ST7 FLASH STICK
User Manual

Release 1.2

October 2004

Ref: DOC-STICK-PP

INSTRUCTIONS FOR USE—WARNING

This product is conform to the 89/336/EEC Directive. It complies with the ITE EN55022 standard for EMC emissions and generic 50082-1 (1992 edition) immunity standards.

This product is an FCC Class-A apparatus. In a residential environment, it may cause radioelectrical disturbances.

In addition, this programming board is not contained in an outer casing; consequently, it cannot be immune against electrostatic discharges (ESD). It should therefore be handled only in static safe working areas. Please refer to *Appendix A Safety Requirements* on page 15 for relevant safety information

Table of Contents

1   INTRODUCTION

Thanks for choosing ST7! This manual will help
you get started programming your ST7
microcontrollers with your **ST7 FLASH STICK**.

The **ST In-circuit Communication Kit (STICK)**
is a powerful, flexible programming tool that is
ideal when you are getting started developing
applications in the world of ST7 Flash
microcontrollers.
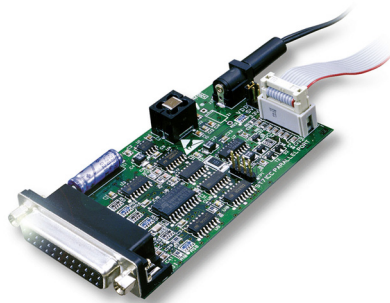
The STICK provides the programming hardware interface between your ST7 and
your host PC, running either ST7 Visual Programmer (STVP7) or ST7 Visual
Develop (STVD7) software.

The STICK takes advantage of the **In-Circuit Communication (ICC)** protocol for
ST7 to provide both **in-circuit programming (ICP)** of the ST7 soldered on your
application board, or socket programming of your microcontroller using an
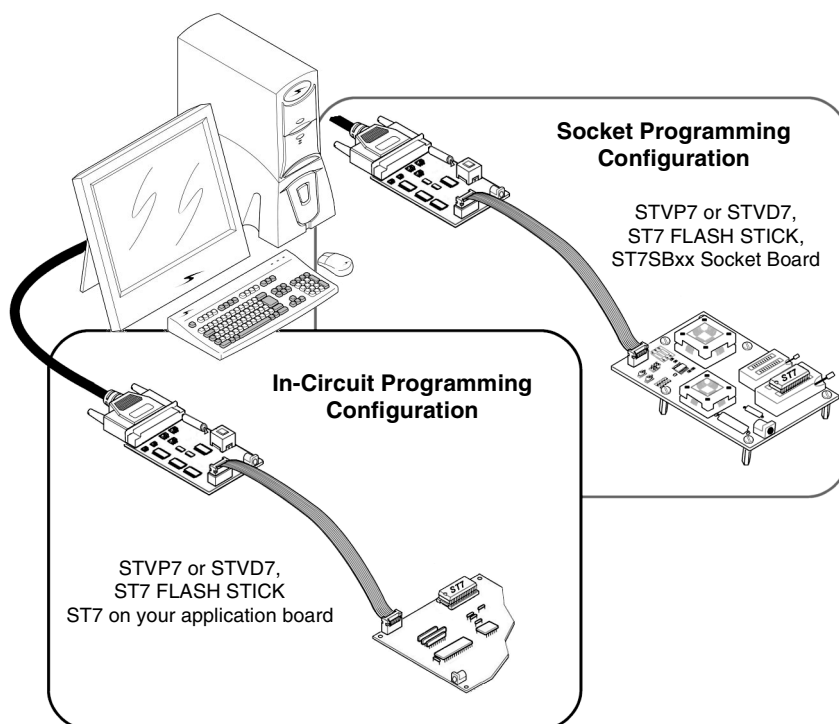**ST7SBxx socket board**.

Figure 1: Programming configurations

The STICK is delivered "ready-to-use" for in-circuit programming of an MCU that has been installed on a properly configured application board. However, socket programming of ST7 MCUs requires an additional ST7SBxx socket board. For more information about socket programming with the STICK, you can refer to the ***ST7SBxx Socket Board User Guide***.

1.1   About this manual...

This manual will help you set up your STICK programming tool and connect it to your PC. Here you will find:

- Setup instructions
- Detailed hardware information
- A trouble shooting guide for your programming tool

For more information about the hardware and software intended for use with your STICK, refer to the following documents:

ST7 Visual Programmer online help– information about the STVP7 programming interface

ST7 Visual Develop User Manual– information about the STVD7 programming interface

ST7SBxx Socket Board User Guide– setup information for socket programming

ST7xxxx Datasheet– includes information about ICC connection and micro-controller programming that is specific to your MCU

1.2   Host PC system requirements

Both hardware and software components of the STICK have been designed to work with PCs meeting the following requirements:

- One of the following operating systems: Microsoft® Windows® 98, 2000, Millennium, NT® or XP®.
- Intel® Pentium (or compatible) processor with minimum speed of 133 MHz.
- Minimum RAM of 32 MB (64 MB recommended).
- 50 MB of free hard disk space to install all of the ST7 tools.
- Parallel port

Note: *Windows® 2000, NT® and XP users must have administrator privileges to install the required software.*

1.3   Getting assistance

For more information, application notes, FAQs and software updates on all the ST microcontroller families, check the CD-ROM or our website:

mcu.st.com

For assistance on all ST microcontroller subjects, for help using your programming tools, refer to the contact list provided in *Product Support* on page 23. We'll be glad to help you!

2   GETTING STARTED

2.1   Delivery checklist

Check that your ST7 FLASH STICK contains the following:

•   One STICK interface board (marked "ST7 FLASH STICK-LPT").

•   One AC/DC power supply adaptor.

•   One PC parallel port cable.

•   One 10-pin HE10 type ribbon cable for ICC connectors.

•   The "Microcontroller Development Tools" CD-ROM containing ST7 Visual
     Programmer (STVP7) software, ST7 Visual Develop (STVD7) and other ST7
     software development tools.

2.2   Setting up the hardware

1 *Set* the W1 jumper on your STICK to correspond to the application power
     supply (V_{DD}).
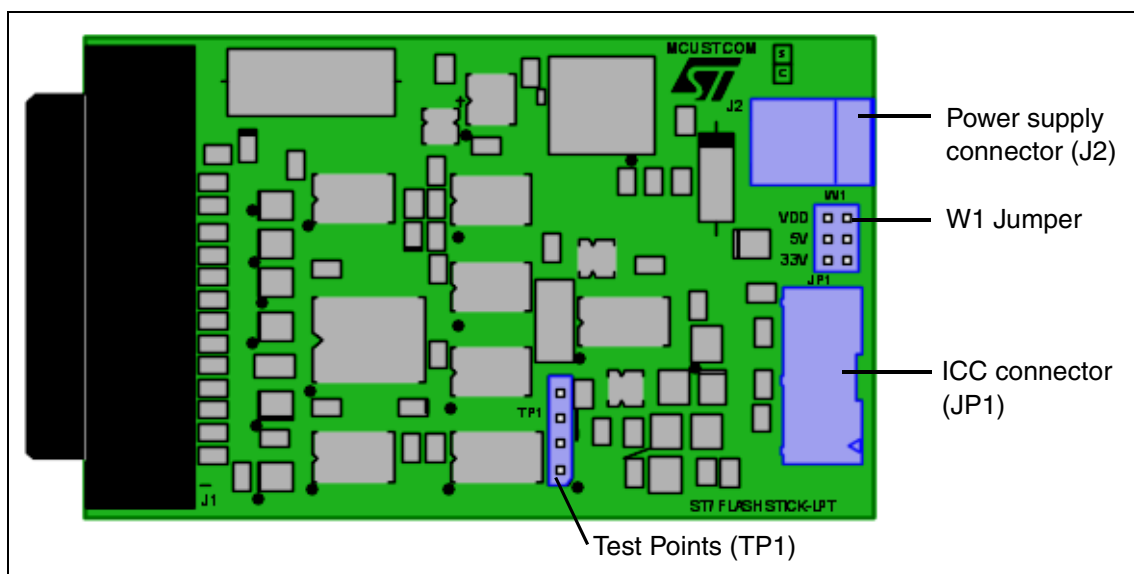
Figure 2: STICK component layout

The W1 jumper must be set to one of the three following positions:

-    **V_{DD}**: The power supply voltage of the STICK's ICC buffer follows the V_{DD}
     used by your ST7. This position allows you to work with any power supply
     voltage supported by your MCU (refer to your *ST7xxxx Datasheet* for
     supported V_{DD}). When the jumper is in this position, you must connect the
     application power supply to pin 7 of the ICC connector.

-   **5 V**: The power supply voltage of the STICK's ICC buffer is 5 V. You don't need to connect the application V_{DD} to pin 7 of the ICC connector, but your application must be powered by 5 V +/- 5%.

-   **3.3 V**: The power supply voltage of the STICK's ICC buffer is 3.3 V. You don't need to connect the application V_{DD} to pin 7 of the ICC connector, but your application must be powered by 3.3 V +/- 5%.

2   ***Connect*** the STICK to the parallel port of your host PC with the supplied parallel cable.

Note: *Be sure to use the provided PC parallel port cable—using a longer cable may cause malfunctions. Connect the cable directly between the host PC and the STICK—using additional cables or switch boxes between the host PC and the STICK may cause malfunctions.*

If a dongle is already connected to the PC's parallel port, it should not interfere with the STICK. However, if your STICK malfunctions, remove the dongle and restart the setup.

3   ***Power on*** the STICK using the provided AC/DC power supply, which you plug into the J2 connector. Ensure that the power supply is adapted to the mains voltage and outlet type used in your country.

4   ***Connect*** the ICC cable to the ICC connectors on your STICK (JP1) and your application board (for more information about installing an ICC connector on your application board, refer to *Section 2.3*).

5   ***Power up*** your application board.

You are now ready to program your ST7. For more information about the programming sequence, refer to *Chapter 3: Programming with STVD7 or STVP7* on page 12, or refer to your software's on-line help file.

2.3   In-circuit programming considerations

The In-Circuit Communication (ICC) protocol for ST7 makes it possible to in-circuit program your application to an ST7 FLASH microcontroller while the device is mounted on your application board. However, when you start developing your application, you must integrate an ICC connector into your application hardware. To help you implement in-circuit programming (ICP) in the development of your application, this section provides a summary of points you should consider when installing an ICC connector.

2.3.1   ICC Connection Requirements

To connect to your application board for ICP, you must install a 10-pin, HE-10 type connector, which receives the STICK's ICC cable and relays the required signals to the ST7 on your application board.

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 STICK (see *Figure 3*, below and *Table 1* on page 10).
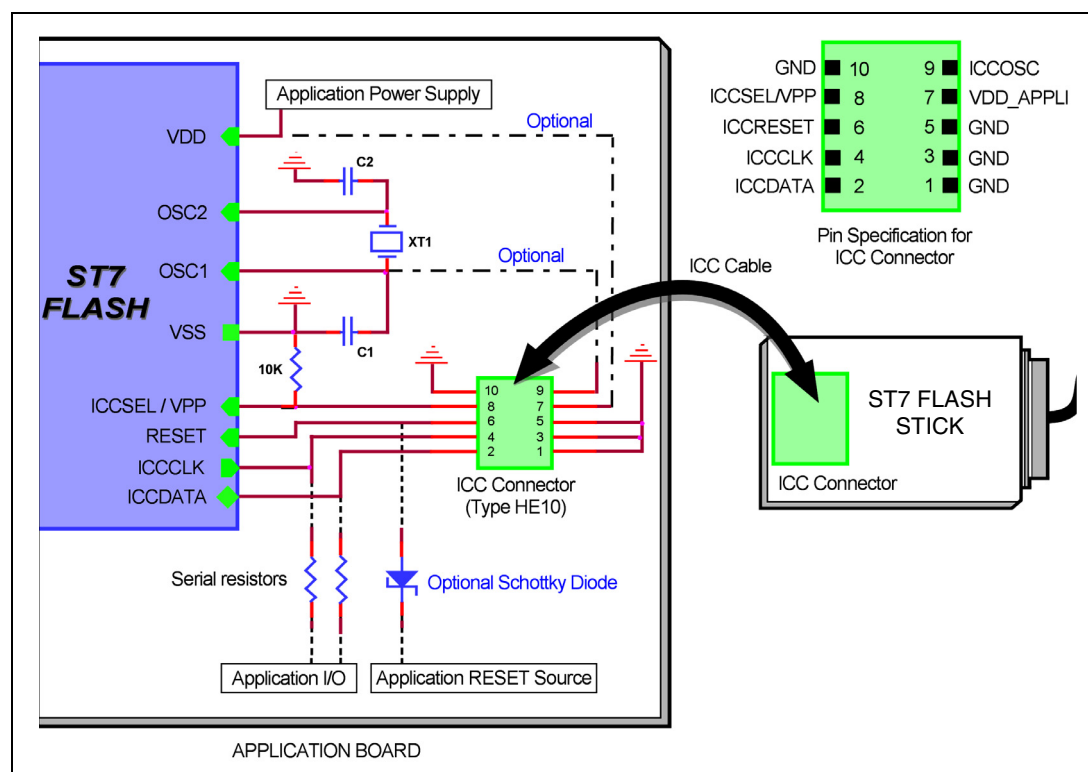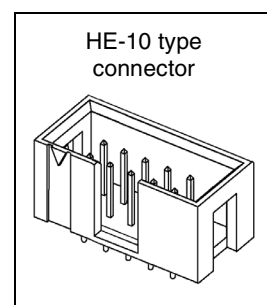

Figure 3: ICC interface

	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 the STICK, see text.

Table 1: ICC connection requirements

Isolation of ICCDATA and ICCCLK pins

As soon as your STICK is plugged into the application board the ICCDATA and ICCCLK pins must not be used by other application devices, even if you are not programming your MCU. 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 MCUs with no 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. For more information, refer to the ST7 ICC Protocol Reference Manual.

Isolation of the RESET pin

During a programming session, you must ensure that the programming tool controls the ST7's RESET pin so that no external reset is generated by the application. 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 **10k**Ω.

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 STICK provides a clock source to initiate communication with the ST7 at a frequency of **8MHz**.

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.

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}. 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 your *ST7xxxx Datasheet*), this pin must be connected and the W1 jumper set to the VDD position.

3 PROGRAMMING WITH STVD7 OR STVP7

You can configure and control the programming of your ST7 with ST7 Visual Programmer (STVP7) or ST7 Visual Develop (STVD7) software running on your host PC. This chapter provides a brief procedure to help you get started programming with each software. For more details refer to their respective on-line help files.

3.1 Start programming with STVD7

1 Launch STVD7.

2 Open the workspace and project that you used when developing your application. You will have selected your MCU during the early stages of application development.

3 Select **Tools>Programmer**.

4 Configure the options in the **Settings** tab:

- **Board**: STICK

- **Port**: LPT1 or LPT2

- Check **Erase Before Programming** if you are <u>reprogramming</u> an MCU with HDFlash memory.

- **Programming Mode**:

    If your ST7's option byte does not include OSCTYPE, then **ICP** is the only in-circuit programming mode available to you.

Note: *For some of the most recent circuits that include OSCTYPE, ICP programming mode is available instead of ICP OPT Disable or Enable.*

    If your ST7's option byte includes OSCTYPE, then you can choose:

    ICP OPT Disable– a safe mode that must be used if your application clock circuitry doesn't match the OSCTYPE option byte selection. In this mode, an external source with a square wave signal from 0 V to V_{DD} must be provided either by the STICK via the ICC connector pin 9 (ICCOSC safe clock), or your application.

    ICP OPT Enable– used only if your application clock circuitry matches the OSCTYPE option byte selection. In this case, the ICC connector pin 9 is not connected and the ICCOSC safe clock is not used.

5 Power on your application board and connect the ICC cable between your STICK and the application.

6   Select the **Memory Area** tab then select a memory area. Click on ***Add***, then use the browse window to identify the file (.s19, .hex) to program the selected memory area with. Repeat this step as necessary for each memory area.

7   Select the **Option Byte** tab to configure any option byte settings.

8   Select the **Program** tab and click on ***Start*** to program your ST7.

3.2   Start programming with STVP7

The following describes a basic procedure for programming your application to your MCU without creating a project in STVP7.

Note: *Setting up a project is a way of configuring STVP7 so that you can use the same configuration each time you run STVP7. For more information about projects, refer to STVP7's on-line help.*

1   Launch STVP7

2   In the Configuration window specify:

-   **Hardware**: STICK

-   **Port**: LPT1 or LPT2

-   **Programming mode**:

    Select **ICP** mode if your ST7's option byte does <u>not</u> include OSCTYPE. The Device field will change to show the list of devices that only use this mode.

Note: *For some of the most recent circuits that include OSCTYPE, ICP programming mode is available instead of ICP OPT Disable or Enable.*

If your ST7's option byte does include OSCTYPE, you can choose one of the following options:

ICP OPT Disable– a safe mode that must be used if your application clock circuitry doesn't match the OSCTYPE option byte selection. In this mode, an external source with a square wave signal from 0 V to V_{DD} must be provided either by the STICK via the ICC connector pin 9 (ICCOSC safe clock), or your application.

ICP OPT Enable– used only if your application clock circuitry matches the OSCTYPE option byte selection. In this case, the ICC connector pin 9 is not connected and the ICCOSC safe clock is not used.

When you choose one of the modes, the Device field will display the list of devices that support these modes.

-    **Device**:

     Select the name of your MCU from the list in the Device field. Keep in mind
     that the list displayed for ICP mode is different from that displayed for the
     other two in-circuit programming modes.

3 Erase memory before reprogramming (*HDFlash only*) by selecting
   Erase>Active sector(s). If you want the memory to be erased systematically
   before programming, you can activate the **Erase Device Memory Before
   Programming** feature (***Edit>Preferences***).

4 Select files (.s19, .sx, .hex) for programming to memory areas. Select the tab
   for the memory area (for example, **PROGRAM MEMORY** or **DATA MEMORY**),
   then select ***File>Open***. Locate the file using the resulting browse window and
   click on ***Open***.

5 Select the **Option Byte** tab. Option bytes can be configured using the list boxes
   in this tab or by loading a HEX or S19 file with the previously used option byte
   settings. To program option bytes from a file, select the **Option Byte** tab, then
   click on ***File>Open*** to load the file containing the option byte settings.

6 Program your ST7 by selecting ***Program>All Tabs (on active sectors, if any)***.

7 Check the content by selecting ***Verify>All Tabs (on active sectors, if any)***. If
   you want to check the programmed content systematically after programming,
   ensure that the Verify After Programming feature is activated
   (***Edit>Preferences***)

APPENDIX A SAFETY REQUIREMENTS

:

- Any tester, equipment, or tool used at any production step, or for any manipulation of semiconductor devices, have its shield connected to ground.

- The product must be placed on a conductive table top, made of steel or clean aluminum, or covered by an antistatic surface (superficial resistivity equal to or higher than 0.5 MΩ/cm^2), grounded through a ground cable (conductive cable from protected equipment to ground isolated with a 1 MΩ resistor placed in series). All manipulation of finished goods must be done at such a grounded worktable.

- The worktable   free of all non-antistatic plastic objects.

- An antistatic floor covering grounded through a conductive ground cable (with serial resistor between 0.9 and 1.5 MΩ) should be used.

- It is recommended that you wear an antistatic wrist or ankle strap, connected to the antistatic floor covering or to the grounded equipment.

- If no antistatic wrist or ankle strap is worn, before each manipulation of the powered-on tool, you touch the surface of the grounded worktable.

- It is recommended that antistatic gloves or finger coats be worn.

- It is recommended that nylon clothing be avoided while performing any manipulation of parts.

APPENDIX B: TROUBLESHOOTING

This appendix covers some of the problems that may occur, and how to solve them.

B.1 Test pins

The STICK is equipped with test pins located at TP1 (see board layout in *Figure 2* on page 7). If you have problems with programming, these pins can help you pinpoint anomalies in the ICC communication by testing or checking the ICC signals.

Pin	Signal	Description
1	**GND**	This pin is marked with a white dot.
2	**Power**	The external power supply value can be checked here. It is an unregulated 12 V DC power supply. Its value should be in the range 13.5 V to 23 V depending on the current load.
3	**VCC**	The V_{CC} is regulated at 5 V +/- 5%.
4	**VCC_a**	This is the operational amplifier output that follows the voltage value selected by the W1 jumper. It should be equal to: • your application V_{DD} voltage value if W1 is in the V_{DD} position, • 5 V if W1 is in the 5 V position, • 3.3 V if W1 is in the 3.3 V position.
5	**ICCSEL_VPP**	This signal may be at 0 V, 5 V or 12 V. This test point is used during factory test. You do not have to check it.

Table 1 Test pins

B.2   Error messages

The following sections explain the cause of some common error messages.

B.2.1   "PC parallel port cable not connected"

Most communication failures between the host PC and the STICK stem from problems in the parallel port connection. To prevent communication problems, when setting up your parallel port connection:

●   Use the parallel cable provided with your STICK—using a longer parallel cable may cause malfunctions.

●   Connect the cable directly between the host PC and STICK interface board— the insertion of additional cables or switch boxes between the host PC and the interface board may cause malfunctions.

●   Remove any parallel port dongles.

●   Ensure that the parallel port address is in the range 03BC-03BF or 0378-037F or 0278-027F.

●   Ensure that the parallel port is not disabled in your PC. For example, in the IBM® ThinkPad™, you can select "infrared printing (LPT) port on".

B.3   "Problem on supply voltages"

When you have supply voltage problems the green LED will not come on. To find the cause of the problem:

●   Check that the AC/DC power supply adaptor is firmly connected to both the main power supply and to the STICK interface board. To check that the main power supply is on, disconnect the ICC cable and measure the voltage on test pin 2 of TP1 (see *Test pins* on page 16). This pin should have an unregulated DC value in the range 18 V to 21 V.

Note: *Ground is on TP1 pin 1 (white dot mark).*

●   Check that the W1 jumper is set to one of the three positions, see *Section 2.2* on page 7. If it is set on the "VDD" position, check that the ICC cable is connected properly and that your application's VDD is connected to ICC connector pin 7. Your application VDD must be in the range 2.4 V to 5 V. The voltage measured on test pin 4 of TP1 (see *Test pins* on page 16), must be the same voltage value that you selected with the W1 jumper.

●   Check that there is 5 V on test pin 3 of TP1 (see *Test pins* on page 16).

If you have made all of these checks and you still get the "Problem on supply voltages" message, contact your ST distributor or sales office (see *Product Support* on page 23) in order to have your STICK repaired.

B.4   "Cannot communicate with the device"

Check that:

- The ICC cable is correctly connected.

- You have selected the right ST7 device.

- The ICC signals are clear and within the following ranges:

    - ICCDATA: This application signal must not drive more than 1 mA.

    - ICCCLK: This application signal must not drive more than 1 mA.

    - ICCRESET: This application signal must not drive more than 5 mA.

    - ICCSEL_VPP: The pull-down resistor must not be lower than 10 kOhm.

- You have selected the right programming mode (see *Chapter 3* on page 12). Remember that:

    - If you use **ICP OPT Enable** mode, check that your application clock circuitry does match the **CLOCK SOURCE** and **OSCTYPE** options already programmed in the ST7 Flash microcontroller option byte. For devices out of factory you have to check these values in datasheet. If you don't know these values you have to select **ICP OPT Disable.**

    - **ICP OPT Disable** mode, ensure that external source clock is a square wave signal from 0 V to VDD. If not, you have to connect ICCOSC safe clock (ICC connector pin 9) to the OSC1 pin of the ST7Flash microcontroller in your application

APPENDIX C: GLOSSARY

This appendix gives a brief definition of acronyms and names used in this manual.

HDFlash

High density FLASH memory is based on FLASH technology. HDFlash is used for microcontrollers with 4K up to 60Kbytes of FLASH memory. It is programmed byte by byte but erased by sector.

ICC protocol

In-Circuit Communication protocol is a way of exchanging data between an ST7 Flash microcontroller and an external system (i.e. PC) using minimum hardware and ST7 I/Os in the user application. In the ST7 Flash microcontrollers, this protocol is handled by the ICC monitor.

ICC monitor

Software that handles the ICC protocol, embedded in a reserved memory area of the ST7 Flash microcontroller. At RESET, using specific signal sequence, the ST7 jumps to this ICC monitor which allows it to download programs in RAM and to execute them. This feature is used to implement the ICP functionality.

In-Circuit Programming (ICP)

This is programming the ST7 FLASH memory while ST7 Flash microcontroller is plugged into the application board.

In-Circuit Testing (ICT)

This is testing ST7 Flash micro and/or your application through the ST7 Flash microcontroller while it is plugged into the application board.

In-Circuit Debugging (ICD)

This is debugging your application while the ST7 Flash microcontroller is plugged into the application board.

ST7 Flash microcontroller

An ST7 microcontroller with electrically erasable memory that can be either XFlash or HDFlash memory.

STICK

ST In-circuit Communication Kit.

XFlash

Extended FLASH memory is based on EEPROM technology. XFlash provides extended features such as byte re-programming (by means of byte erasing) and data EEPROM capability. XFlash microcontrollers are available between 1K to 16 Kbytes.

APPENDIX D: SCHEMATICS
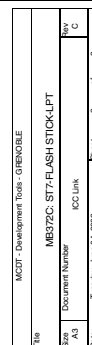
PRODUCT SUPPORT

If you experience any problems with this product, contact the distributor or the STMicroelectronics sales office where you purchased the product. Phone numbers for major sales regions are provided in the *Contact List*, below.

In addition, at our Internet site **mcu.st.com**, you will find a complete listing of ST sales offices and distributors, as well as documentation, software downloads and user discussion groups to help you answer questions and stay up to date with our latest product developments.

Software updates

All our latest software and related documentation are available for download from the ST Internet site, **mcu.st.com**.

Hardware spare parts

Your development tool comes with the hardware you need to set it up, connect it to your PC and connect to your application. However, some components can be bought separately if you need additional ones. You can order extra components, such as sockets and adapters, from STMicroelectronics**,** from the component manufacturer or from a distributor.

To help you find what you need, a listing of accessories for ST development tools is available on the ST internet site, **mcu.st.com**.

Contact List

North America

Canada and East Coast	**Mid West**

STMicroelectronics
Lexington Corporate Center
10 Maguire Road, Building 1, 3rd floor
Lexington, MA 02421
Phone: (781) 402-2650

STMicroelectronics
1300 East Woodfield Road, Suite 410
Schaumburg, IL 60173
Phone: (847) 585-3000

West coast

STMicroelectronics, Inc.
1060 E. Brokaw Road
San Jose, CA 95131
Phone: (408) 452-8585

Note: *For American and Canadian customers seeking technical support the US/ Canada is split in 3 territories. According to your area, contact the appropriate sales office from the list above and ask to be transferred to an 8-bit microcontroller Field Applications Engineer.*

Europe

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U.K. +44 162 889 0800

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