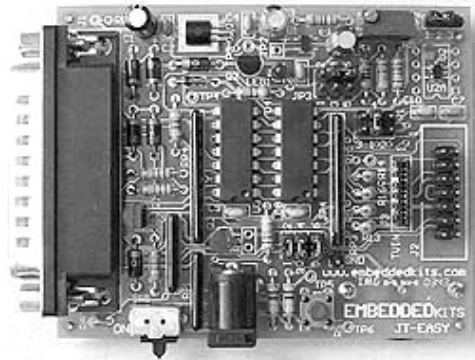


# **JT-EASY™ : MODEL JT-E100A and JT-E100K**

## **USER'S GUIDE**



**Version 1.0**

**© EMBEDDEDkits, 2003; All Rights Reserved**

[www.embeddedkits.com](http://www.embeddedkits.com)

**Disclaimer**

EMBEDDEDkits reserve the right to make changes without further notice to any products or devices herein to improve design, functionality or reliability. EMBEDDEDkits does not assume any liability arising out of use or application of the product(s), device(s), diagram(s), circuit(s), software listing(s) described herein; neither does it convey any license under its patent rights nor the rights of others. EMBEDDEDkits products or devices are not intended or authorized for use as components, or to be used for the design and development of medical devices, products or systems of any type. The same applies for any other application in which the failure of EMBEDDEDkits products or devices could create a situation where personal injury, death or property damage, directly or indirectly, may occur. Should a Buyer(s) purchase or use EMBEDDEDkits products or devices for any such unintended or unauthorized application, Buyer(s) shall indemnify and hold EMBEDDEDkits and its officers, employees, subsidiaries, affiliates, suppliers, and distributors, harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury, death or property damage associated with such unintended or unauthorized use, even if such claim(s) alleges that EMBEDDEDkits was negligent regarding the design, manufacture or testing of the product or device.

The information in this User's Guide or Assembly Guide has been carefully checked, and is believed to be correct. However, no responsibility is assumed for inaccuracies or typographical errors in both, text or graphic form.

# Table of Contents

<b>Section 1</b> .....	<b>1</b>
<u>Overview</u> .....	1
<u>JT-EASY User’s Guide</u> .....	1
<u>Introduction</u> .....	1
<b>Section 2</b> .....	<b>2</b>
<u>JT-EASY Specifications and Features</u> .....	2
<u>JT-E100A features and operation options:</u> .....	2
<u>JT-E100K features and operation options:</u> .....	2
<u>JT-EASY supported MSP430F Modules, Evaluation Systems/Devices</u> .....	2
<u>Texas Instruments, MSP430F Target Socket Modules (and devices) compatibility:</u> .....	2
<u>EMBEDDEDkits, M-Series Modules compatibility:</u> .....	3
<u>SoftBaugh, MSP430F Evaluation Systems compatibility:</u> .....	3
<u>Olimex, MSP430F boards compatibility:</u> .....	3
<b>Section 3</b> .....	<b>4</b>
<u>Getting Started</u> .....	4
<u>JT-E100A package content:</u> .....	4
<u>JT-E100K package content:</u> .....	4
<u>Optional accessories:</u> .....	4
<u>Obtaining the latest materials</u> .....	4
<u>Minimum Hardware and Software Requirements:</u> .....	5
<u>JT-EASY to host PC connection</u> .....	5
<u>JT-EASY to Target Board connection</u> .....	5
<u>14-pin IDC-type JTAG Interface cable connection</u> .....	6
<u>10-pin FFC/FPC-type JTAG Interface cable connection</u> .....	6
<u>8-pin FFC/FPC-type JTAG Interface cable connection (SoftBaugh specific)</u> .....	6
<b>Section 4</b> .....	<b>7</b>
<u>JT-EASY Operation</u> .....	7
<u>JT-EASY Power requirements</u> .....	7
<u>External DC power supply requirements</u> .....	7
<u>JT-EASY user-selected Operation Modes</u> .....	7
<u>Description of Operation Mode Jumpers</u> .....	8
<u>Selecting the JTAG drivers voltage source</u> .....	9
<u>Selecting the voltage source for the Target Board</u> .....	9
<u>Selecting the Target voltage level</u> .....	9
<u>Adjusting the Target Board voltage level</u> .....	10
<u>JTAG Interface signal lines Connect/Disconnect selection</u> .....	10
<u>Target Board local-voltage level auto-sense</u> .....	10
<u>Manually resetting the Target Board or Module’s Microcontroller</u> .....	11
<u>Installing the CR2032 button battery</u> .....	11
<b>Section 5</b> .....	<b>12</b>
<u>JT-EASY to SoftBaugh Evaluation Systems Connection Details</u> .....	12
<u>Connection between JT-EASY and SoftBaugh Evaluation Systems</u> .....	12
<u>FFC/FPC pin-numbering convention</u> .....	12

# Section 1

---

## *Overview*

### **JT-EASY User's Guide**

This User's Guide provides general information, functional description, installation instructions, hardware set-up, and operating instructions for JT-EASY. JT-EASY is available fully-assembled; JT-E100A, or as a reduced-functionality Kit; JT-E100K. In this User's Guide, where the information applies to both versions, the device will be referred as JT-EASY.

### **Introduction**

Congratulations on your purchase of JT-EASY; a JTAG Interface Tool for the Texas Instruments MSP430F family of ultra-low power Microcontrollers. JT-EASY is functionally equivalent to the Texas Instruments MSP-FET430 FET Tool, with additional designed-in features and modes of operation useful to the Hardware/Firmware development engineer. It is available in both assembled; JT-E100A, and easy-to-build kit form; JT-E100K. Both versions of JT-EASY are compatible with Texas Instruments MSP430 Target Socket Modules (TSM) equipped with a 14-pin, IDC-type JTAG interface connector. JT-EASY will also work with SoftBaugh, Olimex or other evaluation boards/systems equipped with a 14-pin IDC-type connector or standard 0.1" header, with the same pin-out connections as the MSP-FET430 FET Tool, or SoftBaugh evaluation systems equipped with an 8-pin, 1-mm, FFC/FPC-type connector. JT-EASY will run with IAR Kickstart with Texas Instruments MSP430 Tool Software, and other third party vendors selling MSP-FET430, FET Tool compatible emulation software.

JT-EASY is a powerful tool that, when combined with IAR Kickstart or other compatible third-party emulation software, can be used as a development platform for MSP430F-based systems. When connected to a host PC, it can be used to erase or program the Target MSP430F Flash memory, or to facilitate Target firmware debugging.

## Section 2

---

### *JT-EASY Specifications and Features*

#### **JT-E100A features and operation options:**

- All debugging/programming functions controlled via host PC Parallel Port
- Power source: PC Parallel Port, AC Adapter (JTE-9VP) or on-board battery
- Power source, auto-sense, auto-switch: Parallel port or AC-Adapter
- User selectable Target voltage level: 2.8V, 3.3V, 3.6V or Adjustable
- User adjustable Target voltage level: 2.0V to 3.6V
- On board voltage regulator can supply up 3.6V at 75mA (max) with the AC- Adapter
- Target voltage level auto-adjust (automatically adjusts JTAG interface voltage)
- User selectable, JTAG interface power source
- Interface control lines enable/disable: Voltage regulator, JTAG lines, Target Reset
- ON/OFF slide switch
- LED Indicator (AC-Adapter plugged-in)
- Target Board Microcontroller reset button
- On-board battery holder for a CR2032, 3V, 20mm battery (battery not included)

#### **JT-E100K features and operation options:**

- All debugging/programming functions controlled via host PC Parallel Port
- Power source: PC Parallel Port, AC Adapter (JTE-9VP) or on-board battery
- Power source, auto-sense, auto-switch: Parallel port or AC-Adapter
- User selectable Target voltage level: 3.6V or adjustable
- User adjustable Target voltage level: 2.0V to 3.6V
- On board voltage regulator can supply up 3.6V at 75mA (max) with the AC-Adapter
- Target voltage level auto-adjust (automatically adjusts JTAG interface voltage)
- User selectable, JTAG interface power source
- Interface control lines enable/disable: Voltage regulator, JTAG lines, Target Reset
- Target Board Microcontroller reset jumper

#### **JT-EASY supported MSP430F Modules, Evaluation Systems/Devices**

##### **Texas Instruments, MSP430F Target Socket Modules (and devices) compatibility:**

###### **MSP-TS430DW28 –**

For the MSP430F11xIDW, MSP430F11x1AIDW, MSP430F11x2IDW, MSP430F12xIDW and MSP430F12x2IDW devices.

###### **MSP-TS430PM64 –**

For the MSP430F13xIPM, MSP430F14xIPM, MSP430F15xIPM, and MSP430F16xIPM, MSP430F41xIPM devices.

###### **MSP-TS430PZ100 –**

For the MSP430F43xIPZ and MSP430F44xIPZ devices

**EMBEDDEDkits, M-Series Modules compatibility:**

All M-Series Modules with the FFC/FPC-type JTAG connector.

**SoftBaugh, MSP430F Evaluation Systems compatibility:**

All Evaluation Systems and boards equipped with a 14-pin, JTAG connector with the same pin-out connections as the Texas Instruments, MSP-FET430 FET Tool.

Evaluation Systems equipped with a top-connect, FFC/FPC-type connector. Will require EMBEDDEDkits, 8-pin FFC cable (Part # FFC-8) for JT-EASY connection.

**Olimex, MSP430F boards compatibility:**

All boards equipped with a 14-pin, JTAG connector with the same pin-out connections as the Texas Instruments, MSP-FET430 FET Tool.

## Section 3

---

### *Getting Started*

#### **JT–E100A package content:**

- Main PC–Board, fully assembled and tested
- PC Parallel Port interface cable (Part # 25P–PPC)
- FFC JTAG Interface Cable for EMBEDDEDkits M–Series Modules (Part # FFC–10)
- 14–wires, IDC–type JTAG Interface Cable (Part # 14P–IDC)
- 120 VAC Adapter, 9VDC @ 200mA output w/ 2.1mm male plug (Part # JTE–9VP )
- User’s Guide (quick–start, printed version) with fully documented schematic

#### **JT–E100K package content:**

- Main PC–Board, with pre–assembled surface mount components
- Kit components
- PC Parallel Port interface cable (Part # 25P–PPC)
- FFC JTAG Interface Cable for EMBEDDEDkits M–Series Modules (Part # FFC–10)
- User’s Guide, (quick–start, printed version) with fully documented schematic
- Assembly Guide (printed version)

#### **Optional accessories:**

EMBEDDEDkits, M–Series Modules. Visit [www.embeddedkits.com](http://www.embeddedkits.com) for list and description of available Modules.

Part # 14P–IDC: 14–wires IDC–type Cable. This cable is needed to connect JT–E100K to Texas Instruments, MSP430 Target Socket Modules, or similar third–party Modules or Boards.

Part # FFC–8: 8–wires, 1mm, Flex Flat Cable (FFC). This cable is needed to connect JT–E100A or JT–E100K to SoftBaugh evaluation systems, equipped with a top–connect FFC–type connector.

Part # CR2032: 3V, 20mm button battery. This battery is needed for JT–E100A, battery–powered feature.

#### **Obtaining the latest materials**

The primary source of MSP430 information, including device specific user’s guide, data sheets, application notes, and code examples can be downloaded from Texas Instruments website [www.ti.com/sc/msp430](http://www.ti.com/sc/msp430). IAR Kikstart and MSP430 Tool Software can be downloaded from the Texas Instruments website [MSP430FREETOOLS](http://MSP430FREETOOLS).

## **Minimum Hardware and Software Requirements:**

- 486 processor (Pentium® is recommended)
- 16MB of RAM (64MB is recommended)
- 7MB free hard disk space
- Parallel Port
- CD-ROM drive
- Internet connectivity (required for downloads)
- Windows® 95/98/NT/ME or 2000
- IAR Kickstart with Texas Instruments MSP430 Tool Software, or compatible third-party emulation software

## **JT-EASY Required Software**

Download the Free, Kickstart Development Tool software from the Texas Instruments website and install the Kickstart software by launching the Kickstart installation program. Respond accordingly to the displayed prompts, to complete the installation.

## **JT-EASY to host PC connection**

### **NOTE**

As a standard practice, to prevent possible damage or operation disruption of host PC, it is recommended that both PC and JT-EASY be turned OFF, before any cable connections are made, or before installing or repositioning any of the operation-selection jumpers. JT-E100A can be turned off via the on-board ON/OFF switch. If used, JT-E100K can be turned OFF by unplugging the AC Adapter plug from the power-in jack.

Connection of JT-EASY to the host PC is accomplished via the supplied 25-pin cable. Connect the female end of the flat cable to the JT-EASY 25-pin connector, and the male end to the PC, Parallel Port connector.

## **JT-EASY to Target Board connection**

### **NOTE**

As a standard practice, to prevent possible damage or operation disruption of JT-EASY or Module or Target Board, it is recommended that JT-EASY and the Module or Target Board power source be turned OFF or be disconnected before making any cable connections.

Connection of JT-E100A to a Target Board or Module with a 14-pin JTAG header or connector is accomplished with the included 14-wires, IDC-type cable, or to EMBEDDEDkits M-Series Modules with the included 10-wires, FFC-type Cable.

Connection of JT-E100K to a Target Board or Module with a 14-pin JTAG header or connector will require the 14-wires IDC-type JTAG Interface connector (Part # 14P-IDC.)

### **NOTE**

The Target Board or Module, JTAG header or connector must have the same pin-out connections as the Texas Instruments MSP430 Target Socket Modules (TSM) equipped with a 14-pin, IDC-type JTAG interface connector.



EMBEDDEDkits, JT-EASY is equipped with both an FFC-type and a 14-pin header for the JTAG Interface connection. To prevent unwanted noise pick-up, only one cable connection should be made.

### **14-pin IDC-type JTAG Interface cable connection**

Connect one end of the cable to JT-EASY 14-pin (J2) connector, and the other end to the Target Board or Module 14-pin connector.

#### **NOTE**

To prevent unwanted bending of the FFC grasp it near the exposed end-fingers, or the hard-plastic backing. It is best to partially insert one corner of the FFC end into the connector first, before squaring the edge to complete the insertion.

### **10-pin FFC/FPC-type JTAG Interface cable connection**

Insert one end of the FFC into JT-EASY, 10-pin FFC (J3) connector, and the other into the EMBEDDEDkits M-Series Module (J1) connector. EMBEDDEDkits uses FFC/FPC-type dual-contact connectors on both JT-EASY and the M-Series Modules, so the orientation (facing up or down) of the cable exposed end-fingers is not important, as long as both ends of the cable are facing the same way. We generally prefer to insert the cable with the exposed end-fingers facing up.

### **8-pin FFC/FPC-type JTAG Interface cable connection (SoftBaugh specific)**

Insert one end of the FFC into JT-EASY, 10-pin FFC (J3) connector, and the other into the EMBEDDEDkits M-Series Module (J1) connector.

When JT-EASY is connected to a board equipped with a top-contact type connector, like SoftBaugh evaluation systems have, both ends of the cable exposed end-fingers must be facing up. See Section 5 for connection details.

## Section 4

---

### *JT-EASY Operation*

#### **JT-EASY Power requirements**

JT-EASY can be powered from the host PC Parallel Port, a Battery (JT-E100A only) or from an external power source like the EMBEDDEDkits AC-Adapter, or a DC power supply.

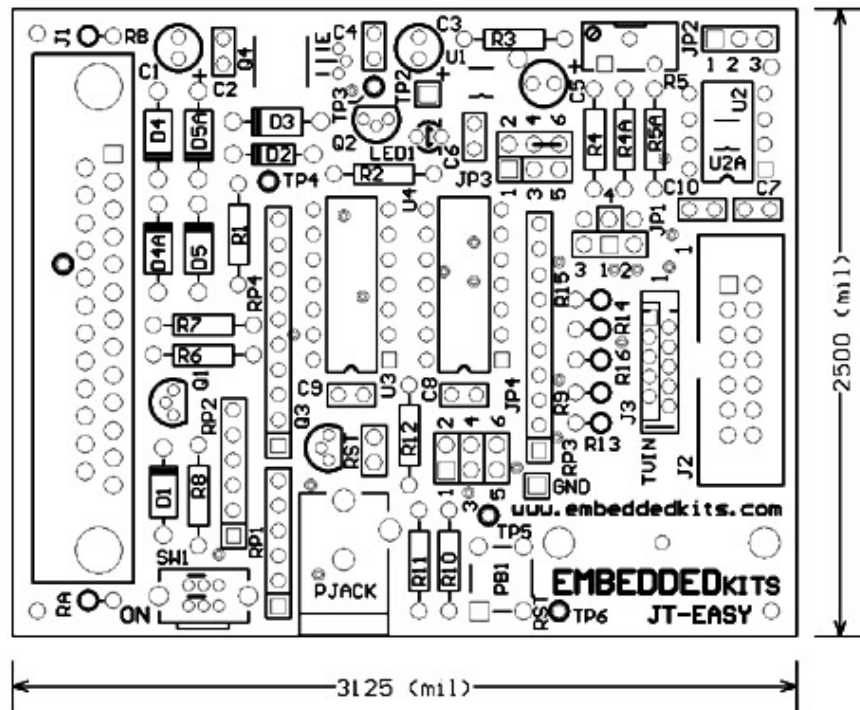
For applications requiring little power, the PC parallel port can directly supply the voltage and current needed to run JT-EASY and the Target Board. With most PC's the derived voltage is around 3V, and is limited to a few hundred microamps of current drain. With some Laptops this may not be possible due to their limited parallel port drivers capability. In this case, or for applications where the Target Board needs additional current to operate, you should run JT-EASY from an external power source or the on-board 3V battery (JT-E100A only). For battery operation a CR2032 button battery needs to be installed. See Section 4 for battery installation details.

#### **External DC power supply requirements**

A power source capable of supplying 9V to 11V DC, 0.5V (max) peak-to-peak 120Hz ripple, at 100mA load can be used to power the unit. JT-EASY power-in Jack can accept a 2.1mm X 5.5mm Plug. For proper operation, the power source Positive (+) lead must be connected to the Plug center terminal (center positive). If the power source is adjustable, we recommend setting the output voltage to 10V DC.

#### **JT-EASY user-selected Operation Modes**

JT-EASY operation mode is configured via installation of, or removal of "Jumpers" (shorting blocks) from Jumper Header JP1, JP2, JP3 and JP4. JT-E100A is shipped with the operation-mode selection jumpers installed in their default position. Prior to connection to a host PC, JT-E100A should be inspected/prepared for proper placement of jumpers.



**NOTE**

JPn: a–b, denotes installation of jumper onto Jumper Header (n), pins (a) and (b).

**JT–E100A Jumpers default setting:**

JP1: 1–3, JP2: 1–2, JP3: 4–6, JP3: 3–5 and JP4: 1–2, 3–4, 5–6

**JT–E100K Jumpers default setting:**

JP1: 1–3, JP2: 1–2, JP3: 3–5, JP4: 1–2, 3–4, 5–6 and RST (open circuit)

**Description of Operation Mode Jumpers**

- JP1 – JTAG Interface drivers voltage source selection
- JP2 – Target voltage source selection
- JP3 – Target voltage level selection
- JP4 – JTAG Interface signal lines Connect/Disconnect selection

## Selecting the JTAG drivers voltage source

Power to the JTAG drivers can be supplied by the on-board voltage regulator; JP1: 1-3, Target Board local-voltage supply; JP1: 1-4, or the on-board battery (JT-E100A only); JP1: 1-2.

When the JTAG drivers voltage is supplied by the Target Board; JP1: 1-4, via (J2) pin-4 or (J3) pin-1, it is recommended that JP2: 2-1 or 2-3 be removed. This is to prevent possible contention or unnecessary current drain from the on-board voltage regulator or the on-board battery (JT-E100A only) and the Target Board voltage source.

## Selecting the voltage source for the Target Board

Power to the Target Board can be supplied by the on-board voltage regulator; JP2: 2-1, or the on-board battery (JT-E100A only); JP2: 2-3.

It is recommended that when the Target Board voltage is supplied by the battery, the JTAG drivers voltage (selected via JP1) also be supplied by the battery. This is to safeguard against the unlikely, but possible situation where JP1: 1-3 is in place and the voltage level supplied by the PC Parallel Port is lower than the on-board battery voltage, which is now supplying power to the Target Board. In this case the JTAG interface output lines, voltage level may not be high enough to reliably drive the Target Board JTAG Interface lines high. This situation will not arise if JT-EASY is powered by the AC-Adapter, because the JTAG drivers voltage will always be higher than the on-board battery voltage.

When the AC-adapter is used, or when the host PC supplied voltage is higher than the battery voltage (measured at Test Point TP3), the current supplied by the battery (JT-E100A only) to power the Target Board can be measured. For this measurement install JP1: 1-4, remove JP2: 2-3, and connect a current meter to complete the circuit.

## Selecting the Target voltage level

### **NOTE**

The AC-Adapter should only be plugged or unplugged into/from JT-EASY power jack when the host PC is turned OFF.

JT-EASY has the ability to auto-sense if the AC-Adapter is plugged into the on-board power jack. When the AC-Adapter is sensed, it can automatically change (bump-up) the Target Board voltage level, thus allowing the Target Board to run at a faster clock speed. The default or bumped-up voltage level is selected via JP3. When JT-EASY is powered from the host PC, the default voltage level is supplied to the Target Board. If desired, the voltage bump-up feature can be disabled by removing JP3: 1-3 or JP3: 3-5.

### **JT-E100A only:**

For 2.8V (default) or 3.3V (auto bump-up) Target Board voltage level, install JP3: 1-3 and 2-4. JP3: 1-3 can be removed to prevent the 3.3V auto bump-up feature.

## **JT–E100A and JT–E100K:**

For user adjustable (default) 2.0V to 3.6V or 3.6V (auto bump–up) Target Board voltage level, install JP3: 4–6 and 3–5. JP3: 3–5 can be removed to prevent the 3.6V auto bump–up feature.

### **Adjusting the Target Board voltage level**

When JT–EASY adjustable feature is selected, the Target Board voltage can be adjusted from approx 2V to 3.6V via Potentiometer R5. To increase voltage level turn potentiometer clockwise, to decrease turn counterclockwise. When JT–EASY is powered from the host PC this level should be limited to 3.0V (max). See “JT–EASY Power requirements” for additional information.

### **JTAG Interface signal lines Connect/Disconnect selection**

#### **NOTE**

The purpose of JP4 is to prevent unwanted effects from undefined JTAG Interface logic levels, when the host PC is OFF. This feature may be required in situations where you want JT–EASY to power the Target Board while the host PC is OFF, and you do not want to disconnect the parallel port cable. The parallel port lines in some PC’s, when turned OFF, can revert to a LOW logic level.

To prevent unwanted Enable/Disable of JT–EASY on–board voltage regulator, remove JP4: 5–6.

To prevent the unwanted Enable/Disable of the JTAG Interface drivers, remove JP4: 3–4.

To prevent unwanted Target Board resets, remove JP4: 1–2.

### **Target Board local–voltage level auto–sense**

#### **NOTE**

When auto–sense is used, the connection from the Target Board local–voltage supply and JT–EASY (J2) pin–2 or (J3) pin–10 must not be made. This is to prevent possible contention or damage to the on–board voltage regulator or the Target Board local–voltage supply, or both.

JT–EASY can auto–sense the Target Board voltage level, and can automatically adjust the JTAG Interface drivers voltage level to that required by the Target Board.

This feature can be used when the Target Board is to be powered from a local supply. In this case, the Target Board local supply must be connector to JT–EASY, JTAG Interface connector (J2) pin–4 or (J3) pin–1, and JP1: 1–4 be must be installed.

## **Manually resetting the Target Board or Module's Microcontroller**

### **JT-E100A only:**

A push-button switch (PB1) is provided to facilitate a hardware reset. To initiate a reset, momentarily press PB1.

### **JT-E100K only:**

A 2-pin header RST is provided to facilitate a hardware reset. To initiate a reset, momentarily short out RST. To do this, it is recommended that you use a shorting block instead of a screwdriver or other metallic object.

## **Installing the CR2032 button battery**

For JT-E100A battery operation a CR2032 battery needs to be installed. When first installing or replacing the battery, make sure that it is properly inserted into the battery holder. The battery holder is located on the bottom side of the PC-board. Before insertion, the battery Positive (+) contact must be facing down. The battery holder is clearly marked with a (+) to show the correct orientation. Incorrect battery installation will damage the unit!

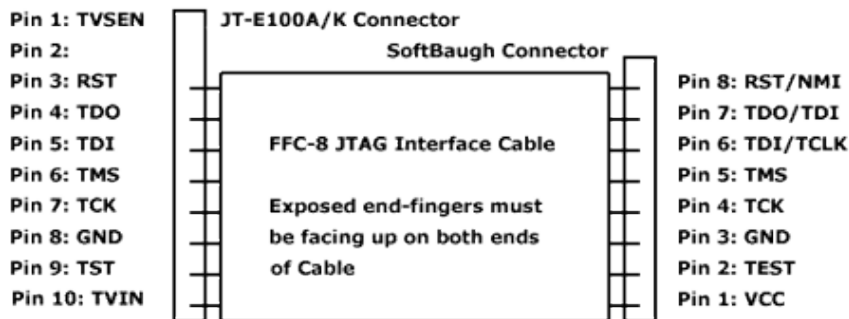
## Section 5

### *JT-EASY to SoftBaugh Evaluation Systems Connection Details*

#### Connection between JT-EASY and SoftBaugh Evaluation Systems

##### **NOTE**

SoftBaugh Evaluation Systems/Boards usually have a jumper to complete the connection from the on-board battery or power-in connector and the PC-Board VCC connection point. This jumper must be removed to prevent contention or possible damage to JT-EASY on-board voltage regulator.



##### **NOTE**

To prevent unwanted bending of the FFC grasp it near the exposed end-fingers, or the hard-plastic backing. It is best to partially insert one corner of the FFC end into the connector first, before squaring the edge to complete the insertion.

Insert one end of the 8-wire FFC-type cable into JT-EASY (J3) connector (make sure to start cable insertion from pin #10, labeled TVIN) and insert other end of cable into the SoftBaugh Evaluation System connector. J3 is the small vertical connector located near header J2.

Please note that even if the to/from pin number differs between the two connectors, the physical connection will be the same as long as both ends of the cable are facing the same way (up or down). When JT-EASY is connected to a board equipped with a top-contact type connector, like SoftBaugh evaluation systems have, both ends of the cable exposed end-fingers must be facing up.

#### **FFC/FPC pin-numbering convention**

EMBEDDEDkits uses FFC/FPC-type dual-contact connectors on both JT-EASY and the M-Series Modules, so cable orientation is never a problem. In addition, for our Modules and Evaluation Boards, we have adopted the standard convention for connector pin-numbering, where the pin number increases from left to right. By using this convention, the schematic pin #1 label coincides with the actual pin #1 marking of the connector, thus avoiding any potential confusion or erroneous connection.