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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

User's Manual

AZ78K0R Ver. 4.00

System Performance Analyzer

Target Tool
RX78K0R Ver. 4.10

Document No. U18802EJ1V0UM00 (1st edition)
Date Published September 2007

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INTRODUCTION

Target Readers

This manual is intended for users who wish to design and develop application systems using the 78K0R microcontrollers.

Purpose

This manual's purpose is to help the user understand the functions and the operation method of the AZ78K0R.

Organization

This manual is organized as follows.

- General
- Installation
- Functions
- Window reference
- Error information

How to Use this Manual

This manual assumes that the reader has general knowledge of microcontrollers, C language, assembly language, and debugging as well as basic knowledge of the Windows operation method.

To learn about the hardware functions and instruction functions of the 78K0R microcontrollers:

→ Read the user's manual for each product.

Conventions

< >:	Indicates a window or dialog box title.
[ ]:	Indicates a menu.
text :	Indicates a button in a window or dialog box.
<< >>:	Indicates a character string displayed in a window or dialog box.
Data significance:	Higher digits on the left and lower digits on the right
Memory map addresses:	Higher addresses on the top and lower addresses on the bottom
Active low representation:	$\overline{xxx}$ (overscore over pin or signal name)
Note:	Footnote for item marked with Note in the text
Caution:	Information requiring particular attention
Numerical representation:	Binary...XXXX or XXXXB
	Decimal...XXXX
	Hexadecimal...0xXXXX
Prefix indicating power of 2 (address space, memory capacity)	
	K (Kilo) $2^{10} = 1024$
	M (Mega) $2^{20} = 1024^2$

Related Documents Please use the following documents in conjunction with this manual.
The related documents listed below may include preliminary versions. However, preliminary versions are not marked as such.

Documents Related to 78K0R microcontrollers Development Tools (User's Manuals)

Document Name		Document No.
CC78K0R C Compiler	Operation	U17838E
	Language	U17837E
RA78K0R Assembler Package	Operation	U17836E
	Language	U17835E
SM+ System Simulator	Operation	U18010E
RX78K0R Real-Time Operating System	Functionalities	U18317E
	Internal Structure	U18318E
	Task Debugger	U18454E
AZ78K0R System Performance Analyzer		This document
PM+ Project Manager		U17990E
ID78K0R-QB Integrated Debugger	Operation	U17839E

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CHAPTER 1 GENERAL

1. 1 Overview

As the performance of microprocessors has increased, application programs have grown in scale and complexity.

With conventional debuggers, theoretical debugging of such application programs is simple, but time-related analysis is not. It is difficult and takes a very long time, for example, to analyze errors such as those caused by incorrect processing timing, or to evaluate the performance of the entire system.

To solve these problems, NEC Electronics Corporation has developed powerful microprocessors such as the 78K0R Microcontrollers. NEC Electronics Corporation has also developed "System Performance Analyzer: AZ78K0R", to support the quantitative performance analysis of application programs.

The AZ78K0R is a performance analysis tool for examining the execution transition statuses and the CPU usage of processing programs that embed the RX78K0R real-time operating system for the 78K0R. Being connected with a conventional debugger, the AZ78K0R achieves a function for collecting data of tracing the event occurrences (issuance of service calls, occurrence of interrupts, etc.) and presenting the trace data graphically.

The AZ78K0R therefore allows the user to readily analyze the execution transition statuses and the CPU usage of processing programs.

Since the AZ78K0R employs the Tool Interface Protocol (TIP) for connection with a debugger, it can be connected with debuggers made by manufacturers other than NEC Electronics, as long as the debugger supports this interface, and can use the relevant functions.

1. 2 Features

The AZ78K0R has the following features:

- Display of execution transition statuses

  The graphically displayed the execution transition status of the processing program in which the RX78K0R is embedded (horizontal axis = time, vertical axis = task name, etc.) permits analysis of execution transition statuses, such as task switching caused by service call issuance and transferring the control to the interrupt handler caused by the occurrence of interrupts. Since all accesses to an object (such as semaphore or eventflag) are marked upon issuance of a service call from a processing program, the usage of objects can also be checked.

- Display of CPU usage

  The CPU usage (total execution time, code coverage, etc.) of a processing program executed within a specified section can be displayed, which enables the quantitative performance analysis for processing programs.

- Linking with debugger

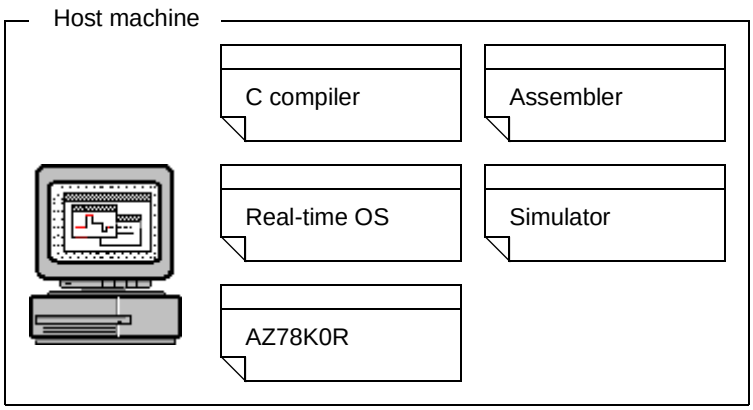
  The AZ78K0R can open the Source window, Assemble window and Memory window of the linked debugger, which enables quick identification of locations where a problem has occurred.

1. 3 System Configuration

The AZ78K0R extends the function of the debugger by communicating with it on the TIP specification.

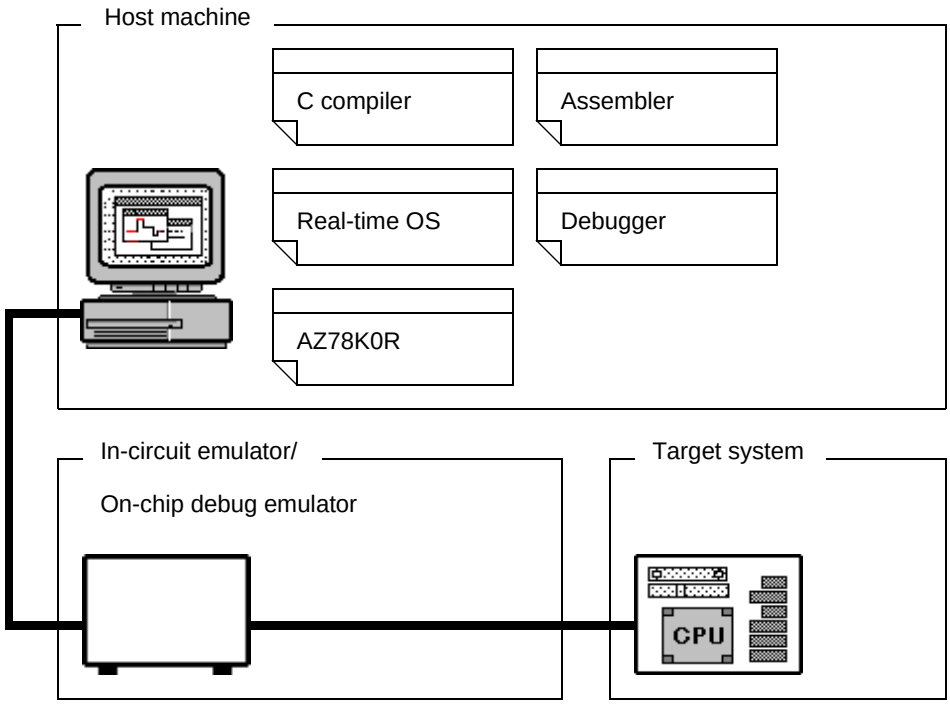
The following shows the AZ78K0R system configuration for debug environments.

Figure 1-1 System Configuration (When Using Simulator)



[Note] When using SM+, the Add Up Timtag check box must be cleared in the Extended Option dialog box, and the Timtag check box must be selected in the Trace Data Select dialog box in SM+.

Figure 1-2 System Configuration (When Using In-circuit Emulator/On-chip Debug Emulator)



[Note] When using ID78K0R-QB, the Timtag check box must be selected in the Extended Option dialog box in the ID78K0R-QB.

1. 4 Execution Environment

The following shows the AZ78K0R operating environment required for executing the quantitative performance analysis for processing programs.

(1) Hardware

- Host machine
  The machine by which the target OS operates.
- In-circuit emulator
  IECUBE series (from NEC Electronics Corporation)

  [Note] In-circuit emulators other than the above can be connected to the AZ78K0R, as long as they support TIP.
- On-chip debug emulator
  MINICUBE2 (from NEC Electronics Corporation)

  [Note] On-chip debug emulators other than the above can be connected to the AZ78K0R, as long as they support TIP.
- Target system
  Target system in which 78K0R is incorporated.

(2) Software

- OS (any of the following)
  Windows® 2000, Windows XP Home Edition, Windows XP Professional

  [Note] It is recommended that the newest Service Pack be installed in any of the above OSs.
- C compiler
  CC78K0R (from NEC Electronics Corporation)
- Assembler
  RA78K0R (from NEC Electronics Corporation)
- Real-time OS
  RX78K0R (from NEC Electronics Corporation)
- Debugger
  ID78K0R-QB (from NEC Electronics Corporation)

  [Note] Debuggers other than the above can be connected to the AZ78K0R, as long as they support TIP.
- Simulator
  SM+ for 78K0R (from NEC Electronics Corporation)
  SM+ for 78K0R/Kx3 (from NEC Electronics Corporation)

  [Note] Simulators other than the above can be connected to the AZ78K0R, as long as they support TIP.

CHAPTER 2 INSTALLATION

2. 1 Installing

This section explains how to install the AZ78K0R.

To install the AZ78K0R again, uninstall it first.

(1) Start Windows

Power on the host machine and peripherals and start Windows.

(2) Set supply media

Set the supply media in the appropriate drive (CD-ROM drive, etc.) of the host machine.

(3) Start setup program

The setup program will start automatically.

Perform the installation by following the message displayed in the monitor screen.

[Note] If the setup program does not start automatically, execute Install.exe on the supply media from Windows Explorer.

(4) Check files

Using Explorer, etc., check the files provided on the supply media has been installed on the host machine.

[Note] For detailes on the files installed on the host machine, refer to "2. 3 File Configuration".

2. 2 Uninstalling

This section explains how to uninstall the AZ78K0R.

(1) Start Windows

Power on the host machine and peripherals and start Windows.

(2) Open Control Panel window

Select [Control Panel] from the Start menu of Windows to open the Control Panel window.

(3) Open Add or Remove Programs window

Double-click the "Add or Remove Programs" icon in the Control Panel window to open the Add or Remove Programs window.

(4) Remove components

Select the components shown below from the list displayed in the Add or Remove Programs window, and then click the [Remove] button.

Follow the messages displayed on the monitor screen to continue uninstallation.

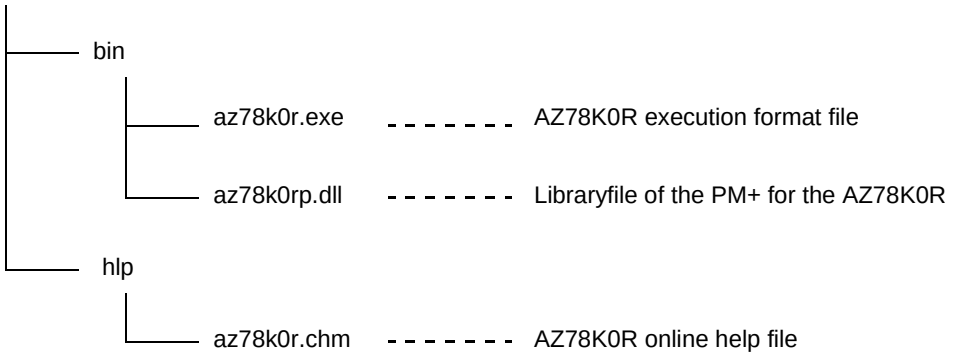
- AZ78K0R System Performance Analyzer V4.*xx* Components
- AZ78K0R (V4.*xx*) Document Components

2. 3 File Configuration

The following shows the file configuration when the files stored in the supply media has been installed.

Figure 2-1 AZ78K0R System Performance Analyzer V4.*xx* Components

Installation folder (default: C:\Program Files\NEC Electronics Tools\AZ78K0R\V4.*xx*)



Windows system folder (default: C:\WINDOWS\system32)

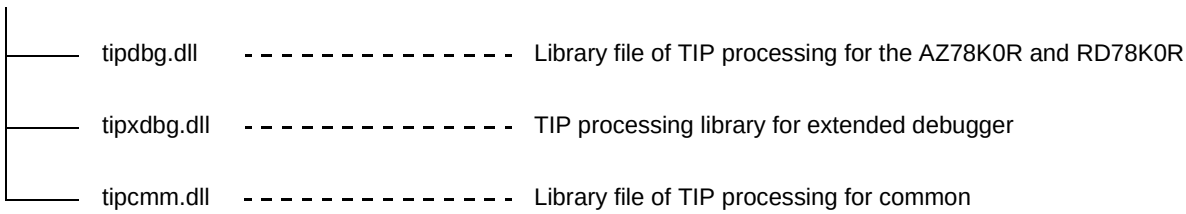
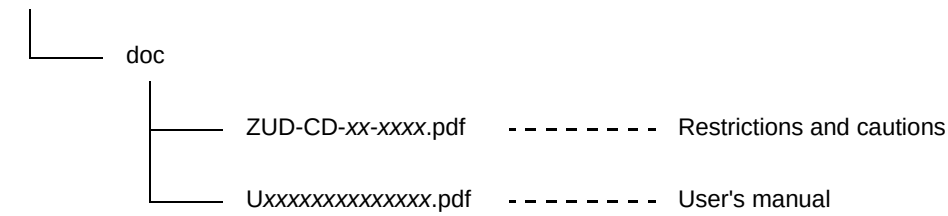


Figure 2-2 AZ78K0R (V4.*xx*) Document Components

Installation folder (default: C:\Program Files\NEC Electronics Tools\AZ78K0R\V4.*xx*)



CHAPTER 3 FUNCTIONS

3. 1 Trace Form

The AZ78K0R supports the following trace form.

- Hard trace form

  Using the qualify trace function provided by the simulator or in-circuit emulator, the AZ78K0R collects trace data and stores it to the trace buffer of the simulator or in-circuit emulator.

  Using this form, trace data can therefore be collected without modifying the processing program code.

  [Note] The AZ78K0R uses the following simulator/in-circuit emulator resource, when switching the AZ trace mode to the ON state.

Table 3-1 Resources Used by AZ78K0R

Resource Name	Remark
Qualify trace condition	1 (for write access)

3. 2 Trace Data

3. 2. 1 Collecting positions and collected data

The following lists the trace data to be collected and positions where they are collected.

Table 3-2 Collected Trace Data and Collecting Positions

Collecting Positions	Collected Data
Service call entry	Time Service call function code ID of object subject to execution by service call Service call issuance address
Service call exit	Time Service call return value
Interrupt handler entry	Time Address at which execution returns from interrupt handler
Interrupt handler exit	Time
Occurrence of task switching	Time ID of a task to which the operation will move (or ID that indicates idle routine is entered)

Collecting Positions	Collected Data
Task entry	Time ID of task to be activated Task activation address

Note that the following items cannot be detected as trace data in the AZ78K0R.

- Address at which ext_tsk is issued
- Entry/exit of reset, NMI, exception (software exception, exception trap)
- Entry/exit of maskable interrupts whose interrupt handler has not been registered
- Boot processing entry/exit
- Initialization routine entry/exit
- Cyclic handler entry/exit

Since the RX78K0R assigns the same function code to service call names to which an "i" is prefixed/not prefixed listed below, the AZ78K0R cannot identified them.

The AZ78K0R therefore handles these service calls without an "i" being prefixed.

- sta_tsk/ista_tsk
- chg_pri/ichg_pri
- can_wup/ican_wup
- sus_tsk/isus_tsk
- rsm_tsk/irsm_tsk
- frsm_tsk/ifrsm_tsk

3. 2. 2 Time accuracy

The accuracy of the time collected as trace data is the same as that of the time tag that is used for the qualify trace function provided by the simulator or in-circuit emulator.

If the system clock is set to the STOP or IDLE mode, however, the AZ78K0R cannot collect an accurate time, and the collected value is therefore not guaranteed. (This is because the AZ78K0R calculates the time taken by processing program execution, based on the system clock.)

[Note] Some in-circuit emulators do not support the time tag for trace data. In such a case, set the display mode of the AZ:Analyze window to "Equal mode"; the task execution status can then be checked.

3. 3 Debugging Procedure

This section describes the procedure for debugging using the AZ78K0R.

(1) Starting the debugger

Start the debugger to be used.

For details on the debugger startup method, refer to the user's manual for the debugger.

(2) Starting the AZ78K0R

Start the AZ78K0R to be used.

The following two methods are available to start the AZ78K0R.

- Starting from Start menu

  Click the Windows Start menu, point to [All Programs], [NEC Electronics Tools], [AZ78K0R], [V4.*xx*] and click [AZ78K0RV4.*xx*] (default), or click the Windows Start menu, point to [All Programs], [NEC Electronics Tools], [Latest Version], and click [AZ78K0R V4.*xx*].

- Starting from PM+

  The procedure to start the AZ78K0R is as follows.

  (a) Start PM+ and then load a workspace file (*.prw).

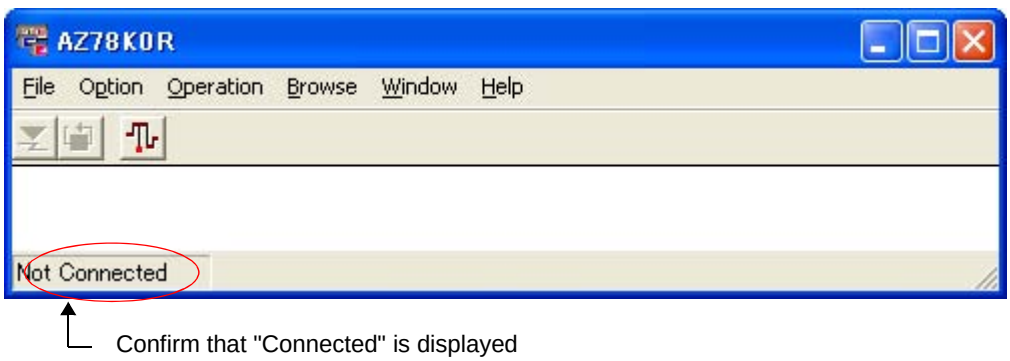
  (b) Click [Tool] in the main window of PM+ and then select [Startup AZ78K0R]

  [Note] When the AZ78K0R is started via PM+, the version can be checked in the Project Settings dialog box (Tool Version Settings tab) of PM+.

After the AZ78K0R is started, the following AZ78K0R window appears.

At this time, make sure that the message "Connected" is displayed on the status bar (Connection status area) in the AZ78K0R window.

Figure 3-1 Starting AZ78K0R

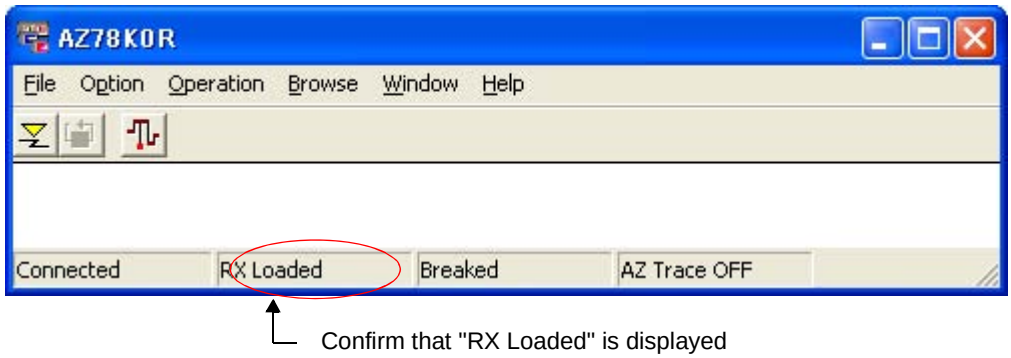


(3) Downloading a load module

Download the load module that has been linked with the RX78K0R in the debugger.

At this time, make sure that the message "RX Loaded" is displayed on the status bar (Load module status area) in the AZ78K0R window.

Figure 3-2 Downloading Load Module

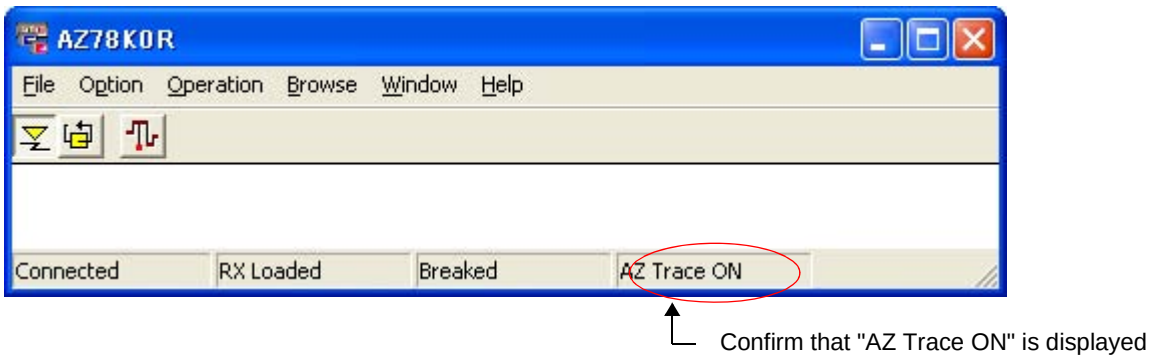


(4) Switching the AZ trace mode

Click  in the AZ78K0R window to turn on AZ trace mode.

At this time, make sure that the message "AZ Trace ON" is displayed on the status bar (AZ trace mode status area) in the AZ78K0R window.

Figure 3-3 Switching AZ Trace Mode



(5) Execution of processing program

Run the processing program in the debugger; collection of trace data then starts.

(6) Stop of processing program

Stop execution of the processing program in the debugger. (If a breakpoint has been set, wait until the processing program breaks.)

Collection of trace data then ends.

(7) Loading of trace data

Click  in the AZ78K0R window to load trace data collected by the simulator or in-circuit emulator.

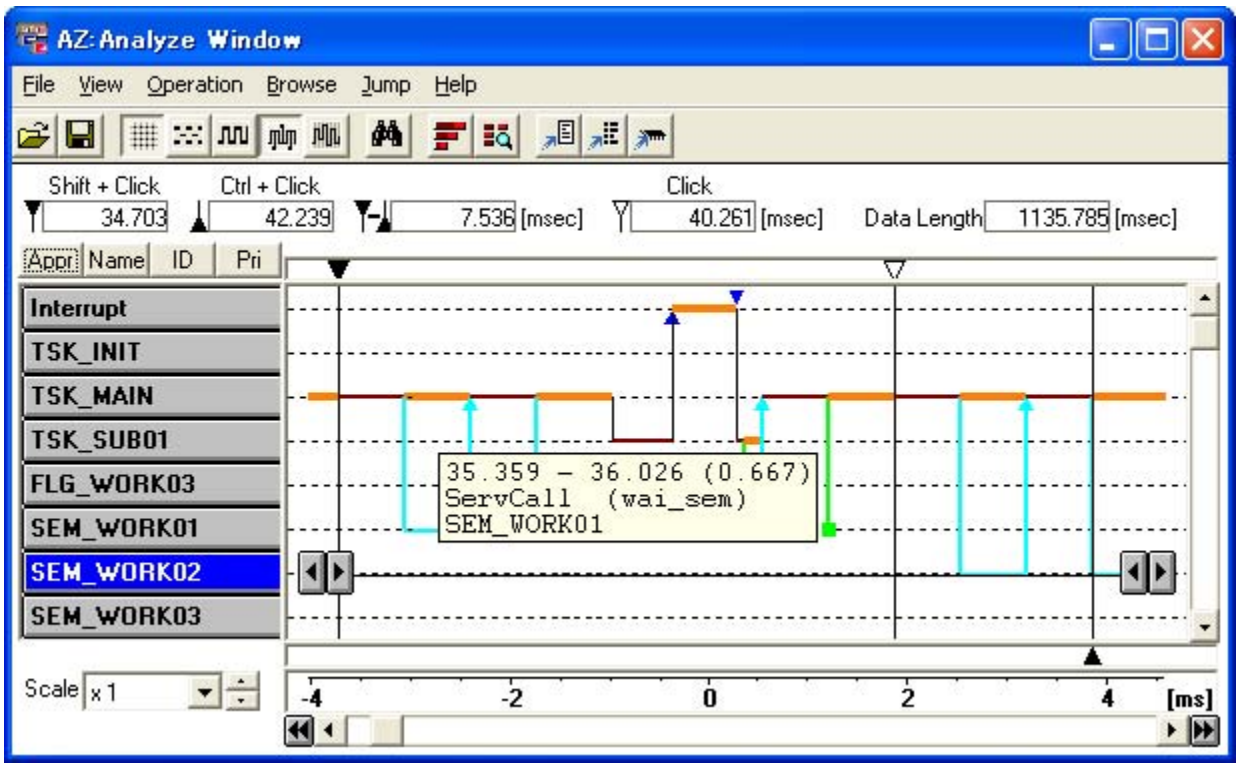
(8) Verification in AZ:Analyze window

Click  in the AZ78K0R window to open the AZ:Analyze window.

In the AZ:Analyze window and windows opened via the the AZ:Analyze window, analysis related to time, such as bugs caused by processing timing and evaluation of entire system performance.

[Note] For how to read the execution transition map displayed in this window, refer to "How to read execution transition map" and "How to verify execution transition map".

Figure 3-4 Display Example of AZ:Analyze Window



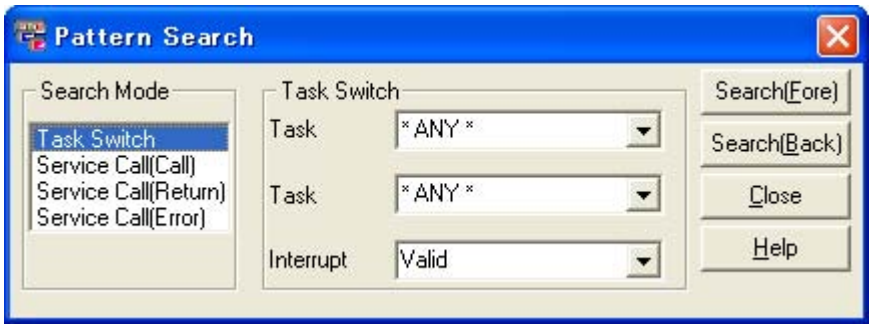
(9) Verification in Pattern Search dialog box

Click  in the AZ:Analyze window to open the Pattern Search dialog box.

In this window, the point at which a specific event occurred can be searched for, based on the execution transition map displayed in the AZ:Analyze window.

[Note] For how to search for the point at which a specific event occurred, refer to "How to search".

Figure 3-5 Display Example of Pattern Search Dialog Box



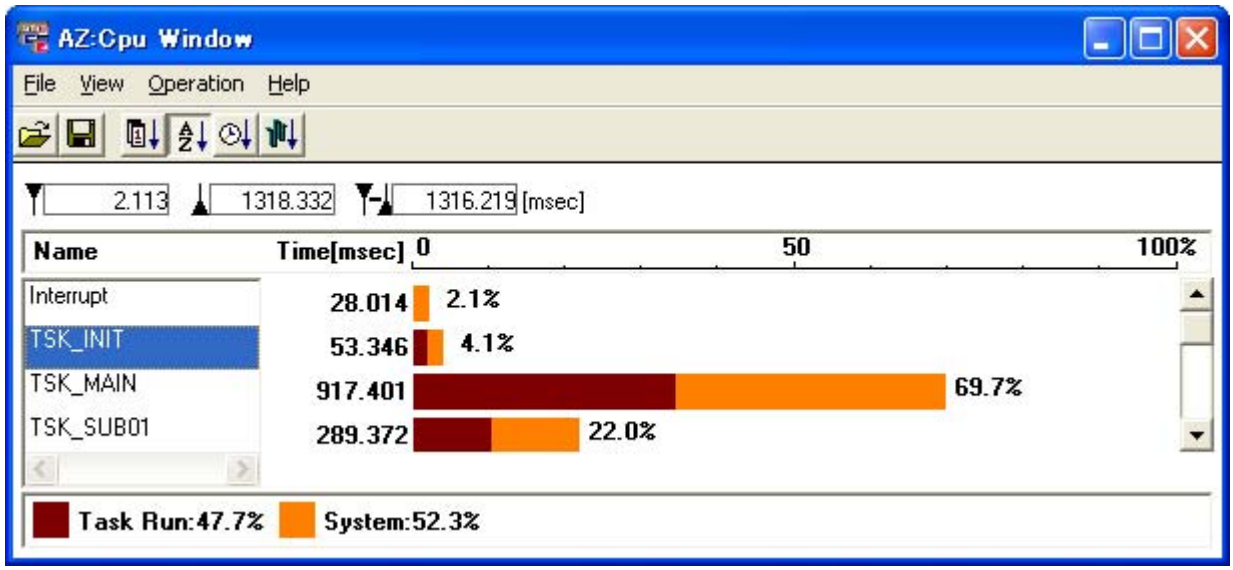
(10) Verification in AZ:Cpu window

Click  in the AZ:Analyze window to open the AZ:Cpu window.

In this window, the CPU usage in a section between the up cursor and down cursor in the AZ:Analyze window can be checked.

[Note] For how to count the CPU usage, refer to "How to search".

Figure 3-6 Display Example of AZ:Cpu Window



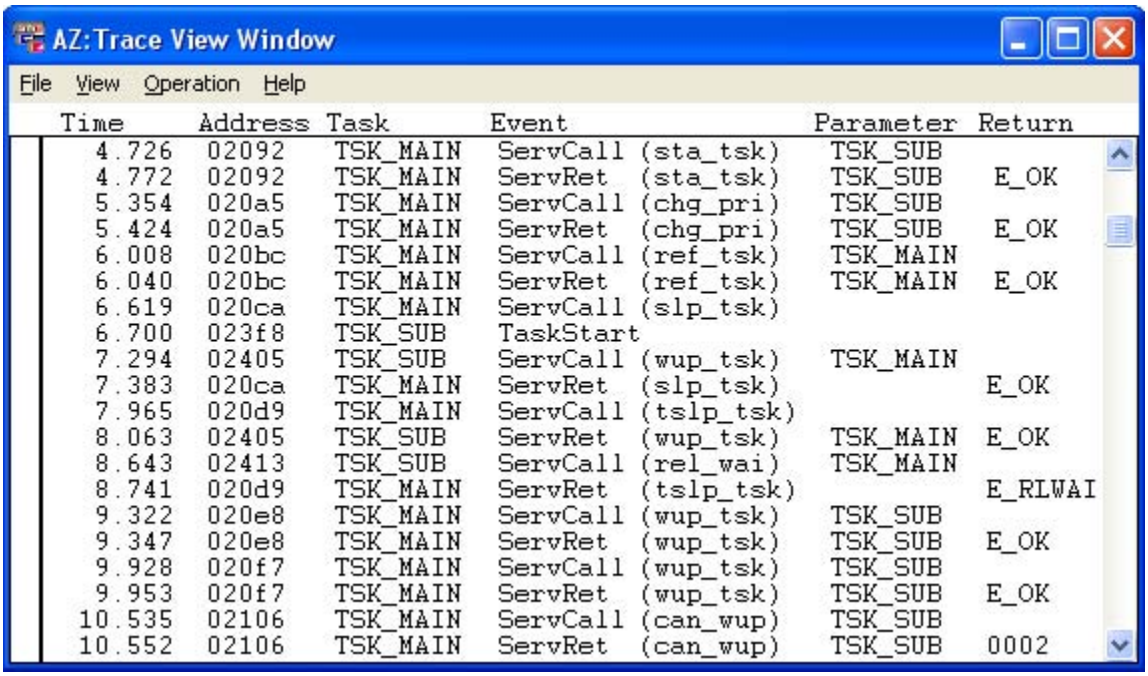
(11) Verification in AZ:Trace View window

Click  in the AZ:Analyze window to open the AZ:Trace View window.

In this window, information obtained from the execution transition map in the AZ:Analyze window can be viewed in list form.

[Note] For how to read the list displayed in this window, refer to "How to read the list".

Figure 3-7 Display Example of AZ:Trace View Window



(12) Verification in Trace Search dialog box

Click the [View] menu -> [Find...] in the AZ:Trace View window to open the Trace Search dialog box.

In this window, specific information (trace data) can be searched for from the list displayed in the AZ:Trace View window.

[Note] For how to search for specific information (trace data), refer to "How to search".

Figure 3-8 Display Example of Trace Search Dialog Box

CHAPTER 4 WINDOW REFERENCE

4. 1 Overview

The following shows the list of the AZ78K0R windows and dialog boxes.

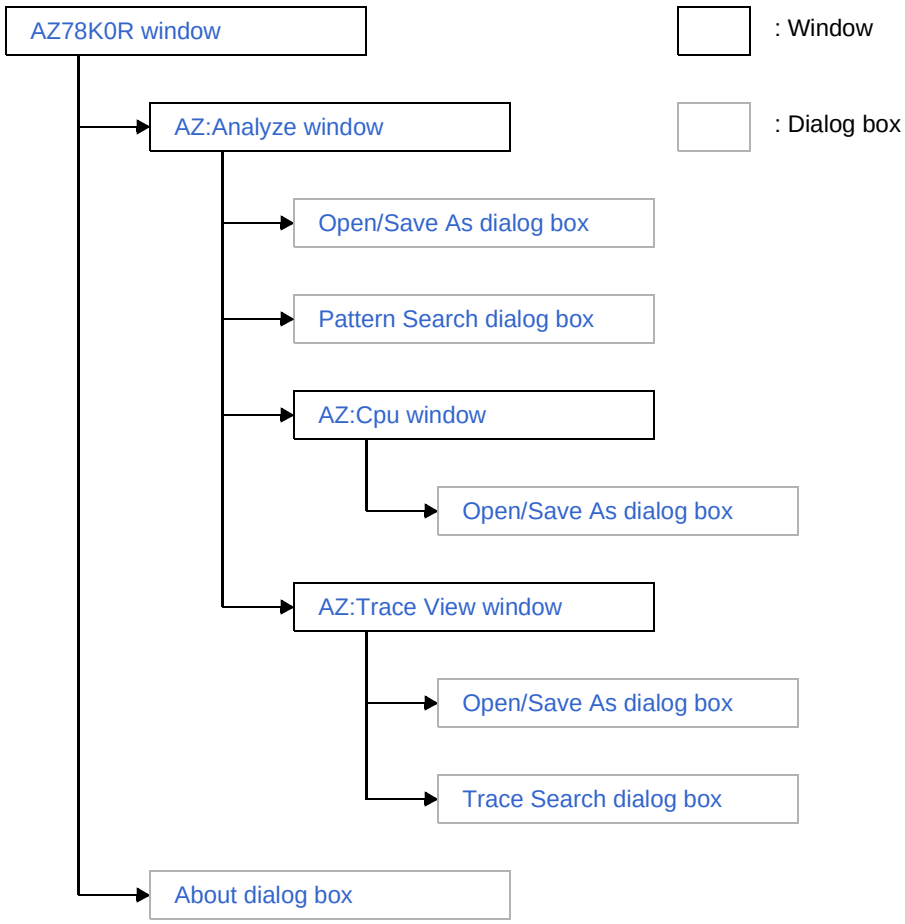
Table 4-1 List of AZ78K0R Windows and Dialog Boxes

Window/Dialog Box Name	Function
AZ78K0R window	Central window for using the functions provided by the AZ78K0R
Open/Save As dialog box	Specifies the file name when loading a file that contains information to be displayed in the AZ:Analyze window and AZ:Cpu window, or when saving information displayed in the AZ:Analyze window, AZ:Cpu window and AZ:Trace View window as a file.
AZ:Analyze window	Displays information obtained from the trace data loaded into the AZ78K0R window, in the form of an execution transition map.
Pattern Search dialog box	Searches for the point at which a specific event occurred, based on the execution transition map displayed in the AZ:Analyze window.
AZ:Cpu window	Displays the CPU usage in a section between the up cursor and down cursor in the AZ:Analyze window.
AZ:Trace View window	Lists information obtained from the execution transition map in the AZ:Analyze window.
Trace Search dialog box	Searches for specific information (trace data) based on the list displayed in the AZ:Trace View window.
About dialog box	Displays the version information of the AZ78K0R.
AZ:Error dialog box	Displays the error information of the AZ78K0R.

4. 2 Relationship of Windows and Dialog Boxes

The following shows the relationship of the windows and dialog boxes.

Figure 4-1 Relationship of Windows and Dialog Boxes



4. 3 Explanation of Windows and Dialog Boxes

This section describes each window/dialog box of the AZ78K0R as follows:

Window/Dialog box name

Shown in the frame are the window or dialog box name.

In addition, the display image of the window or dialog box, functional outline, and how to open the window or dialog box are also explained.

Explanation of each area

Explains items to be set to or displayed in each area of the window or dialog box.

Menu bar

Lists the menu items and explains the operation of each menu item.

Tool bar

Explains the operation of each button on the tool bar.

Status bar

Explains the status bar in constituent units.

Function buttons

Explains the operation of each function button in the window or dialog box.

Caution

Enumerates points that require care during operation in the window or dialog box.

Other

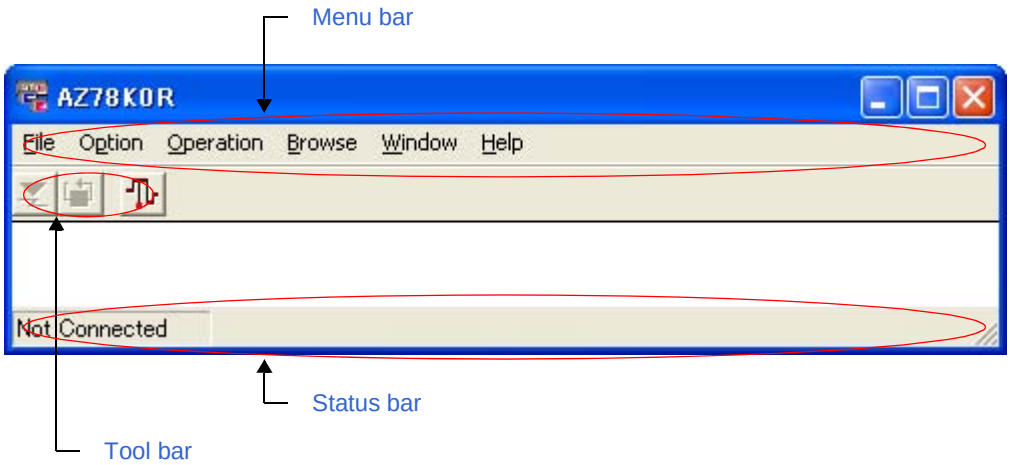
Explains restored file information, how to read the execution transition map, how to verify the execution transition map, search methods, and counting methods.

AZ78K0R window

This is the central window for using the functions provided by the AZ78K0R.

This window opens automatically when the AZ78K0R is started.

Figure 4-2 AZ78K0R Window

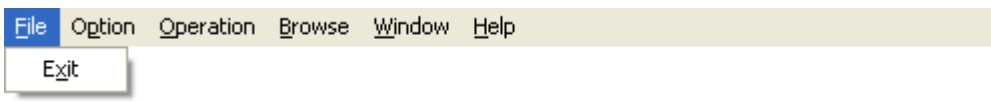


This section describes the following items:

- Menu bar
- Tool bar
- Status bar
- Caution

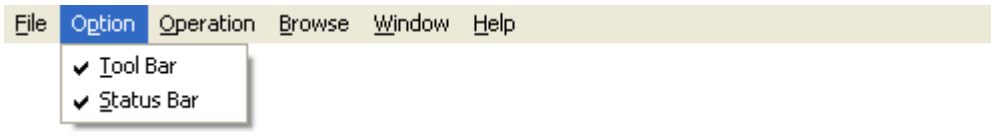
Menu bar

(1) File



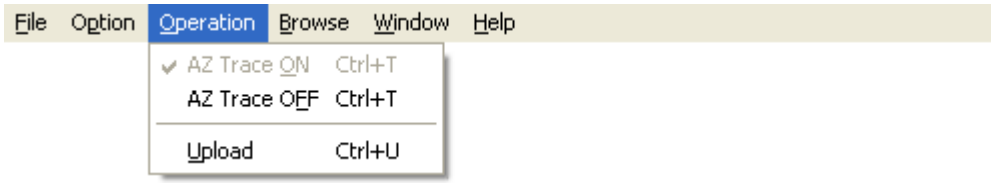
Exit	Terminates the AZ78K0R. The function of this item is same as that of the button.

(2) Option



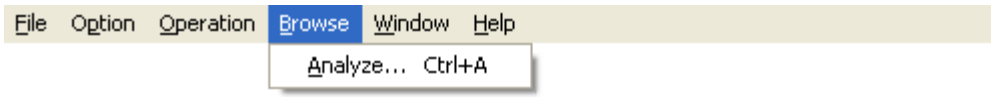
Tool Bar	Switches displaying and hiding the tool bar (default: displayed).
Status Bar	Switches displaying and hiding the status bar (default: displayed).

(3) Operation



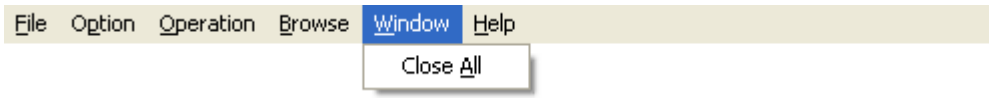
AZ Trace ON	Turns on the AZ trace mode. Trace data is collected into the trace buffer of the simulator/in-circuit emulator by running a processing program while the AZ trace mode is ON. The function of this item is same as that of the button.
AZ Trace OFF	Turns off the AZ trace mode. Trace data is not collected into the trace buffer of the simulator/in-circuit emulator if a processing program is executed while the AZ trace mode is OFF. The function of this item is same as that of the button.
Upload	Loads trace data stored in the trace buffer. The AZ trace mode is automatically turned off when loading of trace data is finished. This menu is unavailable if trace data has not been collected. The function of this item is same as that of the button.

(4) Browse



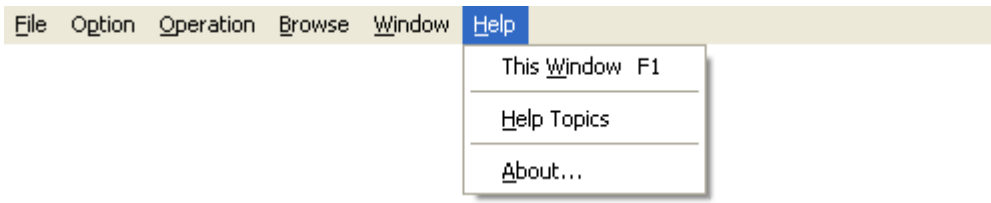
Analyze...	Opens the AZ:Analyze window in Active mode. If loading of trace data has been finished in this window, the execution transition map is displayed in the corresponding window. The function of this item is same as that of the button.

(5) Window



Close All	Closes windows and dialog boxes other than this window.

(6) Help



This Window	Displays the help widnow for this window.
Help Topics	Opens the online help, with the [Search] tab displayed.
About...	Opens the About dialog box. The version information of the AZ78K0R is displayed.

Tool bar

The tool bar consists of buttons that can execute frequently used menu items with a single action.

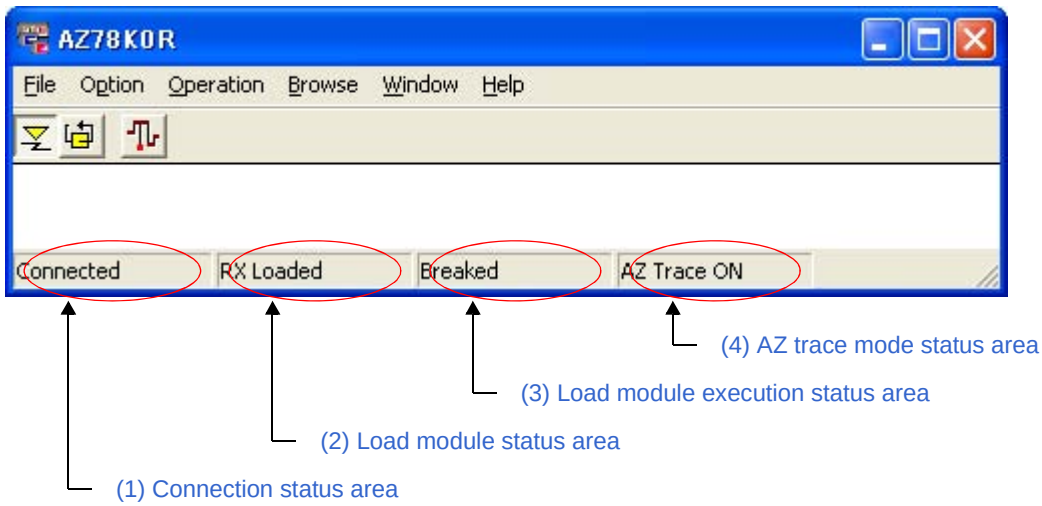
Table 4-2 Tool Bar Buttons (AZ78K0R Window)

Button	Function
	Switches the AZ trace mode. Trace data is collected into the trace buffer of the simulator/in-circuit emulator by running a processing program while the AZ trace mode is ON. Trace data is not collected into the trace buffer of the simulator/in-circuit emulator if a processing program is executed while the AZ trace mode is OFF. Same operation an [Operation] menu -> [AZ Trace ON] or [Operation] menu -> [AZ Trace OFF].
	Loads trace data stored in the trace buffer. The AZ trace mode is automatically turned off when loading of trace data is finished. This button is unavailable if trace data has not been collected. Same operation an [Operation] menu -> [Upload].
	Opens the AZ:Analyze window in Active mode. If loading of trace data has been finished in this window, the execution transition map is displayed in the corresponding window. Same operation an [Browse] menu -> [Analyze...].

Status bar

The following explains areas in the status bar.

Figure 4-3 Status Bar (AZ78K0R Window)



(1) Connection status area

This area indicates the status of connection with the debugger.

Connected	Connected to the debugger.
Not Connected	Not connected to the debugger.

(2) Load module status area

This area indicates the state of the load module to be loaded onto the debugger.

This area is not displayed if the AZ78K0R is not connected to the debugger.

RX Loaded	A load module linked with the RX78K0R has been downloaded.
RX None	No load modules linked with the RX78K0R have been downloaded.

(3) Load module execution status area

This area indicates the state of the application program execution.

This area is not displayed if the AZ78K0R is not connected to the debugger.

Running	Status of application program being execution.
Breaked	Status of application program operation undergoing break.

(4) AZ trace mode status area

This area indicates the current state of AZ trace mode.

This area is not displayed when the AZ78K0R is not connected with a debugger, or if no load modules linked with the RX78K0R have been downloaded.

AZ Trace ON	Status where AZ trace ON has been set.
AZ Trace OFF	Status where AZ trace OFF has been set.

Caution

- When switching the AZ trace mode to the ON state, a load module linked with the RX78K0R must already be downloaded to the debugger ([RX Loaded] is displayed in the status bar).
- Trace condition setting for the simulator or in-circuit emulator is performed when the AZ trace mode is switched to the ON state.

  Refer to "3. 1 Trace Form" for details on trace conditions on the simulator/in-circuit emulator side, which are required for switching the AZ trace mode.

Open/Save As dialog box

This dialog box is used to specify the file name when loading a file that contains information to be displayed in the AZ:Analyze window and AZ:Cpu window, or when saving information displayed in the AZ:Analyze window, AZ:Cpu window and AZ:Trace View window as a file.

This dialog box can be opened from the each window (AZ:Analyze window, AZ:Cpu window, AZ:Trace View window) by any of the following:

[When loading]

- Select the [File] menu -> [Open...].
- Click the  button on the tool bar.
- Press the [Alt], [F] and [O] keys in that order.
- Press the [Ctrl] + [O] keys at the same time.

[When saving]

- Select the [File] menu -> [Save...].
- Click the  button on the tool bar.
- Press the [Alt], [F] and [S] keys in that order.
- Press the [Ctrl] + [S] keys at the same time.

Figure 4-4 Open/Save As Dialog Box (When Loading)

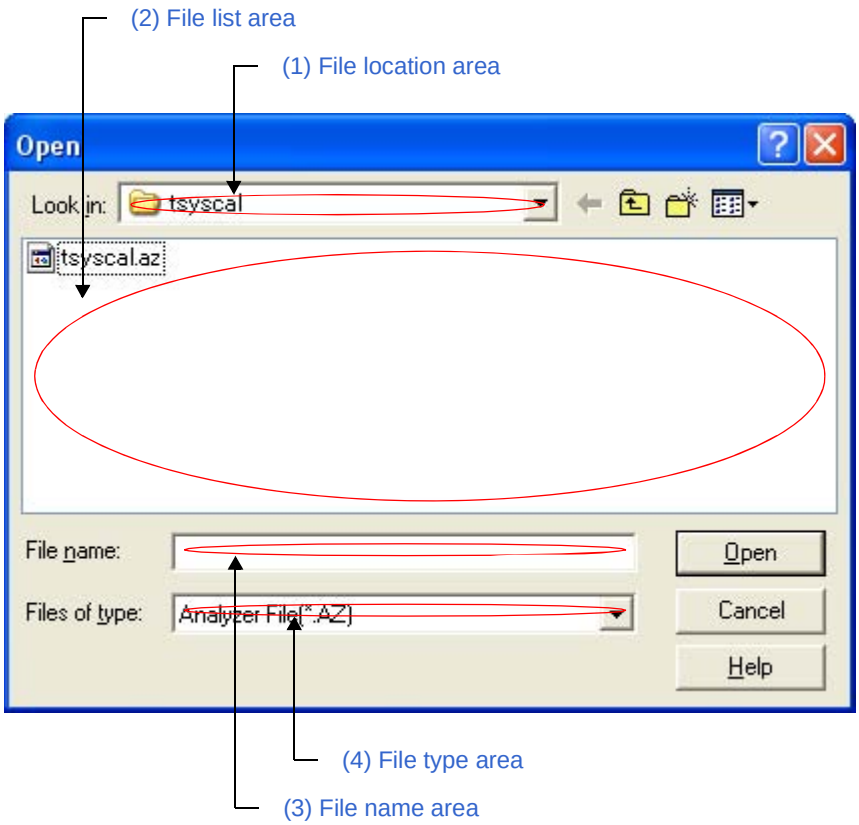
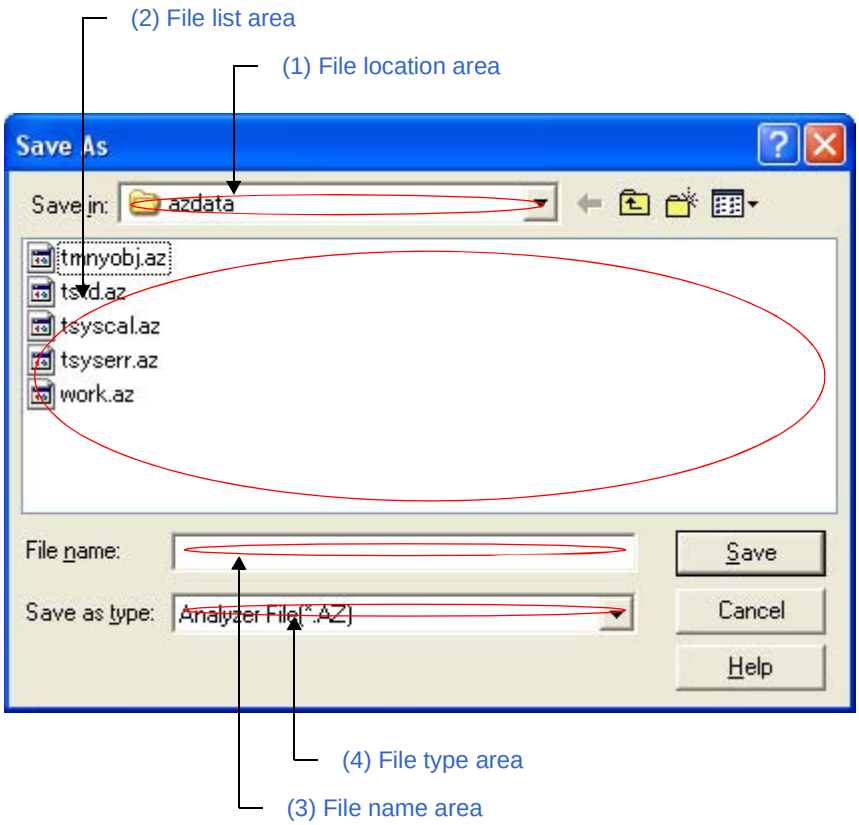


Figure 4-5 Open/Save As Dialog Box (When Saving)



This section describes the following items:

- Explanation of each area
- Function buttons
- Restored file information

Explanation of each area

(1) File location area

This area is used to select the folder where a target file is stored or is to be stored.

(2) File list area

This area lists the files that match the conditions selected in the file location area and file type area.

(3) File name area

This area is used to specify the name of a target file.

(4) File type area

This area is used to select the type of files to be displayed in the file list area.

The default type displayed in this area varies depending on the window from which the file is called, as shown below.

Window Name	File of Type
AZ:Analyze window	Binary (.az)
AZ:Cpu window	CSV (.azc)
AZ:Trace View window	CSV (.azt)

Function buttons

Button	Function
Open/Save	Loads the file that matches the conditions specified in this dialog box. Saves the information displayed in the window into the file that matches the conditions specified in this dialog box.
Cancel	Closes this dialog box.
Help	Displays the help widnow for this dialog box.

Restored file information

Handling of files loaded in this dialog box varies depending on the window from which the file is called, as shown below.

- AZ:Analyze window

  Information of the file loaded into the AZ:Analyze window, which called the file, will be restored. To maintain the previous information, switch to the Hold mode the AZ:Analyze window that has information to be maintained, open another AZ:Analyze window, and then load the file from the window in the Hold mode.

- AZ:Cpu window

  A new AZ:Cpu window opens, and information of the file loaded into the window is restored. The AZ:Cpu window that called the file therefore maintains the previous information.

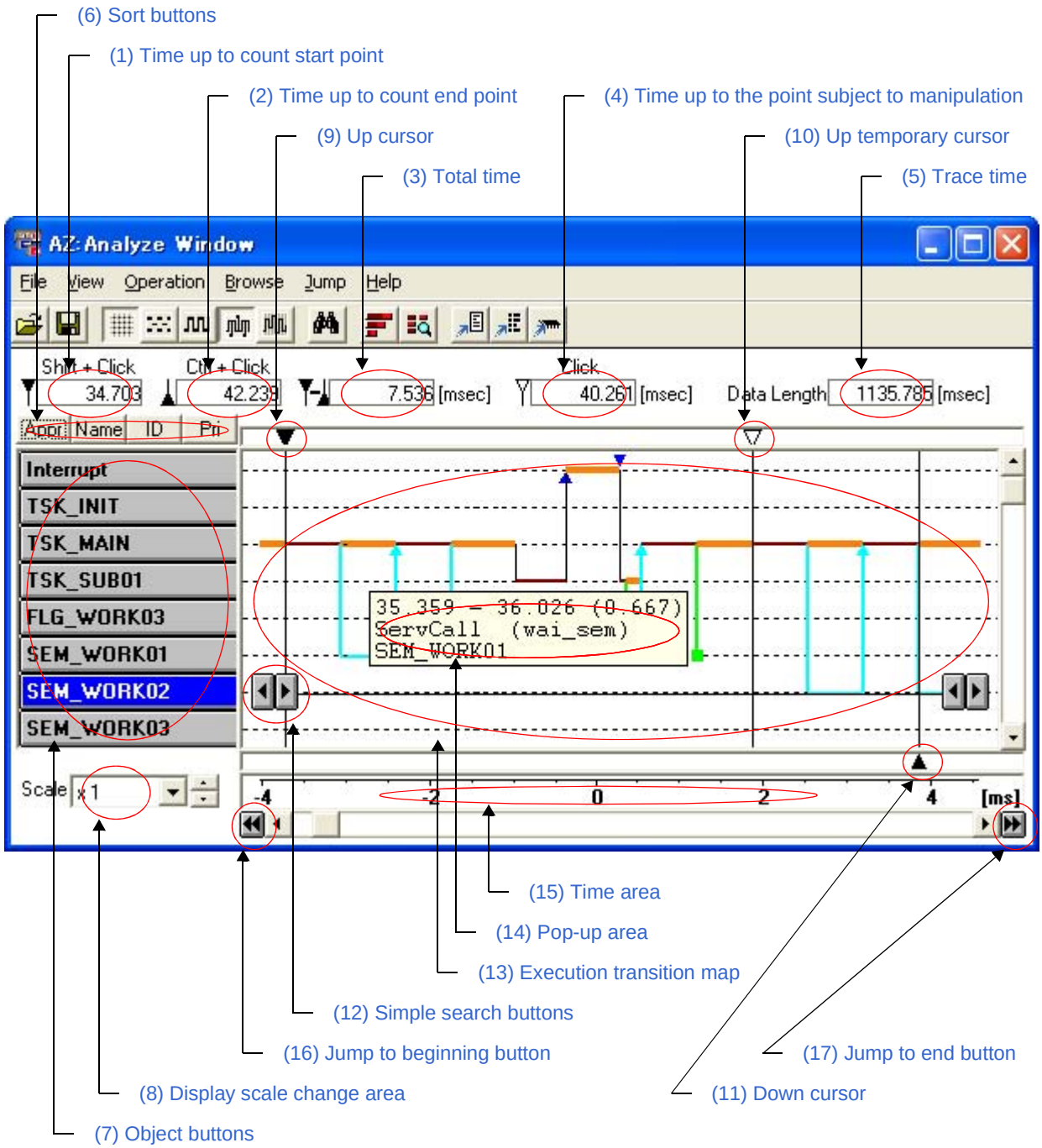
AZ:Analyze window

This window displays information obtained from the trace data loaded into the AZ78K0R window, in the form of an execution transition map.

This dialog box can be opened from the AZ78K0R window by any of the following:

- Select the [Browse] menu -> [Analyze...].
- Click the  button on the tool bar.
- Press the [Alt], [B] and [A] keys in that order.
- Press the [Ctrl] + [A] keys at the same time.

Figure 4-6 AZ:Analyze Window



This section describes the following items:

- Explanation of each area
- Menu bar
- Tool bar
- How to read execution transition map
- How to verify execution transition map

Explanation of each area

(1) Time up to count start point

This area displays the time up to the CPU usage counting start point.

The time up to the count start point is a relative time from when trace processing starts until the execution reaches the up cursor position (unit: msec).

(2) Time up to count end point

This area displays the time up to the CPU usage counting end point.

The time up to the count end point is a relative time from when trace processing starts until the execution reaches the down cursor position (unit: msec).

(3) Total time

This area displays the total time of the CPU usage.

The total time is a relative time indicated from the up cursor position to the down cursor position (unit: msec).

(4) Time up to the point subject to manipulation

This area displays the times up to when various types of manipulation (such as opening of the Source window, Assemble window or Memory window, and execution of simple search) are performed.

The time up to the point subject to manipulation is an absolute time from when trace processing starts until the execution reaches the up temporary cursor (unit: msec).

(5) Trace time

The trace time is a relative time from the start to the end of trace processing (unit: msec).

(6) Sort buttons

This button is used to change the object button display order.

This area consists of the following buttons.

Table 4-3 Sort Buttons in AZ:Analyze Window

Button	Function
Appr	Displays trace data in the order of detection (default).

Button	Function
Name	Displays the objects in the order of ASCII code.
ID	Displays the objects in the ID order.
Pri	Displays the objects in the priority order (valid for tasks only).

(7) Object buttons

These buttons display the objects (interrupt handlers, tasks, idle routines, eventflags, semaphores, mailboxes, or fixed-sized memory pools) detected as trace data.

For details on the object button display format, refer to " Object button display format".

(8) Display scale change area

This area is used to change the display scale of the execution transition map.

The drop-down list consists of the following items.

Table 4-4 Display Scale of Execution Transition Map

Item	Meaning
x 2	Magnifies the execution transition map by 2.
x 1/2	Shrinks the execution transition map to 1/2.

(9) Up cursor

This cursor specifies the point from which the CPU usage is counted.

This cursor can be moved by clicking it with the SHIFT key being pressed in the execution transition map.

(10) Up temporary cursor

This cursor specifies the point from which a manipulation (such as opening of the Source window, Assemble window or Memory window, and execution of simple search) is performed.

This cursor can be moved by dragging it with the SHIFT key being pressed in the execution transition map.

[Note] When the up cursor is moved, the up temporary cursor also moves to the same position.

(11) Down cursor

This cursor specifies the point at which counting of the CPU usage ends.

This cursor can be moved by clicking it with the CTRL key being pressed in the execution transition map.

(12) Simple search buttons

These buttons are displayed when an object button is clicked, and used to perform the following manipulations.

These buttons are hidden when the object button is clicked again.

Table 4-5 Simple Search Buttons in AZ:Analyze Window

Button	Function
	Searches for the point at which an event related to the relevant object occurred, from the search start point toward the reverse direction to the time axis. The up temporary cursor shows the detected point. A beep is generated if no events have occurred at any location.
	Searches for the point at which an event related to the relevant object occurred, from the search start point toward the time axis direction. The up temporary cursor shows the detected point. A beep is generated if no events have occurred at any location.

(13) Execution transition map

This area displays the processing program analysis result.

Refer to "How to read execution transition map" for details on marks shown in the execution transition map.

[Note] If the number of OS resources subject to display exceeds 1,000, this area may not be displayed correctly.

(14) Pop-up area

The following information related to the position pointed to by the mouse pointer pops up.

Table 4-6 Details of Information in AZ:Analyze Window

Mouse Pointer	Meaning
Object button	Object name
Black vertical line	The following information related to processing program switching - Time taken to generate processing program switching (unit: msec) - Name of processing program before switching - Name of processing program after switching

Mouse Pointer	Meaning
Orange horizontal line	The following information related to service calls - Time taken to issue a service call (unit: msec) - Time taken to return from a service call (unit: msec) - Service call processing time (unit: msec) - Service call name - Name of object subject to manipulation by service call
Orange horizontal line	The following information related to interrupts - Time taken to generate an interrupt (unit: msec) - Time taken to finish interrupt handler processing (unit: msec) - Interrupt handler processing time (unit: msec)
Blue triangle	The following information related to interrupts - Time taken to generate an interrupt (unit: msec)
Blue inverted triangle	The following information related to interrupts - Time taken to finish interrupt handler processing (unit: msec)
Light-blue/green line	The following information related to object access status - Time taken to issue a service call (unit: msec) - Time taken to return from a service call (unit: msec) - Name of processing program that issued a service call - Service call name - Name of object subject to manipulation by service call
Red x-mark	The following information related to service calls - Time taken to return from a service call (unit: msec) - Value returned from service call

[Note] Nothing pops up on light-blue horizontal lines.

(15) Time area

This area displays the guide for generation interval of events displayed in the execution transition map. The display unit is shown at the right end of this area.

[Note] In Equal mode, this area displays the guide for the number of events displayed in the execution transition map.

(16) Jump to beginning button

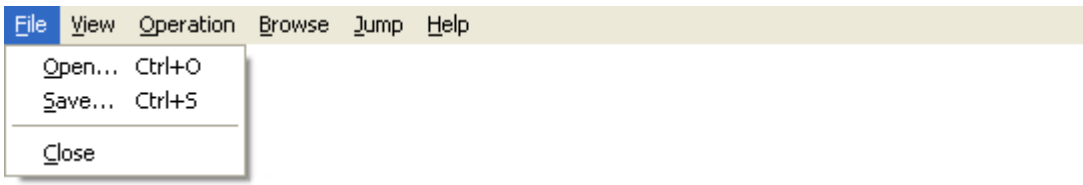
This button moves the up cursor to the top of trace data.

(17) Jump to end button

This button moves the down cursor to the end of trace data.

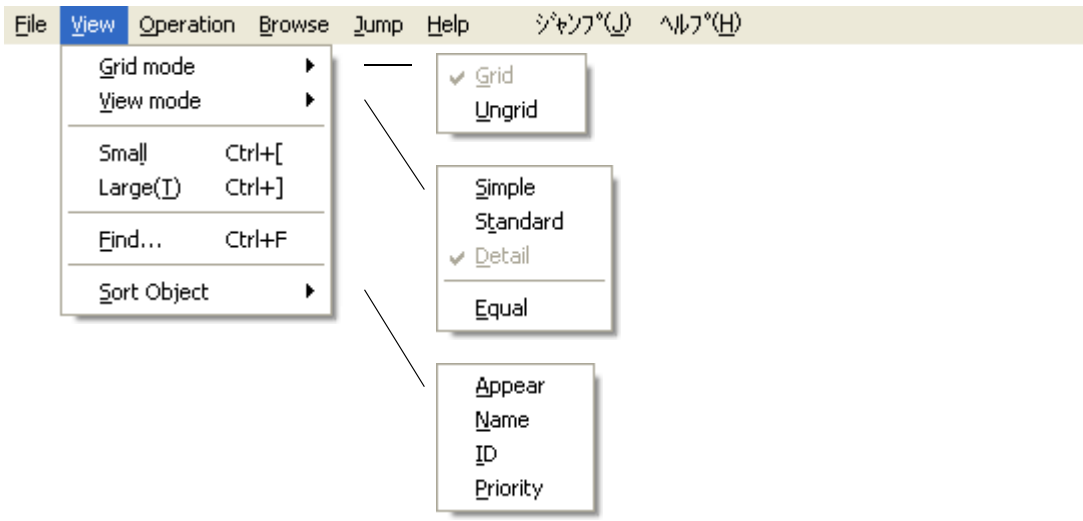
Menu bar

(1) File



Open...	Opens the Open/Save As dialog box. Loads the file that contains information to be displayed in this window (extension: .az). The function of this item is same as that of the button.
Save...	Opens the Open/Save As dialog box. Specifies the name of the file into which information displayed in this window is saved (extension: .az). The function of this item is same as that of the button.
Close	Closes this widnow.

(2) View



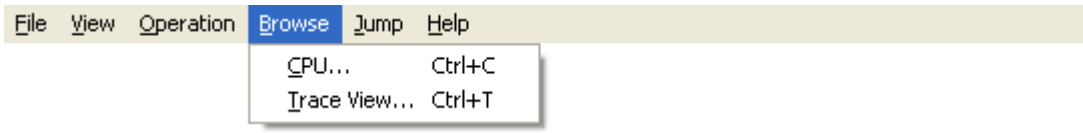
Grid mode	Specifies whether to display gridlines in the execution transition map.

	Grid	Displays gridlines (default).
	Ungrid	Does not display gridlines.
View mode		Specifies the execution transition map display mode.
	Simple	Displays the execution transition map in Simple mode. The function of this item is same as that of the button.
	Standard	Displays the execution transition map in Standard mode. The function of this item is same as that of the button.
	Detail	Displays the execution transition map in Detailed mode (default). The function of this item is same as that of the button.
	Equal	Displays the execution transition map in Equal mode. The function of this item is same as that of the button.
Small		hrinks the execution transition map display to 1/2. The effect is the same as selecting "x 1/2" in the display scale change area.
Large		Magnifies the execution transition map display by 2. The effect is the same as selecting "x 2" in the display scale change area.
Find...		Opens the Pattern Search dialog box. Searches for the point at which a specific event occurred, based on the execution transition map displayed in this window. The function of this item is same as that of the button.
Sort Object		Specifies the object button display order.
	Appear	Displays trace data in the order of detection (default)
	Name	Displays the objects in the order of ASCII code
	ID	Displays the objects in the ID order
	Priority	Displays the objects in the priority order (valid for tasks only)

(3) Operation

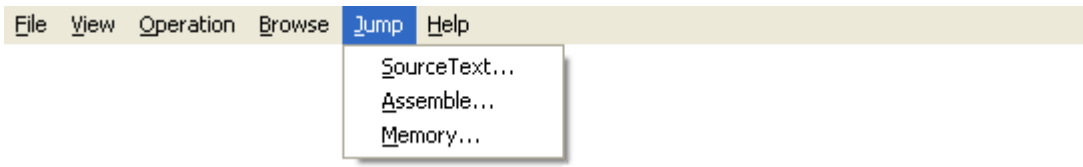
Active	Switches this window to the Active mode. This window is in the Active mode when opened. This window opens automatically when the AZ78K0R is started.
Hold	Switches this window to the Hold mode.

(4) Browse



CPU...	Opens the AZ:Cpu window in Active mode. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the AZ:Cpu window has already been opened in the Active mode, information displayed in the window is updated. The function of this item is same as that of the button.
Trace View...	Opens the AZ:Trace View window in Active mode. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the AZ:Trace View window has already been opened in the Active mode, information displayed in the window is updated. The function of this item is same as that of the button.

(5) Jump

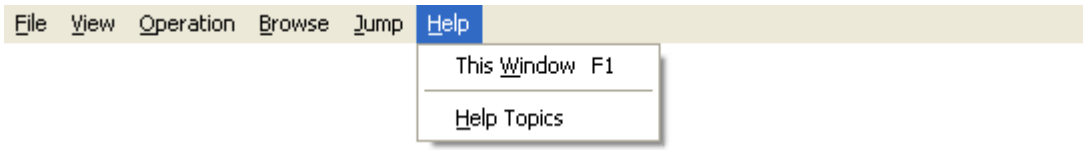


Source Text...	Opens the Source window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Source window has already been opened in the Active mode, information displayed in the window is updated. The function of this item is same as that of the button.
Assemble...	Opens the Assemble window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Assemble window has already been opened in the Active mode, information displayed in the window is updated. The function of this item is same as that of the button.

Memory...	Opens the Memory window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Memory window has already been opened in the Active mode, information displayed in the window is updated. The function of this item is same as that of the  button.

[Note] If there is no address information at the position pointed to by the up temporary cursor, items in the Jump menu are not available.

(6) Help



This Window	Displays the help widnow for this window.
Help Topics	Opens the online help, with the [Search] tab displayed.

Tool bar

The tool bar consists of buttons that can execute frequently used menu items with a single action.

Table 4-7 Tool Bar Buttons (AZ:Analyze Window)

Button	Function
	Opens the Open/Save As dialog box. Loads the file that contains information to be displayed in this window (extension: .az). Same operation an [File] menu -> [Open...].
	Opens the Open/Save As dialog box. Specifies the name of the file into which information displayed in this window is saved (extension: .az). Same operation an [File] menu -> [Save...].
	Specifies whether to display gridlines in the execution transition map (default: Displays gridlines).
	Displays the execution transition map in Simple mode. Same operation an [View] menu -> [View mode] -> [Simple].
	Displays the execution transition map in Standard mode Same operation an [View] menu -> [View mode] -> [Standard].

Button	Function
	Displays the execution transition map in Detailed mode (default). Same operation an [View] menu -> [View mode] -> [Detail].
	Displays the execution transition map in Equal mode. Same operation an [View] menu -> [View mode] -> [Equal].
	Opens the Pattern Search dialog box. Searches for the point at which a specific event occurred, based on the execution transition map displayed in this window. Same operation an [View] menu -> [Find...].
	Opens the AZ:Cpu window in Active mode. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the AZ:Cpu window has already been opened in the Active mode, information displayed in the window is updated. Same operation an [Browse] menu -> [CPU...].
	Opens the AZ:Trace View window in Active mode. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the AZ:Trace View window has already been opened in the Active mode, information displayed in the window is updated. Same operation an [Browse] menu -> [Trace View...].
	Opens the Source window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Source window has already been opened in the Active mode, information displayed in the window is updated. Same operation an [Jump] menu -> [Source Text...].
	Opens the Assemble window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Assemble window has already been opened in the Active mode, information displayed in the window is updated. Same operation an [Jump] menu -> [Assemble...].
	Opens the Memory window of the debugger. Information later than the position pointed to by the up temporary cursor in the execution transition map is displayed in the window. If the Memory window has already been opened in the Active mode, information displayed in the window is updated. Same operation an [Jump] menu -> [Memory...].

Object button display format

Object buttons are displayed as explained below.

A too-long object name is abbreviated, but its real name pops up if the relevant button is pointed to by the mouse pointer.

Button	Meaning
Interrupt	Interrupt handler The button name is fixed to "Interrupt".
Task name	Task Task name defined in system configuration file
Tsk (????)	Unknown processing program If execution of starts in the middle of a processing program, the AZ78K0R cannot identify whether the processing program is an interrupt handler, task, or idle routine. The AZ78K0R therefore handles the processing program as an unknown processing program.
Idle	Idle routine The button name is fixed to "Idle"
Eventflag name	Eventflag Eventflag name defined in system configuration file
Semaphore name	Semaphore Semaphore name defined in system configuration file
Mailbox name	Mailbox Mailbox name defined in system configuration file
Fixed-sized memory pool name	Fixed-sized memory pool Fixed-sized memory pool name defined in system configuration file
Etc.	Object hidden by right-clicking the object button

(1) Object button display order

The object button display order can be changed by clicking a sort button, or by dragging the corresponding object button.

(2) Hiding object buttons

Object buttons can be hidden by right-clicking the button corresponding to the object.

How to read execution transition map

The three types of basic display modes: Simple mode, Standard mode and Detailed mode, are available for displaying the execution transition map. In addition to them, the Equal mode can be specified for each basic mode.

These modes can be selected by selecting the [View] menu -> [View mode].

(1) Simple mode

Displays the CPU usage with horizontal lines.

Figure 4-7 AZ:Analyze Window (Simple Mode)

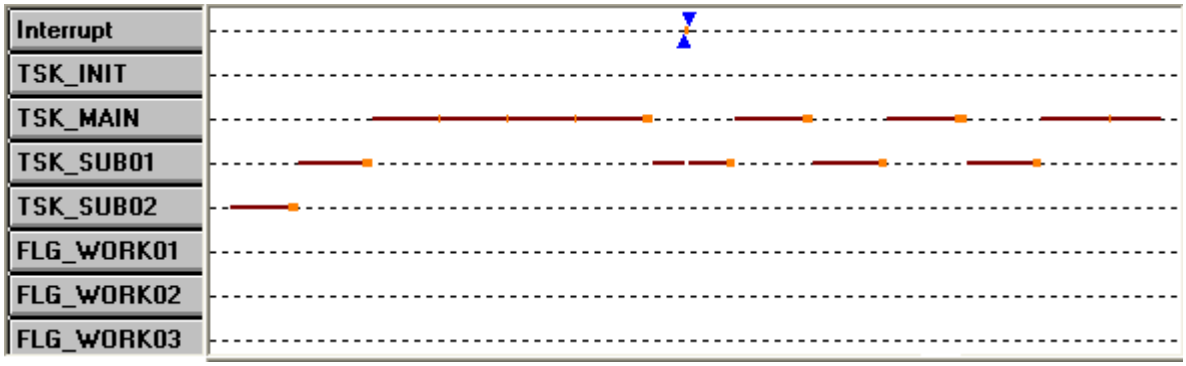


Table 4-8 Marks Displayed in AZ:Analyze Window (Simple Mode)

Mark	Meaning
Brown horizontal line	Task or idle routine
Orange horizontal line	Interrupt handler or RX78K0R internal processing
Blue triangle	Start of interrupt handler processing
Blue inverted triangle	End of interrupt handler processing

(2) Standard mode

Displays the processing program switching status, with vertical lines being combined with information displayed in the Simple mode.

Figure 4-8 AZ:Analyze Window (Standard Mode)

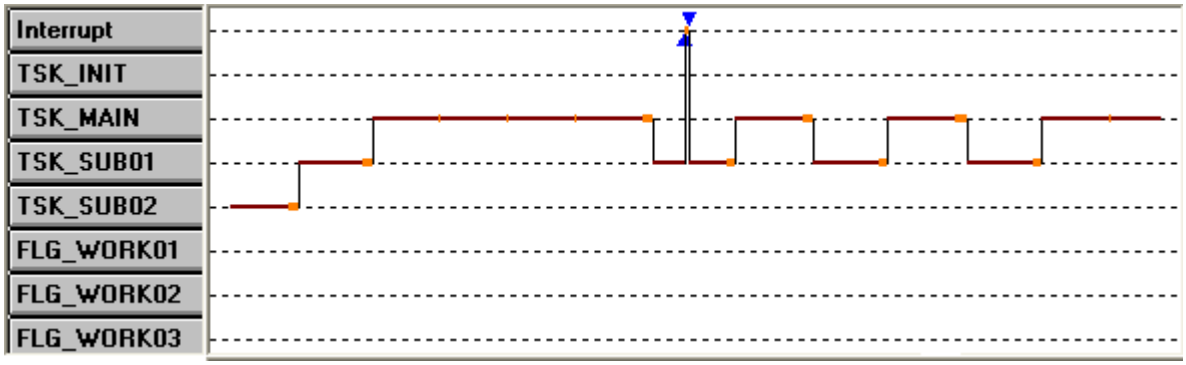


Table 4-9 Marks Displayed in AZ:Analyze Window (Standard Mode)

Mark	Meaning
Brown horizontal line	Task or idle routine
Orange horizontal line	Interrupt handler or RX78K0R internal processing
Blue triangle	Start of interrupt handler processing
Blue inverted triangle	End of interrupt handler processing
Black vertical line	Processing program switching status

(3) Detailed mode

Displays the service call issuance status, in addition to information displayed in the Standard mode.

Figure 4-9 AZ:Analyze Window (Detailed Mode)

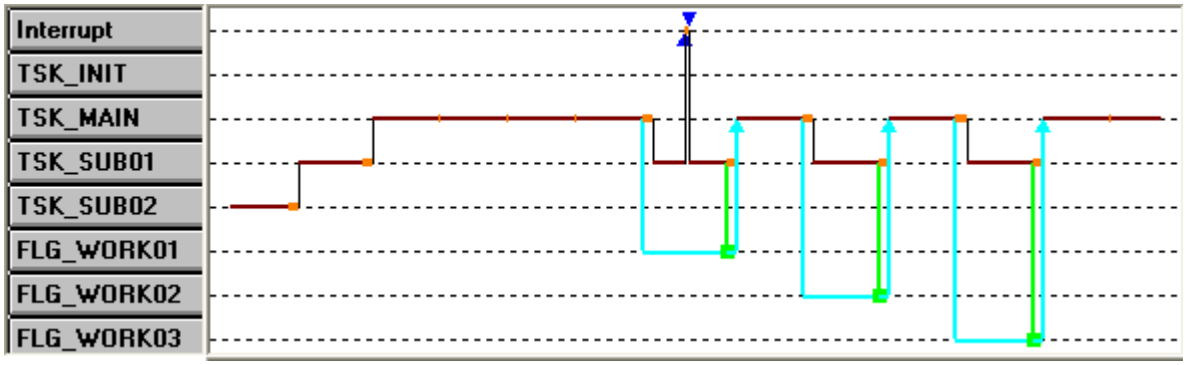


Table 4-10 Marks Displayed in AZ:Analyze Window (Detailed mode)

Mark	Meaning
Brown horizontal line	Task or idle routine
Orange horizontal line	Interrupt handler or RX78K0R internal processing
Blue triangle	Start of interrupt handler processing
Blue inverted triangle	End of interrupt handler processing
Black vertical line	Processing program switching status
Light-blue line	[If a semaphore is subject to manipulation] Issuance of wai_sem, pol_sem or twai_sem [If an eventflag is subject to manipulation] Issuance of wai_flg, pol_flg or twai_flg [If a mailbox is subject to manipulation] Issuance of rcv_mbx, prcv_mbx or trcv_mbx [If a fixed-sized memory pool is subject to manipulation] Issuance of get_mpf, pget_mpf or tget_mpf

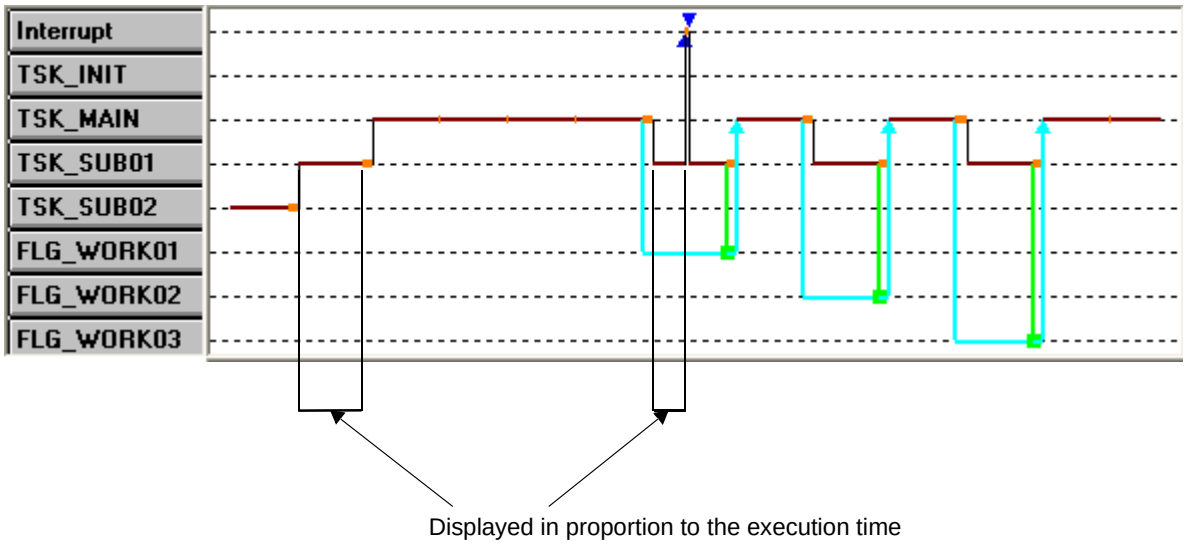
Mark	Meaning
Green line 	[If a semaphore is subject to manipulation] Issuance of sig_sem or Isig_sem [If an eventflag is subject to manipulation] Issuance of set_flg or iset_flg/clr_flg [If a mailbox is subject to manipulation] Issuance of snd_mbx [If a fixed-sized memory pool is subject to manipulation] Issuance of rel_mpf
Red x-mark 	A service call abnormally ended
Timeout mark 	A service call timed out

[Note] If a service call that moves to the WAITING state is issued in an unknown processing program, "Tsk (????)", the AZ78K0R cannot recognize the WAITING state being released. The light-blue horizontal lines will therefore be drawn up to the end of the trace data counting.

(4) Equal mode

In the default state (in which the Equal mode is not specified), the brown/orange horizontal lines that show the CPU usage are displayed in proportion to the execution time taken by each processing program (see Figure 4-10).

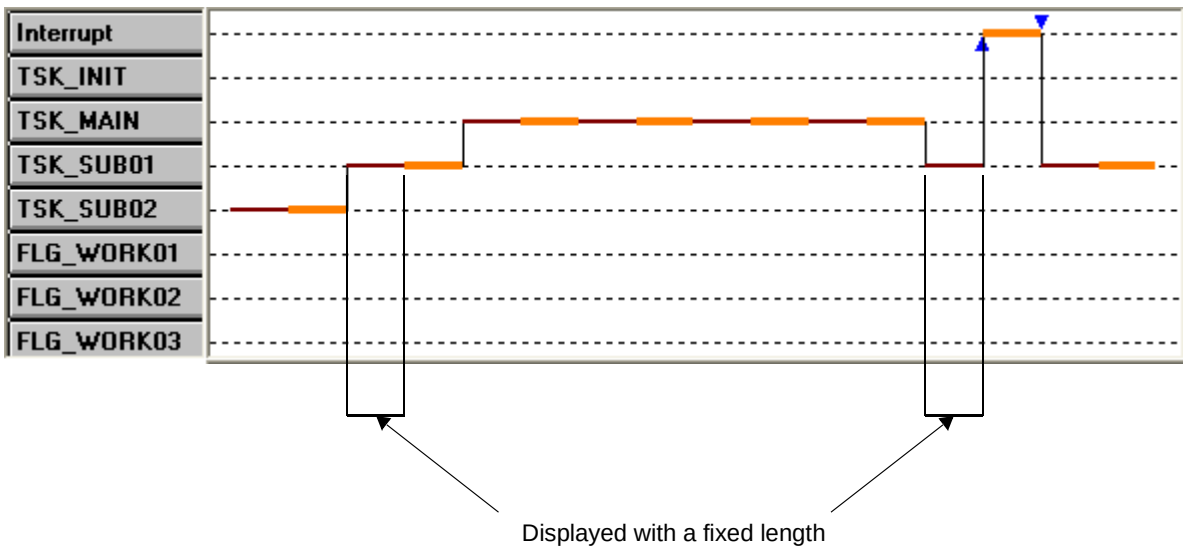
Figure 4-10 AZ:Analyze Window (When Equal Mode Is Not Specified)



In the state in which the Equal mode is specified, in contrast, the brown/orange horizontal lines that show the CPU usage are displayed with a fixed length (see Figure 4-11).

The horizontal lines between events such as task switching are also displayed in a fixed interval, not proportional to the CPU processing time.

Figure 4-11 AZ:Analyze Window (When Equal Mode Is Specified)



How to verify execution transition map

The execution transition map displayed in this window can be verified using either of the following two methods.

(1) Search using simple search buttons

The simple search buttons () can be used for searching for the location where an event related to the specified object occurred.

The following explains the procedure for searching event occurrence location, by using simple search buttons.

(a) Specification of search start point

Move the up temporary cursor to the search start point.

If the up temporary cursor is not displayed, move the up cursor to the search start point.

(b) Displaying simple search buttons

Click the object button corresponding to the object subject to search, to display the simple search buttons.

(c) Clicking simple search buttons

- When the  is clicked

  The point at which an event related to the object selected in (b) occurred is searched for, from the search start point toward the reverse direction to the time axis, and the detected point is shown by the up temporary cursor.

  A beep is generated if no events have occurred at any location.

- When the  is clicked

  The point at which an event related to the object selected in (b) occurred is searched for, from the search start point toward the time axis direction, and the detected point is shown by the up temporary cursor.

  A beep is generated if no events have occurred at any location.

(2) Searching in Pattern Search dialog box

The point at which a specific event occurred can be searched for in the Pattern Search dialog box.

Refer to "How to search" for searching for the point at which a specific event occurred, in the Pattern Search dialog box.

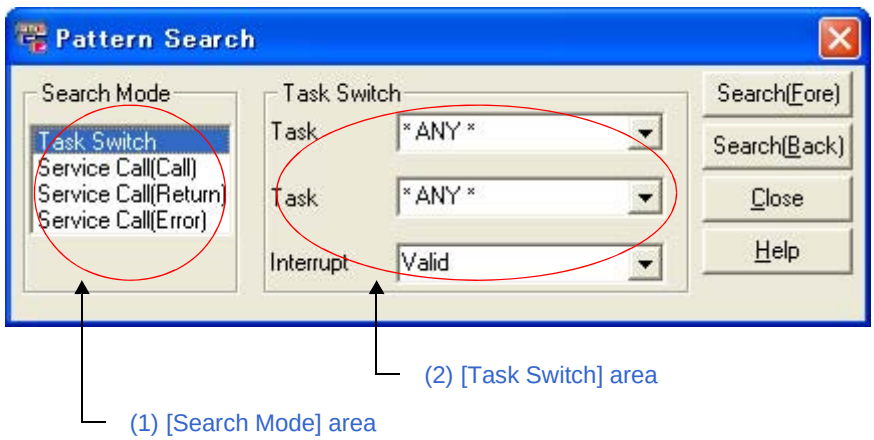
Pattern Search dialog box

This dialog box is used to search for the point at which a specific event occurred, based on the execution transition map displayed in the AZ:Analyze window.

This dialog box can be opened from the AZ:Analyze window by any of the following:

- Select the [View] menu -> [Find...].
- Click the button on the tool bar.
- Press the [Alt], [V] and [F] keys in that order.
- Press the [Ctrl] + [F] keys at the same time.

Figure 4-12 Pattern Search Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons
- How to search

Explanation of each area

(1) [Search Mode] area

This area is used to select events to be searched for (types of events to be searched for from the execution transition map displayed in the AZ:Analyze window).

The following items can be selected as the events to be searched for.

Table 4-11 Types of Searched Events

Searched Event Name	Meaning
Task Switch	Switching of processing programs
Service Call (Call)	Issuance of service call
Service Call (Return)	Returning from a service call routine
Service Call (Error)	Errors returned from a service call

(2) [Task Switch] area

This area is used to select the conditions for searching for the events selected in the Search Mode area.

The items displayed in this area vary depending on the selection in the Search Mode area.

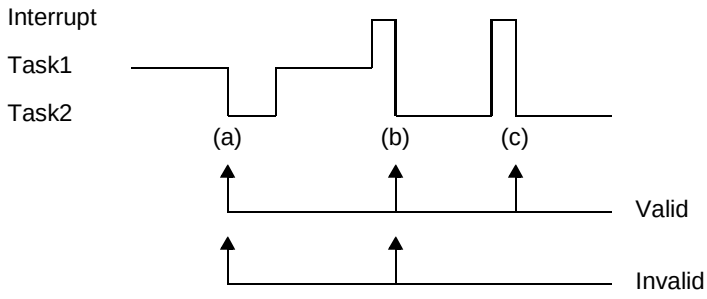
Table 4-12 Search Conditions (When Task Switch Is Selected)

Item	Meaning
Task (upper)	Select a processing program before switching. Select [name of the target task] for task switching, [Interrupt] for interrupt handler switching, or [* ANY *] for any processing program switching.
Task (lower)	Select a processing program after switching. Select [name of the target task] for task switching, [Interrupt] for interrupt handler switching, or [* ANY *] for any processing program switching.
Interrupt	If [* ANY *] is selected for Task (upper) or Task (lower), select whether to include the location where switching to/from an interrupt handler occurred, into the search targets. Select [Valid] to include the location, or [Invalid] not to include the location.

[Note] The search target varies depending on which of the items, [Valid] and [Invalid], is selected in the Interrupt list, as shown below.

The following figure assumes that switching from a "processing program [* ANY *]" to "processing program [Task2]" is included into the search targets.

Figure 4-13 Difference in Search Targets



- Switching point (a)

Valid	Switching from [Task1] to [Task2] is included into the search targets.
Invalid	Switching from [Task1] to [Task2] is included into the search targets.

- Switching point (b)

Valid	Switching from [Interrupt] to [Task2] is included into the search targets.
Invalid	Switching from [Interrupt] to [Task2] is ignored, and switching from [Task1] to [Task2] is included into the search targets.

- Switching point (c)

Valid	Switching from [Interrupt] to [Task2] is included into the search targets.
Invalid	Switching from [Interrupt] to [Task2] is ignored, and switching from [Task1] to [Task2] is included into the search targets.

Table 4-13 Search Conditions (When a Service Call (Call, Return, Error) Is Selected)

Item	Meaning
Task	Select the processing program that issued the service call. Select [name of the target task] for task switching, [Interrupt] for interrupt handler switching, or [* ANY *] for any processing program switching.
Service Call	Select the service call name. Select [* ANY *] for any service call.
Object	Select the name of an object subject to manipulation by the service call. Select [* ANY *] for any object.

Function buttons

Button	Function
Search (Fore)	Searches for the locations that match the conditions selected in this dialog box, from the search start point toward the time axis direction. The up temporary cursor in the AZ:Analyze window shows the locations that match the specified conditions. A beep is generated if no locations match the specified conditions.
Search (Back)	Searches for the locations that match the conditions selected in this dialog box, from the search start point toward the reverse direction to the time axis. The up temporary cursor in the AZ:Analyze window shows the locations that match the specified conditions. A beep is generated if no locations match the specified conditions.
Close	Closes this dialog box.
Help	Displays the help widnow for this dialog box.

How to search

Using the following procedure, the point at which a specific event occurred to be searched for, based on the execution transition map displayed in the AZ:Analyze window.

(1) Specification of search start point

Move the up temporary cursor to the search start point in the AZ:Analyze window.

If the up temporary cursor is not displayed, move the up cursor to the search start point.

(2) 本 How to open this dialog box

Select the [View] menu -> [Find...] in the AZ:Analyze window.

(3) Selection of events to be searched for and search conditions

Select the events to be searched for and search conditions in the Search Mode and Task Switch areas in this dialog box.

(4) Clicking function buttons

- When the [Search (Fore)] button is clicked

  Points that match the conditions selected in this dialog box are searched for from the search start point toward the time axis direction, the up temporary cursor in the AZ:Analyze window shows the locations that match the specified conditions.

  A beep is generated if no locations match the specified conditions

- When the [Search (Back)] button is clicked

  Points that match the conditions selected in this dialog box are searched for from the search start point toward the reverse direction to the time axis. The up temporary cursor in the AZ:Analyze window shows the

locations that match the specified conditions.

A beep is generated if no locations match the specified conditions.

AZ:Cpu window

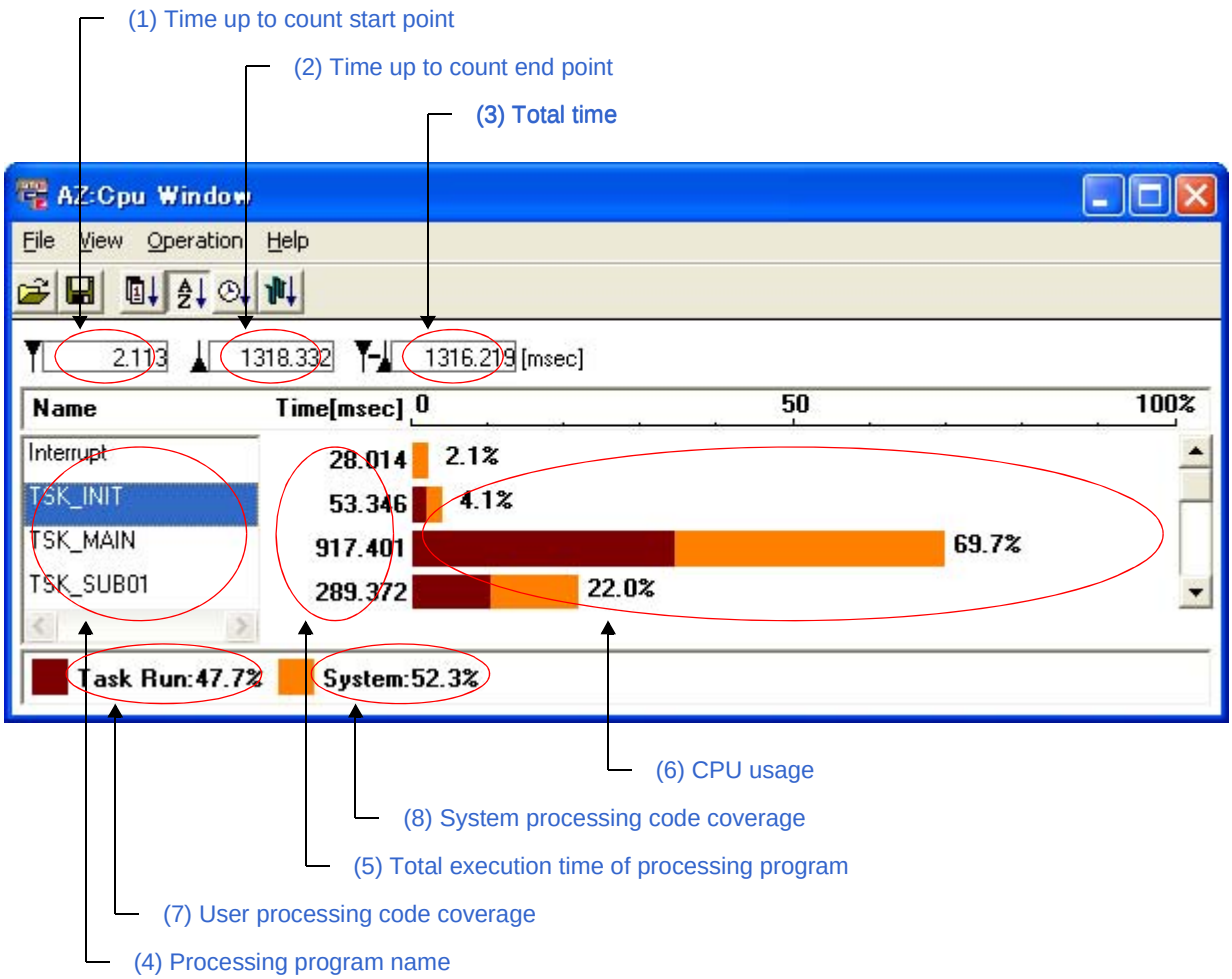
This window displays the CPU usage in a section between the up cursor and down cursor in the AZ:Analyze window.

This window can be opened from the AZ:Analyze window by any of the following:

- Select the [Browse] menu -> [CPU...].
- Click the  button on the tool bar.
- Press the [Alt], [B] and [C] keys in that order.
- Press the [Ctrl] + [C] keys at the same time.

[Note] This window is closed in conjunction with closing the AZ:Analyze window that called the file.

Figure 4-14 AZ:Cpu Window



This section describes the following items:

- Explanation of each area
- Menu bar
- Tool bar
- Count method

Explanation of each area

(1) Time up to count start point

This area displays the time up to the CPU usage counting start point.

The time up to the count start point is a relative time from when trace processing starts until the execution reaches the up cursor position (unit: msec).

(2) Time up to count end point

This area displays the time up to the CPU usage counting end point.

The time up to the count end point is a relative time from when trace processing starts until the execution reaches the down cursor position (unit: msec).

(3) Total time

This area displays the total time of the CPU usage.

The total time is a relative time indicated from the up cursor position to the down cursor position (unit: msec).

(4) Processing program name

This area lists the processing programs executed within the total time.

The following types of processing programs are displayed.

Table 4-14 Processing Program Types

Processing Program Name	Meaning
Task name	Task
Interrupt	Interrupt handler
Idle	Idle routine

(5) Total execution time of processing program

This area displays the total execution time of the processing program within the total time (unit: msec).

(6) CPU usage

This area displays the bar graphs for indicating the percentage of the total time occupied by the execution time of processing programs.

The bar graphs distinguish user processing and system processing with different colors.

Table 4-15 Colors in Bar Graph

Color	Meaning
Brown	User processing (task, idle routine)
Orange	System processing (interrupt handler or RX78K0R internal processing)

[Note] Service calls issued in a task or interrupt handler are handled as RX78K0R internal processing.

(7) User processing code coverage

This area displays the percentage of the total time occupied by the user processing execution time.

(8) System processing code coverage

This area displays the percentage of the total time occupied by the system processing execution time.

Menu bar

(1) File

Open...	Opens the Open/Save As dialog box. Loads the file that contains information to be displayed in this window (extension: .azc). The function of this item is same as that of the button.
Save...	Opens the Open/Save As dialog box. Specifies the name of the file into which information displayed in this window is saved (extension: .azc). The function of this item is same as that of the button.
Close	Closes this window.

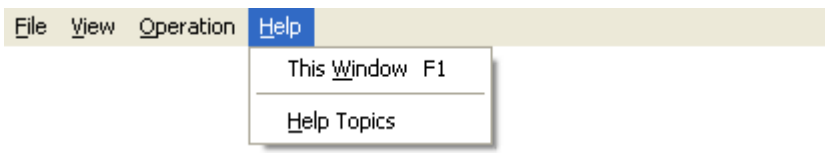
(2) View

Sort Appear	Displays the bar graphs in the order of detection in trace data. The function of this item is same as that of the button.
Sort Name	Displays the bar graphs in the alphabetical order of the processing program names. The function of this item is same as that of the button.
Sort Time	Displays the bar graphs in the order of longer total execution time (default). The function of this item is same as that of the button.
Sort Analyze	Displays the bar graphs in the same order as those displayed in the execution transition map. The function of this item is same as that of the button.

(3) Operation

Active	Switches this window to the Active mode. This window is in the Active mode when opened.
Hold	Switches this window to the Hold mode.

(4) Help



This Window	Displays the help widnow for this window.

Help Topics	Opens the online help, with the [Search] tab displayed.

Tool bar

The tool bar consists of buttons that can execute frequently used menu items with a single action.

Table 4-16 Tool Bar Buttons (AZ:Cpu Window)

Button	Function
	Opens the Open/Save As dialog box. Loads the file that contains information to be displayed in this window (extension: .azc). Same operation an [File] menu -> [Open...].
	Opens the Open/Save As dialog box. Specifies the name of the file into which information displayed in this window is saved (extension: .azc). Same operation an [File] menu -> [Save...].
	Displays the bar graphs in the order of detection in trace data. Same operation an [View] menu -> [Sort Appear].
	Displays the bar graphs in the alphabetical order of the processing program names. Same operation an [View] menu -> [Sort Name].
	Displays the bar graphs in the order of longer total execution time (default). Same operation an [View] menu -> [Sort Time].
	Displays the bar graphs in the same order as those displayed in the execution transition map. Same operation an [View] menu -> [Sort Analyze].

Count method

Using the following procedure, the CPU usage in a section between the up cursor and down cursor in the AZ:Analyze window can be checked.

(1) Specification of count start point

Move the up cursor to the count start position in the AZ:Analyze window.

(2) Specification of count end point

Move the down cursor to the count end position in the AZ:Analyze window.

(3) How to open this window

Select the [Browse] menu -> [CPU...] in the AZ:Analyze window.

When this window is opened, information corresponding to the count section specified in (1) and (2) is displayed.

[Note] When this window is in the Active mode, information displayed in this window is also updated

automatically along with moving of the up/down cursor in the AZ:Analyze window and information corresponding to the move destination of the up/down cursor is displayed.

AZ:Trace View window

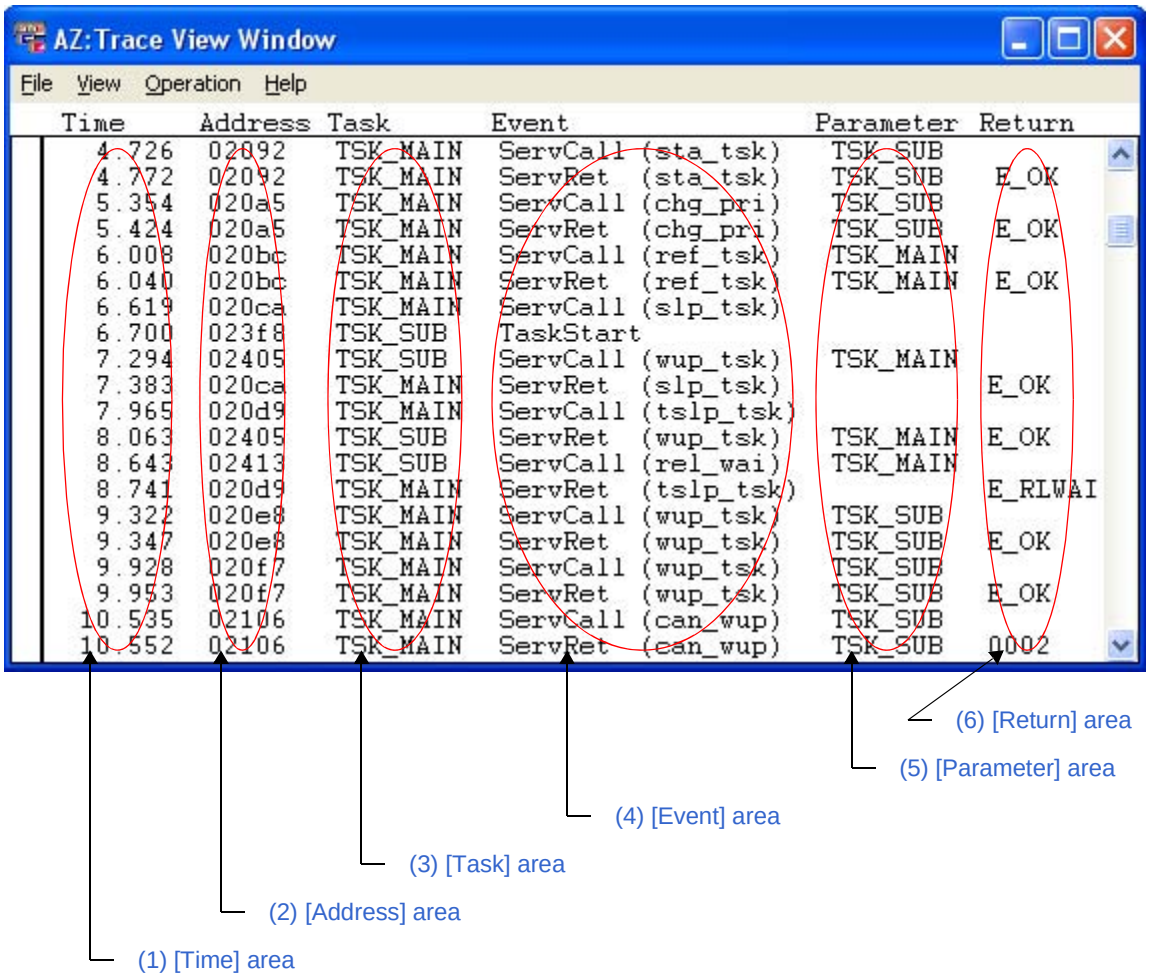
This window displays information obtained from the execution transition map in the AZ:Analyze window in list form.

This window can be opened from the AZ:Analyze window by any of the following:

- Select the [Browse] menu -> [Trace View...].
- Click the  button on the tool bar.
- Press the [Alt], [B] and [T] keys in that order.
- Press the [Ctrl] + [T] keys at the same time.

[Note] This window is closed in conjunction with closing the AZ:Analyze window that called the file.

Figure 4-15 AZ:Trace View Window



This section describes the following items:

- Explanation of each area
- Menu bar
- How to display
- How to read the list
- Caution

Explanation of each area

(1) [Time] area

This area shows a relative time from when trace processing starts until the target event occurs (unit: msec).

(2) [Address] area

This area shows the execution address at which the target event occurred.

(3) [Task] area

This area shows the name of the processing program in which the target event occurred.

The following types of processing programs are displayed.

Table 4-17 Processing Program Types

Processing Program Name	Meaning
Task name	Issuance of service call, returning from a service call routine, start of task processing
Interrupt	Issuance of service call, returning from a service call routine, start of interrupt handler processing, end of interrupt handler processing
Idle	Start of idle routine processing

(4) [Event] area

This area shows the types of the target events.

The following types of events are displayed.

Table 4-18 Event Types

Event Name	Meaning
ServCall (*xxx_xxx*)	Issuance of service call A service call name is displayed inside the parentheses.

Event Name	Meaning
ServRet (*xxx_xxx*)	Returning from a service call routine A service call name is displayed inside the parentheses. The inside of the parentheses is left blank if the event that issued the service call does not exist in the trace buffer.
Int	Start of interrupt handler processing
IntRet	End of interrupt handler processing
TaskStart	Start of task processing
Idle	Start of idle routine processing

(5) [Parameter] area

If the event type is "ServCall (*xxx_xxx*)" or "ServRet (*xxx_xxx*)", this area displays the name of the object to be manipulated by the service call (such as task name, semaphore name, or eventflag name).

(6) [Return] area

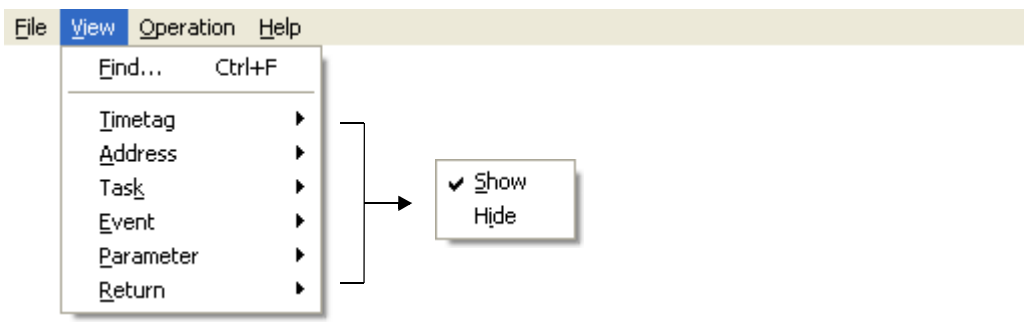
If the event type is "ServRet (*xxx_xxx*)", this area displays the values returned from the service call.

Menu bar

(1) File

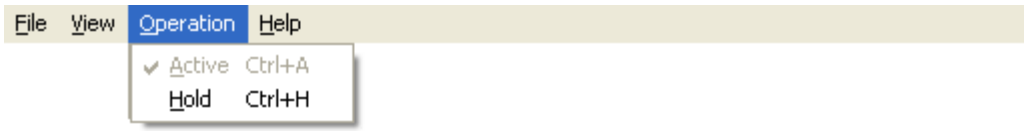
Save...	Opens the Open/Save As dialog box. Specifies the name of the file into which information displayed in this window is saved (extension: .azt).
Close	Closes this window.

(2) View



Find...	Opens the Trace Search dialog box. Searches for specific information (trace data) based on the list displayed in this window. This menu is unavailable when this window is in the Hold mode.
Timetag	Selects [Show] or [Hide] of the Time area (default: Show).
Address	Selects [Show] or [Hide] of the Address area (default: Show).
Task	Selects [Show] or [Hide] of the Task area (default: Show).
Event	Selects [Show] or [Hide] of the Event area (default: Show).
Parameter	Selects [Show] or [Hide] of the Parameter area (default: Show).
Return	Selects [Show] or [Hide] of the Return area (default: Show).

(3) Operation



Active	Switches this window to the Active mode. This window is in the Active mode when opened.
Hold	Switches this window to the Hold mode.

(4) Help

This Window	Displays the help widnow for this window.
Help Topics	Opens the online help, with the [Search] tab displayed.

How to display

Using the following procedure, information obtained from the execution transition map displayed in the AZ:Analyze window can be listed.

(1) Specification of display start position

Move the up temporary cursor to the display start position in the AZ:Analyze window.

If the up temporary cursor is not displayed, the display start position is the top of the trace data.

(2) How to open this window

Select the [Browse] menu -> [Trace View...] in the AZ:Analyze window.

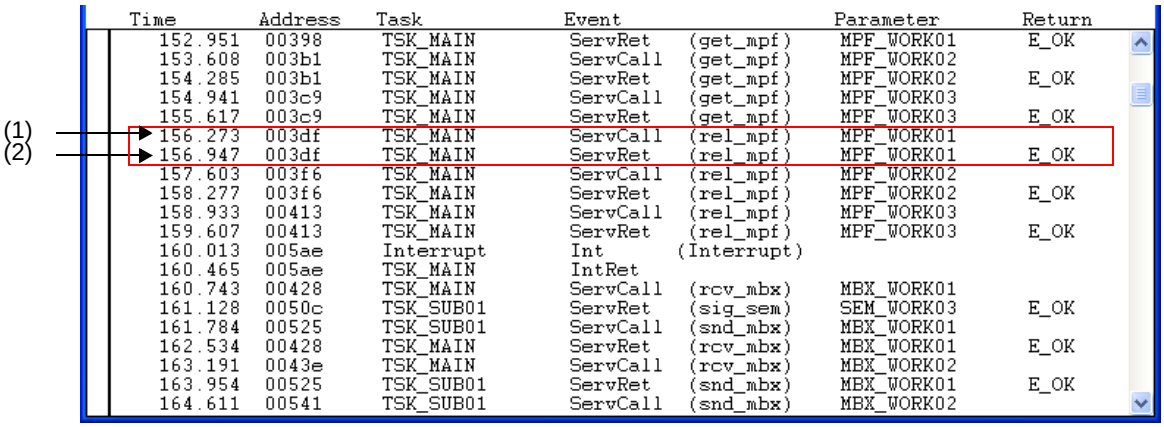
When this window is opened, information corresponding to the display start point specified in (1) is displayed in the first line.

[Note] When this window is in the Active mode, information displayed in this window is also updated automatically along with moving of the up/down cursor in the AZ:Analyze window, and information corresponding to the move destination of the up/down cursor is displayed in the first line.

How to read the list

The following explains how to read the list displayed in this window, using Figure 4-16 as an example.

Figure 4-16 How to Read the List



Time	Address	Task	Event		Parameter	Return
152.951	00398	TSK_MAIN	ServRet	(get_mpf)	MPF_WORK01	E_OK
153.608	003b1	TSK_MAIN	ServCall	(get_mpf)	MPF_WORK02	
154.285	003b1	TSK_MAIN	ServRet	(get_mpf)	MPF_WORK02	E_OK
154.941	003c9	TSK_MAIN	ServCall	(get_mpf)	MPF_WORK03	
155.617	003c9	TSK_MAIN	ServRet	(get_mpf)	MPF_WORK03	E_OK
156.273	003df	TSK_MAIN	ServCall	(rel_mpf)	MPF_WORK01	
156.947	003df	TSK_MAIN	ServRet	(rel_mpf)	MPF_WORK01	E_OK
157.603	003f6	TSK_MAIN	ServCall	(rel_mpf)	MPF_WORK02	
158.277	003f6	TSK_MAIN	ServRet	(rel_mpf)	MPF_WORK02	E_OK
158.933	00413	TSK_MAIN	ServCall	(rel_mpf)	MPF_WORK03	
159.607	00413	TSK_MAIN	ServRet	(rel_mpf)	MPF_WORK03	E_OK
160.013	005ae	Interrupt	Int	(Interrupt)		
160.465	005ae	TSK_MAIN	IntRet			
160.743	00428	TSK_MAIN	ServCall	(rcv_mbx)	MBX_WORK01	
161.128	0050c	TSK_SUB01	ServRet	(sig_sem)	SEM_WORK03	E_OK
161.784	00525	TSK_SUB01	ServCall	(snd_mbx)	MBX_WORK01	
162.534	00428	TSK_MAIN	ServRet	(rcv_mbx)	MBX_WORK01	E_OK
163.191	0043e	TSK_MAIN	ServCall	(rcv_mbx)	MBX_WORK02	
163.954	00525	TSK_SUB01	ServRet	(snd_mbx)	MBX_WORK01	E_OK
164.611	00541	TSK_SUB01	ServCall	(snd_mbx)	MBX_WORK02	

(1) When 156.273 msec have elapsed after trace processing has started, processing program TSK_MAIN issues service call rel_mpf to fixed-sized memory pool MPF_WORK1.

(2) When 156.947 msec have elapsed after trace processing has started, service call rel_mpf that was issued in (1) returns E_OK.

The execution address in the above (1) and (2) means the address at which the relevant service call was issued.

Caution

- If an interrupt occurs during idle routine processing, information related to "IntRet", which indicates the end of the interrupt handler processing, will not be displayed.

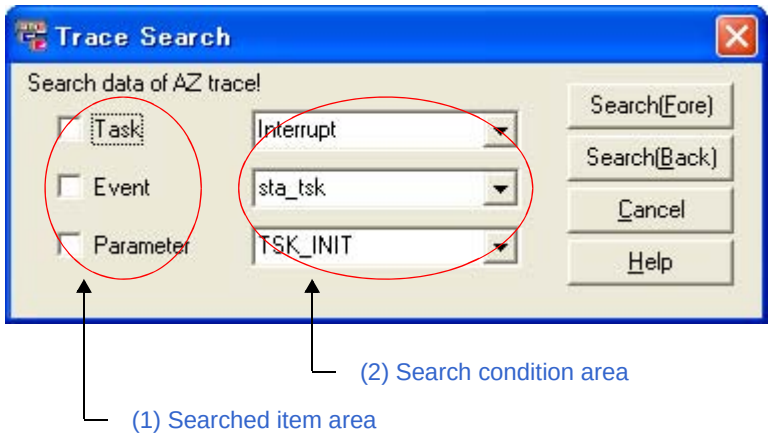
Trace Search dialog box

This dialog box is used to search for specific information (trace data) based on the list displayed in the AZ:Trace View window.

This dialog box can be opened from the AZ:Trace View window by any of the following:

- Select the [View] menu -> [Find...].
- Press the [Alt], [V] and [F] keys in that order.
- Press the [Ctrl] + [F] keys at the same time.

Figure 4-17 Trace Search Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons
- How to search

Explanation of each area

(1) Searched item area

This area is used to specify the items to be searched for (from the list displayed in the AZ:Trace View window).

Multiple items in the following table can be selected as the items to be searched for.

Table 4-19 Search Item Types

Search Item Name	Meaning
Task	Searches for information from the Task area in the list displayed in the AZ:Trace View window.
Event	Searches for information from the Event area in the list displayed in the AZ:Trace View window.
Parameter	Searches for information from the Parameter area in the list displayed in the AZ:Trace View window

(2) Search condition area

This area is used to select the conditions for searching for items specified in the searched item area.

The following items can be selected as the search conditions.

- Processing program name (task name, Interrupt, Idle)
- Event type (service call name)
- Name of object subject to manipulation by service call such as task name, semaphore name, or eventflag name)

Function buttons

Button	Function
Search (Fore)	Searches for information that matches the conditions specified in this dialog box, from the older trace data. Condition match information is displayed in the first line of the AZ:Trace View window. A beep is generated if condition match information does not exist in the relevant list.
Search (Back)	Searches for information that matches the conditions specified in this dialog box, from the newer trace data. Condition match information is displayed in the first line of the AZ:Trace View window. A beep is generated if condition match information does not exist in the relevant list.
Cancel	Closes this dialog box.
Help	Displays the help widnow for this dialog box.

How to search

Using the following procedure, specific information can be searched for, based on the list displayed in the AZ:Trace View window.

(1) Switching to Active mode

Select the [Operation] menu -> [Active] in the AZ:Trace View window to switch the target window to the Active mode.

(2) How to open this dialog box

Select the [View] menu -> [Find...] in the AZ:Trace View window.

(3) Specification of items to be searched for and search conditions

Specify the items to be searched for and search conditions in the searched item area and search condition area in this dialog box.

Figure 4-18 Specification Example 1 (Search for Interrupt)

Figure 4-19 Specification Example 2 (Search for Location at Which sta_tsk Was Issued)

Figure 4-20 Specification Example 3 (Search for Location at Which Service Call Was Issued for TSK_INIT)

(4) Clicking function buttons

- [Search (Fore)] button

  Information that matches the conditions specified in this dialog box is searched for from the newer trace data, and condition match information is displayed in the first line of the AZ:Trace View window.

  A beep is generated if condition match information does not exist.

- [Search (Back)] button

  Information that matches the conditions specified in this dialog box is searched for from the newer trace data, and condition match information is displayed in the first line of the AZ:Trace View window.

  A beep is generated if condition match information does not exist.

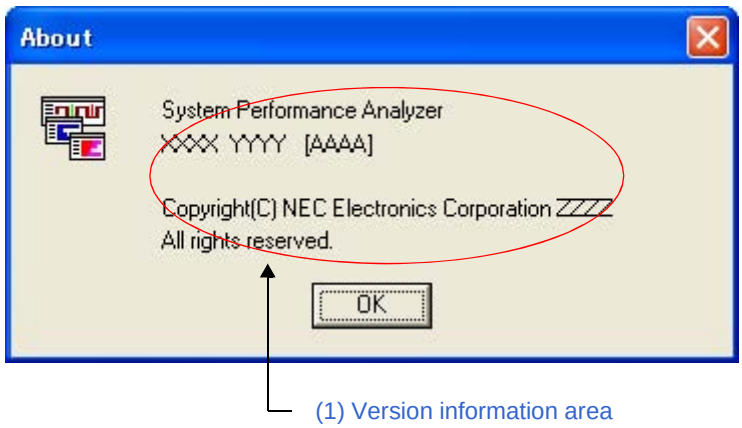
About dialog box

This dialog box is used to display the version information of the AZ78K0R.

This dialog box can be opened from the AZ78K0R window by any of the following:

- Select the [Help] menu -> [About...].
- Press the [Alt], [H] and [A] keys in that order.

Figure 4-21 About dialog box



This section describes the following items:

- Explanation of each area
- Function buttons

Explanation of each area

(1) Version information area

This area is used to display "product name, version number, date of product build and copyright".

Function buttons

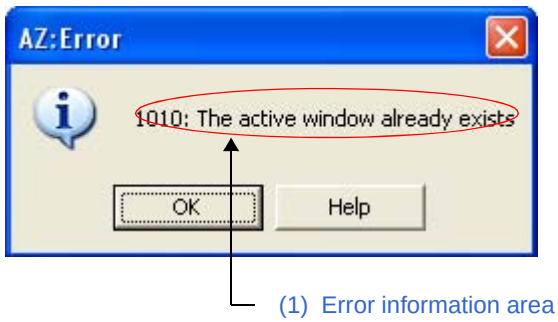
Button	Function
OK	Closes this dialog box.

AZ:Error dialog box

This dialog box is used to display the error information of the AZ78K0R.

This dialog box opens automatically when an invalid operation is performed in a window or a dialog box.

Figure 4-22 AZ:Error Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons

Explanation of each area

(1) Error information area

This area is used to display "error number and error message".

For details of the error information, see "CHAPTER 5 ERROR INFORMATION".

Function buttons

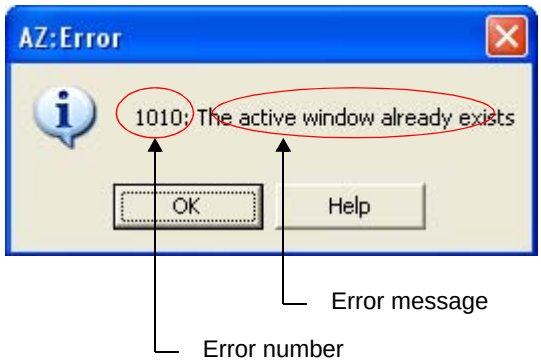
Button	Function
OK	Closes this dialog box.
Help	Displays the help topic corresponding to error information.

CHAPTER 5 ERROR INFORMATION

5. 1 Overview

If an error occurs during an operation in a window/dialog box, the following AZ:Error dialog box that displays the error information is displayed.

Figure 5-1 Error Information Output Format



AZ78K0R error information is shown below.

Table 5-1 Error Information List

Error Number	Description	
1000	Message	Not enough memory.
	Cause	The memory required for the AZ78K0R operation is insufficient.
	Action by User	Close unnecessary application software and then restart the AZ78K0R.
1001	Message	Internal error.
	Cause	An error has occurred in internal AZ78K0R processing.
	Action by User	Restart the AZ78K0R.
1010	Message	The active window already exists.
	Cause	A window in the Active mode is open.
	Action by User	In the AZ78K0R, multiple windows of the same type cannot be open in the Active mode at the same time. Implement either of the following measures. - Change the mode of the window from Active to Hold. - Close the window in the Active mode.
1021	Message	The file does not exist.
	Cause	No relevant files exist in the folder selected in the Open/Save As dialog box.
	Action by User	Specify an existing file.

Error Number	Description	
1022	Message	Fail to write the file.
	Cause	The memory for writing to the file is insufficient, or the file subject to write is write-prohibited.
	Action by User	Implement either of the following measures. - Delete unnecessary files. - Specify another partition for writing. - Change the attribute of the target file so as to enable writing. - Specify a write-enabled file as the file subject to write.
1023	Message	The file format is illegal.
	Cause	A file of an invalid format was selected in the Open/Save As dialog box.
	Action by User	In the AZ78K0R, the format of loadable files varies depending on the window through which the Open/Save As dialog box is opened. AZ:Analyze window -> Binary AZ:Cpu window -> CSV
1100	Message	The debugger does not support AZ interface.
	Cause	The debugger does not support the Tool Interface Protocol (TIP).
	Action by User	Confirm that the debugger supports the TIP.
1110	Message	Fail to switch AZ trace mode.
	Cause	The AZ78K0R failed communication with the debugger.
	Action by User	Restart the AZ78K0R and debugger.
1120	Message	Fail to load the trace data.
	Cause	The AZ78K0R failed communication with the debugger.
	Action by User	Restart the AZ78K0R and debugger.
1121	Message	The trace data does not exist.
	Cause	No information that should be stored in the trace buffer exists in the trace data collect section.
	Action by User	Expand the trace data collect section and retry collection of trace data.

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