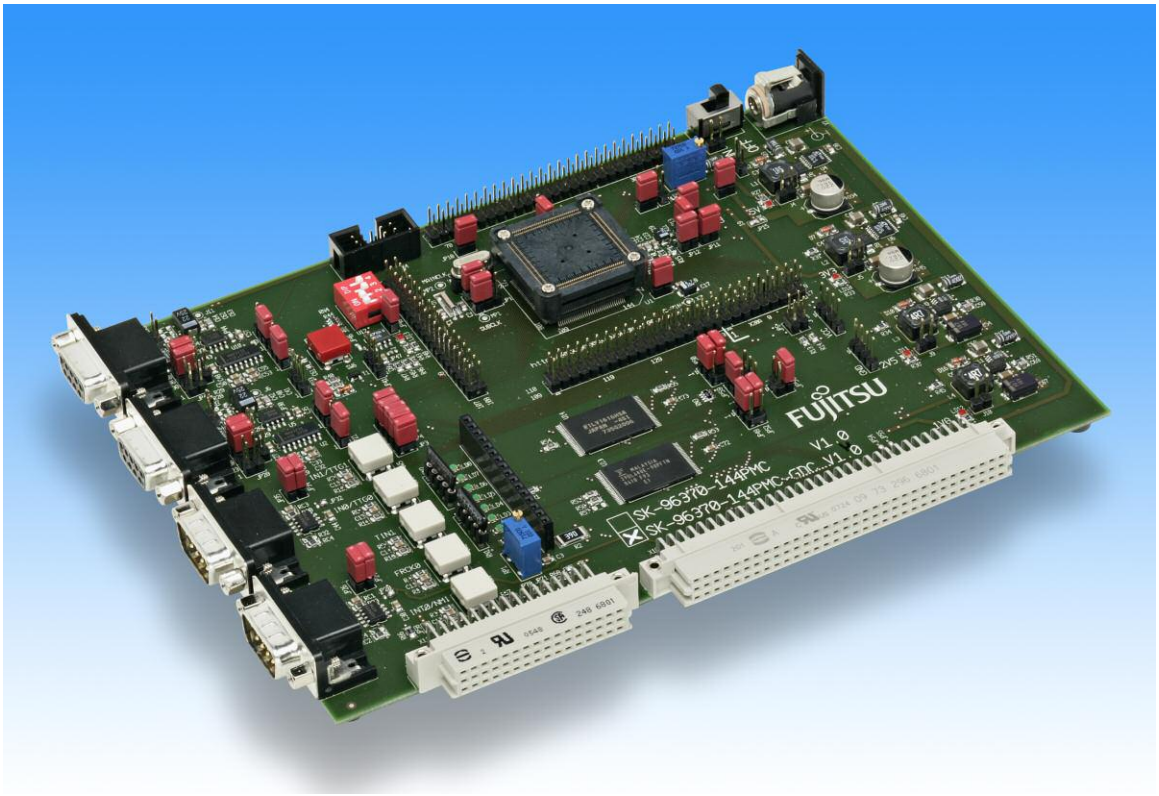
FMEMCU-UG-960014-10

MB96300 SERIES

EVALUATION BOARD

SK-96370-144PMC-GDC

USER GUIDE



Revision History

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This document contains 42 pages.

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0 Contents

1 Overview

1.1 Abstract

The SK-96370-144PMC-GDC is a multifunctional evaluation board for the Fujitsu 16FX Flash microcontroller MB96370 Series.

It can be used stand-alone for software development and testing or as a simple target board to work with the emulator system.

The board allows the designer immediately to start software development before his own final target system is available.

1.2 Features

- Supports Fujitsu's 16FX MB96370 Series with 144 pin PMC / M08 package or the MB2198 Emulator System with the Probe Cable MB2198-507-E.
- 9-15V unregulated external DC power supply
- On-board 3.3V switching mode voltage regulator
- Power-LEDs for all supply voltages
- Onboard voltage supervisor monitor
- In-Circuit serial Flash programming (UART0 or UART2)
- All resources available for evaluation
- All MCU pins routed to connectors
- 4 MHz main crystal
- 32 kHz crystal for sub clock operation
- Two RS232- or LIN interfaces
- Two CAN interfaces
- 3 V capable CAN, LIN, and RS232 transceivers
- 8 User LEDs
  - Optional: alphanumeric standard LC-Display connectable instead of LEDs
- Reset button, Reset LED
- 5 User buttons
- 8 MByte FLASH
- 2 MByte SRAM
- Connector for Fujitsu Graphic-Controller boards (e.g.: CREMSON-STARTERKITLIME)
  - External bus interface routed to 96 pin and 48 pin DIN 41612 (VG) connectors
  - Power Supply: 5V, 3.3V, 2.5V and 1.8V

This board must only be used for test applications
in an evaluation laboratory environment.

1.3 General Description

The SK-96370-144PMC-GDC supports the F^{2}MC-16FX microcontrollers of MB96370 Series with LQFP144-M08 (PMC) package.

It can be used as a stand-alone evaluation board or as a target board for the emulator debugger.

1.3.1 MCU Clocks

The board is supplied with a socketed 4 MHz crystal as main oscillation source. Using the internal PLL of the µC, internal clock rates up to 56 MHz can be achieved.

1.3.2 RS-232 and LIN

Two separate RS232 transceivers and two single-wire LIN-transceivers (TLE7259) are available to connect two out of three on-chip UARTs to 9-pin D-Sub connectors (X5, X9). The transceivers generate the adequate RS232 levels for the receive (RXD) and transmit (TXD) and LIN bus lines. In RS232 mode, either the DTR line or the RTS line can be selected with jumpers (JP23 and JP38) to generate a system reset. The RTS signal can be shortcut to CTS using the jumpers JP19 and JP36. Each of the four D-Sub connectors can be configured as RS232 or LIN. The LIN Vs line can be powered by the unregulated supply input of the board, so no additional supply is needed (JP28 and JP42).

All transceivers are fully 3.3V IO compatible to enable low voltage applications.

In-circuit programming (asynchronous) can be done via LIN-UART 0 and 2 (X5, X9).

1.3.3 CAN Bus

Two high-speed CAN transceivers (TLE6250GV33) can be connected to the CAN interfaces of the MCU to allow easy connection to CAN networks.

All transceivers are fully 3.3V IO compatible to enable low voltage applications.

1.3.4 MCU Pins

All pins of the microcontroller except the oscillator pins X0/X1 and X0A/X1A are connected to edge connectors and are directly available to the user.

1.3.5 Power Supply

The on-board switching mode voltage regulators allow the user to connect an unregulated DC input voltage of +9V to +15V, and supplies all voltages needed by the board and an optional graphic sub-board. The regulators are rated with 3A (5V and 3.3V) resp. 1.5A (2.5V, 1.8V) and are thermally protected against overload.

1.3.6 User Buttons

There are six push button switches on the board, which can be connected to input ports of the microcontroller. This allows the user to evaluate external Interrupts, external timer trigger or Input Capture functions as well as simple input polling. One button is reserved as ‘Reset’-button for the microcontroller, controlled by the supply monitor IC.

1.3.7 User LEDs and optional LCD

Eight user LEDs are connected to Port 09 and grounded by two 1k resistor networks (RN1, RN2). If these LEDs are not required, these resistor networks can be removed to disconnect the LEDs and to free the I/O port.

1.3.8 I2C Bus

Additional 10 kOhm pull-up resistors can be connected to the I²C bus lines by setting the according jumpers. JP9 is for SDA0 and JP10 for SCL0.

1.3.9 Emulator System

If the board is used as an emulator target board, the microcontroller must be removed from the socket and the corresponding probe cable has to be mounted:

Series	V-Chip	Probe cable	Socket
MB96370	MB96V300B	MB2198-507-E	NQPACK144SD-ND HQPACK144SD

Table 1-1: Emulation System

2 Installation

2.1 Connection/Power-On

Carefully remove the board from the shipping carton.

First, check if there are any damages before powering up the evaluation board.

For the power supply a DC input voltage of 9V – 15V is recommended. The positive voltage (+) must be connected to the center pin, and ground (GND) must be connected to the shield of the connector X7!

After power-on (Switch S2 or JP22), the red power-on LEDs (LD9, LD10, LD11, and LD12) should be lit. If the LEDs do not light up, switch off the power supply and check input polarity and current capability of the DC supply used. Please do not look directly into the LEDs to prevent harming your eyes.

The in-circuit programming allows the user to program own applications into the Flash memory. The procedures for Flash programming are described in chapter 5.

If the board shall be used as an emulator target board, switch off the power supply and remove the microcontroller from the socket. Now the probe cable can be mounted on the socket. Take care of the pin 1 marking on the socket and fasten the probe cable with the provided screws.

Do not use any other probe cable than MB2198-507-E only!

Connect the probe cable to the MB2198-500 emulation Adapter Board. Check all jumper settings of the evaluation board, the Probe Cable, and the Adapter Board.

When turning on the system, be sure to use the following power-up sequence:

1. Power up the Emulator Main Unit (MB2198-01)
2. Power up the Adapter Board (MB2198-500), if needed
3. Power up the target Board (SK-96370-144PMC-GDC)

To turn off the system, switch off the components in reverse order, beginning with the target Board.

Please refer to the corresponding user manuals and application notes for the emulator how to set up the emulator system. After power on the ‘UVCC’-LED of the emulator must be on.

Note:

Some customers experience connectivity problems when connecting the MCU into the socket adapter. Only the small red screwdriver available in your box should be used to connect the cover (HQPACK) onto the socket (NQPACK).

If the four screws are not tightening equally, then it may cause a poor contact.

Do not screw the cover too tight (max 0.054 Nm). If you have connectivity problems then please loosen the screws and tighten again the screws equally.

Do not clean NQPACK, YQPACK, and YQSOCKET with steam. Cleaning material will contaminate inside of connector.

2.2 Default Jumper settings for MB96370 Series

The following table lists all jumpers including its default setting and location on the starterkit.

Jumper	Description / Function	Type	Default Setting	Coordinates
JP1	X1A	Jumper 3 pin	1-2	J 10
JP2	X0A	Jumper 4 pin	1-2	J 10
JP3	Switch SW1 : INT0/NMI	Jumper 2 pin	Closed	G 6
JP4	Switch SW2 : INT5	Jumper 2 pin	Closed	G 6
JP5	Switch SW3 : TIN1	Jumper 2 pin	Closed	H 6
JP6	Switch SW4 : IN0 / TTG4/0	Jumper 2 pin	Closed	H 6
JP7	Switch SW5 : IN1 / TTG5/1	Jumper 2 pin	Closed	H 6
JP8	C pin	Jumper 2 pin	Closed	I 14
JP9	SDA0 pull-up	Jumper 2 pin	Open	G 15
JP10	SCL0 pull-up	Jumper 2 pin	Open	G 15
JP11	AVCC	Jumper 2 pin	Closed	J 16
JP12	AVRH	Jumper 2 pin	Closed	J 15
JP13	AVRL	Jumper 2 pin	Closed	J 15
JP14	AVSS	Jumper 2 pin	Closed	K 15
JP15	Voltage selection for MCUVCC (3.3V only for SK-96370-144PMC-GDC with extern. memory)	Jumper 3 pin	2-3 Do not change!	J 17
JP16	MCUVCC	Jumper 2 pin	Closed	K 17
JP17	DVCC	Jumper 3 pin	2-3	L 12
JP18	DVSS	Jumper 2 pin	Closed	L 10
JP19	UART0 : CTS / RTS	Jumper 2 pin	Closed	I 3
JP20	CAN0 Transceiver type	Solder JP 3 pin	1-2	D 4
JP21	SIN0 : RS232 / LIN transceiver	Jumper 3 pin	1-2	H 5
JP22	Mains Switch	Jumper 2 pin	Open	L 17
JP23	UART0 : DTR / RTS	Jumper 3 pin	Open	H 3
JP24	CAN0 RxD	Jumper 2 pin	Closed	D 4
JP25	SOT0 : RS232 / LIN transceiver	Jumper 3 pin	1-2	I 5
JP26	CAN0 TxD	Jumper 2 pin	Closed	D 3
JP27	UART0 : RS232 / LIN	Jumper 3 pin	1-2	I 3
JP28	UART0 : LIN VBat	Jumper 2 pin	Open	H 3
JP29	UART0 : LIN-Enable	Jumper 2 pin	Open	I 3
JP30	LIN0 Transceiver type	Solder JP 3 pin	1-2	I 5
JP31	UART0 : LIN Master	Jumper 2 pin	Open	J 3
JP32	CAN1 Transceiver type	Solder JP 3 pin	1-2	G 4
JP33	Reset by UART 0 / 2	Jumper 3 pin	Open	J 5
JP34	CAN1 RxD	Jumper 2 pin	Closed	G 4
JP35	CAN1 TxD	Jumper 2 pin	Closed	G 3
JP36	UART2 : CTS / RTS	Jumper 2 pin	Closed	K 3
JP37	SIN2 : RS232 / LIN	Jumper 3 pin	1-2	K 5
JP38	UART2 : DTR / RTS	Jumper 3 pin	Open	K 3
JP39	SOT2 : RS232 / LIN	Jumper 3 pin	1-2	K 5
JP40	UART2 : RS232 / LIN	Jumper 3 pin	1-2	K 3
JP41	UART Reset / Inverter	Jumper 3 pin	Open	J 7

Jumper	Description / Function	Type	Default Setting	Coordinates
JP42	UART2 : LIN VBat	Jumper 2 pin	Open	K 3
JP43	UART2 : LIN-Enable	Jumper 2 pin	Open	L 3
JP44	LIN2 Transceiver type	Solder JP 3 pin	1-2	L 5
JP45	UART2 : LIN Master	Jumper 2 pin	Open	M 3
JP46	Direct Reset / Delayed	Solder JP 3 pin	1-2	J 7
JP47	Voltage Monitor	Solder JP 3 pin	2-3	J 8
JP48	MCU Reset	Jumper 2 pin	Closed	J 8
JP49	FLASH : Word / Byte access	Jumper 3 pin	1-2	D 13
JP50	SRAM : Word / Byte access	Jumper 3 pin	1-2	F 13
JP52	FLASH : 16-bit / 8-bit interface	Jumper 3 pin	1-2	D 13
JP53	SRAM : 16-bit / 8-bit interface	Jumper 3 pin	1-2	F 13
JP54	Set A24 to GND for GDC interface	Solder JP 2 pin	Closed	C 15
JP55	Set A25 to GND for GDC interface	Solder JP 2 pin	Closed	C 16
JP56	FLASH / LIME	Jumper 4 pin	2-4	E 14
JP57	Select CS3/CS2 for GDC interface	Jumper 2 pin	Open	E 14
JP58	Supply 1V8 to GDC interface	Solder JP 2 pin	Closed	C 4
JP59	SRAM	Jumper 3 pin	2-3	E 13
JP60	External Vin	Solder JP 2 pin	Open	C 8
JP70	Manual GDC reset (GLRST)	Solder JP 2 pin	Closed	C 7
JP71	Manual GDC reset (FLRST)	Solder JP 2 pin	Closed	C 7
JP85	ALARM0	Jumper 2 pin	Closed	L 15

Table 2-1: Jumper Settings

2.3 Jumper Location

The following picture shows the silk plot of the starter-kit with marked default jumper settings.

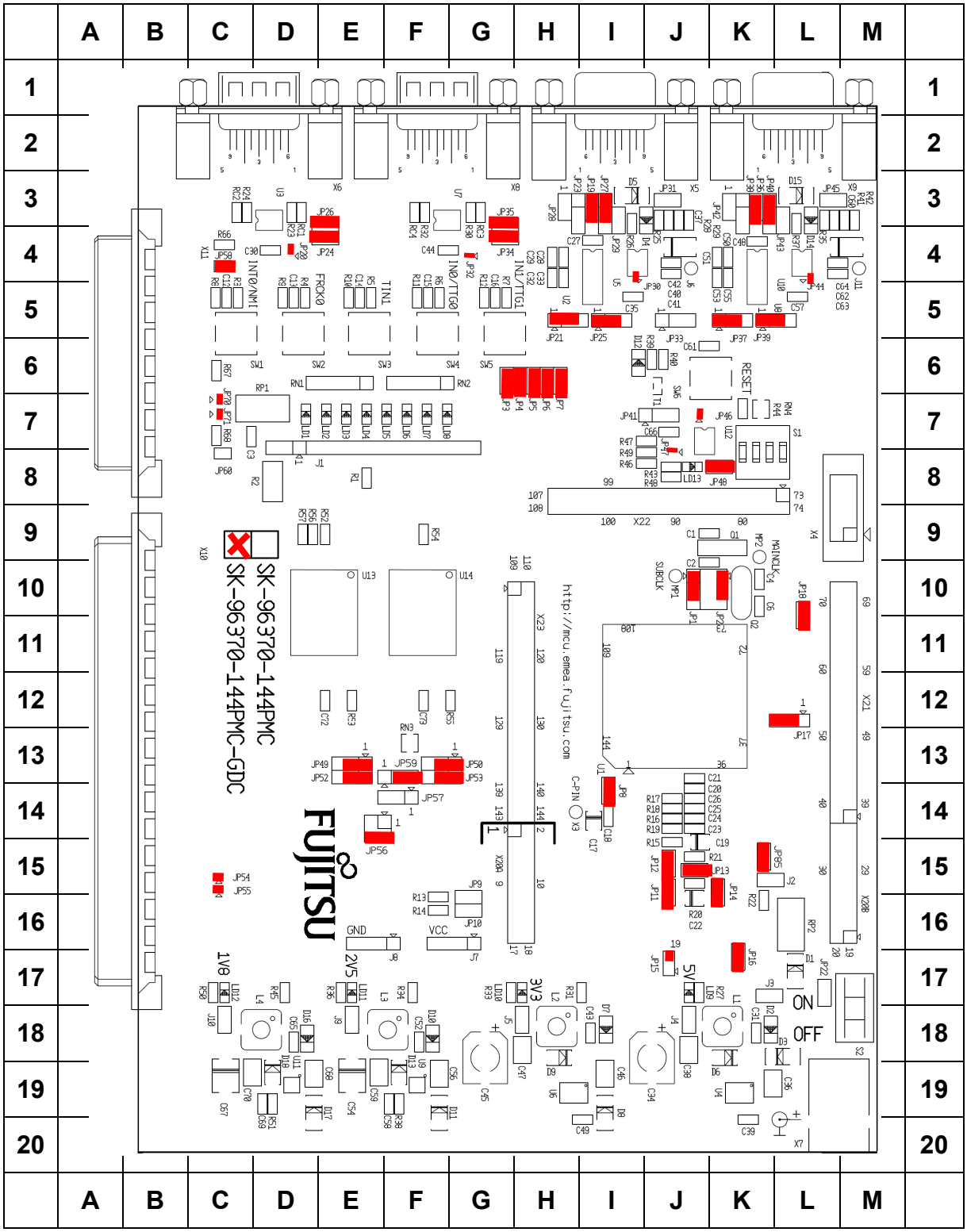


Figure 2-1: Default Jumper Settings

3 Jumpers and Switches

This chapter describes all jumpers and switches that can be modified on the evaluation board. The default setting is shown with a grey shaded area.

3.1 Operating Mode (S1)

This switch controls the MCU operation mode after Reset.

Please take care of the following mode settings:

DIP switch	Setting	Logical value
S1-1 (MD0)	ON (closed)	1 (high)
	OFF (open)	0 (low)
S1-2 (MD1)	ON (closed)	1 (high)
	OFF (open)	0 (low)
S1-3 (MD2)	ON (closed)	1 (high)
	OFF (open)	0 (low)
S1-4 (Not used)	ON (closed)	Not connected
	OFF (open)	Not connected

Table 3-1: MCU Operating Mode

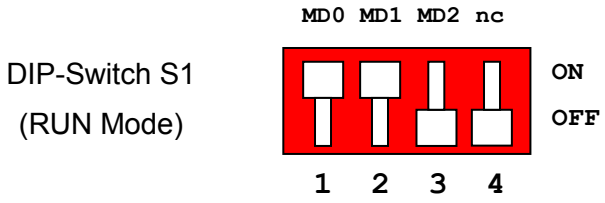


Figure 3-1: MCU mode switch: RUN mode (Fixed Vector Mode)

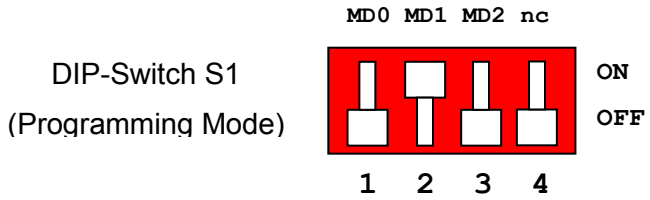


Figure 3-2: MCU mode switch: Flash Programming mode

3.2 Power Supply (S2, JP: 8, 15, 16, 17, 22)

The on-board voltage regulator provides stabilized 5V [*1] and 3.3V supplies to the MCU [*1] and peripherals. Even though they are thermally protected against overload, care must be taken when supplying current for additional circuitry.

The LIN Vs line can be connected directly to the input supply of the board by jumpers. In this case, the input voltage to the board has to be suitable for the connected bus devices (mostly around 12V). Since there is a protection diode between Vin and Vs, it is not possible to power the board over the LIN bus.

S2 Power Switch

JP8 Core power supply stabilization capacitor

JP15 Selects the power supply voltage for the microcontroller

For SK-96370-144PMC-GDC use only 3.3V, because of the external memory

JP16 Connects the power supply voltage to the microcontroller. An ampere meter can be used instead for power consumption measurement.

JP17 Selects the Stepper Motor Driver Voltage (3.3V or 5V)

JP22 Jumper to override the power switch S2

Jumper	Setting	Description
JP8 (C-pin)	Closed	An external capacitor is connected
	Open	An external capacitor is not connected
JP15 [*1] (MCUVCC)	1 - 2	**Power supply (VCC) for MCU is set to 5V (Not allowed for SK-96370-144PMC-GDC)**
	2 - 3	Power supply (VCC) for MCU is set to 3V3
JP16 (MCUVCC)	1 - 2	MCU is disconnected from VCC
	2 - 3	MCU is connected to VCC
JP17 (DVCC)	1 - 2	SMC (DVCC) supply voltage is set to 5V
	2 - 3	SMC (DVCC) supply voltage is set to 3.3V
JP22 (Mains)	Closed	Board is always switched on
	Open	Board power is controlled by switch S2

Table 3-2: Power Supply Configuration

By default, all Board supplies are set to 3.3V.

[*1] For SK-96370-144PMC-GDC use only 3.3V, because of the external memory

3.3 Subclock (JP: 1, 2)

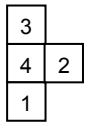
Some devices like e.g. MB96F37xRW support a 32 kHz sub-clock (X0A, X1A), other devices like e.g. MB96F37xRS do not support a sub-clock but will offer additional port-pins (e.g. P04_0, P04_1) instead.

Please check the related datasheet.

JP1: defines usage of pin 69 (X1A)

JP2: defines usage of pin 68 (X0A)

Pin-out JP2:



Jumper	Setting	Description
JP2 (X0A)	1-4	Pin 68 is connected to the 32 kHz sub-clock (X0A)
	2-4	Pin 68 is used as port pin P04_0
	3-4	Pin 68 is connected to GND (in case that subclock-device is used, but no 32 kHz crystal is connected)
JP1 (X1A)	1-2	Pin 69 is connected to the 32 kHz sub-clock (X1A)
	2-3	Pin 69 is used as port pin P04_1

Default: JP1: 1-2, JP2: 1-4

By default, the 32 kHz sub-clock-crystal is connected to the microcontroller.

3.4 Analog Power Supply Voltage (JP: 11, 12, 13, 14)

The power supply as well as the positive reference voltage for the A/D-converter can be provided internally or externally.

JP11, JP14 connects analog power supply voltages (AVcc and AVss)

JP12 connects the low pass filtered analog reference voltage AVRH to AVcc

JP13 connects the low pass filtered analog reference voltage AVRL to AVss

Jumper	Setting	Description
JP11 (AVcc)	Closed	AVcc is connected to Vcc
	Open	AVcc is disconnected from Vcc
JP12 (AVRH)	Closed	AVRH is connected to AVcc
	Open	AVRH defined by resistor network*1
JP13 (AVRL)	Closed	AVRL is connected to AVss
	Open	AVRL defined by resistor network*1
JP14 (AVss)	Closed	AVss is connected to GND
	Open	AVss is disconnected from GND

*1By default the resistor network (R16, R17, R20, R21) is not mounted on the board

Table 3-3: ADC Supply

Default: JP11, JP12, JP13, and JP14 are closed

By default, the A/D-converter supply and reference voltage is the same as the microcontroller supply voltage.

Note:

If JP11 and JP14 are open, the user has to supply an adequate analog voltage supply (AVcc and AVss) to the A/D-converter.

If JP12 and JP13 are open, the resistors R16, R17, R20, and R21 define AVRH and AVRL.

By default the resistor network (R16, R17, R20, and R21) is not mounted on the board.

3.5 Alarm Comparator (JP: 85)

Potentiometer RP2 is connected to ALARM0 in order to evaluate comparator 0 of the microcontroller. Any voltage between VCC and GND can be set. Additionally the adjusted voltage can be measured at connector J2.

JP78 One potentiometer can be connected to the ALARM0/AN8

Jumper	Setting	Description
JP85 (ALARM0)	Closed	Pin 26 (ALRAM0/AN8) of the MCU is connected to RP2
	Open	Pin 26 (ALRAM0/AN8) of the MCU is not connected

Table 3-4: Alarm Comparator

3.6 Reset Generation (JP: 33, 41, 46, 47, 48)

In addition to the internal Power-On reset, the microcontroller can be reset by an external reset circuit (Voltage Monitor) and also by a RS232 interface. Refer to the chapter 'LIN / UART Connectors (X5 or X9)' for DTR / RTS selection.

JP33 Selects X5 or X9 as reset source.

JP41 The signal on the DTR/RTS line can be negated with this jumper. Remove the jumper in order to disable the RS232 reset circuit.

JP46 Selects the mode of the reset button SW6.

JP47 A voltage supply monitor allows monitoring of 1V8 or 2V5 power supply.

JP48 Open this jumper if no external Reset shall be generated. In this case only the internal reset is active (e.g.: power-on).

Jumper	Setting	Description
JP33 (UART RESET)	1-2	X5 (UART0) is used to generate Reset
	2-3	X9 (UART2) is used to generate Reset
JP41 (DTR / DTRx)	1-2	No polarity inversion for the DTR/RTS signal
	2-3	Polarity inversion for the DTR/RTS signal
JP46 (Reset imm./delayed)	1-2	Reset is applied immediately when SW6 is pressed
	2-3	Reset is applied when SW6 is pressed > 2sec
JP47 (Monitor 1V8 / 2V5)	1-2	The voltage supply monitor observes 1V8
	2-3	The voltage supply monitor observes 2V5
JP48 (RST MCU)	Closed	External reset generation is active
	Open	No external reset generation

Table 3-5: Reset Connection

By default, the external reset is enabled and set to immediate reset while the reset by UART is disabled.

Note:

While a reset signal is asserted the red Reset-LED LD13 is lit.

During normal operation, this LED should be off!

If JP41 (DTR/DTRx) is set, the UART RESET jumper (JP33) and the according DTR/RTS (JP23 and JP38) jumper have to be set, too.

If the reset LED is steadily on, check the power supply input voltage and the settings for the reset-generation by UART.

3.7 User Buttons SW1, SW2, SW3, SW4, SW5, SW6 (JP: 3, 4, 5, 6, 7)

Five user push buttons (SW1-SW5) can be connected to the microcontroller.

JP3, 4, 5, 6, 7 Each push button can be connected separately.

Jumper	Setting	Description
JP3 (SW1)	Closed	Pin 139 (INT0/NMI) of the MCU is connected to “SW1”
	Open	No connection to the microcontroller
JP4 (SW2)	Closed	Pin 19 (FRCK0) of the MCU is connected to “SW2”
	Open	No connection to the microcontroller
JP5 (SW3)	Closed	Pin 22 (TIN1) of the MCU is connected to “SW3”
	Open	No connection to the microcontroller
JP6 (SW4)	Closed	Pin 20 (IN0/TTG4/0) of the MCU is connected to “SW4”
	Open	No connection to the microcontroller
JP7 (SW5)	Closed	Pin 21 (IN1/TTG5/1) of the MCU is connected to “SW5”
	Open	No connection to the microcontroller

Table 3-6: User Push Buttons

Default: JP3, 4, 5, 6, 7 closed

By default, all push-buttons are connected to the microcontroller.

3.8 I²C pull-up resistor (JP: 9, 10)

Two 10k pull-up resistors can be connected to the I²C signal line.

JP9, 10 10k pull-up resistors can be connected to SDA0 and SCL0

Jumper	Setting	Description
JP9 (SDA0)	Closed	A 10k pull-up resistor is connected to SDA0
	Open	No pull-up resistor is connected to SDA0
JP10 (SCL0)	Closed	A 10k pull-up resistor is connected to SCL0
	Open	No pull-up resistor is connected to SCL0

3.9 LIN / UART

There are two identical circuit blocks for LIN or RS232 connections. Each of the two D-Sub connectors can be configured as LIN or RS232 interface. DTS or RTS can be selected as reset source, and RTS and CTS can be connected by a jumper, since some terminals and Flash programming tools need this connection. Pin 1 (Vs) of X5 and X9 can be connected to the voltage input of the board by jumpers in order to supply the LIN bus.

3.9.1 LIN-UART 0 (JP: 19, 21, 23, 25, 27, 28, 29, 31)

Jumper	Setting	Description
JP21 (RXD)	1-2	SIN0 is connected to RS232 transceiver
	2-3	SIN0 is connected to LIN transceiver
JP25 (TXD)	1-2	SOT0 is connected to RS232 transceiver
	2-3	SOT0 is connected to LIN transceiver
JP27 (RS232/LIN)	1-2	X5 pin 2 is connected to RS232 transceiver
	2-3	X5 pin 2 is connected to LIN transceiver
JP19 (RTS-CTS)	Closed	RTS and CTS of X5 are connected
	Open	RTS and CTS of X5 are not connected
JP23 (DTR/RTS)	1-2	DTR signal (pin 6 of X5) is used as reset source
	2-3	RTS signal (pin 7 of X5) is used as reset source
JP29 (LIN enable)	Closed	LIN transceiver is enabled
	Open	LIN transceiver is disabled
JP31 (LIN master)	Closed	LIN-UART0 is LIN Master
	Open	LIN-UART0 is LIN Slave
JP28 (LIN Vbat)	Closed	LIN bus (X5 pin 1) is powered by the board
	Open	LIN bus (X5 pin 1) is not powered by the board

Table 3-7: UART0 Settings

3.9.2 LIN-UART 2 (JP: 36, 37, 38, 39, 40, 42, 43, 45)

Jumper	Setting	Description
JP37 (RXD)	1-2	SIN2 is connected to RS232 transceiver
	2-3	SIN2 is connected to LIN transceiver
JP39 (TXD)	1-2	SOT2 is connected to RS232 transceiver
	2-3	SOT2 is connected to LIN transceiver
JP40 (RS232/LIN)	1-2	X9 pin 2 is connected to RS232 transceiver
	2-3	X9 pin 2 is connected to LIN transceiver
JP36 (RTS-CTS)	Closed	RTS and CTS of X9 are connected
	Open	RTS and CTS of X9 are not connected
JP38 (DTR/RTS)	1-2	DTR signal (pin 6 of X9) is used as reset source
	2-3	RTS signal (pin 7 of X9) is used as reset source
JP43 (LIN enable)	Closed	LIN transceiver for X5 is enabled
	Open	LIN transceiver for X5 is disabled
JP45 (LIN master)	Closed	LIN-UART2 is LIN Master
	Open	LIN-UART2 is LIN Slave
JP42 (LIN Vbat)	Closed	LIN bus (X9 pin 1) is powered by the board
	Open	LIN bus (X9 pin 1) is not powered by the board

Table 3-8: UART2 Settings

3.10 CAN interfaces (JP: 24, 26, 34, 35)

Two high-speed CAN-transceivers can be connected to the microcontroller's CAN interfaces (CAN0 and CAN1).

Jumper	Setting	Description
JP24 (CAN0 RX)	Closed	RX0 is connected to CAN0 (X6)
JP26 (CAN0 TX)	Closed	TX0 is connected to CAN0 (X6)
JP34 (CAN1 RX)	Closed	RX1 is connected to CAN1 (X8)
JP35 (CAN1 TX)	Closed	TX1 is connected to CAN1 (X8)

Table 3-9: CAN Settings

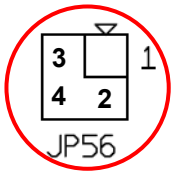
3.11 External Flash memory (JP: 49, 52, 56)

The SK-96370-144PMC-GDC is equipped with an additional 8 MByte Flash memory connected to the external bus interface.

JP49 Selects Flash data width (16 bit / 8 bit)

JP52 Selects between address A0 or data D15 based on the Flash data width

JP56 Signal sharing of A22 and CS2 for FLASH and GDC



Jumper	Setting	Description
JP49 (8 / 16 bit)	1-2	16 bit data width
	2-3	8 bit data width
JP52 (8 / 16 bit)	1-2	AD15 is connected (16 bit data width)
	2-3	A0 is connected (8 bit data width)
JP56 (GDC/FLASH)	2-4	Address line A22 is connected to the FLASH
	1-2 3-4	CS2 is connected to the connector (see jumper JP57), too Address A22 of FLASH is connected to GND

Table 3-10: External Flash Configuration

3.12 External SRAM memory (JP: 50, 53, 59)

The SK-96370-144PMC-GDC is equipped with an additional 2 MByte SRAM memory connected to the external bus interface.

JP50 Selects SRAM data width (16 bit / 8 bit)

JP53 Selects between address A0 or data D15 based on the Flash data width

JP59 Enables or disables the SRAM

Jumper	Setting	Description
JP50 (8 / 16 bit)	1-2	16 bit data width
	2-3	8 bit data width
JP53 (8 / 16 bit)	1-2	AD15 is connected (16 bit data width)
	2-3	A0 is connected (8 bit data width)
JP59 (SRAM)	1-2	Connect CS3 to the SRAM
	2-3	Disables the SRAM

Table 3-11: Flash Configuration Jumpers

3.13 Graphic Display Controller interface (JP: 54, 55, 56, 57, 58, 60, 85, 86)

The SK-96370-144PMC-GDC provides the external bus interface on the two connectors X10 and X11 in order to support Graphic Display Controller sub-boards, e.g.: CREMSON-STARTERKITLIME.

Take care of proper jumper settings, in case those external sub-boards will be connected. Some signals, like A22, CS2 and CS3, are shared with the on-board FLASH and SRAM memory (see also chapter 3.11 and 3.12).

JP54 Address line A24 is not supported by the microcontroller

JP55 Address line A25 is not supported by the microcontroller

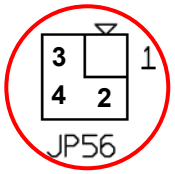
JP56 Signal sharing of A22 and CS2 for FLASH and GDC

JP57 Chip selection for external sub board

JP58 1.8V power supply

JP60 Mains power supply

JP70, 71 The port P08_0 may be used e.g. to generate manual reset on the sub board.



Jumper	Setting	Description
JP54 (A24)	Open	Address line A24 is floating
	Closed	Address line A24 is connected to GND
JP55 (A25)	Open	Address line A25 is floating
	Closed	Address line A25 is connected to GND
JP56 (GDC/FLASH)	2-4	Address line A22 is connected to the FLASH
	1-2 3-4	CS2 is connected to the connector (see jumper JP57), too Address A22 of FLASH is connected to GND
JP57 (CS2/CS3)	1-2	Connect CS3 to the connector
	2-3	Connect CS2 to the connector
JP58 (1V8)	Open	1.8V is not supplied to connector X11B
	Closed	1.8V is supplied to connector X11B
JP60 (Mains)	Open	Mains is not connected to connector X11B
	Closed	Mains is connected to X11B
JP70 (GLRST)	Open	P08_0 is not connected to X11A_11A
	Closed	P08_0 is connected to X11A_11A
JP71 (FLRST)	Open	P08_0 is not connected to X11A_12A
	Closed	P08_0 is connected to X11A_12A

Table 3-12: Graphic Display Controller interface

4 Connectors

4.1 Power connector (X7)

The following figure shows the power connection jack X7. This connector is used to connect an external unregulated DC power supply voltage (9V-15V DC) to the evaluation board.

Connector X7:

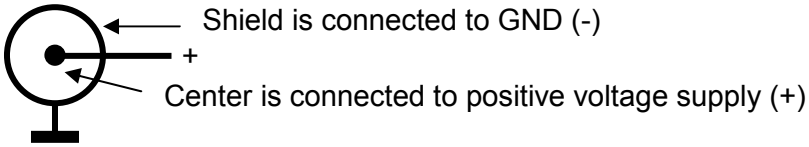


Figure 4-1: Power Connector

4.2 MCU pin header connectors (X20A, X20B, X21, X22 and X23)

All pins (except oscillator and supply pins) of the microcontroller are directly connected to pin headers. Pin 1 of the MCU corresponds to Pin 1 of the connector. Pin 2 of the MCU corresponds to Pin 2 of the connector, and so on.

4.3 LIN-UART connectors (X5, X9)

Two 9-pin D-Sub female connectors are used for the serial interfaces. Note that X5 and X9 are shared between the RS232- and LIN transceivers and must be configured to the desired functionality (refer to chapter 3.9 for details).

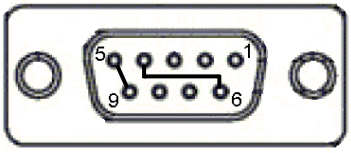


Figure 4-2: UART Connector

Pin Number	Pin Signal	Description
1	+VBat	Power from / to LIN bus
2	TXD	RS-232 transmit output
	LIN	Bi-directional LIN-interface bus
3	RXD	RS-232 receive input
4	DTR	Connected to DSR (pin 6)
5	GND	Ground normally used for RS232 connection
6	DSR	Connected to DTR (pin 4)
7	RTS	Can be connected with CTS by jumper
8	CTS	Can be connected with RTS by jumper
9	LGND	Ground normally used for LIN connection
Shield	GND	Ground

Table 4-1: UART Connector Signals

4.4 CAN Connector (X6, X8)

Two 9-pin D-Sub male connectors are used for the CAN interfaces CAN0 and CAN1. Both CAN interfaces can be used simultaneously.

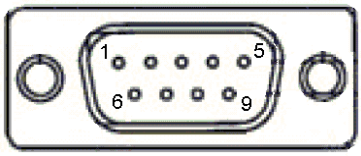


Figure 4-3: CAN Connector

Pin Number	Pin Signal	Description
1	NC	Not used
2	CANL	LOW-level CAN voltage input/output
3	GND	Ground
4	NC	Not used
5	NC	Not used
6	NC	Not used
7	CANH	HIGH-level CAN voltage input/output
8	NC	Not used
9	NC	Not used
Shield	GND	Ground

Table 4-2: CAN Connector Signals

4.5 USER-LEDs & optional LC-Display (J1)

Eight LEDs are supplied for user applications. In order to disconnect the LEDs from the related microcontroller port (Port P09), the resistor network RN1 can be removed.

Instead of the user-LEDs, an alphanumeric LC-Display (optional) can be connected to J1.

The potentiometer RP1 can be used to adjust the contrast of the LC-Display. Pin 15 and 16 of J1 are normally not mounted. If the used LC-Display has pins for LED backlight at this position, they can be connected here (Pin15: Vcc via 39Ω/0.5W, Pin16: GND).

The contrast of an optional LC-Display connected to J1 can be adjusted by RP1.

The following control signals are provided:

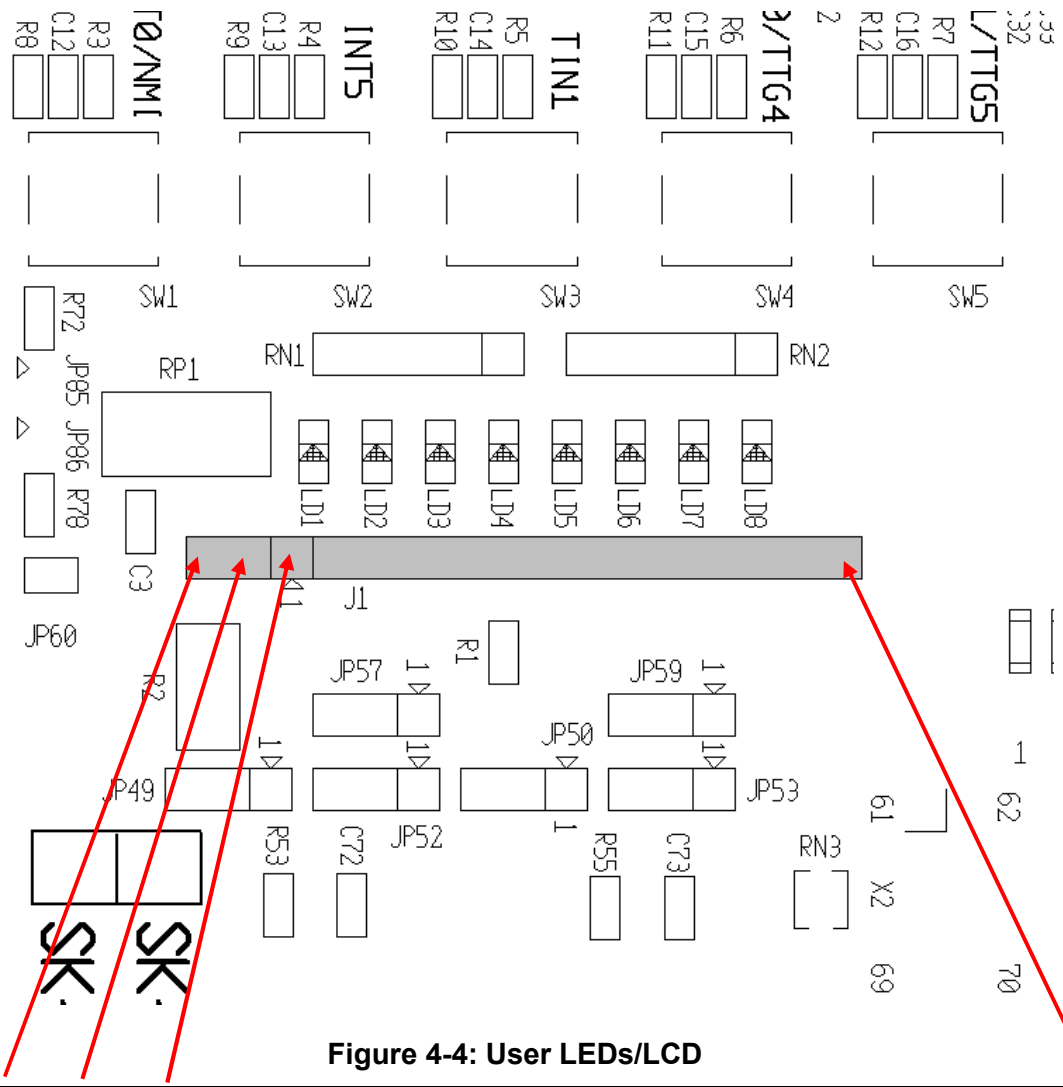


Figure 4-4: User LEDs/LCD

	15*1	16	1	2	3	4	5	6	7	8	9	10	11	12	13	14*
LCD	LCD LED	GND	GND	VCC	V0	RS	R/W	E	-	-	-	-	DB4	DB5	DB6	DB7
LED	-	-	-	-	-	LD1	LD2	LD3	LD4	-	-	-	LD5	LD6	LD7	LD8
Port	-	-	-	-	-	09_0	09_1	09_2	09_3	-	-	-	09_4	09_5	09_6	09_7

Table 4-3: User LEDs/LCD

*1 Pin 15: Vcc via 39Ω/0.5W for LCD backlight

4.6 In-Circuit-Programming Connector (X4)

There is a flash-programming socket on the starter-kit, which makes it possible to program the flash MCU with a special programming adapter. Mode pin MD0 and reset signal are also available at this connector.

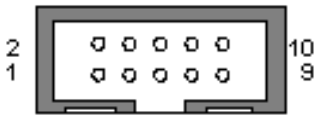


Figure 4-5: In-circuit programming connector

Pin Number	Pin Signal	Description
1	NC	Not used
2	NC	Not used
3	MD0	MCU mode pin MD0
4	NC	Not used
5	RSTX	MCU reset signal
6	SIN3	UART2 receive data
7	SOT3	UART2 transmit data
8	SCK3	UART2 clock
9	VCC	Board supply voltage
10	GND	Ground

Table 4-4: In-circuit programming connector

4.7 Alarm Comparator Connector (J2)

On the Connector J2 the adjusted analog voltage of potentiometer RP2 can be measured. This voltage is used for the alarm comparator ALARM0 or analogue input AN8 on pin 28.

4.8 External Supply Voltage Vin (J3)

This connector is connected to the external supply voltage (Vin).

4.9 Vcc 5 Volts (J4)

On this connector the VCC5V supply can be measured.

4.10 Vcc 3.3 Volts (J5)

On this connector the VCC3V3 supply can be measured.

4.11 Vcc 2.5 Volts (J9)

On this connector the VCC2V5 supply can be measured.

4.12 Vcc 1.8 Volts (J10)

On this connector the VCC1V8 supply can be measured.

4.13 LIN Bus Inhibit (J6)

To this connector the INH pin of the LIN0 transceiver is connected.

4.14 LIN Bus Inhibit (J11)

To this connector the INH pin of the LIN1 transceiver is connected.

4.15 VCC Connector (J7)

On this connector the VCC supply (see chapter 3.2) can be measured.

4.16 GND Connector (J8)

Ground reference terminal GND.

5 Programming the internal Flash memory

All Flash devices have an internal bootloader for asynchronous- as well as for synchronous-Flash-programming:

- Asynchronous serial Flash programming via X5 or X9 (UART0 or UART2)
- Synchronous serial Flash programming via X4 (UART3)

5.1 Asynchronous Mode

This chapter describes the serial asynchronous programming of the internal Flash memory using 'Flash Memory Programmer 16FX' in automatic mode.
For serial asynchronous programming SUB-D9 connectors X5 or X9, which are connected to UART0 and UART2 respectively, can be used on the starter kit.
The following jumper settings are necessary:

5.1.1 Uart0

Jumper	Programming UART	Setting	Description
JP21 (SIN0)	UART0	1-2	SIN0 is connected to RxD of X5
JP25 (SOT0)	UART0	1-2	SOT0 is connected to TxD of X5
JP27 (RS232/LIN)	UART0	1-2	RS232 transceiver is selected for X5
JP28 (Vbat)	UART0	Open	X5-1 is disconnected from the power supply

Table 5-1: Jumper Settings for Programming via UART 0 (X5)

5.1.2 Uart2

Jumper	Programming UART	Setting	Description
JP37 (SIN2)	UART2	1-2	SIN2 is connected to RxD of X9
JP39 (SOT2)	UART2	1-2	SOT2 is connected to TxD of X9
JP40 (RS232/LIN)	UART2	1-2	RS232 transceiver is selected for X9
JP42 (Vbat)	UART2	Open	X9-1 is disconnected from the power supply

Table 5-2: Jumper Settings for Programming via UART 2 (X9)

5.1.3 Reset (optional)

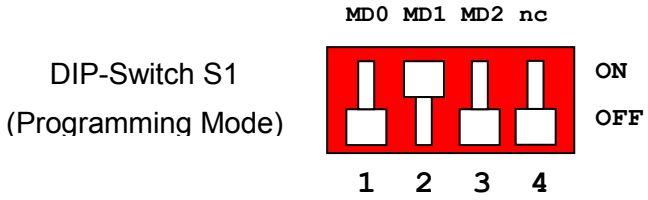
Depending on the programming software a reset signal might be generated by RTS or DTR line. In order to use this optional feature additional jumper have to be set:

Jumper	Programming UART	Setting	Description
JP23 (DTR/RTS)	UART0	1-2	DTR signal of X5 is used as reset source
		2-3	RTS signal of X5 is used as reset source
JP38 (DTR/RTS)	UART2	1-2	DTR signal of X9 is used as reset source
		2-3	RTS signal of X9 is used as reset source
JP33 (RESET A/B)	UART0 or UART2	1-2	LIN-UART 0 (X5) is used to generate reset
		2-3	LIN-UART 2 (X9) is used to generate reset
JP41 (DTR / DTRx)	UART0 or UART2	1-2	No negation for the DTR/RTS signal
		2-3	DTR/RTS signal is negated

Table 5-3: Jumper Settings for reset signal

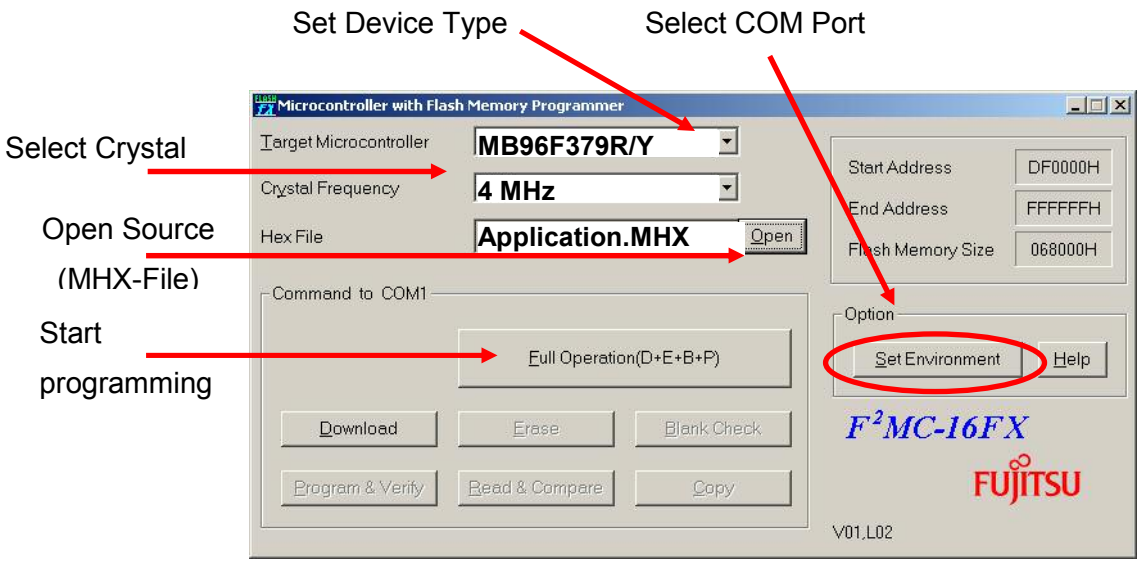
5.1.4 Flash Programming

1) Configure the microcontroller mode:



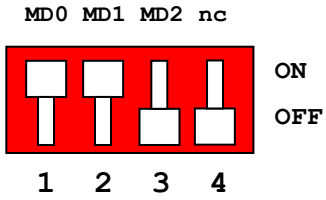
2) Connect the configured UART (see above) to your serial PC communication port. A straight 1:1 cable connection has to be used.

3) Start the tool “Fujitsu Flash MCU Programmer” software and make the settings:



4) After programming the Flash-device, switch off the power supply and set back the mode according to the usage of the application, e.g.:

DIP-Switch S1
(RUN Mode)



5) Power on the board. The user application is started directly.

5.2 Synchronous Mode

In order to program the Flash-ROM synchronously special third-party soft- and hardware has to be used, e.g. GALEP-4 from www.conitec.de. This tool is not available for free.

A dedicated Flash programming socket (X4) is provided on the evaluation-board for direct connection to this programmer.

X4: Flash programming socket

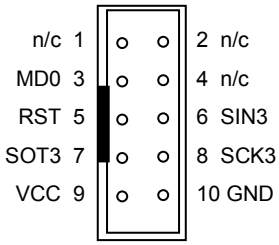


Figure 5-1: Flash Programming Socket

6 Appendix

6.1 Related Products

- SK-96370-144PMC-GDC — Evaluation board for the MB96F37xxxPMC MCU in FPT-144P-M08 (LQFP-144) package including external memory and GDC connector
- SK-96370-144PMC — Evaluation board for the MB96F37xxxPMC MCU in FPT-144P-M08 (LQFP-144) package
- MB2198-01 — Emulator debugger main unit
- MB2198-500 — Emulation Pod
- NQPACK144SD-ND — Socket for package FPT-144P-M08 (LQFP-144) (Tokyo Eletech Corp. www.tetc.co.jp/e_tet.htm)
- HQPACK144SD — Socket header for package FPT-144P-M08 (LQFP-144) (Tokyo Eletech Corp. www.tetc.co.jp/e_tet.htm)
- MB2198-507-E — Emulator probe cable for MB96F37x MCU
- MB96300 Series
  - MB96V300 — MB96300 Series Evaluation chip
  - MB96F37xRS — Flash MCU (Single Clock)
  - MB96F37xRW — Flash MCU (Dual Clock)

7 Information in the WWW

Information about FUJITSU MICROELECTRONICS Products
can be found on the following Internet pages:

Microcontrollers (8-, 16- and 32bit), Graphics Controllers
Datasheets and Hardware Manuals, Support Tools (Hard- and Software)

http://mcu.emea.fujitsu.com/

Power Management Products

http://www.fujitsu.com/emea/services/microelectronics/powerman/

Media Products: SAW filters, acoustic resonators and VCOs

http://www.fujitsu.com/emea/services/microelectronics/saw/

For more information about FUJITSU MICROELECTRONICS

http://www.fujitsu.com/emea/services/microelectronics/

8 China-RoHS regulation

Evaluation Board评估板

Emulation Board 仿真板

根据SJ/T11364-2006

《电子信息产品污染控制标识要求》特提供如下有关污染控制方面的信息。

The following product pollution control information is provided according to SJ/T11364-2006 *Marking for Control of Pollution caused by Electronic Information Products*.

1．电子信息产品污染控制标志说明 Explanation of Pollution Control Label

该标志表明本产品含有超过中国标准SJ/T11363-2006

《电子信息产品中有毒有害物质的限量要求》中限量的有毒有害物质。标志中的数字为本产品的环保使用期，表明本产品在正常使用的条件下，有毒有害物质不会发生外泄或突变，用户使用本产品不会对环境造成严重污染或对其人身、财产造成严重损害的期限，单位为年。

为保证所申明的环保使用期限，应按产品手册中所规定的环境条件和方法进行正常使用，并严格遵守产品维修手册中规定的定期维修和保养要求。

产品中的消耗件和某些零部件可能有其单独的环保使用期限标志，并且其环保使用期限有可能比整个产品本身的环保使用期限短。应到期按产品维修程序更换那些消耗件和零部件，以保证所申明的整个产品的环保使用期限。

本产品在使用寿命结束时不可作为普通生活垃圾处理，应被单独收集妥善处理。

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This symbol to be added to all EIO sold to China, indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 *Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products*. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period, starting from the manufacturing date, during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets, the unit of the period is “Year”.

In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.

Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures.

This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

Please note: The designation of 10 years EFUP is not to be equated with the durability, use-duration or any warranty-claims of the product.

产品中有毒有害物质或元素的名称及含量

Table of hazardous substances name and concentration

部件名称 Component Name	有毒有害物质或元素 Hazardous substances name					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
SK-96370-144PMC-GDC	x	o	o	o	o	o

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求

- 此表所列数据为发布时所能获得的最佳信息
- 由于缺少经济上或技术上合理可行的替代物质或方案，此医疗设备运用以上一些有毒有害物质来实现设备的预期临床功能，或给人员或环境提供更好的保护效果。

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

- Data listed in the table represents best information available at the time of publication

9 Recycling

Gültig für EU-Länder:

Gemäß der Europäischen WEEE-Richtlinie und deren Umsetzung in landesspezifische Gesetze nehmen wir dieses Gerät wieder zurück.

Zur Entsorgung schicken Sie das Gerät bitte an die folgende Adresse:

Fujitsu Microelectronics Europe GmbH

Warehouse/Disposal

Monzastraße 4a

63225 Langen

Valid for European Union Countries:

According to the European WEEE-Directive and its implementation into national laws we take this device back.

For disposal please send the device to the following address:

Fujitsu Microelectronics Europe GmbH

Warehouse/Disposal

Monzastraße 4a

63225 Langen