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F²MC-16L/16LX

Emulator
MB2147-01-E Operation Manual

Doc. # 002-07501 Rev. *B

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Preface



Thank you for purchasing the MCU board for the F²MC*-16L/16LX emulator (MB2147-01-E).

The MB2147-01-E is a development support tool for performing evaluations of application products that use a Cypress F²MC-16L/16LX microcontroller.

This manual is for engineers developing F²MC-16L/16LX application products using the MB2147-01-E (referred to as "the emulator unit" in this manual), and describes the handling of the products and connection methods.

■ Using the product safely

This manual contains important information required for using the MB2146-302A safely. Be sure to read through the manual before using the product and follow the instructions contained therein to use it correctly.

In particular, carefully read the "Caution of the products described in this document" at the beginning of this manual to understand the requirements for safe use of the product before using it.

■ Related manuals

Refer to the following manuals for additional information:

- Evaluation MCU Hardware Manual.
- Adapter board operation Manual.
- Probe cable operation manual
- Probe header operation manual
- "SOFTUNE Workbench Operation Manual"

■ European RoHS compliance

Products with E-suffix on the part number are European RoHS compliance products.

■ Notice on this document

All the 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.

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1. Product Handling and Specifications



1.1 Checking the Items Packaged

Check that the package contains all of the following items before using the emulator unit.

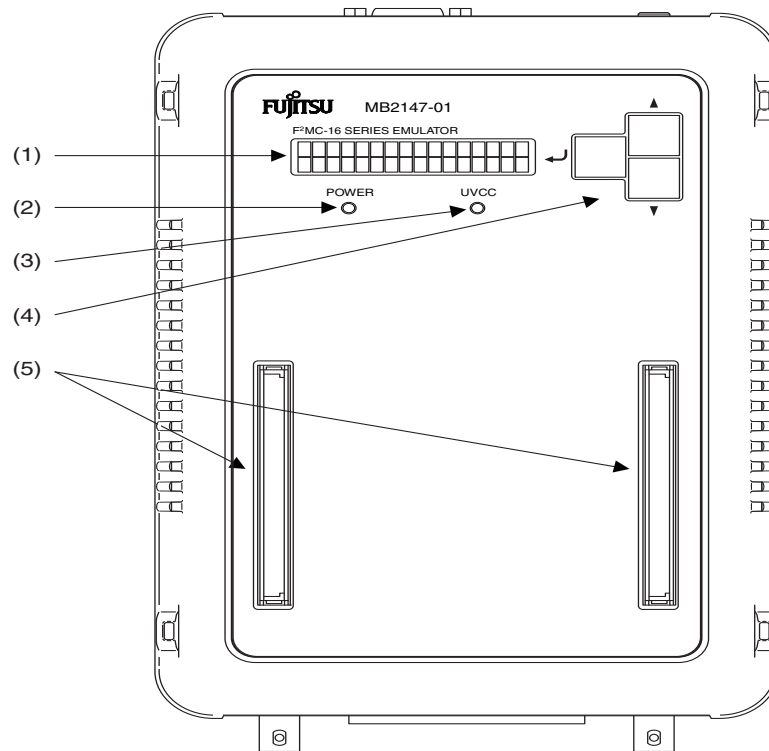
- Emulator unit: 1
- AC adapter: 1
- AC cord*: 1
- Flat cable 1 (standard length): 2
- Flat cable 2 (long): 2
- Operation manuals (English version, this manual): 1
- Operation manuals (Japanese version): 1

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

1.2 Appearance and Part Names

The external appearance and component names of the emulator are shown in [Figure 1-1](#) to [Figure 1-3](#).

Figure 1-1. Top view of the emulator unit



No.	Name	Description
(1)	Status indicator LCD* ¹	Displays different kinds of information, including setting values, communication status, and operating status.
(2)	POWER LED	Lights up when the emulator power is turned on.
(3)	UVCC LED* ²	Lights up when the user system power (UV _{CC}) is turned on.
(4)	Setting switches* ¹	Used to change settings and the information displayed on the status indicator LCD.
(5)	Adapter board connector	Connects to each of the different kinds of adapter boards (which is sold separately).

*1 : For details on the type of information displayed on the status indicator LCD and how to use the setting switches, see Section 3.7 "Using the Setting Switches."

*2 : If the evaluation MCU has a dual source power supply, this LED lights up when both power supplies are turned on.

Figure 1-2. Front view of the emulator unit

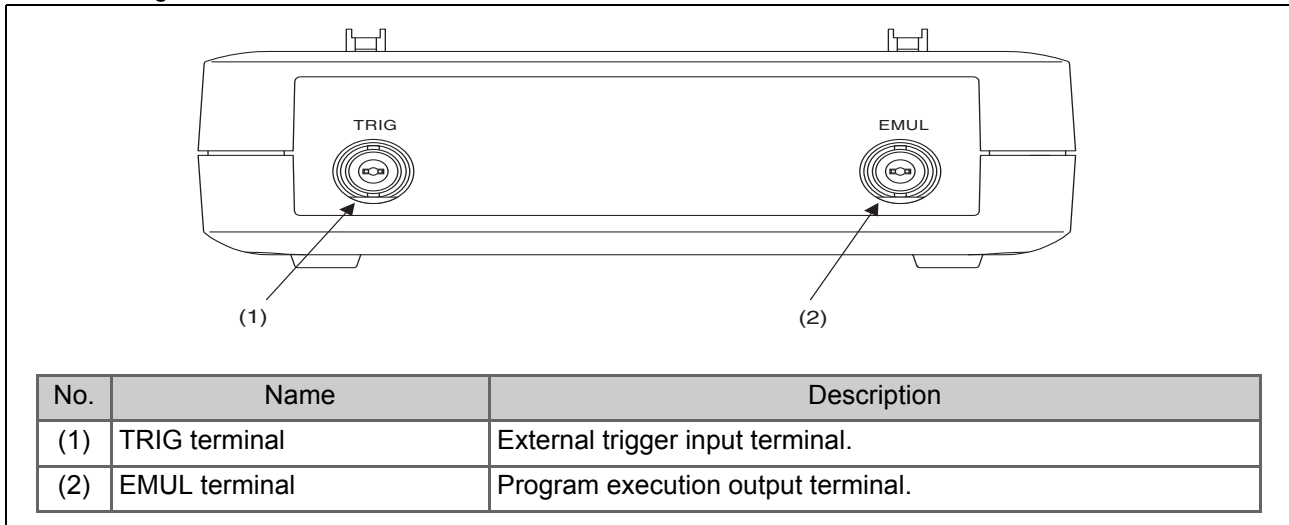
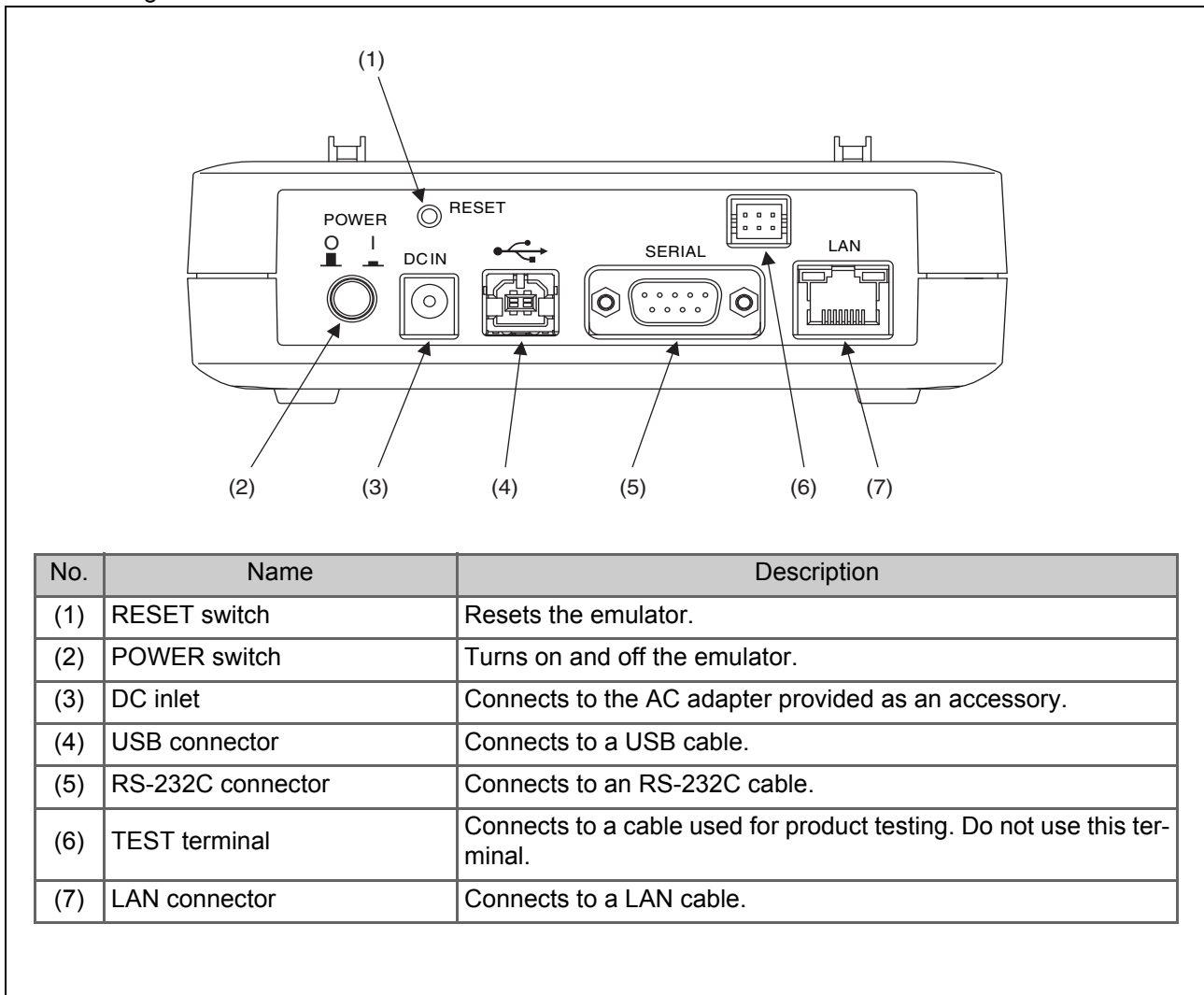


Figure 1-3. Rear view of the emulator unit



1.3 General Specifications

Table 1 lists the general specifications of the emulator.

The following names used in this manual have the following definitions:

- Emulator: Emulator unit + adapter board
- Emulator system: Emulator unit + adapter board + probe

Table 1-1. General specifications

Item	Specification	
Name	F ² MC-16L/16LX Emulator	
Part number	MB2147-01-E	
Emulator power supply	Power supply input	+16 V 2.5 A (supplied using a special AC adapter)
Evaluation MCU power supply	Emulator interface power supply output	+3.3 V or +5.0 V (supplied from the emulator)
	User system power supply input	+1.8 V to +5.5 V* ¹ 10 mA or less* ² (Dual source power supply supported: Supplied from the user system)
Operating frequency	High-speed I/F	8 kHz to 33 MHz* ³
	Conventional interface	8 kHz to 20 MHz* ³
Operating temperature	+5 to +35 degrees Celsius	
Storage temperature	0 to +70 degrees Celsius	
Operating humidity	30% to 80% (No condensation)	
Storage humidity	20% to 90% (No condensation)	
External dimensions	148 mm (W) × 210 mm (D) × 44 mm (H) (excluding protruding sections and rubber feet)	
Weight	700 g	

*1: The upper and lower voltage limits depend on the evaluation MCU used.
For details, contact the sales or support representative.

*2: Does not include the current consumed by the evaluation MCU.

*3: The upper and lower frequency limits depend on the evaluation MCU used. The upper and lower frequency limits may depend on the operating voltage, even if the same evaluation MCU is used.
For details, contact the sales or support representative.

1.4 RS-232C Port Specifications

The emulator includes an RS-232C port.

The RS-232C port specifications are shown in Table 2 and the pin assignment of the RS-232C connector is shown in Figure 1-4.

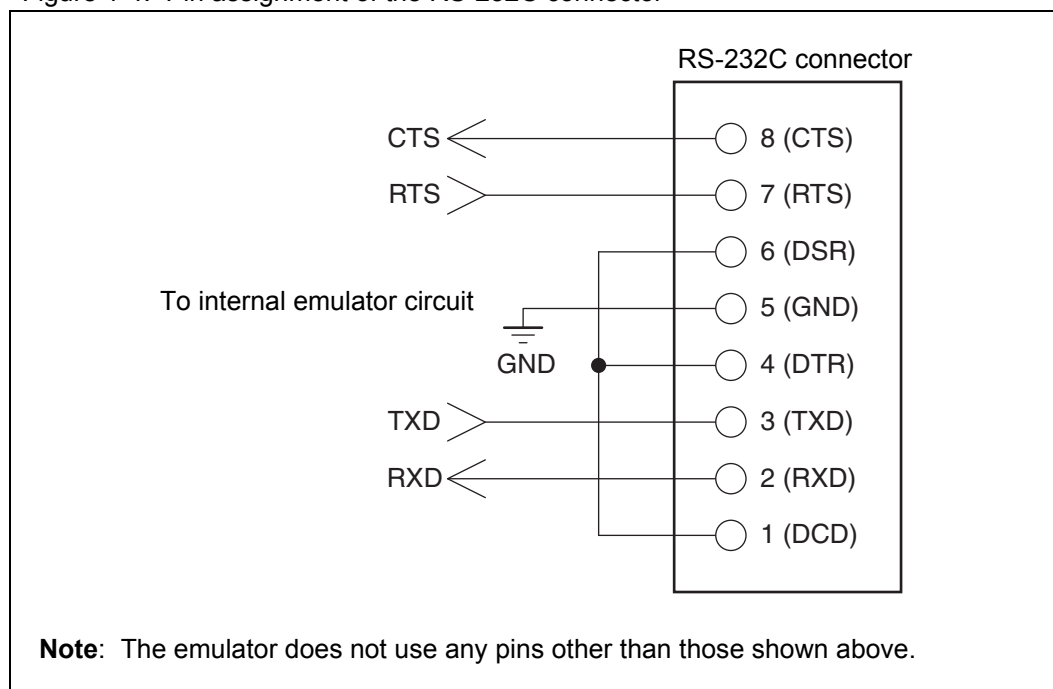
See Section 1.10 Optional Parts for details on the RS-232C cable wiring.

Table 1-2. RS-232C port specifications

Item	Description
Connector shape	D-sub 9-pin (male)
Signal definition	DTE (same as the signal definition for personal computers)
Baud rate*	9600bps, 19.2kbps, 115.2kbps
Data bit length	8 bits
Start bit length	1 bit
Stop bit length	1 bit
Parity bit	None
X control	None

*: Baud rates depend on the emulator debugger specifications.
 For details, see the S_{OF}TUNE Workbench Operation Manual.

Figure 1-4. Pin assignment of the RS-232C connector



1.5 USB Port Specifications

The emulator includes a USB port.

[Table 1-3](#) lists the USB port specifications.

Table 1-3. USB port specifications

Item	Description
Standard compliance	USB 1.1
Communication mode	Full Speed Bulk Transfer
Data transfer rate	12 Mbps
Connector shape	Series B
Power supply	Self Powered

1.6 LAN Port Specifications

The emulator includes a LAN port.

[Table 1-4](#) lists the LAN port specifications.

Table 1-4. Table 4 LAN port specifications

Item	Description
Standard compliance	IEEE 802.3
Communication mode	TCP/IP
Data transfer rate	10 Mbps/100 Mbps
Connector shape	Series B
IP address	Variable
Port address	Variable
Ethernet address	Global: Fixed address (registered in IEEE) Local: Variable address

1.7 External Trigger Input Terminal Specifications

The emulator provides a TRIG terminal for input of external trigger signals.

1.7.1 External trigger input terminal specifications

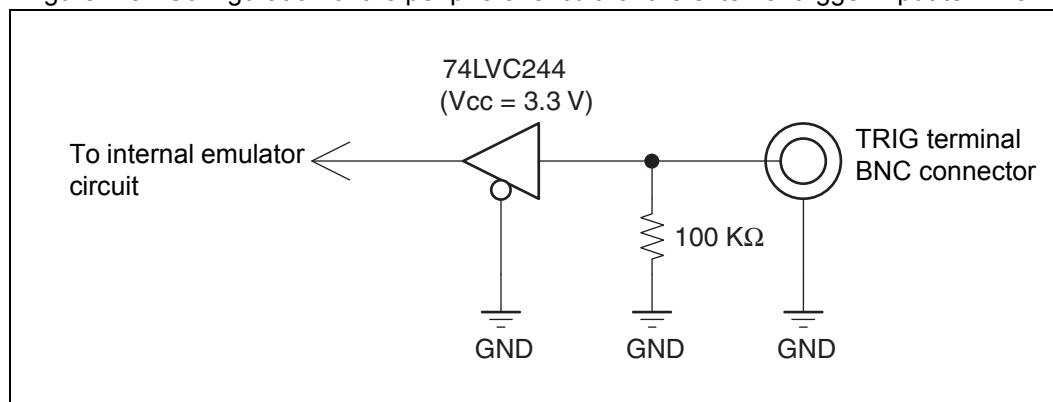
The external trigger input is a mechanism for connecting an external device such as a logic analyzer to the emulator in order for the external device to request the evaluation MCU in the emulator to break (external trigger break function).

The external trigger input terminal specifications are shown in [Table 1-5](#) and the corresponding peripheral circuit configuration is shown in [Figure 1-5](#).

Table 1-5. External trigger input terminal specifications

Terminal name	Input or output	Description
TRIG	Input	<p>Used to input external trigger signals.</p> <p>This terminal is used for break function control.</p> <p>The signal activation can be selected from L to H transition activation or H to L transition activation.</p> <p>A break occurs when the selected activation signal input is detected.</p>

Figure 1-5. Configuration of the peripheral circuit for the external trigger input terminal



1.7.2 Precautions on using the external trigger input terminal

Before using the external trigger function, be sure to understand the break slip characteristics as described below.

■ Break slip

A trigger signal input via the external trigger input terminal is encoded in the emulator internal circuit into the emulator interface command code. The signal is then transmitted to the evaluation MCU in the emulator system. The emulator interface has lower clock frequency than that of the evaluation MCU (the ratio between the clock frequencies depends on the model of evaluation MCU). Therefore, a relatively large break slip (several tens to several hundreds of machine clock cycles) occurs between trigger signal input and the associated break operation of the evaluation MCU.

1.8 Program Execution Output Terminal Specifications

The emulator provides an EMUL terminal that outputs program execution signals.

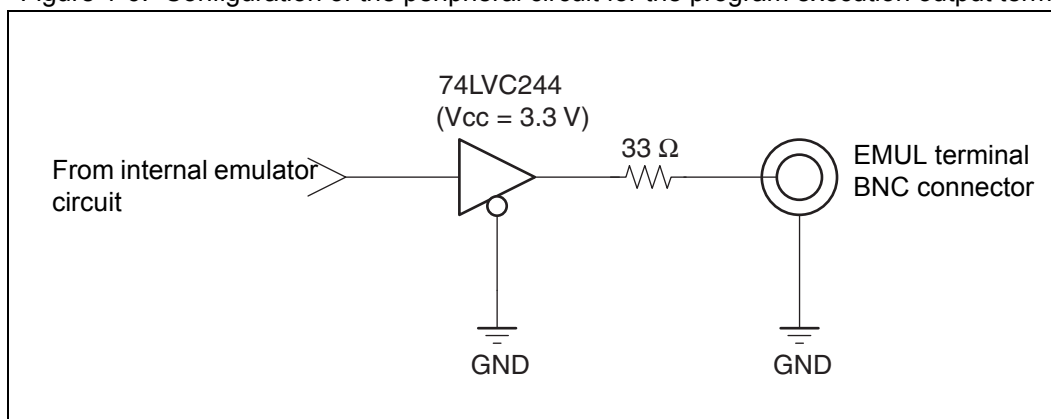
The program execution signal is output continuously while a user program is being executed.

The program execution output terminal specifications are shown in [Table 1-6](#) and the corresponding peripheral circuit configuration is shown in [Figure 1-6](#).

Table 1-6. Program execution output terminal specifications

Terminal name	Input or output	Description
EMUL	Output	Outputs the user program execution signal An H level signal is output continuously while a user program is being executed.

Figure 1-6. Configuration of the peripheral circuit for the program execution output terminal



1.9 Power-On Debug Specifications

The emulator provides a power-on debug function that executes a program immediately after power is turned on to the evaluation MCU.

1.9.1 Power-on debug specifications

The power-on debug function*¹ verifies the processing of an executed program immediately after the power-on sequence by using the PLEV pin*² of the evaluation MCU.

This function must be configured before it can be used.

For details on configuring this function, see the *S_{OPTUNE} Workbench Operation Manual*.

*1: The power-on debug function is enabled if supported by the evaluation MCU.

Contact the sales or support representative before using this function.

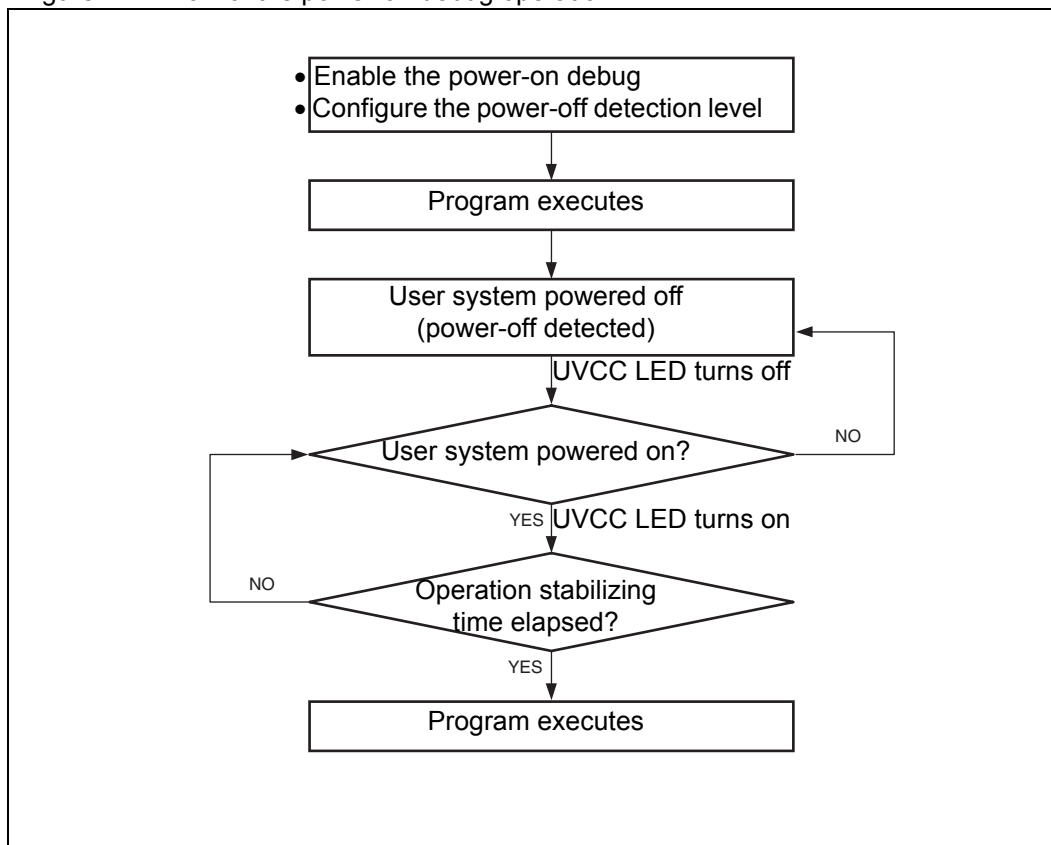
*2: The name of the PLEV pin may vary depending on the model of evaluation MCU to be used.

Contact the sales or support representative before using this function.

1.9.2 Operational flow

Figure 1-7 shows the flow of the power-on debug operation.

Figure 1-7. Flow of the power-on debug operation



1.9.3 Operation outline

Figure 8 shows a timing chart of the power-on debug operation.

- Operation timing
- Detection of power-off:

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

When the user power supply voltage becomes less than or equal to the power-off detection level, the emulator outputs an L-level signal to the PLEV pin of the evaluation MCU to stop the operation of the evaluation MCU (See (1) in Figure 1-8).

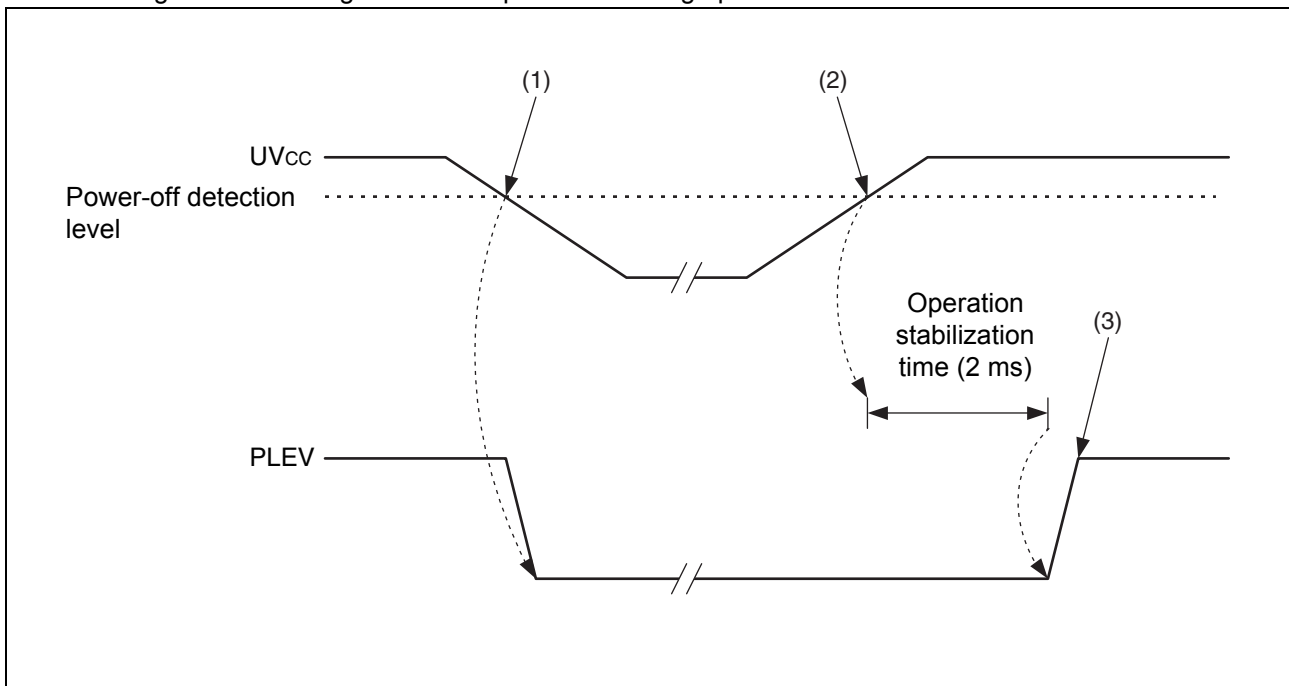
- Detection of power-on:

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

The function checks that a voltage higher than the power-off detection level is held for the operation stabilization time (about 2 ms) of the evaluation MCU after the voltage is detected as being higher than the power-off detection level (See (2) in Figure 1-8).

After the operation stabilization time, the emulator outputs an H-level signal to the PLEV pin of the evaluation MCU and releases the user reset input for program execution (See (3) in Figure 1-8).

Figure 1-8. Timing chart of the power-on debug operation



Note:

The characteristics of the user power supply (UV_{CC}) must be taken into consideration when setting the power-off detection level values.

In general, when using the power-on debug function, set the voltage to approximately 5% higher than the minimum guaranteed operating voltage of the evaluation MCU, and when not using the power-on debug function, set the voltage to the minimum guaranteed operating voltage of the evaluation MCU. While the PLEV pin level is low, the emulator functions (trace, event, and other) are disabled because the evaluation MCU breaks the connection with the emulator in order to prevent the emulator from malfunctioning.

1.10 Optional Parts

A variety of optional parts are available for the emulator. Purchase optional parts separately as necessary.

The emulator unit cannot be used independently. Purchase the optional parts listed in [Table 1-7](#) as required to build an emulator system that is suitable for the evaluation MCU to be used.

Table 1-7. Optional parts

Name	Part number
Evaluation MCU* ¹	MB90Vxxx
Adapter board* ²	MB2147-xx-E
Probe cable* ³	MB2132-xxx
Probe header* ³	MB2147-xxx-E
RS-232C cable* ⁴ * ⁵	-
USB cable* ⁴	-
LAN cable* ⁴	-
BNC cable* ⁶	-

*1: The part numbers differ depending on the evaluation MCU to be used. For details, contact the sales or support representative.

*2: The adapter board is an interface board that connects the user system to the emulator unit. Purchase an adapter board that is compatible with the evaluation MCU to be used. Contact the sales or support representative for details on how to select a suitable adapter board. See the adapter board operation manual for details on how to handle and use the adapter board, and for related safety precautions.

*3: The probe cable is an FPC cable that connects the user system to the emulator. The probe header is a board that uses a flat cable to connect the user system to the emulator. Purchase a probe cable and header that are compatible with package of the mass production MCU to be used. Contact the sales or support representative for details on how to select a suitable probe cable and probe header.

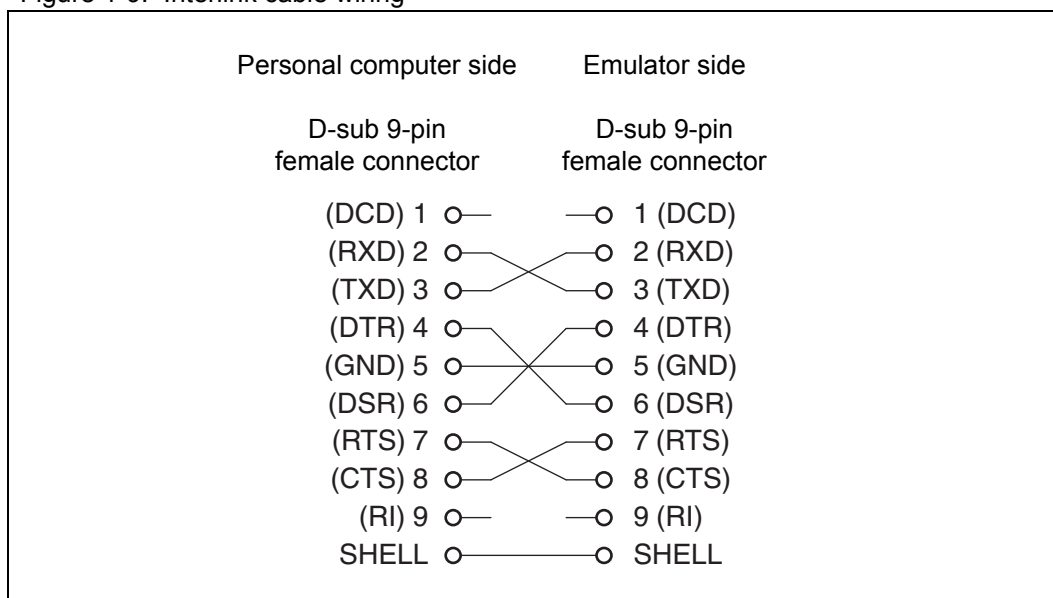
See the probe cable operation manual and probe header operation manual for details on how to handle and use a probe cable and probe header, and for related safety precautions.

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

*5: The RS-232C cable provided should be a crossover (interlink) cable. Figure 9 shows the interlink cable wiring.

*6: A BNC cable is required only if the TRIG or EMUL terminal of the emulator is used. In a BNC cable is required, use a cable with an impedance of 50 ohms and a maximum length of 2 meters. Use a BNC cable that is compatible with both the emulator and the device connected to the emulator.

Figure 1-9. Interlink cable wiring



2. Connecting the Emulator

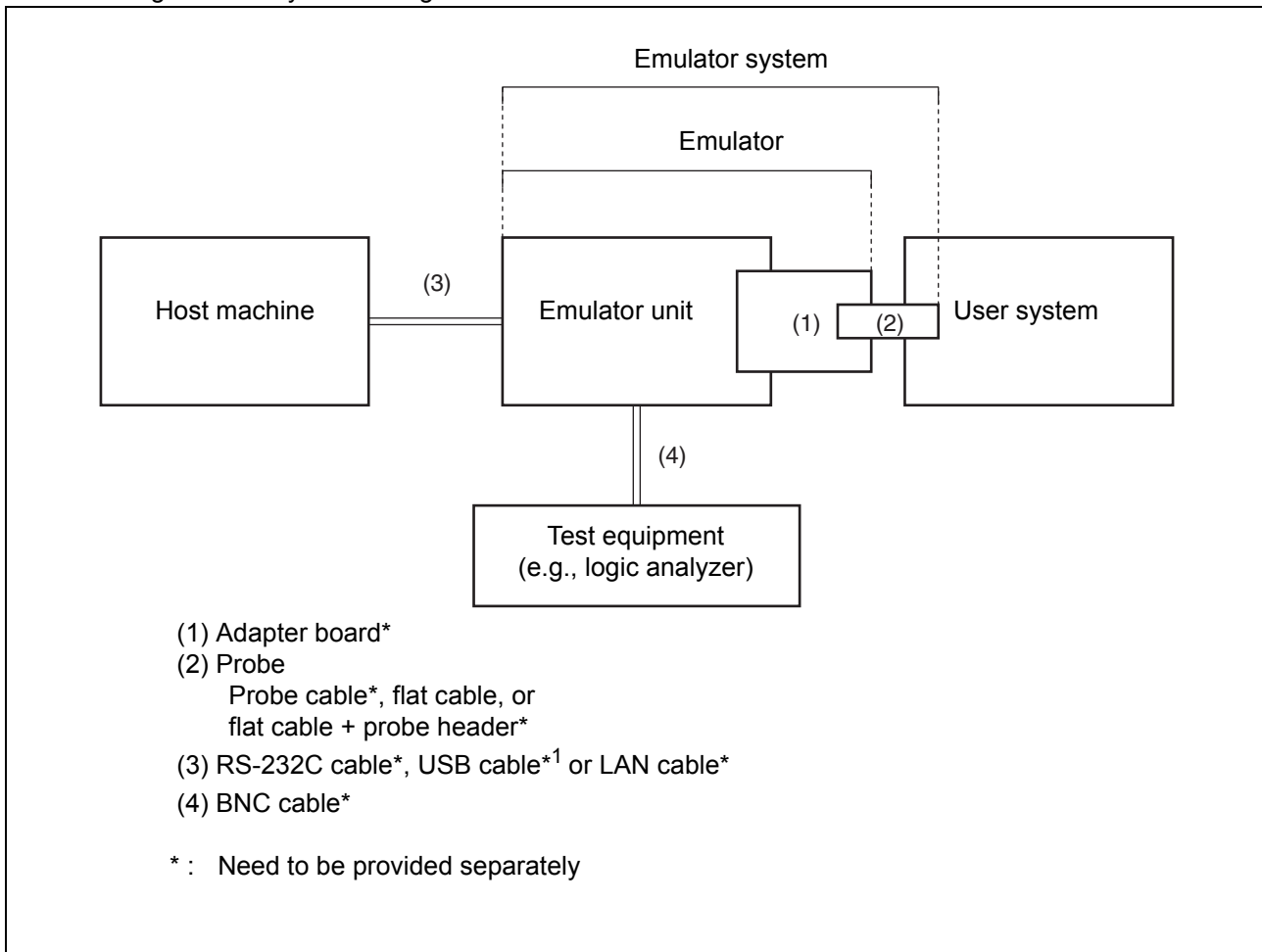


2.1 System Configuration

The emulator is designed to be connected to and controlled by a host machine. The host machine uses emulator debugger software to control the emulator. See the *S_{OPTUNE} Workbench Operation Manual* for details on how to use the software.

Figure 2-1 shows the emulator system configuration.

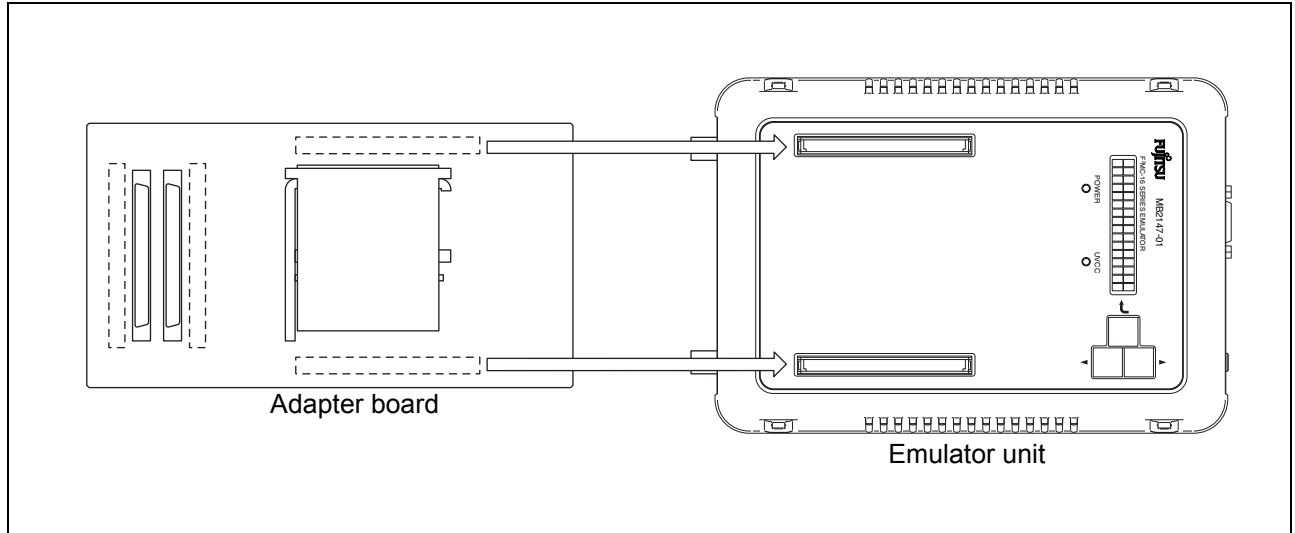
Figure 2-1. System configuration



2.2 Connecting an Adapter Board

Connect the adapter board (which is sold separately) into the adapter board connector at the top of the emulator unit, as shown in [Figure 2-2](#).

Figure 2-2. Connecting the adapter board



2.3 Connecting the User System

Connect a probe to the user system.

2.3.1 Connecting the user system

Connect a probe to the user system.

The method for connecting the probe to the user system depends on the probe configuration. [Table 2-1](#) shows the probe configurations.

Table 2-1. Probe configurations

Cable used	Probe configuration	Connection to user system
Probe cable	Probe cable	Insert the connector* of the probe cable header into the appropriate connector* of the user system.
Flat cable	Flat cable and probe header	Insert the connector* of the probe header into the appropriate connector* of the user system.
	Flat cable	Connect the connector of the flat cable to the connector of the user system.

*: The shape of the header connector depends on the model of header.

Example: IC socket and NQPACK connector

Note:

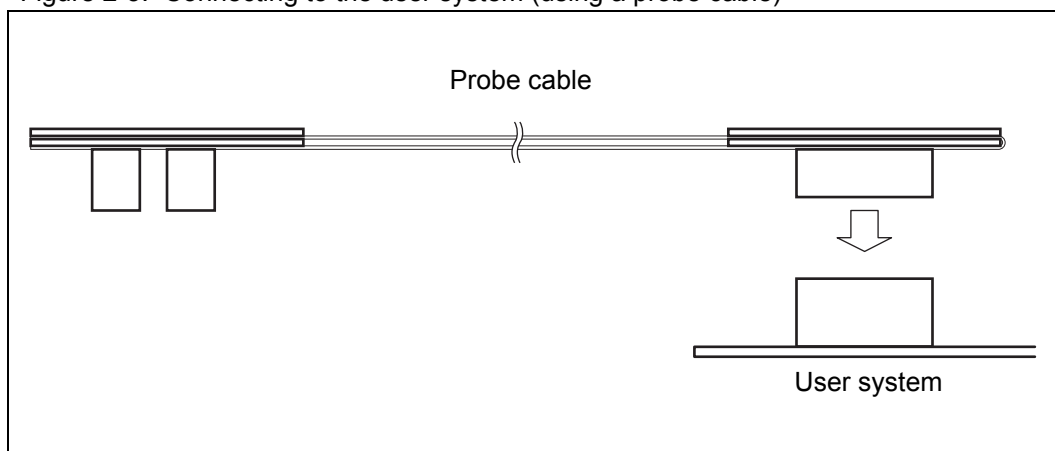
Before connecting the adapter board to the user system using a probe, remove the mass production MCU from the user system.

2.3.2 Connecting to the user system (using a probe cable)

Connect a probe cable that is compatible with the package of the mass production MCU to be used to the connector on the user system, as shown in [Figure 2-3](#).

See the probe cable operation manual for details on how to connect the connector on the header end of the probe cable.

Figure 2-3. Connecting to the user system (using a probe cable)

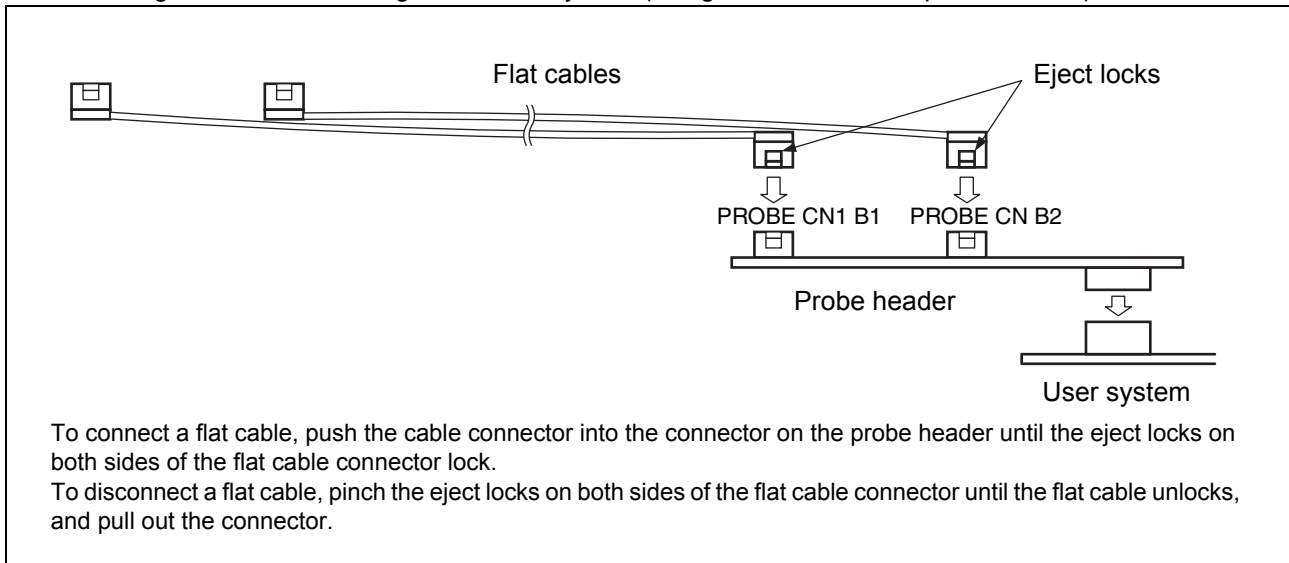


2.3.3 Connecting to the user system (using flat cables and a probe header)

Connect the probe header that corresponds to the package of the mass production MCU to be used to the connector on the user system, as shown in [Figure 2-4](#).

See the probe header operation manual for details on how to connect the connector on the header end of the probe header.

Figure 2-4. Connecting to the user system (using flat cables and a probe header)

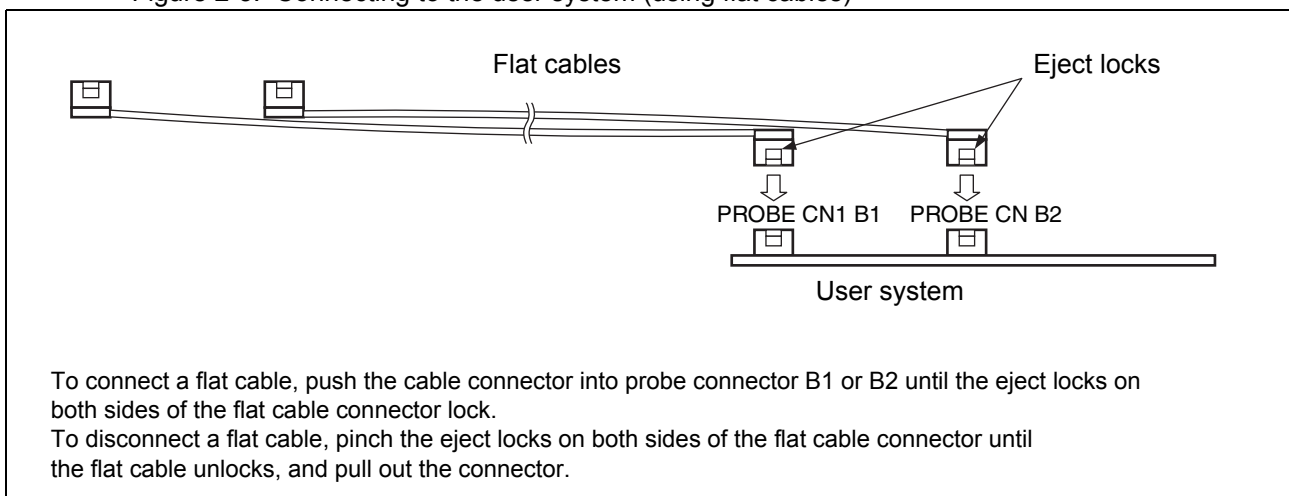


2.3.4 Connecting to the user system (using flat cables)

If connectors that suit probe connectors B1 and B2 of the adapter board are mounted on the user system, the user system can be connected to the adapter board via flat cables. For the interface specifications of probe connector B1 and B2, see the adapter board operation manual.

Connect flat cables to the probe connector B1 and B2 on the user system, as shown in [Figure 2-5](#)

Figure 2-5. Connecting to the user system (using flat cables)



2.4 Connecting a Probe

Connect a probe to the adapter board.

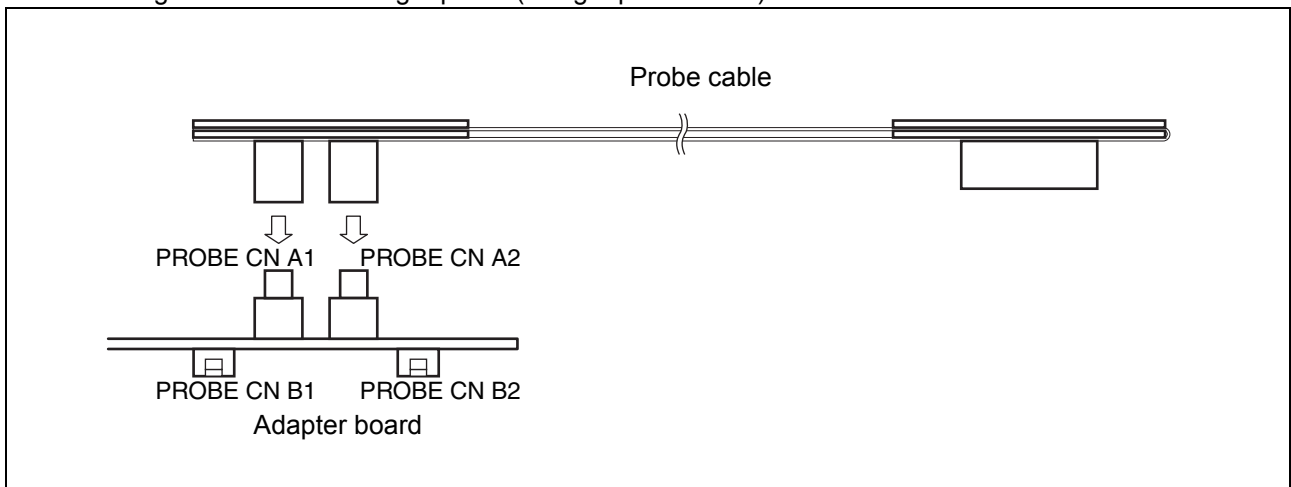
2.4.1 Note on connecting a probe

The adapter board has two pairs of probe connectors. Do not use both pairs at the same time. Use only one of these pairs according to the configuration of the probe used.

2.4.2 Connecting a probe (using a probe cable)

Connect a probe cable to probe connectors A1 and A2 on the adapter board, as shown in [Figure 2-6](#).

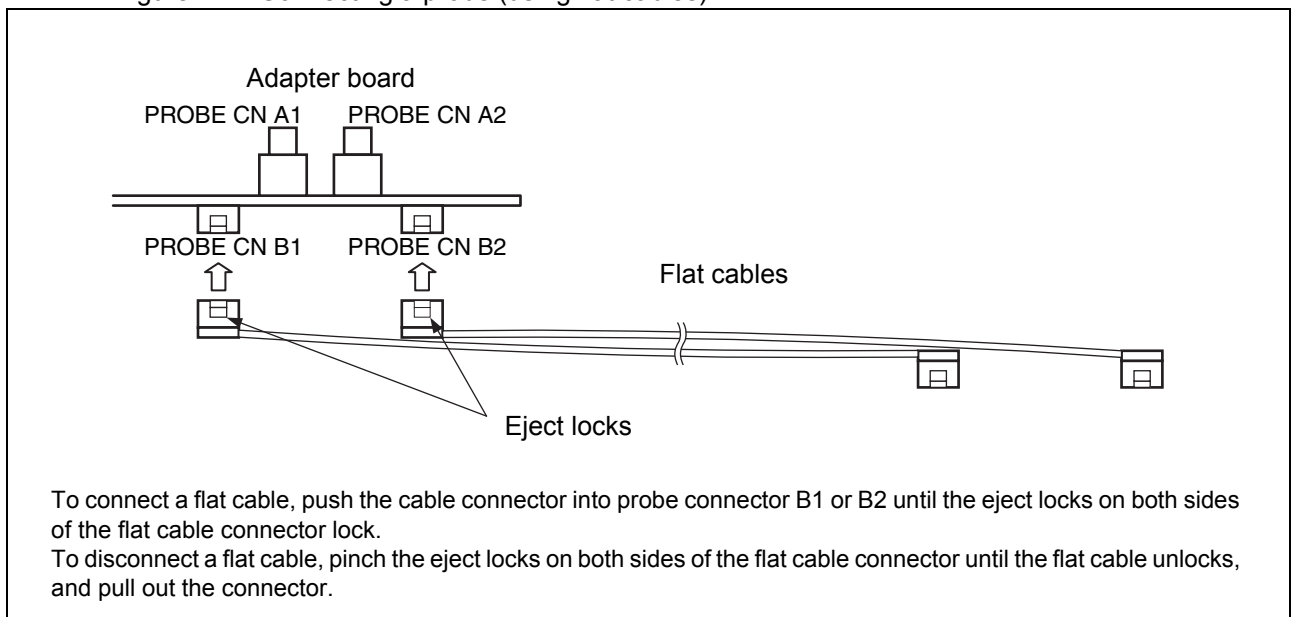
Figure 2-6. Connecting a probe (using a probe cable)



2.4.3 Connecting a probe (using flat cables)

Connect flat cables to probe connectors B1 and B2 on the adapter board, as shown in [Figure 2-7](#).

Figure 2-7. Connecting a probe (using flat cables)

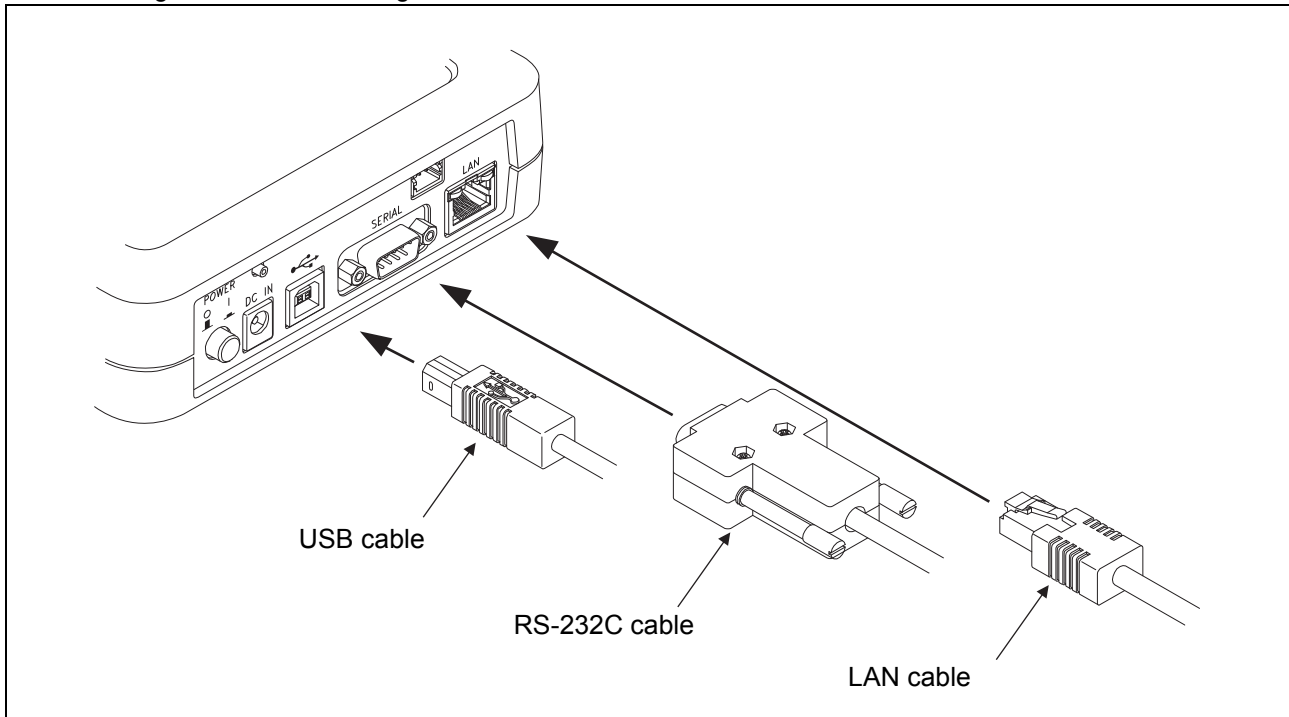


2.5 Connecting a Host Machine

Connect the host machine to the emulator using an RS-232C, USB, or LAN cable, as shown in Figure 2-8.

To make a Plug & Play connection to the host machine using a USB cable, power on all relevant equipment, and then insert the USB cable plug for the host machine into the appropriate host machine socket.

Figure 2-8. Connecting a host machine



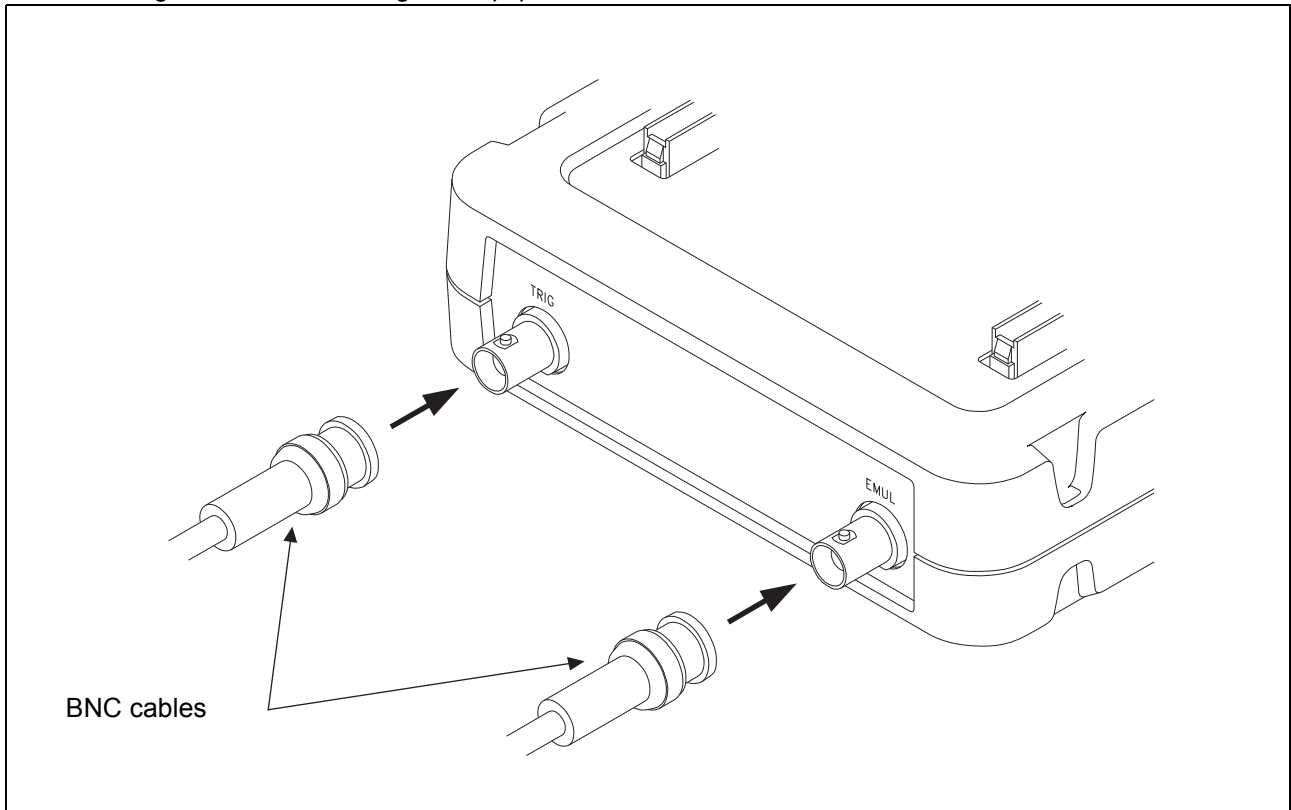
Note:

Connect only one RS-232C, USB, or LAN cable between the host machine and the emulator. Connecting multiple communication cables may result in abnormal operation.

2.6 Connecting Test Equipment

Connect test equipment to the emulator, as shown in [Figure 2-9](#), only if the external trigger input and program execution functions of the emulator are to be used. If these functions are not used, do not connect the TRIG and EMUL terminals.

Figure 2-9. Connecting test equipment



2.7 Connecting the AC Adapter

Connect the AC adapter to the emulator, as shown in [Figure 2-10](#).

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

Figure 2-10. Connecting the AC adapter

