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RENESAS

USER'S MANUAL

IE-70732-MC

IN-CIRCUIT EMULATOR

TARGET DEVICES

V805™

V810™

Document No. U10138EJ1V0UM00 (1st edition)
Date Published May 1996 P
Printed in Japan

The IE-70732-MC conforms to the standards of VCCI, which restricts radio interference in commercial and industrial areas.
Since using the IE-70732-MC in residential districts or their neighboring districts may cause radio or TV interference, follow this manual.

Preface

Users:

This manual is aimed at those users who are responsible for the design and development of application systems based on the μPD70731 (also referred to as the V805) and μPD70732 (also referred to as the V810).

Purpose:

The IE-70732-MC is an in-circuit emulator consisting of an emulation module (IE-70732-MC-EM1) and communication module (IE-70000-MC-SV2). The IE-70732-MC facilitates program debugging when designing a V805 or V810 application system. The purpose of this manual is to help users become familiar with the basic specifications of the IE-70732-MC as well as how it should be used.

Organization:

This manual includes the following chapters:

Overview

Using the In-Circuit Emulator

Initialization of Network Information

Connecting the In-Circuit Emulator

Notes on Hardware Design

Guidance:

Readers of this manual are assumed to have a general knowledge of electronics, logic circuits, and microcomputers.

To become familiar with the basic specifications and the use of the in-circuit emulator:

–> Read this manual in the order of the table of contents.

To become familiar with points to be kept in mind when designing hardware:

–> Read **Chapter 5.**

To recognize the differences from the IE-70732-BX:

–> Read **Appendix B**.

For details of how to operate the IE-70732-MC and use the command functions:

–> Refer to the manual relating to the source debugger, available separately.

Legend:

Data weight	:	High-order digits on the left side Low-order digits on the right side
Active low	:	$\overline{xxx}$ (Pins and signal names are overscored.)
Memory map address	:	High-order address on the upper side Low-order address on the lower side
Note	:	Explanation of the indicated part of text
Caution	:	Information to which the user should afford special attention
Remarks	:	Supplementary information
Numeric value	:	Binary : xxxx or xxxxB Decimal : xxxx Hexadecimal : xxxxH

Units representing powers of 2:

K (kilo) : $2^{10} = 1024$
M (mega) : $2^{20} = 1024^2$
G (giga) : $2^{30} = 1024^3$

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Chapter 1

Overview

This chapter outlines the functions and specifications of the IE-70732-MC.

1.1 Function Overview

The IE-70732-MC is a micro in-circuit emulator that enables the efficient debugging of hardware and software in the development of systems using the V805 and V810. The IE-70732-MC is smaller and less expensive than conventional box-type in-circuit emulators.

The IE-70732-MC is an in-circuit emulator consisting of an emulation module (IE-70732-MC-EM1) and communication module (IE-70000-MC-SV2). The emulation module is provided in a package that supports the minimum functions required of a box-type in-circuit emulator (IE-70732-BX) for the V805 and V810. The communication module is responsible for communication between the IE-70732-MC and host machine(Note 1) via a network (10BASE-T).

For actual debugging, a source debugger(Note 2) is required. For details of its use, refer to the manual supplied with the source debugger being used. This user's manual describes the basic specifications of the IE-70732-MC, the connection and use of the IE-70732-MC, and notes on hardware design.

(Note 1) For information about setting up the host machine, refer to the manual for the debugger being used.

(Note 2) The following source debuggers are offered separately:
SD732 : Manufactured by NEC
MULTI™ : Manufactured by Green Hills Software™, Inc., U.S.A. (Agent in Japan: Advanced Data Controls)

1.2 Features

- With the V805, real-time emulation at up to 20 MHz is possible. With the V810, real-time emulation at up to 25 MHz is possible.
- Very small and light hardware configuration (emulation module)
  - Functions and size closely approximate to the V810 (176-pin PGA)
  - Pin allocation fully compatible with the V810 (176-pin PGA)
- 128K-byte emulation memory
- Conformity to IEEE802.3 (10BASE-T)
- TCP/IP installed as the communication protocol
- LEDs indicating CPU status display (provided on the communication module)
- Control using the source debugger
  - A program being executed can be suspended at an arbitrary address.
  - A program can be started from an arbitrary address.
  - While a program is suspended, the contents of CPU registers can be referenced and updated.
  - While a program is suspended, the contents of memory and I/O data can be referenced and updated.
  - Event break (for up to 4 events) is enabled.
  - Step-by-step execution is enabled.
- Lower-cost

1.3 Specifications

1.3.1 Emulation Module

Table 1-1 lists the specifications of the emulation module.

For details of the break function and data manipulation function, refer to the manual for the source debugger being used. Note that the IE-70732-MC does not support pin mask or trace functions.

Table 1-1. Specifications of Emulation Module (IE-70732-MC-EM1)

Item	Description	
Target CPU	μPD70731 (V805) • 100-pin QFP(Note)	μPD70732 (V810) • 176-pin PGA • 120-pin QFP(Note)
Operating clock (supplied by the target)	2.5-20 MHz	2.5-25 MHz
Emulation memory	64K bytes x 2 banks (1 wait, 16-bit access)	
Target communication module	IE-70000-MC-SV2 (10BASE-T)	
Break function	Event break Number of events : 4 maximum Event condition : Address/instruction fetch, memory read/write access, I/O read/write access	
	Software break	
	Forced break	
Data manipulation function	Memory, I/O, and register manipulation (modification)	
Operating supply voltage, current	5 V±5%, 200 mA (typical, at 25 MHz)	
Operating environment	• Temperature : +10°C to +40°C • Humidity : 10% to 80% RH (no condensation)	
Storage environment	• Temperature : −15°C to +45°C • Humidity : 10% to 80% RH (no condensation)	
Outside dimensions (Unit: mm)	49.1 (D) x 38.5 (W) x 8.5 (H)	
Weight	30 g	

(Note) The pin allocation of the emulation module is fully compatible with that of the 176-pin PGA of the V810. So, when using a CPU other than the 176-pin PGA V810, use a conversion adapter to enable connection to the target system. (See **Section 1.6.**)

1.3.2 Communication Module and Power Supply Unit

The communication module is provided with a dedicated power supply unit. Table 1-2 lists the specifications of the communication module. Table 1-3 lists the specifications of the power supply unit.

Table 1-2. Specifications of Communication Module (IE-70000-MC-SV2)

Item	Description
Target emulation module	General emulation modules for micro in-circuit emulators
External interface	• Ethernet™: Conforms to IEEE802.3 (10BASE-T). • RS-232C: 8-pin connector
Reset function	Power-on reset, reset button
Status display	Status is displayed by LEDs. • IF POWER : Lit while power is supplied to the communication module. • TARGET POWER: Lit while power is supplied to the target system. • RUN : Lit while a user program is being executed. • ERROR : Lit upon the occurrence of a communication error.
Software	• Communication protocol control software: TCP/IP (with routing and subnet capabilities) • Control software for the IE-70732-MC: Downloaded through the external interface
Operating supply voltage, current	5 V±10%, 1.5 A (typical)
Operating environment	• Temperature : +10°C to +40°C • Humidity : 10% to 80% RH (no condensation)
Storage environment	• Temperature : −15°C to +45°C • Humidity : 10% to 80% RH (no condensation)
Outside dimensions (Unit: mm)	67 (D) x 116 (W) x 27.5 (H)
Weight	150 g

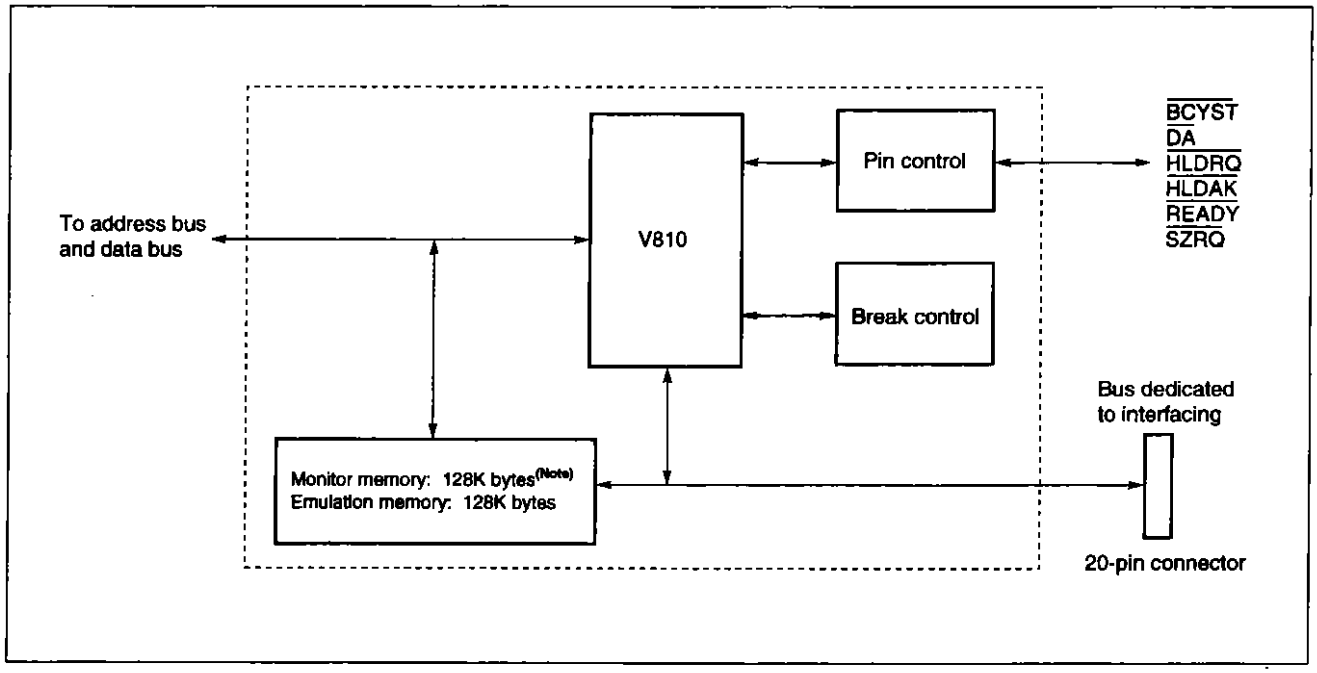
Table 1-3. Specifications of Power Supply Unit (IE-70000-MC-PS)

Item	Description
Power supply	85 – 132 VAC
Supply voltage	5 VDC ±10%
Supply current	2 A (Max.)
Operating environment	• Temperature: +10°C to +40°C • Humidity: 10% to 80% RH (no condensation)
Storage environment	• Temperature: –15°C to +45°C • Humidity: 10% to 80% RH (no condensation)
Outside dimensions (Unit: mm)	105 (D) x 70 (W) x 20 (H)
Weight	Main unit: 190 g, Cable: 145 g

1.4 Block Diagram of Emulation Module

Figure 1-1 is a block diagram of the emulation module (IE-70732-MC-EM1).

Figure 1-1. Block Diagram of Emulation Module



(Note) Work area for the IE-70732-MC (not accessible by the user)

1.5 System Configuration

The IE-70732-MC consists of an emulation module (IE-70732-MC-EM1) and communication module (IE-70000-MC-SV2). The communication module is provided together with a dedicated power supply unit (IE-70000-MC-PS).

Figure 1-2. System Configuration

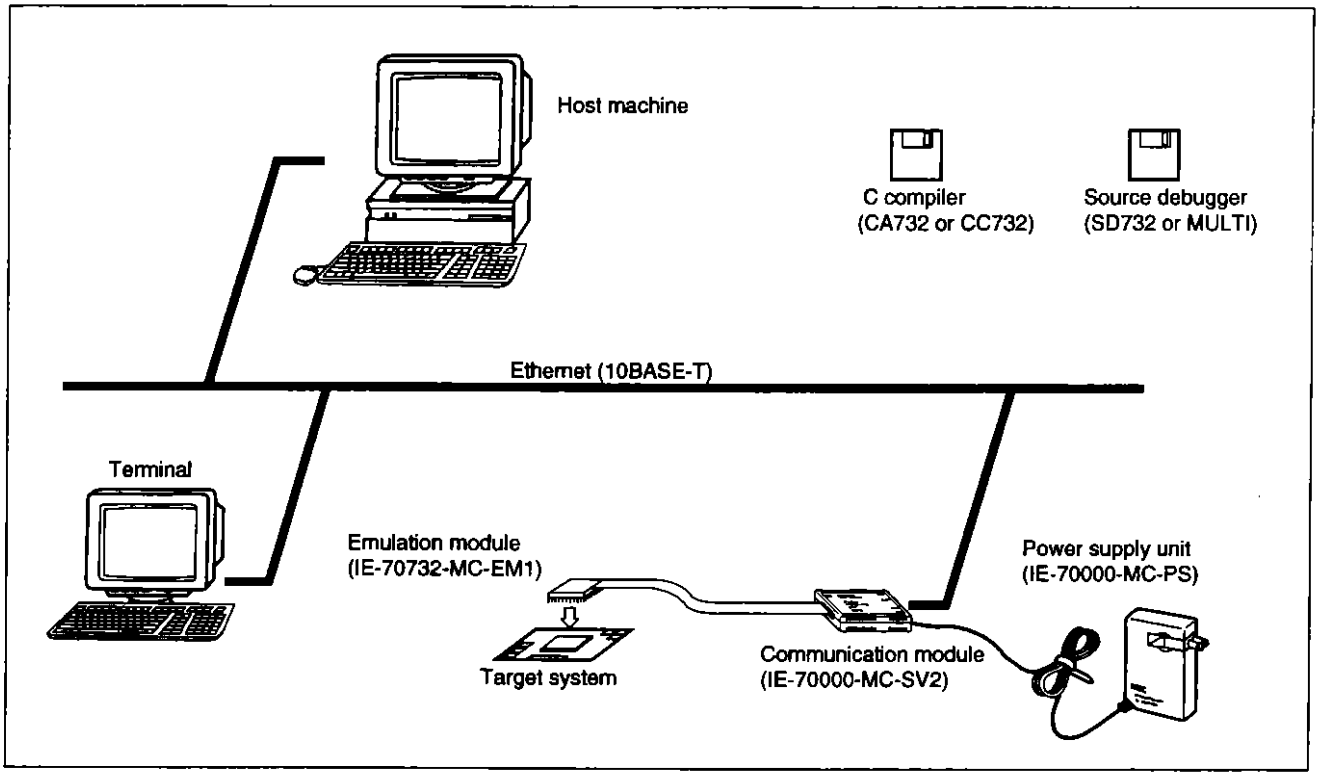


Table 1-4. Hardware Configuration

Type of equipment	Product name	Description
Emulation module	IE-70732-MC-EM1	• The package provides functions that closely approximate to those of the V810. • The pin allocation is fully compatible with that of the V810 (176-pin PGA).
Communication module	IE-70000-MC-SV2	This module is used to make a connection to the host machine via 10BASE-T.
Power supply unit	IE-70000-MC-PS	Provided with the communication module

1.6 Options and Related Products

When the V805 (100-pin QFP) or V810 (120-pin QFP) is being used as a target CPU, a conversion adapter(Note), indicated in Table 1-5, is required.

See **Chapter 4** for an explanation of using the conversion adapter to connect the IE-70732-MC to a target system.

(Note) Use the LVC or ADP. These products are provided with TQPACK and TQSOCKET, respectively.
LVC: Package conversion, 3 V capability
ADP: Package conversion only

Table 1-5. Conversion Adapters

Target CPU (package)	Product name	Accessory
V805 (100-pin QFP)	LVC-PG177-TQF100-V805	TQPACK100SD
	ADP-PG177-TQF100-V805	TQSOCKET100SDW
V810 (120-pin QFP)	LVC-PG177-QF120-V810	TQPACK120SA
	ADP-PG177-QF120-V810	TQSOCKET120SAW

Manufacturers:

- Conversion adapters (LVC, ADP)

  MIDAS LAB

  TEL: 03-3357-2589

  FAX: 03-3357-8029

- TQPACK, TQSOCKET

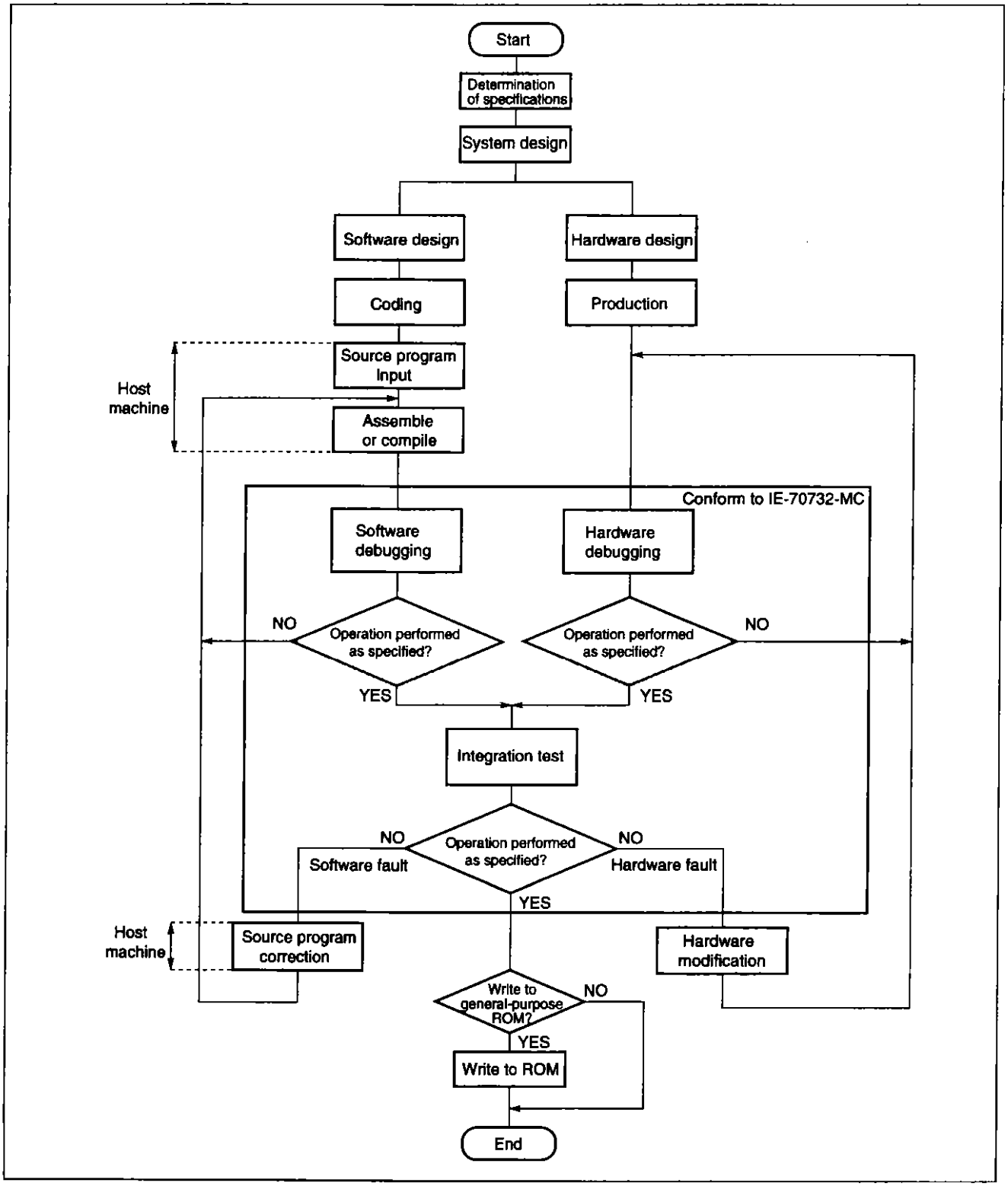
  Daimaru Kogyo, Limited

  TEL: 03-3820-7112, 06-244-6672

1.7 Development Procedure

Figure 1-3 shows the development procedure and scope of work applicable to IE-70732-MC.

Figure 1-3. Development Procedure and Scope of Work Applicable to IE-70732-MC



Chapter 2

Using the In-Circuit Emulator

This chapter describes how to use the IE-70732-MC.

2.1 Notes on Use

(1) When handling the emulation module, be careful not to subject it to an electrostatic discharge or mechanical shock.

(2) The emulation module must be connected to the communication module. Turn off the power before making the connection.

(3) Always follow the specified power-on/off procedure. Otherwise, the IE-70732-MC and/or target system are likely to be damaged.

2.2 Using the In-Circuit Emulator

Perform the following steps, (1) through (6), in the order shown.

(1) Initialization of network information

Connect the communication module to the terminal. Then, set the network information. For details, see **Chapter 3.**

(2) Connection

Turn off the power to the communication module before attempting to make a connection. For details, see **Chapter 4.**

(3) Turning on the power

Perform steps **<1>** through **<3>** in the order shown.

<1> Turn on the power to the host machine.

<2> Turn on the power to the communication module.

<3> Turn on the power to the target system.

(4) Activation of the source debugger

After power-on, execute the required commands from the host machine. For details of the commands, refer to the manual provided with the source debugger.

(5) Termination of the source debugger

Terminate the source debugger by executing the termination command. For details of this command, refer to the manual provided with the source debugger.

(6) Turning off the power

Perform steps **<1>** through **<3>** in the order shown.

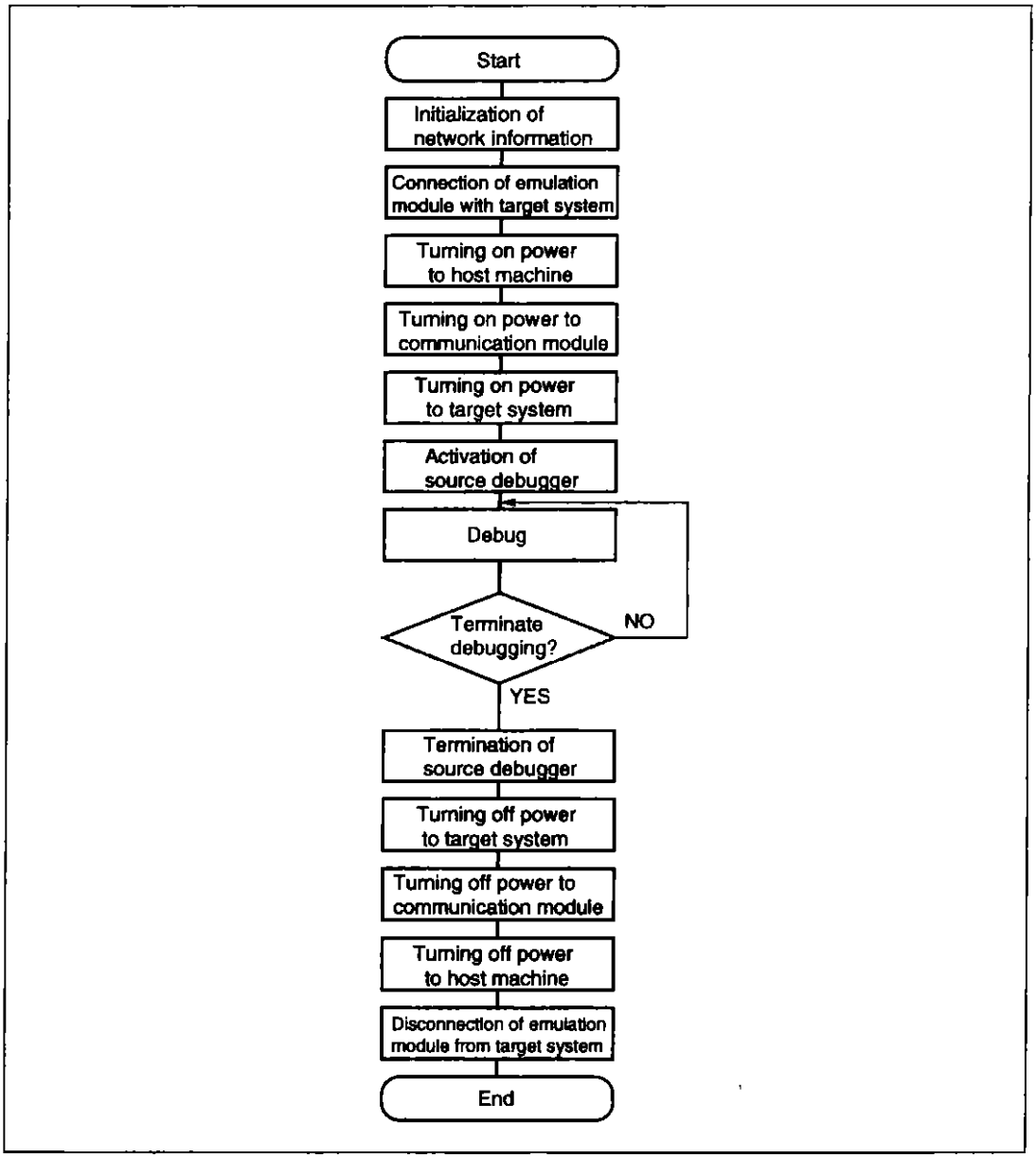
<1> Turn off the power to the target system.

<2> Turn off the power to the communication module.

<3> Turn off the power to the host machine.

Figure 2-1 is a flowchart illustrating the use of the IE-70732-MC.

Figure 2-1. Using the IE-70732-MC



Chapter 3

Initialization of Network Information

The IE-70732-MC communicates with the host machine via a network (10BASE-T). The user must initialize the relevant network information, such as network addresses, by using the initialization menu displayed on the terminal (personal computer) before attempting to connect the host machine to the target system.

Caution **Before connecting the IE-70732-MC to a network, always initialize the network information.**

3.1 Initialization

Initialize the network information by following the procedure detailed below.

(1) Connect the communication module to the terminal by using the RS-232C cable provided with the module. Figure 3-2 shows the RS-232C cable. Check that the terminal is initialized as specified in Table 3-1.

Figure 3-1. Connecting the Communication Module to the Terminal

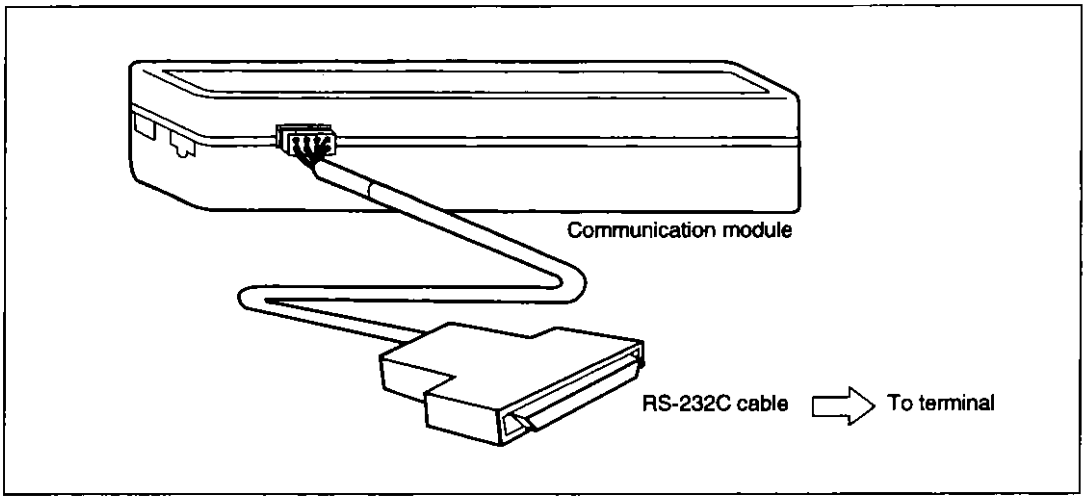


Figure 3-2. RS-232C Cable Configuration

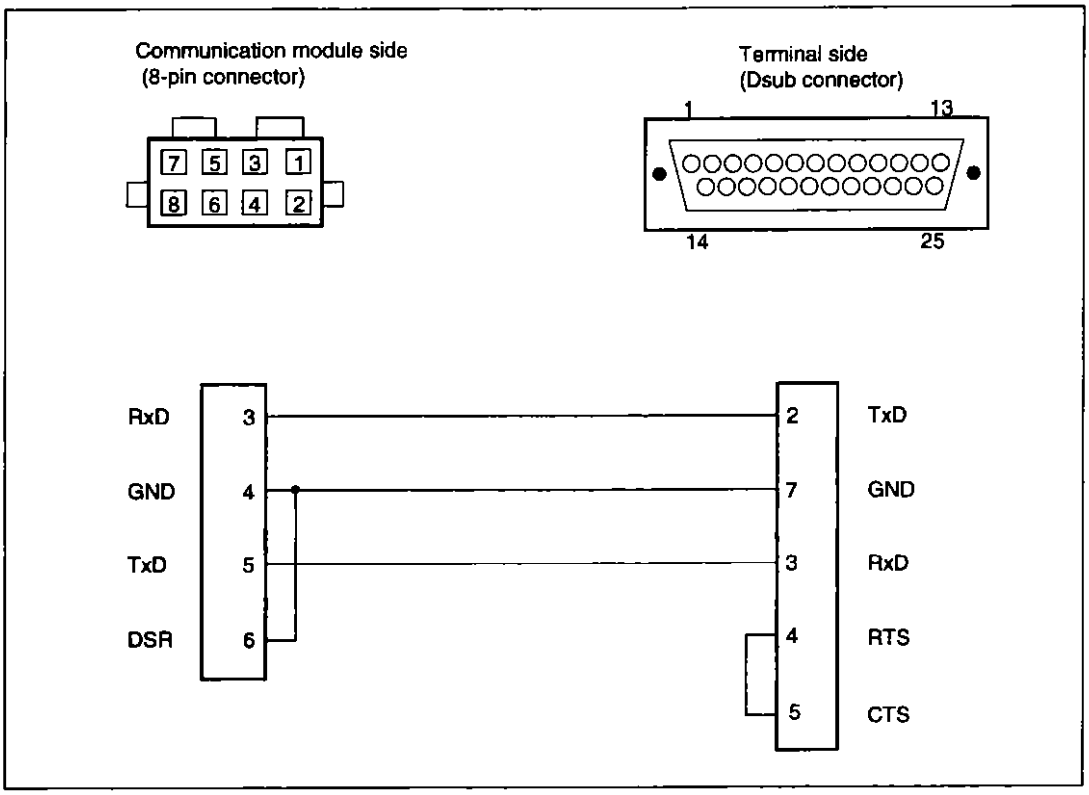
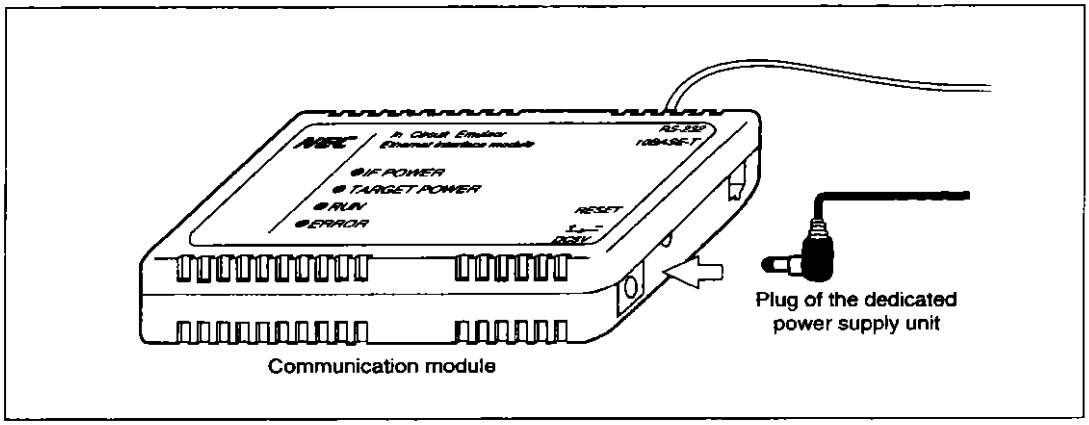


Table 3-1. Terminal Initialization

Item	Description
Interface	RS-232C
Baud rate	9600 bps
Data length	8 bits
Parity check	None
Stop bits	2 bits
X parameter: XON/XOFF	Not applicable
Local echo	Not used
Pressing of the return key	CR code is sent.
Reception of LF code	Line feed operation is performed.

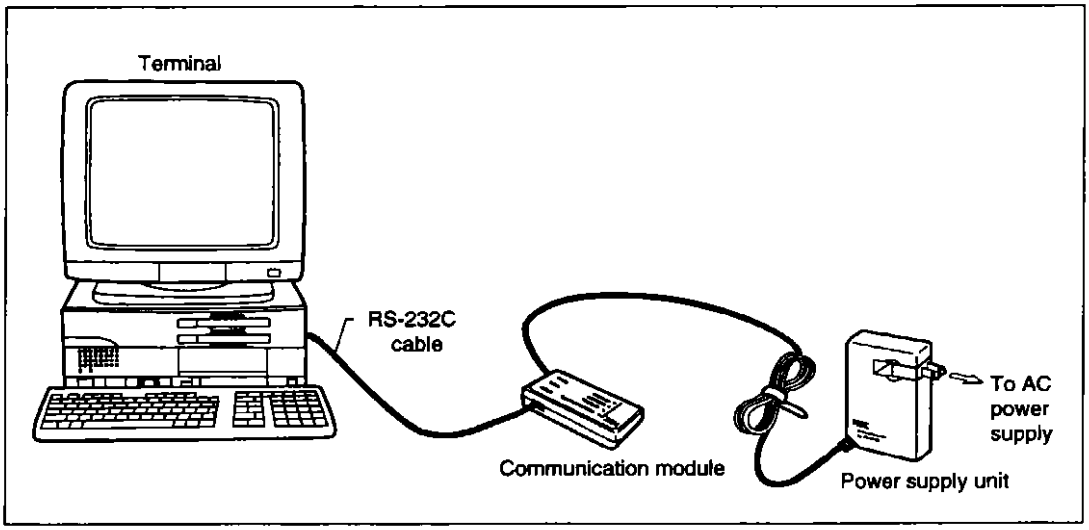
(2) As shown in Figure 3-3, connect the communication module to the power supply unit.

Figure 3-3. Connecting the Communication Module to the Power Supply Unit



(3) As shown in Figure 3-4, turn on the power to the terminal once the connection has been made.

Figure 3-4. Example of Connection for Network Initialization



(4) Turn on the power to the communication module. Then, the initialization menu appears. (For details, see **Section 3.3.**)

(5) Set the initialization menu items as described in **Section 3.3.1.**

(6) After checking the settings, turn off the power to the communication module.

Caution **Be careful to turn off the power to the communication module at this step. Further, always disconnect the RS-232C cable from the communication module.**

3.2 Modifying the Set Network Information

Once network information has been set, the user can modify that information from the terminal connected to the communication module, via the RS-232C cable. (The network information cannot be modified from the source debugger.)

When the source debugger is activated, initialized network information can be modified as follows:

(1) Reconnect the communication module to the terminal, using the RS-232C cable.

(2) Press the reset switch on the communication module. (The initialization menu appears on the terminal.)

(3) Set the network information in the same way as when making the initial setting.

3.3 Initialization Menu

After connecting the communication module to the terminal, turn on the power to the power supply unit and terminal. Then, the menu screen shown below appears on the terminal.

```
--- SETUP NETWORK INFORMATION -------------------------
      1.  LOCAL ETHERNET ADDRESS      XXXXXXXXXXXXX
      2.  LOCAL IP ADDRESS            XXXXXXXX
      3.  LOCAL HOST NAME             XXXXXXXXXXXXXXXX
      4.  LOCAL PORT NO.              XXXX
      5.  REMOTE ETHERNET ADDRESS     XXXXXXXXXXXX
      6.  REMOTE IP ADDRESSS          XXXXXXXX
      7.  REMOTE HOST NAME            XXXXXXXXXXXXXXXX
      8.  REMOTE PORT NO.             XXXX
      9.  ROUTER ADDRESS              XXXXXXXX
     10.  SUBNET ADDRESS MASK         XXXXXXXX
     11.  HUB LINK (ON=1/OFF=0)       0
     99.  EXIT

-------------------------------------------------------
    FUNCTION NO.>>■
```

Enter a desired item number (from 2 to 11, or 99) on the bottom line of the menu screen. Then, the screen for setting the network information for the specified item appears.

Note that the user cannot modify the setting for LOCAL ETHERNET ADDRESS. This is because this item is specific to the board, hence cannot be selected by the user.

Data set using this menu is written to the EEPROM. Therefore, the data is not lost even if the power is turned off.

3.3.1 Setting Initialization Menu Items

The procedure for setting each initialization menu item is described in (1) through (11) below.

(1) Setting LOCAL IP ADDRESS

[Function]

This item sets the IP address of the communication module. An IP address is assigned to each node. Set the IP address assigned by the network administrator.

[Input format]

Enter an 8-digit hexadecimal number.

[Example of input]

```
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>2↵

 LOCAL IP ADDRESS              >XXXXXXXX
 NEW LOCAL IP ADDRESS          >12345678↵

--- SETUP NETWORK INFORMATION ----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
          :
      2. LOCAL IP ADDRESS        12345678
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 2.

The current IP address is displayed.

Enter a new IP address.

The menu is displayed.

The new IP address is displayed.

(2) Setting of LOCAL HOST NAME

[Function]

This item sets the host name (node name) of the communication module.

[Input format]

Enter an alphanumeric character string of no more than 16 characters.

[Example of input]

```
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>3↵

 LOCAL HOST NAME                 >XXXXXX
 NEW LOCAL HOST NAME             >LOCALHOSTNAME↵

--- SETUP NETWORK INFORMATION ----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
          :
      3. LOCAL HOST NAME         LOCALHOSTNAME
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 3.

The current host name is displayed.

Enter a new host name.

The menu is displayed.

The new host name is displayed.

(3) Setting of LOCAL PORT NO.

[Function]

This item sets the port number of the communication module.

[Input format]

Enter a 4-digit hexadecimal number other than 0000. Usually, set 0401 (or 1025 in decimal) or a greater hexadecimal number.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>4↵

 LOCAL PORT NO.                >XXXX
 NEW LOCAL PORT NO.            >0401↵

--- SETUP NETWORK INFORMATION ----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
         :
      4. LOCAL PORT NO.          0401
         :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 4.

The current port number is displayed.
Enter a new port number.

The menu is displayed.

The new port number is displayed.

(4) Setting of REMOTE ETHERNET ADDRESS

[Function]

This item sets the Ethernet address of the host machine used to manipulate the IE-70732-MC.

[Input format]

Enter a 12-digit hexadecimal number. When an arbitrary host machine can be used, set FFFFFFFFFFFF. Usually, enter FFFFFFFFFFFF.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>5↵                                  Enter function number 5.

 REMOTE ETHERNET ADDRESS        >XXXXXXXXXXXX      The current Ethernet address is displayed.
 NEW REMOTE ETHERNET ADDRESS    >0123456789AB↵     Enter a new Ethernet address.

--- SETUP NETWORK INFORMATION ----------------      The menu is displayed.
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
         :
      5. REMOTE ETHERNET ADDRESS 0123456789AB       The new Ethernet address is displayed.
         :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>■
```

(5) Setting of REMOTE IP ADDRESS

[Function]

This item sets the IP address of the host machine.

[Input format]

Enter an 8-digit hexadecimal number. When an arbitrary host machine can be used, set 0. Usually, enter 0.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------
 FUNCTION NO. >>6↵                          Enter function number 6.

 REMOTE IP ADDRESS              >XXXXXXXX   The current IP address is displayed.
 NEW REMOTE IP ADDRESS          >12345678↵  Enter a new IP address.

--- SETUP NETWORK INFORMATION ------------  The menu is displayed.
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
         :
     13. REMOTE IP ADDRESS       12345678   The new IP address is displayed.
         :
     99. EXIT
-------------------------------------------
 FUNCTION NO. >>■
```

(6) Setting of REMOTE HOST NAME

[Function]

This item sets the host name (node name) of the host machine.

[Input format]

Enter an alphanumeric character string not longer than 16 characters. When an arbitrary host machine can be used, enter ↵ only. Usually, just enter ↵.

[Example of input]

```
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>7↵                              Enter function number 7.

 REMOTE HOST NAME              >XXXXXX          The current host name is displayed.
 NEW REMOTE HOST NAME          >REMOTEHOSTNAME↵ Enter a new host name.

--- SETUP NETWORK INFORMATION ----------------  The menu is displayed.
      1. LOCAL ETHERNET ADDRESS XXXXXXXXXXXX
         :
      7. REMOTE HOST NAME       REMOTEHOSTNAME  The new host name is displayed.
         :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>■
```

(7) Setting of REMOTE PORT NO.

[Function]

This item sets the port number of the host machine.

[Input format]

Enter a 4-digit hexadecimal number. When an arbitrary host machine can be used, set 0. Usually, enter 0.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>8↵                                  Enter function number 8.

 REMOTE PORT NO.                 >XXXX              The current port number is displayed.
 NEW REMOTE PORT NO.             >0123↵             Enter a new port number.

--- SETUP NETWORK INFORMATION ----------------      The menu is displayed.
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
         :
      8. REMOTE PORT NO.         0123               The new port number is displayed.
         :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>■
```

(8) Setting of ROUTER ADDRESS

[Function]

This item sets the IP address of a router. This item must be set to enable connection to the host machine via a router.

[Input format]

Enter an 8-digit hexadecimal number. When routing is not required, enter 0.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>9↵

 ROUTER ADDRESS                  >XXXXXXXX
 NEW ROUTER ADDRESS              >12345678↵

--- SETUP NETWORK INFORMATION ----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
         :
      9. ROUTER ADDRESS          12345678
         :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 9.

The current router address is displayed.

Enter a new router address.

The menu is displayed.

The new router address is displayed.

(9) Setting of SUBNET ADDRESS MASK

[Function]

This item sets the subnet address mask field.

[Input format]

Enter an 8-digit hexadecimal number, with the bit indicating the subnet address position set to 1. When subnet address mask setting is not required, enter 0.

[Example of input]

An example of using the higher 24 bits of the IP address for subnet recognition and the lower 8 bits for host recognition is shown below.

```
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>10↵

 SUBNET ADDRESS MASK            >XXXXXXXX
 NEW SUBNET ADDRESS MASK        >FFFFFF00↵

--- SETUP NETWORK INFORMATION ----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
          :
     10. SUBNET ADDRESS MASK     FFFFFF00
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 10.

The current subnet address mask is displayed.

Enter a new subnet address mask.

The menu is displayed.

The new subnet address mask is displayed.

(10) Setting of HUB LINK

[Function]

This item sets the HUB LINK flag to ON or OFF. When this item is set to ON, the test function for checking whether the hub is linked (connected actively) to the communication module is enabled. If a check reveals that the hub is not linked correctly, the ERROR LED on the communication module is lit. If a check determines that the hub is linked correctly, no indication is provided. When this item is set to OFF, the test function is disabled.

[Input format]

Enter 1 to set this item to ON. Enter 0 to set this item to OFF. When a number other than 0 is entered, 1 is assumed to have been input.

[Example of input]

```
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>11↵

 HUB LINK FLG(ON=1/OFF=0)       >0
 NEW HUB LINK FLG(ON=1/OFF=0)  >1↵
--- SETUP NETWORK INFORMATION -----------------
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
          :
     11. HUB LINK(ON=1/OFF=0)     1
          :
     99. EXIT
-------------------------------------------------
 FUNCTION NO. >>■
```

Enter function number 11.

The current hub link test function status is displayed.

Enter a new hub link test function status.

The menu is displayed.

The new hub link test function status is displayed.

(11) EXIT

[Function]

This item terminates the network information setting menu, and writes the set values to the EEPROM.

[Input format]

Enter S, Q, or C.

S : Terminates the menu after writing the set network information to the EEPROM.

Q : Terminates the menu without writing the set network information to the EEPROM.

C : Returns to the menu to enable the continuation of network information setting.

[Example of input]

```
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>99↵                              Enter function number 99.

 Save & quit / Quit / Continue   >S↵             The menu is terminated after writing
                                                 network information to the EEPROM.
 -- Please reset --                              Press the reset switch to restart setting.


          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>99↵                              Enter function number 99.

 Save & quit / Quit / Continue   >Q↵             The menu is terminated without writing
                                                 network information to the EEPROM.



          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>99↵                              Enter function number 99.

 Save & quit / Quit / Continue   >C↵             Network information setting is continued.

--- SETUP NETWORK INFORMATION ----------------   The menu is displayed.
      1. LOCAL ETHERNET ADDRESS  XXXXXXXXXXXX
          :
     99. EXIT
-----------------------------------------------
 FUNCTION NO. >>■
```

Chapter 4

Connecting the In-Circuit Emulator

This chapter describes how to connect the IE-70732-MC.

Caution Turn off the power before attempting to make a connection.

4.1 Packing

The emulation module and communication module are packed as described below.

(1) Emulation module (IE-70732-MC-EM1)

IE-70732-MC-EM1: 1

(2) Communication module (IE-70000-MC-SV2)

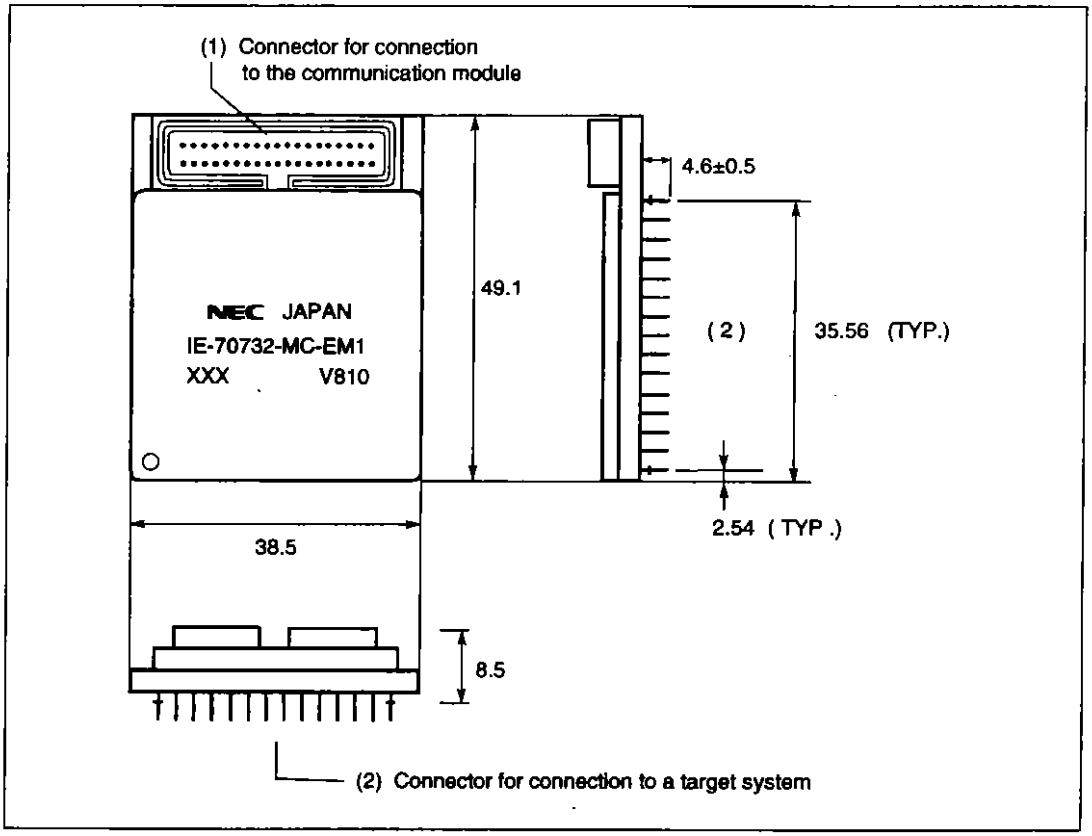
- Main IE-70000-MC-SV2 unit: 1
- IE-70000-MC-PS (power supply unit): 1
- RS-232C cable (for network information setting): 1
- Interface cable (for emulation module connection): 1
- Instruction manual: 1
- Packing list: 1
- Warranty certificate: 1

Remark The source debugger must be purchased separately.

4.2 Component Names and Functions

Figures 4-1 and 4-2 show the components of the emulation module and communication module, respectively.

Figure 4-1. Emulation Module Components



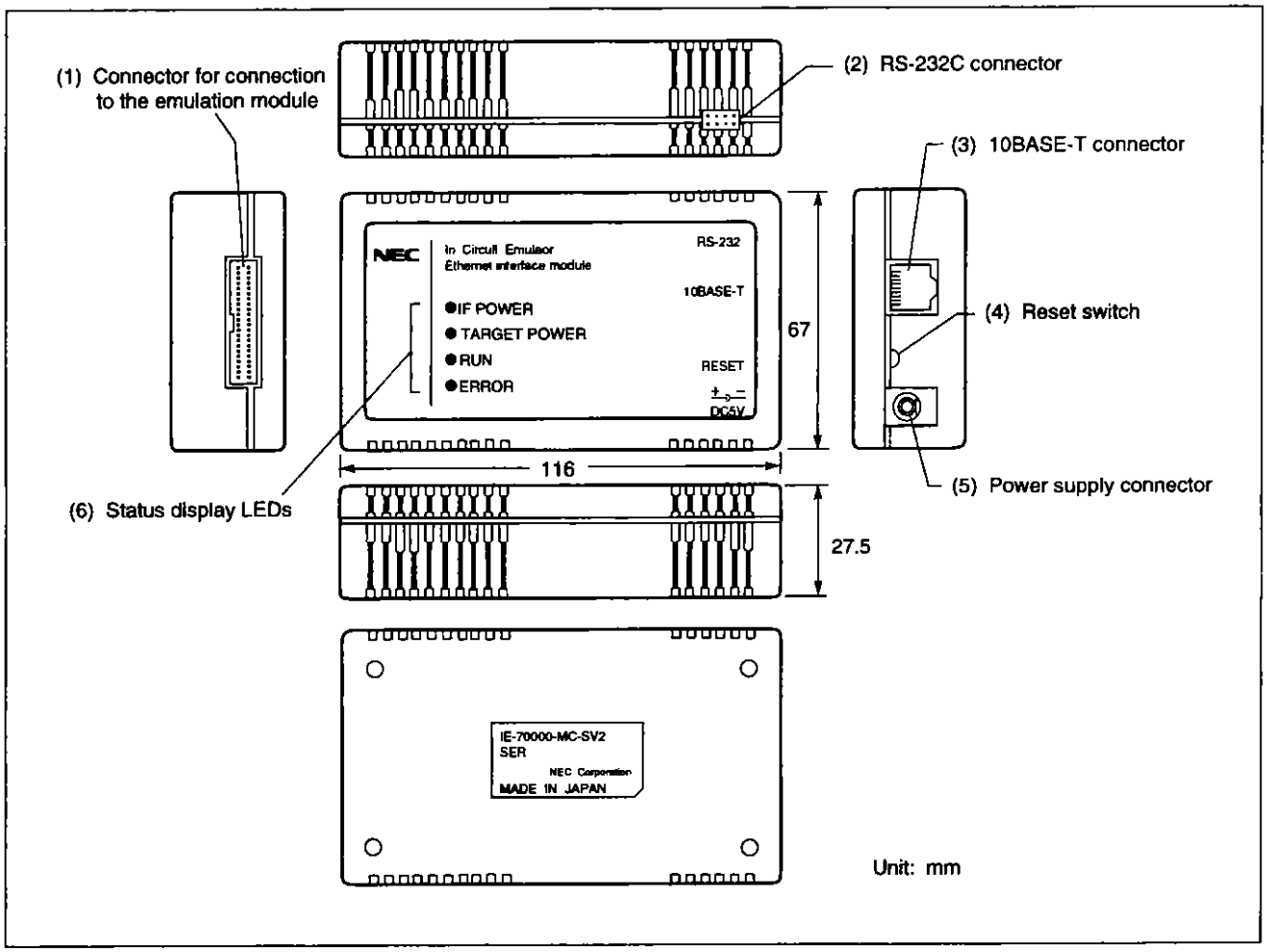
(1) Connector for connection to the communication module

The emulation module is connected to the communication module via the interface cable provided with the communication module.

(2) Connector for connection to a target system

A conversion adapter is required when the target CPU is other than a 176-pin PGA. (See **Section 1.6** for details.)

Figure 4-2. Communication Module Components



(1) Connector for connection to the emulation module

The communication module is connected to the emulation module via the interface cable provided with the communication module.

(2) RS-232C connector

By connecting a terminal via the RS-232C cable provided with the communication module, network information such as the IP address can be set.

(3) 10BASE-T connector

This connector is used to connect a 10BASE-T modular cable.

(4) Reset switch

The reset switch is used to reset the communication module. To press this switch, use a sharp-pointed instrument such as the tip of a mechanical pencil.

(5) Power supply connector

This connector is used to connect the power supply unit provided with the communication module.

(6) Status display LEDs

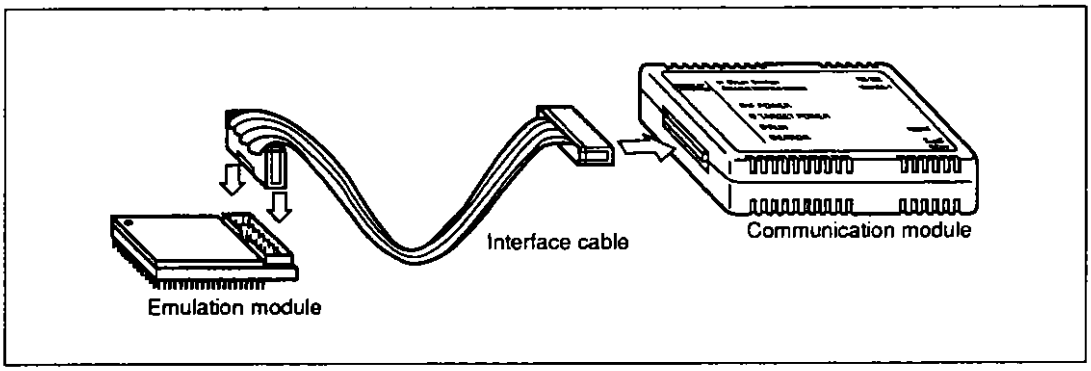
- IF POWER : Lit while power is supplied to the communication module.
- TARGET POWER : Lit while power is supplied to the target system.
- RUN : Lit while a user program is being executed.
- ERROR : Lit upon the occurrence of a TCP/IP communication error.

4.3 Connecting the IE-70732-MC

Make all necessary connections according to Figure 4-3 and Figure 4-4.

The method of connecting the IE-70732-MC to a target system depends on the target CPU (Figure 4-4). When the target CPU is a 100-pin QFP (V805) or 120-pin QFP (V810), use a conversion adapter. (See **Section 1.6** for details.)

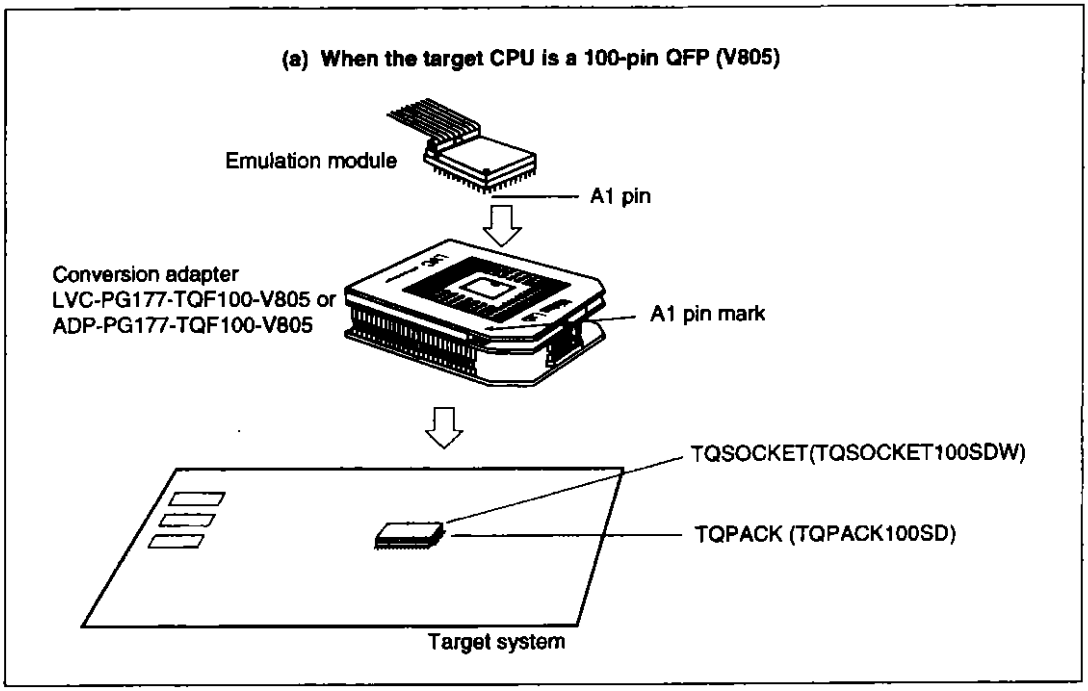
Figure 4-3. Connecting the Emulation Module to the Communication Module



Caution 1. Turn off the power before attempting to make a connection.

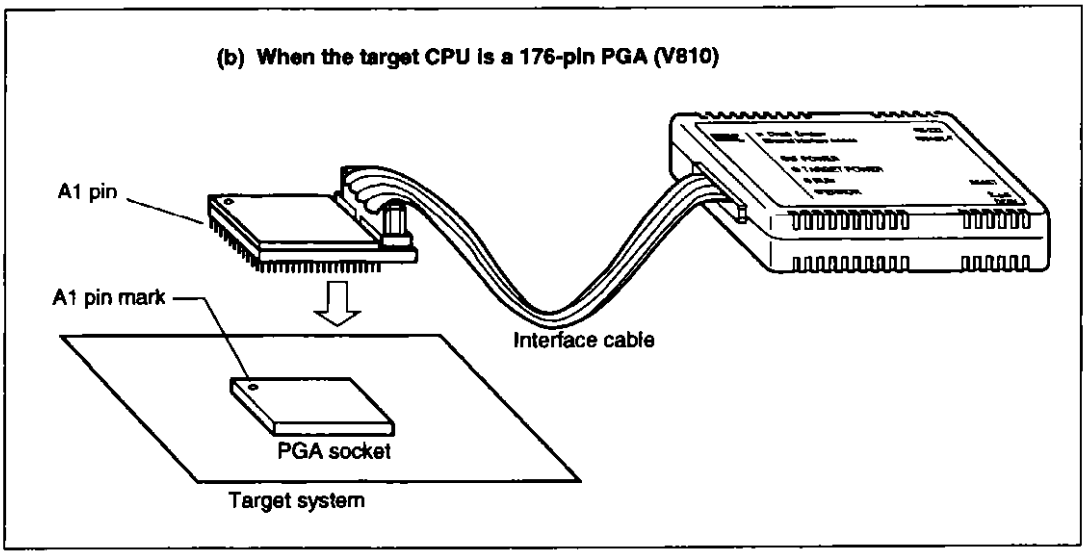
2. Once the interface cable has been connected to the connector of the emulation module, leave the cable connected as far as possible. If the interface cable is frequently disconnected, there is a danger of the pins being damaged.

Figure 4-4. Connecting the Emulation Module to the Target System (1/2)

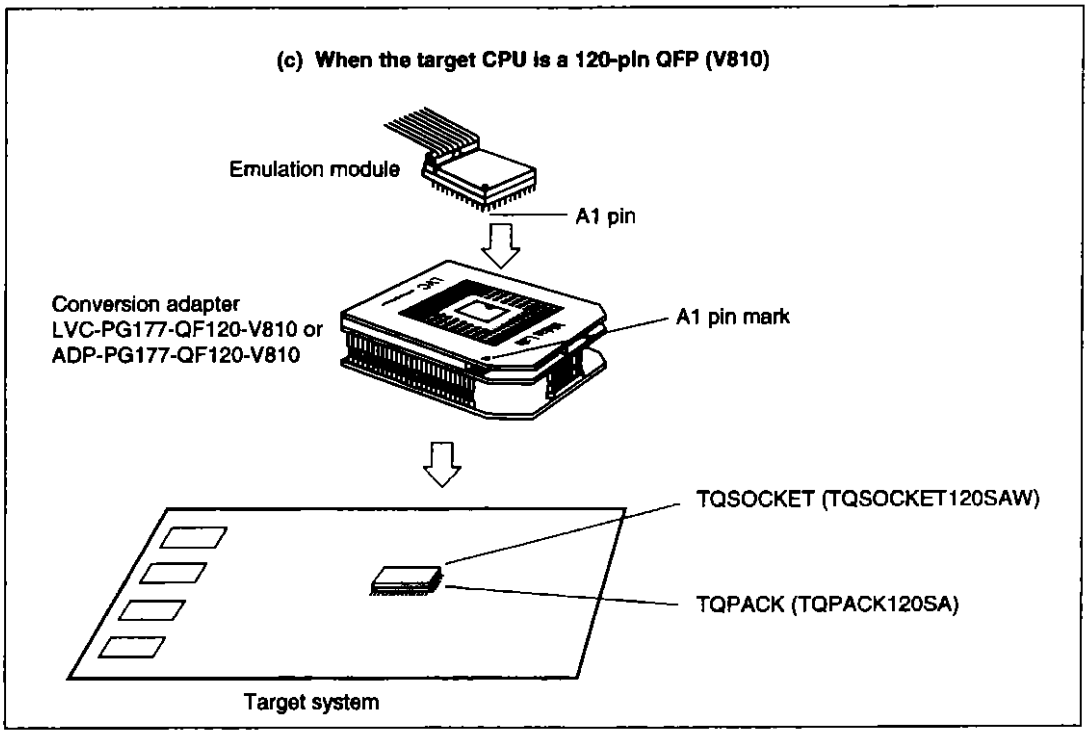


Caution **Before attempting to make a connection, check that the A1 pin of the emulation module is aligned with the A1 pin mark on the conversion adapter.**

Figure 4-4. Connecting the Emulation Module to the Target System (2/2)



Caution **Before attempting to make a connection, check that the A1 pin of the emulation module is aligned with the A1 pin mark on the conversion adapter.**



Caution **Before attempting to make a connection, check that the A1 pin of the emulation module is aligned with the A1 pin mark on the conversion adapter.**

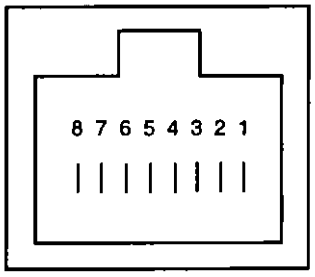
4.4 Connecting to the Network

Caution **Before connecting the IE-70732-MC to a network, first initialize the network information.**

Connect the IE-70732-MC to a network by means of the following procedure. Before attempting to make a connection, turn off the power to the communication module.

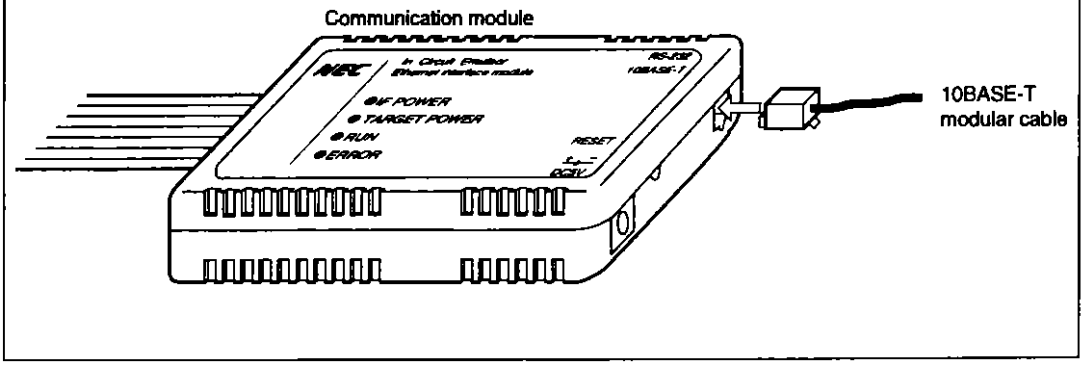
(1) Connect the 10BASE-T modular cable to the 10BASE-T connector on the communication module. (See **Figure 4-5** and **Figure 4-6**.)

Figure 4-5. Pin Allocation of 10BASE-T Connector



1	TX+	Output
2	TX–	Output
3	RX+	Input
4	NC	–
5	NC	–
6	RX–	Input
7	NC	–
8	NC	–

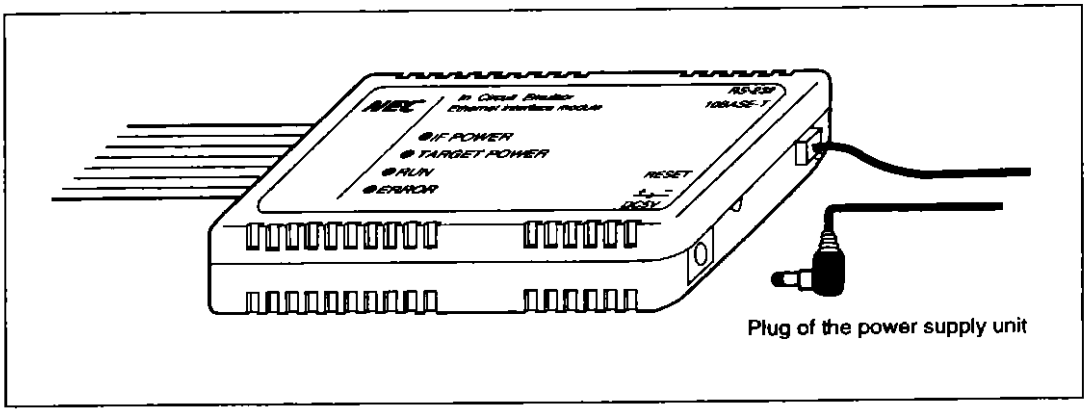
Figure 4-6. Connecting the Communication Module to the 10BASE-T Modular Cable



(2) Connect the communication module to a hub via the 10BASE-T modular cable.

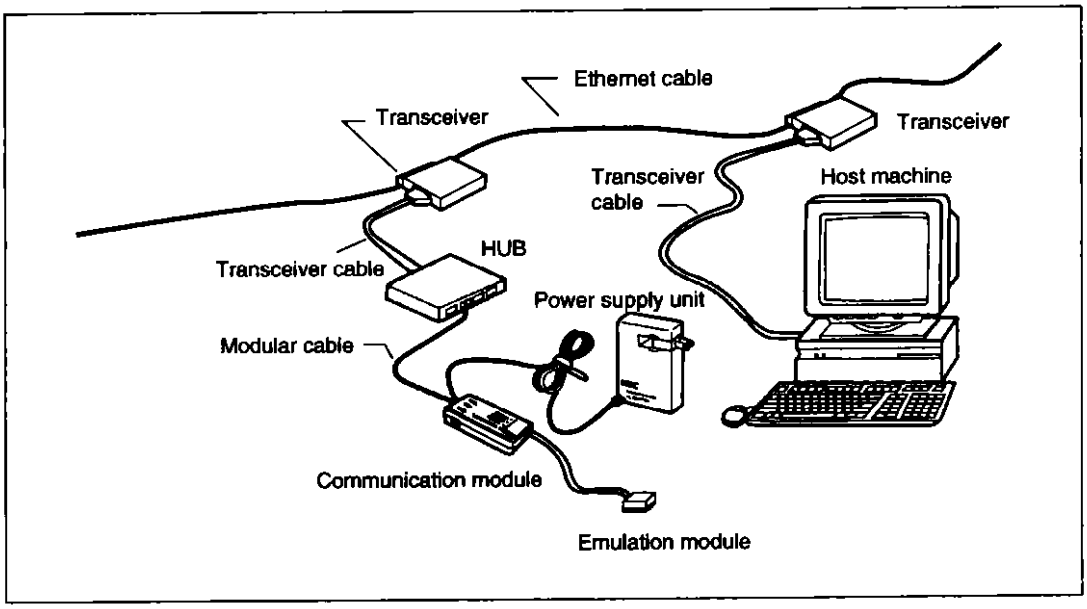
(3) Connect the communication module to the power supply unit.

Figure 4-7. Connecting the Communication Module to the Power Supply Unit



(4) Figure 4-8 shows an example system configuration where the IE-70732-MC is connected to a network.

Figure 4-8. Example of Connecting IE-70732-MC to Network



Chapter 5

Notes on Hardware Design

This chapter provides notes on the hardware design required for emulation using the IE-70732-MC.

5.1 Restrictions

The IE-70732-MC provides emulator functions, so that the functions of the following CPU pins are subject to some restrictions:

$\overline{\text{READY}}$, $\overline{\text{BCYST}}$, $\overline{\text{DA}}$, A31-A1, ST1, ST0, $\overline{\text{MRQ}}$, R/$\overline{\text{W}}$, $\overline{\text{BE3}}$-$\overline{\text{BE0}}$, $\overline{\text{NMI}}$, INT, $\overline{\text{RESET}}$

Other pins function in almost the same way as the actual device.

5.1.1 $\overline{\text{READY}}$ Signal

If the not-ready state is set in the emulation state, the host can forcibly release the not-ready state. The not-ready state is that state which is established when a $\overline{\text{READY}}$ signal is not applied for 256 clock cycles.

5.1.2 $\overline{\text{BCYST}}$ and $\overline{\text{DA}}$ Signals

With the IE-70732-MC, whether access is being performed in the break state or in the emulation state is reported to the target system with the $\overline{\text{BCYST}}$ and $\overline{\text{DA}}$ signals only. Circuits such as a data bus protection circuit and circuit for masking access control signals including R/$\overline{\text{W}}$ signals are not provided.

Therefore, add $\overline{\text{BCYST}}$ and $\overline{\text{DA}}$ signal conditions to the generation of target system data bus control signals.

When the emulation memory function becomes active, the $\overline{\text{BCYST}}$ and $\overline{\text{DA}}$ signals are output one clock cycle later to determine access to the emulation memory area.

5.1.3 A31-A1, ST1, ST0, $\overline{\text{MRQ}}$, R/$\overline{\text{W}}$, and $\overline{\text{BE3}}$-$\overline{\text{BE0}}$ Signals

These signals are set high by the internal pull-up resistors (about 5 ohms) when the IE-70732-MC receives the $\overline{\text{HLDRQ}}$ signal from the target system in the break state.

5.1.4 $\overline{\text{NMI}}$ Signal

An NMI interrupt generated when the IE-70732-MC is in the break state is held; the interrupt is accepted after the state changes to the emulation state.

If an event break or forced break occurs during NMI handling, NMI handling is stopped, and the state changes to the break state.

5.1.5 INT Signal

An INT interrupt, generated when the IE-70732-MC is in the break state, is ignored.

If an event break or forced break occurs during INT handling, INT handling is stopped, and the state changes to the break state.

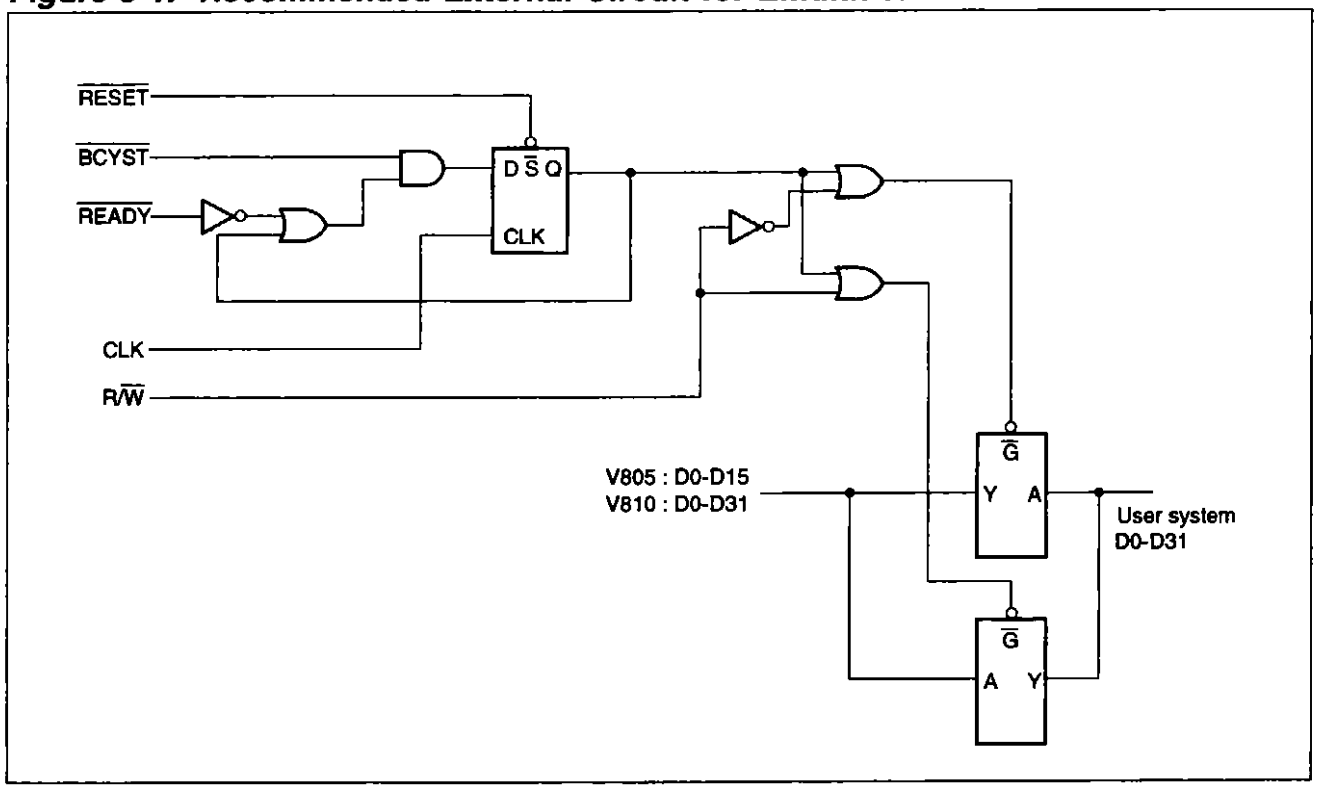
5.1.6 $\overline{\text{RESET}}$ Signal

When the IE-70732-MC is in the break state, the $\overline{\text{RESET}}$ signal from the target system is not accepted. The $\overline{\text{RESET}}$ signal can be generated forcibly under the control of the host.

5.2 Recommended External Circuit

The data bus of the emulation module malfunctions when driven from the user system in the break state. Therefore, control the data bus by using a circuit such as that shown below.

Figure 5-1. Recommended External Circuit for Emulation Module



5.3 Emulation Memory Function

The emulation memory consists of 128K-bytes, and can be allocated in 64K-byte steps in a 4G-byte space. Note, however, that access to the emulation memory is a one-wait operation based on dynamic bus sizing. In this case, the $\overline{\text{BCYST}}$ and $\overline{\text{DA}}$ signals are not activated, but the other signals perform the same operations as in the case of ordinary dynamic bus sizing. (The $\overline{\text{SZRQ}}$ signal is automatically activated in the emulation module.)

The emulation memory has an access port from the CPU only, so that the emulation memory cannot be accessed from a separate bus master on the target system.

A source debugger is used for emulation memory setting.

5.4 Emulator I/O Signals

(1) Figure 5-2 and Table 5-1 indicate the target system clock and clock delays in the emulator.

Figure 5-2. Target System Clock and Clock Delays in Emulator

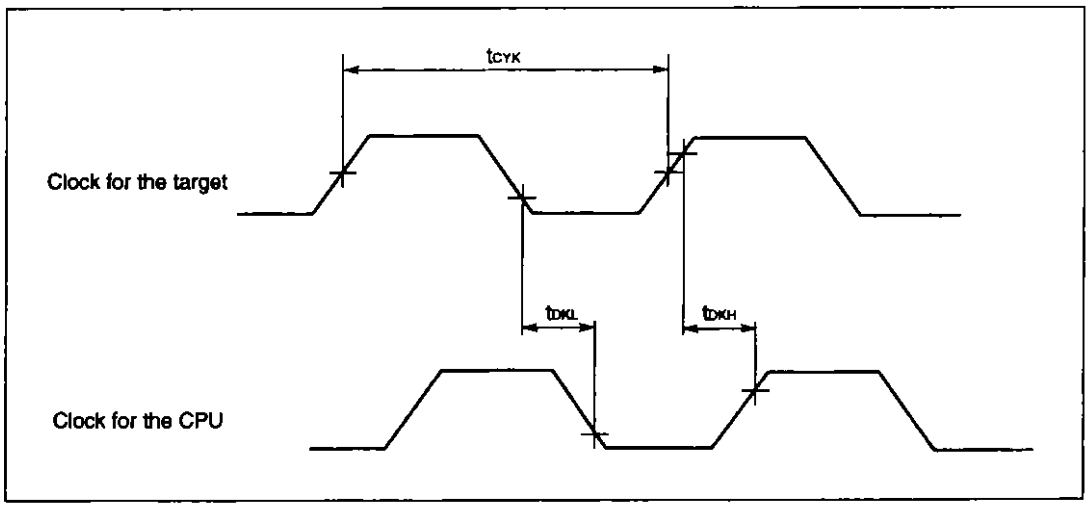


Table 5-1. Target System Clock and Clock Delay Values in Emulator

(T_A = 25°C, V_{DD} = 5 V)

Abbreviation	Parameter	f = 25 MHz TYP. (ns)
t_{CYK}	Clock frequency	40
t_{DKH}	Rising edge delay	8
t_{DKL}	Falling edge delay	8

(2) Figure 5-3 and Table 5-2 indicate delays (in write cycles) in output to the target system when only the target memory is used.

Figure 5-3. Delays in Output to Target System When Only Target Memory Is Used

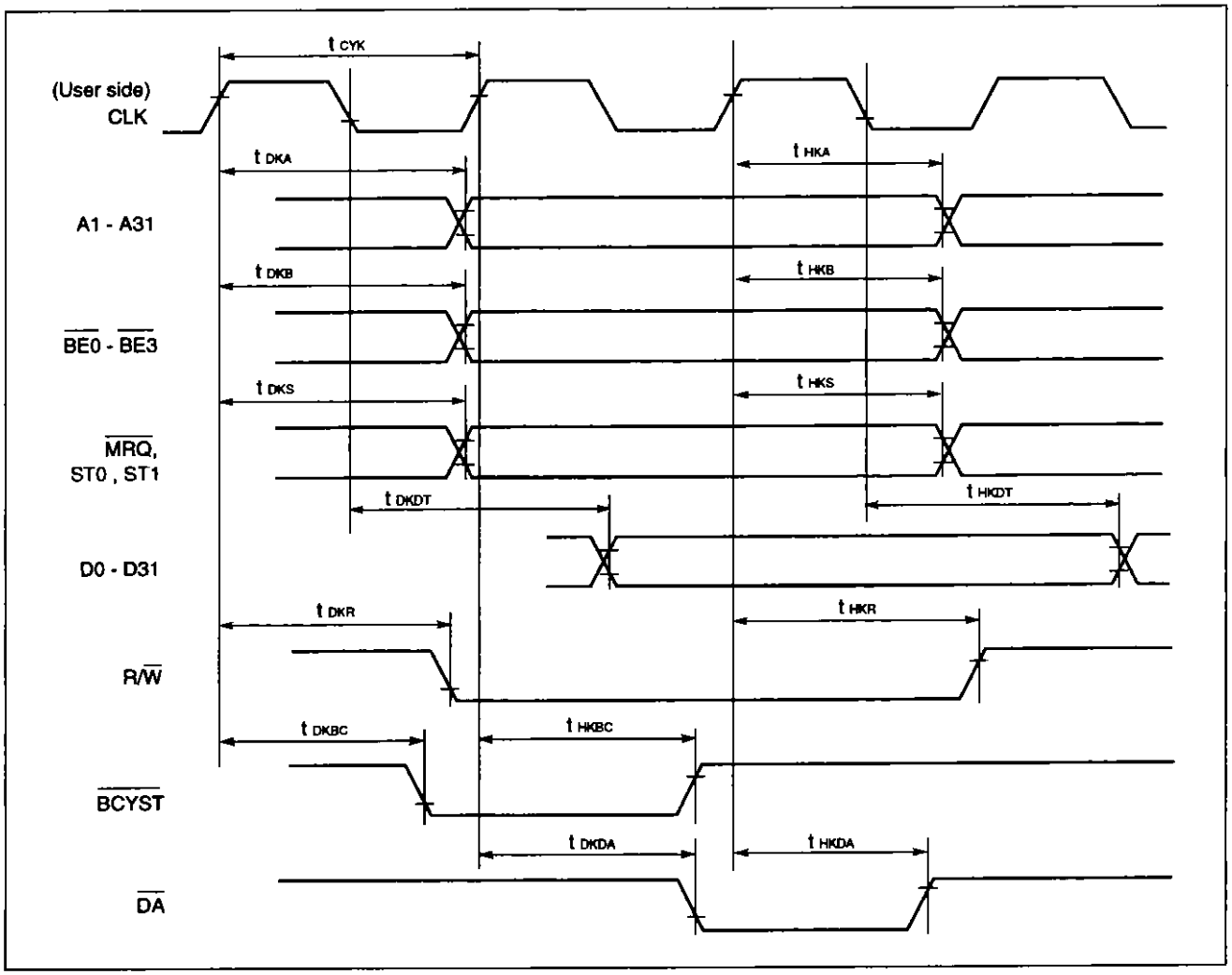


Table 5-2. Delays in Output to Target System When Only Target Memory Is Used

(T_A = 25°C, V_{DD} = 5 V)

Abbreviation	Parameter		f = 25 MHz (t_{CYK} = 40 ns)
			TYP. (ns)
t_{DKA}	Output active delay	(A1-A31)	11
t_{HKA}	Output inactive delay	(A1-A31)	11
t_{DKB}	Output active delay	($\overline{BE0}$-$\overline{BE3}$)	14
t_{HKB}	Output inactive delay	($\overline{BE0}$-$\overline{BE3}$)	13
t_{DKS}	Output active delay	(ST0, ST1)	11
t_{HKS}	Output inactive delay	(ST0, ST1)	10
t_{DKDT}	Output active delay	(D0-D31)	14
t_{HKDT}	Output inactive delay	(D0-D31)	13
t_{DKR}	Output active delay	(R/$\overline{W}$)	12
t_{HKR}	Output inactive delay	(R/$\overline{W}$)	10
t_{DKBC}	Output active delay	($\overline{BCYST}$)	22
t_{HKBC}	Output inactive delay	($\overline{BCYST}$)	17
t_{DKDA}	Output active delay	($\overline{DA}$)	17
t_{HKDA}	Output inactive delay	($\overline{DA}$)	17

(3) Figure 5-4 and Table 5-3 indicate delays (in write cycles) in output to the target system when the emulation memory is used.

Figure 5-4. Delays in Output to Target System When Emulation Memory Is Used (in Write Cycles)

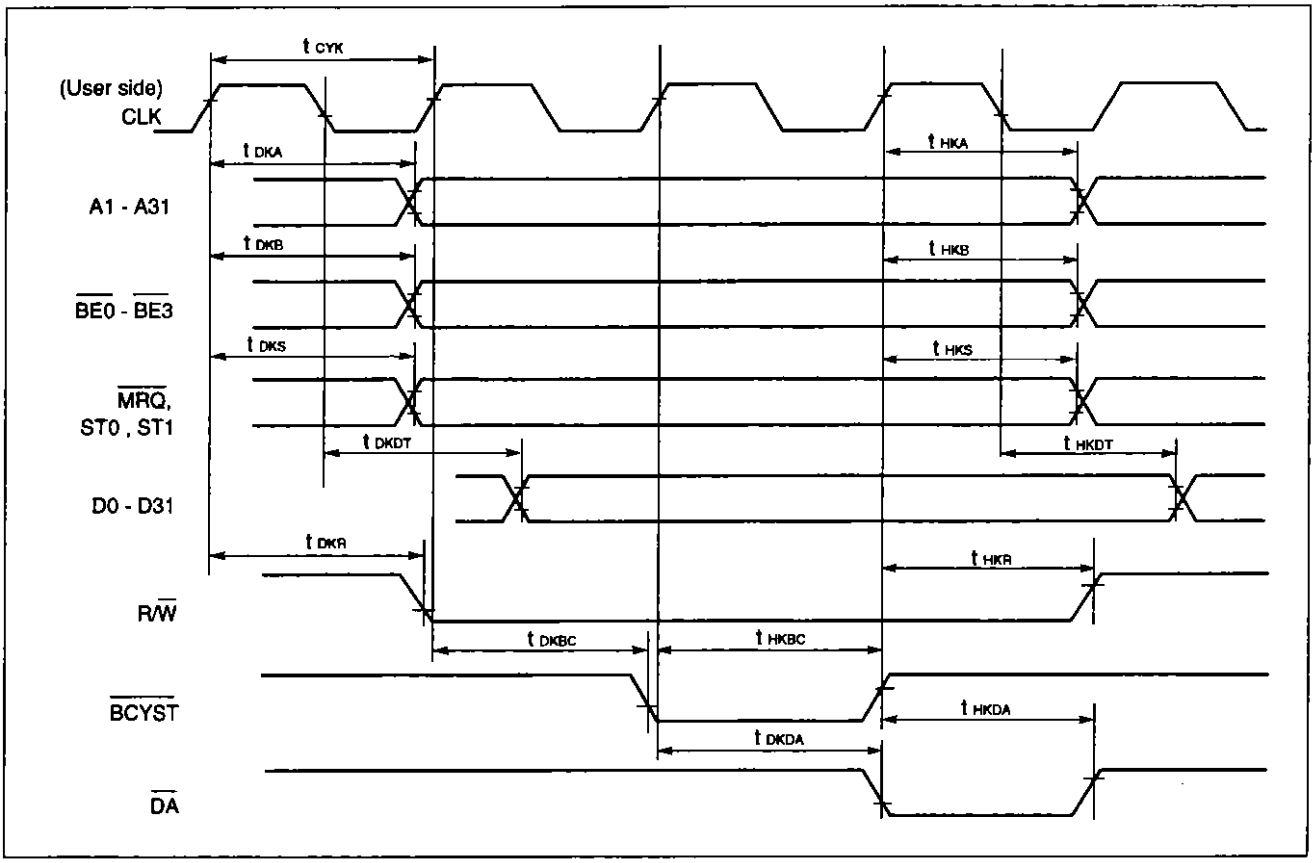


Table 5-3. Delays in Output to Target System When Emulation Memory Is Used (in Write Cycles)

(T_A = 25°C, V_{DD} = 5 V)

Abbreviation	Parameter		f = 25 MHz (t_{CYK} = 40 ns) TYP. (ns)
t_{DKA}	Output active delay	(A1-A31)	11
t_{HKA}	Output inactive delay	(A1-A31)	11
t_{DKB}	Output active delay	($\overline{BE0}$-$\overline{BE3}$)	14
t_{HKB}	Output inactive delay	($\overline{BE0}$-$\overline{BE3}$)	13
t_{DKS}	Output active delay	(ST0, ST1)	11
t_{HKS}	Output inactive delay	(ST0, ST1)	10
t_{DKDT}	Output active delay	(D0-D31)	14
t_{HKDT}	Output inactive delay	(D0-D31)	13
t_{DKR}	Output active delay	(R/$\overline{W}$)	12
t_{HKR}	Output inactive delay	(R/$\overline{W}$)	10
t_{DKBC}	Output active delay	($\overline{BCYST}$)	22
t_{HKBC}	Output inactive delay	($\overline{BCYST}$)	17
t_{DKDA}	Output active delay	($\overline{DA}$)	17
t_{HKDA}	Output inactive delay	($\overline{DA}$)	17

Appendix A

CPU Pin States

Table A-1. CPU Pins for Emulation

Operating state / Pin name	Bus idle during reset reset state)	Bus hold (including	Hold acknowledge	Machine fault	Fetch		Memory access				I/O access	
					User memory	Emulation memory	User memory		Emulation memory		External I/O	
					R	R	R	W	R	W	R	W
A31-A2	H	Z1	O									
A1	C1	Z1	O									
D31-D0	Z	Z	O		I		O	I	O		I	O
$\overline{BE3}$-$\overline{BE0}$	H	Z1	O									
ST1, ST0	H	Z1	O									
$\overline{DA}$	H	Z	O			H	O		H		O	
$\overline{MRQ}$	H	Z1	O									
R/$\overline{W}$	H	Z1	O									
$\overline{BCYST}$	H	Z	O			H	O		H		O	
$\overline{READY}$	I					M	I		M		I	
$\overline{HLDRQ}$	I											
$\overline{HLDAK}$	H	L	O									
$\overline{SZRQ}$	I											
SIZ16B	I											
BLOCK	L		O									
$\overline{ICHEEN}$	I											
$\overline{ADRSERR}$	H	C2	O									
INT	I			X	I							
$\overline{INTV3}$-$\overline{INTV0}$	I			X	I							
$\overline{NMI}$	I			X	I							
CLK	I											
$\overline{RESET}$	I											

Remarks I : Input O: Output H: High-level output
L : Low-level output Z: High impedance X: Invalid M: Mask
C1 : High level is output in 16-bit bus fixed mode. Low level is output in 32-bit bus mode.
C2 : High level is output during reset. In other cases, the state remains the same as the previous state.
Z1 : The pin becomes high-impedance, but high level is output with the internal pull-up resistor.

Table A-2. CPU Pins for Break

Operating state / Pin name	Bus idle during reset	Bus hold	Hold acknowledge	Machine fault	Fetch	Memory access				I/O access	
					Monitor memory	User memory		Emulation memory		External I/O	
					R	R	W	R	W	R	W
A31-A2	—	Z1	—		O						
A1		Z1			O						
D31-D0		Z1			I		O	I	O	I	O
$\overline{BE3}$-$\overline{BE0}$		Z1			O						
ST1, ST0		Z1			O						
$\overline{DA}$		Z			H	O		H		O	
$\overline{MRQ}$		Z1			O						
R/$\overline{W}$		Z1			O						
$\overline{BCYST}$		Z			H	O		H		O	
$\overline{READY}$		I			M	I		M		I	
$\overline{HLDRQ}$		I			I						
$\overline{HLDAK}$		O			O						
$\overline{SZRQ}$		I			I						
SIZ16B		I			I						
BLOCK		L			O						
$\overline{ICHEEN}$		I			I						
$\overline{ADRSERR}$		N			O						
INT		X			X						
$\overline{INTV3}$-$\overline{INTV0}$		X			X						
$\overline{NMI}$		X			X						
CLK		I			I						
$\overline{RESET}$	M										

Remarks I : Input O: Output H: High-level output
L : Low-level output Z: High impedance X: Invalid M: Mask
Z1 : The pin becomes high-impedance, but high level is output with the internal pull-up resistor.
N : The state remains the same as the previous state.
— : State that cannot exist

Appendix B

Differences Between IE-70732-MC and IE-70732-BX

Table B-1 and Table B-2 indicate differences between the IE-70732-MC and IE-70732-BX.

Table B-1. Major Specification Differences

Item \ Product name	IE-70732-MC	IE-70732-BX
Target CPU (package)(Note)	• V805 (100-pin QFP) • V810 (176-pin PGA, 120-pin QFP)	
Operating clock	External: 2.5 MHz to 20 MHz (V805) 2.5 MHz to 25 MHz (V810)	External: 64 kHz to 25 MHz Internal: 25 MHz
Program execution	Execution, step-by-step execution, step-by-step function execution	
Break function	Event break: 4 events maximum	Event break: 16 events maximum
	Software break	
	Forced break	
Pin mask function	None	Set by commands. $\overline{\text{HLDRQ}}$, $\overline{\text{RESET}}$, $\overline{\text{NMI}}$, INT, $\overline{\text{READY}}$, $\overline{\text{SZRQ}}$, SIZ16B, $\overline{\text{ICHEEN}}$
Emulation memory	Standard: 128K bytes	Standard: 1M bytes
	Expansion: Not allowed	Expansion: Allowed up to 2M bytes
External logic probe	None	8-bit external input allowed
Supply voltage source	Power supply unit: IE-70000-MC-PS (85 VAC to 132 VAC)	Internal power supply (automatically switchable between 100 VAC and 220 VAC)
Outside dimensions: Depth x Width x Height (Unit: mm)	• IE-70732-MC-EM1: 49.1x38.5x8.5 • IE-70000-MC-SV2: 67x116x27.5	327.5x122x320
Weight	EM1 + SV2 + PS (excluding cables) = 30 g + 150 g + 190 g = 370 g	Approx. 10 kg
Host interface	Communication module IE-70000-MC-SV2 (Conforming to 10BASE-T)	• EWS (UNIX) base Network interface board IE-70000-BX-SV1 (Supporting 10BASE-5 and 10BASE-2)
		• Personal computer base Personal computer interface board (to be purchased separately) IE-70000-98-IF-B or IE-70000-PC-IF-B
Power supply unit	IE-70000-MC-PS	Built into the main unit

(Note) Use a conversion unit to enable connection between a QFP and the target system. (See **Section 1.6** for details.)

Table B-2. Debugging Function Comparison

Item \ Product name	IE-70732-MC	IE-70732-BX
Program execution	O	
Program load/save	O	
C source level debugging	O	
Symbolic debugging	O	
Software break	O	
Hardware break	O	
Emulation memory	Δ	O
Pin mask function	–	O
Operation with no target system	–	O
Complicated break condition	X	O
Real-time trace	X	O
Parallel interface	–	O
Network interface	O	
Correspondence to actual chip	O	Δ

O: Superior Δ: Average X: Inferior –: Not applicable