A vertical strip on the left side of the page shows three ATMEGA microcontroller chips mounted on a blue printed circuit board (PCB). The chips are black with gold pins and the ATMEL logo is visible on each.

STK511

AVR[®]-Based Uni-Directional Radio Starter Kit

Outline

- **Introduction**
- **Kit Contents**
- **Receiver Application Board**
- **Receiver Interface Board**
 - **Stand-alone Operation**
 - **Operation with STK500**
- **Transmitter Application Board**
- **System Setup**
 - **General Setup**
 - **Demo Setup – Hardware**
 - **Demo Setup – Software**
 - **Demo Receiver Configuration**
 - **Demo Transmitter Configuration**
- **Running the Demo**
- **Conclusion**

Introduction

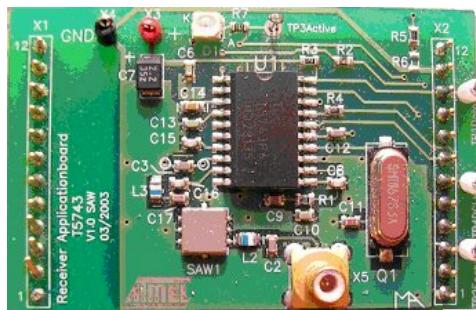
- **UHF radio covers 315, 434, 868 and 915 MHz**
- **Supports “intelligent” receiver ICs**
- **Atmel reference design receiver uses AVR® in STK500**
- **Atmel reference design transmitter uses ATtiny13**
 - **Supports 8-pin TSSOP PLL transmitters ICs**
 - **ASK or FSK transmission is pushbutton selectable**
- **Receiver Interface Board**
 - **Supports stand-alone receiver operation**
 - **Quickly programs configuration registers**
 - **OPMODE**
 - **LIMIT**
 - **Doubles as an expansion card for STK500**
 - **Enables quick prototype development**
 - **Sample software for STK500 included**

Kit Contents

- **STK511 Receiver Interface Board (IFB)**
- **RF Receiver Application Board (RAB) – one of the following:**
 - T5743 (315/433.92 MHz)
 - T5760 (868 MHz)
 - T5761 (915 MHz)
- **RF Transmitter Application Board (TAB) – one of the following:**
 - Tiny13 + T5750 (868/915MHz)
 - Tiny13 + T5753 (315MHz)
 - Tiny13 + T5754 (433.92MHz)
- **CD containing sample software and related documents**
- **Antenna**
 - Transmitter uses integrated PCB trace
 - Receiver uses external monopole whip

Receiver Application Board

- Registers part of Atmel receivers (T5743/60/61)
 - OPMODE & LIMIT set performance of receiver
 - Must be reprogrammed upon power-up
 - Programmed using one-wire protocol over DATA line
- LED to indicate IC activity
- Test points for viewing signal activity
- Matching network for receive antenna



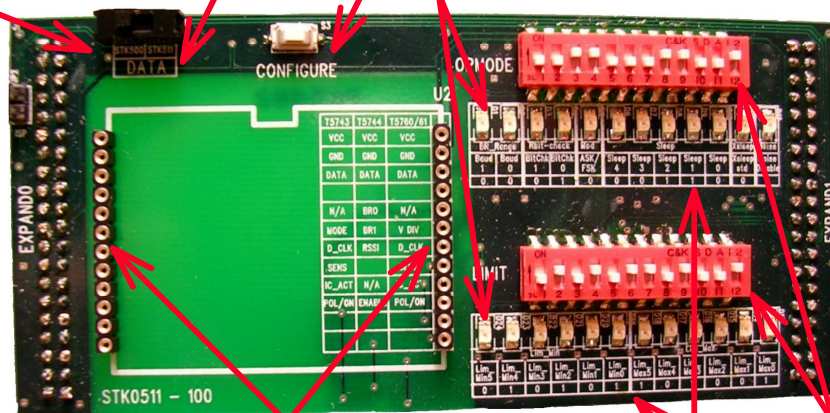
Receiver Interface Board

Data Selector Switch
 --Sends the received DATA to the STK500 for decoding
 --Sends the DATA line to the STK511 for programming

Button to initiate programming of the registers

LEDs display the selected bit settings of the two configuration registers

Routing of other signals from the receiver is controlled via 0 ohm resistor setting on the back of the STK511 board



Onboard ATmega8515 uC with preset firmware controls the configuring of the register with the values selected by the DIP switches

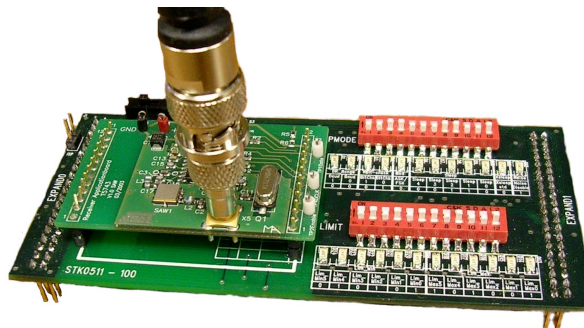
Connectors for RF Receiver Application Boards

Silkscreen legend for easy identification of the settings in the registers

DIP switches to set bits in two configuration registers in receiver ICs

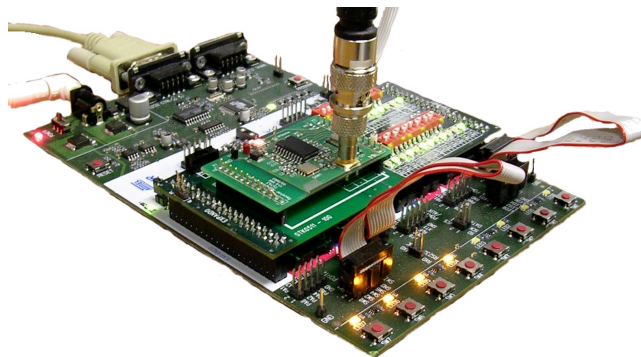
Stand-alone Operation

- **Change receiver's settings without writing software**
 - **DIP switches set configuration register values**
 - **Embedded firmware (ATmega8515) programs registers**
- **Example: Change modulation to ASK**
 - **Set DATA selector switch on IFB to STK511**
 - **Set OPMODE register DIP switch # 5 to "ON" position**
 - **Verify "Mod" LED is illuminated (indicating ASK)**
 - **Press "CONFIGURE" button to program registers**



Operation with STK500

- **STK511 Interface Board is an STK500 expansion card**
 - Still permits DIP switch programming of configuration registers
 - Connects receiver signals to STK500
- **STK500 Capabilities**
 - Allows user to select any AVR[®] for system development
 - Creates environment for easy prototyping
 - Speeds up concept verification
 - Enables functional demos using integral LEDs and switches



Transmitter

- **Atmel ATtiny13 AVR® controls T575x transmitter**
- **Calibrated internal RC oscillator minimizes external parts**
- **Programmable using exposed 6-pin ISP header**
- **Multi function I/O (5 places)**
 - **Button input**
 - **LED driver**
 - **A/D converter**
 - **RF transmission control**
- **ASK or FSK RF modulation**
- **FSK modulation by “pulling” crystal load**
 - **Through I/O port**
 - **Through external FET**



General Setup

- **Stand-alone Operation (RAB to IFB Assembly)**
 - Align signal pins of RAB near DIP switches on IFB
 - Align “+” and “GND” test points of RAB near DATA switch on IFB
 - Insert RAB into 12-pin header connectors on IFB
 - Apply +5V supply to “+” and “GND” test points of RAB

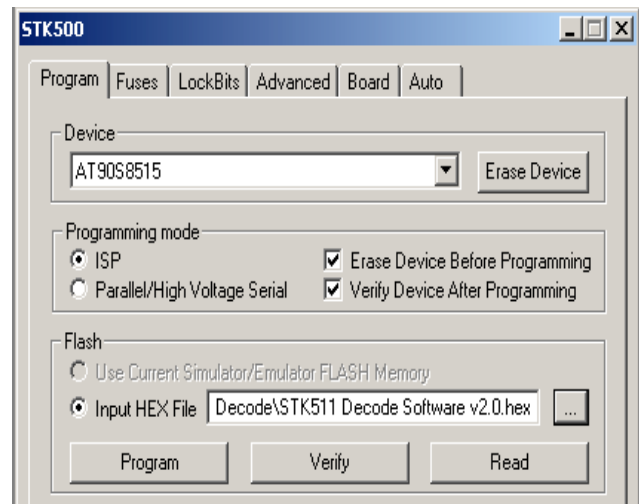
- **Operation with STK500 (RAB/IFB Assembly to STK500)**
 - Align EXPAND0 and EXPAND1 pin headers of IFB & STK500
 - Insert IFB into STK500 (don't pinch ribbon cables!)
 - Use VTARGET of STK500 sourced through EXPAND0/1

Demo Setup - Hardware

- **Verify AT90S8515 AVR® in 40-pin SCKT3000D3 (red silkscreen)**
- **Short VTARGET jumper setting on STK500**
- **Verify cable connections**
 - **DB9: From RS232 CTRL and host PC serial port**
 - **6-wire ribbon: Between SPROG3 and ISP6PIN headers**
 - **10-wire ribbon: From LEDS header to PORTC header**
- **Connect RAB/IFB Assembly to STK500**
- **Apply +12V with supplied connector**

Demo Setup - Software

- **Open AVR Studio and select Tools ⇒ STK500/AVRISP/JTAG ICE**
- **On Board tab, verify VTARGET voltage set to 5V**
- **On Program tab**
 - **In Device, select AT90S8515 from pull-down menu**
 - **In Flash, browse Input Hex File field to STK511 Decode Software v2.0.hex located on CD**
 - **Click Program button to complete programming**



Demo Receiver Configuration

- Set DATA selector switch on IFB to STK511
- Set DIP switches as follows (SW#1 ...SW#12):
 - OPMODE register: 000100011001
 - LIMIT register: 010101101001
 - Default values printed on board silkscreen below DIP switch
- Press “CONFIGURE” button to write values into registers
- Set DATA selector switch on IFB to STK500

Demo Transmitter Configuration

- **Shipped in low current “sleep” mode**
- **Periodic RF transmission starts upon button release**
 - LED(s) blinks on RF activity
 - RF contains ambient light level data
- **Toggle ASK/FSK by pressing buttons simultaneously**
 - FSK selected if both LEDs blink
 - ASK selected if only one LED blinks
- **Reverts to “sleep” mode after 30 seconds**
- **Toggle between fast/slow update rate**
 - Press right button for ¼-second update interval
 - Press left button for 8-second update interval
- **Demo program highlights ATtiny13 A/D converter**

Running the Demo

- Light intensity shown as LED bar graph on STK500
- Varying ambient light level changes LED bar graph
 - As light gets brighter, more LEDs turn on
 - Darkness corresponds to all LEDs off
- 1/4-second RF transmit interval yields real-time updates
- “DATA” test point on RAB (also PB4 on STK500)
 - View demodulated RF data under normal operation
 - View programming data when configuring the receiver registers

Conclusion

- **STK511 is a ...**
 - Flexible development system compatible with the STK500
 - Quality support tool that supports many Atmel devices
- **STK511 enables ...**
 - Easy chipset evaluation of Atmel's uni-directional RF radios
 - Fast design and verification of AVR®-based RF radios
- **STK511 kits are available today**
 - Get yours now!
- **Order numbers**

➤ ATAKSTK511- 3	Operates at 315 MHz
➤ ATAKSTK511- 4	Operates at 434 MHz
➤ ATAKSTK511- 8	Operates at 868 MHz
➤ ATAKSTK511- 9	Operates at 915 MHz