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ALICE DETECTOR DATA LINK

ALICE-DDL

User's Guide for the SIU Simulator

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1. Document Information

1.1 Abstract

This document describes the utilization of the Detector Data Link SIU Simulator. It is intended to be used together with the ***Hardware Guide for the Front-end Designers*** (ALICE/98-21 Internal Note/DAQ, 16 May 2003).

1.2 Document Status Sheet

1. Document Title: User's Guide for the SIU Simulator			
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Draft	1	31st of July 1998	Original document
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Table 1 Document Status Sheet

1.3 Document Change Record

Document Change Record		**DCR No.**	
		Date	
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1. Document Title		User's Guide for the SIU Simulator	
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Table 2 Document Change Record (of changes made since issue ...)

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1.5 List of Figures

1.6 List of Tables

2. Introduction

The *SIU Simulator* (SIMU) is a simple tool designed to ease the integration of the ALICE front-end Electronics (FEE) with the Detector Data Link (DDL). The SIMU is able to simulate alone the complete read-out system that consisting of a DDL, a Read-out Receiver Card (RORC) and a control software package. The SIMU is designed to execute low-level hardware tests of ALICE FEEs. It can be connected to the FEE via the FEE-SIU interface connector, because the SIMU is completely compatible with the SIU in mechanical, electrical and protocol point of view. The SIMU is able to run all the standard FEE related transactions:

- front-end control;
- front-end status read-out;
- event data transmission;
- data block write (with flying '1' pattern, i.e. 0x00000001, 0x00000002, 0x00000004 etc.);
- data block read.

3. SIMU Control

3.1 Switches and push-buttons

The SIMU is a manually controlled device, consisting of a generic selector switch array and some push-button for the setting of the working modes and conditions:

- manual reset push-button ***pb8***
- generic selector switch array ***sw[8..1]***
- load working mode push-button ***pb1***
- load high address byte push-button ***pb2***
- load low address byte push-button ***pb3***
- load block length push-button ***pb4***
- start transaction push-button ***pb5***
- stop transaction push-button ***pb6***
- reserved ***pb7***

After each power-on, the SIMU will be reset automatically. It can also be reset at any time by using the ***pb8 manual reset*** push-button. **Note**: after a reset action, the direction of the front-end bus will be set by the SIMU => FEE information transfer.

The SIMU can be controlled by using the ***sw[8..1]*** generic selector switch array in conjunction with the four load push-buttons. The meaning of the general selector switch bits are different, depending on the push-button used for loading the control information into the SIMU (see Table 3).

	Generic selector switch array sw[8..1]							
Load	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
pb1	transaction selector			multiple/single	flow control	reserved	reserved	reserved
pb2	high byte of the front-end address							
pb3	low byte of the front-end address							
pb4	length of the data block							

Table 3 The meaning of the generic selector switches

The SIMU can operate in different working modes. The transaction selector bits, the multiple/single execution bit of the selected transaction and the flow control activation bit can be loaded into the control logic of the SIMU by using ***pb1*** load working mode push-button.

One of the five valid transaction can be selected by setting the sw[8..6] bits of the generic selector switch array (see Table 4)

	sw[8..6]		
Transaction	**8**	**7**	**6**
front-end control	0	0	0
front-end status read-out	0	0	1
event data transmission	0	1	0
data block write	0	1	1
data block read	1	0	0
reserved	1	0	1
reserved	1	1	0
reserved	1	1	1

Table 4 The selection of the transactions by setting ***sw[8..6]*** bits

A selected transaction can be run either once or repetitively, depending on the state of ***sw4*** multiple/single transaction bit of the generic selector switch array. A selected transaction will run only once, when this bit is set to 'L' state (see Figure 1), while it will run repetitively, when the ***sw4*** bit is set to 'H' state. Since the event data transmission is a continuous data transfer and its termination requires an action by the user, the repetitive execution of this transaction is impossible. Thus in this case, the state of the ***sw4*** bit is don't care.

The SIMU can periodically activate the fiLF_N (link full) flow control line, when the ***sw3*** flow control bit of the generic selector switch array is set to 'H' state (see Figure 1). The flow control is executed by setting the fiLF_N line in active low state for one foCLK period, after every 128 received data words.

Before starting any transactions (excepting the event data transmission), the front-end address (FEA) must be set in two consecutive steps. First the high address byte is selected by setting the ***sw[8..1]*** bits of the generic selector switch array. Then this value can be loaded by using the ***pb2*** load high byte address push-button. As a next step, the low address byte is selected by setting the ***sw[8..1]*** bits of the generic switch array. Then this value can be loaded by using the ***pb3*** load low byte address push-button.

Before starting a data block write transaction, the block length (BL) must be selected within the range of 1kB – 256kB in 1kB steps by setting the ***sw[8..1]*** bits of the generic selector switch array. The preset block length value can be loaded by using the ***pb4*** load block length push-button.

Any transactions can be started by using the ***pb5*** start transaction push-button, however, all the transaction require some preparatory actions before the start. The execution of some preparatory actions are optional. There are also some preparatory actions, which will not produce any effects for the execution of the transactions. Table 5 shows the mandatory (**m**), the optional (**o**) and the non applicable (**n/a**) preparatory actions for the different transactions.

	Preparatory action				
Transaction	**transaction's selection**	**multiple/ single**	**flow control**	**load FEA**	**load BL**
front-end control	m	o	n/a	m	n/a
front-end status read out	m	o	n/a	m	n/a
event data transmission	m	n/a	o	n/a	n/a
data block write	m	o	n/a	m	m
data block read	m	o	o	m	n/a

Table 5 The mandatory, the optional and the non applicable preparatory actions for the transactions

Any repetitively running transactions can be stopped by using the ***pb6*** stop transaction push-button. However, the execution will only be stopped after termination of the given transaction. The termination of the event data transmission transaction can also be provoked by using this push-button.

3.2 LEDs

The SIMU has the following LEDs for the displaying of different working and error conditions:

- power ***ld8*** (green);
- transaction's execution ***ld7*** (yellow);
- data transfer ***ld6*** (yellow);
- transaction time-out ***ld5*** (red);
- front-end error ***ld4*** (red);
- front-end busy ***ld3*** (red);
- reserve ***ld2*** (green);
- reserve ***ld1*** (green);
- configuration ***ld9*** (red).

The ***ld8*** power-on LED is switched on, when the SIMU is powered by the +3.3 V from the FEE.

The ***ld7*** transaction's execution LED switched on, when a DDL transaction is transaction is started. It is switched off, when the given transaction is terminated.

The ***ld6*** data transfer LED is always switched on, when data blocks are transferred either from the SIMU to the FEE or from the SIMU.

The ***ld5*** transaction time-out LED is switched on, when a DDL transaction is not terminated within the predefined time-out period. It can only be switched off by using the ***pb8*** reset push-button.

The ***ld4*** front-end error LED is switched on, when the error bit in any front-end status words is set by the FEE. It can only be switched off by using the ***pb8*** reset push-button.

The ***ld5*** front-end busy LED is switched on, when the FEE is not able to receive data block from the SIMU, i.e. the foBSY_N signal is activated by the FEE.

The ***ld9*** configuration LED is switched on during the system configuration. In the case of a successful system configuration it will be switched off very quickly.

4. Usage of the SIMU

4.1 Connection of the SIMU to the FEE

The SIMU is plugged-in to the FEE via the interface connector. Before doing this, be sure the power is switched off! Three stand-offs on the SIMU daughter board allow mechanical fixation of the SIMU to the FEE motherboard with the help of M2.5 screws. For this purpose the FEE motherboard shall also have three holes in the appropriate position.

4.2 Power-on and system configuration

Switch on the FEE, so that the SIMU will be powered up. The ***ld8 power LED*** indicates that the SIMU is supplied by +3.3 V. The system configuration procedure is started immediately, and during this period, the ***ld9 configuration LED*** will be switched on. **Note**: the configuration procedure is very short. In the case of a successful configuration the SIMU will automatically generate a reset, it will enter into stand-by state (i.e. none of the transactions will be running) and the ***ld9 configuration LED*** will be switched off. In the case of an unsuccessful system configuration the ***ld9 configuration LED*** will not be switched off, so the user shall switch off the FEE and then switch on again.

4.3 Running of the transactions

Running any transaction requires to execute a precise sequence of control actions. This procedure consists of two different phases: a preparation phase (indicated with grey shading) and an execution phase. The control procedure can always be started from the beginning of the execution phase by

pushing the ***pb5***, if the user do not need to change the parameters of the transaction (i.e. working mode, FEA and BL).

The LEDs on the board will inform the user about the normal or abnormal execution of the given transaction.

Front-end control

1. reset the SIMU by pushing the ***pb8***
2. select the front-end control transaction by setting the 000 bit combination on the ***sw[8..6]***
3. set the ***sw4*** to 'H' state, if you wish to execute multiple transactions, otherwise set it to 'L' state
4. load the working mode by pushing the ***pb1***
5. select the high byte of the front-end address by setting the ***sw[8..1]***
6. load the high byte of the front-end address by pushing the ***pb2***
7. select the low byte of the front-end address by setting the ***sw[8..1]***
8. load the low byte of the front-end address by pushing the ***pb3***
9. start the execution of the transactions by pushing the ***pb5***
10. the ***ld7*** will be switched on during the execution of the transactions
11. stop the execution of the repetitive transactions by pushing the ***pb6***

Front-end status read-out

1. reset the SIMU by pushing the ***pb8***
2. select the front-end control transaction by setting 001 bit combination on the ***sw[8..6]***
3. set the ***sw4*** to 'H' state, if you wish to execute multiple transactions, otherwise set it to 'L' state
4. load the working mode by pushing the ***pb1***
5. select the high byte of the front-end address by setting the ***sw[8..1]***
6. load the high byte of the front-end address by pushing the ***pb2***
7. select the low byte of the front-end address by setting the ***sw[8..1]***
8. load the low byte of the front-end address by pushing the ***pb3***
9. start the execution of the transaction by pushing the ***pb5***
10. the ***ld7*** will be switched on during the execution of the transactions
11. the ***ld5*** will be switched on, if the FEE does not return a front-end status word within time-out period
12. the ***ld4*** will be switched on, if the error bit in the front-end status word is set by the FEE
13. stop the execution of the repetitive transactions by pushing the ***pb6***

Event data transmission

1. reset the SIMU by pushing the ***pb8***
2. select the front-end control transaction by setting the 010 bit combination on the ***sw[8..6]***
3. set the ***sw3*** to 'H' state, if you wish to execute flow control, otherwise set it to 'L' state
4. load the working mode by pushing the ***pb1***
5. start the execution of the transaction by pushing the ***pb5***
6. the ***ld7*** will be switched on during the execution of the transactions
7. the ***ld6*** will be switched on during the event data block transfer
8. the ***ld5*** will be switched on, if the FEE does not return event data blocks or of event status words within the time-out period
9. the ***ld4*** will be switched on, if the error bit in the end of event status word is set by the FEE
10. stop the execution of the transactions by pushing the ***pb6***

Data block write

1. reset the SIMU by pushing the ***pb8***
2. select the front-end control transaction by setting the 011 bit combination on the ***sw[8..6]***
3. set the ***sw4*** to 'H' state, if you wish to execute multiple transactions, otherwise set it to 'L' state
4. load the working mode by pushing the ***pb1***
5. select the high byte of the front-end address by setting the ***sw[8..1]***
6. load the high byte of the front-end address by pushing the ***pb2***
7. select the low byte of the front-end address by setting the ***sw[8..1]***
8. load the low byte of the front-end address by pushing the ***pb3***
9. select the length of the data block by setting the ***sw[8..1]***
10. load the block length by pushing the ***pb4***
11. start the execution of the transaction by pushing the ***pb5***
12. the ***ld7*** will be switched on during the execution of transactions
13. the ***ld6*** will be switched on during the block transfer
14. the ***ld3*** will be switched on, when the FEE executes flow control
15. stop the execution of the repetitive transactions by pushing the ***pb6***

Data block read

1. reset the SIMU by pushing the ***pb8***
2. select the front-end control transaction by setting the 100 bit combination on the ***sw[8..6]***
3. set the ***sw4*** to 'H' state, if you wish to execute multiple transactions, otherwise set it to 'L' state
4. set the ***sw3*** to 'H' state, if you wish to execute flow control, otherwise set it to 'L' state
5. load the working mode by pushing the ***pb1***
6. select the high byte of the front-end address by setting the ***sw[8..1]***
7. load the high byte of the front-end address by pushing the ***pb2***
8. select the low byte of the front-end address by setting the ***sw[8..1]***
9. load the low byte of the front-end address by pushing the ***pb3***
10. start the execution of the transaction by pushing the ***pb5***
11. the ***ld7*** will be switched on during the execution of transactions
12. the ***ld6*** will be switched on during the event data block transfer
13. the ***ld5*** will be switched on, if the FEE does not return data blocks or end block status words within the time-out period
14. the ***ld4*** will be switched on, if the error bit in the end of event status word is set by the FEE
15. stop the execution of the repetitive transactions by pushing the ***pb6***

5. Physical Arrangement

Figure 1 shows the physical arrangement of the SIMU. This picture shows only the generic selector switch array, the push-buttons and the LEDs. The FEE-SIU interface connector is also shown. **Note**: the dotted line symbolizes that the connector is placed on the button side of the card. The letters next to the ***sw[8..1]*** switches indicates the corresponding logic state selected.

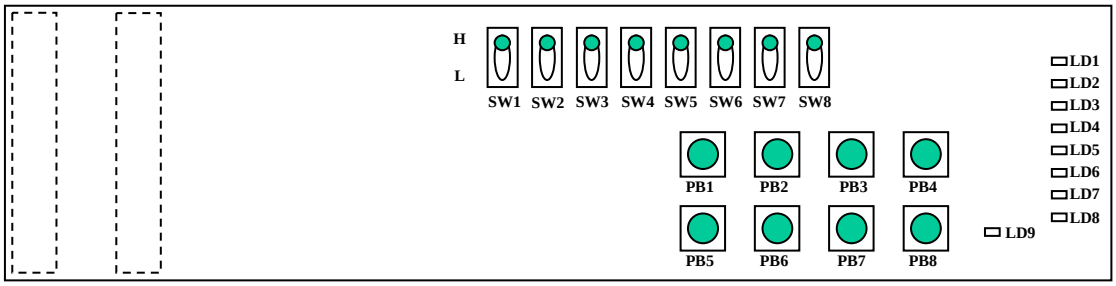

Figure 1 The physical arrangement of the SIMU