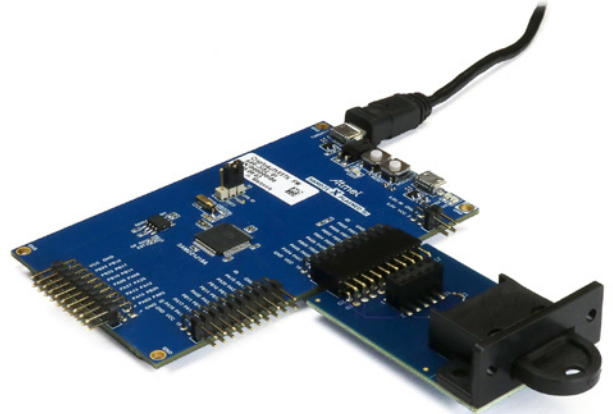


# Using Interrupts to Detect Datakey CryptoAuthentication™ Memory Tokens

## Application Note

This document describes the hardware and firmware to be used with Microchip's (Atmel's) CryptoAuthentication™ Starter Kit (Microchip part number DM320109) so that Datakey CryptoAuthentication memory tokens may be used with the kit's ATSAM21 XPRO development board. The provided firmware and this document are provided as-is, as an unsupported engineering tool.



### Hardware

In addition to the Microchip CryptoAuthentication Starter Kit (DM320109), which includes the ATSAM21 development board, a Datakey CryptoAuthentication extension board is used for the purpose of evaluating or developing firmware to interface with a Datakey CryptoAuthentication memory token. There are two extension boards to choose from:

#### SR4210PCB CryptoAuthentication Extension Board

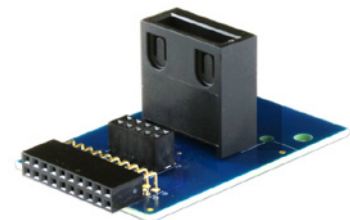
The SR4210PCB CryptoAuthentication extension board (Datakey part number 607-0087-000A) utilizes a right angle, edge-mounted receptacle (model SR4210PCB). The extension board also includes a header connector which allows for the use of panel-mount Datakey SlimLine receptacles.



SR4210PCB CryptoAuthentication™ extension board

#### SR4220VRT CryptoAuthentication Extension Board

The SR4220VRT CryptoAuthentication extension board (Datakey part number 607-0088-000A) utilizes a vertical-mount receptacle (model SR4220VRT). It also includes a header connector for use with panel-mount receptacles. These extension boards are designed to be plugged into the EXT1 header of the ATSAM21 XPRO development board.



SR4220VRT CryptoAuthentication™ extension board

The application described in this note supports Datakey CryptoAuthentication memory tokens based on Microchip's ATSHA204A and ATECC608A CryptoAuthentication ICs. The chart on the next page lists the supported memory tokens:

CryptoAuthentication is a trademark of Microchip Technology Incorporated in the U.S.A. and other countries and is used under license.

Datakey Part Number	Description	Microchip IC
<b>IAT4.5Kb MEMORY TOKENS</b>		
611-0232-000A	IAT4.5Kb CryptoAuthentication Memory Token, Black	ATSHA204A
611-0232-002A	IAT4.5Kb CryptoAuthentication Memory Token, Red	ATSHA204A
611-0232-004A	IAT4.5Kb CryptoAuthentication Memory Token, Yellow	ATSHA204A
611-0232-005A	IAT4.5Kb CryptoAuthentication Memory Token, Green	ATSHA204A
611-0232-006A	IAT4.5Kb CryptoAuthentication Memory Token, Blue	ATSHA204A
611-0232-008A	IAT4.5Kb CryptoAuthentication Memory Token, Gray	ATSHA204A
<b>IAX4.5Kb MEMORY TOKENS</b>		
611-0233-000A	IAX4.5Kb CryptoAuthentication Memory Token, Black	ATSHA204A
611-0233-002A	IAX4.5Kb CryptoAuthentication Memory Token, Red	ATSHA204A
611-0233-004A	IAX4.5Kb CryptoAuthentication Memory Token, Yellow	ATSHA204A
611-0233-005A	IAX4.5Kb CryptoAuthentication Memory Token, Green	ATSHA204A
611-0233-006A	IAX4.5Kb CryptoAuthentication Memory Token, Blue	ATSHA204A
611-0233-008A	IAX4.5Kb CryptoAuthentication Memory Token, Gray	ATSHA204A
<b>IAT10.5Kb MEMORY TOKENS</b>		
611-0234-000A	IAT10.5Kb CryptoAuthentication Memory Token, Black	ATECC608A
611-0234-002A	IAT10.5Kb CryptoAuthentication Memory Token, Red	ATECC608A
611-0234-004A	IAT10.5Kb CryptoAuthentication Memory Token, Yellow	ATECC608A
611-0234-005A	IAT10.5Kb CryptoAuthentication Memory Token, Green	ATECC608A
611-0234-006A	IAT10.5Kb CryptoAuthentication Memory Token, Blue	ATECC608A
611-0234-008A	IAT10.5Kb CryptoAuthentication Memory Token, Gray	ATECC608A
<b>IAX10.5Kb MEMORY TOKENS</b>		
611-0235-000A	IAX10.5Kb CryptoAuthentication Memory Token, Black	ATECC608A
611-0235-002A	IAX10.5Kb CryptoAuthentication Memory Token, Red	ATECC608A
611-0235-004A	IAX10.5Kb CryptoAuthentication Memory Token, Yellow	ATECC608A
611-0235-005A	IAX10.5Kb CryptoAuthentication Memory Token, Green	ATECC608A
611-0235-006A	IAX10.5Kb CryptoAuthentication Memory Token, Blue	ATECC608A
611-0235-008A	IAX10.5Kb CryptoAuthentication Memory Token, Gray	ATECC608A

# Using Interrupts to Detect Datakey CryptoAuthentication™ Memory Tokens

## Firmware

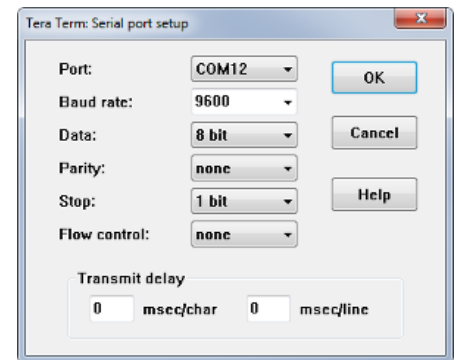
The firmware, which can be downloaded from the Datakey website, is a hybrid of two sample code projects available from Microchip, the *Getting-Started1* solution and the *CryptoAuth-D21-Host* solution. The interrupt-driven nature of the *Getting-Started1* project was retained so as to allow interrupts to be generated by the insertion and removal of a CryptoAuthentication token. The original sample code from Microchip expects an interrupt to come in from the built-in pushbutton (SW0), but this code was modified so as to detect the /LOFO signal from the Datakey receptacle connected to EXT1. The /LOFO signal is mapped to line PB06. Because the code expects the /LOFO signal to be on PB06, the extension board must be connected to the EXT1 header unless the user modifies the source code to expect it elsewhere. For example, if the extension board were to be plugged into the EXT2 header, the /LOFO signal would come in on PA20.

A serial interface can be established between a host computer and the ATSAM21-XPRO board by using a terminal emulator (such as Tera Term or PuTTY) and connecting the USB cable supplied with the ATSAM21-XPRO board between its TARGET USB connector and an available USB port on the host computer. Configure the terminal emulator for 9600 baud, 8 data bits, no parity, one stop bit, and no flow control.

Because the modified firmware is only intended to support the ATSHA204A and the ATECC608A devices, all menu options, commands, and functions associated with other CryptoAuthentication devices have been commented out of the source code. Most commands associated with the ATSHA204A and the ATECC608A have also been commented out of the source code. The commands that remain only allow the user to set the target device type, query the chip revision, query the serial number, and query the lock status of the Config Zone and the Data Zone.

Since the communication protocols differ between the two supported device types, the user must first configure the firmware for the type of device that is to be attached. This is accomplished by typing “204” to configure the system to communicate with an ATSHA204A device (like the IAT4.5Kb memory token), or “608” for use with an ATECC608A device (like the IAT10.5Kb memory token). Type “help” at any time to see a list of the supported commands.

There is a great deal of documentation available from Microchip that details how to program and use the ATSAM21-XPRO development board with Atmel Studio 7.0. The modified firmware solution described above is entitled *cryptoauth-d21-host.atsln*. It is most easily loaded into the ATSAM21-XPRO board by programming its Flash memory with the associated .elf file – which will specify the memory location at which the program is to be stored. Also included with the modified solution is a Doxygen linked listing of the associated source code files, entitled *CA.chm*.



```
Specify the target device type:
608 - set target device to ATECC608A
204 - set target device to ATSHA204A

204
expecting device: ATSHA204A

Specify the target device type:
608 - set target device to ATECC608A
204 - set target device to ATSHA204A

608
expecting device: ATECC608A

help
Usage:
608 - set target device to ATECC608A
204 - set target device to ATSHA204A
lockstat - get the zone lock status
info - get the chip revision
sernum - get the chip serial number
```