In-Situ Programming
# Program ST727x4 monitor MCU OTP Family on Application

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DESCRIPTION

The OTP versions of the ST727x4 Monitor MCU Family are normally programmed with their specific Eprom Programmer Board (EPB). The blank MCU is inserted in the EPB, which is a separate unit, then programmed with the desired binary contents.

Depending on the customer's application, programming the MCU directly on the final application itself, *once* the chip has been soldered on it rather than before, is more suitable. For example, in the case of a TQFP-44 package, the sockets of which are very expensive, and when the customer cannot afford to put one on every application board, the MCU must be soldered along with the rest of the components. This often requires late programming, *once* the MCU has been soldered.

This MCU family provides a way to achieve this *In-Situ Programming* with the use of JTAG connector located on the EPB. This connector which links the board to a few specific MCU pins is used to program when on application.
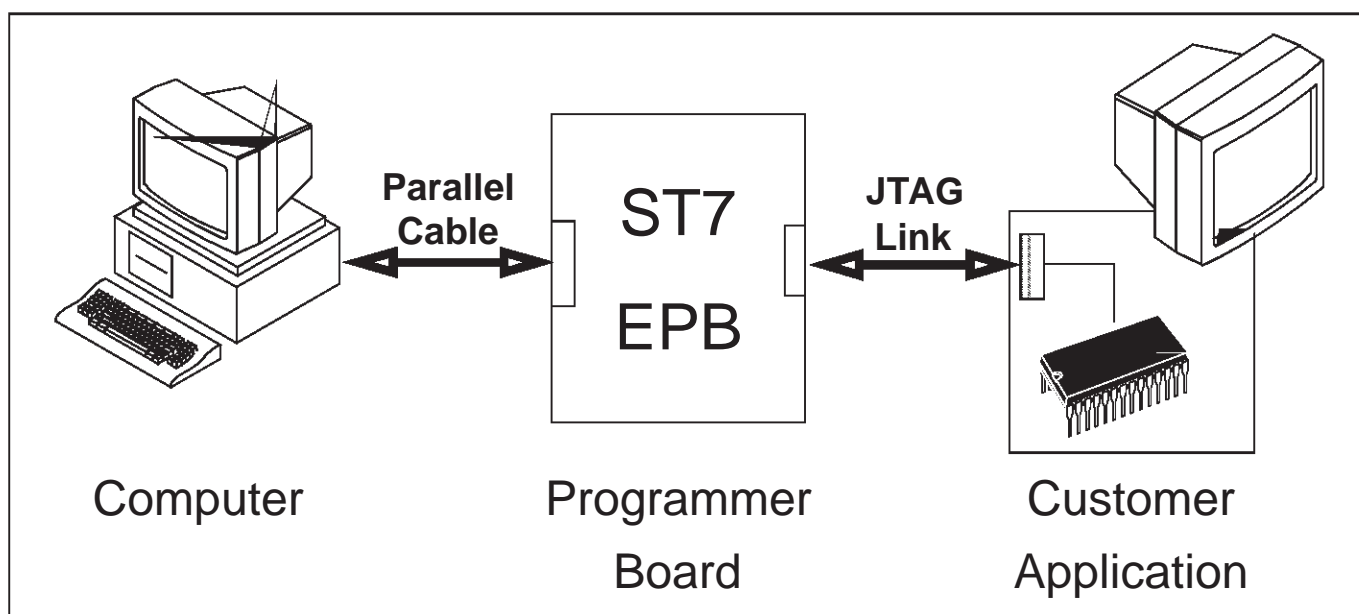
IN-SITU PROGRAMMING FEATURES

■ **Programming is achieved even if the chip is already soldered on the application**

■ **JTAG link requires the normal EPB board and a simple, inexpensive flat cable**

■ **JTAG link is connects to only a few MCU pins**

■ **Those MCU pins are also used as usual with minor restrictions, they are <u>not</u> dedicated**

■ **Normal EPB Software (WinEE, STVP7..) is run and all usual features are available : blank check, program, verify..**

DRAWBACK

■ **Programming operation is only done <u>once</u> (OTP memory array)**

Prerequisites

This Application Note describes how to connect an EPB board to a ST7 already installed in the customer's final application or to the ST727x4 Demoboard.

For this, the following equipment is required:

● The specific EPB Board used by the customer for the MCU(such as ST727x4-EPB) and its accessories (parallel cable, power supply etc)

● The EPB S/W running on the computer: STVP7 (recommended) or WinEE

● A flat ribbon cable (refer to respective section below) used for JTAG communication

● The matching JTAG connector on the customer's application with all needed signals routed to the corresponding MCU pins (refer to respective section below)

● (*optional*) The ST727x4 Demoboard to test

JTAG ribbon cable

This cable is made of two HE-10 16 pin female crimp connectors, mounted on a piece of flat ribbon cable of the desired length (20 to 30 cm):

Figure 1: JTAG ribbon cable
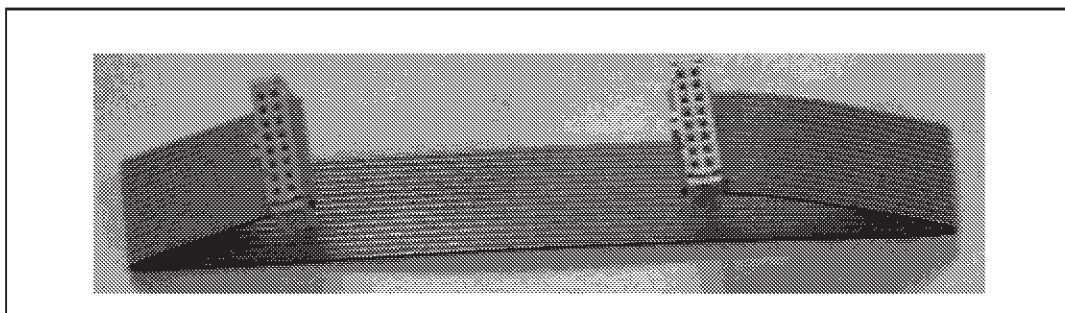
The female connectors that plugs into the EPB is mandatory.

At the other end, the same HE-10 connector is used if plugged into the ST727x4 demoboard. Otherwise, any connector at the customer's choice can be used, although the same connector is strongly recommended.

Note   *The cable should be kept as short as possible, since the signals issued by the EPB are not buffered enough to be conveyed over long cables.*

Connection between EPB and Customer Application

One end of the JTAG cable goes to the matching male header connector labelled "W1" on the EPB.

The other end goes to the matching male connector on the ST727x4 demoboard, or on the customer's final application.

Table 1 shows the "W1" connector pinout on the EPB, and the "J6" connector pinout on the ST727x4 Demoboard, the other pins are not used.

Table 1: "W1" and J6 connector pinout

Connector Pin #	Signal
JTCK	1
OSCIN	2
JTMS	3
RESET	4
JTDI	5
JTDO	7
Ground	15
VPP/TEST	16

For use with the ST727x4 Demoboard

This demoboard is shipped with a mating JTAG HE-10 connector labelled "J6", fitted for the cable previously described.

However, the previous revisions of the ST727x4 demoboard need slightly modifying for the JTAG communication:

- The C15 capacitor (47uf) must be **removed**
  It has been removed on all recent boards as it does not affect normal demoboard behaviour

- The Bicolour LED LD13 (DPMS) must also be **removed**
  This LED, currently used in monitor S/W, is best mounted on socket for easy insertion/removal

A jumper setting must then be changed on ALL demoboards:

- The J7 jumper must be moved upwards from position "XTAL" to position "CLK_JTAG", since the JTAG interface drives the ST7 clock

- Once the JTAG operation is completed, this jumper must be put back on the "XTAL" default position

The EPB and the Demoboard are cross-connected when all the previously described modifications have been applied, as shown below in Figure 2 with red rectangles.

Figure 2: EPB and Demoboard Cross-connection
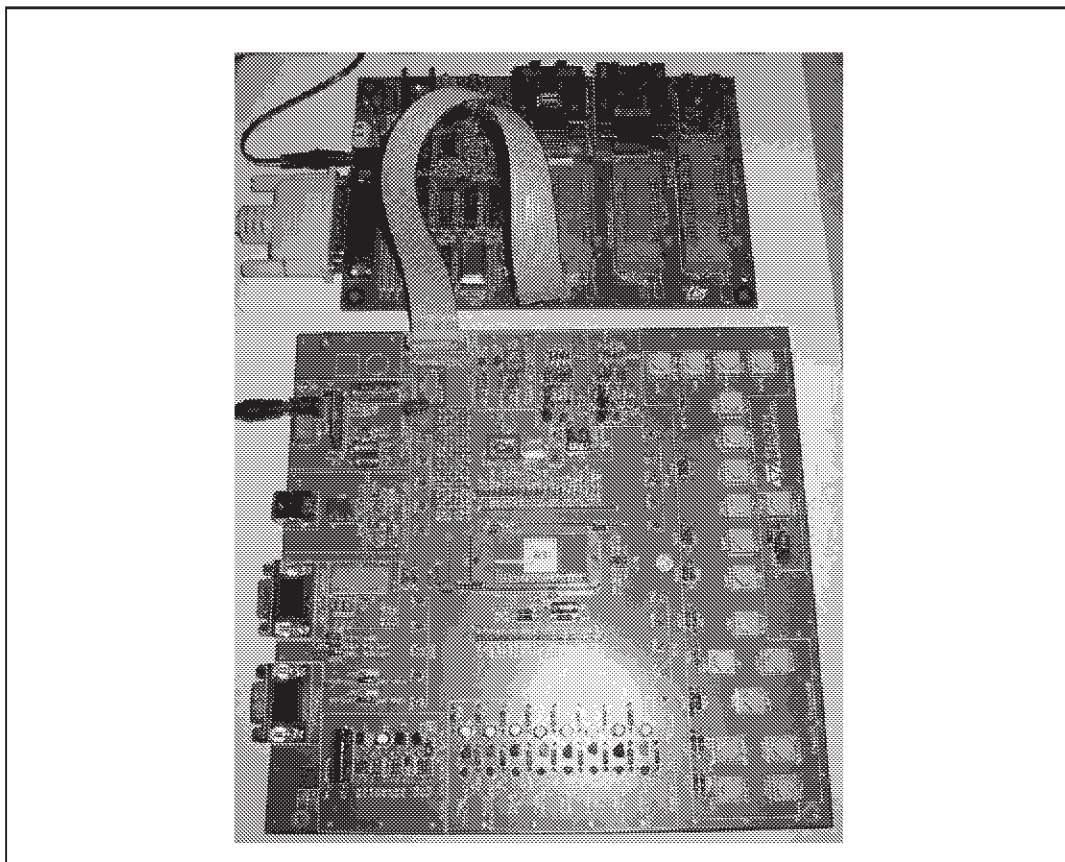
JTAG pins on the MCU

Some MCU pins have an alternate assignment to JTAG signals while the other pins are don't care. Specific restrictions must be considered carefully closely. Still, pullups are allowed on all pins (except TEST/VPP):

Table 2: JTAG pins assigment

JTAG signal	Direction (ST7)	Pin # on SDIP42	Pin # on TQFP44	Specific Restrictions
TEST/VPP	I	41	37	Use a 10K pulldown resistor to ground, do NOT use a fixed ground level
RESET	I	40	36	External reset circuitry must not interfere. For that purpose, use 1K serial resistor in-between to allow driving by JTAG
OSCIN	I	33	29	The crystal should not interfere
JTMS	I	36 (PA4)	32 (PA4)	Do NOT drive a LED or a potentially dangerous circuitry directly with the pin. (if used as output in the application)
JTCK	I	34 (PA6)	30 (PA6)	
JTDI	I/O	31 (PA7)	27 (PA7)	
JTDO	O	11 (PB5)	5 (PB5)	

Other set-ups

Connect the EPB to the PC via its parallel cable, and to the main AC plug via its power supply adaptor.

The ST727x4 Demoboard (if used) or the customer's application **must** also be power supplied. The JTAG cable does **not** provide +5V power to the external application.

Running the EPB S/W

The usual STVP7 (recommended) or WinEE softwares are unchanged: same features, same programming time, LEDs are still active etc..

There is no remarquable difference, apart from the fact that the ZIF socket on the EPB remains empty.