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User's Manual

RX850V4 Ver. 4.30

Real-Time Operating System

Analysis for CubeSuite

Target Tool
RX850V4 Ver. 4.30

Document No. U19439EJ1V0UM00 (1st edition)
Date Published December 2008

[MEMO]

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INTRODUCTION

Target Readers

This manual is intended for users who wish to design and develop application systems using the V850 microcontrollers.

Purpose

This manual's purpose is to help the user understand the functions and the operation method of the RX850V4.

Organization

This manual is organized as follows.

- GENERAL
- FUNCTIONS
- CONSTRUCTING PROGRAM
- AZ MONITOR (SOFT TRACE FORM ONLY)
- DEBUGGING WITH AZ850V4
- CAUTIONS

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 V850 microcontrollers:

→ Read the user's manual for each product.

Conventions

[ ]:	Indicates a menu.
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 V850 microcontrollers Development Tools (User's Manuals)

Document Name		Document No.
RX Series	Start for CubeSuite	U19428E
	Message for CubeSuite	U19433E
RX850V4 Ver.4.30	Coding for CubeSuite	U19436E
	Debug for CubeSuite	U19438E
	Analysis for CubeSuite	This document
	Internal Structure for CubeSuite	U19441E
CubeSuite Integrated Development Environment	Start	U19549E
	Programming	U19390E
	Message	U19550E
	V850 Coding	U19383E
	V850 Build	U19386E
	V850 Debug	U19389E
	V850 Design	U19380E

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CHAPTER 1 GENERAL

This chapter describes an overview of analysis tool (AZ850V4) that CubeSuite provides.

1. 1 Summary

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 V850 Microcontrollers. NEC Electronics Corporation also provides the analysis tool (AZ850V4) to support the quantitative performance analysis of programs.

AZ850V4 is an analysis tool for analyzing the execution transition statuses and the execution efficiency of the CPU for programs that embed the real-time operating system "RX850V4" for the V850 Microcontrollers.

AZ850V4 has a function for tracing the occurrence of events (issue of a service call, occurrence of an interrupt, etc.) and presenting the trace data graphically, in cooperation with CubeSuite. By using this function, the execution transition states of tasks, access states to objects such as an acquisition/release of resource, and execution time for a task can be easily analyzed.

1. 2 Features

The following are the features of the analysis tool for CubeSuite that AZ850V4 provides.

- **Graphical display of execution transition statuses**
  The graphically displayed the execution transition status of the program in which RX850V4 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 program, the usage of objects can also be checked.

- **Graphical display of CPU occupation time**
  Based on the display of the CPU usage within a specified time range, the execution efficiency of the entire system can be estimated.

- **Statistical analysis of processing time**
  The time required for a program to execute a certain operation is calculated and the result is displayed as a histogram. The worst, average, and other values are also displayed.

- **Linked operation with CubeSuite**
  A jump can be made from the AZ850V4's windows to the Editor panel, Disassemble panel, and Memory panel of CubeSuite. This makes it easy to identify any problem.

AZ850V4 supports the following two trace forms. Either of these trace forms can be selected for the user's debugging environment. Refer to the "2. 1 Trace Form" for details on the trace forms.

- **Soft trace form**
  A monitor function is provided on the target system, and the monitor program collects trace data for AZ850V4. The monitor program must be created for use in the user's environment. Refer to the "CHAPTER 4 AZ MONITOR (SOFT TRACE FORM ONLY)" for details on how to create the monitor program.

- **Hard trace form**
  Trace data for AZ850V4 is collected using the trace function of a debug tool that is connected to CubeSuite. The trace data can be collected without modifying the program.

1. 3 Resource

This section describes the resource which is used by AZ850V4.

1. 3. 1 Soft trace form

In the soft trace form, a monitor program (AZ monitor) is embedded into the program and a trace buffer that stores trace data for AZ850V4 is located on the memory of the target system.

Therefore, AZ850V4 uses the following target system memory.

Moreover, a timer counter that is not used by RX850V4 or other applications is required to obtain time information from the timer counter on the target system.

Table 1-1. Resource (Soft Trace Form)

Resource	Required Quantity
Text/data area of AZ850V4 (TEXT attribute)	Approx. 920 bytes
Work area of AZ850V4 (BSS attribute)	40 bytes
Trace buffer area	4K bytes to 4M bytes (64K bytes to 1M byte recommended) The size of this area can be changed with the AZ Option dialog box.
Timer counter	1

1. 3. 2 Hard trace form

In the hard trace form, the following events of the debug tool connected to CubeSute are required to collect trace data for AZ850V4.

Therefore, if the resource for AZ850V4 is insufficient, it may not be possible to set the AZ trace mode.

Table 1-2. Resource (Hard Trace Form)

Resource	Required Quantity
Point Trace event (for write access)	1

CHAPTER 2 FUNCTIONS

This chapter describes main functions of AZ850V4.

2. 1 Trace Form

AZ850V4 supports the following two trace forms.
Either of these trace forms can be selected for the user's debugging environment in the AZ Option dialog box.

- **Soft trace form**

  The soft trace form provides a monitor function on the target system, and collects trace data for AZ850V4 using the monitor program (AZ monitor). The trace data is collected by linking a program with the monitor function to the processing program.

  In the soft trace form, The trace data is stored into the user memory area which is specified in the AZ Option dialog box.

  The monitor program must be created according to the user's environment. For details on how to create the monitor program, refer to the "CHAPTER 4 AZ MONITOR (SOFT TRACE FORM ONLY)".

- **Hard trace form**

  The hard trace form uses the trace function of a debug tool that is connected to CubeSuite to collect trace data for AZ850V4. The trace data can therefore be collected without modifying the processing program code.

  Using this form, the trace data is stored into a trace buffer area (trace memory area) of the debug tool.

The trace form that can be used differs depending on the debug tool to be used.

Table 2-1. Relationship between Debug Tool and Trace Form

Debug Tool	Soft Trace Form	Hard Trace Form
IECUBE	OK	-
MINICUBE	OK	-
MINICUBE2	OK	OK
Simulator	OK	OK

[Caution] When using AZ850V4 in the hard trace form with the simulator, specify [No] with the [Accumulate trace time] property in the [Trace] category on the [Debug Tool Settings] tab in the Property panel of CubeSuite. Unless this property is set to [No], the correct time information cannot be obtained.

2. 2 Trace Data for AZ850V4

2. 2. 1 Detection contents

The locations that can be detected as trace data for AZ850V4 and their contents are described below.

Table 2-2. Detectable Contents as Trace Data

Detected Location	Contents
Service call entry	Time Service call function code ID of object subject to execution by service call Service call return address
Service call exit	Time Service call return value
Interrupt entry	Time Exception code Occurrence address of a interrupt
Interrupt exit	Time
Task switch	Time ID of the task to which operation will shift (or ID that indicates Idle status)
Task entry	Time ID of the task to be activated Task activation address

[Caution] The following items cannot be detected as trace data.

- RESET, NMI and exceptions (software exception, exception trap)
- Interrupts that have not been registered into RX850V4
- Start and end of a cyclic handler
- Start and end of a task exception handling routine
- Issuance address of a service call that is ext_tsk

2. 2. 2 Trace buffer

The trace buffer area that is used for collecting trace data for AZ850V4, and the timing of clearing the area are shown in the table below.

Table 2-3. Trace Buffer Area and Timing of Clearing the Area

Trace Form	Trace Buffer Area	Timing of Clearing the Area
Soft trace form	Arbitrarily specified in trace buffer area specification area in the AZ Option dialog box.	- If AZ trace mode is set to on again after AZ trace mode was switched off - When the CPU is reset
Hard trace form	Trace memory of the debug tool that is connected to CubeSuite	- Every start of a program - When the CPU is reset

2. 2. 3 Time accuracy

The accuracy of the time information collected as trace data for AZ850V4 differs depending on the trace form to be used.

- **Soft trace form**
  Because time information is obtained from a timer counter on the target system, the time information of AZ850V4 accords with the operation of the timer counter.
  How to control the timer counter used with AZ850V4 and read its value is explained in the description of the user own coding block of the AZ monitor (refer to the "4. 2. 1 Creating user own coding block").

- **Hard trace form**
  The accuracy of the time information depends on the setting of the [Rate of frequency division of trace time tag] property in the [Trace] category of the [Debug Tool Settings] tab in the Property panel of CubeSuite.
  Also note that the time information may not be correct when the system clock is set to either STOP mode or IDLE mode (The task execution time is calculated from the CPU system clock).

[Caution] When using AZ850V4 in the hard trace form with the simulator, specify [No] with the [Accumulate trace time] property in the [Trace] category on the [Debug Tool Settings] tab in the Property panel of CubeSuite. Unless this property is set to [No], the correct time information cannot be obtained.

2. 3 Debugging Possible with AZ850V4

This section describes whether it is available of what debugging by using AZ850V4 functions.
For details about the procedure to operate, refer to the window/dialog box descriptions.

2. 3. 1 Verification using the AZ:Analyze Window

The AZ:Analyze Window displays the collected trace data using execution transition map.
Using this window and each of the windows that can be opened from this window, system timing misses as well as the entire system itself can be checked.

- **Checking the service call issue status**
  In addition to execution transition map showing the system flow with the task names/interrupt names as the vertical axis, the service calls supplied by the real-time OS are shown using various marks.
  Furthermore, it is possible to select specific locations within trace data by opening the AZ:Trace View Window from any marked point.

- **Checking object operation**
  The operation of specified objects (tasks/interrupts, etc.) can be searched on execution transition map.

- **Searching the occurrence location of specific events**
  A specific event (a task switching/occurrence of interrupt/service call issuance status, etc.) set in the Pattern Set dialog box can be searched on execution transition map.

- **Jumping to the CubeSuite's panel from a given location**
  The panels displaying source text, disassemble text or memory list corresponding to the position specified with

the up temporary cursor in the execution transition map can be opened on CubeSuite.

2. 3. 2 Verification using the AZ:Pattern window

The pattern (particular processing) set with the Pattern Set dialog box is searched in the execution transition map and the distribution status of that pattern is displayed in the AZ:Pattern Window.

It is possible to obtain the worst execution time value and average execution time value for the program processing from this window.

- **Histogram display of task/interrupt processing time**
  The tabulated results for the searched pattern are displayed in histogram from with the execution time interval as a parameter.

- **Search using task/interrupt processing time**
  Pattern locations where the execution time interval is maximum or minimum are searched in the processing time of the searched pattern and the results of this search are displayed in the execution transition map.
  This enables the easy search of locations where particular patterns are processed.

2. 3. 3 Verification using the AZ:Cpu window

The AZ:Cpu Window displays the CPU usage within the specified period in the execution transition map.

From this window, it is possible to check the execution time of given tasks/interrupts and evaluate the performance of the target data from the idle time and interrupt time.

2. 3. 4 Verification using the AZ:Trace View window

The AZ:Trace View Window displays in list form the collected trace data contents.

- **Checking trace data**
  In addition to the processing time, execution address, and executed task/interrupt name, the service call issuance status provided by the real-time OS is displayed, enabling even finer debugging in task units.

- **Verification of task/interrupt name, event type or service call argument name**
  It is possible to perform searches using conditions such as task/interrupt name, event type, service call argument name, etc.

CHAPTER 3 CONSTRUCTING PROGRAM

This chapter describes the procedure of constructing a program for debugging using AZ850V4.

3. 1 Using AZ850V4 in Soft Trace Form

The following is the procedure of constructing a program when AZ850V4 is used in the soft trace form.

In the soft trace form, a monitor function is provided on the target system, and the monitor program (AZ monitor) collects trace data for AZ850V4 (refer to the "2. 1 Trace Form").

(1) Creating target-dependent modules

Create target-dependent modules that are required to execute processing by RX850V4.

(2) Creating processing programs

Create a program (tasks and various kinds of handler processings, etc.) that will form the processing to realize the application system.

(3) Creating system configuration file

Create a system configuration file required for creating information files that contain data to be provided for RX850V4.

(4) Creating information files

Using the configurator (CF850V4) supplied by RX850V4, create information files (system information table file, system information header file, and entry file) from a system configuration file.

(5) Createing user-own cording modules for RX850V4

Create user-own cording modules that are required to execute processing by RX850V4.

(6) Creating AZ monitor

Create the user own coding block of AZ monitor (refer to the "CHAPTER 4 AZ MONITOR (SOFT TRACE FORM ONLY)").

(7) Creating link directive file

Create a link directive file (section map file) by which the user fixes address allocation performed by the link editor. At this time, note that specify the following additional section definitions for the AZ monitor in the data area and text area of the link directive file.

Table 3-1. Additional Section Name for AZ Monitor

Section Name	Description	Attribute	Occupancy Size
.azmon_b	Work area of the AZ monitor	bss	40 bytes
.azmon_t	Text/data area of the AZ monitor	text	Appro. 920 bytes

Figure 3-1. Example of AZ Monitor Section Definition

```
                :
                :
TEXT : !LOAD ?RX V0x00001000 {
    .rx_text    = $PROGBITS  ?AX .rx_text;
    .text       = $PROGBITS  ?AX .text;
    .azmon_t    = $PROGBITS  ?AX .azmon_t; <--Additional description
};
CONST: !LOAD ?R {
    .rx_info    = $PROGBITS  ?A .rx_info;
    .const      = $PROGBITS  ?A .const;
};

DATA : !LOAD ?RW V0xfffc000 {
    .rx_control = $NOBITS    ?AW .rx_control;
    .rx_memory  = $NOBITS    ?AW .rx_memory;
    .sdata      = $PROGBITS  ?AWG.sdata;
    .sbss       = $NOBITS    ?AWG.sbss;
    .data       = $PROGBITS  ?AW .data;
    .bss        = $NOBITS    ?AW .bss;
    .azmon_b    = $PROGBITS  ?AW .azmon_b; <--Additional description
};
                :
                :
```

[Caution] Locate the .azmon_b section within a RAM area that can be read and written.
The area should not be written (or initialized) by a program or the like.

(8) Creating object files

Compile and assemble the created source programs (including target-dependent modules, information files, and user-own cording modules for RX850V4) to generate object files.
At this time, note that the user own coding block for AZ monitor (azusr_XXX.s) must be assembled to generate a object file.

(9) Creating a load module file

Link all of the following files to create a load module file.

- Object files
- Core of AZ Monitor (azcorec.o)
- All library files provided by RX850V4 (including target-dependent module libraries)
- Link directive file

[Caution] If the AZ monitor is not linked, AZ850V4 cannot be used in the soft trace form.

(10) Debugging and performance analysis using CubeSuite and AZ850V4

Download the load module file created above to the debug tool on CubeSuite to execute debugging and performance analysis.

3. 2 Using AZ850V4 in Hard Trace Form

The following is the procedure of organizing a program when AZ850V4 is used in the hard trace form.

In the hard trace form, trace data is collected using the trace function of a debug tool connected to CubeSuite (refer to the "2. 1 Trace Form").

Using this form, trace data can therefore be collected without modifying the program code (it is not necessary to link the AZ monitor).

(1) Creating target-dependent modules

Create target-dependent modules that are required to execute processing by RX850V4.

(2) Creating processing programs

Create a program (tasks and various kinds of handler processings, etc.) that will form the processing to realize the application system.

(3) Creating system configuration file

Create a system configuration file required for creating information files that contain data to be provided for RX850V4.

(4) Creating information files

Using the configurator (CF850V4) supplied by RX850V4, create information files (system information table file, system information header file, and entry file) from a system configuration file.

(5) Createing user-own cording modules for RX850V4

Create user-own cording modules that are required to execute processing by RX850V4.

(6) Creating link directive file

Create a link directive file (section map file) by which the user fixes address allocation performed by the link editor.

(7) Creating object files

Compile and assemble the created source programs (including target-dependent modules, information files, and user-own cording modules for RX850V4) to generate object files.

(8) Creating a load module file

Link all of the following files to create a load module file.

- Object files
- All library files provided by RX850V4 (including target-dependent module libraries)
- Link directive file

[Caution] If the AZ monitor is not linked, AZ850V4 cannot be used in the soft trace form.

(9) Debugging and performance analysis using CubeSuite and AZ850V4

Download the load module file created above to the debug tool on CubeSuite to execute debugging and performance analysis.

[Caution1] When using AZ850V4 in the hard trace form, AZ850V4 sets a event to the debug tool when the AZ trace ON state is set. Therefore, care is required regarding the number of the event that the debug tool can use. If the resources for AZ850V4 is insufficient, the AZ trace ON state cannot be set. Refer to the "1.

3 Resource" for details.

[Caution2] When using AZ850V4 in the hard trace form with the simulator, specify [No] with the [Accumulate trace time] property in the [Trace] category on the [Debug Tool Settings] tab in the Property panel of CubeSuite.
Unless this property is set to [No], the correct time information cannot be obtained.

CHAPTER 4 AZ MONITOR (SOFT TRACE FORM ONLY)

This chapter describes how to create the AZ monitor (monitor program) that is necessary for using AZ850V4 in the soft trace form.

This chapter may be skipped if AZ850V4 is used only in the hard trace form.

4. 1 About AZ Monitor

AZ monitor is a monitor program which consists of the user own coding block (azusr_XXX.s) and the core block (azcorec.o), that collects trace data when AZ850V4 is used in the soft trace form.

AZ monitor acquires the time information necessary for trace data by using the timer counter of the user's target device. This requires that the control block of the timer counter be coded according to the target device of user.

Therefore, the user own coding block that controls the timer counter must be created to complete creation of the AZ monitor.

4. 2 Creating AZ Monitor

4. 2. 1 Creating user own coding block

Code the control block of the timer counter of the target to be used. Create the control block by referring to the provided sample program (azusr_XXX.s).

Figure 4-1 shows the data and functions necessary for the user own coding block, taking a timer counter as an example.

Figure 4-1. Example of Timer Counter Operation (In Case of Up Counter)

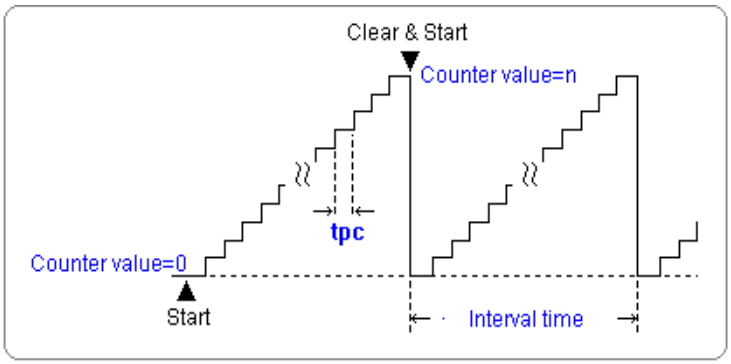


Table 4-1. Data/Functions of User Own Coding Block for AZ Monitor

Name	Type	Description
__AZMON_MaxCount	Data	Specify the maximum number of timer counts. ("n" value in Figure 4-1) Data type: Specify with 4-byte integer format (.word)
__AZMON_CountMode	Data	Specify timer count mode. Data type: Specify with 1-byte integer format (.byte) Data setting values: 0x00 ... Up counter, 0x01 ... Down counter
__AZMON_TimePerCount	Data	Specify the time per count in microsecond units (μs) ("tpc" value in Figure 4-1). Data type: Specify with 4-byte floating-point format (.float)
__AZMON_InitTimer	Function	Specify the timer initialization processing. Input register: lp ... Return address Output register: None Destructible register: Depends on C language calling restrictions
__AZMON_GetCounter	Function	Specify the processing for acquiring the timer counter value. Note that a stack overflow in this function cannot be detected. Therefore, creation without using a stack is recommended. Input register: lp ... Return address Output register: r10 ... Counter value Destructible registers: r1, r11

Figure 4-2. Example of Use Own Coding Block

```
    .globl     __AZMON_MaxCount
    .globl     __AZMON_CountMode
    .globl     __AZMON_TimePerCount
    .globl     __AZMON_InitTimer
    .globl     __AZMON_GetCounter

    .section ".azmon_t", text
    .align     4
__AZMON_MaxCount:
    .word      MaxCountValue     <--Maximum timer count value

    .section ".azmon_t", text
    .align     4
__AZMON_CountMode:
    .byte      CountMode         <--Timer count mode

    .section ".azmon_t", text
    .align     4
__AZMON_TimePerCount:
    .float     TimePerCount      <--Time per count (Unit: microseconds)

    .section ".azmon_t", text
    .align     4
__AZMON_InitTimer:

    The-Code-of-InitTimer        <--Timer's initialization processing code

    jmp     [lp]

    .section ".azmon_t", text
    .align     4
__AZMON_GetCounter:

    The-Code-of-InitTimer      <--Processing code for acquiring the timer counter value

    jmp     [lp]
```

[Caution1] The unit of time displayed as trace data depends on the __AZMON_TimePerCount value (tpc value in Figure 4-1). If the event interval of trace data to be collected is longer than the interval time of the timer counter, the correct time cannot be displayed.

[Caution2] If the "ld.h" instruction is used to acquire the timer counter value (__AZMON_GetCounter), the r10 value is sign-extended to 4-byte value. Therefore, this value must be masked as the example shown below. When the V850E/V850ES/V850E2 is used, however, it is not necessary to mask it with the "andi" instruction by using the "ld.hu" instruction instead of the "ld.h" instruction.

```
ld.h    0[r1],   r10
andi    0xffff,  r10,  r10
```

[Caution3] Do not share the timer to be used for AZ monitor and the timer to be used for RX850V4.

4. 2. 2 Initializing AZ monitor

The AZ monitor must be initialized before it is operated.

"AzInit()" that is a initialization routine for AZ monitor is prepared in AZ monitor. Call AzInit() within the initialization routine of RX850V4 (inirtn).

AzInit() initializes the timer counter and trace control.

AzInit() is the void type function without arguments.

Figure 4-3 shows a example of description for initialization of the AZ monitor.

Figure 4-3. Example of AZ Monitor Initialization Description

```
#include <kernel.h>
void
inirtn(VP_INT exinf)
{
                    :
                    :
    /*
     *Initialize AZ Moniter
     */

    AzInit();    <--Additional description

    return;
}
```

[Caution] AzInit() function must be called after initialization of RX850V4 itself has been completed.
Call this function, therefore, via an initialization handler. If this function is called by boot processing, the initialization will not be correctly executed.

CHAPTER 5 DEBUGGING WITH AZ850V4

This chapter describes the procedure for debugging using AZ850V4.

5. 1 Debugging Procedure Using AZ850V4

The procedure for debugging using AZ850V4 is shown below.

For details on the operating method, refer to the explanation sections of each window and/or dialog box.

(1) Starting CubeSuite

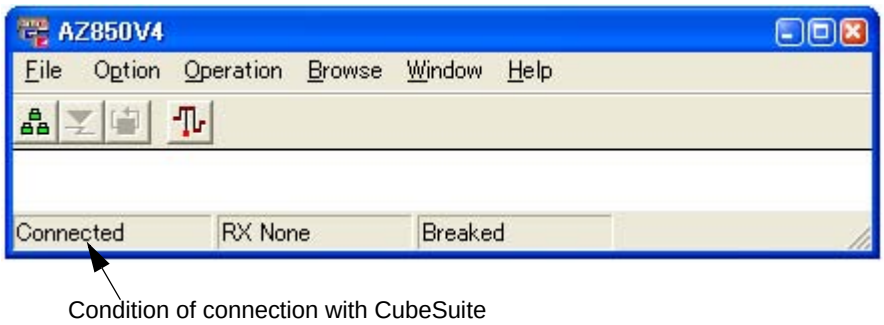
Start CubeSuite and then connect the debug tool to be used to it (select the [Debug] menu -> [Connect to Debug Tool] in the Main window of CubeSuite).

(2) Starting AZ850V4

Start AZ850V4 (select the [View] menu -> [Real-time OS] -> [Performance Analyzer] in the Main window of CubeSuite) to open the AZ850V4 window.

At this time, check whether "Connected" is displayed on the statusbar in the AZ850V4 window. It indicates that AZ850V4 is connected to CubeSuite.

Figure 5-1. Starting AZ850V4



(3) Downloading a load module

Download a load module created for AZ850V4 (refer to the "CHAPTER 3 CONSTRUCTING PROGRAM") into the debug tool (select the [Debug] menu -> [Download] in the Main window on CubeSuite).

Check the following status on the statusbar in the AZ850V4 window after the downloading is completed (if not displayed, the chances are that the symbol information is not included in the load module, or RX850V4/AZ monitor has not been linked to the load module).

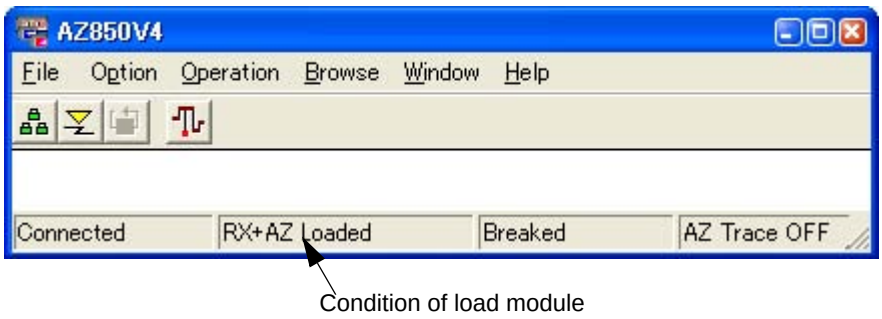
[Using in soft trace form]

RX+AZ Loaded	Both of RX850V4 and AZ monitor are loaded.

[Using in hard trace form]

RX Loaded	RX850V4 is loaded.

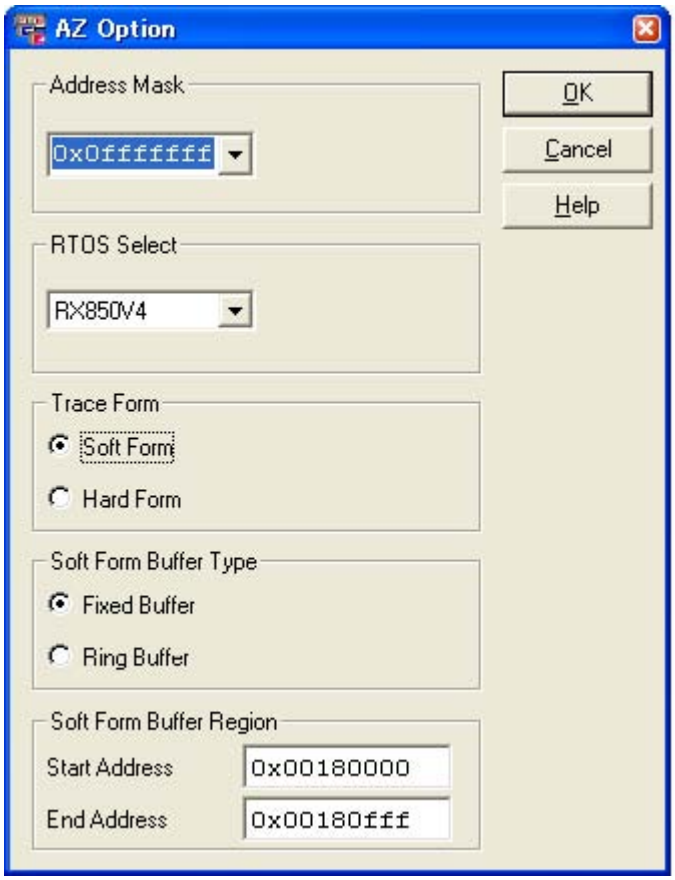
Figure 5-2. Downloading Load Module



(4) Setting in the AZ Option dialog box

Select the [Option] menu -> [AZ Option...] on the AZ850V4 window to open the AZ Option dialog box.

Figure 5-3. Setting in AZ Option Dialog Box



Specify the following options in this dialog box.

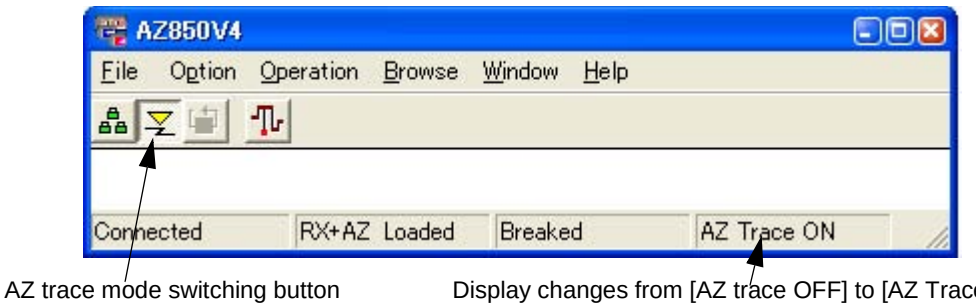
- **Address Mask**
  Specify the maximum physical address of the microcontroller to be used.
- **RTOS Select**
  Select the real-time OS type that has been linked into the downloaded load module.
  Note that you can select only [RX850V4] in the current version.

- **Trace Form**
  Select the trace form to be used.
  If the debug tool to be used supports only one trace form, however, the form is fixed to either of the two form.
- **Soft Form Buffer Type**
  Select the type of trace buffer to be used when the soft trace form has been selected as the trace form. This item is invalid when the hard trace form has been selected.
- **Soft Form Buffer Region**
  Specify the start and end address of the trace bugger region when the soft trace form has been selected as the trace form.
  The trace data collected by AZ850V4 is acquired once into the target memory. This means that it is necessary to specify the unused memory area of the target memory as the trace buffer region.
  Specify the unused memory area in the range of 4K bytes to 4M bytes.
  If this setting is not correctly made when AZ850V4 used in the soft trace form, trace data for AZ850V4 cannot be collected.

(5) Switching the AZ trace mode

Set the AZ trace ON state to enable AZ850V4 trace function by clicking the  button on the AZ850V4 window.
Note that the AZ trace ON state cannot be set until after a load module has been downloaded.

Figure 5-4. Switching AZ Trace Mode



(6) Executing a program

Execute the program on CubeSuite. The trace data starts being collected into the trace buffer along with the program execution.

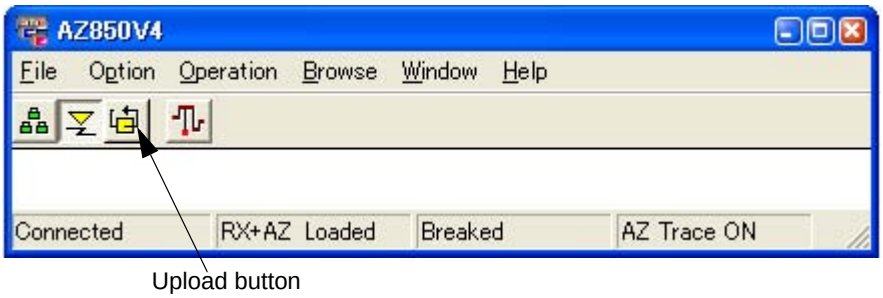
(7) Stopping the program

Stop the program on CubeSuite. If a breakpoint has been set, wait until a break occurs. Stopping the program also stops the collection of trace data.

(8) Uploading of trace data

Click the  button on the AZ850V4 window to upload the trace data for AZ850V4 to AZ850V4.

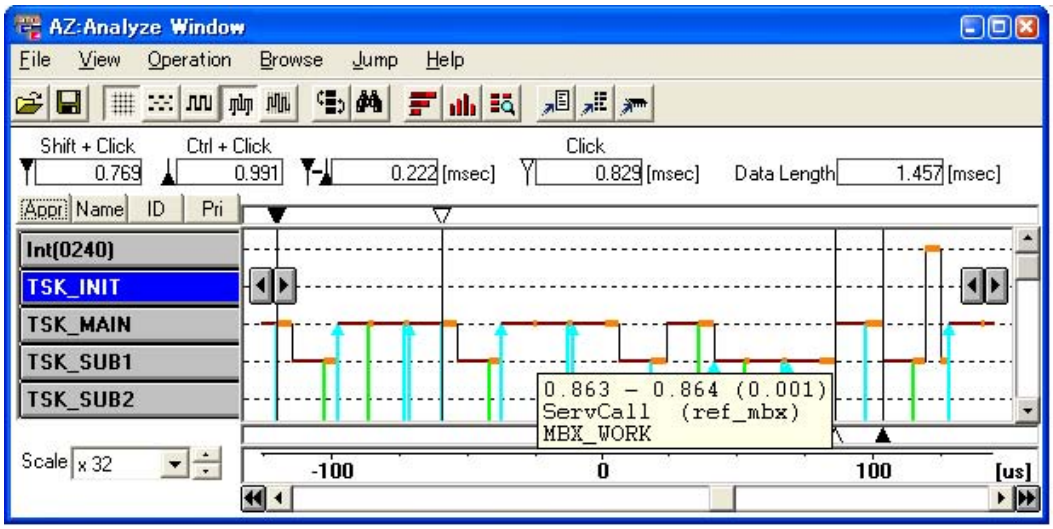
Figure 5-5. Uploading of Trace Data



(9) Check using the AZ:Analyze Window

Click the button on the AZ850V4 window to open the AZ:Analyze Window to display the execution transition map based on the uploaded trace data.
Using this window and each of the windows that can be opened from this window, system timing misses as well as the entire system itself can be checked.

Figure 5-6. Display Example of AZ:Analyze Window

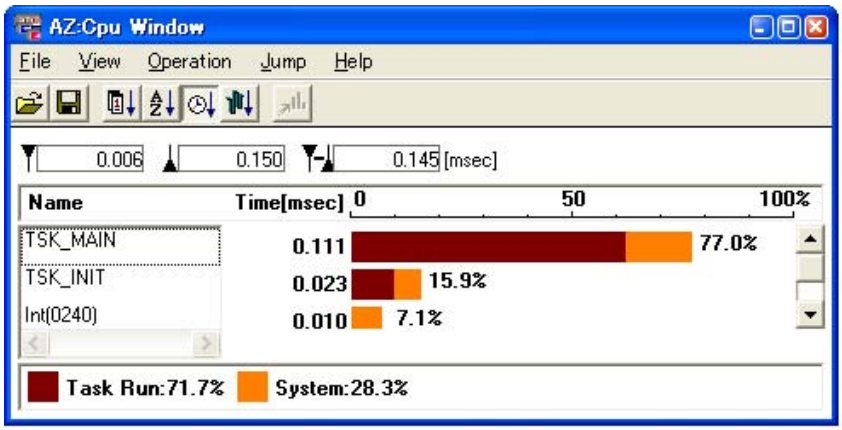


[Remark]For how to read the execution transition map displayed in this window, refer to the "Understanding the execution transition map" and "Verification method in execution transition map".

(10) Check using the AZ:Cpu Window

Check the CPU usage status for the defined range by using the AZ:Cpu Window.
Using this window, the execution time of a specified processing of task/interrupt can be confirmed, and the target data performance can be evaluated, base on the idle time and interrupt processing time.

Figure 5-7. Display Example of AZ:Cpu Window



- To display the AZ:Cpu Window:

  (a) Specify the range for which the total CPU usage is to be calculated, using the up cursor and down cursor in the AZ:Analyze Window.

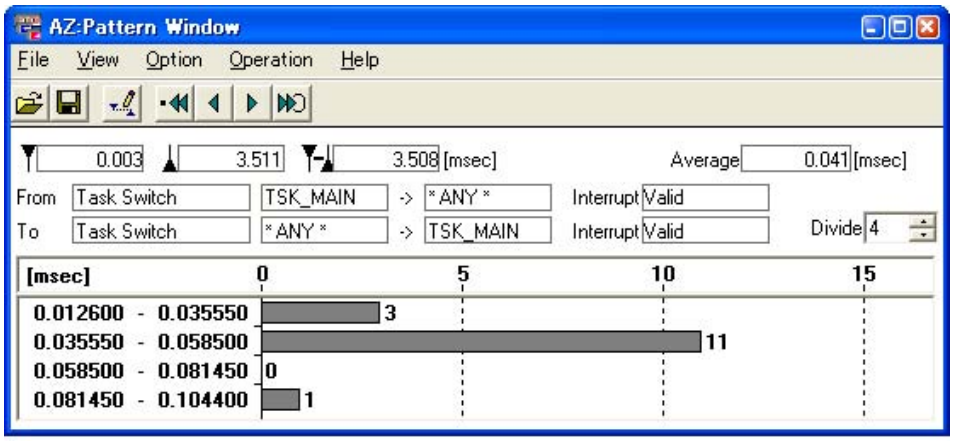
  (b) Click the button on the AZ:Analyze Window.

[Remark] If this window is in the active status and either the up cursor or down cursor is repositioned in the execution transition map, the contents of CPU usage is automatically updated.

(11) Check using the AZ:Pattern Window

Check the distribution of the specified pattern for given execution duration by using the AZ:Pattern Window.
It is possible to obtain the worst execution time value and average execution time value for the program processing from this window.

Figure 5-8. Display Example of AZ:Pattern Window



- To display the AZ:Pattern Window:

  [Displaying a pattern distribution]

  (a) Specify the range for which pattern distribution is to be calculated, using the up cursor and down cursor in the AZ:Analyze Window.

  (b) Click the button on the AZ:Analyze Window. In the Pattern Set dialog box that opens automatically, set the conditions of the pattern to be calculated. Then, click the [OK] button in this dialog box.

[Displaying a pattern distribution from the AZ:Cpu Window]

(a) Specify the range for which pattern distribution is to be calculated, using the up cursor and down cursor in the AZ:Analyze Window.

(b) In the AZ:Cpu Window, select an object in the list.

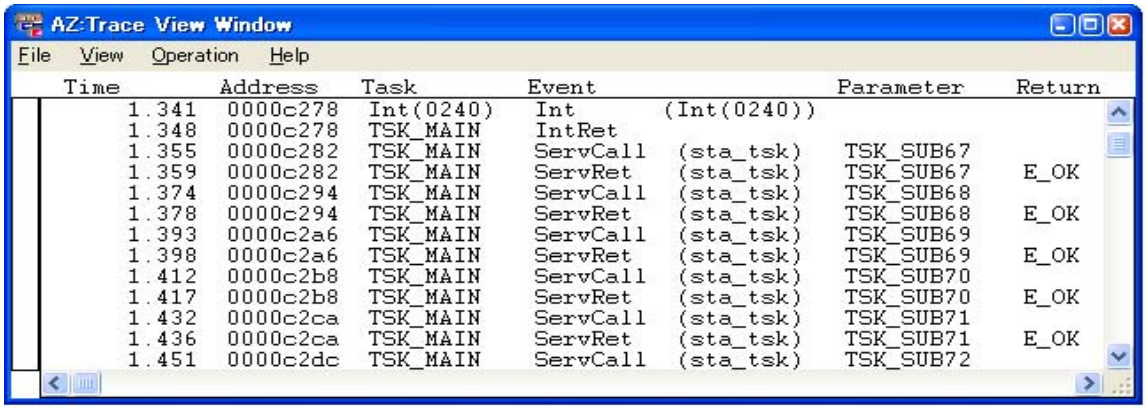
(c) Click the  button on the AZ:Cpu Window.

[Remark] If this window is in the active status and either the up cursor or down cursor is repositioned in the execution transition map, the contents of pattern distribution is automatically updated.

(12) Check using the AZ:Trace View Window

Check the collected trace data in detail by using the AZ:Trace View Window.

Figure 5-9. Display Example of AZ:Trace View Window



- To display the AZ:Trace View Window:

(a) Move the up temporary cursor to the desired position in the AZ:Analyze Window. When the up temporary cursor is not displayed, the beginning of the trace data becomes the display start position.

(b) Click the  button on the AZ:Analyze Window.

[Caution] If this window is in the active status and either the up temporary cursor is repositioned in the execution transition map, the contents of trace data is automatically updated.

Debug the program, repeating steps (6) and after as required.

CHAPTER 6 CAUTIONS

This chapter describes general cautions for using AZ850V4.

6. 1 Allocation of AZ Monitor

When linking the AZ monitor, it is recommended to allocate the .azmon_b section to the internal RAM.

When it is allocated to the external RAM, the external RAM must be referenced correctly (e.g. the peripheral I/O registers are set correctly).

6. 2 Elapsed Time

When executing with hard trace form using IECUBE, if the operating speed of the CPU is 33 MHz or faster, the elapsed time may not be measured between events due to problems with the resolution because the tracer timer is a 16-bit timer.

In such a case, the following phenomena occur:

- It seems that time does not elapse at the entry and exit of a service call
- It seems that time does not elapse at the entry and exit of an interrupt

AZ850V4 calculates the processing time of the specified section by adding the elapsed time between events. Therefore, if multiple events occur in the specified section, the errors described above are accumulated. Consequently, a time shorter than the actual processing time will be displayed (the number of errors is linear to the number of events that occurred in the specified section).

6. 3 Execution Transition Map

- When uploading the trace data for AZ850V4 by clicking the upload button () on the AZ850V4 window, correct information on RX850V4 may not be acquired if the program is stopped during RX850V4 internal processing. In such a case, the following functions will be affected:
  - The function that sorts tasks in the priority order in the AZ:Analyze Window and the Object Select dialog box
  - The function to display the task names and resource names in the AZ:Analyze Window ("Tsk(task ID)" is displayed when task names cannot be acquired)

- If the name of a task cannot be acquired and a service call that waits for resources is issued from an abject displayed as "Tsk(????)", a blue horizontal line indicating the resource waiting status is drawn until the end of trace even after the resource waiting status has been cleared.

- Objects in the AZ:Analyze Window and the execution transition map may not be correctly displayed while the load module subject to trace data has more than 1000 objects.

- The pull-down menu of the Scale modify button in the AZ:Analyze Window may be dunned. However, the operation itself can be performed normally.

6. 4 List of Trace Data

If an interrupt occurs during Idle and Idle is restored from the interrupt, the [IntRet] is not displayed of the [Event] in the AZ:Trace View Window.

6. 5 Others

If the window is vertically expanded in the Object Select dialog box and then reduced, the displayed data may be discredited.

APPENDIX A WINDOW REFERENCE

Appendix A provides detailed explanations of windows and dialog boxes used for debugging with AZ850V4.

A. 1 Description

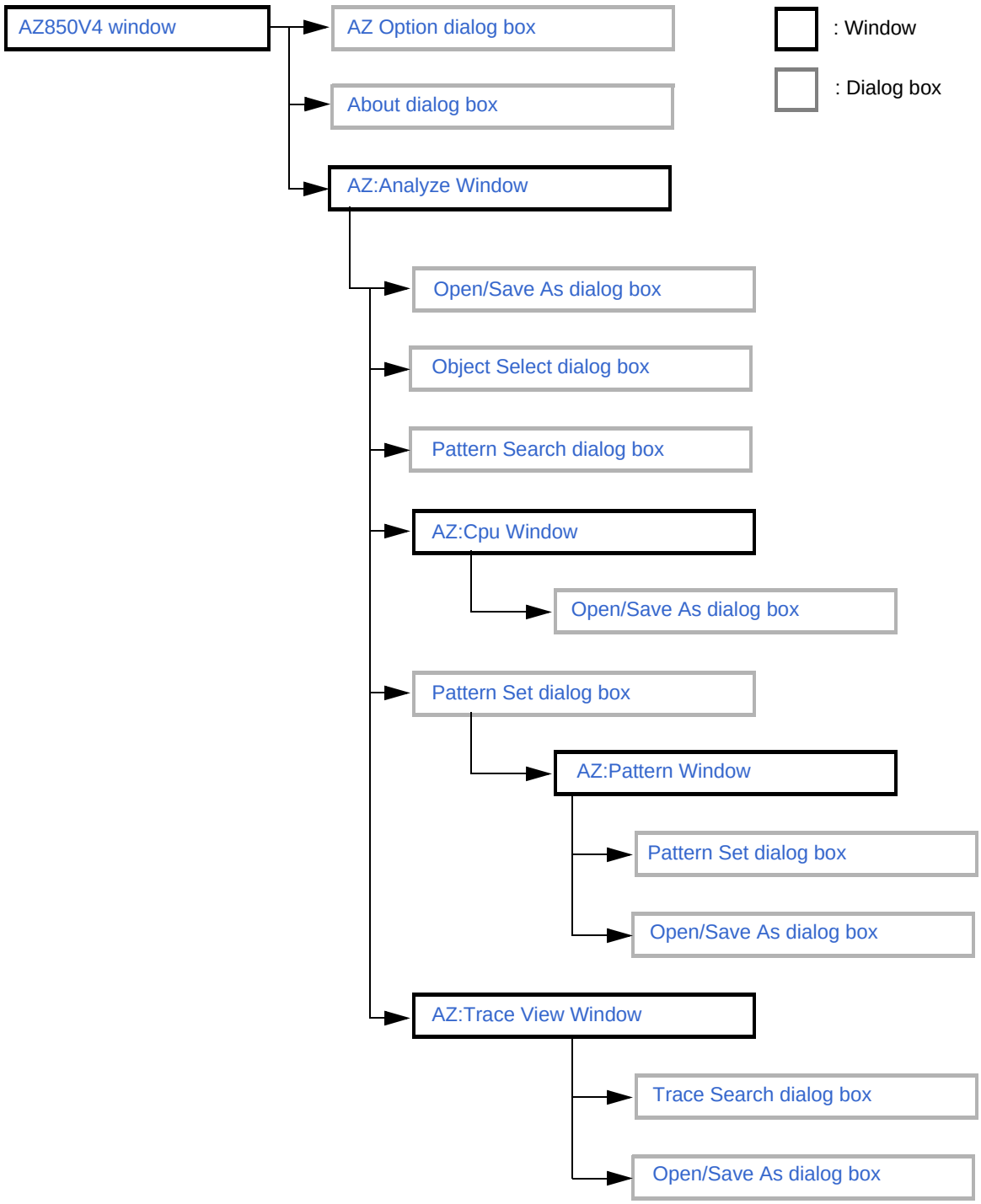
The following shows the list of windows and dialog boxes of AZ850V4.

Table A-1. List of Windows and Dialog Boxes of AZ850V4

Window/Dialog Box Name	Function
AZ850V4 window	Window for performing basic operation of AZ850V4.
AZ Option dialog box	Sets options such as the trace form and the trace level to use AZ850V4.
Open/Save As dialog box	Selects a file when loading or saving the display file.
AZ:Analyze Window	Displays the execution transition map based on the trace data collected.
Object Select dialog box	Selects the objects to be displayed in execution transition map and modifies the order in which those objects are displayed.
Pattern Search dialog box	Sets the search conditions to search for an object in the execution transition map.
AZ:Cpu Window	Displays the CPU usage within the specified period in the execution transition map.
Pattern Set dialog box	Sets the pattern to be displayed in the AZ:Pattern Window.
AZ:Pattern Window	Displays the histogram representing the number of times the specified pattern appears for given execution duration in the execution transition map.
AZ:Trace View Window	Displays the list of the contents of trace data collected.
Trace Search dialog box	Sets the search conditions applied when searching for trace data with the AZ:Trace View Window.
About dialog box	Displays the version information about AZ850V4.
AZ:Error dialog box	Displays the error information of AZ850V4.

The following shows the relationship of AZ850V4 windows and dialog boxes.

Figure A-1. Relationship of AZ850V4 Windows and Dialog Boxes



AZ850V4 window

This window, which opens automatically after AZ850V4 is started up, is used to perform basic operations of AZ850V4. To use AZ850V4, start operation from this window.

Figure A-2. AZ850V4 Window

This section describes the following items:

- Menubar
- Toolbar
- Statusbar
- Caution
- Error

Menubar

(1) [File] menu

Exit	Terminates AZ850V4.

(2) [Option] menu

Tool Bar	Displays (default) or hides the toolbars in windows of AZ850V4. The toolbars are displayed while this item is prefixed with a check mark.
Status Bar	Displays (default) or hides the statusbars in windows of AZ850V4. The statusbars are displayed while this item is prefixed with a check mark.
AZ Option...	Opens the AZ Option dialog box. In this dialog box, trace options for AZ850V4 are specified. The function of this item is same as that of the  button.

(3) [Operation] menu

AZ Trace ON	Sets the AZ trace ON state. While this item is prefixed with a check mark, the AZ trace ON state is set, so that executing the program collects trace data into the trace buffer. Note that this menu item cannot be selected until after both of RX850V4 and AZ monitor (in the case of the soft trace from)/RX850V4 (in the case of the hard trace from) have been downloaded. In addition, this menu item cannot be also selected while the program is being executed. The function of this item is same as that of the  button.
AZ Trace OFF	Sets the AZ trace OFF state . While this item is prefixed with a check mark, the AZ trace OFF state is set, so that executing the program dose not collect trace data for AZ850V4 into the trace buffer. AZ trace OFF state is set as AZ trace mode when AZ850V4 is started. The function of this item is same as that of the  button.
Upload	Uploads the collected trace data for AZ850V4 into AZ850V4. This item cannot be selected if the trace buffer contains no trace data. The function of this item is same as that of the  button.

(4) [Browse] menu

Analyze...	Opens the AZ:Analyze Window. The execution transition map based on the uploaded trace data is displayed in this window. The function of this item is same as that of the  button.

(5) [Window] menu

Close All	Closes all AZ850V4 windows and dialog boxes except this window.

(6) [Help] menu

This Window	Displays the help window for this window.
Help Topics	Starts AZ850V4 online help.
About...	Opens the About dialog box. The version information about AZ850V4 is displayed in this dialog box.

Toolbar

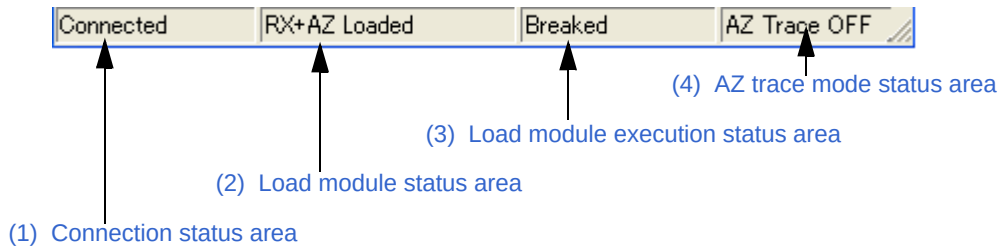
The toolbar consists of buttons that can execute frequently used menu items with a single action.

Button	Function
	Opens the AZ Option dialog box. In this dialog box, the AZ trace options are specified. Same operation as [Option] menu -> [AZ Option...].
	Sets AZ trace ON state if it is OFF state, and vice versa. In the AZ trace ON state, trace data is collected into the trace buffer as the program is executed. Note that the AZ trace ON state cannot be set until after both of RX850V4 and AZ monitor (in the case of the soft trace from)/RX850V4 (in the case of the hard trace from) have been downloaded. In addition, this button cannot be also selected while the program is being executed. In the AZ trace OFF state, trace data is not collected even if the program is executed. Same operation as [Operation] menu -> [AZ Trace ON] or [Operation] menu -> [AZ Trace OFF].
	Uploads the collected trace data for AZ850V4 into AZ850V4. This item cannot be selected if the trace buffer contains no trace data. Same operation as [Operation] menu -> [Upload].
	Opens the AZ:Analyze Window. The execution transition map based on the uploaded trace data is displayed in this window.

Statusbar

Figure A-3 shows the name of each area on the statusbar.

Figure A-3. Statusbar of AZ850V4 Window



(1) Connection status area

This area indicates the status of connection with CubeSuite.

Connected	Connected to CubeSuite
Not Connected	Not connected to CubeSuite

(2) Load module status area

This area indicates the state of the load module to be loaded onto the debug tool connected to CubeSuite.
This area is not displayed if AZ850V4 is not connected to CubeSuite.

RX+AZ Loaded	[In case of soft trace form] Both of RX850V4 and AZ monitor are loaded.
RX+AZ None	[In case of soft trace form] Both or either of RX850V4 and AZ monitor is not loaded.

RX Loaded	[In case of hard trace form] RX850V4 is loaded.
RX None	[In case of hard trace form] RX850V4 is not loaded.

(3) Load module execution status area

This area indicates the state of the program execution.
This area is not displayed if AZ850V4 is not connected to CubeSuite.

Running	Status of program being execution
Breaked	Status of 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 if AZ850V4 is not connected to CubeSuite or a load module (the required symbol information) has not been downloaded onto the debug tool.

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

Caution

- The following state of AZ850V4 is required to set the AZ trace ON.
  In case of soft trace form
  Both of RX850V4 and AZ monitor are loaded ([RX+AZ Loaded] is displayed on the statusbar).
  In case of hard trace form
  RX850V4 is loaded ([RX Loaded] is displayed on the statusbar).
- In the hard trace form, AZ850V4 sets a event to the debug tool when the AZ trace ON state is set. Therefore, care is required regarding the number of the event that the debug tool can use. If the resources for AZ850V4 is insufficient, the AZ trace ON state cannot be set. Refer to the "1. 3 Resource" for details.
- The contents of this window dose not change even if trace data is uploaded. To check the contents of trace data, open the AZ:Analyze Window by selecting the [Browse] menu -> [Analyze...].

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

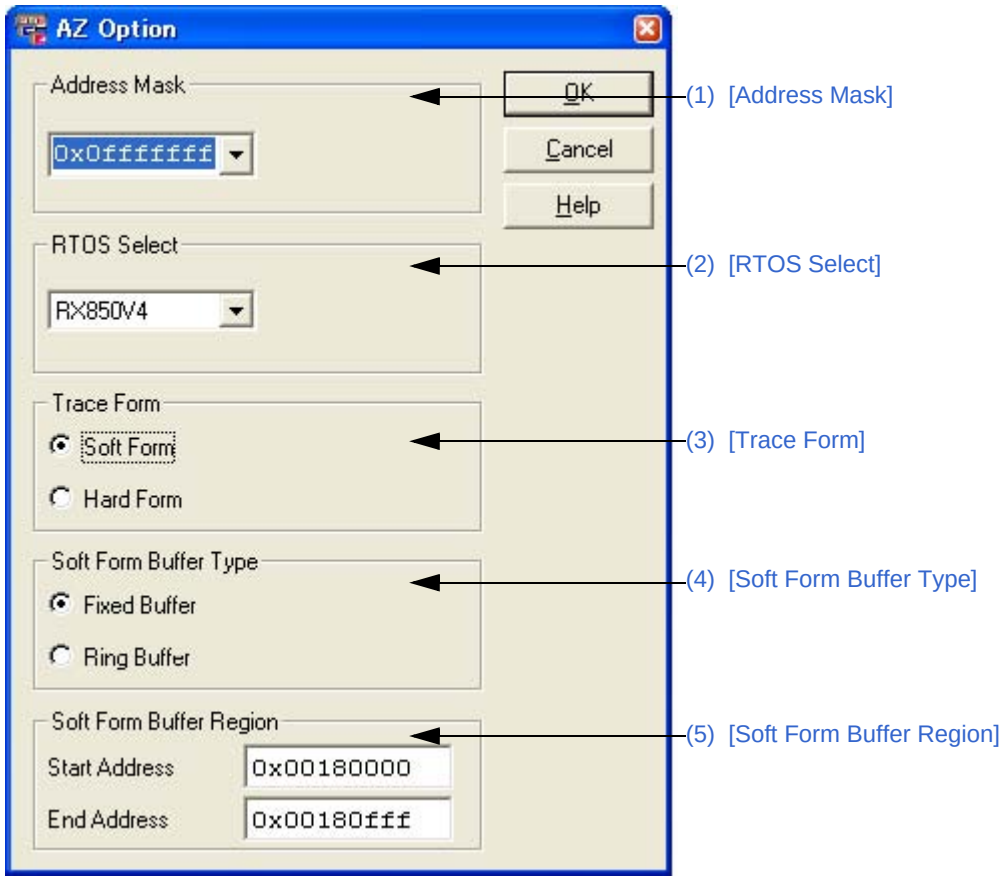
- If an error occurs during the switching processing of the AZ trace mode
- If an error occurs during the uploading processing of the trace data
- If the AZ trace ON is set without set anything with the [Soft Form Buffer Region] in the AZ Option dialog box
- If an attempt is made to upload trace data when no trace data is collected
- If trace data obtained by uploading processing is not correct

AZ Option dialog box

This dialog box is used to specify various options for using AZ850V4.
This dialog box can be opened from the AZ850V4 window by any of the following:

- Select the [Option] menu -> [AZ Option...]
- Click the button on the toolbar.
- Press the [Alt], [P] and [O] keys in that order.
- Press the [Ctrl]+[O] keys at the same time.

Figure A-4. AZ Option Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons
- Error

Explanation of each area

(1) [Address Mask]

This area is used to specify the maximum physical address of miclocontroller to be used.
Select an appropriate item from the drop-down list, or enter an appropriate value in hexadecimal from the keyboard.
For details on the maximum physical address of the miclocontroller, refer to the user's manual of miclocontroller to be used.

(2) [RTOS Select]

This area is used to specify the real-time OS that has been linked into the downloaded load module.
Note that you can select only [RX850V4] in the current version.

(3) [Trace Form]

This area is used to specify the trace form of AZ850V4.
Select the option button corresponding to the operating environment.

Soft Form	AZ850V4 is used in the soft trace form. Select this button when a monitor function is provided on the target system, and the monitor program collects trace data for AZ850V4.
Hard Form	AZ850V4 is used in the hard trace form (default). Select this button when trace data for AZ850V4 is collected using the trace function of a debug tool that is connected to CubeSuite.

[Caution] Either the soft trace form or hard trace form of AZ850V4 must be specified (refer to the "2. 1 Trace Form").
If the debug tool connected to CubeSuite dose not support the hard trace form, this item is fixed to [Soft Form].

(4) [Soft Form Buffer Type]

This area is used to specify the trace buffer type when [Soft Form] is selected with the [Trace Form] area (this area is invalid when [Hard Form] is selected).
Select the option button corresponding to the operating environment.

Fixed Buffer	The trace buffer is fixed type buffer. The trace data is collected until the trace buffer is filled. Therefore, all the trace data up to the point where the program stops is not always collected.
Ring Buffer	The trace buffer is ring type buffer. The oldest trace data is overwritten when the trace buffer is filled.

(5) [Soft Form Buffer Region]

This area is used to specify the trace buffer area when [Soft Form] is selected with the [Trace Form] area (this area is invalid when [Hard Form] is selected).
Directly enter the start address and end address for the trace buffer in hexadecimal number.
In the soft trace form, the trace data collected by AZ850V4 is acquired into the target memory once. This means that it is necessary to specify the unused memory area of the target memory as the trace buffer area.
Specify the unused memory area in the range of 4K bytes to 4M bytes.

Function buttons

Button	Function
OK	Validates the specified settings.
Cancel	Closes this dialog box.
Help	Displays the help window for this dialog box.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If the [OK] button is clicked when the value specified in the [Address Mask] area is not correct
- If the [OK] button is clicked when the address range specified in the [Soft Form Buffer Region] is not correct

Open/Save As dialog box

This dialog box is used to select a file when loading or saving a display file.
The display file is a file that stores the display contents of the AZ850V4's window.
This dialog box can be opened from each window (excluding the AZ850V4 window) by any of the following.

[When loading]

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

Figure A-5. Open/Save As Dialog Box (When Loading)

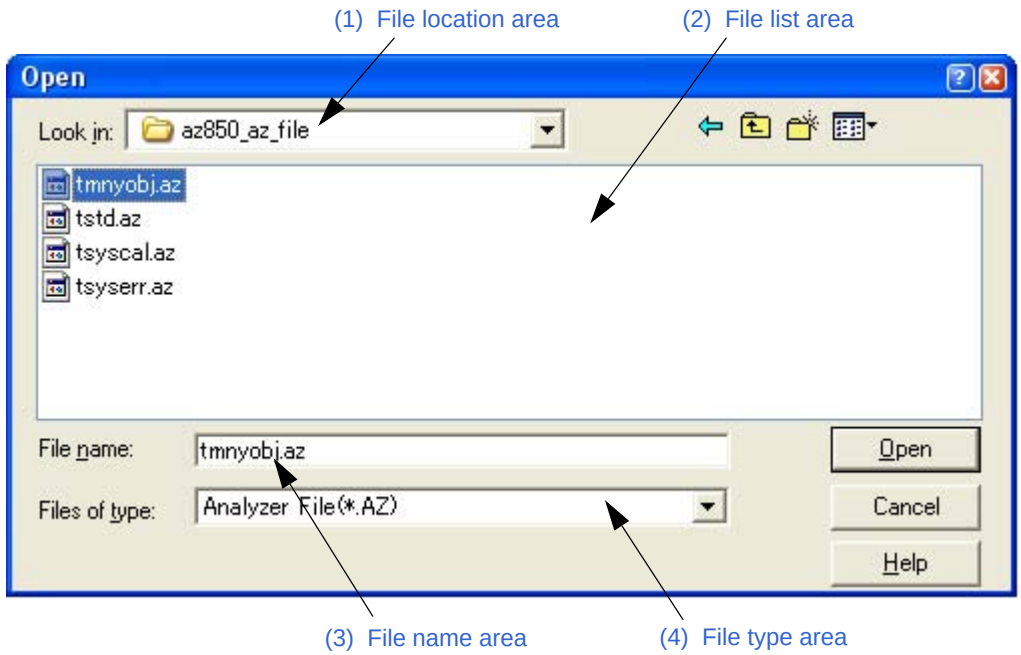
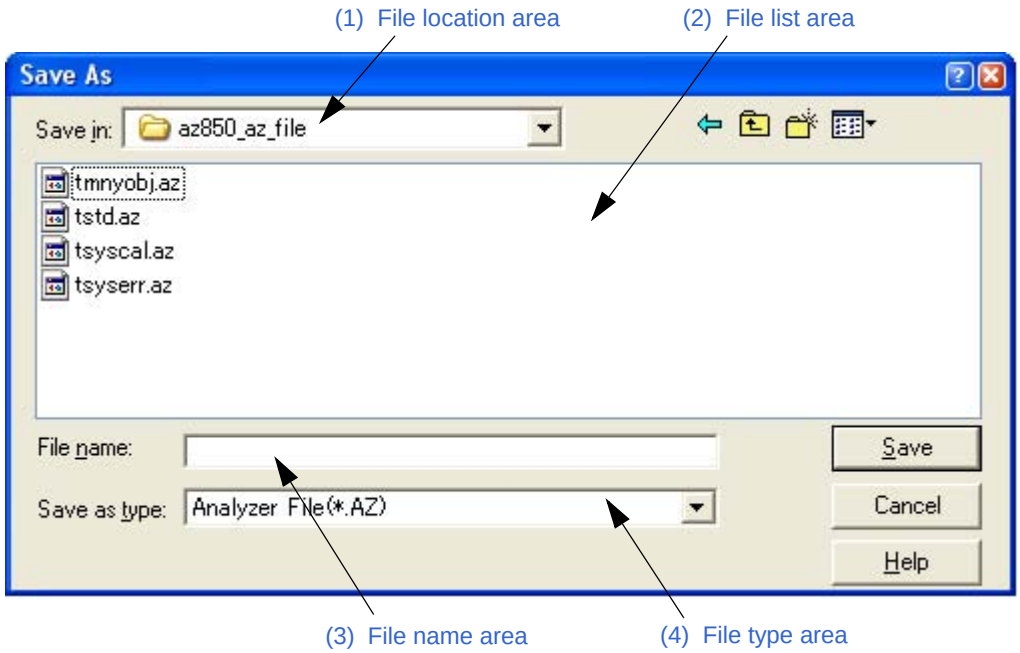


Figure A-6. Open/Save As Dialog Box (When Saving)



This section describes the following items:

- Explanation of each area
- Function buttons
- Other
- Error

Explanation of each area

(1) File location area

Select the folder in which a display file is exists or is to be saved.

(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

Specify the name of the display file to be opened or saved.

(4) File type area

Select the type of the display file to be opened or saved.

For details on the extension for each type of the display file, refer to the "Other".

Function buttons

Button	Function
Open/Save	Loads the specified display file into the caller window. Saves the display file with the specified name.
Cancel	Closes this dialog box.
Help	Displays the help window for this dialog box.

Other

(1) Display file extensions and file formats

Display files vary from window to window, and are differentiated by their extension. The default extensions and formats of display files corresponding to the various windows of AZ850V4 are as follows:

Table A-2. Display File Extensions and Formats

Window Name	Extension	File Format
AZ:Analyze Window	.az	Binary
AZ:Cpu Window	.azc	CSV
AZ:Pattern Window	.azp	CSV
AZ:Trace View Window	.azt	CSV

(2) Display information reproduction

Reproduction of display information by loading a display file differs as follows for each window.

- **AZ:Analyze Window**

  The display information is reproduced in the currently open AZ:Analyze Window. To maintain the currently displayed execution transition map, therefore, set the current AZ:Analyze Window to the hold status, then open a new AZ:Analyze Window and load a display file.

- **Other windows**

  The display information is reproduced in a new window that is opened in the hold status. The display information of the currently displayed window is, therefore, maintained as is on the screen.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If the specified file name format is not correct
- If loading a file that dose not exist is attempt
- If saving data to a write-protected file is attempt
- If loading data that cannot be handled in the current window is attempt

AZ:Analyze Window

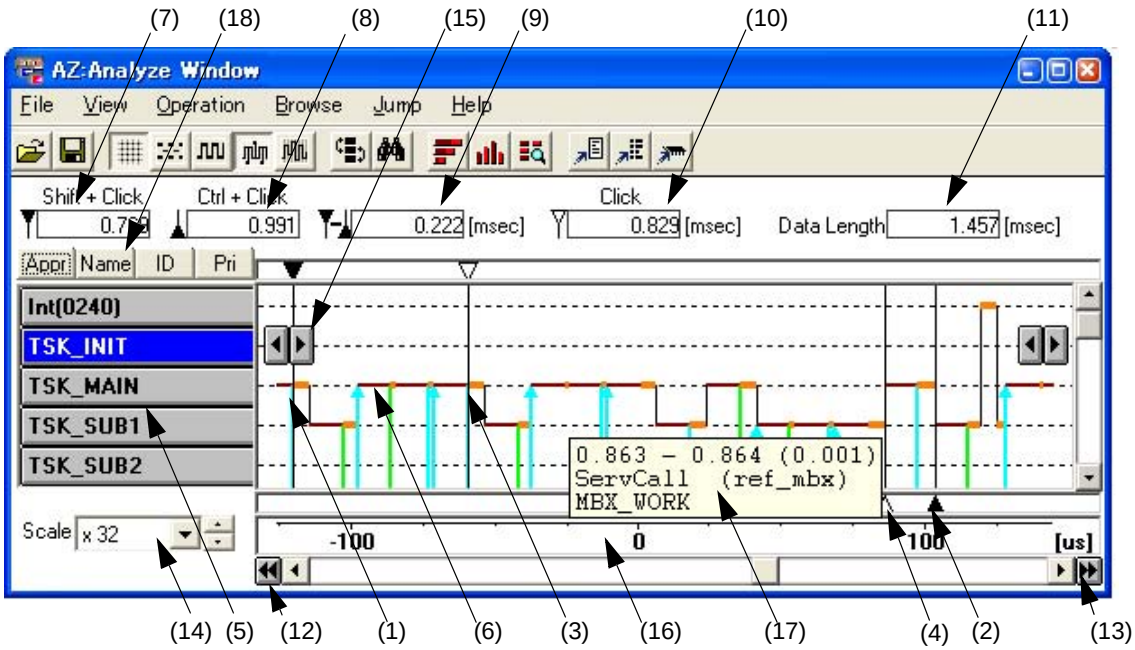
This window is used to display trace data, collected as a result of executing an program, in the execution transition map.

Using this window and each of the windows that can be opened from this window, system timing misses as well as the entire system itself can be checked and analyzed in units of tasks.

This window can be opened from the AZ850V4 window by any of the following.

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

Figure A-7. AZ:Analyze Window



(1) Up cursor
(2) Down cursor
(3) Up temporary cursor
(4) Down temporary cursor
(5) Object button
(6) Analysis result (execution transition map)
(7) Time of up cursor position
(8) Time of down cursor position
(9) Inter-cursor time
(10) Time of up temporary cursor position
(11) Data length
(12) Jump to beginning button
(13) Jump to end button
(14) Scale modify button
(15) Simple search button
(16) Time area
(17) Pop-up display
(18) Sort button

This section describes the following items:

- Explanation of each area
- Menubar
- Toolbar
- About objects
- Understanding the execution transition map
- Verification method in execution transition map
- Caution
- Error

Explanation of each area

(1) Up cursor

This cursor is used to specify the range for measuring a processing time in trace data or for calculating other data (specify the beginning of the range for which a calculation is to be done).
This cursor can be manipulated by clicking on the transition map while pressing the [Shift] key.

(2) Down cursor

This cursor is used to specify the range for measuring a processing time in trace data or for calculating other data (specify the end of the range for which a calculation is to be done).
This cursor can be manipulated by clicking on the transition map while pressing the [Ctrl] key.

(3) Up temporary cursor

This cursor indicates a position resulting from a search by using the "simple search button" or pattern search, or the start position from which a jump is made to the panel of CubeSuite.
When the search result is displayed by using the AZ:Pattern Window, this cursor indicates the start position of the searched pattern.
When the up cursor is moved, the up temporary cursor also moves to the same position.
This cursor can be manipulated by clicking the left mouse button.

(4) Down temporary cursor

When the search result is displayed by using the AZ:Pattern Window, this cursor indicates the end position of the searched pattern.
When the down cursor is moved, the down temporary cursor also moves to the same position.

[Remark] Each cursor can be moved by dragging it with the mouse. When the horizontal scroll bar is valid, the entire screen can be scrolled in the horizontal direction by moving the mouse on the left or right of the transition map, or out of the horizontal frame, while dragging each cursor.

(5) Object button

A button group that is used to indicate objects (interrupt sources, tasks, eventflags, semaphores, mailboxes, fixed-sized memory pools, variable-sized memory pools, mutexes, or data queues) within the collected trace data.
If the object name is too long, part of it is omitted. The correct object name can be displayed by putting the mouse pointer on the button.
The display sequence of each object can be changed freely, by dragging it with the mouse. For details on the objects, refer to the "About objects" below.

The simple search button ( button) appears by clicking an object name. Clicking the object name once more

makes the simple search button disappear.

(6) Analysis result (execution transition map)

This area is used to display the result of analyzing a program.
For details on the marks in the transition map, refer to "Understanding the execution transition map" below.

(7) Time of up cursor position

This box displays the relative time from the start of trace data collection until the up cursor position.
The units are milliseconds (ms).

(8) Time of down cursor position

This box displays the relative time from the start of trace data collection until the down cursor position.
The units are milliseconds (ms).

(9) Inter-cursor time

This box displays the time interval between the up cursor and the down cursor.
The units are milliseconds (ms).

(10) Time of up temporary cursor position

This box displays the absolute time from the start of trace data collection until the up temporary cursor position.
The units are milliseconds (ms).

(11) Data length

This box displays the time interval from the start to the end of trace data.

(12) Jump to beginning button

This button is used to move the up cursor and the display screen to the beginning of the trace data.

(13) Jump to end button

This button is used to move the down cursor and display screen to the end of the trace data.

(14) Scale modify button

This button is used to change the display scale for the execution transition map. A drop-down list with a button that expands the scale by double each time and a button that reduces the scale by 1/2 each time is available.

(15) Simple search button

This button appears by clicking an object name, is used to determine the operation of selected object.

When the  button is clicked, the operation of the object selected is searched in the time axis direction in the execution transition map, and the up temporary cursor moves to the search position.

When the  button is clicked, the operation of the object selected is searched in the opposite direction as the time axis, and the up temporary cursor moves to the search position

(16) Time area

This area indicates the standard time between events displayed on the execution transition map.
The unit is displayed at the rightmost position of this area and displayed in milliseconds (ms) microseconds (μs), or nanoseconds (ns).
When this window is displayed as the equal mode, a guide to the number of events on the transition map is displayed. In this mode, the unit is the number of events, and the number increases from 1 to 10, 100, and so on,

along with the scale. At this time, [unit] is not displayed at the rightmost position of the area.

(17) Pop-up display

The detailed information can be displayed by putting the mouse pointer on the following position.

- Object button
  The name of the object (*the ID number of the object*)
- Vertical line that indicates a task switch
  Time at the task switch
  The name of the task/interrupt source before switching
  The name of the task/interrupt source after switching
- Service call (orange horizontal line)
  The time at issue of the service call - The time at termination of the service call (*The time required for the service call*)
  Servcall (*the name of the service call*)
  The name of the target object (for some service calls, this information cannot be displayed.)
- Interrupt (orange horizontal line)
  The time at occurrence of the interrupt - The time at termination of the interrupt (*the time required for the interrup*t)
  Int (*interrupt source name*)
- Vertical line that indicates an access to an object
  The time at issue/termination of the service call: *the name of a task at the occurrence of an event*
  Servcall/ServRet (*the name of the service call*)
  Target object name
- The mark indicating service call error (red "x" mark)
  The time at termination of the service call
  Return value

[Remark] The time information is displayed in milliseconds unit.

(18) Sort button

This button is used to change the sequence in which object buttons are to be displayed. The following specifications can be made.

Appr	Displays the objects in the sequence in which they were detected as trace data.
Name	Displays the objects according to ASCII code.
ID	Displays the objects according to their ID number.
Pri	Displays the objects according to their priority (valid only for tasks).

[Caution] The objects are sorted by type and displayed, in the order of interrupt source, task, idle routine, eventflag, semaphore, mailbox, fixed-sized memory pool, variable-sized memory pool, mutex, and data queue.

Menubar

(1) [File] menu

Open...	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".az". The file name is displayed on the titlebar after the display file has been read.
Save...	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".az".
Close	Closes this window.

(2) [View] menu

Grid mode	Sets whether grid lines are displayed within the execution transition map. The cascade menu contains the following.
Grid	Displays grid lines (default).
Ungrid	Does not display grid lines.
View mode	Specifies the view mode for the execution transition map. The cascade menu contains the following.
Simple	Dose not display vertical lines on the execution transition map. The function of this item is same as that of the  button.
Standard	Displays only the CPU execution transition. The function of this item is same as that of the  button.
Detail	Displays the "mark" of the service call access state of the RX850V4 (default). The function of this item is same as that of the  button.
Equal	The length of the horizontal line on the transition map becomes equal between events regardless of the execution time of the CPU (if not selected this menu item, a graph in proportion to the execution time of the CPU is displayed). The function of this item is same as that of the  button.
Small	Reduces the scale of the execution transition map. The function of this item is the same as that of the "scale modify button".
Large	Expands the scale of the execution transition map. The function of this item is the same as that of the "scale modify button".
Find...	Opens the Pattern Search dialog box. The function of this item is same as that of the  button.

Sort Object		Specifies the sequence in which object buttons are to be displayed. The cascade menu contains the following. The objects are sorted by type and displayed, in the order of interrupt source, task, idle routine, eventflag, semaphore, mailbox, fixed-sized memory pool, variable-sized memory pool, mutex, and data queue.
	Appear	Displays the objects in the sequence in which they were detected as trace data (default).
	Name	Displays the objects according to ASCII code.
	ID	Displays the objects according to their ID number.
	Priority	Displays the objects according to their priority (valid only for tasks).
Select Object...		Opens the Object Select dialog box. The function of this item is same as that of the  button.

(3) [Operation] menu

Active	Switches this window from the hold status to the active status (default).
Hold	Switches this window from the active status to the hold status.

(4) [Browse] menu

CPU...	Opens the AZ:Cpu Window to display the CPU usage between the up cursor and the down cursor. While the AZ:Cpu Window is already opened and active, the contents of the window is updated. The function of this item is same as that of the  button.
Pattern...	Opens the Pattern Set dialog box. Setting pattern conditions using this dialog box opens the AZ:Pattern Window. While the AZ:Pattern Window is already opened and active, the contents of the window is updated. The function of this item is same as that of the  button.
Trace View...	Opens the AZ:Trace View Window. While the AZ:Trace View Window is already opened and active, the contents of the window is updated. The function of this item is same as that of the  button.

(5) [Jump] menu

Source Text...	Displays the source text in the Editor panel on CubeSuite at the position set with the up temporary cursor. While the source text is already displayed on an active status panel, the contents of the panel is updated. The function of this item is same as that of the  button.
Assemble...	Displays the disassemble text in the Disassemble panel on CubeSuite at the position set with the up temporary cursor. While the disassemble text is already displayed on an active status panel, the contents of the panel is updated. The function of this item is same as that of the  button.

Memory...	Displays the memory list in the Memory panel on CubeSuite at the position set with the up temporary cursor. While the memory list is already displayed on an active status panel, the contents of the panel is updated. The function of this item is same as that of the  button.

[Caution] If there is no address information at the position specified with the up temporary cursor, none of the items on the [Jump] menu can be selected.

(6) [Help] menu

This Window	Displays the help window for this window.
Help Topics	Displays the AZ850V4 help window.

Toolbar

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

Button	Function
	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".az". The file name is displayed on the titlebar after the display file has been read. Same operation as [File] menu -> [Open...].
	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".az". Same operation as [File] menu -> [Save...].
	Toggles the grid mode of the execution transition map on and off.
	Changes the view mode of the execution transition map to the simple mode. Same operation as [View] menu -> [View mode] -> [Simple].
	Changes the view mode of the execution transition map to the standard mode. Same operation as [View] menu -> [View mode] -> [Standard].
	Changes the view mode of the execution transition map to the detailed mode. Same operation as [View] menu -> [View mode] -> [Detail].
	Toggles the equal mode of the execution transition map on and off. Same operation as [View] menu -> [View mode] -> [Equal].
	Opens the Object Select dialog box. Same operation as [View] menu -> [Select Object...].
	Opens the Pattern Search dialog box. Same operation as [File] menu -> [Find...].
	Opens the AZ:Cpu Window to display the CPU usage between the up cursor and the down cursor. While the AZ:Cpu Window is already opened and active, the contents of the window is updated. Same operation as [Browse] menu -> [CPU...].
	Opens the Pattern Set dialog box. Setting pattern conditions using this dialog box opens the AZ:Pattern Window. While the AZ:Pattern Window is already opened and active, the contents of the window is updated. Same operation as [Browse] menu -> [Pattern...].

Button	Function
	Opens the AZ:Trace View Window for the range starting at the position set with the up temporary cursor. While the AZ:Trace View Window is already opened and active, the contents of the window is updated. Same operation as [Browse] menu -> [Trace View...].
	Displays the source text in the Editor panel on CubeSuite at the position set with the up temporary cursor. While the source text is already displayed on an active status panel, the contents of the panel is updated. If there is no address information at the position specified with the up temporary cursor, this button cannot be selected. Same operation as [Jump] menu -> [Source Text...].
	Displays the disassemble text in the Disassemble panel on CubeSuite at the position set with the up temporary cursor. While the disassemble text is already displayed on an active status panel, the contents of the panel is updated. If there is no address information at the position specified with the up temporary cursor, this button cannot be selected. Same operation as [Jump] menu -> [Assemble...].
	Displays the memory list in the Memory panel on CubeSuite at the position set with the up temporary cursor. While the memory list is already displayed on an active status panel, the contents of the panel is updated. If there is no address information at the position specified with the up temporary cursor, this button cannot be selected. Same operation as [Jump] menu -> [Memory...].

About objects

(1) Object names

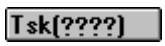
The buttons used to indicate objects are defined as follows:

- RX850V4 objects

The name of the object (task, eventflag, semaphore, mailbox, fixed-sized memory pool, variable-sized memory pool, mutex, or data queue) is indicated by the name that is defined in the system configuration file (CF definition file).

If the object name is too long, part of it is omitted. The correct object name can be displayed by putting the mouse pointer on the object button.

However, an idle routine or a task whose ID number is unknown (unidentified task) is displayed as follows:

	Idle task
	Unidentified task

[Caution] In the system configuration file (CF definition file), if the ID number is specified without an object name specified, the ID number will be displayed as the object name.

[Remark] The ID number of task may not be able to be identified due to the following causes.

- If the program is executed in the middle of a task.
- When the trace buffer is specified in the "ring buffer" type (refer to the "(4) [Soft Form Buffer Type]"), and if a task appears at the beginning of the buffer after trace data has gone around the buffer.

- **Interrupt objects**

The interrupt source name obtained from CubeSuite is indicated.
If the interrupt source name cannot be obtained, the following default names are indicated.

Int(xxxx)	Maskable interrupt (*xxxx*: Exception code (hexadecimal))

- **Other objects**

Etc.	Object group that is set as hidden using the Object Select dialog box or mouse right-click menu.

(2) Modifying the order in which objects are displayed

The display sequence of each object can be changed by dragging the object with the mouse (the display sequence can also be changed by the Sort button on this window).
By right-clicking the object button, the following pop-up menu is displayed, and the selected object can be specified as hidden.

Hide	Hides the selected object.

If the Etc. that indicates an object group to be hidden is right-clicked, the following pop-up menu is displayed.

Show All	Displays all objects.
Show	Specifies the object to be displayed. The cascade menu contains the list of the hidden objects.

[Remark] Selecting objects to be hidden and modifying the order in which objects are displayed is also available in the Object Select dialog box.

Understanding the execution transition map

The execution transition map is displayed in three view modes: "simple mode", "standard mode", "detailed mode". In each of these display modes, "equal mode" can also be specified.

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

(1) Simple mode
(2) Standard mode
(3) Detailed mode (default)
(4) Equal mode

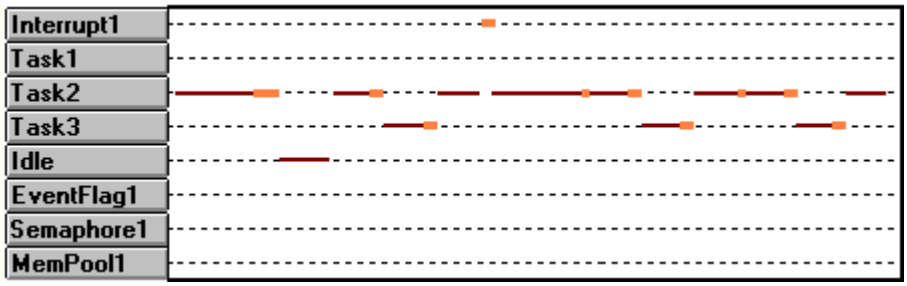
[Remark] Whether to display grid lines in the execution transition map can be specified by selecting the [View] menu -> [Grid mode].

(1) Simple mode

Only those points at which the CPU is operating are indicated, using horizontal lines. This mode is well suited to analyzing trace data over a wide range.

The solid orange line indicates the processing of a service call of RX850V4.

Figure A-8. AZ:Analyze Window (Simple Mode)

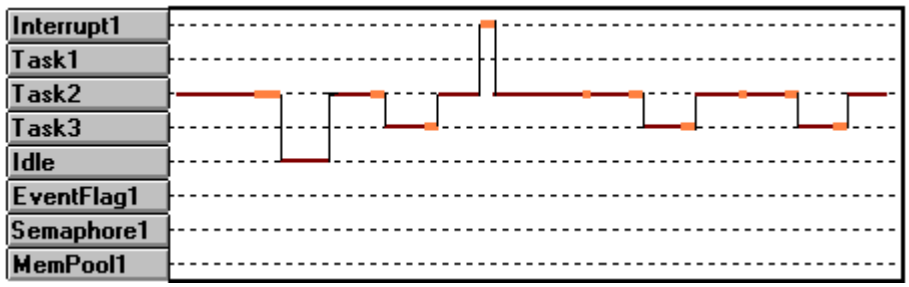


(2) Standard mode

CPU state transitions are indicated using continuous, joined lines.

The solid orange line indicates the processing of a service call of RX850V4.

Figure A-9. AZ:Analyze Window (Standard Mode)

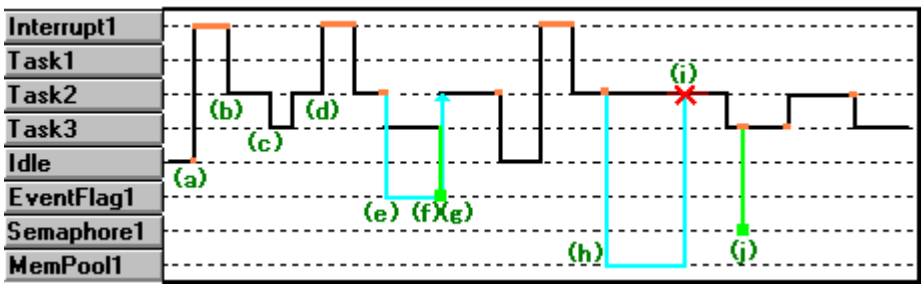


(3) Detailed mode (default)

In addition to the CPU state transitions, those RX850V4 service calls that are related to managing memory pools and synchronous communications are indicated using "marks " (refer to the "Table A-3. List of Marks in AZ:Analyze Window" for details on the mark).

The detailed mode is selected when this window is opened. This mode is well suited to analyzing the accesses made to each object.

Figure A-10. AZ:Analyze Window (Detailed Mode)



(a) The CPU accepts the interrupt in the Idle state (Halt state) and processing shifts to the handling of the interrupt.

(b) Processing shifts to the handling of Task2.

(c) Processing shifts to the handling of Task3.

(d) The CPU accepts an interrupt.

(e) Task2 issues a wai_flg service call to event flag EventFlag1.
Because Task2 enters the wait state, processing shifts to the handling of Task3.

(f) Task3 issues a set_flg service call to event flag EventFlag1.

(g) The wai_flg service call issued by Task2 returns, so that the wait state is cleared.

(h) Task2 issues a get_blf service call to memory pool Mempool1.

(i) An error is returned in response to the service call issued in (h).

(j) Task3 issues a sig_sem service call to semaphore Semaphore1.

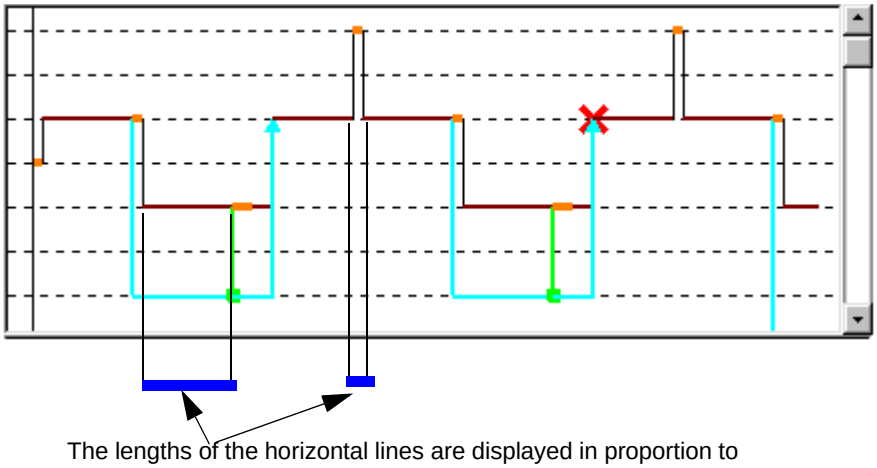
Table A-3. List of Marks in AZ:Analyze Window

<table>
<tr><th>Mark</th><th colspan="2">Description</th></tr>
<tr><td>light blue
  </td><td colspan="2">Indicates that any of the following service call was issued to each object, and the corresponding returned.</td></tr>
<tr><td rowspan="9"></td><td>Object to be Accessed</td><td>Issued Service Call</td></tr>
<tr><td>Event flag</td><td>wai_flg, pol_flg, ipol_flg, twai_flg</td></tr>
<tr><td>Semaphore</td><td>wai_sem, pol_sem, ipol_sem, wai_sem</td></tr>
<tr><td>Data queue</td><td>rcv_dtq, prcv_dtq, ircv_dtq, trcv_dtq, snd_dtq, tsnd_dtq</td></tr>
<tr><td>Mailbox</td><td>rcv_mbx, prcv_mbx, trcv_mbx, ircv_mbx</td></tr>
<tr><td>Mutex</td><td>loc_mtx, ploc_mtx, tloc_mtx</td></tr>
<tr><td>Fixed-sized memory pool</td><td>get_mpf, pget_mpf, iget_mpf, tget_mpf</td></tr>
<tr><td>Variable-sized memory pool</td><td>get_mpl, pget_mpl, iget_mpl, tget_mpl</td></tr>
<tr><td>green
  </td><td colspan="2">Indicates that any of the following service call was issued to each object.</td></tr>
<tr><td rowspan="9"></td><td>Object to be Accessed</td><td>Issued Service Call</td></tr>
<tr><td>Event flag</td><td>set_flg, iset_flg, clr_flg, iclr_flg</td></tr>
<tr><td>Semaphore</td><td>sig_sem, isig_sem</td></tr>
<tr><td>Data queue</td><td>snd_dtq, psnd_dtq, ipsnd_dtq, tsnd_dtq, fsnd_dtq, ifsnd_dtq, rcv_dtq, trcv_dtq</td></tr>
<tr><td>Mailbox</td><td>snd_mbx, isnd_mbx</td></tr>
<tr><td>Mutex</td><td>unl_mtx</td></tr>
<tr><td>Fixed-sized memory pool</td><td>rel_mpf, irel_mpf</td></tr>
<tr><td>Variable-sized memory pool</td><td>rel_mpl, irel_mpl</td></tr>
<tr><td>Red
  </td><td colspan="2">Indicates that the issue of a service call results in an error.</td></tr>
<tr><td>  </td><td colspan="2">Indicates that the service call that was issued has returned a time-out.
This mark is displayed together with the red error mark above.</td></tr>
</table>

(4) Equal mode

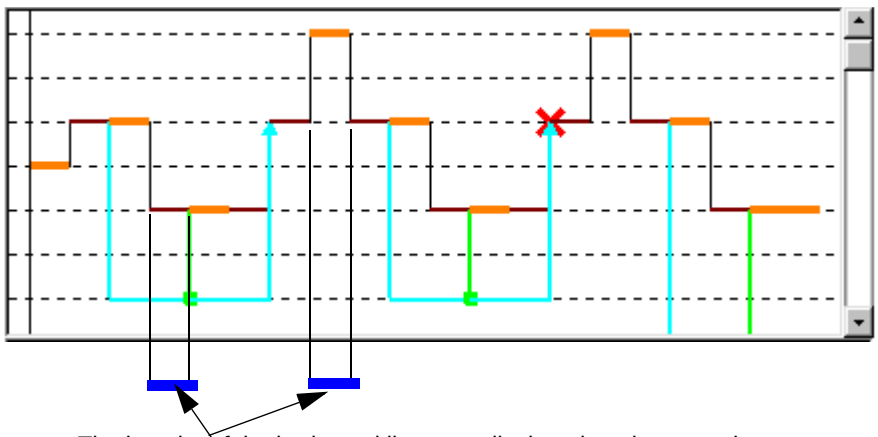
If the equal mode is not specified (default), the horizontal line between events, such as the entrance/exit of a service call, the entrance/exit of an interrupt processing or a task switch, are displayed in proportion to the execution time of the CPU, as shown in Figure A-11.

Figure A-11. AZ:Analyze Window (When Equal Mode Is Not Specified)



In contrast, if the equal mode is specified, the horizontal line between events, such as the entrance/exit of a service call, the entrance/exit of an interrupt or a task switch, are displayed not in proportion to the execution time of the CPU, but at a regular interval, as shown in Figure A-12.

Figure A-12. AZ:Analyze Window (When Equal Mode Is Specified)



This mode is well suited to analyzing the transition relationship between a task and interrupt processing.

Verification method in execution transition map

To check the collected trace data using this window, the following search methods are supported:

(1) Search using the simple search button
(2) Search using the Pattern Search dialog box
(3) Search using the AZ:Pattern Window

(1) Search using the simple search button

Using the simple search button ( button), a search can be made for the processing of a specified object.
The simple search button is displayed at both ends of the transition map by clicking a object name. The operation method is as follows:

(a) If the up temporary cursor is displayed in the execution transition map, move the up temporary cursor to the search start position. If the up temporary cursor is not displayed, move the up cursor to the search start position.

(b) Clicking the button corresponding to the object whose operation is to be confirmed causes the simple search button to be displayed. The simple search button is displayed immediately to the right of the object name, and at the right edge of the execution transition map.

(c) Click the simple search button.

	A search is made for the specified object processing, in the direction of the time axis of the execution transition map. Within the window, the up temporary cursor is shifted to the position identified by the search.
	A search is made for the specified object processing, in the direction opposite to that of the time axis of the execution transition map. Within the window, the up temporary cursor is shifted to the position identified by the search.

If the identified point does not fall within the range currently displayed by the execution transition map, the map is shifted with the identified position being used as the origin.
When the object name is clicked again, the simple search button disappears from the screen.

(2) Search using the Pattern Search dialog box

A search can be made for a specific event (switching point of a task, occurrence of an interrupt, issue of a service call, etc.) set by the Pattern Search dialog box, in the execution transition map. The search result is indicated by the up temporary cursor on the execution transition map.
Refer to the Pattern Search dialog box for details.

(3) Search using the AZ:Pattern Window

A search can be made for a pattern (the processing interval of a task or an interrupt) set by the AZ:Pattern Window, in the execution transition map. The search result is indicated by the up/down temporary cursor on the execution transition map.
Refer to the AZ:Pattern Window for details.

Caution

- The data for the execution transition map is not updated automatically. Once trace data has been newly collected by executing an program, therefore, uploading (select the [Operation] menu -> [Upload] on the AZ850V4 window) must be performed to update the execution transition map.
- If there is no address information in trace data at the position specified with the up temporary cursor, none of the items on the [Jump] menu can be selected.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If an attempt is made to set the AZ:Analyze Window in the hold status to the active status when another AZ:Analyze Window in the active status exists.

Object Select dialog box

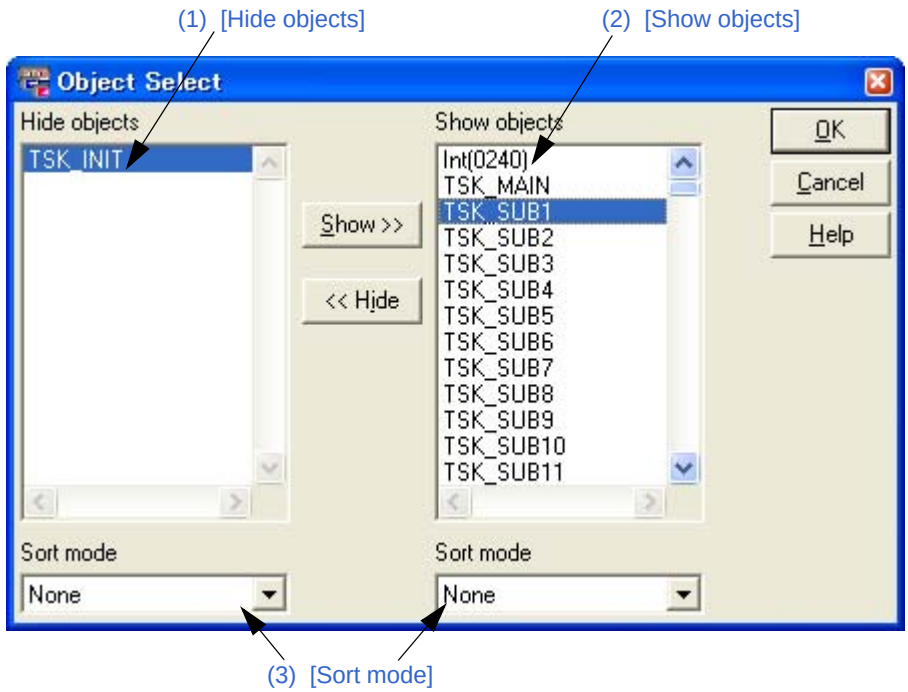
This dialog box is used to select the objects to be displayed in the AZ:Analyze Window and to modify the order in which those objects are displayed.

The function of this dialog box can also be realized by "sort button" in the AZ:Analyze Window (for details, refer to "About objects").

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

- Select the [View] menu -> [Select Object...].
- Click the button on the toolbar.
- Press the [Alt], [V] and [O] keys in that order.

Figure A-13. Object Select Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons
- Operating method

Explanation of each area

(1) [Hide objects]

This area is used to display a list of those objects, from among trace data, that are not to be displayed on the execution transition map.
The horizontal scroll bar is available when a object name is too long. The vertical scroll bar is available when too many objects are listed.

(2) [Show objects]

This area is used to display a list of those objects that are to be displayed on the execution transition map.
In the default, all of the objects contained in trace data are displayed.
The display order specified in this area is applied to the execution transition map.
The horizontal scroll bar is available when a object name is too long. The vertical scroll bar is available when too many objects are listed.

(3) [Sort mode]

This area is used to specify the order into which the objects in the [Hide objects] or [Show objects] will be sorted.

Function buttons

Button	Function
Show >>	Moves those objects selected in the [Hide objects] to the [Show objects]. If the destination has already been specified, the object is inserted immediately ahead of the specified position. If the destination has not been specified, the object is inserted at the end of the list.
<< Hide	Moves those objects selected in the [Show objects] to the [Hide objects]. If the destination has already been specified, the object is inserted immediately ahead of the specified position. If the destination has not been specified, the object is inserted at the end of the list.
OK	Updates the execution transition map based on the objects listed in the [Show objects].
Cancel	Closes this dialog box.
Help	Displays the help window for this dialog box.

Operating method

(1) Restricting the objects to be displayed

The objects to be displayed in the execution transition map can be restricted by the following method.

(a) From the list displayed in the [Show objects], select those objects that need not be displayed in the execution transition map.

(b) Click the [<< Hide] button. The selected object is moved to the [Hide objects]. If the destination has already been specified, the object is inserted immediately ahead of the specified position. If the destination has not been specified, the object is inserted at the end of the list.

(c) Click the [OK] button to update the execution transition map.

[Remark] The objects restricted are displayed collectively as 

in the execution transition map.

(2) Adding objects to be displayed

The objects to be displayed in the execution transition map can be added by the following method.

(a) From those objects listed in the [Hide objects], select objects that need to add to the execution transition map.

(b) Click the [Show >>] button. The selected objects are moved into the [Show objects]. If the destination has already been specified, the object is inserted immediately ahead of the specified position. If the destination has not been specified, the object is inserted at the end of the list.

(c) Click the [OK] button to update the execution transition map.

(3) Modifying the order in which objects are displayed

Objects listed in the [Hide objects] and [Show objects] are classified into interrupt sources, tasks, idle routines, eventflags, semaphores, mailboxes, fixed-sized memory pools, variable-sized memory pools, mutexes, and data queues (default).
To modify the order in which these objects are displayed, select the desired sort order from the drop-down list of the [Sort mode].
In the execution transition map, the display order specified in the [Show objects] is applied.
The following sort modes can be select:

Table A-4. Sort Mode for Objects

Sort mode	Description
None	No-sort mode (default)
Appear	In the order in which trace data is detected
Name	According to ASCII code, within each object class
ID	According to ID, within each object class
Priority	According to priority (valid only when tasks are to be displayed)

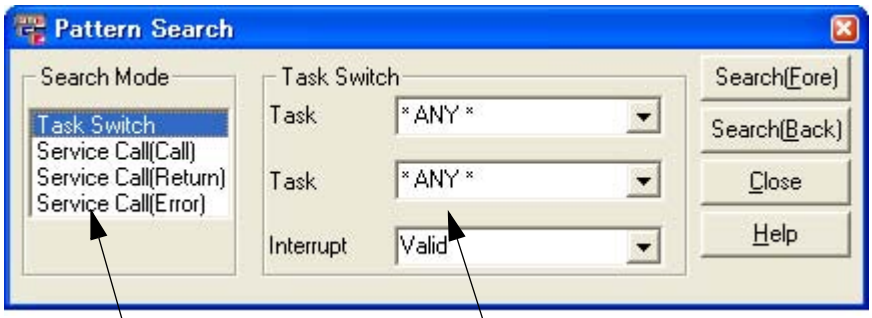
Pattern Search dialog box

This dialog is used to set the search conditions that are applied when a search is made for a specific event (switching point of a task, occurrence of an interrupt, issue of a service call, etc.) in the execution transition map of 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 toolbar.
- Press the [Alt], [V] and [F] keys in that order.
- Press the [Ctrl] + [F] keys at the same time.

Figure A-14. Pattern Search Dialog Box



[Remark] The contents of the Search condition setting area differ depending on the selection of the Search mode selection area.

This section describes the following items:

- Explanation of each area
- Function buttons
- Search method

Explanation of each area

(1) Search mode selection area

This area is used to select the type of an event to be searched as search mode.

The contents displayed in the Search condition setting area vary depending on this search mode.

Select the search mode from the following:

Table A-5. Search Modes

Search Mode	Description
Task Switch	Searches for task switching positions.
Service Call(Call)	Searches for those positions where a service call was called.
Service Call(Return)	Searches for those positions where a service call was returned.
Service Call((Error)	Searches for those positions where an error was returned in response to a service call.

(2) Search condition setting area

This area is used to specify the search conditions corresponding to the search mode specified with the Search mode selection area.

The items to be set depend on the specified search mode.

Select the search condition for each item from the drop-down list.

The following search conditions are available:

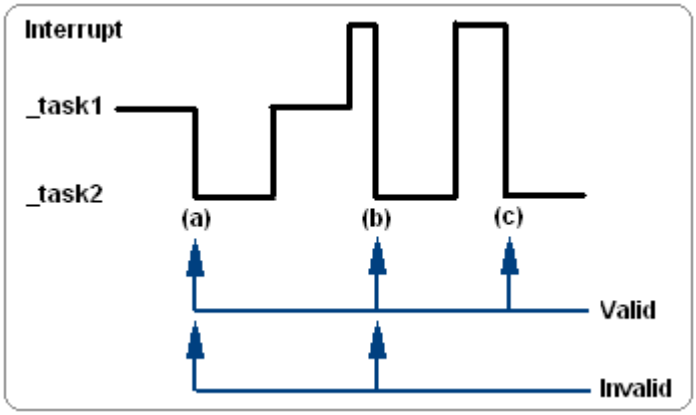
Table A-6. Search Conditions (When [Task Switch] Is Selected)

Item	Meaning of Condition
Task (upper)	Specify the pre-switching task name or interrupt source name. When the specification of the task or interrupt is not critical, specify [* ANY *].
Task (lower)	Specify the post-switching task name or interrupt source name. When the specification of the task or interrupt is not critical, specify [* ANY *].
Interrupt	Specify whether switching to (or from) an interrupt processing is to be included in the search object. Specifying [Valid] causes the interrupt processing transition to be used as a search object. When [Invalid] is specified, the interrupt processing transition is not used as a search object[Note].

Table A-7. Search Conditions (When [Service Call(Call/Return/Error)] Is Selected)

Item	Meaning of Condition
Task	Specify the task name or interrupt source name that issues a service call. When the specification of the task or interrupt is not critical, specify [* ANY *].
Service Call	Specify the name of the service call. When the specification of the service call is not critical, specify [* ANY *].
Object	Specify the target object of the service call. When the specification of the object is not critical, specify [* ANY *].

[Note] The position for which a search is made vary with the specification of [Valid]/[Invalid] for the Interrupt item, as follows, where switching from [* ANY *] to [_task2] is assumed to be specified as the search conditions:



(a)

Valid	Found as switching from [_task1] to [_task2]
Invalid	Found as switching from [_task1] to [_task2]

(b)

Valid	Found as switching from [interrupt] to [_task2]
Invalid	Switching from interrupt handling is ignored but this position is found as switching from [_task1] to [_task2].

(c)

Valid	Found as switching from [interrupt] to [_task2]
Invalid	Switching from interrupt handling is ignored, so that this position is assumed to be switching from [_task2] to [_task2] and, therefore, is not found as switching which matches the conditions.

Function buttons

Button	Function
Search(Fore)	A search is made for those positions that correspond to the specified conditions, starting from the position indicated by the up cursor or up temporary cursor on the execution transition map, in the direction of the time axis. Then, the up temporary cursor is moved to the positions determined by the search.
Search(Back)	A search is made for those positions that correspond to the specified conditions, starting from the position indicated by the up cursor or up temporary cursor on the execution transition map, in the direction opposite to the time axis. Then, the up temporary cursor is moved to the positions determined by the search.
Close	Closes this dialog box.
Help	Displays the help window for this dialog box.

Search method

A search can be made for the desired position on the AZ:Analyze Window by the following method.

(1) Specifying the position from which a search is to be started:
When the up temporary cursor is displayed in the execution transition map, move the up temporary cursor to the start position. Otherwise, move the up cursor to the start position.

(2) Selecting a search mode:
Select a desired search mode in the Search mode selection area on this dialog box.

(3) Selecting search conditions:
Select the search condition for each item form the drop-down list in the Search condition setting area on this dialog box.

(4) Clicking the function button:

- When the [Search(Fore)] button is clicked:
  Search starts from the specified position, in the direction of the time axis. The up temporary cursor is shifted to the position identified by the search.
- When the [Search(Back)] button is clicked:
  Search starts from the specified position, in the direction opposite to the time axis. The up temporary cursor is shifted to the position identified by the search.

AZ:Cpu Window

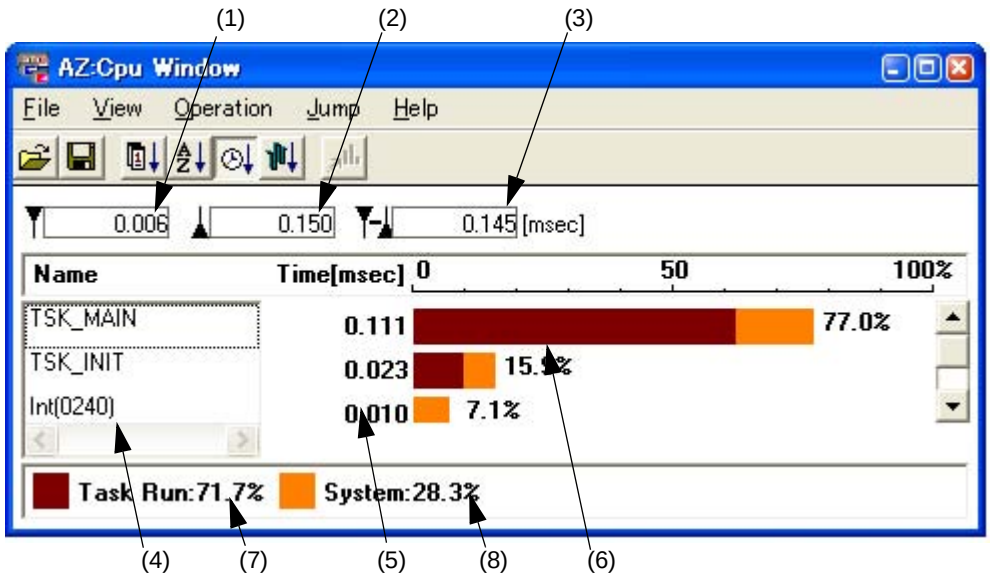
This window is used to display the CPU usage status within the period specified with the up cursor and down cursor in the execution transition map of the AZ:Analyze Window.

Using this window, the execution time of a specified task or interrupt can be confirmed, and the target data performance can be evaluated, base on the idle time and interrupt time.

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 toolbar.
- Press the [Alt], [B] and [C] keys in that order.
- Press the [Ctrl] + [C] keys at the same time.

Figure A-15. AZ:Cpu Window



(1) Time of up cursor position
(2) Time of down cursor position
(3) Total time
(4) Object name
(5) Total execution time for an object
(6) CPU usage
(7) Time percentage of task execution
(8) Time percentage of system execution

This section describes the following items:

- Explanation of each area
- Menubar
- Toolbar
- CPU usage display method
- Caution
- Error

Explanation of each area

(1) Time of up cursor position

This box indicates the time at which calculation of the CPU usage was started.
After the start of trace data collection, the relative time that has elapsed is indicated by the position of the up cursor on the execution transition map. The units are milliseconds (ms).

(2) Time of down cursor position

This box indicates the time at which calculation of the CPU usage was ended.
After the start of trace data collection, the relative time that has elapsed is indicated by the position of the down cursor on the execution transition map. The units are milliseconds (ms).

(3) Total time

This box indicates the duration for which the CPU usage was calculated.
The duration is indicated by the distance between the up and down cursors. The units are milliseconds (ms).

(4) Object name

This area is used to display a list of the names of the objects that exist in the total time range.
The horizontal scroll bar is available when the object name is too long.

(5) Total execution time for an object

This area is used to display the total of the system processing time and the time required to execute a task or that of a task related to interrupt processing in the total time range.

(6) CPU usage

This area is used to display the bar graph for indicating the proportion of the total time occupied by the total execution time of each object.
The displayed graphs are broken down into two part: "time percentage of task execution (brown)" and "time percentage of system execution (orange)".

(7) Time percentage of task execution

This area is used to display the proportion of the task processing execution time to the total time.

(8) Time percentage of system execution

This area is used to display the proportion of the system processing execution time (including the execution time of the interrupt handler) to the total time.

Menubar

(1) [File] menu

Open...	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".azc". The file name is displayed on the titlebar after the display file has been read.
Save...	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".azc".
Close	Closes this window.

(2) [View] menu

Sort Appear	Displays the objects in the sequence in which they are detected as trace data. The function of this item is same as that of the  button.
Sort Name	Displays the objects in alphabetical order. The function of this item is same as that of the  button.
Sort Time	Displays the objects in ascending order of execution time (default). The function of this item is same as that of the  button.
Sort Analyze	Displays the objects in same order as the execution transition map. The function of this item is same as that of the  button.

(3) [Operation] menu

Active	Switches this window from the hold status to the active status (default).
Hold	Switches this window from the active status to the hold status.

(4) [Jump] menu

Pattern...	Opens the AZ:Pattern Window corresponding to the specified object. While the AZ:Pattern Window in the active status is already opened, the contents of the window is updated. The function of this item is same as that of the  button. The pattern calculated with this menu item is automatically set as follows: < Start point>: Task Switch, [* ANY *] -> [Specified object] < End point>: Task Switch, [Specified object] -> [* ANY *] <Interrupt>: Valid

(5) [Help] menu

This Window	Displays the help window for this window.
Help Topics	Displays the AZ850V4 help window.

Toolbar

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

Button	Function
	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".azc". The file name is displayed on the titlebar after the display file has been read. Same operation as [File] menu -> [Open...].
	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".azc". Same operation as [File] menu -> [Save...].
	Displays the objects in the sequence in which they are detected as trace data. Same operation as [View] menu -> [Sort Appear].
	Displays the objects in alphabetical order. Same operation as [View] menu -> [Sort Name].
	Displays the objects in ascending order of execution time (default). Same operation as [View] menu -> [Sort Time].
	Displays the objects in the same order as the AZ:Analyze Window. Same operation as [View] menu -> [Sort Analyze].
	Opens the AZ:Pattern Window corresponding to the specified object. While the AZ:Pattern Window in the active status is already opened, the contents of the window is updated. < Start point>: Task Switch, [* ANY *] -> [Specified object] < End point>: Task Switch, [Specified object] -> [* ANY *] <Interrupt>: Valid Same operation as [Jump] menu -> [Pattern...].

CPU usage display method

By the following method, the CPU usage is displayed within the specified range.

(1) Setting the up and down cursors:

The CPU usage is calculated within the period specified with the up cursor and down cursor on the execution transition map in the AZ:Analyze Window

Specify the range for which the total CPU usage is to be calculated, using the up cursor and down cursor.

(2) Opening the AZ:Cpu Window:

Select the [Browse] menu -> [CPU...] on the AZ:Analyze Window to open this window.

If the AZ:Cpu Window is left open and either the up cursor or down cursor is repositioned in the execution transition map, the displayed CPU usage is automatically updated.

Caution

- Closing the AZ:Analyze Window also closes this window.

- If the 

object is selected, the [Jump] menu -> [Pattern...] cannot be selected.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If an attempt is made to set the AZ:Cpu Window in the hold status to the active status when another AZ:Cpu Window in the active status exists.

Pattern Set dialog box

This dialog box is used to set a pattern to be displayed in the AZ:Pattern Window.

The pattern means the duration of the CPU processing from the point at which a specific event (switching point of a task, occurrence of an interrupt, issue of a service call, etc.) occurs to the point at which the event ends or another event occurs.

This dialog box can be opened as follows:

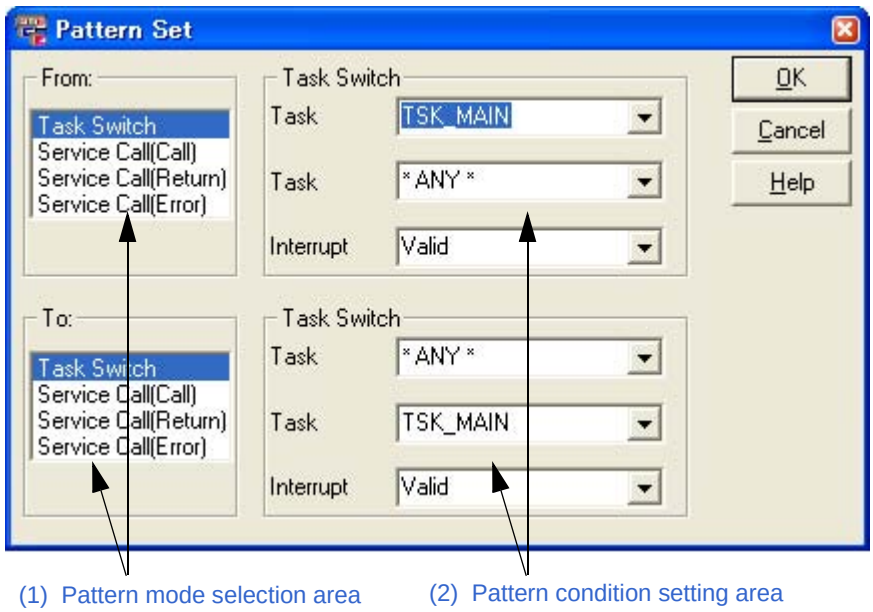
[In the AZ:Analyze Window]

- Select the [Browse] menu -> [Pattern...].
- Click the  button on the toolbar.
- Press the [Alt], [B] and [P] keys in that order.
- Press the [Ctrl]+[P] keys at the same time.

[In the AZ:Pattern Window]

- Select the [Option] menu -> [Pattern Set...]
- Click the  button on the toolbar.
- Press the [Alt], [P] and [S] keys in that order.
- Press the [Ctrl]+[P] keys at the same time.

Figure A-16. Pattern Set Dialog Box



[Remark] The contents of the Pattern condition setting area differ depending on the selection of the Pattern mode selection area.

This section describes the following items:

- Explanation of each area
- Examples of patterns
- Function buttons
- Error

Explanation of each area

(1) Pattern mode selection area

This area is used to select the pattern mode.

Select the type of the event that is to act as the start ([From:]) and end ([To:]) points of the pattern displayed in the AZ:Pattern Window, from the following:

Table A-8. Pattern Modes

Pattern Mode	Description
Task Switch	Task switching positions are used as the start/end point.
Service Call(Call)	Those positions where a service call was called are used as the start/end point.
Service Call(Return)	Those positions where a service call was returned are used as the start/end point.
Service Call(Error)	Those positions where an error was returned in response to a service call are used as the start/end point.

(2) Pattern condition setting area

This area is used to specify the pattern conditions corresponding to the pattern modes specified with the Pattern mode selection area.

The items to be set depend on the specified pattern modes.

Select the pattern condition for each item from the drop-down list.

The following search conditions are available:

Table A-9. Pattern Conditions (When [Task Switch] Is Selected)

Item	Meaning of Condition
Task (upper)	Specify the pre-switching task name or interrupt source name. When the specification of the task or interrupt is not critical, specify [* ANY *].
Task (lower)	Specify the post-switching task name or interrupt source name. When the specification of the task or interrupt is not critical, specify [* ANY *].
Interrupt	Specify whether switching to (or from) an interrupt is to be included in the search object. Specifying [Valid] causes the interrupt transition to be used as a search object. When [Invalid] is specified, the interrupt transition is not used as a search object[Note].

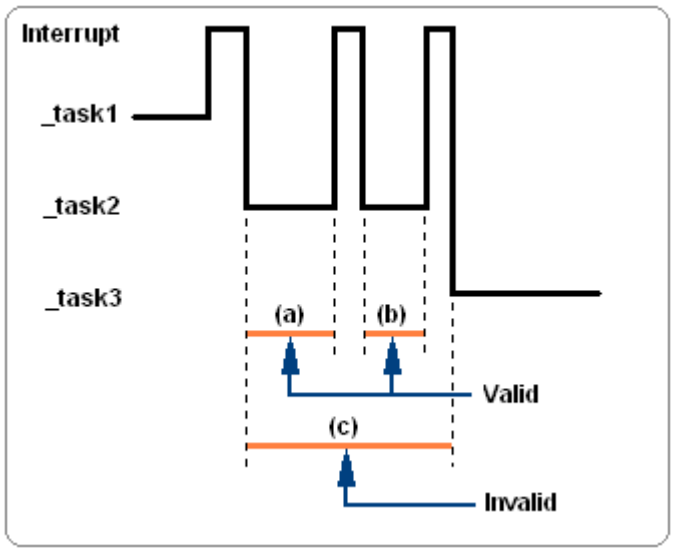
Table A-10. Pattern Conditions (When [Service Call(Call/Return/Error)] Is Selected)

Item	Meaning of Condition
Task	Specify the task name or interrupt source name that issues a service call. When the specification of the task or interrupt is not critical, specify [* ANY *].
Service Call	Specify the name of the service call. When the specification of the service call is not critical, specify [* ANY *].
Object	Specify the target object name of the service call. When the specification of the object is not critical, specify [* ANY *].

[Note] The position for which a search is made vary with the specification of [Valid]/[Invalid] for the Interrupt item, as follows:

Pattern conditions : <From>:[* ANY *] -> [_task2] <To>: [_task2] -> [* ANY*]

Figure A-17. Difference between [Valid] and [Invalid]



When [Valid] is specified

Interrupts are detected as switching objects, so that (a) and (b) are detected as the pattern.

When [Invalid] is specified

Interrupts are not detected as switching objects, so that (c) is detected as the pattern.

In this case, the time at the exit of the interrupt is assumed as the pattern start/end time, and the calculated time required for executing the pattern will include the time required for handling the interrupt.

Examples of patterns

Examples of setting typical patterns are shown below.

- **Analyzing the interrupt handling time**

Analyzing the interrupt source "Interrupt1"

Area	Pattern Mode	Pattern condition
From	Task Switch	[* ANY *] -> [Interrupt1] ; [Valid]
To	Task Switch	[Interrupt1] -> [* ANY *] ; [Valid]

- **Analyzing the time required for processing a service call**

  Analyzing the processing time between "Task1" issuing a wai_sem service call and "Semaphore1" being acquired

Area	Pattern Mode	Pattern Condition
From	Service Call(Call)	[Task1] -> [wai_sem] ; [Semaphore1]
To	Service Call(Return)	[Task1] -> [wai_sem] ; [Semaphore1]

- **Analyzing the processing time between a service call being issued and another task being woken up**

  Analyzing the processing time between "Task1" issuing a wai_tsk service call and processing being passed to "Task2"

Area	Pattern Mode	Pattern Condition
From	Service Call(Call)	[Task1] -> [wai_tsk]
To	Task Switch	[* ANY *] -> [Task2]

- **Analyzing the interval between error returns**

  Analyzing the interval between the locations from which an error is returned, by "Task1"

Area	Pattern Mode	Pattern Condition
From	Service Call(Error)	[Task1] -> [* ANY *] ; [* ANY *]
To	Service Call(Error)	[Task1] -> [* ANY *] ; [* ANY *]

Function buttons

Button	Function
OK	Searches for the set pattern and calculates its distribution within the range specified by the up cursor and down cursor in the execution transition map, then opens the AZ:Pattern Window.
Cancel	Closes this dialog box.
Help	Displays the help window for this dialog box.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If a pattern which satisfies the set pattern conditions is not found within trace data

AZ:Pattern Window

This window is used to search for the pattern specified using the Pattern Set dialog box within the range set with the up cursor and down cursor on the execution transition map, and display a histogram representing the number of times the pattern appears for given execution duration.

The pattern means the duration of the CPU processing from the point at which a specific event (switching point of a task, occurrence of an interrupt, issue of a service call, etc.) occurs to the point at which the event ends or another event occurs.

Using this window, therefore, the worst/average execution time for the processing performed by a program can be obtained.

This window can be opened as follows:

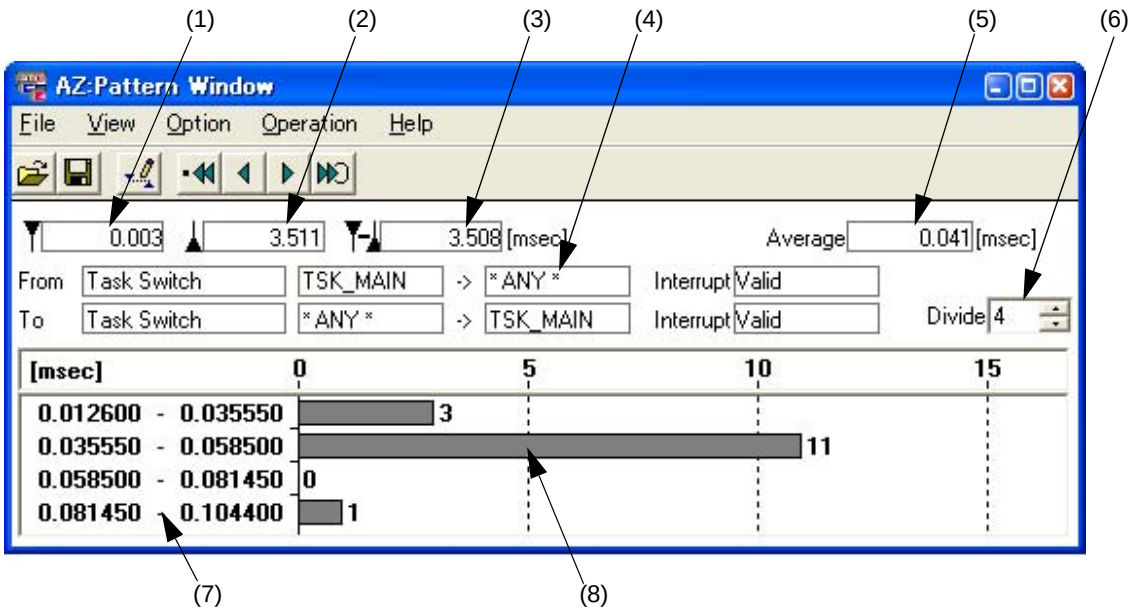
[In the AZ:Analyze Window]

- Select the [Browse] menu -> [Pattern...], and specify the pattern conditions in the Pattern Set dialog box.
- Click the button on the toolbar, and specify the pattern conditions in the Pattern Set dialog box.
- Press the [Alt], [B] and [P] keys in that order, and specify the pattern conditions in the Pattern Set dialog box.
- Press the [Ctrl]+[P] keys at the same time, and specify the pattern conditions in the Pattern Set dialog box.

[In the AZ:Cpu Window]

- Select the [Jump] menu -> [Pattern...].
- Click the button on the toolbar.
- Press the [Ctrl]+[P] keys at the same time.

Figure A-18. AZ:Pattern Window



(1) Time of up cursor position
(2) Time of down cursor position
(3) Total time
(4) Set pattern conditions
(5) Average value
(6) Number of histogram divisions
(7) Processing time
(8) Pattern distribution

This section describes the following items:

- Explanation of each area
- Menubar
- Toolbar
- Pattern distribution display method
- Pattern distribution viewing method
- Search from AZ:Pattern Window
- Caution
- Error

Explanation of each area

(1) Time of up cursor position

This box indicates the time at which calculation of the pattern distribution started.
After the start of trace data collection, the relative time that has elapsed is indicated by the position of the up cursor on the execution transition map. The units are milliseconds (ms).

(2) Time of down cursor position

This box indicates the time at which calculation of the pattern distribution ended.
After the start of trace data collection, the relative time that has elapsed is indicated by the position of the down cursor on the execution transition map. The units are milliseconds (ms).

(3) Total time

This box indicates the duration for which the pattern distribution was calculated.
The duration is indicated by the distance between the up and down cursors. The units are milliseconds (ms).

(4) Set pattern conditions

This area is used to display the contents of the pattern conditions set with the Pattern Set dialog box.
Putting the mouse pointer on this area displays pop-up window that shows the name of the object (if the object name is too long, however, part of it is omitted).

(5) Average value

This area is used to display the average time required to execute the set pattern. The units are milliseconds (ms).

(6) Number of histogram divisions

This area is used to display the number of histogram divisions.
By clicking the button on the right, the number of divisions can be changed to any value between 1 and 100.

(7) Processing time

This area is used to display the duration in which the set pattern is processed.
When the number of the histogram divisions is changed, the time width is also changed.

(8) Pattern distribution

This area is used to display a histogram of the obtained processing times for the set pattern that specified with the up cursor and down cursor of the execution transition map.

Menubar

(1) [File] menu

Open...	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".azp". The file name is displayed on the titlebar after the display file has been read.
Save...	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".azp".
Close	Closes this window.

(2) [View] menu

Divide(+)	Increases the number of histogram divisions by 1.
Divide(-)	Reduces the number of histogram divisions by 1.

(3) [Option] menu

Pattern Set...	Opens the Pattern Set dialog box. The function of this item is same as that of the  button.

(4) [Operation] menu

Active	Switches this window from the hold status to the active status (default).
Hold	Switches this window from the active status to the hold status.
Search(Min)	Indicates, on the execution transition map, the location where the execution duration for the specified pattern is minimum. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. The function of this item is same as that of the  button.
Search(Max)	Indicates, on the execution transition map, the location where the execution duration for the specified pattern is maximum. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. The function of this item is same as that of the  button.
Search(Fore)	Searches the pattern with the next longer execution time compared to the currently searched pattern after selecting the [Search(Min)] or the  button on the toolbar. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. The function of this item is same as that of the  button.

Search(Back)	Searches the pattern with the next shorter execution time compared to the currently searched pattern after selecting the [Search(Max)] or the  button on the toolbar. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. The function of this item is same as that of the  button.

(5) [Help] menu

This Window	Displays the help window for this window.
Help Topics	Displays the AZ850V4 help window.

Toolbar

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

Button	Function
	Opens the Open/Save As dialog box. A previously saved display file, obtained using this window, is read. The default extension for the display file of this window is ".azp". The file name is displayed on the titlebar after the display file has been read. Same operation as [File] menu -> [Open...].
	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".azp". Same operation as [File] menu -> [Save...].
	Opens the Pattern Set dialog box. Same operation as [Option] menu -> [Pattern Set...].
	Indicates, on the execution transition map, the location where the execution duration for the specified pattern is minimum. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. Same operation as [Operation] menu -> [Search(Min)].
	Searches for the location where the execution duration for the pattern is the largest, after that identified by the previous search. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. Same operation as [Operation] menu -> [Search(Back)].
	Searches for the location where the execution duration for the pattern is the smallest, after that identified by the previous search. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. Same operation as [Operation] menu -> [Search(Fore)].
	Indicates, on the execution transition map, the location where the execution duration for the specified pattern is maximum. The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point. Same operation as [Operation] menu -> [Search(Max)].

Pattern distribution display method

By the following method, the distribution of a pattern is displayed within the specified range.

(1) Setting the up and down cursors:

The distribution of a pattern is calculated within the period specified with the up cursor and down cursor on the execution transition map in the AZ:Analyze Window

Specify the range for which pattern distribution is to be calculated, using the up cursor and down cursor.

(2) Setting the pattern:

Select the [Browse] menu -> [Pattern...] on the AZ:Analyze Window to open the Pattern Set dialog box.

In this dialog box, specify the the pattern modes and the pattern conditions corresponding to the start/end point of the pattern to be calculated (refer to the Pattern Set dialog box for details on setting method).

(3) Open the AZ:Pattern Window:

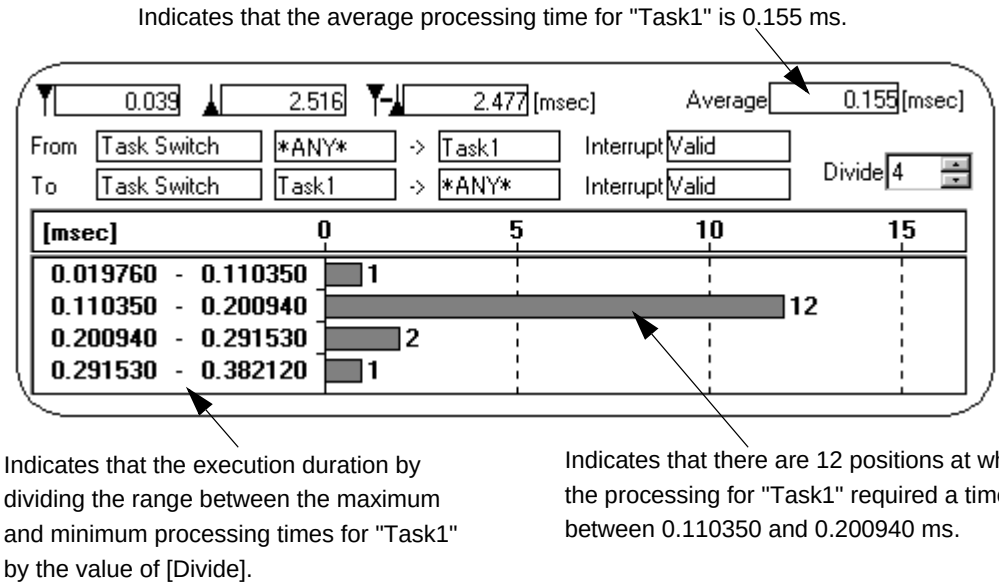
Click the [OK] button on the Pattern Set dialog box to open this window.

If the Pattern Window is left open and either the up cursor or down cursor is repositioned in the execution transition map, the displayed distribution of the pattern is automatically updated.

Pattern distribution viewing method

Figure A-19 shows the example for analysis of the processing time for "Task1".

Figure A-19. Pattern Distribution Viewing Method



Search from AZ:Pattern Window

Using the Toolbar on this window, a search can be made in the calculated pattern distribution, based on the processing time (such as a search for those locations where the pattern execution duration is a maximum or a minimum). The result of the search is displayed in the execution transition map.

The up temporary cursor is moved to the identified pattern start point, while the down temporary cursor is moved to the identified pattern end point.

Caution

- Closing the AZ:Analyze Window also closes this window.
- If this window is in the active status and either the up cursor or down cursor is repositioned in the AZ:Analyze Window, the contents of this window is automatically updated.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If an attempt is made to set the AZ:Pattern Window in the hold status to the active status when another AZ:Pattern Window in the active status exists.

AZ:Trace View Window

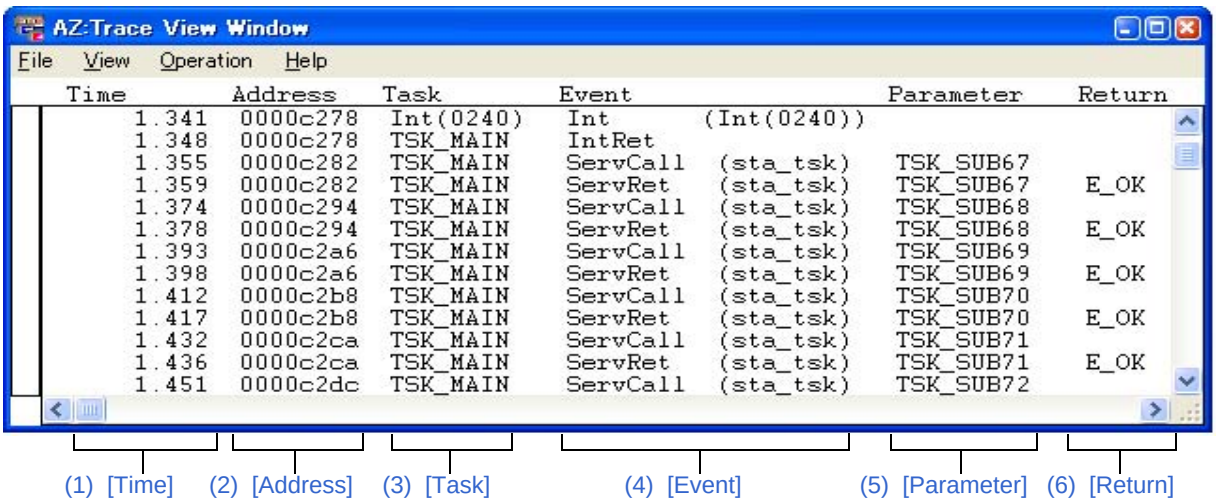
This window is used to list the contents of trace data, displayed as an execution transition map in the AZ:Analyze Window.

The detailed information about trace data can be obtained by using this window.

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 toolbar.
- Press the [Alt], [B] and [T] keys in that order.
- Press the [Ctrl]+[T] keys at the same time.

Figure A-20. AZ:Trace View Window



This section describes the following items:

- Explanation of each area
- Menubar
- Display method
- Viewing method
- Caution
- Error

Explanation of each area

(1) [Time]

This area is used to display the relative time from the AZ trace start time. The units are milliseconds (ms).

(2) [Address]

This area is used to display the execution address of the program.

(3) [Task]

This area is used to display the name of a task (function) or the name of an interrupt source upon occurrence of an event. Refer to the "About objects" for details on the displaying of names.

(4) [Event]

This area is used to display the type of an event in trace data.
The types of events that can be displayed are as follows:

Table A-11. Types of Events In AZ:Trace View Window

Name	Description
ServCall	Indicates the issue of a service call. The name of the issued service call is indicated in parentheses.
ServRet	Indicates a return form a service call. The name of the returned service call is indicated in parentheses. If the event issued by corresponding service call dose not exist in the trace buffer, however, inside the parentheses is blank. This happens if the program is executed from the middle.
Int	Indicates the entry of an interrupt. The name of the interrupt source is indicated in parentheses.
IntRet	Indicates the exit of an interrupt. The name of the interrupt source is indicated in parentheses.
TaskStart	Indicates the initial start up of a task.
Idle	Indicates transition to the Idle state.

(5) [Parameter]

This area is used to display the name of the target object of the service call when the event type is "ServCall" or "ServRet".

(6) [Return]

This area is used to display the return value form the service call in a macro name when the event type is "ServRet".
Note that when can_wup, can_act, ican_wup, or ican_act has been terminated normally, not "E_OK" but the number of invalidated activation requests is displayed.
For details of the return value, refer to the user's manual of the real-time OS used.

Menubar

(1) [File] menu

Save...	Opens the Open/Save As dialog box. The current display information for this window is saved to a display file, which can either be created newly or by copying and renaming an existing file. The default extension for the display file of this window is ".azt".
Close	Closes this window.

(2) [View] menu

Find...	Opens the Trace Search dialog box.
Timetag	Toggles the display of the [Time] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.
Address	Toggles the display of the [Address] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.
Task]	Toggles the display of the [Task] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.
Event	Toggles the display of the [Event] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.
Parameter	Toggles the display of the [Parameter] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.
Return	Toggles the display of the [Return] area between on and off. Select either the [Show] (default) or [Hide], displayed in the cascade menu.

(3) [Operation] menu

Active	Switches this window from the hold status to the active status (default).
Hold	Switches this window from the active status to the hold status.

(4) [Help] menu

This Window	Displays the help window for this window.
Help Topics	Displays the AZ850V4 help window.

Display method

By the following method, the list of trace data is displayed from the position specified.

(1) Setting the cursors:
Specify the up temporary cursor to the start position from which trace data is to be displayed, on the execution transition map in the AZ:Analyze Window (if the up temporary cursor is not displayed, the beginning of trace data becomes the display start position).

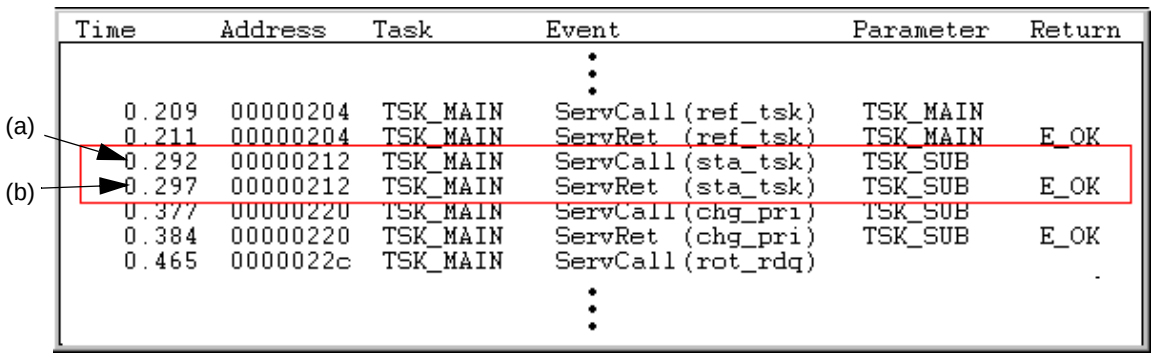
(2) Open the AZ:Trace View Window:
Select the [Browse] menu -> [Trace View...] on the AZ:Analyze Window to open this window.

If the AZ:Trace View Window is left open and the up temporary cursor is repositioned in the execution transition map, the displayed trace data is automatically updated.

Viewing method

Figure A-21 describes how to read the trace data.

Figure A-21. Trace Data Viewing Method



(a) When 0.292 ms has elapsed after the start of the system, task "TSK_MAIN" issued a "sta_tsk" service call to task "TSK_SUB" at address 0x000212.

(b) When 0.297 has elapsed after the start of the system, the previously issued "sta_tsk" service call returned with a return value of "E_OK(0000)", at address 0x000212.

[Caution] Regarding [Event] area, if no event for which a service call was issued exists in the trace buffer, the parentheses include no data. This is caused by execution from a location other than the beginning of the program, etc.

[Remark] By selecting the [View] menu -> [Find...] on this window to open the Trace Search dialog box, a search can be made according to conditions such as "task names, interrupt sources, event types, or service call arguments" (refer to the "Search method").

Caution

- Closing the AZ:Analyze Window also closes this window.
- If this window is in the active status and the up temporary cursor is repositioned in the AZ:Analyze Window, the displayed trace data is shifted automatically.

Error

In the following cases, the AZ:Error dialog box is opened to display messages.

- If an attempt is made to set the AZ:Trace View Window in the hold status to the active status when another AZ:Trace View Window in the active status exists.

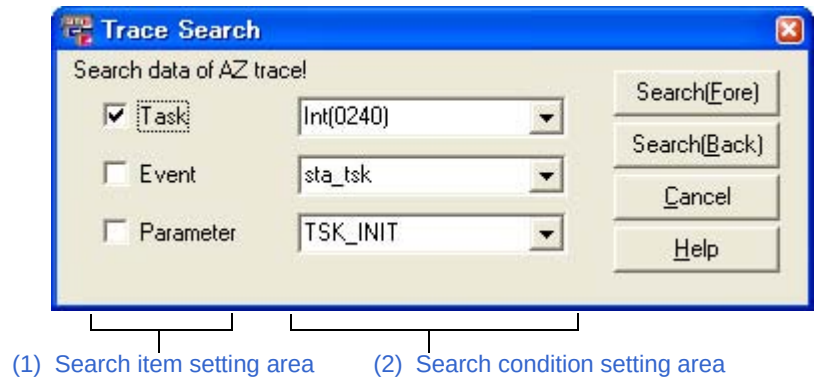
Trace Search dialog box

This dialog box is used to specify the search conditions applied when searching for trace data 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 A-22. Trace Search Dialog Box



This section describes the following items:

- Explanation of each area
- Function buttons
- Search method

Explanation of each area

(1) Search item setting area

This area is used to select the search items for trace data in the AZ:Trace View Window.

Select the check box corresponding to the desired search items. Any number of boxes can be selected.

Task	Searches for a task name or an interrupt source name.
Event	Searches for an event type.
Parameter	Searches for a service call argument.

(2) Search condition setting area

This area is used to specify the search conditions for each search item.

The drop-down list displays the task names and interrupt source names, event types, and service call arguments that exist in the collected trace data.

Function buttons

Button	Function
Search(Fore)	A search is made for a position which satisfies the set search conditions, in the direction of the trace time axis, and the AZ:Trace View Window is displayed with the search position as the beginning.
Search(Back)	A search is made for a position which satisfies the set search conditions, in the direction opposite to the trace time axis, and the AZ:Trace View Window is displayed with the search position as the beginning.
Cancel	Closes this dialog box.
Help	Displays the help window for this dialog box.

Search method

A search can be made for the desired position in the AZ:Trace View Window by the following method.

(1) Selecting search item(s):
Select the item(s) to be searched in the Search item setting area (any number of items can be selected).

(2) Specifying search condition(s):
Specify the search condition(s) for each search item by using the drop-down lists in the Search condition setting area.

(3) Click the function button.

- When the [Search(Fore)] button is clicked:
  A search is made for a position which satisfies the set search conditions, in the direction of the trace time axis, and the AZ:Trace View Window is displayed with the search position as the beginning.
- When the [Search(Back)] button is clicked:
  A search is made for a position which satisfies the set search conditions, in the direction opposite to the trace time axis, and the AZ:Trace View Window is displayed with the search position as the beginning.

Examples of setting search conditions in the Trace Search dialog box is shown below.

Figure A-23. Specification Example 1
(To search for the task "TSK_MAIN")

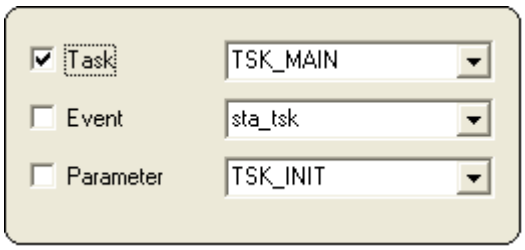


Figure A-24. Specification Example 2

(To search for those locations where the task "TSK_MAIN" has issued a "sta_tsk" service call.)

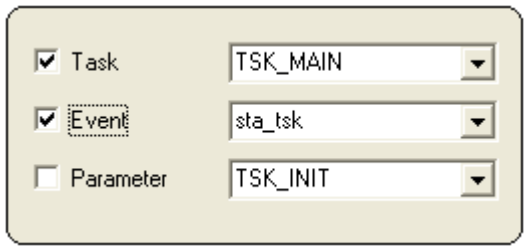
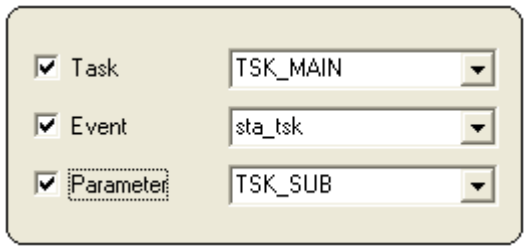


Figure A-25. Specification Example 3

(To search for those locations where the task "TSK_MAIN" has issued a "sta_tsk" service call for the task "TSK_SUB".)

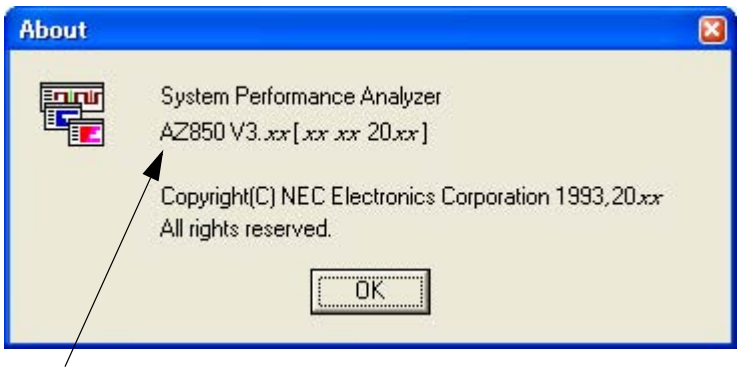


About dialog box

This dialog box is used to display the version information of AZ850V4.
This dialog box can be opened from the AZ850V4 window by any of the following:

- Select the [Help] menu -> [About...].
- Press the [Ctrl]+[A] keys at the same time.

Figure A-26. About Dialog Box



(1) Version information display area

This section describes the following items:

- Explanation of each area
- Function buttons

Explanation of each area

(1) Version information display area

This area is used to display "*Product name*, *Version number of AZ850V4* [*date of product build*] and *Copyright year*".

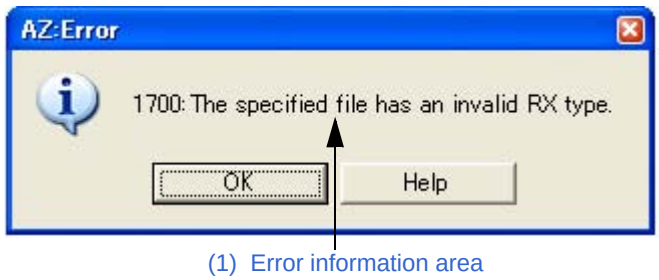
Function buttons

Button	Function
OK	Closes this dialog box.

AZ:Error dialog box

This dialog box is used to display the error information of AZ850V4.
This dialog box opens automatically when an invalid operation is performed in the AZ850V4's window/dialog box.

Figure A-27. 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, refer to the "B. 2 Error Massages".

Function buttons

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

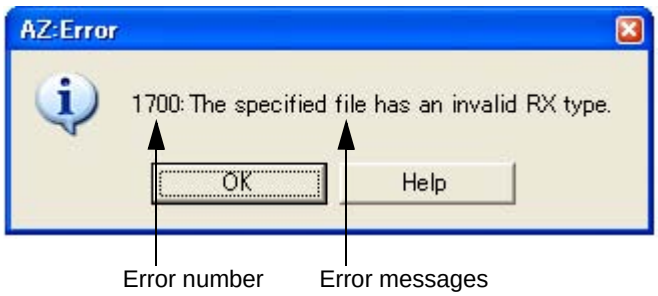
APPENDIX B MESSAGES

Appendix B provides the error information output from AZ850V4.

B. 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 B-1. Error Information Output Format



B. 2 Error Massages

The error number, error message, description of the error, and action to be taken are explained below.

Table B-1. Error Information List

Error Number	Description	
1000	Message	Not enough memory.
	Cause	The memory in the machine is insufficient.
	Action by User	After closing unneeded windows, perform the operation again.
1001	Message	Internal error.
	Cause	An error that could not be anticipated has occurred.
	Action by User	Perform the operation again from the beginning.
1010	Message	The active window already exists.
	Cause	Since an active window already exists, the status of the window cannot be changed to active.
	Action by User	Either change the status of the active window to hold or close the active window before making the desired window active.
1021	Message	The file does not exist.
	Cause	The specified file name does not exist.
	Action by User	Specify a correct file name.

Error Number	Description	
1022	Message	Fail to write the file.
	Cause	Either there is not sufficient free disk space or the specified file is a read-only file, so that it cannot be written to.
	Action by User	Specify a file in a separate disk, or a file that is not read-only.
1023	Message	The file format is illegal.
	Cause	The file cannot be read because its format is incorrect.
	Action by User	Check if it is a file for the AZ850V4's trace data or not.
1031	Message	The RX850 (μITRON3.0) is downloaded.
	Cause	RX850V4 (μITRON4.0) is not embedded into the load module.
	Action by User	Embed RX850V4 (μITRON4.0) into the load module.
1032	Message	The RX850 Pro(μITRON3.0) is downloaded.
	Cause	RX850V4 (μITRON4.0) is not embedded into the load module.
	Action by User	Embed RX850V4 (μITRON4.0) into the load module.
1100	Message	The debugger does not support AZ interface.
	Cause	CubeSuite does not support AZ Interface.
	Action by User	Confirm that CubeSuite supports AZ Interface.
1110	Message	Fail to switch AZ trace mode.
	Cause	An error occurred during the switching processing of the AZ trace mode. The address mask value may not be correct or communication between CubeSuite and AZ850V4 may have failed.
	Action by User	Check that the address mask value is set correctly with the [Address Mask] area in the AZ Option dialog box. Otherwise restart CubeSuite and AZ850V4.
1118	Message	The buffer region not specified.
	Cause	AZ Trace ON was set without a trace buffer area being specified.
	Action by User	Specify the trace buffer area with the [Soft Form Buffer Region] area in the AZ Option dialog box, and then set AZ Trace ON.
1120	Message	Fail to load the trace data.
	Cause	An error occurred during trace data uploading. The settings of the trace buffer area may not be correct.
	Action by User	Check if correct addresses have been specified as the trace buffer area.
1121	Message	The trace data does not exist.
	Cause	There is no trace data in the executed data.
	Action by User	Execute the program in the AZ Trace ON mode and upload the trace data again.
1122	Message	The trace data is illegal.
	Cause	The time tag in the trace data may not be correct.
	Action by User	Check if the user own coding block is correctly coded.
1128	Message	Task level data not included.
	Cause	Task-level trace data was not included in the collected trace data.

Error Number	Description	
1210	Message	The trace buffer address is illegal.
	Cause	The address range specified for the trace buffer is incorrect.
	Action by User	Specify a correct address range with the [Soft Form Buffer Region] area in the AZ Option dialog box.
1220	Message	The address mask is illegal.
	Cause	An illegal value that cannot be handled as a mask value was input for the address mask specification in the AZ Option dialog box.
	Action by User	Specify a hexadecimal number with the [Address Mask] area in the AZ Option dialog box.
1400	Message	The pattern does not exist.
	Cause	The specified pattern dose not exist in the trace data between the up cursor and the down cursor.
	Action by User	Expand the interval between the up cursor and the down cursor, and perform the operation again. If this error occurs even with the maximum interval, the specified pattern does not exist in the trace data.
1700	Message	The specified file has an invalid RX type.
	Cause	An attempt was made to read an AZ file whose real-time OS differs form the real-time OS specified (RX850V4).
	Action by User	Check if the appropriate real-time OS (RX850V4) is specified with the [RTOS Select] area in the AZ Option dialog box.

APPENDIX C INDEX

V

W

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