SIMATIC NET

SIM 1 V1.1

Extension to the User Description Date June,6th 2000

PROCENTEC

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Liability Exclusion
We have checked the content of this document regarding agreement with the hardware and software described. Nevertheless, deviations can't be ruled out, and we are not guaranteeing complete agreement. However, the data in this document is checked periodically. Necessary changes will be included in subsequent editions. Any suggestions for improvement are welcome.

Subject to technical changes.

Version overview

Version	Date	Page	Remarks
0.x			first versions
1.0 preliminary	01/13/97	div.	actual parameters, enhancements, extensions
1.1	05/05/97	div.	actual parameters, enhancements, extensions
1.2	07/01/99		Δ SIM 1 - SIM 11
1.3	06/06/00	div.	brand name SIM 1 V1.1 instead of SIM 11

Table of Contents

1 Overview

The SIM 1 (Siemens IEC MAU) enables the design of a Fieldbus Medium Attachment Unit (MAU) for 31.25 kbit/s according to IEC 61158-2 or DIN EN 61158-2 or ISA S50.2 or EN50170 with only a few external components. The implemented Data Link Layer protocol is not relevant, therefore the ASIC can be used e.g. for PROFIBUS PA and also for Foundation Fieldbus.

Note:

Since July 01. 1999 the ASIC SIM 1 has been replaced by the SIM 1 V1.1.

An unofficial nick-name of SIM 1 V1.1 is SIM 11

2 Differences between SIM1 V1.0 and SIM1 V1.1

Under some circumstances communication distortions or the trigger of a reset are possible when using SIM1.

A sporadic drop of the internal power supply VCC because of a sporadic increase of the current usage of the SIM1 (the current range is between 10.8 and 14.4mA) causes this. The effect only occurs within a small area of about 50 to 900 µA within the range of 10.8 to 14.4mA. In the mode VCM the current reserve is smaller, therefore the effect can occur more often and cause a RESET.

Order number SIM 1
6GK1588-1BA00
6GK1588-1BA10
6GK1588-1BA20
6GK1588-1BA30
6GK1588-1BA40

To solve this problem using SIM 1 V1.0, the increase of the capacity at VCC from 100nF to 1µF or higher (e.g. 4,7µF) is necessary.

3 SIM 1 V1.1

Solving the mentioned problems was the reason to change the SIM 1. This was possible by changing the mask only without changing the design. There is no interaction with existing circuitry and a new certification of the application is not mandatory.

The unsymmetrical modulation in the area from 10 to 14mA is also corrected (in the Constant Current Mode the SIM 1 increased the current usage, when the set current was below 12mA, to enable a modulation at all). Therefore the conformity to IEC 61158-2 can also be guaranteed in this small current range. A transmission below 10mA is no longer possible, but according to IEC 61158-2 is such a transmission not required!

4 Technical Conclusions

The resistor R2 is to be used with 105kΩ as a minimum at a current consumption of 10mA, to guarantee that the current consumption is not below 10mA when taking all tolerances into account (as specified in the FISCO model).

5 Order numbers

The order numbers have changed for the new version of the ASIC. The label of ASIC changed

from: SIM 1 010

new: SIM 1 011

to identify the version SIM 1 V1.1

The SIM 1 V1.0 is no longer available.

At the same time a tray with 160 pieces replaces the tray with 96 pieces**.**

An additional package is available: **Tape & Reel with 1,000 pieces.**

The order numbers for 4,800 and 10,560 pieces are no longer valid.

New order numbers

SIM 1 V1.1		
Order Number	**Pcs.**	**Packaging**
6GK1588-2BA00	5	Card Box
6GK1588-2BA16	160	Tray
6GK1588-2BA20	960	6 Tray Box
6GK1588-2BA21	1,000	Tape & Reel

6 Additional Notes, Extensions, Corrections

The clock can also be provided via X2. In this case X1 is then connected preferably to Vcc. Operation with X1 connected to GND is also possible. The clock signal has then have to have a level of 5V, because this part of the circuitry is supplied with Vcc not with VIF. The operation with 3.3V can not be guaranteed.

The level of the signals TXE,TXS,RXS,RXA are controlled by VIF. Therefore an operation with 3.3V is possible (without galvanic isolation). It is not recommended to use TXSD without galvanic isolation and therefore connected to anything else except 5V.

For use of the dynamic interface (TXSD) the unused inputs TXS and TXE should preferably be connected to GND. A design suggestion for the connection to the SPC41 and DPC31 is under preparation.

To prevent oscillations on the PA bus, the application hints below should be followed..

7 Application Hint: How to avoid oscillations in a PROFIBUS PA Segment

Fieldbus systems with the IEC 61158-2 Physical Layer have been used since 1997 in the process industry and are well accepted in the market place. The Medium Attachment Unit SIM 1 has proven its high performance and flexibility in multiple products.

With the experience of large applications including several hundreds of field devices the IEC 61158-2 Physical Layer has proved to be very stable even under extreme working conditions. However the standard IEC 61158-2 allows device characteristics which can lead to oscillations on the bus in the range of 250 to 500 kHz. The oscillations have normally no influence on the data transmission because the transmission bandwidth is below 40 kHz. Nevertheless, in some limit conditions of the bus topology the oscillations may disturb the data transmission.

To prevent disturbing effects we recommend to optimise the behaviour of the field device above the transmission bandwidth within the circuitry of the SIM 1. Appendix 1 describes an easy solution recommended to implement in all devices under development and in production

Our analysis has shown that the oscillations can occur by using pairs of non-optimised field devices with a distance of ~30m in between the devices. The oscillations don't appear if the distance in between two field devices (non-optimised) is below 10m or above 70m.

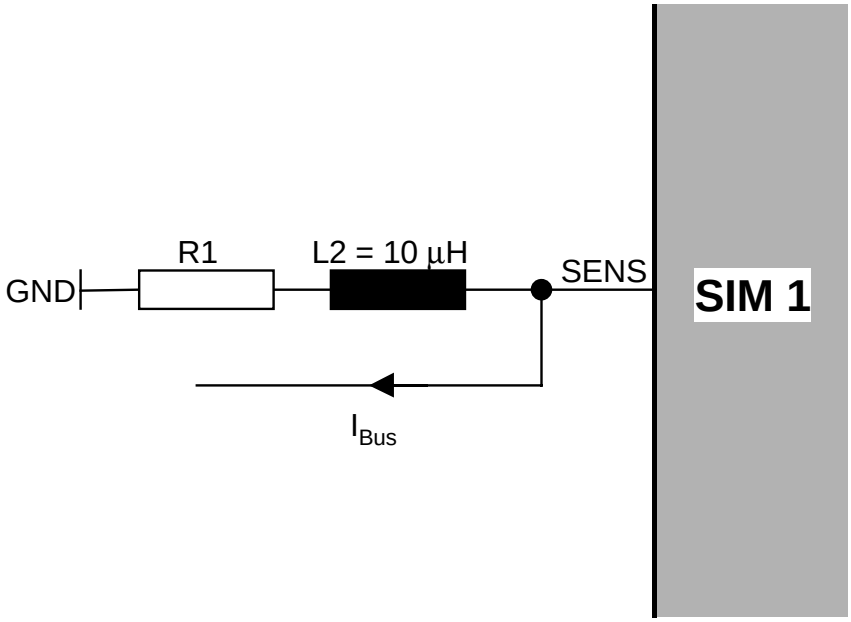
Appendix 2 shows the steps to prevent or eliminate oscillations on an IEC 61158-2 bus segment.

If there are distorted telegrams on an IEC 61158-2 bus segment we recommend checking whether there is an oscillation on the bus and if so perform the described actions.

1.1 Appendix 1: Circuitry of the SIM 1 with prevention of potential oscillations

The circuits that are described in the User Description of the SIM 1 as Application Examples should be adjusted as follows:

- Add a coil L2 of 10 µH in series with the resistor R1



The following should be taken into consideration:

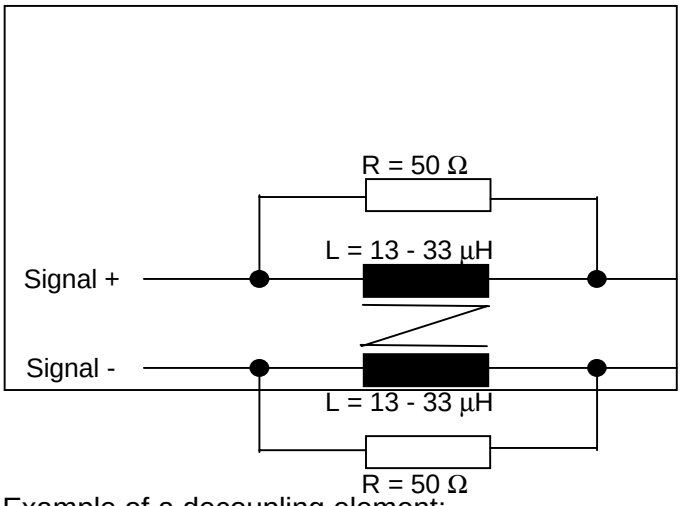
- Tolerance of the resistance of the coil: R(L2) <= 0.25 Ω
  Example of such components:
  muRata LQH3C100K04, L2 = 10 µH, R(L2) = 0,44 Ω ± 30 %
  MEC Citec Model 3613, L2 = 10 µH, R(L2) = 0,56 Ω ± 50 %
- R1 + R(L2) = 10 Ω
- The additional tolerance due to R(L2) can be compensated with lower tolerance components for R1, R2 and R_{ref}.

7.2 Appendix 2: Steps to avoid oscillations in the area of 250 - 500kHz

1. Avoid having pairs of non-optimised field devices on the bus with a distance in between 10 and 70 m.

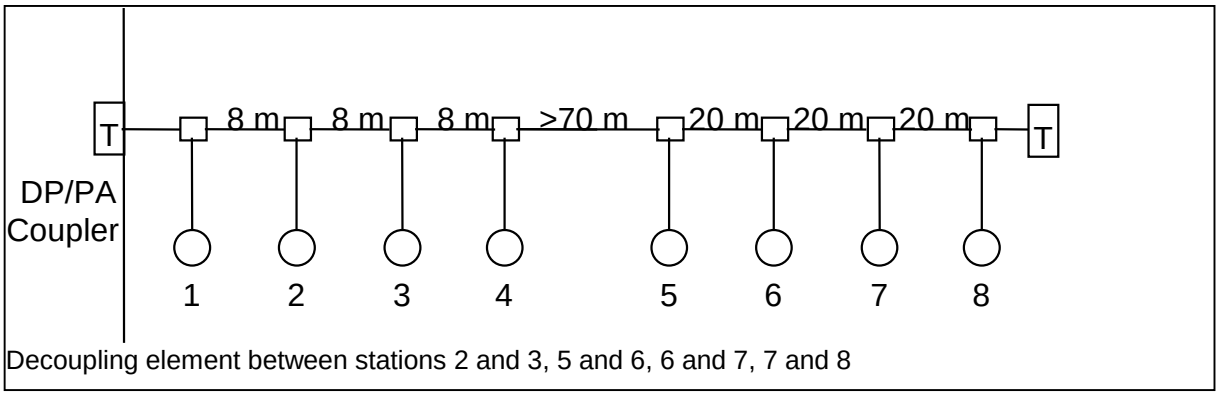
2. If 1. is not possible follow the rule below:

   Include at least one decoupling element between two pairs of not optimised field devices which have a distance between 10 and 70 m.
   The decoupling element is shown below :

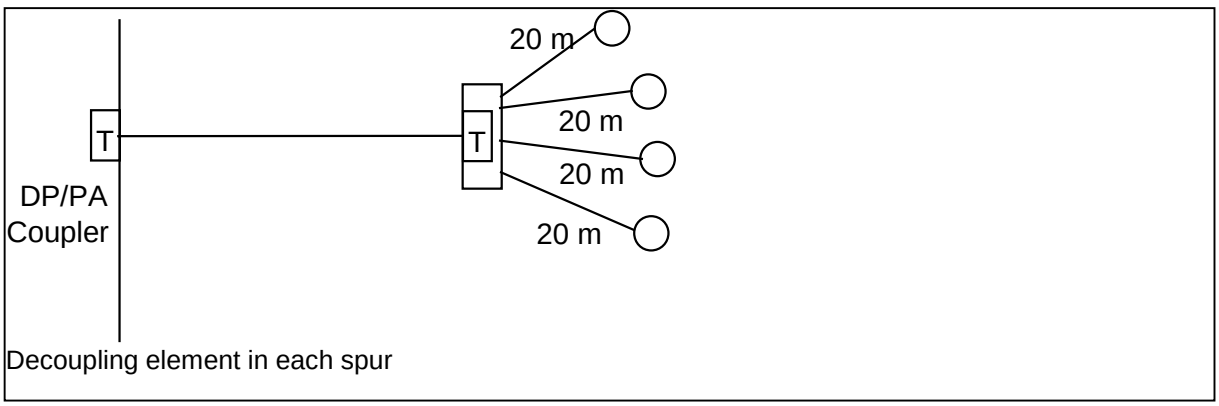


Examples of paired coils:
Siemens Torroidal-Core Inductor B62623-G1-A11
Schaffner Torroidal-Core Inductor RS 512-1/02, RS 612-1/02, RS 514-2/02, RS 614-2/02

Example of a decoupling element:



Decoupling element between stations 2 and 3, 5 and 6, 6 and 7, 7 and 8



Decoupling element in each spur

8 Literature

/1/	IEC 61158-2	Field Bus standard for use in industrial control system- Part 2: Physical layer specification and service definition
/2/	DIN EN 61158-2	Feld Bus for industrial control systems Part 2: Specification of bit transfer layer (Physical layer) and definition of its services (identical to IEC 61158-2)
/3/	ISA SP 50.02 Amendment to Clause 11	Revision of IEC 61158-2 ans S50.02 Part 2 ISA SP 50 Voting Document Rev. 3.0 July 28, 1994

Internet: ASIC documentation and application hints

http://www.ad.siemens.de/csi/pb-doc (German)
http://www.ad.siemens.de/csi_e/pb-doc (English)

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