Programming Cables

User Guide

FPGA-UG-02042-26.4

May 2020

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  - 1.2 V to 5 V JTAG and SPI programming (all other cables)
  - Ideal for design prototyping and debugging
- Connect to multiple PC interfaces
  - USB (v.1.0, v.2.0)
  - PC Parallel Port
- Easy-to-use programming connectors
  - Versatile flywire, 2 x 5 (.100”) or 1 x 8 (.100”) connectors
  - 6 feet (2 meters) or more of programming cable length (PC to DUT)
- Lead-free/RoHS compliant construction

Figure 1.1. USB Cable – HW-USBN-2B

2. Programming Cables

Lattice Programming Cable products are the hardware connection for in-system programming of all Lattice devices. After you complete your logic design and create a programming file with the Lattice Diamond®/ispLEVER® Classic development tools, you can use Diamond Programmer or ispVM™ System software to program devices on your board. The ispVM System/Diamond Programmer software automatically generates the appropriate programming commands, programming addresses and programming data based on information stored in the programming file and parameters you set in Diamond Programmer/ispVM System. Programming signals are then generated from the USB or parallel port of a PC and directed through the programming cable to the device. No additional components are required for programming.

Diamond Programmer/ispVM System software is included with all Lattice design tool products and is available for download from the Lattice web site at www.latticesemi.com/programmer.

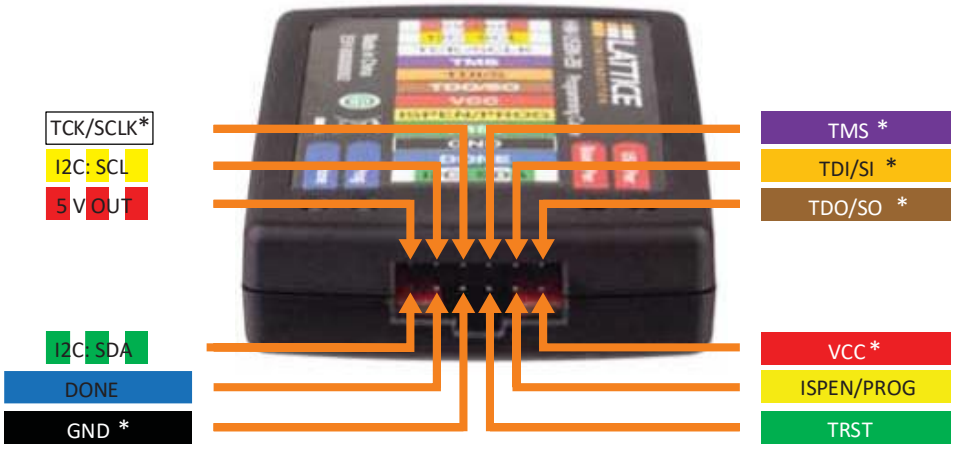
3. Programming Cable Pin Definitions

The functions provided by the programming cables correspond with available functions on Lattice programmable devices. Since some devices contain different programming features, the specific functions provided by the programming cable may depend on the selected target device. ispVM System/Diamond Programmer software automatically generates the appropriate functions based on the selected device. See Table 3.1 for an overview of the programming cable functions.

Table 3.1. Programming Cable Pin Definitions

Programming Cable Pin	Name	Programming Cable Pin Type	Description
VCC	Programming Voltage	Input	Connect to V_{CCIO} or V_{CCJ} plane of the target device. Typical ICC = 10 mA. The target board provides the V_{CC} supply/reference for the cable.
TDO/SO	Test Data Output	Input	Used to shift data out via the IEEE1149.1 (JTAG) programming standard.
TDI/SI	Test Data Input	Output	Used to shift data in via the IEEE1149.1 programming standard.
ISPEN/PROG	Enable	Output	Enable device to be programmed. Also functions as SN/SSPI Chip Select for SPI programming with HW-USBN-2B.
TRST	Test Reset	Output	Optional IEEE 1149.1 state machine reset.
DONE	DONE	Input	DONE indicates status of configuration
TMS	Test Mode Select Input	Output	Used to control the IEEE1149.1 state machine.
GND	Ground	Input	Connect to ground plane of the target device
TCK/SCLK	Test Clock Input	Output	Used to clock the IEEE1149.1 state machine
INIT	Initialize	Input	Indicates device is ready for configuration to begin. INITN is only found on some devices.
I2C: SCL*	I^2C SCL	Output	Provides the I^2C signal SCL
I2C: SDA*	I^2C SDA	Output	Provides the I^2C signal SDA.
5 V OUT*	5 V Out	Output	Provides a 5 V signal for the iCEprogM1050 Programmer.

***Note**: Only found on the HW-USBN-2B cable.



* Indicates flywire connections required for most basic JTAG programming.

Figure 3.1. Programming Cable In-System Programming Interface for the PC (HW-USBN-2B)*

***Note**: Requires Diamond Programmer 3.1 or later.

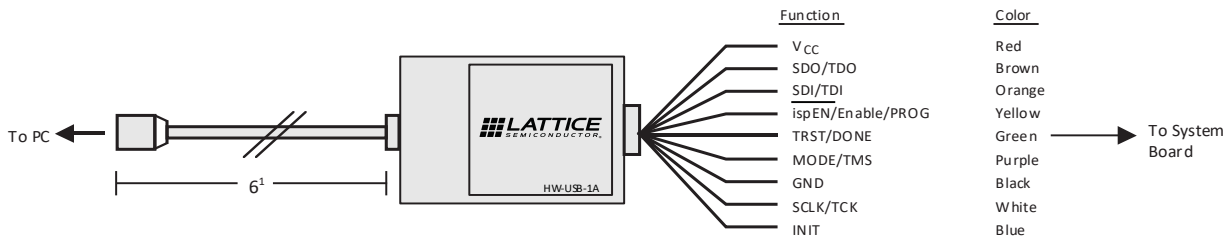


Figure 3.2. Programming Cable In-System Programming Interface for the PC (HW-USB-1A or HW-USB-2A)*

***Note**: Lattice PAC-Designer® software does not support programming with USB cables. To program ispPAC devices with these cables, use the Diamond Programmer/ispVM System software.

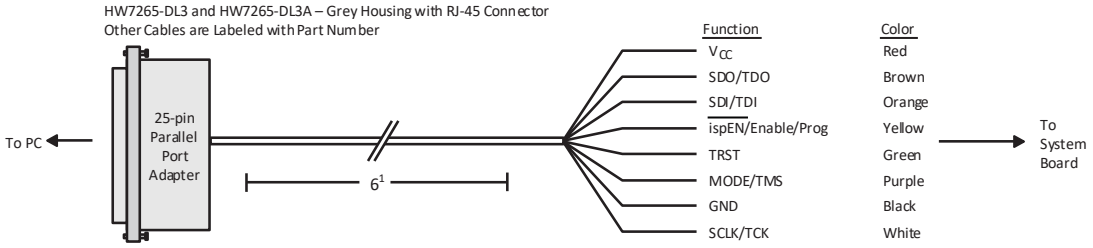


Figure 3.3. Programming Cable In-System Programming Interface for the PC (HW-DLN-3C and Equivalents)*

***Note**: HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C and HW-DLN-3C are functionally equivalent products.

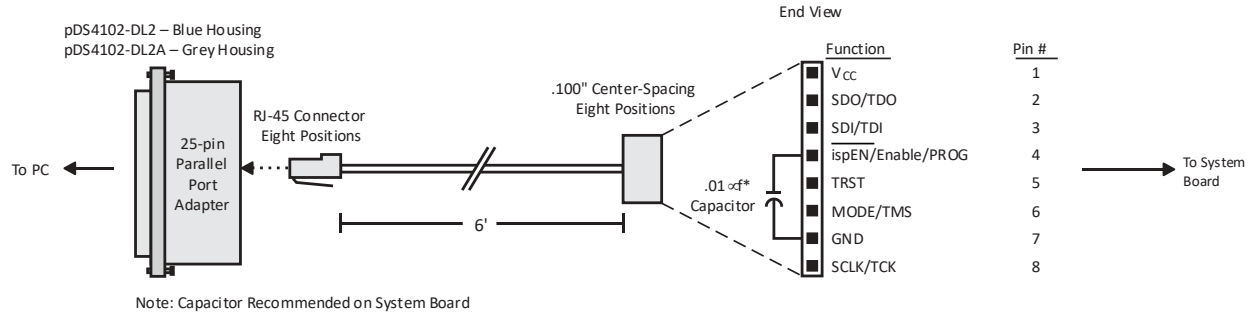


Figure 3.4. Programming Cable In-System Programming Interface for the PC (pDS4102-DL2 or pDS4102- DL2A)

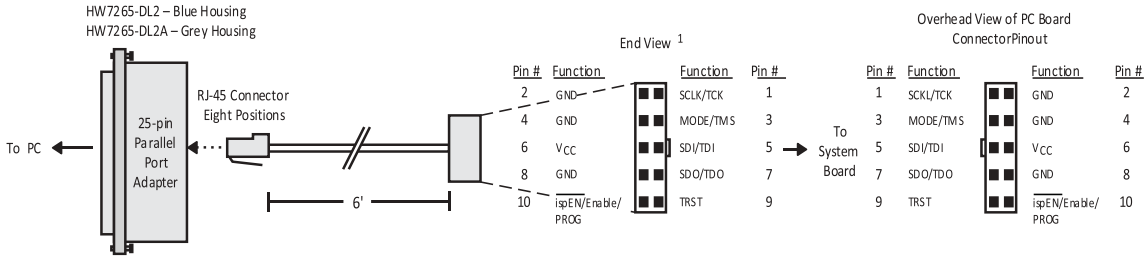


Figure 3.5. Programming Cable In-System Programming Interface for the PC (HW7265-DL2 or HW7265-DL2A)*

***Note**: For reference purposes, the 2 x 10 connector on the HW7265-DL2 or HW7265-DL2A is equivalent to Tyco 102387-1. This will interface to standard 100-mil spacing 2 x 5 headers, or a 2 x 5 keyed, recessed male connector such as the 3M N2510-5002RB.

4. Programming Software

Diamond Programmer and ispVM System for Classic devices is the preferred programming management software tool for all Lattice devices and download cables. The latest version of Lattice Diamond Programmer or ispVM System software is available for download from the Lattice web site at www.latticesemi.com/programmer.

5. Target Board Design Considerations

A 4.7 kΩ pull-down resistor is recommended on the TCK connection of the target board. This pull-down is recommended to avoid inadvertent clocking of the TAP controller induced by fast clock edges or as VCC ramps up. This pull-down is recommended for all Lattice programmable families.

The I^2C signals SCL and SDA are open drain. A 2.2 kΩ pull-up resistor to VCC is required on the target board. Only VCC values of 3.3 V and 2.5 V for I^2C are supported by the HW-USBN-2B cables.

For Lattice device families that feature low power, it is recommended to add a 500 Ω resistor between VCCJ and GND during the programming interval when a USB programming cable is connected to a very low power board design. A FAQ is available that discusses this in more depth at:
http://www.latticesemi.com/en/Support/AnswerDatabase/2/2/0/2205

The JTAG programming port speed may need to be governed when using the programming cables connected to customer PCBs. This is especially important when there is long PCB routing or with many daisy-chained devices. The Lattice programming software can adjust the timing of TCK applied to the JTAG programming port from the cable. This low-precision port setting of TCK depends on many factors, including the PC speed and the type of cable used (parallel port, USB or USB2). This software feature provides an option to slow the TCK for debug or noisy environments. A FAQ is available that discusses this in more depth at: http://www.latticesemi.com/en/Support/AnswerDatabase/9/7/974.aspx

The USB download cable can be used to program Power Manager or ispClock products with Lattice programming software. When using the USB cable with the Power Manager I devices, (POWR604, POWR1208, POWR1208P1), you must slow do TCK by a factor of 2. A FAQ is available that discusses this in more depth at:
http://www.latticesemi.com/en/Support/AnswerDatabase/3/0/306.aspx

6. Programming Flywire and Connection Reference

Refer to Table 6.1 to identify, per Lattice device, how to connect various Lattice programming cable flywires. JTAG, SPI and I^2C configuration ports are unambiguously identified. Legacy cables and hardware are included for reference. In addition, various header configurations are tabulated.

Table 6.1. Pin and Cable Reference

HW-USBN-2B Flywire color	**TDI/SI**	**TDO/SO**	**TMS**	**TCK/SCLK**	**ISPEN/PROG**	**DONE**	**TRST(OUTPUT)**	**VCC**	**GND**	**I2C: SCL**	**I2C: SDA**	**5 V Out**
	Orange	Brown	Purple	White	Yellow	Blue	Green	Red	Black	Yellow/White	Green/White	Red/White
HW-USBN-2A Flywire color	**TDI**	**TDO**	**TMS**	**TCK**	**ispEN/PROG**	**INIT**	**TRST(OUTPUT)/DONE(INPUT)**	**VCC**	**GND**	na		
	Orange	Brown	Purple	White	Yellow	Blue	Green	Red	Black			
HW-DLN-3C Flywire color	**TDI**	**TDO**	**TMS**	**TCK**	**ispEN/PROG**	**na**	**TRST(OUTPUT)**	**VCC**	**GND**	na		
	Orange	Brown	Purple	White	Yellow		Green	Red	Black			
Programming cable pin type	Output	Input	Output	Output	Output	Input	Input/Output	Input	Input	Output	Output	Output
Target Board Recommendation	—	—	4.7 kΩ Pull-Up	4.7 kΩ Pull-Down	(Note 1)	—	—	(Note 2)	—	(Note 3) (Note 6)	(Note 3) (Note 6)	—
	Connect the programming cable wires (above) to the corresponding device or header pins (below).											

JTAG Port Devices

ECP5™	TDI	TDO	TMS	TCK	*Optional connections to device ispEN, PROGRAMN, INITN, DONE and/or TRST signals (Define in Custom I/O settings in ispVM System or Diamond Programmer software. Not all devices have these pins available)*	Required	Required	—	—	—
LatticeECP3™/LatticeECP2M™ LatticeECP2™/LatticeECP™/ LatticeEC™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
LatticeXP2™/LatticeXP™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
LatticeSC™/LatticeSCM™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
MachXO2™/MachXO3™/MachXO3D™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
MachXO™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
ORCA®/FPSC	TDI	TDO	TMS	TCK		Required	Required	—	—	—
ispXPGA®/ispXPLD™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
ispMACH® 4000/ispMACH/ispLSI® 5000	TDI	TDO	TMS	TCK		Required	Required	—	—	—
MACH®4A	TDI	TDO	TMS	TCK		Required	Required	—	—	—
ispGDX2™	TDI	TDO	TMS	TCK		Required	Required	—	—	—
ispPAC®/ispClock™ (Note 4)	TDI	TDO	TMS	TCK		Required	Required	—	—	—
Platform Manager™/Power Manager/ Power Manager II/Platform Manager II (Note 4)	TDI	TDO	TMS	TCK		Required	Required	—	—	—

Table 6.1. Pin and Cable Reference *(Continued)*

HW-USBN-2B Flywire color	**TDI/SI**	**TDO/SO**	**TMS**	**TCK/SCLK**	**ISPEN/PROG**	**DONE**	**TRST(OUTPUT)**	**VCC**	**GND**	**I2C: SCL**	**I2C: SDA**	**5 V Out**
	Orange	Brown	Purple	White	Yellow	Blue	Green	Red	Black	Yellow/White	Green/White	Red/White
HW-USBN-2A Flywire color	**TDI**	**TDO**	**TMS**	**TCK**	**ispEN/PROG**	**INIT**	**TRST(OUTPUT)/DONE(INPUT)**	**VCC**	**GND**	na		
	Orange	Brown	Purple	White	Yellow	Blue	Green	Red	Black			
HW-DLN-3C Flywire color	**TDI**	**TDO**	**TMS**	**TCK**	**ispEN/PROG**	**na**	**TRST(OUTPUT)**	**VCC**	**GND**	na		
	Orange	Brown	Purple	White	Yellow		Green	Red	Black			
Programming cable pin type	Output	Input	Output	Output	Output	Input	Input/Output	Input	Input	Output	Output	Output
Target Board Recommendation	—	—	4.7 kΩ Pull-Up	4.7 kΩ Pull-Down	(Note 1)	—	—	(Note 2)	—	(Note 3) (Note 6)	(Note 3) (Note 6)	—
	Connect the programming cable wires (above) to the corresponding device or header pins (below).											
Slave SPI Port Devices												
ECP5	MOSI	MISO	—	CCLK	SN	*Optional connections to device PROGRAMN, INITN and/or DONE signals*		Required	Required	—	—	—
LatticeECP3	MOSI	MISO	—	CCLK	SN			Required	Required	—	—	—
MachXO2/MachXO3/MachXO3D	SI	SO	—	CCLK	SN			Required	Required	—	—	—
CrossLink™ LIF-MD6000	MOSI	MISO	—	SPI_SCK	SPI_SS	*Opt. CDONE*	CRESET_B	Required	Required	—	—	—
iCE40™/iCE40LM/iCE40 Ultra™/ iCE40 UltraLite™	SPI_SI	SPI_SO	—	SPI_SCK	SPI_SS_B	*Opt. CDONE*	CRESET_B	Required	Required	—	—	—
I²C Port Devices												
MachXO2/MachXO3/MachXO3D	—	—	—	—	*Optional connections to device PROGRAMN, INITN and/or DONE signals*			Required	Required	SCL	SDA	—
Platform Manager II	—	—	—	—				Required	Required	SCL_M + SCL_S	SDA_M + SDA_S	—
L-ASC10	—	—	—	—	—	—	—	Required	Required	SCL	SDA	—
CrossLink LIF-MD6000	—	—	—	—	—	*Opt. CDONE*	CRESET_B	Required	Required	SCL	SDA	—
Headers												
1 x 10 conn (various cables)	3	2	6	8	4	9 or 10	5 or 9	1	7	—	—	—
1 x 8 conn (see Figure 3.4)	3	2	6	8	4	—	5	1	7	—	—	—
2 x 5 conn (see Figure 3.5)	5	7	3	1	10	—	9	6	2, 4,or 8	—	—	—
Programmers												
Model 300	5	7	3	1	10	—	9	6	2, 4,or 8	—	—	—
iCEprog™ iCEprogM1050	8	5	—	7	9	3	1	6	10	—	—	4 (Note 5)

Notes:

1. For older Lattice ISP devices, a 0.01 µF decoupling capacitor is required on ispEN/ENABLE of the target board.
2. For HW-USBN-2A/2B, the target board supplies the power - Typical ICC = 10 mA. For devices that have a VCCJ pin, the VCCJ must be connected to the cable's VCC. For other devices, connect the appropriate bank VCCIO to the cable's VCC. A 0.1 µF decoupling capacitor is required on VCCJ or VCCIO close to the device. Please refer to the device data sheet to determine if the device has a VCCJ pin or what VCCIO bank governs the target programming port (this may not be the same as a target device's core VCC/VSS plane).
3. Open drain signals. Target board should have ~2.2 kΩ pull-up resistor connected to the same plane to which VCC is connected. HW-USBN-2B cables provide internal 3.3 kΩ pull-ups to VCC.
4. When using PAC-Designer® software to program ispPAC or ispClock devices, do not connect TRST/DONE.
5. If using a cable older than HW-USBN-2B, connect a +5 V external supply between iCEprogM1050 pin 4 (VCC) and pin 2 (GND).
6. For HW-USBN-2B, only VCC values of 3.3 V thru 2.5 V are supported for I^2C.

7. Connecting the Programming Cable

The target board must be unpowered when connecting, disconnecting, or reconnecting the programming cable. Always connect the programming cable's GND pin (black wire) before connecting any other JTAG pins. Failure to follow these procedures can result in damage to the target programmable device.

8. Programming Cable TRST Pin

Connecting the board TRST pin to the cable TRST pin is not recommended. Instead, connect the board TRST pin to Vcc. If the board TRST pin is connected to the cable TRST pin, instruct ispVM/Diamond Programmer to drive the TRST pin high.

To configure ispVM/Diamond Programmer to drive TRST pin high:

1. Select the **Options** menu item.
2. Select **Cable and I/O Port Setup**.
3. Select the **TRST/Reset Pin Connected** checkbox.
4. Select the **Set High** radio button.

If the proper option is not selected, the TRST pin is driven low by ispVM/Diamond Programmer. Consequently, the BSCAN chain does not work because the chain is locked into RESET state.

9. Programming Cable ispEN Pin

The following pins should be grounded:

- BSCAN pin of the 2000VE devices
- ENABLE pin of MACH4A3/5-128/64, MACH4A3/5-64/64 and MACH4A3/5-256/128 devices.

However, you have the option of having the BSCAN and ENABLE pins driven by the ispEN pin from the cable. In this case, ispVM/Diamond Programmer must be configured to drive the ispEN pin low as follows:

To configure ispVM/Diamond Programmer to drive ispEN pin low:

1. Select the **Options** menu item.
2. Select **Cable and I/O Port Setup**.
3. Select the **ispEN/BSCAN Pin Connected** checkbox.
4. Select the **Set Low** radio button.

Each programming cable ships with two small connectors that help you keep the flywires organized. The following manufacturer and part number is one possible source for equivalent connectors:

- 1 x 8 Connector (for example, Samtec SSQ-108-02-T-S)
- 2 x 5 Connector (for example, Samtec SSQ-105-02-T-D)

The programming cable flywire or headers are intended to connect to standard 100-mil spacing headers (pins spaced 0.100 inch apart). Lattice recommends a header with length of 0.243 inches or 6.17 mm. Though, headers of other lengths may work equally well.

10. Ordering Information

Table 10.1. Programming Cable Feature Summary

Feature	HW-USBN-2B	HW-USBN-2A	HW-USB-2A	HW-USB-1A	HW-DLN-3C	HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C	HW7265-DL2	HW7265-DL2A	PDS4102-DL2	PDS4102-DL2A
USB	X	X	X	X	—	—	—	—	—	—
PC-Parallel	—	—	—	—	X	X	X	X	X	X
1.2 V Support	X	X	X	—	—	—	—	—	—	—
1.8 V Support	X	X	X	X	X	X	—	X	—	X
2.5-3.3 V Support	X	X	X	X	X	X	X	X	X	X
5.0 V Support	—	X	X	X	X	X	X	X	X	X
2 x 5 Connector	—	X	X	X	X	X	X	X	—	—
1 x 8 Connector		X	X	X	X	X	—	—	X	X
Flywire	X	X	X	X	X	X	—	—	—	—
Lead-free Construction	X	X	—	—	X	—	—	—	—	—
Available for order	X	—	—	—	X	—	—	—	—	—

Table 10.2. Ordering Information

Description	Ordering Part Number	China RoHS Environment- Friendly Use Period (EFUP)
Programming cable (USB). Contains 6' USB cable, flywire connectors, 8-position (1 x 8) adapter and 10-position (2 x 5) adapter, lead-free, RoHS compliant construction.	HW-USBN-2B	
Programming cable (PC only). Contains parallel port adapter, 6' cable, flywire connectors, 8-position (1 x 8) adapter and 10-position (2 x 5) adapter, lead-free, RoHS compliant construction.	HW-DLN-3C	

Note: Additional cables are described in this document for legacy purposes only, these cables are no longer produced. The cables currently available for order are fully equivalent replacement items.

Appendix A. Troubleshooting the USB Driver Installation

It is essential that you install the drivers before connecting your PC to the USB cable. If the cable is connected before installing the drivers, Windows will try to install its own drivers that may not work.

If you have attempted to connect the PC to the USB cable without first installing the appropriate drivers, or have trouble communicating with the Lattice USB cable after installing the drivers, follow the steps below:

1. Plug in the Lattice USB cable. Choose **Start > Settings > Control Panel > System**.
2. In the **System Properties** dialog box, click the **Hardware** tab and **Device Manager** button. Under **Universal Serial Bus controllers**, you should see **Lattice USB ISP Programmer**. If you do not see this, look for the **Unknown Device** with the yellow flag. Double click on the **Unknown Device** icon.

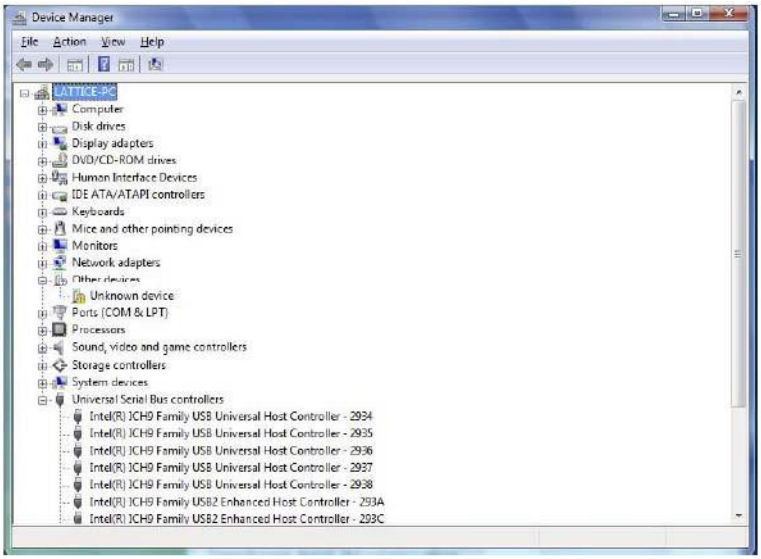


Figure A.1. Device Manager

3. In the **Unknown device Properties** dialog box, click **Reinstall Driver**.

Figure A.2. Unknown Device Properties

4. Select **Browse my computer for driver software**.

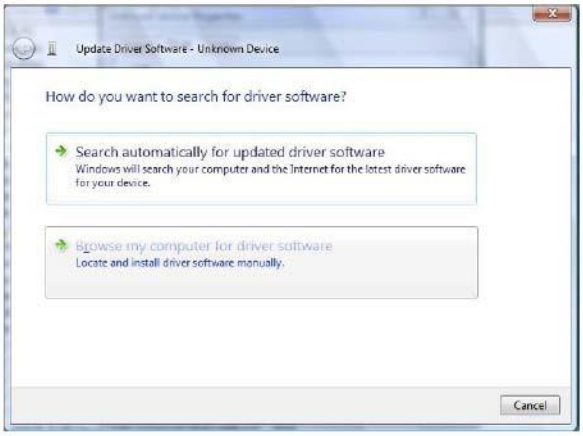


Figure A.3. Update Driver Software

Browse to the **isptools\ispvmsystem** directory for the Lattice EzUSB driver.

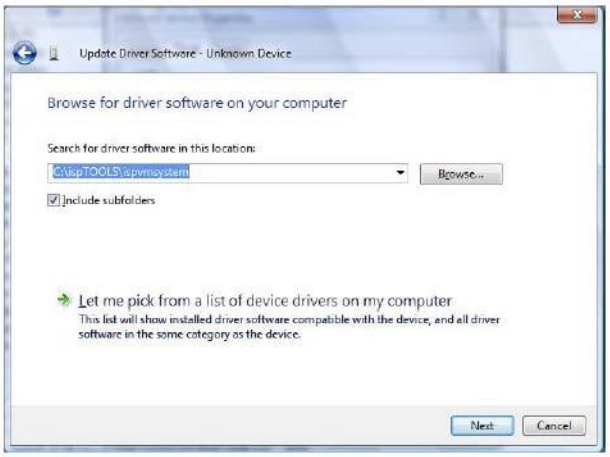


Figure A.4. Lattice EzUSB Driver

Browse to the **isptools\ispvmsystem\Drivers\FTDIUSBDriver** directory for the FTDI FTUSB driver.

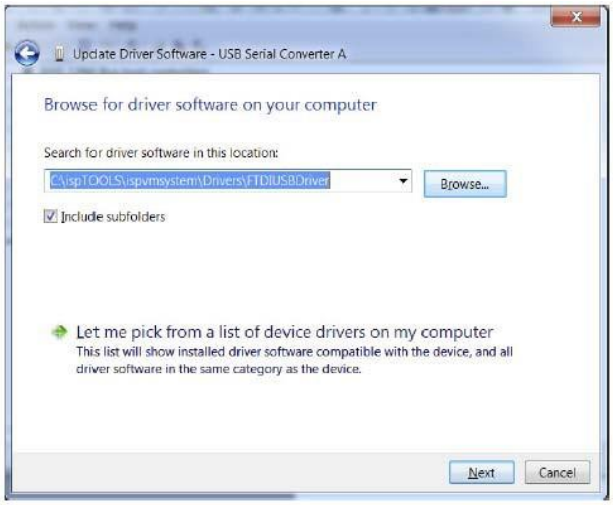


Figure A.5. FTDI FTUSB Driver

5. For Diamond installations, browse to **lscc/diamond/data/vmdata/drivers**. Click **Next**.
6. Select **Install this Driver software anyway**. The system updates the driver.

Figure A.6. Windows Security

7. Click **Close** and finish installing the USB driver.

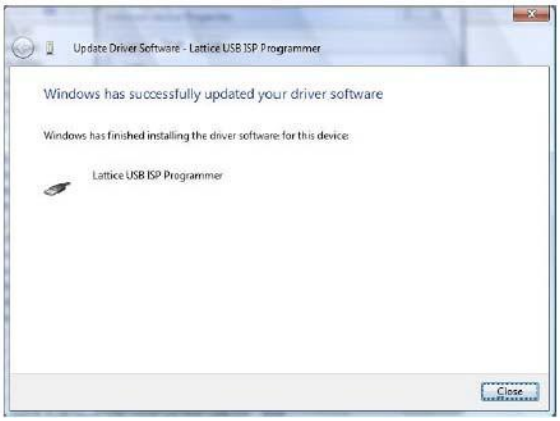


Figure A.7. USB Installation Completed

8. Under **Control Panel >System >Device Manager > Universal Serial Bus Controllers** should include the following:
   For the Lattice EzUSB Driver: Lattice USB ISP Programmer device installed.

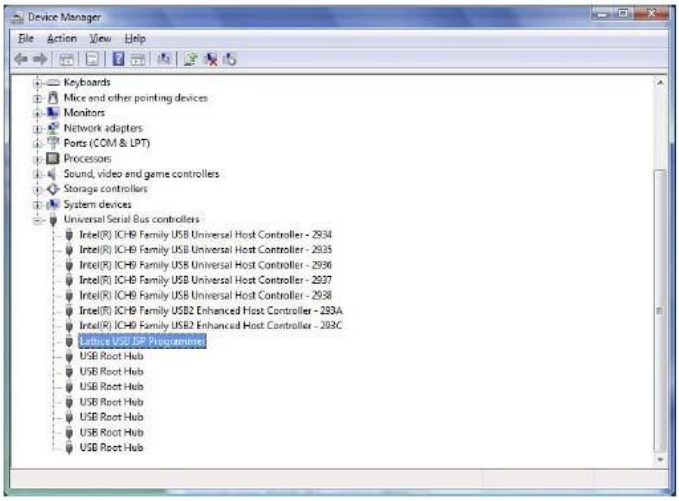


Figure A.8. Installation Completed

For the FTDI FTUSB Driver: USB Serial Converter A and Converter B devices installed.

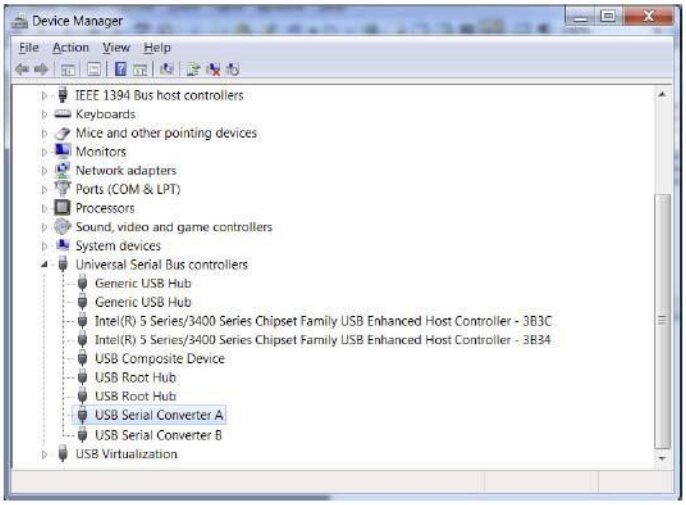


Figure A.9. Installation Completed

If you are experiencing problems or need additional information, contact Lattice Technical Support.

Technical Support

For assistance, submit a technical support case at www.latticesemi.com/techsupport.

Revision History

Revision 26.4, May 2020

Section	Change Summary
Programming Cables	Updated Lattice website link to www.latticesemi.com/programmer.
Programming Software	

Revision 26.3, October 2019

Section	Change Summary
Target Board Design Considerations; Programming Flywire and Connection Reference	Clarified VCC values that I^2C interface supports. Added notes to Table 6.1.

Revision 26.2, May 2019

Section	Change Summary
—	Added Disclaimers section.

Programming Flywire and Connection Reference	Updated Table 6.1. Pin and Cable Reference.
	• Added MachXO3D
	• Added CRESET_B to Crosslink I^2C.
	• Updated items under I^2C Port Devices
	  • Added Platform Manager II.
	  • Changed order of ispPAC.
	• Updated items under I^2C Port Devices.
	  • Changed Power Manager II to Platform Manager II and updated I2C: SDA value.
	  • Changed ASC to L-ASC10
	• Updated footnote 4 to include ispClock devices.
	• Adjusted trademarks.

Revision History	Updated format.
Back cover	Updated template.
—	Minor editorial changes

Revision 26.1, May 2018

Section	Change Summary
All	Corrected entries in the Slave SPI Port Devices section of Table 6.1.

Revision 26.0, April 2018

Section	Change Summary
All	• Changed document number from UG48 to FPGA-UG-02024. • Updated document template.
Programming Cables	Removed redundant information and changed link to www/latticesemi.com/software.
Programming Cable Pin Definitions	Updated Programming Cable Pin names in Table 3.1. Programming Cable Pin Definitions.
Programming Flywire and Connection Reference	Replaced Table 2. Flywire Conversion Reference and Table 3 Recommended Pin Connections with a single Table 6.1 Pin and Cable Reference.
Ordering Information	Moved Table 10.1. Programming Cable Feature Summary under Ordering Information.

Revision 25.0, November 2016

Section	Change Summary
Programming Flywire and Connection Reference	Revised Table 3, Recommended Pin Connections. Added CrossLink device.

Revision 24.9, October 2015

Section	Change Summary
Programming Flywire and Connection Reference	Revised Table 3, Recommended Pin Connections. • Added CRESET-B column. • Added iCE40 UltraLite device.
Technical Support Assistance	Updated Technical Support Assistance information.

Revision 24.8, March 2015

Section	Change Summary
Programming Cable Pin Definitions	Revised description of INIT in Table 1, Programming Cable Pin Definitions.

Revision 24.7, January 2015

Section	Change Summary
Programming Cable Pin Definitions	• In Table 1, Programming Cable Pin Definitions, ispEN/Enable/PROG changed to ispEN/Enable/PROG/SN and its description revised. • Updated Figure 2, Programming Cable In-System Programming Interface for the PC (HW-USBN-2B).
Programming Cable ispEN Pin	In Table 4, Programming Cable Feature Summary, HW-USBN-2B marked as available for order.
Ordering Information	HW-USBN-2A changed to HW- USBN-2B.

Revision 24.6, July 2014

Section	Change Summary
All	Changed document title from ispDOWNLOAD Cables to Programming Cables User's Guide.
Programming Cable Pin Definitions	Updated Table 3, Recommended Pin Connections. Added ECP5, iCE40LM, iCE40 Ultra, and MachXO3 device families.
Target Board Design Considerations	Updated section. Updated FAQ link on ispVM tool control of TCK duty cycle and/or frequency.
Technical Support Assistance	Updated Technical Support Assistance information.

Revision 24.5, October 2012

Section	Change Summary
Programming Flywire and Connection Reference	Added iCE40 configuration port pin names to the Flywire Conversion Reference table.
Programming Flywire and Connection Reference	Added iCE40 information to Recommended Cable Connections table.

Revision 24.4, February 2012

Section	Change Summary
All	Updated document with new corporate logo.

Revision 24.3, November 2011

Section	Change Summary
All	Document transferred to user's guide format.
Features	Added Figure USB Cable – HW-USBN-2A.
Programming Flywire and Connection Reference	Updated Recommended Cable Connections table for MachXO2 devices.
Target Board Design Considerations	Updated section.
Appendix A	Added section.

Revision 24.2, October 2009

Section	Change Summary
All	Added information related to the physical specifications of the flywire connectors.

Revision 24.1, July 2009

Section	Change Summary
All	Added Target Board Design Considerations text section.
Programming Flywire and Connection Reference	Added section heading.

Previous Revisions

Section	Change Summary
—	Previous Lattice releases.

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