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# 1 Purpose of the Document

This application note describes the procedures for reading and writing to the SAP5S/SAP51 EEPROM via the AS-Interface Programmer V2.0 and a command line tool. Recommendation: Before reading this document, refer to the *SAP5S/SAP51 Data Sheet* and the *AS-Interface Programmer User Manual* (see section3).

# 2 SAP5S / SAP51 EEPROM Program Mode

## 2.1. SAP5S / SAP51 EEPROM Memory Map

The SAP5S / SAP51 provides an on-chip EEPROM. For security reasons, the memory area is structured in three independent blocks. The data blocks are the User Area, Firmware Area, and Safety Area (SAP5S only). See Figure 2.1 and Figure 2.2 for more information.

The Firmware Area contains all the manufacturing-related configuration data (e.g., *IO_Code, ID_Code, ID_Code_Extension_2)*. It can be protected against undesired data modification by setting the *Lock_EE_PRG* flag to '1.'

The User Area contains only the data that is relevant for changes in the final application (e.g., slave address, *ID_Code_Extension_1*).

To write the User Area, no special setup is needed. An *Address_Assignment* call and a *Write_Extended_ID-Code_1* call are sufficient to change the content of the EEPROM registers. To write data to the Firmware Area, a special command procedure is necessary.

The details for managing the content of the Firmware Area and the Safety Area are given in this document.

***Figure 2.1 EEPROM Map***

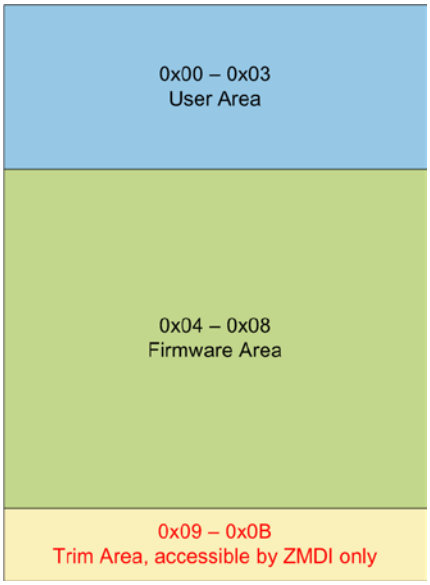
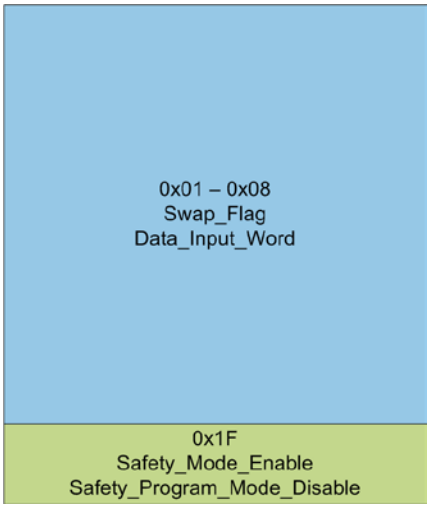



***Figure 2.2 SAP5S Safety EEPROM Map***




## 2.2. AS-Interface Programmer Setup and General Usage

Use this setup for the AS-Interface Programmer:
serial port: 19200 baud; 8 data bits; 1 stop bit; 0 parity bit.

General information regarding the AS-Interface Programmer:

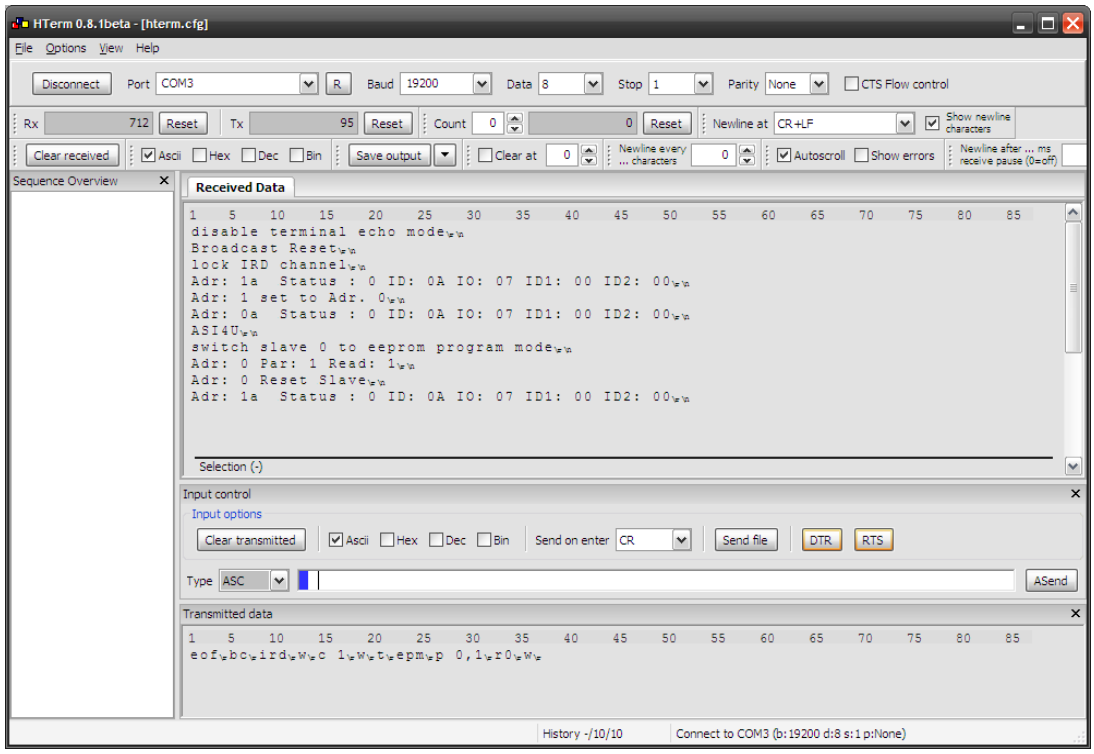
- To close a command, send CR (\r).
- A response is closed with CR LF (\r\n).
- The AS-Interface sends feedback for every command; check content for information.
- The EEPROM Program Mode is only available for a slave at address 0.
- An EEPROM read/write can only be performed with only one connected slave.
- All numbers are in decimal representation.

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## 2.3. Command Line Tools

Common command line tools are HyperTerminal®*, which is included in Microsoft® Windows XP and earlier, HTerm available at www.der-hammer.info/terminal or Putty available at www.putty.org.

***Figure 2.3 HTerm Command Line Tool Example***




## 2.4. Access SAP5S / SAP51 EEPROM

To write to the EEPROM of the SAP5S / SAP51, the user must send a special command procedure. This procedure is only available if the *Lock_EE_PRG* flag is not set. If the *Lock_EE_PRG* flag is set in the EEPROM, the user will not be able to access the EEPROM and will receive a timeout response from the AS-Interface Programmer after reading or writing data from or to an EEPROM address.

The SAP5S / SAP51 does not support reading the content of the EEPROM. The user can only retrieve standard information including the slave address, *ID_Code, ID_Code_Extension_1, ID_Code_Extension_2*, and *IO_Code.*

* HyperTerminal® is a registered trademark of Hilgraeve, Incorporated.

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### *Table 2.1 Write EEPROM Sequence*

Note: The command sequence marked by gray shading is not part of the actual programming.

| Command | Description | Response |
|---|---|---|
| eof | Set up AS-Interface Programmer | Disables Terminal Echo Mode |
| bc | Set up AS-Interface Programmer | Broadcast reset |
| ird | Set up AS-Interface Programmer | Lock IRD channel |
| t | Check for connected SAP5 slave at address 0 | SAP5 |
| s0 | Read Status | s0: Adr: 0 Status: 1 |
| e X | Write *ID_Code_Extension*_1 (EEPROM address 1) | Set ext. ID1 to: X |
| a 1 | Assign address 1 | Set Adr to: 1 |
| o 1b | Prepare for writing *ID_Code* | o1b: Adr: 1b IO config: 06 |
| Write **ID_Code** data and *Synchronized_Data_IO* bit to SAP5 (see Table 2.2) | | |
| j 1b | Prepare for writing *ID_Code_Extension_2* | Adr: 1b ext. ID Code1: 06 |
| Write ***ID_Code_Extension_2*** data and *Inhibit_Write_ID1* bit to SAP5 (see Table 2.2) | | |
| i 1b | Prepare for writing IO Code | Adr: 1b ID Code: 06 |
| Write **IO_Code** data and *P1_Delay_Activation* bit to SAP5 (see Table 2.2) | | |
| r 1b | Prepare for writing to EEPROM address 8 | Adr: 1b Reset Slave |
| Write **EEPROM address 8** data to SAP5 (see Table 2.2) | | |
| k 1b | Prepare for writing EEPROM address 7 | Adr: 1b ext. ID Code2: 06 |
| Write **EEPROM address 7** Data to SAP5 (see Table 2.2) | | |
| c 1 | Clear address | Adr: 1 set to Adr. 0 |
| c 1b | Clear address | Adr: 1bTimeout |
| r 0 | Reset slave | Adr: 0 Reset Slave |

### *Table 2.2 Write Command Sequence*

| Command | Description | Response |
|---|---|---|
| d1 Data[3:0]<br>p1 Data[3:0] | Write EEPROM content using<br>d if data ≤ 15 (Bit 4 = 0)<br>p if data > 15 (Bit 4 = 1) | Adr: 1 Data: X Read: Y |

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***Table 2.3 Read EEPROM Sequence***

| Command | Description | Response |
|---|---|---|
| eof | Set up AS-Interface Programmer | Disables Terminal Echo Mode |
| bc | Set up AS-Interface Programmer | Broadcast reset |
| ird | Set up AS-Interface Programmer | Lock IRD channel |
| j 0 | Read *ID_Code_Extension*_1 (EEPROM address 2) | e.g.: Adr: 0 ext. ID Code1: 00 |
| i 0 | Read ID Code (EEPROM address 8) | e.g.: Adr: 0 ID Code: 0A |
| k 0 | Read *ID_Code_Extension_2* (EEPROM address 9) | e.g.: Adr: 0 ext. ID Code2: 00 |
| o 0 | Read IO Code (EEPROM address 10) | e.g.: Adr: 0 IO config: 07 |
| r 0 | Reset slave; leave EEPROM Program Mode | Adr: 0 Reset Slave |

## 2.5. Access SAP5S Safety Area

***Table 2.4 Access SAP5S Safety Area***

| Command | Description | Response |
|---|---|---|
| eof | Set up AS-Interface Programmer | Disables Terminal Echo Mode |
| bc | Set up AS-Interface Programmer | Broadcast reset |
| ird | Set up AS-Interface Programmer | Lock IRD channel |
| epm | Enter Safety Area Programming Mode | epm: switch slave 0 to EEPROM Program Mode |
| d Addr,Data[3:0]<br>or<br>p Addr, Data[3:0] | Write EEPROM content using<br>d if data ≤ 15 (Bit 4 = 0)<br>p if data > 15 (Bit 4 = 1) | Adr: 1 Data: 1 Read: 1 |
| d 31,Data | Write EEPROM address 31<br>*Safety_Mode_Enable*<br>*Safety_Program_Mode_Disable* | Adr: 31 Data: 1 Read: 1 |
| r 0 | Reset slave; leave EEPROM Program Mode | Adr: 0 Reset Slave |

## 2.6. Additional Commands

- c X Set slave address from X to 0
- a X Assign new slave address from 0 to X
- s X Read status of slave X

Also refer to the *AS-Interface Programmer User Manual* and the *SAP5S / SAP51 Data Sheet*.

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# 3 Related Documents

| Document |
|---|
| *AS-Interface Programmer User Manual ** |
| *SAP5S/SAP51 Data Sheet *** |
| *AS-Interface Programmer Application Note – ASI4U and SAP5 Master Mode*** |

Visit www.IDT.com/SAP5 or contact your nearest sales office for the latest version of these documents.

# 4 Document Revision History

| Revision | Date | Description |
|---|---|---|
| 1.00 | October 10, 2011 | First version of the document |
| 1.10 | June 23, 2015 | Full content revision.<br>Update for template.<br>Minor edits for clarity.<br>Addition of “Related Documents” section. |
| | April 13, 2016 | Changed to IDT branding. |

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(Rev.1.0 Mar 2020)


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