

DSU-FR EMULATOR
F²MC-16FX BGA-416P ADAPTER
MB2198-500-E
OPERATION MANUAL

PREFACE

Thank you for purchasing the DSU-FR*1 emulator F²MC*2-16FX BGA-416P adapter (MB2198-500-E).

This product is a development support tool for performing evaluations of application products that use FUJITSU F²MC-16FX family microcontrollers.

This manual is aimed at engineers developing FUJITSU F²MC-16FX family microcontroller application products using the MB2198-500-E (referred to as the "adapter" in this manual), and describes the handling, functionality, and configuration procedures for the adapter.

*1 : FR, the abbreviation of FUJITSU RISC controller, is a line of products of FUJITSU MICROELECTRONICS LIMITED.

*2 : F²MC is the abbreviation of FUJITSU Flexible Microcontroller.

■ Safe use of this product

This manual contains important information regarding how to use the adapter safely. Read this manual thoroughly before using the adapter, and always use the adapter in accordance with these instructions.

In particular, thoroughly read the “■ Caution of the products described in this document” and Section 6: “Restrictions”, and completely verify that safety is being maintained before using the adapter. After reading the manual, keep it handy for future reference.

■ Warranties and liability

The specifications of this product are subject to change without notice.

Also, please note that FUJITSU MICROELECTRONICS accepts no responsibility for any consequences that result either directly or indirectly from the use of this product.

■ Product operating environment

This product has an operating temperature range of +5 °C to +35 °C and an operating humidity range of 20% to 80%. Use the product in an environment that is free of condensation and avoid high temperature or humidity.

This product consists of a printed circuit board unit without a frame cabinet with exposed electronic components. Accordingly, do not place other objects on top of the circuit board and do not allow the metal parts of the unit to come into contact with people or materials that may have build up static electricity. Similarly, keep any objects that are flammable, likely to cause a short circuit, or cause any other such problem well away from the unit when the power to the unit is turned on.

Keep the unit horizontal as far as possible and do not use in locations that are subject to vibration, dust, explosive gases, or other such dangers.

If the unit is used in an environment that does not satisfy the above guidelines, there is a risk of unexpected damage to property or injury to the user or other people in the vicinity.

You should also keep the packaging materials used for shipping the product. They work well as they are when you transport the product again, for example, if it becomes out of order and needs to be repaired.

■ Related manuals

Please refer also to the following manuals.

- Evaluation MCU hardware manual
- Header operation manual
- “DSU-FR EMULATOR MB2198-01-E OPERATION MANUAL”
- “SOFTUNE Workbench OPERATION MANUAL”

■ European RoHS compliance

A product whose parts number has trailing characters “E” is RoHS compliant.

■ Notice on this document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.

Please confirm the latest relevant information with the sales representatives.

■ **Caution of the products described in this document**

The following precautions apply to the product described in this manual.



Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	The MCU socket is structured to accept an evaluation MCU in a wrong direction or position. Pay due attention to the direction of mounting when mounting the evaluation MCU.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

- The contents of this document are subject to change without notice. Customers are advised to consult with sales representatives before ordering.
- The information, such as descriptions of function and application circuit examples, in this document are presented solely for the purpose of reference to show examples of operations and uses of FUJITSU MICROELECTRONICS semiconductor device; FUJITSU MICROELECTRONICS does not warrant proper operation of the device with respect to use based on such information. When you develop equipment incorporating the device based on such information, you must assume any responsibility arising out of such use of the information. FUJITSU MICROELECTRONICS assumes no liability for any damages whatsoever arising out of the use of the information.
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1. Product Overview

■ Overview

This product is used in combination with one of the F²MC-16FX family headers (MB2198-5xx-E, referred to as the “header” in this manual) to connect a user system that uses a FUJITSU F²MC-16FX family microcontroller to the DSU-FR emulator (MB2198-01-E, referred to as the "emulator" in this manual).

The main features of the adapter are as follows.

- The adapter consists of an adapter board and flat cables (two sets of standard and long).
- An IC socket (BGA-416 pin, package type: BGA-416P-M02) for mounting an evaluation MCU is built into the adapter board
- Flat cables (standard or long) are used to connect to the header
- Used in combination with a header to connect an emulator to a user system
- The adapter board power supply is supplied by the emulator or the user system via the header board
- Supports internal ROM emulation
- Supports external trace
- Supports power-on debugging

■ Verifying the contents of the package

Verify that the following items are contained in the package before using the adapter.

- | | |
|--|---|
| • Adapter board: | 1 |
| • Flat cables (standard: 8 cm): | 2 |
| • Flat cables (long: 20 cm): | 2 |
| • Operation manual (English version: this manual): | 1 |
| • Operation manual (Japanese version): | 1 |

■ Option products

Table 1 shows the option products available for the adapter. Please purchase these separately, as required.

Table 1 Option products

Name	Model
Evaluation MCU*1	FUJITSU F ² MC-16FX family microcontroller
DSU-FR emulator*2	MB2198-01-E
Various F ² MC-16FX headers*3	MB2198-5xx-E
Expansion trace board*4	MB2198-590-E

*1 : The package type of the evaluation MCU is BGA-416P-M02.

Please contact the sales or support representative for information on the evaluation MCU models and package types that can be used with the adapter.

*2 : Debugging software, communication cables, etc. need to be obtained separately to use the emulator. Please contact the sales or support representative for details.

*3 : The header is an interface board for connecting the user system to the adapter. When purchasing the header, select the header that suits the mass production MCU being used.

See the operation manual for each header for details on handling the header, using the header, and safety precautions regarding the header.

*4 : The expansion trace board is an external expansion trace board that is used connected to the adapter. Purchase this board when using the large capacity (2 Gbyte) trace function.

See the Expansion trace board operation manual for details on handling and using the trace board, and safety precautions regarding the trace board.

2. Product Description

■ System configuration

The adapter is used in combination with a header to connect the emulator to a user system. Figure 1 shows a schematic of the system configuration of this product.

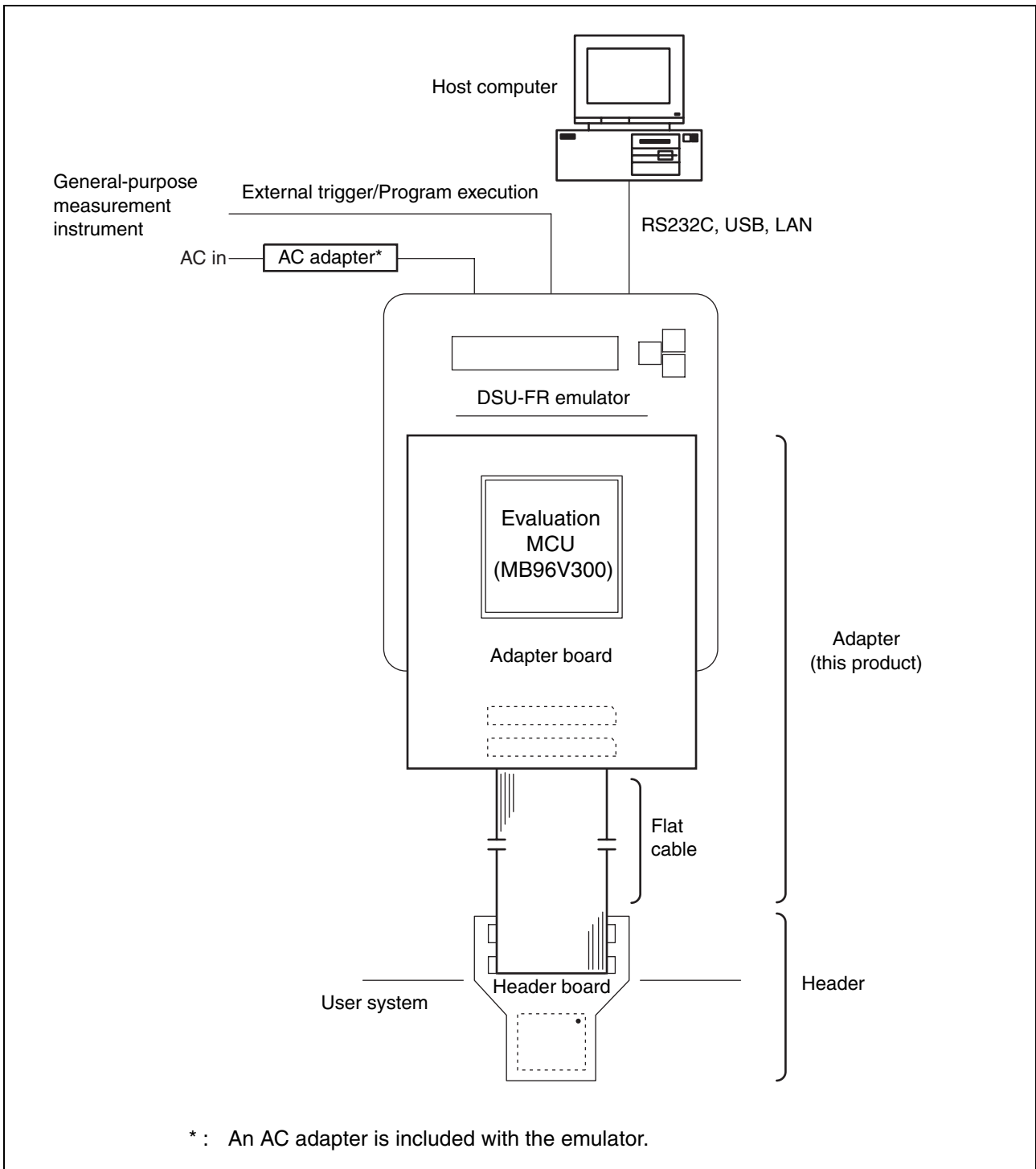


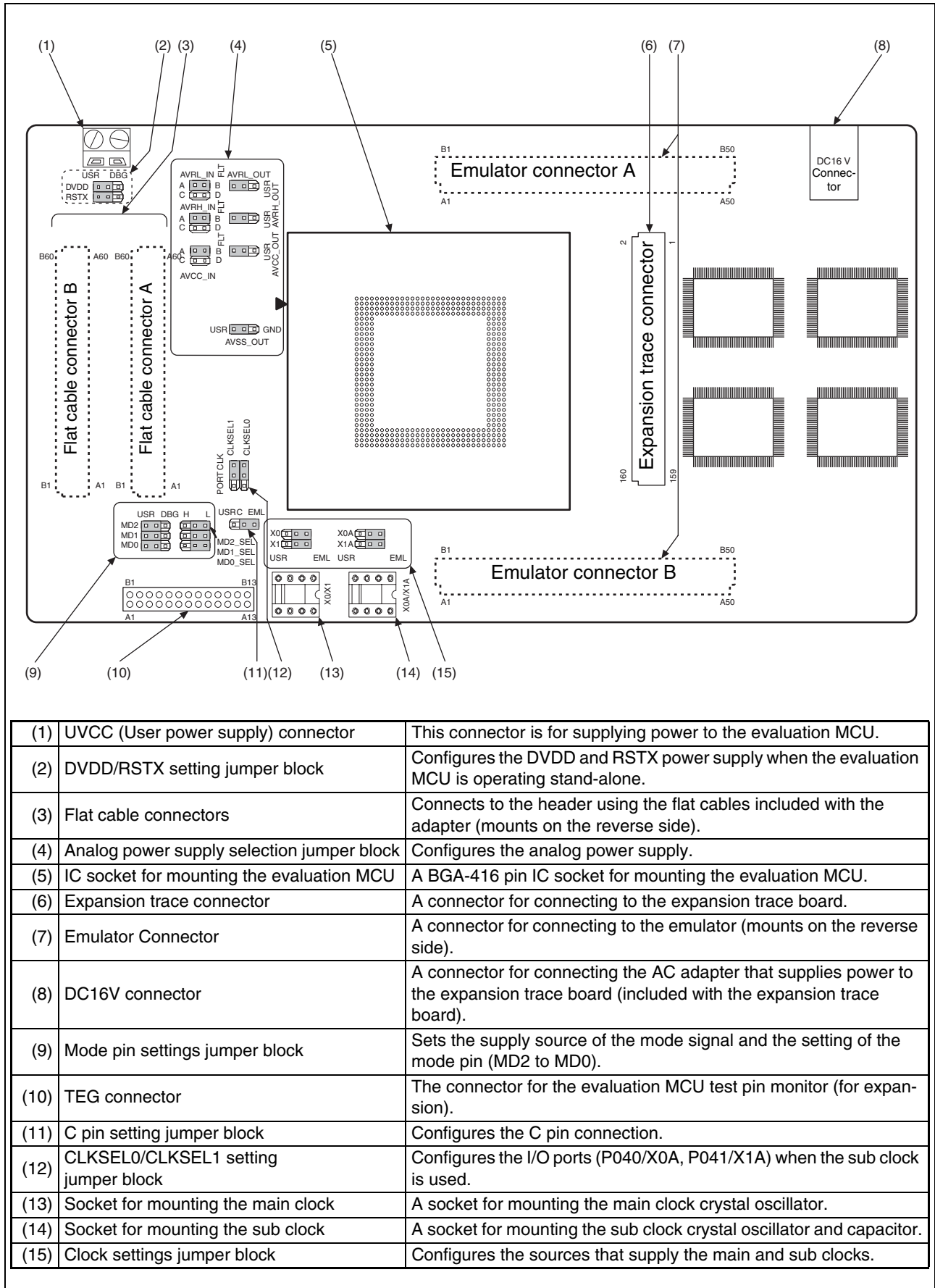
Figure 1 System configuration

See the emulator operation manual for details on connecting the emulator to a host computer or general-purpose measurement device.

The host computer and emulator debugging software need to be obtained separately to use the emulator. See the emulator operation manual for details on the emulator specifications.

■ External appearance and component names

Figure 2 shows the external appearance and the names of each of the components of the adapter board. Note that Figure 2 shows the state of the board when it is shipped.



(1)	UVCC (User power supply) connector	This connector is for supplying power to the evaluation MCU.
(2)	DVDD/RSTX setting jumper block	Configures the DVDD and RSTX power supply when the evaluation MCU is operating stand-alone.
(3)	Flat cable connectors	Connects to the header using the flat cables included with the adapter (mounts on the reverse side).
(4)	Analog power supply selection jumper block	Configures the analog power supply.
(5)	IC socket for mounting the evaluation MCU	A BGA-416 pin IC socket for mounting the evaluation MCU.
(6)	Expansion trace connector	A connector for connecting to the expansion trace board.
(7)	Emulator Connector	A connector for connecting to the emulator (mounts on the reverse side).
(8)	DC16V connector	A connector for connecting the AC adapter that supplies power to the expansion trace board (included with the expansion trace board).
(9)	Mode pin settings jumper block	Sets the supply source of the mode signal and the setting of the mode pin (MD2 to MD0).
(10)	TEG connector	The connector for the evaluation MCU test pin monitor (for expansion).
(11)	C pin setting jumper block	Configures the C pin connection.
(12)	CLKSEL0/CLKSEL1 setting jumper block	Configures the I/O ports (P040/X0A, P041/X1A) when the sub clock is used.
(13)	Socket for mounting the main clock	A socket for mounting the main clock crystal oscillator.
(14)	Socket for mounting the sub clock	A socket for mounting the sub clock crystal oscillator and capacitor.
(15)	Clock settings jumper block	Configures the sources that supply the main and sub clocks.

Figure 2 External appearance

■ General specifications

Table 2 shows the general specifications for the adapter.

Table 2 General specifications

Item	Specification
Name	DSU-FR emulator F ² MC-16FX BGA-416P adapter
Model number	MB2198-500-E
Power supply	User power supply* : +3.3V to +5.5V (UVcc) Tool power supply : +3.3V (supplied by emulator)
Operating temperature	+5 °C to +35 °C
Operating humidity	20% to 80% (no condensation)
Storage temperature	0 °C to +70 °C
Storage humidity	20% to 80% (no condensation)
External dimensions	109mm (W) × 204mm (D) × 33mm (H) (including IC sockets and connectors)
Weight	200g

* : Power is supplied from the power supply connected to the UVCC connector of the adapter or the power supply of the user system on the header. Power cannot be supplied from both of these power supplies simultaneously.

3. Function Descriptions

■ Function specifications

Table 3 shows the specifications of the functions of the adapter.

Table 3 Adapter function specifications

Item	Description
Adapter function	Used in combination with the DSU-FR emulator and a header, and functions as an adapter that connects emulator ↔ Evaluation MCU ↔ User system.
Stand-alone function	Because power can be supplied to the evaluation MCU from the adapter, the emulator system can be started without connecting to a user system.
External trace memory	Supports the external trace function. Trace capacity of 64 Ksteps (1 step: 64 bits) Can be expanded to 256 Mword by connecting the expansion trace board*1
Internal ROM emulation memory	The adapter is equipped with emulation memory that is used as the program and data access region for the evaluation MCU. Capacity of 2 MB (32 bit × 512 Kword)
Power-on debugging	Supports the power-on debugging*2 function that is able to debug programs that execute immediately when the evaluation MCU power is turned on.
Jumper block	There are jumper blocks on the adapter board that can be used to configure various adapter settings.
Clock IC socket	The adapter board is equipped with IC sockets that are used for crystal oscillators, and that enable clock signals to be supplied from the adapter to the main clock (X0/X1) and sub clock (X0A/X1A) pins of the evaluation MCU.

*1 : The external trace memory built into the adapter board cannot be used at the same time as the trace memory on the expansion trace board.

*2 : This function is necessary in order to support the power-on debugging function for the evaluation MCU. Please contact the sales or support representative before using this function.

■ Connector and socket specifications

Table 4 shows the connector and IC socket specifications.

Table 4 Connector and IC socket specifications

Item	Description
Emulator connector	Connects the adapter to the emulator. See Section 4. Connection ■ Connecting the adapter board to the emulator for details on how to connect the emulator.
Flat cable connectors	Uses the flat cables included with the adapter to connect to the header. See Section 4. Connection ■ Connecting the adapter board to the header board for details on how to connect the flat cables.
IC socket for mounting the evaluation MCU	Mounts the evaluation MCU (BGA-416P package). See Section 4. Connection ■ Connecting the evaluation MCU for details on how to mount the evaluation MCU.
Expansion trace connector	Mounts the optional expansion trace board. See Section 4. Connection ■ Connecting the expansion trace board for details on how to mount the expansion trace board.
UVCC connector	A connector for supplying power to the adapter when using the stand-alone function. See Section 5.1. Configuring the evaluation MCU power supply for details on how to supply power to the evaluation MCU.
Crystal oscillator IC socket	Mounts the crystal oscillator and the capacitors for the crystal oscillator. See Section 5.2. Clock supply settings for details on mounting the crystal oscillator and capacitors.

4. Connection

■ Connecting the adapter board to the emulator

Connect the adapter board to the adapter board connector on the emulator.

The method for connecting the adapter board to the emulator is shown in Figure 3.

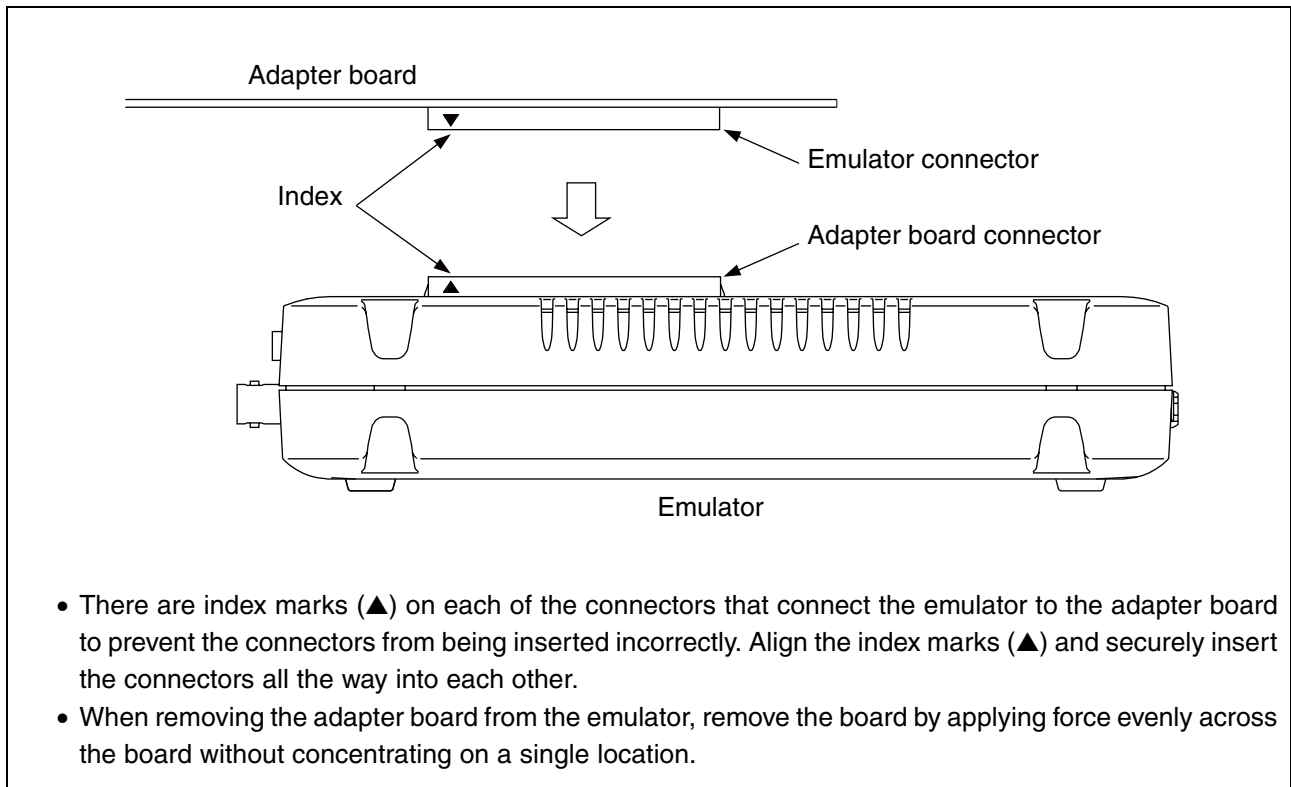


Figure 3 Connecting the adapter board to the emulator

Note : Turn off the power supply before connecting or disconnecting the board.

■ Connecting the adapter board to the header board

The adapter board is connected to the header board using the flat cables included with the adapter. The way in which the adapter board is connected to the header board is shown in Figure 4.

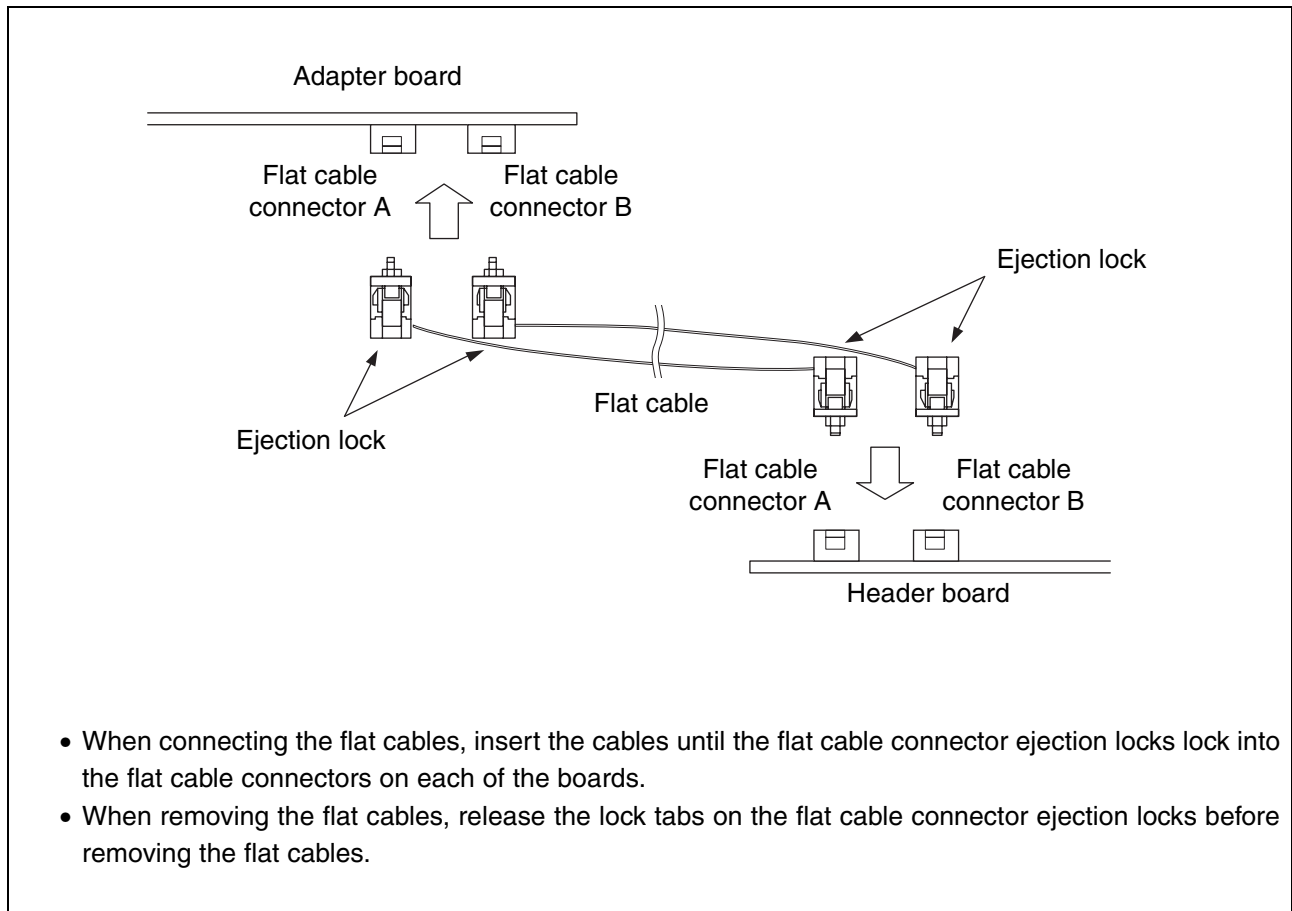


Figure 4 Connecting the adapter board to the header board

Note : Turn off the power supply before connecting or disconnecting the cables.

■ Mounting the evaluation MCU

The evaluation MCU is mounted in the IC socket for mounting the evaluation MCU on the adapter board.

- (1) Push down on the four corners of the cover of the evaluation MCU IC socket (SC1) (see the left side of Figure 5).
- (2) Align the cutout corner of the evaluation MCU with location of pin 1 of the IC socket (SC1) and insert the evaluation MCU keeping it horizontal (see the right side of Figure 5).
- (3) When the cover of the IC socket for mounting the evaluation MCU (SC1) that was pushed down is released, it returns to the upper position under the force of a spring and locks the evaluation MCU into the IC socket (see the left side of Figure 5).
- (4) When removing the evaluation MCU, push down the cover the same as in Step (1) and remove the evaluation MCU (see the left side of Figure 5).

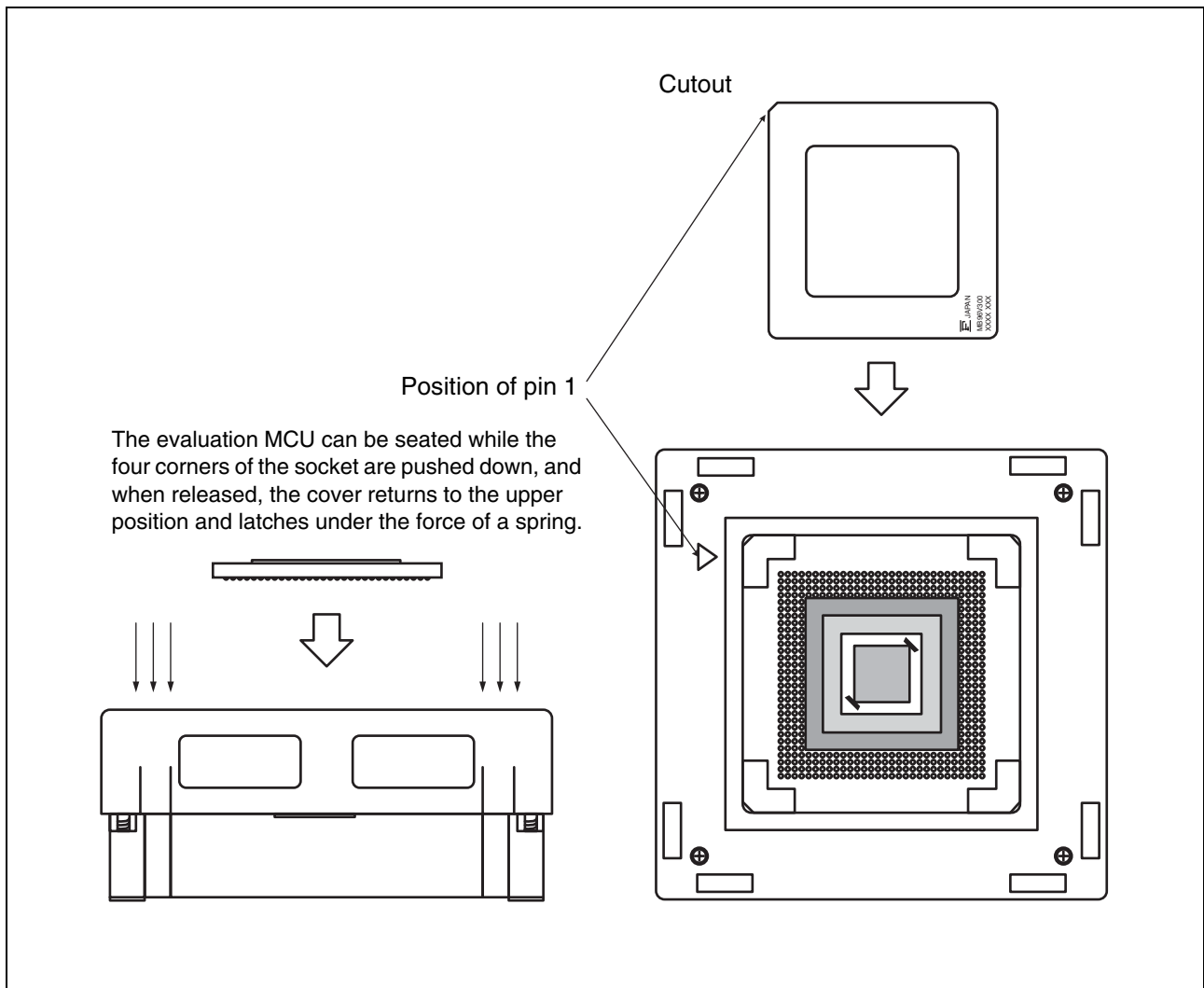


Figure 5 Mounting the evaluation MCU

■ Connecting the expansion trace board

To use the large capacity external trace function, connect the expansion trace board to the expansion trace connector on the adapter board.

See the operation manual of the expansion trace board for details on connecting the board.

5. Operation

This section describes how to configure each of the basic settings before turning the power on, and the procedures for turning the power on and off.

Be sure to read this section before turning the power on.

5.1 Configuring the evaluation MCU power supply

This section describes the jumper blocks that configure each of the power supply settings for the evaluation MCU.

■ Configuring the evaluation MCU power supply

Figure 6. shows the method for connecting the evaluation MCU power supply.

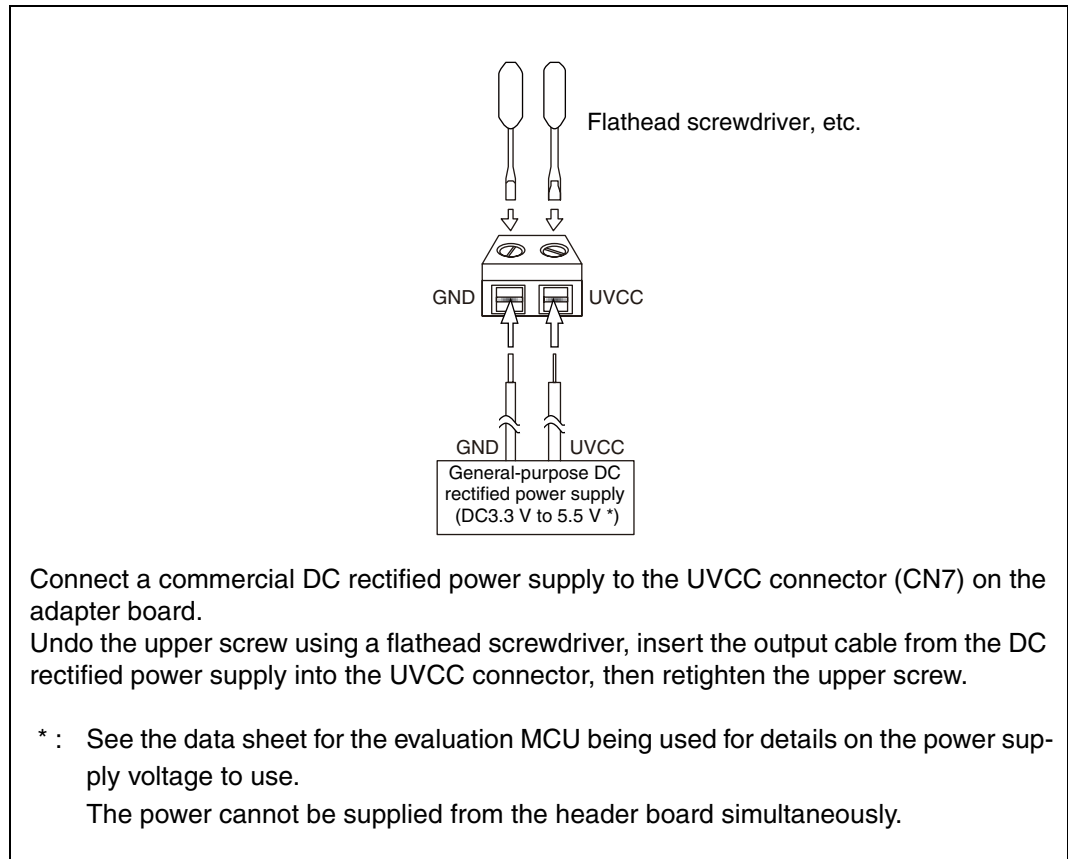


Figure 6 Connecting the evaluation MCU power supply

■ **Debugging power supply selection settings**

If a user system is not being used and the evaluation MCU is operating stand-alone, the debugging power supply that is supplied to the DVDD, RSTC and mode setting pins can be selected. The debugging power supply selection circuit is shown in Figure 7 and each of the jumper block settings are shown in Table 5. The factory default settings of all of the jumper blocks are shown in Figure 8.

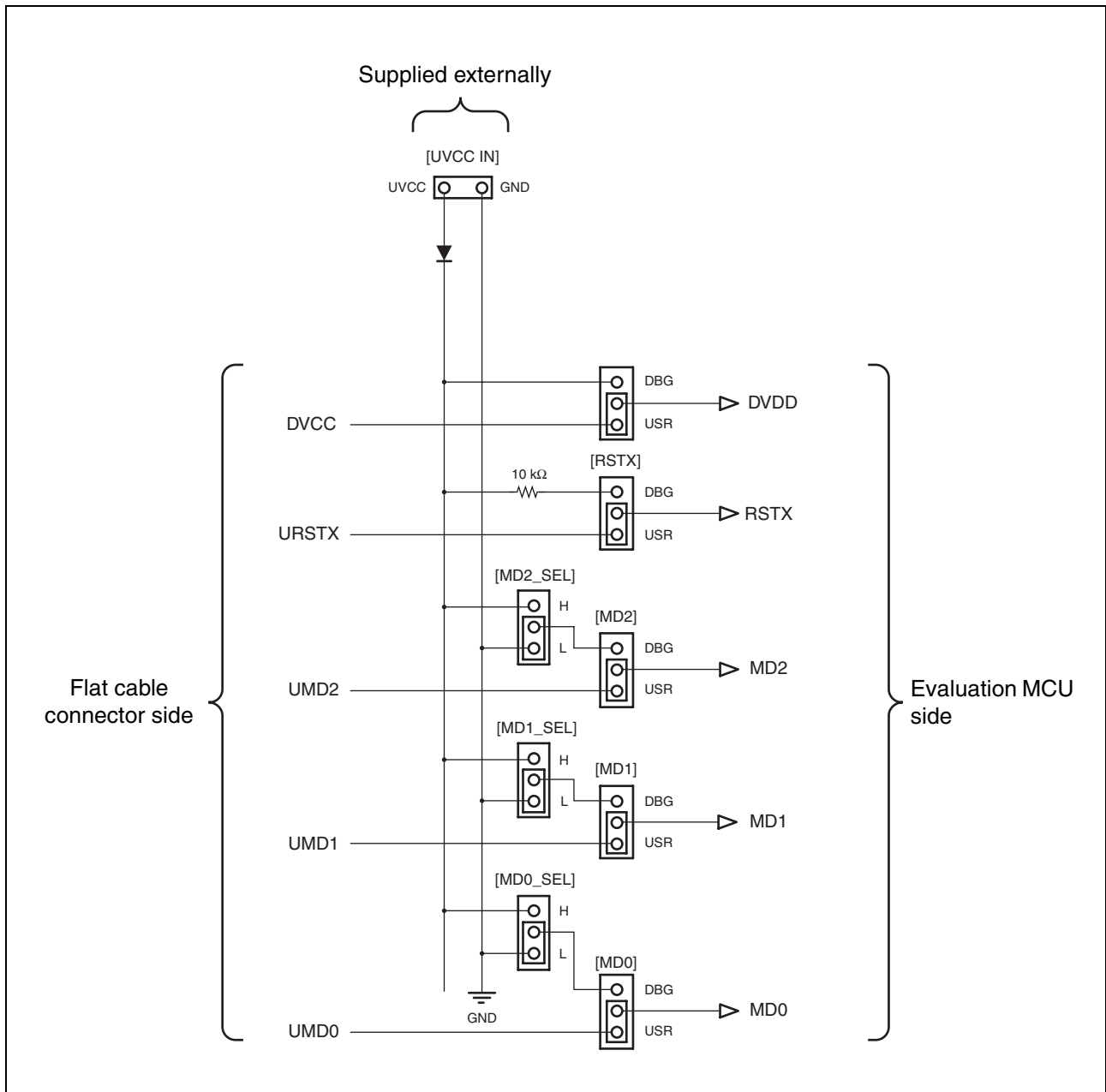


Figure 7 Debugging power supply selection circuit

Table 5 Jumper block settings

Jumper block name	Setting	Evaluation MCU power supply specification
DVDD	DBG	Supplies power from the DC rectified power supply connected to the UVCC connector (CN7).
	USR	Supplies the DVCC power from the user system.
RSTX	DBG	Add 10kΩ resistor for pull-up to the power supply that is supplied from the UVCC connector (CN7).
	USR	Supplies the RSTX signal from the user system.
MD2 MD1 MD0	DBG	Supplies the mode pin signals from the adapter board.
	USR	Supplies the mode pin signals from the user system.
MD2_SEL MD1_SEL MD0_SEL	H	Configures the evaluation MCU mode pins. This setting is valid when the MD2 to MD0 jumpers are set to the DBG side. Each of the signal levels are connected to the UVCC connector (CN7) and have the output level of the DC rectified power supply.
	L	

Note : Do not supply power from the flat cable connectors if power is being supplied from the UVCC connector.

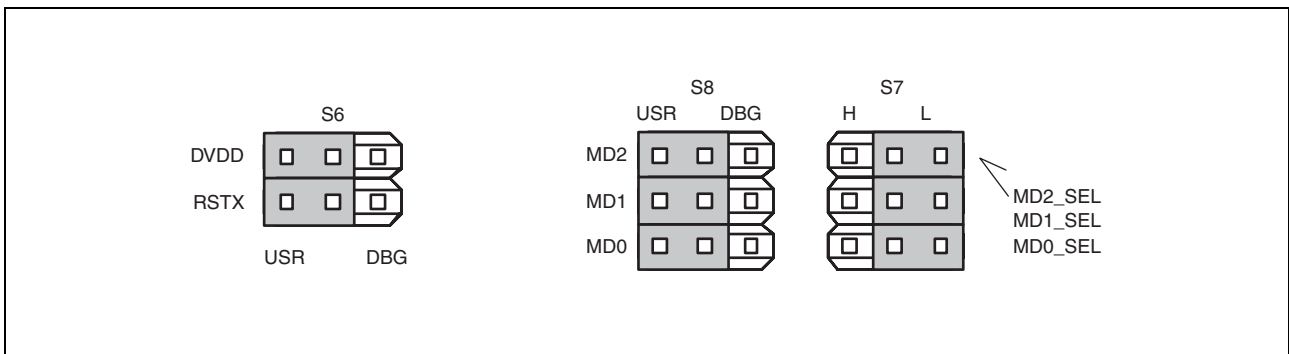


Figure 8 Factory default settings

5.2 Clock supply settings

When the emulator is being used, the clock circuit needs to be treated as specified. See the following description to configure the clock peripheral circuit.

■ Mounting a crystal oscillator

If the clock signals for the main clock (X0/X1) and sub clock (X0A/X1A) of the evaluation MCU are to be supplied from the adapter board, mount the crystal oscillators and capacitors in the crystal oscillator IC sockets (SC2 and SC3) on the adapter board. The way in which the crystal oscillators and capacitors are mounted is shown in Figure 9.

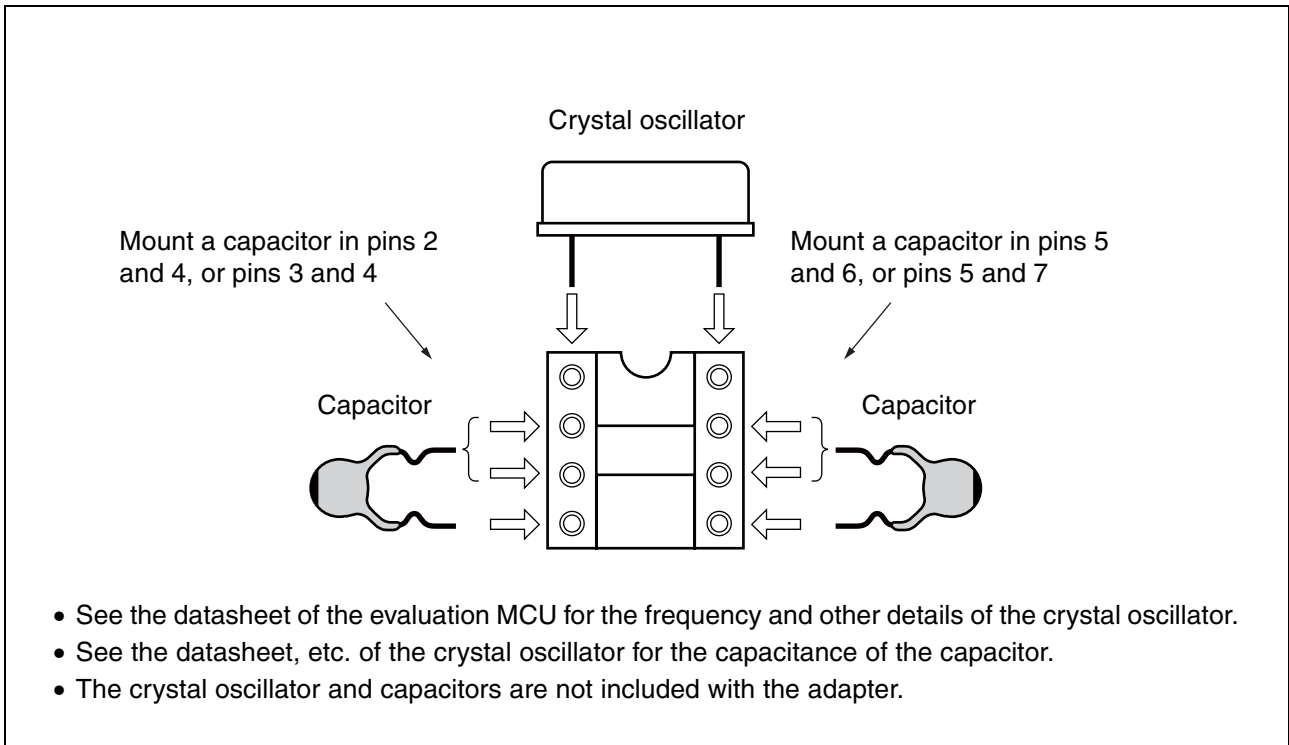


Figure 9 Mounting the crystal oscillator and capacitors

Note : For a capacitor that is mounted with the oscillator, use a capacitor about 10pF smaller than the recommended value of the oscillator.

When a capacitor of the recommended value of the oscillator is mounted, an oscillator stabilization time becomes longer than the standard time due to the parasitic capacitance of a socket and the influence of an interconnect load and that may cause a failure such as instability of clock switching operation etc.

■ **Clock selection jumper block settings**

The settings of the clock selection jumper block (factory default settings) are shown in Figure 10 and the settings of the jumper block for selecting the clock and for configuring the dual-purpose port/sub clock input pins are shown in Table 6.

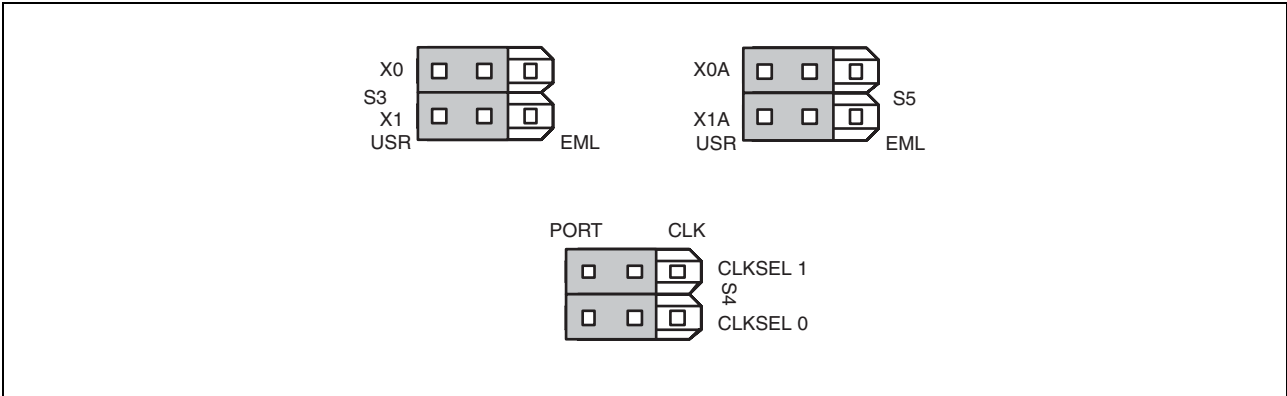


Figure 10 Clock selection jumper block settings (factory default settings)

Table 6 Jumper block settings

Jumper block name	Setting	Clock supply
X1 X0	USR	Supplies the main clock from the user system
	EML	Supplies the main clock from the crystal oscillator IC socket on the adapter board
X1A X0A	USR	Supplies the sub clock from the user system
	EML	Supplies the sub clock from the crystal oscillator IC socket on the adapter board
CLKSEL 1 CLKSEL 0	PORT	The dual-purpose port/sub clock input pins (P040/X0A and P041/X1A) are used as ports
	CLK	The dual-purpose port/sub clock input pins (P040/X0A and P041/X1A) are used as sub clock input pins

Note : There is no function to supply the clock signal to the user system from the adapter.

5.3 Analog power supply settings

This section describes the jumper block settings for configuring the analog power supply (AVCC, AVRH, AVRL, and AVSS) pins.

■ AVCC, AVRH, AVRL, and AVSS pin settings

The analog power supply selection circuit is shown in Figure 11 and the jumper block settings are shown in Table 7. The factory default settings of all of the jumper blocks are shown in Figure 12.

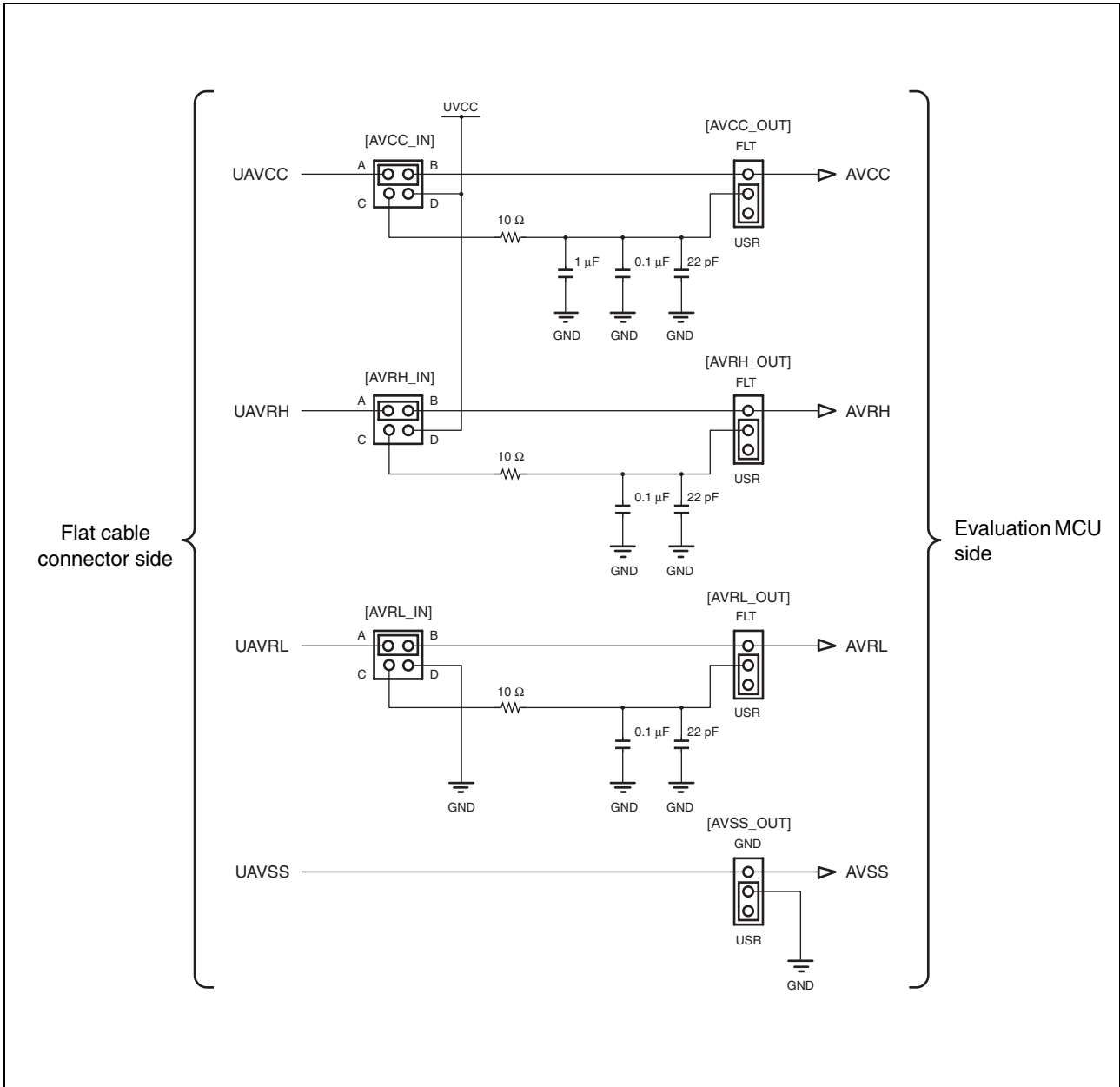


Figure 11 Analog power supply selection circuit

Table 7 Jumper block settings for the analog power supply selection circuit

Jumper block name	Setting	Connection specification
AVCC_IN	A-B	Selects the analog power supply (AVCC) from the user system
	A-C	Selects power supplied by applying an RC filter to the analog power supply (AVCC) from the user system
	B-D	Selects the analog power supply (VDD) from the UVCC connector
	C-D	Selects power supplied by applying an RC filter to the analog power supply (VDD) from the UVCC connector
AVCC_OUT	USR	The power supply selected for AVCC_IN is supplied to the analog power supply (AVCC) of the evaluation MCU
	FLT	An RC filter is applied to the power supply selected for AVCC_IN, and this is supplied to the analog power supply (AVCC) of the evaluation MCU
AVRH_IN	A-B	Selects the analog power supply (AVRH) from the user system
	A-C	Selects power supplied by applying an RC filter to the analog power supply (AVRH) from the user system
	B-D	Selects the analog power supply (VDD) from the UVCC connector
	C-D	Selects power supplied by applying an RC filter to the analog power supply (VDD) from the UVCC connector
AVRH_OUT	USR	The power supply selected for AVRH_IN is supplied to the analog power supply (AVRH) of the evaluation MCU
	FLT	An RC filter is applied to the power supply selected for AVRH_IN, and this is supplied to the analog power supply (AVRH) of the evaluation MCU
AVRL_IN	A-B	Selects the analog power supply (AVRL) from the user system
	A-C	Selects power supplied by applying an RC filter to the analog power supply (AVRL) from the user system
	B-D	The analog power supply (AVRL) of the evaluation MCU is connected to the GND
	C-D	The RC filter is connected to the GND
AVRL_OUT	USR	The power supply selected for AVRL_IN is supplied to the analog power supply (AVRL) of the evaluation MCU
	FLT	An RC filter is applied to the power supply selected for AVRL_IN, and this is supplied to the analog power supply (AVRL) of the evaluation MCU
AVSS	USR	Connects the analog power supply (AVSS) from the user system to the analog power supply (AVSS) of the evaluation MCU
	GND	Connects GND to the analog power supply (AVSS) of the evaluation MCU

Note : Power supply noise may occur due to length of the distribution line that supplies power from the user system to the analog power supply. If this occurs, please supply the power supply where the RC filter on the adapter board is added (see Figure 11).

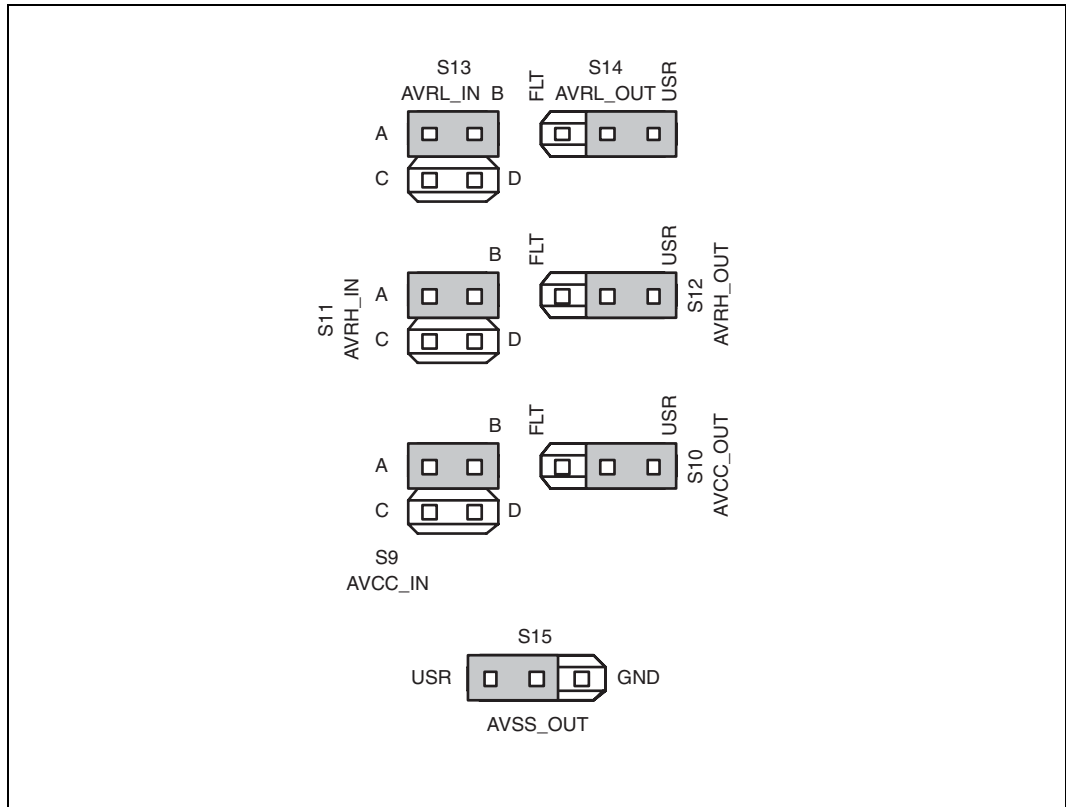


Figure 12 Factory default jumper block settings

5.4 C pin settings

Table 8 shows the jumper settings for the C pin connection.

The factory default jumper block settings are shown in Figure 13.

Table 8 C pin jumper block settings

Jumper block name	Setting	Connection specification
C	USR	Connects the capacitor on the user system to the C pin of the evaluation MCU
	EML	Connects the capacitor on the adapter to the C pin of the evaluation MCU

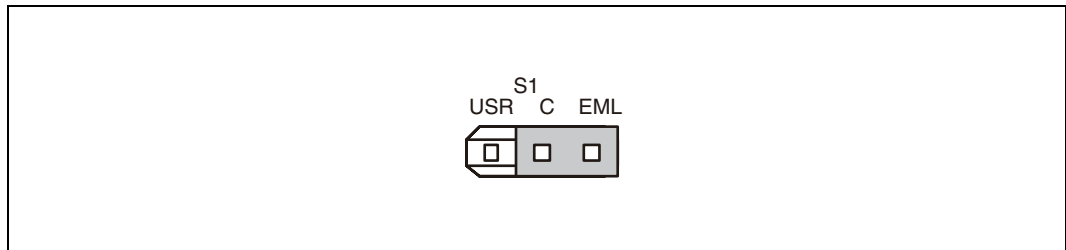


Figure 13 Factory default settings

5.5 Procedures for turning the power on and off

Please turn on the power supply in the sequence of Host computer → Emulator → User system after completing all the connections.

Turn the power off in the sequence of User system → Emulator → Host computer.

■ Procedure for turning the power on

Please turn on the power supply according to the procedure shown in Figure 14 after completing all the connections.

The emulator power can be turned on by pressing down the power switch on the rear of the emulator.

The switch then remains in the depressed position.

See the operation manual of the emulator for details on the position of the power switch.

The emulator needs to be initialized (monitor loading) immediately after the adapter is delivered and before the power is turned on to the user system. See the “SOFTUNE Workbench OPERATION MANUAL” for details on how to perform the initialization.

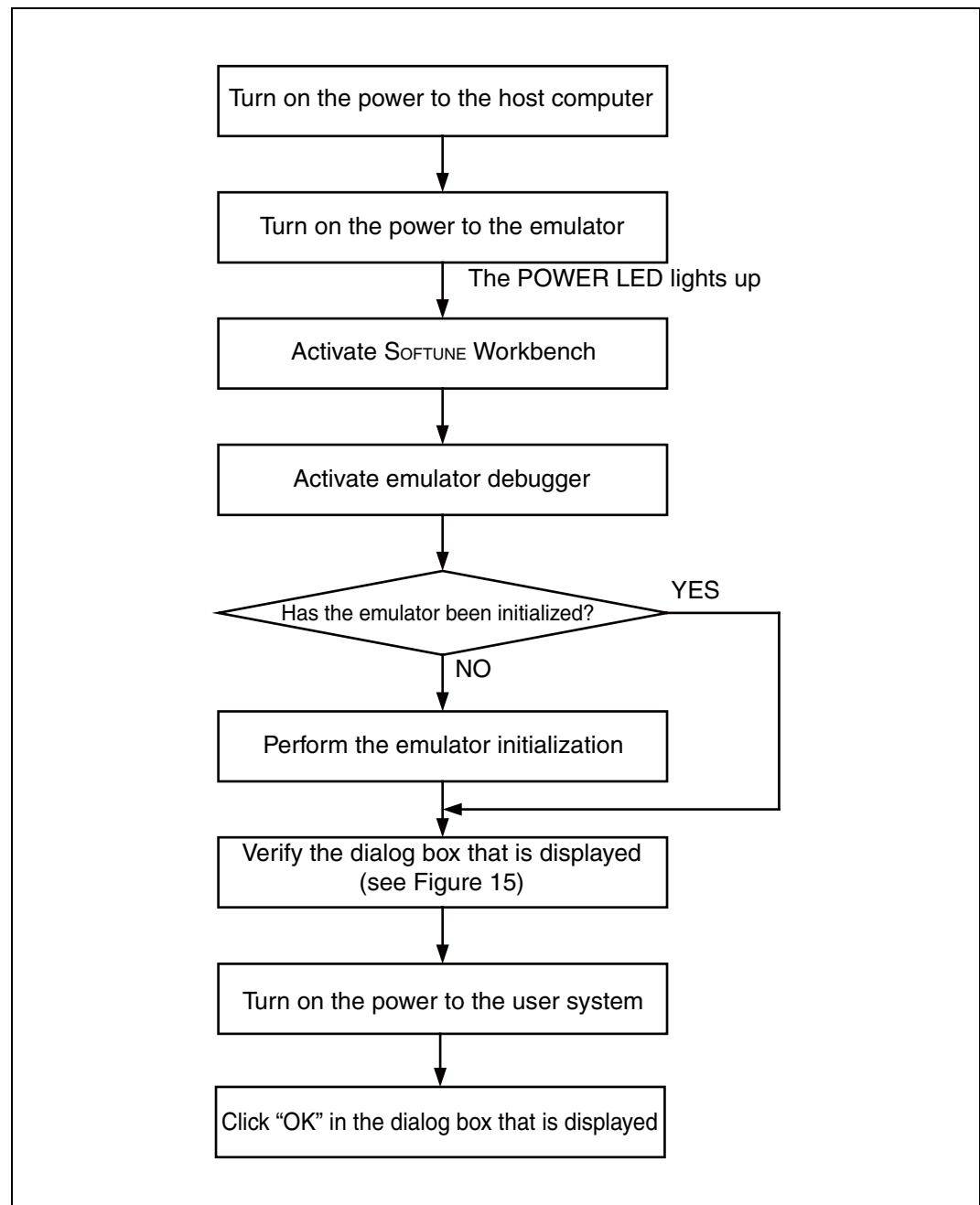


Figure 14 Procedure for turning the power on

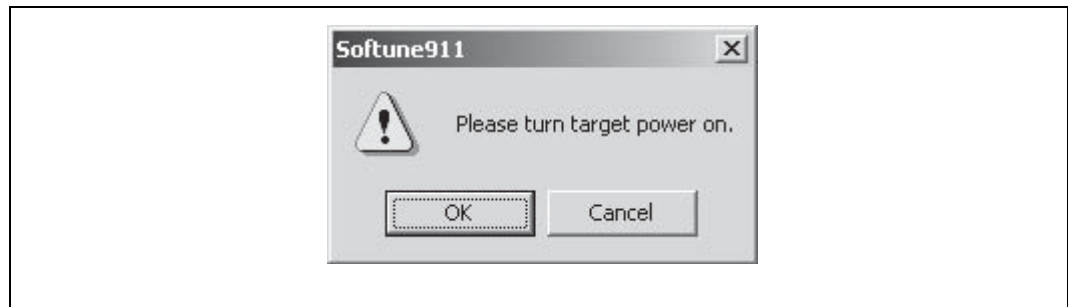


Figure 15 Dialog box displayed

■ **Procedure for turning the power off**

Turn the power off by following the procedure shown in Figure 16.

The emulator power can be turned off by pressing down and releasing the power switch on the rear of the emulator. The switch then returns to the off position (in which the switch protrudes out).

See the operation manual of the emulator for details on the position of the power switch.

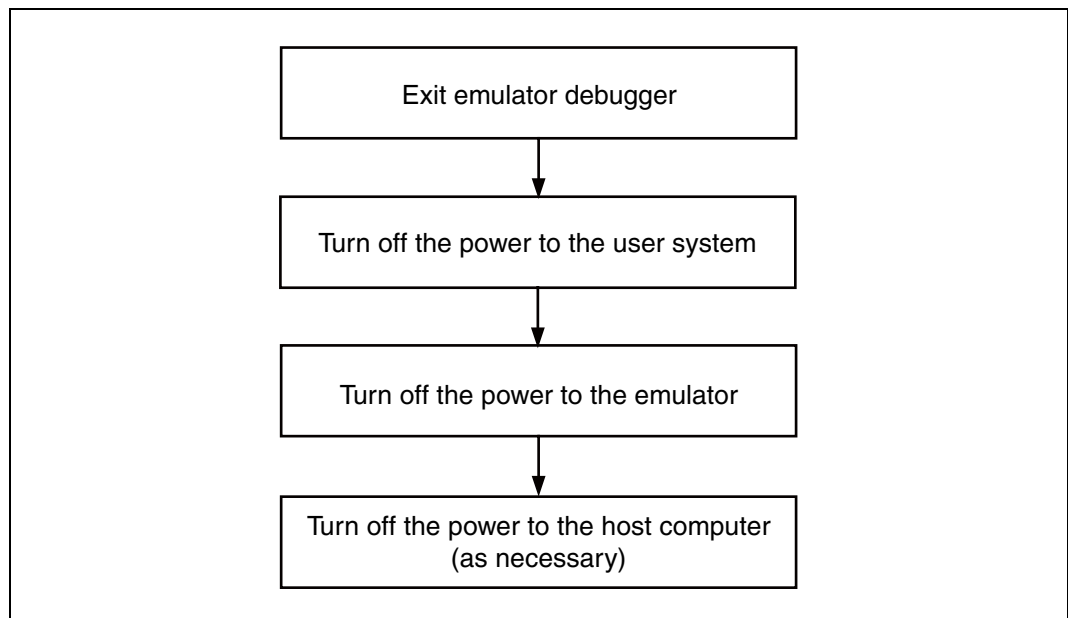


Figure 16 Procedure for turning the power off

6. Restrictions

This section describes items to be noticed when using the product.

In particular, please note that there are many restrictions when using the power-on debugging function.

■ Overall adapter restrictions

- Turn off the power to each of the adapter, the emulator, and the user system before changing jumper settings or switches on the adapter board.
- If the power supply settings for the evaluation MCU are incorrect, there is a risk of damaging the entire system.
- Use a crystal oscillator if the clock signal is supplied to the evaluation MCU from the user system.
- If a crystal oscillator is used to supply a clock signal from the user system to the evaluation MCU, one of the restrictions on the evaluation MCU is that if there is an instruction that sets the X0 pin or the X1 pin to open, the jumper plug that selects the supply source of the clock signal of that pin should be removed. This restriction also applies to the X0A/X1A pins.
- See the datasheet of the evaluation product for details on the states of the user bus pins when the evaluation MCU is in user hold/low-power consumption mode.
- The flat cable (long) can be used if the MCU clock frequency is low or the load on the user pins is exceptionally light. Normally use the flat cable (standard).
- When using the adapter and header, always ensure that the MCU on the user system is mounted in the socket. Use the designated socket for the IC socket.
- Do not supply power from the adapter, header, or emulator to the user system.
- The power cannot be supplied both from the UVCC connector on the adapter board and the user system via the header at the same time.
- When the emulator is being used, the INITX pin of the evaluation MCU is controlled from the emulator side, and the reset input from the user system is input to the evaluation MCU via the emulator. The timing with which the reset becomes effective is therefore delayed by a number of clock cycles, therefore use the reset signal setting jumper set to the emulator side. Furthermore, a reset initiated by the reset command of the emulator only has an effect on the evaluation MCU and does not reset the user system. In addition, signals to the INITX pin from the user system during a break are masked on the emulator side.
- Data in the internal ROM emulation memory and the external trace memory is lost when the power to the user system is turned off.

■ Restrictions when using the power-on debugging function

- Take extreme care regarding the power-supply related settings when performing power-on debugging.
- Ensure that the following three conditions are satisfied when turning the power off during power-on debugging.
 - The time for all of the power supply levels of the evaluation MCU to fall from 0.9V_{cc} to 0.5V_{cc} is 25μs or more.
 - The CPU operating frequency is 1MHz or more.
 - A user program is executing.
- See the hardware manual for the evaluation MCU, the operation manual for the emulator, etc. for details on the power-on debugging function.

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