

# iC-MD EVAL MD1D

## EVALUATION BOARD DESCRIPTION

### ORDERING INFORMATION

Type	Order Designation	Description Options
Evaluation Board	iC-MD EVAL MD1D	iC-MD Evaluation Board ready to operate, accessible through GUI via PC adapter
Software	iC-MD GUI	GUI software for Windows PC Device setup file generation, board configuration via adapter For download link check <a href="http://www.ichaus.com/MD">www.ichaus.com/MD</a>
PC Adapter	iC-MB3 ICSY MB3U-I2C	PC-USB Adapter with <i>BiSS</i> interface and I2C/SPI extension cable
PC Adapter	iC-MB3 ICSY MB3U	PC-USB Adapter with <i>BiSS</i> interface
PC Adapter	iC-MB3 ICSY MB4U	PC-USB Adapter with <i>BiSS</i> interface
PC Adapter	iC-MB3 ICSY MB5U	PC-USB Adapter with <i>BiSS</i> interface Download documentation at <a href="http://www.ichaus.com/tools">www.ichaus.com/tools</a>

### BOARD MD1D

(size 80 mm x 100 mm)

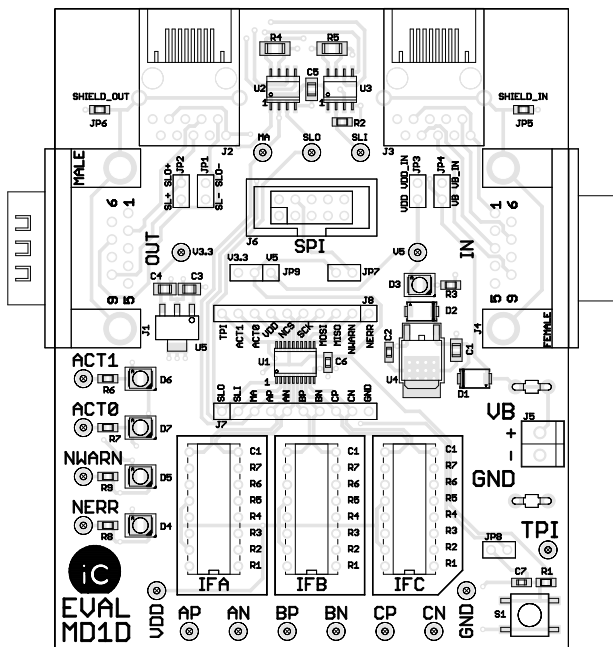


Figure 1: Component side

### TERMINAL DESCRIPTION

VB	+10 to +20 V Supply Voltage
V3.3	+3.3 V Supply Voltage
V5	+5 V Supply Voltage
VDD	Selected iC-MD Supply Voltage
GND	0 V Ground
AP	Incremental Input AP
AN	Incremental Input AN
BP	Incremental Input BP
BN	Incremental Input BN
CP	Incremental Input CP
CN	Incremental Input CN
TPI	Touch Probe Input
ACT1	Actuator 1 Output
ACT2	Actuator 2 Output
NERR	Error Input/Output (active low)
NWARN	Warning Input/Output (active low)
SPI	SPI Interface Connector to SPI master
BiSS IN	<i>BiSS</i> Interface Connector to <i>BiSS</i> master or <i>BiSS</i> bus structure
BiSS OUT	<i>BiSS</i> Interface Connector to <i>BiSS</i> bus structure
MA	Clock Input Interface <i>BiSS</i> /SSI
SLO	Data Output Interface <i>BiSS</i> /SSI
SLI	Data Input Interface <i>BiSS</i> /SSI
D3	Supply Indicator LED

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### RELATED DOCUMENTS

- IC Documentation  
→ <http://www.ichaus.com/MD>
- PC-USB Adapter Description  
→ [http://www.ichaus.com/MB3U\\_MB3U-I2C\\_datasheet\\_en](http://www.ichaus.com/MB3U_MB3U-I2C_datasheet_en)
- PC-USB Adapter Description  
→ [http://www.ichaus.com/MB4U\\_datasheet\\_en](http://www.ichaus.com/MB4U_datasheet_en)
- PC-USB Adapter Description  
→ [http://www.ichaus.com/MB5U\\_datasheet\\_en](http://www.ichaus.com/MB5U_datasheet_en)
- GUI software for Windows PC: check here for download links  
→ <http://www.ichaus.com/MD>

### CONNECTOR AND TERMINAL PINOUT

#### BiSS OUT: 9-pin Sub D Connector J1 - male

PIN	Name	Function
1	VB	+12 V Supply Voltage
2	MAO +	Master Clock Output
3	MAO -	Master Clock Output (inverted)
4	VDD	+5 V Supply Voltage
5	SLO -	Data Output (inverted)
6	GND	0 V Ground
7	SL +	Slave Data
8	SL -	Slave Data (inverted)
9	SLO +	Data Output

#### BiSS IN: 9-pin Sub D Connector J4 - female

PIN	Name	Function
1	VB	+12 V Supply Voltage
2	MA +	Master Clock Input
3	MA -	Master Clock Input (inverted)
4	VDD	+5 V Supply Voltage
5	SLI -	Data Input Line (inverted)
6	GND	0 V Ground
7	SL +	Slave Data
8	SL -	Slave Data (inverted)
9	SLI +	Data Input Line

#### 2-pin Terminal J5- Power Supply Input

PIN	Name	Function
1	VDD	+3.3 ... +5 V Supply Voltage
2	GND	0 V Ground

#### SPI: 10-pin Adapter Connector J6 - male (to SPI Master)

PIN	Name	Function
1	SCL	Serial Clock Line
2	GND	0 V Ground
3	Reserved	-
4	+5V	+5 V Supply Voltage
5	Reserved	-
6	Reserved	-
7	MOSI	Serial Data Line
8	Reserved	-
9	MISO	Serial Data Line
10	GND	0 V Ground

#### SPI connector for USB Adapter MB3U-I2C

The board features the J6 10-pin connector for serial SPI communication. The PC-USB Adapter iC-MB3 iC-SY MB3U-I2C enables the evaluation board to be connected to a common Windows PC via SPI interface. iC-MD software can be used to access the board from a Windows PC (see section "APPLICATION SOFTWARE" for more details).

#### BiSS connector for USB Adapter MB3U-I2C, MB3U, MB4U, MB5U

The board features the J4 9-pin SUB-D connector for serial BiSS communication with the PC-USB Adapters MB3U-I2C, MB3U, MB4U or MB5U. Those BiSS adapters enable the evaluation board to be connected to a common Windows PC via BiSS interface. iC-MD software (version B2 or higher) can be used to access the board from a Windows PC (see section "APPLICATION SOFTWARE" for more details).

**Note :** Please install the latest USB driver before you attach the PC Adapter to the PC.

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NB: IFA IFB IFC are not equipped due to individual application setups.

Additional resistors and capacitors can be equipped to IFA IFB IFC for additional and individual application values e.g. termination or filter function.

Minimum 2 resistors are required to wire a TTL AB counter functionality.

### INPUT INTERFACE A:

**DIL16 16-pin passice component connector IFA - female (to iC-MD input pins and terminal pins)**

PIN	Name	Function
1	IFA-R1.1	AP pin iC-MD
2	IFA-R2.1	AP pin iC-MD
3	IFA-R3.1	AP pin iC-MD
4	IFA-R4.1	AN pin iC-MD
5	IFA-R5.1	AN pin iC-MD
6	IFA-R6.1	AN pin iC-MD
7	IFA-R7.1	AN pin iC-MD
8	IFA-C1.1	AN pin iC-MD
9	IFA-C1.2	AP pin iC-MD
10	IFA-R7.2	AP pin iC-MD
11	IFA-R6.2	GND
12	IFA-R5.2	VDD
13	IFA-R4.2	AN terminal MD1D
14	IFA-R3.2	GND
15	IFA-R2.2	VDD
16	IFA-R1.2	AP terminal MD1D

NB: At IFA the minimum 2 resistors are IFA-R1 and IFA-R4 to be equipped and required to wire signals to iC-MD pins AP and AN.

### INPUT INTERFACE B:

**DIL16 16-pin passice component connector IFB - female (to iC-MD input pins and terminal pins)**

PIN	Name	Function
1	IFB-R1.1	BP pin iC-MD
2	IFB-R2.1	BP pin iC-MD
3	IFB-R3.1	BP pin iC-MD
4	IFB-R4.1	BN pin iC-MD
5	IFB-R5.1	BN pin iC-MD
6	IFB-R6.1	BN pin iC-MD
7	IFB-R7.1	BN pin iC-MD
8	IFB-C1.1	BN pin iC-MD
9	IFB-C1.2	BP pin iC-MD
10	IFB-R7.2	BP pin iC-MD
11	IFB-R6.2	GND
12	IFB-R5.2	VDD
13	IFB-R4.2	BN terminal MD1D
14	IFB-R3.2	GND
15	IFB-R2.2	VDD
16	IFB-R1.2	BP terminal MD1D

NB: At IFB the minimum 2 resistors are IFB-R1 and IFB-R4 to be equipped and required to wire signals to iC-MD pins BP and BN.

### INPUT INTERFACE C:

**DIL16 16-pin passice component connector IFC - female (to iC-MD input pins and terminal pins)**

PIN	Name	Function
1	IFC-R1.1	CP pin iC-MD
2	IFC-R2.1	CP pin iC-MD
3	IFC-R3.1	CP pin iC-MD
4	IFC-R4.1	CN pin iC-MD
5	IFC-R5.1	CN pin iC-MD
6	IFC-R6.1	CN pin iC-MD
7	IFC-R7.1	CN pin iC-MD
8	IFC-C1.1	CN pin iC-MD
9	IFC-C1.2	CP pin iC-MD
10	IFC-R7.2	CP pin iC-MD
11	IFC-R6.2	GND
12	IFC-R5.2	VDD
13	IFC-R4.2	CN terminal MD1D
14	IFC-R3.2	GND
15	IFC-R2.2	VDD
16	IFC-R1.2	CP terminal MD1D

NB: At IFA the minimum 2 resistors are IFC-R1 and IFC-R4 to be equipped and required to wire signals to iC-MD pins CP and CN.

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### JUMPER DESCRIPTION

#### JP1, JP2: BiSS Onboard Loopback

2-pin jumper terminal male

PIN	Name	Function
Open	BiSS Bus Structure	BiSS IN to BiSS OUT, required if components are connected to J1 and J4
Closed	BiSS Start of Bus, Point-To-Point	Loopback of SLO to SL, required if components are connected to J4 only

#### JP3: 5V Power Supply

2-pin jumper terminal male

PIN	Name	Function
Open	No Direct 5V	No direct board supply
Closed	5V Direct Supply	+5V direct board supply

#### JP4: VB Power Supply

2-pin jumper terminal male

PIN	Name	Function
Open	No VB Supply	No VB based board supply
Closed	VB Supply	Supply of +10 to +20V required to board terminals VB and GND

#### JP5, JP6: RJ45 Shield to GND

2-pin jumper terminal male

PIN	Name	Function
Open	No RJ45 Shield to GND	
Closed	RJ45 Shield to GND	RJ45 BiSS connector IN / OUT Shield to GND

#### JP7: 5V Adapter Power Supply

2-pin jumper terminal male

PIN	Name	Function
Open	No 5V Adapter Supply	No direct +5V adapter supply
Closed	5V Adapter Supply	+5V Direct

#### JP8: Enable TPI Button + Buffer

2-pin jumper terminal male

PIN	Name	Function
Open	TPI Button + Buffer Disabled	External TPI operation
Closed	TPI Button + Buffer Enabled	Manual TPI operation possible

#### JP9: 5V Adapter Power Supply

3-pin jumper terminal male

PIN	Name	Function
1-2 closed	5V Voltage Regulator Selection	On board +5V supply
2-3 closed	3.3V Voltage Regulator Selection	On board 3.3V regulator supply

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### CIRCUIT DESCRIPTION

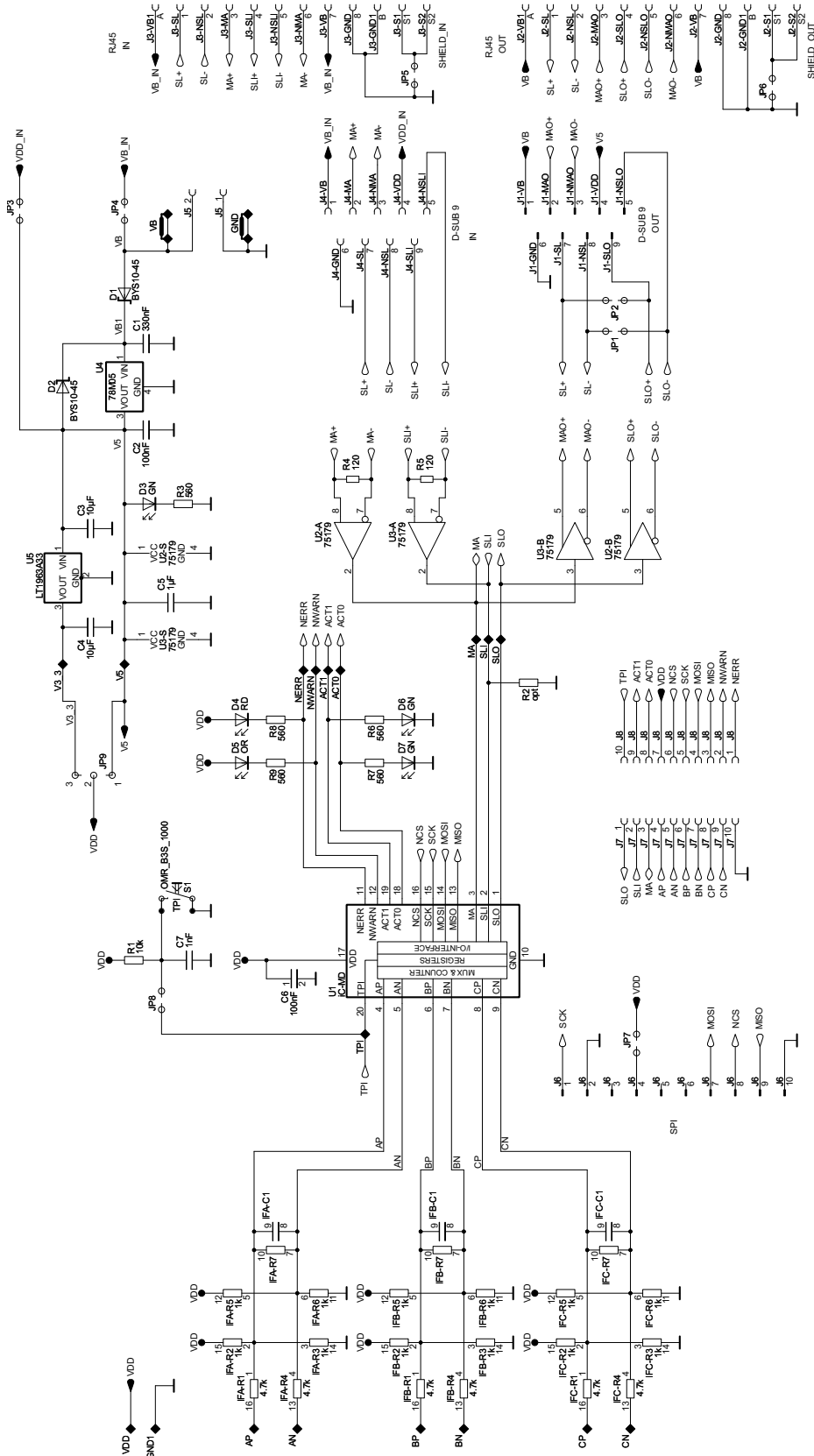


Figure 2: Circuit diagram including optional components

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### SUPPLY AND SIGNAL CONSIDERATIONS

The supply of iC-MD varies over a range on  $VDD(iC-MD) = 3.0\text{ V} \dots 5.5\text{ V}$ . A mixed pin voltage domain can be critical due to CLAMP structures at the pins. 5 V TTL input signals are critical at  $VDD(iC-MD) = 3.3\text{ V}$ . Possible input signals are all quadrature signals AP, AN, BP, BN, CP, CN and additional system signal TPI, NERR, NWARN, SCLK, NCS, MOSI, SLI, MA.

iC-MD supplied with 3.3 V (from the regulator placed at the board) the iC-MD and external AN at 0V, and a ramp in AP from 0 V to 5 V: no current appreciable (only 50  $\mu\text{A}$  approx. due to pulls) at AP from 0 V to 4 V approx. From 4 V to 5 V clamp diode between AP and VDD is activated then current flows. This is present in all input configurations: TTL, RS422 and LVDS.

NB: It is mandatory to keep the same voltage domain for iC-MD as with the provided input signals. Different voltage domains of e.g. iC-MD and microcontrollers SPI interface may damage both devices.

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### ASSEMBLY PART LIST

Device	Value (typical)	Comment
C1	330nF	Supply backup capacitor
C2, C6	100nF	Supply backup capacitor
C3, C4	10uF	Supply backup capacitor
C7, C5	1uF	Supply backup capacitor
J1	D-SUB9-M 90°	BiSS interface connector
J2, J3	RJ45_10 YAMAICHI Y-CONJACK-21	BiSS interface connector (not mounted)
J4	D-SUB9-F 90°	BiSS interface connector
J5	AKL59 02	Supply connector
J6	WSL10	SPI interface connector
U1	iC-MD TSSOP20	iC-MD TSSOP20 or mounted DIL PCB with iC-MD TSSOP20
U2, U3	75LBC179 SO8	RS422 transceiver
U4	78M05 DPAK	5 V supply
U5	LT1963A33 SOT223-4	3.3 V supply
JP1, JP2, JP3, JP4	SLLP1097 2G	2-pin jumper terminal
JP5, JP6, JP7, JP8, JP9	SLLP1097 3G	2-pin/3-pin jumper terminal
GND, VB	LBS02	Supply connector
D1, D2	BYS10-45	Protective diodes
D3	LS-T670 green	LED 5 V
D4	LS-T670 red	LED NERR
D5	LO-T67K orange	LED NWARN
D6, D7	LS-T670 green	LED ACT1 + 2
R1, R2	10k	TPI resistor
R4, R5	120	RS422 terminator
R3, R6, R7, R8, R9	562	LED resistor
IFA, IFB, IFC	DIL16	Input filter system
ACT0, ACT1, AN, AP, BN, BP, CN, CP, GND1, MA, NERR, NWARN, SLI, SLO, TPI, V3_3, V5, VDD	S1-F	Pin
S1	OMR_B3S_1000 OMRON_B3S_1000	TPI button switch
J7, J8	MK0110G	Connection to DIL28 iC-MD adapter
RF1, RF2, RF3, RF4	Rubber foot	

# iC-MD EVAL MD1D

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### EVALUATION SOFTWARE

iC-MD software for PCs running on Windows operating systems as well as the required USB driver are available as a ZIP file. iC-Haus software built with LabVIEW™ requires the installation of the LabVIEW™ Run-Time Engine (RTE). The RTE must be installed only once, hence there are two download links available.

Software overview online: <http://www.ichaus.com/software>

Download package	without RTE (small size)	including RTE (big size)
iC-MD:	<a href="http://www.ichaus.com/MD_gui">http://www.ichaus.com/MD_gui</a>	<a href="http://www.ichaus.com/MD_gui_rte">http://www.ichaus.com/MD_gui_rte</a>

### Features

- IC configuration made easy by parameter tables and tool tips
- Editing of application-specific default setups (\*.hex)
- Access to DUT and transfer of setup data to RAM
- Storage of IC setups as Intel Hex file for programming devices

### Installation

After unzipping the "MD1SO\_gui\_xxрте.zip", the following files are located in the selected directory.  
(xx is a placeholder for the software revision, e.g. B1 )

- "**setup.exe**"
- "**USB\_MB3U\_driver\_ftdiywww.exe**"  
(yyyy is a placeholder for the driver revision, e.g. 20600)

**Note :** Administrator rights are required to run installations.

1. The installation of the software starts by executing the "setup.exe" installation package in the folder "MD1SO\_gui\_xxрте".  
→ Follow the on-screen instructions to finish the installation procedure.
2. USB driver need to be installed to access the evaluation board via the PC Adapter.  
→ Execute the "USB\_MB3U\_driver\_ftdiywww.exe" installation package and follow the on-screen instructions. This process can take a few minutes.
3. Installation will make the software "MD1SO\_gui\_xx.exe" available in the selected working directory. The execution of this file will start the software. Figure 3 shows a screenshot of the start up window.



### GUI Description

The GUI is divided into four sections:

- 1: Menu section
- 2: Header section
- 3: Parameter tables and control buttons
- 4: Status section with transcript window and online help window.

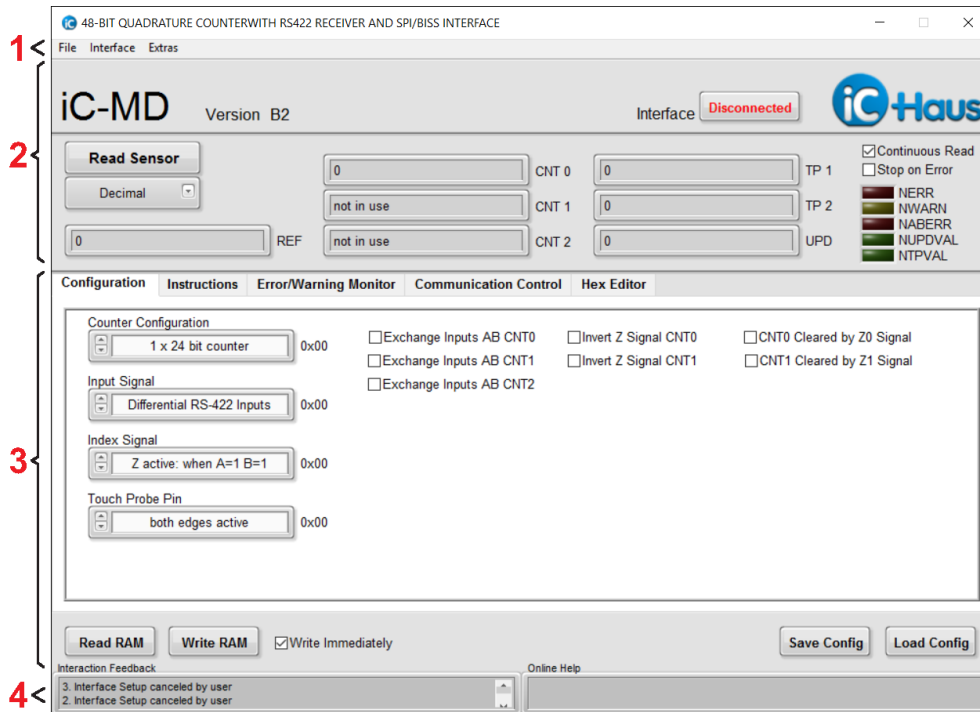


Figure 3: GUI start-up window

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Menu	Button	Description
<b>1 Menu Section</b>		
<File>	Save Config File	Saves the configuration to a file, Intel Hex file format (*.hex).
	Load Config File	Loads the configuration to the IC, Intel Hex file format (*.hex).
	Exit	Quits the software.
<Interface>	No Hardware	Disconnects the board and resets the communication between PC and adapter.
	iC-Interface ↔ USB (MB3U SPI)	Selection for PC-USB adapter MB3U-I2C using the SPI interface.
	iC-Interface ↔ USB (MB3U BiSS)	Selection for PC-USB adapter MB3U/MB3U-I2C using the BiSS interface.
	iC-Interface ↔ USB (MB4U BiSS)	Selection for PC-USB adapter MB4U using the BiSS interface.
	iC-Interface ↔ USB (MB5U BiSS)	Selection for PC-USB adapter MB5U using the BiSS interface.
	Interface Setup	
	→ Default frequencies	SPI and BiSS frequencies of the PC USB adapter.
	→ BiSS clock source	Read & Checked: Internal or external BiSS master clock source.
	Interface Options	
	→ Connect & Read & Checked	Connects the PC adapter and reads the IC registers. Unchecked: connects the PC adapter without reading the IC registers.
<Extras>	Parameter Search	Enables a search field to locate a parameter's control field. If a name match is found, the corresponding control field will be highlighted and focused.
	Generate Report	Generates a *report.zip archive reporting the current software status. This report eases debugging software issues by the iC-Haus' support team.
	About	GUI release information.

## 2 Header Section

Project title, software version, status and connection state.

## 3 Parameter Section

Parameter configuration, read/write access to IC.

<Tabs>	Configuration	Refer to IC datasheet.
	Instructions	Refer to IC datasheet.
	Error/Warning Monitor	Refer to IC datasheet.
	Communication Control	Refer to IC datasheet.
	Hex Editor	This tab is a different view of the IC's register content in HEX format. Changes made are not automatically updated to the other tabs. Push <Read RAM> to update the parameter tabs.
<Parameter>	Read RAM	Reads all parameters from the IC and refreshes the display.
	Write RAM	Writes all parameters from GUI to IC RAM.
	Write Immediately	If checked, any change to a parameter is transferred immediately. If disabled, the GUI can be used stand-alone without hardware.
	Save Config	Reads all parameters from a file.
	Load Config	Writes all parameters to the a file.

## 4 Status Section

Transcript and feedback messages of user actions.

The GUI software starts with <Interface> *Disconnected*.

When moving the mouse cursor across an input box, a tooltip comes up and displays the real parameter name according to this box. If a functional parameter description is required, please refer to the IC datasheet.

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### REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
A1	2010-01-28		First release	

Rel.	Rel. Date*	Chapter	Modification	Page
A2	2014-10-22	ORDERING INFORMATION	Web links updated	1
		RELATED DOCUMENTS	Web links updated	2
		CONNECTOR AND TERMINAL PINOUT	MB3U-I2C connection and supply added	2
		EVALUATION SOFTWARE	Standardized file names updated Web links updated GUI screenshots updated GUI description updated	6, 8

Rel.	Rel. Date*	Chapter	Modification	Page
A3	2018-05-09	ORDERING INFORMATION	BiSS adapters MB3U, MB4U and MB5U added	1
		BOARD MD1D	BiSS Interface details added	1
		RELATED DOCUMENTS	Links to possible BiSS adapters MB3U, MB4U and MB5U added	2
		CONNECTOR AND TERMINAL PINOUT	BiSS interface adapter details added	2
		SUPPLY AND SIGNAL CONSIDERATIONS	Chapter added	6
		EVALUATION SOFTWARE	GUI B2 screenshots updated. GUI B2 description updated: operation via BiSS interface now possible	9 ... 11

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\* Release Date format: YYYY-MM-DD