EPSON
EXCEED YOUR VISION

CMOS 8-BIT SINGLE CHIP MICROCOMPUTER

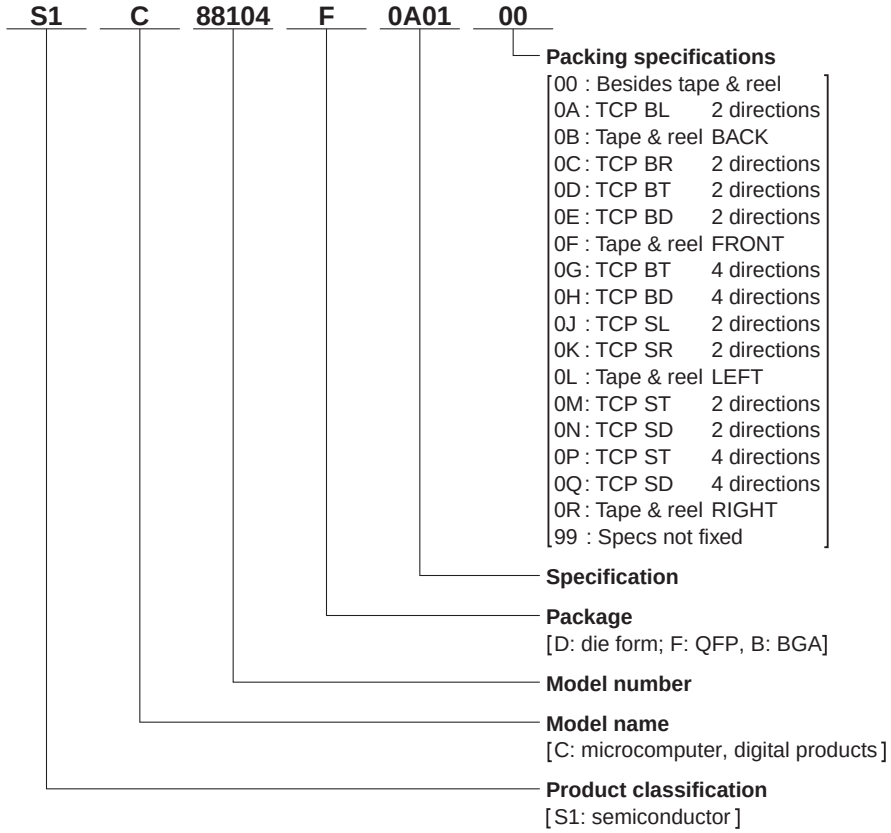
S5U1C88000H5 Manual

(S1C88 Family In-Circuit Emulator)

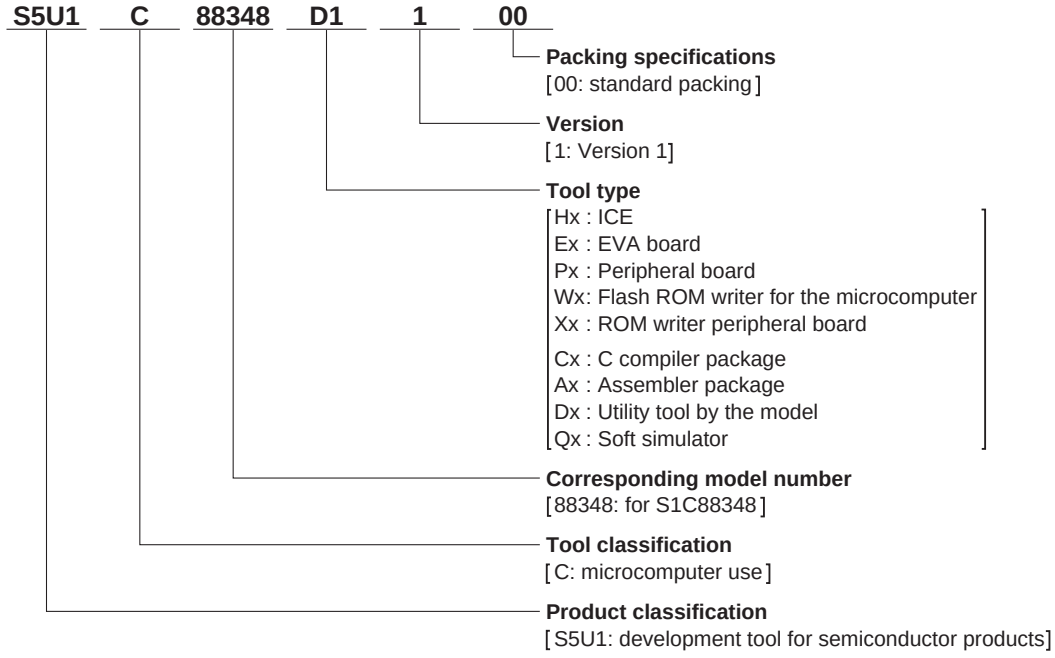
SEIKO EPSON CORPORATION

Configuration of product number

Devices



Development tools



S5U1C88000H5 Manual (S1C88 Family In-Circuit Emulator)

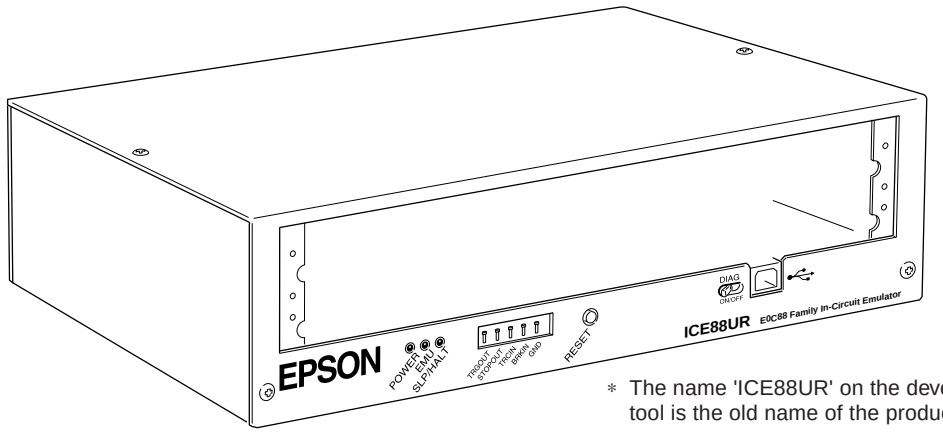
This manual explains the use of the in-circuit emulator (S5U1C88000H5), setting up the system and starting up the debugger.
For the functions and operations of the debugger, see the help topics displayed in the debugger.
See also the tool manuals below which are provided for each model.
- S5U1C88xxxP Manual
- S5U1C88xxxD Manual or S1C88 Family Development Tool Manual

CONTENTS

CHAPTER 1 PREFACE

1.1 Outline

The S5U1C88000H5 package, one of the software development tool packages for the 8-bit single chip microcomputer S1C88 Family, consists of an in-circuit emulator (S5U1C88000H5) and a debugger (S5U1C88000H5 for Windows). It allows the programmer to efficiently debug the target system and the target program.
This system can be used for all the S1C88 Family models. The S5U1C88000H5 in-circuit is compatible with each model of the S1C88 Family by installing the Peripheral Circuit Board (S5U1C88xxxP) that is provided for each model.
The S5U1C88000H5 system provides an advanced software developing environment that uses a personal computer as the host computer.



* The name 'ICE88UR' on the development tool is the old name of the product.

Fig. 1.1.1 S5U1C88000H5 external view

1.2 Operating Environment

To construct an S5U1C88000H5 system, the following equipment is necessary in addition to this package:

Personal computer

- IBM-PC / AT or compatible model with Windows 2000 or Windows XP installed.
- 80486DX2 66 MHz CPU or higher and 24MB RAM are recommended.
- A USB port is required in the personal computer.
- A hard disk drive, a 3.5" floppy disk drive (1.44MB) and a mouse are required.

Display unit

- A 16 or more color display.
- 1024 × 768 dot display is recommended.

Peripheral Circuit Board, other development tools

- Prepare the Peripheral Circuit Board and development tools (software) for the model to be developed.

Basic software

- The S5U1C88000H5 system is compatible with Windows 2000 or Windows XP. Note that it is not guaranteed to work with other versions.

CHAPTER 2 S5U1C88000H5 PACKAGE

2.1 Components

After unpacking the S5U1C88000H5 package, check to see that all the following components are included. Figure 2.1.1 shows the package drawing.

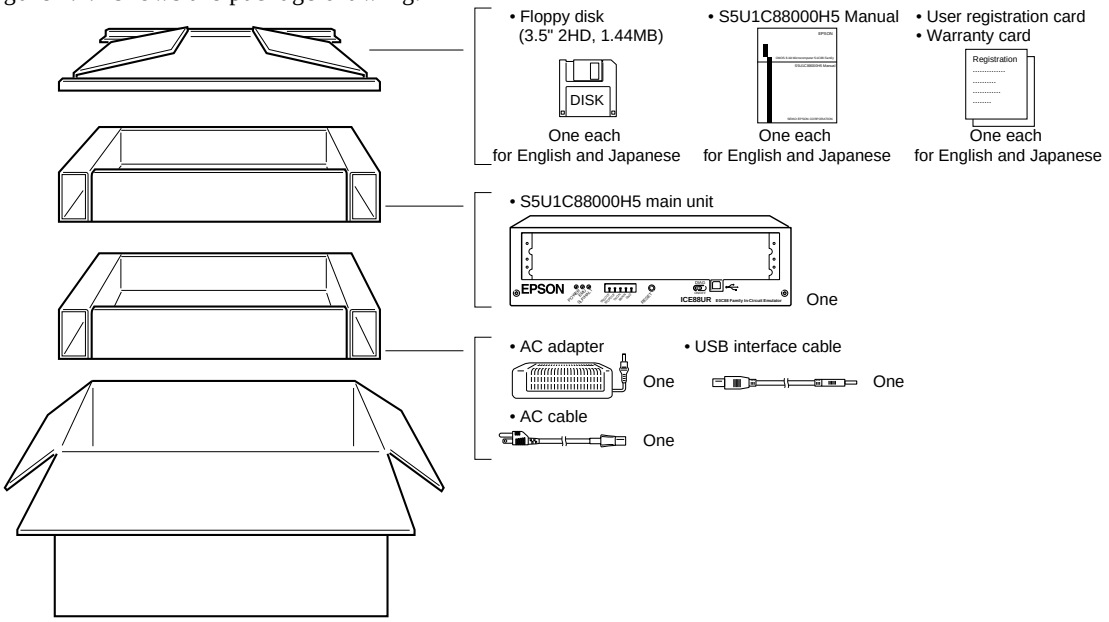


Fig. 2.1.1 S5U1C88000H5 package

2.2 Component Specifications

Table 2.2.1 shows the component specifications in the S5U1C88000H5 package.

Table 2.2.1 S5U1C88000H5 component specifications

Components	Items	Specifications	Remarks
S5U1C88000H5 main unit	Dimensions	270 (W) × 192 (D) × 79 (H) mm	Rubber feet included
	Weight	Approx. 2.5 kg (main body)	
	External color	Cygnus white	
	Input voltage	DC 5 V	
	Current consumption	2 A, max.	
	Board mounted	ICE board (one)	Peripheral Circuit board is sold separately
USB I/F cable	Length	2 m	
AC adapter	Dimensions	160 × 80 × 60 mm	Rubber feet excluded
	Input voltage	AC 90 V to 264 V	
	Input frequency	47 Hz to 63 Hz	
	Power consumption	25 W, max. (in ICE system load)	
	Output voltage/current	DC 5 V/5 A, with overcurrent protection	Outside: 5 V, Inside: 0 V
AC cable	Length	1.8 m	
	Plug type	Bipolar with ground	
Accessories	System disk	3.5" 2HD, 1.44MB (two)	One each for English and Japanese
	Manual	S5U1C88000H5 Manual	
	Warranty card		
	User registration card		
Package	Dimensions	380 (W) × 260 (D) × 225 (H)	
	Materials	W carton, cardboard	
	Total weight of package	Approx. 4 kg	

CHAPTER 3 IN-CIRCUIT EMULATOR (S5U1C88000H5)

3.1 Outline

The S5U1C88000H5 emulates the functions of the S1C88 core CPU and is used by installing a Peripheral Circuit Board for each model. The S5U1C88000H5 is connected to a personal computer via the USB port. The following shows the features of the S5U1C88000H5:

- Supports all the S1C88 Core CPU models
- 576KB of emulation memory built-in
- Advanced emulation functions (continuous execution, step execution, trace, break, coverage, etc...)
- On-the-fly function for real time monitoring memory.

See help topics of the debugger for details of the debugging functions.

Emulation Memory

The S5U1C88000H5 built-in emulation memory consists of the following two parts:

(1) 64KB emulation memory

This part corresponds to a 64KB area from address 000000H to address 00FFFFH in the accessible memory space of the S1C88 core CPU.

(2) 512KB emulation memory

This part can be allocated to a 512KB area within address 010000H to address FFFFFFH. To allocate the emulation memory to a 512KB area to be used, specify the address in a parameter file that is read at the S5U1C88000H5 system start-up.

Thus the emulation memory can be used as an external memory that is generally prepared on the target board if the capacity of the external memory is 512KB or less. It is especially useful for debugging systems that have ROMs as the external memories.

Further, external RAM on the target board can also be debugged like the emulation memory.
See the development tool manual of the model to be developed or the "S1C88 Family Development Tool Manual" for specifying memory configuration.

3.2 Operating Environmental Conditions

Table 3.2.1 shows the environmental conditions that have to be used to operate the S5U1C88000H5.

Table 3.2.1 Environmental conditions

Items	Specifications	Remarks
Operating temperature	5 to 40 °C	
Storage temperature	-10 to 60 °C	
Operating humidity	35 to 80%	
Storage humidity	20 to 90%	No condensation
Resistance to vibration	Operating: 0.25 m/S^2 Transportation: 1 m/S^2	

3.3 Specifications of Operation Panel

Figure 3.3.1 shows the external view of the panels and Table 3.3.1 shows the function of each part of the panels.

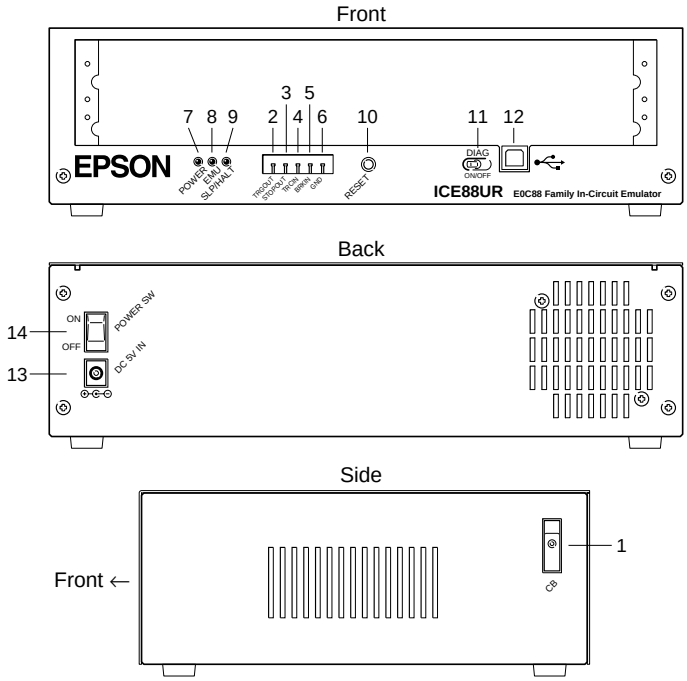


Fig. 3.3.1 External view of S5U1C88000H5 panels

Table 3.3.1 Function list of operation parts

No.	Position	Indicated symbol	Name	Function
1	Side	CB	Circuit breaker	The breaker cuts off the power of the S5U1C880000H5 system (ICE board, Peripheral Circuit board and target board) at consumption current of 4 A or more. A small staff of the breaker comes up at the shut-off. The staff should be at the recessed position for normal operating status. The breaker does not work at the normal operation.
2	Front	TRGOUT	Tracing trigger output terminal	Upon coincidence of trigger conditions with a tracing trigger point, a pulse is output from this terminal.
3	Front	STOPOUT	HALT/SLEEP status output terminal	When the S1C88 CPU is in HALT or SLEEP status, low level signal is output from this terminal. This is used to measure execution rate of the CPU. At the break mode, low level signal is also output.
4	Front	TRCIN	Trace input terminal	Information is stored in the trace memory by connection with a signal of the target system.
5	Front	BRKIN	Break input terminal	A running program enters in break status by input a low level signal from the target system.
6	Front	GND	Ground terminal for above	In case the above terminal is monitored with such an oscilloscope, the GND line of the oscilloscope is connected to this terminal. This is also used as a GND in case the signals are input to the above terminals.
7	Front	POWER	Power-on LED	This green LED lights upon power-on of S5U1C880000H5.
8	Front	EMU	Emulation LED	This red LED lights when the target program is in running status.
9	Front	SLP/HLT	Halt LED	This yellow LED lights when the S1C88 CPU stops executing the program.
10	Front	RESET	Reset switch	This switch reset S5U1C880000H5. (for maintenance)
11	Front	DIAG	Diagnostic switch	Setting up when the S5U1C880000H5 power on, execute the self diagnostic test or not
12	Front	⇽	Connector for connecting USB interface cable	This is a connector to connect the USB interface cable.
13	Back	DC 5V	DC input connector	This is a connector to connect the DC cable of the AC adapter dedicated for S5U1C880000H5.
14	Back	POWER SW	Power switch	Turns the S5U1C880000H5 power on and off.

Note: In case of change the mode by the diagnostic switch, be sure to shift it at power off the S5U1C88000H5.

CHAPTER 4 SETTING UP EQUIPMENT

Connect the equipment as shown in Figure 4.1.

Note: Be sure to turn all the system equipment off before installation and connection.

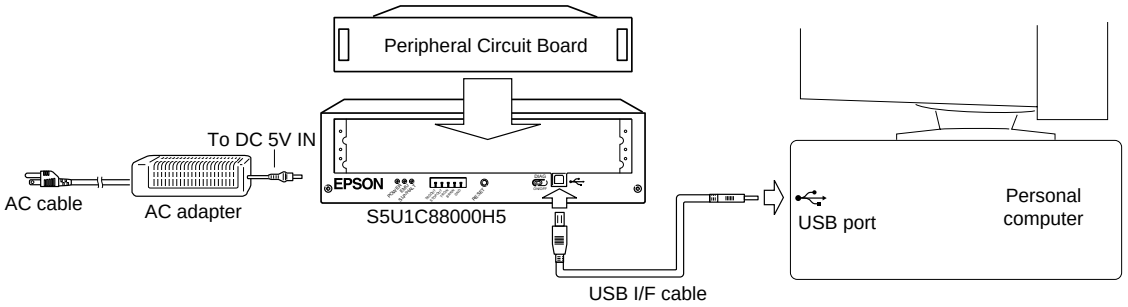


Fig. 4.1 Connection of S5U1C88000H5 system

(1) Installing the Peripheral Circuit Board

Install the Peripheral Circuit Board for the model to be developed to the S5U1C88000H5. The target board is connected to the Peripheral Circuit Board. Refer to the Peripheral Circuit Board manual of each model for how to install the Peripheral Circuit and target boards.

(2) Connecting the USB interface cable

Connect the S5U1C88000H5 to the personal computer using the USB interface cable supplied in this package.

(3) Connecting the AC adapter

Be sure to use the AC adapter supplied in this package for supplying power to the S5U1C88000H5. Connect the DC cord plug of the AC adapter to the DC 5V IN connector of the S5U1C88000H5. For the AC adapter, connect the AC cable supplied in this package. Use the same ground line between the S5U1C88000H5 and the host computer.

Note: Make sure that the equipment is installed and/or connected properly before turning the power on. The USB interface cable can be hot plugged.

CHAPTER 5 INSTALLING SOFTWARE

This package contains two 3.5" floppy disks (English and Japanese). Make backup copies before installing the software.

!! Read the Readme.txt file recorded in the disk !!

The Readme.txt file contains precautions. Be sure to read it before installing the software.

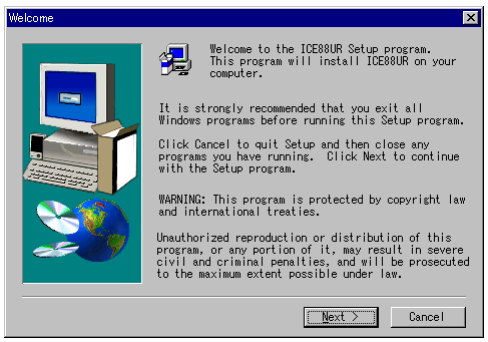
To install the tools

The debugger software should be installed in the host computer's hard disk using the dedicated installer. Follow the installing procedure described below. The explanation uses mouse operation, i.e. click, but key operation is also available. When using the keyboard, enter the underlined letter on the buttons.

(1) Start Windows. If the OS is already active, close active programs.

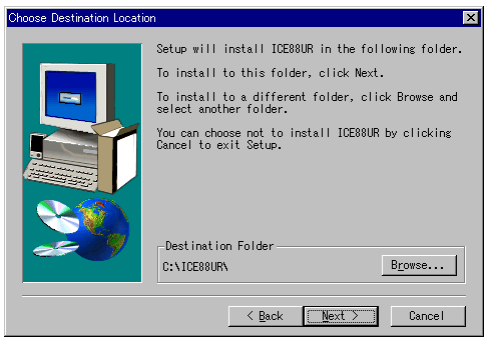
(2) Insert the supplied disk into the drive.

(3) Double-click Setup.exe.



Welcome

(4) Click on the [Next>] button to proceed.



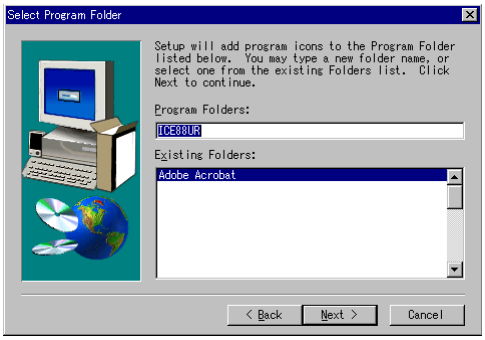
Choose Destination Location

A dialog box for specifying the folder in which to install the tools appears.

(5) If you do not wish to change the default settings, simply click the [Next>] button to execute installation.

To install in another folder

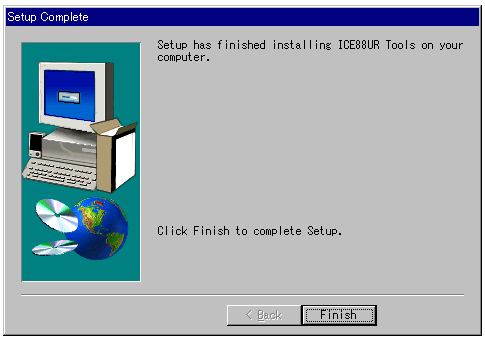
Click [Browse...] to bring up the [Choose Folder] dialog box. From this dialog box, enter the path or select the folder in which to install the tools. Click the [OK] button to finish folder selection and then click the [Next>] button.



Select Program Folder

(6) Enter the desired program folder name and click the [Next>] button. To use the default folder name, simply click the [Next>] button.

The installer will start installing the tools.



Setup Complete

(7) Click [Finish] to terminate the installer.

Program menu

The folder of tools is registered to the program menu by the installer.

To end installation

All dialog boxes that appear during installation have a [Cancel] button. To prematurely terminate installation, click [Cancel] in the dialog box when it is displayed.

To uninstall

To uninstall the installed tools, use "Add/Remove Programs" on the Control Panel.

CHAPTER 6 OPERATION

6.1 Starting up S5U1C88000H5 for Windows

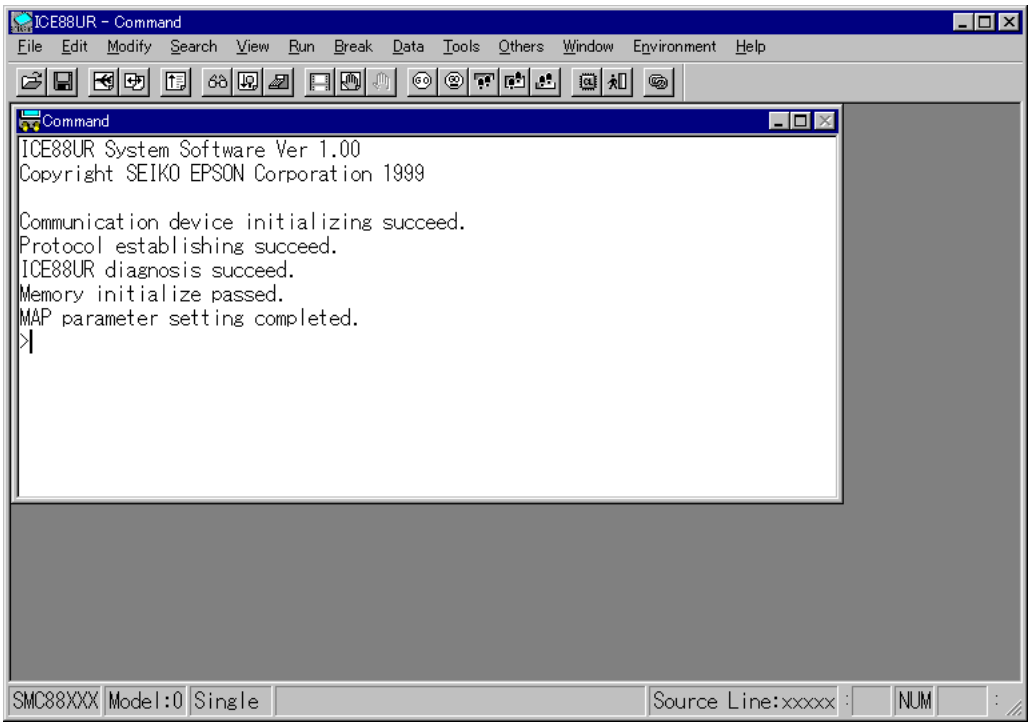
The following shows the start-up procedure of the S5U1C88000H5 system.

(1) Turn the S5U1C88000H5 in-circuit emulator on.

Note:
- *After connecting the S5U1C88000H5 system, make sure that the equipment is installed and connected correctly before turning the power on.*
- *After the S5U1C88000H5 is turned off, do not turn the S5U1C88000H5 on for at least 10 seconds. It may cause a malfunction i*

(2) To start up the debugger, select Ice88ur.exe from the program menu.

The debugger window below is appeared.



The S5U1C88000H5 debugger checks the S5U1C88000H5 hardware and files required. The check result is displayed in the [Command] window. If any error message appears and the debugger does not start up normally, terminate the debugger (choose [Exit] command from the [File] menu), then check the following points.

- Is the Peripheral Circuit Board installed in the S5U1C88000H5 properly?
- Is the S5U1C88000H5 connected to the personal computer with the USB interface cable properly?
- Is the S5U1C88000H5 turned on?
- Is the appropriate parameter file prepared? (see Section 6.3)

6.2 End Procedure

To terminate S5U1C88000H5 for Windows, choose the [Exit] command from the [File] menu.
Do not turn the S5U1C88000H5 off until the debugger is terminated.

6.3 Initial Setup File (ICE88UR.INI) and Parameter File (.PAR)

The Ice88ur.ini file installed in the Windows system folder (\windows) contains the following initial setup information for the S5U1C88000H5 debugger.

Model=

A model name to be developed is specified. The model name described here will appear on the S5U1C88000H5 status bar.
Example: `Model=E0C88316`

Path=

A parameter file is specified.
The parameter file (.PAR) contains the memory mapping information for the model to be developed and information for allocating an external memory area to the S5U1C88000H5 emulation memory. It is read into the debugger (S5U1C88000H5 for Windows) at start-up. The development tool package for each model includes a parameter file that contains a basic memory configuration. It is necessary to customize the contents if the system to be developed has an external memory. Refer to the development tool manual of each model or the "S1C88 Family Development Tool Manual" for the contents of the parameter file and how to customize it.

The installer in this package installs the parameter file "Default.par" for starting up the debugger in the same folder as the debugger program and sets it as the default parameter file so that the debugger will read the file at start-up. To set the debugger to read an actual parameter file used for development, it is necessary to rewrite this Path= specification so that the necessary parameter file will be read in.
Example: `Path=DEFAULT.PAR` → `Path=C:\E0C88\DEV88316\88316.PAR`

When specifying a parameter file existing in the same folder as the debugger program (Ice88ur.exe), rewrite the file name only. When specifying a parameter file existing in another folder, the path should be described.

CCFile=

A command chain file is specified. When a command chain file name is entered here, the S5U1C88000H5 debugger will automatically execute the commands described in the specified file after it starts up. Use the command chain file for the S5U1C88000H5 environment configuration and loading program and option files after starting up.
Example: `CCFile=C:\E0C88\DEV88316\test.com`

When specifying a command chain file existing in the same folder as the debugger program (Ice88ur.exe), rewrite the file name only. When specifying a command chain file existing in another folder, the path should be described.

6.4 Debugging

To read a target program and to debug the program, choose the command from the menu, click the tool bar button, or enter the debug command directly in the [Command] window.
See Help in the debugger for debugging functions, operations and details of the debug commands.
To open the help window, choose the [Index...] command from the [Help] menu. The contents of the help topics appear. Clicking an underlined item jumps to the topic.

CHAPTER 7 PRECAUTIONS

(1) Connecting and disconnecting the equipment

Be sure to turn the personal computer and the S5U1C88000H5 off when installing the Peripheral Circuit Board or connecting cables and disconnecting them. Otherwise, the internal circuits of the equipment may be destroyed.

(2) Turning the power on and off

Do not turn the S5U1C88000H5 on for at least 10 seconds after it is turned off. Turning the power on without the interval may result in abnormal operation of the S5U1C88000H5 or in the circuit breaker cutting off. It may also cause a malfunction.

(3) Overcurrent protection

When the S5U1C88000H5 is turned on under the condition that V_{DD} and V_{SS} are short-circuited on the target system, the AC adapter cuts off the output current due to the overcurrent protection function. In this case, the Power LED on the S5U1C88000H5 does not light up.
3 A or a more steady-state current on the target system cuts off the circuit breaker of the S5U1C88000H5.

(4) Difference between the emulation memory and the RAM in the actual IC

Both the S5U1C88000H5 emulation memory and the RAM in the actual IC are undefined at power-on. The set values are not same, therefore be sure to initialize the memory with the program.

(5) Difference between memory operations by the debugging commands and memory access by programs

Memory dump and other memory operations by the debugging commands use the firmware clock (default: 4 MHz) in the S5U1C88000H5. Memory access by the target program uses an emulation clock similar to the actual IC. Therefore, the read data may differ between the program and the debug command when low-speed devices or devices that delay outputting data are used on the target board. In such cases, use a low-frequency firmware clock set by the debugging command (CLK command).

(6) Setting up USB port

USB functions may be disabled in some personal computers by default. Make sure that the USB port is enabled and setup the BIOS configuration of the personal computer if necessary.

Do not connect the plural S5U1C88000H5 to the USB port. One personal computer can be connected only one S5U1C88000H5.

APPENDIX LIST OF MENUS, SHORTCUT KEYS AND DEBUG COMMANDS

Menu		Shortcut key	Button	Function	Command
[File]	[Open...]	Ctrl + O		Loading program	LF
	[Save...]	Ctrl + S		Saving program	SF
	[Options...]	Ctrl + Shift + O	---	Loading options	LO
	[Symbol]	---	---	Loading/saving symbols	LS, SS
	[Condition]	---	---	Loading/saving conditions	LC, SC
	[Log...]	Ctrl + L	---	Logging	LOG
	[Exit]	Alt + F4	---	Terminating debugger	Q
[Edit]	[Copy]	Ctrl + C, Ctrl + INS	---	Copy to clip board	---
	[Paste]	Ctrl + V, Shift + INS	---	Paste from clip board	---
[Modify]	[Assemble...]	Ctrl + A	---	Assembly	A
	[Edit...]	Ctrl + E	---	Editing memory contents	E
	[Fill...]	Ctrl + F	---	Filling memory area	F
	[Move...]	---	---	Copy memory	M
	[Move to em...]	---	---	Copy target memory to emulation memory	MVE
	[Register...]	Ctrl + R		Modifying registers	R
[Search]	[Data...]	Shift + F3	---	Data search	DS
	[Symbol...]	F3	---	Symbol search	SYS
	[Trace...]	Ctrl + F3	---	Trace memory search	TS
[View]	[Source-Source level]	Ctrl + 1		C source display	SET
	[Source-ASM Mix]	Ctrl + 2		C source & disassembly display	SET
	[Source-ASM]	Ctrl + 3		Disassembly display	SET
	[Dump...]	Ctrl + D	---	Memory dump	D
	[Trace...]	Ctrl + T		Trace data dump	TD
	[Coverage]	---	---	Coverage display	CV
	[List...]	Alt + F3		Specifying program display location	LI
	[Map]	---	---	Memory mapping information display	MA
[Run]	[Go]	F5		Program execution	G
	[Go from Reset]	Shift + F5		Program execution after resetting	G
	[Go with Options...]	Ctrl + F5	---	Program execution from specified location	G
	[Step Into]	F8		Step into	SI
	[Step Over]	F10		Step over	SO
	[Step Exit]	Shift + F7		Step exit	SE
	[Animate-Step Into...]	Alt + F8	---	Step into with step count	SI
	[Animate-Step Over...]	Alt + F10	---	Step over with step count	SI

Menu		Shortcut key	Button	Function	Command
[Break]	[Full Area...]	Shift + F9	---	Setting break points for full area	BA, BAR
	[1MB Area...]	F9		Setting break points with area specification	BP, BPR
	[Sequence...]	Ctrl + Shift + F9	---	Setting sequential break mode	BAS
	[Data...]	Ctrl + F9	---	Setting data break condition	BD, BDR
	[List]	Alt + F9		List of break conditions	BL
[Data]	[Symbol...]	Shift + F2		Registering/deleting symbols	SY, SYR
	[Parallel Dump...]	Ctrl + F2		Setting parallel dump points	PD, PDR
	[Watch...]	F2		Setting watch points	W, WR
[Tools]	[Tool bar]	---	---	Tool bar on/off	---
	[Status bar]	---	---	Status bar on/off	---
[Others]	[Macro]	---	---	Macro	MC, MCR
	[Stub]	---	---	Stub	STB, STBR
	[Scope]	---	---	Function name display	SCP
	[Calculation...]	---	---	Calculation	CAL
	[Command Chain...]	Ctrl + G		Command chain	COM
	[Variables...]	Ctrl + Shift + F2	---	Variable display	VAR
	[History...]	Ctrl + H	---	Command history	---
[Window]	[Cascade]	---	---	Arrangement of windows	---
	[Tile Horizon]	---	---	Arrangement of windows	---
	[Tile Vertical]	---	---	Arrangement of windows	---
	[Arrange Icons]	---	---	Arrangement of icons	---
	[1 Source]	Alt + 1	---	Opening [Source] window	OW
	[2 Dump]	Alt + 2	---	Opening [Dump] window	OW
	[3 Register]	Alt + 3	---	Opening [Register] window	OW
	[4 Parallel dump]	Alt + 4	---	Opening [Parallel dump] window	OW
	[5 Local]	Alt + 5	---	Opening [Local] window	OW
	[6 Watch]	Alt + 6	---	Opening [Watch] window	OW
	[7 Break]	Alt + 7	---	Opening [Break] window	OW
	[8 Trace]	Alt + 8	---	Opening [Trace] window	OW
	[9 Coverage]	Alt + 9	---	Opening [Coverage] window	OW
	[10 Map]	Alt + 0	---	Opening [Map] window	OW
	[11 Search result]	Alt + Shift + 1	---	Opening [Search result] window	OW
	[12 Stdout]	Alt + Shift + 2	---	Opening [STDOUT] window	OW
[Environment]	[Clock Select...]	Shift + F4	---	Clock selection	CLK
	[CPU Reset]	Ctrl + I		CPU reset	RST
	[Set...]	F4	---	Environment settings	SET
	[Trace Mode]	---	---	Setting trace mode	TM
	[Trace Trigger]	---	---	Setting trace trigger point	TP, TPR
[Help]	[Index...]	---	---	Contents of help	---
	[Using Help...]	---	---	How to use help	---
	[About...]	---	---	Version display	
---	---	Esc		Stop execution	---

EPSON

International Sales Operations

AMERICA

EPSON ELECTRONICS AMERICA, INC.

HEADQUARTERS
2580 Orchard Parkway
San Jose, CA 95131, U.S.A.
Phone: +1-800-228-3964 Fax: +1-408-922-0238

SALES OFFICE
Northeast
301 Edgewater Place, Suite 210
Wakefield, MA 01880, U.S.A.
Phone: +1-800-922-7667 Fax: +1-781-246-5443

EUROPE

EPSON EUROPE ELECTRONICS GmbH

HEADQUARTERS
Riesstrasse 15 Muenchen Bayern
80992 GERMANY
Phone: +49-89-14005-0 Fax: +49-89-14005-110

ASIA

EPSON (CHINA) CO., LTD.
7F, Jinbao Bldg., No.89 Jinbao St., Dongcheng District
Beijing 100005, CHINA
Phone: +86-10-6410-6655 Fax: +86-10-6410-7320

SHANGHAI BRANCH
7F, Block B, Hi-Tech Bldg., 900, Yishan Road
Shanghai 200233, CHINA
Phone: +86-21-5423-5522 Fax: +86-21-5423-5512

EPSON HONG KONG LTD.
20/F, Harbour Centre, 25 Harbour Road
Wanchai, Hong Kong
Phone: +852-2585-4600 Fax: +852-2827-4346
Telex: 65542 EPSCO HX

EPSON (CHINA) CO., LTD.
SHENZHEN BRANCH
12/F, Dawning Mansion, Keji South 12th Road
Hi-Tech Park, Shenzhen
Phone: +86-755-2699-3828 Fax: +86-755-2699-3838

EPSON TAIWAN TECHNOLOGY & TRADING LTD.
14F, No. 7, Song Ren Road
Taipei 110
Phone: +886-2-8786-6688 Fax: +886-2-8786-6660

EPSON SINGAPORE PTE., LTD.
1 HarbourFront Place
#03-02 HarbourFront Tower One, Singapore 098633
Phone: +65-6586-5500 Fax: +65-6271-3182

SEIKO EPSON CORPORATION
KOREA OFFICE
50F, KLI 63 Bldg., 60 Yoido-dong
Youngdeungpo-Ku, Seoul, 150-763, KOREA
Phone: +82-2-784-6027 Fax: +82-2-767-3677

GUMI OFFICE
2F, Grand B/D, 457-4 Songjeong-dong
Gumi-City, KOREA
Phone: +82-54-454-6027 Fax: +82-54-454-6093

SEIKO EPSON CORPORATION
SEMICONDUCTOR OPERATIONS DIVISION

IC Sales Dept.
IC International Sales Group
421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN
Phone: +81-42-587-5814 Fax: +81-42-587-5117

S5U1C88000H5 Manual
(S1C88 Family In-Circuit Emulator)

SEIKO EPSON CORPORATION
SEMICONDUCTOR OPERATIONS DIVISION

■ **EPSON Electronic Devices Website**

http://www.epson.jp/device/semicon_e

Document code: 411392700
First issue February, 2000 ⓂA
Printed July, 2008 in Japan ⓁA

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Epson:
S5U1C88000H5100