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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 MCP2120/22 Developer’s Board. Items discussed in this chapter include:

• Document Layout
• Conventions Used in this Guide
• Recommended Reading
• The Microchip Web Site
• Customer Support
• Document Revision History
This document describes how to use the MCP2120/22 Developer’s Board. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Important information about the MCP2120/22 Developer’s Board.
- **Chapter 2. “Installation and Operation”** – Includes instructions on how to get started with this user’s guide and a description of the user’s guide.
- **Appendix A. “Schematic and Layouts”** – Shows the schematic and layout diagrams for the MCP2120/22 Developer’s Board.
- **Appendix B. “Bill Of Materials (BOM)”** – Lists the parts used to build the MCP2120/22 Developer’s Board.
- **Appendix C. “Board Testing”** – Discusses what is and is not tested on the MCP2120/22 Developer’s Board.
- **Appendix D. “Configuring the HyperTerminal® Program”** – Gives aid in the configuration of the HyperTerminal application.
- **Appendix E. “Continuously Transmitted Data Table”** – Shows the data table that the MCP2120/22 Developer’s Board transmits.
- **Appendix F. “Programming the MCP212XDM”** – Gives information to assist in the programming of the MCP2120/22 Developer’s Board.
CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

<table>
<thead>
<tr>
<th>DOCUMENTATION CONVENTIONS</th>
<th>Description</th>
<th>Represents</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arial font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italic characters</td>
<td>Referenced books</td>
<td>MPLAB® IDE User’s Guide</td>
<td>...is the only compiler...</td>
</tr>
<tr>
<td>Emphasized text</td>
<td>the Output window</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial caps</td>
<td>A window</td>
<td>the Settings dialog</td>
<td></td>
</tr>
<tr>
<td>A dialog</td>
<td>A menu selection</td>
<td>select Enable Programmer</td>
<td></td>
</tr>
<tr>
<td>Quotes</td>
<td>A field name in a window or dialog</td>
<td>“Save project before build”</td>
<td></td>
</tr>
<tr>
<td>Underlined, italic text with right angle bracket</td>
<td>A menu path</td>
<td>File&gt;Save</td>
<td></td>
</tr>
<tr>
<td>Bold characters</td>
<td>A dialog button</td>
<td>Click OK</td>
<td></td>
</tr>
<tr>
<td>A tab</td>
<td>Click the Power tab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N'Rnnnn</td>
<td>A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.</td>
<td>4'b0010, 2'hF1</td>
<td></td>
</tr>
<tr>
<td>Text in angle brackets &lt; &gt;</td>
<td>A key on the keyboard</td>
<td>Press &lt;Enter&gt;, &lt;F1&gt;</td>
<td></td>
</tr>
<tr>
<td>Courier New font:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain Courier New</td>
<td>Sample source code</td>
<td>#define START</td>
<td></td>
</tr>
<tr>
<td>Filenames</td>
<td>autoexec.bat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>File paths</td>
<td>c:\mcc18\h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keywords</td>
<td>.asm, .endasm, static</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command-line options</td>
<td>-Opa+, -Opa-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit values</td>
<td>0, 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constants</td>
<td>0xFF, ‘A’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italic Courier New</td>
<td>A variable argument</td>
<td>file.o, where file can be any valid filename</td>
<td></td>
</tr>
<tr>
<td>Square brackets []</td>
<td>Optional arguments</td>
<td>mcc18 [options] file [options]</td>
<td></td>
</tr>
<tr>
<td>Curly brackets and pipe character: {</td>
<td>Choice of mutually exclusive arguments; an OR selection</td>
<td>errorlevel {0</td>
<td>1}</td>
</tr>
<tr>
<td>Ellipses...</td>
<td>Replaces repeated text</td>
<td>var_name [, var_name...]</td>
<td></td>
</tr>
<tr>
<td>Represents code supplied by user</td>
<td>void main (void) { ... }</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECOMMENDED READING

This user’s guide describes how to use MCP2120/22 Developer’s Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **MCP2120 Data Sheet, “Infrared Encoder/Decoder”, DS21618**
- **MCP2122 Data Sheet, “Infrared Encoder/Decoder”, DS21894**

These data sheets provide detailed information regarding the MCP2120 and MCP2122 product families.

You can also find important information in the following Microchip documents:

- **AN946 - “Interfacing the MCP2122 to the Host Controller”, DS00946.**
- **AN923 - “Using the MCP2120 Developer’s Board for IR Sniffing”, DS00923.**
- **AN756 - “Using the MCP2120 for Infrared Communications”, DS00756.**
- **TB073 - “Selecting an MCP21xx Device for IrDA Applications”, DS91073.**

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
- **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

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Users of Microchip products can receive assistance through several channels:

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- 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 2009)

- Initial Release of this Document.
Chapter 1. Product Overview

1.1 INTRODUCTION AND HIGHLIGHTS

This chapter provides an overview of the MCP2120/22 Developer’s Board’s features, the system configurations that they can be used in and the system requirements for the tutorials.

Items discussed in this chapter are:

• What is the MCP2120/22 Developer’s Board?
• MCP2120/22 Developer’s Board Features
• PC Requirements
• What the MCP2120/22 Developer’s Board Kit includes:

1.2 WHAT IS THE MCP2120/22 DEVELOPER’S BOARD?

The MCP2120/22 Developer’s Board allows for the easy demonstration and development of IrDA applications. The board can be powered via USB or the power test points (Vdd and GND). When using the power test points, if JP2 is shorted, the voltage must not exceed the PIC18F65J50 voltage specification.

The preprogrammed PIC18F65J50 firmware generates the MCP2122’s clock. The Host interface can be connected to the UART driver device (for IrDA to UART operation), for communication over the DB-9 connector or connected to the PIC18F65J50 for stand alone operation.

The USB interface signals are fully connected to the PIC18F65J50. So programs can be created where the PIC18F65J50 can communicate to the USB Host and to the MCP2122. This would allow the board to be used as an IrDA to USB converter.
1.3 MCP2120/22 DEVELOPER’S BOARD FEATURES

The MCP2120/22 Developer’s Board has five functional blocks. These are:

• Power
• Host Microcontroller
• MCP212X Device (MCP2120 or MCP2122)
• Optical Transceiver circuitry
• RS-232 circuitry/interface

The MCP2120/22 Developer’s Board power can come from either the USB connection or the power test points. The USB power is regulated to 3.3V, due to requirements from the PIC18F65J50. To allow the other circuitry to operate at higher voltages, the MCP2120/22 Developer’s Board has two power planes. One for the PIC18F65J50 circuitry and the other for the MCP2120/22/Optical Transceiver/RS-232 Driver circuitry. An LED is used to indicate when power is applied to the MCP2120/22/Optical Transceiver/RS-232 Driver circuitry. A jumper (JP2) is used to tie the two power planes together.

The Host Microcontroller (PIC18F65J50) can be used to drive the MCP2120/22 clock. That is what the default firmware does for both demo programs. This clock can be disconnected from the MCP2120/22, and a standard crystal can be used. The Host Controller can be programmed via the ICSP interface with user developed programs.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The PIC18F65J50 has a maximum operational voltage of 3.6V. If the MCP2120/22 Developer’s Board is powered by the VDD and GND Test Points, then care must be taken to ensure that the PIC18F65J50 is not over voltaged. The PIC18F65J50 can be isolated from the MCP2120/22’s power plane by removing the jumper shunt on jumpers JP1 and JP2.</td>
</tr>
</tbody>
</table>

The MCP2120/22DM has the MCP2122 device is mounted in a DIP socket. An SOIC footprint is supplied if testing with an SOIC device is desired.

The board supports up to four optical transceivers circuit implementations. Two implementations share the same general circuit layout. Only one optical transceiver circuit is installed at the time of manufacture. The others are for user implementation and evaluation. Jumpers are used to select the optical transceiver that is used by the system.

A MAX3238 compatible level-shifting IC with all the necessary hardware to support connection of a RS-232 host through the DB-9 connector. The port can be connected to a PC using a straight through cable. Refer to the MCP2122 Data Sheet (DS21894) or MCP2120 Data Sheet (DS21618) for more information on the Host Interface signals.
The MCP2120/22 Developer’s Board, as shown in Figure 1-1, has the following hardware features:

1. Mini USB connector (for powering the board).
2. Onboard +3.3V regulator for powering PIC18F65J50.
3. Hooks for an external regulated DC supply.
4. Jumper to isolate PIC18F65J50 power signal from the rest of board power. This allows the board to operate at voltages higher than 3.3V.
5. DB-9 connector and associated hardware for direct connection to MCP2120 or MCP2122 UART (DB-9 interface requires RS-232 signal levels).
6. Twelve-pin header connection to Host UART interface.
7. Four jumpers (3-pin) to select source of UART signals. Either DB-9 connector or the PIC18F65J50.
8. External Clock (from PIC18F65J50’s ECCP1 pin) Jumper.
9. Green power-on indicator LED.
10. Implemented IR transceiver circuit (two optional optical transceiver circuits implemented but not populated).
11. Reset switch for PIC18F65J50 device.
12. ICSP Header for PIC18F65J50.
14. PIC18F65J50 crystal.
15. MCP2120 crystal socket.
17. Jumper to select source of MCP2120 MODE signal.
18. MCP2120/22 SOIC and DIP Footprints (DIP package is the default installation).

Note: A schematic of the MCP2120/22 Developer’s Board is shown in Section A.2 “Board - Schematic”
FIGURE 1-1: MCP2120/22 DEVELOPER’S BOARD HARDWARE
1.3.1 Selecting Clock Source, Power Source, and Optical Transceiver Interface Jumper Descriptions

Figure 1-2 shows the jumpers used to control the clock source, the power source, and the optical transceiver used.

Jumper JP1 connects the generated clock signal from the PIC18F65J50’s ECCP1 pin to the MCP2120’s OSC2 pin. This allows the board not to need the MCP2120’s crystal circuitry.

Jumper JP2 connects the board’s two power planes. The MCP2120/22 Developer’s Board has a power plane for the PIC18F65J50 and related circuitry, and a second power plane for all other circuitry. Removing the jumper allows the MCP2120/22 portion to operate through the full voltage range of the MCP2120 (2.5V to 5.5V) or MCP2122 (1.8V to 5.5V). When JP2 is connected, then the maximum voltage is restricted to the maximum voltage of the PIC18F65J50 device (3.6V). See A.6 “Board - Power Layer” for the power plane layout.

Jumpers JP1C1 and JP2C1 are used to connect the default installed optical transceiver to the MCP2120/22’s RXPD and TXIR pins. There are footprints for two other optical transceiver implementations. If either of those implementations are installed, then the jumpers may be switched to the desired optical transceiver.

FIGURE 1-2: MCP2120/22 SELECTING SOURCES

This jumper isolates the PIC19’s VDD plane (see Section A.6 “Board - Power Layer”)

JP2

VDD planes are connected

This jumper isolates the PIC18 CCP pin (Clock) from the MCP2120/22 crystal circuit.

JP1

PIC18 CCP1 connected to MCP2122 16XCLK pin or MCP2020 OSC1 pin

MCP2120/22 can use crystal circuit (Y2)

These two jumpers select the optical transceiver logic. Both jumpers should connect the same pin positions.

JP1x1 and JP2x1

Optical Transceiver connected to MCP2120/22 IR Interface

Optical Transceiver Not connected to MCP2120/22 IR Interface
This jumper selects the source of the MCP2120/22’s MODE signal

**JMP7**

- **MODE signal driven from DB-9 interface**
- **MODE signal driven from PIC18’s RB1 pin**

This jumper selects the source of the MCP2120/22’s Reset signal

**JMP5**

- **MCP2120/22 RST signal driven from DB-9 interface**
- **MCP2120/22 RST signal driven from PIC18’s RB0 pin**
1.3.2 Host UART Interface Connection Jumper Descriptions

Figure 1-4 shows the five jumpers used to control the connection of the MCP2120/22’s Host UART signals.

FIGURE 1-4: MCP2120/22 HOST UART INTERFACE CONNECTION

These four jumpers connect the MCP2120/22’s Host UART Signals to either the PIC18F65J50 or the UART Driver device (U5)


MCP2120/22 Host UART Signals connected to PIC18F65J50

MCP2120/22 Host UART Signals connected to UART Driver (U5)
1.3.3 Firmware Program Jumper Descriptions for MCP2122

Figure 1-5 shows the MCP2122 JMP6 program setting for the MCP2120/22 board.

**FIGURE 1-5: MCP2122 JMP6 FIRMWARE OPERATION**

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600 Baud</td>
<td>Reserved</td>
</tr>
<tr>
<td>19200 Baud</td>
<td>Reserved</td>
</tr>
<tr>
<td>38400 Baud</td>
<td>Reserved</td>
</tr>
<tr>
<td>Reserved</td>
<td>PIC streams data from table</td>
</tr>
<tr>
<td>Reserved</td>
<td>PIC echos received Data</td>
</tr>
<tr>
<td>28800 Baud</td>
<td>Data Passes through PIC, UART1 Baud</td>
</tr>
<tr>
<td>57600 Baud</td>
<td>Data Passes through PIC, UART1 &amp; UART2 at</td>
</tr>
<tr>
<td>115200 Baud</td>
<td>same Baud Rate</td>
</tr>
<tr>
<td>N.A.</td>
<td>16XCLK Only</td>
</tr>
</tbody>
</table>

Jumper to specify operation of PIC18F65J50 firmware

![Diagram showing JMP6 jumper settings and their effects on baud rates and device behavior.]

Device: MCP2122

N.A.
1.3.4 Firmware Program Jumper Descriptions for MCP2120

Figure 1-5 shows the MCP2120 JMP6 program setting for the MCP2120/22 DM board.

**FIGURE 1-6: MCP2120 JMP6 FIRMWARE OPERATION**

**Jumper to specify operation of PIC18F65J50 firmware JMP6**

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>Program</th>
<th>Clock Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600 Baud</td>
<td>Reserved</td>
<td>Crystal (7.3728 MHz)</td>
</tr>
<tr>
<td>19200 Baud</td>
<td>Reserved</td>
<td>PIC</td>
</tr>
<tr>
<td>38400 Baud (Cryst. clock source only)</td>
<td>Reserved</td>
<td>PIC streams data from table</td>
</tr>
<tr>
<td>115200 Baud (Cryst. clock source only)</td>
<td>PIC echos received Data</td>
<td></td>
</tr>
<tr>
<td>28800 Baud</td>
<td>PIC echos received Data</td>
<td></td>
</tr>
<tr>
<td>57600 Baud</td>
<td>PIC echos received Data</td>
<td></td>
</tr>
<tr>
<td>115200 Baud (Cryst. clock source only)</td>
<td>PIC CLK pin turned off (use external crystal)</td>
<td></td>
</tr>
<tr>
<td>28800 Baud</td>
<td>PIC echos received Data</td>
<td></td>
</tr>
<tr>
<td>57600 Baud</td>
<td>PIC echos received Data</td>
<td></td>
</tr>
<tr>
<td>115200 Baud (Cryst. clock source only)</td>
<td>PIC CLK pin turned off (use external crystal)</td>
<td></td>
</tr>
</tbody>
</table>

**Device:** MCP2120
1.4 PC REQUIREMENTS

The PC used has four main requirements. These are:

1. Standard serial port
2. USB port (to power the MCP2120/22 Developer’s Board)
3. Terminal emulation program (such as HyperTerminal)
4. IrDA standard driver installed, which treats the IR port as a virtual serial port

A non-legacy-free Intel® compatible model with Windows Operating System (OS) would meet these requirements. The Windows® OS includes a terminal emulation program called Hyperterminal. Section D.1 “Configuring the Hyperterminal® Program” shows instructions to configure Hyperterminal and demonstrate the developer’s board.

1.4.1 The PC with IR Port

A PC with IR Port can be configured to operate as an encoder/decoder. This User’s Guide will not get into implementing this type of system due to the uniqueness of each PC’s drivers.

1.5 WHAT THE MCP2120/22 DEVELOPER’S BOARD KIT INCLUDES:

This MCP2120/22 Developer’s Board kit includes:

• MCP2120/22 Developer’s Board, 102-00239

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Kits no longer ship with CD-ROMs. Any other material is available for download from the Developments Boards product page. This material can include such items as:</td>
</tr>
<tr>
<td>• User’s Guide</td>
</tr>
<tr>
<td>• Firmware</td>
</tr>
<tr>
<td>• GUI programs</td>
</tr>
<tr>
<td>• Schematic Capture and PCB Layout files</td>
</tr>
</tbody>
</table>
Chapter 2. Installation and Operation

2.1 INTRODUCTION

To demonstrate the operation of the MCP2120/22 Developer’s Board, a second Encoder/Decoder board (MCP212XDM, MCP212XEV-DB plus PICDem Board, or the MCP2120 Developer’s Board from the MCP2120/50 Developer’s Kit (DM163008)) is required.

The MCP2120/22 Developer’s Board default firmware program can be used with either the MCP2122 (default device) or the MCP2120. The MCP2122 uses the PIC’s PWM pin to generate the 16XCLK signal. If the MCP2120 is used, the program will either source a 3.6864 MHz clock or the MCP2120 will use an external crystal (not installed). The program expects the crystal frequency to be 7.3728 MHz.

Although the MCP212XDM board supports many operational configurations, only a few will be described. The other modes are left for the customer to experiment with. The configurations described are:

- Demo #1 Operation - Direct IR / UART (DB-9) Mode
- Demo #2 Operation - Echo Character Received (Change Case)
- Demo #3 Operation - Data Stream Mode
- Demo #4 Operation - Pass Through Mode 1

The component layout floor plan of the MCP2120/22 Developer’s Board (MCP2120/22DM) PCB is shown in Figure 2-1 while Table 2-1 shows the hardware requirements to demonstrate the MCP2120/22 Developer’s Board.

### TABLE 2-1: DEMO SYSTEM HARDWARE REQUIREMENTS

<table>
<thead>
<tr>
<th>Qty</th>
<th>Hardware</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>PC with:</td>
<td>Each MCP2120/22 Developer’s Board is an encoder/decoder and can “talk” to the PC’s UART port. The PC’s USB port will power the MCP2120/22 Developer’s Board. Also: Each PC’s UART port will “talk” with the MCP2120/22’s UART interface. The PC will run two instances of HyperTerminal, one connected to each of the PC’s serial ports (UARTs).</td>
</tr>
<tr>
<td>a</td>
<td>One serial port to communicate to the MCP2120/22 Developer’s Board.</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>One USB port to power the MCP2120/22 Developer’s Board</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Serial Cable</td>
<td>To connect the PC serial ports to the MCP2120/22 Developer’s Board serial port.</td>
</tr>
<tr>
<td>2</td>
<td>USB Cable</td>
<td>To power the MCP2120/22 Developer’s Board from the PC’s USB port.</td>
</tr>
<tr>
<td>2</td>
<td>MCP2120/22 Developer’s Board</td>
<td>These are the units to program and test.</td>
</tr>
</tbody>
</table>

Note 1: Depending on the features of the PC, only one PC may be required. The PC would be required to have two Serial Ports (UARTs) and two USB ports (see Figure 2-1).

Note: To keep the board’s cost low, only a portion of the MCP2120/22 Developer’s Board is tested. This test covers the major portions of the system. The portions that are and are not tested are shown in Appendix C. “Board Testing”.

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2.2 THE DEMO SYSTEM

The demo system setup requires two encoder/decoders. This can be two MCP2120/22 Developer’s Boards or one MCP2120/22 Developer’s Board and another encoder/decoder device (such as an USB to IR port dongle with appropriate drivers).

The MCP2120/22 Developer’s Board can be powered by one of two sources:

- The USB sourced power
- The Power supply test points

For the demo descriptions, the board will be powered via USB. So a PC with an UART and USB port is required. The USB voltage is regulated to 3.3V, due to the PIC18 device’s voltage operating range. The PIC18 generates the clock for the MCP2120/22.

This developer’s board can be configured to pass data between the IR interface and the UART interface or to act as a stand alone embedded system.

There are four step by step descriptions for the MCP2120/22 Developer’s Board demos. These are:

- Demo #1 Operation - Direct IR / UART (DB-9) Mode
- Demo #2 Operation - Echo Character Received (Change Case)
- Demo #3 Operation - Data Stream Mode
- Demo #4 Operation - Pass Through Mode 1

2.2.1 The PIC18F65J50 Firmware

The PIC18F65J50 firmware program operation is determined by the state of the JMP6 header. See Figure 1-5 and Figure 1-6 for selecting the different programs. Also the signal routing jumper headers need to be properly configured to ensure that the signals to/from the sources/destinations are proper for the selected firmware operation.

The firmware may also generate a clock source which will be used by the MCP2122 and can be used by the MCP2120.

Table 2-2 shows the state of the MODE7, MODE3 and MODE2:0 signals which are used to create the clock source for the MCP2120/22 device.

Table 2-3 shows the state of the MODE7, MODE3 and MODE6:4 signals which are used to specify the program that will be executed.

If the device is the MCP2120, then three output signals will control the state of the MCP2120’s BAUD2:0 pins to control the MCP2120’s baud rate.

All the other I/O pins will either be left as an input so not to conflict with other signals, or will be configured as an output and driven high or low.

Note: The connectivity of these PIC18F65J50 signals to the MCP2120/22 is dependant on the configuration of the Jumpers JP1 and JMP1 through JMP5.
## TABLE 2-2: MCP2122 AND MCP2120 BAUD RATE SELECTION

<table>
<thead>
<tr>
<th>MODE</th>
<th>PWM Frequency</th>
<th>MCP2122 Baud</th>
<th>MCP2120 Baud</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 3 2:0</td>
<td>1 1 1</td>
<td>1,843,200</td>
<td>115,200</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>1 1 0</td>
<td>921,600</td>
<td>57,600</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>1 0 1</td>
<td>460,800</td>
<td>28,800</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>1 0 0</td>
<td>—</td>
<td>—</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>0 1 1</td>
<td>—</td>
<td>—</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>0 1 0</td>
<td>614,400</td>
<td>38,400</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>0 0 1</td>
<td>307,200</td>
<td>19,200</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
<tr>
<td>7 3 2:0</td>
<td>0 0 0</td>
<td>153,600</td>
<td>9,600</td>
<td>Note 1 Designed for use with MCP2122 only</td>
</tr>
</tbody>
</table>

- **Note 1:** Baud rate would be dependant on the state of the MCP2120's BAUD2:0 pins.
- **Note 2:** A 7.3728 MHz external crystal must be used.
- **Note 3:** This exceeds the device's maximum specification.
- **Note 4:** The MCP2122 16XCLK signal is static.
TABLE 2-3: MCP212XDM FIRMWARE PROGRAM SELECTION

<table>
<thead>
<tr>
<th>MODE</th>
<th>Program</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 1</td>
<td>Generate Clock only (determined by RD0:RD2)</td>
<td>MCP2122 uses PIC 16XCLK</td>
</tr>
<tr>
<td>0 0 0</td>
<td>No Clock Generation</td>
<td>MCP2120 uses Crystal</td>
</tr>
<tr>
<td>1 1 1</td>
<td>Generate Clock only (determined by RD0:RD2)</td>
<td>MCP2122 uses PIC 16XCLK</td>
</tr>
<tr>
<td>1 0 0</td>
<td>Generate Clock only (@ 3.6864 MHz)</td>
<td>MCP212x uses PIC Clock</td>
</tr>
<tr>
<td>1 1 0</td>
<td>Pass Data Through (UART1 &lt;-&gt; UART2)</td>
<td></td>
</tr>
<tr>
<td>1 0 1</td>
<td>Pass Data Through (UART1 --&gt; UART2) with UART2 fixed at 115,200 Baud</td>
<td></td>
</tr>
<tr>
<td>1 0 0</td>
<td>Echo Data Received and change case (A --&gt; a, a --&gt; A)</td>
<td></td>
</tr>
<tr>
<td>0 1 1</td>
<td>Stream a Data Table</td>
<td>See Appendix E.</td>
</tr>
<tr>
<td>0 1 0</td>
<td>RESERVED</td>
<td></td>
</tr>
<tr>
<td>0 0 1</td>
<td>RESERVED</td>
<td></td>
</tr>
<tr>
<td>0 0 0</td>
<td>RESERVED</td>
<td></td>
</tr>
</tbody>
</table>

Legend: X = Undefined (either "1" or "0").

2.2.1.1 FIRMWARE OPERATION - Generate Clock only (determined by RD0:RD2)

The PIC firmware reads the state of the RD7 and RD3 signals. If the signals indicate that the device is the MCP2120 and to use the PIC as the clock source, then the PIC will source a frequency that is determined by the RD2:0 signals.

The PIC firmware reads the state of the RD3 signal to determine if the encoder/decoder device is an MCP2120 or MCP2122.

If the device is the MCP2120, then the PWM output frequency is set to 3.6864 MHz and the PIC drives the MCP2120’s BAUD2:0 signals with the selected baud rate from the state of the RD2:0 signals.

If the device is the MCP2122, then the PWM output frequency is determined from the state of the RD2:0 signals.

This mode requires that the MCP2122’s TX and RX signals are directly connected to the MAX3238 compatible device.

2.2.1.2 FIRMWARE OPERATION - Generate Clock only (@ 3.6864 MHz)

The PIC firmware reads the state of the RD7 and RD3 signals. If the signals indicate that the device is the MCP2120 and to use the PIC as the clock source, then the PIC will source a 3.6864 MHz clock to be used by the MCP2120 device. The PIC will drive the MCP2120’s BAUD2:0 signals with the selected baud rate from the state of the RD2:0 signals.

Although the clock could drive the MCP2122’s 16XCLK pin, the frequency is higher than the maximum specification.

This mode requires that the MCP2120’s TX and RX signals are directly connected to the MAX3238 compatible device.
2.2.1.3 FIRMWARE OPERATION - No Clock Generation

The PIC firmware reads the state of the RD7 and RD3 signals. If the signals indicate that the device is the MCP2120 and to use a crystal as the clock source, then the PIC will control the state of the MCP2120’s MODE2:0 pins based on the state of the RD2:0 signals.

This mode requires that the MCP2122’s TX and RX signals are directly connected to the MAX3238 compatible device.

2.2.1.4 FIRMWARE OPERATION - Echo Data Received and Change Case

This mode has the character that is received on UART1 (RX) be converted to the opposite case and transmitted back on UART1 (TX).

2.2.1.5 FIRMWARE OPERATION - Stream a Data Table

In this mode, the PIC waits for a character to be received, and then continuously streams a data table.

2.2.1.6 FIRMWARE OPERATION - Pass Data Through (UART1 <---> UART2)

In this mode, both the PIC’s UARTs are used. UART1 communicates with the MCP2120/22 device and UART2 communicates with the DB-9 connector (through the SP3238 device). Data received on RX1 (UART1) is transmitted on TX2 (UART2). Data received on RX2 (UART2) is transmitted on TX1 (UART1). This allows the PIC to monitor all data that is sent across the link. Both UART1 and UART2 operate at the selected baud rate.

2.2.1.7 FIRMWARE OPERATION - Pass Data Through (UART1 --> UART2) with UART2 fixed at 115,200 Baud

This mode is almost identical to the mode described in Section 2.2.1.6 “Firmware Operation - Pass Data Through (UART1 <---> UART2)”, except that UART2 operates at a fixed 115,200 baud.

So in this mode, both the PIC24’s UARTs are used. UART1 communicates with the MCP2120/22 device and UART2 communicates with the DB-9 connector (through the SP3238 device). Data received on RX1 (UART1) is transmitted on TX2 (UART2). Data received on RX2 (UART2) is transmitted on TX1 (UART1). This allows the PIC24 to monitor all data that is sent across the link. UART1 operate at the selected baud rate and UART2 operates at a fixed 115,200 baud.
2.3 MCP212XDM DEMOS

A description of the demos, including step-by-step instructions are shown in this section.

2.3.1 Demo #1 Operation - Direct IR / UART (DB-9) Mode

In Demo #1, the MCP2120/22 Developer’s Board #2 will take any data that is received from the IR interface and send it directly out the UART interface to the PC’s serial port. Any data that is received from the UART interface will be directly sent out the IR interface.

This shows the MCP2120/22 encoding and decoding data between the IR port and the Host UART port. In this configuration the MCP2120/22 Developer’s Board can be used as a IR to UART dongle.

Figure 2-1 shows the system setup for this test, while Figure 2-2 shows the jumper configuration for both of the MCP2120/22 Developer’s Boards. Lastly, Table 2-4 shows the steps for Demo #1 operation.

FIGURE 2-1: DEMO #1 SYSTEM BLOCK DIAGRAM

HyperTerminal to Serial Port Settings

The com port settings should be configured as:

- 115200 Baud
- 8-bits
- No Parity
- One Stop
- No Flow Control

Note 1: The PC may be a Notebook with an Integrated IR port.

2: Serial cable. Connects MCP212XDM to PC.

3: USB cable (for power only).
FIGURE 2-2: DEMO #1 CONFIGURATION - DIRECT TO UART (DB-9) MODE

Note: This is the board configuration shipped to customers.
**TABLE 2-4: DEMO #1 STEPS - DIRECT TO UART (DB-9)**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place the two MCP2120/22 Developer’s Boards on a flat surface about 25 cm (10 inches) apart, and with the IR ports facing each other.</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> Ensure that the jumpers are configured as in Figure 2-2.</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> Apply power to each unit via the USB connector.</td>
<td>On the MCP2120/22 Developer’s Boards: The green power LED (D1) will turn on.</td>
</tr>
<tr>
<td>4</td>
<td>Connect PC’s Serial Ports to the DB-9 connector of each MCP2120/22 Developer’s Board.</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td><strong>On the PC:</strong> Open an instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 1) to connect to the MCP2120/22 Developer’s Board #1. Ensure that the window indicates that the HyperTerminal program is connected and properly configured.</td>
<td>On the MCP2120/22 Developer’s Board: — On the PC: The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> See D.1 “Configuring the HyperTerminal® Program”</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><strong>On the PC:</strong> Open a second instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 2) to connect to the MCP2120/22 Developer’s Board #2. Ensure that the window indicates that the HyperTerminal program is connected and properly configured.</td>
<td>On the MCP2120/22 Developer’s Board: — On the PC: The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> See D.1 “Configuring the HyperTerminal® Program”</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><strong>On the PC:</strong> In one of the HyperTerminal program windows (COM 1), type some characters.</td>
<td>On the PC: In the other HyperTerminal program windows (COM 2), those characters appear.</td>
</tr>
<tr>
<td>8</td>
<td><strong>On the PC:</strong> In the other HyperTerminal program windows (COM 2), type some characters.</td>
<td>On the PC: In the other HyperTerminal program windows (COM 1), those characters appear.</td>
</tr>
<tr>
<td>9</td>
<td><strong>On the PC:</strong> In either HyperTerminal program windows, select the Transfer pull-down menu and then the Send Text File ... option. Navigate to the folder that contains the Transmit File.Txt file and select it. Then click Open.</td>
<td>On the PC: In the selected HyperTerminal program window, the displayed data is transmitted and is received and displayed by the other HyperTerminal program window.</td>
</tr>
<tr>
<td>10</td>
<td><strong>On the PC:</strong> Make this file transfer transmitting from the other HyperTerminal program window.</td>
<td>On the PC: In the selected HyperTerminal program window, the displayed data is transmitted, being received and displayed by the other HyperTerminal program window.</td>
</tr>
<tr>
<td>11</td>
<td>Continue steps 7, 8, 9, or 10 for as long as desired.</td>
<td>—</td>
</tr>
</tbody>
</table>
2.3.2 Demo #2 Operation - Echo Character Received (Change Case)

In Demo #2, the MCP2120/22 Developer’s Board #2 will echo the alpha character received on the IR interface after changing its case ("a" → "A" and "A" → "a"). This demo shows the MCP212X device in an embedded application.

Figure 2-3 shows the system setup for this test, while Figure 2-4 shows the jumper configuration for the MCP2120/22 board. Lastly, Table 2-5 shows the steps for Demo #2 operation.

**FIGURE 2-3: DEMO #2 SYSTEM BLOCK DIAGRAM**

Hyperterminal Program Window A (Com 1) (1)

Monitor

PC

System #1 (1) MCP2120/22 Developer’s Board

System #2 MCP2120/22 Developer’s Board

Com 1 (2)

Serial cable. Connects MCP2120/22DM to PC.

Note 1: The PC may be a Notebook with an Integrated IR port.

Note 2: USB cable (for power only).

**Hyperterminal to Serial Port Settings**

The com port settings should be configured as:

- 115200 Baud
- 8-bits
- No Parity
- One Stop
- No Flow Control
These jumpers can be in this configuration or removed.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place the two MCP2120/22 Developer’s Boards on a flat surface about 25 cm (10 inches) apart, and with the IR ports facing each other.</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td><strong>On the MCP2120/22 Developer’s Board #1:</strong> Ensure that the jumpers are configured as in Figure 2-2.</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td><strong>On the MCP2120/22 Developer’s Board #2:</strong> Ensure that the jumpers are configured as in Figure 2-4. Jumpers shown in green are not required and can be left open.</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> Apply power to each unit via the USB connector. <strong>On the MCP2120/22 Developer’s Boards:</strong> The green power LED (D1) will turn on.</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>Connect PC’s Serial Ports to the DB-9 connector of each MCP2120/22 Developer’s Board.</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td><strong>On the PC:</strong> Open an instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 1) to connect to the MCP2120/22 Developer’s Board #1. Ensure that the window indicates that the HyperTerminal program is connected and properly configured. <strong>Note:</strong> See D.1 “Configuring the Hyperterminal® Program” <strong>On the PC:</strong> The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td><strong>On the PC:</strong> In the HyperTerminal program window (COM 1), type some alpha characters, such as &quot;kLwtGh&quot;. <strong>On the PC:</strong> The HyperTerminal program window will display each character and its switched case version. So &quot;kLwtGh&quot; will show &quot;kKLlwWtTGghH&quot;</td>
<td>—</td>
</tr>
<tr>
<td>8</td>
<td>Continue typing any alpha characters (upper or lower case) The alpha character typed and its opposite case will be displayed (such as &quot;aA&quot;, “Aa”, “Bb”,...)</td>
<td>—</td>
</tr>
</tbody>
</table>
2.3.3 Demo #3 Operation - Data Stream Mode

In Demo #3, once the MCP2120/22 Developer’s Board #2 receives a data byte from the IR interface, the PIC will stream a continuously repeated table (Figure E-1:) through the IR port.

This demo shows the MCP212X device in an embedded application.

Figure 2-5 shows the system setup for this test, while Figure 2-6 shows the jumper configuration for the MCP2120/22 board. Lastly, Table 2-6 shows the steps for Demo #3 operation.

**FIGURE 2-5: DEMO #3 SYSTEM BLOCK DIAGRAM**(1)

**Hyperterminal to Serial Port Settings**

The com port settings should be configured as:

- 115200 Baud
- 8-bits
- No Parity
- One Stop
- No Flow Control

**Note 1:** The PC may be a Notebook with an Integrated IR port.

2: Serial cable. Connects MCP2120/22DM to PC.

3: USB cable (for power only).
These jumpers can be in this configuration or removed.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place the two MCP2120/22 Developer’s Boards on a flat surface about 25 cm (10 inches) apart, and with the IR ports facing each other.</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td><strong>On the MCP2120/22 Developer’s Board #1:</strong> Ensure that the jumpers are configured as in Figure 2-2.</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td><strong>On the MCP2120/22 Developer’s Board #2:</strong> Ensure that the jumpers are configured as in Figure 2-6. Jumpers shown in green are not required and can be left open.</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> Apply power to each unit via the USB connector.</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> The green power LED (D1) will turn on.</td>
</tr>
<tr>
<td>5</td>
<td>Connect the PC’s Serial Ports to the DB-9 connector of each MCP2120/22 Developer’s Board.</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td><strong>On the PC:</strong> Open an instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 1) to connect to the MCP2120/22 Developer’s Board #1. Ensure that the window indicates that the HyperTerminal program is connected and properly configured.</td>
<td><strong>On the MCP2120/22 Developer’s Board:</strong> —</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> See D.1 “Configuring the Hyperterminal® Program”</td>
<td><strong>On the PC:</strong> The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
</tr>
<tr>
<td>7</td>
<td><strong>On the PC:</strong> In the HyperTerminal program window (COM 1), type any character.</td>
<td><strong>On the PC:</strong> The HyperTerminal program window will display a continuos data table stream. The Data Table is shown in Figure E-1.</td>
</tr>
</tbody>
</table>
2.3.4 Demo #4 Operation - Pass Through Mode

In Demo #4, the MCP2120/22 Developer’s Board #2 will take any data that is received from the IR interface and send it out the UART interface (after passing through the PIC) to the PC’s serial port. Any data that is received from the UART interface will be sent out the IR interface (after passing through the PIC).

This shows the MCP2120/22 encoding and decoding data between the IR port and the Host UART port. In this configuration the MCP2120/22 Developer’s Board can be used as an IR to UART dongle.

Figure 2-7 shows the system setup for this test, while Figure 2-8 shows the jumper configuration for the MCP2120/22 Developer’s Board. Lastly, Table 2-7 shows the steps for Demo #4 operation.

**FIGURE 2-7: DEMO #4 SYSTEM BLOCK DIAGRAM**

**Note 1:** The PC may be a Notebook with an Integrated IR port.

2: Serial cable. Connects MCP2120/22DM to PC.

3: USB cable (for power only).

**Hyperterminal to Serial Port Settings**

The com port settings should be configured as:

- 115200 Baud
- 8-bits
- No Parity
- One Stop
- No Flow Control
FIGURE 2-8: DEMO #4 CONFIGURATION - PASS THROUGH MODE

Data Flow
- IR Transceivers
- PIC18F65J50
- DB-9 Connector
- TX1, RX1, TX2, RX2
- Data Flow

MCP212X Developer’s Board
### TABLE 2-7: DEMO #4 STEPS - PASS THROUGH

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place the two MCP2120/22 Developer’s Boards on a flat surface about 25 cm (10 inches) apart, and with the IR ports facing each other.</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td><strong>On the MCP2120/22 Developer’s Board #1:</strong> Ensure that the jumpers are configured as in Figure 2-2.</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td><strong>On the MCP2120/22 Developer’s Board #2:</strong> Ensure that the jumpers are configured as in Figure 2-8.</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td><strong>On the MCP2120/22 Developer’s Boards:</strong> Apply power to each unit via the USB connector.</td>
<td>On the MCP2120/22 Developer’s Boards: The green power LED (D1) will turn on.</td>
</tr>
<tr>
<td>5</td>
<td>Connect the PC’s Serial Ports to the DB-9 connector of each MCP2120/22 Developer’s Board.</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td><strong>On the PC:</strong> Open an instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 1) to connect to the MCP2120/22 Developer’s Board. Ensure that the window indicates that the HyperTerminal program is connected and properly configured.</td>
<td>On the MCP2120/22 Developer's Board: — On the PC: The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
</tr>
<tr>
<td>7</td>
<td><strong>On the PC:</strong> Open a second instance of HyperTerminal program window attached to the PC’s Serial Port (such as COM 2) to connect to the MCP2120/22 Developer’s Board. Ensure that the window indicates that the HyperTerminal program is connected and properly configured.</td>
<td>On the MCP2120/22 Developer’s Board: — On the PC: The HyperTerminal window will indicate “connected” and the selected Baud rate settings.</td>
</tr>
<tr>
<td>8</td>
<td><strong>On the PC:</strong> In one of the HyperTerminal program windows (COM 1), type some characters.</td>
<td>On the PC: In the other HyperTerminal program windows (COM 2), those characters appear.</td>
</tr>
<tr>
<td>9</td>
<td><strong>On the PC:</strong> In the other HyperTerminal program windows (COM 2), type some characters.</td>
<td>On the PC: In the other HyperTerminal program windows (COM 1), those characters appear.</td>
</tr>
<tr>
<td>10</td>
<td><strong>On the PC:</strong> In either HyperTerminal program windows, select the Transfer pull-down menu and then the Send Text File... option. Navigate to the folder that contains the Transmit File.Txt file and select it. Then click Open.</td>
<td>On the PC: In the selected HyperTerminal program window, the displayed data is transmitted and is received and displayed by the other HyperTerminal program window.</td>
</tr>
<tr>
<td>11</td>
<td><strong>On the PC:</strong> Make this file transfer transmitting from the other HyperTerminal program window.</td>
<td>On the PC: In the selected HyperTerminal program window, the displayed data is transmitted, being received and displayed by the other HyperTerminal program window.</td>
</tr>
<tr>
<td>12</td>
<td>Continue steps 8, 9, 10, or 11 for as long as desired.</td>
<td>—</td>
</tr>
</tbody>
</table>
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP2120/22 Developer’s Board:
- Board - Schematic
- Board - Top Silk and Pads
- Board - Top layer plus Silk and Pads
- Board - Bottom Layer
- Board - VDD Layer
- Board - Ground Layer

The layer order is shown in Figure A-1.

FIGURE A-1: LAYER ORDER

[Diagram showing the layer order: Top Layer, Ground Layer, Power Layer, Bottom Layer]
A.3 BOARD - TOP SILK AND PADS

MCP212X Developer’s Board

Diagram of the board with components labeled.
A.7 BOARD - GROUND LAYER
Appendix B. Bill Of Materials (BOM)

### 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 the Bill Of Materials may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

The MCP2120/22 Developer’s Board allows the MCP2120/22 device to be evaluated. The board supports customers in the evaluation of three additional optical transceiver devices. This is done with component layout of these additional optical transceiver circuits. The customer would be required to install the desired circuit for testing.

Table B-1 shows the components that are installed in the MCP2120/22 Developer’s Board PCB, while Table B-2 shows the components that are NOT installed on the MCP2120/22 Developer’s Board PCB.

#### TABLE B-1: BILL OF MATERIALS (BOM)

<table>
<thead>
<tr>
<th>Qty</th>
<th>Reference</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C1, C2</td>
<td>CAP 1.0UF 16V CERAMIC X7R 0805</td>
<td>Kemet® Electronics Corp.</td>
<td>C0805C105K4RACTU</td>
</tr>
<tr>
<td>9</td>
<td>C3, C11, C13, C16, C17, C18, C19, C20, C21</td>
<td>CAP .1UF 25V CERAMIC X7R 0805</td>
<td>Panasonic® - ECG</td>
<td>ECJ-2VB1E104K</td>
</tr>
<tr>
<td>2</td>
<td>C8, C9</td>
<td>CAP CERAMIC 22PF 50V NP0 0805</td>
<td>Kemet Electronics Corp.</td>
<td>C0805C220J5GACTU</td>
</tr>
<tr>
<td>2</td>
<td>C10, C12</td>
<td>CAPACITOR 4.7UF/10V TEH SER SMD</td>
<td>Panasonic - ECG</td>
<td>ECS-H1AX475R</td>
</tr>
<tr>
<td>1</td>
<td>C22</td>
<td>CAP 4.7UF 16V CERAMIC F 0805</td>
<td>Panasonic - ECG</td>
<td>ECJ-2FF1C475Z</td>
</tr>
<tr>
<td>1</td>
<td>D1</td>
<td>LED GREEN CLEAR 0805 SMD</td>
<td>LITE-ON® Semiconductor Corp.</td>
<td>LTST-C170KGKT</td>
</tr>
<tr>
<td>1</td>
<td>HD1</td>
<td>CONN HEADER .100 SINGL STR 12POS</td>
<td>Sullins Connector Solutions</td>
<td>PEC12SAAN</td>
</tr>
<tr>
<td>1</td>
<td>J1</td>
<td>CONN RECEPT MINI USB2.0 5POS</td>
<td>Hirose Electronic Co. Ltd</td>
<td>UX60-MB-5ST</td>
</tr>
<tr>
<td>1</td>
<td>J2</td>
<td>CONN HEADER .100 SINGL STR 6POS (Note 2)</td>
<td>Sullins Connector Solutions</td>
<td>PEC36SBAN</td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>CONN D-SUB RCPT R/A 9POS PCB AU</td>
<td>Amphenol Commercial Products</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>JMP1, JMP2, JMP3, JMP4, JMP5, JMP7</td>
<td>CONN HEADER 3POS .100* STR TIN</td>
<td>Molex®/Waldom® Electronics Corp</td>
<td>90120-0123</td>
</tr>
</tbody>
</table>

**Note 1:** The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

**Note 2:** This connector can be made by cutting a single .100 Single R/A 36POS into six pieces.
<table>
<thead>
<tr>
<th>Qty</th>
<th>Reference</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>JMP6</td>
<td>CONN HEADER 2x8 (16 POS) .100&quot; VERT GOLD</td>
<td>Molex®/Waldom® Electronics Corp</td>
<td>10-89-1161</td>
</tr>
<tr>
<td>4</td>
<td>JP1, JP2,</td>
<td>CONN HEADER 2POS .100 VERT TIN</td>
<td>Molex/Waldom Electronics Corp</td>
<td>22-03-2021</td>
</tr>
<tr>
<td></td>
<td>JP1C1, JP2C1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>L1</td>
<td>INDUCTOR POWER 10UH 1008</td>
<td>TDK® Corporation</td>
<td>NLV25T-100J-PF</td>
</tr>
<tr>
<td>1</td>
<td>PCB</td>
<td>RoHS Compliant Bare PCB, MCP2120/22 Developer’s Board</td>
<td>—</td>
<td>104-00239</td>
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<tr>
<td>1</td>
<td>Q1</td>
<td>300mA CMOS LDO</td>
<td>Microchip Technology Inc.</td>
<td>TC1108-3.3VDB</td>
</tr>
<tr>
<td>10</td>
<td>R2, R12, R13, R14, R15, R16, R17, R18, R19, R22</td>
<td>RES 10K OHM 1/8W 5% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6GEYJ103V</td>
</tr>
<tr>
<td>7</td>
<td>R20, R21, R23, R24, R25, R26, R27</td>
<td>RES 10K OHM 1/10W 5% 0603 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-3GEYJ103V</td>
</tr>
<tr>
<td>1</td>
<td>R6</td>
<td>RES 0.0 OHM 1/8W 5% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6GEY0R00V</td>
</tr>
<tr>
<td>1</td>
<td>R8</td>
<td>RES 47 OHM 1/8W 5% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6GEYJ470V</td>
</tr>
<tr>
<td>1</td>
<td>R10</td>
<td>RES 470 OHM 1/8W 5% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6GEYJ471V</td>
</tr>
<tr>
<td>1</td>
<td>S1</td>
<td>SWITCH LT TOUCH 6X3.5 100GF SMD</td>
<td>Panasonic - ECG</td>
<td>EVQ-PE104K</td>
</tr>
<tr>
<td>1</td>
<td>U2</td>
<td>64/80-Pin High-Performance, 1-Mbit Flash USB Microcontrollers</td>
<td>Microchip Technology Inc.</td>
<td>PIC18F86J50-I/PT</td>
</tr>
<tr>
<td>1</td>
<td>U4</td>
<td>Infrared Transceivers SIR 115.2 kbits/s</td>
<td>Viaish Semiconductors</td>
<td>TFDU4300-TR3</td>
</tr>
<tr>
<td>1</td>
<td>U5</td>
<td>Intelligent +3.0V to +5.5V RS-232 Transceiver</td>
<td>SIPEX</td>
<td>SP3238EEY-L</td>
</tr>
<tr>
<td>1</td>
<td>U6</td>
<td>IC SOCKET 14PIN MS TIN/TIN .300</td>
<td>Mill-Max Manufacturing Corp.</td>
<td>110-99-314-41-001000</td>
</tr>
<tr>
<td>1</td>
<td>U7</td>
<td>TRANS BRT NPN 100MA 50V SC59</td>
<td>ON Semiconductor</td>
<td>MUN2211T1G</td>
</tr>
<tr>
<td>1</td>
<td>U9</td>
<td>IC SOCKET 8PIN MS TIN/TIN .300</td>
<td>Mill-Max Manufacturing Corp.</td>
<td>110-99-308-41-001000</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>MCP2122 Infrared Encoder / Decoder</td>
<td>Microchip Technology Inc.</td>
<td>MCP2122-E/P</td>
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<tr>
<td>2</td>
<td>VDD, GND</td>
<td>TEST POINT PC COMPACT SMT</td>
<td>Keystone® Electronics</td>
<td>5016</td>
</tr>
<tr>
<td>1</td>
<td>Y1</td>
<td>CRYSTAL 14.7456 MHZ 20PF SMD</td>
<td>CTS-Frequency Controls</td>
<td>ECS-147.4-20-5P-TR</td>
</tr>
<tr>
<td>2</td>
<td>Y2</td>
<td>PIN RECPT .015/.025 DIA 0667 SER (Populate Y2 Location)</td>
<td>Mill-Max Manufacturing Corp.</td>
<td>0667-0-15-01-30-27-10-0</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Bottom side on Each Corner</td>
<td>JAMECO® VALUEPRO</td>
<td>2012JH-R</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Shunts for JP1, JP2, JP1C1, JP2C1, JMP1-JMP5, JMP7, and JMP6</td>
<td>JAMECO® VALUEPRO</td>
<td>2012JH-R</td>
</tr>
<tr>
<td>4</td>
<td>Feet</td>
<td>BUMPON HEMISPHERE .44X.20 BLACK</td>
<td>3M</td>
<td>SJ-5003 (BLACK)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.100&quot; Shorting Block with Handle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

**Note 2:** This connector can be made by cutting a single .100 Single R/A 36POS into six pieces.
### TABLE B-2: TABLE OF CONTENTS (BOM) – PCB COMPONENTS NOT INSTALLED

<table>
<thead>
<tr>
<th>Qty</th>
<th>Reference</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>C4</td>
<td>CAP .47UF 16V CERAMIC X7R 080</td>
<td>Panasonic - ECG</td>
<td>ECJ-2YB1C474K</td>
</tr>
<tr>
<td>0</td>
<td>C5</td>
<td>AP TANTALUM 6.8UF 16V 20% SMD</td>
<td>Nichicon® Corporation</td>
<td>F931C685MAA</td>
</tr>
<tr>
<td>0</td>
<td>C6</td>
<td>CAP 4.7UF 16V CERAMIC F 0805</td>
<td>Panasonic - ECG</td>
<td>ECJ-2FF1C475Z</td>
</tr>
<tr>
<td>0</td>
<td>C7</td>
<td>CAP .1UF 25V CERAMIC X7R 0805</td>
<td>Panasonic - ECG</td>
<td>ECJ-2VB1C104K</td>
</tr>
<tr>
<td>0</td>
<td>C14, C15</td>
<td>CAP CERAMIC 22PF 50V NP0 0805</td>
<td>Kemet® Electronics Corp.</td>
<td>C0805C220JS5GACTU</td>
</tr>
<tr>
<td>0</td>
<td>JP1A1, JP1B1, JP2A1, JP2B1</td>
<td>CONN HEADER 2POS .100 VERT TIN</td>
<td>Molex/Waldom Electronics Corp.</td>
<td>22-03-2021</td>
</tr>
<tr>
<td>0</td>
<td>HD1</td>
<td>CONN HEADER 12POS .100 VERT TIN</td>
<td>Molex/Waldom Electronics Corp.</td>
<td>22-28-4120</td>
</tr>
<tr>
<td>0</td>
<td>JMP6</td>
<td>CONN HEADER 16POS .100 VERT GOLD</td>
<td>Molex/Waldom Electronics Corp.</td>
<td>10-89-1161</td>
</tr>
<tr>
<td>0</td>
<td>R1</td>
<td>RES 2.2 OHM 1/8W 1% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6RQF2R2V</td>
</tr>
<tr>
<td>0</td>
<td>R3, R4, R5</td>
<td>RES 0.0 OHM 1/8W 5% 0805 SMD</td>
<td>Panasonic - ECG</td>
<td>ERJ-6GEY0R00V</td>
</tr>
<tr>
<td>0</td>
<td>U1</td>
<td>IRDA MODULE 115.2KBPS 6-SMD</td>
<td>LITE-ON Semiconductor Corp.</td>
<td>HSDL-3000#007</td>
</tr>
<tr>
<td>0</td>
<td>U3</td>
<td>Infrared Transceivers SIR 115.2 kbits/s</td>
<td>Vishay®</td>
<td>TFDU4101-TR3</td>
</tr>
<tr>
<td>0</td>
<td>U7</td>
<td>IC SOCKET 18PIN MS TIN/TIN .300</td>
<td>Mill-Max Manufacturing Corp.</td>
<td>110-99-318-41-00100</td>
</tr>
<tr>
<td>0</td>
<td>U8</td>
<td>MCP2120 in SOIC</td>
<td>Microchip Technology Inc.</td>
<td>MCP2120-I/SL</td>
</tr>
<tr>
<td>0</td>
<td>U10</td>
<td>MCP2122 in SOIC</td>
<td>Microchip Technology Inc.</td>
<td>MCP2122-I/SL</td>
</tr>
<tr>
<td>0</td>
<td>Y2</td>
<td>CRystal 3.6864 MHZ 20PF 49US</td>
<td>ECS Inc.</td>
<td>ECS-36-20-4DN</td>
</tr>
</tbody>
</table>

**Note 1:** The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.
Appendix C. Board Testing

C.1 WHAT IS TESTED

The MCP2120/22 Developer’s Board can be used in multiple configurations. Only a subset of these configurations will be tested. The following portions of the board are tested:

- **MCP2122**
- TFDU-4300 (U5) and circuitry (JP1C1, JP2C1)
- USB Power circuitry
- DB-9 Interface and circuitry
- ICSP Header (J2)
- Y1 circuitry (14.7456MHz)
- JP1 and JP2 shorted
- JMP1 (P1 – P2, P2 – P3)
- JMP2 (P1 – P2, P2 – P3)
- JMP3 (P1 – P2, P2 – P3)
- JMP4 (P1 – P2, P2 – P3)
- JMP5 (P1 – P2)
- JMP7 (P2 – P3)
- JMP6 (RD4, RD5, RD6)

C.2 WHAT IS NOT TESTED

The following portions, but not limited to, of the board are NOT tested:

- **MCP2120** and associated crystal circuitry (7.3728 MHz)
- TFDU-4101 (U3) and circuitry
- HSDL-3000 (U1) and circuitry
- Header HD1
- JP1 and JP2 open
- JMP6 (RD0, RD0, RD2, RD3, RD7)
- JMP5 (P2 – P3)
- JMP7 (P1 – P2)
- USB Data Lines
- Switch S1
Appendix D. Configuring the HyperTerminal® Program

D.1 CONFIGURING THE HyperTerminal® PROGRAM

To ensure that the PC is able to communicate to the PICDEM™ HPC Explorer Demo Board, the HyperTerminal program must be properly configured. This section describes the configuration that the HyperTerminal program should be in.

The screenshots shown in Figure D-1 through Figure D-6 show the settings of the HyperTerminal program in the Windows® operating system.

You should save each configuration of the HyperTerminal program in order to easily distinguish which HyperTerminal program window is “talking” with which PICDEM™ HPC Explorer Board.

After opening the HyperTerminal program window, select Call -> Disconnect. In the lower-left corner, the HyperTerminal program window will indicate “Disconnected”. Next, in the HyperTerminal program window, select File -> Properties. The window in Figure D-2 is shown. Ensure that the appropriate COM port is selected for both the “Golden” unit and the “Testing” unit. Then select the Configure button.

FIGURE D-1: HyperTerminal® PROGRAM MAIN WINDOW
This will open up the Port Settings window. The port settings should be configured as shown in Figure D-3 with the “Bits per second” selected with 115200. After configuring the port settings, select OK. The Figure D-2 window will be shown. Select the Settings tab.
The window will now look as shown in Figure D-4. Ensure that your settings match the settings shown. Select the **ASCII Setup** button. This will open the ASCII Setup window (Figure D-5).

**FIGURE D-4: HyperTerminal® PROGRAM PROPERTIES SETTINGS WINDOW**

Ensure that your settings match the settings shown. Select the **OK** button. The window in Figure D-4 will again be shown. Select the **Input Translation** button. This will open the Translation Button window (Figure D-6). Click **OK** and close each window. After these “property” windows are closed, you may wish to save each configuration with a name that you can remember (one for COM1 and the other for COM2).

**FIGURE D-5: HyperTerminal® PROGRAM ASCII SETUP WINDOW**
Appendix E. Continously Transmitted Data Table

FIGURE E-1: CONTINUOUSLY TRANSMITTED DATA TABLE

<table>
<thead>
<tr>
<th>Data String</th>
<th>Characters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;12345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>&quot;2BCDEFGH&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>&quot;32345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>&quot;4bcdefgh&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>&quot;52345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>&quot;6BCDEFGH&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>&quot;72345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>&quot;8bcdefgh&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td>&quot;92345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>&quot;ABCDEFGH&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>&quot;B2345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>110</td>
</tr>
<tr>
<td>&quot;Cbcdefgh&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>120</td>
</tr>
<tr>
<td>&quot;D2345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>130</td>
</tr>
<tr>
<td>&quot;EBCDEFGH&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>140</td>
</tr>
<tr>
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<td>150</td>
</tr>
<tr>
<td>&quot;1bcdefgh&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>160</td>
</tr>
<tr>
<td>&quot;22345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>170</td>
</tr>
<tr>
<td>&quot;3BCDEFGH&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>180</td>
</tr>
<tr>
<td>&quot;42345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>190</td>
</tr>
<tr>
<td>&quot;5bcdefgh&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>200</td>
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<td>220</td>
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<td>10</td>
<td>230</td>
</tr>
<tr>
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<td>10</td>
<td>240</td>
</tr>
<tr>
<td>&quot;a2345678&quot;, 0x0D, 0x0A</td>
<td>10</td>
<td>250</td>
</tr>
</tbody>
</table>

NOTE: 0x0D = Carriage Return, 0x0A = Line Feed
Appendix F. Programming the MCP212XDM

The user may reprogram the PIC18F65J50 with their application firmware or the supplied demo firmware.

The programming will require the following items:
- 1 PC USB port for programming
- 1 MPLAB ICD 2 module (with USB cable)
- 1 RJ-11 to ICSP Adapter (AC164110)
- "HEX" file to program into device (00239 - CLKGen.HEX)

Figure F-1 shows a high level block diagram for programming the MCP2120/22 Developer’s Board. How to program is described in the appropriate MPLAB-IDE and MPLAB-ICD2 documentation.

![Programming Block Diagram](image)

**TABLE 6-1: SYSTEM HARDWARE REQUIREMENTS**

<table>
<thead>
<tr>
<th>Qty</th>
<th>Hardware</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC with one USB port</td>
<td>To run MPLAB-IDE and communicate to the ICD or ICE hardware.</td>
</tr>
<tr>
<td>1</td>
<td>ICD2, ICD3, or Real ICE</td>
<td>To program the MCP2120/22 Developer’s Board PIC18F65J50 device.</td>
</tr>
<tr>
<td>1</td>
<td>RJ-11 to ICSP Adapter</td>
<td>Converts RJ-11 connector of ICD 2 to pins to use for programming the PICkit interface on the MCP2120/22 Developer’s Board.</td>
</tr>
<tr>
<td></td>
<td>MCP2120/22 Developer’s Board</td>
<td>The board to program</td>
</tr>
</tbody>
</table>
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