

JTAG Adapter for the ATMEGA16

Tom Wheeler, NØGSG
July 2007

Description

When constructing prototype Atmel-based systems on white breadboards, hand-wiring of the JTAG interface is normally employed to support in-circuit programming (ISP). This is hard to do because the pin spacing of the JTAG connector isn't compatible with breadboards, and this leads to the possibility of wiring errors. The JTAG adaptor was designed to eliminate this problem. It is designed to work directly with the ATMEGA16, however, it may be adapted for use with other Atmel parts.

The adapter is straightforward: It connects the JTAG signals on pins 24-27 of the ATMEGA16 correctly to a 10-pin connector that directly connects to the JTAG ICE mkII. A fifth signal, system RESET, is also supported, and must be wired to pin 9 of the ATMEGA16.

All signals are protected from misapplication by series 220-ohm resistors. This protects the JTAG ICE in the event that a processor pin is accidentally misconfigured or shorted to the V_{CC} bus. Figure 1 shows the schematic diagram of the unit, and Figure 2 shows the PC board layout.

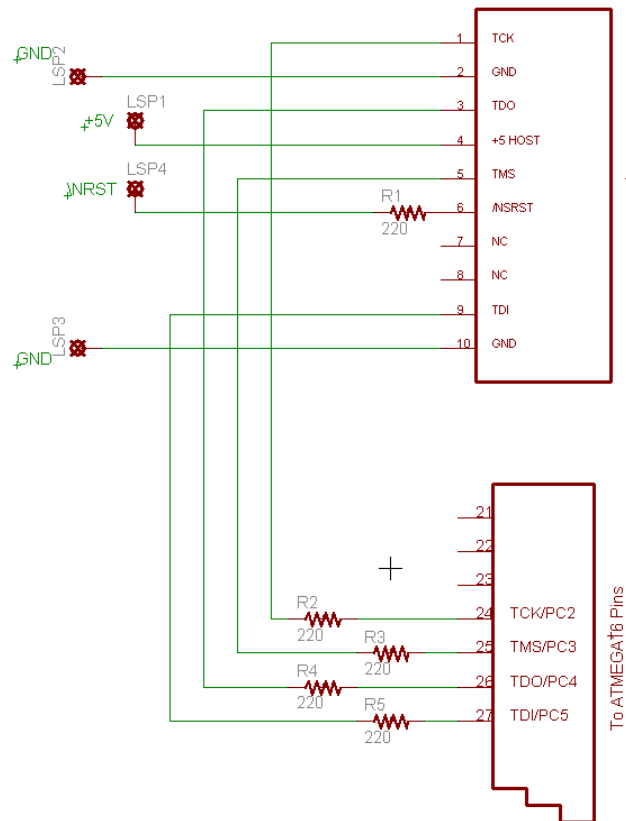


Figure 1: Schematic Diagram of ATMEGA16 JTAG Adapter

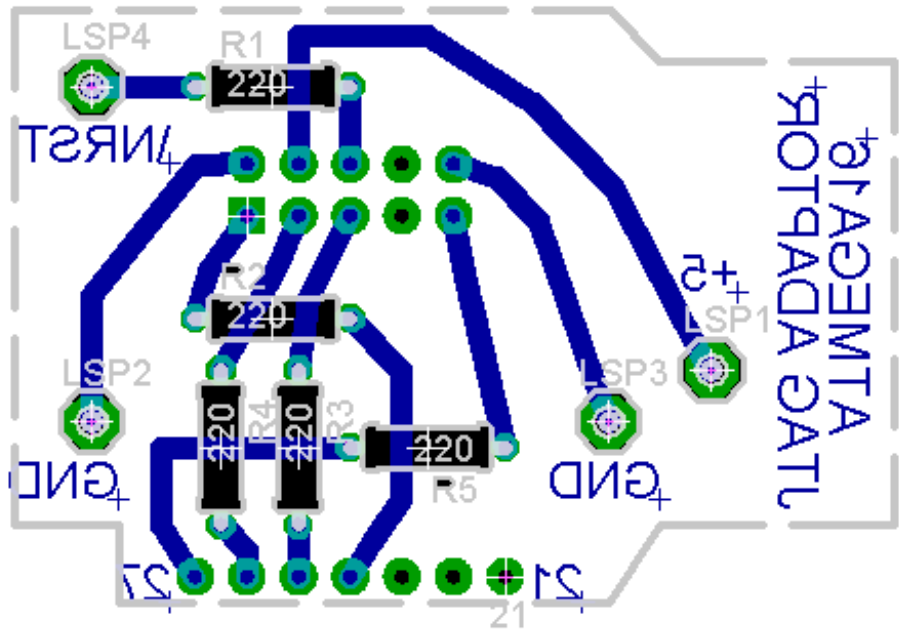


Figure 2: PC Board Layout of the Adapter (Component Side View)

The EAGLE CAD files for regenerating this board layout are in the archive "JTAG_ADAPTER.ZIP" on this web site.

Constructing and Using the Adapter

The adapter is built according to Figures 1 and 2. The board is designed for 1/8 watt 220 ohm resistors, but 1/4 watt parts should also fit. (You can also solder jumpers across these resistors, but that is not recommended for safety.) The JTAG connector is simply two rows of standard 0.100" header pins. Extend pin 1 of the JTAG connector 0.025" higher than the other pins to mark it clearly. To solder the pins to the back of the PC board, simply slide the plastic insulators up and away from the solder joints; solder the pins; then push the plastic insulators back onto the board. For durability, use non-conductive epoxy to secure the pins onto the back of the board.

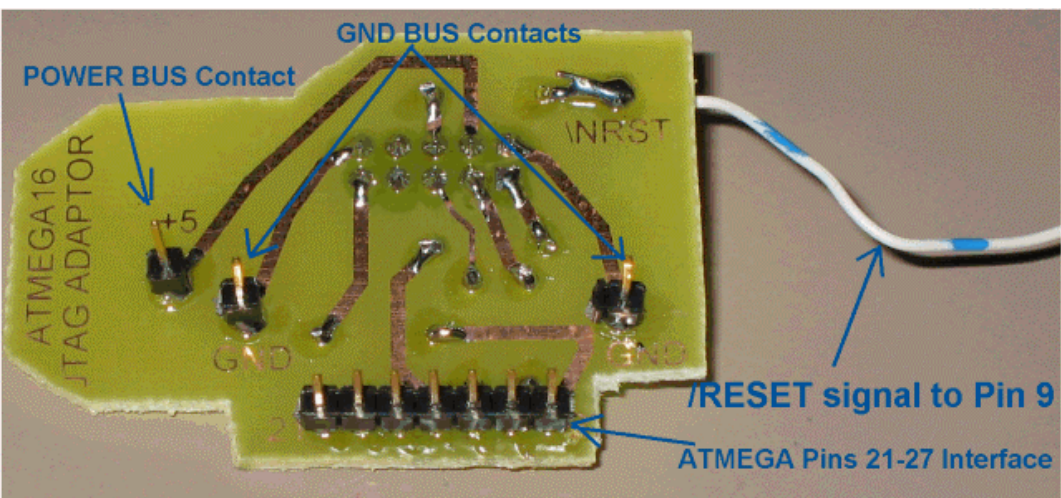


Figure 3: Bottom View of Adapter

Figure 4 shows the adapter in use. It fits directly adjacent to pins 21-27 of the ATMEGA16. Pins 21 through 23 are *not* used by the adapter; these pins are included to aid in positioning of the unit, and also improve mechanical stability.

Very carefully note the positioning of the POWER and GND bus pins. You must make sure that the busses intercepted by these pins are properly connected to V_{CC} and GND. Use care when inserting the adapter to avoid damaging these pins!

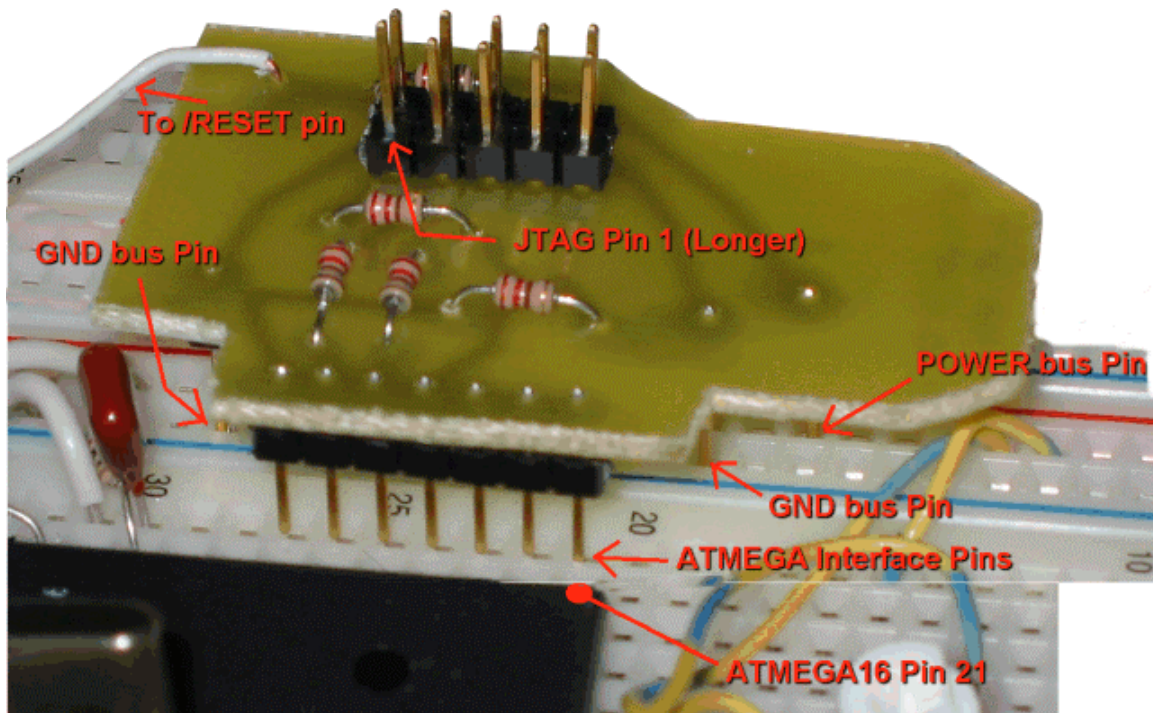


Figure 4: Adapter in Use (Not fully inserted into breadboard!)

The JTAG ICE connector fits directly onto the JTAG connector on the adapter PC board. There are two connectors on the JTAG ICE unit; either connector can be used. Since these connectors are not keyed, use care to ensure that pin 1 is correctly oriented. Don't forget to wire the /RESET signal to pin 9 of the ATMEGA16.

Use caution, as it is possible to insert the JTAG connector upside down, which may damage the ATMEGA16 or JTAG ICE.

Happy programming!