

Application Note 31101

In-System Programming of ATMEL ATmega Devices

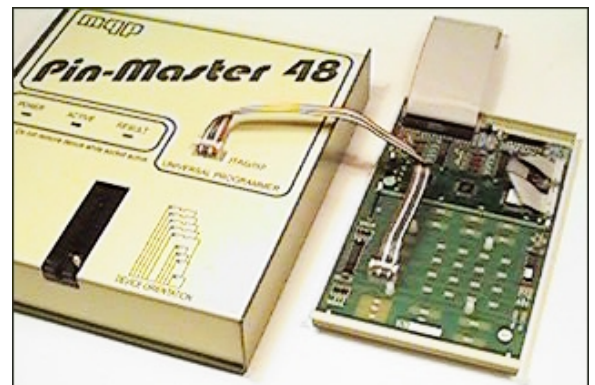
This application note describes how Atmel ATmega devices may be programmed in-circuit using the dedicated JTAG/ISP connector on the Pin-Master 48 universal programmer. The programming cable, the design of the target board, and programming procedures are described.

INTRODUCTION

Atmel ATmega devices are 8 bit microcontrollers. The latest generation of devices can be programmed while mounted on the end-users target system using a JTAG interface.

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.

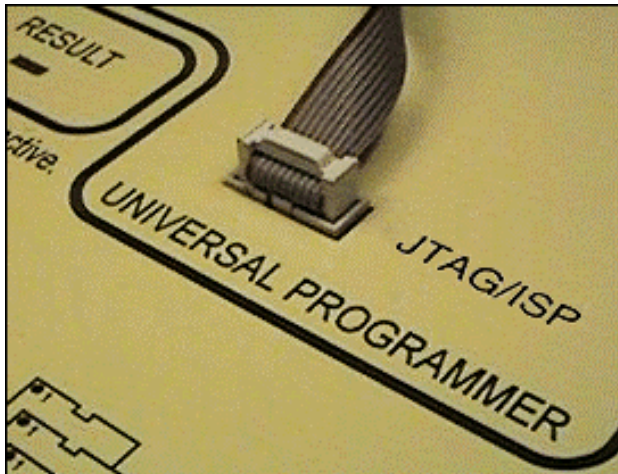
The interface between the programmer and target board is made up of 5 standard signals, plus ground.



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 user's own requirements connects the socket to the target board.

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



the target board. The cable should be kept as short as possible (maximum length 1m).

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
TCK	TMS	TDI	TDO	TRST*

* May be Enable, Vpp, or No Connect

1	TCK	Test Clock	Device input
2	GND	Ground	
3	TMS	Test Mode Select	Device input
4	GND	Ground	
5	TDI	Test Data Input	Device input
6	GND	Ground	
7	TDO	Test Data Output	Device output
8	GND	Ground	
9	TRST*	Test Reset	Device input
10	GND	Ground	

* TRST is an optional signal on a JTAG interface. On some devices it is used for an ENABLE or Vpp high voltage signal. It is not used when programming Atmel ATmega devices with a Pin-Master 48.

A ribbon cable with alternate wires connected to ground is used between the Pin-Master 48 and

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. If using a different arrangement, care should be taken not to run signals adjacent to any signal other than ground in a ribbon cable.

- **RESET**

This pin should be left unconnected.

- **TCK SIGNAL**

Most in-system programming failures are caused by a noisy TCK signal. Keep the cable and track lengths to a minimum; try to minimise coupling from adjacent tracks. Make provision for a 100pF capacitor between TCK and ground

PROGRAMMING PROCEDURE

As no power is provided by the programmer, the target board must be independently powered.

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 'Script File' which would automatically change the device type and instruct the operator where to plug in the cable.

PROGRAM FILES

Please see the appropriate device notes for details of the Program file required for the device.

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