

FR20/30 Series
FR-DSU3 PGA299P EVALUATION BOARD
MB2197-110
HARDWARE MANUAL

PREFACE

■ Using the MB2197-110 Safely

This manual contains important information for using the MB2197-110 safely. Be sure to read it before using the MB2197-110 and use the MB2197-110 only as instructed. Be especially sure to read the section "Safety Precautions" thoroughly and make all safety checks before using the MB2197-110.

Keep this manual in a handy location so that you can refer to it while using the MB2197-110.

■ Purpose and Intended Reader

The MB2197-110 is a development support tool used to develop and evaluate application products that run on FR20/30 series products.

This manual is intended for engineers who use the MB2197-110 to develop application products that run on FR20/30 series products. The manual explains handling, functions, and setup of the MB2197-110 (hereafter, evaluation board). Please read through this manual.

■ Trademark

FR is an abbreviation of Fujitsu RISC Controller, a product of Fujitsu Limited.

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■ MB2197-110 Operating Environment

The MB2197-110 operates at an ambient temperature of 0 to 35°C and at an ambient humidity of 30 to 80%. Do not store the MB2197-110 in very hot or humid places and do not allow condensation to form on the MB2197-110.

The MB2197-110 is a PC board unit with all its electronic parts exposed; it is not housed in a cabinet. Do not put any objects on the MB2197-110. Do not allow your body or any charged substances to come into contact with the metallic portions of the MB2197-110. After power-on, keep materials that may cause a short circuit and combustible materials away from the MB2197-110. Use the MB2197-110 as level surface as possible. Do not use it in locations with excessive vibration or dust or in the vicinity of explosive gases.

Use of the MB2197-110 in an operating environment subject to the hazards described above damage may result in injury to users and other persons or in damage to property.

The packing materials used to deliver the MB2197-110 should be stored and used again if the MB2197-110 must be transported because of a failure.

■ Safety Warnings



In this manual, important warnings are indicated as explained below.

Read the relevant pages and make a safety check before using the MB2197-110.



This indicates that minor or moderate personal injury may occur if a procedure is not performed correctly. It also indicates that the MB2197-110, connected equipment, software resources such as data, or property may be damaged if a procedure is not performed correctly.

Warning	Description	Page
Prohibited 	Do not put any objects on the MB2197-110.	5
	Be sure to turn off the power before inserting or removing cables.	5
	To remove a cable, hold the case connector instead of pulling the cable.	5
	To prevent damage from static electricity, make sure that your fingers or an object does not touch metallic components, such as connector pins.	5
	Do not put any objects on the MB2197-110. Because the MB2197-110 does not have a cabinet, it should be kept in its packing box when it is stored.	5
	Do not subject the MB2197-110 to shock. Subjecting it to shock may cause a failure.	5
	To prevent condensation from forming, do not expose the MB2197-110 to direct sunlight or place it in a very hot or humid environment.	5
	Because the MB2197-110 uses many electronic components, do not store it for long periods in the vicinity of strong electric or magnetic fields. Storing it in such locations may cause a failure.	5
	Do all work described in Chapter 4 after all power to the system has been turned off. Doing the work while the power is on may result in electric shock or equipment failure.	17
	Be sure to hold the connector when inserting and removing cables. Pulling the cable may break the cable wire.	17
	Do not forcibly bend the cables. Bending them may break the cable wire.	17
	Turn the power to the MB2197-110 on or off according to the procedures described in this manual. Performing unnecessary operations may unexpectedly damage the system.	24

Warning	Description	Page
Directive 	The MB2197-110 has many sharp, exposed areas such as monitor pins. Handle the MB2197-110 very carefully to avoid injury.	5
	Set up and use the MB2197-110 as described in this manual.	5
	The header interface connector has no lock. If necessary, check whether the header interface cable is loose as required when the evaluation board is being used.	20
Caution 	The MB2197-110 can be damaged during transport. Because transport of the MB2197-110 may be necessary, store the packing materials used to deliver it.	3
	Operating the MB2197-110 outside the specified range of values may cause it to become defective. Use the MB2197-110 only within the specified limits.	10

■ Organization of This Manual

This manual has four chapters. Be sure to read the manual before using the MB2197-110.

Chapter 1 Overview and Handling of the MB2197-110

This chapter presents an overview of the MB2197-110 and explains how to handle it.

Chapter 2 MB2197-110 Description

This chapter describes the system configuration of the evaluation board, and presents section names and specifications.

Chapter 3 Explanation of Evaluation Board Functions

This chapter explains the functions of the evaluation board.

Chapter 4 Connection and Setup Methods

This chapter explains how to connect and set up the evaluation board and to turn power on and off. Be sure to read this chapter before turning on the power.

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HOW TO READ THIS MANUAL

■ Page Layout

Each section in this manual contains a summary beneath the section heading. Simply reading through the summaries will give you an overview of the MB2197-110.

The title of a section also appears in a lower-level section to make it easier for you to locate where you are in the manual.

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CHAPTER 1 OVERVIEW AND HANDLING OF THE MB2197-110

This chapter presents an overview of the MB2197-110 evaluation board and explains how to handle it.

- 1.1 Overview
- 1.2 Verifying Shipped Parts
- 1.3 Parts Sold Separately
- 1.4 Notes on Use

1.1 Overview

The evaluation board is a development support tool for developing and evaluating hardware and software that use the evaluation MCU of Fujitsu FR-DSU3 of PGA299 pin.

■ Overview

The MB2197-110 is used with the MB2197-110 LQFP100P header (MB2197-111), MB2197-110 QFP100P header (MB2197-112), and MB2197-110 LQFP144P header (MB2197-115) (in this manual, these are referred to as header board), which allow connection to the user system using the DSU-FR20/30 emulator (MB2197-01) (in this manual, emulator) and FR series MCUs such as the MB91110 (LQFP144) and MB91106 (LQFP100, QFP100). For information on which MCUs and evaluation MCUs are compatible with the MB2197-110, contact a Fujitsu sales engineer.

The MB2197-110 also includes connectors for connection to a ROM alternate memory unit (MB2197-90) and external trace memory for the evaluation MCUs (MB91V110 and MB91V106). This enables the MB91110 and MB91106 to be used for efficient development and evaluation of the user systems.

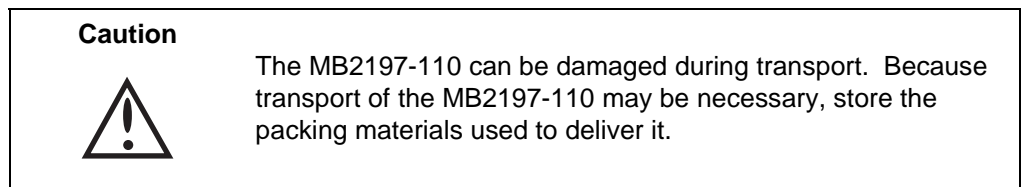
The following are the major features of the evaluation board:

- The evaluation board has an evaluation MCU IC socket, DSU connector, and connector for the ROM alternate memory unit. The evaluation board is connected to the header board with a pair of accessory header interface cables.
- The evaluation board is used with the header board to connect the emulator and user system.
- The power to the evaluation board is supplied from the user system via the header board.
- Large-capacity trace memory is mounted for the evaluation MCUs.
- A ROM alternate memory unit can be connected.

1.2 Verifying Shipped Parts

Before using the evaluation board, make sure you have received the following parts.

■ Verifying Shipped Parts



Before using the evaluation board, make sure you have received the following parts:

- Evaluation board: 1
- Standard header interface cable: 2
- Long header interface cable: 2
- Hardware manual: 1

1.3 Parts Sold Separately

Table 1.3-1 lists the parts for the evaluation board that are sold separately.

■ Parts Sold Separately

Table 1.3-1 Parts Sold Separately

Name	Model
Evaluation MCU (PGA-299C-A01)	MB91V106
	MB91V110
MB2197-110 LQFP100P header(*1)	MB2197-111
MB2197-110 QFP100P header(*2)	MB2197-112
MB2197-110 LQFP144P header(*3)	MB2197-115
DSU-FR20/30 emulator(*1)	MB2197-01
ROM alternate memory unit(*5)	MB2197-90

*1 This header corresponds to the MB91106 (LQFP100). For other compatible MCUs, contact a Fujitsu sales engineer.

*2 This header corresponds to the MB91106 (QFP100). For other compatible MCUs, contact a Fujitsu sales engineer.

*3 This header corresponds to the MB91110 (LQFP144). For other compatible MCUs, contact a Fujitsu sales engineer.

*4 Use of the emulator requires resources such as debugger software and a communication cable. For more information, contact a Fujitsu sales engineer.

*5 The ROM alternate memory unit is an option only. The evaluation board can be used without a ROM alternate memory unit connected.

1.4 Notes on Use

Observe the following precautions in using the evaluation board.

■ Notes on Use

CAUTION

Prohibited



Do not put any objects on the MB2197-110.

Be sure to turn off the power before inserting or removing cables.

To remove a cable, hold the case connector instead of pulling the cable.

To prevent damage from static electricity, make sure that your fingers or an object does not touch metallic components, such as connector pins.

Directive



The MB2197-110 has many sharp, exposed areas such as monitor pins. Handle the MB2197-110 very carefully to avoid injury.

Set up and use the MB2197-110 as described in this manual.

■ Notes on Storage

CAUTION

Prohibited



Do not put any objects on the MB2197-110. Because the MB2197-110 does not have a cabinet, it should be kept in its packing box when it is stored.

Do not subject the MB2197-110 to shock. Subjecting it to shock may cause a failure.

To prevent condensation from forming, do not expose the MB2197-110 to direct sunlight or place it in a very hot or humid environment..

Because the MB2197-110 uses many electronic components, do not store it for long periods in the vicinity of strong electric or magnetic fields. Storing it in such locations may cause a failure.

CHAPTER 1 OVERVIEW AND HANDLING OF THE MB2197-110

Table 1.4-1 lists the ambient operating and storage temperatures and operating and storage humidity.

Table 1.4-1 Operating and Storage Environment

	Temperature	Humidity
Operating	0 to 35°C	30 to 80% (no condensation)
Storage	-20 to 70°C	30 to 90% (no condensation)

CHAPTER 2 MB2197-110 DESCRIPTION

This chapter describes the system configuration of the evaluation board, and presents section names and specifications.

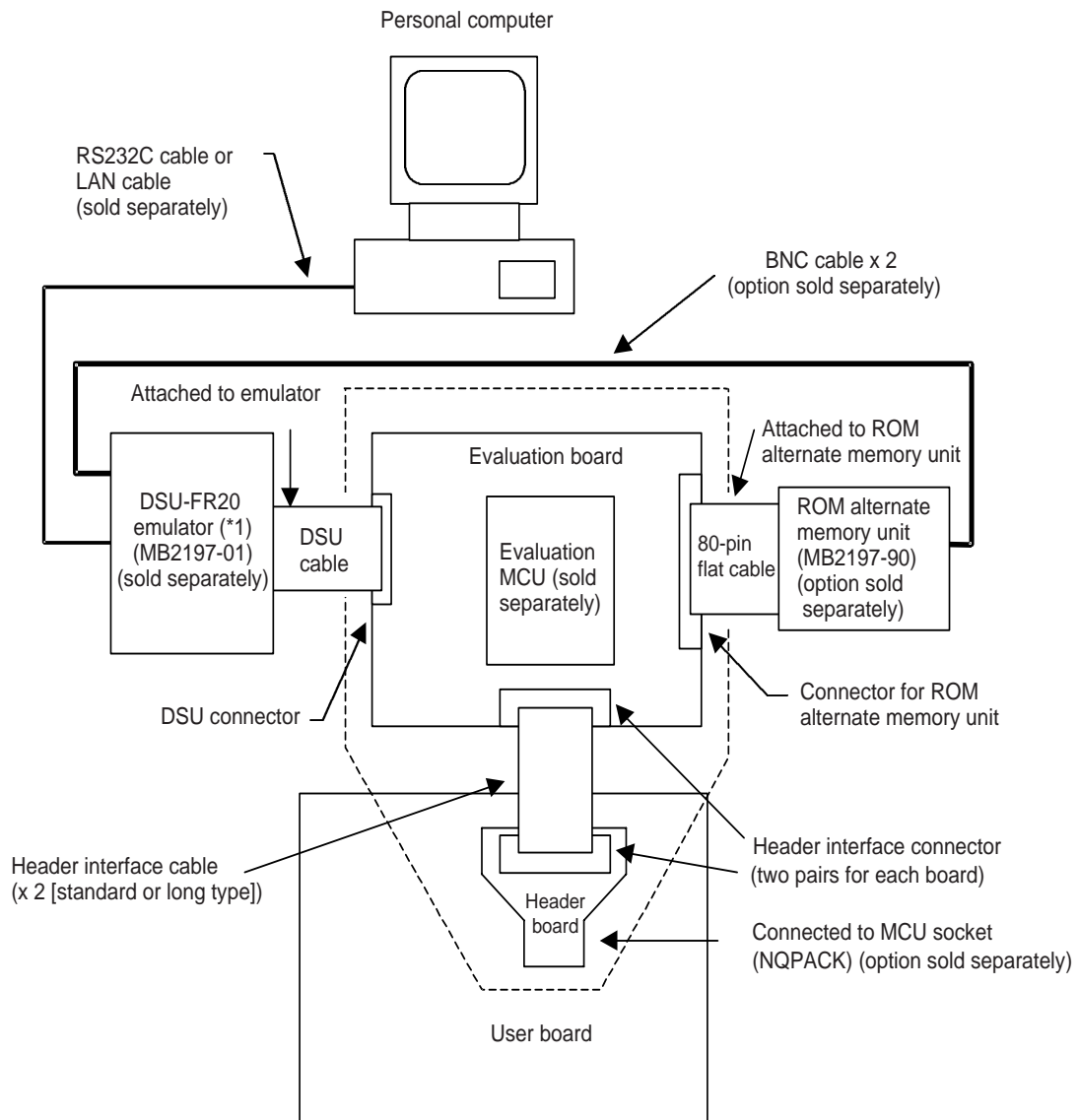
- 2.1 System Configuration
- 2.2 Schematic and Section Names
- 2.3 General Specification

2.1 System Configuration

The evaluation board is used after it has been connected to the emulator, header board, and user board.

■ System Configuration

Figure 2.1-1 shows the system configuration of the evaluation board.



*1 Refer to the emulator and the ROM alternate memory unit manuals for more information about the specifications of the emulator and ROM alternate memory unit.

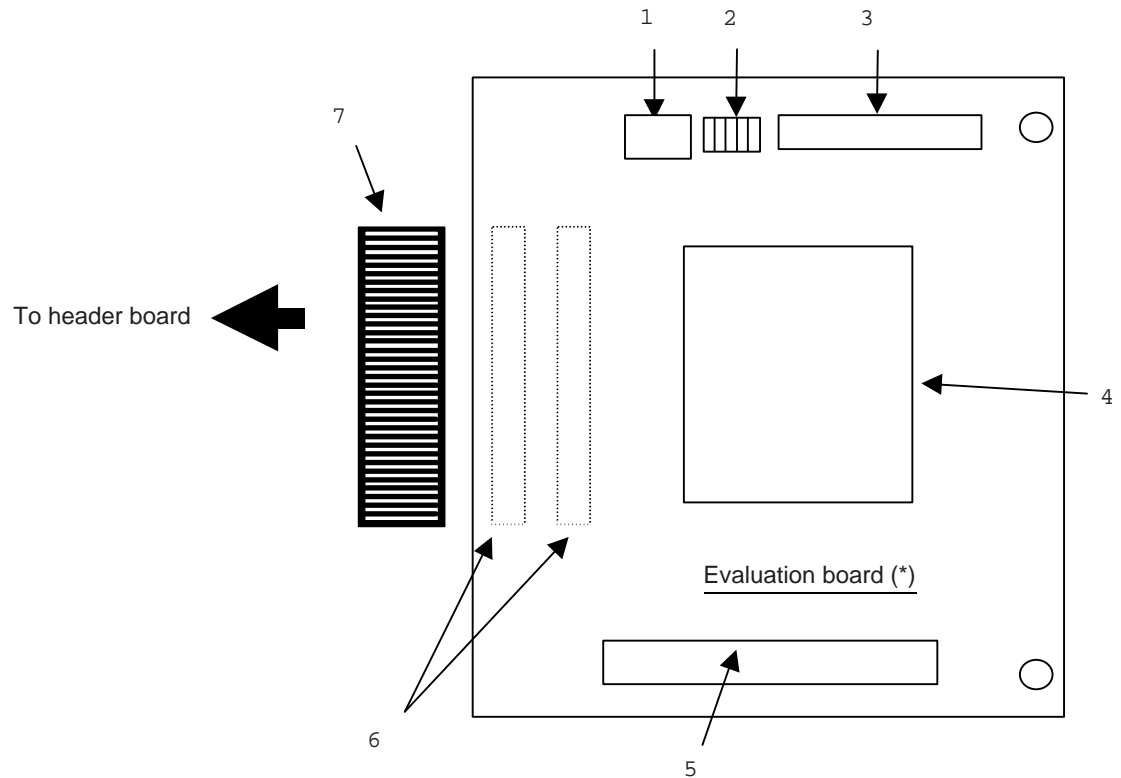
Figure 2.1-1 System Configuration Diagram

2.2 Schematic and Section Names

This section presents a schematic of the evaluation board and section names.

■ Schematic and Section Names of Evaluation Board

Figure 2.2-1 shows a schematic of the evaluation board and section names.



- 1 IC socket for Quartz Crystal: connects the Quartz Crystal to supply a clock signal to the evaluation MCU on the evaluation board.
 - 2 Jumper plug: allows various settings to be made.
 - 3 DSU connector: connects the emulator DSU cable.
 - 4 Evaluation MCU IC socket: connects the evaluation MCU (package code: PGA-299C-A01).
 - 5 Connector for ROM alternate memory unit: connects the 80-pin flat cable to the ROM alternate memory unit.
 - 6 Header interface connector: connects the header interface cable attached to the evaluation board (mounted on the rear side).
 - 7 Header interface cable: connects the evaluation board and header board (a pair).
- * The evaluation board has an insulator on the back side.

Figure 2.2-1 Evaluation Board

2.3 General Specification

Table 2.3-1 lists the general specification of the evaluation board.

■ General Specifications



 Caution	Operating the MB2197-110 outside the specified range of values may cause it to become defective. Use the MB2197-110 only within the specified limits.
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Table 2.3-1 General Specifications

Item		Description	Remarks
Power supply input(*1)		Vcc3: 3.3V ± 5%	Supplied from the user board.
		Vcc5: 5V ± 10%	Supplied from the user board.
Device dimensions (*2)	Evaluation board	120 mm (W) × 145 mm (D) × 23mm (H)	No cabinet. Has insulator on back side
Device weight	Evaluation board	210 g	
Header interface cable dimensions		Standard: 5 cm, long: 20 cm	Cable section only
Temperature (*3)		Operating: 0 to 35°C, storage: 20 to 70°C	No condensation
Humidity		Operating: 30 to 80%, storage: 30 to 90%	No condensation

*1 Vcc 3 is the user power supplied from the user board. Vcc 5 is the user power supplied from the user board.

*2 Width (W) and depth (D) indicate external dimensions of the PC board. Height (H) indicates the height from the connector on the back side of the board to the top of the highest-profile part on the PC board.

*3 Refer to the evaluation MCU data sheet for more information about the ambient temperature for the evaluation MCU.

CHAPTER 3 EXPLANATION OF EVALUATION BOARD FUNCTIONS

This chapter explains the functions of the evaluation board.

- 3.1 Function Specification
- 3.2 Connector Specifications
- 3.3 Signal Line Processing
- 3.4 Restrictions

3.1 Function Specification

Table 3.1-1 lists the function specifications of the evaluation board.

■ Evaluation Board Function Specifications

Table 3.1-1 Evaluation Board Function Specifications

Item	Description
Evaluation board function	The emulator and the user board are connected.
Trace memory	Large-capacity SSRAM is mounted as the external trace memory for the evaluation MCU.
ROM alternate memory unit connection	A ROM alternate memory unit can be connected. The data bus width can be switched between 8 and 16 bits.
Jumper plug	The emulator, the clock supplied to the evaluation MCU, and the CSOX signal output destination can be switched.

3.2 Connector Specifications

Table 3.2-1 lists the connector specifications of the evaluation board.

■ Connector Specifications

Table 3.2-1 Connector Specifications

Name	Specification
DSU connector	Connects the DSU cable attached to the emulator.
Connector for connecting ROM alternate memory unit	Connects the 80-pin cable attached to the ROM alternate memory unit.
Header interface connector	The accessory header interface cables (a pair) are used to connect the evaluation board and header board.

3.3 Signal Line Processing

This section explains the input-output signals for the user board.

■ Clock Input Processing

Clock inputs (X0 and X1) from the user board are connected to the evaluation MCU via the jumper plug on the evaluation board. This is because the jumper plug is used to select whether the clock signals (X0 and X1) are supplied to the evaluation MCU from the user board or from the Quartz Crystal on the evaluation board. For supply of the clock signals from the user board, see Section 3.4, "Restrictions."

■ Analog Power Pin Processing

The analog power pins (AVCC, AVRH, AVSS, and AVRL) are connected directly to the user board without additional circuitry.

■ Port Pin Processing

All port pins except the port pins that are also used for the external data bus pin and address output pin for the evaluation MCU are connected directly to the user board without additional circuitry.

3.4 Restrictions

This section explains the restrictions on the use of the evaluation board. Observe these when using the evaluation board.

■ Restrictions

- Before using the evaluation board, be sure to socket-mount the MCU on the user board. Use the specified IC socket for the MCU IC socket.
- To connect the ROM alternate memory unit to the evaluation board, turn the power on and off as described in Section 4.6, "Power-On/Off Sequence."
- The emulator controls the RSTX pin of the evaluation MCU. The reset input from the user system is connected to the evaluation MCU via the emulator. This causes the reset timing to delay several clocks in contrast to the reset timing of the user system. Reset using the reset command of the emulator resets only the evaluation MCU; the user system is not reset. Because the impedance of the reset input (*RSTIN) pin of the emulator is low, ensure that the reset circuit on the user board has sufficient drive capability (refer to the emulator manual for more information).
- While the evaluation MCU is in user hold or low power consumption mode, the user bus pin enters the state that is described in the evaluation MCU specifications.
- To supply the clock signal from the user board to the evaluation MCU, use the crystal oscillator as the source of the clock signal from the user board. As an MCU restriction, remove the jumper plug for switching the X1 signal on the evaluation board if the X1 pin is specified to be open when the crystal oscillator is used.
- The long header interface cable can be used only if the MCU clock frequency is low or the load on the user pin is very light. Normally, use the standard header interface cable.
- If the bus cycle clock is 14 M hertz or higher, insert one or more waits to access the ROM alternate unit.
- When the ROM alternate memory unit is used, A [21:16] pin must be supplied to the ROM alternate memory regardless of the external bus width. This pin cannot be used as a port.
- The CSOX signal is used as the chip select signal for the ROM alternate memory unit. When the ROM alternate memory unit is used, the CSOX signal on the user board is permanently high because of the 10-K-ohm pull-up resistor.

CHAPTER 4 CONNECTION AND SETUP METHODS

This chapter explains how to set up devices and basic items before power is turned on and how to turn power on and off.

- 4.1 Setting Up the Evaluation Board
- 4.2 Connecting the Evaluation Board and Header Board
- 4.3 Connecting the Evaluation Board and User Board
- 4.4 Connecting the Evaluation Board and Emulator and ROM Alternate Memory Unit
- 4.5 Configuration for Using the Evaluation Board
- 4.6 Power-On/Off Sequence



Prohibited



Do all work described in Chapter 4 after all power to the system has been turned off. Doing the work while the power is on may result in electric shock or equipment failure.

Be sure to hold the connector when inserting and removing cables. Pulling the cable may break the cable wire.

Do not forcibly bend the cables. Bending them may break the cable wire.

4.1 Setting Up the Evaluation Board

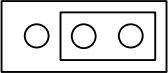
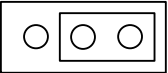
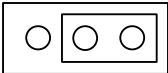
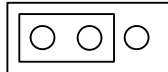
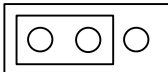
This section explains the settings for the jumper plugs on the evaluation board and connection of the crystal oscillator and socket-mounted resistor.

■ Jumper Plug Settings

The jumper plugs on the evaluation board enable the clocks supplied to the evaluation MCU, the CSOX signal output destination, the data bus width for accessing the ROM alternate memory unit, and the emulators to be switched.

Table 4.1-1 lists the jumper plug settings

Table 4.1-1 Jumper Plug Settings

Jumper plug	Silk-screened signal	Function
RES  FR	RES	Reserved. Do not set to RES.
	FR	When the emulator is used, always set to FR.
8 bit  16 bit	8 bit (*1)	Set 8bit if the external bus width for the MCU is 8 bits when the ROM alternate memory unit is used.
	16 bit (*1)	Set to 16bit if the external bus width for the MCU is 16 bits when the ROM alternate memory unit is used.
ROM  USR	ROM	Set to ROM to connect the ROM alternate memory unit.
	USR	Set to USR to connect the CSOX signal to the user board.
USRX0  EMLX0	USRX0	Set to USRX0 to supply the clock signal (X0) from the user board.
	EMLX0	Set to EMLX0 to supply the clock signal (X0) from the Quartz Crystal on the evaluation board.
USRX1  EMLX1	USRX1 (*2)	Set to USRX1 to supply the clock signal (X1) from the user board.
	EMLX1	Set to EMLX1 to supply the clock signal (X1) from the Quartz Crystal on the evaluation board.

*1 Match the setting of this jumper plug with the setting of the bus width switch on the ROM alternate memory unit.

*2 As an MCU restriction, remove the jumper plug for switching the X1 signal on the evaluation board if the X1 pin is specified to be open when the crystal oscillator is used.

■ Connection of Quartz Crystal

When the clock signal is supplied from the evaluation board to the evaluation MCU, the Quartz Crystal must be connected to the IC (SC1) socket for the Quartz Crystal on the evaluation board.

Figure 4.1-1 shows how to connect the Quartz Crystal.

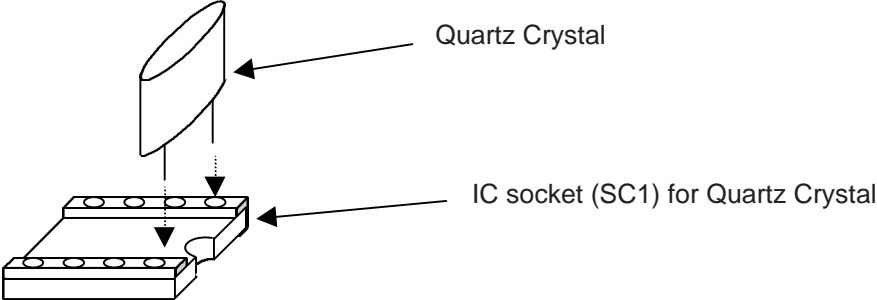


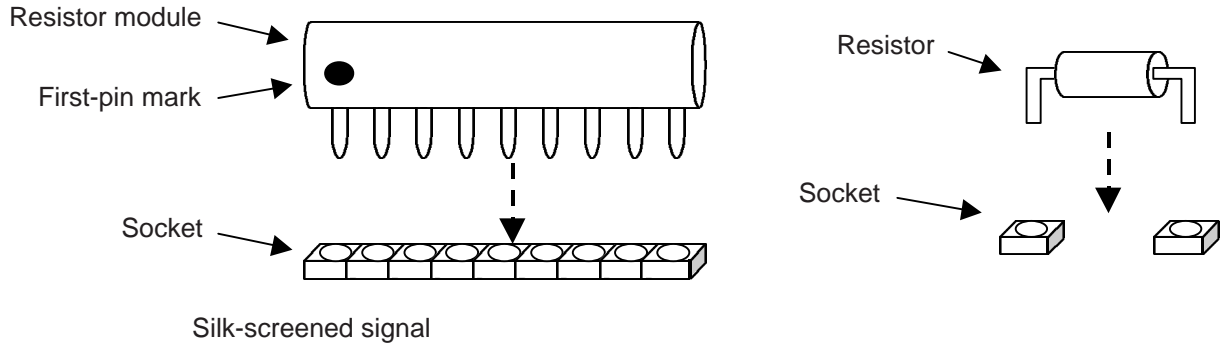
Figure 4.1-1 IC Socket for Quartz Crystal

■ Socket-mounted Resistor

See Table 4.1-2 for handling of the socket-mounted resistors on the evaluation board. Figure 4.1-2 shows how to connect the resistors.

Table 4.1-2 Handling of Socket-mounted Resistors

MCU signal name	Silk-screened signal	Resistor	Resistor connection
A23/P67-A16/P60	RB3 (A [21:16])	8-element resistor module	If the pull-up resistor is connected to each signal on the user board, it can be removed.
D31-D24	RB6 (D [31:24])	8-element resistor module	
D23/P27-D17/P21	RB7 (D [23:16])	8-element resistor module	
WR1X/P85	R7 (WR1X)	Single resistor	



* : All resistances are 100 K ohms.

Figure 4.1-2 Connecting the Resistor

Because the resistor module has polarity, be sure to connect it with the correct polarity. To connect the resistor module, insert the first pin of the resistor module into the socket nearest the silk-screened signal on the evaluation board. The single resistor has no polarity. Insert the single resistor into the socket on the evaluation board.

4.2 Connecting the Evaluation Board and Header Board

Figure 4.2-1 shows how to connect the evaluation board and header board.

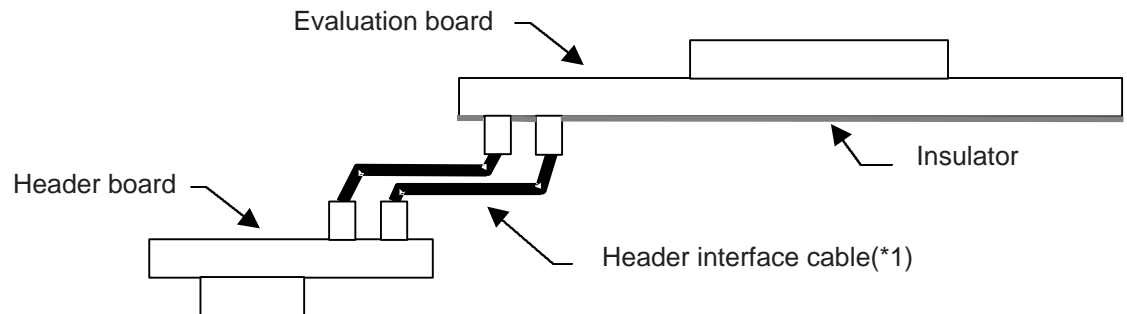
■ Connecting the Evaluation Board and Header Board



Directive



The header interface connector has no lock. If necessary, check whether the header interface cable is loose when the evaluation board is being used.



*1 The long header interface cable can be used only if the MCU clock frequency is low or the load on user pin is very light. Normally, use the standard header interface cable.

Figure 4.2-1 Connecting the Evaluation Board and Header Board

4.3 Connecting the Evaluation Board and User Board

This section explains how to connect the evaluation board and user board.

■ Connecting the Evaluation Board and User Board

Before the evaluation board and the user board can be connected, the MCU IC socket attached to the header board must be mounted on the user board. Refer to the operation manual supplied with each header board for more information about the MCU IC socket.

To connect the evaluation board and user board, connect the header board to the MCU IC socket on the user board, then secure it with the four screws supplied with the header board, as shown in Figure 4.3-1.

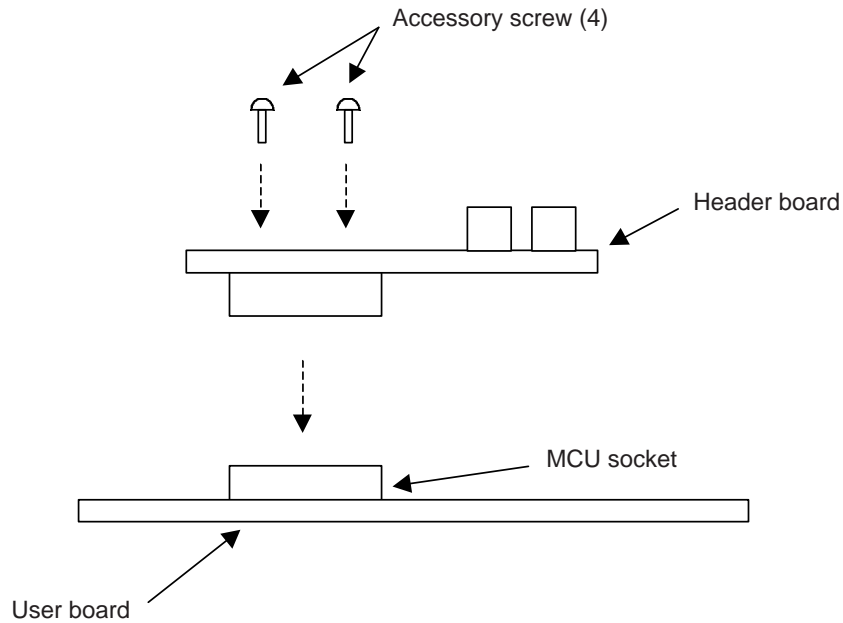


Figure 4.3-1 Connecting the Evaluation Board and User Board

Note: The fitting sections of the header board and MCU socket are very delicate. Always insert and remove the header board vertically. Handle the header board carefully so that excessive force is not applied to the header board when it is connected.

4.4 Connecting the Evaluation Board and Emulator and ROM Alternate Memory Unit

This section explains how to connect the evaluation board and emulator and ROM alternate memory unit.

■ Connecting the Evaluation Board and Emulator and ROM Alternate Memory Unit

Refer to the emulator hardware manual for more information about how to connect the evaluation board and emulator.

Refer to the ROM alternate memory unit hardware manual for more information about how to connect the evaluation board and the ROM alternate memory unit.

4.5 Configuration for Using the Evaluation Board

Figures 4.5-1 and 4.5-2 show examples of configurations for using the evaluation board.

■ Configuration for Using the Evaluation Board

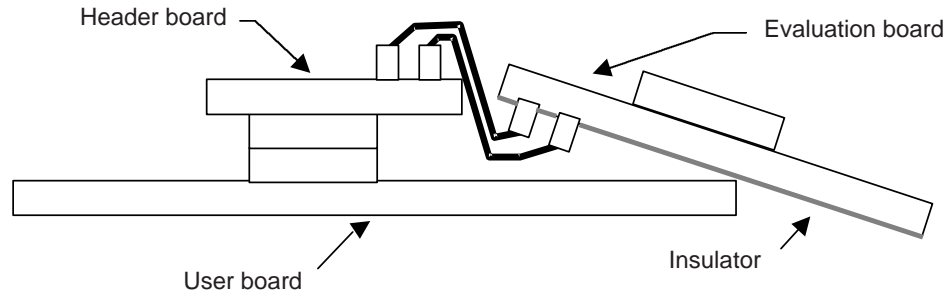


Figure 4.5-1 Example 1 of Configuration for Using the Evaluation Board

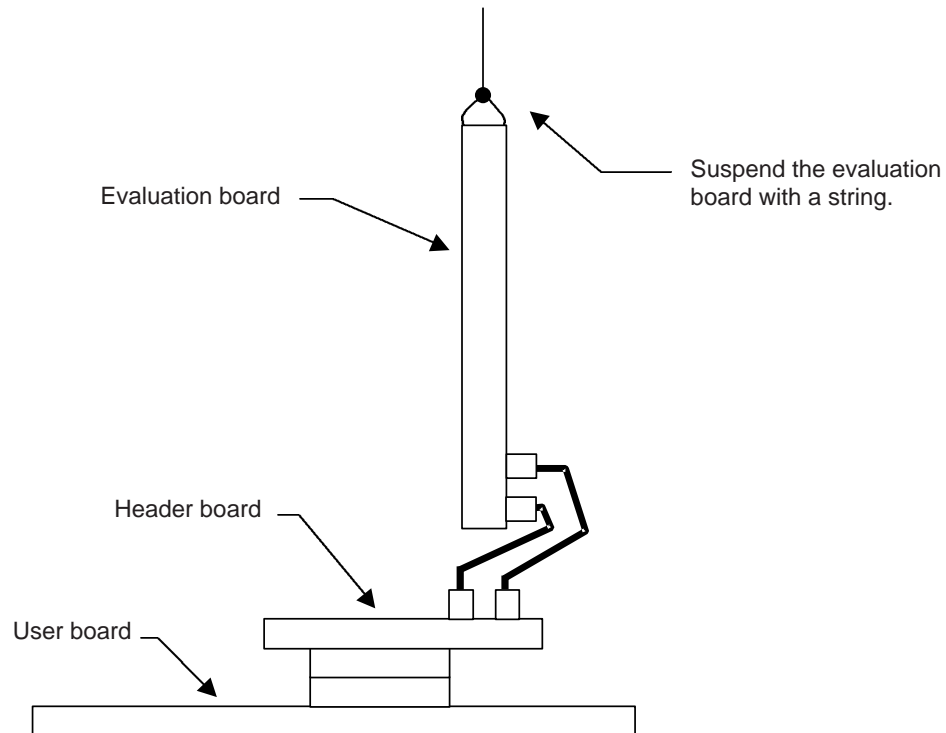


Figure 4.5-2 Example 2 of Configuration for Using the Evaluation Board

Note: Secure the DSU cable and ROM alternate memory unit to the evaluation board with tape. In the above configuration, make the header interface cable flexible, then connect it to the user board.

4.6 Power-On/Off Sequence

This section explains the power-on/off sequence for the evaluation board.

■ Power-on/off Sequence for the Evaluation Board



Prohibited



Turn the power to the MB2197-110 on or off according to the procedures described in this manual. Performing unnecessary operations may accidentally damage the system.

○ Power-on sequence

- 1) Turn on power to the ROM alternate memory unit (during connection).
- 2) Turn on power to the emulator.
- 3) Turn on user power.

○ Power-off sequence

- 1) Turn off user power.
- 2) Turn off power to the emulator.
- 3) Turn off power to the ROM alternate memory unit (during connection).

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