AN1813
APPLICATION NOTE

ST7-STICK and ST7MDTxx-EPB programmers In-Circuit Programming Considerations

INTRODUCTION

The In-Circuit Communication (ICC) protocol for ST7 makes it possible to in-circuit program your application to an ST7 XFLASH or HDFLASH microcontroller while the device is mounted on your application board.

Both the ST7-STICK and the ST7xxxx-EPB programmers allow **in-circuit programming** of supported ST7 Flash microcontrollers. However, when you start developing your application, you must integrate an ICC connector into your application hardware. To help you implement ICP in the development of your application, this application note provides a summary of points you should consider when installing an ICC connector.

1   ICC CONNECTION REQUIREMENTS

To connect to your application board for ICP, you need to install a 10-pin, HE-10 type connector. This connector receives the programming tool's ICC cable and relays the required signals to the ST7 that is mounted on your application board.

HE-10 type connector

Using the In-Circuit Communication (ICC) protocol for ICP requires that a minimum of 4 and as many as 6 pins of your ST7 be connected to the programming tool. These connection requirements are illustrated in *Figure 1*, below and summarized in *Table 1 on page 2*.
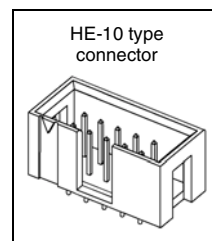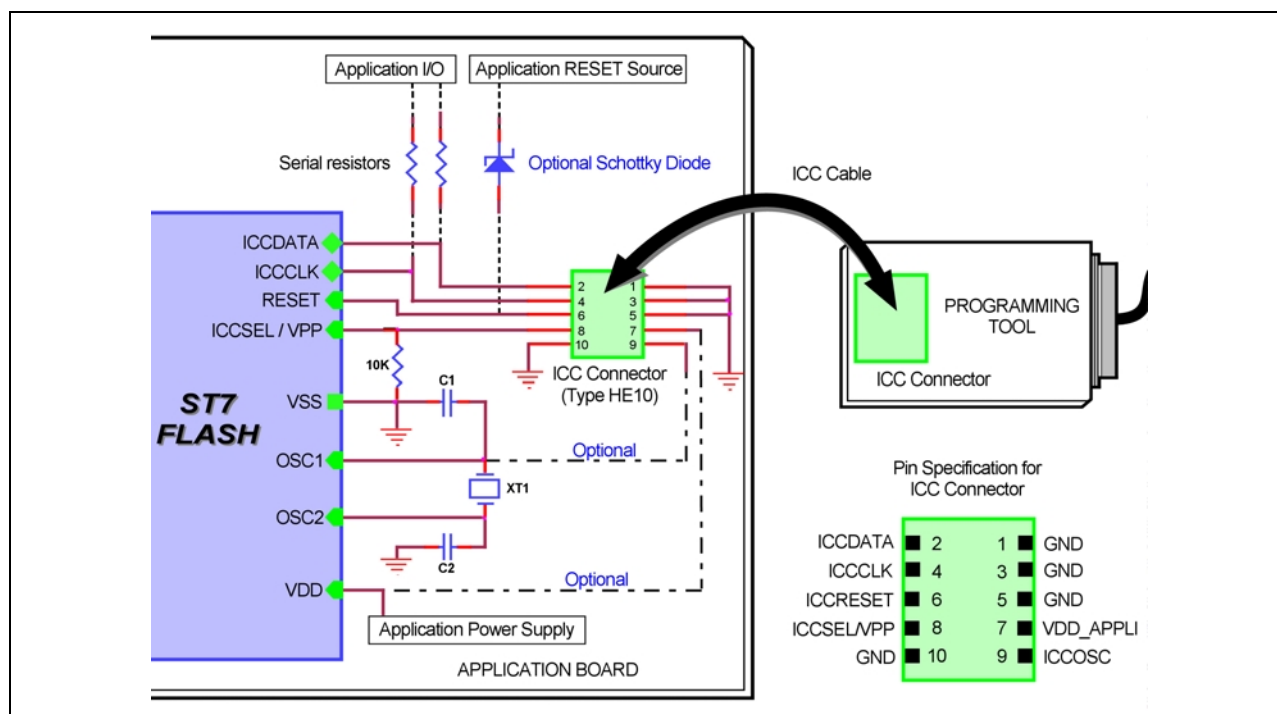
Figure 1: ICC Interface

ST7 pin		Connects to
ICCDATA	ICC input serial data pin	ICCDATA
ICCCLK	ICC output serial clock pin	ICCCLK
RESET	Device reset	ICCRESET
ICCSEL/VPP	Programming voltage	ICCSEL/VPP
OSC1 or **OSCIN** * #	Main clock input for external	ICCOSC
VDD *	Device power supply	VDD_APPLI
VSS	Device power supply (ground)	GND

* Optional connection for ST7-STICK, see text.

Optional connection for ST7MDTxx-EPB, see text.

Table 1: ICC connection requirements

Isolation of ICCDATA and ICCCLK pins

As soon as an ICP tool is plugged into the application board the ICCDATA and ICCCLK pins must not be used by other application devices, even if an ICC session is not in progress. If the application uses these pins as inputs, isolation such as a serial resistor must be implemented to prevent other application devices from forcing a signal on either of these pins. The application board must not drive current in excess of 1mA.

If the ICCDATA and ICCCLK pins are only used as outputs by the application, no signal isolation is necessary.

For ST7 without an ICCSEL pin, during normal operation the ICCCLK pin must be pulled-up internally or externally (10KΩ pull-up required in noisy environments). This is to avoid entering ICC mode unintentionally during a reset.

Isolation of the RESET pin

During an ICC session, you must ensure that no external reset is generated by the application. The programming tool must control the RESET pin. This can lead to a conflict if the application reset circuitry signal exceeds 5mA (push-pull output or pull-up resistor <1k). To avoid such conflicts, a Shottky diode can be used to isolate the application reset circuit.

ICCSEL/VPP pin

The application pull-down resistor must not be lower than 10kΩ.

ICCOSC pin *

The ICCOSC pin of the ICC connector must be connected to the ST7's OSC1 or OSCIN pin if the clock is not provided by the application, or if the application clock source is not programmed in the option byte. This connection allows you to start your ICP session using the **ICP OPT Disable** programming mode. In this mode, the programming tool provides a clock source to initiate communication with the ST7. The ST7-STICK provides a clock source at a frequency of 8MHz; the ST7MDTxx-EPB clock frequency is 16MHz.

For ST7 devices with multi-oscillator capability, when the ICCOSC pin is connected, the OSC2 pin should be grounded.

If your application provides a clock signal and you are certain that it is programmed in the ST7's option byte, you can start your ICP session using the **ICP OPT Enable** programming mode. In this

mode, your application clock source provides the clock signal for initiating communication with your ST7 and ICCOSC is not connected to your ST7.

Note: *The ST7MDTxx-EPB programmer provides a clock signal when using both the ICP OPT Disable and ICP OPT Enable programming modes. If you start your ICP session using ICP OPT Enable, the clock signal provided by the programmer may conflict with the application clock and can cause a communication failure with your ST7. To avoid this we recommend installing a jumper on the connection between ICCOSC and the ST7. This jumper is removed when starting in the ICP OPT Enable programming mode. If the user requires a clock signal from the programmer to start in the ICP OPT Disable mode, the jumper is left in place.*

VDD_APPLI pin *

This pin is used by the programming tool's power supply follower, which adapts the voltage of the tool's signals to your application's V_{DD}.

Whether you connect the VDD_APPLI pin depends on your programming tool. It must be connected when using any ST7MDTxx-EPB programmer with ICP capability, *except* the ST7MDTS1-EPB. It can also be connected when programming with the ST7-STICK depending on the voltage used by your application.

For the ST7-STICK, if the application board VDD is equal to 5v or 3.3v, VDD_APPLI is not connected. However, the W1 jumper must be set to the appropriate position (5v or 3.3v). For all other VDD values supported by your ST7 (refer to *ST7xxxx Datasheet*), this pin must be connected and the W1 jumper set to the VDD position.

ICC cable

Your programming tool includes an ICC cable for connecting to the HE-10 type connector on your application board. The provided cable is 30cm long, however you can use a cable up to 2 meters long. Typical characteristics for provided ICC cable are provided in *Table 2*, below.
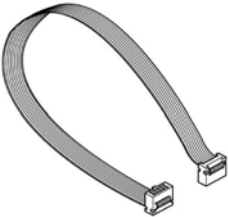
Pitch	1.27 mm
Section	0.09mm2
Impedance	100 Ohms
Nominal Voltage	300V
Max. Current	1A
Temperature	-10°C to +105° C

Table 2: Typical ICC cable characteristics

2　TROUBLE SHOOTING

"Communication failure with the ST7"

Check that:

❑ The ICC cable is properly connected.

❑ You have selected the right ST7 microcontroller.

❑ Your hardware set up meets the ICC requirements specified in this document

❑ You have selected the right programming mode:

ICP OPT Enable: you are certain that your application clock matches the **CLOCK SOURCE** and **OSCTYPE** options that are already programmed in ST7 Flash microcontroller option byte. If you don't know these values, select **ICP OPT Disable.**

ICP OPT Disable: ensure that external clock source from the ICC connector (ICCOSC, pin 9) is connected to the OSC1 or OSCIN pin of the ST7Flash microcontroller in your application

"Supply voltage problems" (ST7-STICK)

When you have supply voltage problems, i.e. the green LED will not come on.

Check that:

❑ The AC/DC power supply adaptor is firmly connected.

❑ The W1 jumper is set to the correct position for your application:

VDD — when using the voltage supply follower for voltages ranging between 2.4 and 5 V. Ensure that the ST7's VDD pin is connected to the VDD_APPLI pin on the ICC connector.

3.3V or **5V** — if your application uses either of these voltages and you are not using the voltage follower feature.

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