

Application Note 50601

In-System Programming of ST7 Microcontrollers

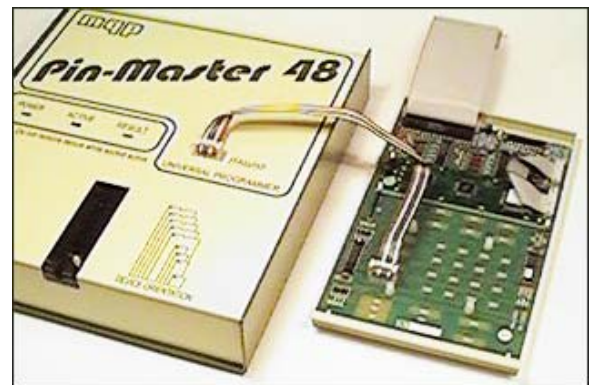
This application note describes how the ST7 series of microcontrollers from ST may be programmed in-circuit using the dedicated JTAG/ISP connector on the Pin-Master 48 universal programmer. The programming cable, the design of the target board, and programming procedures are described.

INTRODUCTION

The ST7 series is a family of 8bit microcontrollers. The extended flash (XFLASH) and the high density (HDFLASH) devices (see Table 1) can be serially programmed while in the end users target system.

In system programming reduces the number of times the parts have to be handled during the manufacturing process and allows the latest or custom software to be loaded just prior to shipping.

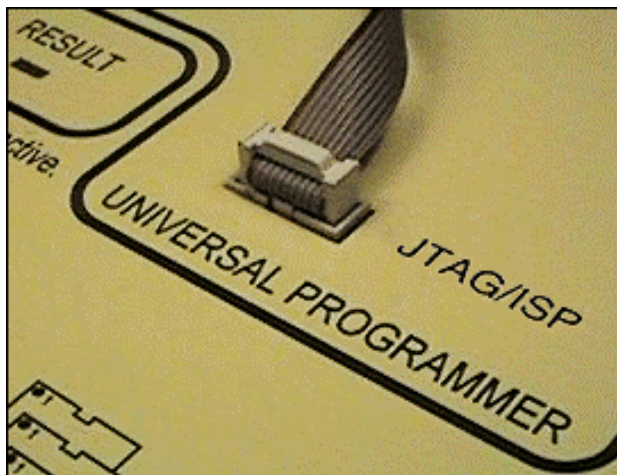
The serial interface between the programmer and target board is made up of reset, data, clock, oscillator, select and ground lines. The select line carries the 12V programming voltage required for HDFLASH devices. The oscillator signal is not always required if a local oscillator is provided, see later section for details.



Production Programming using Pin-Master 48

The Pin-Master 48 universal programmer has a dedicated JTAG/ISP connector fitted to the top of the unit. A cable made up to the users own requirements connects the socket to the target board.

The requirements of in-system programming affects the circuit design of the target board. Aspects of the design which must be considered are explained later in this application note.



JTAG/ISP SOCKET

The socket is a standard 10 way 0.1" header. A diagram of the socket is shown below:

Viewed from top, front of programmer

2	4	6	8	10
GND	GND	GND	GND	GND
1	3	5	7	9
ICCSEL	OSC1	ICCDATA	ICCCLK	\RESET

1	ICCSEL	Select and VPP input
2	GND	Ground
3	OSC1	ST7 oscillator input
4	GND	Ground
5	ICCDATA	Data I/O (open drain)
6	GND	Ground
7	ICCCLK	Clock (open drain)
8	GND	Ground
9	\RESET	Reset (active low)
10	GND	Ground

CABLE

A ribbon cable with alternate wires connected to ground is used between the Pin-Master 48 and the target board. The cable should be kept as short as possible.

TARGET BOARD

CONNECTOR

The target board should be equipped with a suitable connector. This could be most simply

achieved with a similar connector and pin layout to that used at the programmer end of the cable.

- **GND Pins 2, 4, 6, 8 and 10**

Connect these five pins to the target system ground.

- **ICCSEL**

ICCSEL must be connected to the ICCSEL pin of the ST7. It is used to enter the programming mode and in the case of HDFLASH devices carries the 12V programming voltage. In normal mode the target board must tie this signal low.

- **OSC1**

If no oscillator is available on the target board then this signal can be used to drive the OSC1 pin. The OSC2 pin must be connected to ground. The following factors must be taken into account when deciding how to connect the oscillator.

A new device with the option bytes in their default state can only be programmed using an external oscillator connected to OSC1.

A crystal or ceramic resonator can only be used if the option bytes have been programmed to their appropriate values prior to mounting the device on the target board.

The internal RC oscillator must never be used for programming.

When programming HDFLASH devices the oscillator must be in the range 8 – 16MHz. Use the oscillator signal provided over the cable if the target board does not provide this frequency.

When using the oscillator signal provided over the cable make sure any other oscillator is disabled.

- **ICCDATA**

Pin 5 of the ISP connector must be connected to the ICCDATA pin of the ST7. This is an open drain signal and any other circuit connected to ICCDATA for normal operation must not affect its operation.

- **ICCCLK**

Pin 7 of the ISP connector must be connected to the ICCCLK pin of the ST7. This is an open drain signal and any other circuit connected to ICCCLK for normal operation must not affect its operation.

- **\RESET**

Pin 9 of the ISP connector must be connected to the \RESET pin of the ST7. Any other circuit connected to \RESET for normal operation must not affect its operation.

- **VDD**

The VDD voltage is not provided over the cable and must be provided locally. However to ensure compatible logic levels the Pin-Master 48 must be set to the same voltage as the target board. This is done by adjusting the 'JTAG VOLTAGE' value in the PROGRAMMER SETTINGS window of the Pin-Master 48.

DEVICE PIN-OUTS

TABLE 1 - Device Pin-outs

Device Type: ST72F260G, ST72F262G, ST72F264G

<i>PACKAGE</i>	<i>ICCSEL</i>	<i>OSCI</i>	<i>ICCDATA</i>	<i>ICCCLK</i>	<i>\RESET</i>
PDIP32	30	2	28	29	1
SOIC28	26	2	24	25	1

Device Type: ST72F321

<i>PACKAGE</i>	<i>ICCSEL</i>	<i>OSCI</i>	<i>ICCDATA</i>	<i>ICCCLK</i>	<i>\RESET</i>
64 PIN TQFP	53	59	39	41	54
44 PIN TQFP	38	42	27	29	39

PROGRAMMING PROCEDURE

To avoid earth potential differences the programmer and target board should be connected to a common mains supply.

- Connect the cable to the target board and the programmer.
- Power up the target board and proceed with programming in the normal way.
- If there are any other devices to be programmed on the board move the cable and repeat the procedure. This could be simplified by using a batch file which would automatically change the device type and instruct the operator where to plug in the cable.

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