MCP46XX PICtail™ Plus Daughter Board User's Guide

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- 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.
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MCP46XX PICTAIL™ PLUS DAUGHTER 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 MCP46XX PICtail™ Plus Daughter 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

DOCUMENT LAYOUT

This document describes how to use the MCP46XX PICtail™ Plus Daughter Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP46XX PICtail™ Plus Daughter 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 MCP46XX PICtail™ Plus Daughter Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the MCP46XX PICtail™ Plus Daughter Board.
- **Appendix C. "Board Testing"** – Describes the testing method for the MCP46XX PICtail™ Plus Daughter Board and which aspects of the board are tested and which are not.

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 the MCP46XX PICtail™ Plus Daughter Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

AN1080 Application Note, *"Understanding Digital Potentiometer Resistor Variations"*, DS01080

These data sheets provide detailed information regarding the MCP41XX/42XX product family:

MCP453x/455x/463x/465x Data Sheet, *"7/8-Bit Single/Dual I^2C Digital POT with Non-Volatile Memory"*, DS22107

MCP454x/456x/464x/466x Data Sheet, *"7/8-Bit Single/Dual I^2C Digital POT with Volatile Memory",* DS22096

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

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 (April 2009)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP46XX PICtail™ Plus Daughter Board demonstrates the features and abilities of Microchip's MCP45XX and MCP46XX Digital Potentiometers. This board is designed to exclusively use the MCP46XX devices.

The MCP45XX and MCP46XX are digital potentiometers with an I^2C interface. These devices have either 7 bits or 8 bits of resolution, single or dual offering, and are available as either volatile or non-volatile memory options.

This board is designed to easily operate with any of the following:

- Explorer 16 Development Board (DM240001)
- PICkit™ Serial Analyzer (DV164122)
- Other PICDEM Demo Board that includes a PICtail Plus female connector

The use of the Explorer 16 Development Board (DM240001) will require a tool to program the supplied firmware into the PIC24FJ128GA010 device. The use of any other PICDEM Demo Board will require the user to modify the supplied "C" source program appropriately.

The use of the PICkit Serial Analyzer will require the PC GUI interface program to control the command and data sent to the MCP42XX devices serial port. The PICkit Serial Analyzer GUI may be used.

This chapter covers the following topics:

- What is the MCP46XX PICtail™ Plus Daughter Board?
- What the MCP46XX PICtail™ Plus Daughter Board Kit includes.

1.2 WHAT IS THE MCP46XX PICTAIL™ PLUS DAUGHTER BOARD?

The MCP46XX PICtail™ Plus Daughter Board is used to demonstrate the use of digital potentiometers. This board is designed to be used in conjunction with either the Explorer 16 Development Board or the PICkit™ Serial Analyzer. Figure 1-1 shows the board's components placement and the purpose of the jumpers.

The board has an MCP4261-103 (10 kΩ) device for evaluation. This device is in the TSSOP package (U2). This is a dual 8-bit Non-Volatile Potentiometer device. The MCP4661 uses an I^2C interface and can be controlled via the PICkit Serial Analyzer interface (J1) or via the PICtail Plus interface (J3).

When using the PICtail Plus interface, the HVC voltages can be taken to a V_{IHH} level for high voltage commands. This is done by controlling the selection of the analog switch device (U1).

Jumpers allow the Terminal A and Terminal B voltages to be tied to AVDD and VSS, or come from an external source.

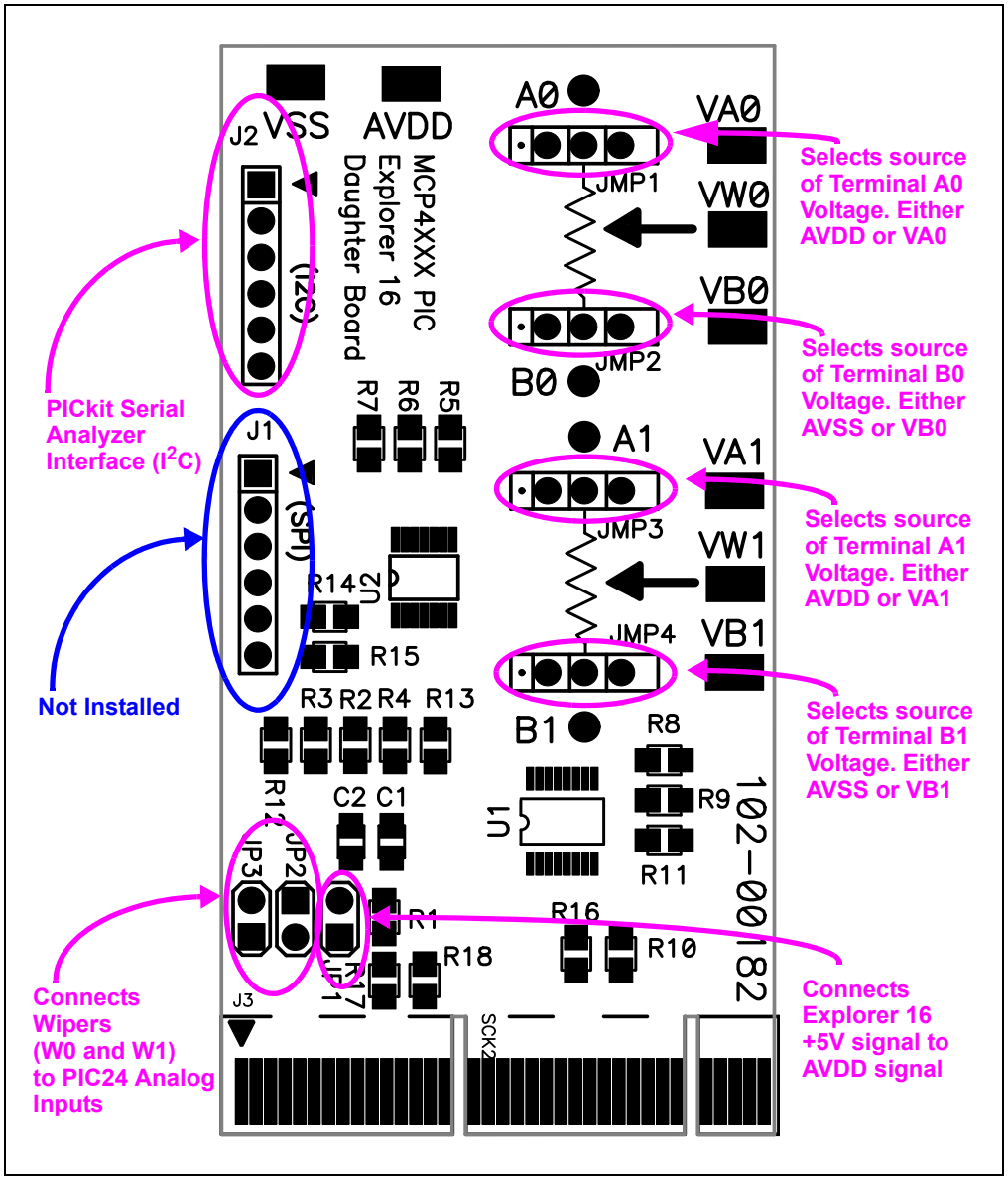


FIGURE 1-1: *MCP46XX Explorer 16 Daughter Board Demo Board Connectors.*

Some of the features of the board include:

- PICkit Serial Analyzer Interface (J1)
- PICtail Plus Interface (J3)
- MAX4582L High Voltage analog switch to allow HVC voltage to be selected as one of four voltages (V_{SS}, 3.3V, 5.0V, or 9.0V) - High Voltage command support
- Jumpers (JP2:JP3) to connect Wiper pins (W0 and W1) to the PICDEM Analog Channels
- Jumper (JP1) to allow AVDD to be driven by external power supply while connected to the PICDEM board or the PICkit Serial Analyzer
- Jumpers to allow Terminal A pins to be connected to the AV_{DD} or VAx pad
- Jumpers to allow Terminal B pins to be connected to the V_{SS} or VBx pad
- Connection point for easy connection to the Resistor Network Terminal pins

1.3 WHAT THE MCP46XX PICTAIL™ PLUS DAUGHTER BOARD KIT INCLUDES

This MCP46XX PICtail™ Plus Daughter Board Kit includes:

- One MCP46XX PICtail™ Plus Daughter Board, 102-00182
- Important Information “Read First”

NOTES:

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP46XX PICtail™ Plus Daughter Board is used to demonstrate the operation of digital potentiometers. The operation of the MCP45XX devices is similar to the MCP46XX devices. Therefore, the MCP46XX PICtail™ Plus Daughter Board can be used as a development platform for either device family.

The MCP46XX PICtail™ Plus Daughter Board is designed to be used in conjunction with either the Explorer 16 Development Board or the PICkit™ Serial Analyzer.

2.2 FEATURES

The MCP46XX PICtail™ Plus Daughter Board supports the following features:

- Each digital potentiometer's Terminal A pin can be individually connected to either AV_{DD} or the corresponding VAx pad
- Each digital potentiometer's Terminal B pin can be individually connected to either AV_{SS} or the corresponding VBx pad
- It can control the voltage on the MCP4661's HVC/A0 pin to either V_{SS}, 3.3V, 5.0V, or 9.0V via control signals from the PICtail Plus interface (J3)
- It can control the MCP4661 via the PICkit™ Serial Analyzer interface (J2)
- PIC24 can monitor the voltage levels of the MCP4661's W0 and W1 pins
- It is supplied with a "C" program that demonstrates normal and high voltage commands
- It demonstrates a split rail application, with digital logic at 3.3V and analog operation at 5.0V

2.3 GETTING STARTED

Figure 2-1 shows a simplified circuit for the MCP46XX PICtail™ Plus Daughter Board. The layout of the board is shown in Figure 2-3. This board can be operated with either a PICDEM board with a PICtail Plus header or the PICkit Serial Analyzer. The MCP46XX PICtail™ Plus Daughter Board kit comes with firmware for the Explorer 16 Starter Kit (DV164033). The layout of this board is shown in Figure 2-5.

The MCP46XX PICtail™ Plus Daughter Board supports the following Microchip Digital Potentiometer devices, which allows demonstration of all MCP46XX devices. The board has the footprint for the following devices:

- MCP46X1

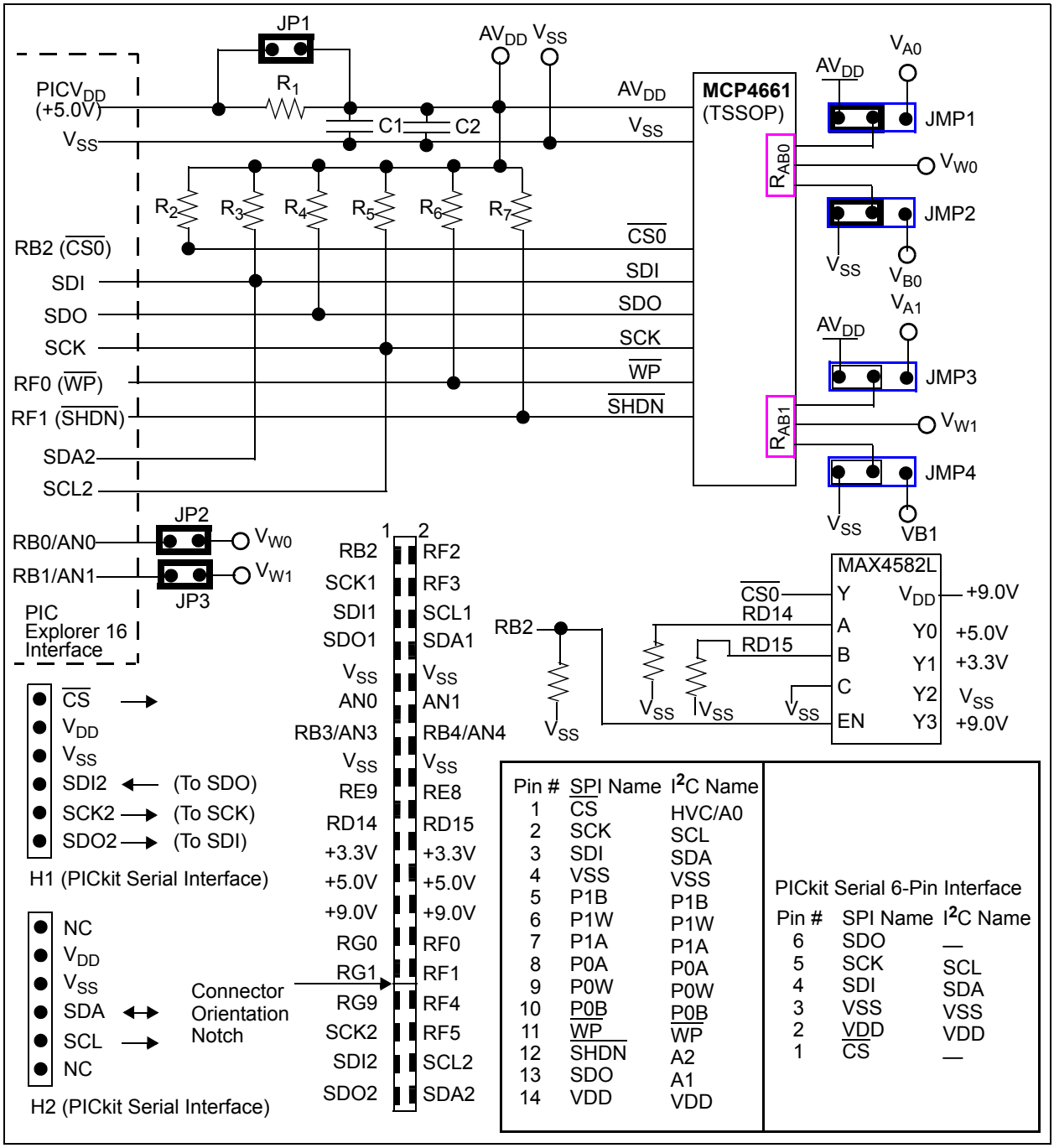


FIGURE 2-1: *MCP46XX PICtail™ Plus Daughter Board Simplified Circuit.*

2.3.1 The Hardware

Figure 2-2 shows the component placement of the MCP46XX PICtail™ Plus Daughter Board as well as the operation of the board jumpers.

The VAx and VBx pads allow an external voltage source to be applied to the device's desired Terminal A or Terminal B pin. The VWx pad is directly connected to the corresponding Terminal W pin, which makes it easy to measure the resulting voltage. The AVDD pad allows an external power supply to power the board, which should improve performance compared to powering the board via the PICtail Plus header or the PICkit Serial Analyzer.

The Printed Circuit Board (PCB) has been designed for the support of the SPI and I^2C device families (MCP42XX and MCP46XX), so not all components are installed to support the operation of the SPI version of the MCP46XX PICtail™ Plus Daughter Board.

2.3.1.1 JUMPER DESCRIPTIONS

Figure 2-2 shows the function of the MCP46XX PICtail™ Plus Daughter Board jumpers. Some of the jumpers configure the voltage source of the Terminal A and Terminal B pins while others determine the connection of the W pins. Lastly, there is a jumper to ensure that drive conflicts do not occur if an external power supply is being used for the AVDD voltage.

The default jumper configuration for the shipped MCP46XX PICtail™ Plus Daughter Board is shown in Figure 2-3.

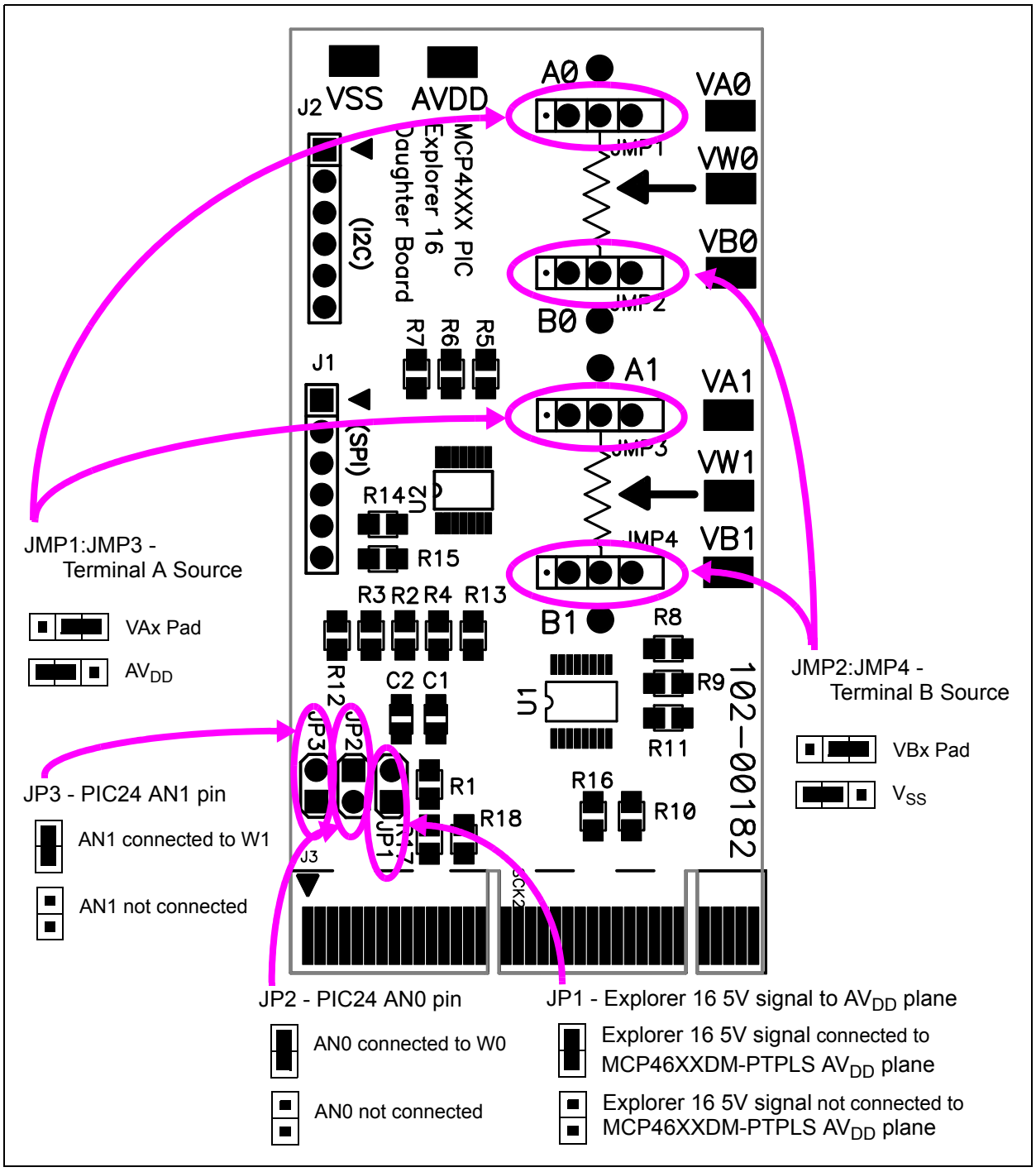


FIGURE 2-2: *MCP46XXDM-PTPLS Jumper Configuration and Oscilloscope Test Points.*

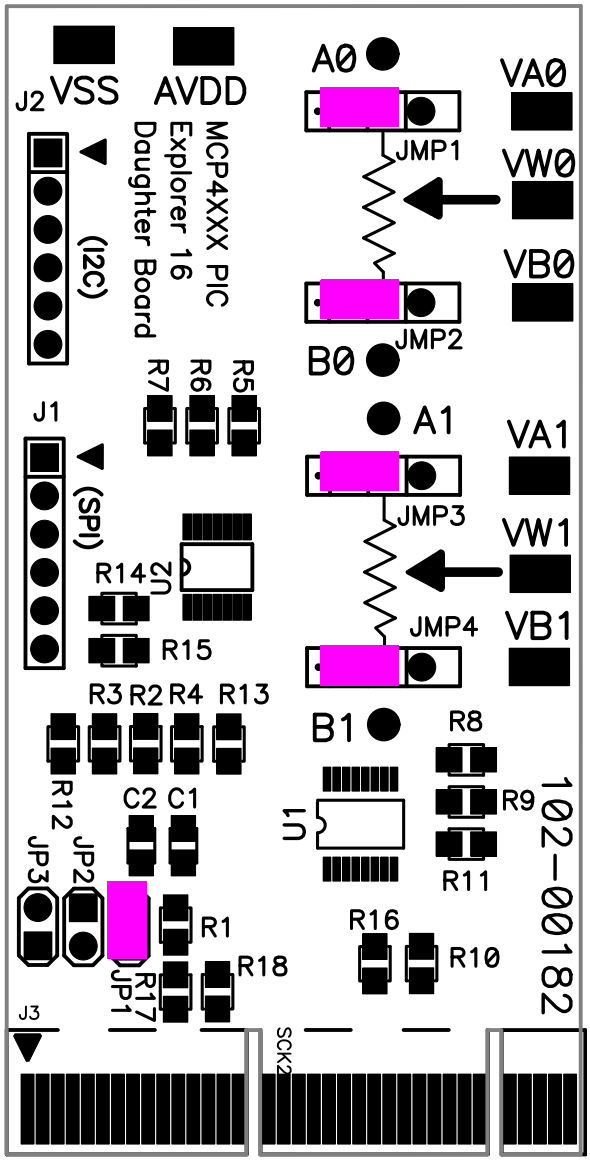


FIGURE 2-3: *MCP46XX PICtail™ Plus Daughter Board Layout with Default Jumper Settings*

Note:	This is the jumper configuration that the board should be shipped with.

2.3.2 The Firmware

The supplied PIC24FJ128A010 firmware is written in 'C' for the Microchip 'C' Compiler. The program is written using Microchip's released I2C library routines.

There are two program modes of operation, determined by the state of the S3 switches after a device reset. Program one will generate a saw wave on Wiper 1 pin (VW1), while program two will allow the user to control the value of the Wiper 1 register with the S4 and S6 switches. If it is desired to save that setting, the S5 switch can be depressed to copy the value in the Volatile Wiper 1 register to the Non-Volatile Wiper 1 register. So on any POR/BOR event the volatile Wiper 1 register will be loaded with the value of the non-volatile Wiper 1 register.

2.4 MCP46XX PICTAIL™ PLUS DAUGHTER BOARD DEMOS

This section describes how to demonstrate the MCP46XX PICtail™ Plus Daughter Board. The demos will either use an Explorer 16 Development Board or a PICkit Serial Analyzer.

The demo using the Explorer 16 Development Board is discussed in **Section 2.4.1 "Demos with the Explorer 16 Development Board"**, while the demo using the PICkit Serial Analyzer is discussed in **Section 2.4.2 "Demo with the PICkit Serial Analyzer"**.

Note:	Both demos require that the MCP46XXDM-PTPLS board jumper settings are as shown in Figure 2-4.

2.4.1 Demos with the Explorer 16 Development Board

Note:	For information on how to use the MPLAB-IDE, ICD-2, or any other aspect of the PIC Development tool platform, please refer to the appropriate documentation.

This demo will use the Explorer 16 Development Board. This board needs to be programmed with the supplied firmware. This firmware can be downloaded from the Microchip web site. It is a good practice to check the Microchip web site for updates to the demo firmware.

The supplied firmware program has two modes of operation. In the first mode, the program generates a saw wave on the VW1 pin (see Figure 2-6). The second mode is to display the operation of High Voltage commands to Wiper 1 (see Figure 2-7). This is where the $\overline{CS}$ signal is driven to 9V.

The program selected is determined after a reset (including the Power-on reset) by the state of the S3 switch. The programs are:

- Wiper 1 Saw Wave (Switch S3 not depressed)
- Increment / Decrement with High Voltage Write to Non-Volatile Wiper 1 Register (Switch S3 depressed)

Table 2-1 shows the required hardware to operate the demo.

TABLE 2-1: DEMO HARDWARE REQUIREMENTS

Item #	Description	Comment
1	Explorer 16 Development Board and power supply (DV164033)	**Note 1**
2	MCP46XXDM-PTPLS	—
3	4-Channel oscilloscope	**Note 2**

Note 1: A development tool to program the Explorer 16 Development Board is required. This development tool could be Microchip's MPLAB ICD-2.

2: An oscilloscope with fewer channels can be used, but this will require that the probes be moved between signals to verify the output states. A 2-channel oscilloscope is the minimum requirement, but it is not recommended.

2.4.1.1 THE MCP46XXDM-PTPS JUMPER CONFIGURATION

Before inserting the board into the Explorer 16 Development Board, the jumper configuration must be verified. Figure 2-4 shows the configuration of the jumpers.

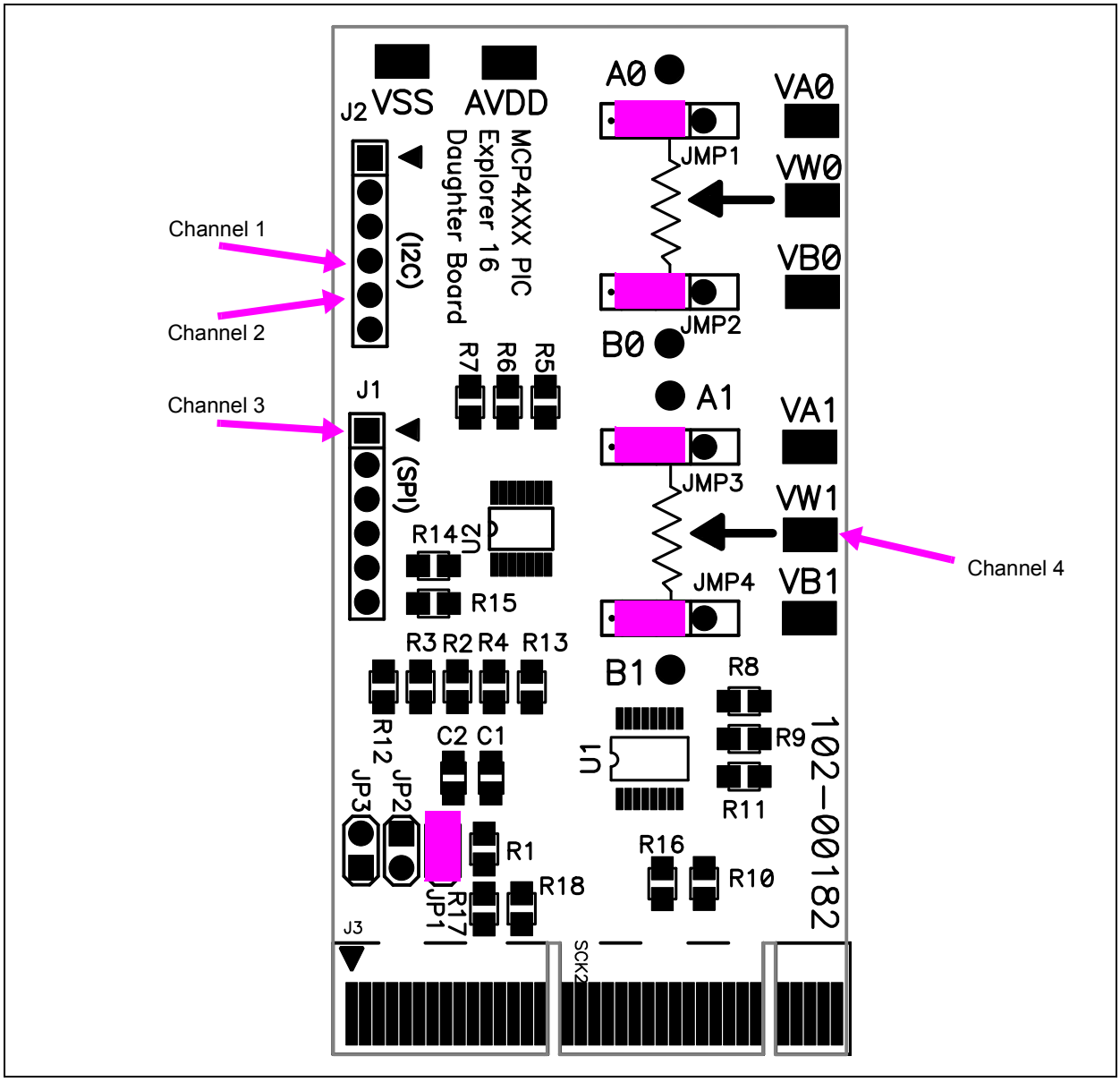


FIGURE 2-4: *MCP46XXDM-PTPLS Jumper Configuration and Oscilloscope Test Points.*

Note:	This is the jumper configuration that the board should be shipped with.

2.4.1.2 MCP46XX PICTAIL™ PLUS DAUGHTER BOARD (MCP46XXDM-PTPLS) INTO THE EXPLORER 16 STARTER KIT (DV164033)

Figure 2-5 shows the component placement on the Explorer 16 Development Board including the PICtail Plus header that the MCP46XX PICtail™ Plus Daughter Board is inserted into. The board's Reset switch and other switches are pointed out.

Ensure that the MCP46XXDM-PTPLS is installed in the correct orientation into the Explorer 16 Development Board. Figure 2-5 shows the location where the daughter board is inserted into the Explorer 16 Development Board.

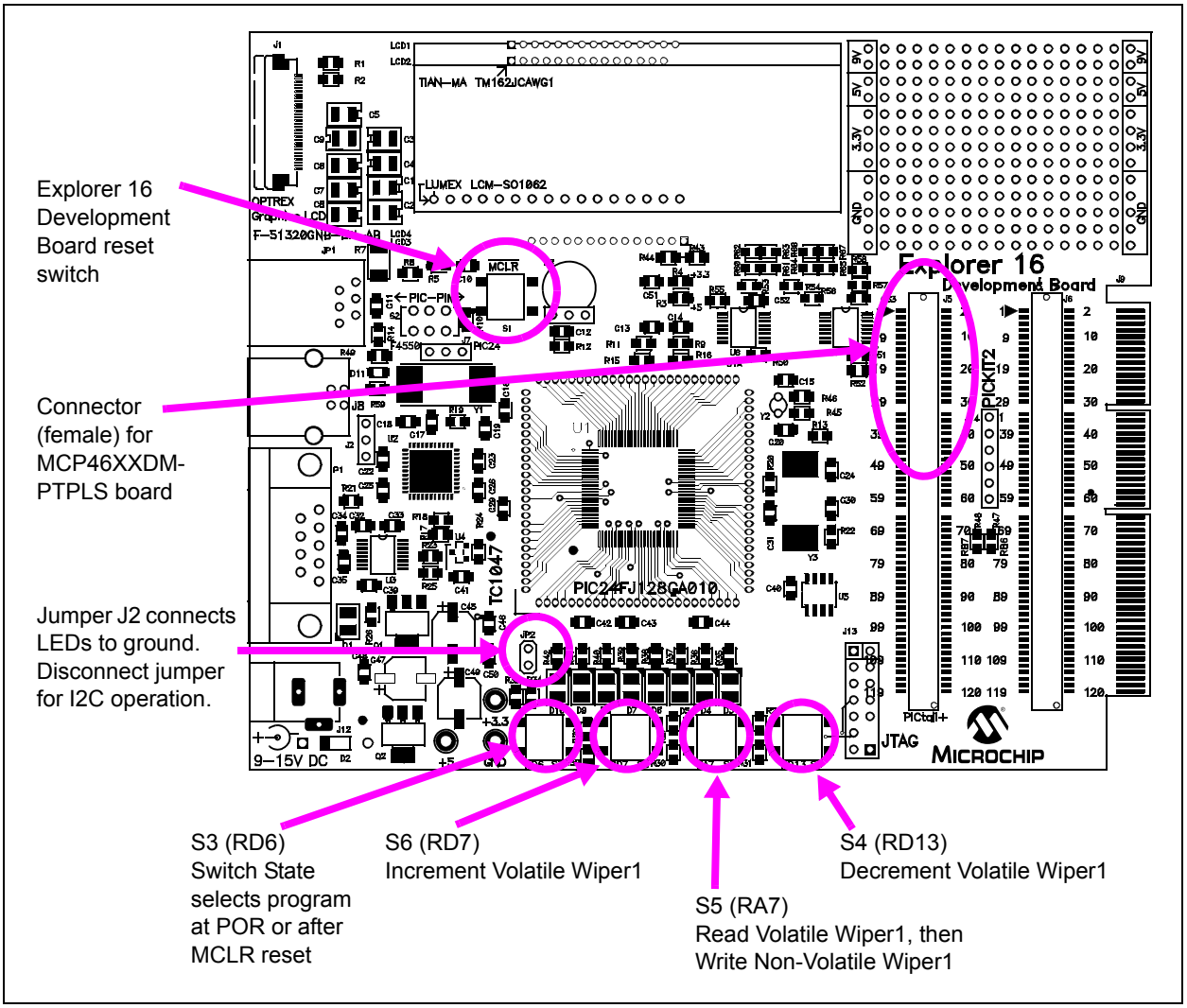


FIGURE 2-5: *Explorer 16 Development Board (DV164033).*

2.4.1.3 DEMO STEPS

The Explorer 16 Development Board firmware contains two programs. The program selected is determined after a reset (including the Power-on reset) by the state of the S3 switch. The programs are:

1. Wiper 1 Saw Wave (Switch S3 not depressed).
2. Increment / Decrement with High Voltage Write to Non-Volatile Wiper 1 Register (Switch S3 depressed).

Table 2-2 shows the sequence of steps to demonstrate the MCP46XXDM-PTPLS board with the Explorer 16 Development Board.

Figure 2-6 shows the expected output waveform for Program #1 (Wiper 1 Saw Wave) as well as the voltage levels and ranges of the four signals. Figure 2-7 shows an example waveforms for the High Voltage Write Command for the SDA, SCL, and HVC signals.

TABLE 2-2: DEMO STEPS USING THE PICDEM HPC EXPLORER DEMO BOARD

Step	Action	Result
1a	Turn on the oscilloscope and configure it as follows: • Channel 1, 2, 3, and 4 @ 5V/Division • Channel 1 to 4 have the same ground reference point	—
1b	Configure the oscilloscope as follows: • Time-base = 10 ms/Division (see Figure 2-6 for scope details)	—
2a	Configure the MCP46XXDM-PTPLS to the jumper settings shown in Figure 2-4.	—
2b	On the Explorer 16 Development Board, remove the shunt on JP2 (near the indicator LEDs).	The LEDs are disabled (no longer connected to ground).
3	Insert the MCP46XXDM-PTPLS board into the Explorer 16 Development Board J5 header (see Figure 2-5). Ensure proper orientation of Daughter Board to J5 Header.	—
4	Connect the oscilloscope probes as follows: • Channel 1 to the $\overline{CS}$ Pin of Header J1 (HVC signal of MCP4661) • Channel 2 to the SDA Pin of Header J2 • Channel 3 to the SCL Pin of Header J2 • Channel 4 to the VW1 Pad	—
5	Power up the programmed Explorer 16 Development Board and depress and release the MCLR push button.	Program 1 is now selected. Output waveform should look similar to Figure 2-6. Ensure to verify voltage levels/ranges of the four signals. **(Note 1)**
6	Depress the Explorer 16 Development Board's S3 push button.	—
7	Depress and release the Explorer 16 Development Board's MCLR push button.	—

Note 1: The SDA and SCL signals go from V_{SS} to approximately 3.3V due to the PIC24 operating at 3.3V. The VW1 signals go from V_{SS} to approximately 5V.

TABLE 2-2: DEMO STEPS USING THE PICDEM HPC EXPLORER DEMO BOARD (CONTINUED)

Step	Action	Result
8	Release the Explorer 16 Development Board's S3 push button.	Program 2 is now selected.
9	Configure oscilloscope as follows: • Time-base = 100 µs/Division (see Figure 2-7 for scope details)	—
10	Depress the Explorer 16 Development Board's S6 push button.	While S6 is depressed, the voltage on Wiper 1 (VW1) increases.
11	Depress the Explorer 16 Development Board's S4 push button.	While S4 is depressed, the voltage on Wiper 1 (VW1) decreases.
12	Use the S4 and S6 push buttons to configure the Volatile Wiper 1 register to either near V_{DD} or near V_{SS}. Take note of Wiper Voltage value.	—
14	Configure Scope to Capture on Channel 2.	—
15	Depress the Explorer 16 Development Board's S5 push button.	While S5 is depressed, the volatile Wiper 1 register is read, this value is written to the Non-Volatile Wiper 1 register, and then approximately a 10 ms delay occurs while the NV write cycle occurs. Capture will look similar to Figure 2-7. **(Note 1)**
16	Unplug Power from the Explorer 16 Development Board.	—
17	Depress the Explorer 16 Development Board's S3 push button.	—
18	Power up the programmed Explorer 16 Development Board and depress and release the MCLR push button.	—
19	Release the Explorer 16 Development Board's S3 push button.	The voltage on the Wiper 1 pad (VW1) should be the same voltage level as when Step 12 is completed.
20	Unplug Power from the Explorer 16 Development Board and remove the MCP46XXDM-PTPLS board.	—

Note 1: The SDA and SCL signals go from V_{SS} to approximately 3.3V due to the PIC24 operating at 3.3V. The VW1 signals go from V_{SS} to approximately 5V.

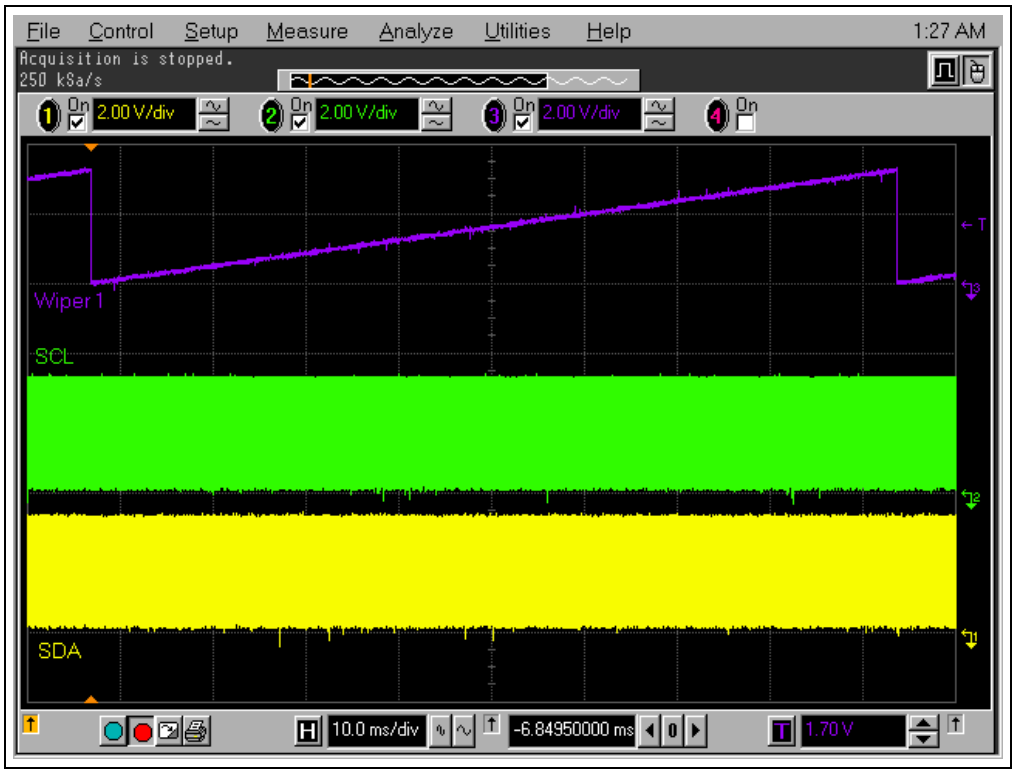


FIGURE 2-6: *Screen Capture of Program 1 Output Waveforms.*

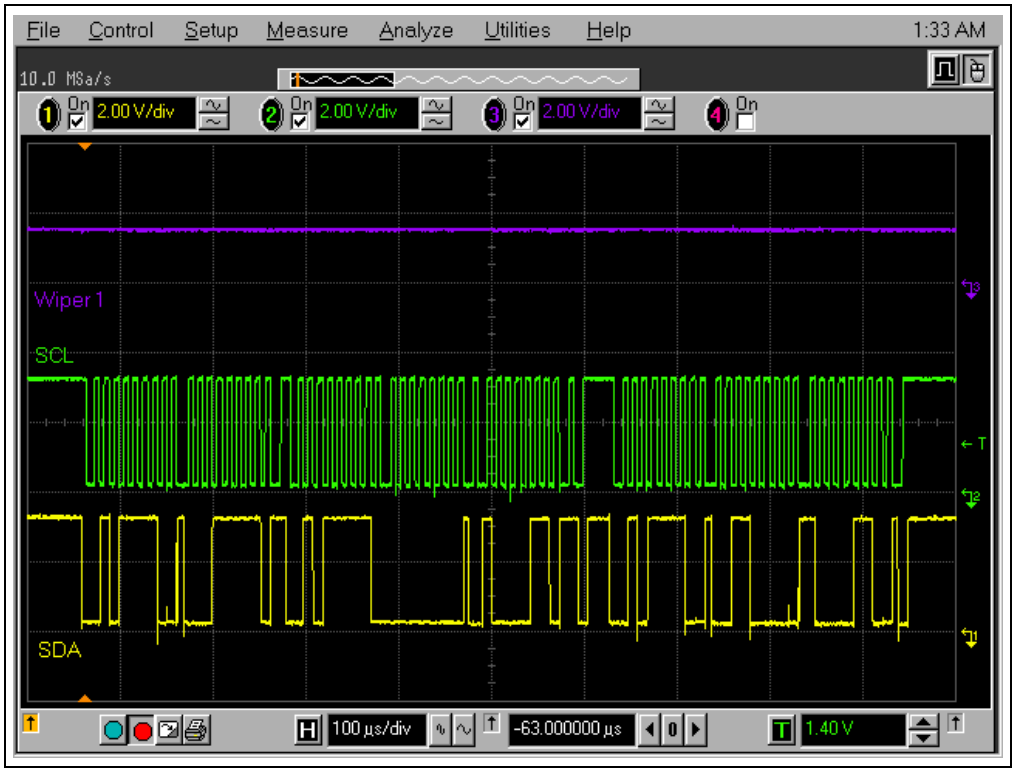


FIGURE 2-7: *Screen Capture of Program 2 Non-Volatile Write Waveform.*

2.4.2 Demo with the PICkit Serial Analyzer

Note: For information on how to use the PICkit Serial Analyzer, or any other aspect of the PIC® Development tool platform, please refer to the appropriate documentation.

This demo requires that you have previously installed the PICkit Serial Analyzer (DV164122) on your computer.

Note: The GUI available for the MCP42XXDM-PTPLS (SPI version) will be updated to support the I^2C devices. After the program is updated, this section's description will be updated.
This GUI will be supplied "As Is", but the source code is supplied to allow developers a starting point for any GUI development.

TABLE 2-3: DEMO HARDWARE REQUIREMENTS

Item #	Description	Comment
1	PC with USB port running Windows XP	—
2	PICkit Serial Analyzer Adapter (DV164122)	—
3	MCP46XXDM-PTPLS	—
4	Oscilloscope	**Note 1**

Note 1: A Digital Multi-Meter (DMM) may be used to measure the W pins voltage.

Figure 2-8 shows the PICkit Serial Analyzer GUI after the program first starts. It is then necessary to ensure that the proper communication mode is selected (I^2C Master). Modifing the Communication Mode is shown in Figure 2-9. The communication mode then needs to be configured, and should have the settings as shown in Figure 2-10.

After the communication mode settings have been saved, it is necessary to set up the I^2C communication scripts. Figure 2-11 shows how to open the script builder window. The default script builder window is shown in Figure 2-12. Figure 2-13 through Figure 2-16 show four simple scripts to read or write to Wiper 1. Other scripts may be created for your testing. The Transaction Window (see Figure 2-8) shows the status of the executed script.

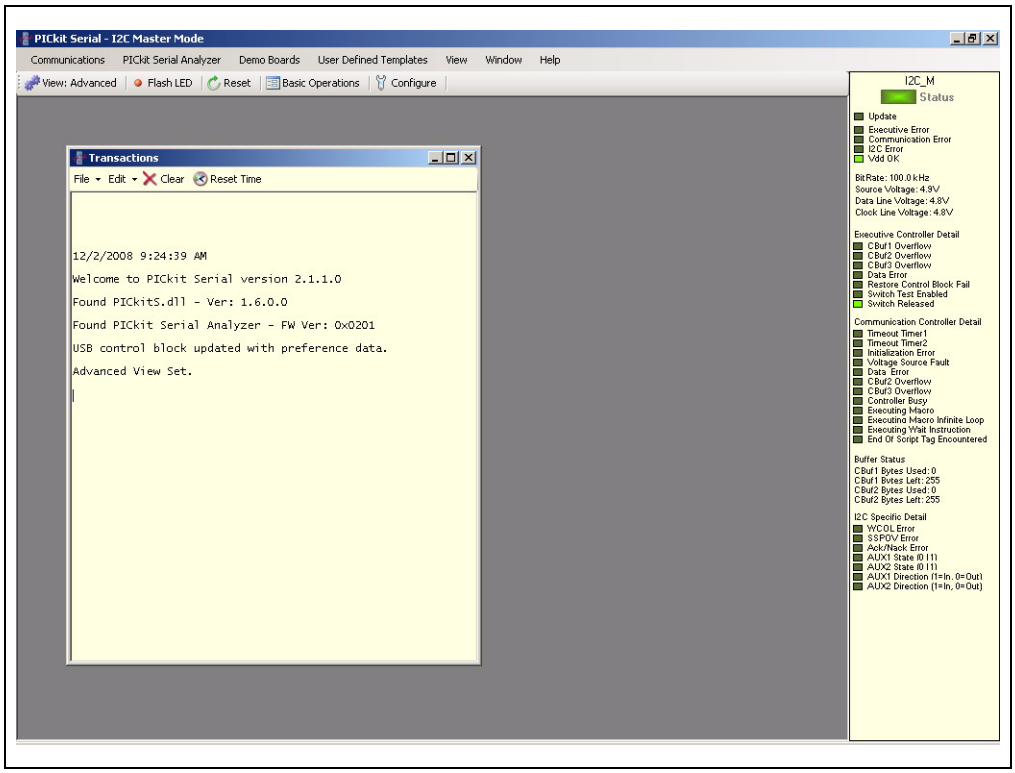


FIGURE 2-8: *PICkit Serial Analyzer GUI 1st Window.*

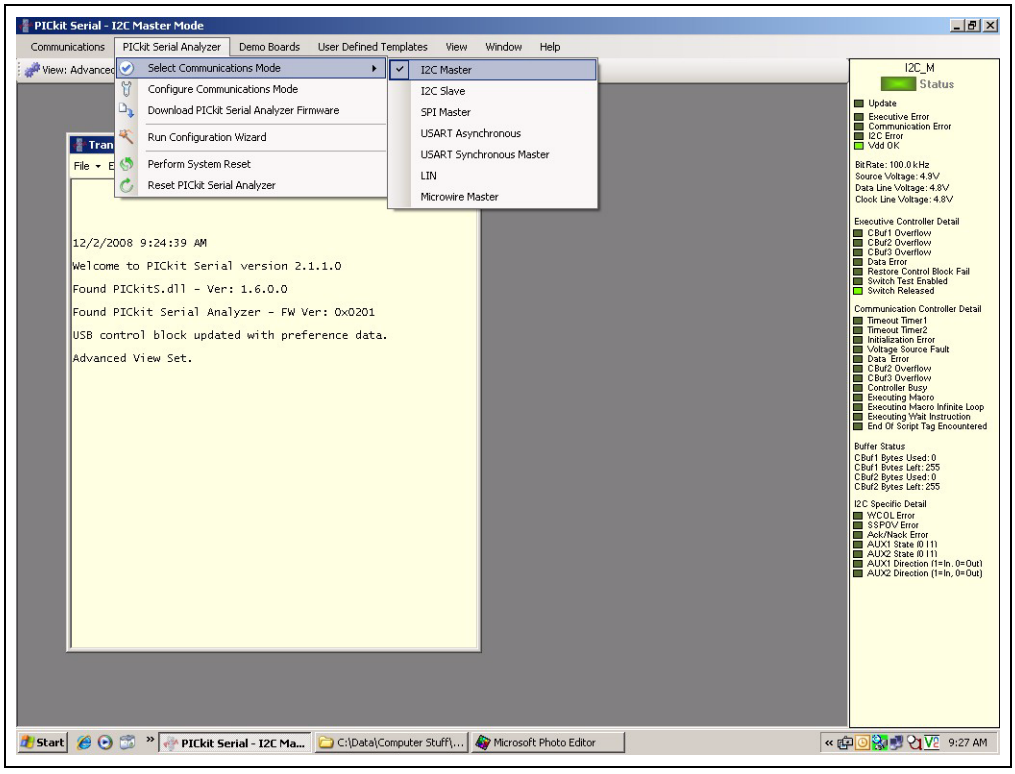


FIGURE 2-9: *Selecting Communication Mode.*

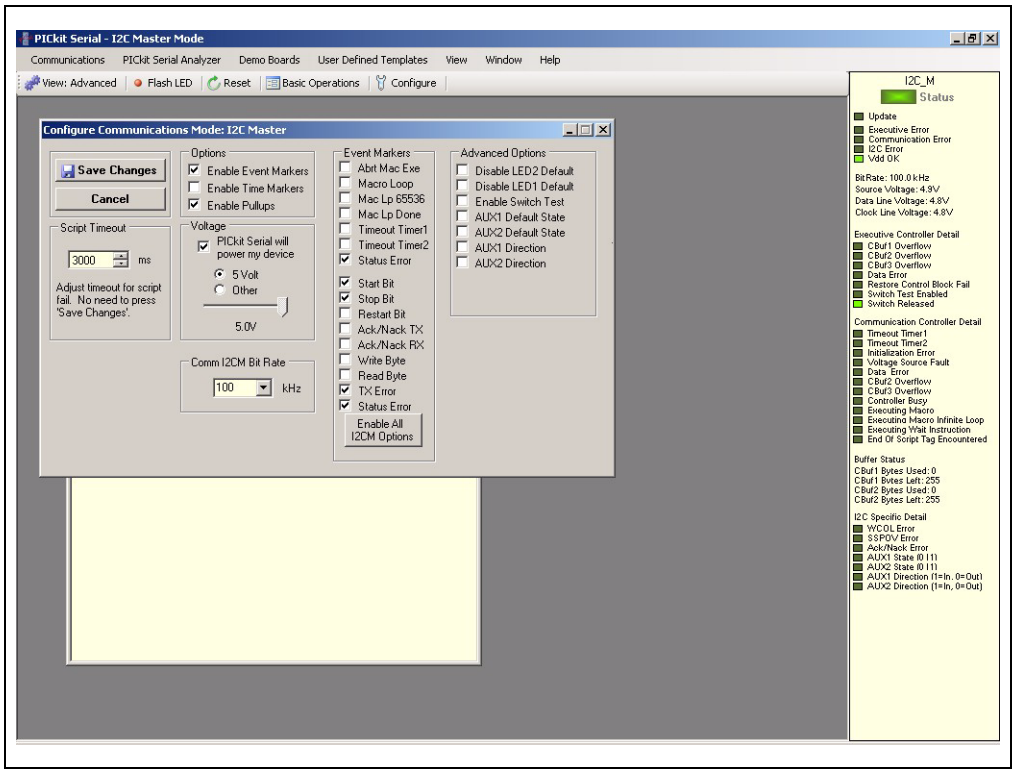


FIGURE 2-10: *Configuring Communication Mode.*

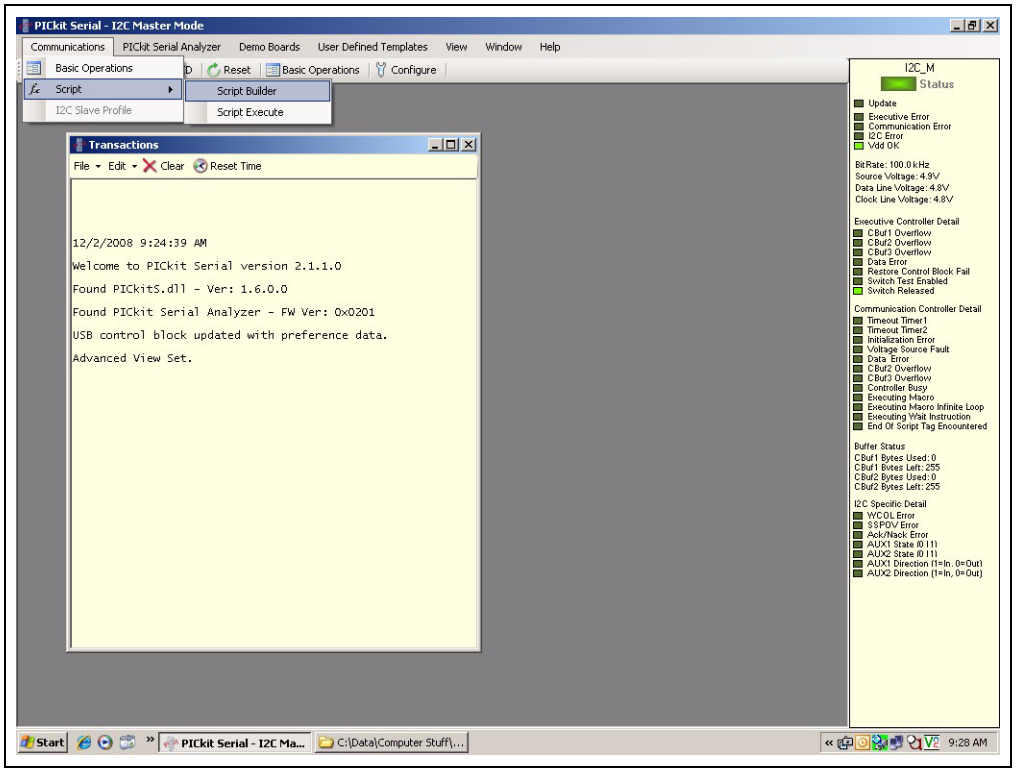


FIGURE 2-11: *Opening Script Builder Window.*

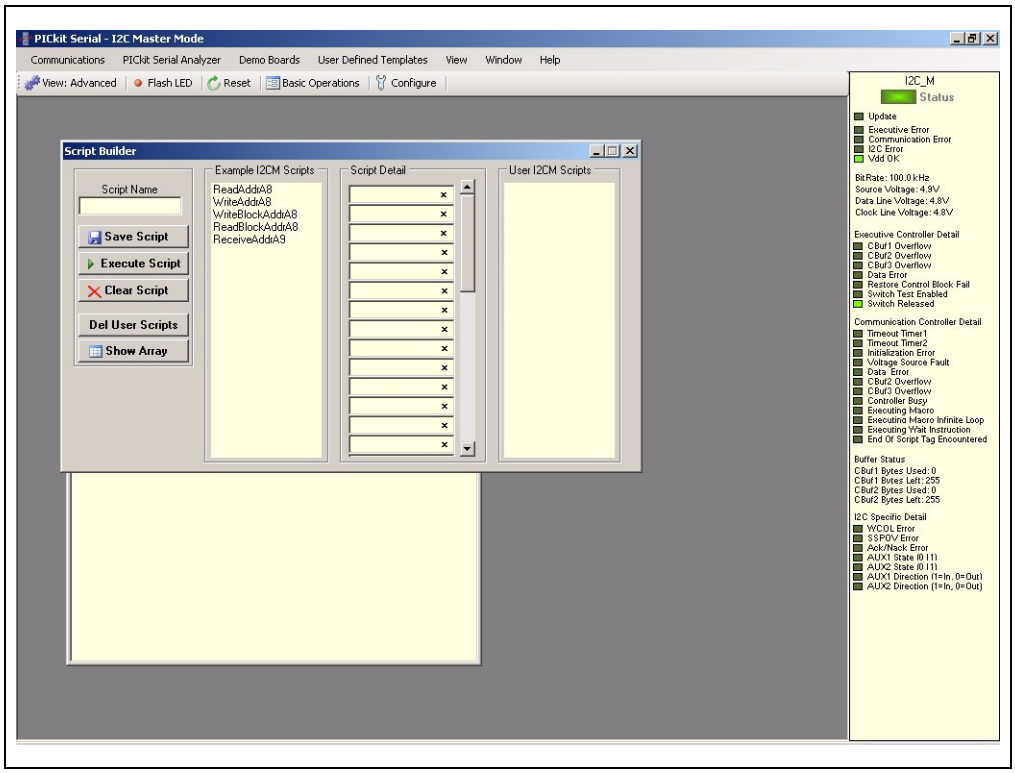


FIGURE 2-12: *Default Script Builder Window.*

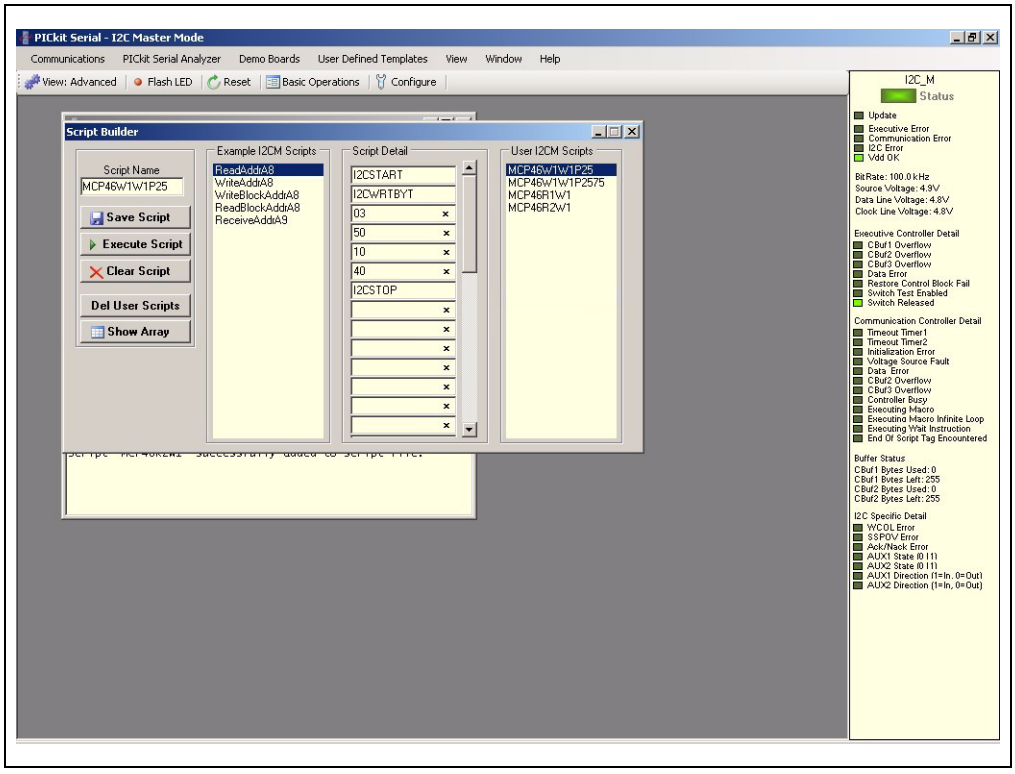


FIGURE 2-13: *Write 1 Byte to Wiper 1 Script (MCP46W1W1P25).*

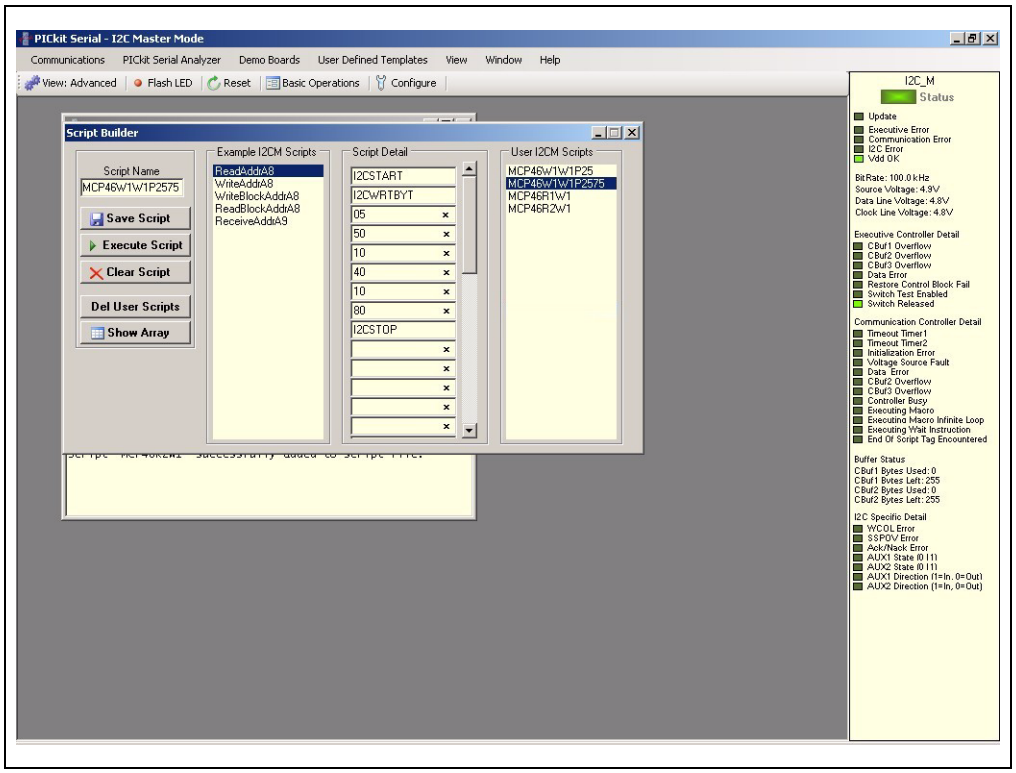


FIGURE 2-14: *Write 2 Bytes to Wiper 1 Script (MCP46W1W1P2575).*

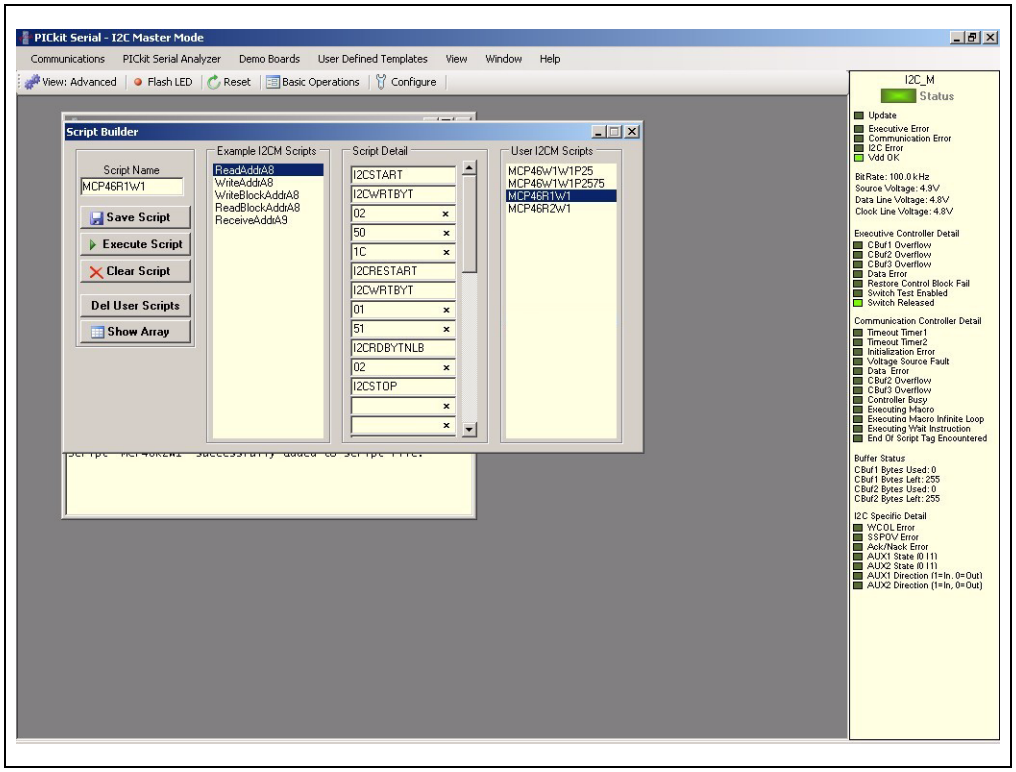


FIGURE 2-15: *Read 1 Byte from Wiper 1 Script (MCP46R1W1).*

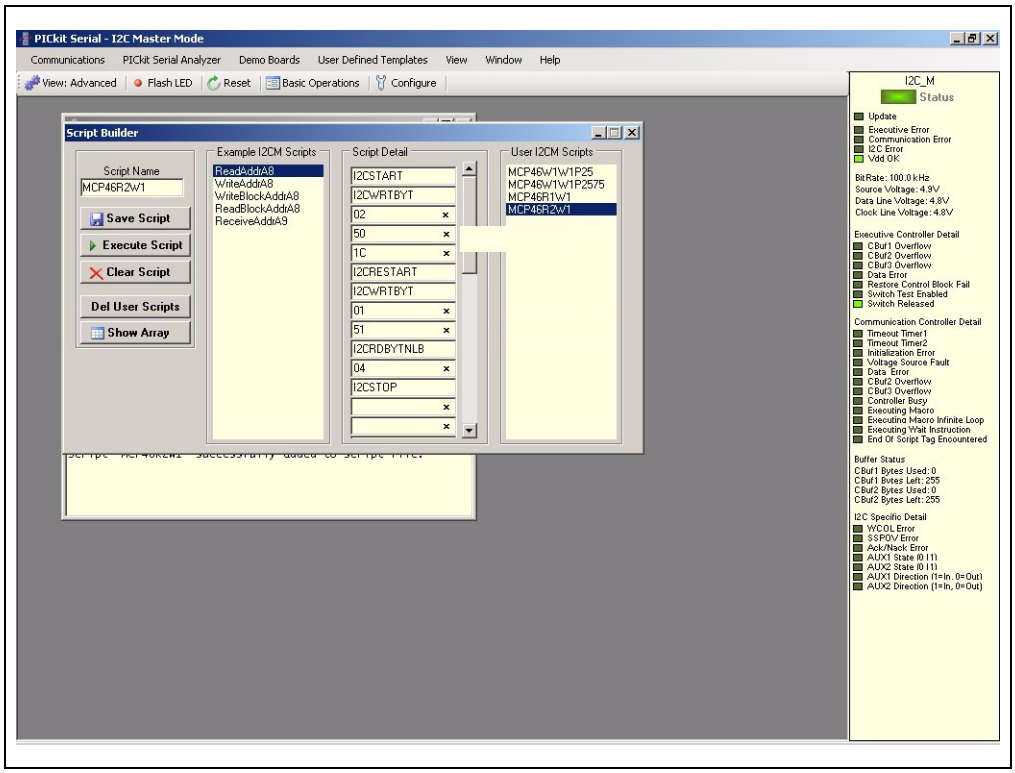


FIGURE 2-16: *Read 2 Bytes from Wiper 1 Script (MCP46R2W1).*

NOTES:

Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the schematic and layouts for the MCP46XX PICtail™ Plus Daughter Board. Diagrams included in this appendix are:

- Board - Schematic
- Board - Top Silk-screen Layer
- Board - Top Component Plus Silk-screen
- Board - Ground Layer
- Board - Power Layer
- Board - Bottom Layer

A.2 SCHEMATICS AND PCB LAYOUT

A.3 "Board - Schematic" shows the schematic of the MCP46XX PICtail™ Plus Daughter Board.

A.4 "Board – Top Silk-Screen Layer" shows the layout for the top layer of the MCP46XX PICtail™ Plus Daughter Board. The layer order is shown in Figure A-1.

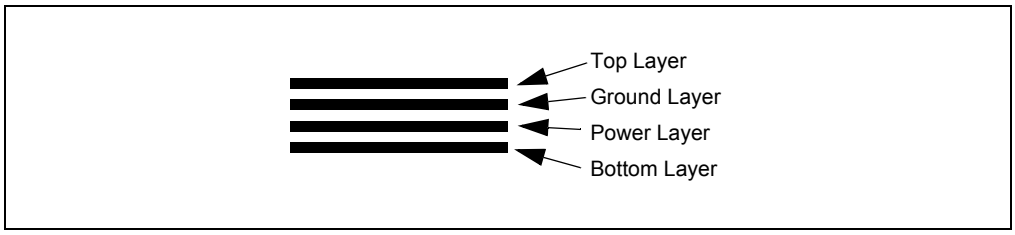
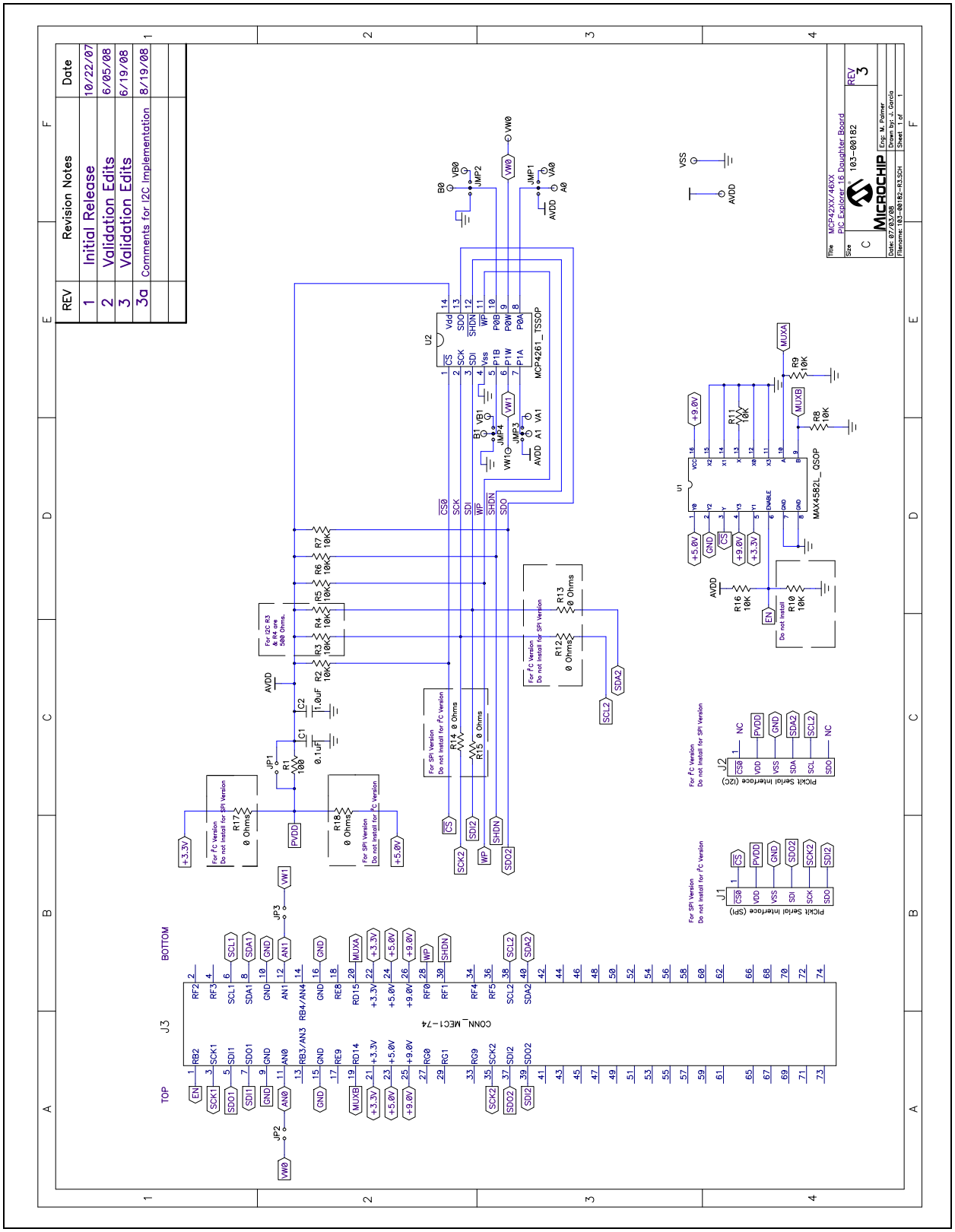
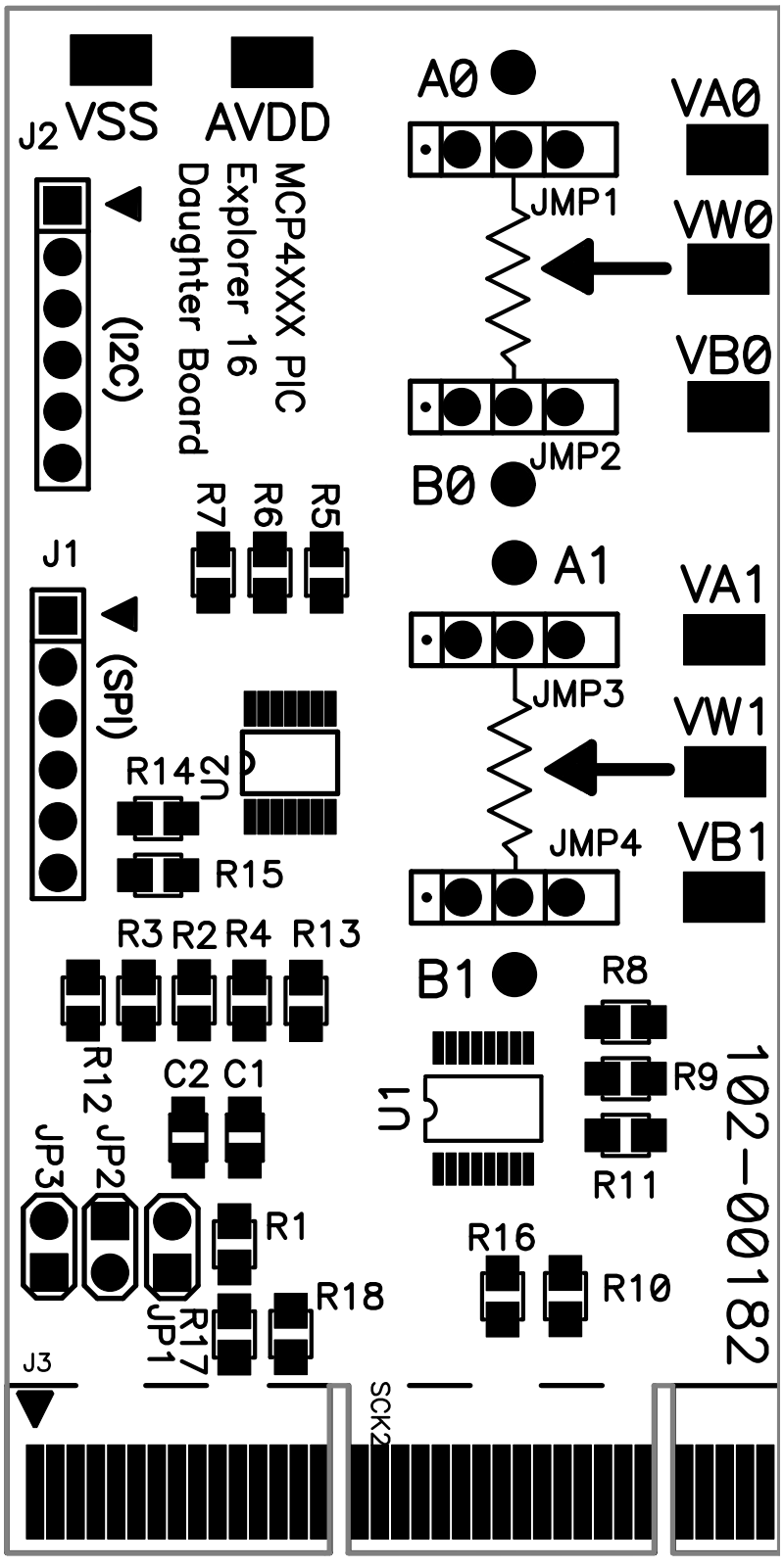


FIGURE A-1: *Layer Order.*

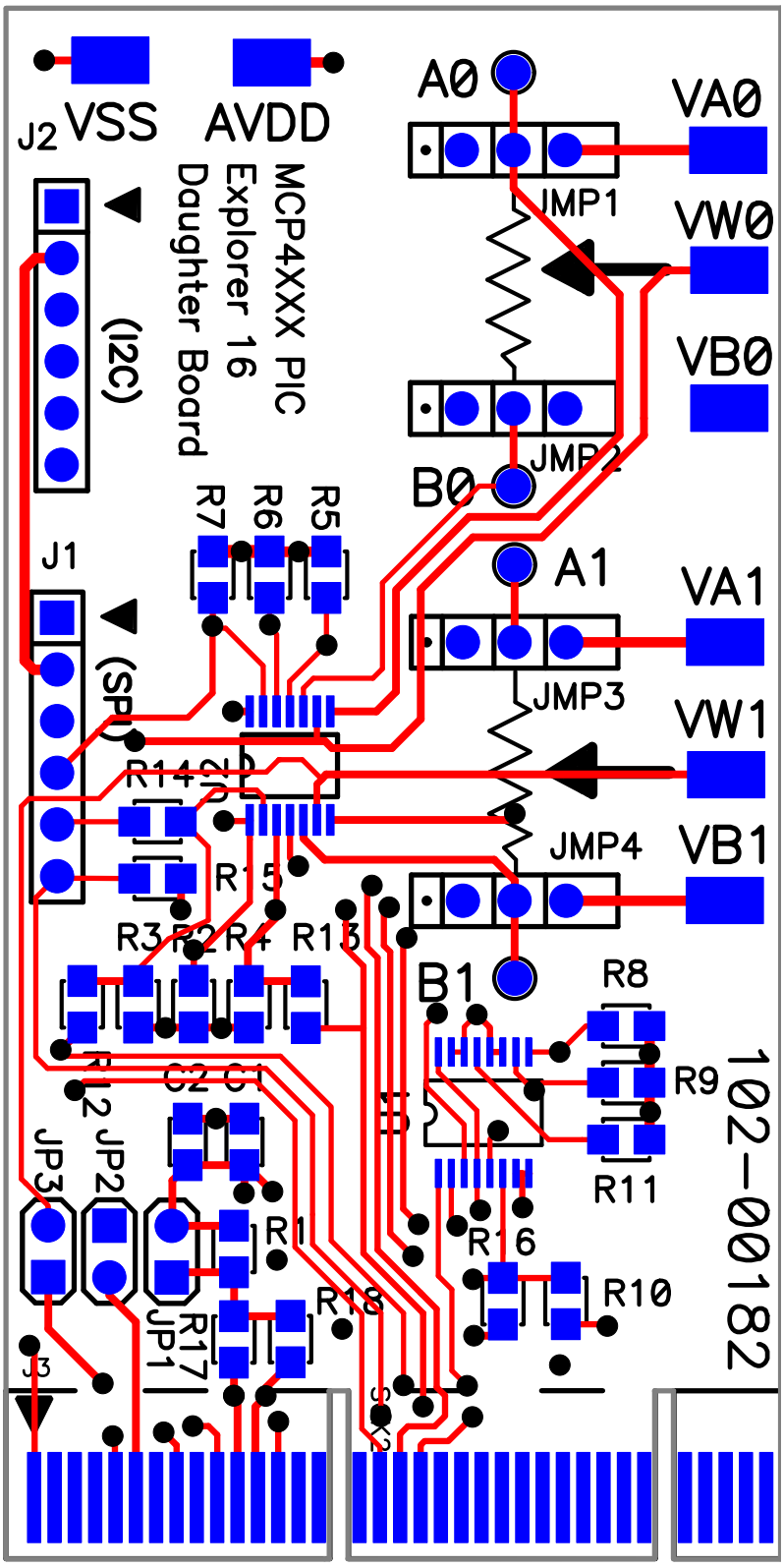
A.3 BOARD - SCHEMATIC



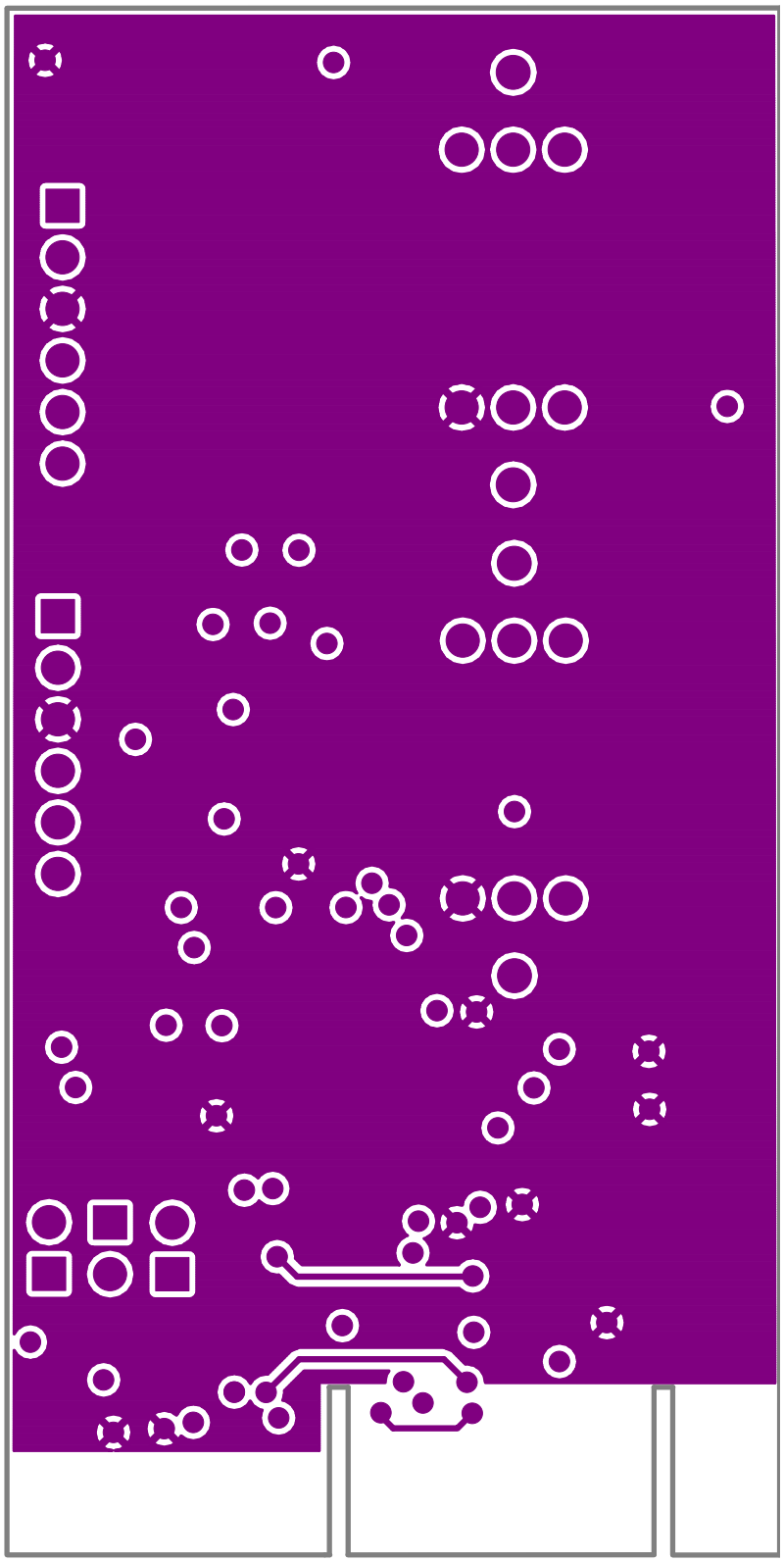
A.4 BOARD – TOP SILK-SCREEN LAYER



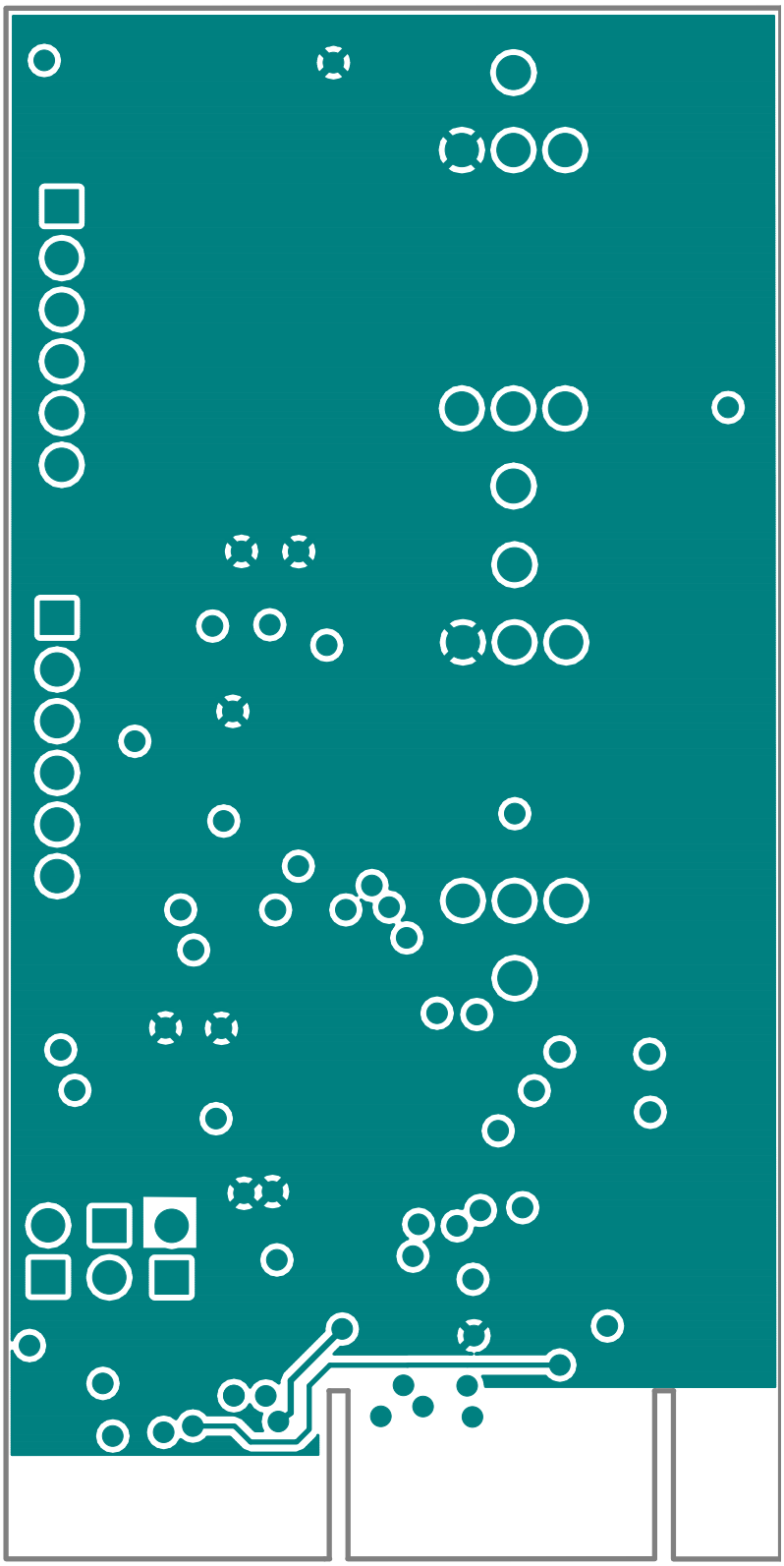
A.5 BOARD – TOP COMPONENTS AND SILK-SCREEN



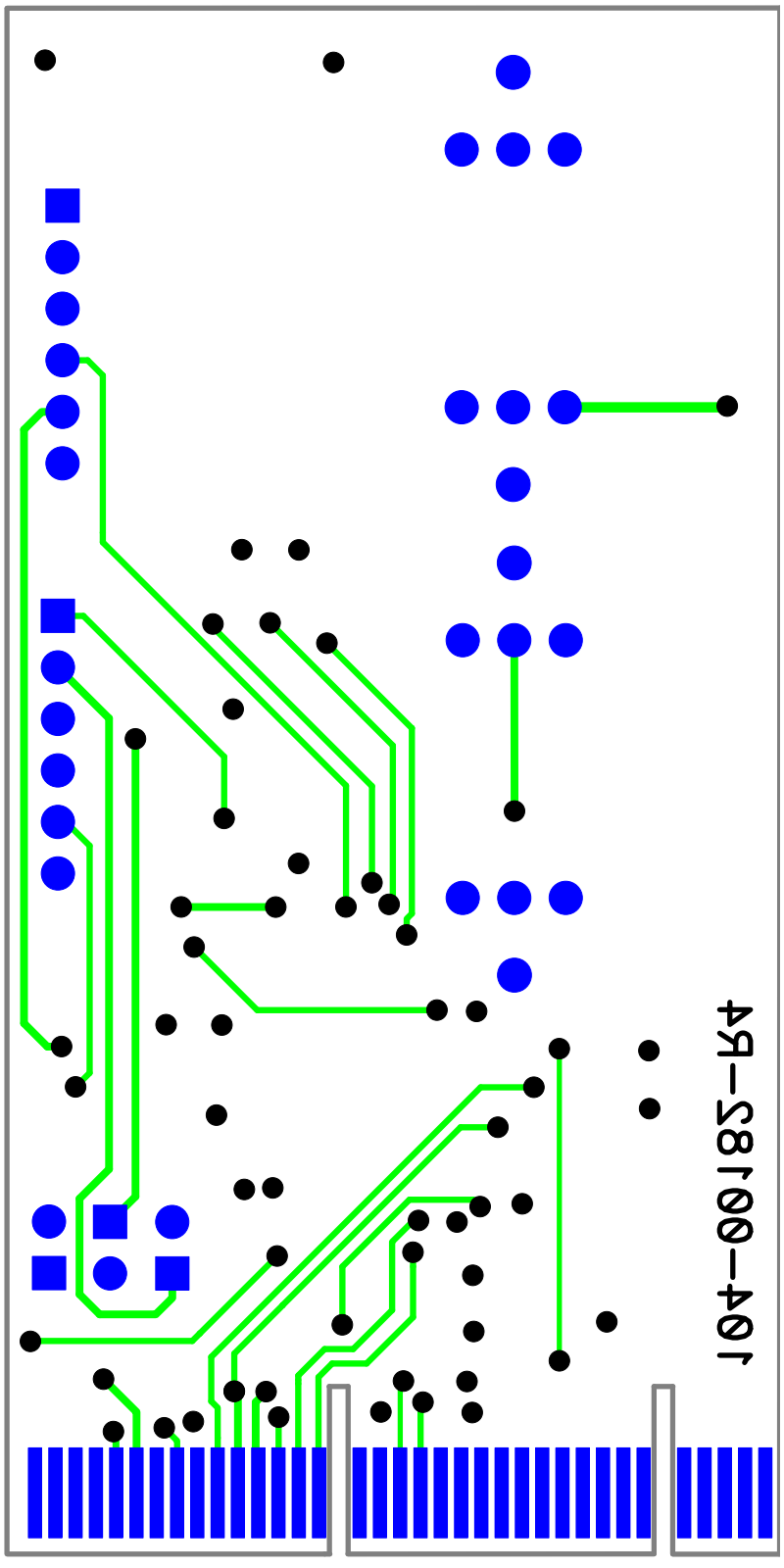
A.6 BOARD – GROUND LAYER



A.7 BOARD – POWER LAYER



A.8 BOARD – BOTTOM LAYER



NOTES:

Appendix B. Bill Of Materials (BOM)

B.1 BILL OF MATERIALS (BOM)

This appendix contains the Bill Of Materials for the MCP46XX PICtail™ Plus Daughter Board.

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
1	C1	CAP .1UF 25V CERAMIC X7R 0805	Panasonic® - ECG	ECJ-2VB1E104K
1	C2	CAP 1.0UF 16V CERAMIC X7R 0805	Kemet® Electronics	C0805C105K4RACTU
1	J2	CONN HEADER 6POS .100 VERT TIN	Molex/Waldom® Electronics Corp	22-28-4060
3	JP1, JP2, JP3	CONN HEADER 2POS .100 VERT TIN	Molex/Waldom Electronics	22-03-2021
4	JMP1, JMP2, JMP3, JMP4	CONN HEADER 3POS .100" STR TIN	Molex/Waldom Electronics Corp	90120-0123
1	PCB	RoHS Compliant Bare PCB, MCP4XXX PICTail Plus Daughter Board	Microchip Technology Inc.	104-00182
1	R1	RES 100 OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF1000V
8	R2, R5, R6, R7, R8, R9, R11, R16	RES 10.0K OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF1002V
2	R3, R4	RES 500 OHM 1/8W 1% 0805 SMD	Panasonic - ECG	ERJ-6ENF5000V
3	R12, R13, R17	RES 0.0 OHM 1/8W 5% 0805 SMD	Rohm	MCR10EZPJ000
1	U1	ANALOG MUX, DUAL, 4-CHANNEL, CMOS, SSOP, 16PIN, PLASTIC 16-QSOP	Maxim	MAX4582LEEE
1	U2	MCP454X/456X/464X/466X, 7/8-Bit Single/Dual I^2C Digital POT with Non-Volatile Memory	Microchip Technology Inc.	MCP4661T-103E/ST
12	VA0, VW0, VB0, VA1, VW1, VB1, VSS, AVDD	PC TEST POINT COMPACT SMT	Keystone Electronics®	5016

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.

TABLE B-2: BILL OF MATERIALS — COMPONENTS NOT INSTALLED

Qty	Reference	Description	Manufacturer	Part Number
0	J1	DO NOT POPULATE CONN HEADER 6POS .100 VERT TIN	—	—
0	R10, R14, R15, R18	DO NOT POPULATE	—	—

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.

NOTES:

Appendix C. Board Testing

C.1 INTRODUCTION

The MCP46XX PICtail™ Plus Daughter Board can be used in multiple configurations. Only a subset of these configurations are tested. The tests were performed with the configuration shown in Figure C-1. The tested nodes are Channel 1 through Channel 4.

Other configurations, Pad connections, and circuit performance are not tested.

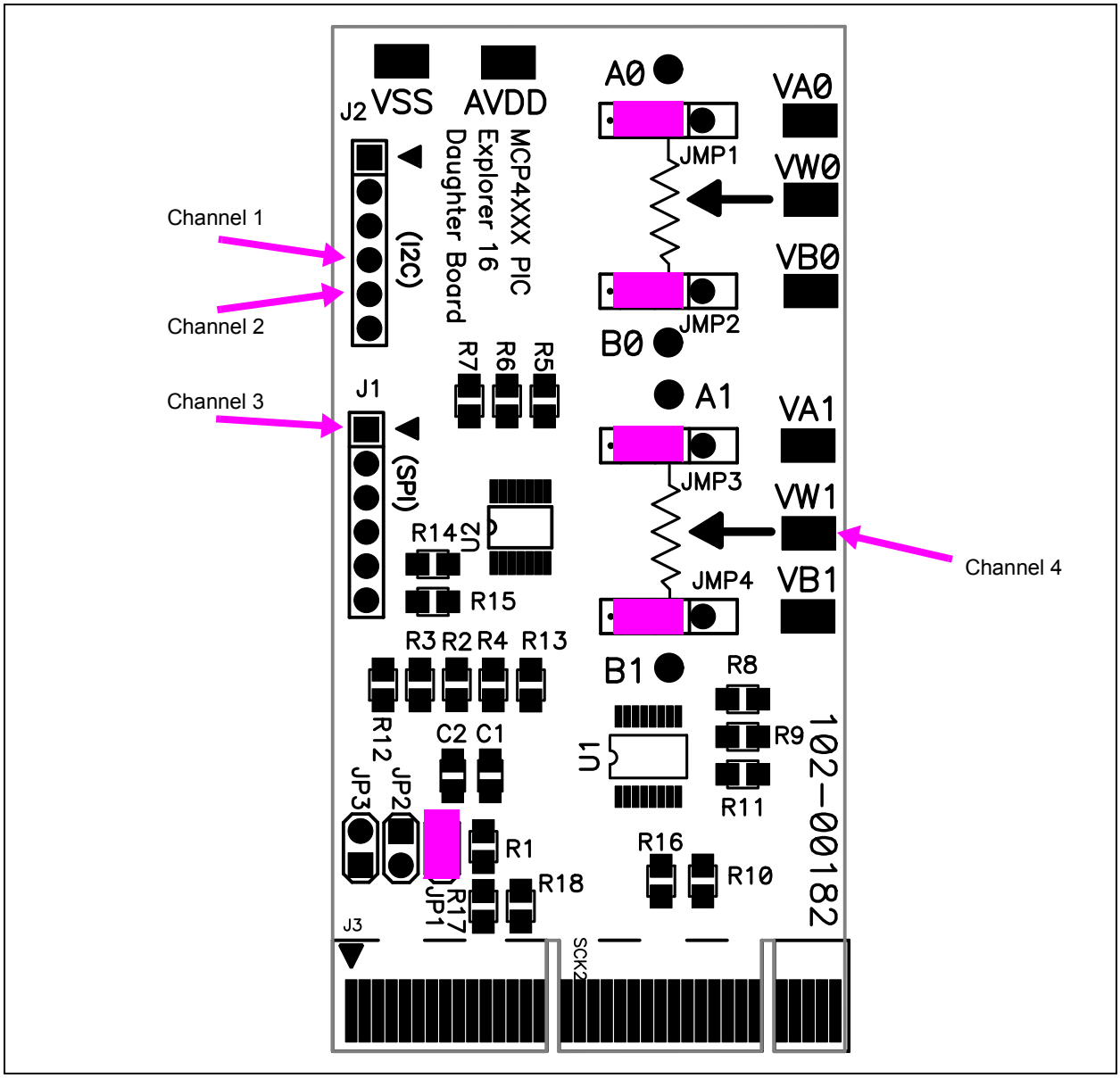


FIGURE C-1: *Tested Jumper Configuration and Test Points.*

C.2 WHAT IS TESTED

The following portions of the board are tested:

- MCP4661 (U2)
  - U2 MCP4661 Pot 1 is tested in Potentiometer configuration.
- JMP3 (P1 – P2) - AVDD to P1A
- JMP4 (P1 – P2) - AVSS to P1B
- MAX4582 (U1)
  - Y0 (5.0V), Y3 (9.0V), and Y2 (VSS) switching.
- Pads: VW1

C.3 WHAT IS NOT TESTED

The following portions of the board are NOT tested:

- JMP1
- JMP2
- JMP3 (P2 – P3) - VA1 to P1A
- JMP4 (P2 – P3) - VB1 to P1B
- Jumpers: JP1, JP2, and JP3
- MAX4582 (U1)
  - Y1 (3.3V) switching.
- J1: PICkit Serial Analyzer Interface (SPI)
- J2: PICkit Serial Analyzer Interface (I^2C)
- Pads: VA0, VB0, VW0, VA1, VB1, AVDD, and VSS
- Test Points: A0, B0, A1, and B1
- Connections to unpopulated components

NOTES:

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