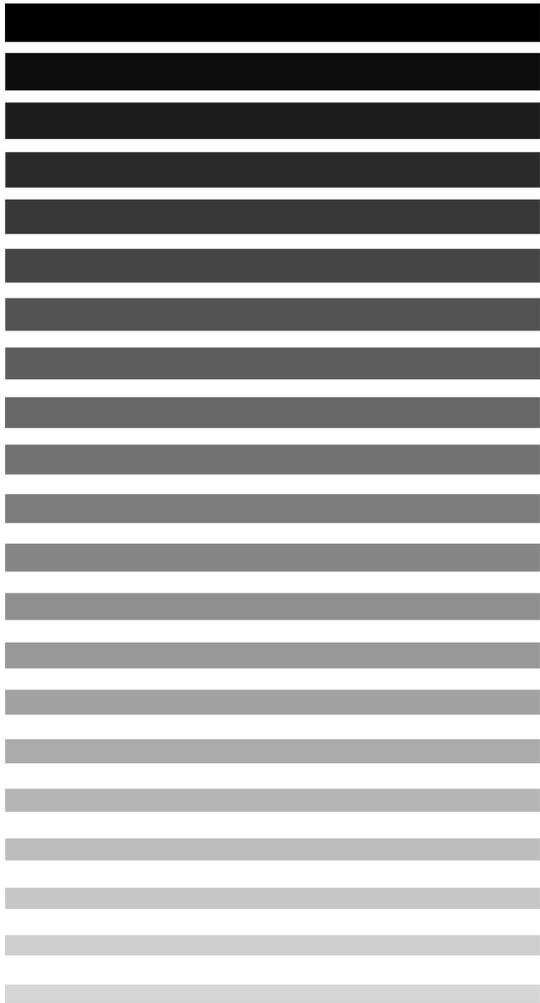


DENSO



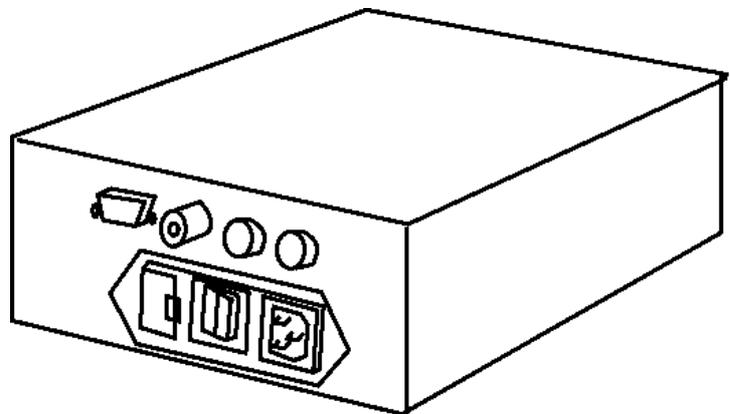
DENSO ROBOT

Vision device

μ Vision-21 Super

Model: VC-21XP, VC-21XPD

SETTING-UP & MAINTENANCE GUIDE



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Preface

Thank you for purchasing this vision device “ μ Vision-21 Super”.

Before operating your “ μ Vision-21 Super”, read this manual carefully to safely get the maximum benefit from your device.

Products covered by this manual

- Vision device μ Vision-21 Super (VC-21XP): for parallel I/O
 μ Vision-21 Super (VC-21XPD): for DeviceNet slave

 - Peripheral devices Camera
 Monitor
 Lens
 Cables

 - Robot controller ; The μ Vision-21 can be used together with DENSO robot controller.
-

Important

To ensure operator safety, be sure to read the precautions and instructions in "SAFETY PRECAUTIONS," page iii.

How the documentation set is organized

The documentation set consists of the following four books. If you are unfamiliar with this vision device, please read all books and understand them fully before operating your μ Vision-21 Super.

SETTING-UP & MAINTENANCE GUIDE - this book -

Provides an explanation of the μ Vision-21 Super outline, instructions for installing the vision system components, operation of the μ Vision-21 Super, and maintenance & inspection procedures. Introduces you to the μ Vision-21 Super.

WINCAPSII GUIDE - included in Manual Pack CD -

Provides instructions on how to use the teaching system installed on the PC, connected to the vision device, for developing and managing programs.

PROGRAMMER'S MANUAL (I) , (II) - included in Manual Pack CD -

Describes the PAC programming language, steps to develop programs in PAC, and command specifications.

ERROR CODE TABLES - included in Manual Pack CD -

List error codes that will appear on the teach pendant, the operating panel, or the PC screen if an error occurs on a robot, WINCAPSII or μ Vision-21 Super. Also summarize the description and the actions to be taken.

How this book is organized

This book consists of SAFETY PRECAUTIONS and chapters one through seven.

SAFETY PRECAUTIONS

Defines safety terms, safety related symbols and provides precautions that should be observed. Be sure to read this section before operating your μ Vision-21 Super.

Chapter 1 General Information about μ Vision-21 Super

This chapter touches on general information about the specifications and configuration of the μ Vision-21 Super.

Chapter 2 Option devices

This chapter describes the configurations and functions of these optional devices --- camera, monitor and lens.

Chapter 3 Operation of WINCAPSII(Supplement)

This chapter describes the dedicated functions for the μ Vision-21 Super in the software of WINCAPSII.

Chapter 4 Creating program for μ Vision-21 Super

This chapter describes how to create the program and how to check the program motion for the μ Vision-21 Super. You can learn the procedure while creating the sample program.

Chapter 5 μ Vision-21 Super interface

This chapter describes the necessary requirements to connect the robot , PLC and other external devices to the μ Vision-21 Super.

Chapter 6 Maintenance and inspection

This chapter describes the regular maintenance and inspections necessary for maintaining the performance and functions of the μ Vision-21 Super.

Chapter 7 DeviceNet slave unit (Only for VC-21XPD model)

This chapter describes how to use the μ Vision-21 Super as DeviceNet slave unit.

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.

1. Installation Precautions

1.1 Insuring the proper installation environment

The μ Vision-21 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) there is sulfuric cutting or grinding oil mist, or
- (6) there are any large-sized inverters, high output/high frequency transmitters, large contactors, welders, or other sources of electrical noise.

1.2 Service space

The μ Vision-21 and peripheral equipment should be installed so that sufficient service space is maintained for safe programming, maintenance, and inspection.

1.3 Positioning of gauges

The display monitor and other gauges should be installed in an easy-to-check location.

1.4 Protection of electrical wiring

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

1.5 No robot modification allowed

Never modify the μ Vision-21 unit or other devices.

1.6 Lighting

Sufficient illumination should be assured for safe operation.

2. 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 vision device 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.

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Chapter1 General Information about μ Vision-21 Super

This chapter touches on general information about the specifications and configuration of the μ Vision-21.

1.1 Items Contained in the Package

1.1.1 Standard Items

The items listed in the table below are contained in the product package.

Standard Items

No.	Item	Qty.
(1)	μ Vision-21 unit : Two types below are selectable. VC-21XP (parallel I/O type) VC-21XPD (parallel I/O and DeviceNet slave type)	1
(2)	Power cable (2 m)	1
(3)	Manuals 1) μ Vision-21 Super (this book) 2) Manual Pack CD	1 each
(4)	Personal computer system teaching software; WINCAPSII in CD-ROM or floppy disk	1

1.1.2 Optional Items

The table below lists the optional items.

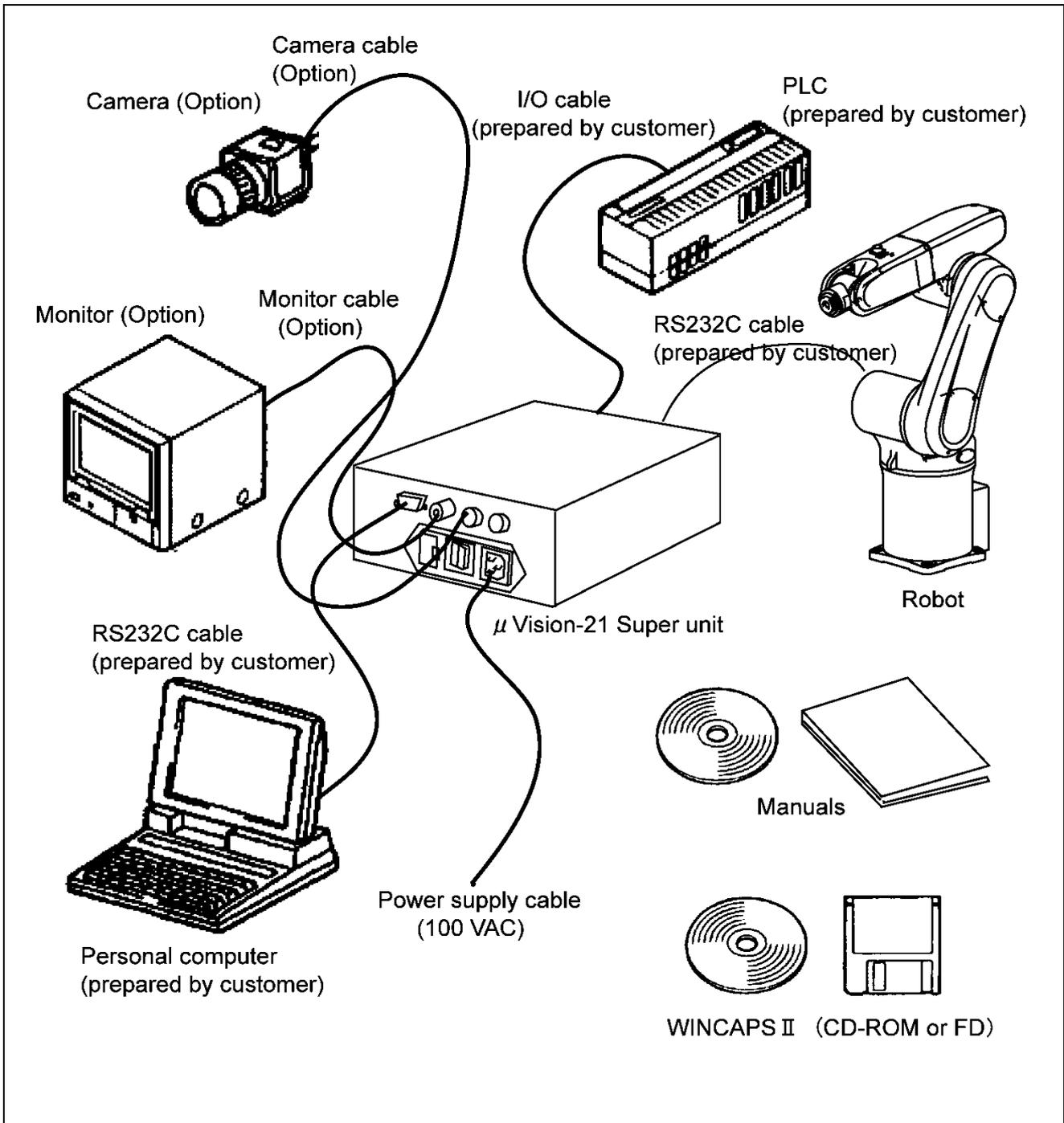
Optional Items

Classification	No.	Item	Remarks	Part No.
Camera	1	Camera	1/2- inch, CCD	463980-0030
Monitor	2	Monitor	9-inch , monochrome	463980-0021
Lens parts	3	CCD lens	8mm	463980-0080
	4	CCD lens	16mm	463980-0090
	5	CCD lens	25mm	463980-0100
	6	CCD lens	35mm	463980-0111
	7	CCD lens	50mm	463980-0120
	8	CCD lens	75mm	463980-0130
	9	Cover glass (for protection of lens)	For 8mm CCD lens	463980-0140
	10	Cover glass (for protection of lens)	For 16, 25 or 35mm CCD lens	463980-0150
	11	Cover glass (for protection of lens)	For 50 or 75mm CCD lens	463980-0160
	12	Macro ring set	1 each (0.5,1,2,5,10,20,40mm)	463980-0170
Cable	13	Camera cable	3m	463981-0110
	14	Camera cable	5m	463981-0120
	15	Camera cable	15m	463981-0160
	16	Monitor cable	BNC 1m	463981-0010
	17	Monitor cable	BNC 3m	463981-0030
	18	Monitor cable	BNC 5m	463981-0050

1.2 Configuration

1.2.1 μ Vision-21 Super System

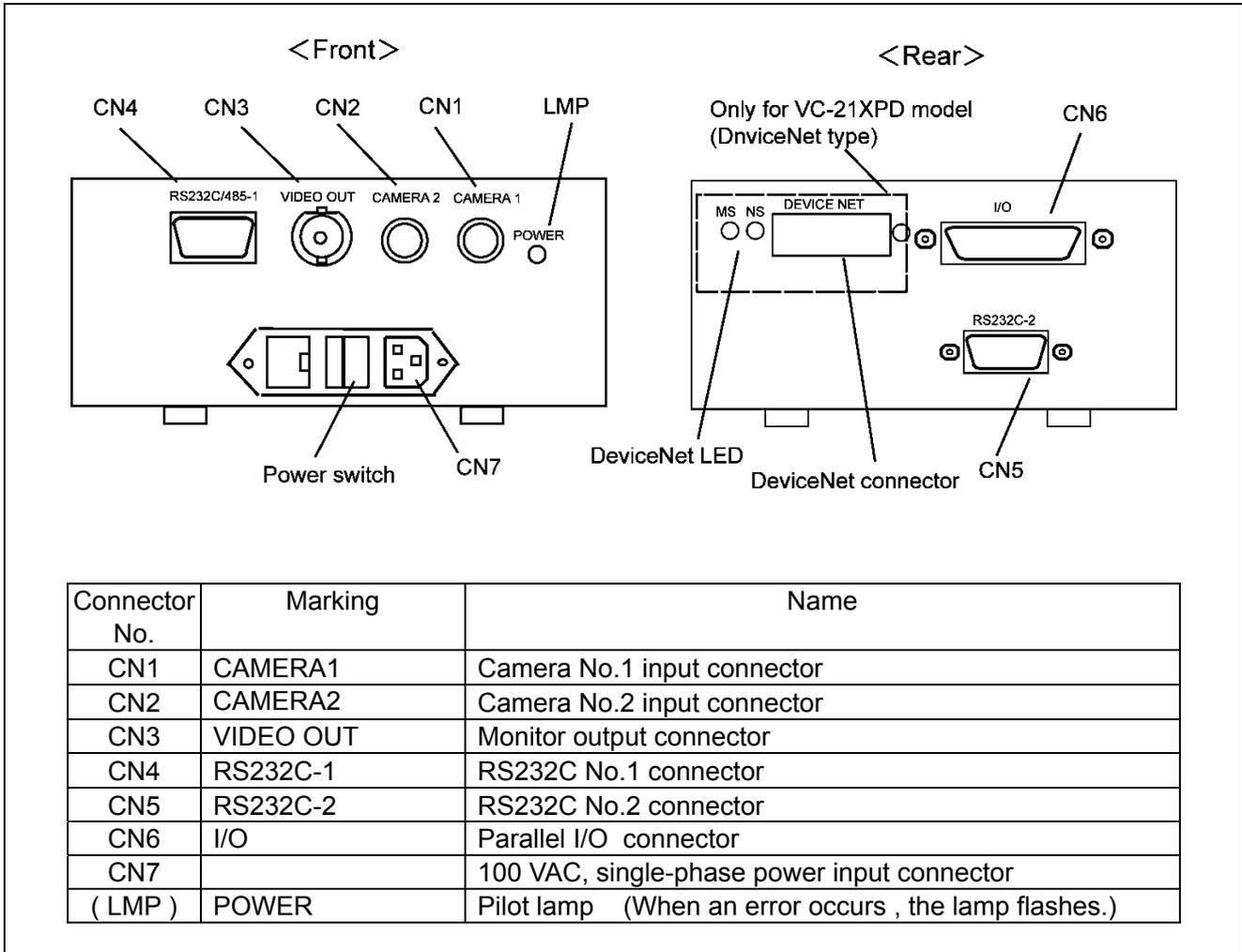
The figure below shows the entire configuration of the μ Vision-21 system.



Configuration of μ Vision-21 system

1.2.2 Names of μ Vision-21 Super Components

The Figure below shows the names of the components of the μ Vision-21.



Names of the components

⚠ Caution: These connectors are of a screw-lock type or ring-lock type. Lock the connectors securely. If even one of the connectors is not locked, weak contact may result thereby causing an error.
Be sure to turn the power switch OFF before connecting/disconnecting the connectors. Otherwise, the internal circuits of the μ Vision-21 unit may be damaged.

1.3 μ Vision-21 Super Specifications

1.3.1 Specifications of μ Vision-21 Unit

The table below shows the specification of the μ Vision-21 unit.

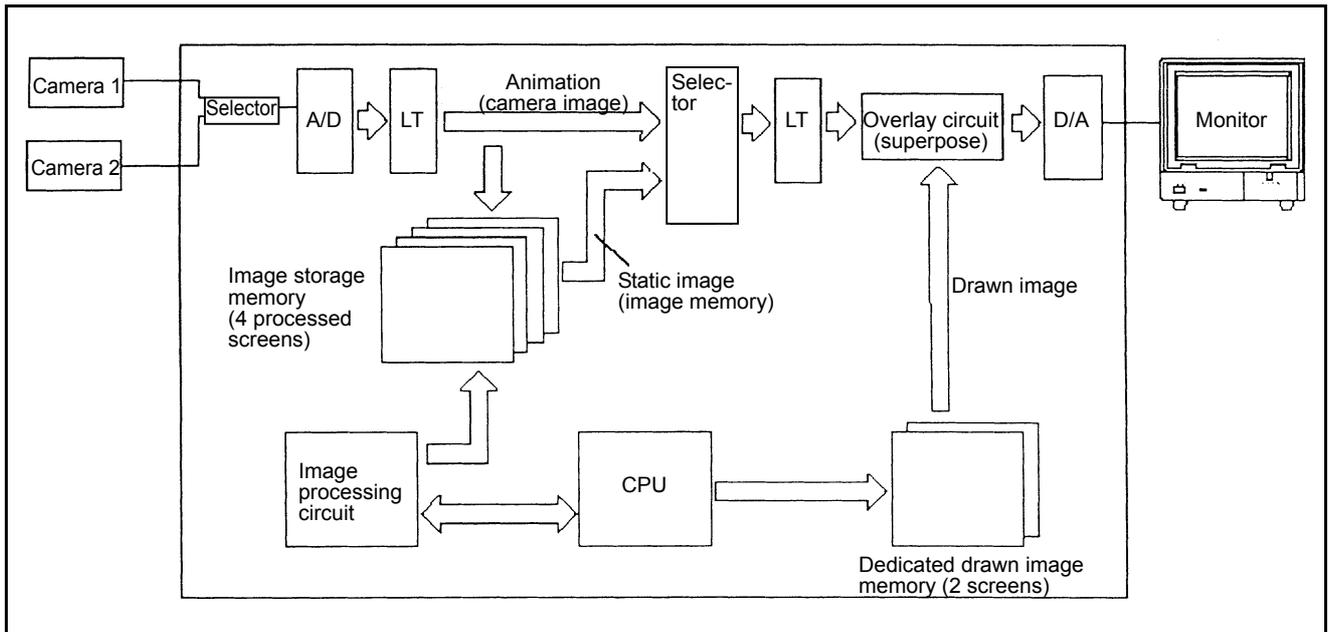
Specifications of μ Vision-21 unit

Item	Specifications
Model	VC-21XP (Standard type), VC-21XPD (DeviceNet type)
CPU	SH7750, 167MHz
Memory	SDRAM: 16MB FLASHROM: 4MB EEPROM: 32KB
Image storage memory (processed image)	Horizontal (H) 512 \times Vertical (V) 480 pixels, 8 bits \times 4 screens
Overlay memory (drawn image)	Horizontal (H) 640 \times Vertical (V) 480 pixels, 2 bits \times 2 screens
Search model and program registration memory	1 MB (H255 \times V255 \times 8 models), up to 100 models registrable Note (1)
Image input, number of channels	RS170, monochrome, 256 gradations,
Number of input channels	2 channels
Image output	NTSC, monochrome, 1 channel
Serial interface	RS232C, 2 channels
Image processing	Binary feature extract (area, center of gravity, main axis angle, luminance integration), histogram, edge detection, image-to-image operation, filtering, labeling, light/dark image search, code recognition (QR code)
Processing range specification (window)	Up to 512 windows registrable (shape: straight line, rectangle, circle, ellipse, sector)
Self-diagnosis function	Memory check, incorrect input, incorrect processing range, improper camera connection, etc.
Error display	When an error occurs, the pilot lamp flashes. Errors will be displayed on the monitor (option).
Power source	Single-phase, 100 VAC, 50/60Hz
Environmental conditions (during operation)	Temperature: 0 to 40°C Humidity: 90 %RH or less (Dew condensation shall not be allowed.)
Outside dimensions (H \times W \times D)	59 \times 142 \times 200 mm (excluding projections of connectors)
VC-21XPD model	DeviceNet-compliant

Note (1) Search models and programs are registered in the same memory area.

The number of registrable models and programs depends on the model image size and program size.

1.3.2 Block Diagram and Internal Configuration of μ Vision-21 Super

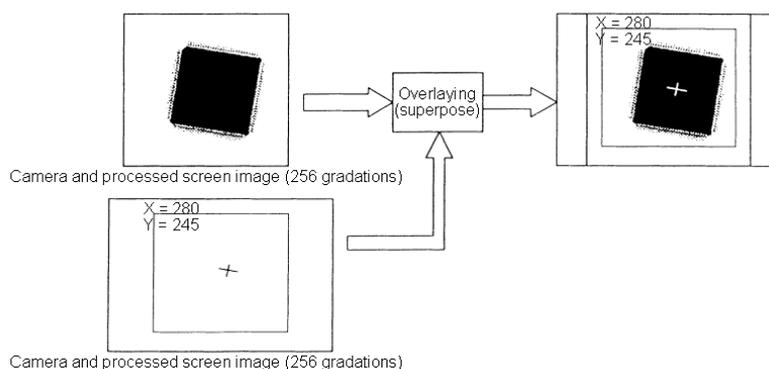


Block Diagram of μ Vision-21

The figure illustrates the processing flow of the μ Vision-21 as reference. The actual circuit configuration is different from this diagram.

Camera selector	Selects camera image.
A/D	Converts analog signals into digital signals (8-bit).
Monitor selector	Selects whether to display the camera or the static image on the monitor.
LT	Converts 8-bit data values using the appropriate table.
Overlay circuit	Overlays a drawn image, stored in the dedicated drawn image memory, on the camera or the static image (see Figure 3-13, the overlay conceptual diagram).
D/A	Converts digital data into analog signals.
Image storage memory	Reads and stores camera images. Images are displayed on the monitor as static images. Up to four screens can be stored on this board.
Dedicated drawn image memory	The memory used to store drawn images of characters and figures. Images can be displayed on the monitor using the overlay circuit. Up to two screens can be stored on this board.
Image processing circuit	The circuit to process images.
CPU	Manages the entire system.

Overlay Concept



1.4 Different Specifications between μ Vision-21 Super and Robot Controller

Different specifications between the μ Vision-21 and the robot controller (RC5) are as follows.

1.4.1 Available Variables

Variable Types I, F, D and S are available with the μ Vision-21.

Variable Types V, P, J and T are not available with the μ Vision-21.

1.4.2 Save and Load of Global Variables

Global variables (Type I, F, D and S) can not be saved or loaded to the μ Vision-21.

When turning off the power switch ,or loading the project to the μ Vision-21, global variables are initialized.

1.4.3 Multitasking

The μ Vision-21 has not multitasking function.

Multiple programs can not be executed concurrently in the μ Vision-21.

1.4.4 Circuit Number of Serial Communication

The table below lists the relationship between the circuit numbers and channel numbers assigned in the μ Vision-21.

Note: The circuit number of the μ Vision-21 is deferent from the one of the robot controller.

Circuit and Channel Number Assignment in the μ Vision-21

Circuit number	Channel number	Used as:
1	Ch1	WINCAPSII port
2	Ch2	Universal port

1.5 Warranty

DENSO WAVE manufactures the μ Vision-21 under strict quality control. In case of failure, we warranty the robot under the following conditions:

Warranty Period

The warranty shall be effective for one year from the date of purchase.

Warranty Coverage

DENSO WAVE shall repair the robot free of charge when a failure occurs and is attributable to the design, manufacture or material of the robot within the warranty period in spite of proper use.

Items Not Covered

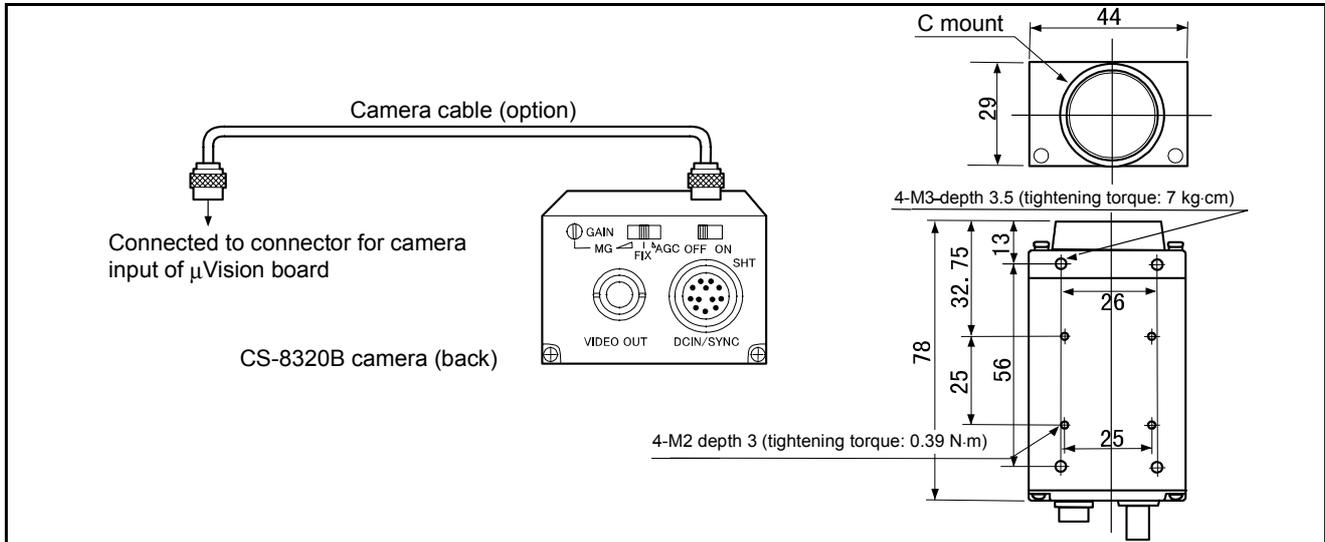
Failures, which arise from one of the following, shall not be covered by the warranty even if the robot is under warranty:

- (1) Failures caused by improper repair, modification, transfer or handling by you or a third party;
- (2) Failures caused by the use of a part or oil/fat other than those specified by DENSO WAVE;
- (3) Failures caused by a fire, salt damage, earthquake, storm/flood or other acts of God;
- (4) Failures caused by the use of the robot in an environment other than the environment specified by DENSO WAVE, such as dust and water ingress;
- (5) Failures caused by a worn-out consumable, such as a fan filter;
- (6) Failures caused by improper performance or non-performance of maintenance or inspections stated in this owner's manual; and
- (7) Damages other than the μ Vision-21 repair costs.

Chapter2 Option devices

This chapter describes the configurations and functions of these optional devices --- camera, monitor and lens.

2.1 General Information about the Camera



Camera Dimensions and its Parts Names

Camera Specifications

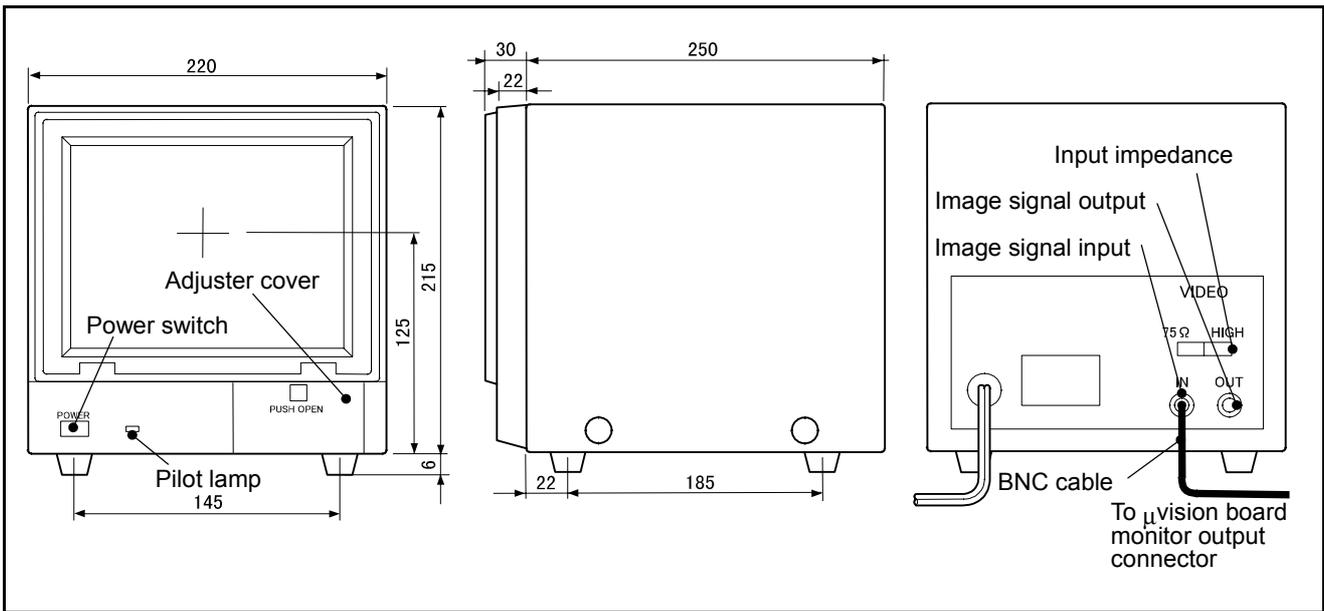
Item	Specifications
Manufacturer	Tokyo Electronic Industry Co., Ltd.
Manufacturer's model	CS8320B
Image pickup interline transfer system	CCD pixels: 768 (H) 493 (V)
Lens mount	C mount
Image output NTSC signal	1.0 Vp-p / 75 Ω
Power source/Ambient temperature	Supplied from power adapter, 0 to +40°C
Weight	120 g
Vibration-proof	98 m/s, 10G (10 to 50 Hz, 30 minutes in each of X, Y and Z directions)

Cables (Option)

Cable length	Camera cable model
3 m	CPC3440-03
5 m	CPC3440-05
15 m	CPC3440-15

- Caution:**
- (1) When mounting the camera to the equipment, tighten the screws securely to the specified torque.
 - (2) Do not apply a strong impact or vibration to the camera. A failure may result.
 - (3) Do not touch the inside of the camera. An electric shock or accident may result.
 - (4) For setting camera data, refer to the instruction manual that comes with the camera.

2.2 General Information about the Monitor



Monitor Dimensions and its Parts Names

Monitor Specifications

Item	Specifications
Manufacturer	CHUOMUSEN
Manufacturer's model	TMP-233-03
Cathode-ray tube	9-inch, monochrome
Image input NTSC signal	0.7 Vp-p (straight polarity)
Power supply	100 VAC, 50/60 Hz
Power consumption	Approx. 30 W
Ambient temperature	0 to 40°C
Humidity	90% or less (without dew condensation)

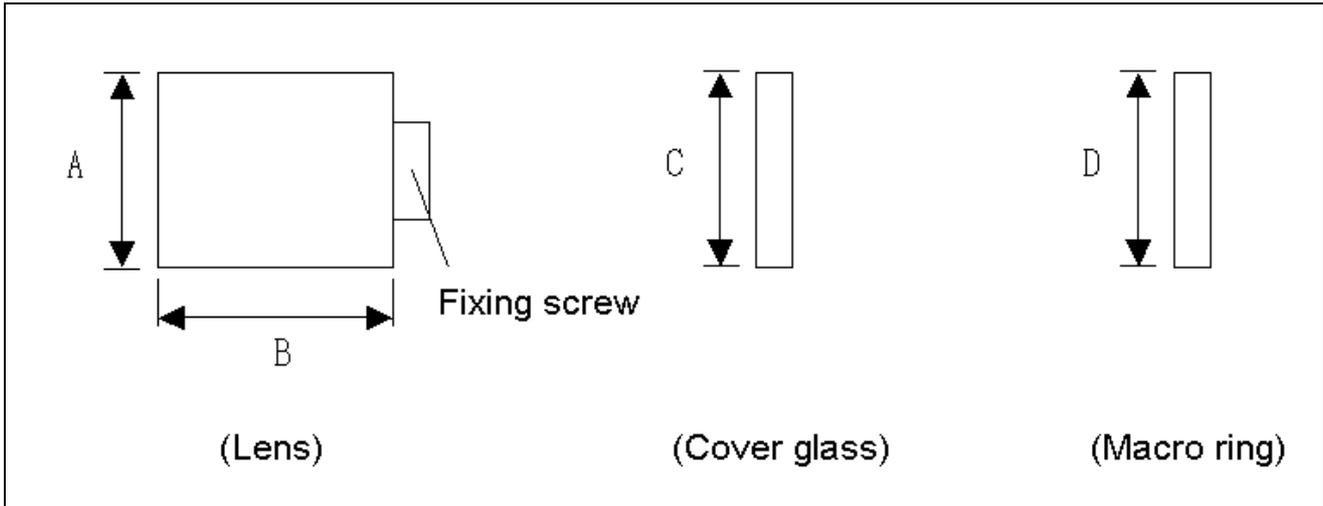
Cables (Option)

Cable length	BNC coaxial cable type
1 m	3CV-PP (1)
3 m	3CV-PP (3)
5 m	3CV-PP (5)

Caution (1): NEVER disassemble the monitor.

(2): Be sure to set a ferrite core clamp (ZCAT1518) to the BNC cable at the monitor output connector of the μVision board.

2.2.1 General Information about the lens



Lens, Cover glass and Macro ring

Specifications of lens items

No.	Part Name	Manufacture	Manufacture's model	Dimensions	Remarks
1	CCD lens	MORITEX Corporation	ML-0813	A= ϕ 29mm, B= 34.5mm	8mm
2	CCD lens	MORITEX Corporation	ML-1614	A= ϕ 30mm, B=24.5mm	16mm
3	CCD lens	MORITEX Corporation	ML-2514	A= ϕ 30mm, B=24.5mm	25mm
4	CCD lens	MORITEX Corporation	ML-3519	A= ϕ 35mm, B=37.5mm	35mm
5	CCD lens	MORITEX Corporation	ML-5018	A= ϕ 32mm, B=37.3mm	50mm
6	CCD lens	MORITEX Corporation	ML-7527	A= ϕ 29.4mm, B=42.5mm	75mm
7	Cover glass (for protection of lens)	MORITEX Corporation	ML-GA255	C= ϕ 27.5mm	For 8mm CCD lens
8	Cover glass (for protection of lens)	MORITEX Corporation	ML-GA270	C= ϕ 29mm	For 16, 25 or 35mm CCD lens
9	Cover glass (for protection of lens)	MORITEX Corporation	ML-GA305	C= ϕ 32mm	For 50 or 70mm CCD lens
10	Macro ring set	MORITEX Corporation	ML-EXR	D= ϕ 30mm	1 each (0.5,1,2,5,10,20,40mm)

Chapter3 Operation of WINCAPSII (Supplement)

This chapter describes the dedicated functions for the μ Vision-21 in the software of WINCAPSII.

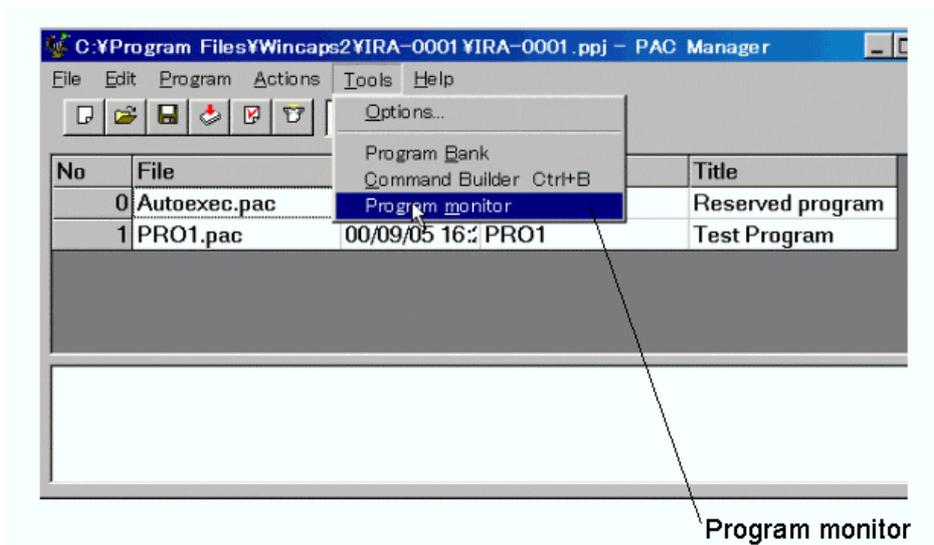
3.1 Dedicated functions for μ Vision-21 Super

3.1.1 Outline of dedicated functions

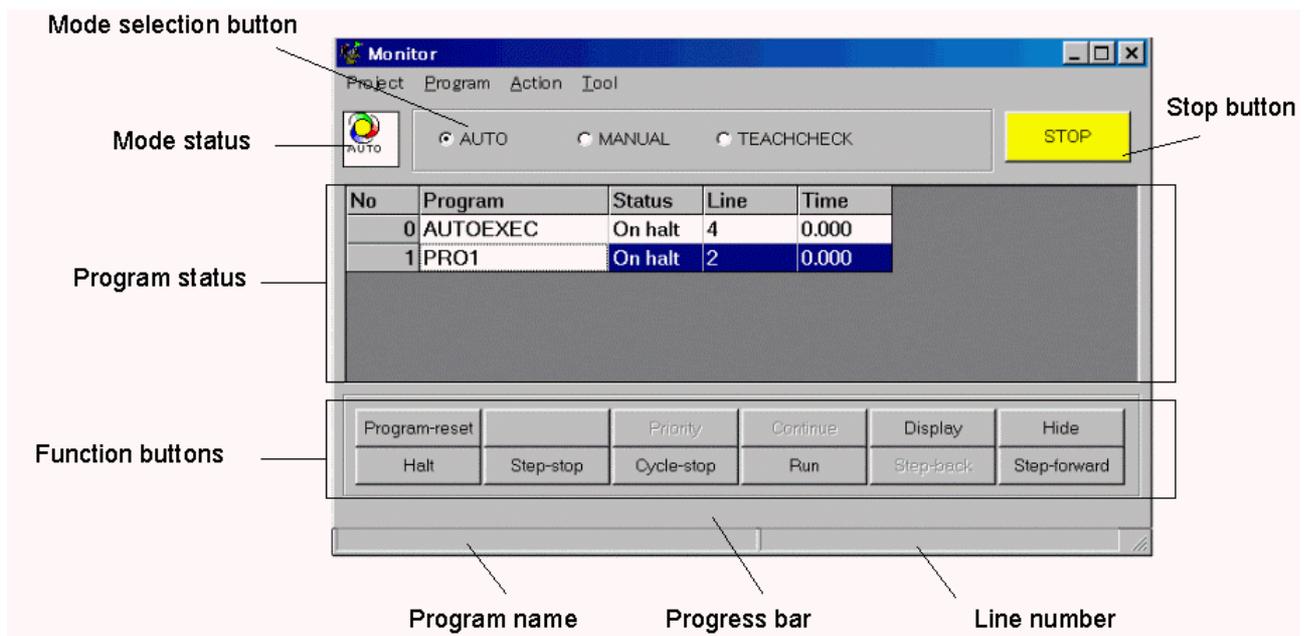
The run or stop operations of the program are executed by using WINCAPSII in the μ Vision-21. The dedicated functions for the μ Vision-21 are prepared in the program "Monitor" of the "PAC manager".

They help you debug efficiently.

The program "Monitor" is opened from the Tool menu.



"PAC Manager" window



Program "Monitor" window

Mode selection button	: Selects the operation mode of μ Vision-21.
Mode status	: Displays the current operation mode.
Stop button	: Stops all programs.
Program status	: Displays the status of programs.
Function button	: Runs or stops the selected program.
Program name	: Displays the name of the selected program.
Line number	: Displays the executing line (step) of the selected program.

3.1.2 Function buttons

(1) “Halt” button

Instantaneously stops the running program of which is selected in the program status list. (See “3.4.2 (1) Halt”.)

(2) “Step-stop” button

Step-stops the running program of which is selected in the program status list. (See “3.4.2 (2) Step-stop”.)

(3) “Cycle-stop” button

Cycle-stops the running program of which is selected in the program status list. (See “3.4.2 (3) Cycle-stop”.)

(4) “Run” button

Runs the program of which is selected in the program status list. (See “3.4.3 Run”.)

(5) “Step-forward” button

Steps forward the program of which is selected in the program status list. (See “3.4.4 (1) Step-forward”.)

(6) “Program reset” button

Changes the program to the stop status. (See “3.3.1 Reset”.)

(7) “Display” button

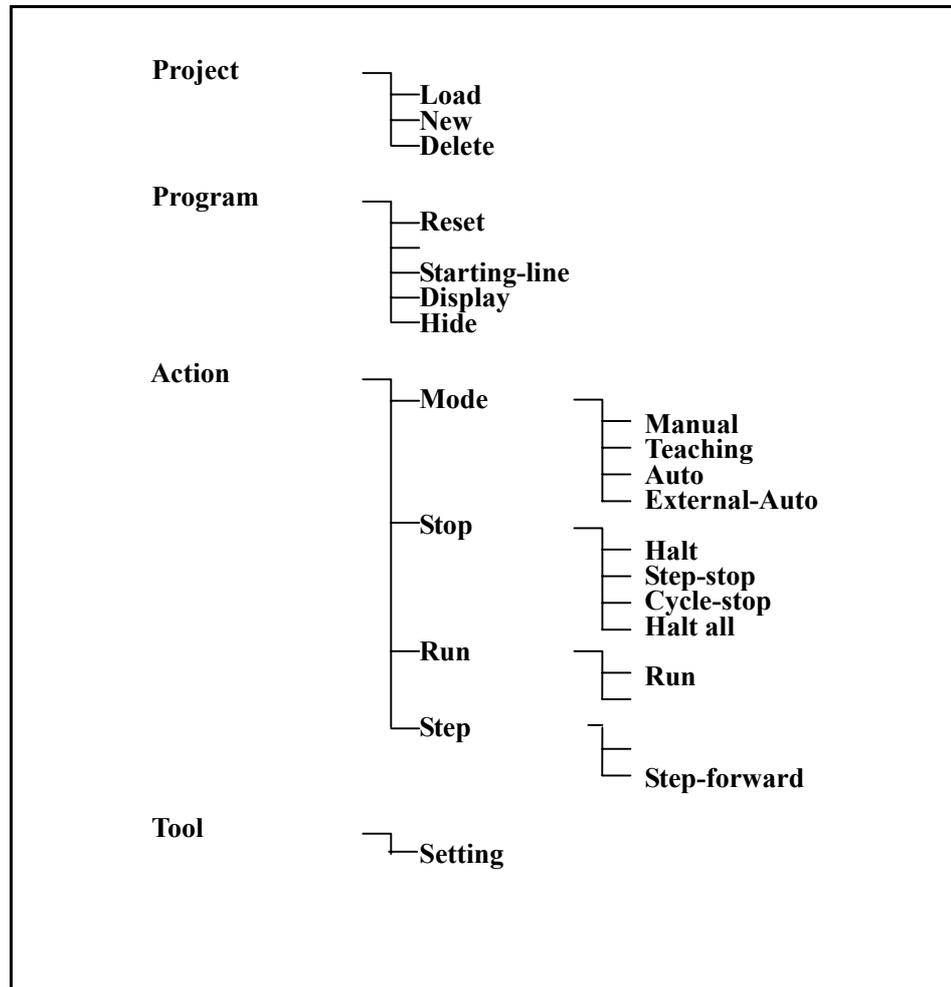
Displays the contents of the program. (See “3.3.3 Display or Hide”.)

(8) “Hide” button

Hides the contents of the program. (See “3.3.3 Display or Hide”.)

3.1.3 Menu list of program “Monitor”

The program “Monitor” command menu has the following tree structure.



Menu list of program “Monitor”

3.1.4 Executable functions in each operation mode

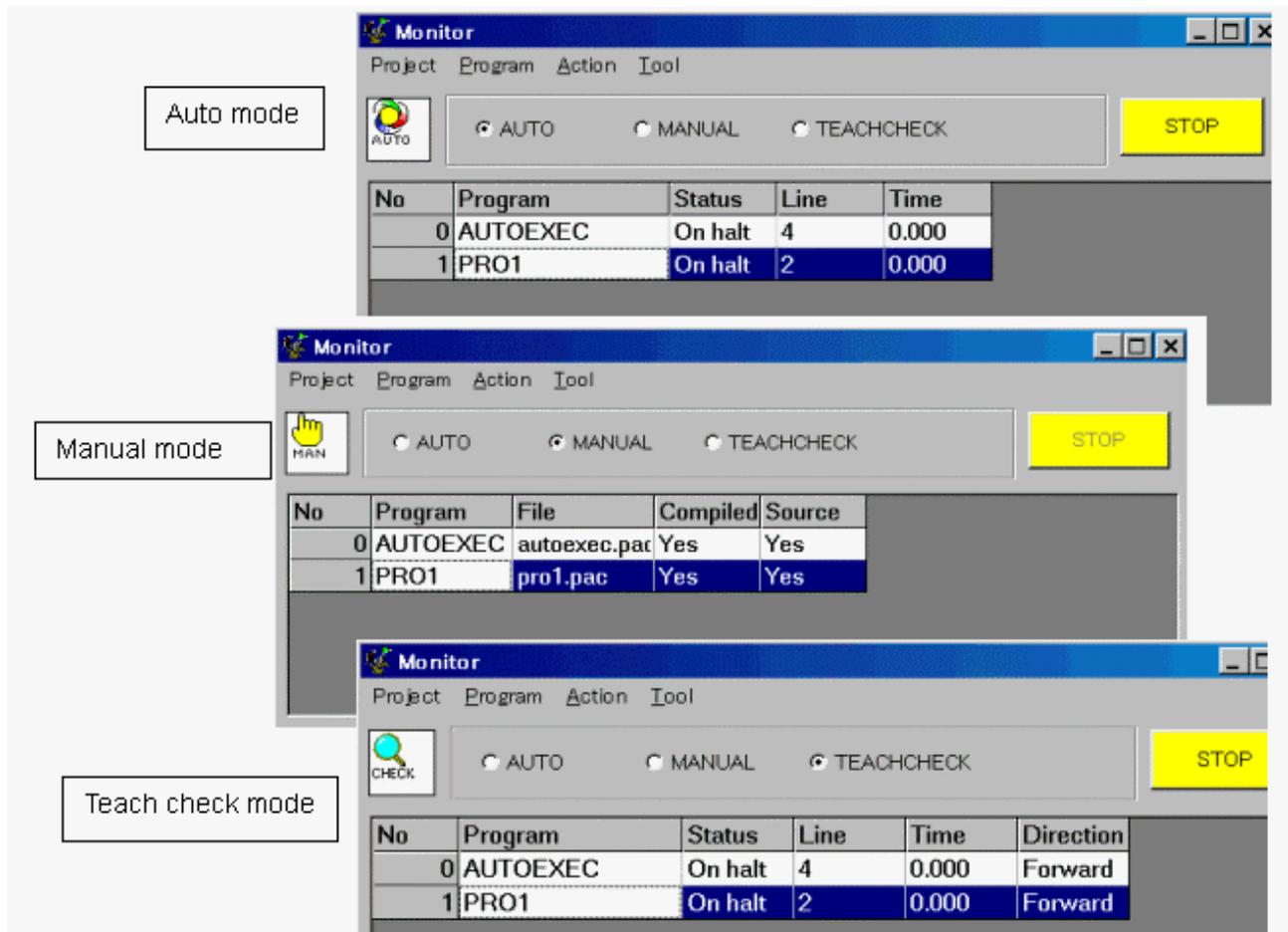
Executable functions in each operation mode are as follows.

Function	External Auto	Auto	Manual	Teach check
Transferring file		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Receiving file	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loading project		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Creating new project			<input type="radio"/>	
Deleting program			<input type="radio"/>	
program reset		<input type="radio"/>		<input type="radio"/>
Specifying starting-line				<input type="radio"/>
Display or Hide	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change of operation mode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stop - Halt	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
Stop - Cycle-stop	<input type="radio"/>	<input type="radio"/>		
Stop - Step-stop	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
Stop - Halt all	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
Run - Single-cycle run		<input type="radio"/>		<input type="radio"/>
Run - Continuously run		<input type="radio"/>		
Step - Step-forward		<input type="radio"/>		<input type="radio"/>

○: Executable function

3.1.5 Format of program status

The displayed items of the program list are shown below in each operation mode of the μ Vision-21.



Program status display in each mode

Program : Displays the program name.

Status : Displays the program status. The kinds of status are
"On halt", "Running", "Suspended", "Step-stop" and so on.

Line : Displays the current line number of the program.

Time : Displays the execution time of the program.

Direction : Displays the direction of the program step.

File : Displays the file name of the program.

Compiled : Displays that the program is executable or not. ("Yes" or "No")

Source : Displays that the program file exists or not. ("Yes" or "No")

3.2 Project menu

This figure shows the “Project” menu of the program “Monitor” window.



“Project” menu

3.2.1 Load

Loads the project to the μ Vision-21.

The transferred project to the μ Vision-21 should be loaded. The loaded project changes into the executable one.

Loading can be functioned in the “Auto”, “ Manual” and “ Teach check” mode.

Caution : When loading the project, variable data are initialized.
Save the necessary data before loading the project.

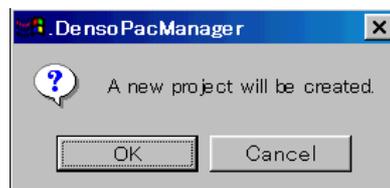
3.2.2 New

Creates a new project in the μ Vision-21.

Select the “New” in the “Project” menu, and the message of ”A new project will be created” appears.

When clicking on the “OK” button, all programs in the μ Vision-21 are deleted and a new project is created.

This operation can be functioned in the “ Manual mode”.



Message window

Caution : When creating a new project, system setting data, window data, search model data and other data are deleted.
Save the necessary data before creating a new project.

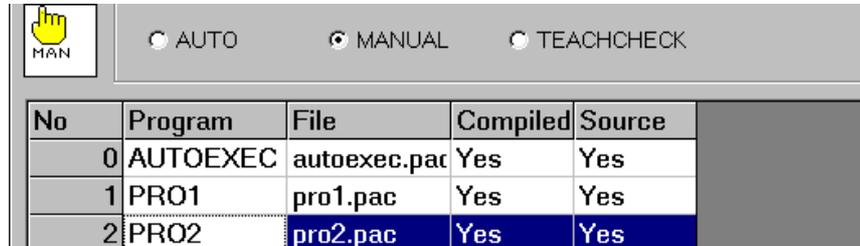
3.2.3 Delete

Deletes the program source file in the μ Vision-21.

This deleting does not affect to the executable program.

This operation can be functioned in the “Manual mode”.

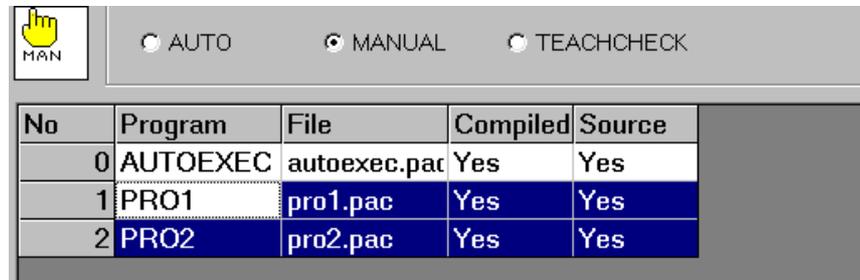
- **STEP 1** Selects the deleted program in the program status list of the program “monitor” window.



The screenshot shows the Denso PacManager interface in Manual mode. The mode is set to MANUAL. The program status list is as follows:

No	Program	File	Compiled	Source
0	AUTOEXEC	autoexec.pac	Yes	Yes
1	PRO1	pro1.pac	Yes	Yes
2	PRO2	pro2.pac	Yes	Yes

Selection of single program



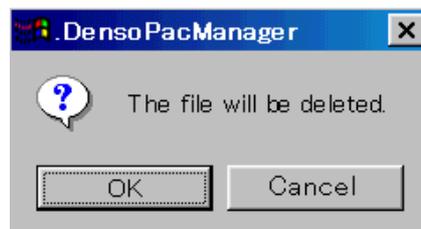
The screenshot shows the Denso PacManager interface in Manual mode. The mode is set to MANUAL. The program status list is as follows:

No	Program	File	Compiled	Source
0	AUTOEXEC	autoexec.pac	Yes	Yes
1	PRO1	pro1.pac	Yes	Yes
2	PRO2	pro2.pac	Yes	Yes

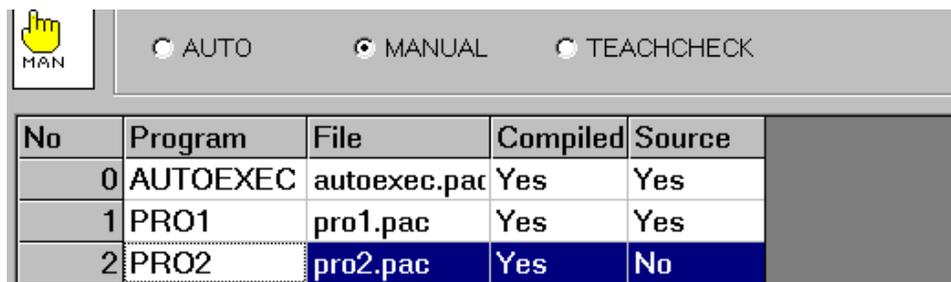
Selection of two programs

- **STEP 2** Select the “Delete” in the “Project” menu, and the message of “The file will be deleted” appears.

When clicking on the “OK” button, the selected programs in the program status list are deleted in the μ Vision-21. After finishing deletion, the display of “Source” column changes from “Yes” to “No”.



Message window



The screenshot shows the Denso PacManager interface in Manual mode. The mode is set to MANUAL. The program status list is as follows:

No	Program	File	Compiled	Source
0	AUTOEXEC	autoexec.pac	Yes	Yes
1	PRO1	pro1.pac	Yes	Yes
2	PRO2	pro2.pac	Yes	No

Display after finishing delete

3.3 Program menu

This figure shows the “Program” menu of the program “Monitor” window.



“Program” menu

3.3.1 Program reset

Changes the program to the stop status.

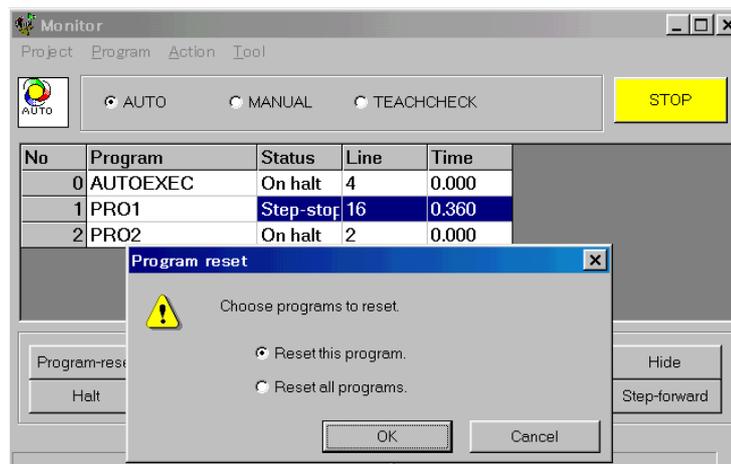
Select the “Reset” in the “Program” menu, and the message of

”Choose programs to reset” appears.

After selecting “Reset this program” or “Reset all programs”, click on the “OK” button.

The selected programs in the program status list are changed to the stop status and the display of “Status” column changes to “On halt”.

This operation can be functioned in the “Auto mode” and “Teach check mode”.



Resetting programs

3.3.2 Starting-line

Specifies the starting line of the program. If the specified line is the line for comment, the starting line is set to next executable line.

If the starting line is specified while the program is “On halt”, the program is executed to the starting line and then stopped. In this status, the program is executable by single-cycle run and single-step run.

Though the starting-line can be specified while the program is “Step-stopped” or “Suspended”, the program is not executed. In this status, single-start run executes the program to the starting line and stops.

This operation can be functioned in the “Teach check mode”.

► STEP 1

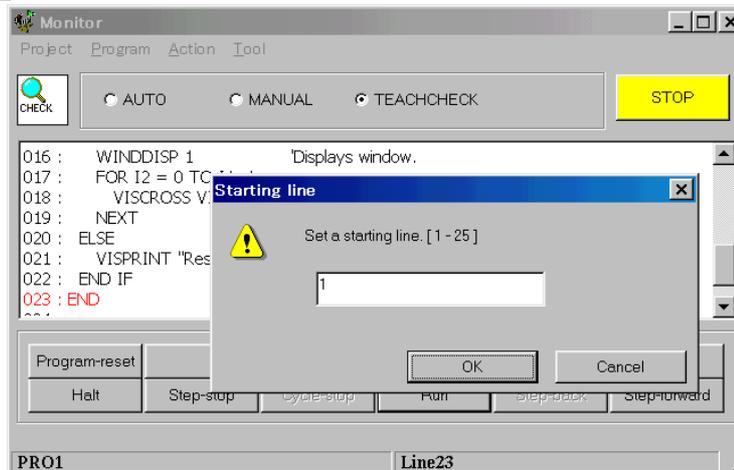
Selects the program specified starting-line in the program status list of the program “monitor” window.

No	Program	Status	Line	Time	Direction
0	AUTOEXEC	On halt	4	0.000	Forward
1	PRO1	On halt	23	0.350	Forward
2	PRO2	On halt	2	0.000	Forward

Selection of program

► STEP 2

Select the “Starting-line” in the “Program” menu, and the message of “Set a starting line” appears and displays the program.



Setting of Starting-line

► STEP 3

If clicking on the “OK” button after setting the starting line, displays the set line after executing.

Caution: When specifying the starting-line, the project should be same between WINCAPSII and the μ Vision-21.

3.3.3 Display or Hide

Displays or hides the contents of the program.

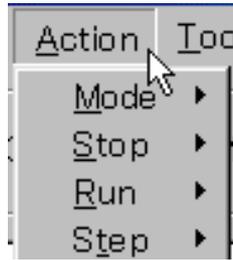
When selecting the “Display” in the “Program” menu, the contents of the program will be displayed. When selecting the “Hide” in the “Program” menu, the program status lists will be displayed.

This operation can be functioned in the “External auto mode”, “Auto mode”, “Manual mode” and “Teach check mode”.

Caution: When displaying the program, the project should be same between WINCAPSII and the μ Vision-21. Because WINCAPSII searches the same name of the program with the selected program of the μ Vision-21 from the project on the personal computer.

3.4 Action menu

This figure shows the “Action” menu of the program “Monitor” window.

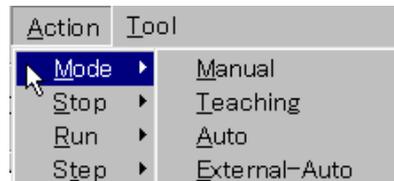


”Action” menu

3.4.1 Mode

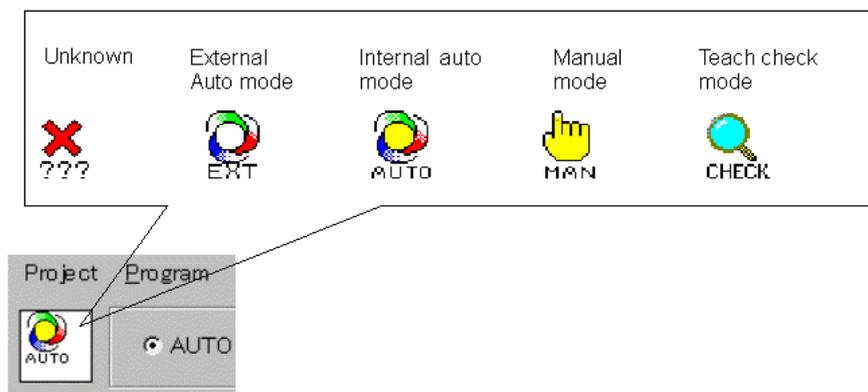
Sets the operation mode of the μ Vision-21 to the “Manual”, “Teach check”, “Auto” or “External auto mode”.

The “Mode” menu is shown below.



“Mode” menu

The program “Monitor” always monitors the operation mode of the μ Vision-21, and displays in the “Monitor” window. The display formats of the operation mode are as follows.



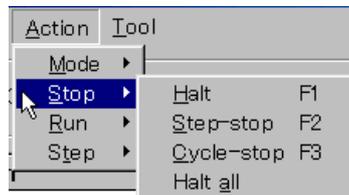
Display formats of the operation mode

Note: When executing the program, the operation mode can not be changed. If you want to change the operation mode, stop all programs and then those status are “On halt”.

3.4.2 Stop

Stops the execution of the program.

The kinds of stop are “Halt”, “Step-stop”, “Cycle-stop” and “Halt all”. The “Stop” menu is shown below.



”Stop” menu

(1) Halt

Instantaneously stops the running program of which is selected in the program status list.

The “Halt” interrupts the execution of the step, and its status is “Suspended”.

This operation can be functioned in the “ External auto mode”, “Auto mode” and “Teach check mode”.

(2) Step-stop

Step-stops the running program of which is selected in the program status list.

The “Step-stop” stops the program after finishing the execution of the step, and its status is “Step-stop”.

This operation can be functioned in the “ External auto mode”, “Auto mode” and “Teach check mode”.

(3) Cycle-stop

Cycle-stops the running program of which is selected in the program status list.

The “Cycle-stop” stops the program after finishing the execution of the last step, and its status is “On halt”.

This operation can be functioned in the “ External auto mode” and “Auto mode”.

(4) Halt all

Instantaneously stops all programs by “Halt”.

This operation can be functioned in the “ External auto mode”, “Auto mode” and “Teach check mode”.

3.4.3 Run

Runs the program.

The kinds of “Run” are “Single-cycle run” and “Continuously run”.

The “Run” menu is shown below.



”Run” menu

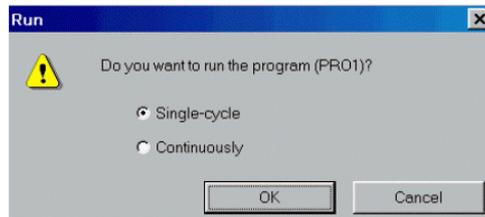
(1) “Single-cycle” run

Runs the program of which is selected in the program status list by single cycle.

When selecting the “Run” in the “Run” menu, the message of “Do you want to run the program?” appears.

Click on the “OK” button after selecting the “Single-cycle”, and the selected program runs by single cycle.

This operation can be functioned in the “Auto mode” and “Teach check mode”.



”Single-cycle” run

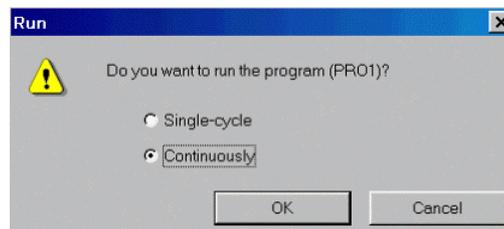
(2) “Continuously” run

Runs continuously the program of which is selected in the program status list.

When selecting the “Run” in the “Run” menu, the message of “Do you want to run the program?” appears.

Click on the “OK” button after selecting the “Continuously”, and the selected program runs continuously.

This operation can be functioned in the “Auto mode”.



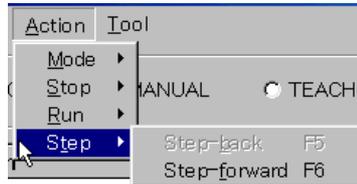
“Continuously” run

Caution: (a) The program runs from the current line. If you want to run the program from the top line, the setting of twice executing “Halt” before is necessary.
(b) The program including arguments can not be run.
(c) The program can not be run while another program is executing except stop status (; “Suspended”, “Step-stop” and so on.).

3.4.4 Step

Executes the one step of the program.

The “Step” menu is shown below.



“Step” menu

(1) Step-forward

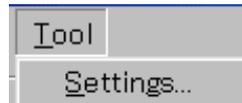
Steps forward the program of which is selected in the program status list.

When selecting the “Step-forward”, the selected program is executed by one step and is stopped in the “Step-stop”.

This operation can be functioned in the “Auto mode” and ”Teach check” mode.

3.5 Tool menu

The “Tool” menu in the program “Monitor” window is shown below.



“Tool” menu

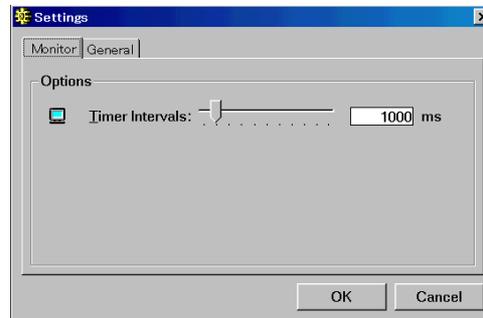
3.5.1 Settings

Sets the operating environments of the program monitor.

If “Settings” is executed, the “Settings” window will appear.

(1) “Monitor” tab

Sets the timer intervals at which the program monitor gets data from the μ Vision-21. The initial value is 1000 ms.

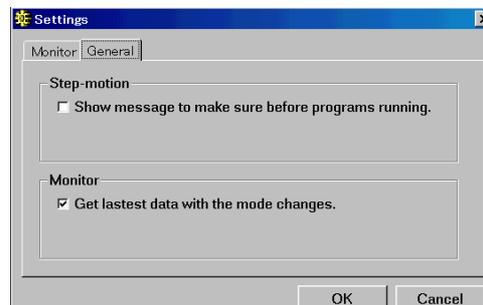


“Settings” window (“Monitor” tab)

Note: If you set the monitor intervals short, the frequent communications operations with the μ Vision-21 may load the Program monitor. If the program monitor can not operate smoothly, set the monitor intervals longer. (Recommended value: 1000 ms)

(2) “General” tab

Makes general settings for the program monitor.



“Settings” window (“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 μ Vision-21 every time the μ Vision-21 changes mode.

Chapter4 Creating program for μ Vision-21 Super

This chapter describes how to create the program and how to check the program motion for the μ Vision-21.

You can learn the procedure while creating the sample program.

4.1 Creating a program

This section describes how to input the program and save it into the file by using sample program "PRO1".

4.1.1 Creating new project

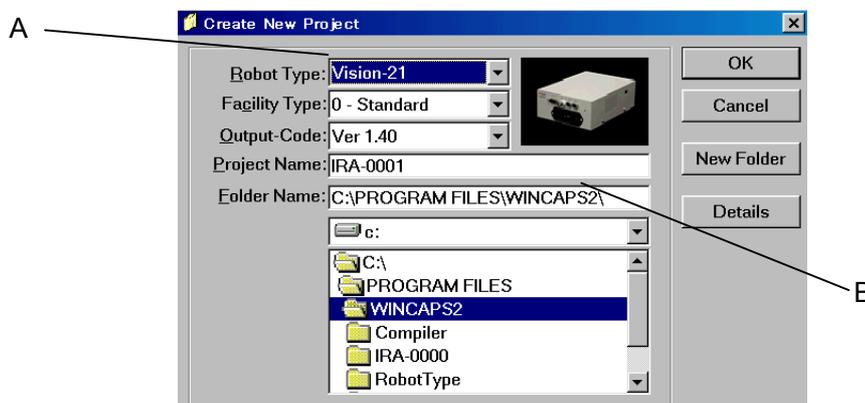
You must create a new project before creating the program for μ Vision-21 by using WINCAPSII. All works of creating the program are carried out on this project. This section describes how to create the project as follows.

- **STEP 1** When you select "New Project" in the File menu of the System Manager, the "New Project" window appears.



File menu of System Manager

- **STEP 2** Select "Vision-21" in the Robot Type box (:A) of "New Project" window. Specify the project name which is not used before in the Project Name box (:B). (In this example:IRA-0001)
When clicking on "OK", the project of μ Vision-21 is created and here after System Manager opens the new μ Vision-21 project automatically.



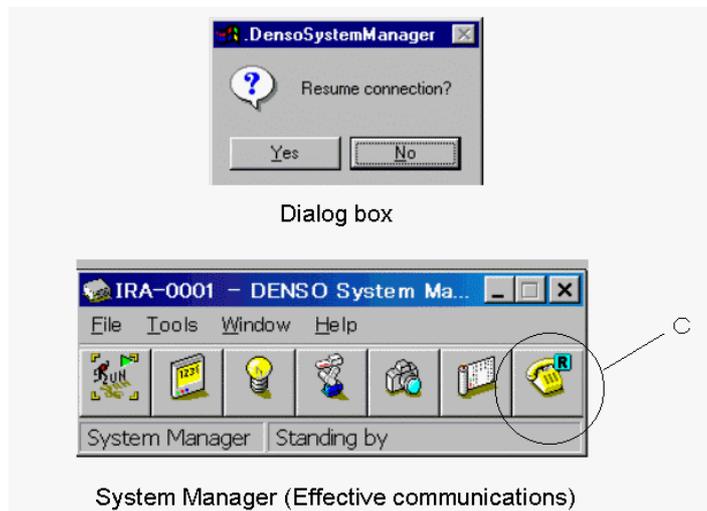
New Project window

► STEP 3

After creating the μ Vision-21 project, the “ Resume connection? ” dialog appears.

Click “Yes” after confirming that the μ Vision-21 is powered ON and is connected to the personal computer with the RS232C cable.

The communications between the μ Vision-21 and the personal computer become effective and the mark “C” of System Manager changes below.

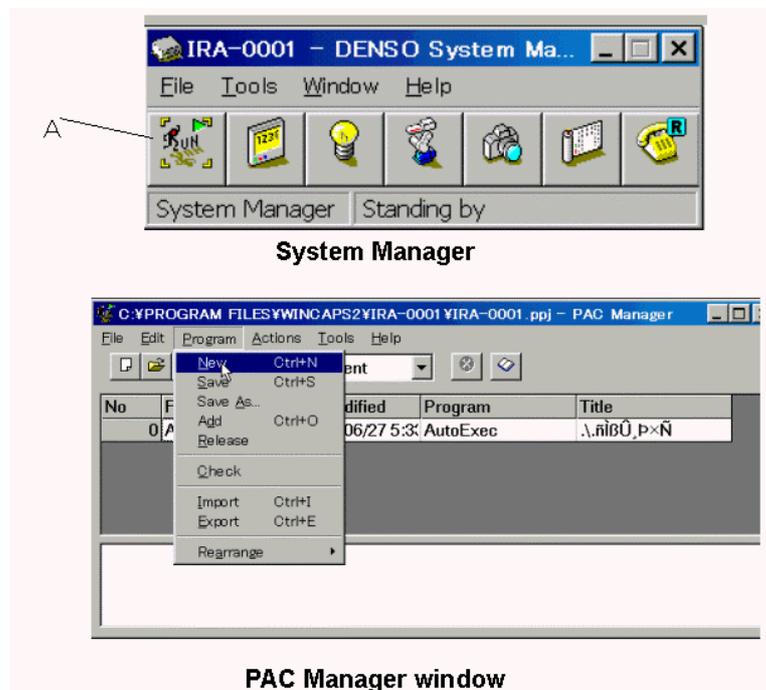


4.1.2 Creating a program

This section describes how to create a new program of μ Vision-21 using PAC Program Manager as follows.

► STEP 1

When clicking the System Manager “ A “ button, the PAC manager window appears.



► STEP 2

When you select “New” in the Program menu of the PAC Manager window, a new program window appears.



```
·!TITLE "<Title>"
PROGRAM <Program name>

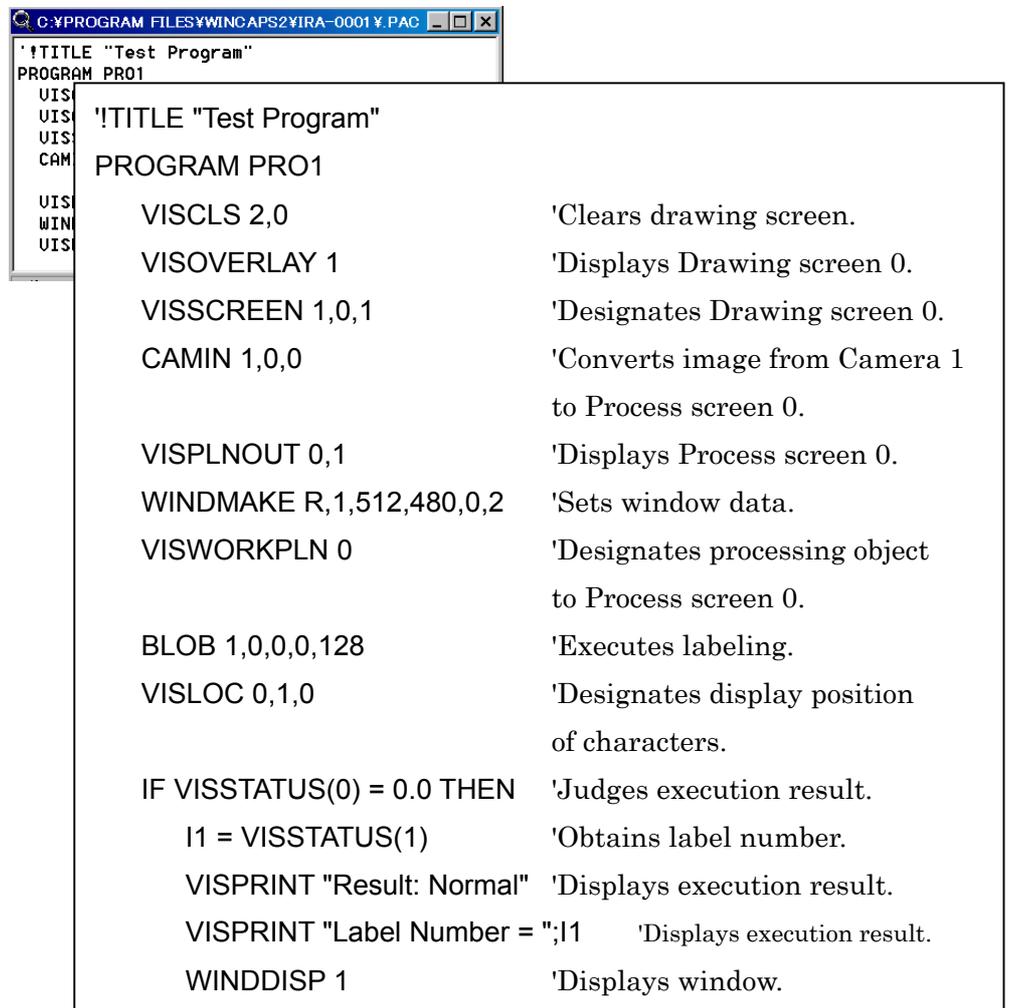
END
```

1 line CAPS NUM INS

New program window

► STEP 3

Input the new program (:PRO1) into the new program window.



```
C:\PROGRAM FILES\WINCAPS2\IRA-0001\*.PAC
·!TITLE "Test Program"
PROGRAM PRO1
VIS
VIS
VIS
CAM
VIS
WIN
VIS
VISCLS 2,0
VISOVERLAY 1
VISSCREEN 1,0,1
CAMIN 1,0,0
VISPLNOUT 0,1
WINDMAKE R,1,512,480,0,2
VISWORKPLN 0
BLOB 1,0,0,0,128
VISLOC 0,1,0
IF VISSTATUS(0) = 0.0 THEN
  I1 = VISSTATUS(1)
  VISPRINT "Result: Normal"
  VISPRINT "Label Number = ";I1
WINDDISP 1
```

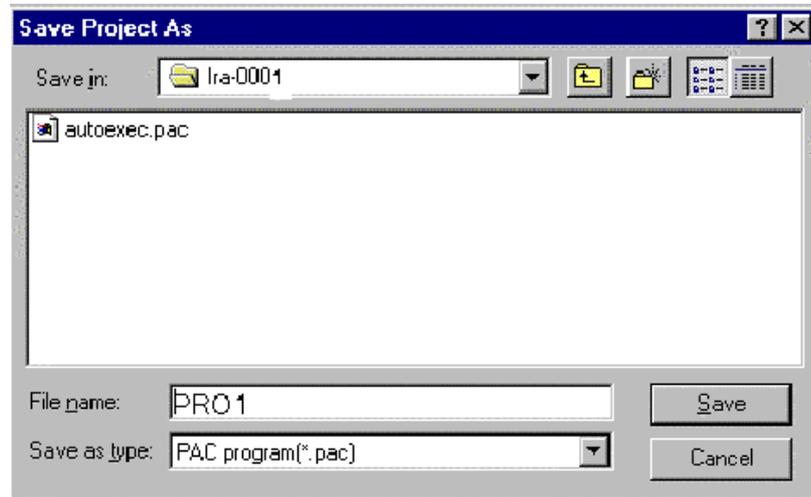
'Clears drawing screen.
'Displays Drawing screen 0.
'Designates Drawing screen 0.
'Converts image from Camera 1 to Process screen 0.
'Displays Process screen 0.
'Sets window data.
'Designates processing object to Process screen 0.
'Executes labeling.
'Designates display position of characters.
'Judges execution result.
'Obtains label number.
'Displays execution result.
'Displays execution result.
'Displays window.

Program [PRO1]

► STEP 4

When you select “Save As” in the Program menu of the PAC Manager window, a “Save Project As” window appears. And when you click on “ Save” button after specifying the file name, the program is saved in the program file with a new file name.

As the initial file name is same to the program name, we recommend you to save the initial file name without changing.



Save Project As window

4.1.3 Making executable program

You need to compile all programs, contained in the project; that is, translate them into executable formats for μ Vision-21.

During compiling, syntax errors will be detected if contained in the edited program. These procedures are as follows.

► STEP 1

When you click “Make Exec. Program” in the File menu of the PAC Manager window, compiling is executed.

The result of the compiling process is displayed in the message ; “ Number of programming errors (warnings)= * (*).

If the “Number of programming errors (warnings)=0(0)” is displayed, click “OK”. Then, the executable program is created.

If errors are showing, go to STEP 2.

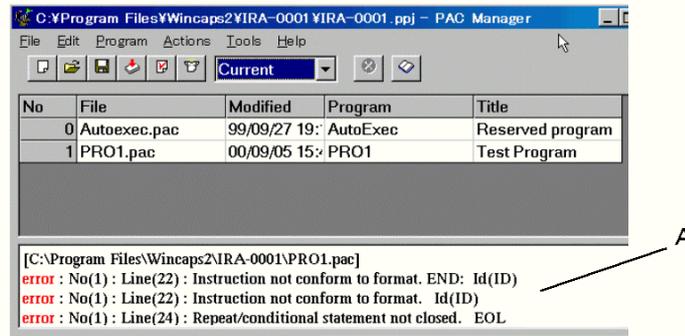


► STEP 2

Correct the program syntax errors as follows.

The contents of errors are generated during compiling are displayed in the message pane “A” of PAC Manager window. Double-clicking on the error line in the message pane jumps the display to the location of the error.

After correcting errors, save the program by clicking “Save” in the Program menu of the PAC Manager window and return to STEP 1.



Contents of errors

4.2 Transferring Project

This section describes how to transfer the created project to the μ Vision-21 using sample program”PRO1”.

4.2.1 Change of Operation Mode

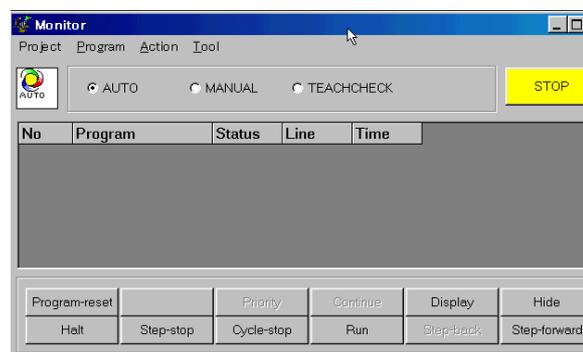
When the μ Vision-21 power is turned ON, the operation mode is set to “External auto mode” that the program cannot be transferred. Therefore, the operation mode should be changed to “Internal auto mode”, “Manual mode” or “Teach check mode” as follows.

► STEP 1

When you select “Program monitor” in the Tool menu of the PAC Manager window, the “Monitor” window appears.

► STEP 2

Change the operation mode of the μ Vision-21 to the “ Internal Auto” by selecting “ Action”-“Mode”-“Auto” in the “Monitor” window.



Program “Monitor” window

Note : The operation mode cannot be changed during executing program.

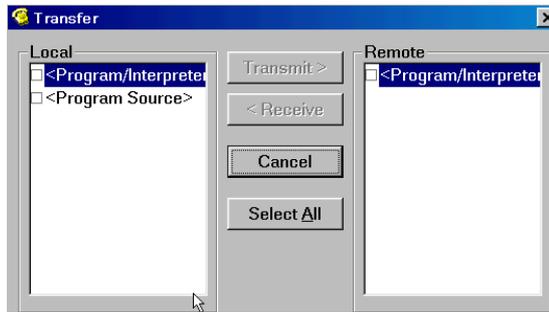
When changing the mode, stop all programs and each status should be “On halt”.

4.2.2 Transferring project

This section describes how to transfer the program to the μ Vision-21.

► **STEP 1** | Close the program “Monitor” window.

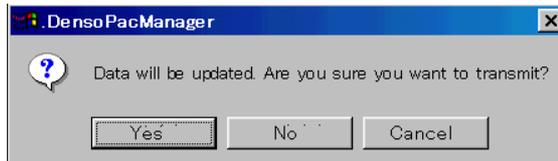
► **STEP 2** | When you select “Transfer Project” in the File menu of the “PAC Manager” window, the “Transfer” window appears.



“Transfer” window

► **STEP 3** | Click on the “Select All” button in the “Transfer” window. All files in the project are selected.

► **STEP 4** | When you click on the “Transmit” button in the “Transfer” window, the message, “Data will be updated. Are you sure you want to transmit ?”, appears. Click on the “Yes” button, and the program is transferred.



Message window

4.2.3 Loading project

The transferred project to the μ Vision-21 should be loaded.

This section describes how to load the project.

► **STEP 1** | When you select “Program monitor” in the Tool menu of the PAC Manager window, the “Monitor” window appears.

► **STEP 2** | Load the project by selecting “ Project” - “Load” in the “Monitor” window.

4.3 Executing program

This section describes how to execute or stop the program by using the sample program "PRO1".

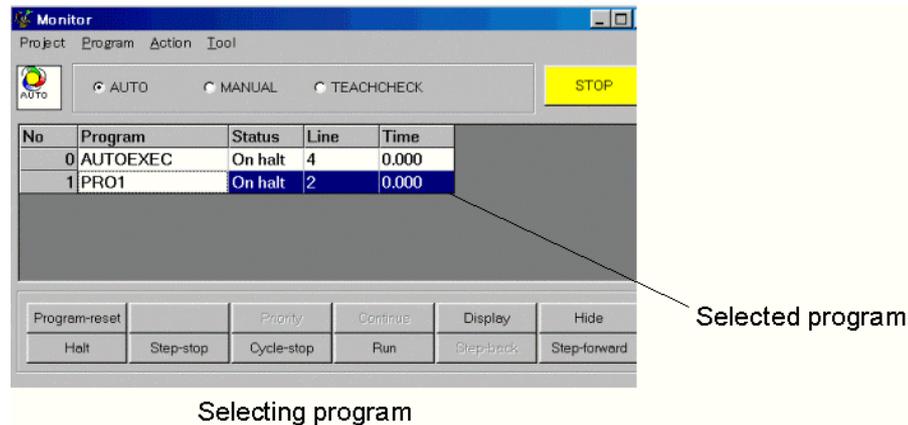
4.3.1 Single-step run

Single-step run executes the selected program by a single step.

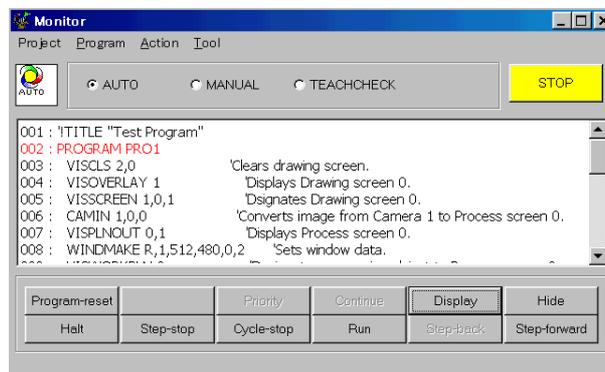
By using this function, you can check the motion of the program by single step and you can debug the program effectively.

► **STEP 1** Change the operation mode of the μ Vision-21 to the "Internal Auto" by selecting "Action"- "Mode"- "Auto" in the "Monitor" window.

► **STEP 2** Select the program for executing in the "Monitor" window.



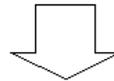
► **STEP 3** Click on the "Display" button in the "Monitor" window, and the program is displayed.



▶ STEP 4

Click on the “Step-forward” button in the “Monitor” window, and the program is executed by single step and the next line (step) turns into red color.

```
001: '! TITLE " Test Program"
▶ 002: PROGRAM PRO1
003: VISCLS 2,0           'Clears drawing screen.
004: VISOVERLAY 1        'Displays Drawing screen 0.
005: VISSCREEN 1,0,1    'Designates Drawing screen 0.
006: CAMIN 1,0,0        'Converts image from Camera 1 to Process screen 0.
007: VISPLNOUT 0,1      'Displays Process screen 0.
```



Clicking on the “Step-forward”

```
001: '! TITLE " Test Program"
▶ 002: PROGRAM PRO1
003: VISCLS 2,0           'Clears drawing screen.
004: VISOVERLAY 1        'Displays Drawing screen 0.
005: VISSCREEN 1,0,1    'Designates Drawing screen 0.
006: CAMIN 1,0,0        'Converts image from Camera 1 to Process screen 0.
007: VISPLNOUT 0,1      'Displays Process screen 0.
```

Displaying the next executing line (; Red color)

4.3.2 Single-cycle run

Single-cycle run executes the selected program by single cycle.

By using this function, the selected program can be executed from the beginning to the end once.

▶ STEP 1

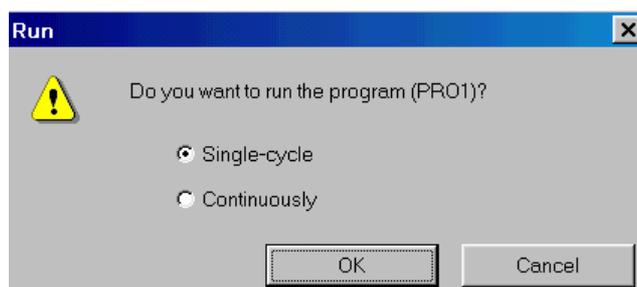
Select the program for executing in the “Monitor” window.

▶ STEP 2

Click on the “Run” button in the “Monitor” window, and the “Run” window appears.

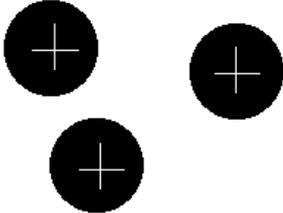
▶ STEP 3

Select the “Single-cycle” button in the “Run” window, and click on the “OK” button. The program is executed by single cycle.



“Run” window

Result: Normal
Label Number=3



The program "PRO1" is executed as follows.

- a. Converts image from Camera 1.
- b. Labels black objects.
- c. If three black objects are in the window as left, label number is 3 and draws cross symbol on each object that position is specified as the center of gravity.

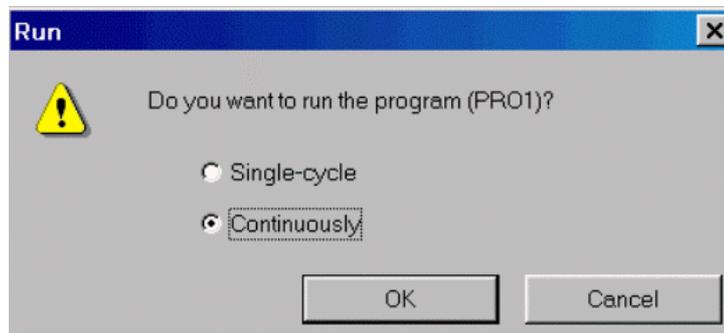
Execution result of program "PRO1"

4.3.3 Continuous run

Continuous run executes the selected program continuously.

By using this function, the same program can be executed continuously.

- ▶ **STEP 1** | Select the program for executing in the "Monitor" window.
- ▶ **STEP 2** | Click on the "Run" button in the "Monitor" window, and the "Run" window appears.
- ▶ **STEP 3** | Select the "Continuously" button in the "Run" window, and click on the "OK" button. The program is executed continuously.



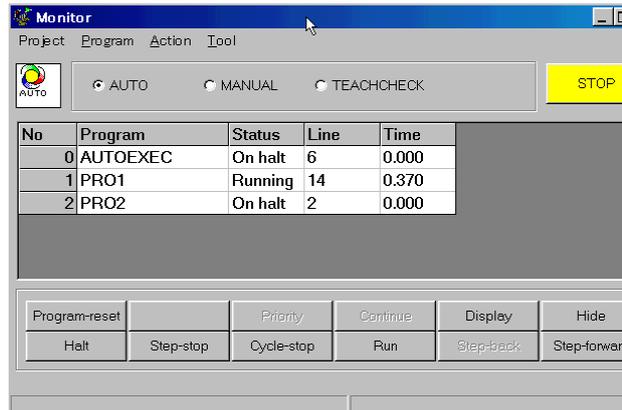
"Run" window

4.3.4 Program monitor

The execution progress of programs can be monitored by the program monitor function. By using this function, you can know “the program status”, “the current executing line” and “the executing time”.

(1) Monitoring program list

- **STEP 1** You can check the program current status from the program list in the “Monitor” window.



Program list in the “Monitor” window

(2) Monitoring program

- **STEP 1** Select the program for monitoring in the “Monitor” window.

- **STEP 2** Click on the “Display” button in the “Monitor” window, and the program is displayed and the current executing line is displayed with red color.

```
001: '! TITLE " Test Program"
002: PROGRAM PRO1
003: VISCLS 2,0           'Clears drawing screen.
004: VISOVERLAY 1        'Displays Drawing screen 0.
005: VISSCREEN 1,0,1    'Designates Drawing screen 0.
006: CAMIN 1,0,0        'Converts image from Camera 1 to Process screen 0.
007: VISPLNOUT 0,1      'Displays Process screen 0.
```

Displaying the current executing line (; Red color)

4.3.5 Stop of program

This section describes about the stop of the program.
Types of stop are "Halt", "Step stop" and "Cycle stop".

(1) Halt

► **STEP 1** | Select the program "PRO1" in the "Monitor" window.

► **STEP 2** | Click on the "Run" button in the "Monitor" window, and the "Run" window appears.
Select the "Continuously" button in the "Run" window, and click on the "OK" button. The program "PRO1" is executed continuously.

► **STEP 3** | Click on the "Halt" button in the "Monitor" window, and the program "PRO1" is immediately interrupted midway the moment the "Halt" button is pressed.

No	Program	Status	Line	Time
0	AUTOEXEC	On halt	4	0.000
1	PRO1	Suspend	10	0.370

Stop status of program "PRO1"

(2) Step stop

► **STEP 1** | Select the program "PRO1" in the "Monitor" window.

► **STEP 2** | Click on the "Run" button in the "Monitor" window, and the "Run" window appears.
Select the "Continuously" button in the "Run" window, and click on the "OK" button. The program "PRO1" is executed continuously.

► **STEP 3** | Click on the "Step-Stop" button in the "Monitor" window, and the program "PRO1" is interrupted after executing the step in which the "Step-Stop" button is pressed.

No	Program	Status	Line	Time
0	AUTOEXEC	On halt	4	0.000
1	PRO1	Step-stop	8	0.380

Stop status of program "PRO1"

(3) Cycle stop

▶ **STEP 1** Select the program "PRO1" in the "Monitor" window.

▶ **STEP 2** Click on the "Run" button in the "Monitor" window, and the "Run" window appears.
Select the "Continuously" button in the "Run" window, and click on the "OK" button. The program "PRO1" is executed continuously.

▶ **STEP 3** Click on the "Cycle-Stop" button in the "Monitor" window, and the program "PRO1" is stopped after executing the last step.

No	Program	Status	Line	Time
0	AUTOEXEC	On halt	4	0.000
1	PRO1	On halt	23	0.350

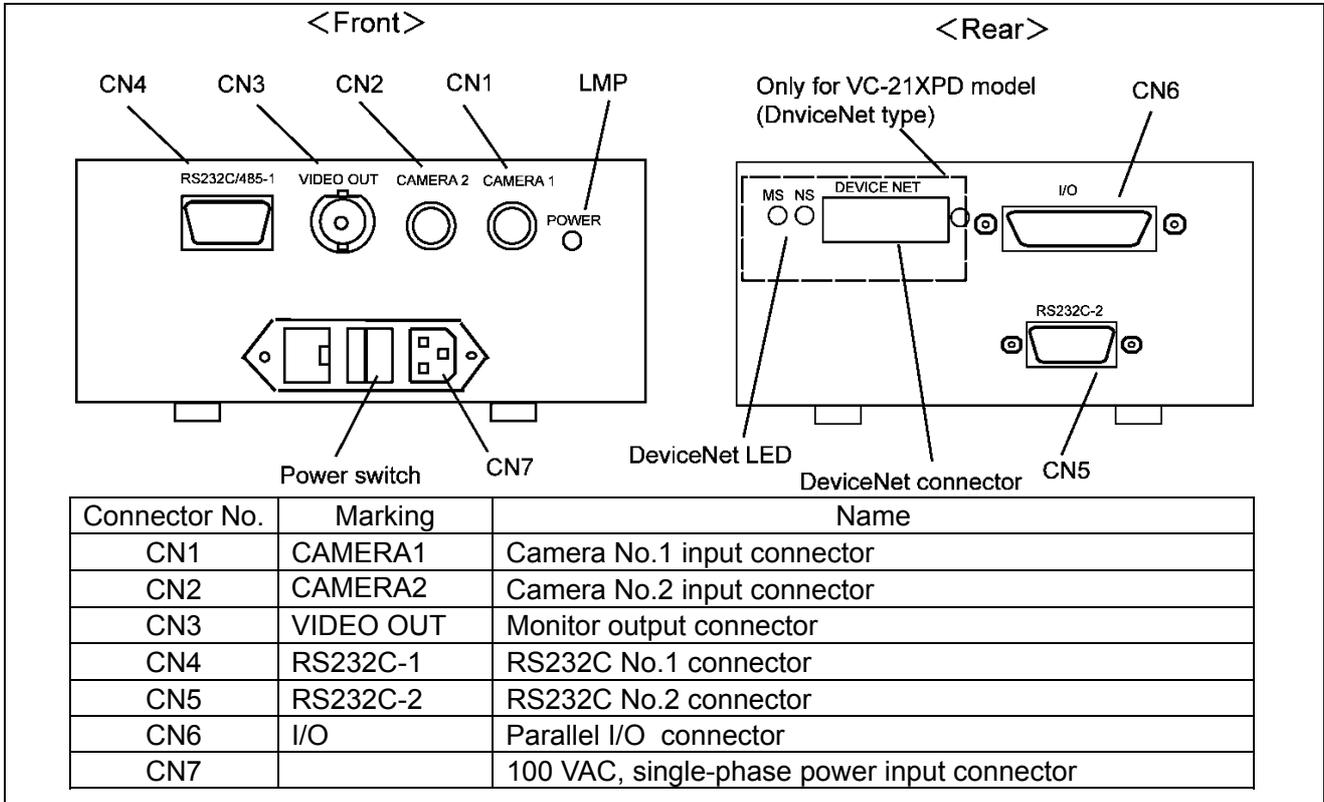
Stop status of program "PRO1"

Chapter5 μ Vision-21 Super Interface

This chapter describes the necessary requirements to connect the robot, sequencer and other external devices to the μ Vision-21.

5.1 μ Vision-21 Appearance and Connector Name

The figure below shows the appearance of the μ Vision-21 unit and the connector name.

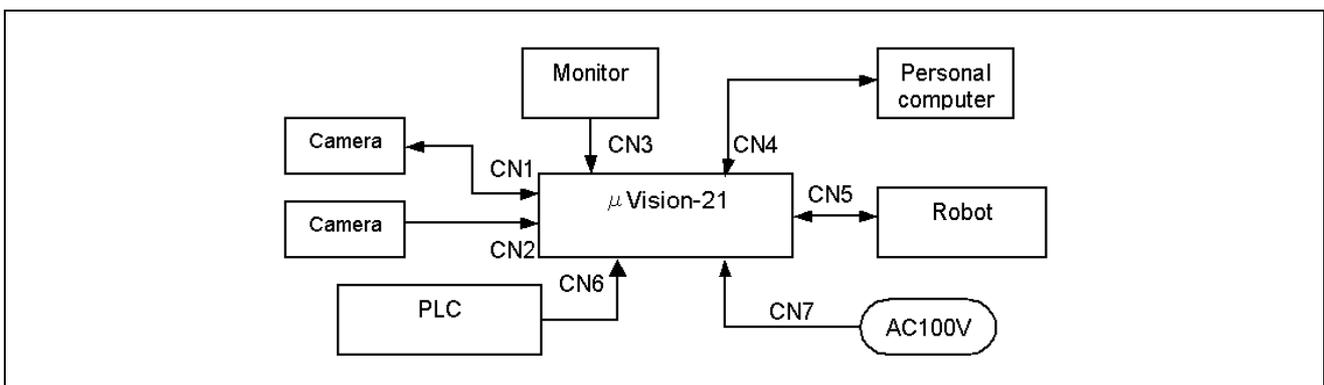


Names of the components

⚠ Caution: These connectors are of a screw-lock type or ring-lock type. Lock the connectors securely. If even one of the connectors is not locked, weak contact may result thereby causing an error. Be sure to turn the power switch OFF before connecting/ disconnecting the connectors. Otherwise, the internal circuits of the μ Vision-21 unit may be damaged.

5.2 Example of Control System Configuration

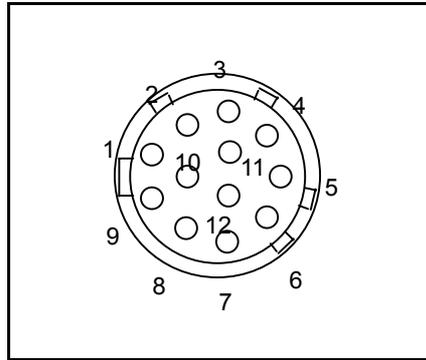
The figure below shows an example of the control system configuration.



System Configuration Example

5.3 Camera Input Connector (CN1, CN2)

The pin layout of the camera input connector is shown below.



Pin layout of CN1/ CN2 (View from cable side engaging face)

(Connector model / manufacturer: Equivalent to HR10A-10R-12S / HIROSE ELECTRIC)

Pin No.	Name of signal	Remarks
1	GND	Power source for camera (Ground)
2	+12V	Power source for camera (+12V)
3	GND	Power source for camera (Ground)
4	VIDEO	Video signal
5	HDGND	Horizontal synchronous signal(Ground)
6	HD	Horizontal synchronous signal
7	VD	Vertical synchronous signal
8	NC	Not connected
9	NC	Not connected
10	NC	Not connected
11	TRIG	Trigger signal (Unused)
12	VDGND	Vertical synchronous signal (Ground)



Caution:

1. Keep the total current capacity of the cameras below 600mA.
2. Be sure to turn the μ Vision-21 OFF before connecting / disconnecting the camera cable. Otherwise, the internal circuits of the μ Vision-21 may be damaged.

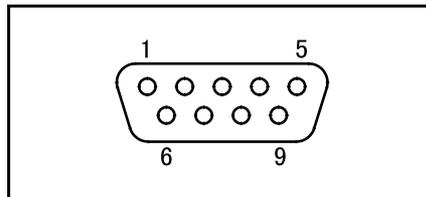
5.4 Serial Communications

5.4.1 Serial Communications connector

The figure below shows the RS-232C connector pin assignments and the function of each pin.

As the channel 1 (RS232C-1) is used for communications with a personal computer for WINCAPSII, you cannot change the communication protocol.

As the channel 2 (RS232C-2) is the communication port for a general purpose, you can freely change these settings.



Pin layout of CN4/ CN5 (View from cable side engaging face)

(Connector model / manufacturer : Equivalent to DE-9P / Japan Aviation Electric)

Pin No.	Name of Signal	Remarks
1	DCD	Carrier Detect (Not connected)
2	RxD	Receive Data
3	TxD	Transmit Data
4	DTR	Data Terminal Ready
5	SG	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	R I	Ring Indicator (Not connected)

Specifications of RS-232C

Item	Specifications
Baud rate	9600, 19200 or 38400 BPS · Channel 1: 38400 BPS fixed · Channel 2: 38400 BPS at power ON
Data length	7 or 8 bits · Channel 1: 8 bits fixed · Channel 2: 8 bits at power ON
Stop bit	0 or 1 bit · Channel 1: 1 bit fixed · Channel 2: 1 bit at power ON
Parity	None, even or odd · Channel 1: None fixed · Channel 2: None at power ON

5.4.2 Change of serial communications setting (Channel 2 only)

The serial communications setting of channel 2 can be changed in μ Vision-21.

When changing these settings, use the LETENV command (;LETENV 1, *, *) as follows.

Change of communications setting by using LETENV command

(LETENV 1,A,B)

Item	A	B	Setting
Communication permission	11	0	Disables the communication port.
		1	Permits the communication port. Note: When changing the communications setting, the communication permission should be "1" for the effective setting.
Baud rate	12	9600	9600 BPS
		19200	19200 BPS
		38400	38400 BPS
Parity	13	0	Even
		1	None
		2	Odd
Data length	14	7	7 bits
		8	8 bits
Stop bit	15	0	1 bit
		2	2 bits
Delimiter	16	0	CR
		1	CR + LF

Example of setting change :

LETENV 1,12,19200 ... Baud rate :19200 BPS

LETENV 1,13,1 ... Parity : None Data

LETENV 1,14,8 ... Data length : 8 bits

LETENV 1,15,0 ... Stop bit : 1 bit

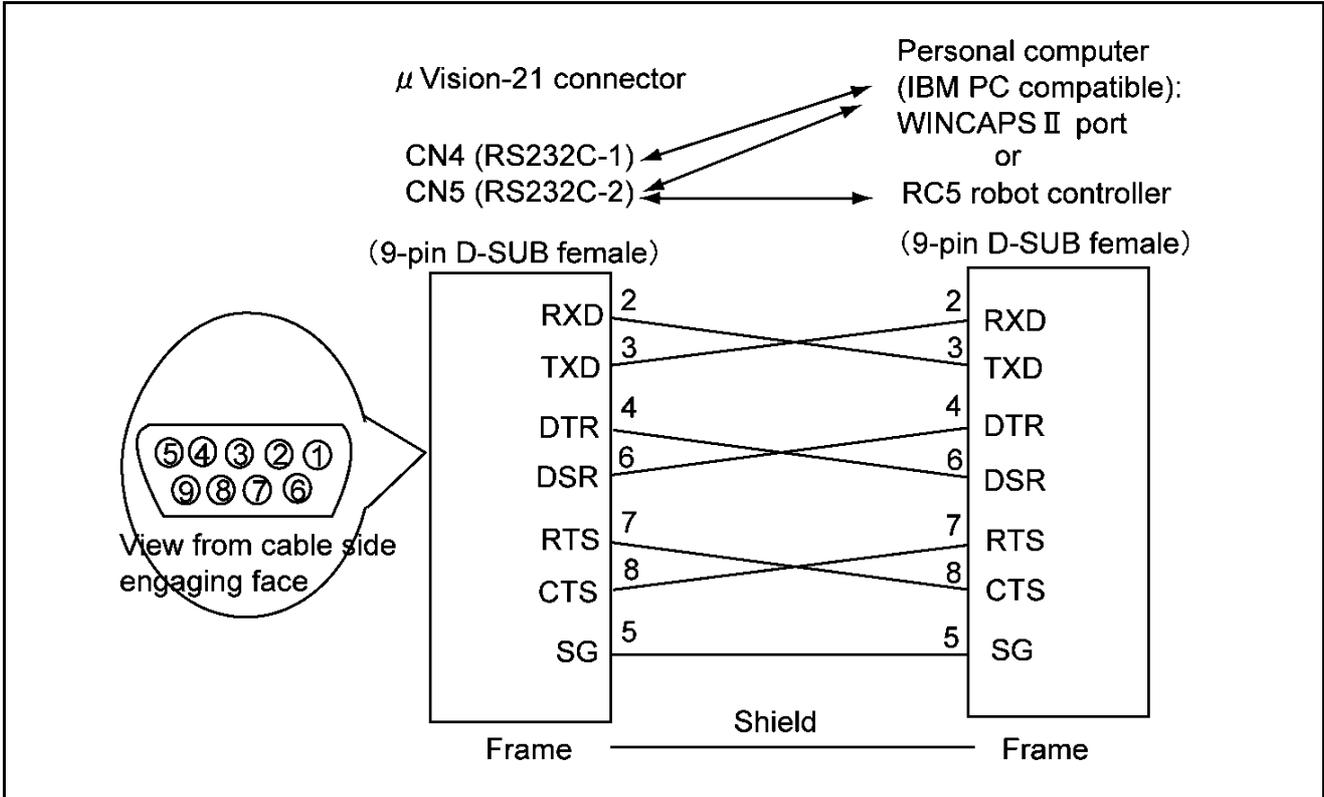
LETENV 1,16,0 ... Delimiter : CR

LETENV 1,11,1 ... After this communication permission, above settings are effective.

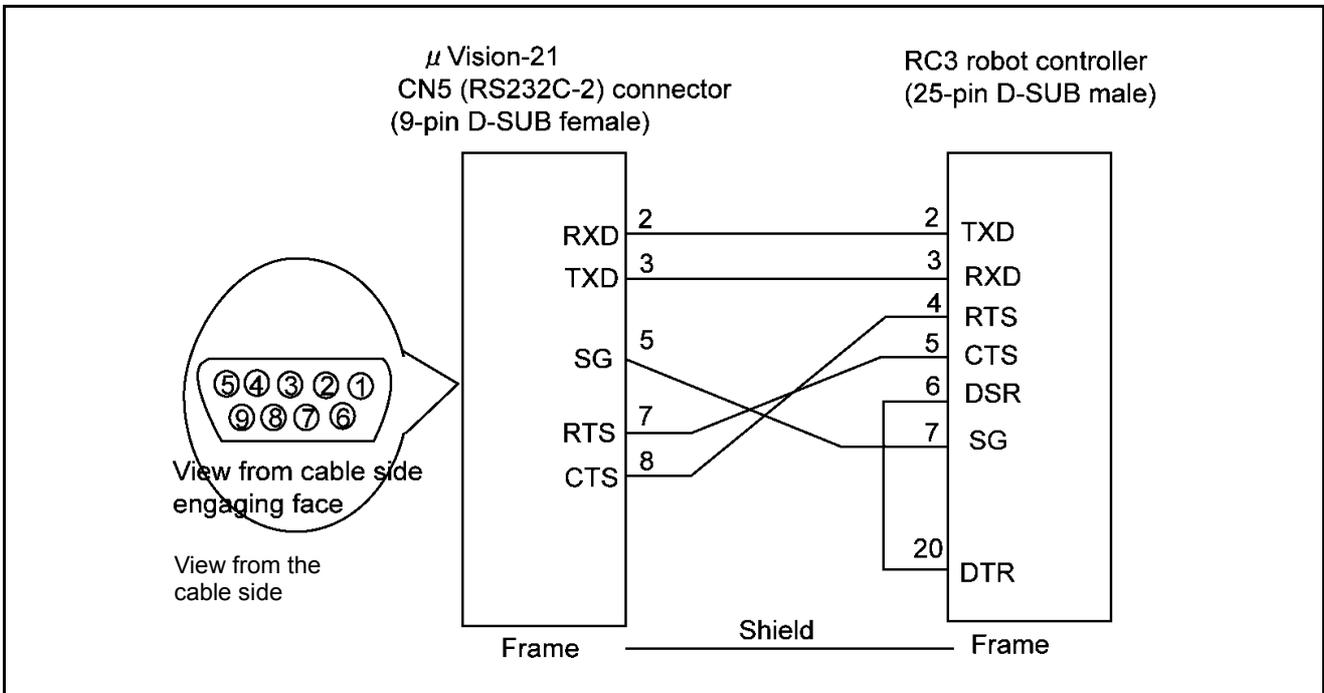
Note: When turning off the power switch, the communications settings are initialized. If you want to change again the settings, execute the LETENV command.

5.4.3 Communications Cable

To enable the computer (or the robot controller) and the μ Vision-21 to communicate with each other, they must be connected with a communications cable. Use the appropriate RS-232C for cross cable wiring, as shown in the figure below.



RS-232C Communication Cable Wiring Diagram (For IBM PC compatible or RC5 robot controller)



RS-232C Communications Cable Wiring Diagram (For RC3 robot controller)

5.5 Parallel I/O Signals

5.5.1 Types and General Information about parallel I/O Signals

This section describes the parallel I/O signals for the μ Vision-21.

The I/O signals are grouped into user I/O signals and system I/O signals.

Types of parallel I/O Signals

Fixed by system		
Type	No. of points	Function
System input	1	Restart signal (Vision error reset) only for external start mode
System output	1	Error signal (Vision error) only for external start mode
Controlled by user program		
Type	No. of points	Function
User input	7	Inputs to read the external I/O status with an IN command or IO [] variable. Used for analysis condition identification, condition satisfaction wait, data input from the external device, etc.
User output	7	Outputs to issue a signal to the external device during program execution with a SET command, RESET command, etc.

5.5.2 Using User I/O Signals

To use user I/O signals you need to first declare, in the program, the use of user I/O as I/O type variables with a DEFIO command. Next, access the user I/O by writing it to the I/O type variables or reading it.

5.5.3 I/O Type Variable Declaration

I/O type variables are classified into I/O type global variables that are available without any declaration, and I/O type local variables that are not available without a declaration.

(1) I/O Type Global Variables

I/O type global variables are used to refer to or change user I/O signals bit by bit. Since they are global variables, they can be used without any declaration.

I/O type global variables are expressed in either of the following two ways:

IO[nn] (nn: terminal number) Example: IO[104]

IOnn (nn: terminal number) Example: IO104

(2) I/O Type Local Variables

I/O type local variables are used to collectively refer to or change 1-bit, 8-bit, 16-bit or 32-bit user I/O signals starting from a specified terminal number.

I/O type local variables require a declaration, which will be made with a DEFIO command, before they are used. For further information about declarations with a DEFIO command, refer to the PROGRAMMER'S MANUAL, Chapter 9, Section 9.7 "DEFIO".

5.5.4 User Input Commands

There are two types of user input commands, IN and WAIT. The IN command substitutes the input result for a variable. The WAIT command waits until the input result meets specified conditions.

(1) IN Command

The IN command inputs a signal from the user input specified by an IO type variable and substitutes it for an arithmetic variable.

For further information about the IN command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, "IN."

5.5.5 User Output Commands

There are three types of user output commands, SET, RESET and OUT. The SET and RESET commands turn ON and OFF all user outputs specified by I/O type variables. The OUT command outputs data to a specified user output.

(1) SET Command

The SET command turns ON all user outputs specified by I/O type variables.

For further information about the SET command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, "SET."

(2) RESET Command

The RESET command turns OFF all user outputs specified by I/O type variables.

For further information about the RESET command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, "RESET."

(3) OUT Command

The OUT command outputs data to the user output specified by an I/O type variable.

For further information about the OUT command, refer to the PROGRAMMER'S MANUAL (I), Chapter 13, "OUT."

5.5.6 Usage of System I/O Signals

The usage of each system I/O signal is described below.

System I/O signals are usable while the μ Vision-21 runs in external auto mode.

(1) Vision Error (Output)

Function

The signal outputs to the external device when an error occurs with the μ Vision-21. This signal outputs only for external auto start.

Terminal number

No.18 of connector CN6.

Usage

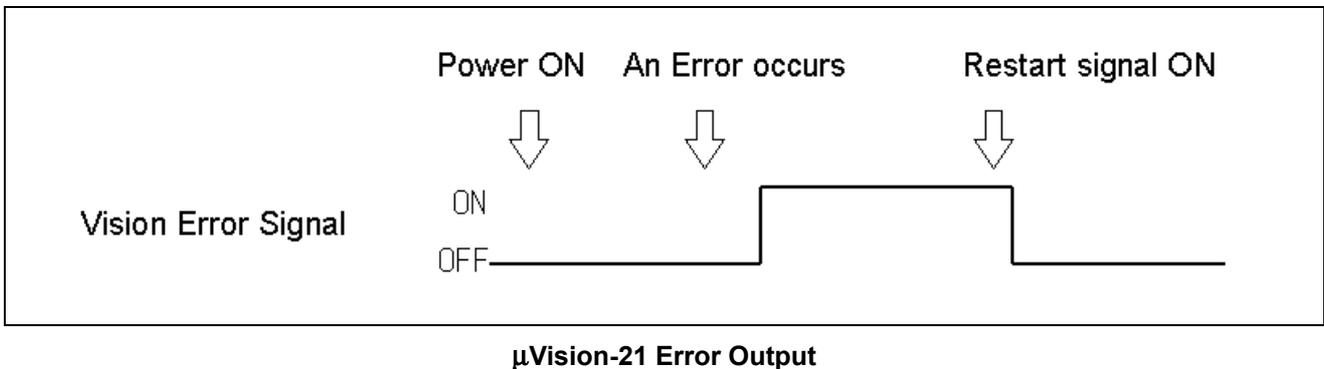
By this signal, the external device can detect that a Vision Error occurs and the μ Vision-21 stops. This signal outputs only for external auto start.

ON conditions

When an error occurs.

OFF conditions

- Soon after turning the μ Vision-21 power ON.
- When the μ Vision-21 runs normally.
- When the μ Vision-21 receives a restart signal after the error occurs.



(2) Restart Signal (Input)

Function

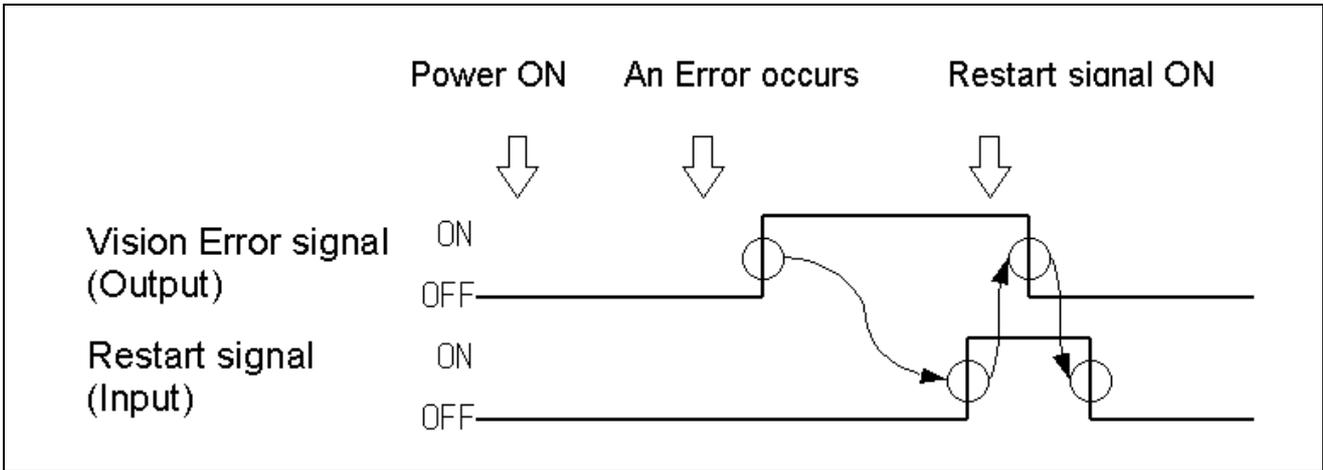
Restarts the μ Vision-21 after an error occurs in external auto start mode.

Terminal number

No.23 of connector CN6.

Usage

The μ Vision-21 can restarts by this signal when a Vision Error occurs. The μ Vision-21 cannot restarts by this signal in the mode except the external auto start mode or in the normal operation.

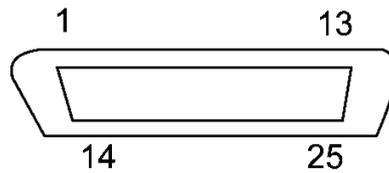


μVision-21 restart signal

5.5.7 I/O Signal Connector Pin Layout

This section describes the μVision-21 connector pin layouts for I/O signals.

Pin layout of CN6



View from cable side engaging face

(Connector model / manufacturer: Equivalent to DE-25P / Japan Aviation Electric)

Pin No.	Name	Port No.	Pin No.	Name	Port No.
1	Not connected	-	14	Common output (Ground)	-
2	User output	8	15	User output	12
3	User output	9	16	User output	13
4	User output	10	17	User output	14
5	User output	11	18	Vision error output	-
6	Not connected	-	19	Common input (+24V)	-
7	User input	0	20	User input	4
8	User input	1	21	User input	5
9	User input	2	22	User input	6
10	User input	3	23	Restart signal input	-
11	Not connected	-	24	Not connected	-
12	Not connected	-	25	Not connected	-
13	Not connected	-			

⚠ Caution : The allowable current is 40mA per one output, and the allowable voltage is 24V±10% per one output.
Keep under these allowable values.

5.5.8 μ Vision-21 I/O Circuits

The figure below shows an example of the configuration and connection of parallel I/O circuits in the μ Vision-21.

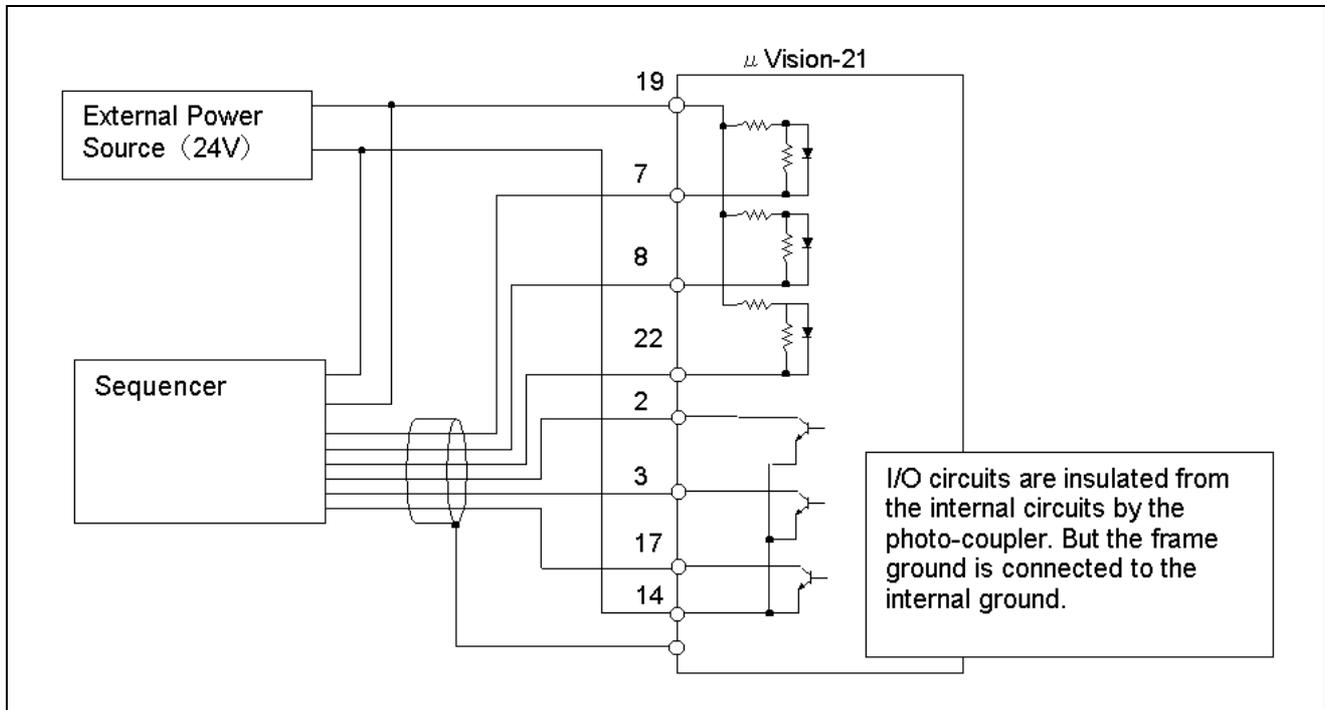
- (1) The User-Output and System-Output are open collector output circuits.
- (2) The maximum allowable intake current is 40mA.
Keep the current consumption of a device to be connected to the μ Vision-21, such as a PLC and a relay coil, below the allowable current.
- (3) Select an induction load, such as a relay coil, which has a built-in diode (for absorbing inverse electromotive force).
To use an induction load without a built-in diode, add a diode equivalent to the 1S1888 (Toshiba) in close vicinity to the coil.

⚠ Caution: When externally attaching a diode, connect it with correct polarity. Incorrect polarity may damage the Output circuit.

- (4) Connecting a lamp requires a circuit through which dark current flows.

⚠ Caution: Since the initial resistance of a lamp is small, the output circuit may be damaged by rush current that flows when the lamp lights.

- (5) Use a multi-core shielding cable for the purpose of protecting the devices from external noise. Ground it to the μ Vision-21.



Example of Parallel I/O Circuit

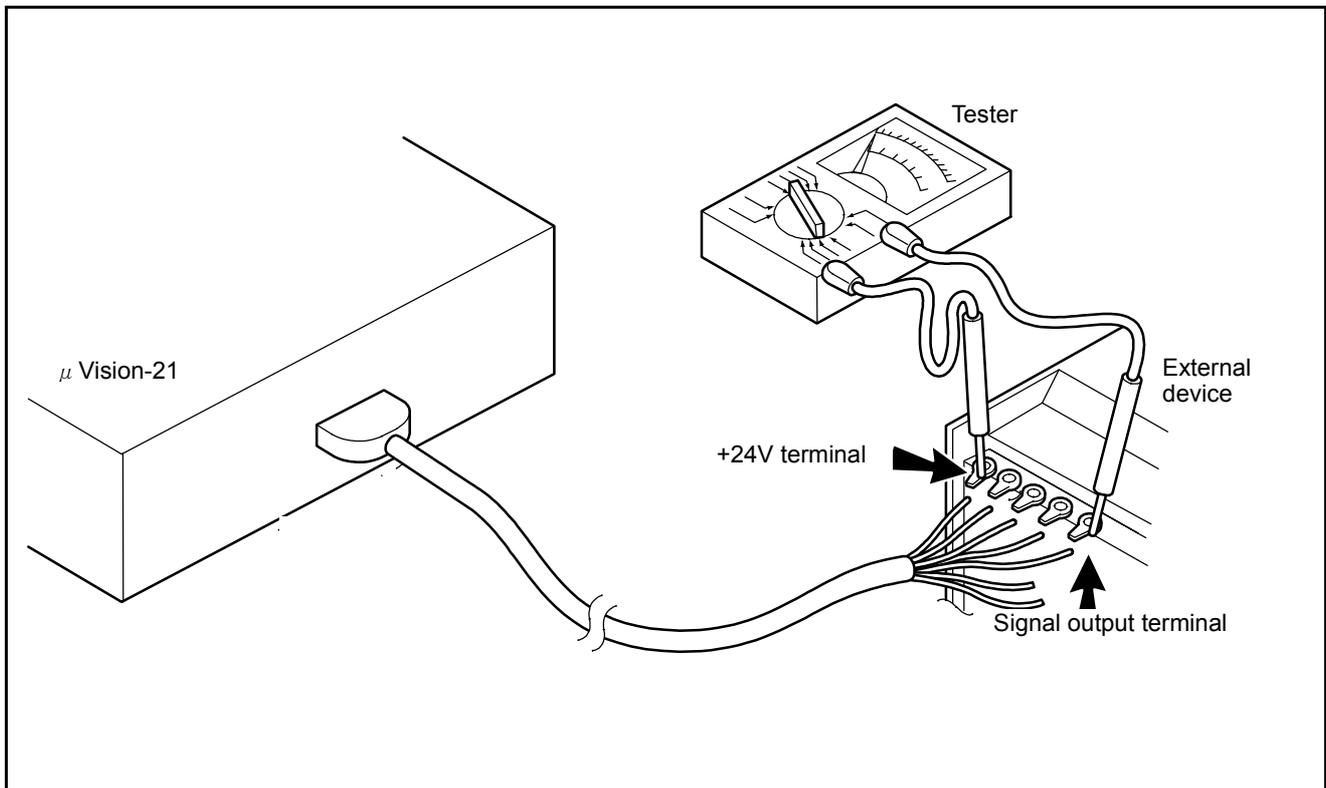
5.5.9 Precautions When Wiring the μ Vision-21 I/O Connectors

After the wiring of the I/O connectors of the μ Vision-21 is completed, check the following before turning ON the power:

Using a tester, check across the "signal output terminal" and "+24V terminal" of each connector to see that there is no continuity. See the figure below.

⚠ Caution: If the wiring between "signal output terminal" and "+24V terminal" of each connector is shorted, damage to the output circuit of the μ Vision-21 will result.

⚠ Caution: Wind adhesive vinyl tape around all ends of the unconnected wiring of each connector to prevent them from contacting other wiring and parts, which results in shorting.



Checking Example

Chapter6 Maintenance and Inspection

This chapter describes the regular maintenance and inspections necessary for maintaining the performance and functions of the μ Vision-21.

6.1 Maintenance & Inspection Intervals Purposes

The table below lists the intervals and purposes of maintenance & inspection required for your μ Vision-21.

Maintenance & Inspection Intervals and Purposes

No.	Intervals		Purposes
1	Daily	Perform inspection jobs specified in <u>Section 6.2</u> every day before starting operations.	To use your μ Vision-21 safely.
2	Semiannual	Perform inspection jobs specified in <u>Section 6.3</u> every six months.	To maintain the performance and functions of the μ Vision-21.

6.2 Daily Inspections

Before starting operations, check the items listed in the table below every day.

Daily Inspections Table

No.	Check:	Controller Power	How to check:	Criterion	What to do: (Note 1)
1	Connectors (CN1 to CN7 on the controller) and their mating parts	OFF	Visually	No looseness, disengagement or dirt.	Engage the parts properly and clean them.
2	Cables (connected to CN1 to CN7 on the controller) and their mating parts.	OFF	Visually	Free of damage or gouges.	Repair or replace.
3	Pilot lamps on the controller	ON	Visually	Should light.	Repair or replace.
4	Monitor	ON	Visually	Should display the version information when turning the power ON.	Repair or replace.

Note 1 Some repair and replacement operations, shown in "What to do:" column, may involve special work. Contact the Robot Service Section.

6.3 Semiannual Inspections

Check the items as listed in the table below every six months.

Semiannual Inspections Table

No.	Check:	Controller Power	How to check:	Criterion	What to do:
1	Power supply voltage: For μ Vision-21, camera and monitor	ON	Tester	Voltage range: 90 to 110 V	Change the power supply.
2	Power supply voltage: For parallel I / O	ON	Tester	Voltage range: 22 to 26 V	Change the power supply.
3	Contamination of the camera lens	OFF	Visually	Free from contamination	Clean the lens with commercially available dedicated cleaning paper.

Chapter7 DeviceNet Slave Unit (Only for VC-21XPD model)

AS the VC-21-XPD model has a built-in DeviceNet slave board, it can communicate with external devices according to the DeviceNet-compliant protocol.

As a slave unit for serial communications which is compliant with the open network DeviceNet, the μ Vision-21 may easily exchange I/O data with a variety of DeviceNet-compliant control devices of many manufacturers.

7.1 DeviceNet Communications Specifications

Item	Specifications			
Communications protocol	DeviceNet-compliant			
Connection supported	Master/slave connection: Polling I/O function			
Bit rate	500, 250, 125 kbps (selectable by WINCAPSII, DIO Manager)			
Communications media	Special cable consisting of 5 wires (2 for signals, 2 for power supply and 1 as a shield wire)			
Communications cable length	Bit rate	Maximum network length	Branch length	Total branch length
	500 kbps	100 m or less	6 m or less	39 m or less
	250 kbps	250 m or less	6 m or less	78 m or less
	125 kbps	500 m or less	6 m or less	156 m or less
Power supply for communication	External supply of 24 VDC \pm 10%			
Node address	Can freely set any of 0 through 63 to a node address unless the address is double-assigned on the same network. (Selectable by WINCAPSII, DIO Manager)			
Number of I/Os	Input: 1 point for system input (included 1 slot) 8 points to 256 for user input (1 to 32 slot) The number of I/Os can be set in unit of 8 points. Output: 1 point for system output (included 1 slot) 8 to 256 points for user output (1 to 32 slot) The number of I/Os can be set in unit of 8 points.			

7.2 Allocation of I/O Data (in Standard Mode)

The input/output data in standard mode are allocated as shown in the table below.

Allocation of I/O Data (in Standard Mode)

I/O port No. of μ Vision-21	Type	Macro name	Slot	Remarks
0 to 6	User input	UIN 1 to UIN 7	Parallel	At parallel I/O use
7	System input (Vision error reset)	SIN 1	Parallel	
8 to 14	User output	UOUT 1 to UOUT 7	Parallel	
15	System output (Vision error)	SOUT 1	Parallel	
16 to 511	Not used	-	-	
512 to 518	User input	DUIN 1 to DUIN 7	Input 1 st slot	At serial I/O use (Added at DeviceNet slave setting)
519	System input (Vision error reset)	DSIN 1	Input 1 st slot	
520 to 767	User input	DUIN 8 to DUIN 255	Input 2 nd slot to 32 nd slot	
768 to 774	User output	DUOUT 1 to DUOUT 7	Output 1 st slot	
775	System output (Vision error)	DSOUT1	Output 1 st slot	
776 to 1023	User output	DUOUT 8 to DUOUT 255	Input 2 nd slot to 32 nd slot	

Note 1: When using the DeviceNet slave, the serial I/O area through No. 16 to No. 1023 is added.

Note 2: The parallel I/O and the serial I/O are usable at the same time.

Note 3: The system output (Vision error) and the system input (Vision error reset) are set in the both parallel I/O and the serial I/O, and they are usable from either I/O.

7.3 How to allocate the Serial I/O Data

The allocation of serial I/O data is usable only for the standard mode.
The user input / output data are usable for both the parallel I/O and DeviveNet I/O.
Unless using the DeviveNet, select the allocation of parallel I/O.

Operating procedure

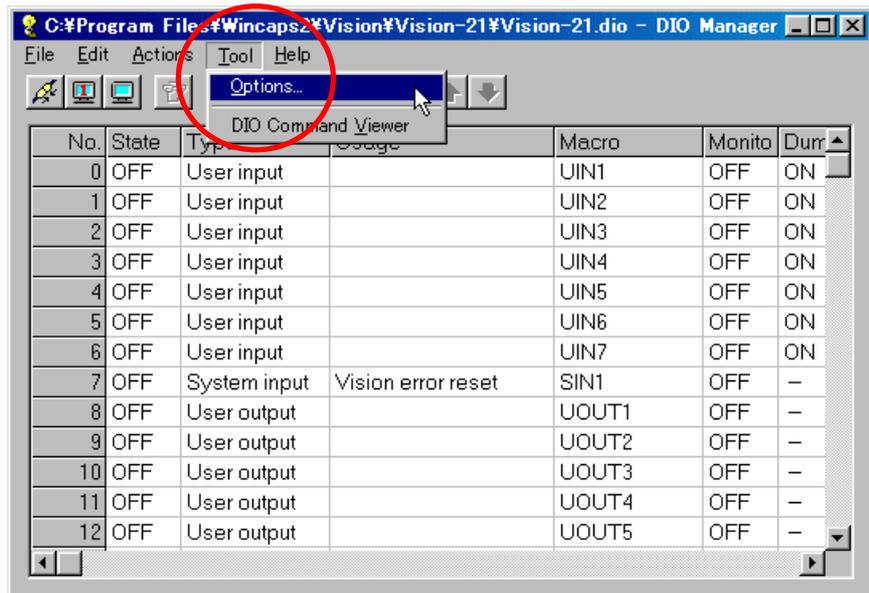
► STEP 1

Click on the button to start the DIO Manager.



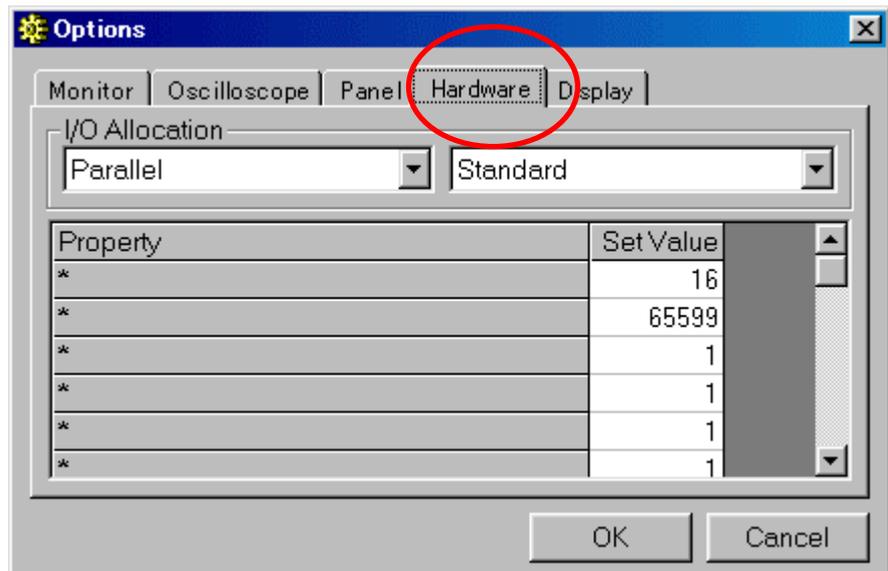
► STEP 2

Upon selecting Options from the Tool menu, the Options dialog box appears on the screen.



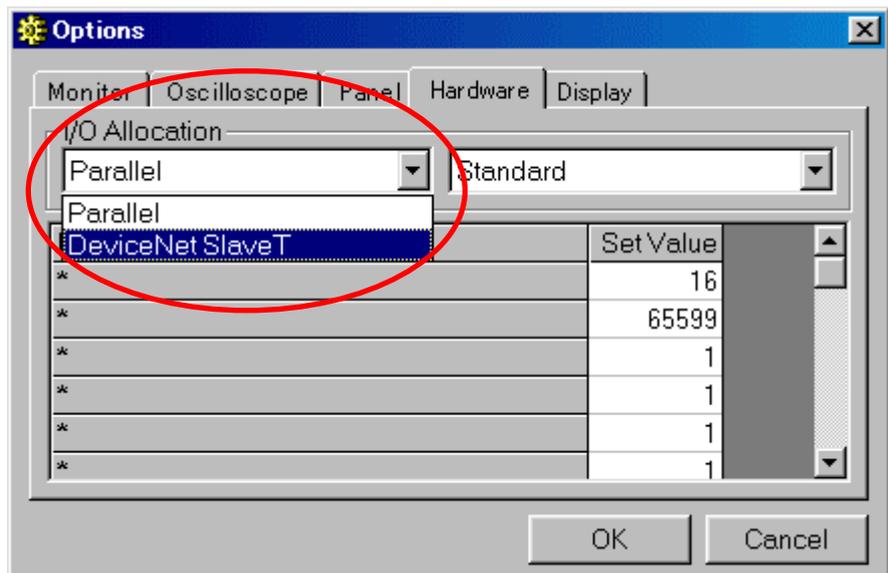
► STEP 3

Select the Hardware tab.



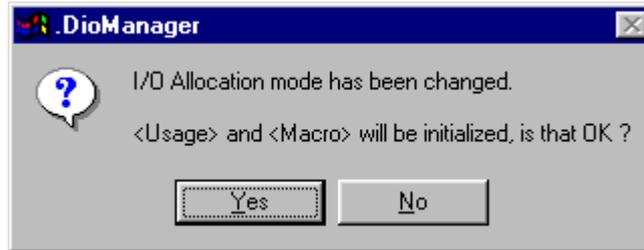
► STEP 4

Select the "DeviceNet Slave" on the "I/O Allocation frame display" and press "OK".



► STEP 5

Following the system message, select the “YES”.



New serial I/O allocations are added to No. 16 or after.

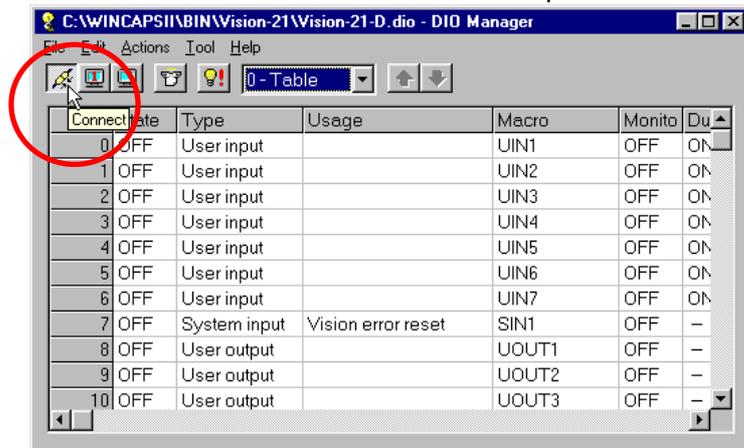
No.	State	Type	Usage	Macro	Monito	Durr
6	OFF	User input		UIN7	OFF	ON
7	OFF	System input	Vision error reset	SIN1	OFF	–
8	OFF	User output		UOUT1	OFF	–
9	OFF	User output		UOUT2	OFF	–
10	OFF	User output		UOUT3	OFF	–
11	OFF	User output		UOUT4	OFF	–
12	OFF	User output		UOUT5	OFF	–
13	OFF	User output		UOUT6	OFF	–
14	OFF	User output		UOUT7	OFF	–
15	OFF	System output	Vision error	SOUT1	OFF	–
16	OFF	(Not used)			OFF	–
17	OFF	(Not used)			OFF	–
18	OFF	(Not used)			OFF	–
19	OFF	(Not used)			OFF	–
20	OFF	(Not used)			OFF	–
21	OFF	(Not used)			OFF	–

User inputs are allocated to No. 512 or after.

No.	State	Type	Usage	Macro	Monito	Durr
501	OFF	(Not used)			OFF	–
502	OFF	(Not used)			OFF	–
503	OFF	(Not used)			OFF	–
504	OFF	(Not used)			OFF	–
505	OFF	(Not used)			OFF	–
506	OFF	(Not used)			OFF	–
507	OFF	(Not used)			OFF	–
508	OFF	(Not used)			OFF	–
509	OFF	(Not used)			OFF	–
510	OFF	(Not used)			OFF	–
511	OFF	(Not used)			OFF	–
512	OFF	User input		DUIN1	OFF	ON
513	OFF	User input		DUIN2	OFF	ON
514	OFF	User input		DUIN3	OFF	ON
515	OFF	User input		DUIN4	OFF	ON
516	OFF	User input		DUIN5	OFF	ON

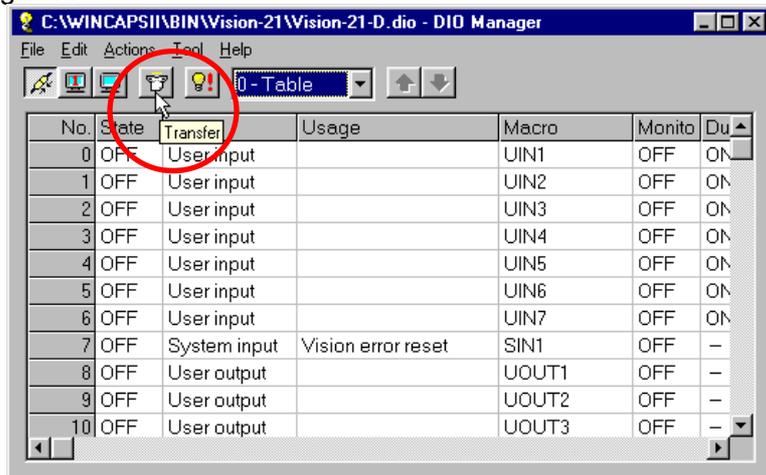
► STEP 6

Click on the connect button  to connect the μ Visino-21.



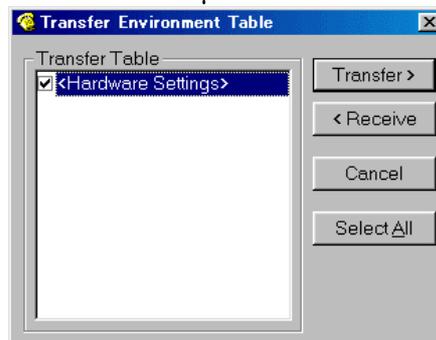
► STEP 7

Click on the transfer button  to open the Transfer Environment Table dialog box.



► STEP 8

After clicking the “Hardware Settings” check box, press the “Transfer” button to transfer the data to the μ Visino-21.



After the restart message appears, restart the μ Visino-21.

After restarting, the newer allocated data will go into effect and displays the DeviceNet version when turning the μ Visino-21 power ON.

Note: Unless this setting, the DeviceNet functions are not usable.

7.4 Setting Node Address and Bit Rate

Set the node address of the μ Visino-21 as follows.

You may freely set any of 0 through 63 to a node address unless the address is double-assigned on the same network including the master and slaves. Double assignment will cause an address double-assignment error, disabling the network.

Operating procedure

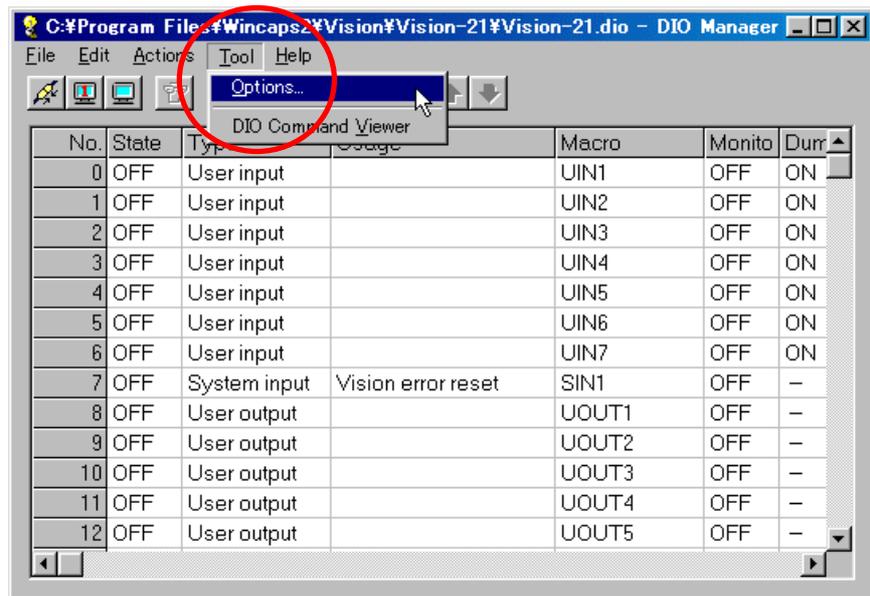
► STEP 1

Click on the button to start the DIO Manager.



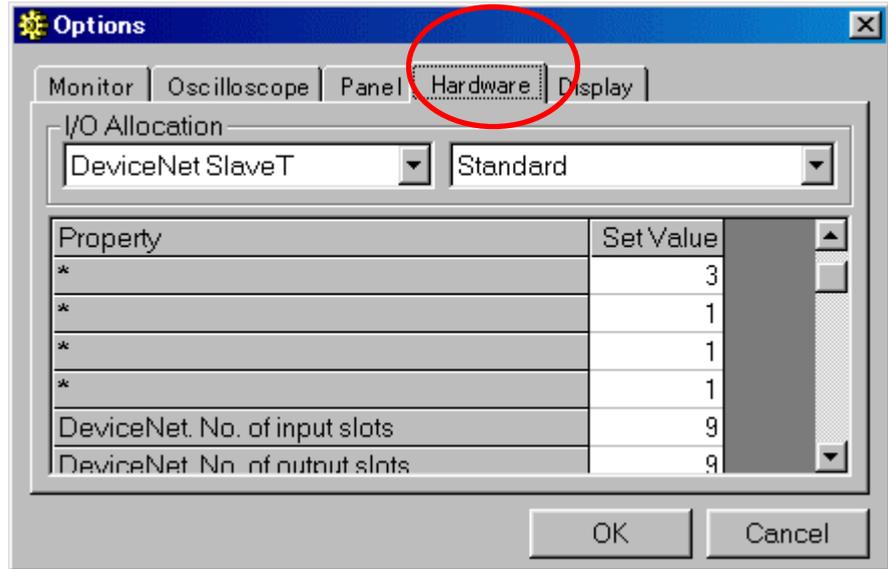
► STEP 2

Upon selecting Options from the Tool menu, the Options dialog box appears on the screen.



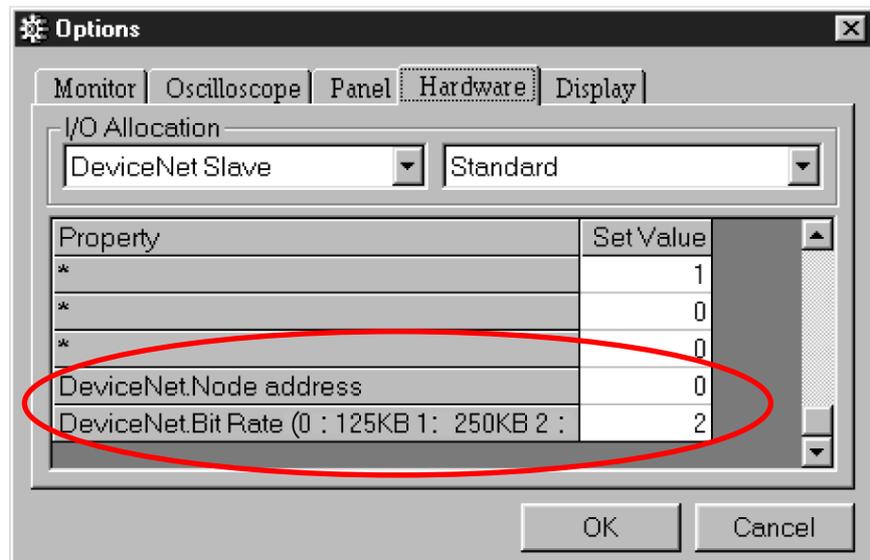
► STEP 3

Select the Hardware tab.



► STEP 4

Enter the required numbers of the node address and the bit rate, and press OK.



Note: The initial setting of the node address is 0. You may freely set any of 0 through 63 to a node address unless the address is double-assigned on the same network including the master and slaves.

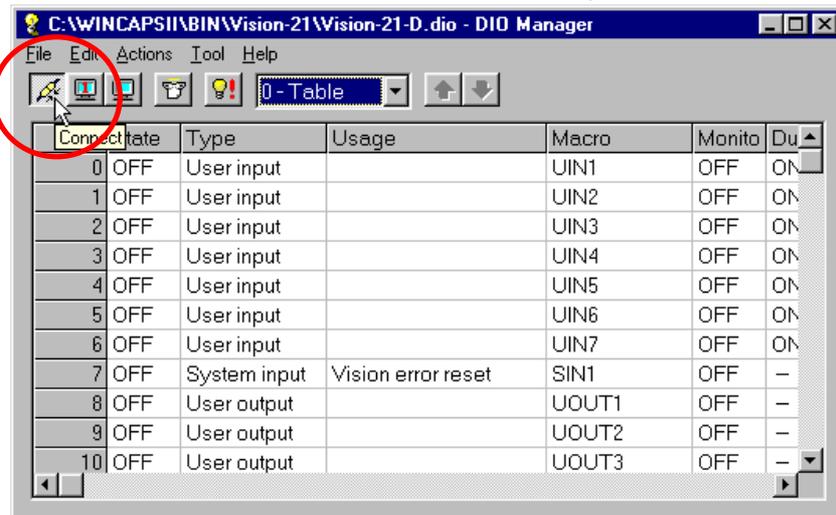
Note: The initial setting of the bit rate is 500Kbps. On the same network, set the same bit rate to all nodes (master and slave) using 0 to 2.

Bit rate

0: 125Kbps, 1: 250Kbps, 500Kbps (initial setting)

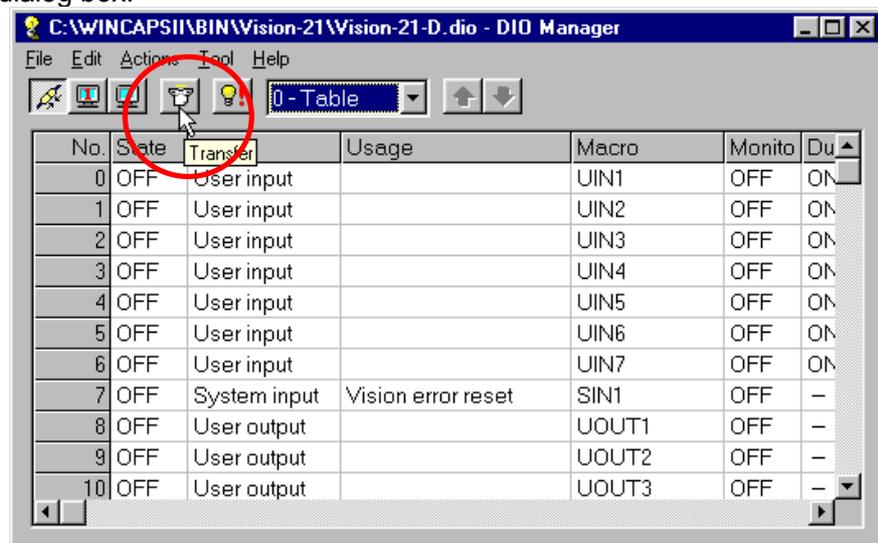
► STEP 5

Click on the connect button  to connect the μ Visino-21.



► STEP 6

Click on the transfer button  to open the Transfer Environment Table dialog box.



► STEP 7

After clicking the “Hardware Settings” check box, press the “Transfer” button to transfer the data to the μ Visino-21.



After the restart message appears, restart the μ Visino-21.

Note: After restarting, the newer node address and bit rate will go into effect.

7.5 Entering the number of Input/Output Slots

The μ Visino-21 allows you to increase or decrease the number of input/output slots in bytes. The number of input slots can be set in the range from 9 (initial setting) to 32 (Max.), and the number of output slots in the range from 9 (initial setting) to 32 (Max.).

Operating procedure

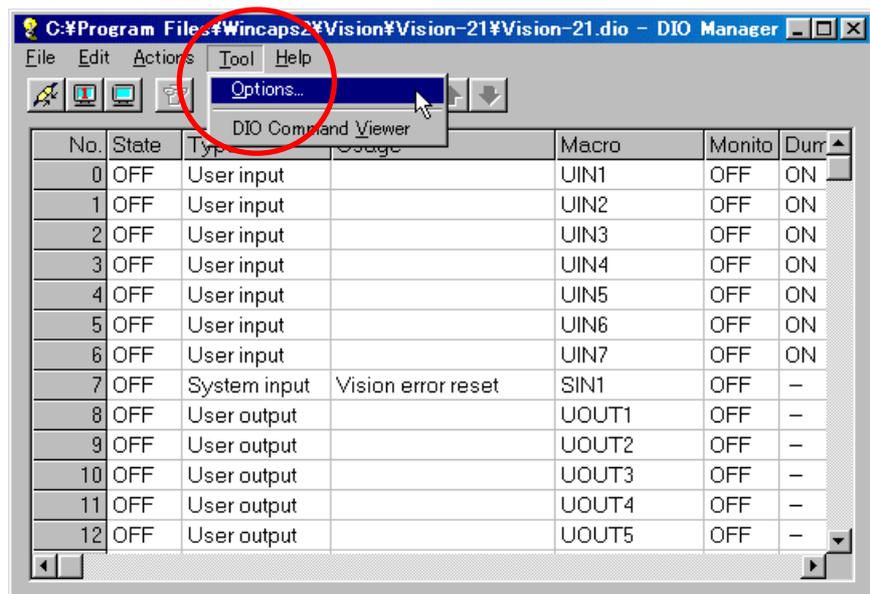
► STEP 1

Click on the button to start the DIO Manager.



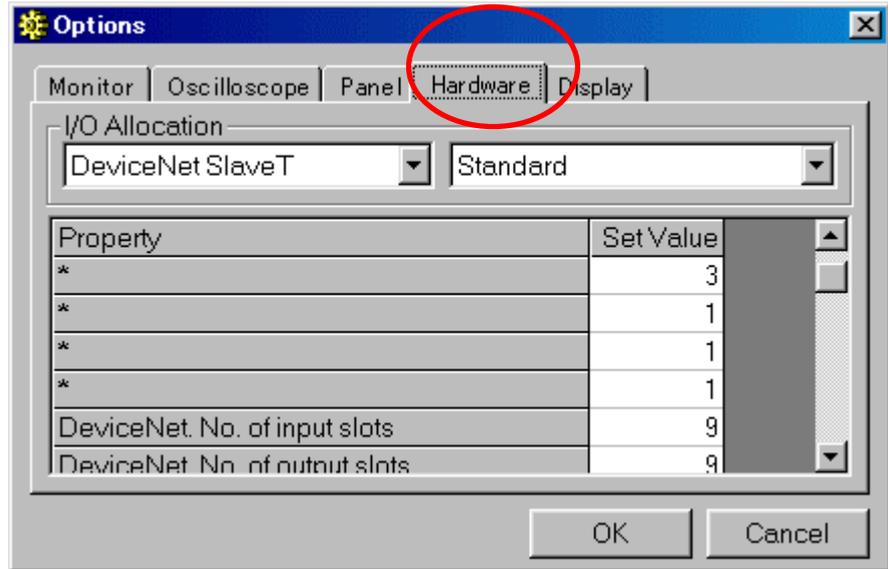
► STEP 2

Upon selecting Options from the Tool menu, the Options dialog box appears on the screen.



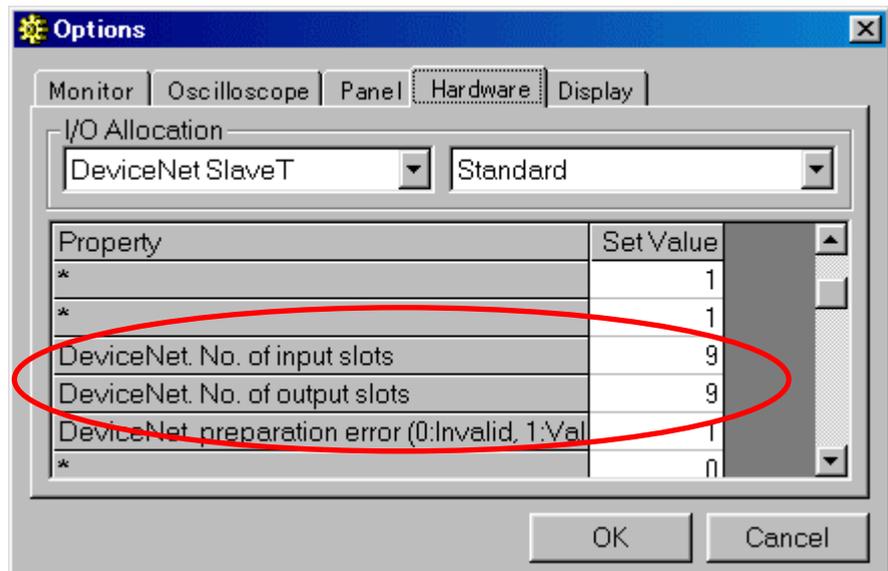
► STEP 3

Select the Hardware tab.



► STEP 4

Enter the required numbers of input slots and output slots, and press OK.

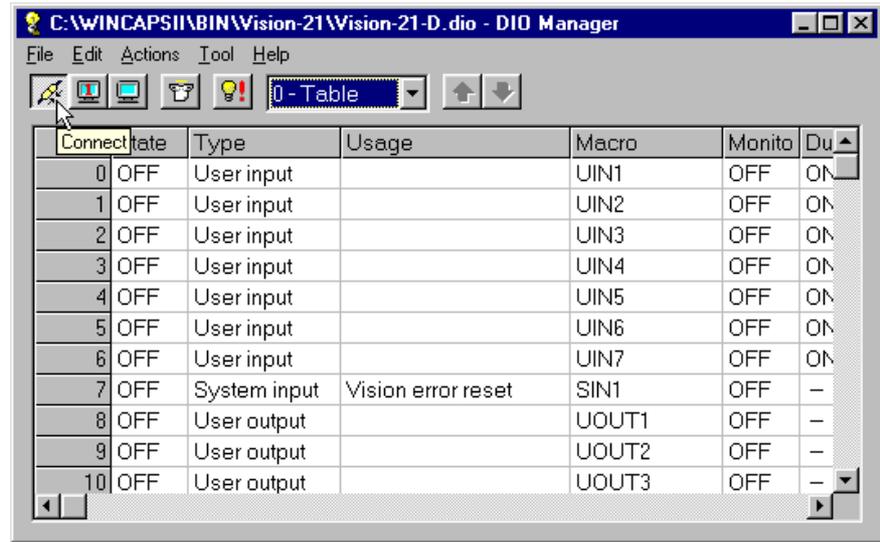


Note: The initial setting of input slots is 9. You may freely set any of 1 through 32 to the input slots. One slot is necessary for the system input (Vision error reset).

Note: The initial setting of output slots is 9. You may freely set any of 1 through 32 to the output slots. One slot is necessary for the system output (Vision error).

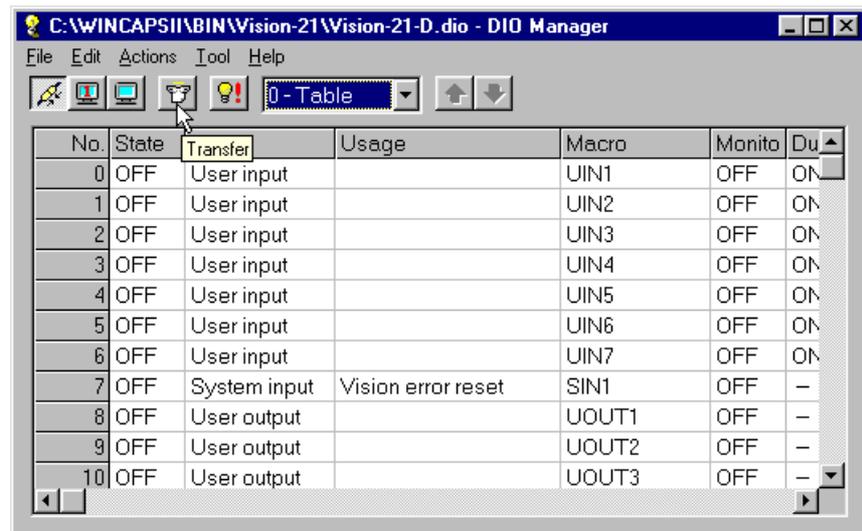
► STEP 5

Click on the connect button  to connect the μ Visino-21.



► STEP 6

Click on the transfer button  to open the Transfer Environment Table dialog box.



► STEP 7

After clicking the “Hardware Settings” check box, press the “Transfer” button to transfer the data to the μ Visino-21.



After the restart message appears, restart the μ Visino-21.

Note: After restarting, the newer input/output slots will go into effect.

7.6 Error Code Tables

Here, only the error codes relative to DeviceNet communication errors are described in the table below. For other error codes, refer to the ERROR CODE TABLES, "2 Controller Error Code Table."

Error code	What has happened:	What to do:	LEDs	
			MS	NS
1201	Preparing for communications (link not established) <ul style="list-style-type: none"> The DeviceNet module is working normally, but has not established link with the master device. 	Establish the link from the master device.	 G	 G
1202	Preparing for communications (link not established) <ul style="list-style-type: none"> The DeviceNet module is working normally and has established explicit link with the master device, but not established an I/O link. 	Establish the I/O link from the master device.	 G	 G
1203	Preparing for communications (communications idling) <ul style="list-style-type: none"> The DeviceNet module is working normally, but cannot receive data except empty data from the master device. 	Check the contents of I/O data that the master device sends.	 G	 G
1204	Preparing for communications (I/O timeout) <ul style="list-style-type: none"> The DeviceNet module is working normally, but cannot receive data from the master device within the specified time. 	Check that the DeviceNet cable is not broken or its connector is firmly plugged in. Check the DeviceNet cable length and that a terminator resistor is attached to each end of the trunk line.	 G	 R
1210	A DeviceNet internal communications error has occurred.	Turn the controller power off and then on, and do the same operation again.	-	-
1213	The network is broken or "bus off." <ul style="list-style-type: none"> The DeviceNet cable is broken or not connected. 	Check whether the DeviceNet cable is connected with the robot controller. If this error occurs after you change the DIP switch setting, check whether the bit rate setting made with the DIP switch matches the network's bit rate.	 G	 R
1215	Preparing for communications (Initial setting error) <ul style="list-style-type: none"> No initial settings have been received from the robot. 	Check whether the bit rate setting made with the DIP switch matches the network's bit rate..	 G	
1216	Data length setting error <ul style="list-style-type: none"> DeviceNet INSLOT or OUTSLOT is not 32 or less. 	Turn the controller power off and then on. Then, set correct DeviceNet INSLOT and OUTSLOT values.	 R	
1217	Node address double-assign error <ul style="list-style-type: none"> The same node address is double assigned to the μVisino-21 and any other online node. 	Assign an exclusive node address to each node (including the robot controller) on the same DeviceNet.	 G	 R
1232	Reset command received <ul style="list-style-type: none"> The μVisino-21 has received a reset command from the master device. 	Turn the μ Visino-21 power off and then on, and do the same operation again.	 G	 G

 : ON  : Flashing  : OFF - : Indefinite

7.7 Conditions of Automatic Run (AUTOEXE. PAC)

The μ Visino-21 runs automatically in the single-cycle run mode when the following conditions are satisfied:

- (1) Parallel I/O setting: when the μ Visino-21 power is turned ON at the Parallel I/O setting.
- (2) DeviceNet setting: when the μ Visino-21 power is turned ON and also the DeviceNet communications are established.

Vision device μ Vision-21 Super

Model: VC-21XP, VC-21XPD

SETTING-UP & MAINTENANCE GUIDE

First Edition February 2003

DENSO WAVE INCORPORATED
Factory Automation Division

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The purpose of this manual is to provide accurate information in the handling and operating of the robot. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will DENSO WAVE INCORPORATED be liable for any direct or indirect damages resulting from the application of the information in this manual.

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