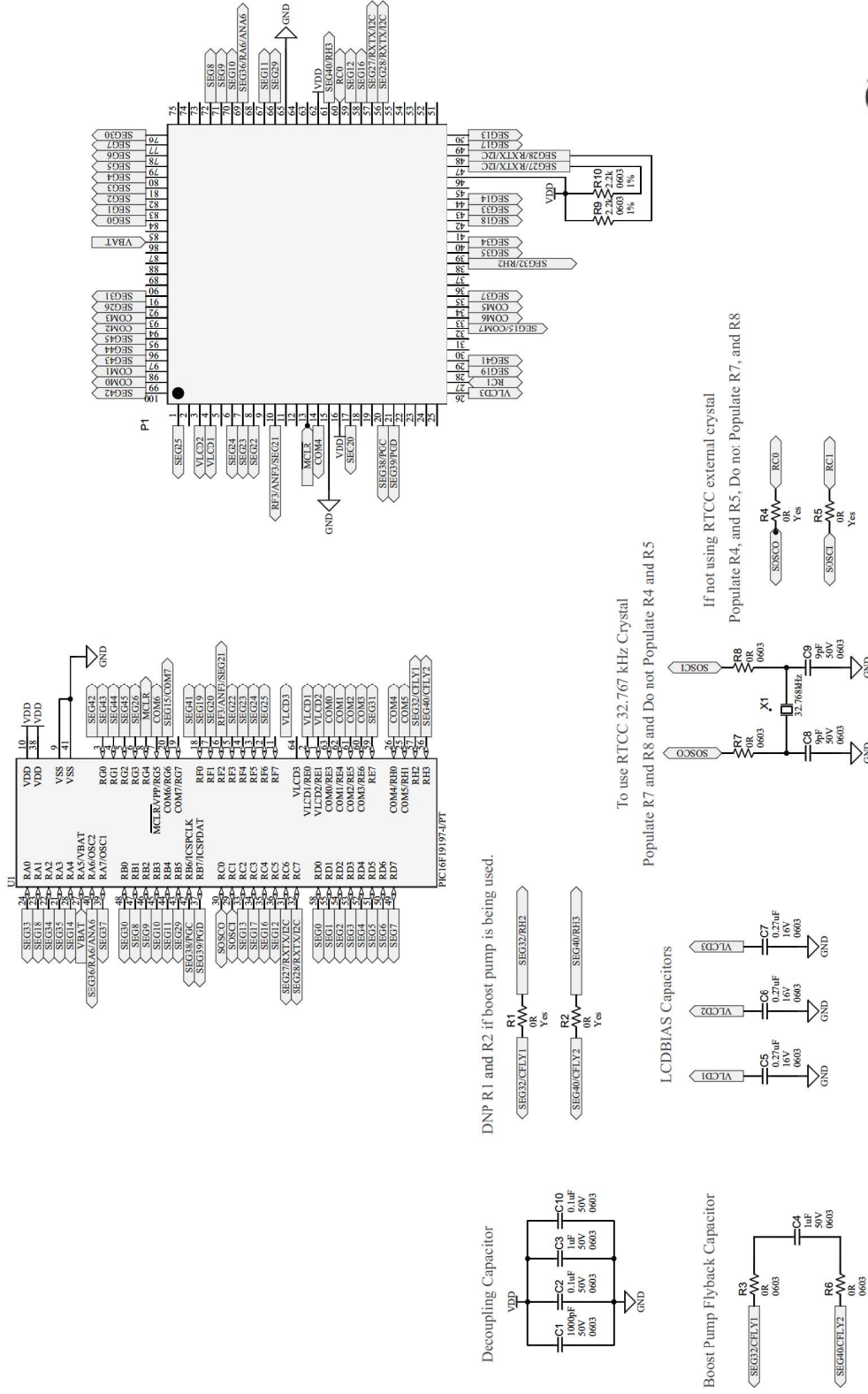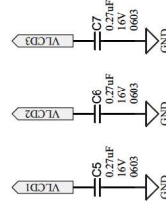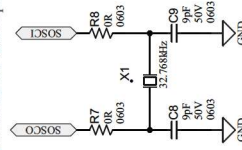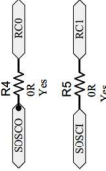
Worldwide Sales and Service
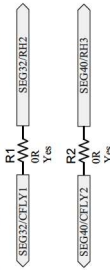
AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880- 3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7289-7561

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820