Table of Contents

TABLE OF CONTENTS 1

STK505 USER GUIDE 2

Introduction 2

Features 2

Getting Started 3

Hardware Overview 3

ZIF socket 3

DIP socket 3

Low voltage programming connectors 3

High voltage programming connectors 3

Port configuration switches 3

Crystal sockets 3

Mounting the STK505 4

Clock Sources and Reset 5

The Clock Switch 5

The Reset/PORTB Switch 5

Programming the AVR 6

Introduction 6

In-System programming 6

High Voltage Programming 7

High Voltage Programming the ATtiny24 7

High Voltage Programming the ATtiny26 8

Troubleshooting Guide 10

Programming problems 10

General problems 11

STK505 User Guide

Introduction

The STK505 board is a top module to the STK500 development board from Atmel Corporation. It adds support for the 14-pin and 20-pin AVR microcontrollers listed in the feature list below.
STK505 includes connectors and hardware allowing full utilization of the features of these devices.
This user guide is a general getting started guide as well as a complete technical reference for advanced users.
Included in the kit is samples of ATtiny24 and ATtiny26.



Figure 1-1: The STK505 starter kit

Features

- Supports the ATtiny24 and ATtiny26
- Supported by AVR Studio 4
- Zero Insertion Force (ZIF) socket for 14-pin SOIC packages
- DIP socket for 20-pin PDIP packages
- Supports High Voltage Programming through STK500
- Supports Low Voltage programming through STK500
- Switch to select between different clock sources
- Switch to select between reset and I/O functionality for the reset pin
- On board crystal sockets

Getting Started

This section describes how to connect the STK505 onto the STK500, and connect cables to different peripherals.

Hardware Overview

The STK505 is divided into two colored sections: the green section that supports the ATtiny24 and the blue section that supports the ATtiny26.

Note: Only one AVR device should be inserted in the sockets at a time.

ZIF socket

The ZIF socket is for the ATtiny24, in soic package.
Pin1 on the socket is indicated with the white triangle beside the lower right corner.

DIP socket

The DIP socket is for the ATtiny26.
Pin1 on the socket is indicated with the white triangle beside the lower right corner.

Low voltage programming connectors

The AVR can be programmed in serial mode by using a 6-pin cable between the ISP6PIN on the STK500 and the SPROG headers on the stk505.

High voltage programming connectors

The ATtiny26 can be programmed in parallel high voltage mode by using 10-pin cables between STK500 and STK505.
The ATtiny24 can be programmed in serial high voltage mode be using 10-pin cables between STK500 and STK505.

Port configuration switches

The XTAL1, XTAL2 and the reset pin on both ATtiny24 and ATtiny26 can also be used as regular I/O port pins when not used as clock inputs or reset.

The pin configuration switches connects the pins to different components/signals dependant on their usage.
This is described in more detail in the chapter Clock Sources and Reset

Crystal sockets

The clock crystal sockets are placed close to each target socket to make it possible to use high frequency crystals.
When crystals are used to generate the target clock signal the clock selection switch must be in position "XTAL".

Mounting the STK505

The first thing you should do is to mount the STK505 onto the STK500.

1. Turn off the power on STK500.
2. Remove any other top card from the STK500.
3. Remove any AVR mounted in any of the sockets on the STK500.
4. Place the STK505 on top of the STK500. Make sure the EXPAND0 and EXPAND1 connectors on both cards align properly.

Clock Sources and Reset

The Clock Switch

The STK505 has support to easily configure the hardware to support three different clock configurations

- External Clock
- On board crystal
- Internal Oscillator

The XTAL1 and XTAL2 pins are configured as regular I/O port pins when not used as clock input/output.
The clock selection switch is used to connect the pins to different components dependant on whether it is used as clock pins or I/O pins.

Note: The device fuses must be programmed to use the selected clock source. See the device datasheet for more details.

Position	**Function**
XTAL	XTAL1 and XTAL2 pins connected to the XTAL socket
EXT CLK	XTAL1 pin connected to the STK500 clock source XTAL2 pin connected to PORTB header
INT RC	XTAL1 and XTAL2 pins connected to the PORTB header

The Reset/PORTB Switch

The RESET/PORTB switch connects the reset pin to either the reset signal from STK500, or to the PORTB header on STK500 to make it accessible for use as a regular I/O pin.

Note: The RSTDISBL fuse must be programmed to disable reset functionality and use the pin as a regular I/O port pin. Se the device datasheet for further details.

Programming the AVR

Introduction

There are two different ways of programming the AVR on STK505:

1. Low Voltage Programming (also called In-System Programming)
2. High-Voltage Programming (serial mode for tiny24 or parallel mode for tiny26)

From now on Low Voltage Programming will be described as In-System Programming.

The following sections will describe how to connect the appropriate cables. See the STK500 user guide for how to use the AVR Studio *Programming Dialog*.

In-System programming

To program the device on the STK505 using the In-System Programming (ISP) mode, connect a 6-pin cable between the ISP6PIN connector on STK500 and the SPROG connector on STK505 colored section corresponding to the device used. I.e. if programming ATtiny24, connect the 6-pin cable to the SPROG header on the green section, as shown in figure 2-1.
If programming ATtiny26 connect the 6-pin cable to the SPROG header on the blue section, as shown in figure 2-2.
Then start the *Programming Dialog* in AVR Studio

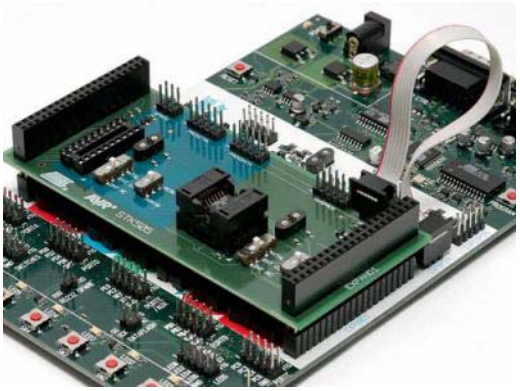


Figure 2-1: In-System Programming of the ATtiny24

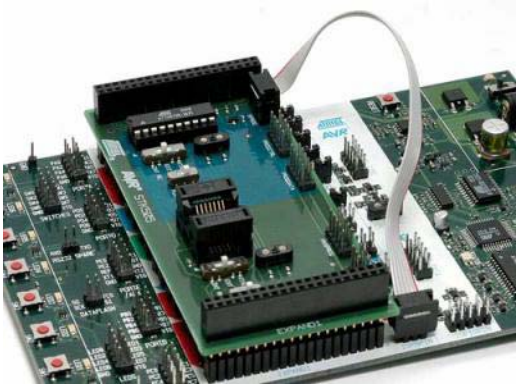


Figure 2-2: In-System Programming of the ATtiny26

Note: To be able to ISP program the AVR, the ISP programming enable fuse must be set. The ISP programming enable fuse can be programmed by *High-Voltage Programming*.
Please consult the Fuses section in the STK500 documentation.

High Voltage Programming

⚠High-Voltage Programming requires the target voltage to be set to between 4.5 and 5.5V. If you have any external hardware connected to STK505/STK500 that does not tolerate these levels, it must be disconnected before you High-Voltage program the AVR.

High Voltage Programming the ATtiny24

To program the ATtiny24 mounted on STK505 using High-Voltage Programming, follow these steps:

1. Turn off the STK500 power switch
2. Disconnect from STK500 and STK505 any hardware that does not tolerate 5V.
3. Connect the PROGDATA on STK500 to HVSPROG on STK505, as shown on figure 2-3.
4. Connect the PROGCTRL on STK500 to the PORTA header on STK500, as shown on figure 2-3.
5. Set jumpers and switches according to table 2-1.
6. Turn on STK500 power.
7. Start the *Programming Dialog* in AVR Studio

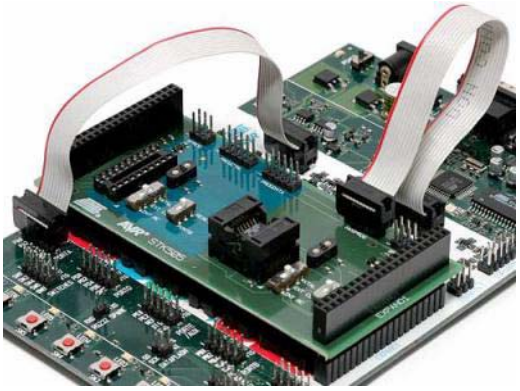


Figure 2-3: High voltage programming of the ATtiny24

Table 2-1: High-Voltage programming jumper settings for ATtiny24

STK500	
VTARGET	Mounted
AREF	Optional
RESET	Mounted
XTAL1	Mounted
OSCSEL	Mounted, pin 1 and 2
BSEL2	Mounted
PJUMP	Open
STK505	
RESET Switch	RESET position
XTAL Switch	EXT CLK position

High Voltage Programming the ATtiny26

To program the ATtiny26 mounted on STK505 using High-Voltage Programming, follow these steps:

1. Turn off the STK500 power switch.
2. Disconnect from STK500 and STK505 any hardware that does not tolerate 5V.
3. Connect PROGCTRL on stk500 to PROGCTRL on STK505, as shown on figure 2-4.
4. Connect PROGDATA on stk500 to PROGDATA on STK505, as shown on figure 2-4.
5. Set jumpers and switches according to table 2-2.
6. Turn on STK500 power.
7. Start the *Programming Dialog* in AVR Studio

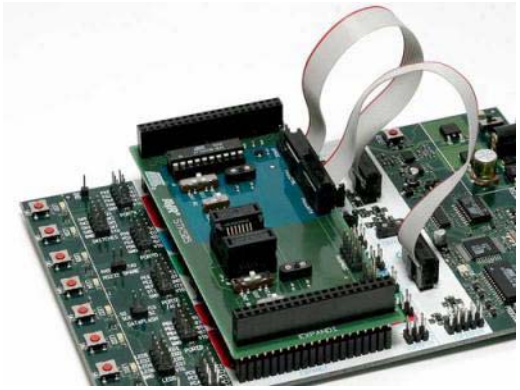


Figure 2-4: High voltage programming of the ATtiny26

Table 2-2: High-Voltage programming jumper settings for the ATtiny26

STK500	
VTARGET	Mounted
AREF	Optional
RESET	Mounted
XTAL1	Mounted
OSCSEL	Mounted, pin 1 and 2
BSEL2	Not Mounted
PJUMP	Open
STK505	
RESET Switch	RESET position
XTAL Switch	EXT CLK position

Troubleshooting Guide

Programming problems

Problem	Cause	Solution
ISP programming does not work	**ISP cable is not connected**	**Connect a 6-pin cable between the ISP6PIN connector on STK500 and the ISP connector on STK505 on the selected target section. See also Programming the AVR.**
ISP programming does not work	**The AVR is running at too low clock frequency.**	**Make sure the clock switch on STK500 is in the right position. In the *Board* page of the programming dialog in AVR Studio, try reducing the clock frequency so less or equal to the frequency the AVR is running at.**
ISP programming does not work	The SPI enable fuse is not programmed.	Program the SPI enable fuse using high voltage programming.
ISP programming does not work	The Reset Disable fuse is programmed.	Unprogram the Reset Disable fuse using high voltage programming.
ISP programming does not work	The DebugWire fuse is programmed.	Unprogram the DebugWire fuse using high voltage programming.
High-Voltage programming does not work.	The 10-pin cables are not connected correctly.	See the Programming the AVR chapter for setup.
High-Voltage programming does not work.	The (BSEL2), OSCSEL, RESET and VTARGET jumpers on STK500 are not set correctly.	See the Programming the AVR chapter for setup.
High-Voltage programming does not work.	The STK505 clock switch is in the wrong position.	Set the switch to the EXT CLK position. See also Programming the AVR.
High-Voltage programming does not work.	The STK505 Reset switch is in PORTB position	Set the switch to the RESET position.

General problems

Problem	Cause	Solution
Some of the port pins are not working.	**The AVR is not properly mounted in the ZIF socket.**	**Make sure the chip is properly aligned in the socket. When the spring-loaded latch is depressed, the chip should fit nicely into the bottom of the socket.**
The code isn't running.	**The AVR has no/wrong clock source.**	**According to the clock fuse setting, select the appropriate clock source on STK500 and STK505. Check the OSCSEL jumper on STK500 and clock switch on STK505. If you are using a crystal in one of the sockets, check that it is firmly mounted in its socket.**
The AVR will not run on x MHz, but works ok on lower frequencies.	The clock frequency is exceeding the clock rate of the AVR (at a certain operating voltage).	Check that you are running the AVR within specifications. Check the speed grade of the AVR and consult the datasheet for operating frequencies and voltages.
The AVR will not run on x MHz, but works ok on lower frequencies. I have a x MHz crystal mounted on STK500	Crystals should be placed in the crystal socket on STK505.	Place the crystal in the socket on STK505. Set the clock switch to the HF position.

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