Application Note AN502

HBI-0289

Adapter for Arduino for the Cortex-M Prototyping System (MPS2 and MPS2+)

Non-Confidential

ARM®

Adapter for Arduino

Release Information

The following changes have been made to this Application Note.

Change History

Date	Issue	Confidentiality	Change
14/12/2015	A	Non-Confidential	First release
30/01/2017	B	Non-Confidential	Table 5-1 updated with EXT_20-22

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Contents

Adapter for Arduino

1 Conventions and Feedback

The following describes the typographical conventions and how to give feedback:

Typographical conventions

The following typographical conventions are used:

`monospace` denotes text that you can enter at the keyboard, such as commands, file and program names, and source code.

`monospace` denotes a permitted abbreviation for a command or option. You can enter the underlined text instead of the full command or option name.

`monospace italic`
denotes arguments to commands and functions where the argument is to be replaced by a specific value.

`monospace bold`
denotes language keywords when used outside example code.

italic highlights important notes, introduces special terminology, denotes internal cross-references, and citations.

bold highlights interface elements, such as menu names. Denotes signal names. Also used for emphasis in descriptive lists, where appropriate.

Feedback on this product

If you have any comments and suggestions about this product, contact your supplier and give:

- Your name and company.
- The serial number of the product.
- Details of the release you are using.
- Details of the platform you are using, such as the hardware platform, operating system type and version.
- A small standalone sample of code that reproduces the problem.
- A clear explanation of what you expected to happen, and what actually happened.
- The commands you used, including any command-line options.
- Sample output illustrating the problem.
- The version string of the tools, including the version number and build numbers.

Feedback on documentation

If you have comments on the documentation, e-mail `errata@arm.com`. Give:

- The title.
- The number, DAI0502B.
- If viewing online, the topic names to which your comments apply.
- If viewing a PDF version of a document, the page numbers to which your comments apply.
- A concise explanation of your comments.

ARM also welcomes general suggestions for additions and improvements.

ARM periodically provides updates and corrections to its documentation on the ARM Information Center, together with knowledge articles and *Frequently Asked Questions* (FAQs).

Other information

- ARM Information Center, http://infocenter.arm.com/help/index.jsp
- ARM Technical Support Knowledge Articles, http://infocenter.arm.com/help/topic/com.arm.doc.faqs/index.html
- ARM Support and Maintenance, http://www.arm.com/support/services/support-maintenance.php
- ARM Glossary, http://infocenter.arm.com/help/topic/com.arm.doc.aeg0014g/index.html

The ARM Glossary is a list of terms used in ARM documentation, together with definitions for those terms. The ARM Glossary does not contain terms that are industry standard unless the ARM meaning differs from the generally accepted meaning.

1.1 Terms and abbreviations

Term	Meaning
MPS2	Cortex-M Prototyping System
ADC	Analog to Digital Converter

2 Overview

2.1 Purpose of this application note

This application note discusses installation and operation of HBI-0289 Adaptor for Arduino board which allowed communication between Cortex-M Prototyping System (MPS2) Motherboard and Arduino shields.

2.2 References

- *ARM® Versatile™ Express Cortex®-M Prototyping System (V2M-MPS2)Technical Reference Manual*
  http://infocenter.arm.com/help/topic/com.arm.doc.100112_0200_06_en/index.html

3 Getting Started

The steps below show you how to set up the Adapter board on the MPS2 Motherboard.

1. Remove the two plastic spacers, supplied with MPS2 Motherboard, from the mounting holes (Figure 3-1).

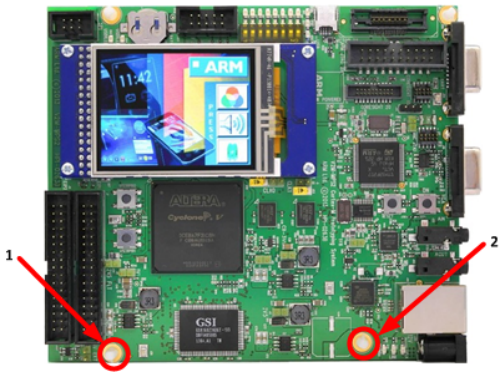


Figure 3-1 Plastic spacers removal

2. Replace them with the two spacers provided with the Adaptor board as shown in Figure 3-2

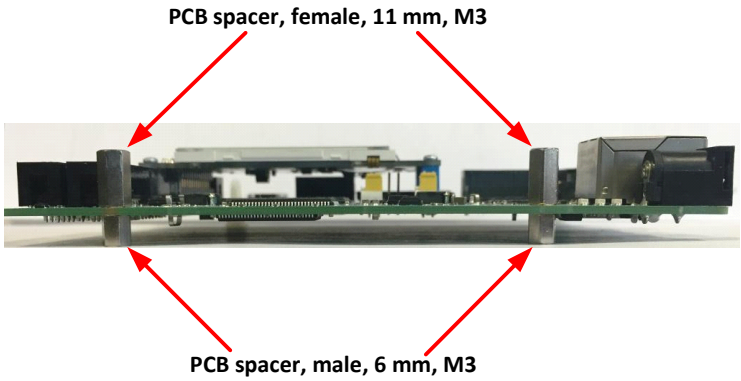


Figure 3-2 Spacers replacement

3. Install plastic standoff (Hex Standoff M3 Nylon 11MM) on Adapter board and fix it with screw (Screw, steel, 6mm, M3) (Figure 3-3).

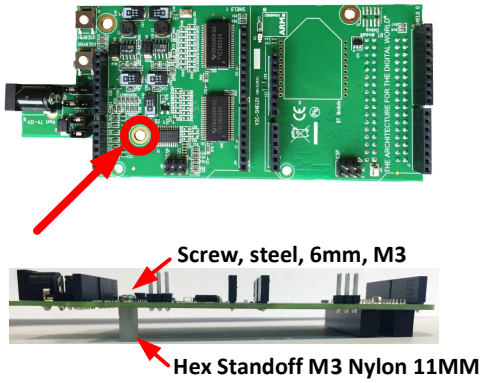


Figure 3-3 Plastic standoff

4. Place the Adapter for Arduino board on the expansion port of MPS2 Motherboard, and fix it with two screws (Screw, steel, 6mm, M3) (Figure 3-4).

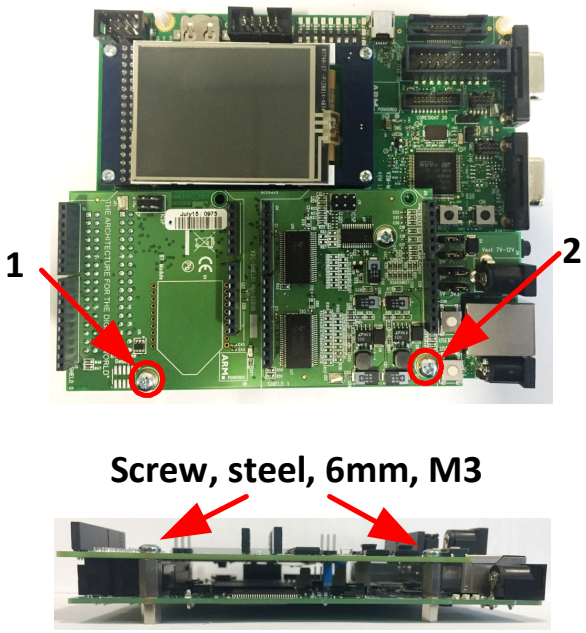


Figure 3-4 Placing Adapter board

Note that 12 volt DC supply is provided by MPS2 Motherboard via its expansion ports.

The additional power connector can be used if the maximum current level provided by the MPS2 expansion port (270 mA) is exceeded.

Functional overview

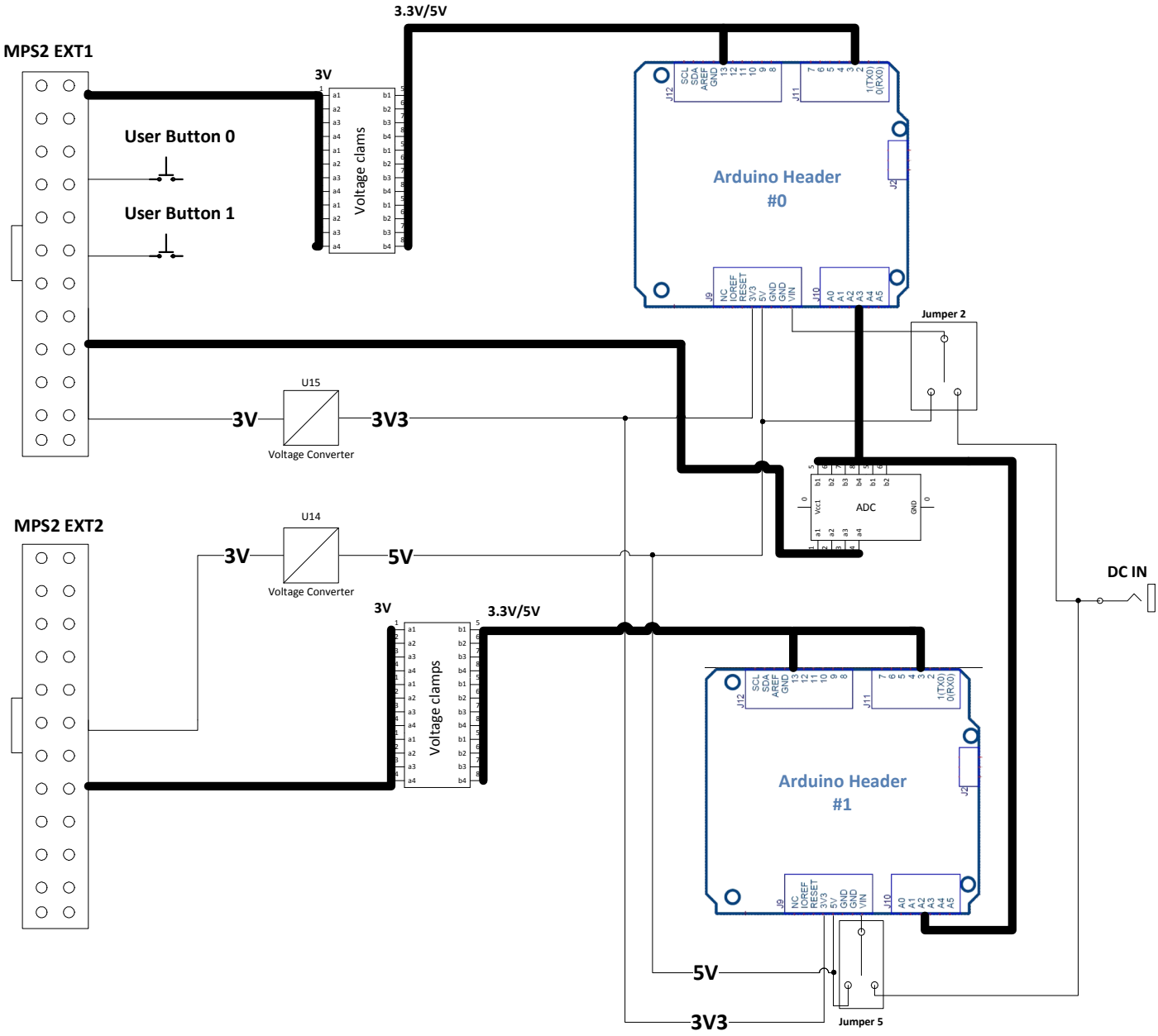


Figure 3-5 Functional Diagram

Please refer to *section* 5 for headers connectivity.

3.1 Module functionality

MPS2 EXAPANSION PORTS (EXT1/2)

MPS2 IDC expansion ports are used to connect adapter board to the MPS2 Motherboard.

ADRUINO HEADERS

Support for two Arduino form factor shield boards via Arduino R3 headers.

ADC

Include ADC for compatibility with Arduino headers.

USER BUTTONS

Two user definable push buttons directly connected the MPS2 Motherboard FPGA GPIO pins. These can be used to replace the MPS2 Motherboard buttons which are inaccessible with the Adaptor board is fitted.

VOLTAGE CLUMPS

Drives out 3V level signals to Arduino headers and converts 5V or 3V3 into 3V, required on the MPS2 motherboard.

DCIN CONNECTOR AND JUMPERS

Can be used to provide power to the Arduino Shields via the VIN pin.

Note: Care must be taken that shields do not provide power on the VIN pin if the DCIN pin is being used.

4 PIN MAPPING

The adapter supports two Arduino form factor shields via Arduino R3 headers. Pin mapping presented on Figure 4-1

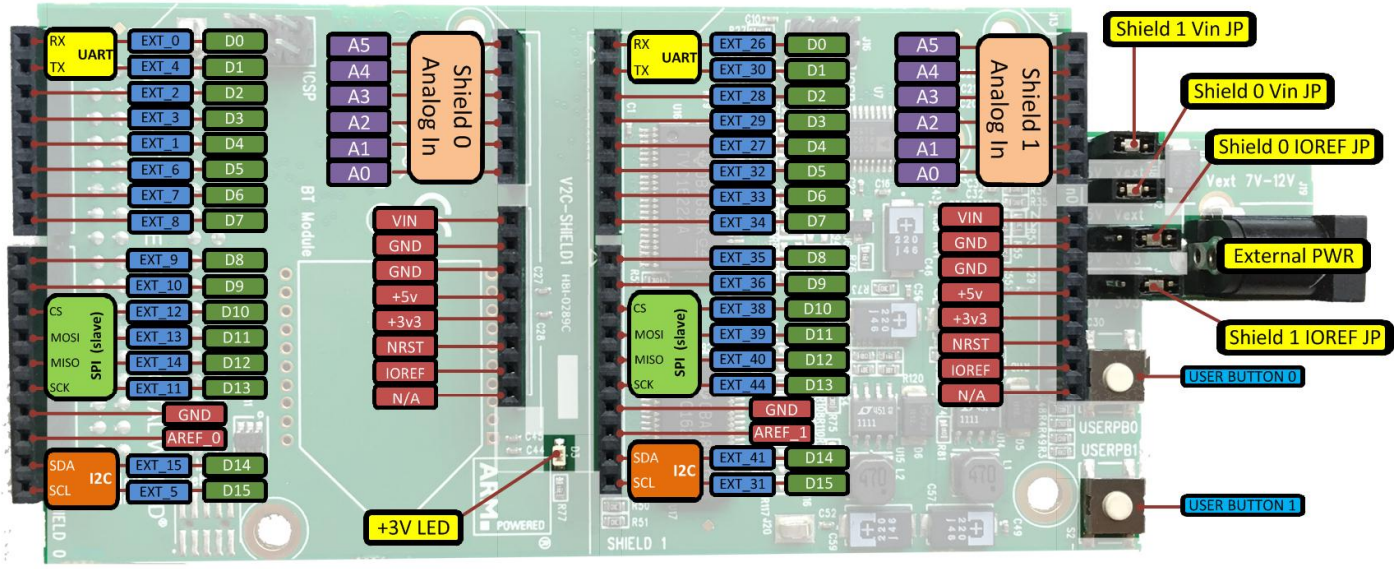


Figure 4-1 Arduino pin mapping

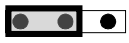
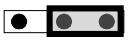
JUMPER ON BOARD	Position 1-2 	Position 1-2 
J5 (Shield 0 IOREF JP)	Shield 0 IOREF pin = 5V	Shield 0 IOREF pin = 3V3
J10 (Shield 1 IOREF JP)	Shield 1 IOREF pin = 5V	Shield 1 IOREF pin = 3V3
J2 (Shield 0 Vin JP)	Shield 0 VIN pin = 5V	Shield 0 VIN pin = Vext
J18 (Shield 0 Vin JP)	Shield 1 VIN pin = 5V	Shield 1 VIN pin = Vext

Table 4-1 Jumpers options

5 CONNECTIVITY

Table 5-1 represents connectivity between MPS2 expansion ports, Arduino headers and rest peripherals.

MPS2 Header Signal	Arduino Interface	Other Interfaces	Adaptor board signal
EXT_0	SHIELD0 D0 UART_RX		SH0_3V_IO0
EXT_1	SHIELD0 D1		SH0_3V_IO4
EXT_2	SHIELD0 D2		SH0_3V_IO2
EXT_3	SHIELD0 D3		SH0_3V_IO3
EXT_4	SHIELD0 D1 UART_TX		SH0_3V_IO1
EXT_5	SHIELD0 D15 SCL		SH0_3V_IO15
EXT_6	SHIELD0 D5		SH0_3V_IO5
EXT_7	SHIELD0 D6		SH0_3V_IO6
EXT_8	SHIELD0 D7		SH0_3V_IO7
EXT_9	SHIELD0 D8		SH0_3V_IO8
EXT_10	SHIELD0 D9		SH0_3V_IO9
EXT_11	SHIELD0 D13 SPI_SCK		SH0_3V_IO13
EXT_12	SHIELD0 D10 SPI_nCS		SH0_3V_IO10
EXT_13	SHIELD0 D11 SPI_MOSI		SH0_3V_IO11
EXT_14	SHIELD0 D12 SPI_MISO		SH0_3V_IO12
EXT_15	SHIELD0 D14 SDA		SH0_3V_IO14
EXT_16		ADC SPI nCS	ADC_CS
EXT_17		ADC SPI MISO	ADC_DOUT
EXT_18		ADC SPI MOSI	ADC_DIN
EXT_19		ADC SPI SCK	ADC_CLK
EXT_20	SHIELD0/1 NRST		nRESET_3/5V
EXT_21		USER BUTTON 0	USER_BUT_R_0
EXT_22		USER BUTTON 1	USER_BUT_R_1
EXT_23		*RESERVED*	*RESERVED*
EXT_24		*RESERVED*	*RESERVED*
EXT_25		*RESERVED*	*RESERVED*
EXT_26	SHIELD1 D1 UART RX		SH1_3V_IO0
EXT_27	SHIELD1 D4		SH1_3V_IO4
EXT_28	SHIELD1 D2		SH1_3V_IO2
EXT_29	SHIELD1 D3		SH1_3V_IO3
EXT_30	SHIELD1 D1 UART TX		SH1_3V_IO1
EXT_31	SHIELD1 D15 SCL		SH1_3V_IO15
EXT_32	SHIELD1 D5		SH1_3V_IO5
EXT_33	SHIELD1 D6		SH1_3V_IO6
EXT_34	SHIELD1 D7		SH1_3V_IO7
EXT_35	SHIELD1 D8		SH1_3V_IO8
EXT_36	SHIELD1 D9		SH1_3V_IO9
EXT_37		*RESERVED*	*RESERVED*
EXT_38	SHIELD1 D10 SPI_nCS		SH1_3V_IO10
EXT_39	SHIELD1 D11 SPI_MOSI		SH1_3V_IO11
EXT_40	SHIELD1 D12 SPI_MISO		SH1_3V_IO12
EXT_41	SHIELD1 D14 SDA		SH1_3V_IO14
EXT_42		*RESERVED*	*RESERVED*
EXT_43		*RESERVED*	*RESERVED*
EXT_44	SHIELD1 D13 SPI SCK		SH1_3V_IO13

EXT_45		*RESERVED*	*RESERVED*
EXT_46		*RESERVED*	*RESERVED*
EXT_47		*RESERVED*	*RESERVED*
EXT_48		*RESERVED*	*RESERVED*
EXT_49		*RESERVED*	*RESERVED*
EXT_50		*RESERVED*	*RESERVED*
EXT_51		*RESERVED*	*RESERVED*

Table 5-1 Connectivity