

DSU-FR EMULATOR

MB2198-01

HARDWARE MANUAL

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HARDWARE MANUAL

PREFACE

■ Using the Product Safely

This manual provides important information on using this product safely. Read this manual carefully before using the product to ensure correct use.

In particular, carefully read "Safety Precautions" in this Preface before using the product so that you understand the requirements for safe use of the product.

After reading this manual, keep it handy for reference.

■ Objectives and Intended Readers

The MB2198-01 is a development support tool used to develop and evaluate application products that use microcontrollers of the FR family.

This manual is intended for engineers who use the MB2198-01 (hereafter called the emulator) to develop application products with Fujitsu FR-family microcontrollers. The manual explains how to handle and connect the emulator.

■ Trademarks

FR is the abbreviation of FUJITSU RISC Controller.

■ Guarantee and Liability

The specifications of this product may be changed without prior notice.

The publisher assumes no responsibility for any effect or incident resulting from the operation of this product.





■ Safety Precautions

The following tables contain descriptions of important warnings in this manual and indicate the pages on which they appear.

Before using the product, read these pages so that you fully understand the requirements for safe use of the product.




This symbol indicates that incorrect use of the product may result in death or serious injury to the user.

Warning	Description	Page
<p>Electric shock</p> 	<p>Do not touch the inside of a connector port. Doing so may result in electric shock or device problems.</p>	<p>16</p>
<p>Plug</p> 	<p>If the product emits excessive heat, smoke, an offensive smell, or an unusual noise, turn off power immediately. Then, disconnect the power plug from the outlet. If smoke was detected, make sure that no more smoke is coming from the product. Then, contact our sales or support department to request that the product be repaired. Do not attempt to repair the product by yourself. Otherwise, personal injury, damage to the product, or other property damage may result. Using such a product without having it properly repaired may result in fire or electric shock.</p>	<p>15</p>
	<p>If water or other liquid, a metallic object, or other foreign matter enters the product, immediately turn off power, and disconnect the power plug from the outlet. Then, consult with our sales or support department. Using the product under such abnormal conditions may result in device problems, fire, or electric shock.</p>	<p>15</p>
	<p>Disconnect the power plug during electrical storms. Using the product during an electrical storm may result in damage to the product or fire.</p>	<p>16</p>
<p>No disassembly</p> 	<p>Do not open the product case. Do not modify the product without permission. Doing so may result in device problems, fire, or electric shock.</p>	<p>16</p>
<p>No moisture</p> 	<p>Do not use the product near water such as near a bath or shower. Doing so may result in device problems, fire, or electric shock.</p>	<p>16</p>



⚠ WARNING

This symbol indicates that incorrect use of the product may result in death or serious injury to the user.

Warning	Description	Page
Prohibition 	Do not touch the product with wet hands. Doing so may result in electric shock.	17
	Do not place the product in a location exposed to excessive moisture or dust or in a poorly ventilated location. Do not place the product near an open flame. Doing so may result in device problems, fire, or electric shock.	17
	Do not block the product ventilation holes. Doing so may cause generation of excessive heat, possibly resulting in a fire.	17, 19
	Do not insert metallic, combustible, or other objects or allow them to drop into the product through a ventilation hole or other opening. Doing so may result in device problems, fire, or electric shock.	17
	Do not use a voltage other than the indicated value of supply voltage. Do not connect power cable together with too many plugs to an outlet. Doing so may result in fire or electric shock.	17
	The product must not be scratched, modified, forcibly bent, pulled, twisted, or exposed to heat. Do not place heavy objects on the product. Doing so may result in device problems, fire, or electric shock.	17
	Do not use the product if it has a fault, damage, or sever wires in the cable. Doing so may result in fire or electric shock.	19




⚠ CAUTION

This symbol indicates that incorrect use of the product may result in minor or moderate injury to the user, in damage to the product and any devices connected to it, or in the destruction of data and other software resources or other property.

Warning	Description	Page
<p>Plug</p> 	<p>Disconnect the power plug before moving the product. Disconnect all other connected cables. Exercise caution when working near cables on the floor. Damage to a cable may result in fire or electric shock. A falling device may result in injury.</p>	18
	<p>If the product is not to be used for an extended period, disconnect the power plug. Doing so may result in fire or electric shock.</p>	18
<p>Prohibition</p> 	<p>Do not place the product in a location exposed to shock or a location that is not level or stable. Doing so may result in device problems or the product falling over or falling on the floor.</p>	18
	<p>Do not grasp the cable when unplugging the power plug and cable. Always grasp the power plug or connector itself. Pulling the cable may expose conductors or sever wires in it, possibly resulting in device problems, fire, or electric shock.</p>	18
	<p>Do not place the product in a location, such as near a speaker or television tuner, where it is exposed to an electromagnetic field. Doing so may result in device problems.</p>	18
	<p>Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables, or removing or mounting boards (unless such an operation uses USB cables for plug-and-play devices). Doing so may result in device problems or electric shock.</p>	19
	<p>To prevent device damage by electrostatic discharge, do not touch, and do not let any object contact pins of connectors or other parts of the product. Before handling the product, be sure to discharge static electricity from your body by touching a metallic object, such as doorknob. Doing so may result in device problems.</p>	19
	<p>Do not apply any shock to this product. Doing so may result in device problems.</p>	20
	<p>Do not expose the product to direct sunlight, and do not place it where it is hot and humid. Do not allow condensation to form on the product.</p>	20
	<p>Do not store the product in a dusty location. Doing so may result in device problems.</p>	20
<p>Do not store the product where it is exposed for a long time to relatively strong electric or magnetic fields. Because the product uses many electronic components, problems may result.</p>	20	

⚠ CAUTION

This symbol indicates that incorrect use of the product may result in minor or moderate injury to the user, in damage to the product and any devices connected to it, or in the destruction of data and other software resources or other property.

Warning	Description	Page
<p>Prohibition</p> 	<p>Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.</p>	<p>23, 25, 26, 28, 29, 31, 32, 33</p>
	<p>Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.</p>	<p>23, 25, 26, 28, 29, 31, 32, 33</p>
	<p>Make sure that power to the product is turned off and the power plug is disconnected from outlet before removing or mounting boards. Doing so may result in device problems or electric shock.</p>	<p>30</p>
	<p>Do not apply pressure on one part of a board when mounting the board. Attempt to distribute equal pressure on the entire board. Doing so may result in damage to the board.</p>	<p>30</p>
	<p>Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables (unless such an operation uses USB cables for plug-and-play devices). Doing so may result in device problems or electric shock.</p>	<p>31</p>
	<p>Follow the procedure described in the manual to turn on the product. Doing so may result in device problems.</p>	<p>39</p>
	<p>After power is turned on to the product, do not move the system, or apply any shock or vibration to it. Doing so may result in device problems.</p>	<p>39</p>
	<p>Follow the procedure described in the manual to turn off the product. Doing so may result in device problems.</p>	<p>41</p>
<p>Attention</p> 	<p>To re-transport the product, use the package used at the delivery, and pack them as it was packed. Doing so may result in damage to the product.</p>	<p>2</p>
	<p>Insert the power plug so that the connection is secure. Doing so may result in device problems or fire.</p>	<p>18</p>
	<p>Because incorrectly connected probes may cause a short-circuit or reverse connection between power supply and GND in operation, to ensure safety, insert a protective circuit such as a fuse into power supply pattern. Doing so may result in device problems or fire.</p>	<p>52</p>
<p>Caution</p> 	<p>Use the product according to its specifications. Doing so may result in device problems.</p>	<p>6</p>

■ Organization of This Manual

This manual consists of three chapters. Read the manual thoroughly before using the emulator.

CHAPTER 1 PRODUCT HANDLING AND SPECIFICATIONS

This chapter explains handling of the emulator and gives its specifications.

Before using the emulator, read this chapter thoroughly and be sure that you understand the information about the product.

CHAPTER 2 CONNECTION METHOD

This chapter explains how to connect the emulator.

CHAPTER 3 OPERATION METHOD

This chapter explains how to operate the emulator and provides procedures for powering on and off the emulator.

Read this chapter thoroughly before powering on the emulator.

APPENDIX

The appendix contains DSU-FR cable specifications and user system specifications.

■ Related Manual

See also the following manual:

- Hardware Manual of the evaluation MCU used
- Hardware Manual of the adapter used
- Operation Manual of the header used
- DSU-FR Emulator DSU-FR Cable MB2198-10 Operation Manual
- SOFTUNE Workbench Operation Manual

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CHAPTER 1 PRODUCT HANDLING AND SPECIFICATIONS

This chapter explains handling of the emulator and gives its specifications. Before using the emulator, read this chapter thoroughly and be sure that you understand the information about the product.


- 1.1 "Checking Packed Components"
- 1.2 "Appearance and Part Names"
- 1.3 "General Specifications"
- 1.4 "RS-232C Port Specifications"
- 1.5 "USB Port Specifications"
- 1.6 "LAN Port Specifications"
- 1.7 "External Trigger Input Terminal Specifications"
- 1.8 "Program Execution Output Terminal Specifications"
- 1.9 "Power-on Debug Specifications"
- 1.10 "Options"
- 1.11 "Precautions on Possible Problems"
- 1.12 "Precautions on Handling the Emulator"
- 1.13 "Precautions on Use"

1.1 Checking Packed Components

Before using the emulator, check the packed components to make sure that all components have been delivered.

■ Checking Packed Components



Attention 	To re-transport the product, use the package used at the delivery, and pack them as it was packed. Doing so may result in damage to the product.
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Before using the emulator, make sure that the following packed components have been delivered:

- DSU-FR emulator: 1
- AC adapter: 1
- AC cord: 1
- Hardware manuals: 1 each (in Japanese and in English [this manual])

Note:

The AC cord and AC adapter are packed in the same box.

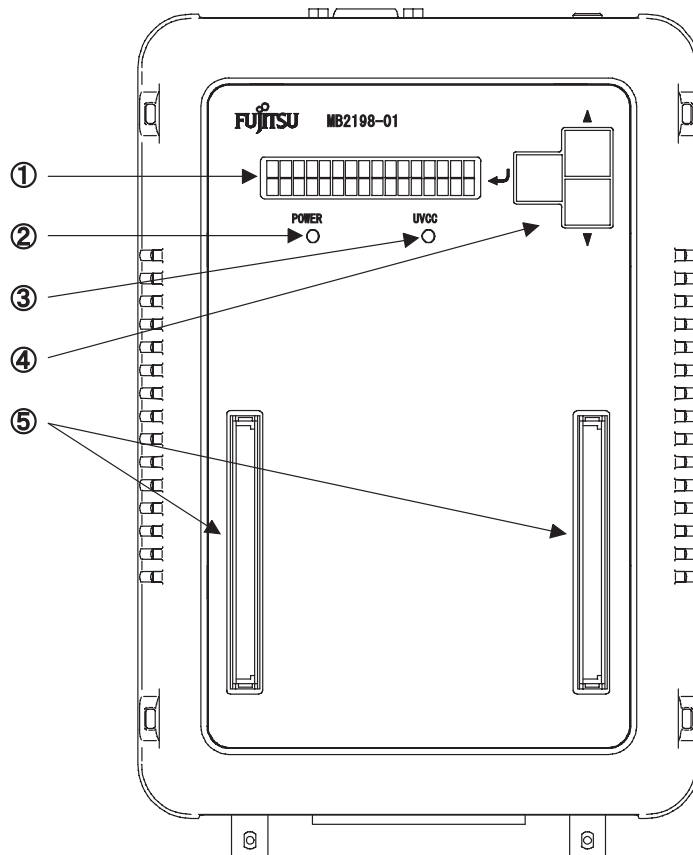
1.2 Appearance and Part Names

This section describes parts on the outside of the emulator and gives their names. For information on connecting the emulator, see Chapter 2 "CONNECTION METHOD".

■ Appearance and Part Names

Figure 1.2-1 "Emulator Appearance (top view)" to Figure 1.2-3 "Emulator Appearance (rear view)" show the appearance and have names of parts on the outside of the emulator.

Figure 1.2-1 Emulator Appearance (top view)

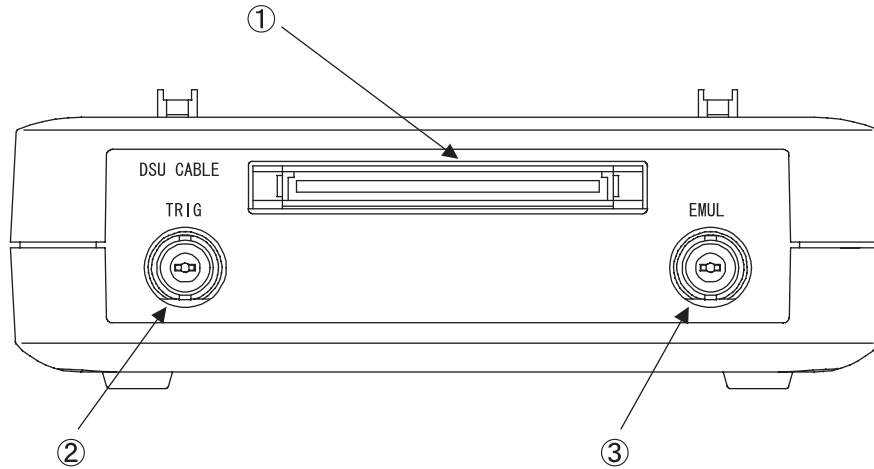


No.	Name	Description
①	Status indicator LCD	Displays a variety of information, including settings, communication status, and operation status. (*1)
②	POWER LED	Goes on when emulator power is supplied.
③	UVCC LED	Goes on when user system power (UVcc) is supplied.
④	Setting switch	Used to change settings and the information displayed on the status indicator LCD. (*1)
⑤	Adapter board connector	Accepts the connection of different types of adapter boards (options). (*2)

*1 For explanations of displays of the status indicator LED and how to operate the setting switch, see Section 3.1, "Operating Setting Switches."

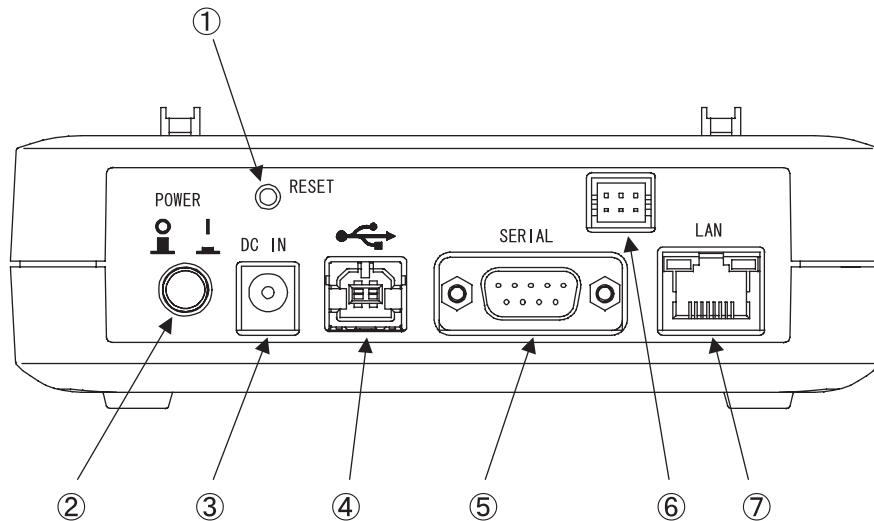
*2 This connector is not used if a DSU-FR cable is used.

Figure 1.2-2 Emulator Appearance (front view)



No.	Name	Description
①	DSU-FR cable connector	Connector for a DSU-FR cable
②	TRIG terminal	Terminal used for input of external trigger signals
③	EMUL terminal	Terminal that outputs program execution signals

Figure 1.2-3 Emulator Appearance (rear view)



No.	Name	Description
①	Reset switch	Reset switch for the emulator system
②	Power switch	Power switch for the emulator
③	DC inlet	Inlet in which to plug the AC adapter
④	USB connector	Connector for a USB cable
⑤	RS-232C connector	Connector for a RS-232C cable
⑥	TEST terminal	Terminal for testing the product. Do not use this terminal.
⑦	LAN connector	Connector for a LAN cable

1.3 General Specifications

Table 1.3-1 "General Specifications of Emulator" lists the general specifications of the emulator.

■ General Specifications of Emulator




 Caution	Use the product according to its specifications. Doing so may result in device problems.
---	--

Table 1.3-1 General Specifications of Emulator

Item	Specification	
Name	DSU-FR emulator	
Model number	MB2198-01	
Power	Emulator power input	+16 V / 2.5 A (supplied from the dedicated AC adapter)
	DSU-dedicated power output(*1)	+3.3 V ($V_{CC T}$) / 350 mA (with fuse)
	User system power input(*2)	0 V to +5.5 V (UV_{CC}) / 100 mA or less
Operating frequency	Maximum of 33 MHz(*3)	
Operating temperature	5 to 35 °C	
Operating humidity	20% to 80% (No condensation)	
External dimensions	148 (W) x 210 (D) x 44 (H) mm (not including protrusions and rubber pads)	
Weight	700 g	

*1 Use this only if the evaluation MCU has a DSU-dedicated power input terminal.

Do not use this terminal for any other purpose.

The emulator supplies power through a DSU-FR cable or adapter board to the evaluation MCU.

*2 The user system power must be supplied from the user system through a DSU-FR cable or adapter board.

*3 Note that this is the operating frequency of the emulator interface bus and not that of the MCU. The minimum operating frequency depends on the debugger software.

1.4 RS-232C Port Specifications

The emulator can be connected to one RS-232C cable.

■ RS-232C Port Specifications

Table 1.4-1 "RS-232C Port Specifications" lists the RS-232C port specifications. Figure 1.4-1 "RS-232C Connector Circuit Configuration" shows the connector circuit configuration.

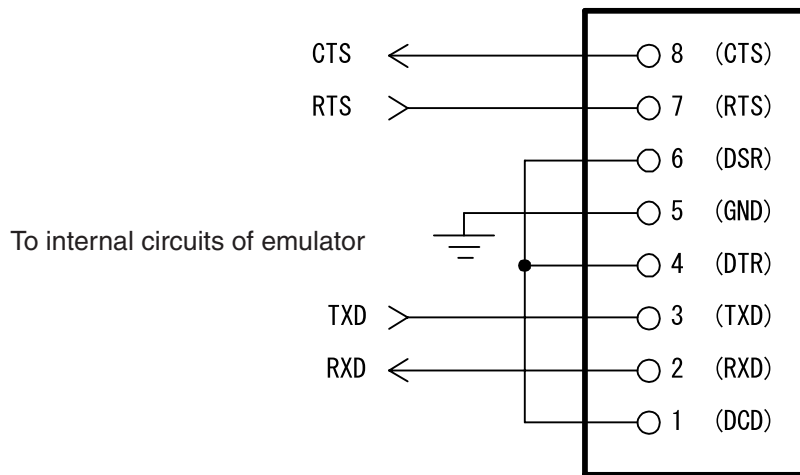
For information on Interlink cable connection, see Section 1.10 "Options".

Table 1.4-1 RS-232C Port Specifications

Item	Description
Connector type	D-Sub 9-pin male
Signal definition	DTE (same as for a personal computer)
Baud rate(*1)	9600, 19.2 K, 115.2 K [bps]
Data bit length	8 bits
Stop bit length	1 bit
Parity bit	None
X control	None

*1 The possible values depend on the emulator debugger specifications. For more information, see the *Softune Workbench Operation Manual*.

Figure 1.4-1 RS-232C Connector Circuit Configuration



Note: The emulator uses pin assignments that do not use some signal lines, as shown above.

1.5 USB Port Specifications

The emulator can be connected to one USB cable.

■ USB Port Specifications

Table 1.5-1 "USB Port Specifications" lists the USB port specifications.

Table 1.5-1 USB Port Specifications

Item	Description
Applicable standard	USB 1.1
Communication protocol	Full Speed Bulk Transfer
Data transfer rate	12 Mbps
Connector type	Series B
Power	Self Powered

1.6 LAN Port Specifications

The emulator can be connected to one LAN cable.

■ LAN Port Specifications

Table 1.6-1 "LAN Port Specifications" lists the LAN port specifications.

Table 1.6-1 LAN Port Specifications

Item	Description
Applicable standard	IEEE 802.3
Communication protocol	TCP/IP
Data transfer rate	10 Mbps/100 Mbps
Connector type	Series B
IP address	Variable
Port address	Variable
Ethernet address	Global: Fixed (registered with IEEE) Local: Variable

1.7 External Trigger Input Terminal Specifications

The emulator has the TRIG terminal that is used as a input terminal for external trigger signals.

External Trigger Input Terminal Specifications

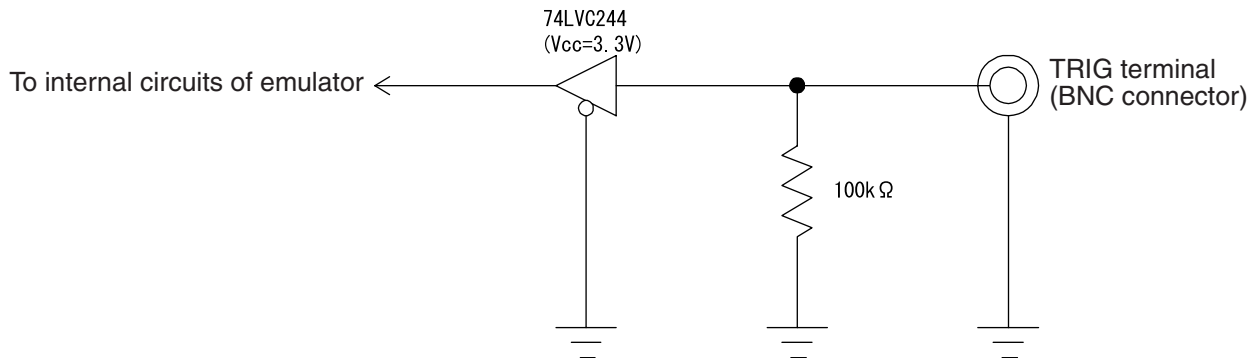
The external trigger input terminal is a part that connects a logic analyzer or other such external device to the emulator. An external device uses the external trigger input terminal to request the evaluation MCU on the user system for a break (External trigger break function).

Table 1.7-1 "External Trigger Input Terminal Specifications" lists the external trigger input terminal specifications. Figure 1.7-1 "External Trigger Input Terminal Circuit Configuration" shows the circuit configuration.

Table 1.7-1 External Trigger Input Terminal Specifications

Terminal name	Input or output	Description
TRIG	Input	External trigger signals are input into this terminal. The terminal is used for break control. A break occurs when a change from "L" to "H" is detected in input signal level.

Figure 1.7-1 External Trigger Input Terminal Circuit Configuration



Notes Regarding Use of the External Trigger Input Pin

Before using the external trigger function, be sure that you understand the following break slip characteristics:

- The trigger signal entered from the external trigger input pin is transmitted to the evaluation MCU after being synchronized with the operating frequency of the emulator interface in the emulator.

The operating frequency of the emulator interface is lower than that of the evaluation MCU (The operating frequency ratio depends on the evaluation MCU.).

Consequently, a break slip of tens to several hundreds of machine clocks is generated between the trigger signal input and the evaluation MCU break.

1.8 Program Execution Output Terminal Specifications

The emulator has the EMUL terminal that is used as an output terminal for program execution signals

■ Program Execution Output Terminal Specifications

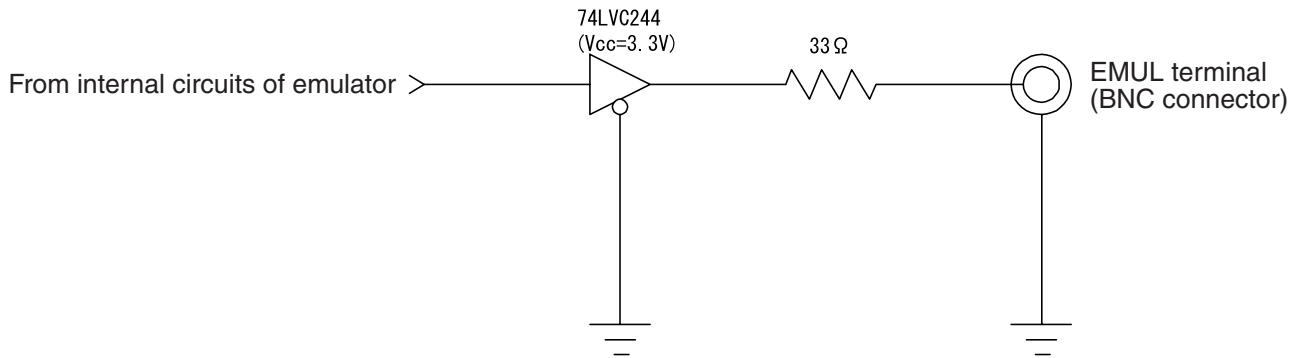
The program execution output terminal is used to execute user programs.

Table 1.8-1 "Program Execution Output Terminal Specifications" lists the program execution output terminal specifications. Figure 1.8-1 "Program Execution Output Terminal Circuit Configuration" shows the circuit configuration.

Table 1.8-1 Program Execution Output Terminal Specifications

Terminal name	Input or output	Description
EMUL	Output	User program execution signals are output from this terminal. This terminal outputs "H" level signals while a user program is being executed.

Figure 1.8-1 Program Execution Output Terminal Circuit Configuration



1.9 Power-on Debug Specifications

The emulator has a power-on debug function that executes a program immediately after the evaluation MCU is powered on.

■ Power-on Debug Specifications

Power-on debug(*1) is a function using the reset terminal(*2) of the evaluation MCU to verify execution of a program immediately after the power-on sequence.

Before the power-on debug function can be used, related operations must be completed to prepare it.

For information on such operations, see the *Softune Workbench Operation Manual*.

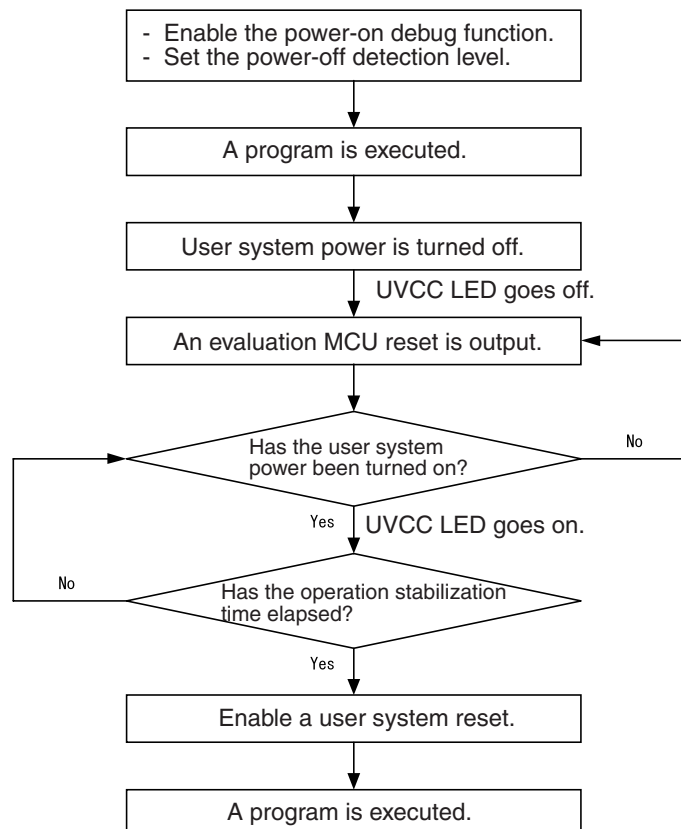
*1 The evaluation MCU must be compatible with the power-on debug function. For more information, contact the Fujitsu Sales Dept. or Support Dept.

*2 The name of the reset terminal may depend on the model of the evaluation MCU. For more information, contact the Fujitsu Sales Dept. or Support Dept.

■ Operation Flow

Figure 1.9-1 "Power-on Debug Operation Flow" shows the flow of the power-on debug operation.

Figure 1.9-1 Power-on Debug Operation Flow



■ Operation Overview

Figure 1.9-2 "Timing of Power-on Debug Operation" is a timing chart of the power-on debug operation.

In this example, the reset terminal name is assumed to be " $\overline{\text{INIT}}$ ".

[Operation timing]

Power-off detection:

The power-off status of user system power (UV_{CC}) voltage is detected.

If the voltage drops to the power-off detection level or lower, the emulator outputs an "L" level signal to the $\overline{\text{INIT}}$ terminal of the evaluation MCU in order to prevent the evaluation MCU from malfunctioning.

(See (1) of Figure 1.9-2 "Timing of Power-on Debug Operation".)

Power-on detection:

The power-on status of user system power (UV_{CC}) voltage is detected.

After user system power is detected as having reached the power-on detection level or higher, the emulator checks whether voltage is maintained at the power-on detection level or higher during the operation stabilization time (about 10 ms) of the evaluation MCU.

(See (2) of Figure 1.9-2 "Timing of Power-on Debug Operation".)

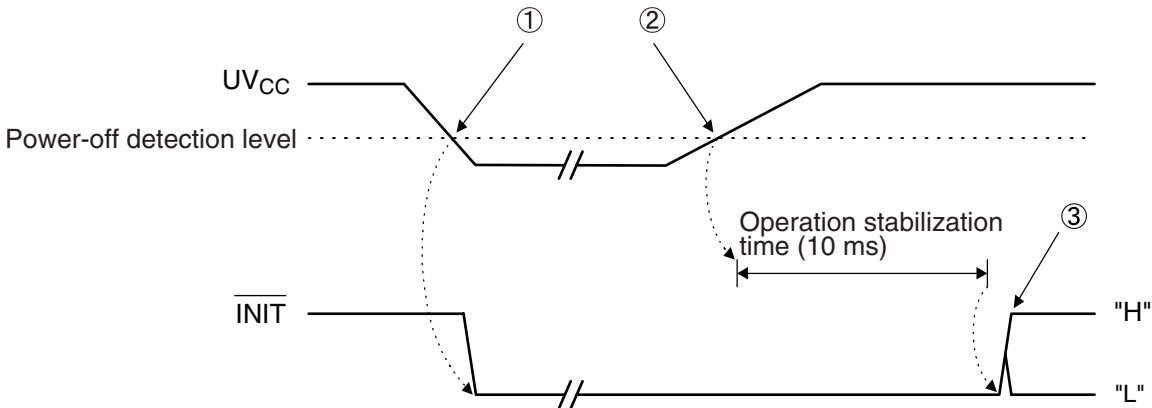
Reset cancellation:

The reset terminal is controlled.

After the operation stabilization time has elapsed, $\overline{\text{INIT}}$ terminal output of the evaluation MCU is switched to reset input (xRSTIN) from the user system.

(See (3) of Figure 1.9-2 "Timing of Power-on Debug Operation".)

Figure 1.9-2 Timing of Power-on Debug Operation



■ Operating Conditions

To turn off user system power (UV_{CC}) voltage during the power-on debug operation, the following three conditions must be satisfied at all:

- The all user power level of the evaluation MCU changes from $0.9 V_{CC}$ to $0.5 V_{CC}$ in $25 \mu\text{s}$ or more.
- The evaluation MCU has an internal operating frequency of 1 MHz or higher.
- The user program is executing.

1.10 Options

The options listed in Table 1.10-1 "Options" are available for the emulator. Purchase the options separately as required.

■ Options

The emulator unit cannot be used independently. Table 1.10-1 "Options" lists options for the emulator. As required, purchase options to build an emulator system suitable for the evaluation MCU used.

Table 1.10-1 Options

Name	Model number
Evaluation MCU (*1)	MB91xxx, MB91Vxxx
DSU-FR cable (*2)	MB2198-10
Adapter board (*3)	MB2197-xxx, MB2198-xxx
Header board (*3)	MB2197-xxx, MB2198-xxx
RS-232C cable (*4), (*5)	-
USB cable (*4), (*6)	-
LAN cable (*4)	-
BNC cable (*7)	-

*1: The model name depends on the evaluation MCU used. For more information, contact the Fujitsu Sales Dept. or Support Dept.

*2: A DSU-FR cable connects the user system to the emulator.

Several types of this cable may be released in the future. Select and purchase a DSU-FR cable that is compatible with both the emulator and the user system.

For information on selecting a suitable DSU-FR cable, contact the Fujitsu Sales Dept. or Support Dept.

Explanations involving a DSU-FR cable in this manual are referring to the MB2198-10.

*3: The adapter board and header board are an interface board that connects the user system to the emulator unit. Purchase an adapter board and header board that are compatible with the evaluation MCU used. Contact the Fujitsu Sales Dept. or Support Dept. for information on selecting a suitable adapter board.

For information on how to handle and use an adapter board and header board, and for related safety precautions, see the respective manuals.

*4: Use an RS-232C, USB, or LAN cable for the communication interface. Prepare a cable that is compatible with both the emulator and the host machine used.

*5: Prepare an RS-232C cable by selecting a cross (interlink) type cable.

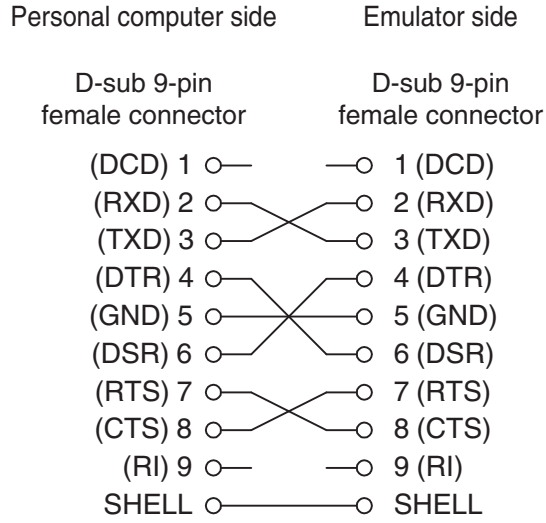
Figure 1.10-1 "Interlink Cable Wiring" shows interlink cable wiring.

*6: Prepare a USB cable with a maximum length of 2 meters.

*7: A BNC cable is required only if the TRIG or EMUL terminal in the emulator is used. In a BNC cable is required, prepare one with an impedance of 50 ohms and a maximum length of 2 meters.

Prepare a BNC cable that is compatible with both the emulator and the emulator to the device connected.

Figure 1.10-1 Interlink Cable Wiring



1.11 Precautions on Possible Problems

Take the following precautions for problems that may occur while you are using the emulator.

■ Precautions on Possible Problems

WARNING

Plug



If the product emits excessive heat, smoke, an offensive smell, or an unusual noise, turn off power immediately. Then, disconnect the power plug from the outlet. If smoke was detected, make sure that no more smoke is coming from the product. Then, contact our sales or support department to request that the product be repaired. Do not attempt to repair the product by yourself. Otherwise, personal injury, damage to the product, or other property damage may result. Using such a product without having it properly repaired may result in fire or electric shock.

If water or other liquid, a metallic object, or other foreign matter enters the product, immediately turn off power, and disconnect the power plug from the outlet. Then, consult with our sales or support department. Using the product under such abnormal conditions may result in device problems, fire, or electric shock.

1.12 Precautions on Handling the Emulator

Take the following precautions on handling the emulator.

■ Precautions on Handling the Emulator

WARNING

Electric shock



Do not touch the inside of a connector port. Doing so may result in electric shock or device problems.

Plug



Disconnect the power plug during electrical storms. Using the product during an electrical storm may result in damage to the product or fire.

No disassembly



Do not open the product case. Do not modify the product without permission. Doing so may result in device problems, fire, or electric shock.

No moisture



Do not use the product near water such as near a bath or shower. Doing so may result in device problems, fire, or electric shock.

 **WARNING**

Prohibition



Do not touch the product with wet hands. Doing so may result in electric shock.

Do not place the product in a location exposed to excessive moisture or dust or in a poorly ventilated location. Do not place the product near an open flame. Doing so may result in device problems, fire, or electric shock.

Do not block the product ventilation holes. Doing so may cause generation of excessive heat, possibly resulting in a fire.

Do not insert metallic, combustible, or other objects or allow them to drop into the product through a ventilation hole or other opening. Doing so may result in device problems, fire, or electric shock.

Do not use a voltage other than the indicated value of supply voltage. Do not connect power cable together with too many plugs to an outlet. Doing so may result in fire or electric shock.

The product must not be scratched, modified, forcibly bent, pulled, twisted, or exposed to heat. Do not place heavy objects on the product. Doing so may result in device problems, fire, or electric shock.

 **CAUTION**

Plug



Disconnect the power plug before moving the product. Disconnect all other connected cables. Exercise caution when working near cables on the floor. Damage to a cable may result in fire or electric shock. A falling device may result in injury.

If the product is not to be used for an extended period, disconnect the power plug. Doing so may result in fire or electric shock.

Prohibition



Do not place the product in a location exposed to shock or a location that is not level or stable. Doing so may result in device problems or the product falling over or falling on the floor.

Do not grasp the cable when unplugging the power plug and cable. Always grasp the power plug or connector itself. Pulling the cable may expose conductors or sever wires in it, possibly resulting in device problems, fire, or electric shock.

Do not place the product in a location, such as near a speaker or television tuner, where it is exposed to an electromagnetic field. Doing so may result in device problems.

Attention



Insert the power plug so that the connection is secure. Doing so may result in device problems or fire.

1.13 Precautions on Use

Take the following precautions on using the emulator.

■ Precautions on Use

WARNING

Prohibition



Do not block the product ventilation holes. Doing so may cause generation of excessive heat, possibly resulting in a fire.

Do not use the product if it has a fault, damage, or sever wires in the cable. Doing so may result in fire or electric shock.

CAUTION

Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables, or removing or mounting boards (unless such an operation uses USB cables for plug-and-play devices). Doing so may result in device problems or electric shock.

To prevent device damage by electrostatic discharge, do not touch, and do not let any object contact pins of connectors or other parts of the product. Before handling the product, be sure to discharge static electricity from your body by touching a metallic object, such as doorknob. Doing so may result in device problems.

Note:

Follow the instructions in this manual on setting up and using the emulator.

■ Precautions on Storage




<p>Prohibition</p> 	<p>Do not apply any shock to this product. Doing so may result in device problems.</p>
	<p>Do not expose the product to direct sunlight, and do not place it where it is hot and humid. Do not allow condensation to form on the product.</p>
	<p>Do not store the product in a dusty location. Doing so may result in device problems.</p>
	<p>Do not store the product where it is exposed for a long time to relatively strong electric or magnetic fields. Because the product uses many electronic components, problems may result.</p>

Table 1.13-1 "Operating and Storage Temperature and Humidity Levels of the Emulator" lists the operating and storage temperature and humidity levels of the emulator.

Table 1.13-1 Operating and Storage Temperature and Humidity Levels of the Emulator

	Temperature	Humidity
During operation	+5 to +35 °C	20 to 80% (No condensation)
During storage	0 to +70 °C	20 to 80% (No condensation)

CHAPTER 2 CONNECTION METHOD

**This chapter explains how to connect the emulator.
Read this chapter thoroughly before powering on the emulator.**

- 2.1 "System Configuration"
- 2.2 "Connection of DSU-FR Cable to Attached Cable"
- 2.3 "Connection of User System"
- 2.4 "Connection of DSU-FR Cable"
- 2.5 "Connection of Adapter Board"
- 2.6 "Connection of Host Machine"
- 2.7 "Connection of AC Adapter"
- 2.8 "Connection of Test Equipment"

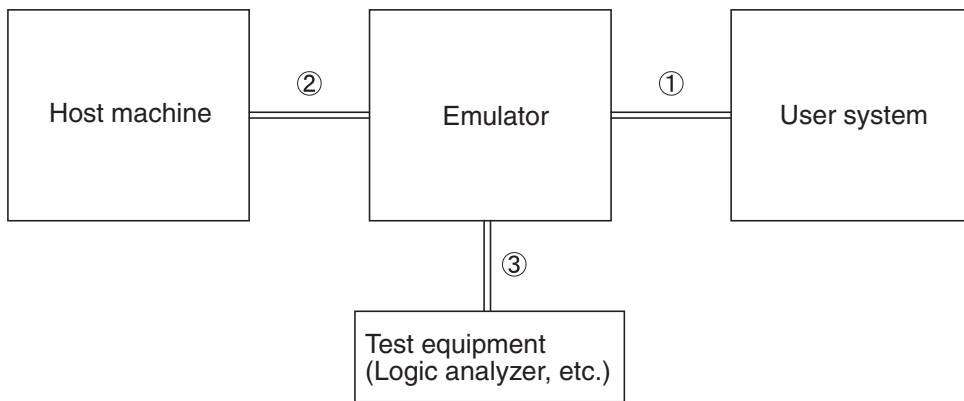
2.1 System Configuration

The emulator is designed to be connected to and controlled from a host machine. The host machine uses emulator debugger software to control the emulator. For information on using the software, see the **Softune Workbench Operation Manual**.

■ System Configuration

Figure 2.1-1 "System Configuration (if a DSU-FR cable is used)" and Figure 2.1-2 "System Configuration (if an adapter board is used)" show the system configuration of the emulator.

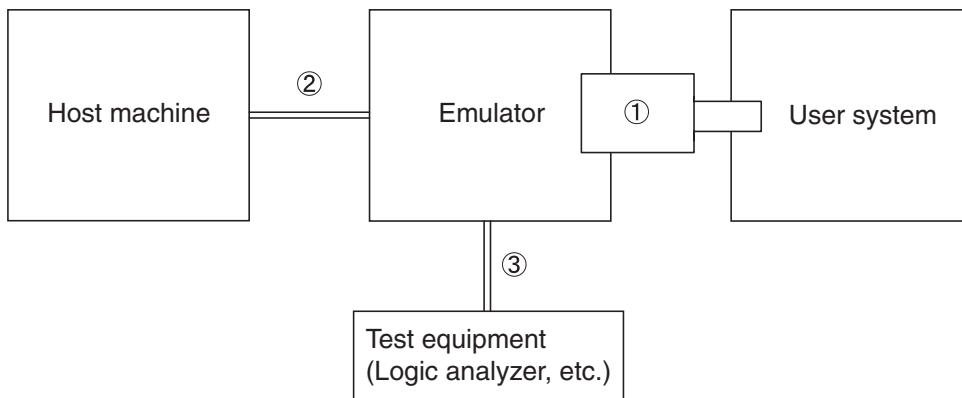
Figure 2.1-1 System Configuration (if a DSU-FR cable is used)



- ① DSU-FR cable (including an attached cable)*
- ② RS-232C cable *, USB cable *, or LAN cable*
- ③ BNC cable*

*: Not included with this product

Figure 2.1-2 System Configuration (if an adapter unit is used)



- ① Adapter unit* (Adapter board plus flat cable plus header board*)
- ② RS-232C cable *, USB cable *, or LAN cable*
- ③ BNC cable*

*: Not included with this product

2.2 Connection of DSU-FR Cable to Attached Cable

Connect an attached cable (FPC or flat cable) to a DSU-FR cable as shown in Figure 2.2-1 "Connection of DSU-FR Cable to FPC Cable (DSU-3)" and Figure 2.2-2 "Connection of DSU-FR Cable to Flat Cable (DSU-4)". In the factory configuration of DSU-FR cable, a flat cable is connected.

■ Connection of DSU-FR Cable to an attached Cable

Use an attached cable to connect the user system to a DSU-FR cable.

The attached cable used depends on the type of emulator interface system (DSU-3 or DSU-4) contained in the evaluation MCU. Check the hardware manual of each evaluation MCU before connecting the cable.

For more information on emulator interface types, see Appendix A "DSU-FR cable Specifications".

■ Connection of DSU-FR Cable to FPC Cable (for DSU-3)

CAUTION

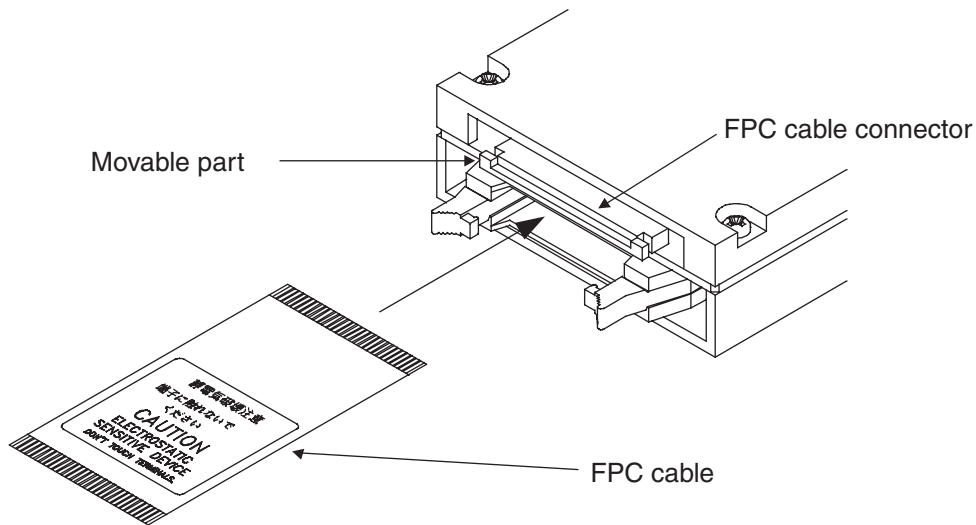
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.2-1 Connection of DSU-FR Cable to FPC Cable (DSU-3)



To connect the FPC cable, pull out the movable part (white part) below the FPC cable connector, insert the FPC cable, and then push the movable part back in place.

To remove the FPC cable, pull out the movable part (white part) below the FPC cable connector, unplug the FPC connector, and then push the movable part back in place.

■ Connection of DSU-FR Cable to Flat Cable (for DSU-4)

⚠ CAUTION

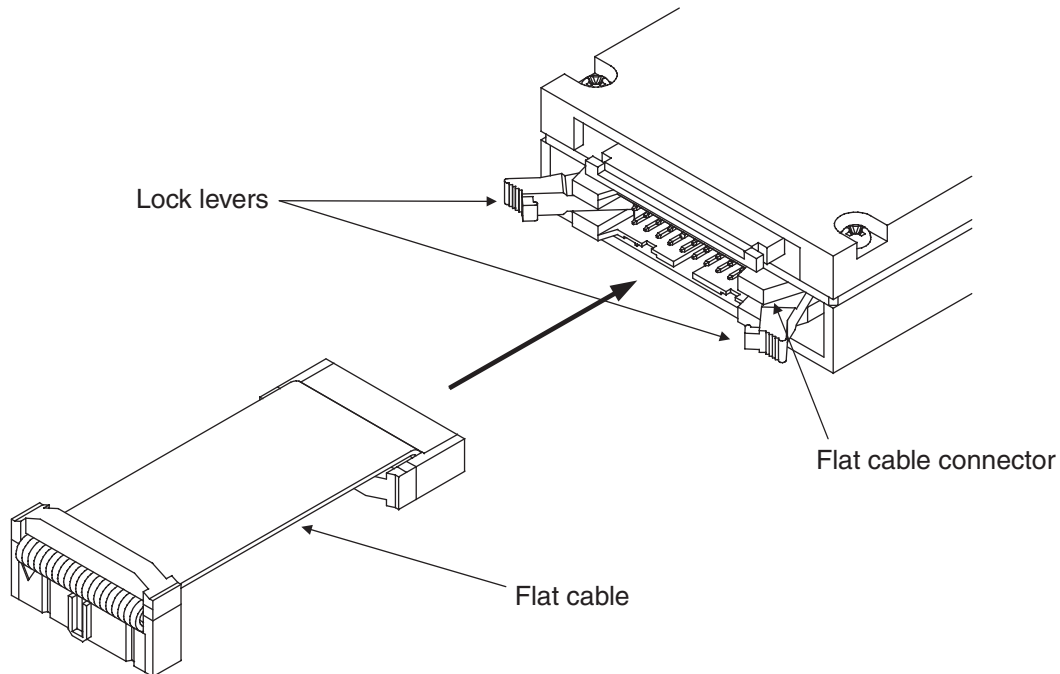
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.2-2 Connection of DSU-FR Cable to Flat Cable (DSU-4)



To connect the flat cable, open the lock levers of the flat cable connector, insert the flat cable, and then close the lock levers.

To remove the flat cable, open the lock levers of the flat cable connector, unplug the connector, and then close the lock levers.

2.3 Connection of User System

Connect a DSU-FR cable to the emulator interface connector on the user system as shown in Figure 2.3-1 "Connection of User System (DSU-3)" or Figure 2.3-2 "Connection of User System (DSU-4)".

For the emulator interface connector specifications, see Appendix B "User System Specifications".

■ Connection of User System (for DSU-3)



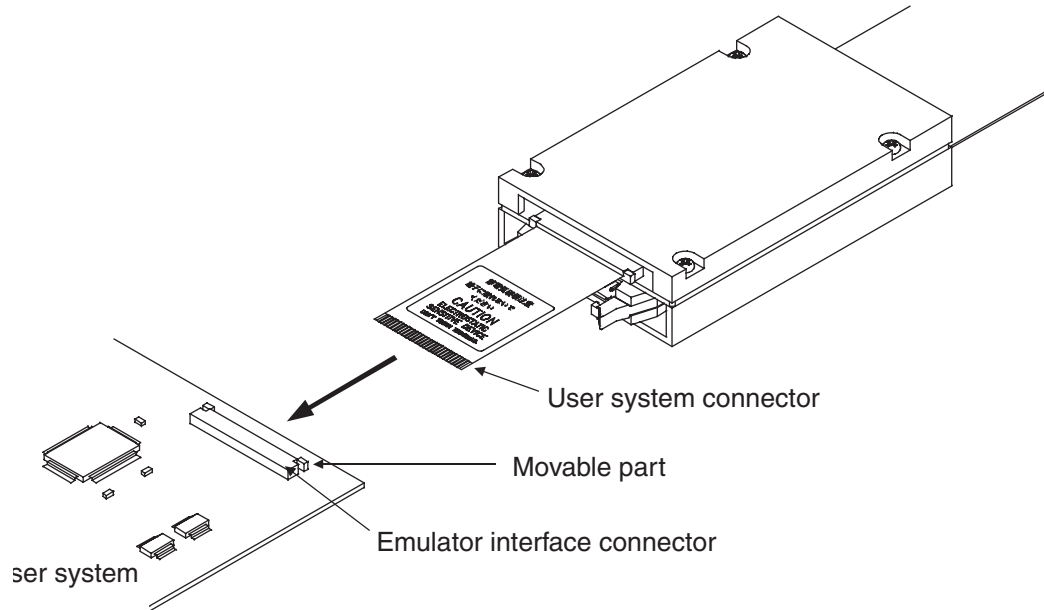
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.3-1 Connection of User System (DSU-3)



To connect the DSU-FR cable, pull out the movable part (white part) below the emulator interface connector on the user system, insert the user system connector, and then push the movable part back in place.

To remove the DSU-FR cable, pull out the movable part (white part) below the emulator interface connector on the user system, remove the user system connector, and then push the movable part back in place.

■ Connection of User System (for DSU-4)

⚠ CAUTION

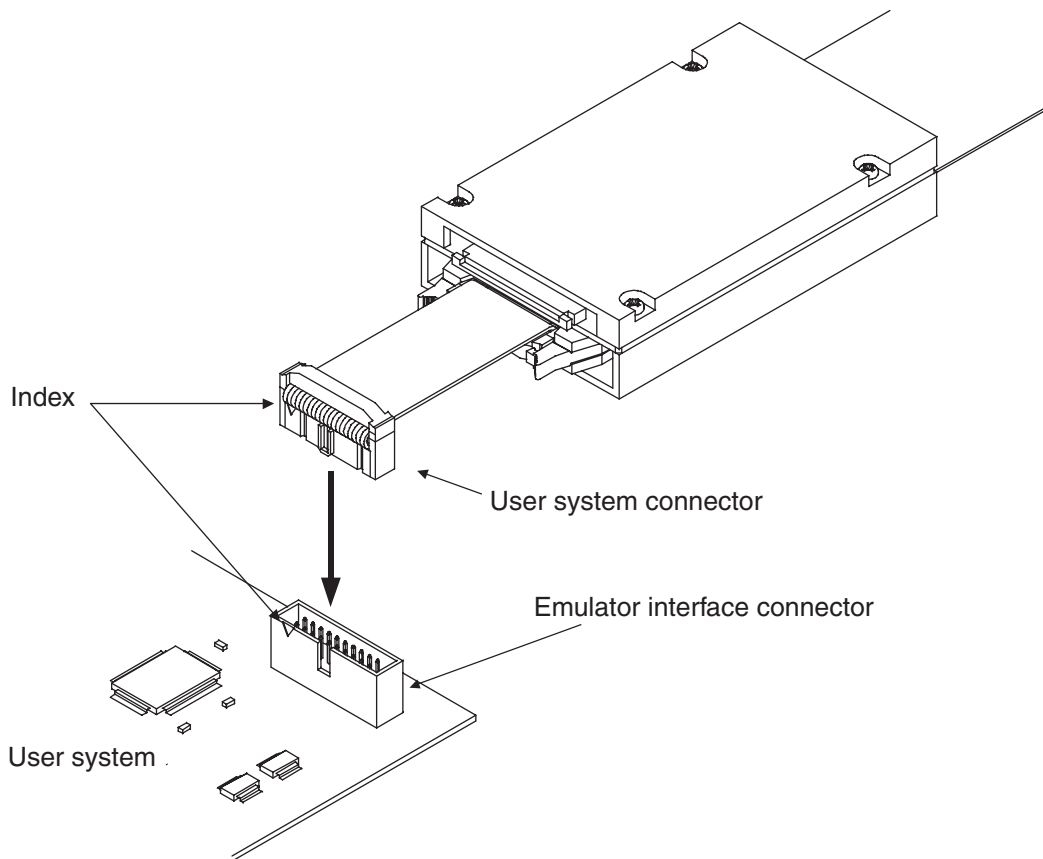
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.3-2 Connection of User System (DSU-4)



To connect the DSU-FR cable, connect the emulator interface connector on the user system and the user system connector by fitting their indexes.

To remove the DSU-FR cable, pull the user system connector out from the emulator interface connector on the user system.

2.4 Connection of DSU-FR Cable

Connect a DSU-FR cable to the DSU-FR cable connector on the front of the emulator as shown in Figure 2.4-1 "Connection of DSU-FR Cable".

For the DSU-FR cable specifications, see Appendix A "DSU-FR Cable Specifications".

■ Connection of DSU-FR Cable

⚠ CAUTION

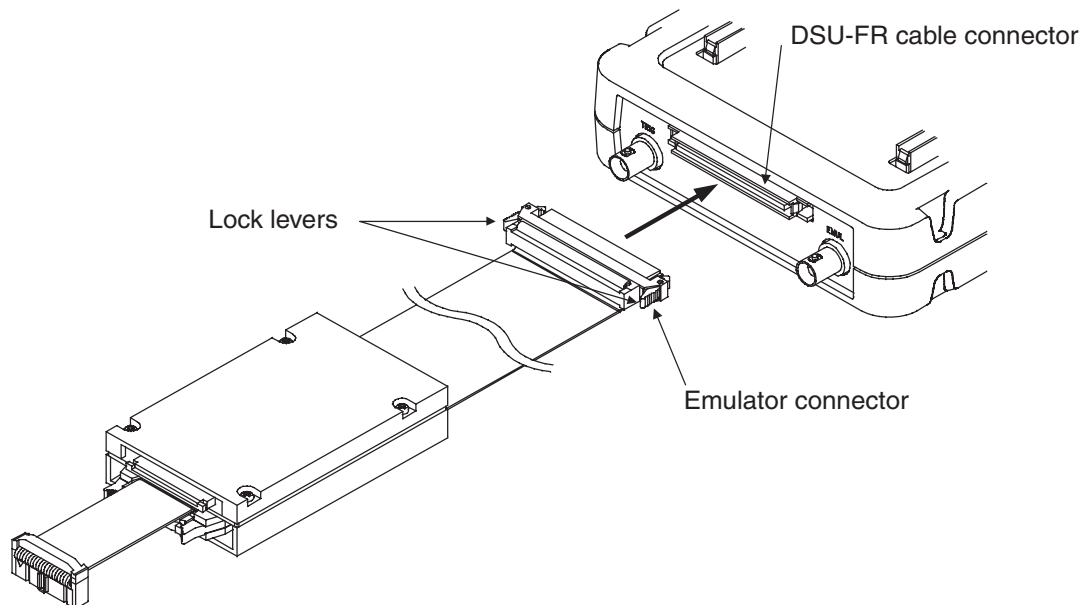
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.4-1 Connection of DSU-FR Cable



To connect the DSU-FR cable, hold the lock levers at both ends of the emulator connector, insert the emulator connector into the DSU-FR cable connector, and then push the emulator connector until it locks into place.

To disconnect the DSU-FR cable, hold the lock levers at both ends of the emulator connector, undo the lock, and then remove the DSU-FR cable from the DSU-FR cable connector.

2.5 Connection of Adapter Board

Connect an adapter board (option) to the adapter board connector on the top of the emulator. Use a header board to connect the adapter board to the user system. For information on connecting an adapter board to the user system, see the hardware manual of the adapter board.

■ Connection of Adapter Board



Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlet before removing or mounting boards. Doing so may result in device problems or electric shock.

Do not apply pressure on one part of a board when mounting the board. Attempt to distribute equal pressure on the entire board. Doing so may result in damage to the board.

2.6 Connection of Host Machine

Connect a host machine to the emulator through an RS-232C cable, USB cable, or LAN cable as shown in Figure 2.6-1 "Connection of Host Machine".

To connect a plug-and-play device through a USB cable to the host machine, first turn on the power to all devices, and then connect the USB cable to the host machine.

■ Connection of Host Machine

⚠ CAUTION

Prohibition

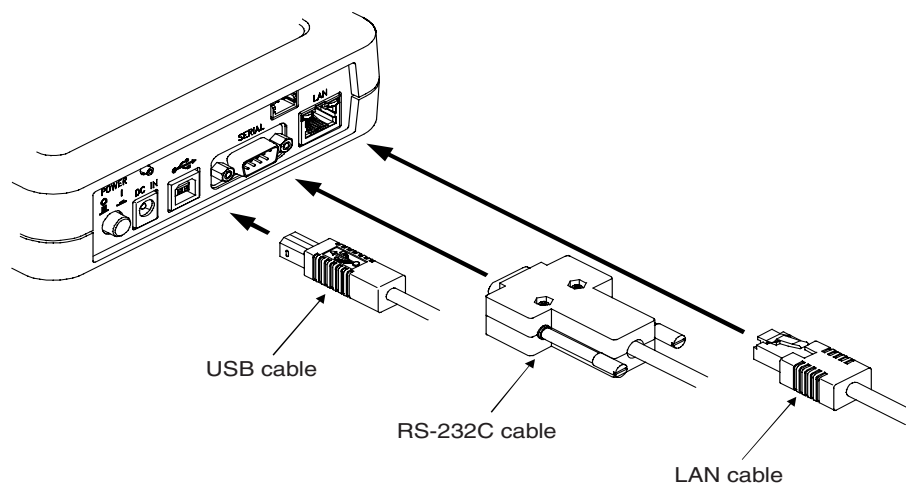


Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables (unless such an operation uses USB cables for plug-and-play devices). Doing so may result in device problems or electric shock.

Figure 2.6-1 Connection of Host Machine



Note:

To connect a host machine to the emulator, each of an RS-232C cable, USB cable or LAN cable must be connected. If the plural cables are connected simultaneously, it may cause malfunctions.

2.7 Connection of AC Adapter

Connect the AC adapter to the emulator as shown in Figure 2.7-1 "Connection of AC Adapter".

First, connect the AC cord to the AC adapter. Then, connect the AC adapter to the emulator. Finally, insert the AC plug into an AC outlet.

■ Connection of AC Adapter

⚠ CAUTION

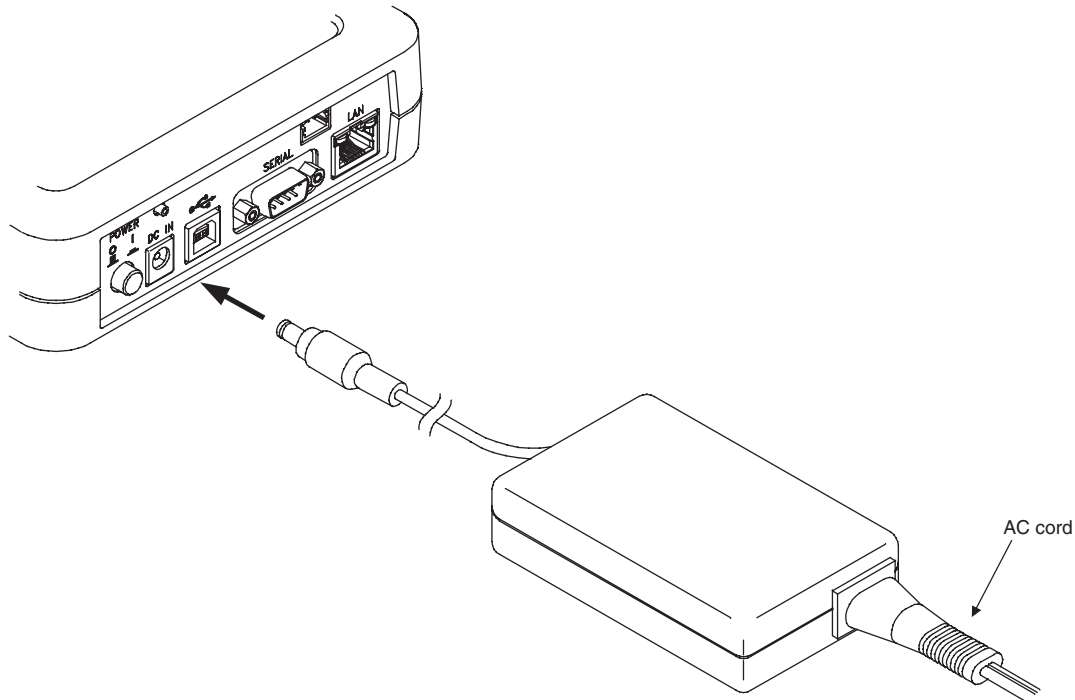
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.7-1 Connection of AC Adapter



2.8 Connection of Test Equipment

To use the external trigger input function and the program execution output function of the emulator, connect test equipment to the emulator as shown in Figure 2.8-1 "Connection of Test Equipment".

If neither of the functions is to be used, leave the terminals unconnected.

■ Connection of Test Equipment

⚠ CAUTION

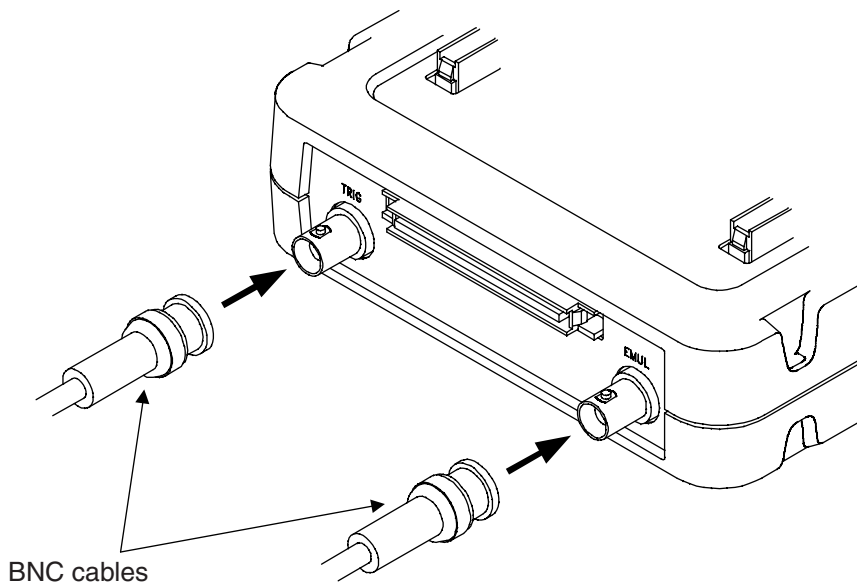
Prohibition



Make sure that power to the product is turned off and the power plug is disconnected from outlets before connecting or disconnecting cables. Doing so may result in device problems or electric shock.

Grasp connectors when connecting or disconnecting a cable. Do not grasp the cable. Doing so may result in device problems or electric shock.

Figure 2.8-1 Connection of Test Equipment



CHAPTER 3 OPERATION METHOD

This chapter explains how to operate the emulator and provides procedures for powering on and off the emulator.

Read this chapter thoroughly before powering on the emulator.

3.1 "Operating Setting Switches"

3.2 "Power-on Sequence"

3.3 "Power-off Sequence"

3.1 Operating Setting Switches

This section explains how to operate the setting switches and the status indicator LCDs.



■ Functions of Setting Switches

The setting switches can be used to change the information displayed on the status indicator LCD (called "LCD" in the rest of this manual) and change LAN parameters displayed on the LCD.

This section explains the menu displayed on the LCD and how to use the setting switches with by selecting from the menu. For details about use of the switches and information displayed on the LCD in menu selection mode or normal operation mode, see the *Softune Workbench Operation Manual*.

Table 3.1-1 "Functions of Setting Switches" lists the functions of the setting switches.

Table 3.1-1 Functions of Setting Switches

Key name	Marking created by silk screen printing	Information displayed on LCD	Function
ENTER key		Emulator top screen	Changes the screen to the menu.
		Menu	Changes display to the submenu of the selected item.
		LAN parameters	Sets the column (position) to be changed.
			Sets a new value (numeric value).
Select/check	Sets a selected item or terminates display after confirmation.		
Up and down keys		Menu	Moves the cursor upward, downward, to the left, or to the right.
		LAN parameter/select	Moves the cursor up, down, to the right, or to the left.
		LAN parameters	Increments or decrements the value (numeric value) to be changed.

■ Procedure for Changing a Parameter

The following procedure describes how to change a parameter.

1. After parameters are displayed, press the up and down keys to move the cursor (blinking) to the digit (position) that you want to change.
2. Press the ENTER key to accept the digit (position) to be changed. At this time, the cursor becomes an underscore (_).
3. Press the up and down keys to increment and decrement, respectively, the digit value (value) until the desired one is displayed.
4. Press the ENTER key to accept the new value (value).
5. After accepting all new values (values), press the up and down keys to move the cursor to the right of [OK], press the ENTER key, and exit the parameter change operation.

■ Methods for Selecting and Checking

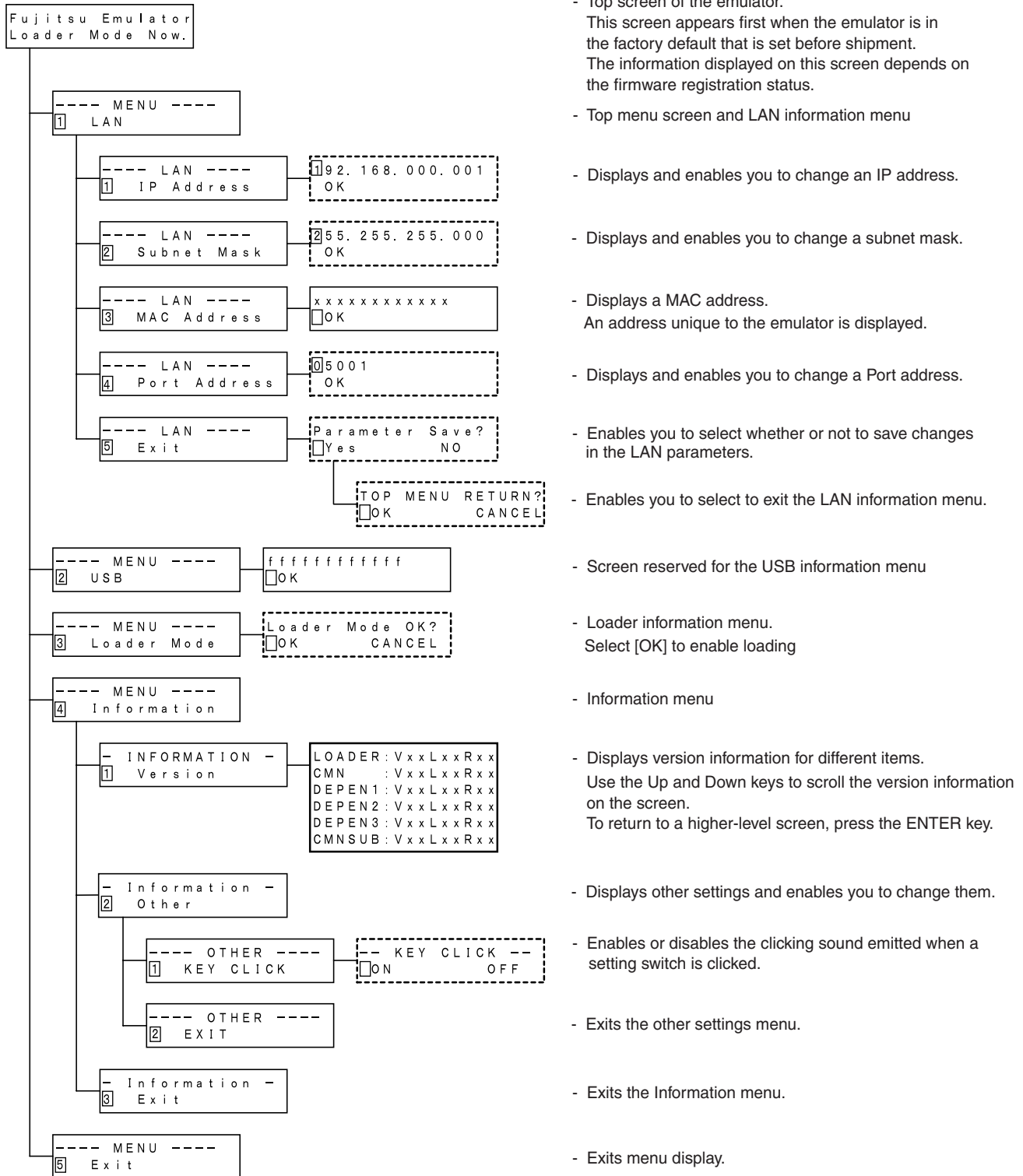
Methods for selecting and checking are described below.

- For selection: Use the Up or Down key to move the cursor to the location immediately to the right of an item or command (e.g., [Yes] or [No]) to select the item or command, and click the ENTER key.
- For confirmation: Move the cursor to the location immediately to the right of [OK], and click the ENTER key.

■ Structure of Menus

Figure 3.1-1 "Structure of Menus" shows the structure of menus.

Figure 3.1-1 Structure of Menus



3.2 Power-on Sequence

After making all necessary connections, power on the host machine, emulator, and user system in this sequence.

In the initial state immediately after product shipment, you must initialize the emulator (monitor program downloading) before powering on the user system.

■ Power-on Sequence



Prohibition



Follow the procedure described in the manual to turn on the product. Doing so may result in device problems.

After power is turned on to the product, do not move the system, or apply any shock or vibration to it. Doing so may result in device problems.

After making all the necessary connections, power on the units following the sequence shown in Figure 3.2-1 "Power-on Sequence".

To power on the emulator, push the power switch located on the back of the emulator (see Figure 1.2-3 "Emulator Appearance (rear view)"). The switch then remains fixed in the position where it is pushed in.

In the initial state immediately after product shipment, you must initialize the emulator (monitor program downloading) before powering on the user system. For the initialization method, see the Softune Workbench Operation Manual.

Figure 3.2-1 Power-on Sequence

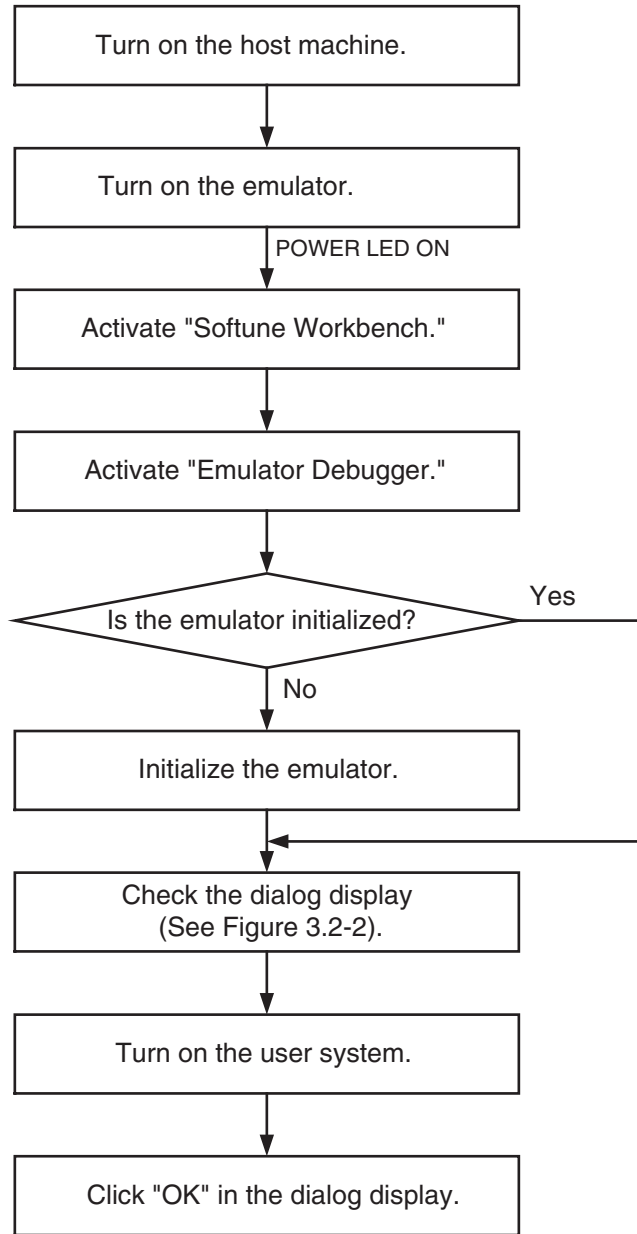
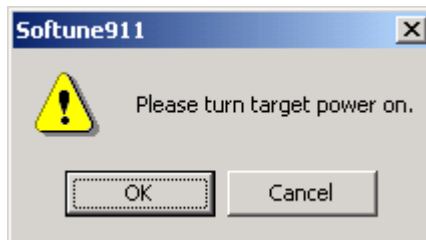


Figure 3.2-2 Dialog Display



3.3 Power-off Sequence

Power off the user system, emulator, and host machine in this sequence.

■ Power-off Sequence



Prohibition

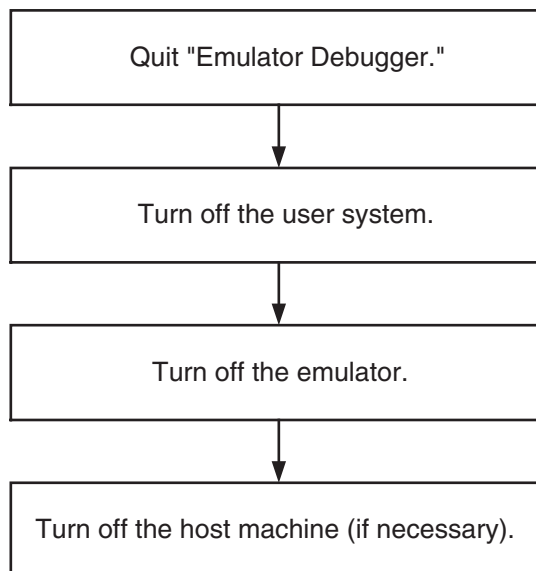


Follow the procedure described in the manual to turn off the product. Doing so may result in device problems.

Power off the units following the sequence shown in Figure 3.3-1 "Power-off Sequence".

To power off the emulator, push the power switch located on the back of the emulator (see Figure 1.2-3 "Emulator Appearance (rear view)") and release it. The switch then returns to the OFF position (protruding).

Figure 3.3-1 Power-off Sequence



APPENDIX

This appendix contains the specifications of both the DSU-FR cable and the user system.

APPENDIX A "DSU-FR Cable Specifications"

APPENDIX B "User System Specifications"

APPENDIX A DSU-FR Cable Specifications

The type of DSU-FR cable connected to the user system depends on the emulator interface system (DSU-3 or DSU-4) contained in the evaluation MCU.

■ DSU-FR Cable Specifications

Table A-1 "DSU-FR Cable Specifications" lists the specifications and Figure A-1 "DSU-FR Cable Appearance" shows the appearance of the DSU-FR cable.

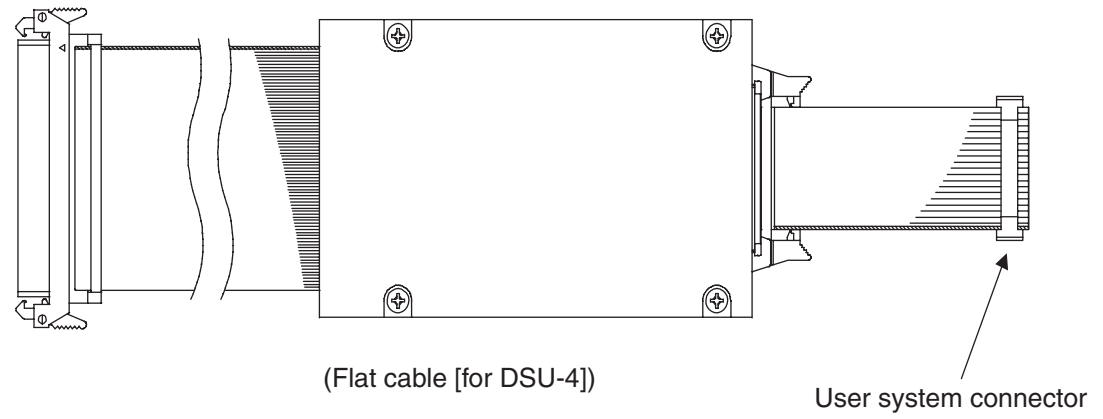
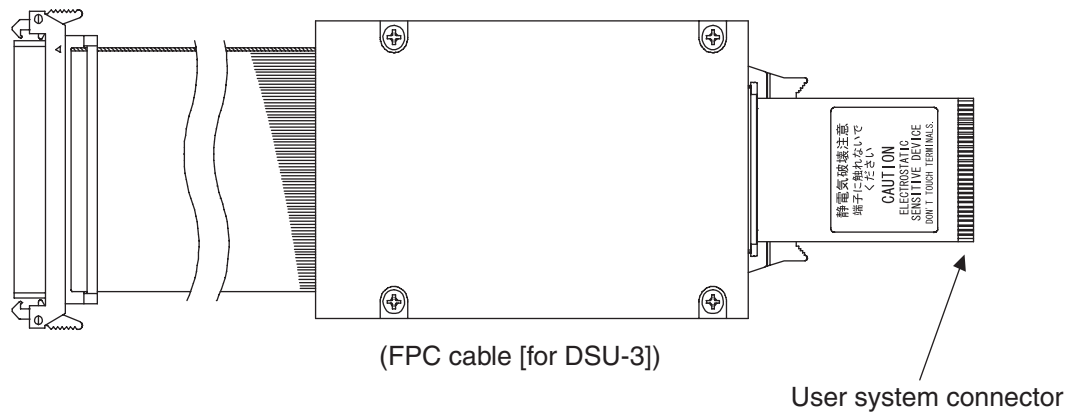
Table A-2 "Emulator Interface Signal Line Terminal Arrangement (DSU-3 connector)" and Table A-3 "Emulator Interface Signal Line Terminal Arrangement (DSU-4 connector)" summarize and Figure A-2 "DSU-3 Connector Terminal Arrangement" and Figure A-3 "DSU-4 Connector Terminal Arrangement" show the arrangement of signal line terminals of emulator interfaces.

Table A-1 DSU-FR Cable Specifications

Item	Specification
Name	DSU-FR emulator DSU-FR cable
Model number	MB2198-10
Cable length	650 mm (including cable connector when the flat cable is connected)
External dimensions	62 (W) x 100 (D) x 22 (H) mm (not including protrusions)
Weight	160 g (when flat cable is connected)
Connector model No.	User system connector * <ul style="list-style-type: none"> • If DSU-3 is used: KM66M-4030-0270 (FPC cable, a Tokyo Eletech product) • If DSU-4 is used: FAS-2001-2101-0BF (Yamaichi Electric product)

*: The DSU-FR cable depends on the type of emulator interface system (DSU-3 or DSU-4) contained in the evaluation MCU. Check the hardware manual of each evaluation MCU before connecting the cable.

Figure A-1 DSU-FR Cable Appearance



APPENDIX A DSU-FR Cable Specifications

Table A-2 Emulator Interface Signal Line Terminal Arrangement (connector for DSU-3)

Terminal number	Terminal name	Input or output	Description	Connection conditions
3	ICLK	Input	Emulator control	<ul style="list-style-type: none"> Connected to the terminal with the same name on the evaluation MCU. Has a maximum wiring length of 50 mm.
5	ICS[0]	Input		
7	ICS[1]	Input		
9	ICS[2]	Input		
11	ICD[0]	Input/Output		
13	ICD[1]	Input/Output		
15	ICD[2]	Input/Output		
17	ICD[3]	Input/Output		
19	BREAK	Output		
21	$\overline{\text{RST}}$	Output	Evaluation MCU reset	<ul style="list-style-type: none"> Connected to the reset terminal of the evaluation MCU. The reset output circuit of the user system and the evaluation MCU reset terminal must be isolated during use of the emulator. Open drain output. Includes a 10kΩ pull-up resistor using the UV_{CC} terminal. (V_{OL}= +0.4 V max, I_{OL}= 12 mA)
23	xRSTIN	Input	User system reset	<ul style="list-style-type: none"> Connected to the reset output circuit of the user system. Enabled when "L" level signals are input. (V_{IH}= +1.7 V min, I_{IH}= -10 μA) (V_{IL}= +0.8 V max, I_{IL}= 10 μA)
25	FR	Input	Mode	<ul style="list-style-type: none"> Must be left unconnected because it is not used.
27,29	UV _{CC} *	Input	User system power	<ul style="list-style-type: none"> Connected to the external I/O power supply of the evaluation MCU. (0 V to +5.5 V / 100 mA or less)
1,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30	GND	-	GND	<ul style="list-style-type: none"> Connected to the V_{SS} terminal (0 V) of the evaluation MCU.

*: Connect to the V_{CC} pin if the evaluation MCU has a single power supply and to the external I/O power supply if it has multiple power supplies.

Figure A-2 Connector Terminal Arrangement for DSU-3

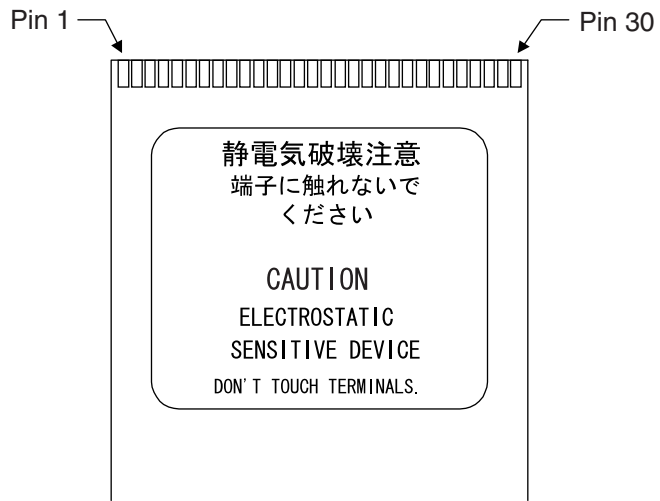
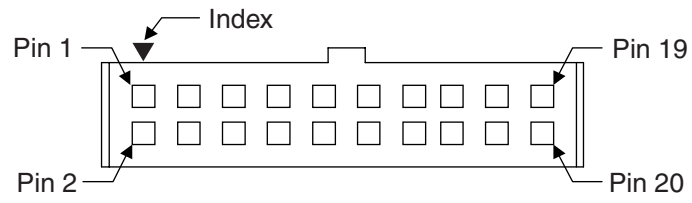


Figure A-3 Connector Terminal Arrangement for DSU-4



APPENDIX B User System Specifications

This section covers the recommended models, circuit configuration, design precautions, and wiring specifications for an emulator interface connector implemented on the user system.

For the flat cable environment, Fujitsu recommends selecting a combination of connectors along with appropriate housing.

■ Model Numbers of Recommended Connectors

Table B-1 Model Numbers of Recommended Connectors

Attached cable	Model number	Remarks
FPC cable	FH10A-30S-1SH (manufactured by Hirose Electric Co., Ltd.)	Includes a latch
Flat cable	FAP-2001-120*(1)-0BS (manufactured by Yamaichi Electronics Co., Ltd.) FAP-20-08#*(2) (manufactured by Yamaichi Electronics Co., Ltd.) FAP-20-04#*(1) (manufactured by Yamaichi Electronics Co., Ltd.)	Includes housing and a short latch Includes housing but no latch No housing included (beware of insertion mistakes)

1: The asterisk () represents each of the following terminal forms:

- 1: Right angle/wrapping
- 2: Right angle/solder dip
- 3: Straight/wrapping
- 4: Straight/solder dip

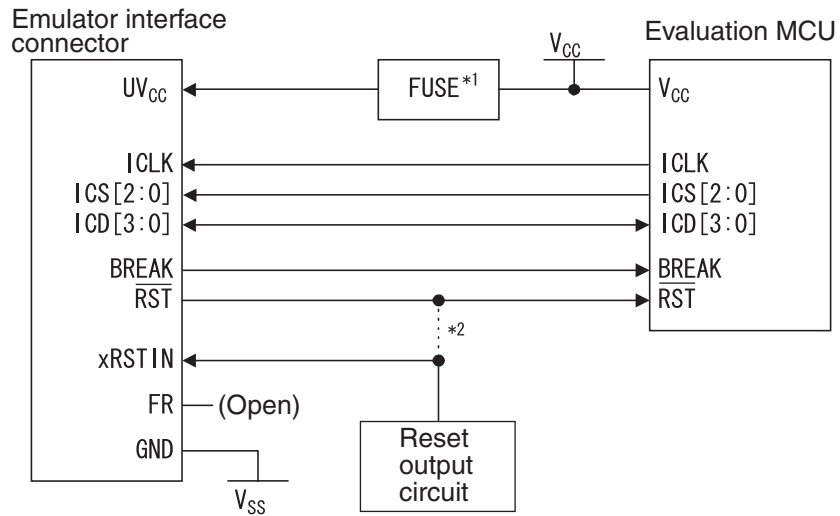
2: The asterisk () represents each of the following terminal forms:

- 1: Right angle/wrapping
- 2: Right angle/solder dip
- 4: Straight/solder dip

See the data sheet of the respective manufacturer according to information such as connector type and dimensions.

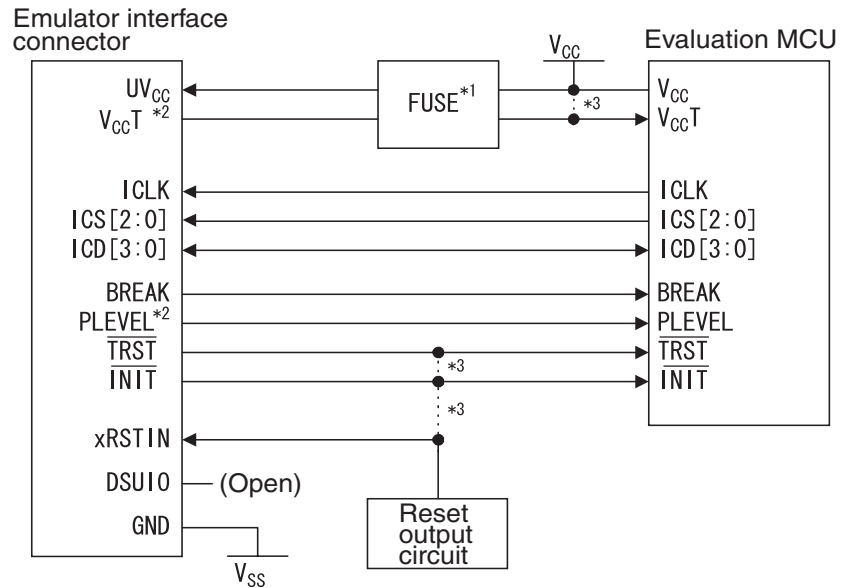
■ Circuit Configuration

Figure B-1 Circuit Configuration (DSU-3)



- *1: See the information concerning UV_{CC} in "Wiring specifications" on the next page.
- *2: Since a switching circuit may be necessary, see "Design precautions" on the next page.

Figure B-2 Circuit Configuration (DSU-4)



- *1: See the information concerning UV_{CC} and V_{CC} T in "Wiring specifications" on the next page.
- *2: Some evaluation MCUs do not have a PLEVEL or V_{CC} T terminal. In such cases, leave the terminal unconnected.
- *3: Since a switching circuit may be necessary, see "Design precautions" on the next page.

APPENDIX B User System Specifications

■ Design Precautions

To operate the evaluation MCU on the user system without connecting the emulator, you must adequately terminate the input terminals of the evaluation MCU that are connected to the emulator interface on the user system.

A switching circuit may therefore be necessary on the user system. Be careful on this point during the design process.

Table B-2 "Emulator Interface Terminal Termination (DSU-3)" and Table B-3 "Emulator Interface Terminal Termination (DSU-4)" summarize the termination of emulator interface terminals.

Table B-2 Emulator Interface Terminal Termination (DSU-3)

Evaluation MCU terminal name	Termination
$\overline{\text{RST}}$	Must be connected to the reset output terminal of the user system.
Other	Must be left unconnected.

Table B-3 Emulator Interface Terminal Termination (DSU-4)

Evaluation MCU terminal name	Termination
V_{CCT}	Must be connected to the V_{CC} terminal (+3V power) of the evaluation MCU.
$\overline{\text{TRST}}$	Must be connected to the reset output terminal of the user system.
$\overline{\text{INIT}}$	Must be connected to the reset output terminal of the user system.
Other	Must be left unconnected.

■ Wiring Specifications



Attention



Because incorrectly connected probes may cause a short-circuit or reverse connection between power supply and GND in operation, to ensure safety, insert a protective circuit such as a fuse into power supply pattern. Doing so may result in device problems or fire.

Table B-4 Emulator Interface Wiring Specifications

Signal line name	Wiring specification
ICLK ICS[2:0] ICD[3:0] BREAK	<ul style="list-style-type: none"> • The total wiring length of each signal line (from the evaluation MCU pin to the Emulator interface connector pin) must be 50 mm or less. • The total wiring lengths of every signal line may differ by 2 cm at the most. The total wiring length of ICLK must be the shortest.
UV _{CC} V _{CC} ^T	<ul style="list-style-type: none"> • Prepare wiring in a pattern with more capacity than the rated current. • An erroneous connection of a probe may cause a short-circuit between a power source and ground or be a reverse connection. As a safety measure, include a protective circuit such as a fuse in each of the power circuit patterns.
GND	<ul style="list-style-type: none"> • Connect terminals directly to power circuit patterns, such as the ground plane.

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