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XDS560v2 System Trace JTAG Emulator

Technical Reference

2010 ***DSP Development Systems***

XDS560v2 System Trace
JTAG Emulator
Technical Reference

512105-0001 Rev. C
August 2010

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About This Manual

This document describes the module level operations of the XDS560v2 System Trace JTAG Emulator. This emulator is designed to be used with digital signal processors (DSPs) and microcontrollers designed by Texas Instruments.

The XDS560v2 System Trace JTAG Emulator is a table top module that attaches to a personal computer or laptop to allow hardware engineers and software programmers to develop applications with DSPs and microcontrollers.

Notational Conventions

This document uses the following conventions.

The XDS560v2 System Trace JTAG Emulator will sometimes be referred to as the XDS560v2 STM, XDS560v2 System Trace Module, JTAG Emulator, or Emulator.

Program listings, program examples, and interactive displays are shown is a special italic typeface. Here is a sample program listing.

equations
!rd = !strobe&rw;

Information About Cautions

This book may contain cautions.
This is an example of a caution statement.
A caution statement describes a situation that could potentially damage your software, or hardware, or other equipment. The information in a caution is provided for your protection. Please read each caution carefully.

Related Documents

- Texas Instruments document SPRU655d.pdf

- MIPI Alliance Recommendation for Test and Debug: Debug and MIPI System Trace Connectors, Version 1.00.00, 5 June 2007

Chapter 1

Introduction to the XDS560v2 STM JTAG Emulator

This chapter provides you with a description of the XDS560v2 STM JTAG Emulator along with the key features.

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1.0	**Overview of the XDS560v2 STM JTAG Emulator**	**1-2**
1.1	**Key Features of the XDS560v2 STM JTAG Emulator**	**1-2**
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1.0 Overview of the XDS560v2 STM JTAG Emulator

The XDS560v2 STM JTAG Emulator is designed to be used with digital signal processors (DSPs) and microprocessors which operate from +1.2 to +4.1 volt levels on the JTAG interface. The power for the emulator comes from the provided supply. This means no power is drawn from the target system or host PC.

The XDS560v2 STM is designed to be compatible with the existing Texas Instruments XDS560 emulator and operates with debuggers provided by Texas Instruments.

1.1 Key Features of the XDS560v2 STM JTAG Emulator

The XDS560v2 STM JTAG Emulator has the following features:

- Supports Texas Instrument's Digital Signal Processors with JTAG interface (IEEE 1149.1)
- Modular tail connector for alternate JTAG headers.
- Advanced emulation controller provides high performance.
- MIPI System Trace capability for advanced development.
- Ethernet communications to host PC.
- USB 2.0 communications to host PC.
- Supports +1.2 volt to +4.1 volt JTAG interfaces.
- 1 power LED
- 6 LEDs for operational status.
- 2 LEDs for ethernet status.
- User accessible RESET switch
- Power provided by +5 volt supplied power supply
- Compatible with Texas Instruments Code Composer Studio, DSP BIOS, and RTDX
- Compatible with Windows 2000/XP/Vista Operating Systems

1.2 Key Items on the XDS560v2 STM JTAG Emulator

Figure 1-1 shows the XDS560v2 STM. The key items identified are:

- Status LEDs
- JTAG Header
- Emulator Tail Assembly
- USB connector to the host PC or hub
- Ethernet connector to the host PC or router
- Power connector to power supply



Figure 1-1, KEY ITEMS ON THE XDS560v2 STM

Chapter 2

Installing the XDS560v2 STM JTAG Emulator

This chapter helps you install the XDS560v2 STM JTAG Emulator. For use with specific software packages such as the TI's Code Composer Studio refer to their respective documentation.

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2.1 What You'll Need

The following checklists detail items that are shipped with the XDS560v2 STM JTAG emulator and additional items you'll need to use these tools.

Hardware checklist

__ **host computer** An IBM PC/AT or 100% compatible PC or laptop running Windows XP/2000/Vista with the following peripherals:

- 2 GB of free hard disk space
- Minimum 1 GB ram, 2 GB recommended
- Minimum 1.5 GHz., dual core recommended
- Color display
- Internet access
- USB port
- Ethernet port
- DVD reader

__ **emulator module** XDS560v2 STM JTAG emulator with power supply, USB or ethernet cable

__ **target system** A board with a TI DSP or Microcontroller and power supply

__ **optional adapters to target system, included** TI 14-pin (2x7), 20-pin CTI (2x10), 60 pin TI, ARM 20 pin connector to MIPI 60 pin interface

Software checklist

Please refer to the Quick Start Guide for the specific requirements of the software development tool chain you are using.

2.2 Installing the XDS560v2 STM JTAG Emulator

The next three sections describe the steps for installing the XDS560v2 STM JTAG Emulator to interface to a PC or laptop via ethernet or USB.

WARNING !

Target Cable Connectors:

Be very careful with the target cable connectors. connect them gently; don't force them into position, or you may damage the connectors.

Do **not** connect or disconnect the emulator tail while the target system is powered up.

Installing the XDS560v2 STM JTAG emulator is a three step process:

1. Installing the Code Composer Studio software
2. Configuring the emulator tail with correct target adapter
3. Installing the USB or Ethernet connection to the host PC

2.2.1 Installing Code Composer Studio Software

Code Composer Studio should be installed before starting the hardware installation. Please refer to the separate software Installation guide for the installation of Code Composer Studio and XDS560v2 STM device drivers.

If you are doing a custom driver installation make sure the CD ROM is installed in the CD-ROM drive on your PC.

2.2.2 Configuring the Emulator Tail

The emulator tail is the physical interface between the emulator and target board. The tail configuration will consist of 3 parts:

A - Emulator tail header
B - Emulator tail header to MIPI 60 pin adapter
C - MIPI 60 to target JTAG connector adapter
    MIPI 60 to 20 pin CTI - *installed at the factory*
    MIPI 60 to TI 14 pin
    MIPI 60 to TI 60 pin
    MIPI 60 to ARM 20 pin

The female JTAG connector attached to the end of the emulator tail plugs onto the target's male pin header. The figure below shows how the XDS560v2 STM emulator header plugs onto the target's JTAG header

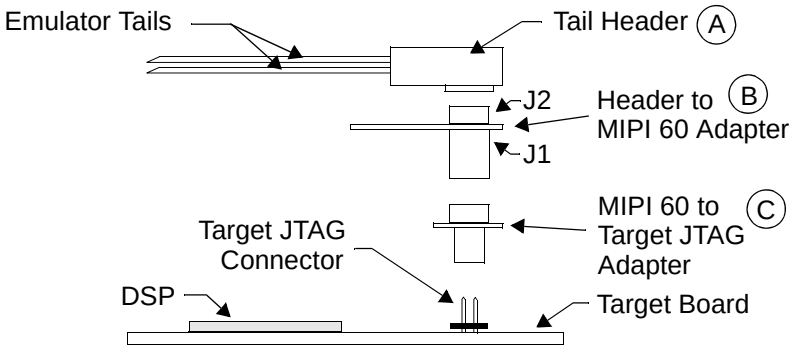


Figure 2-1, Connecting the XDS560v2 STM JTAG Emulator to the DSP Target Board

The figure below shows the factory installed configuration, MIPI60 to CTI20.

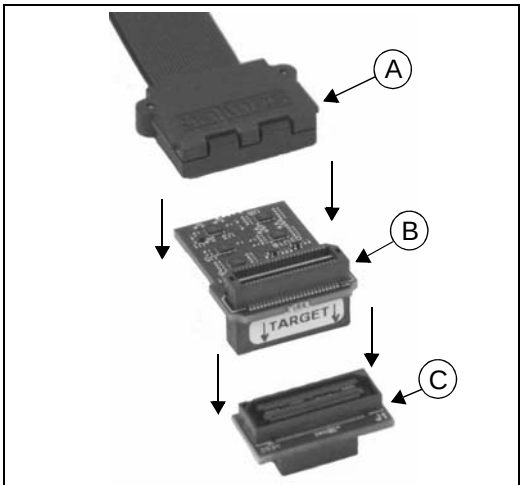


Figure 2-2, Tail plugs into MIPI60 which plugs into CTI20 Adapter

These 4 adapters which come with the XDS560v2 STM are shown in the figure below.

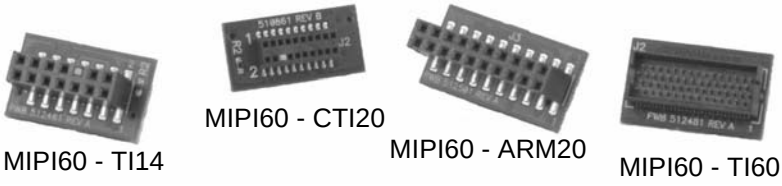


Figure 2-3, MIPI 60 to Target Connector Adapters

2.2.3 XDS560v2 STM Ethernet/USB Installation Checklist

The following section provides instructions to install the XDS560v2 STM JTAG emulator using the Ethernet or USB interface. To install the XDS560v2 STM JTAG emulator using the Ethernet or USB interface execute the following checklist:

❏ Turn off the power to your target board.

❏ The XDS560v2 STM may be connected to the host PC via Ethernet and/or USB. Connect the supplied Ethernet or USB cable to your PC or laptop. The XDS560v2 STM may be used with an Ethernet router or **powered** USB hub.

❏ Connect the other end of the Ethernet or USB cable to the XDS560v2 STM.

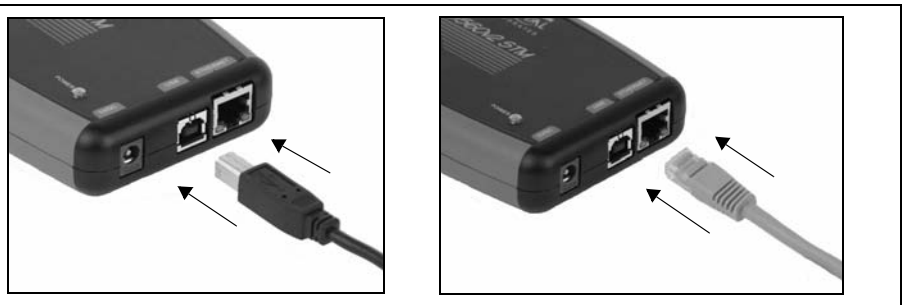


Figure 2-4, Connecting the Ethernet and/or USB Cable to XDS560v2 STM

❏ Connect the included +5V power supply to your wall AC power source using the AC power cord.

❑ Apply power to the XDS560v2 STM by connecting the power supply to the +5V input on the XDS560v2 STM located at the rear of the emulator.



Figure 2-5, Applying Power to XDS560v2 STM

When power is connected the “PWR” LED on the XDS560v2 STM should illuminate. After about 45 seconds LEDs “State 2”, “State 3” should come on. At this point the XDS560v2 STM has booted its operating system and is ready for connecting via USB or Ethernet.

If this is the first connection over the USB the Windows Hardware Wizard should find the XDS560v2 STM and install its USB drivers.

The figure below shows the Ethernet or USB cable, and power cord plugged into the XDS560v2 STM.

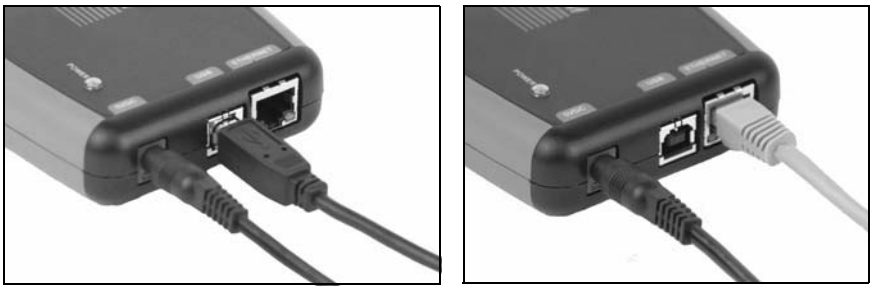
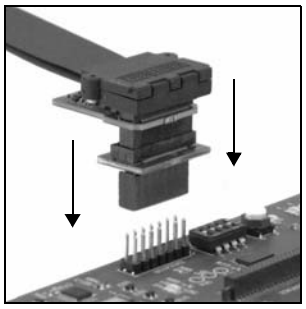


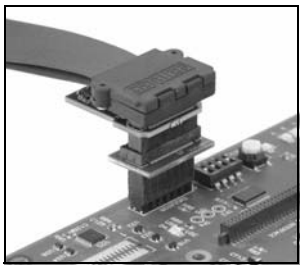
Figure 2-6, USB Cable and Power Cord Attached to XDS560v2 STM

❑ Now connect the tail of the emulator to the JTAG header on your target board. If your target board requires a different interface than the generic 60 pin header on the tail, attach one of the header adapters as required.

Caution should be used in the routing of the tail ribbon cable to insure it does not go near the processor(s), power traces, or power cords.



Align the emulator tail over the target connector, then push down



Emulator tail attached to target

Figure 2-7, Attaching the XDS560v2 STM Emulator Tail To Target

❑ Apply power to the target board.

❑ Your system configuration should be similar to the one in Figures 2-8 through Figure 2-11.

Figures 2-8 and 2-9 show typical configurations in which the XDS560v2 STM can be used with a host PC and target board via the USB interface.

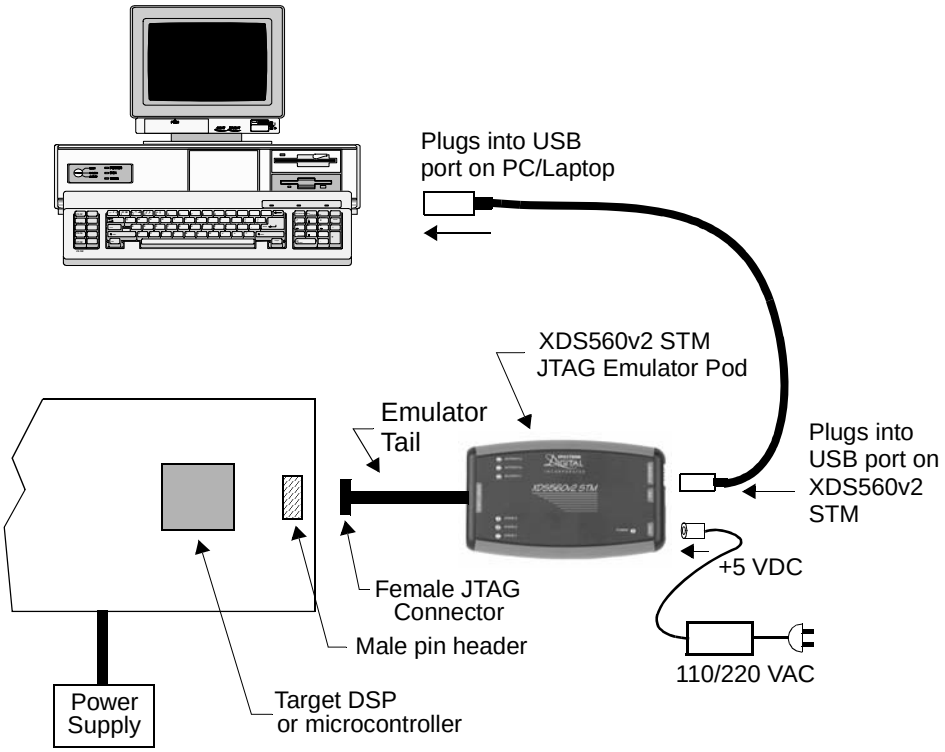


Figure 2-8, Connecting the XDS560v2 STM To Your Target System

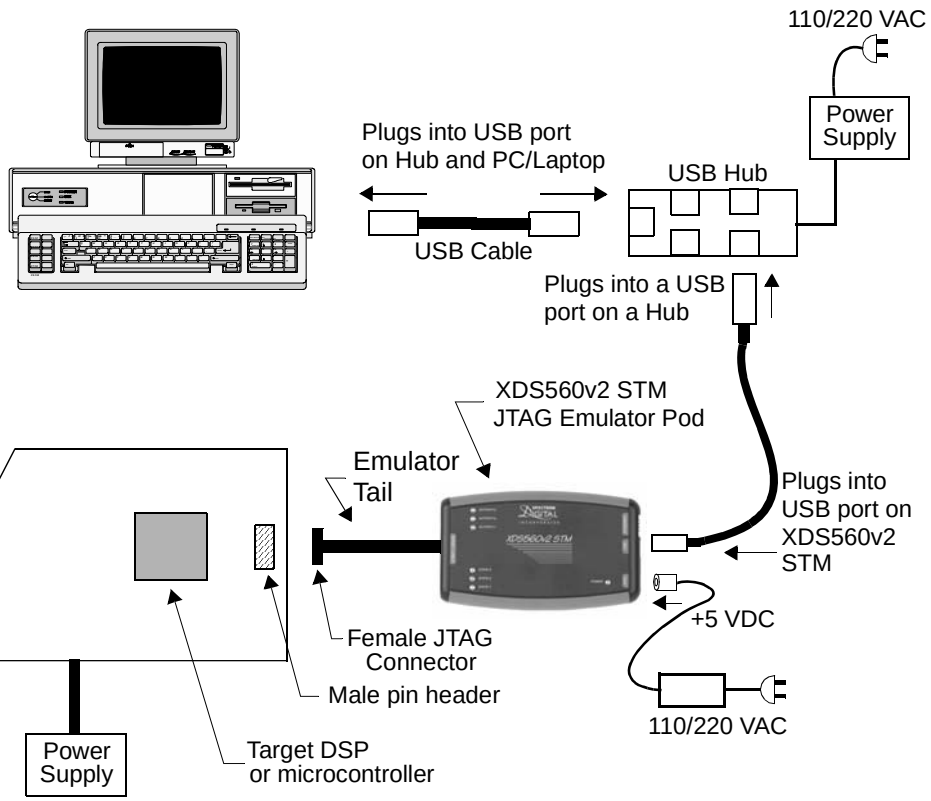


Figure 2-9, Connecting the XDS560v2 STM Through a USB Hub

Figures 2-10 and 2-11 show two typical configurations in which the XDS560v2 STM can be used with a host PC and target board via the Ethernet interface.

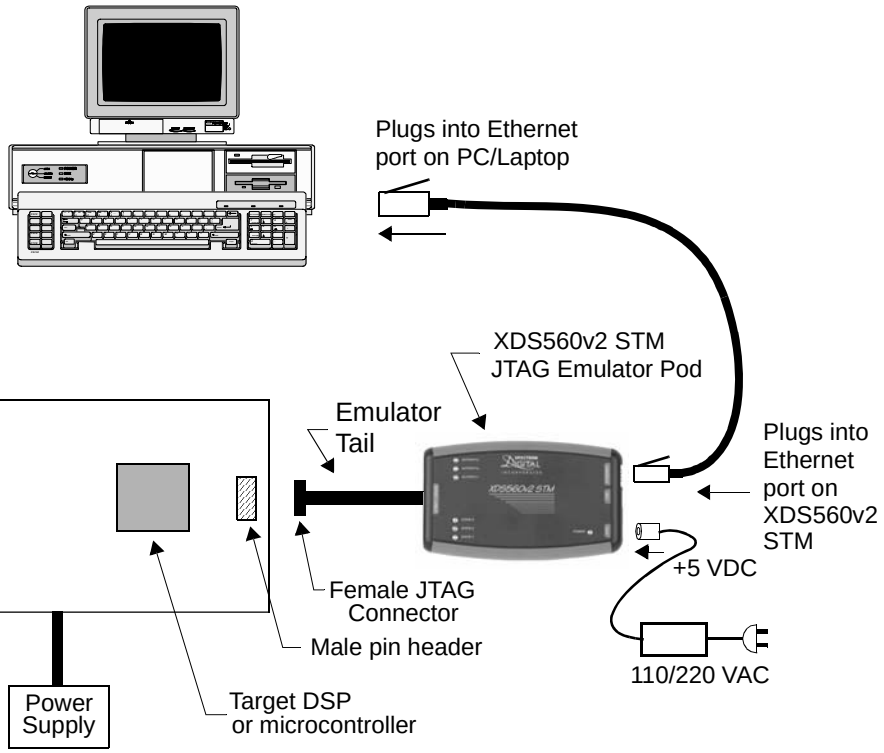


Figure 2-10, Connecting the XDS560v2 STM To Your Target System

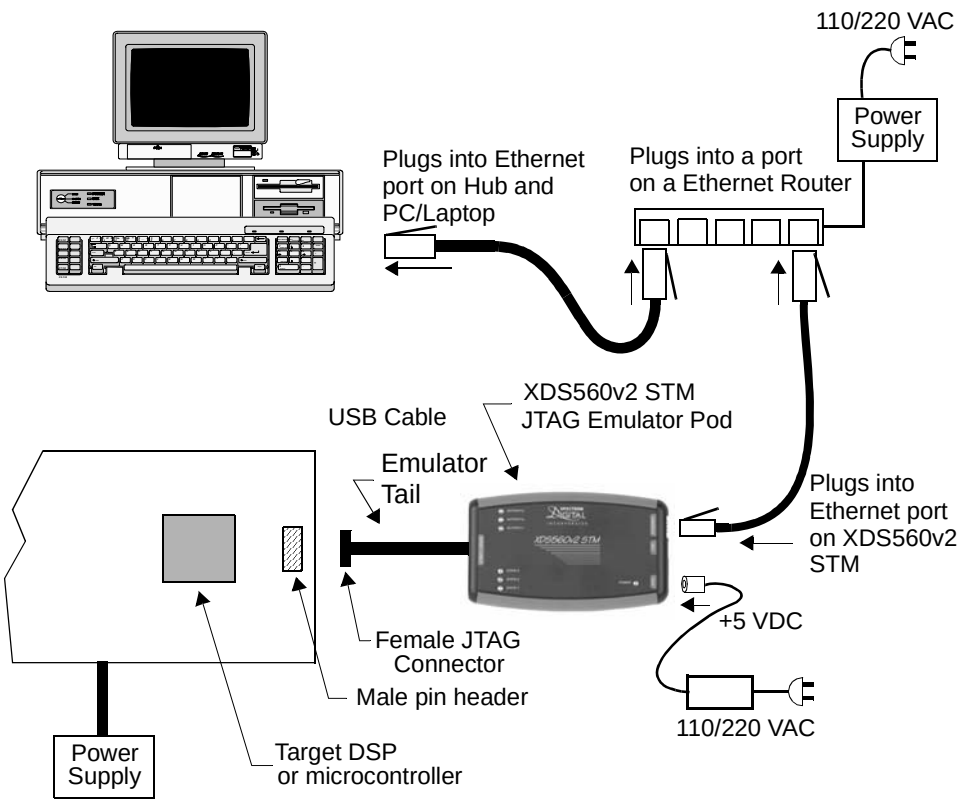


Figure 2-11, Connecting the XDS560v2 STM Through a Ethernet Hub

2.3 XDS560v2 STM LEDs

The XDS560v2 STM has nine (9) Light Emitting Diodes (LEDs). These LEDs provide the user with the status of the emulator. The position of each LED is shown in the diagrams below.



Figure 2-12, XDS560v2 STM Case LEDs

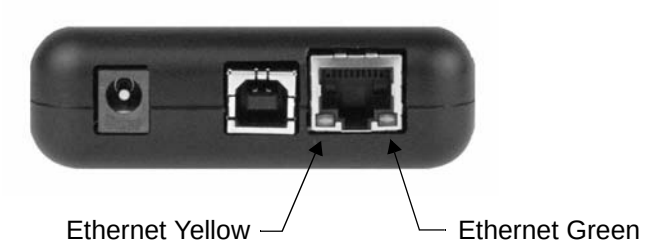


Figure 2-13, XDS560v2 STM Ethernet LEDs

The function of each LED is described in the table below.

Table 1: XDS560v2 STM LEDs

LED Name	LED Color	Function
POWER	Green	Emulator power indicator
ACTIVITY-3	Red	Target to XDS560v2 STM trace activity
ACTIVITY-2	Yellow	XDS560v2 STM to host activity
ACTIVITY-1	Green	Reserved
STATE-3	Red	On = XDS560v2 STM ready Off = XDS560v2 STM not ready
STATE-2	Yellow	On = FPGA programmed Off = FPGA not programmed
STATE-1	Green	On = CCS connected Off = CCS disconnected
Ethernet Yellow	Yellow	Ethernet Link/Activity : LINKLED- Signal
Ethernet Green	Green	Ethernet Collision/Duplex/Speed : LED1- Signal

2.3.1 XDS560V2 STM LEDs During Boot

When power is applied to the XDS510v2 it will begin booting its OS and provide a visual indication of its progress and also indicate if booting for normal operation or into safe mode. The boot manager will go to “Safe Mode” if it detects a problem during OS boot or a potential hardware problem with the XDS560v2. When in “Safe Mode” you cannot run CCS instead you can use the ***Sd560v2Cnfg*** utility to diagnose the problem and return to normal boot mode. The following sequences with approximate timings are provided for reference. From the sequences you can see that it may take the XDS560v2 around 60 seconds to boot so during this time do **not** power cycle the unit.

Normal Boot Progress:
POWER.....ON time0
ACTIVITY-1...ON time0 + 3 seconds : Linux+Application booting
STATE-2.....ON time0 + 39 seconds : FPGA loaded
STATE-3.....ON time0 + 41 seconds : Communications application running
ACTIVITY-1...OFF time0 + 41 seconds : Boot process complete

Safe Mode Boot Progress:
POWER.....ON time0
ACTIVITY-1...ON time0 + 3 seconds : Linux+Application booting
STATE-3.....ON time0 + 4 seconds : Linux boot to Safe Mode
ACTIVITY-3, ACTIVITY-2, STATE-1 Blinking time0 + 41 seconds : Safe Boot process complete

2.4 RESET Switch

If the emulator becomes non-responsive the unit can be reset by depressing the RESET switch. The RESET switch is recessed and should be depressed with a non-metallic tool. The position of the RESET switch is shown in the figure below.



Figure 2-14, XDS560v2 STM RESET Switch

2.5 Replacing the Emulator Tail Assembly

The XDS560v2 STM JTAG emulator has a modular tail assembly. This allows the tail assembly and header to be replaced or upgraded if necessary. The next two sections describe the steps necessary to replace the XDS560v2 STM tail assembly.

2.5.1 Removing The Emulator Tail Assembly

The checklist below provides instructions on how to remove the tail assembly and header.

❏ Remove power from the target board.

❏ Unplug the power connector from the XDS560v2 STM.

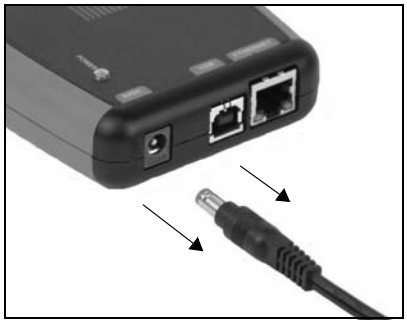


Figure 2-15, Removing Power from XDS560v2 STM

❏ Unplug the XDS560v2 STM power supply from the wall.

❑ Remove the JTAG Header end of the tail assembly from the target board by pulling up on the entire assembly.

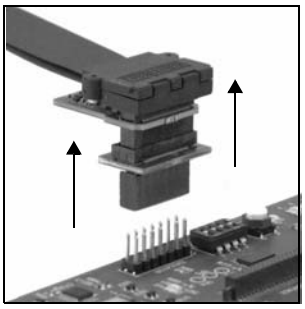
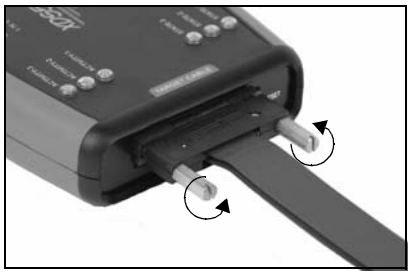


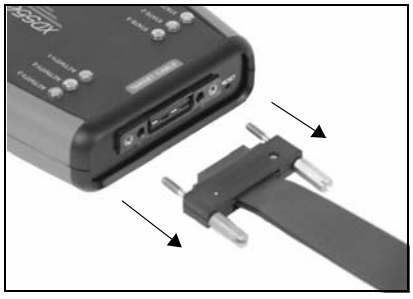
Figure 2-16, Removing the Header From Target Board

❑ Remove tail assembly from the XDS560v2 STM by unscrewing the 2 screws on each side of the connector. These screws should be able to be loosened by turning the screws counterclockwise. This can be done by hand but if necessary a flat blade screwdriver may be used.

After both screws are free from the XDS560v2 STM enclosure grab the black connector and gently pull it free from the enclosure.



Loosen Screws by Turning Counterclockwise



Gently Pull Free From Enclosure

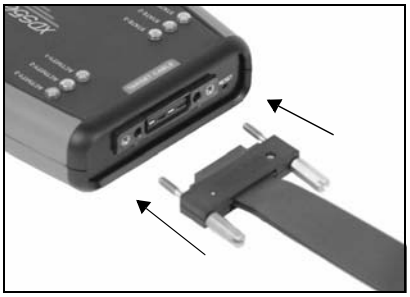
Figure 2-17, Removing the Tail Assembly From XDS560v2 STM

2.5.2 Installing The Emulator Tail Assembly

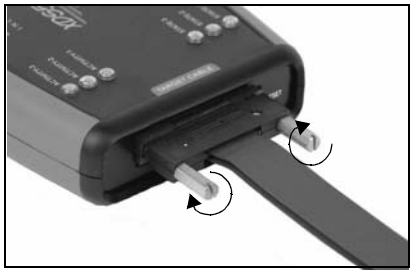
The checklist below provides instructions on how to install the tail assembly and header.

❑ Align the black connector on the tail assembly with the connector on the XDS560v2 STM. This is a keyed connector with the notched corners on the bottom side of the connector. Gently insert the black connector into the XDS560v2 STM.

Secure the connector to the XDS560v2 STM by tightening the two screws on each side of the connector by turning them clockwise. The best procedure is to turn both screws at the same time for even seating of the connector. Do NOT over tighten. You should be able to tighten these screws by hand.



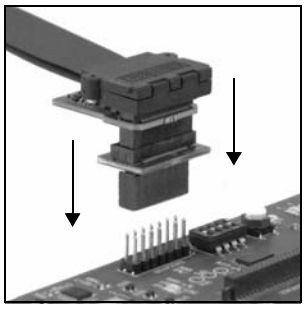
Gently Insert Tail Connector Into XDS560v2 STM Connector



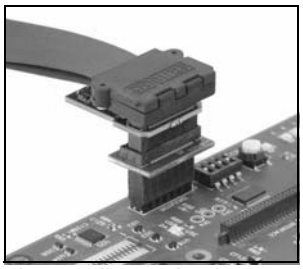
Tighten Screws by Turning Clockwise

Figure 2-18, Attaching the Tail Assembly To the XDS560v2 STM

❏ Now connect the tail of the emulator to the JTAG header on your target board. If your target board requires a different interface than the generic 60 pin header on the tail, attach one of the header adapters as required.



Align the emulator tail over the target connector, then push down



Emulator tail attached to target

Figure 2-19, Attaching the XDS560v2 STM Emulator Tail To Target

❏ Plug the XDS560v2 STM power supply into the wall power outlet.

❏ Plug the power connector into the XDS560v2 STM.

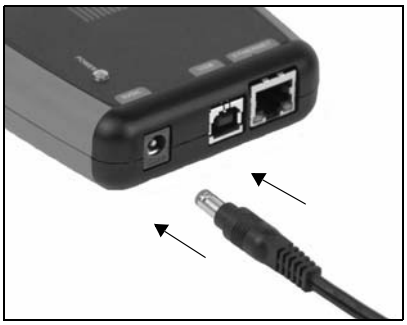


Figure 2-20, Applying Power To The XDS560v2 STM

❏ Make sure you USB or Ethernet connection is connected properly.

❏ Apply power to the target board.

❏ You may now bring up the debug environment on the PC.

Chapter 3

Specifications For Your Target System's Connection to the Emulator

This chapter contains information about connecting the XDS560v2 STM JTAG emulator to your target system. The emulator tail may plug directly onto the target board or use an intermediate adapter.

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3.1 Designing Your Target System's Emulator Connector

The XDS560v2 STM JTAG emulator tail provides the MIPI 60 interface. If your target board cannot use or accommodate this connector a target adapter will be required. Some common target board interfaces are:

- TI 14 pin (2 x 7)
- ARM 20 pin (2 x 10)
- TI 60 pin 9 4 x 15)
- TI 20 CTI (2 x 10)

For more information about the signals on these pins of the above connectors and their physical characteristics please refer to the specifications for these interfaces on the vendors web site. These specification will also provide guidelines for the use of the interfaces.

3.2 References

The following references can assist an engineer in the design and layout of the JTAG interface on a target board.

- Texas Instruments document SPRU655d.pdf

- MIPI Alliance Recommendation for Test and Debug: Debug and MIP System Trace Connectors, Version 1.00.00, 5 June 2007

3.3 Physical Layout of MIPI 60 Connector

The following two figures show the 60 pin MIPI header on the tail of the XDS560v2 STM JTAG emulator and the mating connector on an adapter or target board.

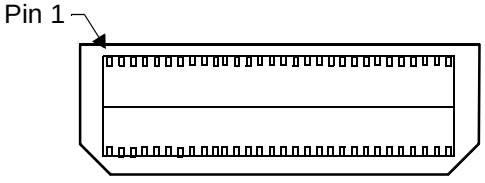


Figure 3-1, XDS560v2 STM MIPI 60 Header

3.4 MIPI 60 Connector Signals

The following table shows the signals on the MIPI 60 pin connector. The greyed out signals are not supported.

Table 1: MIPI 60 Connector Signals

Signal	Pin #	Pin #	Signal
VREF_DEBUG	1	2	TMS/TMSC
TCK	3	4	TDO/EXTA
TDI/EXTB	5	6	nRESET
RTCK/EXTC	7	8	TRST_PD
nTRST/EXTD	9	10	EXTE/TRIGIN
EXTF/TRIGOUT	11	12	VREF/TRACE
TRC_CLK[0]	13	14	TRC_CLK[1]
Target Presence Detect	15	16	GND
TRC_DATA[0][0]	17	18	TRC_DATA[1][0] or TRC_DATA[0][20]
TRC_DATA[0][1]	19	20	TRC_DATA[1][1] or TRC_DATA[0][21]
TRC_DATA[0][2]	21	22	TRC_DATA[1][2] or TRC_DATA[0][22]
TRC_DATA[0][3]	23	24	TRC_DATA[1][3] or TRC_DATA[0][23]
TRC_DATA[0][4]	25	26	TRC_DATA[1][4] or TRC_DATA[0][24]
TRC_DATA[0][5]	27	28	TRC_DATA[1][5] or TRC_DATA[0][25]
TRC_DATA[0][6]	29	30	TRC_DATA[1][6] or TRC_DATA[0][26]
TRC_DATA[0][7]	31	32	TRC_DATA[1][7] or TRC_DATA[0][27]
TRC_DATA[0][8]	33	34	TRC_DATA[1][8] or TRC_DATA[0][28]
TRC_DATA[0][9]	35	36	TRC_DATA[1][9] or TRC_DATA[0][29]
TRC_DATA[3][0] or TRC_DATA[0][10]	37	38	TRC_DATA[2][0] or TRC_DATA[1][10] or TRC_DATA[0][30]
TRC_DATA[3][1] or TRC_DATA[0][11]	39	40	TRC_DATA[2][1] or TRC_DATA[1][11] or TRC_DATA[0][31]
TRC_DATA[3][2] or TRC_DATA[0][12]	41	42	TRC_DATA[2][2] or TRC_DATA[1][12] or TRC_DATA[0][32]
TRC_DATA[3][3] or TRC_DATA[0][13]	43	44	TRC_DATA[2][3] or TRC_DATA[1][13] or TRC_DATA[0][33]
TRC_DATA[3][4] or TRC_DATA[0][14]	45	46	TRC_DATA[2][4] or TRC_DATA[1][14] or TRC_DATA[0][34]
TRC_DATA[3][5] or TRC_DATA[0][15]	47	48	TRC_DATA[2][5] or TRC_DATA[1][15] or TRC_DATA[0][35]
TRC_DATA[3][6] or TRC_DATA[0][16]	49	50	TRC_DATA[2][6] or TRC_DATA[1][16] or TRC_DATA[0][36]
TRC_DATA[3][7] or TRC_DATA[0][17]	51	52	TRC_DATA[2][7] or TRC_DATA[1][17] or TRC_DATA[0][37]
TRC_DATA[3][8] or TRC_DATA[0][18]	53	54	TRC_DATA[2][8] or TRC_DATA[1][18] or TRC_DATA[0][38]
TRC_DATA[3][9] or TRC_DATA[0][19]	55	56	TRC_DATA[2][9] or TRC_DATA[1][19] or TRC_DATA[0][39]
GND	57	58	GND
TRC_CLK[3]	59	60	TRC_CLK[2]

3.5 Emulator Tail Header Height

The emulator tail header is a stack of plugable adapters. This stack consumes more physical height than just the target JTAG connector. This height should be taken into consideration if the target board fits in an enclosure. The figure below shows the height of the tail header with adapters.

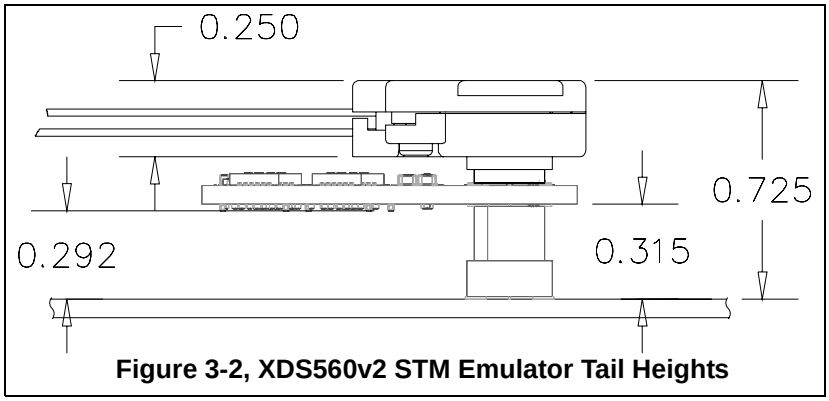


Figure 3-2, XDS560v2 STM Emulator Tail Heights

Appendix A

Mechanical Information

This appendix contains the mechanical information about the XDS560v2 STM JTAG Emulator produced by Spectrum Digital.

The figure below provides the physical dimension of the XDS560v2 STM JTAG emulator.

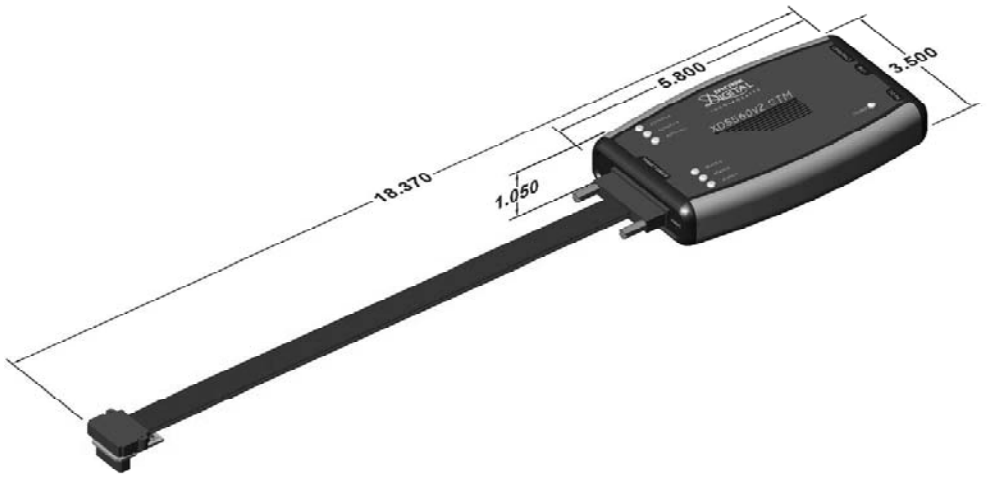


Figure A-1, XDS560v2 STM Dimensions

Note: All dimensions are in inches and are nominal dimensions, unless otherwise specified.

[redacted]

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