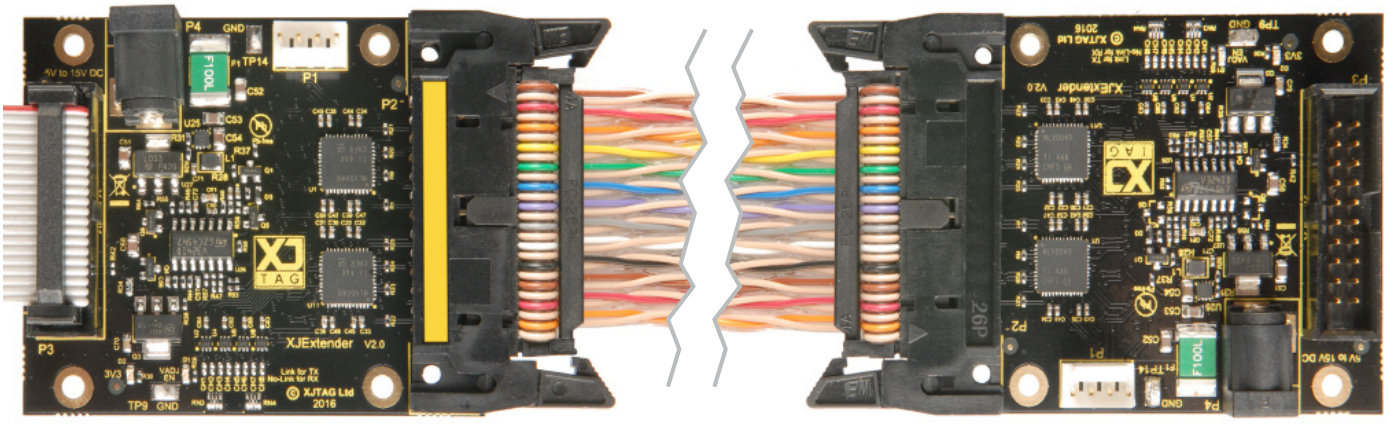
XJTAG®

XJExtender Boards

User Guide

Version 3.1



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1. Introduction

XJExtender is XJTAG's recommended solution when connecting a JTAG controller to a Device Under Test (DUT) in conditions where signal integrity can be an issue or when improved performance over distance is needed. This flexible and extensible system has been designed to complement existing XJTAG hardware and as such forms a powerful addition to any test installation.

The XJExtender system consists of two boards connected together with a length of 26-way twisted-pair ribbon cable (not supplied). Connecting to the JTAG controller is the **Controller unit** and connecting to the DUT is the **Target unit**.

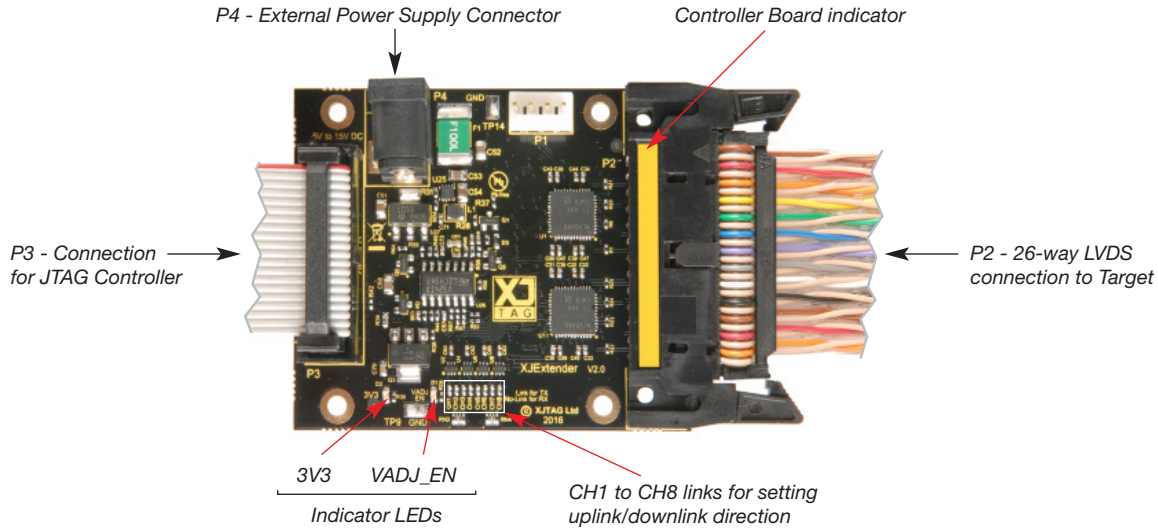


Figure 1 – XJExtender (Controller) position of connectors, links and indicators

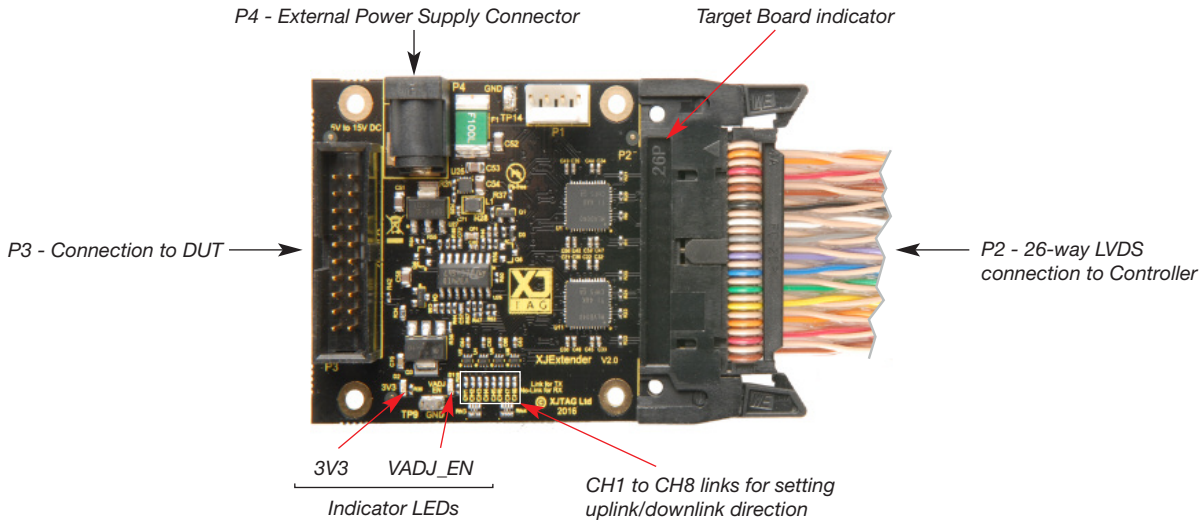


Figure 2 – XJExtender (Target) position of connectors, links and indicators

2. Features

- Reliably extends the distance between an XJLink2 JTAG controller and DUT
- Allows DUT testing in larger installations or environmental chambers
- Provides superior EMI to preserve signal integrity
- Can be used with other XJTAG hardware including the XJIsolator and XJXDP
- Variable I/O voltage from 1.8 V to 3.3 V (set by JTAG controller)
- Provides 8 channels individually configurable as downlink (Controller to Target) or uplink (Target to Controller). Default configuration: 6 downlink / 2 uplink.
- Controller connects directly to XJLink2 though standard 20-way ribbon cable
- Target connects to DUT
- Flexible power supply voltage: 5 V to 15 V
- LED indicators show power status
- Up to 50 MHz operation
- ESD protection
- Transparent to XJTAG software
- Can provide power to DUT

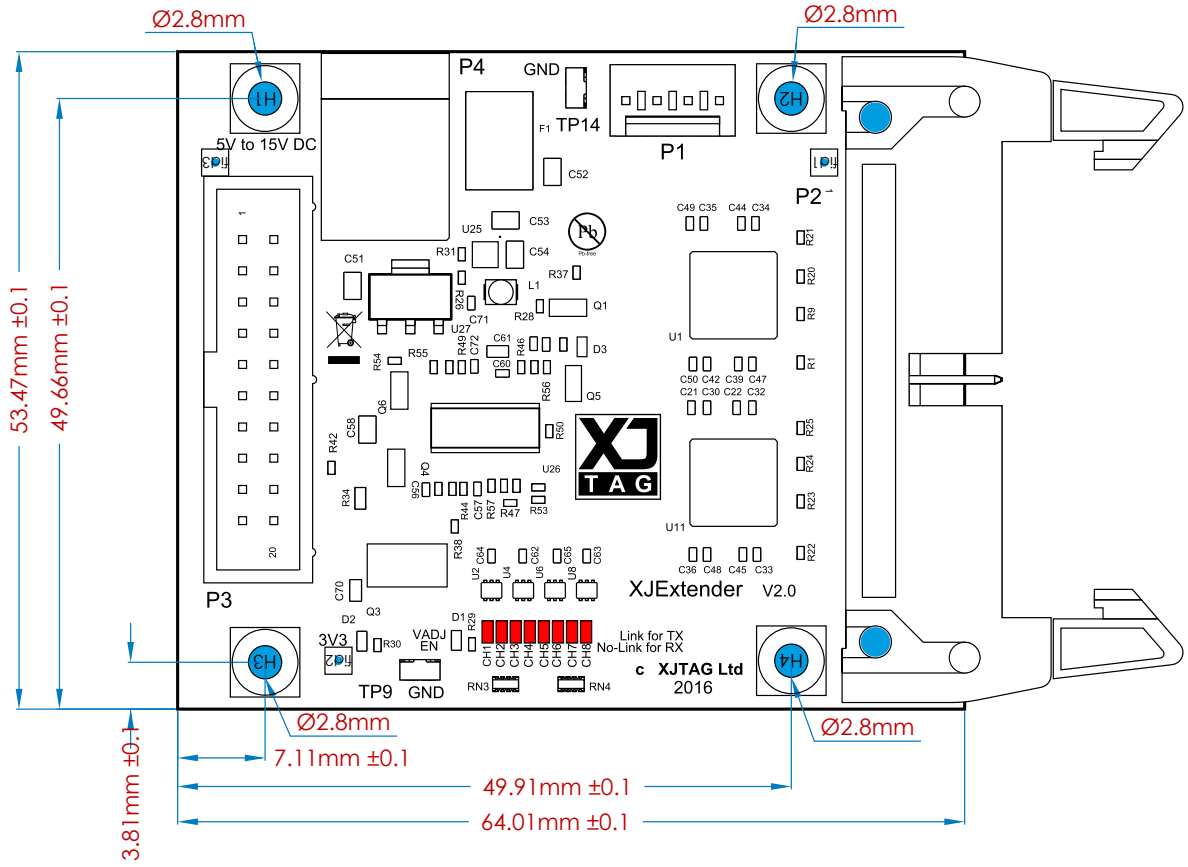
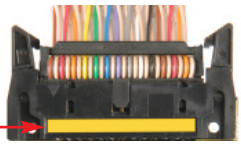


Figure 3 – Dimensions

3. Specifications

Outer dimensions (including connectors)	81.5 mm length x 53.5 mm width x 14 mm height
Maximum TCK frequency	50 MHz (guaranteed for 10 m cable between Controller and
XJLink2 signaling and pin 1 power output voltage setting	1.8 V to 3.3 V
External power supply voltage	5 V to 15 V
Maximum required supply current	250 mA
Power supply plug (to mate to P4 socket)	2.1 mm inner diameter, 5.5 mm outer diameter
XJLink2/DUT connector (P3)	20 pin, dual row, 2.54 mm pitch
LVDS connector (P2)	26 pin, dual row, 2.54 mm pitch
Maximum DUT supply current (from pin 1 of P3 of Target)	100 mA
Operating temperature range (Target)	-40° C to +85° C

4. Identification



The Controller and Target components of the XJExtender system look very similar. It is important not to confuse them. There are a number of ways of identifying the boards:

- 26-way connector (P2) on Controller board has a **yellow stripe**.
- The underside of each unit has a table for the type of board: Controller boards are identified as "**XJL**". Target boards are identified as "**DUT**".

5. Connector Pin Assignments

Controller Connector P3

(20-way, 2.54 mm pitch, XJLink connection)

Pin	Signal Name	I/O	Description
1	VREF	IN	Reference voltage in
2	GND		Ground
3	IO1	IN/OUT	Default configuration: Uplink (signal received by XJLink2)
4	GND		Ground
5	IO2	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
6	GND		Ground
7	IO3	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
8	GND		Ground
9	IO4	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
10	GND		Ground
11	IO5	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
12	GND		Ground
13	IO6	IN/OUT	Default configuration: Uplink (signal received by XJLink2)
14	GND		Ground
15	IO7	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
16	GND		Ground
17	IO8	IN/OUT	Default configuration: Downlink (signal driven by XJLink2)
18	GND		Ground
19	NO_CONNECT		No connect
20	GND		Ground

Target Connector P3

(20-way, 2.54 mm pitch, DUT connection)

Pin	Signal Name	I/O	Description
1	VADJ	OUT	Reference voltage out/DUT power
2	GND		Ground
3	IO1	IN/OUT	Default configuration: Uplink (signal to XJLink2)
4	GND		Ground
5	IO2	IN/OUT	Default configuration: Downlink (signal from XJLink2)
6	GND		Ground
7	IO3	IN/OUT	Default configuration: Downlink (signal from XJLink2)
8	GND		Ground
9	IO4	IN/OUT	Default configuration: Downlink (signal from XJLink2)
10	GND		Ground
11	IO5	IN/OUT	Default configuration: Downlink (signal from XJLink2)
12	GND		Ground
13	IO6	IN/OUT	Default configuration: Uplink (signal to XJLink2)
14	GND		Ground
15	IO7	IN/OUT	Default configuration: Downlink (signal from XJLink2)
16	GND		Ground
17	IO8	IN/OUT	Default configuration: Downlink (signal from XJLink2)
18	GND		Ground
19	NO_CONNECT		No connect
20	GND		Ground

Connector P2

(26-way, 2.54 mm pitch, Controller-Target LVDS connection)

Pin	Description
1	Differential Enable Signal
2	Differential Enable Signal
3	LVDS channel 1 N
4	LVDS channel 1 P
5	LVDS channel 2 N
6	LVDS channel 2 P
7	Ground
8	Ground
9	LVDS channel 3 N
10	LVDS channel 3 P
11	LVDS channel 4 N
12	LVDS channel 4 P
13	Ground
14	Ground
15	LVDS channel 5 N
16	LVDS channel 5 P
17	LVDS channel 6 N
18	LVDS channel 6 P
19	Ground
20	Ground
21	LVDS channel 7 N
22	LVDS channel 7 P
23	LVDS channel 8 N
24	LVDS channel 8 P
25	Ground
26	Ground

6. Configuration

XJExtender boards are delivered with the direction of the I/O pins configured as described in the Connector Pin Assignments section. If the default I/O direction is not suitable for the DUT, it can be changed by adding or removing the solder links CH1 to Ch8 as shown in Figure 1 and Figure 2.
Each Uplink/Downlink channel must be configured correctly to match on both the Controller and Target XJExtender boards. Use the following table to determine how to set CH1 to CH8. If channels are not used they can be set as either downlink or uplink.

Channel	Example Signal	CHx solder link on Controller	CHx solder link on Target
Downlink	TDI, TMS, TCK, nTRST	Fitted	Not fitted
Uplink	TDO	Not fitted	Fitted

7. Operating Instructions

Quick start instructions

1 Connect P3 on the XJExtender Controller to the XJLink2 using 20-way ribbon cable
2 Connect P3 on the XJExtender Target to the DUT
3 Connect the Controller and Target boards together using 26-way ribbon cable (twisted pair ribbon cable recommended)
4 Set XJLink bank voltages to match DUT I/O voltage
5 Provide external power to both Controller and Target boards (5 V to 15 V)
6 3V3 LED is illuminated when board power is present
7 To enable the XJExtender, enable power on XJLink2 pin1 (select Bank 1 'Power On' on Pin Mapping screen)
8 VADJ_EN on Controller is illuminated when XJLink2 pin1 is powered
9 VADJ_EN on Target is illuminated when outputs are enabled and reference voltage is available on pin 1 of P3

Detailed description

The XJExtender system connects to the XJLink2 and DUT via standard 20-way 0.1" headers. For the highest clock speeds, the connections should be kept as short as possible. The Controller and Target boards should be connected together with 26-way ribbon cable (twisted pair ribbon cable is recommended, particularly in electrically noisy environments). 10 m of cable is guaranteed to work at 50 MHz (providing the DUT can support this TCK frequency). Longer cable lengths will require slower TCK frequencies; the maximum TCK frequency is limited by the low pass filtering effect of the cable and XJTAG's autoskew algorithm which compensates for delay between TCK and TDO. If `CheckChain` is failing when using the XJExtender system, reduce the TCK frequency by ~20% and repeat the test.

Both Controller and Target boards need to be provided with external power, via input connector P4, at a voltage between 5 V and 15 V. The external power supplies should be able to provide up to 250 mA to each XJExtender board. If the ground terminals of the power supplies are not floating, make sure they are at the same potential (the XJExtender system can tolerate a small difference in ground potential between the Controller and Target boards plus considerable noise on the grounds but operation is not guaranteed if the difference in ground potential is greater than 0.5 V). The Target board can provide up to 100 mA on pin 1 to power the DUT or alternatively this pin can be used as a reference voltage for the DUT. If neither option is required, pin 1 should not be connected to the DUT.

Configure the Pin Mapping to match the direction of each channel. The output voltage and input voltage threshold should match the DUT and be the same for both banks. Power On should be enabled for pin 1. All configurable even pins should be set as Soft GND.

Figure 4 shows an example Pin Mapping for two chains that will work with the default configuration. The I/O pins on P3 are high impedance until power is provided to pin 1 of P3 on the Controller unit. At this point the I/O pins on the Controller and Target become active and pin 1 on the Target is powered at the XJLink output voltage level.

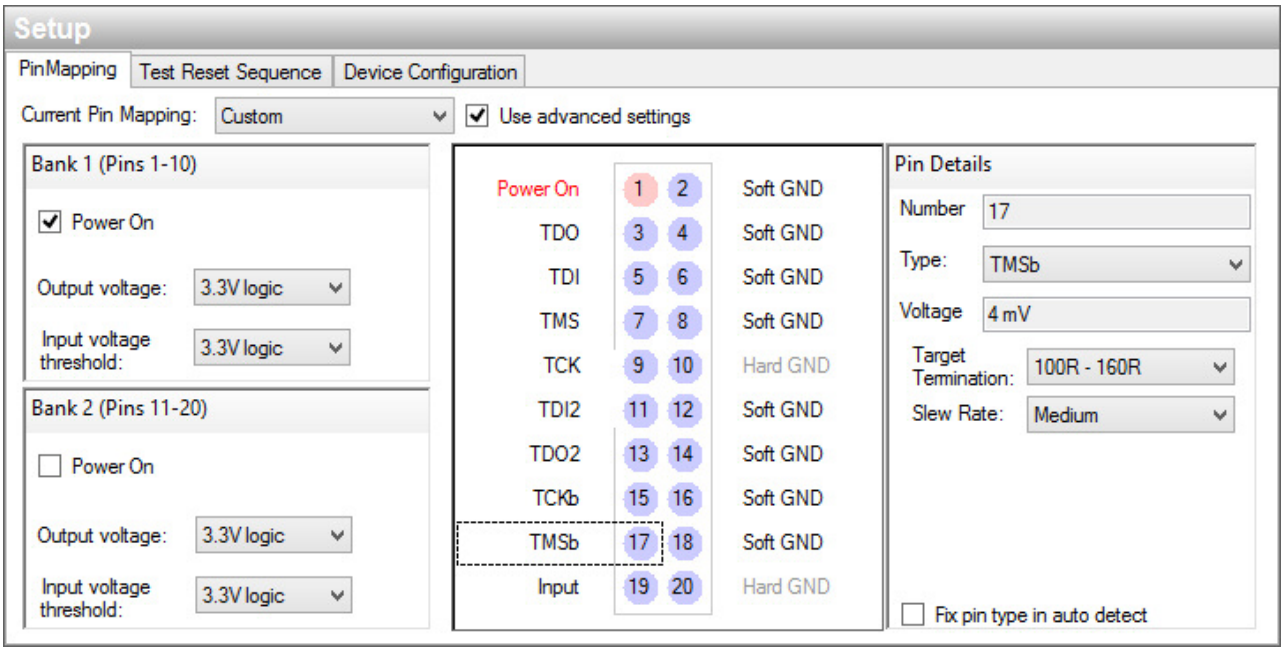


Figure 4 – Example Pin Map for default configuration

8. Using XJExtender at Temperature Extremes

The XJExtender Target is rated for ambient temperatures from -40°C to 85°C. When operating the board at temperatures significantly different from room temperature, signal integrity needs special consideration due to the variation over temperature of carrier mobility.

At low temperatures, the increased carrier mobility results in higher drive strength and therefore faster rise/fall times and potentially more ringing if signals are not terminated well.

Conversely at high temperatures, the reduced carrier mobility results in lower drive strength and therefore slower rise/fall times and potentially bit errors if the TCK frequency is very high or the signal is driving a lot of capacitance.

If the chain is robust at room temperature but fails Signal Integrity testing (using XJTAG Chain Debugger) at extreme temperatures reduce the TCK frequency and repeat the test.

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Use of the XJExtender system is transparent to the XJTAG software. Tests can be developed with the board connected directly to the DUT and then the XJExtender system added at a later date when the test system is deployed. As long as the pin map is suitable for the XJExtender system, no software changes are required (it may be necessary to decrease the TCK frequency if there is significant distance between the Controller and Target units – see above).