



# AVR USB ISP

## Fast ISP for AVR with JTAG

### Why USB?

Why use the USB port? More and more PCs are fitted with a USB port as standard, so connecting to your PC via the USB port not only allows you to keep your serial and parallel ports free, but you also benefit from USB flexibility and speed. Older PCs can easily be modified using a plug in card to provide quick and easy upgrades. The USB port can operate at up to 12Mbps/sec giving you vastly increased programming times. Using a hub, multiple units can be run from one PC.

### Serial Programming (ISP) or JTAG

The programmer software gives a choice of programming methods, either using standard ISP - Serial Programming - or JTAG programming. The software installation and PC connection to the programmer remain the same whichever programming method is used.

#### Serial Programming

- Uses standard ISP interface
- All AVR devices are supported including AT90S and ATtiny
- No adapter needed

#### JTAG Programming

- Uses JTAG interface - same as ICE
- Faster programming speeds
- Only ATmega devices with more than 40 pins are supported

### Selecting Programming Method

There is a drop down box at the top left of the screen, shown in the picture. Select the option you require, either ISP or JTAG. If you select JTAG, the adapter supplied with the programmer must be connected to the end of the programmer lead, NOT directly into the programmer..

The rest of this page and page 2 apply to both methods. Interface descriptions for the two methods are given on page 3.

### The User Interface

The user interface has been carefully designed to provide "easy operation". The AVR USB ISP automatically shows all the programmers connected to the USB and you just select the matching ID number in the drop down list. Then select the device type from a list and load flash and EEPROM files (Intel Hex, Motorola S-Record etc.). The status of the programmer is clearly shown, and errors are highlighted in red. The Flash and EPROM buffers are editable in ASCII or Hex and Check Sums are supported.



◆ Fast:  
Uses USB port

◆ Flexible:  
Custom Configuration for individual Programmers

◆ Easy operation:  
Auto-program

◆ Comprehensive:  
Complete fuse and lockbit programming

◆ Convenient:  
serial numbering and controllable via DLL

◆ Voltage:  
1.8V - 5V

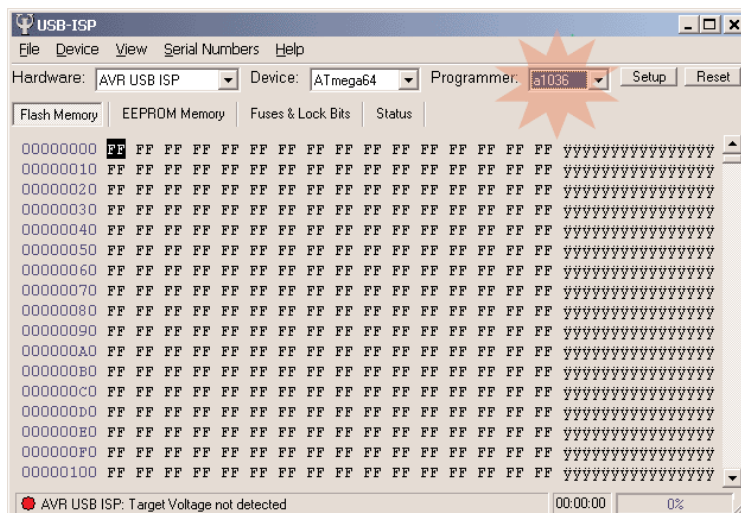
◆ JTAG adapter and software included

#### Install:

1. Install software
2. Plug in programmer
3. Run AVR USB

If this procedure is followed, Windows will automatically detect programmer/programmers.

Order Code  
**AVRUSB**



Compatible with Windows 98/2000/ME/XP -USB port required (win95 and early Win98 requires USB update). The drivers are for real Plug and Play, not Virtual Serial Port

**Device Support:**

- ATtiny12
- ATtiny13
- ATtiny15
- ATtiny22
- ATtiny2313
- ATtiny24
- ATtiny25
- ATtiny26
- ATtiny45
- ATtiny85
- AT90S1200
- AT90S2313
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All Low voltage versions are supported, down to 1.8 Volts

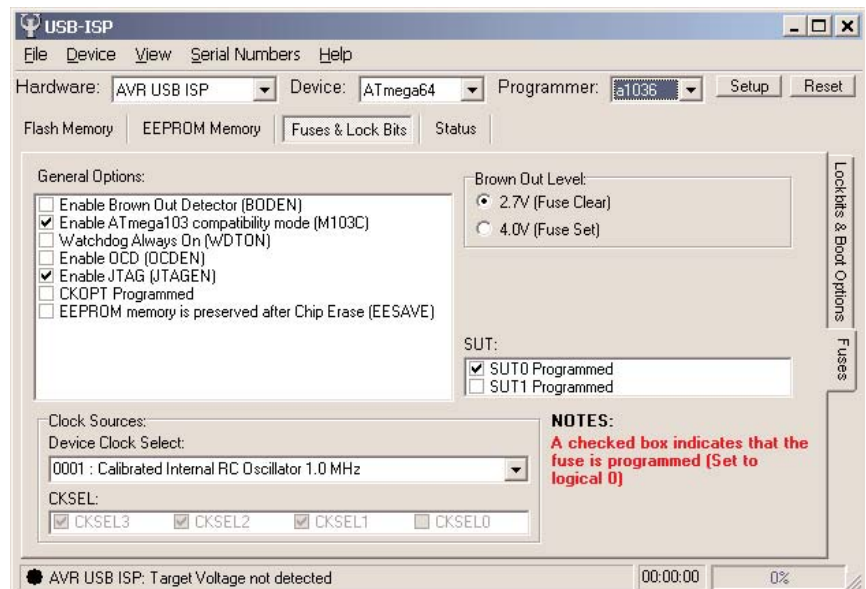
## Fuses and Lockbits

One of the great features of the AVR are the customisable fuses and lockbits. The AVR USB ISP fully supports programming off all lockbits, including the new extensions for self programming in the Atmega163. Most AVR devices also feature fuse bits which can be used to change the behaviour of on-board peripherals, startup times, watchdog configuration, brown-out settings etc.

Programming or reading the fuse and lockbits is very simple on the programmer. The fuse and lock bits screen pictured changes to match the selected device, so only the fuses available on that device are displayed.

Simple check boxes are used to set or clear Fuses. There is a second Tab on the right for Lockbits.

Note: it is possible to lock the device by setting incorrect options especially on clock bits if the target circuit does not support them.

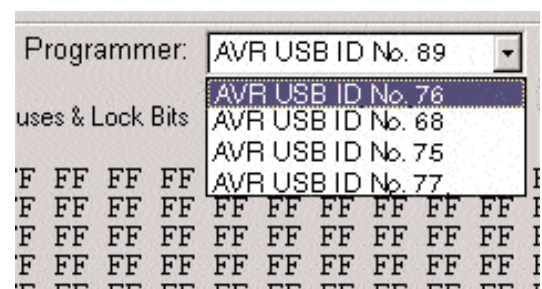


## Multiple Programmers

In both the development and production environments, the ability to have more than one programmer connected to a single PC is beneficial. With the AVRUSB, more than one programmer can be run from one PC. Each Programmer is detected automatically by the software and is displayed in a drop-down list.

The ID No identifies the programmer and matches the number written on every programmer. Each programmer has its own software interface and can be loaded with separate files or set to support different devices.

Programmers can be run from 1 interface or each can have its own screen. Up to 127 programmers can be theoretically run from one PC, but the practical limit is how many programmer screens can be displayed.



## Production Programming

As well as being ideally suited for the development environment the AVRUSB has some added extras for use on a production line.

- Auto-program facility allows you to perform a complete erase/program/verify cycle with a single click
- Auto-detection facility allows the auto-program cycle to begin automatically as soon as the programmer is inserted for faster programming times and less operator intervention.
- User intervention on error - if selected, the user must reset the programmer on the PC if an error occurs, which stops errors being ignored
- Programming errors are shown by a red LED on the programmer and on the PC screen, where more information is given.

## Serial Numbers

Serial numbering facilities are included for QA and other purposes. A 2, 4 or 8-byte serial number can be written to a user defined location in Flash or EEPROM. The serial number can be set to auto-increment.

Compatible with Windows 98/2000/ME/XP -USB port required (win95 and early Win98 requires USB update).

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All Low voltage versions are supported, down to 1.8 Volts

### DLL Version

A DLL version of the software is available for integration into existing systems, which use Visual Basic, Delphi, Visual C++, Labview or a Command Line. Please contact sales for further information.

### Serial Interface

This is the target view of the ISP interface. Vcc and all GND lines should be connected to the header to provide a voltage reference for the programmer. This enables the programmer to support target voltages from 1.8V to 5V. The target must be powered (from 1.8-5V) as the USB bus cannot supply enough current especially if multiple programmers are connected. The programmer runs at 5V and needs a reference voltage from the target to set programming voltage to match it.

MISO	SCK	RESET	LED	MOSI
9	7	5	3	1
10	8	6	4	2
GND	GND	GND	GND	Vcc

### JTAG Interface

This is the target view of the JTAG interface. Vcc and at least one GND line must be connected to the header to provide a voltage reference for the programmer. This enables the programmer to support target voltages from 1.8V to 5V. The target must be powered (from 1.8-5V) as the USB bus cannot supply enough current especially if multiple programmers are connected. The programmer runs at 5V and needs a reference voltage from the target to set programming voltage to match it.

TCK	1	2	GND
TDO	3	4	V Tref
TMS	5	6	nSRST
Vsup	7	8	TRST
TDI	9	10	GND

### JTAG Adapter

The Adapter supplied is fitted to the end of the programmer 10-way lead, NOT directly into the programmer. Plug the programmer 10-way lead into the box header on the adapter, and plug the other end into your JTAG interface on the target.

### JTAG Device Support

Only newer AVR devices with 40 pins or more have the JTAG interface, so other AVR devices will need to be serial programmed. See our website for latest device support.

### Supported Devices

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| ● AT90CAN128 | ● ATmega165  | ● ATmega324  | ● ATmega640  |
| ● ATmega128  | ● ATmega169  | ● ATmega325  | ● ATmega644  |
| ● ATmega1280 | ● ATmega2560 | ● ATmega3250 | ● ATmega645  |
| ● ATmega1281 | ● ATmega2561 | ● ATmega329  | ● ATmega6450 |
| ● ATmega16   | ● ATmega32   | ● ATmega3290 | ● ATmega649  |
| ● ATmega162  | ● ATmega323  | ● ATmega64   | ● ATmega6490 |
| ● ATmega164  |              |              |              |

Low Voltage variants are supported down to 1.8V. New devices will be supported as they are released.

### JTAG Programming Speeds

	Serial	JTAG
ATmega128 Flash Read	33s	13s
ATmega128 Flash Write	33s	8s
ATmega128 EEPROM Read	1s	2s
ATmega128 EEPROM Write	39s	8s



## Technical Specification

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### Power Requirements

- Programmer is powered by PC USB port or hub up to a maximum current of 200 mA
- Programmer conforms to USB specification for power requirements, including sleep mode
- Target device must have its own power supply of 1.8 - 5V to match device voltage
- Vcc must be connected to programmer via the programming header Vcc pin to supply voltage level (1.8 - 5V) to programmer as a reference.

### USB Specification

- Software drivers are self installed
- Plug and Play operation
- Supports USB 1.1 protocol
- USB 2.0 Compatible
- Data through-put 1MBit/sec
- Direct Driver not Virtual COM Port
- Up to 127 units can be connected to one PC

### Physical

- Dimensions Metric: 66 x 66 x 28mm
- Dimensions Imperial: 2.6 x 2.6 x 1.1 inches
- Weight: approx 300g (10 oz) complete package
- Programmer USB connector : USB B socket
- Supplied with 1.8m USB A (PC or Hub) to USB B (Programmer) lead
- Can be used with USB extension cables - not supplied
- Programmer target connector: 10-way box header for connecting programming lead
- Supplied with 1m target programming cable with 10-way connector on each end
- Supplied in video case with software on CD

### Software Functions

- Load/Save files in most formats
- EEPROM and Flash Buffers can be edited in ASCII or Hex
- Colour coded buffer for error display
- Erase, Read, Verify, Program Functions
- All Fuse and Lockbits supported
- Comprehensive Check Sum support on EEPROM and Flash - CR16,CR32, XOR16/32
- Auto-program function: select which operations to include in programming cycle
- Serial numbering: user defined locations in Flash or EEPROM with Auto-increment
- Program cycle starts when programmer is connected to powered target
- Full Verify or only Verify pages with data for faster programming cycles

### Error Handling

- Programmer :
  - No Light - Programmer not found by PC
  - Green light - Ready to program. When programmer is plugged in, light will flash if the device is found. If it stays Green, then there is no power, no device or incorrect insertion of device.
  - Flashing Red/Green - Programming in progress
  - Red light - Programming error. If set in software, this will stay Red until programmer is reset on PC even if programmer is disconnected from target.
- PC:
  - Status indicator and error messages - stored in log
  - Pop-up error message feature can be enabled. This forces operator to reset the programmer on PC if programming error occurs



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email: [sales@kanda.com](mailto:sales@kanda.com)

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## Technical Information

AVR USB is designed to be fast and easy to use, while being resistant to damage from faulty target systems. But like all programmers, it does have some requirements for successful use.

### TARGET CONNECTION

The programming cable is designed to connect to a target system with a standard Kanda 10pin ISP connector: For JTAG, plug adapter into end of lead.

Adapters for 6pin connections are available - 10FLEX6 (flying leads) and 10DIL6

### TARGET SYSTEM

Both VCC and GND must be connected to the ISP connector. The programmer requires a reference voltage, in order to drive the programming lines to the correct value. No more than 5mA will be drawn from the target system.

MOSI, MISO, CLK, and RESET. These lines must be free to be controlled without contention from other circuitry. Any pull-up/pull-down characteristic present at these device pins should be no stronger than that provided by a 1K resistor to VCC/GND. This assumes a direct connection between the programmer and the device (no components in series). That is:

- 1) The reset pull-up resistor should be 1K or greater in value.
- 2) Any additional circuitry on port pins used in ISP, should be de-coupled by a resistor greater than 1K in value.

Please see APPENDIX B for example circuits.

Connection to the LED pin is optional. It is pulled low by the programmer during programming, so can be used to switch on an indicator LED, or control a multiplexor.

### PROGRAMMER CONNECTION

If you need to make up your own **cable**, the connection on the programmer is laid out as follows:

GND	1	2	MISO
N/C	3	4	CLK
GND	5	6	RESET
GND	7	8	LED OPTIONAL
VCC	9	10	MOSI

TOP VIEW OF THE CONNECTOR ON THE PROGRAMMER

0.1" PITCH 2\*5 BOXHEADER WITH POLARISING NOTCH

Note that it is rotated, when compared with the target connection.

**Kanda.com**

web site: [www.kanda.com](http://www.kanda.com)  
Phone/Fax: +44 (0)8707 446 807  
email: [sales@kanda.com](mailto:sales@kanda.com)

Compatible with  
Windows  
98/2000/ME/XP  
-USB port required  
(win95 and early  
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versions are  
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## UPDATING THE PROGRAMMER FIRMWARE

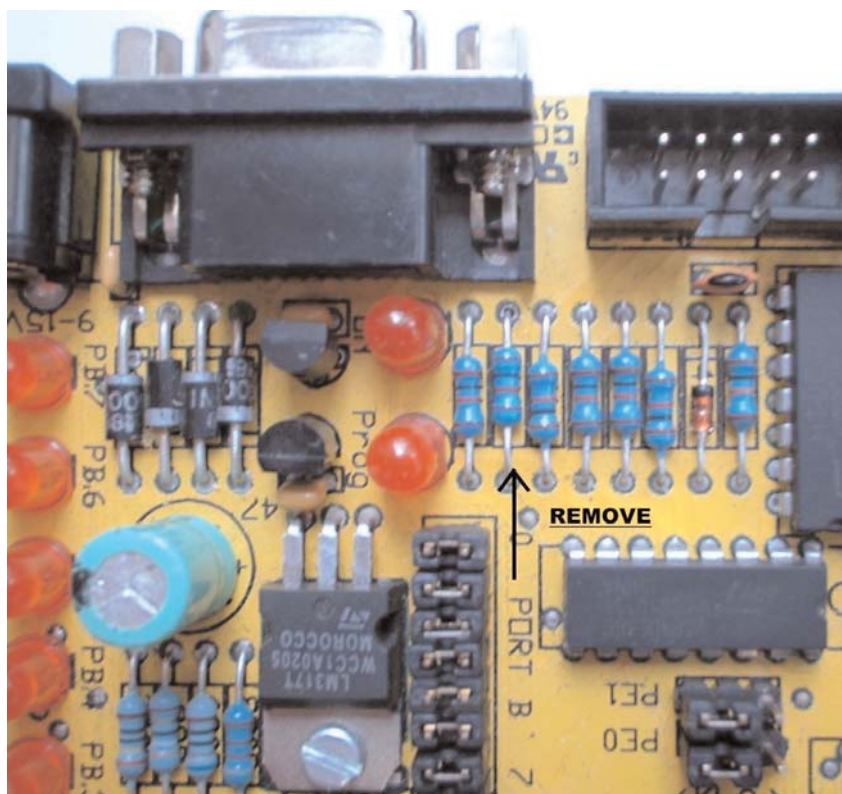
The firmware, and an update utility are included as part of the PC software. Firmware updates are always released as part of a software update. If the software detects that the programmer has a different firmware version to the one included with it, you will be prompted to update the firmware. Normally the only time that the firmware will need reprogramming is when updating to a new software version. However, the update utility can be run at any time by selecting "Firmware update" from the help menu - but please use care with this.

**WARNING:** A firmware update takes around 7 minutes, and MUST be allowed to complete once started. So go and make a cup of tea! If a firmware update is incomplete or otherwise unsuccessful - further attempts will not be possible. This will leave the programmer nonfunctional. Should this happen, please contact **support@kanda.com**

## Appendix A

### USING STK300 with AVR USB.

The original design of the STK300 reset circuit does not comply with the requirements of AVR USB. To use AVR USB with older STK300's , a small modification to the STK300 is required.



Check the value of the resistor indicated by the arrow.  
If the value is 1K, it should be removed.

STK200's require no modification.

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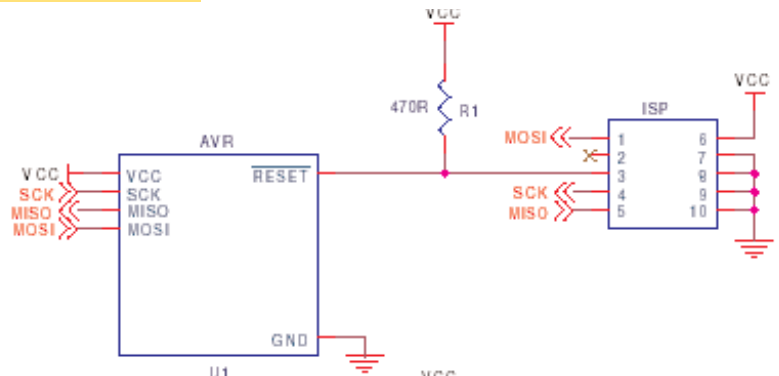
web site: [www.kanda.com](http://www.kanda.com)  
Phone/Fax: +44 (0)8707 446 807  
email: [sales@kanda.com](mailto:sales@kanda.com)

## GENERAL

Examples apply to all programming lines (MOSI, MISO, SCK and RESET). Applies equally to pull-down resistors.

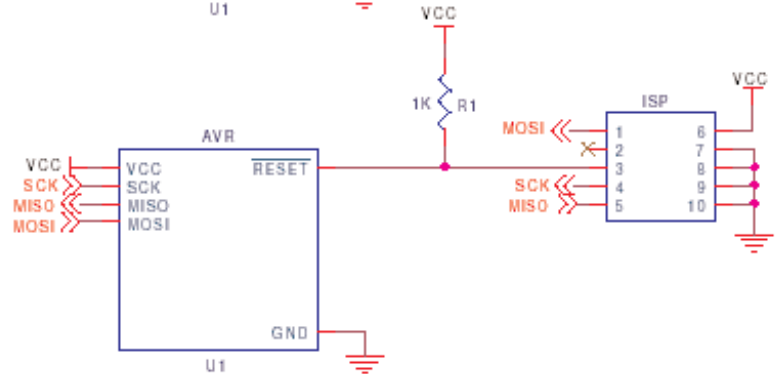
NO

The Pull-up resistor, R1, is too strong.



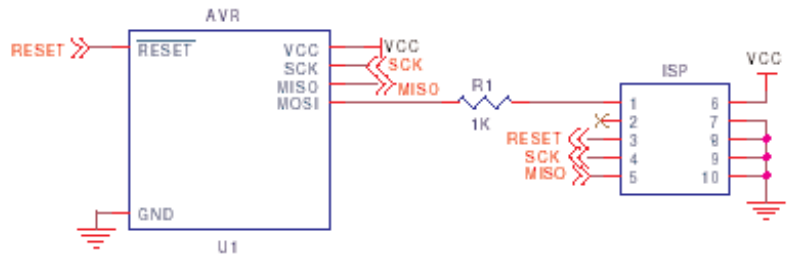
YES

The Pull-up resistor, R1, is no stronger than 1K



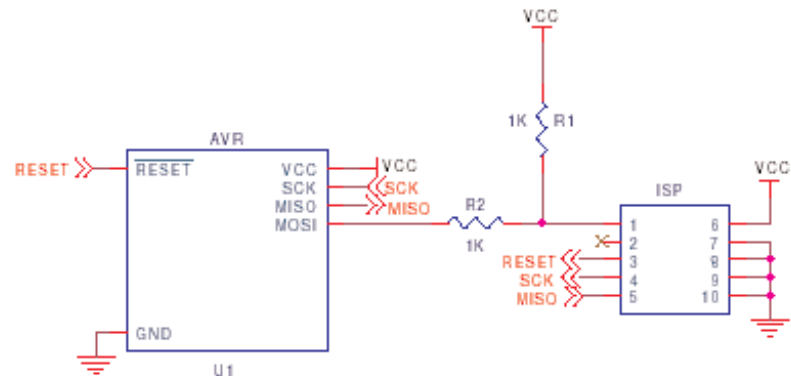
YES

A resistor in series; by its's self, will have no effect.



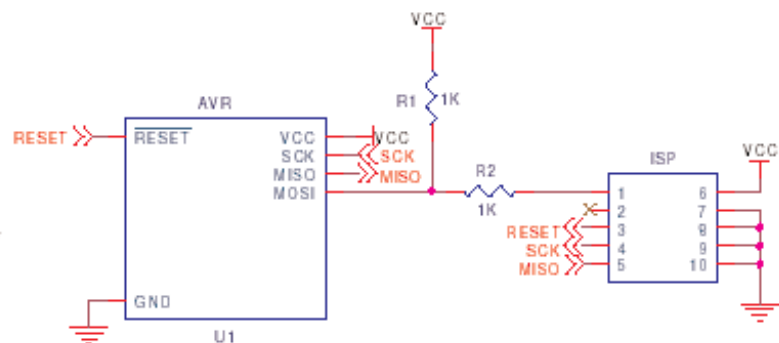
YES

Again, the series resistor will have no effect.



NO

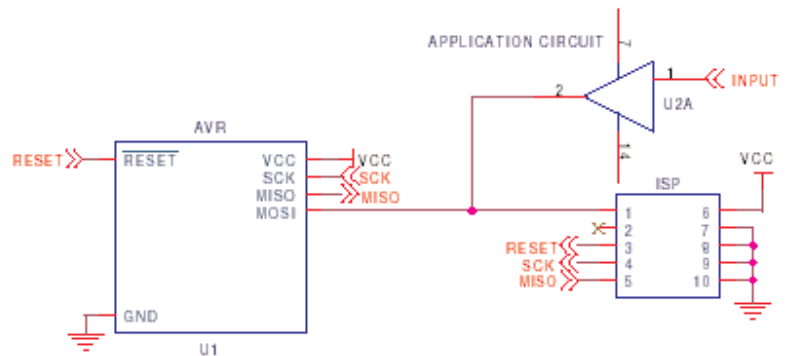
This is a potential problem. As the series resistor will weaken the programmer's ability to act on the programming line.



# APPLICATION CIRCUIT USING ISP PORT PINS

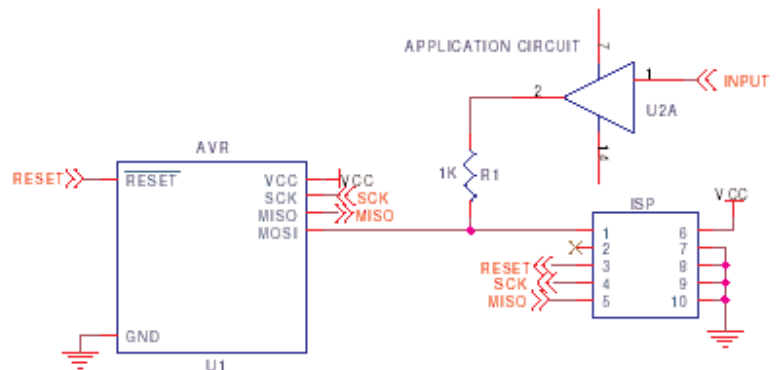
## NO

Here, the application uses PB5 as an INPUT to read the output of U2.  
The state of the line is held by U2.



## YES

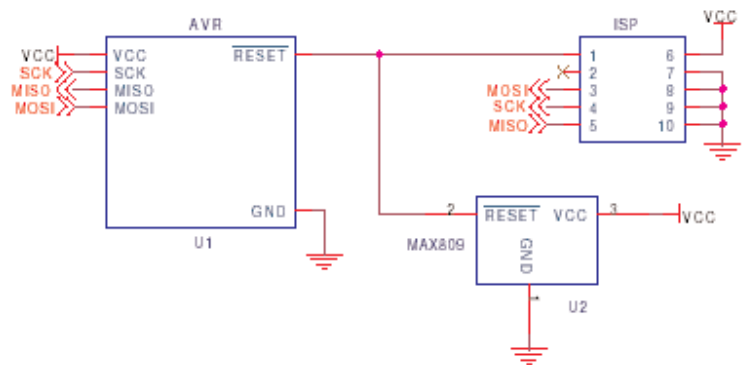
Again, PB5 is used as an INPUT to read the output of U2, but this time;  
The output of U2 is sufficiently decoupled by R1



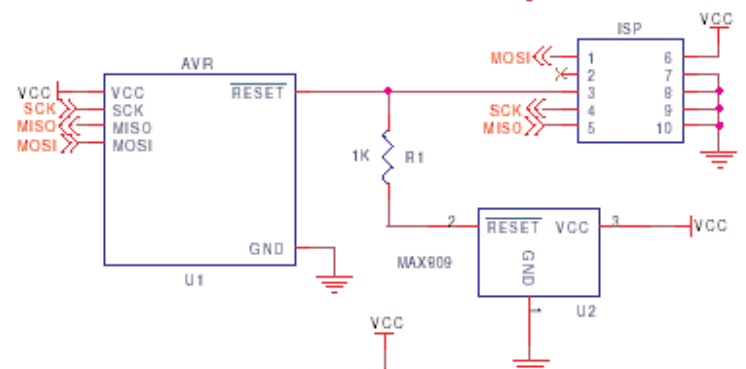
## RESET IC's

## NO

The commonly used brown-out IC MAX809 as a PUSH-PULL output. It will hold the RESET line high.



## YES



## YES

The MAX803 IC is equivalent to the MAX809 - BUT as an OPEN DRAIN output.

