TOSHIBA
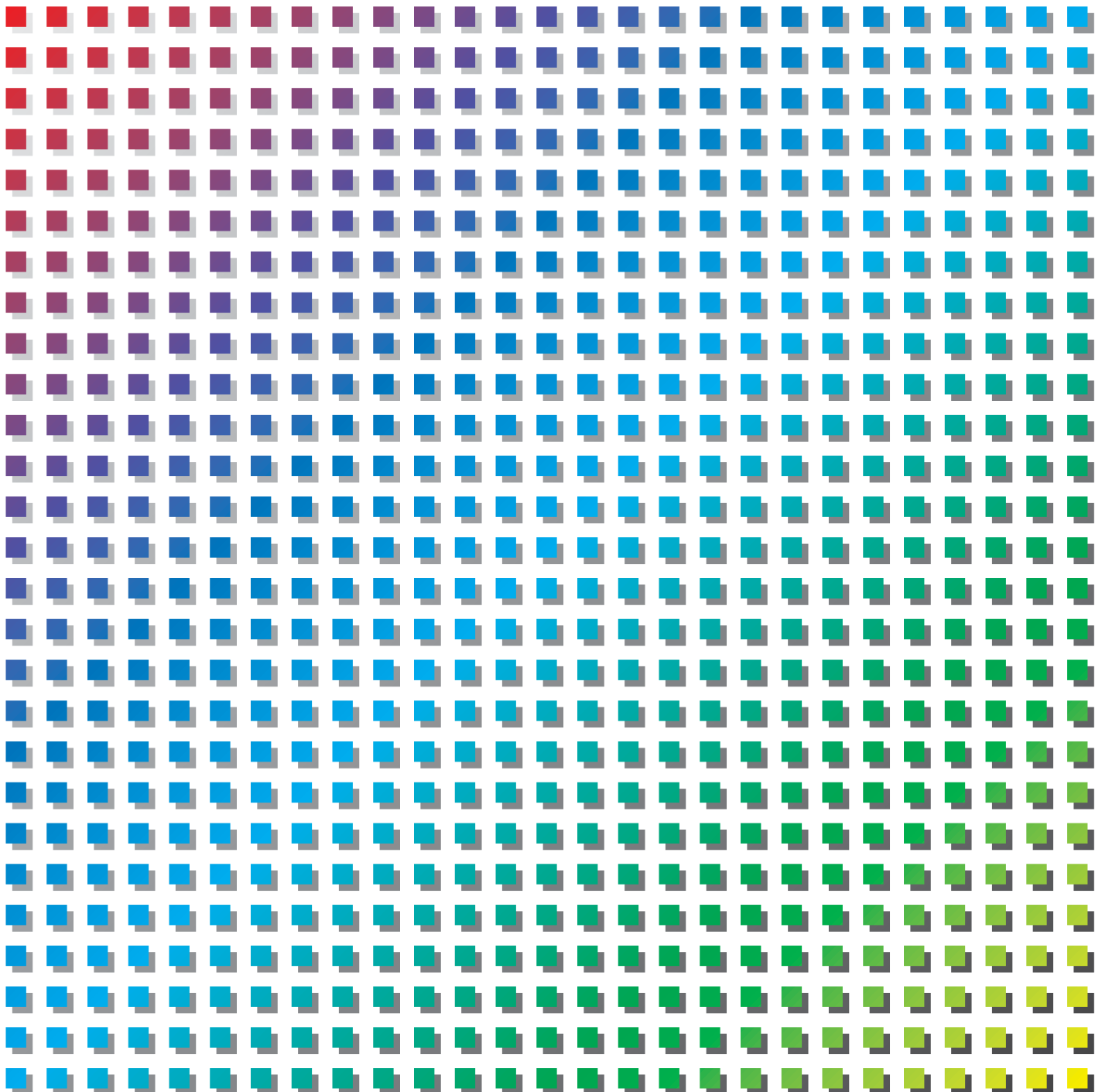
Integrated Controller V series

⟨⟨ MENU

model 2000/3000
Computer Module C2/C3 Windows NT Version User's Manual

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Safety Precautions

This manual contains important information for the operator to operate this product safely and correctly and avoid bodily injury and property damage.
Grasp the meanings of the following marks and their descriptions before reading this manual.

Hazard Classifications

◇ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
△ CAUTION	Indicates a potentially hazardous situation which, if not a avoided, can result in minor or moderate injury, or property damage. It can also be used to alert against unsafe practices.

Note: 1. Serious injury means loss of sight, injury, burns (high temperature, low temperature), electrical shock, fracture, or intoxication which leaves aftereffects or requires hospitalization or need to go to the hospital for a long time.
2. Injury means hurt, burn, or electrical shock which does not require hospitalization or going to the hospital for a long time.
3. Property damage means extended breakdown of assets and materials.

Notation of Markings

⊘ Prohibited	Indicates a "may not" mark. The concrete forbiddance is indicated with a pictograph or wording.
❶ Mandatory	Indicate a mandatory action that you should never fail to do. The concrete content is indicated inside or near the circle with a pictograph or wording.
△ Caution	Indicates a caution. The concrete content is indicated inside or near the triangle.

Note: The description of forbiddance, mandatory, and caution marks are subject to change, depending on the labels on the main unit.

1. Safety Precautions during Installation

⬙ WARNING

🔴 **Mandatory**

Make certain to ground the transmission paths by grounding with 100É[1] or less ground resistance exclusively for each segment. Ground at one point.
Noncompliance may cause transmission errors.
Noncompliance may cause an electric shock or a fire.

🔴 **Mandatory**

Do not impress high voltage to a connector or a terminal board exceeding rated voltage, such as 100V AC. Always connect to correct polarity. Incorrect polarity may cause an electric shock or a fire.

⚠ CAUTION

🔴 **Mandatory**

Avoid installing or storing the controller in the following environment:
- A dusty place.
- A place in which a corrosive gas (SO_2, H_2S) or combustible gas generates.
- A place subjected to vibration or shocks exceeding permissible values.
- A place that causes condensation due to sudden temperature changes.
- Low or high temperature outside of installation conditions.
- High humidity outside of installation conditions.
- Direct sunshine.
- Near equipment that emits a strong radio wave or magnetic field.

🔴 **Mandatory**

Install the equipment in a place affording easy maintenance servicing and checks. Otherwise, a trouble may be caused during a failure, resulting in a major accident.

🚫 **Forbidden**

Do not block the ventilation port or suction/exhaust port of the equipment.
Otherwise, overheating or other phenomena may cause a fire or a failure.

🔴 **Mandatory**

Noncompliance with the installation conditions described in this manual during system installation or wiring may disable the controller to demonstrate its design performance and may cause equipment malfunction or failures.

🔴 **Mandatory**

Always install the module after turning the external power supply off. Otherwise, the module failure or an electric shock may result.

2. Safety Precautions during Maintenance Servicing or Checks

◇ WARNING

Mandatory

Always turn the power off when plugging or unplugging a module or a board, or when connecting equipment.
Otherwise, an electric shock accident or equipment failure may result.

Mandatory

Make certain that the external power is turned off before mounting or dismounting the module after installing cables in it.
Otherwise, an electric pole will appear on the backside of the external terminal board, potentially causing an electric shock.

⚠ CAUTION

Forbidden

Exercise reasonable care and do not drop, collide with other article or apply a strong shock to the equipment or a board.
Otherwise, a failure may result.

Mandatory

Place a conducting mat or a conducting bag (bag containing a spare board or other part) on a grounded table and put a board or the module removed from a unit or a base unit on the table.
Otherwise, parts may be damaged by static electricity or other phenomenon.

Mandatory

Discharge static electricity charged on human body by touching a grounded metal before touching the equipment or a board.
Otherwise, static electricity may cause equipment malfunction or a failure.

Forbidden

Do not use benzine, thinner or other solvent when cleaning a module or a board.
Otherwise, a panel, module or board may deform or discolor.

Mandatory

Clean equipment, a module or board dirtiness using a soft cloth. Use a cloth moistened with water and wringed if dirtiness is stiff.
The equipment, the module or a board left dirty may cause a wrong decision or malfunction.

3. Safety Precautions in Replacing Parts with Ended Life

⬦ WARNING

Mandatory

Make certain to set the switch of any equipment to the OFF position before replacing a power fuse or an alarm fuse installed in the equipment.
Otherwise, an electric shock or a fire may result.

4. Safety Precautions in Daily Operation

⬦ WARNING

Mandatory

Make certain to check that the power supply capacity, frequency, voltage and regulation meet the equipment specification.
Otherwise, the controller will not be able to demonstrate its design performance and may cause equipment damage, a fire due to overheating, or other trouble.

Mandatory

In case the ambient or internal temperature of the equipment increases abnormally or the equipment fails, stop operating and turn the power off to the equipment. Then contact the Toshiba distributor in your area.
Continuing to operate the equipment without taking any action may result in a fire due to overheating or other trouble.

⚠ CAUTION

🚫

Forbidden

Do not touch the ICs, terminals, connectors, solder surfaces or other parts inside the modules, except the operation section (setting switches inside the module).
Otherwise, ICs, LSIs or other devices may be destroyed by static electricity, resulting in a failure. An injury by the terminal of a parts lead wire or a burn by a high-temperature part may result.

🚫

Forbidden

Do not disassemble or remodel the equipment, module or a board.
   Otherwise, equipment safety may be lost and equipment malfunction or failure may potentially result.

🚫

Forbidden

Do not bend, pull or twist the power cord or cable too strongly.
This may cause wire breakage or heating.

🚫

Forbidden

Do not insert a metal piece or drop a paper clip through a clearance in the equipment body.
A fire or other trouble may result.

5. Safety Precautions During Transportation, Storage and Scrapping

⚠ CAUTION

❗

Mandatory

Comply with ordinances or regulations of the local government in your area when discarding the product.

🚫

Forbidden

When transporting or storing, put the product in a conducting bag and pack it in a crated box.
Otherwise, a failure may result.

CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

Limitation of Applications

The equipment has been designed and manufactured for use in an industrial environment. However, the equipment is not intended to be used for systems which can endanger human life (Note 1).

Consult Toshiba if you intend to use the equipment for a special application which involves human life and has great influence on the maintenance of the public function (Note 2). This is why such application requires special care on the operation, maintenance, and control of the system (Note 3).

(Note 1) The systems which can endanger human life are life maintenance systems, equipment installed in the surgery, and other medical equipment.

(Note 2) The systems which involve human life and have great influence on the maintenance of the public function mean the main control system of a nuclear power plant, safety and protection system of a nuclear power facility, transport operation and control systems for mass transportation, control systems of aviation and space systems, and other systems and subsystems where safety is critical.

(Note 3) "Special care" means to build a safety system (foolproof design, fail safe design, redundancy design, etc.) in full consultation with Toshiba's engineers.

Immunity

Toshiba is not liable for any loss caused by fire, earthquake, action by a third party, or other accidents, or the operator's intentional or accidental misuse, incorrect use, or use under abnormal condition.

Toshiba is not liable for any incidental loss caused by the use or non-use of this product, such as loss of business profits, suspension of business, or loss or change of data on memory.

Toshiba is not liable for the loss caused by an operation contradictory to any of the instructions stated in this manual.

Toshiba is not liable for the loss caused by an incorrect operation in combination with other equipment.

Toshiba is not liable for the loss caused by a malfunction in combination with an application program made by the customer.

> NOTE:
>
> Use cellular phones and PHSs at least one meter away from the working equipment, transmission cables, and I/O bus cable. Otherwise, the system can malfunction.

model 2000/3000 Computer Module C2/C3 Windows NT Version

The Structure of This Manual

This manual describes Windows NT, the operating system of Microsoft Corporation, installed in the Computer Modules C2/C3 of the Integrated Controller, with a focus on the features added or extended to the operating system. The reader is invited to read manuals of Microsoft for the full information on Windows NT.

This manual is composed of the following chapters:

Chapter 1 Windows NT

Chapter 1 describes initial settings of Windows NT, which is preinstalled, and other matters.

Chapter 2 I/O Bus Support Software

The C2/C3 can directly control the parallel bus I/O modules. This chapter describes the I/O bus support features, which control the modules, and API.

Chapter 3 RAS Support Software

This chapter describes the RAS features of the C2/C3 and usage of them.

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Chapter 1 Windows NT

This chapter describes cautions and other matters in using Windows NT4.0 on the Computer Modules of the Integrated Controller.

The reader is invited to read manuals published by Microsoft and books sold in bookstores for the full information on Windows NT.

1

1.1 Precautions

Power Supply

Turning the power off before normal ending of Windows NT may damage the file system and important files. In the worst case, Windows NT cannot potentially be started.

Make certain to execute finish processing of Windows NT before turning the power off. Also, make certain to supply the power that is always stable.

Detection of Abnormal Temperature

If the operating environment is not suitable, the inside temperature of the main unit may exceed the specified value, which potentially presents a hazard of a system fault due to equipment malfunction.

The C2/C3 monitors the CPU temperature through the RAS feature and generates an alarm in case the temperature exceeds a preset value (currently 55°C), to notify a trouble. It is strongly recommended that application systems incorporate a program that detects this alarm. The program should inform the operator about a trouble and stop the system till the cause for a temperature error is removed when it receives such notice.

See the XrasUserWindow Command in "RAS Support Software" in chapter 3 for a method to detect a temperature error by a specific application program.

File Backing Up

Back up important files from time to time by copying files into backup files. Important files cannot be restored in case they are lost by an unanticipated accident, unless they are stored in backup files.

Changing Registry Value

Changes of the registry, which stores set values and registration information of Windows NT require very careful execution. If an error is made in making a change, system startup may be disabled.

Service Pack[1] Installation

Reinstall the Service Pack when the system configuration is added or changed, such as network protocol addition.

Caution for setting memory space addresses for PCMCIA card

Note that memory addresses 0xC8000 to 0xCA000 cannot be used for a PCMCIA card or other card when mounting a card to use memory spaces in PCMCIA slots.

This is not shown in the Windows NT resource display, but a graphic chip also uses these addresses.

---

1. A collection of Windows NT bug correction modules supplied by Microsoft. The Service Pack is stored in the root directory of Drive C in "SP6a" or other name.

1.2 Initialization

When shipped from the factory, Windows NT is set as follows:

Version

Windows NT4.0 Workstation (Build 1381 Service Pack 6)

This is the version as of May 29 2000. The Service Pack version may vary depending on the release status of Microsoft Corporation.

The Service Pack is stored in the hard disk as C:¥SP6a.

QFE (Quick Fix Engineering)[2] also is stored under SP6a. Be sure to install QFE also after installing SP6a.

Registered User Name

administrator (No password)

Guest (No password)

User management is executed by [User Manager] inside [Control Tool Group] after logging on by "administrator" when adding a new user or setting or changing a password.

Network

No software setting

When using the 10BASE-T port on the C2/C3 main unit, use the network driver supplied as an accessory, instead of a Windows NT CD-ROM driver.

Make certain to reinstall the Service Pack after setting the network.

Graphic

Standard VGA Driver
Using the graphic driver supplied as an accessory (NeoMagic MagicGraph 128/Z/ZV), the C2/C3 accomplishes screen display with a resolution of 1024 x 768 and 65,536 color pallet colors.

The driver can be installed as follows:
"Control Panel" → "Screen" → "Display Setting" → "Display Type" → select "Change" in Adapter Type → select "NeoMagic" in Manufacturer → specify "Disk Used"

A correction program to avoid specified faults and problems, which are not contained in the Service Pack, supplied by Microsoft.

1

1.3 Other Information

Driver Storage Positions

The device drivers and other applications are stored under the following directories during preinstallation. This directory configuration is the same as that in the backup CD-ROM.

i386	A device driver supported by Windows NT as a standard provision.
DRVLIB	A device driver by driver distribution service of CompuServe of the United States manufactured by a third party.
DRVLIBJ	A device driver manufactured by a third party in Japan (Japanese version only)
SUPPORT¥USPRNDRV	A printer driver supplied with Windows NT of the US version as a standard provision.
TOSHIBA	A network driver graphic driver for Ethernet port of the main unit.
SP6a	Service Pack 6a (contains QFE)

A path for the driver storage directory needs be specified when installing a driver or other application. If the CD-ROM cannot be used when "E:¥i386" or other data is displayed, execute by specifying "C:¥i386" in the field for path name specification.

These directories store drivers needed in driver installation during a system configuration change or in other instances. These drivers can be deleted without affecting Windows NT operation if system configuration changes are not required.

These directories will not be created when the customer reinstalls Windows NT. Specify driver paths for directories needed for driver installation, to read from the CD-ROM. If the CD-ROM is assigned to Drive E, specify "E:¥driver path name."

Floppy Disks Attached

The floppy disks supplied with the equipment store modules of various features described in this manual.

Revision Upgrading

When the version of the preinstalled Windows NT is upgraded, the latest version of Windows NT has to be purchased separately.

The customer needs to purchase and install the Service Pack separately for revision upgrading. The latest Service Pack can be purchased at cost through a Web site or from Microsoft.

This chapter describes the I/O bus support software.

This software supports data from the C2/C3 input to and output from the various I/O modules connected to the I/O bus. This software enables direct access of the I/O modules from Windows NT, thereby easily accomplishing system construction with only the C2/C3.

The following advantages can be derived by using this software:

• Easy creation of an I/O control application system merging screen control and network features.

• This means that linkage with SCADA (supervisory control and data acquisition) software can be accomplished easily.

• An enhanced development environment of Windows NT can be used when creating an I/O access program.

• Processing of a high parallelism by using multi process and multi thread.

• The same machine can develop and execute programs.

References:

The reader is recommended to read the following documents also after reading this manual:

• Sequence Controller S3 Main Unit Instruction Manual   (6E8C3783)

• Parallel I/O Instruction Manual   (6E8C3785)

• Pulse Input Module Instruction Manual (PI312)   (6E8C3968)

• Analog Input Module Instruction Manual   (6E8C3969)

• Sequence Controller S2 Hardware Manual   (6E8C3857)

2.1 Software Installation

2

This software is supplied in floppy disks.

When reinstalling this software in a machine, in which this software is already installed, temporarily uninstall (delete) the software and install it again as follows:

START Menu → "Program" → Select "Uninstall" in the holder "Toshiba G310 Support Software"

After uninstalling, restart the system.

Execute setup.exe stored in the first floppy disks. Then operate by following guidance messages displayed on the screen.

2.2 Hardware Configuration

figure 2-1shows the maximum hardware configuration of C3 supported by this software.
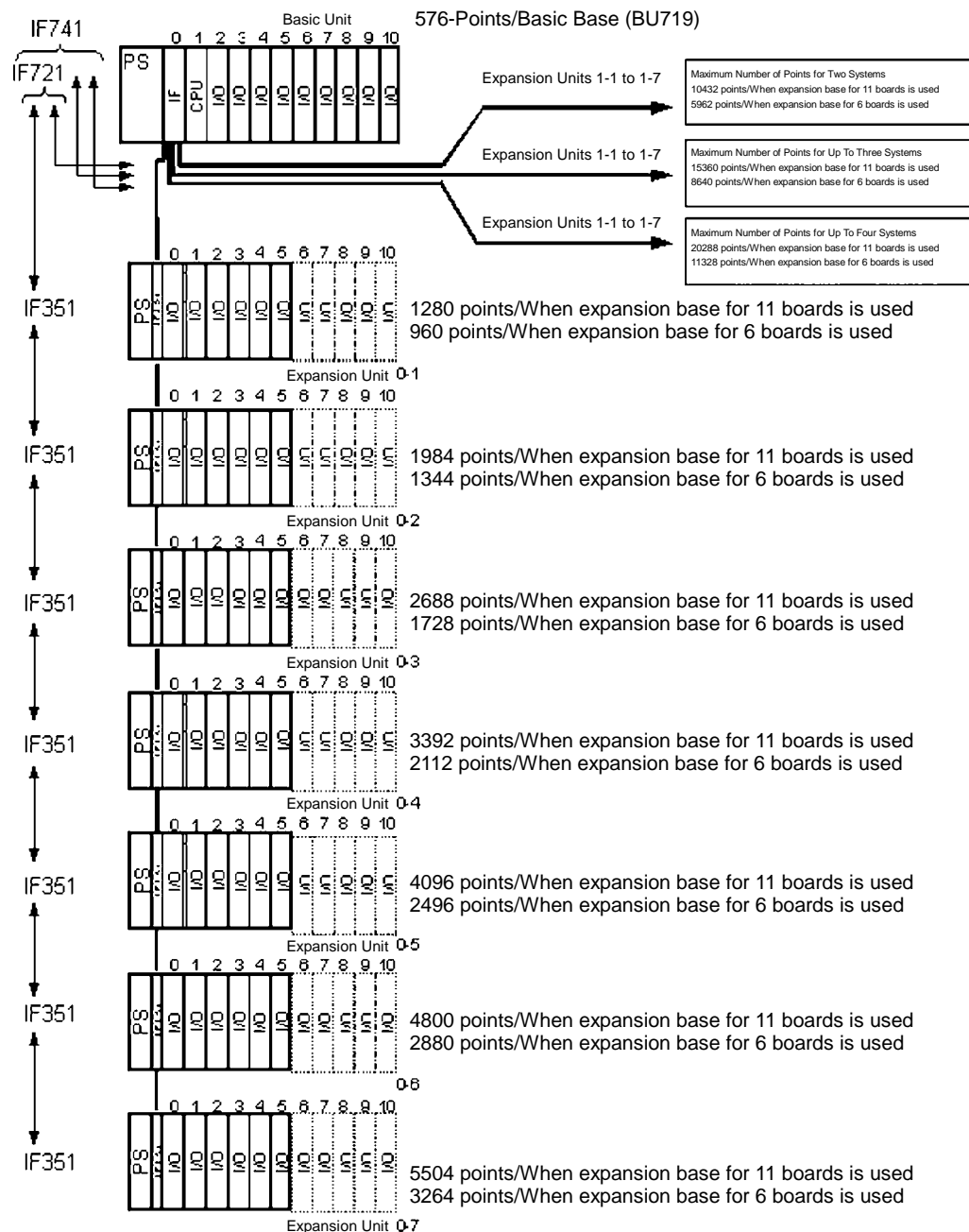
Figure 2-1 Maximum Hardware Configuration of C3 2 Basic Unit

2.3 Software Configuration

2
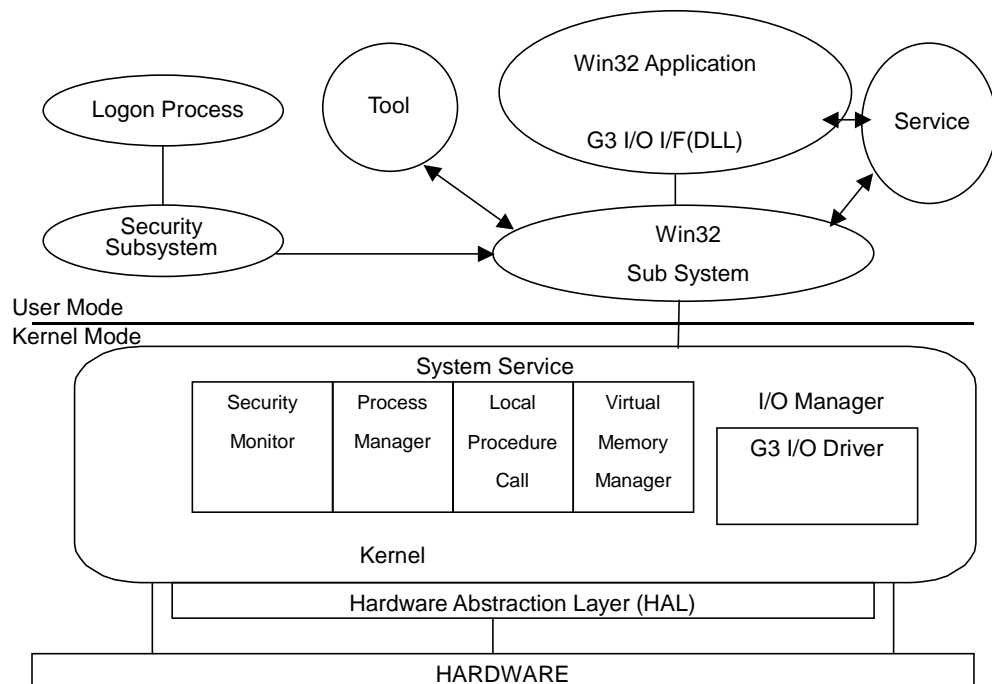
Figure 2-2 G3 I/O Support Software Configuration

2.3.1   API

The API needed for an application to access an I/O module is mounted as DLL. The file name of DLL is "g3iolib.dll."

The API provides interfaces for data input and output, various initializations, module error information acquisition and other purposes.

2.3.2   Service

The service manages startup function registration when interrupts from the application are generated. In case an I/O module specified for startup is interrupted, the user function registered in advance is executed. The service manages batch input/output data between the driver and application.

The parameters to specify operations by the batch input/output feature are stored in the registry. For the complete information, see "2.7 Batch Input/Output"

2.3.3   Tool

The tool is a GUI tool that operates on Windows NT. Using this tool, the following settings can be executed and information can be displayed.

(1) Individual mapping

The tool sets the types of mounting slots and modules of the I/O modules. Specify mounting slots by a channel number, unit or a position inside a unit. Specify module types by selecting from X, Y, X+Y, iX, iY and iX+Y.

The set information will be stored in the registry and will be looked up when the driver starts up.

2

Individual mapping information, which is specified once, can be cancelled and automatic mapping can be executed.

(2) Display of result of automatic mapping

In case individual mapping is not specified, the driver will execute automatic mapping when the system is started. The tool displays results of automatic mapping.

(3) I/O bus mapping address change

Addresses of a memory space to be used by the I/O bus can be changed.

A change is not required in normal operations. A change is needed only if an address conflicts when a PC card is used.

The following two addresses can be selected:

A) 0xD0000-0xD7FFF (Default)

B) 0xD8000-0xDFFFF

(4) Setting I/O bus time-out diagnosis time

An I/O bus time-out diagnosis time is set. If ACK is not returned within a preset time, a hardware error will be declared and subsequent I/O bus accesses will be disabled.

A diagnosis time can be set between 4μs minimum and 60μs maximum in increments of 4μs. Default is set at 32μs.

The following settings can be executed by directly changing registry values using the registry editor:

- Execute/non-execute on startup of module diagnosis

Whether or not to diagnose faults of the I/O modules executed by the device driver should be executed beginning system startup can be specified.

> Key: DiagStart
>
> Value: 0 (Non-execute on start [default]) or 1 (Execute on start)

If execution is not started on start, diagnosis can be started using the function "IobusSetDiag."

- Module diagnosis time interval

A time interval to execute the foregoing module diagnosis is specified.

> Key: DiagInterval
>
> Value: An integer larger than 0 (in seconds); default value 5

- Number of retry sessions during module error detection

The number of retries executed when an error occurs in module accessing is specified. The driver tries accessing for the specified number. If errors still continue, the status of the module is set to "error" and this module will be excluded in subsequent accessing.

By increasing this value, the resistance to temporary module errors increases. However, the input/output speed will lower.

> Key: RetryCount
>
> Value: An integer larger than 0 (in cycles); default value 5

2.3.4   G3 I/O Driver

A G3 I/O access driver that functions as an I/O driver of Windows NT. The driver processes data input/output from applications via API and initialize requests.

Operations of this driver are transparent to the application program.

2.4 Precautions on Use of This Software

2

This software implements the features provided by S3 and S2 designed exclusively for I/O module control. The integrated controller basically differs from the so-called PLC in hardware and software and an application system must be designed heeding to the following when constructing an application system.

2.4.1   Specification Limitations and Cautions

- In case more than one controller are installed in the same basic unit, only one controller installed in Slot 0 can control the I/O modules.

- The interrupt response time may vary depending on the system environment (hardware and software configurations and other elements).

- Intervals of interrupts from modules that may generate interrupts such as CDDIs and intervals of timer interrupts by software must be designed taking the load of the entire system into consideration. If intervals are too short, the response performance of the entire system may be lowered.

- A feature equivalent to the fixed-time scan feature in S3 can be implemented using Win32API. The interval accuracy depends on the features and performance provided by Windows NT.

- Depending on how the priority is set by application, operation of this software may delay by operations of other Windows applications.

- If I/O module accessing causes a time-out, scan execution period by the service will delay.

2.4.2   Programming Precautions

- Application programs are created as Win32 applications.

  The application programs call functions supplied by this support software and access the I/O modules.

- Fixed-cycle interrupts can be implemented by using a feature provided by Win32API.

- In both floating scanning and fixed-time scanning, the control structure such as repeating has to be described by an application itself.

- The startup timing of application programs that use the features of this software is the same as in starting ordinary Win32 applications.

- Execution of a program without releasing the CPU will deteriorate the response of the entire system.

- Functions can be started up by interrupts such as CDDIs. These functions are executed as threads and a library (libcmt.lib) compatible to multithreads must be linked during coding.

  For the complete information, see the API reference "IobusRegCallbackFunc."

- Function ending and data sending to an actual device of batch output functions in this support software are not synchronized. Data is stored by output operation of the service.

  For the complete information, see "2.7 Batch Input/Output"

2.4.3   Comparison with S2/S3

- The feature "In case one scan processing time exceeds a preset time in fixed-time scanning, scanning will change to floating scan, but will reset to fixed-time scanning when the processing time returns" in S2/S3 is not provided. If this processing is needed, it must be processed by an application program.

- Modes corresponding to HALT, HOLD and DEBUG in mode control processing provided by S2/S3 are not available.

- Normally operated in a mode corresponding to RUN or RUN-F. The mode will change to the ERROR mode if a critical error occurs, stopping the access feature.

  Whether normal operations correspond to RUN or RUN-F depends on coding of the application program.

- User data is initialized by data setting by an application program.

- A feature to latch user data in a power failure is not provided.

2.4.4   Purchasing and Development Environment

- This software is authorized to be installed in one each application development machine and target machine only. The user is requested to kindly purchase this software for each of target machines in case more than one target machine are used.

- A C/C++ development environment for Windows NT, such as Visual C++ of Microsoft, needs be purchased in developing application programs.

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2.5 Support Input/Output Module

The input and output modules supported by this software are listed below. For the complete information of each module, see related information of the I/O modules.

model 2000 Support Module

Table 2-1 Output Module

Classification	Model	Specification	Points
Transistor Output	DO633	DC5-24V	16 points
	DO634	DC5-24V	32 points
	DO635	DC5-24V	64 points
	DO633P	DC 12-24V source output	16 points
Triac Output	AC663	AC100-240V	12 points
Contact Output	RO663	AC240V/DC24V	16 points
	RO662S	AC 240V/DC 24V independent common	8 points
Analog Output	DA622L	8bit 4 to 20mA/1 to 5V/0 to 10V	2ch
	DA622	12bit 4 to 20mA/1 to 5V 15 12bit ±10V	2ch
	DA672	12bit ±10V	2ch

Table 2-2 Input Module

Classification	Model	Specification	points
DC/AC Input	DI633	DC/AC 12-24V	16 points
DC Input	DI634	DC24V	32 points
	DI635	DC24V	64 points
	DI335H	DC 24V high-speed response type	64 points
AC Input	IN653	AC100-120V	16 points
	IN663	AC200-240V	16 points
Analog Input	AD624L	8bit 1 to 5V	4ch
	AD624	12bit 1 to 5V	4ch
	AD634L	8bit 0 to 10V	4ch
	AD338	12bit ±10V	4ch

model 3000 Support Module

Table 2-3 Input Module

Classification	Model	Specification	points
DC Input	DI334	DC12/24V	32 points
	DI334H	DC 12/24V high-speed response type	32 points
	DI344	DC48V	32 points
	DI335	DC24V	64 points
	DI335H	DC 24V high-speed response type	64 points
AC Input	IN354	AC100V	32 points
	IN364	AC200V	32 points
Analog Input	AD368	Voltage/current input	8ch
	AD318	0 to 5V high-speed type	8ch
	AD328	0 to 20mA high-speed type	8ch
	AD338	±10V high-speed type	8ch
Status Change Detection	CD332	DC12/24V	8 points
Pulse Input	PI312	50kbps DC5/12V	2ch

Table 2-4 Output Module

Classification	Model	Specification	points
Transistor Output	DO333	DC24V	16 points
	DO334	DC24V	32 points
	DO335	DC24V	64 points
	DO344	DC48V	32 points
Triac Output	AC363	AC100/200V	16 points
	AC364	AC100/200V	32 points
Contact Output	RO364	AC250V/DC30V	32 points
	RO363S	AC 250V/DC 30V independent common	16 points
Analog Output	DA364	Voltage output	4ch
	DA374	Current output	4ch

2

2.6 API

2.6.1 Basic Processing Flow

2

As a rule, the I/O bus support API is used in the following flow:

(1) Gets a file handle by CreateFile (WIN32 API).

(2) Gets results of automatic mapping by IobusGetMappedinfo. (Option)

(3) Registers callback function for interrupts by IobusRegCallbackFunc. (Option)

(4) Specifies module diagnosis during I/O execution by IobusSetDiag. (Option)

(5) Issues Iobus{RecvData|SendData|RecvDataDirect|SendDataDirect} and executes batch data input and output and direct input and output.

Executes registration functions when an interrupt generates or at a fixed cycle.

(6) Repeats Step 5) for a necessary number of operations.

(7) Releases the file handle gotten in Step 1) by CloseHandle (WIN32 API) and ends the flow.

Functions are provided by g3iolib.dll and g3iolib.lib and these functions are prefixed "Iobus." When using each function, include Header File g3iolib.h.

The files will be stored in the following positions:

C:¥Program Files¥TOSHIBA¥G3IO¥bin¥g3iolib.dll

C:¥Program Files¥TOSHIBA¥G3IO¥include¥g3iolib.h

C:¥Program Files¥TOSHIBA¥G3IO¥lib¥g3iolib.lib

2

Directories and libraries are set as follows in Visual C++5.0 (and subsequent versions) of Microsoft:

• Directory Setting

Set a directory to search header files and library files.

(1) Select "Option (O) ..." in the "Tool (T)" Menu.

(2) Select "Directory" Tab.

(3) Select "Include File" in "Directory to Show (S)."

(4) Add "C:¥Program Files¥TOSHIBA¥G3IO¥include" to the new path.

(5) Click "OK" to complete setting.
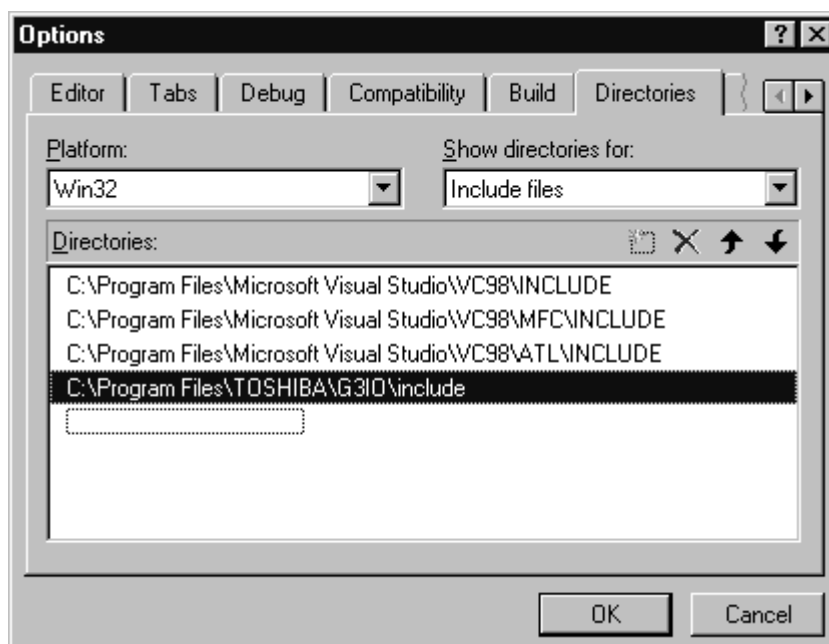
• Library Setting

(1) Select "Set (S) ..." in the "Project (P)" Menu.

(2) Select "Link" Tab and add g3iolib.lib to "Object/Library Module (L)."
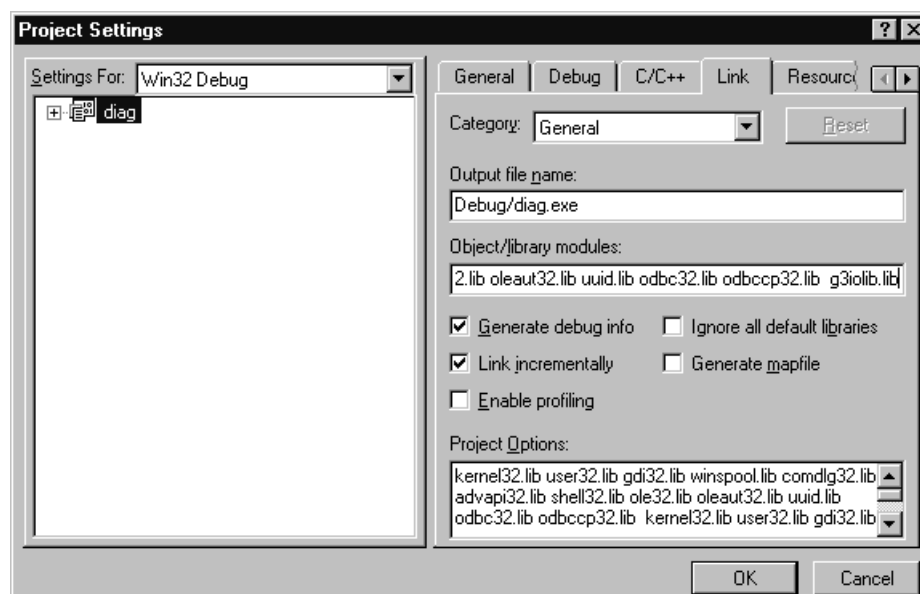
2.6.2   List of APIs

The APIs provided by this support software are listed below:

CreateFile(Win32)

- Get file handle

CloseHandle(Win32)

- Release file handle

IobusGetMappedinfo

- Get result of automatic mapping

IobusSetDiag

- Specify execution of module diagnosis (Equivalent to I/O error map create feature)

IobusResetDiag

- Reset module diagnosis execute

IobusRegCallbackFunc

- Specify callback function when interrupt is generated

IobusRecvData

- Batch input of data

IobusSendData

- Batch output of data

IobusRecvDataDirect

- Direct data input

IobusSendDataDirect

- Direct data output

IobusGetDiagInfo

- Get result of module diagnosis

IobusDoBusReset

- Issue bus reset command

IobusModuleSuspend

- Set access disable of I/O modules

IobusModulResume

- Reset access disable of I/O modules

2.7 Batch Input/Output

This section describes operating principles of batch input and output in this support software and useful information for creating application programs.
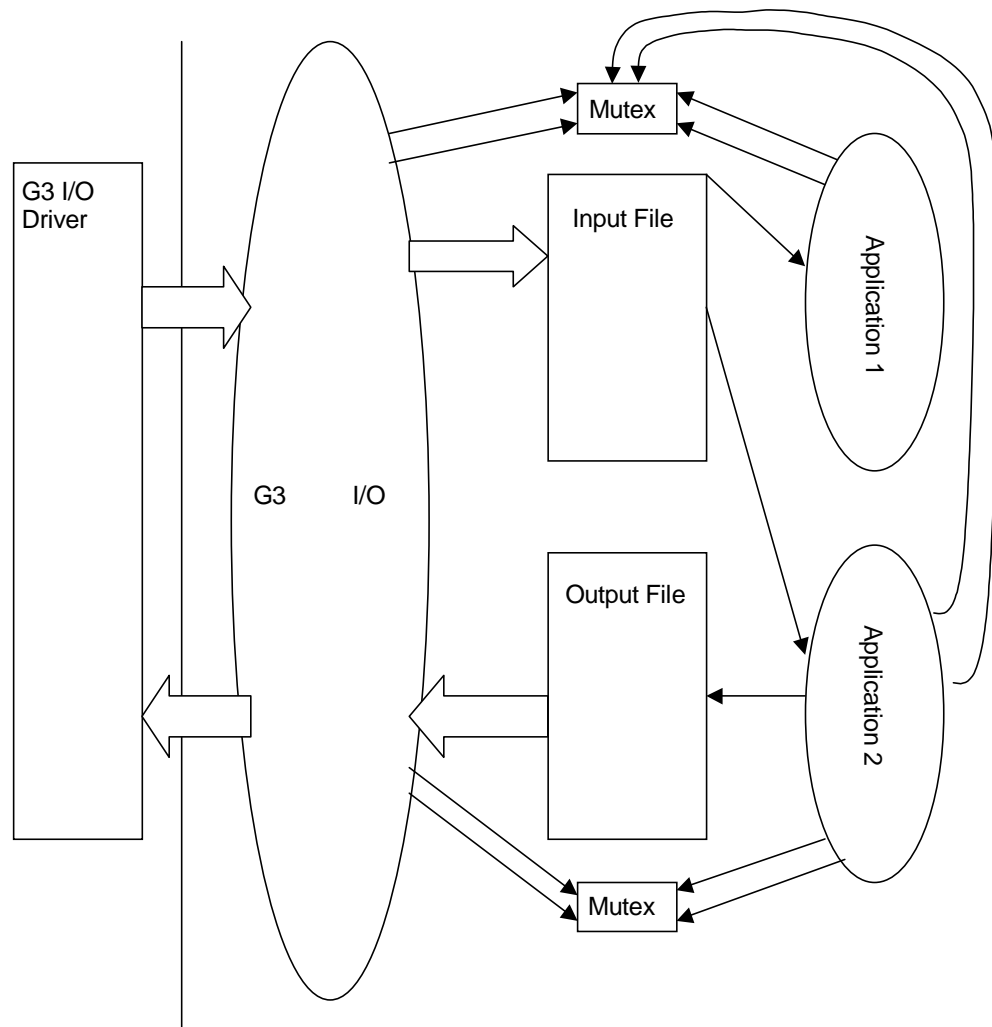
Figure 2-3 Configuration of Batch Input/Output Software

2.7.1 Operating Principles

Batch input and output is accomplished by interaction among the I/O driver (g3iodrv.sys), I/O service (g3iosrv.exe), function IobusSendData () and IobusRecvData.

Input and output data is the data that is produced when the input and output registers of the I/O modules are in a continual state.

• Operation on Input Side

(1) The I/O service accesses each input module through the I/O driver and collects input data.

(2) Data collected from each input register is stored in an input file as byte streams.

(3) The applications issue Function IobusRecvData.

(4) Exclusive processing (mutex secure) is performed inside the function to access an input file.

2

(5) Securing mutex, data will be transferred from an input file to the user buffer.

(6) Simultaneous with transfer, input module information is obtained.

(7) The applications return from the function.

• Operation on Output Side

(1) The applications issue Function IobusRecvData.

(2) Exclusive processing (mutex secure) is performed inside the function to access an output file.

(3) Securing mutex, data will be transferred from the user buffer to an output file.

(4) The applications return from the function.

(5) The service reads data from the output file.

(6) Read data is written in the output module through the driver.

The service on the input side periodically stores input module data in the input file regardless of application operations. The service on the output side queues for updating of file data from the application and transfers data to the output module when updating is confirmed.

Completing one cycle each of operation for input and output, the service pauses for ScanCycle*100ms and proceeds to the next operation cycle.

In case "1" is specified in Registry Value Scan Policy, the service can neither secure mutex nor perform file exclusive control in file accessing. As the number of application processes increases, the time to secure mutex also increases. As a result, the operation cycle sometimes lengthens. This setting avoids phenomena of operation cycles becoming unstable. Nevertheless, elimination of exclusive control may result in data, which is being accessed, exchanged with a function and data consistency cannot be guaranteed.

The service starts and processes different threads on the READ and WRITE sides.

2.7.2   Application Creation

Applications that use batch input and output proceed as follows:

(1) Gets the number of input and output modules and totals of word numbers on the input and output sides using IobusMappedinfo() and verifies that the numbers agree with the system configuration.

(2) The input and output sides secure buffers that satisfy the total size of the number of words on both the input and output sides. The buffers may be secured dynamically or statically.

(3) Data is input and output using IobusSendData() and Iobus RecvData().

(4) The IO information structure () is externally looked up inside functions and a check is made whether or not errors have occurred with the modules.

(5) Return to (3).

2.7.3   Service Registry

Parameters that specify service scanning operations can be controlled by the registry.

HKEY_LOCAL_MACHINE¥System¥CurrentControlSet¥Services¥g3iosrv

2

- Scan Operation Policy

Specify whether data consistency warranty should be given the priority or the scan cycle time is given the priority before performing scanning.

> Key: Scan Policy

> Value: 0 (priority given to data consistency [default]) or 1 (priority given to cycle time)

- Scan Operation Cycle

Specify a time to hibernate after finishing one scan. A short hibernation time achieves carefully-thought-out I/O, but increases the CPU load, thereby potentially affecting other processes and threads adversely.

> Key: ScanCycle

> Value: An integer larger than 1 (in millisecond), default value 5 (500msec)

2.7.4   mutex (Exclusive Control)

In case many processes or threads are requesting access, the service or the function may not be able to secure mutex. The time-out times for them are fixed at G3WRITEWAIT and G3READWAIT.

If the service cannot secure Mutex, files are not read or written during this cycle and next scan operation is processed. If the IobuxSendData/IobusRecvData function cannot secure Mutex, the function will make an error return, allowing fetching of ERROR_TIMEOUT by GetLastError().

In case the foregoing event occurs, the function can retry. However, the access frequency should be adjusted to prevent such time-outs.

2.8 RAS Feature

2.8.1   Self-Diagnosis

As part of the RAS features of this software, a driver and hardware self-diagnostic feature is implemented.

Table 2-5 Self-Diagnosis Items (When driver is loaded)

Diagnosis Item	Diagnosis	Operation When Trouble is Detected
Access Authority Check	Check is made whether or not own controller can access the I/O modules.	Records "No access authority" in event log. All subsequent data input/output requests from applications will become errors.
I/O Collation Check	If individual mapping is specified, mapping information and implementation status are collated.	Records "Information mismatch" in event log. All subsequent data input/output requests from applications will become errors.

Table 2-6 Self-Diagnosis Items (When application is executed)

Diagnosis Item	Diagnosis	Operation When Trouble is Detected
MIF Time-Out	Check is made if response comes back within specified time during module access.	Records "MIF time-out" in event log.
Module Error Diagnosis (Option: Can be set/reset by API)	Module error status is periodically checked.	Records "error" in module management table. This information can be fetched by API.

2.8.2   Event Log

This software records the following trouble information and alarm messages in the event log of Windows NT. The event log can be checked using the event viewer.

• The service "Source" will be stored in g3iosrv and in "Application" of the event log.

Table 2-7 Event Log Messages of G3 I/O Service

Category	Message	Meaning
Information	detect unreaded message (chan %d, unit %d, mod %d)	Detected that previous interrupt information is not fetched in a function when an interrupt was generated from channel %d, unit %d or module %d. → Means that "interrupt omission" has occurred.
	No %s module founded (%s: Input or Output)	An input module or output module does not exist.
Warning	Can't set service version to driver	Service driver cannot be registered in the driver. → It does not affect operation.
	No Mailslot created (chan %d, unit %d, mod %d)	An interrupt was generated from channel %d, unit %d or module %d, but Mailslot to notify to function is not created.
	Invalid(%s) value(%d). Use default	Illegal value (%d) was specified by Registry Key %s. Use an implicit value.

Table 2-7 Event Log Messages of G3 I/O Service

Category	Message	Meaning
Error (Behind each message, a character string for error cause will be stored. For complete information, see GetLastError().)	StartServiceCtrlDispatcher failed	Failed in service start.
	SetServiceStatus failed	Failed to set service status in Service Control Manager.
	CreateFile(%s) faild(%s: Device name, file name, etc.)	Failed to open %s.
	IobusGetMappedinfo failed	Failed to get I/O module mapping information.
	CreateThread(%s) failed(%s: Thread name)	Failed to create a thread.
	CreateMailslot failed (chan %d, unit %d, mod %d)	Failed to create Mailslot of chan %d, unit %d and mod %d.
	DeviceIoControl(%s) failed(%s: IOCTL code)	Failed in DeviceIoControl.
	WriteFile(%s) failed(%s: Mailslot or file)	Failed in WriteFile.
	RegOpenKeyEx failed	Failed to open the registry.
	RegQueryValueEx(%s) failed(%s: Registry name)	Failed to get Registry key %s.
	malloc(%s) failed(%s: Execution place)	Failed in malloc (dynamic area secure)
	CreateMutex(%s) failed(%s: mutex name)	Failed to create Mutex.
	CreateFileMapping(%s) failed(%s: File name)	Failed in File %s mapping.
	WaitForMultipleObjectEx(%s) failed(%s: Execution place)	Failed in WaitForMultipleObjectEx.
	SetFilePointer(%s) failed(%s: File name)	Failed to set the file pointer of File %s at top.
	ReadFile(%s) failed(%s: File name)	Failed to read File %s.
	CreateEvent(%s) failed(%s: Event name)	Failed to generate Event %s.
	GetFileTime(%s) failed(%s: File name)	Failed to get File %s update time.

- The device driver "Source" will be stored in g3iodrv and in "System" of the event log.

2

Table 2-8 Event Log Messages of G3 I/O Device Driver

Category	Message	Meaning
Information	Module has been suspended	The module has been suspended. (IobusModSuspend executed)
	Module has been resumed	Operation of the module has been resumed. (IobusModResume executed)
Warning	RESET command executed	G3 I/O bus resetting has been requested. (IobusDoRest executed)
Error	Can't setup I/O space.	Failed to initialize I/O space.
	Can't read registry	Failed to get the Registry.
	Can't setup memory space	Failed to initialize memory space.
	Can't setup symbolic link.	Failed to create symbolic link.
	can't assign resources	Failed to secure resources.
	Can't control modules(Invalid slot)	Slot mounting position is illegal and modules cannot be controlled.
	Can't connect interrupt.	Failed to register interrupt.
	Module check failed	Module collation produced mismatch.
	Detect illegal interrupt	Illegal interrupt has occurred.

2.9 API References

2.9.1   CreateFile

```
HANDLE
CreateFile(
        LPCSTR          lpszName,
        DWORD           fdwAccess,
        DWORD           fdwShareMode,
        LPSECURITY_ATTRIBUTElpsa,
        DWORD           fdwCreate,
        DWORD           fdwAttrsAndFlags,
        HANDLE          hTemplateFile);
```
Driver file handle get

Parameters

lpszName	Driver name address
	Specify ¥¥.¥g3io.
fdwAccess	Access mode
	Specify OR of GENERIC_READ and GENERIC_WRITE.
fdwShareMode	Shared mode
	Specify OR of FILE_SHARE_READ and FILE_SHARE_WRITE.
lpsa	Address of security descriptor
	Not used. Specify NULL.
fdwCreate	File creating method
	Specify OPEN_EXISTING.
fdwAttrsAndFlags	File descriptor
	Not used. Specify 0 (zero).
hTemplateFile	File handle with attribute to be copied
	Not used. Specify NULL.

2.9.2   CloseHandle

```
BOOL
CloseHandle(
        HANDLE          hDevice;
        );
```
Handle reset

Parameters

hDevice	Driver handle gotten by CreateFile.

2.9.3   **IobusGetMappedinfo**

BOOL

IobusGetMappledinfo (

      HANDLE   hDevice,

      struct IOMAP   *iomap

      );

Gets results of I/O automatic mapping by the driver.

Parameters

hDevice   Driver handle gotten by CreateFile.

iomap   Pointer to IOMAP structure arrangement.

                    The arrangement should be 3D arrangement of NCHANNEL X NUNIT X NMODULE.

2.9.4   **IobusSetDiag**

BOOL

IobusSetDiag (

      HANDLE   hDevice

      );

Specifies I/O module diagnosis execute. Execution of this function is equivalent to I/O error map create function of T3/T3H.

I/O module diagnosis checks the module error status when accessing a module. Execution of this feature, therefore, increases overhead. Detected module errors can be gotten by Function IobusGetDiagInfo.

Parameters

hDevice   Driver handle gotten by CreateFile.

2.9.5   **IobusResetDiag**

BOOL

IobusResetDiag (

      HANDLE   hDevice

      );

Resets I/O module diagnosis execute specified by IobusSetDiag or the registry. This function can be called any time.

Parameters

Parameters

hDevice   Driver handle gotten by CreateFile.

2.9.6   IobusRegCallbackFunc

BOOL

IobusRegCallbackFunc(

VOID	(__cdecl Func)(void *)	
CHAR	cCh,	
CHAR	cUnit,	
CHAR	cMod,	
);		

Specifies a function to be called when an interrupt generates in a specified module.

Calling this function will create a thread to queue for an interrupt to generate. An interrupt will create other new thread, which will execute the function Func.

The thread, which called this function, will reset immediately.

Data by interrupt can be selected by looking up the InterruptedData structural arrangement, which is an internal variable of DLL.

The InterruptedData structure is a structure consisting of the following members:

To look up this structural arrangement, use the Keyword _declspec keyword of the extended attribute syntax and declare by using the storage class attribute dllimport unique to Microsoft.

```
typedef struct InterruptData {
    DWORD        TimeStamp;
    WORD         Xw;
    WORD         Reserved;
} InterruptData_t;
```

The application to use this function will be the Multithread Application.

The link of the C Run Time Library (libcmt.lib) compatible to multithread will be needed. Specify Option /MT, /D, or "_X86_" when executing the CL Command.

When Visual C++ is used, specify the Multithread Run Time Library in the Dialog Box "Project Options."

When creating threads in other place by an application that uses this function, use _beginthread or _beginthreadex. Do not use CreateThread or ExitThread. For the complete information, see the section which describes _beginthread.

Parameters:

Func	Function to be started
cCh	Channel No. (0 to 4, 0: Basic unit)
cUnit	Unit No. (0 to 7, 0: Basic unit)
cMod	Module No. (0 to F)

2.9.7 IobusRecvData

BOOL

IobusRecvData (

HANDLE	hDevice,
WORD	wLength,
WORD	wOffset,
LPWORD	lpwData,
	);

Data is input in batch from the input register.

The area specified by pwData must be an area sufficient to store input data.

Parameters:

hDevice	The driver handle gotten by CreateFile.
wLength	Input data length (unit: word)
wOffset	Offset beginning from first data segment of the input register to access (unit: word)
lpwData	Pointer to input data. Data is handled as continuation of input register data

Return Values:

When normally ended, a value other than 0 is returned for this function.

When abnormally ended, return 0 and call GetLastError () to know error details.

An ERROR_TIMEOUT generates if mutex cannot be secured during accessing.

2.9.8 Remark

The module data when data is read by issuing this function can be checked by looking up Symbol ModuleStatus. ModuleStatus is in word arrangement as in arguments used in Function IobusGetDiagInfo. See IobusGetDiagInfo for the complete information of the data.

2.9.9   IobusSendData

BOOL

IobusSendData (

      HANDLE   hDevice,

      WORD   wLength,

      WORD   wOffset,

      LPWORD   lpwData,

      );

Data is output in batch to the output register.

2

Parameters:

hDevice	The driver handle gotten by CreateFile.
wLength	Output data length (unit: word)
wOffset	Offset beginning from first data segment of the output register to access (unit: word)
lpwData	Pointer to output data. Data is written as continuation of output register data

Return Values:

When normally ended, a value other than 0 is returned for this function.

When abnormally ended, return 0 and call GetLastError () to know error details.

An ERROR_TIMEOUT generates if mutex cannot be secured during accessing.

2

2.9.10 IobusRecvDataDirect

```
BOOL
IobusRecvDataDirect(
        HANDLE          hDevicew
        CHAR            cChw
        CHAR            cUnitw
        CHAR            cModw
        CHAR            cOffsetw
        WORD            wLengthw
        LPWORD          lpwData
        );
```

A wLength length is directly input to data pwData from an address specified by cCh, cUnit, cMod or cOffset.

A check is not made whether or not a module actually exists or an input device exists at the specified address. This has to be confirmed by an application.

An area sufficient to store the data length specified by wLength must be provided in lpwData.

Data is input in a unit of word.

Parameters:

hDevice	The driver handle gotten by CreateFile.
cCh	Channel specification

	0-	Basic unit
	1-	Channel 1
	2-	Channel 2
	3-	Channel 3
	4-	Channel 4

cUnit	Unit No. in each channel (Counted beginning 0)
cMod	Module No. in each unit (Counted beginning 0)
cOffset	Offset inside a module (in unit of word)
wLength	Length of data input (in unit of word)
lpwData	Pointer to input data

2.9.11 IobusSendDataDirect

```
BOOL
IobusSendDataDirect(
        HANDLE          hDevice,
        CHAR            cCh,
        CHAR            cUnit,
        CHAR            cMod,
        CHAR            cOffset,
        WORD            wLength,
        LPWORD          lpwData
        );
```

Data pwData is directly output to an address specified by cCh, cUnit, cMod or cOffset for the wLength length.

A check is not made whether or not a module actually exists at the specified address or the device can output. This has to be confirmed by an application.

Data is output in a unit of word.

Parameters:

hDevice	The driver handle gotten by CreateFile.
cCh	Channel specification

	0-	Basic unit
	1-	Channel 1
	2-	Channel 2
	3-	Channel 3
	4-	Channel 4

cUnit	Unit No. in each channel (Counted beginning 0)
cMod	Module No. in each unit (Counted beginning 0)
cOffset	Offset inside a module (in unit of word)
wLength	Length of data output (in unit of word)
lpwData	Pointer to output data

2.9.12 IobusGetDiagInfo

BOOL

IobusGetDiagInfo (

> HANDLE   hDevice,

> LPWORD   lpwResults

>);

Gets results of module diagnosis.

Parameters:

hDevice   The driver handle gotten by CreateFile.

lpwResults   Arrangement area to store diagnostic results
                 Results one word per unit are stored in the following sequence.

Basic : Unit0
CH1 : Unit1
CH1 : Unit2
• • •
CH1 : Unit7
CH2 : Unit1
• • •
CH3 : Unit1
• • •
CH4 : Unit7

In each word, Bit 1 shows information for Module 1 and information of Bit 0 to Module 0 is stored.

15					1	0
Mod15					Mod1	Mod0

Mod0 to Mod15: 0 (normal), 1 (abnormal, including not mounted yet)

2.9.13 IobusDoBusReset

BOOL

IobusDoBusReset (

      HANDLE   hDevice

      );

Sends a reset signal to the G3 I/O bus.

Parameters:

hDevice   The driver handle gotten by CreateFile.

2.9.14 IobusModuleSuspend

BOOL

IobusModuleSuspend (

      HANDLE   hDevice,

      CHAR   cCh,

      CHAR   cUnit,

      CHAR   cMod,

      );

Inhibits access of modules specified by cCh, cUnit and cMod. This feature is used when inhibiting access prior to exchange when changing an I/O module in an online state.

This feature will have no meaning if it is executed with a module already in a suspend state. This function becomes an error if a specified I/O module does not exist.

Parameters:

hDevice	The driver handle gotten by CreateFile.	
cCh	Channel specification	
	0-	Basic unit
	1-	Channel 1
	2-	Channel 2
	3-	Channel 3
	4-	Channel 4
cUnit	Unit No. in each channel (Counted beginning 0)	
cMod	Module No. in each unit (Counted beginning 0)	

2.9.15 IobusModulResume

```
BOOL
IobusModuleResume (
        HANDLE          hDevice,
        CHAR            cCh,
        CHAR            cUnit,
        CHAR            cMod,
        );
```

Resets access inhibit of modules specified by cCh, cUnit and cMod. This feature is used when resuming access by software after completing an I/O module change in an online state.

This feature will have no meaning if it is executed with a module already in a accessible state. This function becomes an error if a specified I/O module does not exist.

Parameters:

hDevice	The driver handle gotten by CreateFile.
cCh	Channel specification

	0-	Basic unit
	1-	Channel 1
	2-	Channel 2
	3-	Channel 3
	4-	Channel 4

cUnit	Unit No. in each channel (Counted beginning 0)
cMod	Module No. in each unit (Counted beginning 0)

3.1 Overview of RAS Support Software

This support software supports features that enhance the RAS (reliability, availability and serviceability) performance of the Integrated Controller Computer Module.

3.1.1 Features of RAS Hardware Processing

This support software has the following RAS features related to hardware processing by the RAS hardware.

- LED lighting control
- RAS memory read and write
- Internal trouble or error detection (Fan stop, abnormal temperature)
- NMI detection (WDT or INZ switch pressed, shutdown request, low voltage)
- System reset (Hardware reset)
- CPU thermometer
- Low battery voltage detection

The RAS hardware uses the following I/O areas and interrupts and must be set to avoid competition with other expansion boards. If the RAS hardware competes with other expansion board, operation of the software cannot be guaranteed.

I/O Areas

- 0x0140 - 0x016F   : Basic RAS I/O
- 0x0061, 0x0070 - 0x0071   : NMI control I/O (I/O on the main board)
- 0xC140 - 0xC141   : CPU thermometer I/O

Interrupts

- IRQ5 is used

Aside from hardware processing of the RAS board, this support software has the following features:

3.1.2 Function to Inform User of Interruption

This informs the user application program of the interruption signal.

The interruption signal is classified into the following two types.

- Maskable interruption: This becomes an interruption signal when it is registered with the registry. The interruption No. is 5.
- Non-maskable interruption: WDT, Power Supply off, AC voltage decrease or System memory parity error/Multi-bit error becomes the interruption signal.

3

3.1.3   Automatic Shutdown Function

When the non-maskable interruption occurs, the automatic shutdown processing is done. In the following cases, however, hardware resetting is done.

- When AC voltage decrease, system memory parity error/multi-bit error or PCI bus system error was detected.
- When the non-maskable interruption continues for about 2 seconds or longer.

3.1.4   RAS Information Processing Function

RAS information when starting, during operation, and when ending, is logged in the WindowsNT event log. It is also possible to write in and read from the non-volatile memory.

3.1.5   Get DIP Switch State

This feature reads the ON/OFF state of the 4bit DIP switch installed on the front panel of the equipment.

3.1.6   LED Lighting Control

This software controls LED 0, which is installed as a standard provision, as follows:
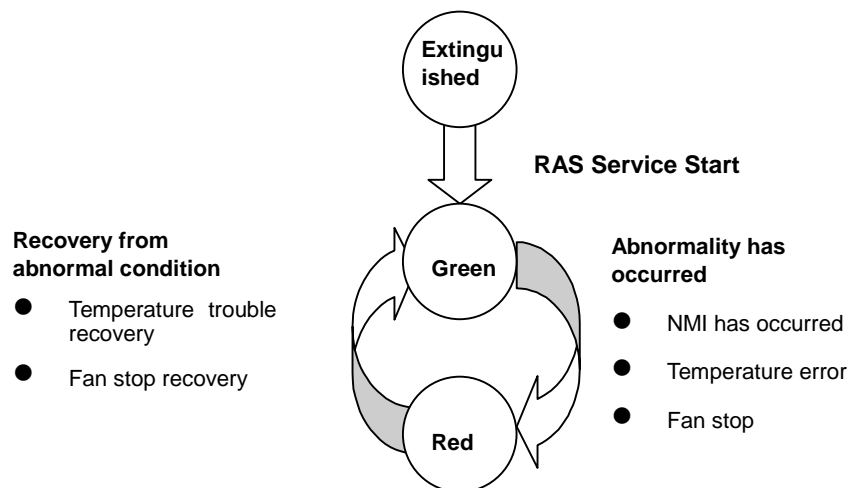
3.1.7   Functions of RAS Software Processing

In addition to the hardware processing of the RAS board, this Support Software has RAS window functions to display and set these RAS information, making it possible to monitor and control the operatin status of the system.

Also, it has interfaces for user application programs, and it is possible to create user application programs to cope with system abnormalities, etc. using the RAS function processing commands or methods. By means of these user functions, it is possible to construct systems with higher reliability.

3.1.8 Software Configuration

This Support Software is a program to operate under the WindowsNT environment, and consists of the following 5 modules.

- RAS device driver

This device driver operates under the control of the I/O manager of WindowsNT Executive, and it is a driver program to process access to the RAS board, interruption from the RAS board, and request from the user application program.

- RAS service

Service program to perform processing of messages from the RAS device driver, event log processing, and shutdown processing.

- RAS window

Window program to display the information of the RAS board and change the registry information of the RAS Support Software.

- RAS Support Software DLL

Dynamic Link Library (DLL) to make interface between RAS device driver and user application program (VC, etc.).
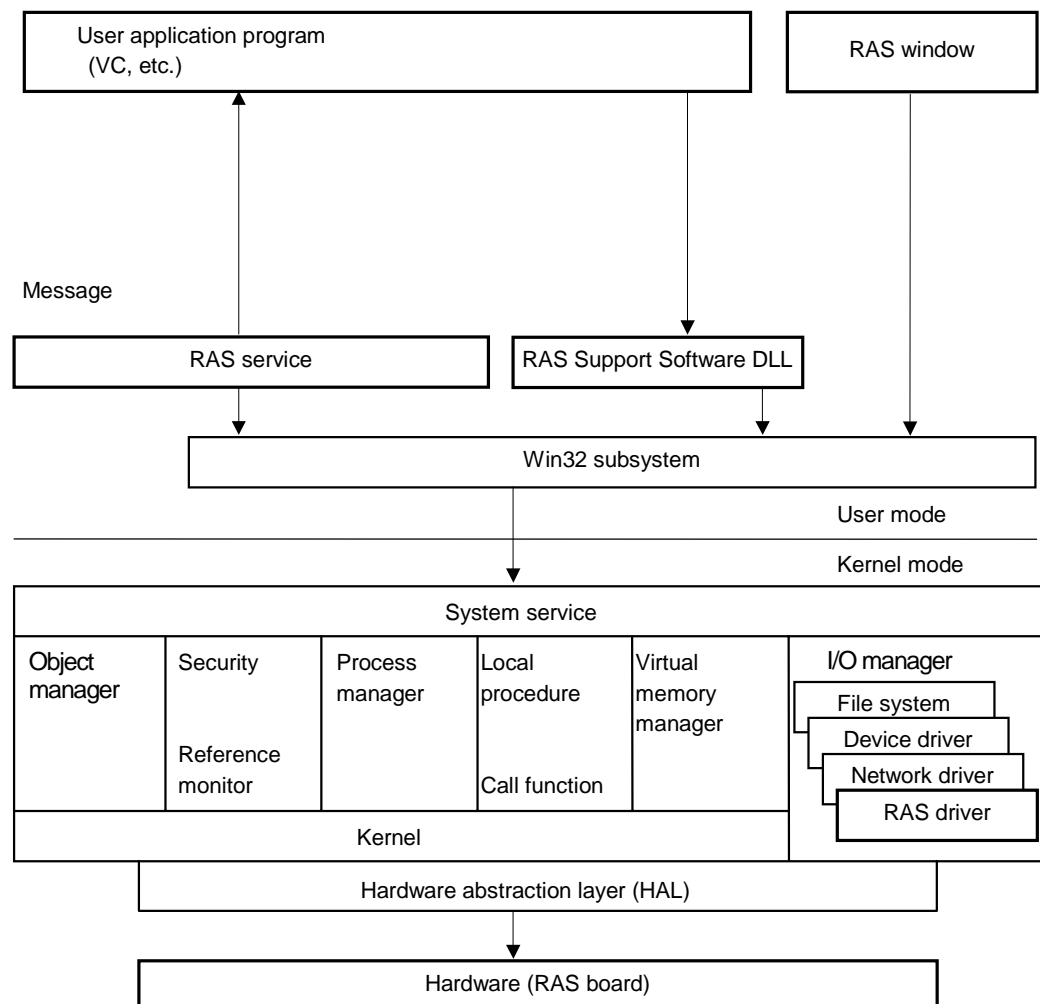
Figure 3-1 Functions of RAS Software Processing

3.2 RAS Support Commands

The following shows the list of RAS support commands which can be used by the user application programs (VC++, etc.). The following pages describes the syntax, argument, returned value, and explanation for each command.

Command name	Outline
CreateFile (Win32)	Open command
CloseHandle (Win32)	Close command
XRasGetVersion	RAS support software version reading command
XRasGetDriveError	RAS driver error information reading command
XRasUserWindow	RAS message receive window setting command
XRasUserMailslot	RAS message receive mail slot setting command
XRasDI	Digital signal input command
XRasDO	Digital signal output command
XRasDiInt	DI interruption setting command
XRasPowerLed	Power LED indication command
XRasAlarmMemory	User RAS memory reading command
XRasWriteMemory	User RAS memory writing command
XRasReadSysMemory	System RAS memory reading command
XRasWDT	WDT setting command
XRasResetWDT	User WDT reset command
XRasUserShutdown	User shutdown command
XRasThermometer	CPU temperature information reading command
XRasThermometerEx	CPU peripheral temperature information reading command
XRasBattery	Battery information reading command
XRasGetSwitchStat	Switch status Read
XRasGetHardwareRevision	Har-dware Revision Read
XRasSetLed	Main Unit LED Control
XRasSetLedEx	Main Unit LED Control

The data types explained in the following sections are those defined by WindowsNT, and for the application program, it is necessary to include windows.h and winioctl.h.

Since the data types, constants, etc. defined by the RAS Support Software are described in xrasdll.h, the user application program must include this header file as well. For linking the user application, it is necessary to link XRasDLL.lib (RAS DLL library). These xrasdll.h and XRasDLL.lib exist under the directory specified when installing.

3.2.1　Open Command

```
┌─────────────┐
│   Syntax    │
└─────────────┘
HANDLE                    hDevice;
LPCTSTR                       lpszName;
DWORD                         fdwAccess;
DWORD                         fdwShareMode;
LPSECURITY_ATTRIBUTES     lpsa;
DWORD                         fdwCreate;
DWORD                         fdwAttrsAndFlags;
HANDLE               hTemplateFile;


lpszName  =  "¥¥¥¥.¥¥XRAS";
fdwAccess  =  GENERIC_READ  |  GENERIC_WRITE;
fdwShareMode  =  FILE_SHARE_READ  |  FILE_SHARE_WRITE;
lpsa  =  NULL;
fdwCreate  =  OPEN_EXISTING;
fdwAttrsAndFlags  =  0;
hTemplateFile  =  NULL;
hDevice  =  CreateFile(      lpszName,
                            fdwAccess,
                            fdwShareMode,
                            lpsa,
                            fdwCreate,
                            fdwAttrsAndFlags,
                            hTemplateFile   );
```

```
┌─────────────┐
│   Argument  │
└─────────────┘
```

lpszName	Driver name address
	Set the name of RAS driver (\\.\XRAS).
fdwAccess	Access mode
	Set the combination of GENERIC_READ and GENERIC_WRITE.
fdwShareMode	Shared mode
	Set the combination of FILE_SHARE_READ and FILE_SHARE_WRITE.
lpsa	Address of security descriptor
	Set NULL as it is not used.
fdwCreate	Creating method
	Set OPEN EXISTING.
fdwAttrsAndFlags	File descriptor
	Set 0 as it is not used.
hTemplateFile	Handle of file with attribute for copying
	Set NULL as it is not used.

Returned value

If the device could be normally opened, the open handle of the RAS driver is returned.
When error occurred, INVALID_HANDLE_VALUE is returned.

3

Explanation

Command to open the RAS driver.

3.2.2   Close Command

> | Syntax |

BOOL   sts;

HANDLE hDevice;

sts = CloseHandle(hDevice   );

3

> | Argument |

hDevice   RAS driver open handle

> | Returned value |

If the device could be normally closed, TRUE is returned. When error occurred, FALSE is returned.

> | Explanation |

Command to close the RAS driver.

3.2.3   RAS Support Software Version Reading Command

3

Syntax

BOOL   sts;

HANDLE hDevice;

LPDWORD   lpVersion;

sts = XRasGetVersion(hDevice, lpVersion);

Argument

hDevice   RAS driver open handle

lpVersion   Address to the buffer in which the version is stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the version of the RAS Support Software.

The following shows the format to be stored in the buffer.

```
 31              16 15            8 7            0
 ┌───────────────┬──────────────┬──────────────┐
 │               │              │              │
 └───────────────┴──────────────┴──────────────┘
        │                │              │
        │                │              └── Revision No.
        │                └───────────────── Version No.
        └─────────────────────────────────── (Reserved)
```

In case of V0l.02, 0x01 is entered for the version and 0x02 for the revision.

3.2.4　RAS Driver Error Information Reading Command

Syntax

BOOL　　　　　　　　sts;

HANDLE hDevice;

Pxrasp_GetDriverError　lpError;

sts　=　XRasGetDriverError(　hDevice,　lpError　);

Argument

hDevice　　　　　　RAS driver open handle

lpError　　　　　　Address to the buffer in which the RAS driver error

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the error information of the RAS driver.

The "pointer to buffer in which the RAS driver error information is stored" in the argument is the pointer to the structure shown below. On the following pages, the members are explained.

```
struct    {
          ULONG InzErrReg;    // Registering error information
          ULONG InzErrAdr;    // Converting error information
          ULONG InzErrRes;    // Resource error information
          ULONG InzErrInt;    // Interruption error information
          ULONG InzErrNmi;    // NMI error information
          BOOLEAN RasAlive;   // RAS board error information
          ULONG RasService;   // RAS service error information
}  xrasp_GetDriverError;
typedef  xrasp_GetDriverError  *Pxrasp_GetDriverError;
```

3

3

• InzErrReg (registering error information)

This indicates that the information registered in the registry was an abnormal value.

If the registering was abnormal, bit to correspond to that information is set.

In such a case, the default value is used for the registered value for starting up.

The following shows the definition of bits to correspond to information.

IEREG_INTERRUPT	Interruption No. abnormality error
IEREG_SERVICE	Service shutdown diagnosis time abnormality bit
IEREG_USER	User shutdown diagnosis time abnormality bit
IEREG_SHUTDOWN	Shutdown execution diagnosis time abnormality bit
IEREG_SWDT	System WDT abnormality bit
IEREG_HEALTHY	Healthy signal abnormality bit

• InzErrAdr (converting error information)

This indicates that the I/O address used by the RAS Support Software could not be converted to the address controlled by WindowsNT.

If this error occurs, the RAS Support Software cannot normally operate and no interruption processing is done (if Power key is turned, power is turned off).

What can be used is only the open, close, version reading, and driver error information reading commands. The following shows the definition of bits to correspond to the information.

IEADR_RAS	0x0140 to 0x016F converting disability bit
IEADR_SYSCON	0x0061 converting disability bit
IEADR_NMI	0x0070 to 0x0071 converting disability bit
IEADR_OPL	0x0178 to 0x017B or 0x0388 to 0x038B converting disability bit
IEADR_THM	0xC140 to 0x141 converting disability bit

• InzErrRes (resource error information)

This indicates that the hardware resource to be used by the RAS Support Software could not be obtained.

This error, like the converting error, restricts the operation of the RAS Support Software. The following shows the definition of bits to correspond to the information.

IERES_RES	Hardware resource acquisition abnormality bit
IERES_SHUTDOWN	Shutdown routine registering abnormality bit

• InzErrInt (interruption error information)

This indicates that the interruption handler of the RAS Support Software could not be registered. This error, like the converting error, restricts the operation of the RAS Support Software. The following shows the definition of bit to correspond to the information.

IEINT_CONNECT	Interruption registering abnormality bit

• InzErrNmi (NMI error information)

This indicates that the NMI handler of the RAS Support Software could not be registered. This error, like the converting error, restrics the operation of the RAS Support Software. The following shows the definition of bit to correspond to the information.

IENMI_DESCRIPTOR	NMI registering abnormality bit

- RasAlive (RAS board error information)

This indicates if the RAS board is inserted. If the RAS board is inserted, TRUE is set, or if it is not inserted, FALSE is set.

This information becomes valid when InzErrAdr, InzErrRes, InzErrInt, and InzErrNmi are normal. If the RAS board is not inserted, the operation of the RAS Support Software is restricted, like the converting error.

3

- RasService (RAS service error information)

This indicates if the RAS service is started. If the RAS service is started, a value other than 0 is set, or if it is started, 0 is set.

This information becomes valid when InzErrAdr, InzErrRes, InzErrInt, and InzErrNmi are normal and the RAS board is inserted. If the RAS service is not started, the operation of the RAS Support Software is restricted, like the converting error.

Xrasp_GetDriveError structure, Pxrasp_GetDriverError pointer type, and described constant (IExxx_xxx) are defined in xrasdll.h.

3.2.5 RAS Message Receive Window Setting Command

3

Syntax

BOOL   sts;

HANDLE hDevice;

HWND   hWnd;

sts = XRasUserWindow(hDevice, hWnd);

Argument

hDevice   RAS driver open handle

hWnd   User window handle
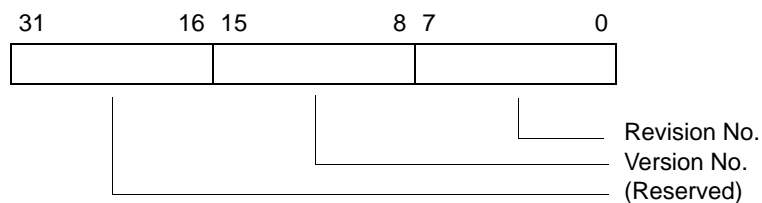
Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command for setting the user window to receive messages from the RAS Support Software.

The following shows messages to be transmitted by the RAS Support Software.

Since WM_USER+ (RAS message ID : registered in registry) is used for the message to be transmitted, operation to a window using this message ID cannot be guaranteed. In such a case, the registering of the RAS message ID should be changed. For the window set with this command, shutdown processing must be done when the NMI message is received. For this reason, when the window is deleted, it is necessary to issue the command with NULL set to the user window handle.

- Fan stop (wParam=RASMSG_FAN_STOP)

    This is transmitted when the fan stop is detected.

- Fan recovery (wParam=RASMSG_FAN_STOP_RECOVER)

    This is transmitted when recovery is made after fan stop is detected.

- Temperature abnormality (wParam=RASMSG_OVER_THERMO)

    This is transmitted when temperature abnormality is detected.

- Temperature recovery (wParam=RASMSG_OVER_THERMO_RECOVER)

    This is transmitted when recovery is made after temperature abnormality is detected.

- DI change (wParam=RASMSG_DI0, RASMSG_DI1, RASMSG_DI2, RASMSG_DI3)

    RASMSG_DI2, RASMSG_DI3)

    This is transmitted when DI change is detected.

- Mirroring disk abnormality
  (wParam=RASMSG_ILLEGAL_MIRRORDISK0,RASMSG_ILLEGAL_MIRRORDISK1)

    This is transmitted when abnormality is detected when the mirroring disk is connected.

- NMI occurrence (wParam=RASMSG_NMI)

    This is transmitted when the first NMI is detected after the system starts up. NMI factor is set to IParam.

3
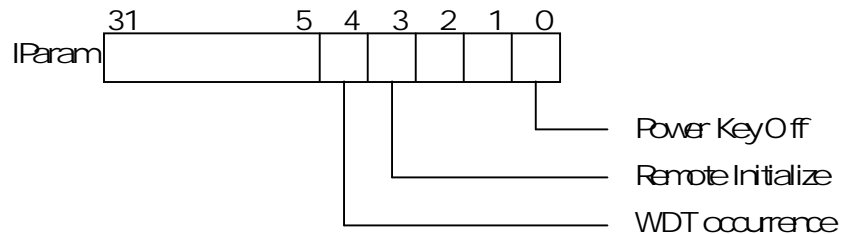
After receiving this message, the user must do internal shutdown processing and issue the user shutdown command (XRasUserShutdown) or the user power off command (XRasUserPowerdown).

After NMI occurrence, the messages of fan stop/recovery, temperature abnormality/ recovery, DI change, and mirroring disk abnormality are not transmitted.

3.2.6 RAS Message Receive Mail Slot Setting Command

3

> Syntax

BOOL   sts,   flag;

HANDLE hDevice;

PHANDLE   lpMail;

sts = XRasUserMailslot(hDevice,   flag,   lpMail);

> Argument

hDevice   RAS driver open handle

flag   Mail slot creating flag

lpMail   Address to buffer in which created mail slot handle is stored

> Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

> Explanation

Like the RAS message receive window setting command, this command is to make preparation for receiving messages from the RAS Support Software.

In the case of the RAS message receive window setting command, the user application program to receive the messages must be a window program, but if this command is used, even a user application program not having such window handle as console application can receive the messages.

By executing this command, the mail slot to receive messages from the RAS Support Software is created/deleted.

If TRUE is set to the mail slot creating flag of the argument, the mail slot is created or if FALSE is set, it is deleted.

To receive the message, firstly create the mail slot with this command and issue the receive command of Win32 API (ReadFile) to the mail slot handle of the returned value. Then when the user application receiving the message ends, issue this command and delete the mail slot.

As the priority for transmitting the RAS messages, the RAS Support Software firstly checks if there exists the mail slot created with this command.

If it exists, it transmits the messages only to the mail slot. If the mail slot does not exist, then it checks if the receiving window exists. Thus, even if the receiving window is set, the message is not transmitted to the receiving window if the receiving mail slot is set.

Like the RAS message receive window setting command, the application program set with this command requires shutdown processing when the NMI message is received. For this reason, when the application program ends, it is necessary to delete the mail slot by issuing this command.

Message data which can be read by using the receive command (ReadFile) are 8 bytes consisting of message ID and detailed data. They are stored in the buffer as shown below.

+0	Message ID (ULONG)
+4	Detailed data (ULONG)

3

- Fan stop (message ID : RASMSG_FAN_STOP)

    This is transmitted when fan stop is detected.

- Fan recovery (message ID : RASMSG FAN_STOP_RECOVER)

    This is transmitted when recovery is made after fan stop is detected.

- Temperature abnormality (message ID : RASMSG_OVER_THERMO)

    This is transmitted when temperature abnormality is detected.

- Temperature recovery (message ID : RASMSG_OVER_THERMO_RECOVER)

    This is transmitted when recovery is made after temperature abnormality is detected.

- DI change (message ID : RASMSG_DI0, RASMSG_DI1, RASMSG_DI2, RASMSG_ DI3)

    This is transmitted when DI change is detected.

- NMI occurrence (message ID : RASMSG_NMI)

    This is transmitted when the first NMI is detected after the system starts up. The NMI factor is set to the detailed data portion. The following shows the content of the detailed data portion.
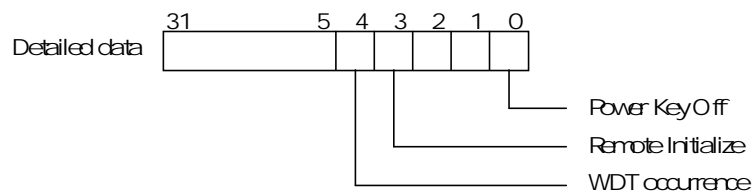
After receiving this message, the user must do the internal shutdown processing and issue the user shutdown command (XRasUserShutdown) or the user power off command (XRasUserPowerdown).

After NMI occurrence, the messages of fan stop/recovery, temperature abnormality/ recovery, DI change, and mirroring disk abnormality are not transmitted.

3.2.7 Digital Signal Input Command

Syntax

BOOL   sts;

HANDLE hDevice;

LPDWORD   lpDI;

sts = XRasDI(hDevice, lpDI);

Argument

hDevice   RAS driver open handle

lpDI   Address to the buffer in which the DI information is stored.

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the state of the digital input signal of the RAS board.

The following figure shows the contents of the DI information stored in the buffer.
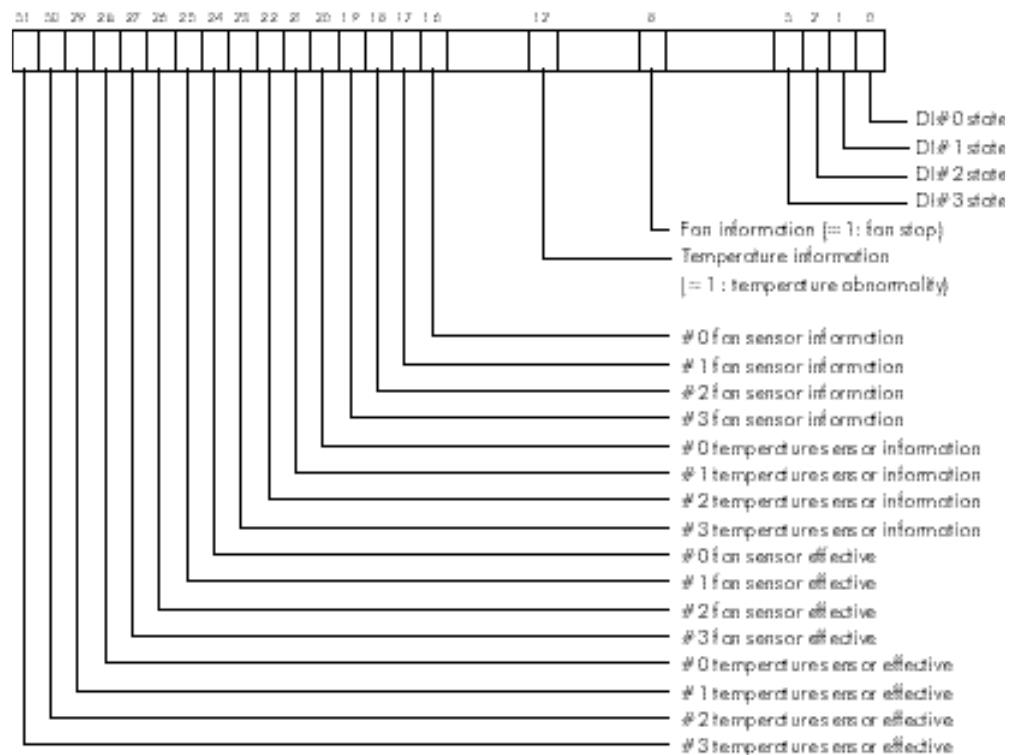
In C2/C3, DI/DO information does not have any meaning.

Detailed trouble information of each sensor can be read in Bits 31 to 16 of a read value.

• Bits 31 to 24: Data whether each sensor is effective (1) or not effective (0) is stored.

• Bits 23 to 16: Status of each sensor (0: normal/1: abnormal) is stored

.

Bit	
24	#0 fan sensor
25	-
26	-
27	-
28	#0 temperature sensor
29	-
30	-
31	-

3

3.2.8   LED Indication Command

3

| Syntax |

BOOL   sts;

HANDLE hDevice;

DWORD   dwLed;

sts = XRasPowerLed(hDevice, dwLed);

| Argument |

hDevice   RAS driver open handle

dwLed   Power LED indication information

| Returned value |

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

| Explanation |

Command to make green/red the indication color of LED on the front of equipment. The following figure shows the contents of the LED indication information of the argument.

Indication color (= 0: green, = 1: red)
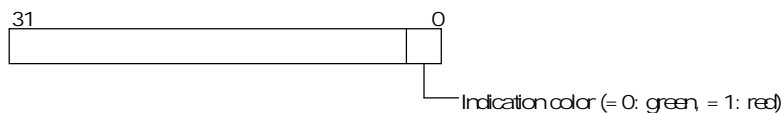
The indication may be used by the healthy signal of the RAS Support

Software, and in such a case, care must be taken. The indication when power is turned on is green.

3.2.9   User RAS Memory Reading Command

<div style="text-align:center">

Syntax

</div>

BOOL   sts;

HANDLE hDevice;

DWORD   dwAdr;

DWORD   dwSize;

LPUCHAR   lpBuffer;

sts = XRasReadMemory(hDevice, dwAdr, dwSize, lpBuffer);

Argument

hDevice   RAS driver open handle

dwAdr   User RAS memory leading address

dwSize   Number of bytes to be read

lpBuffer   Address of buffer in which data read are stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the data of the user RAS memory portion.

Since the RAS Support Software does not operate this user RAS memory, the user can use it freely.

The following table shows the range of leading address and the range of the number of bytes to be read of the argument.

The leading address + number of bytes to be read must not exceed the size of the user RAS memory.

User RAS memory size	Range of leading address	Range of number of bytes to be read
65312 bytes	0-65311	1-256

3.2.10 User RAS Memory Writing Command

<div style="margin-left: 2em;">

Syntax

BOOL   sts;

HANDLE   hDevice;

DWORD   dwAdr;

DWORD   dwSize;

LPUCHAR   lpBuffer;

sts = XRasWriteMemory(hDevice, dwAdr, dwSize, lpBuffer);

Argument

hDevice   RAS driver open handle

dwAdr   Leading address of system RAS memory

dwSize   Number of bytes to be written

lpBuffer   Address of buffer in which data written are stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the data of the user RAS memory portion.

Since this system RAS memory is used by the RAS Support Software, no writing

can be done.

The leading address of the argument is in the range of 0 to 0xff, and the number of bytes to be read must be specified within the range of 1 to 0x100.

The addresses 0xe0 to 0xff correspond to 0x00 to 0x1f of user RAS memory, and same contents can be read.

The leading address + number of bytes to be read must not exceed 0x100.

</div>

3.2.11 System RAS Memory Reading Command

Syntax

BOOL   sts;

HANDLE   hDevice;

DWORD   dwAdr;

DWORD   dwSize;

LPUCHAR   lpBuffer;

sts = XRasReadSysMemory(hDevice, dwAdr, dwSize, lpBuffer);

Argument

hDevice   RAS driver open handle

dwAdr   Leading address of system RAS memory

dwSize   Number of bytes to be written

lpBuffer   Address of buffer in which data written are stored

---

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the data of the user RAS memory portion.

Since this system RAS memory is used by the RAS Support Software, no writing

can be done.

The leading address of the argument is in the range of 0 to 0xff, and the number of bytes to be read must be specified within the range of 1 to 0x100.

The addresses 0xe0 to 0xff correspond to 0x00 to 0x1f of user RAS memory, and same contents can be read.

The leading address + number of bytes to be read must not exceed 0x100.

3

3.2.12 WDT Setting Command

<div style="border:1px solid">Syntax</div>

BOOL   sts;
HANDLE   hDevice;
DWORD   dwWDT

sts = XRasWDT(hDevice, dwWDT);

<div style="border:1px solid">Argument</div>

hDevice   RAS driver open handle
dwWDT   WDT setting information

<div style="border:1px solid">Returned value</div>

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

<div style="border:1px solid">Explanation</div>

Command to set Watchdog Timer (WDT).

The time can be set in the range of 524ms (set value1) to 2 minutes and 13 seconds (set value255) in the units of 524ms. If the set value is 0, WDT is prohibited. WDT setting cannot be done after NMI occurrence or after shutdown starting.

If the bit 15 of the WDT setting information is 0, the RAS Support Software automatically reset the WDT by the timer interruption (500ms cycle), but if the bit 15 is 1, no resetting is done by the RAS Support Software. In such a case, it is necessary for the user application program to periodically issue the user WDT reset command to reset the WDT.

```
31        15      7        0

                            WDT time

                  Resetting method(= 1:user resetting)
```

At the time of power on, user WDT registered in the registry is operating. In case a user WDT which was previously registered in the registry is time out, WDT is disabled at the time power is on.
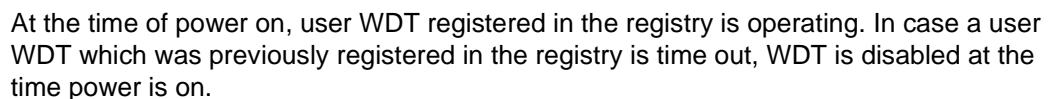
3.2.13 User WDT Reset Command

> **Syntax**

BOOL   sts;

HANDLE   hDevice;

sts = XRasResetWDT(hDevice);

3

> **Argument**

hDevice   RAS driver open handle

> **Returned value**

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

> **Explanation**

Command to reset the WDT on the RAS board.

This command becomes effective when selected after the user application program reset the WDT with the WDT setting command. It cannot be used after NMI occurrence.

3.2.14 User Shutdown Command

3

Syntax

BOOL   sts;

HANDLE   hDevice;

sts = XRasUserShutdown(hDevice   );

Argument

hDevice   RAS driver open handle

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to instruct the RAS Support Software to execute the shutdown.

If the NMI occurrence message is received with the RAS message receive window setting command (XRasUserWindow), the user application program must do its own shutdown processing and issue this command or the user power off command (XRasUserPowerdown).

When this command is issued, the RAS Support Software starts the shutdown of WindowsNT. If this command was not issued with the NMI message despite the fact that the user's window was set with the RAS message receive window setting

command, the shutdown of WindowsNT is automatically started assuming that this command was issued, after the elapse of the user shutdown diagnosis time registered with the registry.

3.2.15 CPU Temperature Information Reading Command

Syntax

BOOL   sts;

HANDLE   hDevice;

LPLONG   lpThermo

3

sts = XRasThermometer(hDevice, lpThermo);

Argument

hDevice   RAS driver open handle

lpThermo   Address to buffer in which CPU temperature information is stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the CPU temperature information of a model which supports the CPU thermometer.

The information read indicates the temperature of -55°C to 125°C in the units of 0.5^{o}C.

CPU temperature information read	CPU temperature
0x000000FA	125.0^{o}C
0x00000033	25.5^{o}C
0x00000000	0°C
0xFFFFFFFF	-0.5^{o}C
0xFFFFFFCE	-25.0^{o}C

This command is effective only for models with the mechanism of CPU thermometer (error occurs for other models).

3.2.16 CPU Peripheral Temperature Information Reading Command

3

Syntax

BOOL   sts;

HANDLE   hDevice;

LPLONG   lpThermo

sts = XRasThermo(hDevice, lpThermo);

Argument

hDevice   RAS driver open handle

lpThermo   Address to buffer in which CPU peripheral temperature information is
                 stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is
returned.

Explanation

Command to read the CPU peripheral temperature information of a model which
supports the CPU peripheral thermometer.

The information read indicates the temperature of -55°C to 125°C in the units of 0.5°C.

CPU peripheral temperature information read	CPU peripheral temperature
0x000000FA	125.0°C
0x00000033	25.5°C
0x00000000	0°C
0xFFFFFFFF	-0.5°C
0xFFFFFFCE	-25.0°C

This command is effective only for models which support the CPU peripheral
temperature mechanism (error occurs for other models).

3.2.17 Battery Information Reading Command

Syntax

BOOL   sts;

HANDLE hDevice;

LPLONG   lpBattery

sts = XRasBattery(hDevice, lpBattery);

Argument

hDevice   RAS driver open handle

lpBattery   Address to buffer in which battery information is stored

Returned value

If the command is normally completed, TRUE is returned. When error occurs, FALSE is returned.

Explanation

Command to read the battery information on the RAS board.

```
31                          7      0
┌───────────────────────┬───┬───┐
│                       │   │   │
└───────────────────────┴─┬─┴───┘
                          │
                          └── Battery information
                              (= 1: voltage normal/= 0: voltage short)
```
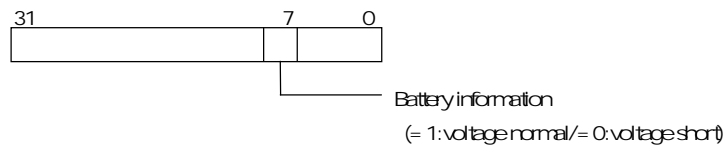
3.2.18 Switch Status Read

BOOL

XRasGetSwitchStat(

            HANDLE   hDevice,

            LPDWORD   lpdwSwitch

            );

Gets the status of the 4bit DIP switch of the main unit.

Parameters

hDevice   The driver handle gotten by CreateFile.

lpwSize   Shows status of the DIP switch (1: ON, 0: OFF)

31	•••	3	2	1	0
•••	•••	SW4	SW3	SW2	SW1

SW1: Status of Switch 1

SW2: Status of Switch 2

SW3: Status of Switch 3

SW4: Status of Switch 4

3.2.19 Hardware Revision Read

BOOL

XRasGetHardwareRevision(

	HANDLE	hDevice,
	LPDWORD	lpdwRevision
	);

Gets the hardware revision information.

3

Parameters

hDevice   The driver handle gotten by CreateFile.

lpdwRevision   Shows the hardware revision by the following format:

31	F	B	A	8	7	4	3	0

	Peripheral Board		Main Board	
•••••	Revision	Number of revisions	Revision	Number of revisions

The information is composed of the version and number of revisions for the main and peripheral boards.

Revisions are increased in number: 0 for Version A, 1 for Version B and 2 for Version C.

3.2.20 Main Unit LED Control

BOOL

XRasSetLed(

> HANDLE   hDevice.
>
> DWORD   dwState
>
>);

This software controls lighting of the 4bit LEDs of the main unit.

Parameters

hDevice   The driver handle gotten by CreateFile.

dwState   Specify the LED lighting status by the following format:

- •
- •
- •

3 1		7			4	3			0
		COL3	COL2	COL1	COL0	LED3	LED2	LED1	LED0
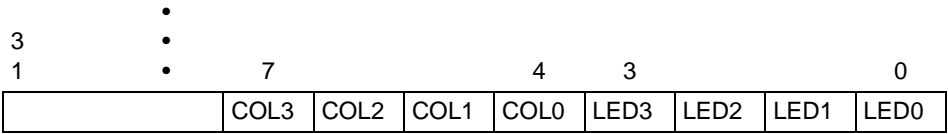
LED0 - Specify 1: LED0 lit, 0: extinguished
LED1 - Specify 1: LED1 lit, 0: extinguished
LED2 - Specify 1: LED2 lit, 0: extinguished
LED3 - Specify 1: LED3 lit, 0: extinguished
COL0 - Specify 1: LED0 color red, 0: green
COL1 - Specify 1: LED1 color red, 0: green
COL2 - Specify 1: LED2 color red, 0: green
COL3 - Specify 1: LED3 color red, 0: green

⚠ Caution

LED 0 cannot be controlled while the RAS service is in operation.

3.2.21 Main Unit LED Control (2)

BOOL

XRasSetLedEx(

HANDLE	hDevice,
DWORD	dwState,
DWORD	dwMask
);	

This software controls lighting of the 4bit LEDs of the main unit individually.

Parameters

hDevice   The driver handle gotten by CreateFile.

dwState   Specify the LED lighting status by the following format:

3 · · · 1	· · · ·	7			4	3			0
		COL3	COL2	COL1	COL0	LED3	LED2	LED1	LED0
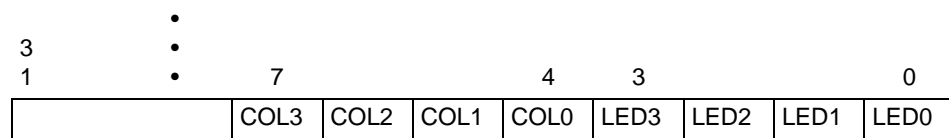
LED0 - Specify 1: LED0 lit, 0: extinguished
LED1 - Specify 1: LED1 lit, 0: extinguished
LED2 - Specify 1: LED2 lit, 0: extinguished
LED3 - Specify 1: LED3 lit, 0: extinguished
COL0 - Specify 1: LED0 color red, 0: green
COL1 - Specify 1: LED1 color red, 0: green
COL2 - Specify 1: LED2 color red, 0: green
COL3 - Specify 1: LED3 color red, 0: green

dwMask Specify whether or not LED operation is required by the following mapping.

If "Specified," lighting of the LED is controlled in accordance with specification by dwState.

If "Not specified," the state before this function is issued will be maintained regardless of dwState setting.

3 · · · 1	· · · ·	7			4	3			0
						MASK3	MASK2	MASK1	MASK0
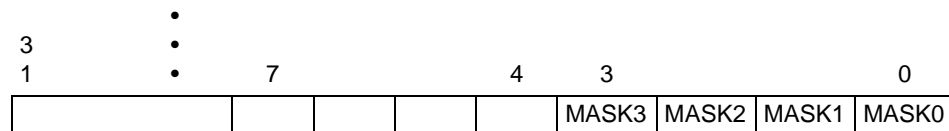
MASK0 - Specify 1: LED0 lit, 0: extinguished
MASK1 - Specify 1: LED1 lit, 0: extinguished
MASK2 - Specify 1: LED2 lit, 0: extinguished
MASK3 - Specify 1: LED3 lit, 0: extinguished

⚠ Caution

LED 0 can be controlled while the RAS service is in operation.
The difference with the xRASSetLed function is that this software can control individual LEDs.

3.3 RAS Support Software Registering

For the RAS Support Software, it is necessary to register all the following registry information (they are automatically registered by installing the RAS Support Software).

If the registered value of each entry of parameter is abnormal, it operates using the default value.

3

3.3.1 Registry information of RAS drive

Under ¥HKEY_LOCAL_MACHINE¥SYSTEM¥CurrentControlSet¥Service¥XRAS registry key

Value entry name	Type	Default value
ErrorControl	REG_DWORD	0x01
Group	REG_SZ	Extended Base
Start	REG_DWORD	0x02
Type	REG_DWORD	0x01
Version	REG_SZ	Version No. of this Support Software

Under¥HKEY_LOCAL_MACHINE¥SYSTEM¥CurrentControlSet¥Service¥XRAS¥Parameters registry key

Name	Value entry name	Type	Default value
Interruption No.	Interrupt	REG_DWO RD	0x05
Healthy signal	HealthyDo	REG_DWORD	0x04
System WDT	SystemWdt	REG_DWORD	60
User WDT	UserWdt	REG_DWORD	0
Service shutdown diagnosis time	TimerService	REG_DWORD	60
User shutdown diagnosis time	TimerUser	REG_DWORD	360
Shutdown execution diagnosis time	TimerShutdown	REG_DWORD	600
Option	Option	REG_DWORD	0x00

3.3.2 Registry information of RAS service

Under¥HKEY_LOCAL_MACHINE¥SYSTEM¥CurrentControlSet¥Service¥XRASService registry key

Value entry name	Type	Default value
DisplayName	REG_SZ	Toshiba RAS Service
ErrorControl	REG_DWORD	0x01
ImagePath	REG_EXPAND_SZ	%SystemRoot%¥system32¥XRassrv.exe
ObjectName	REG_DWORD	LocalSystem
Group	REG_SZ	Extended Base
Start	REG_DWORD	0x02
Type	REG_DWORD	0x110

Under
¥HKEY_LOCAL_MACHINE¥SYSTEM¥CurrentControlSet¥Service¥XRASService¥Parameters registry key

Name	Value entry name	Type	Default value
RAS service thread priority	ServicePriority	REG_SZ	Normal
RAS message ID	MessageID	REG_DWORD	0x1000
RAS mail slot name	MailslotName	REG_SZ	XRASMSG
RAS mail slot receiving diagnosis time	MailslotReadTimeOut	REG_DWORD	60000
Forced shutdown diagnosis time	TimerForceShutdown	REG_DWORD	240

3.3.3 Registry information of RAS window

Under
¥HKEY_LOCAL_MACHINE¥SYSTEM¥CurrentControlSet¥Control¥XRASWindowregistry key

Name	Value entry name	Type	Default value
RAS window start style	Startup	REG_SZ	Normal
RAS window object name	ObjectName	REG_SZ	XRASWINDOW
Normal window position (X)	NormalPos.x	REG_DWORD	0
Normal window position (Y)	NormalPos.y	REG_DWORD	0
Mini window display level	MiniLevel	REG_SZ	TopMost
Mini window position (X)	MiniPos.x	REG_DWORD	0
Mini window position (Y)	MiniPos.y	REG_DWORD	0
RAS include file install path	InstPathInclude	REG_SZ	(No default)
RAS library file install path	InstPathLibrary	REG_SZ	(No default)

3.3.4 System WDT(XRAS : SystemWdt)

This specifies the time of system WDT of the RAS Support Software.

After NMI occurrence, the RAS Support Software sets WDT to be reset with the RAS service software, regardless of the present WDT state. This WDT is called system WDT.

Should the system WDT be set, the hardware will be reset, and so due care must be taken. The following shows the setting range. The values are to be set in the units of 524ms.

2(1048ms) to 255(abt. 2 minutes) (Default value is 60 : abt. 30 seconds)

3.3.5 Service Shutdown Diagnosis Time (XRAS : TimerService)

This specifies the diagnosis time of service in shutdown.

After NMI is detected, the RAS driver informs the RAS service of the NMI occurrence. And the RAS service informs the RAS driver of the receiving. This period is called service shutdown diagnosis time.

If the RAS service does not respond within this diagnosis time, it is judged that the RAS service is unable to operate and the hardware will be reset, and so due care must be taken when setting. The following shows the setting range. The values are to be set in the units of 500ms.

2(1 second) to 1200(10 minutes) (Default value is 60 : 30 seconds)

3

3.3.6 User Shutdown Diagnosis Time (XRAS : TimerUser)

This specifies the diagnosis time of the user in shutdown.

After NMI occurrence, the RAS Support Software sends the NMI occurrence message to the user window set with the RAS message receiving window setting command (XRasUserWindow). The user window receiving the message must do its internal shutdown processing (data saving, etc.), issue the user shutdown command (XRasUserShutdown), and instruct the RAS Support Software to shut down the WindowsNT.

After the message is sent, the RAS Support Software monitors the time until the user shutdown command is issued. This time is called user shutdown diagnosis time. If the user shutdown command is not issued within this diagnosis time, it is judged that the user window program is unable to operate, and the RAS Support Software shutdown processing will proceed as if the user shutdown command was automatically issued. The following shows the setting range. The values are to be set in the units of 500ms.

2(1 second) to 1200(10 minutes) (Default value is 360 : 3 minutes)

3.3.7 Shutdown Execution Diagnosis Time (XRAS : TimerShutdown)

This specifies the diagnosis time in the shutdown of WindowsNT.

The RAS Support Software monitors the time from the start of WindowsNT shutdown processing to the end of actual shutdown. This is called shutdown execution diagnosis time.

If the shutdown is not completed within this diagnosis time, it is judged that the WindowsNT is unable to operate, and the hardware is reset, and so due care must be taken when setting. To make this diagnosis time invalid, set 0xFFFFFFFF. This is effective when it is desired to stop the system in the shutdown state (desired not to reboot the system). (It can be utilize when the UPS function is used) The following shows the setting range. The values are to be set in the units of 500ms.

2(1 second) to 1200(10 minutes) (Default value is 600 : 5 minutes)

3.3.8 RAS Service Thread Priority (XRASService : ServicePriority)

This specifies the execution priority of the RAS service thread.

The values which can be set are shown below.

Set value	Priority
TimeCritical	31
High	26
Normal (default value)	24
Low	13

3.3.9   RAS Message ID (XRASService : MessageID)

This specifies the RAS message value to be sent to the user application program by the RAS Support Software.

This value is added to WM_USER and informed to the window procedure of the user application program. The following shows the setting range.

0 to 0x7BFF (Default value is 0x1000 : WM_USER+0x1000)

The above range is applied when WM_USER is 0x0400, and actually the total of WM_USER and set value is to be in the range of 0x7FFF or lower.

The program designer of the window to receive the RAS message must set a window message ID not used.

3.3.10   RAS Mail Slot Name (XRASService : MailslotName)

This specifies the name of the mail slot to be created with the RAS message receiving mail slot setting command.

For the mail slot name to be specified here, a name not used by other program within the system must be described.

As the default, the name XRASMSG is set.

3.3.11   RAS Mail Slot Receiving Diagnosis Time (XRASService : MailslotReadTimeOut)

This specifies the diagnosis time of the receiving command (ReadFile) to the mail slot created with the RAS message receiving mail slot setting command.

In case of time-out of the receiving command, the error information obtaining command (GetLastError) returns ERROR_SEM_TIMEOUT.

The values are to be set in the units of ms, and as the default, 60000 (60 seconds) is set.

If 0 is set as the set value, the receiving command immediately ends if there is no message. If the set value is 0xffffffff, it waits until the message is sent.

3.3.12   Forced Shutdown Diagnosis Time (XRASService : TimerForceShutdown)

This specifies the diagnosis time in the forced shutdown of WindowsNT.

As the WindowsNT shutdown method, the RAS Support Software takes two steps. Firstly, it tries to shut down the WindowsNT while informing the application of the shutdown. If there exists any process which does not respond, the shutdown is temporarily stopped (dialogue box is displayed and key input is waited for), leading to the situation that a system of unmanned operation, etc. cannot normally complete the shutdown. To avoid such a situation, the RAS Support Software provides the diagnosis time, and at time-out, it forcefully shuts down the WindowsNT (forcefully ends the application program).

This diagnosis time is called forced shutdown diagnosis time.

Since the shutdown execution diagnosis time (TimerShutdown) is started from the start of the first shutdown, this forced shutdown diagnosis time must be set shorter than the diagnosis time to make it effective. If the shutdown execution diagnosis time is shorter, the equipment is reset before the forced shutdown is made.

If this diagnosis time is too short, the forced shutdown will be executed in the midst of shutdown, and WindowsNT may not normally be shut down. For the detail, see the restrictions of "3.4 RAS Shutdown Processing"

The following shows the setting range. The values are to be set in the units of 500ms.

2(1 second) to 1200 (10 minutes) (Default valve is 240 : 2 minutes)

3.3.13 RAS Window Start Style (XRASWindow : Startup)

This specifies the start style (normal window/mini window) of the RAS window.

Set value	Start style
Normal (default value)	Normal window
Mini	Mini window

3.3.14 RAS Window Object Name (XRASWindow : ObjectName)

This specifies the object name of the object to be used for double start prevention by the RAS window. The object name specified here must be a name not used by other program within the system.

As the default, the name XRASWINDOW is set.

3.3.15 Normal Window Position (X) (XRASWindow : NormalPos.x)

This specifies the window position of X axis of the normal window.

The window position shown differs depending on the setting of the display.

The default value is 0, ultimate left side.

3.3.16 Normal Window Position (Y) (XRASWindow : NormalPos.y)

This specifies the window position of Y axis of the normal window. The default value is 0, highest side.

3.3.17 Mini Window Display Level (XRASWindow : MiniLevel)

This specifies the display level of the mini window.

Set value	Display level
Top	Arranged at the highest level of Z sequence
TopMost (default value)	Arranged always as the front window even when non-active

3.3.18 Mini Window Position (X) (XRASWindow : MiniPos.x)

This specifies the window position of X axis of the mini window. The default value is 0, ultimate left side.

3.3.19 Mini Window Position (Y) (XRASWindow : MiniPos.y)

This specifies the window position of Y axis of the mini window. The default value is 0, highest side.

3.3.20 RAS Include File Install Path (XRASWindow : InstPathInclude)

The path name which installed the include file (xrasdll.h) of the RAS Support Software is recorded. This information is used when uninstalling is done.

RAS include file install path name : XRAS.BAS

3.3.21 RAS Library File Install Path (XRASWindow : InstPathLibrary)

The path name which installed the library file (XRasDLL.lib) of the RAS Support Software is recorded. This information is used when uninstalling is done.

3.3.22 Option (XRAS : Option)

This is a set value for future use, and 0 must be set.

3

3.4 RAS Shutdown Processing

3.4.1 Shutdown Operation

The RAS Support Software has the function to automatically shut down the WindowsNT when NMI (excluding voltage decrease system memory parity error/multi-bit error and PCI bus system error) is detected.

The automatic shutdown operation differs depending on whether the user application program is receiving the RAS messages with the RAS message receiving window setting command (XRasUserWindow).
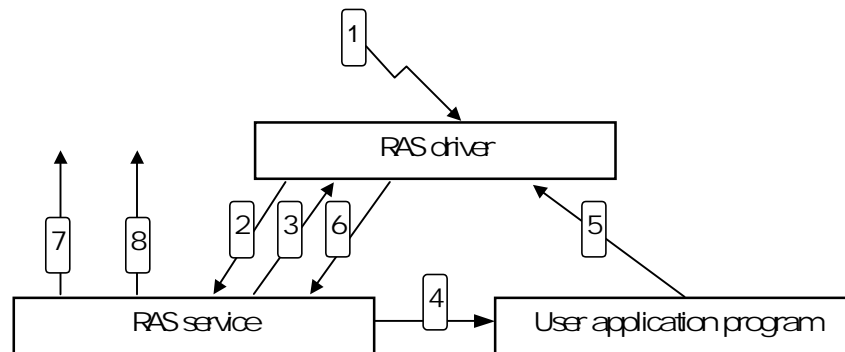
(1) NMI occurrence. The RAS driver sets the system WDT. If the NMI factor is system memory parity error/multi-bit error, PCI bus system error or voltage decrease, the information is left in the RAS memory and the hardware is reset.

(2) The RAS driver informs the RAS service of the NMI message. It starts to monitor the service shutdown diagnosis time (TimerService).

(3) The RAS service informs the RAS driver that the NMI message was received. Then, the RAS driver clears the service shutdown diagnosis time and starts to monitor the user shutdown diagnosis time (TimerUser) if there is the RAS message receiving user or the shutdown execution diagnosis time (TimerShutdown) if there is no user. Also, the RAS service moves to the processing of [7] if there is no RAS message receiving user.

(4) The RAS service informs the RAS message receiving user of the NMI occurrence message.

(5) The RAS message receiving user performs post-processing in the program and issues the user shutdown command (XRasUserShutdown) or the user power off command (XRasUserPowerdown).

(6) When the user shutdown command is issued or the user shutdown diagnosis time time-out occurs, the RAS driver informs the RAS service of the shutdown execution message. Also it starts to monitor the shutdown execution monitor time (TimerShutdown).

(7) The RAS service executes the shutdown in the method to inform the application of the shutdown. Also it starts to monitor the forced shutdown diagnosis time (TimerForceShutdown).

(8) After the time-out of the forced shutdown diagnosis time, the shutdown is forcefully done.

3.4.2 Restrictions on WindowsNT shutdown in the RAS Support Software

(1) If the RAS Support Software is started and then stopped (uninstall, etc.), the power cannot be turned off even if the power key is set to OFF.

This phenomenon is caused by temporarily setting the RAS board circuit. In case the RAS support software is stopped, shut down Windows NT manually, then temporarily turn the power off by switching off the power switch located on the backside. By this, the power is turned off by switching off the switch beginning next operation. (Windows NT is not shut down)

(2) If the forced shutdown functions and the shutdown is executed in the midst of the shutdown processing of WindowsNT, the shutdown may not normally be executed.

3

3.5 RAS Windows

With the RAS Support Software, the following RAS windows are prepared.

These windows are developed from the main window of the RAS window.

This makes it possible to process the RAS information display and RAS command execution at the GUI level.

3

RAS window	Description
Status window	Window to display the information of RAS Support Software
DIO window	Window for setting DI information display, DO output, and DI interruption
WDT window	Window to display present WDT state and set WDT
Alarm window	Window to output alarm sound
RAS memory window	Window for reading/writing of user RAS memory and displaying system RAS memory
Event log window	Window to display event information on RAS Support Software
Registry window	Window to display and change registry information on RAS Support Software
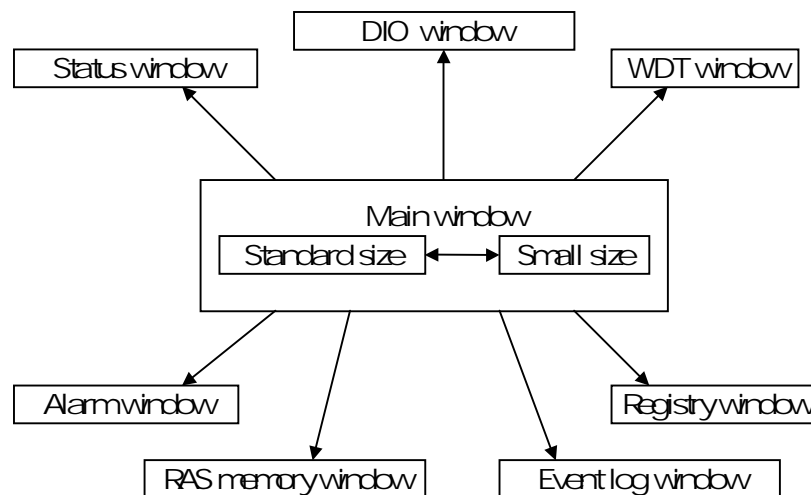
3.5.1 Main Window

The main window is the basic window of the RAS window, and from this window, development is made to various windows.

If the RAS board is not installed or RAS device driver is not installed, the buttons of DIO window, WDT window, alarm window, and RAS memory window are made invalid, and they cannot be opened.

If the desk top area is made smaller or font size is made larger, the whole of the RAS window may not be displayed on the screen. In such a case, the whole of the window can be checked by moving the window by selecting the movement of the system control menu through the keyboard.

3
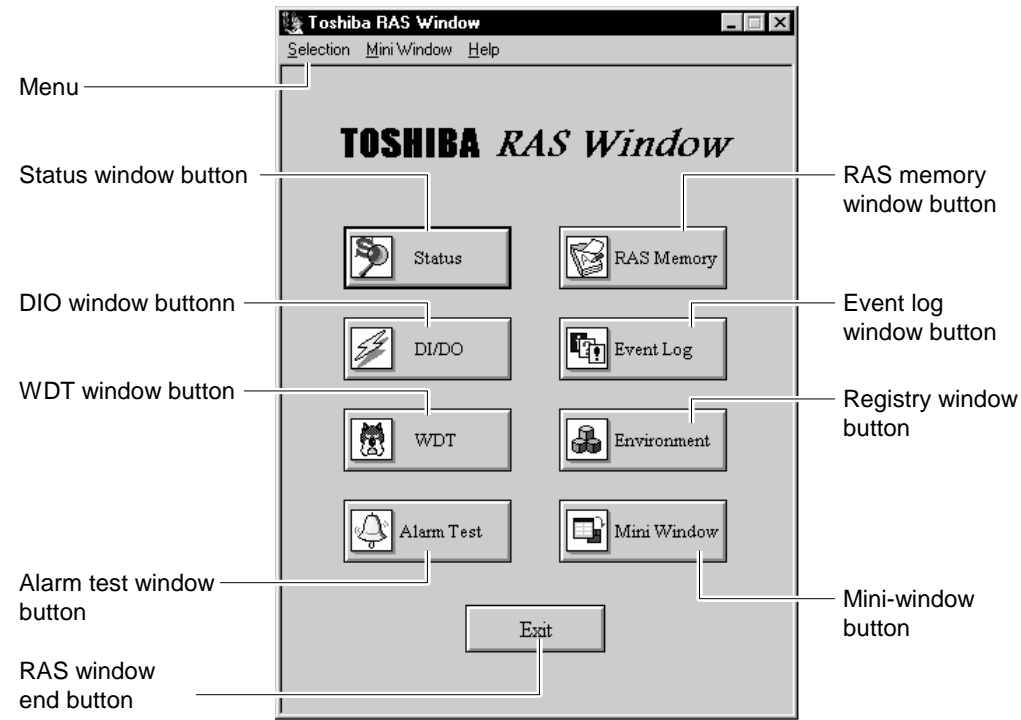
- Menu

  The menu consists of 3 items, [SELECT], [MINI WINDOW], and [Other], and each has the following function.

[SELECT]

This menu item is to select a RAS window, and each window name is displayed, and by selecting it, the specified window can be opened.

[MINI WINDOW]

This menu item is to set the operation of the mini window, and the following two items can be checked.

	No check	Check
Highest level display	Display is made at the highest level only when active	Always displayed at the highest level
Mini window start	Main window is displayed when RAS window is started	Mini window is displayed when RAS window is started

3

[OTHER]

When you select the version information, the version of the RAS window is displayed as shown in the figure below. By selecting Help, you can view the online help which is equivalent to this manual.

```
About Toshiba RAS Window                                    ☒

    🖼   Toshiba RAS Window (XRasWin.exe)    V01.04

        Copyright (C) 1996,97 TOSHIBA Corporation,
                  All Rights Reserved.
                    ┌──────────────┐
                    │      OK      │
                    └──────────────┘
```
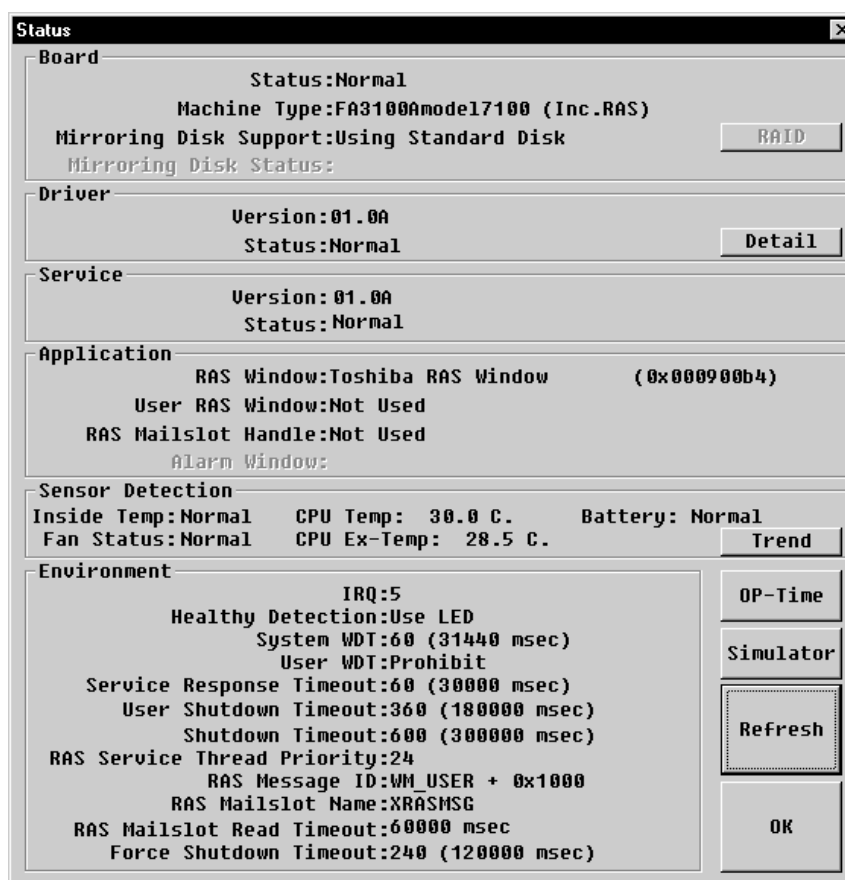
- Window button

  Each window is opened by pressing each window button (status, DIO, WDT, RAS memory, event log, registry).

- Mini window button

  By pressing the mini window button, the main window is closed and the mini window is opened.

- RAS window end button

  By pressing the RAS window end button, the RAS window is ended.

3.5.2   Status Window

The status window is to display the status information of the RAS Support Software.

By pressing the [REFRESH] button, the information displayed is updated.

```
Status                                                    [×]
┌Board─────────────────────────────────────────────────────┐
│                    Status:Normal                          │
│            Machine Type:FA3100Amodel7100 (Inc.RAS)        │
│    Mirroring Disk Support:Using Standard Disk      RAID   │
│    Mirroring Disk Status:                                 │
├Driver────────────────────────────────────────────────────┤
│                  Version:01.0A                            │
│                   Status:Normal                   Detail  │
├Service───────────────────────────────────────────────────┤
│                  Version: 01.0A                           │
│                   Status:Normal                           │
├Application───────────────────────────────────────────────┤
│          RAS Window:Toshiba RAS Window      (0x000900b4)  │
│     User RAS Window:Not Used                              │
│   RAS Mailslot Handle:Not Used                            │
│              Alarm Window:                                │
├Sensor Detection──────────────────────────────────────────┤
│ Inside Temp:Normal    CPU Temp:  30.0 C.    Battery: Normal│
│  Fan Status:Normal    CPU Ex-Temp:  28.5 C.        Trend  │
├Environment───────────────────────────────────────────────┤
│                    IRQ:5                         OP-Time  │
│            Healthy Detection:Use LED                      │
│              System WDT:60 (31440 msec)        Simulator │
│                 User WDT:Prohibit                         │
│    Service Response Timeout:60 (30000 msec)              │
│      User Shutdown Timeout:360 (180000 msec)    Refresh  │
│          Shutdown Timeout:600 (300000 msec)              │
│  RAS Service Thread Priority:24                           │
│            RAS Message ID:WM_USER + 0x1000                │
│          RAS Mailslot Name:XRASMSG                  OK   │
│  RAS Mailslot Read Timeout:60000 msec                    │
│     Force Shutdown Timeout:240 (120000 msec)             │
└──────────────────────────────────────────────────────────┘
```

3

By pressing the [DETAIL] button, detailed information of the RAS device driver can be displayed.

```
Driver Status Detail                      ×
┌ Registry Information Acquisition ─────────┐
│                                           │
│                    Interrupt:Normal       │
│     Service Response Timeout:Normal       │
│        User Shutdown Timeout:Normal       │
│             Shutdown Timeout:Normal       │
│                   System WDT:Normal       │
│                     User WDT:Normal       │
│      User WDT startup state:Normal        │
│            Healthy Detection:Normal       │
├───────────────────────────────────────────┤
│ ┌ I/O Address Conversion ────────────────┐ │
│ │                                        │ │
│ │     RAS Board Basic Addr:Normal        │ │
│ │  Sys Ctrl Register Addr:Normal         │ │
│ │  NMI Mask Register Addr:Normal         │ │
│ │     RAS Board Alarm Addr:Normal        │ │
│ │         Thermo-meter Addr:Normal       │ │
│ └────────────────────────────────────────┘ │
│ ┌ Other ─────────────────────────────────┐ │
│ │                                        │ │
│ │     H/W Resource Acquire:Normal        │ │
│ │   Shutdown Routine                     │ │
│ │             Registration:Normal        │ │
│ │   Interrupt Handler                    │ │
│ │             Registration:Normal        │ │
│ │  NMI Handler Registration:Normal       │ │
│ └────────────────────────────────────────┘ │
│              ┌─────────┐                    │
│              │   OK    │                    │
│              └─────────┘                    │
└───────────────────────────────────────────┘
```

Detail on registry information obtaining is shown.
Normal obtaining
Registry information could be read correctly.
Obtaining error
Registry information could not be read correctly.

Detail on I/O address converting is shown.
Normal converting
Address could be converted.
Converting error
Address could not be converted.

Detail on starting information of the driver is shown.
Normal obtaining/registering
Could be normally obtained/registered.
Obtaining/registering error
Could not normally be obtained/registered.

3.5.3 Service

For the service item, the following information related to the RAS service is displayed.

- Version

  The version information of the RAS service is displayed.

- Status

  The start information of the RAS service is displayed.

Display	Content
Normal	RAS service is normally operating
Not started	RAS service is not started
Unknown	RAS driver is not installed

3.5.4 Application

For the application related item, the following information related to message informing is displayed.

- RAS window

Display	Content
User window caption and window handle	User window is set
Not started	RAS service is not started
Unknown	RAS driver is not installed

- User window

Display	Content
RAS window caption and window handle	RAS window is normally operating
Not normal starting	User window is not set
Unknown	RAS driver is not installed

- User mail slot handle

Display	Content
User mail slot handle	User mail slot is created
Not used	User mail slot is not created
Unknown	RAS driver is not installed

- Alarm window

  Invalid display is made.

3.5.5 Sensor Detection

For the sensor detection item, the following information related to internal abnormality detection is displayed.

In case of a model not supporting each sensor mechanism, respective invalid display is made.

- Temperature inside equipment

Display	Content
Normal	Temperature in equipment is normal
Abnormal	Temperature in equipment is abnormal
Unknown	RAS driver is not installed

- Fan operation status

Display	Content
Normal	Power fan is normally running
Stopped	Power fan is stopped
Unknown	RAS driver is not installed

- CPU peripheral temperature

  CPU temperature and CPU peripheral temperature are displayed. In case of a model not supporting this function, "-^{o}C" is displayed in invalid character.

- Battery information

  Battery information is displayed.

Display	Content
Normal	Battery voltage is normal
Short	Battery voltage is shor
Unknown	RAS driver is not installed

3.5.6 Operation Environment

For the operation environment item, the information of the present operation environment is displayed.

If the RAS service is not started, "unknown" is displayed for the RAS service related information (RAS service thread priority, RAS message ID, RAS mail slot name, RAS mail slot receiving diagnosis time, forced shutdown diagnosis time) or if the RAS driver is not started, "unknown" is displayed for all the information.

3

	Display item	Content
Driver related	Interruption No.	Interruption No. used by RAS board is displayed.
	Healthy detection means	Healthy signal output means of RAS Support Software is displayed.
	System WDT time	Set value of each time and actual time
	User WDT time	
	Service shutdown diagnosis time are displayed.	
	User shutdown diagnosis time	
	Shutdown execution diagnosis time	
Service related	RAS service thread priority	Priority of RAS service thread is displayed
	RAS message ID	Window message ID used in RAS message informing is displayed.
	RAS mail slot name	Mail slot name used for RAS mail slot is displayed
	RAS mail slot receiving diagnosis time	RAS mail slot receiving diagnosis time is displayed. If the receiving diagnosis time is infinite, "FOREVER" is displayed.
	Forced shutdown diagnosis time	Set value of forced shutdown diagnosis time and actual time are displayed.

3.5.7 DIO Window

The DIO Window processes LED 0 display settings on the GUI level. The other features are for extension and have no meanings.
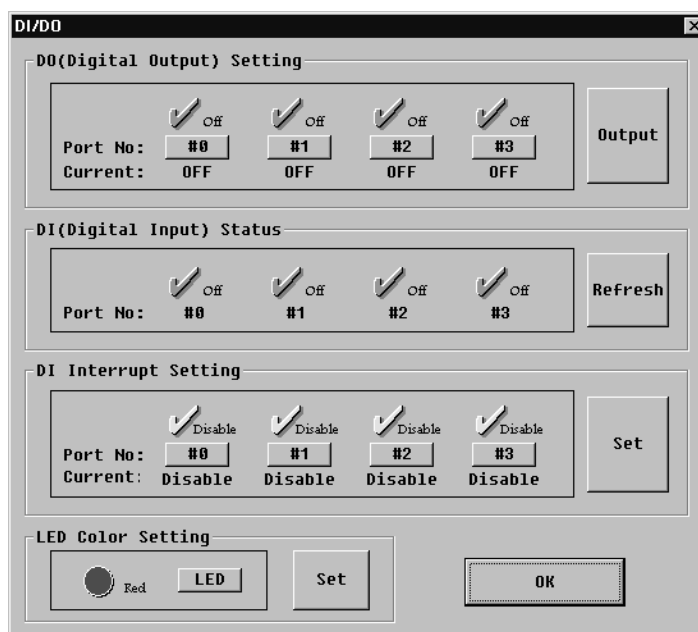
3.5.8 LED Indication Color Setting

Item to change the indication color of the power LED#0 on the front panel of equipment.
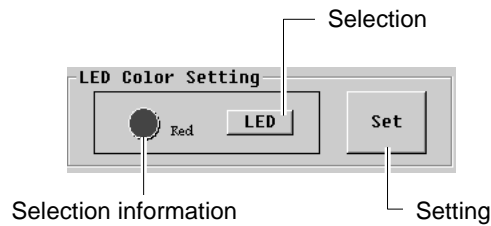
• Select button

By pressing the select button, selecting the indication color of the LED #0, and pressing the set button, the color of the LED is actually displayed.

• Selected information

The indication color (green/red) of the power LED selected by pressing the select button
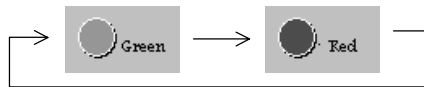
• Set button

By pressing the set button, the indication color of the LED #0 selected with the select button is actually displayed in the LED of the front panel of the equipment.

3.5.9   WDT Window

WDT window can process at the GUI level the setting of WDT supported by the RAS Support Software. When the WDT window is opened, the present set information is displayed.

If the RAS board is not installed or RAS device driver is not installed, the main window and mini window buttons are made invalid and this window cannot be opened.

3

Reset selection button

Setting button

WDT count

WDT time

Reset button

- • Reset select button

  Button to select the resetting method of WDT. Either system reset or user reset is selected.

- • WDT count

  Item to set the count value of WDT. It can be set in the range of 2 to 255 counts (1 count = 524ms). If 0 is set, WDT is prohibited.

- • WDT time

  The time of the WDT count set is displayed. If WDT is prohibited, nothing is displayed.

- • Set button

  By pressing the set button, the WDT information set with the reset select button and WDT count is actually set.

- • Reset button

  This is valid only when the WDT resetting method is the user reset, and by pressing this button, WDT resetting can be done.

3.5.10 Alarm Window

The buttons of the main and mini windows are made invalid.

3.5.11 RAS Memory Window

The RAS memory window can process at the GUI level the reading/writing of the user RAS memory and reading of the system RAS memory supported by the RAS Support Software.

If the RAS board is not installed or the RAS device driver is not installed, the main window and mini window buttons are made invalid and this window cannot be opened.

If the extended RAS memory functions (Operating Time Monitoring, Thermometer Trend, and NMI Trigger Information) are being executed, the area in the extended memory which is available to the user becomes smaller.
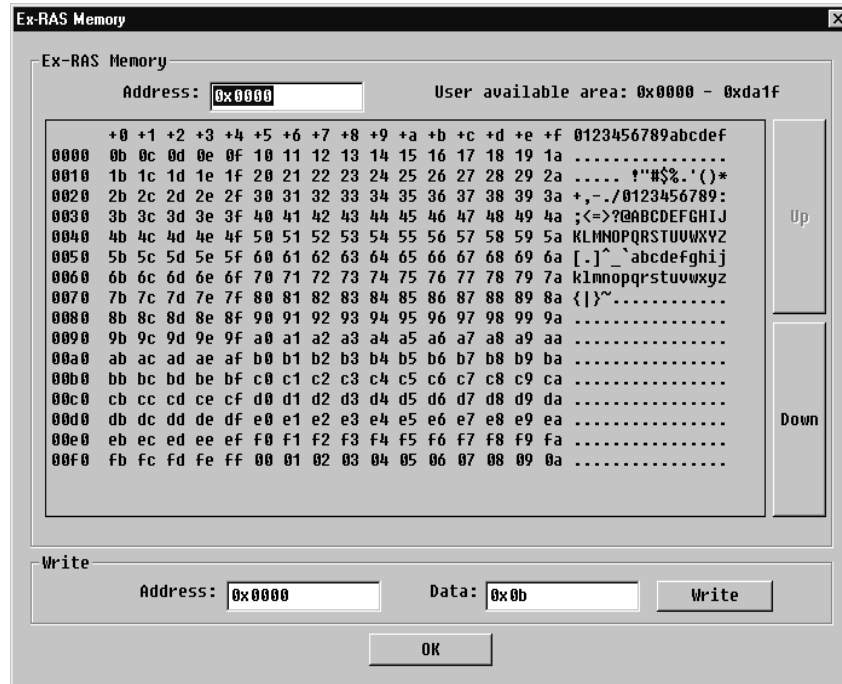
- System RAS memory

  000h to 0DFh of the system RAS memory are displayed. 0E0h - 0FFh are omitted because of the user RAS memory.
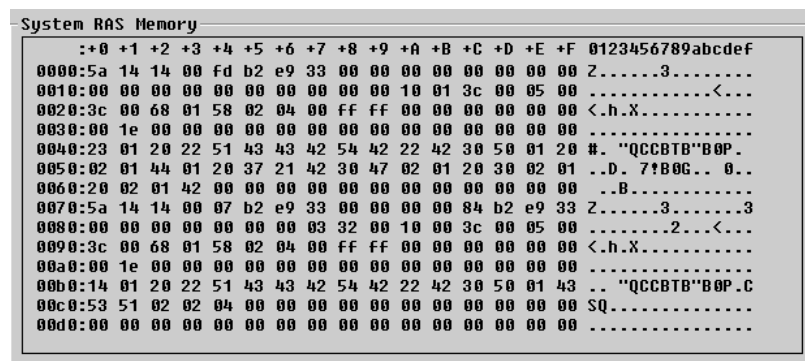
- User RAS memory

  User RAS memory is displayed. They correspond to 0E0h - 0FFh of the system RAS memory.

```
User RAS Memory
    :+0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F 0123456789abcdef

0000:c0 ff 00 ff 08 ff 00 ff ff 00 af 00 ff 00 ff 00 ................
0010:fe 00 ff 00 ff 00 ff 00 00 ff 00 ff 00 ff 00 ff ................
```
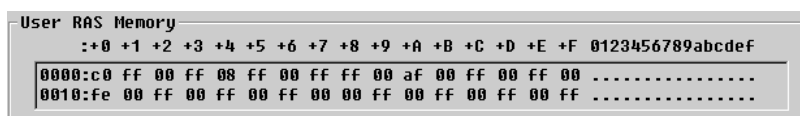
- Refresh button

  By pressing the refresh button, the display is updated to the display of the newest RAS memory information.

- Extension memory button

  With a system supporting the extension RAS memory, the extension portion of the user RAS memory can be displayed/edited by pressing the extension memory button. With a system not supporting the extension RAS memory, the button is made invalid and clicking cannot be done.

3
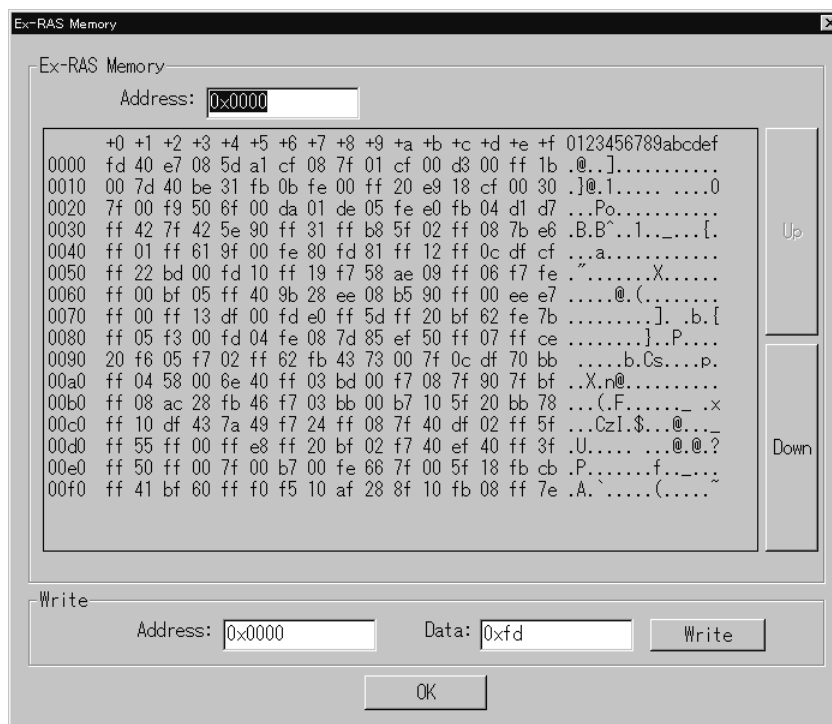
• User memory correction button

By pressing the user memory correction button, the window for writing the user RAS memory is displayed and the user RAS memory can be changed.

Batch write data

Write selection

Address selection

Present value

Byte data   Write button

Edit User RAS Memory

Batch Write

+0+1+2+3+4+5+6+7+8+9+A+B+C+D+E+F

0000 c0ff00ff08ff00ffff00af00ff00ff00

0010 fe00ff00ff00ff0000ff00ff00ff00ff

Write (by byte)

Index: Vlue:

Present Value:

Write

Exit
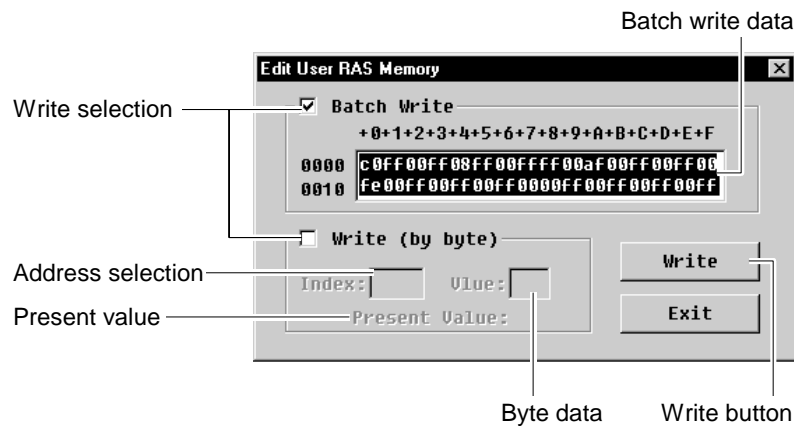
• Write select

Button to select writing method of the user RAS memory. Either batch writing or byte-unit writing is selected.

• Batch data

If writing is done in the user RAS memory by the batch writing method, the data of all the user RAS memories can be written at once by entering the data in this area and pressing the write button.

• Address select

When writing is done in the user RAS memory using the byte-unit writing method, the address of the target user RAS memory is entered in this item.

• Byte data

When writing is done in the user RAS memory using the byte-unit writing method, the data to be written is entered in this item and the write button is pressed, and then the data are actually written in the user RAS memory.

• Present value

When writing is done in the user RAS memory using the byte-unit writing method, the value presently written in the user RAS memory selected with the address select.

• Write button

By pressing the write button, the input data are written in the user RAS memory.

3.5.12 Event Log Window

The event log window displays the event log information logged by the RAS Support Software. In this window, maximum 256 events are displayed. More old events can be checked through the event viewer.

3

```
┌─────────────────────────────────────────────────┐
│ Toshiba RAS Event Log                        [X] │
│                                                  │
│           Event Log on\\SEKIGOGO                 │
│                                                  │
│  Date      Time      Type      EventID           │
│  08/07/97 20:35:25  Info      1100     ▲         │
│  08/07/97 20:35:25  Info      1000               │
│  08/07/97 20:31:19  Info      1100               │
│  08/07/97 20:31:19  Info      1000               │
│  08/07/97 20:27:37  Info      1100               │
│  08/07/97 20:27:37  Info      1000               │
│  08/07/97 20:25:37  Warning   2100               │
│  08/07/97 20:20:11  Info      1100               │
│  08/07/97 20:20:11  Info      1000               │
│  08/07/97 20:17:56  Warning   2100               │
│  08/07/97 20:13:25  Info      1100               │
│  08/07/97 20:13:25  Info      1000               │
│  03/21/97 14:12:58  Warning   2100               │
│  03/21/97 14:12:50  Info      2501               │
│  03/21/97 14:12:50  Info      1000               │
│  03/21/97 14:12:00  Warning   3000               │
│  03/21/97 14:11:10  Info      1100               │
│  03/21/97 14:11:09  Info      1000               │
│  03/21/97 14:05:24  Info      2501               │
│  03/21/97 14:05:24  Info      1000     ▼         │
│                                                  │
│                   [  Refresh  ]     [   OK   ]   │
└─────────────────────────────────────────────────┘
```

Event log information

Refresh button

3.5.13 Refresh button

By pressing the refresh button, the display of the event log window is updated to the newest information.

3.5.14 Event log information
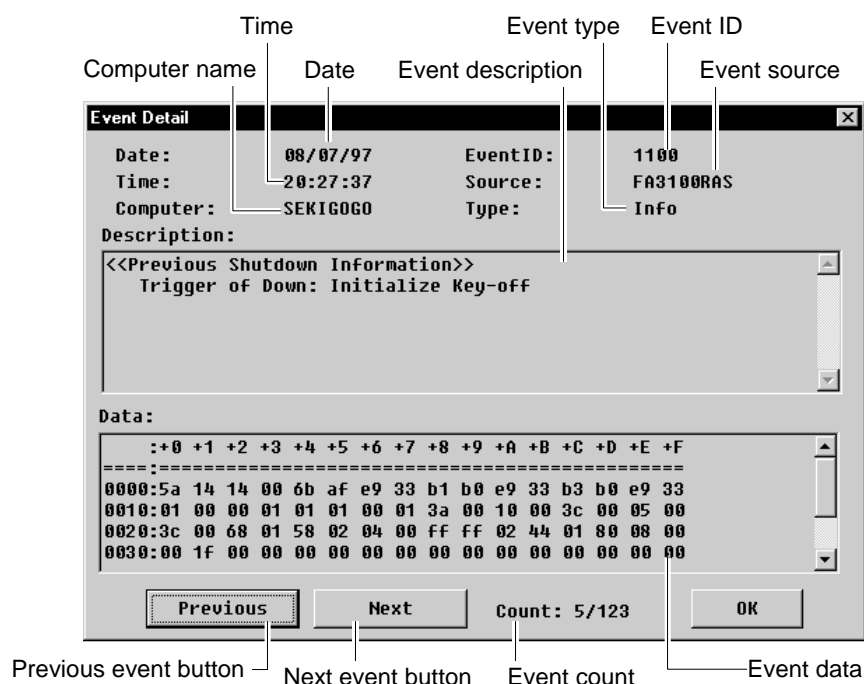
The event log information logged by the RAS Support Software is displayed sequentially from the newest information. By double-clicking on each event of the event log information with the mouse, the detailed information of the event is displayed.

- Date

  Date of this event log logged is displayed.

- Time

  Time of this event log logged is displayed.

- Computer name

  The computer name which logged this event log is displayed.

- Event ID

  The event message identifier of the RAS Support Software is displayed.

- Event source

  The indentifier of the event log logged by the RAS Support Software is displayed.

- Event type

  The type (information/warning/error) of this event is displayed.

- Event explanation

  The explanation of this event log is displayed.

- Event data

  Data attached to this event log are displayed.

- Preceding event button

  For moving to a newer event than this event log.

- Next event log

  For moving to an older event than this event log.

- Event count

  The count value of the event log displayed in this window is displayed.

In case of 1/256 display, there are 256 events in total, and of them, the newest event is displayed.

3.5.15 Registry Window

The registry window is to set the registry information of the RAS Support Software. When the registry window is opened, the present set information is displayed.
It should be noted that this registry information is not necessarily same as the information under the environment of the RAS Support Software now operating (the environment presently in operation can be checked through the status window).

This setting becomes valid when WindowsNT is shut down once and then restarted.

3
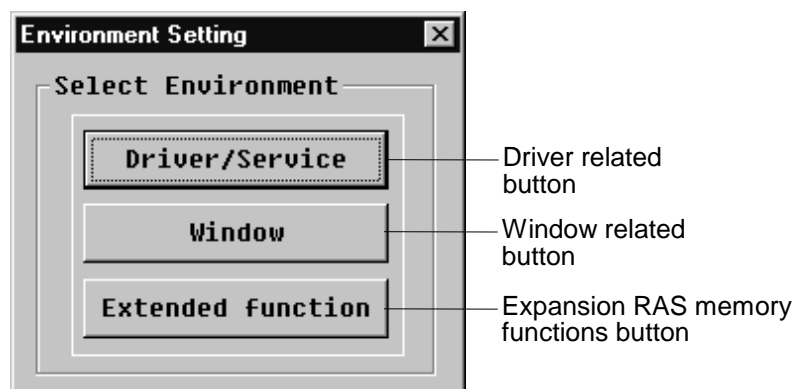
If the log-in user does not have the right to rewrite the registry, all the settings through this window are made invalid.

3.5.16 Driver Related Button

By pressing the driver related button, the window to set the registry information of the RAS device driver and RAS service is displayed.

3

- Interruption No.

  Interruption No. to be used by the RAS board is set. Numbers other than 5 cannot be set.

- Healthy signal

  Healthy signal outputted by the RAS Support Software is set.

- System WDT

  System WDT time is set.

- User WDT

  User WDT time at starting is set.

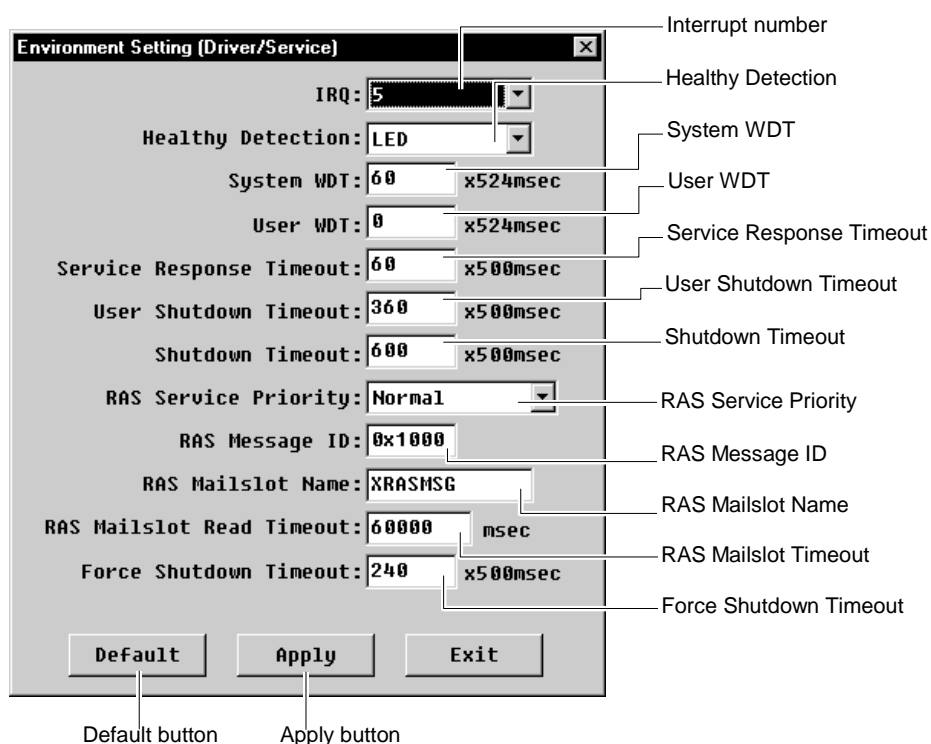- Service diagnosis time

  Service shutdown diagnosis time is set.

- User diagnosis time

  User shutdown diagnosis time is set.

- Execution diagnosis time

  Shutdown execution diagnosis time is set.

- Service priority

  RAS service thread execution priority is set.

- Message ID

  RAS message ID, window message, is set.

- Mail slot name

  RAS mail slot name is set.

- Mail slot diagnosis time

  RAS mail slot receiving diagnosis time is set.

  For infinite waiting, "FOREVER" is set.

- Forced diagnosis time

  Forced shutdown diagnosis time is set.

- Default button

  All the registry set information is set to the default value.

- Set button

  By pressing the set button, the registry information is actually registered.

3.5.17 Window Related Button

When you push window buttons, the window appears in which you can set the registry information of the RAS window.

3
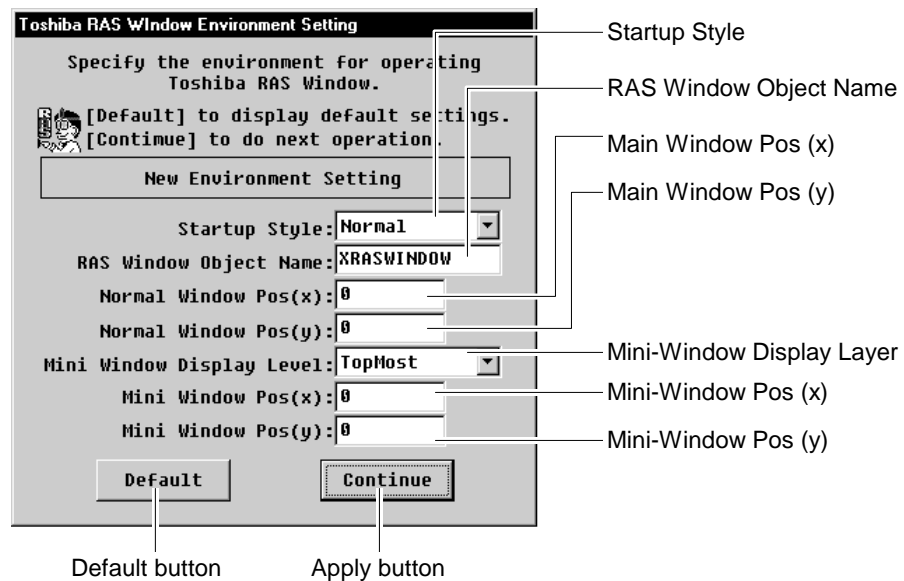
- Start style

  The start style of the RAS window is set.

- Object name

  Object name to be used by the RAS window is set.

- Main position (X, Y)

  The position of the main window is set.

- Mini display level

  The display level of the mini window is set.

- Mini position (X, Y)

  The position of the mini window is set.

- Default button

  All the registry set information is set to the default value.

- Set button

  By pressing the set button, the registry information is actually registered.

3.5.18 Mini-Window

The mini window is an icon version of the main window, and from this window, development can be made to various windows. And it displays real-time the power fan information, and internal temperature information.

If the lower half area (RAS logo portion, power fan information portion, internal temperature information portion) of the mini window is moved while pressing with the left button of the mouse, the mini window moves following the mouse cursor.

If the RAS board is not installed or the RAS device driver is not installed, the buttons of DIO window, WDT window, and alarm window are made invalid and the windows cannot be opened.

The button of the alarm window is made invalid and the window cannot be opened.
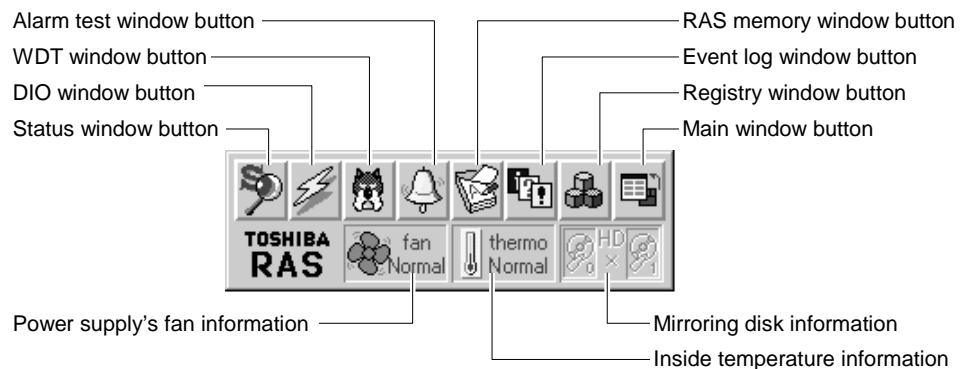
3.5.19 Window buttons

By pressing each window button, the window is opened.

Status window	DIO window	WDT window
Alarm window	RAS memory window	Event log window
Registry window		

3

- Main window button

  By pressing the main window button, the mini window is closed and the main window is opened.

- Power fan information

  The power fan information is displayed real-time.

  In case of a system not supporting the sensor detection, invalid display is made.

Display	Content
fan Normal	Power fan is normally running.
fan Error	Power fan is stopped.
fan	RAS board or power fan is not installed or RAS driver is not installed.

- Internal temperature information

  The information of the temperature in the equipment is displayed realtime.

Display	Content
thermo Normal	Internal temperature is normal.
thermo Error	Internal temperature is abnormal.
thermo	RAS board is not installed or RAS driver is not installed.

3.6 Event Log Information

The RAS Support Software logs the RAS information such as startup information, shutdown information, abnormality information in the event log of WindowsNT with the RAS service program.

The event log control information is stored under the Eventlog key of the configuration (registry) data base.

3

3.6.1   Logging Information When RAS Service Starts

The RAS service logs the following information in the event log when the system starts.

- Error information when RAS service starts

  In case of error occurrence such as no installation of the RAS driver, abnormal registry information, or faulty setting of service thread priority, the event log on the error is logged.

- Error information when RAS driver starts

  In case of error occurrence such as no inserting of RAS board, abnormal registry information, or failure to install the driver normally, the event log on the error is logged.

- Last shutdown information

  When WindowsNT starts shutdown processing, it cannot log the event log. For this reason, with the RAS Support Software, the information is left in the RAS memory at the shutdown and logged in the event log at the time of next startup.

- RAS Support Software start information

  The fact that the RAS Support Software is installed and started is logged.

3.6.2   Logging Information during Operation of RAS Service

The RAS service logs the following information in the event log during system operation.

- Power fan stop/recovery information

  When the power fan stop or recovery is detected, the information is logged in the event log.

- Equipment internal temperature abnormality/recovery information

  When the internal temperature abnormality or recovery is detected, the information is logged in the event log.

- RAS Support Software error information

  If any error (e.g. abnormality of communication between driver and service) occurs with the RAS Support Software during system operation, the information is logged in the event log.

3.6.3 Logging Information at End of RAS Service

The RAS service logs the following information in the event log at the time of system shutdown.

• NMI information

In case of shutdown due to NMI occurrence, the RAS Support Software logs the NMI factor in the event log. For NMI of parity error or voltage decrease, the logging is done at the time of next startup.

• RAS service stop information

If the RAS service is stopped during system operation from the control panel, etc., the RAS Support Software does not normally function, and so the service stopping is logged in the event log.

3.6.4 Event Log List

The following shows the list of events bo be logged by the RAS Support Software.

Severity	MessegeId	Explanation
Information	1000	Service start informing
Information	1100	Information of last shutdown
Information	1200	Recovery from fan stop
Information	1201	Recovery from internal temperature abnormality
Information	1300	NMI trigger information
Error	2000	RAS device open error
Error	2001	I/O processing error
Error	2002	RAS board not installed
Error	2003	Driver initializing registry error
Error	2004	Driver initializing address error
Error	2005	Driver initializing resource error
Error	2006	Driver initializing interruption error
Error	2007	Driver initializing NMI error
Error	2008	RAS board interruption receive error
Error	2100	NMI detection (power key, remote initialize : warning)
Error	2101	Fan stopping
Error	2102	Internal temperature abnormality
Error	2104	Wrong MI detected
Error	2105	Driver message buffer flow
Error	2110	System memory single bit error
Error	2200	Error of thread connection to control manager
Error	2201	Registry information obtaining error
Error	2202	Service thread generating error
Error	2203	Process priority setting error
Error	2204	Thread priority setting error
Error	2205	Service status updating error
Error	2206	RAS memory abnormality
Error	2300	Mail slot opening error
Error	2301	Main slot writing error
Error	2302	Message transmitting error
Error	2400	Shutdown processing error
Error	2401	Forced shutdown informing

Severity	MessegeId	Explanation
Error	2500	Last shutdown informing error (RASMEM)
Error	2501	Last shutdown informing error (last driver status abnormality)
Error	2502	Last shutdown informing error (error occurrence at service start)
Error	2503	Last shutdown informing error (RAS board abnormality)
Error	2600	Forced ending of service
Warning	3000	Service stopping during system operation
Warning	3001	Battery voltage shortage
Warning	3100	RAS start file write error
Warning	3101	RAS down file write error

3.6.5 Event Log Detail

The following shows the detail of the events logged by the RAS Support Software.

<<Information events>>

MessageId : 1000 (at start)

  Factor : service start informing when service normally starts

  Message : Toshiba RAS service was started.

  Data : nil

MessageId : 1100 (at start)

  Factor : informing of last shutdown information

  Message : <<last shutdown information>>

       Shutdown trigger : %1

       Reset occurrence cause :%2

       %3

  Data : last RAS memory content (112 bytes)

      %1 → Cause for triggering the shutdown is inserted.

        (Initialize key off, remote initialize, etc.)

      %2 → When resetting occurs, the cause is inserted.

        (AC fail, system WDT, system memory abnormal, PCI bus system error, etc.)

      %3 → When system down due to panic occurrence is detected, the fact is inserted.

> **Remarks**
>
> This event is logged only when the Toshiba RAS service is started for the first time. Therefore, no logging is done when the service is restarted during system operation.

MessageId : 1200 (during operation)

  Factor : recovery from fan stopping

  Message : Recovery was made from fan stop state.

  Data : nil

CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

94   model 2000/3000 Computer Module C2/C3 Windows NT Version

MessageId : 1201 (during operation)

    Factor :   recovery from the state of internal temperature abnormality

    Message :   Normal recovery was made from abnormal state of internal temperature.

    Data :   nil

MessageId: 1300 (at start)

    Factor :   NMI occurs while the NMI Trigger Information Function is running.

    Message :   <<Previous NMI trigger information>>

    Data :   NMI trigger information

In NMI trigger information, the first 16 bytes is the header of the NMI trigger information, the next 128 bytes contain the CMOS information, and the following part stores the PCI bus information (configuration address and configuration data).

<<Error Events>>

MessageId : 2000 (at start/during operation)

    Factor :   RAS device opening failure

    Message :   Device opening failed.
                  Toshiba RAS driver is not normally installed.

    Data :   nil

MessageId : 2001 (at start/during operation)

    Factor :   Error return of I/O processing request to the driver

    Message :   I/O processing request (%1) to Toshiba RAS driver failed.

    Data :   IOCTL command

                 %1 →IOCTL command

MessageId : 2002 (at start)

    MessageId :RAS board not installed

    Message :   Toshiba RAS board is not installed.

    Data :   nil

3

MessageId : 2003 (at start)

Factor : Registry registering error when RAS driver initializing is done

Message : <<Initializing error information when Toshiba RAS driver starts>>

Information registered in the registry is abnormal.

Toshiba RAS driver starts using the default value.

%1

%2

%3

%4

%5

%6

%7

%8

Data : nil

%1 → Interruption No. abnormality

%2 → Service shutdown diagnosis time abnormality

%3 → User shutdown diagnosis time abnormality

%4 → Shutdown execution diagnosis time abnormality

%5 → System WDT abnormality

%6 → Healthy detection means abnormality

%7 → User WDT abnormality

%8 → User WDT disabled

MessageId : 2004 (at start)

Factor : Address converting error when RAS driver initializing is done

Message : <<Initializing error information when Toshiba RAS driver starts>>

I/O address converting error occurred.

%1

%2

%3

%4

%5

Data : nil

%1 → x0140 - 0x016f address converting error

%2 → 0x0061 address converting error

%3 → 0x0070 - 0x0071 address converting error

%4 → 0x0178 - 0x017B or 0x0388 - 0x38B address converting error

%5 → 0xC140 - 0xC141 address converting error

MessageId : 2005 (at start)

 Factor : Resource obtaining error when RAS driver initializing is done

 Message : <<Initializing error information when Toshiba RAS driver is started>>

      Hardware resource obtaining error occurred.

      %1

      %2

 Data :   nil

      %1 → Hardware resource obtaining error

      %2 → Shutdown routine registering error

MessageId : 2006 (at start)

 Factor : Interruption registering error when RAS driver initializing is done

 Message : <<Initializing error information when Toshiba RAS driver is started>>

      Interruption handler registering error occurred.

      %1

 Data :   nil

      %1 → Interruption registering error

MessageId : 2007 (at start)

 Factor : NMI registering error when RAS driver initializing is done

 Message : <<Initializing error information when Toshiba RAS driver is started>>

      NMI (non-maskable interruption) handler registering error occurred.

      %1

 Data :   nil

      %1 → NMI (non-maskable interruption) handler registering error

MessageId: 2008 (at start)

 Factor : An interrupt of the RAS board is not notified to the driver.

 Message : No interrupt can be received from the Toshiba RAS board.

      A collision may have occurred with the interrupt from any other extended boards.

      %1

 Data :   None

      %1 → The interrupt number set to the RAS board

MessageId : 2100 (during operation)

 Factor : Detection of NMI other than AC fail, memory parity

 Message : NMI was detected.

 Factor : %1

 Data :   nil

      %1 → NMI factor is inserted (initialize key off, remote initialize request, WDT occurrence).
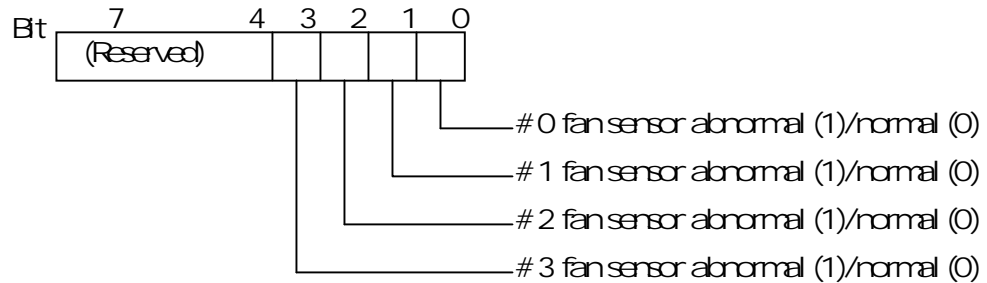
Remarks:

Logging of this event is performed only during initial start of the Toshiba RAS service. Thus, logging is disabled when the service is resumed while the system is operating.

3

MessageId : 2101 (during operation)

> Factor : Fan stopping detected
>
> Message : Fan stopping was detected.
>
> Data : Abnormal sensor detail information (1 byte) in case of a RAS board having the sensor abnormality detail information

Bit

7			4	3	2	1	0
(Reserved)							

#0 fan sensor abnormal (1)/normal (0)

#1 fan sensor abnormal (1)/normal (0)

#2 fan sensor abnormal (1)/normal (0)

#3 fan sensor abnormal (1)/normal (0)

MessageId : 2102 (during operation)

> Factor : Detection of internal temperature abnormality
>
> Message : Equipment internal temperature abnormality was detected.
>
> Data : Abnormal sensor detail information (1 byte) in case of a RAS board having sensor abnormality detail information

Bit

7			4	3	2	1	0
(Reserved)							

#0 temperature sensor abnormal (1)/normal (0)

#1 temperature sensor abnormal (1)/normal (0)

#2 temperature sensor abnormal (1)/normal (0)

#3 temperature sensor abnormal (1)/normal (0)
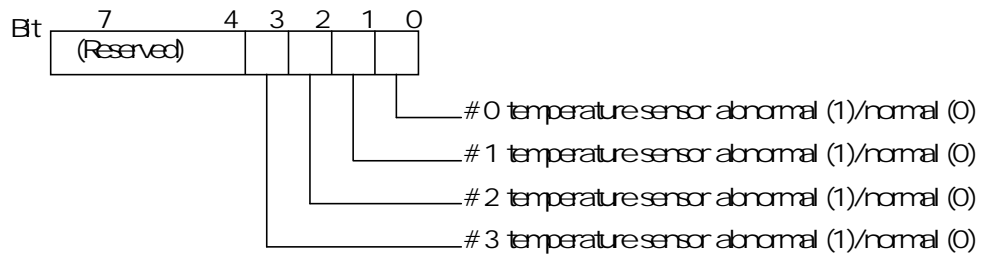
MessageId : 2104 (during operation)

> Factor : Unknown MI detected
>
> Message : Wrong MI was detected.
>
> Data : nil

MessageId : 2105 (during operation)

> Factor : Overflow of message buffer of RAS driver
>
> Message : Service informing message buffer of Toshiba RAS driver overflowed.
>
> Data : nil

MessageId: 2110 (in operation)

    Factor :   A single-bit error of the system memory

    Message :   A single-bit error occurred in the system memory.

    Bank :   %1

    Data :   None

        %1 → Indicates the bank number of the system memory where the single-bit error occurred.

        For more information on bank numbers, refer to the section for multi-bit errors in the notification of previous shutdown information (MessageId: 1100).

        If this event is frequently logged, replace the memory with the bank number and operate the system.

3

MessageId : 2200 (at start)

    Factor :   Failure of main thread connection service to service control manager

    Message :   Service main thread connection to service control manager failed.

    Data :   nil

MessageId : 2201 (at start)

    Factor :   Failure of obtaining the registry information for service operation environment

    Message :   To obtain the registry information of the service operation environment failed.

        Toshiba RAS service continues the startup processing under the environment of default.

    Data :   nil

MessageId : 2202 (at start)

    Factor :   Failure of generating service supply thread

    Message :   Service supply thread generating failed.

    Data :   nil

MessageId : 2203 (at start)

    Factor :   Failure of setting service main process (thread) specifying priority

    Message :   Service main process priority setting failed.

        Start processing is continued at the priority (%1) of default.

    Data :   nil

        %1 → Value of default priority is inserted.

MessageId : 2204 (at start)

    Factor :   Failure of setting service supply thread specifying priority

    Message :   Service supply thread priority setting failed.

        Start processing is continued at the priority (%1) of default.

    Data :   nil

        %1 →The value of default priority is inserted.

3

MessageId : 2205 (at start/during operation)

    Factor :   Service status updating failure

    Message : Toshiba RAS service status updating failed.

    Data :   nil

MessageId : 2206 (at start)

    Factor :   Abnormality is recognized with KEYWORD of RAS memory

    Message : Unconformity occurred with RAS memory.

                It is considered that Toshiba RAS board is abnormal.

                %1

                %2

                %3

    Data :   RAS memory content (112 bytes)

                1% $\rightarrow$ The abnormal RAS memory address

                2% $\rightarrow$ Write data

                3% $\rightarrow$ Read data

MessageId : 2300 (during operation)

    Factor :   Opening failure of message informing mail slot

    Message : Message informing mail slot opening failed.

                RAS message is destroyed.

    Data :   nil

MessageId : 2301 (during operation)

    Factor :   Failure of message writing in message informing mail slot

    Message : To write RAS message in the message informing mail slot failed.

                RAS message destroyed is %1.

    Data :   Destroyed RAS message

                %1 $\rightarrow$The RAS message is inserted.

MessageId : 2302 (during operation)

    Factor :   Failure of informing message to RAS window or user RAS window

    Message : To inform RAS message to %1 failed.

                RAS message "%2" was destroyed.

    Data :   Window handle and destroyed RAS message

                %1 $\rightarrow$Character string of "RAS window" or "user RAS window" is

                     inserted.

                %2 $\rightarrow$The RAS message is inserted.

MessageId : 2400 (at end)

    Factor :   Failure of shutdown execution

    Message : Shutdown execution failed.

    Data :   nil

MessageId : 2401 (at end)

    Factor :   When forced shutdown is executed

    Message : Forced shutdown is executed.

                File data not saved, etc. are destroyed.

    Data :   nil

MessageId : 2500 (at start)

Factor :   Unconformity occurrence with RAS memory in last shutdown information
            survey routine

Message :   <<Last shutdown information>> could not be logged for the following
            reason.

            Unconformity occurred with RAS memory.

            It is considered that Toshiba RAS board was removed/inserted or battery
            is exhausted.

Data :   Last RAS memory content (112 bytes)

MessageId : 2501 (at start)

Factor :   In the last shutdown information survey routine, the RAS driver could not
            normally operate in the last system or RAS driver was not intalled

Message :   <<Last shutdown information>> could not be logged for the following
            reason.

            In the last system, Toshiba RAS driver was not normally started.

Data :   Last RAS memory content (112 bytes)

MessageId : 2502 (at start)

Factor :   Last shutdown information could not be logged due to error occurrence
            in startup processing

Message :   <<Last shutdown information>> could not be logged for the following
            reason.

            Error occurred when service starting was done.

Data :   Last shutdown memory content (112 bytes) if RAS memory information
            was obtained at the time of error occurrence.

            Nil if not obtained.

MessageId : 2503 (at start)

Factor :   It is judged that RAS board did not normally operated in the last
            shutdown information survey routine.

Message :   <<Last shutdown information>> could not be logged for the following
            reason.

            It was confirmed that Toshiba RAS board did not normally operated in the
            last system.

Data :   The last RAS memory content (112 bytes) if RAS memory information
            was obtained at time of error occurrence.

            Nil if not obtained.

> **Remarks**
>
> The last shutdown information is logged only when Toshiba RAS service is started for
> the first time after the system is started.
> Therefore, no logging is done when the Toshiba RAS service is restarted.

3

MessageId : 2600 (at start/during operation)

> Factor :   Occurrence of error to disable the service to continue in service processing
>
> Message : The service is forcefully completed.
>
> Data :   nil

MessageId : 3000

> Factor :   When Toshiba RAS service was stopped during system operation
>
> Message : Toshiba RAS service was stopped during system operation.
>
> Data :   nil

MessageId : 3001

> Factor :   With a model supporting battery mechanism, battery voltage shortage was detected at the time of service startup.
>
> Message : Battery voltage is short.   Replace the battery.
>
> Data :   nil

MessageId: 3100

> Factor :   RAS Start File Write Error
>
> Message : Cannot write the content of the RAS memory to the start file.
>
> Data :   None

MessageId: 3101

> Factor :   RAS Down File Write Error
>
> Message : Cannot write the content of the RAS memory to the down file.
>
> Data :   None