DENSO ROBOT

WINCAPSII GUIDE

Preface

Thank you for purchasing the WINCAPSII. It is designed for efficient program development and verification of the DENSO robot on your PC connected to the robot controller (NetwoRC).

WINCAPSII also makes it possible to verify robot programs and data at a remote location via telephone line.

On your PC, WINCAPSII allows you to simulate robot motions, variables, I/Os or manage program files in units of project, helping you easily develop and manage programs.

Before using WINCAPSII, read this manual carefully to safely get the maximum benefit from your WINCAPSII system.

Version compatibility between WINCAPSII and robot controller system software

WINCAPSII is compatible with the same or earlier versions of the robot controller system software.

For example, WINCAPSII version 2.2 is compatible with robot controller system software versions 2.0, 2.1, and 2.2, but not compatible with version 2.3.

Notes

(1) If your Robot Controller is newer than WINCAPSII in software version, updates the WINCAPSII version using the DENSO Robot NetwoRC CD packaged together with the robot set.

(2) WINCAPSII version is printed on the label of the WINCAPSII CD-ROM.

(3) Robot controller OS version is printed on the "SETPRM LIST" label affixed to the top of the controller. It can also be checked on the Version screen called up by pressing [F6 Set]—[F6 Maint.]—[F2 Version] from the top screen of the teach pendant.

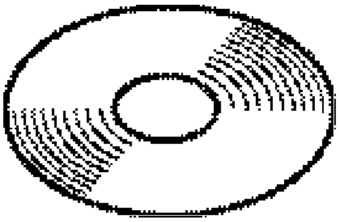
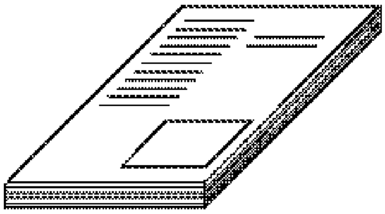
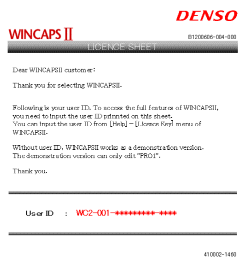
Important

To ensure operator safety, be sure to read the precautions and instructions in "SAFETY PRECAUTIONS" pages 1 through 10.

Notice to user

Components of WINCAPSII

The WINCAPSII package consists of the following.

Software	User's Manuals	
WINCAPSII CD-ROM (Product Version)  Note: There are three types of WINCAPSII versions as listed below.	WINCAPSII GUIDE (this book)  Note: The CD-ROM contains this book in the PDF file format.	WINCAPSII License Certificate  DENSO WINCAPS II B1200606-004-000 LICENCE SHEET Dear WINCAPSII customer: Thank you for selecting WINCAPSII. Following is your user ID. To access the full features of WINCAPSII, you need to input the user ID prinnted on this sheet. You can input the user ID from [Help] – [Licence Key] menu of WINCAPSII. Without user ID, WINCAPSII works as a demonstration version. The demonstration version can only edit "PRO1". Thank you. User ID : WC2-001-**********-**** 410002-1460

WINCAPSII Versions

Versions	Features	Appearance
WINCAPSII Product Version	This is optional WINCAPSII sold in a single software package.	
WINCAPSII Light Version	This version comes with an optional mini-pendant. (1) This is WINCAPSII version designed for the mini-pendant. (2) The "continuous monitoring" and "print" features are not available.	
WINCAPSII Trial Version (NetwoRC CD)	This version comes with the robot set. (1) Any program other than "PRO1" cannot be edited. (2) Entering a user ID upgrades the trial version to the product version. (3) This is used to upgrade existing WINCAPSII versions.	

Updating WINCAPSII

To use the newer version of the robot controller system than that of the current WINCAPSII in your PC, you need to update the WINCAPSII using the following procedure.

Updating procedure

(1) Uninstall the current WINCAPSII.

(2) Install newer version of WINCAPSII using the latest WINCAPSII CD-ROM.

NOTE: If your user ID has been entered before uninstallation, installing any of the WINCAPSII product version, light version, and trial version updates the current WINCAPSII to the product version. If you have two or more versions of CD-ROMs, use the latest one.

Required operating environments

The following operating environments are required for running WINCAPSII smoothly.

Operating Environments for the PC Teaching System Software

CPU	Pentium or higher capacity
OS	Windows 95 or upper version (See Note 1.)
Memory	32 MB or more (64 MB recommended)
Hard disk	A free area of 80 MB or more is required at installation.
Monitor resolution	640 × 480 or higher

Note 1 **WINCAPS cannot run properly on earlier versions of Windows 95.**

The version of Windows 95 can be checked with [Control Panel – System – Information]. If A, B or C is not displayed (no symbol) at the end of the version information (4.00, 95B), update your Windows 95 with the Windows 95 Service Pack 1 that is available from the Microsoft's web site.

Notes for the first use of WINCAPSII

1. Release restrictions on WINCAPSII functions

Without entry of User ID, WINCAPSII does not operate except “PRO1”, which is designed to operate for the trial purpose. On activation of WINCAPS II, the license information screen appears. Enter User ID printed in the license card.

2. Store the license card with care

The User ID printed in the license card is your purchased product number. The User ID is needed when you receive after-sales service. Keep the license card with care.

Language restriction

The same language should be used in WINCAPSII and robot controller.

The use of different languages may cause the following problems because of the difference in character code when WINCAPSII receives data from the robot controller or opens a project:

-“Programs” or “string variables” may become garbled. Also, editing or storing a garbled program or string variable may corrupt data in some cases.

-The use of a project name or file name that contains non-alphanumeric characters may prevent WINCAPSII from opening a project.

How the documentation set is organized

The documentation set consists of the following books. If you are unfamiliar with this robot and option(s), please read all books and understand them fully before operating your robot and option(s).

GENERAL INFORMATION ABOUT ROBOT - this book -

Provides the packing list of the robot and outlines of the robot system, robot unit, and robot controller.

INSTALLATION & MAINTENANCE GUIDE

Provides instructions for installing the robot components and customizing your robot, and maintenance & inspection procedures.

STARTUP HANDBOOK

Introduces you to the DENSO robot system and guides you through connecting the robot unit and controller with each other, running the robot with the teach pendant, and making and verifying a program. This manual is a comprehensive guide to starting up your robot system.

SETTING-UP MANUAL

Describes how to set up or teach your robot with the teach pendant or mini-pendant.

For the panel designer functions, refer to the Panel Designer User's Manual (SUPPLEMENT).

WINCAPSII GUIDE - this book -

Provides instructions on how to use the teaching system WINCAPSII which runs on the PC connected to the robot controller for developing and managing programs.

PROGRAMMER'S MANUAL I, Program Design and Commands

Describes the PAC programming language, program development, and command specifications in PAC. This manual consists of two parts; Part 1 provides the basic programming knowledge, and Part 2, details of individual commands.

PROGRAMMER'S MANUAL II, PAC Library

Describes the program libraries that come with WINCAPSII as standard.

CONTROLLER MANUAL

Provides the specifications, installation and maintenance of the controller. It also describes interfacing with external devices, system- and user-input/output signals, and I/O circuits.

ERROR CODE TABLES

List error codes that will appear on the teach pendant, mini-pendant, or PC screen if an error occurs in the robot series or WINCAPSII. These tables provide detailed description and recovery ways.

OPTIONS MANUAL

Describes the specifications, installation, and use of optional devices.

For the extension board "conveyer tracking board," refer to the OPTIONS MANUAL (SUPPLEMENT).

How this book is organized

This book is just one part of the documentation set. It consists of SAFETY PRECAUTIONS, ten chapters, appendices, and index

SAFETY PRECAUTIONS

Defines safety terms and related symbols and provides precautions to be observed. Be sure to read this section before operating your robot.

Chapter 1 Outline of Personal Computer Teaching System

Describes the configuration of the personal computer teaching system and its features.

Chapter 2 Setting Personal Computer Teaching System

Describes how to make connections and setting of the personal computer teaching system.

Chapter 3 Starting Teaching System and Knowing Each Manager

Describes the procedures for starting and terminating the personal computer teaching system and outlines the functions of each Manager.

Chapter 4 System Manager

Describes the functions and operation of the system manager that constitutes the nucleus of WINCAPSII software to be used for the personal computer teaching system.

Chapter 5 Operating PAC Program Manager

Describes PAC Program Manager of WINCAPSII software functions.

Chapter 6 Operating Variable Manager

Describes Variable Manager of WINCAPSII software functions.

Chapter 7 Operating DIO Manager

Describes DIO Manager of WINCAPSII software functions.

Chapter 8 Operating Arm Manager

Describes Arm Manager of WINCAPSII software functions.

Chapter 9 Operating Vision Manager

Describes Vision Manager of WINCAPSII software functions.

Chapter 10 Operating Log Manager

Describes Log Manager of WINCAPSII software functions.

SAFETY PRECAUTIONS

Be sure to observe all of the following safety precautions.

Strict observance of these warning and caution indications are a MUST for preventing accidents, which could result in bodily injury and substantial property damage. Make sure you fully understand all definitions of these terms and related symbols given below, before you proceed to the text itself.

⚠ **WARNING**	Alerts you to those conditions, which could result in serious bodily injury or death if the instructions are not followed correctly.
⚠ **CAUTION**	Alerts you to those conditions, which could result in minor bodily injury or substantial property damage if the instructions are not followed correctly.

Terminology and Definitions

Maximum space: Refers to the space which can be swept by the moving parts of the robot as defined by the manufacturer, plus the space which can be swept by the end-effector and the workpiece. (Quoted from the ISO 10218-1:2006.)

Restricted space: Refers to the portion of the maximum space restricted by limiting devices (i.e., mechanical stops) that establish limits which will not be exceeded. (Quoted from the ISO 10218-1:2006.)

Motion space: Refers to the portion of the restricted space to which a robot is restricted by software motion limits. The maximum distance that the robot, end-effector, and workpiece can travel after the software motion limits are set defines the boundaries of the motion space of the robot. (The "motion space" is DENSO WAVE-proprietary terminology.)

Operating space: Refers to the portion of the restricted space that is actually used while performing all motions commanded by the task program. (Quoted from the ISO 10218-1:2006.)

Task program: Refers to a set of instructions for motion and auxiliary functions that define the specific intended task of the robot system. (Quoted from the ISO 10218-1:2006.)

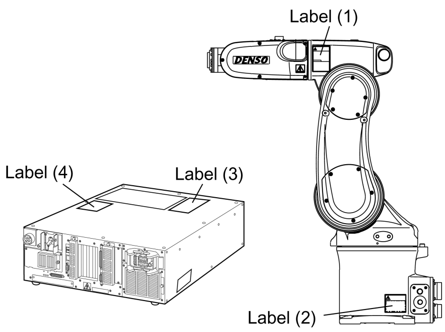
1. Introduction

This section provides safety precautions to be observed for the robot system.

The installation shall be made by qualified personal and should confirm to all national and local codes.

2. Warning Labels

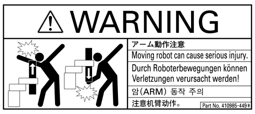
The robot unit and controller have warning labels. These labels alert the user to the danger of the areas on which they are pasted. Be sure to observe the instructions printed on those labels.

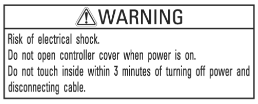


(Example: Location of labels)

<table>
<tr><th>Warning label</th><th>Instructions printed on the label</th></tr>
<tr><td>

Label (1)</td><td>Risk of injury.
Never enter the restricted space.</td></tr>
<tr><td><Except HM>


<HM>


Label (2)</td><td><u>For UL-Listed robot units only</u>
Risk of injury.
This label alerts the user that pressing the brake release switch could drop the arm.</td></tr>
<tr><td>

Label (3)</td><td>Risk of electrical shock.
Never open the controller cover when the power is on.
Never touch the inside of the controller for at least 3 minutes even after turning the power off and disconnecting the power cable.</td></tr>
<tr><td>

Label (4)</td><td>Risk of injury.
Be sure to perform lockout/tagout before starting servicing.
Turning the power ON when a person is inside the safety fence may move the arm, causing injuries.</td></tr>
</table>

3. Installation Precautions

3.1 Insuring the proper installation environment

- **For standard type**

The standard type has not been designed to withstand explosions, dust-proof, nor is it splash-proof. Therefore, it should not be installed in any environment where:

(1) there are flammable gases or liquids,

(2) there are any shavings from metal processing or other conductive material flying about,

(3) there are any acidic, alkaline or other corrosive gases,

(4) there is cutting or grinding oil mist,

(5) it may likely be submerged in fluid,

(6) there is sulfuric cutting or grinding oil mist, or

(7) there are any large-sized inverters, high output/high frequency transmitters, large contactors, welders, or other sources of electrical noise.

- **For dust- & splash-proof type**

The dust- & splash-proof type has an IP54-equivalent structure, but it has not been designed to withstand explosions. (The HM/HS-G-W and the wrist of the VM/VS-G-W are an IP65-equivalent dust- and splash-proof structure.)

Note that the robot controller is not a dust- or splash-proof structure. Therefore, when using the robot controller in an environment exposed to mist, put it in an optional protective box.

The dust- & splash-proof type should not be installed in any environment where:

(1) there are any flammable gases or liquids,

(2) there are any acidic, alkaline or other corrosive gases,

(3) there are any large-sized inverters, high output/high frequency transmitters, large contactors, welders, or other sources of electrical noise,

(4) it may likely be submerged in fluid,

(5) there are any grinding or machining chips or shavings,

(6) any machining oil not specified in this manual is in use, or

Note: Yushiron Oil No. 4C (non-soluble) is specified.

(7) there is sulfuric cutting or grinding oil mist.

3.2 Service space

The robot and peripheral equipment should be installed so that sufficient service space is maintained for safe teaching, maintenance, and inspection.

3.3 Control devices outside the robot's restricted space

The robot controller, teach pendant and mini-pendant should be installed outside the robot's restricted space and in a place where you can observe all of the robot’s movements and operate the robot easily.

3.4 Positioning of gauges

Pressure gauges, oil pressure gauges and other gauges should be installed in an easy-to-check location.

3.5 Protection of electrical wiring and hydraulic/pneumatic piping

If there is any possibility of the electrical wiring or hydraulic/pneumatic piping being damaged, protect them with a cover or similar item.

3.6 Grounding resistance

The grounding resistance of the robot power supply should not be more than 100Ω.

3.7 Positioning of emergency stop switches

Emergency stop switches should be provided in a position where they can be reached easily should it be necessary to stop the robot immediately.

(1) The emergency stop switches should be red.

(2) Emergency stop switches should be designed so that they will not be released after pressed, automatically or mistakenly by any other person.

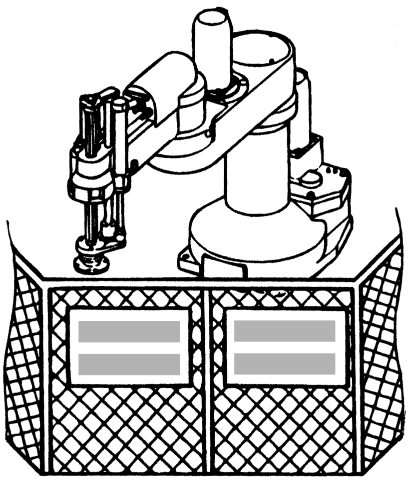
(3) Emergency stop switches should be separate from the power switch.

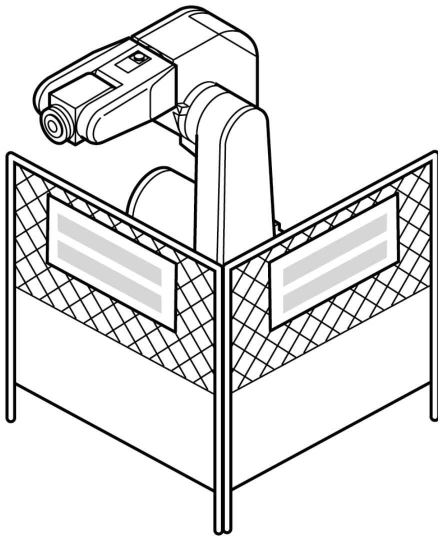
3.8 Positioning of operating status indicators

Operating status indicators should be positioned in such a way where workers can easily see whether the robot is on a temporary halt or on an emergency or abnormal stop.

Note: The UL-Listed robot units have motor ON lamps on their robot arms.

3.9 Setting-up a safety fence





A safety fence should be set up so that no one can easily enter the robot's restricted space.

(1) The fence should be constructed so that it cannot be easily moved or removed.

(2) The fence should be constructed so that it cannot be easily damaged or deformed through external force.

(3) Establish the exit/entrance to the fence. Construct the fence so that no one can easily get past it by climbing over the fence.

(4) The fence should be constructed to ensure that it is not possible for hands or any other parts of the body to get through it.

(5) Take any one of the following protections for the entrance/exit of the fence:

1) Place a door, rope or chain across the entrance/exit of the fence, and fit it with an interlock that ensures the emergency stop device operates automatically if it is opened or removed.

2) Post a warning notice at the entrance/exit of the fence stating "In operation--Entry forbidden" or "Work in progress--Do not operate" and ensure that workers follow these instructions at all times.

When making a test run, before setting up the fence, place an overseer in a position outside the robot’s restricted space and one in which he/she can see all of the robot’s movements. The overseer should prevent workers from entering the robot's restricted space and be devoted solely to that task.

3.10 Setting the robot's motion space

The area required for the robot to work is called the robot's operating space.

If the robot’s motion space is greater than the operating space, it is recommended that you set a smaller motion space to prevent the robot from interfering or disrupting other equipment.

Refer to the INSTALLATION & MAINTENANCE GUIDE, Chapter 2.

3.11 No robot modification allowed

Never modify the robot unit, robot controller, teach pendant or other devices.

3.12 Cleaning of tools

If your robot uses welding guns, paint spray nozzles, or other end-effectors requiring cleaning, it is recommended that the cleaning process be carried out automatically.

3.13 Lighting

Sufficient illumination should be assured for safe robot operation.

3.14 Protection from objects thrown by the end-effector

If there is any risk of workers being injured in the event that the object being held by the end-effector is dropped or thrown by the end-effector, consider the size, weight, temperature and chemical nature of the object and take appropriate safeguards to ensure safety.

3.15 Affixing the warning label

Place the warning label packaged with the robot on the exit/entrance of the safety fence or in a position where it is easy to see.

4. Precautions while Robot is Running

⚠ **Warning**

Touching the robot while it is in operation can lead to serious injury. Please ensure the following conditions are maintained and that the cautions listed from Section 4.1 and onwards are followed when any work is being performed.

1) Do not enter the robot's restricted space when the robot is in operation or when the motor power is on.
2) As a precaution against malfunction, ensure that an emergency stop device is activated to cut the power to the robot motor upon entry into the robot's restricted space.
3) When it is necessary to enter the robot's restricted space to perform teaching or maintenance work while the robot is running, ensure that the steps described in Section 4.3 "Ensuring safety of workers performing jobs within the robot's restricted space" are taken.

4.1 Creation of working regulations and assuring worker adherence

When entering the robot’s restricted space to perform teaching or maintenance inspections, set "working regulations" for the following items and ensure workers adhere to them.

(1) Operating procedures required to run the robot.

(2) Robot speed when performing teaching.

(3) Signaling methods to be used when more than one worker is to perform work.

(4) Steps that must be taken by the worker in the event of a malfunction, according to the contents of the malfunction.

(5) The necessary steps for checking release and safety of the malfunction status, in order to restart the robot after robot movement has been stopped due to activation of the emergency stop device

(6) Apart from the above, any steps below necessary to prevent danger from unexpected robot movement or malfunction of the robot.

   1) Display of the control panel (See Section 4.2 on the next page.)
   2) Assuring the safety of workers performing jobs within the robot's restricted space (See Section 4.3 on the next page.)
   3) Maintaining worker position and stance

      Position and stance that enables the worker to confirm normal robot operation and to take immediate refuge if a malfunction occurs.

4) Implementation of measures for noise prevention
5) Signaling methods for workers of related equipment
6) Types of malfunctions and how to distinguish them

Please ensure "working regulations" are appropriate to the robot type, the place of installation and to the content of the work.

Be sure to consult the opinions of related workers, engineers at the equipment manufacturer and that of a labor safety consultant when creating these "working regulations".

4.2 Display of operation panel

To prevent anyone other than the worker from accessing the start switch or the changeover switch by accident during operation, display something to indicate it is in operation on the operation panel or teach pendant. Take any other steps as appropriate, such as locking the cover.

4.3 Ensuring safety of workers performing jobs within the robot's restricted space

When performing jobs within the robot's restricted space, take any of the following steps to ensure that robot operation can be stopped immediately upon a malfunction.

(1) Ensure an overseer is placed in a position outside the robot's restricted space and one in which he/she can see all robot movements, and that he/she is devoted solely to that task.
   ① An emergency stop device should be activated immediately upon a malfunction.
   ② Do not permit anyone other than the worker engaged for that job to enter the robot's restricted space.

(2) Ensure a worker within the robot's restricted space carries the portable emergency stop switch so he/she can press it (the emergency button on the teach pendant) immediately if it should be necessary to do so.

4.4 Inspections before commencing work such as teaching

Before starting work such as teaching, inspect the following items, carry out any repairs immediately upon detection of a malfunction and perform any other necessary measures.

(1) Check for any damage to the sheath or cover of the external wiring or to the external devices.
(2) Check that the robot is functioning normally or not (any unusual noise or vibration during operation).
(3) Check the functioning of the emergency stop device.
(4) Check there is no leakage of air or oil from any pipes.
(5) Check there are no obstructive objects in or near the robot's restricted space.

4.5 Release of residual air pressure

Before disassembling or replacing pneumatic parts, first release any residual air pressure in the drive cylinder.

4.6 Precautions for test runs

Whenever possible, have the worker stay outside of the robot's restricted space when performing test runs.

4.7 Precautions for automatic operation

(1) At start-up

Before the robot is to be started up, first check the following items as well as setting the signals to be used and perform signaling practice with all related workers.

1) Check that there is no one inside the robot's restricted space.

2) Check that the teach pendant and tools are in their designated places.

3) Check that no lamps indicating a malfunction on the robot or related equipment are lit.

(2) Check that the display lamp indicating automatic operation is lit during automatic operation.

(3) Steps to be taken when a malfunction occurs

Should a malfunction occur with the robot or related equipment and it is necessary to enter the robot's restricted space to perform emergency maintenance, stop the robot's operation by activating the emergency stop device. Take any necessary steps such as placing a display on the starter switch to indicate work is in progress to prevent anyone from accessing the robot.

4.8 Precautions in repairs

(1) Do not perform repairs outside of the designated range.

(2) Under no circumstances should the interlock mechanism be removed.

(3) When opening the robot controller's cover for battery replacement or any other reasons, always turn the robot controller power off and disconnect the power cable.

(4) Use only spare tools specified in this manual.

5. Daily and Periodical Inspections

(1) Be sure to perform daily and periodical inspections. Before starting jobs, always check that there is no problem with the robot and related equipment. If any problems are found, take any necessary measures to correct them.

(2) When carrying out periodical inspections or any repairs, maintain records and keep them for at least 3 years.

6. Management of Floppy Disks

(1) Carefully handle and store the "Initial settings" floppy disks packaged with the robot, which store special data exclusively prepared for your robot.

(2) After finishing teaching or making any changes, always save the programs and data onto floppy disks.

Making back-ups will help you recover if data stored in the robot controller is lost due to the expired life of the back-up battery.

(3) Write the names of each of the floppy disks used for storing task programs to prevent incorrect disks from loading into the robot controller.

(4) Store the floppy disks where they will not be exposed to dust, humidity and magnetic field, which could corrupt the disks or data stored on them.

7. Safety Codes

The safety standards relating to robot systems are listed below.

As well as observing the safety precautions given in this manual, ensure compliance with all local and national safety and electrical codes for the installation and operation of the robot system.

Standards	Title
ANSI/RIA R15.06-1999	Industrial Robots and Robot Systems--Safety Requirements
ANSI/UL1740: 1998	Safety for Robots and Robotic Equipment
CAN/CSA Z434-03	Industrial Robots and Robot Systems--General Safety Requirements
ISO10218-1: 2006	Robots for industrial environments--Safety requirements--Part 1: Robot
NFPA 79: 2002	Electrical Standard for Industrial Machinery

CONTENTS

CHAPTER 9 OPERATING VISION MANAGER

CHAPTER 10 OPERATING LOG MANAGER

Chapter 1

Outline of Personal Computer Teaching System

This chapter describes the configuration of the personal computer teaching system and its features.

1.1 Features of Personal Computer Teaching System

The personal computer teaching system is designed to make program development and verification efficient by connecting a personal computer to the robot controller.
It is possible to use this system to verify the robot program and/or data from a remote point using the telephone line.
The WINCAPSII software, when installed on a personal computer, provides advanced functions that include robot motion simulation, variables and I/O in the software, and program file management of each project. These features are most efficiently exercised in the development and/or control of programs.

Note: For information regarding the specifications of the necessary personal computer and for an outline of the personal computer teaching system software function, refer to "General Information about WINCAPSII Personal Computer Teaching System Software" in the OPTIONS MANUAL.

1.2 System Configuration

The following three methods are available for connecting the robot controller to the personal computer:

(1) RS232C connection
(2) Ethernet connection
(3) Modem connection

Each of these connection methods is explained below.

1.2.1 RS232C Connection

This connection method uses an RS232C standard serial communication port. Figure 1-1 shows the position of the RS232C communication port on the robot controller.
Use the cross cable that conforms to the specifications described in "Communication Cable" of the OPTIONS MANUAL.

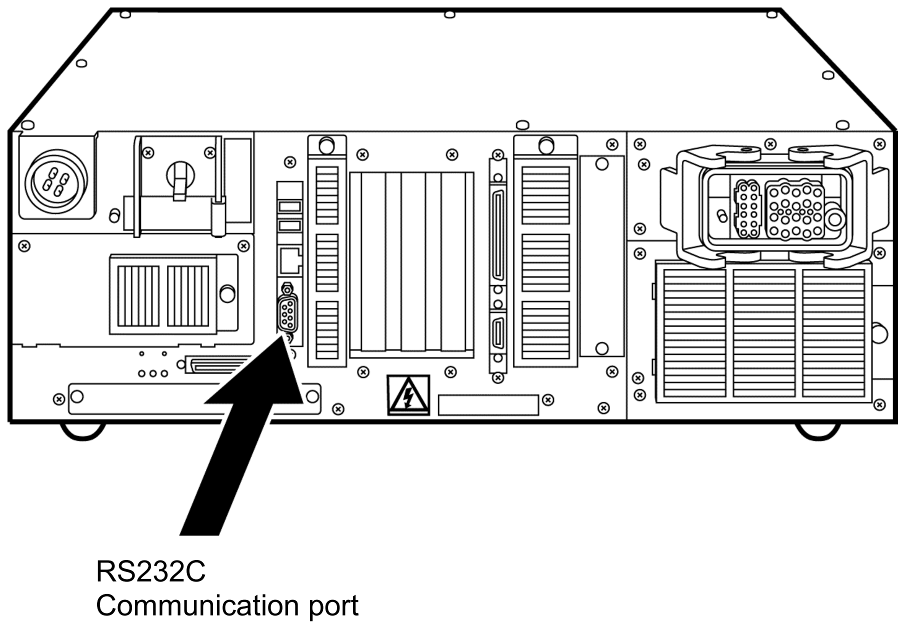


Fig. 1-1 RS232C Communication Port on Robot Controller

Figure 1-2 shows the configuration of the personal computer teaching system connected with RS232C.

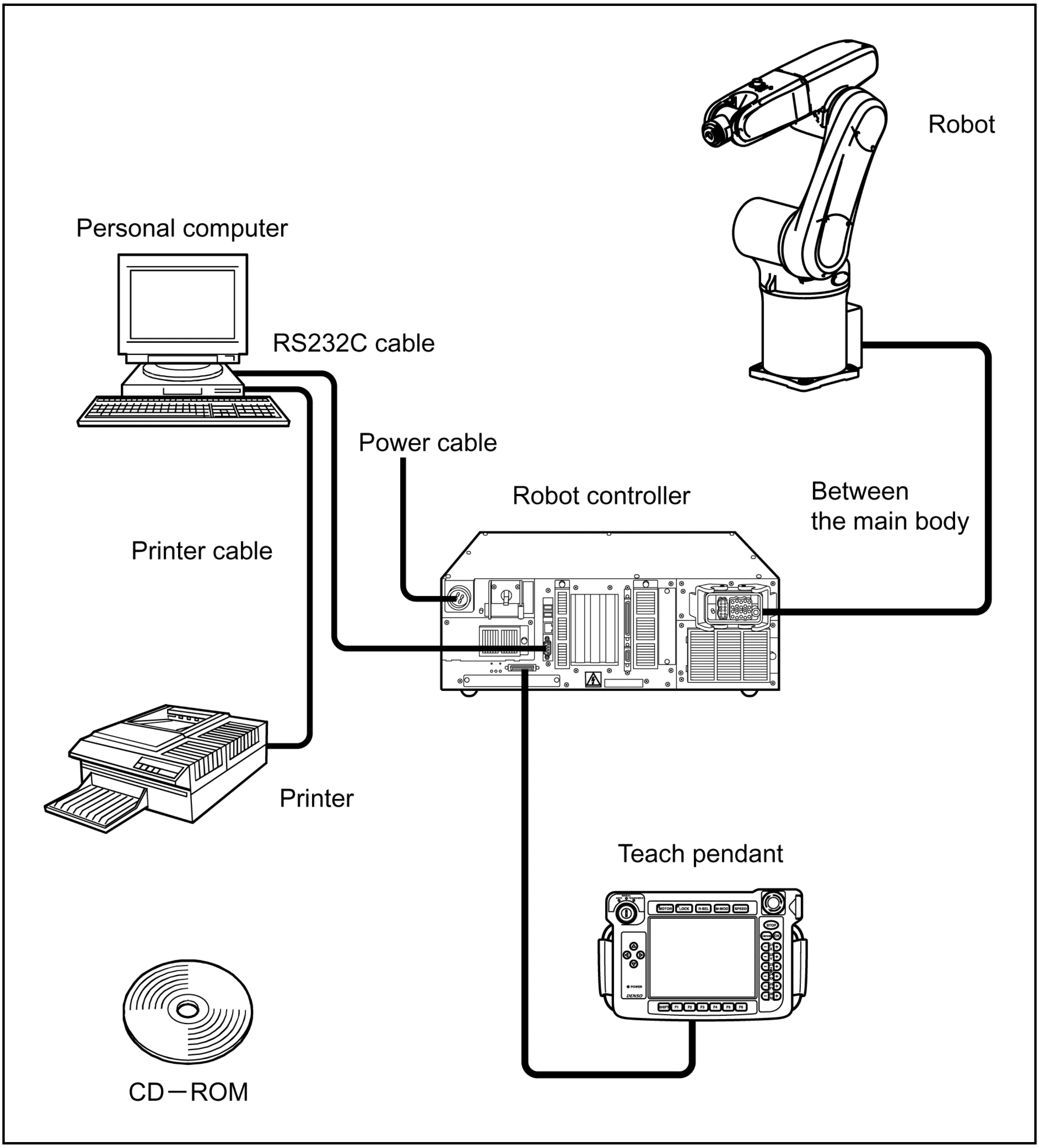


Fig. 1-2 Configuration of Personal Computer Teaching System Connected with RS232C

1.2.2 Ethernet Connection

This connection method uses an Ethernet communication network.
To effect this connection, ensure that the personal computer is compatible with Ethernet and can be connected to the network.
The RC5 robot controller requires an optional Ethernet board to be mounted.

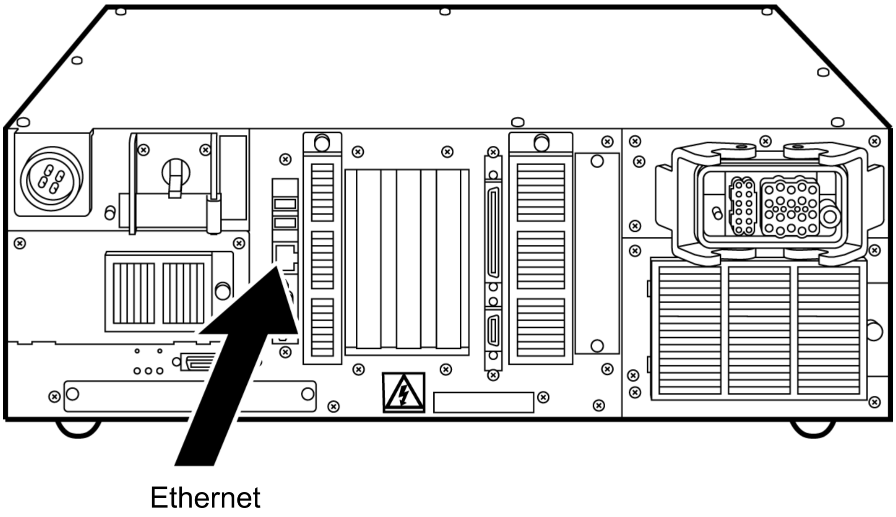


Fig. 1-3 Location of Ethernet Board

Figure 1-4 shows the configuration of a personal computer teaching system connected with Ethernet. Determine the connection to the network by consulting with the network administrator.

Notes: (1) For direct connection between the robot controller and a computer via Ethernet, use a cross cable. For connection using a hub, use a straight cable.
(2) Multiple personal computers may be connected to the network, but they cannot establish communication with the robot controller simultaneously.

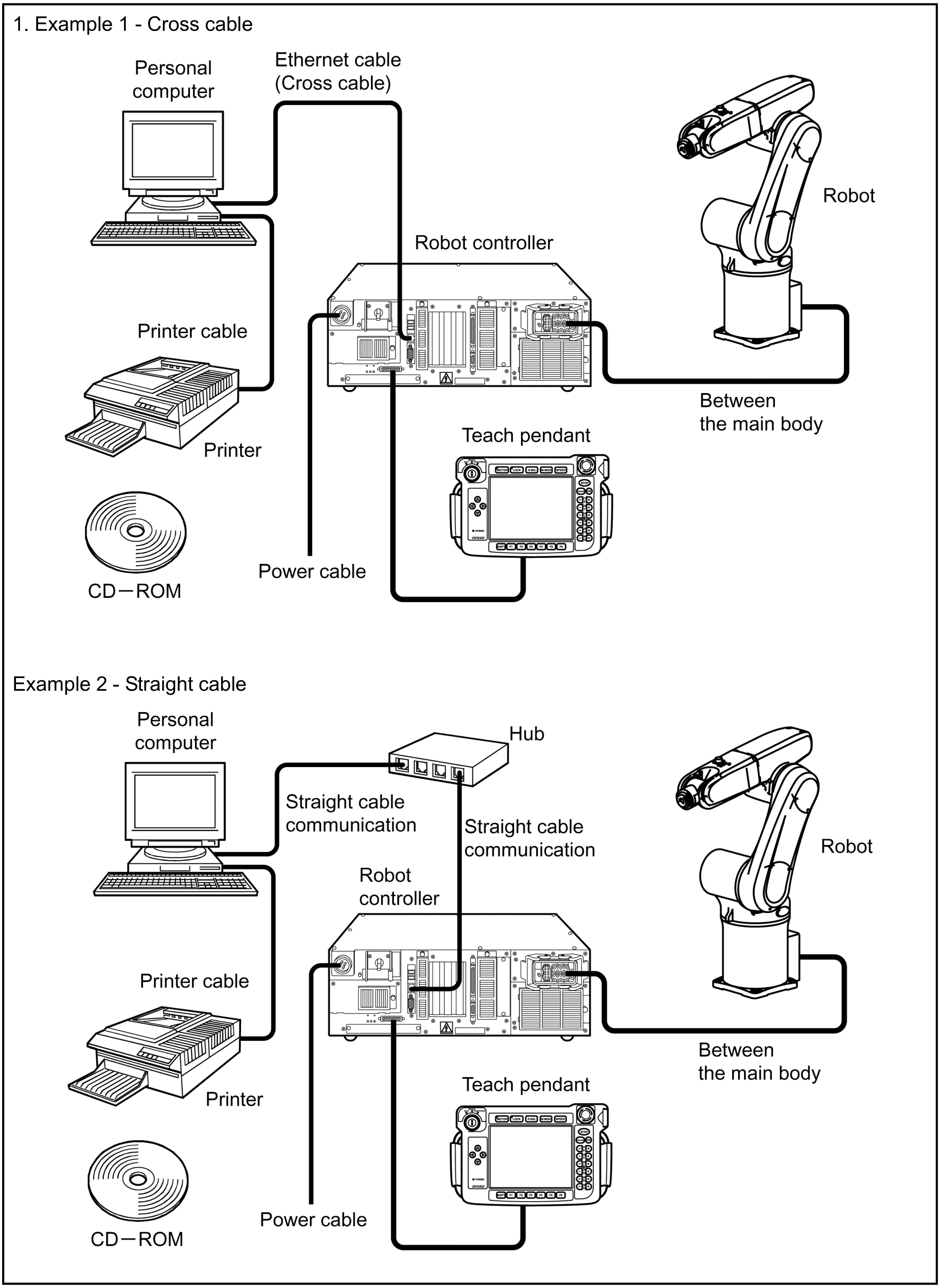


Fig. 1-4 Configuration of Personal Computer Teaching System Connected with Ethernet

1.2.3 Modem Connection

This subsection describes how to connect the robot with a remote personal computer through the telephone by connecting a modem to the RS232C communication port of the robot controller.
This connection method requires a serial communication port obtained by connecting a modem to the personal computer.
Figure 1-5 shows the RS232C communication port of the robot controller to which the modem is connected.
Refer to “Communication Cable” in the OPTIONS MANUAL regarding the communication cable for connection with a modem. Select the cable that meets the specifications of the modem to be used.

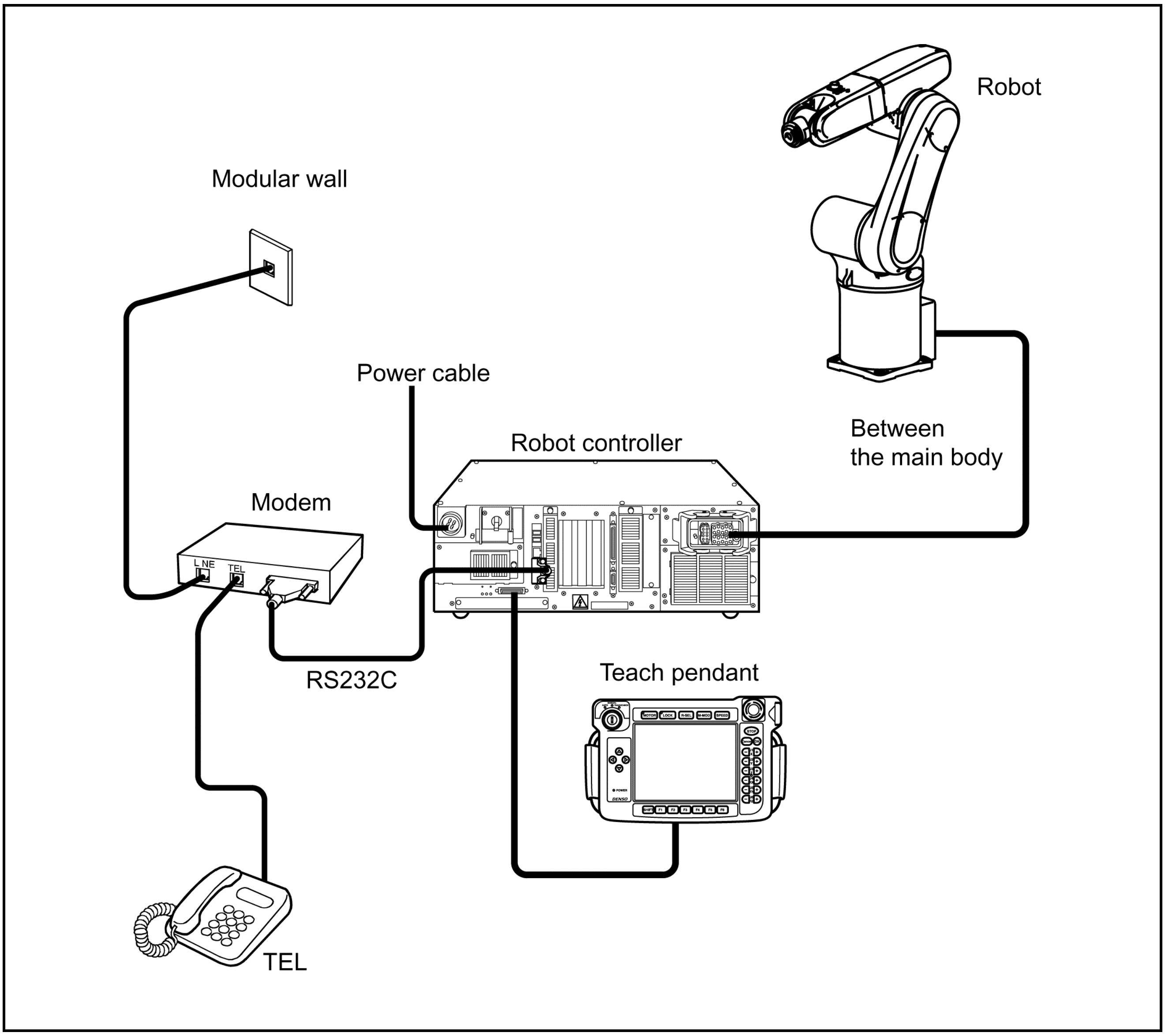


Fig. 1-5 Connection of the Robot Controller and Modem

Figure 1-6 shows the configuration of the personal computer teaching system connected with a modem.

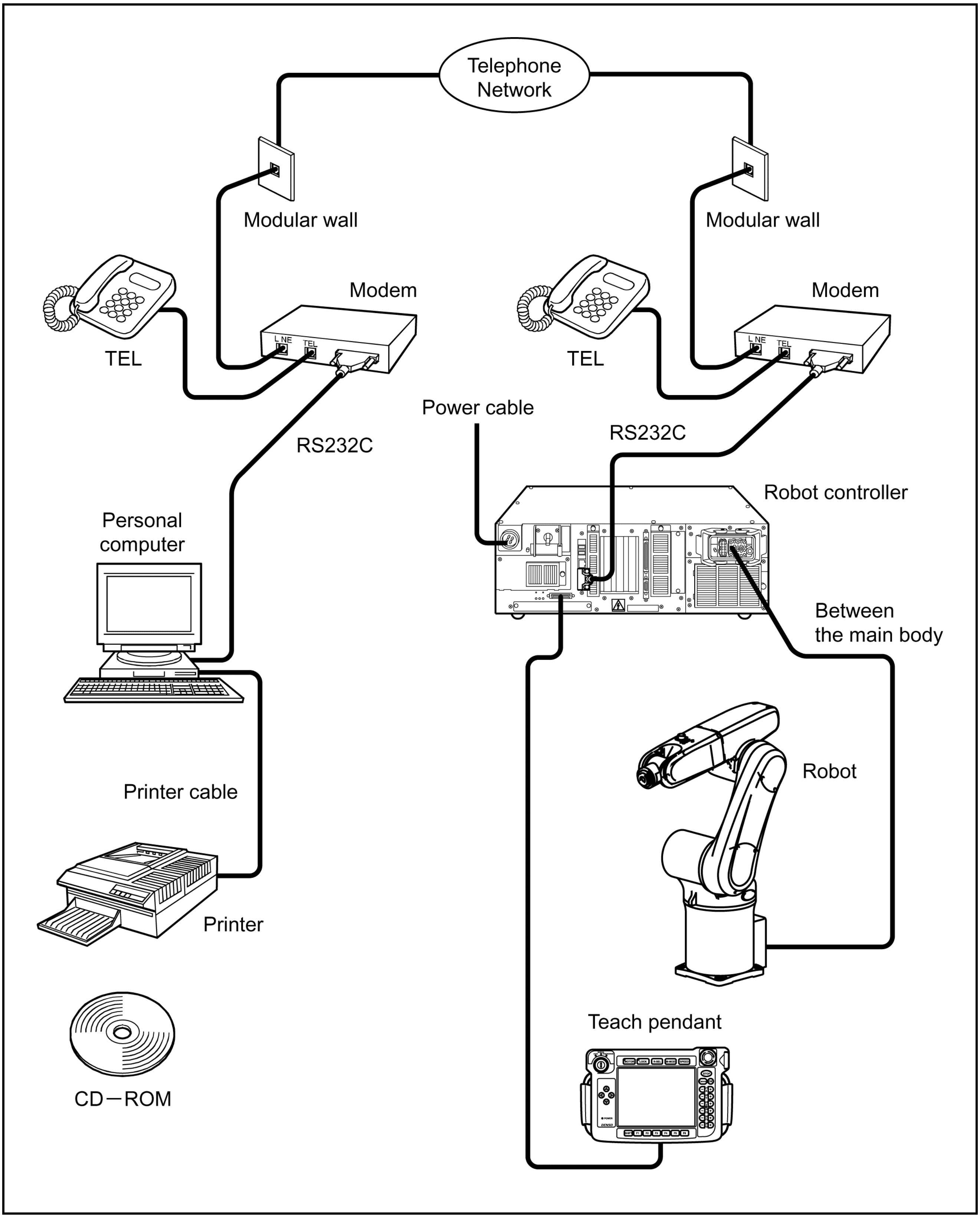


Fig. 1-6 Configuration of Personal Computer Teaching System Connected with a Modem

1.3 Security

For data control security reasons, the personal computer teaching system divides users into two levels to limit operation and information that can be can accessed.
Higher order users are identified via password to allow access to higher operation and information.

1.3.1 User Level

Table 1-1 indicates user levels.

Table 1-1 User Level

User level	Description
Operator	Not allowed to modify contents. No password is required.
Programmer	May modify contents except system critical items. Password is required for access. For initial access enter an optional password. This will be automatically registered as the password.

Note: The range of accessible information varies with the user level. If necessary information is not printed by printing operation, select Re-Login from the Tools menu of the System Manager to change the user level and proceed with printing again. For information regarding Re-Login, refer to "4.3.3 Re-Log In".

1.3.2 Password

The user will be prompted to enter a password in the following cases:

- When starting WINCAPSII
- Immediately upon selecting **Set** in each Manager
- Immediately upon selecting **Print** in each Manager

Once correctly entered, the password will not be requested before the session is over.

When a password is required, the Password window as shown in Fig. 1-7 will appear. Select the user level from the popup menu and enter the password correctly as required. Press **OK** to proceed.
When using the system for the first time, enter an optional password. It will be automatically registered.

Note: A distinction is made between upper and lower case letters in the password.

Fig. 1-7 Password

To change the user level during processing, select Re-Login from the Tools menu of the System Manager, change the user level and enter the password again.

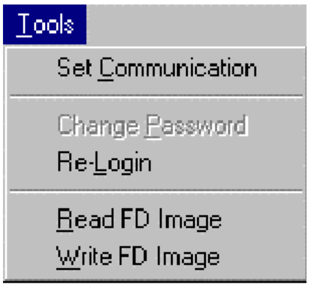


Fig. 1-8 Re-Login

Fig. 1-9 Password

Note: The user level is referred to when opening dialogue boxes. To change the user level when the dialogue box has already been opened by Set or Print command, close the dialogue box once, and reopen it. The new user level will then be enabled.

Chapter 2

Setting Personal Computer Teaching System

This chapter describes how to connect and set the personal computer teaching system.

2.1 Installing WINCAPSII Software

Install the WINCAPSII software on the personal computer to use the personal computer teaching system.

Note (1): If the WINCAPSII software is already installed on the computer, first uninstall the existing WINCAPSII software and then reinstall it. For uninstall procedure, refer to "2.1.2 Uninstall".
Note (2): Always install or uninstall the software after quitting all the applications currently running. Shared components in operation cannot be installed or uninstalled. If a shared component that WINCAPSII is to use is being used by another application, the install/uninstall process may fail.
Note (3): During installation of WINCAPSII, the message "Error has occurred during file copying" may appear depending upon the PC environments. This is because any other application is using the file to which WINCAPSII is attempting to overwrite. Ignore the message and continue installation.

2.1.1 Installation Procedures

Install the WINCAPS II according to the following procedure.

STEP 1

Terminate all the currently running applications.

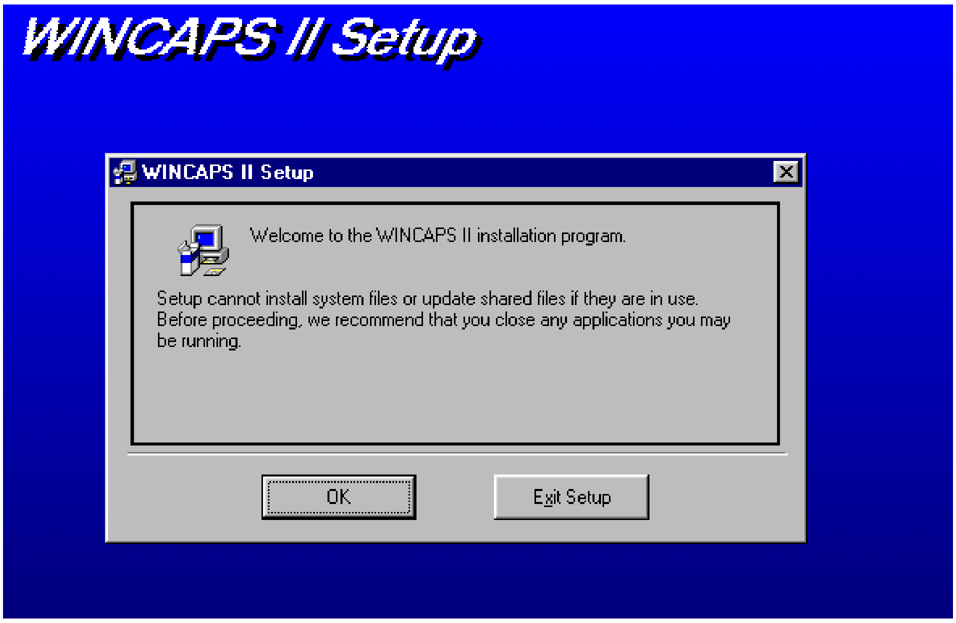
STEP 2

Insert the WINCAPS II CD-ROM in a CD-ROM drive of your personal computer.
Denso NetwoRC screen appears. Select "Install WINCAPS II" from the menu.
If the screen does not appear, proceed to the STEP 3.

Note: f you install the WINCAPS II from the floppy disks, proceed to the STEP 3.

STEP 3

Click Start at Windows 95 and then click Run. Type the WINCAPS II installer name in the Open box and click OK.



Drive E is for CD-ROM (Example)

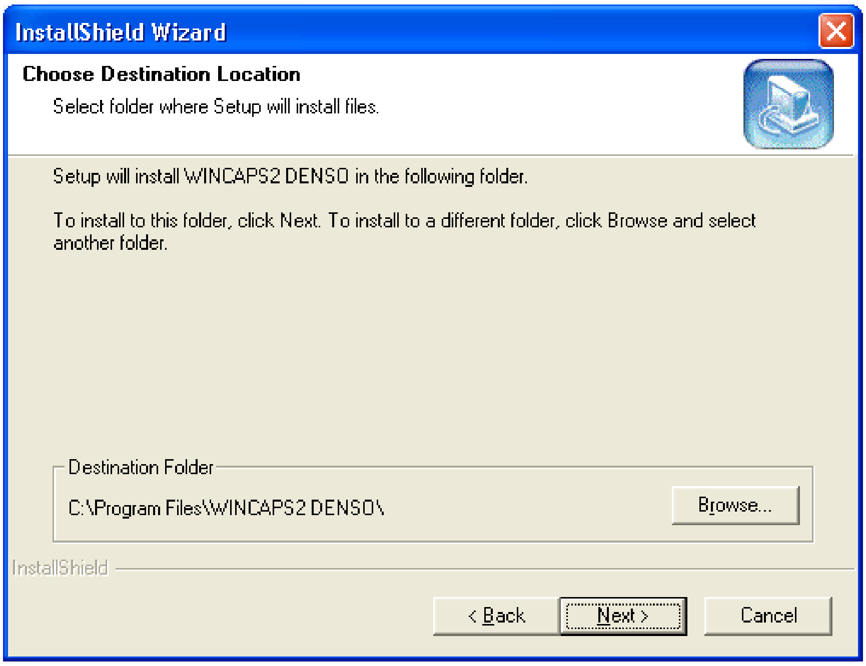
Note: When loading software from floppy disks, insert DISK-1 into a floppy disk drive and then select Setup.exe file.

▸ STEP 4

Click on OK in the WINCAPSII Setup window to start the WINCAPSII Setup program.

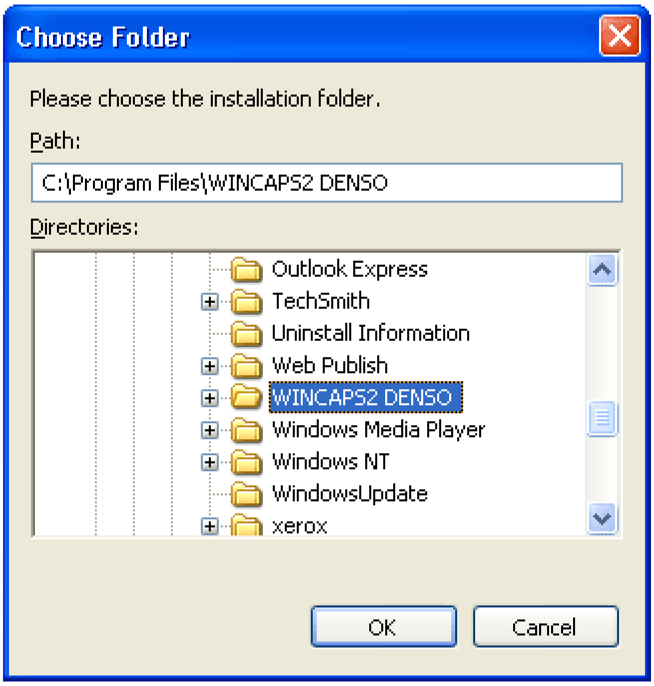
▸ STEP 5

The directory where WINCAPSII will be installed is indicated at Directory.
If OK, click on  button to start setup. Proceed to STEP 13.
To change the directory (not recommended), click on Change Directory.



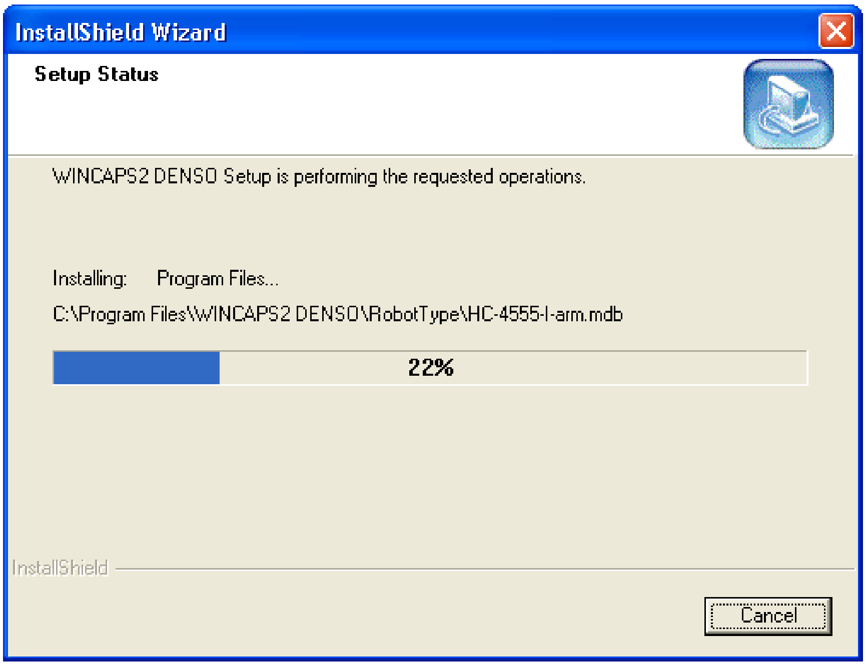
▸ STEP 6

Enter a desired directory for installation. Click on OK to start Installation.
Hereafter, proceed with your operation interactively according to the messages displayed on the screen.



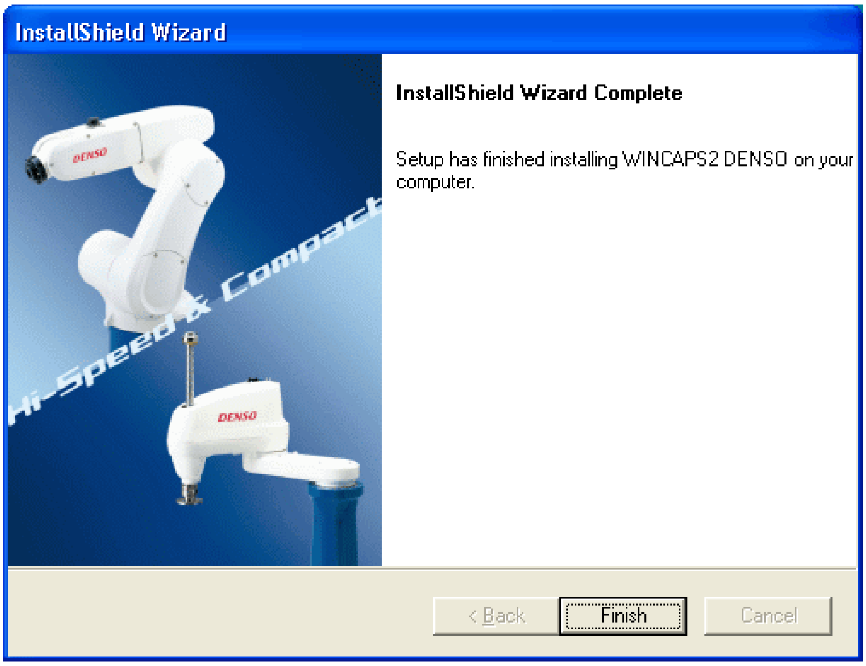
▶ STEP 7

Installation starts and the progress is indicated via a bar graph.



▶ STEP 8

When installation is completed, the following message will appear on the screen. Click on OK.



▶ STEP 9

Restart Windows 95.
WINCAPSII is then ready for use.

2.1.2 Uninstall

Note: Always quit all the applications currently running before you install or uninstall software. Shared components, if they are running, cannot be installed or uninstalled. If a shared component that WINCAPSII is to use is being used by another application, the install/uninstall process may fail.

STEP 1

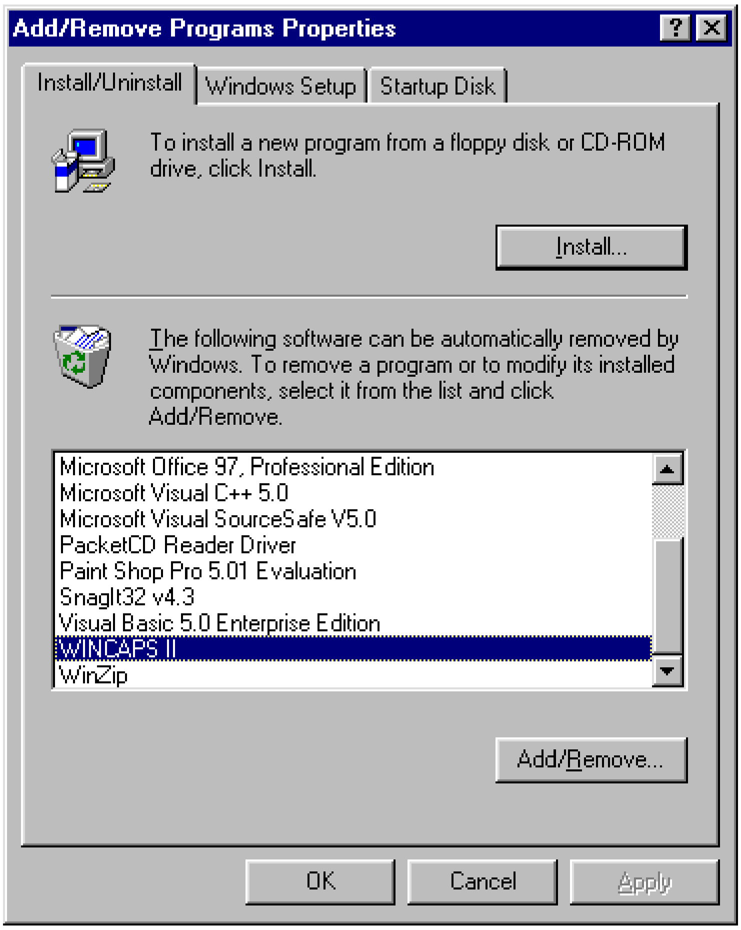
Click on Start at Windows 95 and select and open Control Panel from the Settings menu.

STEP 2

Double click on Add/Remove Programs in the Control Panel window.

STEP 3

The dialogue box for Add/Remove Programs Properties appears on the screen. Click on Install/Uninstall tab and select WINCAPSII.



STEP 4

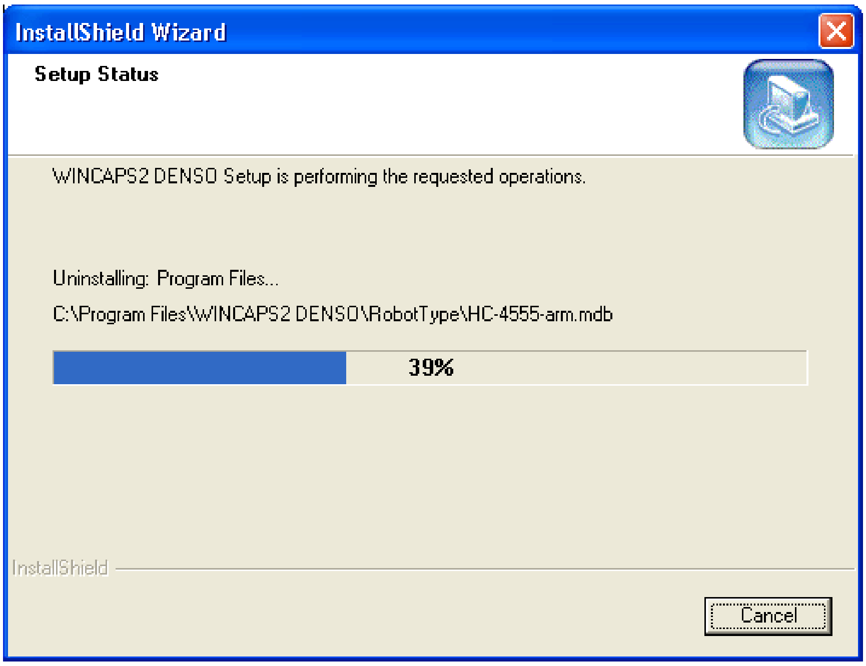
Click on Add/Remove .... .

STEP 5

Click on Yes in the Application Removal dialogue box. (All non-shared components are deleted.)

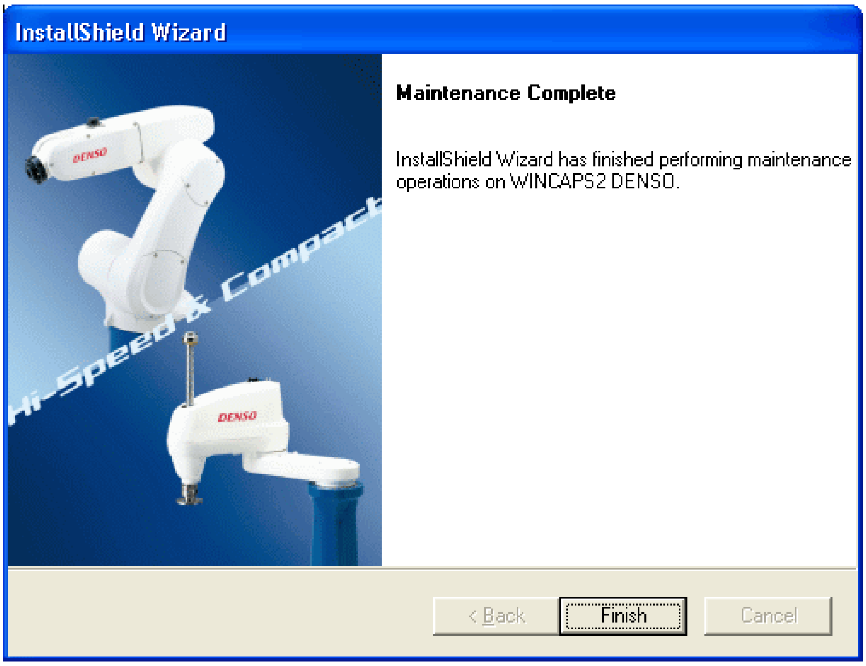
▸ STEP 6

Uninstall begins.
If the Shared Component window appears in the middle of the screen, click on Remove None. (Shared components are not deleted.)



▸ STEP 7

Upon completion of uninstall, a dialogue box for confirming completion of processing will appear on the screen. Click on OK.



▸ STEP 8

Upon completion of uninstall, restart Windows 95.

Note: Files created by WINCAPSII (such as *.pac, *.ini, etc.) are not deleted by uninstall operation. Delete files manually as needed.

2.2 How to Connect Personal Computer and Controller

This section describes each of the three types of connections between the personal computer and the controller.

Note: Always turn both the personal computer and the controller OFF before proceeding with connection work. Otherwise the equipment may be damaged.

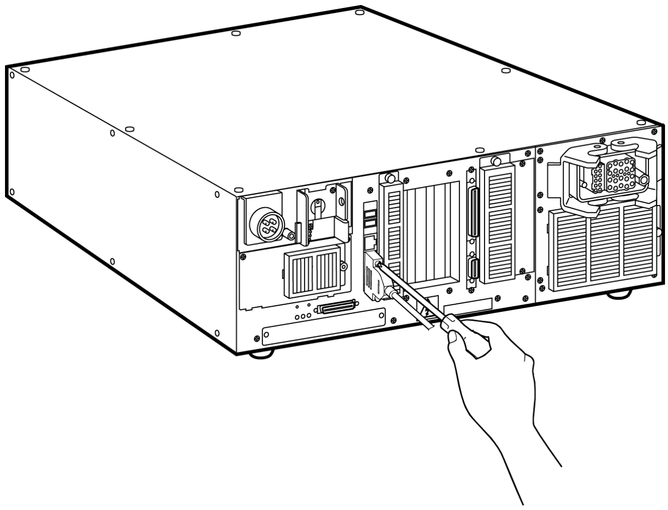
2.2.1 RS232C

This subsection describes RS232C connection. Use the COM2 port on the robot controller for communication with the personal computer.
For connection between the computer and other peripheral equipment, refer to respective instruction manuals.

2.2.1.1 Connecting Cable

STEP 1

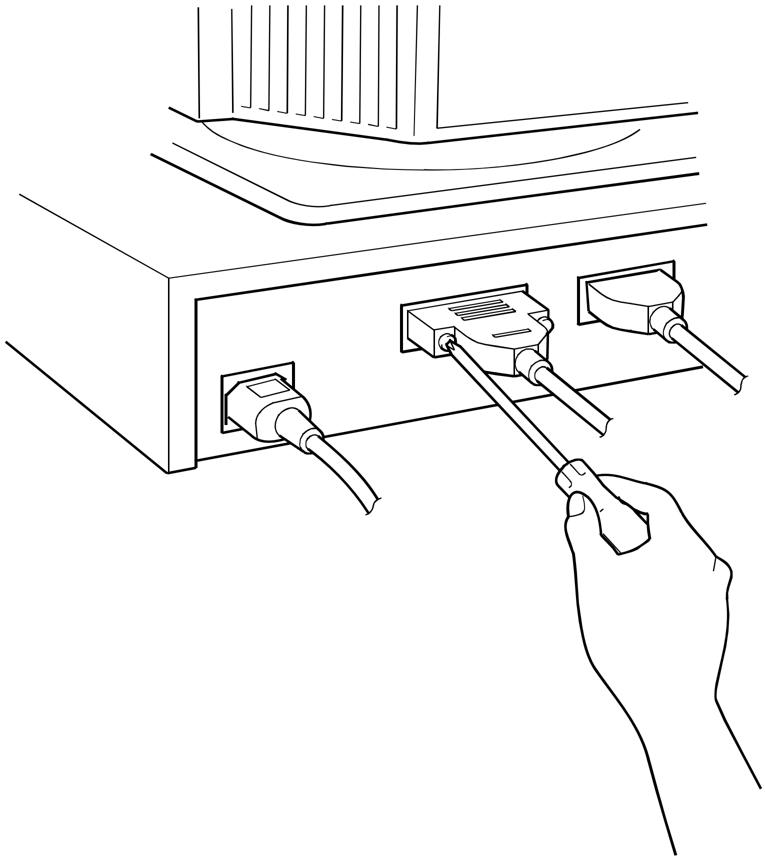
Connect an RS232C communication cross-cable to the robot controller. Insert it securely in the controller and tighten the screws.



Connection of Robot Controller and RS232C Communication Cable

▸ STEP 2

Connect the other end of the RS232C communication cross-cable to the communication port on the personal computer. Insert it securely in the computer and tighten the screws.



Connection of Personal Computer and

RS232C Communication Cable

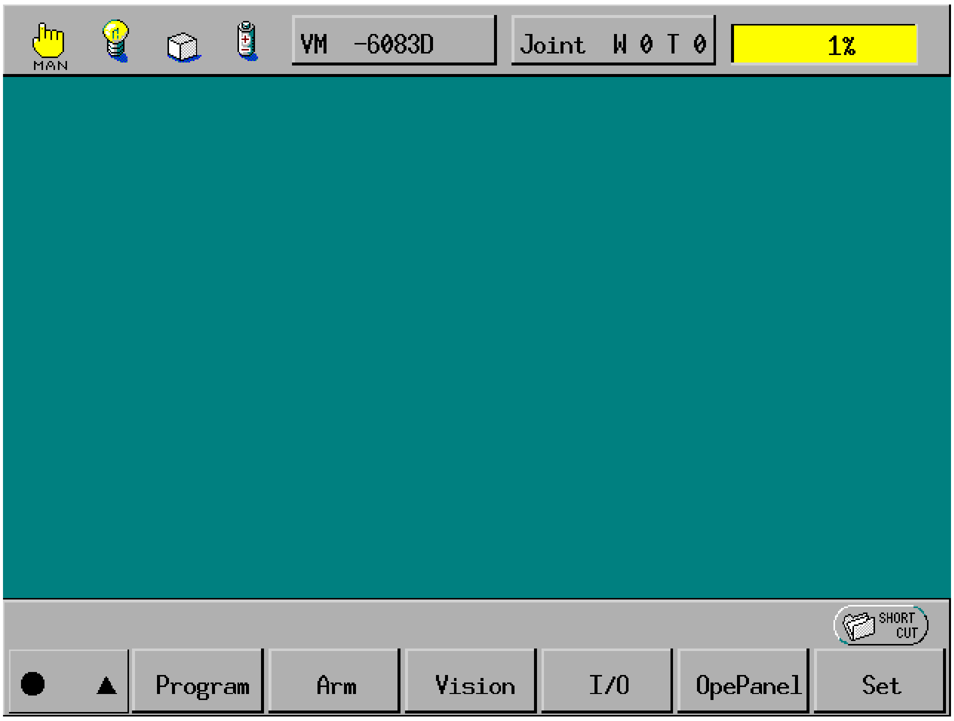
2.2.1.2 Setting Robot Controller

Set up the robot controller to use the RS232C port for the personal computer teaching system. Make this setting using the teaching pendant.

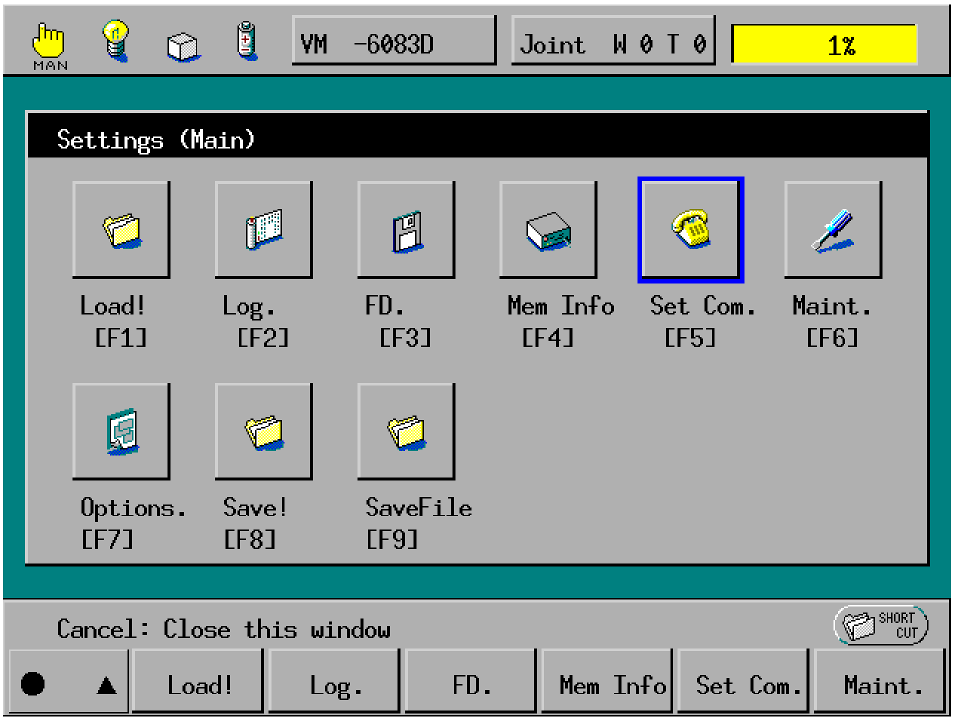
STEP 1

F6

Press F6 Set on the teaching pendant basic screen.



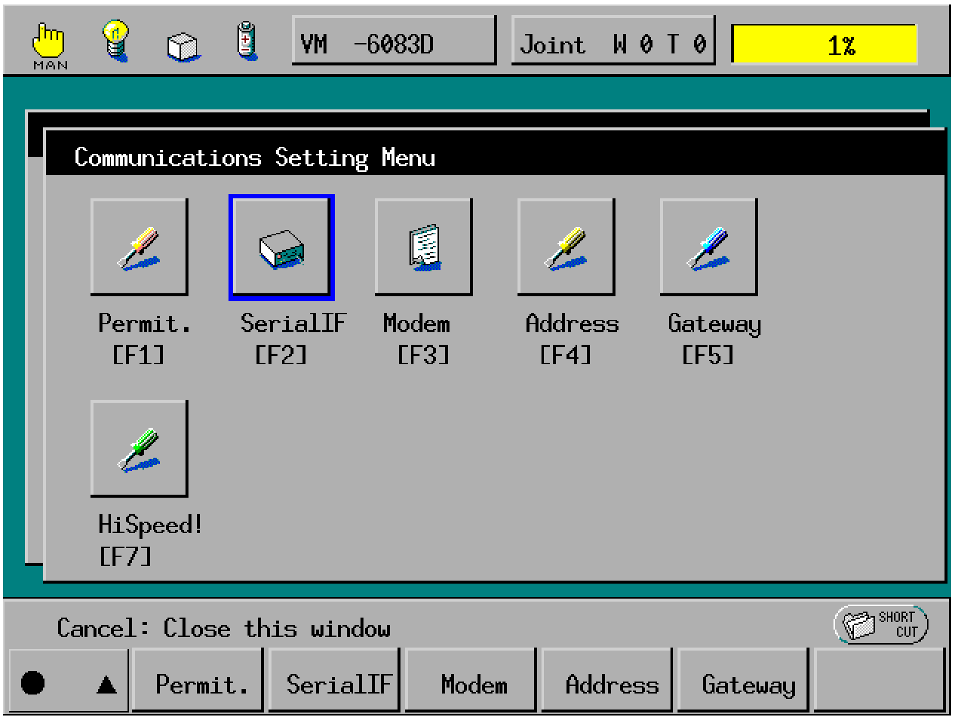
The Settings (Main) window will appear on the screen.



STEP 2

F4

Press F4 Set Com.
The Communications Setting Menu appears on the screen.



STEP 3

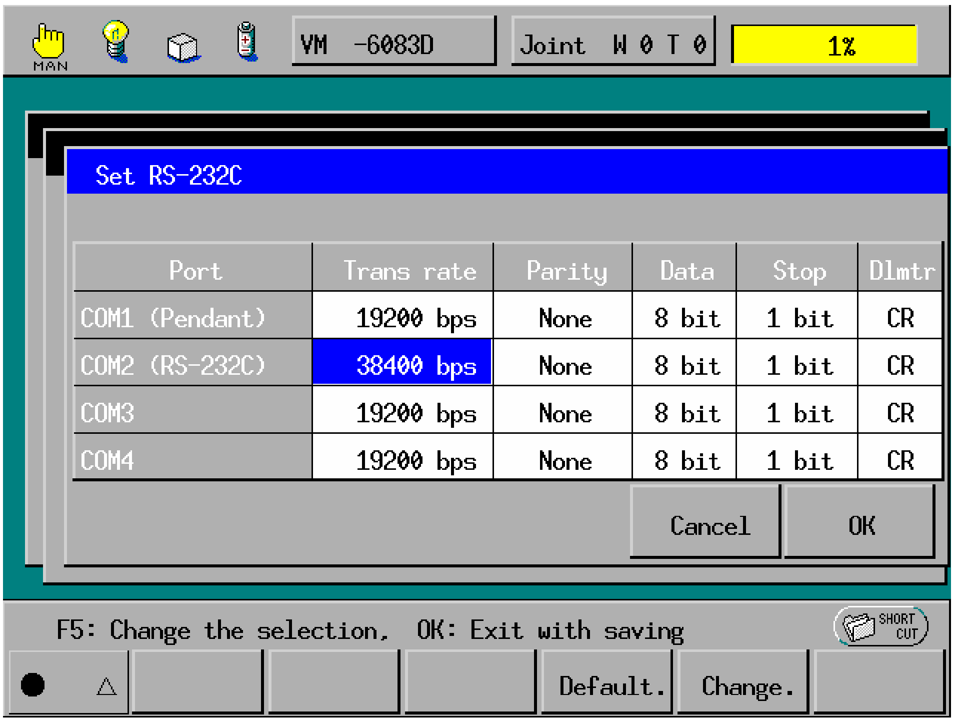
F2

Press F2 Serial IF.
The Set RS-232C window appears on the screen.

STEP 4

F5

Select COM2 and press F5 Change.

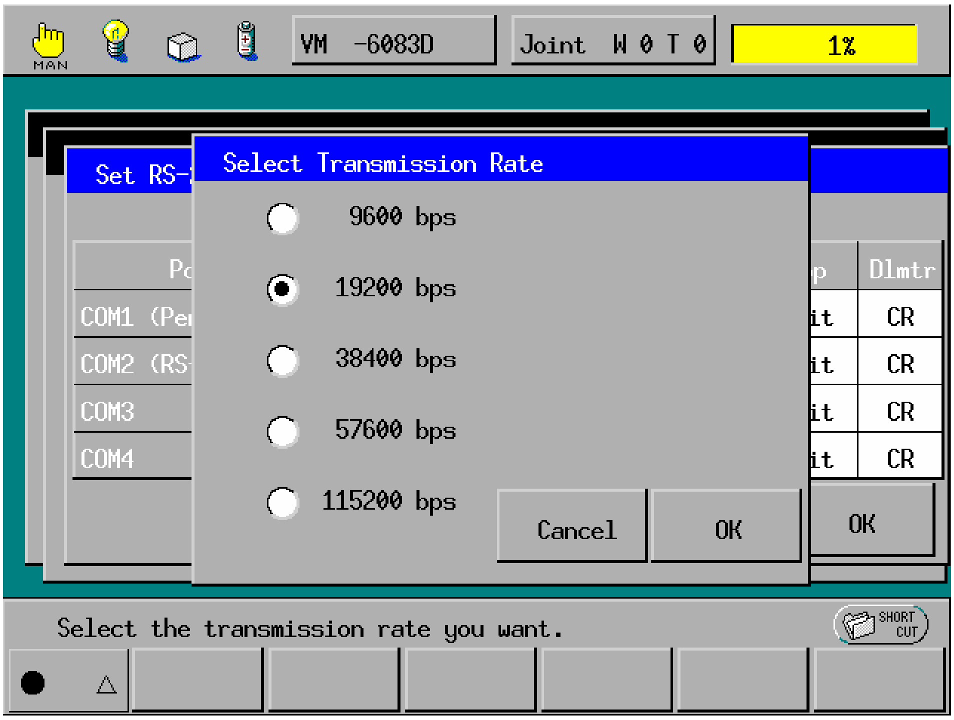


The Select Transmission Rate window appears on the screen.

STEP 5

OK

Select the transmission rate and press OK.

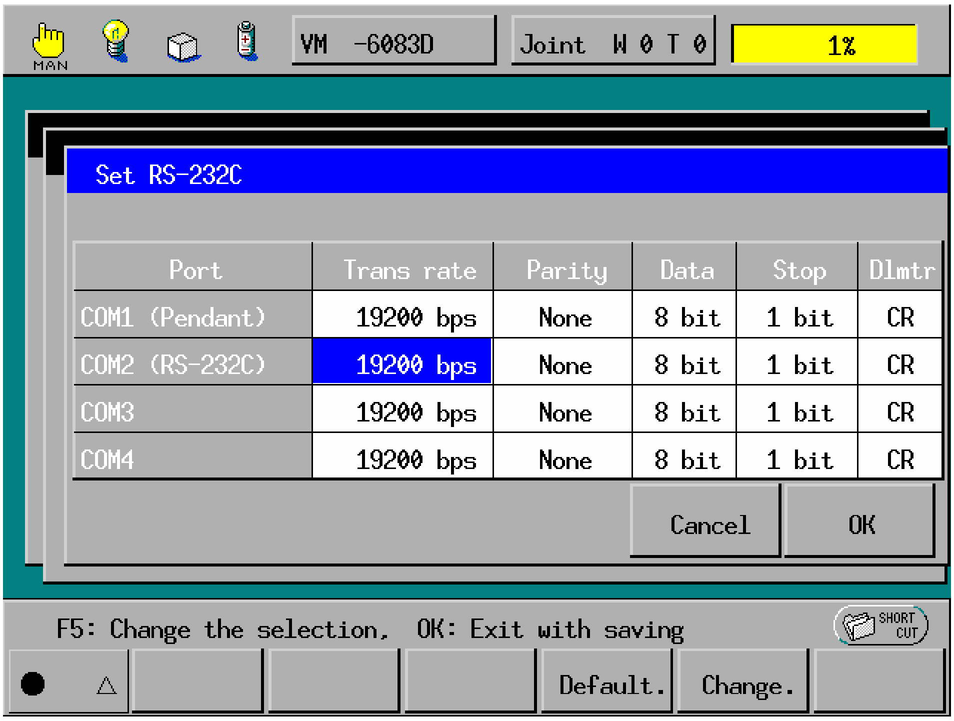


The screen returns to the Set RS-232C window.

STEP 6

OK

Check the display contents and press OK.
The set transfer rate becomes valid.

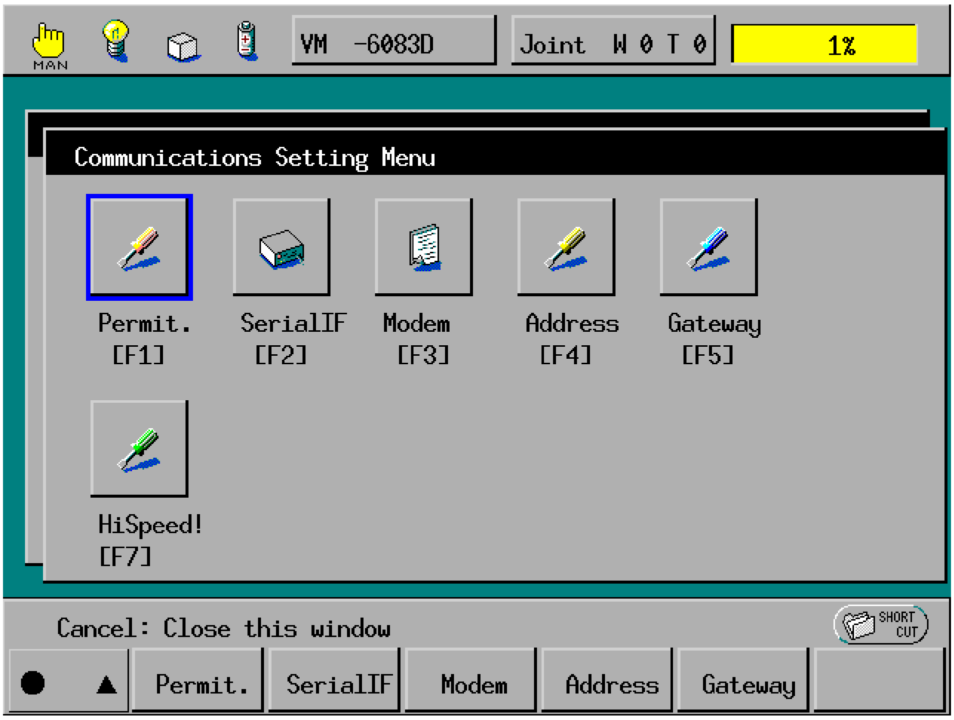


The screen returns to the Communications Setting Menu window.

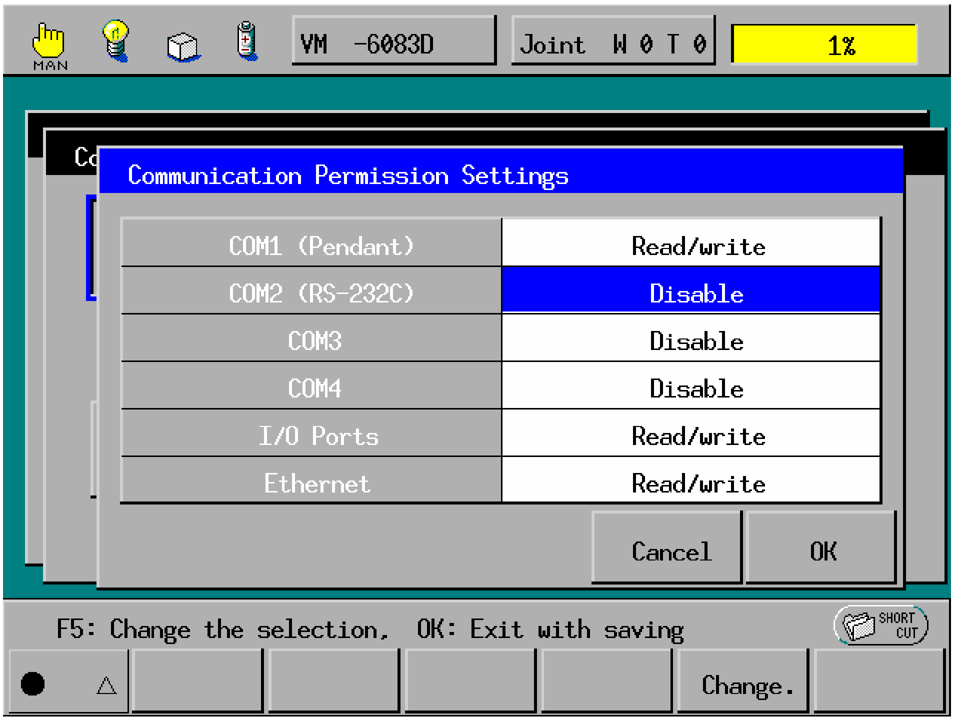
▶ STEP 7

F1

Press F1 Permit. in the Communications Setting Menu window.



The Communication Permission Settings window appears on the screen.



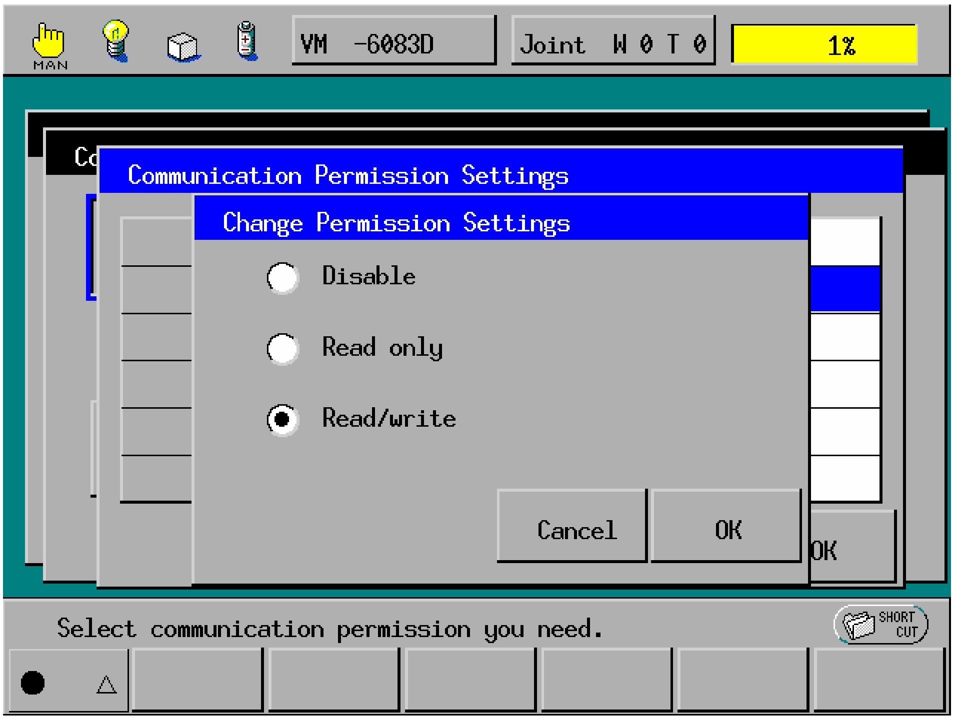
▶ STEP 8

F5

Select COM2 and press F5 Change.
The Change Permission Settings window appears on the screen.

STEP 9

Select the necessary permission settings.



The meanings of the permission settings are as follows:

- Disable: Communication port is not used.
- Read only: Personal computer is enabled to read the robot controller data. It is not allowed to send data to the robot controller.
- Read/Write: Data exchange is allowed between the personal computer and robot controller.

When creating a program, select Read/Write.
When supervising only variables or I/O values by automatic operation of a ready program, select Read only.

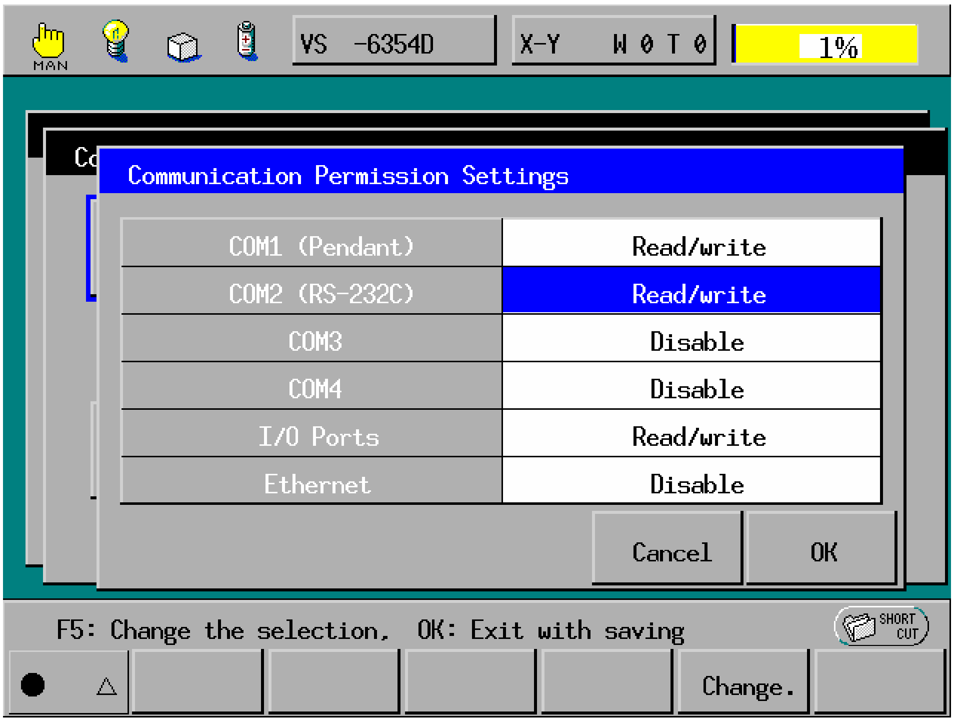
Upon making a selection, press OK.
The screen returns to the Communication Permission Settings window.

Note: You cannot select Read/Write Enabled for both RS232C and Ethernet simultaneously.

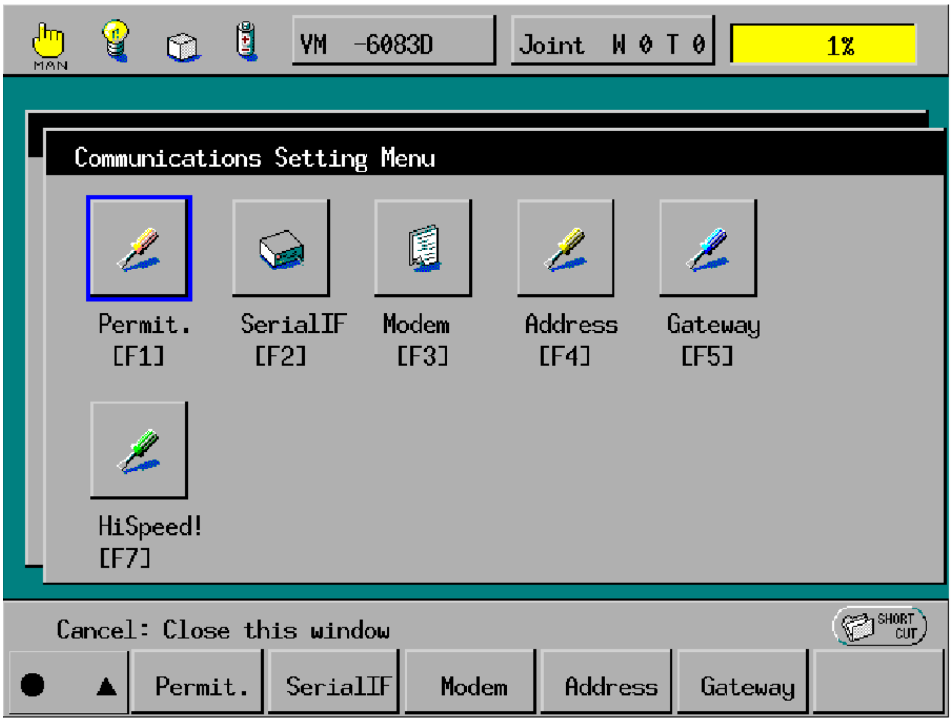
STEP 10

OK

Check the display contents and press OK.
The permission setting is enabled.



The screen returns to the Communications Setting Menu window.



STEP 11

Cancel

Press Cancel twice.
The display returns to the basic screen.

2.2.1.3 Setting Personal Computer

Set the personal computer to enable the installed WINCAPSII software to communicate with the robot controller. Make this setting at your computer.

STEP 1

Start the System Manager from Programs by clicking on Start at Windows 95.
The System Manager starts up and the System Manager window appears on the screen.

Note: For the method of starting System Manager, refer to "3.1 Starting Personal Computer Teaching System".

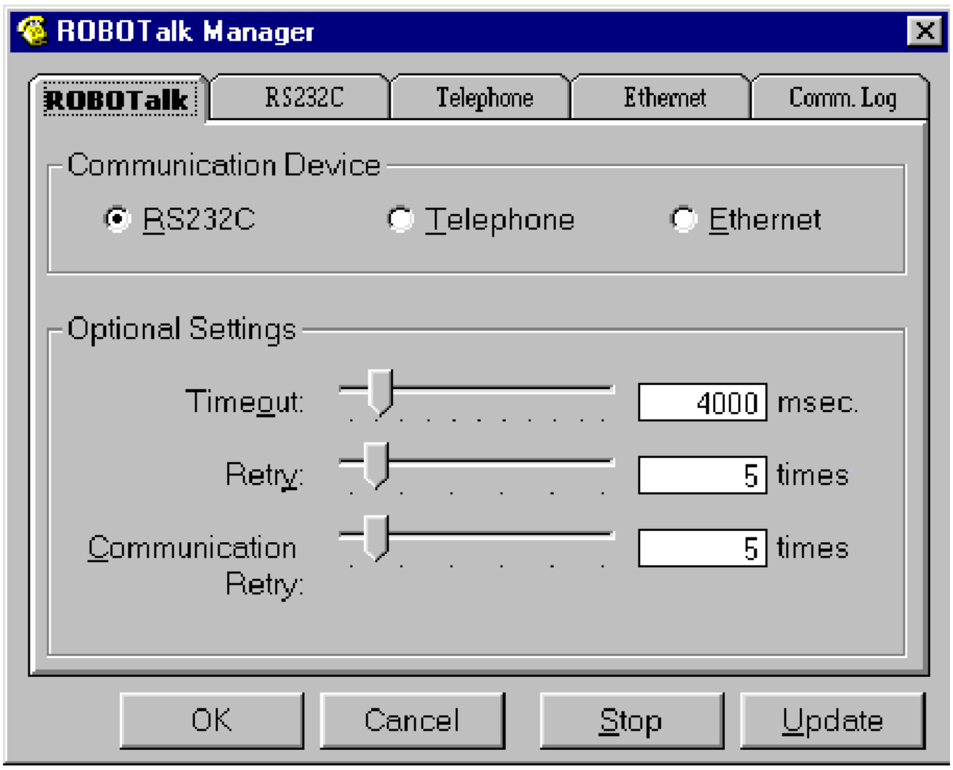
STEP 2

Click on Set communication button .
The ROBOTalk Manager starts up and the ROBOTalk Manager window appears on the screen.
If a password has not been input, the Password dialog box will appear on the screen. Enter the password. For the method of entering a password, refer to "1.3.2 Password".

Setting communication

STEP 3

Click on the ROBOTalk tab.
The ROBOTalk Manager window will change as follows:



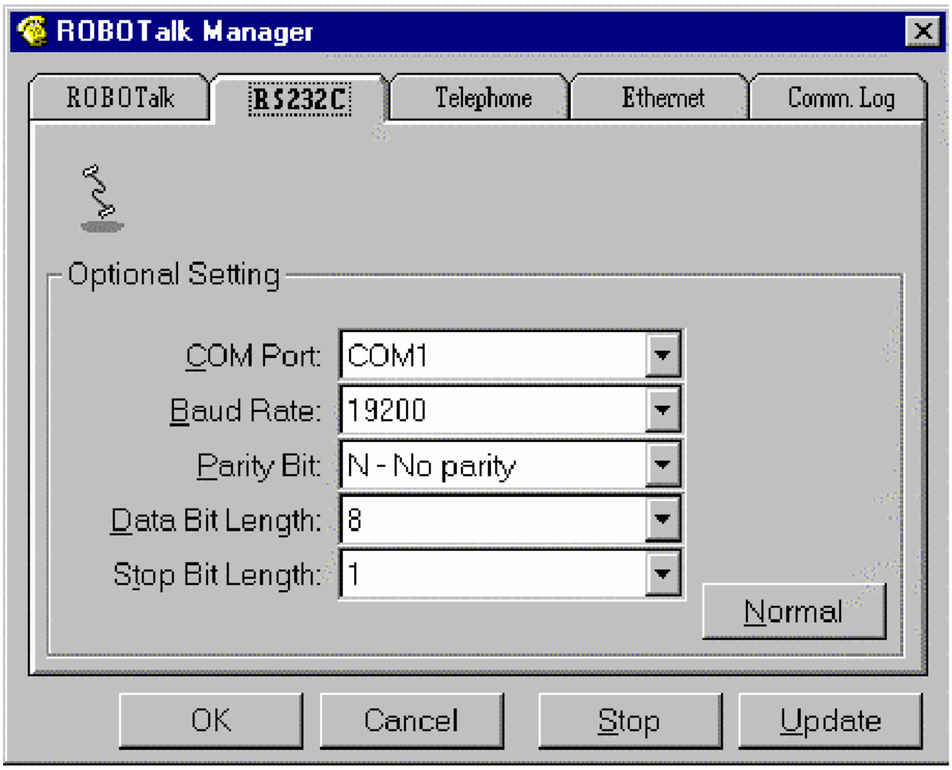
STEP 4

Select RS232C(R) in the Communication Device column.
Set the data as shown below in the Optional Settings column.

Timeout	: 4000 msec
Retry	: 5 times
Communication retry	: 5 times

STEP 5

Click on RS232C tab.
The ROBOTalk Manager window will change as follows:



Select a communication port to use on the personal computer in the COM Port column. Select it according to the specifications of the personal computer.
For the Baud Rate column, select the same speed as is set for the robot controller.

STEP 6

Click on OK.
The ROBOTalk Manager window closes.

This completes the communication settings for the personal computer.

2.2.1.4 Connecting to the Robot Controller

If RS232C is selected as the communication device in the preceding item 2.2.1.3 “Setting Personal Computer”, the Setting communication button for the system manager will appear as shown below:

Fig. 2-1 Setting communication Button (RC232C)

When the respective managers are started from the system manager button and set for connection, corner marks will appear on each manager button. For information on how to connect each manager, read the descriptions on the operation of each manager in chapters 5 through 10.

2.2.2 Telephone Line

A telephone line needs to be set up for the personal computer and robot controller for telephone communication.

2.2.2.1 Connecting Modem

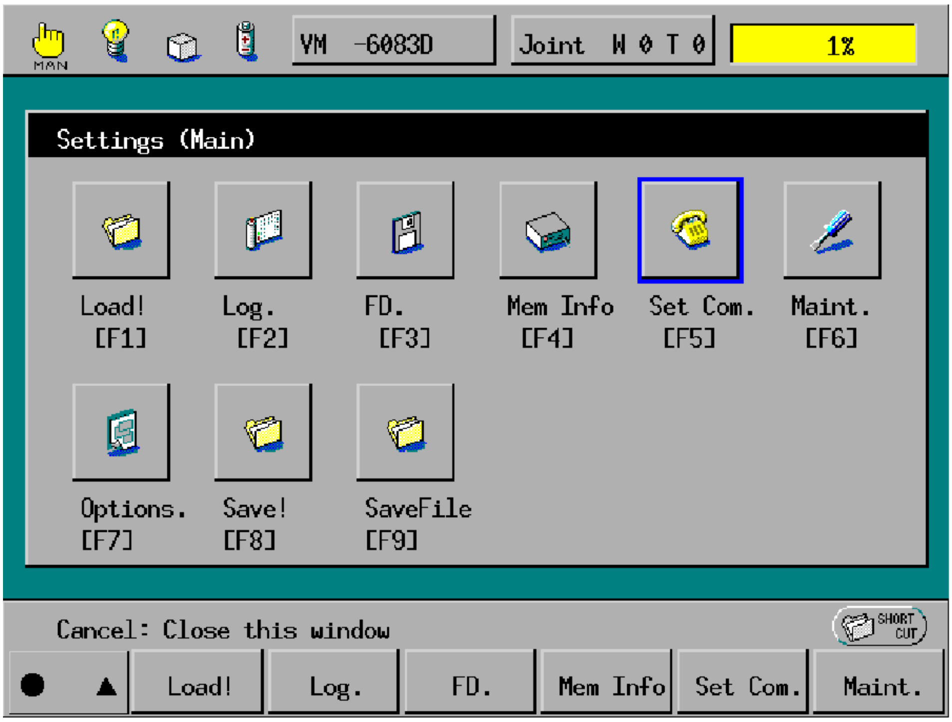
To make connection via a telephone line, a modem must be installed.
To do this, use Modems on the Control Panel in Windows.
For the connection of a personal computer and modem, refer to the respective instruction manual as it varies depending on the hardware.

2.2.2.2 Setting Robot Controller

STEP 1

F6

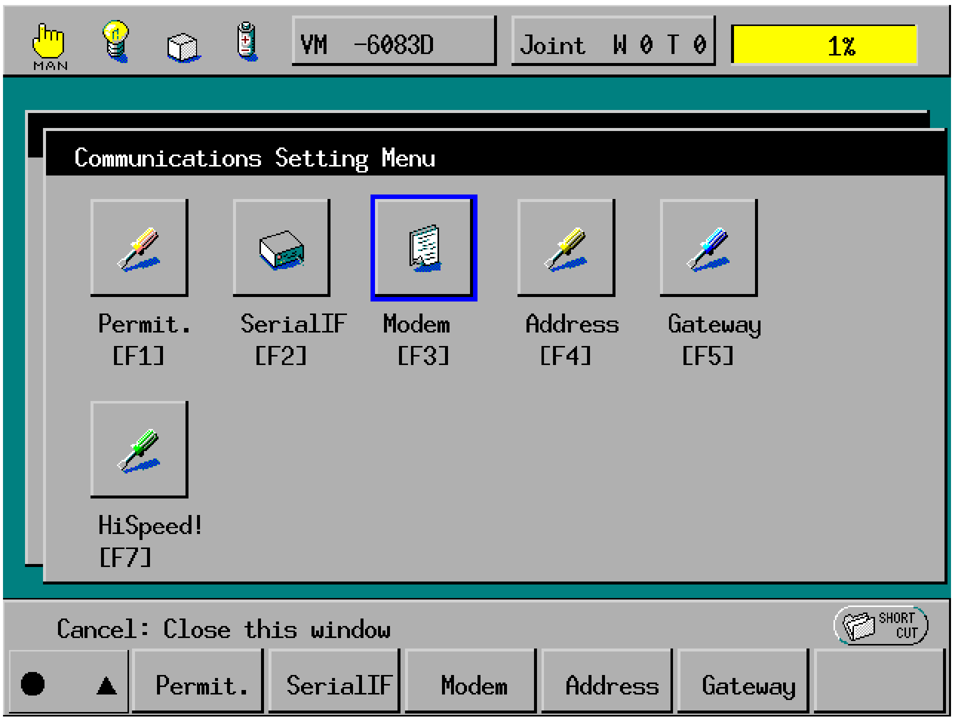
Press F6 Set on the basic screen of the teach pendant.
The Settings (Main) window will appear on the screen.



STEP 2

F4

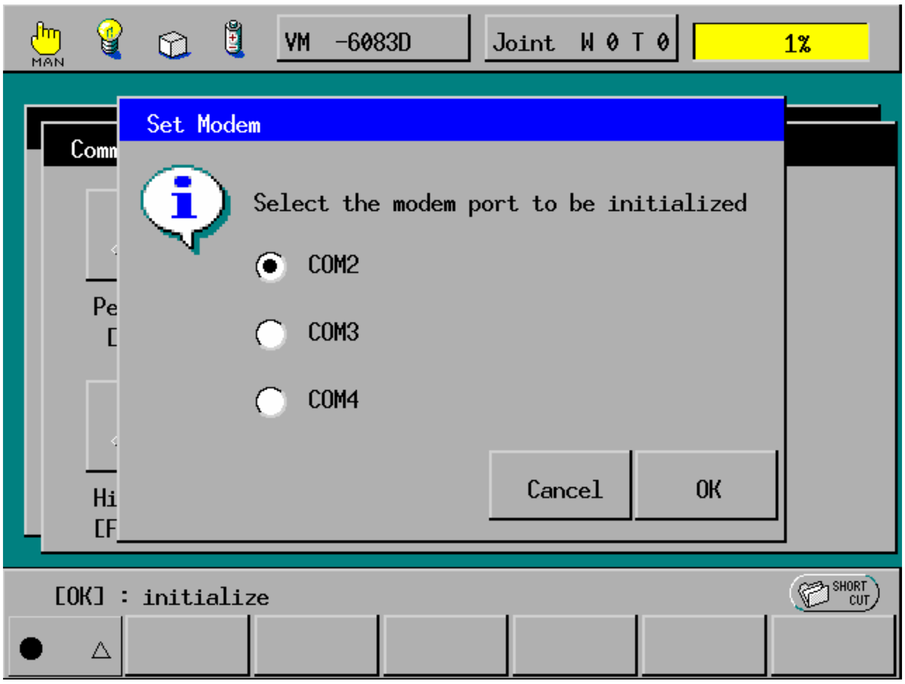
Press F4 Set Com.
The Communications Setting Menu window appears on the screen.



STEP 3

F3

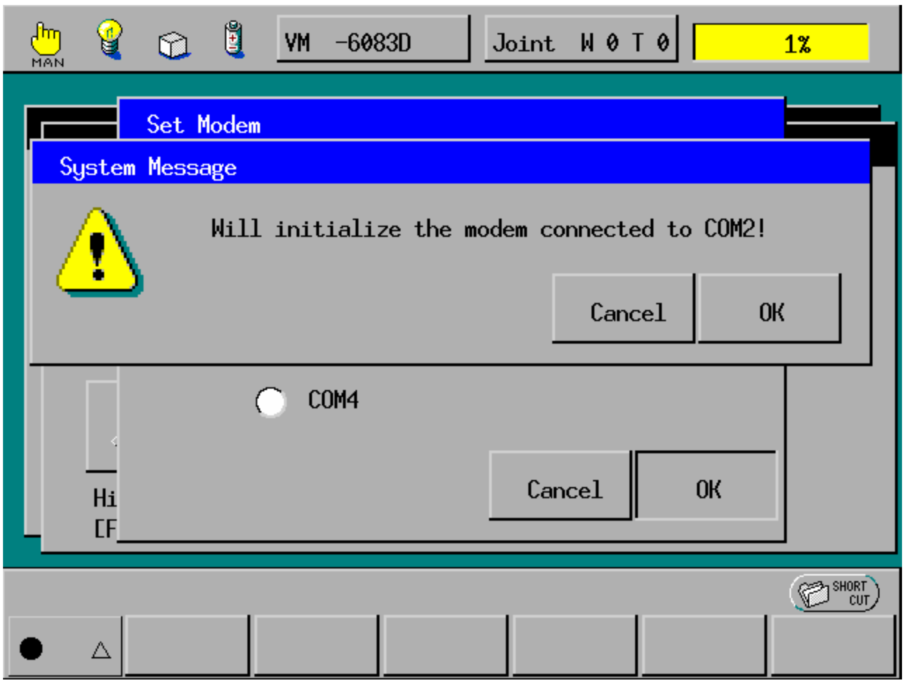
Press F3 Modem.
The Set Modem window appears on the screen.



STEP 4

OK

Select the communication port of the controller to which the modem is connected.
Select COM2 and press OK.
The following system message appears.



STEP 5

OK

Check the system message and press OK.

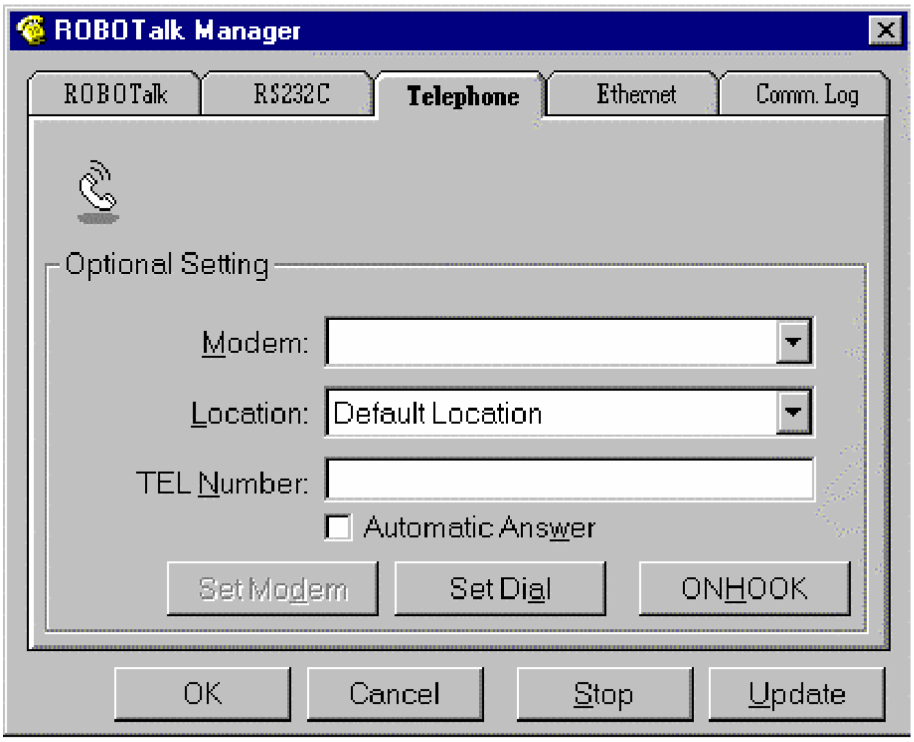
2.2.2.3 Setting Personal Computer

STEP 1

Click on Setting communication button of the System Manager.
The ROBOTalk Manager starts and the ROBOTalk Manager window appears on the screen.
If a password is not yet input, the Password dialog box appears. In this case, input the password. For the method of entering a password, refer to "1.3.2 Password".

STEP 2

Double-click on the Telephone tab.
The ROBOTalk Manager window will change as follows:



STEP 3

Enter each item by referring to the descriptions in Table 2-1 and click on OK.

Table 2-1 Telephone Optional Setting

Items	Description
Modem	Modem used for remote connection
Location	Information of current location (Information on the dialing party)
TEL Number	Telephone number of the other party (called party)
Automatic Answer	Call receiving side will be checked.
Set Modem	Makes detailed modem settings.
Set Dial	Modifies or adds location information.

2.2.2.4 Connecting to Robot Controller

Upon selecting the telephone line for the communication device as a result of the setting operation in the preceding item “2.2.2.3 Setting the Personal Computer, the Setting communication button  of the System Manager will appear as shown below:

Fig. 2-2 Setting communication Button (Telephone)

When the respective managers are started from the system manager button and set for connection, corner marks  will appear on each manager button. For information on how to connect each manager, read the descriptions on the operation of each manager in chapters 5 through 10.

2.2.3 Ethernet

Setting is required to enable communication between the personal computer and the robot controller by connecting them via Ethernet.

2.2.3.1 Connecting Cable

The personal computer and the robot controller need to be connected via an Ethernet network. For information regarding this connection, refer to “1.2.2 Ethernet Connection”.

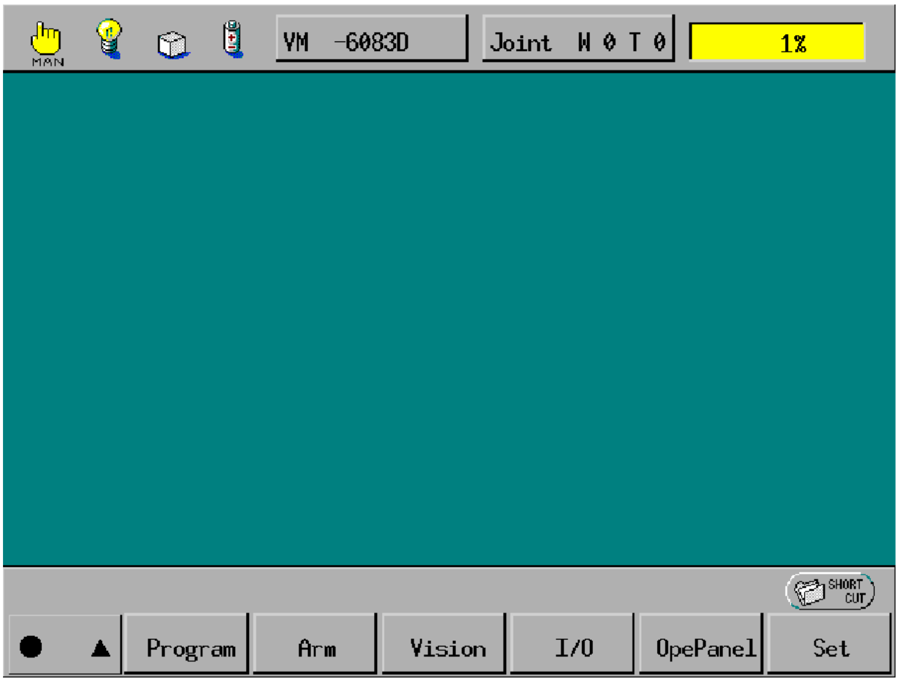
2.2.3.2 Setting Robot Controller

Set the robot controller to use the Ethernet port for the personal computer teaching system. Make this setting using the teach pendant.
Specify the permission setting.
In the present stage, you cannot set the IP address (your IP address) and gate address (gateway IP address).

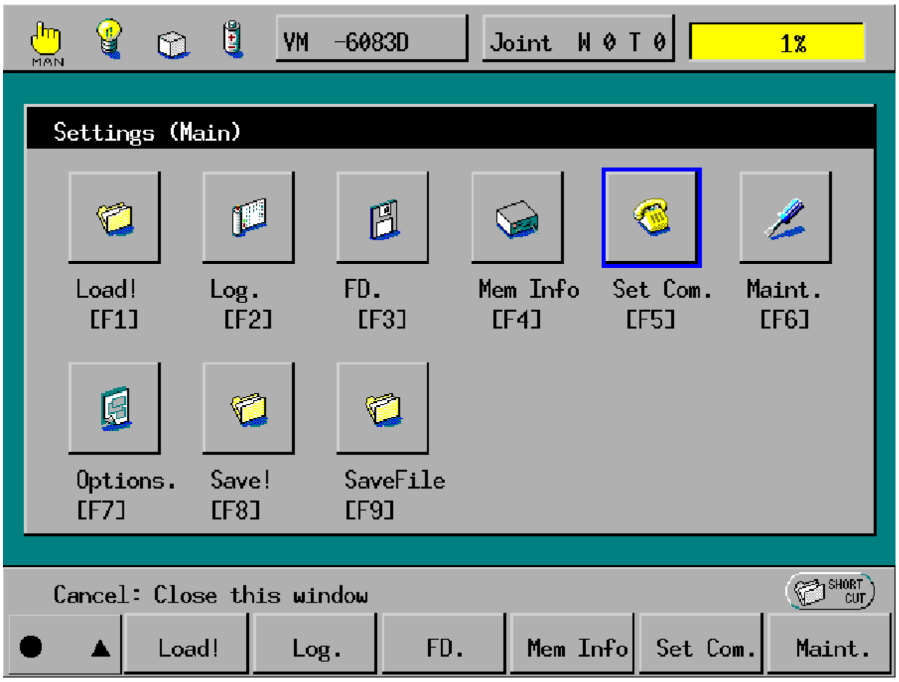
STEP 1

F6

Press F6 Set on the basic screen of the teach pendant.



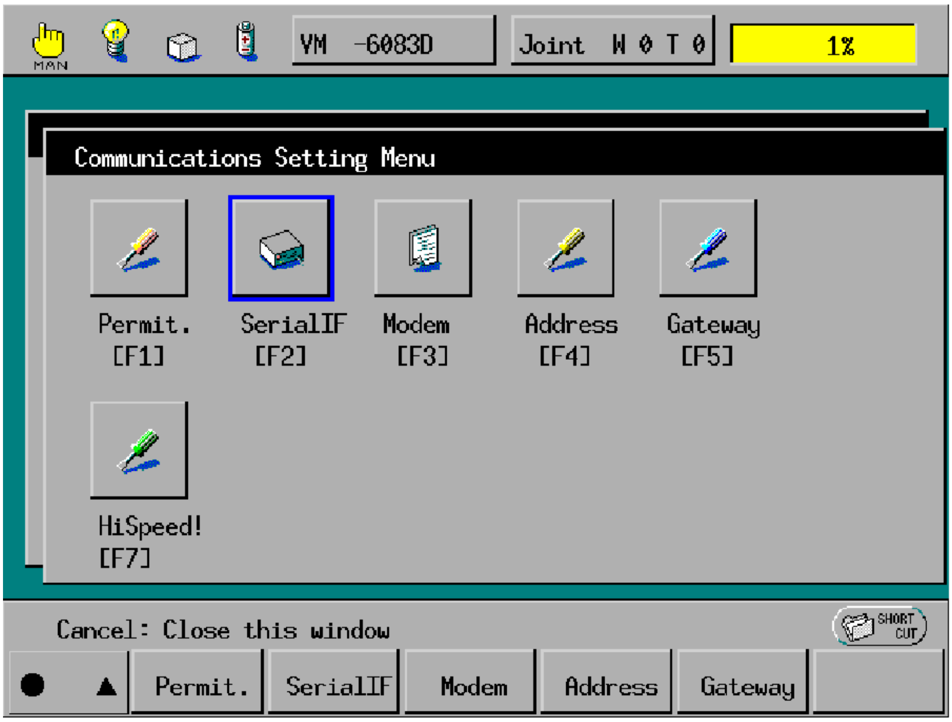
The Settings (Main) window appears on the screen.



STEP 2

F4

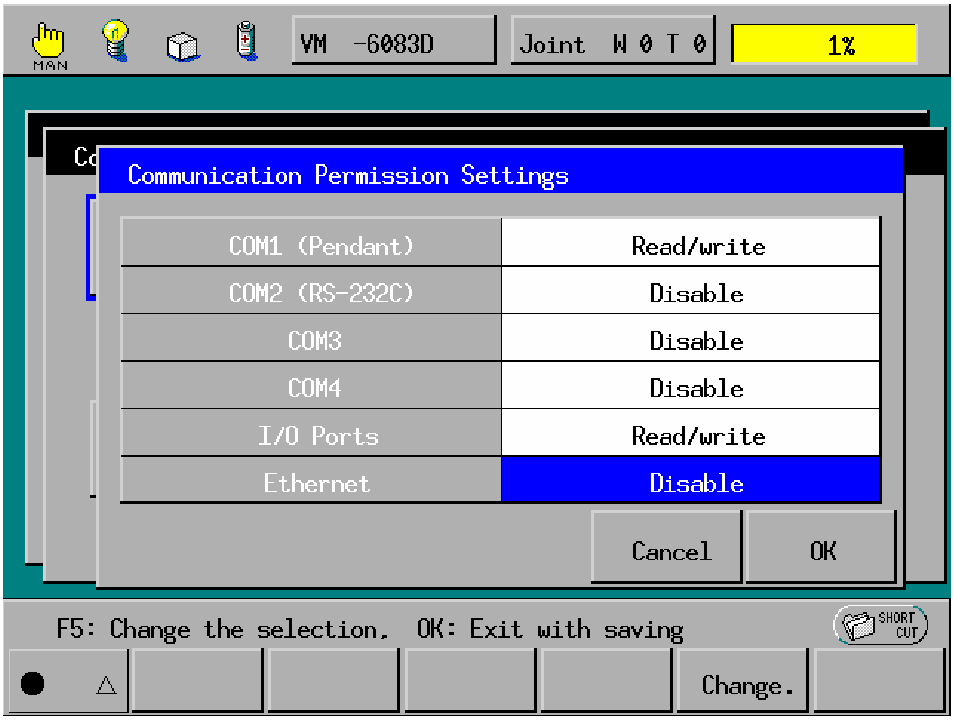
Press F4 Set Com.
The Communications Setting Menu window appears on the screen.



STEP 3

F1

Press F1 Permit.
The Communication Permission Settings window appears on the screen.



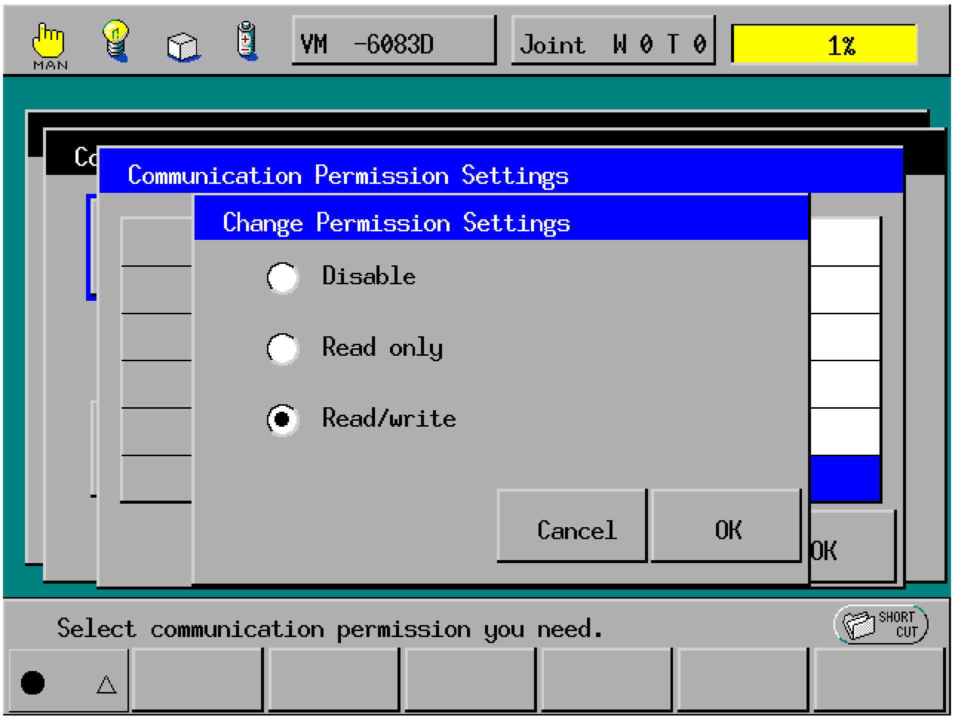
STEP 4

F5

Select Ethernet and press F5 Change.
The Change Permission Settings window appears on the screen.

▸ STEP 5

Select Read/Write.



The meanings of the permission settings are as follows:
When using Ethernet, select Read/Write.

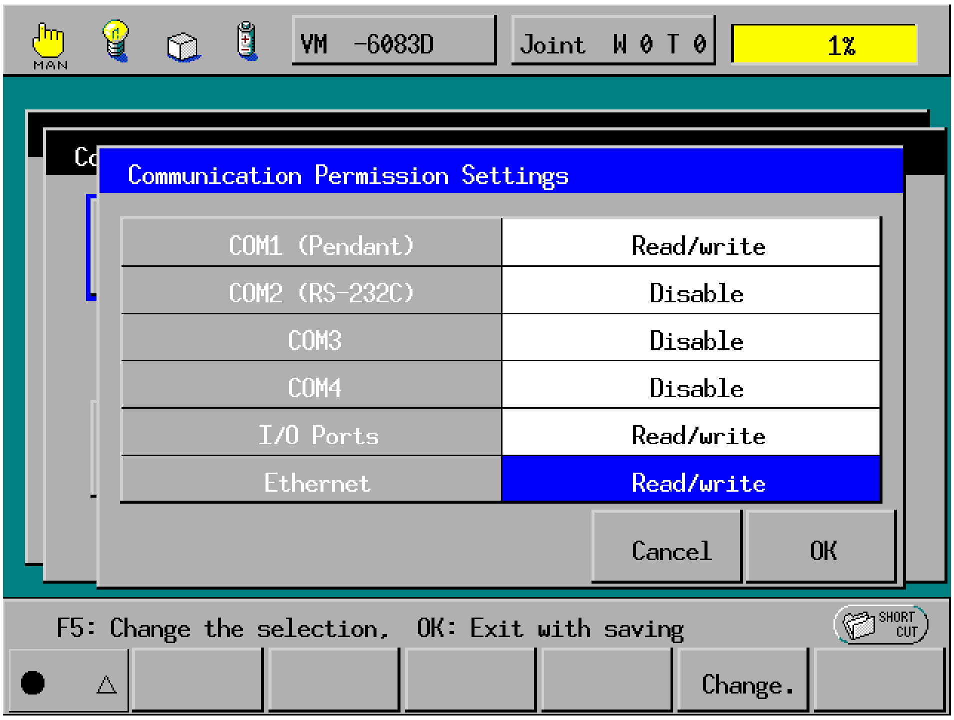
- Disable: Communication port is not used.
- Read only: Personal computer is enabled to read the robot controller data. It is not allowed to send data to the robot controller.
- Read/Write: Data exchange is allowed between the personal computer and robot controller.

Upon making section, press OK.
The screen returns to the Communication Permission Settings window.

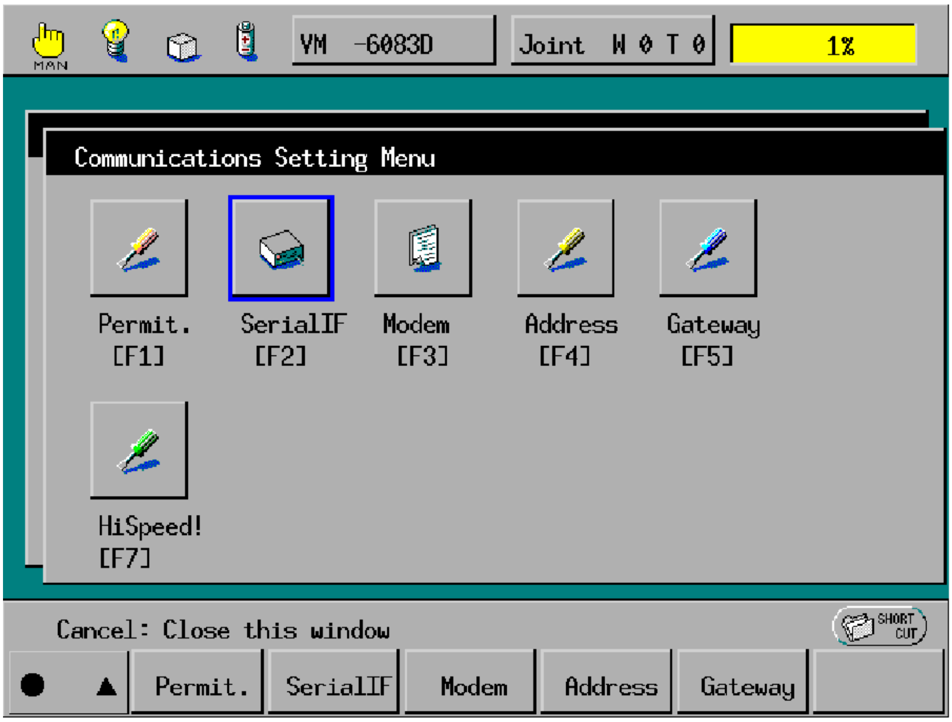
Note: You cannot select Read/Write Enabled for both RS232C and Ethernet simultaneously.

STEP 6

Check the display contents and press OK.
The permission setting becomes valid.



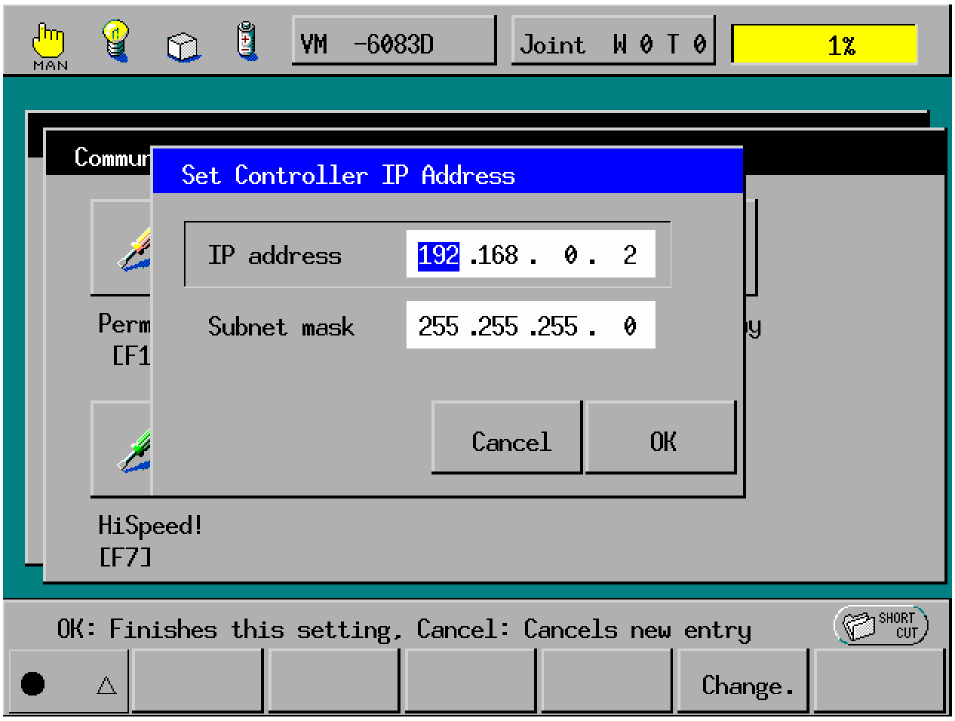
The screen returns to the Communications Setting Menu window.



STEP 7

F4

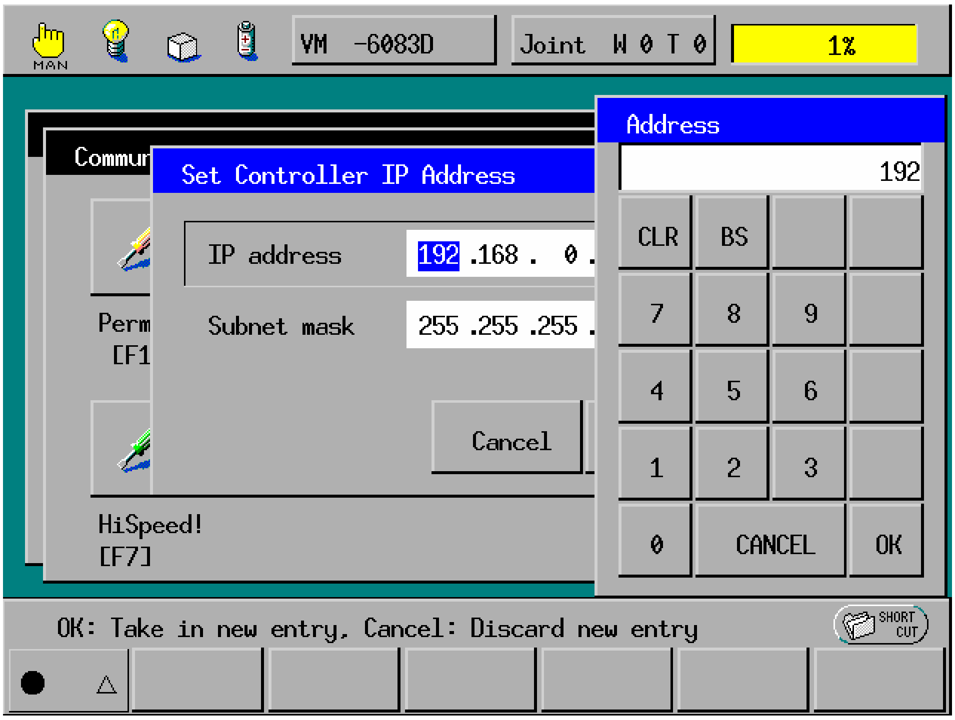
Press F4 Set Address.
The Set Controller IP Address window appears.



STEP 8

F5

Press F5 Change and enter a required address.
In the example here, IP Address is set to 192.168.0.1 and Subnet Mask to 255.255.255.0.



STEP 9

Press Cancel twice.
The display returns to the basic screen.

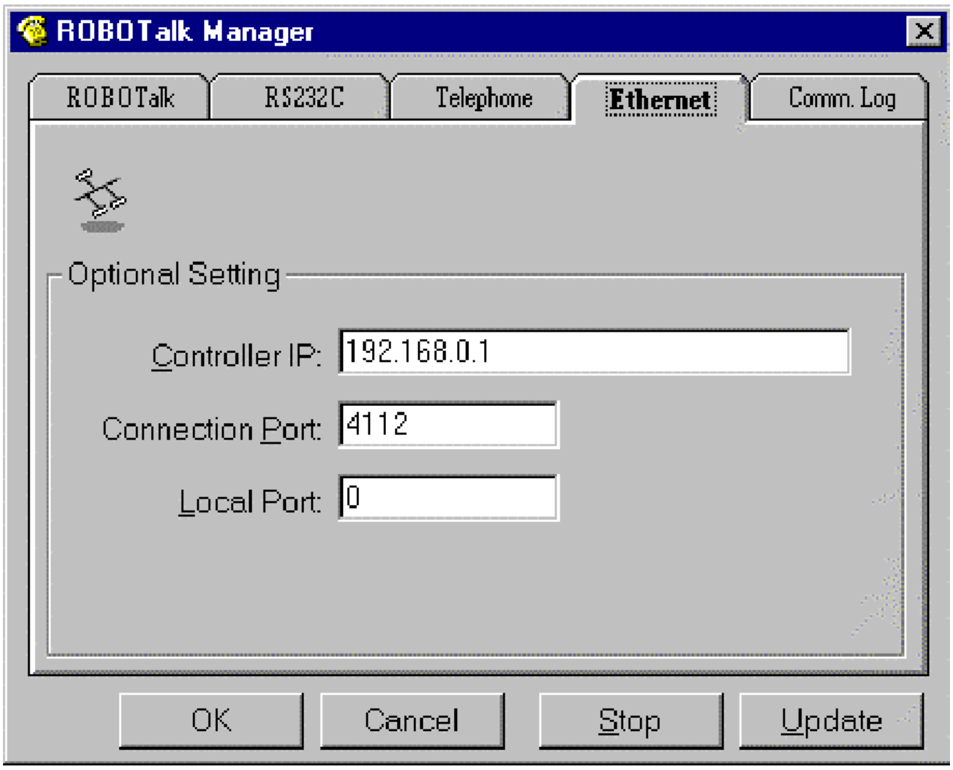
2.2.3.3 Setting Personal Computer

STEP 1

Click on the Setting communication button of the System Manager.
The ROBOTalk Manager starts and the ROBOTalk Manager window appears on the screen.
If a password is not yet input, the Password dialog box appears on the screen. In such a case, enter the password. For information regarding how to enter a password, refer to “1.3.2 Password”.

STEP 2

Click on the Ethernet tab.



▸ STEP 3

Enter data in Controller IP, Connection Port, and Local Port at Optional Setting and then click on OK.
Controller IP is the IP address of the party at the destination. Match it to the desired party for connection. (For example, an IP address such as 192.168.0.1).
Communication Port is the local port number of the opposite party at destination. Match it to the desired party for connection. (For example, 4112).
Local Port is the port number for own use. In principle it should be over 1024 and may be freely set if it does not infringe on others within the same network.

Note: The following relationships have to be established for the Ethernet connection: Own Connection Port = Local Port of the other party.
Own Local Port = Connection Port of the other party
If connection is limited to the ROBOTalk Manager and robot controller, the local port will be automatically replaced with an appropriate value by setting zero (0) in the Local Port on the ROBOTalk Manager side.

Table 2-2 Ethernet Optional Setting Option

Items	Description
Controller IP	IP address or host name of the opposite party
Connection Port	Fixed at 4112
Local Port	Fixed at 0

2.2.3.4 Setting Network Environment

To effect connection by EtherNet, it is necessary to set up Windows. The network environment setting procedures will be described here preconditioned on the fact that the network card (adapter) is installed and that the Internet protocol (RCP/IP) is effective.

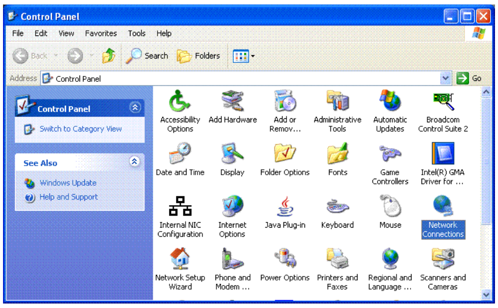
First, check that the local area connection is effective.

Next, set up an IP address for the TCP/IP property.

STEP 1

Select Settings and Control Panel in this order from the START of Windows.

The Control Panel window will appear on the screen.

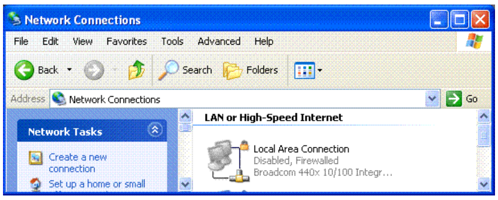


STEP 2

On the above screen, click the icon "Network Connections."

The Local Area Connection icon appears as shown below.

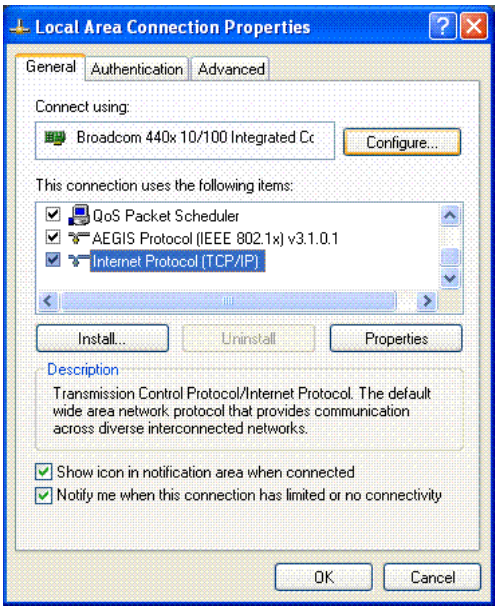
If "Disabled" is displayed with the icon, move the pointer to the icon, click the right mouse button, and then select "Enable."



STEP 3

Place the pointer on the "Local Area Connection Properties" icon, click the right mouse button and select "Property."

The Local Area Connection Properties appears.



STEP 4

In the Local Area Connection Properties window, select the General tab.

In the "This connection uses the following item:" area, press the Properties button with the Internet Protocol [TCP/IP] selected. The Internet Protocol (TCP/IP) Properties window appears.

STEP 5

Select the General tab and click the "Use the following IP address:".

Then enter the IP address and the Subnet mask.

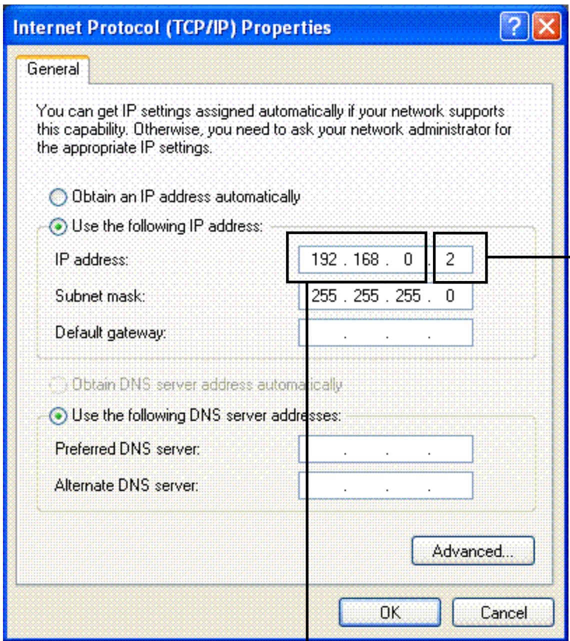
For the actual values of the IP address and subnet address, inquire to the network administrator in charge of the pertinent network.

If the network is local (for example, an environment for connecting the personal computer and the robot controller only), the IP address can be set as desired. Therefore, the IP address will be tentatively set here to 192.168.0.1 and the subnet address to 255.255.255.0.

Click on **OK** and the IP address setting is completed.

Note (1): When making connection to a wide area network (for example an in-house network), always inquire to the network administrator before setting the IP address and subnet mask.
If an IP address used for the local area network is connected to the wide area network (for example the in-house network) without first invalidating it, confusion may be occur in the connected network.

Note (2): No redundant IP addresses are allowed within the same network. When making a connection to a widely shared network, care should be taken not to allow an IP address to be redundant with another terminal. The following are examples of IP addresses that have the least probability of redundancy with another terminal:
192.168.0.2 to 192.168.0.xxx (xxx represent 003 to 999.)



This section must be the same as that specified in the controller.

This value must <u>not</u> be the same as that specified in the controller.

2.2.3.5 Connecting to Robot Controller

If Ethernet is selected for the communication device according to “2.2.3.3 Setting Personal Computer” and “2.2.3.4 Setting the Network environment” thus far described, the Setting communication button of the System Manager will be displayed as shown below:

Fig. 2-3 Setting Communication Button Display (Ethernet)

When the respective managers are started from the system manager button and set for connection, corner marks appear on each manager button. For information regarding how to connect each manager, read the descriptions on the operation of each manager in chapters 5 through 10.

Chapter 3

Starting Teaching System and Knowing Each Manager

This chapter describes the procedures for starting and terminating the personal computer teaching system and outlines the functions of each Manager.

3.1 Starting Personal Computer Teaching System

Let's start and run the WINCAPS II on your personal computer in order to input, edit, and verify the robot operation programs.

Starting the System Manager

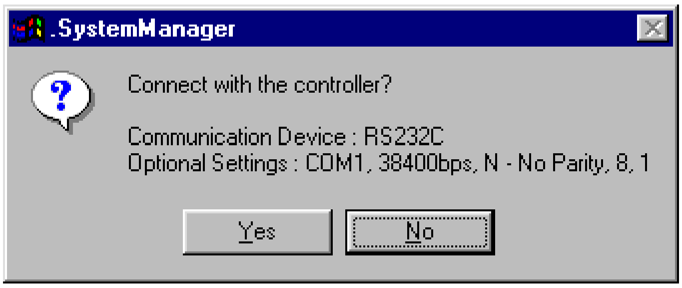
DENSO application software WINCAPS II for personal computer teaching system consists of the following function modules.

- PAC Program Manager
- Variable Manager
- DIO Manager
- Arm Manager
- Vision Manager
- Log Manager
- Communication Setting Manager

All these function modules are controlled by the System Manager. That is, all the functions of WINCAPS II should be called from the System Manager before they are implemented.
To use the personal computer teaching system, start the System Manager first.

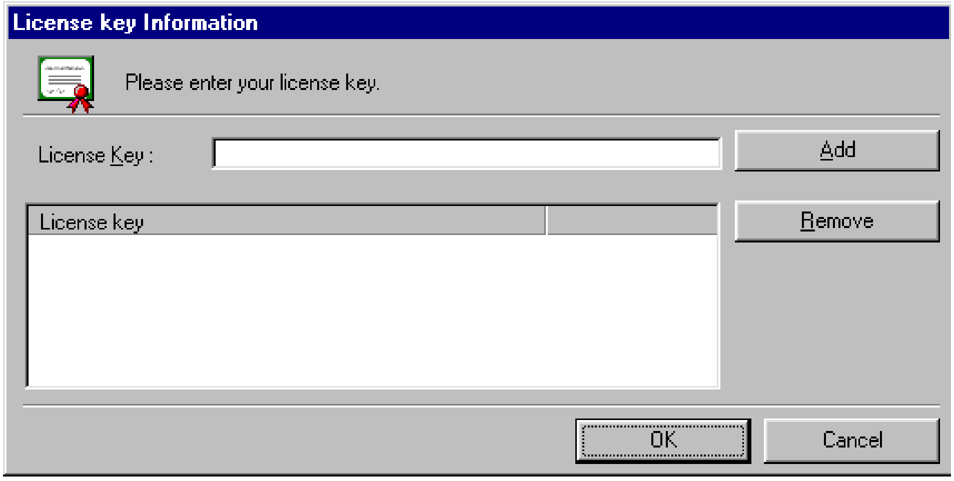
STEP 1

Click **Start** at Windows 95. Point to **Programs**, and then click **System Manager** in the WINCAPS II folder.



STEP 2

The WINCAPS II Information window appears. Read the information and click **OK**.



Note: If you click the check box "Omit this message" at the lower left of the screen, the above window will not appear from the next startup operation.

STEP 3

The License Information window does not appear until you enter your license key. Enter User ID printed in the license card and click **OK**.

Note: For detail on entering the license key, refer to 4.5.1 License Key. Once you enter your license key, this window will not appear from the next startup operation.

STEP 4

When starting the System Manger after initial installation of WINCAPS II, create a program bank.

Note: When the dialog box "Create Program Bank" appears, specify the files to be used in the program bank according to the procedure described in "5.7.2.3 Updating Program Bank".

STEP 5

You need to create a project when activating the WINCAPS II for the first time after installation, because no system project has been defined.

Note: If a dialog box "Create New Project" appears, create a project for the robot to be connected by referring to "4.2.1. New Project".

STEP 6

When the WINCAPS II is activated the second time and after, the dialog box "Open Project" appears. Select a desired project. The default is the previously used project.

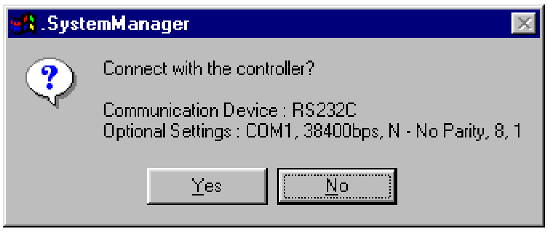
STEP 7

The Password window appears. Select the user level from the pop-up menu, enter the password if necessary, and then click **OK**.

Note: For the password, refer to “1.3.2 Password”.

STEP 8

The dialog box appears with the message “Connect with the controller? ”. Click **No**.



The System Manager is activated and the System Manager window appears. The icon buttons are used to activate the modules classified by the function.
To use each of these function modules, click the required module icon or select the required function from the command menu in the System Manager window.

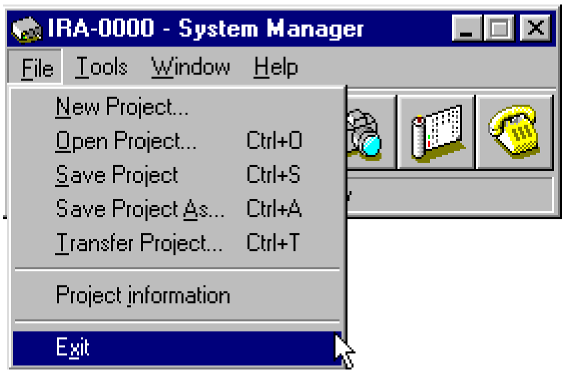
3.2 Terminating Personal Computer Teaching System

To terminate the personal computer teaching system, you need to terminate the programs of both personal computer and Robot Controller.

3.2.1 Terminating Personal Computer

STEP 1

Clicking the close box at the upper right of the System Manager window will terminate all the software for WINCAPS II running on your personal computer.



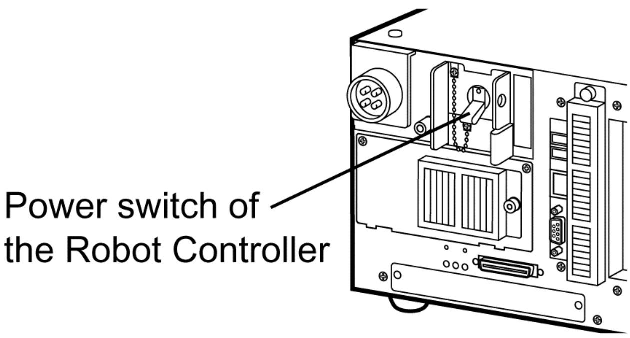
STEP 2

Terminate the Windows 95 and turn off the personal computer, if necessary.

3.2.2 Terminating Robot Controller Connected with Personal Computer

STEP 1

Turn off the power switch.



3.3 Function Outline of Each Manager

The application software for the personal computer teaching system consists of the various Managers classified by their functions. The following table lists the function outline of each Manager.

Manager	Functions	Reference
System Manager: Totally controls the personal computer teaching system.	1. Starts each Manager.	4.1.2
	2. System project management ● Creates a new project. ● Opens an existing project. ● Saves a project. ● Transfers a project. ● Terminates the personal computer teaching system.	4.1.3, 4.2
	3. Sets the communication devices and their operating conditions.	4.3.1
	4. Changes password.	4.3.2
	5. Reads data from or records data onto the floppy disk.	4.3.4, 4.3.5
	6. Enters the license key.	4.5.1
PAC Program Manager: Totally supports the program development using the robot language.	1. File operations ● Creates a new program project. ● Opens an existing program project. ● Saves a program project. ● Sets the parameters used for the project. ● Receives/transfers the program data. ● Prints program data. ● Creates an executable program. ● Terminates PAC Program Manager.	5.2
	2. Program editing ● Edits program. ● Searches and replaces character-string in program. ● Jumps to another line.	5.3
	3. Program Management ● Creates a program and adds it to the project. ● Saves a program file with another name. ● Adds an existing program to the project. ● Removes a program from the project. ● Imports and exports a program. ● Changes the order of displayed programs.	5.4
	4. Makes various settings for PAC Program Manager.	5.6
	5. Uses the program bank. * An existing program can be registered or used as a part.	5.6.2
	6. Command builder * Supports proper inputs of commands and arguments in program editing.	5.6.3

Manager	Functions	Reference
Variable Manager: Backs up or monitors the variables used by the Robot Controller.	1. Monitor the variables. 2. Operates the variables data. 3. Prints the variables table. 4. Backs up data in the variables table. 5. Creates a macro definition file for variables. 6. Transfers the variables table between personal computer and the Controller. 7. Sends messages via RS232C.	6.4 6.1.3 6.2.6 6.2.4 6.2.7 6.2.5 6.5.2
DIO Manager: Monitors the I/O status and sets dummy I/O data	1. Monitors the I/O status. 2. Changes the I/O status according to dummy input. 3. Prints the I/O table. 4. Backs up the I/O table data. 5. Creates the macro definition file for assigning I/O data. 6. Transfers the I/O table between the personal computer and the controller.	7.4.3 7.4.4 7.2.6 7.2.3 7.2.7 7.2.5
Arm Manager: Monitors the current robot arm position, work number, and tool number.	1. Monitors the current position of robot arm. 2. Views the work number and the tool number. 3. Gets the current position into pose data. 4. Simulates robot movements. 5. Sets the parameters related with the robot arm. 6. Defines the tool coordinate system. 7. Defines the work coordinate system. 8. Defines the area. 9. Object tree * Defines the object drawn in the robot display. 10. Converts pose data. * Type conversion among P, J, T type data	8.4 8.5 6.4.4 8.6.2 8.6.1 8.6.1 8.6.1 8.6.1 8.6.3 8.6.4

Manager	Functions	Reference
Vision Manager: Supports creation of vision program using PAC language.	1. Opens the image data.	9.2.7
	2. Connects with the Robot Controller.	9.3.1
	3. Creates a macro definition file for vision.	9.4.2
	4. Displays the camera image.	9.4.6
	5. Edits the window.	9.4.3
	6. Edits the search model.	9.4.4
	7. Executes the camera CAL.	9.4.5
	8. Uses the image analysis tool.	9.4.6
LOG Manager: Gets the log (robot operation record) into personal computer and manages the log data.	1. Browses log data. ● Error log ● Operation log ● Control log ● Communication log	10.1
	2. Creates new log file.	10.2.1
	3. Receives the log data from the controller.	10.2.5
	4. Prints the log.	10.2.6
	5. Searches and replaces the character strings.	10.3.7
	6. Control log (Records the control log so that the operation can be replayed using the Arm Manager.)	10.4.3
	7. Displays the version of each robot controller part.	10.6.1

Chapter 4

System Manager

This chapter describes the function and operation of the System Manager, which constitutes the nucleus of the WINCAPSII software used in the personal computer teaching system.

4.1 Outline of System Manager

4.1.1 Outline of Functions

WINCAPSII application software for the personal computer teaching system consists of various managers with their own respective functions, as stated below:

• System Manager:	Overall control (including communication setting)
• PAC Program Manager:	Program editing control
• Variable Manager	Variable information control
• DIO Manager:	I/O information control
• Arm Manager:	Robot action information control
• Vision Manager:	Vision information control
• Log Manager	Log information control

The System Manager makes controls the overall data files controlled by other managers, as a system project. It also controls communication setting and password setting.
Respective managers can be used by calling them from the System Manager.
To start the System Manager, select the System Manager program with the Start key of Windows. When started, the main screen of WINCAPSII and the System Manager window appear on the screen.
For starting procedure details, refer to Chapter 3 “3.3.1 Starting System Manager” in this manual.

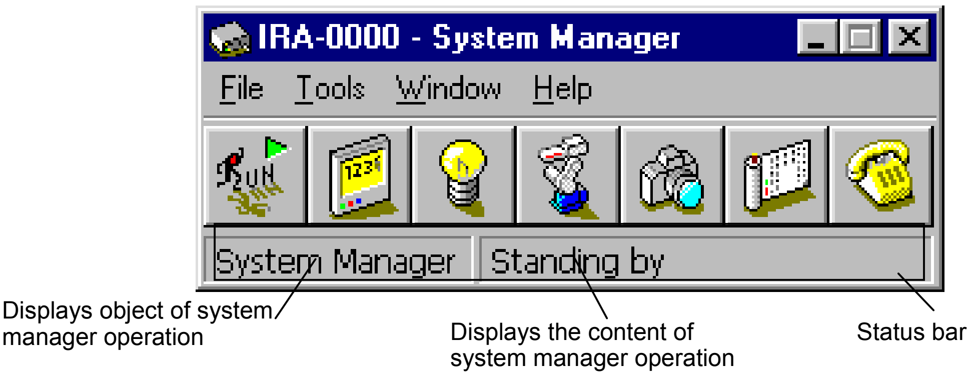


Fig. 4-1 WINCAPSII Main Screen

4.1.2 Tool Bar

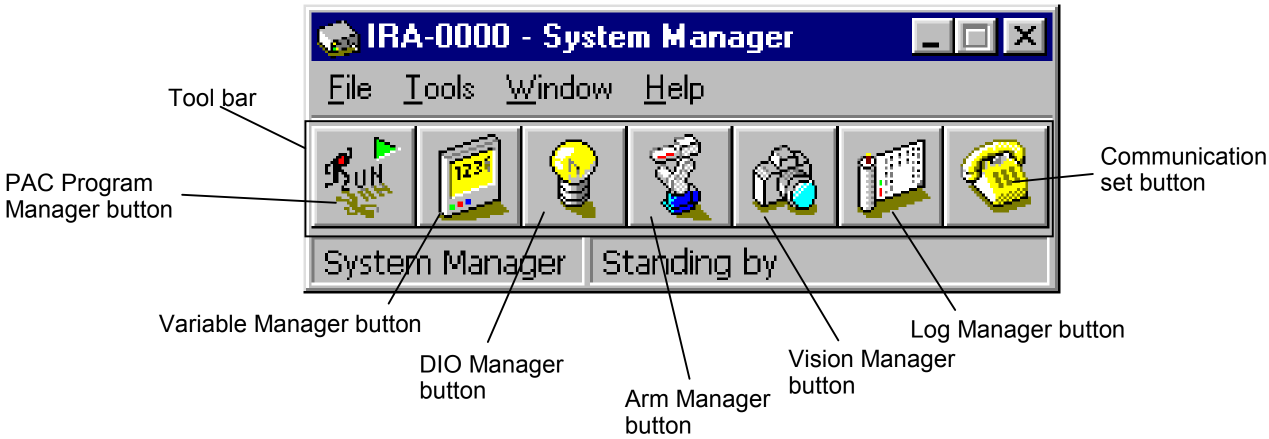


Fig. 4-2 Tool Bar

PAC Program Manager Button 

Click on this button to start the PAC Program Manager.
For descriptions on the operating procedures of the PAC Program Manager, refer to Chapter 5 “Operating PAC Program Manager” and Chapter 3 “3.5 Entering and Editing Programs” in this manual.
When the PAC Program Manager is connected to the Robot Controller, the button icon changes to  .

Variable Manager Button 

Click on this button to start the Variable Manager.
For Variable Manager operating procedures, refer to Chapter 6 “Operating Variable Manager” and Chapter 3 “3.14.1 Starting Variable Manager” in this manual.
When Variable Manager is connected to the Robot Controller, the button icon display changes to  .

DIO Manager Button 

Click on this button to start DIO Manager.
For the procedures for operating DIO Manager, refer to Chapter 7 “Operating DIO Manager” and Chapter 3 “3.13.1 Starting DIO Manager” in this manual.
When the DIO Manager is connected to the Robot Controller, the button icon changes to  .

Arm Manager Button 

Click this button to start the Arm Manager.
For the procedures for operating Arm Manager, refer to Chapter 8 “Operating Arm Manager.”
When the Arm Manager is connected to the Robot Controller, the button icon changes to .

Vision Manager Button 

Click on this button to start the Vision Manager.
For Vision Manager operating procedures, refer to Chapter 9 “Operating Vision Manager” in this manual.
When the Vision Manager is connected to the Robot Controller, the button icon display changes to  .

Log Manager Button 

Click on this button to start the Log Manager.
For Log Manager operating procedures, refer to Chapter 10 “Operating Log Manager” in this manual.
When the Log Manager is connected to the Robot Controller, the button icon display changes to  .

Set Communication Button 

Click this button to set communication.
To set Communication, refer to Chapter 4 “4.3.1 Set Communication” and Chapter 2 “2.2 How to Connect Personal Computer and Controller” in this manual

“Set Communication” button display changes for each selected communication device:

 When not in connection

Connected via RS232C

Connected by telephone line via modem

Connected by TCP/IP via Ethernet

4.1.3 System Project Management

When developing a program using WINCAPSII, in addition to the program data, a number of data such as variables and parameters that accompany the operation of the program have to be processed.
With WINCAPSII, the System Manager manages programs and the related groups of data, in terms of a system project. This management information is stored in the system project file (SPJ file). The system project file controls all information needed for operating a unit of the robot.

4.1.3.1 WINCAPSII-Generated Files

Fig. 4-3 shows the relationship among the files, which are generated and managed by their respective WINCAPSII managers, for the purpose of data storage.
Files other than the program bank file are placed in the project folder, immediately after a system project is newly created. The program bank file is placed in the folder named ProgramFiles\Wincaps2, if the default exists where WINCAPSII application is installed.
For example, if a project named IRA-0000, which appears initially by default is generated, this project is generated in the folder named ProgramFiles\Wincaps2 by default. Files other than the program bank files are placed in the project folder named IRA-0000. Fig. 4-4 shows the position of files generated and managed by WINCAPSII.

Note: Each Manager has a current folder. These Managers output their respective control files to their current folders.
Immediately after newly creating a system project, all the Managers use the same current folder.
When respective Managers newly create files, the current folder will not be changed, unless the folder is changed.
If the current folder is changed, a reference path for the input file will be required using #INCLUDE statement and other file input commands.

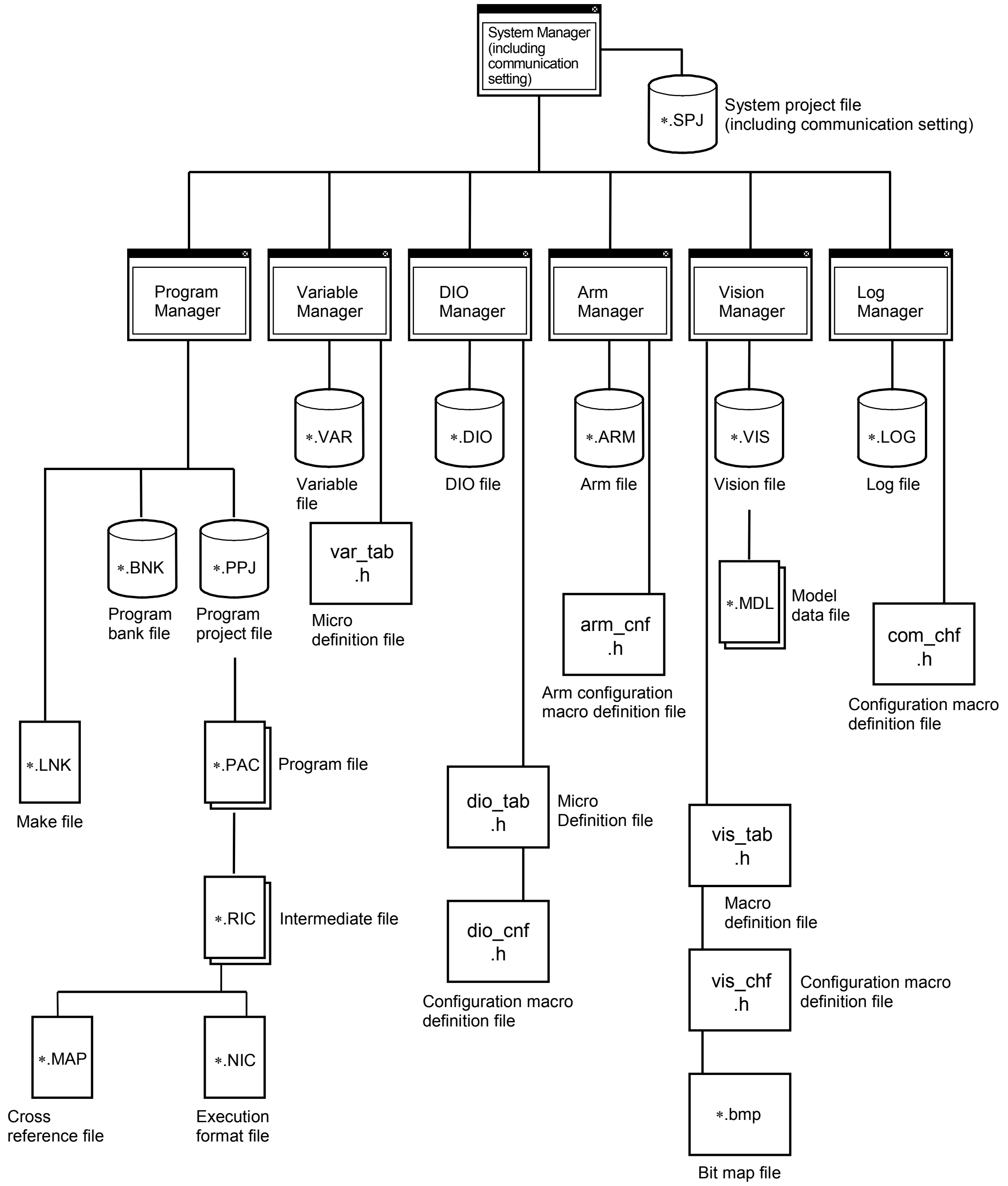


Fig. 4-3 Files Generated and Managed by WINCAPSII

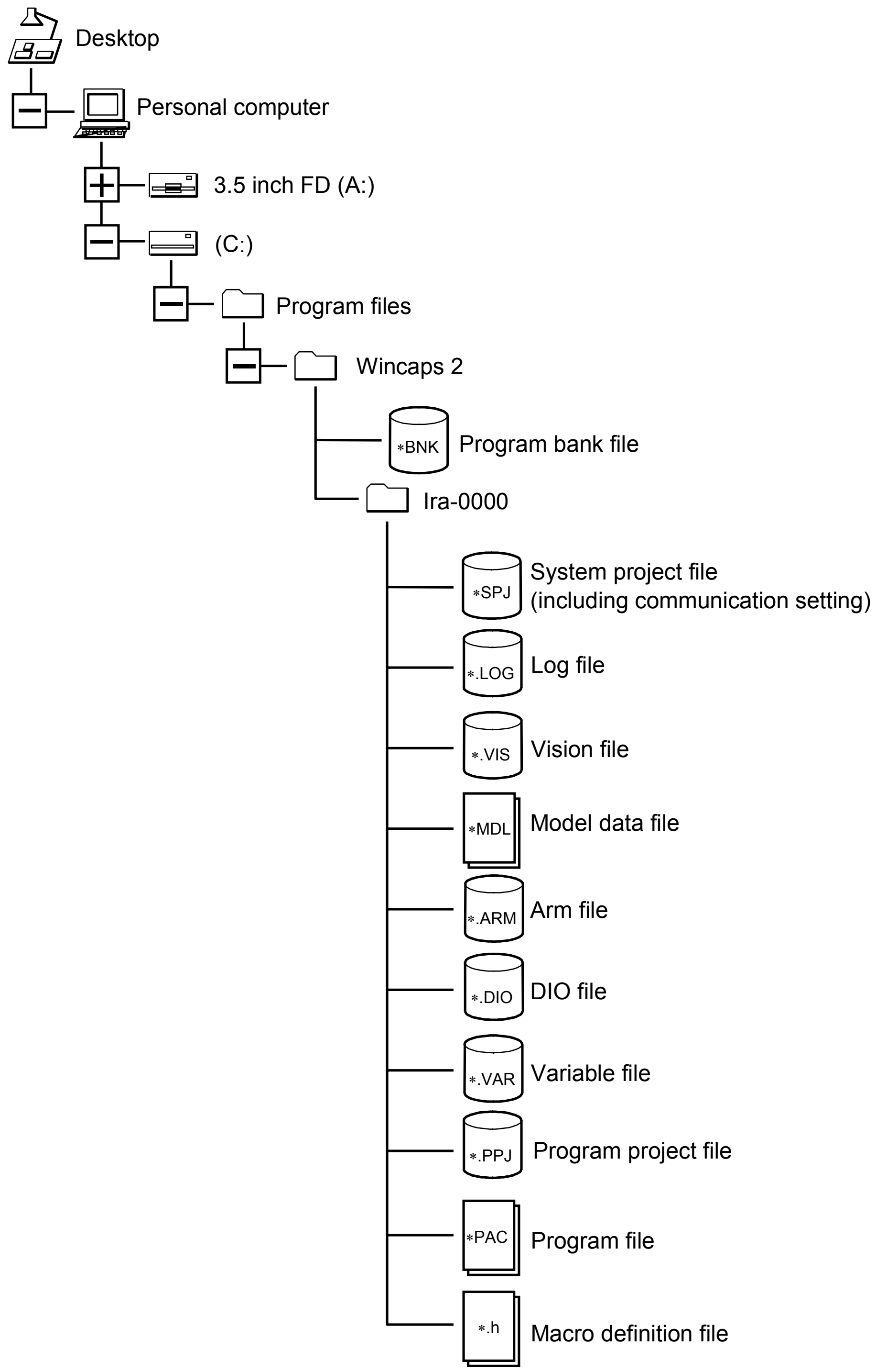


Fig. 4-4 Position of Files to Be Generated and Managed by WINCAPSII

4.1.3.2 File Management by System Manager

The System Manager manages the relation of data files generated by other groups of Managers. The system project file (*.spj) generated by the System Manager has data files which are referenced by each Manager.
When starting each Manager, the System Manager specifies the reference data files for the started Manager. Therefore each Manager can use the groups of programs or variables that differ by project, without confusion.
The Set Communication is a function incidental to the System Manager and, therefore, it does not have its own data file. The Set Communication information is included in the system project file.
The system project file has an extension code ".SPJ".

4.1.4 Menu List

The System Manager command menu has the following tree structure:

File
- New Project
- Open Project
- Save Project
- Save Project As
- Transfer Project
- Project information
- Exit

Tools
- Set Communication
- Change Password··········(Programmer Level)
- Re-Login
- Read FD Images
- Write FD Images

Window
- PAC Manager
- Variable Manager
- DIO Manager
- Arm Manager
- Vision Manager
- LOG Manager

Help
- License Key
- System Extension
- About System Manager

Fig. 4-5 System Manager Menu Tree

4.2 File Menu

The System Manager FILE menu contains commands for controlling the project, besides the command for exiting the System Manager.

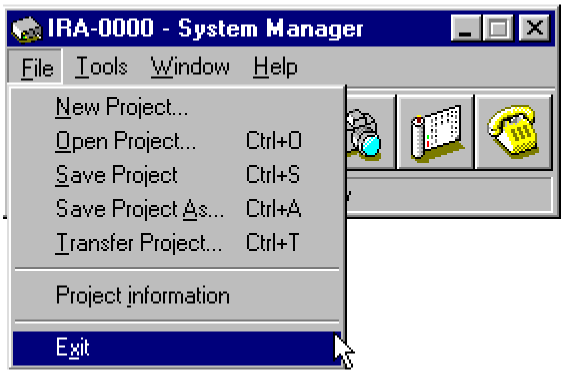


Fig. 4-6 File Menu

> **Note: The New Project and Open Project menu commands are invalid when any of PAC, DIO Arm, Vision and LOG Managers is connected.**

4.2.1 New Project

This command is used for creating a new system project.
After selecting this command, the Create New Project dialog box appears on the screen. Input default data, after changing it as may be needed, and click on **OK**. If **Cancel** is clicked, the command closes the box without creating a project.

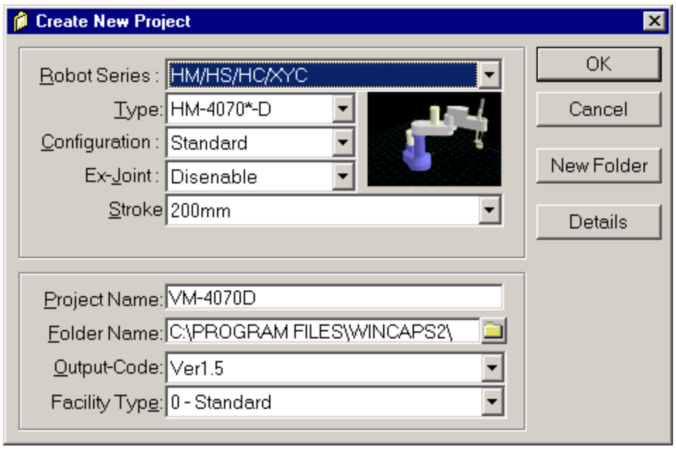


Fig. 4-7 Create New Project Dialog Box

- Robot Series: Select a desired robot series.
- Type: Select a robot type from "Robot Series."
- Environment: Select environment according to the selected robot.
- Additional Axis: Select whether there is an additional axis.
- Stroke: Displayed for each robot type as required. Select this item according to the selected robot.
- Project Name: Enter the project name.
- Folder: Describes a folder for storing the project. You can select a folder path by clicking the Folder button.
- Output Code: Sets a version of the execution program to be created according to the version of the connected controller.
- Facility Type: Select a facility type. A program library necessary for the type selected here is automatically added to the PAC program manager. If Standard is selected, nothing will be added.
- New Folder: After clicking, the New Folder Window appears. The new folder can be created by entering the folder name.

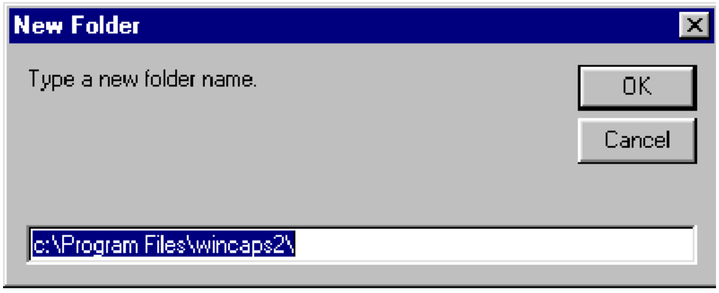


Fig. 4-8 New Folder Window

- Details: After clicking, the Details window appears. Specify, in this WINDOW box, the default data reference files of the respective Managers. The default data is created in the process of Create New Project. Set the respective reference files using "..." Clicking on Initialize returns the specified reference file to the default setting. It is usually not necessary to change the detail setting.

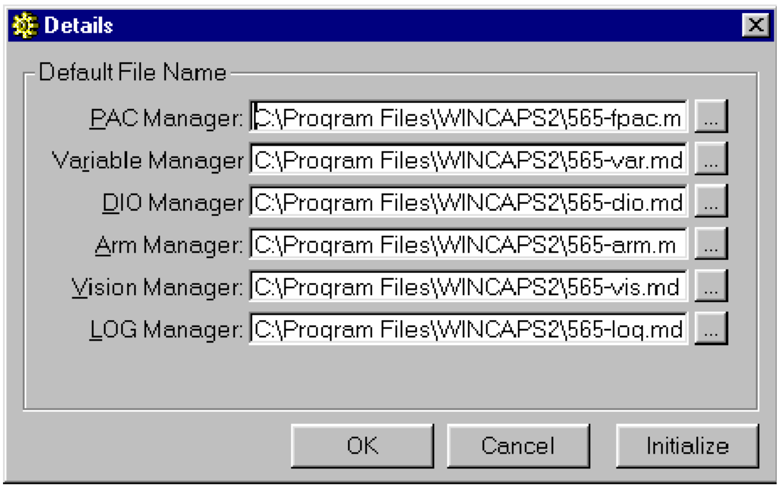


Fig. 4-9 Details Window

4.2.2 Open Project

This command opens the existing projects.
When this command is specified, the Open project window appears.

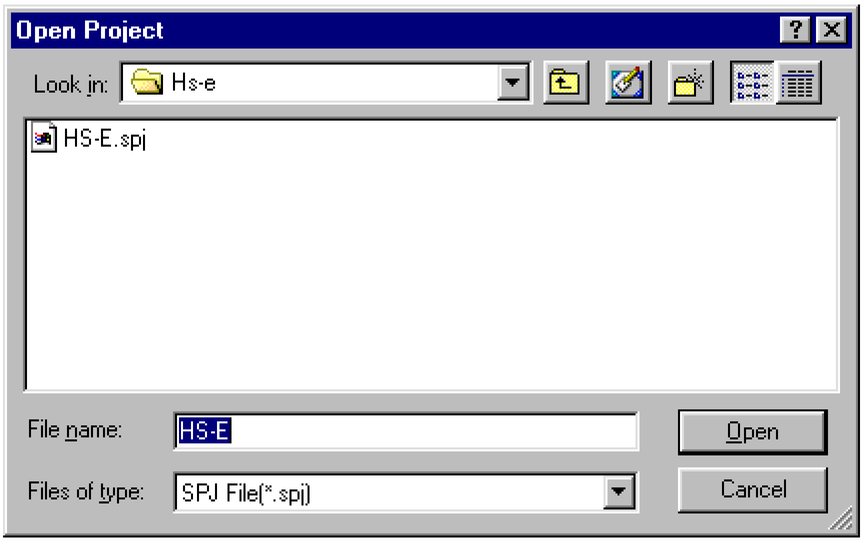


Fig. 4-10 Open Project Window

The files that contain the project management information have the extension file name ".spj". Select a file having the ".spj" extension for the project name.
Click on the Move up one holder level button  or the folder in the display box, and you can change the path.
When you click on a file having an ".spj" extension, the file name is entered in the File name box. Click on **Open** to opens the project.
To close the dialogue box without opening the project, click on **Cancel**.

4.2.3 Save Project

This command saves the currently opened project information.

4.2.4 Save Project As

This command stores the currently opened project as another one. All files used for the current project are copied to the new project.

Note: Do not select "Floppy (A:)" as place saved in.

4.2.5 Transfer Project

This command transmits the system project data. In the Robot Controller, this command is used for backing up the data.
Data may be transmitted in a batch, or may be transmitted in parts by selecting each Manager data from the transmission table.

> **Note: To transmit data selectively under the control of a manager other than the System Manager, you can use the Transmit command in the File menu of each respective Manager.**

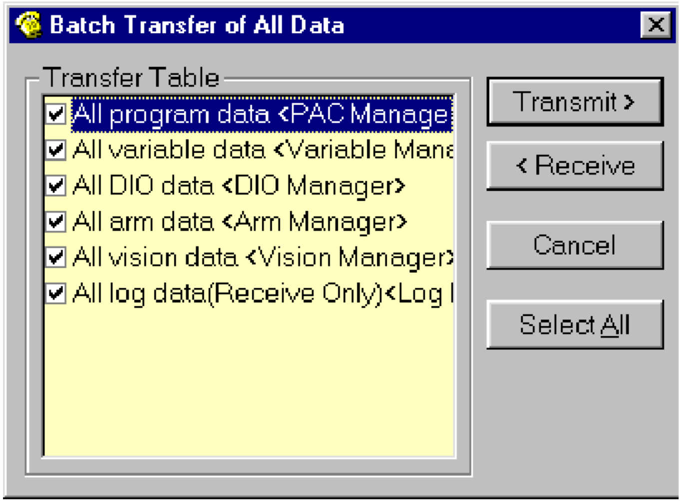


Fig. 4-11 All Data Batch Transfer Window

4.2.6 Project Information

Displays the set robot type or the project information for each Manager.

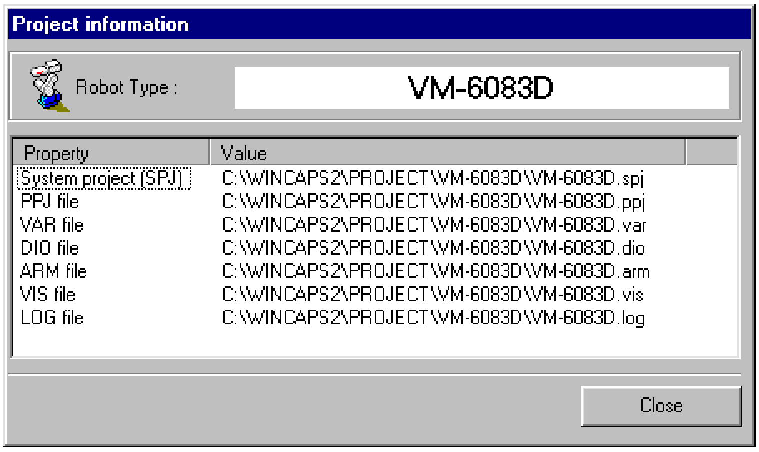


Fig. 4-11-1 Project Information Dialog Box

4.2.7 Exit

This command terminates the WINCAPSII application software.
The functional managers opened from the System Manager are simultaneously terminated.

4.3 Tools Menu

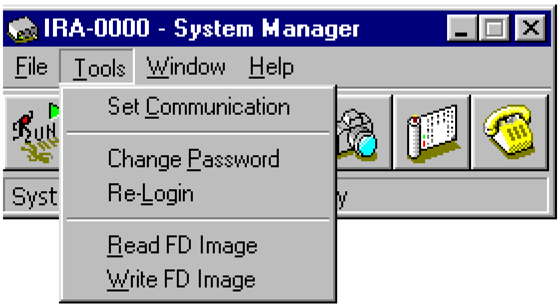


Fig. 4-12 Tools Menu

4.3.1 Set Communication

When you select “Set Communication” in the Tools menu, the ROBOTalk Manager dialog appears.

Click on the set communication button , to display the ROBOTalk Manager dialog.

The ROBOTalk Manager dialog box is used to set the communication device and communicating conditions, and to perform service processing of the communication protocol for the robot. This dialog box is also used to monitor the communication state and save the communication log.

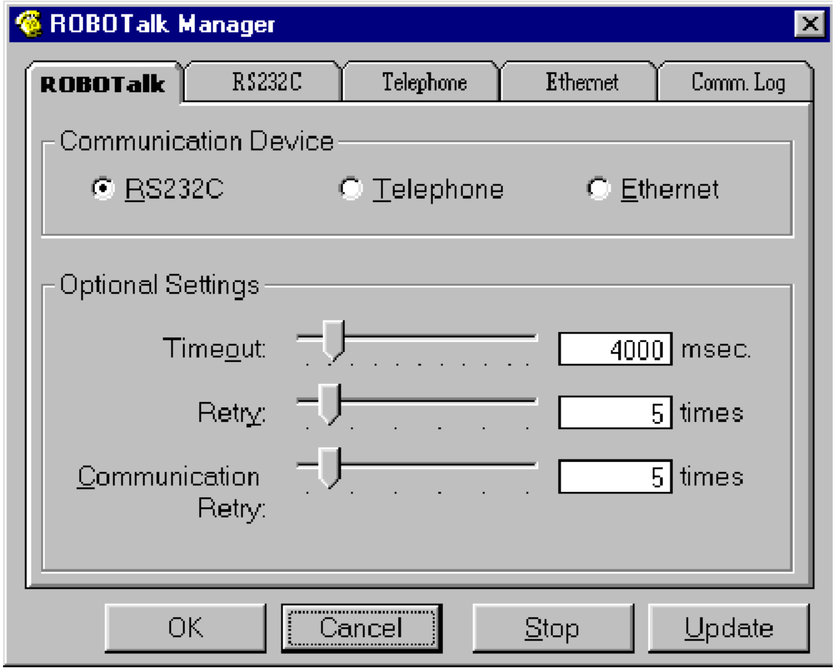


Fig. 4-13 ROBOTalk Manager Window

Clicking on the **ROBOTalk** tab enables you to make settings, as described in the following section downward.
When all the settings have been completed, click on **OK**.
When you lick on **Cancel,** the ROBOTalk Manager dialogue box is closed without any change of set values.
Press **Stop** in such cases where you want to interrupt transmission from the personal computer, no response is returned from the other party, or you want to stop the ongoing transmission.
Update is a button for confirming the contents until now. Clicking on **OK** closes the Communication Manager. Use **Update** to check the set data without closing the Communication Manager.

Note: The OK and UPDATE (A) buttons are invalid when one of the PAC, Variable, DIO, Arm, Vision or LOG Managers is in connection or the user level is set to “0-Operator”.

[1] ROBOTalk

Click on **ROBOTalk** tab in the ROBOTalk Manager window, and the screen shown in Fig. 4-14 appears.

Fig. 4-14 ROBOTalk

Communication Device

Select a communication device to use for communication with the Robot Controller by clicking on a desired device.
The Set Communication button icon  in the System Manager changes to the communication device selected here.

 RS232C is selected.

 Telephone line is selected.

 Ethernet is selected.

Setting Option

Timeout:	Sets the waiting time, for error judgment when no response is received from the Robot Controller. Default: 4000 msec.
Retry:	Sets the number of retries, when a timeout error is generated in communication. Default: 5 times
Communication retry:	Sets the number of retries when an error is generated in communication. Default: 5 times

[2] RS232C

Click on **RS232C** tab of the ROBOTalk Manager window to display the screen shown in Fig. 4-15.
Set the required data on this screen to enable connection between the personal computer and the Robot Controller directly with the RS232C cable.

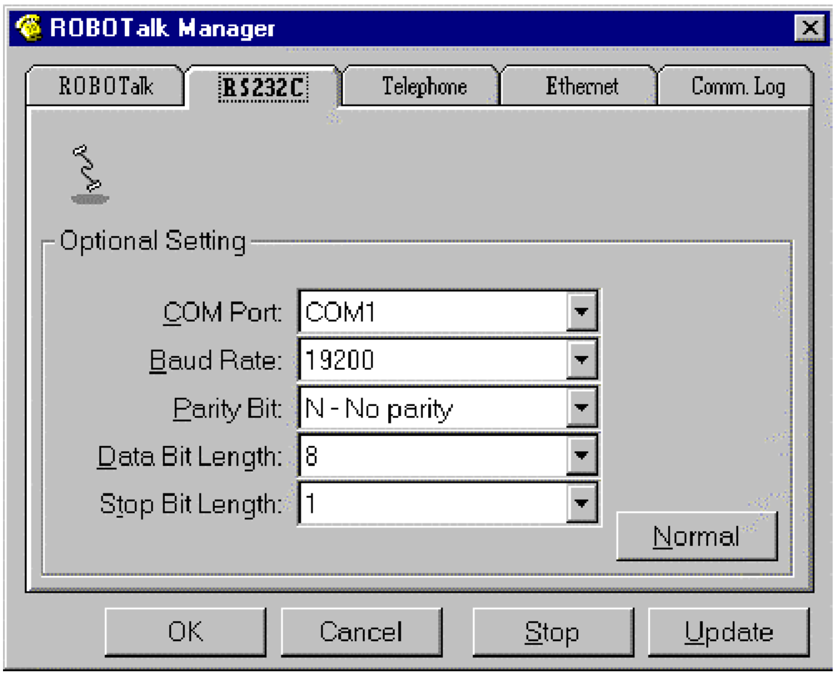


Fig. 4-15 RS232C

COM Port

Select the communication port to be used on the personal computer. When you click on the arrow , the options appear in a pull-down menu.

Baud Rate

Select the baud (communication) rate. When you click on the arrow , the options appear in a pull-down menu.

Note: The faster the communication speed, the more frequently the communication error tends to occur.

Parity Bit

Select the parity check bit. Click on the arrow to display the options in a pull-down menu.

Data Bit Length

Select the data bit length for communication. Click on the arrow to display the options in a pull-down menu.

Stop Bit Length

Select the stop bit length. Click on the arrow to display the options in a pull-down menu.

Normal

Set all RS232C related items to normal settings.

Communication port	: COM1
Baud rate	: 19200
Parity bit	: N-No parity
Data bit length	: 8
Stop bit length	: 1

[3] Telephone

Click on **Telephone** tab in ROBOTalk Manager dialogue box to display the screen shown in Fig. 4-16.
Set the required data on this screen to enable connection between the personal computer and Robot Controller using a telephone line.

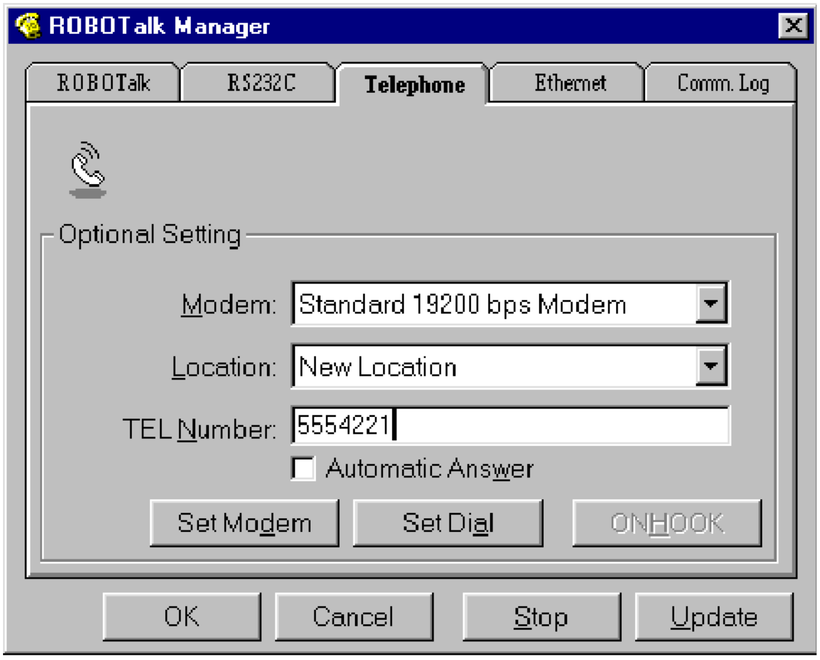


Fig. 4-16 Telephone Tab

Modem

The above dialog box shows the currently selected modem. Click on the arrow to display the options in a pull-down menu.
By clicking on Modem icon in the control panel, you can select a registered modem.
For how to use the Modem in the control panel, refer to the instruction manual for Windows 95.

Location

Select the location where the personal computer is used. Clicking on the arrow to display the options in a pull-down menu.
You can select a registered location by the following dial settings:

TEL Number

Enter the telephone number of the other party to which you intend to connect. Only enter the numerical characters. Hyphen, bracket, or the other signs are not usable for entry of telephone number.

Automatic Answer

If you put a checkmark in Automatic Answer check box, the personal computer automatically answer the calls.

Set Modem

This column shows the property of the selected modem.
For details on modem property setting, refer to the instruction manual for Windows 95.

Set Dial

This column displays the dial property.
For details on dial property setting, refer to the instruction manual for Windows 95.

ONHOOK

Press the ONHOOK button to disconnect the telephone connection.

Note: Connection with a telephone line is possible only when the modem is installed. For details on modem installation, refer to Chapter 2 "2.2.2 Telephone Line" in this manual.

[4] Ethernet

Click on **Ethernet** tab on the ROBOTalk Manager dialogue box to display the screen shown in Fig. 4-17.
Set the required data on this screen to enable connection between the personal computer and Robot Controller using Ethernet.

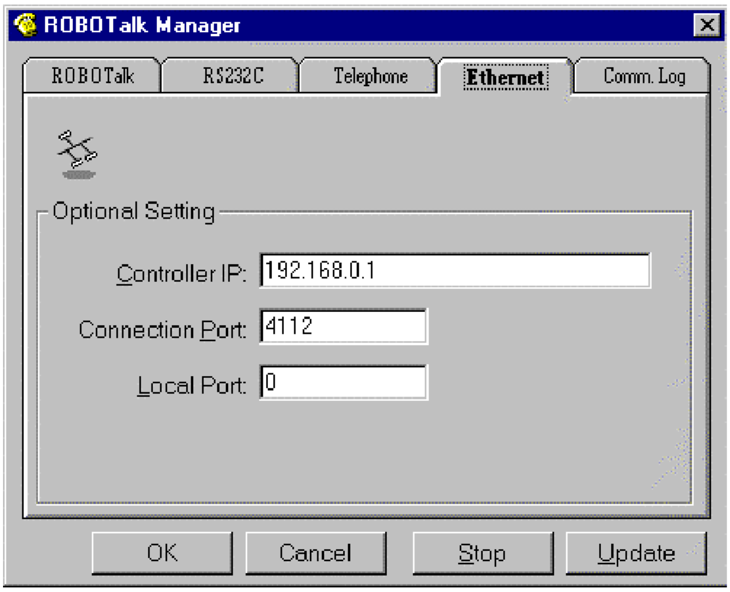


Fig. 4-17 Ethernet

Controller IP

Enter the IP address or the host name of the opposite station.

Connection Port

Enter the port number of the opposite station. Always set this number to 4112.

Local Port

Enter the port number of the personal computer.
Always set this number to 0 (zero).

[5]   Communication Log

Click on **Comm. Log** tab on the ROBOTalk Manager dialogue box to display the screen shown in Fig. 4-18.
The communication log function is used for checking the communication state. Use this function for checking the line condition, should you have a communication error.

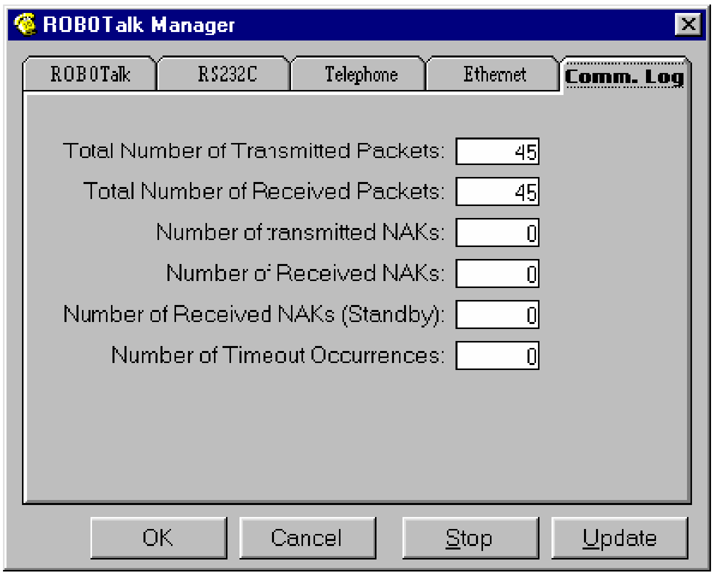


Fig. 4-18 Communication Log

Total Number of Transmitted Packets:	Total number of packets transmitted by WINCAPSII
Total Number of Received Packets:	Total number of packets received by WINCAPSII
Number of Transmitted NAKs:	Number of NAKs (error packets) transmitted by WINCAPSII
Number of Received NAKs:	Number of NAKs (error packets) received by WINCAPSII
Number of Received NAKs (Standby):	Number of NAKs (error packets) received by WINCAPSII except the errors caused in response to the transmitted packets
Number of Timeout Occurrences:	Number of timeouts except the timeout errors caused in response to the packets transmitted by WINCAPSII

Note: If timeout occurs for reasons other than connection failure, extend the timeout duration as noted in Chapter 4 "Setting Option" .

4.3.2 Changing Password (Programmer Level)

To change the password, select **Change Password** from the Tools menu. The Changing password window appears.

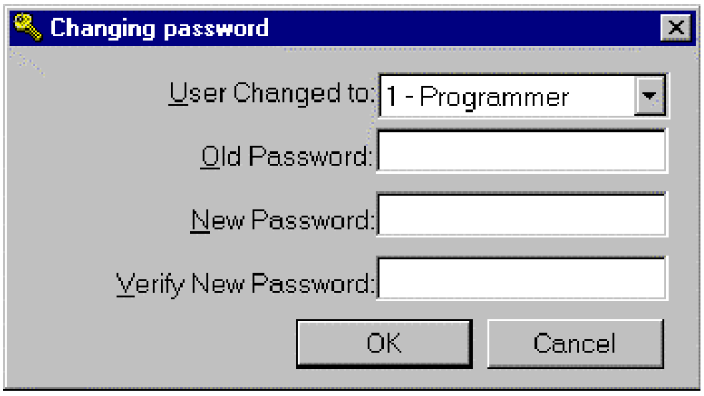


Fig. 4-19 Changing Password Window

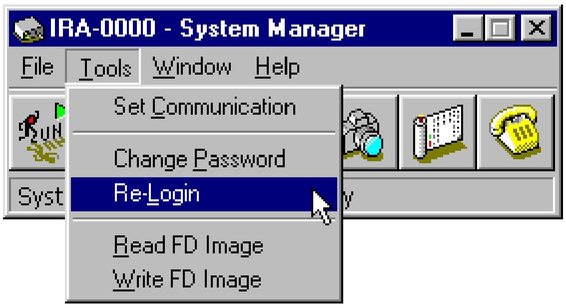
At **User Changed to**, select the user level whose password is to be changed.
At **Old Password**, enter the previous password.
At **New Password**, enter a new password.
At **Verify New Password**, re-enter the new password for verification.
After correctly entering all the items, click on **OK**.
To cancel change of password, click on **Cancel**.

4.3.3 Re-Log In

Use this function when changing the user level.

STEP 1

Select Re-Login from the Tools menu in the System Manager.
The password window appears on the screen.



STEP 2

Select the user level from the popup menu.

STEP 3

Input the password correctly and click on OK.
The user level has been changed.

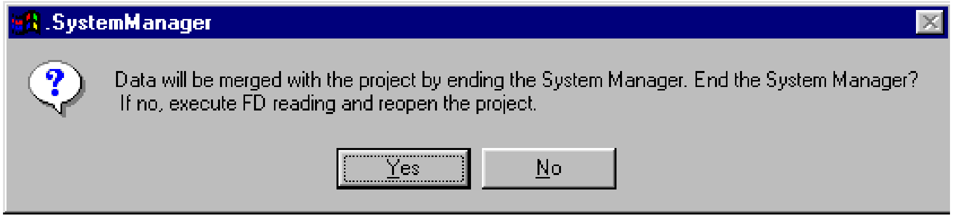
Note: If you press Cancel without entering password, you will be requested to enter the password when you specify the data setting, printing, or communication commands.

4.3.4 Reading FD Images

Data may be exchanged by using a floppy disk as the media between the Robot Controller, instead of data transmission using communication.
When reading data from a floppy disk, read the FD images.

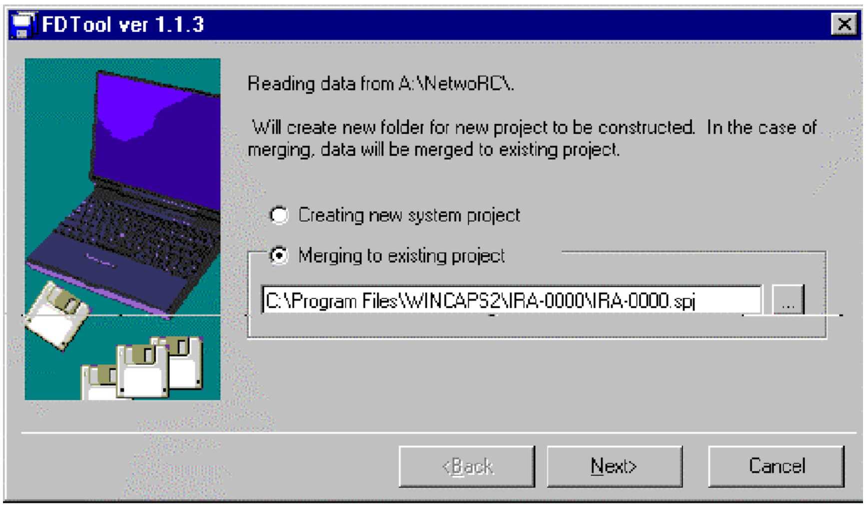
STEP 1

Select Read FD Image from the Tools menu.
The dialogue appears requesting you to end the System Manager. Click on Yes.



STEP 2

Click on Next.



Creating new system project: A folder and a system project file are newly created. The read data is merged in that project.

Merging to existing project: The read date is merged in the existing project.

Reference: Select an existing system project.

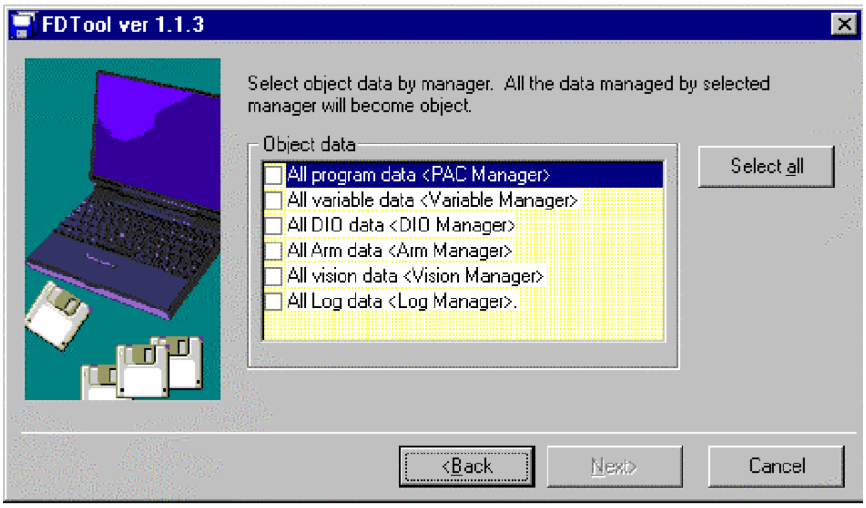
Back: Return to the initialize the screen.

Next: Proceed to the read a data object select screen.

Cancel: End

STEP 3

Select a data object and click on Next.
Select the data attached with a check mark as the object.



Select All: Select all object data for reading.

Back: Return to the system project select screen.

Next: Read from the floppy disk.

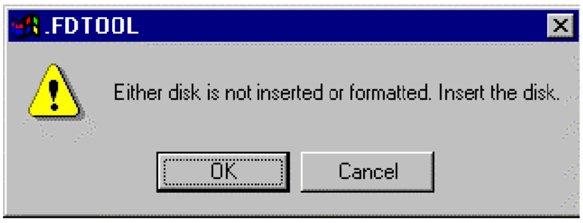
Cancel: End

▶ STEP 4

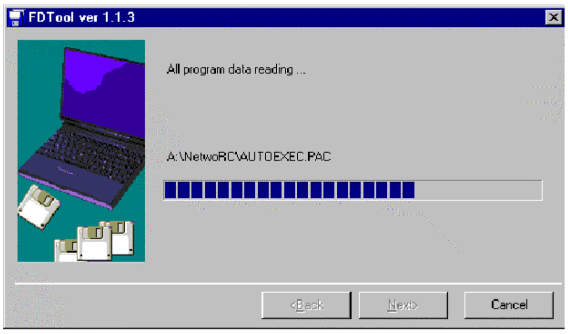
The following message appears requesting you to insert the floppy disk. Insert the floppy disk containing the read data into the floppy drive and click on OK.

If the floppy disk has different data from the object being read, a message appears prompting you to change disks. Replace with the correct disk and click on **OK**. Clicking on **Cancel** returns the display to the object data select screen.

If the floppy disk is neither inserted nor formatted, an error message appears. Insert the correct disk and click on **OK**.

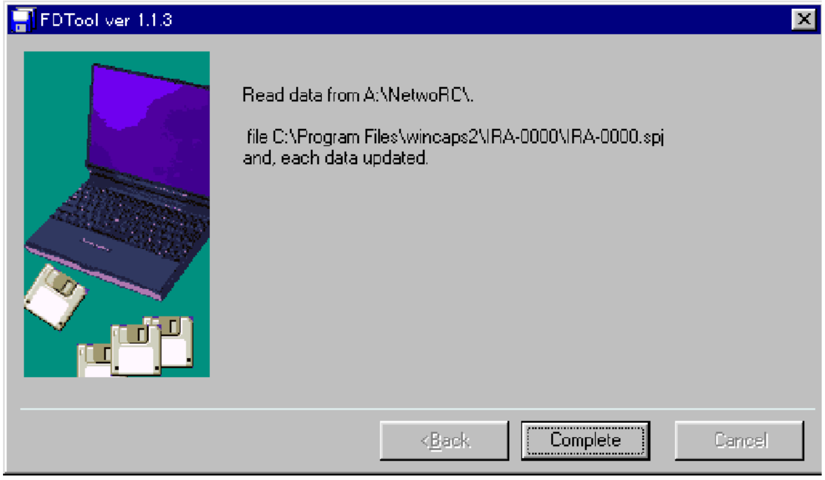


When the correct disk is inserted, the object data is read. Reading progress is indicated with a bar graph.



STEP 5

When the data is read normally, an indication to that effect appears. Click on Complete.

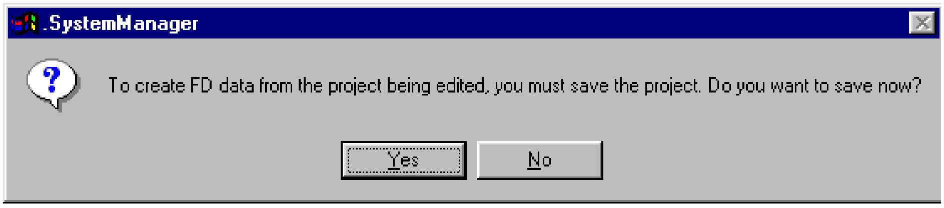


4.3.5 Write FD Images

Data can be exchanged by using a floppy disk as the media between the personal computer and the Robot Controller, instead of data transmission using communication.
When recording data to a floppy disk, write the FD images.

STEP 1

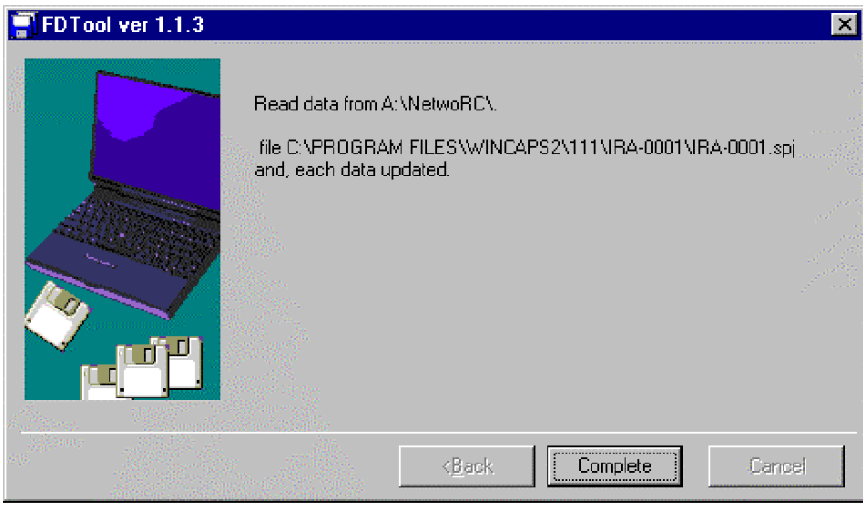
Select Write FD Image from the Tools menu.
A dialogue appears requesting you to save the project. Click on Yes. Save the data using the same method as selecting Save Project command in the File menu.



Note: Always save the project data. If FD image is written without saving the project data, the present state may not be written.

▶ STEP 2

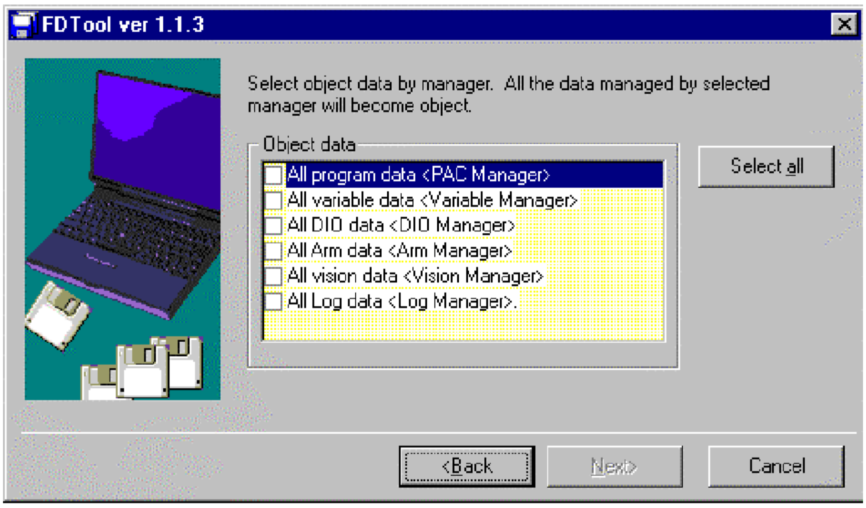
Click on Next.



Reference:	Select an optional system project.
Back:	Return to the initial screen.
Next:	Proceed to the write object data select screen.
Cancel:	End

▶ STEP 3

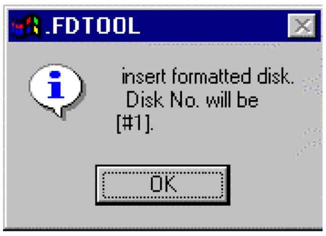
Select the object data and click on Next.
Select data by attaching a check mark for the write object.



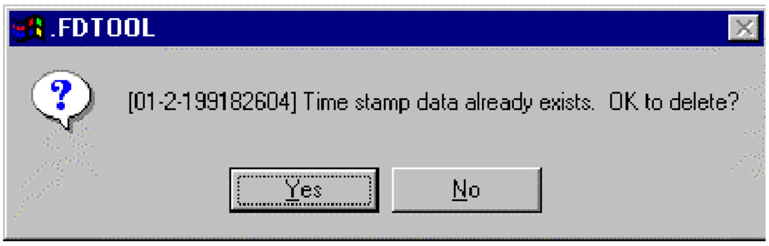
Select All:	Select all object data for writing.
Back:	Return to the select screen of the system project.
Next:	Write to a floppy disk.
Cancel:	End

▶ STEP 4

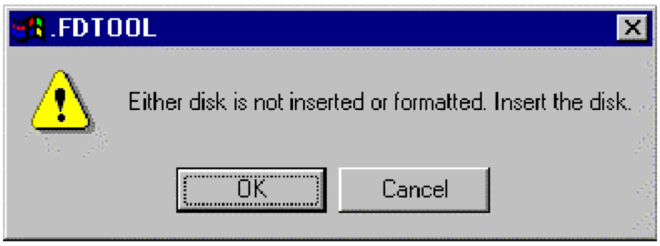
The following message appears requesting you to insert formatted floppy disk. Insert a formatted floppy disk into the floppy drive and click on OK.



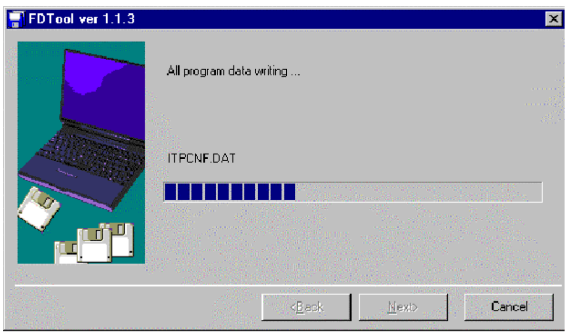
If the inserted floppy disk already has data on it, the system asks if it is OK to delete it.
Clicking on **Yes** deletes the file on the floppy disk.
Clicking on **No** returns the display to the object data select screen.



If the floppy disk is neither inserted nor formatted, an error message appears. Insert the correct disk and click on **OK**.

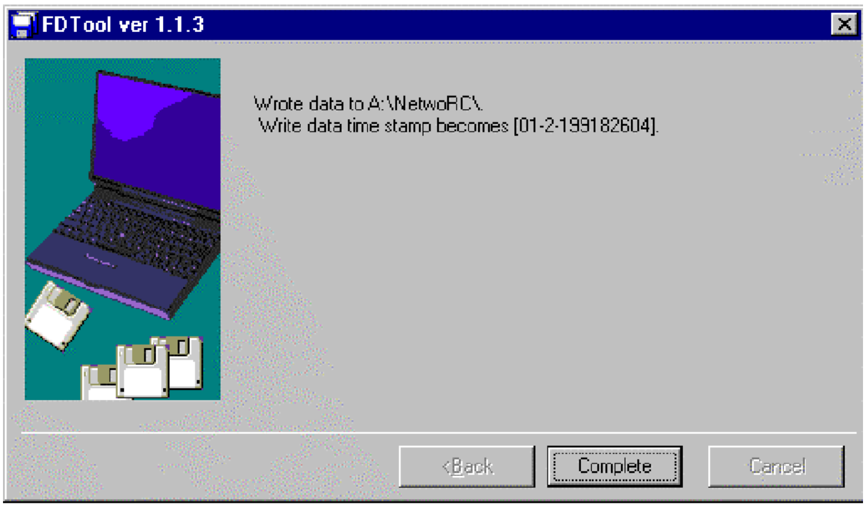


When the correct disk is inserted, the object data is read. Reading progress is indicated with a bar graph.



▶ STEP 5

When data is written normally, an indication to that effect appears. Click on Complete.



4.4 Window Menu

Fig. 4-20 Window Menu

4.4.1 PAC Manager

Start the PAC Program Manager.
The PAC Program Manager may be started by clicking on the PAC Program Manager button  .
For details on the PAC Program Manager, read Chapter 5, “Operating PAC Program Manager” and Chapter 3, subsection 3.5 “Entering and Editing Program”, of this instruction manual.
When PAC Program Manager is connected to the Robot Controller, the button icon display changes to  .

4.4.2 Variable Manager

Start the Variable Manager.
The Variable Manager may be started by clicking on Variable Manager button  .
For details on the Variable Manager, refer to Chapter 6 “Operating Variable Manager”. For operating procedures, refer to Chapter 3 “3.14.1 Starting Variable Manager” in this manual.
While Variable Manager is connected to the Robot Controller, the button icon display changes to  .

4.4.3 DIO Manager

Start the DIO Manager.
The DIO Manager may be started by clicking on DIO Manager button  .
For details on the DIO Manager, refer to Chapter 7 “Operating DIO Manager”. For operating procedures, refer to Chapter 3 “3.13.1 Starting DIO Manager” in this manual.
While DIO Manager is connected to the Robot Controller, the button icon display changes to  .

4.4.4 Arm Manager

Start the Arm Manager.
The Arm Manager may be started by clicking on Arm Manager button .
For details on the Arm Manager, refer to Chapter 8 “Operating Arm Manager”.
While the Arm Manager is connected to the Robot Controller, the button icon display changes to .

4.4.5 Vision Manager

Start Vision Manager.
Vision Manager may be started by clicking on Vision Manager button .
For details on the Vision Manager, refer to Chapter 9 “Operating Vision Manager”.
While Vision Manager is connected to the Robot Controller, the button icon display changes to .

4.4.6 LOG Manager

Start LOG Manager.
LOG Manager may be started by clicking on the LOG Manager button .
For details on the LOG Manager, refer to Chapter 10 “Operating LOG Manager”.
While LOG Manager is connected to the Robot Controller, the button icon display changes to .

4.5 Help Menu

The Help menu provides useful information on how to use WINCAPSII.

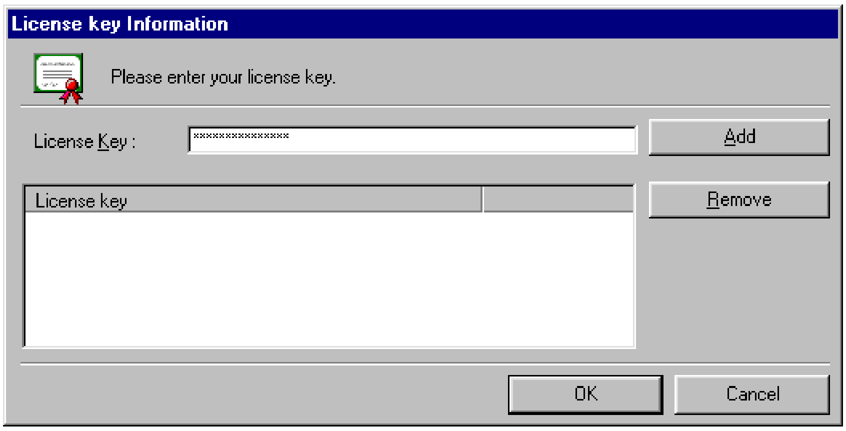
Fig. 4-21 Help Menu

4.5.1 License Key

Register the license key of your WINCAPS II. This registration allows you to use all the WINCAPS II functions.

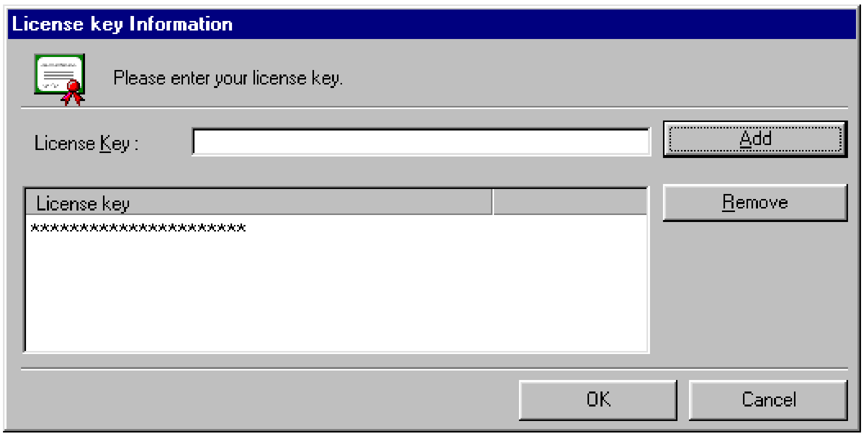
STEP 1

Enter the User ID printed in the license card and click Add.



STEP 2

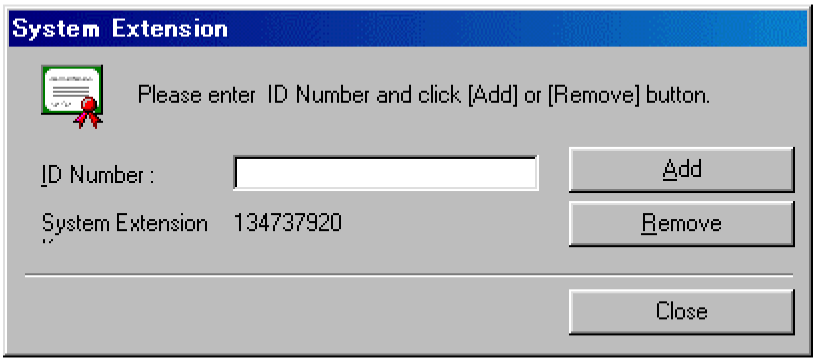
Confirm that the entered User ID is displayed in the license key list and then click OK.



4.5.2 System Extension

Even in WINCAPSII Version 1.9 or later, you may resist or delete optional functions that the robot controller will use.

When WINCAPSII and the controller are in connection, select the “System Extension” of the Help Menu. The System Extension screen appears.



After inputting the specified ID Number, resist or delete the optional function by pressing the “Add” or “Remove” button.

Examples of optional functions

Optional function	ID No.	Reference manual
Tip compliance control	6519	PROGRAMMER’S MANUAL Chapter 3
Supervisory task	1111	SETTING-UP MANUAL Chapter 3

4.5.3 About System Manager

Displays the version information of WINCAPSII on the screen.
Use this for verifying the WINCAPSII version for maintenance and other.

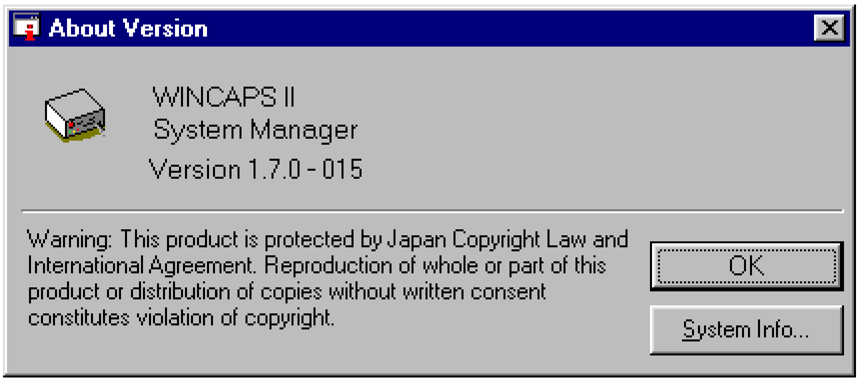


Fig. 4-23 About System Manager

Chapter 5

Operating PAC Program Manager

This chapter describes how the PAC Program Manager, within WINCAPSII software, functions and is used by the personal computer teaching system.

5.1 Outline of PAC Program Manager

5.1.1 Outline of Functions

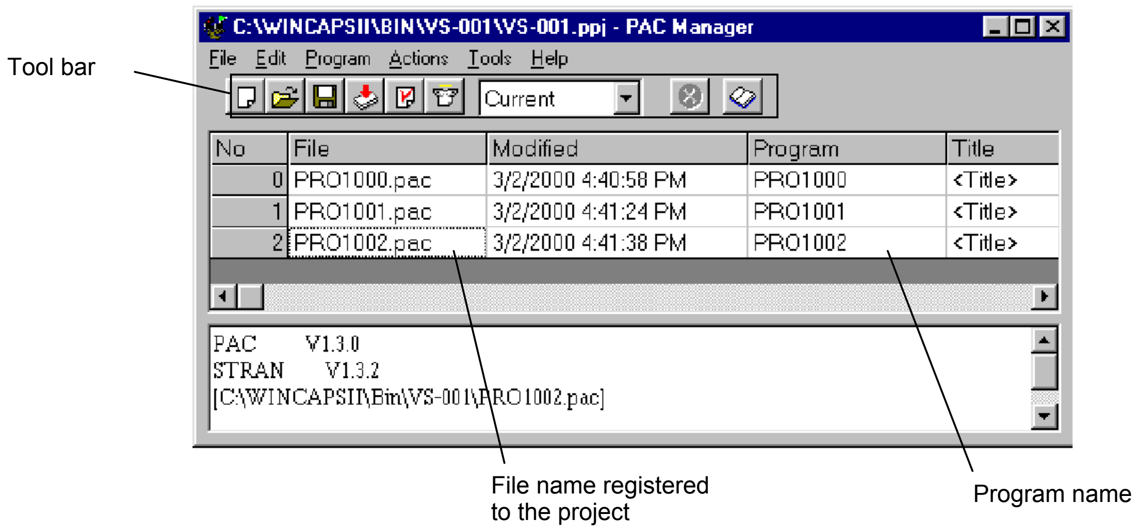
The PAC Program Manager is a comprehensive support tool for developing structured robot language for the PAC program. In addition to general functions of the text editor, the Program Manager enables you to create programs with ease, using the PAC language command builder, program bank and other tools.

The PAC Program Manager starts when the System Manager button is clicked on or from the Window menu.

Upon starting the PAC Program Manager, the PAC Manager window appears on the screen.

> **Note: In RC7 Version 2.2 or later, a tree pane showing how the folders are organized is newly added in the PAC Manager screen. Depending upon the system version, the project configuration varies as shown below.**

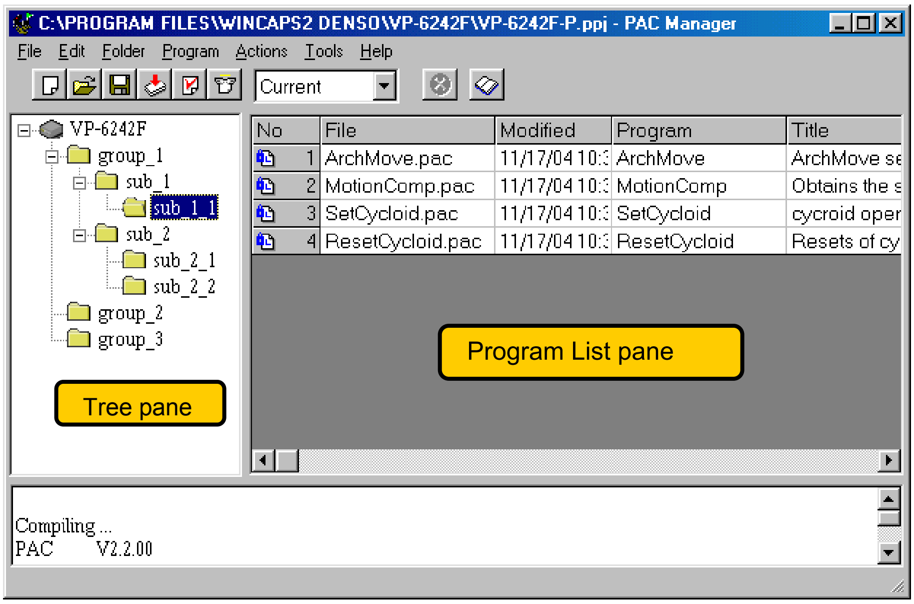
<u>**RC5 PAC Manager window**</u>



Program name:	Displays the program name registered to the project.
Program title:	Displays the title information registered with TITLE statement in the program.

Fig. 5-1 (1) PAC Manager Window

RC7 PAC Manager window



Tree pane:	Displays how the folders are organized. The root of the tree bears a project name.
Program List pane:	Lists the programs contained in the selected folder.

Fig. 5-1 (2) PAC Manager Window

Note: [RC7 Ver. 2.2 or later]
Folder feature and Panel Designer

(1) The folder feature enables hierarchical management of user programs with a directory structure. You can organize your programs into a set of hierarchically structured folders by function or by type. This makes the configuration of programs easy to understand and allows you to handle programs on a folder basis, facilitating the use of existing programs for development of other programs. For details, refer to the SETTING-UP MANUAL, Section 3.2.5, "Folder Feature."

(2) WINCAPSII includes the Panel Designer, software for creating teach pendant operating panel screen software. For details about the Panel Designer, refer to the user's manual of "Teach Pendant Operating Panel Editor, Panel Designer" separately issued.

5.1.2 Tool Bar

NEW PROGRAM Button

Newly registers the program to the project

ADD PROGRAM Button

Adds an existing program to the project.

SAVE PROJECT Button

Saves the state of all programs and projects currently being edited.

CREATE EXECUTION PROGRAM Button

Creates a program in the executable format from the program registered to the project.

SYNTAX CHECK button

Checks the syntax of the selected program.

TRANSMIT Button

Transmits data between the Robot Controller and the personal computer.

SELECT ACTION OBJECT List

Selects the action object. The following are the action object types:

Current: Action object for action in the currently selected program.
Project: Action object for action in all of the current programs.
Group: Action object for action in the current group program.
This function is designed for execution with all action object actions that have selected items, other than CONNECT and STOP in the action menu.

Note: For the group setting, refer to Chapter 5 "5.2.5.4 Group" in this manual.

STOP Button

Stops the creation of the execution program.

HELP Button

Displays the descriptions of commands (COMMAND HELP).

5.1.3 Basic Usage

The following illustrates the basic flow of the PAC Program Manager.
Figure 5-2 shows the monitoring program operation flow.
Figure 5-3 shows the program creation design flow.

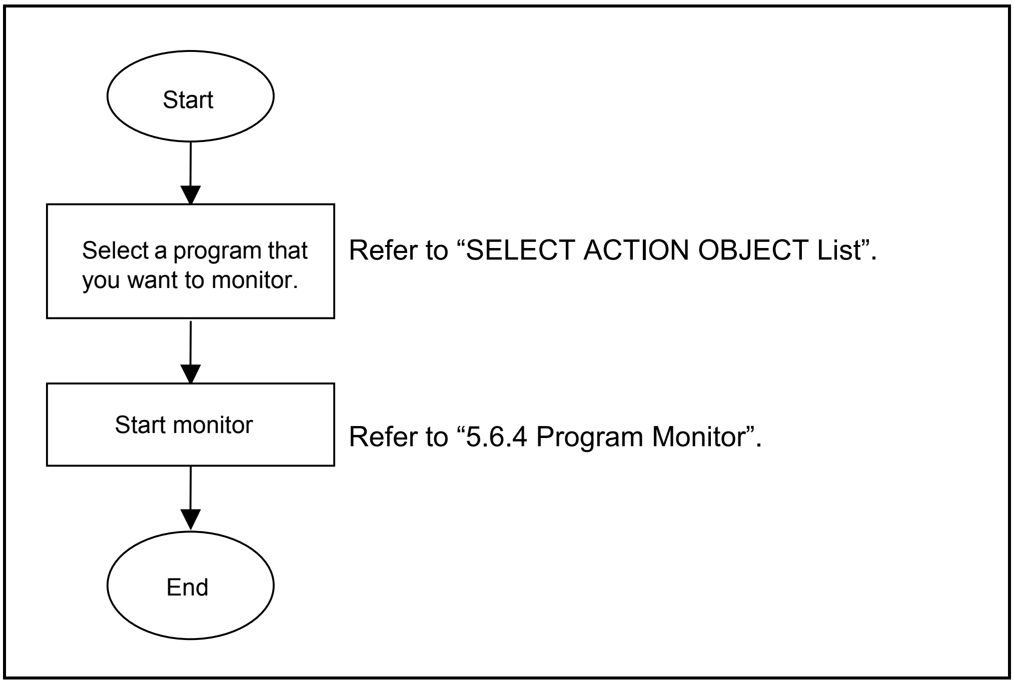


Fig. 5-2 PAC Program Manager Basic Usage (Monitor)

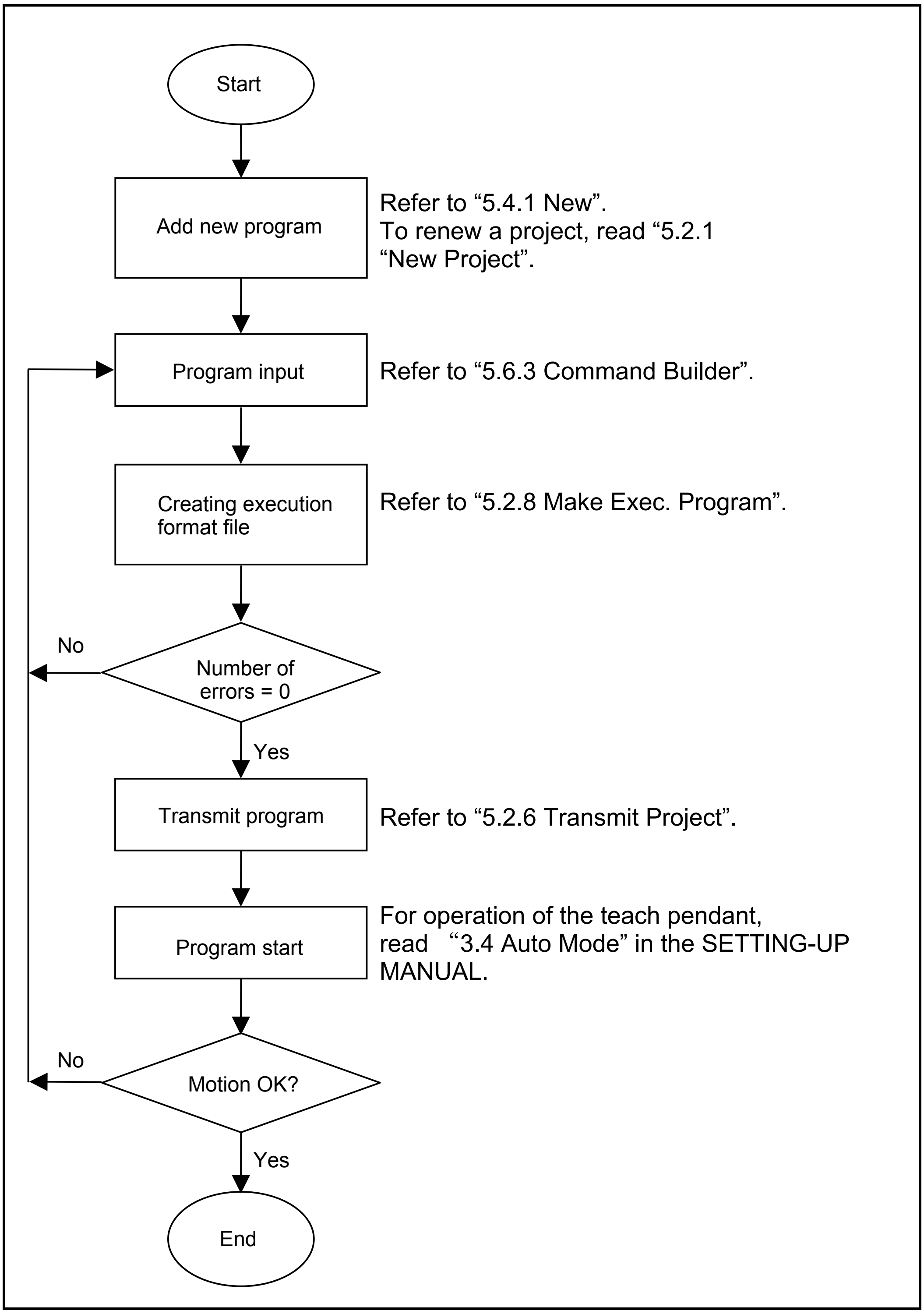


Fig. 5-3 PAC Program Manager Basic Usage (Design)

5.1.4 File Management

Figure 5-4 illustrates the types of files that can be managed with the PAC Program Manager. Descriptions of each file are given below:

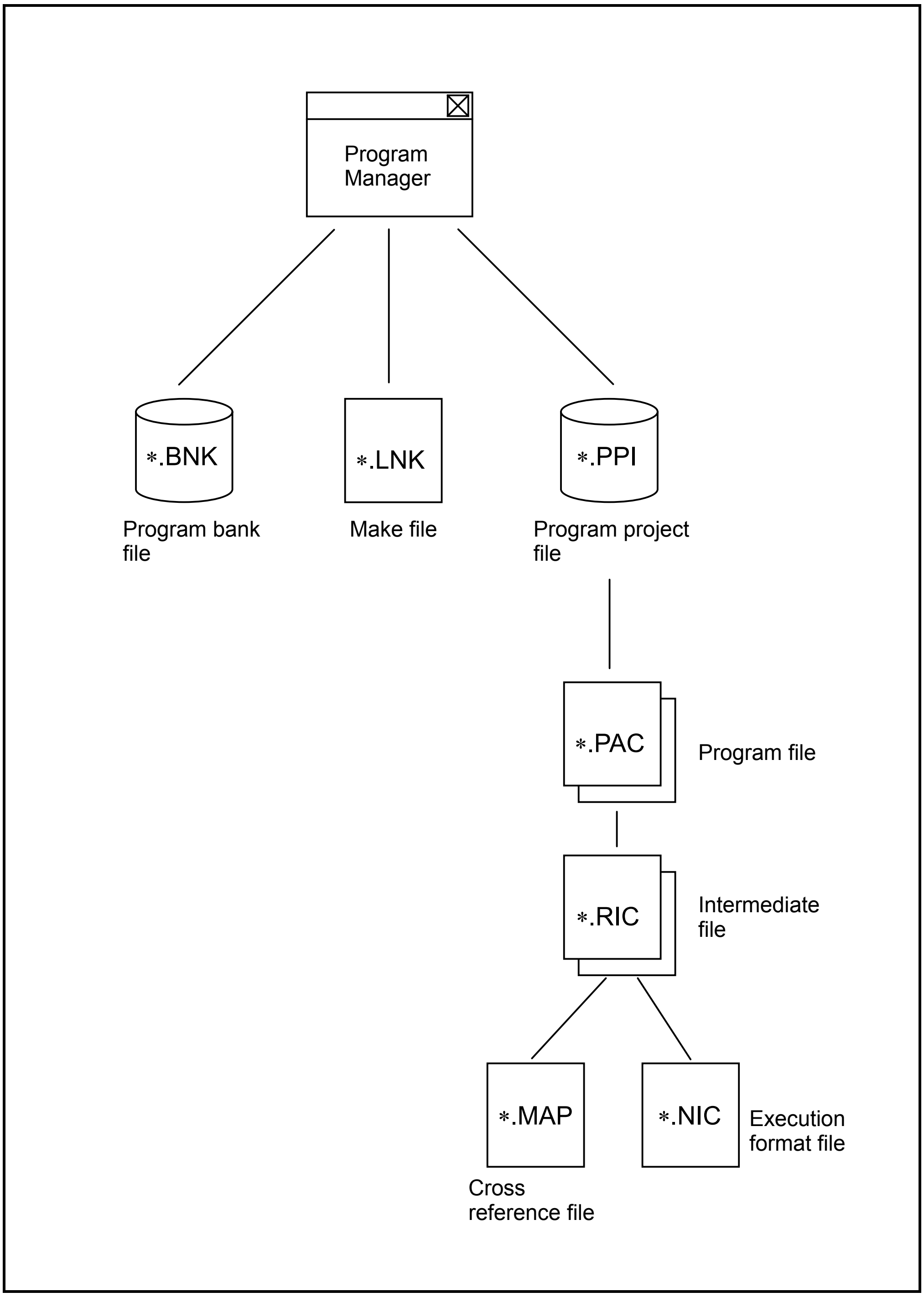


Fig. 5-4 Files Managed with PAC Program Manager

5.1.4.1 Program Project File (*.PPJ)

Program Project refers to a group of programs used simultaneously.
Only one program project can be opened at a time.
The Program project file saves the program source file reference information, included in the program project.
The program project file extension is ".PPJ".
The System Manager controls which program project to use with the currently selected system project. The System Manager specifies which program project file to use when it starts the program manager.
When the program project is changed with PAC Program Manager, data concerning the System Manager program project file is automatically changed.

5.1.4.2 Program Source File (*.PAC)

Program Source File refers to the file used to save individual programs sources.
One program source file for each program source.
The file extension is ".PAC".
One program source file may be registered to multiple program projects. In this case, changing a program source file from a program project will affect other projects.

5.1.4.3 Intermediate File (*.RIC)

A file that accommodates intermediate code is automatically generated when converting a program to an executable.
The file extension is ".RIC".

5.1.4.4 Program Bank File (*.BNK)

Saves the library programs to be used by the program bank.
One program bank file saves all the programs to be used in one library.
The file extension is ".BNK".

5.1.4.5 Executable File (*.NIC)

Accommodates format program data execution.
The file extension is “.NIC”.

5.1.4.6 Cross Reference File (*.MAP)

A file that accommodates cross reference is automatically generated when converting a program into an executable.
The file extension is “.MAP”.

5.1.4.7 Make File (*.LNK)

A file that accommodates link information is automatically generated when converting a program into an executable.
The file extension is “.LNK”.

5.1.5 Menu List (PAC Program Manager)

The PAC Program Manager command menu has the following tree structure:

File
- New Project (Programmer Level) *
- Open Project (Programmer Level) *
- Save Project
- Save Project As (Programmer Level) *
- Set Project
- Transmit Project (Programmer Level)
- Print
- Make Exec. Program
- Make Macro Definition File
- Close

Edit
- Undo
- Cut
- Copy
- Paste
- Delete
- Select All
- Search
- Replace
- Jump line No

Folder [RC7 Ver. 2.2 or later]
- New
- Rename
- Release
- Delete
- Import

Program
- New
- Save
- Save As
- Add
- Release
- Check
- Import
- Export
- Rearrange
  - File Name
  - File Date
  - Program Name
- Use/No use [RC7 Ver. 2.2 or later]

Actions
- Show
- Hide
- Stop

Tools
- Options
- Program Bank
- Command Builder
- Program Monitor
- Panel Designer [RC7 Ver. 2.2 or later]

Help
- About PAC Manager

Fig. 5-5 PAC Program Manager Menu Tree

* Displayed only when the display option file extension menu is checked. To set the display option, first login again at Programmer level, then select Tool, Options, and View and check the option file extension menu.

5.2 File Menu (PAC Program Manager)

PAC Program Manager File menu is shown below:

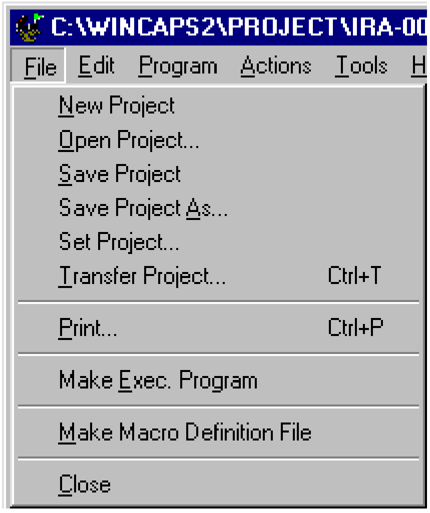


Fig. 5-6 File Menu

5.2.1 New Project (Programmer Level)

Create a new program project and simultaneously save it to the new program project file.

5.2.2 Open Project (Programmer Level)

Select and open the program project file.

5.2.3 Save Project

Save the program project information currently under editing to the program project by overwriting.
Clicking on the SAVE PROJECT button provides the same function.

5.2.4 Save Project As (Programmer Level)

Save the program project information currently under editing to the new program project file. Optionally, name the new program project file to avoid redundancy.

5.2.5 Set Project (Programmer Level)

Creates project settings.
Upon selecting Set Project from FILE menu, the Set Project dialog box appears. Click on OK to register the change content. To erase the change content, click on **Cancel**.

5.2.5.1 Document

Click the Document tab to enter the document name used when creating the project.

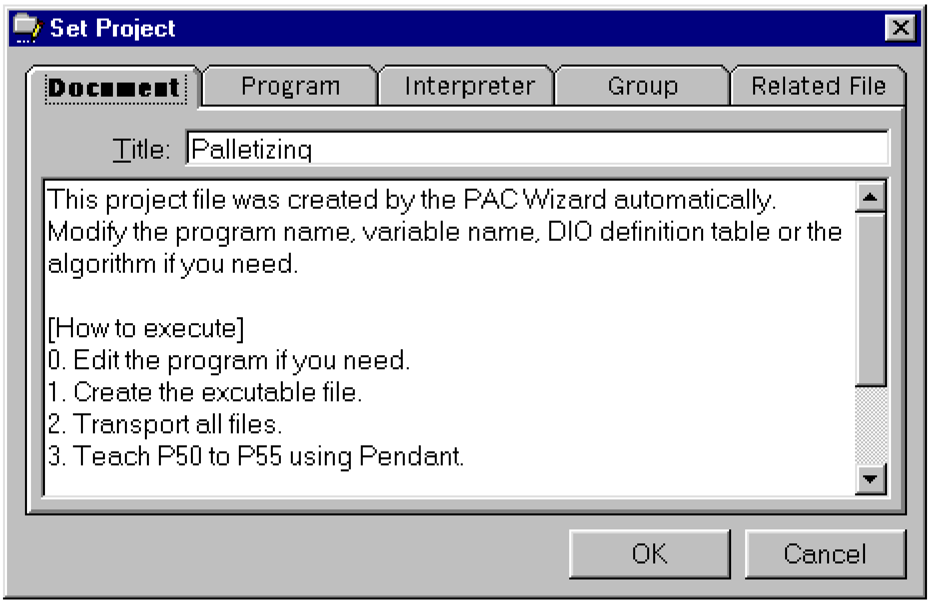


Fig. 5-7 Document Tab (Set Project) Dialog

5.2.5.2 Program

Click the Program tab to set the variable parameters to be used by the project. For details on the parameters, refer to “Appendix” in the PROGRAMMER'S MANUAL I.

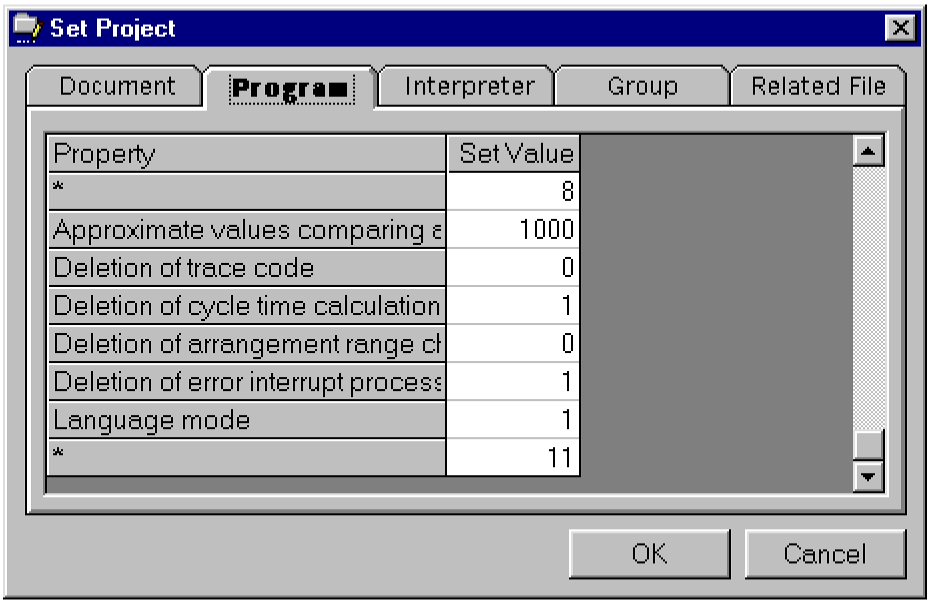


Fig. 5-8 Program Tab (Set Project) Dialog

> **Note: The asterisks (*) under the property are the parameters of which settings are prohibited because of the programmer level selected when you log in to the WINCAPS II.**

5.2.5.3 Interpreter

Click the Interpreter tab to set the parameters to be used by the project execution program.
Set the variable parameters to be used by the project. For details on the parameters, refer to “Appendix” in Owner’s Manual (Programming).

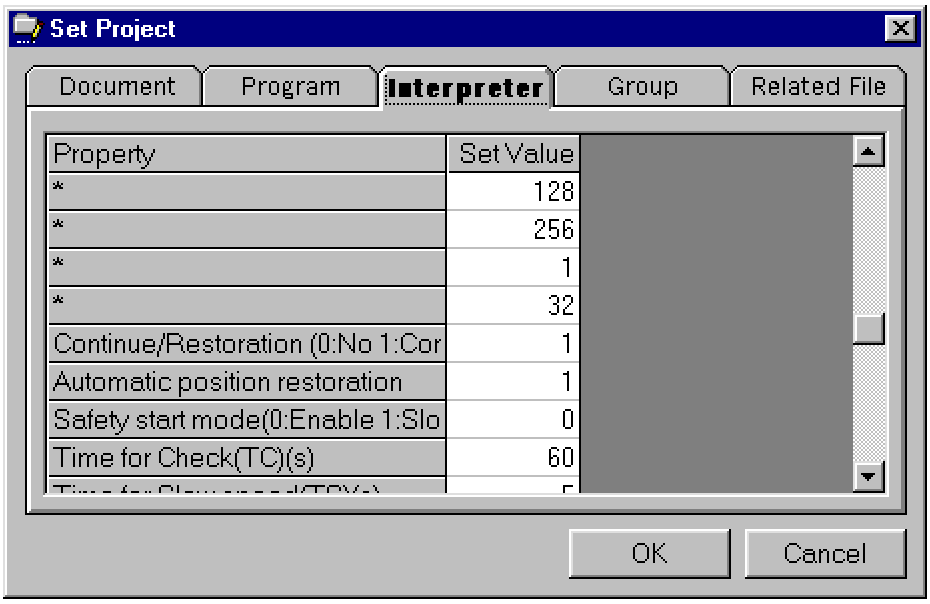


Fig. 5-9 Interpreter Tab (Set Project) Dialog

5.2.5.4 Group

Click the Group tab to group the programs.
After setting the groups, all the programs registered to the groups can be handled as action objects.

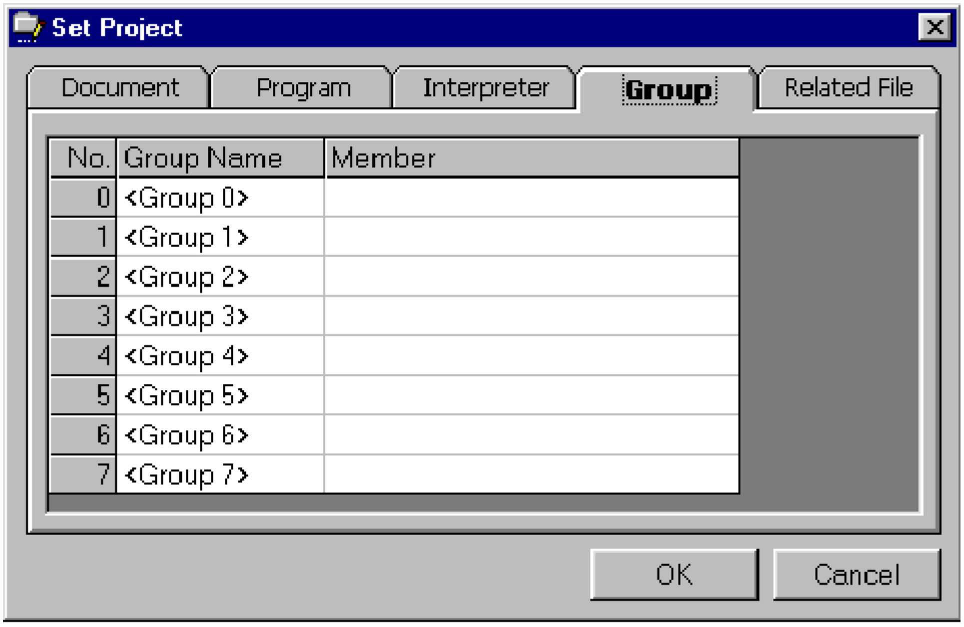


Fig. 5-10 Group Tab (Set Project) Dialog

Set up the groups using the following procedures:

▶ STEP 1

Register the group name.
Input an optional group name.

▶ STEP 2

Input the group members.
Input the program names to be registered to the group.
Input a semi-colon at the end of each program name.
(Example) PRO1; PRO2; PRO3;

5.2.5.5 Related File

Click the Related File tab to register the include files of own creation or related files, created with other application software here.
Registered files may be opened by double clicking. This automatically starts the created application.

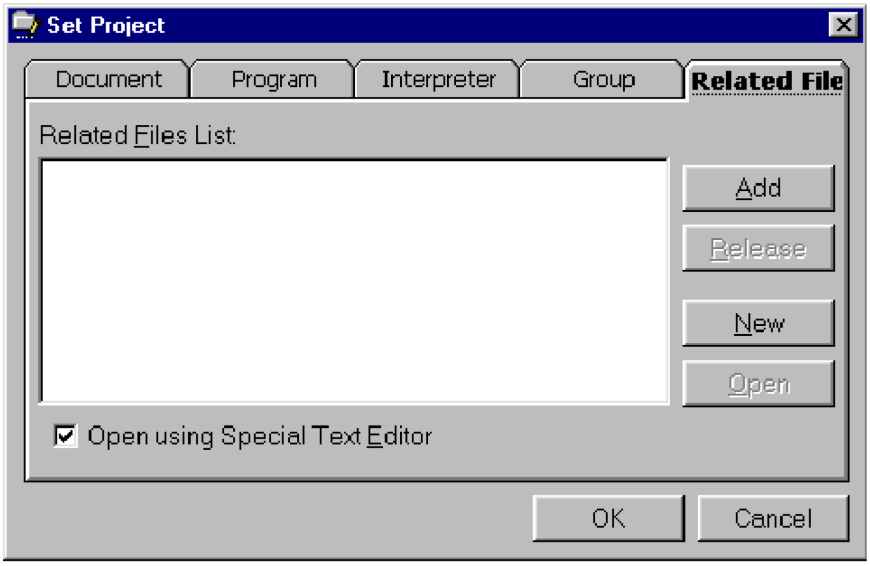


Fig. 5-11 Related File Tab (Set Project) Dialog Box

Add button: Adds a created file to the project.
Release button: Releases, from the project, files selected from the Related File List.
New button: Creates a new file and starts the dedicated editor.
Open button: Opens the file selected from the Related File List. The file may be opened by double-clicking.

If you put a checkmark at **Open with Special Text Editor,** the dedicated text editor is used. If the application software used to create the file is not defined, the file is opened with the normal editor.

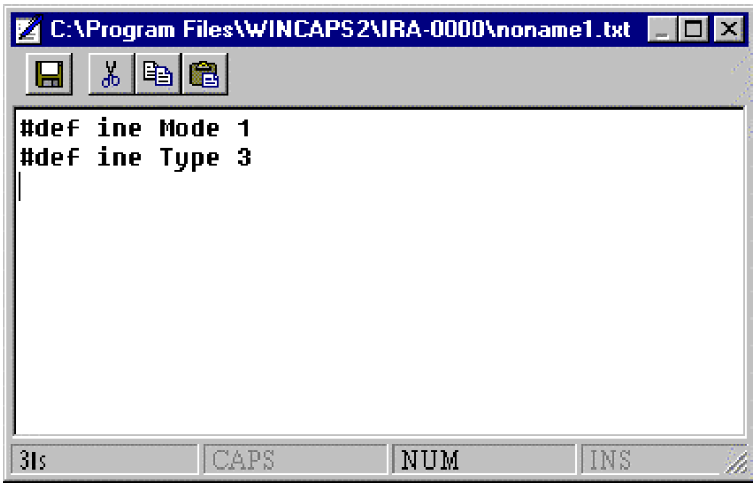


Fig. 5-12 Operation with Dedicated Editor

 : Saves the file currently being edited.

 : Cuts out selected range data. Cut data can be used with the Paste command.
The same operation can be accomplished with [Ctrl]+[X].

 : Copies selected range data. The copied data can be used with the Paste command.
The same operation can be accomplished with [Ctrl]+[C].

 : Pastes cut or memorized data by copying to a specified location. The same operation can be accomplished with [Ctrl]+[V].

5.2.6 Transmit Project

Program data may be transmitted or received only when the Robot Controller is in connected communication state.

When the Transfer dialog box appears, select the data to be transmitted and click on Transmit or Receive to send or receive data.

The same result can be achieved by clicking on the Transmit button  .

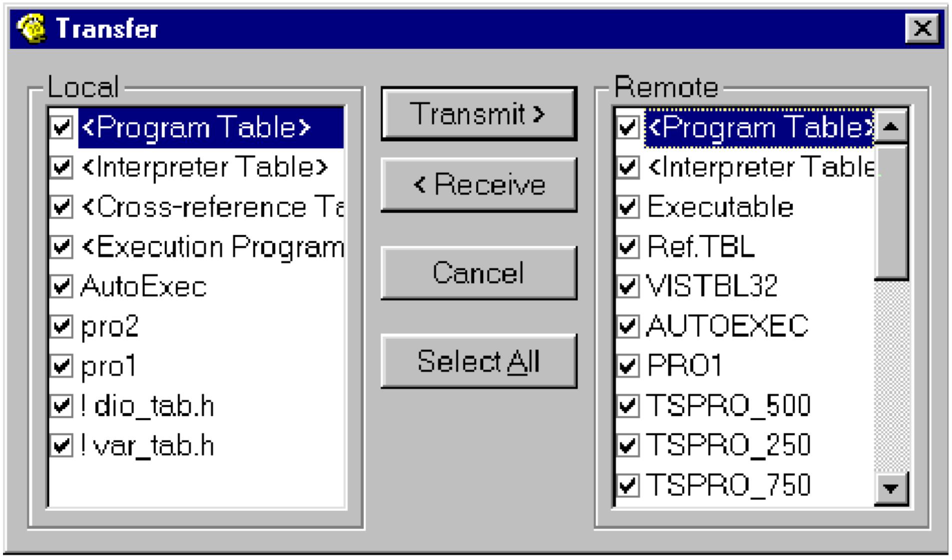


Fig. 5-13 Transmit Dialog Box

5.2.6.1 Program/Interpreter Table

- Program table
  Shows the project setting data described in “5.2.5.2 Program”.
- Interpreter table
  Shows the project setting data described in “5.2.5.3 Interpreter”.

5.2.6.2 Map/Executable Program

- Map File
  This file is needed when you refer to the variables or the other data used in the executable program.
  The map file is referred to when the program is executed. Therefore, treat the file in pair with the executable program.
- Executable Program
  Program in the executable format created from the programs registered in the project.

5.2.6.3 Program Source

- Source File
  PAC program (*.PAC) needed for creating an executable program.
  Your personal computer (remote side) displays all the PAC programs currently stored in the Robot Controller, while the Controller (local side) displays all the PAC programs registered in the project.
- Header File
  This file is referred to by the PAC program (*.PAC). Specify the header file name with the “#INCLUDE” statement in the program.

5.2.7 Print

Prints the program list and the parameter table of the PAC Program Manager.

5.2.7.1 Print Object

The Print Manager dialog box appears on the screen. Select the Print Object tab. Select the item to be printed and click on **Print** to print the specified data.

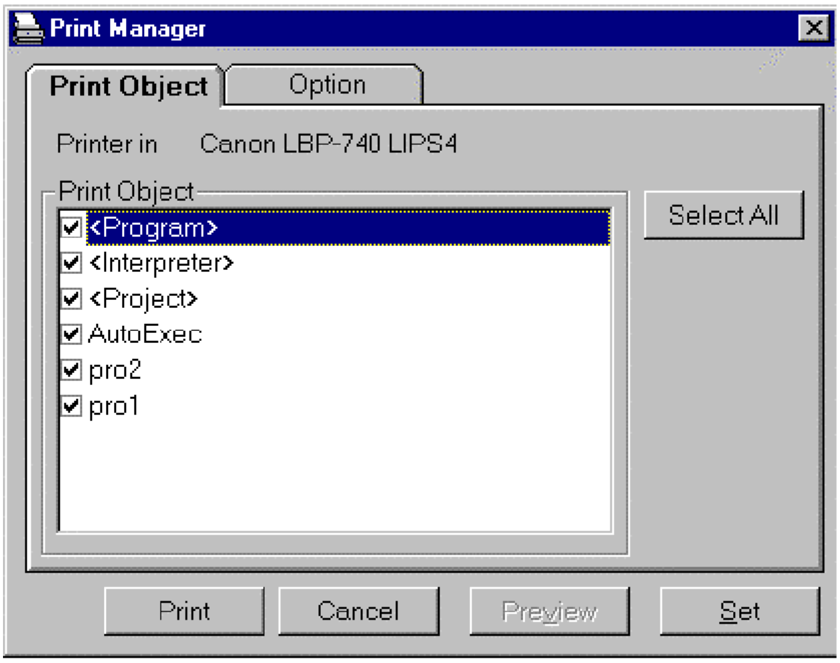


Fig. 5-14 Print Object Tab (Print Manager) Dialog Box

- Select All: Selects all objects for printing at one time.
- Set: The printer data setting dialog appears. In this dialog, set the required printing conditions.
- Preview: Enables viewing the printing state before actual printing.
- Cancel: Closes the dialog box without printing.
- Print: Prints the selected object.

Supplement: If you wish to print only the specified page, see preview and click on the print button  **.**

Note: Preview is not usable if several objects are selected for printing.

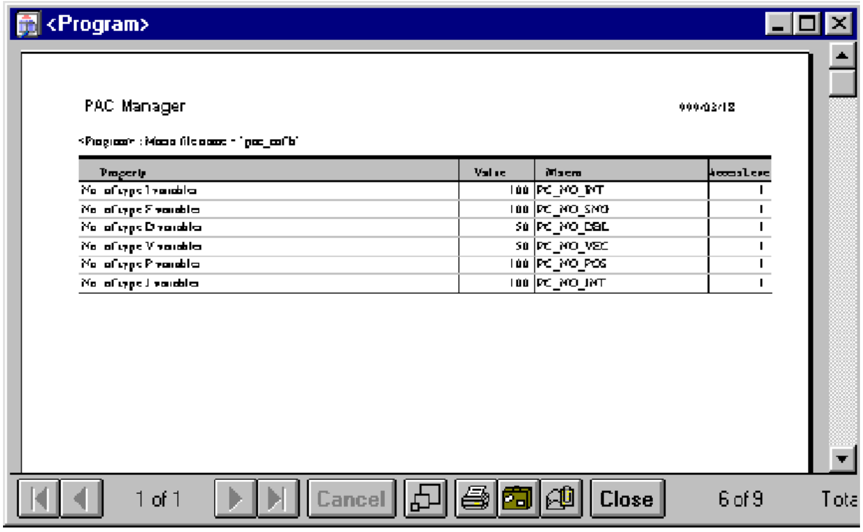
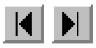


Fig. 5-15 Preview Window

 : Moves the cursor to the top/end of the page.

 : Moves the cursor to the preceding/following page.

 : Selects the display size (Reduced/Standard/Expanded)

 : Sets the printing conditions.
You can specify the printing range (in pages) of the object file.

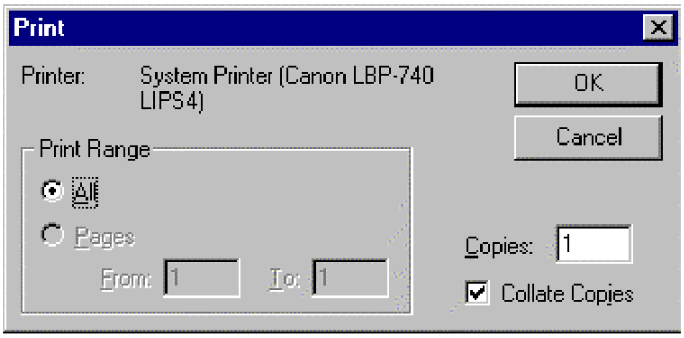


Fig. 5-16 Print Widow

 : Exports the object file.
Outputs destination after converting to a specified file format.

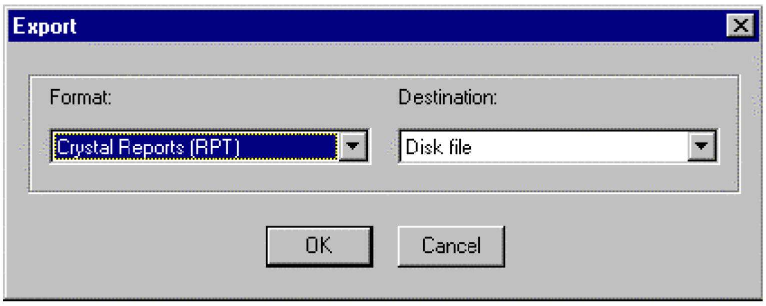


Fig. 5-17 Export Window

5.2.7.2 Option

Selecting the Option tab displays print options.

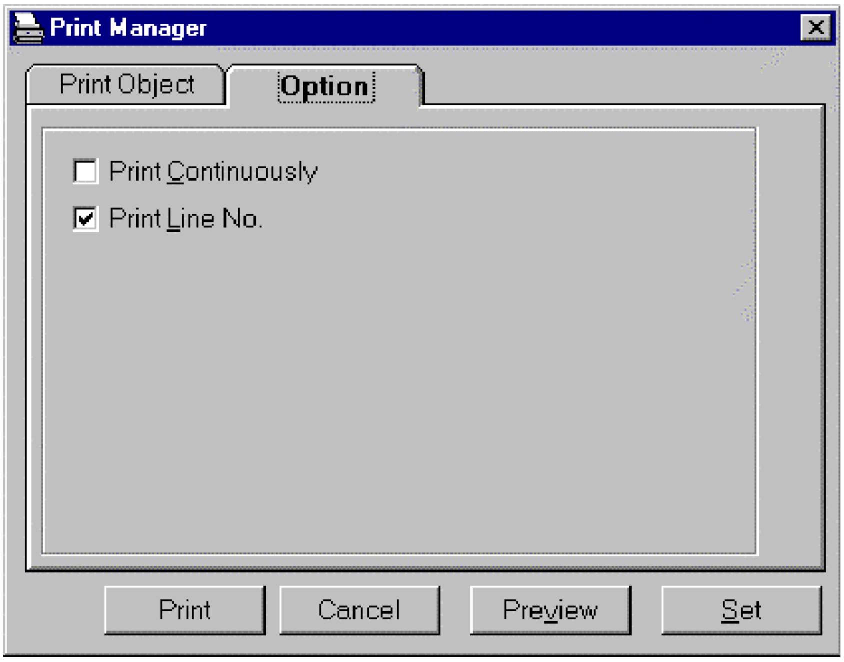
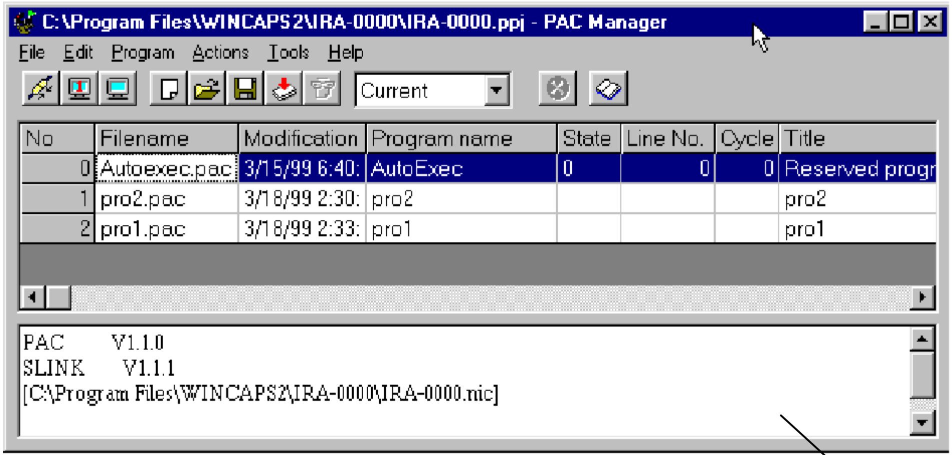


Fig. 5-18 Option Tab (Print Manager) Dialog

- Print Continuously : When this box is checked, several programs are continuously printed without change of page.
- Print Line No. : When this box is checked, the line numbers are also printed.

5.2.8 Make Exec. Program

Translates a program file, contained in the project, into an executable format. Consecutively displays the state of execution to the message display.
The contents of errors generated during translation are displayed in the message pane. Double-clicking on the error line in the message pane jumps the display to the location of the error.
The same function is available by clicking on the Make Exec. Program button .



Message Pane

Fig. 5-19 Message Pane

> **Note: [RC7 Ver. 2.2 or later]**
> If a project contains an operating panel file, WINCAPSII automatically compiles the operating panel file after translating it into an executable format. The compilation result appears in the message pane in the same way as in earlier version.

5.2.9 Make Macro Definition File

This button allows you to create the header file that defines the parameter numbers.
You can refer to the parameter values from the program using the defined macro names.

- Macro definition file for interpreter: itp_cnf.h
- PAC definition file: pac_cnf.h

5.2.10 Close

Ends the PAC Program Manager and closes the PAC Manager window.

5.3 Edit Menu (PAC Program Manager)

This Edit menu functions as a standard editing menu, adopted from application software for Windows 95. The editing object consists of character strings, handled in the program editing window.

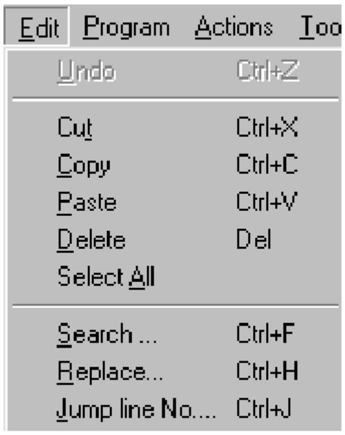


Fig. 5-20 Edit Menu

5.3.1 Undo

Cancels the previous operation and restored the initial state.

5.3.2 Cut

Cuts out selected range data. The cut data can be used with the PASTE command.

5.3.3 Copy

Temporarily memorizes selected range data. The temporarily memorized data can be used with the PASTE command.

5.3.4 Paste

Pastes the cut data or temporarily memorized data, by copying to a specified location.

5.3.5 Delete

Deletes selected range data. The cut data cannot be used with the PASTE command.

5.3.6 Select All

Selects all the data currently displayed in the active window.

5.3.7 Search

When you select **Search** from the Edit menu, the Search dialog box appears on the screen.
Specify the necessary items and click on **Find Next**. The specified character string is then searched for.
The found character string is displayed in reverse video.
To close the dialog, click on **Cancel**.

Fig. 5-21 Search Dialog Box

- Find What : Enter a character string that you want to search.
- Search : Specify the searching direction. If you select **Whole**, the search is carried out downward to the bottom end and then continued from the top of the data downward.
- Object : Select the searching range from whole project, current program and selected range.
- Match Case : If this box is checked, a search is carried out with distinction between upper and lower cases.

5.3.8 Replace

This function replaces the specified character string with a separately specified character string.
When the Replace dialog box appears, specify the necessary items and click on **Find Next**. The found character string is displayed in reverse video.
Click on **Replace**, and the found character string is replaced.
If you click on **Replace All**, all the occurrences of the selected character string will be replaced.

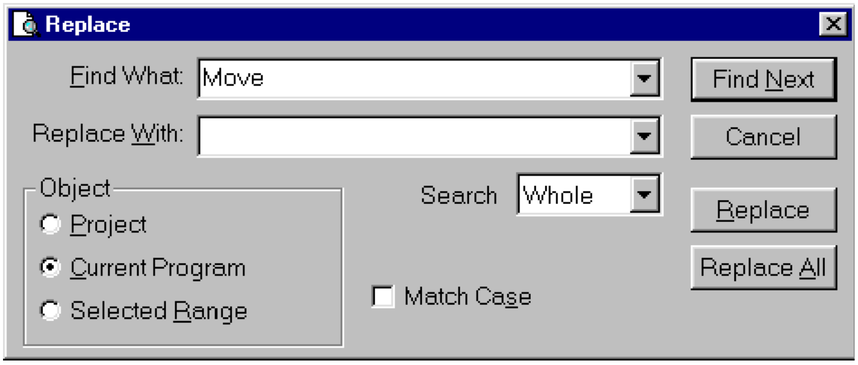


Fig. 5-22 Replace Dialog Box

- Find What : Enter a character string to be searched.
- Replace with : Enter a character string to be replaced with.
- Search : Specify the searching direction. If you select **Whole**, the search is carried out downward to the bottom end and then continued from the top of the data downward.
- Object : Select the searching range from whole project, current program and selected range.
- Match Cases : If this box is checked, the search is carried out with distinction between upper and lower cases.

5.3.9 Jump To

Displays a specified line of a specified program.
When the Jumping Line No. dialog box appears on the screen, specify all necessary items and click on GOTO. The specified program is displayed and the cursor is set to the head of the specified line.

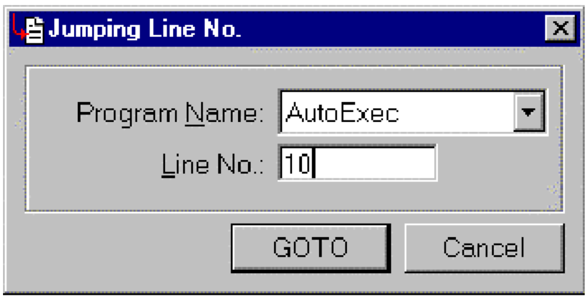


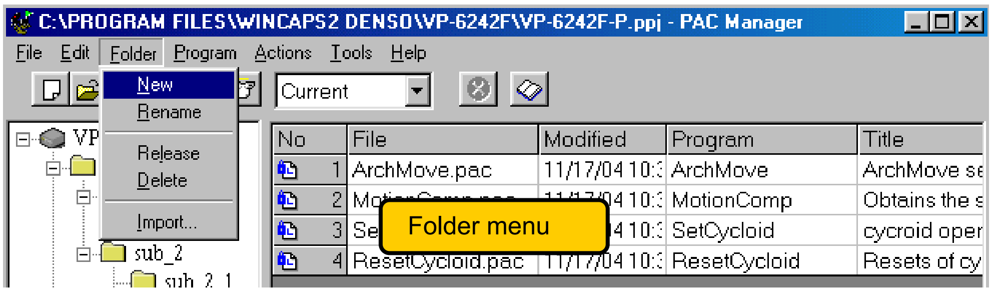
Fig. 5-23 Jumping Line Number Dialog Box

- Program Name: When clicked on, the program file names appear in a pulldown menu for selection.
- Line Number: Input to specify a line number.

5.4 Folder menu [RC7 Ver. 2.2 or later]

The Folder menu is newly added as a special menu for handling the organization of folders.

Right-clicking in the tree pane also displays the same Folder menu.



Folder menu

5.4.1 New

This command creates a new folder under the selected folder.

There are the following restrictions on the creation of a new folder.

(1) Folder name: This must start with an alphanumeric character. The length is a maximum of 16 characters.

(2) Depth of levels: Up to 4, counting from the root of the project

(3) Number of folders: Up to 256

5.4.2 Rename

This command changes the name of the selected folder.

5.4.3 Release

This command erases the selected folder from the program list together with its subordinate objects.

Note: This command erases only data from the project registry. Files remain intact.

5.4.4 Delete

This command deletes the selected folder from the program list together with its subordinate objects. It also deletes files.

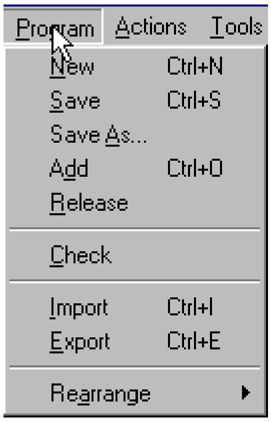
5.4.5 Import

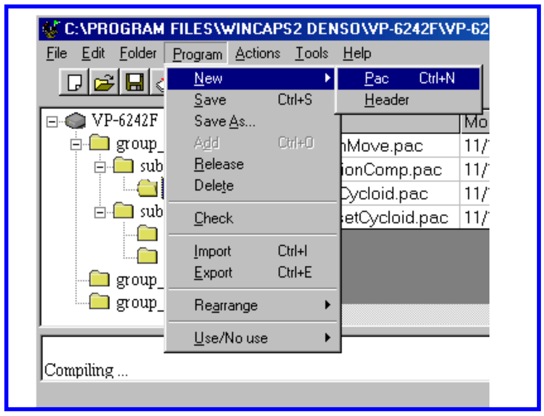
This command brings (imports) a folder under the selected one together with its subordinate objects to add all of them into the program list.

Note: If importing a folder causes the number of levels to exceed four counting from the project's root, the excess will be trimmed.

5.5 Program Menu

Manages the program files.





[RC5 Ver. 1.9* or earlier] **[RC7 Ver. 2.2 or later]**

Fig. 5-24 Program Menu

5.5.1 New

Creates a new program file and adds it to the project.
A new file is added to the end of the PAC Program Manager file name list and the Edit window automatically opens.
The same function is available by clicking on the new program button .

Note: In RC7 Version 2.2 or later, a header file can be also created.

5.5.2 Save

Saves the selected program file.

5.5.3 Save As

Saves a program file with a new file name.
When the Save Project As dialog box appears, specify the path, program name and click on Save to save the program.

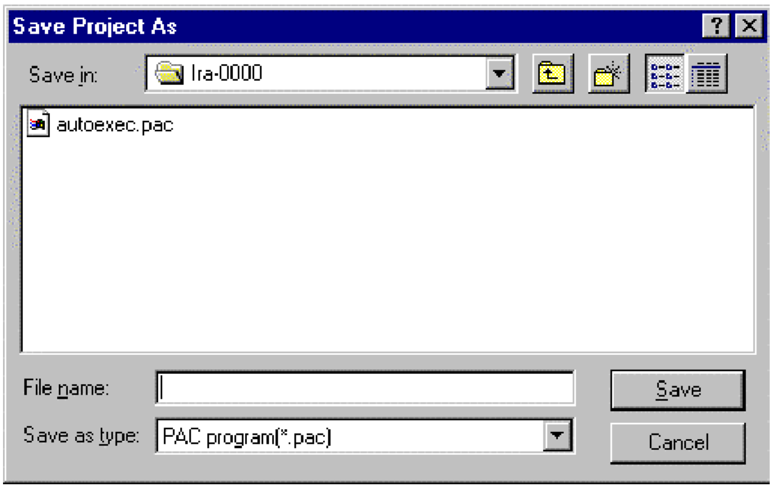


Fig. 5-25 Save Project As Dialog Box

Note: To newly save the program, save the current content to a program source file under a separate name. Update the program project reference information so that is references the new program source file. If retaining the program project reference information, as it was and creating a file under a separate name, use Export. For details, refer to Chapter 5 "5.5.9 Export" in this manual.

Note: Full file path [RC7 Ver. 2.2 or later]

The folder feature added allows a program name to appear with a full path. The program monitor and transfer screens, for example, display the [folder name. program name]. However, the PAC Manager program list pane displays program names only since it displays files in a selected folder.

5.5.4 Add

This function adds the existing program to the current project.
When the Adding program dialog box appears, specify the path, program name and click on **Open**.
The same function is available by clicking on the add program button .
When specifying several programs simultaneously, click on the files while pressing the shift key or the control key.

Note: In RC7 Version 2.2 or later, selecting a root folder enables this function.

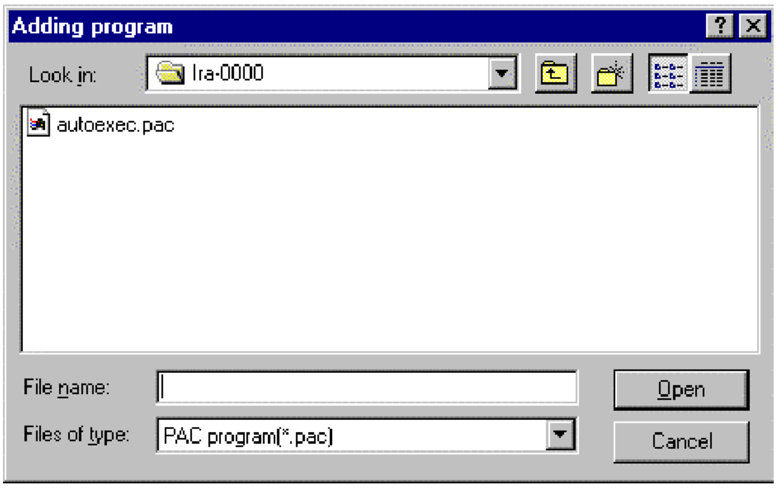


Fig. 5-26 Add Program Dialog Box

Note: When sharing one program among several program projects, use the Add Program function. If the program is changed but you do not want to affect other projects, use Import. For details, refer to Chapter 5 "5.5.8 Import" in this manual.

5.5.5 Release

Releases the currently selected program file in the program project.
The program file remains as it is, but it is no longer contained in the project. Reference information for the program is deleted from the program project reference information.

Note: A project must have at least one program. It is not possible to release all the programs.

5.5.6 Delete [RC7 Ver. 2.2 or later]

This command deletes the selected file from the program list and also deletes the file itself.

5.5.7 Syntax Check

This button allows you to check the syntax of the selected program. If an error is found, the message pane displays the error. Double-clicking the Error Line makes the cursor jump to the corresponding error position.

5.5.8 Import

Registers a specified file name to the program project after copying it to the folder in which the project is contained.
If imported, the program is not shared with other program projects.

Note: In RC7 Version 2.2 or later, a header file and operation panel file can be also specified.

Note: When sharing one program among several program projects, use the Add Program function. For details, refer to Chapter 5 "5.4.4 Add" in this manual. In this case, note that change of the shared program in a project will affect the other projects.

5.5.9 Export

Saves a selected program as a new program source file, under a specified file name.

Note: In RC7 Version 2.2 or later, a header file and operation panel file can be also specified.

Note: With export, program project reference information remains unchanged and a separate file is created. When updating to refer to a new program source file, use Save As. Refer to Chapter 5 "5.4.3 Save As" in this manual.

5.5.10 Rearrange

Changes the display order of program files in the file type.

This command provides the following choices--file name, file date, and program name.

In the program list pane, files appear starting from PAC program files to header files.

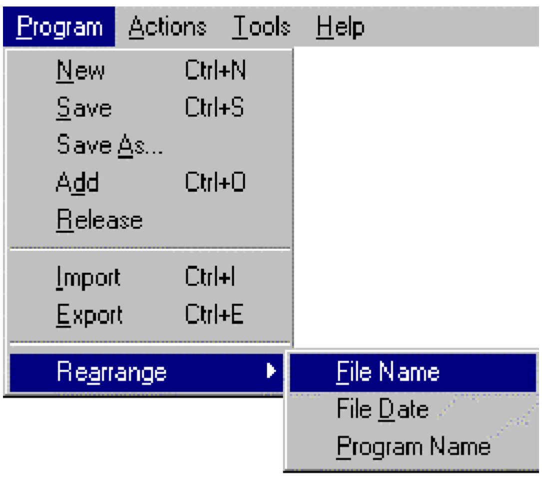


Fig. 5-27 Rearrange

5.5.10.1 File Name

Rearranges the program files in order of file name; the file names are listed according to the ASCII code.

5.5.10.2 File Date

Rearranges the program files in order of date; recently updated or created files come to the top.

5.5.10.3 Program Name

Rearranges the program files in order of program name; the program names are listed according to the ASCII code.

Note: When Rearrange is executed, the date check option is temporarily turned OFF. This means all the source programs will be compiled again when Compiling is executed. For details, refer to Chapter 5 "5.7.1.2 Make" in this manual.

5.6 Actions Menu (PAC Program Manager)

The Actions menu has the following commands. The tool bar of Program Manager has the buttons that correspond to these commands and have the same effect.

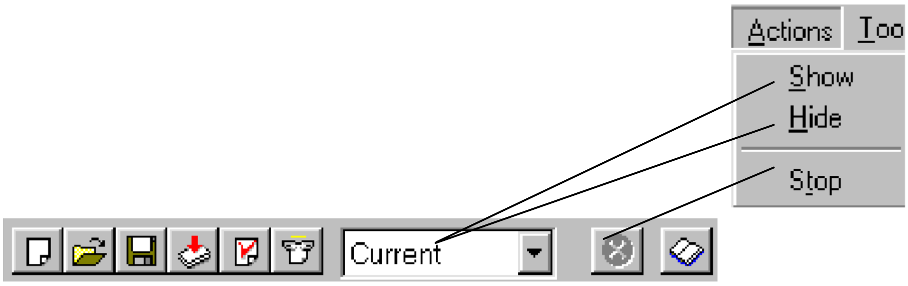


Fig. 5-28 Action Menu and Buttons

5.6.1 Show

Displays the edit window of the program selected from the Select action object list.
The edit window also appears when you double-click on the program file name in the list.

5.6.2 Hide

Closes the active edit window of the program selected from the Select action object list.
The edit window is also closed when you click on the close box in the Edit window.

5.6.3 Stop

Stops program creation specified by **Make Exec. Program** in the File menu. When stopped in the middle, the message pane shows “Interrupted”.
The stop button has the same function as the Stop command.

5.7 Tools Menu (PAC Program Manager)

5.7.1 Options

Used to set the operating conditions of PAC Program Manager.
After selecting Options from the Tools menu, the Options dialog box appears on the screen.

Note: Items that can be edited differ by user level. For restrictions by user level, refer to Chapter 1 "1.3 Security". To change the access level in the middle of program editing, refer to Chapter 4 "4.3.3 Re-Log In" in this manual.

5.7.1.1 Editor

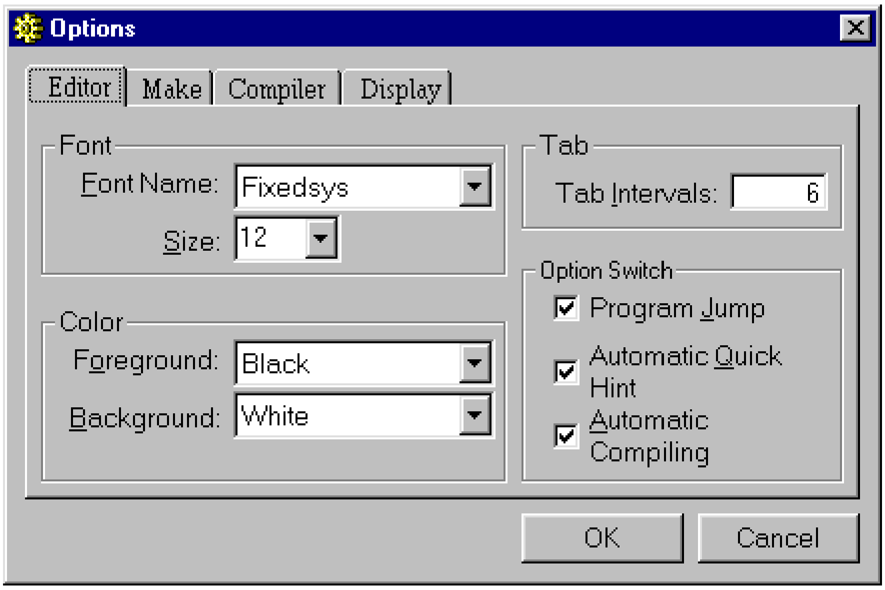
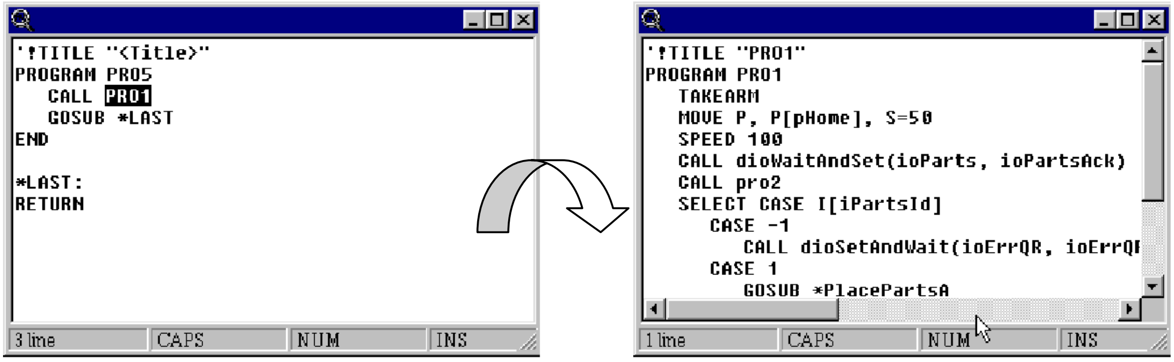


Fig. 5-30 Editor Tab (Options Dialog Box)

- Font Name: Specifies the font to use for text editing. Clicking on the arrow displays the list of selection items.
- Size: Specifies the font size. Clicking on the arrow displays the list of selection items.
- Foreground: Specifies the color of the foreground. Clicking on the arrow displays the list of selection items.
- Background: Specifies the color of the background. Clicking on the arrow displays the list of selection items.
- Tab Intervals: Specifies the distance (in millimeters) from one tab position to the next.
- Program Jump: If you execute Search by Key in the File menu with this option set at valid by specifying the program name or label name, the specified program name or label name is displayed.
- Automatic Quick Hint: With this option switch ON, a quick hint appears to help your text input.
- Automatic Compile: With this option switch ON, the Program Manager automatically checks the syntax after the program is stored.

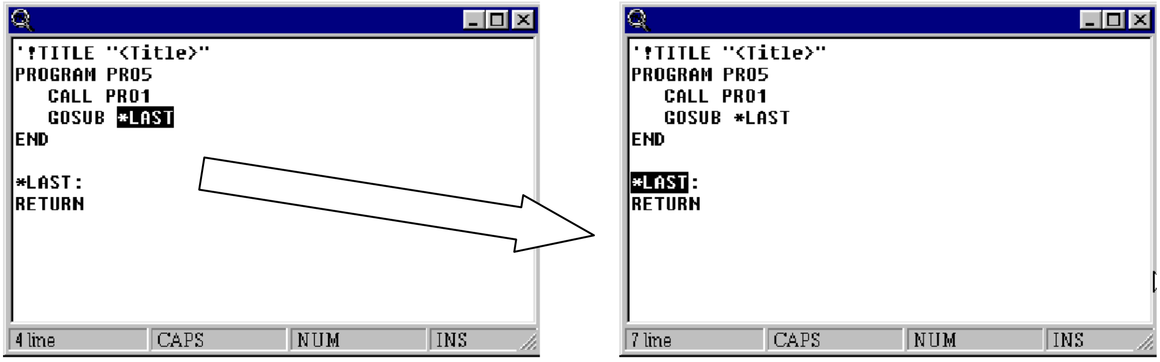
<Program name>



Execute Search by Key

PRO1 Edit Window Appears

<Label name>



Execute Search by Key

Shift to "*LAST:"

Fig. 5-31 Program Jump

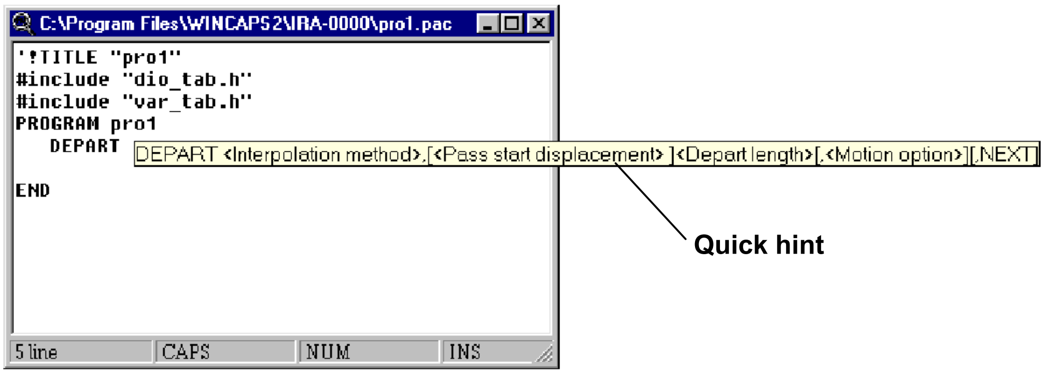


Fig. 5-32 Automatic Quick Hint

5.7.1.2 Make

Click the Make tab to set the conditions for execution program.

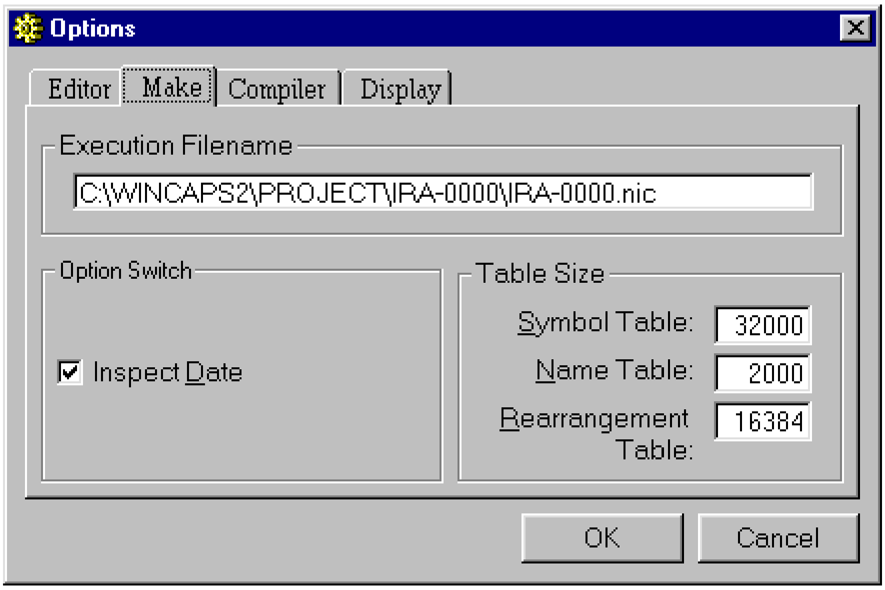


Fig. 5-33 Make Tab (Options Dialog Box)

- Execution Filename: Specifies a file name when renaming the execution file. By default, a program project file name having the extension “nic” is specified. If you do not wish to overwrite this file or wish to unify all the projects in an executable file name, change this value.
- Date Inspection: If this switch is checked, only the changed programs are converted into execution form by depression of Make Exec. Program, shortening the program creation time.
- Symbol Table: Sets the size of working range for storing information on symbols.
- Name Table: Sets the size of working range for registering information on names such as label name. This range is used to register information on all names handled by the program files included in the executable file.
- Rearrange Table: Sets the size of working range for determining the absolute addresses.

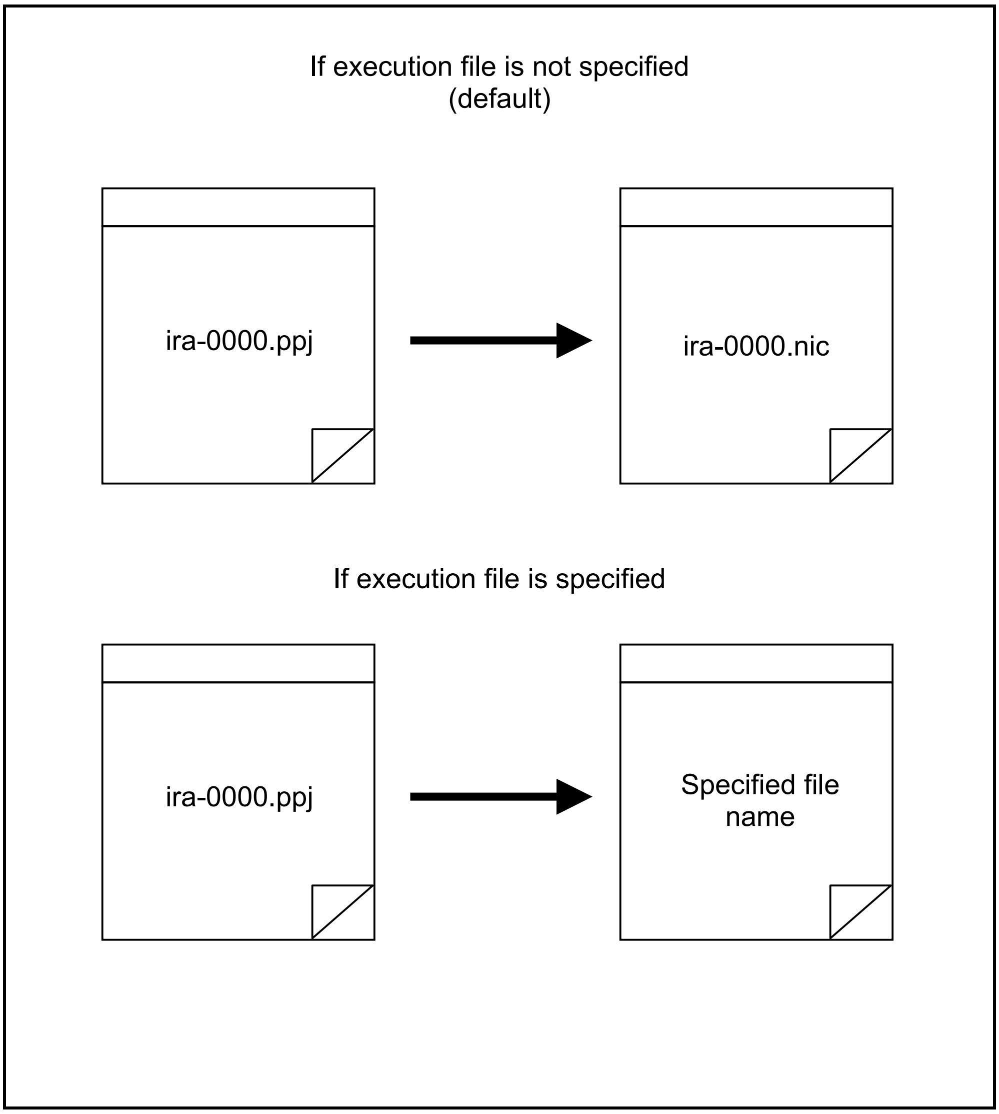


Fig. 5-34 Option for Renaming an Executable File

5.7.1.3 Compiler

Click the Compiler tab to Make settings for creating an execution program.

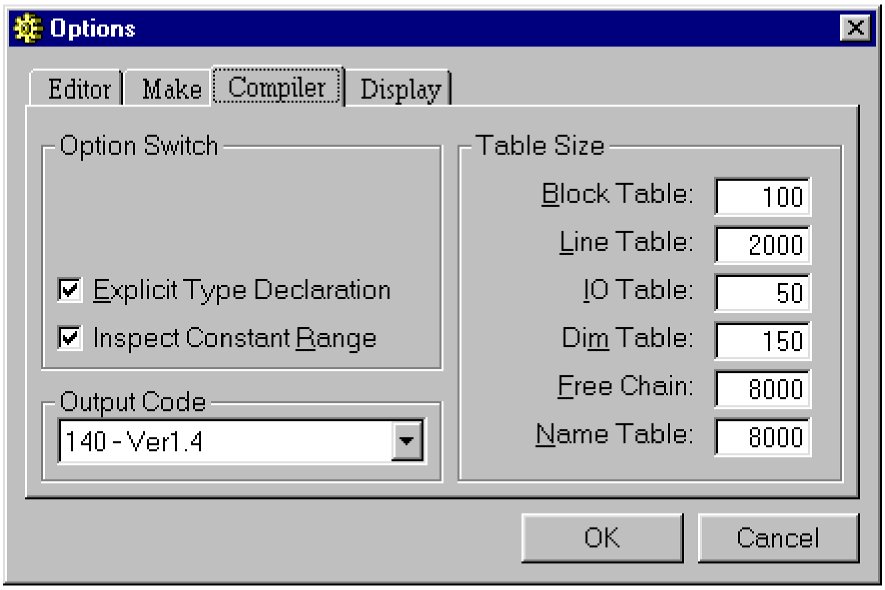


Fig. 5-35 Compiler Tab (Options Dialog Box)

- Explicit Type Declaration: Error will occur unless local variables are explicitly declared with a specification statement or postfix. If this option is found invalid, without explicit descriptions, it will be regarded as a single accuracy variable.
- Inspect Constant Range: Checks the range of an argument with the statement described as constant when creating the execution program.
- Output Code: Sets the software version of the robot controller. Depending upon the version, the output codes of the execution program will differ. If the version specified here is different from the actual software version of the connected controller, an error will occur at the time of communication.
- Block Table: Sets the size of working range for storing the nested state of loops and conditional statement, etc.
- Line Table: Sets the size of working range for registering line information. The numerical value of this table is equal to the number of all the lines that can be compiled. The same value is equal to the nest level allowed for compiling.
- IO Table: Sets the size of working range for registering information on IO variables. The numerical value of this table is equal to the number of defined IO variables.
- Dim Table: Sets the size of working range for registering information on array variables. The numerical value of this table is equal to the number of array variables that can be defined.
- Free Chain: Sets the size of working range for registering information address link. This is the range used for solving label addresses, jumping address of branch and loop commands, and global variables.
- Name Table: Sets the size of working range for registering information concerning label and other names. This is the range used for registering information on reserved words and user-defined labels, etc.

5.7.1.4 Display (Programmer Level)

Makes the SHOW/HIDE settings of display options.

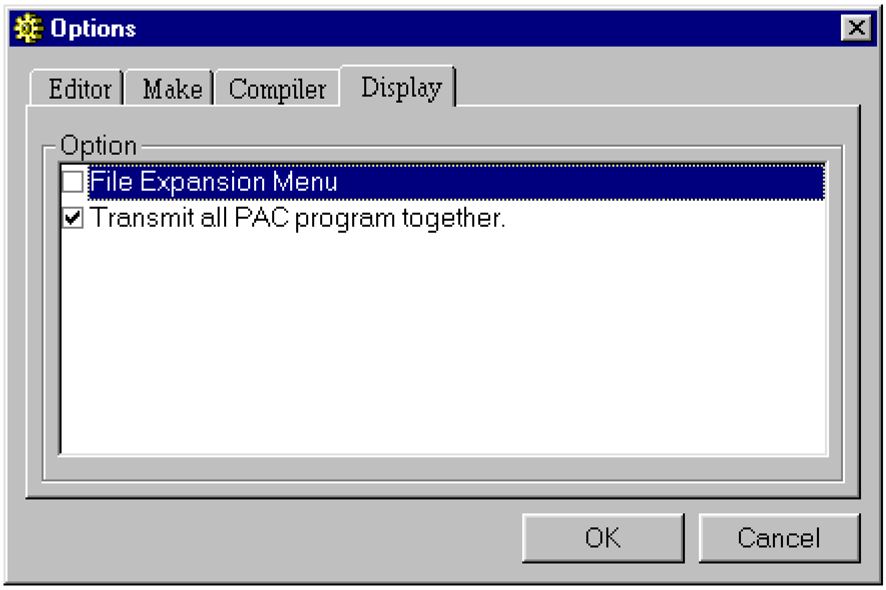


Fig. 5-36 Display Tab (Options Dialog Box)

- File Expansion Menu: Used to extend FILE (F) menu of the PAC Program Manager. For details, refer to Section 5.1.5, "Menu List" in this chapter.
- Batch Transfer of PAC Programs:
  This option allows you to select all the PAC programs so that the project can be transferred at a time. To transfer the programs one by one, set this check box empty.

5.7.2 Program Bank

5.7.2.1 Outline of Functions

This is the function for registering or using a program as an individual part to share a created program with other robot applications.
When you select Program Bank from the Tools menu, the Program bank dialog box appears on the screen.

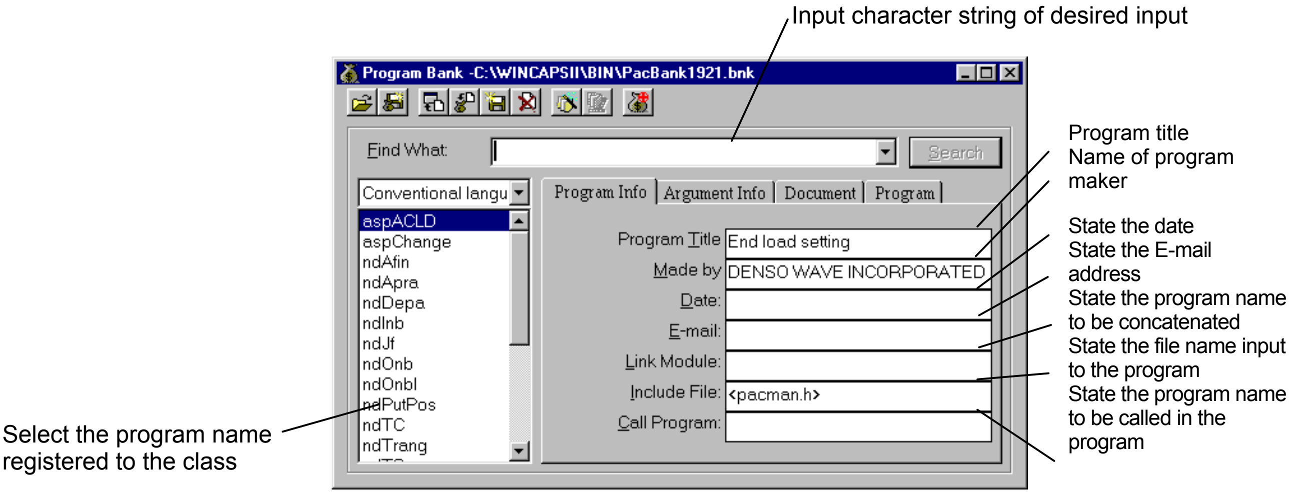


Fig. 5-37 Program Information - Program Bank Dialog Box

Opens the registered program bank.
Saves a new library to the program bank. (Programmer Level)
Adds a library to the project. (Programmer Level)
Registers a library to the program bank. (Programmer Level)
Saves the current program bank. (Programmer Level)
Deletes a registered program. (Programmer Level)
Registers a new class to the program bank. (Programmer Level)
Changes the registered class name. (Programmer Level)
Gets another program bank. (Programmer level)
Conventional langu Selects the class. For details on library program, refer to Part 2 "Command Reference" in the PROGRAMMER'S MANUAL.

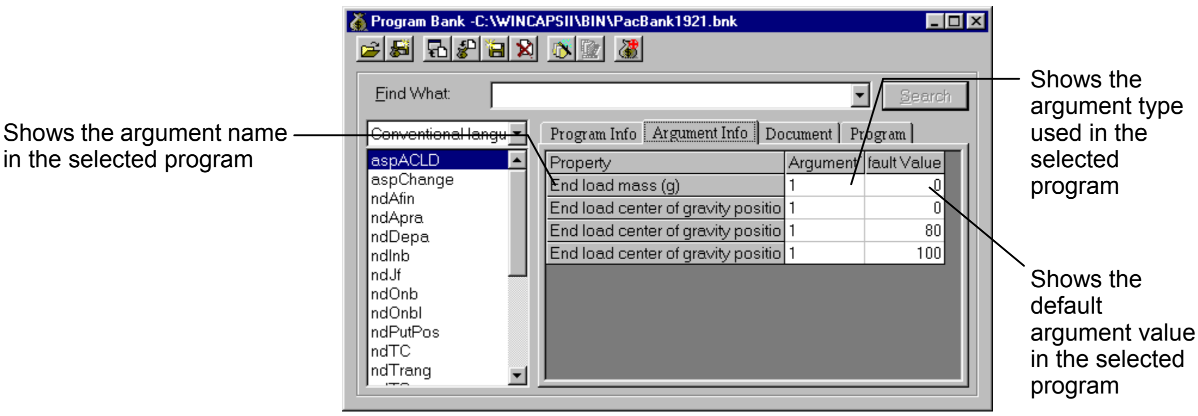


Fig. 5-38 Argument Information - Program Bank Dialog Box

Displays the descriptions of the selected program. Writing enabled.

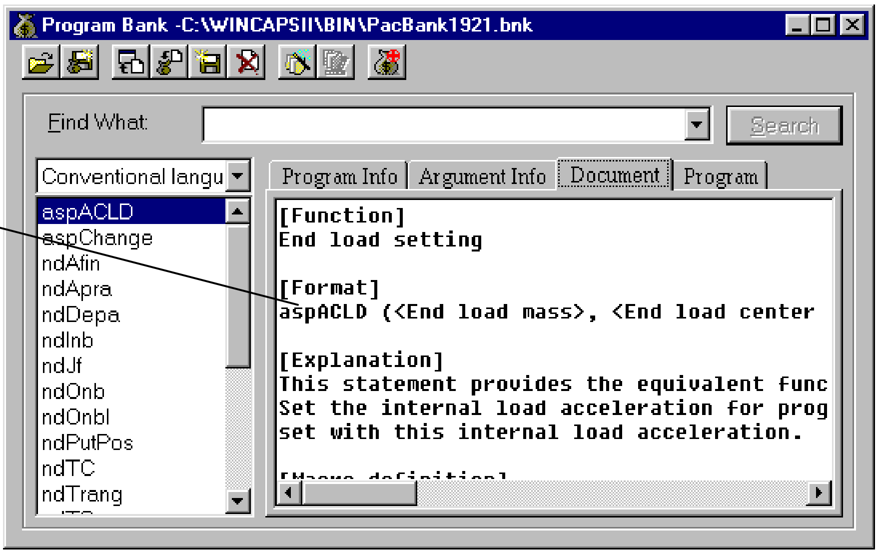


Fig. 5-39 Document – Program Bank Dialog Box

Shows the selected program. Writing enabled.

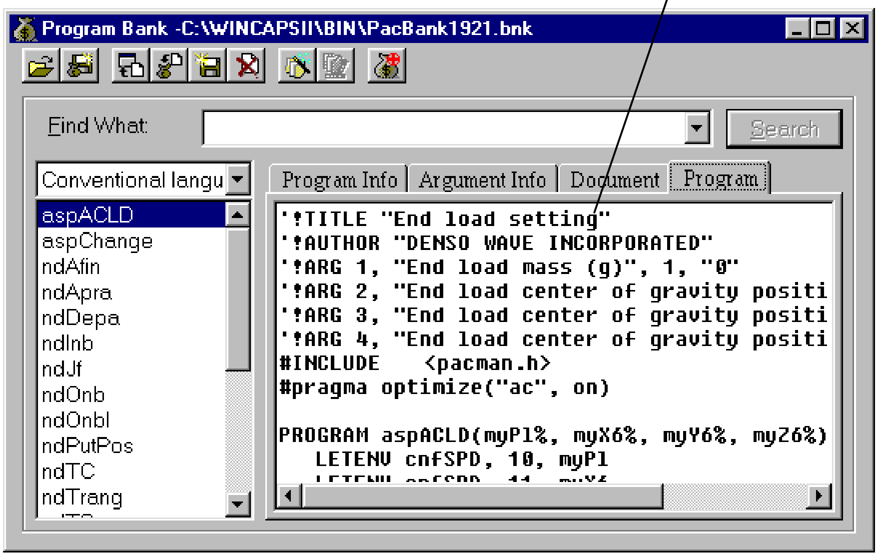


Fig. 5-40 Program – Program Bank Dialog Box

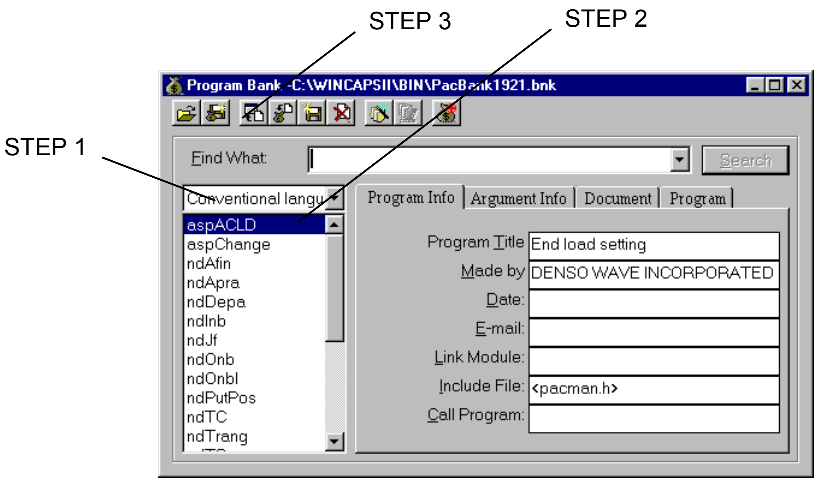
5.7.2.2 Basic Usage

[1] Adding Libraries to a Project

▶ STEP 1 **Select a class.**

▶ STEP 2 **Select a program.**

▶ STEP 3 **Click on the button.**



[2] Registering a Program to Program Bank

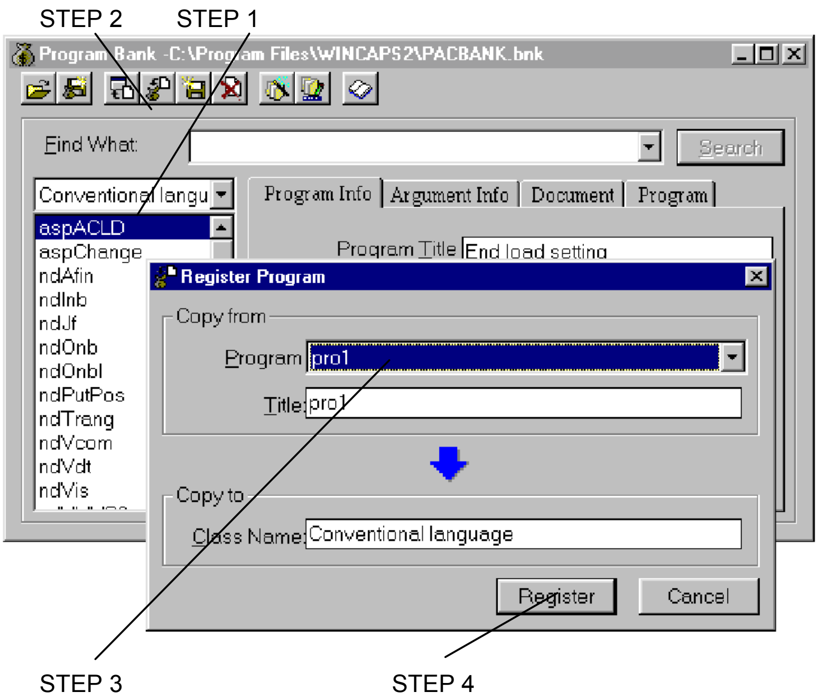
▶ STEP 1 **Select a class.**

▶ STEP 2 **Click on the button.**

▶ STEP 3 **Select a program to be registered.**

▶ STEP 4

Click on Register.



[3] Deleting Program Registered to Program Bank

▶ STEP 1

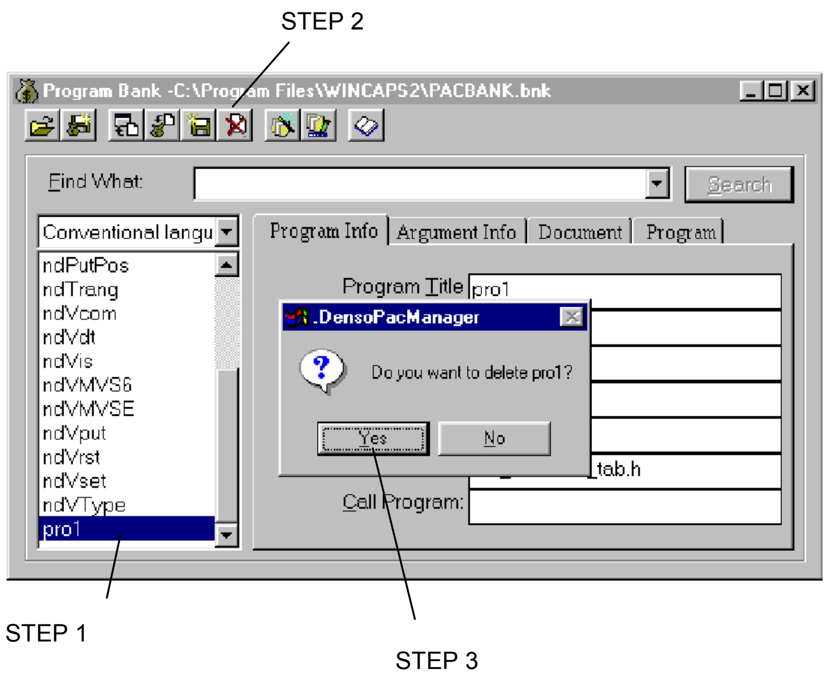
Select a program to be deleted.

▶ STEP 2

Click on the  **button.**

▶ STEP 3

Click on Yes.



5.7.2.3 Updating Program Bank

You can freely customize the program bank by adding or deleting programs. However, the number of libraries, which is supplied to each version as a standard, increases each time you upgrade the software version.

When you update WINCAPSII to a newer version, you need to import program bank related contents customized in the old version into the newer one. WINCAPSII Version 1.9 or later allows you to do it easily by providing the Auto and Manual importing facilities.

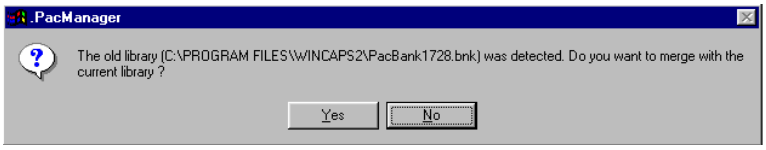
If you use either of those facilities, WINCAPSII will unconditionally import class libraries added or customized in the old version into the current program bank.

[1] Auto importing facility

When you open the program bank at the first time after updating WINCAPSII, the Auto importing facility is executed. Even if you do not update the program bank at this time, you can freely update it by the Manual importing facility.

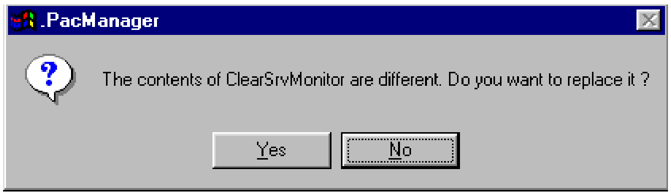
► STEP 1

If an old library is detected, the following massage appears.
When you want to update it, select the "Yes" button.



► STEP 2

If the importing facility finds a class library that has the same name as one already stored in the current program bank but has different contents, then the following message appears, prompting you to confirm overwriting.
If you want to use the old library, select the "Yes" button.

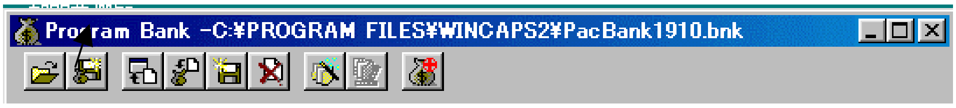


[2] Manual importing facility

The manual importing facility is executed by clicking the “Merge Program Bank” button.

▶ STEP 1

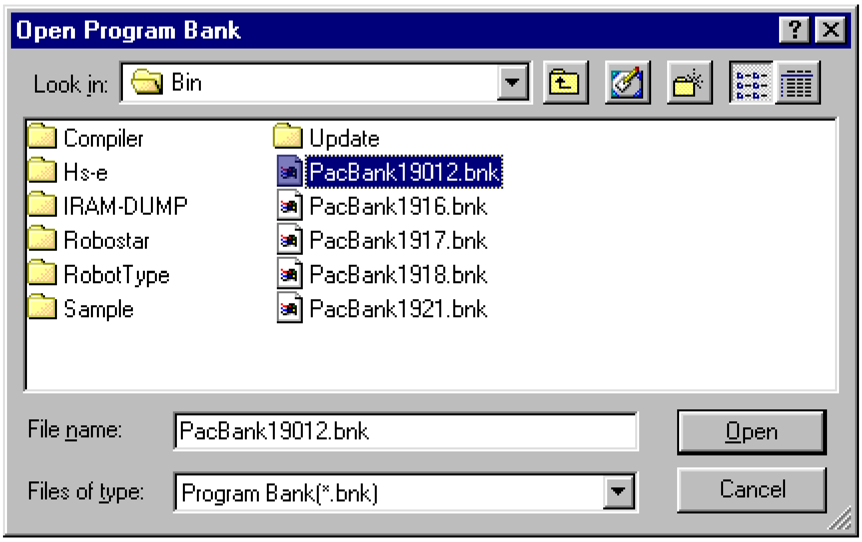
Click the button on the tool bar of the program bank.



“Merge Program Bank” button.

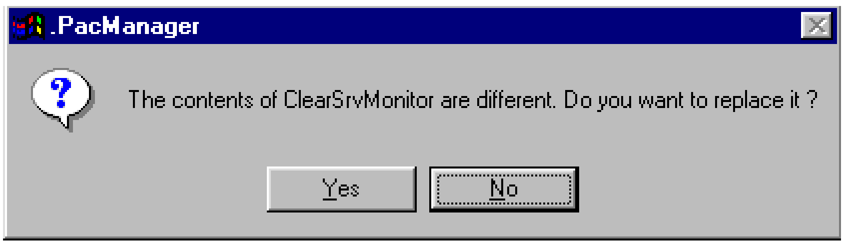
▶ STEP 2

The “Open Program Bank” screen appears/
Select the program bank that you want to merge.



▶ STEP 3

If the importing facility finds a class library that has the same name as one already stored in the current program bank but has different contents, then the following message appears, prompting you to confirm overwriting.
If you want to use the old library, select the “Yes” button.



5.7.3 Command Builder

5.7.3.1 Outline of Functions

Assists correct input of commands and arguments, when making and/or editing a program.
When you select the Command Builder from the Tools menu, the Command Builder dialog box appears on the screen.

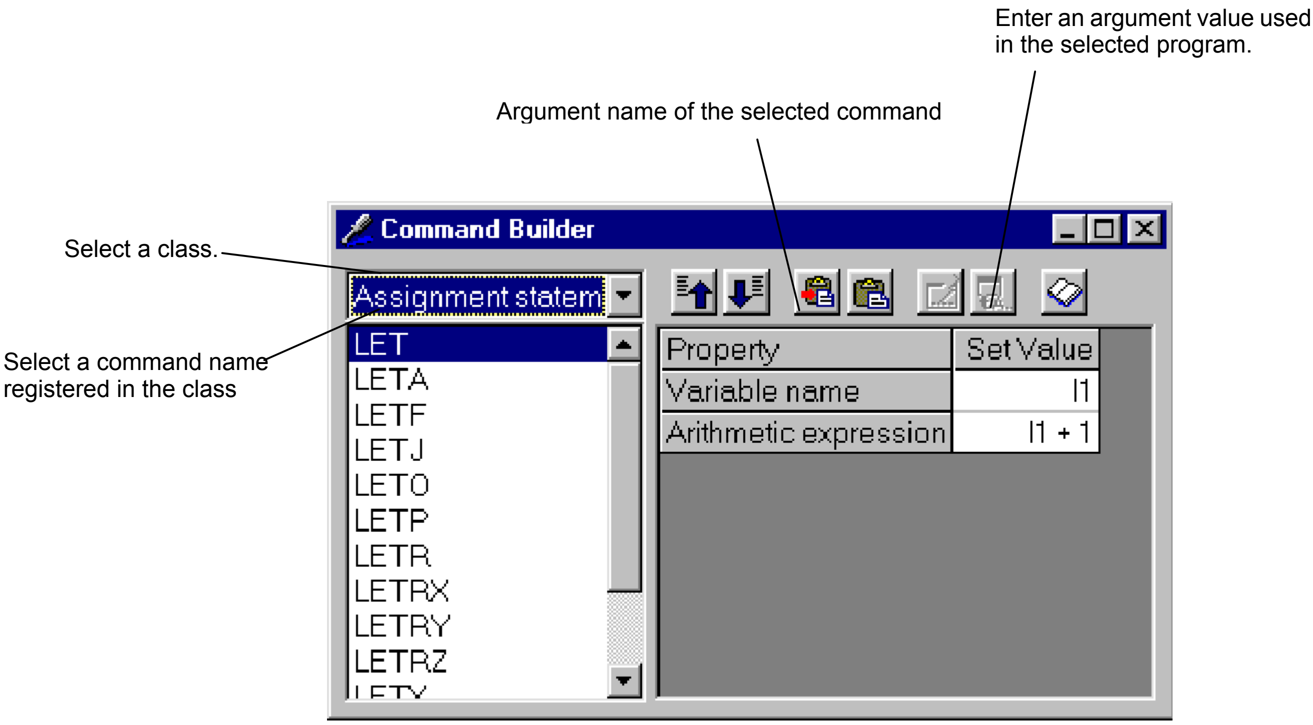


Fig. 5-41 Command Builder Dialog Box

Shows the previous class.
Shows the next class.
Copies the set value of the selected argument to the clipboard.
Pastes the clipboard data at the Set Value.
Executes the program related by a LINK command in the USER PROGRAM class.
Executes the program related by a respective command in the other class.
If no related program is found, clicking is invalid.
Pastes the command selected in the class to the program being edited
Displays the help data for command reference.

5.7.3.2 Basic Usage

This section describes the method of editing program using the command builder. The following is an example program line:

MOVE P, P1, S = 50 MOVE PTP TO P1 AT 50% INSIDE SPEED

► STEP 1

Move the cursor to a desired input position in the Program Edit window.

► STEP 2

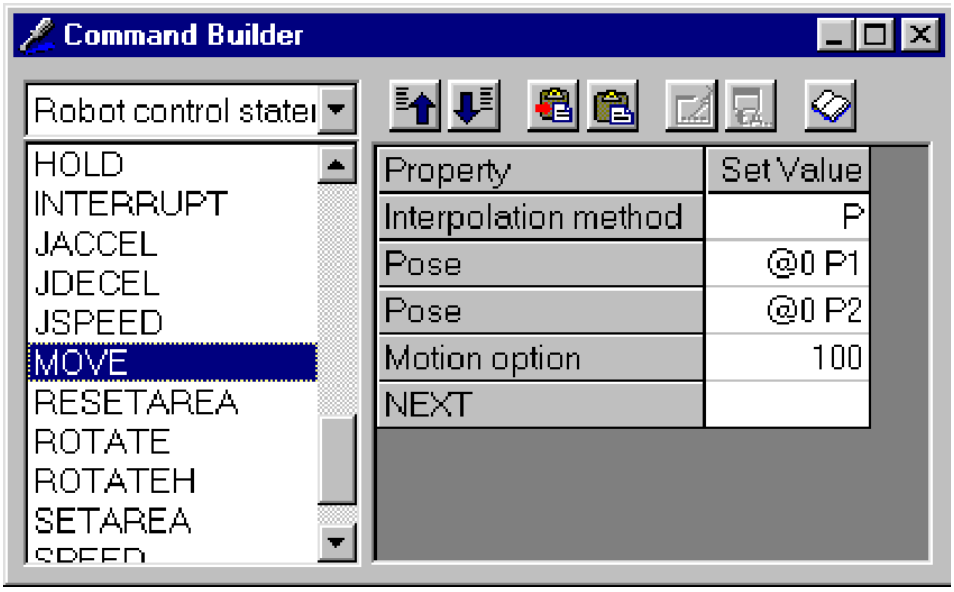
Open the command builder and select the Robot control statement from the class selection list.

► STEP 3

Select the MOVE command from the command list.

► STEP 4

Enter the argument values of the selected MOVE command as follows:



► STEP 5

Click on the  **button.**
The command is entered in the cursor-located position of the program being edited. (Enter comments from the keyboard.)

MOVE P, P1, S = 50

5.7.4 Program Monitor

5.7.4.1 Outline

This command monitors the execution progress of programs. As shown below, the running step is displayed in red, helping you debug efficiently.

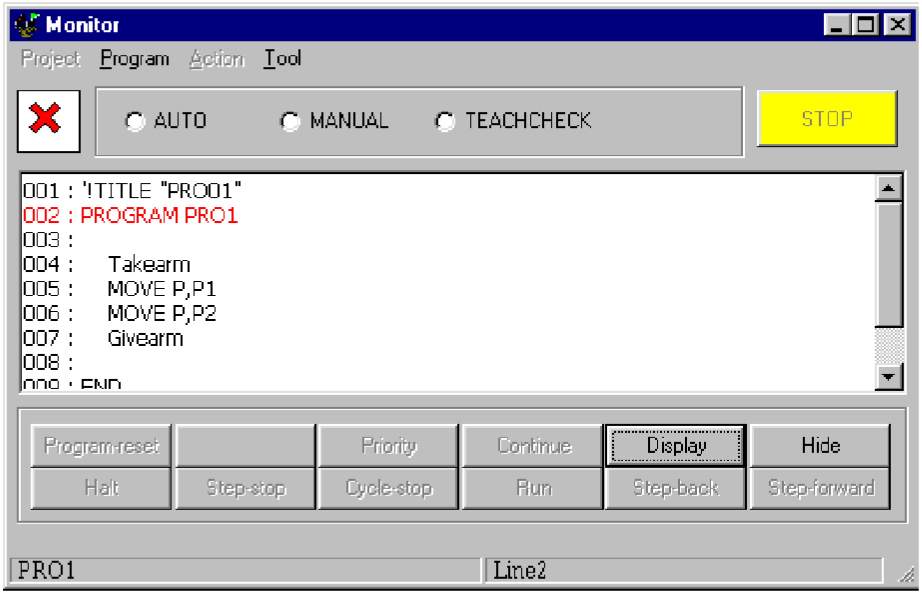


Fig. 5-41-1 Monitor Window

5.7.4.2 Menu

The command menu of the Program Monitor is shown below.

Project *[1]

Program
- Display
- Hide

Actions *[1]

Tools
- Settings

*[1] Menus exclusively prepared for vision equipment (μVision-21). In WINCAPSII for standard robots, these menus cannot be selected.

5.7.4.3 Program menu

The Program menu of the Program Monitor is shown below.

Fig. 5-41-2 Program Menu

Display/Hide: Displays or hides the contents of programs. If Display is executed, the contents of a program selected in the program status list will appear; if Hide, the program status list will appear.

5.7.4.4 Tool menu

The Tool menu of the Program Monitor is shown below.

Fig. 5-41-3 Tool Menu

Settings: Sets the operating environment of the program monitor. If Setting is executed, the Settings window will appear.

Monitor tab: Sets the timer intervals at which the program monitor gets data from the controller. The initial value is 1000 ms.

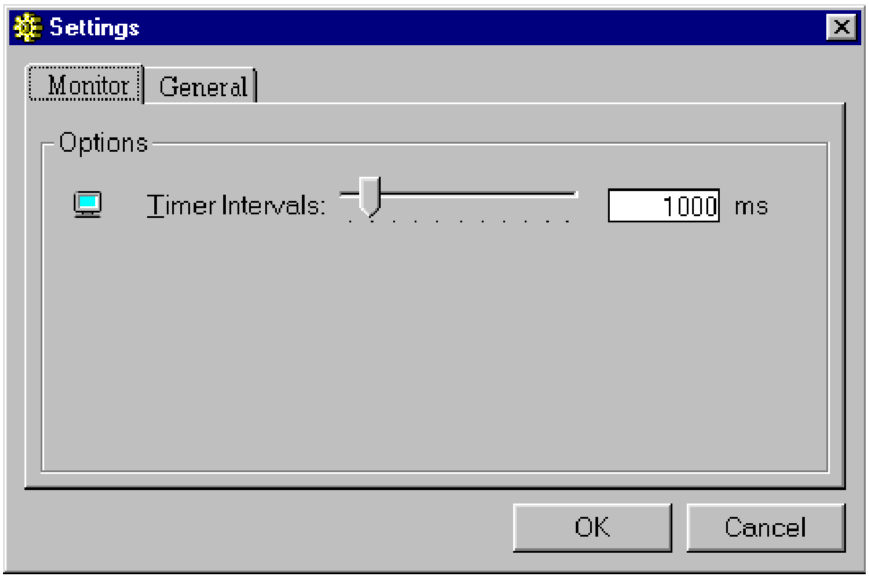


Fig. 5-41-4 Settings Dialog Box (Monitor tab)

> **Note: If you set the monitor intervals short, the frequent communications operations with the controller may load the Program Monitor. If the Program Monitor cannot operate smoothly, set the monitor intervals longer. (Recommended value: 1000 ms)**

General tab: Makes general settings for the Program Monitor.

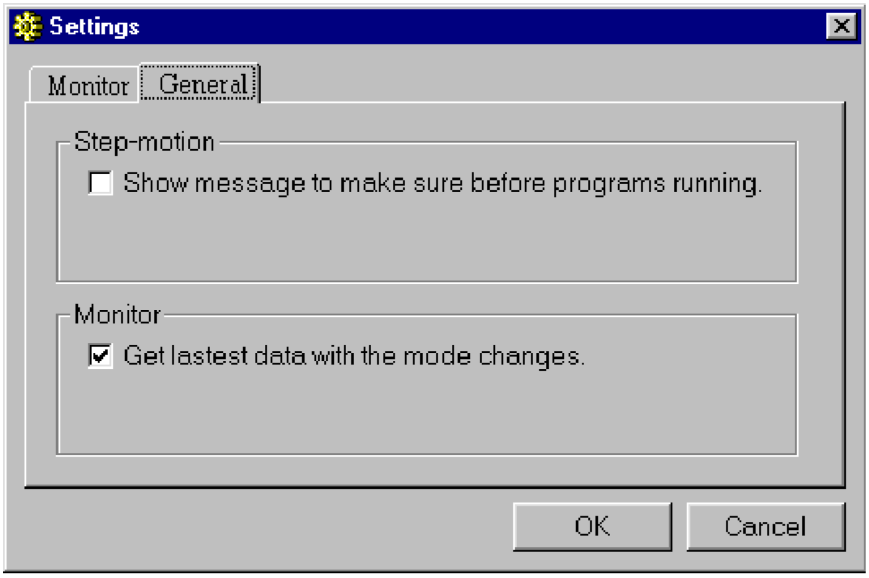


Fig. 5-41-5 Settings Dialog Box (General tab)

Step-motion: Determines whether or not the confirmation message will appear before the execution of a program step.

Monitor: Determines whether or not the Program Monitor will get the latest data stored in the controller every time the controller changes the mode.

5.7.4.5 Operating procedure

This section describes how to monitor the program [PRO1].

► STEP 1

Click a program ([PRO1] in this example) to be monitored by Program Monitor.

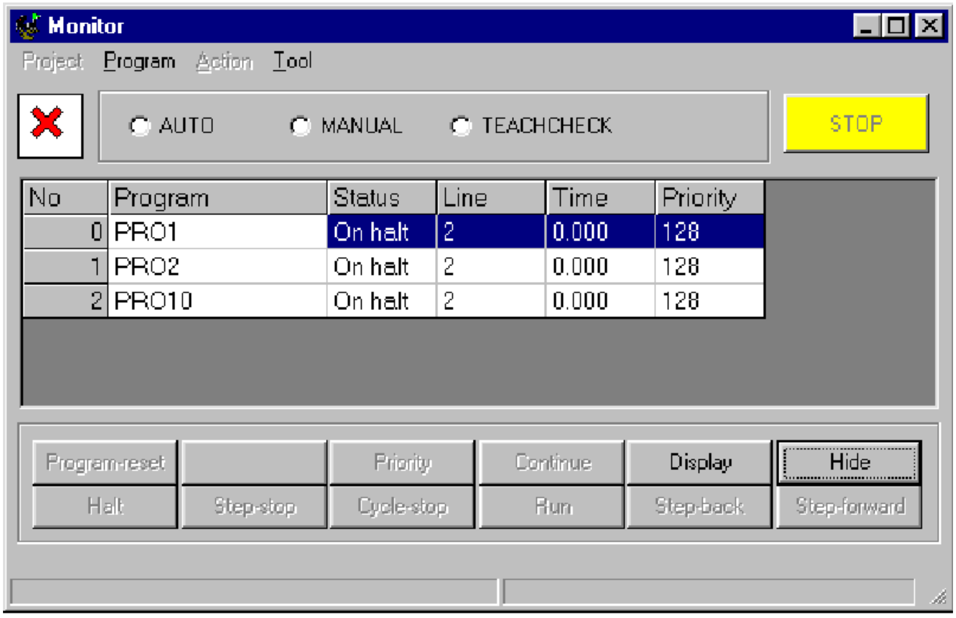


Fig. 5-41-6 Selecting a Program

► STEP 2

Click the Display button to show the contents of the selected program. The running step is displayed in red.

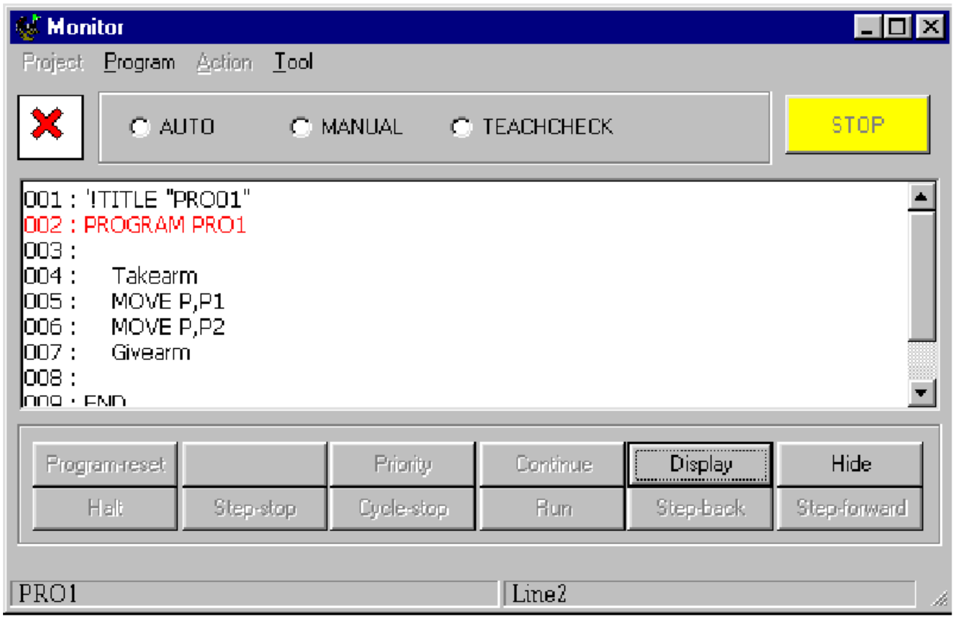


Fig. 5-41-7 Displaying the Contents of the Program

5.8 Help Menu

Use the Help menu to view descriptions on how to use WINCAPSII.

Fig. 5-42 Help Menu

5.8.1 About PAC Manager

Displays the version information on PAC Program Manager.

Chapter 6

Operating Variable Manager

This chapter describes the Variable Manager functions, in the WINCAPSII software, that may be used with the personal computer teaching system.

6.1 Outline of Variable Manager

6.1.1 Outline of Functions

The Variable Manager provides variable data backups and monitoring functions for the Robot Controller.
Through connection with the Arm Manager and/or the Vision Manager off-line teaching is possible.
After starting the Variable Manager the Variable Manager window is displayed.

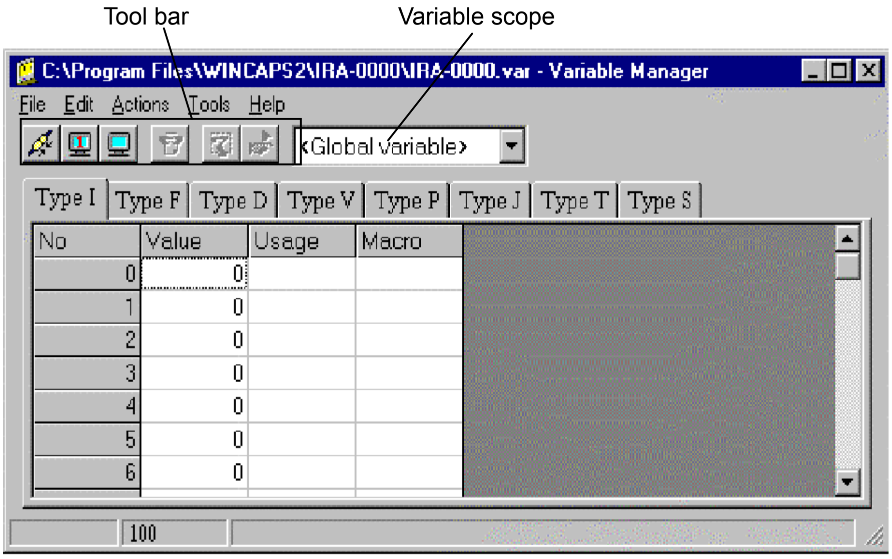


Fig. 6-1 Variable Manager Window

6.1.1.1 Selecting Scope

Selects object variables from the variable scope list.
Global variables and local variables can be selected.
Note: Local variables can be selected only when WINCAPSII is online with the robot controller.

6.1.1.2 Type I (Integer Type) Variables

Clicking on the Type I tab displays a list of Type I (Integer type) variables.

6.1.1.3 Type F (Single-precision Real Number Type) Variables

Clicking on the Type F tab displays a list of Type F (Single-precision real number type) variables.

6.1.1.4 Type D (Double-precision Real Number Type) Variables

Clicking on the Type D tab displays a list of Type D (Double-precision real number type) variables.

6.1.1.5 Type V (Vector Type) Variables

Clicking on the Type V tab displays a list of Type V (Vector type) variables.

6.1.1.6 Type P (Position Type) Variables

Clicking on the Type P tab displays a list of Type P (Position type) variables.

6.1.1.7 Type J (Joint Type) Variables

Clicking on the Type J tab displays a list of Type J (Joint type) variables.

6.1.1.8 Type T (Homogeneous Conversion Type) Variables

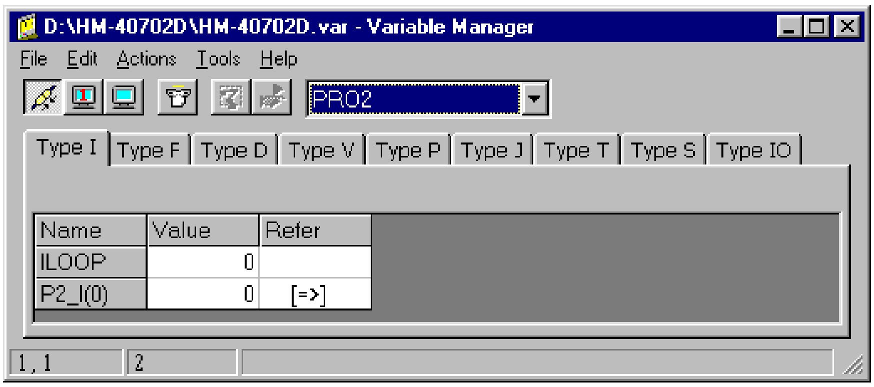
Clicking on the Type T tab displays a list of Type T (Homogeneous conversion type) variables.

6.1.1.9 Type S (Character String Type) Variables

Clicking on the Type S tab displays a list of Type S (Character String type) variables.

6.1.1.10 Local Variables

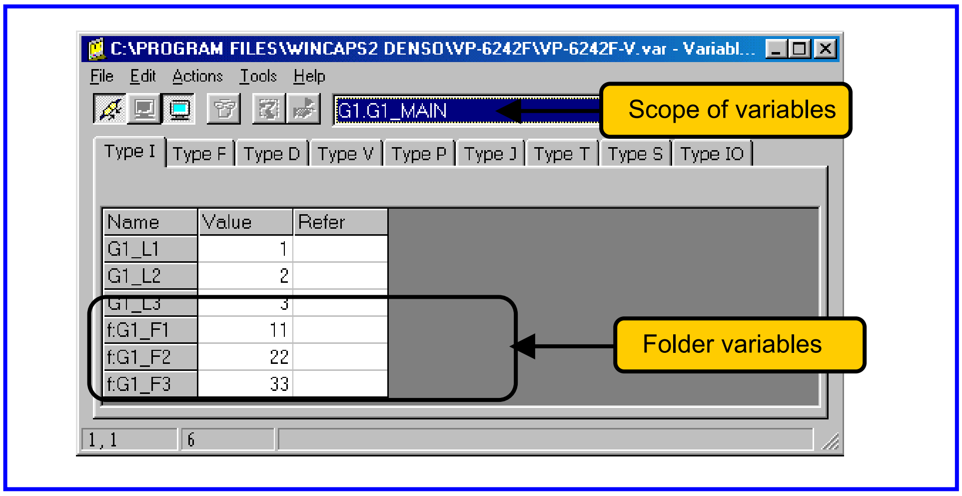
If WINCAPSII is online with the robot controller, you may monitor and modify local variables in each program by switching the scope of variables.
Note: For details, refer to the SETTING-UP MANUAL.



6.1.1.11 Folder Variables [RC7 Ver. 2.2 or later]

The Variables Manager monitors folder variables in the same way as local variables.

Note: The name of a folder variable is preceded by [f:].



6.1.2 Tool Bar

CONNECT button. For functions, refer to Chapter 6 "6.4.1 Connect" in this manual.

SNAPSHOT button. For functions, refer to Chapter 6 "6.4.2 Snapshot" in this manual.

MONITOR button. For functions, refer to Chapter 6 "6.4.3 Monitor" in this manual.

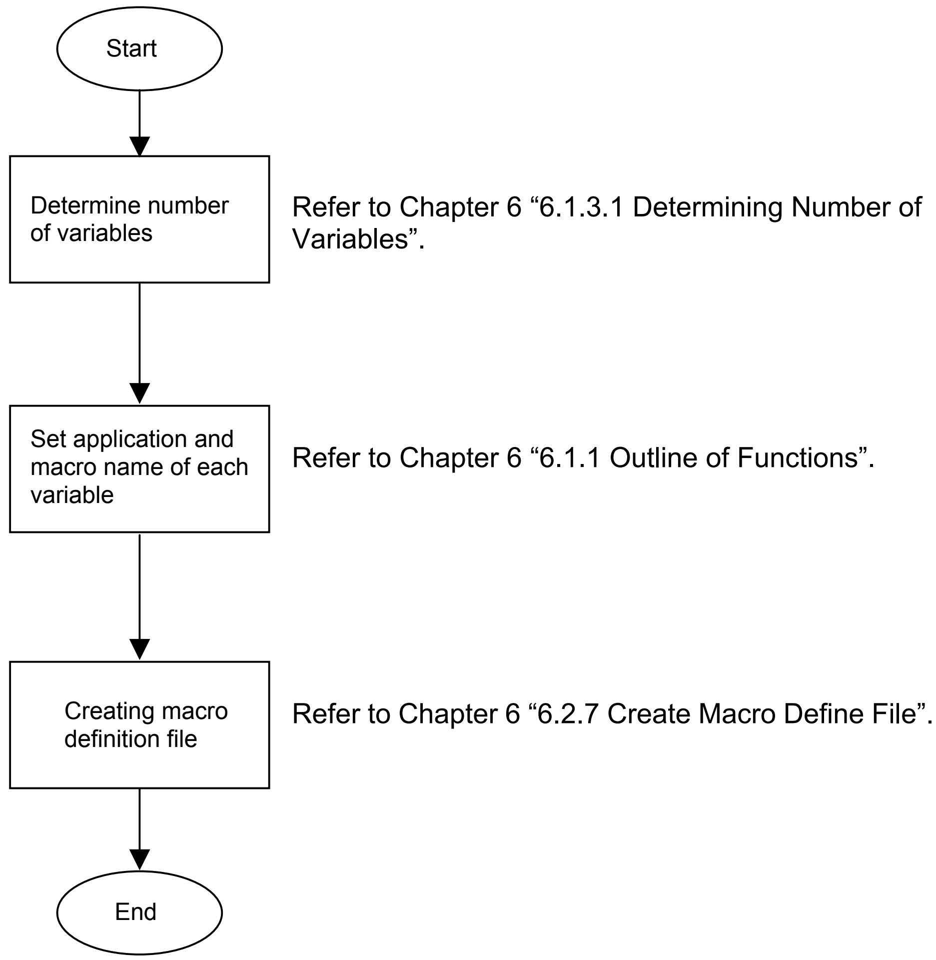
TRANSMIT button. For functions, refer to Chapter 6 "6.2.5 Transfer File" in this manual.

INPUT POSE button. For functions, refer to Chapter 6 "6.4.4 "Get Pose" in this manual.

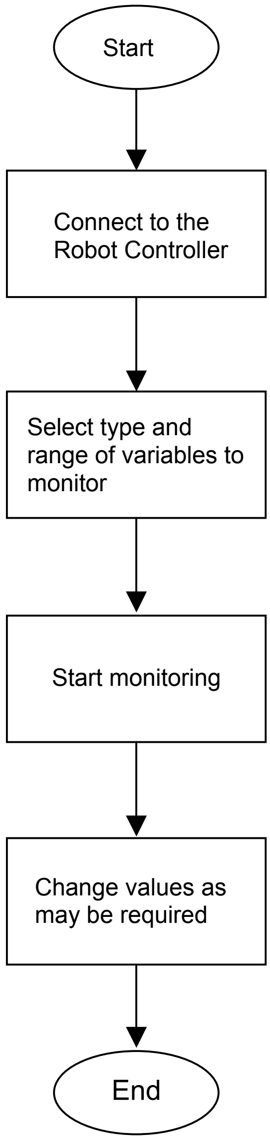
MOVE button. For reference, refer to Chapter 6 "6.4.5 Move" in this manual.

6.1.3 Basic Usage

When designing



When monitoring



Refer to Chapter 6 “6.4.1 Connect”.

Refer to Chapter 6 “6.4.3 Monitor”.

Refer to Chapter 6 “6.4.3 Monitor”.

Refer to Chapter 6 “6.1.1 Outline of Functions”.

6.1.3.1 Determining Number of Variables

You can change the number of variables in either of the following two methods:

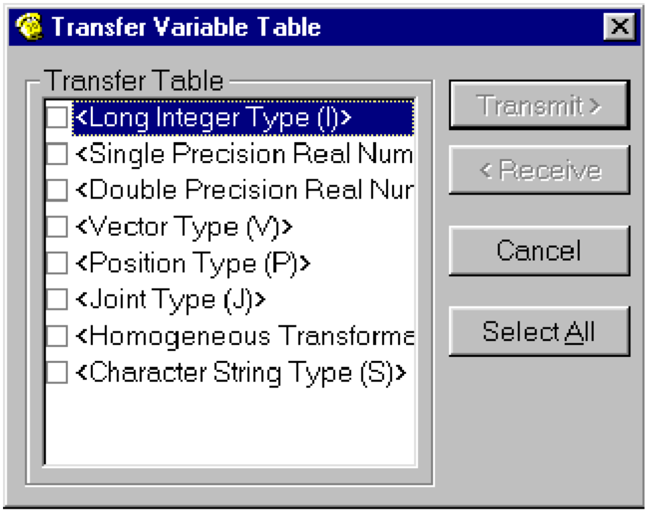
■ Setting with Pendant

► STEP 1

Set the variable number with the pendant.
For the data setting procedure, refer to the SETTING-UP MANUAL.

► STEP 2

Click on the connect button in Variable Manager to establish a connection, then click on the TRANSMIT button to display the TRANSMIT dialogue on the screen.



► STEP 3

Select the variable object type and run.
The number of variables in the Robot Controller and that in Variable Manager should match.

■ Setting with PAC Program Manager

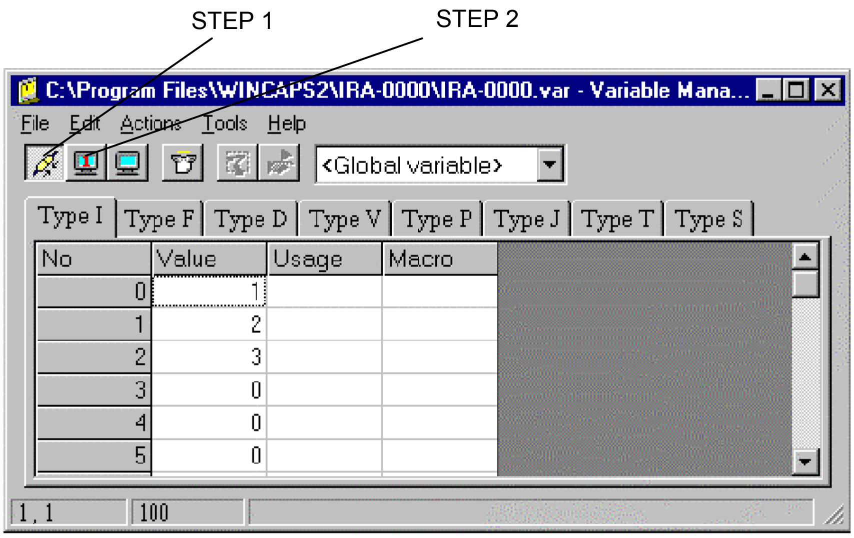
You can set the number of variables by selecting [Tools], [Set], and [Variable] in this order.
Refer to "6.5.1.2 Variables".

6.1.3.2 Editing Variables

[1] Editing Controller Variable Table

► STEP 1

Click on button to establish a connection to the Robot Controller.
button is displayed in the pressed state.

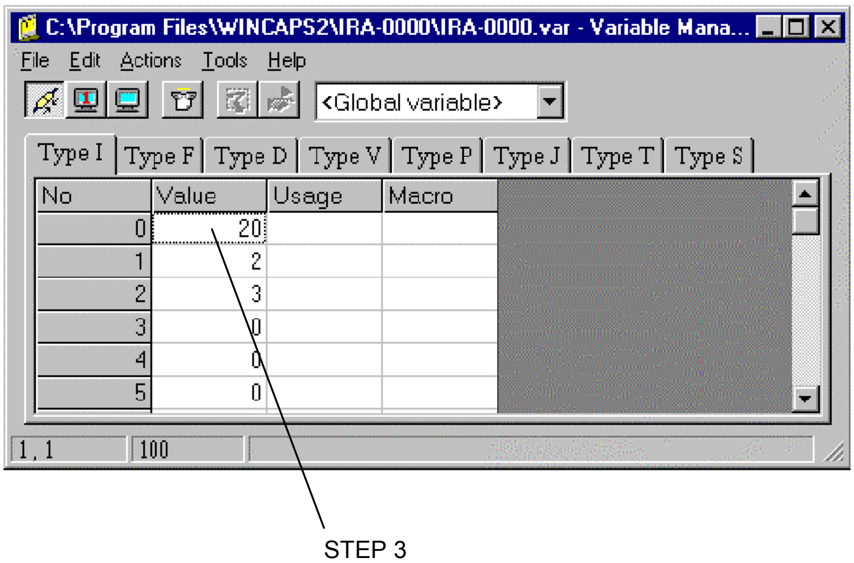


► STEP 2

Click on button and acquire the variable information, instan-taneously indicated from the Robot Controller.
The values of the Robot Controller variables are indicated in the grid.

► STEP 3

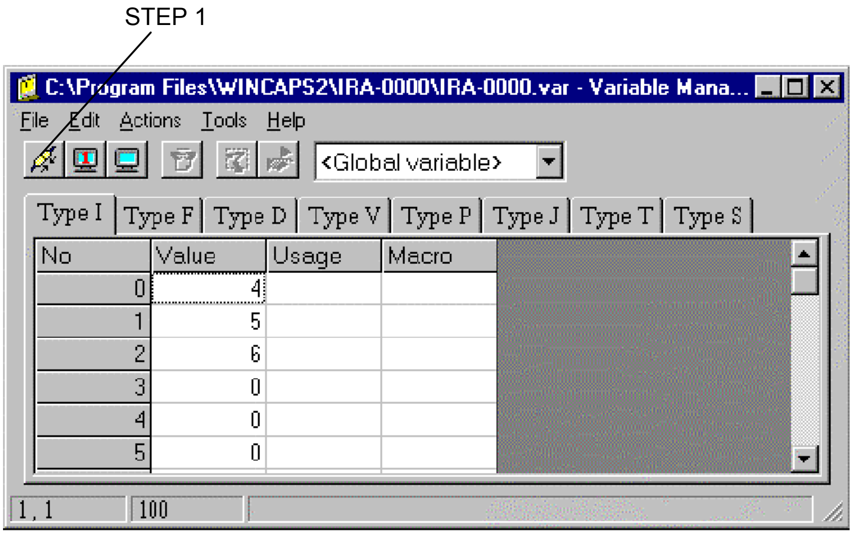
Select the variable grid you wish to change and input the new values.



[2] Editing Personal Computer Variable Table

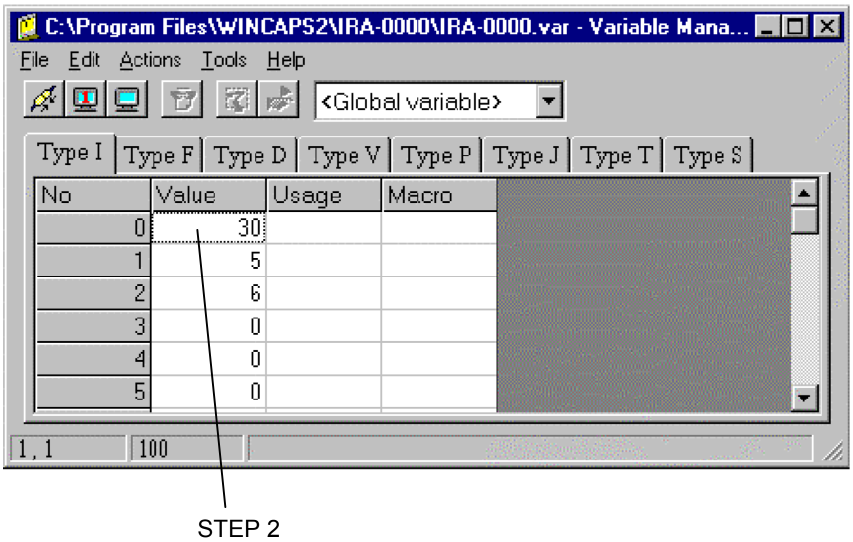
► STEP 1

Click on [button] button to disconnect from the Robot Controller.
The button is shown expanded. At this time, the values of the variable table currently being edited, by the personal computer, is displayed in the grid.



► STEP 2

Select the variable grids to change and input the new values.



[3] Transmitting Controller Variable Table

STEP 1

Change the values of the variable table on the personal computer, as instructed to in Chapter 6, Section 6.1.3.2 [2] "Editing the Personal Computer Variable Table" of this instruction manual.

STEP 2

Transmit the variable table from the personal computer to the Robot Controller according to the procedure described in Section 6.2.5 "Transfer File". The values of the robot controller variable table change to the new values that have been transmitted from the personal computer.

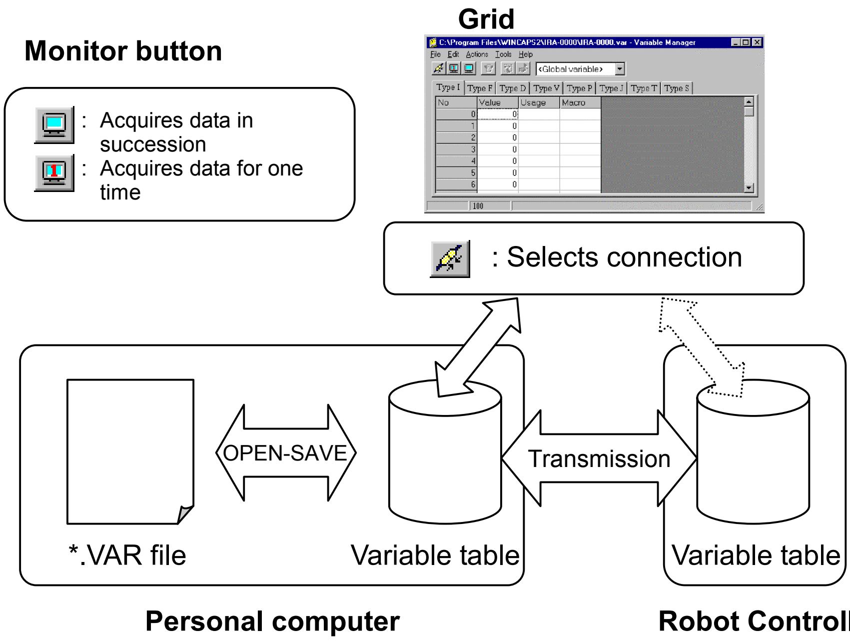
[4] Backing Up Controller Variable Table

STEP 1 **Receive the Robot Controller variable table, following the instructions in Chapter 6, Section 6.2.5 "Transfer File" of this instruction manual. The values of personal computer variable table change to the new values, received from the Robot Controller.**

STEP 2 **Save the personal computer variable table as a VAR file, following the instructions in Chapter 6, Section 6.2.3 "Save File" of this instruction manual.**

- Variable Table Handling -

By using  button, select which grid to edit. The personal computer or the controller? When the value of a grid changes, the content of the object variable table changes. Pressing the monitor button displays the contents of the variable table on the opposite end. (No change is enabled during monitoring.)
Data transmission between the personal computer and the controller is affected by respective variable tables. Variable data, received by the personal computer, can be saved as a "*.VAR" file with "Save". Existing data may be referenced with "OPEN".



6.1.4 Files to Be Managed

Figure 6-2 shows the file types managed by the Variable Manager. The following sections explain each variable.

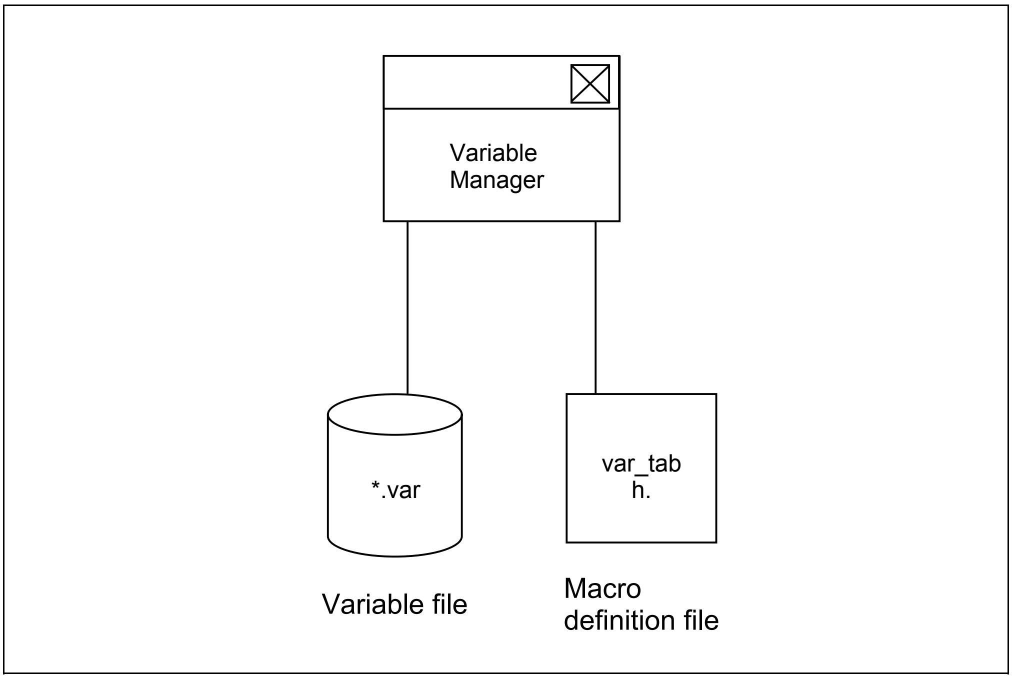


Fig. 6-2 Files Managed by Variable Manager

6.1.4.1 Variable File (*.VAR)

The Variable file saves the variable information used for the program project.
Since a separate file is created for each project, respective variables can be managed without any confusion, even if multiple program projects exist.
The file extension is ".VAR".

6.1.4.2 Macro Definition File (var_tab.h)

This file contains variable macro names, by type and the variable numbers corresponding definition.
The macro definition file is placed when the variable file, with extension (*.VAR).
The file name is "var_tab.h".
To use a variable related macro from a PAC program, it is necessary to input this macro definition file by using the #INCLUDE statement at the head of the program.

6.1.5 Menu List

The Variable Manager command menu has the following tree structure:

File
- New (Programmer Level) *1
- Open (Programmer Level) *1
- Save
- Save As (Programmer Level) *1
- Transfer
- Print
- Make Macro Define File
- Import Macro Define File
- Close

Edit
- Copy
- Paste
- Search on Grid

Actions
- Connect
- Snapshot
- Monitor
- Get Pose
- Move

Tools
- Options
- RS232C Dummy Input
- Calculator

Help
- About Variable Manager

Fig. 6-3 Variable Manager Menu Tree

*1: Displayed only when the file extension display option menu is checked. To set the display option, log-in again, at the programmer level. Select Tools, Options, and View and check the optional file extension menu.

6.2 File Menu (Variable Manager)

Variable Manager uses the VAR file (variable file) to save variable information (variable table). The Variable Manager file menu is used for managing this VAR file.

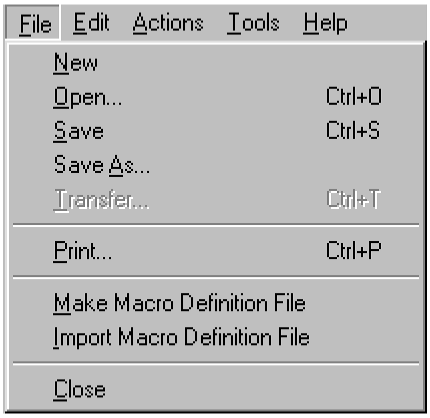


Fig. 6-4 File Menu

6.2.1 New (Programmer Level)

Creates variable information (variable table).

6.2.2 Open (Programmer Level)

Opens the existing VAR file.
Since the standard Windows dialogue box appears, select a VAR file to open, click on [OPEN] to open the desired file.

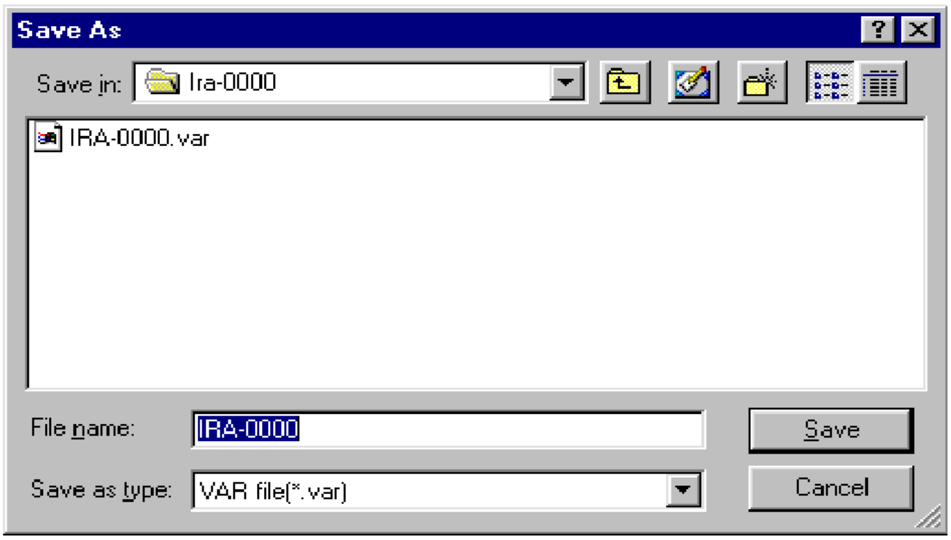


Fig. 6-5 Open Project Dialogue Box

6.2.3 Save

Saves the current state to the currently selected VAR file.

6.2.4 Save As (Programmer Level)

Saves the variable information (variable table) to a new VAR file.
The standard Windows dialogue box appears. Select the path, input the file name and click on SAVE to save data.

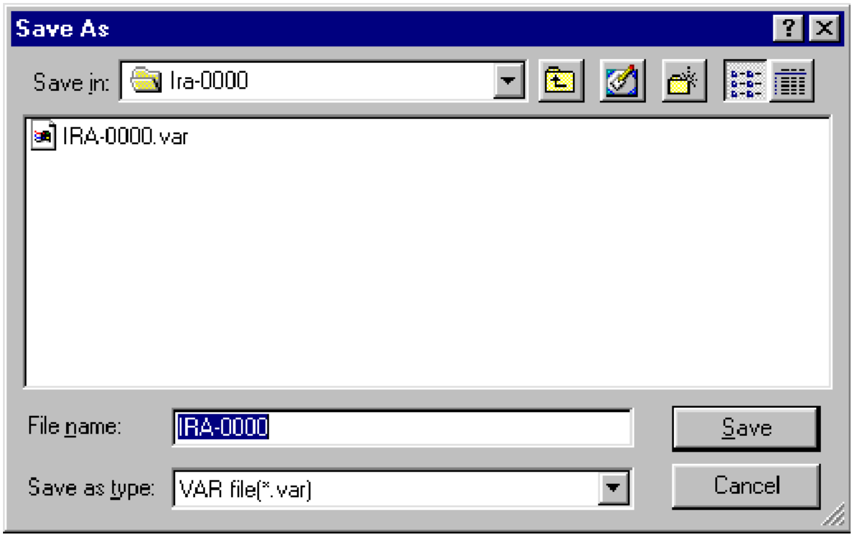


Fig. 6-6 Newly Saving File Dialogue Box

6.2.5 Transfer

When the communication with the Robot Controller is ON, the variable table data may be transmitted or received.
The variable table refers to an array of variable data.
When the Transfer Variable Table dialogue appears on the screen, select the respective variable types tables and click on either Transmit or Receive to transmit data.

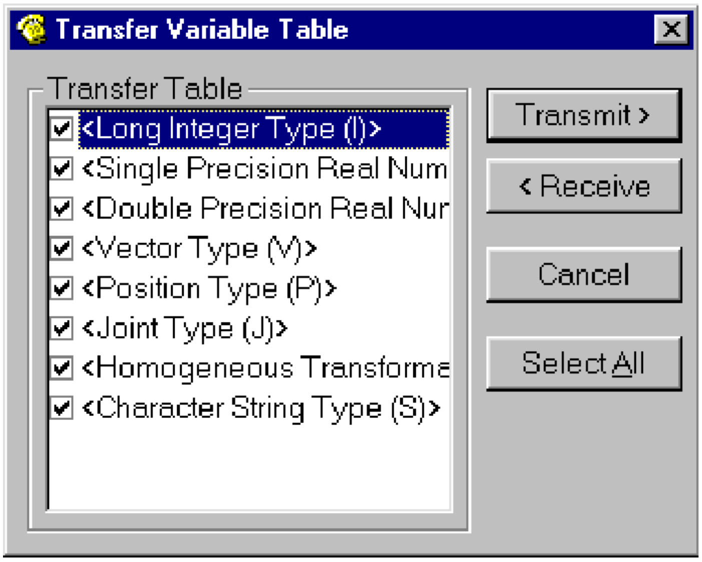


Fig. 6-7 Transfer Variable Table Dialogue Box

6.2.6 Print

Prints variable tables for respective variable types.

6.2.6.1 Print Object

When the Print Manager dialogue box appears on the screen, select the Print Object tab, select the table and click on **Print** to print the data.

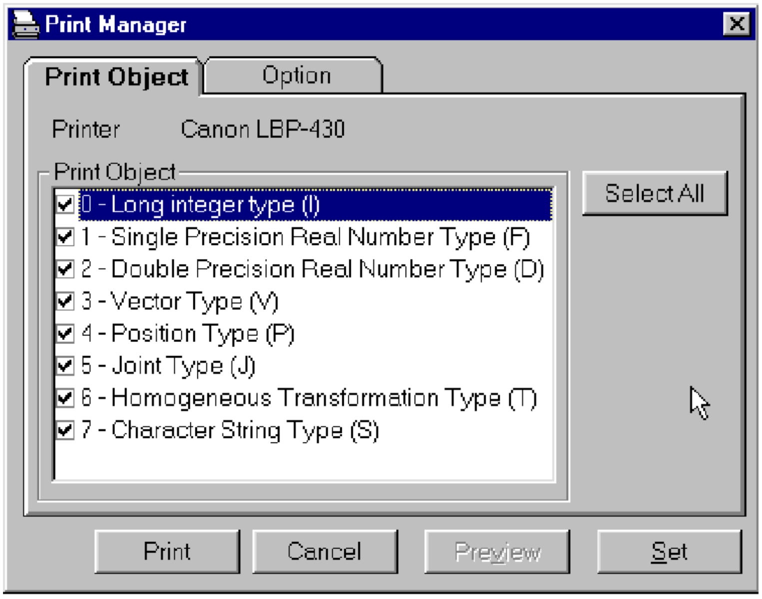


Fig. 6-8 Print Object Tab (Print Manager Dialog Box)

- Select All: Selects all objects for printing simultaneously.
- Set: Displays the printer setting dialogue and makes various settings for the printer.
- Preview: Allows the user to see the print format before actual printing.
- Cancel: Closes the dialogue box without printing.
- Print: Prints variable tables.
- Option: Displays printing options.

TIP: To print specified pages only, click the printer button after previewing. You may specify the print range in the printing preview.

Note: If you select more than one object to be printed, Preview is not usable.

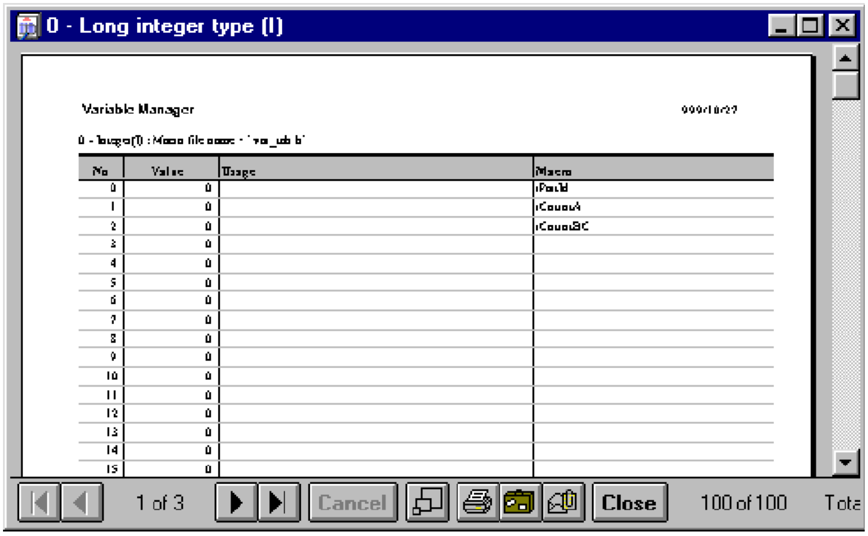
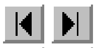


Fig. 6-9 Preview Window

 : Moves to the head/tail end of the page.

 : Moves to the immediately preceding/following page.

 : Selects display (Reduction/Standard/Expansion)

 : Sets print execution
The printing range (specific pages) of an object file can be specified.

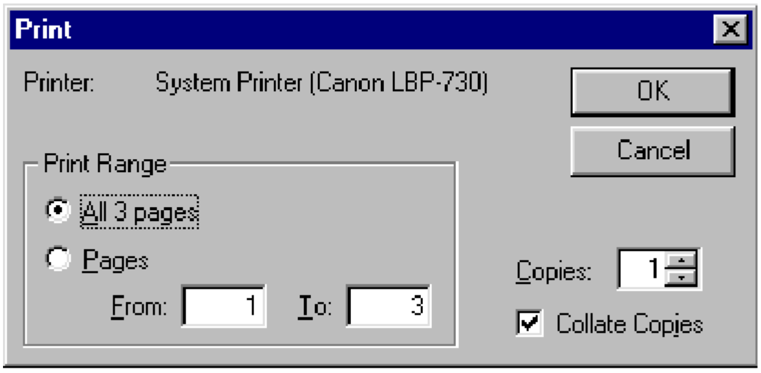


Fig. 6-10 Print Window

 : Exports the object file.
The selected object file will be converted into the file format specified in Format and outputted (saved) to the Destination.

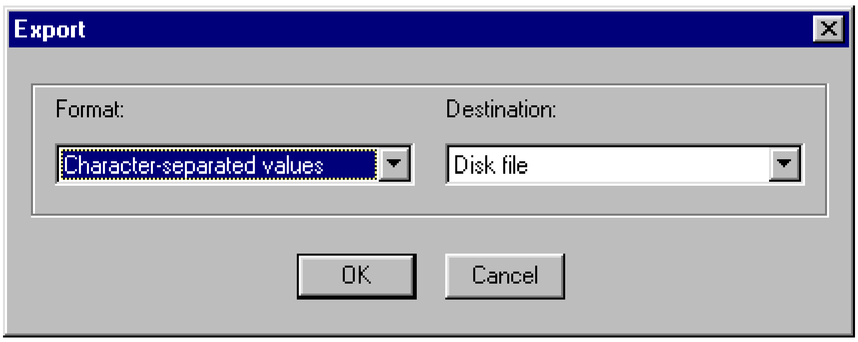


Fig. 6-11 Export Window

6.2.6.2 Option

Selecting the Option tag will display the print options.

Note: Print option is not available from the Variable Manager.

6.2.7 Make Macro Define File

Create a “var_tab.h” file in the folder where the variable file (*.VAR) resides.

The “var_tab.h” file contains the variable macro name, listed by type and information corresponding to variable numbers.

6.2.8 Import Macro Define File

Reads the macro definition file (var_tab.h) and expands in the "Use" and "Macro Name" columns for each variable.

6.2.9 Close

Ends Variable Manager and closes the Variable Manager window.

6.3 Edit Menu (Variable Manager)

Fig. 6-13 Edit Menu

6.3.1 Copy

Temporarily stores the same data as that in the selected range. Data temporarily stored by copying can be used with the **Paste** command.

6.3.2 Paste

Pastes temporarily stored data by cutout or copying to a specified location.

6.3.3 Search on Grid

Searches for a specified character string from an application field or macro name field.
When the Search on Grid dialogue box appears on the screen, specify the necessary items and click on Find Next. The line containing the found character string is displayed in reverse.

Fig. 6-14 Grid Search Dialogue Box

• Find What:	Enter a character string to be searched.
• Field Name:	Select an object field to search from the application field or macro name field.
• Search:	Specify the direction of search. If All is selected, searching is carried out downward until the end, then it is continued from the beginning of the data.
• Object:	Select the range to search, either All or selected range.
• Match Case:	If checked, upper case and lower case are searched separately.

6.4 Actions Menu (Variable Manager)

The commands in this actions menu can be specified also with the buttons.

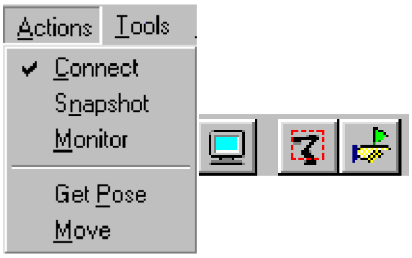


Fig. 6-15 Actions Menu and Buttons

6.4.1 Connect

Establishes communication with the Robot Controller.
During connection with the Robot Controller, a checkmark appears in the menu.
 button has the same function as the connect button. When connected, the button is displayed in the pressed state.

6.4.2 Snapshot

Acquires variable data of the moment from the Robot Controller.
 button has the same function as the snapshot command.
Set the communication conditions before executing the snapshot command.

6.4.3 Monitor

Acquires variable data in succession from the Robot Controller.
 button has the same function as the monitor command.
Set the communication conditions before running the monitor command.
The personal computer acquires the data only of the variables displayed on the screen from the Robot Controller during continuous monitoring, and does not acquire the variable data not displayed on the screen. You can, therefore, specify the data acquisition range by displaying the variables to be monitored.

6.4.4 Get Pose

With this command, the personal computer captures the current robot position data from the Arm Manager to the currently selected variables of type P, J, or T. (In the Variable Manager window, variable types and numbers are displayed in reverse video.) If the Arm Manager is connected, you can obtain the actual robot position.
button has the same function as the Get Pos. command.

6.4.5 Move

The values of the currently selected variable types P, J, and T are written to the Arm Manager as the current robot position. (In the Variable Manager window, variable types and numbers are displayed in reverse.) At this time, the robot does not move to the specified position even if the Arm Manager is connected. However, only the virtual arm of the Arm Manager moves to the specified position.
button has the same function as the MOVE command.

Note: Arm Manager moves its imaginary arm in the continuous monitoring state or when the Snapshot button is pressed.

6.5 Tools Menu (Variable Manager)

6.5.1 Options

Used to set the operating conditions of Variable Manager.
When you select Options from the Tools menu, the Options dialogue box appears on the screen.

Note: Items that can be edited differ by user level. For restrictions, by user level, refer to Chapter "1.3 Security" in this manual. For how to change the access level in the middle, refer to Chapter 4 "4.3.3 Re-Log In" in this manual.

6.5.1.1 Monitor

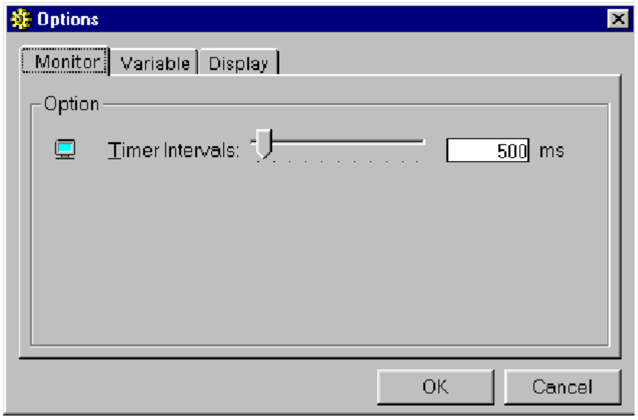


Fig. 6-16 Monitor Tab (Options Dialog Box)

- Timer intervals: Sets intervals of getting data from the monitor. Default is 500 milliseconds.

6.5.1.2 Variables (Programmer Level)

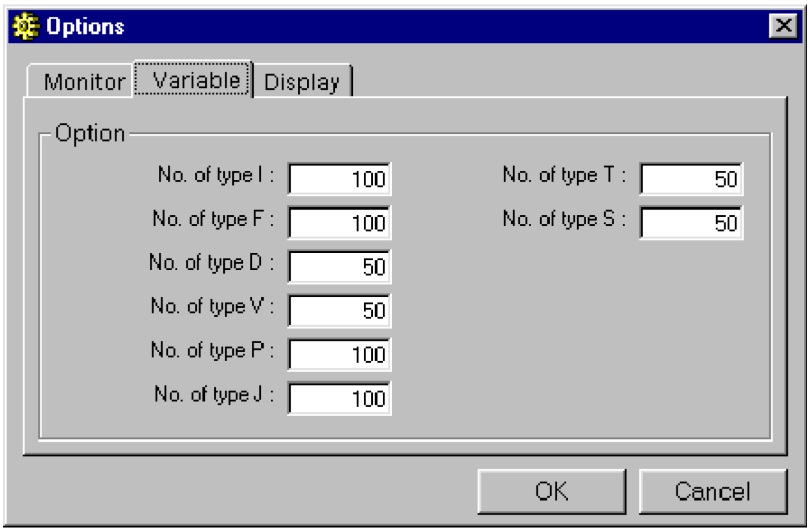


Fig. 6-17 Variable Tab (Options Dialog Box)

- Click the variable tab to sets the number of variables for each type.

If you modify the number of variables, take the following procedure to bring the modified result into the internal data of the robot.

► STEP 1

Recompile the source file into the executable file.
Refer to Section 5.2.8, "Make Exec. Program."

► STEP 2

Transmit the Program Table, Execution Program Table, and Cross-reference Table to the robot controller.
Refer to Section 5.2.6, "Transmit a Project."

► STEP 3

Loads the project from the teach pendant.
Refer to the SETTING-UP MANUAL, Section 6.6, "Loading a project, [F6 Set]–[F1 Load!].

6.5.1.3 Display (Programmer Level)

Click the display tab to set the display option for Show/Hide.
A display tab is indicated when the user level is higher than the programmer.

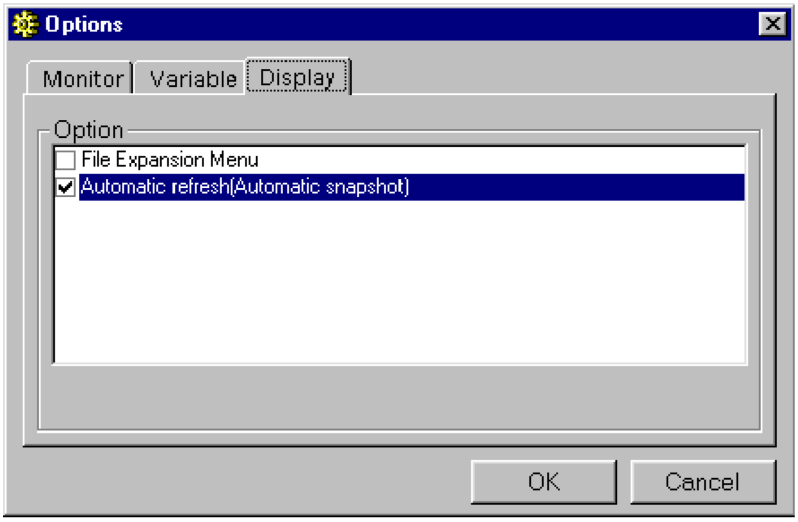


Fig. 6-18 Display Tab (Options Dialog Box)

- File Expansion Menu: Used to extend FILE (F) menu of the PAC Program Manager. For details, refer to Section 6.1.5, "Menu List" in this chapter.
- Automatic refresh (Automatic snapshot): If selected, this option automatically monitors the current status as a snapshop when the communication gets linked or when you change the window size during connection or scroll the screen.

6.5.2 RS232C Dummy Input

Note: To execute RS232C Dummy Input command, ensure the following conditions are met:

- **RoboTalk is set in RS232C.**
- **Each WINCAPSII manager is not connected. Since RS232C Dummy Input command uses the RS232C port of the personal computer. Therefore, if a Manager is connected to the Robot Controller, an error will occur due to conflict.**

The message entered in the dialogue box is transmitted to the Robot Controller via RS232C.
Use this function when debugging the program.
If you execute RS232C Dummy Input command without connecting the robot, the personal computer teaching system behaves as if it has transmitted the data to the RS232C of Robot Controller.
You can choose a delimiter from between [CR+LF] and [CR] as an end code attached to the output character string.

6.5.3 Calculator

Displays the standard Windows calculator. If the calculator is not installed, a message reading “Could not find the file” appears on the screen.

6.6 Help Menu

Descriptions on how to use WINCAPSII can be read by using the help menu.

Fig. 6-19 Help Menu

6.6.1 About Variable Manager

Displays the version information on Variable Manager.

Chapter 7

Operating DIO Manager

This chapter describes the WINCAPSII software DIO Manager functions that are used with the personal computer teaching system.

7.1 Outline of DIO Manager

7.1.1 Outline of Functions

The DIO Manager can monitor I/O status and/or manage the I/O layout table. In addition, the program can be debugged prior to the completion of the facility to test the program by adjusting Dummy SW ON or OFF to vary the I/O state falsely.
When the MONITOR SW is turned ON or OFF and the DIO Manager connected, the status of an I/O can be changed.
There are three methods for displaying I/Os: table, oscilloscope and panel. The DIO Manager window appears on the screen when DIO Manager is started.
The DIO Manager can select a standard mode or conventional interchange mode for I/O layout. For details, refer to 7.5.1.4 “Hardware”. For information regarding the standard mode and conventional compatible mode for I/O layout, refer to Chapter 5 the RC5 CONTROLLER INTERFACE MANUAL.

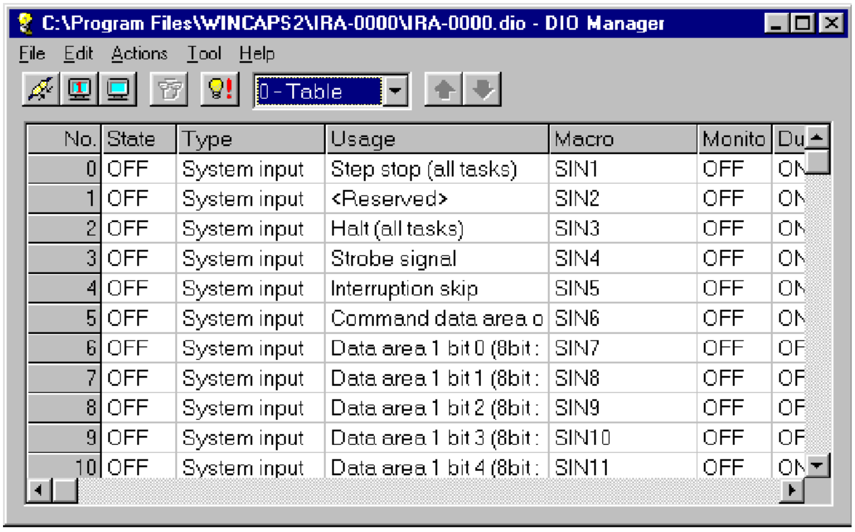


Fig. 7-1 DIO Manager Window

The following are the functions of the DIO Manager.

7.1.2 Tool Bar

 CONNECT button to make connection with the Robot Controller.

 SNAPSHOT button to input the I/O status of the Robot Controller a single time only.

 MONITOR button to input the I/O status of the Robot Controller in succession.

 TRANSMIT button to either transmit or receive environmental table data.

 DUMMY INPUT/OUTPUT button to select whether to use the dummy I/O in the Robot Controller. It selects the I/O number for which the DUMMY SW grid is set to ON.

 DISPLAY SELECT list for specifying the format of the I/O status display.

 RETURN button to select the preceding page when the number of I/Os to monitor stretches over multiple pages.

 NEXT button to select the following page when the number of I/Os to monitor stretches over multiple pages.

7.1.3 Table Item

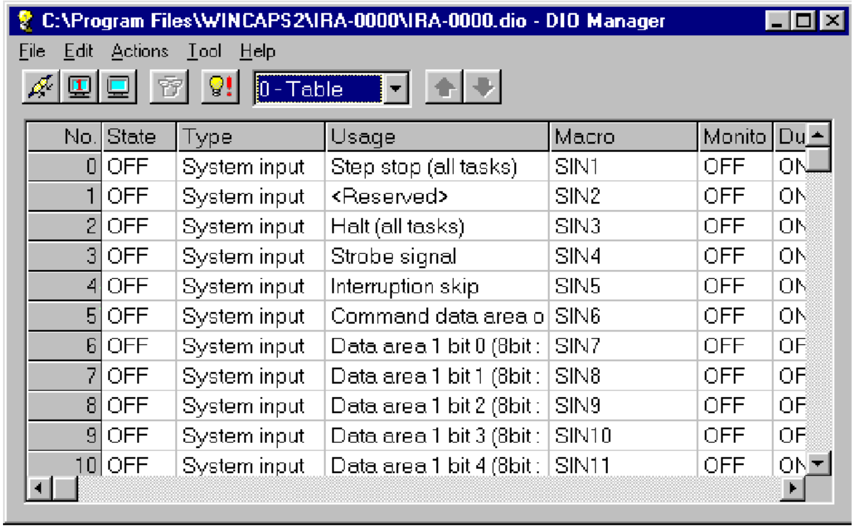
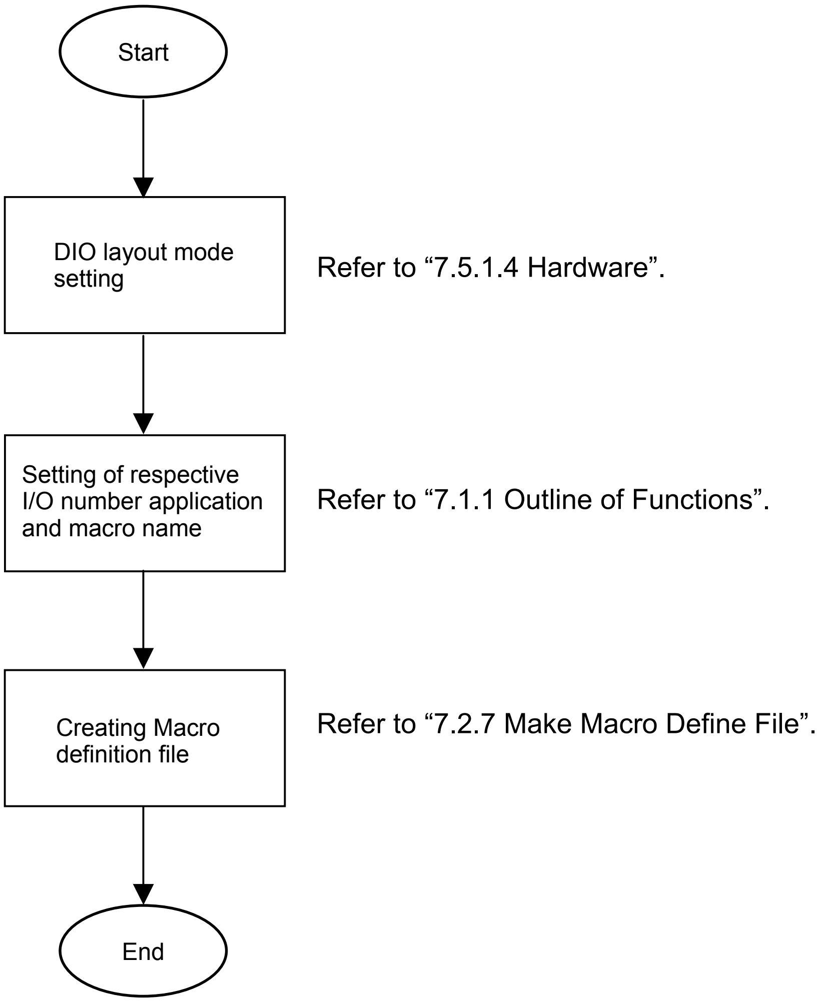


Fig. 7-2 Table Items

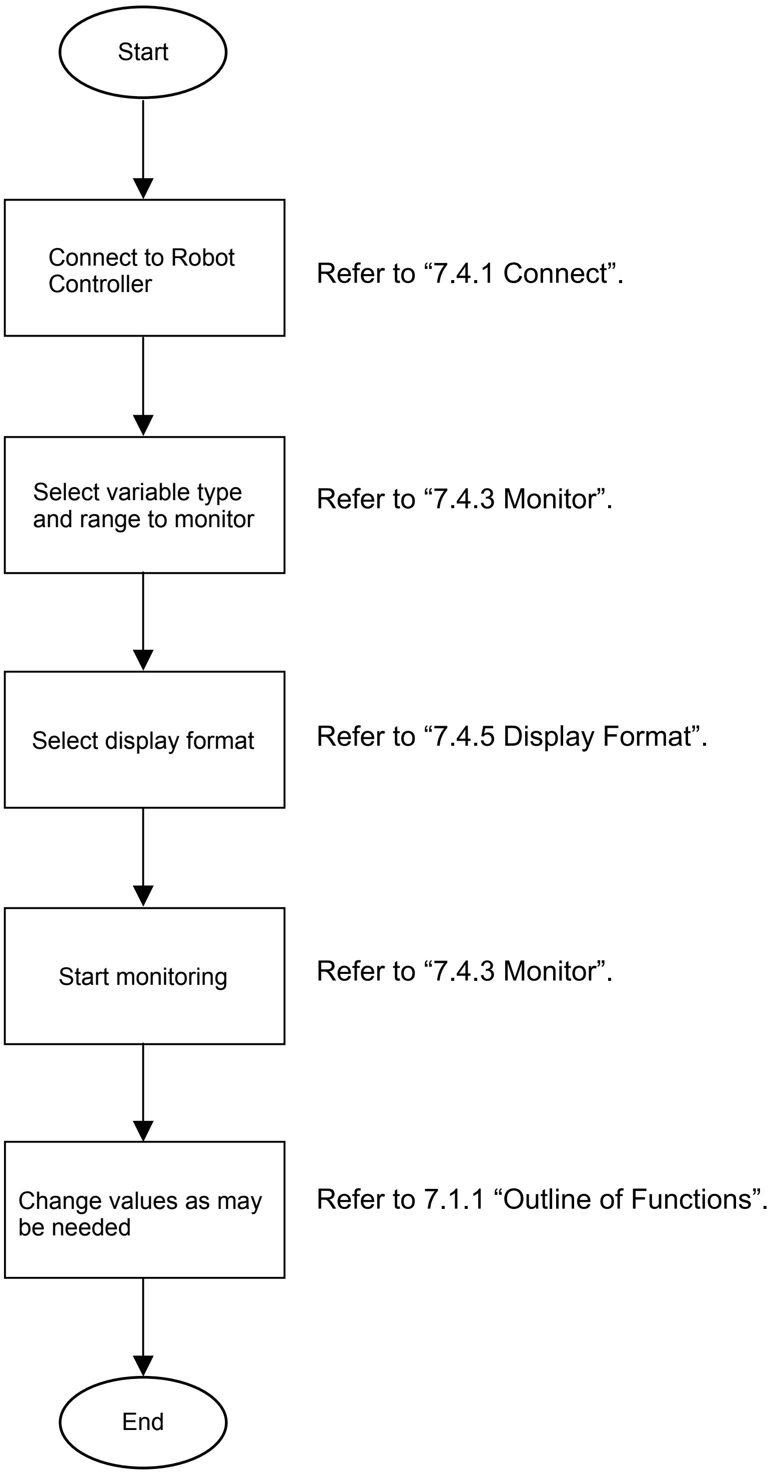
- Number: I/O layout number.
- State: Status of I/O. In the MONITOR state, it indicates the status of the Robot Controller I/O or the emulated I/O (memory) in the personal computer. It is able to operate (ON-OFF) the Robot Controller I/O or the emulated I/O in the personal computer except when in the continuous monitor state. In the connected state the Robot Controller I/O is the object of action while in the disconnected state the emulated I/O in the personal computer is the object of action.
- Type: I/O layout type. Display only and not for editing.
- Application: I/O layout application. Can make entry as a comment. Double clicking enables entry.
- Macro name: I/O layout macro name. Corresponds to the I/O macro name and the I/O number described in the macro definition file dio_tab.h. Double clicking enables entry.
- Monitor SW: Specifies whether to monitor or not. Turns ON-OFF by double clicking.
- Dummy SW: Specifies whether to use the actual I/O of the Robot Controller or the dummy SW (emulate memory). Turns ON-OFF by double clicking. When turned ON the DUMMY SW (emulate memory) is used. Unless the dummy I/O button is set to ON, the Dummy SW setting is not enabled.

7.1.4 Basic Usage

When designing



When monitoring



7.1.5 Files to Be Managed

Fig. 7-3 shows the types of files managed by the DIO Manager:

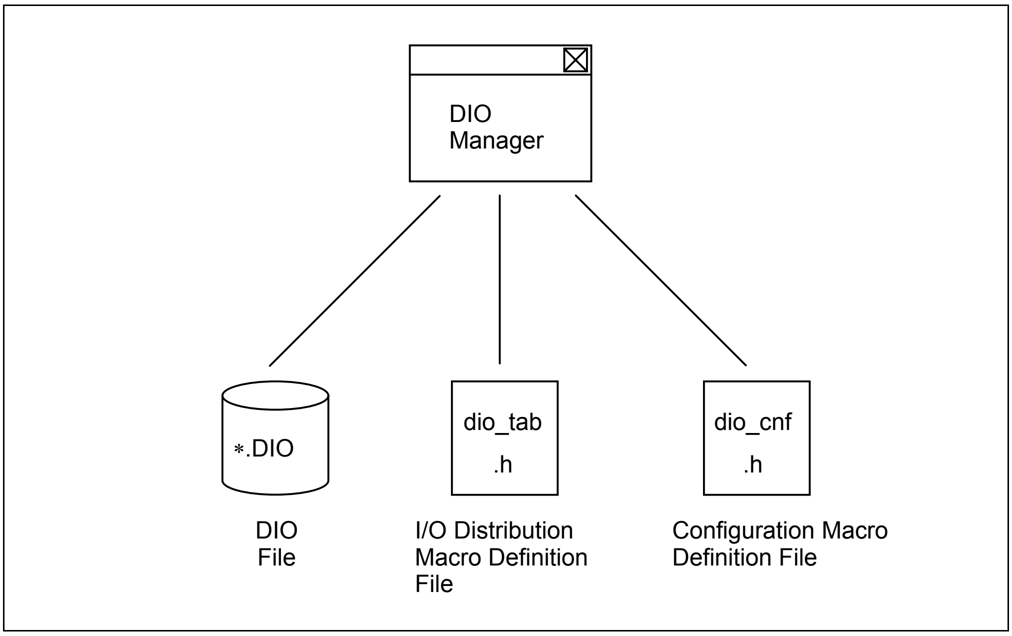


Fig. 7-3 Files Managed by DIO Manager

7.1.5.1 DIO File (*.DIO)

The DIO file saves I/O information used for the project.
Since a separate file is created for each project, respective I/O information can be managed without confusion even if multiple projects are involved.
The file name extension is ".DIO".

7.1.5.2 I/O Layout Macro Definition File (dio_tab.h)

This file contains definitions corresponding to I/O macro names and I/O numbers.
The I/O layout macro definition file is located where the DIO file (*.DIO) is found.
The file name reads "dio_tab.h".
To render the I/O macro applicable from the PAC program, it is necessary to input this macro definition file at the head of the program using #INCLUDE statement.

7.1.5.3 Configuration Macro Definition File (dio_cnf.h)

Contains the macro definitions for the content of hardware settings.
The Configuration macro definition file is located where the system project file is found.
The file name reads "dio_cnf.h".

7.1.6 Menu List (DIO Manager)

The DIO Manager command menu has the following tree structure:

File
- New (Programmer Level) *1
- Open (Programmer Level) *1
- Save
- Save As (Programmer Level) *1
- Transfer
- Print
- Make Macro Define File
- Import Macro Define File
- Close

Edit
- Copy
- Paste
- Find on Grid
- Selected Range All ON
- Selected Range All OFF

Actions
- Connect
- Snapshot
- Monitor
- Pseudo input/output
- Display Style

Tools
- Options
- DIO Command Viewer

Help
- About DIO Manager

Fig. 7-4 DIO Manager Menu Tree

*1: Displayed only when the file extension menu of the display option is checked. To set the display option, (re) login on the Programmer level and then select Tools, Options and View, and check the option file extension menu.

7.2 File Menu (DIO Manager)

The DIO Manager has the DIO files for saving I/O data. The File menu of DIO Manager is used for managing the DIO files.

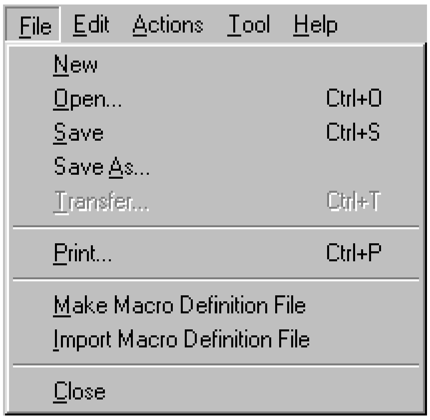


Fig. 7-5 File Menu

7.2.1 New (Programmer Level)

Creates new I/O information.

7.2.2 Open (Programmer Level)

Opens an existing DIO file.
When the standard Windows dialog box appears on the screen, select the DIO file to open, and click on OPEN to open the file.

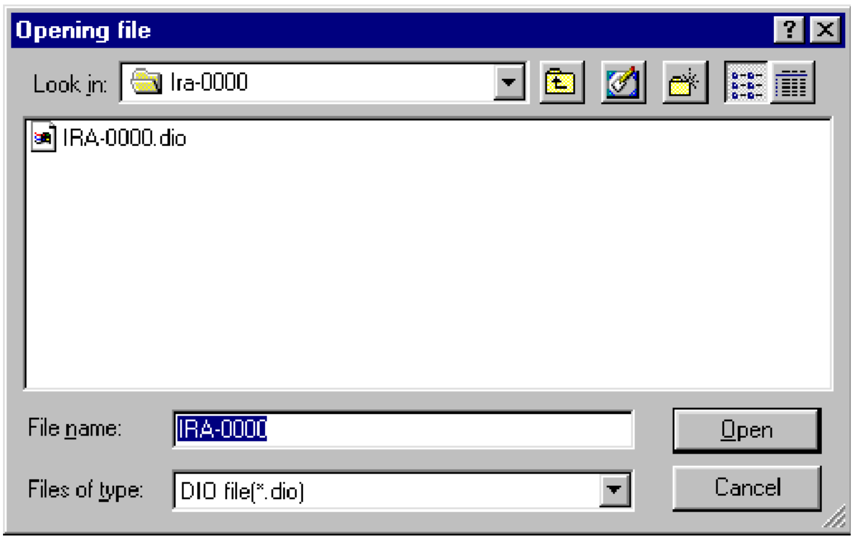


Fig. 7-6 Open Project Dialog Box

7.2.3 Save

Saves the current status in the presently selected DIO file.

7.2.4 Save As (Programmer Level)

Saves I/O information to a new DIO file.
When standard Windows dialog box appears on the screen, select the path, input file name, and click on SAVING to save the data.

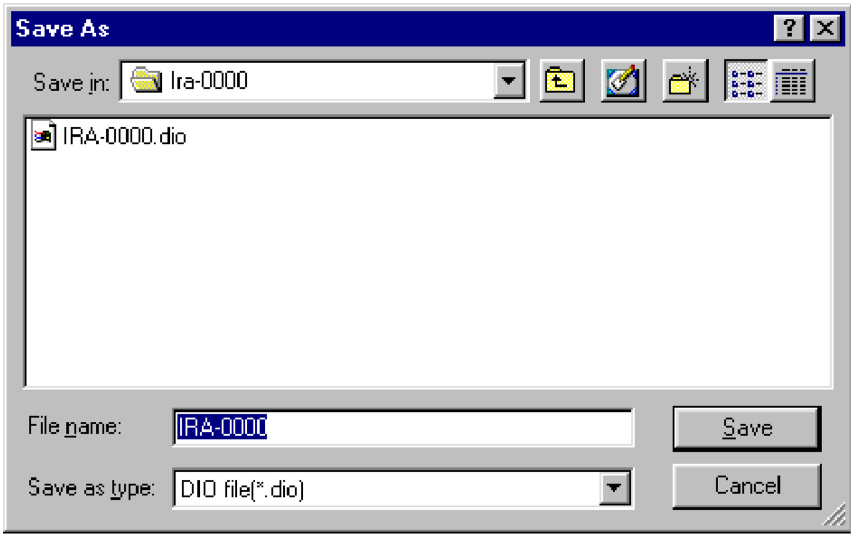


Fig. 7-7 New File Save Dialog Box

7.2.5 Transfer

When the Robot Controller is connected for communication, it is capable of transmitting or receiving the environmental table data.
The environmental table refers to an array of data the robot needs to operate.
When the Transfer Environment Table dialog appears on the screen, select the table and click on either Transfer or Receive to transmit data.

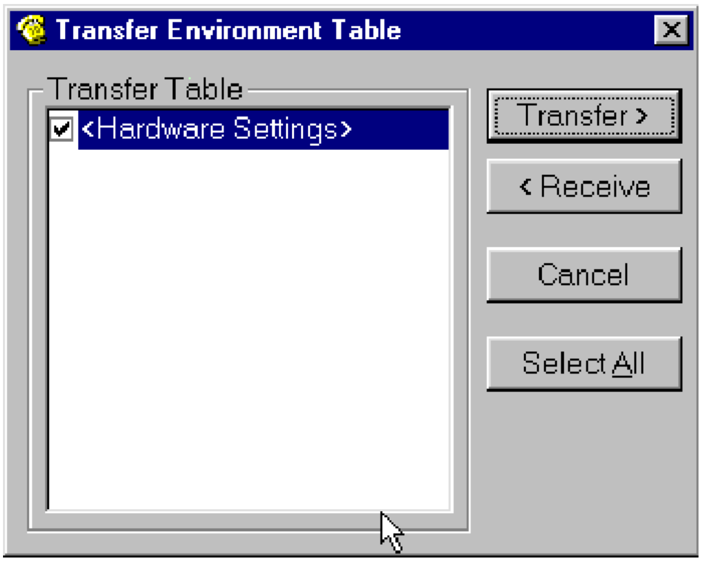


Fig. 7-8 Transfer Environment Table Dialog Box

Hardware setting: Setting various parameters needed for DIO operation.
If this content is changed, press either **Transfer** or **Receive** so as to share the same data between WINCAPSII and the controller. After data transmission from WINCAPSII to the controller, restart the controller.

7.2.6 Print

Prints the DIO Manager environment table and I/O layout table.

7.2.6.1 Print Object

When the Print Manager dialog box appears on the screen, select the Print Object tab, the table, and then click on **Print** to print the data.

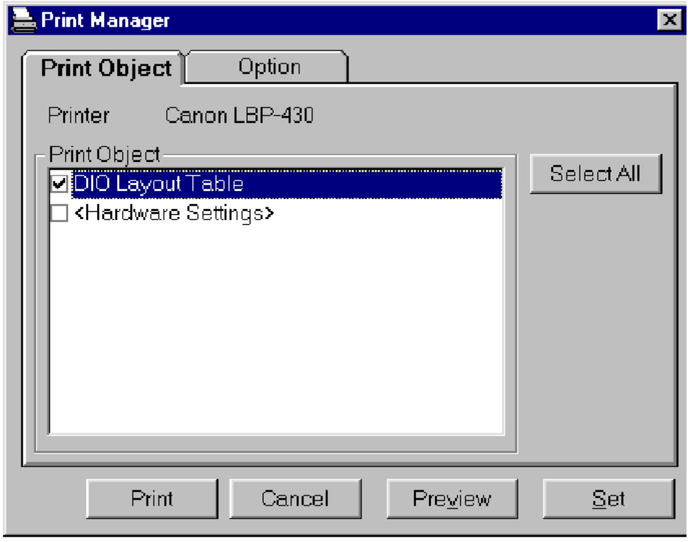


Fig. 7-9 Print Object Tab Print Manager Dialog Box

- Select All: Selects all objects for printing.
- Set: Displays the printer set dialogue and makes various printer settings.
- Preview: Enables the user to see the print before starting the print job.
- Cancel: Closes the dialog box without printing.
- Print: Starts printing.
- Option tab The printing option setting sheet appears.

TIP: If you wish to print only the specified page, see preview and click on the print button .

Note: If you select more than one object to be printed, Preview is not usable.

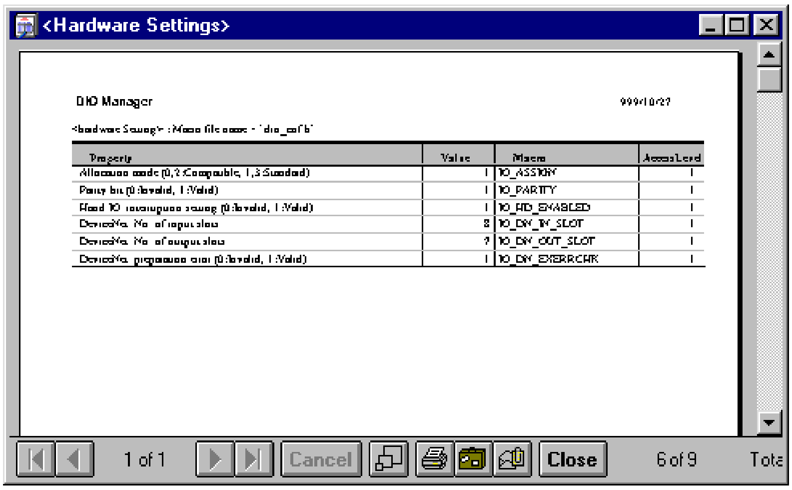
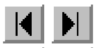


Fig. 7-10 Preview Window

 : Moves to the head/tail end of the page.

 : Moves to the immediately preceding/following page.

 : Selects display (Reduction/Standard/Expansion)

 : Sets print execution
The printing range (specific pages) of an object file can be specified.

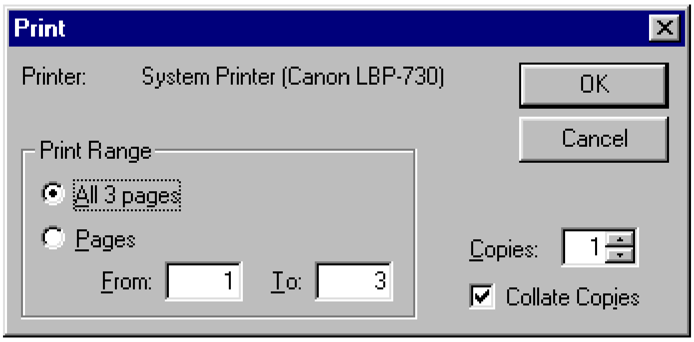


Fig. 7-11 Print Window

 : Exports the object file.
The selected object file will be converted into the file format specified in Format and outputted (saved) to the Destination.

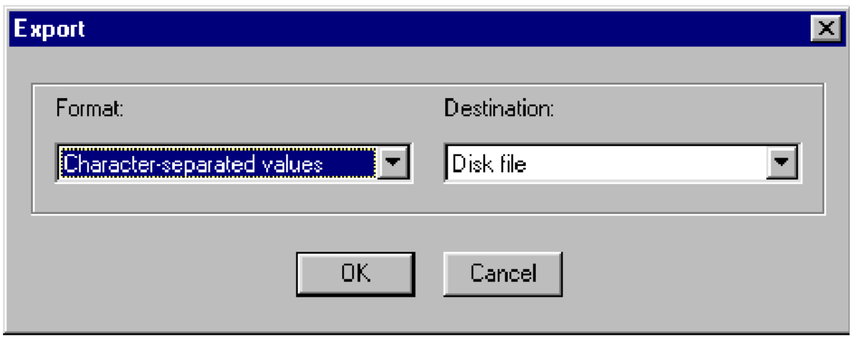


Fig. 7-12 Export Window

7.2.6.2 Option

Selecting the Option tag will display the print options.

Note: Print option is not available from the Variable Manager.

7.2.7 Make Macro Define File

Create a "dio_tab.h" file in the folder where the DIO file (*.DIO) resides.

The "dio_tab.h" file contains the I/O numbers and macro name information.

7.2.8 Import Macro Define File

Reads the macro definition file (dio_tab.h) and expands in the "Use" and "Macro Name" columns on the screen.

7.2.9 Close

Ends DIO Manager and closes the DIO Manager window.

7.3 Edit Menu (DIO Manager)

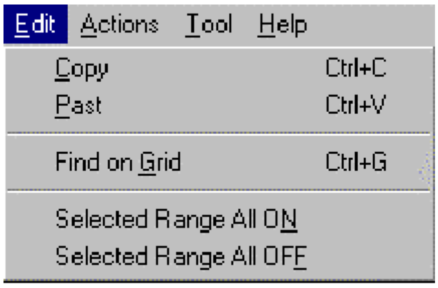


Fig. 7-14 Edit Menu

7.3.1 Copy

Temporarily stores a specified range of data. Data temporarily stored by copying can be used by the **Paste** command.

7.3.2 Paste

Pastes the temporarily stored data by cutting or copying to a specified location. This operation is enabled in the “Application” and “Macro name” fields only.

7.3.3 Search on Grid

Searches for a specified character string from either the application or macro name field.
When the SEARCH ON GRID dialog box appears on the screen, specify the necessary items and click on FIND NEXT. The line containing a found character string is displayed in reverse video.

Fig. 7-15 Search on Grid Dialog Box

• Find What:	Enter a desired character string to be searched.
• Field Name:	Choose the searching object field from between Usage Field and Macro Field.
• Search:	Specify the searching direction. If **Whole** is selected, the search is made downward to the end, and then the search restarts from the beginning of the data downward.
• Object:	Choose the searching range from between all and just a selected range.
• Match Case:	If this box is checked, search is made with distinction between upper and lower cases.

7.3.4 Selected Range All ON

Multiple monitor and dummy switches may be selected and turned ON simultaneously.
As Fig. 7-12 shows, first select the I/O number of the desired item (monitor or dummy switch), then select **Selected Range All ON**. The menu content can be more easily displayed by clicking the right button of the mouse to select the command as shown below.

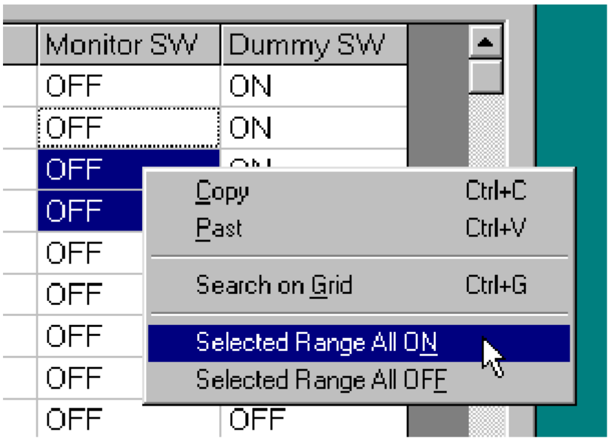


Fig. 7-16 Selected Range All ON

7.3.5 Selected Range All OFF

Multiple monitor switches and dummy switches may be selected and turned OFF simultaneously.
As Fig. 7-13 shows, first select the I/O number of a desired item (monitor switch or dummy switch). Then select **Selected Range All OFF**. The menu content can be more easily displayed by clocking the right button of the mouse to select the command as shown below.

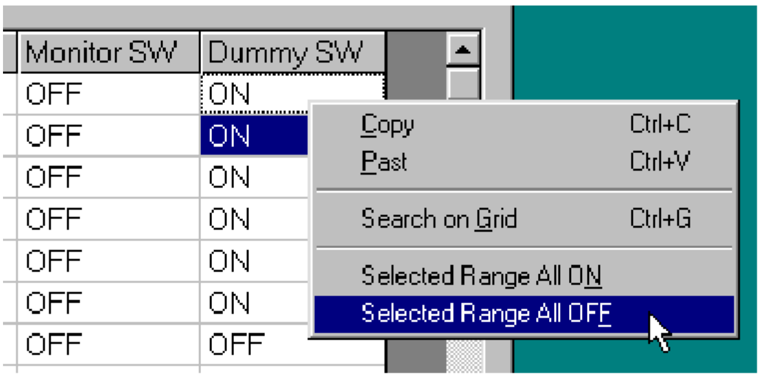


Fig. 7-17 Selected Range All OFF

7.4 Actions Menu (DIO Manager)

The Actions menu commands are also issued by depression of the tool buttons.

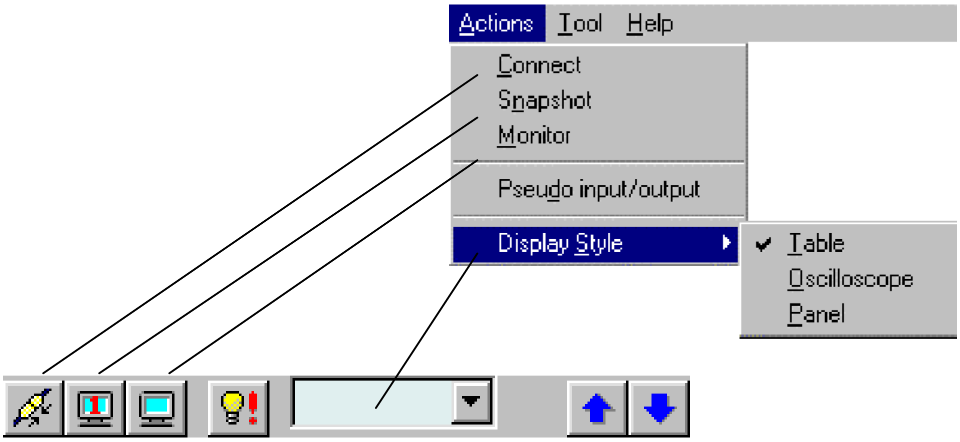


Fig. 7-18 Action Menu and Buttons

7.4.1 Connect

Connects the communication line with the Robot Controller.
When connected, check mark is attached to the menu.
 button works the same as the Connect command. When connected it is displayed as if depressed.

7.4.2 Snapshot

Acquires the data of the moment from the Robot Controller.
 button has the same function as the Snapshot command.
Before executing the Snapshot command, ensure that the Manager is connected with the Robot Controller.

7.4.3 Monitor

Acquires data in succession from the Robot Controller.
button has the same function as the Monitor command.
Before executing the Monitor command, ensure that the Manager is connected with the Robot Controller.
During monitoring, the DIO Manager acquires the data only of I/O numbers displayed on the screen from the Robot Controller, and does not acquire the I/O number data not displayed on the screen. You can, therefore, specify the data acquisition range by displaying the I/O numbers to be monitored.
Monitor intervals can be set with the timer intervals. Refer to “7.5.1.1 Monitor”.

7.4.4 Pseudo input/output

To emulate (dummy input/output) the state in the Robot Controller, false I/Os are provided in the Robot Controller in addition to the actual I/Os. Selection of the actual versus false I/Os can be specified for each port by turning the Dummy SW grid of the table display ON-OFF.
When the Dummy input/output button is turned ON, every port with the Dummy SW grid set to ON will function as a dummy I/O.
If the button is turned OFF, all the I/O signals are activated as the actual I/O signals irrespective of the setting of the Dummy SW grid in the table.

Valid setting range of dummy I/Os is as follows:
Standard mode
34-55, 552-575+(DeviceNet input slot number-8)×8
Interchange mode
21-55, 536-559+(DeviceNet input slot number-8)×8

Note: DeviceNet input slot number may be referred to with the hardware. If DeviceNet is not installed, the range will be only 34-55 (Standard mode) or 21-55 (Interchange mode).

7.4.5 Display Format

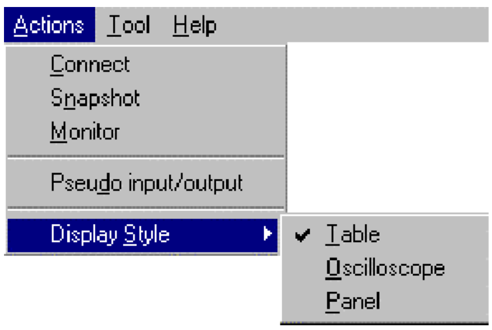


Fig. 7-19 Display Format Menu

The DIO Manager has three methods for displaying I/O statuses. Select **Display Style** from Actions menu, and the three display styles appear on the right: Table, Oscilloscope, and Panel. Select a required one.
You can also select the display style by clicking on Display selection list and displaying the pull-down menu.

7.4.5.1 Table

When you select the table type display, the I/O states are displayed in the table type as shown in the list.

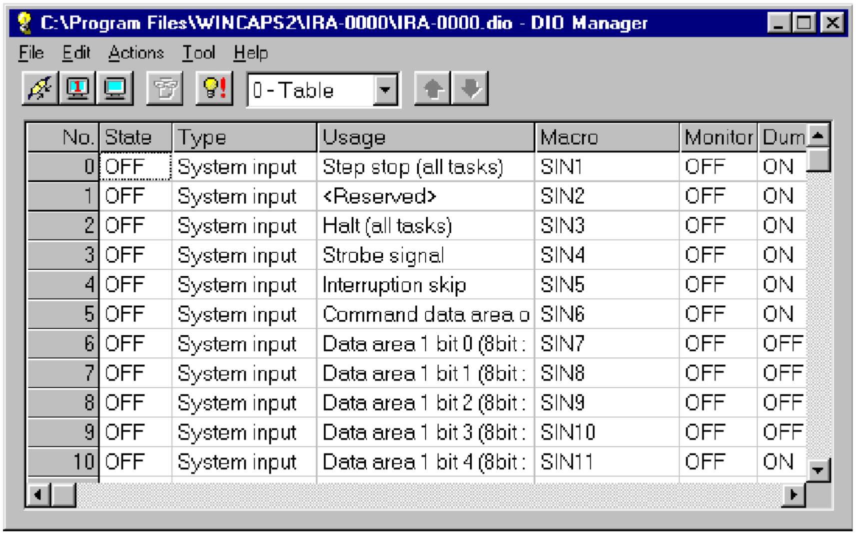


Fig. 7-20 Table Display (DIO Manager) Window

In the table type display, I/Os are displayed in different colors depending on the classification group. Tables 7-1 and 7-2 outline the colors and classifications in the standard mode and compatible mode for the conventional type.

Table 7-1 I/O Colors and Classifications (Standard Mode)

Classification	Color	Delimit	Layout	Name	Macro	Remarks
Standard input (64 points)	White	0	0	System input	SINxx	(Robot stop and Enable Auto are excluded.)
			33		(34 points)	
			34	User input	UINxx	
		47	45		(12 points)	(No. 46 and 47 are missing.)
		48	48	Hand input	HINxx	
		55	55		(8 points)	No. 55 for interruptive detection of disconnection
		56	56	(Missing number)	Missing number	
		63	63			
Standard output (64 points)	Pink	64	64	Hand output	HOUTxx	
		71	71		(8 points)	
		72	72	System output	SOUTxx	
			103		(32 points)	
			104	User output	UOUTxx	
		127	127		(24 points)	
Internal I/O (384 points)	Yellow	128	128	Internal I/O	ITIOxx	
		511	511		(384 points)	
DeviceNet input (256 points)	Green	512	512	System input	DSINxx	SINxx (517 and 518 are missing.)
		551	547		(34 points)	(548 to 551 are missing.)
		552	552	User input	DUINxx	Extensible in unit of 8 points
		767	767		(216 points)	Default: 24 points
DeviceNet output (256 points)	Blue	768	769	System output	DSOUTxx	SOUTxx
		799	1246		(31 points)	(No. 768 CPU is normally missing.)
		800	800	User output	DUOUTxx	Extensible in unit of 8 ports
		1023	1023		(224 points)	Default: 24 points

Table 7-2 I/O Colors and Classifications (Previous Model – compatible Mode)

Classification	Color	Delimit	Layout	Name	Macro	Remarks
Standard input (64 points)	White	0	0	System input	SINxx	(Robot stop and Enable Auto are excluded.)
			33		(21 points)	
			34	User input	UNIxx	
		47	45		(25 points)	(No. 46 and 47 are missing.)
		48	48	Hand input	HINxx	
		55	55		(8 points)	No. 55 for interruptive detection of disconnection
		56	56	(Missing number)	Missing number	
		63	63			
Standard output (64 points)	Pink	64	64	Hand output	HOUTxx	
		71	71		(8 points)	
		72	72	System output	SOUTxx	
			103		(32 points)	
			104	User output	UOUTxx	
		127	127		(24 points)	
Internal I/O (384 points)	Yellow	128	128	Internal I/O	ITIOxx	
		511	511		(384 points)	
DeviceNet input (256 points)	Green	512	512	System input	DSINxx	SINxx (517 and 519 are missing.)
		535	534		(21 points)	(535 is missing.)
		536	536	User input	DUINxx	Extensible in unit of 8 points
		767	767		(232 points)	Default: 24 points
DeviceNet output (256 points)	Blue	768	769	System output	DSOUTxx	SOUTxx
		799	1246		(31 points)	(No. 768 CPU is normally missing.)
		800	800	User output	DUOUTxx	Extensible in unit of 8 ports
		1023	1023		(224 points)	Default: 24 points

7.4.5.2 Oscilloscope

Upon selecting the oscilloscope display type, the I/O statuses are displayed in graphical form as on an oscilloscope.
When displayed in the table type, turn the Monitor SW grid of the desired I/O display to ON.
The maximum number of I/Os that can be displayed simultaneously is 8.
Clicking the Return button or Next button scrolls the list by one page.

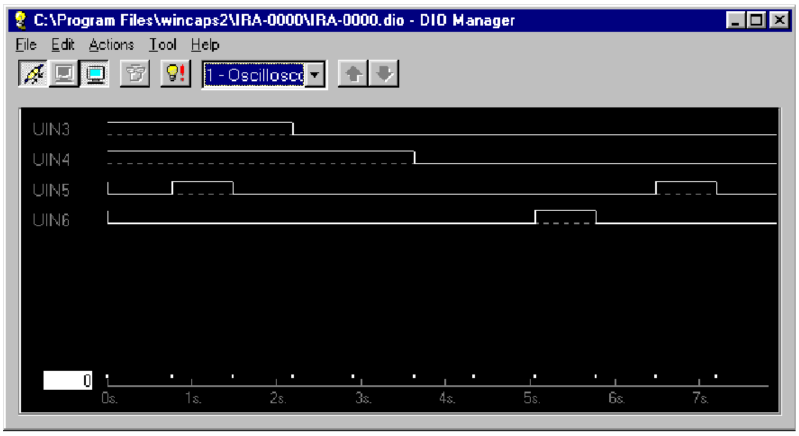


Fig. 7-21 Oscilloscope Display (DIO Manager)

7.4.5.3 Panel

Upon selecting the panel display type, the I/O states are displayed in panel. When displayed in the table type, turn the Monitor SW grid of the desired I/O display to ON.

The maximum number of I/Os that can be displayed simultaneously is 32.

Clicking on the Return button or Next button scrolls the list by one page.

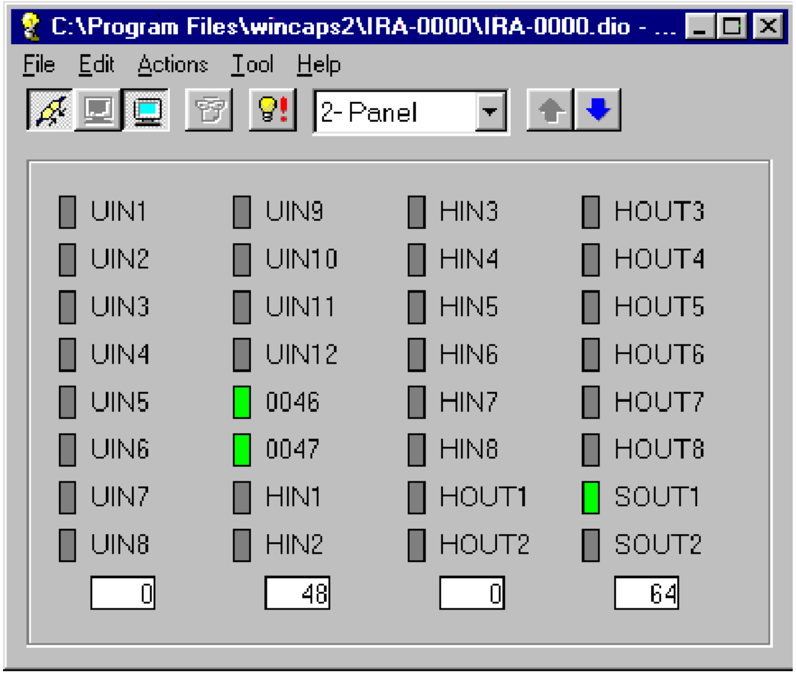


Fig. 7-22 Panel Display (DIO Manager) Window

7.5 Tools Menu (DIO Manager)

7.5.1 Options

Makes various types of settings needed for the DIO Manager.
Upon selecting Options from the Tools menu, the Options dialog box appears on the screen. Clicking the tab enables each item to be set.
Checking Create Header File creates the configuration macro definition file (dio_cnf.h). The dio_cnf.h file contains the macro definition information for hardware settings.

> **Note: The items that can be edited differ depending on the user level. For restrictions by user level refer to 1.3 "Security". For information on how to change the access level, refer to 4.3.3 "Re-Log In".**

7.5.1.1 Monitor

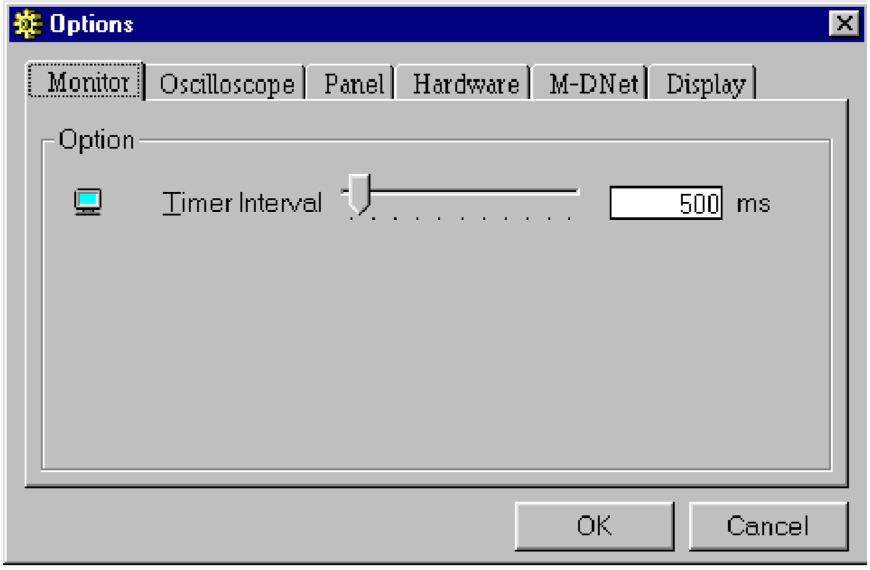


Fig. 7-23 Monitor Tab (Options) Dialog Box

- Timer intervals: Sets the intervals for acquiring data through continuous monitoring. Default is 500 msec.

7.5.1.2 Oscilloscope

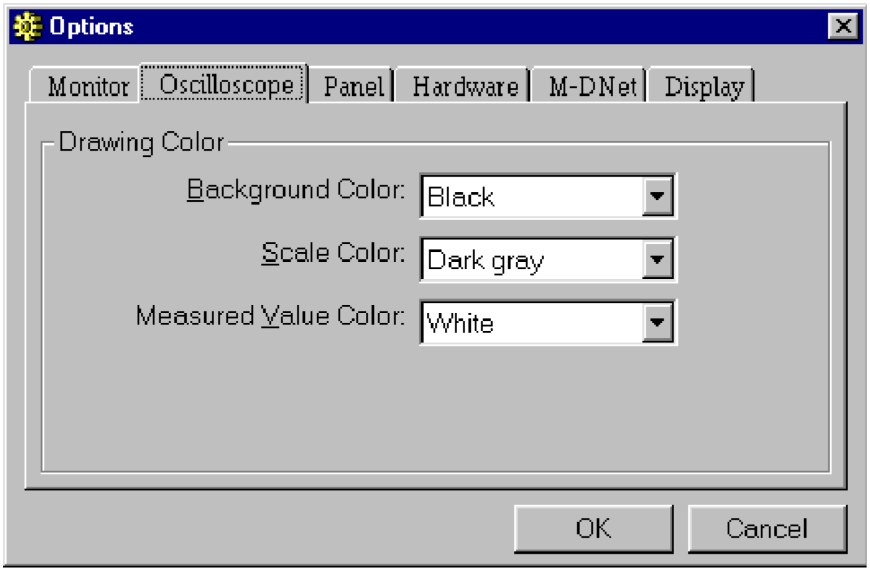


Fig. 7-24 Oscilloscope Tab (Options) Dialog Box

- Background: Specify the background color of the oscilloscope.
- Scale color: Specify the scale color of the oscilloscope.
- Measured: Specify the color of measured values in the oscilloscope.

7.5.1.3 Panel

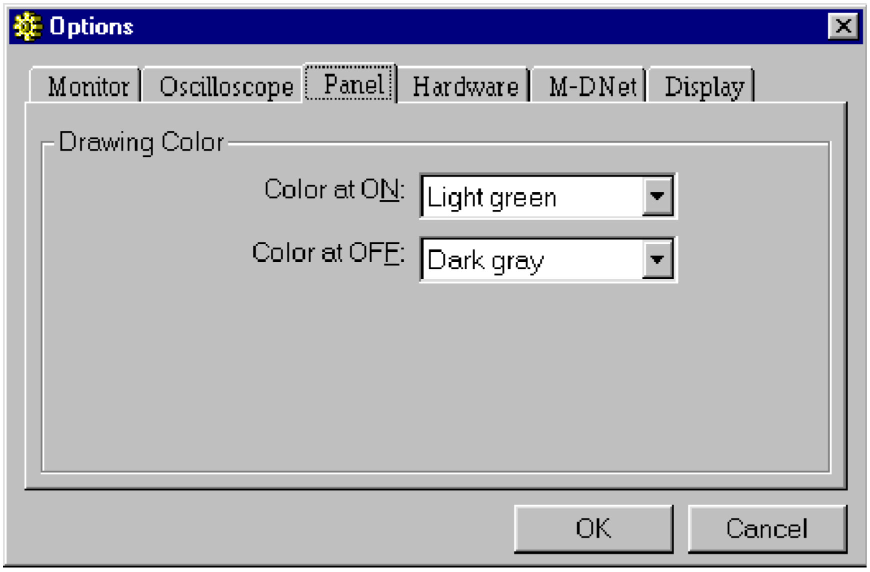


Fig. 7-25 Panel Tab (Options) dialog Box

- Color at ON: Specify the color at ON in the panel display.
- Color at OFF: Specify the color at OFF in the panel display.

7.5.1.4 Hardware

Click the Hardware tab to set various parameters needed for DIO operation. For the meanings and element numbers of parameters, refer to “Appendix” in the PROGRAMMER’S MANUAL.
The left side of the I/O layout frame displays I/O device, the right side displays I/O layout.

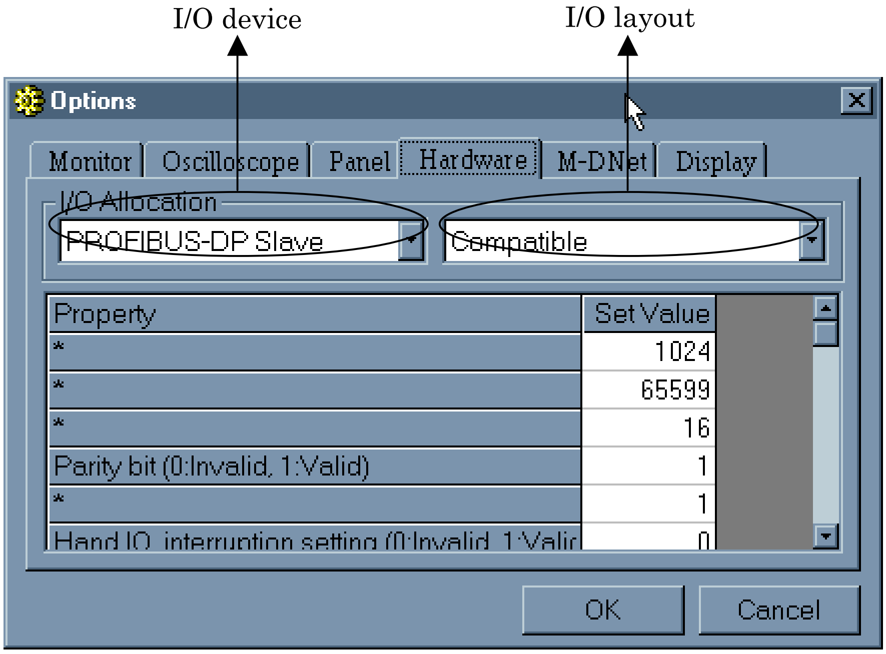


Fig. 7-26 Hardware Tab (Options) Dialog Box

7.5.1.5 M-DNet

Click the M-DNet tab to set the parameters needed for establishing the Device Net master mode. For the meanings and element numbers of parameters, refer to the instruction manual for Device Net master.

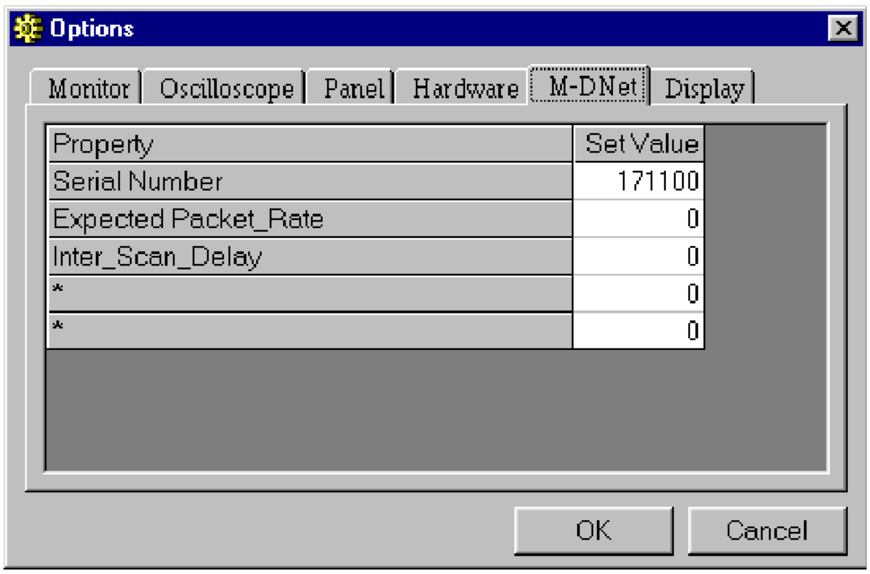


Fig. 7-27 M-DNet Tab in Option Dialog Box

7.5.1.6 Display

Click the Display tab to set SHOW/HIDE option for display.
This display tab appears when the user level is higher than the programmer.

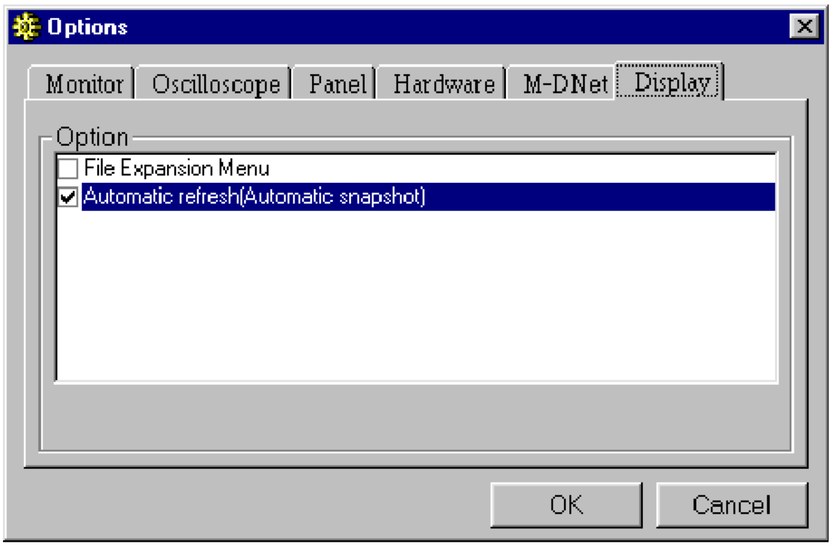


Fig. 7-28 Display Tab (Options) Dialog Box

- File extension menu: Extends the Files menu of the DIO Manager. For details, refer to 7.1.6 “Menu List”.
- Auto Update (automatic acquisition of snapshot):
  If you change the window size or scroll the screen when the DIO Manager is connected or in the process of connection to the Robot Controller, the Manager automatically monitors the snapshot.

7.5.2 DIO Command Viewer

The DIO command viewer shows the bit pattern of DIO command.
For information on the DIO commands, refer to Chapter 5 “Robot Controller Interface” of the RC5 CONTROLLER INTERFACE MANUAL.

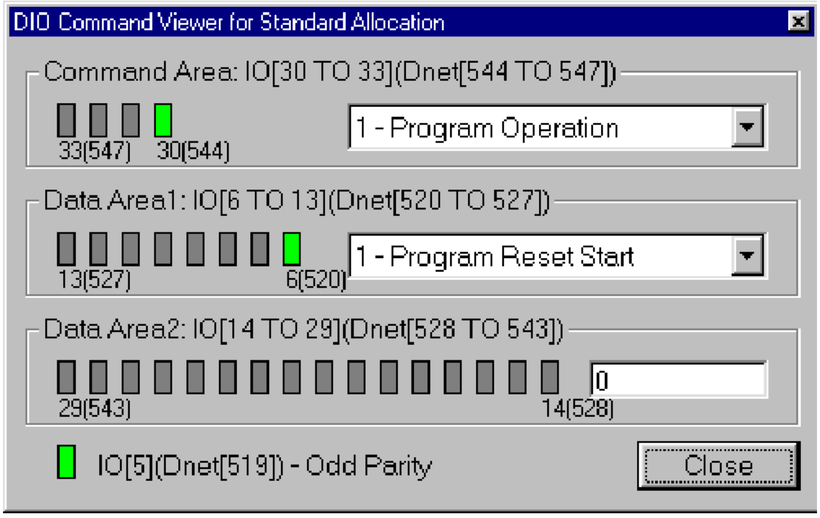


Fig. 7-29 DIO Command Viewer

7.6 Help Menu

The Help menu provides explanations on how to use WINCAPSII.

Fig. 7-30 Help Men

7.6.1 About DIO Manager

Displays the version information on DIO Manager.

Chapter 8

Operating Arm Manager

This chapter describes the WINCAPSII software Arm Manager functions that are used with the personal computer teaching system.

8.1 Outline of Arm Manager

8.1.1 Outline of Functions

The Arm Manager is a tool provided for monitoring the current robot arm position, effective tool number, and effective work number.
Since robot actions can be simulated without actually operating the robot, robot programs can be developed efficiently and safely from the initial stage of development.

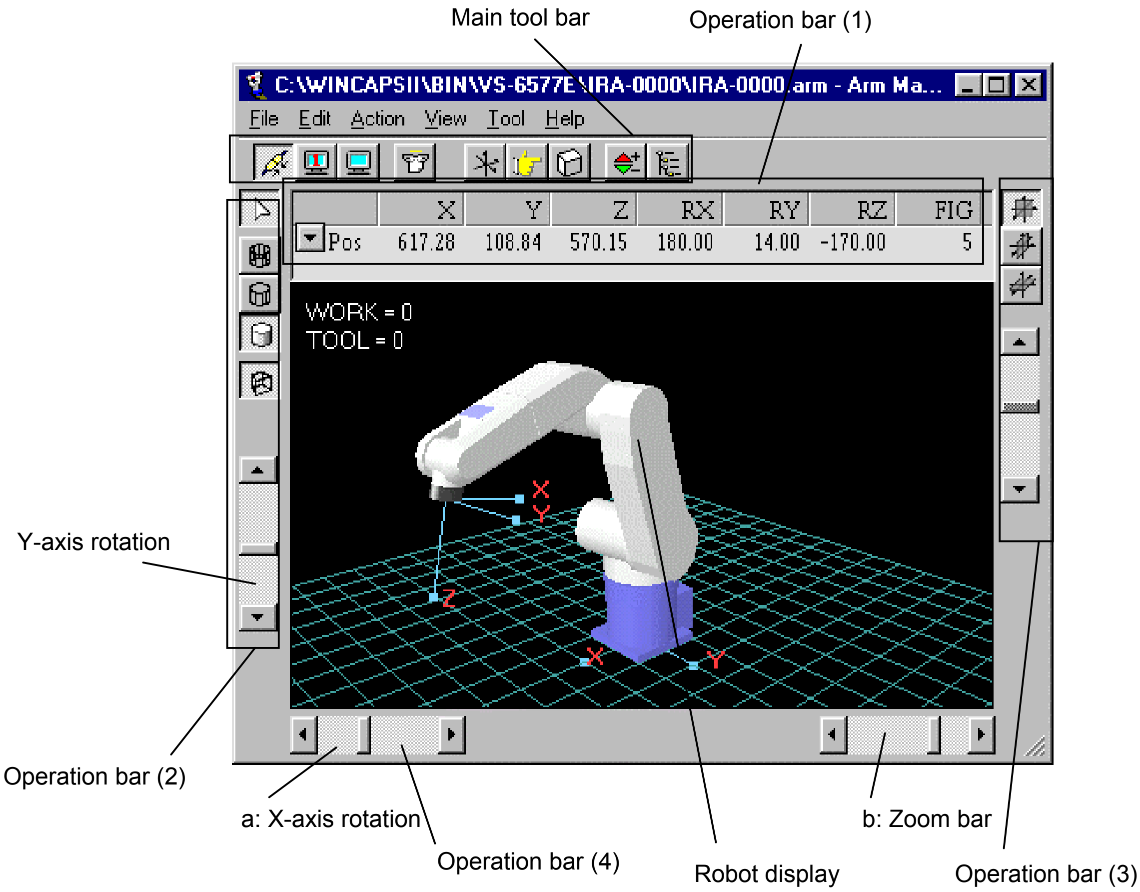


Fig. 8-1 Arm Manager Window

8.1.2 Tool Bar (Arm Manager)

Main Tool Bar

 CONNECT button. Refer to “8.4.1 Connect”.

 SNAPSHOT button. Refer to “8.4.2 Snapshot”.

 MONITOR button. Refer to “8.4.3 Monitor”.

 TRANSMIT button. Refer to “8.2.5 Transfer Project”.

 WORK COORDINATE SYSTEM SET button. Refer to “8.6.1.6 Work”.

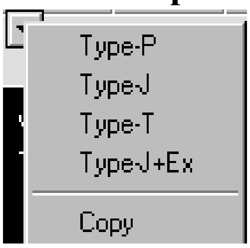
 TOOL COORDINATE SYSTEM SET button. Refer to “8.6.1.5 Tool”.

 AREA COORDINATE SYSTEM SET button. Refer to “8.6.1.7 Area”.

 REMOTE OPERATION button. Refer to “8.6.2 “Remote Operation”.

 OBJECT TREE button. Refer to “8.6.4 Object Trees”.

Operating Bar (1)

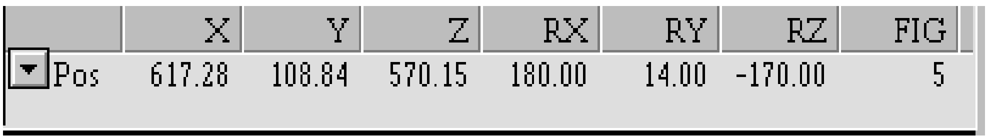


T TYPE button: Displays the current position of the robot in T type.

P TYPE button: Displays the current position of the robot in P type.

J TYPE button: Displays the current position of the robot in J type.

COPY button: Copies the current position of the robot to the clipboard.



CURRENT POSITION DISPLAY box: Displays the current position of the robot.

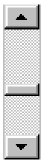
Operating Bar (2)

 WIRE FRAME button. Changes the robot arm drawing to a wire frame.

 FLAT SHADING button. Changes the robot arm drawing to flat shading.

 SMOOTH SHADING button. Changes the robot arm drawing to smooth shading.

 PROJECT button. Specifies whether to display the robot in perspective.

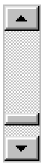
 VIEWPOINT SHIFT Y-AXIS ROTATION bar. Rotates the robot display around the Y-axis.

Operating Bar (3)

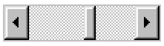
LOCK Z button which sets the viewpoint in the direction of Z-axis.

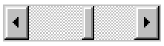
 LOCK X button which sets the viewpoint in the direction of X-axis.

 LOCK Y button which sets the viewpoint in the direction of Y-axis.

 VIEWPOINT SHIFT VERTICAL bar. Scrolls the robot display vertically.

Operating Bar (4)

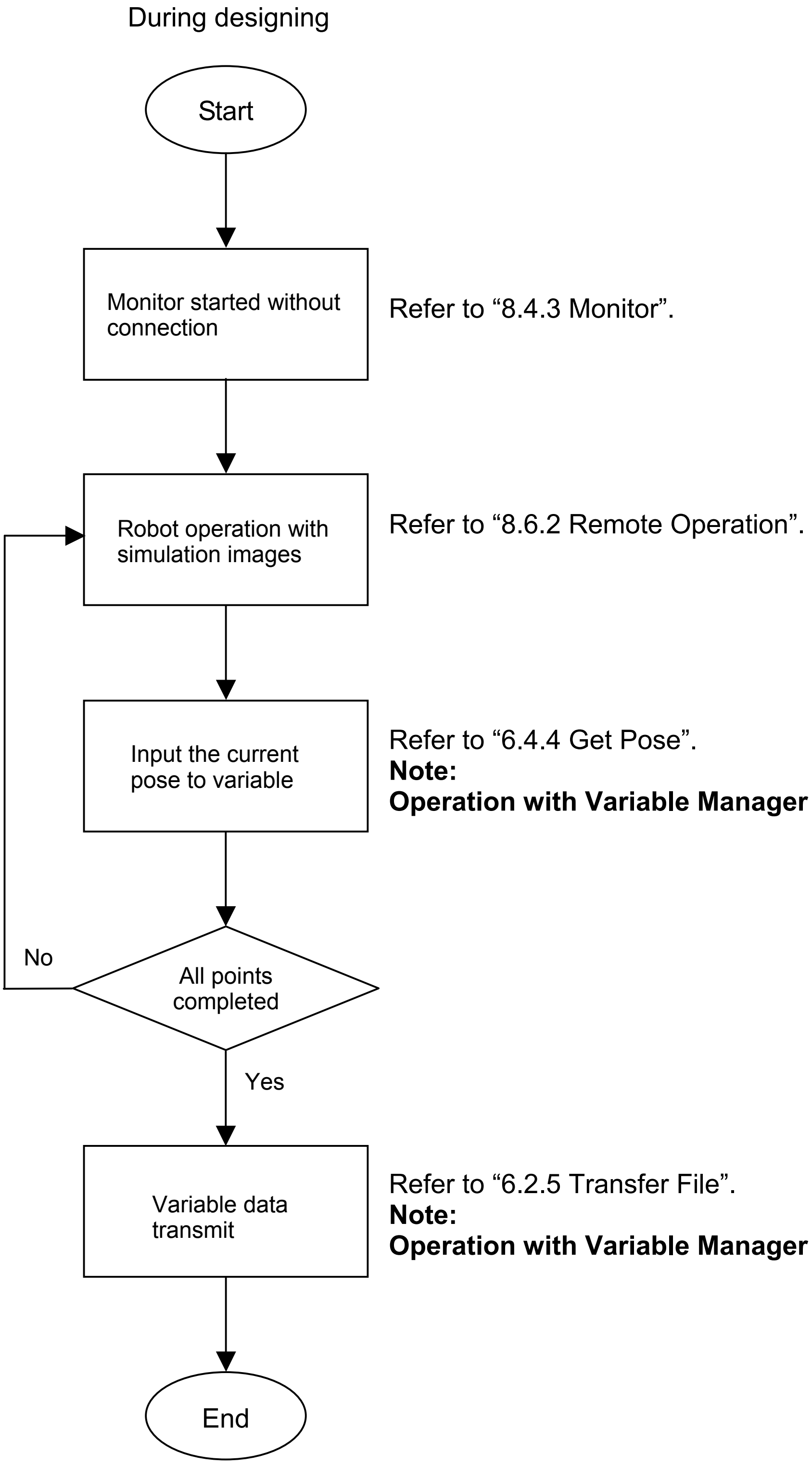
a:  VIEWPOINT SHIFT X-AXIS ROTATION bar. Rotates the robot display around the X-axis.

b:  ZOOM bar. Zooms the robot display in or out.

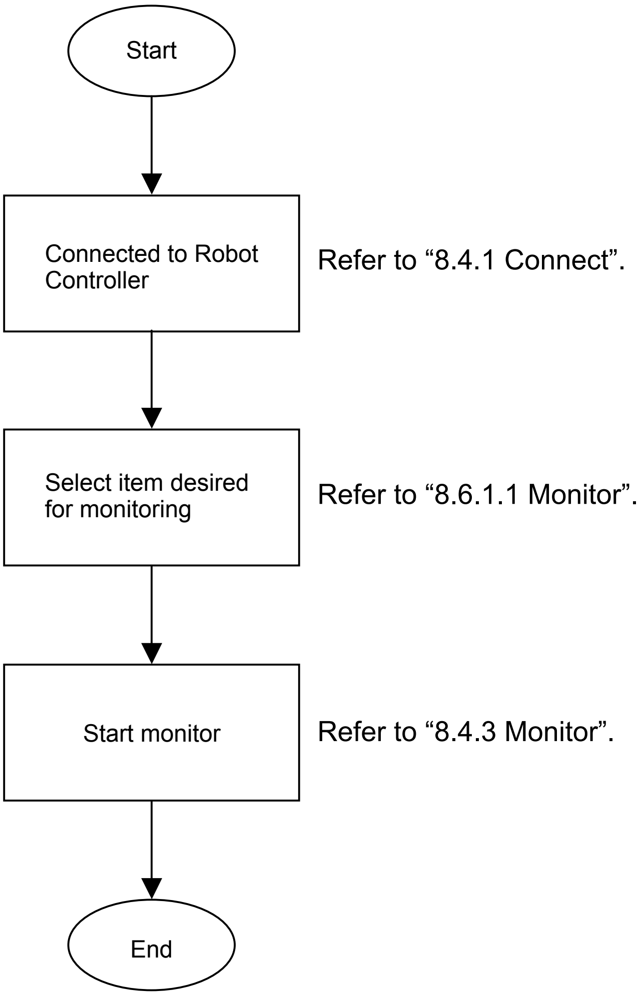
8.1.3 Basic Application

This subsection describes the flow of off-line point teaching.

> **Note: Since the current Arm Manager has no such accuracy in calibration to provide teaching with precision, rough point teaching is conducted to check program operation.**



During Monitoring



8.1.4 Files to Manage

Fig. 8-2 shows the files that the Arm Manager manages. The following are the description of each file.

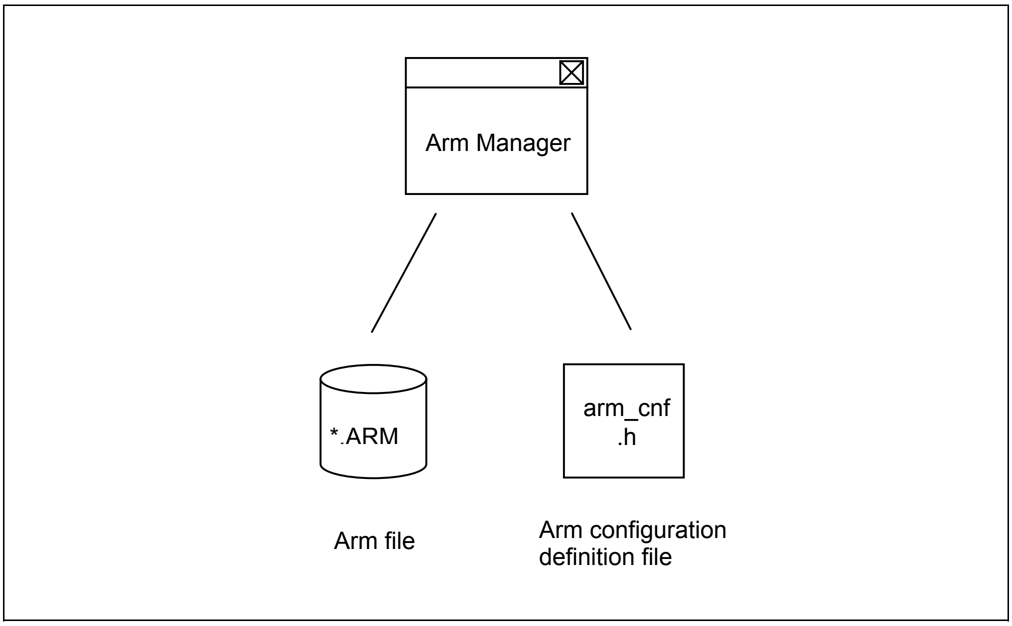


Fig. 8-2 Files Managed by Arm Manager

8.1.4.1 Arm Files (*.ARM)

The Robot Controller servo information used for a project and other information used for setting and reading using the SET command in the Arm Manager TOOL menu are saved in an Arm file.
Since a separate file is created for every project, robot characteristics that differ from one project to another can be managed without confusion even when multiple projects are being managed.
The extension for the file reads “ARM”.

8.1.4.2 Arm Configuration Macro Definition File (arm_cnf.h)

Stores the macro definition information of arm set data.
The Configuration macro definition file is located where arm files (*.ARM) are found.
The file name is “arm_cnf.h”.
To use a macro concerning arm configuration from the PAC program, it is necessary to input this macro definition file at the head of the program using an #INCLUDE statement.

8.1.5 Menu List (Arm Manager)

The Arm Manager command menu has the following tree structure:

File
- New (Programmer level) *1
- Open (Programmer level) *1
- Save
- Save As (Programmer level) *1
- Transfer
- Print
- Close

Edit
- Cut
- Copy
- Paste
- Rename
- Rebuild

Actions
- Connect
- Snapshot
- Monitor

View
- Arm
- Tool
- Work
- Area
- Obstacle

Tools
- Options
- Remote Operation
- Object Trees
- Pose Conversion

Help
- About Arm Manager

Fig. 8-3 Menu Tree of Arm Manager

*1: Displayed only when the file extension menu of the display option is checked. To set the display option first re-login on the programmer level. Then select Tools, Options, and View and check the option file extension menu.

8.2 File Menu (Arm Manager)

The Arm Manager has an ARM file to save information on trajectory generation.
The Arm Manager File menu is used for managing the ARM files.

Fig. 8-4 File Menu

8.2.1 New (Programmer level)

Creates new robot arm information.

8.2.2 Open (Programmer level)

Opens an existing ARM file.
When the standard Windows dialog box appears on the screen, select an ARM file to open, and click on OPEN to open the file.

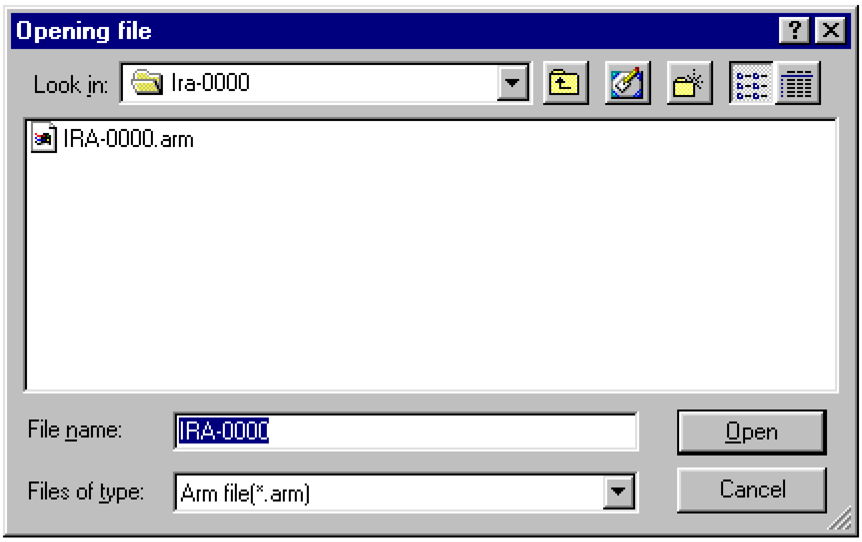


Fig. 8-5 Open Project Dialog Box

8.2.3 Save

Saves the current status in the currently selected ARM file.

8.2.4 Save As (Programmer level)

Saves the current robot arm information to a new ARM file.
When the standard Windows dialog box appears on the screen, select the path and input the file name. Click on **Save** to save the data.

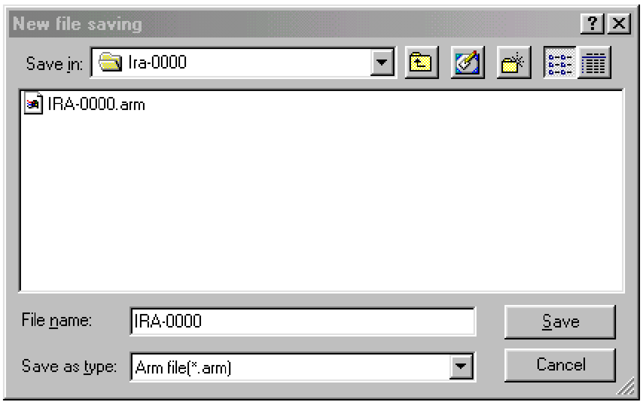


Fig. 8-6 New Saving of File Dialog Box

8.2.5 Transfer

When communication with the Robot Controller is ON, this enables it to transmit or receive the environmental table data.
The environmental table refers to the arrangement of data necessary for the robot to operate.
When the Transfer Environment Table dialog box appears on the screen, select the table, and click on either **Transmit** or **Receive** to transmit data.

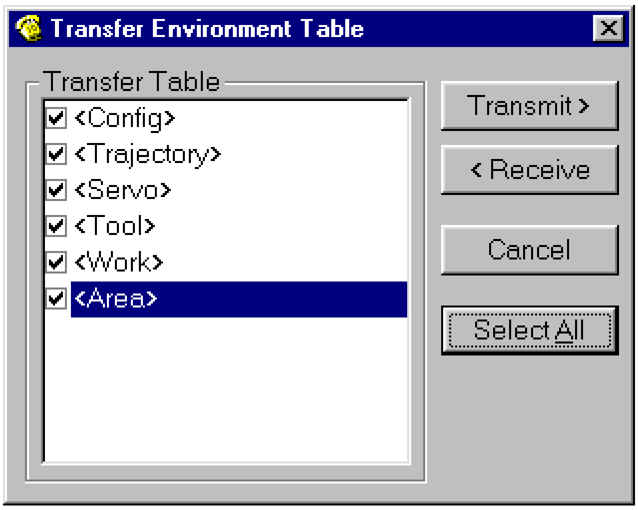


Fig. 8-7 Transfer Environment Table Dialog Box

The items in the transfer table are the contents set in 8.6 "Tools Menu".

Note 1:	**After sending the configuration setting, trajectory, and servo data, you need to restart the Robot Controller.**
Note 2:	**For the tool and work data, the Controller receives the values which has been changed with the TOOL and WORK commands.**

8.2.6 Print

Prints the Arm Manager environmental table.

8.2.6.1 Print Object

The Print Manager dialog box appears on the screen. Select the Print Object tab and select the object to be printed. Click on **Print** to print data.

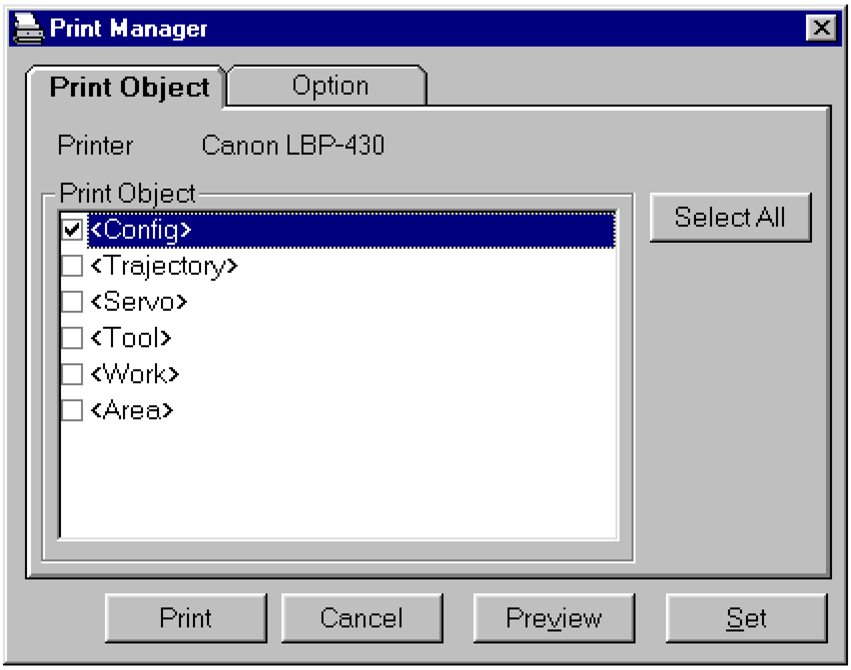


Fig. 8-8 Print Object Tab (Print Manager Dialog Box)

- Select All: Selects all of the environmental tables as the object for simultaneous printing.
- Set: Displays the printer SET dialog box and makes various printer settings.
- Preview: Enables viewing of the print status prior to actual printing.
- Cancel: Closes the dialog box without printing.
- Print: Prints the table.
- Option: Print options appear.

TIP: To print only specified page(s), click on the printer button  **after previewing.**

> **NOTE: If you select more than one object to be printed, Preview is not usable.**

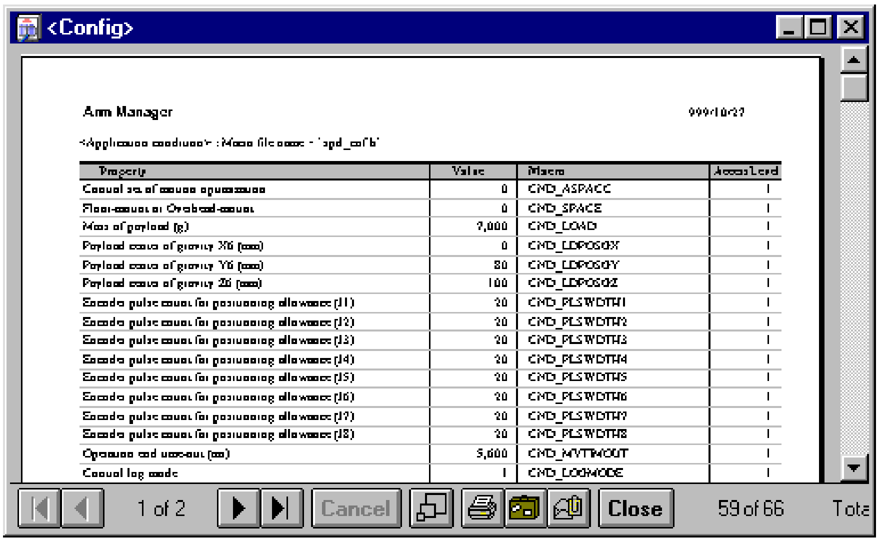
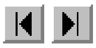


Fig. 8-9 Preview Window

 : Moves to the head/tail end of the page.

 : Moves to the immediately preceding/following page.

 : Selects display (Reduction/Standard/Expansion)

 : Sets print execution

The printing range (specific pages) of an object file can be specified.

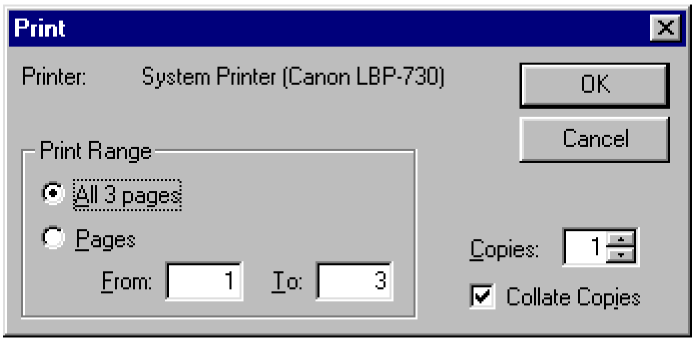


Fig. 8-10 Print Window

 : Exports the object file.

The selected object file will be converted into the file format specified in Format and outputted (saved) to the Destination.

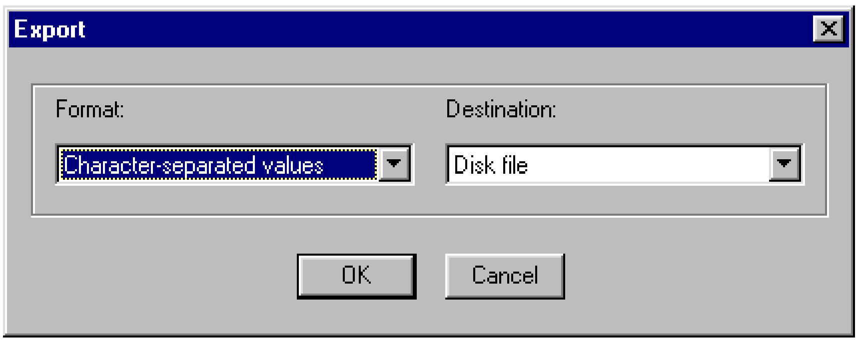


Fig. 8-11 Export Window

8.2.6.2 Option

Selecting the Option tag will display the print options.

Note: Print option is not available from the Arm Manager.

8.2.7 Close

Ends Arm Manager and closes the Arm Manager window.

8.3 Edit Menu (Arm Manager)

This menu is for editing the object tree.

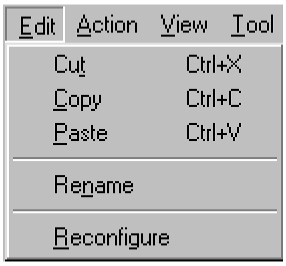


Fig. 8-13 Edit Menu

8.3.1 Cut

Cuts data out of the selected range. The cutout data can be used with the Paste command.

Note: Only the selected data is cut out. Note that the data that exists on the lower level than the selected data will be also deleted.

8.3.2 Copy

Temporarily stores the same data as in the selected range. Data temporarily stored by copying can be used in the PASTE command.

8.3.3 Paste

Pastes temporarily stored data by cutout or copying to a specified location.

8.3.4 Rename

Open the object tree, specify an object and use RENAME to change the name of the object.

8.3.5 Reconfigure

Re-draws the display of the object tree and displays only the root object.

8.4 Actions Menu (Arm Manager)

The Actions menu commands can be also issued by depression of the buttons on the tool bar.

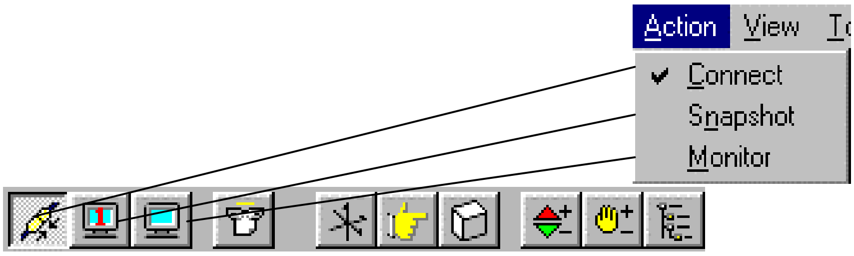


Fig. 8-14 Actions Menu and Button

8.4.1 Connect

Connects communication between the Robot Controller.
When connected the menu is attached with a check mark.
The connect button  works the same as the Connect command. When connected it is displayed as if depressed.

8.4.2 Snapshot

Acquires the data of the moment from the Robot Controller.
The snapshot button  has the same function as the Snapshot command.
Before executing the snapshot command, ensure that the Arm Manager is connected with the Robot Controller.

8.4.3 Monitor

Acquires data in succession from the Robot Controller.
The monitor button  has the same function as the Monitor command.
Before executing the monitor command in succession, ensure that the Arm Manager is connected with the Robot Controller.

8.5 View Menu (Arm Manager)

Specifies the elements to be displayed in the robot display.

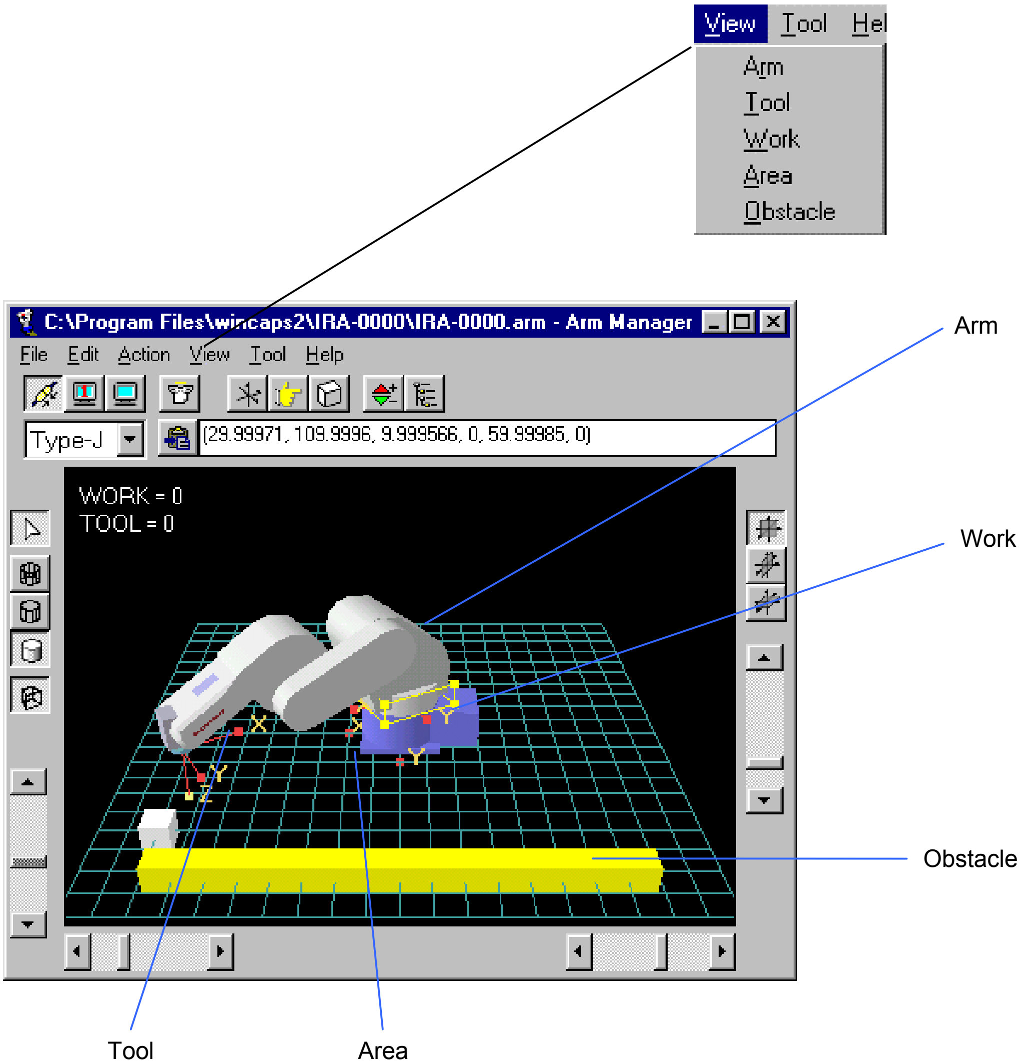


Fig. 8-15 View Menu and Screen Display

8.5.1 Arm

Specifies display of the robot arm. When Arm on the menu is check-marked, the robot arm is displayed.

8.5.2 Tool

Specifies display of the tool coordinates. When Tool on the menu is check-marked, the tool is displayed.

8.5.3 Work

Specifies display of the work coordinates. When Work on the menu is check-marked, the work coordinates are displayed.

8.5.4 Area

Specifies display of the area. When AREA on the menu is check-marked, the area is displayed.
Define the area with Object Tree in the Tools menu. Refer to “8.6.3 Object Trees”.

8.5.5 Obstacle

Specifies display of an object. When Obstacle in the menu is check-marked the obstacle object is displayed.
Define the obstacle with Object Tree in the Tools menu. Refer to “8.6.3 Object Trees”.

8.6 Tools Menu (Arm Manager)

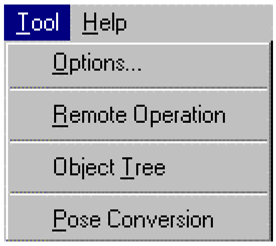


Fig. 8-16 Tools Menu

8.6.1 Options

Makes various settings that are necessary for Arm Manager.
Select **Options** from the Tools menu to display the Options dialog box. Click on the tab and set the required data at the respective items.
When you put a checkmark at Create Header File, the macro definition file (arm_cnf.h) for arm configuration is created.

**Note: The items that can be edited vary with the user level. For restrictions by user level, refer to “1.3 Security”.
For information on how to change the access level, refer to “4.3.3 Re-Log In”.**

8.6.1.1 Monitor

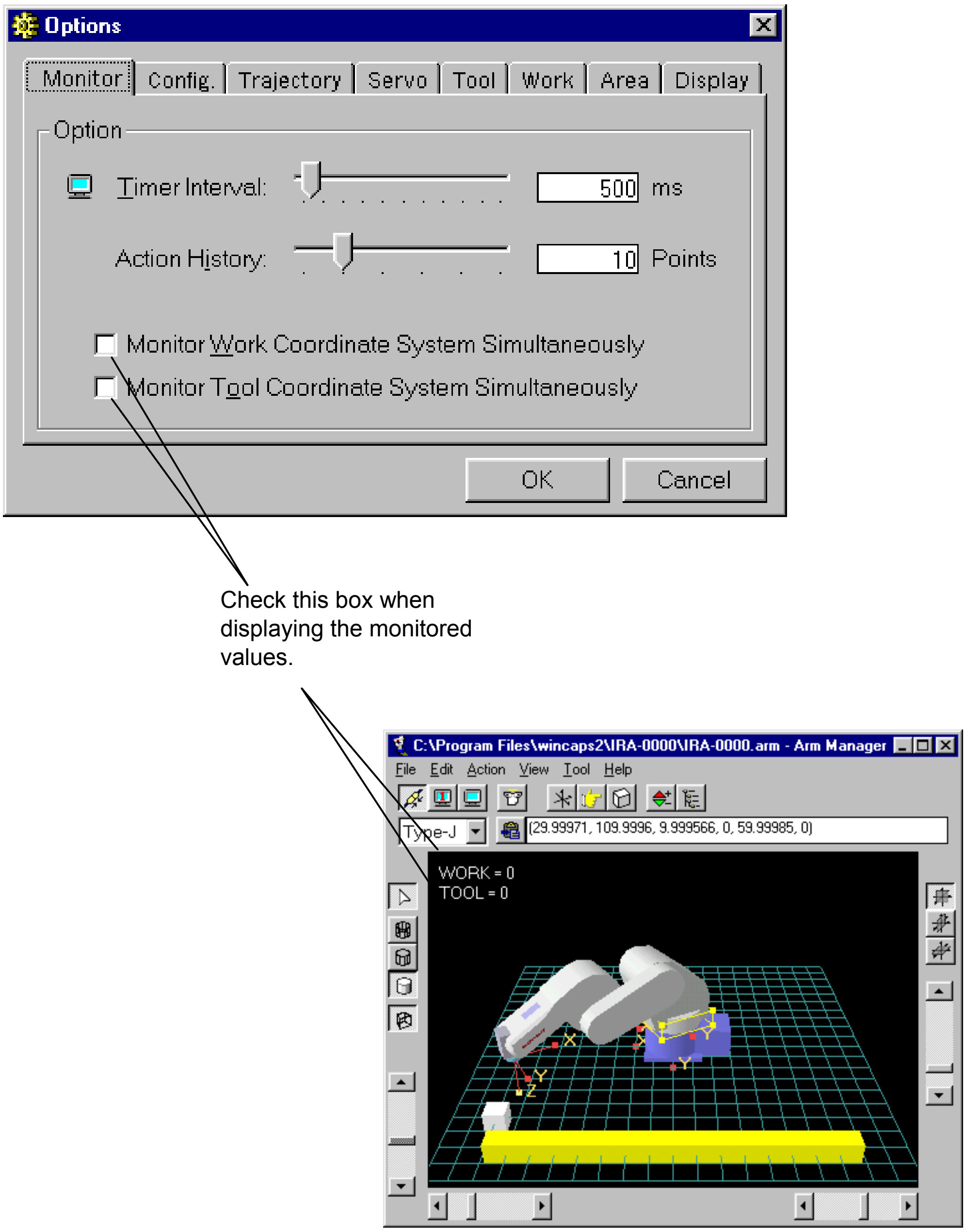


Fig. 8-17 Monitor Tab (Options Dialog Box)

- Timer intervals: Sets the intervals for acquiring data on the monitor. Default is 500 msec.
- Action history: When drawing the trajectory of a robot, this specifies how many points of position data to draw. Default is 10 points.

8.6.1.2 Configuration

Click the Config. tab to set various parameters that affect acceleration, deceleration, and positioning. For the meaning of each parameter, refer to “4.6 Control Sets of Motion Optimization”, “4.7 Setting the Master Control Parameters in User Preferences” and “Appendices” in the PROGRAMMER'S MANUAL.

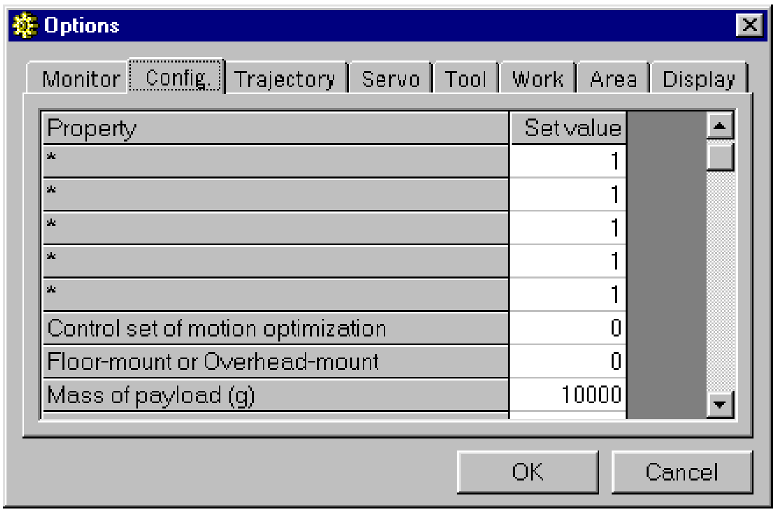


Fig. 8-18 Config. Tab (Options Dialog Box)

8.6.1.3 Trajectory Generation

Click the Trajectory tab to set various parameters needed for robot arm operation.
Change parameters by rewriting the set value grid in the list.
For the meanings of parameters, refer to “Appendix” in the PROGRAMMER'S MANUAL.

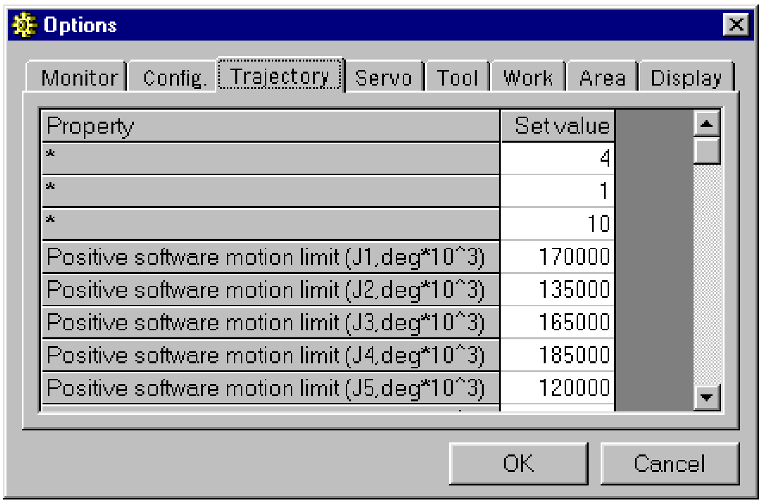


Fig. 8-19 Trajectory Tab (Options Dialog Box)

8.6.1.4 Servo

Click the Servo tab to set various parameters necessary for the robot arm servo system.
Change parameters by rewriting the set value grid in the list.
For the meaning of parameters, refer to “Appendix” in the PROGRAMMER'S MANUAL.

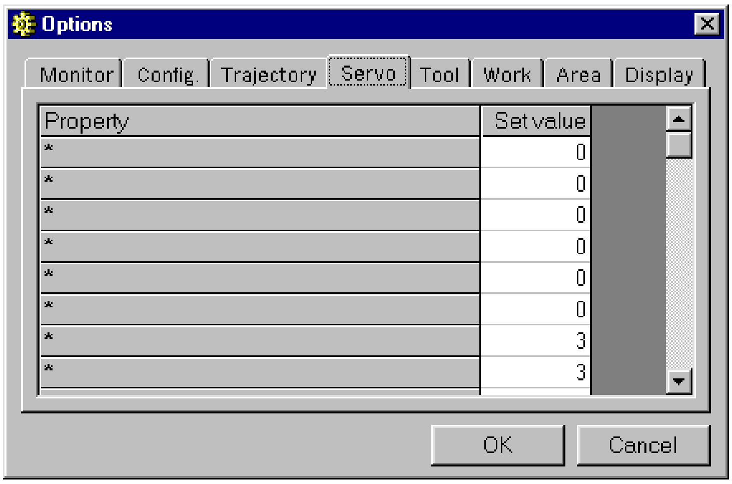


Fig. 8-20 Trajectory Generation Tab (Options Dialog Box)

8.6.1.5 Tool

Click the Tool tab to define the tool coordinates to be displayed on the robot display.
Clicking on the tool coordinate system set button will open the same Options dialog box.

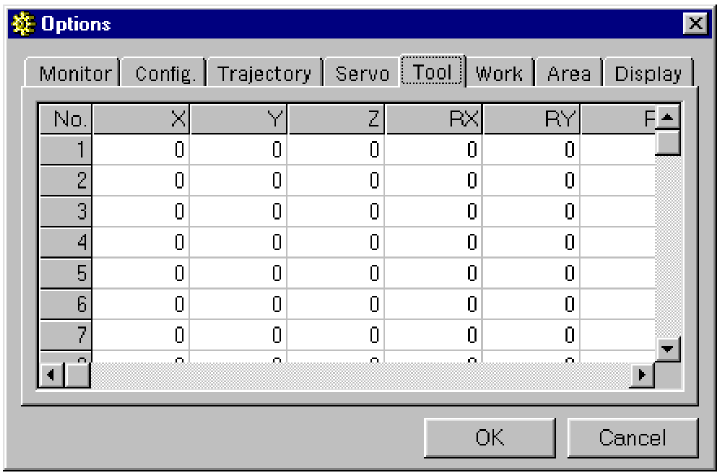


Fig. 8-21 Tool Tab (Options Dialog Box)

8.6.1.6 Work

Click the work tab to define the work coordinates to display on the robot display. Clicking on the work coordinate system set button will open the same Options dialog box.

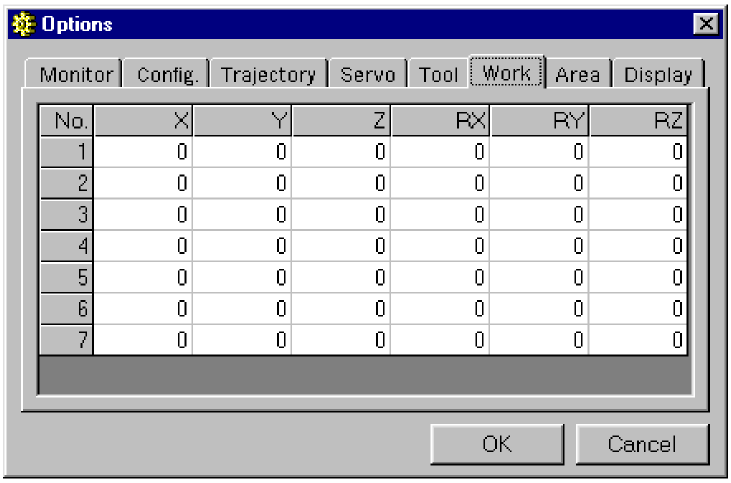


Fig. 8-22 Work Tab (Options Dialog Box)

8.6.1.7 Area

Click the Area tab to define the area to display on the robot display.
Clicking on the area set button will open the same SET dialog box.

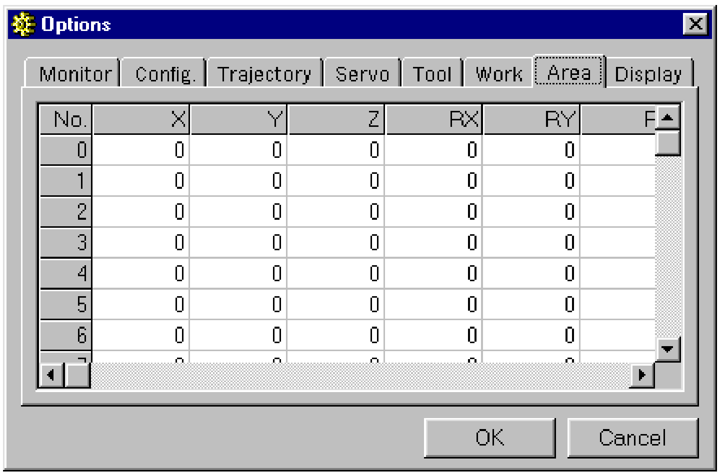


Fig. 8-23 Area Tab (Options Dialog Box)

8.6.1.8 Display

Click the Display tab to set the display option between Show and Hide.
This display tab appears when the user level is higher than the programmer.

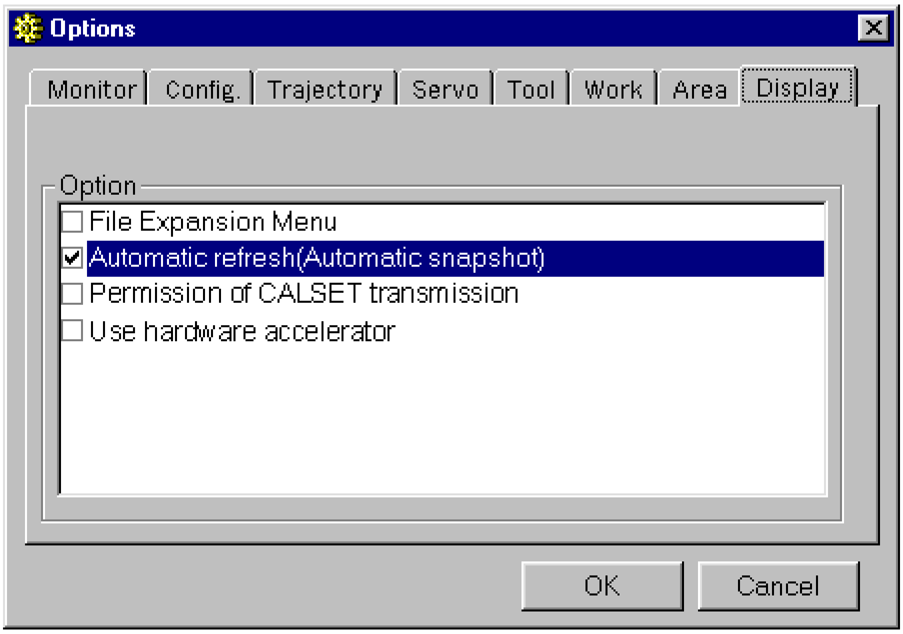


Fig. 8-24 Display Tab (Options Dialog Box)

- File extension menu: Extends the Files menu of the Arm Manager. For details, refer to 8.1.5 "Menu List".
- Auto Update (automatic acquisition of snapshot):
  If you change the window size or scroll the screen when the Arm Manager is connected or in the process of connection to the Robot Controller, the Manager automatically monitors the snapshot.

- Only when the "Permission of CALSET transmission" is selected, CALSET data (RANG, CALSET values) may be transmitted. This is to avoid unexpected transmission of CALSET data.

  This option is not selected by default.

Note:The RANG and CALSET values differ in each robot. When transmitting them, make sure that correct data is set up for transmission. If the robot controller receives incorrect data, the robot will not run normally.

For details about "CALSET," refer to the INSTALLATION & MAINTENANCE GUIDE.

- You may choose the use of hardware accelerator.

  If enabled, the hardware accelerator will make Arm Manager draw faster on screens according to the "Graphic hardware accelerator" settings of your PC.

  If you modify this setting, restart WINCAPSII to make it go into effect.

Note: Depending upon graphics drivers installed in PCs, the hardware accelerator may cause Arm Manager to fail to display correctly in some cases. If such occurs, disable the hardware accelerator.

- Displaying details of arm objects [Ver. 1.8 or later]

  When "Detailed display of arm objects" is selected, the screen shows all the robot objects in the object tree from base to flange. The screen is changed when the WINCAPSII is activated.

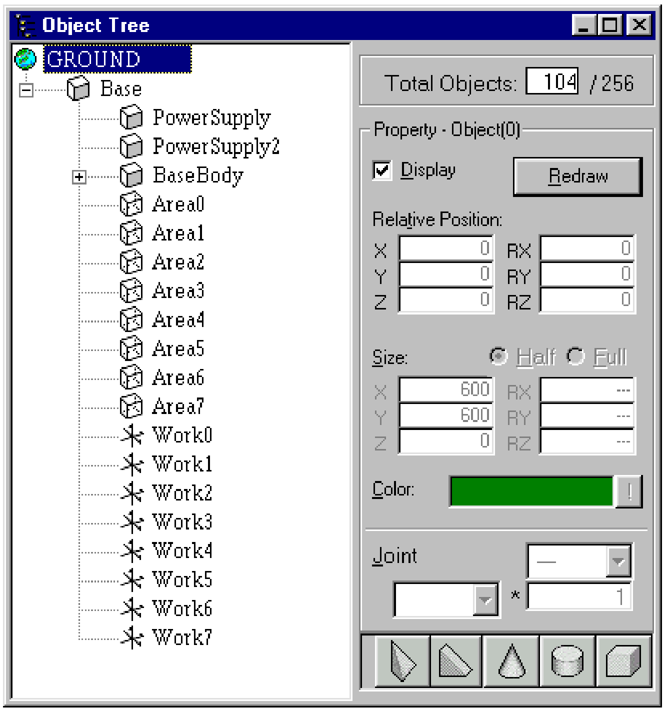


Fig. 8-24b Object Tree Dialog Box

8.6.2 Remote Operation

Selecting the remote operation command displays the Remote Operation dialog box.
To remote-operate the robot, click the remote operation button on the Remote Operation Dialog Box using the mouse.

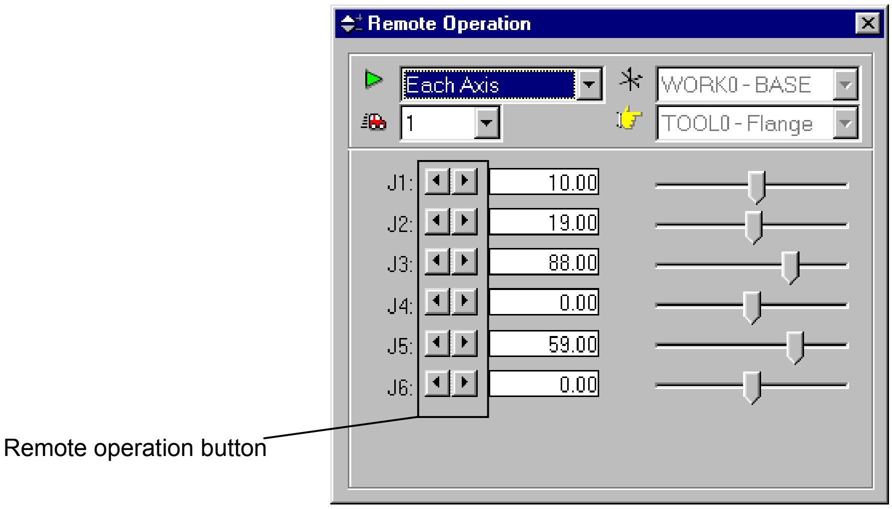


Fig. 8-25 Remote Operation Dialog Box

Note: Use the Arm Manager in the disconnected state. For reasons of safety, the robot is designed not to move even if the Robot Controller is connected.

8.6.3 Object Trees

Defines the object to draw on the robot display.
Select Object Tree from the Tools menu to display the Object Tree dialog box.

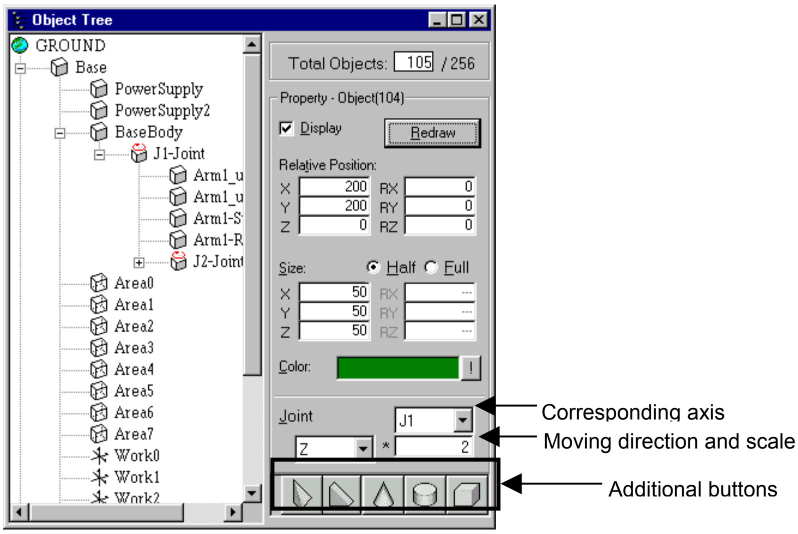


Fig. 8-26 Object Tree Dialog Box

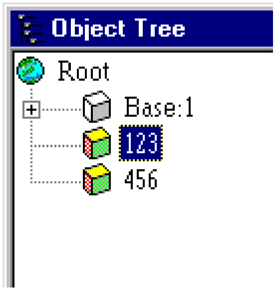
- [+] mark: Indicates that the hierarchical structure of the lower order of the object tree is hidden. Clicking will show the hierarchical structure of the lower order.
- [–] mark: Indicates that the hierarchical structure of the lower order is displayed. Clicking will hide the hierarchical structure of the lower order.
- Additional buttons: Use these buttons to add an object with the specified shape as a subdirectory of the currently selected object.
- Close: Closes the Object Tree dialog box.
- Relative Position: Inputs the position of relative object in the event coordinate system
- X/Y/Z: Refers to x/y/z components of the relative position of the object. Units in millimeters.
- RX/RY/RZ: Angle of rotation of the object around x/y/z axes. Specified in degrees.
- Size(L): Inputs the size of the object.
- X/Y/Z: Refers to the length (size) in the direction of x/y/z. Units in millimeters.
- Color(C): Selects and inputs the color of the object.
- REDRAW: Refreshes the robot display.
- Display: When check-marked it is displayed on the robot display.
- Corresponding axis: It is possible to move the object in combined motion with the selected robot axis. Select the corresponding axis and its moving direction and scale.

Cautions:	**(1) Even if the property of the object is changed, it will not be reflected unless the REDRAW button is depressed.** **(2) Positions of the arm, tool, work, area and size cannot be changed.** **(3) To change tool, work and area use the SET menu.**

8.6.3.1 Adding New Objects to Object Trees

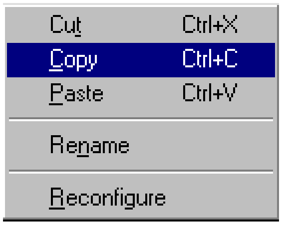
►STEP1

Select an object to be added.



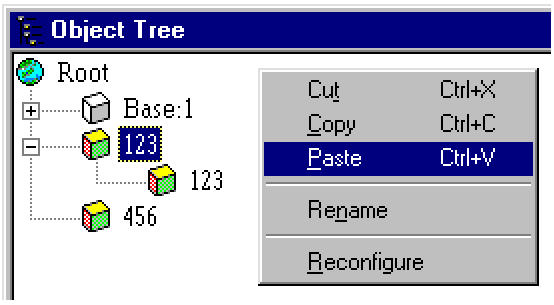
►STEP 2

Right-click to display the contents menu, and copy the object.



►STEP 3

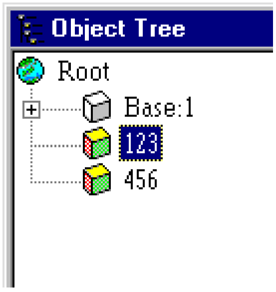
Right-click to display the contents menu, and paste the object.



8.6.3.2 Deleting Objects

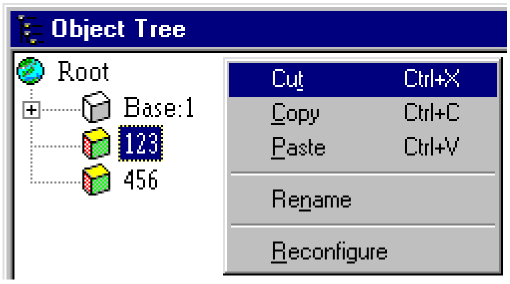
►STEP 1

Select an object to be deleted.



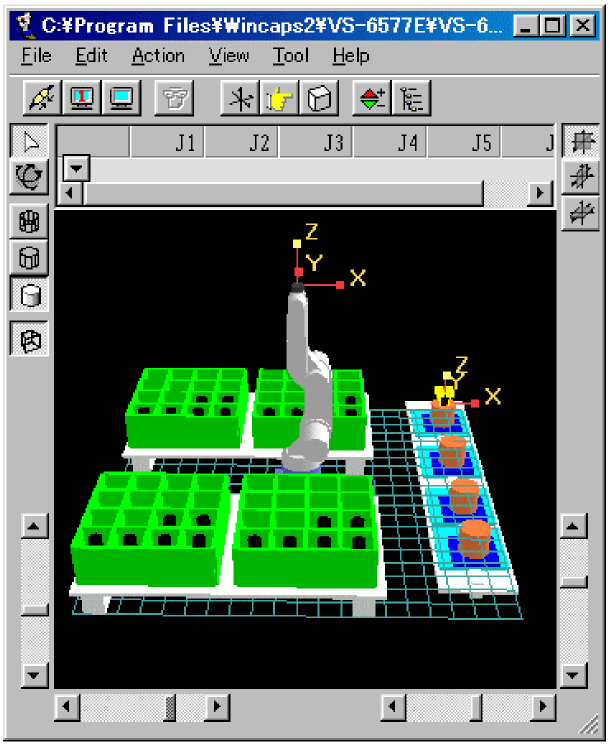
►STEP 2

Right-click to display the contents menu and cut the object.



8.6.3.3 Rendering Object Images by Arm Manager

This section describes how to create object images including palette bases, palettes, works, conveyer and its tool as shown below.



The object image rendering procedure consists of the following steps:

(1) Creating a palette base

- Resizing the object
- Moving the object position
- Copying the object

(2) Creating a palette

(3) Creating a work

(4) Copying a combined object (palette + work)

(5) Copying a combined object (palette base + palette + work)

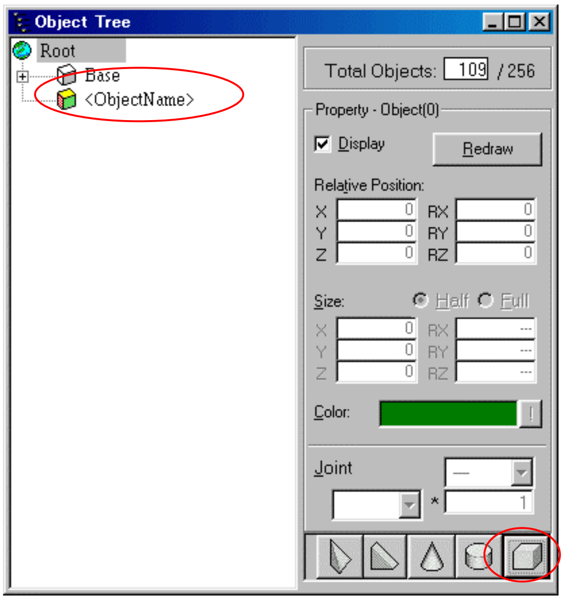
(6) Creating a conveyer and its tool object, then setting the work object onto the conveyer tool object.

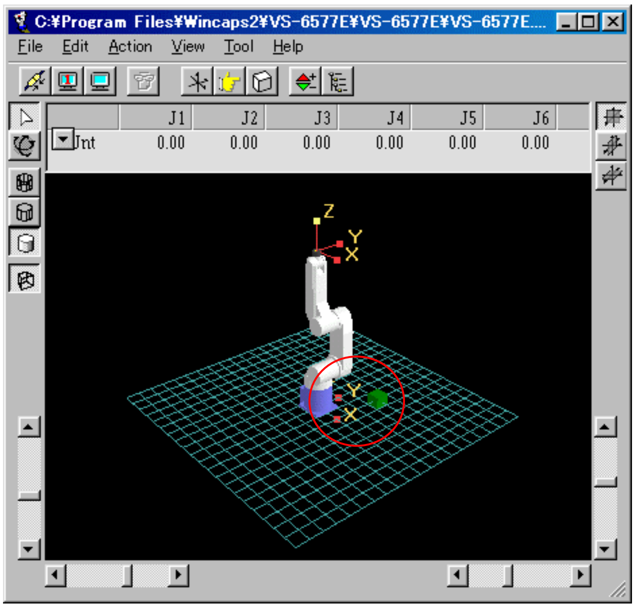
[1] Creating a palette base object

(1) On the Tool menu, click **Object Tree** to open the Object Tree dialog box.

(2) First let's create one foot of a palette base object.

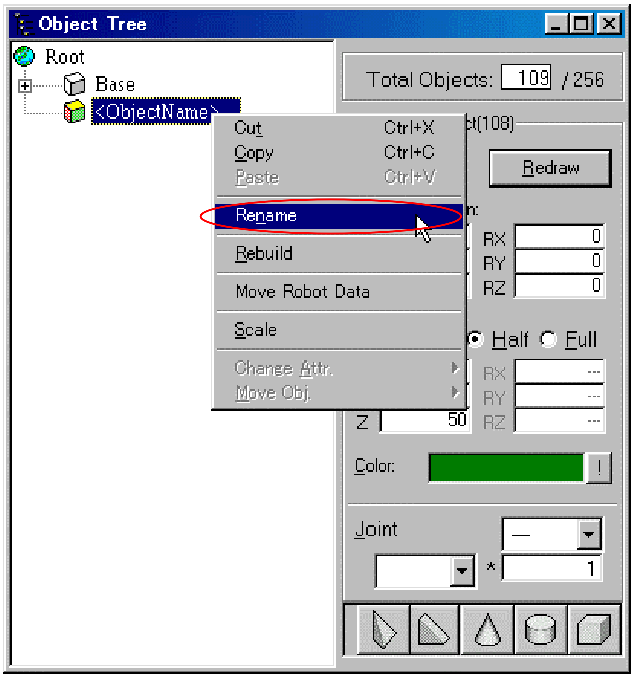
Click the  button to create a square base image object. The object will be added to the object tree at the same time.

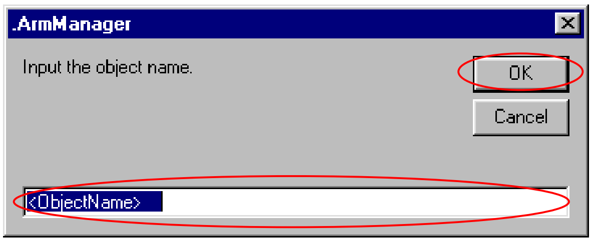




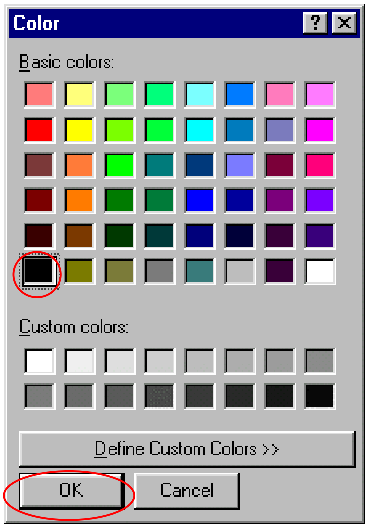
(3) On the Object Tree, right-click the **<ObjectName>** and click **Rename** in the dropdown menu to give it the desired object name.

Enter the object name you want to use and click **OK**.

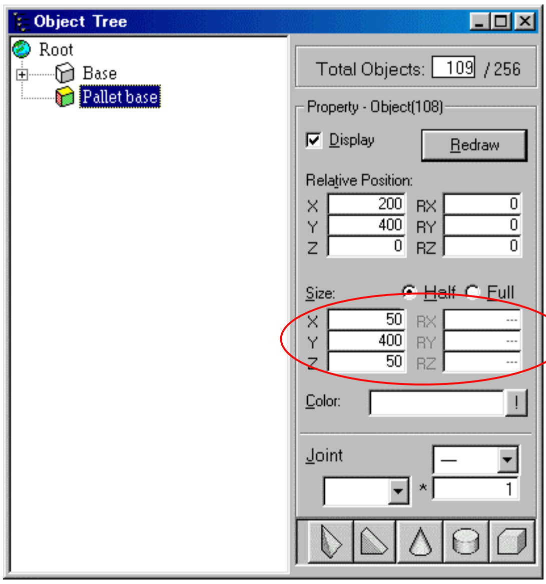


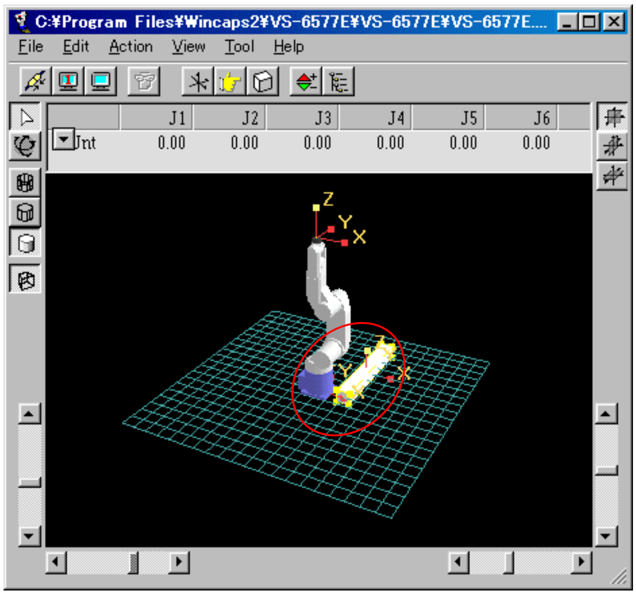


(4) Change the object color, if you want, by clicking the color buttons.

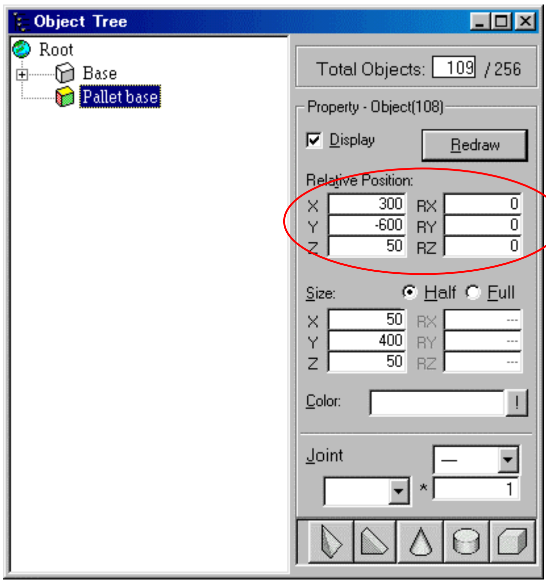


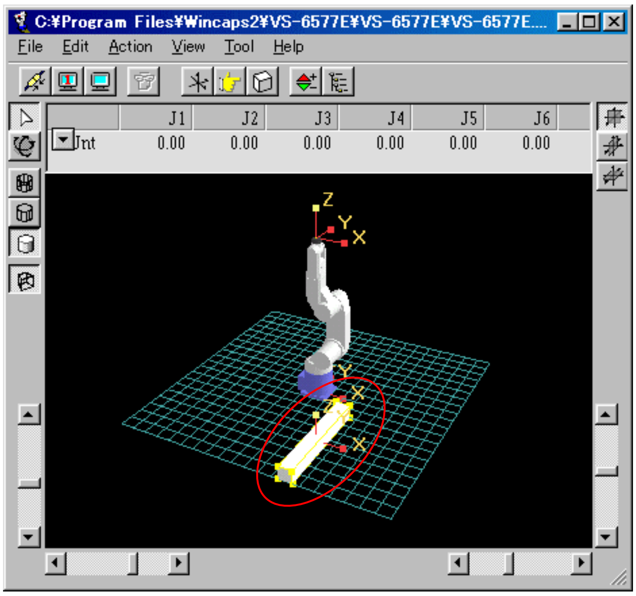
(5) To change the object size, click the object you want to change in size and enter the desired size (numeric values) into the Size boxes as shown below at left.





(6) To move the object position, click the object you want to move and enter the target position (numeric values) into the Relative Position boxes as shown below at left.

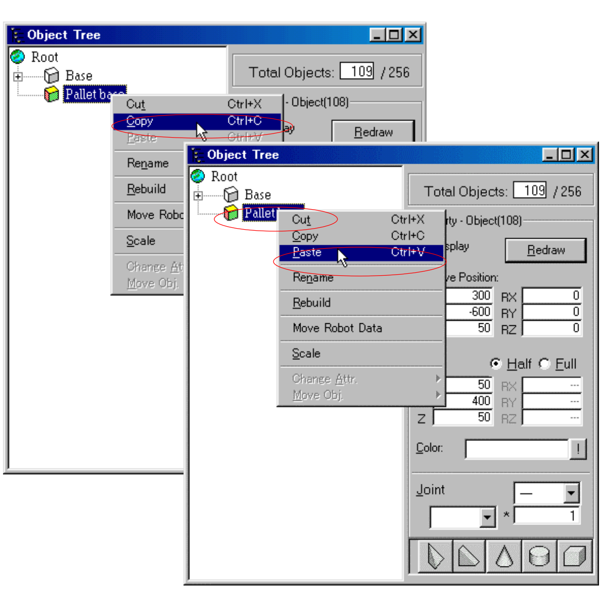


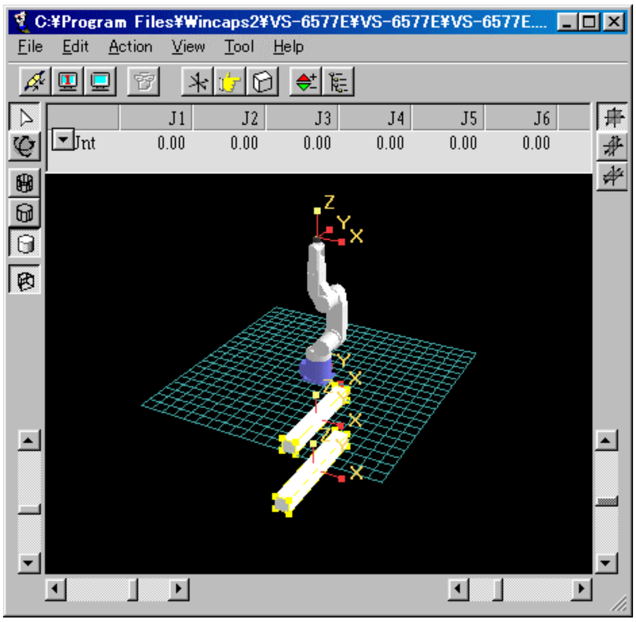


(7) To create another foot of a pallet base, copy and paste the object in Arm Manager according to these steps:

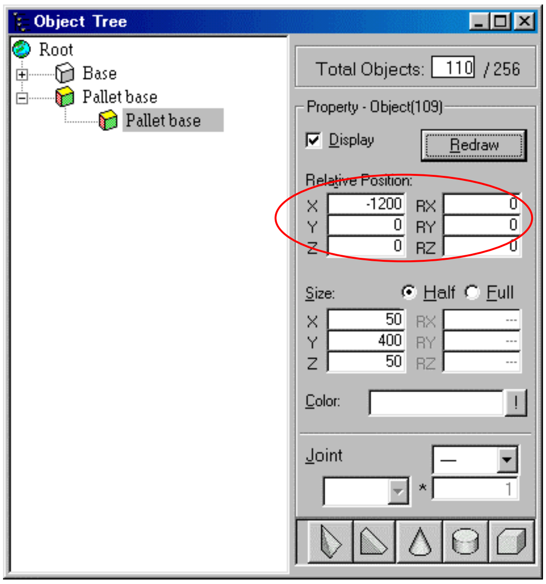
Right-click the object (the foot created in the steps above) you want to copy and click **Copy** as shown below at left.

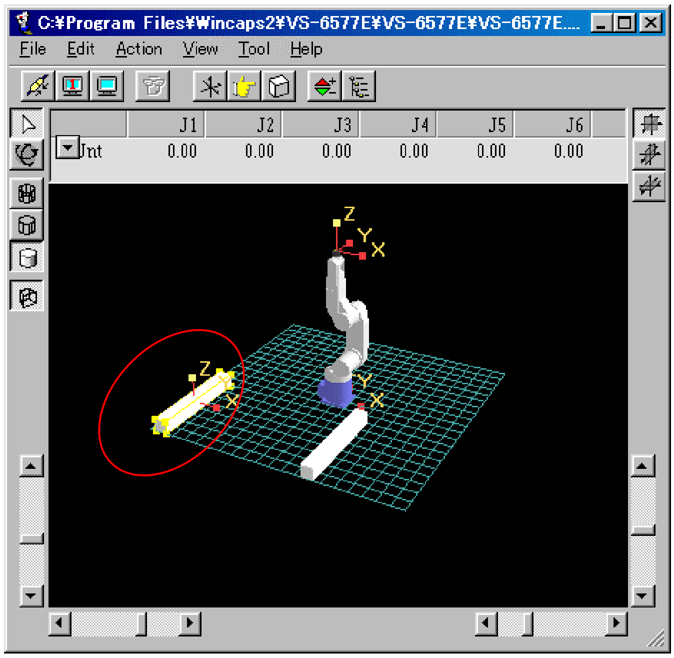
Click the target place where the object should be pasted, then click **Paste**.





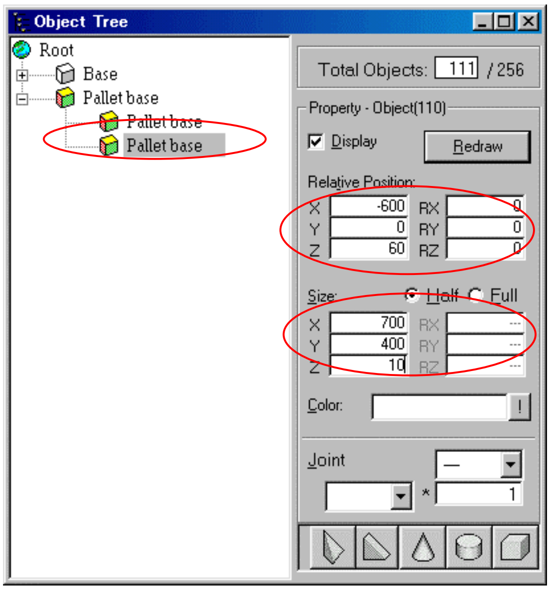
(8) To move the pasted object in Arm Manager, click the object and enter the target position (numeric values) into the Relative Position boxes as shown below at left.

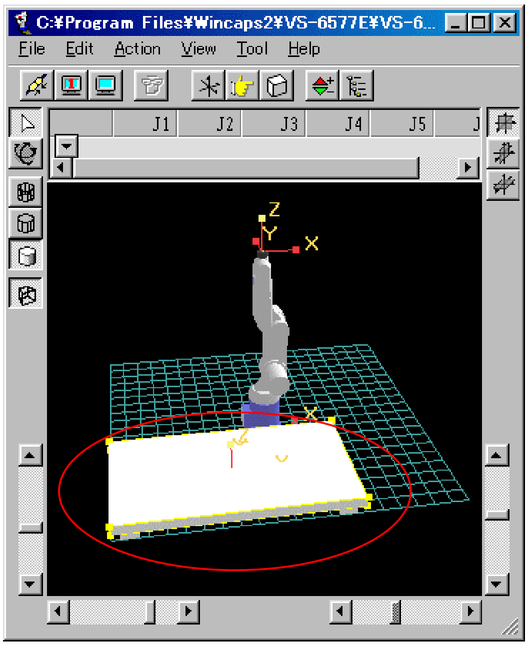




(9) Let's create a palette base object.

Copy and paste the object and enter the desired size and target position into the Size and Relative Position boxes, respectively, as shown below at left.



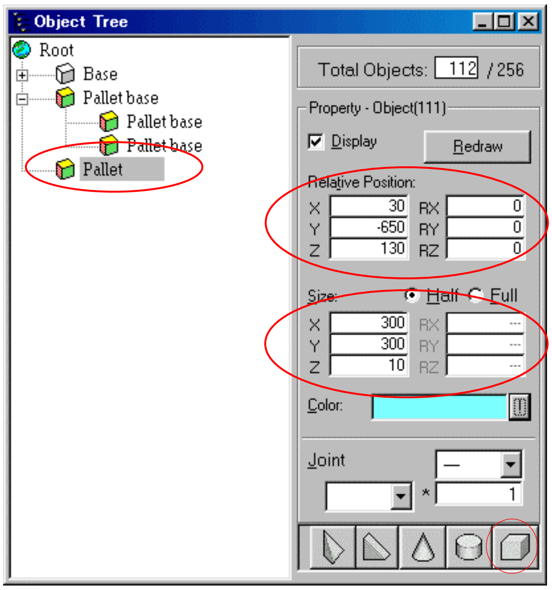


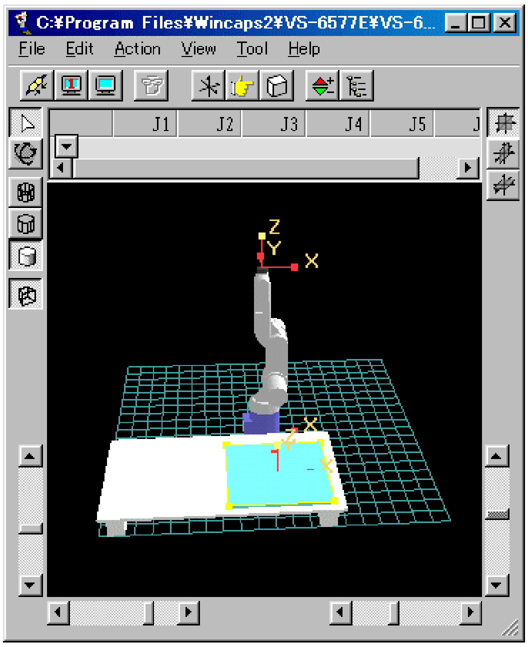
[2] Creating a palette object

(1) First let's create a palette bottom plate.

Click the button in the object tree window to create a square bottom plate object. The object will be added to the object tree at the same time.

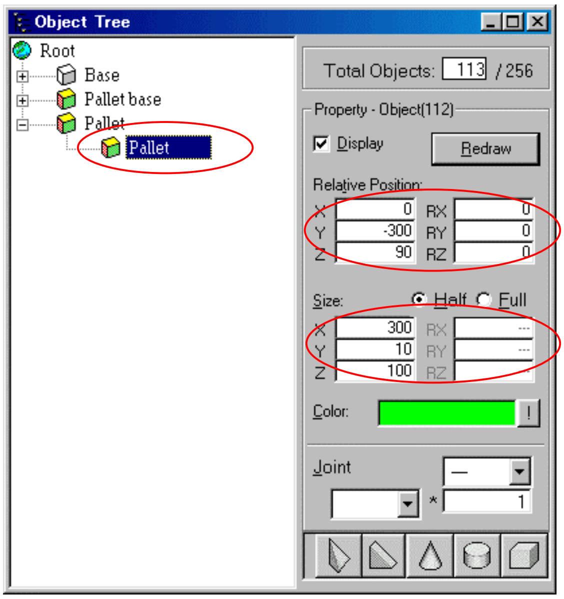
(2) Enter the desired size and the target position into the Size and Relative Position boxes, respectively, to set the pallet bottom plate.

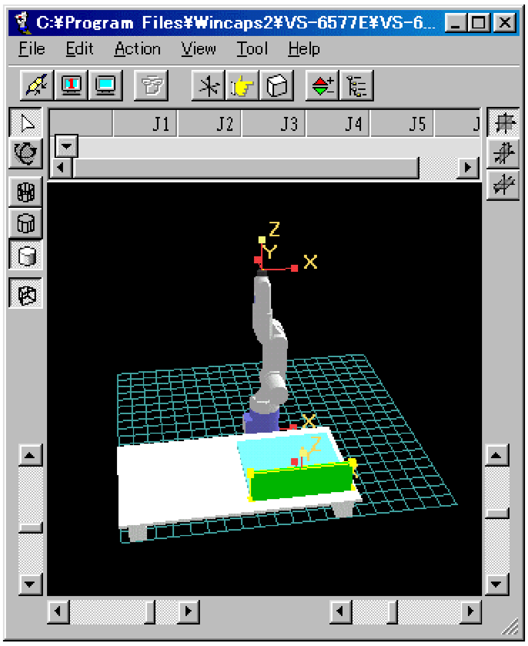




(3) Let's create a partition.

Click **Pallet** in the object tree and enter the desired size and target position into the Size and Relative Position boxes, respectively, based on the bottom plate created.

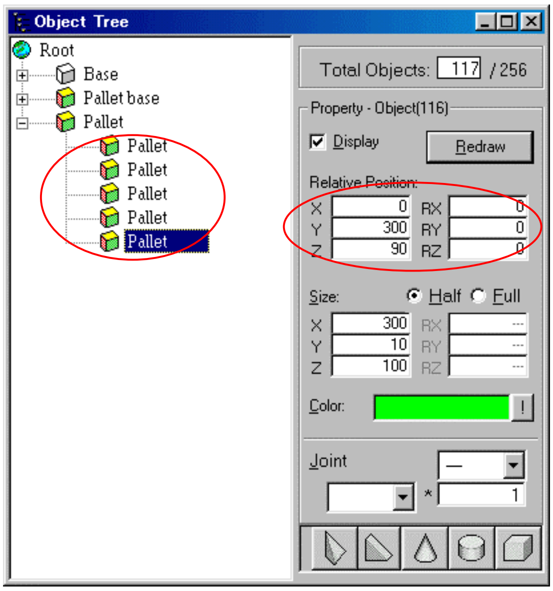


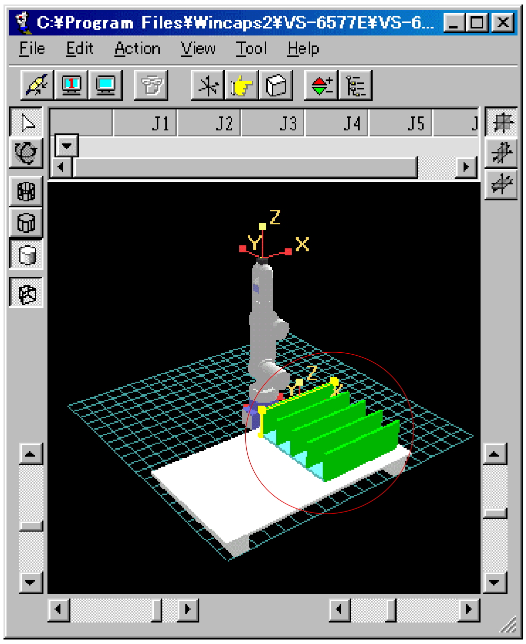


(4) Let's copy the original partition object created in step (3) to arrange it in parallel with the original partition object.

Copy the original partition object and click the target position to paste it.

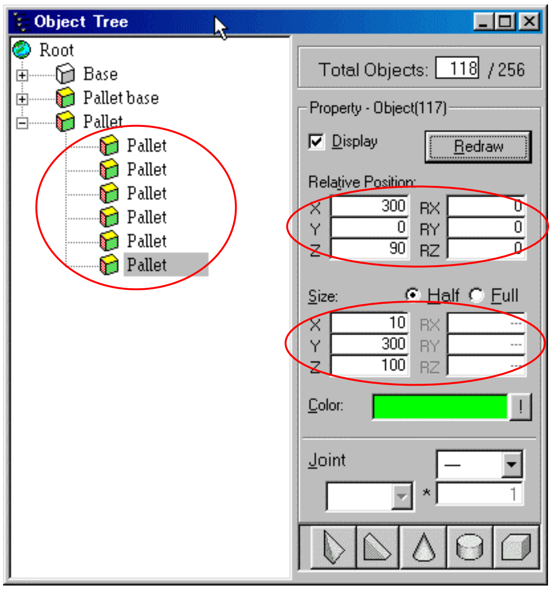
Enter the desired position (numeric values) into the Relative Position boxes to set the partition. Repeat this operation to create the required number of partitions.

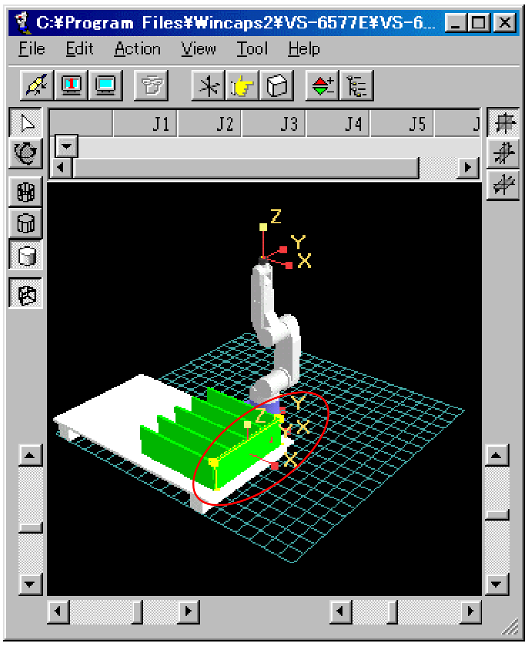




(5) Let's create a partition perpendicular to the partitions created in steps above.

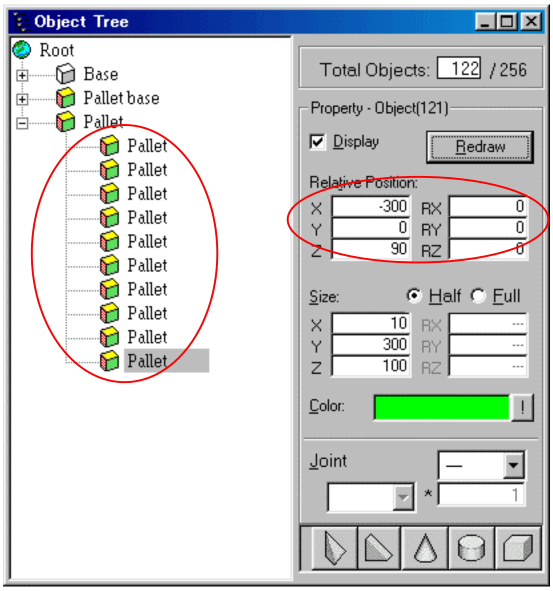
Click **Pallet** in the object tree and copy the original partition object and click the target position to paste it. Enter the desired position (numeric values) into the Relative Position boxes to set the partition.

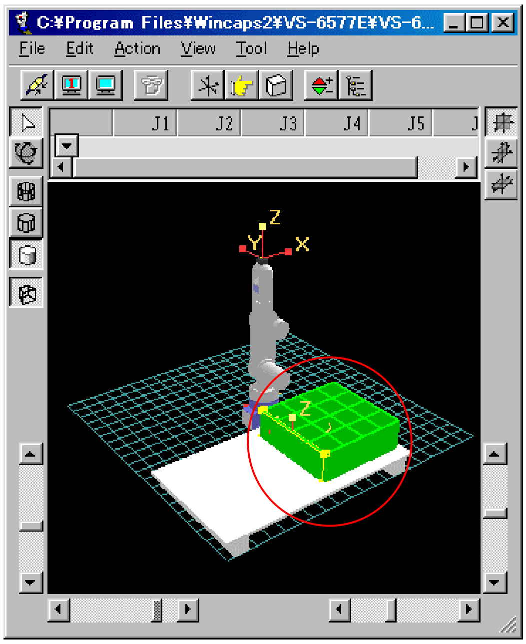




(6) Let's copy the original partition object created in step (5) to arrange it in parallel with the original partition object.

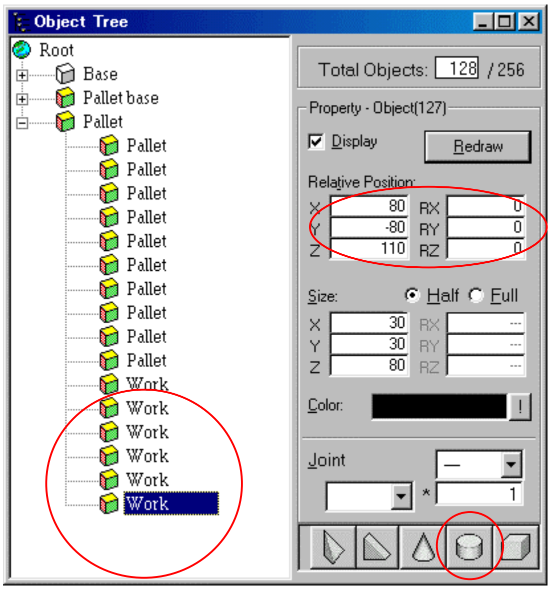
Copy the original partition object and click the target position to paste it. Enter the desired position (numeric values) into the Relative Position boxes to set the partition. Repeat this operation to create the required number of partitions.

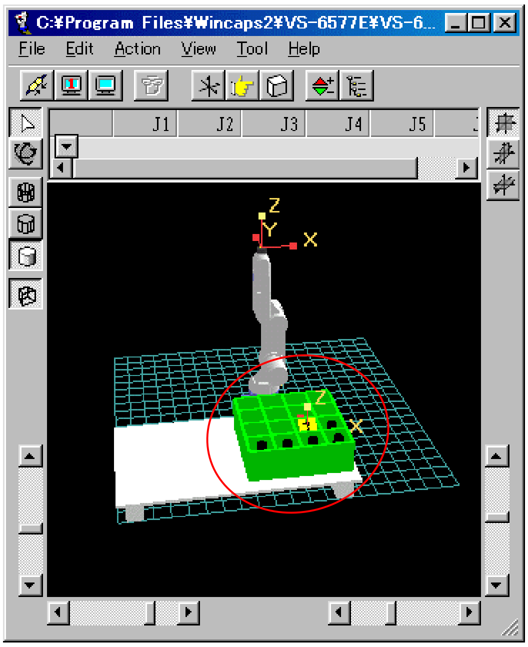




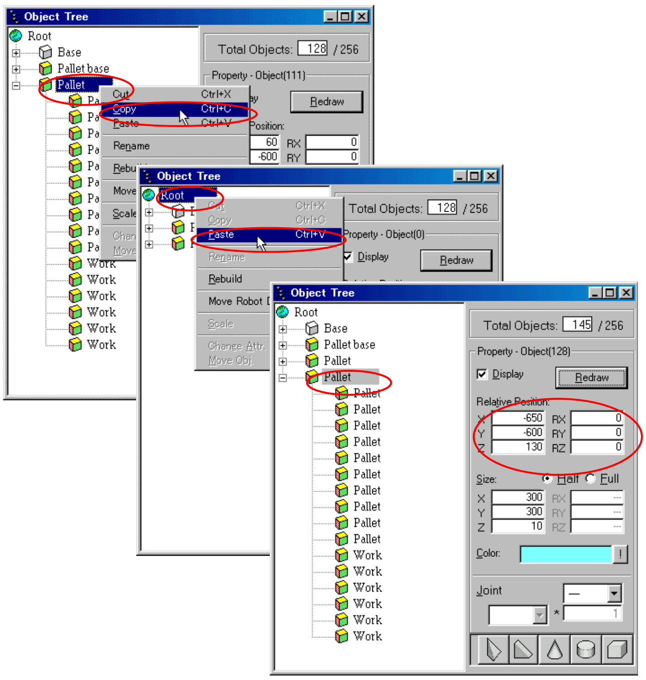
[3] Creating a work object

Create a work object by using the  button in the Object Tree window and put it in the partitioned space, in the same way as described in the previous sections.





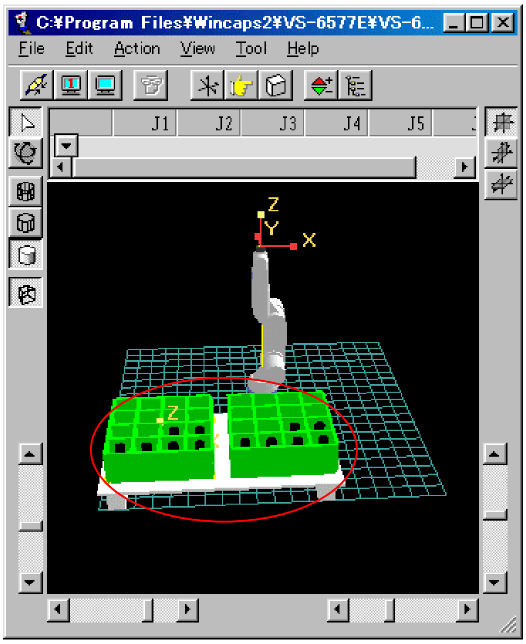
[4] Copying a combination object (pallet + works)



(1) In the Object Tree, right-click a higher class object containing objects to be copied, and click **Copy**.

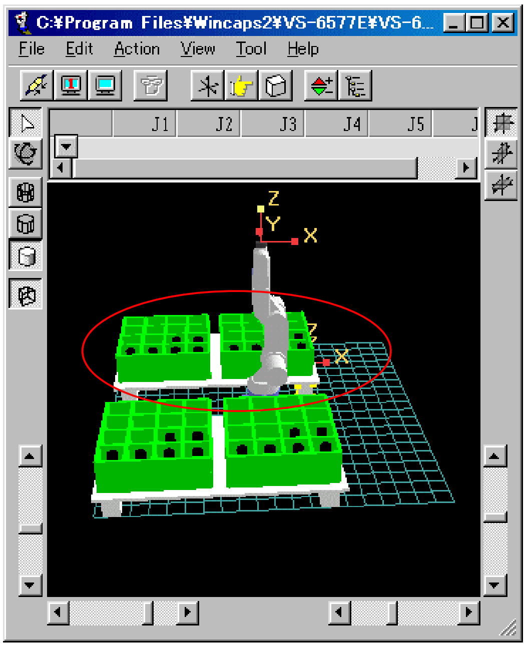
(2) Click the object to which you want to paste the copied object, then click **Paste**.

(3) Enter the target position (numeric values) into the Relative Position boxes to set a combination object (pallet + works) as shown below.



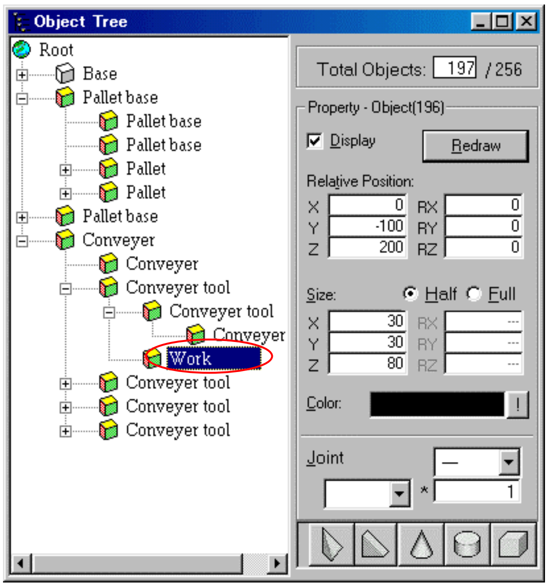
[5] Copying a combination object (pallet base + pallets + works)

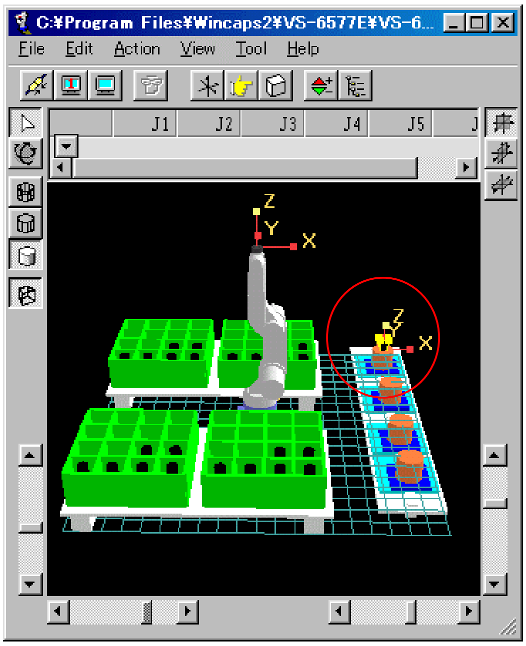
In the same way as described above, copy a combination object of a pallet base, pallets and works onto the desired position.



[6] Creating a conveyer object and its tool objects

In the same way as described in the previous sections, create a conveyer object and its tool objects and then put works on the conveyer tools.





8.6.4 Pose Data Conversion

This is the tool for converting the data type between the three types of pose data (P type, J type and T type). Conversion is made on the basis of the specified work coordinate system (WORK) and tool coordinate system (TOOL). Clicking on the work coordinate system, tool coordinate system or the data type will run the calculations for conversion.

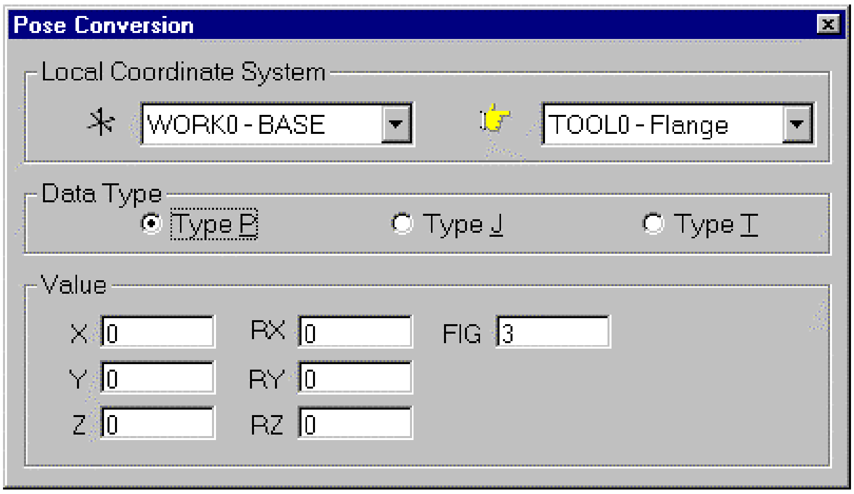


Fig. 8-27 Pose Conversion Dialog Box

8.7 Help Menu

Descriptions on how to use WINCAPSII can be viewed using the Help menu.

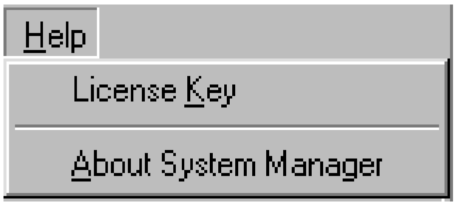


Fig. 8-28 Help Menu

8.7.1 About Arm Manager

Displays the version information on Arm Manager.

Chapter 9

Operating Vision Manager

The Vision Manager handles the functions of the vision control device. This chapter describes the WINCAPSII Vision Manager used by the personal computer teaching system.

9.1 Outline of Vision Manager

9.1.1 Outline of Functions

The Vision Manager supports the creation of vision programs in PAC.
The Vision Manager enables you to interactively proceed with the defining vision processing windows, create search model, and lookup tables.
Image data can be backed up in BMP format, while search model data can be backed up by user defined specific formats.
You can start the Vision Manager by clicking on the System Manager button or from the Window menu.
When the Vision Manager is started, the Vision Manager window appears on the screen. The following are the functions of the DIO Manager.

Note: A μVision board (optional) is needed to use the Vision Manager.

9.1.1.1 Vision Manager Window

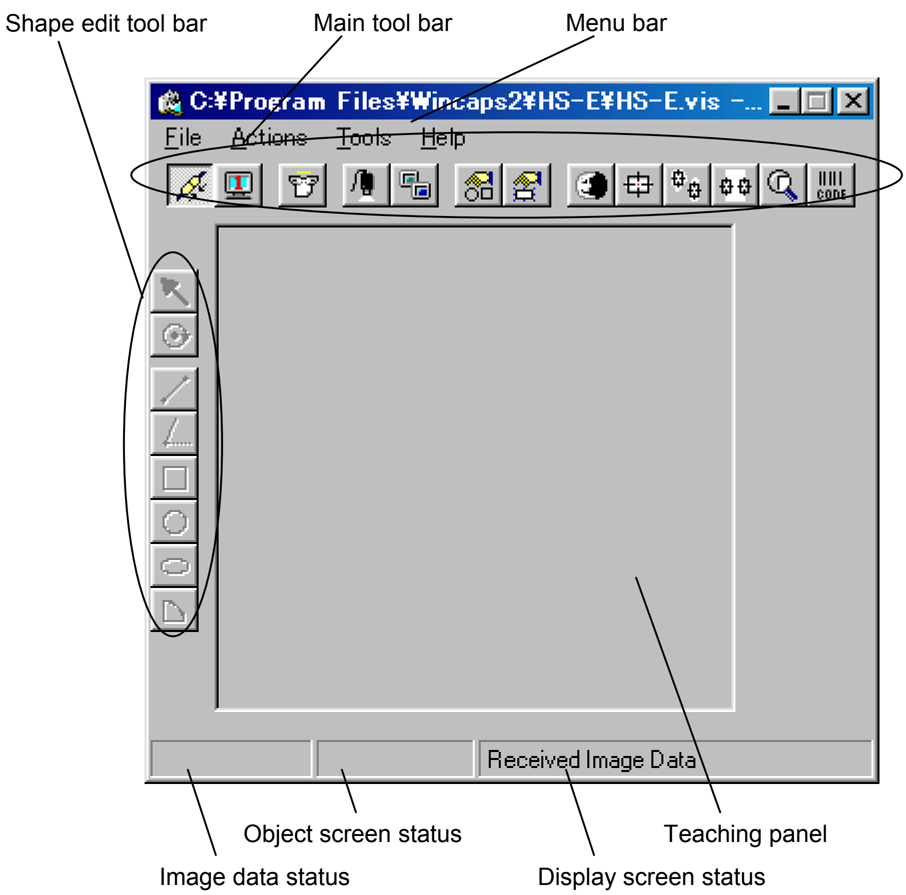


Fig. 9-1 Vision Manager Window

Teaching Panel:
When editing the window shape and/or search model shape, adjust the shape with the teaching panel, using the mouse.

Display Screen Status:
Displays the current screen displayed state on the Vision Monitor. The camera or processing screen state is also displayed here.

Object Screen Status:
Displays the screen analysis processing object (Process Screen 0 to 3).

Image Data Status:
Displays the attributes of image data displayed on the teaching panel.

9.1.1.2 Options Window

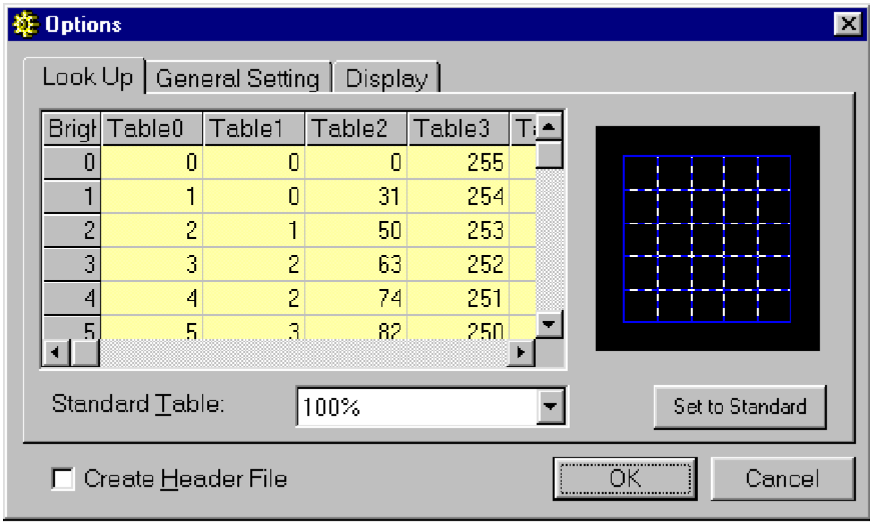


Fig. 9-2 Options Window

Look Up tab:
Sets the lookup table.

General Setting tab:
Sets general information concerning vision function.

Display tab:
Sets the extended display.

9.1.1.3 Edit Macro Name Window

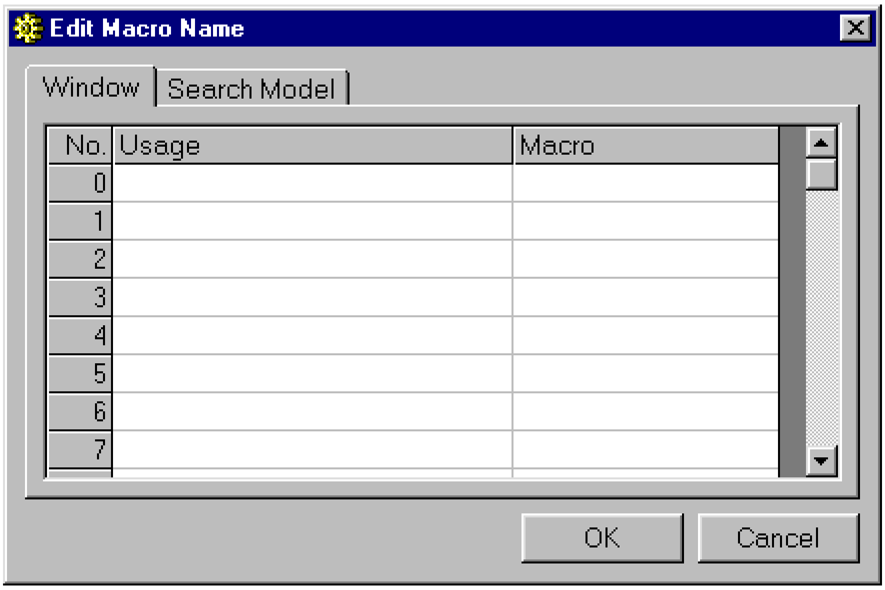


Fig. 9-3 Edit Macro Name Window

Edits the macro names of the windows and search models. The macro name definition file can be created from the input macro name. The macro name can then be used in programs.

9.1.1.4 Various Tool Windows

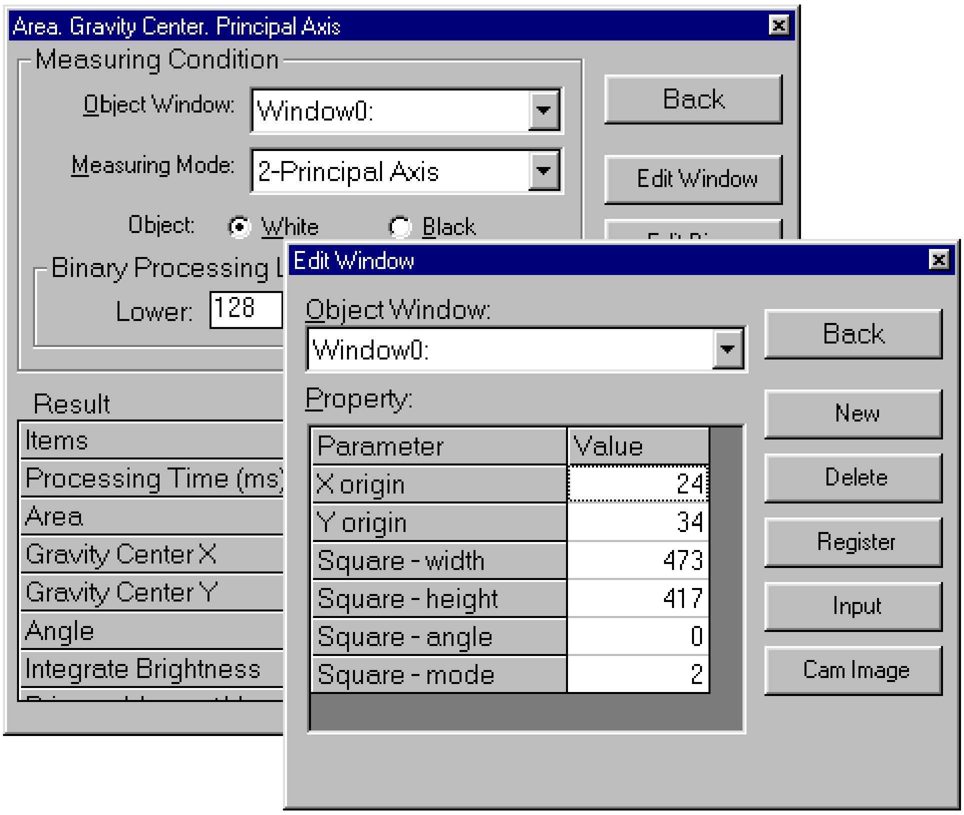


Fig. 9-4 Various Tool Windows

The Tool window is called from the main window. The work objective is carried out through a combination of these tool windows.

Table 9-1 Functions of Various Tools

Camera input	Inputs camera images
Select display screen	Controls screen to display on vision monitor
Edit window	Makes window
Edit search model	Makes search model
Binary-coded registration	Sets binary code level for image analysis
Area, center of gravity, principal axis	Analyzes area, center of gravity and spindle
Measure labeling	Analyzes labeling
Measure edge	Analyzes edge
Model search	Makes pattern matching using search model
Read code	Reads QR code

9.1.2 Tool Bar

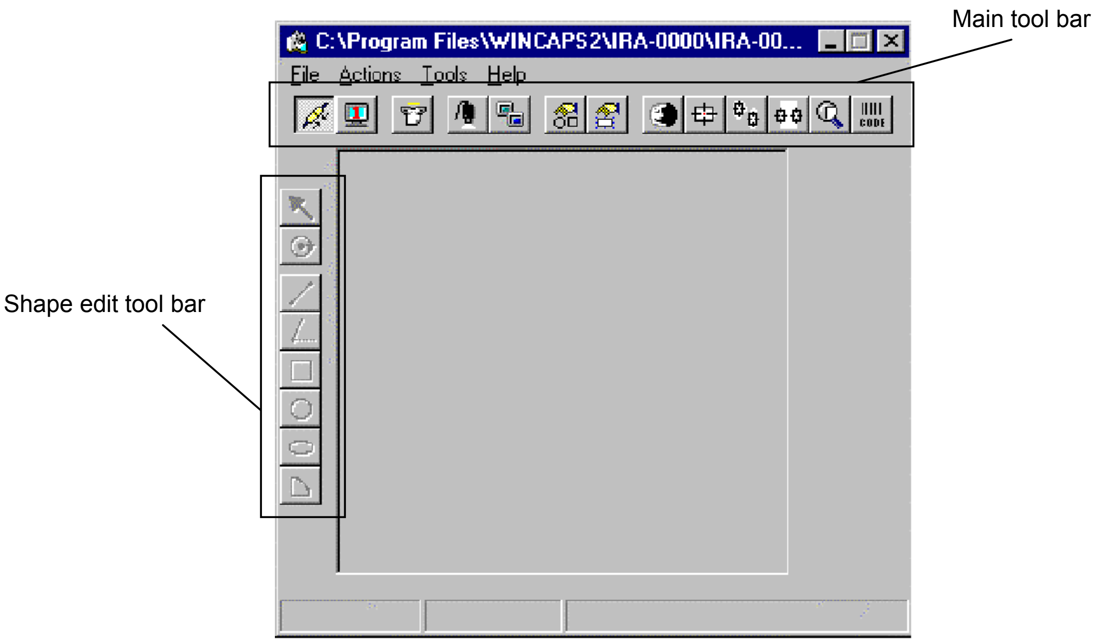


Fig. 9-5 Main Window and Tool Bar

Main Tool Bar

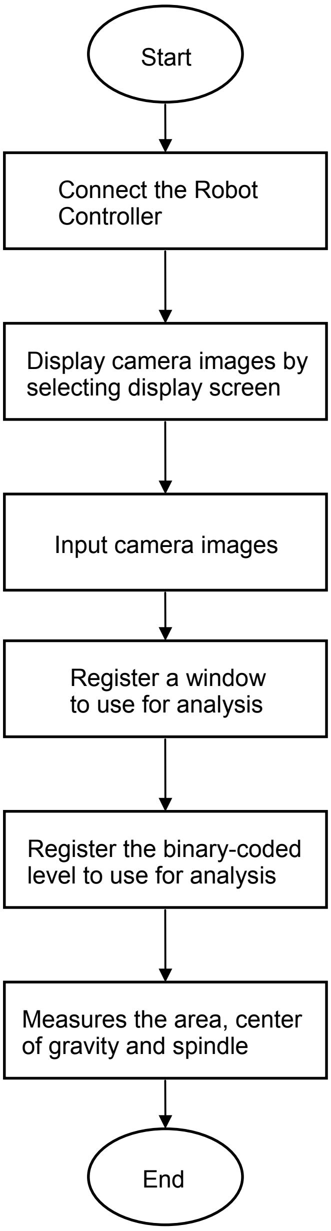
Connects with the Controller.	Acquires controller information.
Displays the environmental table transmit dialog.	Displays the screen display tool.
Displays the camera input tool.	Displays search model edit tool.
Displays the window edit tool.	Displays the area, center of gravity and spindle tools.
Displays the binary processing registration tool.	Displays the edge tool.
Displays the labeling tool.	Displays the code read tool.
Displays the model search tool.	

Shape Edit Tool Bar

Makes changes, moves and edit.	Makes rotary editing.
Specifies the shape of lines (between two points).	Specifies the shape of the line (length).
Specifies the shape as oblong.	Specifies the shape as a circle.
Specifies the shape as an ellipse.	Specifies the shape as a sector.

9.1.3 Basic Application

During image analysis



Chapter 9, subsection 9.3.1 “Connect."

Chapter 9, subsection 9.4.6.3 “Select Display Screen."

Chapter 9, subsection 9.4.6.2 “Camera Input."

Chapter 9, subsection 9.4.3 “Edit Window."

Chapter 9, subsection 9.4.6.4 “Binary-coded Registration."

Chapter 9, subsection 9.4.6.5 “Area, Center of Gravity, and Principal Axis."

9.1.4 Files to Be Managed

Fig. 9-6 shows the five files that the Vision Manager manages.

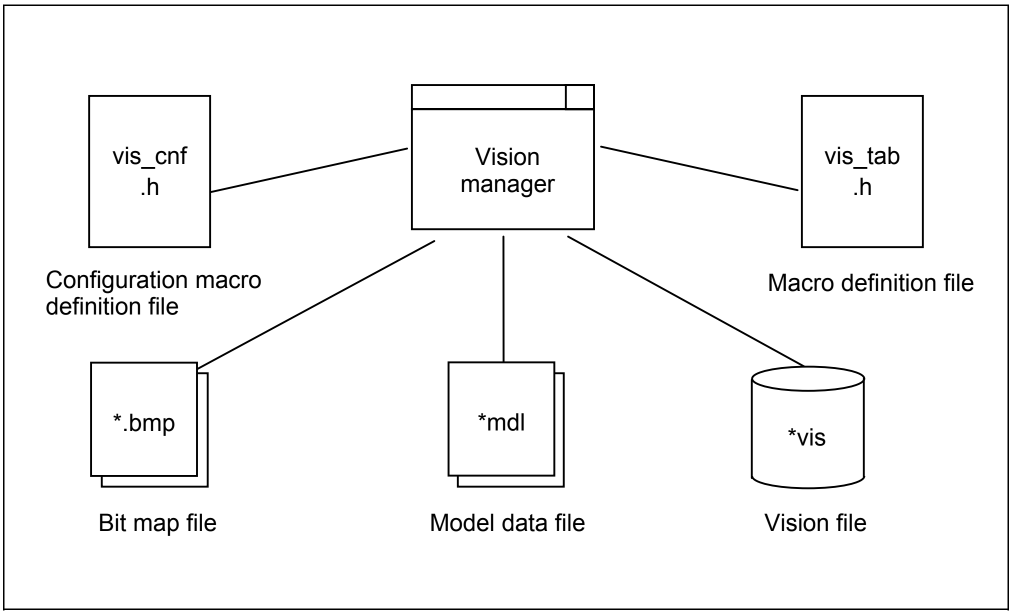


Fig. 9-6 Management Files of The Vision Manager

9.1.4.1 Vision File (*.vis)

Contains set information about the vision board including window, search model, calibration, lookup table and system settings. Since they are in different files by project, the respective vision information can be managed without confusion, even if multiple projects are involved. The file extension is ".VIS".

9.1.4.2 Model Data File (*.mdl)

Contains the search model image data. It is managed with relational information registered to the vision file. The model data file is located wherever the vision file (*.vis) is. The extension is ".MDL".

9.1.4.3 Bit Map File (*.bmp)

The Vision Manager can handle files in BMP format. Image data received from the Robot Controller can be stored in BMP format. Also, BMP formatted files stored, in advance, in the Vision Manager can be opened. Bit Map File is located wherever the vision file (*.vis) is. The extension is "*.BMP".

9.1.4.4 Macro Definition File (vis_tab.h)

Contains the correspondence definition, between the window macro name and number, and the macro name and number of search model. The macro definition file is located wherever the vision file (*.vis) is. The file name is "vis_tab.h".

9.1.4.5 Configuration Macro Definition File (vis_cnf.h)

Contains the vision set data macro definition information. The configuration macro definition file is located wherever the vision file (*.vis) is. The file name is "vis_cnf.h".

To use the macros related with window, search model, and configuration in PAC project, it is necessary to read this macro definition file by specifying #INCLUDE statement at the top of program.

9.1.5 Menu List

The Vision Manager command menu has the following tree structure:

File
- New *1
- Open *1
- Save
- Save As *1
- Transfer
- Open Image Data
- Save Image Data As
- Print
- Make Macro Define File
- Import Macro Define File
- Close

Actions
- Connect
- Get Info

Tools
- Options
- Edit Macro Name
- Edit Window
- Edit Search Model
- Calibration
- Image Analysis
- Camera Input
- Display image
- Binary-coded Registration
- Area, center of gravity, principal axis
- Labeling
- Edge
- Model search
- Read code

Help
- About Vision Manager

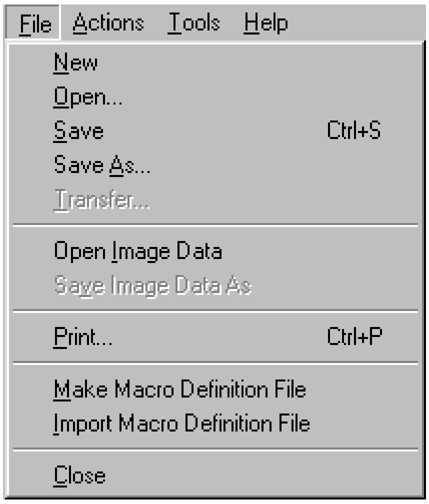
Fig. 9-7 The Vision Manager Menu Tree

*1: Displayed only when the display option file extension menu is checked. To set the display option, re-log in at programmer level, then select Tools, Options and View, and check the option file extension menu.

9.2 File Menu

The file stores necessary information for operating the vision device and it also reflects the contents of editing with the Vision Manager. The following shows the list of data stored:

- System set data (camera setting, etc.)
- Lookup table data
- Window data
- Search model data
- Calibration data (teaching point data and conversion factor)



9.2.1 New (Programmer level)

Creates a new set file for an editing object. Default is stored when making a new file.

9.2.2 Open (Programmer level)

Opens the saved set file to edited an object.

9.2.3 Save

Saves set data currently being edited.

9.2.4 Save As (Programmer level)

Saves the set data under editing by newly creating a file.

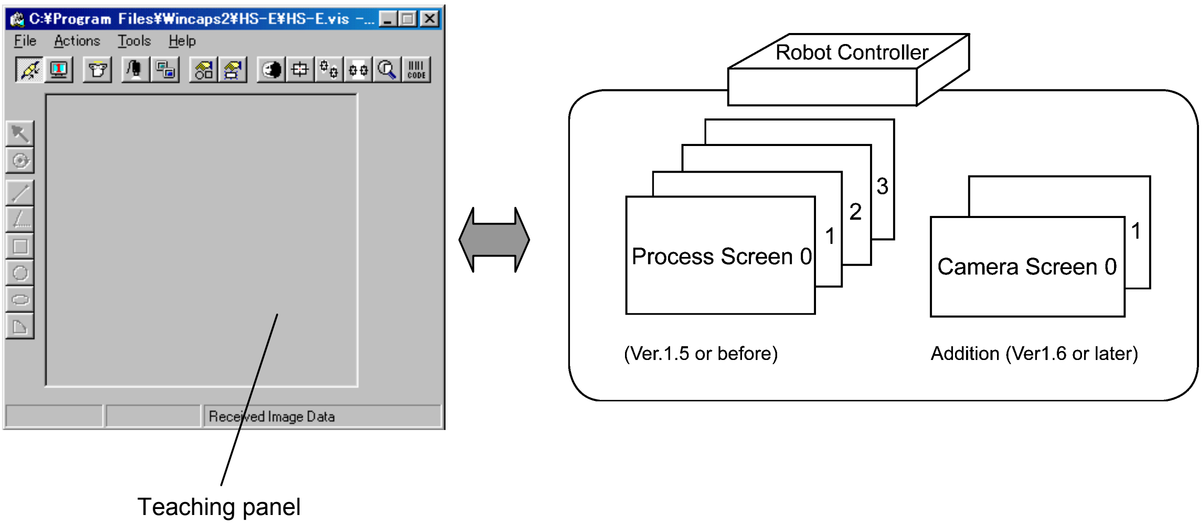
9.2.5 Transfer

9.2.5.1 Transmitting Set Data

Transmits set data between the Robot Controller and the personal computer. This function is used for transmitting set data edited by the Vision Manager or for receiving Robot Controller (backup) set data.
To transmit set data, it is necessary to be connected to the Robot Controller. For instructions how to establish a connection, refer to Chapter 9 "9.3.1 Connect" in this manual.

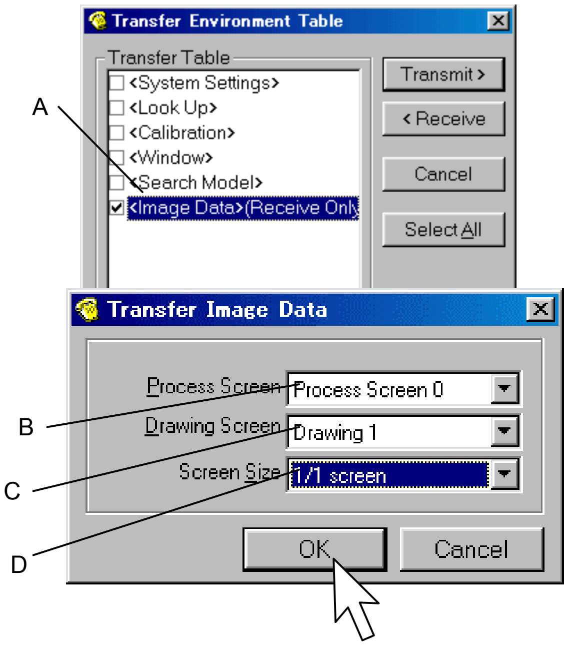
9.2.5.2 Transmitting Image Data

Image data is transmitted between the teaching panel and the Robot Controller (Ver.1.5 or before: Process screen 0 to 3, Ver.1.6 or later: + Camera screen 0 to 1). The teaching panel displays the images of the currently held image data. If nothing appears on the teaching panel, no image data is being held.



Note1: If no image data is held, only receiv-ing is enabled.
2: Camera screen is only for receiving.

9.2.5.3 Image Data Transmit Procedure

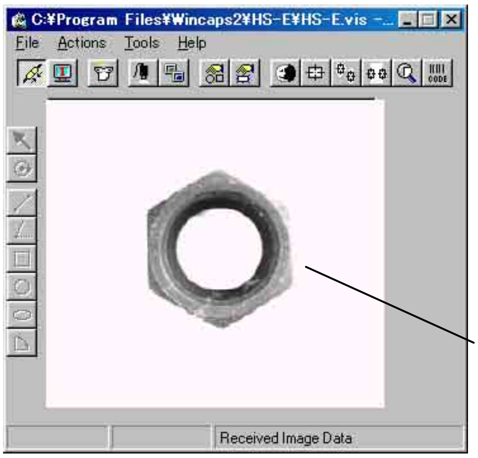


(1) Check image data (A) in the Transfer Environment Table dialog.

(2) Click on either **Transmit** or **Receive**.
The data update check dialog appears on the screen, click on **Yes**.
The Transfer Image Data dialog appears.

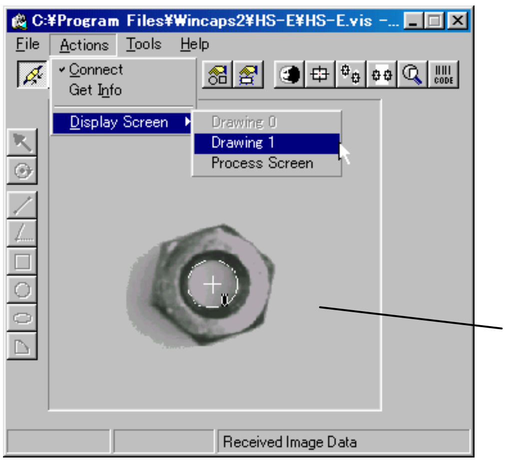
(3) Set the processing screen (B) and the drawing screen (C) as the object screen for transmission. Image data is transmitted between the processing screen, specified here, and the teaching panel.
(Drawing Screen is for Ver.1.6 or later.)

(4) When receiving image data only, set the Screen Size to either 1/4 screen or 1/1 screen. When transmitting, the screen size is determined according to the image data held in the teaching panel.



Received image

(5) Click on **OK** in the Transfer Image Data dialog box.
The image data is transmitted.
When receiving, images of new image data are displayed on the teaching panel.
Also, during transmission, image data is transmitted onto the processing screen specified.
(When transmitting, the image data on the drawing screen is not transmitted.)



Displayed screen

(6) After receiving image data, you can display the drawing screen or the process screen by selecting the action menu, and can save image data. (Ver.1.6 or later)

9.2.5.4 Image Data Screen Size

Determine the size of image data to be received using the Screen Size setting in the Transfer Image Data dialog. The 1/1 screen receives all the image data on the processing screen. The 1/4 screen receives the image data on the processing screen by thinning the data to 1/4. When 1/4 screen is selected, time required for data transmission is reduced to 1/4 of the 1/1 screen thus saving time.

The display size of the teaching panel differs by the screen size. Since the 1/1 screen is about 4 times larger in size than the 1/4 screen, it is not possible to display everything on a low-resolution personal computer screen. In cases like this, receive the image data by setting the screen size to 1/4 screen.

When the image data that has been saved is transmitted to the Controller, it is possible to analyze the same image data. In this case, if image data to be transmitted is on the 1/4 screen, the analytical result will be different from before, since the image data is thinned to 1/4.

Note: If the number of possible colors displayed on the personal computer screen is less than 256, some color errors may be generated to the image data displayed on the teaching panel. Although no particular operational problem will result, use a personal computer screen having 65,535 (16-bit color) or more colors that can be displayed to ensure correct color display.

9.2.6 Save Image Data As

The Vision Manager can save image data displayed on the teaching panel in a bit map formatted file. When image data is received from the Controller, the data image is displayed on the teaching panel. Select **Save Image Data As** to save the image data sample.

<Ver.1.6 or later>
The Vision Manager can save image data set on the teaching panel by selecting “Export”. If the process screen or the drawing screen is selected, composite image data is saved.
Screen sizes are as follows.

Kind of screen	Selection	Size
Process screen	1/1 screen	512 x 480
	1/4 screen	256 x 240
Drawing screen	1/1 screen	640 x 480
	1/4 screen	320 x 240

9.2.7 Open Image Data

With **Save Image Data As**, the Vision Manager can read the image data saved in the bit map format and display it on the teaching panel. By transmitting image data displayed on the teaching panel to the Robot Controller, you can analyze the sample image that has been saved.

9.2.8 Print

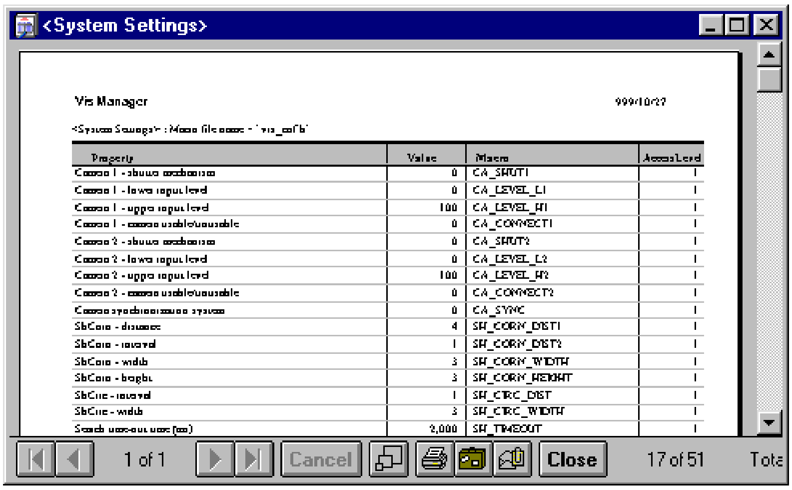
Prints the set data currently being edited with the Vision Manager.

9.2.8.1 Print Object

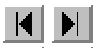
- Select All: Selects all of the environmental tables as the object for simultaneous printing.
- Set: Displays the printer SET dialog box and makes various printer settings.
- Preview: Enables viewing of the print status prior to actual printing.
- Cancel: Closes the dialog box without printing.
- Print: Prints the table.
- Option: Print options appear.

TIP: To print only specified page(s), click on the printer button  after previewing.

Note: If you select more than one object to be printed, Preview is not usable.



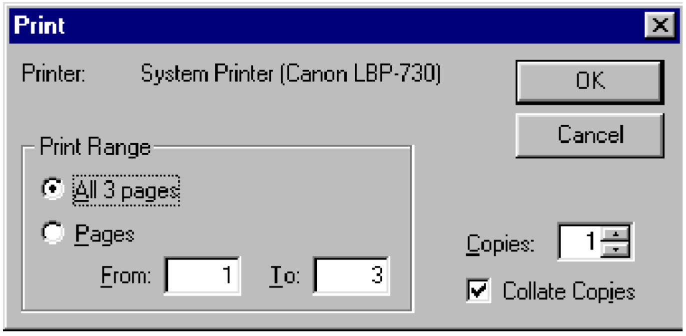
Preview Window

 : Moves to the head/tail end of the page.

 : Moves to the immediately preceding/following page.

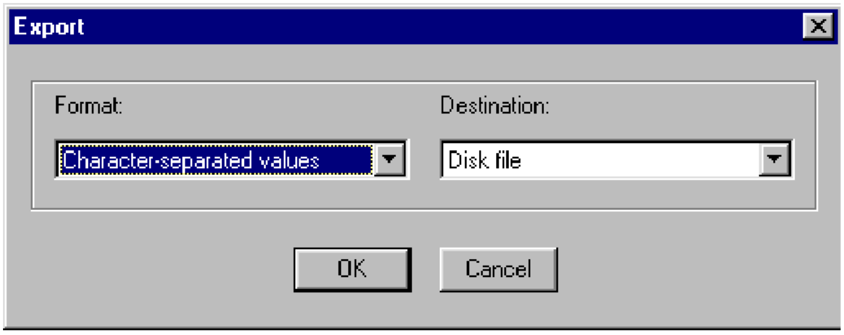
 : Selects display (Reduction/Standard/Expansion)

 : Sets print execution
The printing range (specific pages) of an object file can be specified.



Print Window

 : Exports the object file.
The selected object file will be converted into the file format specified in Format and outputted (saved) to the Destination.



9.2.8.2 Option

Selecting the Option tag will display the print options.

Note: Print option is not available from the Vision Manager.

9.2.9 Make Macro Definition File

Prepare the data created using the macro-name-edit function. This function is used to create the macro definition file (vis_tab.h) in the folder having the vision (*.VIS) file. By reading the macro definition file into the program, you can use the macro names entered using the macro edit function.

9.2.10 Import Macro Definition File

Reads the macro definition file (vis_tab.h) and expands in the Macro Edit Window.

9.2.11 Close

Erases the Vision Manager from the personal computer screen. The vision manager is not displayed on the screen but exists on the memory. When restarted from the System Manager, the Vision Manager appears with the edit data displayed just before the Vision Manager is closed.

9.3 Actions Menu

9.3.1 Connect

Sets the connection object (edit object) of the Vision Manager. By establishing a connection, communication with the Controller becomes possible. As a result, editing of the controller setting (window and search model) and image analysis can be performed. If set for non-connection, the Vision Manager sets the file on the personal computer as the object to be edited.

Connection selection method 1:

① Click on **Actions** in the menu bar. The Actions menu appears.

② Click on **Connect**.
The Vision Manager is connected and disconnected alternately each time this command is issued.

Connection selection method 2:

The connection ON/OFF state alternates also when you click on  in the tool bar.

- Display of Connection State -

The connection state is indicated by the pressed state of CONNECT button  in the tool bar or a checkmark in front of **Connect** in the Actions menu.

Disconnected

Connected

9.3.1.1 Edit Object of Vision Manager

The objects to be edited using Vision Manager can be mainly classified into the following three types:

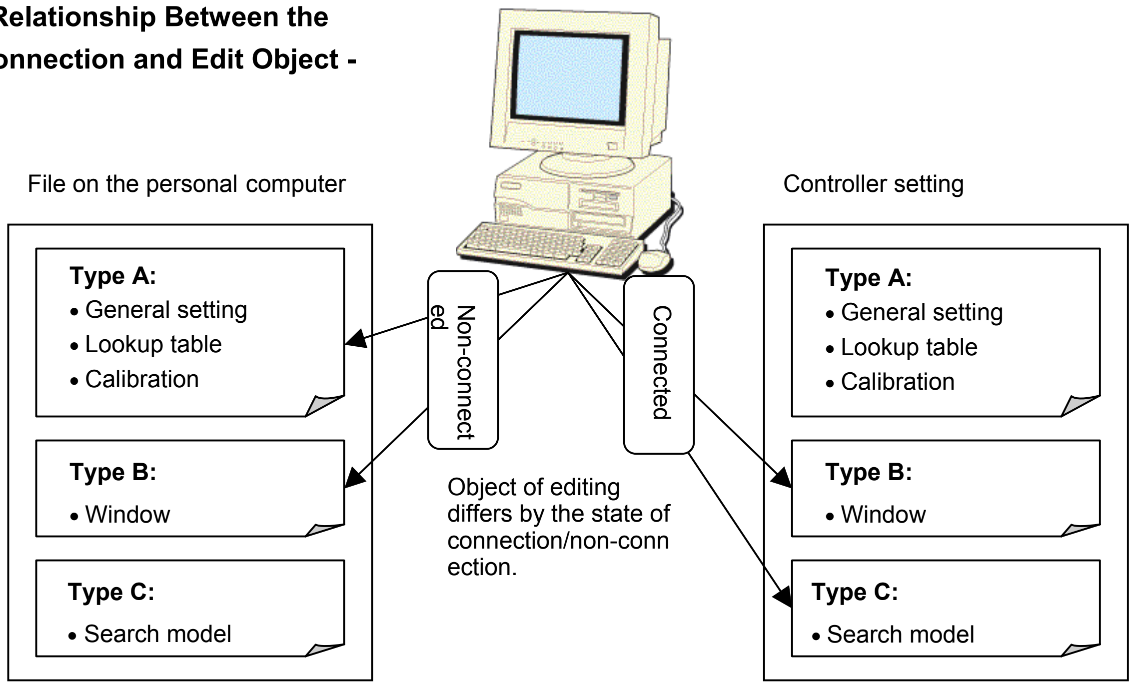
Type A, editing only the files in the personal computer. After editing, the set value is transmitted to the Controller.
(Objects: general setting, lookup table, and calibration data).

Type B, editing both the settings of the Controller and the personal computer files. After editing, the set values are shared between the personal computer and the Controller by data transmission.
(Objects: Window)

Type C, editing only the settings of the Controller. After editing, the set values are backed up in the personal computer file
(Objects: Search model).

In the case of Type A, the file on the personal computer is always the object of editing, irrespective of the connection state with the Controller.
Types B and C have different edit objects, depending on the state of connection. When connected, Type B selects the Controller information as the object of editing. When disconnected, it selects the file on the personal computer as the edit object.
Type C selects the Controller information only for the edit object. Consequently, editing cannot take place unless connected to the Controller.

- Relationship Between the Connection and Edit Object -



- Type A edits the file on the personal computer and transmits set value to the Controller.
- Type C edits the Controller information and backs it up on the personal computer.

9.3.2 Get Info

To edit Controller Types B and C settings, as described in Chapter 9 “9.3.1.1. Edit Object of the Vision Manager” in this manual, you must read the Robot Controller information into the personal computer in advance. Without getting information on the Controller, the Vision Manager cannot correctly edit the Robot Controller settings.
To get information, connect the Vision Manager with the Controller in advance. For details on connection the Robot Controller, refer to Chapter 9 “9.3.1 Connect” in this manual.

Information acquisition method 1:
① Click on **Actions** in the menu bar. The Actions menu appears on the screen.
② Click on **Get Info**.
Controller information (window/search model) is acquired.

Information acquisition method 2:
Click on  in the tool bar to acquire same information.

9.4 Tools Menu

9.4.1 Options

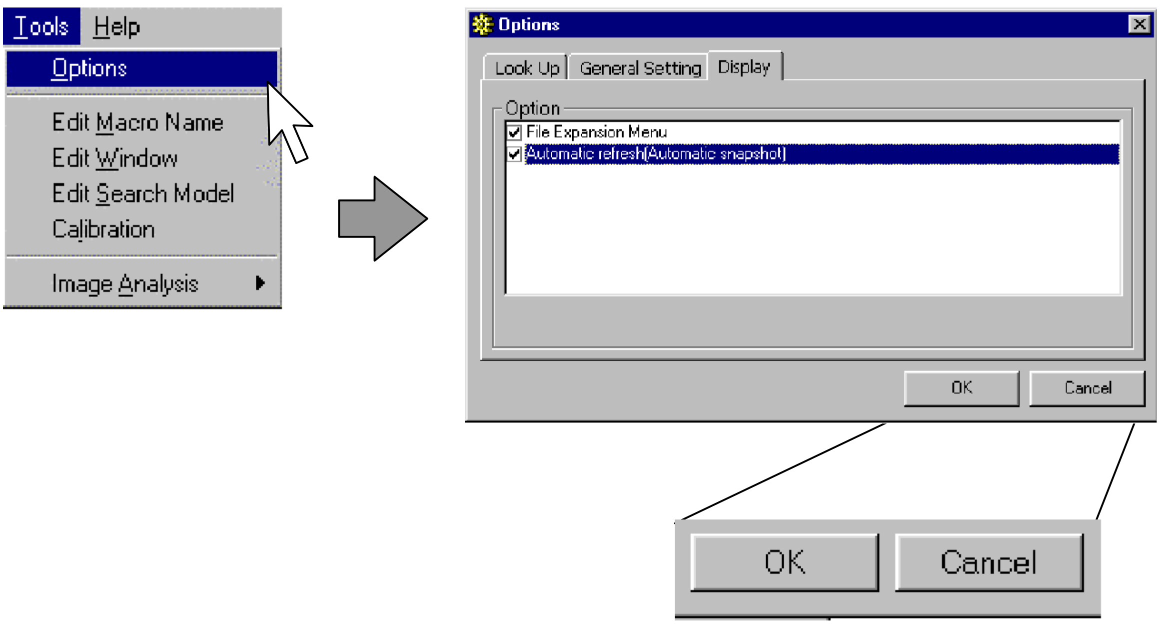
Creates the various settings needed by the Vision Manager.
Checking the Create Header File creates configuration macro definition file (vis_cnf.h).

① Click on **Tools** in the menu bar. The Tools menu appears.
② Click on **Options**.
The Options window appears.

> **Note: Items that can be edited differ by the user level. As to restrictions by user level, refer to Chapter 1 “1.3 Security” in this manual. To change the access level in the middle of operation, refer to Chapter 4 “4.3.3 Re-Log In” in this manual.**

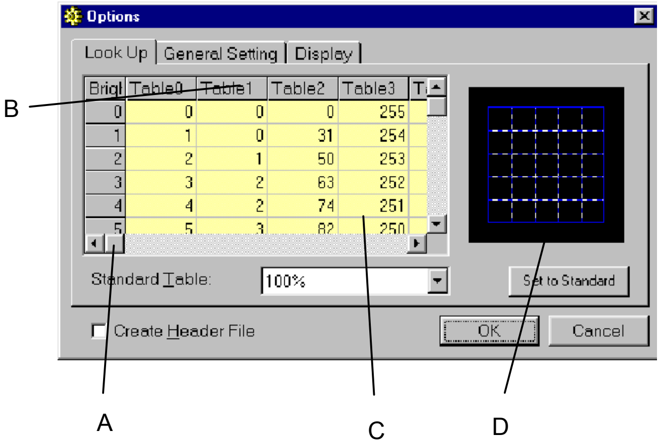
③ Change the set contents.

④ Click **OK** to register the changed contents.
Click **Cancel** to invalidate the changed contents.



9.4.1.1 Look-up Table

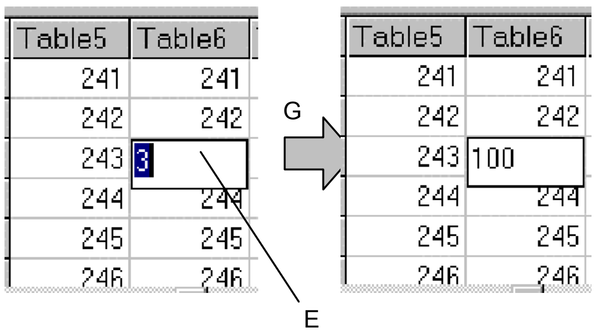
Click the Look Up tab to set the lookup table characteristics. By changing the lookup table the user can change the camera image input characteristics, camera images and processing screen display characteristics. 0 to 4, in the lookup table, are reserved by the system. 5 to 15, in the lookup table, can be changed by general users.



Graphic display of characteristics

① Drag scroll bar (A) to display the table of characteristics in the list (B).

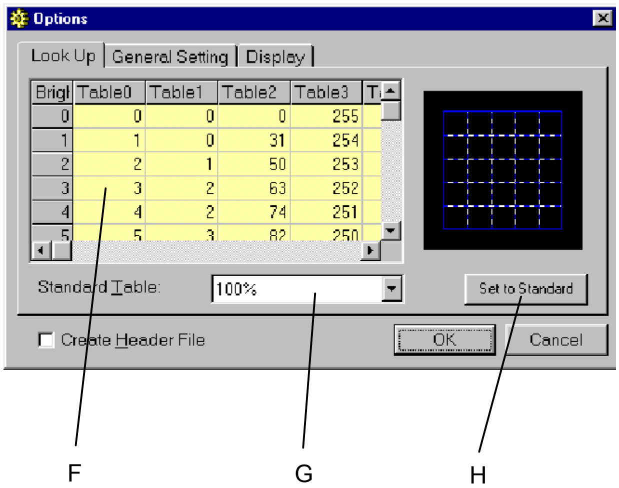
② Click the column (C) in the table to display characteristics.
In this example, the graph (D) shows the characteristics of Table 7.



Input and edit of set value numerals

① Double-click the cell (E) to change the set value.
The cell character is displayed in reversal.

② The input character will then be input (inserted) in the position in the reversed character.



Copy a standard table

① Click the column (F) in the table to copy the standard table.

② Select the standard table (G).

③ Click on **Set to Standard** (H).
The standard table is copied into the selected table. In this example, 100% is copied to Table 5.

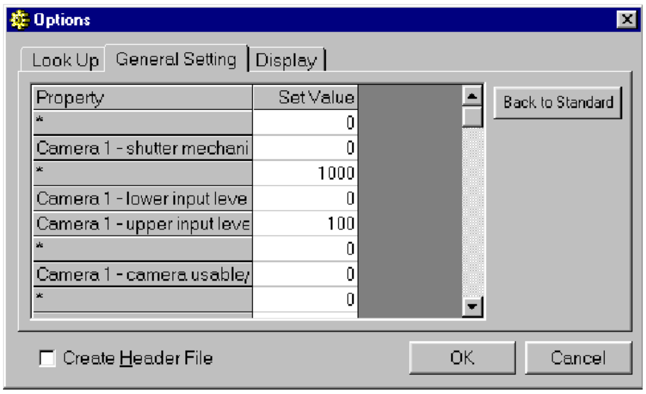
Save editing results

Click **OK** to save the set value.
To invalidate the editing results, click **Cancel**.

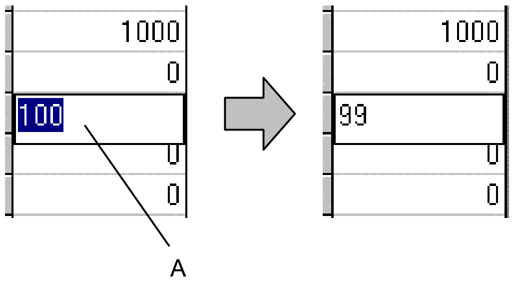
9.4.1.2 General Setting

Click the General Setting tab to make various settings for Vision Board.
For parameter definitions and element numbers, refer to “Appendix” in the PROGRAMMER'S MANUAL.

Note: If you put a checkmark at Create Header File and select OK, the parameter macro definition file “vis_cnf.h” is automatically created. To use macro name with GETENV and LETENV in PAC language, you must include this file.



① Double-click the cell (A) to change the set value.
The cell character is displayed in reverse video.
② Enter a value. The entered value appears (is inserted) in the reversed value position.
③ Click **OK** to register the changed value. Click **Cancel** to invalidate the changed value.
④ Click **Back to Standard** to restore the default value settings.



(1) Shutter method

Set the camera shutter system for each camera.
0: Field shutter 1: Frame shutter

(2) Input upper/lower limit level

Set the camera input level and the camera output signal relationships for each camera.
By changing the upper/lower limit, the pertinent camera output signal can be input, in more detail.
Always set the lower limit value to value lower than the upper limit value. (Upper limit value > Lower limit value)

(3) Synchronous method

Set the synchronous method in the camera. Since all the cameras are simultaneously set, it is not possible to discretely change the camera settings. For internal synchronization, set camera input with the Vision Board internal synchronous signal. For external synchronization, set camera input with the camera synchronous signal.
0: Camera internal synchronization 1: Camera external synchronization

(4) SHCORNER setting

Set the SHCORNER command measuring conditions. For details of each parameter (distance, intervals, width and height), refer to SHDEFCORNER command.

(5) SHCIRCLE setting

Set the SHCIRCLE command measuring conditions. For details of each parameter (intervals and width), refer to SHDEFCIRCLE command.

(6) Search time-out time

Set the timeout time for search measurements (SHMODEL command, SHCORNER command and SHCIRCLE command).
Search measurement error is detected by timeout.

(7) Vision monitor display position

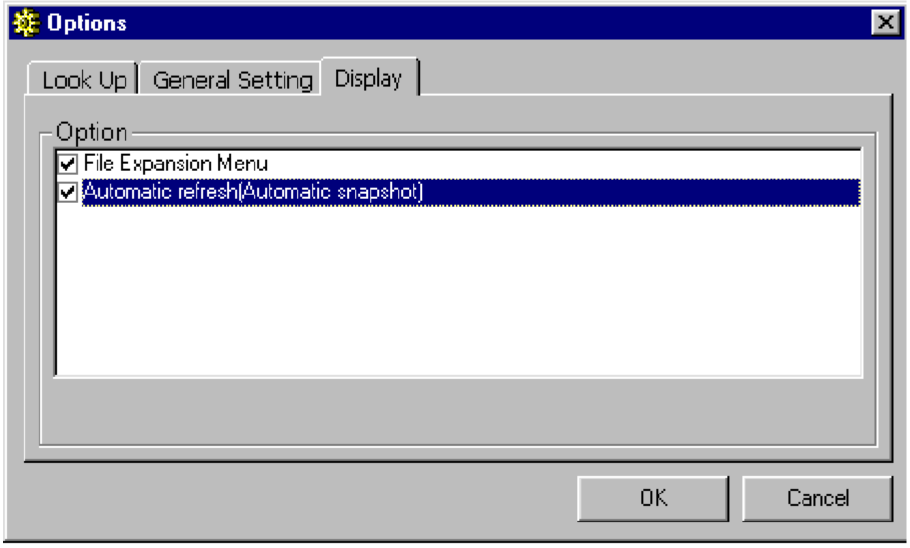
Set the display position with the processing screens (0 to 2) displayed on the Vision Monitor.
0: Center 1: Left 2: Right

(8) Search compatible mode

Set the kind of search models to be registered.
The search models are classified into two kinds: search mode that does not require angle measurement and the model that requires angle measurement. This setting allows you to choose the model kind for registration. If you select “1” or ”2”, the models that can be registered with one model number to limited to one kind; thereby, you can increase the number of models that you can register.
1: Model that does not require angle measurement
2: Model that requires angle measurement
3: Both

9.4.1.3 Display

Click the Display tab to set the display option between Show and Hide.
This display tab appears when the user level is higher than the programmer.



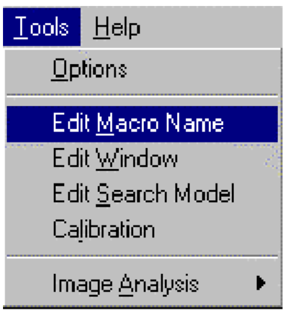
- File extension menu: Extends the File menu of Vision Manager. For details, refer to Chapter 9 “9.1.5 Menu List” in this manual.
- Auto Update: When you connect the Vision Manager to the Robot Controller (by selecting Connect from the Actions menu), the Vision Manager obtains information in the same way as you select Get Info from the Actions menu.

9.4.2 Edit Macro Name

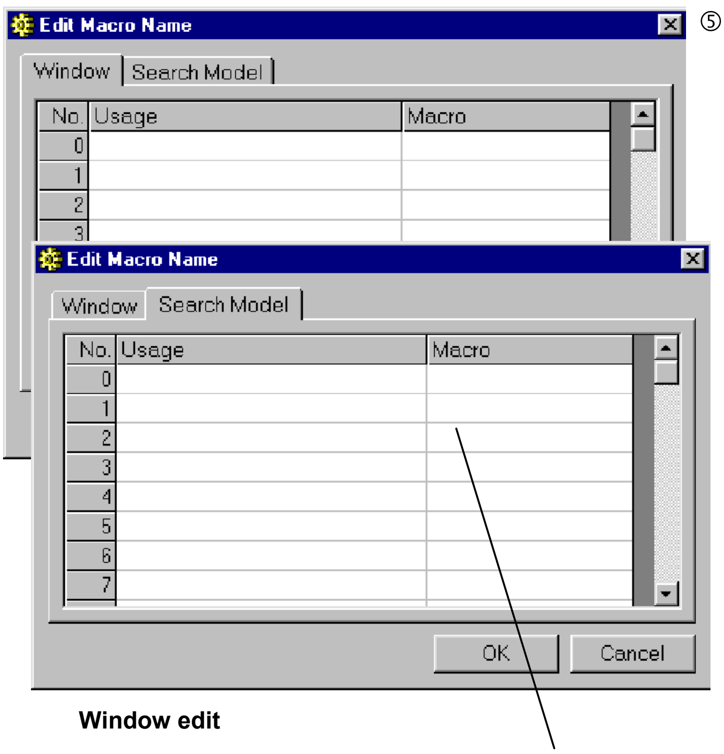
Edit window and search model macro names and usage. A Macro definition file is created from the input macro name, which can be used in the program.
Only single-byte characters can be used for macro names, as shown below. Using any other characters than these, the macro definition file will be created but it cannot be used in the program.

Characters that can be used for macro name

Single-byte alphabetic character	A to Z, a to z (The upper and lower cases are treated with the same.)
Single byte numerical character	0 to 9
Single-byte katakana	
Single-byte underline	-



① Click on TOOL in the menu bar.
The TOOL menu appears.
② Click on Edit Macro Name.
The Edit Macro Name window appears.
③ Double-click on cell (A) to be edited.
Characters already entered in the cell are displayed in reverse video. If the cell has no characters, the cursor appears.
④ Input character.
Input characters will then be input (inserted) in the position in the reversed character.
⑤ Click on **OK** to register the changed contents.
Click on **Cancel** to invalidate the changed contents.



Window edit

A

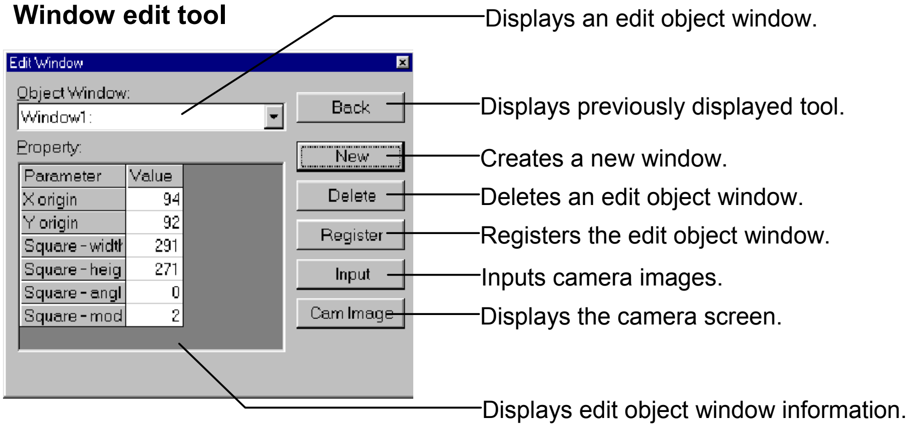
9.4.3 Edit Window

To edit the Robot Controller window settings, it is necessary to get the Robot Controller information on the personal computer, in advance. For the method of getting information, refer to Chapter 9 “9.3.1 Connect” and “9.3.2 Get Info” in this manual.

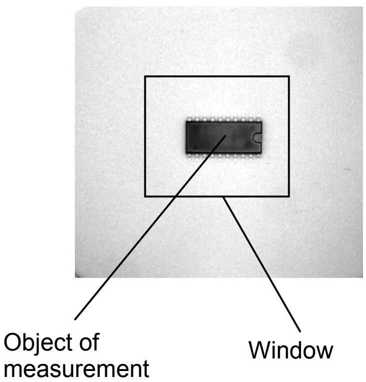
9.4.3.1 Window Editing Tool

Edit the window (register, delete, etc.).

Window edit tool



- Window -

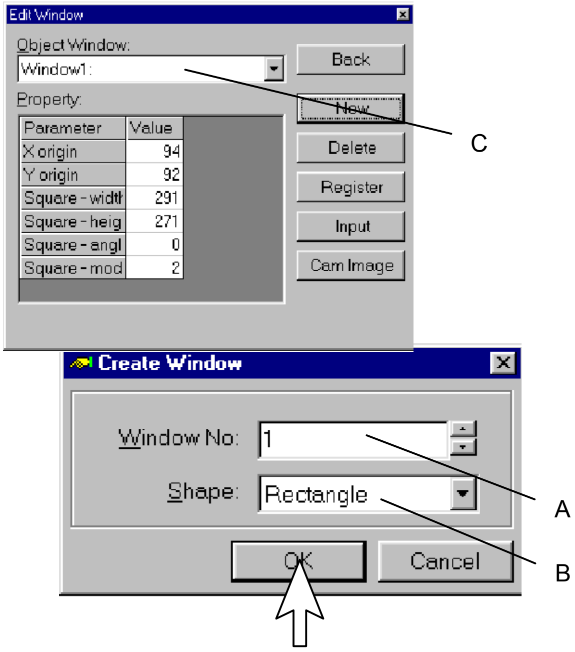


The μVision board sets the image processing range window area. The window size is stored on the μVision board by window number. There are two methods of editing the window; Vision Manager method and user program method. Window information edited by a user program is temporarily registered. It will be deleted upon turning off the power. Use care when using this method.

9.4.3.2 New

When newly registering a window, click on **New**. The Create Window appears in the window edit tool. To validate this window, you must register the window.

Window edit tool



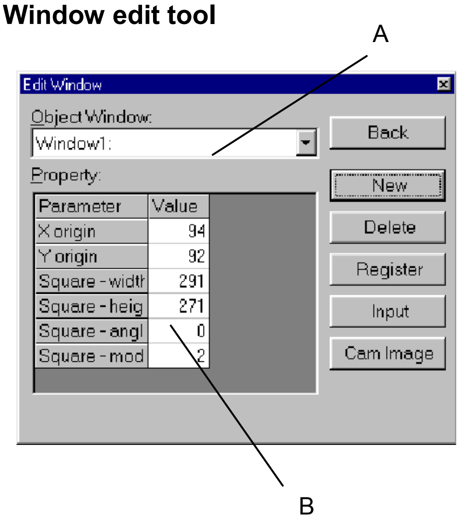
① Click  in the tool bar.
The Window edit tool appears.
② Click **New**.
The Create Window dialog box appears.
③ Set a window number.
(By default, an unused window number is automatically set.)
④ Set the window shape (B).
The example screen shows "Rectangle".
⑤ Click **OK**.
The default shape (rectangle) is displayed as the set value (C).
The window shape is displayed on the teaching panel.
If the Vision Manager is connected to the Controller, the window shape is displayed on the Vision Monitor.
To change the shape, refer to Chapter 9 "9.4.3.3 "Modify Windows" in this manual.
⑥ Click **Register**.
The set value (C) of the window edit tool is registered in the window.

9.4.3.3 Modify Windows

Edit the edit object window with the teaching panel. To validate the window after editing, you must register the window.

(1) Edit with the teaching panel

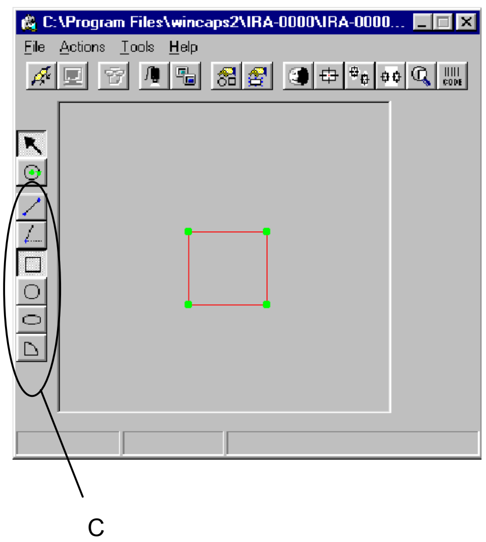
Window edit tool



① Click on [icon] in the tool bar.
The window edit tool appears.

② Select window (A) as the object to be changed.
The window shape in the edit object appears on the teaching panel.
If connected, the window shape appears on the Vision Monitor.

Teaching panel



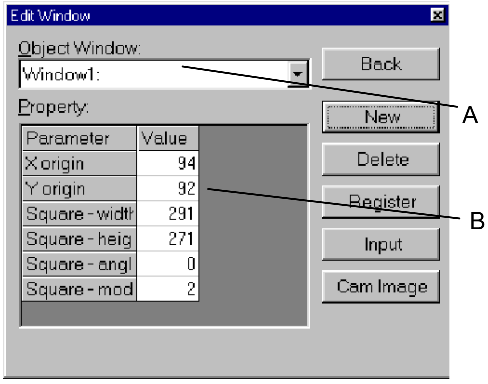
③ If the window shape requires changing to some other shape, click on the shape change button (C).
Shape after change appears on the set value (B).
The specified shape window appears on the teaching panel. If connected, the window shape appears on the Vision Monitor.

④ Drag the window displayed on the teaching panel with the mouse to adjust the window shape.
When the shape is changed, the new value appears as the window edit tool set value (B).

⑤ Click on Register in the window edit tool.
The set value (B) in the window edit tool is then registered to the window.

(2) Edit by numerical value input

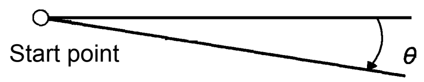
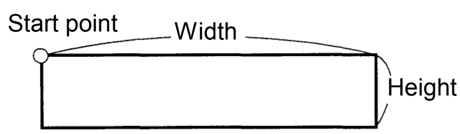
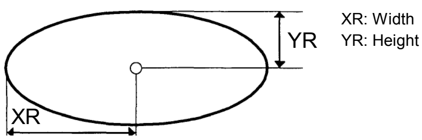
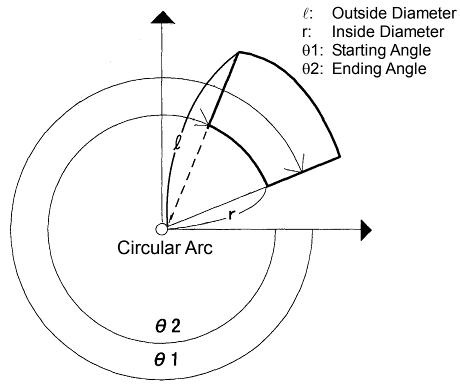
Window edit tool



① Click on in the tool bar.
The window edit tool appears.
② Select a window (A) to be edited.
③ Double-click on the cell (B) to change the set value.
Cell characters are displayed in reverse video.
④ When you enter a value, it replaces (or is inserted into) the reversed value.
⑤ Click on **Register** in the window edit tool.
The set value (B) in the window edit tool is registered to the window.

(3) Teaching window by key operation

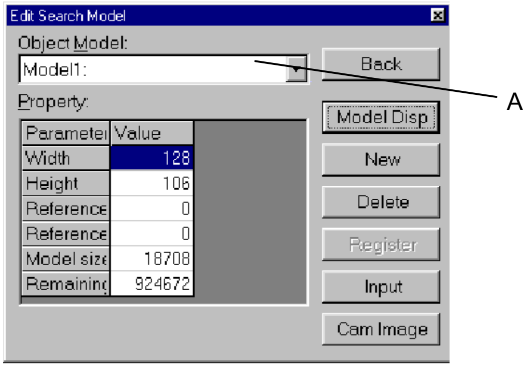
Using the teaching panel, the window shape can be fine-adjusted by carrying out the following key operations while editing the window shape.

<table>
<tr><th colspan="2">Window type</th><th rowspan="2">Illustration</th><th rowspan="2">Teaching method</th></tr>
<tr><th></th><th>Name</th></tr>
<tr><td rowspan="2">Straight line</td><td>WNDDPT</td><td>
</td><td>X Start Point Shift Left/Right [→][←]
Y Start Point Shift Up/Down [↑][↓]
X End Point Shift Left/Right [W][S]
Y End Point Shift Up/Down [H][L]</td></tr>
<tr><td>WNDALN</td><td>
</td><td>X Start Point Shift Left/Right [→][←]
Y Start Point Up/Down [↑][↓]
Length Extend/Reduce [W][S]
Angle Increase/Decrease [B][C]</td></tr>
<tr><td>Rectangle</td><td>WNDRCT</td><td>
</td><td>X Start Point Shift Left/Right [→][←]
Y Start Point Shift Up/Down [↑][↓]
Width Increase/Decrease [W][S]
Height Increase/Decrease [H][L]</td></tr>
<tr><td>Perimeter</td><td>WNDCIR</td><td>
</td><td>X Center Shift Left/Right [→][←]
Y Center Shift Up/Down [↑][↓]
Radius Increase/Decrease [W][S]</td></tr>
<tr><td>Elliptic perimeter</td><td>WNDELP</td><td>
</td><td>X Center Shift Left/Right [→][←]
Y Center Shift Up/Down [↑][↓]
Width Increase/Decrease [W][S]
Height Increase/Decrease [H][L]</td></tr>
<tr><td>Circular arc</td><td>WNDSCT</td><td>
</td><td>X Center Shift Left/Right [→][←]
Y Center Shift Up/Down [↑][↓]
Inside Diameter Increase/Decrease [W][S]
Outside Diameter Increase/Decrease [H][L]
Starting Angle Increase/Decrease [B][C]
Ending Angle Increase/Decrease [M][N]</td></tr>
</table>

9.4.3.4 Delete Window

Delete a window selected for editing.

Window edit tool

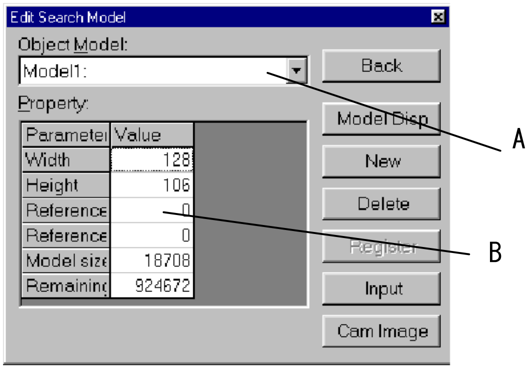


① Click on in the tool bar.
The window edit tool appears.
② Select the window to be deleted in the cell (A).
③ Click on **Delete**.
The selected window is deleted.

9.4.3.5 Register Window

Register a window selected for editing.

Window edit tool

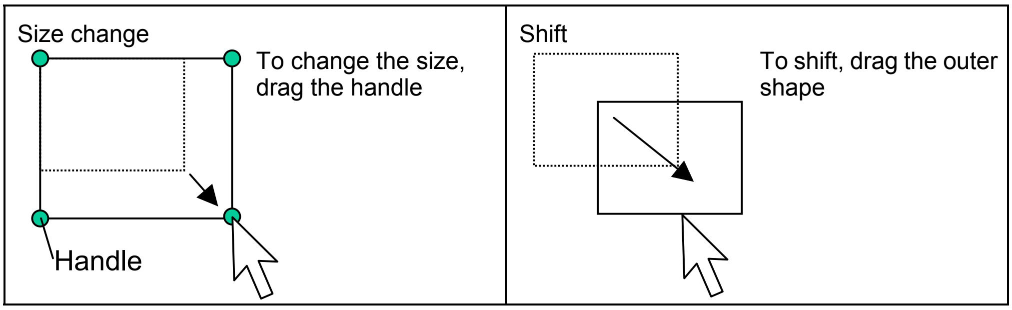


① Click on in the tool bar.
The window edit tool appears.
② Select the window to be registered in the cell (A).
③ Edit the window set values (B).
④ Click on **Register.**
The windows set value (B) is registered to the window.

9.4.3.6 Editing Windows with Teaching Panel

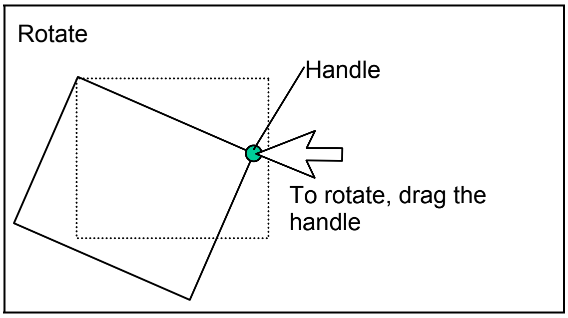
(1) Window size change and shift

To change the window size or shift the window, click on Change-shaft in the shape edit tool bar.



(2) Window rotation

To rotate, click on (Rotate) in the shape edit tool bar.

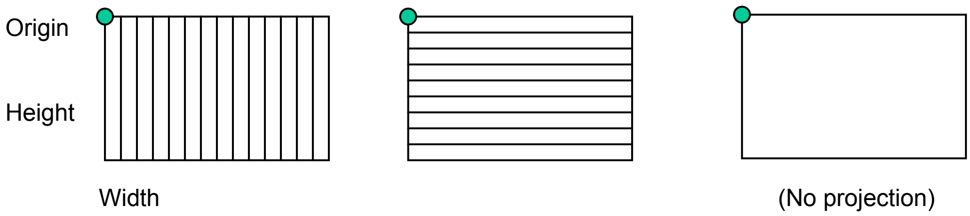


9.4.3.7 Projection Window

For window shape parts (rectangle and sector), it is necessary to set the mode. The mode is a parameter for specifying the window projection shape. It is quite important when measuring the edge. For measuring shapes, other than the edge, it is necessary to set the mode = 2 (all projection). When a window is newly created or a window shape is changed, it is set to mode = 2.
Set the mode parameter according to the purpose.

(1) Rectangle window

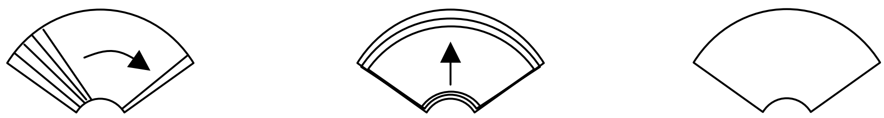
Mode = 0 (X-axis projection) | Mode = 1 (Y-axis projection) | Mode = 2 (total)



(No projection)

(2) Sector window

Mode = 0 (projection in meridian direction) | Mode = 1 (projection in perimeter direction) | Mode = 2 (total)



(No projection)

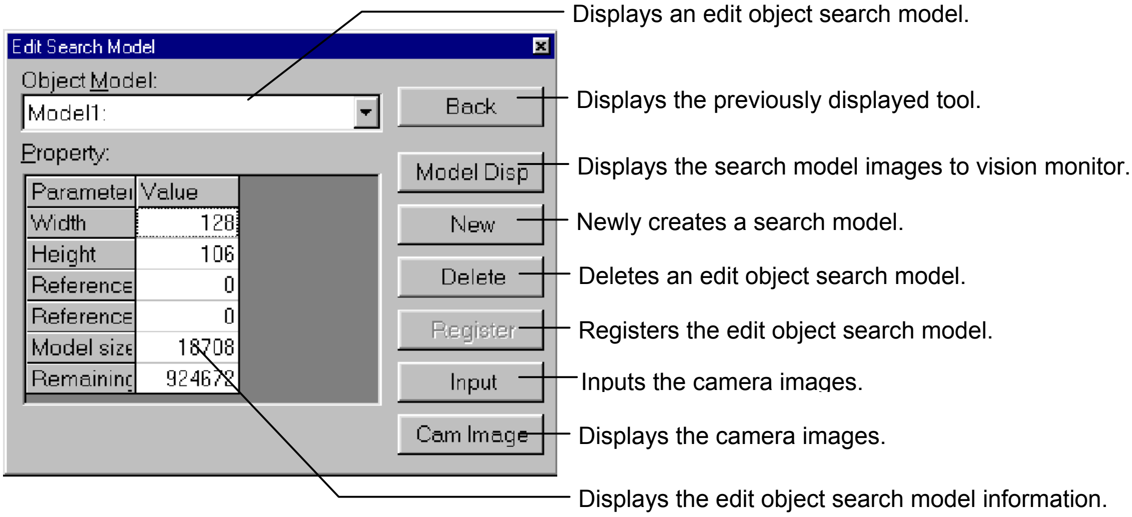
9.4.4 Edit Search Model

To edit a search model in the Robot Controller, it is necessary to get the Robot Controller information on the personal computer, in advance. For the method of getting information, refer to Chapter 9 “9.3.2 Get Info” in this manual.

9.4.4.1 Search Model Edit Tool

Edit (register, delete, etc.) the search model. Editing of a search model is possible only when the Vision Manager is connected to the Robot Controller with a built-in vision board.

Search model edit tool



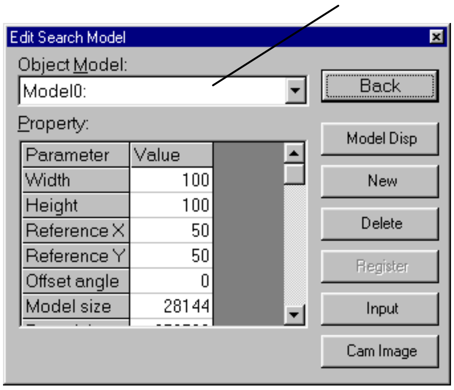
Note: If the Robot Controller is not capable of angle measurement, you cannot set any data at Offset Angle.

9.4.4.2 Search Model Reference

Display the search model image registered to the vision board on the Vision Monitor.

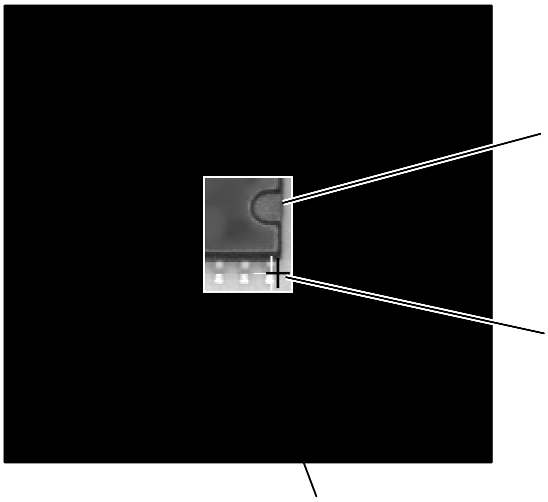
Search model edit tool

A



① Click on  in the tool bar.
The Edit Search Model window appears.
② Select a search model to be referenced in the cell (A).
③ Click on Model Disp.
The search model image appears on the Vision Monitor.

Display to the vision monitor



Search model image

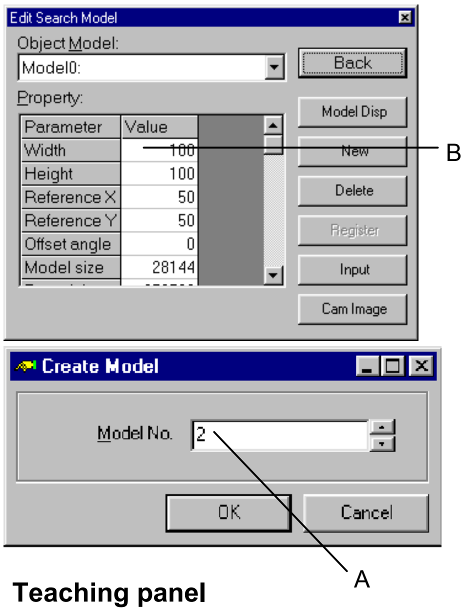
Reference position

Monitor display frame

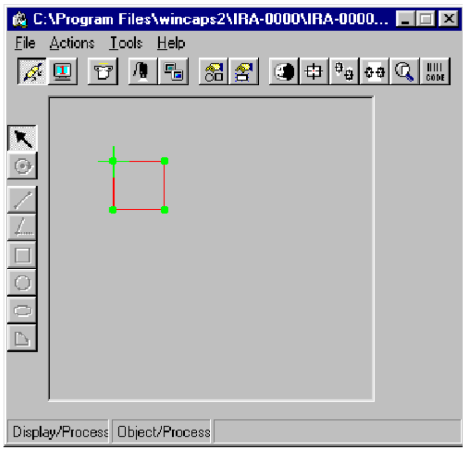
9.4.4.3 New

Use the **New** command to register a search model. When the search model is newly created, the search model edit tool shows the range of images to be registered to the vision board. To register the search model image to the vision board, a registration process is required.

Search model edit tool



Teaching panel



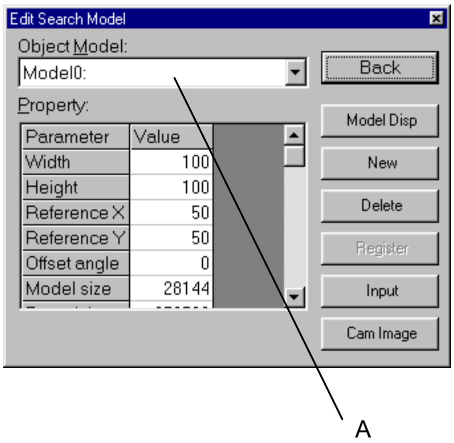
① Click on [icon] in the tool bar.
The search model edit tool appears.
② Click on **New**.
The Create model dialog box appears.
③ Set the search model number (A).
(By default, an unused search model number is automatically set.)
④ Click on **OK.**
Default search model data appears as the set values (B).
The search model shape appears on the teaching panel.
The shape also appears on the vision monitor if the Vision Manager is connected with the Robot Controller.

⑤ Drag the search model shape displayed on the teaching model with the mouse to adjust it.
When the shape is changed, the value appears as the search model edit tool set value (B).
When changing the shape, refer to Chapter 9 “9.4.4.5 Editing Search Model with Teaching Panel” in this manual.
⑥ Click on **Register**.
Register the image, in the range specified with set value (B), in the search model edit tool, to the vision board.

9.4.4.4 Delete Search Model

Delete the edit object search model.

Search model edit tool



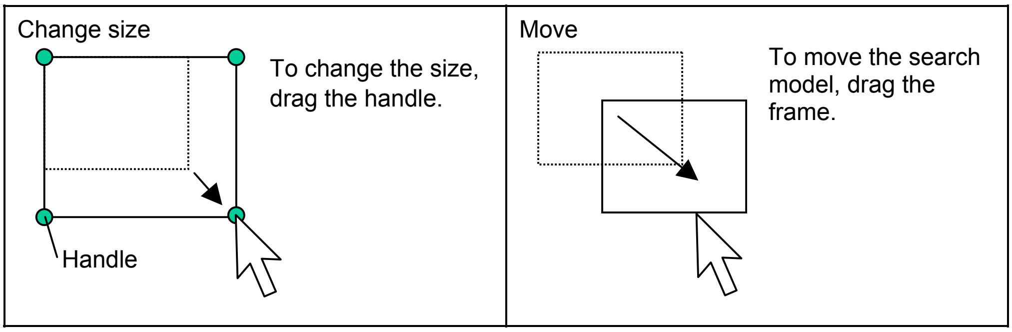
① Click on in the tool bar.
The Edit Search Model window appears.

② Select the search model to be deleted in the cell (A).

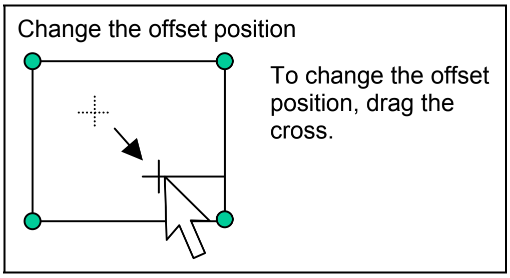
③ Click on **Delete**.
The selected search model is deleted.

9.4.4.5 Editing Search Model with Teaching Panel

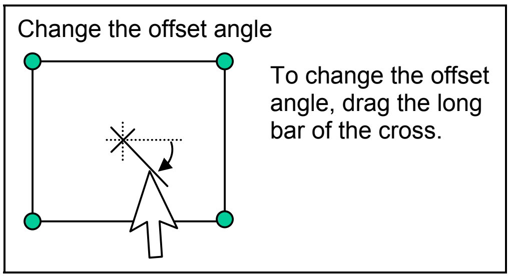
(1) Changing size and moving the search model



(2) Changing the offset position

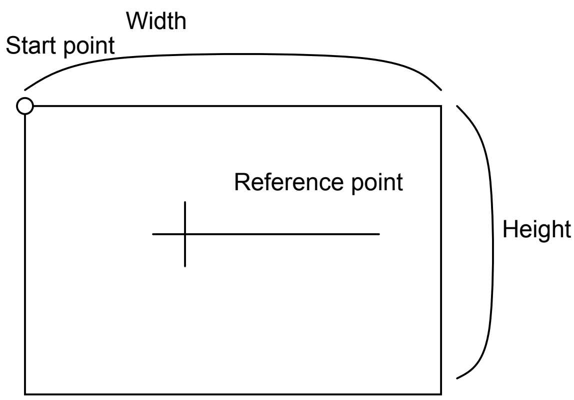


(3) Changing the offset angle



(4) Search Model Teaching by Key Operation

When editing the search Model shape with the teaching panel, the search Model shape can be fine adjusted with the following key operation:

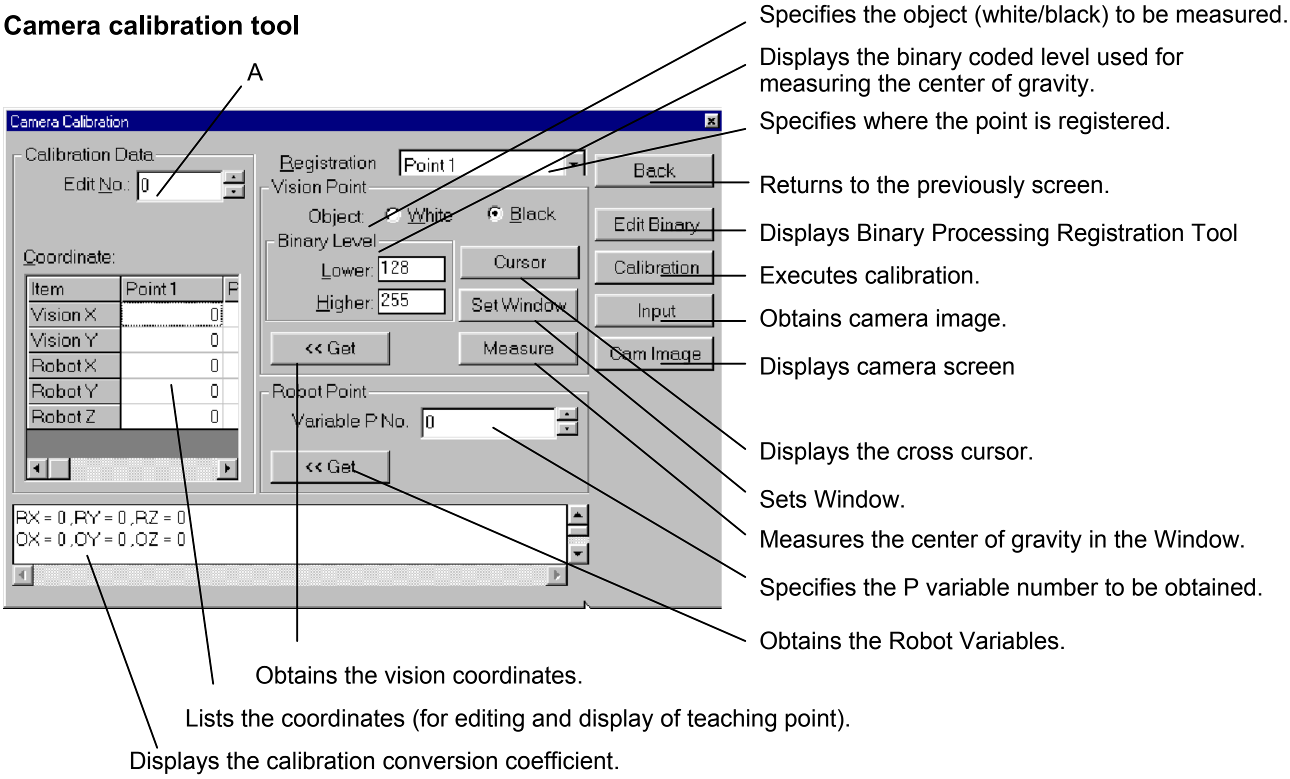


X Start Point Left/Right	[←][→]
Y Start Point Up/Down	[↑][↓]
Width Increase/Decrease	[W][S]
Height Increase/Decrease	[H][L]
X Offset Left/Right	[B][C]
Y Offset Up/Down	[M][N]
Offset Angle Increase/ Decrease	[I][D]

9.4.5 Calibration

9.4.5.1 Camera Calibration Tool

Camera calibration tool



9.4.5.2 Camera Calibration Procedure

The camera calibration tool calculates the coordinate conversion coefficients from the robot coordinate values, corresponding to the coordinate values of the three points of vision.
The camera calibration tool manages 32 different sets of camera calibration data (edit No. 0 to 31) and calculates the coordinate conversion coefficients, according to the procedure described later. The vision coordinates, robot coordinates, and coordinate conversion coefficients are registered with the calibration number specified in the edit number (A).
Camera calibration is as follows:

Positioning at 3 places	
⇩	
Specifying calibration No.	In the Edit No. grid (A)
⇩	
Entering vision coordinates	Refer to “9.4.5.3 Entering Vision Coordinates”.
⇩	
Entering robot coordinates	Refer to “9.4.5.4 Entering Robot Coordinates”.
⇩	
Calculating coordinate conversion coefficients	Refer to “9.4.5.5 Executing Camera Calibration”.

9.4.5.3 Entering Vision Coordinates

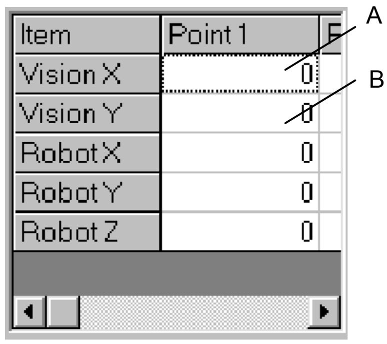
There are the following three methods for entering vision coordinates:

(1) Numerical Input Method
(2) Cursor Input Method. This method is a method of marking while checking the images on the vision monitor screen (cursor)
(3) Measurement Input Method. This method uses the center of gravity data, in the image, as the input value by using the image analysis function

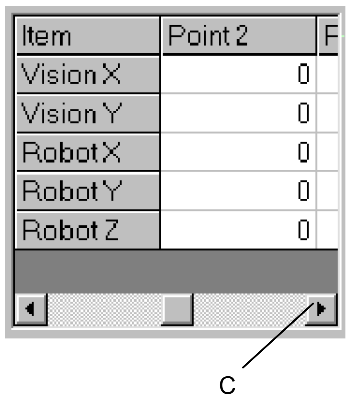
The following are the procedures of the above methods.

The points refer to the three points for calibration. Coordinates in the three points, of the vision and the robot coordinates, can be correlated with each other by point number.

(1) Input of numerals



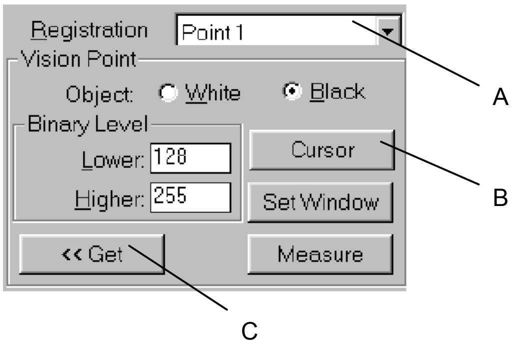
① Double-click on cell (A) to input the vision X coordinates.
The cursor appears in the cell.
② After entering the numeral, it is input (inserted) to the cursor position.
③ Pressing the Enter key registers the numeral.
④ Input the vision coordinates in cell (B) for the vision Y coordinates, using the same steps as above.



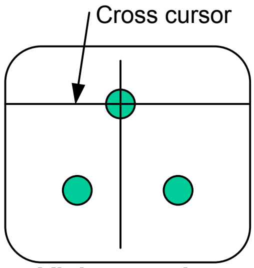
⑤ Click on (C) in the scroll bar.
The 2 point cells appear.
⑥ Hereafter, input the vision coordinates (X, Y) for points 2 and 3, using the same steps as above.

(2) Cursor input

You can enter the vision coordinates while observing the camera images using the cross cursor.

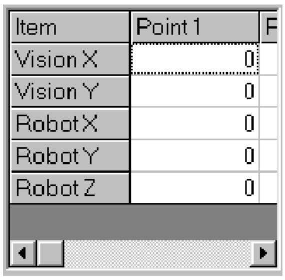


① Enter the camera images to the processing screen.
② Display the processing screen with the camera image on the vision monitor.
③ Select Point 1 at Registration (A) where the coordinates are to be entered.
④ Click on **Cursor**.
The cross cursor appears on the teaching panel and on the vision monitor.
⑤ Move the cross cursor by dragging or key operation. Set the cursor to the target coordinates.
⑥ Click on **Get** (C).
The cross cursor coordinates are entered in the vision coordinates of Point 1 set at Registration (A) (and displayed in the coordinate list).
⑦ Enter the coordinates of Points 2 and 3 in the same procedure.



Vision monitor

List of coordinates



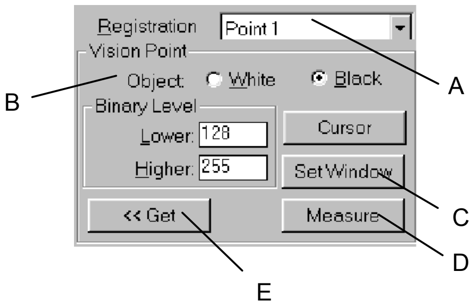
Item	Point 1	P
Vision X	0	
Vision Y	0	
Robot X	0	
Robot Y	0	
Robot Z	0	

Key operation of cross cursor

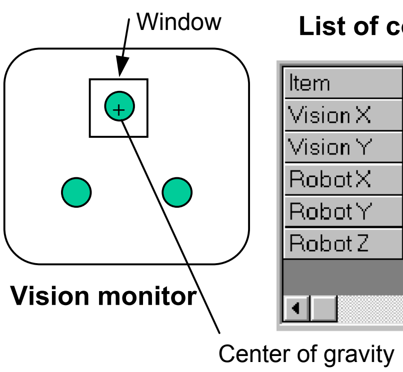
[←] [→] Cross cursor shift left/right
[↑] [↓] Cross cursor shift up/down

(3) Measurement input

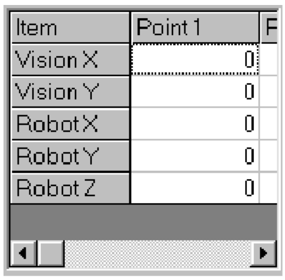
Center of gravity can be obtained from the camera image, through image analysis, and entered as the vision coordinates.



① Enter the camera images to the processing screen.
② Display the processing screen with the camera image on the vision monitor.
③ Select Point 1 at Registration (A) where the coordinates are to be entered.
④ Set object (B).
⑤ Click on **Set Window**.
A window appears on the teaching panel.
A window appears on the vision monitor.
⑥ Shift or adjust the window position by dragging or key operation.
⑦ Click on **Measure**.
The Vision Manager measures the center of gravity in the window and displays its position on the vision monitor.
⑧ Click on **Get** (E).
Measured center of gravity coordinates are entered in the vision coordinates of Point 1 set at Registration (A) (and displayed in the coordinate list).
⑨ Enter the coordinates of Points 2 and 3 in the same procedure.



List of coordinates



Item	Point 1
Vision X	0
Vision Y	0
Robot X	0
Robot Y	0
Robot Z	0

Window teaching by key operation

[←] [→]	Window shift left-right
[↑] [↓]	Window shift up-down
[W] [S]	Window width increase-decrease
[H] [L]	Window height increase-decrease

9.4.5.4 Entering Robot Coordinates

Input the robot coordinates with either of the following two methods:

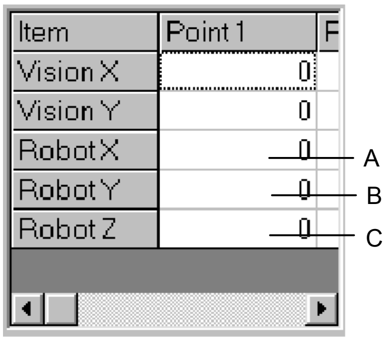
(1) Input numerals directly

(2) Use the coordinates stored in the P variables of the robot, as the input values.

The following are the procedures of the above methods.

Note: Always input the robot coordinates at a position corresponding with the input point number of the vision coordinates.

(1) Numeral input

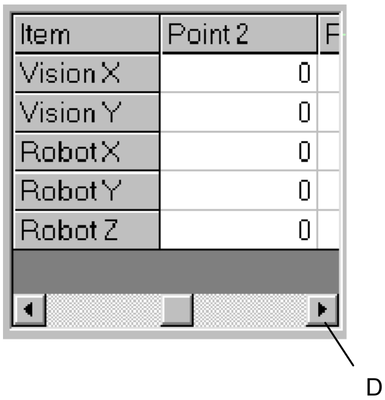


① Double-click on the cell (A) of the robot X coordinates.
The cursor appears in the cell.

② When entered, a value is inserted at the cursor position.

③ Press the Enter key to register the entered value.

④ Enter the robot Y coordinates (B) and robot Z coordinates in the same procedure.

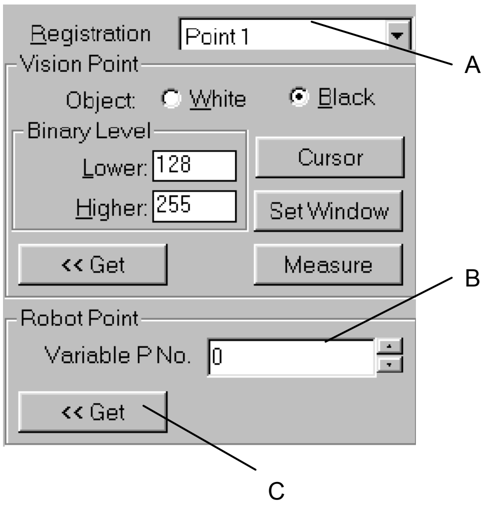


⑤ Click on the scroll bar (D).
The Point 2 cell appears.

⑥ Enter the robot coordinates (X, Y, and Z) of Points 2 and 3 in the same procedure.

(2) Variable input

Coordinates stored by the P variables of a robot can be used as the input values.



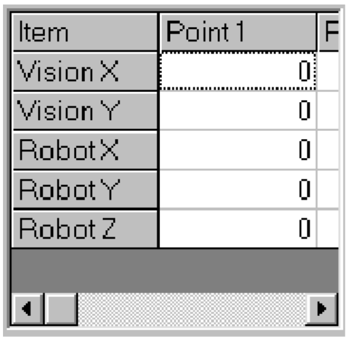
① Select Point 1 at Registration (A) where the coordinates are entered.

② Specify the P variable number where the point coordinates are stored at Variable P No. (B).

③ Click on **Get** (C).
The robot variable coordinates are entered in the robot coordinates of Point 1 set at Registration (A) (and displayed in the coordinate list).

④ Enter the robot coordinates (X, Y, and Z) of Points 2 and 3 in the same procedure.

Coordinate List



Item	Point 1
Vision X	0
Vision Y	0
Robot X	0
Robot Y	0
Robot Z	0

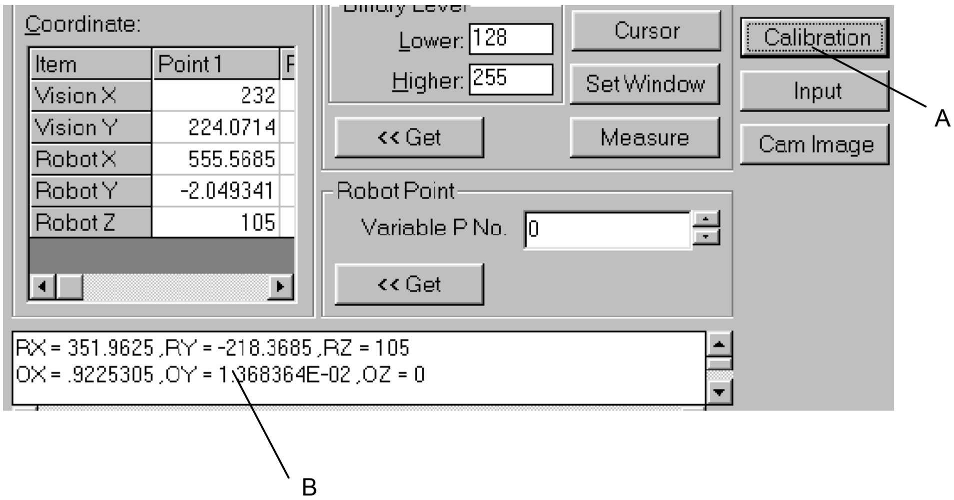
Note: When entering variables, connect the Variable Manager to the Robot Controller. The personal computer can get the robot variables via the Variable Manager. If the Manager is not connected, the computer cannot get the current robot position.

9.4.5.5 Executing Camera Calibration

When you execute camera calibration, the Vision Manager calculates the coordinate conversion coefficients from the entered vision coordinates and the robot coordinates. Then, the Manager stores the calculation results in the file specified on the personal computer. To register the calibration data to the Controller, you need to transmit the data to the Controller from the personal computer.

When the calibration data is transmitted to the Controller, only the coordinate conversion coefficients are registered to the Controller. You can convert the vision coordinates of user program into robot coordinates using the coordinate conversion library.

The coordinate conversion library converts the coordinates using the coordinate conversion coefficients registered in the Controller.



① Click on **Calibration** (A).
Coordinate conversion coefficients are calculated and displayed in B.
The coordinate conversion coefficients are saved in a set file on the personal computer.

② Transmit the calibration data to the Robot Controller from the personal computer.
For the transmit method, refer to Chapter 9 “9.2.5 Transfer” in this manual.
When calibration data is transmitted, all the data is transmitted in a batch. When executing calibration at several points, execute calibration of all the points, and then transmit the data to the Robot Controller.

Notes ①:	**If the error message “Improper coordinate data” appear during calibration, check the coordinates of all the points and enter them again.**
②:	**If you change the coordinates, always press the calibration button to recalculate the coordinate conversion coefficients.**

9.4.6 Image Analysis

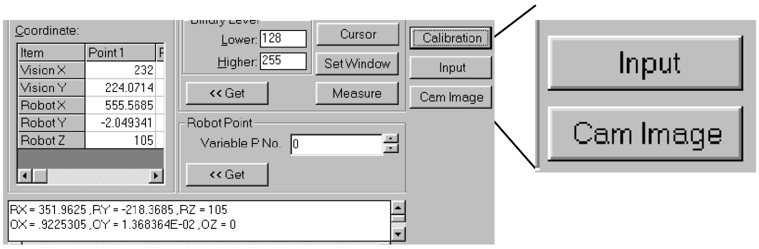
9.4.6.1 Image Analysis Tool in General

[1] Common Button Functions

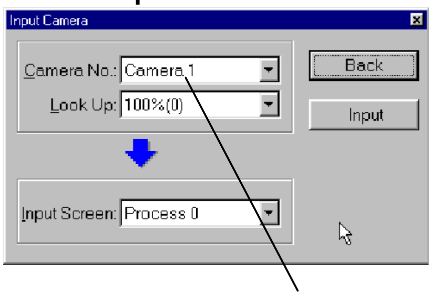
Buttons shared by each tool are arranged in the image analysis tool. The shared buttons include **Input** and **Cam Image**.

Click on **Input,** and the Vision Manager enters the camera images to the processing screen under the condition set using the camera input tool. The Manager displays the obtained image data of the processing screen on the vision monitor. The same result can be achieved by clicking on **Input** in the camera input tool.

Click on **Cam Image** to display the image of the camera number set in the camera input tool on the vision monitor.



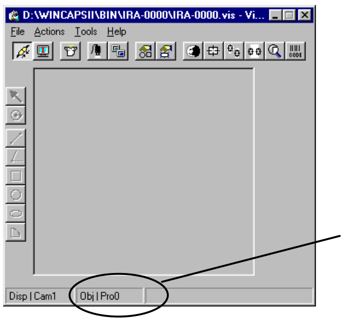
Camera input tool



Camera number

[2] Object of Image Analysis

Main window



Status

The image analysis tool analyzes the image data stored on the processing screen. At this time, the analysis tool measures the processing screen indicated at the status of the main window. By entering camera images with the camera input tool (**Input**), the processing screen to which image data is entered is selected as an object to be processed. When the processing screen appears with the image display tool, the displayed processing screen becomes the object for processing.

[3] Process Time

The image analysis tool displays the processing time required for measurement in terms of milliseconds. However, since the minimum intervals of measurement for processing time is 10 (milliseconds), time under 10 (milliseconds) cannot be correctly displayed. For example, if actual processing time is 35 milliseconds, the image analysis tool displays the time as 30 (milliseconds). Moreover, if the processing time displayed on the image analysis tool reads 0 (millisecond), the actual processing time would be 0 to 10 (milliseconds) or less.

[4] Measuring Result

To display the measurement data, bring focus to an object in the list of measurement result of each window.

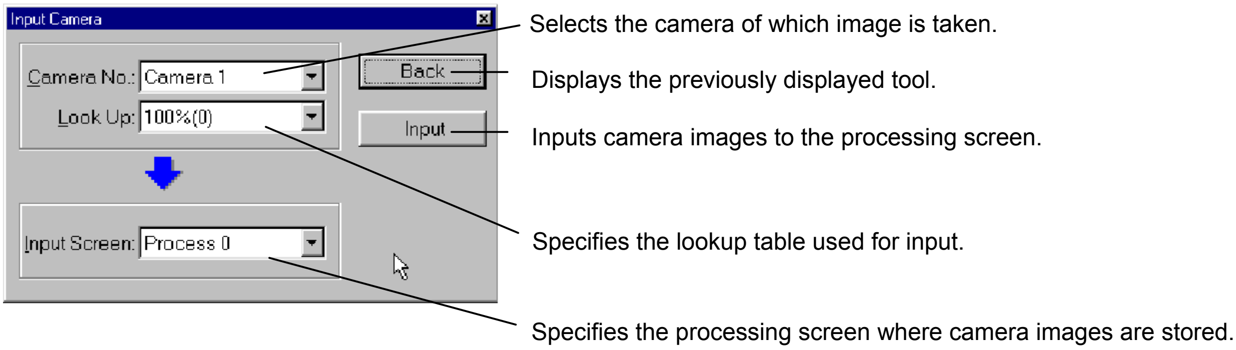
> **Note: When you execute image analysis, the screen mode (such as character size) of the μVision board changes. Therefore, when you run a user program after image analysis, you may obtain unexpected results. In this case, make corrections by setting the necessary points in the user program.**

9.4.6.2 Camera Input

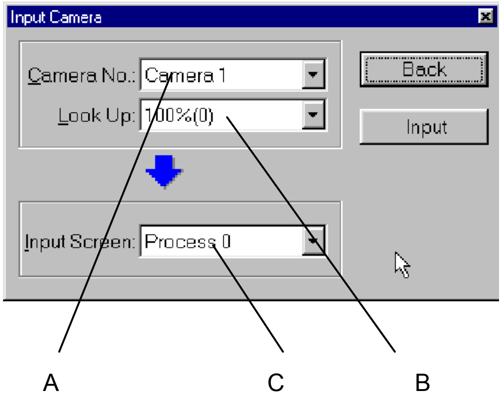
[1] Camera Input Tool

This tool inputs images from the camera to the processing screen.

Camera input tool



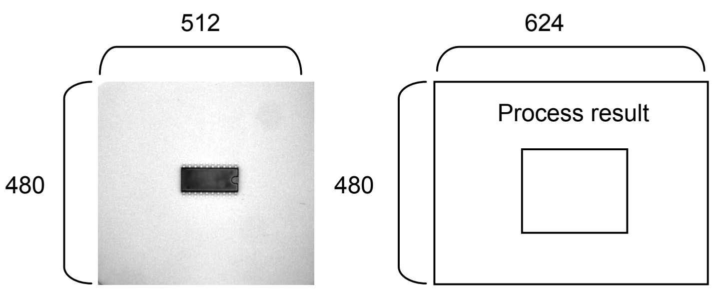
[2] Input Video Image



① Click on in the tool bar.
The camera input tool appears.
② Select the camera number (A) from which image data is taken.
③ Select the look up table used for display in the cell (B).
④ Select the input screen (C) to store the camera images on.
⑤ Click on INPUT.
The camera images are input to the processing screen.

- Pixel -

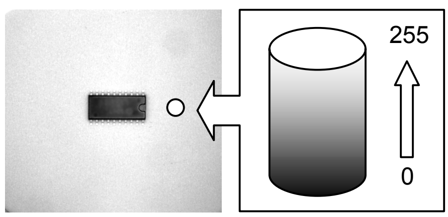
The μVision board internally handles image data as a group of individual points, one of which is called pixel.
The μVision board handles 512 x 480 pixels (lengthwise x widthwise) in the storage memory (processing screen), and 624 x 480 pixels (lengthwise x widthwise) in the dedicated drawing memory (drawing screen).



Processing screen Drawing screen

- Brightness -

Each pixel of image data processed by the μVision board has a value (0 to 255) that represents brightness (in 256 steps). This value is called brightness.
As the number gets close to “0”, the pixel becomes darker. As it gets closer to 255, the pixel becomes brighter.



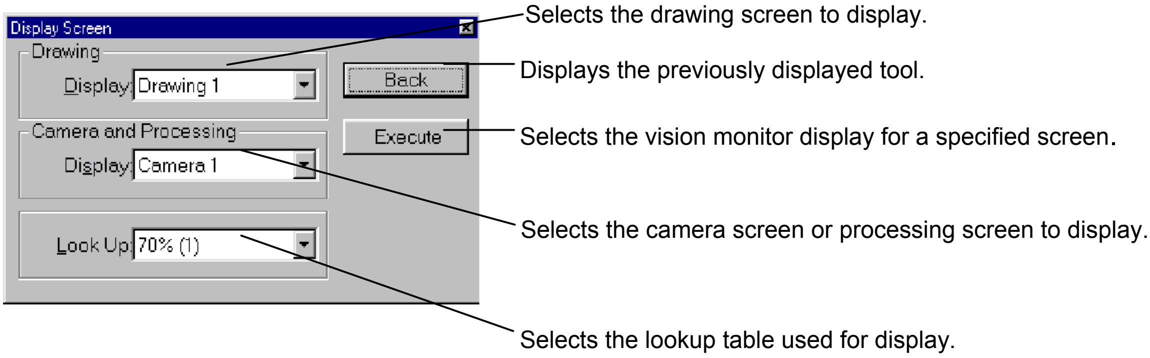
Processing screen

9.4.6.3 Selecting Display Screen

[1] Display Screen Tool

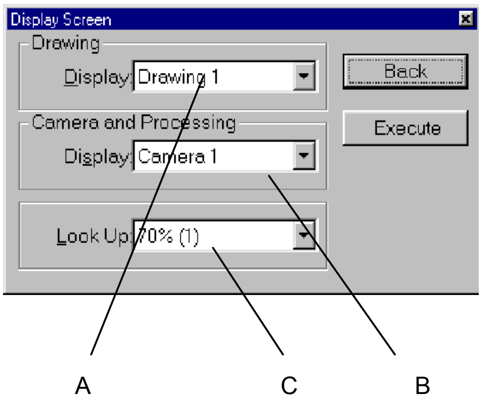
Select a screen (camera, processing screen and drawing screen) to be display on the vision monitor.

Display screen tool



[2] Selecting Vision Monitor Display

Display screen tool



① Click on in the tool bar.
   The display screen tool appears.
② Select the drawing screen as the screen to be displayed on the display screen (A).
③ Select the camera screen or processing screen to display with the display screen (B).
④ Select the lookup (C) table used for display.
⑤ Click on **Execute**.
   Select the vision monitor display for a specific screen.

> **Note: After image analysis, the Vision Manager automatically changes the display screen setting (A) on the display screen tool so that drawing screen 1 will appear, where measurement result is drawn. If the current setting is Drawing 0, the setting will be changed to Drawing 0+1 after image analysis.**

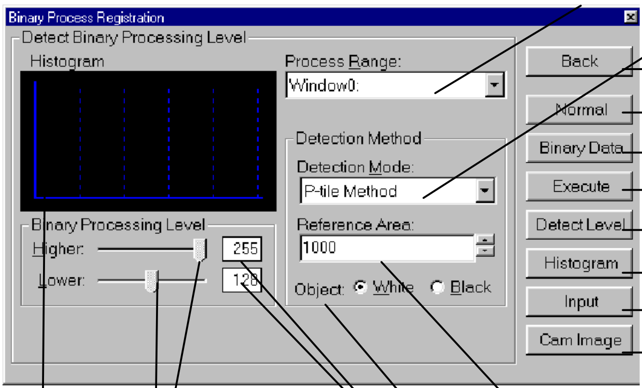
9.4.6.4 Binary-coded Registration

[1] Binary-coded Registration Tool

Register the binary-coded level with the image analysis tool.
The detection method for the binary-coded level includes manual and automatic methods (mode method, discriminant analysis method and P tile method).
Optimal condition can be verified by using the binary-coded register tool.

Binary-coded register tool

Selects a window that specifies the range of processing.



Selects the select mode for binary-coded level.
Displays the previously displayed tool.
Changes the vision monitor display to the normal display.
Changes the vision monitor display to binary-coded display.
Binary-codes the currently displayed processing screen.
Detects the binary-coded level if detection mode is set to auto.
Displays a histogram.
Inputs camera images.
Displays the camera screen.

Specifies the reference area to be used by P tile method.
Specifies the measuring object of an area to be used by P tile method.
Specifies binary-coded level.

Specifies binary-coded level manually.

Displays the histogram.

- Binary-coding -

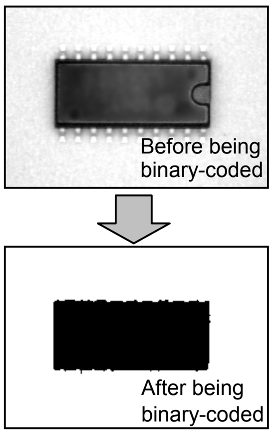


Image data input from the camera to the μVision board has 256 gradations of brightness per pixel.
Binary-coding refers to rewriting the brightness of each pixel into white or black, based on a threshold borderline value.
Such threshold value is called the binary-coded level. The μVision board specifies the binary-coded level with two binary limits, the lower and upper limits.
Values greater than the lower binary limit and to the upper binary limit are binary-coded as white (1) and other values

Note: Only the oblong window can be selected for processing (angle = 0).

- Histogram -

Here, histogram refers to the counting of the frequency of appearance of brightness values, for a range specified by the window of the image data input from the camera. When graphically displayed, the histogram provides ease of understanding the distribution state of brightness, which makes it easier to determine the binary-coded level, when image data is being binary-coded. Moreover, the μVision board provides a function for automatically determining the binary-coded level. This function determines the binary-coded level by using the histogram.
Figure 1 shows the histogram of image data before it is binary-coded, showing that the object and background are separated into two portions. Figure 2 shows the result of binary-coding, on the different binary-coded level, the lower limit (lower limit of binary) and the upper limit (upper limit of binary) are adjusted to produce different binary-coding results.

Fig. 1

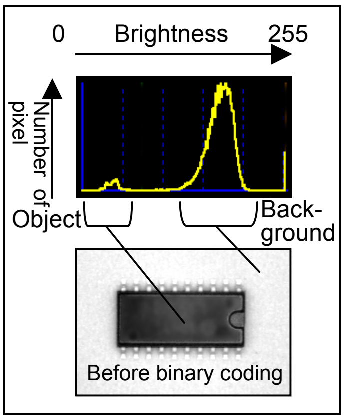
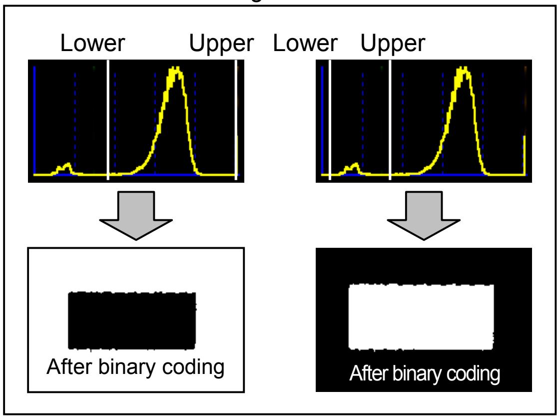


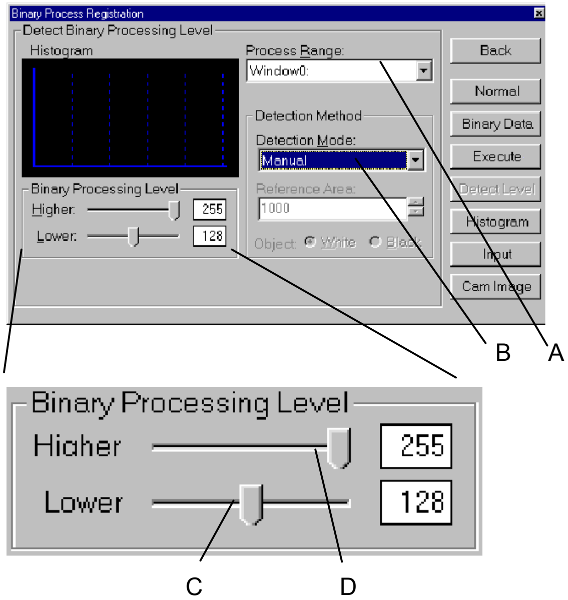
Fig. 2



[2] Binary-coded Level Registration

(1) Manual

Binary process registration tool



① Click on [icon] in the tool bar.
The binary process registration tool appears.

② Select a window for measuring the histogram with process range (A).

③ Set the detection mode (B) to Manual.

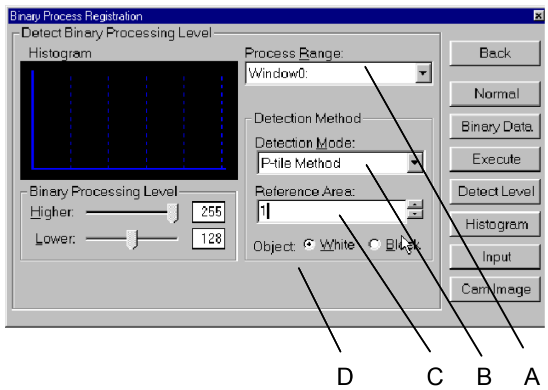
④ Click on **Histogram**.
The histogram appears.

⑤ Drag the slider (C) and set the lower limit of binary-coding level.

⑥ Drag the slider (D) and set the upper limit of binary-coding level.
Sliders (C and D) can be dragged (changed) only when the detection mode (B) is set to Manual.

(2) Automatic

Binary process registration tool



① Click on [icon] in the tool bar.
The binary -coded register tool appears.

② Select a window for measuring the histogram with the process range (A).

③ Set the detection mode (B) to automatic mode (mode method, discriminant analysis method, and P tile method). If you are using a method other than the P tile method of detection, this is the end of the procedure.

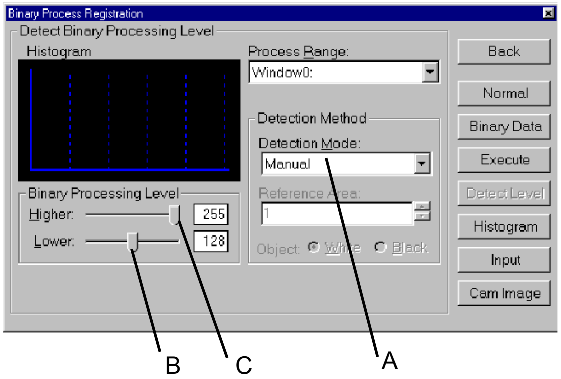
④ Specify the reference area (C) used for the P tile method.

⑤ Specify the object (D) of the area to measure with the P tile method.

[3] Selecting Display

The binary-coded register tool can display the camera screen and the process screen currently displayed on the vision monitor in a binary-coded format.
In binary-coded display, it is possible to check the binary-coded results without having the actual data binary-coded.

Binary process registration tool

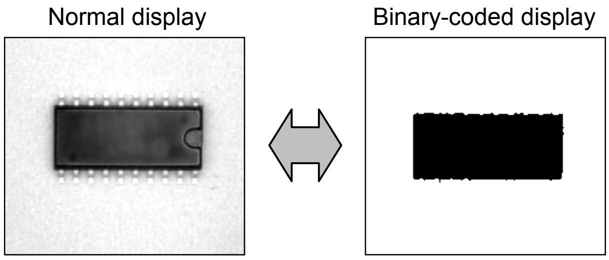


① Click on [icon] in the tool bar.
The binary process registration tool appears.

② Click on **Binary Data**.
The Vision Monitor display changes to binary code.
Set detection mode (A) to Manual and change the binary-coded level by dragging sliders (B and C). Then the display of vision monitor is updated with the binary-coded level after the change.

③ Click on **Normal**. The vision monitor returns to normal display.

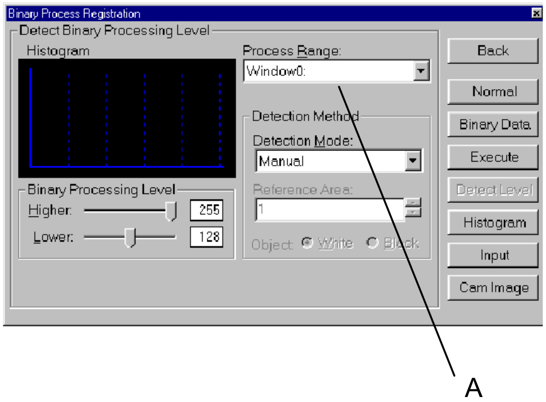
- Result of display selection -



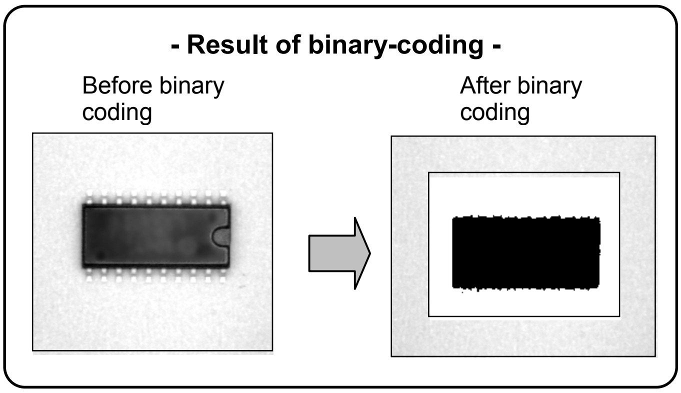
[4] Binary Process Registration Screen

Converts the specified range of the currently displayed processing screen to the binary codes.

Binary process registration tool



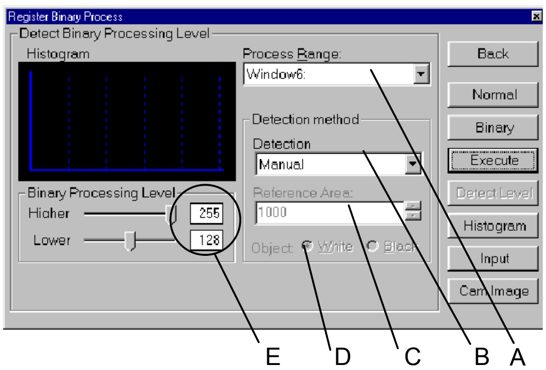
① Display the processing screen to be binary-coded on the vision monitor by using the monitor display.
② Click on [icon] in the tool bar.
The Binary Process Registration window appears.
③ Select a window for specifying the binary-coding range at Process Range (A).
④ Click on **Execute**.
The specified range of the processing screen is binary-coded.



[5] Detecting Binary-coded Level

Automatically detect the binary-coded level of the processing screen currently on display.

Binary process registration tool



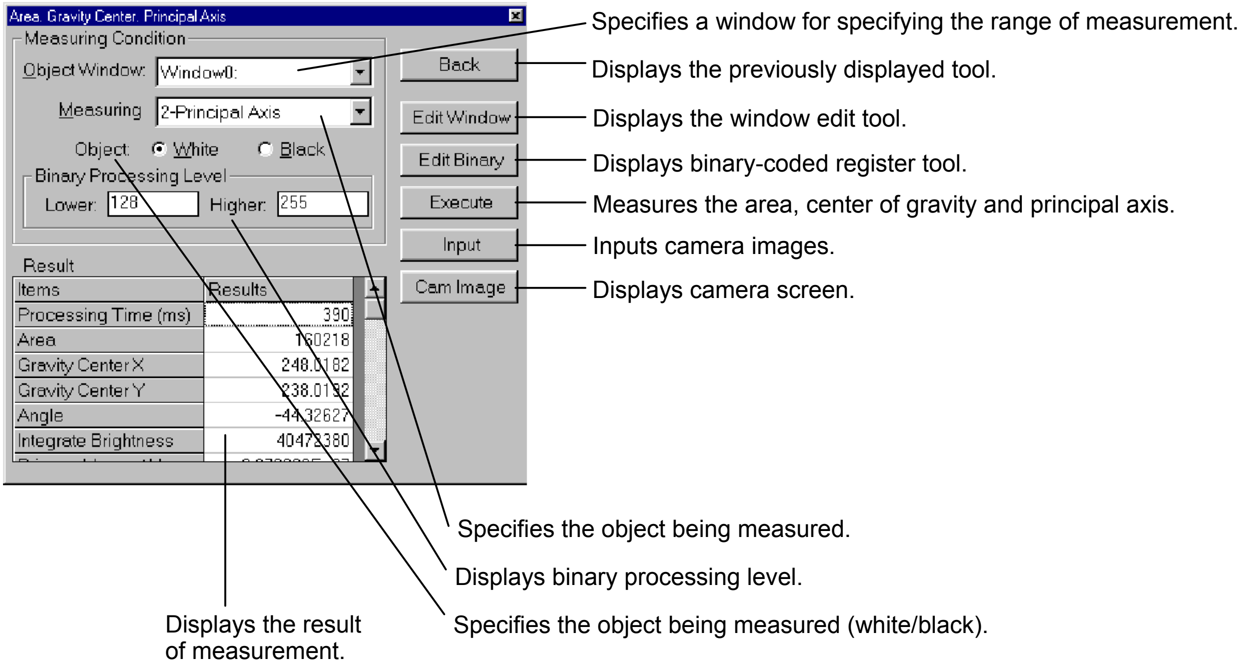
① Display a processing screen where you want to detect the binary-coded level using the monitor display tool.
② Click on [icon] in the tool bar.
The Binary Process Registration window appears.
③ Select a window for detecting binary-coded level with processing range (A).
④ Set detection mode (B) to auto (mode method, discriminant analysis method and P tile method). For detection mode other than P tile method, proceed with step after ⑦.
⑤ Specify the reference area (C) to use for the P tile method.
⑥ Specify the object area (D) to measure with the P tile method.
⑦ Click on **Detect Level**.
The histogram appears.
Displays the detected binary-coded level at (E).

9.4.6.5 Area, Center of Gravity, and Principal Axis

[1] Area, Center of Gravity and Principal Axis Measuring Tool

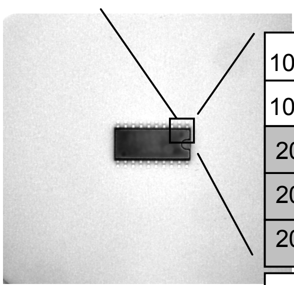
Measure the area, center of gravity, and principal axis in a specified window. Set the binary processing level to use with the image analysis tool using the binary-coded register tool.

Area, center of gravity and principal axis measuring tool



- Brightness integration value -

Window

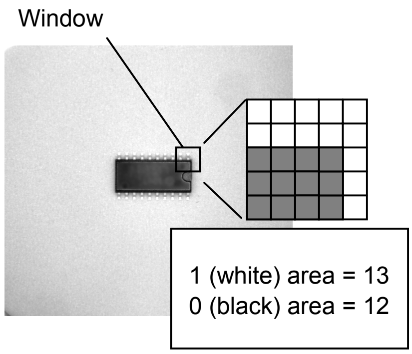


100	100	100	100	100
100	100	100	100	100
20	20	20	20	100
20	20	20	20	100
20	20	20	20	100

Brightness integration = 100x13+20x12=1540

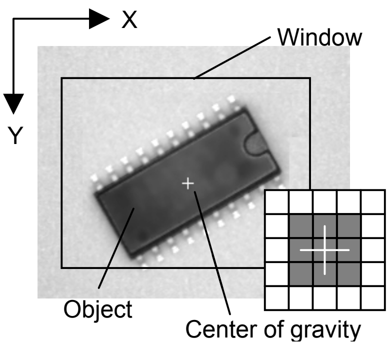
Brightness integration value refers to the sum of the brightness values of every pixel, within a range specified by the window, of image data input from the camera.

- Area -



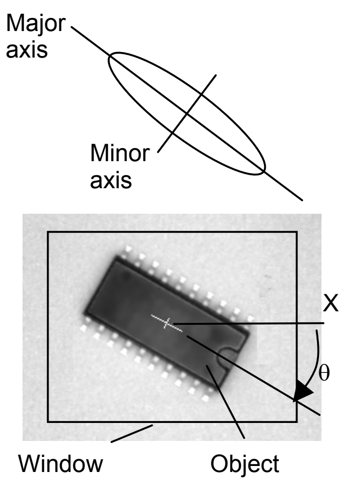
Area refers to the counting of white (1) or black (0) pixels in the range specified, by the window, after binary-coding the image data is input from the camera. The result is the number of pixels. With the μVision board, the area is measured by binary-coding the brightness of every pixel in the window in real time without changing it, so it is not necessary to binary-code image data in advance.

- Center of gravity -



The object from the image data input from the camera forms a plane. The center of gravity refers to the point at which the weight of an object on the plane would remain in equilibrium.
The μVision board obtains the center of gravity from white(1) or black (0) pixels within the range specified by the window after image data is binary-coded. The center of gravity is expressed with X coordinates and Y coordinates.

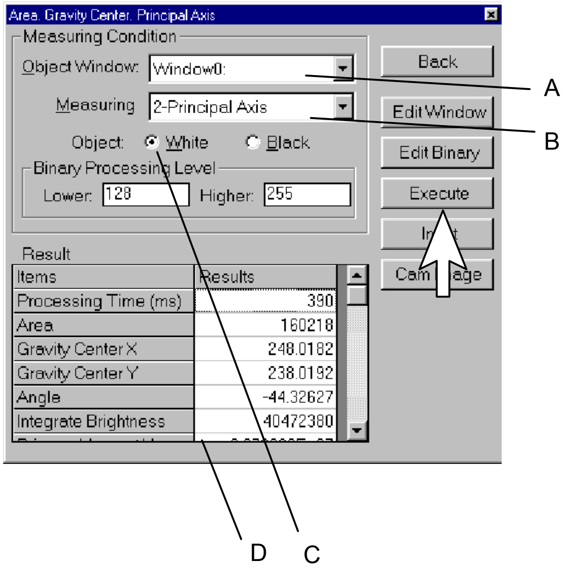
- Principal axis angle -



The object from the image data input from the camera forms a plane. When this planar object is rotated, the longitudinal axis around which the object rotates best is called the major axis of the principal axis and the axis that intersects it orthogonally is called the minor axis. The μVision board defines the angle (theta) from the horizontal axis (X-axis) to the major axis of the principal axis as the angle (θ) of principal axis. The angle of principal axis is obtained in from white (1) or black (0), object in a range specified by the window after the image data is binary-coded.

[2] Measuring Area, Center of Gravity and Principal Axis

Area, center of gravity, and principal axis measuring tool



① Click on  in the tool bar.
The Area, Gravity Center, Principal Axis measuring window appears.
The window shape appears on the teaching panel and the vision monitor.

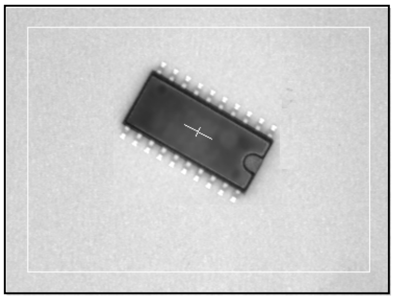
② Select object window (A).
The range of the specified window shall be the object of measurement.

③ Select measurement mode (B).
Select the object of measurement from Area, Center of gravity and Principal axis.

④ Select object (C).
Select object for binary-coded measurement from White and Black.

⑤ Click on **Execute**.
The processing screen, of the current object being processed is measured, and the results are displayed in the measuring results (D) list. The vision monitor displays the result of processing.

- Result of measurement -

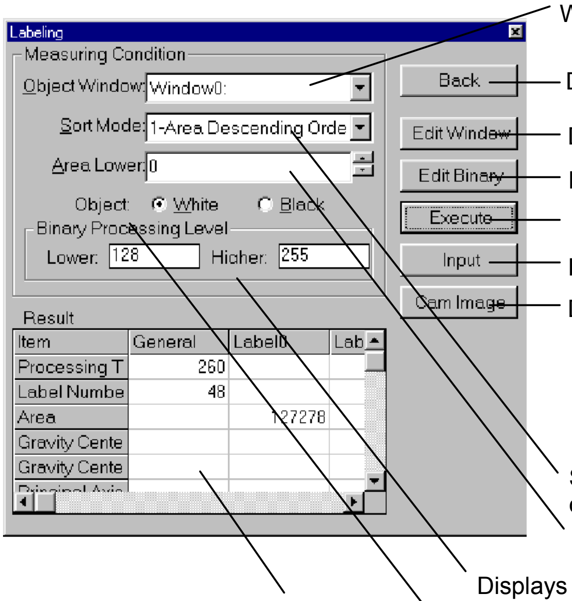


9.4.6.6 Labeling

[1] Labeling Measuring Tool

Measure the labeling in a specified window.
Set the binary-coded level to be used with the image analysis tool using the binary-coded register tool.

Labeling measurement tool



- Labeling -

Labeling refers to the numbering process of the concatenated areas of white (1) or black (0) pixels after binary-coding image data input from the camera. (Refer to Fig. 1) Labeling enables you to separately handle multiple objects that are present in the area specified by the window.
With the μVision board, area, center of gravity, angle of principal axis, fillet shape and circumferential length are obtained as the characteristics of respective objects upon running the labeling. The fillet shape refers to an oblong that circumscribes the object. (See Fig. 2) The circumferential length refers to the counting of pixels that constitute the external shape of the object. (See Fig. 3)

Fig. 1

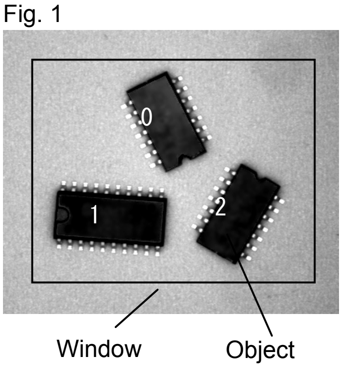


Fig. 2

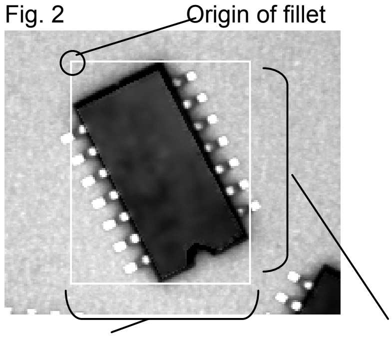
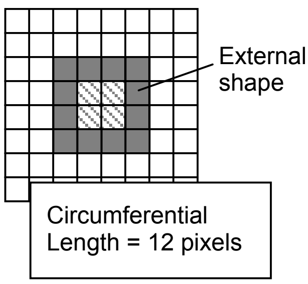


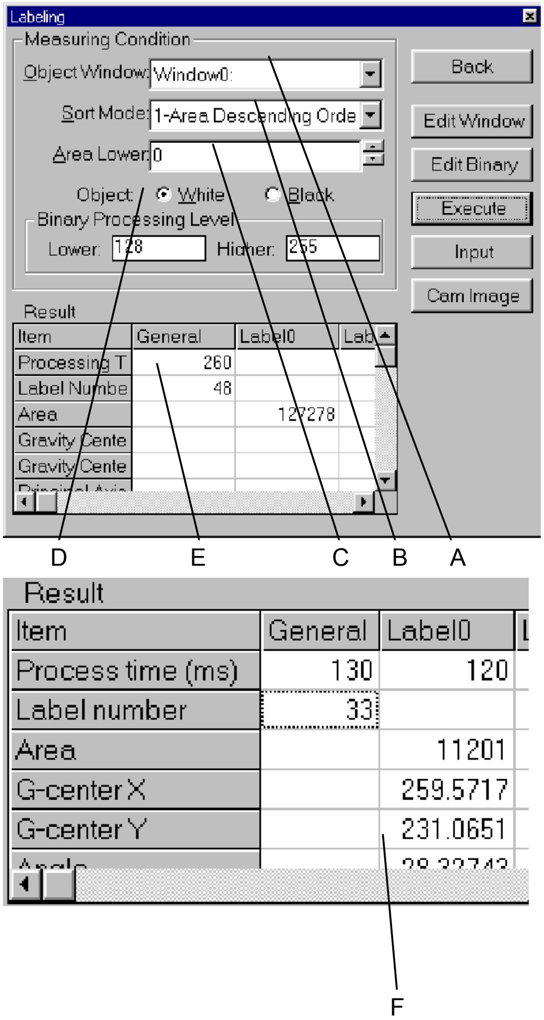
Fig. 3



Note: Only the oblong window can be selected for processing (angle = 0).

[2] Measuring Labeling

Labeling measuring tool



① Click on in the tool bar.
The labeling measuring tool appears. The window shape appears on both the teaching panel and the vision monitor.

② Select an object window (A).
The object of measurement shall be the range of the specified window.

③ Select the sort mode (B) from Labeling Order, Area Descending Order, and Area Ascending Order.
Measuring results are displayed in the specified order.

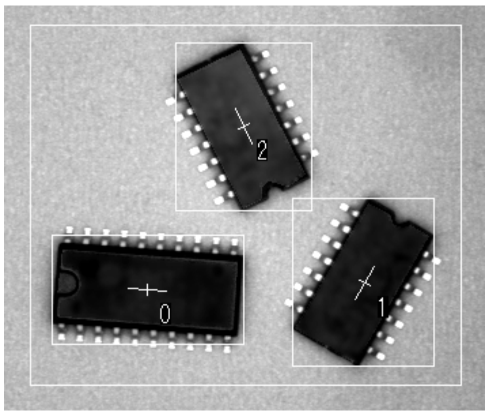
④ Specify Area Lower Limit (C).
Labels greater than the specified area are measured. This setting allows you to disregard minor objects.

⑤ Select Object (D).
Choose an object for binary-coded measurement between White and Black.

⑥ Click on **Execute**.
Measures the processing screen currently being the object of processing. The number of measured labels is displayed in the Measuring Result List (E).

⑦ Click on the respective label grids (F) under Result.
Detailed results of the clicked table are displayed in the table under Result and the vision monitor.

- Measurement result -

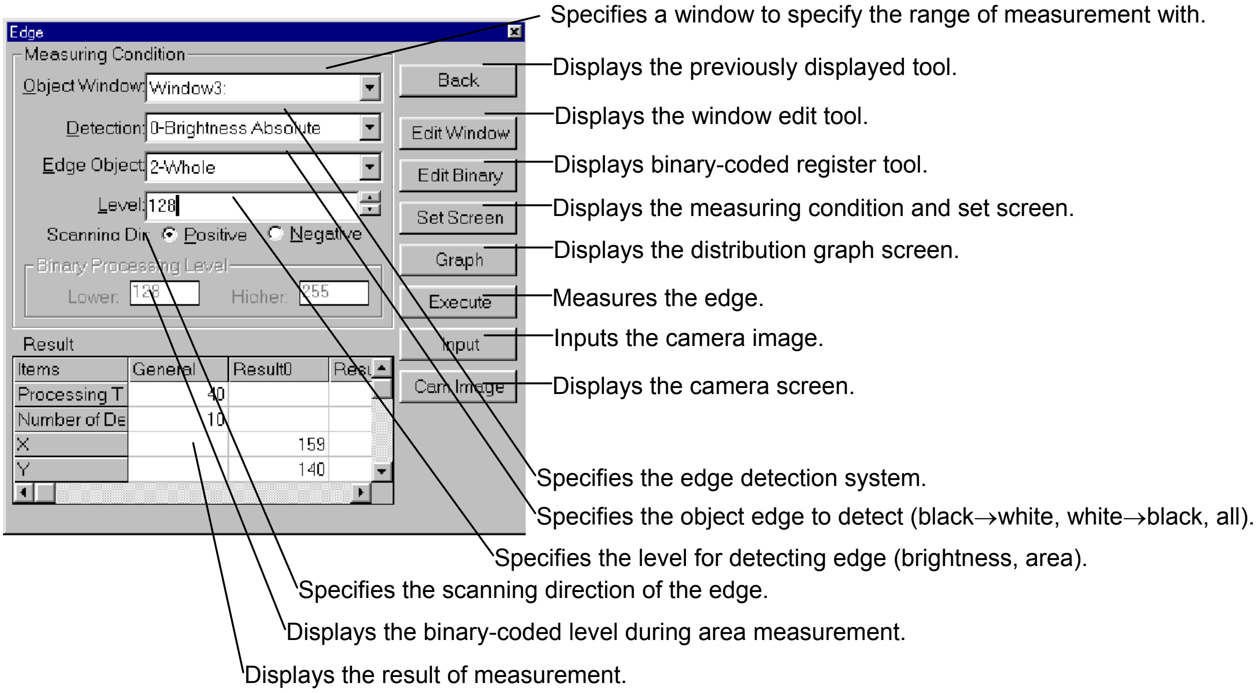


9.4.6.7 Edge

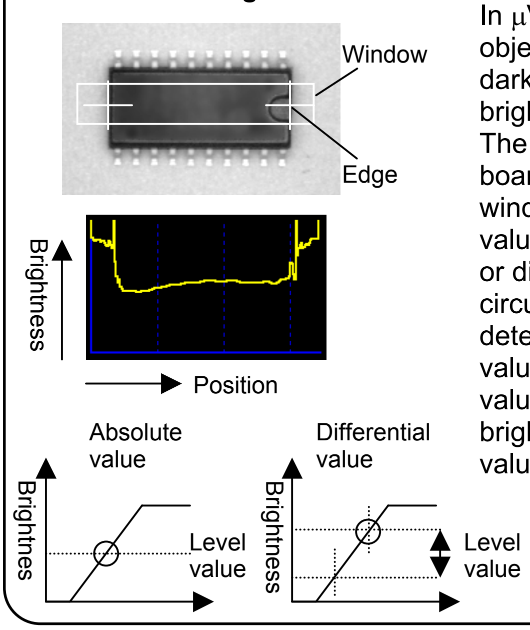
[1] Edge Measuring Tool

Measure the edge in a specified window.
Use projection window (mode = 0 or 1).
Read 9.4.3.7 “Projection Window."

Edge measuring tool



- Edge -



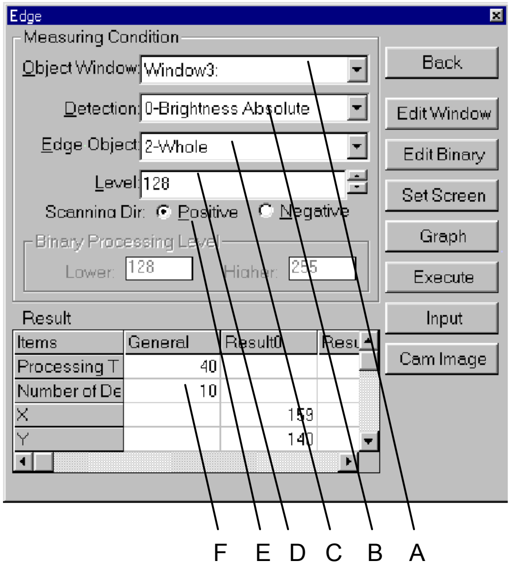
In µVision board, edge refers to a point at which an object in the specified window changes from darkness to brightness (black to white) or from brightness to darkness (white to black).
The position of the edge detected by the µVision board refers to a point at which the brightness in the window or the area value meets the specified level value. To specify the level value, an absolute value or differential value is used depending on the circumstances of the object. The absolute value detects the position at which brightness or area value passes a specified location. The differential value detects the position at which variation of brightness or area is greater than the specified value.

○: Edge detect position

Note: Windows that can be selected with the object window are those where the edge can be measured (straight line, oblong {mode = 1, 0}, sector {mode = 1, 0}).

[2] Measuring Edge

Edge measuring tool



① Click on  in the tool bar.
The Edge measuring tool window appears.
The window shape appears on both the teaching panel and the vision monitor.

② Select Object Window (A).
The specified window range is to be measured.

③ Select Detection System (B) from among Brightness absolute value, Brightness differential value, Area absolute value, and Area differential value.

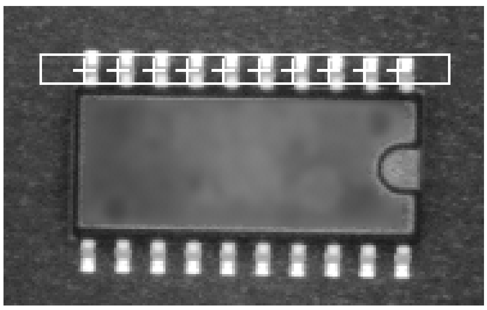
④ Select Edge Object (C) from Black→White, White→Black, and Whole.

⑤ Specify Level (D).

⑥ Choose the projection window scanning direction between Positive and Negative at Scanning Dir (E).

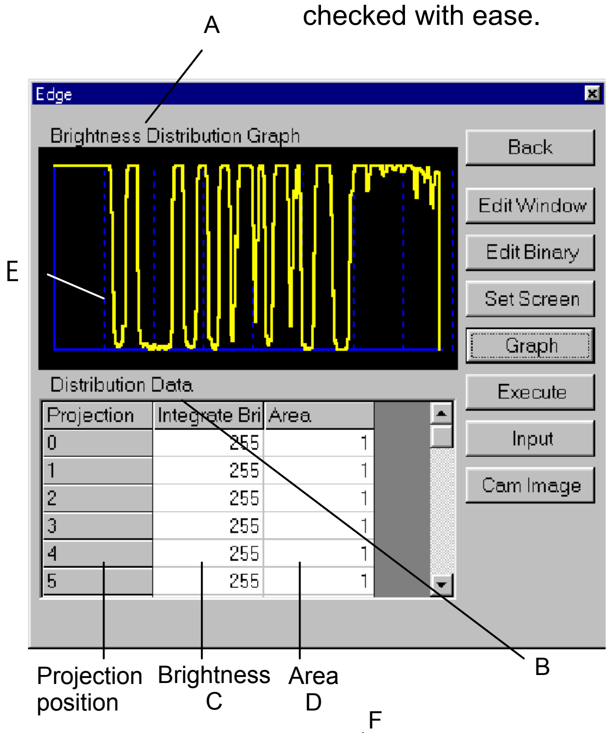
⑦ Click on **Execute**.
The Vision Manager measures the currently selected processing screen and displays the result in the Result table (F).
The processing results appear on the vision monitor.

- Measurement result -



[3]   Distribution Graph

The edge measuring tool can display the distribution graph of a measured window. According to this distribution graph, variation of brightness in the window and the area can be checked. By linking the distribution graph and the distribution data display, brightness and area of the graph-specified point can be checked with ease.

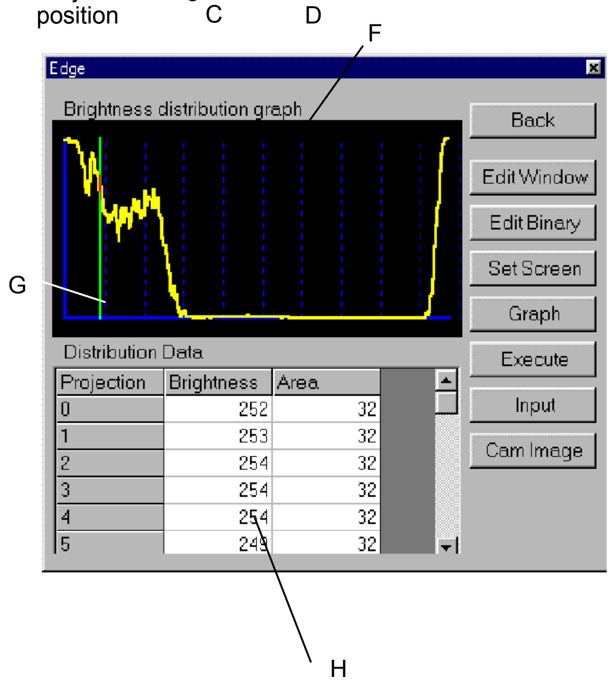


Displays distribution graph

① Click on **Graph**.
A distribution brightness graph appears. At this time, Brightness Distribution Graph appears as the title (A).
The brightness integration and area appear as the distribution data (B).

Selection of graphic display

① Click on Integrate Brightness grid (C) of Distribution Data (B) or Area grid (D).
When the Brightness Integration grid is clicked on, the brightness distribution graph appears.
Conversely, when the Area grid is clicked on, the area distribution graph appears. The currently displayed data name (Brightness Distribution Graph or Area Distribution Graph) appears at the title (A). At this time, the marker (E) appears at the distribution graph at the position corresponding to the projection position of the clicked grid.

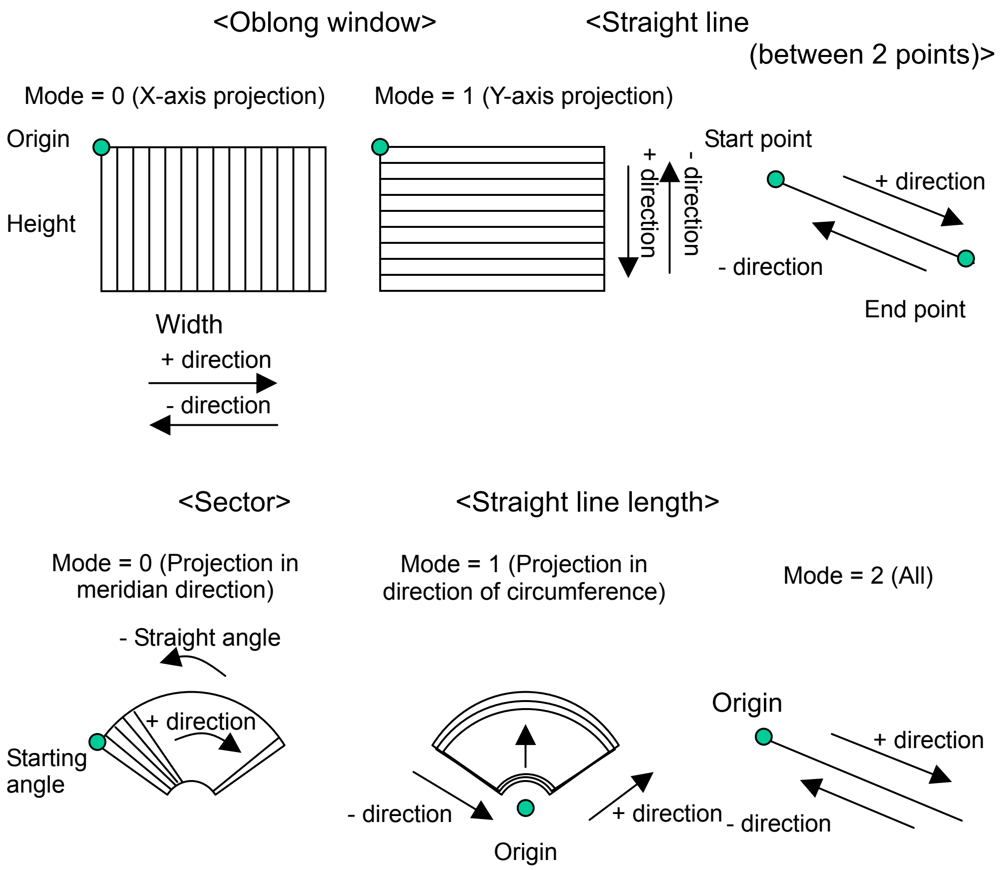


Read the distribution data of a graph-specified point

① Click on the point of distribution data (F) desired for reference in the distribution graph.
The cursor (G) appears at the clicked point in the distribution graph.
The brightness integration and area of the point clicked on in the distribution graph appear in Distribution Data (H). At this time, the projection position corresponding to the clicked point is displayed in reverse order.

[4] Setting Measuring Conditions

Level	Specify the level at which to detect the edge. If the detection system is based on brightness absolute value and differential value, specify brightness (0 to 255). If the detection system is based on the area absolute value and differential value, specify area value (0 to 512).
Binary processing level	If the detection system is based on the area absolute value and differential value, specify area value (0 to 512). Values greater than the binary value lower limit of the binary value upper limit shall be judged as white.
Scanning direction	Set the edge scanning direction. The definition of + and - directions differ by window shape.

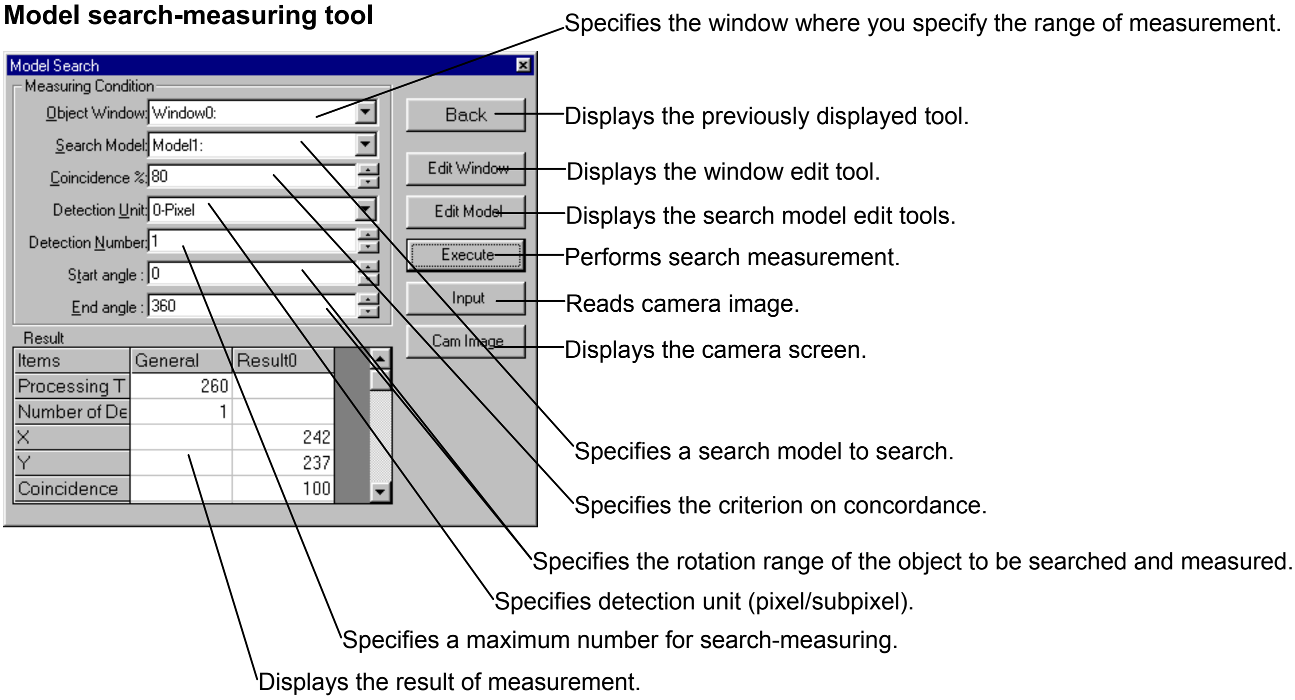


9.4.6.8 Model Search

[1] Model Search Measuring Tool

This function searches and measures the specified search model inside a specified window.
It is necessary to register, in advance, the search model used for measurement.

Model search-measuring tool



- Search -

Search refers to searching for a point of concordance, by moving the standard image data (search model), registered in advance, within the range for search (within the window range) of the object to be measured. (Refer to Fig. 1) With the μVision board, the standard image data is called "search model" which consists of image data and reference coordinates (OX, OY). (Refer to Fig. 2) Numeral to express the degree of concordance between the search model and measure object image is called "concordance". If acquired concordance is greater than the specified value, coordinates for the point of concordance between the search model and the measure object image can be obtained. The minimum unit for coordinate detection accuracy for pixel is one pixel. With sub-pixel, measuring result can be obtained with an accuracy of under one pixel. If measured by sub-pixel, the measuring time will be longer than the measurement by pixel.

Fig. 1

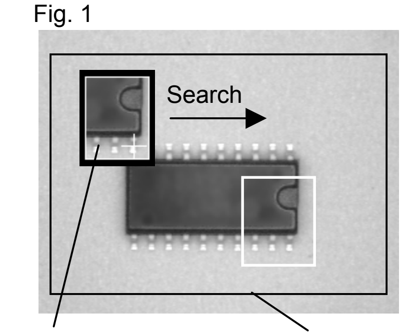
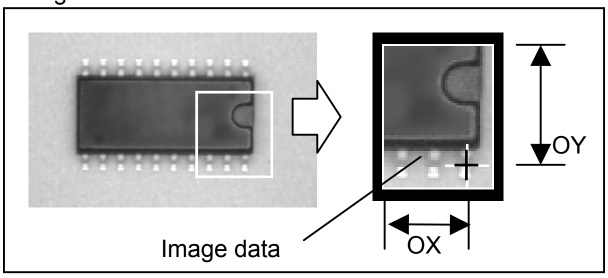


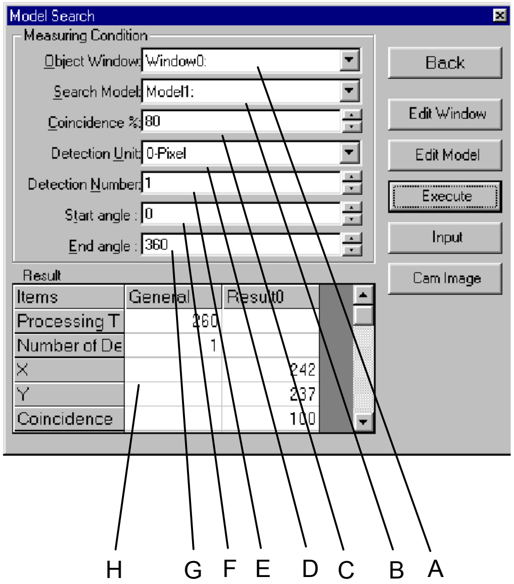
Fig. 2



Note: ①: Only the rectangular window can be selected (angle = 0).
②: If the Robot Controller is not capable of angle measurement, you cannot set any data at Start Angle or End Angle.

[2]   Model Search Measuring

Model search measure tool



① Model search measure tool in the tool bar.
The Model Search window appears.
The window shape appears on both the teaching panel and the vision monitor.

② Select Object Window (A).
The specified window range will be the object for measuring.

③ Select Search Model (B).

④ Specify Coincidence (C).

⑤ Select Detection unit (D) from Pixel or Sub-pixel.

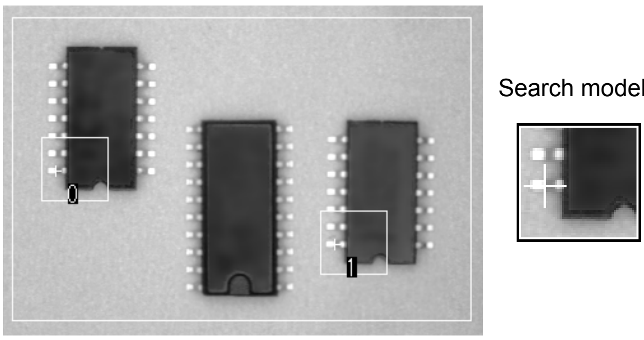
⑥ Specify Detection number (E).

⑦ Specify Start Angle (F).

⑧ Specify End Angle (G).

⑨ Click on **Execute**.
The Vision Manager measures the currently selected processing screen and displays the results in the Result table (H).
The processing results appear on the vision monitor.

- Measurement result -



[3] Setting Measuring Conditions

Object window	The range of a specified window shall be the object of measuring.
Search model	Runs the search/process inside the window by using a specified search model.
Concordance	Position having the concordance value greater than specified will be handled as the result.
Unit of detection	Specifies accuracy (pixel or sub-pixel) of the coordinates to be search-measured. If measured with sub-pixels, longer measuring time is required.
Maximum number of detection	Specifies the number of results obtained from a search-measuring. If the number of results reaches the value specified with the maximum number of detection, the measurement ends normally. If the number of result fails to reach a specified maximum number, TIMEOUT error will be generated. In this case, reduce the maximum number.
Start Angle End Angle	Specify the rotation range of the object to be searched and measured. The Vision Manager measures the object of which angle from the origin resides between the preset start and end angles.

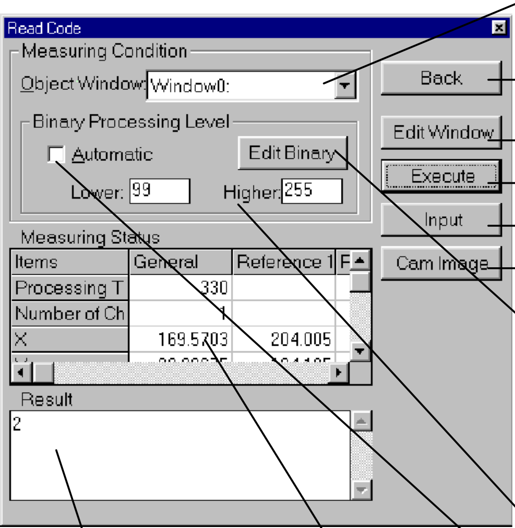
9.4.6.9 Reading Code

[1] Code Reading Measuring Tool

Read the QR code in the specified window.

Code reading measuring tool

Specifies a window for specifying the range of measurement.



Displays the previously displayed tool.

Displays the window edit tool.

Runs code measuring.

Inputs the camera images.

Displays the camera screen.

Displays binary-coded register tool.

Displays binary-coded level.

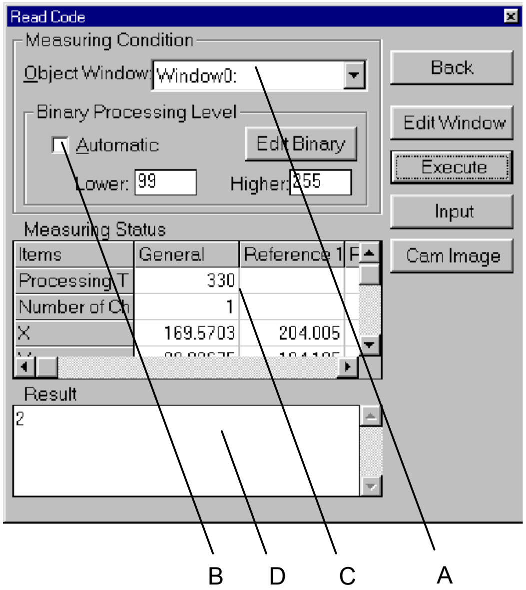
Specifies the presence of automatic binary-coded.

Specifies the presence of automatic binary-coded measuring.

Displays the measuring Character string.

[2] Code Reading Measuring

Code reading measuring



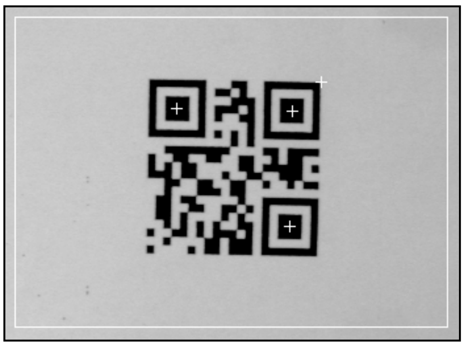
① Click on [CODE icon] in the tool bar.
The Read Code window appears.
The window shape appears on both the teaching panel and vision monitor.

② Select Object Window (A).
The range of a specified window will be the object of measuring.

③ To perform automatic binary processing, check the Automatic check box (B). If you do not select automatic binary processing, set the binary code level with the binary processing registration tool.

④ Click on **Execute**.
The Vision Manager measures the current selected processing screen and displays the status at Measuring Status (C).
Measured character string is displayed in Measuring Result (D).
The processing results appear on the vision monitor.

- Measurement result -

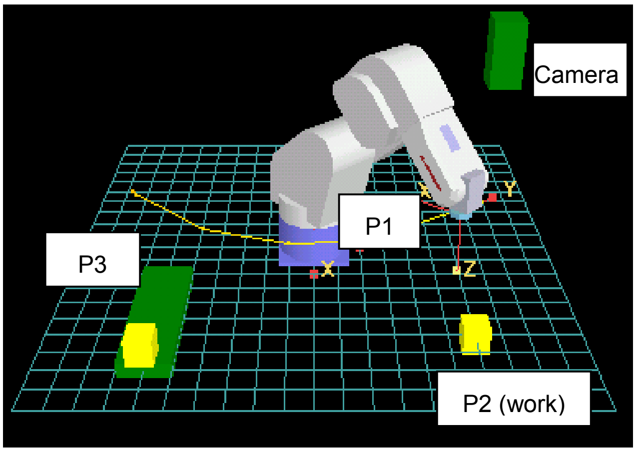


[3] Setting Measuring Conditions

Automatic binary processing	If you select automatic binary processing, the code is read on an optimal binary code level.
Binary code level	Set a binary code level to be used when not using automatic binary processing.

9.5 Visually Calibrating Robot Position

This section describes the procedures for visually correcting the robot position. In the example shown, a series of operations are performed, that includes: ① Moving the robot to the standby position (P1), ② Moving the robot to the work position detected with the camera (P2) and holding the work, ③ Moving the work to the pallet position (P3) and unload.



9.5.1 Work Flow

Set the robot and vision according to the following steps:

Input coordinates (vision, robot) of points 1 to 3

Execute calibration

Refer to Chapter 9, subsection 9.4.5 “Calibration”

Transmit the calibration data to the robot (register)

Refer to Chapter 9, subsection 9.2.5 “Transfer”.

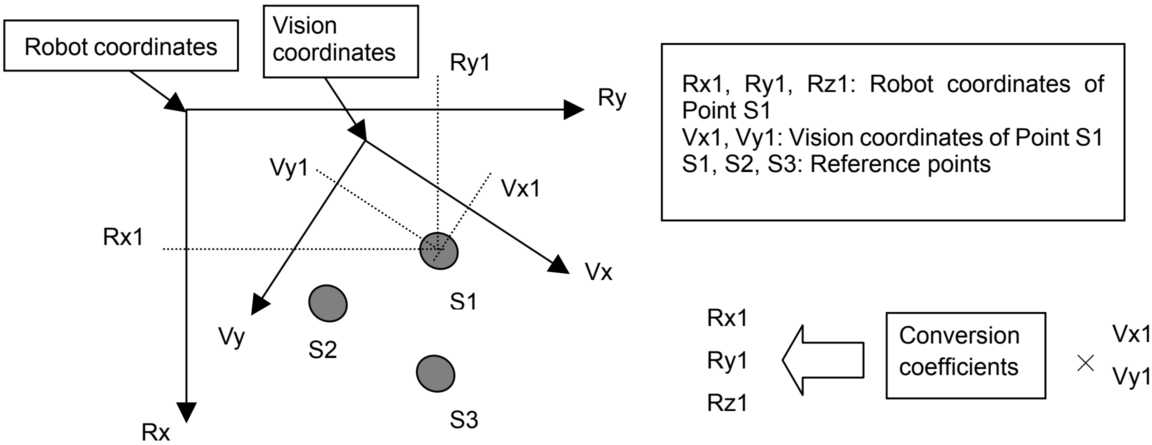
Edit program

Transmit the program to the robot

Check the robot motion

9.5.2 Calibration of Robot Coordinates and Vision Coordinates

To visually correct the robot position using measured coordinates, it is necessary to convert the vision coordinates to robot coordinates. To do this, it is necessary to obtain the relationship between the vision and the robot coordinates, in advance. The work for acquiring this relationship is called camera calibration. It is possible to calculate coordinate conversion coefficients (calibration data) by entering the vision coordinates (Vx, Vy) of 3 points (S1, S2, and S3) determined in the camera field of view (vision coordinates) and the robot coordinates (Rx, Ry and Rz) of the Vision Manager camera calibration tool. Once obtained, coordinate conversion coefficients needs to be transmitted to the Controller for registration. With the user program, convert vision coordinates to robot coordinates by using the coordinate conversion library (viTran6). The coordinate conversion library uses the coordinate conversion coefficients registered to the Controller for converting coordinates.



- Calibration Data and Coordinate Conversion -

Camera calibration data registered to the Controller can be referred to using the VISREFCAL command. (See Table 1) The coordinate conversion library converts vision coordinates to robot coordinates by using the calibration data referred to by VISREFCAL command. (See equation 1)

Table 1 Relationship between VISREFCAL Command and Vision Manager VISREFCAL (a,b)

	b											
	0	1	2	3	4	5	6	7	8	9	10	11
a=0 to 31	NX	OX	AX	RX	NY	OY	AY	RY	NZ	OZ	AZ	RZ

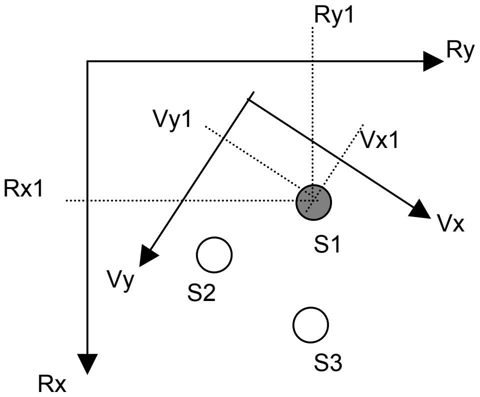
Equation 1 Conversion of coordinate conversion library (viTran6)

$$\begin{pmatrix} RX \\ RY \\ RZ \\ 1 \end{pmatrix} = \begin{pmatrix} NX & OX & AX & RX \\ NY & OY & AY & RY \\ NZ & OZ & AZ & RZ \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} VX \\ VY \\ 0 \\ 1 \end{pmatrix}$$

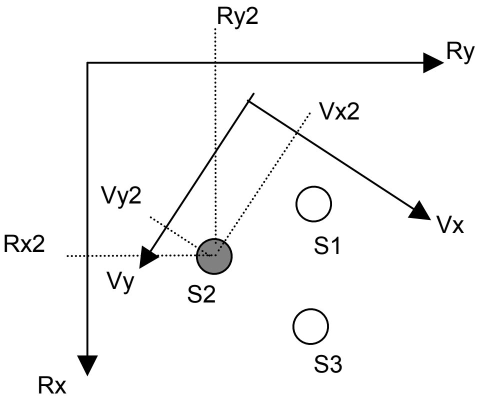
RX, RY, RZ : Robot coordinates
VX, VY : Vision coordinates
NX, NY, NZ : Table 1
OX, OY, OZ : Table 1
AX, AY, AZ : Table 1
RX, RY, RZ : Table 1

9.5.3 Camera Calibration Procedure

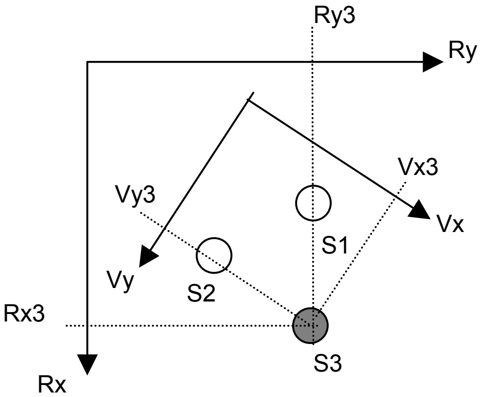
Obtain camera calibration data (coordinate conversion coefficients) according to the following procedures. This operation will complete preparation for running visual robot position correction.



① Input vision coordinates (Vx1, Vy1) of Point S1 and the robot coordinates (Rx1, Ry1, Rz1) for Point 1 of the camera calibration tool.



② Input vision coordinates (Vx2, Vy2) of Point S2 and the robot coordinates (Rx2, Ry2, Rz2) for Point 2 of the camera calibration tool.



③ Input vision coordinates (Vx3, Vy3) of Point 3 and the robot coordinates (Rx3, Ry3, Rz3) for Point 3 of the camera calibration tool.

④ Click on Calibration of the camera calibration tool and calculate calibration data (coordinate conversion coefficients). Refer to Chapter 9 “9.4.5 Calibration” in this manual.

Rx, Ry:	Robot coordinate
Vx, Vy:	Visual coordinate

⑤ Transmit the calibration data (coordinate conversion coefficients) to the Robot Controller. Refer to Chapter 9 “9.2.5 Transfer” in this manual.

9.5.4 Program Example

The following program list represents an example of visual robot position correction. Take note on how to use the coordinate conversion library. This program enables you to check the method for moving a robot by converting the coordinates measured with vision to the robot coordinates.

Program List "PRO1"

"Robot position correction"

```
#INCLUDE "dio_tab.h"
```

Specify the I/O macro definition file.

```
PROGRAM PR1
   TAKEARM
   TAKEVIS
   CHANGETOOL 1                'Set the tool for vision calibration
   MOVE L,P1                   'Move to the standby position (P1)
   VISSCREEN 1,0,1             'Specify drawing screen0 as the object screen for drawing
   VISCLS 0                    'Clear drawing screen0
   VISOVERLAY 1                'Display drawing screen0
   CAMIN 1,0,0                 'Input camera images to processing screen0
   VISWORKPLN 0                'Specify process object to processing screen0
   VISPLNOUT 0,1               'Display processing screen0
   WINDMAKE R ,1,512,480,0,2   'Set window
   VISMEASURE 1,0,0,1,1,100,255 'Measure center of gravity (work position)
   IF VISSTATUS(0) = 0 THEN
      F1 = VISPOSX(0)          'Store vision coordinate X to F1
      F2 = VISPOSY(0)          'Store vision coordinate Y to F2
      P2 = P1                  'Copy the data of standby position attitude
      CALL viTran6(0, F1, F2 , P2)'Convert vision coordinates to the robot coordinates
                                (by using "0" of vision calibration data)
      APPROACH P,P2,100
      MOVE L,P2                'Move to the position measured by vision
      GOSUB *ChuckItem         'Part chuck
      DEPART L,100
      APPROACH P,P3,100
      MOVE L,P3                'Move to pallet P3 position
      GOSUB *UnchuckItem       'Part unchuck
      DEPART L,100
      CHANGETOOL 0
   END IF
   GIVEVIS
   GIVEARM
END

'===== Part chuck =====

*ChuckItem:
   SET IO[ioChuck]
   RESET IO[ioUnChuck]
   RETURN

'===== Part unchuck =====

*UnchuckItem:
   RESET IO[ioChuck]
   SET IO[ioUnChuck]
   RETURN
```

Coordinate conversion library "viTrans6" is registered to the Vision class in the program bank. To convert coordinates, add the library "viTrans6" to the project. For the method of addition, refer to Chapter 5 "5.6.2 Program Bank" in this manual.

9.5.5 Executing Program

Execute the program according to the following procedures:

① Create a new project.
② Create a new program and input the program from Chapter 9, subsection 9.5.4 “Program Example” of this instruction manual.
③ Add the “viTrans6” library to the project from the program bank.
④ Define macro names “ioChuck, ioUnChuck” to be used with the hand chuck for general output of the DIO Manager.
⑤ Create the DIO Manager macro definition file.
⑥ Create the execution program.
⑦ Transmit the program to the Controller.
⑧ Teach the robot standby position (P1) and the pallet position (P3).
⑨ Check the program motion.

9.6 Help Menu

The Help menu provides explanation on how to use WINCAPSII.

Fig. 9-8 Help Menu

9.6.1 About Vision Manager

Displays the version information on Vision Manager.

Chapter 10

Operating Log Manager

This chapter describes the WINCAPSII software Log Manager that is used with the personal computer teaching system.

10.1 Outline of Log Manager

10.1.1 Outline of Functions

The Robot Controller holds the record of operation as a log. The personal computer teaching system Log Manager inputs this log to the personal computer and controls it in batch. The Log Manager can run log search, display graphics, or reproduce action with the Arm Manager, error monitor, etc.
It can implement the initial stage of the maintenance operation from a remote location by using the communication function.

Start Log Manager by clicking on  button of the System Manager or from the WINDOW menu.
When started the Log Manager window will appear on the screen.
The Log Manager window displays the logs as described in the following:

10.1.1.1 Document

Click the Document tab to record the history of maintenance operation, service operation, etc.

Note: As for the history of program changes, users are recommended to record changes in document in the project setting of the PAC Program Manager. Refer to 5.2.5.1 "Document".

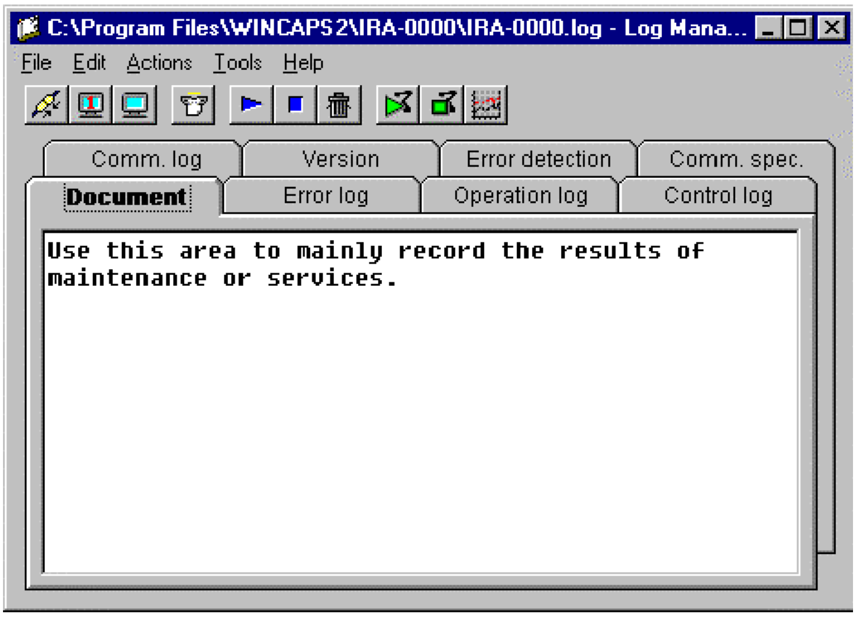


Fig. 10-1 Document

10.1.1.2 Error Log

If an error is generated during robot operation, this log records the content of the error together with the time of generation. To acquire the error log, run the operation given in 10.2.5 "Receive Data" and receive the Error Log from the robot controller.

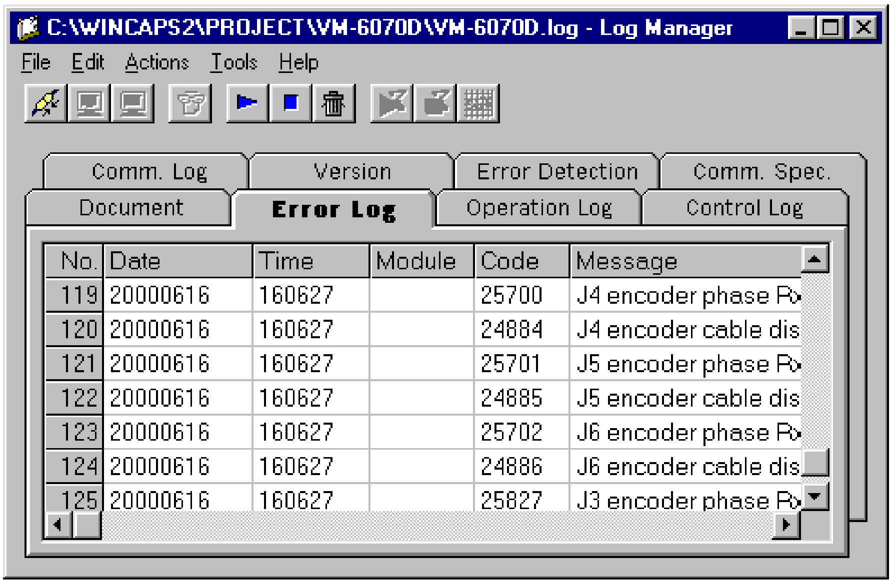


Fig. 10-2 Error Log

10.1.1.3 Operation Log

Click the Operation Log to record the content of operation from the teach pendant. To acquire the operation log, run the operation given in 10.2.5 "Receive Data" and receive the Operation Log from the robot controller.

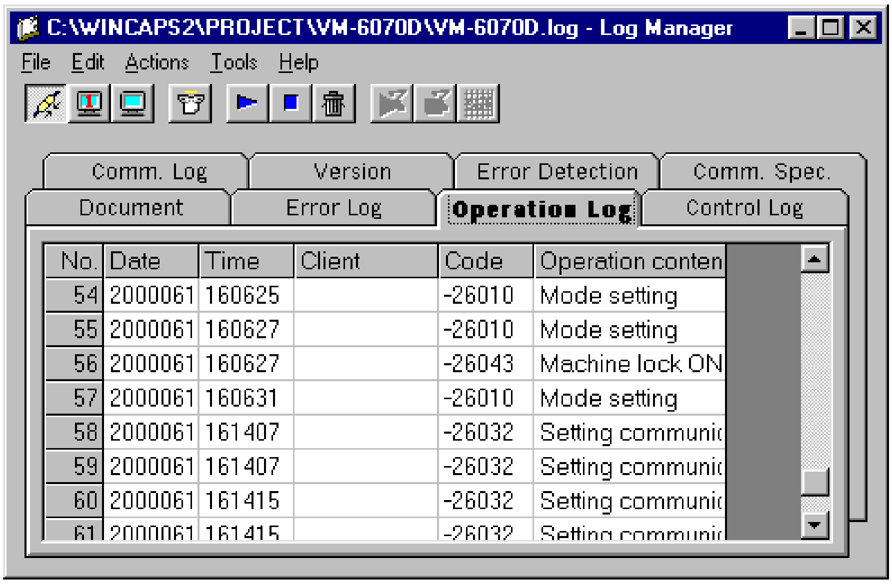


Fig. 10-3 Operation Log

10.1.1.4 Control Log

Click the Control Log to record the command value, encoder value, current value and load ratio for each respective operating axis. Although the number of control axes differs by model, the record for the number of control axes is retained. To acquire the control log, run the operation given in 10.2.5 “Receive Data” and receive the Control Log from the robot controller.

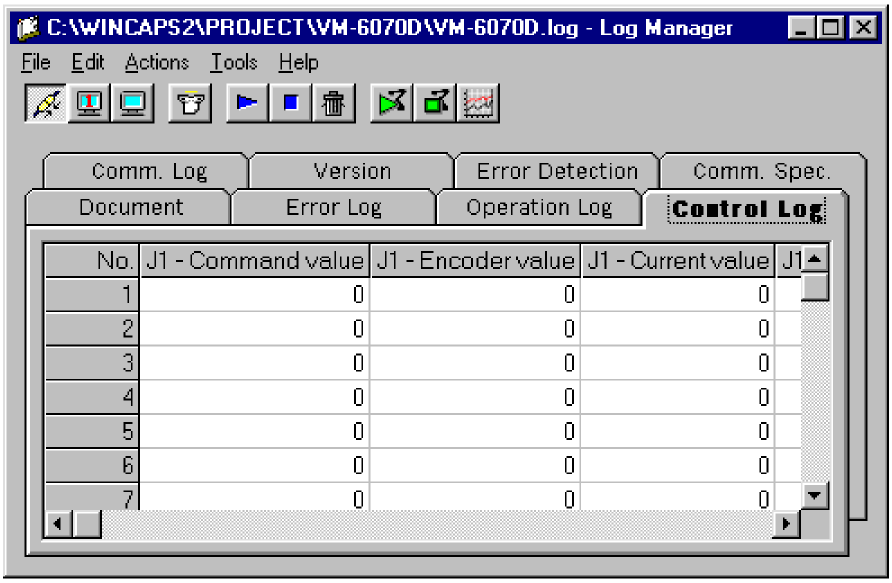


Fig. 10-4 Control Log

10.1.1.5 Communication Log

This log is used for checking the status of communication. It is the same thing as the communication log in Communication Manager.
To acquire the communication log, run the operation given in 10.2.5 “Receive Data” and receive the Communication Log from the robot controller.

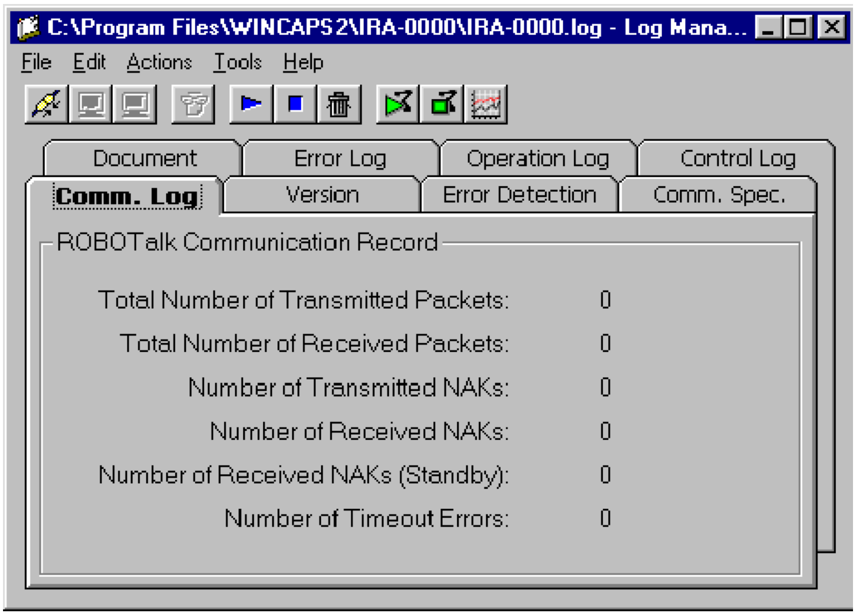


Fig. 10-5 Communication Log

10.1.1.6 Version

Records the version of each respective section of the Robot Controller. To acquire the version log, run the operation in 10.2.5 “Receive Data” and receive the Version Log from the robot controller.

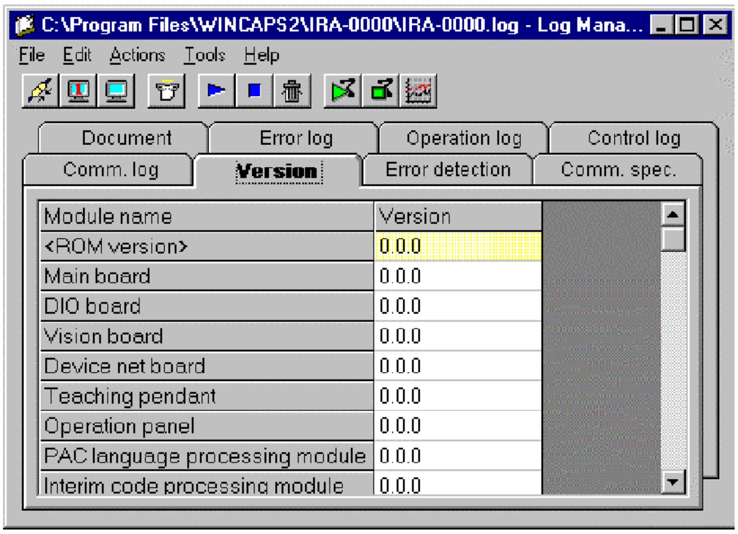


Fig. 10-6 Version

10.1.1.7 Error Detection

If an error occurs, the error detection lamp in the Log Manager window changes from green to red and the detected error appears in the Search conditions (C) dialogue box.
The error detecting conditions correspond to the error detection settings in the Set dialog box which is displayed using the Set command in the Tools menu.
Clicking on **Program** starts the application specified as the start program in Error detection of the Set dialog box.
For information regarding Error detection in the Set dialog box, refer to 10.5.1.4 “Error Detection”.

Note: No error is detected unless the error and monitor buttons are turned ON.

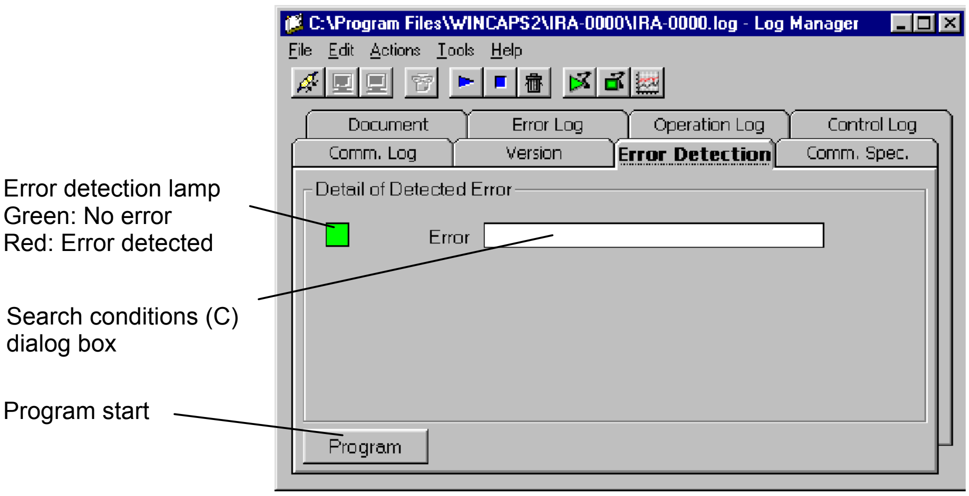


Fig. 10-7 Error Detection

10.1.1.8 Communication Specifications

Click the Comm.spec.tab to record the contents of the Robot Controller communication setting. For communication use, run the operation in 10.2.5 "Receive Data" and receive the Communication Application Log from the robot controller.

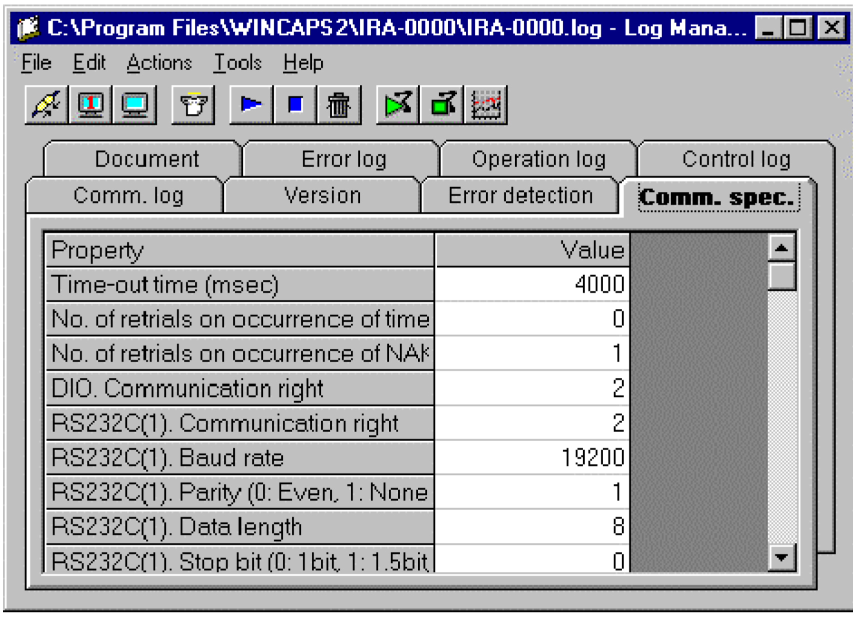


Fig. 10-8 Communication Specification

10.1.2 Tool Bar (Log Manager)

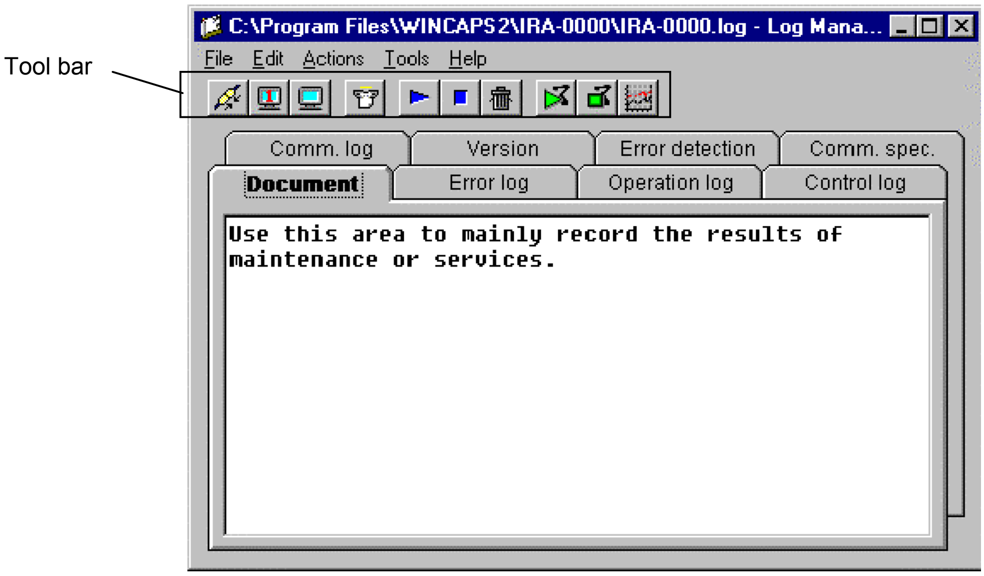


Fig. 10-9 Tool Bar

CONNECT button: Establishes connection to the Robot Controller. When connected, this button is displayed as if depressed.

SNAPSHOT button: Records the current status of the Robot Controller once.

MONITOR button: Records the status of the Robot Controller in succession.

RECEIVE button: Receives the Controller data.

CONTROL LOG START button: Starts the recording of the control log at the Robot Controller. This serves the same function as the STOPLOG command in the PAC command set.

CONTROL LOG STOP button: Stops the recording of control log at the Robot Controller. This serves the same function as the STOPLOG command in the PAC command set.

CONTROL LOG CLEAR button: Erases Robot Controller control log record. This serves the same function as the CLEARLOG command in the PAC command set.

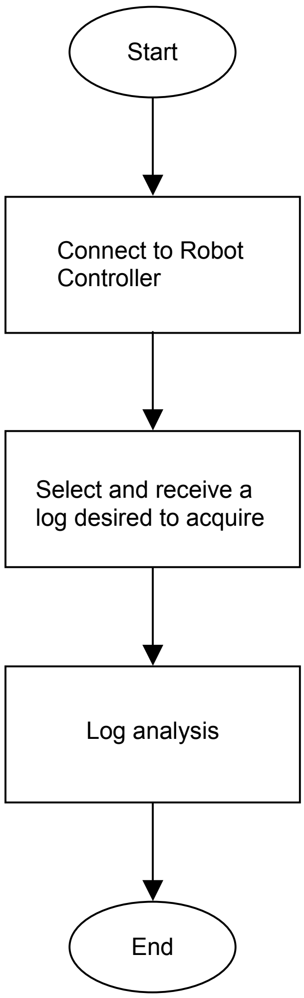
CONTROL LOG MOTION REPRODUCTION (1 cycle) button: Reproduces robot action for one cycle using the Arm Manager based the command values recorded to log at intervals of 8 msec.

CONTROL LOG MOTION STOP button: Stops reproduction motion if the control log motion is being reproduced.

CONTROL LOG GRAPHIC button: Graphically displays data recorded to the Control Log.

10.1.3 Basic Usage

During monitoring



Refer to “10.4.1 Connect”.

Refer to “10.2.5 Receive Data”.

Refer to “10.3.9 Search on Grid”.
(Another tool may be used as an option)

10.1.4 Files to Be Managed

The Log Manager manages log files (*.LOG) as shown in Fig. 10-10.

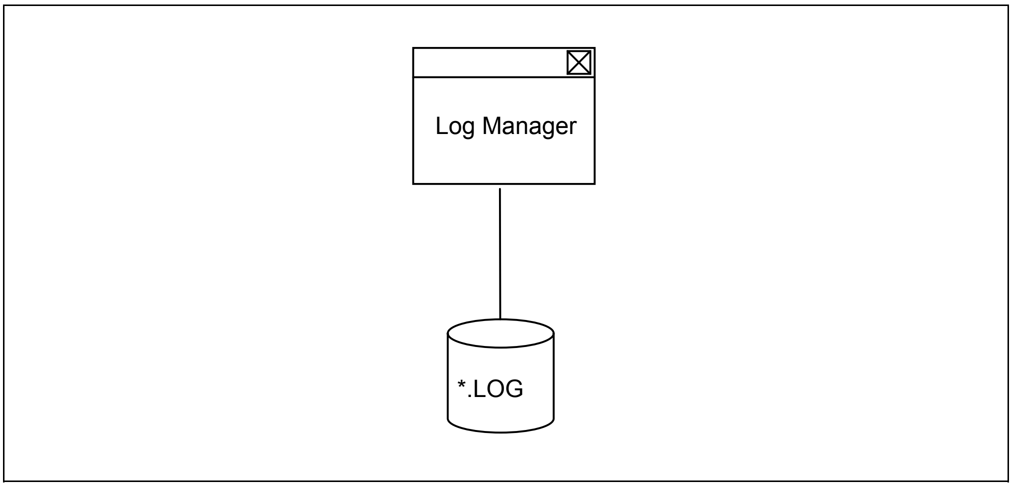


Fig. 10-10 File Managed by Log Manager

10.1.4.1 Log File (*.LOG)

A log file stores the log information of project.
Since log information is stored in separate files for each project, the log information can be managed without confusion even when multiple projects are involved.
The extension of the file reads ".LOG".

10.1.5 Menu List (Log Manager)

The command menu of the Log Manager has the following tree structure:

File
- New *1
- Open *1
- Save
- Save As *1
- Receive
- Print
- Import
- Export
- Close

Edit
- Undo
- Cut
- Copy
- Paste
- Delete
- Select All
- Search
- Replace
- Search on Grid

Actions
- Connect
- Snapshot
- Monitor
- Begin Control Log
- End Control Log
- Clear Control Log
- Reproduce Control Log Action
- Graph Control Log

Tools
- Options
- Analyze by Control Log
- Servo Joint Graph

Help
- About Version

Fig. 10-11 Menu Tree of Log Manager

*1: To be displayed only when the file extension menu of the display option is checked. To set the display option, re-login on the programmer level, select Tool, Options, and View, and then check the option file extension menu.

10.2 File Menu (Log Manager)

The Log Manager File menu is used for managing files of saved logs.
A file used for saving the content of a log is attached with ".log" as the extension.

Fig. 10-12 File Menu

10.2.1 New (Programmer Level)

Newly creates a LOG file for saving the contents of a log. The extension reads ".log".

10.2.2 Open (Programmer Level)

Opens an already existing LOG file.
When the standard Windows dialog box appears, select a log file to open, and click on Open to open the file.

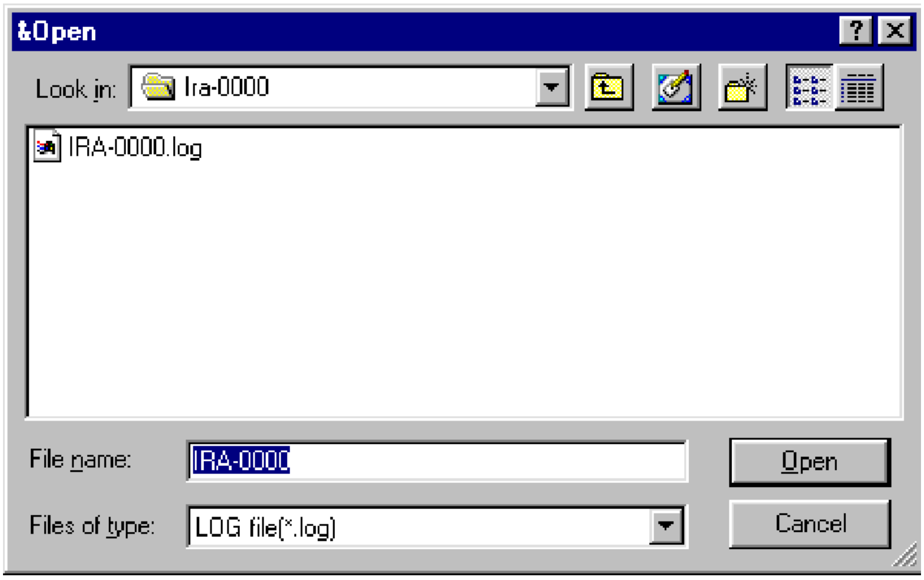


Fig. 10-13 Open Dialog Box

10.2.3 Save

Saves the contents of the current log to the currently selected file.

10.2.4 Save As (Programmer Level)

Saves the content of the current log to a new file.
When the standard Windows dialog box appears, select a path, input the file name, and click on SAVE to save the log data.

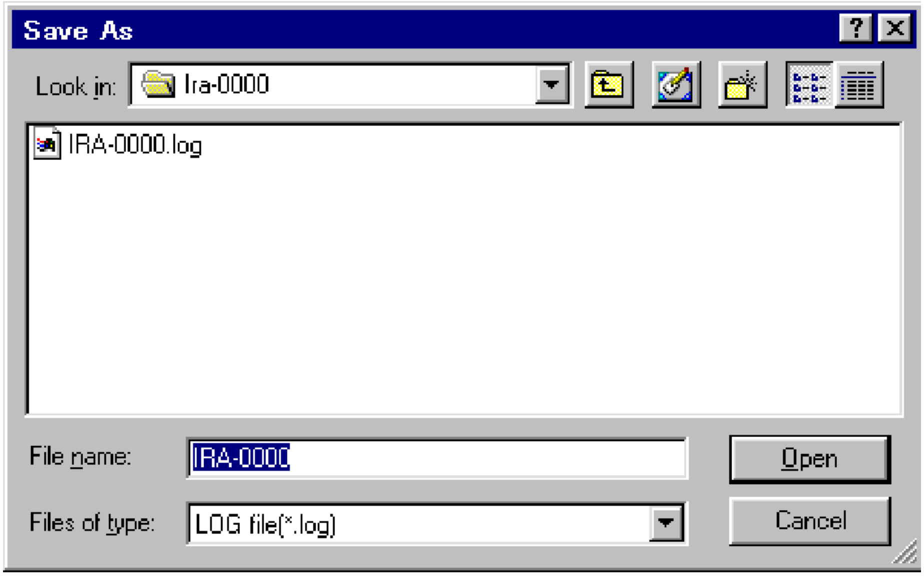


Fig. 10-14 Save As Dialog Box

10.2.5 Receive

Receives log data in the Robot Controller.
This command can be operated using Receive.
When the Receive Table dialog box appears, check select the desired item and click on Receive.
The log data is input to the personal computer.

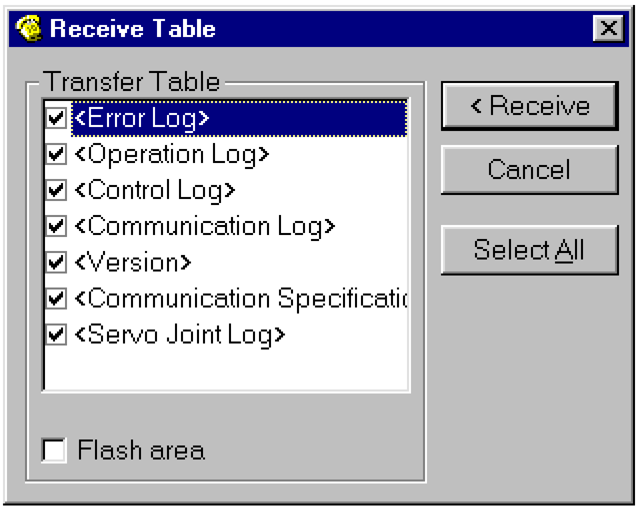


Fig. 10-15 Receive Table Dialog Box

10.2.6 Print

Prints each log.

10.2.6.1 Print Object

When the Print Manager dialog box appears, check select the desired item and click on PRINT.
Clicking on PREVIEW allows the printed image to be reviewed on the screen.
Check selecting the optional PRINT LINE NUMBER adds the line number for printing.

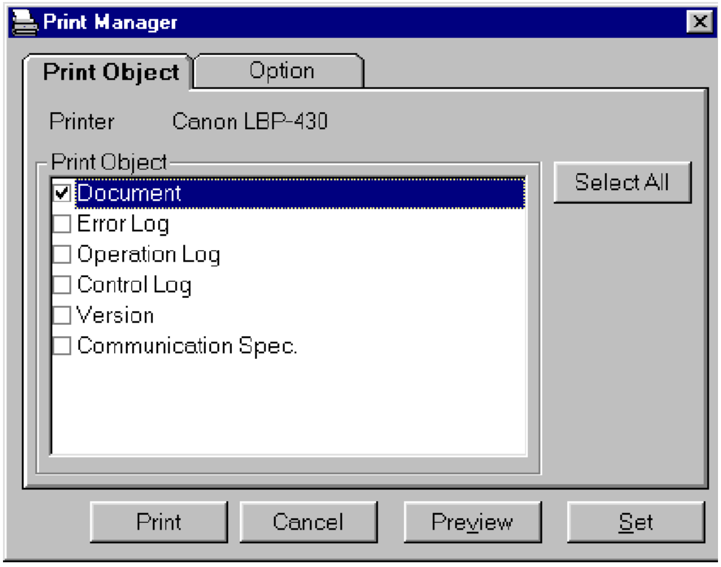


Fig. 10-16 Print Manager Dialog

- Select All: Selects all objects for printing simultaneously.
- Set: Displays the printer setting dialogue and makes various printer settings.
- Preview: Allows the user to see the print format before actual printing.
- Cancel: Closes the dialogue box without printing.
- Print: Prints variable tables.
- Option: Displays printing options.

TIP: To print specified pages only, click the printer button after previewing. You may specify the print range in the printing preview.

Note: If you select more than one object to be printed, Preview is not usable.

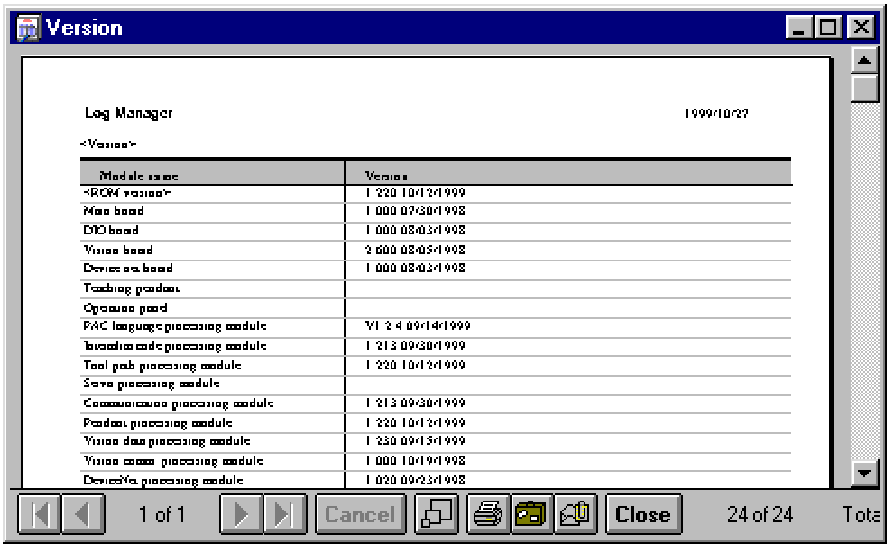


Fig. 10-17 Preview Window

 : Moves to the head/tail end of the page.

 : Moves to the immediately preceding/following page.

 : Selects display (Reduction/Standard/Expansion)

 : Sets print execution
The printing range (specific pages) of an object file can be specified.

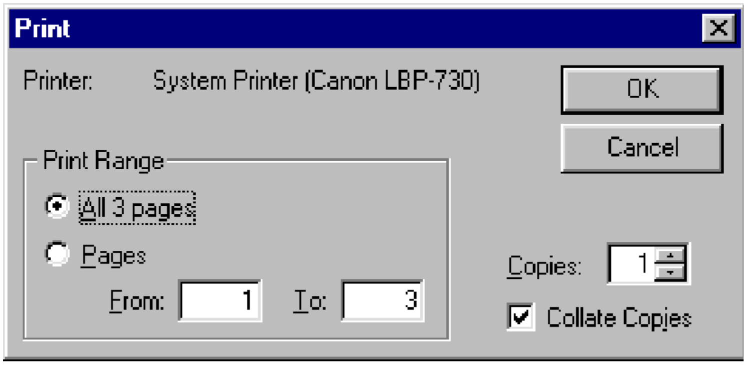


Fig. 10-18 Print Window

 : Exports the object file.
The selected object file will be converted into the file format specified in Format and outputted (saved) to the Destination.

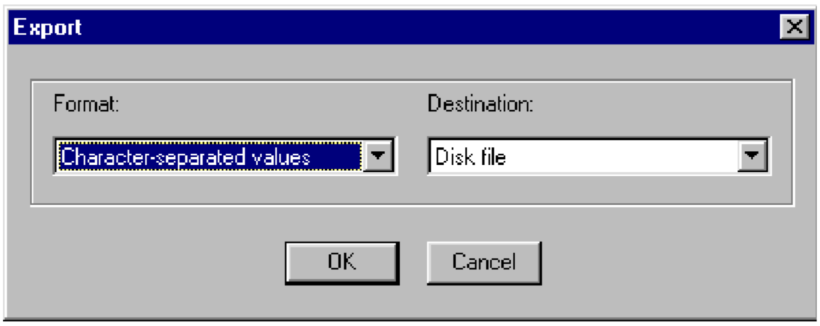


Fig. 10-19 Export Window

10.2.6.2 Option

Selecting the Option tab will display the print options.

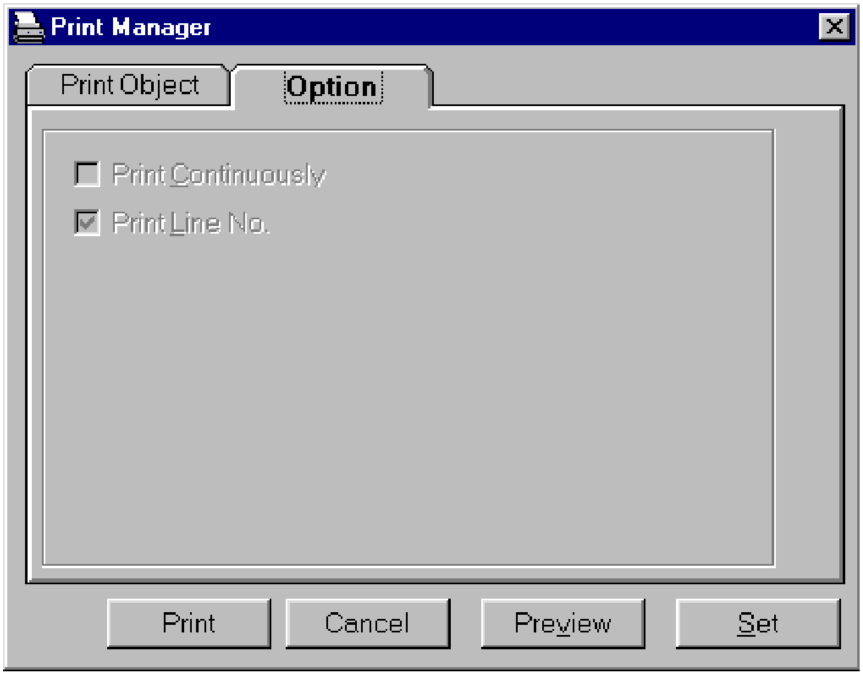


Fig. 10-20 Option Tab (Print Manager Dialog Box)

- Print Line No.: Selecting this with a check mark will print the selected program together with the line numbers.

10.2.7 Import

Reads "Servo Single-Axis Data Log" data stored in the CSV format. The read data can be displayed graphically with "Servo Single-Axis Data Graph" on the TOOL menu.
The Windows standard dialog box appears. Select a desired file and also select a read file, then click on Open.

10.2.8 Export

Stores "Servo Single-Axis Data Log" data in a CSV-format file. The stored file is available for "Import" on the FILE menu or another application.
The Windows standard dialog appears. Select a path, enter the file name, and click on Save.

10.2.9 Close

Ends Log Manager.

10.3 Edit Menu (Log Manager)

This EDIT menu has the standard editing menu functions as are in any application software used for Windows 95.

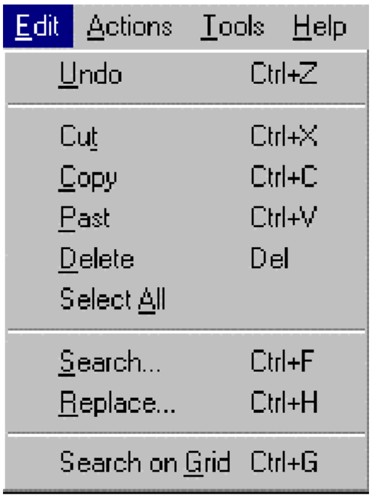


Fig. 10-21 Edit Menu

10.3.1 Undo

Cancels immediately preceding operation to "document" to restore the original status.

10.3.2 Cut

Cuts out a selected range of data of the “document.” Cut data can be used by the Paste command.

10.3.3 Copy

Temporarily stores the selected data in the Error Log, Control Log, Version, Error Detection, and Communication Specification. Data temporarily stored by copying can be used in the PASTE command.

10.3.4 Paste

Temporarily stored data by cutting-out or copying is pasted to a specified location in the “Document.”

10.3.5 Delete

Deletes the selected data in the “document.”

10.3.6 Select All

Selects all the data displayed when the “Document” tab is clicked on.

10.3.7 Search

Searches for the specified character string in the “document.”
When the Retrieve dialog box appears, specify the necessary item and click on Find Next. Detected character strings are displayed in reverse.

Fig. 10-22 Search Dialog Box

- Find What: Input the desired character string for search here.
- Replace With: Input character string desired for replacement here.
- Search Direction: Specify the direction of the search. If All is selected, search runs downward to the end, then it runs downward from the top of the data.
- Object: Select the range of search; all the document or within a selected range.
- Maintain cases: If you check this box, upper and lower case letters will be distinguished in searching character strings.

10.3.8 Replace

Replaces the specified character string in the “document” with the separately specified character string.
When the Replace dialog box appears, specify the necessary item and click on Find Next. Detected character strings are displayed in reverse.
Clicking on Replace replaces the character string currently being displayed in reverse.
Clicking on Replace All replaces every applicable element in the selected object.

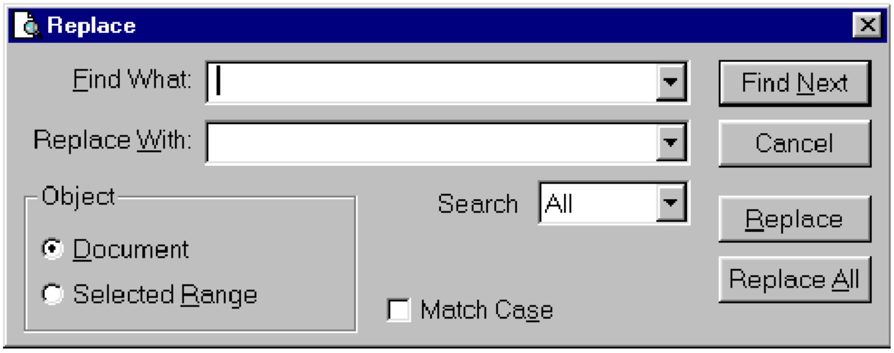


Fig. 10-23 Replace Dialog Box

- Find What: Input the desired character string for search here.
- Replace With: Input the character string desired for replacement here.
- Search Direction: Specify the direction of search. If ALL is selected, search runs downward to the end, then it runs downward from the top of the data.
- Object: Select the range of search; all the document or within a selected range.
- Maintain cases: If you check this box, upper and lower case letters will be distinguished in replacing character strings.

10.3.9 Search on Grid

Searches the Error log and Operation log grids.
The basic operation is the same as described in 10.3.7 “Retrieving”, but the field name is added to the retrieving condition. The search runs for the field specified in the Field Name box. If a matching character string is found the appropriate page is displayed.

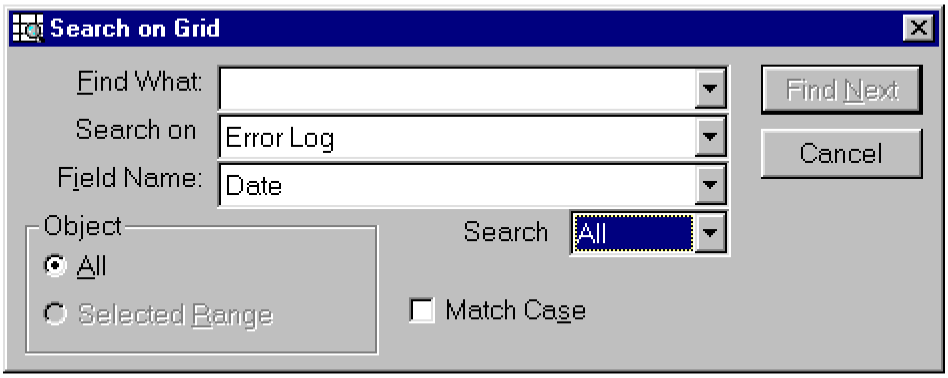


Fig. 10-24 Search on Grid Dialog Box

10.4 Actions Menu (Log Manager)

Commands arranged in this Actions menu can be also specified by the buttons shown below.

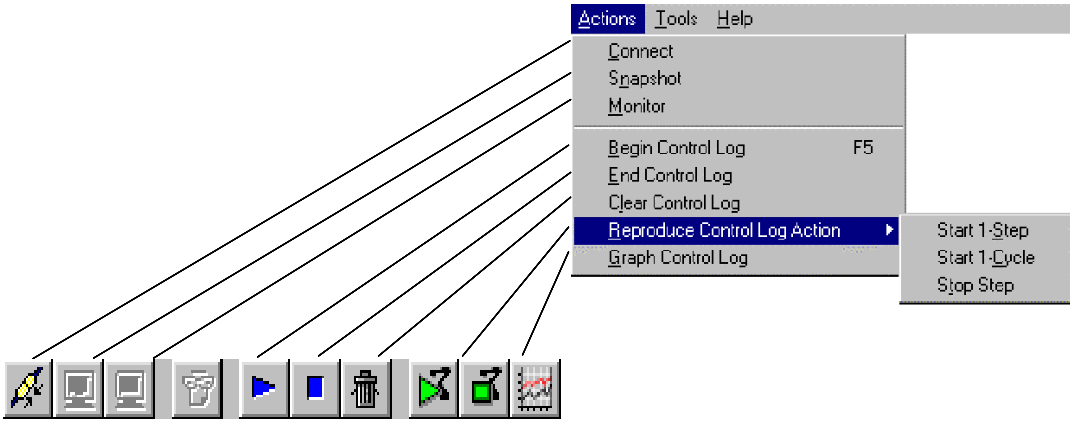


Fig. 10-25 Actions Menu and Buttons

10.4.1 Connect

Makes connection for communication with the Robot Controller.
When connected, the menu has a check mark.
The CONNECT button works the same way as the CONNECT command.
When connected, it is displayed as if depressed.

10.4.2 Snapshot

Acquires the instantaneous data from the Robot Controller.
The SNAPSHOT button works the same as the SNAPSHOT command.
To run the snapshot command communication must be set up in advance.

10.4.3 Monitor

Acquires data in succession from the Robot Controller.
The MONITOR button works the same as the MONITOR command.
To run the monitor command communication must be set up in advance.

10.4.4 Begin Control Log

Starts recording the control log at the Robot Controller.
To run the Begin Control Log command, it is necessary for the communication to be set up in advance.
The START LOG button works the same as the Begin Control Log command. It has the same function as the PAC STARTLOG command. Refer to “19.2 STARTLOG (Statement)” in Part 2 of the PROGRAMMER'S MANUAL.

10.4.5 End Control Log

Stops recording the control log at the Robot Controller.
The STOP LOG button works the same way as the End Control Log command. It has the same function as the PAC STOPLOG command. Refer to “19.2 STOP LOG” in Part 2 of the PROGRAMMER'S MANUAL.

10.4.6 Clear Control Log

Erases the content of the control log at the Robot Controller.
The Clear Control Log button works the same way as the Clear Control Log command. It has the same function as the PAC CLEARLOG command. Read 19.2 “CLEARLOG (Statement)”, Part 2, the PROGRAMMER'S MANUAL.

10.4.7 Reproduce Control Log Action

Prepares the Arm Manager and Log Manager using the following procedure to reproduce motion by control log:

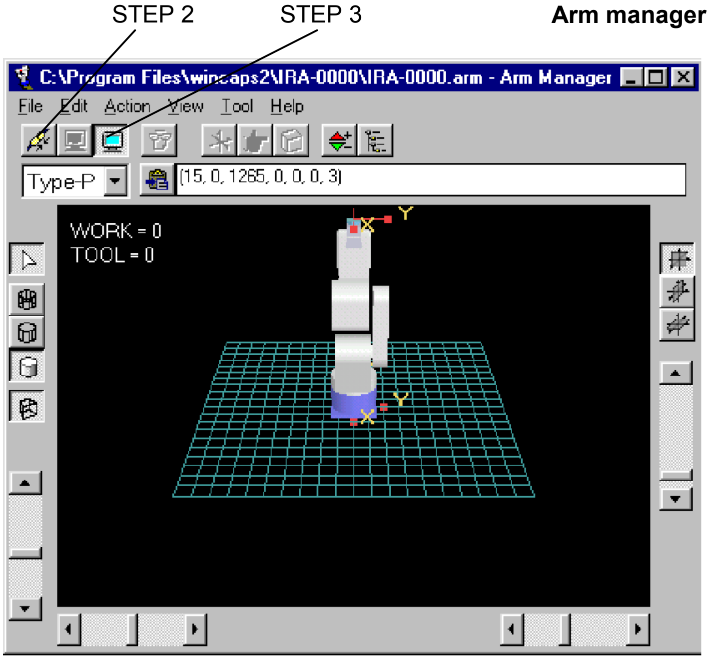
►STEP 1

Click on button of System Manager.
The Arm Manager starts.

►STEP 2

Set button of Arm Manager to the disconnected status.

STEP 2 STEP 3



Arm manager

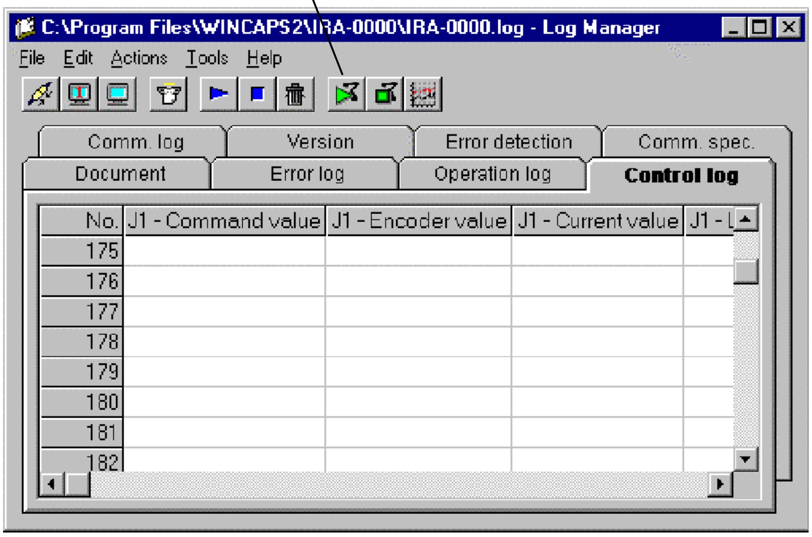
►STEP 3

Click the button of Arm Manager to enter Monitor status.

►STEP 4

Click the button.

STEP 4 **Log Manager**



This completes the preparation. Run respective reproduction operation according to the following descriptions:

Start 1-Step

Reproduces one step portion of the currently selected control log.

Start 1-Cycle

Reproduces robot action using the Arm Manager and the command value recorded in the control log of Log Manager every 8 msec.
The playback button works the same way as the Reproduce Control Log-Start 1-Cycle command.

Stop Step

When reproducing the current control log motion this will stop such motion.
The control log motion stop button works the same way as the Reproduce Control Log-Stop Step command.

10.4.8 Graph Control Log

Graphically displays the data recorded in the control log.
The graph button works the same way as the Graph Control Log command.

10.5 Tools Menu (Log Manager)

The Tools menu has these commands.

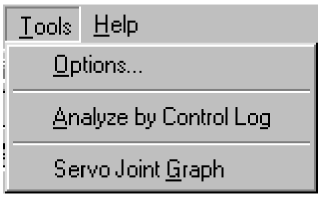


Fig. 10-26 Tools Menu

10.5.1 Options

Selecting Options command in the Tools menu and the Options dialog box appears. Clicking on the table displays the respective option items.

> **Note: Items that can be edited vary depending on the user level. For restrictions by user level, refer to "1.3 Security". For the method of changing the access level, refer to "4.3.3 Re-Log In".**

10.5.1.1 Monitor

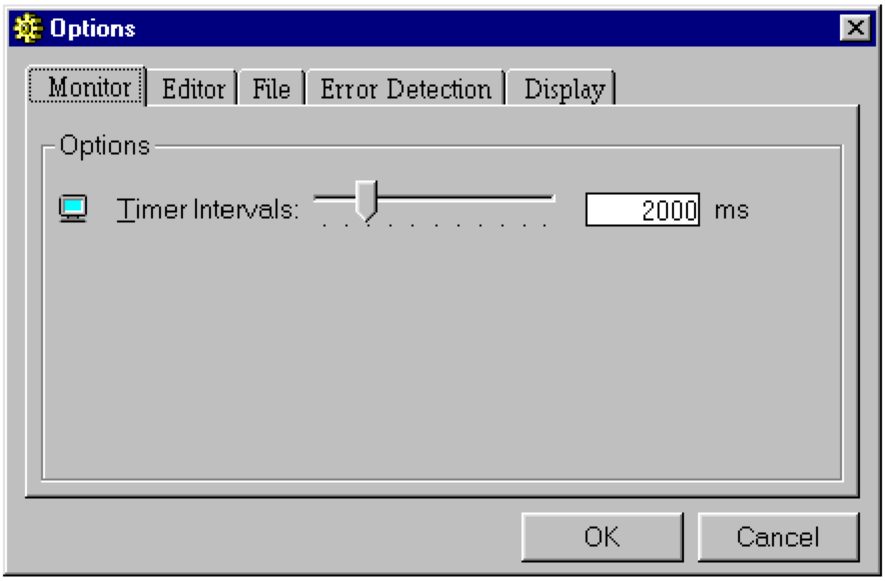


Fig. 10-27 Monitor (Options) Dialog Box

- Timer intervals: Sets the data input intervals for monitoring. Initial status is 2000 msec.

10.5.1.2 Editor

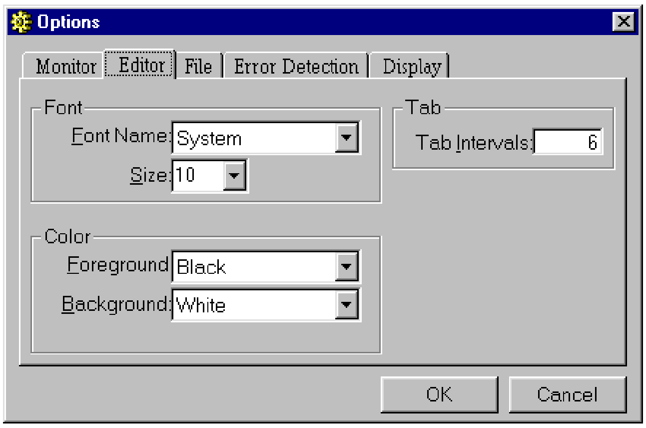


Fig. 10-28 Editor (Options) Dialog Box

- Font name: Specifies font to be used in the document. Clicking on ▼ arrow opens the list of selection items.
- Size: Specifies the font size to be used in the document. Clicking on ▼ arrow opens the list of selection items.
- Foreground: Specifies the color of foreground to be used in the document. Clicking on ▼ arrow opens the list of selection items.
- Background: Specifies the color of background to be used in the document. Clicking on ▼ arrow opens the list of selection items.
- Tab intervals: Specifies the number of half size spaces for one tab interval.

10.5.1.3 File

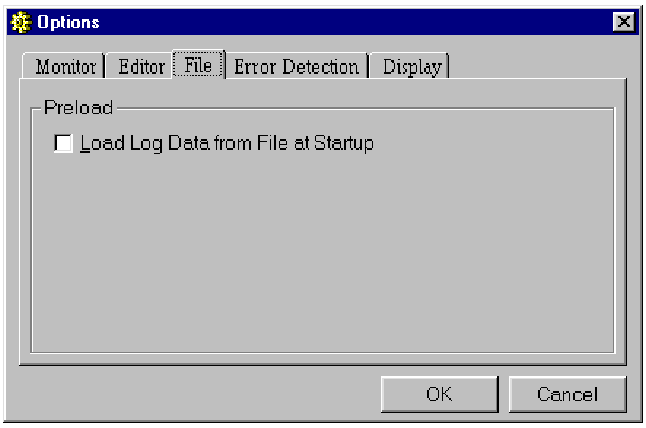


Fig. 10-29 File (Options) Dialog Box

- Load log data from the file at start: Specifies whether to read past data saved in the log file when the Log Manager is started.

Note:	**Reading takes some length of time. The Log Manager automatically starts when WINCAPSII is started.**

10.5.1.4 Error Detection

Click the Error Detection tab to specify the processing performed upon generation of an error.
The detection condition of errors displayed in ERROR DETECTION in the main Log Manager window, conforms to the setting in ERROR DETECTION of the SET dialog box.
For more information on Error Detection in the Log Manager window, refer to “10.1.1.7 Error Detection”. For actual error detection, the Controller must be constantly supervised. Detect errors by turning ON the MONITOR button in the Log Manager window.

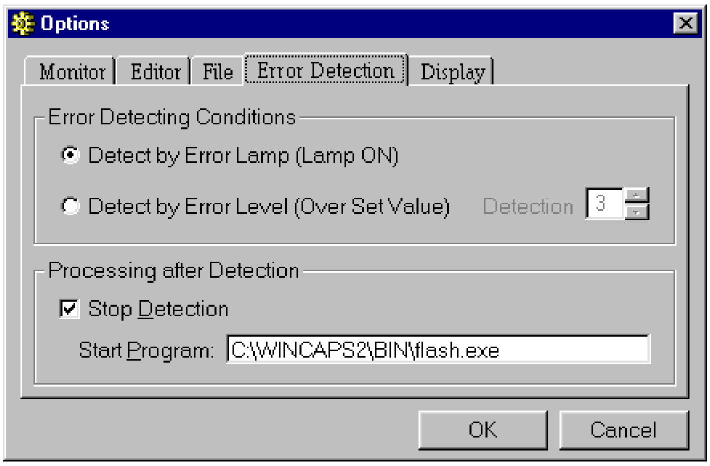


Fig. 10-30 Error Detection (Set) Dialog Box

- Servo error: If checked, executes the PROCESSING AFTER DETECTION setting when a servo error occurs.
- Control log buffer full: If checked executes the Processing after detection setting when the control log buffer becomes full.
- Stop detection: If checked, disregards the error after the second time the same error occurs.
- Start program: If an error is detected, specifies an application to start.

10.5.1.5 Display (Programmer Level)

Click the Display tab to set the display options between show and Hide.
This item only displays on the programmer level.

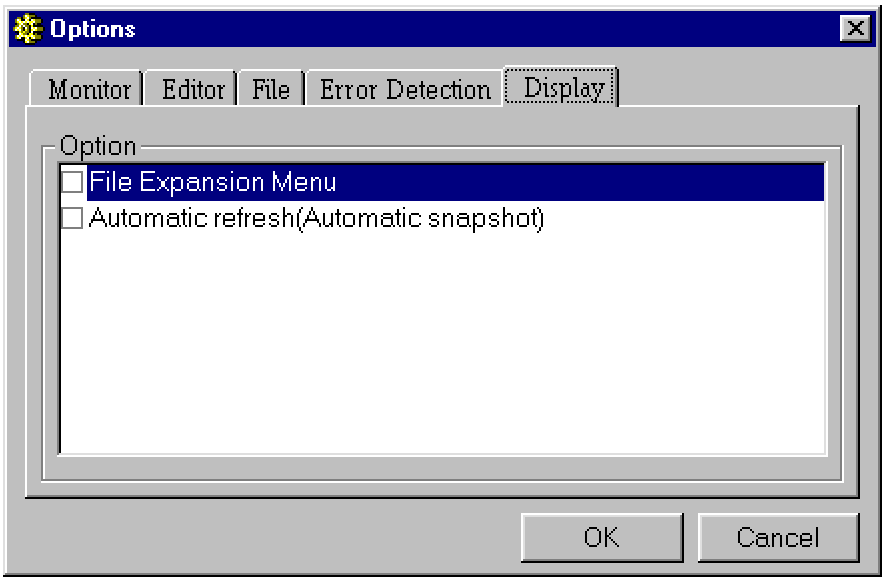


Fig. 10-31 Display Tab (Options Dialog Box)

- File extension menu: Extends File menu
  For details, refer to “10.1.5 Menu List."
- Auto Update (automatic acquisition of snapshot): If you change the window size or scroll the screen when the Log Manager is connected or in the process of connection to the Robot Controller, the Manager automatically monitors the snapshot.

10.5.2 Control Log Analysis

Performs analysis on the basis of control log data and displays the expected load ratio, maximum load ratio and expected rotational resistance load ratio of each respective axis.

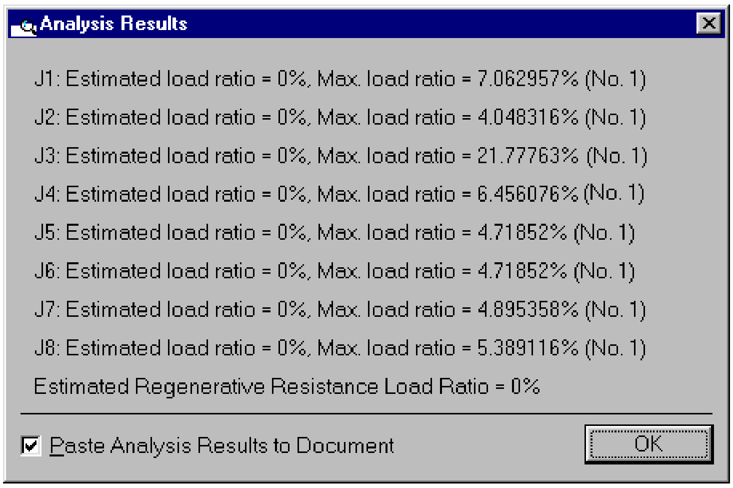


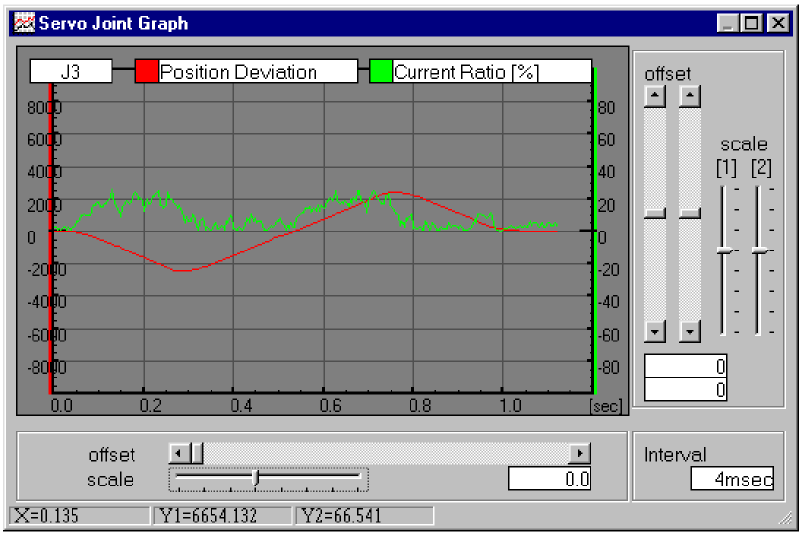
Fig. 10-32 Analysis Results Dialog Box

Paste the results of analysis in the document, check (d) and click on **OK**. The analytical results of the displayed control log will then be added to the document described in “10.1.1.1 Document”.

10.5.3 Servo Joint Graph

Graphically displays "Servo Single-Axis Data Log" received from the controller or imported on the FILE menu.

Note: For details on how to specify the receive data axis number and item, refer to the Robot Instruction Manual.



10.6 Help Menu

Descriptions on how to use WINCAPSII can be viewed using the Help menu.

Fig. 10-33 Help Menu

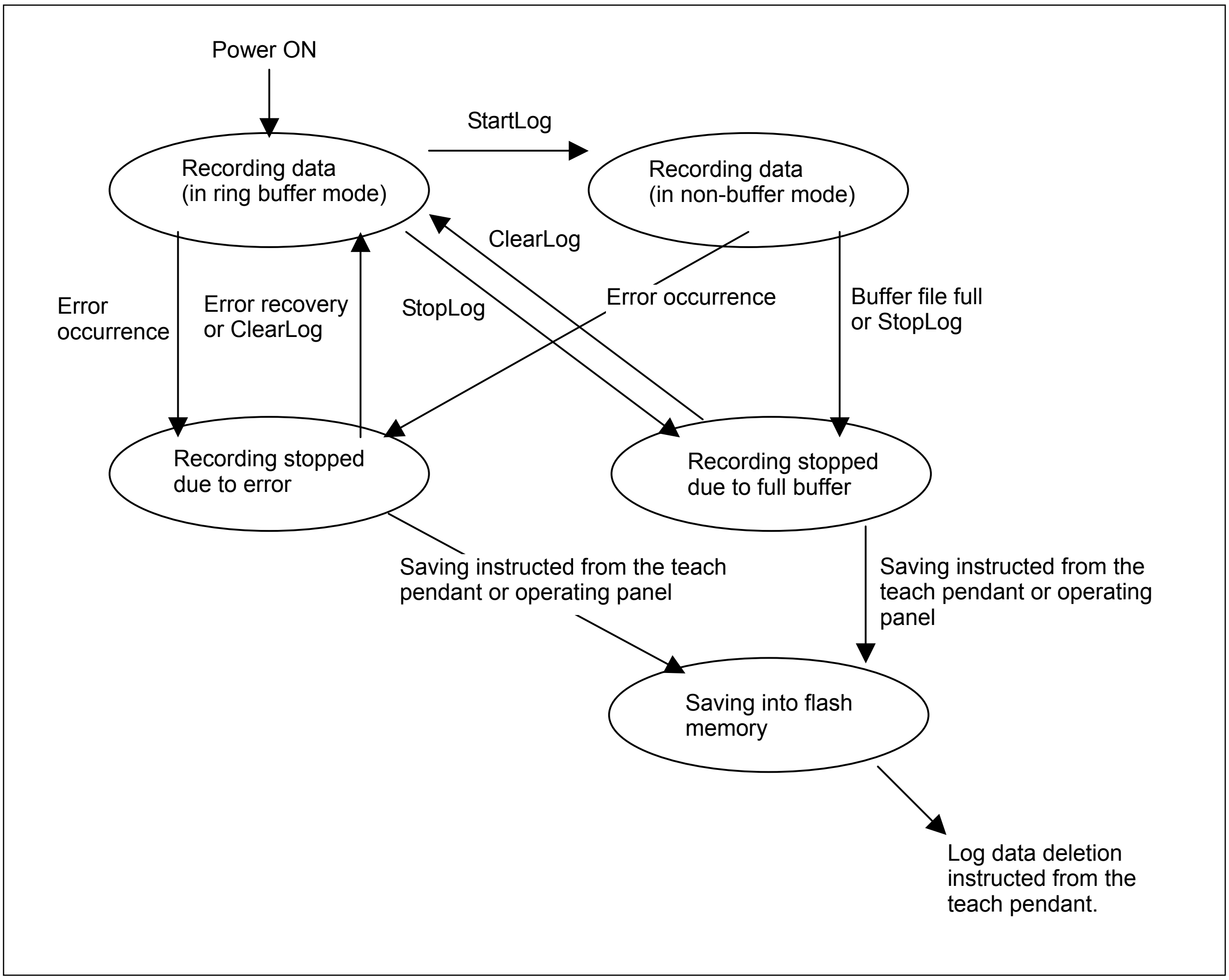
10.6.1 About Log Manager

Displays the version information of the Log Manager.

10.7 New Control Log (Ver. 1.20 or newer)

10.7.1 New Control Log Function

WINCAPSII version 1.20 or newer supports a new control log whose operation status will change as illustrated below.



NOTE: A flash memory refers to an area which preserves data even if power supply is cut off.

When the power is on, control log is always recording data in ring buffer mode. The buffer size for this can be specified by the user.

Data recording will be aborted due to an error occurrence (Error 6000's Level 3 or higher) or by StartLog or StopLog.

ClearLog or removing error will start data recording. (ClearLog will be automatically called up when data is preserved from the ring buffer to the flash area or to WINCAPSII.) Control log can be fetched only from WINCAPSII.

If recording is aborted, data can be fetched from the ring buffer or the flash area.

NOTE 1: If the log is switched from a recording stop (recording aborted) to the ring buffer mode after the removal of an error, data can be fetched until the ring buffer will stop next. If ClearLog is executed, data can be no longer fetched.

NOTE 2: If the log is switched to a recording stop due to a full buffer by user operation, it cannot be switched back to the ring buffer mode until it gets ClearLog.

NOTE 3: If any error occurs during data fetching from the ring buffer, the error log will not be recorded.

10.7.2 User's Operations While Using Control Log

User's operations which the user performs related to control log are as follows:

- Setting the ring buffer for preserving data. (Subsection 10.7.3)
- StartLog (Subsection 10.7.4)
- StopLog (Subsection 10.7.5)
- ClearLog (Subsection 10.7.6)
- Saving or deleting control log to/from the flash area. (Subsection 10.7.7)
- Fetching control log (Subsection 10.7.8)
- Saving control log to floppy disks (Subsection 10.7.9)

10.7.3 Setting the Ring Buffer for Preserving Data

You may change the ring buffer settings from the teach pendant or in WNCAPSII. The ring buffer settings include two types of parameters--control log record mode and control log sampling interval. The new settings you made will take effect when power supply is turned on next time.

Control log record mode

Any of integers 1 to 3. The number of sampling times will change according to the mode.

1: 1250 times

2: 2500 times

3: 3750 times

NOTE: Depending upon the mode, memory sometimes cannot be secured. If this happens, an error occurs at the time of project loading. Downgrade the mode and restart the controller.

Control log sampling interval

Any of 8, 16, 24, and 32. The unit is millisecond.

NOTE: If you specify a value other than the above four integers, the entered value will be automatically raised to the nearest higher value. (e.g., if you specify 12, the sampling interval will be set to 16.)

Defaults

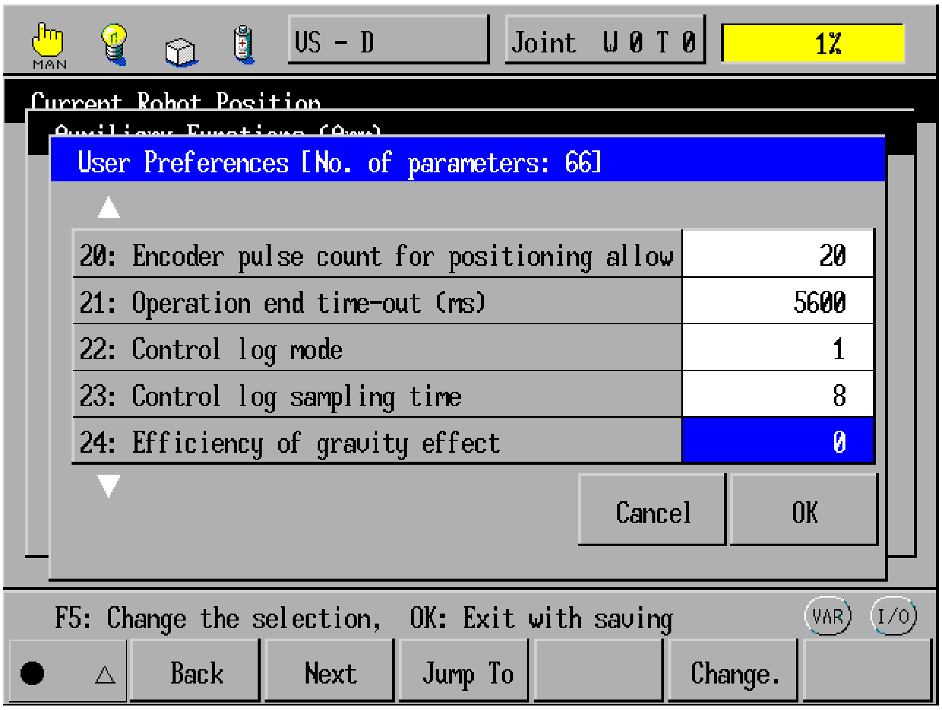
Control log record mode: 1

Control log sampling interval: 8

The sampling time is 10 seconds.

Parameter setting procedure from the teach pendant

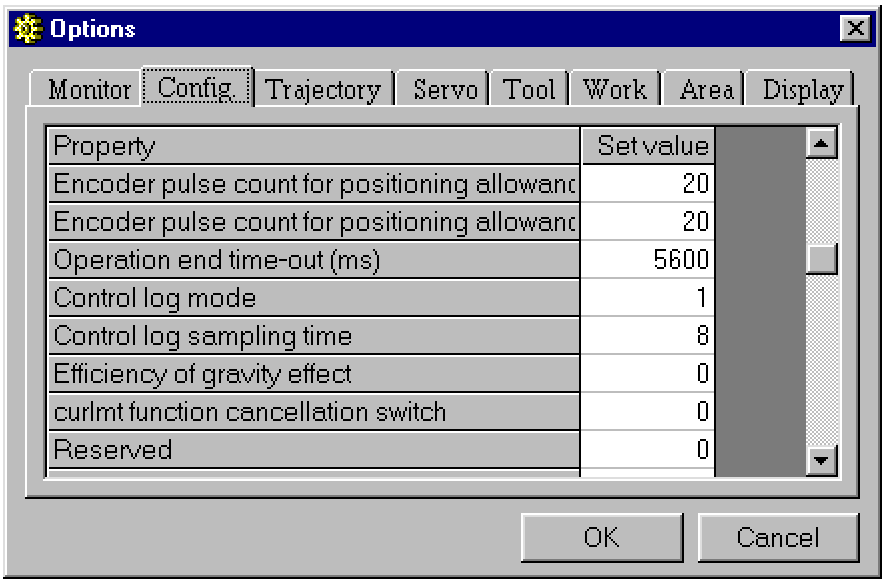
Access: Top screen –[F2 Arm]–[F6 Aux.]–[F7 Config.]



Setting the Ring Buffer that Preserves Data

Modify the Control log mode and Control log sampling time parameters.

Parameter setting procedure in WINCAPSII



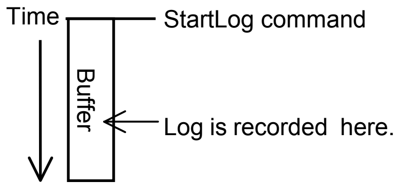
Setting the Ring Buffer that Preserves Data

Enter into WINCAPSII by 1-Programmer level. Open Arm Manager and select [Tool] [Options] [Config.]. Set the control log record mode and control log sampling interval parameters, then send those settings to the controller.

10.7.4 StartLog

After execution of StartLog, if the ring buffer becomes full, the process will be stopped.

That is, the log of process from StartLog to the full buffer state can be fetched.



10.7.5 Stoplog

The current ring buffer can be stoped at the same time as StopLog.

10.7.6 ClearLog

Restarts the ring buffer.

Restarts the sampling process which has been stopped with StartLog or StopLog.

10.7.7 Saving or Deleting Control Log to/from the Flash Area

If the control log cannot be immediately read in WINCAPSII, then use this function to take a backup.

Control log preserved in the flash memory is secured even after the power supply of the controller is cut off.

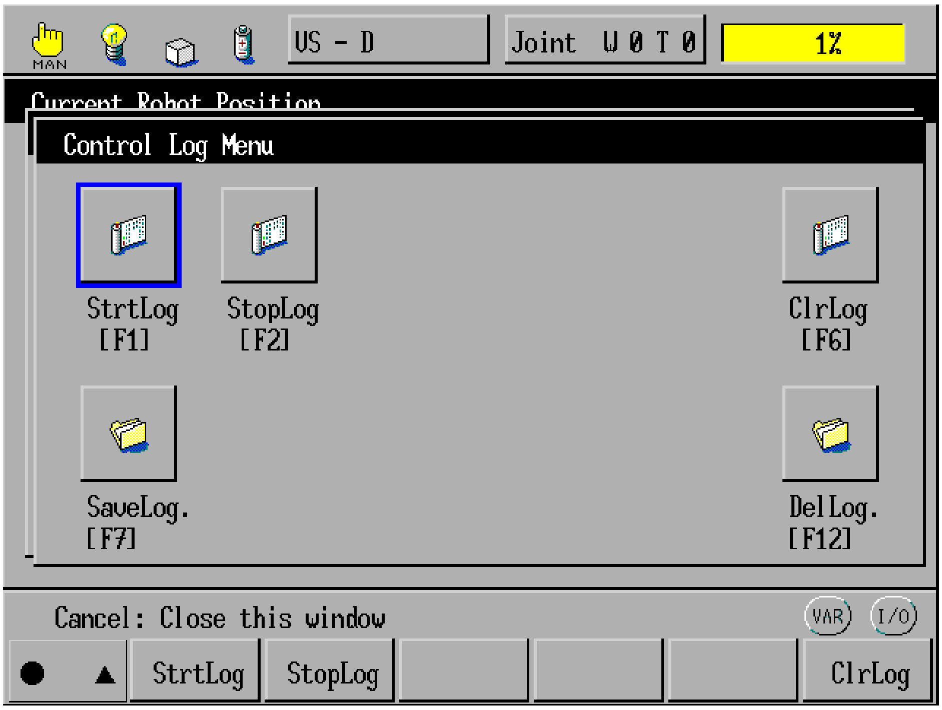
You may save control log from the teach pendant or operating panel. Deletion of control log is possible only from the teach pendant.

NOTE: There may be changes of failure in save process due to insufficient flash memory.

NOTE: If you save control log again after saving it, the log data will be overwritten.

Log saving/deleting procedure from the teach pendant

Access: Top screen –[F2 Arm]–[F6 Aux.]–[F11 Log]



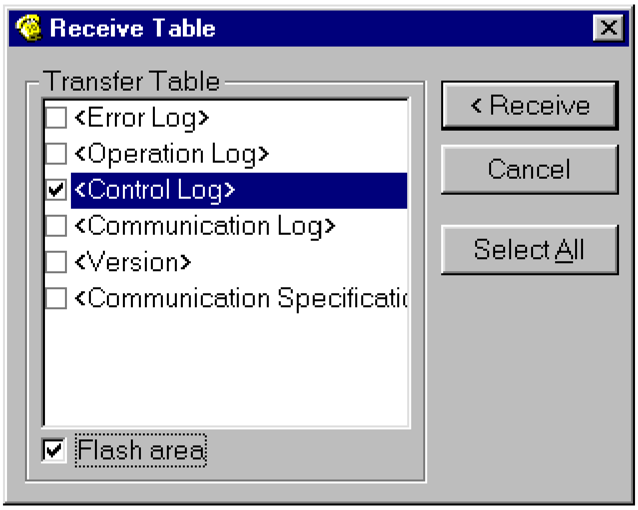
Control Log Menu

[F7 SaveLog.] Saves the control log into the flash memory.

[F12 DelLog.] Deletes the control log from the flash memory.

10.7.8 Fetching Control Log

Receive the control log from LogManager.



Fetching Control Log in WINCAPSII

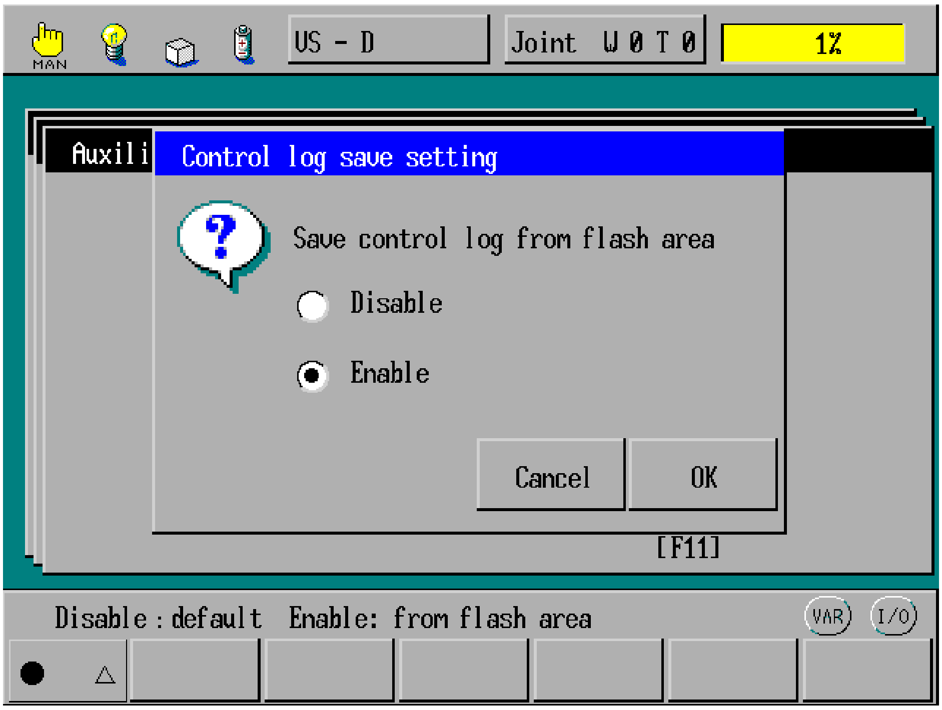
To fetch the control log from the flash memory, you need to check the flash memory beforehand.

NOTE: Checking the flash memory is possible only with control log. It has no effect on sending/receiving other data.

10.7.9 Saving Control Log to Floppy Disks

If you fetch log data with the FDD function, the control log will also be saved onto the floppy disk. For details, refer to the SETTING-UP MANUAL.

To fetch the control log from the flash memory, press [F6 Set]—[F3 USB.]—[F12 AUX.]—[F11 CtrlLog.] and select "Enable" option, making the Saving of control log possible.



Enabling Control Log Saving

NOTE: When the controller starts, the parameter for saving the control log in the flash area is set to Disable.

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