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CMOS 16-BIT SINGLE CHIP MICROCONTROLLER

S5U1C17001H User Manual

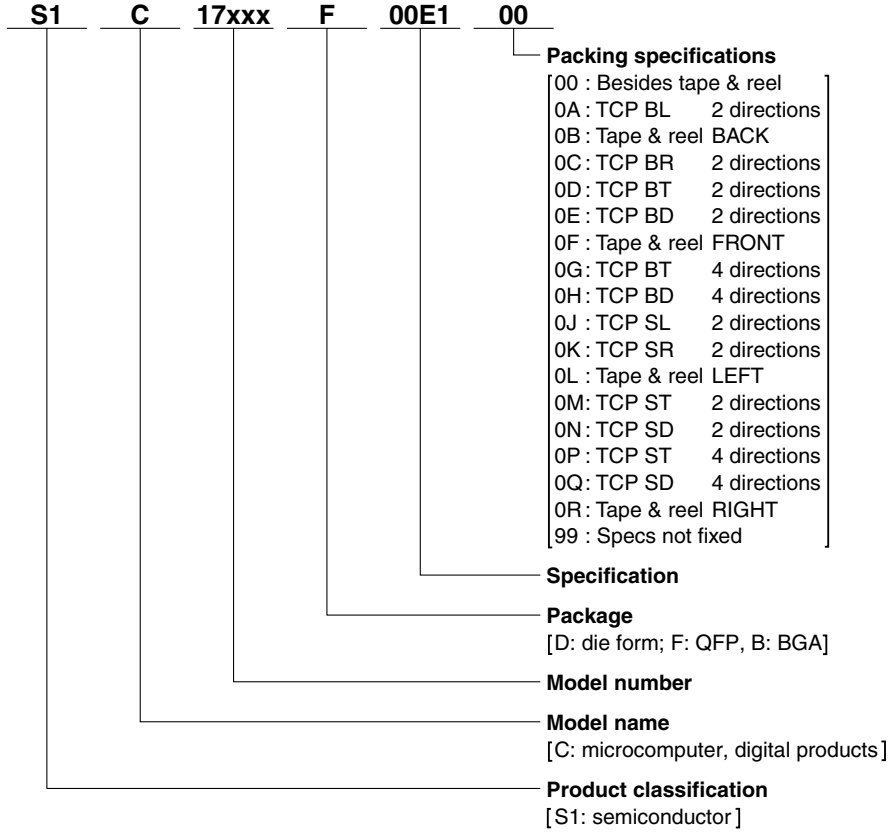
(ICDmini Ver1.0 and Ver1.1)

SEIKO EPSON CORPORATION

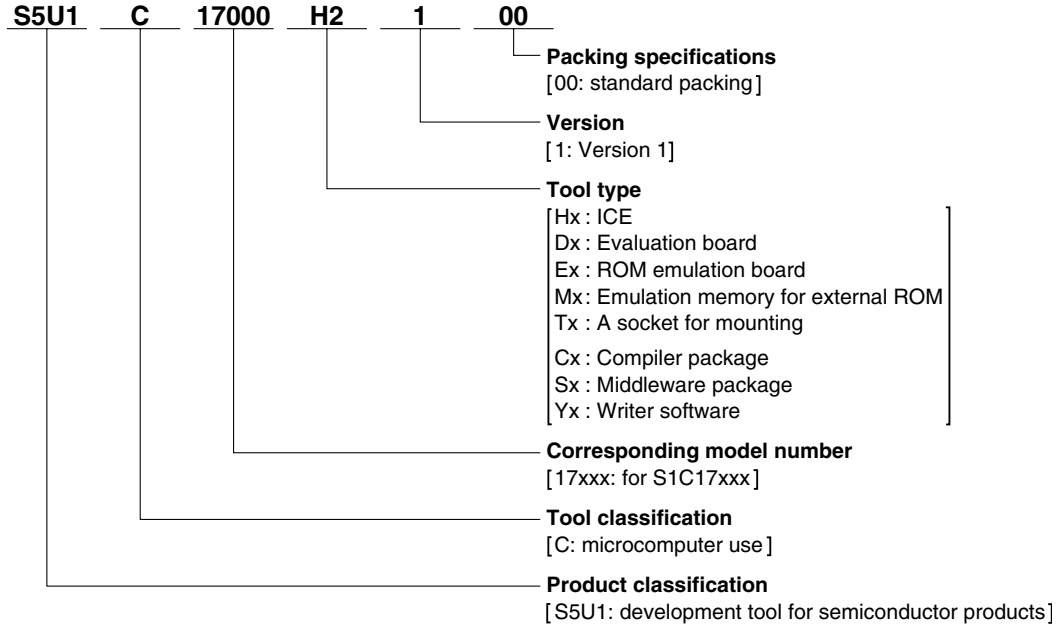
Rev.1.2

Configuration of product number

Devices



Development tools



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Explanation of Terms (various modes)

S5U1C17001H (ICDmini)

ICD mode	Flash programmer mode
This mode is for debugging the target. The debugging requires a PC and the debugger gdb (included in the S5U1C17001C S1C17 Family C Compiler Package).	This mode is for programming the Flash of the target without a PC used. Before programming can be performed, the program to be written must be loaded to the S5U1C17001H (ICDmini) in ICD mode.

Debugger gdb (included in the S5U1C17001C S1C17 Family C Compiler Package)

Connect mode	
Simulator (SIM) mode	ICD Mini mode
The simulator mode simulates the target program execution on the PC memory and no other tools are not required. However, the debug functions depending on the ICD cannot be used.	This is the mode to debug the target program using the S5U1C17001H (ICDmini) or ICD board. The program will be executed on the target board. The S5U1C17001H (ICDmini) must be used in this mode.

Target (S1C17xxx)

Normal mode	Debug mode
The normal mode is the normal state while the target is executing the user program. The target enters debug mode by one of the conditions shown below. • When a beak condition set by the debugger gdb has met • When the break button on the gdb window is clicked while the debugger is connected to the target • When a low level signal is input to the DSIO pin of the target • When the CPU executes the brk instruction	In this mode, the target accepts the control by the debugger gdb. Various debugging operations, such as display and rewriting the registers/memory, can be performed. The target enters this mode when executing the startup sequence after connecting it to the S5U1C17001H (ICDmini).

1 Overview

The S5U1C17001H (ICDmini) is a hardware tool (emulator) that allows software to be efficiently developed for the S1C17 Family of 16-bit processors*. The S5U1C17001H provides a software development environment with the debugger (gdb.exe) by communicating it to the S1C17 processor on the target system and the debugger. In addition to debugging, it can be used as a Flash programmer to program the Flash memory built into the S1C17 processor on the target system as flash writer at main unit.
This manual primarily explains how to use the S5U1C17001H. For details on the debugger functions and commands, refer to the "Debugger" section in the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)."

S5U1C17001H External View

Note: Do not open the case as it may cause a malfunction.

This manual is for the following 2 models.

- S5U1C17001H1100 (ICDmini ver1.0)
- S5U1C17001H1200 (ICDmini ver1.1)

* Through firmware update, support is also expected for the S1C33 family 32-bit processor.

Precautions before using the S5U1C17001H

Please read the sections shown below before getting started with the S5U1C17001H. These sections, especially (2) and (3), describe the answers to frequently asked questions.

(1) Chapter 2, Components Included with Package
Make sure all of the listed items are included with your package.

(2) Section 4.2, Connecting to the Host Computer
Install the USB driver before the S5U1C17001H can be used.

(3) Section 4.1, Connecting the Target System
Please pay particular attention to the Notes.

1.1 Features

• S1C cores supported	S1C17 Core S1C33 STD Core *1 S1C33 mini Core *1 S1C33 PE Core *1 S1C33 ADV Core *1
• Host interface	USB 1.1
• Debugger(gdb) mode	ICD Mini mode
• Program break functions	PC break function Lapse of time break function Forced break function External forced break function (BRK IN pin input)
• Measurement of program execution time	Can be measured from within 3 µs to 6515 hours
• Standalone Flash programmer function	Available
• Firmware update function	Available
• DCLK frequency to communicate with the target	4 kHz to 40 MHz*2
• Flash programming power voltage supply	Available
• Target reset signal output	Available
• Target system I/O interface voltage	3.3 V, 1.8 V, or voltage (Ver1.0 : 1.0 to 5.0V, Ver1.1 : 1.0 to 5.5V) input from the target
• Target system interface connector	4-pin connector
• Flash programming power supply connector	4-pin connector

∗1 Scheduled to be supported with a firmware update. The latest firmware will be released on the user's web site.
∗2 For data download speed, the reference value per each S1C processor model is disclosed by user’s site.

1.2 Operating Environment

As the host computer, the S5U1C17001H uses a PC with a USB port (USB 1.1) available.
Windows 2000, Windows XP, or Windows Vista is recommended for the OS.

2 Components Included with Package

The following shows the components included with the S5U1C17001H package:

(1) S5U1C17001H main unit 1
(2) USB cable 1
(3) Target interface cable (4-pin) 1
(4) Flash programming power supply cable (4-pin) 1
(5) User registration card ..... English/Japanese, 1 each
(6) Warranty card ..... English/Japanese, 1 each
(7) Usage precautions ..... English/Japanese, 1 each
(8) Manual download guide ..... English/Japanese, 1 each

The items specified below are not included with the package. These items must be prepared separately.

(9) S5U1C17001H User Manual (ICDmini Ver 1.0 - 1.1) (this PDF, downloadable from the SEIKO EPSON HP)

When developing an S1C17 application

(10) Debugger (gdb.exe) for the S1C17 Family (included in the S1C17 Family C Compiler Package)
(11) Manual for the S1C17 family debugger (included in the C compiler manual of the S1C17 family C compiler package.)

When developing an S1C33 application (scheduled to be supported)

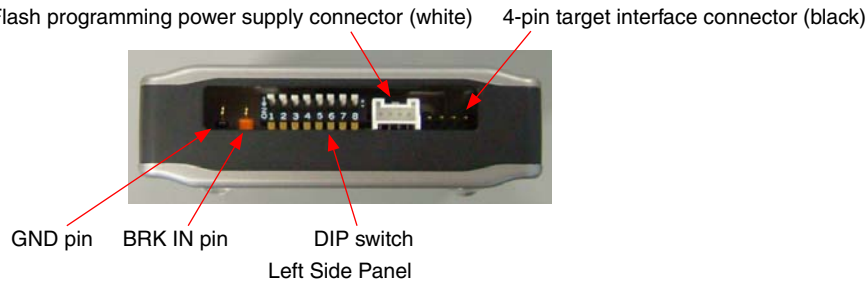
(10) Debugger (gdb.exe) for the S1C33 Family (included in the S1C33 Family C Compiler Package)
(11) Manual for the S1C33 family debugger (included in the C compiler manual of the S1C33 family C compiler package.)

Figure 2.1 Components in the S5U1C17001H Package

3 Name and Function of Each Part

The following shows the name of each part of the S5U1C17001H.

3.1 Left Side Panel



Left Side Panel

4-pin target interface connector (black)

This connector is used to input/output the debug signals (DCLK, DSIO, and DST2) from/to the S1C processor on the target system. See Section 4.1.1, "Target Interface Connector," for the pin assignment and connection.

4-pin Flash programming power supply connector (white)

This connector is used to output the reset signal to the target system and to supply a power voltage for Flash programming (Note). Also it is used to input the target operating voltage when the target system voltage level is used for the debug signal interface. See Section 4.1.2, "Flash Programming Power Supply Connector," for the pin assignment and connection.

Note: The S5U1C17001H is equipped with a 7-V Flash programming power supply with output capacities of 30mA. Note, however, that its usage depends on the S1C processor. Be sure to avoid using this power supply for the S1C processor (do not set SW8 of the DIP switch to ON) if its technical manual does not describe the usage of the Flash programming power supply, as the chip may be destroyed due to overvoltage. This pin must be left open if the connector is attached on the target system.

DIP switch

The DIP switch assembly is used to select the target CPU core, Flash programmer mode, DSIO signal level, connection test feature, firmware update feature, and Flash programming voltage output.

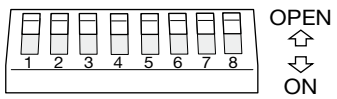


Figure 3.1.1 DIP Switch Assembly

Note: The changed switch settings will take effect after the RESET/START switch is pressed.

Selecting the target CPU core (SW1)

Table 3.1.1 SW1 Settings

SW1	Setting
OPEN (↑)	S1C17 Core (default)
ON (↓)	S1C33 Core *

* Scheduled to be supported with a firmware update

Selecting either ICD mode or Flash programmer mode (SW2 and SW3)

Table 3.1.2 SW2 and SW3 Settings

SW2	SW3	Setting
OPEN (↑)	OPEN (↑)	ICD mode (default)
ON (↓)	OPEN (↑)	Flash programmer mode Erase → program
OPEN (↑)	ON (↓)	Flash programmer mode Verify
ON (↓)	ON (↓)	Flash programmer mode Erase → program → verify

In ICD mode, the debugger on the PC controls the S5U1C17001H to execute the debug commands. (See Chapter 5.)
In Flash programmer mode, the S5U1C17001H operates as a standalone Flash programmer. (See Chapter 6.)

Selecting the DSIO signal level (SW4 and SW5)

Table 3.1.3 SW4 and SW5 Settings

SW4	SW5	Setting
OPEN (↑)	OPEN (↑)	3.3 V (default)
OPEN (↑)	ON (↓)	1.8 V
ON (↓)	–	Voltage (Ver1.0 : 1.0 to 5.0V,Ver1.1 : 1.0 to 5.5V) input from the target

The target operating voltage should be input to Pin 4 on the Flash programming power supply connector.

Enabling the connection test (SW6)

Table 3.1.4 SW6 Settings

SW6	Setting
OPEN (↑)	Omitt connection test (default)
ON (↓)	Execute connection test

The connection test is a communication diagnostic feature at start up of the debugger.

Setting firmware update mode (SW7)

Table 3.1.5 SW7 Settings

SW7	Setting
OPEN (↑)	OFF (default)
ON (↓)	ON

When SW7 is set to ON, a connection between the S5U1C17001H and the debugger can be established even if a target is not connected. See Chapter 7, “Firmware Update,” for how to update the firmware.

Enabling voltage output for Flash programming (SW8)

Table 3.1.6 SW8 Settings

SW8	Setting
OPEN (↑)	OFF (default)
ON (↓)	ON

Note: The S5U1C17001H is equipped with a 7-V Flash programming power supply with output capacities of 30mA. Note, however, that its usage depends on the S1C processor. Be sure to avoid using this power supply for the S1C processor (do not set SW8 of the DIP switch to ON) if its technical manual does not describe the usage of the Flash programming power supply, as the chip may be destroyed due to overvoltage.

BRK IN pin

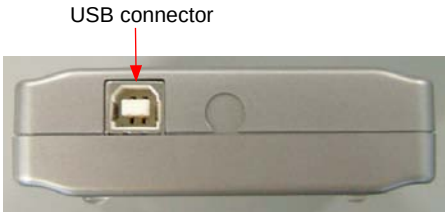
In ICD mode, if a Low level signal is input to this pin when the target program is being executed, execution of the target program is suspended. After a Low level is input to the BRK IN pin, a break will occur after a few instructions have been executed.
In Flash programmer mode, inputting a Low level to this pin has the same effect as pressing the RESET/START switch (it starts erasing/writing/verification).

Note: The voltage to apply to the BRK IN pin must be 0 V for low level and 3.3 V or open for high level. The BRK IN pin is always pulled up to 3.3 V.

GND pin

Connect this pin to the GND level (0 V).

3.2 Right Side Panel



Right Side Panel

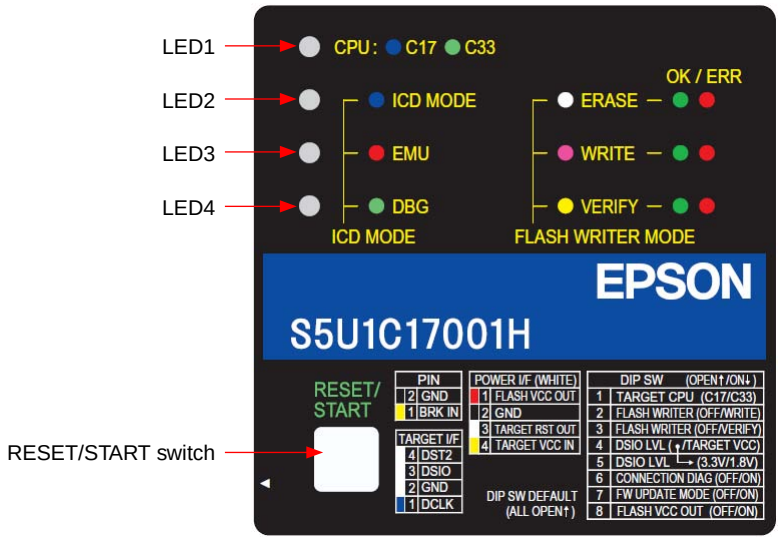
USB connector

This connector is used to connect to a PC using the supplied USB cable.

Note: When a bus-powered USB hub is used to connect the S5U1C17001H to the PC, there may be a shortage of drive power. Especially if supplying the flash programming voltage, either connect directly to the host computer's USB port, or use an AC adapter (with USB 5 V output) capable of supplying power to the USB cable.

If using an AC adapter, set the S5U1C17001H mode to be used and confirm beforehand that erasing and writing is possible as desired.

3.3 Top Panel



Top Panel

LED1–LED4

The four LEDs located on the top panel indicate debugging and Flash programming statuses.
The indicated status differs between ICD mode and Flash programmer mode.

In ICD mode

LED1 (CPU)

This LED indicates the target CPU selected using SW1.

- ● (blue) C17: Target CPU is an S1C17xxx or a product in which the S1C17 Core is embedded.
- ● (green) C33: Target CPU is an S1C33xxx or a product in which the S1C33 Core is embedded.
  ∗ C33 is scheduled to be supported with a firmware update.

LED2 (ICD MODE)

This LED always lights in blue (●) when ICD mode is selected using SW2 and SW3.

- ● (blue) The S5U1C17001H is being operated in ICD mode.

LED3 (EMU)

This LED lights when the target program is started from the debugger to indicate that the target system is executing the target program. Also this LED lights when the target system is in power-off status or it is not connected. In this case, the LED will go out by turning the target system on or by pressing the RESET/START switch after connecting the target system properly.

- ● (red)
  • The target system is in power-off status.
  • The target system is not connected properly.
  • The target system is executing the user program.
- ● (out) Other

LED4 (DBG)

This LED indicates that the target S1C processor is placed in debug mode.

- ● (green) The target S1C processor is placed in debug mode.
  Also this LED rights with LED3 before the initial connection between the S5U1C17001H and the target S1C processor has been established.
- ● (out) Other

In Flash programmer mode

When the S5U1C17001H starts up in Flash programmer mode, LED2 lights in white (○), LED3 lights in magenta (●), or LED4 lights in yellow (●).

LED1 (CPU)

This LED indicates the target CPU selected using SW1.

- ● (blue) C17: Target CPU is an S1C17xxx or a product in which the S1C17 Core is embedded.
- ● (green) C33: Target CPU is an S1C33xxx or a product in which the S1C33 Core is embedded.
  ∗ C33 is scheduled to be supported with a firmware update.

LED2 (ERASE)

This LED indicates a Flash erasing selection/operation status.

- ○ (white) The Flash erasing function is selected.
- ✲ (blinking in white) The Flash memory is being erased.
- ● (green) The Flash erasing operation has completed normally. (OK)
- ● (red) A Flash erase error has occurred. (ERR)

LED3 (WRITE)

This LED indicates a Flash programming selection/operation status.

- ● (magenta) The Flash programming function is selected.
- ✸ (blinking in magenta) The Flash memory is being programmed.
- ● (green) The Flash programming operation has completed normally. (OK)
- ● (red) A Flash program error has occurred. (ERR)

LED4 (VERIFY)

This LED indicates a Flash verification selection/operation status.

○ (yellow)	The Flash verification function is selected.
✲ (blinking in yellow)	The Flash memory is being verified.
● (green)	The Flash verify operation has completed normally. (OK)
● (red)	A Flash verify error has occurred. (ERR)

RESET/START switch

The function differs between ICD mode and Flash programmer mode.

In ICD mode

Click:

The firmware restarts and performs the initial sequence for connecting with the S1C processor on the target system. If the target board has not been connected physically, the S5U1C17001H enters initial connection waiting status.

When the TARGET RST OUT signal of the S5U1C17001H has been connected to the target system, a reset signal is output to the target system simultaneously.

In Flash programmer mode

Click:

The S5U1C17001H starts the selected Flash operation (erasing, programming, verification).

If the LED for the operation to be executed indicates OK or ERR, a hardware reset will return to default state.

Press and hold (about three seconds):

Issues a hardware reset to the S5U1C17001H.

Note: When a DIP switch setting is changed, it will take effect by pressing the RESET/START switch (in both ICD and Flash programmer modes).

4 Connections

4.1 Connecting the Target System

4.1.1 Target Interface Connector

The 4-pin target interface connector (black) on the S5U1C17001H is used to input/output the debug signals from/to the S1C processor on the target system. Use the target interface cable attached to the S5U1C17001H to connect between this connector and the target system. This connection is always required to perform debugging. The pin assignment of the 4-pin connector (black) on the S5U1C17001H is shown in the table below. For the debug pin numbers on the S1C processor, refer to the technical manual of each model.

Table 4.1.1.1 Pin Assignment of the Target Interface Connector (Black)

No.	Pin name	I/O	Pin function
1	DCLK	I	Clock signal input pin for debugging
2	GND	–	Power supply GND pin
3	DSIO	I/O	Serial transfer I/O pin for debugging
4	DST2	I	Debug status signal input pin

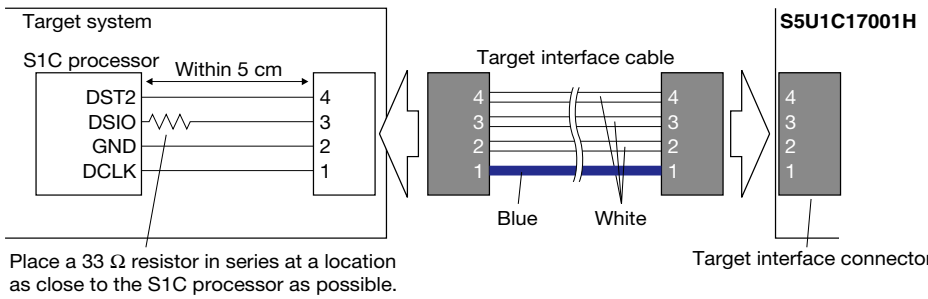


Figure 4.1.1.1 Connecting the Target System

Notes:
- Set the interface level (3.3V/1.8V/target input) using the DIP switches SW4 and SW5, and select the CPU Core using the SW1 according to the target system before connecting the target system.
- The signals connected to the S5U1C17001H are very high-speed signals, so the connector on the target system must be mounted within 5cm from the S1C processor. If there is more distance between the connector and the S1C processor, the S5U1C17001H may not work properly.
- When wiring the S1C processor to the target connector for connecting the S5U1C17001H, insert a 33Ω resistor in series between the S1C processor DSIO pin and the connector. This resistor must be placed as close to the S1C processor as possible. Although the system can operate without this 33Ω resistor, we recommend inserting this resistor to prevent malfunctions. The other pins are connected directly. A low-level input to the DSIO pin issues a forced break to set the S1C processor into debug mode. Although this signal is pulled up through about 100kΩ internally, when not debugging, we recommend either removing the 33Ω resistor to reduce noise and other problems or pulling this line up to the V_{DD} level.
- Be sure to use the supplied 4-pin cable for connecting the target system to the S5U1C17001H. Using another cable may cause a malfunction. If another cable must be necessarily used, do not extend the target interface cable and connect the cable directly to the S5U1C17001H so that the distance to the S1C processor on the target system will be shortest.
- The 4-pin connector does not have a projection for preventing reverse insertion. Check the cable color (blue) of pin 1 to be sure the insertion of connector is proper when connecting it to the target system.

4.1.2 Flash Programming Power Supply Connector

The 4-pin Flash programming power supply connector (white) is used to output a reset signal and a Flash programming voltage to the target system, and to input the target interface voltage. These signals are not necessary for debugging. Connect between this connector and the target system using the Flash programming power supply cable attached to the S5U1C17001H as necessary. The pin assignment of the 4-pin connector (white) on the S5U1C17001H is shown in the table below.

Table 4.1.2.1 Pin Assignment of the Flash Programming Power Supply Connector (White)

No.	Pin name	I/O	Pin function
1	FLASH VCC OUT	O	Flash programming voltage output pin
2	GND	–	Power supply GND pin
3	TARGET RST OUT	O	Target reset signal output pin
4	TARGET VCC IN	I	Target voltage input pin

∗ Pay attention to the pin number assignment. (It is the reverse order of the target interface connector.)

Target reset signal output (TARGET RST OUT)

By pressing the RESET/START switch in ICD mode, the TARGET RST OUT outputs a reset signal to the target system.

When using the TARGET RST OUT output, a reset circuit as shown in the figure below is recommended.

The connection to #RESET of target reset signal is not essential, although it allows debugging to be performed more efficiently. When using the Flash protection function, it is best to have a connection. Connection is also recommended in the Flash programmer mode and when using the S5U1C17001H as the Gang Writer (Gang Programmer) using S5U1C17000Y2.

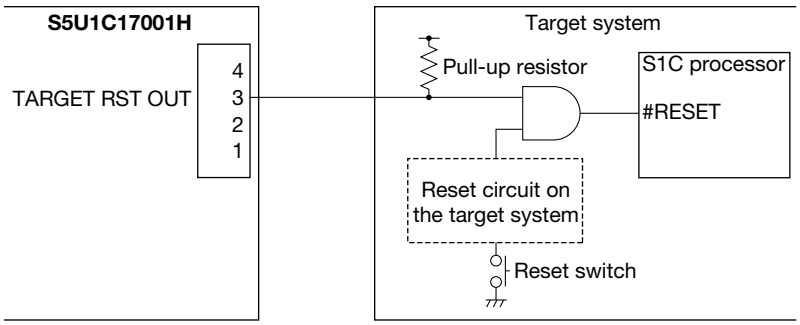


Figure 4.1.2.1 Example of Target Reset Circuit

Target voltage input (TARGET VCC IN)

In addition to 3.3 V and 1.8 V, the S5U1C17001H is capable of interfacing with the target system using the voltage (Ver1.0 : 1.0 to 5.0V, Ver1.1 : 1.0 to 5.5V) input from the target system. To use this function, set SW4 to ON and input the target voltage to the TARGET VCC IN pin.

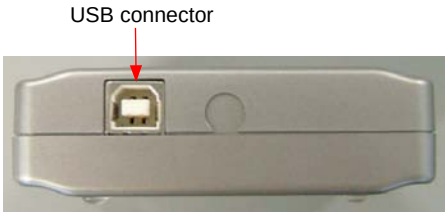
Flash programming voltage output (FLASH VCC OUT)

Depending on the Flash memory module built into the S1C processor on the target system, its programming voltage (7V) can be supplied from the S5U1C17001H. The maximum current that can be supplied is 30mA.

To use this output, set SW8 to ON and connect between the FLASH VCC OUT pin and the power supply pin on the target system. This mode functions only in Flash Writer mode. When SW8 is set to ON, the FLASH VCC OUT pin always outputs a 7-V voltage regardless of whether the RESET/START switch is pressed or not.

Note: Refer to the technical manual of each model as to whether the target S1C processor is operable with this voltage or not. Do not use this voltage unless there is a description about the usage in the technical manual, as the S1C processor may be destroyed due to overvoltage.

3.2 Right Side Panel



Right Side Panel

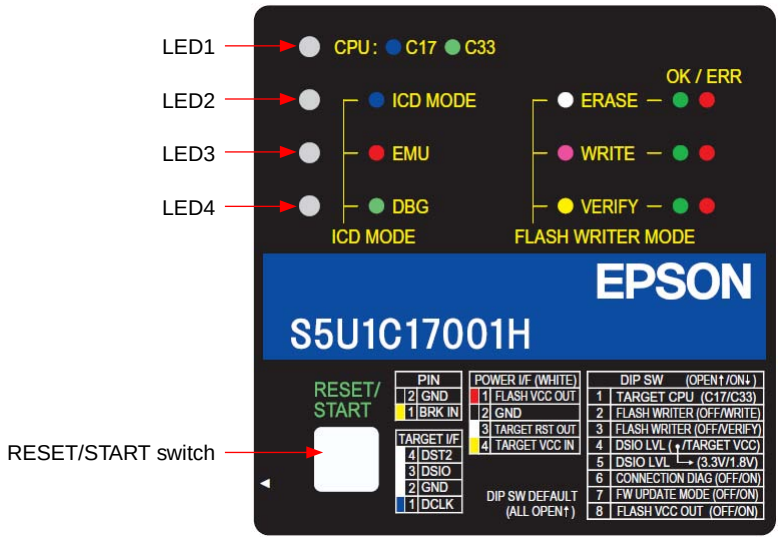
USB connector

This connector is used to connect to a PC using the supplied USB cable.

Note: When a bus-powered USB hub is used to connect the S5U1C17001H to the PC, there may be a shortage of drive power. Especially if supplying the flash programming voltage, either connect directly to the host computer's USB port, or use an AC adapter (with USB 5 V output) capable of supplying power to the USB cable.

If using an AC adapter, set the S5U1C17001H mode to be used and confirm beforehand that erasing and writing is possible as desired.

3.3 Top Panel

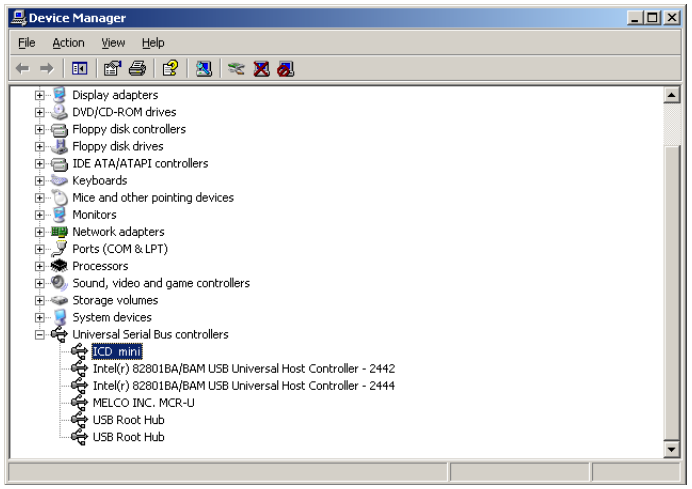


Top Panel

LED1–LED4

The four LEDs located on the top panel indicate debugging and Flash programming statuses.
The indicated status differs between ICD mode and Flash programmer mode.

The device manager will be displayed as shown below when the USB driver has been installed correctly.



Note: If the window above is not displayed correctly, try to reinstall the USB driver.

5 ICD Mode

ICD mode is an S5U1C17001H operating mode for debugging the target system by connecting the S5U1C17001H to the debugger (gdb.exe) on the PC. The following explains the settings for activating ICD mode and operations. Downloading the program to Flash can also be performed in this mode.

5.1 Specifying ICD Mode

Set the DIP switches as below so that the S5U1C17001H will start up in ICD mode.

SW2 = OPEN
SW3 = OPEN
SW7 = OPEN

5.2 Activation in ICD Mode

After connecting the S5U1C17001H to the target system and the host computer, start up the S5U1C17001H by following the procedure described below. If the S5U1C17001H is started up in another procedure, it may not be connected to the target system normally.

5.2.1 When the TARGET RST OUT Signal is Not Connected

When the TARGET RST OUT signal is not connected to the reset input on the target system, start up the S5U1C17001H by the procedure described below.

(1) Hold down the RESET/START switch on the S5U1C17001H.
LED1 ○ (white)
LED2 ○ (white)
LED3 ○ (white)
LED4 ● (out)

(2) Hold down the reset switch on the target system.

(3) Release the RESET/START switch on the S5U1C17001H.
LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (green)

(4) Release the reset switch on the target system.
*For firmware Ver 1.1 and later, hold down the RESET/START switch on the S5U1C17001H. It is also possible to connect through the step of holding down the reset switch on the target system after releasing the RESET/START switch.

When the S5U1C17001H has been connected to the target S1C processor normally

LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (out)
LED4 ● (green)

When the S5U1C17001H has not been connected to the target system

LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (out)

In this case, retry from Step (1).

5.2.2 When the TARGET RST OUT Signal is Connected

When the TARGET RST OUT signal is connected to the reset input on the target system, just press the RESET/START switch on the S5U1C17001H for starting up. The S5U1C17001H automatically generates a target reset signal with the proper connection sequence.

(1) Press the RESET/START switch on the S5U1C17001H.
LED1 ○ (white)
LED2 ○ (white)
LED3 ○ (white)
LED4 ● (out)

(2) Release the RESET/START switch on the S5U1C17001H.

When the S5U1C17001H has been connected to the target S1C processor normally

LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (out)
LED4 ● (green)

When the S5U1C17001H has not been connected to the target system

LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (out)

In this case, retry from Step (1).

5.3 Starting Up the Debugger

Start up the debugger (gdb.exe) on the PC after the connection between the S5U1C17001H and the target S1C processor has been established by the operations described above.
When debugging using the debugger with the S5U1C17001H connected, the debugger must be set to ICD Mini mode by executing the target command.

```
(gdb) target icd usb ← Command to set the debugger in ICD Mini mode
```

For the debug commands and how to operate the debugger, refer to the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)."

* When `(gdb) target sim` is executed, the software simulator starts up.

Note: Before disconnecting the S5U1C17001H from the host computer, be sure to terminate the debugger.

5.4 Connection Test

The S5U1C17001H has a connection test feature to diagnose if it can communicate with the target system properly when the debugger (gdb.exe) starts up. Perform the connection test, for example, when the S5U1C17001H does not start up by the correct procedure. Use the DIP switch to select whether the connection test will be omitted or executed.

Omitting the connection test (default)

When SW6 is set to OPEN, the S5U1C17001H will omit the connection test at the start up of the debugger (gdb.exe).

Executing the connection test

When SW6 is set to ON, the S5U1C17001H will execute the connection test at the start up of the debugger (gdb.exe).

6 Flash Programmer Mode

As flash writer at main unit, flash programmer mode is an S5U1C17001H operating mode for using it as a standalone Flash programmer. The following explains the settings for activating the Flash programmer mode and operations.
This mode is not used when debugging programs. This task is only performed when using the ICDmini as a Flash writer without a PC for mass production and so on.

6.1 Preparation for Flash Programming

The Flash programming feature allows programming the target system's Flash memory with data such as a program, which has been downloaded into the S5U1C17001H's internal Flash memory.
First download the data to program the target system's Flash memory into the S5U1C17001H by the procedure described below.

(1) Start up the S5U1C17001H in ICD mode (see Section 5.2).

(2) Start up the debugger.
   1. Launch GDB.
   2. Connect the target.
      `(gdb) target icd usb`

(3) Save the Flash erase/write program (FLS program) in the ICDmini with the `c17 fwlp` command.
   Example: When the S1C17701 is the target (ICDmini firmware ver1.1)

   ```
   (gdb) c17 fwlp C:\EPSON\GNU17\mcu_model\17701\fls\fwr17701v11.saf   0x48 0x80
   ```

   A Flash erase/write program for the Mini target (S1C processor) or external Flash memory must be saved in the ICDmini. For details of the Flash erase/write program, refer to the readme file below following installation of GNU17.
      `C:\EPSON\GNU17\mcu_model\xxxxx\fls\` (Default installation)

(4) Save the user program for writing to the target Flash memory in the ICDmini with the `c17 fwlp` (or `c17 fwdc`) command. At the same time, set the range of the Flash memory to erase.
   Example: Erase all sectors and load sample.saf in the Flash memory
   (When the Flash starting address is 0x8000)

   ```
   (gdb) c17 fwld sample.saf 0 0 0x8000
   ```

(5) Quit the debugger.

For details of the debugger (gdb.exe) and "objcopy.exe," refer to the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)."

6.2 Operations in Flash Programmer Mode

The following describes how to start up the S5U1C17001H and procedure for Flash programming.

(1) Set SW2 and SW3 according to the Flash operation to be performed.
   One of the three sequences, erasing and programming, verification only, or erasing, programming, and verification, can be selected.

Table 6.2.1 DIP Switch Settings in Flash Programmer Mode

SW2	SW3	Setting
OPEN (↑)	OPEN (↑)	ICD mode (default)
ON (↓)	OPEN (↑)	Flash programmer mode Erase → program
OPEN (↑)	ON (↓)	Flash programmer mode Verify
ON (↓)	ON (↓)	Flash programmer mode Erase → program → verify

(2) If you change the DIP switches with power supplied from USB, press the RESET/START switch to set the ICDmini to the Flash programmer mode. The DIP switch settings are enabled by pressing the RESET/START switch.
If you change the DIP switch settings with the power off, connect the USB cable of the ICDmini to the USB port of the host computer or to a 5 V AC USB adapter (see Section 3.2) to supply power.
(In the Flash programmer mode, only power is required from the USB cable and there is no communication with the PC.)

Waiting for connection with the target

● ERASE	● (out)
● WRITE	● (red)
● VERIFY	● (green)

When connected normally, the LEDs light up in accordance with the selected operation.

After connecting with the target

	Erase → Write	Verify	Erase → Write → Verify
● ERASE	○ (white)	● (out)	○ (white)
● WRITE	● (magenta)	● (out)	● (magenta)
● VERIFY	● (out)	● (yellow)	● (yellow)

(3) Connect the target system including the Flash to be programmed to the S5U1C17001H.

(4) Press the RESET/START switch.
The S5U1C17001H starts the selected Flash operation.
The LED indicates the operation being executed.

	During erasing	During programming	During verification
● ERASE	✲ (blinking in white)	–	–
● WRITE	–	✲ (blinking in magenta)	–
● VERIFY	–	–	✲ (blinking in yellow)

(5) When the Flash operation has finished, the LED lights as shown below to indicate that the operation has completed normally or an error has occurred.

When completed normally

	Erasing has completed	Programming has completed	Verification has completed
● ERASE	● (green)	–	–
● WRITE	–	● (green)	–
● VERIFY	–	–	● (green)

When an error has occurred

	Erase error	Program error	Verify error
● ERASE	● (red)	–	–
● WRITE	–	● (red)	–
● VERIFY	–	–	● (red)

(6) Disconnect the target system.

(7) Return to Step (3) to continue the same Flash operation.
Return to Step (1) to change the Flash operation.
When finishing Flash programming, disconnect the USB cable and set the DIP switch back to ICD mode.

Supplement: Instead of pressing the RESET/START switch on the top panel, the operation can be performed by inputting a GND level signal to the BRK IN pin (pulled up to 3.3 V).

7 Firmware Update

The S5U1C17001H has a firmware update function using the debugger (gdb.exe). The following shows the procedure to update the S5U1C17001H firmware.

Note: Before the firmware can be updated, the USB driver must be installed.For installation of the USB driver, see Section 4.2, “Connecting to the Host Computer.”

(1) Connect only S5U1C17001H to the host computer using USB cable.

(2) Set the DIP switch SW7 of S5U1C17001H to ON (the other SWs are OPEN), then press the RESET/START switch.
The LEDs of S5U1C17001H are as follows;
LED1 ● (blue) or ● (green)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (green)

(3) Start up the debugger (gdb.exe).
The same command can be executed by running the batch file provided with the firmware update.

To invoke at the command prompt:

```
>C:
>cd \EPSON\gnu17
>gdb
```

(4) Enter the commands shown below when debugger starts up.

```
(gdb) target icd usb
```

After entering the commands, the following will be displayed.

```
C17 ICD17 debugging
Connecting with target (ID_OK) ..... done
ICD Initializing (ICD_INITALIZE)  ... done
Read ICD Version (ICD_VER_READ) ..... done
ICDmini hardware version ..... 1.0
ICDmini software version ..... 1.1  ← The current firmware version
Debug base address (ID_DATA_READ)  .. xxxx
Boot address (ICD_DATA_READ) ..... xxxx
```

(5) Check the current firmware version, and enter the following commands if you need to update the firmware.

`(gdb) c17 firmupdate` *path*`\`*filename*`.saf`

path: Path of the new firmware
filename`.saf`: File name of the new firmware

After entering the commands, the following will be displayed.

```
Erase flash data ...done
Load flash data ....done
ICD firmware update ...done
Please quit gdb, and power off ICD when LED2/LED3/LED4 is green.
(LED is green in the case of SVT17701).
```

This procedure may take about 15 minutes.
While updating the firmware, DO NOT reset S5U1C17001H or turn off the power.
Otherwise S5U1C17001H may not start up.

(6) The firmware update has completed when the LEDs light as below.
LED1 ● (blue) or ● (green)
LED2 ● (green)
LED3 ● (green)
LED4 ● (green)

(7) Set SW7 to OPEN and press the RESET/START switch to restart the S5U1C17001H.
After completing the operation and the LEDs are as follows;
LED1 ● (blue) or ● (green)
LED2 ● (red)
LED3 ● (red)
LED4 ● (red)
or after pressing and releasing the RESET/START switch, if the LEDs are as follows;
LED1 ○ (white)
LED2 ○ (white)
LED3 ○ (white)
LED4 ● (out)
the firmware update may have failed for some reason.

If a malfunction occurs during a firmware update and the S5U1C17001H does not operate normally, please contact our sales office.

8 Precautions

8.1 Restrictions on Debugging

The debugging using the S5U1C17001H is subject to the restrictions specified below.

Operation of the internal peripheral circuits

The peripheral circuits of the target S1C processor stop operating when the debugger (gdb.exe) on the host computer is ready to accept commands, that is, unless the target program is running. For this reason, the peripheral circuits do not operate in real time when the target program is executed in the single-step mode. For details on single-step execution, refer to the "Debugger" section in the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)".

Interrupts when the target program is not running

If an interrupt request to the S1C Core is generated by the target system when the target program is not running, interrupt processing is paused. The interrupt that has been paused is serviced immediately before the target program is executed or immediately after one instruction is executed after the debugger (gdb.exe) on the host computer has directed that the target program be executed.

Interrupts when the target program is executed in a single step

If an interrupt request to the S1C Core is generated by the target system during single-step execution of the target program, including functions and subroutines (STEP), the interrupt request is paused. During single-step execution of the target program, not including functions and subroutines (NEXT), an interrupt request received within a function or subroutine is serviced without being paused and an interrupt received in other parts of the program is paused as with the STEP command. The interrupt that has been paused is serviced immediately before the target program is executed or immediately after one instruction is executed after the debugger (gdb.exe) on the host computer has directed that the target program be executed. For details on single-step execution (STEP and NEXT), refer to the "Debugger" section in the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)".

Execution counter

1. The measuring execution times up to 6515 hours.
2. A 3 µs or less of program execution time cannot be measured correctly.
3. As it includes the precision of the oscillator built into ICDmini and the processing of debug mode entry/exit, the measurement result contains the following error.
   measuring result = actual time (±50ppm) + debug mode entry/exit processing (around 40 cycles)

The counter is also used for clocking of the lapse of time break function, therefore, execution times cannot be measured when the lapse of time break function is used.

Reset sequence

The sequence from when the S5U1C17001H is powered on until the target program is executed is entirely different from that of the actual S1C processor.

However, a sequence for the reset request input from the target system while the target program is being executed is the same as that for the actual S1C processor.

Regarding the reset sequence in the actual S1C processor, refer to the technical manual of each model.

Break functions when a reset request is accepted

If a reset request (reset input or reset interrupt from the watchdog timer) is accepted while the S1C processor on the target system is executing the target program in normal mode, the hardware PC break and software PC break functions are disabled. It will be enabled again when the S1C processor enters debug mode.

I/O memory dump by the S5U1C17001H

Note that some S1C peripheral circuits may change the control register status due to their specifications when the I/O memory is read using the memory dump function of the S5U1C17001H or when the target program execution is suspended.

For details on the memory dump function, refer to the "Debugger" section in the "S5U1C17001C Manual (C Compiler Package for S1C17 Family)".

8.2 Differences from the Actual IC

The S5U1C17001H is different from the actual IC in the way specified below. If this difference is not taken into consideration in an application, the program may not operate normally in the actual IC.

Register initialization

The initial CPU register values may be different from those of the actual IC. Therefore, be sure not to create a program that depends on the initialized value.

The initial values when the S5U1C17001H is connected are as follows:

r0–r7: 0x000000
pc: 0x008000 (Note)
sp: 0xfffffc
psr: 0x00 (IL = 000, IE = 0, CVZN = 0000)

Note: The PC initial value is decided according to the TTBR register setting value (boot address). Refer to the technical manual of each model for the TTBR value.

8.3 Notes on Use of S5U1C17001H

Powering on/off

After turning off the power to the S5U1C17001H by disconnecting the USB cable, wait at least 10 seconds before turning the power on (connecting the USB cable) again. If the power is turned on immediately after it is turned off, the S5U1C17001H may not be initialized correctly in a power-on reset, and may cause a malfunction.

Connecting the target system

The signals connected to the S5U1C17001H are very high-speed signals, so the connector on the target system must be mounted within 5 cm from the target S1C processor. If there is more distance between the connector and the S1C processor, the S5U1C17001H may not work properly. Furthermore, be sure to use the supplied 4-pin cable for connecting the target system to the S5U1C17001H. Using another cable may cause a malfunction. If another cable must be necessarily used, do not extend the target interface cable and connect the cable directly to the S5U1C17001H so that the distance to the S1C processor on the target system will be shortest.

Operation of the S5U1C17001H system

The S5U1C17001H can work by connecting a target system in which the actual S1C processor is mounted. Since the S5U1C17001H package does not include any board equivalent to a target system, please prepare separately.

Wiring between the S1C processor and target connector

When wiring the S1C processor to the target connector for connecting the S5U1C17001H, insert a 33 Ω resistor in series between the S1C processor DSIO pin and the connector. This resistor must be placed as close to the S1C processor as possible. If the reset line is not connected, the system can be operated without this 33 Ω resistor. However, we recommend inserting this resistor to prevent malfunctions. The other pins are connected directly. The total length of the line must be under 5 cm. A low-level input to the DSIO pin issues a forced break to set the S1C processor into debug mode. Although this signal is pulled up through about 100 kΩ internally, when not debugging, we recommend either removing the 33 Ω resistor to reduce noise and other problems or pulling this line up to the VDD level.

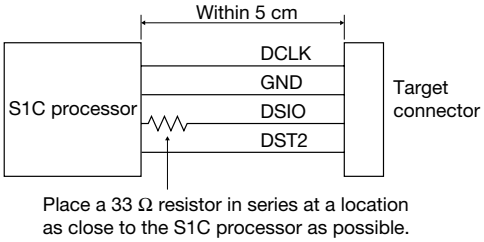


Figure 8.3.1 Wiring between S1C Processor and Target Connector

Reset request

Do not reset the target system while the target program execution is suspended as the S5U1C17001H will be unable to operate normally.

Notes on target system's interface

The allowable voltage range for the signals input from the target system is 0 to 5.0V for Ver 1.0 and 0 to 5.5V for Ver 1.1. The S5U1C17001H may fail if voltages that exceed this range are input. Therefore, target systems to be connected to the S5U1C17001H must be designed so that voltages outside this range are not applied. Take special care in designing the target system power supply, and design the target system so that overvoltages are not applied to the S5U1C17001H when the target system power supply is turned on or off.

9 Troubleshooting

The following shows the problems attributable to the hardware:

Table 9.1 Troubleshooting

Symptom	Cause/remedy
The LED3 (EMU) that lit when the S5U1C17001H was turned on does not go out.	(1) Is the target system turned on? →Turn the target system on. (2) Is the target system connected with the S5U1C17001H? → See Section 4.1, "Connecting the Target System," and check to see if the target system is connected correctly. (3) Was the start up sequence correct? → See Section 5.2, "Activation in ICD Mode," and start up in the correct order.
The following message appears when the debugger (gdb.exe) in the host computer is invoked: Cannot open ICD17 usb driver.	(1) Is the S5U1C17001H connected to the host computer correctly? → See Section 4.2, "Connecting to the Host Computer" and check to see if the S5U1C17001H is connected to the host computer correctly. (2) Was the debugger (gdb.exe) restarted after resetting the S5U1C17001H while the debugger is running? → See Section 5.2, "Activation in ICD Mode," and start up in the correct order.
The following message suddenly appears while the target program is being executed by the debugger (gdb.exe) in the host computer: Break by external break. Program received signal SIGINT, Interrupt.	This problem is caused by low-level noise on the DSIO signal of the target system or when the BRK IN pin goes GND level. (1) Is the target system connected with a cable other than the supplied, or is the supplied cable used with extension cables? → Use the supplied cable. If it cannot be used then use extension cables that are as short as possible and shield them in order to avoid occurrence of low-level noise on the DSIO signal. (2) Is there any conductive material near the BRK IN pin? → Remove the conductive material.
The operation is unstable.	(1) Is the DSIO output level (SW4, SW5) set correctly? → See Section 3.1, "Left Side Panel," and make sure that the setting is correct. (2) Is the target system connected with a cable other than the one supplied, or is the supplied cable used with extension cables? → Use the supplied cable. If it cannot be used then use extension cables that are as short as possible and shield them in order to avoid occurrence of low-level noise on the DSIO signal.

10 Specifications

Table 10.1 Specifications

Components	Items	Specifications	Remarks
S5U1C17001H	Dimensions	100 mm (W) × 85 mm (L) × 25 mm (H)	Rubber feet included
	Input voltage	DC 5 V	
	Power consumption	2.5 W max.	
USB cable	Length	1 m	
	Connector	S5U1C17001H side: Standard-B type Host PC side: Standard-A type	
Target system interface cable (4 pins)	Length	Approx. 15 cm	
Flash programming power supply cable (4 pins)	Length	Approx. 15 cm	

Table 10.2 Recommended Connectors on the Target System

Components	Items	Specifications	Remarks
Target system interface connector (4 pins)	Connector	4-pin (straight): A2-4PA-2.54DS(71) (HRS)	
Flash programming power supply connector (4 pins)	Connector	4-pin (L angle): S04B-PASK-2 (JST)	

Table 10.3 Operating Environment

Items	Specifications	Remarks
Operating temperature	5 to 35°C	
Storage temperature	-10 to 60°C	
Operating humidity	35 to 80%	
Storage humidity	20 to 90%	No condensation

Appendix

Initial Validation when Designing a Target Board

This section explains the procedure for checking that the S1C processor mounted on the target board is working properly.

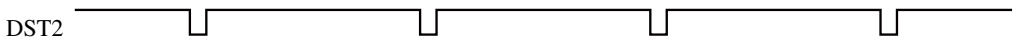
Step 1

Check that the most basic circuits such as the power supply, reset, and debugging pins are working normally.

(1) With the ICDmini switched on but not connected, input High → Low → High signals to the #RESET pin.
This resets the S1C processor.

(2) Input a Low signal to the DSIO pin (input pin).
This sets the S1C processor to debug mode.

(3) If DST2 pin (output pin) changes from Low to High, it indicates that the most basic functions of the S1C17 processor are working.
(If the S1C processor is set to the debug mode, the DST2 pin changes from Low to High.)
Strictly speaking, if a Low signal is input continuously, the output from DST2 is as follows.



If DST2 pin (output pin) does not change from Low to High, check the hardware of the target board.

Step 2

Try to establish a connection with the ICDmini.

(1) Set the DIP switches of the ICDmini.
The default is all open. Set the switches appropriately for the target board.
In this test, make the following settings at the minimum.
SW2 = OPEN
SW3 = OPEN
SW7 = OPEN
SW8 = OPEN

If the S1C17 processor is operating with IO voltage other than 3.3 V, it is necessary to change the settings of SW4 and SW5.

(2) Connect the ICDmini to a PC installed with the ICDmini USB driver, and connect the debugging pins (DCLK, DSIO, and DST2) and GND to the ICDmini with the target interface cable provided.

The target is functioning normally if the LEDs on the top of the case are as follows.
LED1 ● (blue)
LED2 ● (blue)
LED3 ● (out)
LED4 ● (green)
→ Normal.

LED1 ● (blue)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (green)
→ Input High → Low → High signals to the #RESET pin.
This resets the S1C processor.

LED1 ● (blue)
LED2 ● (blue)
LED3 ● (red)
LED4 ● (out)

→ Press the RESET/START switch on the ICDmini once and input High → Low → High signals to the #RESET pin.

Revision History

Code No.	Page	Contents
411153600	ALL	First edition
411153601	Cover	Change title MICROCONTROLLER (ICDmini Ver1.0 and Ver1.1) Update the information of NOTICE to the latest version. Change the contents of Developement tools. Hx: ICE Dx: Evaluation board Ex: ROM emulation board Mx: Emulation memory for external ROM Tx: A socket for mounting Cx: Compiler package Sx: Middleware package Yx: Writer software
	ii	Change name ICDmini
	1	Change name ICDmini Add description • as flash writer at main unit, • This manual is for the following 2 models. • S5U1C17001H1100 (ICDmini ver1.0) • S5U1C17001H1200 (ICDmini ver1.1) • * Through firmware update, support is also expected for the S1C33 family 32-bit processor.
	2	Deletion of item Data download rate Change description • Debugger (gdb) • (Ver1.0 : 1.0 to 5.0V,Ver1.1 : 1.0 to 5.5V) • The latest firmware will be released on the user's web site. • *2 For data download speed, the reference value per each S1C processor model is disclosed by user's site. • Windows 2000, Windows XP, or Windows Vista is recommended for the OS.
	3	Change description • S5U1C17001H main unit • S5U1C17001H User Manual (ICDmini Ver 1.0 - 1.1) • (11) Manual for the S1C17 family debugger (included in the C compiler manual of the S1C17 family C compiler package.) • (11) Manual for the S1C33 family debugger (included in the C compiler manual of the S1C33 family C compiler package.)
	4	Change the value 30mA
	5	Change description and the value • (Ver1.0:1.0 to 5.0V,Ver1.1 : 1.0 to 5.5V) • 30mA • In ICD mode, if a Low level signal is .... erasing/writing/verification).
	7	Adjust layout
	8	Change of description a hardware reset will be issued to the S5U1C17001H → a hardware reset will return to default state.
	9	Delete information
	10	Add description • The connection to #RESET of target reset signal is • This mode functions only in Flash Writer mode, Change description and the value • (Ver1.0:1.0 to 5.0V,Ver1.1:1.0 to 5.5V) • 30mA

Code No.	Page	Contents
	11	Add description * When used as the ICD for the S1C33 core, follow the instructions in the documentation provided with the firmware update.
	13	Add description • Downloading the program to Flash can also be performed in this mode. • SW7 = OPEN • * For firmware Ver 1.1 and later, ... It is also possible to connect through the step of …. Change description • ● (blue) or ● (green)
	14	Add description • When (gdb) target sim is executed, the software simulator starts up. Change description • ● (blue) or ● (green)
	15	Add description • As flash writer at main unit • This mode is not used when debugging ... production and so on. • refer to the readme file below. Change description • (3) Save the Flash erase/write program ... C17 fwld sample.saf 0 0 0x8000 • Debugger (gdb.exe) Deletion of item readme.txt Delete information
	16	Add description • (2)If you change the DIP switches with power .... ● (yellow) • The DIP switch settings are enabled by pressing the RESET/START switch. • Supplement:Instead of pressing .... signal to the BRK IN pin (pulled up to 3.3 V).
	17	Add description the USB driver must be installed.For installation of the USB driver, see Section 4.2, “Connecting to the Host Computer.” The same command can be executed by ..... the firmware update. Change description • (1) Connect only S5U1C17001H to the host computer using USB cable. • (2) Set the DIP switch SW7 of S5U1C17001H … LED4 ● (Green) • (4) Enter the commands shown below .... (5) Check the current firmware version, …. may not start up. • (5) → (6) Change of step number • (6) → (7) Change of step number ● (blue) or ● (green)
	18	Change description After completing the operation and the LEDs are as follows; .... the firmware update may have failed for some reason.
	19	Change of description 1. The measuring execution … debug mode entry/exit processing (around 40 cycles)
	20	Delete information
	21	Change of description • Notes on target system’s interface • 0 to 5.0V for Ver 1.0 and 0 to 5.5V for Ver 1.1
	24, 25	Add Appendix
411153602	6	Change of description * Recommend AC adapters ...

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