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April 1st, 2010
Renesas Electronics Corporation

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M34519T-MCU

User's Manual

MCU Board for 4500 Series 4518, 4519, 4583 and
4584 Group MCUs

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Preface

This user's manual describes the specifications of MCU board M34519T-MCU for the Renesas 4518, 4519, 4583 and 4584 Groups of 4-bit CMOS single-chip MCUs. The M34519T-MCU is an MCU board for the PC4504 emulator. For emulator main unit PC4504 and emulator debugger M3T-PD45, refer to each user's manual (online manual).

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.

Contents

Chapter 1. Precautions for Safety	5
1.1 Safety Symbols and Meanings	5
Chapter 2. Package Contents	9
2.1 Contents of the M34519T-MCU	9
2.2 Other Necessary Products	10
Chapter 3. M34519T-MCU	11
3.1 Outline	11
3.2 Specifications	12
3.3 Switches	13
3.4 Check Pins	14
3.5 Connectors	14
3.6 Connection to the Target System	18
3.7 How to Replace the MCU	22
Chapter 4. Precautions to Be Taken When Debugging a Program	23
4.1 Reset	23
4.2 Watchdog Timer	23
4.3 RAM Backup Mode	24
4.4 Port I/O Timings	24
4.5 A-D Converter	25
4.6 System Clock	26
4.7 Real-time Capability of the Timer	26
4.8 Pullup Transistor Control	26
4.9 Program Execution (G, GB)	27
4.10 External Trigger Signal	28
4.11 Other Precautions	28
Chapter 5. Connection Circuit Diagrams	29
5.1 Connection Circuit Diagrams	29
Chapter 6. Pitch Converter Board External Dimensions	31
6.1 M34513T-PTCA	31
6.2 M34513T-PTCB	31
6.3 M34513T-PTCC	31
Chapter 7. Maintenance and Guarantee	33
7.1 Maintenance	33
7.2 Guarantee	33
7.3 Repair Provisions	33
7.4 How to Request for Repair	34

Chapter 1. Precautions for Safety

Both in the M34519T-MCU user's manual and on the product, 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 precautions which should be taken in order to use the M34519T-MCU 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

Warning for Installation:



- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the main unit 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 to Be Taken for This Product:



- Do not disassemble or modify this product. Disassembling or modifying this product can cause damage. Disassembling and modifying the product will void your warranty.
- Use caution when handling the main unit. Be careful not to apply a mechanical shock.
- Do not pull the emulator probe (100-wire half-pitch cable etc.) to disconnect from the emulator main unit.
- 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.

IMPORTANT

Notes on Differences between Actual MCUs and the Emulator:

- Emulator operation differs from emulation of a mask MCU, as listed below. For details refer to "Chapter 4. Precautions to Be Taken When Debugging a Program" (page 23).
 - (1) Reset condition
 - (2) Operation of the watchdog timer function
 - (3) Operation in RAM backup mode
 - (4) Port I/O timings and characteristics
 - (5) A-D conversion function
- Therefore, always be sure to evaluate your system with an evaluation MCU (OTP version). Also, be sure to perform onboard evaluation with CS (Commercial Sample) version MCU to make final confirmation of device operation before starting mask production.

Note on the Target System:

- Make sure that the target's supply voltage is + 3.0 V or + 5.0 V. Therefore the target's supply voltage should be in the range of + 3.0 V \pm 10% or + 5.0 V \pm 10%.

IMPORTANT

Notes on Connecting the Target System:

- When connecting the target system, be sure to shut off the power of the emulator and the target system.
- Connect the emulator probe carefully.
- When connecting the emulator probe, use care not to twist the cable. An excessive twist may cause breaking of the wire.

Note on MCU board Installation:

- Before installing and removing the MCU board, always be sure to power off the PC4504 emulator main unit and unplug its power cord from the outlet.

Note on Registers that Can be Operated from M3T-PD45

- The table below lists the registers that can be operated from M3T-PD45. The "Yes" in the table means that the register can be operated; the "No" means that the register can not be operated.

Register	Reference	Modification	Remarks	Register	Reference	Modification	Remarks
PC	Yes	Yes		W3	Yes	Yes	
CY	Yes	Yes		W4	Yes	Yes	
A	Yes	Yes		W5	Yes	Yes	
B	Yes	Yes		W6	Yes	Yes	
D	Yes	Yes		J1	Yes	Yes	4518 and 4519 only
E	Yes	Yes		Q1	Yes	Yes	
X	Yes	Yes		Q2	Yes	Yes	
Y	Yes	Yes		Q3	Yes	Yes	
Z	Yes	Yes		K0	Yes	Yes	
V1	Yes	Yes		K1	Yes	Yes	
V2	Yes	Yes		K2	Yes	Yes	
I1	Yes	Yes		PU0	Yes	Yes	
I2	Yes	Yes		PU1	Yes	Yes	
MR	Yes	Yes		FR0	No	Yes	
RG	No	Yes		FR1	No	Yes	
PA	No	Yes		FR2	No	Yes	
W1	Yes	Yes		FR3	No	Yes	4518 and 4519 only
W2	Yes	Yes		SI	Yes	Yes	4518 and 4519 only

MEMO

Chapter 2. Package Contents

2.1 Contents of the M34519T-MCU

Table 2.1 shows the contents of the M34519T-MCU package. When unpacking it, check to see that all of these components are included.

Table 2.1 Contents of the M34519T-MCU package

Item	Product name	Quantity
1	M34519T-MCU	1
2	M34584MD-001FP (for replacement)	1
3	M4584 monitor ROM for the 4583 and 4584 Groups (for replacement)	1
4	100-wire half-pitch cable (40 cm)	1
5	50-wire normal-pitch cable (10 cm)	1
6	2-wire external trigger cable (50 cm)	1
7	Pitch converter board PCA4029	1
8	Pitch converter board M34513T-PTCA	1
9	Pitch converter board M34513T-PTCB	1
10	Pitch converter board M34513T-PTCC	1
11	Oscillator circuit board OSC-2 (only J1 mounted)	1
12	M34519T-MCU user's manual (this manual)	1
13	M34519T-MCU user's manual (Japanese)	1

IMPORTANT

Notes on Components of this Product:

- If you find any item missing or faulty, or any suggestion, contact your local distributor.
- Keep the packaging carton and cushion material of the M34519T-MCU to transport it for repair or for other purposes in the future.
- The M34519T-MCU has a preinstalled oscillator circuit board OSC-2 for 6.0 MHz (main clock) and another oscillator circuit board OSC-2 on which only J1 is mounted.

2.2 Other Necessary Products

To bring forward your program development with the 4518, 4519, 4583 and 4584 Groups of 4-bit MCUs, the products listed in Table 2.2 are necessary in addition to those contained in the package. Get them separately when necessary.

Table 2.2 Other products required for developing the 4518, 4519, 4583 and 4584 Group MCUs

Product	Product type name
Emulator main unit	PC4504
Emulator debugger	M3T-PD45
Programming adapter	PCA7441 (for 4519 and 4584) PCA7442FPG02 (for 4518 and 4583 LQFP) PCA7442SP (for 4518 and 4583 SDIP)

3.2 Specifications

Table 3.1 lists specifications of the M34519T-MCU.

Table 3.1 M34519T-MCU specifications

Emulator	Emulator PC4504			
Applicable MCUs	4518 Group, 4519 Group, 4583 Group*1, 4584 Group*1			
Evaluation MCU	4518, 4519 Groups	M34519M8-001FP (preinstalled)		
	4583, 4584 Groups	M34584MD-001FP (included)		
Monitor program	4518, 4519 Groups	M4519 (preinstalled)		
	4583, 4584 Groups	M4584 (included)		
Clock	Main clock: 6.0 MHz (OSC-2 [6.0 MHz mounted])			
	5 V	Divide-by-8 mode (f(XIN)/8)		6.0 MHz
		Divide-by-4 mode (f(XIN)/4)		
		Divide-by-2 mode (f(XIN)/2)		
		Through mode (f(XIN))		
	3 V	Divide-by-8 mode (f(XIN)/8)		4.4 MHz
		Divide-by-4 mode (f(XIN)/4)		
		Divide-by-2 mode (f(XIN)/2)		
		Through mode (f(XIN))		
Target system voltage	3 V ±10% or 5 V ±10%			
Power supply to MCU board	Supplied by the PC4504's internal power supply (+5 V, +12 V). 3 V is generated from +12 V.			
Port emulation	Port	Direction	Device used	
	P00--P03, P10--P13, D0--D5	Input/output *2	Input	74HC245
			Output	74ALS641 (N-ch) 74VHC125 (CMOS)
	P21, P22	Input/output	Input/Output: 74HC4066	
Emulated functions	Key-on wakeup input in RAM backup mode	Pin	Factor of return	
		P00--P03, INT0, INT1	Edge detection or level detection	
		P10--P13	L-level detection	
	Pullup resistor control	Pin	Control register	
		P00--P03	PU0	
		P10--P13	PU1	
	Port output type control	Pin	Control register	
		P00--P03, P10--P13	FR0	
		D0--D5	FR1, FR2	
Board dimensions	233.35 x 135.00 x 1.60 mm			
Operating temperature	5 to 35°C (non-condensing)			
Product configuration	<ul style="list-style-type: none">• M34519T-MCU• 100-wire half-pitch cable• PCA4029• 50-wire normal-pitch cable• 2-wire external trigger cable• M34513T-PTCA• M34513T-PTCB• M34513T-PTCC• OSC-2 (not mounted)• M34584MD-001FP (MCU for replacement)• M4584 (ROM for replacement)			












*1. Available by changing MCUs

*2. N-ch open drain output and CMOS output are selectable by a control register.

3.3 Switches

Table 3.2 shows the functions of the switches and their factory-settings.

Table 3.2 Functions of the switches

Switch	Label	Switch position	Description	Factory-setting
SW1	OFF	ON  OFF	Does not output VDD from the M34519T-MCU to the target system.	 OFF
	ON	ON  OFF	Outputs VDD from the M34519T-MCU to the target system.	
SW2	ROMSIZE		Set the MCU's ROM size. <ul style="list-style-type: none"> • Set "2" for M2 • Set "4" for M4 • Set "6" for M6 • Set "8" for E8, M8 • Set "D" for ED, MD 	 8
SW3	5 V	3 V  5 V	Operates the evaluation MCU on the M34519T-MCU at 5 V.	 5 V
	3 V	3 V  5 V	Operates the evaluation MCU on the M34519T-MCU at 3 V.	
SW4	519	518  519	Operates for the 4519 and 4584 Groups.	 519
	518	518  519	Operates for the 4518 and 4583 Groups.	

CAUTION

Caution for Setting the Switches:



- Before changing switch settings, be sure to shut off the power.

3.4 Check Pins

Table 3.3 lists the check pins of the M34519T-MCU, and Figure 3.3 shows their positions.

Table 3.3 Check pins

Pin		Function
TP1	VDD	Outputs +3 V or +5 V (MCU voltage) according to the setting of SW3.
TP2	XIN	Outputs a system clock input to the evaluation MCU.
TP3	GND	Ground
TP4	RUN/STOP	Held low when a user program is executed, held high when it is stopped.
TP5	WRST	Held high when WRST instruction is executed, and you can check the initialization cycle of the watchdog timer by observing pulse widths.

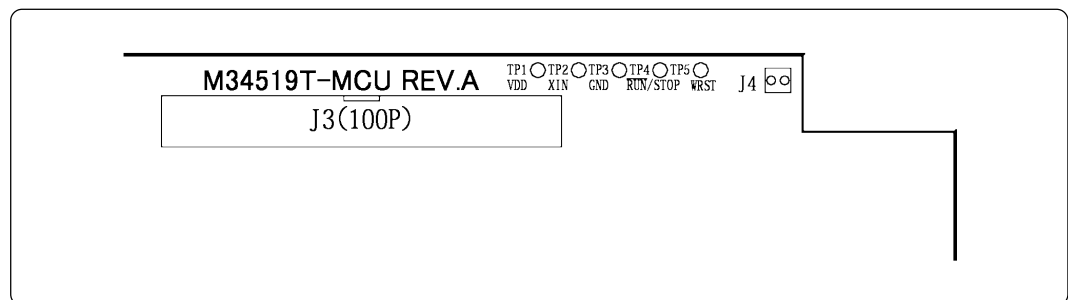


Figure 3.3 Positions of the check pins

3.5 Connectors

Table 3.4 lists the functions of the connectors of the M34519T-MCU.

Table 3.4 Connectors

Connector	Function
J1	Connects the evaluation MCU bus.
J2	Connects the monitor CPU bus.
J3	Connects the target system. (100-pin)
J4	Connects external trigger signal. (2-pin)
J6	Connects oscillator circuit board OSC-2. (4-pin)

(1) Connector J3

Table 3.5 lists the pin assignments of the 100-wire half-pitch connector J3 for connecting the PCA4029. And Figure 3.4 shows the pin layout of connector J3.

Table 3.5 Pin assignments of connector J3

Line A			Line B			Line C			Line D		
Pin No.	Signal	I/O	Pin No.	Signal	I/O	Pin No.	Signal	I/O	Pin No.	Signal	I/O
1	GND		1	GND		1	P13	I/O	1	P12	I/O
2	GND		2	GND		2	D0	I/O	2	P11	I/O
3	GND		3	GND		3	D1	I/O	3	P10	I/O
4	GND		4	GND		4	D2	I/O	4	P03	I/O
5	GND		5	GND		5	D3	I/O	5	P02	I/O
6	GND		6	GND		6	D4	I/O	6	P01	I/O
7	GND		7	GND		7	D5	I/O	7	P00	I/O
8	GND		8	GND		8	D6/CNTR0	I/O	8	P43/AIN7	I/O
9	GND		9	GND		9	D7/CNTR1	I/O	9	P42/AIN6	I/O
10	GND		10	GND		10	P50	I/O	10	P41/AIN5	I/O
11	GND		11	GND		11	P51	I/O	11	P40/AIN4	I/O
12	GND		12	GND		12	P52	I/O	12	P63/AIN3	I/O
13	GND		13	GND		13	P53	I/O	13	P62/AIN2	I/O
14	GND		14	GND		14	P20/SCK	I/O	14	P61/AIN1	I/O
15	GND		15	GND		15	P21/SOUT	I/O	15	P60/AIN0	I/O
16	GND		16	GND		16	P22/SIN	I/O	16	P33	I/O
17	GND		17	GND		17	RESET	I	17	P32	I/O
18	GND		18	GND		18	CNVSS	-	18	P31/INT1	I/O
19	GND		19	GND		19	XOUT	-	19	P30/INT0	I/O
20	GND		20	GND		20	XIN	-	20	VDCE	I
21	GND		21	GND		21	VSS		21	VDD	
22	GND		22	GND		22	NC	-	22	NC	-
23	GND		23	GND		23	NC	-	23	NC	-
24	GND		24	GND		24	NC	-	24	NC	-
25	GND		25	GND		25	NC	-	25	NC	-

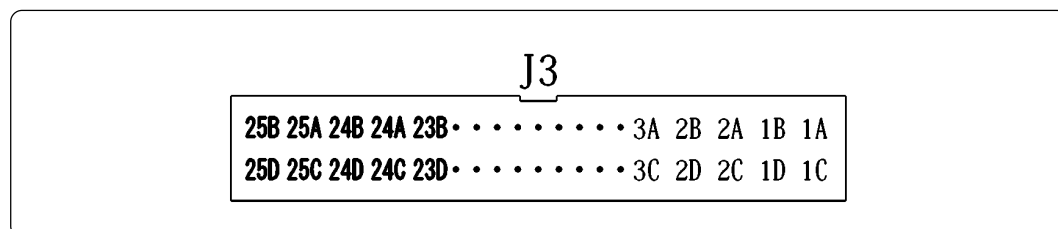


Figure 3.4 Connector J3 pin layout

Some signals which are connected to the target system are emulated by the M34519T-MCU. Table 3.6 lists the connections of the target system and each pin.

Table 3.6 Connection of the target system and each pin

Item	Signal	
	4519 Group	4584 Group
Pins connected directly to the target system (12 types 23 pins)	<ul style="list-style-type: none"> • P20/SCK • P21/SOUT • P22/SIN • P30/INT0, P31/INT1 • P32, P33 • P40/AIN4--P43/AIN7 • P50--P53 • P60/AIN0--P63/AIN3 • D6/CNTR0 • D7/CNTR1 • VDCE • VSS 	<ul style="list-style-type: none"> • P20--P23 • P30/INT0, P31/INT1 • P40--P43 • P50--P53 • P60/AIN0, P61/AIN1 • P62, P63 • D6/CNTR0 • C/CNTR1 • VDCE • VSS
Pins connected to the target system via an emulation circuit etc. (5 types 16 pins)	<ul style="list-style-type: none"> • P00--P03 • P10--P13 • D0--D5 • RESET • VDD 	
Pins not connected to the target system (3 types 3 pins)	<ul style="list-style-type: none"> • XIN • XOUT • CNVSS 	

CAUTION

Notes on Connecting the Evaluation MCU and Target System:



- VDD is not used for inputting power from the target system, but it is used for outputting power from the power circuit on the M34519T-MCU to the target system. Output of VDD (ON or OFF) is set by switch SW1, and the voltage (3 V or 5 V) is set by switch SW3.
- XIN is input from the oscillator board OSC-2 on the M34519T-MCU, and it is not input from the oscillator on the target system. To change a system clock frequency, use another oscillator board OSC-2 (included) with other necessary parts.

(2) Connector J4

Connect the 2-wire external trigger cable included with the M34519T-MCU to 2-pin connector J4 for external trigger signal. Connect the black clip of the 2-wire external trigger cable to GND, and use the white clip for external trigger signal input.

External trigger signal is used for event input of external trigger breaks or external trace points. Table 3.7 lists the pin assignments of connector J4.

Table 3.7 Pin assignments of connector J4

Pin No.	Signal	Function
1	TRIG	External trigger signal input
2	GND	GND

(3) Connector J6

Connector J6 is a connector used to connect oscillator circuit board OSC-2. Table 3.8 lists the pin assignments of connector J6. Figure 3.5 shows the pin layout of connector J6. Figure 3.6 shows a connection diagram of oscillator circuit board OSC-2 (6.0 MHz).

Table 3.8 Pin assignments of connector J6

Pin No.	Signal	Function
1	VCC	Power supply
2	GND	GND
3	CLK	Clock input
4	GND	GND

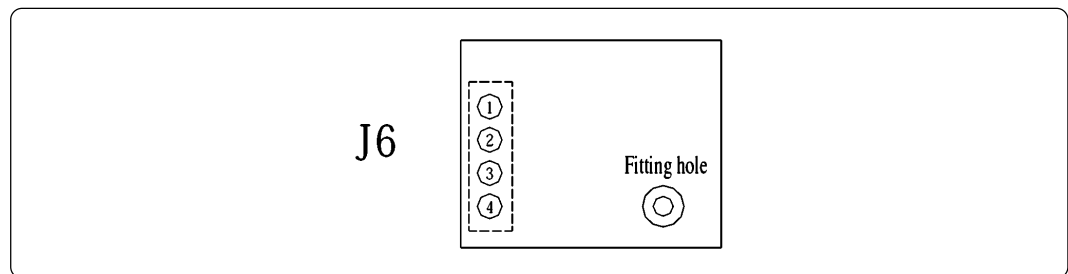


Figure 3.5 Pin layout of connector J6

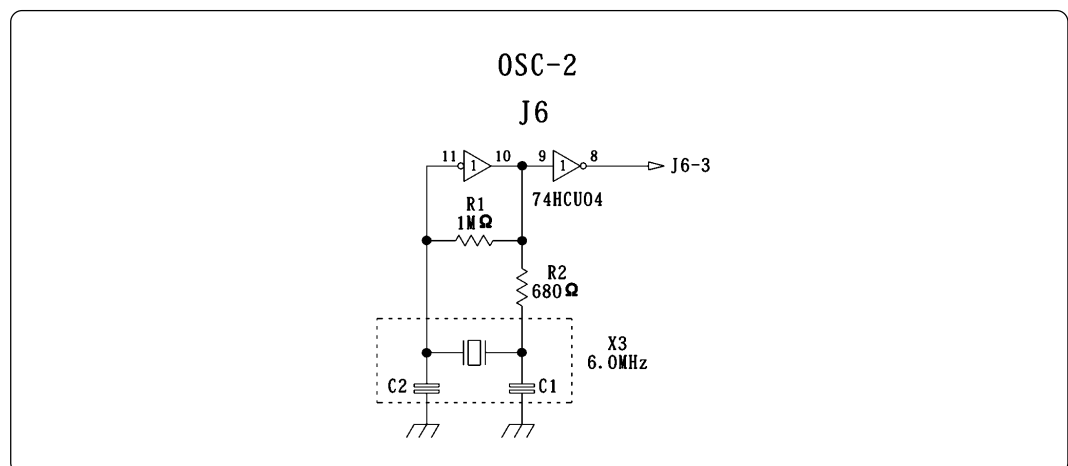


Figure 3.6 Connection diagram of the oscillator circuit

CAUTION

Notes on Changing a Clock Frequency:

- When changing a clock frequency, be sure to shut off the power supply to replace the oscillator circuit board (OSC-2).
- For details about the oscillation circuit constant, consult your oscillator manufacturer.

3.6 Connection to the Target System

Connections of the M34519T-MCU and target systems are shown in Figure 3.7 below.

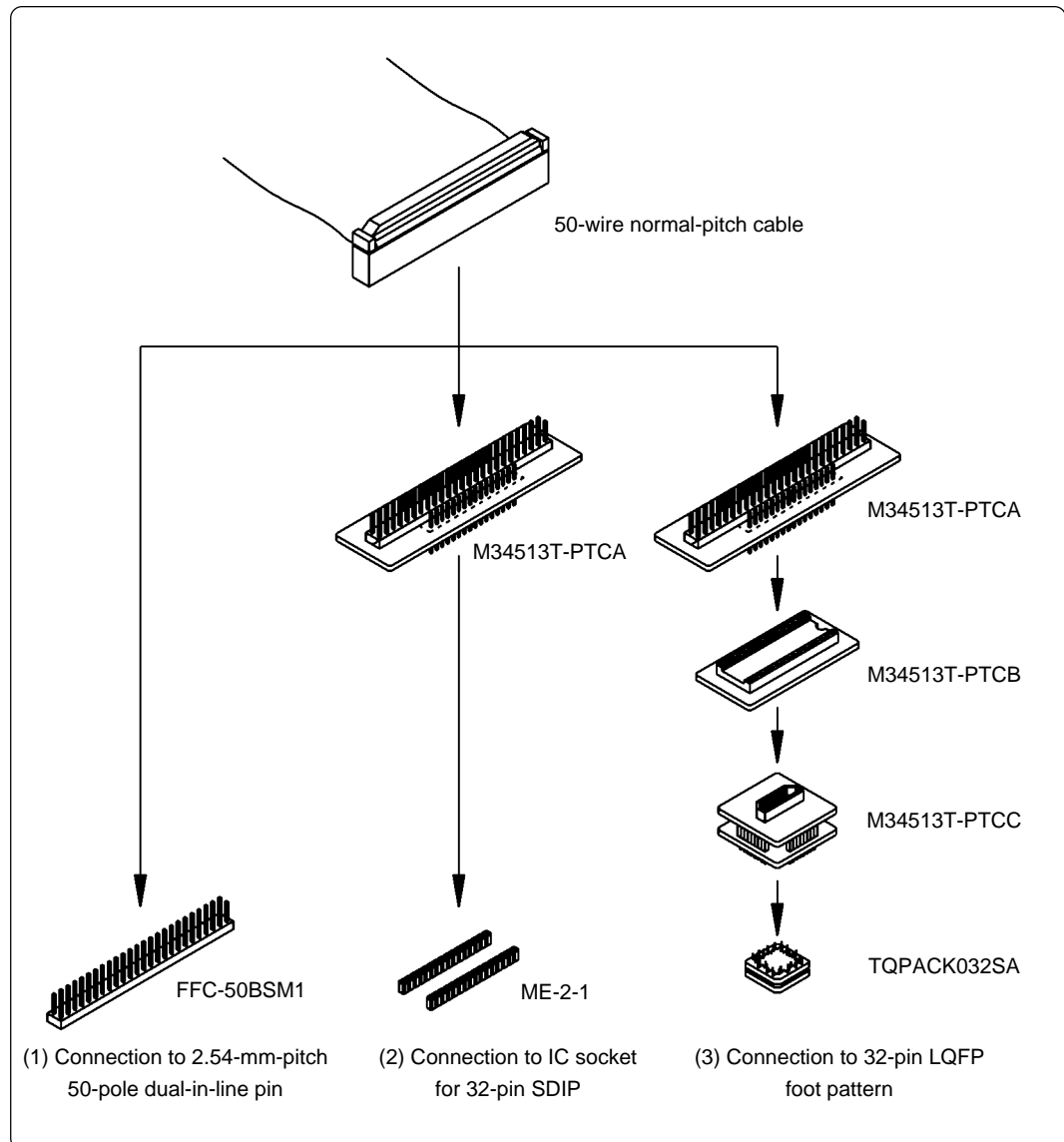


Figure 3.7 Connections to target systems

(1) Connection to 2.54-mm-pitch 50-pole dual-in-line pins (for 42-pin SSOP)

Connect this product to 50-pole dual-in-line pins using the included 50-wire normal-pitch cable.

Use the following products:

- (1) 100-wire half-pitch cable (40 cm)
- (2) Pitch converter board PCA4029
- (3) 50-wire normal-pitch cable (10 cm)

Table 3.9 lists the connector assignments of the 50-wire normal-pitch cable, and Figure 3.8 shows the pin layout of the 50-wire normal-pitch cable. Be careful not to connect the cable in a wrong direction.

Table 3.9 Connector assignments of the 50-wire normal-pitch cable

Connector pin No.	MCU pin No.	Signal	Connector pin No.	MCU pin No.	Signal
1	1	P13	50	42	P12
2	2	D0	49	41	P11
3	3	D1	48	40	P10
4	4	D2	47	39	P03
5	5	D3	46	38	P02
6	6	D4	45	37	P01
7	7	D5	44	36	P00
8	8	D6/CNTR0	43	35	P43/AIN7
9	9	D7/CNTR1	42	34	P42/AIN6
10	10	P50	41	33	P41/AIN5
11	11	P51	40	32	P40/AIN4
12	12	P52	39	31	P63/AIN3
13	13	P53	38	30	P62/AIN2
14	14	P20/SCK	37	29	P61/AIN1
15	15	P21/SOUT	36	28	P60/AIN0
16	16	P22/SIN	35	27	P33
17	17	RESET	34	26	P32
18	18	NC (CNVSS)	33	25	P31/INT1
19	19	NC (XOUT)	32	24	P30/INT0
20	20	NC (XIN*2)	31	23	VDCE
21	21	VSS	30	22	VDD*1
22	-	NC	29	-	NC
23	-	NC	28	-	NC
24	-	NC	27	-	NC
25	-	NC	26	-	NC

*1: VDD is not used for inputting power from the target system, but it is used for outputting power from the power circuit on the M34519T-MCU to the target system. Output of VDD (on/off) is set by switch SW1. For details, refer to "3.3 Switches" (page 13).

*2: XIN is input from oscillator board OSC-2 on the M34519T-MCU, and it is not input from the oscillator circuit on the target system. To change a system clock frequency, change the frequency of oscillator board OSC-2.

CAUTION

Note on Connecting the Target System:



- Always shut OFF power before connecting the target system. Otherwise internal circuits of the target system and the emulator may be damaged.

(2) Connection to the IC socket for 32-pin SDIP

Attach pitch converter board M34513T-PTCA to the 50-wire normal-pitch cable, and connect it to an IC socket for 32-pin SDIP on the target system.

Use the following products:

- (1) 100-wire half-pitch cable (40 cm)
- (2) Pitch converter board PCA4029
- (3) 50-wire normal-pitch cable (10 cm)
- (4) Pitch converter board M34513T-PTCA

Table 3.10 lists the connector assignments of pitch converter board M34513T-PTCA. When attaching the pitch converter board, check the No. 1 pin positions of the cable and the connector. Be careful not to connect the cable in a wrong direction.

Table 3.10 Connector assignments of pitch converter board M34513T-PTCA

Connector pin No.	MCU pin No.	Signal	Connector pin No.	MCU pin No.	Signal
1	1	D0	32	32	P13
2	2	D1	31	31	P12
3	3	D2	30	30	P11
4	4	D3	29	29	P10
5	5	D4	28	28	P03
6	6	D5	27	27	P02
7	7	D6/CNTR0	26	26	P01
8	8	D7/CNTR1	25	25	P00
9	9	P20/SCK	24	24	P63/AIN3
10	10	P21/SOUT	23	23	P62/AIN2
11	11	P22/SIN	22	22	P61/AIN1
12	12	RESET	21	21	P60/AIN0
13	13	CNVSS	20	20	P31/INT1
14	14	XOUT	19	19	P30/INT0
15	15	XIN*2	18	18	VDCE
16	16	VSS	17	17	VDD*1

*1: VDD is not used for inputting power from the target system, but it is used for outputting power from the power circuit on the M34519T-MCU to the target system. Output of VDD (on/off) is set by switch SW1. For details, refer to "3.3 Switches" (page 13).

*2: XIN is input from oscillator board OSC-2 on the M34519T-MCU, and it is not input from the oscillator circuit on the target system. To change a system clock frequency, change the frequency of oscillator board OSC-2.

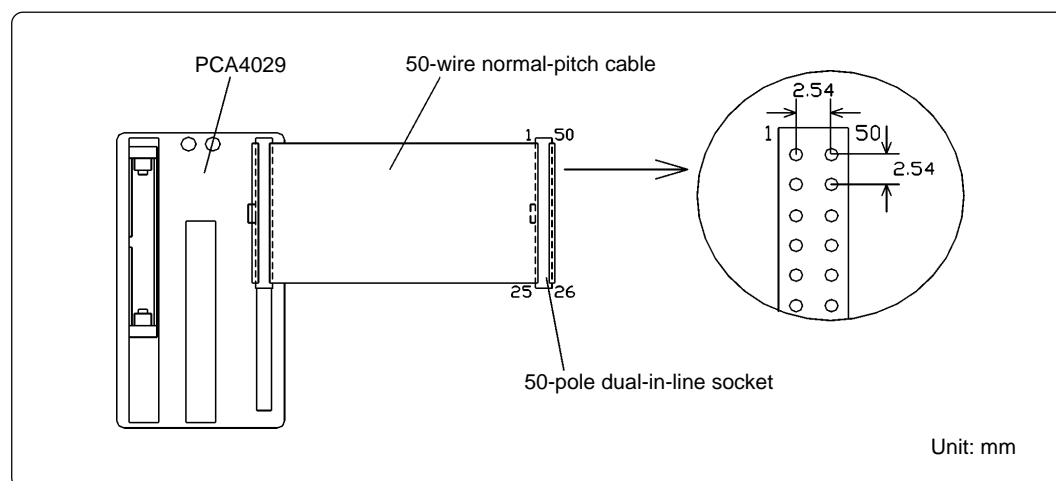


Figure 3.8 Pin layout of the 50-wire normal-pitch cable

(3) Connection to a 32-pin LQFP foot pattern

Attach pitch converter boards M34513T-PTCA and M34513T-PTCB to the included 50-wire normal-pitch cable, and connect them to the TQPACK032SA soldered on a 32-pin LQFP foot pattern of the target system via the M34513T-PTCC.

Use the following products:

- (1) 100-wire half-pitch cable (40 cm)
- (2) Pitch converter board PCA4029
- (3) 50-wire normal-pitch cable (10 cm)
- (4) Pitch converter board M34513T-PTCA
- (5) Pitch converter board M34513T-PTCB
- (6) Pitch converter board M34513T-PTCC (including TQPACK032SA)

Table 3.11 lists the pin assignments of the TQPACK032SA. Solder the TQPACK032SA on a 32-pin LQFP foot pattern of the target system. Attach the M34513T-PTCC to the TQPACK032SA matching the No. 1 pin positions (see Figure 3.9). Be careful not to connect them improperly.

Table 3.11 Pin assignments of the TQPACK032SA

Connector pin No.	MCU pin No.	Signal	Connector pin No.	MCU pin No.	Signal
1	1	D3	32	32	D2
2	2	D4	31	31	D1
3	3	D5	30	30	D0
4	4	D6/CNTR0	29	29	P13
5	5	D7/CNTR1	28	28	P12
6	6	P20/SCK	27	27	P11
7	7	P21/SOUT	26	26	P10
8	8	P22/SIN	25	25	P03
9	9	RESET	24	24	P02
10	10	CNVSS	23	23	P01
11	11	XOUT	22	22	P00
12	12	XIN*2	21	21	P63/AIN3
13	13	VSS	20	20	P62/AIN2
14	14	VDD*1	19	19	P61/AIN1
15	15	VDCE	18	18	P60/AIN0
16	16	P30/INT0	17	17	P31/INT1

*1: VDD is not used for inputting power from the target system, but it is used for outputting power from the power circuit on the M34519T-MCU to the target system. Output of VDD (on/off) is set by switch SW1. For details, refer to "3.3 Switches" (page 13).

*2: XIN is input from oscillator board OSC-2 on the M34519T-MCU, and it is not input from the oscillator circuit on the target system. To change a system clock frequency, change the frequency of oscillator board OSC-2.

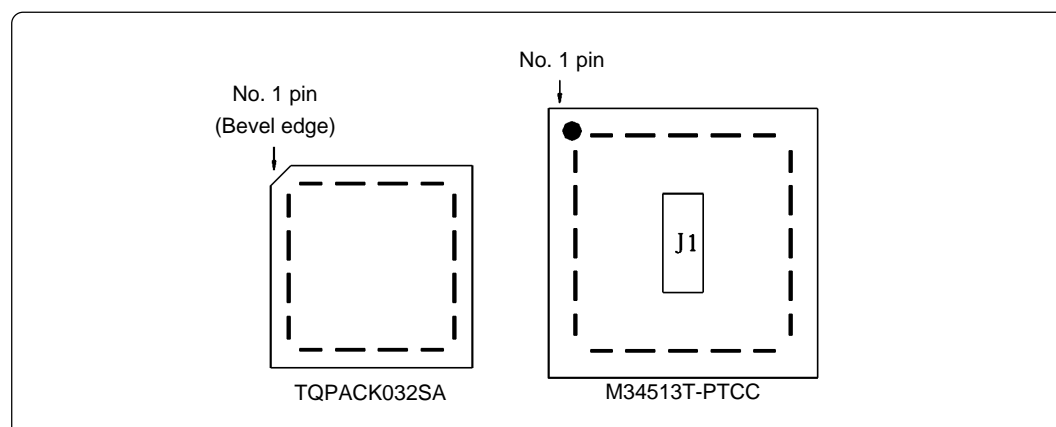


Figure 3.9 Pin layouts of the TQPACK032SA and M34513T-PTCC

3.7 How to Replace the MCU

For debugging the 4583 and 4584 Group MCUs, it is necessary to replace the evaluation MCU to the included M34584MD-001FP. When replacing the MCU, match the No. 1 pin of the IC socket and that of the MCU as shown in Figure 3.10. Incorrect insertion may cause a fatal damage to the MCU.

The M34519M8-001FP is mounted when shipped from the factory.

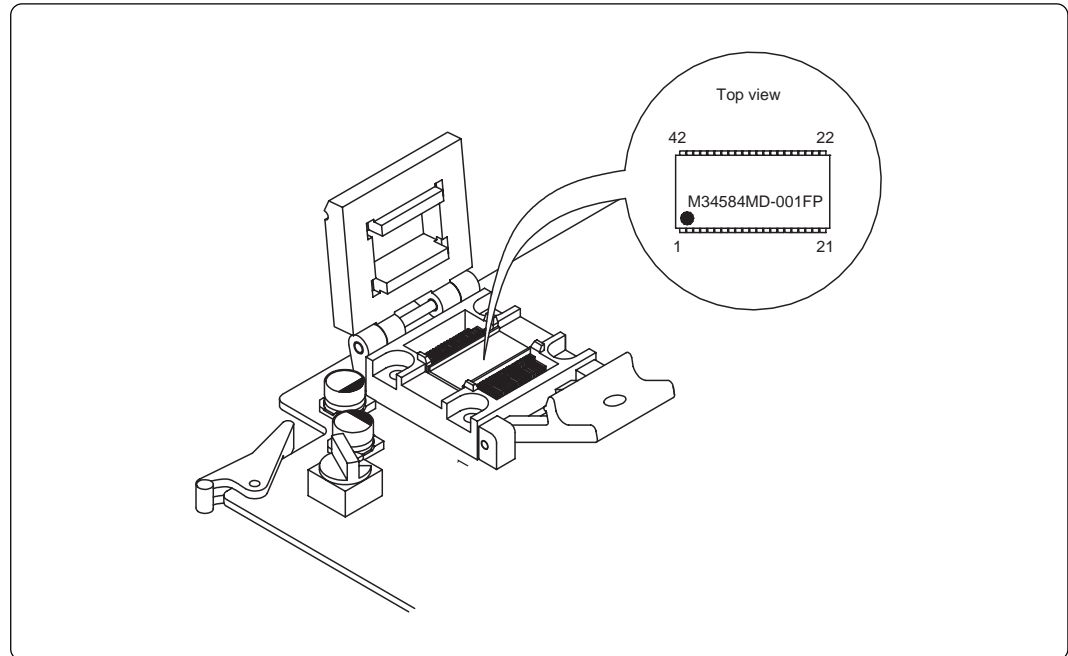


Figure 3.10 Replacing the MCU

CAUTION

Cautions for Replacing the MCU:



- Before replacing the MCU, be sure to shut off the power supply.
- When mounting the evaluation MCU, be sure to match the No. 1 pin. Incorrect insertion may cause a fatal damage to the MCU.
- When opening and closing the IC socket, hold the adapter horizontally. Otherwise the inside of the IC socket may become damaged and cause an electrical insulation failure.
- When debugging a 4583 or 4584 Group MCU, it is necessary to replace the MCU to the included M34584MD-001FP and change the setting of switch SW4. For switch setting, see "3.3 Switches" (page 13).

Chapter 4. Precautions to Be Taken for Debugging a Program

4.1 Reset

The M34519T-MCU uses a 74HC14 for its RESET signal input buffer, so that its electrical characteristics differ from those of an actual MCU. Table 4.1 lists the RESET signal input characteristics of the M34519T-MCU.

Table 4.1 RESET signal input characteristics

Item	Symbol	Voltage	Min.	Max.
H-level threshold voltage	VP	VCC = 2.0 V	1.0 V	1.5 V
		VCC = 4.5 V	2.3 V	3.15 V
		VCC = 6.0 V	3.0 V	4.2 V
L-level threshold voltage	VN	VCC = 2.0 V	0.3 V	0.9 V
		VCC = 4.5 V	1.13 V	2.0 V
		VCC = 6.0 V	1.5 V	2.6 V
Hysteresis voltage	VH	VCC = 2.0 V	0.3 V	1.0 V
		VCC = 4.5 V	0.6 V	1.4 V
		VCC = 6.0 V	0.8 V	1.7 V

4.2 Watchdog Timer

The M34519T-MCU does not have an operational watchdog timer. Therefore, use an evaluation MCU (OTP version) to verify the operation associated with a watchdog timer.

The M34519T-MCU outputs a signal whose waveform is shown below from check pin TP5 during WRST instruction execution cycles. This signal allows you to check the initialization cycle of a watchdog timer.

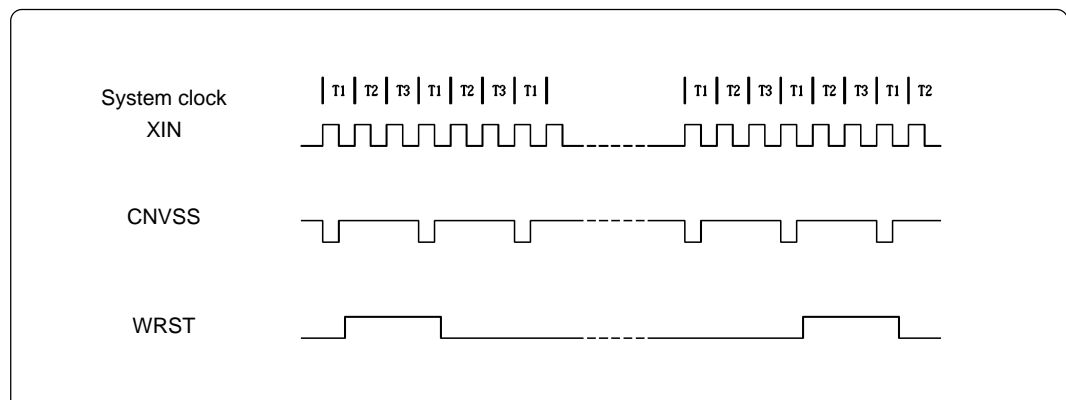


Figure 4.1 Waveform output from check pin TP5

4.3 RAM Backup Mode

In RAM backup mode, the M34519T-MCU operates differently from the actual MCUs. Although the actual MCU enters RAM backup mode depending on a combination of instructions EPOF and POF, the M34519T-MCU is placed in RAM backup mode by executing instruction POF only. Instruction EPOF has no effect on the M34519T-MCU.

<i>Program example 4.1</i>	[Actual MCU]
RC	Placed in RAM backup mode
INY	
EPOF	
POF	
•	
•	
<i>Program example 4.2</i>	[Actual MCU]
RC	Not placed in RAM backup mode
INY	
POF	
•	
•	
	[M34519T-MCU]
	Placed in RAM backup mode

4.4 Port I/O Timings

(1) Port input timings

Port input timings are the same as with actual the MCUs.

(2) Port output timings

When using the M34519T-MCU, output timings are different from those of the actual MCUs, because the following ports that are configured with the port emulation circuits.

- Ports D0--D5
- Ports P00--P03
- Ports P10--P13

With the actual MCUs, changes occur at the beginning of the T3 state of an output instruction. With the M34519T-MCU, changes occur at the beginning of the T2 state of the next output instruction. Figure 4.2 shows the port output timings of the actual MCUs and M34519T-MCU. For the other ports, the output timings are the same as with the actual MCUs.

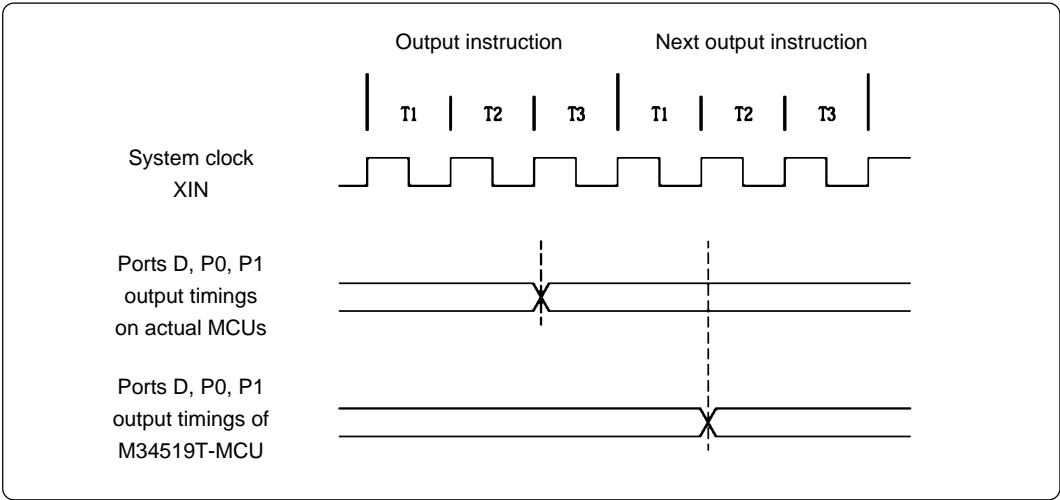


Figure 4.2 Ports D, P0 and P1 output timings

(3) Port I/O Characteristics

With the M34519T-MCU, port I/O characteristics are different from actual MCUs because there are emulation circuits in ports P00--P03, P10--P13 and D0--D5. Table 4.2 lists port I/O characteristics of the M34519T-MCU.

Table 4.2 Emulation port I/O characteristics

Port		Device	Item	Condition	Min.	Standard	Max.	Remarks
P0, P1, D0--D5	Input	74HC245	V_{IH}	VCC = 2.0 V	1.50 V	-	-	
				VCC = 4.5 V	3.15 V	-	-	
			V_{IL}	VCC = 2.0 V	-	-	0.50 V	
				VCC = 4.5 V	-	-	1.35 V	
	Output*1	74ALS641	V_{OL}	VCC = 4.5 V	-	0.35 V	0.5 V	
			I_{OL}	VCC = 5.0 V	-	-	48 mA	
		74VHC125	V_{OH}	VCC = 3.0 V	2.48 V	-	-	$I_{OH} = -4$ mA
				VCC = 4.5 V	3.94 V	-	-	$I_{OH} = -8$ mA
			V_{OL}	VCC = 3.0 V	-	-	0.44 V	$I_{OL} = 4$ mA
				VCC = 4.5 V	-	-	0.44 V	$I_{OL} = 8$ mA
P21, P22	Input/ Output	74HC4066	R_{ON}	VCC = 2.0 V	-	160 Ω	-	
				VCC = 4.5 V	-	96 Ω	200 Ω	
			ΔR_{ON}	VCC = 4.5 V	-	10 Ω	-	
			I_{OFF}	VCC = 12 V	-	-	± 1 μ A	
			I_Z	VCC = 12 V	-	-	± 1 μ A	

*1 According to the setting of the output method control register FRx, change its device for output in the emulation circuit.

- When N-ch open drain output chosen: 74ALS641
- When CMOS output chosen: 74VHC125

4.5 A-D Converter

For the M34519T-MCU, its voltage is fixed at 3 V or 5 V. Therefore, because of the difference of voltage, the results of its A/D conversions are slightly different from the theoretical values. And, some characteristics are different from those of actual MCUs, because a flat cable and pitch converter board and other devices are used between the evaluation MCU and target system.

4.6 System Clock

Depending on the supply voltage and operation mode, use one of the following frequencies listed in Table 4.3.

Table 4.3 M34519T-MCU operating frequencies

Voltage	Mode	Frequency
5 V	Divide-by-8	6.0 MHz or less
	Divide-by-4	
	Divide-by-2	
	Through	
3 V	Divide-by-8	6.0 MHz or less
	Divide-by-4	
	Divide-by-2	
	Through	4.4 MHz or less

To change a clock frequency, attach the necessary parts to the included oscillator circuit board OSC-2.

For details about the oscillation circuit constant, consult your oscillator manufacturer.

4.7 Real-time Capability of the Timer

The M34519T-MCU has its internal clock operating even during emulation, so that the timer values keep changing.

Examples: (1) When single-stepping the program
(2) When registers or internal RAM are referenced or modified

4.8 Pullup Transistor Control

Because the M34519T-MCU has an emulation circuit present in ports P0 and P1, you cannot use the MCU's internal pullup transistors. Therefore, the M34519T-MCU controls on/off of external pullup resistors by decoding the pullup control register transfer instructions (TPU0A and TPU1A).

The M34519T-MCU contains 150kΩ pullup resistors for use with the 4518, 4519, 4583 and 4584 Groups. If these pullup resistors need to be changed, replace the RA5 resistor array.

4.9 Program Execution (G, GB)

The PC4504 and M34519T-MCU's hardware is subject to the following restrictions with respect to the operation of the program execution commands (G and GB).

(1) Continuous description of instructions

Hardware breakpoints set in a continuous description of instructions following one after another do not cause a break to occur in the continuous description of instructions. A break occurs only after fetching the address where the continuous description of instructions is discontinued. (See Program example 4.3.)

However, a break does occur even in a continuous description of instructions when an external trigger break or forced break is encountered. For execution to be resumed in this case, you need to make sure that the execution start address is next to the continuous description of instructions. (See Program example 4.4.)

Program example 4.3

```
                LA    0
POINT:          LA    1          ; Continuous description of instructions
                LA    2
POINT+2:        XAM  3
```

If a break is set at POINT, execution is halted immediately before the XAM instruction at address POINT+2.

Program example 4.4

```
                LA    0
POINT:          LA    1          ; Continuous description of instructions
POINT+1:        LA    2
POINT+2:        XAM  3
```

If a forced or external trigger break is applied at POINT, execution is halted at POINT +1. When resuming program execution after the break, make sure that the start address is at POINT+2, an address immediately after the continuous description of instructions is discontinued.

(2) Skip instructions (e.g. SNZP, INY, DEY, SZB, SEAM, SZC and RTS)

In cases when a skip instruction skips the next instruction, a breakpoint set in the skipped instruction does not cause execution to halt. (See Program examples 4.5 and 4.6.)

Program example 4.5

```
                LXY   0,0
                SZD
POINT:          B     jmp_adr    ; Skips when D(0)=0
POINTA:        TAM   0
                •
                •
```

If a breakpoint is set at address POINT, the program stops before executing the instruction at POINT when D(0)=1, but does not stop running when D(0)=0 because the instruction at POINT is skipped. To stop the program immediately after executing a skip instruction, be sure to set a breakpoint at both POINT and POINT_A.

Program example 4.6

```
                RC    0,0
                INY
POINT:          TABP          ; Skips when D(0)=0
                LA    0
                •
                •
```

If a break with pass count is set at address POINT, the count is taken and execution is halted only when the instruction at address POINT is executed.

4.10 External Trigger Signal

(1) External trigger signal input timing

The latch timing of the external trigger signal is shown in Figure 4.3.

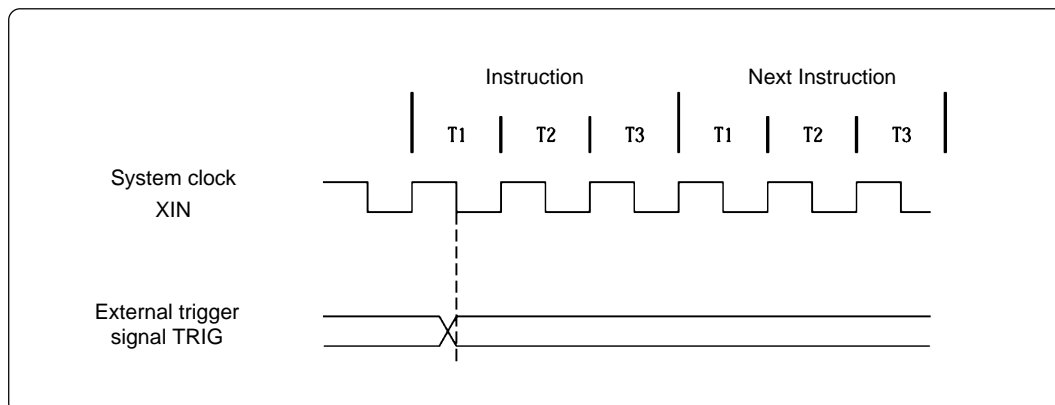


Figure 4.3 Latch timing of the external trigger signal

(2) External trigger signal input characteristics

Trigger breaks work according to the conditions (leading edge/trailing edge) of signals input from the external trigger cable. External trigger signals of trace points and break points use the same signals. The input characteristics of external trigger signals are shown in Table 4.4 below. See the table before using external trigger signals.

Table 4.4 External trigger signal input characteristics

Item	Symbol	Voltage	Min.	Max.
H-level voltage	VIH	VCC = 2.0 V	1.5 V	-
		VCC = 4.5 V	3.15 V	-
L-level voltage	VIL	VCC = 2.0 V	-	0.5 V
		VCC = 4.5 V	-	1.35 V

4.11 Other Precautions

With the M34519T-MCU, you cannot evaluate systems that use some functions as described below. In such a case, therefore, the system needs to be evaluated using an evaluation-purpose MCU (OTP version).

- (1) Because an emulation circuit exists in the RESET pin, systems that use RESET output cannot be evaluated.
- (2) Because the M34519T-MCU has its power supply voltage fixed at 3 V or 5 V, systems that use a power-down detect function cannot be evaluated. Therefore, results of A-D conversions may be different from expected values.
- (3) Power-on reset operation cannot be verified.
- (4) Because the M34519T-MCU is clocked by the system clock on the board, its clock source cannot be changed to an on-chip oscillator, CR or crystal oscillator. When using an emulator, do not use the CMCK, CRCK and CYCK instructions in a program.
- (5) With the M34519T-MCU, you cannot use the SRST instruction. When it is used, it will be executed as a NOP instruction.

Chapter 5. Connection Circuit Diagrams

5.1 Connection Circuit Diagrams

Figures 5.1 and 5.2 show the connection circuit diagrams of the M34519T-MCU. These circuit diagrams depict the M34519T-MCU connection centering on circuits connected to the target system. Emulator control blocks and other similar circuits that are not connected to the target system are omitted in this diagram.

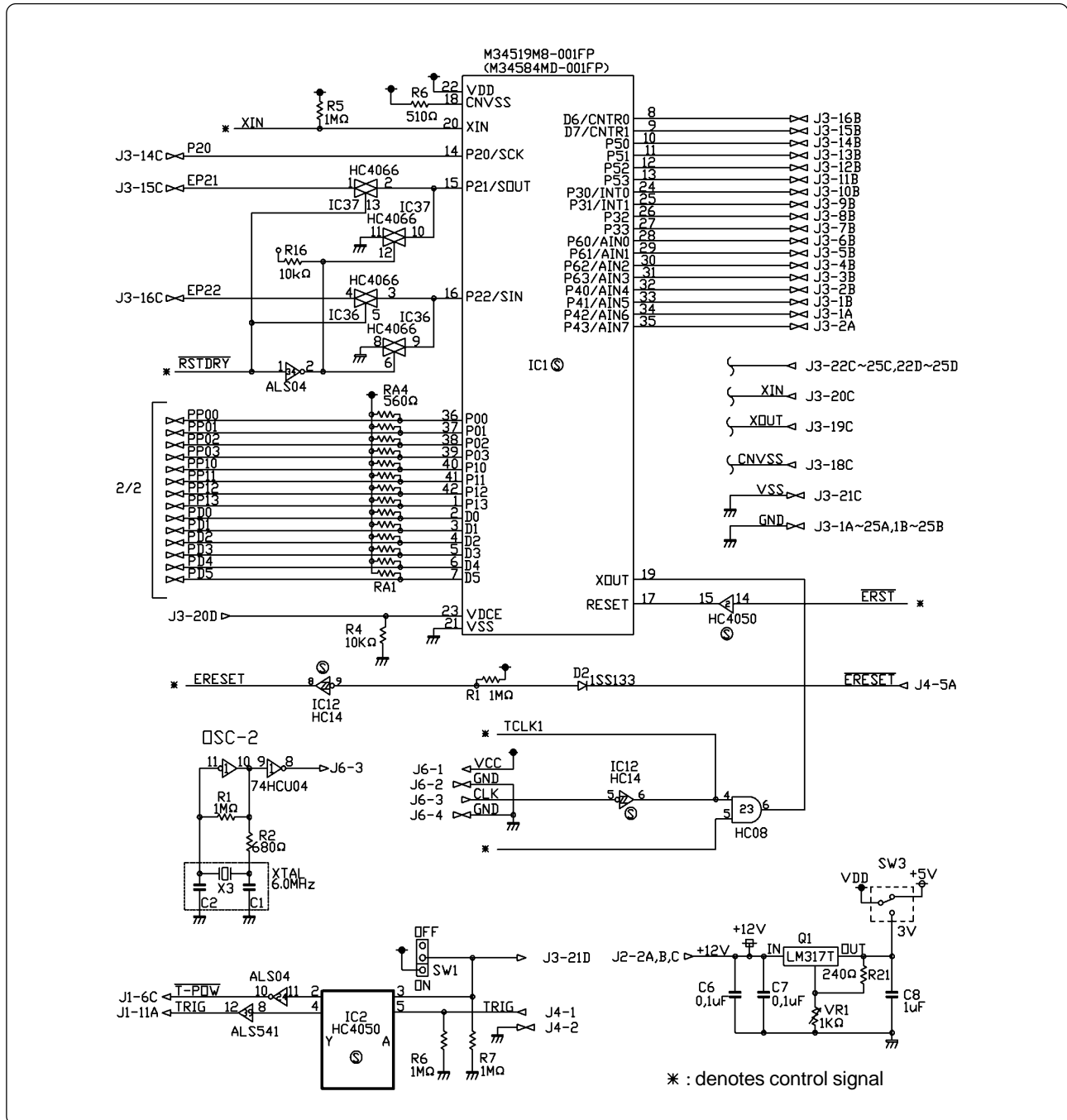


Figure 5.1 Connection circuit diagram (1/2)

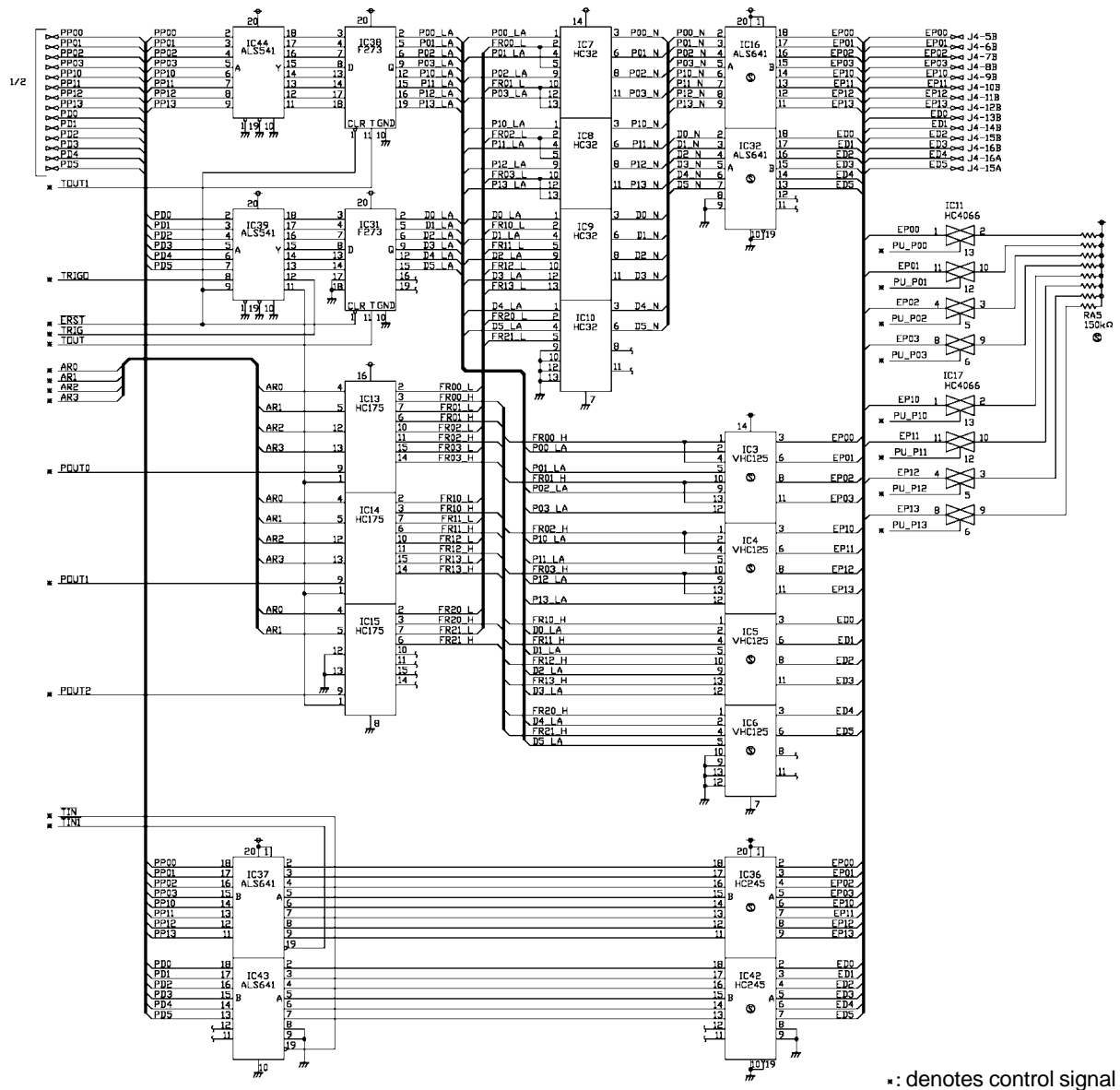


Figure 5.2 Connection circuit diagram (2/2)

Chapter 6. Pitch Converter Board External Dimensions

6.1 M34513T-PTCA

Figure 6.1 shows external dimensions of the M34513T-PTCA.

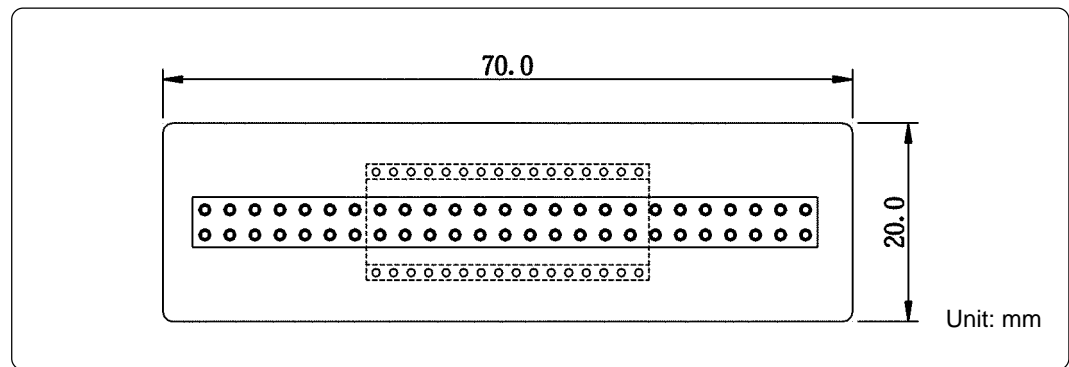


Figure 6.1 External dimensions of the M34513T-PTCA

6.2 M34513T-PTCB

Figure 6.2 shows external dimensions of the M34513T-PTCB.

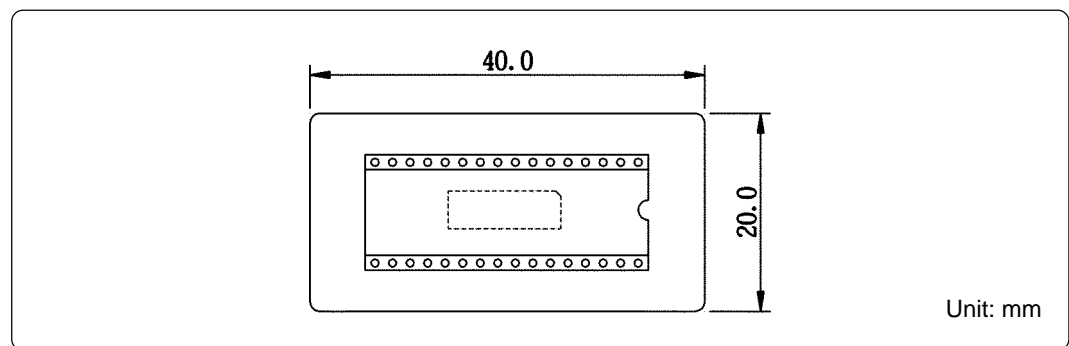


Figure 6.2 External dimensions of the M34513T-PTCB

6.3 M34513T-PTCC

Figure 6.3 shows external dimensions of the M34513T-PTCC.

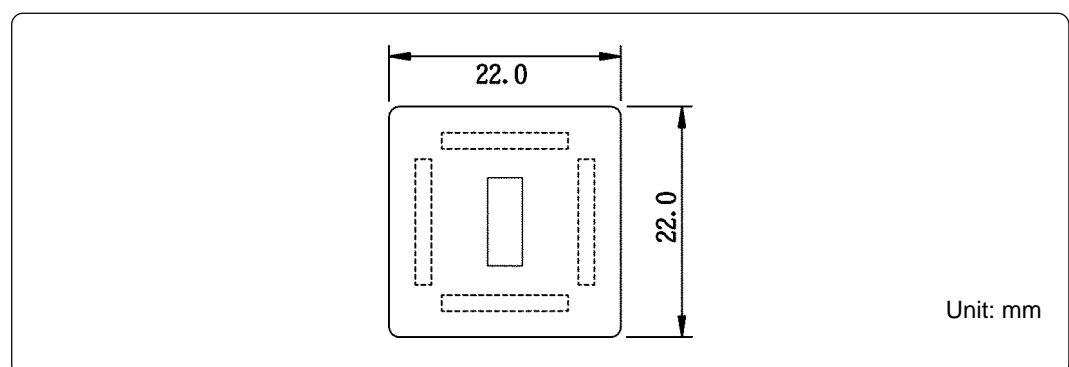


Figure 6.3 External dimensions of the M34513T-PTCC

MEMO

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 twelve months 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 twelve months 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

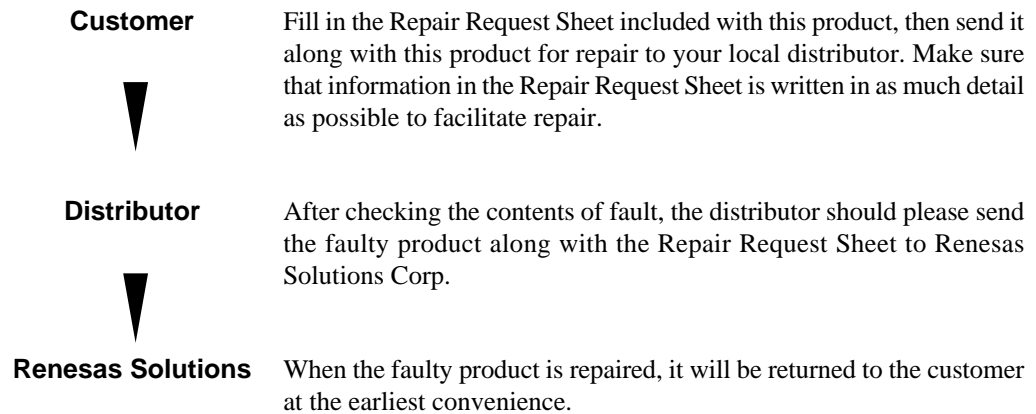
When a period of twelve months elapses after the model was dropped from production, repairing products of the model may become impossible.

(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 M34519T-MCU is found faulty, follow the procedure below to send your product for repair.



CAUTION

Note on Transporting the Product:



- When sending your product for repair, use the packing box and cushion material supplied with the product 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 product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

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Rev.2.00
July 1, 2004
REJ10J0071-0200Z

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REJ10J0071-0200Z