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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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User's Manual

M32100T5-SDI-E

User's Manual

SDI Emulator System for M32R Family

Renesas Electronics
www.renesas.com

Rev.1.00 2004.03

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\SUPPORT\Product-name\SUPPORT.TXT

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Preface

The M32100T5-SDI-E is an emulator system using the internal debug interface SDI (Scalable Debug Interface) of the M32R Family MCUs. Using with the emulator debugger M3T-PD32RM included in this product package, it is possible to develop programs for MCUs on which the SDI is mounted.

This user's manual mainly describes specifications of the M32100T5-SDI-E emulator system and how to setup it. For details on the emulator debugger, refer to M3T-PD32RM release notes and online help.

All the components of this product are shown in "2.2 Package Components" (page 15) of this user's manual. If there is any question or doubt about this product, contact your local distributor.

To use the product properly

Precautions for Safety

- In both this user's manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.
- The icons' graphic images and meanings are given in "Chapter 1. Precautions for Safety". Be sure to read this chapter before using the product.

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Chapter 1. Precautions for Safety

This chapter describes precautions for using this product safely and properly. For precautions of the emulator and emulator debugger, refer to each user's manual.

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Chapter 1. Precautions for Safety

In both the user's manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read this chapter before using this product.

1.1 Safety Symbols and Meanings

⚠ **WARNING**	If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death.
⚠ **CAUTION**	If the requirements shown in the "CAUTION" sentences are ignored, the equipment may malfunction.
IMPORTANT	It means important information on using this product.

In addition to the three above, the following are also used as appropriate.

△ means WARNING or CAUTION.

Example: ⚠ **CAUTION AGAINST AN ELECTRIC SHOCK**

⃠ means PROHIBITION.

Example: **DISASSEMBLY PROHIBITED**

● means A FORCIBLE ACTION.

Example: **UNPLUG THE POWER CABLE FROM THE RECEPTACLE.**

The following pages describe the symbols "WARNING", "CAUTION", and "IMPORTANT".

⚠ WARNING

Warnings for AC Power Supply:

- If the attached AC power cable does not fit the receptacle, do not alter the AC power cable and do not plug it forcibly. Failure to comply may cause electric shock and/or fire.
- When using outside Japan, use an AC power cable which complies with the safety standards of the country.
- Do not touch the plug of the AC power cable with wet hands. This may cause electric shock.
- If other equipment is connected to the same branch circuit, care should be taken not to overload the circuit. Refer to the nameplate of the AC adapter for electrical ratings.

- When installing this equipment, insure that a reliable ground connection is maintained.

- If you smell a strange odor, hear an unusual sound, or see smoke coming from this product, then disconnect power immediately by unplugging the AC power cable from the outlet. Do not use this as it is because of the danger of electric shock and/or fire. Please, contact your local distributor.

Warnings to Be Taken for This Product:

- Do not disassemble or modify this product. Personal injury due to electric shock may occur if this product is disassembled or modified.
- Make sure nothing falls into the cooling fan on the top panel, especially liquids, metal objects, or anything combustible.

Warning for Installation:

- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the emulator can cause an unrepairable damage.

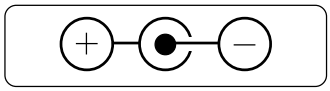
Warning for Use Environment:

- This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

⚠ CAUTION

Cautions for AC Adapter:

- Use only the AC adapter included in the product package.
- Before installing this equipment or connecting it to other equipment, disconnect the AC power cable from its outlet to prevent injury or accident.
- The DC plug on the included AC adapter has the below polarity.



Cautions for Powering Up Sequence:

- When turning on power, activate the emulator first and then the target system.
- When turning off power, deactivate the target system first and then the emulator.
- Always wait for about 10 seconds after turning off the power before turning it on again.

Caution for Installation:

- This product is designed to be used being laid down. Do not use this product being set up.

Cautions to Be Taken for Handling This Product:

- Use caution when handling the product. Be careful not to apply a mechanical shock.
- Do not touch the connector pins of the communications interface cable, emulator and target system. Static electricity may damage the internal circuits.
- Do not pull this product by the cable which is connected to the emulator. The cable may cause a break.
- Do not use inch-size screws for this equipment. The screws used in this equipment are all ISO (meter-size) type screws. When replacing screws, use same type screws as equipped before.

Caution for Abnormal Operation:

- If the emulator malfunctions because of interference like external noise, shut down the emulator once and then reactivate it.

IMPORTANT

Notes on Product Information:

- For the information about this product, visit the Renesas Tools Homepage.
  http://www.renesas.com/eng/products/mpumcu/toolhp/mcu/m32r_e.htm
- For the user registration for this product, use the registration form created when installing the emulator debugger. To registered users, the latest information about this product is delivered by e-mail.
- This product contains the CD-ROM of the emulator debugger, but it is also possible to download the latest version of the emulator debugger from the Renesas Tools Homepage.
  http://www.renesas.com/eng/products/mpumcu/toolhp/mcu/m32r_e.htm

Notes on Downloading Firmware:

- When using this product for the first time or the emulator debugger has been upgraded, the emulator debugger automatically downloads the firmware (control software for the emulator built into it) to the emulator. When downloading firmware is terminated normally, the firmware will not be downloaded later.
- Do not shut down the emulator while downloading the firmware. If this happens, the product will not start up properly.
- When downloading the firmware has not completed successfully and the emulator debugger does not start up, see "4.2 Downloading Firmware" (page 33) and redownload the firmware.

Notes on USB Interface:

- USB interface can not be used with a host machine running Windows 95 or Windows NT 4.0.
- With the USB interface of the M32100T5-SDI-E, not all hardware (such as host machine, USB devices, USB hub) combination will work and guaranteed.

IMPORTANT

Notes on Dependencies on the MCU Model:

- As the following items dependent on the MCU model are described in the release notes, be sure to read them.

  (1) Differences between the emulator and actual MCU
  (2) MCU signals connected to the SDI MCU control interface connector (Section 3.3)
  (3) MCU signals connected to the SDI trace interface connector (Section 3.3)
  (4) Debug specifications dependent on MCU model (Section 5.1)
  (5) Other cautions and restrictions dependent on MCU model

- Download the latest release notes and MCU file from the Renesas Tools Homepage.
  http://www.renesas.com/eng/products/mpumcu/toolhp/mcu/m32r_e.htm

Note on Stack Capacity and Stack Pointer:

- Set an address which has the device to read/write to the SPI (Stack Pointer for Interrupt) and SPU (Stack Pointer for User) during target program execution.

Notes on Target Program Execution in Real-time:

- The DMA controller for the emulator incorporated in the MCU is used for the memory references/ settings during target program execution. Therefore, for the memory references/settings during target program execution, the bus-cycle by the DMA controller occurs.

- Restrictions on trace output mode

  The real-time tracing is possible when the SDI trace interface cable or the connector for in-circuit connection (option) is connected. As such, trace output mode from the target MCU can be switched by the script command (MTRM), trace point window, and time measurement window of the emulator debugger. MCU operation in each mode is as follows.

  (1) Trace: MCU trace data is given priority.
  The MCU outputs all trace data (jump instruction, branch instruction execution, EIT generation, or data access) generated during target program execution.
  When trace information output is generated, real-time target program execution is lost.
  This mode is practical for gaining full use of real-time trace and break function even without real-time target program execution.

  (2) Execute: MCU execution is given priority.
  When trace information output is generated continuously during target program execution, the MCU can lose trace data on this processing. This loss can cause skipping in real-time trace recording and other problems such as incomplete events. (Even in this case, MCU internal events operate normally.)
  Even when trace information output is generated, the target program is executed in real-time.
  This mode is useful when real-time target program execution is important.

IMPORTANT

Note on Specifying Breakpoints:

- Due to the MCU's architecture, the following addresses cannot be set as a breakpoint.

  (1) Addresses (4n + 2) in the middle of a 1-word instruction
  (2) Addresses (4n + 2) in an instruction located in word align + 2 addresses, which are executed in parallel

Notes on Reset Control Switch:

- It is always recommended to set this switch to LOW.
- When the reset control switch on the emulator is set to Hiz START, the following operation allows you to execute the program from the reset vector during time from (2) to (3).

  (1) Turn on the emulator.
  (2) Turn on the target system.
  (3) Start the emulator debugger M3T-PD32RM.

  This phenomenon occurs immediately after the emulator starts up only.

Note on Using Reset Mask:

- If the reset signal from the target board is masked (disabled) using the script command (ResetMask) of the emulator debugger, the reset signal that is input to the target MCU during target program execution will be ignored and the target MCU will not be reset.

  By resetting only peripheral circuits, problems will occur such as target MCU bus cycles not completing, and the target MCU may runaway.

Note on LED Display:

- Take note of the fact that the target status LEDs cannot show MCU status properly after the emulator is powered on until the emulator debugger gets started.

Note on Access Prohibited Areas:

- The emulator uses the addresses H'FFFF 8000 to H'FFFF 9FFF of the target MCU as the dedicated area for the emulator. When accessing to this area from the target program, the operation of the emulator cannot be guaranteed. Therefore, do not access to this area from the target program.

IMPORTANT

Notes on Target System:

- The power to the MCU can be turned off and back on again during target program execution. However, because the emulator makes various settings on the MCU after it is powered back on again, it takes a little longer time than when not using the emulator before the MCU can start running the program after being powered up again.
- In systems where the power is frequently turned off and back on again, the program may not operate normally.
- If the power to the MCU is turned off while the program remains idle, an error results.
- The software breaks that had been set before the power was turned off have no effect when the power is back on again, so that no software break occurs.

Chapter 2. Preparation

This chapter describes the package components, the system configuration and the preparation for using this product for the first time.

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Chapter 2. Preparation

2.1 Terminology

Some specific words used in this user's manual are defined as follows:

Emulator system

This means an emulator system built around the M32100T5-SDI-E emulator. The M32100T5-SDI-E emulator system is configured with an emulator, host machine, emulator debugger and target board.

Emulator (M32100T5-SDI-E)

This means an emulator for the M32R Family MCUs on which the debug interface SDI (Scalable Debug Interface) is mounted. This emulator consists of the M32100T5-SDI-E and M32RT2-CNV board. To connect the target board or converter board for in-circuit connection with the SDI interface cable, use the M32RT2-CNV board.

Host machine

This means a personal computer used to control the emulator.

Emulator debugger

This means the software tool M3T-PD32RM to control the emulator from the host machine through an interface. The M3T-PD32RM is included with this product.

Firmware

Program that analyzes contents of communication with the emulator debugger and controls the emulator hardware. This program is downloadable from the emulator debugger M3T-PD32RM when occasion demands.

Target MCU

This means the microcomputer you are going to debug.

Target system

This means a user's application system using the microcomputer to be debugged.

Target board

This means a board using the microcomputer to be debugged.

Target program

This means a program using the microcomputer to be debugged.

JTAG connection

A connection of the emulator via the MCU installed in the target board and the SDI interface connector. In this case, the MCU on the target board executes the target program.

In-circuit connection

A connection of the emulator to an MCU pattern on the target board using the converter for in-circuit connection (option). Depending on the MCU model, the optional converter for in-circuit connection (e.g. M32170T-PTC) is prepared in order to supplement insufficient debugging signals of the MCU.

2.2 Package Components

The M32100T5-SDI-E package consists of the following items. When unpacking, check to see if it contains all of these items.

Item	Quantity
M32100T5-SDI-E emulator	1
M32RT2-CNV board for connecting the SDI interface cable	1
USB interface cable (1.8 m)	1
SDI MCU control interface cable (10-pin 1.27-mm-pitch flat cable)	1
SDI trace interface cable (20-pin 1.27-mm-pitch flat cable)	1
AC adapter	1
AC power cable for use in Japan (3 m)	1
M3T-PD32RM CD-ROM	1
M32100T5-SDI-E user's manual (this manual)	1
M32100T5-SDI-E user's manual (Japanese)	1
Release notes (English)	1
Release notes (Japanese)	1
Hardware tool user registration FAX sheet	1

* When using the M32100T5-SDI-E outside Japan, use the AC power cable which complies with the safety standards of the country.
* The latest version of the emulator debugger M3T-PD32RM is downloadable from the Renesas Tools Homepage (http://www.renesas.com/eng/products/mpumcu/toolhp/mcu/m32r_e.htm).
* Please keep the M32100T5-SDI-E's packing box and cushion material in your place for reuse at a later time when sending your product for repair or other purposes. Always use these packing box and cushion material when transporting the M32100T5-SDI-E.
* If any of these items are missing or found faulty, please contact your local distributor.
* If there is any question or doubt about the packaged product, contact your local distributor.

2.3 System Configuration of the M32100T5-SDI-E

Because the M32100T5-SDI-E uses a debug interface SDI (Scalable Debug Interface) built in the MCU, JTAG connection is available, which can directly control the MCU installed in the target board.

Depending on the MCU model, the optional converter for in-circuit connection is provided in order to supplement insufficient debugging signals of the MCU. When using the optional converter for in-circuit connection, connect the converter for in-circuit connection to the MCU pattern on the target board using the in-circuit connection method.

(1) JTAG Connection

The system configuration when using the M32100T5-SDI-E by JTAG connection is shown below.

(1) Host machine (Personal computer)
(2) Emulator (M32100T5-SDI-E)
(3) Emulator debugger (M3T-PD32RM)
(4) SDI trace interface cable
(5) SDI MCU control interface cable
(6) USB interface cable
(7) AC adapter

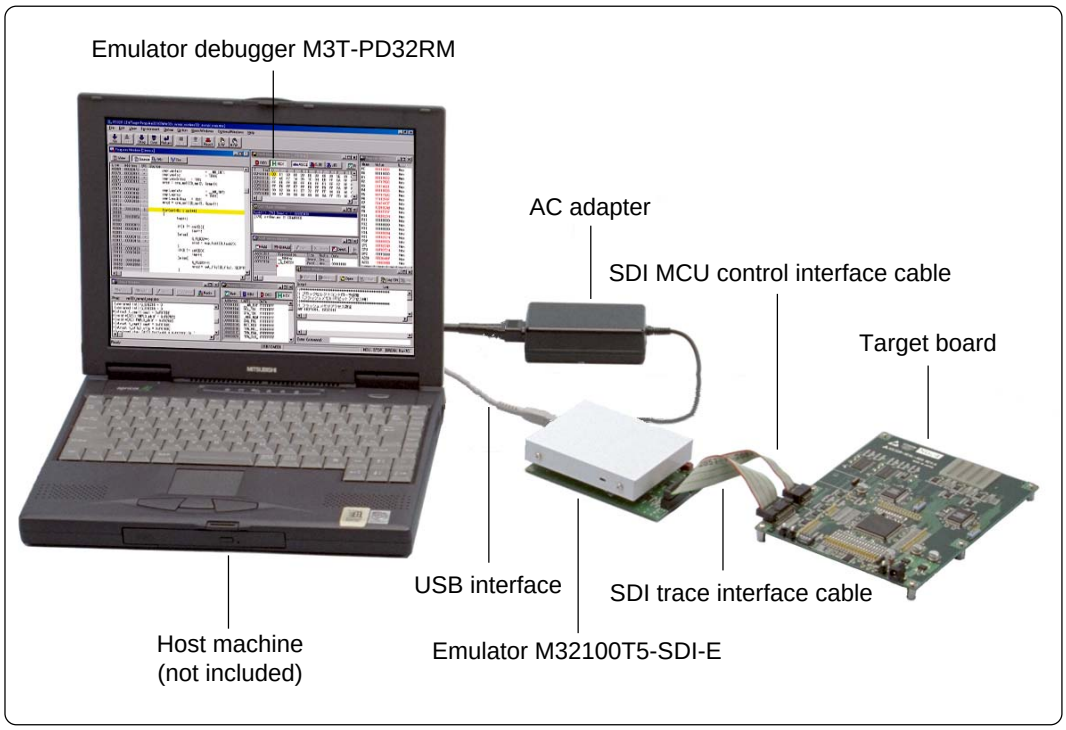


Figure 2.1 System configuration (JTAG connection)

Use the provided SDI interface cables to connect an SDI connector you prepare on the target board.

Connect the SDI MCU control interface cable and SDI trace interface cable to the M32RT2-CNV board attached to the emulator.

Because the emulator is connected to the target board using the SDI MCU control interface connector (10-pin) and SDI trace interface connector (20-pin), the flexibility of designing around the MCU on the target board increases. It can be used for debugging and evaluation on a test machine.

MCU models which do not provide the SDI trace pins do not require an SDI trace interface. In this case, you cannot use real-time trace, time measurement or break function based on the trace output.

Directly installed on the target board, the target MCU will not cause problems on electrical equivalent and poor connection.

(2) In-circuit Connection

The system configuration when using the M32100T5-SDI-E by in-circuit connection is shown below.

(1) Host machine (Personal computer)
(2) Emulator (M32100T5-SDI-E)
(3) Emulator debugger (M3T-PD32RM)
(4) Converter for in-circuit connection
(5) SDI trace interface cable
(6) SDI MCU control interface cable
(7) Interface cable
(8) AC adapter

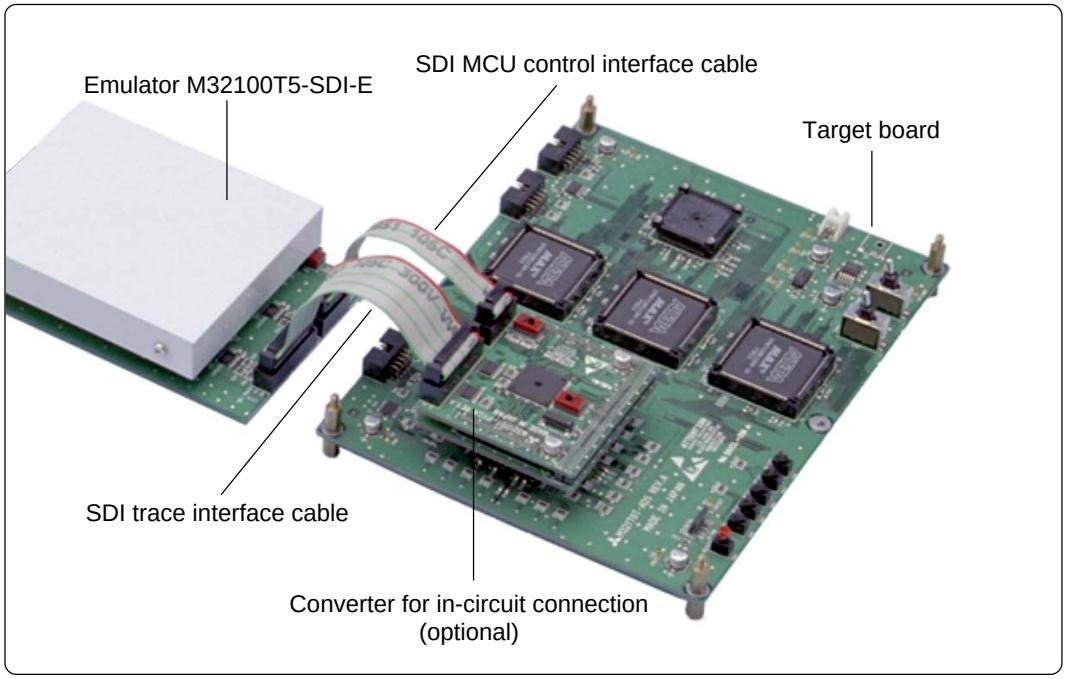


Figure 2.2 Magnified view of the in-circuit connection

Connect the emulator to the MCU pattern on the target board via a connector provided for the converter for in-circuit connection. For details on this connection method, see the instruction manual of the converter for in-circuit connection.

Connect the SDI MCU control interface cable and SDI trace interface cable to the M32RT2-CNV board attached to the emulator.

You should reserve space on the target board to connect the converter.

On the target board, load capacity of all the signal lines of the MCU becomes greater than that of the actual signal lines on the MCU.

2.4 Name of Each Part

Here explains the name and function of each part.

(1) Names and Functions of Parts on the Upper Panel

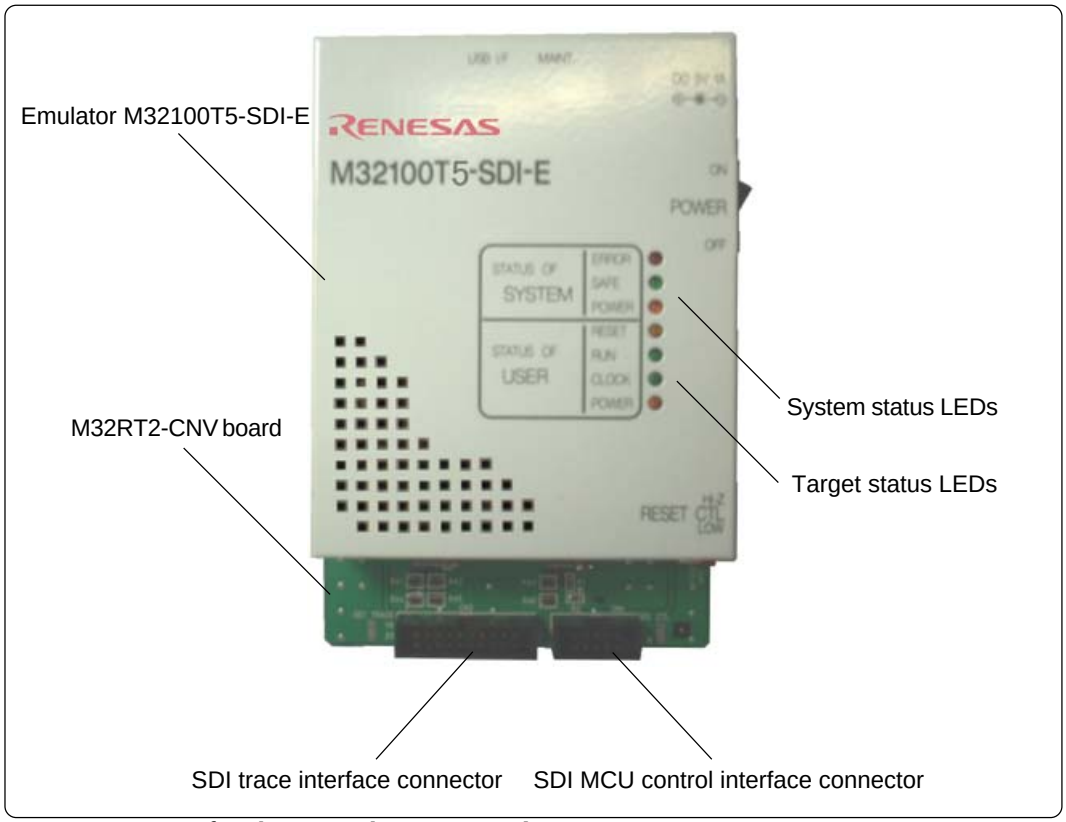


Figure 2.3 Name of each part on the upper panel

1. System status LEDs

The system status LEDs indicate the M32100T5-SDI-E emulator's power supply, firmware operating status, etc. Table 2.1 lists the definitions of the system status LEDs.

Table 2.1 Definitions of the system status LEDs

Name	ON/OFF	Meaning
POWER	OFF	Emulator system is turned off.
	ON	Emulator system is turned on.
SAFE	OFF	Emulator system is not operating normally.
	Blinking	1. Emulator hardware is being configured. This occurs after the emulator is powered on until the emulator debugger gets started. 2. Emulator is in special mode (maintenance mode) for downloading firmware. Only firmware download is executed.
	ON	Emulator system is operating normally.
ERROR	OFF	Emulator is operating normally.
	Blinking	Firmware is being downloaded.
	ON	1. Emulator is not operating normally. 2. Emulator is in special mode (maintenance mode) for downloading firmware. Only firmware download is executed.

2. Target status LEDs

The target status LEDs indicate the status of the target MCU's operation and the target board's power supply, etc. Table 2.2 lists the definitions of the target status LEDs.

Table 2.2 Definitions of the target status LEDs

Name	ON/OFF	Meaning
POWER	OFF	Power is not supplied to the target board.
	ON	Power is supplied to the target board.
CLOCK *1	OFF	Target MCU clock is not oscillating.
	ON	Target MCU clock is oscillating.
RUN	OFF	Target program has been halted.
	ON	Target program is being executed.
RESET	OFF	Target MCU is not being reset from an external pin.
	ON	Target MCU is being reset from an external pin. When connected by JTAG, it is not turned on by inserting a buffer into the RST signal of the SDI MCU control signal on the target board.

*1 The CLOCK LED is turned on only when the SDI trace interface connector is connected.

3. SDI trace interface connector

On the SDI trance interface connector, trace signals used to connect the emulator using the JTAG connection method are assigned. To connect the emulator to the target board, use the provided SDI trace interface cable.
For details, refer to "3.3 Connecting the Target System" (page 26).

4. SDI MCU control interface connector

The target MCU control signals used for the emulator with JTAG connection are assigned on the SDI MCU control interface connector. For connecting with the target board, use the included SDI MCU control interface cable.
For details, refer to "3.3 Connecting the Target System" (page 26).

(2) Names and Functions of Parts on the Side Panel

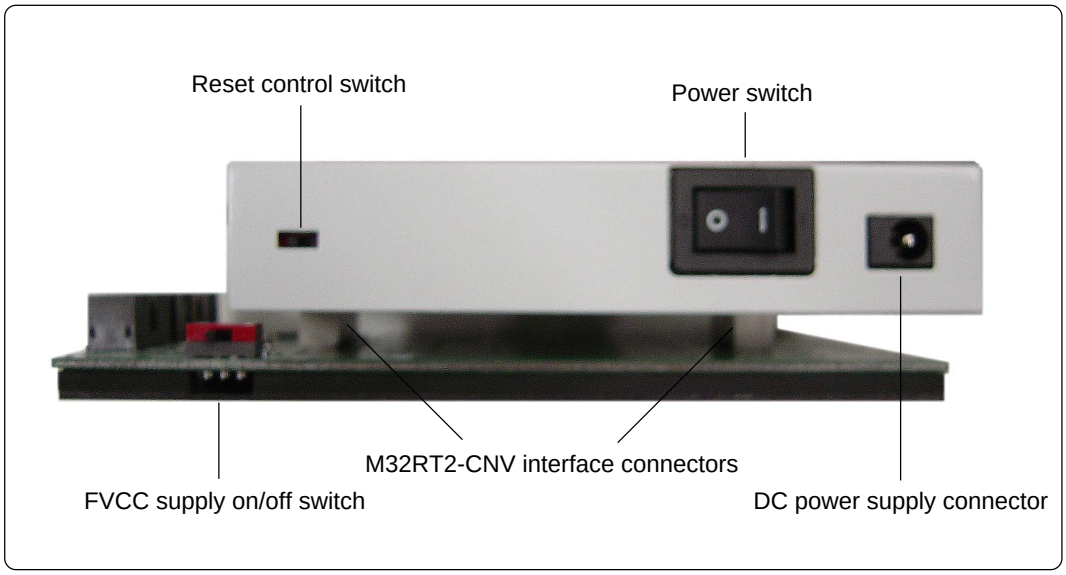


Figure 2.4 Name of each part on the side panel

1. Reset control switch

   The reset control switch selects the status of the /RESET signal to the target MCU after the emulator power is turned on until the emulator debugger gets started. Table 2.3 shows the switch functions.

   It is always recommended to set this switch to LOW.

Table 2.3 Functions of the reset control switch

Setting	/RESET signal to the target MCU
Hi-z	High impedance (MCU on the target board enabled.)
LOW	Fixed to low level (MCU on the target board reset.)

2. FVCC supply on/off switch

   This switch is on the M32RT2-CNV board which is attached to the emulator. Usually set the switch off during operation.

3. DC power connector

   Connects the DC output connector of the AC adapter with the plug of the included AC adapter.

4. Power switch

   DC power switch of the M32100T5-SDI-E.
   According to the connection status with the host machine and connection status with the target board, the emulator may not start up normally when powering on immediately after shutting off the power. Wait about 10 seconds after turning off the power before turning on it again.

5. M32RT2-CNV interface connector

   Connects the M32100T5-SDI-E and M32RT2-CNV.

(3) Names and Functions of Parts on the Rear Panel

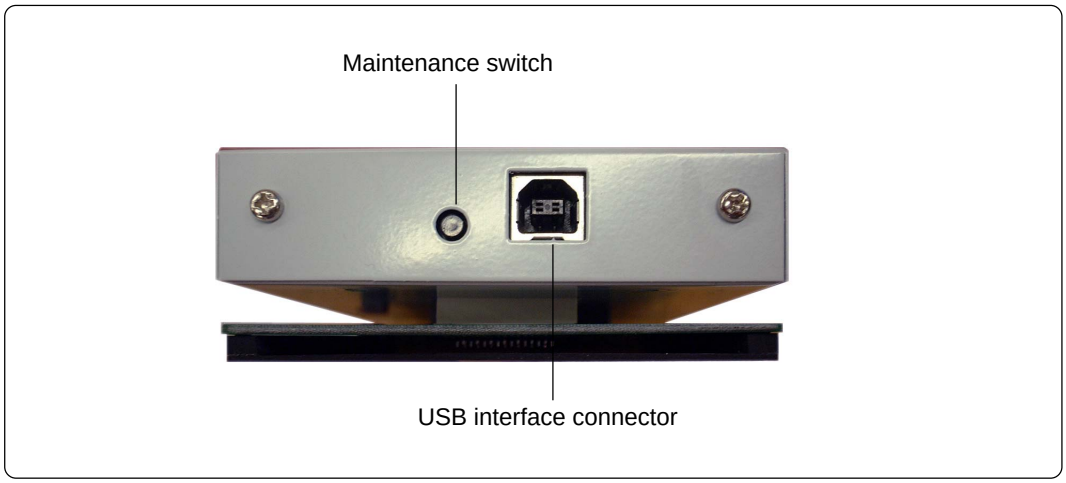


Figure 2.5 Name of each part on the rear panel

1. Maintenance switch

   If this switch is pressed within 2 seconds after turning on the power, the emulator switches to maintenance mode for downloading firmware. In maintenance mode you can only download firmware. Emulator status in the mode can be checked by the system status LEDs.

   Take note of the fact that the emulator has no reset switch.

2. USB interface connector

   Connects the included USB interface cable.

MEMO

Chapter 3. Setup

This chapter describes switch settings required for using this product and how to connect this product to the host machine and the target system.

3.1 Connecting the AC Adapter 24
3.2 Connecting the Host Machine 25
3.3 Connecting the Target System 26
(1) Connecting the SDI Interface Connector 26
(2) SDI MCU Control Interface Connector 26
(3) SDI Trace Interface Connector 28
(4) Emulator Side Circuit Diagram 29

Chapter 3. Setup

Figure 3.1 shows how to setup the M32100T5-SDI-E.

Install the emulator debugger before setting up the M32100T5-SDI-E. For installing the emulator debugger, refer to the M3T-PD32RM release notes.

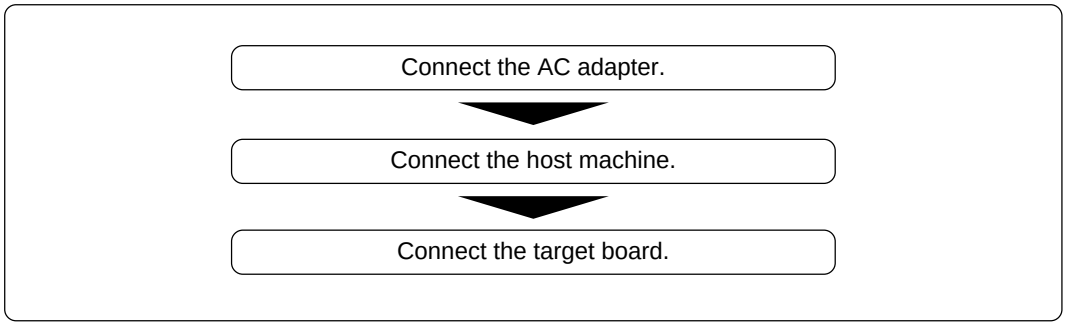


Figure 3.1 Setup procedure

3.1 Connecting the AC Adapter

Shut off the power of the M32100T5-SDI-E before setting up. Figure 3.2 shows how to connect the AC adapter.

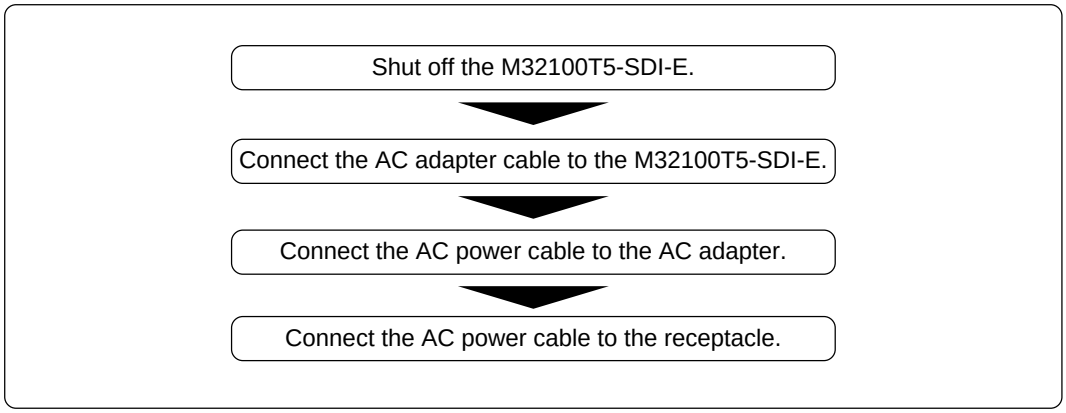


Figure 3.2 Connecting AC adapter

3.2 Connecting the Host Machine

The emulator is connected to the host machine via the USB interface. Figure 3.3 shows how to connect the USB interface.

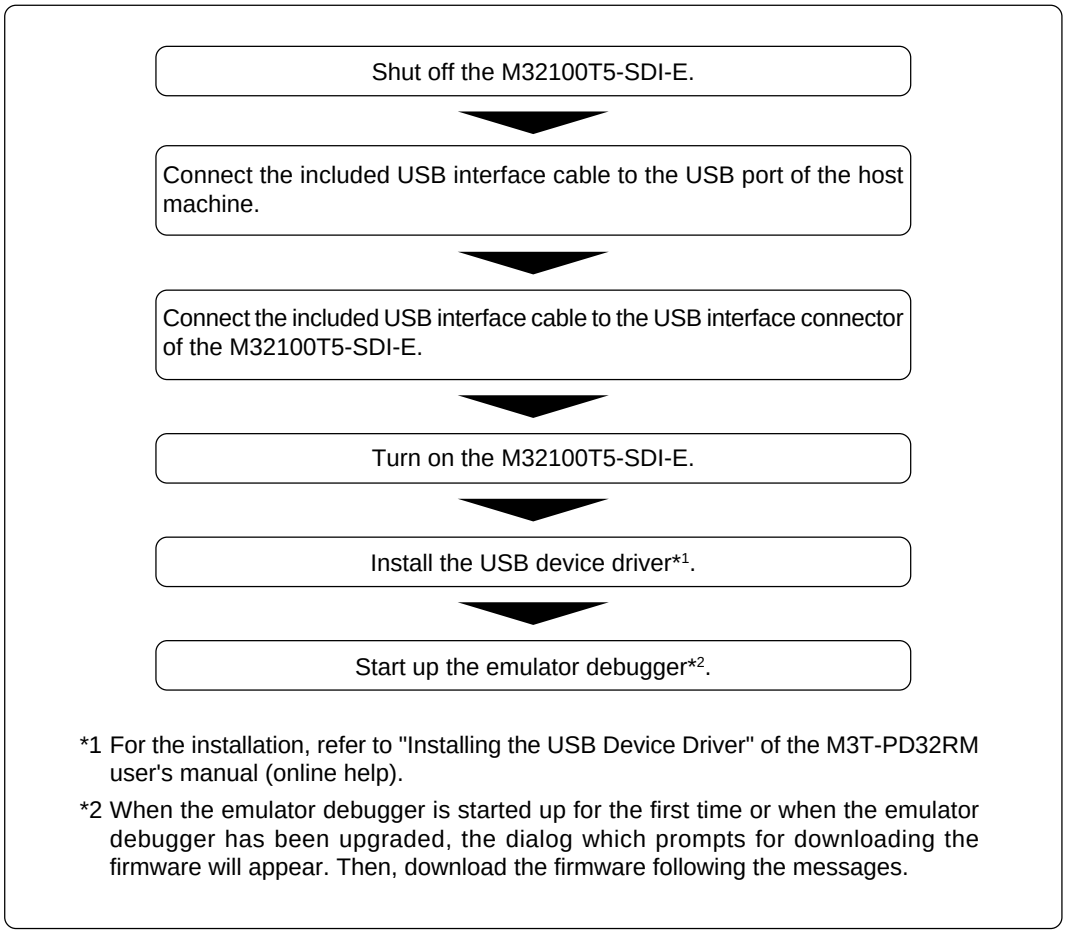


Figure 3.3 USB interface connection procedure

3.3 Connecting the Target System

The M32100T5-SDI-E has two ways available to connect to the target board; in-circuit connection and JTAG connection. How to connect the M32100T5-SDI-E to the target board with JTAG is shown below. For in-circuit connection, refer to the instruction manual of the converter for in-circuit connection.
To connect the emulator to the target board using the JTAG connection method, you should have the SDI MCU control interface connector and SDI trace interface connector on the target board. Connect the M32100T5-SDI-E connector to the SDI interface connector on the target board using the provided cable.

(1) Connecting the SDI Interface Connector

Figure 3.4 shows how to connect the SDI MCU control interface connector and the SDI trace interface connector on the target board to the emulator, and the pin numbers of the SDI MCU control interface connector and the SDI trace interface connector.

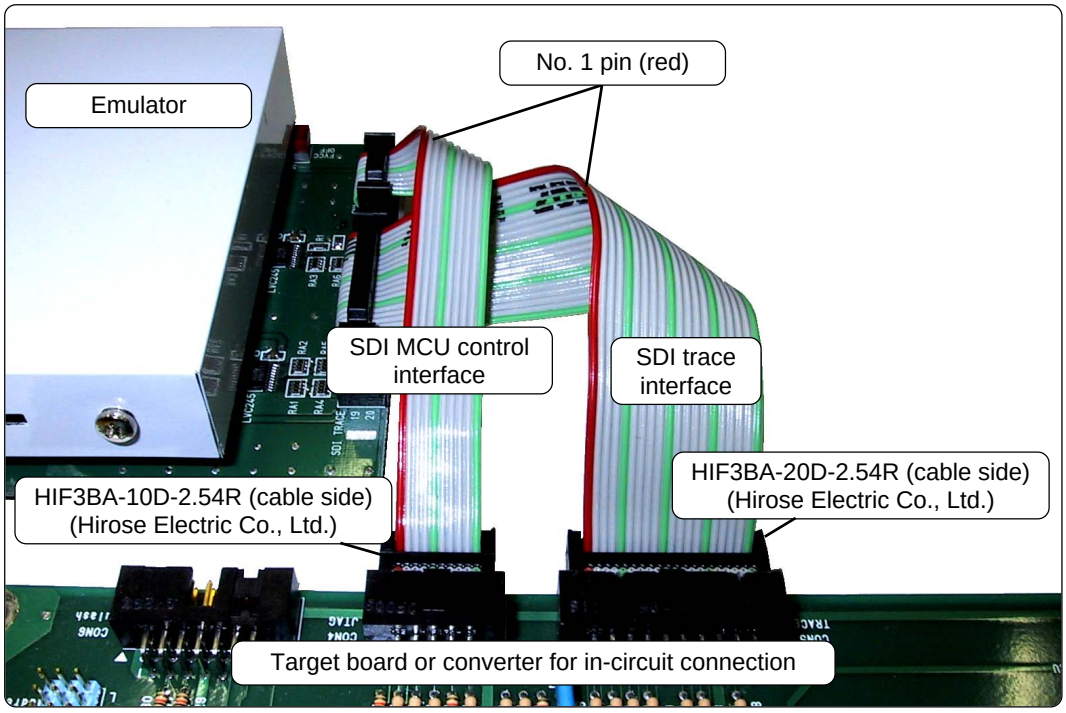


Figure 3.4 Connecting the SDI interface cables

(2) SDI MCU Control Interface Connector

Table 3.1 lists the pin assignments of the SDI MCU control interface connector. Figure 3.5 shows a sample circuit of the SDI MCU control interface. The MCU signals' names of the connection target are those of the M32170.

Table 3.1 SDI MCU control interface signal assignments

Pin No.	Pin	Direction	Connection target	Remarks
1	TCLK	Emulator to target	JTCK of MCU	Clock frequency: 10 MHz/5 MHz
2	Vss	-	GND (0 V)	
3	TDI	Emulator to target	JTDI of MCU	
4	TDO	Target to emulator	JTDO of MCU	
5	TMS	Emulator to target	JTMS of MCU	
6	TRST	Emulator to target	JTRST of MCU	Totem-pole output on emulator side
7	DBI	Emulator to target	JDBI of MCU	
8	N.C.	-	No connection	
9	Vcc	Target to emulator	VCCE of MCU	
10	RST	Emulator to target	System reset	Open collector output on emulator side

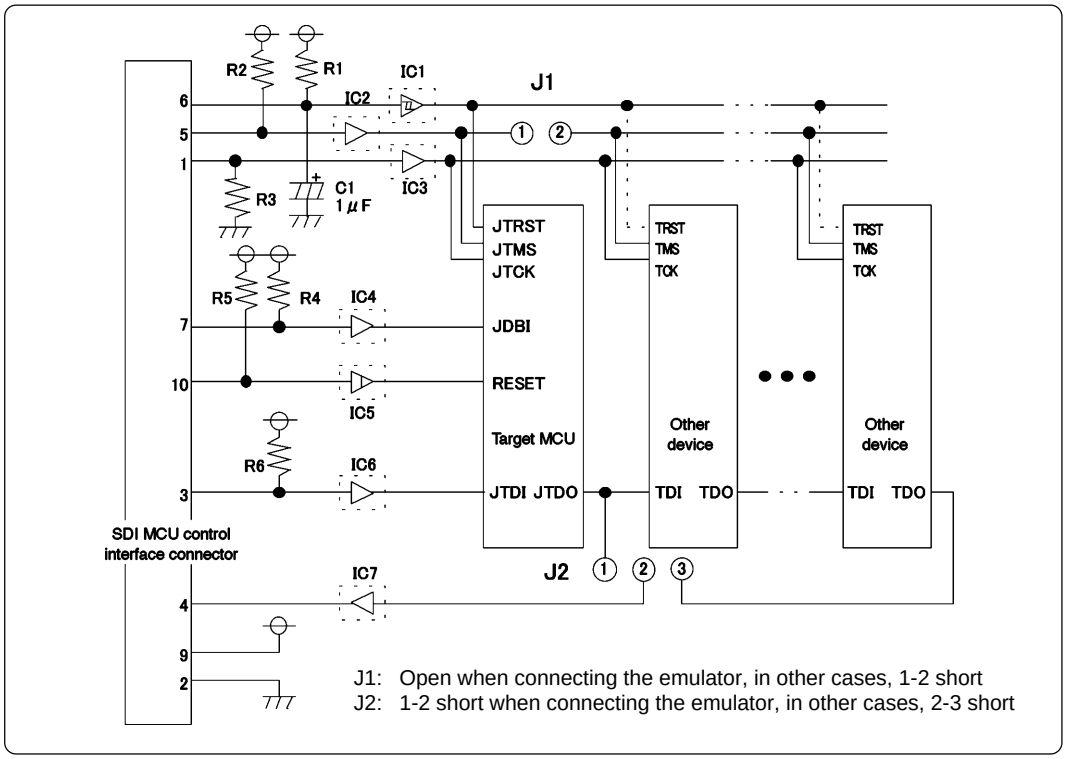


Figure 3.5 Sample circuit of the SDI MCU control interface

The following must be observed in designing a target system when you connect the SDI MCU control interface connector to the target system.

(1) Connect the target MCU so that it is the first device seen from the SDI MCU control interface connector (JTAG connector).
(2) Keep the TMS separate so that operation from the emulator does not adversely effect other devices.
(3) The TDO of the M32R Family MCU should be directly connected to the TDI (pin 4) of the SDI MCU control interface connector.
(4) Do not use TRST as RST (MCU reset request).
When using the emulator, the emulator controls TRST and RST separately. Therefore, if the two are tied together, the emulator will not function properly.
(5) Use a CR circuit or an open collector output device to generate the TRST and RST signals on the target system without obstructing operation from the emulator. Do not connect devices with totem-pole output.

Table 3.2 Parts of the SDI MCU control interface

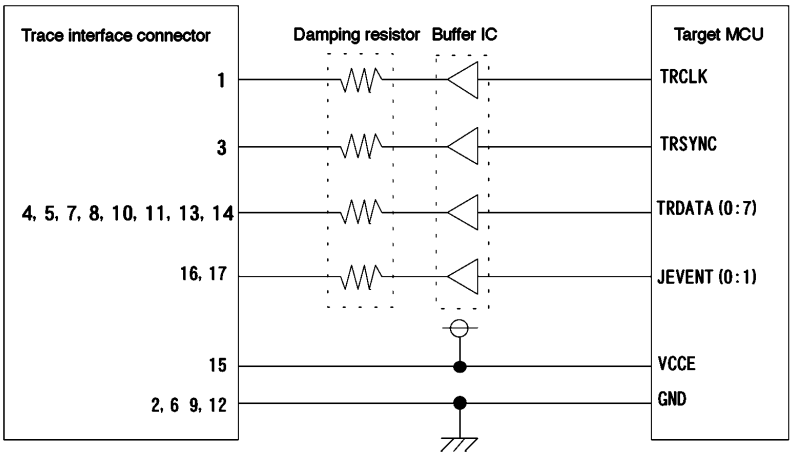
Part No.	Specification	Remarks
R1, R2, R6	Resistor of 10 kΩ	Pull-up with VCCE power supply Pull-up is absolutely necessary for signal lines where a buffer IC is inserted. It is not necessary for signal lines where a buffer IC is not inserted.
R4, R5	Resistor of 10 kΩ	Pull-up with VCCE power supply Pull-up is necessary whether a buffer IC is inserted or not.
IC1 to IC7	Buffer IC	It is logically unnecessary, but it is recommended to mount one to stabilize operation.
R3	Resistor of 10 kΩ	Pull-down at GND Pull-down is absolutely necessary when a buffer IC (IC3) is inserted. It is not necessary when a buffer IC is not inserted.
C1	1 μF capacitor	Resets the MCU's JTAG circuit when turned on.
J1	Jumper pin	1-2 connected: except when the emulator is connected
J2	Jumper pin	1-2 connected: when the emulator is connected 2-3 connected: when the emulator is not connected

(3) SDI Trace Interface Connector

Table 3.3 lists the pin assignments of the SDI trace interface connector. Figure 3.6 shows a sample circuit of the SDI trace interface. The MCU signals' names of the connection target are those of the M32170.

Table 3.3 SDI trace interface signal assignments

Pin No.	Pin	Direction	Connection target	Remarks
1	TRCLK	Target to emulator	TRCLK of MCU	
2	Vss		GND (0 V)	
3	TRSYNC	Target to emulator	TRSYNC of MCU	
4	TRDATA (0)	Target to emulator	TRDATA0 of MCU	
5	TRDATA (1)	Target to emulator	TRDATA1 of MCU	
6	Vss		GND (0 V)	
7	TRDATA (2)	Target to emulator	TRDATA2 of MCU	
8	TRDATA (3)	Target to emulator	TRDATA3 of MCU	
9	Vss		GND (0 V)	
10	TRDATA (4)	Target to emulator	TRDATA4 of MCU	
11	TRDATA (5)	Target to emulator	TRDATA5 of MCU	
12	Vss		GND (0 V)	
13	TRDATA (6)	Target to emulator	TRDATA6 of MCU	
14	TRDATA (7)	Target to emulator	TRDATA7 of MCU	
15	Vcc	Target to emulator	VCCE of MCU	
16	EVENT0	Target to emulator	JEVENT0 of MCU	
17	EVENT1	Target to emulator	JEVENT1 of MCU	
18	NC		Not used	
19	NC		Not used	
20	NC		Not used	



You can connect the signal lines of the SDI trace interface from the target MCU to the connector directly. However, to ensure safe operation of the emulator, insertion of a buffer IC and damping resistor to each signal line is recommended.
The recommended buffer IC and damping resistor value are listed below:

- Buffer IC: TC74LCX245 made by Toshiba Corporation
- Damping resistor: 33 to 47 ohm

Figure 3.6 Sample circuit of the SDI trace interface

(4) Emulator Side Circuit Diagram

Figure 3.7 shows the circuit diagram in the emulator of the SDI trace interface part, and Table 3.4 lists the explanation of the circuit diagram.

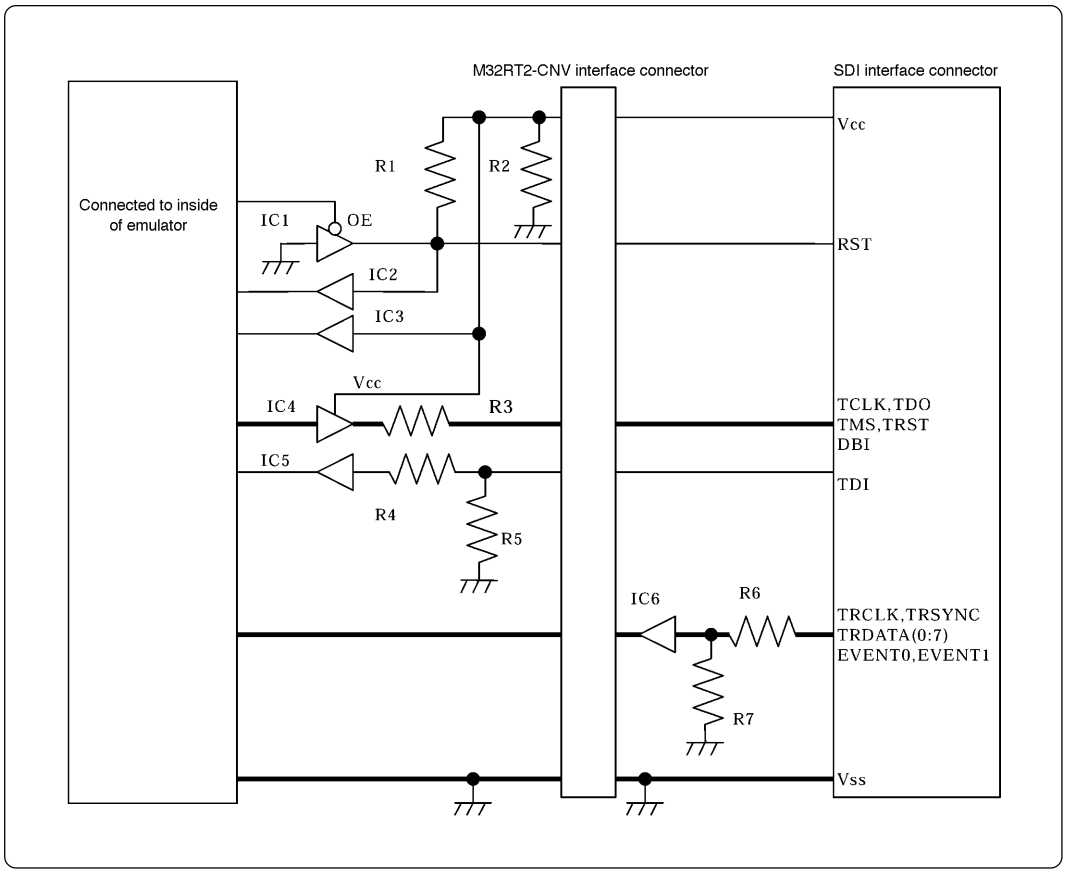


Figure 3.7 Circuit diagram of the emulator side of the SDI interface

Table 3.4 Parts in the emulator

Part No.	Specification	Remarks
IC1, IC2, IC3	Buffer IC: TC7SZ125 (made by Toshiba Corporation)	
IC4	Buffer IC: LCX245 (made by Toshiba Corporation)	Power supplied from the target board
IC5, IC6	Buffer IC: LVC245 (made by TI)	
R1, R2, R5, R7	Resistor: 100 kΩ	
R3, R4, R6	Resistor: 33 Ω	

MEMO

Chapter 4. Usage

This chapter describes from turning on the power of this product to starting up the emulator debugger.

4.1 Turning on the Power Supply 32
(1) Checking the Connections of the System 32
(2) Turning On/Off the Power Supply 32
4.2 Downloading Firmware 33
(1) When It is Necessary to Download Firmware 33
(2) Downloading Firmware in Maintenance Mode 33

Chapter 4. Usage

4.1 Turning on the Power Supply

(1) Checking the Connections of the System

Before turning on the power, check the connections of the host machine, communications interface cable, emulator and target system.

(2) Turning On/Off the Power Supply

- When turning on, activate the M32100T5-SDI-E first and then the target system.
- When turning off, deactivate the target system first and then the M32100T5-SDI-E.
- Always wait for about 10 seconds after turning off the power before turning it on again.

IMPORTANT

Notes on Power Supply:

- The emulator's pin V_{CC} is connected to the target system in order to monitor target system voltage. For this reason, the emulator cannot supply power to the target system. Therefore, provide the target system with a separate power supply.
- Do not change the power supply voltage after the target system has been activated.

4.2 Downloading Firmware

(1) When It is Necessary to Download Firmware

It is necessary to download the firmware in the occasions listed below. Generally, these are detected when the emulator debugger starts up, then downloading the firmware is started.

(1) When you use this product for the first time
(2) When the firmware has been upgraded
(3) When the emulator debugger has been upgraded

Redownload the firmware when the power supply is shut off or when the communication interface cable is pulled out accidentally while downloading the firmware from the emulator debugger, following the procedure below.

(2) Downloading Firmware in Maintenance Mode

Download the firmware in maintenance mode as explained here following.

(1) Within 2 seconds of activating power to the emulator, press the maintenance switch on the emulator front panel. This will switch the emulator to maintenance mode.
When switching to maintenance mode, the "SAFE" system status LED blinks.

(2) Start up the emulator debugger. When the Init dialog box setup is complete, the dialog which prompts for downloading the firmware will appear. Download the firmware following the messages. It takes about 5 seconds for downloading the firmware.

IMPORTANT

Note on Downloading Firmware:

- Do not shut off power while the firmware is being downloaded. Doing so, the emulator will not start up properly. If power is shut off by mistake, redownload the firmware in maintenance mode.

MEMO

Chapter 5. Specifications

This chapter describes specifications of this product.

5.1 Specifications 36

Chapter 5. Specifications

5.1 Specifications

Table 5.1 lists specifications of the M32100T5-SDI-E.

Table 5.1 Specifications of the M32100T5-SDI-E

Applicable MCU		M32R MCUs integrating SDI whose operation verification has been completed by Renesas Technology *1
Emulation memory	Capacity	MCU with built-in flash ROM used as emulation memory. *2
Software break		Implemented by internal resource of MCU or instruction replacement. *2
Hardware break	Forcible break	Implemented by internal resource of MCU *2
	Data access break	Implemented by internal resource of MCU *2
Real-time trace *3	Memory size	192 KB *4
	To be recorded	Information of branching address/data access, time stamp
	Recording mode	• About 192 KB from starting execution • About 192 KB up to stopping execution • About 192 KB from event • About 192 KB up to event • About 192 KB of before and after event
	Trace recording event	Detects events based on the branching address/data access
Time measurement *3	Measurement	Measures 4 intervals (max./min./number of passing)
	Time measurement event	Detects events based on the branching address/data access
Communications interface		USB 2.0, High-speed
Connection type for target board		JTAG connection (optional converter required for in-circuit connection)
Power supply		Supplied from the included AC adapter
External dimensions (main body)	Width	92 mm
	Depth	140 mm (including M32RT2-CNV)
	Height	35 mm (including M32RT2-CNV)
Weight		260 g
Use environment	Temperature, humidity	5 to 35°C, 20 to 80%
	Dust and dirt	General office environment
Storage environment	Temperature, humidity	-10 to 60°C, 0 to 90%
	Dust and dirt	General office environment
Overseas standards		• U.S. EMI standards (FCC part 15 Class A) • CE marking (EN55022, EN55024, EN61000-3-3)

*1 The latest list of the applicable MCUs is available on the Renesas Tools Homepage. http://www.renesas.com/eng/products/mpumcu/toolhp/mcu/m32r_e.htm

*2 Depends on the MCU specifications. For details, see the release notes.

*3 Enabled only when the MCU has an SDI trace interface and the SDI trace interface cable has been connected. Because the emulator debugger automatically judges the status of connection to the target board, disabled functions cannot be selected from the menu.

*4 The number of cycles which can be recorded varies depending on what the emulator traces. An estimated number of cycles is 30000.

AC power supply	AC 100 V to 240 V (50 Hz/60 Hz)
Power consumption	Max. 20 W
DC output	Voltage: 5.2 ±0.1 V (2 A), Current: max. 4 A
DC output polarity	
External dimensions	Width: 122 mm, Depth: 60 mm, Height: 36 mm
Weight	235 g

Chapter 6. Troubleshooting

This chapter describes how to troubleshoot when this product does not work properly.

6.1 Flowchart to Remedy Troubles 38
6.2 When the Emulator Debugger Does Not Start up Properly 39
(1) When the LED Display of the M32100T5-SDI-E is Abnormal 39
(2) Errors Occur When the Emulator Debugger Starts Up 40

Chapter 6. Troubleshooting

6.1 Flowchart to Remedy Troubles

Figure 6.1 shows the flowchart to remedy troubles from when the emulator is activated until the emulator debugger gets started. Check this while the target system is disconnected.

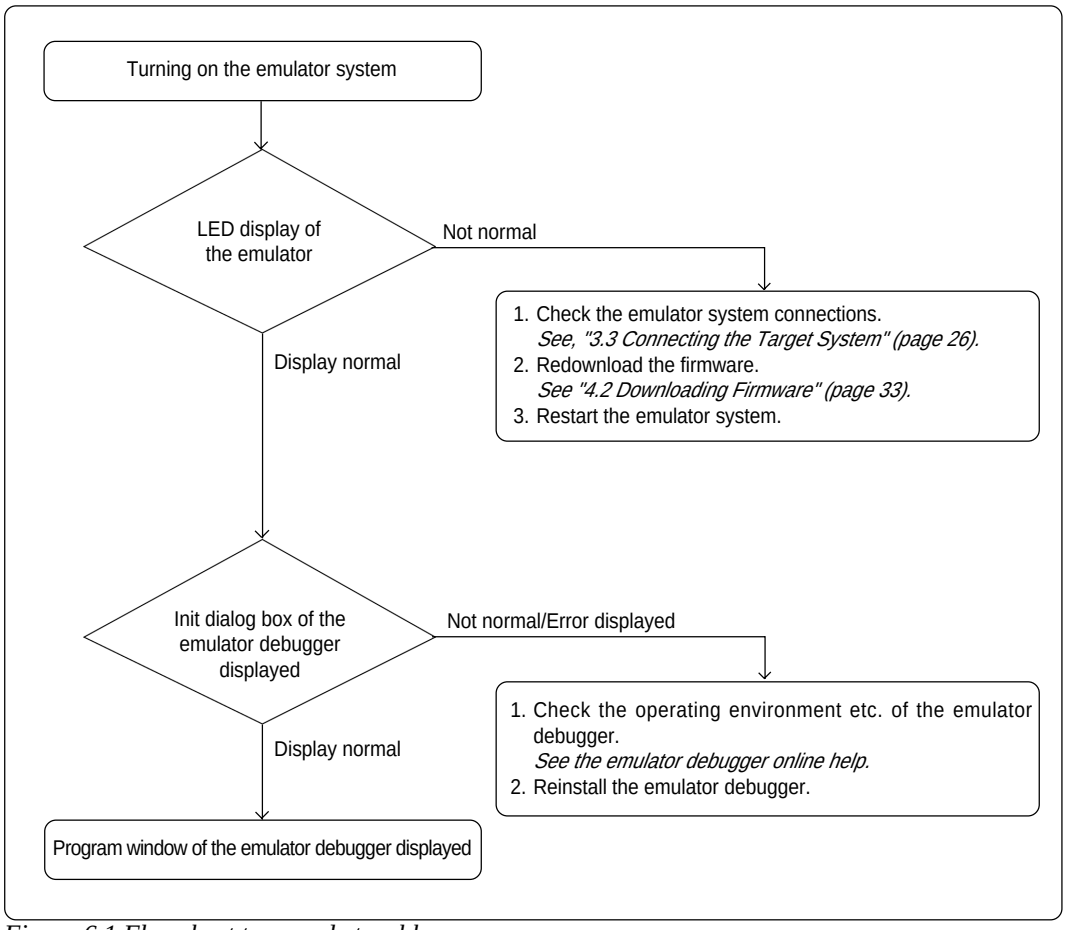


Figure 6.1 Flowchart to remedy troubles

6.2 When the Emulator Debugger Does Not Start Up Properly

(1) When the LED Display of the M32100T5-SDI-E is Abnormal

Table 6.1 LED's abnormal display and its checkpoints

Error	Connection to the target system	Checkpoint
LEDs do not light up.	-	Recheck the power cable of the AC adapter is connected to the M32100T5-SDI-E. *See "3.1 Connecting the AC Adapter" (page 24).*
The SAFE or ERROR LED of "STATUS OF SYSTEM" remains lit.	-	Turn on the power again. *See "4.1 Turning on the Power Supply" (page 32).*
The POWER LED of "STATUS OF USER" does not light up.	Connected	Check that power and GND are properly supplied to the target system.
The CLOCK LED of "STATUS OF USER" does not light up.	Connected	Check that the oscillation circuit on the target system is oscillating.

(2) Errors Occur When the Emulator Debugger Starts Up

Table 6.2 Checkpoints of errors when starting up the emulator debugger

Error	Checkpoint
• Communication ERROR. Can't send data.	Check that the serial number of the emulator is displayed in the MCU tab of the Init dialog box of the emulator debugger.
• The version of M3T-PD32RM and the firmware on the target are not same.	Download the proper firmware. *See "4.2 Downloading Firmware" (page 33).*
• Target MCU is reset state.	(1) Check that the reset pin of the target system is pulled up. (2) Check that the reset pin of the target system has changed from "L" to "H". (3) Check that the following pins of the MCU are properly connected. Pins: JTRST, JTCK, JTMS, JTDO, JTDI, JDBI *See "3.3 Connecting the Target System" (page 26).*
• Target MCU cannot be reset.	(1) Check that bus hold signal is negated. (2) If the reset circuit of the target system has a watchdog timer, disable the timer. (3) Check that power and GND are properly supplied to the target system . (4) The program may be uncontrollable in an area where memory is not allocated. (5) Check that the following pins of the MCU are properly connected. Pins: JTRST, JTCK, JTMS, JTDO, JTDI, JDBI *See "3.3 Connecting the Target System" (page 26).*
• Target MCU is not under control.	Check that the following pins of the MCU are properly connected. Pins: JTRST, JTCK, JTMS, JTDO, JTDI, JDBI *See "3.3 Connecting the Target System" (page 26).*
• Target MCU is in sleep mode. • Target MCU is in standby/stop mode.	The MCU is either in sleep/standby/stop wait mode. Either reset the MCU or cancel the mode with an interrupt. *See the user's manual of the MCU.*
• Target MCU is not given clock.	Check that the oscillation circuit of the target system is oscillating properly.
• Target MCU is not given power.	Check that power and GND are properly supplied to the target system .
• Sent command cannot be executed in this H/W environment.	(1) Check that the proper MCU file is specified. (2) Reinstall the emulator debugger.

Chapter 7. Maintenance and Guarantee

This chapter describes how to maintenance, repair provisions and how to request for repair.

7.1 Maintenance 42
7.2 Guarantee 42
7.3 Repair Provisions 42
7.4 How to Request for Repair 43

Chapter 7. Maintenance and Guarantee

7.1 Maintenance

If dust or dirt collects on any equipment of your emulation system, wipe it off with a dry soft cloth. Do not use thinner or other solvents because these chemicals can cause the equipment's surface coating to separate.

7.2 Guarantee

If your product becomes faulty within one year after its purchase while being used under good conditions by observing "Precautions for Safety" described in Chapter 1 of this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

- Misuse, abuse, or use under extraordinary conditions
- Unauthorized repair, remodeling, maintenance, and so on
- Inadequate user's system or misuse of it
- Fires, earthquakes, and other unexpected disasters

In the above cases, contact your local distributor. If your product is being leased, consult the leasing company or the owner.

7.3 Repair Provisions

(1) Repair with extra-charge

The products elapsed more than one year after purchase can be repaired with extra-charge.

(2) Replacement with extra-charge

If your product's fault falls in any of the following categories, the fault will be corrected by replacing the entire product instead of repair, or you will be advised to purchase new one, depending on the severity of the fault.

- Faulty or broken mechanical portions
- Flaw, separation, or rust in coated or plated portions
- Flaw or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

(3) Expiration of the repair period

When a period of one year elapses after the model was dropped from production, repairing products of the model may become impossible.

(4) Transportation fees at sending your product for repair

Please send your product to us for repair at your expense.

7.4 How to Request for Repair

If your M32100T5-SDI-E is found faulty, follow the procedure below to send your product for repair.

Customer

Fill in the Repair Request Sheet included with this product, then send it along with this product for repair to your local distributor. Make sure that information in the Repair Request Sheet is written in as much detail as possible to facilitate repair.

Distributor

After checking the contents of fault, the distributor should please send the faulty product along with the Repair Request Sheet to Renesas Solutions Corp.

Renesas Solutions

When the faulty product is repaired, it will be returned to the customer at the earliest convenience.

⚠ CAUTION

Note on Transporting the Product:

- When sending your M32100T5-SDI-E for repair, use the packing box and cushion material supplied with the M32100T5-SDI-E when delivered to you and specify handling caution for it to be handled as precision equipment. If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use conductive polyvinyl supplied with the M32100T5-SDI-E (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

MEMO

M32100T5-SDI-E User's Manual

Rev.1.00
May 1, 2004
REJ10J0455-0100Z

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REJ10J0455-0100Z