JTAG

series

SIGNUM SYSTEMS CORPORATION

JTAG Probes for Signum Emulators

Technical Specifications

SIGNUM SYSTEMS

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SIGNUM SYSTEMS
1211 FLYNN RD., UNIT #104
CAMARILLO, CA 93012, U.S.A
PHONE 805 • 383 • 3682
WWW.SIGNUM.COM

Signum JTAG Probes at a Glance

PART NUMBER	VOLTAGE	PINS	CPU	DESCRIPTION	PG
ADA-JET-ARM20	3.3 – 5.0V (± 10%)	20	ARM XScale	Standard 20-pin JTAG ARM probe.	1
ADA-JET-ARM14	N/A	14	ARM XScale	Passive probe for ADA-JET-ARM20 and ADA-JET-ARM-LV.	1
ADA-JET-ARM-LV	1.8 – 3.3V (± 10%)	20	ARM XScale	Low voltage version of ADA-JET-ARM20.	3
ADA-JET-ARM-SWD	1.8 – 3.3V (± 10%)	20 20/10	ARM XScale Cortex	Low-voltage probe for ARM, Cortex-SWD and Cortex-SWO.	5
ADA-JET-TI14	3.3 – 5.0V (± 10%)	14	OMAP TMS320 TMS470	Standard 14-pin JTAG probe for Texas Instruments DSP.	7
ADA-JET-TI14-LV	1.8 – 3.3V (± 10%)	14	DaVinci OMAP TMS320 TMS470	Low voltage version of ADA-JET-TI14.	7
ADA-ISO-TI14	3.0 – 5.0V (± 10%)	14	OMAP TMS320 TMS470 TMS570	JTAG isolation probe for TI TMS320/470/570 devices, 14-pin.	9
ADA-ISO-TI14-E	3.0 – 5.0V (± 10%)	14	OMAP TMS320 TMS470 TMS570	Isolation probe for TI-14 JTAG with Auxiliary Power Input	11
ADA-JET-CTI20	1.8 – 3.3V (± 10%)	20	DaVinci DM OMAP	Compact Texas Instruments 20-pin JTAG probe for DaVinci, DM and OMAP.	13
ADA-ETM-JTAG	1.8 – 3.3V (± 10%)	14 20 38	ARM OMAP DaVinci TMS320 TMS470	JTAG and Embedded Trace Module signal separator probe.	18
ADA-ARM20-SWD	N/A	20/10	Cortex	Passive 20- and 10-pin probe for Cortex.	20
ADA-ETM-SWD20	N/A	20	Cortex	Passive 20-pin probe for Cortex ETM trace.	21

TABLE 1 Comparison of selected Signum JTAG probes.

JTAG Probes for ARM

ADA-JET-ARM20 and ADA-JET-ARM14

Signum JTAG probes for ARM provide a physical interface between Signum emulators for the ARM processor and ARM target boards. These probes have 20-pin (ADA-JET-ARM20) and 14-pin (ADA-JET-ARM14) double-row, polarized, .100" × .100". (2.54 mm × 2.54 mm) female connectors. Signum JTAG probes come with a 30.5 cm (12 in.) cable. The layout and dimensions of the probes are shown in Figure 1 through Figure 8.

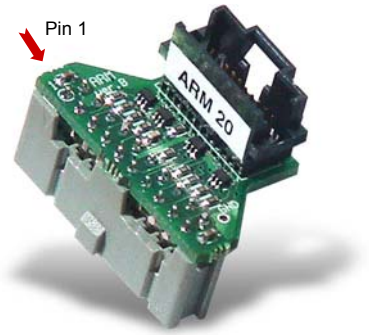

FIGURE 1 The 20-pin JTAG ADA-JET-ARM20 probe for ARM.

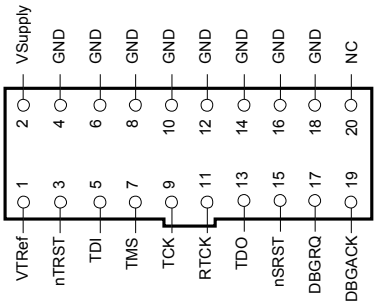

FIGURE 2 The pinout of the ADA-JET-ARM20 probe. Top view.

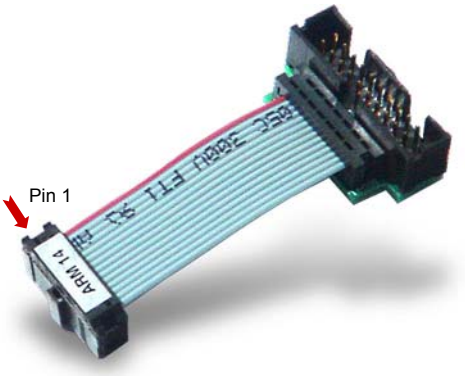

FIGURE 3 The 14-pin JTAG ADA-JET-ARM14 probe for ARM.

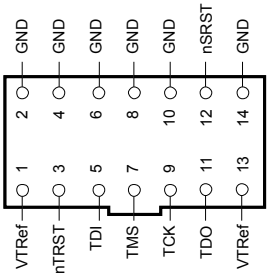

FIGURE 4 The pinout of the 14-pin JTAG probe for ARM. Top view.

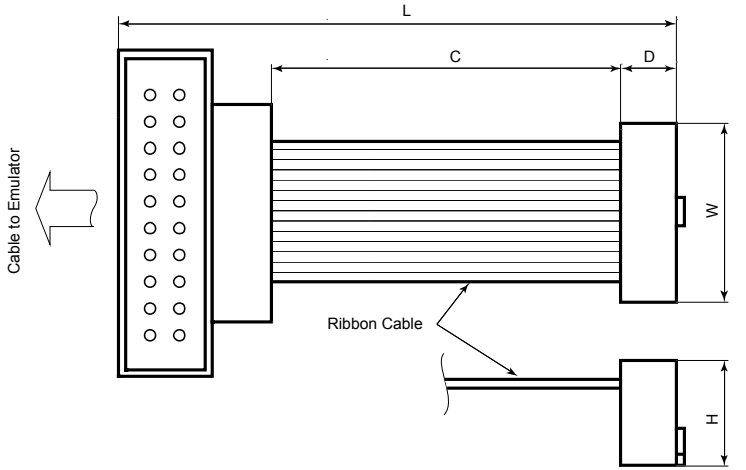

FIGURE 5 The dimensions of the ADA-JET-ARM14 probe with a cable extender. L = 63.0 mm (2.5 in.), C = 40.0 mm (1.55 in.) D = 6.0 mm (.24 in.), W = 22.5 mm (.9 in.), H = 11.5 mm (0.45 in.).

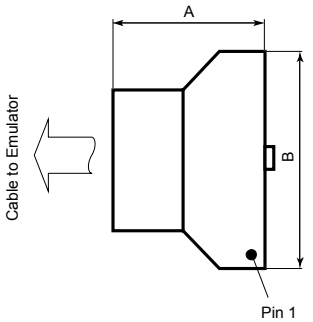

FIGURE 6 The dimensions of the ADA-JET-ARM20 probe. Top view. A = 19.3 mm (0.76 in.) [low-voltage: A = 24.3 mm (0.96 in.)] B = 30.5 mm (1.2 in.)

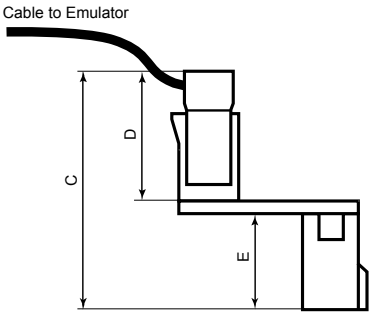

FIGURE 7 The dimensions of the ADA-JET-ARM20 probe. Side view. C = 22.7 mm (0.88 in.) D = 15.0 mm (0.59 in.) E = 11.0 mm (0.43 in.)

ADA-JET-ARM-LV

Your emulator can also be ordered with a low-voltage variant of the JTAG probe, or with both standard and low-voltage variants. These two variants have slightly different dimensions (Figure 6). The voltage range of the low-voltage probe is 1.8V – 3.3V (± 10%).

Caution: Voltage higher than 4.0V may permanently damage the low-voltage probe.

Cable Extender

In addition to its standard version shown on page 3, the 20-pin probe is offered in a version with a 1.55 in. ribbon cable extender that allows the probe to remain outside the target board by lowering the probe's profile. (The 14-pin probe comes always with a ribbon cable extender.)

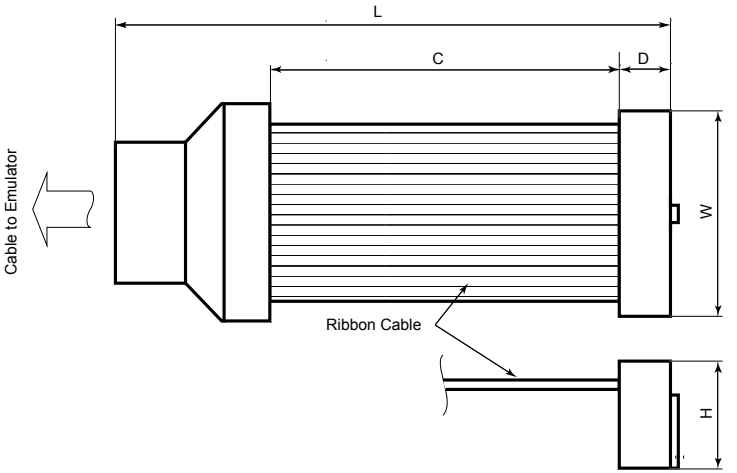

FIGURE 8 Top and side views of the 20-pin ARM probe with a cable extender. L = 69 mm (2.7 in.), C = 40.0 mm (1.55 in) D = 6.0 mm (.24), W = 30.0 mm (1.2 in.), H = 11.5 mm (0.45 in.).

Target Board Header

On the target board, we recommend using a polarized box header, such as:

14-PIN	20-PIN
14-Pin, Double-Row, Polarized Box Header-Straight, .100" × .100" (2.54 mm × 2.54 mm). Manufacturers:	20-Pin, Double-Row, Polarized Box Header-Straight, .100" × .100" (2.54 mm × 2.54 mm). Manufacturers:
• 3M (Mouser Electronics, Part No. 517—2514-6002).	• 3M (Mouser Electronics, Part No. 517—2520-6002).
• tyco/AMP, Part No. 103308-2 – Digi-Key Part No A26269-ND.	• tyco/AMP, Part No. 103308-5 – Digi-Key Part No. A26273-ND.

TABLE 2 Recommended target board headers.

ADA-ARM-SWD

The ARM-SWD probe supports both ARM and Cortex boards at voltages 1.8V to 3.3V. It must be used when Cortex Serial Wire Debug or Cortex Serial Wire Output operation mode is required.

In addition to a standrd 20-pin double-row female ARM connector, this probe has a 20-pin and 10-pin high-density Cortex connectors. Only one connector can be used at a time. The ARM connector, mounted underneath the probe, has the pinout of the ADA-JET-ARM20 probe (Figure 10). The pinouts of the 20-pin and 10-pin Cortex connectors are shown in Figure 11 and Figure 12, respectively. The two high-density cables included with the probe provide a link between the Cortex connectors and the target board (Figure 9).

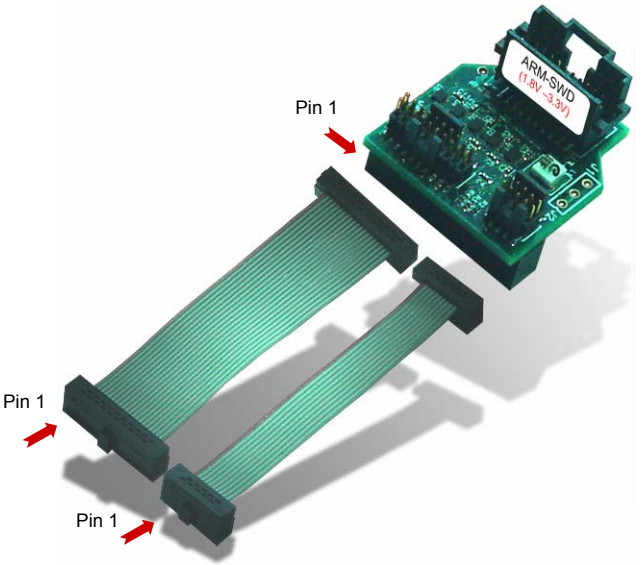

FIGURE 9 The ADA-ARM-SWD probe with the Cortex cables.

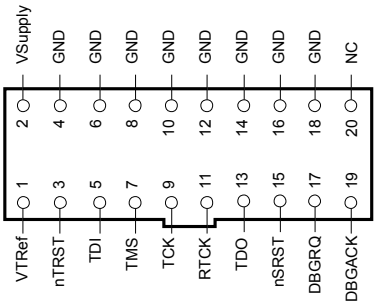

FIGURE 10 The pinout of the ADA-ARM-SWD probe's ARM connector. Top view.

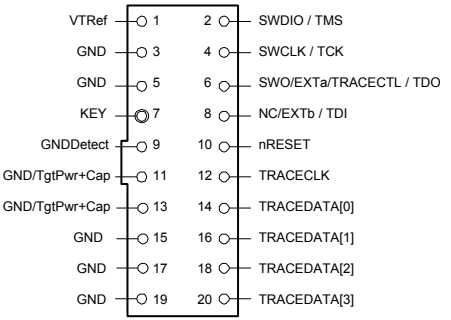

FIGURE 11 The pinout of the ADA-ARM-SWD probe's high-density 20-pin Cortex connector. Top view.

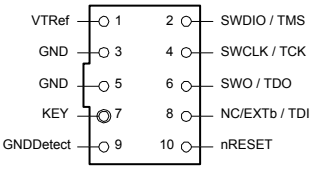

FIGURE 12 The pinout of the ADA-ARM-SWD probe's high-density 10-pin Cortex connector. Top view.

The mating JTAG headers for targets are shrouded with a key, but will require removal of one pin (Table 3).

SAMTEC PART NO.	DESCRIPTION
FTSH-110-01-L-DV-K	20-pin Cortex header (0.05 x 0.05 in. spacing)
FTSH-105-01-L-DV-K	10-pin Cortex header (0.05 x 0.05 in. spacing)

TABLE 3 ARM Cortex probe-mating headers by Samtec Inc.

JTAG Probes for OMAP and TMS320 DSP

ADA-JET-TI14

The Signum JTAG probe for OMAP devices, ADA-JET-TI14, provides a physical interface between Signum emulators for the OMAP processor and OMAP target boards. This probe is the same as that for the Texas Instruments TMS320 devices. It has 14-pin double-row, polarized, .100" × .100". (2.54 mm × 2.54 mm) female connectors. The pinout and dimensions of the probe are shown below (Figure 14 through Figure 16).

Caution: Voltage higher than 4.0V may permanently damage the low-voltage probe.

ADA-JET-TI14-LV

Your emulator can also be ordered with a low-voltage, or—if so desired—with both standard and low-voltage—variants of the probe for OMAP devices. These two variants have slightly different dimensions (Figure 15). The voltage range of the low-voltage probe is 1.8 – 3.3V (± 10%).

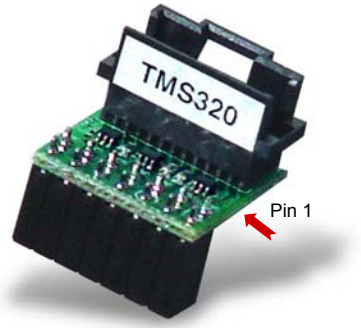

FIGURE 13 The 14-pin JTAGjet probe for OMAP and TMS320 DSP.

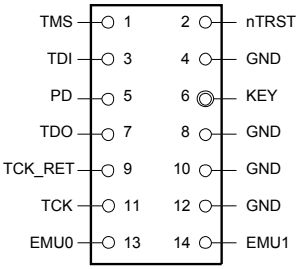

FIGURE 14 The pinout of the 14-pin JTAGjet probe for OMAP and TMS320 DSP. On the right, a top view of a matching probe layout for a target board.

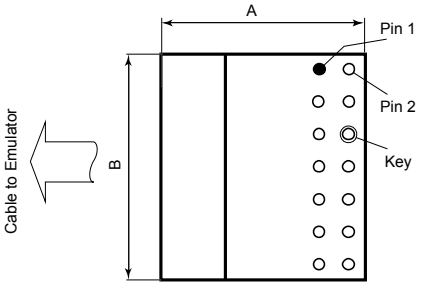

FIGURE 15 The dimensions of the 14-pin JTAGjet probe for OMAP and TMS320 DSP. Top view. A = 18.5 mm (0.73 in.) [low-voltage: 23.0 mm (0.9 in.)], B = 18.3 mm (0.72 in.).

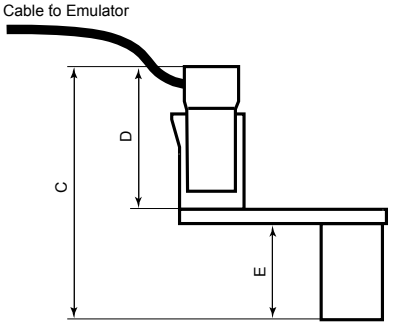

FIGURE 16 The dimensions of the 14-pin JTAGjet probe for OMAP and TMS320 DSP. Side view. C = 24 mm (.95 in.), D = 14.7 mm (0.58 in.), E = 8.5 mm (0.34 in.)

JTAG TMS320 Isolation Probe

ADA-ISO-TI14

The JTAG Isolation Probe for TMS320/470/570 Devices from Texas Instruments is a full isolation JTAG probe for JTAGjet emulators which reduces the chance of damage to the emulator associated with ground loops, voltage spikes, electrostatic discharge (ESD) and noise on power and ground lines generated by high-current motors and other machinery.

The probe fits between the JTAGjet emulator and the user's target board equipped with the Texas Instruments style 14-pin JTAG connector. The distinctive features of the ADA-ISO-TI14 include

- Support for all TMS320C2000, C5000, C6000, OMAP, DM and TMS470 / 570 devices
- Operating JTAG voltage from 3.0 V to 5.0 V (± 10%)
- Galvanic isolation up to 1000 V (peak)*
- 50kV/µs transient immunity (typical) on JTAG lines
- ESD protection of 8kV on contact and 15kV air discharge
- Maximum JTAG clock rate up to 15MHz

***) Important Notice about Isolation & Safety**

Isolation of 1000V cannot be provided for more then 1 sec. The continuous normal operating voltage across the isolation barrier is 0 VDC – 60 VDC. The isolation voltage represents a measure of immunity to transient voltages and the probe should never be used as an element of a safety isolation system. The probe could be expected to function correctly with few hundred volts offset applied continuously across the isolation barrier, but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must be used according to safety standard requirements.

Signum Systems will not be liable for any damages related from usage of this probe.

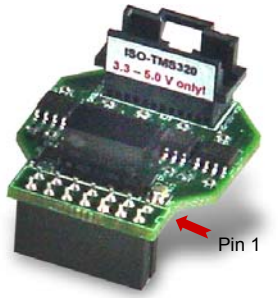

FIGURE 17 The JTAGjet TMS320 ADA-ISO-TI14 isolation probe.

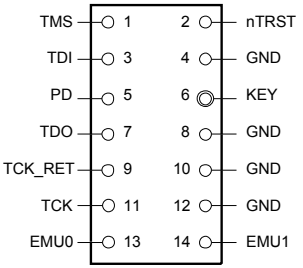

FIGURE 18 The pinout of the 14-pin JTAGjet TMS320 isolation probe.

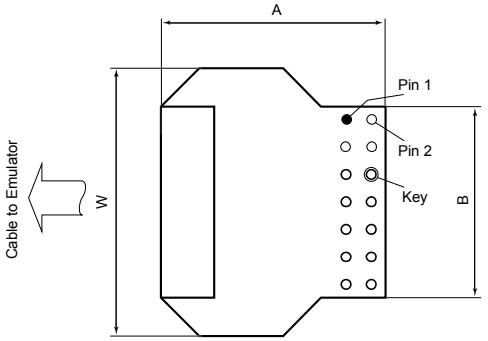

FIGURE 19 The dimensions of the 14-pin JTAGjet isolation probe for TMS320 style devices. Top view. A = 32.0 mm (1.28 in), B = 20.8 mm (0.82 in), W = 29.0 mm (1.14 in).

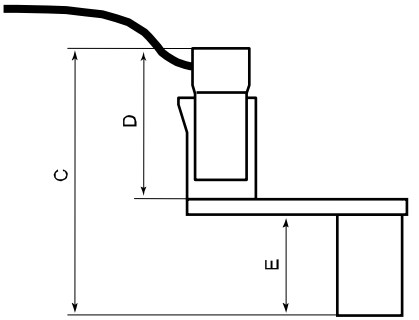

FIGURE 20 The dimensions of the 14-pin JTAGjet isolation probe for TMS320 style devices. Side view. C = 20.5 mm (.81 in.), D = 14.2 mm (0.56 in.), E = 8.5 mm (0.33 in.).

Isolation Probe for TI-14 JTAG with an Auxiliary Power Input

ADA-ISO-TI14-E

The isolation probe for TI-14 JTAG with an auxiliary power input (ADA-ISO-TI14-E) should be used in applications where the target board does not have enough current to supply the isolation probe (about 150mA). When used with external power adapter, this probe reduces the current taken from the target board to approximately 1 mA.

The ADA-ISO-TI14-E probe requires a 3.3V VDC external power source (marked AUX 3.3V) to be connected to pin2 of the J1 header. Pin 1 (square pad) is designated as AUX GND.

The auxiliary power probe is not supplied with the isolation probe.

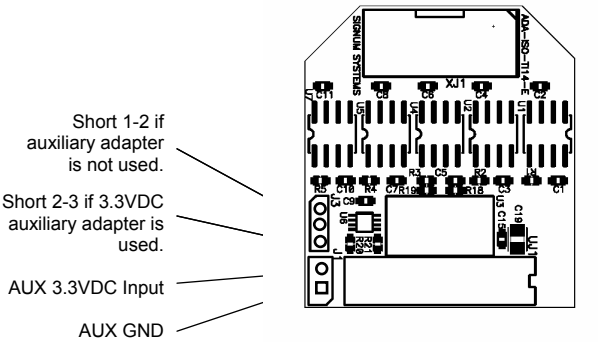

FIGURE 21 An early version of the ADA-ISO-T14-E with jumper-controlled auxiliary power input.

In an older (now discontinued) version of the ADA-ISO-TI14-E, moving the J3 jumper header to short positions 1-2 makes it possible to use the probe without the AUX power adapter.

For other elements of the specification of the ADA-ISO-TI14-E probe, see the ADA-ISO-TI14 section.

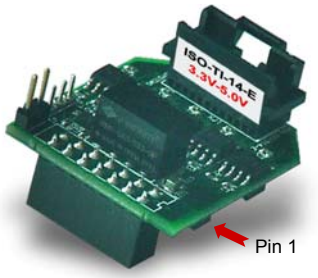

FIGURE 22 The isolation probe for TI-14 JTAG with auxiliary power input ADA-ISO-TI14-E probe with an auxiliary power input.

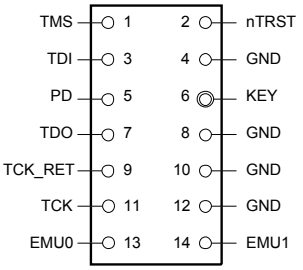

FIGURE 23 The pinout of the ADA-ISO-TI14-E probe. Top view.

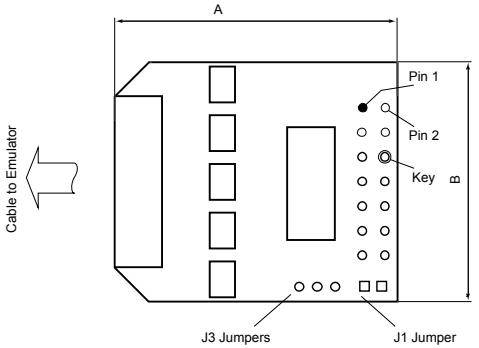

FIGURE 24 The dimensions of the 20-pin ADA-ISO-TI14-E probe. Top view. A = 32.4 mm (1.28 in), B = 28.5 mm (1.12 in).

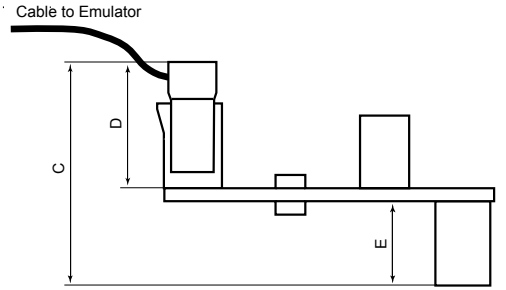

FIGURE 25 The ADA-ISO-TI14-E probe. Side view. C = 20.5 mm (.81 in.), D = 14.2 mm (0.56 in.), E = 8.5 mm (0.33 in.).

Compact TI 20-pin JTAG probe for DaVinci

ADA-JET-CTI20

The Signum JTAG ADA-JET-CTI20 probe provides a physical interface between the Signum JTAGjet-eBinder emulator and DaVinci, DM and OMAP target boards. This probe has 20-pin receptacles. The pin-to-pin X spacing is 0.10 in., Y spacing 0.05 in. The female connector on the probe is SAMTEC RSM-110-02-S-D. This is a low votage probe operating in the 1.8 – 3.3V (± 10%) range. Figure 27 shows the probe's pinout.

FIGURE 26 The ADA-JET-CTI20 probe for the Signum JTAGjet-eBinder emulator.

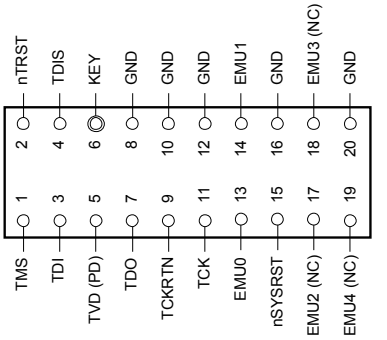

FIGURE 27 The pinout of the ADA-JET-CTI20 probe. Top view.

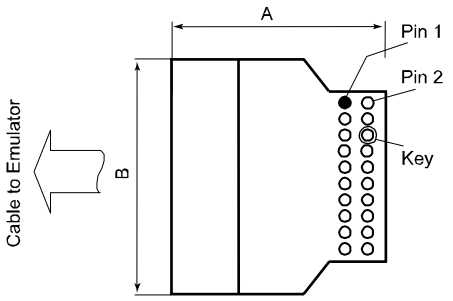

FIGURE 28 Dimensions of the 20-pin CTI20 probe. Top view. A = 27.0 mm (1.06 in.) B = 17.8 mm (0.70 in.).

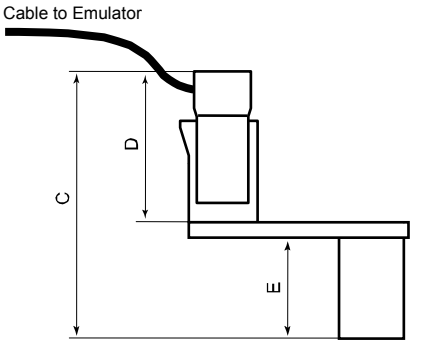

FIGURE 29 Dimensions of the 20-pin CTI20 probe. Side view. C = 23.0 mm (.91 in.), D = 12.5 mm (0.49 in.), E = 6.4 mm (0.25 in.).

The 4-position DIP switch on the CTI20 probe allows you to convert the EMU0 or EMU1 to a CPU reset line (Figure 30).

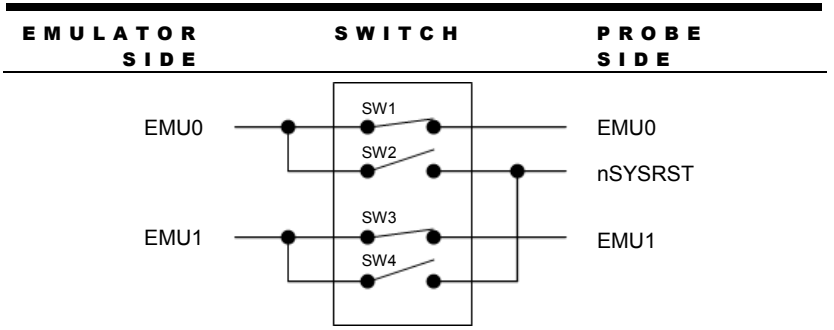

FIGURE 30 The DIP switches SW1-4 on the CTI20 probe in default setting positions.

	SW1	SW2	SW3	SW4
Default – EMU01 and EMU1 controlled in standard way	ON	OFF	ON	OFF
Emulator's EMU0 connected to CTI20 probes's nSYSRST	OFF	ON	ON	OFF
Emulator's EMU1 connected to CTI20 probe's nSYSRST	ON	OFF	OFF	ON
EMU0, EMU1 and nSYSRST disconnected from target (only weak pull-up resistors used)	OFF	OFF	OFF	OFF

TABLE 4 The allowed settings of the ADA-JET-CTI20 probe.

Note 1	Set the SW1-4 switches only when the emulator and the target are not powered!
Note 2	Do not set SW1-2 and SW3-4 pairs both ON. The setting will short the EMU0, EMU1 and nSYSRTS lines on the target.
Note 3	The nSYSRTS, EMU0 and EMU1 lines are bi-directional and are driven by an open-collector gate in the emulator. EMU0 and EMU1 have 100K pull-ups to the PD pin on the probe side, while nSYSRST has 220K pull-up to the PD pin.
Note 4	Certain JTAGjet driver packages may not easily allow configuring EMU0 and EMU1 as nSYSRST. Therefore it is recommended to leave the DIP switch in its default position. The software is unable determine the position of this switch automatically. When SW2 or SW4 are ON, the software needs to be configured accordingly. Sample settings that allow EMU0 to act as a CPU reset signal (nSYSRST) are shown in Figure 31.

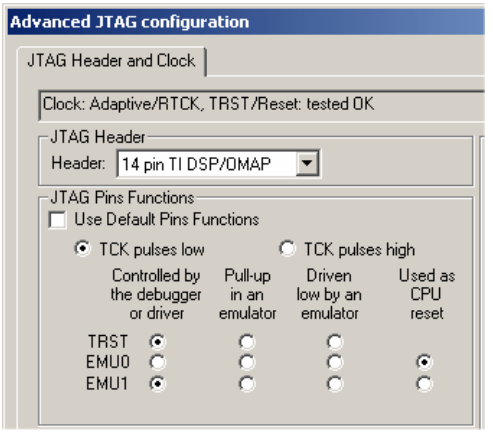

FIGURE 31 Configuring the JTAGjet-eBinder driver to use the EMU0 signal as the CPU reset signal (EmuDiag for the JTAGjet-eBinder).

All future releases of the JTAGjet software will allow the user to redefine the EMU0 and EMU1 pins as CPU reset pins.

ETM Connector for ARM & OMAP

The JTAGjet-Trace series emulators come with an Embedded Trace Macrocell (ETM) cable terminated with a 38-pin Mictor connector. This connector is polarized and cannot be inserted the wrong way.

ARM SIGNAL	OMAP SIGNAL	PIN		OMAP SIGNAL	ARM SIGNAL
No connect	No connect	1	2	No connect	No connect
No connect	No connect	3	4	No connect	No connect
GND	GND	5	6	TRACECLK	TRACECLK
DBGRQ	EMU0	7	8	EMU1	DBGACK
nSRST	CPU_RESET	9	10	EXTTRIG	EXTTRIG
TDO	TDO	11	12	Vtref (ETM)	Vtref
RTCK	TCK_RET	13	14	PD (JTAG)	Vsupply
TCK	TCK	15	16	TRACEPKT[7]	TRACEPKT[7]
TMS	TMS	17	18	TRACEPKT[6]	TRACEPKT[6]
TDI	TDI	19	20	TRACEPKT[5]	TRACEPKT[5]
nTRST	TRST'	21	22	TRACEPKT[4]	TRACEPKT[4]
TRACEPKT[15]	TRACEPKT[15]	23	24	TRACEPKT[3]	TRACEPKT[3]
TRACEPKT[14]	TRACEPKT[14]	25	26	TRACEPKT[2]	TRACEPKT[2]
TRACEPKT[13]	TRACEPKT[13]	27	28	TRACEPKT[1]	TRACEPKT[1]
TRACEPKT[12]	TRACEPKT[12]	29	30	TRACEPKT[0]	TRACEPKT[0]
TRACEPKT[11]	TRACEPKT[11]	31	32	TRACESYNC	TRACESYNC
TRACEPKT[10]	TRACEPKT[10]	33	34	PIPESTAT[2]	PIPESTAT[2]
TRACEPKT[9]	TRACEPKT[9]	35	36	PIPESTAT[1]	PIPESTAT[1]
TRACEPKT[8]	TRACEPKT[8]	37	38	PIPESTAT[0]	PIPESTAT[0]

TABLE 5 The pinout of the ETM connector.

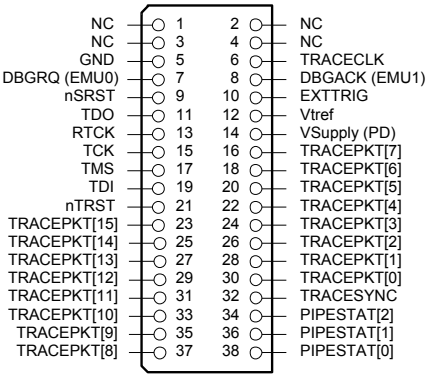

FIGURE 32 A quick reference: the pinout of the ETM connector when used with ARM targets.

JTAG-ETM Splitter Probe

ADA-ETM-JTAG

A typical target board has both the JTAG signals and the ETM signals connected to the same standard 38-pin ETM Mictor connector (see *ETM Connector for ARM & OMAP* on p. 16). Some boards, however, separate the two types of signals, providing two different connectors for them. These boards require a JTAG-ETM splitter probe, ADA-ETM-JTAG. This probe is also useful when debugging an ARM or a DSP target board that does not have an ETM connector on it.

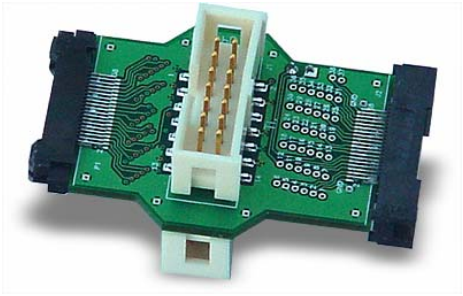

FIGURE 33 The JTAG-ETM splitter probe.

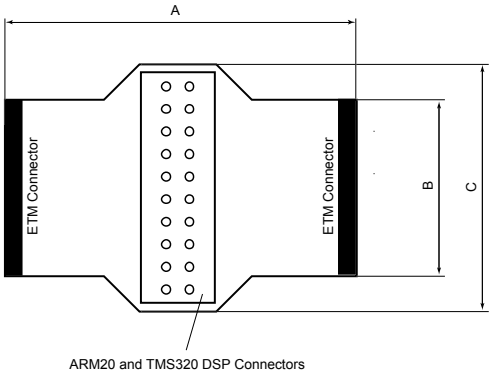

FIGURE 34 The dimensions of the JTAG-ETM splitter board. A = 52.0 mm (2.05 in), B = 25.4 mm (1 in), C = 33.9 mm (1.34 in).

FIGURE 35 The JTAG-ETM splitter board attached to the JTAGjet-Trace emulator. Connected to it are a 20-pin ARM JTAG cable and an ETM Mictor cable (lower). A receptacle for an additional 14-pin TMS320 DSP JTAG cable is located at the bottom of the board.

ARM Cortex Probe

ADA-ARM20-SWD

This passive probe allows you to interface any Signum JTAGjet emulator that uses the 20-pin JTAG probe for ARM (ADA-JET-ARM20 or its low-voltage variant ADA-JET-ARM-LV) with a Cortext target board. Both 20-pin and 10-pin high-density Cortex connectors are supported, but only one of them can be used at a time. The ARM connector of the probe has the pinout of the ADA-JET-ARM20 probe (Figure 2). The pinouts of the 20-pin and 10-pin Cortex connectors are shown in Figure 11 and Figure 12 (page 6), respectively.

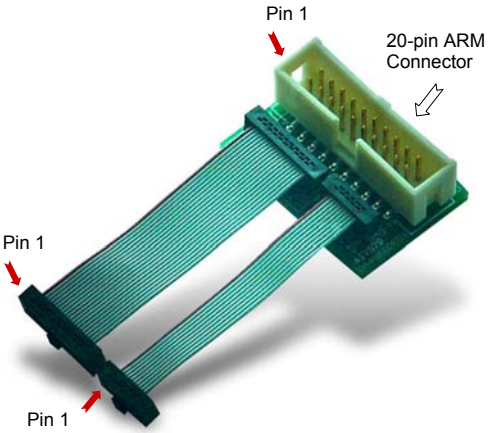

FIGURE 36 The ADA-ARM20-SWD probe for the JTAGjet.

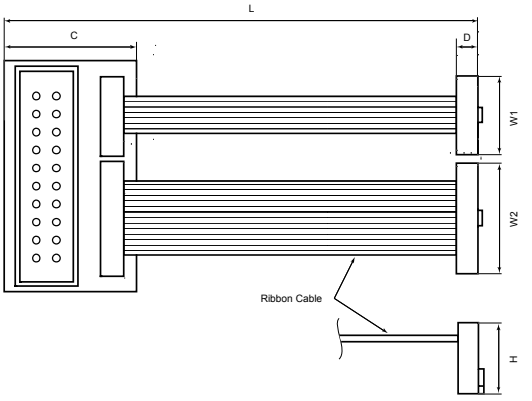

FIGURE 37 The dimensions of the ADA-ARM20-SWD probe. C = 23.6 mm (0.93 in), D = 3.11 mm (0.122 in), H = 5.1 mm (0.2 in), L = 69.3 mm (2.73 in), W = 15.73 (0.62 in), W1 = 10.5 mm (0.41 in), W2 = 16.9 mm (0.67).

The mating JTAG headers for targets are the same as those for the ADA-ARM-SWD probe (Table 3 on page 6).

Passive 20-pin Probe for Cortex ETM trace

ADA-ETM-SWD20

This passive probe provides an interface between the Signum JTAGjet-Trace emulator and the 20-pin high-density connector on a Cortex target board. The pinout of the probe's Cortex connector is the same as the pinout of the ADA-ARM20-SWD probe's 20-pin connector (Figure 2). The probe's ETM connector has the pinout of ETM connector when used with ARM targets (Figure 32).

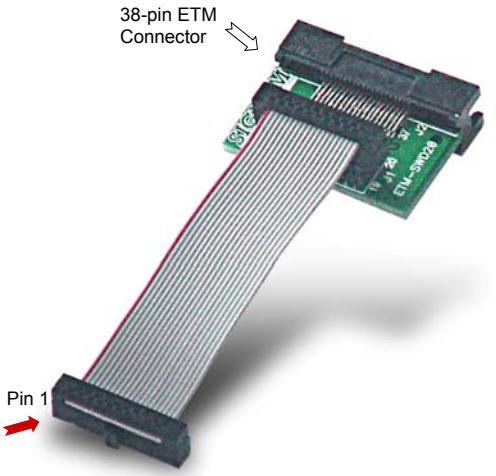

FIGURE 38 The ADA-ETM-SWD20 probe for Cortex boards with ETM trace.

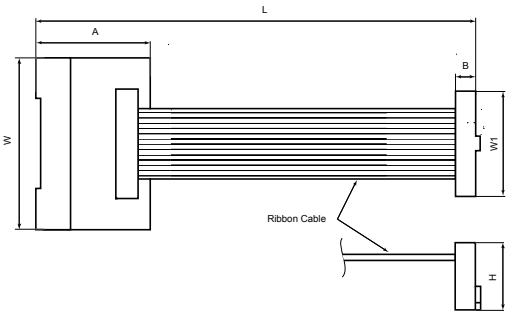

FIGURE 39 The dimensions of the ADA-ETM-SWD20 probe. A = 19.12 mm (0.75 in), B = 3.11 mm (0.122 in), H = 5.1 mm (0.2 in), W1 = 16.9 mm (0.67), W = 25.7 (1.01 in), L = 65.5 mm (2.58 in).

❑