Cat. No. I147E-EN-01

SCARA Robots
YRC Series

SCARA Vision and tracking

USER´S MANUAL

OMRON

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Introduction

Thank you for purchasing the OMRON SCARA Vision System. Please read this manual carefully before using the Vision and tracking system in order to ensure correct and safe operation.

Disclaimers

CHANGE IN SPECIFICATIONS
Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

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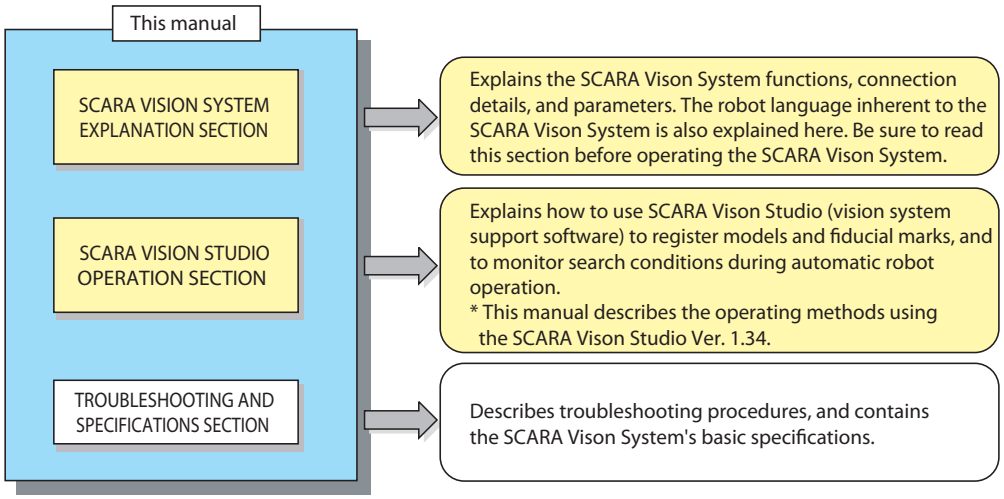
The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

About this manual

This manual comprises 3 main sections: the SCARA VISION SYSTEM EXPLANATION SECTION, the SCARA VISION STUDIO OPERATION SECTION, and the TROUBLESHOOTING AND SPECIFICATIONS SECTION. To use the SCARA Vision System in an efficient manner, refer to the sections which apply to the purpose at hand. Moreover, the manual should be stored in a location where it can be easily referenced when necessary, and the manual must always be forwarded to the end-user.



When performing SCARA Vison System installation, operations, and adjustments, etc., use one of the following methods to ensure easy referencing to the contents of this manual.

1. Install, operate, and adjust with this manual in hand.
2. Install, operate, and adjust while referencing the CD-ROM version of this manual which displays on a personal computer screen.
3. Print out the relevant portions of the CD-ROM version manual in advance, then install, operate, and adjust with reference to that information.

Although care has been taken to ensure the accuracy of this manual content, please contact your OMRON representative if content errors are found.
Refer to the relevant user's manuals for information regarding the robot, and regarding subjects other than the installation, operations, and adjustments inherent to the SCARA Vision System. Refer to the OMRON Robot Controller YRC Series Programming Manual for robot language information beyond basic items such as the robot language command statement format, variables, and constants, and for information outside the scope of the SCARA Vision System's inherent robot language.

Safety cautions and marks

This manual uses the symbol marks shown below to indicate safety instructions which must be heeded, and to specify handling cautions, prohibitions, instructions, and important procedural points, etc.
Please familiarize yourself with the meanings of these symbols before reading the manual.

DANGER	INDICATES AN IMMINENTLY HAZARDOUS SITUATION WICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY. ADDITIONALLY, THERE MAY BE SEVERE PROPERTY DAMAGE.
WARNING	INDICATES A POTENTIALLY HAZARDOUS SITUATION WICH, IF NOT AVOIDED, COUL RESULT IN DEATH OR SERIOUS INJURY. ADDITIONALLY, THERE MAY BE SEVERE PROPERTY DAMAGE
CAUTION	INDICATES A POTENTIALLY HAZARDOUS SITUATION WICH, IF NOT AVOIDED, COULD RESULT IN MINOR OR MODERATE INJURY OR DAMAGE TO THE EQUIPMENT OR SOFTWARE.

Examples	Meaning
	This warning symbols indicate a caution or warning you must heed. The specific caution or warning is often indicated by a pictorial sign. Always follow these instructions to ensure correct and safe product use.
	This symbols indicate a prohibited action. The specific prohibited action is often indicated by a pictorial sign. Never attempt the prohibited action.
	This symbol indicates a mandatory action. The specific instruction is often indicated by a pictorial sign. Read the instructions carefully and always use the specified procedure.

This manual also uses the following marks to indicate key points and tips for operation.

NOTE	Explains the key point in the operation in a simple and clear manner.
MEMO	Gives supplementary information related to robot controller operation.

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The OMRON robot and/or related product you have purchased are warranted against the defects or malfunctions as described below.

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Warranty Period:

The warranty period ends 24 months after the date of manufacturing as shown on the products.

Exceptions to the Warranty:

This warranty will not apply in the following cases:

(1) Fatigue arising due to the passage of time, natural wear and tear occurring during operation (natural fading of painted or plated surfaces, deterioration of parts subject to wear, etc.)

(2) Minor natural phenomena that do not affect the capabilities of the robot and/or related product (noise from computers, motors, etc.).

(3) Programs, point data and other internal data that were changed or created by the user.

Failures resulting from the following causes are not covered by warranty.

1) Damage due to earthquakes, storms, floods, thunderbolt, fire or any other natural or man-made disasters.
2) Troubles caused by procedures prohibited in this manual.
3) Modifications to the robot and/or related product not approved by OMRON or OMRON sales representatives.
4) Use of any other than genuine parts and specified grease and lubricants.
5) Incorrect or inadequate maintenance and inspection.
6) Repairs by other than authorized dealers.

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1. Overview

1.1 Features and functions

1.1.1 SCARA Vision System features

The OMRON SCARA Vision System is a dedicated board which is installed in YRC robot controller for the purpose of processing information obtained from cameras, and it allows the robot to search for workpieces, pick them up, verify their positions, and install them. The SCARA Vision System in effect gives the robot an "eye", thereby greatly reducing the man-hours which were previously required for robot handling preparations (teaching, arranging the parts to be supplied, positioning, etc.).

- **Easy calibration**

  A "calibration" refers to the process in which the coordinates (camera coordinates) of the image acquired by the camera are aligned with the robot coordinates. The SCARA Vision System features an interactive operation format at the programming box which both simplifies and speeds up troublesome calibrations.

- **Dedicated high-speed bus line connection**

  A direct bus connection to the robot controller CPU board enables much faster data transmissions than is possible by commercially available serial communication formats. The SCARA Vision System easily accommodates even the high-speed processing required for conveyor tracking.

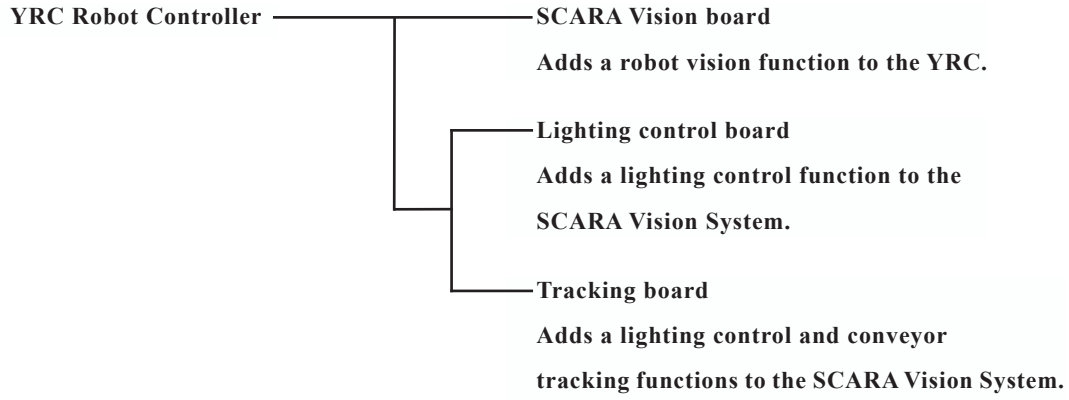
- **No coordinate data conversion program required**

  The workpiece coordinates acquired from the camera image can be output as robot point data, eliminating the need for creating a coordinate conversion program at the robot controller.

- **Various operations controlled in the robot language**

  Operations such as camera and lighting control, and conveyor tracking control, etc., can be performed in the SCARA Vision System inherent robot language.

The SCARA Vision System consists of a board which is installed in the YRC Robot Controller.



NOTE

- The lighting control board and tracking board cannot be used at the same time.

The features and functions of each board are explained below.

1.1.2 SCARA Vision board features and functions

The SCARA Vision board can be installed to add a robot vision function to the YRC robot controller.

- **Edge (contour) searches**

  The SCARA Vision System performs edge searches based on contour shape information. Conventional machine vision systems often employ a gray search format (normalized correlation search) which is easily affected by the lighting conditions and by missing or soiled workpieces. The edge search format of the SCARA Vision System is relatively unaffected by missing and soiled workpieces.

- **Generous number of registered models**

  Up to 40 models can be registered and used in searches. This permits easy setup changes simply by changing the model number.

- **Supports 2 cameras**

  Up to 2 cameras can be connected (both cameras must be the same type).

- **SCARA Vision Studio permits search conditions to be monitored during automatic robot operation**

  SCARA Vision Studio permits monitoring of work search conditions during automatic robot operation, and monitoring of fiducial mark search conditions during calibration setting operations.

1.1.3 Lighting control board features and functions

The lighting control board is used to add a lighting control function to the SCARA Vision System.
The lighting control board offers the following features and functions.

- **Digitally modulated light format used for PWM**

  A digitally modulated light format is used for pulse width modulation (PWM), resulting in stable light modulation.

- **Light emission format (continuous light / strobe light) is selectable according to the application**

  The light emission format can be selected according to the application in question.

  Continuous light : 100-step light modulation (0 to 100%)
  Strobe light : 10μs to 33ms light emission time setting

- **Automatic strobe light synchronization**

  When the SCARA Vision board is installed with a "S/W trigger" setting, the strobe light emission is automatically synchronized with the robot language command for image acquisition.

- **Supports 12V and 24V lighting specifications (constant voltage type)**

  Either a 12V or 24V lighting specification can be used to supply power which matches the LED lighting specification in question. LED lighting colors (red, white, green, blue) are also supported.

- **2Ch lighting output, with max. output capacity of 60W**

  2 lighting channels can be used simultaneously, provided that the total power consumption for both channels does not exceed 60W (for 24VDC. For 12VDC, the maximum is 30W). The modulated light and lighting control mode settings can be specified individually.

1.1.4 Tracking board features and functions

The tracking board is used to add lighting control and conveyor tracking functions to the SCARA Vision System.
Conveyor tracking can only be used with the main robot.

- **Conveyor tracking support**

  The tracking board receives pulse signals (AB phase) from conveyor encoders in order to continuously check the positions of conveyed workpieces. This allows workpieces to be picked up without stopping the conveyor.
  Conveyor tracking can only be used with the main robot.

- **Equipped with 2 pulse counters**

  The tracking board has 2 pulse counters, allowing workpieces to be checked on 2 lines simultaneously. Each of the pulse counters supports pulse inputs of up to 2Mpps.

- **Equipped with lighting control function**

  The tracking board is equipped with the lighting control board functions, allowing it to perform all the SCARA Vision System functions with only an SCARA Vision board and a tracking board.

1.2 System configuration

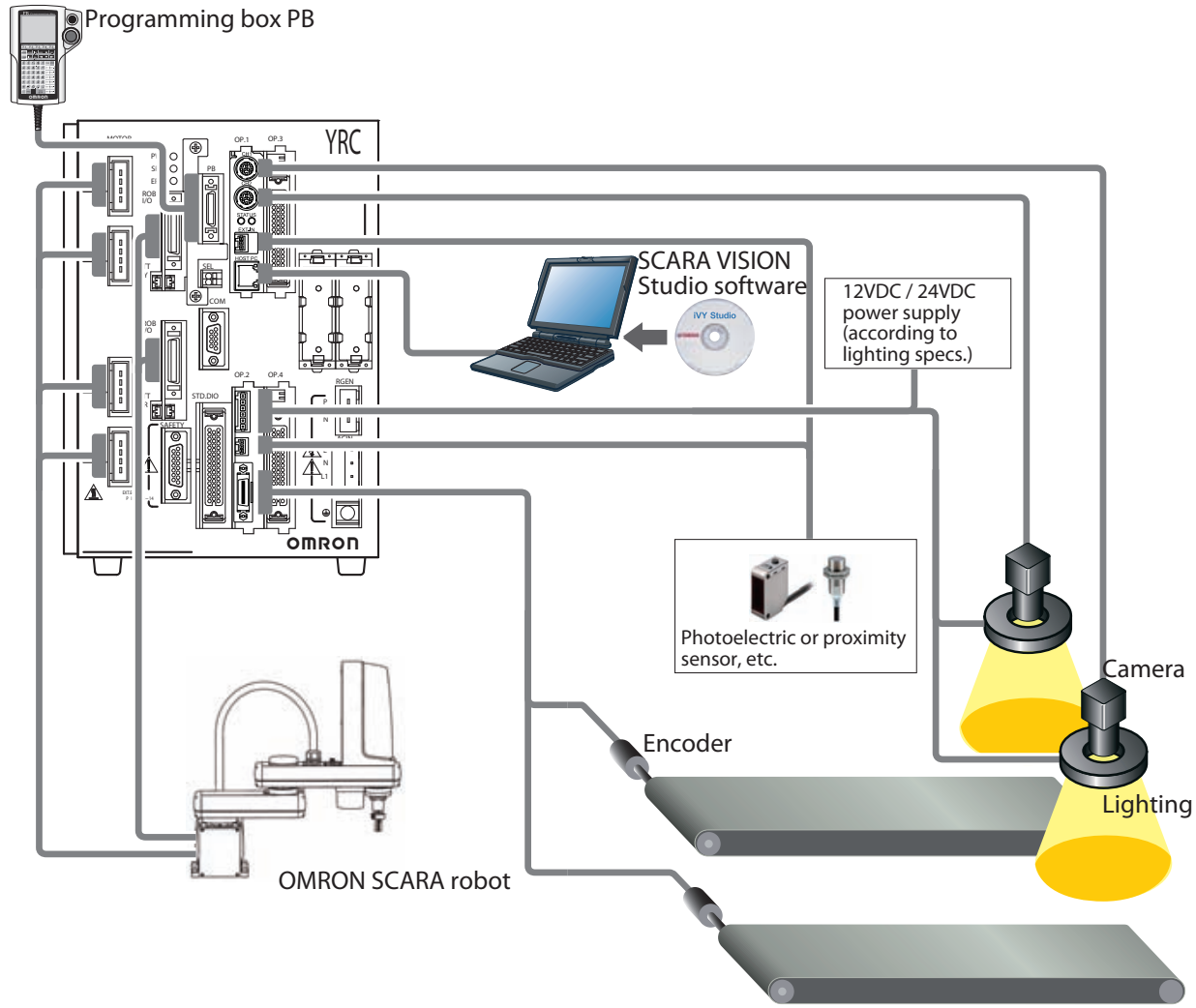
A1

Overview

1.2.1 SCARA Vision System configuration

The SCARA Vision System enables a system configuration like that shown below.

System configuration illustration



*The above configuration example shows a system where the SCARA Vision board and tracking board are used.

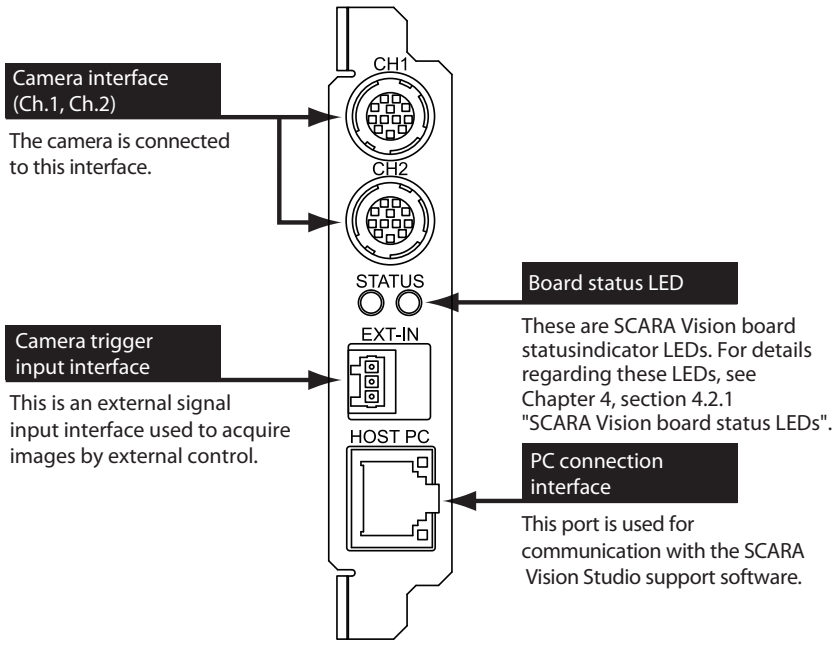
*Connections to the STD.DIO, ACIN, and SAFETY connectors is not shown in the above illustration.

1.3 Component names and functions

This section lists the names and functions of components on the SCARA Vision board, lighting control board, and tracking board.

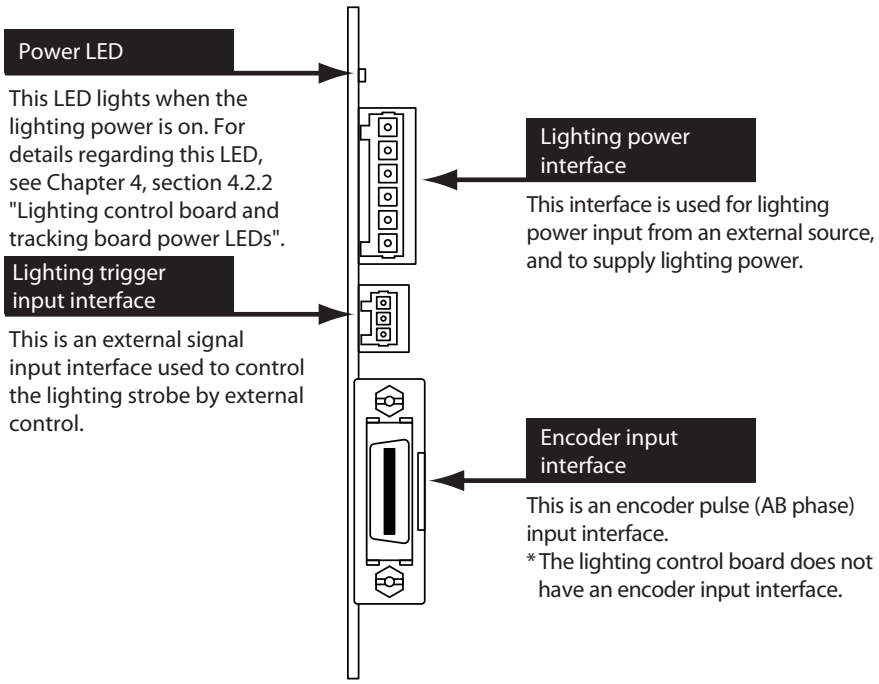
■ SCARA Vision board

Names and functions of SCARA Vision board components



■ Lighting control board / tracking board

Names and functions of the Lighting control board / tracking board components



1.4 Required items and options

1.4.1 Required items

The following items are required in order to use the SCARA Vision System.

1. OMRON controller vision board (SCARA Vision board)

The SCARA Vision board is used to add a robot vision function to the YRC robot controller, and is installed in the YRC robot controller which the customer has purchased.

[SCARA Vision board accessories]

1-1. Camera trigger input cable connector
Type: KX0-M657L-00 1 piece
Dedicated tool
Type: KX0-M657M-00 1 piece
} Set type: KX0-M657K-00

2. Vision system support software (SCARA Vision Studio)

This SCARA Vision system support software is connected to the robot controller in order to register models and fiducial marks, and to monitor search conditions during automatic robot operation.

1.4.2 Options

The following options are available for use in the SCARA Vision System.

1. Lighting control board for OMRON controller.

The lighting control board is used to add a lighting control function to the SCARA Vision System. Note that it is not possible to use both a lighting control board and a tracking board in the same system.

[Lighting control board accessories]

1-1. Lighting power cable connector
Type: KX0-M657L-10 1 piece
Wiring lever
Type: KX0-M657M-10 1 piece
} Set type: KX0-M657K-10

1-2. Lighting trigger input cable connector
Type: KX0-M657L-00 1 piece
Dedicated tool
Type: KX0-M657M-00 1 piece
} Set type: KX0-M657K-00

2. Tracking board for OMRON controller.

The tracking board is used to add lighting control and conveyor tracking functions to the SCARA Vision System. Note that it is not possible to use both a lighting control board and a tracking board in the same system.

[Tracking board accessories]

2-1. Lighting power cable connector
Type: KX0-M657L-10 1 piece
Wiring lever
Type: KX0-M657M-10 1 piece
} Set type: KX0-M657K-10

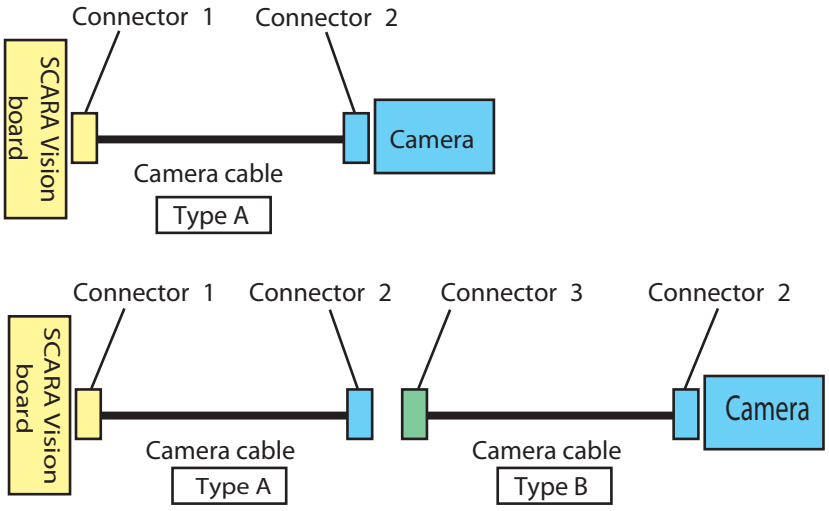
2-2. Lighting trigger input cable connector
Type: KX0-M657L-00 1 piece
Dedicated tool
Type: KX0-M657M-00 1 piece
} Set type: KX0-M657K-00

2-3. Encoder input cable connector
Type: KX0-M657L-20 1 piece
Encoder input cable connector case
Type: KX0-M657M-20 2 piece
} Set type: KX0-M657K-20

3. Camera cable

These cables are used to connect the camera to the SCARA Vision board.

As shown below, there are 2 different types of cables depending on the connector type, so use caution.



No.	Connector Model	Pin	Connectable Connector
1	HR10A-10PD-12P	Male	Board only
2	HR10A-10PD-12S	Female	Camera, Connector 3
3	HR10A-10J-12P	Male	Connector 2 only

The following 2 types of camera cables are used.

Type	Connector	Remarks
A	1 - 2	Used to connect to the SCARA Vision board.
B	3 - 2	Used to connect to the camera when extending Type A cable.

Camera Cable Type	Configuration	Length	Connection	Cable Type	Connector Used (See figure above)
KX0-M66F3-10	-	6m	• Board - Camera • Board - Connector	Type A	1 - 2
KX0-M66F3-00	-	3.5m	• Board - Camera • Board - Connector	Type A	1 - 2
KX0-M66F0-20	KX0-M66F3-10	6m	• Board - Connector	Type A	1 - 2
	KX0-M66F4-00	3.5m	• Connector - Camera	Type B	3 - 2

For details concerning the connection method, see Chapter 3, section 3.1.1.1 "Wiring to the camera connector".

4. CCD camera

Type:		KX0-M7913-00

5. Lens

Type:	8mm	KM7-M7214-60
	12mm	KM7-M7214-40
	16mm	KM7-M7214-30
	25mm	KM7-M7214-20

6. Close-up ring

Type:	0.5mm	KX0-M7215-00
	1.0mm	KX0-M7215-10
	2.0mm	KX0-M7215-20
	5.0mm	KX0-M7215-30

7. Ethernet crossover cable (shielded)

This cable is used to connect the SCARA Vision board directly to a personal computer.

Type:	5m	KX0-M55G0-00

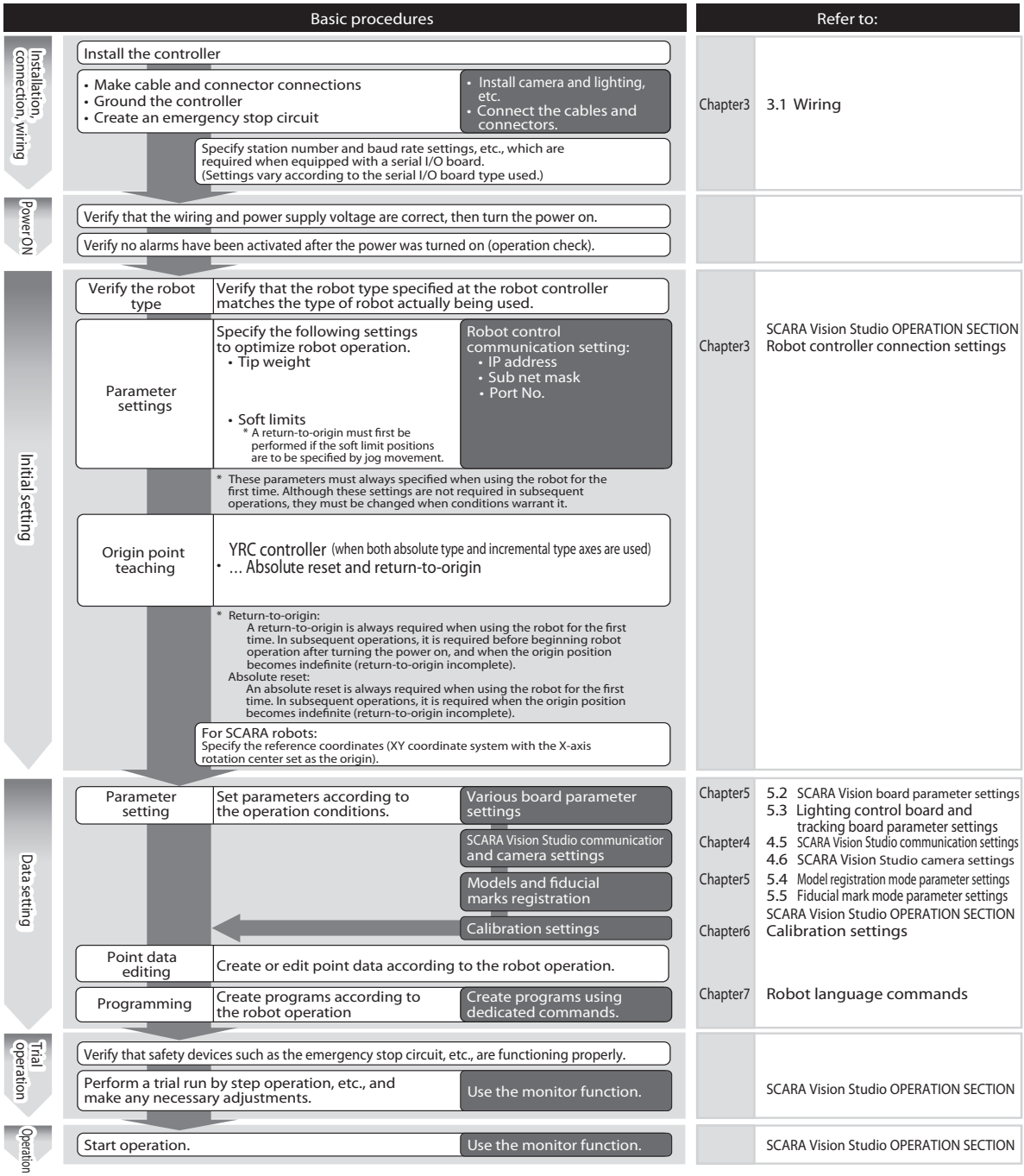
8. Encoder input cable

Type:	CH1 dedicated 10m	KX0-M66AF-00

For details concerning the wiring method, see Chapter 3, section 3.1.3.3 "Wiring to the AB phase input connector".

2. Preparations for SCARA Vision System use

This section explains the basic preparation procedures from the point when the SCARA Vision System is purchased, until it is operated. The preparation items are as shown in the illustration below. Refer to the relevant user's manuals for information regarding robot operation and regarding subjects other than the installation, operation, and adjustment procedures inherent to the SCARA Vision System.



3. Connections

3.1 Wiring

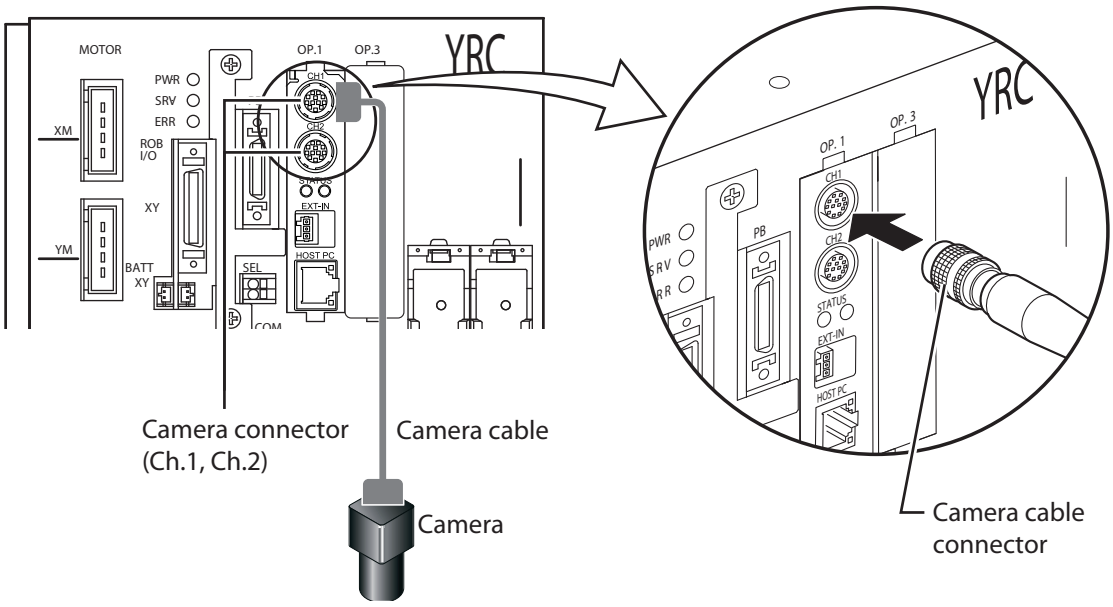
3.1.1 Wiring to the SCARA Vision board

3.1.1.1 Wiring to the camera connector

Connect the camera cable connector to the camera connector port of the channel to be used. To do this, align the camera cable connector and connector port pin configurations, then plug the camera cable into the connector port until a clicking sound is heard, indicating that it is locked.

CAUTION

- BECAUSE THE CAMERA CABLE CONNECTOR AND CONNECTOR PORT PIN CONFIGURATIONS MUST BE CORRECTLY ALIGNED, USE CARE NOT TO APPLY EXCESSIVE FORCE WHEN PLUGGING THE CAMERA CABLE IN. BE SURE THAT THE CABLE CONNECTOR AND CONNECTOR PORT PIN CONFIGURATIONS ARE CORRECTLY ALIGNED.
- NEVER CONNECT OR DISCONNECT THE CAMERA CABLE WHILE THE POWER IS ON. DOING SO COULD DAMAGE THE CAMERA AND SCARA VISION BOARD. BE SURE THAT THE POWER IS OFF BEFORE CONNECTING OR DISCONNECTING THE CAMERA CABLE.



The camera cable types are shown below.

Camera cable	Types:	3.5m	KX0-M66F3-00
		6m	KX0-M66F3-10
		6m+3.5m	KX0-M66F0-20

NOTE

The camera connector type used for the SCARA Vision board is as follows:

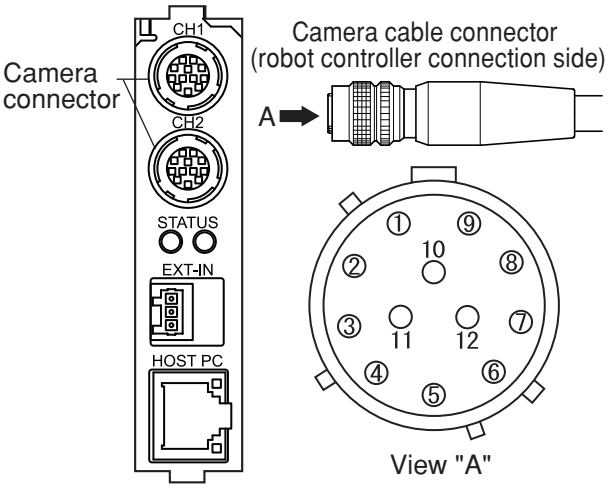
Camera connector type: HR10-A-10R-12SC(71) HIROSE ELECTRIC Co., Ltd.

Customers who supply their own camera cable must choose a cable which conforms to the specifications of the cable indicated above.

- **Camera interface signal table**

Camera interface signal table

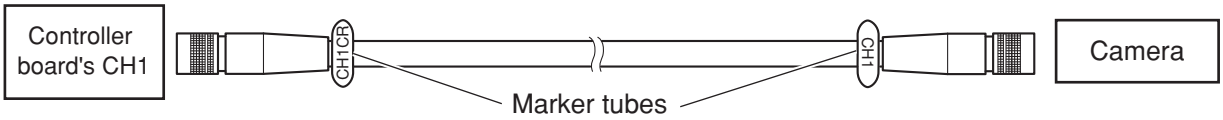
Terminal No.	Signal Name	Signal Description
1	12VDC GND	Camera power (0V)
2	12VDC	Camera power (+12V)
3	VIDEO GND	Image input ground
4	VIDEO INPUT	Image input terminal
5	HD GND	Horizontal sync ground
6	HD OUTPUT	Horizontal sync output terminal
7	VD OUTPUT	Vertical sync output terminal
8	TRIG GND	Trigger output ground
9	NC	Not presently used
10	WEN INPUT	Input terminal
11	TRIG OUTPUT	Trigger output terminal
12	VD GND	Vertical sync ground



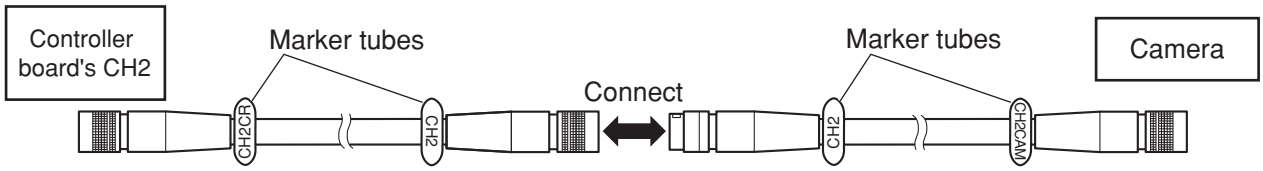
- **Camera cable connector connection**

The camera cable has marker tubes at both ends. When connecting the camera cable connector, connect it to the board's channel and to the camera which match the marker tube indications. After connecting, secure the camera cable with tie-bands.

Example 1) Connecting a 3.5m cable (KX0-M66F3-00) to CH1.

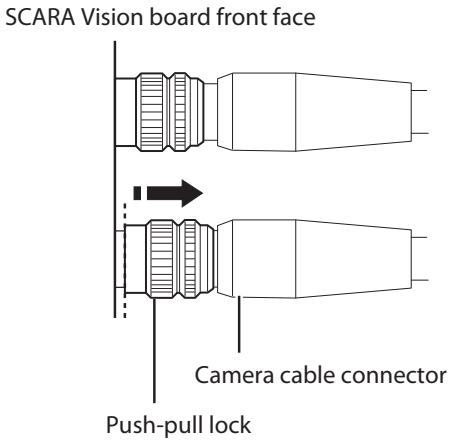


Example 2) Connecting a 6m + 3.5m cable (KX0-M66F0-20) to CH2.



- **Disconnecting the camera cable connector**

To disconnect the camera cable connector, grasp the cable connector at its push-pull lock area, then slide the lock forward while pulling it straight out of the connector port.



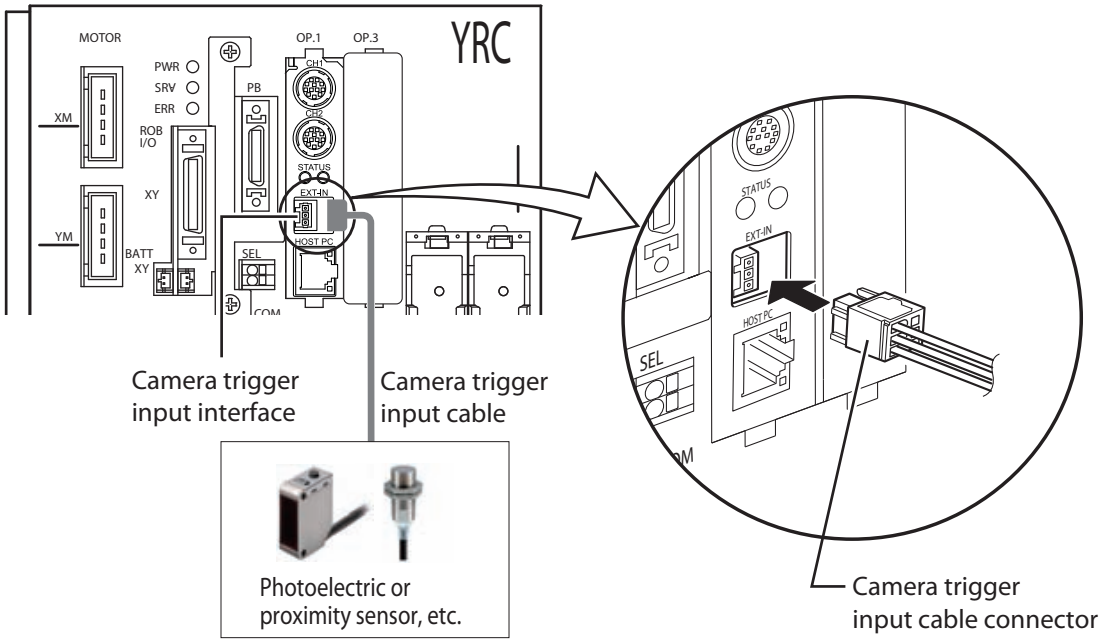
3.1.1.2 Wiring to the camera trigger input interface

Connect the camera trigger input cable connector to the camera trigger input interface.

DANGER

BE SURE THAT ALL SYSTEM POWER IS OFF WHEN MAKING SCARA VISION BOARD WIRINGS. FAILING TO DO SO COULD RESULT IN ELECTRICAL SHOCKS.

After performing the necessary wire preparation work at the SCARA Vision board's accessory camera trigger input cable connector (see illustration below), connect the cable to the camera trigger input interface.



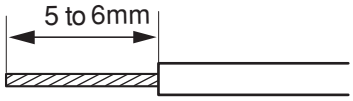
The camera trigger input cable connector types are shown below.

Camera trigger input cable connector	Type:	KX0-M657L-00	Set type: KX0-M657K-00
Dedicated tool	Type:	KX0-M657M-00	

A non-contact type photoelectric or proximity sensor is recommended for trigger purposes. A contact type sensor or relay can produce chattering which may cause the timing of the lighting control board or tracking board strobe and camera exposure to vary, thereby preventing accurate image acquisition.
The strobe and exposure START timing is 500μs after the trigger input.

- **Wiring connection method**

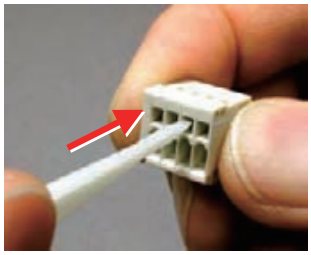
Cut the wire sheath to expose a 5 to 6mm length of the wire.



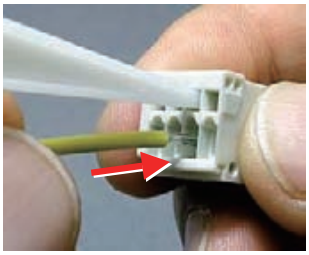
AWG size : 28 to 20
Max. sheath outer diameter : ϕ2.2mm

Dedicated tool

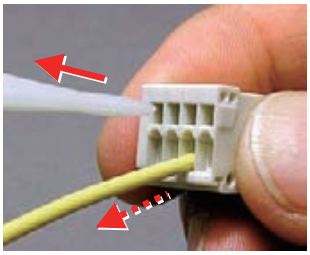
* Although a 4-pin connector is shown in the connection illustration at right, a 3-pin connector is actually used on the camera trigger input cable.



(1) Insert the dedicated tool into the upper service slot to open the spring.

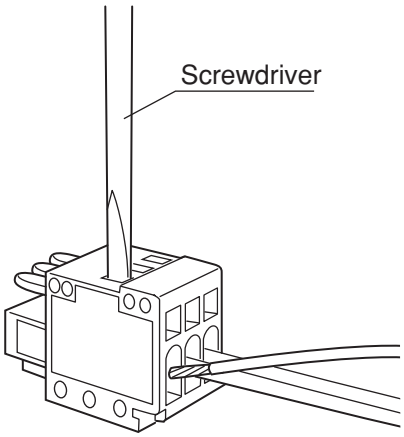


(2) Insert the exposed wire into the wire port until it makes contact with the back wall.



(3) The connection is made when the dedicated tool is extracted (the spring closes). Pull the wire lightly to verify that it is securely connected. (Do not pull the wire with excessive force.)

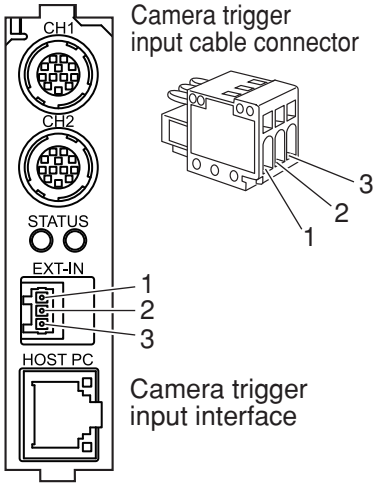
The exposed wire can also be inserted into the wire port while pressing the spring down with a screwdriver inserted into the upper service slot.



- **Camera trigger input interface signal table**

Camera trigger input interface signal table

Terminal No.	Signal Name	Signal Description
1	COMMON	External power supply input (0V)
2	C.TRG1	Camera Ch.1 external trigger input (24V)
3	C.TRG2	Camera Ch.2 external trigger input (24V)



3.1.1.3 Wiring to the personal computer connector

A 100BASE-TX type personal computer connector is used. The SCARA Vision board is connected directly to the personal computer by a cable.

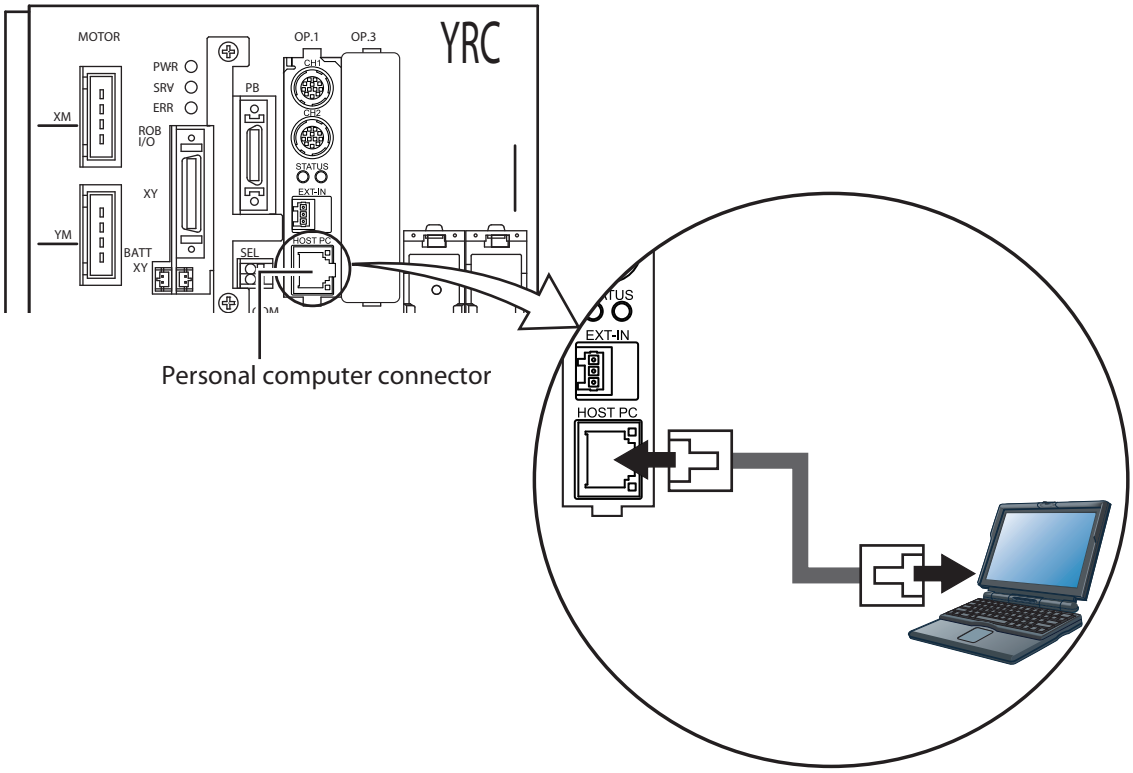
Cable used:

A category 5 or higher crossover type cable is required.

The optional OMRON Ethernet cable type is shown below.

Ethernet crossover cable (shielded) Type: 5m KX0-M55G0-00

Plug the cable's modular jack into the personal computer connector until a clicking sound is heard.



NOTE

OMRON recommends using a personal computer which has a wired LAN connector, allowing the cable's modular jack to be plugged directly into the personal computer. Anti-noise performance could be reduced by using a personal computer equipped with LAN conversion type format such as PCMCIA card, etc.

Moreover, because the anti-noise performance is also affected by the personal computer being used, OMRON cannot guarantee the anti-noise performance of its recommended optional cable.

3.1.2 Wiring to the lighting control board

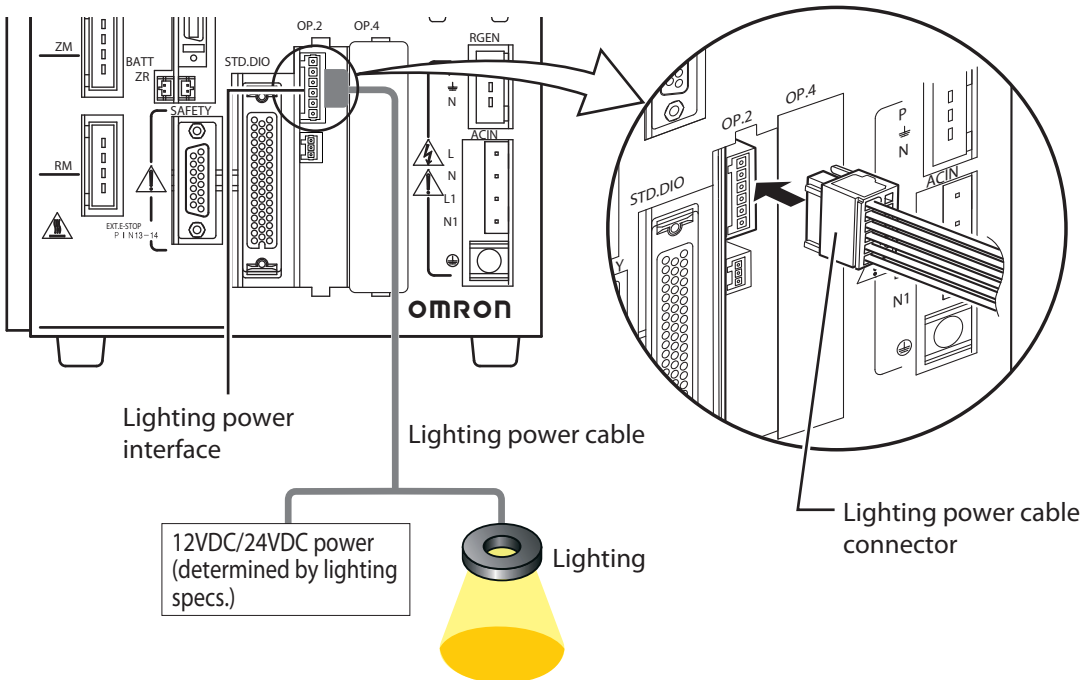
3.1.2.1 Wiring to the lighting power interface

Connect the lighting power cable connector to the lighting power interface.

DANGER

BE SURE THAT ALL SYSTEM POWER IS OFF WHEN MAKING LIGHTING CONTROL BOARD WIRINGS. FAILING TO DO SO COULD RESULT IN ELECTRICAL SHOCKS.

After performing the necessary wire preparation work at the lighting control board's accessory lighting power cable connector (see illustration below), connect the cable to the lighting power interface.

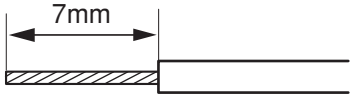


The lighting power interface types are shown below.

Lighting power interface	Type:	KX0-M657L-10	} Set type: KX0-M657K-10
Wiring lever	Type:	KX0-M657M-10	

- **Wiring connection method**

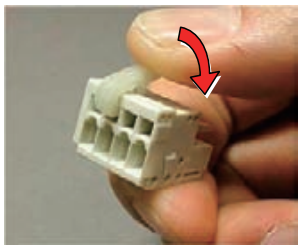
Cut the wire sheath to expose a 7mm length of the wire.



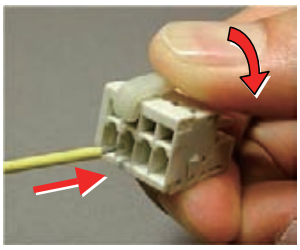
AWG size : 28 to 14
Max. sheath outer diameter : ϕ3.4mm
* A wiring size of AWG24 or larger is recommended.
(For a 2ch lighting current total of 3A.)

Wiring lever

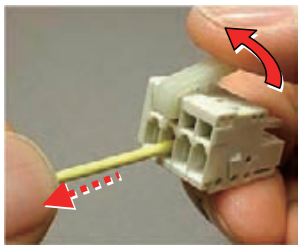
* Although a 4-pin connector is shown in the connection illustration at right, a 6-pin connector is actually used on the lighting power cable.



(1) Insert the wiring lever into the upper service slot and press the lever down with your finger to open the spring.

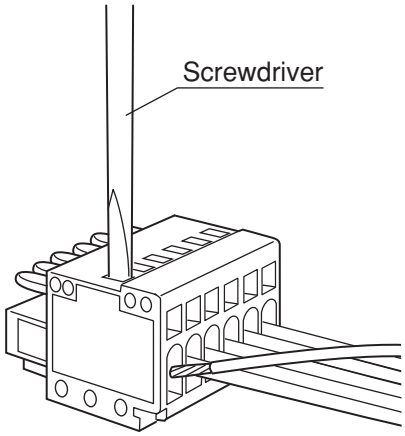


(2) With the wiring lever pressed down, insert the wire into the wire port until it makes contact with the back wall.



(3) Release the lever to make the connection. Pull the wire lightly to verify that it is securely connected. (Do not pull the wire with excessive force.)

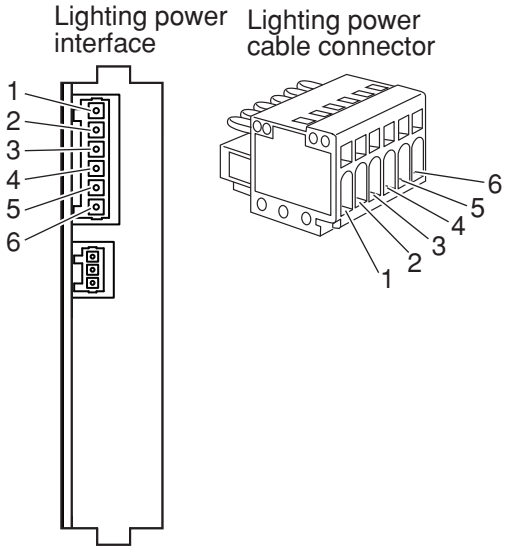
The exposed wire can also be inserted into the wire port while pressing the spring down with a screwdriver inserted into the upper service slot.



- **Lighting power interface signal table**

Lighting power interface signal table

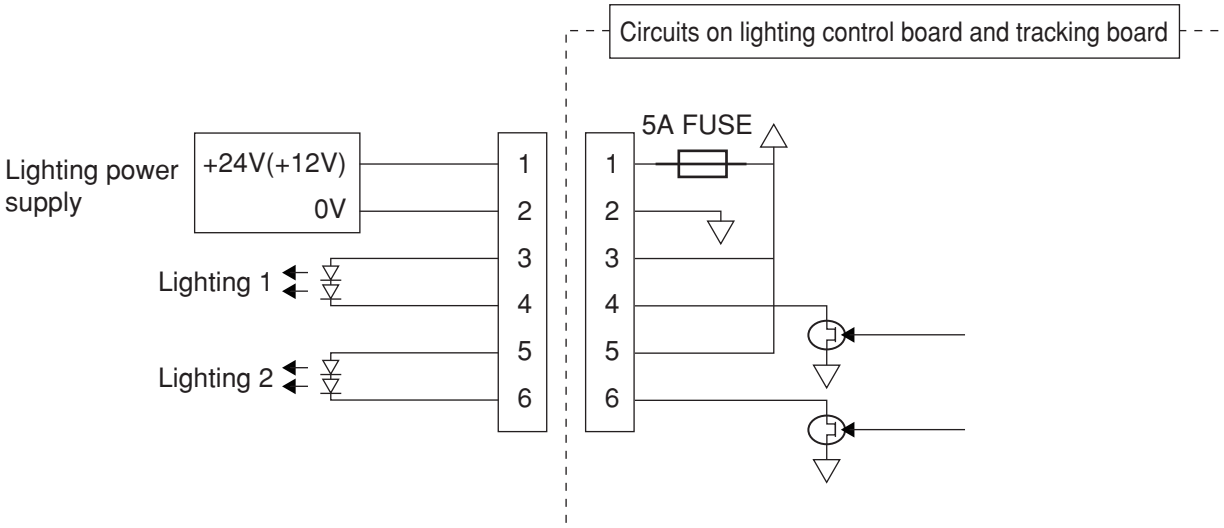
Terminal No.	Signal Name	Signal Description
1	DC12/24V	Lighting external power input (12V/24V)
2	GND	Lighting external power input (0V)
3	LOUT1+	Lighting 1 control output + (12V/24V)
4	LOUT1-	Lighting 1 control output -
5	LOUT2+	Lighting 2 control output + (12V/24V)
6	LOUT2-	Lighting 2 control output -



CAUTION

INCORRECT WIRING OF THE LIGHTING POWER CABLE COULD CAUSE DEVICE DAMAGE. BE SURE TO VERIFY THE INTERFACE PIN NUMBERS AND THE WIRING BEFORE CONNECTING.

The lighting control circuit configuration is shown below.



CAUTION

RUSH CURRENT CONDITIONS OF APPROXIMATELY 60A, 1MS OCCUR AT THE LIGHTING POWER SUPPLY. THEREFORE, CARE SHOULD BE TAKEN TO PREVENT ADVERSE EFFECTS FROM POWER VOLTAGE DROPS AND OVER-CURRENT PROTECTION FUNCTIONS, ETC., UNDER RUSH CURRENT CONDITIONS, WHEN SHARING THE LIGHTING POWER SUPPLY WITH OTHER APPLICATIONS (LOADS).

CAUTION

A LIGHTING POWER SUPPLY SHOULD BE SELECTED WHICH IS SUITABLE FOR THE LIGHTING VOLTAGE CONDITIONS, AND WHICH SATISFIES THE CURRENT CONSUMPTION CONDITIONS. (USING A 24V POWER SUPPLY WITH A 12V LIGHTING SYSTEM COULD TRIP A FUSE AT THE LIGHTING CONTROL BOARD AND/OR TRACKING BOARD, AND COULD POSSIBLY DAMAGE THE LIGHTING.)

CAUTION

IN THE EVENT OF A LIGHTING CONTROL FUNCTION FAILURE AT THE LIGHTING CONTROL BOARD AND/OR TRACKING BOARD, A 100% LIGHTING-ON CONDITION COULD OCCUR. THEREFORE, THE LIGHTING POWER SUPPLY SHOULD EITHER HAVE A RATING WHICH CAN ACCOMMODATE A 100% LIGHTING-ON CONDITION, OR IT SHOULD HAVE A PROTECTIVE FUNCTION SUCH AS A TEMPERATURE FUSE, ETC.

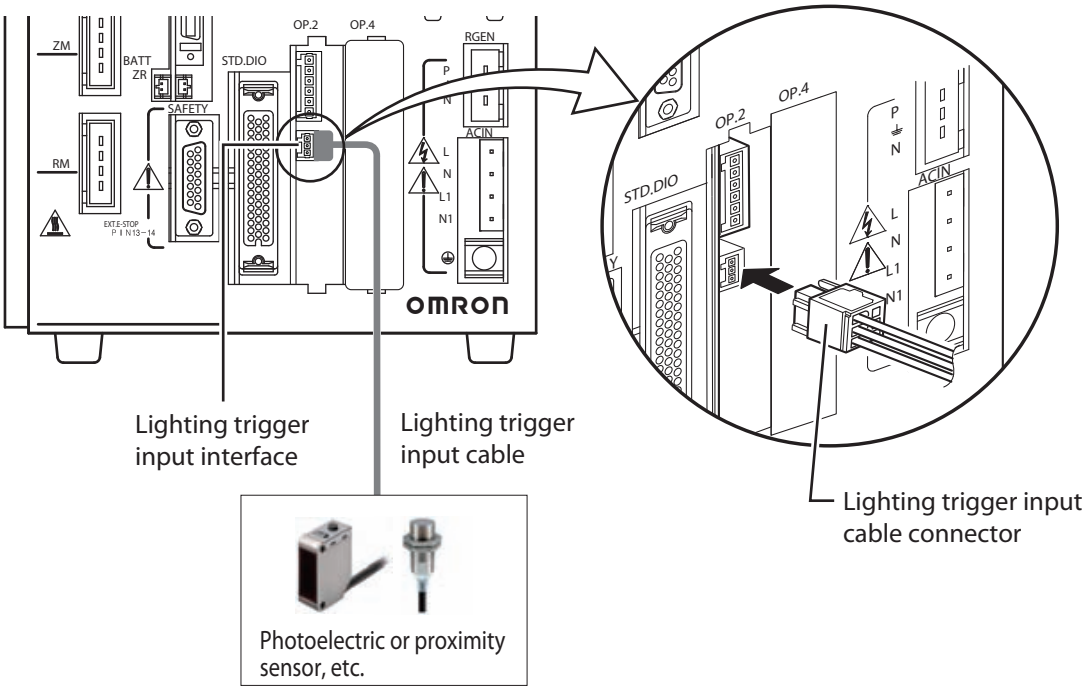
3.1.2.2 Wiring to the lighting trigger input interface

Connect the lighting trigger input cable connector to the lighting trigger input interface.

DANGER

BE SURE THAT ALL SYSTEM POWER IS OFF WHEN MAKING LIGHTING CONTROL BOARD WIRINGS. FAILING TO DO SO COULD RESULT IN ELECTRICAL SHOCKS.

After performing the necessary wire preparation work at the lighting control board's accessory lighting trigger input cable connector (see illustration below), connect the cable to the lighting trigger input interface.



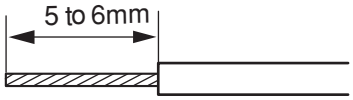
The lighting trigger input cable connector type is shown below.

Lighting trigger input cable connector	Type:	KX0-M657L-00	Set type: KX0-M657K-00
Dedicated tool	Type:	KX0-M657M-00	

A non-contact type photoelectric or proximity sensor is recommended for trigger purposes. A contact type sensor or relay can produce chattering which may cause the timing of the lighting control board or tracking board strobe and camera exposure to vary, thereby preventing accurate image acquisition.
The strobe and exposure START timing is 500μs after the trigger input.

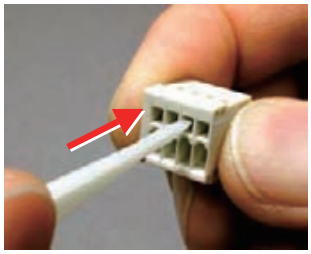
- **Wiring connection method**

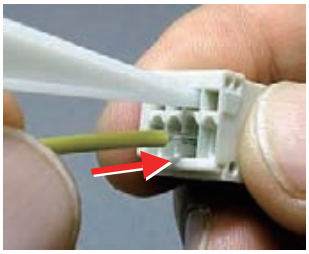
  Cut the wire sheath to expose a 5 to 6mm length of the wire.

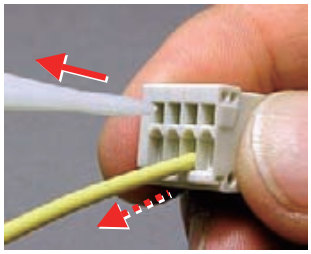


AWG size : 28 to 20
Max. sheath outer diameter : ϕ2.2mm

Dedicated tool







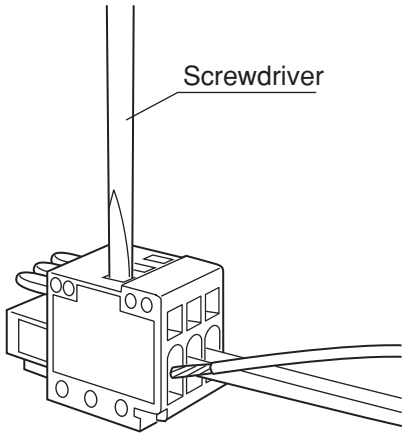
* Although a 4-pin connector is shown in the connection illustration at right, a 3-pin connector is actually used on the lighting trigger input cable.

(1) Insert the dedicated tool into the upper service slot to open the spring.

(2) Insert the exposed wire into the wire port until it makes contact with the back wall.

(3) The connection is made when the dedicated tool is extracted (the spring closes). Pull the wire lightly to verify that it is securely connected. (Do not pull the wire with excessive force.)

The exposed wire can also be inserted into the wire port while pressing the spring down with a screwdriver inserted into the upper service slot.

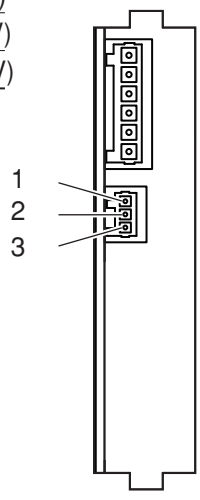


- **Lighting trigger input interface signal table**

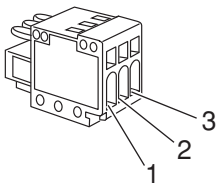
Lighting trigger input interface signal table

Terminal No.	Signal Name	Signal Description
1	COMMON	External power supply input (0V)
2	L.TRG1	Lighting 1 external trigger input (24V)
3	L.TRG2	Lighting 2 external trigger input (24V)

Lighting trigger input interface



Lighting trigger input cable connector



3.1.3 Wiring to the tracking board

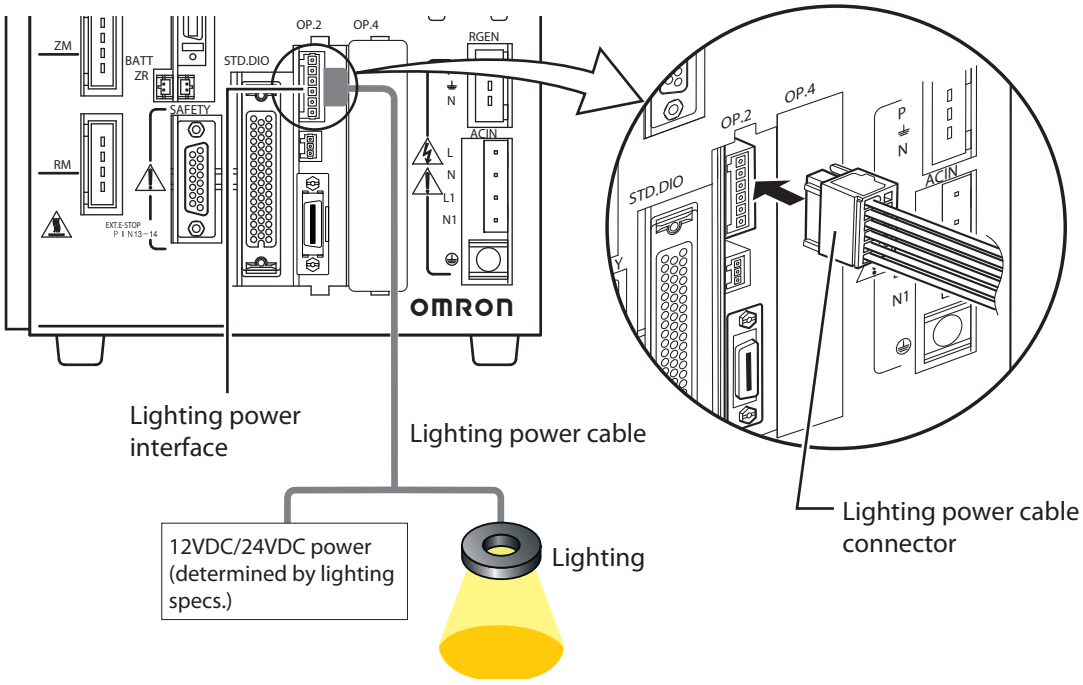
3.1.3.1 Wiring to the lighting power interface

Connect the lighting power cable connector to the lighting power interface in the manner described in the " Wiring to the lighting control board's lighting power interface" section.
After performing the necessary wire preparation work at the tracking board's accessory lighting power cable connector, connect the cable to the lighting power interface.

DANGER

BE SURE THAT ALL SYSTEM POWER IS OFF WHEN MAKING TRACKING BOARD WIRINGS. FAILING TO DO SO COULD RESULT IN ELECTRICAL SHOCKS.

For details concerning the wiring connection method and the interface signal table, see Chapter 3, section 3.1.2.1 " Wiring to the lighting power interface".



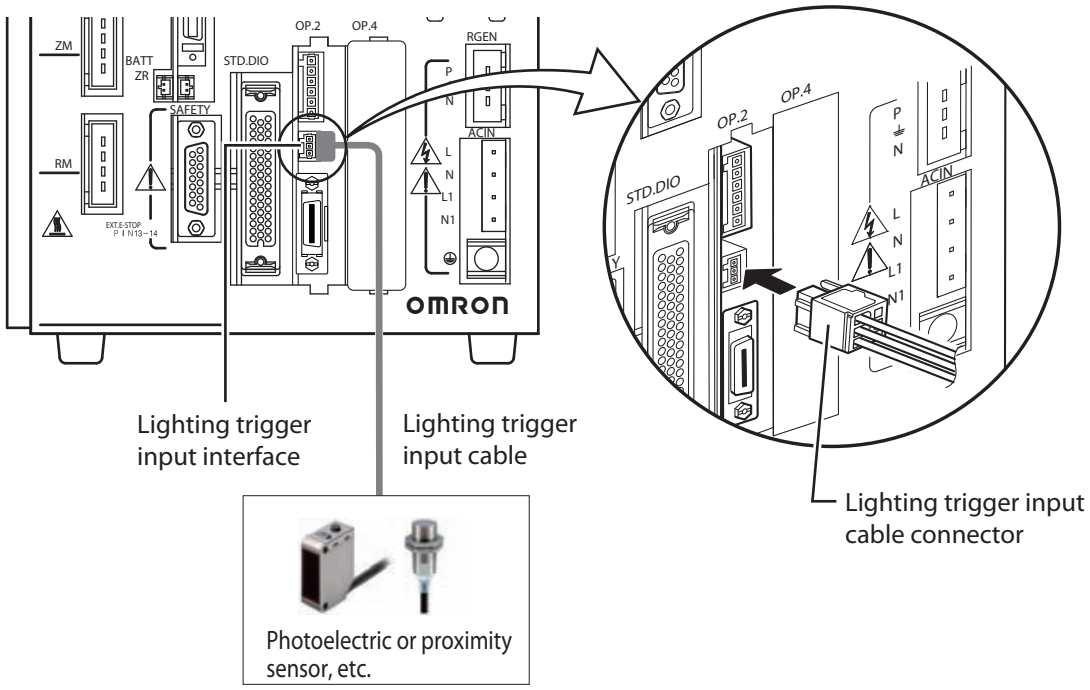
3.1.3.2 Wiring to the lighting trigger input interface

Connect the lighting trigger input cable connector to the lighting trigger input interface in the manner described in the " Wiring to the lighting control board's lighting trigger input interface" section.
After performing the necessary wire preparation work at the tracking board's accessory lighting trigger input cable connector, connect the cable to the lighting trigger input interface.

DANGER

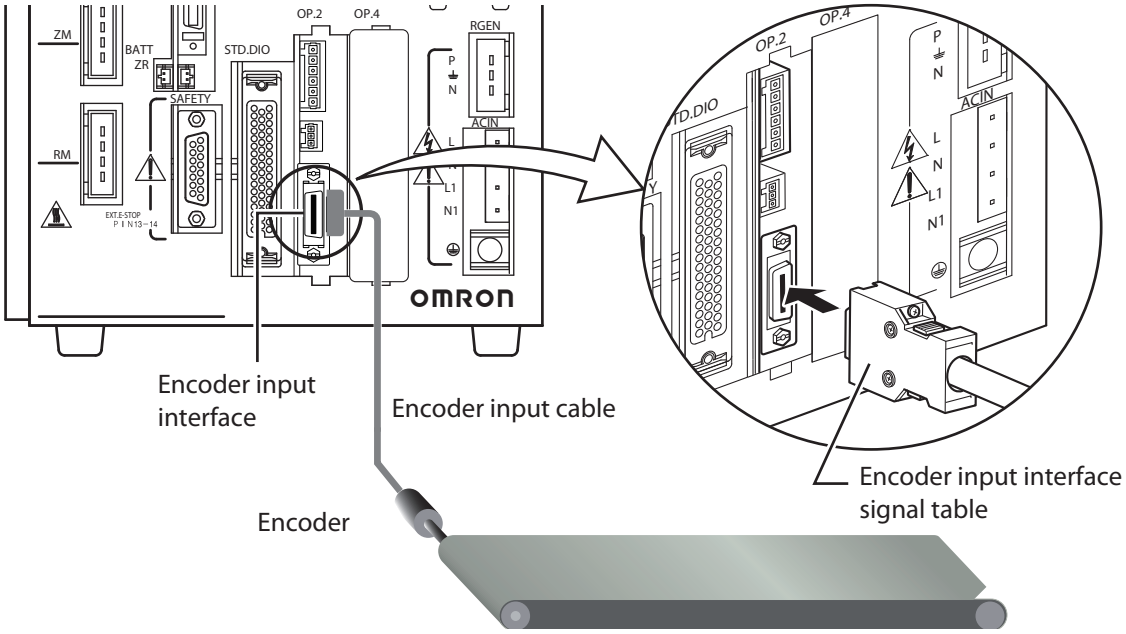
BE SURE THAT ALL SYSTEM POWER IS OFF WHEN MAKING TRACKING BOARD WIRINGS. FAILING TO DO SO COULD RESULT IN ELECTRICAL SHOCKS.

For details concerning connector types, the wiring connection method, and the interface signal table, see Chapter 3, section 3.1.2.2 " Wiring to the lighting trigger input interface".



3.1.3.3 Wiring to the encoder input interface

Connect the encoder input cable connector to the encoder input interface. After performing the necessary wire preparation work at the tracking board's accessory encoder input cable connector, connect the cable to the encoder input Interface.



The encoder input cable connector models are shown below.

Encoder input cable connector	Type:	KX0-M657L-20	Set type: KX0-M657K-20
Encoder input cable connector case	Type:	KX0-M657M-20	

The following cable is recommended for connection to the AB phase input cable connector.

Kaneko Cord Co., Ltd. brand shielded twisted-pair, multi-core cable: 0.3SQ SPMCU-08

* Except for the encoder connection, the cable should be connected directly (no relay).

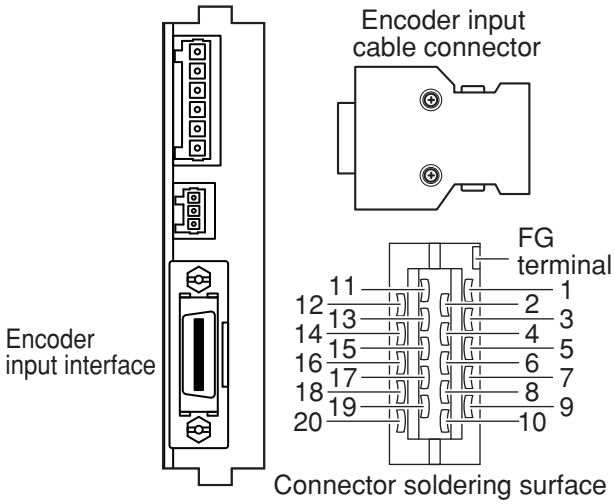
The encoder must satisfy the following conditions:

Power supply	: 5VDC
Current consumption	: 2ch total of less than 500mA
Output phase	: A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ phase
Output format	: Line driver output (RS422 compliant: with built-in 26LS31 or 26C31 or equivalent)
Max. response frequency	: 2MHz or less

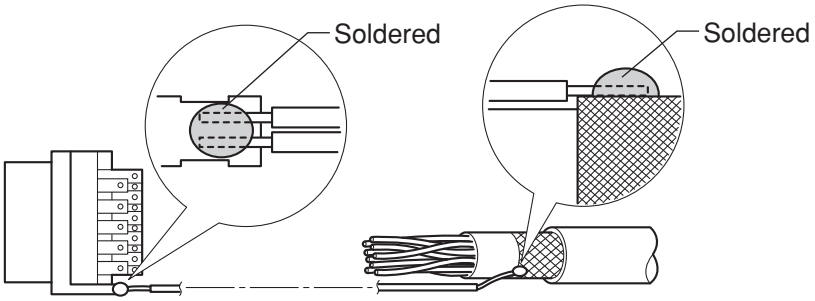
- **Encoder input interface signal table**

Encoder input interface signal table

Terminal No.	Signal Name	Signal Description
1	+5V	Counter power +5V
2	NC	Use is prohibited
3	PA1+	Counter 1+A phase
4	PA1-	Counter 1-A phase
5	PB1+	Counter 1+B phase
6	PB1-	Counter 1-B phase
7	PZ1+	Counter 1+Z phase
8	PZ1-	Counter 1-Z phase
9	0V	Counter power 0V
10	NC	Use is prohibited
11	+5V	Counter power +5V
12	NC	Use is prohibited
13	PA2+	Counter 2+A phase
14	PA2-	Counter 2-A phase
15	PB2+	Counter 2+B phase
16	PB2-	Counter 2-B phase
17	PZ2+	Counter 2+Z phase
18	PZ2-	Counter 2-Z phase
19	0V	Counter power 0V
20	NC	Use is prohibited

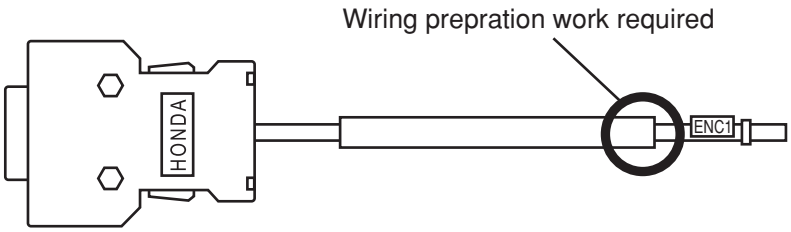


Solder the FG wire to the shield mesh to connect to the FG terminal of the AB phase input cable connector.



- **When using OMRON optional encoder input cable:**

As shown in the illustration below, there is no connector at the end which connects to the encoder. This connector must be prepared by the user.

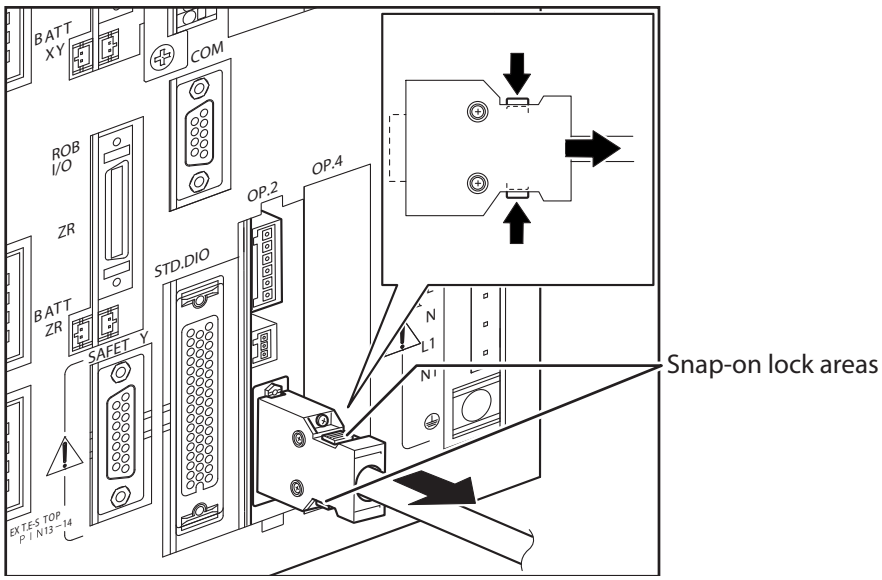


The cable core wires and their corresponding signals are shown in the table below.

Core Wire Color	Signal Name	Signal Description
Blue	PA1+	Counter 1 + A-phase
Orange	PA1-	Counter 1 - A-phase
Green	PB1+	Counter 1 + B-phase
Brown	PB1-	Counter 1 - B-phase
Gray	PZ1+	Counter 1 + Z-phase
Red	PZ1-	Counter 1 - Z-phase
Black	0V	Counter power supply 0V
Yellow	+5V	Counter power supply +5V
Gray (thick)	FG	Frame ground for shielded wire

- **Disconnecting the encoder input cable connector**

  To disconnect the encoder input cable connector, press the cable connector's snap-on lock areas (see illustration below), then pull the connector straight out of the connector port.



3.2 Verifying the robot controller settings

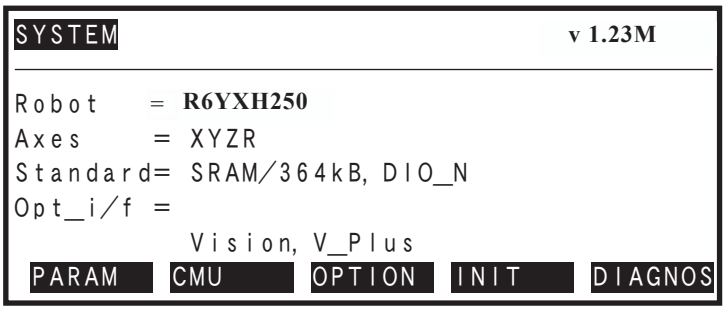
From the programming box (PB), verify that the SCARA Vision board, lighting control board, and tracking board are installed in the robot controller.
The procedure for verifying the robot controller settings is given below.

1 ***Select the "SYSTEM" mode.***

2 ***Verify that the board name is indicated at the "Opt_i/f" item.***

The SCARA Vision board is installed if "Vision" is indicated at the "Opt_i/f" item. The lighting control board or tracking board is installed if "V_Plus" is indicated at the "Opt_i/f" item.

"SYSTEM" mode screen



4. Preparations

4.1 Verifying the board condition

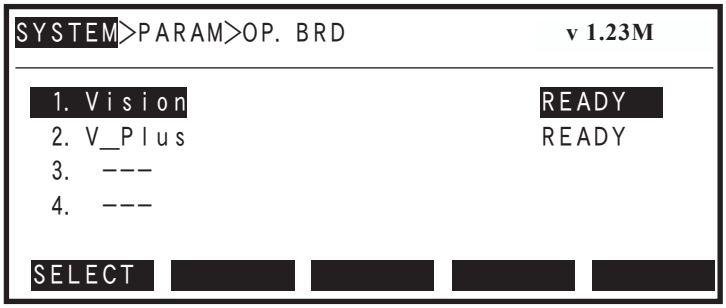
4.1.1 Verifying the SCARA Vision board condition

The SCARA Vision board must be in an enabled (READY) condition in order to use the robot vision function. The method for verifying the SCARA Vision board condition is given below.

1 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

2 ***Use the (↑ / ↓) cursor keys to select "Vision", then press the*** F 1 ***(SELECT) key.***

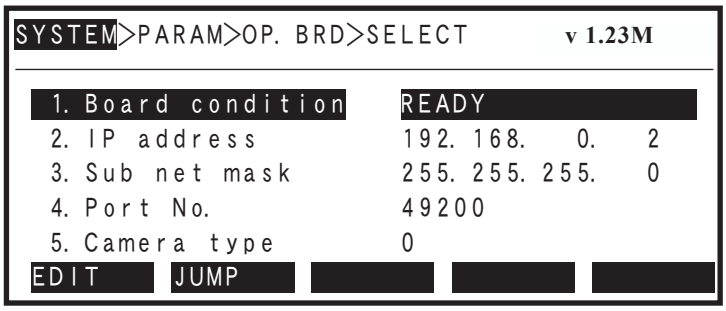
"SYSTEM>PARAM>OP.BRD" mode screen



3 ***Verify that "READY" is indicated at the "1. Board condition".***

If "READY" is indicated at the "1. Board condition", the SCARA Vision board is in a usable condition.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



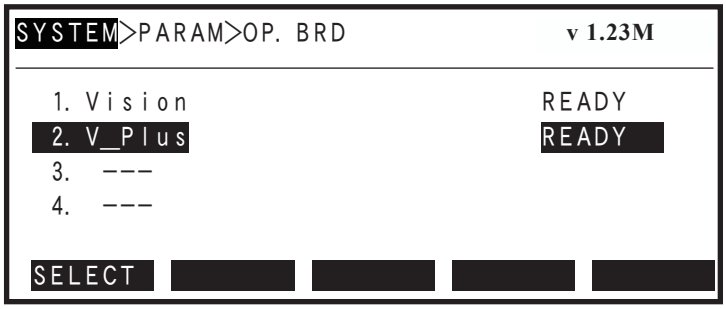
4.1.2 Verifying the lighting control board condition

The lighting control board must be in an enabled (READY) condition in order to use the lighting control function.
The method for verifying the lighting control board condition is given below.

1 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

2 ***Use the (↑ / ↓) cursor keys to select "V_Plus", then press the*** F 1 ***(SELECT) key.***

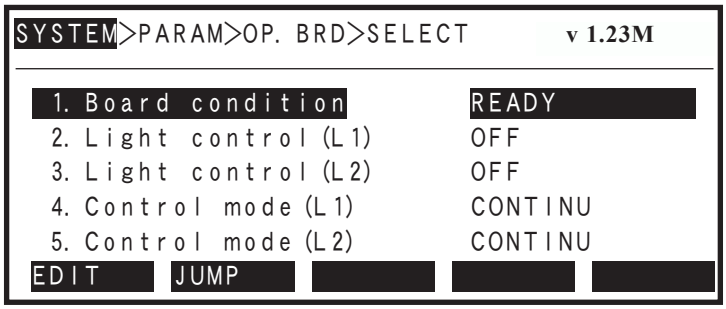
"SYSTEM>PARAM>OP.BRD" mode screen



3 ***Verify that "READY" is indicated at the "1. Board condition".***

If "READY" is indicated at the "1. Board condition", the lighting control board is in a usable condition.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



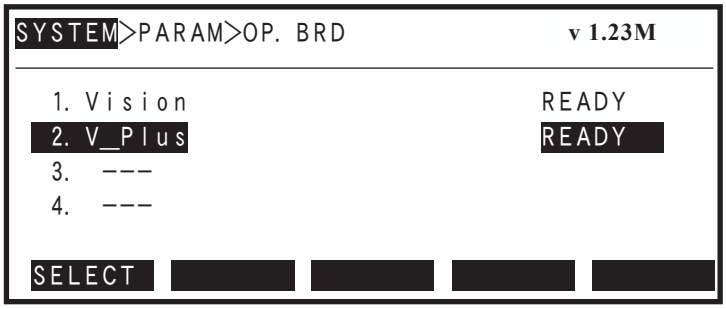
4.1.3 Verifying the tracking board condition

The tracking board must be in an enabled (READY) condition in order to use the lighting control and conveyor tracking functions.
The method for verifying the tracking board condition is given below.

1 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

2 ***Use the (↑ / ↓) cursor keys to select "V_Plus", then press the*** F 1 ***(SELECT) key.***

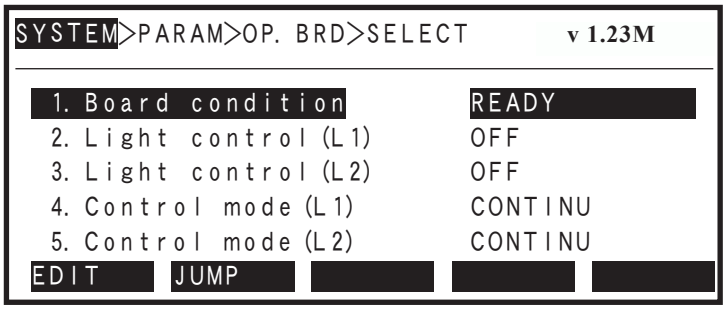
"SYSTEM>PARAM>OP.BRD" mode screen



3 ***Verify that "READY" is indicated at the "1. Board condition".***

If "READY" is indicated at the "1. Board condition", the tracking board is in a usable condition.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen

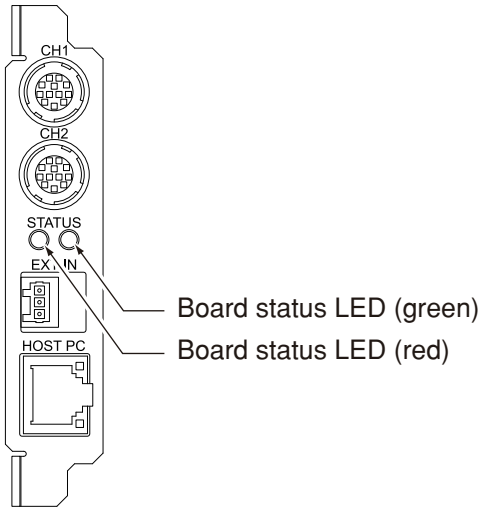


4.2 Checking board LED statuses

4.2.1 SCARA Vision board status LEDs

The board status LEDs at the SCARA Vision board indicate the SCARA Vision board statuses. Descriptions of the LED indications are given below.

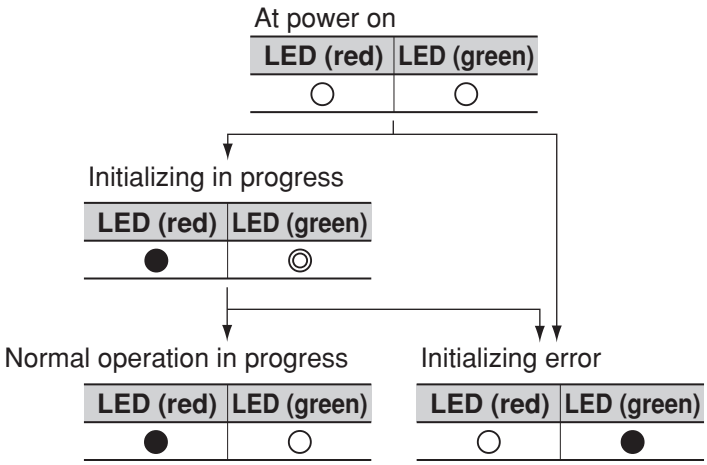
Board status LEDs



Board status LED descriptions and status changes

LED (red) status	LED (green) status	Description
○	○	At power on
○	●	Initializing error
●	○	Normal operation in progress
●	◎	Initializing in progress

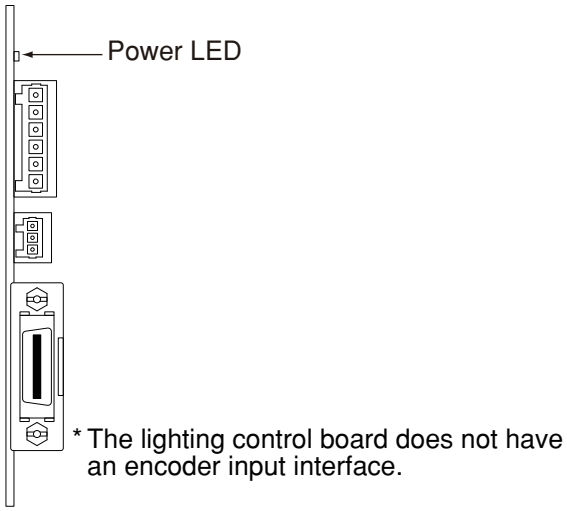
○: On (not blinking), ◎: Blinking, ●: Off



4.2.2 Lighting control board and tracking board power LEDs

The power LEDs at the lighting control board and tracking board indicate that power on/off status. Descriptions of the LED indications are given below.

Power LED



Power LED descriptions

LED status	Description
○	Lighting power is on.
●	Lighting power is off.

○: ON, ●: Off

4.3 Setting the robot controller's control mode

In order to use the SCARA Vision System, the controller's vision control mode must be specified or changed in accordance with the operation to be performed. The controller has 3 vision control modes, and these are described below. Mode settings are maintained through a robot controller restart (the mode which was in effect when a robot controller restart occurred is reestablished after the restart).

Mode name	Description
Controller mode	Select this mode to specify SCARA Vision board parameter settings, and to perform automatic operation without using SCARA Vision Studio's monitor mode.
Host PC mode	Select this mode when SCARA Vision Studio is to be used in any of the following modes: Model registration mode, vision mode, fiducial mark mode.
Monitor mode	Select this mode when SCARA Vision Studio is to be used in the monitor mode to check search conditions during automatic operation. Also select this mode when SCARA Vision Studio is to be used in the monitor mode to check conditions during calibration setting operations.

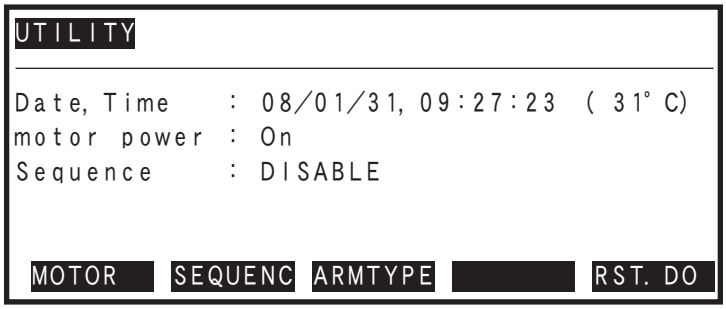
The procedure for setting the robot controller's vision control mode is described below.

1 ***Press the*** [UTILITY] ***(***[LOWER] + [ESC]***) key to establish the "UTILITY" mode.***

The "UTILITY" mode is accessible from any other mode.

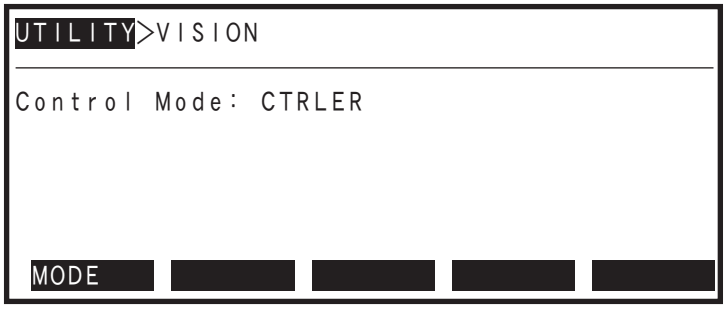
2 ***Press the*** [F11] ***(VISION) key.***

"UTILITY" mode screen



3 ***Press the*** [F1] ***(MODE) key.***

"UTILITY>VISION" mode screen



4 ***Select the vision control mode.***

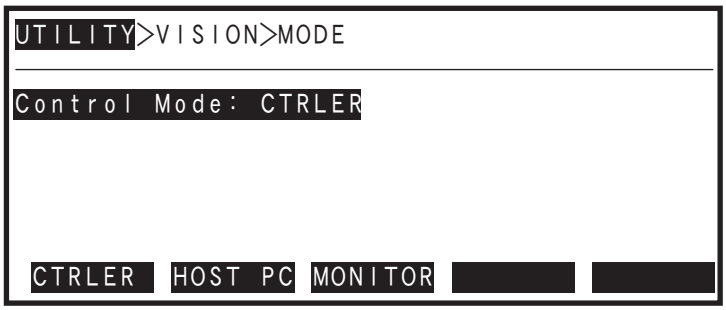
The currently specified vision control mode displays.

Press F 1 (CTRLER) to change from the vision control mode to the controller mode.

Press F 2 (HOST PC) to change from the vision control mode to the host PC mode.

Press F 3 (MONITOR) to change from the vision control mode to the monitor mode.

Vision control mode selection



5 ***Press ESC to return to the mode status which existed immediately before the "UTILITY" mode was selected.***

4.4 PC and robot controller connection settings

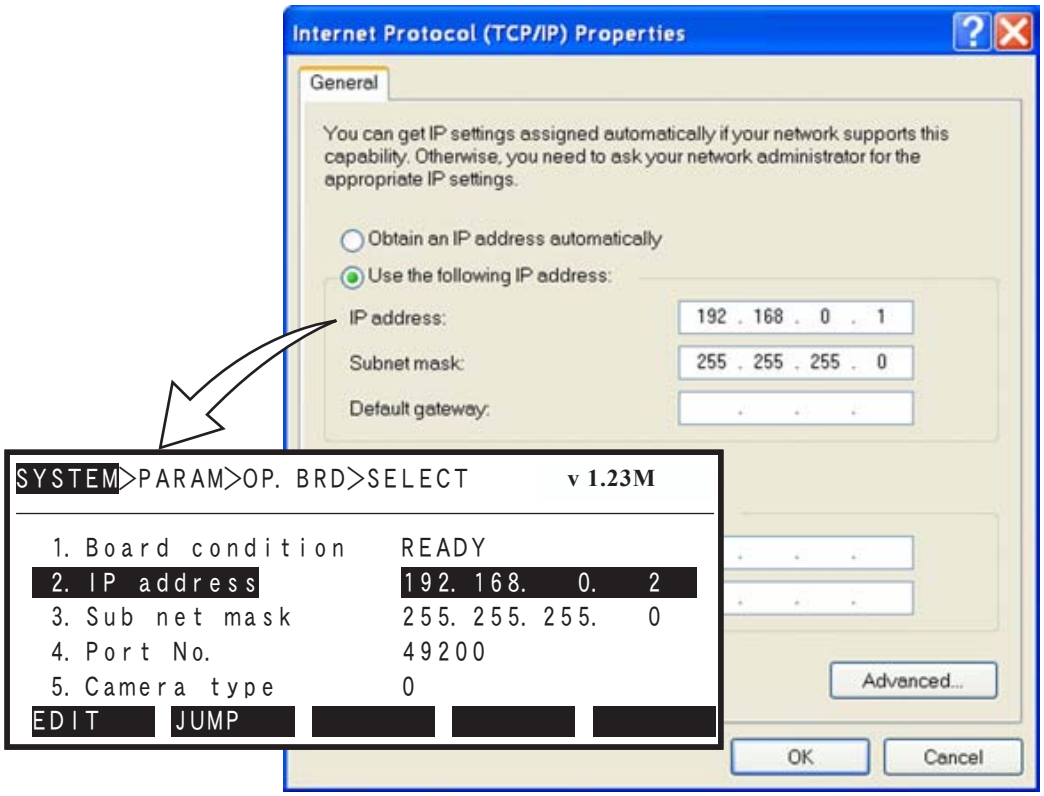
To connect the robot controller to the SCARA Vision Studio, the communication settings such as IP address and sub net mask must be specified in advance for each of the robot controller and the PC in which the SCARA Vision Studio is installed. Specify the robot controller's communication settings based on the PC settings.

For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 3 "Robot controller connection settings".

NOTE

Specify the communication settings such as IP address and sub net mask for each of the PC and the robot controller according to the user's network environment. For the setting values, please ask the network administrator.

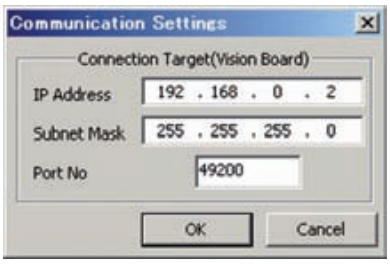
PC and robot controller connection settings



4.5 SCARA Vision Studio communication settings

The SCARA Vision Studio communication settings consist of information (IP address, sub net mask, port number) about the robot controller to which SCARA Vision Studio is connected.
The connection destination robot controller's IP address, sub net mask, and port number settings are those which were specified in Chapter 3, section 3.2 "Setting the robot controller's communication".
For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 5, section 5.1 "Communication settings".

SCARA Vision Studio "Communication Setting" screen



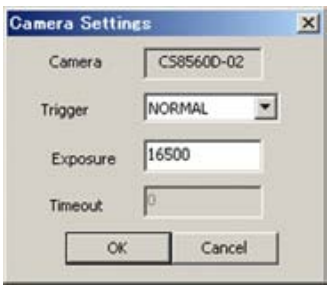
4.6 SCARA Vision Studio camera settings

The camera settings must be specified before SCARA Vision Studio can be used.
The SCARA Vision Studio camera settings consist of the "trigger mode", "exposure time", and "timeout" camera information.

The SCARA Vision Studio "trigger mode" and "exposure time" settings are the same as the SCARA Vision board's "trigger mode" (7. Trigger mode) and "exposure time" (8. Exposure time [µs]) parameter settings. The "timeout" period, however, differs from the SCARA Vision board's "trigger timeout" (9. Triger timeout [sec]) item because a different mode is used for image acquisition.

For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 5, section 5.2 "Camera settings".

SCARA Vision Studio "Camera Setting" screen



4.6.1 Parameter details

Camera type	Input range	Default setting	Units
	Read only	—	—

Function

Indicates the camera type to which the SCARA Vision board is connected.

Explanation

Indicates the camera type which was specified at the SCARA Vision board's "Camera type" (5. Camera type) parameter item.

Trigger mode	Input range	Default setting	Units
	Camera internal / H/W trigger / S/W trigger	S/W trigger	—

Function

Specifies the image acquisition timing.

Explanation

It is not possible to specify separate trigger mode settings for each camera channel. The image acquisition timing setting specified here applies for both channels.

Settings

Camera internal: Specifies the exposure START timing which is generated by the camera's internal processing.

H/W trigger: Specifies the exposure START timing as the point when the trigger input to the external trigger terminal occurs.

S/W trigger: Specifies the exposure START timing as the point when the software outputs the image acquisition command to the camera.

NOTE

This setting is the same as that specified at the SCARA Vision board's "Trigger mode" (7. Trigger mode) parameter setting. Therefore, if the SCARA Vision board's "Trigger mode" parameter is changed, this parameter setting value is also changed.

Exposure time	Input range	Default setting	Units
	10 to 33000	16500	µs

Function

Specifies the camera's exposure time in "µs" (microseconds) units.

Explanation

A shorter exposure time produces a darker image, and a longer exposure time produces a brighter image. Moreover, a shorter exposure time can be used to obtain blur-free images of fast-moving objects.

It is not possible to specify separate exposure time settings for each camera channel. The exposure time specified here applies for both channels.

NOTE

This setting is the same as that specified at the SCARA Vision board's "Exposure time" (8. Exposure time [µs]) parameter setting. Therefore, if the SCARA Vision board's "Exposure time" parameter is changed, this parameter setting value is also changed.

Timeout	Input range	Default setting	Units
	0 to 36000	0	sec

Function

Specifies the image acquisition timeout period in "seconds" units.

Explanation

This parameter applies to image acquisition operations where the vision control mode is "Host PC" and the trigger mode is "H/W trigger". A timeout setting cannot be specified if the trigger mode is "Camera internal" or "S/W trigger".

A setting of "0" is processed as no timeout setting.

NOTE

This setting differs from SCARA Vision board's "trigger timeout" (9. Trigger timout [sec]) parameter item because a different mode is used for image acquisition. The SCARA Vision board's "trigger timeout" parameter applies when the vision control mode is "CTRLER" (Controller) and the trigger mode is "H/W trigger".

5. Parameter settings

5.1 Parameter list

The parameters are divided into 4 main groups:

- SCARA Vision board parameters
- Lighting control board and tracking board parameters
- Model registration mode's edge setting and search setting parameters
- Fiducial mark mode's edge setting and search setting parameters

SCARA Vision Studio is used to specify the model registration mode's and fiducial mark mode's edge setting and search setting parameters.

5.1.1 SCARA Vision board parameter list

The SCARA Vision board's parameter items are listed in the following table.

Parameter No.	Name PB display	Description	Input range	Default setting	Units	Restart
1	Board condition Board condition	Indicates the SCARA Vision board condition.	Read only	—	—	—
2	IP address IP address	Specifies the robot controller's IP address setting.	—	192.168.0.2	—	Required
3	Sub net mask Sub net mask	Specifies the robot controller's sub net mask setting.	—	255.255.255.0	—	Required
4	Port number Port No.	Specifies robot controller's port number.	0 to 65535	49200	—	Required
5	Camera type Camera type	Specifies the camera type to which the SCARA Vision board is conected.	0 to 255	0	—	—
6	Image intake channel Image intake Ch.	Specifies the camera channel where image acquisition is to occur.	Ch.1/Ch.2	Ch.1	—	—
7	Trigger mode Trigger mode	Specifies the image acquisition timing.	Camera internal / H/W trigger / S/W trigger	S/W trigger	—	—
8	Exposure time Exposure time[μs]	Specifies the camera exposure time in μs units.	10 to 33000	16500	μs	—
9	Trigger timeout Trigger timeout[sec]	Specifies the image acquisition timeout period in "seconds" units. This parameter applies when the vision control mode is "CTRLER" and the trigger mode is "H/W trigger".	0 to 36000	0	sec	—
10	SCARA Vision engine version SCARA Vision engine ver.	Indicates the version of the SCARA Vision board's vision processing engine.	Read only	—	—	—
11	SCARA Vision engine compilation date SCARA Vision engine compild	Indicates the date when the SCARA Vision board's vision processing engine was created.	Read only	—	—	—
12	Firmware version Firmware version	Indicates the version of the SCARA Vision board's firmware.	Read only	—	—	—
13	MAC address MAC address	Indicates the MAC address.	Read only	—	—	—

5.1.2 Lighting control board and tracking board parameter list

The lighting control board's and tracking board's parameter items are listed in the following table.

Parameter No.	Name / PB display	Description	Input range	Default setting	Units	Restart
1	Board condition / Board condition	Indicates the lighting control board and tracking board condition.	Read only	—	—	—
2	Lighting control [L1] / Light control [L1]	Switches the lighting control function ON and OFF.	ON/OFF	OFF	—	—
3	Lighting control [L2] / Light control [L2]					
4	Control mode (L1) / Control mode (L1)	Specifies the lighting control mode	Continuous / Strobe	Continuous	—	—
5	Control mode (L2) / Control mode (L2)					
6	Lighting volume (L1) / Light volume [%](L1)	Specifies the modulated light volume (in % units) used in the continuous lighting mode.	0 to 100	0	%	—
7	Lighting volume (L2) / Light volume [%](L2)					
8	Strobe time (L1) / Strobe time [µs](L1)	Specifies the light emission time used in the strobe lighting mode.	10 to 33000	16500	µs	—
9	Strobe time (L2) / Strobe time [µs](L2)					
10	Synchronized camera (L1) / Camera to sync w/(L1)	Specifies the camera which emits synchronized light when using strobe lighting. This parameter is enabled only when the SCARA Vision board's trigger mode parameter is set to "S/W trigger".	Ch.1/Ch.2	Ch.1	—	—
11	Synchronized camera (L2) / Camera to sync w/(L2)			Ch.2		
12	Counter condition (C1) / Counter condition (C1)	VALID/INVALID the counter function. * These parameters are disabled at the lighting control board.	VALID / INVALID	INVALID	—	—
13	Counter condition (C2) / Counter condition (C2)					
14	Count evaluation (C1) / Count evaluation (C1)	Specifies the counter's evaluation. * These parameters are disabled at the lighting control board.	QUAD (x4) / DOUBLE (x2)	4QUAD (x4)	—	—
15	Count evaluation (C2) / Count evaluation (C2)					
16	Conveyor speed coefficient (C1) / Count vel coef [%](C1)	Specifies the multiplier for the offset amount at conveyor follow-up operations. * These parameters are disabled at the lighting control board.	0 to 1000	1000	%	—
17	Conveyor speed coefficient (C2) / Count vel coef [%](C2)					
18	Tracking limit (C1) / Tracking limit (C1)	System value of tracking limit. Normally, the default setting should be used. * These parameters are disabled at the lighting control board.	0 to 100	80	—	—
19	Tracking limit (C2) / Tracking limit (C2)					

*The meanings of the L1, L2, C1, C2 items in the parameter names are as follows:
L1: Lighting 1; L2: Lighting 2; C1: Counter 1; C2: Counter 2

5.1.3 Model registration mode parameter list

The model registration mode's edge setting and search setting parameter items are listed in the following tables.

■ **Edge settings**

Parameter No.	Name	Description	Input range	Default setting	Units	Restart
—	Filter	Specifies the processing method for the filter which acquires the workpiece edge image.	Sobel / correlated edge	Sobel	—	—
—	Min. contrast	Specifies the threshold contrast (brightness difference) for workpiece edge discrimination.	0 to 255	30	—	—
—	Edge strength	Specifies the threshold for the edge value (edge strength) when using the "correlated edge filter" processing method.	0 to 255	160	—	—
—	Filter size	Specifies the size of the filter used to extract the workpiece edge when using the "correlated edge filter" processing method.	3 to 21 odd numbers	13	—	—

NOTE

The "edge strength" and "filter size" parameters display only when "correlated edge" is specified as the filter parameter setting value.

■ **Search settings**

Parameter No.	Name	Description	Input range	Default setting	Units	Restart
—	START angle	Specifies the START angle of the permissible rotation angle range, based on the edge data of the registered model.	-180 to 179	-180	degrees (°)	—
—	END angle	Specifies the END angle of the permissible rotation angle range, based on the edge data of the registered model.	-180 to 179	179	degrees (°)	—
—	Compression rate	Specifies the compression rate of the workpiece edge data.	0 to 5	3	—	—
—	Error range	Specifies the permissible deformation range based on the edge data of the registered model.	0 to 5	1	—	—
—	Score threshold 1	Specifies the score threshold to narrow the number of search object candidates before performing a search for a registered model.	0 to 100	50	—	—
—	Score threshold 2	Specifies the threshold value for registered model search result outputs.	0 to 100	60	—	—
—	Precision	Specifies the search precision when searching for registered models.	Standard / high precision	Standard	—	—
—	Reduction weight	Specifies the score reduction for the reduction area when searching for registered workpiece models.	0 to 100	2	%	—
—	Edge Polarity	Specifies the contrast polarity of the image to be detected when searching for registered workpiece models.	Normal / Reverse / Mix	Normal	—	—
—	Detected workpiece quantity	Specifies the max. number of detected workpieces when searching for registered models.	1 to 40	1	Pieces	—
—	Timeout	Specifies the timeout period for searches of registered models.	0 to 600	0	100ms	—

5.1.4 Fiducial mark mode parameter list

The fiducial mark mode's edge setting and search setting parameter items are listed in the following tables.

■ **Edge settings**

Parameter No.	Name	Description	Input range	Default setting	Units	Restart
—	Filter	Specifies the processing method for the filter which acquires the fiducial mark edge image.	Sobel / correlated edge	Sobel	—	—
—	Min. contrast	Specifies the threshold contrast (brightness difference) for fiducial mark edge discrimination.	0 to 255	30	—	—
—	Edge strength	Specifies the threshold for the edge value (edge strength) when using the "correlated edge filter" processing method.	0 to 255	160	—	—
—	Filter size	Specifies the size of the filter used to extract the fiducial mark edge when using the "correlated edge filter" processing method.	3 to 21 odd numbers	13	—	—

NOTE

The "edge strength" and "filter size" parameters display only when "correlated edge" is specified as the filter parameter setting value.

■ **Search settings**

Parameter No.	Name	Description	Input range	Default setting	Units	Restart
—	START angle	Specifies the START angle of the permissible rotation angle range, based on the edge data of the fiducial mark.	-180 to 179	-180	degrees (°)	—
—	END angle	Specifies the END angle of the permissible rotation angle range, based on the edge data of the fiducial mark.	-180 to 179	179	degrees (°)	—
—	Compression rate	Specifies the compression rate of the fiducial mark edge data.	0 to 5	3	—	—
—	Error range	Specifies the permissible deformation range based on the edge data of the fiducial mark.	0 to 5	1	—	—
—	Score threshold 1	Specifies the score threshold to narrow the number of search object candidates before performing a search for a fiducial mark.	0 to 100	50	—	—
—	Score threshold 2	Specifies the threshold value for fiducial mark search result outputs.	0 to 100	60	—	—
—	Precision	Specifies the search precision when searching for fiducial marks.	Standard / high precision	Standard	—	—
—	Reduction weight	Specifies the score reduction for the reduction area when searching for registered workpiece models.	0 to 100	2	%	—
—	Edge Polarity	Specifies the contrast polarity of the image to be detected when searching for registered workpiece models.	Normal / Reverse / Mix	Normal	—	—

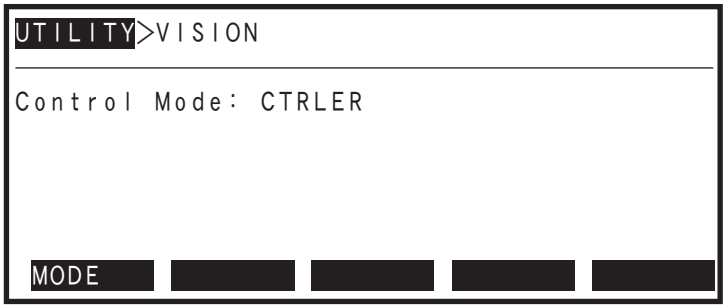
5.2 SCARA Vision board parameter settings

The procedures for specifying the SCARA Vision board parameter settings are given below.

1 ***Check that the vision control mode is set to "Controller" mode.***

To set the SCARA Vision board parameters, the vision control mode must be set to "Controller" mode. If not, change the vision control mode to "Controller" mode.
When changing the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode".

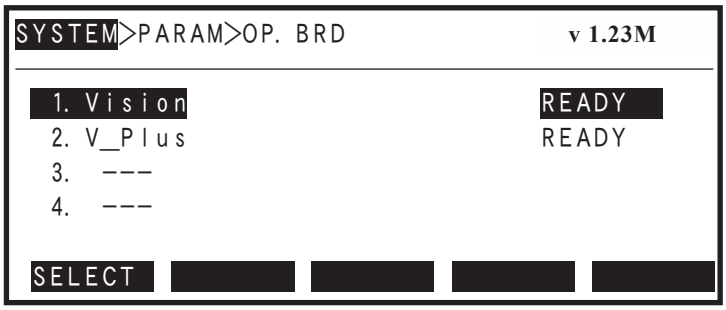
Vision control mode confirmation screen



2 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

3 ***Use the (↑ / ↓) cursor keys to select "Vision", then press the*** F 1 ***(SELECT) key.***

"SYSTEM>PARAM>OP.BRD" mode screen



4 ***The SCARA Vision board's parameter items display at the screen.***

Parameter setting details are given in the following section.

5.2.1 Parameter details

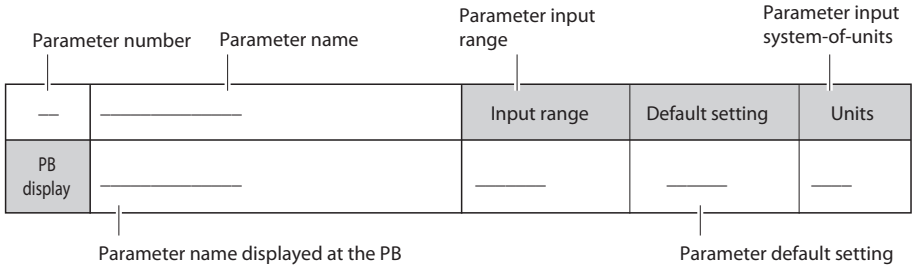
This section explains each of the SCARA Vision board's parameter items.

MEMO

The methods for setting the following parameter items are detailed in the sections listed below.

Parameter name	Refer to:
1. Board condition	Chapter 4, section 4.1.1 "Verifying the SCARA Vision board condition"
2. IP address	SCARA Vision Studio OPERATION SECTION Chapter 3, section 3.2.1 "Setting the robot controller's IP address"
3. Sub net mask	SCARA Vision Studio OPERATION SECTION Chapter 3, section 3.2.2 "Setting the robot controller's sub net mask"
4. Port number	SCARA Vision Studio OPERATION SECTION Chapter 3, section 3.2.3 "Setting the robot controller's port number"

[Table explanation]



5	Camera type	Input range	Default setting	Units
PB display	5.Camera type	0 to 255	0	—

Function

Specifies the camera type to which the SCARA Vision board is connected.

Settings

0: Camera used : CS8560D-02 (TOSHIBA TELI CORPORATION)
Frame rate : Double speed (60fps)
Acquired image size : VGA size (640 x 480 pixels)

NOTE

Consult with your OMRON representative before using a camera other than that indicated above.

MEMO

The term "frame rate" refers to the number of image frames which are refreshed each second, and is expressed in "fps" (frames per second) units.

Parameter setting procedure

1 ***Use the (↑ / ↓) cursor keys to select "5. Camera type", then press the*** F 1 ***(EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the F 2 (JUMP) key.
   1) Press the F 2 (JUMP) key.
   2) Enter the 0 to 9 parameter number, then press ⇨.
2. By using the page keys ⇈ ⇊.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen

```
SYSTEM>PARAM>OP. BRD>SELECT          v 1.23M

 5. Camera type          0
 6. Image intake Ch.     Ch. 1
 7. Trigger mode         S/WTRIG
 8. Exposure time[µs]    16500
 9. Trigr timout[sec]    0
EDIT    JUMP
```

2 ***Specify the parameter setting.***

Use the 0 to 9 keys to specify the desired setting value, then press ⇨ to register the setting.

"5. Camera type" parameter setting

```
SYSTEM>PARAM>OP. BRD>SELECT          v 1.23M

 5. Camera type          0
 6. Image intake Ch.     Ch. 1
 7. Trigger mode         S/WTRIG
 8. Exposure time[µs]    16500
 9. Trigr timout[sec]    0
[0-255]  Enter >0
```

3 ***Press*** ESC ***to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

6	Image intake Channel	Input range	Default setting	Units
PB display	6.Image intake Ch.	Ch.1/Ch.2	Ch.1	—

Function

Specifies the camera channel where image acquisition is to occur.

Settings

Ch.1: Specifies "Ch.1" as the camera channel to be used.

Ch.2: Specifies "Ch.2" as the camera channel to be used.

Parameter setting procedure

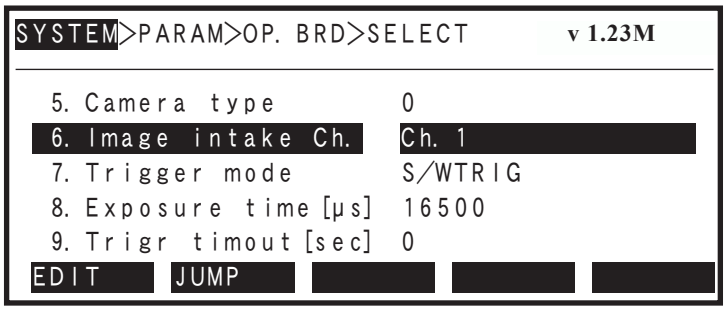
1 ***Use the (↑ / ↓) cursor keys to select "6. Image intake Ch.", then press the [F 1] (EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

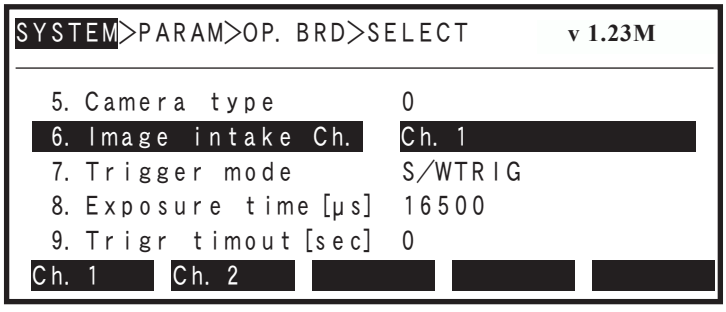
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Specify the setting by pressing [F 1] (Ch.1) or [F 2] (Ch.2).

"6. Image intake Ch." parameter setting



3 ***Press*** ESC ***to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

7	Trigger mode	Input range	Default setting	Units
PB display	7.Trigger mode	Camera internal / H/W trigger / S/W trigger	S/W trigger	—

Function

Specifies the image acquisition timing.

Explanation

It is not possible to specify separate trigger mode settings for each camera channel. The image acquisition timing setting specified here applies for both channels.

Settings

Camera internal : Specifies the exposure START timing which is generated by the camera's internal processing.

H/W trigger : Specifies the exposure START timing as the point when the trigger input to the external trigger terminal occurs.

S/W trigger : Specifies the exposure START timing as the point when the software outputs the image acquisition command to the camera.

NOTE

This setting is the same as that specified at the SCARA Vision Studio camera setting's "Trigger mode" item. Therefore, if the SCARA Vision Studio's "Trigger mode" parameter is changed, this parameter setting value is also changed. The changed setting value displays after ending the SCARA Vision Studio connection and switching to the "CTRLER" vision control mode.

Parameter setting procedure

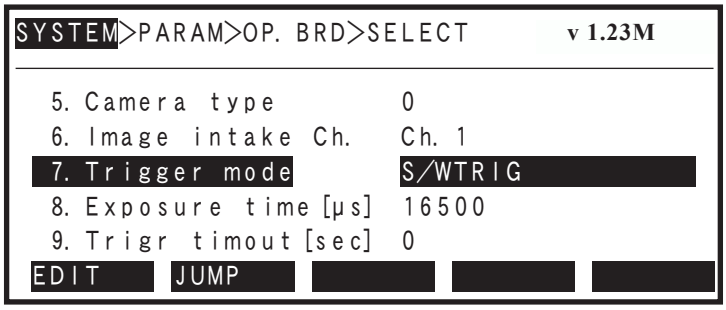
1 ***Use the (↑ / ↓) cursor keys to select "7. Trigger mode", then press the*** F 1 ***(EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

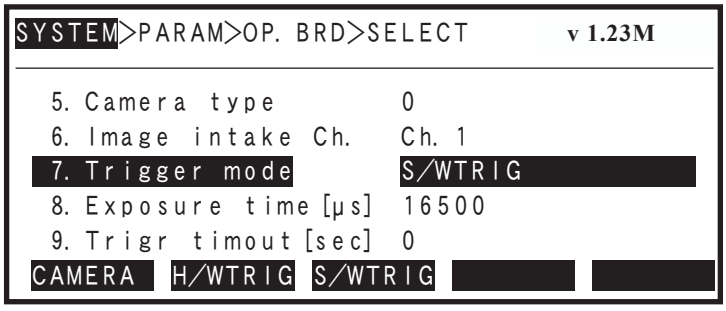
"SYSTEM>PARAM>OP.BRD>SELECT" mode sccreen



2 ***Specify the parameter setting.***

Specify the setting by pressing [F 1] (CAMERA), [F 2] (H/WTRIG), or [F 3] (S/WTRIG).

"7. Trigger mode" parameter setting



3 ***Press [ESC] to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press [ESC] at this time. Instead, select the next parameter item and enter its setting. Press [ESC] when all the desired parameter settings have been specified.

8	Exposure time	Input range	Default setting	Units
PB display	8.Exposure time[µs]	10 to 33000	16500	µs

Function

Specifies the camera's exposure time in "µs" (microseconds) units.

Explanation

A shorter exposure time produces a darker image, and a longer exposure time produces a brighter image. Moreover, a shorter exposure time can be used to obtain blur-free images of fast-moving objects.

It is not possible to specify separate exposure time settings for each camera channel. The exposure time specified here applies for both channels.

NOTE

This setting is the same as that specified at the SCARA Vision Studio's "Exposure time" (8. Exposure time [µs]) parameter item. Therefore, if the SCARA Vision Studio' "Exposure time" parameter is changed, this parameter setting value is also changed. The changed setting value displays after ending the SCARA Vision Studio connection and switching to the "CTRLER" vision control mode.

Parameter setting procedure

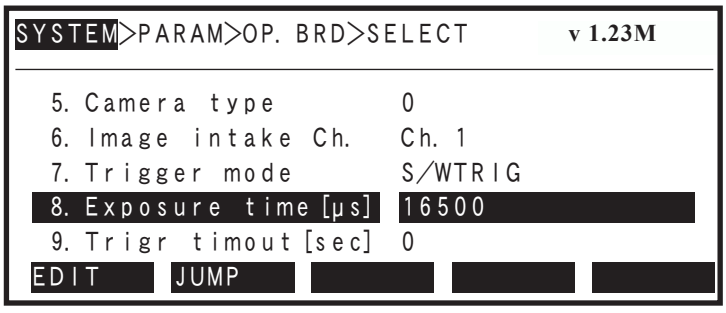
1 ***Use the (↑ / ↓) cursor keys to select "8. Exposure time [µs]", then press the*** F 1 ***(EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the F 2 (JUMP) key.
   1) Press the F 2 (JUMP) key.
   2) Enter the 0 to 9 parameter number, then press ⇒.
2. By using the page keys ∧∧ ∨∨.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Use the 0 to 9 keys to specify the desired setting value, then press ⇒ to register the setting.

"8. Exposure time [µs]" parameter setting

```
SYSTEM>PARAM>OP. BRD>SELECT          v 1.23M

  5. Camera type          0
  6. Image intake Ch.     Ch. 1
  7. Trigger mode         S/WTRIG
  8. Exposure time [µs]   16500
  9. Trigr timout [sec]   0
[10-33000] Enter >16500
```

3 ***Press ESC to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

9	Trigger timeout	Input range	Default setting	Units
PB display	9.Trigr timout [sec]	0 to 36000	0	sec

Function

Specifies the image acquisition timeout period in "seconds" units.

Explanation

This parameter applies when the vision control mode is "CTRLER" and the trigger mode is "H/W trigger".
A setting of "0" is processed as no timeout setting.

NOTE

This setting differs from the "Timeout" camera setting at SCARA Vision Studio because a different mode is used for image acquisition. The SCARA Vision Studio "Timeout" setting applies when the vision control mode is "Host PC" and the trigger mode is "H/W trigger".

Parameter setting procedure

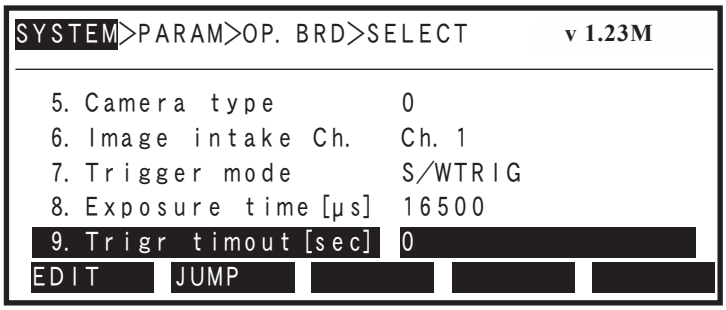
1 ***Use the (↑ / ↓) cursor keys to select "9. Trigr timout [sec]", then press the [F 1] (EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇨].
2. By using the page keys [⇑] [⇓].

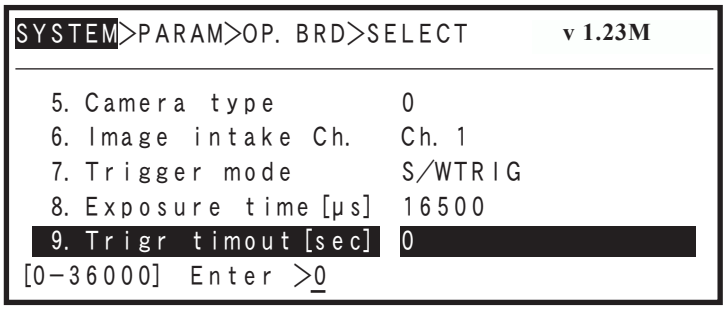
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Use the [0] to [9] keys to specify the desired setting value, then press [⇨] to register the setting.

"9. Trigr timout [sec]" parameter setting



3 ***Press [ESC] to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press [ESC] at this time. Instead, select the next parameter item and enter its setting. Press [ESC] when all the desired parameter settings have been specified.

10	SCARA Vision engine version	Input range	Default setting	Units
PB display	10. iVY engine ver.	Read only	—	—

Function

Indicates the version of the SCARA Vision board's vision processing engine.

Parameter setting procedure

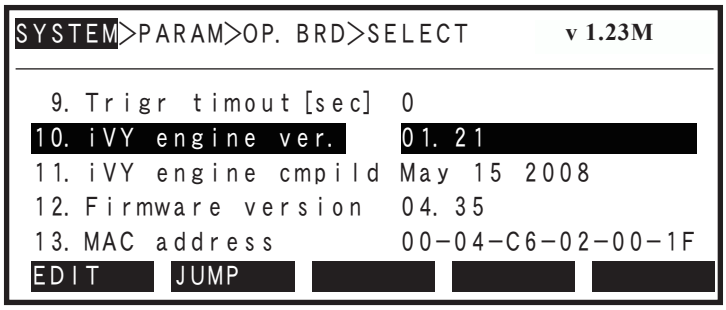
1 ***Use the (↑ / ↓) cursor keys to select "10. iVY engine ver.".***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



NOTE

The "10. iVY engine ver." parameter is a read-only item which cannot be edited.

11	SCARA Vision engine compilation date	Input range	Default setting	Units
PB display	11. iVY engine cmpild	Read only	—	—

Function

Indicates the date when the SCARA Vision board's vision processing engine was created.

Parameter setting procedure

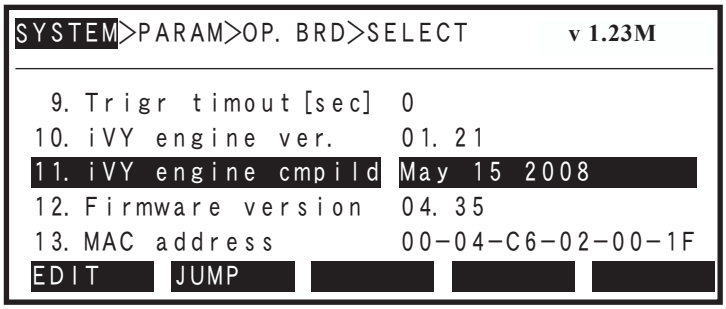
1 ***Use the (↑ / ↓) cursor keys to select "11. iVY engine cmpild", then press the [F 1] (EDIT) key.***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



NOTE

The "11. iVY engine cmpild" parameter is a read-only item which cannot be edited.

12	Firmware version	Input range	Default setting	Units
PB display	12. Firmware version	Read only	—	—

Function

Indicates the version of the SCARA Vision board's firmware.

Parameter setting procedure

1 ***Use the (↑ / ↓) cursor keys to select "12. Firmware version ".***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [→].
2. By using the page keys [∧∧] [∨∨].

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen

```
SYSTEM>PARAM>OP. BRD>SELECT          v 1.23M

  9. Trigr timout[sec]  0
 10. iVY engine ver.    01. 21
 11. iVY engine cmpild  May 15 2008
 12. Firmware version   04. 35
 13. MAC address        00-04-C6-02-00-1F
EDIT    JUMP
```

NOTE

The "12. Firmware version" parameter is a read-only item which cannot be edited.

13	MAC address	Input range	Default setting	Units
PB display	13. MAC address	Read only	—	—

Function

Indicates the MAC address.

Parameter setting procedure

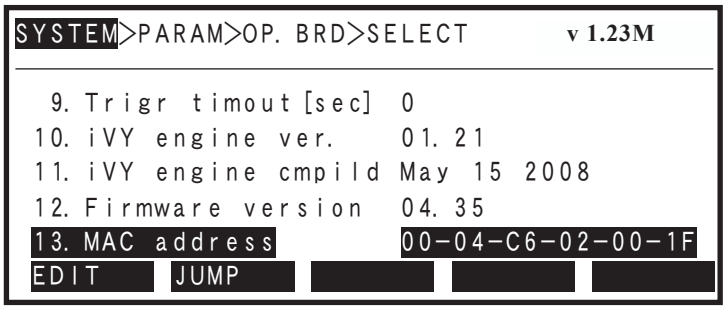
1 ***Use the (↑ / ↓) cursor keys to select "13. MAC address".***

MEMO

Parameter items can also be selected by the following methods.

1. By using the F 2 (JUMP) key.
   1) Press the F 2 (JUMP) key.
   2) Enter the 0 to 9 parameter number, then press ⇨.
2. By using the page keys ∧∧ ∨∨.

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



NOTE

The "13. MAC address" parameter is a read-only item which cannot be edited.

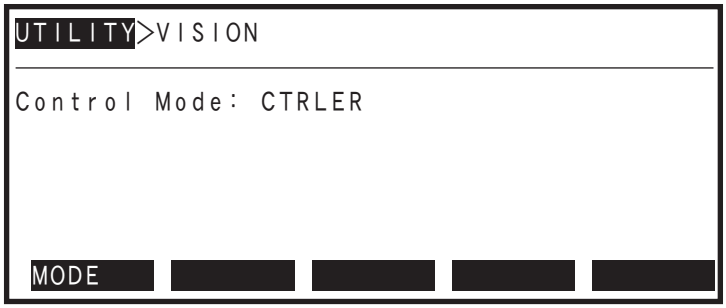
5.3 Lighting control board and tracking board parameter settings

The procedures for specifying the lighting control board and tracking board parameter settings are given below.

1 ***Check that the vision control mode is set to "Controller" mode.***

To set the lighting control board and tracking board parameters, the vision control mode must be set to "Controller" mode. If not, change the vision control mode to "Controller" mode.
When changing the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode".

Vision control mode confirmation screen

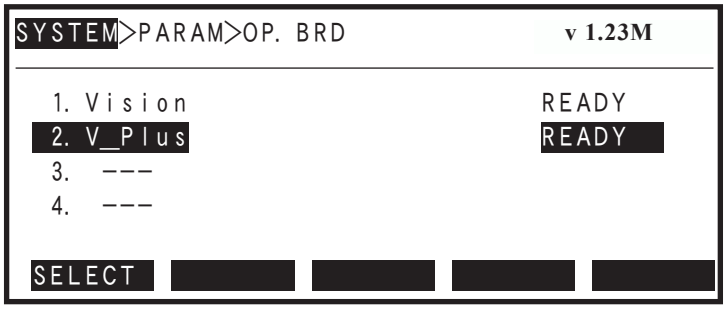


2 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

3 ***Use the (↑ / ↓) cursor keys to select "V_Plus", then press the*** F 1 ***(SELECT) key.***

"V_Plus" displays for both the lighting control board and the tracking board.

"SYSTEM>PARAM>OP.BRD" mode screen



4 ***The selected board's parameter items display at the screen.***

Parameter setting details are given in the following section.

5.3.1 Parameter details

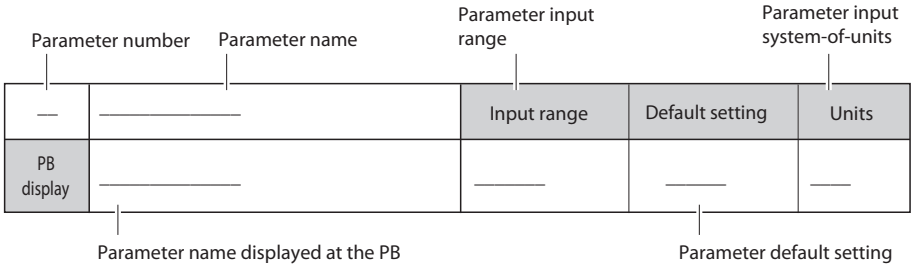
This section explains each of the lighting control board's and tracking board's parameter items.

MEMO

See Chapter 4 "Preparations" for details concerning the setting procedures for the following parameter items.

Parameter name	Refer to:
1. Board condition	4.1.2 Verifying the lighting control board condition 4.1.3 Verifying the tracking board condition

[Table explanation]



2, 3	Lighting control (L1 / L2)	Input range	Default setting	Units
PB display	2. Light control (L1) 3. Light control (L2)	ON/OFF	OFF	—

Function

Switches the lighting control functions (Lighting 1 and Lighting 2) on and off.

Explanation

The Lighting 1 setting is specified at "2. Light control (L1)", and the Lighting 2 setting is specified at "3. Light control (L2)".

Settings

ON: Switches the lighting control function on (lighting is enabled).

OFF: Switches the lighting control function off (lighting is disabled).

Parameter setting procedure

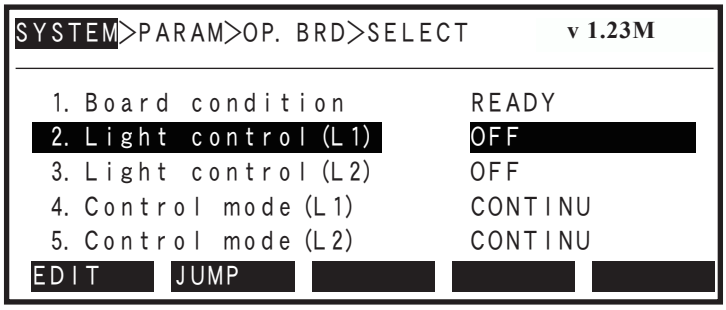
1 ***Use the (↑ / ↓) cursor keys to select either "2. Light control (L1)" or "3. Light control (L2)", then press*** F 1 ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

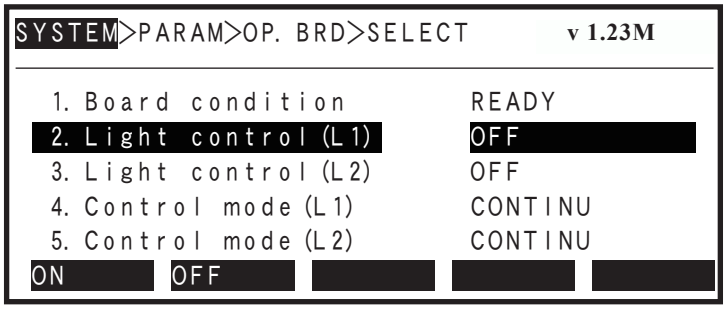
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Specify the desired ON/OFF setting by pressing either [F 1] (ON) or [F 2] (OFF).

"2. Light control (L1)" parameter setting



3 ***Press [ESC] to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press [ESC] at this time. Instead, select the next parameter item and enter its setting. Press [ESC] when all the desired parameter settings have been specified.

4, 5	Control mode (L1 / L2)	Input range	Default setting	Units
PB display	4. Control mode (L1) 5. Control mode (L2)	Continuous / strobe	Continuous	—

Function

Specifies the lighting control mode used for Lighting 1 and Lighting 2.

Explanation

The Lighting 1 setting is specified at "4. Control mode (L1)", and the Lighting 2 setting is specified at "5. Control mode (L2)".

Settings

CONTINU : Specifies "continuous lighting" as the lighting control mode.

STROBE : Specifies "strobe lighting" as the lighting control mode.

Parameter setting procedure

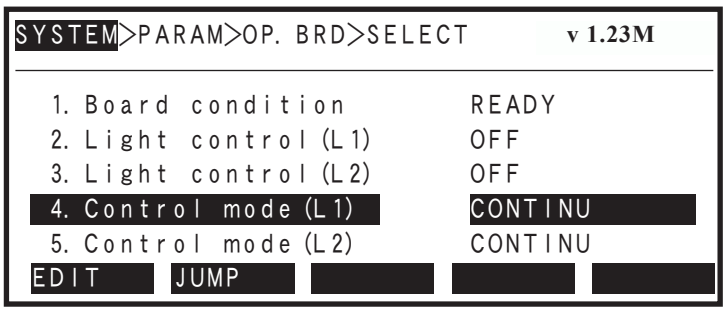
1 ***Use the (↑ / ↓) cursor keys to select either "4. Control mode (L1)" or "5. Control mode (L2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇨].
2. By using the page keys [∧∧] [∨∨].

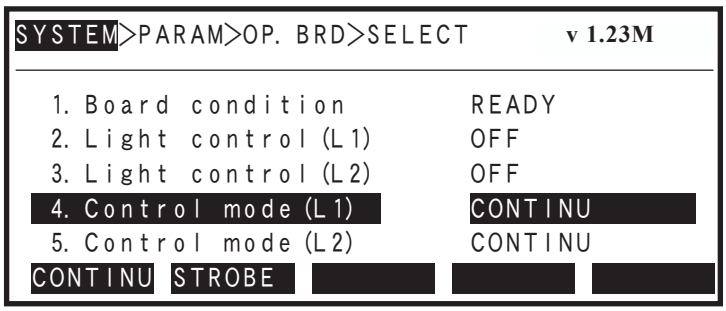
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Specify the desired ON/OFF setting by pressing either F 1 (CONTINU) or F 2 (STROBE).

"4. Control mode (L1)" parameter setting



3 ***Press ESC to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

6, 7	Lighting volume (L1 / L2)	Input range	Default setting	Units
PB display	6. Light volume [%] (L1) 7. Light volume [%] (L2)	0 to 100	0	%

Function

Specifies the light volume value (in % units) used in the continuous lighting mode for Lighting 1 and Lighting 2.

Explanation

The Lighting 1 volume setting is specified at "6. Light volume [%] (L1)", and the Lighting 2 volume setting is specified at "7. Light volume [%] (L2)".

Parameter setting procedure

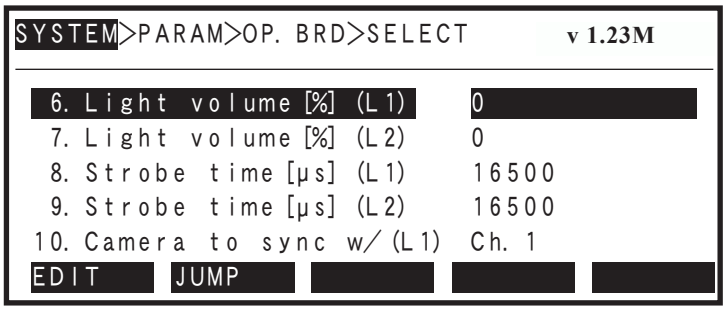
1 ***Use the (↑ / ↓) cursor keys to select either "6. Light volume [%] (L1)" or "7. Light volume [%] (L2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

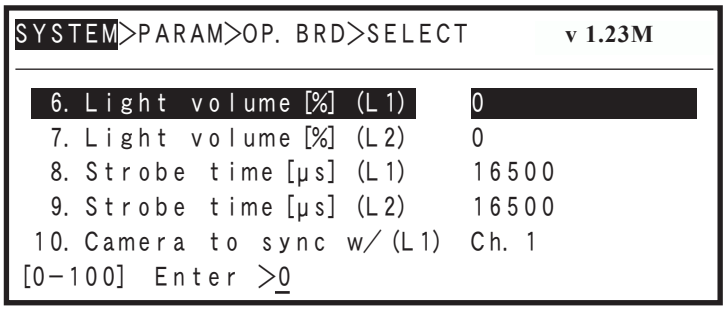
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Use the [0] to [9] keys to specify the desired setting value, then press [⇒] to register the setting.

"6. Light volume [%] (L1)" parameter setting



3 ***Press*** ESC ***to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

8, 9	Strobe time (L1 / L2)	Input range	Default setting	Units
PB display	8. Strobe time [µs] (L1) 9. Strobe time [µs] (L2)	10 to 33000	16500	µs

Function

Specifies the Lighting 1 and Lighting 2 light emission time used in the strobe lighting mode in "µs" (microsecond) units.

Explanation

The Lighting 1 setting is specified at "8. Strobe time [µs] (L1)", and the Lighting 2 setting is specified at "9. Strobe time [µs] (L2)".

Parameter setting procedure

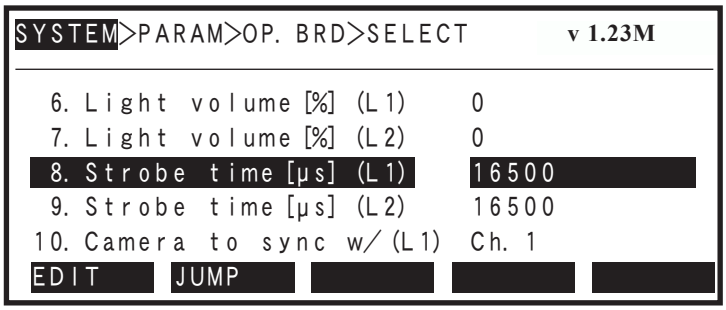
1 ***Use the (↑ / ↓) cursor keys to select either "8. Strobe time [µs] (L1)" or "9. Strobe time [µs] (L2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [⇑] [⇓].

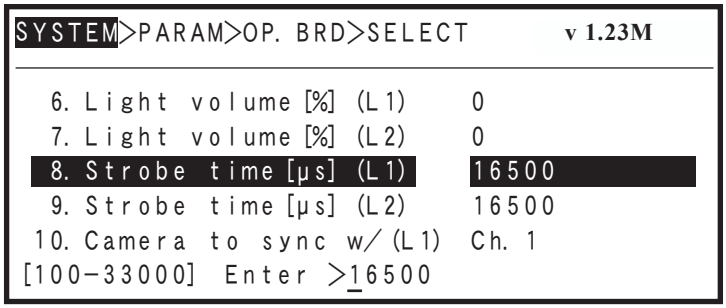
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Use the [0] to [9] keys to specify the desired setting value, then press [⇒] to register the setting.

"8. Strobe time [µs] (L1)" parameter setting



3 ***Press [ESC] to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press [ESC] at this time. Instead, select the next parameter item and enter its setting. Press [ESC] when all the desired parameter settings have been specified.

10, 11	Synchronized camera (L1 / L2)	Input range	Default setting	Units
PB display	10. Camera to sync w/ (L1) 11. Camera to sync w/ (L2)	Ch.1/Ch.2	Ch.1 Ch.2	—

Function

Specifies the Lighting 1 and Lighting 2 synchronized light emitting camera to be used for strobe lighting.

Explanation

This parameter is enabled only when the SCARA Vision board's trigger mode parameter is set to "S/W trigger".

The Lighting 1 setting is specified at "10. Camera to sync (L1)", and the Lighting 2 setting is specified at "11. Camera to sync (L2)".

Settings

Ch.1 : Specifies "Ch.1" as the synchronized light emitting camera channel when strobe lighting is used.

Ch.2 : Specifies "Ch.2" as the synchronized light emitting camera channel when strobe lighting is used.

Parameter setting procedure

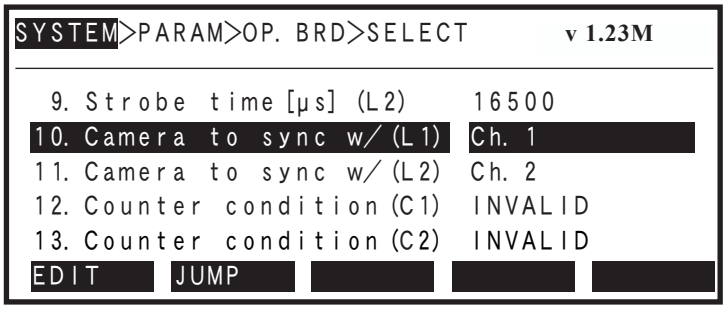
1 ***Use the (↑ / ↓) cursor keys to select either "10. Camera to sync (L1)" or "11. Camera to sync (L2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [→].
2. By using the page keys [∧∧] [∨∨].

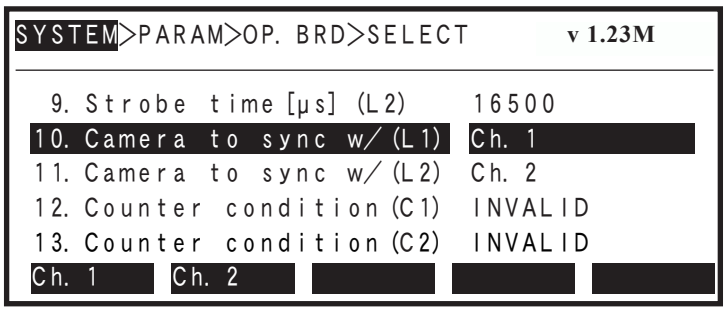
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Specify the desired ON/OFF setting by pressing either F 1 (Ch. 1) or F 2 (Ch. 2).

"10. Camera to sync w/ (L1)" parameter setting



3 ***Press ESC to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

12, 13	Counter condition (C1 / C2)	Input range	Default setting	Units
PB display	12. Counter condition (C1) 13. Counter condition (C2)	VALID/ INVALID	INVALID	—

Function

VALID/INVALID the counter 1 and counter 2 functions.

NOTE

- Enabling a counter function at a counter channel where no Encoder input interface is connected will trigger the disconnection detection function.
- This is a tracking board parameter, and it is invalid at the lighting control board.

Explanation

The "12. Counter condition (C1)" is specified for counter 1, and the "13. Counter condition (C2)" setting is specified for counter 2.

Settings

VALID : Enables the counter status.
INVALID : Disables the counter status.

Parameter setting procedure

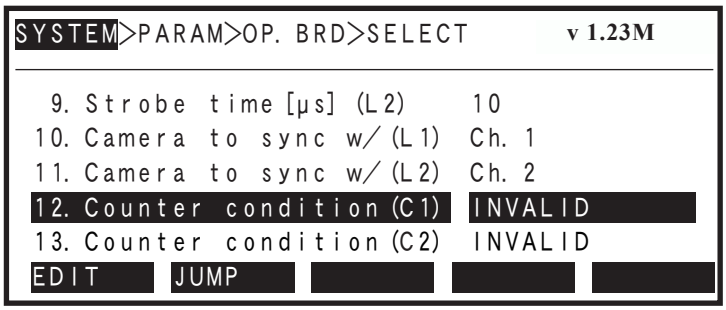
1 ***Use the (↑ / ↓) cursor keys to select either "12. Counter condition (C1)" or "13. Counter condition (C2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [→].
2. By using the page keys [∧∧] [∨∨].

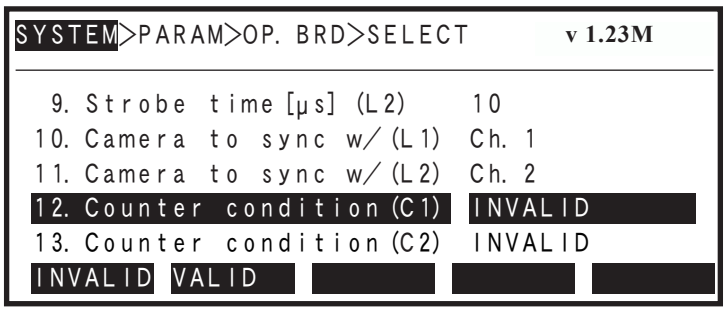
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Press the F 1 (INVALID) or F 2 (VALIDD) to select the desired setting.

"12. Counter condition (C1)" parameter setting



3 ***Press ESC to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

14, 15	Counter evaluation (C1 / C2)	Input range	Default setting	Units
PB display	14.Count evaluation (C1) 15.Count evaluation (C2)	QUAD (x4) / DOUBLE (x2)	QUAD (x4)	—

Function

Specifies the Counter 1 and Counter 2 evaluation.

NOTE

This is a tracking board parameter, and is therefore disabled at the lighting control board.

Explanation

The Counter 1 setting is specified at "14. Count evaluation (C1)", and the Counter 2 setting is specified at "15. Count evaluation (C2)".

Settings

QUAD (x4) : Specifies a "x4" counter evaluation.
DOUBLE (x2) : Specifies a "x2" counter evaluation.

Parameter setting procedure

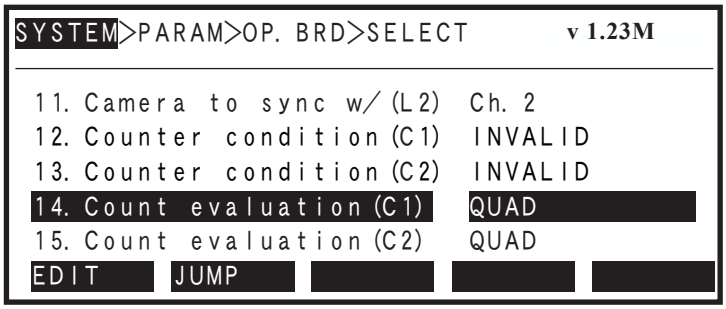
1 ***Use the (↑ / ↓) cursor keys to select either "14. Count evaluation (C1)" or "15. Count evaluation (C2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [→].
2. By using the page keys [∧∧] [∨∨].

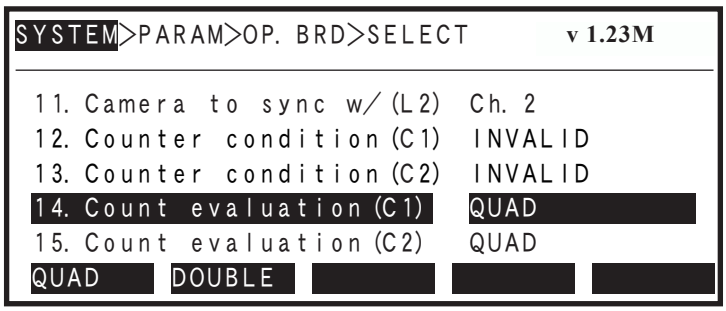
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Specify the desired ON/OFF setting by pressing either F 1 (QUAD) or F 2 (DOUBLE).

"14. Count evaluation (C1)" parameter setting



3 ***Press ESC to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press ESC at this time. Instead, select the next parameter item and enter its setting. Press ESC when all the desired parameter settings have been specified.

16, 17	Conveyor speed coefficient (C1 / C2)	Input range	Default setting	Units
PB display	16.Count vel coef [%] (C1) 17.Count vel coef [%] (C2)	0 to 10000	1000	%

Function

Specifies the multiplier for the offset amount at conveyor follow-up operations.

NOTE

- If a conveyor follow-up delay occurs, use this parameter to make the appropriate adjustment.
- This is a tracking board parameter, and it is invalid at the lighting control board.

Explanation

The "16. Count vel coef [%] (C1)" is specified for counter 1, and the "17. Count vel coef [%] (C2)" setting is specified for counter 2.

Parameter setting procedure

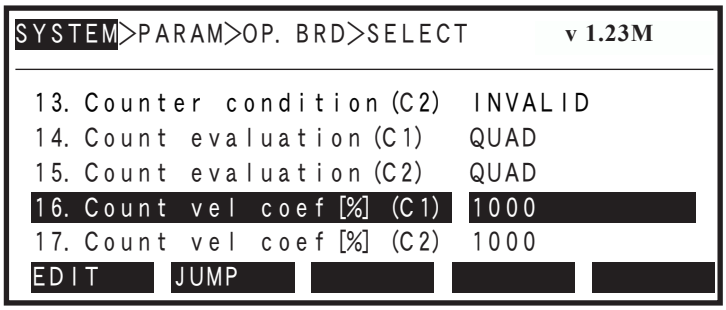
1 ***Use the (↑ / ↓) cursor keys to select either "16. Count vel coef [%] (C1)" or "17. Count vel coef [%] (C2)", then press*** [F 1] ***(EDIT).***

MEMO

Parameter items can also be selected by the following methods.

1. By using the [F 2] (JUMP) key.
   1) Press the [F 2] (JUMP) key.
   2) Enter the [0] to [9] parameter number, then press [⇒].
2. By using the page keys [∧∧] [∨∨].

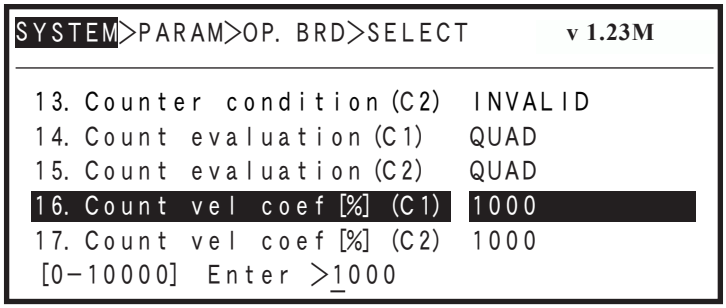
"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



2 ***Specify the parameter setting.***

Use the [0] to [9] keys to enter the desired setting, then press [⇒] to register the setting.

"16. Count vel coef [%] (C1)" parameter setting



3 ***Press [ESC] to end the edit mode.***

MEMO

To remain in the edit mode and continue with other parameter settings, do not press [ESC] at this time. Instead, select the next parameter item and enter its setting. Press [ESC] when all the desired parameter settings have been specified.

18, 19	Tracking limit (C1 / C2)	Input range	Default setting	Units
PB display	18.Tracking limit (C1) 19.Tracking limit (C2)	1 to 100	80	—

Function

Specifies the system value of tracking limit. Normally, do not change.

NOTE

This parameter is for the tracking board, and is disabled at the lighting control board.

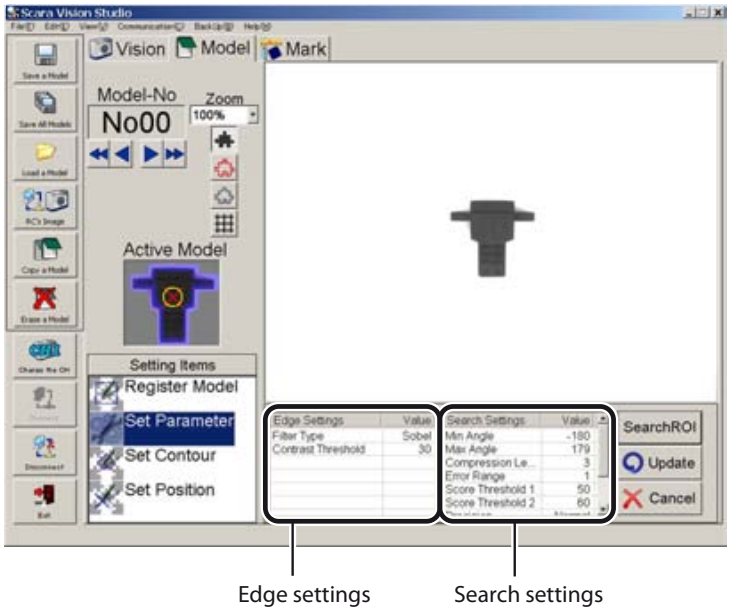
Explanation

Normally, the default setting should be used.

5.4 Model registration mode parameter settings

This section explains the various parameter settings required in order to register models in the model registration mode.

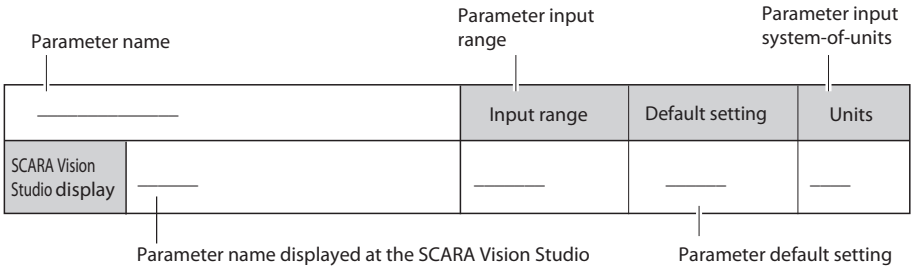
SCARA Vision Studio Model registration - Parameter settings



5.4.1 Edge settings

This section explains the parameters related to edge extractions which occur in the model registration mode.

[Table explanation]



5.4.1.1 Parameter details

Filter		Input range	Default setting	Units
SCARA Vision Studio display	Filter	Sobel / correlated edge	Sobel	—

Function

Specifies the processing method for the filter which acquires the workpiece edge image.

Explanation

The various characteristics of the "sobel filter" and "correlated edge filter" methods are given below. Select the filter type which is suitable for the application in question.

Filter characteristics

Filter name	Characteristics	
Sobel filter	Merits	Offers high-speed edge extraction.
	Demerits	Easily affected by noise and light changes.
Correlated edge filter	Merits	Relatively unaffected by noise and light changes.
	Demerits	Offers low-speed edge extraction.

Settings

Sobel : Specifies the sobel filter.

Correlated edge : Specifies the correlated edge filter.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Min. contrast		Input range	Default setting	Units
SCARA Vision Studio display	Min. contrast	0 to 255	30	—

Function

Specifies the threshold contrast (brightness difference) for workpiece edge discrimination.

Explanation

Edges with contrast which is less than this setting is not processed as edges.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Edge strength		Input range	Default setting	Units
SCARA Vision Studio display	Edge strength	0 to 255	160	—

Function

Specifies the threshold for the edge value (edge strength) when using the "correlated edge filter" processing method.

NOTE

The "Edge strength" parameter displays only when the filter parameter is specified as "correlated edge".

Explanation

Normally, the default setting should be used.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Filter size		Input range	Default setting	Units
SCARA Vision Studio display	Filter size	3 to 21 (odd numbers)	13	—

Function

Specifies the size of the filter used to extract the workpiece edge when using the "correlated edge filter" processing method.

NOTE

The "Filter size" parameter displays only when the filter parameter is specified as "correlated edge".

Explanation

Normally, the default setting should be used. However, when acquiring an edge image along fine lines such as characters, etc., the filter size should be adjusted in accordance with the line thickness. The narrower the line, the smaller this setting value should be.

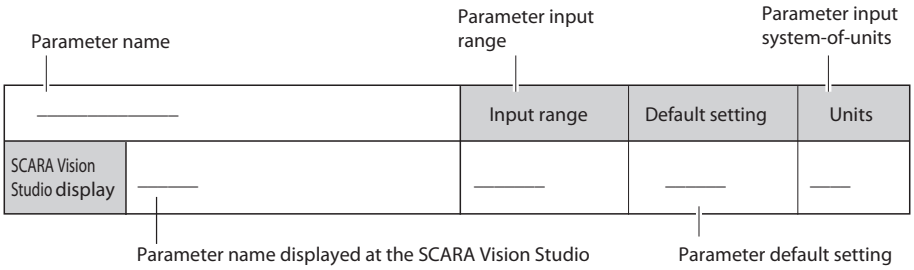
Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

5.4.2 Search settings

This section explains the various search related parameters which apply in the model registration mode.

[Table explanation]



5.4.2.1 Parameter details

START angle		Input range	Default setting	Units
SCARA Vision Studio display	START angle	-180 to 179	-180	degrees (°)

Function

Specifies the START angle of the permissible rotation angle range, based on the edge data of the registered model.

Explanation

When an actual search is performed, the search focuses on candidates within the setting range specified by the START and END angle parameters.

The narrower the search range, the faster the search. When searching for edge data to which circular rotation does not apply, both the START and END angles can be specified as "0°" (permissible rotation angle range: 0° to 0°) to enable a high-speed search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

END angle		Input range	Default setting	Units
SCARA Vision Studio display	END angle	-180 to 179	179	degrees (°)

Function

Specifies the END angle of the permissible rotation angle range, based on the edge data of the registered model.

Explanation

When an actual search is performed, the search focuses on candidates within the setting range specified by the START and END angle parameters.

The narrower the search range, the faster the search. When searching for edge data to which circular rotation does not apply, both the START and END angles can be specified as "0°" (permissible rotation angle range: 0° to 0°) to enable a high-speed search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Compression rate		Input range	Default setting	Units
SCARA Vision Studio display	Compression rate	0 to 5	3	—

Function

Specifies the compression rate of the workpiece edge data.

Explanation

Although a higher setting value will shorten the search time, the detection probability also decreases.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Error range		Input range	Default setting	Units
SCARA Vision Studio display	Error range	0 to 5	1	—

Function

Specifies the permissible deformation range based on the edge data of the registered model.

Explanation

Although a higher setting increases the detection probability, the erroneous detection probability also increases.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Score threshold 1		Input range	Default setting	Units
SCARA Vision Studio display	Score threshold 1	0 to 100	50	—

Function

Specifies the score threshold to narrow the number of search object candidates before performing a search for a registered model.

Explanation

A search occurs only for objects with scores equal to or higher than this setting value. Be sure that the "Score threshold 1" setting value is less than the "Score threshold 2" setting value.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Score threshold 2		Input range	Default setting	Units
SCARA Vision Studio display	Score threshold 2	0 to 100	60	—

Function

Specifies the threshold value for registered model search result outputs.

Explanation

Only search results with scores equal to or higher than this threshold value are reported.
Be sure that the "Score threshold 1" setting value is less than the "Score threshold 2" setting value.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Precision		Input range	Default setting	Units
SCARA Vision Studio display	Precision	Standard / High precision	Standard	—

Function

Specifies the search precision when searching for registered models.

Explanation

The settings and their characteristics are given below. Select a setting which is suitable for the application in question.

Search precision settings and their characteristics

Setting	Characteristics
Standard	Gives priority to the search speed, resulting in reduced precision.
High precision	Gives priority to the search precision, resulting in slower searches.

Settings

Standard : Specifies a "standard precision" search.
High precision : Specifies a "high precision" search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Reduction weight		Input range	Default setting	Units
SCARA Vision Studio display	Reduction weight (%)	0 to 1000	2	%

Function

Specifies the score reduction which is used for search if an edge is detected in the reduction area of a registered workpiece model.

Explanation

The score is reduced if an edge is detected in the reduction area. Changing this parameter setting adjusts the score reduction.

If an edge is detected in the reduction area, then the score is calculated as follows:

$$\text{Score} = \frac{(\text{Number of matched edge points} - \text{Number of edge points in reduction area} \times \text{Reduction weight})}{\text{Number of edge points of registered workpiece model}} \times 100$$

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Edge Polarity		Input range	Default setting	Units
SCARA Vision Studio display	Edge Polarity	Normal / Reverse / Mix	Normal	—

Function

Specifies the contrast polarity of the image to be detected when searching for registered workpiece models.

Explanation

If the background of a model registration workpiece varies greatly, changing this parameter setting makes an improvement. For example, when this parameter is set to "Normal", a gray colored workpiece registered on a white background (lower left figure) is not found on a black background (lower right figure). In this case, setting this parameter to "Reverse" or "Mix" allows the gray colored workpiece to be found on the black background (lower right figure). If the background color is not uniform, use "Mix". The workpiece will be found stably.

(When set to "Reverse", the gray colored workpiece cannot be found on the white background (lower left figure).

Gray colored workpiece on white background

Gray colored workpiece on black background

Settings

Normal : Detects the image contrast that is the same as the registered workpiece model.

Reverse : Detects the image contrast that is the reverse of registered workpiece model.

Mix : Detects the image contrast that is the same as the registered workpiece model and also detects the image contrast that is the reverse of the registered workpiece model.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Number of detected workpieces		Input range	Default setting	Units
SCARA Vision Studio display	Number of detected workpieces	1 to 40	1	Piece

Function

Specifies the max. number of detected workpieces when searching for registered models.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

Timeout		Input range	Default setting	Units
SCARA Vision Studio display	Timeout	0 to 600	0	100ms

Function

Specifies the timeout period for searches of registered models.

Explanation

Specifies the timeout period is specified in 100ms units. A setting of "0" (no setting) disables the timeout function.

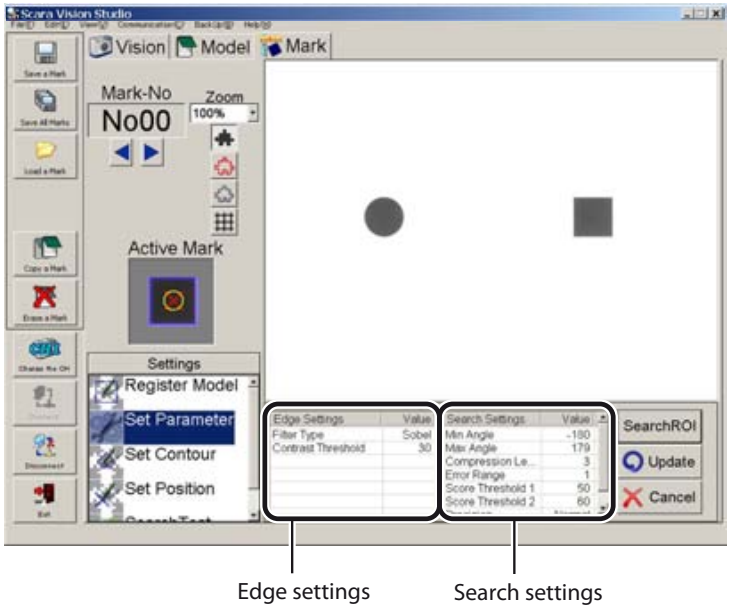
Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.3.3 "Parameter settings".

5.5 Fiducial mark mode parameter settings

This section explains the various parameter settings required in order to register fiducial marks in the fiducial mark mode.

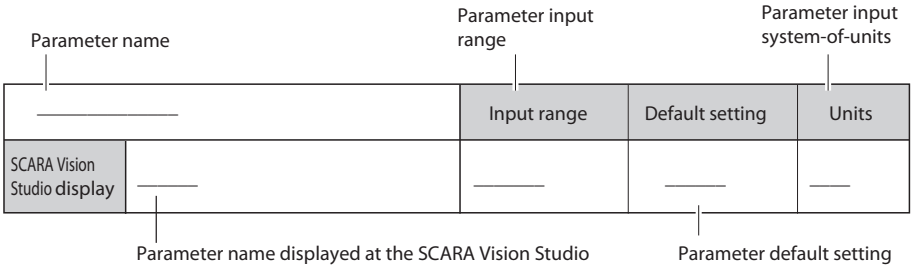
SCARA Vision Studio fiducial mark - Parameter settings



5.5.1 Edge settings

This section explains the parameters related to edge extractions which occur in the fiducial mark mode.

[Table explanation]



5.5.1.1 Parameter details

Filter		Input range	Default setting	Units
SCARA Vision Studio display	Filter	Sobel / correlated edge	Sobel	—

Function

Specifies the processing method for the filter which acquires the fiducial mark edge image.

Explanation

The various characteristics of the "sobel filter" and "correlated edge filter" methods are given below. Select the filter type which is suitable for the application in question.

Filter characteristics

Filter name	Characteristics	
Sobel filter	Merits	Offers high-speed edge extraction.
	Demerits	Easily affected by noise and light changes.
Correlated edge filter	Merits	Relatively unaffected by noise and light changes.
	Demerits	Offers low-speed edge extraction.

Settings

Sobel : Specifies the sobel filter.

Correlated edge : Specifies the correlated edge filter.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Min. contrast		Input range	Default setting	Units
SCARA Vision Studio display	Min. contrast	0 to 255	30	—

Function

Specifies the threshold contrast (brightness difference) for fiducial mark edge discrimination.

Explanation

Edges with contrast which is less than this setting is not processed as edges.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Edge strength		Input range	Default setting	Units
SCARA Vision Studio display	Edge strength	0 to 255	160	—

Function

Specifies the threshold for the edge value (edge strength) when using the "correlated edge filter" processing method.

NOTE

The "Edge strength" parameter displays only when the filter parameter is specified as "correlated edge".

Explanation

Normally, the default setting should be used.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Filter size		Input range	Default setting	Units
SCARA Vision Studio display	Filter size	3 to 21 (odd numbers)	13	—

Function

Specifies the size of the filter used to extract the fiducial mark edge when using the "correlated edge filter" processing method.

NOTE

The "Filter size" parameter displays only when the filter parameter is specified as "correlated edge".

Explanation

Normally, the default setting should be used. However, when acquiring an edge image along fine lines such as characters, etc., the filter size should be adjusted in accordance with the line thickness. The narrower the line, the smaller this setting value should be.

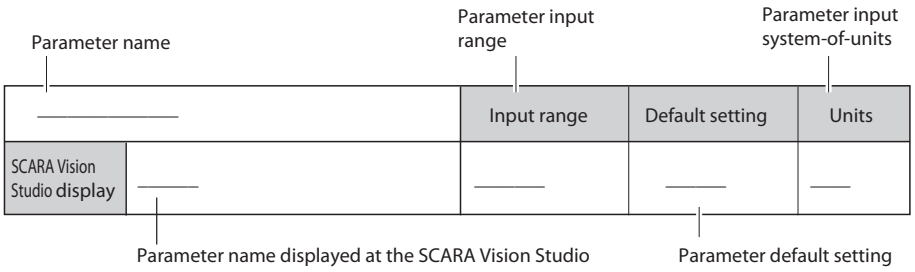
Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

5.5.2 Search settings

This section explains the various search related parameters which apply in the fiducial mark mode.

[Table explanation]



5.5.2.1 Parameter details

START angle		Input range	Default setting	Units
SCARA Vision Studio display	START angle	-180 to 179	-180	degrees (°)

Function

Specifies the START angle of the permissible rotation angle range, based on the edge data of the fiducial mark.

Explanation

When an actual search is performed, the search focuses on candidates within the setting range specified by the START and END angle parameters.

The narrower the search range, the faster the search. When searching for edge data to which circular rotation does not apply, both the START and END angles can be specified as "0°" (permissible rotation angle range: 0° to 0°) to enable a high-speed search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

END angle		Input range	Default setting	Units
SCARA Vision Studio display	END angle	-180 to 179	179	degrees (°)

Function

Specifies the END angle of the permissible rotation angle range, based on the edge data of the fiducial mark.

Explanation

When an actual search is performed, the search focuses on candidates within the setting range specified by the START and END angle parameters.

The narrower the search range, the faster the search. When searching for edge data to which circular rotation does not apply, both the START and END angles can be specified as "0°" (permissible rotation angle range: 0° to 0°) to enable a high-speed search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Compression rate		Input range	Default setting	Units
SCARA Vision Studio display	Compression rate	0 to 5	3	—

Function

Specifies the compression rate of the fiducial mark edge data.

Explanation

Although a higher setting value will shorten the search time, the detection probability also decreases.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Error range		Input range	Default setting	Units
SCARA Vision Studio display	Error range	0 to 5	1	—

Function

Specifies the permissible deformation range based on the edge data of the fiducial mark.

Explanation

Although a higher setting increases the detection probability, the erroneous detection probability also increases.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Score threshold 1		Input range	Default setting	Units
SCARA Vision Studio display	Score threshold 1	0 to 100	50	—

Function

Specifies the score threshold to narrow the number of search object candidates before performing a search for a fiducial mark.

Explanation

A search occurs only for objects with scores equal to or higher than this setting value. Be sure that the "Score threshold 1" setting value is less than the "Score threshold 2" setting value.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Score threshold 2		Input range	Default setting	Units
SCARA Vision Studio display	Score threshold 2	0 to 100	60	—

Function

Specifies the threshold value for fiducial mark search result outputs.

Explanation

Only search results with scores equal to or higher than this threshold value are reported.

Be sure that the "Score threshold 1" setting value is less than the "Score threshold 2" setting value.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Precision		Input range	Default setting	Units
SCARA Vision Studio display	Precision	Standard / High precision	Standard	—

Function

Specifies the search precision when searching for fiducial marks.

Explanation

The settings and their characteristics are given below. Select a setting which is suitable for the application in question.

Search precision settings and their characteristics

Setting	Characteristics
Standard	Gives priority to the search speed, resulting in reduced precision.
High precision	Gives priority to the search precision, resulting in slower searches.

Settings

Standard : Specifies a "standard precision" search.

High precision : Specifies a "high precision" search.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Reduction weight		Input range	Default setting	Units
SCARA Vision Studio display	Reduction weight (%)	0 to 1000	2	%

Function

Specifies the score reduction which is used for search if an edge is detected in the reduction area of a registered workpiece model.

Explanation

The score is reduced if an edge is detected in the reduction area. Changing this parameter setting adjusts the score reduction.

If an edge is detected in the reduction area, then the score is calculated as follows:

$$\text{Score} = \frac{(\text{Number of matched edge points} - \text{Number of edge points in reduction area} \times \text{Reduction weight})}{\text{Number of edge points of registered workpiece model}} \times 100$$

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Edge Polarity		Input range	Default setting	Units
SCARA Vision Studio display	Edge Polarity	Normal / Reverse / Mix	Normal	—

Function

Specifies the contrast polarity of the image to be detected when searching for registered workpiece models.

Explanation

If the background of a model registration workpiece varies greatly, changing this parameter setting makes an improvement. For example, when this parameter is set to "Normal", a gray colored workpiece registered on a white background (lower left figure) is not found on a black background (lower right figure). In this case, setting this parameter to "Reverse" or "Mix" allows the gray colored workpiece to be found on the black background (lower right figure). If the background color is not uniform, use "Mix". The workpiece will be found stably.

(When set to "Reverse", the gray colored workpiece cannot be found on the white background (lower left figure).

Gray colored workpiece on white background

Gray colored workpiece on black background

Settings

Normal : Detects the image contrast that is the same as the registered workpiece model.

Reverse : Detects the image contrast that is the reverse of registered workpiece model.

Mix : Detects the image contrast that is the same as the registered workpiece model and also detects the image contrast that is the reverse of the registered workpiece model.

Parameter setting procedure

This parameter setting is specified at SCARA Vision Studio. For the setting procedure, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

6. Calibration settings

A "calibration" refers to the process in which the coordinates (camera coordinates) of the image acquired by the camera are aligned with the robot coordinates.

This section explains the setting procedures for camera calibration and conveyor calibration.
A camera calibration is required the first time the SCARA Vision system is used, and when the camera and robot positional relationship has been changed (due to a camera positional deviation, etc.). A conveyor calibration is required when the conveyor tracking function is used, and when a positional relationship change occurs between the conveyor, camera, and robot.

6.1 Camera calibration setting

A camera calibration is required the first time the SCARA Vision system is used, and when the camera and robot positional relationship has been changed (due to a camera positional deviation, etc.).

6.1.1 Interactive camera calibration setting method

The interactive camera calibration setting method is given below.

1 ***Register 2 fiducial marks at SCARA Vision Studio.***

For details concerning how to register fiducial marks at SCARA Vision Studio, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5 "Registering fiducial marks".

NOTE

The two fiducial marks to be registered must have different shapes.

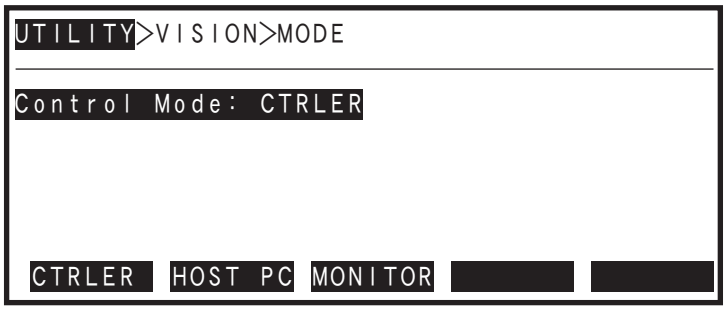
2 ***Verify the vision control mode setting.***

Select "UTILITY>VISION>MODE", then verify the vision control mode setting.
The camera calibration is only possible in the "CTRLER" or "MONITOR" mode. However, when the calibration setting is made with the SCARA Vision Studio monitor function at Step 10, the "MONITOR" mode must be selected.
If the vision control mode is not set to the "CTRLER" or "MONITOR" mode, change the vision control mode setting. For details concerning how to change the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode".

NOTE

When making the calibration setting with the SCARA Vision Studio monitor function, you must set the vision control mode to the "MONITOR" mode. If the vision control mode is not set to the "MONITOR" mode, you cannot use the SCARA Vision Studio monitor function.

"UTILITY>VISION>MODE" screen

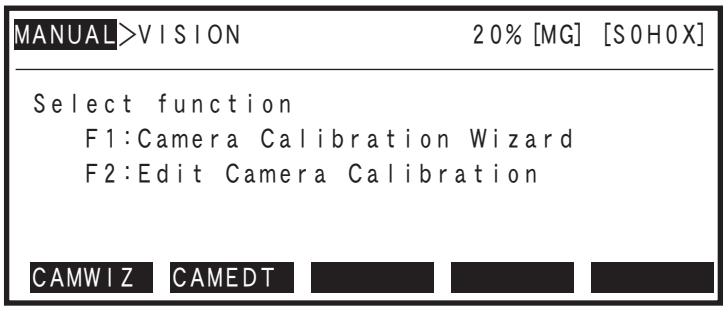


3 ***Select the "MANUAL>VISION" mode.***

4 ***Press*** F 1 ***(CAMWIZ).***

The interactive camera calibration setting operation begins.

Interactive camera calibration setting begins



NOTE

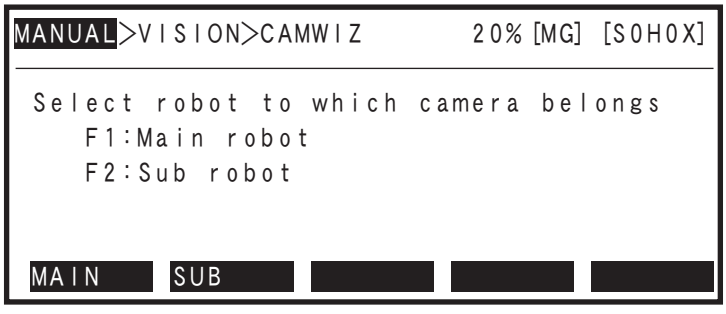
If neither the "CTRLER" or "MONITOR" mode was selected as the vision control mode at Step 2 above, a message displays prompting a control mode change. Press F 4 (YES) to change to the control mode, or press F 5 (NO) if the mode is not be changed. If F 4 (YES) is pressed, the vision control mode changes to the "CTRLER" mode.

5 ***Select the robot to which the camera is associated.***

Press F 1 (MAIN) if the camera is associated with the main robot, or press F 2 (SUB) if associated with the sub robot*.

*Sub robot not used in OMRON version

Selecting the robot to which the camera is associated



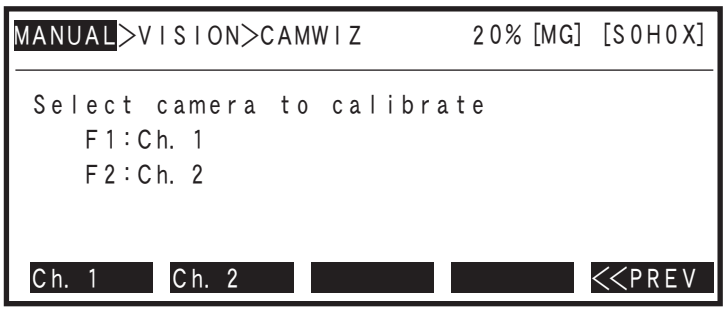
6 ***Select the camera to be calibrated.***

Press [F 1] (Ch.1) if camera channel 1 is to be calibrated.

Press [F 2] (Ch.2) if camera channel 2 is to be calibrated.

Press [F 5] (<<PREV) to return to the previous step (Step 5).

Selecting the camera to be calibrated



7 ***Select the calibration number.***

Use the [F 1] (CALIB0) to [F 4] (CALIB3) keys to select the registration number of the calibration setting.

Press [F 5] (<<PREV) to return to the previous step (Step 6).

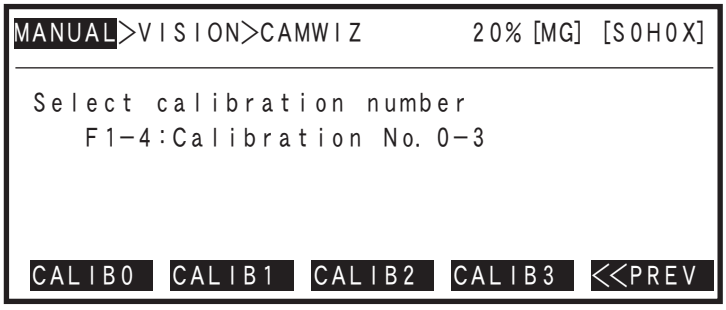
NOTE

The calibration number used at the camera calibration is also used at the conveyor calibration.

MEMO

For robot languages commands such as "VSEARCH", etc., where the calibration number must be specified, the calibration number (0 to 3) selected here is specified in that language command.

Selecting the calibration number



8 ***Select the camera installation method.***

Press F 1 (2ND ARM) if the camera is to be installed on the SCARA robot or the Y-axis or Z-axis of the Cartesian coordinate system.

Press F 3 (DOWNWRD) if a fixed camera pointing downward is to be used.

Press F 4 (UPWRD) if a fixed camera pointing upward is to be used.

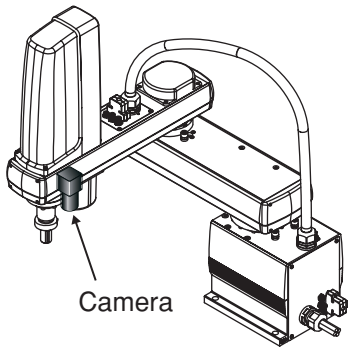
Press F 5 (<<PREV) to return to the previous step (Step 7).

NOTE

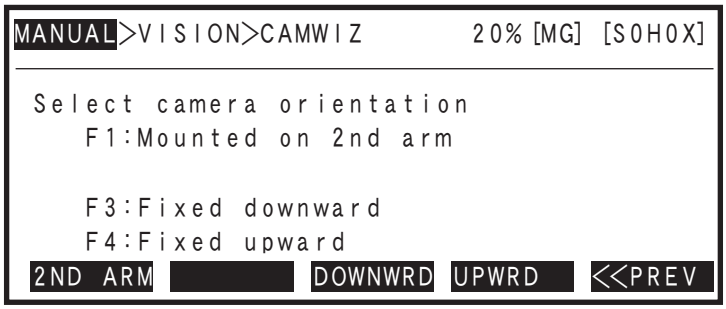
When installing the camera on the robot, do not install it on the rotating part, such as R-axis shaft or on the X-axis.

Example of camera installation

When the camera is to be installed on the Y-axis or Z-axis of the robot, press F 1 (2ND ARM).



Selecting the camera setting method



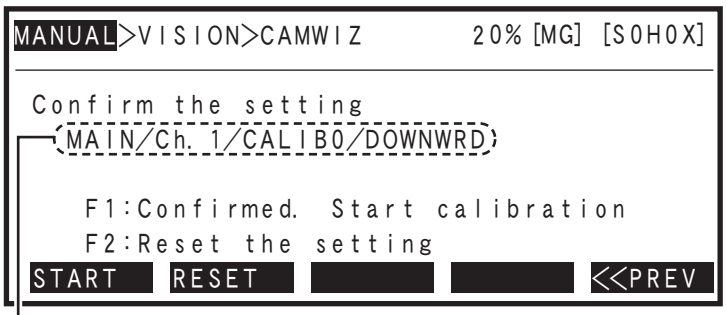
9 ***Verify the setting content up to Step 8.***

The setting content up to Step 8 displays for verification. If all the settings are OK, press F 1 (START) to begin the calibration.

If a setting must be corrected, press F 2 (RESET) to re-specify the setting from Step 5.

Press F 5 (<<PREV) to return to the previous step (Step 8).

Verifying the setting content



Applicable robot / camera channel number / calibration number / camera installation method

10 ***Place 2 fiducial marks within the camera's field of view so that they are as apart from each other as possible. If the fiducial marks are detected, press*** ⇒.

Place 2 fiducial marks (fiducial marks 0 and 1) within the camera's field of view so that they are as apart from each other as possible. However, when placing the fiducial marks, do not put them at 4 corners of the camera's field of view.

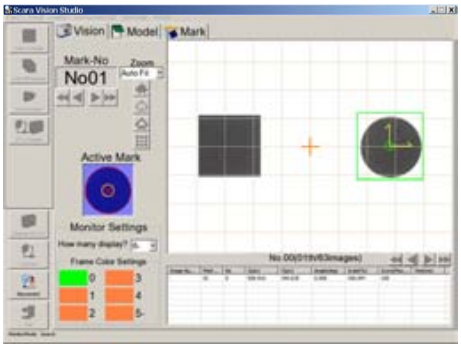
A fiducial mark search begins when 2 fiducial marks are placed within the camera's field of view.

When fiducial mark 0 is detected, the "Mrk0" display content at the PB screen changes from "---" to "+++". If the "Mrk0" display content remains as "---", this indicates that fiducial mark 0 has not been detected.

In the same manner, the "Mrk1" display content at the PB screen changes from "---" to "+++" when fiducial mark 1 is detected. If the "Mrk1" display content remains as "---", this indicates that fiducial mark 1 has not been detected.

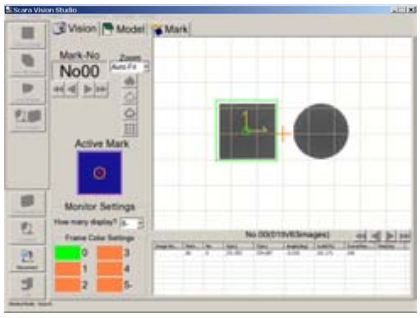
When both the Mrk0 and Mrk1 displays have changed to "+++", press ⇒.

OK example

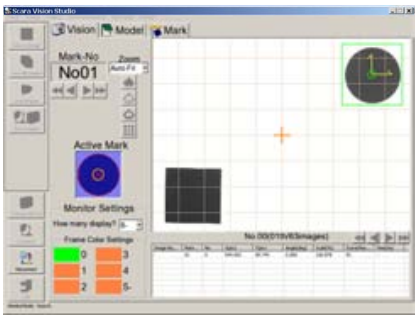


NG example

①



②



1- The fiducial marks are close to each other.
If the fiducial marks are close to each other, the accuracy of the coordinate conversion lowers. Place the fiducial marks so that they are as apart from each other as possible.

2- The fiducial marks are put at 4 corners of the camera's field of view.
If the fiducial marks are put at 4 corners of the camera's field of view, the fiducial mark image may become distorted depending on the type of lens to be used. Do not place the fiducial marks at 4 corners of the camera's field of view.

NOTE

- The SCARA Vision Studio monitor function can be used to check the fiducial mark search status during the calibration setting operation.
- An error occurs if is pressed when either the Mrk0 or Mrk1 display status is "---".
- If a fiducial mark is not detected, revise the parameter settings (edge settings, search settings, search range) in SCARA Vision Studio's fiducial mark mode. For details regarding setting values and setting procedures, refer to Chapter 5, section 5.5 "Fiducial mark mode parameter settings". Also refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Fiducial mark placement and detection

```
MANUAL>VISION>CAMWIZ          20% [MG]  [S0H0X]
                x          y          z          r
 Place 2 marks within FOV and press
 ENTER key
   Mrk0: +++   Mrk1: ---

[POS]      0.00       0.00       0.00       0.00
                                  VEL+       VEL-
```

11 ***Move the applicable robot to the fiducial mark 0 position, then press*** .

Move the applicable robot's tip to the fiducial mark 0 position, then press .

Move the robot tip by using the Jog keys, or press the PB [Emergency Stop] switch, then move the robot by hand.

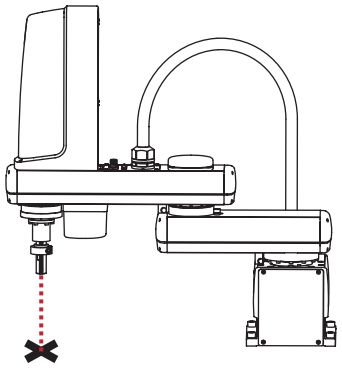
The Mrk0 robot tip position (XY coordinates) is set when is pressed.

WARNING

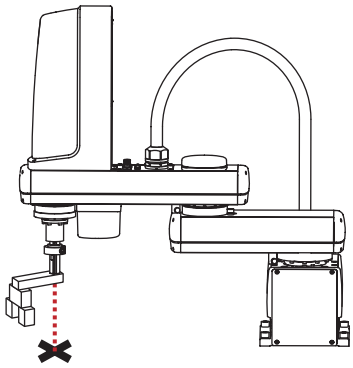
- ROBOT MOTION OCCURS WHEN THE JOG KEYS ARE USED. THIS MOTION CAN BE HAZARDOUS, AND ENTRY INTO THE ROBOT MOTION RANGE MUST THEREFORE BE PROHIBITED AT THIS TIME.
- BE SURE TO PRESS THE PB [EMERGENCY STOP] BUTTON BEFORE ATTEMPTING TO MOVE THE ROBOT BY HAND. SERVOS ARE MECHANICALLY DISABLED WHEN THE [EMERGENCY STOP] BUTTON IS PRESSED.

For SCARA robots

The center of the rotation axis becomes the top end of the robot.
Adjust the center of the rotation axis to the fiducial mark 0 even when the tool which has been offset is attached to the top end of the rotation axis. At this time, set the hand definition to the non-hand setting.



Example ① of robot with rotation axis



Example ② of robot with rotation axis

NOTE

When using the hand definition for the actual operation after the calibration of the robot without rotation axis has been completed, set the hand definition as follows.

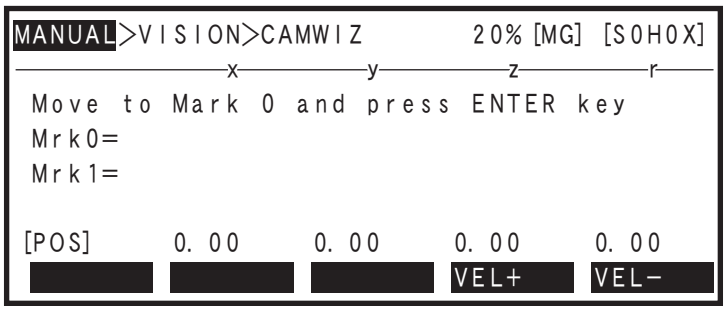
- Set “non-hand” for the hand (tool), which has been moved to the fiducial mark position during calibration.
- If multiple hands exists, set a hand other than the hand, which has been moved to the fiducial mark position during calibration, using the hand definition based on the hand moved to the fiducial mark.

NOTE

- When teaching the "fiducial mark 0" (Mrk0) robot tip position coordinates, the setting is registered in "mm" units even if entered in "pulse" units (pulse-to-mm conversion occurs).
- Use the following function keys to change the robot's manual movement velocity at Jog key operation:

  F 4 (VEL+), F 5 (VEL-), F 9 (VEL++), F 10 (VEL--).

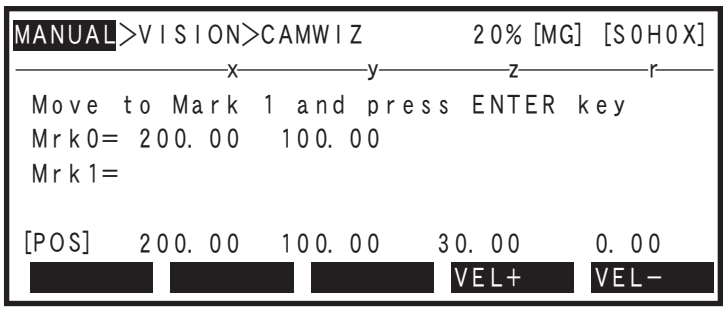
Moving to fiducial mark 0 (with a one-robot setting)



12 ***Move the applicable robot to the fiducial mark 1 position, then press , in the same manner as at Step 11.***

Move the applicable robot's tip to the fiducial mark1 position, then press .

Moving to fiducial mark 1 (with a one-robot setting)

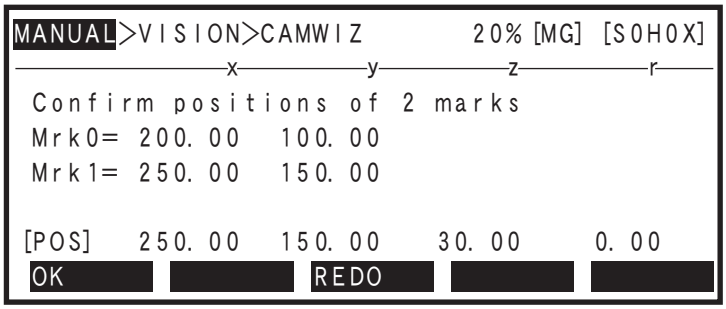


13 ***Verify that the two fiducial mark positions are OK, then press*** F 1 ***(OK).***

Verify that the robot coordinate data is OK for the Step 11 and Step 12 fiducial mark 0 and 1 positions, then press F 1 (OK).

To re-teach the fiducial mark's robot coordinate data, press F 3 (REDO). Processing then returns to Step 11.

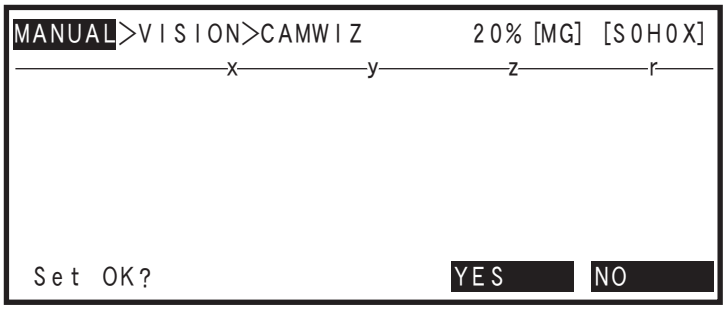
Verifying the fiducial mark positions



14 ***Press*** F 1 ***(YES) to register the camera calibration settings.***

When the "Set OK?" confirmation message displays at the bottom of the PB screen, press F 1 (YES) to register the camera calibration settings. To abort the camera calibration settings, press F 2 (NO).

Registering the camera calibration settings



6.2 Conveyor calibration settings

The conveyor calibration settings must be specified before using the conveyor tracking function, and when a positional relationship change occurs between the conveyor, camera, and robot.

6.2.1 Interactive conveyor calibration setting method

The interactive conveyor calibration setting method is given below.

1 ***Register 2 fiducial marks at SCARA Vision Studio.***

For details concerning how to register fiducial marks at SCARA Vision Studio, refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5 "Registering fiducial marks".

NOTE

The two fiducial marks to be registered must have different shapes.

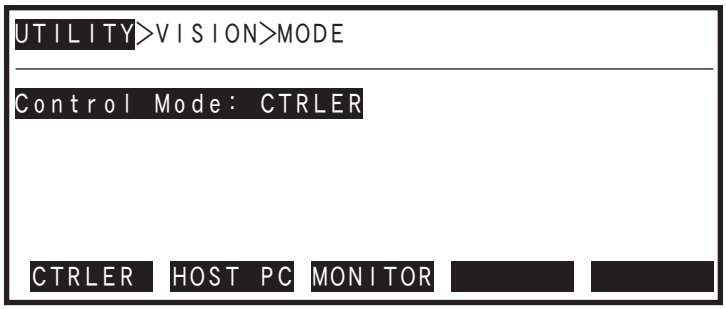
2 ***Verify the vision control mode setting.***

Select "UTILITY>VISION>MODE", then verify the vision control mode setting.
The conveyor calibration is only possible in the "CTRLER" or "MONITOR" mode. However, when the calibration setting is made with the SCARA Vision Studio monitor function at Step 11, the "MONITOR" mode must be selected.
If the vision control mode is not set to the "CTRLER" or "MONITOR" mode, change the vision control mode setting. For details concerning how to change the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode".

NOTE

When making the calibration setting with the SCARA Vision Studio monitor function, you must set the vision control mode to the "MONITOR" mode. If the vision control mode is not set to the "MONITOR" mode, you cannot use the SCARA Vision Studio monitor function.

"UTILITY>VISION>MODE" screen

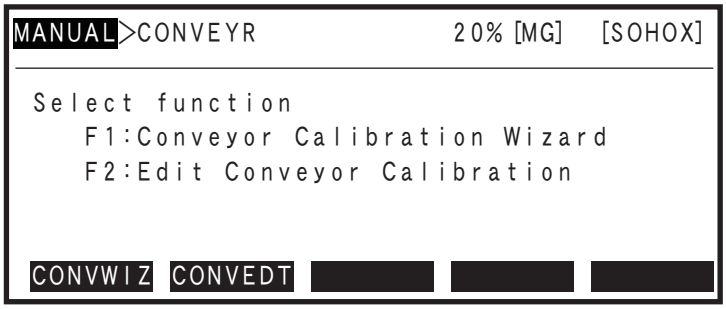


3 ***Select the "MANUAL>CONVEYR" mode.***

4 ***Press*** [F 1] ***(CONVWIZ).***

The interactive conveyor calibration setting operation begins.

Interactive conveyor calibration setting begins



NOTE

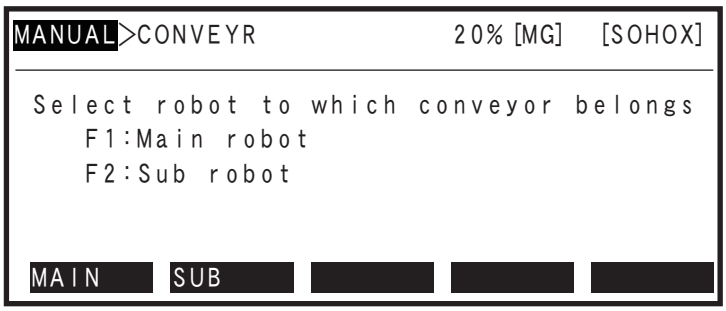
If neither the "CTRLER" or "MONITOR" mode was selected as the vision control mode at Step 2 above, a message displays prompting a control mode change. Press [F 4] (YES) to change to the control mode, or press [F 5] (NO) if the mode is not be changed. If [F 4] (YES) is pressed, the vision control mode changes to the "CTRLER" mode.

5 ***Select the robot to which the conveyor is associated.***

Press [F 1] (MAIN) if the conveyor is associated with the main robot, or press [F 2] (SUB) if associated with the sub robot*.

*Sub robot not used in OMRON version.

Selecting the robot to which the conveyor is associated



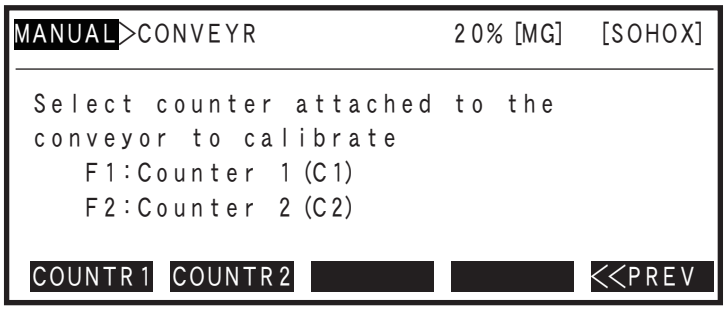
6 ***Select the number of the counter installed at the conveyor where the calibration is to occur.***

To select counter 1 (C1), press [F 1] (COUNTR1)

To select counter 2 (C2), press [F 2] (COUNTR2)

Press [F 5] (<<PREV) to return to the previous step (Step 5).

Selecting the number of the counter installed at the conveyor



7 ***Select the camera to be calibrated.***

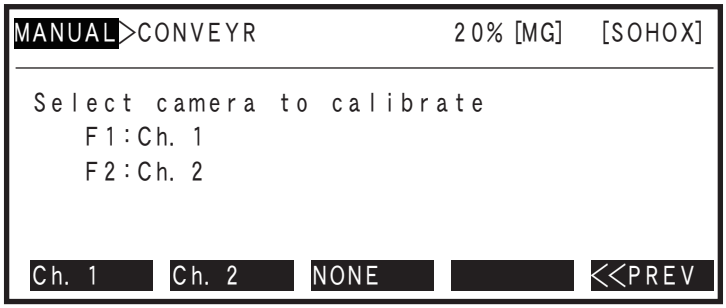
Press F 1 (Ch.1) if camera channel 1 is to be calibrated.

Press F 2 (Ch.2) if camera channel 2 is to be calibrated.

Press F 3 (NONE) if a camera is not to be used.

Press F 5 (<<PREV) to return to the previous step (Step 6).

Selecting the camera to be calibrated



8 ***Select the calibration number.***

Use the F 1 (CALIB0) to F 4 (CALIB3) keys to select the registration number of the calibration setting.

Press F 5 (<<PREV) to return to the previous step (Step 7).

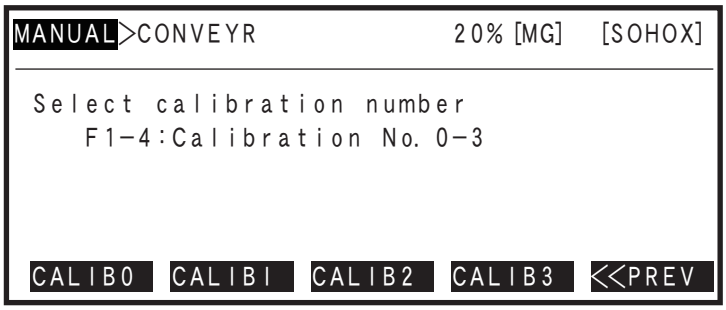
NOTE

The calibration number used at the camera calibration is also used at the conveyor calibration.

MEMO

For robot languages commands such as "VSEARCH", etc., where the calibration number must be specified, the calibration number (0 to 3) selected here is specified in that language command.

Selecting the calibration number



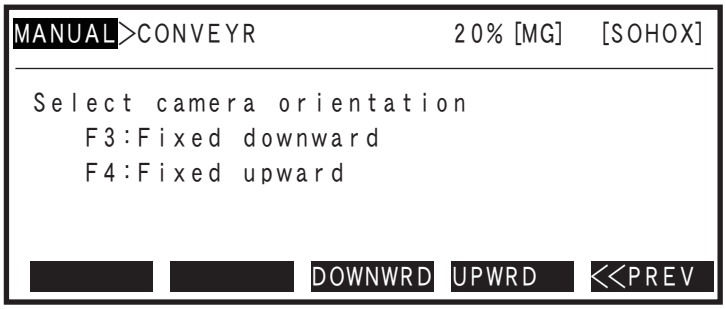
9 ***Select the camera installation method.***

Press F 3 (DOWNWRD) if a fixed camera pointing downward is to be used.

Press F 4 (UPWRD) if a fixed camera pointing upward is to be used.

Press F 5 (<<PREV) to return to the previous step (Step 8).

Selecting the camera setting method



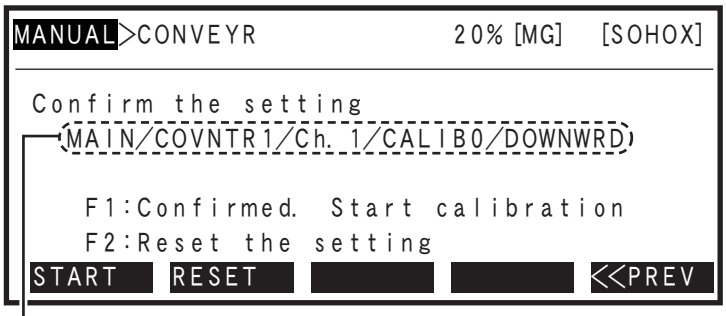
10 ***Verify the setting content up to Step 9.***

The setting content up to Step 9 displays for verification. If all the settings are OK, press F 1 (START) to begin the calibration.

If a setting must be corrected, press F 2 (RESET) to re-specify the setting from Step 5.

Press F 5 (<<PREV) to return to the previous step (Step 9).

Verifying the setting content



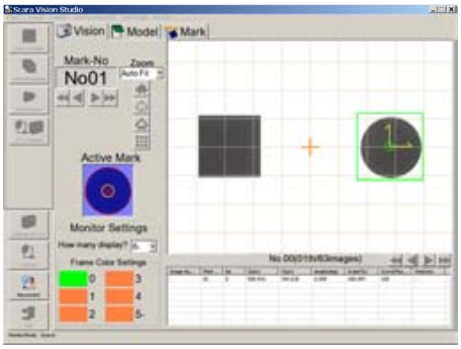
Applicable robot / counter number / camera channel number
calibration number / camera installation method

11 ***Place 2 fiducial marks within the camera's field of view so that they are as apart from each other as possible. If the fiducial marks are detected, press*** .

Place 2 fiducial marks (fiducial marks 0 and 1) within the camera's field of view so that they are as apart from each other as possible. However, when placing the fiducial marks, do not put them at 4 corners of the camera's field of view.
A fiducial mark search begins when 2 fiducial marks are placed within the camera's field of view.
When fiducial mark 0 is detected, the "Mrk0" display content at the PB screen changes from "---" to "+++". If the "Mrk0" display content remains as "---", this indicates that fiducial mark 0 has not been detected.
In the same manner, the "Mrk1" display content at the PB screen changes from "---" to "+++" when fiducial mark 1 is detected. If the "Mrk1" display content remains as "---", this indicates that fiducial mark 1 has not been detected.

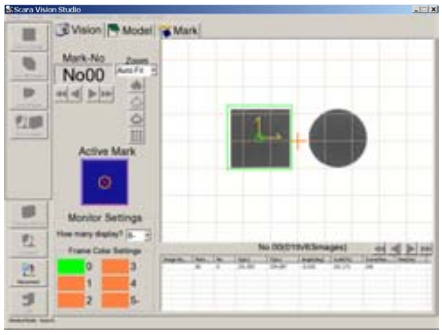
When both the Mrk0 and Mrk1 displays have changed to "+++", press .

OK example

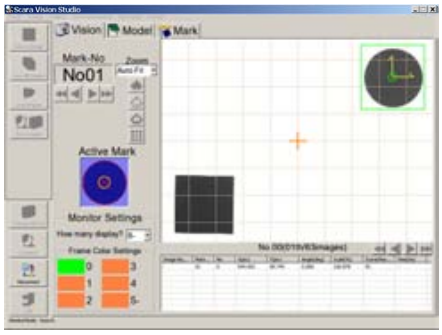


NG example

①



②



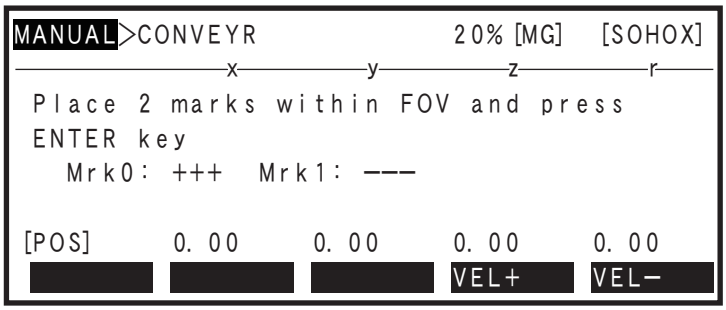
1- The fiducial marks are close to each other.
If the fiducial marks are close to each other, the accuracy of the coordinate conversion lowers. Place the fiducial marks so that hey are as apart from each other as possible.

2- The fiducial marks are put at 4 corners of the camera's field of view.
If the fiducial marks are put at 4 corners of the camera's field of view, the fiducial mark image may become distorted depending on the type of lens to be used. Do not place the fiducial marks at 4 corners of the camera's field of view.

NOTE

- The SCARA Vision Studio monitor function can be used to check the fiducial mark search status during the calibration setting operation.
- An error occurs if [→] is pressed when either the Mrk0 or Mrk1 display status is "---".
- If a fiducial mark is not detected, revise the parameter settings (edge settings, search settings, search range) in SCARA Vision Studio's fiducial mark mode. For details regarding setting values and setting procedures, refer to Chapter 5, section 5.5 "Fiducial mark mode parameter settings". Also refer to the "SCARA Vision Studio OPERATION SECTION", Chapter 7, section 7.5.2 "Parameter settings".

Fiducial mark placement and detection



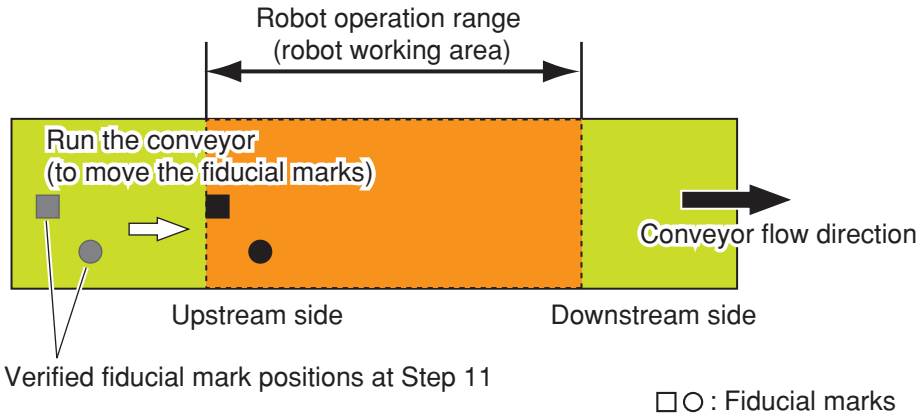
12 ***Move the fiducial marks to the upstream limit of the robot operation range, then press [→].***

Run the conveyor to move the fiducial marks to the upstream limit of the robot operation range, then press [→].

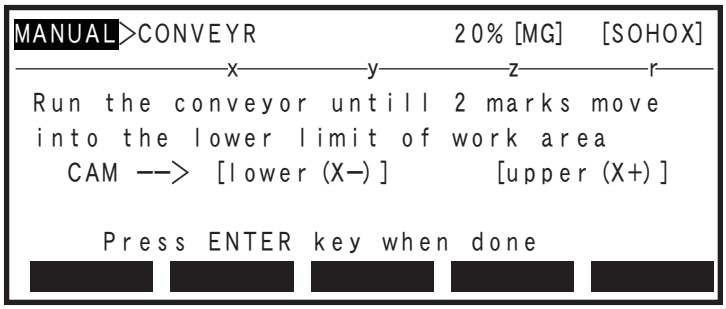
NOTE

- When moving the fiducial marks to the upstream limit of the robot operation range, be sure that both marks are within the robot's operation range.
- Move one of the fiducial marks to the upstream limit position of the robot operation range.

Specifying the upstream position of the robot operation range (1)



Specifying the upstream position of the robot operation range (2)



MEMO

At the PB, the conveyor's upstream position of the robot operation range represents the lower limit of the robot working area based on the robot's reference coordinates.

13 ***Move the applicable robot to the fiducial mark 0 position, then press*** .

Move the applicable robot's tip to the fiducial mark 0 position, then press .

Move the robot tip by using the Jog keys, or press the PB [Emergency Stop] switch, then move the robot by hand.

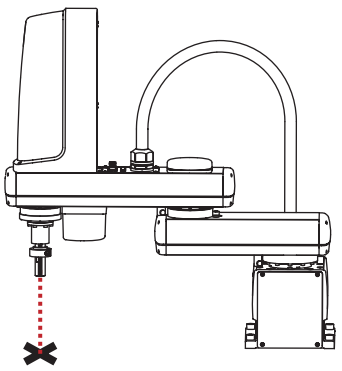
The Mrk0 robot tip position (XY coordinates) is set when is pressed.

WARNING

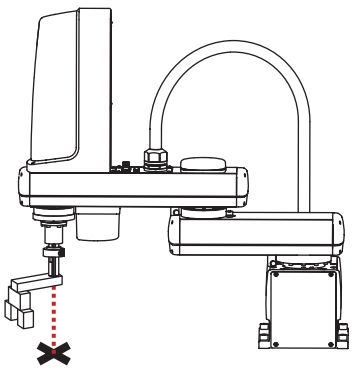
- ROBOT MOTION OCCURS WHEN THE JOG KEYS ARE USED. THIS MOTION CAN BE HAZARDOUS, AND ENTRY INTO THE ROBOT MOTION RANGE MUST THEREFORE BE PROHIBITED AT THIS TIME.
- BE SURE TO PRESS THE PB [EMERGENCY STOP] BUTTON BEFORE ATTEMPTING TO MOVE THE ROBOT BY HAND. SERVOS ARE MECHANICALLY DISABLED WHEN THE [EMERGENCY STOP] BUTTON IS PRESSED.

For SCARA robots

The center of the rotation axis becomes the top end of the robot.
Adjust the center of the rotation axis to the fiducial mark 0 even when the tool which has been offset is attached to the top end of the rotation axis. At this time, set the hand definition to the non-hand setting.



Example of robot with rotation axis



Example of robot with a tool that is offset from the rotation axis

NOTE

When using the hand definition for the actual operation after the calibration of the robot without rotation axis has been completed, set the hand definition as follows.

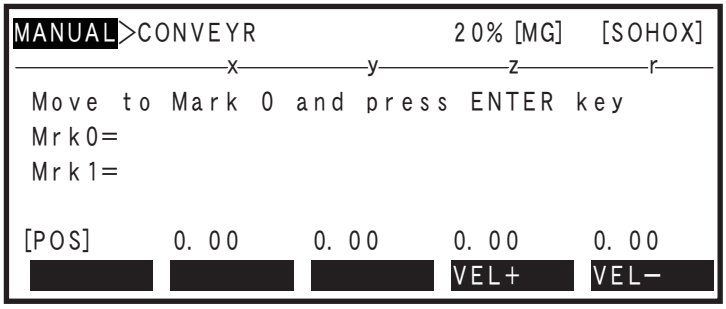
- Set “non-hand” for the hand (tool), which has been moved to the fiducial mark position during calibration.
- If multiple hands exists, set a hand other than the hand, which has been moved to the fiducial mark position during calibration, using the hand definition based on the hand moved to the fiducial mark.

NOTE

- When teaching the "fiducial mark 0" (Mrk0) robot tip position coordinates, the setting is registered in "mm" units even if entered in "pulse" units (pulse-to-mm conversion occurs).
- Use the following function keys to change the robot's manual movement velocity at Jog key operation:

  F 4 (VEL+), F 5 (VEL-), F 9 (VEL++), F 10 (VEL--).

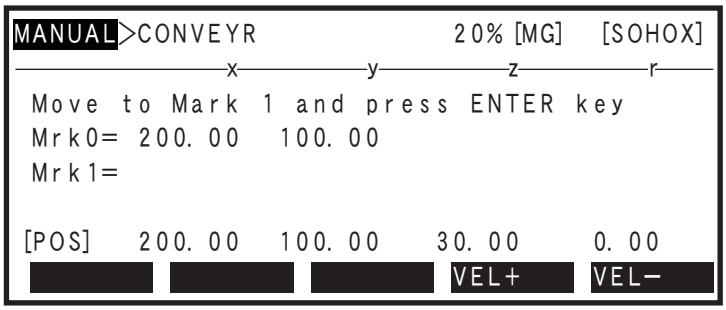
Moving to fiducial mark 0 (with a one-robot setting)



14 ***Move the applicable robot to the fiducial mark 1 position, then press , in the same manner as at Step 13.***

Move the applicable robot's tip to the fiducial mark1 position, then press .

Moving to fiducial mark 1 (with a one-robot setting)

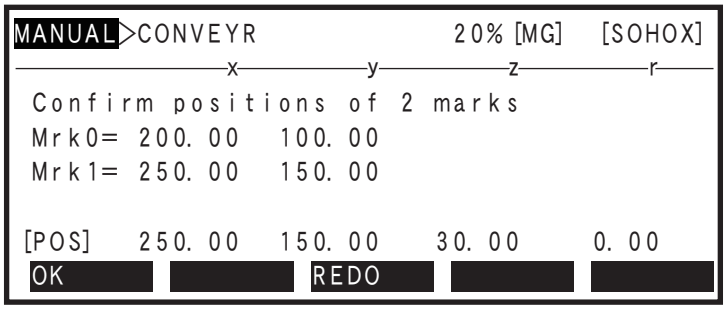


15 ***Verify that the two fiducial mark positions are OK, then press*** F 1 ***(OK).***

Verify that the robot coordinate data is OK for the Step 13 and Step 14 fiducial mark 0 and 1 positions, then press F 1 (OK).

To re-teach the fiducial mark's robot coordinate data, press F 3 (REDO). Processing then returns to Step 13

Verifying the fiducial mark positions



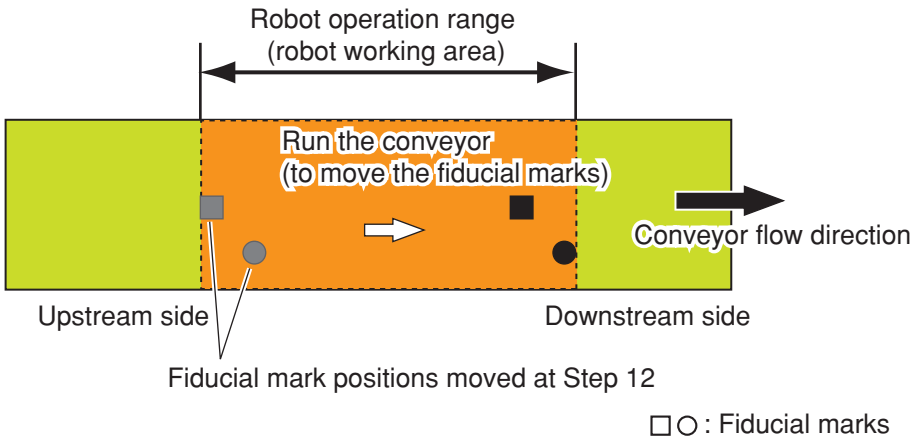
16 ***Move the fiducial marks to the downstream limit of the robot operation range, then press*** .

Run the conveyor to move the fiducial marks to the downstream limit of the robot operation range, then press .

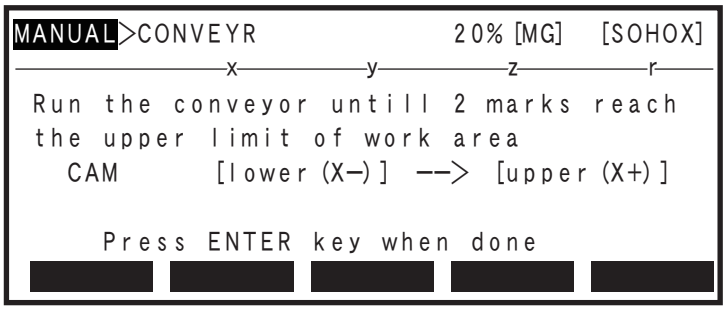
NOTE

- When moving the fiducial marks to the downstream limit of the robot operation range, be sure that both marks are within the robot's operation range.
- Move one of the fiducial marks to the downstream limit position of the robot operation range.

Specifying the downstream position of the robot operation range (1)



Specifying the downstream position of the robot operation range (2)



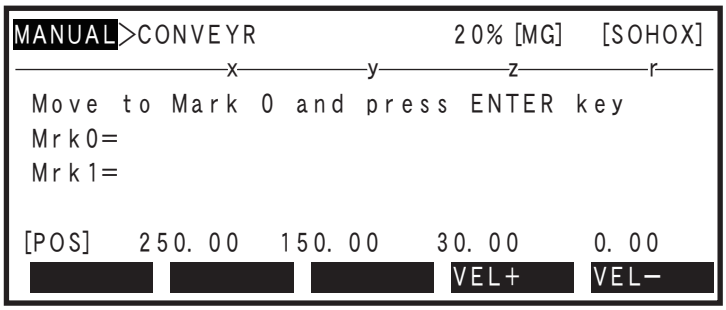
MEMO

At the PB, the conveyor's downstream position of the robot operation range represents the upper limit of the robot working area based on the robot's reference coordinates.

17 ***Move the applicable robot to the fiducial mark 0 position, then press , in the same manner as at Step 13.***

Move the applicable robot's tip to the fiducial mark 0 position, then press .

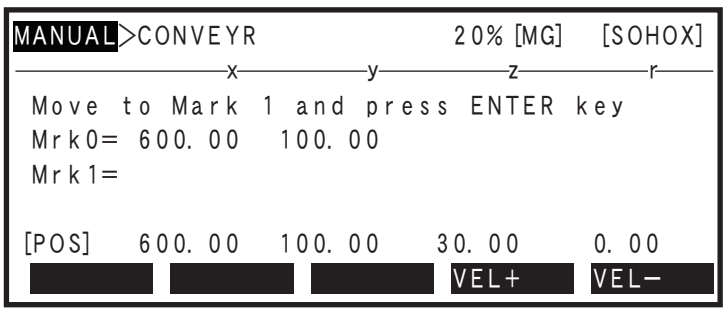
Moving to fiducial mark 0 (with a one-robot setting)



18 ***Move the applicable robot to the fiducial mark 1 position, then press , in the same manner as at Step 14.***

Move the applicable robot's tip to the fiducial mark 1 position, then press .

Moving to fiducial mark 1 (with a one-robot setting)

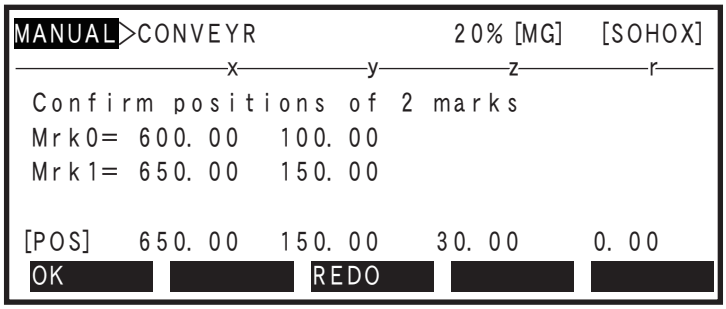


19 ***Verify that the two fiducial mark positions are OK, then press*** F 1 ***(OK).***

Verify that the robot coordinate data is OK for the Step 17 and Step 18 fiducial mark 0 and 1 positions, then press F 1 (OK).

To re-teach the fiducial mark's robot coordinate data, press F 3 (REDO). Processing then returns to Step 17.

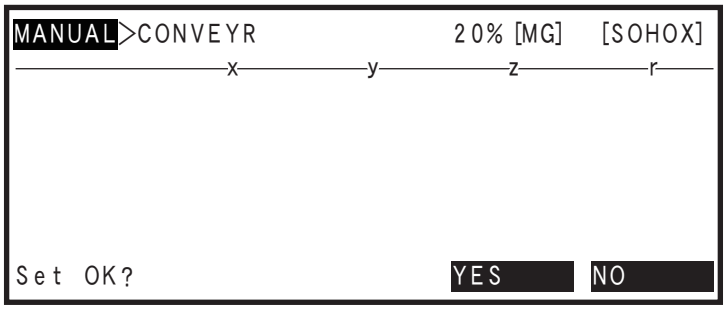
Verifying the fiducial mark positions



20 ***Press*** F 1 ***(YES) to register the conveyor calibration settings.***

When the "Set OK?" confirmation message displays at the bottom of the PB screen, press F 1 (YES) to register the conveyor calibration settings. To abort the conveyor calibration settings, press F 2 (NO).

Registering the conveyor calibration settings



7. Robot language commands

This section explains the SCARA Vision system's dedicated robot language commands.
Refer to the OMRON Robot Controller YRC Series Programming Manual for robot language information beyond basic items such as the robot language command statement format, variables, and constants.
Always refer to the above programming manual when performing programming operations.

Although the language command formats which appear in this manual differ from those in the OMRON Robot Controller YRC Series Programming Manual, these differences are restricted to the expressions which appear in the explanations. The methods for using the robot language commands themselves are the same.

[Example] YRC Series Programming Manual: ACCEL (<expression 1>) = (<expression 2>)
This manual: VCOMPLVL (<model number>) = (<setting value>)

7.1 Robot language command list

Reading the table

- "Executable condition" numerals denote the following condition numbers.
  - Condition 1: Command which can be executed both directly and online.
  - Condition 2: Command to which condition 1 applies, and which can be executed only for Task 1 (main task).
  - Condition 3: Command to which condition 1 applies, and which has an operand which cannot be executed in certain direct and online commands.
  - Condition 4: Command to which condition 5 applies, and in which the STOPON option cannot be executed in direct and online commands.
  - Condition 5: Command to which condition 1 applies, and which is executed after positioning is completed.
  - Condition 6: Command which cannot be executed directly or online commands.

7.1.1 Vision processing related language commands

■ **Image recognition processing**

Language command	Type	Function / Format	Executable condition
VCAPTURE	Command	The memory acquires the image from the camera. VCAPTURE <camera number> [, <memory number> [, <calibration number>]]	6
VSAVEIMG	Command	Saves the memory image in a BMP format. VSAVEIMG <memory number>, <file name>	6
VSEARCH	Command	Searches the camera images for a specific workpiece model number. VSEARCH <camera number>, <model number> [, <calibration number>]	6
VSEARCHM	Command	Searches the memory images for a specific workpiece model number. VSEARCHM <memory number>, <model number> [, <search method number>]	6
VSEARCHR	Command	Performs a rough search of camera images for a specific workpiece model number. VSEARCHR <memory number>, <model number> [, <calibration number>]	6
VSEARCHS	Command	Performs a single item search of camera images for a specific workpiece model number. VSEARCHS <memory number>, <model number> [, <calibration number>]	6

■ **Obtaining search results**

Language command	Type	Function / Format	Executable condition
VGETCNT	Function	Obtains the number of items detected by the search. VGETCNT	—
VGETPIX	Function	Obtains the specified array element number's pixel data in point data format from the search result array following a search. VGETPIX (<array element number>)	—
VGETPOS	Function	Obtains the specified array element number's point data from the search result array following a search. VGETPOS (<array element number>)	—
VGETPOSX	Function	Obtains the X coordinate of the specified array element number's point data from the search result array following a search. VGETPOSX (<array element number>)	—
VGETPOSY	Function	Obtains the Y coordinate of the specified array element number's point data from the search result array following a search. VGETPOSY (<array element number>)	—
VGETSCLE	Function	Obtains the specified array element number's scale data from the search result array following a search. VGETSCLE (<array element number>)	—
VGETSCR	Function	Obtains the specified array element number's score data from the search result array following a search. VGETSCR (<array element number>)	—
VGETTIME	Function	Obtains the time (ms) which was required to execute the search command following a search. VGETTIME	—

■ **Condition changes / parameter changes**

Language command	Type	Function / Format	Executable condition
VCOMPLVL	Command	Changes the search settings "compression rate" parameter for the specified workpiece model number. VCOMPLVL (<model number>) = (setting value)	6
VCONTRST	Command	Changes the edge settings "minimum contrast" parameter for the specified workpiece model number. VCONTRST (<model number>) = (setting value)	6
VEDGTHRS	Command	Changes the edge settings "edge strength" parameter for the specified workpiece model number. VEDGTHRS (<model number>) = (setting value)	6
VERRANGE	Command	Changes the search settings "error range" parameter for the specified workpiece model number. VERRANGE (<model number>) = (setting value)	6
VFLTRSIZ	Command	Changes the edge settings "filter size" parameter for the specified workpiece model number. VFLTRSIZ (<model number>) = (setting value)	6
VFLTRTYP	Command	Changes the edge settings "filter" parameter for the specified workpiece model number. VFLTRTYP (<model number>) = (<filter number>)	6
VMAXANGL	Command	Changes the search settings "END angle" parameter for the specified workpiece model number. VMAXANGL (<model number>) = (setting value)	6

Language command	Type	Function / Format	Executable condition
VMAXNUM	Command	Changes the search settings " detected workpieces quantity" parameter for the specified workpiece model number. VMAXNUM (<model number>) = (setting value)	6
VMINANGL	Command	Changes the search settings "START angle" parameter for the specified workpiece model number. VMINANGL (<model number>) = (setting value)	6
VMONITOR	Command	Switches the monitor mode on and off. VMONITOR |ON OFF|	6
VPRECMOD	Command	Changes the search settings "precision" parameter for the specified workpiece model number. VPRECMOD (<model number>) = (setting value)	6
VSELCAM	Command	Switches the camera channel. VSELCAM <camera number>	6
VSETCALB	Command	Specifies the calibration data for coordinate conversions. VSETCALB <camera number>, <calibration number>	6
VSETSORT	Command	Specifies the search result array sorting method. VSETSORT <sort method number>	6
VTHRESH1	Command	Changes the search settings "score threshold 1" parameter for the specified workpiece model number. VTHRESH1 (<model number>) = (setting value)	6
VTHRESH2	Command	Changes the search settings "score threshold 2" parameter for the specified workpiece model number. VTHRESH2 (<model number>) = (setting value)	6
VTIMEOUT	Command	Changes the search settings "timeout" parameter for the specified workpiece model number. VTIMEOUT (<model number>) = (setting value)	6
VTRGTOUT	Command	Changes the trigger timeout parameter for the SCARA Vision board. VTRGTOUT = (setting value)	6

7.1.2 Lighting related language commands

Language command	Type	Function / Format	Executable condition
LCONTROL	Command	Turns the lighting control board and tracking board "lighting control" on and off. LCONTROL |ON OFF| [(<light number>)]	6
LCTRLMOD	Command	Changes the lighting control board and tracking board "control mode" (L1 / L2) parameter. Format 1: LCTRLMOD <mode number> Format 2: LCTRLMOD (<light number>) = <mode number>	6
LSTRBTIM	Command	Change the lighting control board and tracking board "strobe time" (L1 / L2) parameter. Format 1: LSTRBTIM <light emission time> Format 2: LSTRBTIM (<light number>) = <light emission time>	6
LVOLUME	Command	Changes the lighting control board and tracking board "lighting volume" (L1 / L2) parameter. Format 1: LVOLUME <lighting volume> Format 2: LVOLUME (<light number>) = <lighting volume>	6

7.1.3 Conveyor tracking related language commands

Language command	Type	Function / Format	Executable condition
CADDQUE	Command	Adds point data to the position monitoring array. CADDQUE <counter number>, <point data>	6
CCHKQUE	Function	Checks the position monitoring array's first point data position to see where it is located relative to the work area. CCHKQUE (<counter number>)	—
CCOND	Command	Changes VALID/INVALID of the tracking board counter condition (C1/C2). CCOND |ON / OFF| [(＜counter number＞)]	6
CGETPULS	Function	Obtains the conveyor's pulse value. CGETPULS (<counter number>)	—
CGETQUE	Function	Obtains the point data contained in the position monitoring array. CGETQUE (<counter number>, <array element number>)	—
CGETRATE	Function	Obtains the conveyor velocity (pulse / 10ms). CGETRATE (<counter number>)	—
CGETVELX	Function	Obtains the conveyor velocity (mm/10ms) in the X-direction of the robot's Cartesian coordinates. CGETVELX (<counter number>)	—
CGETVELY	Function	Obtains the conveyor velocity (mm/10ms) in the Y-direction of the robot's Cartesian coordinates. CGETVELY (<counter number>)	—
CQUECNT	Function	Obtains the number of data contained in the position monitoring array. CQUECNT (<counter number>)	—
CRMVQUE	Command	Deletes the position monitoring array's first point data. CRMVQUE (<counter number>)	6
CRSTPULS	Command	Resets the conveyor's pulse value. CRSTPULS (<counter number>)	6
CTCONTRL	Command	Switches the conveyor tracking function on and off. CTCONTRL |ON / OFF|	6
CTDRIVE	Command	Changes the follow-up height during conveyor follow-up operation which occurs relative to the main robot axis. CTDRIVE (<follow-up height> [,S=<axis movement velocity>]	6
CTMOVE	Command	Executes conveyor follow-up operation relative to the main robot axis. CTMOVE <counter number> [,Z = <follow-up height>]	6
CTRKLMT	Command	Changes the tracking limit (C1/C2) parameter for the tracking board. CTRKLMT (<counter numbert>) = <setting value>	6
CTVISION	Command	Switches the conveyor tracking camera function on and off. CTVISION |ON / OFF|	6
CVELCOEF	Command	Changes the conveyor speed coefficient (C1/C2) parameter for the tracking board. CVELCOEF (<counter numbert>) = <setting value>	6

7.2 Robot language command details

This section explains each of the robot language commands.

7.2.1 Vision processing related language commands

7.2.1.1 VCAPTURE

VCAPTURE	VCAPTURE <camera number> [, <memory number> [, <calibration number>]]
	The memory acquires the image from the camera.

Function

This command saves a camera-acquired image to the memory. The image is obtained from the specified camera channel number, and is saved to the specified memory number. The specified calibration number information is added to the image when it is saved. The added calibration number information is used when executing the VSEARCHM command.

Explanation

<Camera number>

Specifies the camera channel number from which the image is acquired. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

<Memory number>

Specifies the memory number to which the acquired image is saved. Only one number may be specified (0 to 63). The memory number can also be specified by a variable. If no memory number is specified, the system specifies "0" as the number.

Memory numbers are used in common, regardless of the camera channel number.

<Calibration number>

Specifies the calibration number used in search operations. Only one number may be specified (0 to 3). The calibration number can also be specified by a variable.

If no calibration number is specified, the calibration data specified at VSETCALB is used. If no calibration number is specified, and no calibration data has been specified at VSETCALB, a "no-calibration" setting is adopted

CAUTION

MEMORY NUMBER "0" IS ALSO USED BY VSEARCH, VSEARCHR, AND VSEARCHS. THEREFORE, IF ANY OF THE VSEARCH, VSEARCHR, VSEARCHS COMMANDS ARE EXECUTED AFTER AN IMAGE HAS BEEN SAVED TO MEMORY NUMBER "0" BY VCAPTURE, THAT IMAGE WILL BE OVERWRITTEN.

Statement examples

```
VCAPTURE 1          .....Acquires an image from the channel 1 camera. (The image is saved to
                         memory 0.)

VCAPTURE 2,1        .....Acquires an image from the channel 2 camera, and saves the image to memory 1.

VCAPTURE 1,2,3      .....Acquires an image from the channel 1 camera, and saves the image to
                         memory 2 with calibration 3 information added to it.

FOR A%=1 TO 3
  VCAPTURE 1,A%     .....Acquires an image from the channel 1 camera, and saves the image to
                         memory A% (1 to 3 in this case).
NEXT A%
```

7.2.1.2 VCOMPLVL

VCOMPLVL	VCOMPLVL (<model number>) = (setting value)
	Changes the search settings "compression rate" parameter for the specified workpiece model number.

Function

Changes the search settings "compression rate" for the specified workpiece model number. This "compression rate" parameter setting is changed for the specified model number when VCOMPLVL is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "compression rate" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "compression rate" value. The permissible setting range is 0 to 5. The "compression rate" value can also be specified by a variable.

Statement example

```
B%=30
C%=4
VCOMPLVL(B%)=C%      .....Changes the search settings "compression rate" to "4" for model
                          number 30.
```

7.2.1.3 VCONTRST

VCONTRST	VCONTRST (<model number>) = (setting value)
	Changes the edge settings "minimum contrast" parameter for the specified workpiece model number.

Function

Changes the edge settings "minimum contrast" for the specified workpiece model number. This "minimum contrast" parameter setting is changed for the specified model number when VCONTRST is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the edge settings "minimum contrast" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "minimum contrast" value. The permissible setting range is 0 to 255. The "minimum contrast" value can also be specified by a variable.

Statement example

```
B%=15
VCONTRST(3)=B%      .....Changes the edge settings "minimum contrast" to "15" for model number 3.
```

7.2.1.4 VEDGTHRS

VEDGTHRS	VEDGTHRS (<model number>) = (setting value)
	Changes the edge settings "edge strength" parameter for the specified workpiece model number.

Function

Changes the edge settings "edge strength" for the specified workpiece model number. This "edge strength" parameter setting is changed for the specified model number when VEDGTHRS is executed.

NOTE

- This language command is used only when the edge settings filter parameter setting has been specified as "correlated edge filter".
- Normally, the default "edge strength" setting should be used.

Explanation

<Model number>

Specifies the workpiece model number to which the edge settings "edge strength" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "edge strength" value. Although the permissible setting range is 0 to 255, a setting of "160" should normally be specified. The "edge strength" value can also be specified by a variable.

Statement example

```
B%=160
VEDGTHRS(5)=B%        .....Changes the edge settings "edge strength" to "160" for model number 5.
```

7.2.1.5 VERRANGE

VERRANGE	VERRANGE (<model number>) = (setting value)
	Changes the search settings "error range" parameter for the specified workpiece model number.

Function

Changes the search settings "error range" for the specified workpiece model number. This "error range" parameter setting is changed for the specified model number when VERRANGE is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "error range" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "error range" value. The permissible setting range is 0 to 5. The "error range" value can also be specified by a variable.

Statement example

```
B%=14
C%=0
VCOMPLVL(B%)=C%       .....Changes the search settings "error range" to "0" for model number 14.
```

7.2.1.6 VFLTRSIZ

VFLTRSIZ	VFLTRSIZ (<model number>) = (setting value)
	Changes the edge settings "filter size" parameter for the specified workpiece model number.

Function

Changes the edge settings "filter size" for the specified workpiece model number. This "filter size" parameter setting is changed for the specified model number when VFLTRSIZ is executed.

NOTE

This language command is used only when the edge settings filter parameter setting has been specified as "correlated edge filter".

Explanation

<Model number>

Specifies the workpiece model number to which the edge settings "filter size" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "filter size" value. The permissible setting range is 3 to 21 (odd numbers only). The "filter size" value can also be specified by a variable.

Statement example

```
B%=4
C%=13
VFLTRSIZ(B%)=C%        .....Changes the edge settings "filter size" to "13" for model number 4.
```

7.2.1.7 VFLTRTYP

VFLTRTYP	VFLTRTYP (<model number>) = (<filter number>)
	Changes the edge settings "filter" parameter for the specified workpiece model number.

Function

Changes the edge settings "filter" (filter type) for the specified workpiece model number. This "filter" parameter setting is changed for the specified model number when VFLTRTYP is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the edge settings "filter" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Filter number>

Specifies the filter number (filter processing method). The filter number can also be specified by a variable.

0 .... Sobel filter

1 .... Correlated edge filter

Statement example

```
B%=2
VFLTRTYP(B%)=1        .....Changes the edge settings "filter" (filter type) to "correlated edge"
                           for model number 2.
```

7.2.1.8 VGETCNT

VGETCNT	VGETCNT
	Obtains the number of items detected by the search.

Function

This function obtains the number of detected items following a search.

Statement example

```
VSEARCH 1,2
PRINT VGETCNT        .....Outputs (to programming box screen) the number of items
                          detected by the search.
C%=VGETCNT-1
FOR A%=0 TO C%       .....Repeats processing in accordance with the number of items
                          detected by the search.
 PRINT VGETSCR(A%)
NEXT A%
```

7.2.1.9 VGETPIX

VGETPIX	VGETPIX (<array element number>)
	Obtains the specified array element number's pixel data from the search result array following a search. (The obtained value is in point data format.)

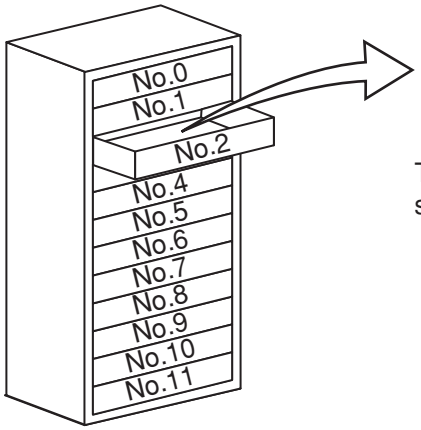
Function

This function obtains the pixel data from the search result array following a search. The pixel data is obtained from the specified array-element in the search result array. The pixel data is obtained in "pixel" units.

NOTE

- The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

- Hand system flags are not included in the obtained point data.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

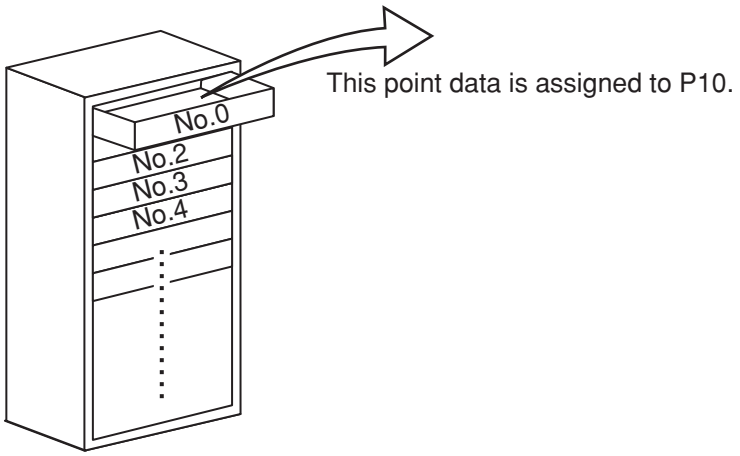
<Array element number>

The "array element number" specifies an array element in the search result array. It specifies the search result array's element number from which pixel data is to be obtained. Only one number may be specified (0 to (VGETCNT-1)). An array element number can also be specified by a variable.
The search result array count begins from No.0. The array is sorted by the method specified by the VSETSORT command in the order of robot coordinates. (The sorting order is determined by the pixel coordinates if no calibration number is specified.)

Statement example

P10=VGETPIX(0) .....Assigns the pixel data from search result number 1 (array element number 0) to P10.

P10=VGETPIX(0)



Search result array
(The array elements are sorted in the order specified by the VSETSORT command.)

NOTE

This function cannot be written in a manner like MOVE P and VGETPIX(0).

7.2.1.10 VGETPOS

VGETPOS	VGETPOS (<array element number>)
	Obtains the specified array element number's point data from the search result array following a search.

Function

This function obtains point data from the search result array following a search. The point data is obtained from the specified array-element in the search result array. The robot's Z-axis height at the time of the search is obtained as the Z-axis point data. The point data is obtained in "mm" units (Cartesian coordinate system).

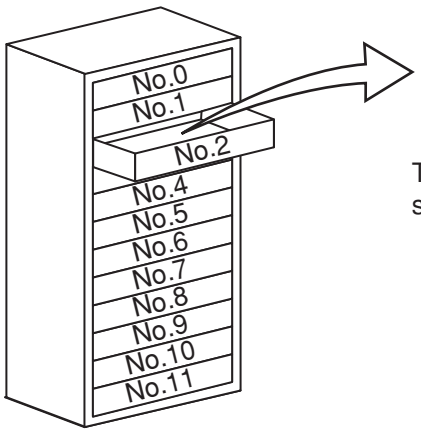
CAUTION

THE ROBOT'S Z-AXIS HEIGHT AT THE TIME OF THE SEARCH IS OBTAINED AS THE Z-AXIS DATA OF THE POINT DATA OBTAINED BY THE VGETPOS COMMAND. THEREFORE, THE POSITION OF THE POINT DATA OBTAINED BY THE VGETPOS COMMAND MAY VARY DEPENDING ON THE ROBOT POSITION AT THE TIME OF THE SEARCH. WHEN MOVING THE ROBOT TO THE POSITION OF THE POINT DATA OBTAINED BY THE VGETPOS COMMAND, CAREFULLY CHECK THE ROBOT MOVEMENT ROUTE SO THAT THE Z-AXIS DOES NOT COLLIDE WITH OTHER OBJECT.

NOTE

- The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

- The "20.10: No vision calibration setting" error occurs if a VSEARCH search is attempted without using a calibration setting.
- Hand system flags are not included in the obtained point data.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

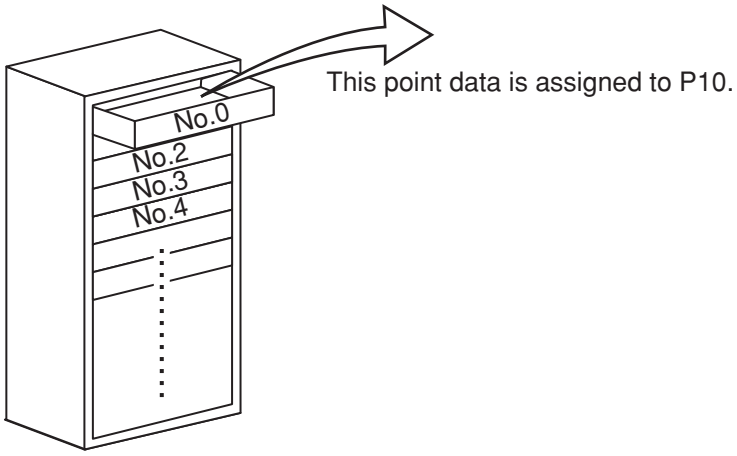
<Array element number>

The "array element number" specifies an array element in the search result array. It specifies the search result array's element number from which point data is to be obtained. Only one number may be specified (0 to (VGETCNT-1)). An array element number can also be specified by a variable.
The search result array count begins from No.0. The array is sorted by the method specified by the VSETSORT command in the order of robot coordinates. (The sorting order is determined by the pixel coordinates if no calibration number is specified.)

Statement example

P10=VGETPOS(0) .....Assigns the point data from search result number 1 (array element number 0) to P10.

```
P10=VGETPOS(0)
```




```
C%=VGETCNT-1
FOR A%=0 TO C%
  MOVE P,VGETPOS(A%) .....Moves sequentially to all the search result point data positions.
NEXT A%
```

7.2.1.11 VGETPOSX / VGETPOSY

VGETPOSX VGETPOSY	VGETPOSX (<array element number>) VGETPOSY (<array element number>)
	Obtains the X or Y coordinate position of the specified array element number's workpiece from the search result array following a search.

Function

This function obtains the X or Y coordinate position of the workpiece from the search result array following a search. The X or Y coordinate position of the workpiece is obtained from the specified array element in the search result array. The data is obtained in "mm" units (Cartesian coordinate system).

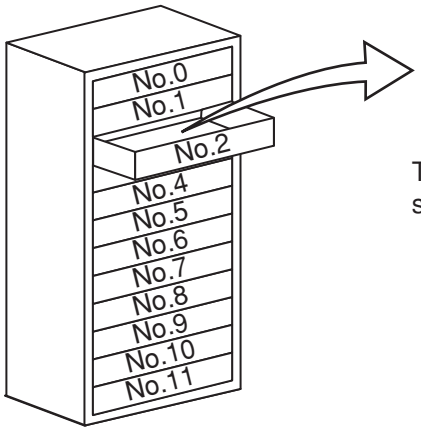
VGETPOSX .... Obtains the X coordinate position of the workpiece from the search result array.

VGETPOSY..... Obtains the Y coordinate position of the workpiece from the search result array.

NOTE

- The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

- The "20.10: No vision calibration setting" error occurs if a VSEARCH search is attempted without using a calibration setting.
- Hand system flags are not included in the obtained point data.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

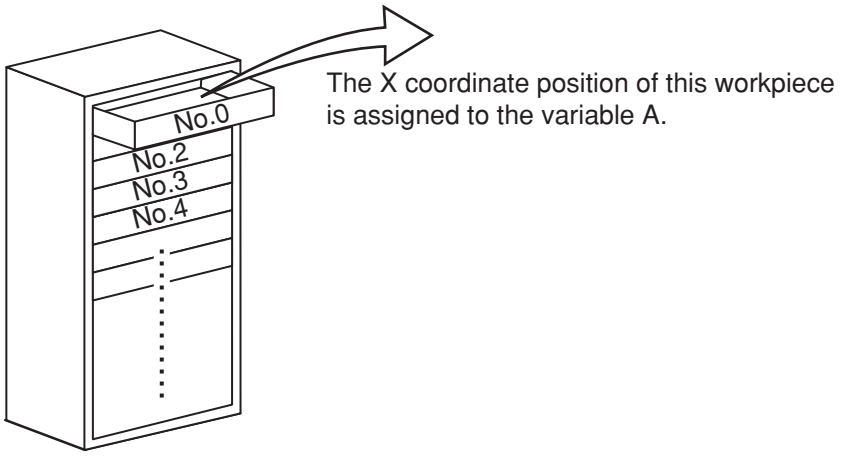
<Array element number>

The "array element number" specifies an array element in the search result array. It specifies the search result array's element number from which data is to be obtained. Only one number may be specified (0 to (VGETCNT-1)). An array element number can also be specified by a variable.
The search result array count begins from No.0. The array is sorted by the method specified by the VSETSORT command in the order of robot coordinates. (The sorting order is determined by the pixel coordinates if no calibration number is specified.)

Statement example

A=VGETPOSX(0) .....Assigns the X coordinate position of the workpiece of research result number 1 (array element number 0) to A.

```
A=VGETPOSX(0)
```



7.2.1.12 VGETSCLE

VGETSCLE	VGETSCLE (<array element number>)
	Obtains the specified array element number's scale data from the search result arrays following a search.

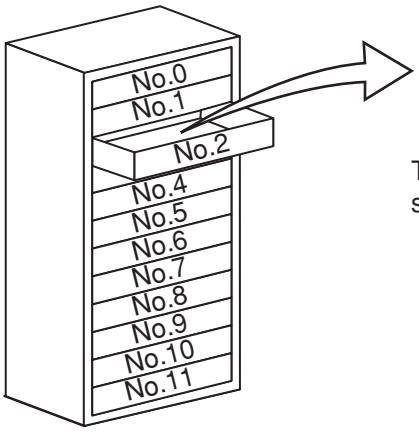
Function

This function obtains scale data from the search result array following a search. The scale data is obtained from the specified array-element in the search result array.

NOTE

The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

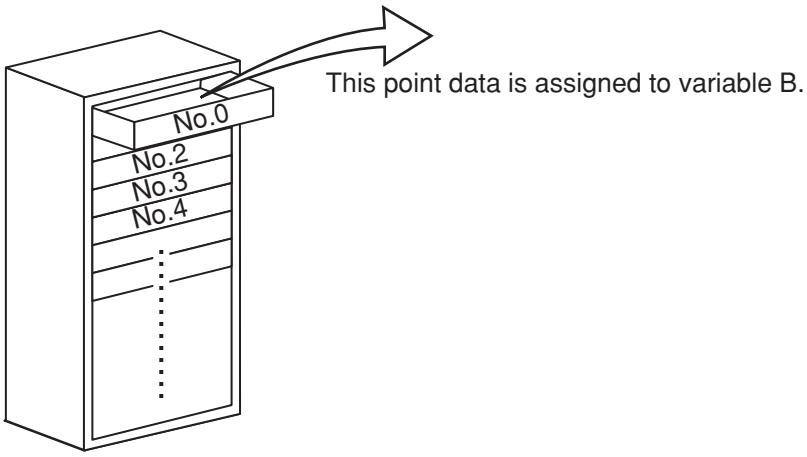
<Array element number>

The "array element number" specifies an array element in the search result array. It specifies the search result array's element number from which scale data is to be obtained. Only one number may be specified (0 to (VGETCNT-1)). An array element number can also be specified by a variable.
The search result array count begins from No.0. The array is sorted by the method specified by the VSETSORT command in the order of robot coordinates. (The sorting order is determined by the pixel coordinates if no calibration number is specified.)

Statement example

B=VGETSCLE(0) .....Assigns the scale data from search result number 1 (array element number 0) to variable B.

B=VGETSCLE(0)




```
C%=VGETCNT-1
FOR A%=0 TO C%
 IF VGETSCLE(A%)>98 THEN    .....Moves sequentially to the search result point data positions
                                 of workpieces with scales larger than 98%.
  MOVE P,VGETPOS(A%)
 ENDIF
NEXT A%
```

7.2.1.13 VGETSCR

VGETSCR	VGETSCR (<array element number>)
	Obtains the specified array element number's score data from the search result array following a search.

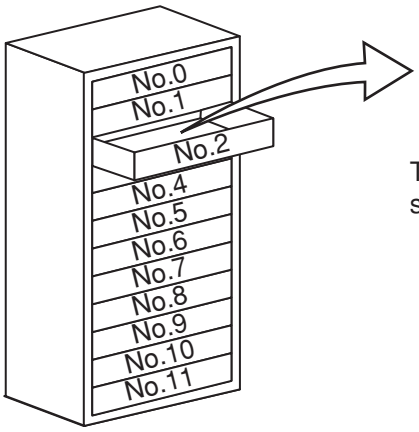
Function

This function obtains score data from the search result array following a search. The score data is obtained from the specified array-element in the search result array.

NOTE

The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

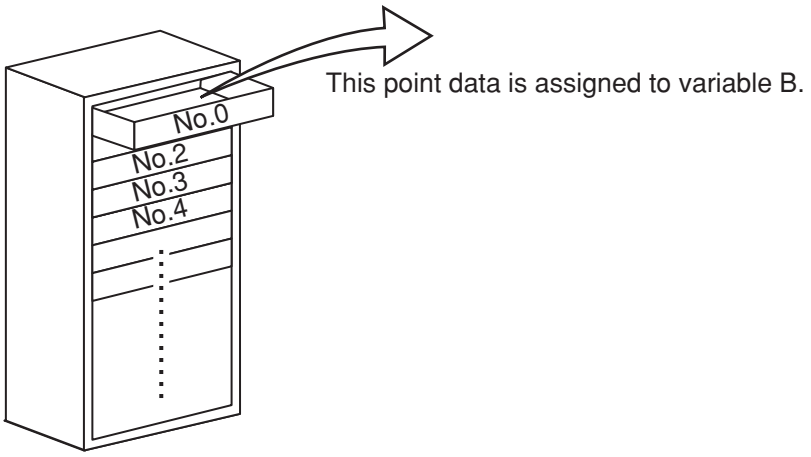
<Array element number>

The "array element number" specifies an array element in the search result array. It specifies the search result array's element number from which score data is to be obtained. Only one number may be specified (0 to (VGETCNT-1)). An array element number can also be specified by a variable.
The search result array count begins from No.0. The array is sorted by the method specified by the VSETSORT command in the order of robot coordinates. (The sorting order is determined by the pixel coordinates if no calibration number is specified.)

Statement example

B=VGETSCR(0) .....Assigns the score data from search result number 1 (array element number 0) to variable B.

B=VGETSCR(0)




```
C%=VGETCNT-1
FOR A%=0 TO C%
 IF VGETSCR(A%)>80 THEN     .....Moves sequentially to the search result point data positions
                                 of workpieces with scores higher than 80.
  MOVE P,VGETPOS(A%)
 ENDIF
NEXT A%
```

7.2.1.14 VGETTIME

VGETTIME	VGETTIME
	Obtains the time (ms) which was required to execute the search command following a search.

Function

Obtains the time (following a search) which was required to execute the search command (units: ms).

Statement example

```
VSEARCH 1,1
PRINT "SEARCH TIME:"; VGETTIME
```

.....The search command execution time displays at the programming box screen.

7.2.1.15 VMAXANGL

VMAXANGL	VMAXANGL (<model number>) = (setting value)
	Changes the search settings "END angle" parameter for the specified workpiece model number.

Function

Changes the search settings "END angle" for the specified workpiece model number. This "END angle" parameter setting is changed for the specified model number when VMAXANGL is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "END angle" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "END angle" value. Although the permissible setting range is -180 to 179 (units: degrees), this setting must be larger than the VMINANGL setting value. The "END angle" value can also be specified by a variable.

Statement example

```
B%=20
C%=90
VMAXANGL(B%)=C%      .....Changes the search settings "END angle" to "90°" for model
                          number 20.
```

7.2.1.16 VMAXNUM

VMAXNUM	VMAXNUM (<model number>) = (setting value)
	Changes the search settings " detected workpieces quantity" parameter for the specified workpiece model number.

Function

Changes the search settings "detection workpieces quantity" for the specified workpiece model number. This "detection workpieces quantity" parameter setting is changed for the specified model number when VMAXNUM is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "detection workpieces quantity" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "detection workpieces quantity" value. The permissible setting range is 1 to 40. The "detection workpieces quantity" value can also be specified by a variable.

Statement example

```
B%=3
C%=20
VMAXNUM(B%)=C%      .....Changes the search settings "detection workpieces quantity" to
                         "20" for model number 3.
```

7.2.1.17 VMINANGL

VMINANGL	VMINANGL (<model number>) = (setting value)
	Changes the search settings "START angle" parameter for the specified workpiece model number.

Function

Changes the search settings "START angle" for the specified workpiece model number.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "START angle" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "START angle" value. Although the permissible setting range is -180 to 179 (units: degrees), this setting must be smaller than the VMAXANGL setting value. The "START angle" value can also be specified by a variable.

Statement example

```
B%=20
C%=-90
VMINANGL(B%)=C%      .....Changes the search settings "START angle" to "-90°" for model
                          number 20.
```

7.2.1.18 VMONITOR

VMONITOR	VMONITOR |ON OFF|
	Switches the monitor mode on and off.

Function

Switches the monitor mode on and off.

The robot controller's vision control mode ("UTILITY>VISION>MODE") setting is changed when VMONITOR is executed.

Explanation

ON…Changes the vision control mode to the monitor mode.

OFF…Changes the vision control mode to the controller mode.

Statement example

```
VMONITOR ON          .....Changes the vision control mode to the monitor mode.
VSEARCH 1,1
VMONITOR OFF         .....Changes the vision control mode to the controller mode.
```

7.2.1.19 VPRECMOD

VPRECMOD	VPRECMOD (<model number>) = (setting value)
	Changes the search settings "precision" parameter for the specified workpiece model number.

Function

Changes the search settings "precision" for the specified workpiece model number. This "precision" parameter setting is changed for the specified model number when VPRECMOD is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "precision" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "precision" value. The "precision" value can also be specified by a variable.

0…Standard

1…High precision

Statement example

```
B%=7
C%=1
VPRECMOD(B%) = C%    .....Changes the search settings "precision" to "high precision" for
                          model number 7.
```

7.2.1.20 VSAVEIMG

VSAVEIMG	VSAVEIMG <memory number>, <file name>
	Saves the memory image in a BMP format.

Function

Saves acquired images (images acquired and saved to memory by the VACAPTURE command and by search commands such as VSEARCH, etc.) in the BMP format at the robot controller.

Explanation

<Memory number>

Specifies the memory number where the image to be saved is located. Only one number may be specified (0 to 63). The memory number can also be specified by a variable.

<File name>

Specifies the file name under which the image is to be saved. The file name can also be specified by a variable. A file name can be specified by numerals and character strings (characters enclosed in double quotation marks ("")). If specified by variables and arrays, the values assigned to those variables and arrays are adopted as the file name. File names with semicolon (;) breakpoints are processed as continuous file names.

File names may contain up to 8 characters (not including the extend name).

File name examples

```
Example 1) VSAVEIMG 0,"TEST"  ..... File name: TEST.bmp
Example 2) A%=111
           VSAVEIMG 0,A%      ..... File name: 111.bmp
Example 3) A%=2
           VSAVEIMG 0,"TEST";A% ..... File name: TEST2.bmp
```

Statement example

```
B%=2
VCAPTURE 1,B%
VSAVEIMG B%,"IMAGE" .....        The memory 2 image is saved under the "IMAGE.bmp" file
name.
VSEARCHM B%, 3
IF VGETCNT<1 THEN
  VSAVEIMG B%,"ERR",B%.....If the search detected no workpieces, the image is saved under
                                the "ERR2.bmp" file name.
ENDIF
```

7.2.1.21 VSEARCH

VSEARCH	VSEARCH <camera number>, <model number> [, <calibration number>]
	Searches the camera images for a specific workpiece model number.

Function

Searches the camera images for a specified workpiece model number. The images are acquired from the specified camera channel number, and are searched for the specified workpiece model number. If a calibration number is specified, a coordinate conversion occurs (from camera coordinates to robot coordinates), based on the specified calibration number's data.

Explanation

<Camera number>

Specifies the camera channel number from which the image is acquired. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

<Model number>

Specifies the workpiece model number to be searched for. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Calibration number>

Specifies the calibration number to be used in the search. Only one number may be specified (0 to 3). The calibration number can also be specified by a variable.
If no calibration number is specified, the calibration data specified at VSETCALB is used. If no calibration number is specified, and no calibration data has been specified at VSETCALB, a "no-calibration" setting is adopted.

CAUTION

- THE VSEARCH COMMAND SAVES AN IMAGE TO MEMORY NUMBER 0. THEREFORE, IF THE VSEARCH COMMAND IS EXECUTED AFTER AN IMAGE HAS BEEN SAVED TO MEMORY NUMBER "0" BY VCAPTURE, THAT IMAGE WILL BE OVERWRITTEN.
- SEARCH RESULTS ARE CLEARED IF THE CONTROLLER POWER IS TURNED OFF.

Statement examples

VSEARCH 1,2 .....Searches the camera channel 1 images for workpiece model number 2.

VSEARCH 2,3,1 .....Searches the camera channel 2 images for workpiece model number 3, and performs calibration number 1.

```
FOR A%=1 TO 3
  VSEARCH 1,A%  .....Searches the camera channel 1 images for workpiece model number A% (1 to 3 in this case).
NEXT A%
```

7.2.1.22 VSEARCHM

VSEARCHM	VSEARCHM <memory number>, <model number> [, <search method number>]
	Searches the memory images for a specific workpiece model number.

Function

Searches the memory images for a specified workpiece model number. The search is performed at the specified memory number, and occurs in accordance with specified search method number.
When calibration number information is added to an image at the specified memory number (by VCAPTURE), a camera-to-robot coordinate conversion is executed, using that calibration number data.

Explanation

<Memory number>

Specifies the memory number where the image to be searched for is located. Only one number may be specified (0 to 63). The memory number can also be specified by a variable.
Memory numbers are used in common, regardless of the camera channel number.

<Model number>

Specifies the workpiece model number to be searched for is located. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Search method number>

Specifies the search method number. The search method number can also be specified by a variable. If no search method number is specified, the "standard search" method is adopted.

0…Standard search
1…Rough search (gives priority to the search speed, resulting in reduced precision.)
2…Single item search (the search ends when one workpiece is detected.)

CAUTION
SEARCH RESULTS ARE CLEARED IF THE CONTROLLER POWER IS TURNED OFF.

Statement examples

VSEARCHM 1,2 .....Searches the memory 1 images for workpiece model number 2.

VSEARCHM 2,3,1 .....Performs a rough search of memory 2 images for workiece model number 3.

```
VCAPTURE 1,2,3
VSEARCHM 2,4  .....Searches the memory 2 images for workpiece model number 4, and performs calibration at calibration number 3.
```

7.2.1.23 VSEARCHR

VSEARCHR	VSEARCHR <memory number>, <model number> [, <calibration number>]
	Performs a rough search of camera images for a specific workpiece model number.

Function

Performs a rough search of the camera images for a specified workpiece model number. This rough search gives priority to the search speed, resulting in reduced precision. An initial rough search occurs for rough positioning, followed by a standard search.
The images are acquired from the specified camera channel number, and are searched for the specified workpiece model number. If a calibration number is specified, a coordinate conversion occurs (from camera coordinates to robot coordinates), based on the specified calibration number's data. Except for its "rough search" format, VSEARCHR is identical to VSEARCH.

Explanation

<Camera number>

Specifies the camera channel number from which the image is acquired. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

<Model number>

Specifies the workpiece model number to be searched for. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Calibration number>

Specifies the calibration number to be used in the search. Only one number may be specified (0 to 3). A variable can also be used to select the calibration number.
If no calibration number is specified, the calibration data specified at VSETCALB is used. If no calibration number is specified, and no calibration data has been specified at VSETCALB, a "no-calibration" setting is adopted.

CAUTION

- THE VSEARCHR COMMAND SAVES AN IMAGE TO MEMORY NUMBER 0. THEREFORE, IF THE VSEARCHR COMMAND IS EXECUTED AFTER AN IMAGE HAS BEEN SAVED TO MEMORY NUMBER "0" BY VCAPTURE, THAT IMAGE WILL BE OVERWRITTEN.
- SEARCH RESULTS ARE CLEARED IF THE CONTROLLER POWER IS TURNED OFF.

Statement examples

```
VSEARCHR 1,2        .....Performs a rough search of camera channel 1 images for workpiece
                         model number 2.

VSEARCHR 2,3,1      .....Performs a rough search of camera channel 2 images for workpiece
                         model number 3, and performs calibration number 1.

FOR A%=1 TO 3
  VSEARCHR 1,A%     .....Performs a rough search of camera channel 1 images for workpiece
                         model number A% (1 to 3 in this case).
NEXT A%
```

7.2.1.24 VSEARCHS

VSEARCHS	VSEARCHS <memory number>, <model number> [, <calibration number>]
	Performs a single item search of camera images for a specific workpiece model number.

Function

Performs a single item search of the camera images for a specified workpiece model number. This single item search gives priority to the search speed, and it ends when one workpiece is detected. The images are acquired from the specified camera channel number, and are searched for the specified workpiece model number.

If a calibration number is specified, a coordinate conversion occurs (from camera coordinates to robot coordinates), based on the specified calibration number's data. Except for its "single item search" format, VSEARCHS is identical to VSEARCH.

Explanation

<Camera number>

Specifies the camera channel number from which the image is acquired. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

<Model number>

Specifies the workpiece model number to be searched for. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Calibration number>

Specifies the calibration number to be used in the search. Only one number may be specified (0 to 3). A variable can also be used to select the calibration number.

If no calibration number is specified, the calibration data specified at VSETCALB is used. If no calibration number is specified, and no calibration data has been specified at VSETCALB, a "no-calibration" setting is adopted.

CAUTION

- THE VSEARCHS COMMAND SAVES AN IMAGE TO MEMORY NUMBER 0. THEREFORE, IF THE VSEARCHS COMMAND IS EXECUTED AFTER AN IMAGE HAS BEEN SAVED TO MEMORY NUMBER "0" BY VCAPTURE, THAT IMAGE WILL BE OVERWRITTEN.
- SEARCH RESULTS ARE CLEARED IF THE CONTROLLER POWER IS TURNED OFF.

Statement examples

```
VSEARCHS 1,2        .....Performs a single item search of camera channel 1 images for
                         workpiece model number 2.

VSEARCHS 2,3,1      .....Performs a single item search of camera channel 2 images for
                         workpiece model number 3, and performs calibration number 1.

FOR A%=1 TO 3
  VSEARCHS 1,A%     .....Performs a single item search of camera channel 1 images for
                         workpiece model number A% (1 to 3 in this case).
NEXT A%
```

7.2.1.25 VSELCAM

VSELCAM	VSELCAM <camera number>
	Switches the camera channel.

Function

Switches the camera channel (Ch.1 and Ch.2).
The SCARA Vision board's image acquisition channel (6. Image intake Ch.) parameter setting changes when VSELCAM is executed.

Explanation

<Camera number>

Specifies the camera channel number from which the image is acquired. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

Statement example

VSELCAM 1 .....Switches to camera Ch.1.

B=2
VSELCAM B .....Switches to camera Ch.2.

7.2.1.26 VSETCALB

VSETCALB	VSETCALB <camera number>, <calibration number>
	Specifies the calibration data for coordinate conversions.

Function

Specifies the calibration data used for coordinate conversion. Calibration data can be specified for each camera channel.
If no calibration number is specified when using the VCAPTURE, VSEARCH, VSEARCHR, and VSEARCHS commands, the calibration data specified at VSETCALB is adopted.

Explanation

<Camera number>

Specifies the camera channel number which the calibration is set. Only one number may be specified (1 or 2). The camera number can also be specified by a variable.

<Calibration number>

Specifies the calibration number to be used in the search. Only one number may be specified (0 to 3). The calibration number can also be specified by a variable.

NOTE
VESETCALB specifies the calibration when performing a search. Even if VSETCALB is used to change the calibration number before using VGETPOS following a search, it will have no effect.

Statement examples

VSELCALB 1,2 .....Assigns calibration number 2 to camera Ch.1.

B=3
VSELCALB 2,B .....Assigns calibration number 3 to camera Ch.2.

7.2.1.27 VSETSORT

VSETSORT	VSETSORT <sort method number>
	Specifies the search result array sorting method.

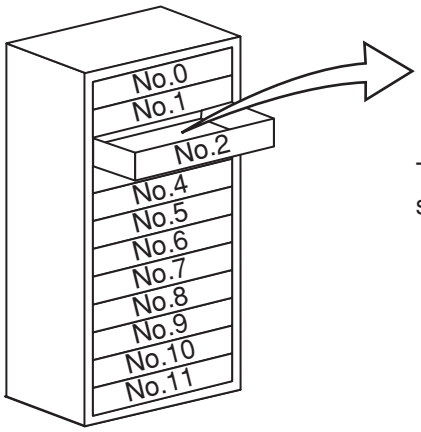
Function

Specifies the search result array's sorting method. Search result content is output in the sorting method specified by this setting.

NOTE

The search result array is the array where the search results are saved following a search.

Search result array



Information on detected workpiece is stored.
- X and Y coordinate positions
- Workpiece angle
- Scale (ratio of size to a specified workpiece model)
- Score (degree to which the workpiece matches a specified workpiece model)

These results can be obtained using the commands shown below.
- VGETPIX Pixel data
- VGETPOS Robot coordinate data
- VGETPOSX Robot coordinate data (X-axis)
- VGETPOSY Robot coordinate data (Y-axis)
- VGETSCLE Scale
- VGETSCR Score

* The array elements are sorted in the order specified by the VSETSORT command.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

<Sorting method number>

Specifies the search result array's sorting method number. The sorting method number can also be specified by a variable.

0…In score order

1…In ascending X-coordinate order

2…In descending X-coordinate order

3…In ascending Y-coordinate order

4…In descending Y-coordinate order

NOTE

- At searches where no sorting method is specified (no VSETSORT statement), the search result array is output in their score order.
- The search result array is sorted by the robot coordinate. However, if no calibration number is specified, the search result array is sorted by the pixel coordinate.

Statement examples

VSETSORT 1 .....Specifies search result output in ascending X-coordinate order.

B=4

VSETSORT B .....Specifies search result output in descending Y-coordinate order.

7.2.1.28 VTHRESH1

VTHRESH1	VTHRESH1 (<model number>) = (setting value)
	Changes the search settings "score threshold 1" parameter for the specified workpiece model number.

Function

Changes the search settings "score threshold 1" for the specified workpiece model number. This "score threshold 1" parameter setting is changed for the specified model number when VTHRESH1 is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "score threshold 1" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "score threshold 1" value. The permissible setting range is 0 to 100. The "score threshold 1" value can also be specified by a variable.

Statement example

B%=6

C%=60

VTHRESH1(B%)=C% .....Changes the search settings "score threshold 1" to "60" for model number 6.

7.2.1.29 VTHRESH2

VTHRESH2	VTHRESH2 (<model number>) = (setting value)
	Changes the search settings "score threshold 2" parameter for the specified workpiece model number.

Function

Changes the search settings "score threshold 2" for the specified workpiece model number. This "score threshold 2" parameter setting is changed for the specified model number when VTHRESH2 is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "score threshold 2" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "score threshold 2" value. The permissible setting range is 0 to 100. The "score threshold 1" value can also be specified by a variable.

Statement example

```
B%=6
C%=70
VTHRESH2(B%)=C%      .....Changes the search settings "score threshold 2" to "70" for model
                          number 6.
```

7.2.1.30 VTIMEOUT

VTIMEOUT	VTIMEOUT (<model number>) = (setting value)
	Changes the search settings "timeout" parameter for the specified workpiece model number.

Function

Changes the search settings "timeout" for the specified workpiece model number. This "timeout" parameter setting is changed for the specified model number when VTIMEOUT is executed.

Explanation

<Model number>

Specifies the workpiece model number to which the search settings "timeout" change is to apply. Only one number may be specified (0 to 39). The model number can also be specified by a variable.

<Setting value>

Specifies the "timeout" value in "100ms" units. The permissible setting range is 0 to 600 (units: 100ms). The "timeout" value can also be specified by a variable.

Statement example

```
B%=1
C%=600
VTIMEOUT(B%)=C%      .....Changes the search settings "timeout" to "1 minute" for model
                          number 1.
```

7.2.1.31 VTRGTOUT

VTRGTOUT	VTRGTOUT = (setting value)
	Changes the trigger timeout parameter for the SCARA Vision board.

Function

This command changes the timeout period (unit: sec.) for capturing an image.

The trigger timeout ("9. Trigger timeout") parameter setting for the SCARA Vision board is changed when VTRGOUT is executed.

Explanation

<Setting value>

Specifies the trigger timeout setting (unit: sec.). The permissible setting range is 0 to 36000 (unit: sec.) It can also be specified by a variable.

Statement example

```
B%=10
VTRGTOUT = B%          .....Changes the trigger timeout setting to 10 seconds.
```

7.2.2 Lighting related language commands

7.2.2.1 LCONTROL

LCONTROL	LCONTROL ON|OFF [(<light number>)]
	Turns the lighting control board and tracking board "lighting control" on and off.

Function

Switches the "lighting control" on and off. This on/off switching occurs at the specified light number. If no light number is specified, on/off switching occurs at both Lighting 1 and Lighting 2. The lighting control board and tracking board lighting control (L1/L2) (2. Light control (L1), 3. Light control (L2)) parameter settings are changed when the LCONTROL command is executed.

Explanation

<Light number>

Specifies the light number where the control is to occur. Only one number may be specified (1 or 2). The light number can also be specified by a variable.

Statement examples

LCONTROL ON ..... Turns both Lighting 1 and Lighting 2 on.

LCONTROL OFF ..... Turns both Lighting 1 and Lighting 2 off.

LCONTROL ON(1) ..... Turns Lighting 1 on.

B=2

LCONTROL OFF(B) ..... Turns Lighting 2 off.

7.2.2.2 LCTRLMOD

LCTRLMOD	Format 1: LCTRLMOD <mode number> Format 2: LCTRLMOD (<light number>) = <mode number>
	Changes the lighting control board and tracking board "control mode" (L1 / L2) parameter.

Function

Changes the lighting "control mode".

Format 1 changes the lighting "control mode" at both Lighting 1 and Lighting 2. Format 2 changes the lighting "control mode" at the light specified by the <light number>.

The lighting control board and tracking board "control mode" (L1/L2) (4. Control mode (L1), 5. Control mode (L2)) parameter settings are changed when the LCTRLMOD command is executed.

Explanation

<Mode number>

Specifies the lighting "control mode". The mode number can also be specified by a variable.

0…Continuous lighting mode

1…Strobe lighting mode

<Light number>

Specifies the light number where the control is to occur. Only one number may be specified (1 or 2). The light number can also be specified by a variable.

Statement examples

LCTRLMOD 0 .....Changes the control mode for both lighting 1 and 2 to the continuous lighting mode.

LCTRLMOD(2)=1 .....Specifies the "Strobe lighting" control mode for Lighting 2.

7.2.2.3 LSTRBTIM

LSTRBTIM	Format 1: LSTRBTIM <light emission time> Format 2: LSTRBTIM (<light number>) = <light emission time>
	Change the lighting control board and tracking board "strobe time" (L1 / L2) parameter.

Function

Changes the strobe lighting mode's "light emission time" (units: µs).

Format 1 changes the "light emission time" at both Lighting 1 and Lighting 2. Format 2 changes the "light emission time" at the light specified by the <Light number>.

The lighting control board and tracking board strobe time (L1/L2) (8. Strobe time [µs] (L1), 9. Strobe time [µs] (L2)) parameter settings are changed when the LSTRBTIM command is executed.

Explanation

<Light emission time>

Specifies the light's light emission time. The permissible setting range is 10 to 33000 (units: µs). The "light emission time" can also be specified by a variable.

<Light number>

Specifies the light number where the control is to occur. Only one number may be specified (1 or 2). The light number can also be specified by a variable.

Statement examples

LSTRBTIM 16500 .....Changes the "light emission time" to 16500 µs at both Lighting 1 and Lighting 2.

LSTRBTIM(1)=20000 .....Changes the "light emission time" to 20000 µs at Lighting 1.

7.2.2.4 LVOLUME

LVOLUME	Format 1: LVOLUME <lighting volume> Format 2: LVOLUME (<light number>) = <lighting volume>
	Changes the lighting control board and tracking board "lighting volume" (L1 / L2) parameter.

Function

Changes the continuous lighting mode's "lighting volume" (units: %).

Format 1 changes the "lighting volume" at both Lighting 1 and Lighting 2. Format 2 changes the "lighting volume" at the light specified by <light number>.

The lighting control board and tracking board "lighting volume" (L1/L2) (6. Light volume [%] (L1), 7. Light volume [%] (L2)) parameter settings are changed when the LVOLUME command is executed.

Explanation

<Lighting volume>

Specifies the lighting's "lighting volume". The permissible setting range is 0 to 100 (units: %). The "lighting volume" can also be specified by a variable.

<Light number>

Specifies the light number where the control is to occur. Only one number may be specified (1 or 2). The light number can also be specified by a variable.

Statement examples

LVOLUME 70 .....Changes the "lighting volume" to 70% at both Lighting 1 and Lighting 2.

LVOLUME(2)=80 .....Changes the "lighting volume" to 80% at Lighting 2.

7.2.3 Conveyor tracking related language commands

7.2.3.1 CADDQUE

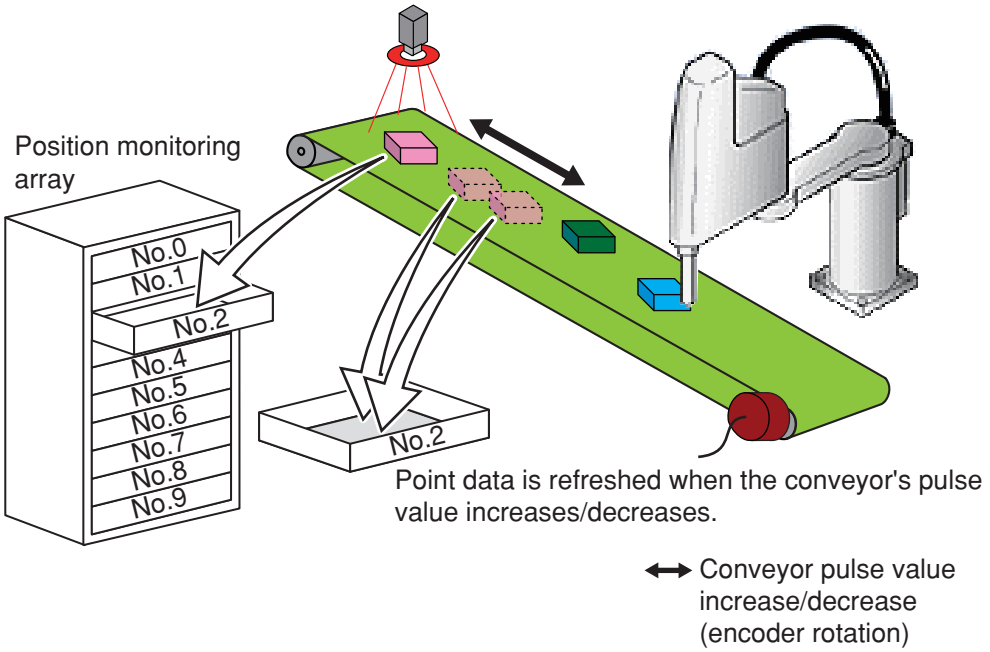
CADDQUE	CADDQUE <counter number>, <point data> [, <Judgement area distance>]
	Adds point data at the end of the position monitoring array.

Function

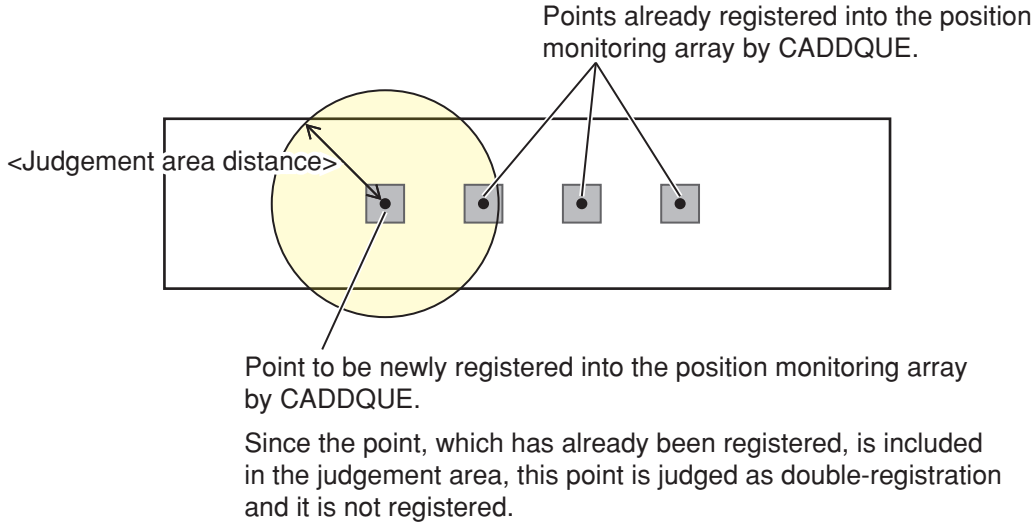
Adds point data at the end of the positioning monitoring array of the specified counter No. However, further point data is not added if several array elements already exist at the position monitoring array. Additionally, when <Judgement area distance> is specified, this prevents double-registration of the point data. If points, which have already been registered into the position monitoring array, are included in the area formed by <Judgement area distance>, this is judged as double-registration. If judged as double-registration, no data is added to the position monitoring array. Furthermore, no error occurs at this time.

The added point data is refreshed in accordance with pulse value increases/decreases which occur at the conveyor corresponding to the specified counter number.

CADDQUE



<Judgement area distance> option



NOTE

- The position monitoring array is the array which stores the workpiece point data. The point data stored in this array is constantly monitored, and is refreshed when the conveyor pulse value increases/decreases.
- The position monitoring array comprises 10 elements.
- Position monitoring arrays are provided for both counter 1 and counter 2.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

<Counter number>

Specifies the counter number of the position monitoring array where point data is to be added. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

<Point data>

Specifies the point data to be added to the position monitoring array. The point data can be specified either by the point definition number or by the point data's function. However, the specified data must be Cartesian data (units: mm, degrees).

Specifying point data by "point definition number":

Example: P0, P110, P[A], P[START_POINT]

NOTE

If the specified point definition number data contains a hand system flag, that hand system flag information is added at the position monitoring array.

Specifying point data by "point data function":

Example: VGETPOS(1), PPNT(1,2), WHRXY

<Judgement area distance>

Specifies an area where the double-registration of the point data is judged. A real number is specified (unit: mm). It is also possible to specify an area by the variable.
An area with a radius of <Judgement area distance> around the position of the point data to be registered into the position monitoring array by CADDQUE becomes the double-registration judgement area.

NOTE

If the value of <Judgement area distance> is too large, point data existing in the position monitoring array is always included in the judgement area and new point data may not be registered into the position monitoring array.
Therefore, specify the value of <Judgement area distance> so that it is not too large.

Statement example

```
VSEARCH 1,2,3
C%=VGETCNT-1
FOR I%=0 TO C%
 CADDQUE 1, VGETPOS(I%)     .....Adds the search result position data to the counter 1
                                 position monitoring array.
NEXT I%

VSEARCH 1,2,3
C%=VGETCNT-1
WORK_R!=20.00               .....Defines the radius of the judgement area to “20 mm”.
FOR I%=0 TO C%
 CADDQUE 1, VGETPOS(I%), WORK_R!
                            .....Adds the position data of the search results to the
                                 position monitoring array of the counter number 1.
                                 However, when data, which has already been registered,
                                 exists in the area specified as judgement area, data is not
                                 added to the position monitoring array.
NEXT I%
```

7.2.3.2 CCHKQUE

CCHKQUE	CCHKQUE (<counter number>)
	Checks the position monitoring array's first point data position to see where it is located relative to the work area.

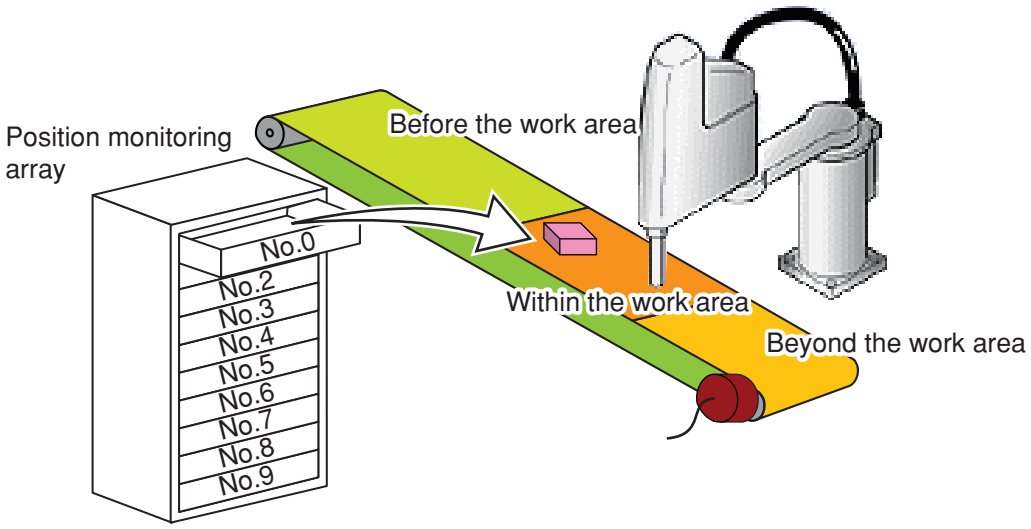
Function

This function checks the position of the first point data in the position monitoring array to see where it is located relative to the work area.

This function's return values are as follows:

0…Before the work area
1…Within the work area
-1…Beyond the work area
2…Tracking in progress

CCHKQUE



In the above example, the position monitoring array's first data ( ) is within the current work area.

NOTE

- The work area is specified when making the calibration setting.
- The positioning monitoring array is the array which stores the workpiece point data. The point data stored in this array is constantly monitored, and is refreshed when the conveyor pulse value increases/decreases.
- The position monitoring array comprises 10 elements.
- Position monitoring arrays are provided for both counter 1 and counter 2.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

<Counter number>

Specifies the counter number of the position monitoring array where the position check is to occur. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
WHILE CCHKQUE(1)<0   .....Checks points which have passed beyond the work area.
 CRMVQUE(1)
WEND
IF CCHKQUE(1)>0 THEN .....Checks points within the work area.
 CTMOVE 1
 CRMVQUE(1)
ENDIF
```

7.2.3.3 CCOND

CCOND	CCOND |ON / OFF| [(<counter number>)]
	Sets the tracking board counter condition to VALID or INVALID.

Function

This command changes VALID/INVALID of the counter condition. The counter condition of the specified number is set to VALID or INVALID. If no counter number is specified, the VALID/INVALID condition of both counter 1 and counter 2 is controlled.

The tracking board counter condition (C1/C2) ("12. Counter condition (C1)" or "13. Counter condition (C2)") parameter setting is changed when CCOND is executed.

Explanation

<Counter number>

Specifies the counter number to control. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
CCOND ON          .....Sets both counter 1 and counter 2 to VALID.
CCOND OFF         .....Sets both counter 1 and counter 2 to INVALID.
CCOND ON(1)       .....Sets counter 1 to VALID.
B=2
CCOND OFF(B)      .....Sets counter 2 to INVALID.
```

7.2.3.4 CGETPULS

CGETPULS	CGETPULS (<counter number>)
	Obtains the conveyor's pulse value.

Function

This function obtains the conveyor's pulse value. The pulse value of the conveyor corresponding to the specified counter number is obtained within a 0 to 65535 range (units: pulses).

MEMO

- The conveyor pulse value referred to here is actually the count value of the encoder installed on the conveyor. The conveyor pulse value range in the OMRON vision system is 0 to 65535. The pulse value per encoder turn varies according to the encoder type which is installed.
- The conveyor pulse value counts up (0 → 65535) or counts down (65535 → 0), depending on the installed encoder's rotation direction. When 65535 is reached while counting up, the output pulse value count-up begins again from 0. When 0 is reached while counting down, the output pulse value count-down begins again from 65535.

Explanation

<Counter number>

Specifies the counter number of the conveyor for which the pulse value is to be obtained. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
CRSTPULS 1
  ⋮
C%=CGETPULS(1)   .....Obtains the counter 1 pulse value.

B=2
D%=CGETPULS(B)   .....Obtains the counter 2 pulse value.
```

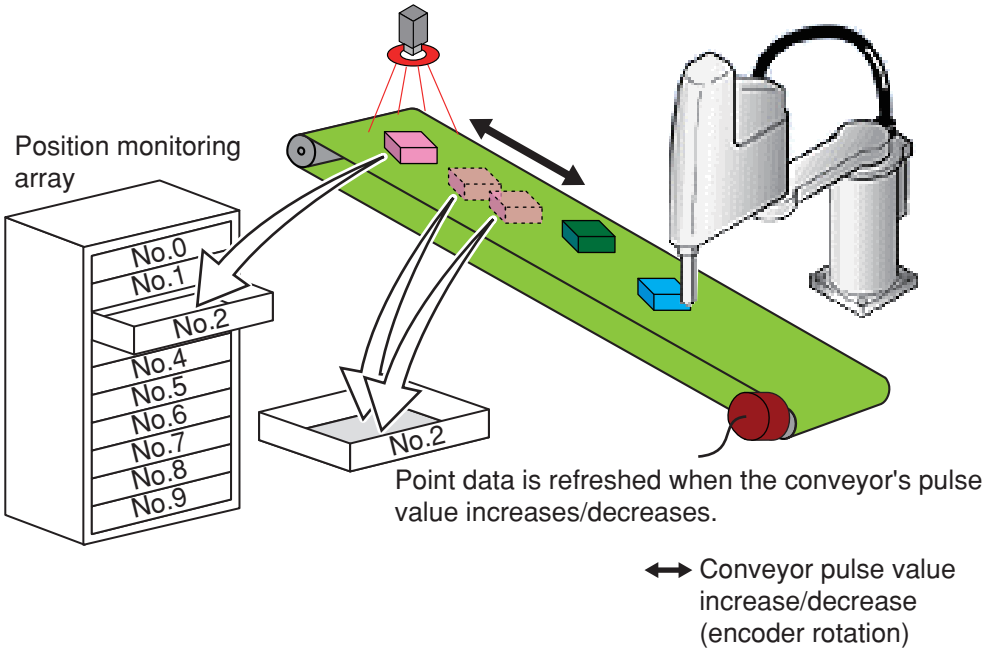
7.2.3.5 CGETQUE

CGETQUE	CGETQUE (<counter number>, <array element number>)
	Obtains the position monitoring array's point data.

Function

This function obtains the position monitoring array's point data of the specified counter number.

CGETQUE



NOTE

- The position monitoring array is the array which stores the workpiece point data.
  The point data stored in this array is constantly monitored, and is refreshed when the conveyor pulse value increases/decreases.
- The position monitoring array comprises 10 elements.
- Position monitoring arrays are provided for both counter 1 and counter 2.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

<Counter number>

Specifies the counter number of the position monitoring array where point data is to be added. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

<Array element number>

The "array element number" specifies an array element in the position monitoring array. It specifies the array element number from which point data is to be obtained. Only one number may be specified (0 to (CQUECNT-1)). An array element number can also be specified by a variable.
The position monitoring array count begins from No.0. The sorting order of the array elements is determined by the CADDQUE command.

```
IF CQUECNT(1)>0 THEN
  P10=CGETQUE(1, 0)      .....Assigns the current position of position monitoring array
                              number 0 for counter number 1 to P10.
ENDIF
```

7.2.3.6 CGETRATE

CGETRATE	CGETRATE (<counter number>)
	Obtains the conveyor velocity (pulse / 10ms).

Function

This function obtains the conveyor velocity (units: pulses/10ms). The velocity of the conveyor corresponding to the specified counter number is obtained.

Explanation

<Counter number>

Specifies the counter number of the conveyor for which the velocity is to be obtained. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
C%=CGETRATE(1)   .....Obtains the counter number 1 velocity (units: pulses/10ms).

B=2
D%=CGETRATE(B)   .....Obtains the counter number 2 velocity (units: pulses/10ms).
```

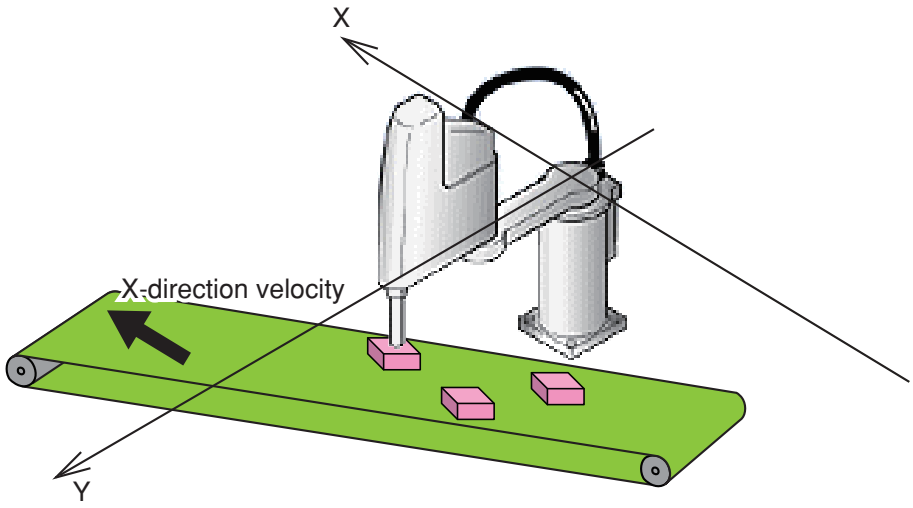
7.2.3.7 CGETVELX

CGETVELX	CGETVELX (<counter number>)
	Obtains the conveyor velocity (mm/10ms) in the X-direction of the robot's Cartesian coordinates.

Function

This function obtains the conveyor velocity (units: mm/10ms) in the X-direction of the robot's Cartesian coordinate system. The X-direction (in robot's Cartesian coordinate system) velocity of the conveyor corresponding to the specified counter number is obtained.

CGETVELX



Explanation

<Counter number>

Specifies the counter number of the conveyor for which the velocity is to be obtained. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement example

VX1$=CGETVELX(1)..... Obtains the counter number 1 velocity (mm/10ms) in the X-direction of the robot's Cartesian coordinates.

B=2

VX2$=CGETVELX(B) ..... Obtains the counter number 2 velocity (mm/10ms) in the X-direction of the robot's Cartesian coordinates.

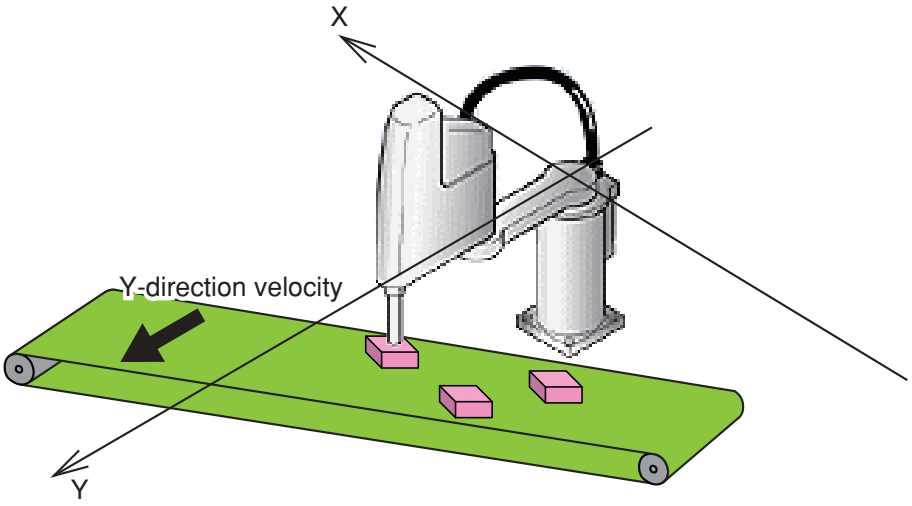
7.2.3.8 CGETVELY

CGETVELY	CGETVELY (<counter number>)
	Obtains the conveyor velocity (mm/10ms) in the Y-direction of the robot's Cartesian coordinates.

Function

This function obtains the conveyor velocity (units: mm/10ms) in the Y-direction of the robot's Cartesian coordinate system. The Y-direction (in robot's Cartesian coordinate system) velocity of the conveyor corresponding to the specified counter number is obtained.

CGETVELY



Explanation

<Counter number>

Specifies the counter number of the conveyor for which the velocity is to be obtained. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement example

VY1$=CGETVELY(1) ..... Obtains the counter number 1 velocity (mm/10ms) in the Y-direction of the robot's Cartesian coordinates.

B=2

VY2$=CGETVELY(B) ..... Obtains the counter number 2 velocity (mm/10ms) in the Y-direction of the robot's Cartesian coordinates.

7.2.3.9 CQUECNT

CQUECNT	CQUECNT (<counter number>)
	Obtains the number of point data added to the position monitoring array.

Function

This function obtains the number of point data added to the position monitoring array. The number of position monitoring arrays for the specified counter number is obtained.

Explanation

<Counter number>

Specifies the counter number to control. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

A% = CQUECNT(1) .....Obtains the number of the counter 1 position-monitoring arrays in A%.

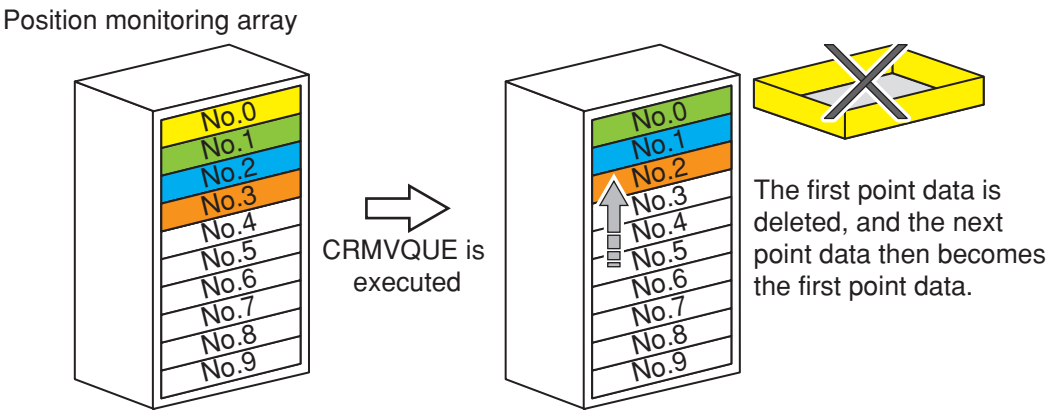
7.2.3.10 CRMVQUE

CRMVQUE	CRMVQUE (<counter number>)
	Deletes the position monitoring array's first point data.

Function

Deletes the first point data in the position monitoring array. When this command is executed, the first point data in the position monitoring array is deleted, and the next point data then becomes the first point data.

CRMVQUE



NOTE

- The position monitoring array is the array which stores the workpiece point data.
- The position monitoring array comprises 10 elements.
- Position monitoring arrays are provided for both counter 1 and counter 2.

MEMO

The array is analogous to a chest-of-drawers. Each drawer has a name (array element number), and contains data. All drawers contain the same type of data. Although this manual refers to the drawer names as "array element numbers", they are also known as "subscripts".

Explanation

<Counter number>

Specifies the counter number of the position monitoring array where the first point data is to be deleted. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
WHILE CCHKQUE(1)<0
 CRMVQUE 1              .....Deletes the point data which has passed beyond the work area.
WEND
IF CCHKQUE(1)>0 THEN
 CTMOVE 1
 CRMVQUE 1              .....Deletes the work-completed point data.
ENDIF
```

7.2.3.11 CRSTPULS

CRSTPULS	CRSTPULS (<counter number>)
	Resets the conveyor's pulse value.

Function

Resets the conveyor's pulse value. The pulse value of the conveyor corresponding to the specified counter number is reset to zero.

MEMO

The conveyor pulse value referred to here is actually the count value of the encoder installed on the conveyor. The conveyor pulse value range in the OMRON vision system is 0 to 65535. The number of pulses per encoder turn varies according to the encoder type which is installed.

Explanation

<Counter number>

Specifies the counter number of the conveyor where the pulse count value is to be reset. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

```
CRSTPULS 1          .....Resets the counter 1 pulse value.
 ⋮
C%=CGETPULS(1)

B=2
CRSTPULS B          .....Resets the counter 2 pulse value.
```

7.2.3.12 CTCONTRL

CTCONTRL	CTCONTRL |ON OFF|
	Switches the conveyor tracking function on and off.

Function

Switches the conveyor tracking function on and off. An "off" setting disables the conveyor tracking function.

Explanation

ON…Turns the conveyor tracking function on.

OFF…Turns the conveyor tracking function off.

Statement examples

CTCONTRL ON .....Turns the conveyor tracking function on.

CTCONTRL OFF .....Turns the conveyor tracking function off.

7.2.3.13 CTDRIVE

CTDRIVE	CTDRIVE (<follow-up height>) [S=<axis movement velocity (%)>]
	Changes the follow-up height during conveyor follow-up operation which occurs relative to the main robot axis.

Function

Changes the follow-up height to the specified height during conveyor follow-up operation which occurs relative to the main robot axis.

NOTE

This command is only enabled during follow-up operation. An error occurs if this command is attempted at any other time.

To continue the process after an error has occurred, use the "ON ERROR GOTO" statement, which allows recovery from the error.

Explanation

<Follow-up height>

Specifies the Z-axis movement height at main robot axis follow-up operations. Either a real number (units: mm) or a variable can be specified.

<Axis movement velocity (%)>

Specifies the program movement velocity for Z-axis movement at follow-up operations. The "axis movement velocity" setting range is 1 to 100 (units: %). A variable can also be specified. The velocity specified here is valid only for the specified CTDRIVE statement.

The follow-up Z-axis movement velocity is the product of the "automatic movement velocity" and the "program movement velocity" values.

NOTE

This setting only determines the maximum velocity. It does not guarantee the specified velocity.

Statement examples

CTDRIVE(100.0) .....Movement to a height of 100.00 occurs during conveyor follow-up operation.

CTDRIVE(160.00) , S=10 .....Movement to a height of 160.00, and a velocity of 10%, occurs during conveyor follow-up operation.

7.2.3.14 CTMOVE

CTMOVE	CTMOVE <counter number> [,Z = <follow-up height>]
	Executes conveyor follow-up operation relative to the main robot axis.

Function

Executes the main robot axis conveyor follow-up operation.
The main robot axis follow-up movement occurs in accordance with the first point data of the position monitoring array specified counter number.

NOTE
An error occurs if the position monitoring array is empty or the first point of the position monitoring array "has passed beyond the work area" or follow-up movement is not possible.
To continue the process after an error has occurred, use the "ON ERROR GOTO" statement, which allows recovery from the error.

Explanation

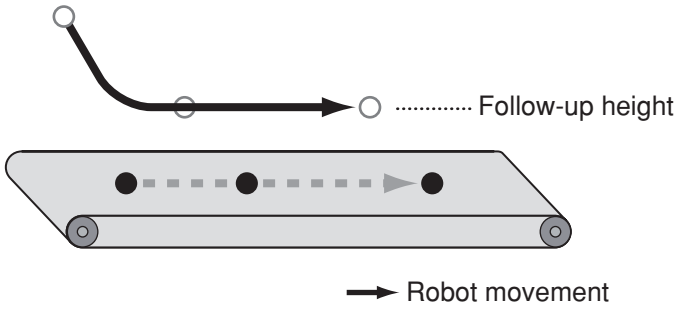
<Counter number>

Specifies the counter number of the position monitoring array which operates the main robot axis follow-up operation. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

<Follow-up height>

Specifies the Z-axis height of the main robot axis follow-up movement. This value can be specified by a real number (units: mm) or by a variable.

Follow-up height



NOTE
An error occurs if the follow-up height is specified by an integer.

Statement examples

CTMOVE 1 .....Performs follow-up movement in accordance with the first point data of the counter 1 position monitoring array.

CTMOVE 1,Z=160.00 .....Performs follow-up movement to the first point data of the counter 1 position monitoring array, at a Z=160.00mm height.

7.2.3.15 CTRKLMT

CTRKLMT	CTRKLMT (<counter number>) = <setting value>
	Sets the tracking limit of the tracking board.

Function

This command sets the tracking limit. The tracking limit of the specified number is set. The tracking board's tracking limit (C1/C2) ("18. Tracking limit [%] (C1)" or "19. Tracking limit (C2)") parameter setting is changed when CTRKLMT is executed.

Explanation

<Counter number>

Specifies the counter number to control. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

CTRKLMT(1) = 80 .....Sets the tracking limit of counter 1 to 80.

NOTE

- Normally, the default tracking limit setting should be used.

7.2.3.16 CTVISION

CTVISION	CTVISION |ON OFF|
	Switches the conveyor tracking camera function on and off.

Function

Switches the conveyor tracking camera function on and off.

Specify an "ON" setting to use the camera at the conveyor tracking function.

Explanation

ON…The camera is used at the conveyor tracking function.

OFF…The camera is not used at the conveyor tracking function.

NOTE

- When CTVISION is set as "ON", the camera captures images only at S/W trigger outputs, and the conveyor's pulse value is reset the instant an image capture occurs.
- When the power is turned off, the setting returns to the state where the camera is not used for conveyor tracking.

Statement examples

CTVISION ON .....The camera is used at the conveyor tracking function.

CTVISION OFF .....The camera is not used at the conveyor tracking function.

7.2.3.17 CVELCOEF

CVELCOEF	CVELCOEF (<counter number>) = <setting value>
	Sets the conveyor speed coefficient of the tracking board.

Function

This command sets the conveyor speed coefficient. The conveyor speed coefficient of the specified number is set. The tracking board conveyor speed coefficient (C1/C2) ("16. Conveyor speed coefficient [%] (C1)" or "17. Conveyor speed coefficient [%] (C2)") parameter setting is changed when CVELCOEF is executed.

Explanation

<Counter number>

Specifies the counter number to control. Only one number may be specified (1 or 2). The counter number can also be specified by a variable.

Statement examples

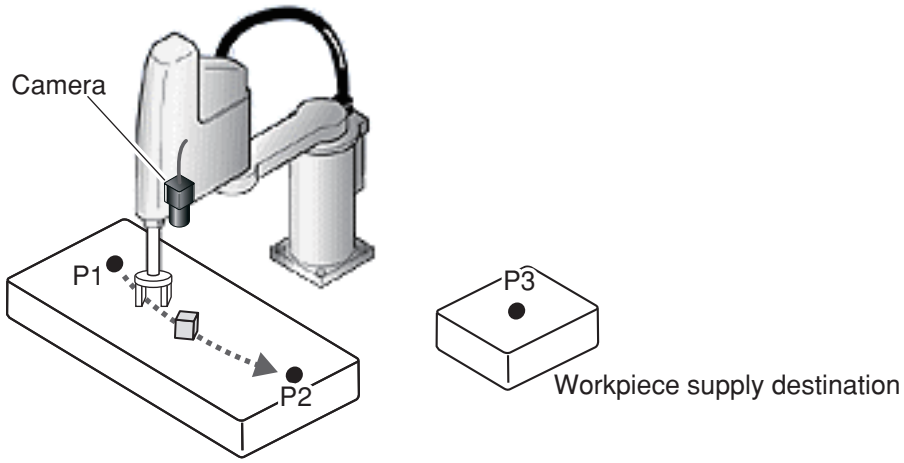
CVELCOEF(1) = 950 .....Sets the conveyor speed coefficient of counter 1 to 950.

7.3 Sample programs

7.3.1 Pick-and-place using the search function

■ **Overview**

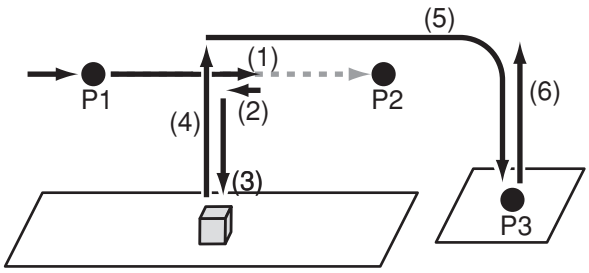
Searches for a workpiece between search start position (P1) and search end position (P2) while moving between those positions. The workpiece which was detected between P1 and P2 is picked up and placed at the workpiece supply destination (P3).



■ **Prerequisites**

● **Robot movement**

■ **When a workpiece is detected**



(1) Rough search movement occurs between search start position (P1) and search end position (P2), and stops if a workpiece is detected.

(2) A higher-precision search then occurs, and if a workpiece is detected, movement to that workpiece location occurs.

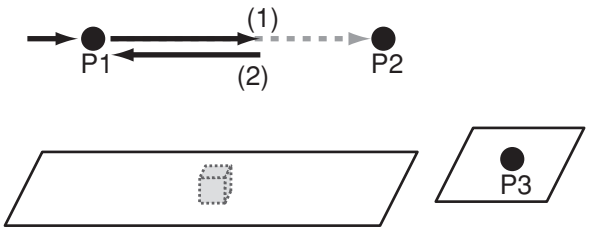
(3) The Z-axis is lowered, and the workpiece is grasped.

(4) The Z-axis is raised.

(5) Arch motion to the workpiece supply destination (P3) then occurs, and the workpiece is released there.

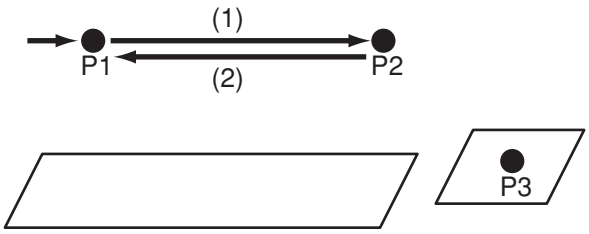
(6) The Z-axis is raised.

■ **When a workpiece is detected by the rough search, but not by the subsequent higher-precision search:**



(1) Rough search movement occurs between search start position (P1) and search end position (P2), and stops if a workpiece is detected.
(2) A higher-precision search then occurs, and if a workpiece is not detected, movement to search start position (P1) occurs, and the search begins again.

■ **When no workpiece is detected:**



(1) Rough search movement occurs between start position (P1) and search end position (P2).
(2) If no workpiece is detected at step (1) above, movement to search start position (P1) occurs, and the search begins again.

● **Points used**

P1 … Search start position
P2 … Search end position
P3 … Workpiece supply destination

● **Input/output signals used**

Output signal description		Output signal status	
		1	0
DO(20)	Workpiece pick-and-place command	Grasp	Release

● **Other**

- The camera is mounted on robot arm 2.
- "Ch.1" is used as the camera channel number.
- Information concerning the workpiece to be detected is registered at model number 2.
- The robot Z-axis height is 100.0mm at the point where the workpiece is grasped.
- The calibration data is registered at calibration number 0.

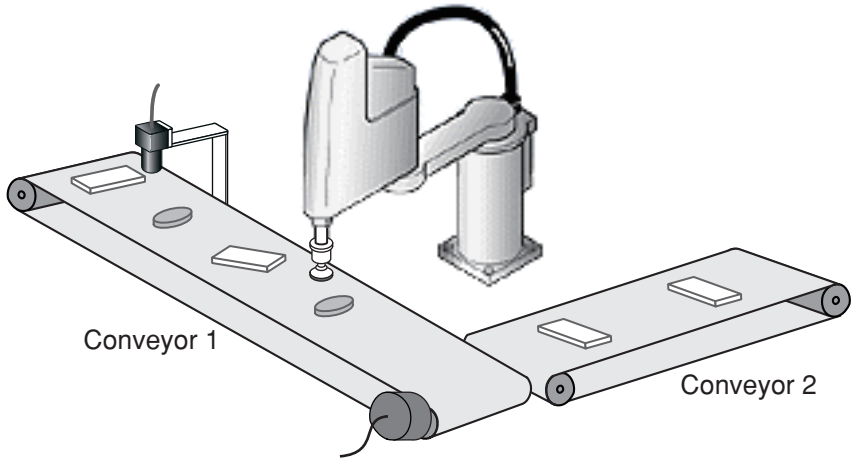
■ **Sample program**

```
*ST:                                    ..... Label definition
  MOVE P,P1                             ..... Movement to P1
  SCAN_RET%=0
  START *WORK_SCAN,T2                   ..... Start the search task (sub task)
  MOVE P,P2,S=10,STOPON SCAN_RET%=1     ..... Stop if workpiece is detected while
                                              moving to P2.
  IF SCAN_RET%=0 THEN                   ..... If no workpiece is detected,
    CUT T2                              ..... End the search task
    GOTO *ST                            ..... Jump to label *ST (perform search again
                                              from beginning)
  ENDIF
  WAIT ARM                              ..... Wait for robot operation end
  VSEARCH 1,2,0                         ..... Perform higher-precision search (camera
                                              Ch.1, model number 2, calibration
                                              number 0)
  IF VGETCNT>0 THEN                     ..... If workpiece is detected,
    MOVE P,VGETPOS(0)                   ..... Move to detected workpiece position
    DRIVE(3,100.0)                      ..... Lower Z-axis to 100.0mm height.
    DO(20)=1                            ..... Grasp the workpiece
    DRIVE(3,0.0)                        ..... Raise Z-axis to 0.0mm height
    MOVE P,P3,Z=0.0                     ..... Perform arch motion movement to P3
    DO(20)=0                            ..... Release the workpiece
    DRIVE(3,0.0)                        ..... Raise Z-axis to 0.0mm
    HALT
  ENDIF
  GOTO *ST                              ..... Jump to label *ST (search for next
                                              workpiece)
* WORK_SCAN:                            ..... Label definition (search task)
  VSEARCHR 1,2,0                        ..... Perform rough search (camera Ch.1,
                                              model number 2, calibration number 0)
  IF VGETCNT>0 THEN                     ..... If workpiece is detected,
    SCAN_RET%=1                         ..... Activate "search end" flag
    EXIT TASK                           ..... End search task
  ENDIF
  GOTO *WORK_SCAN                       ..... Jump to label *WORK_SCAN (repeat
                                              search)
```

7.3.2 Conveyor tracking

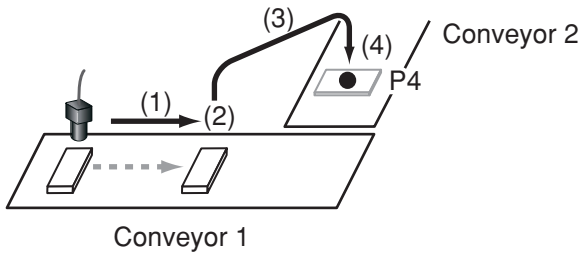
■ **Prerequisites**

Searches for and tracks a workpiece being conveyed on conveyor 1, and places that workpiece on conveyor 2.



■ **Prerequisites**

● **Robot movement**



(1) A search occurs, and when the detected workpiece enters the work area, conveyor follow-up movement occurs to track that workpiece.
(2) The workpiece is grasped.
(3) The workpiece is moved to the workpiece supply destination (P4).
(4) The workpiece is released.

● **Points used**

P4 …Workpiece supply destination (conveyor 2)

● **Input/output signals used**

Output signal description		Output signal status	
		1	0
DO(20)	Workpiece pick-and-place command	Grasp	Release

● **Other**

- A fixed camera pointing downward is mounted at the conveyor's upstream position.
- "Ch.1" is used as the camera channel number.
- Information concerning the workpiece to be detected is registered at model number 2.
- The robot Z-axis height is 120.0mm at the point where the workpiece is grasped.
- The conveyor calibration data is registered at calibration number 0.
- Conveyor counter number 1 is used.
- The search is performed every 800ms.

■ **Sample program**

```
   ON ERROR GOTO *ERROR_CHECK
   CTCONTRL ON                          ..... Turn conveyor tracking function on
   CTVISION ON                          ..... Switch to the "use camera" mode at
                                              conveyor tracking.
   START *CONV_SCAN,T2                  ..... Start the search task (sub task)
*CONVEYOR:                              ..... Label definition
   WHILE CCHKQUE(1) < 0
      CRMVQUE 1
   WEND

                                        ..... Delete point data of workpiece (at
                                              position  monitoring array) which has
                                              passed beyond the work area
   IF CCHKQUE( 1 ) > 0 THEN             ..... Start work when workpiece enters the
                                              work area
      CTMOVE 1 , Z=110.00               ..... Start follow-up movement
      CTDRIVE(120.0) , S=100            ..... Move to workpiece height
      DELAY 200                         ..... Wait for 200ms
      DO(20) = 1                        ..... Grasp the workpiece
      CTDRIVE(110.0) , S=100            ..... Raise the workpiece
      MOVE P , P4 , Z=0.0               ..... Perform arch motion movement to place
                                              point
      CRMVQUE 1                         ..... Delete point data of workpiece (at position
                                              monitoring array) which has moved.
      DO(20) = 0                        ..... Release the workpiece
   ENDIF
   GOTO *CONVEYOR                       ..... Jump to label *CONVEYOR (go to
                                              tracking of next workpiece)
*CONV_SCAN:                             ..... Label definition (search task)
   VSEARCH 1,2,0                        ..... Perform search (camera Ch.1, model
                                              number 2, calibration number 0)
   IF VGETCNT>0 THEN                    ..... If workpiece is detected,
      FOR I%=0 TO VGETCNT-1
         CADDQUE 1,VGETPOS(I%)
      NEXT I%

                                        ..... Add all search results to the position
                                              monitoring array
   ENDIF
   DELAY 800                            ..... Wait 800ms before beginning next search
   GOTO *CONV_SCAN                      ..... Jump to label *CONV_SCAN (repeat search)

*ERROR_CHECK:                           ..... Label definition (error avoidance)
                                        (Process continues in the following errors)
   IF ERR = &H1436 THEN *NEXT1          ..... Error number 20.54
   IF ERR = &H143A THEN *NEXT2          ..... Error number 20.58
   IF ERR = &H143B THEN *NEXT1          ..... Error number 20.59
   ON ERROR GOTO 0                      ..... Display error and stop execution.

*NEXT1:                                 ..... Label definition (internal error
                                              avoidance processing)
   RESUME NEXT                          ..... Jump to the line next to the line where
                                              error occurred, and continue execution.
*NEXT2:                                 ..... Label definition (internal error
                                              avoidance processing 2)
   CRMVQUE 1                            ..... Delete data which has passed beyond
                                              the work area
   RESUME *CONVEYOR                     ..... Jump to CONVEYOR label and continue
                                              execution
```

B. SCARA VISION STUDIO OPERATION SECTION

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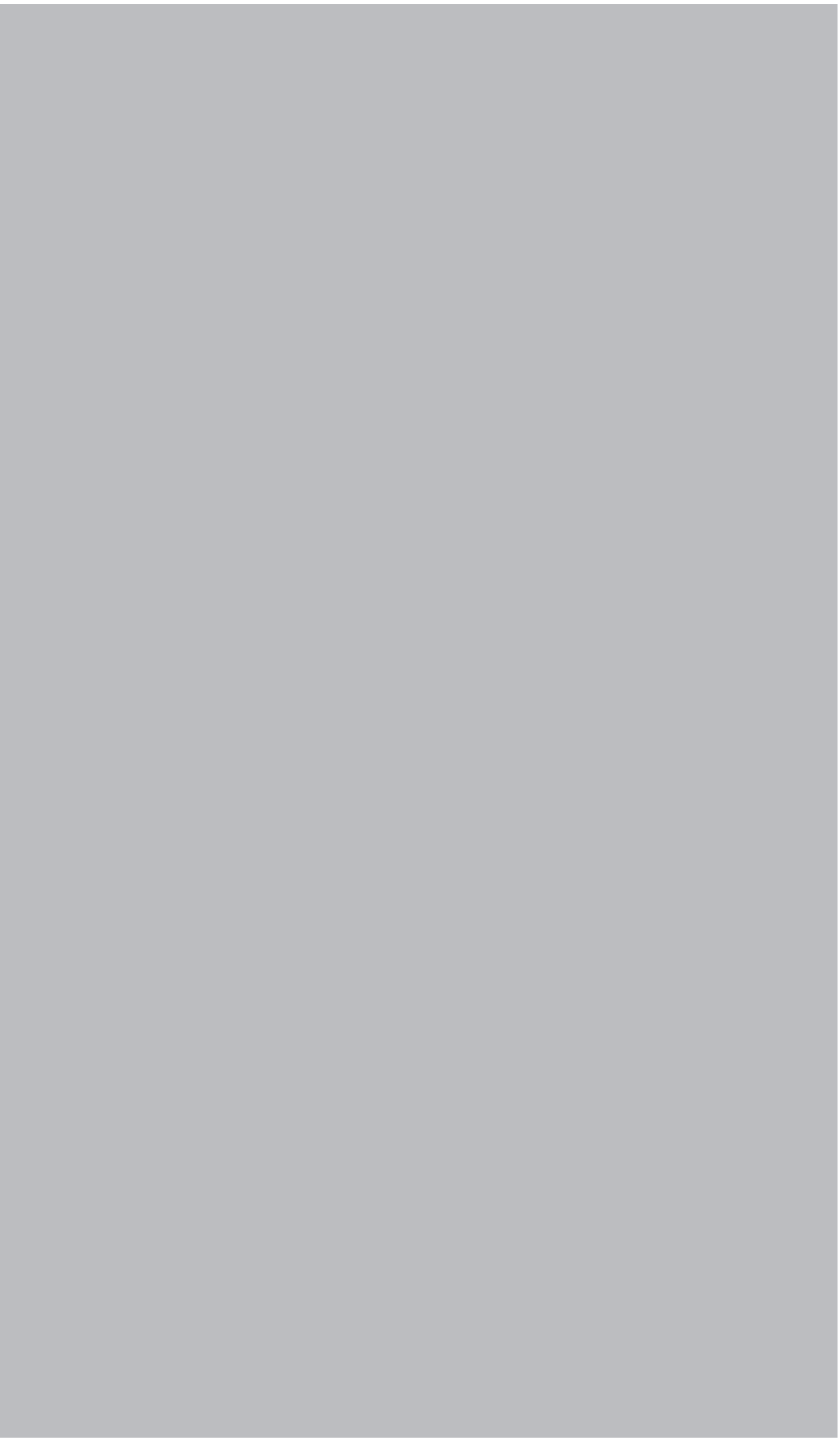


1. SCARA Vision Studio overview

1.1 SCARA Vision Studio

SCARA Vision Studio is support software for the SCARA Vision System.

The SCARA Vision System uses SCARA Vision Studio to register workpiece data in advance at an YRC Series controller (here after referred to as "robot controller") with SCARA Vision option, to enable a system which can recognize images based on that workpiece data.

SCARA Vision Studio offers the following four functions:

- **Model registration**
  Registers workpiece data at the robot controller.
- **Search**
  Searches the camera's captured images, and images saved to memory, to find registered models (workpieces).
- **Fiducial mark registration**
  Registers (at robot controller) the fiducial mark data required for calibrations.
- **Monitoring**
  Allows the operator to monitor workpiece search conditions and calibration setting related fiducial mark search conditions during automatic robot operation.

In order to use the SCARA Vision System, the workpiece models must first be registered at SCARA Vision Studio. After registering the workpiece models, perform a search to verify that these models are detected without problem. Next, register the fiducial marks at SCARA Vision Studio. After completing the workpiece model and fiducial mark registration procedures, specify the calibration settings at the robot controller.
When all the required settings have been made, the robot program can be executed to perform automatic robot operation.

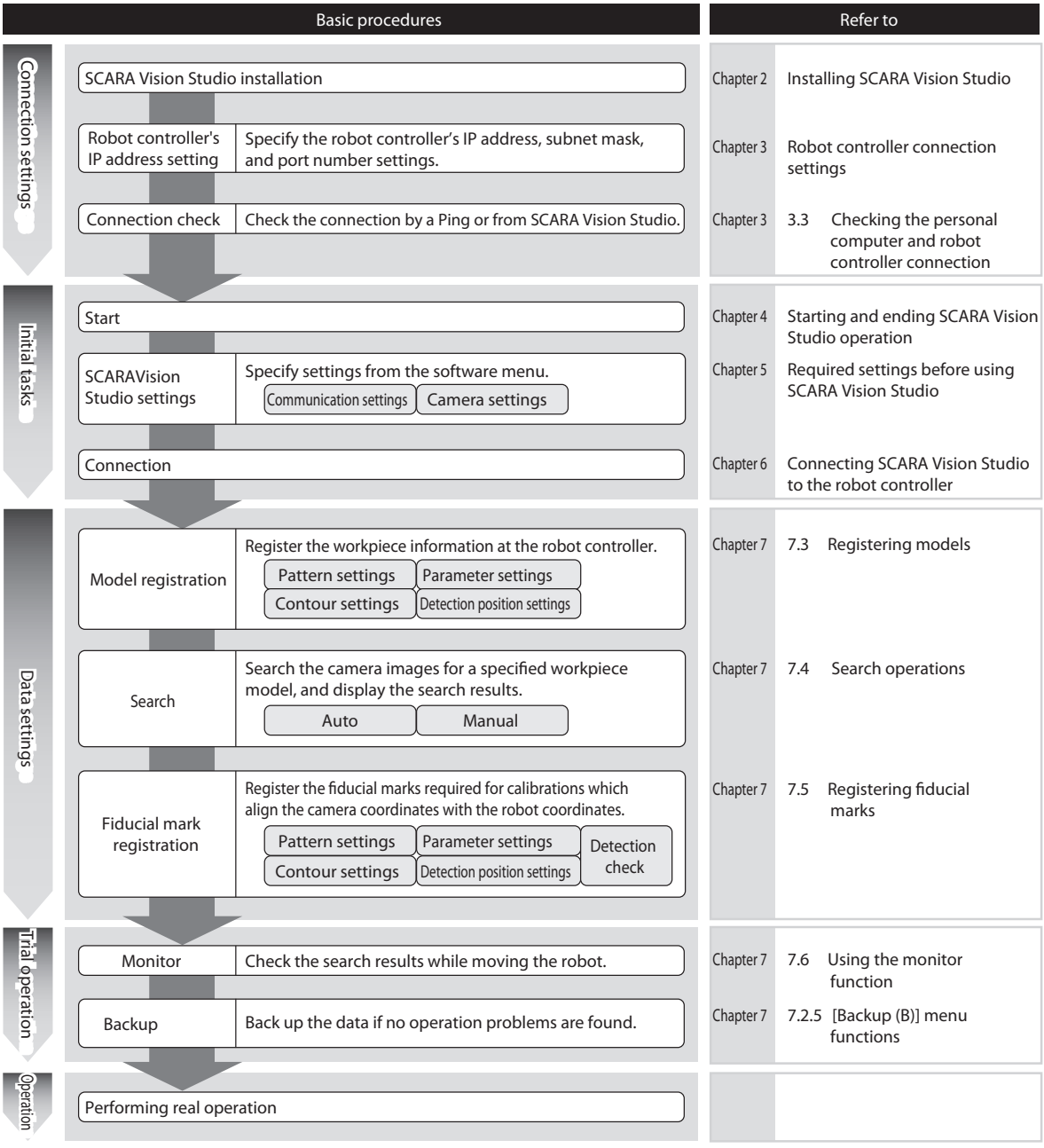
For details concerning basic preparation procedures from the point when SCARA Vision Studio is purchased, until it is operated, refer to Chapter 1, section 1.2 "Preparations for SCARA Vision Studio use".

NOTE
In order to use the SCARA Vision System, dedicated robot language commands must be written into the program.

MEMO
A "calibration" refers to the process in which the coordinates (camera coordinates) of the image acquired by the camera are aligned with the robot coordinates.

1.2 Preparations for SCARA Vision Studio use

This section explains the basic preparation procedures from the point when the SCARA Vision Studio is purchased, until it is operated. Refer to the illustration given below.



2. Installing SCARA Vision Studio

2.1 Items to check before the installation

Before installing SCARA Vision Studio, verify that the operating environment of the personal computer where the installation is to occur satisfies the following requirements.

OS	: Microsoft Windows 2000 / Windows XP / Windows Vista * Operation is not guaranteed in 64-bit systems
CPU	: The CPU (or higher) which is recommended for the OS being used.
Memory	: 64MB or more (recommended)
Hard disk capacity	: 4.0MB of vacant space on the drive where SCARA Vision Studio is to be installed. * Additional vacant space is required for saving images and data.
Display	: 800 x 600 dot, or higher, 32768 colors (16bit High Color) or higher (recommended)
Network	: TCP/IP compatible Ethernet port x 1

* Microsoft, Windows 2000, Windows XP, Windows Vista are registered trademarks of the Microsoft Corporation, USA.
* Ethernet is a registered trademark of the XEROX Corporation, USA.

2.2 SCARA Vision Studio installation procedure

This section explains how to install SCARA Vision Studio in the user's personal computer. These instructions apply to a personal computer which is running Windows XP.

1 ***End all programs/applications which are currently running.***

2 ***Insert the setup disk into the CD-ROM drive.***

3 ***Start the setup program.***

The setup program should start automatically.

If it does not, perform the following procedure to start it.

1. Select [START] – [My Computer].
2. Double-click the CD-ROM drive where the setup disk has been inserted.
3. Double-click the [Setup] icon. (Depending on the Explorer settings, the icon name may read as [Setup.exe].)

4 ***The SCARA Vision Studio installation begins.***

Follow the on-screen guidance messages to perform the installation.

2.3 Uninstalling SCARA Vision Studio

This section explains how to uninstall SCARA Vision Studio from the user's personal computer. These instructions apply to a personal computer which is running Windows XP.

1 ***Open the "Add or Remove Programs" window.***

Select [START] – [Control Panel (C)] – [Add or Remove Programs].

2 ***Select the program to be removed.***

Select the [Change or Remove Programs (H)] icon, then select the currently installed "SCARA Vision Studio".

3 ***The SCARA Vision Studio uninstall operation begins.***

Follow the on-screen guidance messages to perform the uninstall operation.

2.4 Upgrading the SCARA Vision Studio version

When upgrading the SCARA Vision Studio version, be sure to uninstall the old-version SCARA Vision Studio first, then install the new version.

3. Robot controller connection settings

To connect SCARA Vision Studio to the robot controller, it is necessary to set the robot controller's IP address, subnet mask, and port number.
The robot controller connection settings must be specified in the following order.

1 Verify the personal computer's IP address and subnet mask values.
2 Set the robot controller's IP address, subnet mask, and port number.
3 Verify the connection between the personal computer and the robot controller.

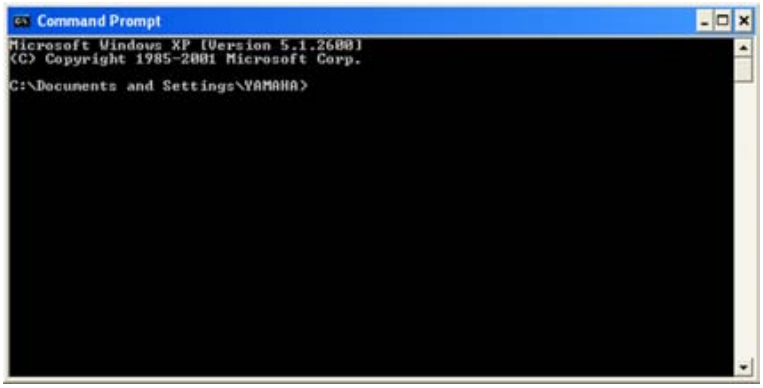
3.1 Checking the personal computer's IP address and subnet mask

There are several kinds of personal computer's IP address checking procedures. This section describes how to check the personal computer's IP address from the command prompt with Windows XP used as an example. Please read the following steps for your reference.

1 ***Start up the command prompt.***

Click [Start]-[All Programs (P)]-[Accessories]-[Command Prompt].

Starting up the command prompt.



2 ***Run the "ipconfig" command.***

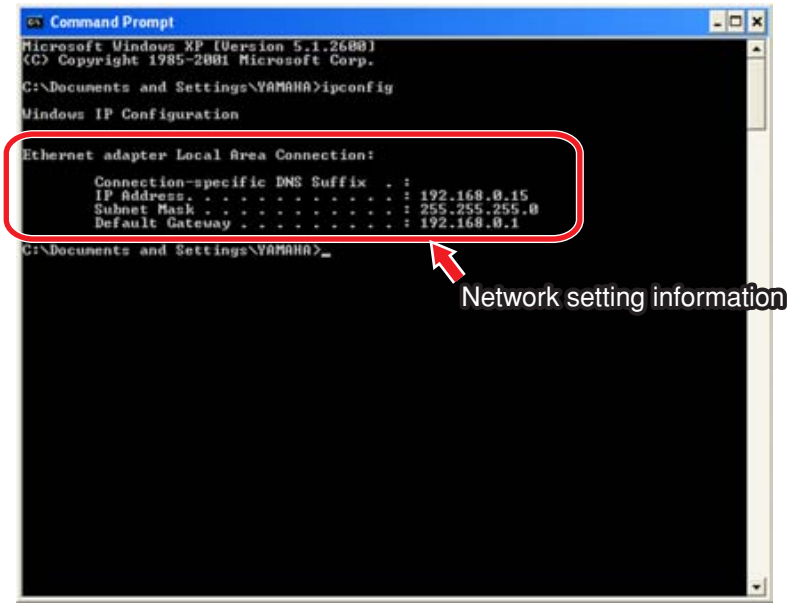
Following >, type "ipconfig" and press .

MEMO

"ipconfig" is a command intended to display the network setting information on the command prompt.

3 ***The network setting information, such as IP address and subnet mask values is displayed.***

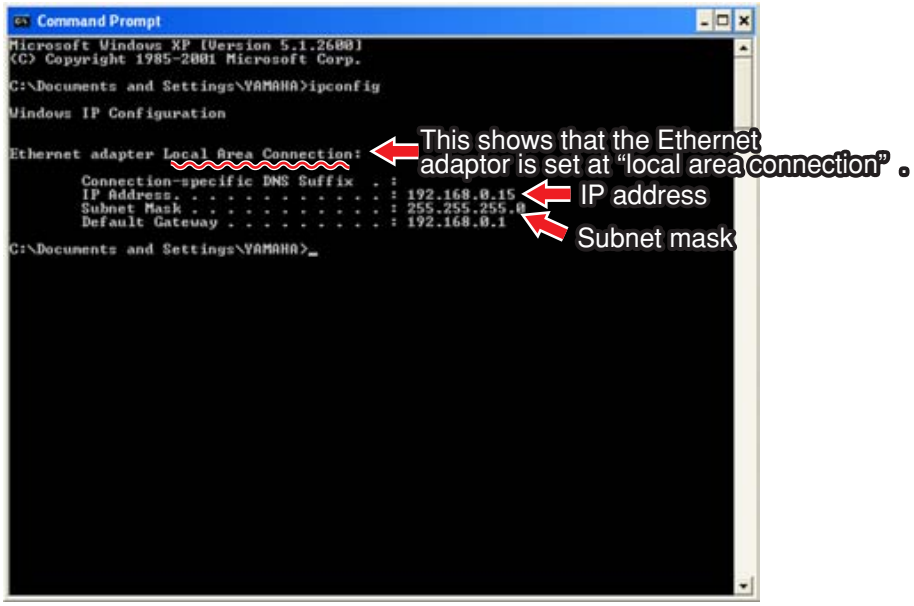
Command prompt screen (1)



4 ***Check the setting information and record the IP address and subnet mask values.***

1. Check that the Ethernet adaptor is set at "local area connection".
   If "local area connection" is not displayed, the network connection may conflict with other connection, such as wireless LAN. In this case, make other connection disabled or make the setting so that other connection can be shared.
2. Check the IP address and subnet mask values and record these set values.
   The values you have recorded here are used when setting the robot controller's connection.

Command prompt screen (2)



3.2 Setting the robot controller's communication

3.2.1 Setting the robot controller's IP address

To connect SCARA Vision Studio to the robot controller, it is necessary to set the robot controller's IP address. The robot controller's IP address is set based on the IP address of the personal computer main unit.

IP address ..... Set a numeric value at the lowest digit, which is different from the personal computer's value.

NOTE

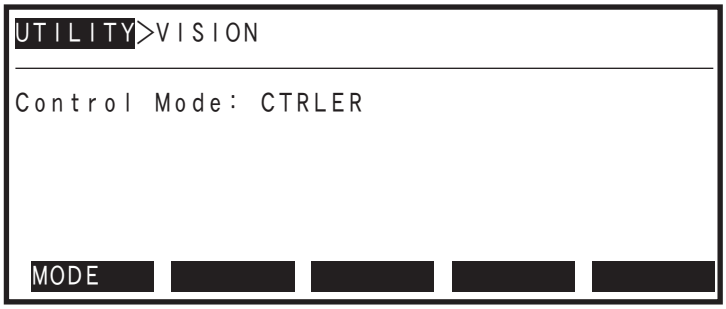
The IP address is set corresponding to the customer's network environment. For details concerning the set value, contact the network administrator.

The robot controller's IP address is set using PB. The following describes how to set the robot controller's IP address.

1 ***Check that the vision control mode is set to the "CTRLER" mode.***

To set the robot controller's IP address, the vision control mode must be set to the "CTRLER" mode. If the vision control mode is not set to the "CTRLER" mode, change the vision control mode to the "CTRLER" mode. For details concerning how to change the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode" in SCARA VISION SYSTEM EXPLANATION SECTION.

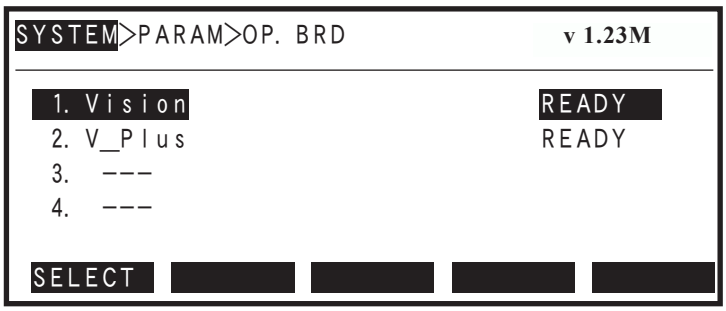
Vision control mode check screen



2 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

3 ***Use the (↑ / ↓) cursor keys to select "Vision", then press the*** F 1 ***(SELECT) key.***

"SYSTEM>PARAM>OP.BRD" mode screen



4 ***Use the (↑ / ↓) cursor keys to select "2. IP address", then press the [F 1] (SELECT) key.***

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen

```
SYSTEM>PARAM>OP. BRD>SELECT        v 1.23M

  1. Board condition     READY
  2. IP address          192. 168.   0.   2
  3. Sub net mask        255. 255. 255.   0
  4. Port No.            49200
  5. Camera type         0
EDIT    JUMP
```

5 ***Enter the IP address.***

The current IP address displays. To change this setting, use the [0] to [9] keys to enter the desired IP address.

Also enter a period [.] mark.

When the revision is completed, press the [⇔] key.

IP address input

```
SYSTEM>PARAM>OP. BRD>SELECT        v 1.23M

  1. Board condition     READY
  2. IP address          192. 168.   0.   2
  3. Sub net mask        255. 255. 255.   0
  4. Port No.            49200
  5. Camera type         0
Enter IP address >192. 168.   0.   2
```

6 ***Press the [ESC] key, then restart the robot controller.***

If a correct IP address has been entered, the following message displays: "0.7 : Turn on power again". At this time, press the [ESC] key to end the EDIT mode, then restart the robot controller. The edited (revised) setting becomes valid after the robot controller is restarted.

Power supply restart message screen

```
SYSTEM>PARAM>OP. BRD>SELECT        v 1.23M
——— 0. 7:Turn on power again ———————————
  1. Board condition     READY
  2. IP address          192. 168.   0.   2
  3. Sub net mask        255. 255. 255.   0
  4. Port No.            49200
  5. Camera type         0
Enter IP address >192. 168.   0.   2
```

MEMO

To continue with the sub net mask and port number setting operations, use the (↑ / ↓) cursor keys to select "3. Sub net mask" or "4. Port No." without pressing the ESC key. After specifying those settings, press the ESC key and then restart the robot controller. In this case, the changed IP address, sub net mask, and port number settings all become valid after the robot controller is restarted.

3.2.2 Setting the robot controller's subnet mask

To connect SCARA Vision Studio to the robot controller, it is necessary to set the robot controller's subnet mask and port number in addition to the robot controller's IP address. The robot controller's subnet mask is set based on the subnet mask value of the personal computer main unit.

Subnet mask ..... Set the same value as the personal computer's value.

NOTE

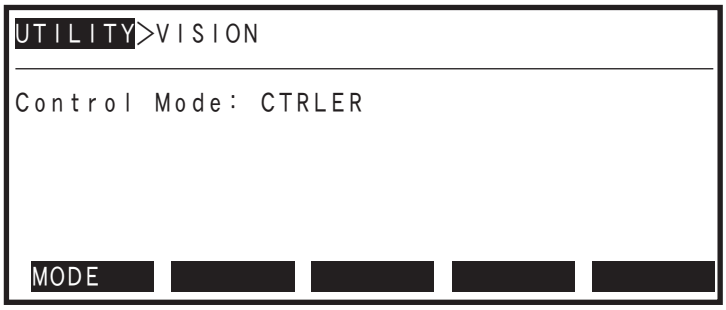
The subnet mask is set corresponding to the customer's network environment. For details concerning the set value, contact the network administrator.

The robot controller's subnet mask is set using PB. The following describes how to set the robot controller's subnet mask.

1 ***Check that the vision control mode is set to the "CTRLER" mode.***

To set the robot controller's subnet mask, the vision control mode must be set to the "CTRLER" mode. If the vision control mode is not set to the "CTRLER" mode, change the vision control mode to the "CTRLER" mode. For details concerning how to change the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode" in SCARA VISION SYSTEM EXPLANATION SECTION.

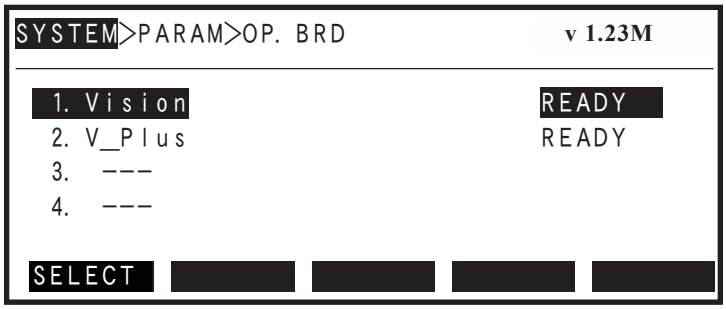
Vision control mode check screen



2 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

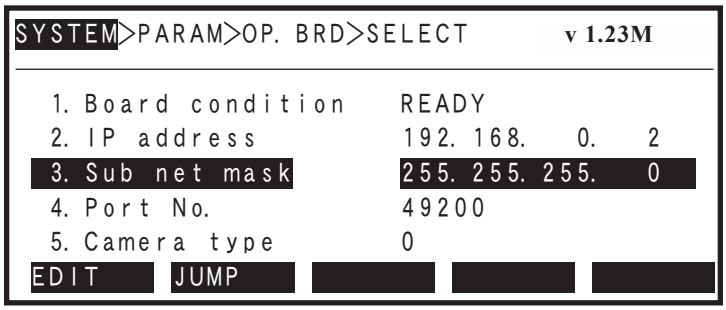
3 ***Use the (↑ / ↓) cursor keys to select "Vision", then press the [F 1] (SELECT) key.***

"SYSTEM>PARAM>OP.BRD" mode screen



4 ***Use the (↑ / ↓) cursor keys to select "3. Sub net mask ", then press the [F 1] (SELECT) key.***

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen



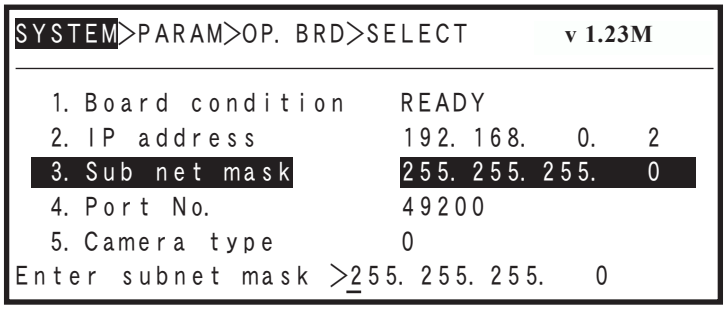
5 ***Enter the sub net mask.***

The current sub net mask displays. To change this setting, use the [0] to [9] keys to enter the desired IP address.

Also enter a period [.] mark.

When the revision is completed, press the [⇨] key.

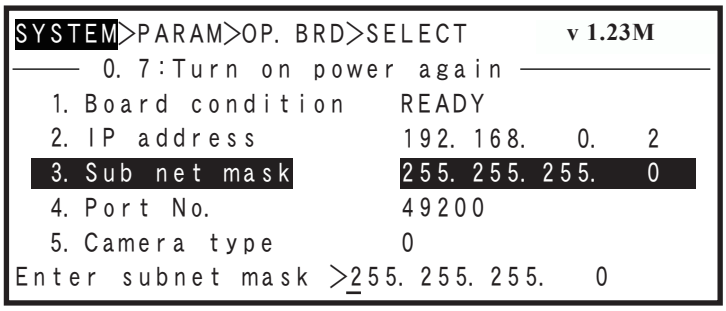
Sub net mask input



6 ***Press the ESC key, then restart the robot controller.***

If a correct sub net mask has been entered, the following message displays: "0.7 : Turn on power again". At this time, press the ESC key to end the EDIT mode, then restart the robot controller. The edited (revised) setting becomes valid after the robot controller is restarted.

Power supply restart message screen



MEMO

To continue with the IP address and port number setting operations, use the (↑ / ↓) cursor keys to select "2. IP address" or "4. Port No." without pressing the ESC key. After specifying those settings, press the ESC key and then restart the robot controller. In this case, the changed IP address, sub net mask, and port number settings all become valid after the robot controller is restarted.

3.2.3 Setting the robot controller's port number

To connect SCARA Vision Studio to the robot controller, it is necessary to set the robot controller's subnet mask and port number in addition to the robot controller's IP address. The port number is set in a range of 49152 to 65535. Be careful to set the robot controller's port number so that it is not duplicated with that of other software (service).

NOTE

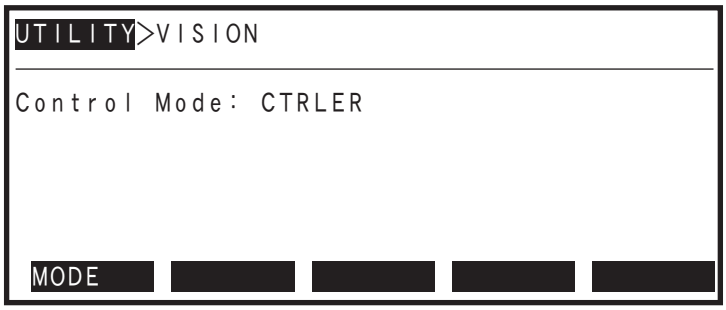
The port number is set corresponding to the customer's network environment. For details concerning the set value, contact the network administrator.

The robot controller's port number is set using PB. The following describes how to set the robot controller's port number.

1 ***Check that the vision control mode is set to the "CTRLER" mode.***

To set the robot controller's port number, the vision control mode must be set to the "CTRLER" mode. If the vision control mode is not set to the "CTRLER" mode, change the vision control mode to the "CTRLER" mode. For details concerning how to change the vision control mode, refer to Chapter 4, section 4.3 "Setting the robot controller's control mode" in SCARA VISION SYSTEM EXPLANATION SECTION.

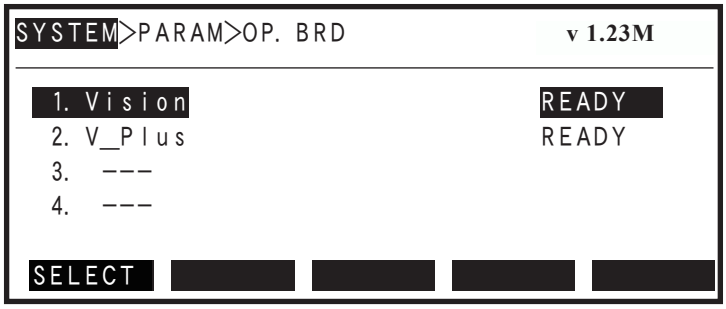
Vision control mode check screen



2 ***Select the "SYSTEM>PARAM>OP.BRD" mode.***

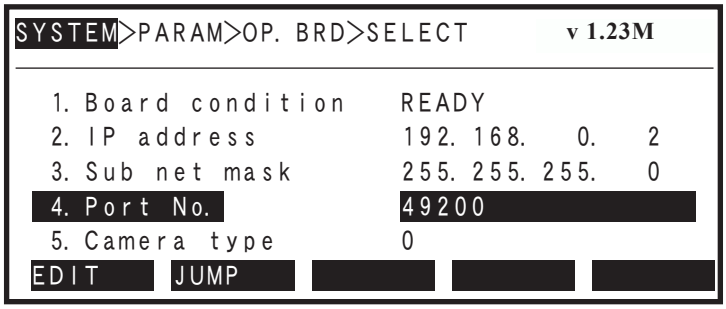
3 ***Use the (↑ / ↓) cursor keys to select "Vision", then press the*** F 1 ***(SELECT) key.***

"SYSTEM>PARAM>OP.BRD" mode screen



4 ***Use the (↑ / ↓) cursor keys to select "4. Port No.", then press the*** F 1 ***(SELECT) key.***

"SYSTEM>PARAM>OP.BRD>SELECT" mode screen

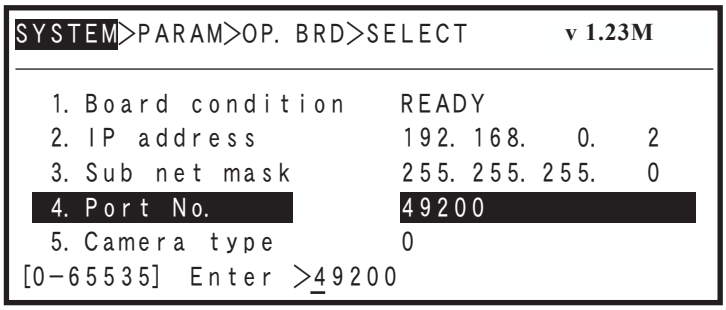


5 ***Enter the port number.***

The current port number displays. To change this setting, use the 0 to 9 keys to enter the desired IP address.

When the revision is completed, press the ⇨ key.

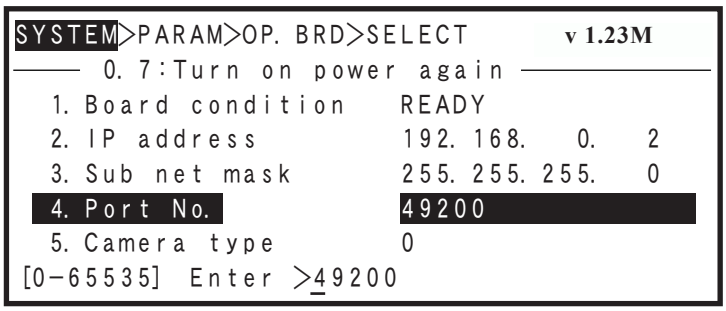
Port number input



6 ***Press the*** ESC ***key, then restart the robot controller.***

If a correct port number has been entered, the following message displays: "0.7 : Turn on power again". At this time, press the ESC key to end the EDIT mode, then restart the robot controller. The edited (revised) setting becomes valid after the robot controller is restarted.

Power supply restart message screen



MEMO

To continue with the IP address and sub net mask setting operations, use the (↑ / ↓) cursor keys to select "2. IP address" or "3. Sub net mask" without pressing the ESC key. After specifying those settings, press the ESC key and then restart the robot controller. In this case, the changed IP address, sub net mask, and port number settings all become valid after the robot controller is restarted.

3.3 Checking the personal computer and robot controller connection

After checking the personal computer's IP address and subnet mask settings and finishing the robot controller communication settings, verify that normal communication is enabled between the personal computer and the robot controller.
This communication status check can be performed by either of the following methods.

[Check methods]

- Connection check by SCARA Vision Studio.
- Connection check by Ping.

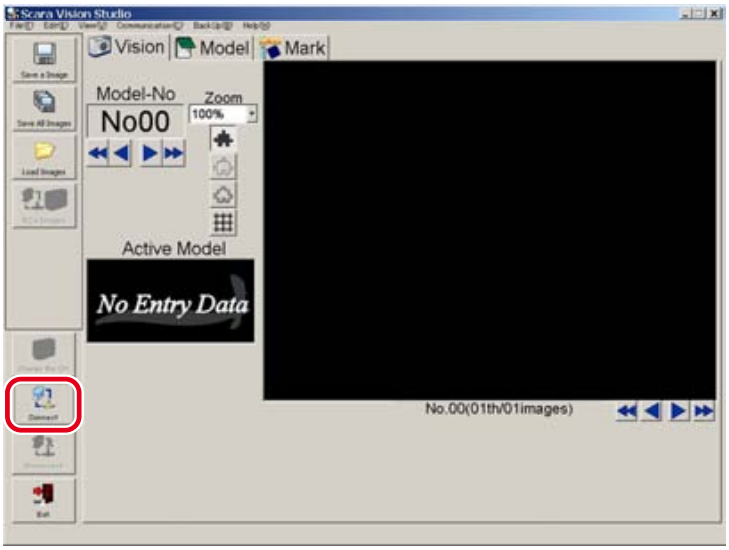
3.3.1 Connection check by SCARA Vision Studio

The communication status between the personal computer and robot controller can be checked by starting SCARA Vision Studio. This procedure is given below.

1 ***Start SCARA Vision Studio.***

2 ***Press the [Connect] button.***

SCARA Vision Studio initial screen



3 ***Check the connection status.***

■ A normal communication exists if the "Please change the control mode into the HOST-PC Mode or the Monitor Mode" error message displays.

Connection is enabled when the robot controller's control mode is changed to " Host PC" or "Monitor". The control mode can be changed at "UTILITY>VISION>MODE". For the control mode changing procedure, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 4, section 4.3 "Setting the robot controller's control mode".

Connection status check (1)

■ Normal connection is possible if the "Connecting in progress…" message displays.

Connection status check (2)

■ When a connection error displays

Normal communication may be disabled. Check the following items.

- Specify the SCARA Vision Studio communication settings, then check the connection status again. For the SCARA Vision Studio communication setting procedure, refer to Chapter 5, section 5.1 "Communication settings".
- Review the connection destination robot controller's IP address setting, then check the connection status again.
  For details concerning how to check and change the connection destination robot controller's IP address, refer to Chapter 3, section 3.2.1, "Setting the robot controller's IP address".
- Review the connection destination robot controller's subnet mask setting, then check the connection status again.
  For details concerning how to check and change the connection destination robot controller's subnet mask, refer to Chapter 3, section 3.2.2, "Setting the robot controller's subnet mask".
- Check that the connection destination robot controller's port number is not duplicated with other software's port number. When necessary, change the port number in a range of 49152 to 65535. After that, check the connection status again.
  For details concerning how to check and change the robot controller's port number, refer to Chapter 3, section 3.2.3, "Setting the robot controller's port number".

- Check that the personal computer's local area connection is enabled, then check the connection status again.
  For details concerning how to check the personal computer's local area connection, refer to Chapter 3, section 3.1, "Checking the personal computer's IP address and subnet mask".
- Verify that the Ethernet crossover cable is connected, then check the connection status again.

NOTE

If the connection destination robot controller's IP address, subnet mask, or port number setting has been changed, it is necessary to restart the robot controller.

Connection status check (3)

3.3.2 Connection check by ping

The Ping method can also be used to check if normal communication is possible between the personal computer and robot controller.

MEMO

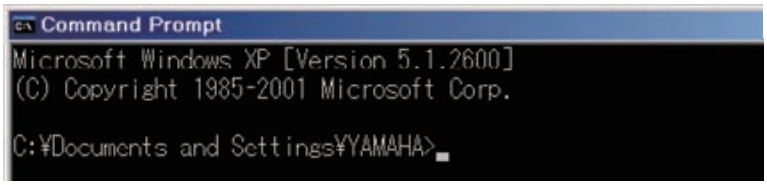
Ping is a standard network diagnosis tool built in to the OS.

The simple Windows XP method for using Ping is explained below for reference purposes.

1 ***Start the command prompt.***

Select [Start] – [All Programs] – [Accessories] – [Command Prompt].

Starting the command prompt



2 ***Execute the Ping command.***

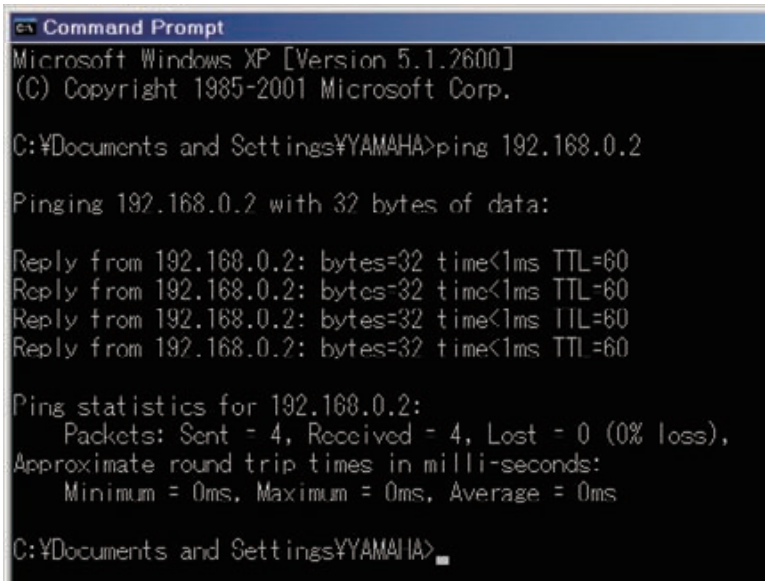
After the ">" prompt, enter "ping xxx.xxx.xxx.xxx", then press the [Enter] key. Enter the robot controller's IP address as the "xxx.xxx.xxx.xxx" data.

In this example, the following is entered: "ping 192.168.0.2".

3 ***Information which indicates the time required for reception, etc., displays.***

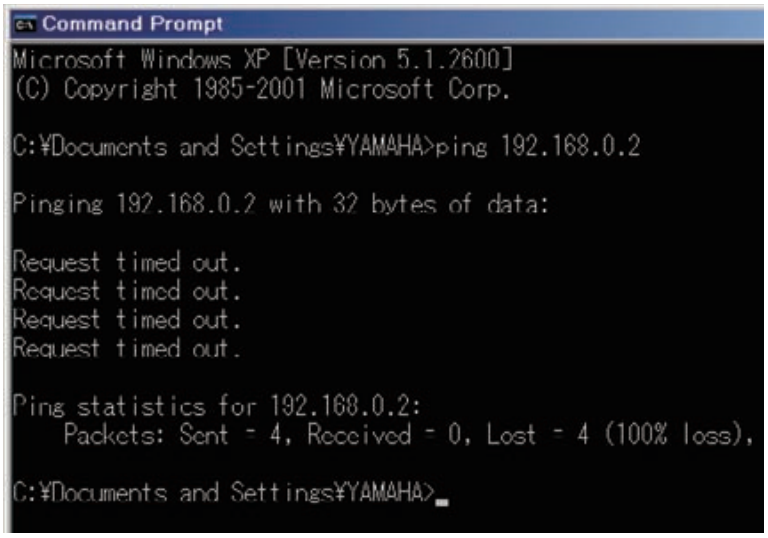
This information displays if the communication status is normal.

When communication status is normal



A message such as "Request time out.", etc., displays if a normal communication cannot be established. If this occurs, revise the connection destination robot controller's IP address communication setting, etc., then check the status again.
For details concerning how to check or change the robot controller's communication setting, refer to Chapter 3, section 3.2, "Setting the robot controller's communication".

When normal communication cannot be established



4. Starting and ending SCARA Vision Studio operation

4.1 Starting SCARA Vision Studio operation

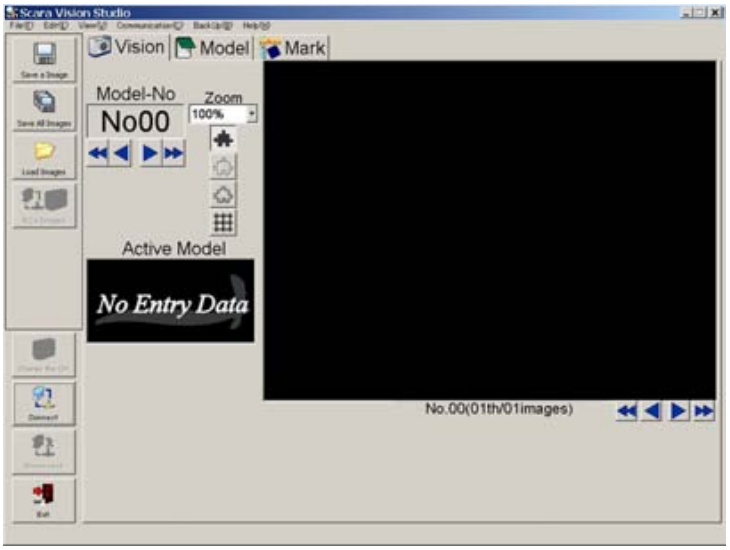
The procedure for starting SCARA Vision Studio operation is given below. The starting instructions given here apply to a computer which is running Windows XP.

1 ***Start SCARA Vision Studio.***

Select [Start] – [All Programs] – [Scara Vision Studio] – [Scara Vision Studio].

2 ***The SCARA Vision Studio screen displays.***

SCARA Vision Studio start screen.



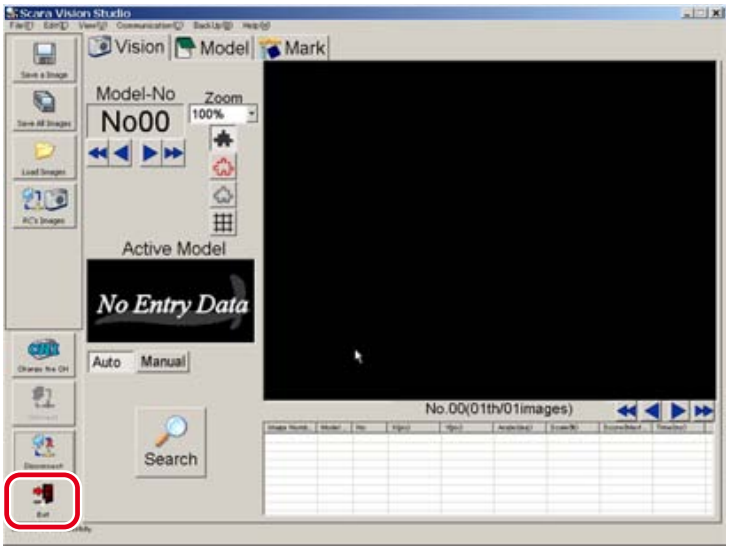
4.2 Ending SCARA Vision Studio operation

■ **The procedure for ending SCARA Vision Studio operation is given below.**

1 ***Press the [Exit] button.***

Press the [Exit] button at the left-side toolbar.

Ending SCARA Vision Studio operation

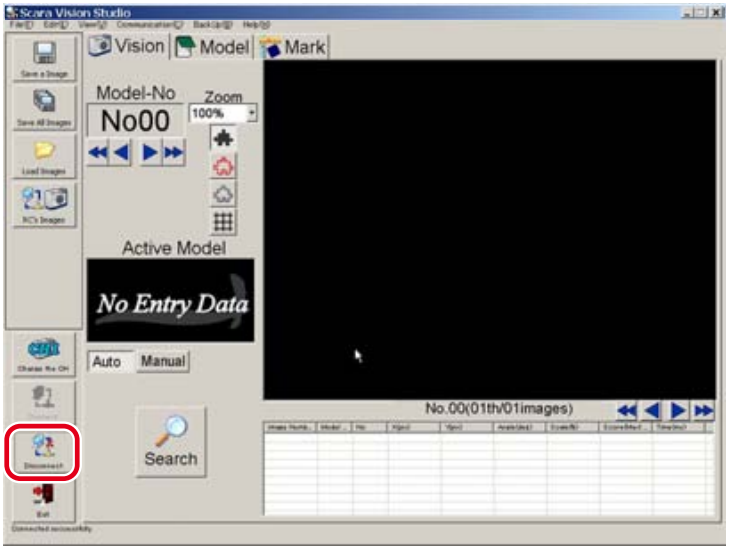


■ **The procedure for ending only communication is given below.**

1 ***Press the [Disconnect] button.***

Press the [Disconnect] button at the left-side toolbar.

Disconnecting communication



5. Required settings before using SCARA Vision Studio

Communication and camera settings must be specified before SCARA Vision Studio can be used.
The communication settings must be specified before SCARA Vision Studio is connected to the robot controller, and the camera settings are to be specified after connecting SCARA Vision Studio to the robot controller.

5.1 Communication settings

The communication settings consist of the connection destination robot controller information (IP address, sub net mask, port number).

For details concerning how to check the connection destination robot controller's IP address, subnet mask, and port number, refer to Chapter 3, section 3.2 " Setting the robot controller's communication".

NOTE

The communication settings must be specified before connecting SCARA Vision Studio to the robot controller.

1 ***From the [Communication (C)] menu, select [Settings].***

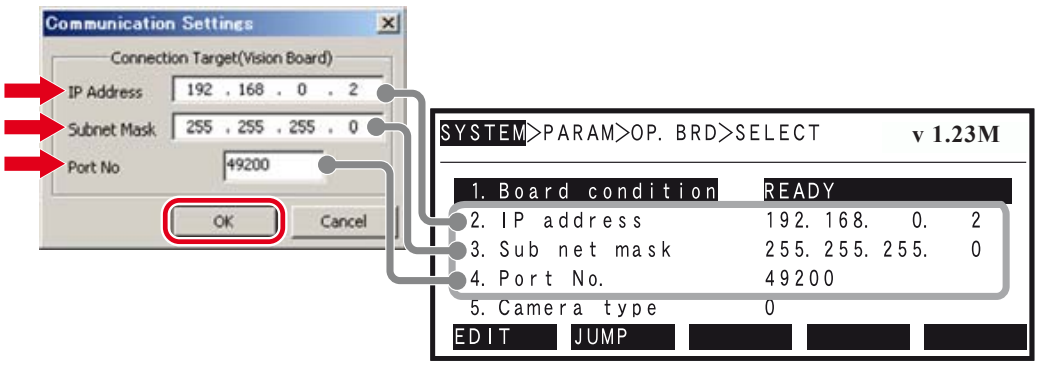
[Communication (C)] - [Settings] menu screen

2 ***Specify the connection destination robot controller information, then press [OK] button.***

The communication settings screen then displays.
Specify the connection destination robot controller's IP address, sub net mask, and port number.

To abort the setting operation, press the [Cancel] button.

Communication settings screen



5.2 Camera settings

The camera settings consist of the camera information (trigger mode, exposure time, timeout).

NOTE

The camera settings are specified after connecting SCARA Vision Studio to the robot controller.

1 ***From the [File(F)] menu, select [Set Camera].***

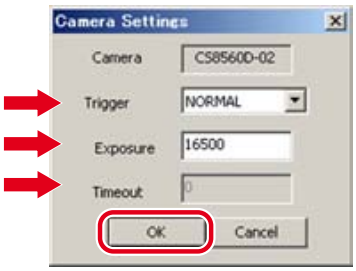
The [File(F)] – [Set Camera] menu screen

2 ***Specify the camera settings, then press [OK].***

When the camera setting screen displays, specify the trigger mode, exposure time, and timeout settings. For details concerning these setting items, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 4, section 4.6 "SCARA Vision Studio camera settings".

To abort the camera settings procedure, press the [Cancel] button.

Camera settings screen



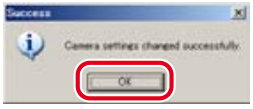
NOTE

The "timeout" setting can only specified when the trigger mode is "H/W trigger".

3 ***End the camera settings operation.***

The following screen displays if the camera settings have been changed successfully. Press [OK] to end the camera settings operation.

Ending the camera settings operation



6. Connecting SCARA Vision Studio to the robot controller

6.1 Before connecting SCARA Vision Studio to the robot controller

Before connecting SCARA Vision Studio to the robot controller, check the following items.

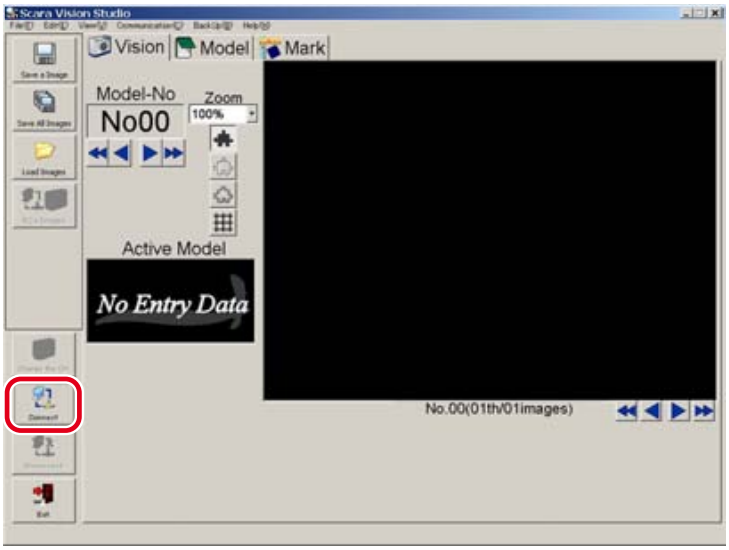
- Are the robot controller and personal computer connected by an Ethernet crossover cable?
  For details concerning this Ethernet crossover cable connection, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 3, section 3.1.1.3 "Connecting to the personal computer connector".
- Is the robot controller's vision control mode set to the Host PC Mode or the Monitor Mode?
  For details concerning how to change the vision control mode, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 4, section 4.3 "Setting the robot controller's control mode".
- Is the personal computer's local area connection enabled?
  For details concerning how to check the personal computer's local area connection, refer to Chapter 3, section 3.1 " Checking the personal computer's IP address and subnet mask".

6.2 SCARA Vision Studio and robot controller connection procedure

1 ***Press the [Connect] button.***

Press the [Connect] button at the screen's left-side toolbar.

SCARA Vision Studio and robot controller connection

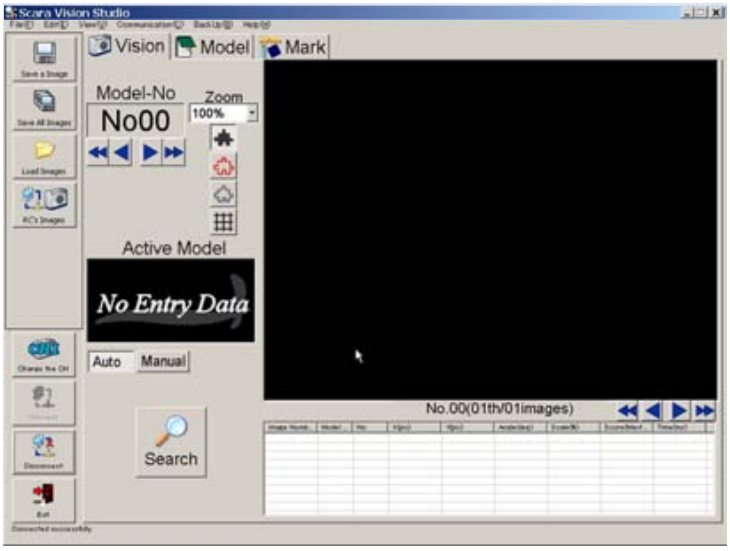


2 ***Switching mode screens***

The screens which display vary according to the robot controller's vision control mode.

■ When the robot controller's vision control mode is "Host PC", the vision mode (Vision), model registration mode (Model), and fiducial mark mode (Mark) screens display.

Vision mode screen



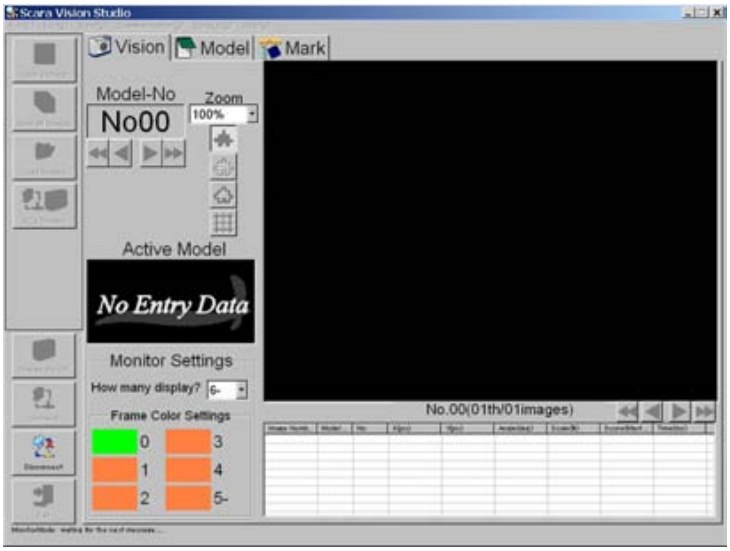
CAUTION

A WARNING MESSAGE DISPLAYS WHEN CONNECTION OCCURS IF THE ROBOT CONTROLLER'S VISION CONTROL MODE IS "HOST PC", AND THE SCARA VISION ENGINE VERSION IS DIFFERENT FROM THE SCARA VISION STUDIO VERSION. IN THIS CASE, THE SCARA VISION STUDIO FUNCTIONS MAY FAIL TO OPERATE PROPERLY.

■ When the robot controller's vision control mode is "Monitor", the monitor mode screen displays.

A "MonitorMode: waiting for the next message....." message displays at the bottom left of the monitor mode screen.

Monitor mode screen



NOTE

Connection may be unstable in systems with multiple Ethernet ports. Unused ports should therefore be set as "disable". To disable these ports, open [Control Panel] – [Network Connections], then double-click on the connection name and press the [Disable] button.

To enable a disabled connection, simply double-click on that connection name.

7. Using SCARA Vision Studio

SCARA Vision Studio comprises four modes. The names and functions of these modes are given below.

Model registration mode (Model)	Select this mode to register workpiece data at the robot controller.
Vision mode (Vision)	Select this mode to search for a workpiece which has been registered at SCARA Vision Studio.
Fiducial mark mode (Mark)	Select this mode to register (at robot controller) fiducial mark data required for calibrations.
Monitor mode (Monitor)	Select this mode to monitor workpiece search conditions during automatic robot operation, and to monitor fiducial mark search conditions during calibrations.

When selecting any of the Model, Vision, and Mark modes, the vision control mode of the robot controller must be set to the "HOST PC" mode before connecting SCARA Vision Studio to the robot controller.
In the same manner, when selecting the Monitor mode, the vision control mode of the robot controller must be set to the "MONITOR" mode.
For details concerning how to change the vision control mode of the robot controller, refer to Chapter 4, section 4.3, "Setting the robot controller's control mode", in SCARA VISION SYSTEM EXPLANATION SECTION.

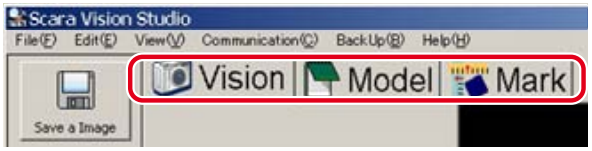
7.1 Basic operations

7.1.1 Switching modes

■ **Switching between the Vision, Model, and Mark modes**

Switch between the Vision, Model, and Mark modes by clicking on the mode name tabs at the top of the screen. The mode tab which is in the foreground indicates the current mode.

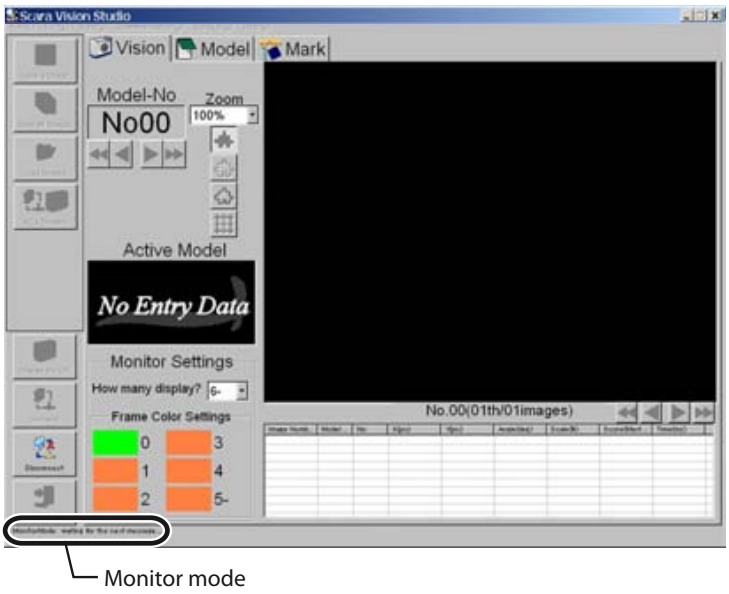
Switching between the Vision, Model, and Mark modes



■ **Switching to the Monitor mode**

The Monitor mode is automatically established if the robot controller's control mode is changed to "Monitor" before connecting the SCARA Vision Studio to the robot controller connection.
For details concerning how to change the control mode of the robot controller to the "Monitor" mode, refer to Chapter 4, section 4.3, "Setting the robot controller's control mode", in SCARA VISION SYSTEM EXPLANATION SECTION.

Switching to the Monitor mode



7.1.2 Operations common to all modes

7.1.2.1 Camera channel switching

The selected camera channel can be changed by pressing the [Change the CH] button at the screen's left-side toolbar. Select the camera channel which is to be used.
The number of the currently selected camera channel is indicated at the button.
This operation cannot be performed in the Monitor mode.

Switching the camera channel

● Camera channel number
The number of the currently selected camera channel is indicated at the button.

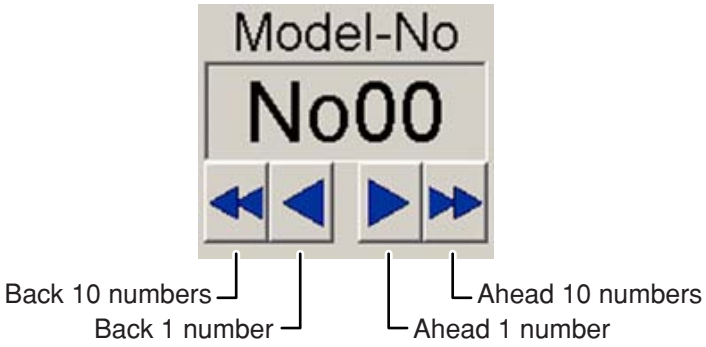
7.1.2.2 Moving a model number or mark number

A model number can only be moved in the Vision and Model modes. A mark number can only be moved in the Mark mode.
Neither of these operations can be performed in the Monitor mode.

■ **Moving a model number**

Move a model number by pressing the arrow buttons located beneath it. The model number range is 00 to 39.

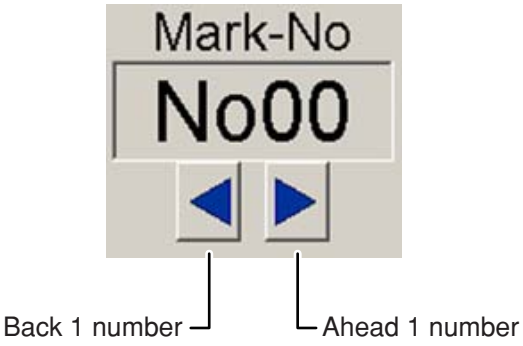
Moving a model number



■ **Moving a mark number**

Move a mark number by pressing the arrow buttons located beneath it. The mark number range is 00 to 01.

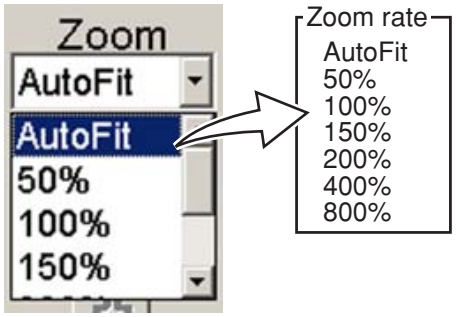
Moving a mark number



7.1.2.3 Changing the display zoom setting

The display zoom setting can be changed to display an image at the specified zoom level.
If set to "AutoFit", the zoom setting is automatically determined according to the image size.

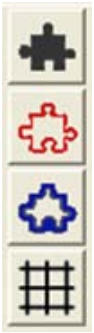
Changing the display zoom setting



7.1.2.4 Switching the display

The display switching buttons located beneath the zoom setting area can be pressed to turn each of the displays (background, edge, contour, grid) off and on.
This operation is not possible in the Monitor mode.

Switching the display



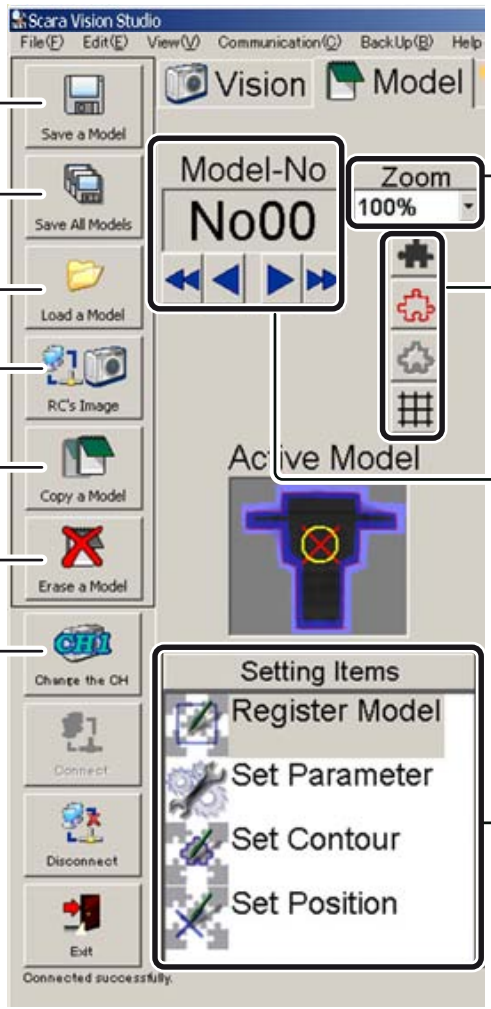
- Background
  Turns the acquired image display on and off.
- Edge
  Turns the extracted edge display on and off.
- Contour
  Turns the contour (specified by the counter setting) display on and off.
- Grid
  Turns the grid display on and off.
  A red cross-hairs displays when the grid display is turned on, indicating the center position of the display screen.

Example: The background display can be turned off and the edge display turned on to enable easy checking of the extracted edge. Use these buttons to check settings and results.

7.1.3 Model mode

This section explains the basic Model mode operations.

Model mode functions



Save a Model

Saves the model data of the currently selected (active) model number to the personal computer.

Save All Models

Saves the data for all models to the personal computer.

Load a Model

Loads model data saved at the personal computer to the currently selected (active) model number.

RC's Image

Loads image data saved at the robot controller to the currently selected (active) model number and deletes image data from the robot controller.
(A robot language command is used to save the image.)

Copy a Model

Copies model data saved at the robot controller to the currently selected (active) model number.

Erase a Model

Deletes the model data of the currently selected (active) model number.

Change the CH

Switches the selected camera channel. (See Chapter 7, section 7.1.2.1 "Camera channel switching".)

Zoom setting

Displays an image at the specified zoom level. (See Chapter 7, section 7.1.2.3 "Changing the display zoom setting".)

Display switching buttons

Turns each of the displays (background, edge, contour, grid) on and off. (See Chapter 7, section 7.1.2.4 "Switching the display".)

Model-No display

Displays the currently selected (active) model number. (This operation is enabled in all modes.)

Moving a model number

Press the arrow keys to move the currently selected (active) model number. (See Chapter 7, section 7.1.2.2 "Moving a model number or mark number".)

Setting Items list

Displays the setting items required for registering a model.

7.1.3.1 Saving a model

This operation saves the model data of the currently selected (active) model number to the personal computer.

1 ***Press the [Save a Model] button.***

[Save a Model] button

NOTE

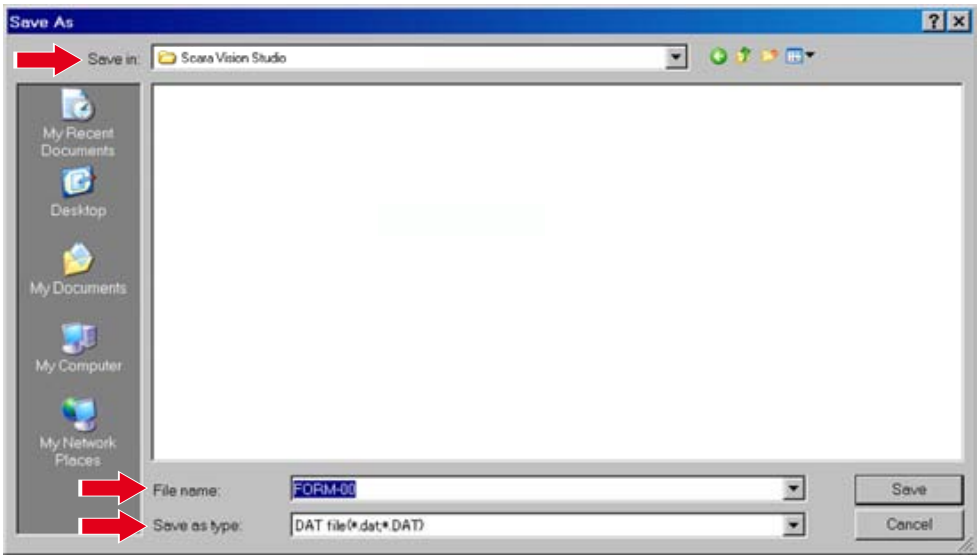
Model data can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [Model…].

2 ***Save the model data of the currently selected (active) model number.***

Save the model data of the currently selected (active) model number.
At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

Specify any desired location as the "Save in".
Specify any desired name as the "File name".
Verify that the "Save as type" is specified as a "DAT file (*.dat, *.DAT)"

Specifying the "model" data's save destination

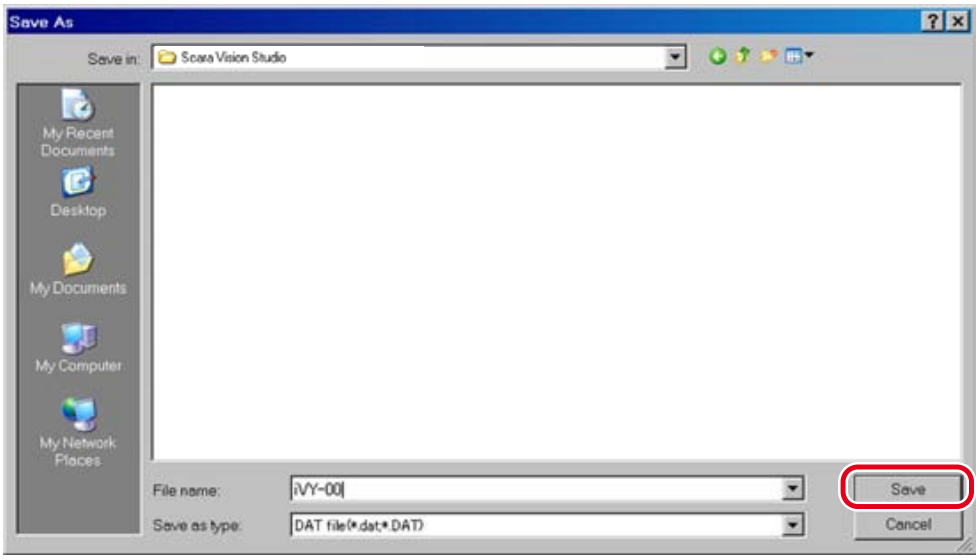


3 ***Press the [Save] button.***

To abort the model save operation, press the [Cancel] button.

If a same-name file already exists at the specified save location, an overwrite confirmation message displays. To proceed with overwriting, press [Yes (Y)]. If overwriting is not desired, press [No (N)].

Saving model



CAUTION

MODEL DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A MODEL DATA SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE MODEL DATA IS BEING SAVED.

7.1.3.2 Saving all models

This operation saves the data for all models to the personal computer.

1 ***Press the [Save All Models] button.***

[Save All Models] button

NOTE

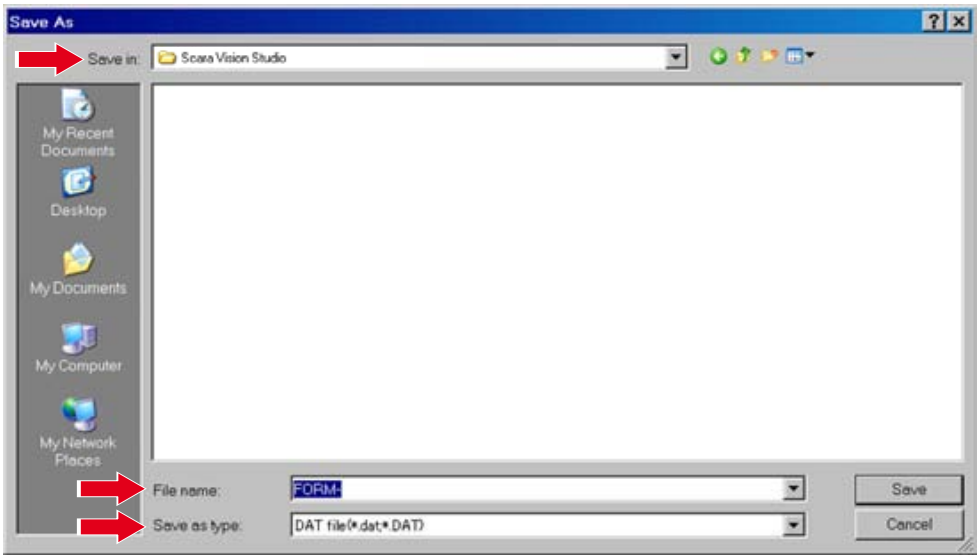
All models data can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [All Models…].

2 ***Save the data for all models.***

At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

Specify any desired location as the "Save in".
Specify any desired name as the "File name". Individual files are created for each model's data, and the model numbers are added at the end of the file names (for model number 00, "00" is added at the end of the file name).
Verify that the "Save as type" is specified as a "DAT file (*.dat, *.DAT)".

Specifying the "all model" data's save destination



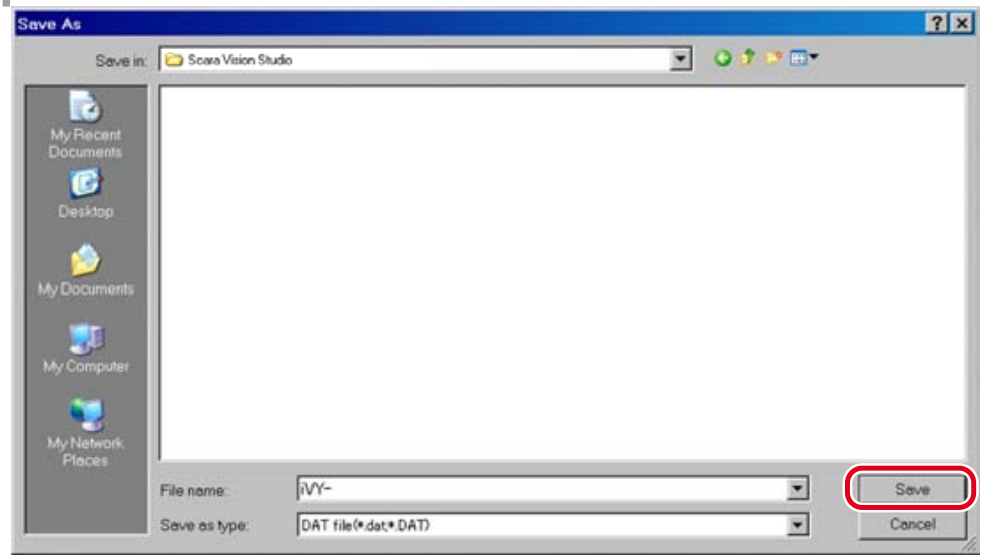
3 ***Press the [Save] button.***

To abort the all models save operation, press the [Cancel] button.

NOTE

If a same-name file already exists at the specified save location, the existing file's data is overwritten.

Saving the data for all models



CAUTION

MODEL DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A MODEL DATA SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE MODEL DATA IS BEING SAVED.

7.1.3.3 Load a model

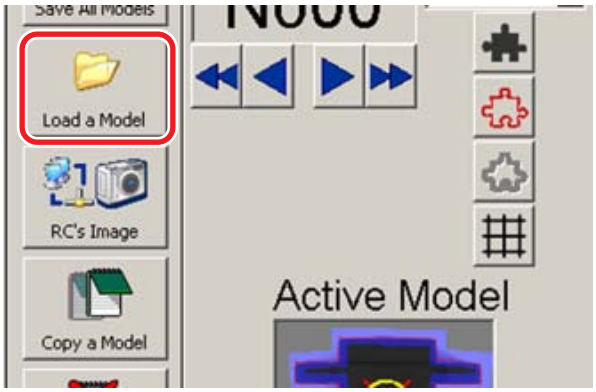
This operation loads model data saved at the personal computer to the currently selected (active) model number.

NOTE

The model number to which the model data is to be loaded must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Load a Model] button.***

[Load a Model] button



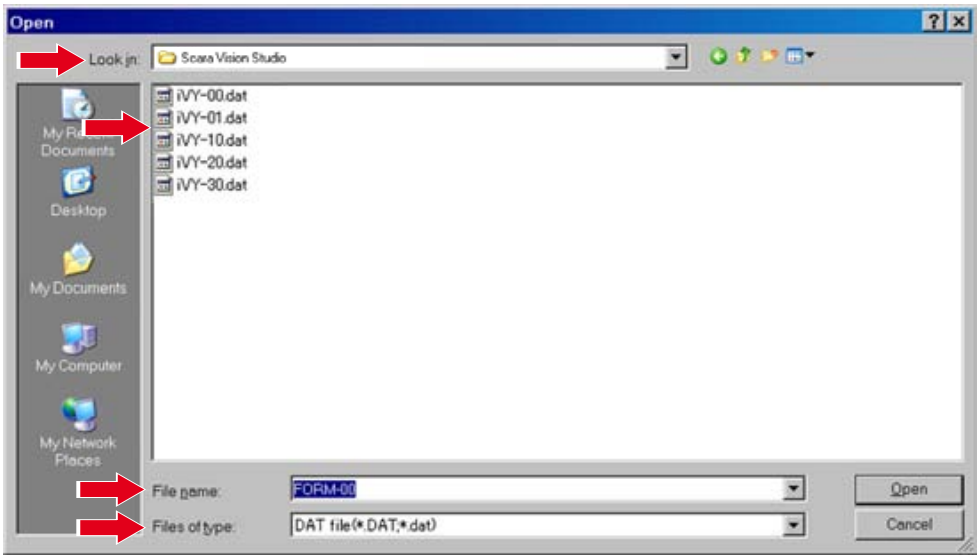
NOTE

Model data can also be loaded from the [File (F)] menu by selecting [Open (O)] – [Model…].

2 ***Select the model data to be loaded.***

At the "Open" window which displays, select the model data to be loaded. Only "DAT" type model data files (files with an extend name of "*.dat" or "*.DAT") can be loaded.

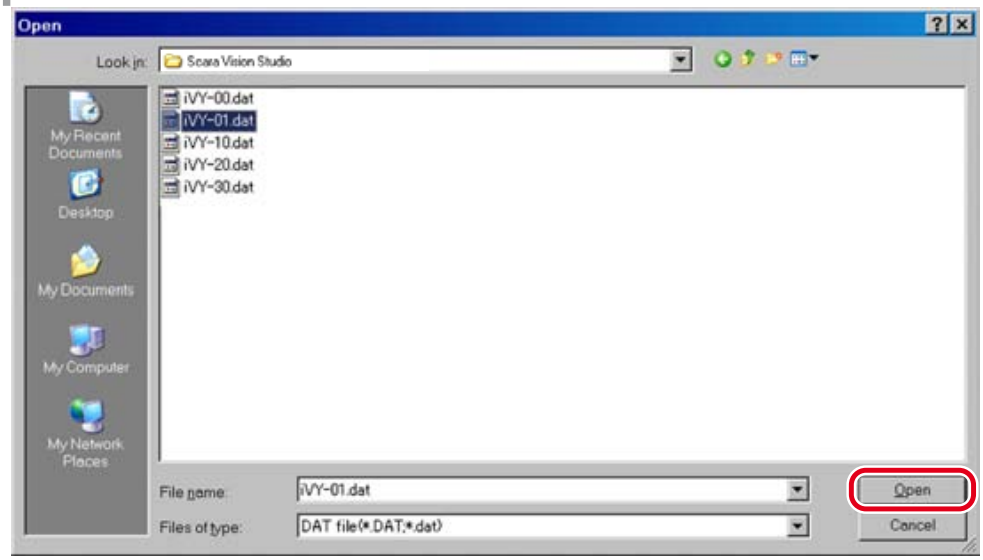
Selecting the model data to be loaded



3 ***Press the [Open] button.***

To abort the model loading operation, press the [Cancel] button.

Loading the model data



4 ***Model data loading occurs.***

The model data is loaded to the currently selected (active) model number.

CAUTION

MODEL DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A MODEL DATA LOADING OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE MODEL DATA IS BEING LOADED.

7.1.3.4 RC image operations – loading images

Press the [RC's Image] button to load image data from the robot controller memory to the currently selected (active) model number, and to delete image data from the robot controller memory.
The procedure for loading saved image data from the robot controller to the currently selected (active) model number is given below.

MEMO

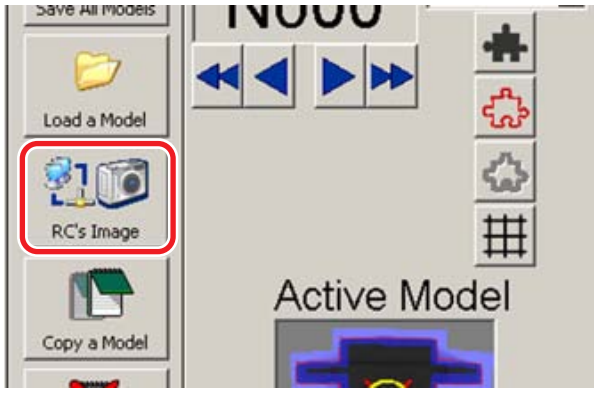
Image data is saved to the robot controller by a dedicated robot language command.

NOTE

In order to load image data, the model number to which the image data is to be loaded must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [RC's Image] button.***

[RC's Image] button



NOTE

RC image operations (loading/deletion) can also be performed from the [File (F)] menu by selecting [Open (O)] – [RC's Images…].

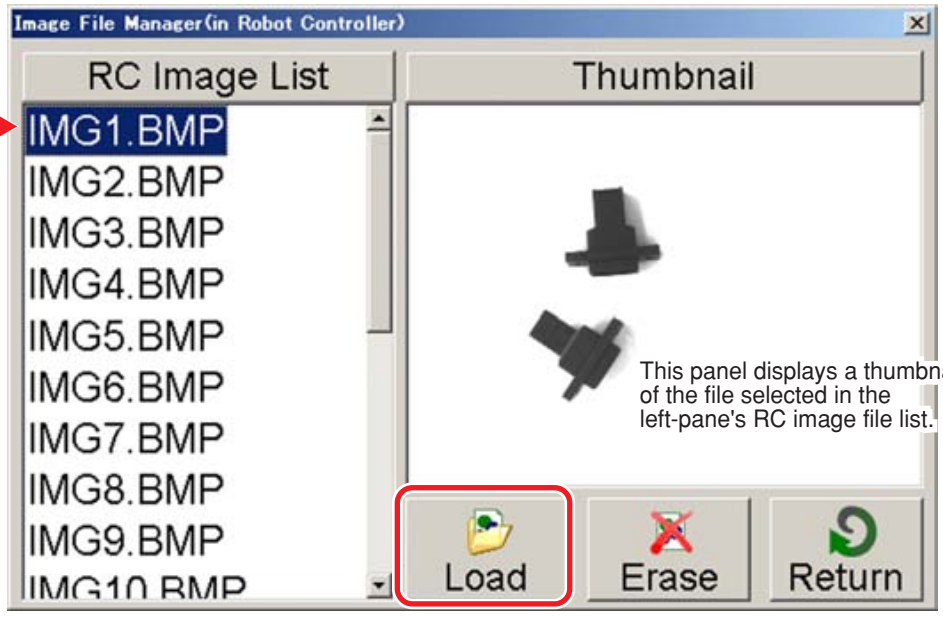
2 ***Select the image data to be loaded, then press the [Load] button.***

At the "Image File Manager (in Robot Controller)" window which displays, select the image data to be loaded.
Only "BMP" type image data files (files with an extend name of "*.bmp" or "*.BMP") can be loaded.

After selecting the image data to be loaded, press the [Load] button.

To abort the image data loading operation, press the [Return] button.

Selecting the image data to be loaded



NOTE

Image data can also be loaded by double-clicking on that image data's file name.

3 ***Image data loading occurs.***

The image data is loaded to the currently selected (active) model number.

CAUTION

IMAGE DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING AN IMAGE DATA LOADING OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE IMAGE DATA IS BEING LOADED.

7.1.3.5 RC image operations – deleting images

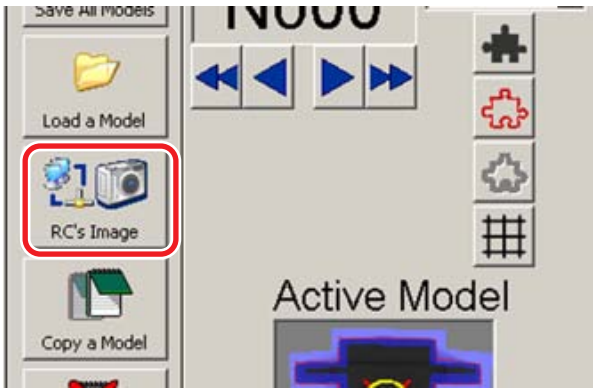
Press the [RC's Image] button to load image data from the robot controller memory to the currently selected (active) model number, and to delete image data from the robot controller.
The procedure for deleting saved image data from the robot controller is given below.

MEMO

Image data is saved to the robot controller by a dedicated robot language command.

1 ***Press the [RC's Image] button.***

[RC's Image button]



NOTE

RC image operations (loading/deletion) can also be performed from the [File (F)] menu by selecting [Open (O)] – [RC's Images…].

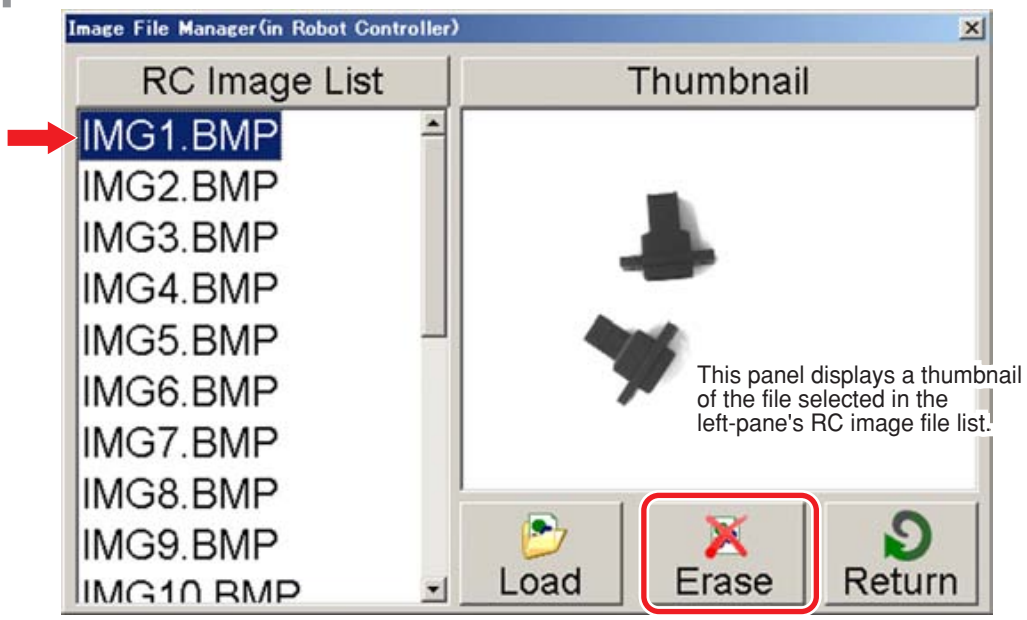
2 ***Select the image data to be deleted, then press the [Erase] button.***

At the "Image File Manager (in Robot Controller)" window which displays, select the image data to be deleted. Multiple image data can be selected.
Only "BMP" type image data files (files with extend name of "*.bmp" or "*.BMP") can be deleted.

After selecting the image data to be deleted, press the [Erase] button.

To abort the image data deletion operation, press the [Return] button.

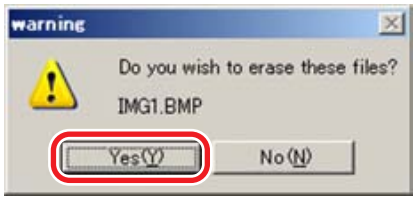
Selecting image data to be deleted



3 ***At the deletion confirmation message which displays, press the [Yes (Y)] button to proceed with the deletion.***

To abort the deletion operation, press the [No (N)] button.

Deletion confirmation message



4 ***Image data deletion occurs.***

The specified image file is deleted from the robot controller memory.

7.1.3.6 Copy a model

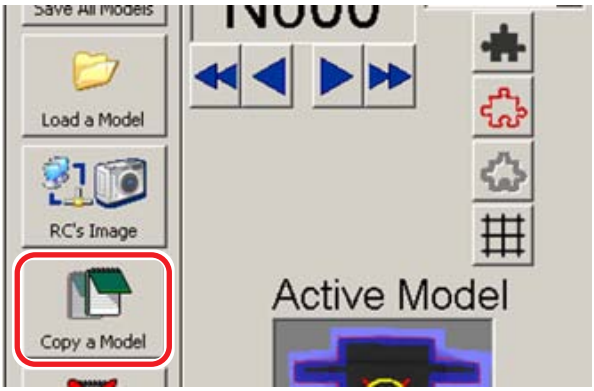
This operation copies model data from the robot controller to the currently selected (active) model number.

NOTE

The model number to which the model data is to be copied must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Copy a Model] button.***

[Copy a Model] button



NOTE

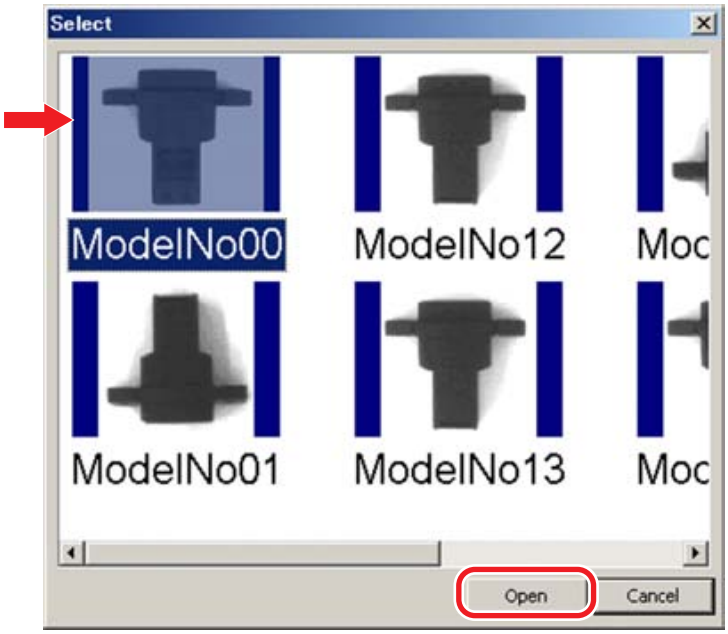
Model data can also be copied from the [File (F)] menu by selecting [Open (O)] – [RC's Model…], or from the [Edit (E)] menu by selecting [Copy] - [Model…].

2 ***Select the copy source model data, then press the [Open] button.***

When the "Select" window then displays, select the copy source model data.

To abort the model copy operation, press the [Cancel] button.

Selecting the copy source model data



NOTE

Model data can also be copied by double-clicking on the copy source model data.

3 ***The selected model number data is copied to the currently selected (active) model number.***

CAUTION

MODEL DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A MODEL DATA COPY OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE MODEL DATA IS BEING COPIED.

7.1.3.7 Erase a model

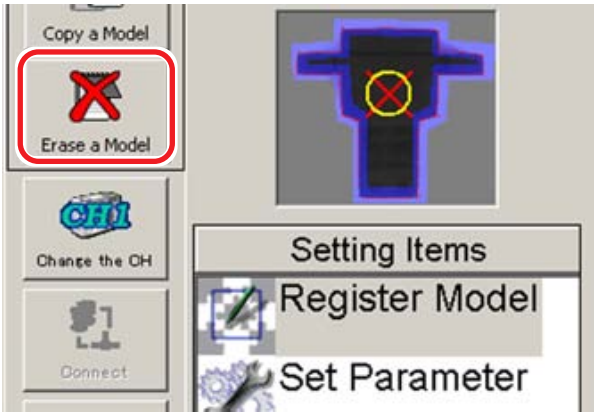
This operation deletes the model data of the currently selected (active) model number.

NOTE

The model number to be deleted must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Erase a Model] button.***

[Erase a Model] button



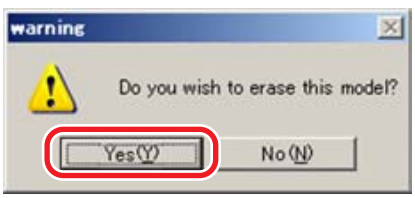
NOTE

Model data can also be deleted from the [Edit (E)] menu by selecting [Erase] - [Model].

2 ***When the deletion confirmation message displays, press [Yes (Y)] to perform the deletion.***

To abort the deletion operation, press [No (N)].

Deletion confirmation message



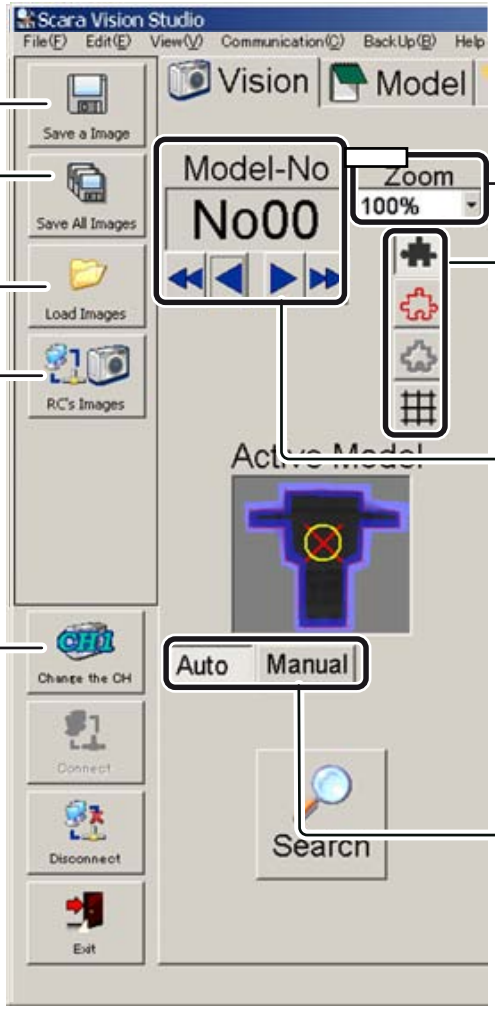
3 ***The model data is deleted.***

The data of the currently selected (active) model number is deleted.

7.1.4 Vision mode

This section explains the basic Vision mode operations.

Vision mode functions (left side of screen)



Save an Image
Saves the currently displayed (active) image to the personal computer.

Save All Images
Saves the data for all images to the personal computer.

Load Images
Loads image data saved at the personal computer to the currently selected (active) image number.

RC's Images
Loads image data at the robot controller to the currently selected (active) image number and deletes image data from the robot controller.
(A robot language command is used to save the image.)

Change the CH
Switches the selected camera channel. (See Chapter 7, section 7.1.2.1 "Camera channel switching".)

Zoom setting
Displays an image at the specified zoom level. (See Chapter 7, section 7.1.2.3 "Changing the display zoom setting".)

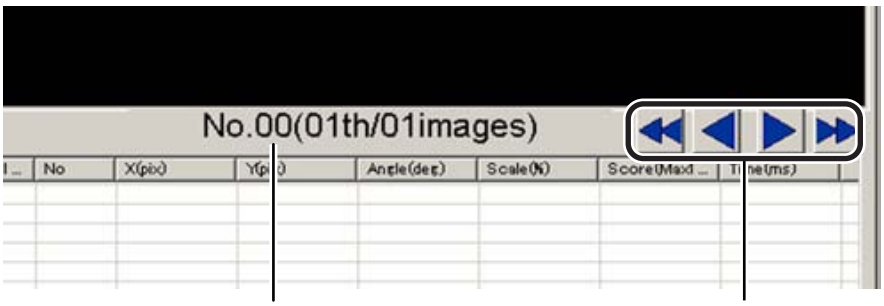
Display switching buttons
Turns each of the displays (background, edge, contour, grid) on and off. (See Chapter 7, section 7.1.2.4 "Switching the display".)

Model-No display
Displays the currently selected (active) model number. (This operation is enabled in all modes.)

Moving a model number
Press the arrow keys to move the currently selected (active) model number. (See Chapter 7, section 7.1.2.2 "Moving a model number or mark number".)

[Auto/Manual] switching buttons
Switches the search mode between Auto and Manual. (For details concerning Auto searches and Manual searches, refer to Chapter 7, section 7.4 "Search operations".

Vision mode functions (screen's lower right)



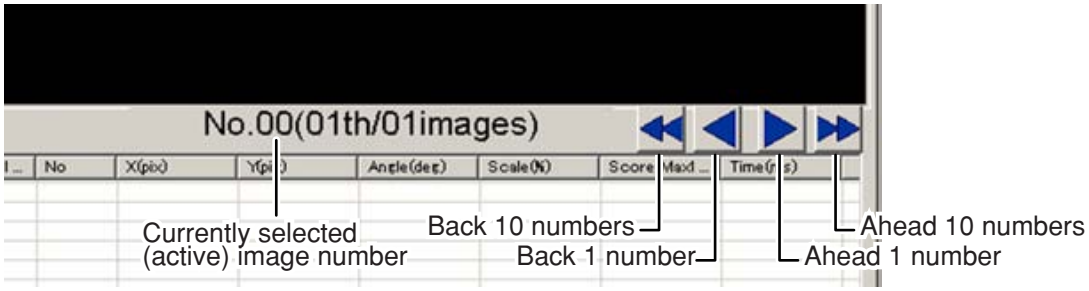
● Image number display
Displays the currently selected (active) image number.

● Image number movement
The arrow keys can be used to move the currently selected (active) image number.

7.1.4.1 Moving an image number

The arrow keys to the right of the image number can be pressed to move that image number. The image number range is 0 to 62.

Moving an image number



7.1.4.2 Save an image

This operation saves the currently displayed image to the personal computer.

1 ***Press the [Save an Image] button.***

[Save an Image] button

NOTE

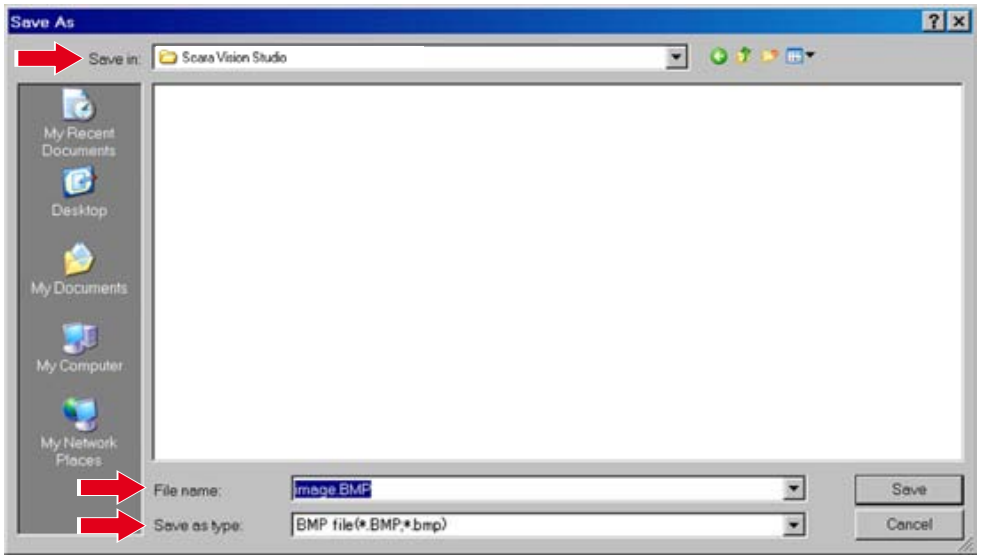
Images can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [Image…].

2 ***Save the currently displayed (active) image.***

At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

Specify any desired location as the "Save in".
Specify any desired name as the "File name".
Verify that the "Save as type" is specified as a "BMP file (file with extend name of *.bmp, *.BMP)".

Specifying the "images" data's save destination

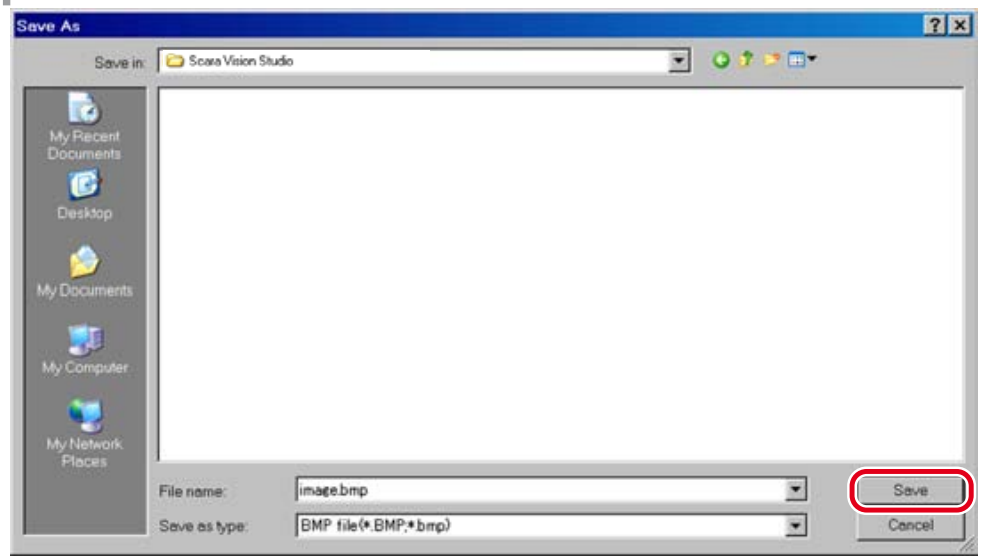


3 ***Press the [Save] button.***

To abort the image save operation, press the [Cancel] button.

If a same-name file already exists at the specified save location, an overwrite confirmation message displays. To proceed with overwriting, press [Yes (Y)]. If overwriting is not desired, press [No (N)].

Saving image data



CAUTION

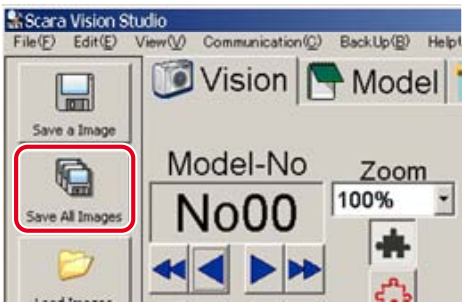
IMAGE DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING AN IMAGE DATA SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE IMAGE DATA IS BEING SAVED.

7.1.4.3 Saving all images

This operation saves the data for all images to the personal computer.

1 ***Press the [Save All Images] button.***

[Save all Images] button



NOTE

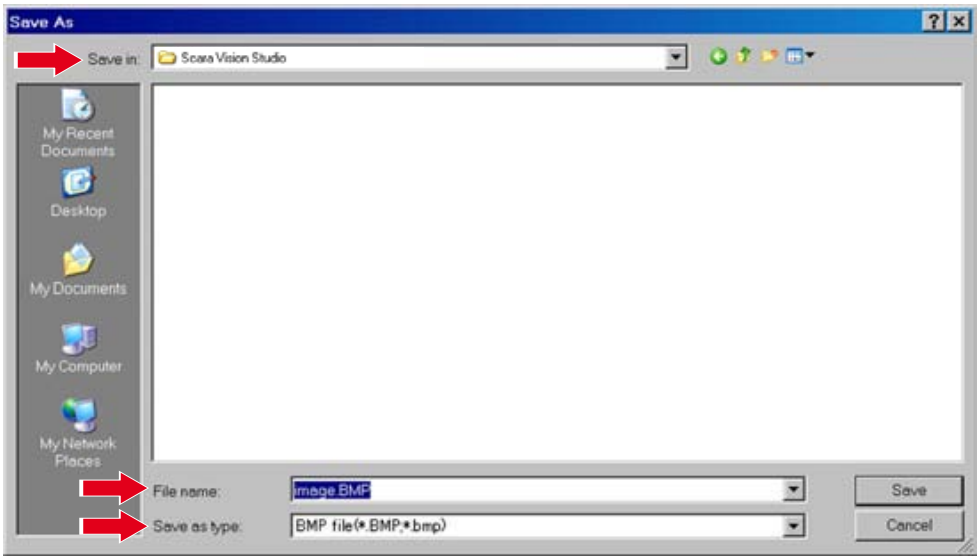
All images can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [All Images…].

2 ***Save the data for all the images.***

At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

Specify any desired location as the "Save in".
Specify any desired name as the "File name". A sequentially numbered file is created for each image, and these sequential numbers (01, 02, …) are added at the end of the file names.
Verify that the "Save as type" is specified as a "BMP file (file with extend name of *.bmp, *.BMP)".

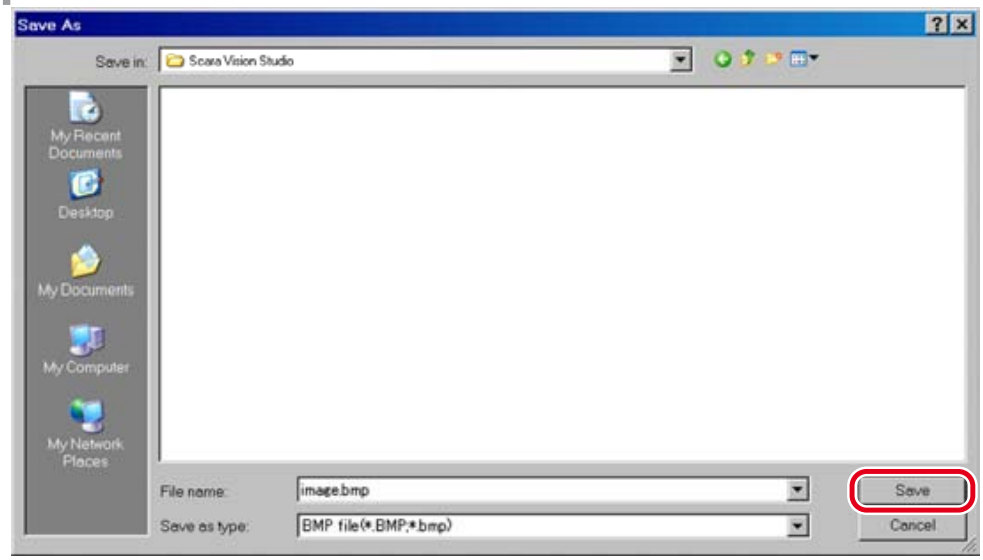
Specifying the "all images" data's save destination



3 ***Press the [Save] button.***

To abort the all images save operation, press the [Cancel] button.
If a same-name file already exists at the specified save location, an overwriting confirmation message displays. To proceed with overwriting, press [Yes (Y)]. If overwriting is not desired, press [No (N)].

Saving the data for all images



CAUTION

IMAGE DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING AN IMAGE DATA SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE IMAGE DATA IS BEING SAVED.

7.1.4.4 Loading images

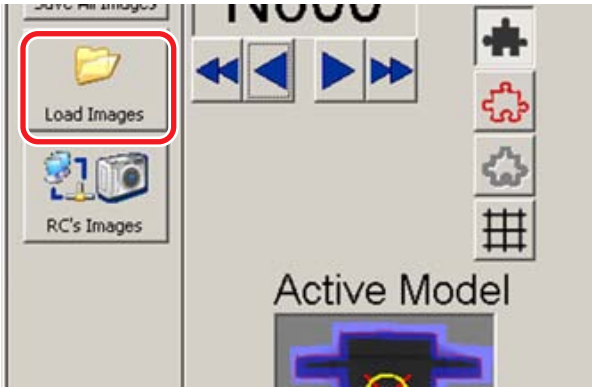
This operation loads image data saved at the personal computer to the currently selected (active) image number.

NOTE

When loading the data for a single image, the image number to which the image data is to be loaded must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.4.1 "Moving an image number".
When loading the data for multiple images, that data is loaded sequentially (from image No.00), after resetting (clearing) all the existing image data.

1 ***Press the [Load Images] button.***

[Load Images] button



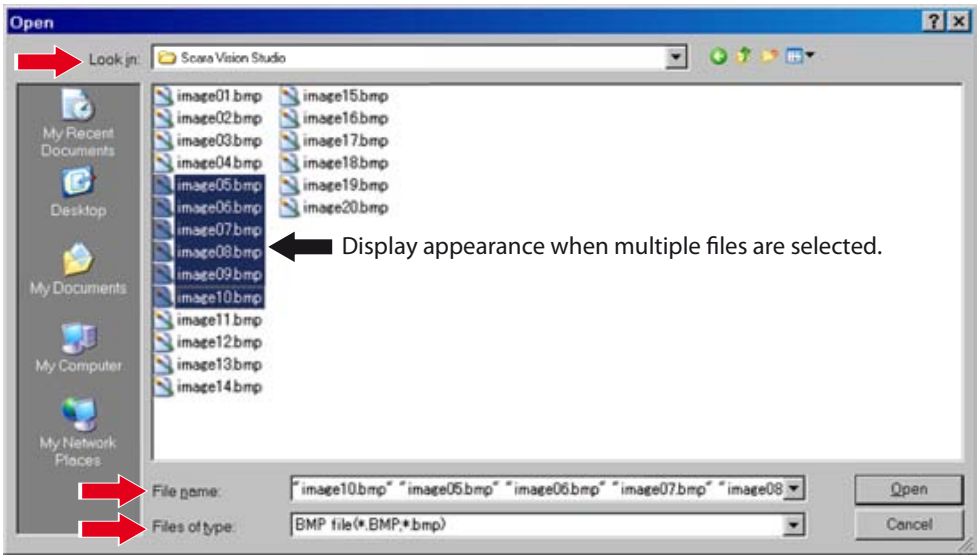
NOTE

Image loadings can also be performed from the [File (F)] menu by selecting [Open (O)] – [Images…].

2 ***Select the images to be loaded.***

At the "Open" window which displays, select the image data to be loaded.
Only "BMP" type image data files (files with an extend name of "*.bmp" or "*.BMP") can be loaded.

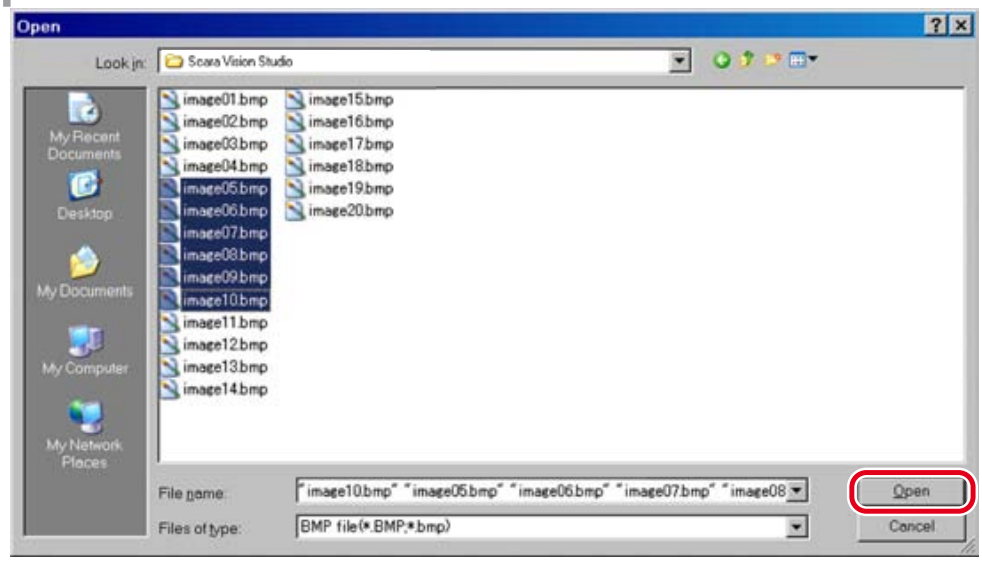
Selecting the image data to be loaded (1)



3 ***Press the [Open] button.***

To abort the image loading operation, press the [Cancel] button.

Selecting the image data to be loaded (2)



4 ***Image data loading occurs.***

The image data is loaded to the currently selected (active) image number.
If multiple image data are selected, each image data is loaded sequentially from the currently selected image number.

CAUTION

IMAGE DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING AN IMAGE LOADING OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE IMAGE DATA IS BEING LOADED.

7.1.4.5 RC image operations – loading images

Press the [RC's Images] button to load image data from the robot controller memory to the currently selected (active) image number, and to delete image data from the robot controller memory.
The procedure for loading saved image data from the robot controller to the currently selected (active) image number is given below.

MEMO

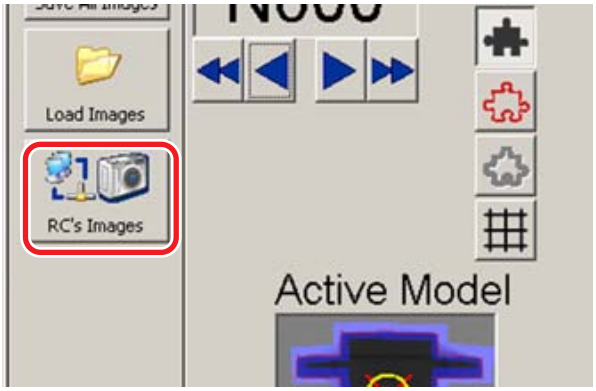
Image data is saved to the robot controller by a dedicated robot language command.

NOTE

The image number to which image data (one image) is to be loaded must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.4.1 "Moving an image number".
When loading multiple image data, all the currently loaded image data is reset, and the new image data is loaded to sequential image numbers, beginning from No.00.

1 ***Press the [RC's Images] button.***

[RC's Images] button



NOTE

RC image operations (loading/deletion) can also be performed from the [File (F)] menu by selecting [Open (O)] – [RC's Images…].

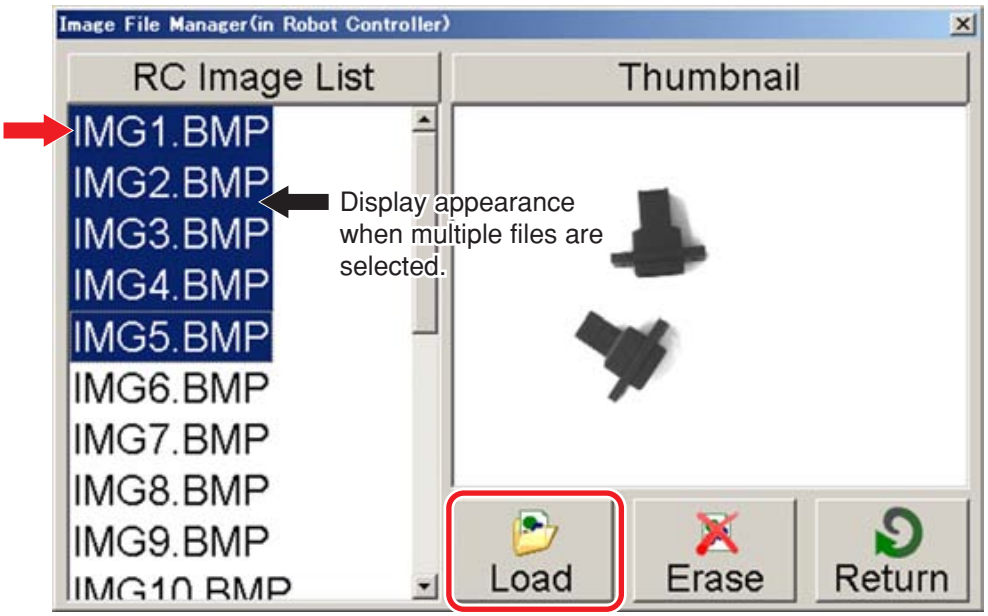
2 ***Select the image data to be loaded, then press the [Load] button.***

At the "Image File Manager (in Robot Controller)" window which displays, select the image data to be loaded. Multiple image data can also be selected.
Only BMP type image data files (files with an extend name of "*.bmp" or "*.BMP") can be loaded.

After selecting the image data to be loaded, press the [Load] button.

To abort the image data loading operation, press the [Return] button.

Selecting the image data to be loaded



NOTE

Image data can also be loaded by double-clicking on that image data's file name.

3 ***Image data loading occurs.***

The image data is loaded to the currently selected (active) image number.
When loading multiple image data, all the currently loaded image data is reset, and the new image data is loaded to sequential image numbers, beginning from No.00.

CAUTION

IMAGE DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING AN IMAGE DATA LOADING OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE IMAGE DATA IS BEING LOADED.

7.1.4.6 RC image operations – deleting images

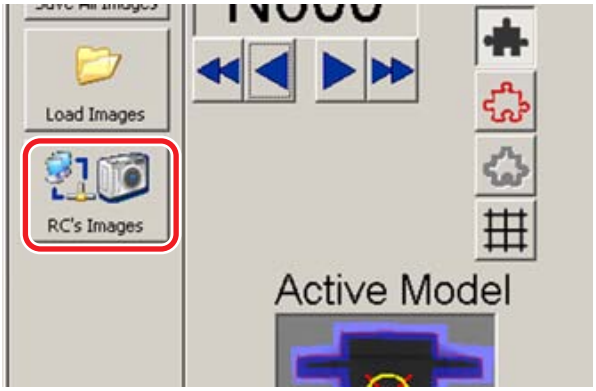
Press the [RC's Images] button to load image data from the robot controller memory to the currently selected (active) image number, and to delete image data from the robot controller.
The procedure for deleting saved image data from the robot controller is given below.

MEMO

Image data is saved to the robot controller by a dedicated robot language command.

1 ***Press the [RC's Images] button.***

[RC's Images] button



NOTE

RC image operations (loading/deletion) can also be performed from the [File (F)] menu by selecting [Open (O)] – [RC's Images…].

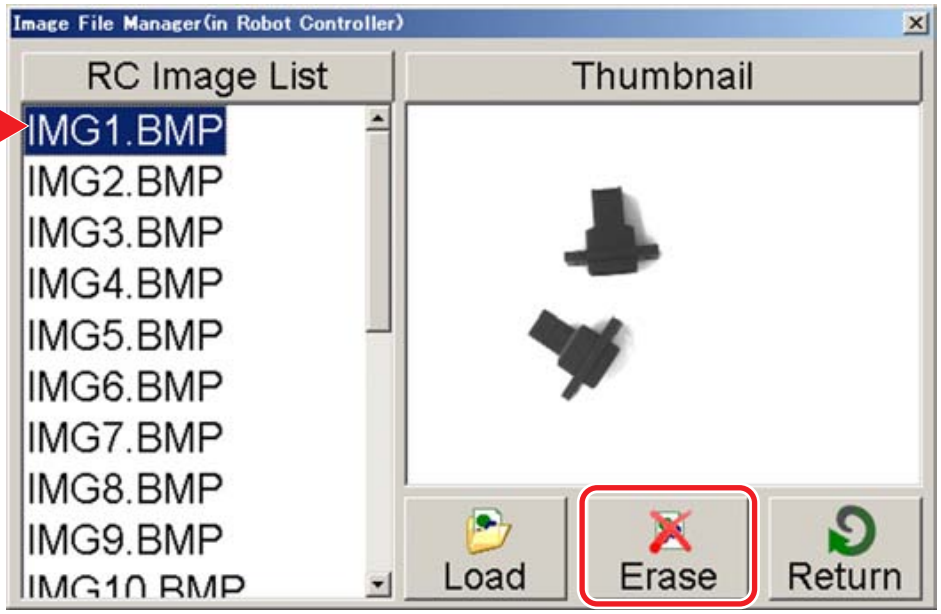
2 ***Select the image data to be deleted, then press the [Erase] button.***

At the "Image File Manager (in Robot Controller)" window which displays, select the image data to be deleted. Multiple image data can be selected.
Only BMP type image data files (files with extend name of "*.bmp" or "*.BMP") can be deleted.

After selecting the image data to be deleted, press the [Erase] button.

To abort the image data loading operation, press the [Return] button.

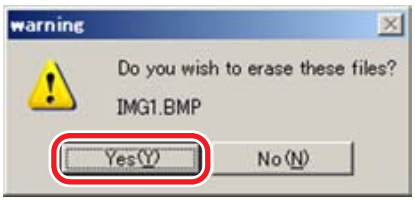
Selecting the image data to be deleted



3 ***At the deletion confirmation message which displays, press the [Yes (Y)] button to proceed with the deletion.***

To abort the deletion operation, press the [No (N)] button.

Deletion confirmation message



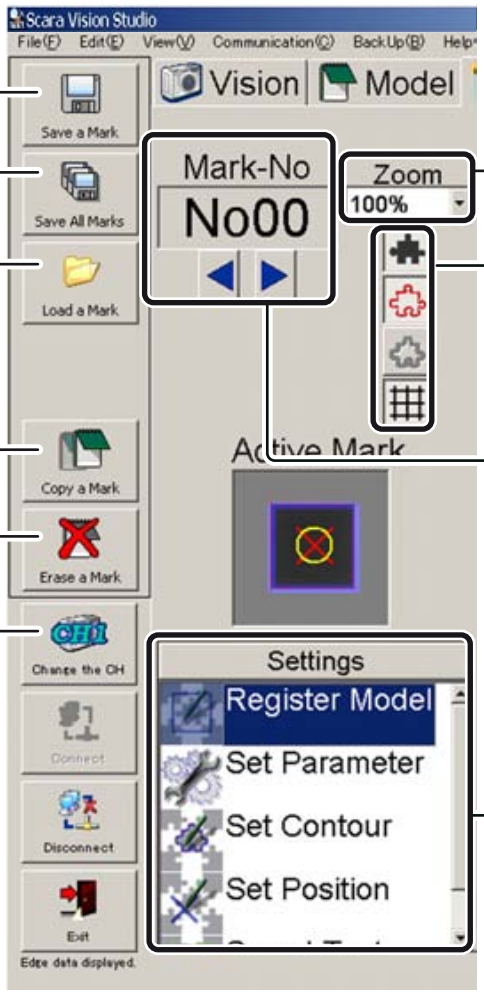
4 ***Image data deletion occurs.***

The specified image file is deleted from the robot controller memory.

7.1.5 Mark mode

This section explains the basic Mark mode operations.

Mark mode functions



Save a Mark

Saves the fiducial mark data of the currently selected (active) mark number to the personal computer.

Save All Marks

Saves the data for all fiducial marks to the personal computer.

Load a Mark

Loads fiducial mark data saved at the personal computer to the currently selected (active) mark number.

Copy a Mark

Copies fiducial mark data saved at the robot controller to the currently selected (active) mark number.

Erase a Mark

Deletes the fiducial mark data of the currently selected (active) mark number.

Change the CH

Switches the selected camera channel. (See Chapter 7, section 7.1.2.1 "Camera channel switching".)

Zoom setting

Displays an image at the specified zoom level. (See Chapter 7, section 7.1.2.3 "Changing the display zoom setting".)

Display switching buttons

Turns each of the displays (background, edge, contour, grid) on and off. (See Chapter 7, section 7.1.2.4 "Switching the display".)

Mark-No display

Displays the currently selected (active) mark number. (This operation is enabled only in the Mark mode.)

Moving a mark number

Press the arrow keys to move the currently selected (active) mark number. (See Chapter 7, section 7.1.2.2 "Moving a model number or mark number".)

[Setting items] list

Displays the setting items required for registering a fiducial mark.

7.1.5.1 Saving a fiducial mark

This operation saves the fiducial mark data of the currently selected (active) mark number to the personal computer.

1 ***Press the [Save a Mark] button.***

[Save a Mark] button

NOTE

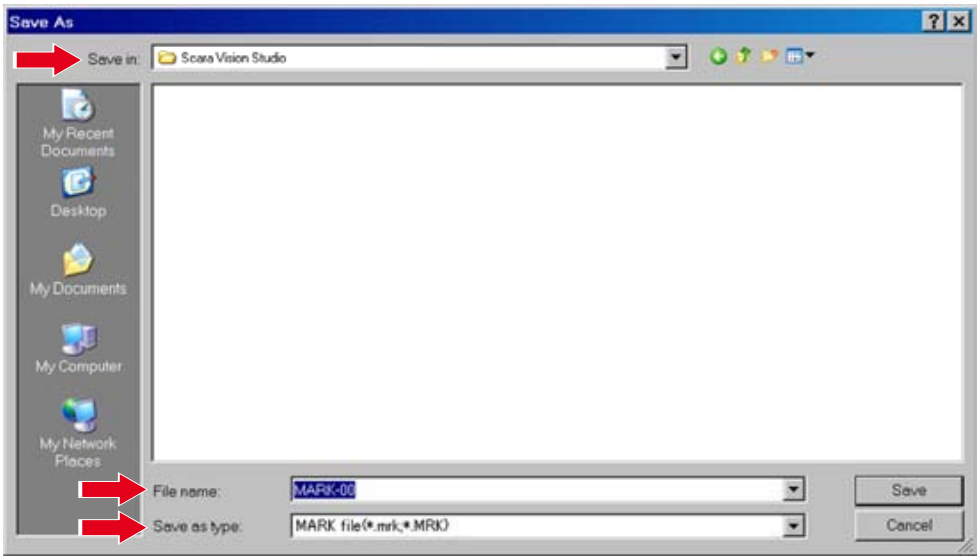
Fiducial marks can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [Mark…].

2 ***Save the fiducial mark data of the currently selected (active) mark number.***

At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

Specify any desired location as the "Save in".
Specify any desired name as the "File name".
Verify that the "Save as type" is specified as a "Mark file (*.mrk, *.MRK)".

Specifying the "fiducial mark" data's save destination

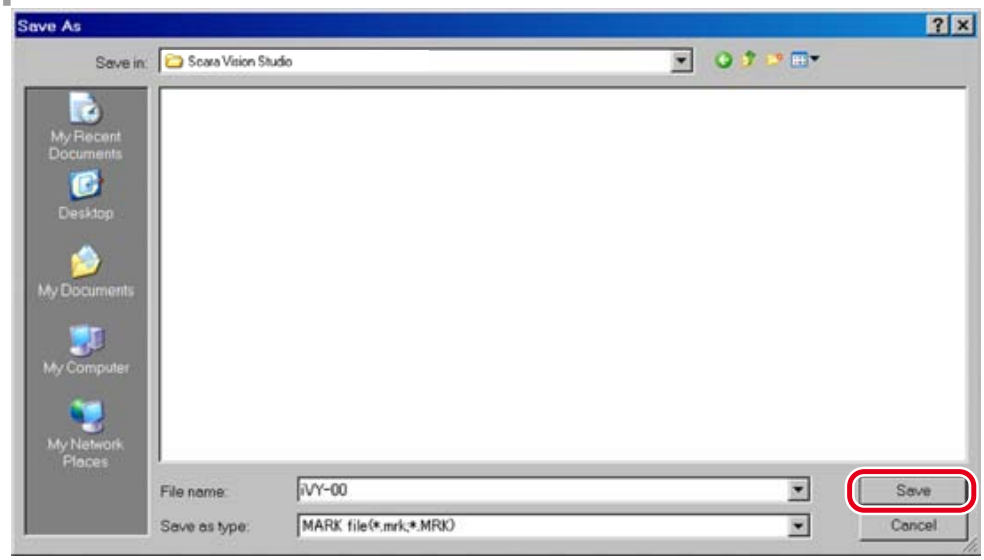


3 ***Press the [Save] button.***

To abort the fiducial mark save operation, press the [Cancel] button.

If a same-name file already exists at the specified save location, an overwrite confirmation message displays. To proceed with overwriting, press [Yes (Y)]. If overwriting is not desired, press [No (N)].

Saving fiducial mark data



CAUTION

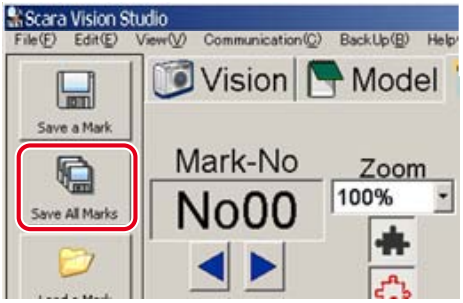
FIDUCIAL MARK DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A FIDUCIAL MARK SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE FIDUCIAL MARK DATA IS BEING SAVED.

7.1.5.2 Saving all fiducial marks

This operation saves the data for all fiducial marks to the personal computer.

1 ***Press the [Save All Marks] button.***

[Save All Marks] button



NOTE

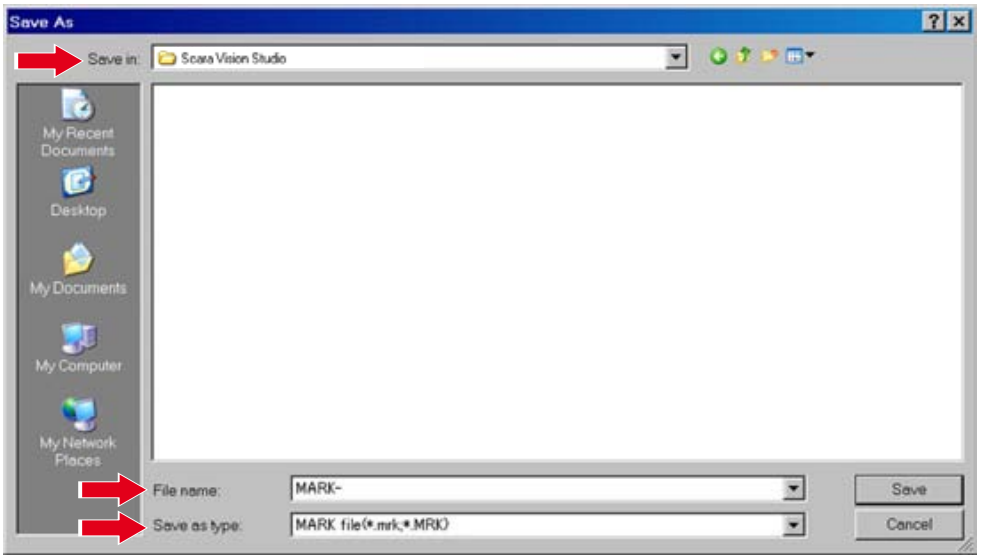
The "fiducial marks" data can also be saved from the [File (F)] menu, by selecting [Save As (A)] – [All Marks…].

2 ***Save the data for all fiducial marks.***

At the "Save As" window which displays, specify the " Save in", "File name", and "Save as type ".

Specify any desired location as the "Save in".
Specify any desired name as the "File name".
A sequentially numbered file is created for each fiducial mark data, and these sequential numbers (00, 01, …) are added at the end of the file names.
Verify that the "Save as type" is specified as a "MARK file (file with extend name of *.mrk, *.MRK)".

Specifying the "all fiducial marks" data's save destination



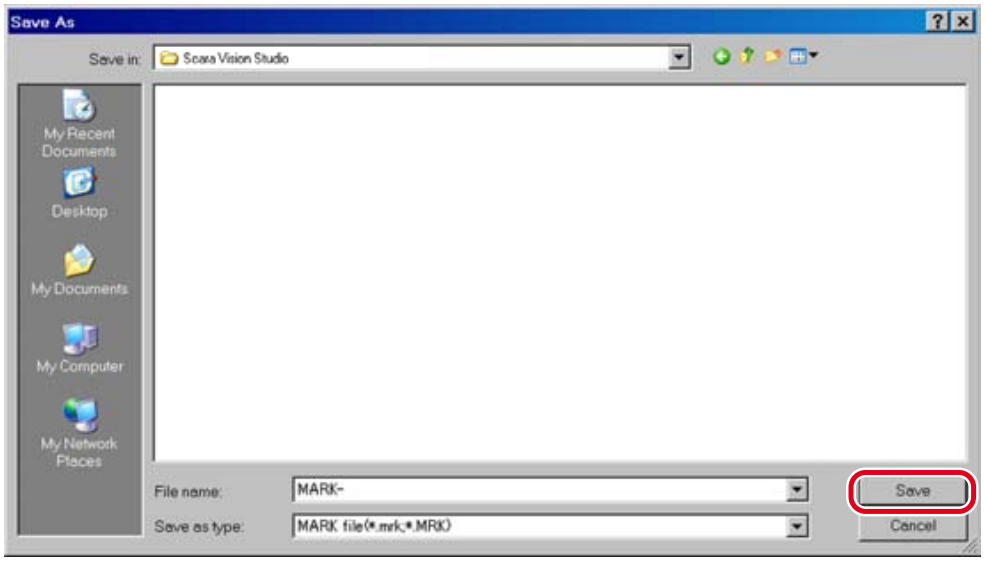
3 ***Press the [Save] button.***

To abort the "all fiducial marks" save operation, press the [Cancel] button.

NOTE

If a same-name file already exists at the specified save location, the existing file's data is overwritten.

Saving the data for all fiducial marks



CAUTION

FIDUCIAL MARK DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A FIDUCIAL MARK SAVE OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE FIDUCIAL MARK DATA IS BEING SAVED.

7.1.5.3 Loading fiducial marks

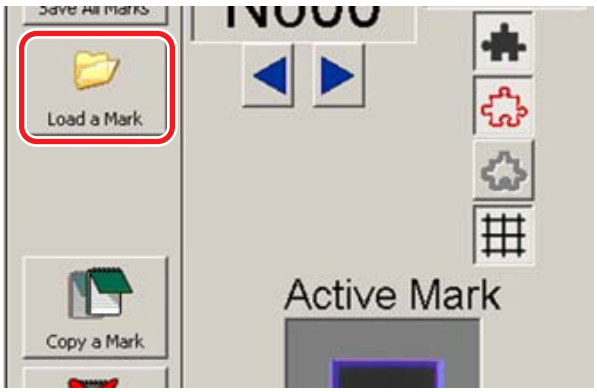
This operation loads fiducial mark data saved at the personal computer to the currently selected (active) mark number.

NOTE

The mark number to which the fiducial mark data is to be loaded must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Load a Mark] button.***

[Load a Mark] button



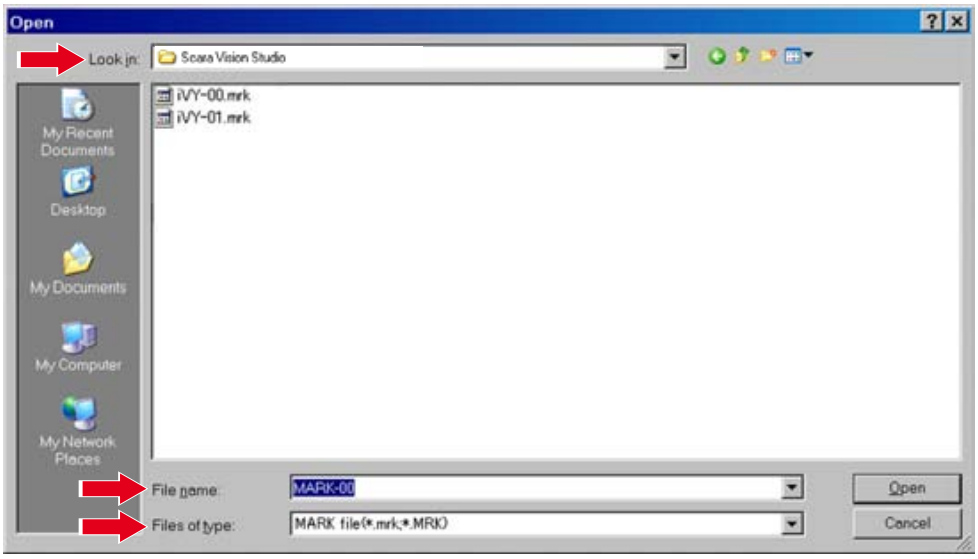
NOTE

Mark data can also be loaded from the [File (F)] menu by selecting [Open (O)] – [Mark…].

2 ***Select the fiducial mark data to be loaded.***

At the "Open" window which displays, select the fiducial mark data to be loaded.
Only "MARK" type fiducial mark data files (file with extend name of "*.mrk" or "*.MRK") can be loaded.

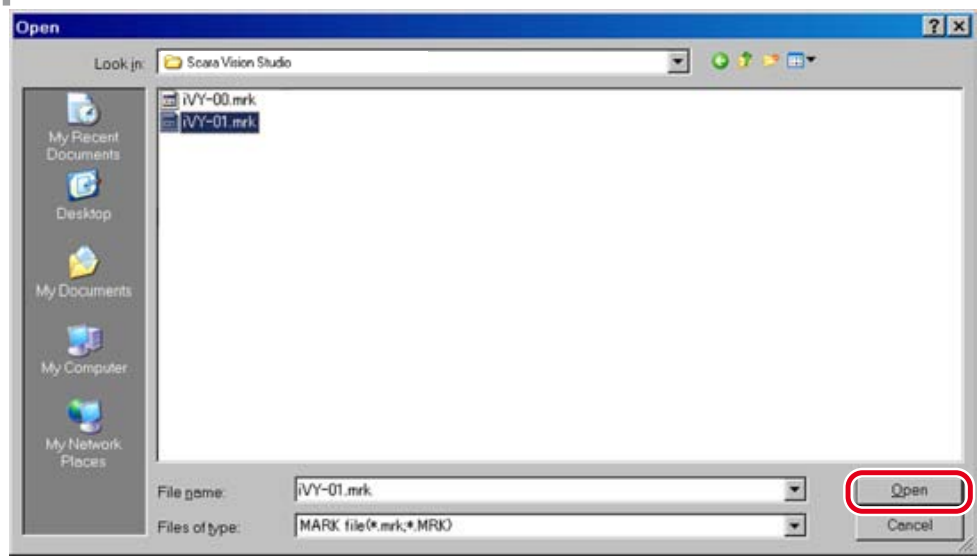
Selecting the fiducial mark data to be loaded



3 ***Press the [Open] button.***

To abort the fiducial mark loading operation, press the [Cancel] button.

Loading the fiducial mark data



4 ***Fiducial mark data loading occurs.***

The fiducial mark data is loaded to the currently selected (active) mark number.

CAUTION

FIDUCIAL MARK DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A FIDUCIAL MARK LOADING OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE FIDUCIAL MARK DATA IS BEING LOADED.

7.1.5.4 Copy a fiducial mark

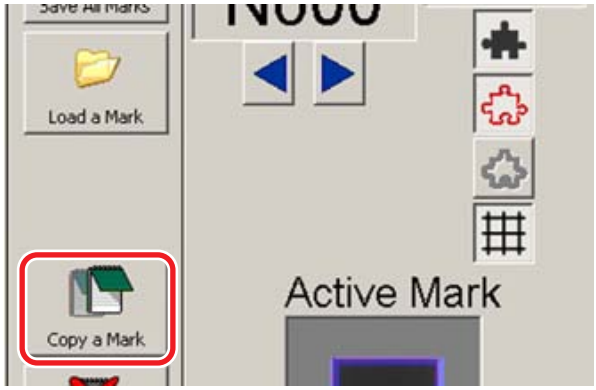
This operation copies fiducial marks from the robot controller to the currently selected (active) mark number.

NOTE

The mark number to which the fiducial mark data is to be copied must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Copy a Mark] button.***

[Copy a Mark] button



NOTE

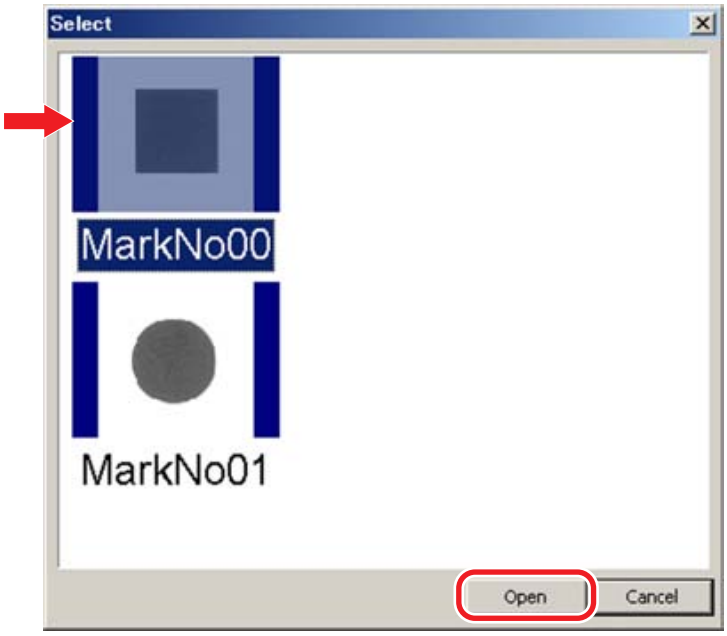
Mark data can also be copied from the [File (F)] menu by selecting [Open (O)] – [RC's Mark…], or from the [Edit (E)] menu by selecting [Copy] - [Mark…].

2 ***Select the copy source fiducial mark data, then press the [Open] button.***

When the "Select" window displays, select the copy source fiducial mark data.

To abort the copy operation, press the [Cancel] button.

Selecting the copy source fiducial mark data



NOTE

Fiducial mark data can also be copied by double-clicking on the copy source fiducial mark data.

3 ***The selected fiducial mark number data is copied to the currently selected (active) mark number.***

CAUTION

FIDUCIAL MARK DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING A FIDUCIAL MARK COPY OPERATION. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE FIDUCIAL MARK DATA IS BEING COPIED.

7.1.5.5 Erase a mark

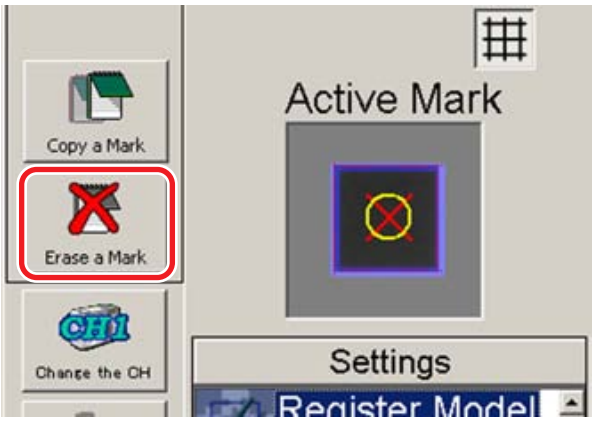
This operation deletes the data of the current (active) fiducial mark.

NOTE

The mark number to be deleted must be selected in advance. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

1 ***Press the [Erase a Mark] button***

[Erase a Mark] button



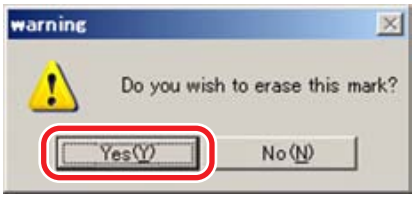
NOTE

Fiducial mark data can also be deleted from the [Edit (E)] menu by selecting [Erase] - [Mark].

2 ***When the deletion confirmation message displays, press [Yes (Y)] to perform the deletion.***

To abort the deletion operation, press [No (N)].

Deletion confirmation message



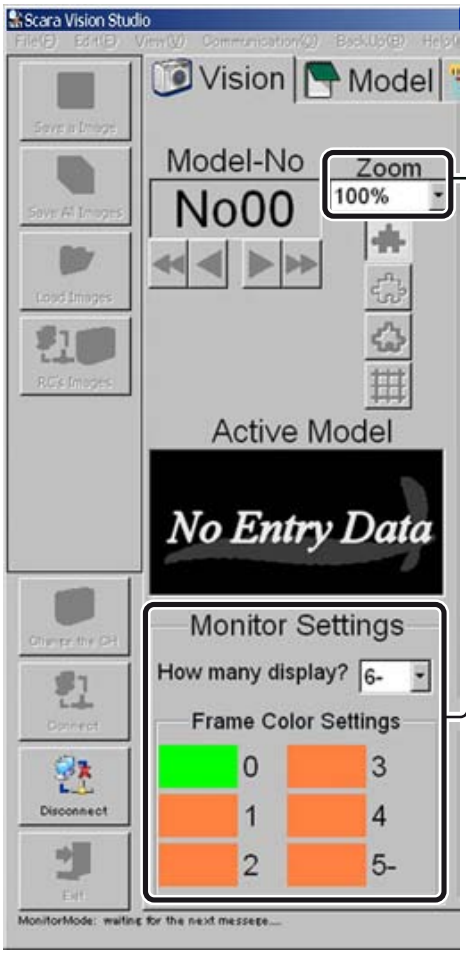
3 ***The fiducial mark data is deleted.***

The data of the currently selected (active) mark number is deleted.

7.1.6 Monitor mode

This section explains the basic Monitor mode operations.

Monitor mode functions



Zoom setting

Displays an image at the specified zoom level. (See Chapter 7, section 7.1.2.3 "Changing the display zoom setting".)

Monitor Settings

The number of workpieces detected by a search displays in the search result number order.

- "How many display?" frame
  Specifies the number of detection frame items.
- "Frame color settings" (score ranking)
  Specifies the detection frame color. Any frame color can be specified.

(For details about Monitor settings, refer to Chapter 7, section 7.6.2 "Monitor settings".)

7.2 Menu operations

This section explains the functions which can be performed from the various SCARA Vision Studio menus. SCARA Vision Studio has the following six menus: [File (F)], [Edit (E)], [View (V)], [Communication (C)], [BackUp (B)], [Help (H)].

Menu screen

7.2.1 [File (F)] menu functions

Functions which can be performed from the [File (F)] menu are shown below.

[File (F)] menu screens

- When in the Model mode

- When in the Vision mode

- When in Mark mode

Menu	Sub Menu	Function	Usable Modes		
			Model	Vision	Mark
Open (O)	Images…	Loads image data saved at the personal computer to the currently selected (active) model number. This procedure is the same as that explained in Chapter 7, section 7.1.4.4 "Loading images".	●		
		Loads image data saved at the personal computer to the currently selected (active) image number. This procedure is the same as that explained in Chapter 7, section 7.1.4.4 "Loading images".		●	
	Model…	Loads model data saved at the personal computer to the currently selected (active) model number. This procedure is the same as that explained in Chapter 7, section 7.1.3.3 "Load a model".	●	●	
	Mark data…	Loads fiducial mark data saved at the personal computer to the currently selected (active) mark number. This procedure is the same as that explained in Chapter 7, section 7.1.5.3 "Loading fiducial marks".			●
	RC's Images…	Loads image data saved at the robot controller to the currently selected (active) model number, and deletes image data from the robot controller. This procedure is the same as that explained in Chapter 7, section 7.1.3.4 "RC image operations – loading images", and section 7.1.3.5 "RC image operations – deleting images".	●		
		Loads image data saved at the robot controller to the currently selected (active) image number, and deletes image data from the robot controller. This procedure is the same as that explained in Chapter 7, section 7.1.4.5 "RC image operations – loading images", and section 7.1.4.6 "RC image operations – deleting images".		●	
	RC's Model…	Copies model data saved at the robot controller to the currently selected (active) model number. This procedure is the same as that explained in Chapter 7, section 7.1.3.6 "Copy a model".	●	●	
	RC mark data…	Copies fiducial mark data saved at the robot controller to the currently selected (active) mark number. This procedure is the same as that explained in Chapter 7, section 7.1.5.4 "Copy a fiducial mark".			●
Save as (A)	Images…	Saves the currently displayed (active) image to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.4.2 "Save an image".	●	●	
	All images…	Saves all stored images to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.4.3 "Saving all images".		●	
	Model…	Saves the model data of the currently selected (active) model number to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.3.1 "Saving a model".	●	●	
	All models…	Saves the data for all models to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.3.2 "Saving all models".	●	●	
	Mark…	Saves the fiducial mark data of the currently selected (active) mark number to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.5.1 "Saving a fiducial mark".			●
	All marks…	Saves the data for all fiducial marks to the personal computer. This procedure is the same as that explained in Chapter 7, section 7.1.5.2 "Saving all fiducial marks".			●
Set camera…		Specifies the camera settings. This procedure is the same as that explained in Chapter 5, section 5.2 "Camera settings".	---	---	---
Exit (X)		Ends SCARA Vision Studio operation.	---	---	---

CAUTION

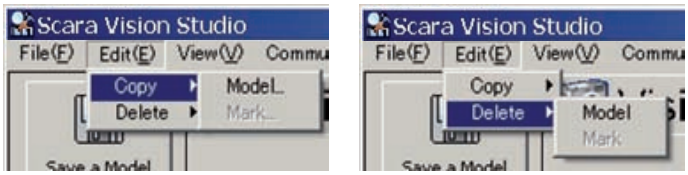
DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING DATA LOADING AND SAVING OPERATIONS. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE LOADING OR SAVING DATA.

7.2.2 [Edit (E)] menu functions

Functions which can be performed from the [Edit (E)] menu are shown below.

[Edit (E)] menu screens

Model / Vision modes



Mark mode

Menu	Sub Menu	Function	Usable Modes		
			Model	Vision	Mark
Copy	Model…	Copies model data saved at the robot controller to the currently selected (active) model number. This procedure is the same as that explained in Chapter 7, section 7.1.3.6 "Copy a model".	•	•	
	Mark…	Copies fiducial mark data saved at the robot controller to the currently selected (active) mark number. This procedure is the same as that explained in Chapter 7, section 7.1.5.4 "Copy a fiducial mark".			•
Delete	Model	Deletes the model data of the currently selected (active) model number. This procedure is the same as that explained in Chapter 7, section 7.1.3.7 "Erase a model".	•	•	
	Mark	Deletes the fiducial mark data of the currently selected (active) mark number. This procedure is the same as that explained in Chapter 7, section 7.1.5.5 "Erase a mark".			•

CAUTION

DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING DATA COPY OPERATIONS. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE COPYING DATA.

7.2.3 [View (V)] menu functions

Functions which can be performed from the [View (V)] menu are shown below.

[View (V)] menu screens

Menu	Sub Menu	Function
Size Of Screen	1024×768	Adjusts the screen to the 1024 x 768 screen size.
	800×600	Adjusts the screen to the 800 x 600 screen size.
Language	Japanese	Specifies Japanese language displays. (After specifying a language, SCARA Vision Studio must be restarted to enable that language change.)
	English	Specifies English language displays. (After specifying a language, SCARA Vision Studio must be restarted to enable that language change.)

7.2.4 [Communication (C)] menu functions

Functions which can be performed from the [Communication (C)] menu are shown below.

[Communication (C)] menu screens (when not connected)

[Communication (C)] menu screens (when connected)

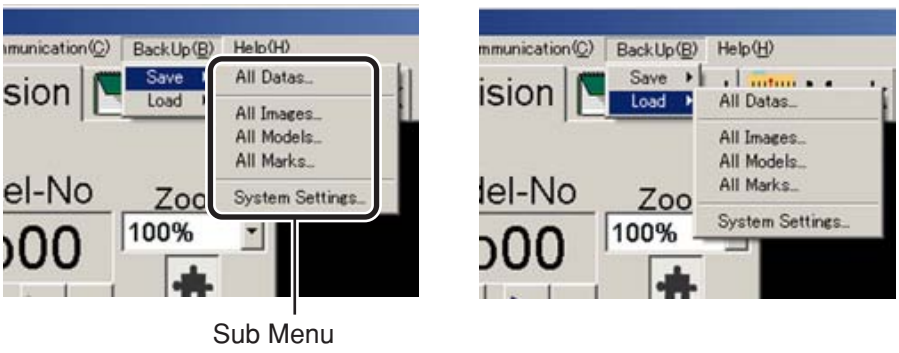
Menu	Function
Connect	Connects SCARA Vision Studio to the robot controller.
Disconnect	Disconnects communication between SCARA Vision Studio and the robot controller.
Settings…	Specifies the communication settings. This procedure is the same as that explained in Chapter 5, section 5.1 "Communication settings".

7.2.5 [BackUp (B)] menu functions

The [BackUp (B)] menu functions can be used to back up various data, and to load backed up data to the robot controller. The backup function is enabled only when SCARA Vision Studio is connected to the robot controller. After restoring backed up data (including system settings), the robot controller must be restarted.

Functions which can be performed from the [BackUp (B)] menu are shown below.

[BackUp (B)] menu screens



Menu	Sub Menu	Function
Save	All Data…	Saves all memory data (model data, image data, fiducial mark data, system settings) from the robot controller memory to the personal computer.
	All Images…	Saves all image data from the robot controller memory to the personal computer.
	All Models…	Saves all model data from the robot controller memory to the personal computer.
	All Marks…	Saves all the fiducial mark data from the robot controller memory to the personal computer.
	System Settings…	Saves the system settings (communication settings, camera settings) from the robot controller to the personal computer.
Load	All Data…	Loads all the data (model data, image data, fiducial mark data, system settings) from the personal computer to the robot controller.
	All Images…	Loads all image data from the personal computer to the robot controller.
	All Models…	Loads all model data from the personal computer to the robot controller.
	All Marks…	Loads all the fiducial mark data from the personal computer to the robot controller.
	System Settings…	Loads all the system settings (communication settings, camera settings) from the personal computer to the robot controller.

CAUTION

DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING DATA LOADING AND SAVING OPERATIONS. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE LOADING OR SAVING DATA.

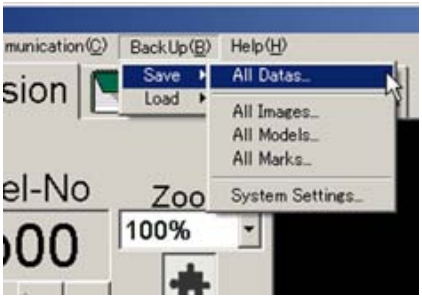
7.2.5.1 [Save] functions

The [BackUp (B)] – [Save] menu procedures are explained below.

1 ***Select the data to be saved from the [BackUp (B)] – [Save] menu.***

Select the data to be saved.

[BackUp (B)] – [Save] menu screen



2 ***Save the specified data.***

At the "Save As" window which displays, specify the "Save in", "File name", and "Save as type".

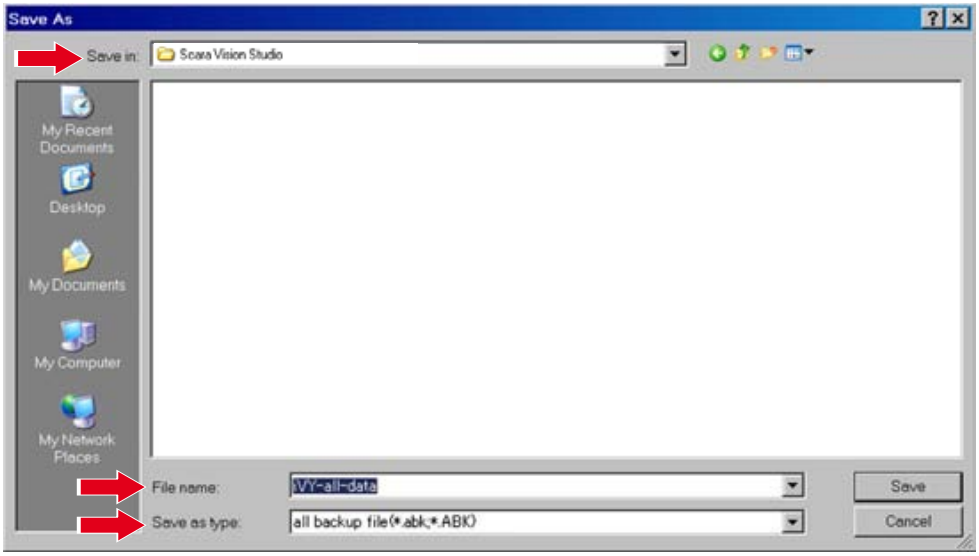
Specify any desired location as the "Save in".

Specify any desired name as the "File name".

The "Save as type" varies according to the type of data being saved.

Data Types	File Type
All Data	all backup file (*.abk,*.ABK)
All Images	all images backup file (*.ibk,*.IBK)
All Models	all models backup file (*.fbk,*.FBK)
All Marks	all marks backup file (*.mbk,*.MBK)
System Settings	settings backup file (*.sbk,*.SBK)

Specifying the selected data's save destination

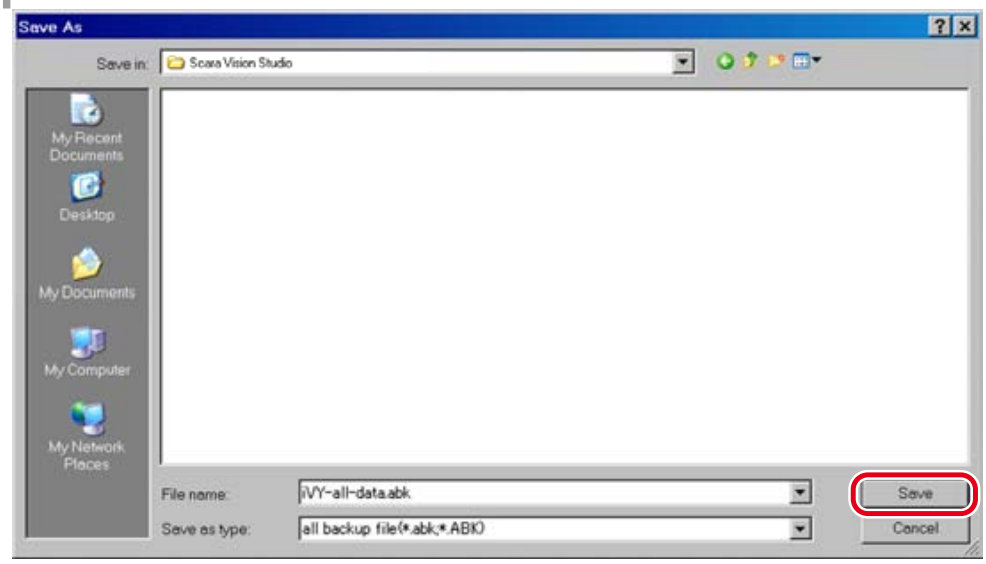


3 ***Press the [Save] button.***

To abort the save operation, press the [Cancel] button.

If a same-name file already exists at the specified save location, an overwrite confirmation message displays. To proceed with overwriting, press [Yes (Y)]. If overwriting is not desired, press [No (N)].

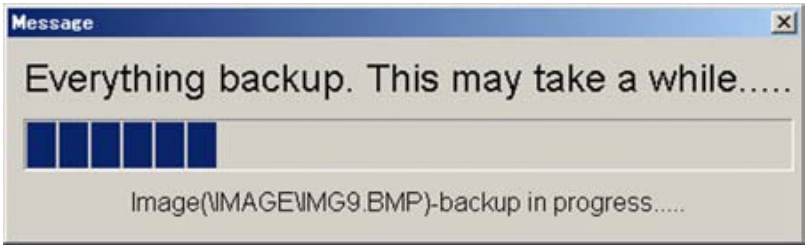
Saving fiducial mark data



4 ***The data is saved.***

An "Everything backup. This may take a while…" message displays while the backup operation is in progress.

Data backup in progress



CAUTION

DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING DATA SAVE OPERATIONS. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE SAVING DATA.

7.2.5.2 [Load] functions

The [BackUp (B)] – [Load] menu procedures are explained below.
Only data which was saved from the [BackUp (B)] – [Save] menu can be loaded by this function.

1 ***Select the data to be loaded from the [BackUp (B)] – [Load] menu.***

Select the data to be loaded to the robot controller.

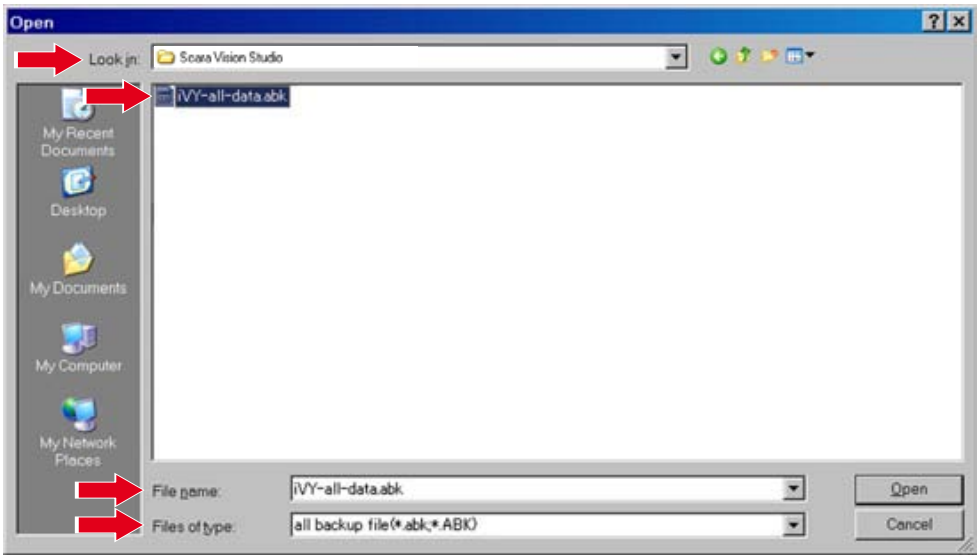
[BackUp (B)] – [Load] menu screen

2 ***Specify the data to be saved.***

At the "Open" window which displays, specify the data file to be loaded. The "file type" of the data to be loaded is indicated in the window.

Selected Data Type	File Type
All Data	all backup file (*.abk,*.ABK)
All Images	all images backup file (*.ibk,*.IBK)
All Models	all models backup file (*.fbk,*.FBK)
All Marks	all marks backup file (*.mbk,*.MBK)
System Settings	settings backup file (*.sbk,*.SBK)

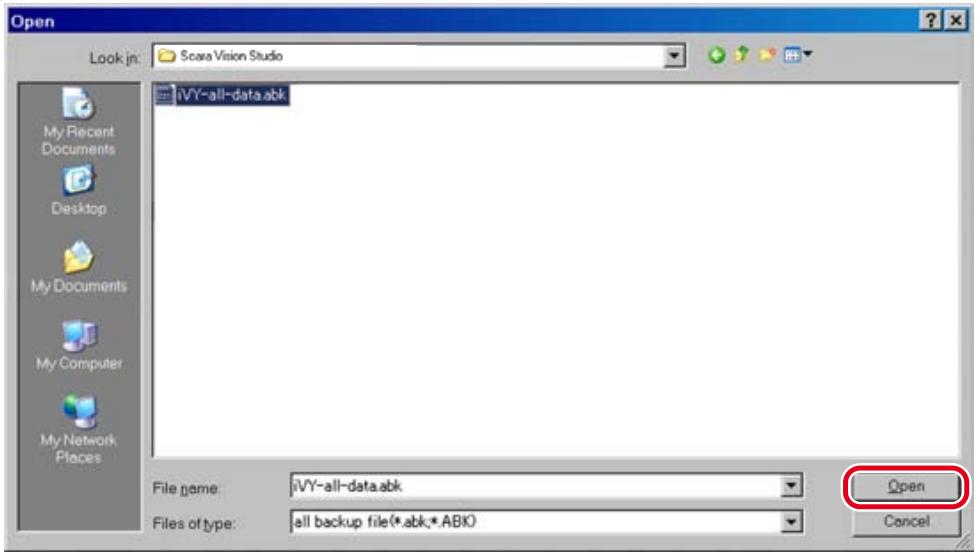
Selecting the image data to be loaded (1)



3 ***Press the [Open] button.***

To abort the data loading operation, press the [Cancel] button.

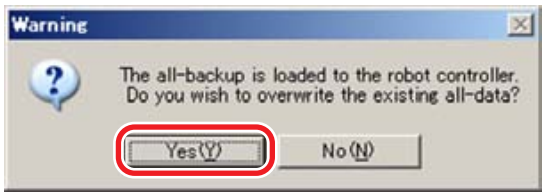
Selecting the image data to be loaded (2)



4 ***If overwrite confirmation message displays, press the [Yes (Y)] button.***

Press [Yes (Y)] to proceed with overwriting, or [No (N)] if overwriting is not desired.

Overwrite confirmation message screen



5 ***Data loading occurs.***

A "Loading backup in progress..." message displays during the data loading operation.

Data loading in progress

CAUTION

DATA CAN BE LOST IF THE ROBOT CONTROLLER OR PERSONAL COMPUTER POWER IS TURNED OFF, OR IF A CABLE OR CONNECTOR IS DISCONNECTED, DURING DATA LOADING OPERATIONS. NEVER TURN OFF THE POWER OR DISCONNECT A CABLE WHILE LOADING DATA.

NOTE

Data which is not recognized as significant "load data" remains in the robot controller memory.

[Example] At "All Models" loading operation:

Before loading	Is model number 10 registered at the robot controller?	●	●	×	×
During loading	Is model number 10 included in the "all-models" data?	●	×	●	×
After loading	Model number 10 data at robot controller	Data is overwritten	Data is unchanged	Data is overwritten	Data remains unregistered

6 ***A "loading completed" message displays.***

A "loading completed" message displays if data loading was completed successfully. Press the [OK] button at this time.

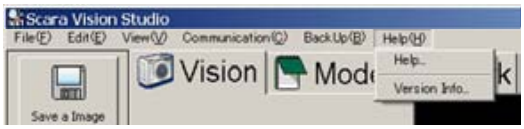
To then include system settings in the loaded data, end the SCARA Vision Studio and robot controller communication, then restart the robot controller.

Data loading completed (the following message screen displays if a restart is required)

7.2.6 [Help (H)] menu functions

Functions which can be performed from the [Help (H)] menu are shown below.

[Help (H)] menu screen



Menu	Function
Help…	Displays SCARA Vision Studio "Help" information.
Version Info…	Displays the SCARA Vision Studio version, the robot controller's SCARA Vision engine version, and the firmware version.

Version Info screen

7.3 Registering models

This section explains how to register models.

A model registration operation consists of registering the camera-captured workpiece image data at the robot controller. The following four settings must be specified in order to register models.

- **Pattern setting**

  A workpiece image is captured, and the range of the image to be registered is specified.

- **Parameter setting**

  The edge extraction and search parameter settings are specified.

- **Contour setting**

  The workpiece contour is specified.
  The SCARA Vision System performs searches based on the workpiece edge information. The search precision can be increased by limiting the edges used.

- **Detection position setting**

  Specifies the reference position for the workpiece position information used at searches.

The settings required for model registration must be performed in the following order.

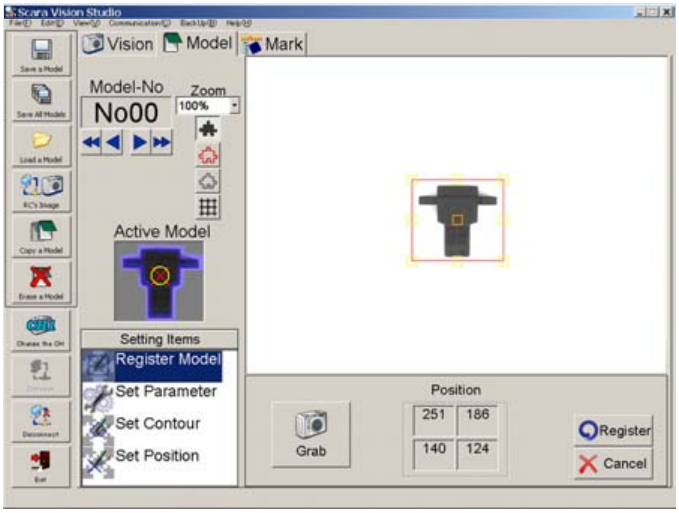
Setting order
Pattern setting → Parameter setting → Contour setting → Detection position setting

NOTE

The above settings must be specified again if specified in the wrong order. Be sure to specify the settings in the order shown above.

When registering models, the vision control mode of the robot controller must be set to the "HOST PC" mode before connecting SCARA Vision Studio to the robot controller.
For details concerning how to set the vision control mode of the robot controller to the "HOST PC" mode, refer to Chapter 4, section 4.3, "Setting the robot controller's control mode", in SCARA VISION SYSTEM EXPLANATION SECTION.

Model registration screen



7.3.1 Model registration and R-axis angle

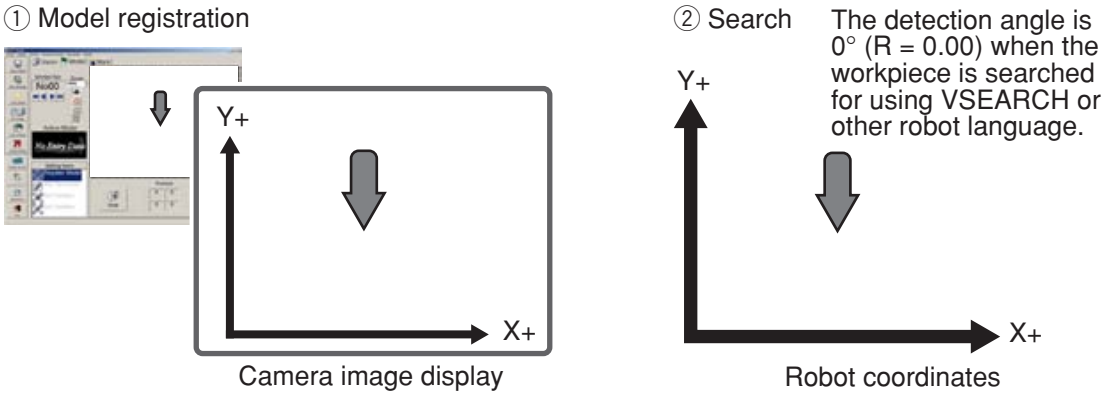
The orientation of the workpiece you have registered its model with SCARA Vision Studio becomes a detection angle of 0° (robot coordinates, R = 0.00) at the time of the search using the robot language, such as VSEARCH.
Therefore, in particular, if a workpiece you want to register its model has a directionality (non-circle workpiece), pay special attention to the orientation of the workpiece when registering a model.

For example, assuming that the operation steps are performed from the model registration to the search as follows:

1- Register an arrow type workpiece with SCARA Vision Studio as shown in the figure below.

2- Search for this workpiece using the robot language, such as VSEARCH.

At this time, the detection angle when the workpiece is searched for using the robot language, such as VSEACH becomes 0° (robot coordinates, R=0.00) regardless of the camera mounting method, mounting position, and mounting angle.

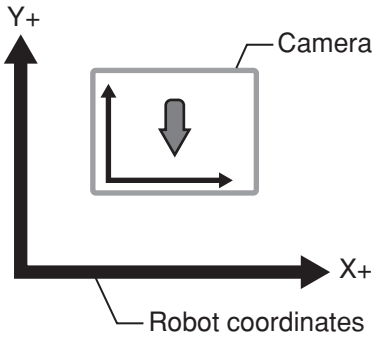


MEMO

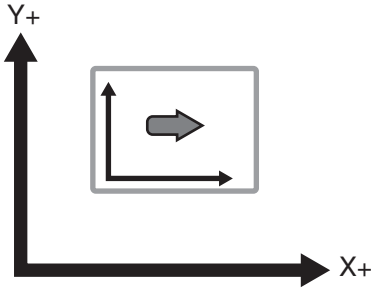
The detection angle when the search operation is executed in the Vision mode of SCARA Vision Studio becomes the difference between the orientation of the workpiece you have registered its model and the workpiece shown on the camera image display.

According to the description above, the following shows examples of detection angles by the workpiece orientation and camera mounting angle.

- **Camera mounting angle is 0°.**

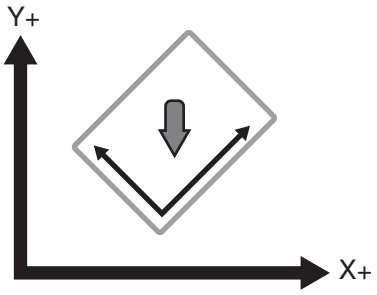


	Detection angle
Search in Vision mode of SCARA Vision Studio	0°
Search using robot language	0° (R=0.00)



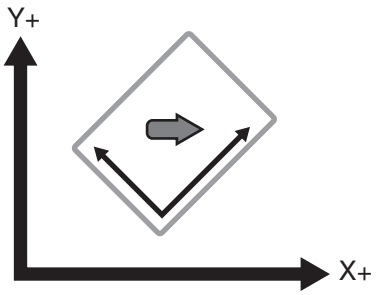
	Detection angle
Search in Vision mode of SCARA Vision Studio	90°
Search using robot language	90° (R=90.00)

- **Camera mounting angle is 45°.**



	Detection angle
Search in Vision mode of SCARA Vision Studio	-45°
Search using robot language	0° * (R=0.00)

* -45° (Search detection angle in the Vision mode of SCARA Vision Studio) + 45° (Camera angle) = 0° (Robot coordinates)

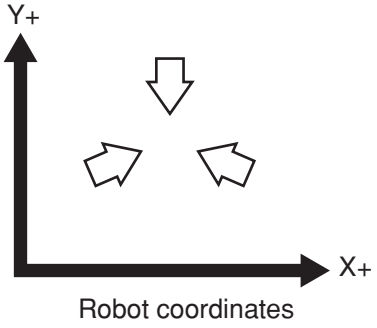


	Detection angle
Search in Vision mode of SCARA Vision Studio	45°
Search using robot language	90° * (R=90.00)

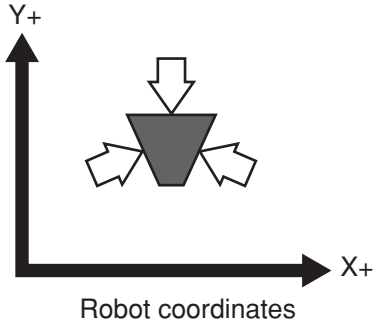
* 45° (Search detection angle in the Vision mode of SCARA Vision Studio) + 45° (Camera angle) = 90° (Robot coordinates)

Example:

Assuming that a tool which chucks a workpiece at 3 points in the directions shown in the lower left figure exists when the R-axis satisfies "R=0.00", the following describes that a trapezoidal workpiece is chucked using this tool as shown in the lower right figure.

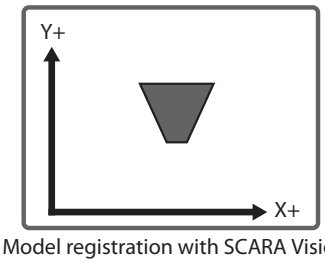


Robot coordinates



Robot coordinates

In this case, a workpiece in the orientation shown in the figure below is registered in the model registration.

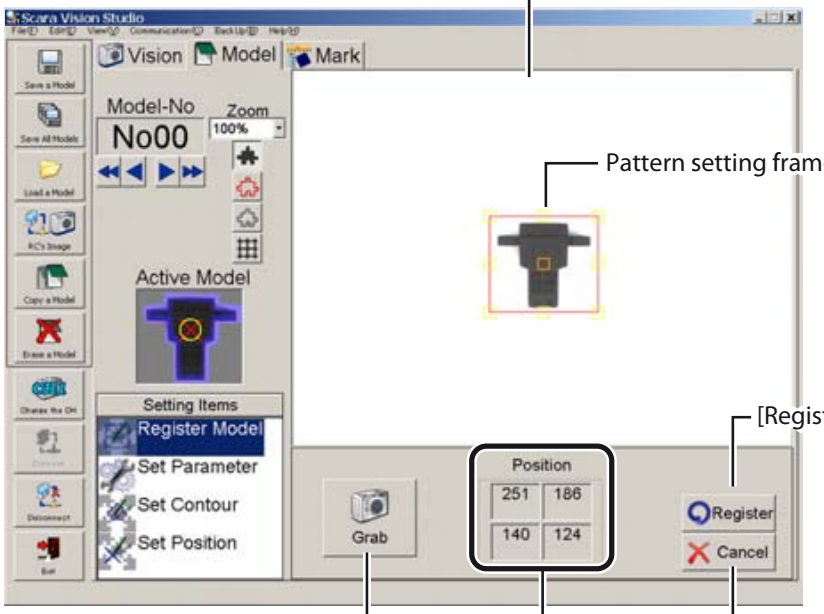


Model registration with SCARA Vision Studio (Camera image display)

7.3.2 Pattern setting

The pattern setting specifies the image range to be registered within a workpiece image that has been captured by the camera, and registers that image range data at the robot controller.

Model registration – Pattern setting screen



[Grab/Start] button

This button functions either as a "Grab" or "Start" button, depending on the pattern setting process currently being performed.

Position of pattern setting frame (pixel value display)

(1)	(2)
(3)	(4)

(1) Pattern setting frame's upper left X-coordinate
(2) Pattern setting frame's upper left Y-coordinate
(3) Pattern setting frame's width
(4) Pattern setting frame's height

The pattern setting procedure is given below.

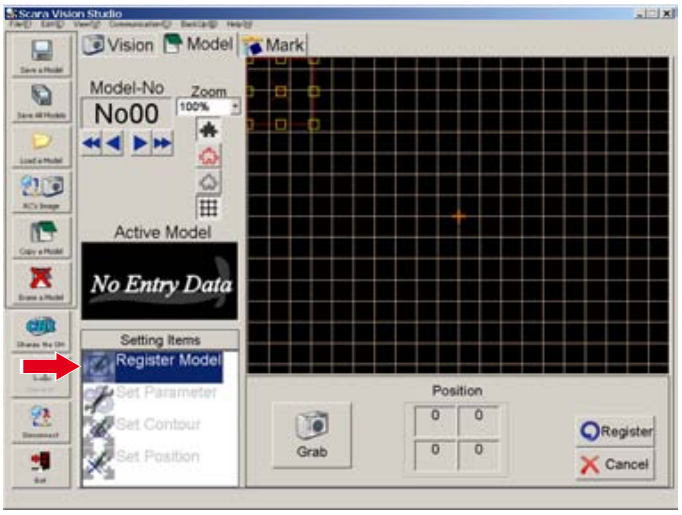
NOTE

Check the following items before beginning the pattern setting procedure.

- Verify that the model number to be registered is selected. If it is not selected, select it. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".
- Verify that the grid display is on at the camera image display area. For this procedure, refer to Chapter 7, section 7.1.2.4 "Switching the display".

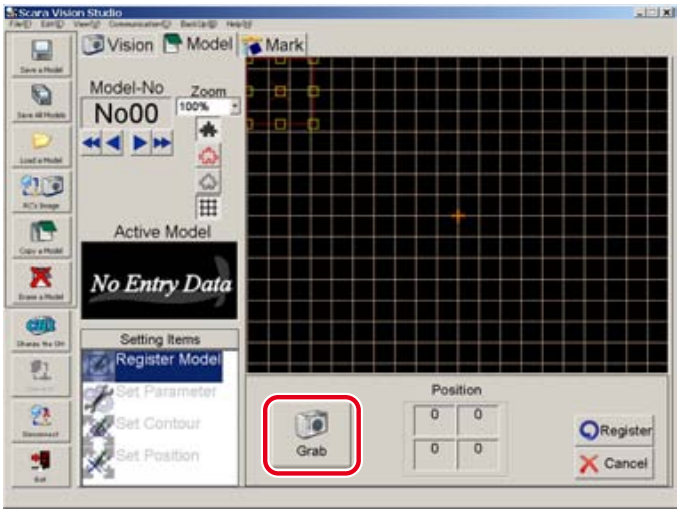
1 ***In the Model mode, select the "Register Model" setting item.***

Select "Register Model"



2 ***Press the [Grab] button.***

[Grab] button



3 ***Place the registration-object workpiece directly beneath the camera, then press the [Start] button.***

With the registration-object workpiece placed directly beneath the camera, adjust the workpiece orientation while observing the camera image display. For details concerning the orientation of the registration-object workpiece, refer to section 7.3.1, "Model registration and R-axis angle".
To abort the workpiece image capture operation, press the keyboard's [ESC] key before the [Start] button is pressed.

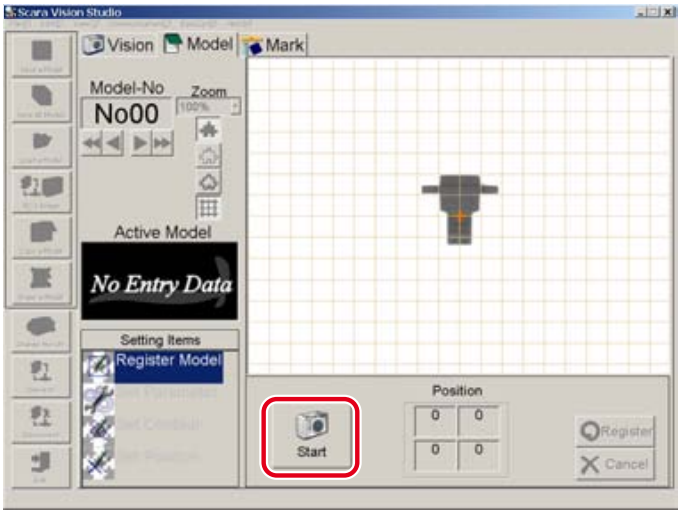
CAUTION

WHEN REGISTERING THE WORKPIECE, DO NOT PLACE IT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE WORKPIECE IS PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE REGISTRATION-OBJECT WORKPIECE IMAGE MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED. WHEN REGISTERING THE WORKPIECE, PLACE THE REGISTRATION-OBJECT WORKPIECE DIRECTLY BENEATH THE CAMERA AND CAPTURE THE WORKPIECE IMAGE.

MEMO

Adjusting the workpiece angle is easier with the grid display on.

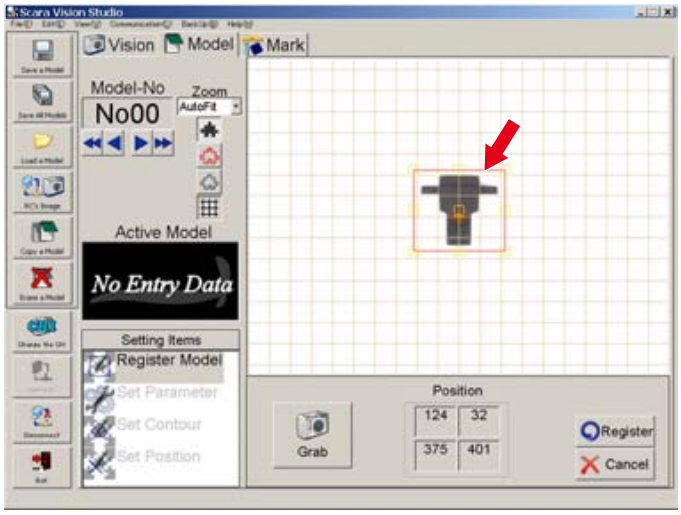
Capturing the workpiece image



4 ***Align the pattern setting frame with the workpiece to be registered.***

To change the size of the pattern setting frame (red frame), use the mouse to drag the yellow boxes which appear on the frame lines.

Aligning the pattern setting frame

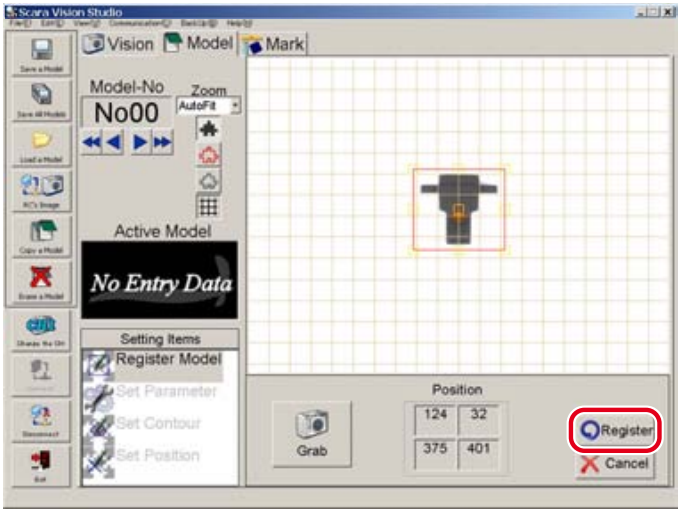


5 ***Press the [Register] button.***

The data is transmitted to the robot controller when the [Register] button is pressed.

To abort the registration operation, press the [Cancel] button.

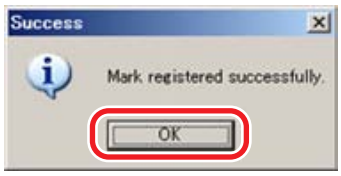
Registering a pattern



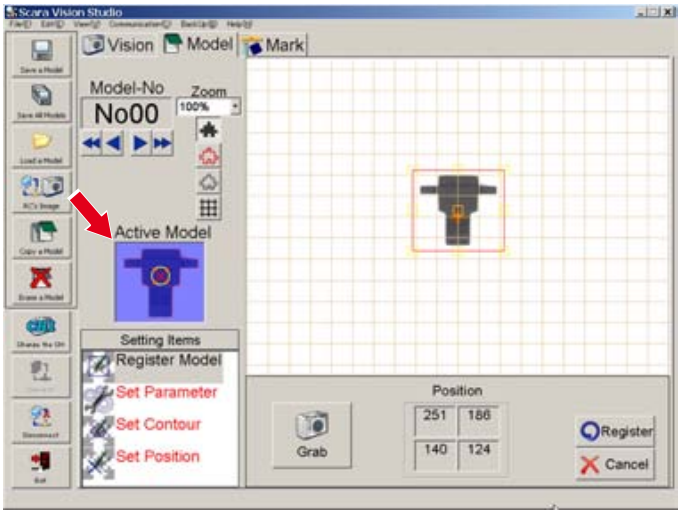
6 ***The "Mark registered successfully" message displays.***

The "Mark registered successfully" message displays when a pattern registration is completed. Press the [OK] button at this time.
Registration is completed when the "Active Model" workpiece image displays in the workpiece view area.

Pattern registration completed (1)



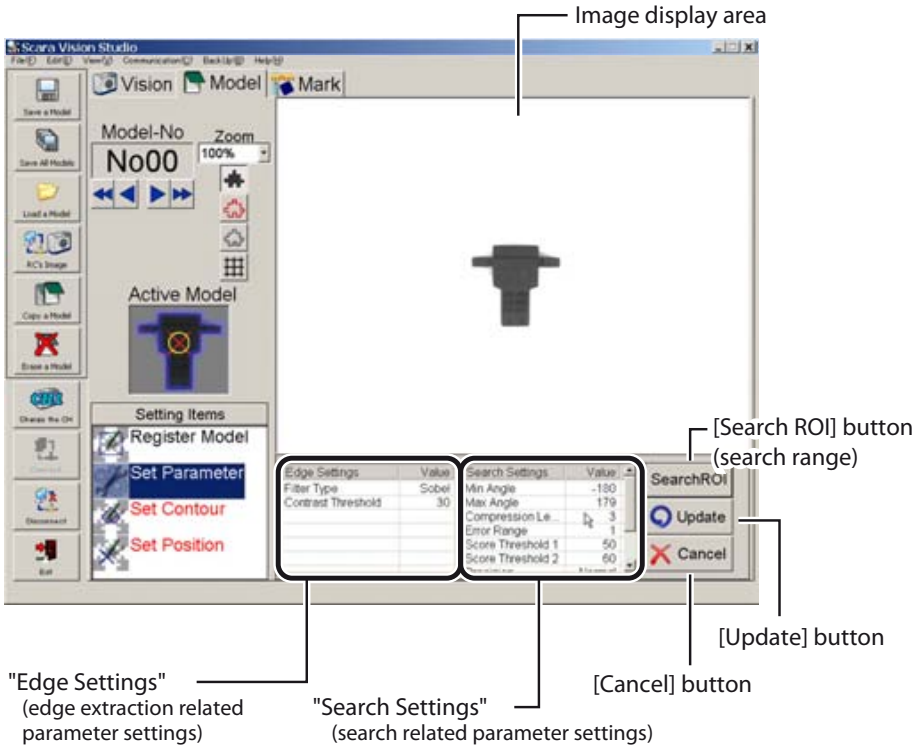
Pattern registration completed (2)



7.3.3 Parameter settings

The parameter setting comprises the edge extraction and search parameter settings. The degree of edge extraction changes in accordance with changes made in the edge settings. The search results which are output change in accordance with changes made in the search settings.

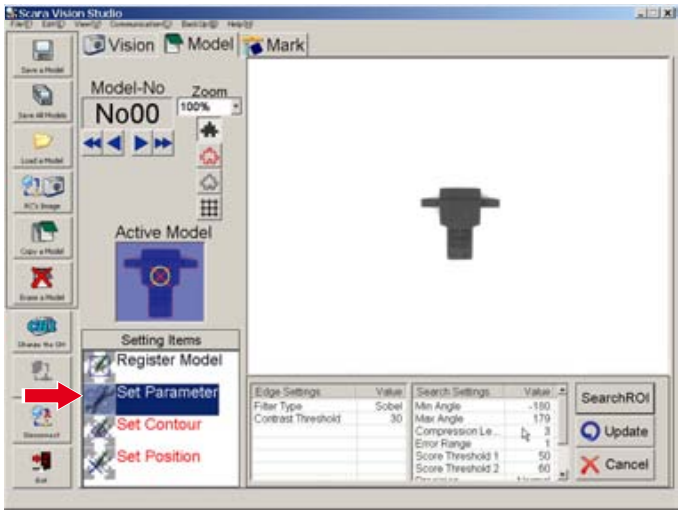
Model registration – Parameter settings screen



The parameter setting procedure is given below.

1 ***In the Model mode, select the "Set Parameter" setting item.***

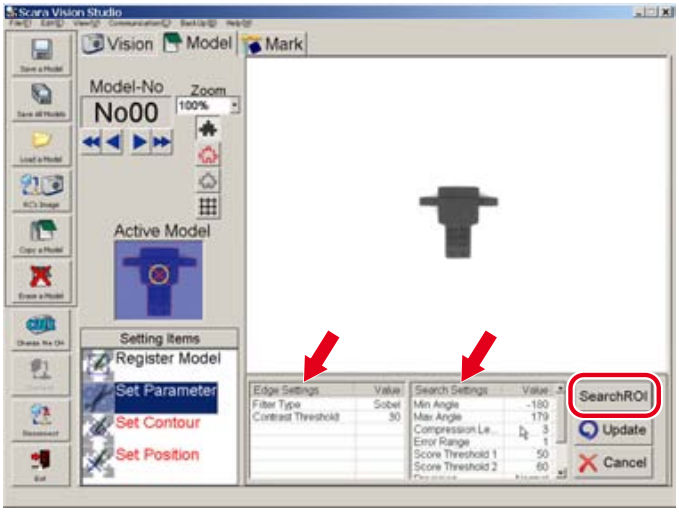
Select "Set Parameter"



2 ***Specify the parameter settings.***

Specify the following three parameter settings.

Setting the parameters



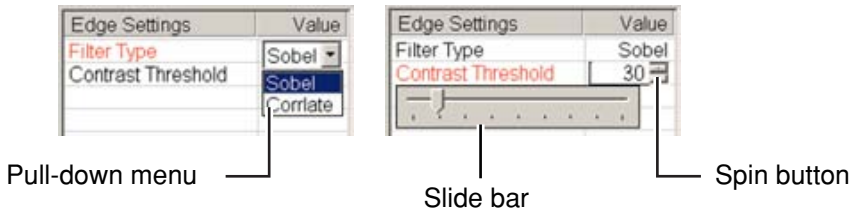
■ Edge Settings

The edge extraction related parameter settings are specified here.
Click on the item for which a setting is to be specified. That item then displays in red, and the Edit mode is established.
Settings for parameters requiring numeric inputs can be specified by entering the numeric values from the keyboard, or by using the slide bar or spin button. Other parameter settings are specified by selections made from pull-down menus.
The descriptions of each setting item, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 5, section 5.4.1 "Edge settings".

■ Search Setting

The search related parameter settings are specified here.
Click on the item for which a setting is to be specified. That item then displays in red, and the Edit mode is established.
Settings for parameters requiring numeric inputs can be specified by entering the numeric values from the keyboard, or by using the slide bar or spin button. Other parameter settings are specified by selections made from pull-down menus.
The descriptions of each setting item, refer to the SCARA VISION SYSTEM EXPLANATION SECTION, Chapter 5, section 5.4.2 "Search settings".

Pull-down menu, Slide bar, Spin button



■ Search range settings

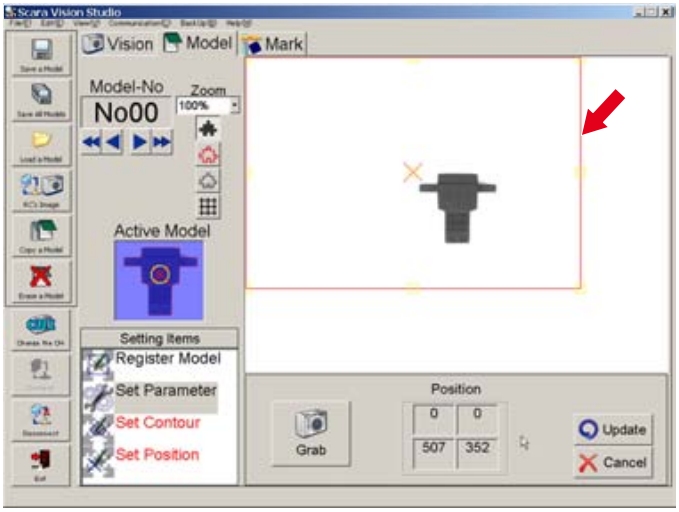
This setting specifies the search range.
A search for the specified workpiece occurs within the range specified here. The default search range setting is the camera's full field of view.

1. Press the [Search ROI] button.
2. Specify the desired search range (red frame area).
   To change the size of the range setting frame (red frame), use the mouse to drag the yellow boxes which appear on the frame lines. To move the range setting frame, use the mouse to drag the yellow box which appears in the center.

MEMO

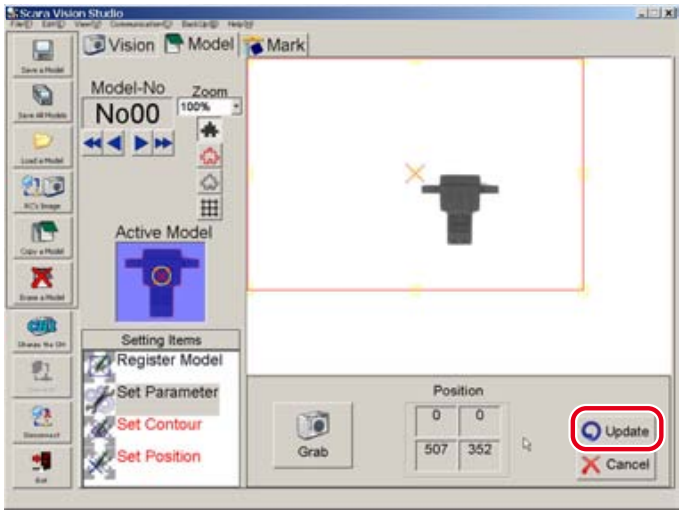
The search range (red frame) setting operation is easier if performed while changing the zoom setting.

Setting the search range (1)



3. Press the [Update] button to register the setting changes which have been made.
   To abort the setting operation, press the [Cancel] button. The original (before change) settings are then reestablished.

Setting the search range (2)



4. The "Area set successfully" message displays
   The "Area set successfully" message displays when a search range setting is completed. Press the [OK] button at this time.

Search range setting completed

3 *Press the [Update] button.*

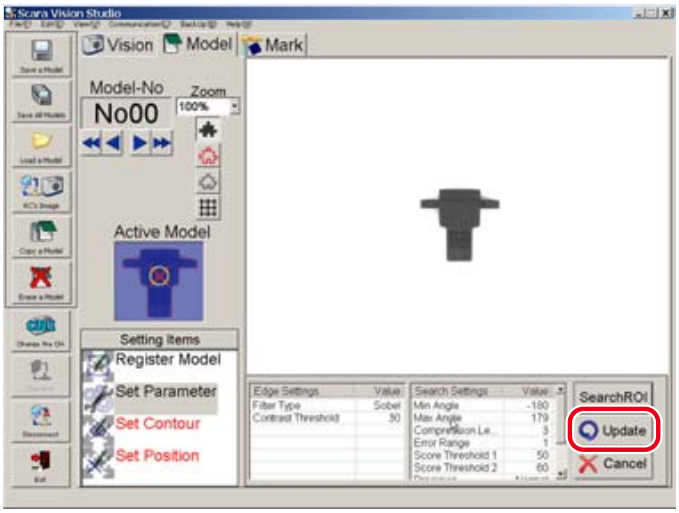
Press the [Update] button to register the setting changes which have been made.

To abort the setting operation, press the [Cancel] button. The original (before change) settings are then reestablished.

NOTE

Once the search range has been changed at Step 2 above, the original settings will not be reestablished even if the [Cancel] button is pressed at the parameter settings screen shown above. To restore the original settings, the search range must be set again.

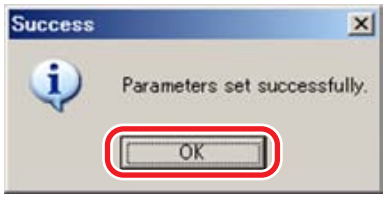
Registering the parameter settings



4 *The "Parameters set successfully" message displays.*

The "Parameters set successfully" message displays when the parameter settings are completed. Press the [OK] button at this time.

Parameter settings completed

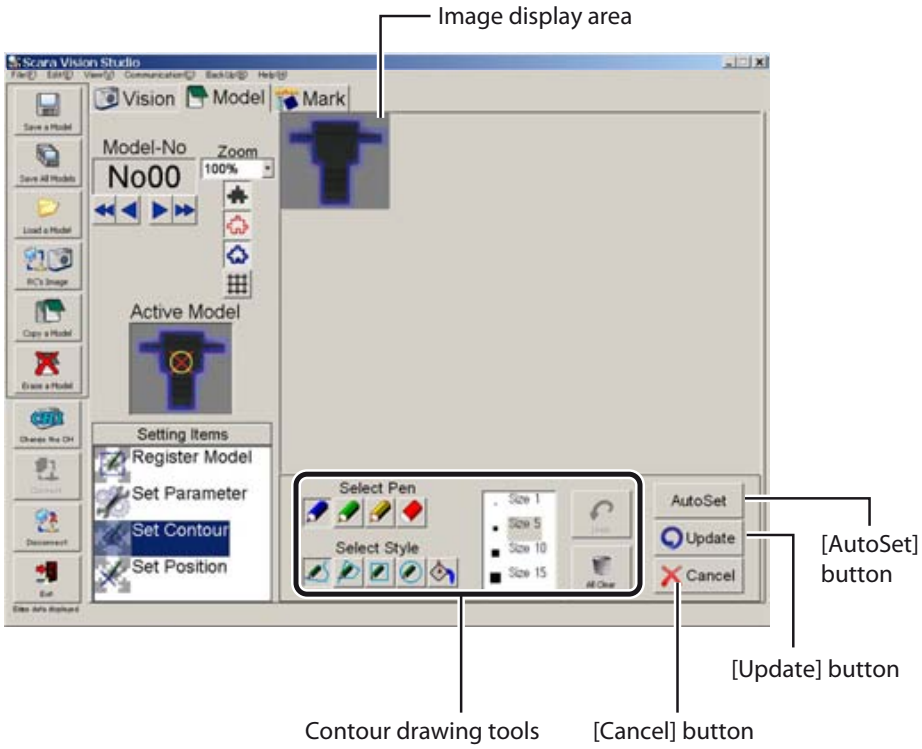


7.3.4 Contour setting

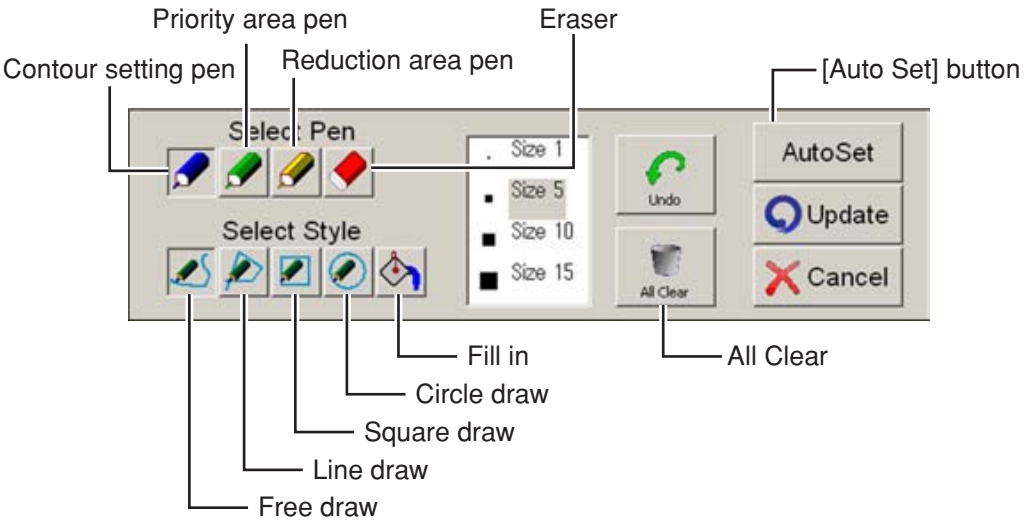
This setting specifies the workpiece contour which is used in searches. Automatically detected edges appear in red. Search operations use the edge (red area) located within the contour specified by this contour setting.

The default contour setting specifies the use of all edges.

Model registration – Contour setting screen



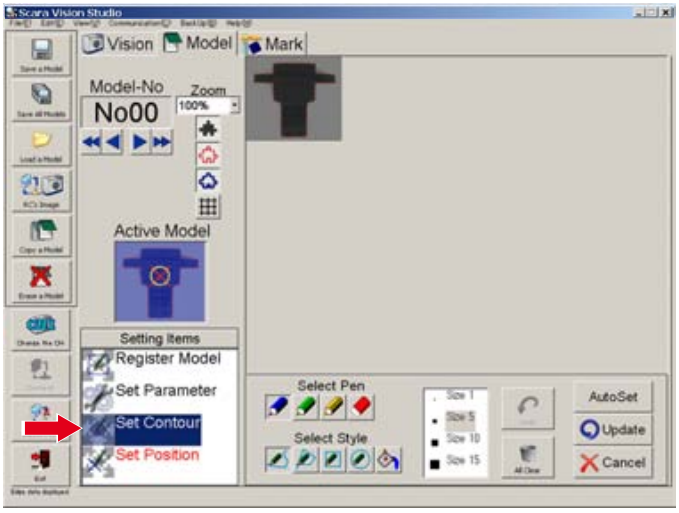
Contour drawing tools



The contour setting procedure is given below.

1 ***In the Model mode, select the "Set Contour" setting item.***

Select "Set Contour"



2 ***Verify that the "Background", "Edge", and "Contour" displays are on (buttons are pressed).***

Press the "Background", "Edge", and "Contour" buttons to display the image, extracted edge, and the contour to be specified. For this procedure, refer to Chapter 7, section 7.1.2.4 "Switching the display".

3 ***Use the "contour draw" tools to select a contour.***

Instructions for using the draw tools are given below.

■ Select Pen

- Contour setting pen : Paints (in blue) the area to be used from among the automatically detected edges.
- Priority area pen : Paints (in green) the area to be used from among the automatically detected edges. The areas painted in green are used as priority areas at search operations. In other words, these areas are viewed as important edge areas during search. In cases where multiple similar-shaped workpieces exist, use this pen to accurately identify the separate models.
- Reduction area pen : Paints (in yellow) the area to be used from among the automatically detected edges. The areas painted in yellow are used as unnecessary areas during search. In other words, no edges should be found in these areas. Use this pen when not searching for workpiece models having scratches or when reducing the score.
(The score reduction can be adjusted by the "reduction weight" parameter.)

NOTE

- If the areas drawn by the contour setting pen, priority area pen and reduction area pen overlap, then the area last drawn has priority.

• Eraser : Erases the color painted by the pen. (Automatically detected edges are not erased.)

■ Select Style

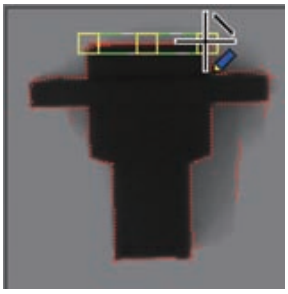
Selects the styles (shapes) which are drawn by the pen (contour setting pen, priority area pen and reduction area pen), and which are erased by the eraser.

• Free draw : Use to draw free shapes with the pen of the selected size. Draw by dragging the mouse. The eraser can be used in the same manner.

Free draw

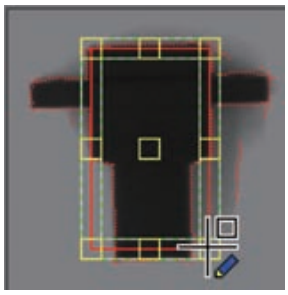
• Line draw : Use to draw a straight line between start and end points. Draw by dragging the mouse. The eraser can be used in the same manner.
The red line indicates the straight line's drawing destination, and the green box indicates the straight line thickness. The yellow boxes at both ends of the straight line can be used to change the direction or length of the straight line. The box at the center can be used to move the straight line.
To register the straight line, click at any point away from the line, or press the keyboard's [Enter] key.
To cancel a drawn straight line (before it is registered), press the keyboard's [ESC] key.

Line drawing



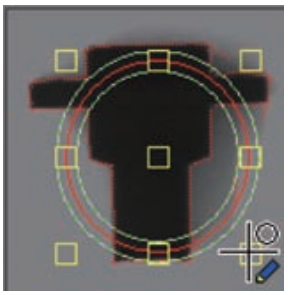
• Square draw : Use to draw a square by dragging the mouse diagonally away from the start point. The eraser can be used in the same manner.
The red line indicates the square's drawing destination, and the green box indicates the square line thickness. The outer perimeter yellow boxes can be used to change the size of the square, and the center box can be used to move the square.
To register the square, click at any point away from the square, or press the keyboard's [Enter] key.
To cancel a drawn square (before it is registered), press the keyboard's [ESC] key.

Square draw



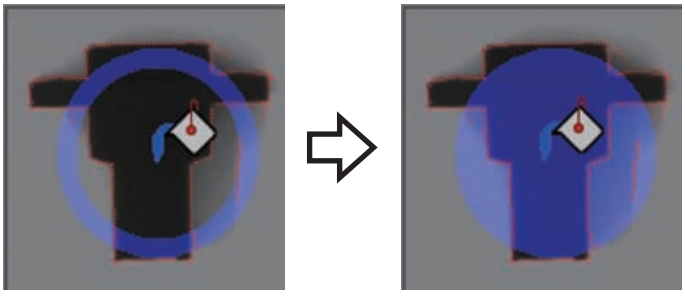
• Circle draw : Use to draw a circle by dragging the mouse diagonally away from the start point. The eraser can be used in the same manner.
The red line indicates the circle's drawing destination, and the green box indicates the circle line thickness. The outer perimeter yellow boxes can be used to change the size of the circle, and the center box can be used to move the circle.
To register the circle, click at any point away from the circle, or press the keyboard's [Enter] key.
To cancel a drawn circle (before it is registered), press the keyboard's [ESC] key.

Circle draw



• Fill in : Use to fill in (paint) an enclosed area by clicking inside that area. Erasing occurs in the same manner when the eraser is selected.

Fill in



■ Size selection

Specifies the pen's line thickness and the eraser size.

■ Undo

Restores the status which existed prior to the operation which was just performed. The most recent operations (up to 5 operations) can be undone.

■ All Clear

Clears (deletes) all drawn objects.

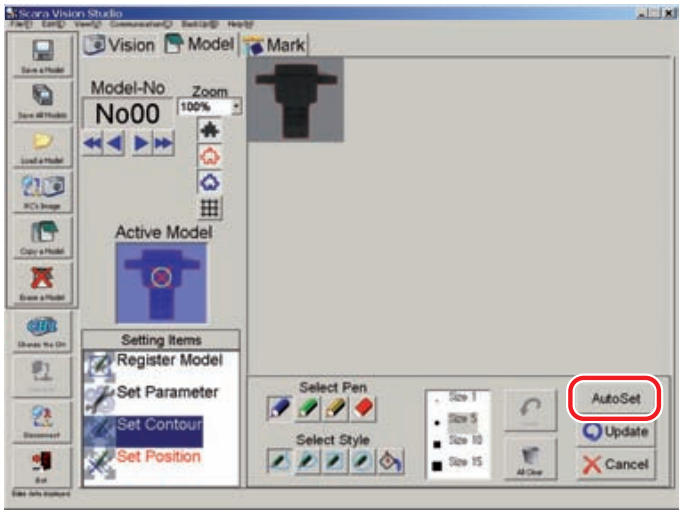
■ Auto contour setting

If the workpiece contour has a shape that is defined to some extent, it can easily be drawn by the auto contour setting.
(This function works well when the contour shape resembles a circle, square or cross.)

To use the auto contour setting, proceed as follows:

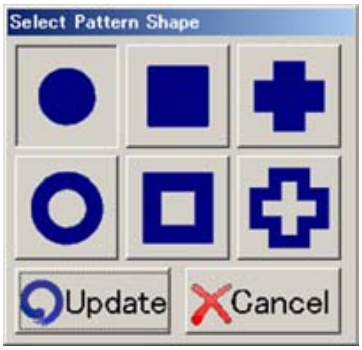
1. Click the [Auto Set] button.

Select "Set Contour"



2. The "Select Pattern Shape" screen appears. Select the button that is closest to the shape for auto contour setting.

"Select Pattern Shape" screen

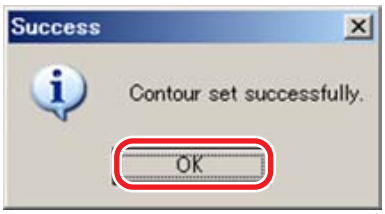


3. Click the [Update] button.
   Clicking the [Update] button executes auto contour setting.
   To stop the auto contour setting, click the [Cancel] button.

   Clicking the [Update] button also changes the search settings "START angle" and "END angle" parameters.

4. A message appears indicating the setting is completed.
   When the auto contour setting is completed, the message "Contour set successfully" appears.
   Click the [OK] button.

Auto contour setting is completed

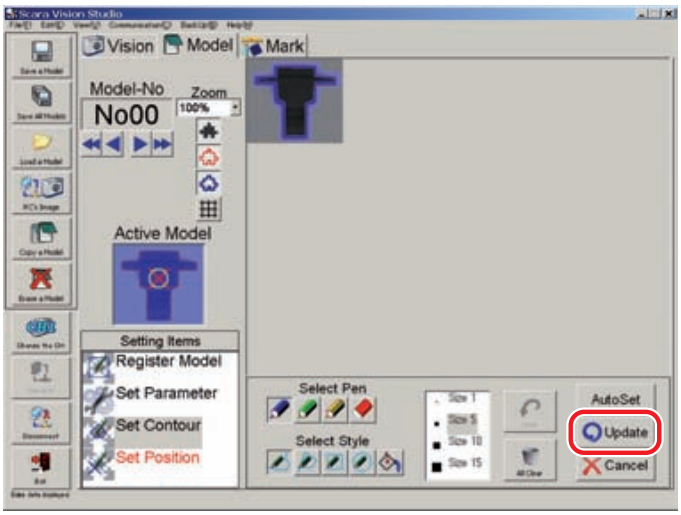


4 *Press the [Update] button.*

Press the [Update] button to register setting changes which have been made.

To abort the setting operation, press the [Cancel] button.

Registering the contour setting



5 *The "Contour set successfully" message displays.*

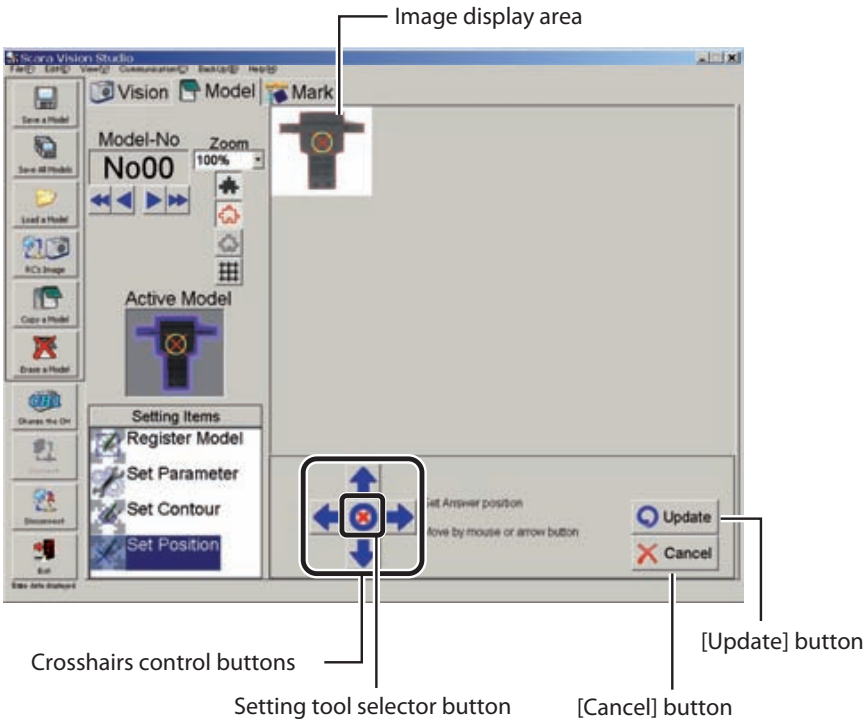
The "Contour set successfully" message displays when a contour setting is completed. Press the [OK] button at this time.

Contour setting completed

7.3.5 Detection position setting

This setting specifies the workpiece position information's reference position which is used in searches. When a search is performed, the robot movement points, etc., are generated based on this information.

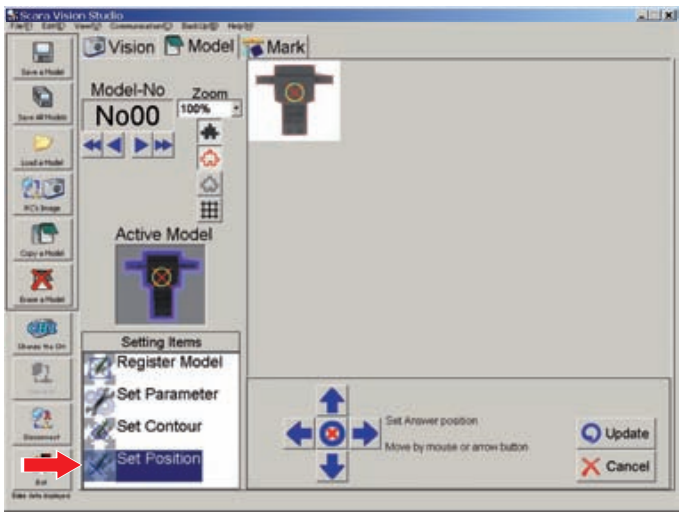
Model registration – Detection position setting screen



The detection position setting procedure is given below.

1 ***Select the Model mode's "Set Position" setting item.***

Select "Set Position"



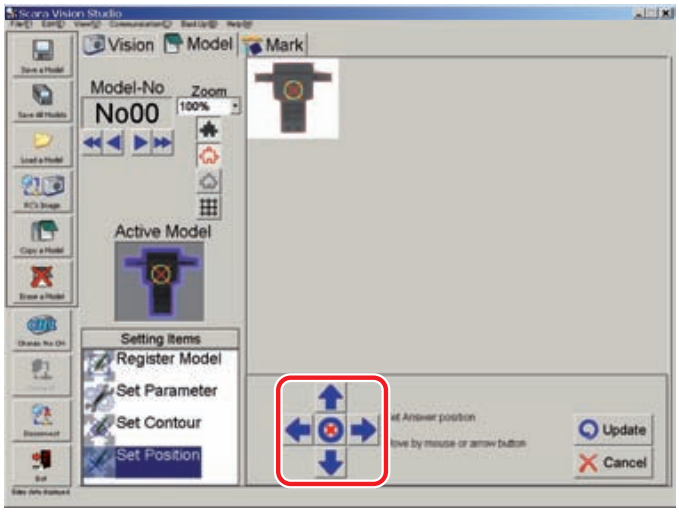
2 ***Set the detection position.***

Use the crosshairs control buttons (arrow buttons) at bottom of screen to move the detection position. The detection position can be specified by a point or rectangle designation. Each time the setting tool selector button at the center of the crosshairs control buttons is pressed, the designation method toggles between the point and rectangle method. The procedures for moving the detection position with each designation method (point/rectangle) are shown below.

NOTE

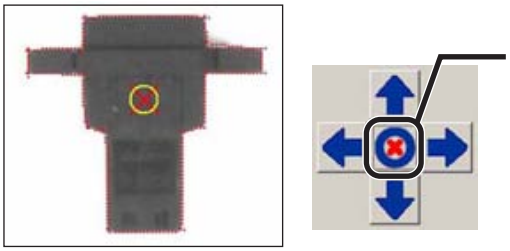
When the search, such as VSEARCH is executed, information on workpiece position is created based on the detection position set in this step.
The position of the point data obtained by VGETPOS, etc. becomes the detection position of this workpiece. Therefore, when the movement to the position of VGETPOS is executed by the movement command, such as MOVE, the top end of the robot will move to the detection position of this workpiece. (The point data of the Z-axis becomes the Z-axis height of the robot when the search operation is executed.)

Setting the detection position



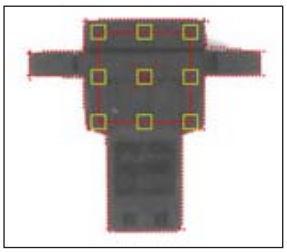
• Point designation method : Use the crosshairs control buttons ( ) at the bottom of the screen to move the detection position. The detection position can also be moved by dragging the ⊠ mark (detection position mark) with the mouse.

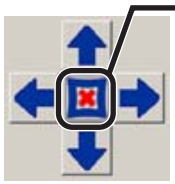
Setting the detection position by point designation



• Rectangle designation method : With the rectangle designation method, the detection position is at the center of the rectangular frame.
The size of the rectangular frame (red) can be changed by dragging the yellow squares at its perimeters.
The rectangular designation frame can be moved by using the crosshairs control buttons ( ) at the bottom of the screen, or by dragging the yellow square at the center of the rectangular frame.

Detection position setting by rectangle designation





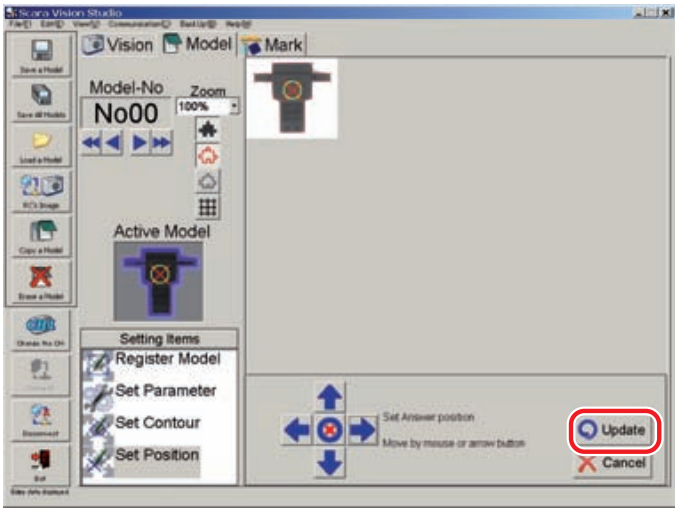
Appearance when the rectangle designation method is selected.

3 ***Press the [Update] button.***

Press the [Update] button to set the detection position.

To abort the setting operation, press the [Cancel] button.

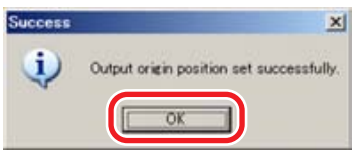
Registering the detection position setting



4 ***The "Output origin position set successfully" message displays.***

The "Output origin position set successfully" message displays when the detection position setting operation is completed. Press the [OK] button at this time.

At completion of detection position setting operation



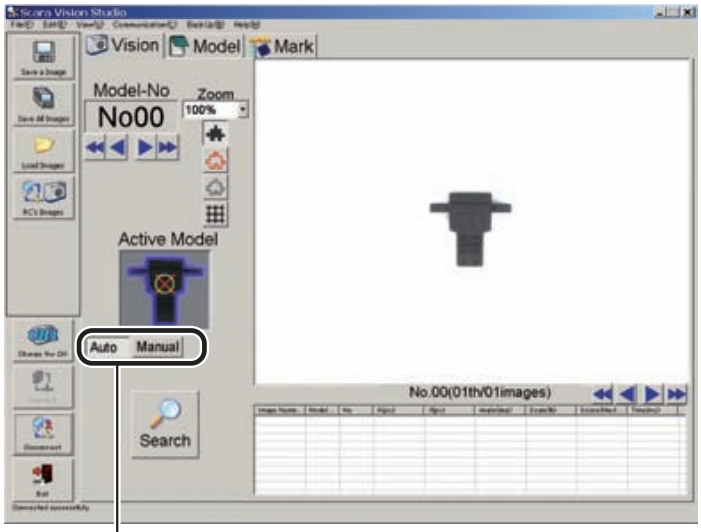
7.4 Search operations

This section explains how to perform searches.

A "search" consists of searching for registered workpiece models in the camera's captured images, and in the images saved to memory.
A search is performed to verify that registered workpiece models can be detected (have been registered successfully). Searches can be performed in the following two ways.

- **[Auto] search**
  A button is pressed to search for a registered workpiece model in the camera's captured images.
- **[Manual] search**
  Searches for a registered workpiece model in either the camera's captured images, or in the images already saved to memory. When using this search method, the number of images to be captured and the number of search-object images must be specified.

Search screen



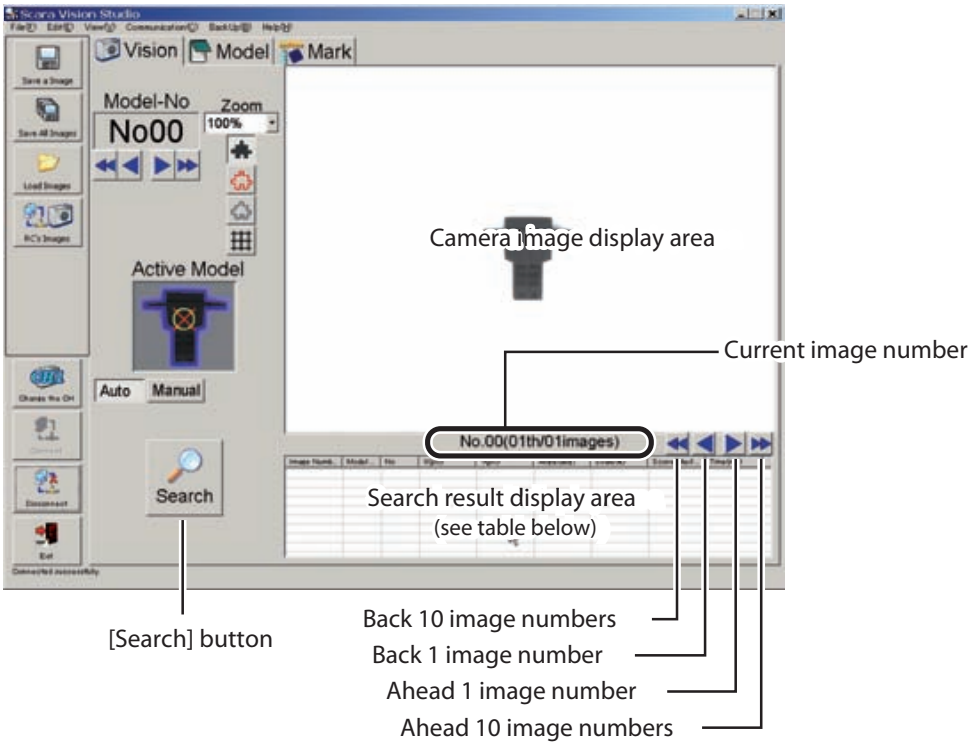
[Auto/Manual] switching buttons
Use these buttons to switch between the Auto and Manual search modes.

When performing the search operation, the vision control mode of the robot controller must be set to the "HOST PC" mode before connecting SCARA Vision Studio to the robot controller.
For details concerning how to set the vision control mode of the robot controller, refer to Chapter 4, section 4.3, "Setting the robot controller's control mode", in SCARA VISION SYSTEM EXPLANATION SECTION.

7.4.1 Auto search

An Auto search can be performed simply by pressing a button.

Vision mode – Auto search screen



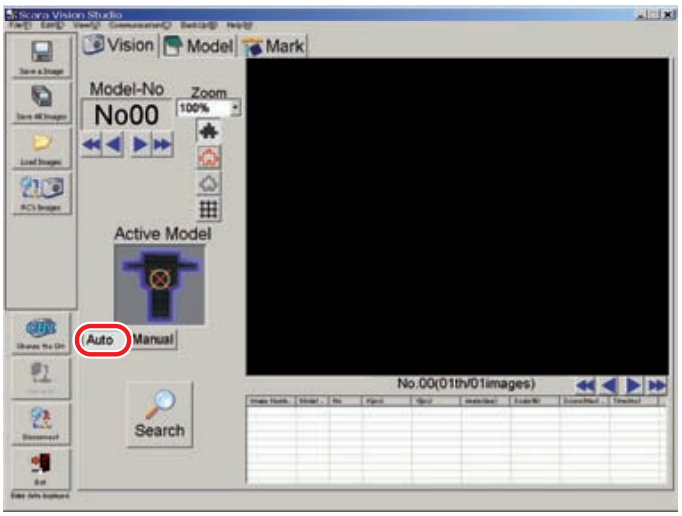
Search result display details

Item	Description
Image Number	Indicates the searched image number.
Model Number	Indicates the searched model.
No.	Indicates the detected workpiece's ranking (in descending score order) within the searched images.
X (pix)	Indicates the detected workpiece's X-position in the camera coordinate system.
Y (pix)	Indicates the detected workpiece's Y-position in the camera coordinate system.
Angle (deg)	Indicates the detected workpiece's angle (within a –180.000° to 179.999° range).
Scale (%)	Indicates the proportional size relative to the specified workpiece model number.
Score (Max100)	Indicates the degree of correlation with the specified workpiece model number.
Time (ms)	Indicates the time required to perform the search.

The Auto search procedure is given below.

1 ***In the Vision mode, select the "Auto" setting.***

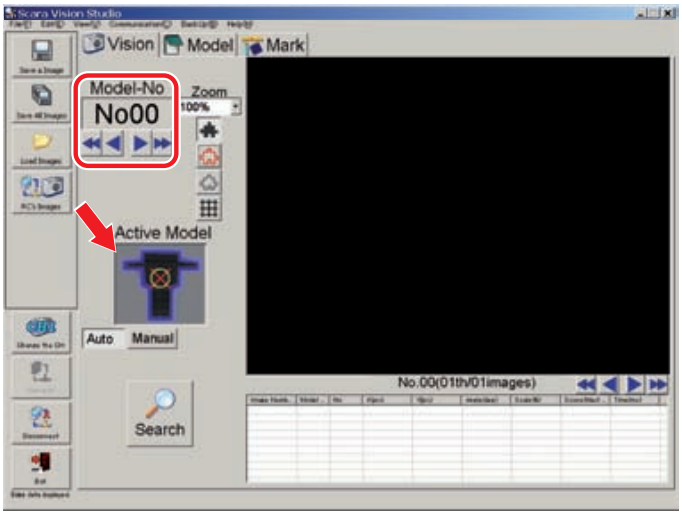
Select "Auto search"



2 ***Select the model number to be searched for.***

An image of the search-object model number's workpiece displays in the "Active Model" area. Verify that the displayed workpiece image corresponds to the model to be searched for. If the search-object model number has not yet been selected, select it. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

Select model number



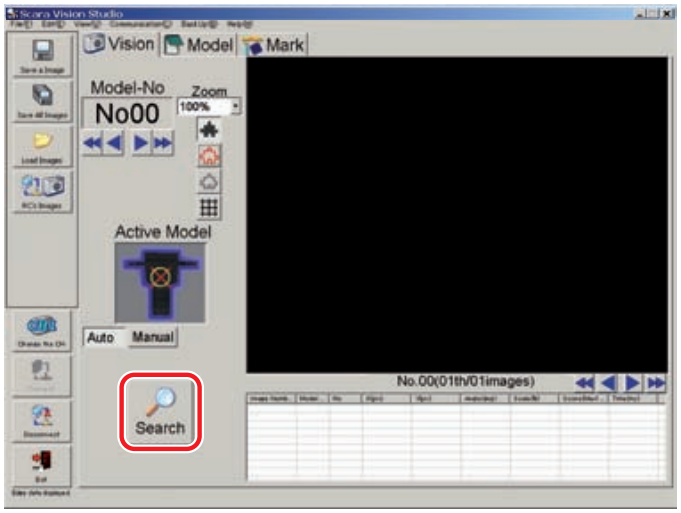
3 ***Place the workpiece within the camera's field of view, then press the [Search] button.***

When the [Search] button is pressed, the image is loaded to the current (active) image number, and the search occurs.

CAUTION

WHEN PERFORMING THE SEARCH OPERATION, DO NOT PLACE THE WORKPIECE AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE WORKPIECE IS PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE WORKPIECE IMAGE MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED.

Performing an auto search

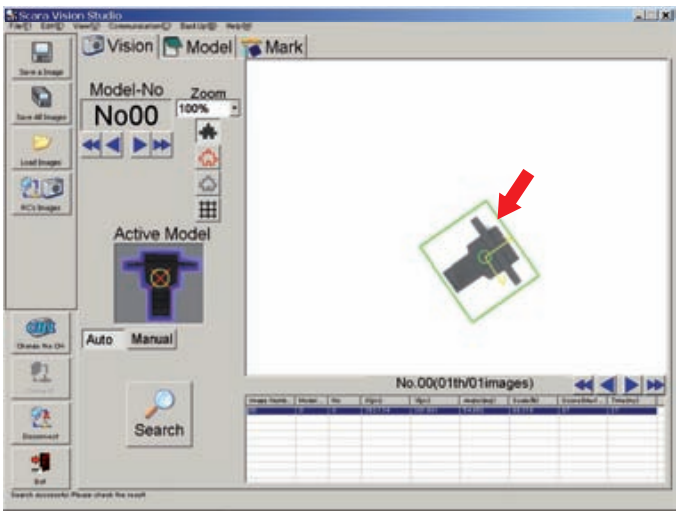


4 ***Check the search results.***

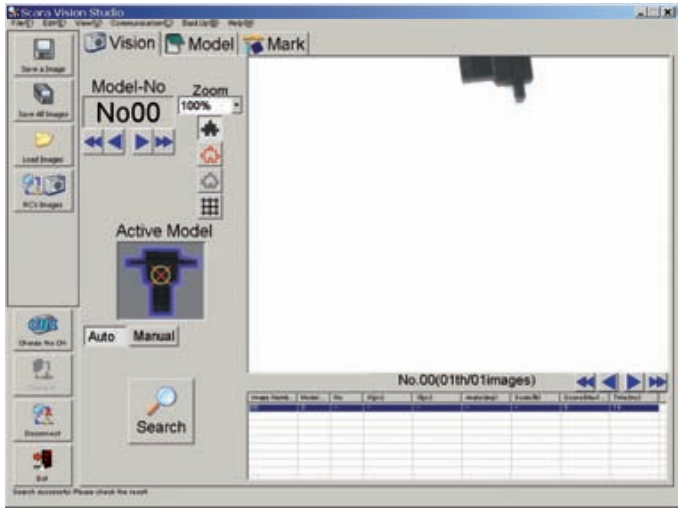
Check the detected results at the search results display area.

The workpiece is enclosed in a green frame if the search was successful. The green frame does not display if the search was unsuccessful.
If the search detected multiple workpieces, click on each line of the search results display area to move the green frame to that workpiece.

Example of successful search detection



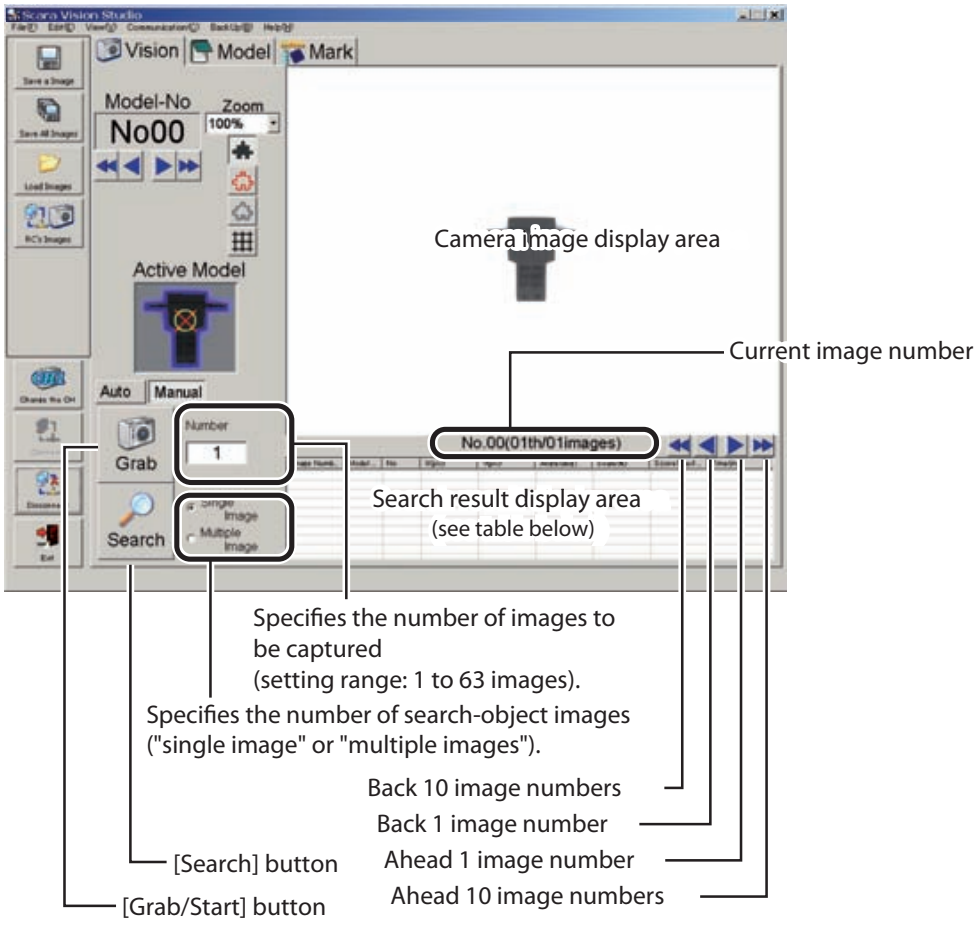
Example of failed search detection



7.4.2 Manual search

When using the Manual search method, the number of images to be captured and the number of search-object images must be specified.

Vision mode – Manual search screen



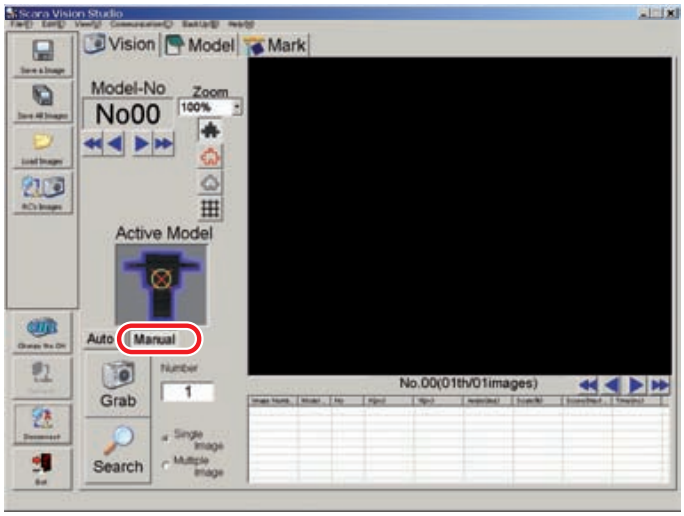
Search result display details

Item	Description
Image Number	Indicates the searched image number.
Model Number	Indicates the searched model.
No.	Indicates the detected workpiece's ranking (in descending score order) within the searched images.
X (pix)	Indicates the detected workpiece's X-position in the camera coordinate system.
Y (pix)	Indicates the detected workpiece's Y-position in the camera coordinate system.
Angle (deg)	Indicates the detected workpiece's angle (within a –180.000° to 179.999° range).
Scale (%)	Indicates the proportional size relative to the specified workpiece model number.
Score (Max100)	Indicates the degree of correlation with the specified workpiece model number.
Time (ms)	Indicates the time required to perform the search.

The Manual search procedure is given below.

1 ***In the Vision mode, select the "Manual" setting.***

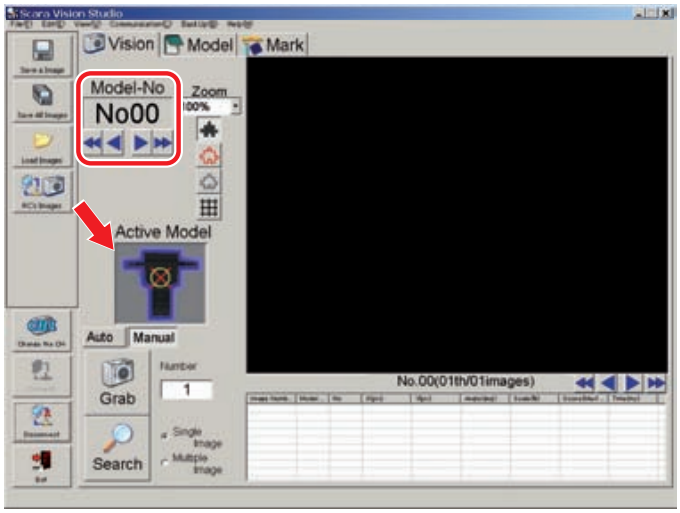
Select "Manual search"



2 ***Select the model number to be searched for.***

An image of the search-object model number's workpiece displays in the "Active Model" area. Verify that the displayed workpiece image corresponds to the model to be searched for. If the search-object model number has not yet been selected, select it. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

Select model number



3 ***Capturing the image.***

Any of the following image capturing methods can be used.

■ Capturing images with the camera

1. Specify the number of images (1 to 63) to be captured, then press the [Grab] button.
2. Place the workpiece in the camera's field of view.
3. Press the [Start] button.

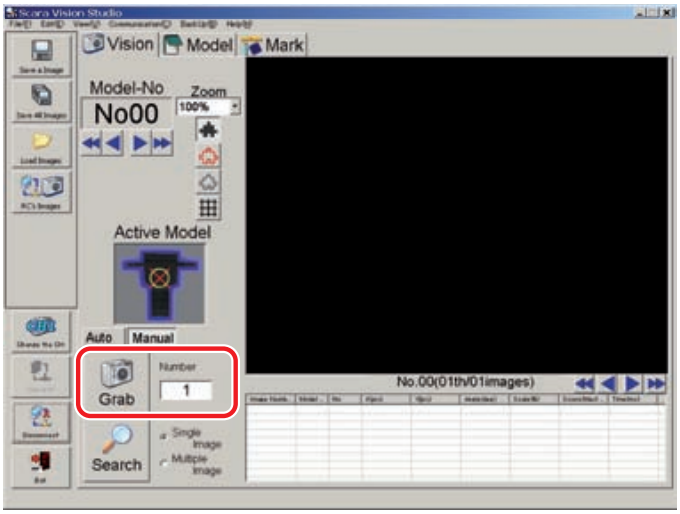
   To abort a workpiece image capture operation, press the keyboard's [ESC] key before the [Start] button has been pressed.
4. The specified number of images is captured sequentially in a continuous manner. The capture timing varies according to the camera settings. Previously loaded images are deleted when a new image capture operation occurs, and the new images are assigned sequential numbers, beginning from image number 00.

   If an image capture standby continues for some reason when the camera setting's trigger mode is set to "H/W trigger", the keyboard's [ESC] key can be pressed for 1 second or longer to abort the capture operation.

CAUTION

WHEN CAPTURING IMAGES WITH THE CAMERA, DO NOT PLACE THE WORKPIECE AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE WORKPIECE IS PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE WORKPIECE IMAGE MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED.

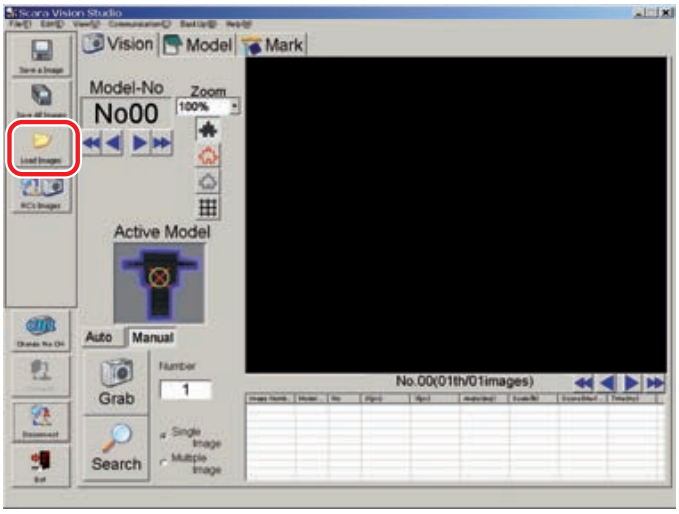
Capturing images with the camera



■ Loading image data from the personal computer

Press the [Load Images] button at the left-side toolbar, then specify the images to be loaded. When loading a single image, the current (active) image number is loaded. When loading multiple images, previously loaded images are deleted, and the new images are loaded sequentially, beginning from image number 00. For details regarding the image loading procedure, refer to Chapter 7, section 7.1.4.4 Loading images".

Loading image data from the personal computer

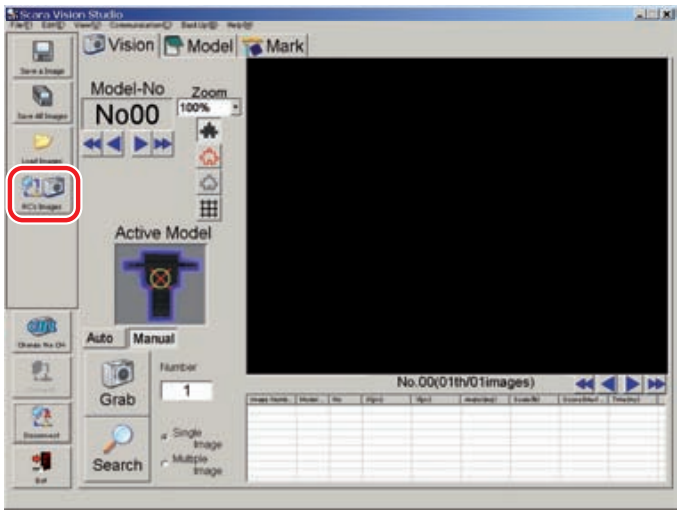


■ Loading images from the robot controller

Press the left-side toolbar's [RC's Images] button, then select the image to be loaded. When loading a single image, the current (active) image number is loaded. When loading multiple images, previously loaded images are deleted, and the new images are loaded sequentially, beginning from image number 00.

For details regarding this image loading procedure, refer to Chapter 7, section 7.1.4.5 "RC image operations – loading images".

Loading image data from the robot controller



4 ***Specify the number of search-object images, then press the [Search] button.***

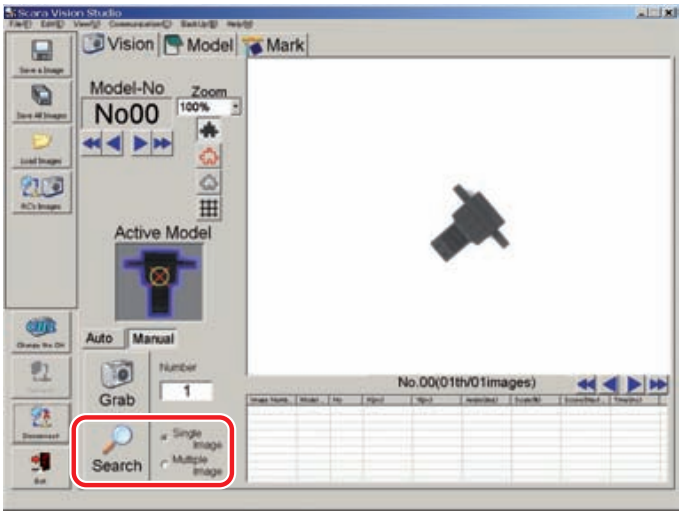
Setting	Description
Single image	Searches for the current (active) image number.
Multiple image	Searches all the captured images.

When the [Search] button is pressed, the search occurs in accordance with the "Single Image" or "Multiple Image" setting.

NOTE

When performing a "Single Image" search, be sure to specify the search-object image number before pressing the [Search] button.

Executing a search

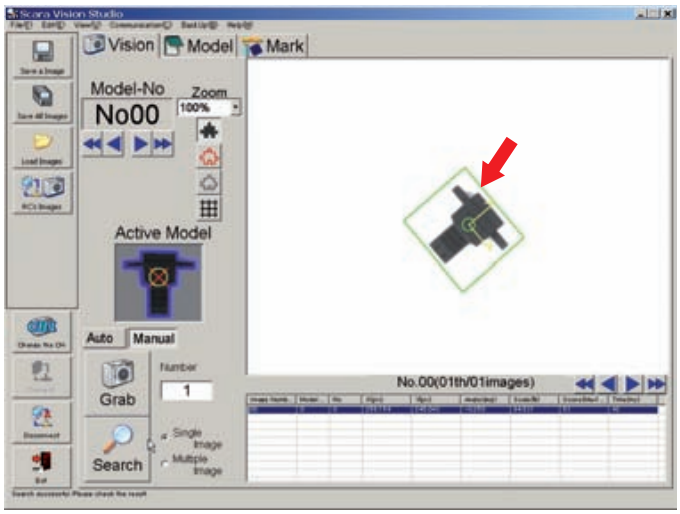


5 ***Check the search results.***

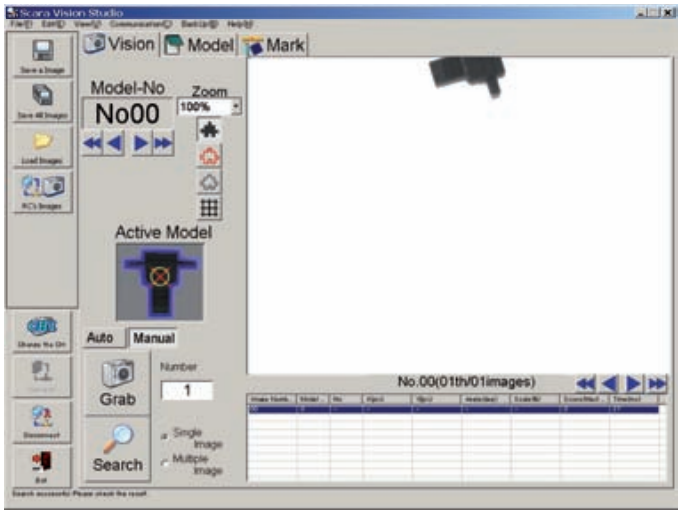
Check the detected results at the search results display area.

The workpiece is enclosed in a green frame if the search was successful. The green frame does not display if the search was unsuccessful.
If multiple images are detected in a "Single Image" search, click on each line of the search results display area to move the green frame to that workpiece.
The same applies to "Multiple Image" search results. Here too, click on each line of the search results display area to move the green frame to that workpiece. The arrow buttons to the right of the image number can also be used to switch the image number, with the green frame then moving accordingly to that workpiece, permitting scrolling through the search result display.

Example of successful search detection



Example of failed search detection



7.5 Registering fiducial marks

Fiducial marks are required in order to perform calibration operations.

When the camera height is changed, this causes deviations in the coordinates (camera coordinates) of the image to be captured, and in the robot coordinates. Therefore, calibration settings are required for each camera height.

The SCARA Vision System allows up to four calibration data to be saved for each camera channel. Calibration settings are specified from the programming box, based on the fiducial marks which have been registered at SCARA Vision Studio. For details, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 6 "Calibration settings".
Two fiducial marks are required for each calibration setting.

MEMO

A "calibration" refers to the process in which the coordinates (camera coordinates) of the image captured by the camera are aligned with the robot coordinates.

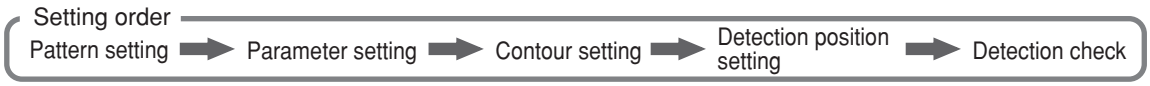
NOTE

- No more than two fiducial marks (mark numbers 00, 01) can be registered, regardless of the camera channel. Therefore, fiducial mark registration is required at each calibration setting operation.
- After registering fiducial marks, be sure to save that fiducial mark data to the personal computer.
- The two fiducial marks to be registered must have different shapes.

The fiducial mark registration procedure is given below.
A fiducial mark registration operation consists of capturing the fiducial mark image with the camera, and then registering that image. The following five settings are required in order to register fiducial marks.

- **Pattern setting**
  A mark image is captured, and the range of the image to be registered is specified.
- **Parameter setting**
  The edge extraction and search parameter settings are specified.
- **Contour setting**
  The fiducial mark contour is specified.
- **Detection position setting**
  Specifies the reference position for the workpiece position information used at searches.
- **Detection check**
  Verifies that registered marks can be detected successfully.

The settings required for fiducial mark registration must be performed in the following order.

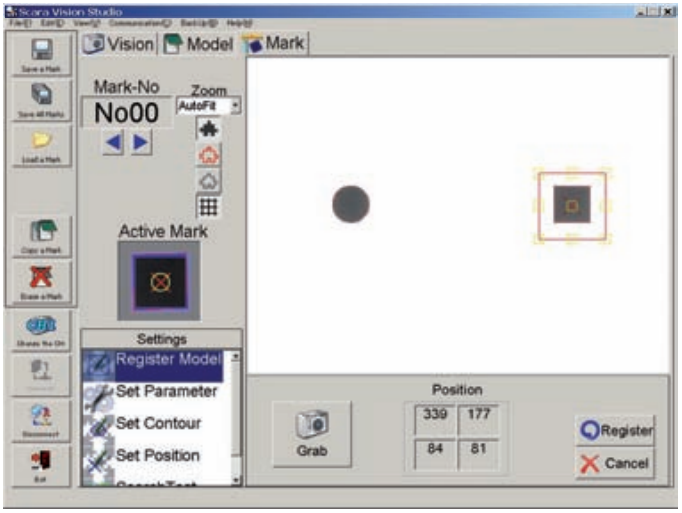


NOTE

The above settings must be specified again if specified in the wrong order. Be sure to specify the settings in the order shown above.

When registering fiducial marks, the vision control mode of the robot controller must be set to the "HOST PC" mode before connecting SCARA Vision Studio to the robot controller.
For details concerning how to set the vision control mode of the robot controller to the "HOST PC" mode, refer to Chapter 4, section 4.3, "Setting the robot controller's control mode", in SCARA VISION SYSTEM EXPLANATION SECTION.

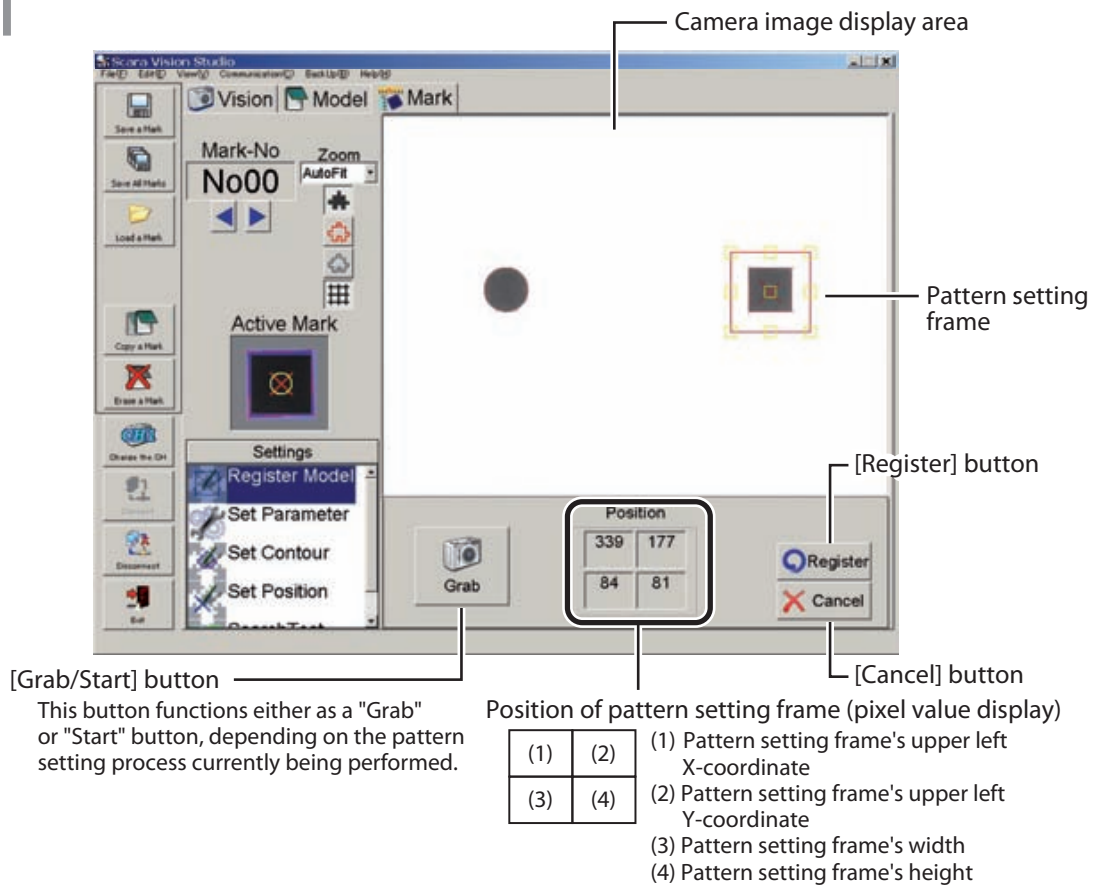
Fiducial mark registration screen



7.5.1 Pattern setting

The fiducial mark's pattern setting operation consists of capturing the fiducial mark image, specifying the image range to be registered in that image, and then registering that data at the robot controller.

Fiducial mark pattern setting screen



The fiducial mark pattern setting procedure is given below.

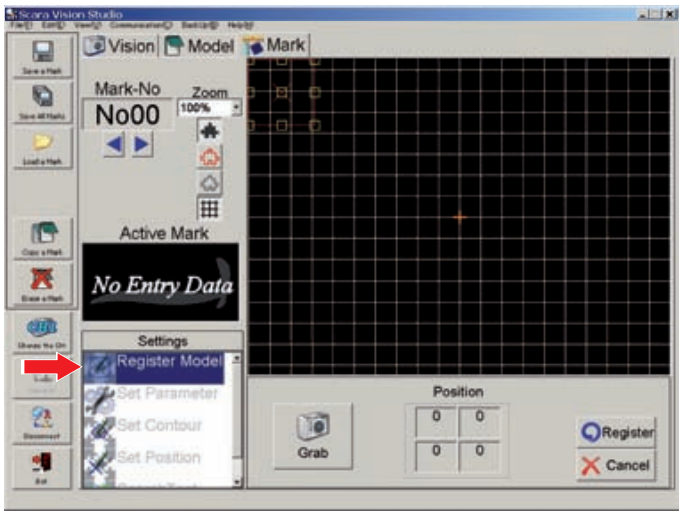
NOTE

Check the following items before beginning the pattern setting procedure.

- Verify that the mark number to be registered is selected. If it is not selected, select it. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number.
- Verify that the grid display is on at the camera image display area. For this procedure, refer to Chapter 7, section 7.1.2.4 "Switching the display".

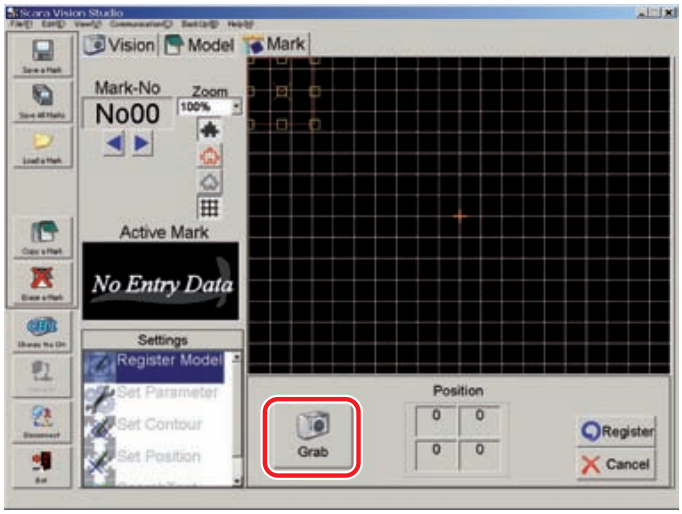
1 ***In the Mark mode, select the "Register Model" setting item.***

Select "Register Model"



2 ***Press the [Grab] button.***

[Grab] button



3 ***Place the registration-object mark directly beneath the camera, then press the [Start] button.***

With the registration-object mark placed directly beneath the camera, adjust the mark position (while observing the camera image display) so that the mark is perpendicular to the screen. Perform this mark position adjustment by aligning the mark's angle with the screen's grid lines.

To abort the mark image capture operation, press the keyboard's [ESC] key before the [Start] button is pressed.

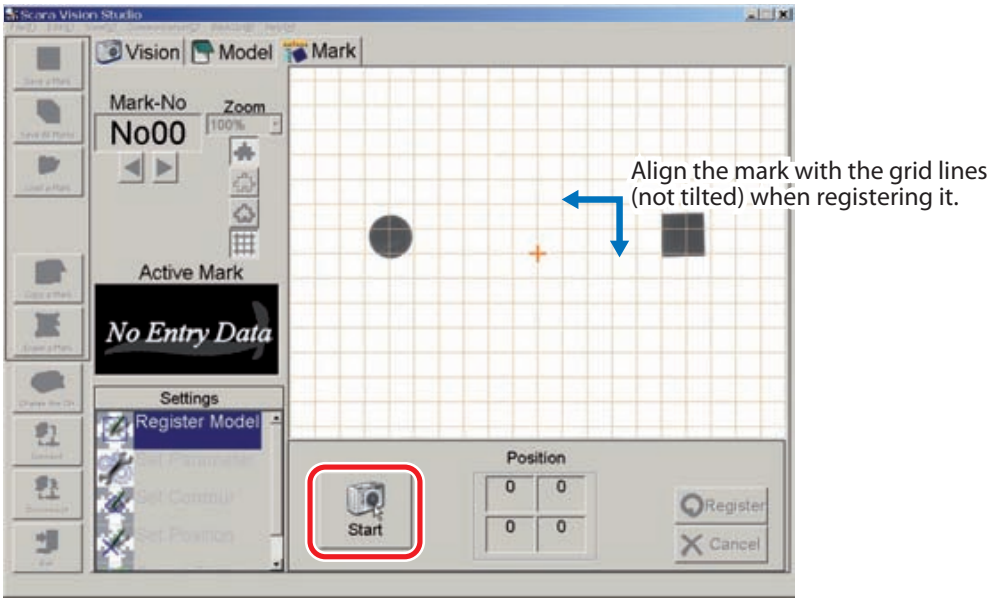
CAUTION

WHEN REGISTERING THE FIDUCIAL MARK, DO NOT PLACE THE MARK AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE MARK IS PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE REGISTRATION-OBJECT MARK IMAGE MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED. WHEN REGISTERING THE FIDUCIAL MARK, PLACE THE REGISTRATION-OBJECT MARK DIRECTLY BENEATH THE CAMERA AND CAPTURE THE MARK IMAGE.

NOTE

Registering a mark with its angle aligned with the grid lines enables the camera and robot coordinate angles to be aligned at calibration operations.

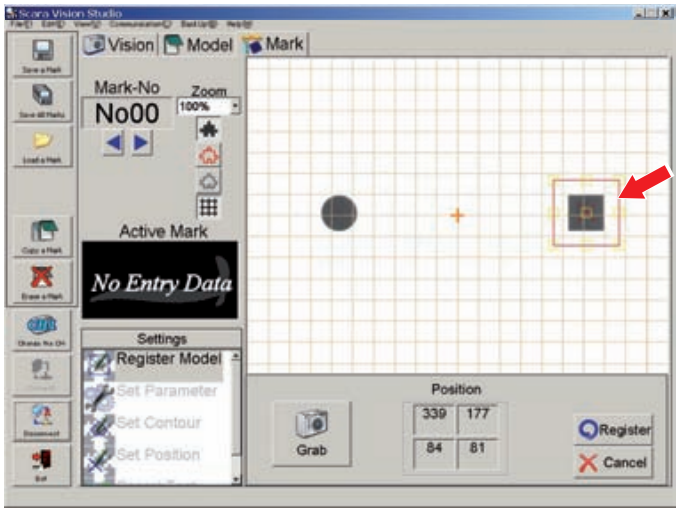
Capturing a fiducial mark image



4 ***Align the pattern setting frame with the mark to be registered.***

To change the size of the pattern setting frame (red frame), use the mouse to drag the yellow boxes which appear on the frame lines.

Aligning the pattern setting frame

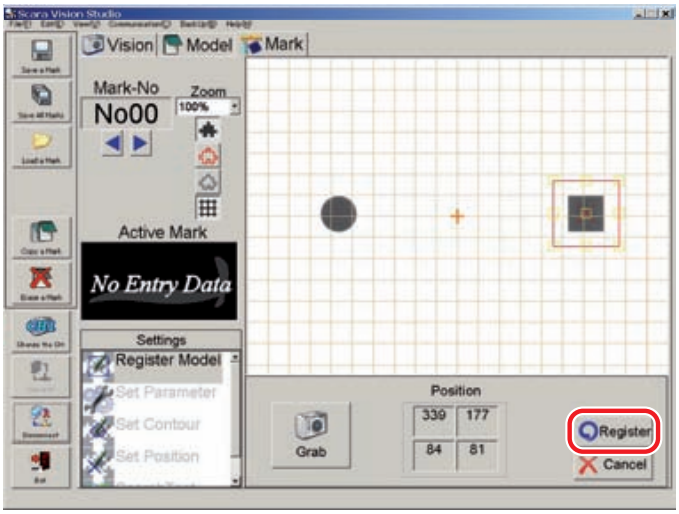


5 ***Press the [Register] button.***

The data is transmitted to the robot controller when the [Register] button is pressed.

To abort the registration operation, press the [Cancel] button.

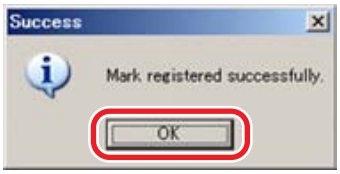
Registering a pattern



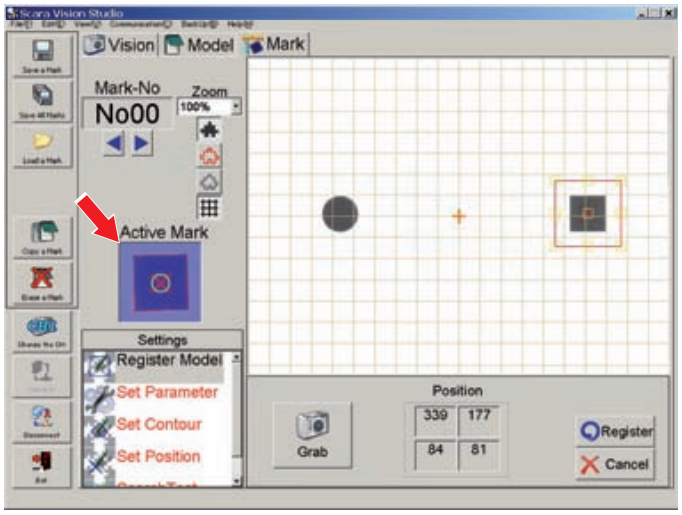
6 ***The "Mark registered successfully" message displays.***

The "Mark registered successfully" message displays when a pattern registration is completed. Press the [OK] button at this time.
Registration is completed when the "Active Model" workpiece image displays in the workpiece view area.

Pattern registration completed (1)



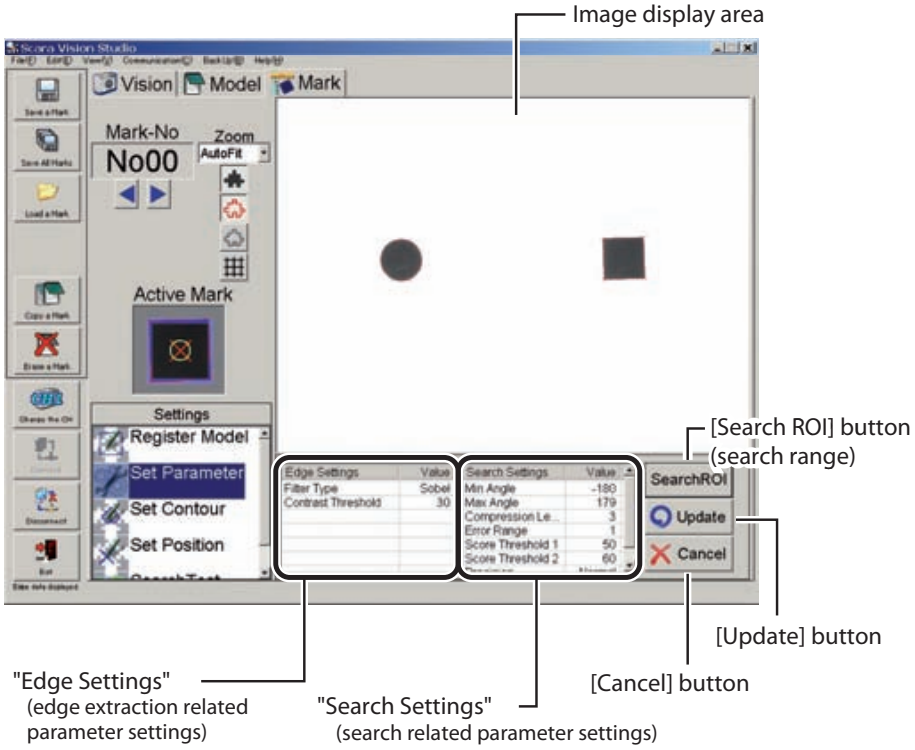
Pattern registration completed (2)



7.5.2 Parameter settings

The fiducial mark parameter setting comprises the edge extraction and search parameter settings. The degree of edge extraction changes in accordance with changes made in the edge settings. The search results which are output change in accordance with changes made in the search settings.

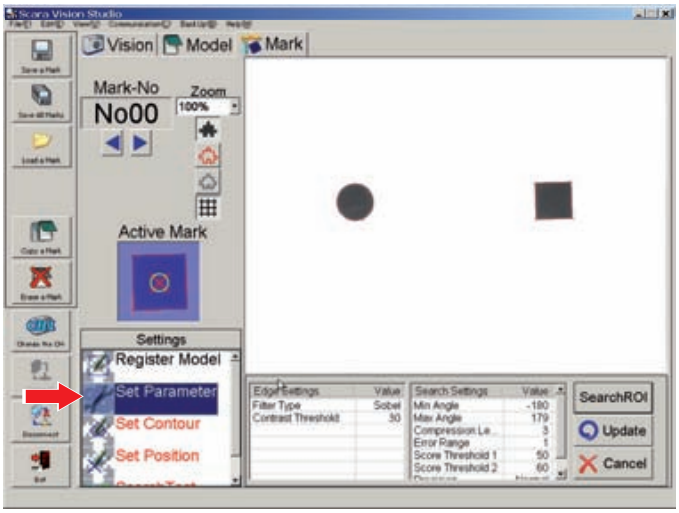
Fiducial mark – Parameter settings screen



The fiducial mark parameter setting procedure is given below.

1 ***In the Mark mode, select the "Set Parameter" setting item.***

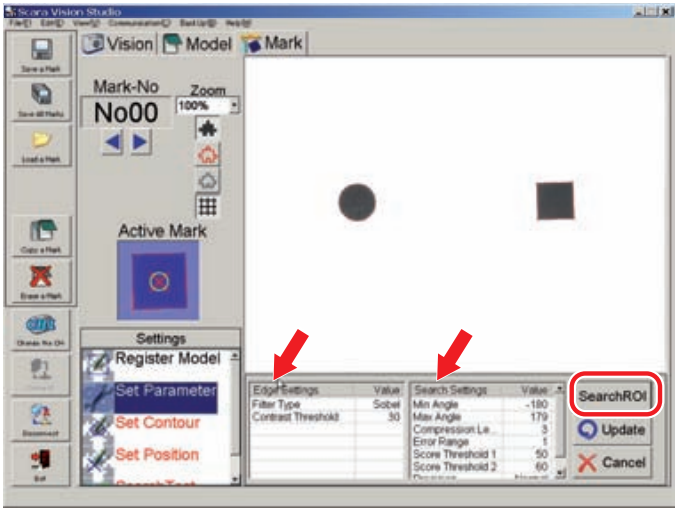
Select "Set Parameter"



2 ***Specify the parameter settings.***

Specify the following three parameter settings.

Setting the parameters



■ Edge Settings

The edge extraction related parameter settings are specified here.

Click on the item for which a setting is to be specified. That item then displays in red, and the Edit mode is established.

Settings for parameters requiring numeric inputs can be specified by entering the numeric values from the keyboard, or by using the slide bar or spin button. Other parameter settings are specified by selections made from pull-down menus.

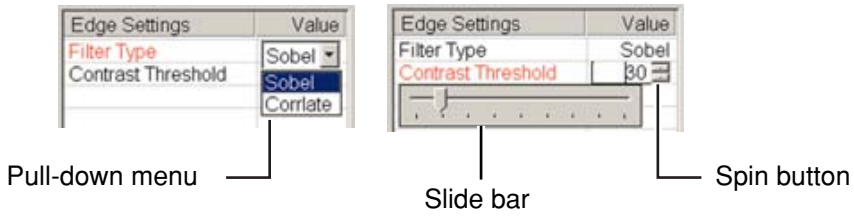
The descriptions of each setting item, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 5, section 5.5.1 "Edge settings".

■ Search Setting

The search related parameter settings are specified here.
Click on the item for which a setting is to be specified. That item then displays in red, and the Edit mode is established.
Settings for parameters requiring numeric inputs can be specified by entering the numeric values from the keyboard, or by using the slide bar or spin button. Other parameter settings are specified by selections made from pull-down menus.

The descriptions of each setting item, refer to the SCARA VISION SYSTEM EXPLANATION SECTION, Chapter 5, section 5.5.2 "Search settings".

Pull-down menu, Slide bar, Spin button



■ Search range settings

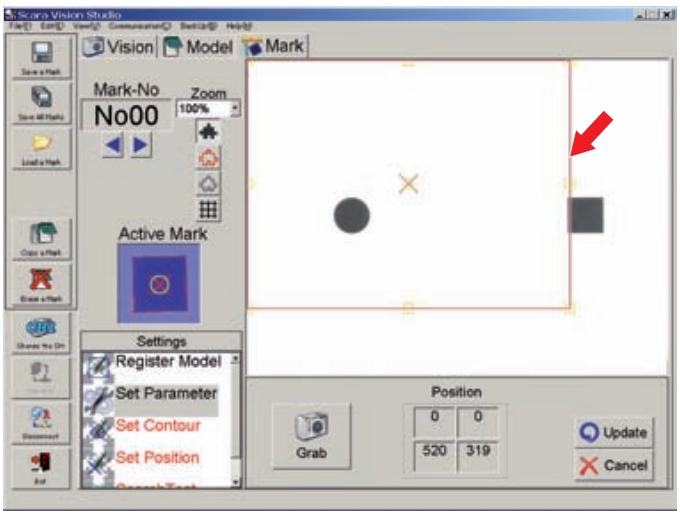
This setting specifies the search range.
A search for the specified fiducial mark occurs within the range specified here. The default search range setting is the camera's full field of view.

1. Press the [Search ROI] button.
2. Specify the desired search range (red frame area).
   To change the size of the range setting frame (red frame), use the mouse to drag the yellow boxes which appear on the frame lines. To move the range setting frame, use the mouse to drag the yellow box which appears in the center.

MEMO

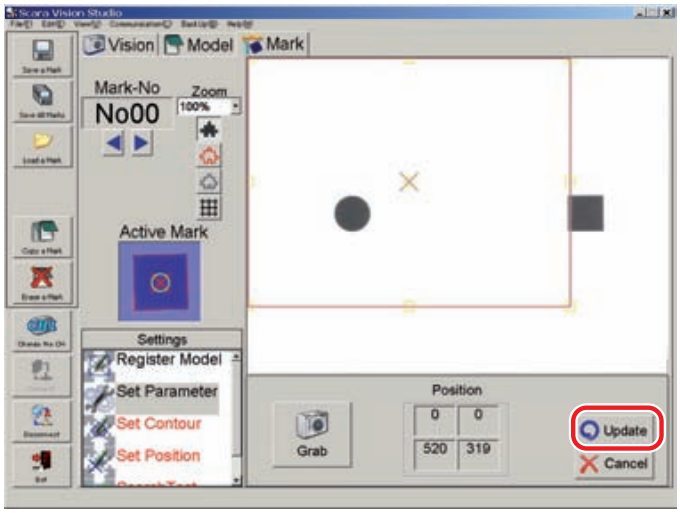
The search range (red frame) setting operation is easier if performed while changing the zoom setting.

Setting the search range (1)



3. Press the [Update] button to register the setting changes which have been made.
   To abort the setting operation, press the [Cancel] button. The original (before change) settings are then reestablished.

Setting the search range (2)



4. The "Area set successfully" message displays
   The "Area set successfully" message displays when a search range setting is completed. Press the [OK] button at this time.

Search range setting completed

3 ***Press the [Update] button.***

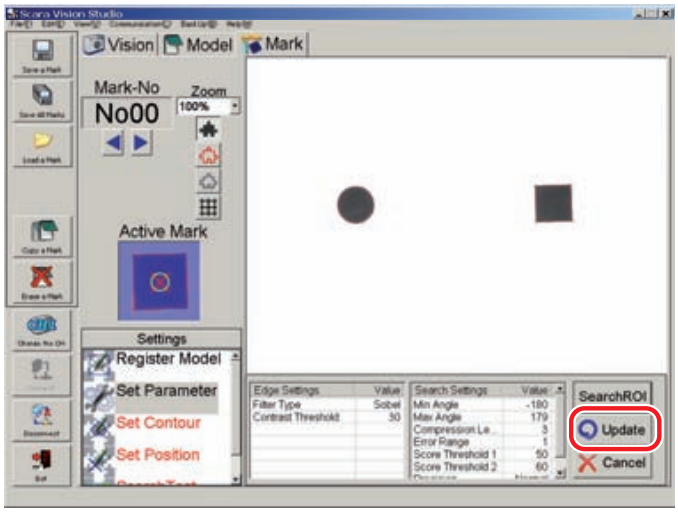
Press the [Update] button to register the setting changes which have been made.

To abort the setting operation, press the [Cancel] button. The original (before change) settings are then reestablished.

NOTE

Once the search range has been changed at Step 2 above, the original settings will not be reestablished even if the [Cancel] button is pressed at the parameter settings screen shown above. To restore the original settings, the search range must be set again.

Registering the parameter settings



4 ***The "Parameters set successfully" message displays.***

The "Parameters set successfully" message displays when the parameter settings are completed. Press the [OK] button at this time.

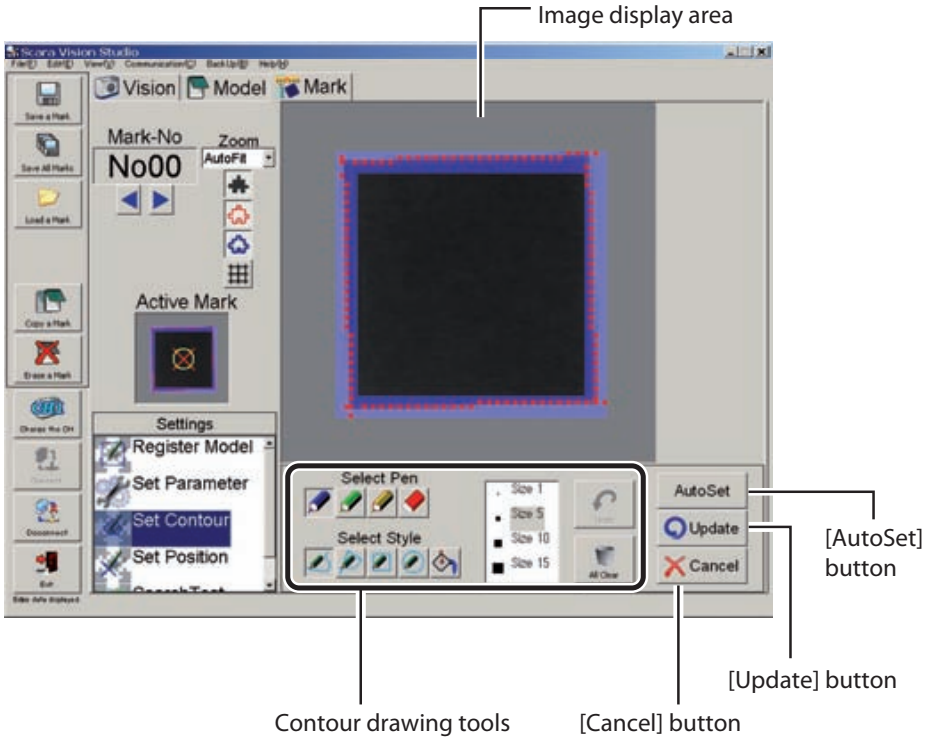
Parameter settings completed

7.5.3 Contour setting

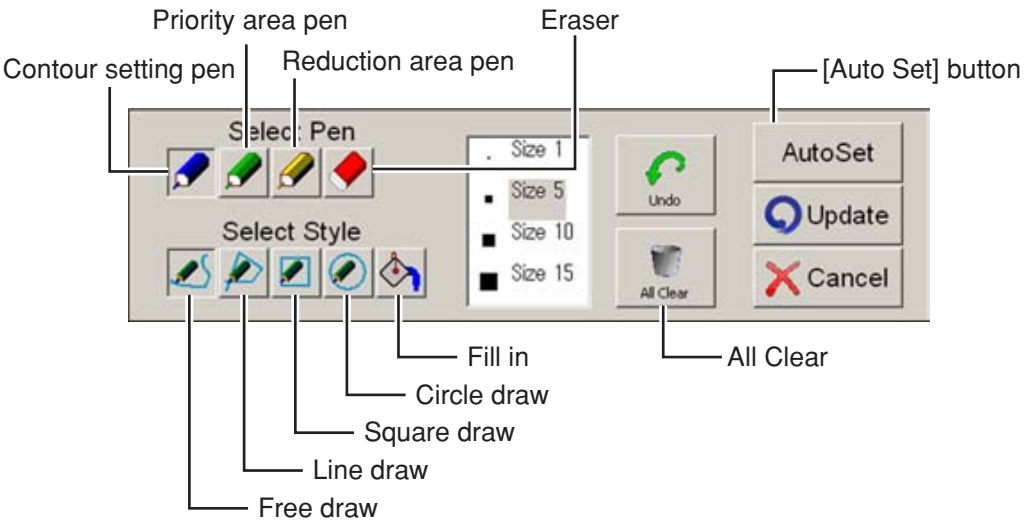
This setting specifies the fiducial mark contour which is used in searches. Automatically detected edges appear in red. Search operations use the edge (red area) located within the contour specified by this contour setting.

The default contour setting specifies the use of all edges.

Model registration – Contour setting screen



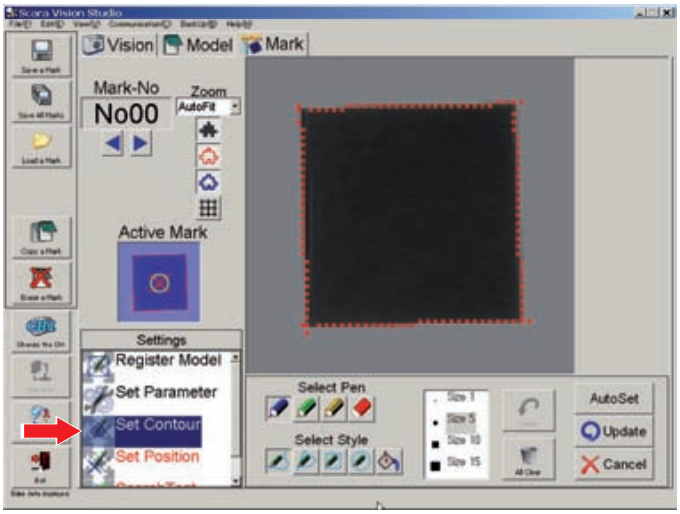
Contour drawing tools



The fiducial mark contour setting procedure is given below.

1 ***In the Mark mode, select the "Set Contour" setting item.***

Select "Set Contour"



2 ***Verify that the "Background", "Edge", and "Contour" displays are on (buttons are pressed).***

Press the "Background", "Edge", and "Contour" buttons to display the image, extracted edge, and the contour to be specified. For this procedure, refer to Chapter 7, section 7.1.2.4 "Switching the display".

3 ***Use the "contour draw" tools to select a contour.***

Instructions for using the draw tools are given below.

■ Select Pen

- Contour setting pen : Paints (in blue) the area to be used from among the automatically detected edges.
- Priority area pen : Paints (in green) the area to be used from among the automatically detected edges. The areas painted in green are used as priority areas at search operations. In other words, these areas are viewed as important edge areas during search. In cases where multiple similar-shaped workpieces exist, use this pen to accurately identify the separate models.
- Reduction area pen : Paints (in yellow) the area to be used from among the automatically detected edges. The areas painted in yellow are used as unnecessary areas during search. In other words, no edges should be found in these areas. Use this pen when not searching for workpiece models having scratches or when reducing the score.
(The score reduction can be adjusted by the "reduction weight" parameter.)

NOTE

- If the areas drawn by the contour setting pen, priority area pen and reduction area pen overlap, then the area last drawn has priority.

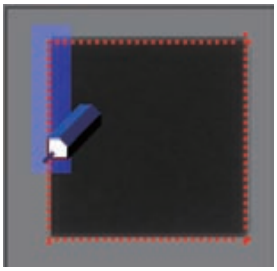
• Eraser : Erases the color painted by the pen. (Automatically detected edges are not erased.)

■ Select Style

Selects the styles (shapes) which are drawn by the pen (contour setting pen, priority area pen and reduction area pen), and which are erased by the eraser.

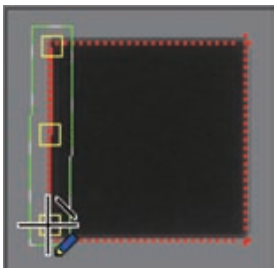
• Free draw : Use to draw free shapes with the pen of the selected size. Draw by dragging the mouse. The eraser can be used in the same manner.

Free draw



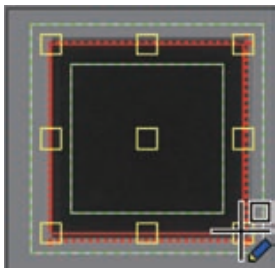
• Line draw : Use to draw a straight line between start and end points. Draw by dragging the mouse. The eraser can be used in the same manner.
The red line indicates the straight line's drawing destination, and the green box indicates the straight line thickness. The yellow boxes at both ends of the straight line can be used to change the direction or length of the straight line. The box at the center can be used to move the straight line.
To register the straight line, click at any point away from the line, or press the keyboard's [Enter] key.
To cancel a drawn straight line (before it is registered), press the keyboard's [ESC] key.

Line drawing



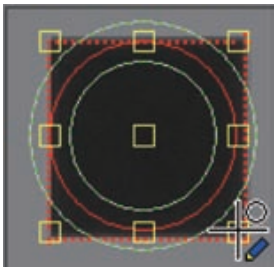
• Square draw : Use to draw a square by dragging the mouse diagonally away from the start point. The eraser can be used in the same manner.
The red line indicates the square's drawing destination, and the green box indicates the square line thickness. The outer perimeter yellow boxes can be used to change the size of the square, and the center box can be used to move the square.
To register the square, click at any point away from the square, or press the keyboard's [Enter] key.
To cancel a drawn square (before it is registered), press the keyboard's [ESC] key.

Square draw



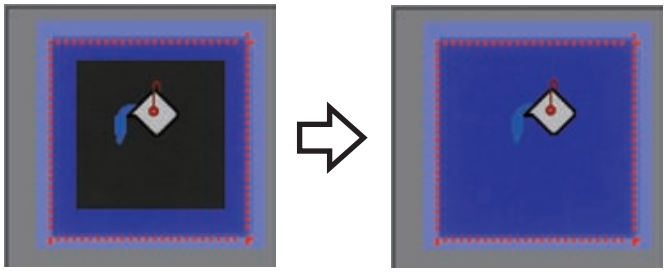
• Circle draw : Use to draw a circle by dragging the mouse diagonally away from the start point. The eraser can be used in the same manner.
The red line indicates the circle's drawing destination, and the green box indicates the circle line thickness. The outer perimeter yellow boxes can be used to change the size of the circle, and the center box can be used to move the circle.
To register the circle, click at any point away from the circle, or press the keyboard's [Enter] key.
To cancel a drawn circle (before it is registered), press the keyboard's [ESC] key.

Circle draw



• Fill in : Use to fill in (paint) an enclosed area by clicking inside that area. Erasing occurs in the same manner when the eraser is selected.

Fill in



■ Size selection

Specifies the pen's line thickness and the eraser size.

■ Undo

Restores the status which existed prior to the operation which was just performed. The most recent operations (up to 5 operations) can be undone.

■ All Clear

Clears (deletes) all drawn objects.

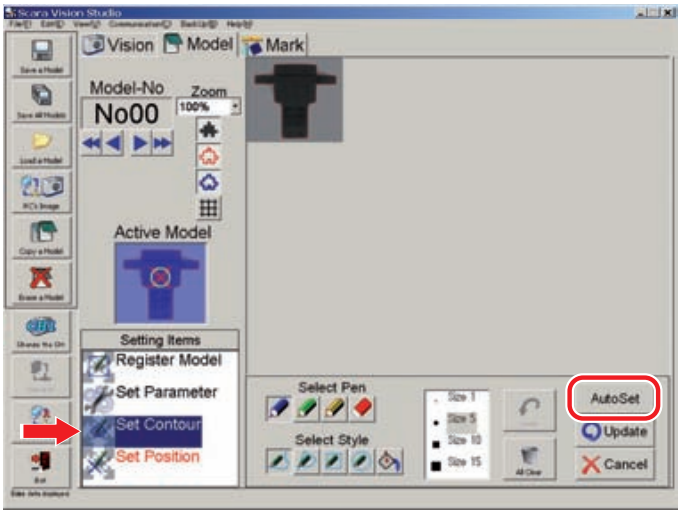
■ Auto contour setting

If the workpiece contour has a shape that is defined to some extent, it can easily be drawn by the auto contour setting.
(This function works well when the contour shape resembles a circle, square or cross.)

To use the auto contour setting, proceed as follows:

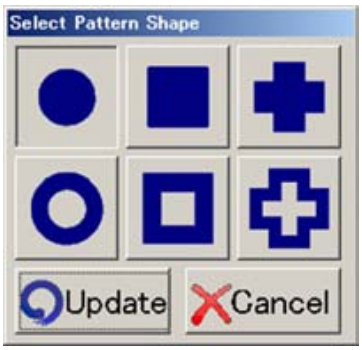
1. Click the [Auto Set] button.

Select "Set Contour"



2. The "Select Pattern Shape" screen appears. Select the button that is closest to the shape for auto contour setting.

"Select Pattern Shape" screen



3. Click the [Update] button.
   Clicking the [Update] button executes auto contour setting.
   To stop the auto contour setting, click the [Cancel] button.

   Clicking the [Update] button also changes the search settings "START angle" and "END angle" parameters.

4. A message appears indicating the setting is completed.
   When the auto contour setting is completed, the message "Contour set successfully" appears.
   Click the [OK] button.

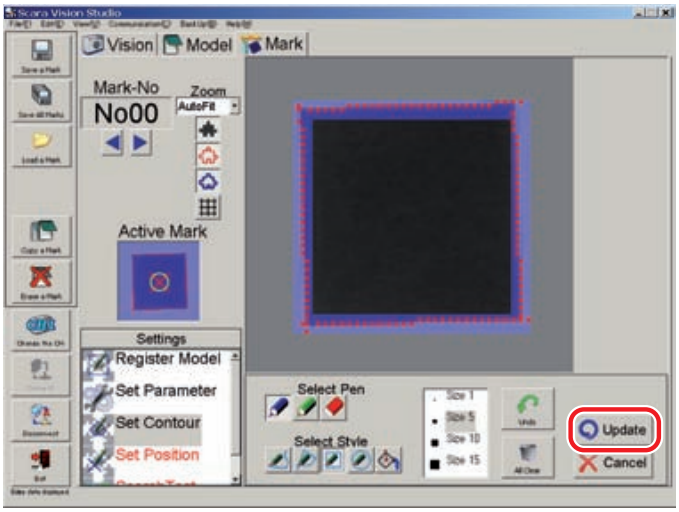
Auto contour setting is completed

4 *Press the [Update] button.*

Press the [Update] button to register setting changes which have been made.

To abort the setting operation, press the [Cancel] button.

Registering the contour setting



5 *The "Contour set successfully" message displays.*

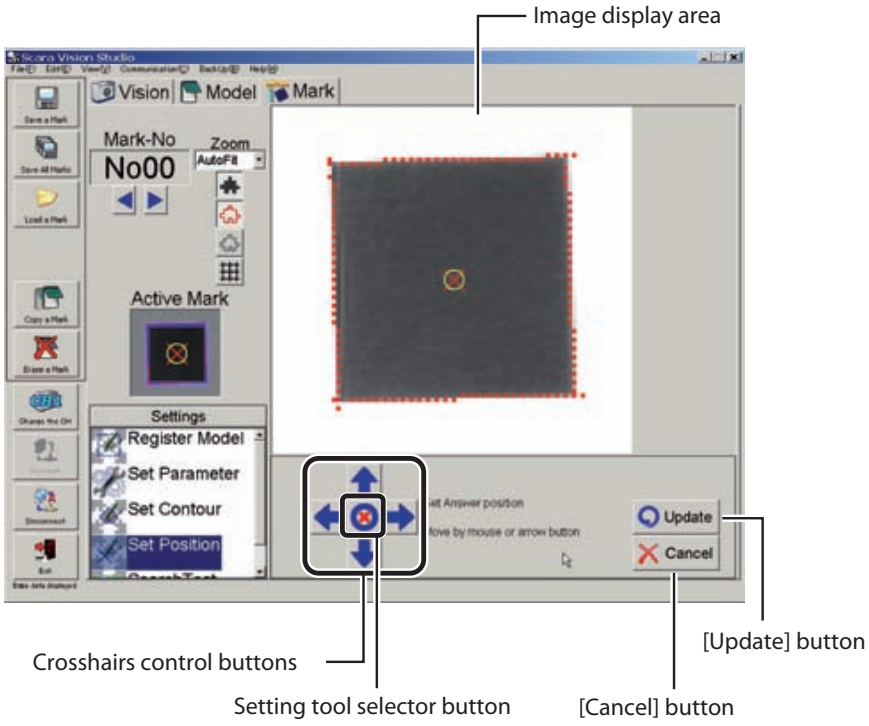
The "Contour set successfully" message displays when a contour setting is completed. Press the [OK] button at this time.

Contour setting completed

7.5.4 Detection position setting

This setting specifies the reference position for the fiducial mark position information used at searches. The position registered here is recognized as the fiducial mark center point.

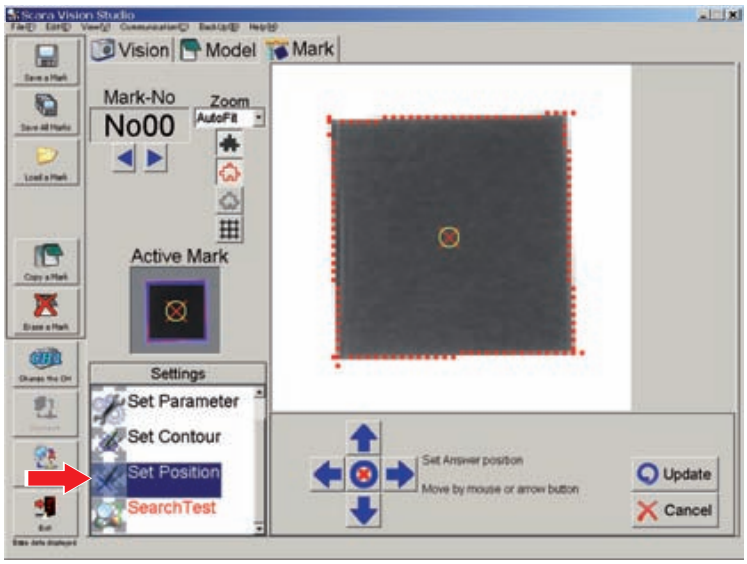
Fiducial mark –Set Position screen



The fiducial mark detection position setting procedure is given below.

1 ***Select the Mark mode's "Set Position" setting item.***

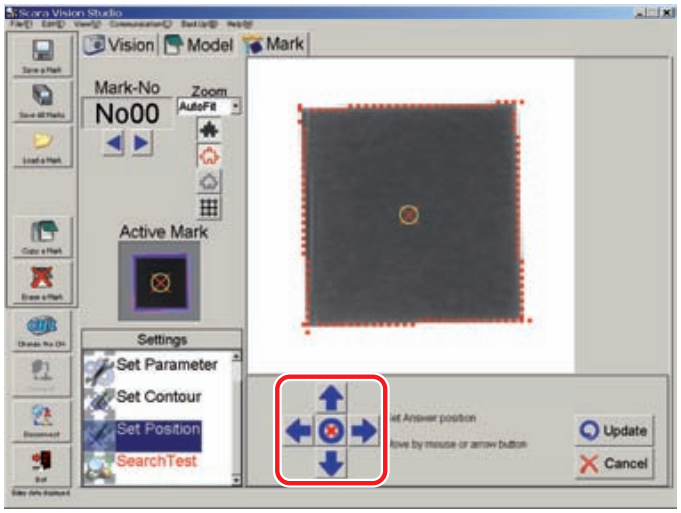
Select "Set Position"



2 ***Set the detection position.***

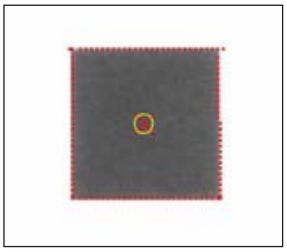
Use the crosshairs control buttons (arrow buttons) at bottom of screen to move the detection position. The detection position can be specified by a point or rectangle designation. Each time the setting tool selector button at the center of the crosshairs control buttons is pressed, the designation method toggles between the point and rectangle method. The procedures for moving the detection position with each designation method (point/rectangle) are shown below.

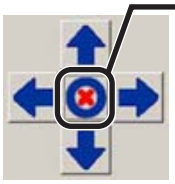
Setting the detection position



• Point designation method : Use the crosshairs control buttons ( ) at the bottom of the screen to move the detection position. The detection position can also be moved by dragging the ⊠ mark (detection position mark) with the mouse.

Setting the detection position by point designation

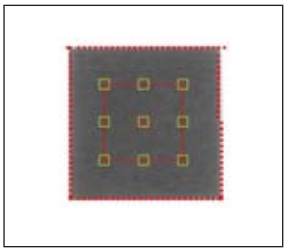


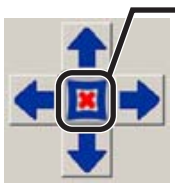


Appearance when the point designation method is selected.

• Rectangle designation method : With the rectangle designation method, the detection position is at the center of the rectangular frame.
The size of the rectangular frame (red) can be changed by dragging the yellow squares at its perimeters.
The rectangular designation frame can be moved by using the crosshairs control buttons ( ) at the bottom of the screen, or by dragging the yellow square at the center of the rectangular frame.

Detection position setting by rectangle designation





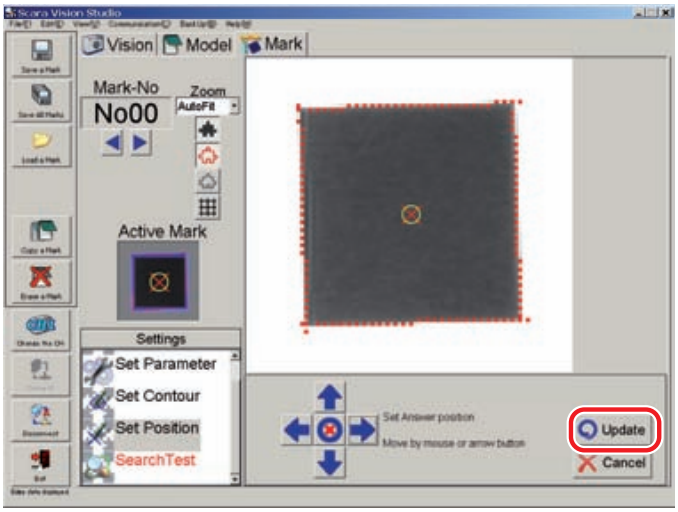
Appearance when the rectangle designation method is selected.

3 ***Press the [Update] button.***

Press the [Update] button to set the detection position.

To abort the setting operation, press the [Cancel] button.

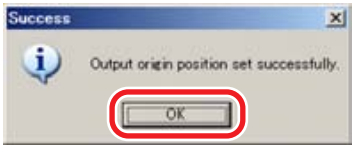
Registering the detection position setting



4 ***The "Output origin position set successfully" message displays.***

The "Output origin position set successfully" message displays when the detection position setting operation is completed. Press the [OK] button at this time.

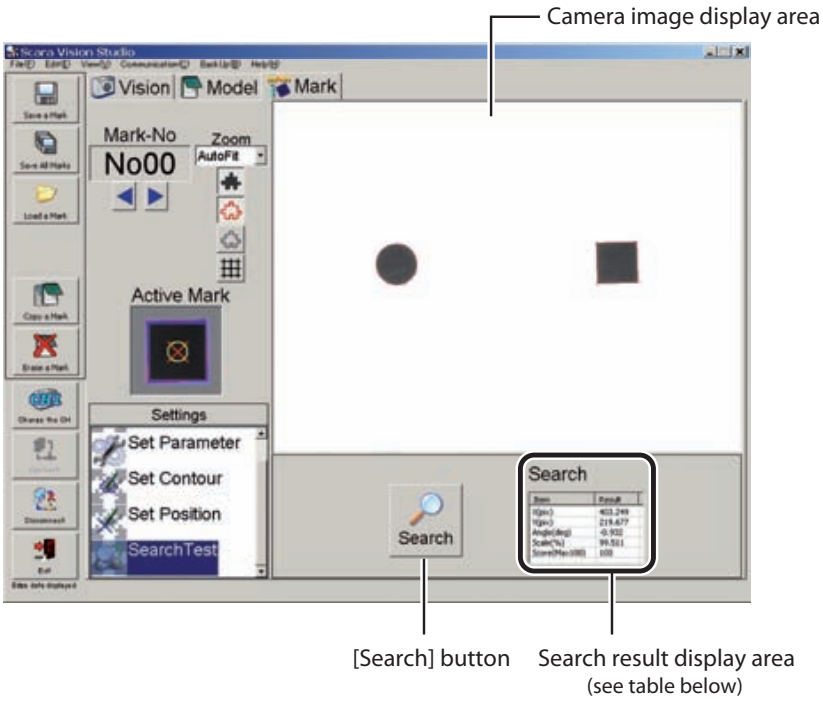
At completion of detection position setting operation



7.5.5 Detection check

The fiducial mark registration process is completed when the pattern setting, parameter setting, contour setting, and detection position setting have all been specified. A fiducial mark detection check (search) is then performed to verify that the registered fiducial marks can be detected.

Fiducial mark – Search Test screen



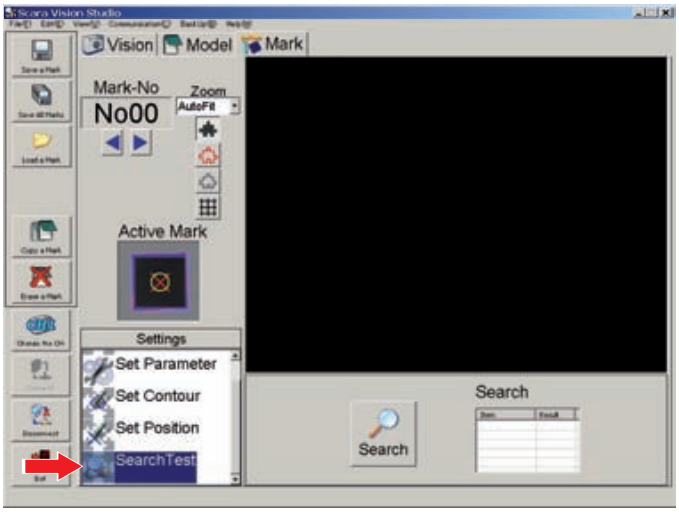
Search result display details

Item	Description
X (pix)	Indicates the detected workpiece's X-position in the camera coordinate system.
Y (pix)	Indicates the detected workpiece's Y-position in the camera coordinate system.
Angle (deg)	Indicates the detected mark's angle (within a –180.000° to 179.999° range).
Scale (%)	Indicates the proportional size relative to the specified fiducial mark.
Score (Maxi)	Indicates the degree of correlation with the specified fiducial mark.

The fiducial mark detection check (search test) procedure is given below.

1 ***In the Mark mode, select the "Search Test" setting item.***

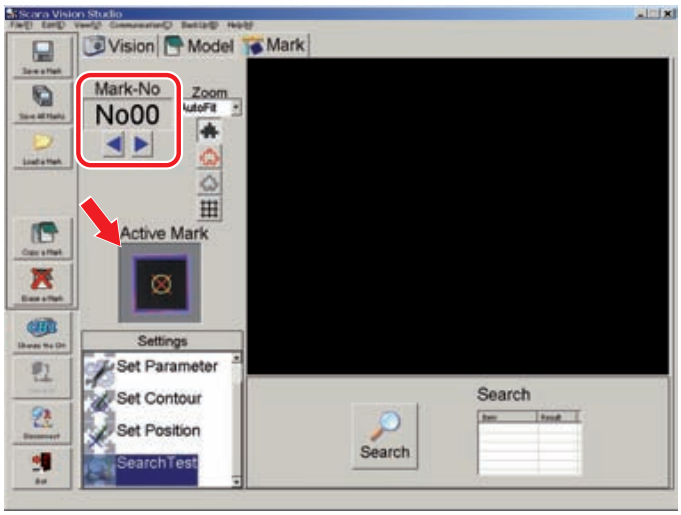
Select "Search Test"



2 ***Select the mark number to be searched for.***

The search-object mark number's image displays at the "Active Mark" item. Verify that the correct search-object mark is indicated. If the correct mark number is not indicated, select the mark number to be searched for. For this procedure, refer to Chapter 7, section 7.1.2.2 "Moving a model number or mark number".

Select the mark number



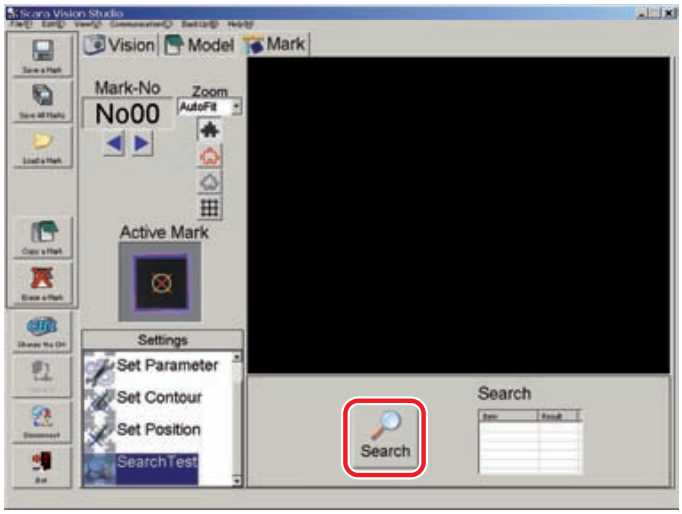
3 ***Place the mark within the camera's field of view, then press the [Search] button.***

When the [Search] button is pressed, images are captured at the camera image display area, and the search occurs.

CAUTION

WHEN PERFORMING THE SEARCH OPERATION, DO NOT PLACE THE MARK AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE MARK IS PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE MARK IMAGE MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED.

Executing the search

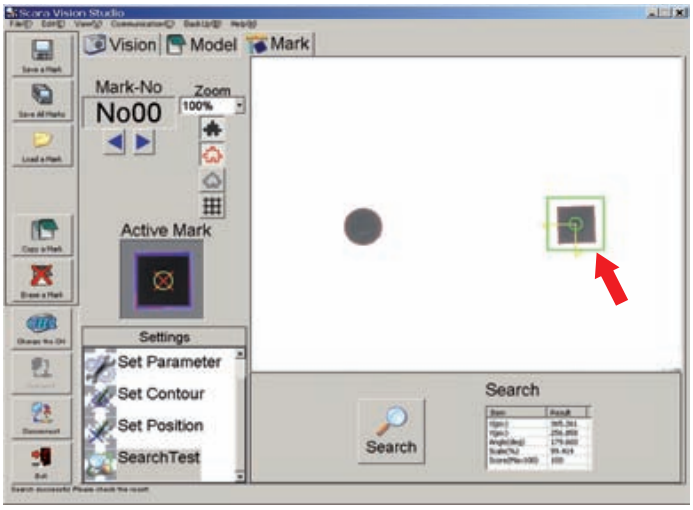


4 ***Check the search results.***

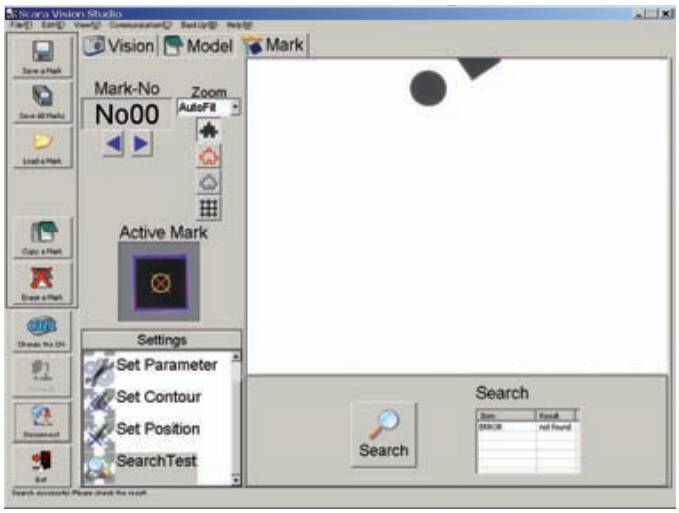
Check the search results at the search results display area. Verify that the "score" and "scale" values are near 100.

The workpiece is enclosed in a green frame if the search was successful. The green frame does not display if the search was unsuccessful.
If the search was unsuccessful, or if the search results are poor, register the fiducial marks again.

Example of successful search detection



Example of failed search detection

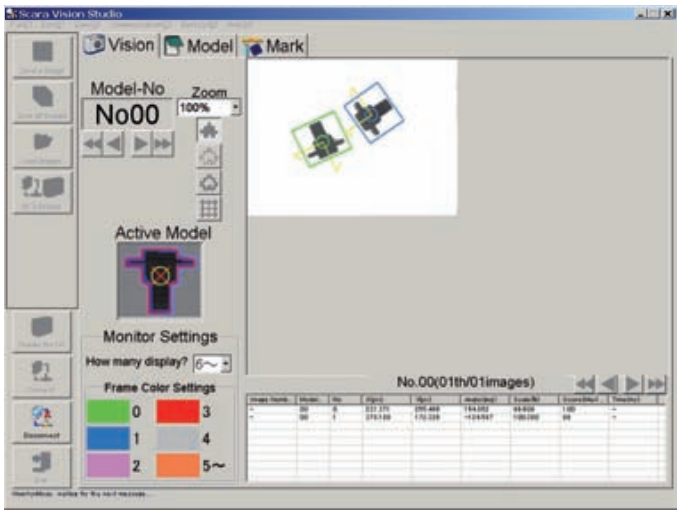


7.6 Using the monitor function

SCARA Vision Studio permits monitoring of workpiece search results during automatic robot operation, and monitoring of fiducial mark search conditions during calibration setting operations.

The monitoring function is only enabled when in the Monitor mode.

Monitor function screen



7.6.1 Using the monitor function

SCARA Vision Studio must be in the Monitor mode in order to use the Monitor function. In order to set SCARA Vision Studio to the Monitor mode, the robot controller's vision control mode must be set to Monitor Mode before SCARA Vision Studio is connected to the robot controller. If SCARA Vision Studio is already connected to the robot controller in another mode, SCARA Vision Studio must first be disconnected from the robot controller, and the robot controller's vision control mode must then be set to Monitor Mode. For details, refer to the "SCARA VISION SYSTEM EXPLANATION SECTION", Chapter 4, section 4.3 "Setting the robot controller's control mode".
SCARA Vision Studio is automatically set to the Monitor Mode if it is started and connected to the robot controller when the robot controller's vision control mode is set to Monitor Mode.

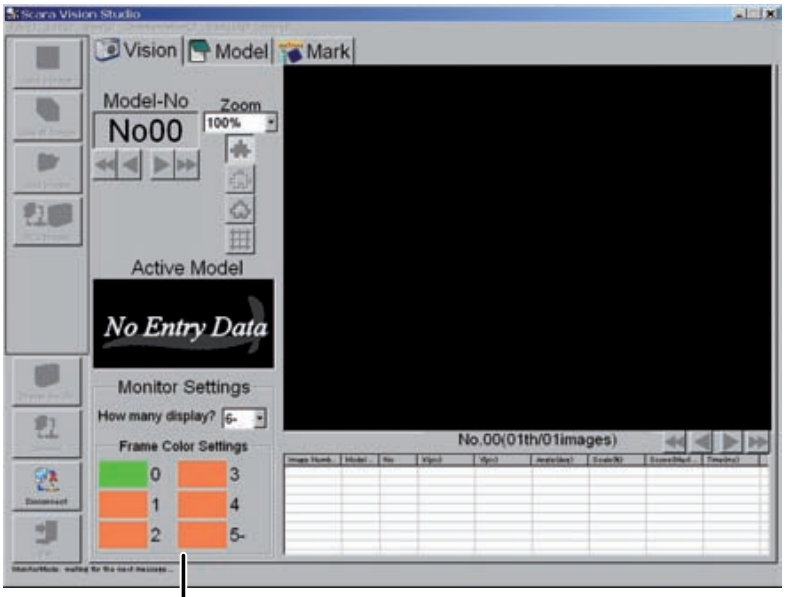
MEMO

When switched to the Monitor Mode, a "MonitorMode: started successfully" message displays at the bottom left of the SCARA Vision Studio screen.

7.6.2 Monitor settings

At monitor function searches, a detection frame encloses the detected workpieces in the search result number order. The monitor settings specify how many detection frames are to be displayed, and the detection frame color.

Monitor settings



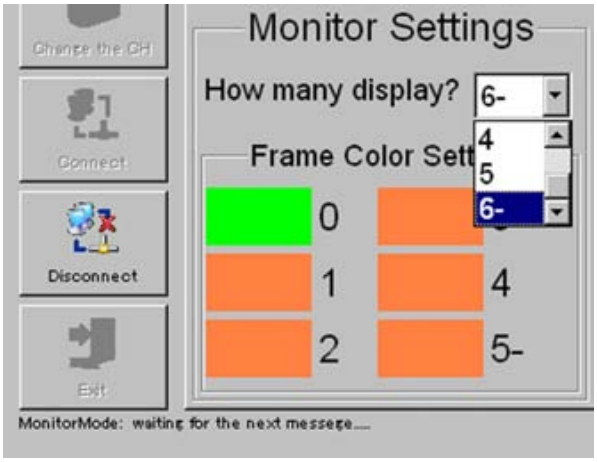
Monitor settings
- How many display?
  Specifies the number of detection frames to be displayed.
- Frame color settings
  Specifies detection frame colors in the search result number order.
  Any frame color can be specified.

The "monitor settings" setting procedure is given below.

1 ***Set SCARA Vision Studio to the Monitor mode.***

2 ***Specify the number of detection frames ("How many display?" setting).***

Specifying the "How many display?" setting

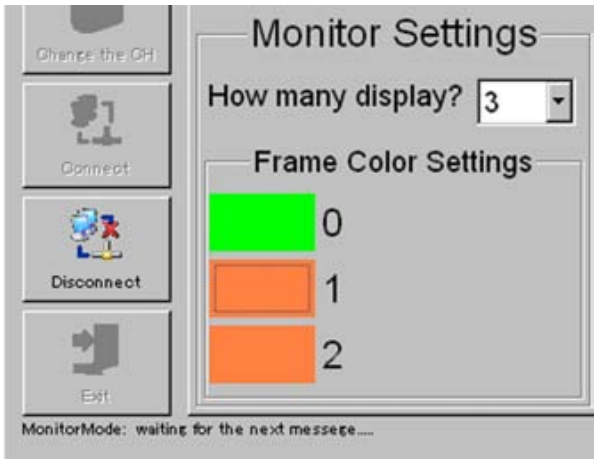


3 ***Click on the detection frame color to be changed.***

The numerals to the right of the detection frame colors indicate the search result numbers. Detection frame color settings can be specified for each search result number.

If "How many display?" is set as "6 ~", the colors of all search result number 5 and higher frames will be the color specified at "5 ~".

Detection frame color setting (1)



4 ***Select the detection frame color, then press the [OK] button.***

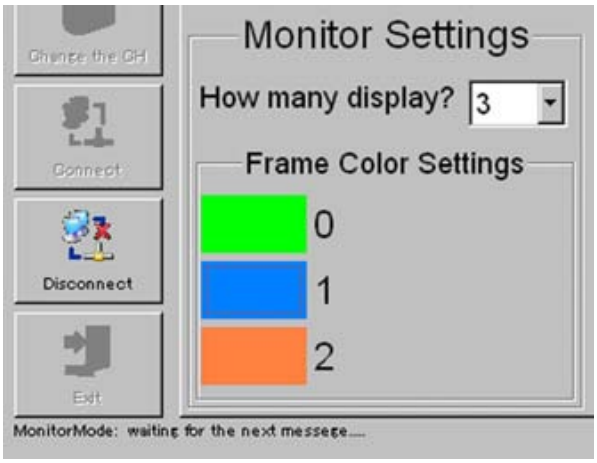
The detection frame color is then established.

To abort the detection frame color setting operation, press the [Cancel] button.

Detection frame color setting (2)

5 *The detection frame colors are set.*

Detection frame color setting is completed



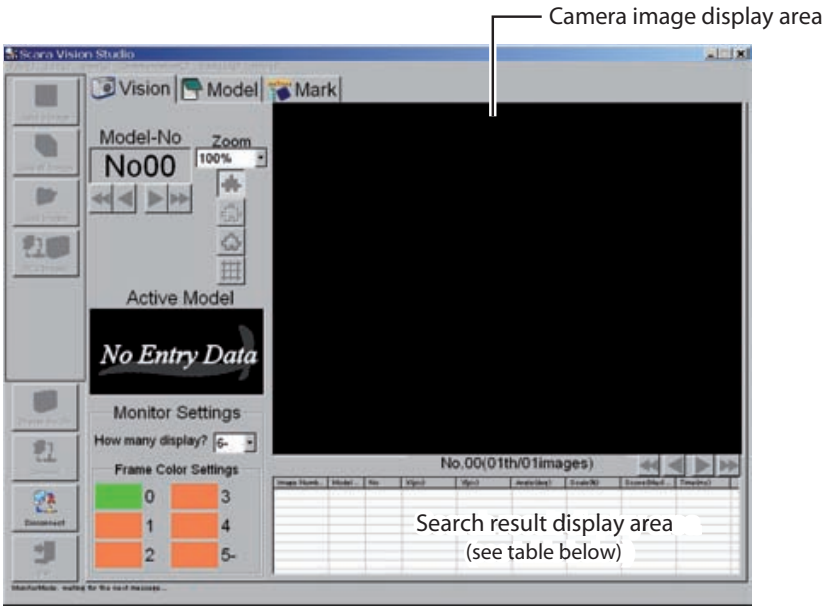
NOTE

To continue the operation in order to change the color of another detection frame, repeat the above procedure from step 3.

7.6.3 Using the monitor function

The monitor function is explained here using a "search result check during automatic robot operation" as an example.

Monitor function



Search result display details

Item	Description
Image Number	Indicates the searched image number.
Model / Mark No. *1	Indicates the searched model or fiducial mark.
No.	Indicates the detected workpiece's ranking (in descending score order) within the searched images.
X (pix) / X (mm) *2	Indicates the detected workpiece's X-position in the camera coordinate system.
Y (pix) / Y (mm) *2	Indicates the detected workpiece's Y-position in the camera coordinate system.
Angle (deg)	Indicates the detected workpiece's angle (within a –180.000° to 179.999° range).
Scale (%)	Indicates the proportional size relative to the specified workpiece model number.
Score (Max100)	Indicates the degree of correlation with the specified workpiece model number.
Time (ms)	Indicates the time required to perform the search.

*1:"Model" displays at model number searches, and "Mark No." displays at fiducial mark number searches.
*2:If a search is performed by specifying a calibration number, the position will be indicated by the robot coordinate position (X (mm), Y (mm)), not by the camera coordinate pixel values (X (pix), Y (pix)).

The procedure for using the monitor function during automatic robot operation is given below.

1 ***Set SCARA Vision Studio to the Monitor mode.***

2 ***Run a robot program.***

Run the robot program which contains dedicated robot language commands. Set the robot controller to the AUTO mode, then run any robot program.

NOTE

Leave the robot controller's vision control mode set to the Monitor Mode at this time. Changing the vision control mode will disable the monitor function.

[Example] Program which uses camera 1 to search for model number 0:

```
*LOOP:
  VSEARCH  1. 0    ← The model number 0 workpiece is searched for in the images captured by the Ch.1 camera.
GOTO *LOOP
```

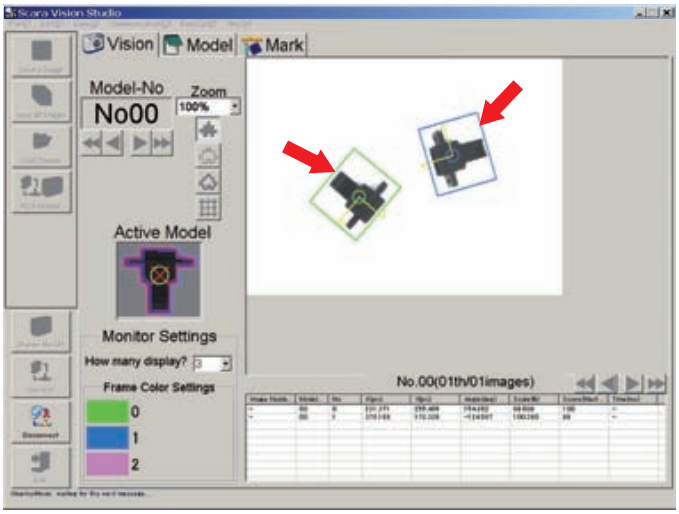
MEMO

Robot programs cannot be run from SCARA Vision Studio.

3 *The search results display at SCARA Vision Studio.*

The search results display at the search results display area.
The number of displayed search-detected items depends on the "detection quantity" (search settings) specified in the Model mode.
If the search was successful, the detected workpiece is enclosed in a detection frame of the specified color.

VSEARCH 1, 0 execution result screen



CAUTION

WHEN PERFORMING THE SEARCH OPERATION, DO NOT PLACE THE WORKPIECE AND MARK AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW. IF THE WORKPIECE AND MARK ARE PUT AT 4 CORNERS OF THE CAMERA'S FIELD OF VIEW, THE WORKPIECE AND MARK IMAGES MAY BECOME DISTORTED DEPENDING ON THE TYPE OF LENS TO BE USED.

MEMO

To use the monitor function to check the fiducial mark search status during a calibration setting operation, specify a calibration setting at Step 2. In this case, searches are performed for one mark at a time, resulting in alternating searches for 2 marks.

C. TROUBLESHOOTING AND SPECIFICATIONS SECTION

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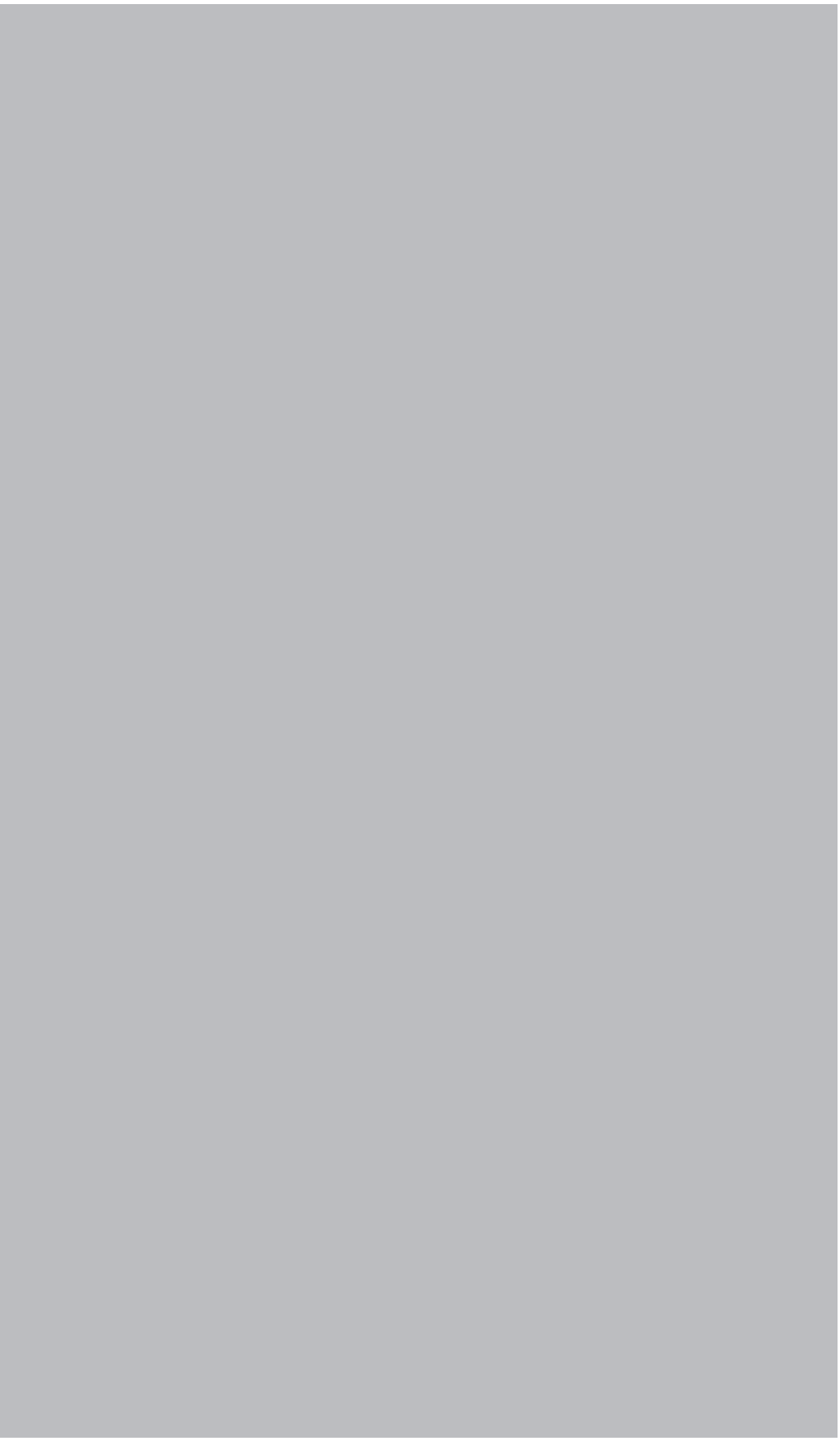


1. Troubleshooting

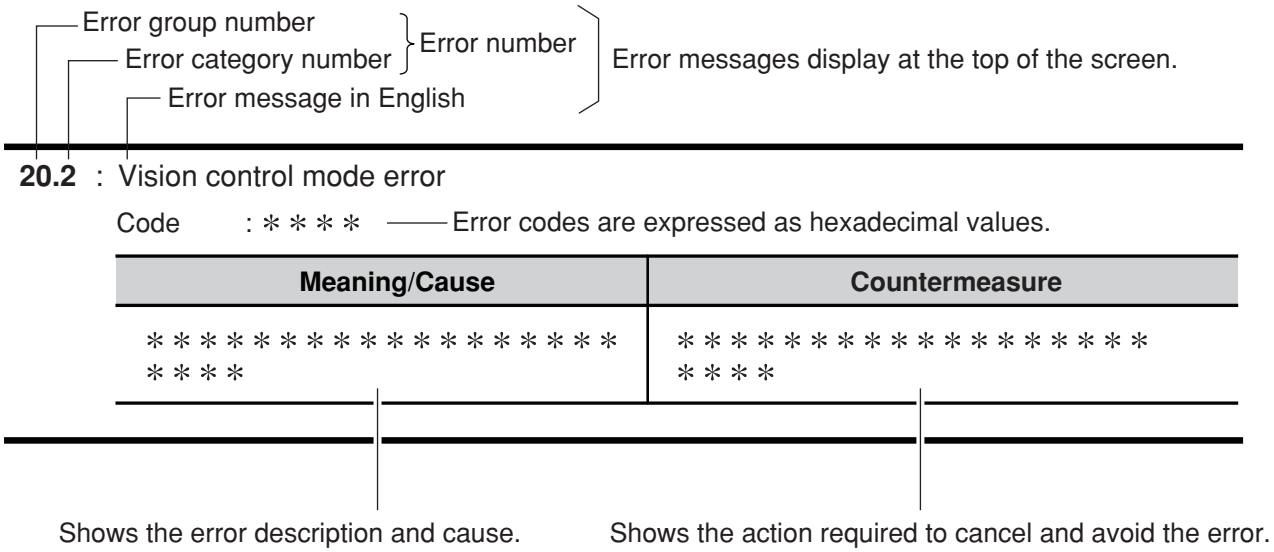
1.1 Error messages

This section explains the SCARA Vision System error messages. For details concerning other errors, refer to the user's manual for the robot controller being used.

If an error occurs, an error message displays at the PB screen message line (2nd line). The error messages and their explanations are given below.

NOTE
Please contact your OMRON representative if the recommended countermeasures fail to prevent a given error from recurring.

[Error message display format]



* In some cases information about the error occurrence location (axis, optional unit, etc.) is inserted at the beginning of the error message.

Error number: [<occurrence location>] Error message

M …Main group axis number
D …Driver axis number
OP …Optional unit slot number

For example, the "2.1: M1, Soft limit over" error message indicates that a "soft limit over" error occurred at the 1st axis of a main group robot. In the same manner, the "17.4 D2, Overload" error message indicates that an "overload" error occurred at the 2nd axis of the driver unit. Although the axis configuration is normally 1-to-1 as viewed from both the robot and the driver, there are cases (in a dual drive axis system, etc.) where the axis configuration may appear as 1 axis when viewed from the robot, but 2 axes when viewed from the driver.

[20] SCARA Vision System errors

20.0 : Vision not installed

Code : &H1400

Meaning/Cause	Countermeasure
No robot vision function settings.	Check to see if the SCARA Vision board is properly connected.

20.1 : Vision init. error

Code : &H1401

Meaning/Cause	Countermeasure
Error occurred during SCARA Vision board initial processing.	Contact your OMRON representative, and provide the error condition details.

20.2 : Vision control mode error

Code : &H1402

Meaning/Cause	Countermeasure
Vision system robot language commands and parameter changes, etc., are not possible in the "Host PC" vision control mode.	Switch to the "Controller" vision control mode.

20.3 : Vision camera disconnected

Code : &H1403

Meaning/Cause	Countermeasure
Camera recognition problem.	• Check the camera cable connection. • Check the camera channel. • Check for severed/disconnected camera cable. • Check power supply wiring for the SCARA Vision board.

20.4 : Vision undefined error

Code : &H1404

Meaning/Cause	Countermeasure
"Undefined" error occurred at SCARA Vision board.	Contact your OMRON representative, and provide the error condition details.

20.5 : Vision not ready

Code : &H1405

Meaning/Cause	Countermeasure
SCARA Vision board startup is in progress.	Do not attempt operation until the SCARA Vision board's status LED (green) changes from a "blinking" to "constant on" (not blinking) condition.

20.7 : Vision hardware error

Code : &H1407

Meaning/Cause	Countermeasure
Hardware error occurred at the SCARA Vision board.	Contact your OMRON representative, and provide the error condition details.

20.8 : Vision calibration error

Code : &H1408

Meaning/Cause	Countermeasure
Error occurred during camera calibration.	• Check to see if fiducial marks have been registered. • Check to see if fiducial marks are being recognized properly. • Check the calibration settings.

20.9 : Vision calibration in prog.

Code : &H1409

Meaning/Cause	Countermeasure
Switching to the "Host PC" vision control mode is not possible during camera calibration.	Switch the mode after camera calibration is completed.

20.10 : Vision calibration not set

Code : &H140A

Meaning/Cause	Countermeasure
Incorrect calibration number specified.	• Change the specified calibration number. • Perform a camera calibration setting operation.

20.11 : Vision calib. data type error

Code : &H140B

Meaning/Cause	Countermeasure
Mismatch between calibration data and the robot configuration.	• Check the specified calibration number. • Specify the calibration setting operation again.

20.12 : Vision calib. data destroyed

Code : &H140C

Meaning/Cause	Countermeasure
Calibration data error occurred.	Contact your OMRON representative, and provide the error condition details.

20.13 : Vision no pattern data

Code : &H140D

Meaning/Cause	Countermeasure
No model has been registered for the specified model number.	• Change the specified model number. • Register the model.

20.14 : Vision trigger timeout

Code : &H140E

Meaning/Cause	Countermeasure
Trigger timeout occurred.	• Check the "Trigger timeout (9. Trigger timeout [sec]) setting in SCARA Vision board's parameter data. • Check the camera trigger input cable wiring and connection. • Check for severed/disconnected camera trigger input cable.

20.15 : Vision Disk full

Code : &H140F

Meaning/Cause	Countermeasure
SCARA Vision board's disk is full.	Delete unnecessary image data from the SCARA Vision board.

20.16 : Vision parameter error

Code : &H1410

Meaning/Cause	Countermeasure
Incorrect parameter value specified.	Change the specified parameter value.

20.17 : Vision search timeout

Code : &H1411

Meaning/Cause	Countermeasure
Search ended due to timeout.	Change the timeout setting for the specified model.

20.50 : V_Plus not installed

Code : &H1432

Meaning/Cause	Countermeasure
No settings are made for the lighting control function and/or conveyor tracking function.	Check whether the lighting control board and tracking board are correctly connected.

20.51 : V_Plus Watchdog error

Code : &H1433

Meaning/Cause	Countermeasure
Lighting control/tracking board operation is abnormal. Bits which should be reversed periodically are not being reversed due to a stopped clock or CPLD freeze, etc.	Perform a restart. If the restart fails to restore a normal condition, check the board connection condition and the board recognition at the PB.

20.52 : V_Plus counter wire breakage

Code : &H1434

Meaning/Cause	Countermeasure
Disconnected encoder input cable detected.	Set unused encoder input channels to "INVALID". Verify that the cable connector is not disconnected or severed. Check to see if the encoder is operating normally.

20.53 : V_Plus Tracking error

Code : &H1435

Meaning/Cause	Countermeasure
Tracking was attempted during tracking.	Review the robot program and change it so that the CTMOVE statement will not be executed during tracking.

20.54 : V_Plus Not Tracking error

Code : &H1436

Meaning/Cause	Countermeasure
A command that should be executed during tracking was executed while tracking is not in progress.	Review the robot program and change it so that the command will be executed during tracking.

20.55 : V_Plus not have Z Axis error

Code : &H1437

Meaning/Cause	Countermeasure
The CTDRIVE statement was executed for the robot with no Z-axis.	Change the main robot setting to a robot with the third axis.

20.56 : V_Plus parameter error

Code : &H1438

Meaning/Cause	Countermeasure
The lighting control board parameter and/or tracking board parameter are incorrect.	Initialize the parameters and set them correctly.

20.57 : V_Plus calibration not set

Code : &H1439

Meaning/Cause	Countermeasure
Conveyor calibration data is not set.	Set the conveyor calibration data and re-execute calibration.

20.58 : V_Plus out of Tracking work area

Code : &H143A

Meaning/Cause	Countermeasure
Tracking was attempted after the first point data in the position monitoring array has passed the work area.	Use the CRMVQUE command to delete the data that indicates the first point data in the position monitoring array has passed the work area, and then review the robot program and change it so that the CTMOVE statement will be executed.

20.59 : V_Plus Tracking queue empty

Code : &H143B

Meaning/Cause	Countermeasure
Tracking was attempted while no data is registered in the position monitoring array.	Use the CADDQUE command to add data to the position monitoring array, and then review the robot program and change it so that the CTMOVE statement will be executed.

1.2 Troubleshooting

1.2.1 When faults occur

When contacting your OMRON representative regarding faults which have occurred, please provide the following information.

Item			Description (example)
Product information	What?	Controller name	YRC
		Controller manufacture number	xxxxxx
		Robot name	R6YXH250
		Robot manufacture number	xxx-xxxxxx
		Controller version	Ver. 1
		SCARA Vision Studio version	Ver. 1.34
Fault description	When?	Purchase date	January, 2008
		Period used	1 year
		Usage conditions	24-hour full operation
		Occurrence timing	1 hour after power is switched on
	Under what conditions?	Occurrence conditions	• During automatic operation • During programming • When robot moves to specific position • During model registration at SCARA Vision Studio
	What happened?	Fault conditions	• Servo lock failed to occur • Error occurs (error message displays at PB) • Abnormal sound from motor • PB keys fail to function
	Frequency?	Occurrence frequency	• Always occurs • Occurs once per hour • Does not recur

NOTE

When the PB unit is connected to the robot controller, the error message which displays at the PB screen provides important countermeasure related information.

The items listed below should be checked when lighting control/tracking board problems occur.

- **Lighting fails to switch on.**

  * Check the power LED on/off status.

  [If the LED is off]

  - Check the power supply voltage.
  - Check to see if the protective fuse has been tripped at the lighting control/tracking board.

  [If the LED is on]

  - Check to see if the lighting parameter values of the lighting control/tracking board parameters are correct.
  - Verify that the lighting specifications and power supply specifications are compatible, and that the lighting is operational (normal).
  - Check to see if the "22.12 Abnormal temperature" error occurred. If this error occurred, turn the lighting output off.
    Check to see if the fan on the rear of the robot controller is correct, then turn the power on again.

- **Encoder does not count correctly.**

  * Check to see if counting occurs when the encoder is rotated.

  [If counting does not occur]

  - Check the encoder input cable connection.
  - Check to see if the encoder is operational (normal).
  - Verify that the counter status (C1/C2) parameter on the tracking board is set at "VALID".

  [If counting occurs, but the count value is erroneous]

  - Verify that the encoder pulse is 2Mpps or less.
  - Verify that the count multiplication (C1/C2) parameter set value on the tracking board is correct.
  - Verify that the encoder rotation direction is correct.
  - Review the entire program and verify whether or not the designation of the counter number to be used is correct.

- **Controller restarts or controller fails to start.**

  * Unplug the encoder input interface to see if improvement occurs.

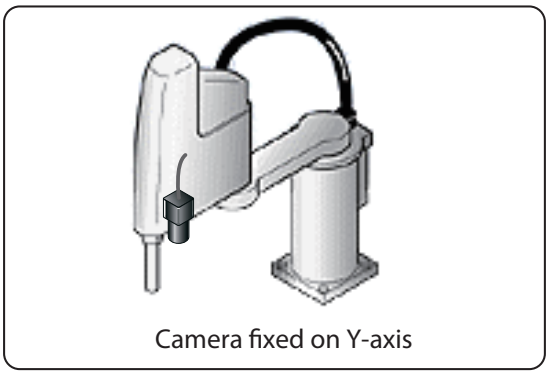
  - If improvement occurs, there may be 5V short-circuit or ground fault at the encoder input cable or in the encoder.

2. Specifications list

Specification Item		SCARA Vision board
Basic specifications	Supported controller	YRC
	Number of screen pixels	640(H)×480(V) (300,000 pixels, VGA)
	Model setting capacity	40 models
	Number of connectable cameras	Max. 2 cameras * If 2 cameras are connected, both must be the same model.
	Connectable camera	Double-speed compatible analog camera (VGA)
	External interface	Ethernet (100BASE-TX) * For setting and monitor operations
Search method		Edge search (correlated edge filter, Sobel filter)
Image capturing	Trigger mode	S/W trigger, H/W trigger, camera internal
	External trigger input	2 points
Function		Position correction, automatic point data generation
Camera installation position		Fixed to the fixed camera (up, down) or robot (Y-axis, Z-axis). Perpendicular to the workpiece to be captured.
Setting support function		Calibration, image save function, model registration*, fiducial mark registration*, monitor function* * SCARA Vision Studio function (requires a Windows PC)

Note: Due to ongoing improvements, the specifications may be changed at any time without prior notice.

■ **Camera mounting example**



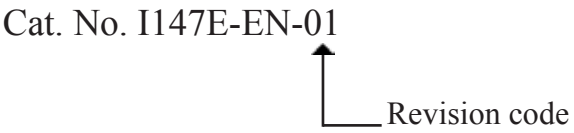
Camera fixed on Y-axis

Specification Item		Lighting control board
Basic specifications	Compatible controller	YRC
	Number of connected lighting units	Up to 2 units.
	Light modulation format	PWM control (0 to 100%) (Cycle: 60kHz)
		Strobe light (10 to 33000μs)
	Trigger	Switch trigger, Hardware trigger
	External trigger input	2 points
	Lighting power input	12VDC or 24VDC (external supply shared by both channels)
	Lighting output	For 12VDC supply: Total of less than 30W for both channels. For 24VDC supply: Total of less than 60W for both channels.

Specification Item		Tracking board
Basic specifications	Compatible controller	YRC
	Number of connected lighting units	Up to 2 units.
	Light modulation format	PWM control (0 to 100%) (Cycle: 60kHz)
		Strobe light (10 to 33000μs)
	Trigger	Switch trigger, Hardware trigger
	External trigger input	2 points
	Lighting power input	12VDC or 24VDC (external supply shared by both channels)
	Lighting output	For 12VDC supply: Total of less than 30W for both channels. For 24VDC supply: Total of less than 60W for both channels.
	Number of connected encoders	Up to 2 units.
	Encoder power supply	5VDC (Total of less than 500mA for both channels.) (Supplied from controller)
	Applicable encoder	26LS31/26C31 or equivalent line driver (RS422 compliance).
	Input phase	A. $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$
	Max. response frequency	2MHz or less
	Counter	0 to 65535
	Multiplier	x2 or x4 (selectable)
	Other	With disconnection detection function

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous revision.

Revision code	Date	Revised content
01	July 2010	Original production