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M34502T-MCU

User's Manual

MCU Board for PC4504 Emulator System

Renesas Electronics
www.renesas.com

Rev.2.00   2004.07

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\SUPPORT\Product-name\SUPPORT.TXT

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Contents

Preface

This user's manual describes the specifications of the M34502T-MCU emulator board for Renesas 4501, 4502, 4506, 4507 and 4580 Groups of 4-bit single-chip MCUs. The M34502T-MCU is an MCU board for the PC4504 system used by installing on the PC4504 emulator main unit. For emulator main unit PC4504 and emulator debugger M3T-PD45, refer to each user's 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.

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

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.

• Use caution when handling the main unit. Be careful not to apply a mechanical shock.

• Do not pull the emulator by the probe (60-wire half-pitch cable or 26-wire normal-pitch cable).

• 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 an Actual MCU and the Emulator:

- Emulator operation differs from emulation of a mask MCU, as listed below. For details refer to "5. Precautions to Be Taken When Debugging".

  - (1) Reset condition
  - (2) Initial values of internal resource data at power-on
  - (3) Internal ROM and RAM capacities, etc.
  - (4) Electrical characteristics
  - (5) Operation in the RAM backup mode
  - (6) Operation of the watchdog timer function
  - (7) Port I/O Timing

- Therefore, always be sure to evaluate your system with an evaluation MCU (OTP version). Also, be sure to perform board-mounted evaluation with an ES (Engineering 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 specification is +3.0 V or +5.0 V. Therefore the target's supply voltage should be in the range of +3.0 V ±10% or +5.0 V ±10%.

Notes on Connecting the Target System:

- When connecting the emulator probe, be careful to the wrong connection.

- When connecting the emulator probe, be careful to a warp of the cable. The warp may cause breaking the wire.

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2. Handling Precautions

When using the M34502T-MCU board, pay attention to the following:

(1) About the emulator

To use the M34502T-MCU board, install it on the PC4504 emulator main unit.

(2) About the 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. For details on how to install and remove the MCU board, see "Chapter 2. Setup" in the PC4504 System User's Manual.

(3) Emulator debugger (M3T-PD45)

When using the M34502T-MCU board to debug your program, you need emulator debugger M3T-PD45 (sold separately). Be sure to use the data file for 4501, 4502 or 4580 Group included with emulator debugger M3T-PD45.

(4) Registers that can be operated from M3T-PD45

Tables 2.1 and 2.2 list the registers that can be operated from M3T-PD45.

Table 2.1 Registers that can be operated for 4501, 4502, 4506 and 4507 Group MCUs

Register	Reference	Modification	Register	Reference	Modification
PC	Yes	Yes	W1	Yes	Yes
CY	Yes	Yes	W2	Yes	Yes
A	Yes	Yes	W6	Yes	Yes
B	Yes	Yes	Q1	Yes	Yes
X	Yes	Yes	K0	Yes	Yes
Y	Yes	Yes	K1	Yes	Yes
Z	Yes	Yes	K2	Yes	Yes
D	Yes	Yes	PU0	-	Yes
E	Yes	Yes	PU1	-	Yes
SP	Yes	-	PU2	-	Yes
V1	Yes	Yes	MR	Yes	Yes
V2	Yes	Yes	R1	-	Yes
I1	Yes	Yes	R2	-	Yes

Table 2.2 Registers that can be operated for 4580 Group MCUs

Register	Reference	Modification	Register	Reference	Modification
PC	Yes	Yes	W2	Yes	Yes
CY	Yes	Yes	W6	Yes	Yes
A	Yes	Yes	Q3	Yes	Yes
B	Yes	Yes	Q4	Yes	Yes
X	Yes	Yes	K0	Yes	Yes
Y	Yes	Yes	K1	Yes	Yes
Z	Yes	Yes	K2	Yes	Yes
D	Yes	Yes	PU0	-	Yes
E	Yes	Yes	PU1	-	Yes
SP	Yes	-	PU2	-	Yes
V1	Yes	Yes	MR	Yes	Yes
V2	Yes	Yes	R1	-	Yes
I1	Yes	Yes	R2	-	Yes
W1	Yes	Yes			

3. Contents of the Package

3.1 Package Components of the M34502T-MCU

Table 3.1 shows the contents of the M34502T-MCU package. When unpacking your M34502T-MCU package, check to see that all of these components are included.

Table 3.1 Contents of the M34502T-MCU

Item	Product name	Quantity
1	M34502T-MCU	1
2	60-wire half-pitch cable (40 cm)	1
3	26-wire normal-pitch cable (10 cm)	1
4	2-wire cable for external trigger signal (50 cm)	1
5	PCA4029 pitch converter board	1
6	OSC-2 oscillator circuit board (J1 connector mounted)	1
7	M34501T-PTC pitch converter board	1
8	M34502T-MCU user's manual (this manual)	1

*1 The M34502T-MCU has an oscillator circuit board OSC-2 (for 4.19 MHz) that is incorporated when shipped from the factory. In addition, it comes with an oscillator circuit board OSC-2, with only a connector J1 mounted.

*2 Keep the packaging carton and cushion material of the M34502T-MCU to transport it for repair or for other purposes in the future.

*3 If you find any item missing or faulty, or any suggestion, contact your local distributor.

3.2 Other Necessary Products

To bring forward programs development on the 4501, 4502, 4506, 4507 and 4580 Group of 4-bit MCUs, the products given below are necessary in addition to those contained in the package above. Get them separately to be ready when necessary.

    (1) Emulator main unit: PC4504

    (2) Emulator debugger: M3T-PD45

    (3) Programming adapter: MS4238-20F
                               (for serial programming 4501, 4506 and 4580 Group MCUs)
                               MS4502-24F
                               (for serial programming 4502 and 4507 Group MCUs)

    (4) Serial programmer: MSP-II or EFP-I

The programming adapters and the serial programmers listed above are products of Suisei Electronics System Co., Ltd. For details on products, contact Suisei Electronics System Co., Ltd.

<p align="center">http://www.suisei.co.jp/index_e.htm</p>

MEMO

4. M34502T-MCU

4.1 Outline

By using with the PC4504 emulator main unit, the M34502T-MCU can make up an emulator system which can be operated by a personal computer. Figure 4.1 shows the development support system configuration for 4502 and 4507 Group MCUs. And Figure 4.2 shows the development support system configuration for 4501, 4506 and 4580 Groups.
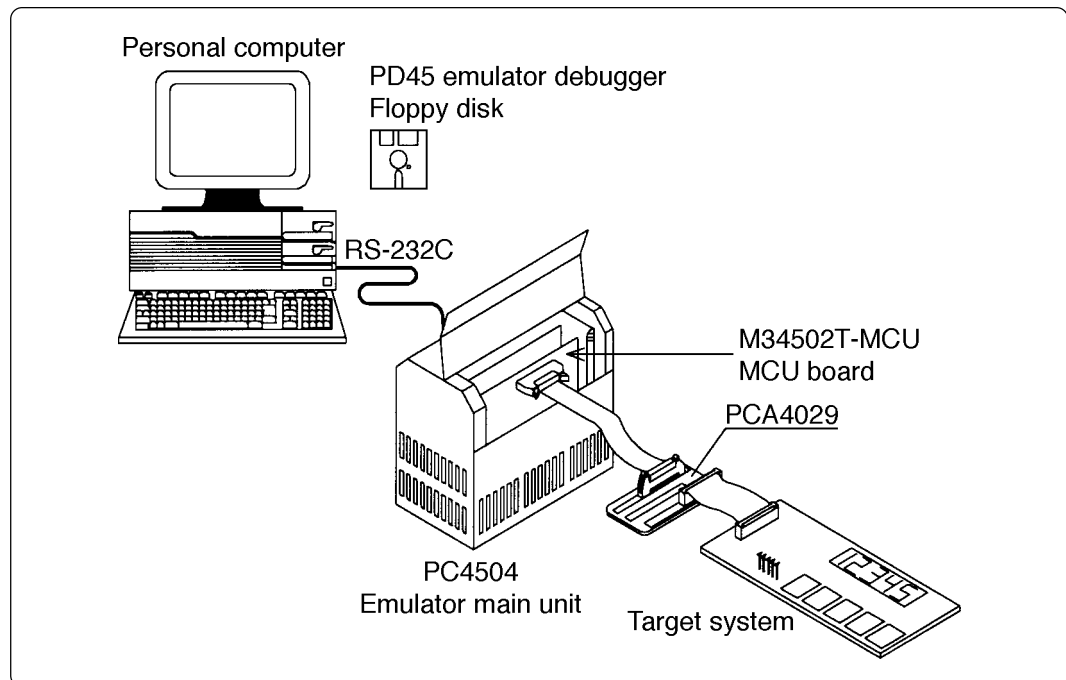
Figure 4.1 Development support system configuration for 4502 and 4507 Group MCUs
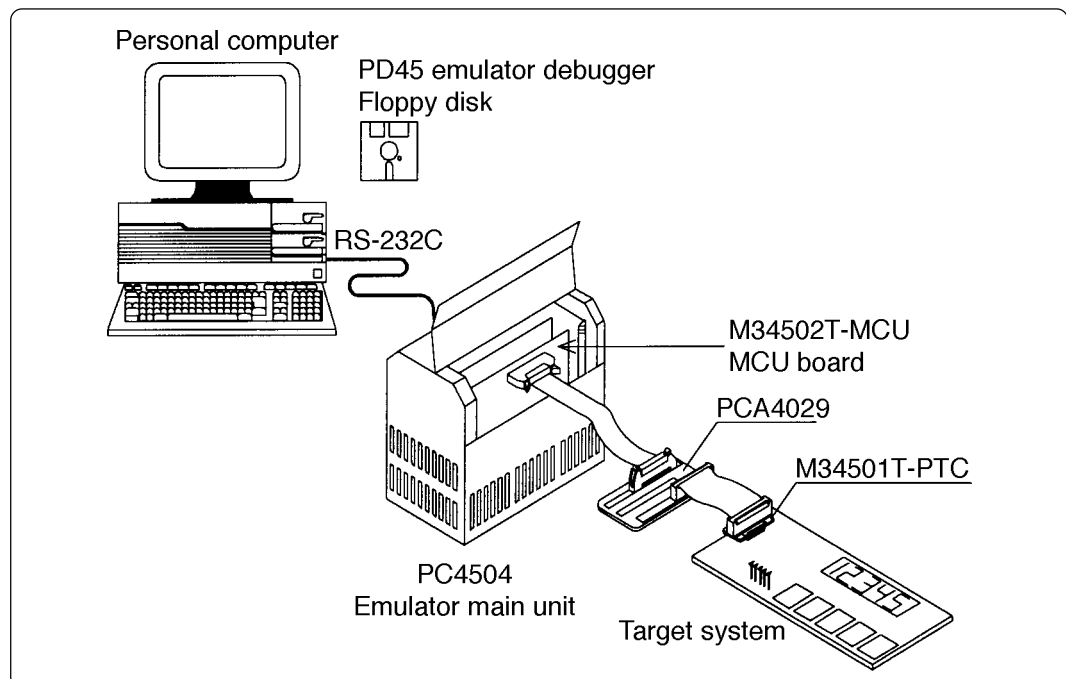
Figure 4.2 Development support system configuration for 4501, 4506 and 4580 Group MCUs

*1 Use the M34501T-PTC pitch converter board for 20SDIP.

4.2 Specifications

Table 4.1 lists specifications of the M34502T-MCU.

Table 4.1 M34502T-MCU specifications

Applicable MCUs	4501 Group			
	4502 Group			
	4506 Group			
	4507 Group			
	4580 Group			
Evaluation MCU	M34502E4FP (mounted)			
Maximum operating clock frequency	System clock: 4.19 MHz (with OSC-2 for 4.19 MHz)[1]			
	3 V	Default mode	4.4 MHz	
		Low-speed mode		
		Medium-speed mode	3.0 MHz	
		High-speed mode	1.5 MHz	
	5 V	Default mode	4.4 MHz	
		Low-speed mode		
		Medium-speed mode		
		High-speed mode		
Target system voltage	3 V or 5 V			
Power supply	Supplied by the PC4504's internal power supply (+5 V, +12 V)			
Port emulation	Port	Output type	Direction	Device used
	D_0 - D_5	N-channel open drain	Input/output	Input: 74HC4050 Output: 74LS06
	$P0_0$ - $P0_3$		Input/output	
	$P1_0$ - $P1_3$		Input/output	
	$P2_0$, $P2_1$	-	Input/output	Input/output: 74HC4066
Board dimensions	233 (D) x 135 (W) x 1.6 (H) mm			
Operating temperature	5 to 35°C (no dew)			
Product configuration	• M34502T-MCU • 60-wire half-pitch cable • 26-wire normal-pitch cable • External trigger cable • PCA4029 • OSC-2 (for changing frequencies) • M34501T-PTC			

[1] The M34502T-MCU has an oscillator circuit board OSC-2 (for 4.19 MHz) that is incorporated when shipped from the factory. In addition, it comes with an oscillator circuit board OSC-2, with only a connector J1 mounted.

And the M34502T-MCU operates in the default mode (instruction-clock: $f(X_{IN})/8$) immediately after a RESET is released.

4.3 Switches

Figure 4.3 shows the positions of switches of the M34502T-MCU. Table 4.2 lists the functions of the switches and their factory-settings.
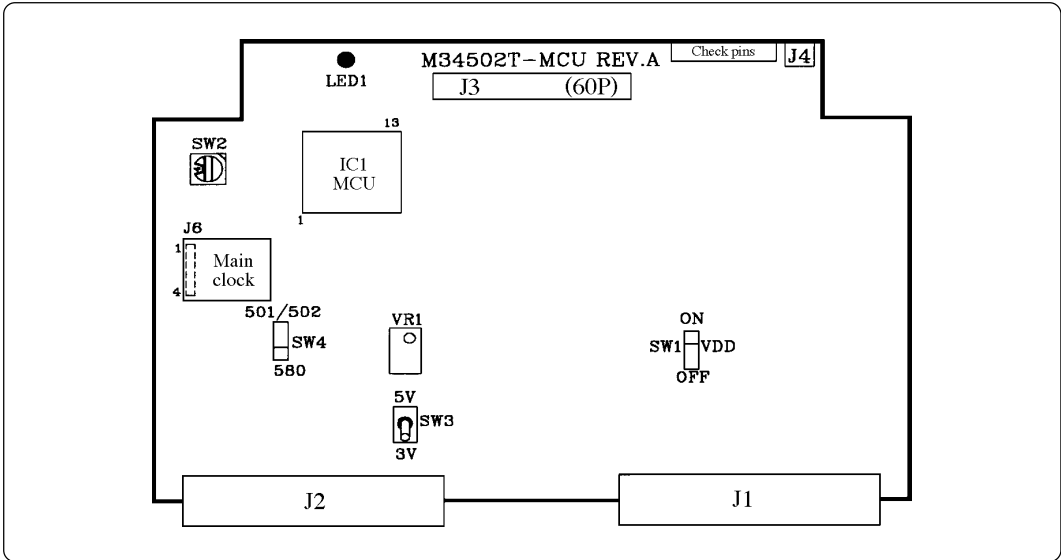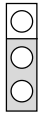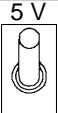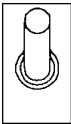
Figure 4.3 Positions of switches

Table 4.2 Functions of switches

Switch	Label	Setting	Description	Factory-setting
SW1	OFF	ON ⬜ OFF	Does not output the V_{DD} of the M34502T-MCU to the target system.	OFF
	ON	ON ⬜ OFF	Outputs the V_{DD} of the M34502T-MCU to the target system.	
SW2	ROMSIZE		Set the MCU's ROM size. • Set "2" for M2 • Set "4" for M4	Set to "4"
SW3	5 V	5 V ⬜ 3 V	Operates the evaluation MCU on the M34502T-MCU at +5 V.	5 V
	3 V	5 V ⬜ 3 V	Operates the evaluation MCU on the M34502T-MCU at +3 V.	
SW4	501/502	501/502 ⬜ 580	The M34502T-MCU operates for 4501, 4502, 4506 and 4507 Groups.	501/502
	580	501/502 ⬜ 580	The M34502T-MCU operates for 4580 Group.	

4.4 Check Pins

The M34502T-MCU has check pins listed in Table 4.3.

Table 4.3 Check pins

Pins	Function
V_{DD}	Outputs 3 V or 5 V by MCU voltage according to the setting of SW3.
GND	Ground
X_{IN}	Outputs an instruction clock (depending on the operating mode) of the MCU.
$\overline{RUN}$/STOP	"L" when running user program, "H" when stopping execution.
WRST	"H" when decoding WRST instruction, possible to monitor the clear cycle of the watchdog timer flag by a waveform.

4.5 Connectors

Table 4.4 lists the functions of the connectors, and Figure 4.4 shows the positions of connectors.

Table 4.4 Connectors

Connector	Function
J1	Connects the evaluation MCU bus.
J2	Connects the monitor CPU bus.
J3	Connects the target system (60-pin).
J4	Connects the external trigger signal (2-pin).
J6	Connects the oscillator circuit board (4-pin).
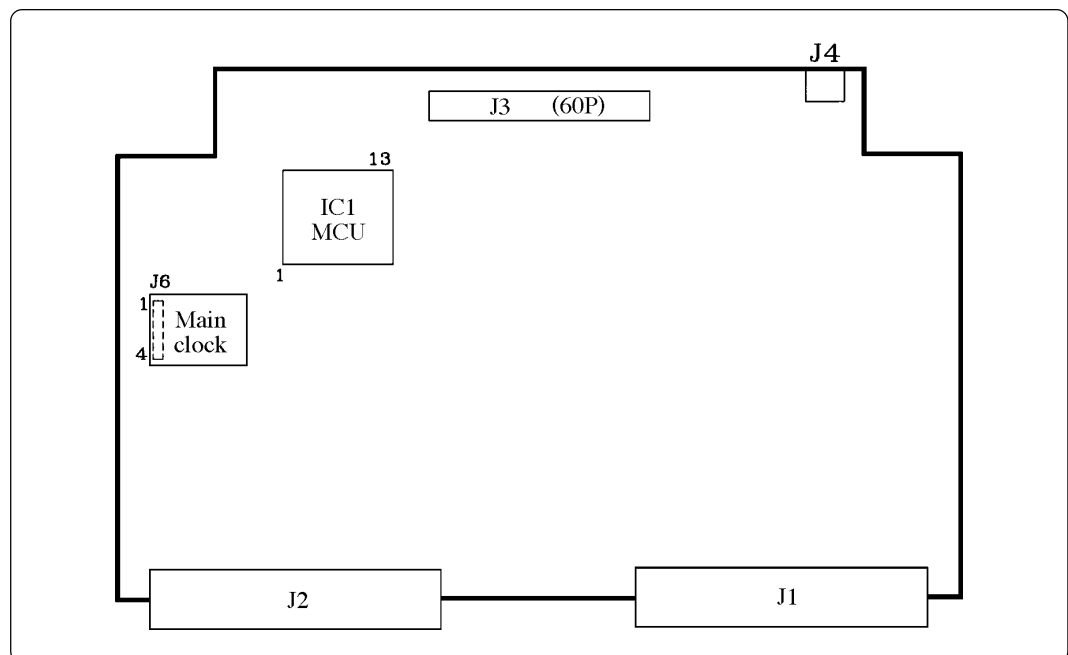
Figure 4.4 Positions of the connectors

(1) Connector J3

Table 4.5 lists the pin assignments of the 60-wire half-pitch connector (J3) for connecting the PCA4029. And Figure 4.5 shows the connector J3 pin layout.

Table 4.5 Pin assignments of the 60-wire half-pitch connector (J3) for connecting the PCA4029

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	EV_{DD}	O	1	$P3_0/A_{IN2}$	I/O
2	GND		2	GND		2	V_{SS}		2	$P3_1/A_{IN3}$	I/O
3	GND		3	GND		3	X_{IN}	-	3	$EP0_0$	I/O
4	GND		4	GND		4	X_{OUT}	-	4	$EP0_1$	I/O
5	GND		5	GND		5	CNV_{SS}	-	5	$EP0_2$	I/O
6	GND		6	GND		6	$\overline{ERESET}$	I	6	$EP0_3$	I/O
7	GND		7	GND		7	$EP2_1/A_{IN1}$	I/O	7	$EP1_0$	I/O
8	GND		8	GND		8	$EP2_0/A_{IN0}$	I/O	8	$EP1_1$	I/O
9	GND		9	GND		9	ED_5	I/O	9	$EP1_2/CNTR$	I/O
10	GND		10	GND		10	ED_4	I/O	10	$EP1_3/INT$	I/O
11	GND		11	GND		11	ED_3	I/O	11	ED_0	I/O
12	GND		12	GND		12	ED_2	I/O	12	ED_1	I/O
13	GND		13	GND		13	NC	-	13	NC	-
14	GND		14	GND		14	NC	-	14	NC	-
15	GND		15	GND		15	NC	-	15	NC	-

In the I/O column "I" denotes "Input"; "O" denotes "Output"; "I/O" denotes "Input/output"; "-" denotes "Not connected".

J 3

15B 15A 14B ·············· 3A 2B 2A 1B 1A

15D 15C 14D ············· 3C 2D 2C 1D 1C
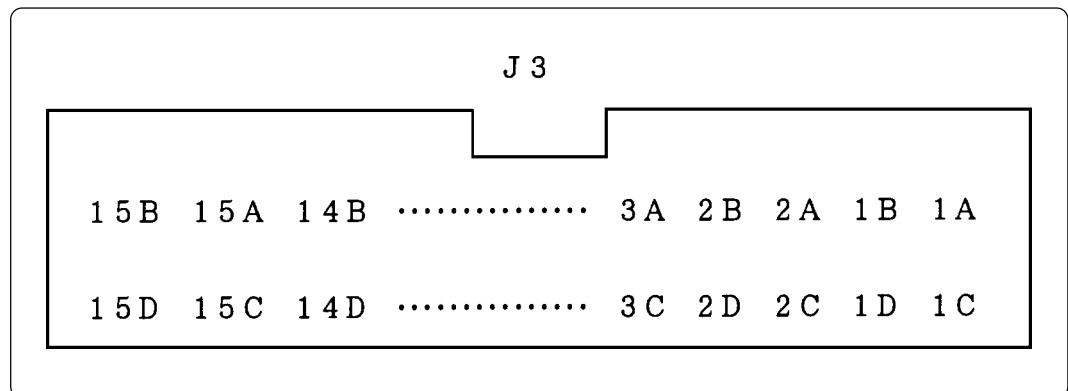
Figure 4.5 Connector J3 pin layout

(2) Connector J4

For the connector J4 for the external trigger signal, use the 2-wire external trigger signal cable included with your M34502T-MCU. Connect the black clip of the external trigger cable to GND, and use the white clip for an external trigger signal input. Use the external trigger signal as an external trigger break or an event input of the trace point by the external trigger. Table 4.6 lists the pin assignments of the connector J4.

Table 4.6 Pin assignments of the connector J4

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

(3) Connector J6

The connector J6 is a connector used to connect an oscillator circuit board OSC-2. Table 4.7 lists the pin assignments of the connector J6. Figure 4.6 shows the pin layout of the connector J6. For the 4.19MHz operation with the oscillator circuit board OSC-2, see Figure 4.7.

Table 4.7 Pin assignments of the connector J6

Pin No.	Signal	Function
1	Vcc	Power supply
2	GND	GND
3	CLK	Clock input
4	GND	GND
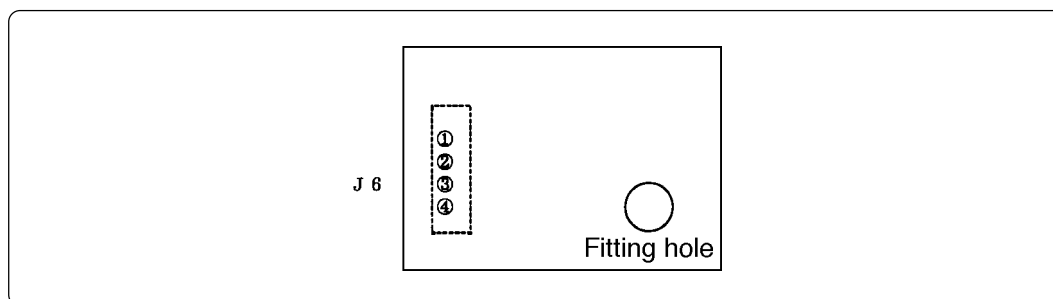
Figure 4.6 Pin layout of the connector J6
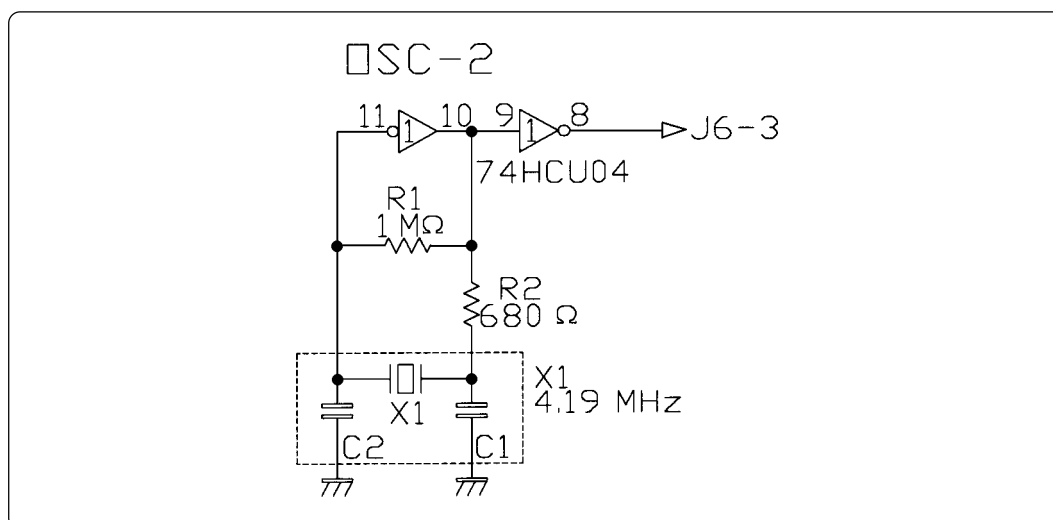
Figure 4.7 Circuit diagram of oscillator circuit board OSC-2 (4.19 MHz)

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4.6 Connecting to the Target System

(1) For 4502 and 4507 Groups

How to connect the M34502T-MCU to the target system when using for 4502 and 4507 Groups is shown below.

Make note of the fact that it is not possible to connect the M34502T-MCU directly to the foot pattern of the MCU package (24P2Q-A).

a. Connecting to 2.54-mm-pitch Dual-in-line Pins on the Target System

Use the 26-wire normal-pitch cable (included) to connect the 26-pin dual-in-line pins on the target system. The following products are required for connection to the target system.

- 60-wire half-pitch cable (40 cm)
- Pitch converter board PCA4029
- 26-wire normal-pitch cable (10 cm)

Figure 4.8 shows the M34502T-MCU board connected to the target system using the 26-wire normal-pitch cable. Table 4.8 lists the connector signal assignments of the 26-wire normal-pitch cable. And Figure 4.9 shows the pin layout of the 26-wire normal-pitch cable.
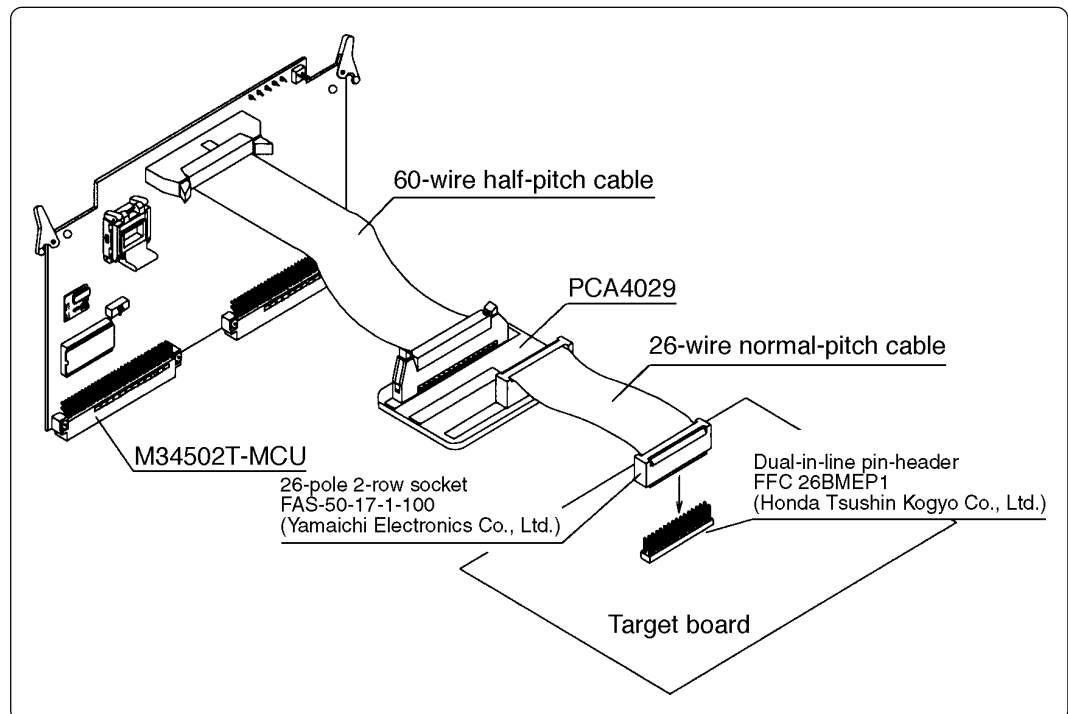
Figure 4.8 Connection to the target system using dual-in-line pins

Table 4.8 26-wire normal-pitch cable pin assignments

1	EV_{DD}*1	26	$P3_0/A_{IN2}$
2	V_{SS}	25	$P3_1/A_{IN3}$
3	NC (X_{IN}*2)	24	$EP0_0$
4	NC (X_{OUT})	23	$EP0_1$
5	NC (CNV_{SS})	22	$EP0_2$
6	$\overline{ERESET}$	21	$EP0_3$
7	$EP2_1/A_{IN1}$	20	$EP1_0$
8	$EP2_0/A_{IN0}$	19	$EP1_1$
9	ED_5	18	$EP1_2/CNTR$
10	ED_4	17	$EP1_3/INT$
11	ED_3	16	ED_0
12	ED_2	15	ED_1
13	NC	14	NC

*1 EV_{DD} does not input the power supply from the target system, but outputs it to the target system from the power circuit on the M34502T-MCU.

*2 X_{IN} is input from oscillator circuit board OSC-2 on the M34502T-MCU and cannot be input from the oscillator circuit on the target system.
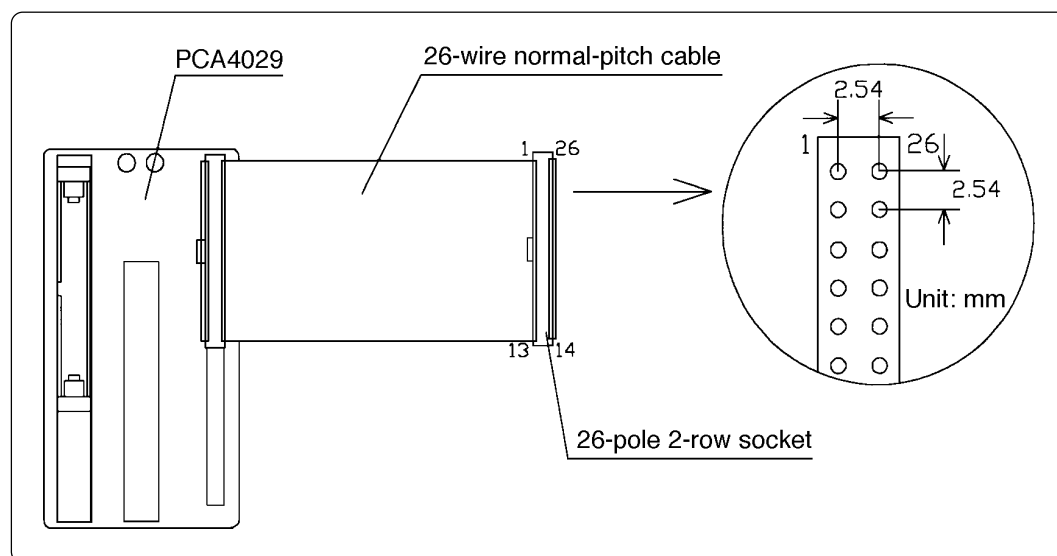
Figure 4.9 Pin layout of the 26-wire normal-pitch cable

(2) For 4501, 4506 and 4580 Groups

How to connect the M34502T-MCU to the target system when using for 4501, 4506 and 4580 Groups is shown below.

Make note of the fact that it is not possible to connect the M34502T-MCU directly to the foot pattern of the MCU package (20P2N-A).

a. Connecting to the IC Socket for 20-pin SDIP on the Target System

Attach the 26-wire normal-pitch cable (included) to pitch converter board M34501T-PTC to connect the M34501T-MCU board with the IC socket for 20-pin SDIP on the target system. Figure 4.10 shows the connection to the target system using the M34501T-PTC. And Figure 4.11 shows the pin assignments of the M34501T-PTC. The following products are required for connection to the target system.

- 60-wire half-pitch cable (40 cm)
- Pitch converter board PCA4029
- 26-wire normal-pitch cable (10 cm)
- Pitch converter board M34501T-PTC

Table 4.9 lists the connector signal assignments of pitch converter board M34501T-PTC. The pin assignments of the M34501T-PTC is the same as for the 20SDIP of the 4501 and 4506 Groups. When connecting pitch converter board M34501T-PTC, check the No. 1 pin positions of the cable and the connector.

To avoid damage to the emulator and target system, be careful of the connection.
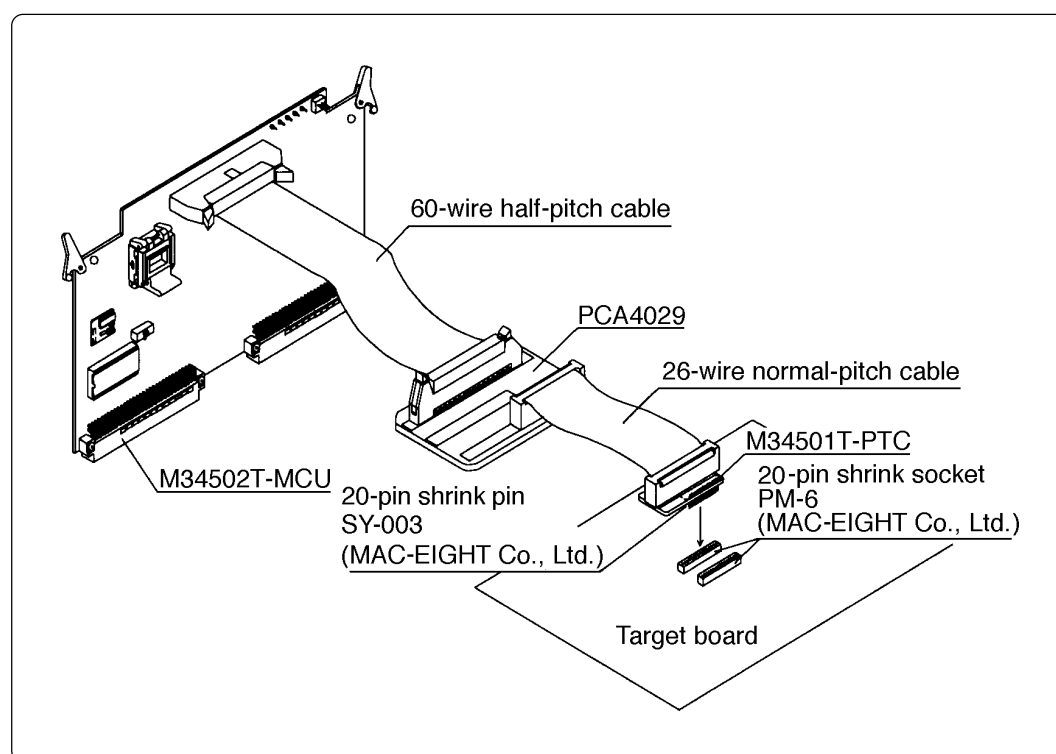
Figure 4.10 Connecting to an IC socket for 20-pin SDIP

Table 4.9 M34501T-PTC pin assignments

	M34501T-PTC J2		
1	EV_{DD}*1	20	$EP0_0$
2	V_{SS}	19	$EP0_1$
3	NC (X_{IN}*2)	18	$EP0_2$
4	NC (X_{OUT})	17	$EP0_3$
5	NC (CNV_{SS})	16	$EP1_0$
6	$\overline{ERESET}$	15	$EP1_1$
7	$EP2_1/A_{IN1}$	14	$EP1_2/CNTR$
8	$EP2_0/A_{IN0}$	13	$EP1_3/INT$
9	ED_3	12	ED_0
10	ED_2	11	ED_1

*1 EV_{DD} does not input the power supply from the target system, but outputs it to the target system from the power circuit on the M34502T-MCU.

*2 X_{IN} is input from oscillator circuit board OSC-2 on the M34502T-MCU and cannot be input from the oscillator circuit on the target system.
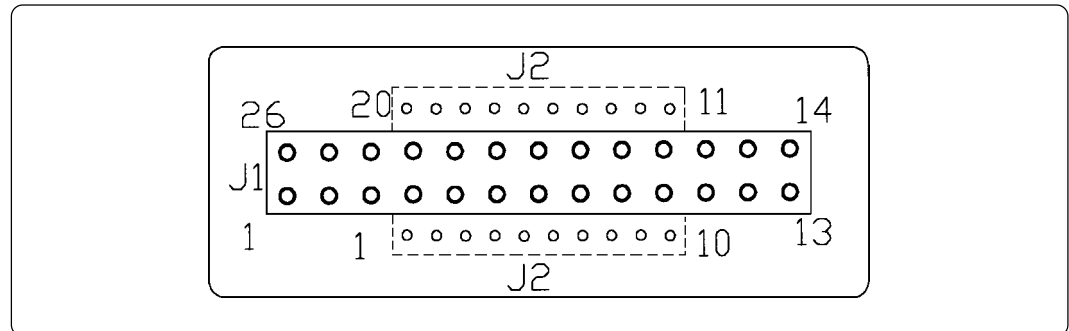
Figure 4.11 Pin layout of the M34501T-PTC

Some signals connected to the target system are emulated on the M34502T-MCU. For details, see "6. Connection Circuit Diagram of the M34502T-MCU".

(1) Pins connected directly to the target system (2 types, 3 lines)

- $P3_0$, $P3_1$*1
- V_{SS}

(2) Pins connected to the target system via emulation circuits and other devices. (6 types, 18 lines)

- $P0_0$ to $P0_3$
- $P1_0$ to $P1_3$
- $P2_0$, $P2_1$
- D_0 to D_5*2
- $\overline{RESET}$
- EV_{DD}*3

(3) Pins not connected to the target system (3 types, 3 lines)

- X_{IN}*4
- X_{OUT}
- CNV_{SS}

*1 For 4501, 4506 and 4580 Group MCUs, the ports $P3_0$ and $P3_1$ are not connected to the target system when the M34501T-PTC is mounted.

*2 For 4501, 4506 and 4580 Group MCUs, the ports D_4 and D_5 are not connected to the target system when the M34501T-PTC is mounted.

*3 EV_{DD} does not input the power supply from the target system, but outputs it to the target system from the power circuit on the M34502T-MCU. The output (ON/OFF) and the power supply (3 V/5 V) of EV_{DD} are changed by the switches SW1 and SW3 respectively.

*4 X_{IN} is input from oscillator circuit board OSC-2 on the M34502T-MCU and cannot be input from the oscillator circuit on the target system. To change the frequency of the system clock, use oscillator circuit board OSC-2 (included) with other necessary parts mounted.

4.7 LED

Figure 4.12 shows the LED layout of the M34502T-MCU. The LED lights in green when the power is supplied.
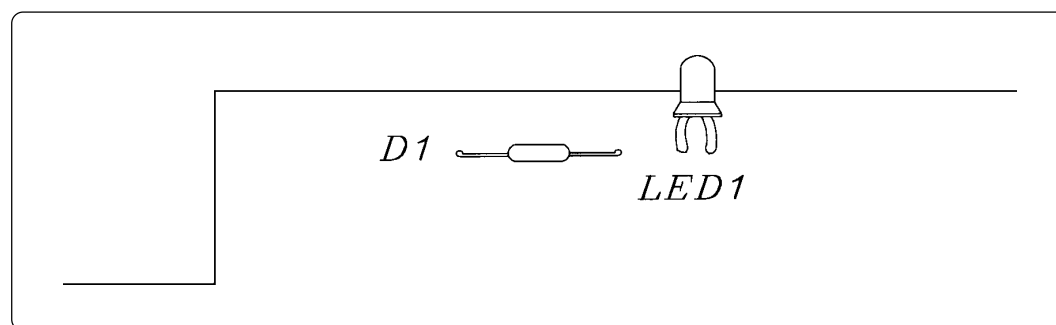
Figure 4.12 Layout of the LED

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5. Precautions to Be Taken When Debugging

5.1 Reset

The M34502T-MCU uses a 74AC14 for its $\overline{\text{RESET}}$ signal input buffer, so that its electrical characteristics differ from those of an actual MCU. Table 5.1 lists the $\overline{\text{RESET}}$ signal input characteristics of the M34502T-MCU.

Table 5.1 $\overline{\text{RESET}}$ signal input characteristics

Item	Symbol	Voltage (V_{CC})	Min.	Max.
H-level threshold voltage	V_P	3.0 V	-	2.2 V
		4.5 V	-	3.2 V
		5.5 V	-	3.9 V
L-level threshold voltage	V_N	3.0 V	0.5 V	-
		4.5 V	0.9 V	-
		5.5 V	1.1 V	-
Hysteresis voltage	V_H	3.0 V	0.3 V	1.2 V
		4.5 V	0.4 V	1.4 V
		5.5 V	0.5 V	1.6 V

5.2 System Clock

Depending on the supply voltage and operation modes, use one of the frequencies listed in Table 5.2.

Table 5.2 Operating frequencies of M34502T-MCU

Voltage	Mode	Frequency
3 V	Default	4.4 MHz or less
	Low-speed	
	Medium-speed	3.0 MHz or less
	High-speed	1.5 MHz or less
5 V	Default	4.4 MHz or less
	Low-speed	
	Medium-speed	
	High-speed	

To change this clock frequency to suit that of the target system, attach the necessary parts to oscillator circuit board OSC-2 (included).

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

5.3 Real-time Capability of Timer

The PC4504 and M34502T-MCU have their internal clock operating even during emulation, so that the timer values keep changing.

Example: (1) When single-stepping the program

           (2) When registers or internal RAM are referenced or modified

5.4 Watchdog Timer

The M34502T-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 M34502T-MCU outputs a signal whose waveform is shown below from the check pin TP5 during WRST instruction execution cycles. This signal allows you to check the initialization cycle of a watchdog timer.
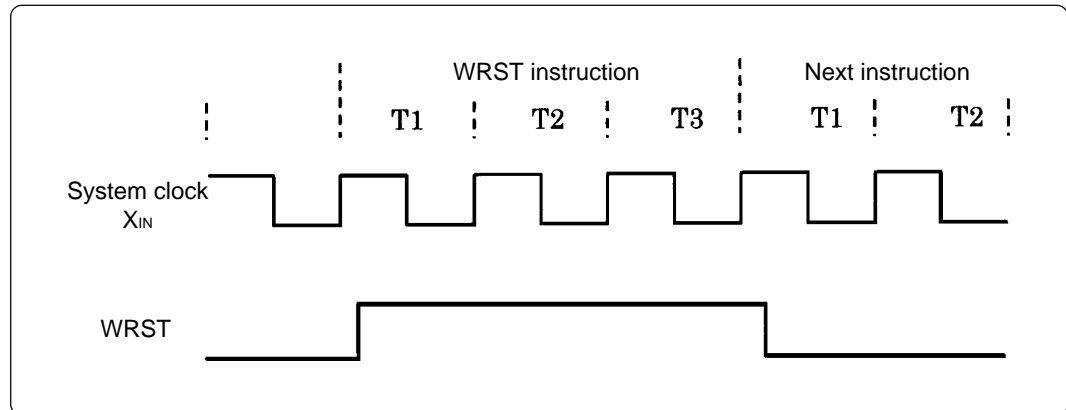
Figure 5.1 Waveform output from check pin TP5

5.5 Port I/O Timing

(1) Port input timing

Port input timings are the same as with each actual MCU.

(2) Port output timing

The output timings of the following ports are different from those of actual MCUs because of the emulation circuits configured with the ports of the M34502T-MCU.

• Ports D_0 to D_5
• Ports $P0_0$ to $P0_3$
• Ports $P1_0$ to $P1_3$

With actual MCUs, the changes occur at the beginning of the T3 state of an output instruction, while with the M34502T-MCU, the changes occur at the beginning of the T2 state of the next output instruction. Figure 5.2 shows the port output timings of actual MCUs and the M34502T-MCU. For the other ports, the output timings are the same as those of actual MCUs.
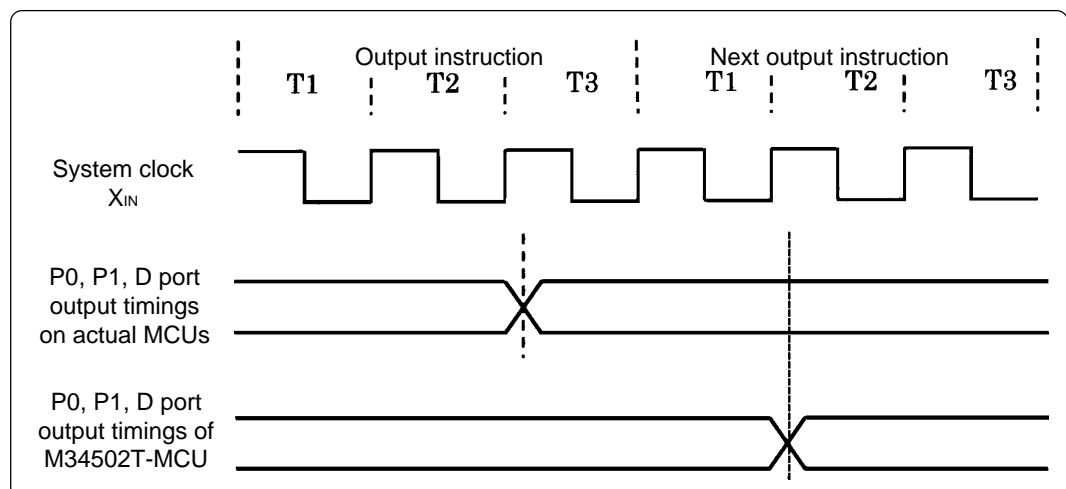
Figure 5.2 D, P0 and P1 port output timings

5.6 Port I/O Characteristics

With the M34502T-MCU, port I/O characteristics are different from those of actual MCUs because there is an emulation circuit in ports P0, P1, P2 and D_0 to D_5. Table 5.3 lists port I/O characteristics of the M34502T-MCU.

Table 5.3 Emulation port I/O characteristics

Port		Device	Item	Voltage (V_{CC})	Min.	Max.	Remarks
P0, P1	Input	74HC4050	V_{IH}	2.0 V	1.5 V	-	
				4.5 V	3.15 V	-	
			V_{IL}	2.0 V	-	0.5 V	
				4.5 V	-	1.35 V	
	Output	74LS06	I_{OH}	4.75 V	-	250 µA	V_{OH} = MAX
			I_{OL}		-	40 mA	
			V_{OL}		-	0.4 V	I_{OL} = 16 mA
					-	0.7 V	I_{OL} = MAX
P2	Input/ output	74HC4066	R_{ON}	2.0 V	160 Ω	-	$V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≤ 1 mA
				4.5 V	70 Ω	130 Ω	
					96 Ω	200 Ω	$V_{I/O}$ = V_{CC} or GND $I_{I/O}$ ≤ 1 mA
			△R_{ON}	4.5 V	10 Ω	-	$V_{I/O}$ = V_{CC} to GND $I_{I/O}$ ≤ 1 mA
D_5 - D_0	Input	74HC4050	V_{IH}	2.0 V	1.5 V	-	
				4.5 V	3.15 V	-	
			V_{IL}	2.0 V	-	0.5 V	
				4.5 V	-	1.35 V	
	Output	74LS06	I_{OH}	4.75 V	-	250 µA	V_{OH} = MAX
			I_{OL}		-	40 mA	
			V_{OL}		-	0.4 V	I_{OL} = 16 mA
					-	0.7 V	I_{OL} = MAX

5.7 Pullup Transistor

Since ports P_0, P_1, D_2 and D_3 contain emulation circuits, the pullup transistor in an MCU cannot be used.

For the M34502T-MCU, the pullup resistor of 51 kΩ is mounted. When it is necessary to change the pullup resistor, replace the resistance arrays of R3 and R4.

5.8 RAM Backup Mode

In the RAM backup mode, the M34502T-MCU operates differently from actual MCUs.

(1) On Port Output (Ports D, P0 and P1) in the RAM Backup Mode

With an actual MCU, the state of ports immediately before the RAM backup mode is retained, while with the M34502T-MCU, it is not retained. (a restriction of the M34502T-MCU)

With the M34502T-MCU, in the RAM backup mode, ports D, P0 and P1 are held HIGH, and when returned from the RAM backup mode they retain their previous state.

Therefore, to evaluate a system which needs ports D, P0 and P1 to be held LOW in the RAM backup mode, you need an evaluation MCU (OTP version).

(2) RAM Operation of the M34502T-MCU

Though the actual chip is placed in the RAM backup mode by executing a combination of "EPOF" and "POF" or "POF2" instructions, the M34502T-MCU is placed in the RAM backup mode by only either "POF" instruction or "POF2" instruction.

In the M34502T-MCU, the "EPOF" instruction does not have any effect.

Program example 5.1

```
RC                              Actual MCU
INY                     The RAM backup mode works.
EPOF
POF       — — — — — — — — — — — — — — — — — — — — — —
 •
 •                            M34502T-MCU
                        The RAM backup mode works.
```

Program example 5.2

```
RC                              Actual MCU
INY               The RAM backup mode does NOT work.
POF
 •        — — — — — — — — — — — — — — — — — — — — — —
 •
 •                            M34502T-MCU
                        The RAM backup mode works.
```
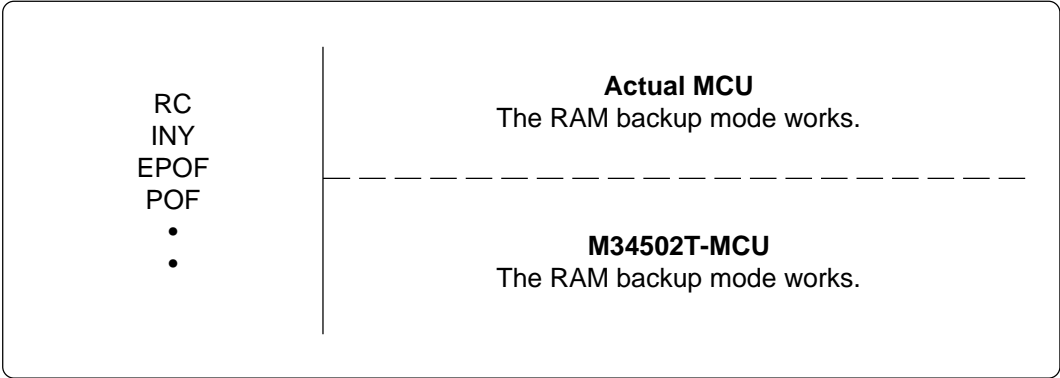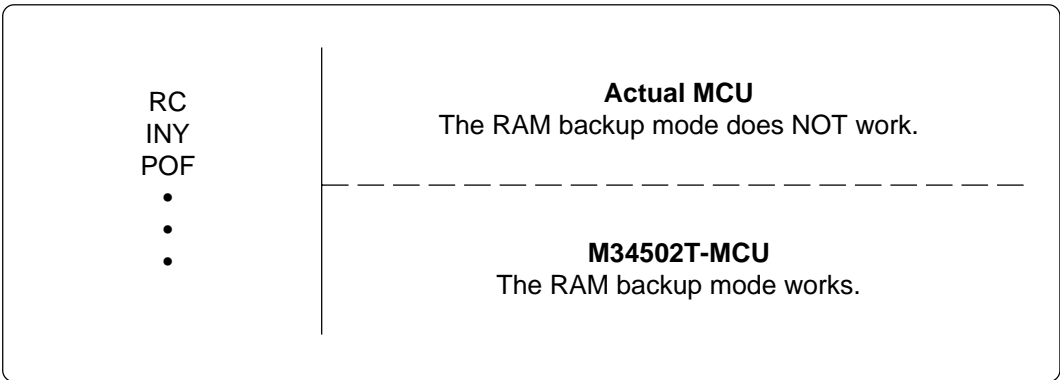
5.9 Program Execution (G, GB)

According to the specifications of the PC4504 and M34502T-MCU, there are following restrictions concerned to the operation of the program execution commands (G and GB commands).

(1) Continuous description of instructions

Hardware breakpoints set in a continuous description of instructions 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 5.3)

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 5.4)

Program example 5.3

```
            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 5.4

```
            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 instructions)

When a skip instruction skips the next instruction, a breakpoint set in the skipped instruction does not break. (See Program examples 5.5 and 5.6)

Program example 5.5

	RC			SC	
	SZC			SZC	
POINT:	TABP		POINT:	TABP	
POINTA:	TAM	0	POINTA:	TAM	0
	•			•	
	•			•	

A breakpoint set at address POINT causes execution to halt immediately before address POINTA in only the case of the instruction shown on the right side.

Program example 5.6

	RC		; Skip instructions
	INY		
POINT:	TABP		
	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.

5.10 External Trigger Signal

(1) External trigger signal input timing

The latch timing of the external trigger signal is shown in Figure 5.3.
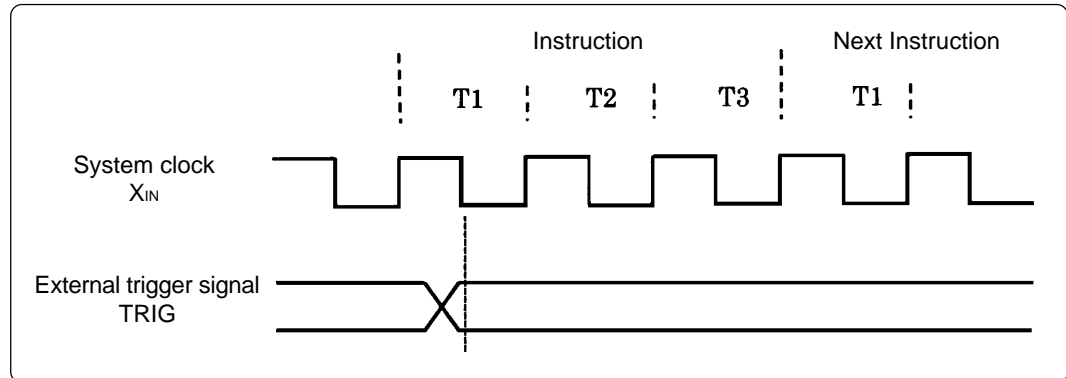

Figure 5.3 Latch timing of external trigger signal

(2) External trigger signal input characteristics

Trigger breaks work according to the condition (leading edge/trailing edge) of signals input from the external trace cable. The external trigger signals of the trace points and the external trigger signals of the break points use the same signals. The input characteristics of the external trigger signals are shown in Table 5.4 below. See the table before using external trigger signals.

Table 5.4 External trigger signal input characteristics

Item	Symbol	Voltage (V_{CC})	Max.	Min.
H-level voltage	V_{IH}	2.0 V	-	1.5 V
		4.5 V	-	3.15 V
L-level voltage	V_{IL}	2.0 V	0.5 V	-
		4.5 V	1.35 V	-

5.11 Other Precautions

With the M34502T-MCU if any of the following restrictions applies, it is necessary to evaluate the system by an evaluation MCU (OTP version).

(1) The system which uses $\overline{\text{RESET}}$ output cannot be evaluated.

(2) The system which uses low-power detection function cannot be evaluated.

(3) The operation cannot be checked by a power-on reset.

(4) After resetting, it is not possible to change to the ceramic oscillation or CR oscillation by starting up from the on-chip oscillator. After resetting, the system operates by the system clock of the M34502T-MCU.

(5) As the operating voltage of the M34502T-MCU is 3 V or 5 V, the results of the A-D conversion may differ from the theoretical values because of the difference with the voltage of the target system.

(6) With the M34502T-MCU, it is not possible to evaluate the system which uses the multi comparator function for 4580 Group.

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6. Connection Circuit Diagram of the M34502T-MCU

Figure 6.1 shows the connection circuit diagram of M34502T-MCU. This circuit diagram depicts the M34502T-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.
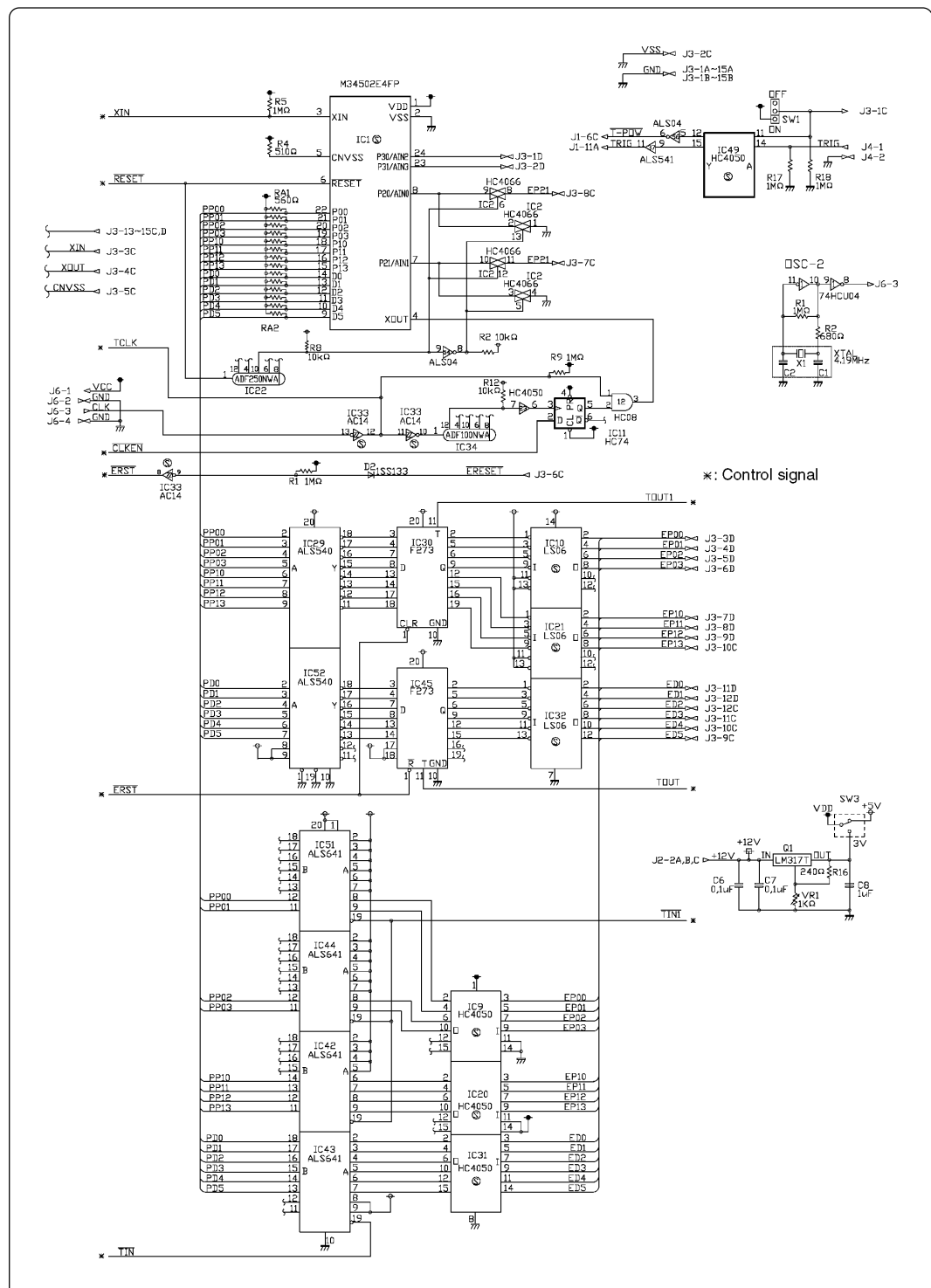

Figure 6.1 Connection circuit diagram of the M34502T-MCU

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7. External Dimensions of the Pitch Converter Board

7.1 M34501T-PTC

Figure 7.1 shows the external dimensions of the M34501T-PTC.
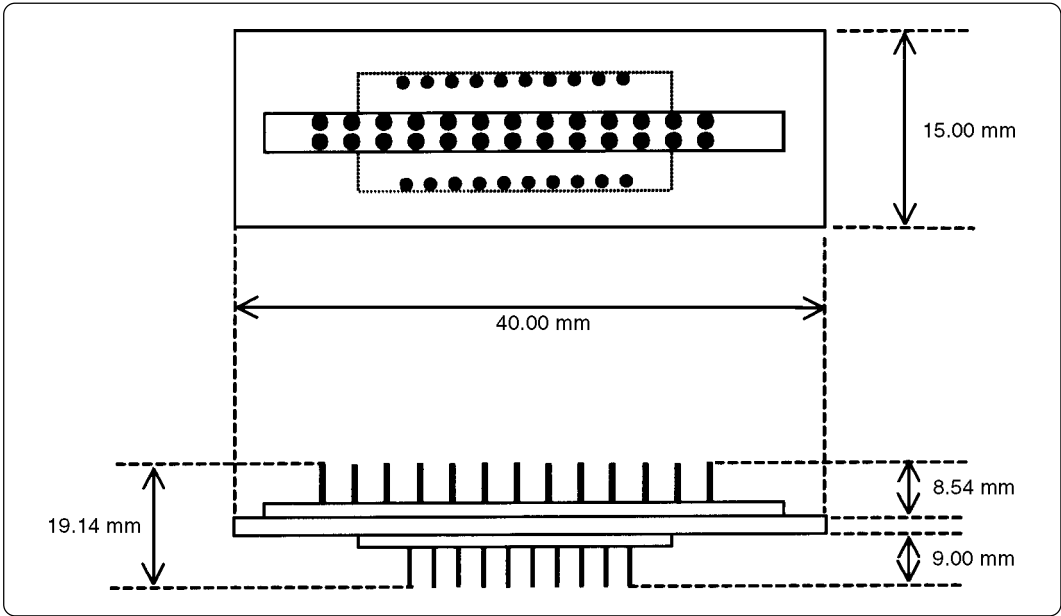

Figure 7.1 External dimensions of the M34501T-PTC

Appendix A. How to Request for Repair

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

M34502T-MCU User's Manual

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