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M69

Quadruple
RS232 Interface
M-Module

User Manual

20M069-00 E1

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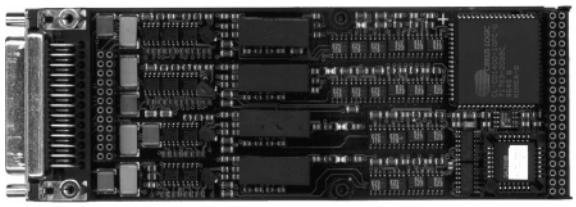
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M69 - Quadruple RS232 Interface

The M69 allows use of four very flexible, optically isolated, asynchronous receivers/ transmitters with modem control lines on a single M-Module.

The M69 is based on one CL-CD1400 device with four full-duplex serial channels. With optional special character processing capabilities, it is especially suited for UNIX-like applications. Its high throughput, low power consumption and high-level integration allow for system designs with minimum part-count, maximum performance and maximum reliability.

12 bytes of FIFO for each transmitter and each receiver reduce the interrupt load for the host CPU and prevent loss of receive data.



Technical Data

4 RS232 Interfaces:

- 2 with 4 lines (2 modem control lines)
- 2 with 6 lines (4 modem control lines)
- all 4 channels optically isolated from the system and from each other

CL-CD1400 Communication Engine:

- software programmable serial data rates up to 135kbits/s full duplex on 4 channels
- 12 bytes of FIFO for each transmitter/receiver
- GOOD DATA interrupts eliminate the need for character status check
- independent bit rate selections for transmit and receive on each channel
- automatic flow control modes for serial channels:
  - XON/XOFF
  - RTS/CTS
  - DTR/DSR
- special character processing, optionally handled by CL-CD1400
- line break detection (start and end) and generation
- insertion of transmit delays in data stream
- one timer per channel for receiver data timeout interrupt
- 5..8 bits per character plus parity
- parity mode: odd, even, no or forced
- stop bits: 1, 1.5 or 2

Peripheral Connections:

- via front panel on a shielded 25-pin D-Sub connector (female)
- via base board connector

M-Module Characteristics:

- A08, D08, INTA, IDENT

Electrical Specifications:

- isolation voltage: 500V DC
- supply voltage/power consumption: +5V (4.85V..5.25V) @ 700mA typ.
- MTBF: tbd.

Mechanical Specifications:

- dimensions: conform to M-Module Standard
- weight: 92g

Environmental Specifications:

- temperature range (operation): 0..60°C (industrial temperature range on request)
- temperature range (storage): -25..70°C
- relative humidity range (operation): max. 95% without condensation
- relative humidity range (storage): max. 95% without condensation
- altitude: -300m to + 3,000m
- shock: 15g/0.33ms, 6g/6ms
- vibration: 1g/5..2,000Hz

Safety:

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC:

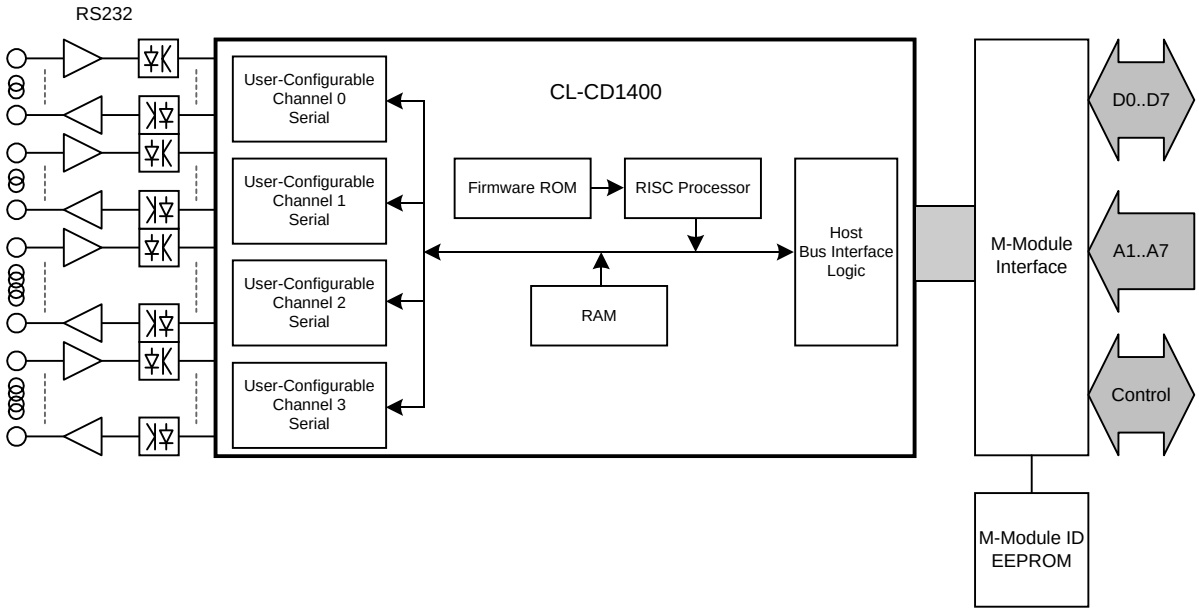
- tested according to IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support:

- OS-9 SPF driver
- WindowsNT driver

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Block Diagram



Ordering Information

Standard Hardware

04M069-00	M69 hardware
20M069-00	M69 user manual

Standard Software

13M069-01	OS-9 SPF driver software (object code)
21M069-00	M69 OS-9 driver manual
13M069-70	WindowsNT driver software incl. user manual

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Contents

1 Getting Started 6
1.1 Installation Check List 6
1.2 Power Supply 6
2 Connection of the Module 6
2.1 Peripheral Interfaces 6
2.2 Host Interface 7
3 Address Organization 8
3.1 Address Organization of the M-Module 8
3.2 Address Organization of the CL-CD1400 8
4 Functional Description 10
4.1 The CL-CD1400 Communications Engine 10
4.2 Interrupts 10
4.3 M-Module Identification 11
5 Appendix 11
5.1 Literature 11
5.2 Module Revisions 11
5.3 Configuration Plan 12

Figures

Figure 1: Configuration Plan of M69 Rev. 00 12

Tables

Table 1: Pin Assignment of the female 25-Pin D-Sub Connector 6
Table 2: Female 24-Pin Connector 7
Table 3: Signal Correspondence between 24-Pin Module and 96-pin Base Board Connector 7
Table 4: Signal Mnemonics 7
Table 5: Supported Pins of male 60-Pin Connector on Base Board 7
Table 6: Address Map 8
Table 7: CL-CD1400 Registers in Alphanumerical Order 8
Table 8: Table of Revisions 11

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About the Manual

This manual describes the hardware functions of the M-Module, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

All circuit diagrams included in this manual are intended for information only and are therefore subject to change without notice.

History

Edition	Description	Technical Content	Date of Issue
E1	First edition	Jonny Speckner	April 29,1998

Conventions



This sign marks important notes or warnings concerning proper functionality of the product described in this manual. You should read them in any case.

0xFF	Hexadecimal numbers are preceded by "0x", which is the usual C-language convention.
/IRQ	Signal names preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.
in/out	Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

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1 Getting Started

This chapter will give an overview of the module and some hints for first installation in a system as a "check list".

1.1 Installation Check List

You can use the following "check list" to install the M-Module on a carrier board for the first time and to test proper functioning of the module.

The M-Module is completely trimmed on delivery.

- ☑ Power-down the system.
- ☑ Install the M-Module carrier board in your system without the M-Module.
- ☑ Power-up the system.
- ☑ Test the carrier board.
- ☑ If O.K., power-down the system and remove the carrier board.
- ☑ Install the module in slot 0 of the carrier board.
- ☑ Initially, do not change any jumpers or switches.
- ☑ Insert the base board into the system again.
- ☑ Power-up the system.
- ☑ Load a suitable debugger.
- ☑ Read a word from the base address plus 0x80.
- ☑ If a bus error is occurring now, the module is not plugged properly.
- ☑ Reading from the above address should yield the value 0x4646 or 0x4747 (firmware revision code of CL-CD1400).
- ☑ Observe the installation manuals for operating system dependent software.

Note: Operation and functionality of the M69 M-Module depend heavily on software support. MEN supplies standard software for various operating systems. If you use MEN software, please refer to the software manual for a description of supported functions. If you **don't** use MEN software, please refer to the data sheet of the CL-CD1400 (see Chapter 5.1 Literature on page 11) for detailed information on the device.

1.2 Power Supply

Power supply to the logic part is done via the base board. The necessary voltage is +5V.

2 Connection of the Module

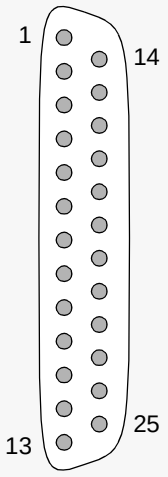
2.1 Peripheral Interfaces

There are two possibilities for connecting peripherals:

- connection via 25-pin D-Sub connector or
- connection via the base board.

When a base board with a 96-pin DIN 41612 PCB connection is used for peripheral signals (for example a 6U VMEbus base board), these are fed to the module through the female 24-pin connector. You can connect up to four 21-pin connectors to the 96-pin connector (cf. base board manual). When these connectors are used, for each module three pins of the DIN 41612 PCB connector cannot be used. The pin numbers for the 96-pin connector shown below are valid for module slot number 3. If other module slots (2, 1 or 0) are used, the value 8, 16 or 24 must be added as appropriate.

Table 1: Pin Assignment of the female 25-Pin D-Sub Connector



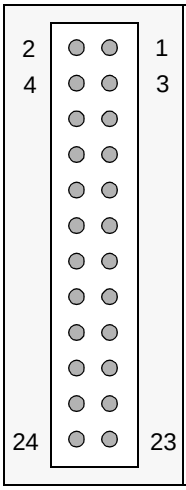
1	CTS0	14	RXD0
2	TXD0	15	DTR0
3	GND0	16	CTS1
4	RXD1	17	TXD1
5	DTR1	18	GND1
6	CTS2	19	RXD2
7	TXD2	20	DTR2
8	GND2	21	CTS3
9	RXD3	22	TXD3
10	DTR3	23	GND3
11	DSR3	24	RTS3
12	DSR2	25	RTS2
13	-		

Connector types:

- according to DIN41652/MIL-C-24308, with thread bolt UNC 4-40
- mating connector:
  25-pin D-Sub plug according to DIN41652/MIL-C-24308, available for ribbon cable (insulation piercing connection), hand-soldering connection or crimp connection

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Table 2: Female 24-Pin Connector

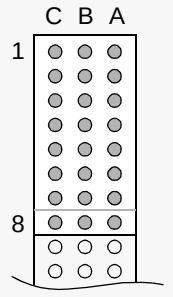


2	RXD0	1	CTS0
4	DTR0	3	TXD0
6	CTS1	5	GND0
8	TXD1	7	RXD1
10	GND1	9	DTR1
12	RXD2	11	CTS2
14	DTR2	13	TXD2
16	CTS3	15	GND2
18	TXD3	17	RXD3
20	GND3	19	DTR3
22	-	21	-
24	-	23	-

Connector types:

- two 12-pin receptacles, high-precision, 2.54mm pitch, for square pins ∅ 0.635mm gold, 6.9mm height
- mating connector:
  two 12-pin plugs, 2.54mm pitch, square pins ∅ 0.635mm gold

Table 3: Signal Correspondence between 24-Pin Module and 96-pin Base Board Connector



	C	B	A
1	TXD0	RXD0	CTS0
2	CTS1	GND0	DTR0
3	DTR1	TXD1	RXD1
4	RXD2	CTS2	GND1
5	GND2	DTR2	TXD2
6	TXD3	RXD3	CTS3
7	-	GND3	DTR3
8	-	-	-

Table 4: Signal Mnemonics

Signal	Direction	Function
CTS	in	Clear To Send
DSR	in	Data Set Ready (only channels 2 and 3)
DTR	out	Data Terminal Ready
GND	-	reference signal
RTS	out	Request To Send (only channels 2 and 3)
RXD	in	receive data line
TXD	out	transmit data line

2.2 Host Interface

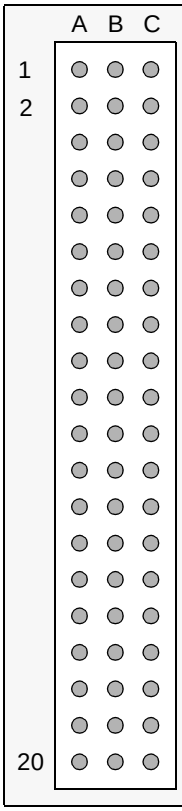
The M69 module supports the following signals of the male 60-pin base board interface connector:

Note: Only two rows - A and B - of the 60-pin connector are mounted on the M69!

Connector types:

- three 20-pin receptacles, high-precision, 2.54mm pitch, for square pins ∅ 0.635mm gold, 6.9mm height
- mating connector:
  three 20-pin plugs, 2.54mm pitch, square pins ∅ 0.635mm gold

Table 5: Supported Pins of male 60-Pin Connector on Base Board



	A	B	C
1	/CS	GND	-
2	A01	+5V	-
3	A02	-	-
4	A03	-	-
5	A04	GND	-
6	A05	-	-
7	A06	-	-
8	A07	GND	-
9	-	D00	-
10	-	D01	-
11	-	D02	-
12	-	D03	-
13	-	D04	-
14	-	D05	-
15	-	D06	-
16	-	D07	-
17	-	/DS0	-
18	/DTACK	/WRITE	-
19	-	/IRQ	-
20	/RESET	SYSCLK	-

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3 Address Organization

When using the driver software supplied, you do not need to be familiar with the hardware of the M69 module in detail. However, familiarity with the address organization of the board is essential if you wish to write your own software for the module or do low-level development.

3.1 Address Organization of the M-Module

The 256-byte I/O area of the M69 module is hardware-mapped. The address at which individual functions can be addressed from the base board is computed from the base address of the module plus the address in the following table.

Table 6: Address Map

Address	D15..D8	D7..D0
0x00..0xFD	-	CD1400 channels 0..3 (r/w)
0xFE	-	module identification (r/w)

3.2 Address Organization of the CL-CD1400

To calculate the internal register addresses of the CD1400 the address values of the data sheet must be multiplied by two (see table below).

The following table gives the register set of the CD1400 in alphanumerical order.

Table 7: CL-CD1400 Registers in Alphanumerical Order

Name	Address	Function	Type
CAR	0xD0	channel access register (r/w)	G
CCR	0x0A	channel command register (r/w)	C
CCSR	0x16	channel control status register (r)	C
COR1	0x10	channel option register 1 (r/w)	C
COR2	0x12	channel option register 2 (r/w)	C
COR3	0x14	channel option register 3 (r/w)	C
COR4	0x3C	channel option register 4 (r/w)	C
COR5	0x3E	channel option register 5 (r/w)	C
EOSRR	0xC0	end of service request register (w)	V
GCR	0x96	global configuration register (r/w)	G
GFRCR	0x80	global firmware revision code register (r/w)	G
LIVR	0x30	local interrupt vector register (r/w)	C
LNC	0x48	lnext character (r/w)	C
MCOR1	0x2A	modem change option register 1 (r/w)	C
MCOR2	0x2C	modem change option register 2 (r/w)	C
MICR	0x8C	modem interrupt channel register (r/w)	G
MIR	0xD2	modem interrupt register (r/w)	G
MISR	0x98	modem interrupt status register (r)	V
MIVR	0x82	modem interrupt vector register (r)	V
MSVR1	0xD8	modem signal value register 1 (r/w)	C
MSVR2	0xDA	modem signal value register 2 (r/w)	C
PRP	0xFC	prescaler period register (r/w)	G
PSVR	0xDE	printer signal value register (r/w)	C
RBPR	0xF0	receive baud rate period register (r/w)	C
RCOR	0xF8	receive clock option register (r/w)	C
RDCR	0x1C	received data count register (r)	C
RDSR	0xC4	receive data/status register (r)	V

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Name	Address	Function	Type
RICR	0x88	receive interrupt channel register (r/w)	G
RIR	0xD6	receive interrupt register (r/w)	G
RIVR	0x86	receive interrupt vector register (r)	V
RTPR	0x42	receive time-out period register (r/w)	C
SCHR1	0x34	special character register 1 (r/w)	C
SCHR2	0x36	special character register 2 (r/w)	C
SCHR3	0x38	special character register 3 (r/w)	C
SCHR4	0x3A	special character register 4 (r/w)	C
SCRH	0x46	special character range, high (r/w)	C
SCRL	0x44	special character range, low (r/w)	C
SRER	0x0C	service request enable register (r/w)	C
SVRR	0xCE	service request register (r)	G
TBPR	0xE4	transmit baud rate period register (r/w)	C
TCOR	0xEC	transmit clock option register (r/w)	C
TDR	0xC6	transmit data register (w)	V
TICR	0x8A	transmit interrupt channel register (r/w)	G
TIR	0xD4	transmit interrupt register (r/w)	G
TIVR	0x84	transmit interrupt vector register (r)	V

Note: register type abbreviations:
G = global register
V = virtual register
C = per-channel register

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4 Functional Description

4.1 The CL-CD1400 Communications Engine

Overview

The CL-CD1400 is a flexible asynchronous receiver/transmitter with four full-duplex serial channels, or three full-duplex channels and one high-speed bidirectional parallel channel (which cannot be used on the M69). With optional special-character processing capabilities, it is especially well-suited for UNIX applications. The CL-CD1400 is fabricated in an advanced CMOS process and operates on a system clock of up to 25MHz (16MHz used on the M69). Packaged in a 68-pin PLCC, its high throughput, low power consumption and high level of integration permit system designs with minimum part-count, maximum performance and reliability: a good choice for an M-Module.

Registers

All communication with the CL-CD1400 takes place through a large array of registers. Registers are considered one of three types: global, virtual and per-channel. Global registers affect all channels within the device. Per-channel registers pertain only to the channel being referenced.

Global registers are always available for the host access. Access to the local registers of a particular channel requires selecting the register set of that channel. Virtual registers are only available to the host during the context of a service routine. There are four sets of per-channel registers, one for each channel. Selection of the register set is accomplished by writing the channel number (0 through 3) into the Channel Access Register (CAR). This causes a 'bank switch' action, allowing the registers of the selected channel to be accessed. At any given time, only the registers of a single channel are available. Once selected, this register set remains available until the CAR is changed by the host.

A detailed description of the host interface and the register programming is presented in the data sheet of the device.

Device Architecture

The CL-CD-1400 is a small computer system for sending and receiving serial and parallel data. It is comprised of a RISC processor (MPU), RAM, ROM, host bus interface logic, and serial data channels. It has special instructions and hardware that facilitate serial data manipulation.

The MPU is a true RISC processor. In addition to having a compact, efficient set of instructions, it has a 'windowed' architecture that allows it to handle one channel and its registers at once. Before starting any operation on a given channel, it loads an internal Index Register that forces all accesses to the appropriate register set. The Index Register becomes part of the internal address and permits direct addressing of the register. No address computation is needed to select the proper channel.

4.2 Interrupts

From the host point of view, the CL-CD1400 operates in one of two modes: normal mode of operation and service request/acknowledge. The normal mode of operation allows the host to make changes and obtain current operation status on a global and per-channel basis. The Service Request/Acknowledge Mode is used when a particular channel needs service; it is used, for example, when a receive FIFO has reached its programmed threshold and requires emptying. A service request can only be responded after it has been placed in a service acknowledge 'context'.

The term 'interrupt' is used as a general description of the method by which the device gains the attention of the host CPU. The external request is the activation of one of the SVCREQ* output pins, depending on whether the type of service needed is for receive, transmit or modem signal change. All six lines of the CL-CD1400 on the M69 are ORed together to generate the /IRQ line of the M-Module. The internal request includes a channel pointer that points to the channel requiring service. When the host service acknowledge begins, the pointer is loaded into the CAR, thus the request automatically services the proper channel.

Interrupts of the module are in accordance with

Mode a) of the M-Module Specification,

i.e., the interrupt request is reset by software, but the M69 module itself is not able to supply a vector during the interrupt-acknowledge cycle.

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4.3 M-Module Identification

The M69 module is supplied with an identification EEPROM in accordance with the M-Module standard.

Access to M-Module address 0xFE will never meet the CL-CD1400 but the EEPROM register.

M-Module Identification (0xFE) (r/w)

15..8	7..3	2	1	0
-	-	CS	CLK	DATA

CS: 1 = chip-select for EEPROM (write)

CLK: serial identification clock (write)

DATA: identification data (read/write)

5 Appendix

5.1 Literature

- M-Module Standard:
  ANSI/VITA 12-1996, M-Module Specification;
  VMEbus International Trade Association
  7825 E. Gelding Dr., Ste. 104,
  Scottsdale, AZ 85260
  WWW: *http://www.vita.com*
- UXART CL-CD1400:
  CL-CD1400 Data Sheet
  Cirrus Logic, Inc., USA, 1992
  WWW: *http://www.cirrus.com*

5.2 Module Revisions

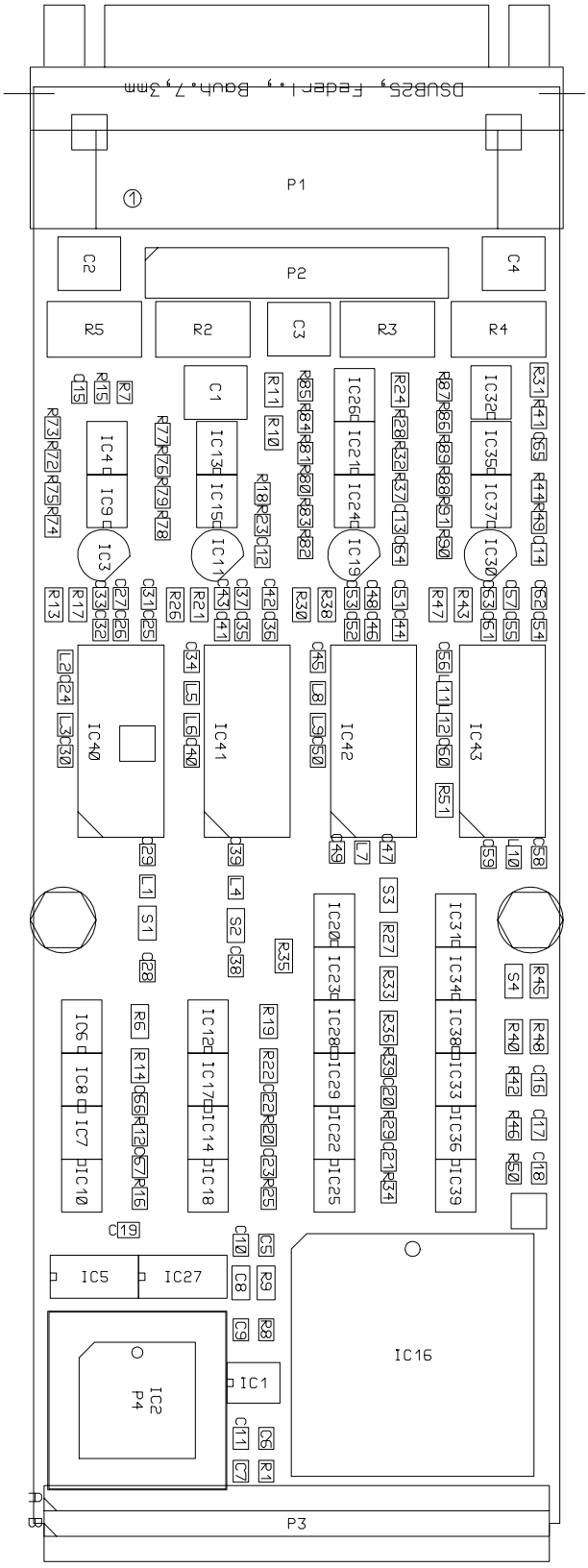
Table 8: Table of Revisions

Rev.	Comment	Restrictions
0.x	first revision	none known

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5.3 Configuration Plan

Figure 1: Configuration Plan of M69 Rev. 00



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You can request the circuit diagrams for the current revision of the product described in this manual by completely filling out and signing the following non-disclosure agreement.

Please send the agreement to MEN by mail. We will send you the circuit diagrams along with a copy of the completely signed agreement by return mail.

MEN reserves the right to refuse sending of confidential information for any reason that MEN may consider substantial.

Non-Disclosure Agreement

for Circuit Diagrams provided by MEN Mikro Elektronik GmbH

between

MEN Mikro Elektronik GmbH
Neuwieder Straße 7
D-90411 Nürnberg

("**MEN**")

and

_____
_____
_____
_____

("**Recipient**")

We confirm the following Agreement:

MEN		**Recipient**	
Date:	_____	Date:	_____
Name:	_____	Name:	_____
Function:	_____	Function:	_____
Signature:		Signature:	
_____		_____	

The following Agreement is valid as of the date of MEN's signature.

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Information in the circuit diagrams has been carefully checked and is believed to be accurate as of the date of release; however, no responsibility is assumed for inaccuracies. MEN will not be liable for any consequential or incidental damages arising from reliance on the accuracy of the circuit diagrams. The information contained therein is subject to change without notice.

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The recipient, obtaining confidential information from MEN because of this Agreement, is obliged to protect this information.

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This Agreement does not result in any obligation of the parties to purchase services or products from the other party.

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7 General

If any provision of this Agreement is held to be invalid, such decision shall not affect the validity of the remaining provisions and such provision shall be reformed to and only to the extent necessary to make it effective and legal.

This Agreement is only effective if signed by both parties.

Amendments to this Agreement can be adopted only in writing. There are no supplementary oral agreements.

This Agreement shall be governed by German Law.

The court of jurisdiction shall be Nuremberg.

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Who you are...

Name	_____	**Phone No.**	_____
Company	_____	**Fax No.**	_____
Department	_____	**E-mail**	_____

What we can do for you...

Product Support

Product Article No. _____

Revision __ __ . __ __ . __ __

If the product is a mezzanine module:

Carrier Article No. _____

Revision __ __ . __ __ . __ __

Operating system

- ❍ OS-9
- ❍ VxWorks
- ❍ WindowsNT
- ❍ other: _____

Manual Feedback

Manual Article No. _____

Edition E ___

Useful or awful?

very useful ❍ ❍ ❍ ❍ ❍ totally awful

Usage

- ❑ I read the manual and decided to buy the related product.
- ❑ I read the manual when I got the product.
- ❑ I refer to the manual only when I have problems.

Your problems/comments...

Use our online forms at http://www.men.de

- **Technical Support**
- **User Manuals**

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