OVERVIEW

This Application Note resumes the Common JTAG interface pinouts used by the most popular manufacturers of processors, FPGAs or CPLDs devices as ARM, Altera, Lattice, MIPS, Xilinx and so more …

General Notes:

• Amontec accepts NO responsibility for the accuracy of the following information. These are the pinouts that our JTAG adapters use, but a semiconductor manufacturer may change these specifications at any time. We strongly recommend that you use the BDM/ISP/JTAG header specified by the semiconductor manufacturer and refer to this list before connecting to your target.

• VREF pins should be the I/O voltage reference. This signal is used to determine the electrical characteristics of the other IO signals. VREF should be regulated

• If you are building your own board, place the header as close to the processor as possible, use short traces of approximately equal length on all clock and data signals.

• Unless otherwise indicated, all headers are male dual-row header connectors (2.54 mm pitch).

Pins are identified by number and type:

- • o =   output from target processor to the emulator.
- • I =   input to target processor from the emulator.
- • p =   power pin
- • od =   open drain driven from the JTAG emulator, either floating or actively held low
- • nc =   not connected, ie: not driven nor read by ODD interface
- • k =   key, pin is typically missing from the target board

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**Powered by
Amontec Chameleon POD & JTAG Accelerator
Amontec JTAGkey & OpenOCD (FT2232)**

ALL BDM / ISP / JTAG interfaces described in this dodument may be emulated by Amontec Chameleon POD!

BDM \ ISP \ JTAG CONNECTORS

ALTERA BYTEBLASTER MV AND II 10-PIN (JTAG)

AMONTEC REF: ALTERA10JTAG
NAME: ALTERA ByteBlaster MV and II (JTAG)
CATEGORY: JTAG
TARGET: All ALTERA CPLDs and FPGAs
COMMENT: See ALTERA ByteBlaster MV or II datasheet for more details
CONNECTOR: 10-pin Header (2.54mm)
CONNECTOR TYPE: dual

TCK	i	1	2	p	GND
TDO	o	3	4	p	VREF
TMS	i	5	6	nc	-
-	nc	7	8	nc	-
TDI	i	9	10	p	gnd

Table 1: ALTERA ByteBlaster MV and II (JTAG) connector (target board)

ALTERA BYTEBLASTER MV AND II 10-PIN (PS MODE)

AMONTEC REF: ALTERA10PS
NAME: ALTERA ByteBlaster MV and II (PS MODE)
CATEGORY: ISP
TARGET: A large part of ALTERA CPLDs and FPGAs
COMMENT: See ALTERA ByteBlaster MV or II datasheet for more details
CONNECTOR: 10-pin Header (2.54mm)
CONNECTOR TYPE: dual

DCLK	i	1	2	p	GND
CONF_DONE	o	3	4	p	VREF
nCONFIG	i	5	6	nc	-
nSTATUS	o	7	8	nc	-
DATA0	i	9	10	p	gnd

Table 2: ALTERA ByteBlaster MV and II (PS MODE) connector (target board)

ALTERA BYTEBLASTER II 10-PIN (AS MODE)

AMONTEC REF: ALTERA10AS

NAME: ALTERA ByteBlaster MV and II (AS MODE)

CATEGORY: ISP

TARGET: A large part of ALTERA FPGAs

COMMENT: See ALTERA ByteBlaster II datasheet for more details

CONNECTOR: 10-pin Header (2.54mm)

CONNECTOR TYPE: dual

DCLK	i	1	2	p	GND
CONF_DONE	o	3	4	p	VREF
nCONFIG	i	5	6	i	nCONFIG
nSTATUS	o	7	8	i	nCS
DATA0	i	9	10	p	gnd

Table 3: ALTERA ByteBlaster MV and II (AS MODE) connector (target board)

AMD – ATHLON 16-PIN (JTAG)

AMONTEC REF: AMD16ATHLON

NAME: AMD - Athlon

CATEGORY: JTAG

TARGET: AMD - Athlon

COMMENT: See AMD's Athlon datasheet for more details

CONNECTOR: 16-pin Header (1.27mm)

CONNECTOR TYPE: dual

VREF	p	1	2	i	TCK
-	nc	3	4	i	TMS
-	nc	5	6	nc	-
-	nc	7	8	i	TDI
-	nc	9	10	i	TRST_N
GND	p	11	12	o	TDO
DBREQ_N	i	13	14	o	DBRDY
SRST_N	od	15	16	i	PLLTEST_N

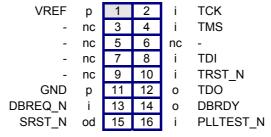**Table 4:** AMD - Athlon connector (target board)

AMD – ÈLAN SC520 12-PIN (JTAG)

AMONTEC REF: AMD12ELAN

NAME: AMD – Èlan SC520

CATEGORY: JTAG

TARGET: AMD Èlan SC520

COMMENT: See AMD's Èlan SC520 datasheet for more details

CONNECTOR: 12-pin Header (2mm)

CONNECTOR TYPE: dual

Signal	Dir	Pin	Pin	Dir	Signal
GND	p	1	2	p	VREF
TCK	i	3	4	o	CMDACK
TMS	i	5	6	i	BR/TC
TDI	i	7	8	o	STOP/TX
TDO	o	9	10	o	TRIG/TRACE
SSRST_N	od	11	12	k	KEY

Table 5: AMD – Èlan SC520 connector (target board)

AMD – OPTERON 26-PIN (JTAG)

AMONTEC REF: AMD26OPTERON

NAME: AMD - Opteron

CATEGORY: JTAG

TARGET: AMD - Opteron

COMMENT: See AMD's Opteron datasheet for more details

CONNECTOR: 26-pin Header (1.27mm)

CONNECTOR TYPE: dual

Signal	Dir	Pin	Pin	Dir	Signal
GND	p	1	2	p	GND
RSVD1	o	3	4	p	GND
RSVD0	i	5	6	p	GND
DBREQ_N	i	7	8	p	GND
DBRDY	o	9	10	p	GND
TCK	i	11	12	p	GND
TMS	i	13	14	p	GND
TDI	i	15	16	p	GND
TRST_N	i	17	18	p	GND
TDO	o	19	20	p	GND
VREF	p	21	22	p	GND
VREF	p	23	24	nc	-
KEY	k	25	26	nc	–

Table 6: AMD - Opteron connector (target board)

http://www.amontec.com/

ARM 14-PIN (JTAG)

AMONTEC REF: ARM14
NAME: ARM 14-pin
CATEGORY: JTAG
TARGET: ARM7, ARM9, ARM10, XSCALE
COMMENT: There are two standard ARM pinouts, an older 14 pin specification and a newer 20 pin specification.
CONNECTOR: 14-pin Header (2.54mm)
CONNECTOR TYPE: dual

Signal	Dir	Pin	Pin	Dir	Signal
VREF	p	1	2	p	GND
TRST_N	i	3	4	p	GND
TDI	i	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	p	GND
TDO	o	11	12	od	SRST_N
VREF	p	13	14	p	GND

Table 7: ARM 14-pin connector (target board)

ARM 20-PIN (JTAG)

AMONTEC REF: ARM20
NAME: ARM 20-pin
CATEGORY: JTAG
TARGET: ARM7, ARM9, ARM10, XSCALE
COMMENT: There are two standard ARM pinouts, an older 14 pin specification and a newer 20 pin specification.
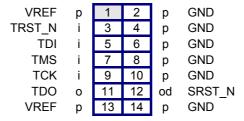**CONNECTOR:**   20-pin Header (2.54mm)
CONNECTOR TYPE: dual

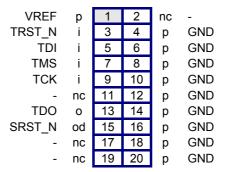| Signal	Dir	Pin	Pin	Dir	Signal
VREF	p	1	2	nc	-
TRST_N	i	3	4	p	GND
TDI	i	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	p	GND
-	nc	11	12	p	GND
TDO	o	13	14	p	GND
SRST_N	od	15	16	p	GND
-	nc	17	18	p	GND
-	nc	19	20	p	GND

Table 8: ARM 20-pin connector (target board)

ARM 20-PIN WITH RTCK FEATURE (JTAG)

AMONTEC REF: ARM20RTCK

NAME: ARM 20-pin with RTCK feature

CATEGORY: JTAG

TARGET: ARM7-s, ARM9-s, ARM10-s. ARMx-s processor series use the RTCK JTAG Baudrate feature.

COMMENT:

CONNECTOR: 20-pin Header (2.54mm)

CONNECTOR TYPE: dual

VREF	p	1	2	nc	-
TRST_N	i	3	4	p	GND
TDI	i	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	p	GND
RTCK	o	11	12	p	GND
TDO	o	13	14	p	GND
SRST_N	od	15	16	p	GND
-	nc	17	18	p	GND
-	nc	19	20	p	GND

Table 9: ARM 20-pin connector with RTCK feature (target board)

ATMEL AVR STKX00 ISP DOWNLOAD CABLE 10-PIN (ISP)

AMONTEC REF: STKx0010

NAME: ATMEL AVR STKx00 ISP Download Cable (STK200 and STK300)

CATEGORY: ISP

TARGET: ATMEL AVR micro-processor

COMMENT: See ATMEL AVR STK200 or STK300 download cable datasheet for more details.
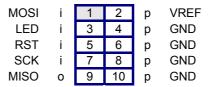
CONNECTOR: 10-pin Header (2.54mm)

CONNECTOR TYPE: dual

MOSI	i	1	2	p	VREF
LED	i	3	4	p	GND
RST	i	5	6	p	GND
SCK	i	7	8	p	GND
MISO	o	9	10	p	GND

Table 10: ATMEL AVR STKx00 ISP Download Cable connector (target board)

ATMEL ATDH2081 DOWNLOAD CABLE 10-PIN (ISP)

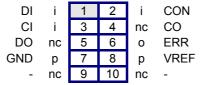|	
AMONTEC REF:	ATDH208110
NAME:	ATMEL ATDH2081 Download Cable
CATEGORY:	ISP
TARGET:	Atmel's ATDH2081 download cable allows designers to configure Atmel's family of AT6K/40K Field Programmable Gate Array (FPGA) and AT94K Field Programmable System Level Integrated Circuit (FPSLIC) devices. Download Cable
COMMENT:	See CYPRESS UltraISR JTAG download cable datasheet for more details.
CONNECTOR:	10-pin Header (2.54mm)
CONNECTOR TYPE:	dual

```
DI    i  | 1  | 2  | i   CON
CI    i  | 3  | 4  | nc  CO
DO    nc | 5  | 6  | o   ERR
GND   p  | 7  | 8  | p   VREF
-     nc | 9  | 10 | nc  -
```

Table 11: ATMEL ATDH2081 Download Cable connector (target board)

CYPRESS ULTRAISR DOWNLOAD CABLE 10-PIN (JTAG)

AMONTEC REF:	ULTRAISR10
NAME:	CYPRESS UltraISR Download cable (JTAG)
CATEGORY:	JTAG
TARGET:	All Cypress CPLD Types
COMMENT:	See CYPRESS UltraISR JTAG download cable datasheet for more details.
CONNECTOR:	10-pin Header (2.54mm)
CONNECTOR TYPE:	dual

```
GND     p  | 1  | 2  | i   TMS
JTAGen  i  | 3  | 4  | i   TCK
ISR     i  | 5  | 6  | i   TDI
VREF    p  | 7  | 8  |     k
TDO     o  | 9  | 10 | p   GND
GND     p  | 1  | 2  | i   TMS
```
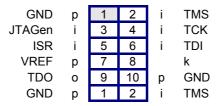
Table 12: CYPRESS UltraISR Download cable (JTAG) connector (target board)

CYPRESS ULTRAISR DOWNLOAD CABLE 10-PIN (ISR)

AMONTEC REF: ULTRAISR10
NAME: CYPRESS UltraISR Download cable (ISR)
CATEGORY: ISP
TARGET: All Cypress CPLD Types
COMMENT: See CYPRESS UltraISR JTAG download cable datasheet for more details.
CONNECTOR: 10-pin Header (2.54mm)
CONNECTOR TYPE: dual

GND	p	1	2	i	SMODE
ISRVPP	i	3	4	i	SCLK
ISR	i	5	6	i	SDI
VREF	p	7	8	k	
SDO	o	9	10	p	GND

Table 13: CYPRESS UltraISR Download cable (ISR) connector (target board)

IBM / MOTOROLA PPC "COP" INTERFACE 16-PIN (JTAG)

AMONTEC REF: COP16
NAME: COP Interface
CATEGORY: JTAG
TARGET: MOTOROLA Freescale PowerPC 6xx, 7xx, 8xxx and IBM PowerPC 6xx and 7xx
COMMENT: IBM also refers to this connection as RISCWatch.
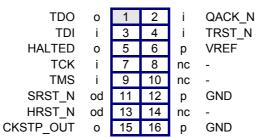**CONNECTOR:**   16-pin Header (2.54mm)
CONNECTOR TYPE: dual

TDO	o	1	2	i	QACK_N
TDI	i	3	4	i	TRST_N
HALTED	o	5	6	p	VREF
TCK	i	7	8	nc	-
TMS	i	9	10	nc	-
SRST_N	od	11	12	p	GND
HRST_N	od	13	14	nc	-
CKSTP_OUT	o	15	16	p	GND

Table 14: IBM / MOTOROLA "COP" Interface connector (target board)

IBM 4XX 16-PIN (JTAG RISCWATCH)

AMONTEC REF: IBM16

NAME: IBM 4xx

CATEGORY: JTAG

TARGET: IBM 4xx

COMMENT: IBM also calls this RISCWatch.

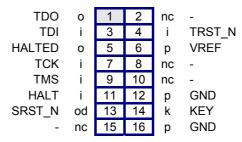**CONNECTOR:**   16-pin Header (2.54mm)

CONNECTOR TYPE: dual

TDO	o	1	2	nc	-
TDI	i	3	4	i	TRST_N
HALTED	o	5	6	p	VREF
TCK	i	7	8	nc	-
TMS	i	9	10	nc	-
HALT	i	11	12	p	GND
SRST_N	od	13	14	k	KEY
-	nc	15	16	p	GND

Table 15 IBM 4xx connector (target board)

LATTICE ISPDOWNLOAD 8-PIN (JTAG AND ISP)

AMONTEC REF: LATTICE8

NAME: LATTICE ispDOWNLOAD 8-pin connector

CATEGORY: JTAG ISP

TARGET: All LATTICE CPLDs

COMMENT: See LATTICE ispDOWNLOAD JTAG download cable datasheet for more details.

CONNECTOR: 8-pin Header (2.54mm)

CONNECTOR TYPE: inline

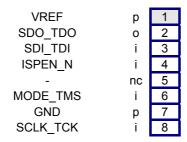|		
VREF	p	1
SDO_TDO	o	2
SDI_TDI	i	3
ISPEN_N	i	4
-	nc	5
MODE_TMS	i	6
GND	p	7
SCLK_TCK	i	8

Table 16: LATTICE ispDOWNLOAD 8-pin connector (target board)

LATTICE ISPDOWNLOAD 10-PIN (JTAG AND ISP)

AMONTEC REF: LATTICE10

NAME: LATTICE ispDOWNLOAD 10-pin header

CATEGORY: JTAG ISP

TARGET: All LATTICE CPLDs

COMMENT: See LATTICE ispDOWNLOAD JTAG download cable datasheet for more details.

CONNECTOR: 10-pin Header (2.54mm)

CONNECTOR TYPE: dual

TCK	i	1	2	nc	-
TMS	i	3	4	p	GND
TDI	i	5	6	p	VREF
TDO	o	7	8	p	GND
TRST	i	9	10	i	ISPEN_N

Table 17: LATTICE ispDOWNLOAD 10-pin connector (target board)

MIPS – EJTAG-2.5 14-PIN (JTAG)

AMONTEC REF: MIPS14

NAME: MIPS - EJTAG 2.5

CATEGORY: JTAG

TARGET: MIPS, MIPS32, MIPS64, MIPS-32, MIPS-64,

COMMENT: There are many MIPS JTAG headers in use. This is the one specified by MTI for EJTAG 2.5
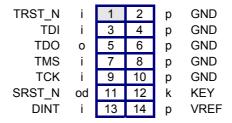
CONNECTOR: 14-pin Header (2.54mm)

CONNECTOR TYPE: dual

TRST_N	i	1	2	p	GND
TDI	i	3	4	p	GND
TDO	o	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	p	GND
SRST_N	od	11	12	k	KEY
DINT	i	13	14	p	VREF

Table 18: MIPS - EJTAG 2.5 connector (target board)

MOTOROLA FREESCALE COLFIRE 26-PIN (BDM P&E)

AMONTEC REF: COLDFIRE26

NAME: MOTOROLA Freescale Colfire BDM P&E (cable_cf)

CATEGORY: BDM

TARGET: MOTOROLA Freescale Colfire

COMMENT: See COLDFIRE P&E BDM debug product datasheet for more details.

CONNECTOR: 26-pin Header (2.54mm)
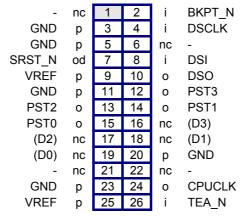
CONNECTOR TYPE: dual

-	nc	1	2	i	BKPT_N
GND	p	3	4	i	DSCLK
GND	p	5	6	nc	-
SRST_N	od	7	8	i	DSI
VREF	p	9	10	o	DSO
GND	p	11	12	o	PST3
PST2	o	13	14	o	PST1
PST0	o	15	16	nc	(D3)
(D2)	nc	17	18	nc	(D1)
(D0)	nc	19	20	p	GND
-	nc	21	22	nc	-
GND	p	23	24	o	CPUCLK
VREF	p	25	26	i	TEA_N

Table 19: MOTOROLA Freescale Colfire (target board)

MOTOROLA FREESCALE MPCXXX 10-PIN (BDM)

AMONTEC REF: BDM10

NAME: BDM for MOTOROLA Freescale

CATEGORY: BDM

TARGET: MOTOROLA Freescale MPC8xx, MPC5xx

COMMENT: It is vital that pins 1 and 6 properly reflect the status of the target processor immediately following RESET. Some processors have configurable pins (MPC8xx, etc.) that are specified by a reset configuration word at the time of reset. These pins must be set properly and must ALWAYS reflect the status of the processor correctly. Check the 'hardware reset configuration word' in the MOTOROLA Freescale User's manual.
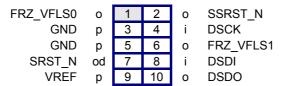
CONNECTOR: 10-pin Header (2.54mm)

CONNECTOR TYPE: dual

FRZ_VFLS0	o	1	2	o	SSRST_N
GND	p	3	4	i	DSCK
GND	p	5	6	o	FRZ_VFLS1
SRST_N	od	7	8	i	DSDI
VREF	p	9	10	o	DSDO

Table 20: MOTOROLA Freescale MPCxxx BDM connector (target board)

MOTOROLA "ONCE", ON CHIP EMULATION 14-PIN (JTAG)

AMONTEC REF: ONCE14
NAME: OnCe, On Chip Emulation
CATEGORY: JTAG
TARGET: MOTOROLA Freescale DSP, M*CORE
COMMENT: -
CONNECTOR: 14-pin Header (2.54mm)
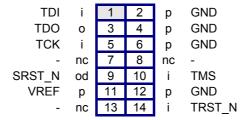**CONNECTOR TYPE:** dual

TDI	i	1	2	p	GND
TDO	o	3	4	p	GND
TCK	i	5	6	p	GND
-	nc	7	8	nc	-
SRST_N	od	9	10	i	TMS
VREF	p	11	12	p	GND
-	nc	13	14	i	TRST_N

Table 21: MOTOROLA "OnCe" connector (target board)

PHILLIPS'S MIPS 20-PIN (JTAG)

AMONTEC REF: MIPS20PHILLIPS
NAME: PHILLIPS's MIPS
CATEGORY: JTAG
TARGET: MIPS, MIPS32, MIPS64, MIPS-32, MIPS-64
COMMENT: See PHILLIPS's MIPS datasheet for more details
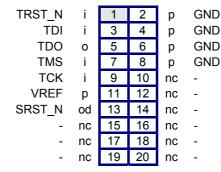**CONNECTOR:**   20-pin Header (2.54mm)
CONNECTOR TYPE: dual

TRST_N	i	1	2	p	GND
TDI	i	3	4	p	GND
TDO	o	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	p	GND
SRST_N	od	11	12	p	GND
-	nc	13	14	p	GND
-	nc	15	16	p	GND
-	nc	17	18	p	GND
-	nc	19	20	p	GND

Table 22: PHILLIPS's MIPS connector (target board)

ST PSD FLASHLINK PROGRAMMER 14-PIN (JTAG)

AMONTEC REF: PSD14

NAME: ST PSD FlashLINK programmer

CATEGORY: JTAG

TARGET: All ST PSD Flash products

COMMENT: See ST PSD FlashLINK JTAG cable datasheet for more details.

CONNECTOR: 14-pin Header (2.54mm)

CONNECTOR TYPE: dual

JEN_N	od	1	2	od	TRST_N
GND	p3	4	od	i	CNTL
TDI	i	5	6	o	TSTAT
VREF	p	7	8	i	RST_N
TMS	i	9	10	p	GND
TCK	i	11	12	p	GND
TDO	o	13	14	o	TERR_N

Table 23: ST PSD FlashLINK programmer connector (target board)

TI MSP430 14-PIN (JTAG)

AMONTEC REF: MSP43014

NAME: TI MSP430 JTAG

CATEGORY: JTAG

TARGET: Texas Instruments TI MSP430

COMMENT: See Texas Instruments TI MSP430 JTAG interface for more details.

CONNECTOR: 14-pin Header (2.54mm)

CONNECTOR TYPE: dual

TDO	o	1	2	p	VREF
TDI	i	2	4	p	nc
TMS	i	5	6	i	TCLK
TCK	i	7	8	o	TST_VPP
GND	p	9	10	nc	-
RST_NMI	i	11	12	nc	-
-	nc	13	14	nc	-

Table 24: TI MSP430 JTAG connector (target board)

TOSHIBA'S MIPS 20-PIN (JTAG)

AMONTEC REF:	MIPS20TOSHIBA
NAME:	TOSHIBA's MIPS
CATEGORY:	JTAG
TARGET:	MIPS, MIPS32, MIPS64, MIPS-32, MIPS-64
COMMENT:	See TOSHIBA's MIPS datasheet for more details
CONNECTOR:	20-pin Header (1.27mm)
CONNECTOR TYPE:	dual

TRST_N	i	1	2	p	GND
TDI	i	3	4	p	GND
TDO	o	5	6	p	GND
TMS	i	7	8	p	GND
TCK	i	9	10	nc	-
VREF	p	11	12	nc	-
SRST_N	od	13	14	nc	-
-	nc	15	16	nc	-
-	nc	17	18	nc	-
-	nc	19	20	nc	-

Table 25: TOSHIBA's MIPS connector (target board)

XILINX PARALLEL CABLE III 9-PIN (SLAVE SERIAL)

AMONTEC REF:	XILINX9SERIAL
NAME:	XILINX Parallel Cable III (Slave Serial)
CATEGORY:	ISP
TARGET:	A large part of XILINX FPGAs. SPARTAN, SPARTAN-XL, SPARTAN3, VIRTEX, VIRTEX-II, VIRTEX-PRO.
COMMENT:	See XILINX Parallel Cable III for more details
CONNECTOR:	9-pin Header (2.54mm)
CONNECTOR TYPE:	inline

VREF	p	1
GND	p	2
CCLK	i	3
-	nc	4
-	nc	5
DONE	bod	6
DIN	i	7
-	nc	8
PROG	i	9

Table 26: XILINX Parallel Cable III (Slave Serial) connector (target board)

XILINX PARALLEL CABLE III AND IV 9-PIN (JTAG)

AMONTEC REF:	XILINX9INLINE	
NAME:	XILINX Parallel Cable III and IV (JTAG)	
CATEGORY:	JTAG	
TARGET:	A large part of XILINX CPLDs, FPGAs and Flash. CoolRunner, CoolRunner-II, SPARTAN, SPARTAN-XL, SPARTAN3, VIRTEX, VIRTEX-II, VIRTEX-PRO.	
COMMENT:	See XILINX Parallel Cable III or IV for more details	
CONNECTOR:	9-pin inline Header (2.54mm)	

CONNECTOR TYPE: inline

Signal	Type	Pin
VREF	p	1
GND	p	2
-	nc	3
TCK (CCLK)	i	4
-	nc	5
TDO (DONE)	bod	6
TDI (DIN)	i	7
-	nc	8
TMS (PROG)	i	9

Table 27: XILINX Parallel Cable III and IV (JTAG) connector (target board)

XILINX PARALLEL IV 14-PIN (JTAG AND SLAVE SERIAL)

AMONTEC REF:	XILINX14	
NAME:	XILINX Parallel IV (JTAG and Slave Serial)	
CATEGORY:	JTAG ISP	
TARGET:	A large part of XILINX CPLDs, FPGAs and Flash. CoolRunner, CoolRunner-II, SPARTAN, SPARTAN-XL, SPARTAN3, VIRTEX, VIRTEX-II, VIRTEX-PRO.	
COMMENT:	See XILINX USB PlatformCable for more details.	
CONNECTOR:	14-pin Header **(2mm)**	

CONNECTOR TYPE: dual

Signal	Type	Pin	Pin	Type	Signal
VGND	io	1	2	p	VREF
GND	p	3	4	i	TMS (PROG)
GND	p	5	6	i	TCK (CCLK)
GND	p	7	8	o	TDO (DONE)
GND	p	9	10	i	TDI (DIN)
GND	p	11	12	nc	-
GND	p	13	14	io	NC (INIT)

Table 28: XILINX Parallel IV (JTAG and Slave Serial) connector (target board)

FIGURE AND TABLE INDEX

CONTENT REVISIONS

This dodument contains the following changes to content, causing it to differ from previous versions:

Version	Date	Changes
V1.0	05-FEB-2005	First version (by Laurent Gauch)
V1.1	07-FEB-2006	Adding Amontec JTAG tools

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