OMRON

Vision Sensor

FH Series

Vision System

Robot Connection Guide

OMRON Viper Series Edition

Z448-E1-02

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Introduction

Thank you for purchasing the FH Series.

This manual contains information that is necessary to use the FH Series.

Please read this manual and make sure you understand the functionality and performance of the FH Series before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

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For details on Safety Precautions, refer to Safety Precautions in the *Vision System FH Series 3D Robot Vision Application Construction Guide (Cat. No. Z446)*.

Waring

For details on Waring, refer to Waring in the *Vision System FH Series 3D Robot Vision Application Construction Guide (Cat. No. Z446)*.

Precautions for Safe Use

For details on Precautions for Safe Use, refer to Precautions for Safe Use in the *Vision System FH Series 3D Robot Vision Application Construction Guide (Cat. No. Z446)*.

Precautions for Correct Use

For details on Precautions for Correct Use, refer to Precautions for Correct Use in the *Vision System FH Series 3D Robot Vision Application Construction Guide (Cat. No. Z446)*.

Regulations and Standards

For details on Regulations and Standards, refer to Regulations and Standards in the *Vision System FH Series 3D Robot Vision Application Construction Guide (Cat. No. Z446)*.

Related Manuals

<Application Construction Guide>

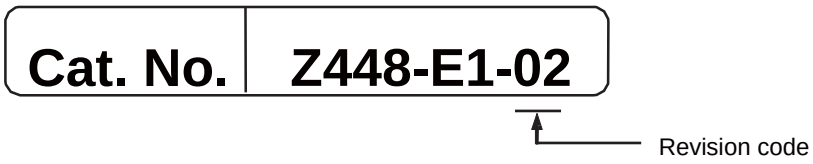
Name of Manual	Cat. No.	Model	Purpose	Contents
Vision Sensor FH Series 3D Robot Vision Application Construction Guide	Z446	FH-5050 FH-SMDA-GS050B	When User want to know about the FH series 3D robot vision system.	Describes the soft functions, setup, and operations to use FH series 3D robot vision system.

<Robot Manual>

Name of Manual	Cat. No.	Model	Purpose	Contents
Viper 650/850 Robot with eMB-60R USER'S GUIDE	I599	17201-360□□	When User want to know the setup and hardware specifications of the Viper Robot	Describes the specifications, external dimensions, part names, settings, and maintenance of the Viper series.
T20 Pendant User's manual	I601	10046-010	When User want to know how to set up and use the teaching pendant	Describes the specifications, installation, operation, and maintenance of the T20 pendant.
SmartController EX User's Guide	I602	19300-000 19200-000	When User want to Know the Setup and Specifications of SmartControllerEX	Describes SmartControllerEX external dimensions, part names, I/O specifications, settings, and maintenance.
Automation Control Environment (ACE) User's Guide	I603	-	When User want to know how to operate ACE	Describes how to operate ACE
eV+ language User's Guide	I604	-	When User want to Know the eV+ Language Specification	Describes the specification of the eV+ language
Robot Safety Guide	I590	-	When User want to know how to handle an industrial robot safely	Describes precautions for safe handling of the robot.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Rev. Code	Rev. Date	Revision Contents
01	Feb. 2021	Original product
02	Jun. 2021	Clerical corrections

1. Overview

1.1. Overview

This manual describes procedures for connections and settings required for constructing robot vision applications by connecting your robot controller to the Vision Sensor FH (hereafter referred to as Vision Sensor).
Utilizing this manual and Robot Vision Application Construction Guide can reduce man-hours to connect the Vision Sensor to your robot controller, set the Vision Sensor, and create robot programs.

1.2. Instructions for building a 3D Robot Vision Application

Please follow the flow below for constructing 3D robot vision applications

Procedure	Reference
Creating Data Set for Robot Vision	[3D Robot Vision Application Construction Guide] Chapter 6
↓	
System Settings for Vision Sensors	[3D Robot Vision Application Construction Guide] Chapter 7
↓	
Setting Communications for Robot controller	Refer to Chapter 3.1
↓	
Connecting Vision Sensor to Robot Controller	Refer to Chapter 3.2 Refer to Chapter 3.3
↓	
Robot Vision Settings for Vision Sensors	[3D Robot Vision Application Construction Guide] Chapter 8
↓	
Description of the sample programs	Refer to Chapter 6

1.3. Robot Programs Covered in this Manual

The two types of robot programs covered in this manual are output from the Robot Vision Dataset Output Tool. Each program is used for a different purpose.

Program	Program Name	Detail
Setup Program	fhsetup_main	This program allows the Vision Sensor to give operating instructions to the robot to configure the Vision Sensor for robot vision. This program consists of the following functions - Send the current robot position to the Vision Sensor. - Move to the indicated position on the Vision Sensor.
Sample Program	fhsample_main	This program is a sample of the basic program flow for a pick application. In this program, the robot gives control instructions to the Vision Sensor. The program consists of the following functions - Connecting to the Vision Sensor - Scene switching of the Vision Sensor - Moving to the measurement position - Registering the current robot position to the Vision Sensor - Execute measurement instructions to the Vision Sensor - Receives the position of the workpiece to be recognized - Move to approach position - Move to the target work location (grasping position) Based on this program, a pick-and-place application is built by adding the robot movement to operate the end-effector (hand) and to place the workpiece.

2. System Configuration

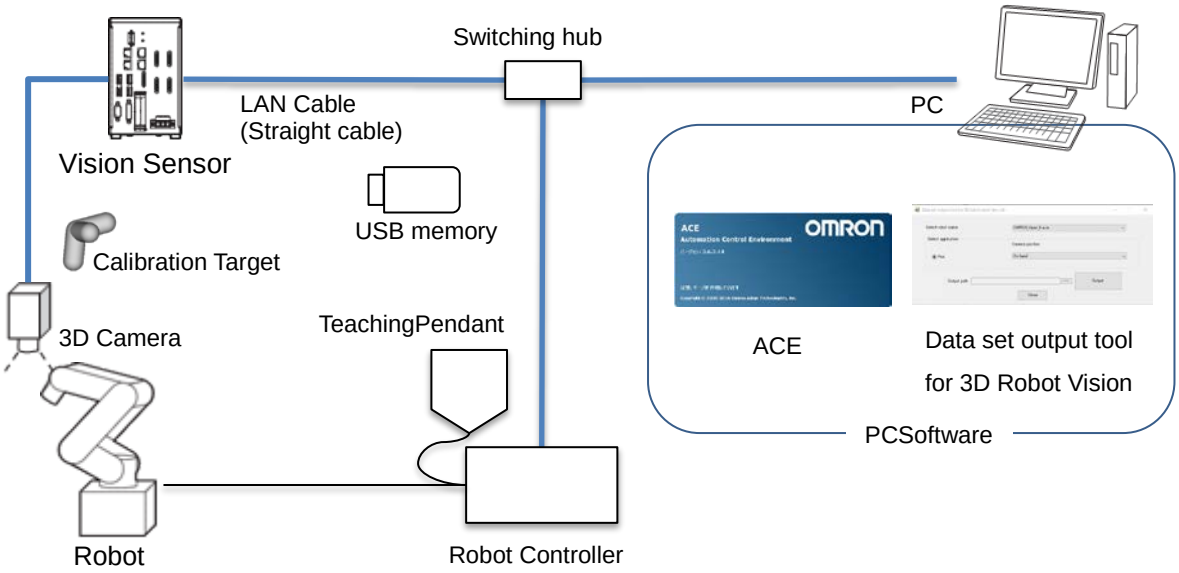
This chapter describes the system configuration and target devices to construct robot vision applications.

2.1. Cautions for Robot Equipment

none in particular

2.2. When Using Vision Sensor FH Series 3D Vision Sensor

2.2.1. System Configuration



2.2.2. Target Devices

Device name	Manufacturer	Name	Model	Remarks
Vision Sensor	OMRON	Vision Sensor FH Series	FH-5050	Ver. 6.40 or later Controllers other than FH-5050 are not supported.
3D Camera	OMRON	3D Vision Sensor	FH-SMDA-GS050B	-
Camera Cable	OMRON	Ethernet cable super bending resistance	FHV-VNBX□M FHV-VNLBX□M	-
Camera I/O cable	OMRON	I/O cable super bending resistance	FH-VSDX-BX□M FH-VSDX-LBX□M	-
Calibration	OMRON	Handeye Calibration	FH-XCAL-R	-

target		Target		
	OMRON	Camera Calibration Target	FH-XCAL-S	-
3D Software	OMRON	3D Robot Vision Software Installer	FH-UM3D1	-
Robot controller	OMRON	Robot controller SmartController EX	19300-000	-
Robot	OMRON	Vertical multi-joint robot Viper 650	1720□-36000 1720□-36020 1720□-36010	-
		Viper 850	1720□-38000 1720□-38020 1720□-38010	-
Teaching pendant	OMRON	Teaching pendant T20	10046-010	-
PC software	OMRON	Data set output tool for 3D robot vision	-	Ver.1.00 Please contact us for how to obtain it.
	OMRON	Software Automation Control Environment (ACE)	-	Ver. 3.7 or later
Switching hub	OMRON	Industrial switching hub	W4S1-□□□	Recommended product
USB memory	OMRON	USB memory	FZ-MEM8G	Recommended product

Precautions for Correct Use

Do not use any device except mentioned above for each device of the system configuration.

Additional Information

This manual does not provide operations, installation, and wiring methods for each device.
For details, refer to manuals noted in Related Manuals.

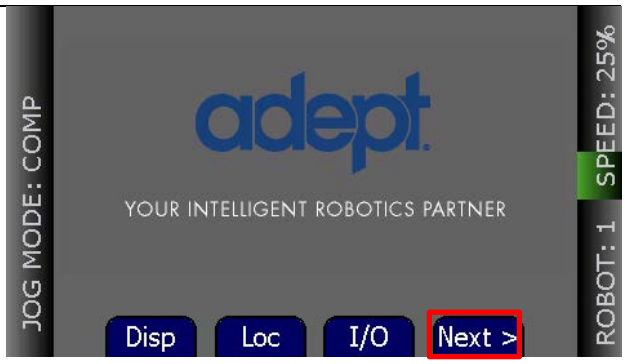
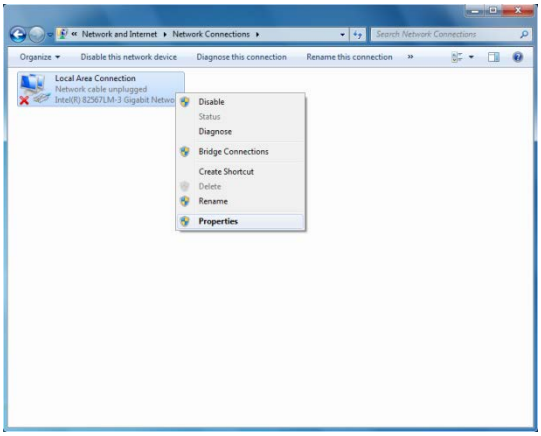
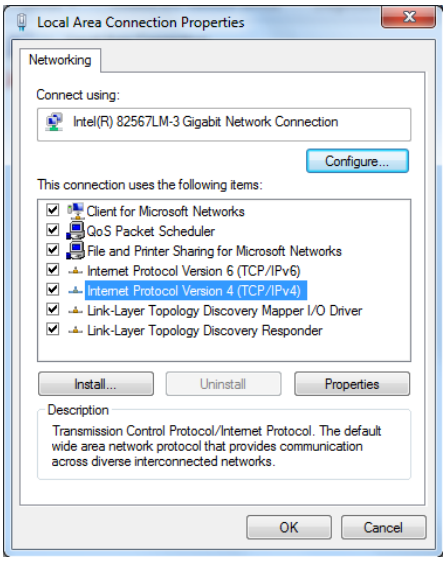
3. Connecting Vision Sensor to Robot Controller

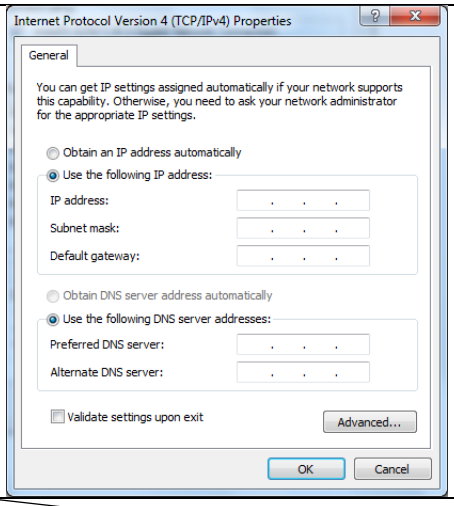
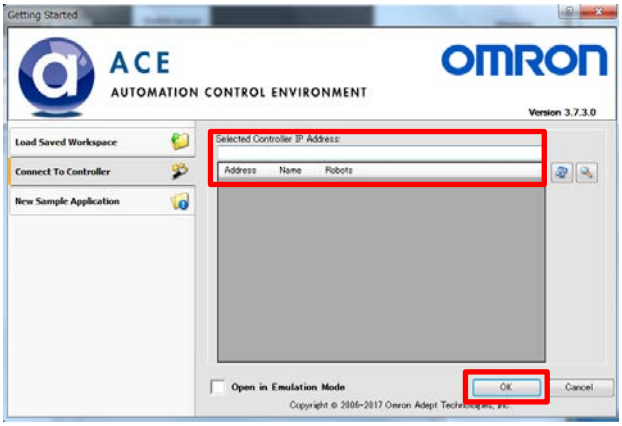
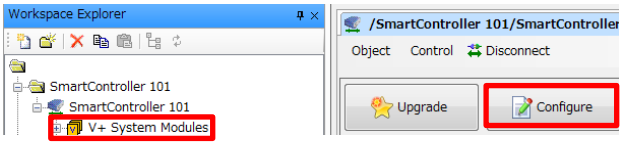
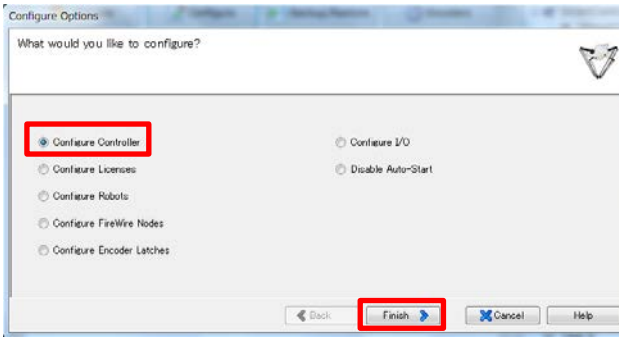
This chapter describes procedures to connect the Vision Sensor to the robot controller.
Please follow the flow below for the settings.
The IP address of each device is described below.
Vision Sensor　: 10.5.5.100
Robot controller: 10.5.5.101

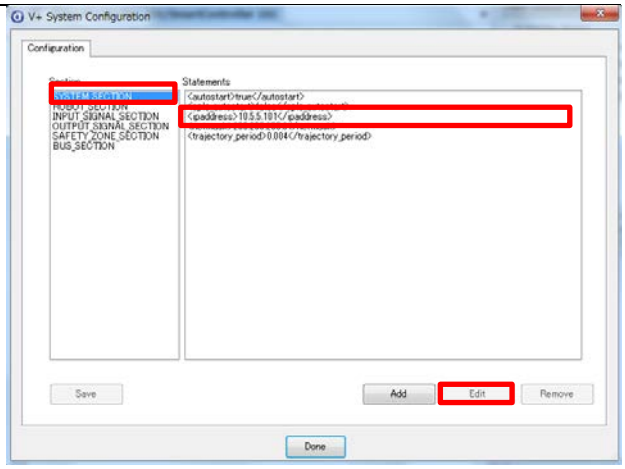
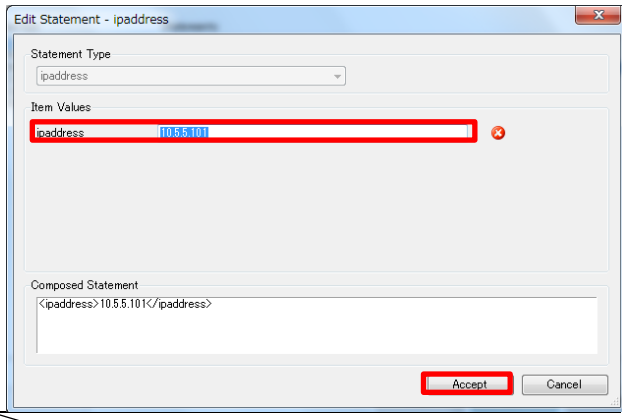
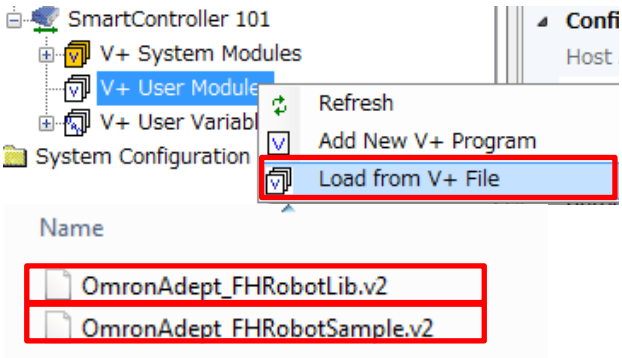
3.1	Setting communications for the robot controller	To modify the communication settings for the robot controller, connect the PC (ACE) and the robot controller. Modify the default IP address of the robot controller with PC (ACE) according to the communication settings in the Vision Sensor.
▼		
3.2	Verifying Ethernet Communication	Check the connection status of Ethernet using PING command.
▼		
3.3	Verify Commands Sent/Received	Run a robot program for startup to establish the TCP/IP connection between the Vision Sensor and the robot controller. Check the communication status by sending and receiving commands.

3.1.1. Setting Communications for Robot Controller

Please follow the procedures below to set the communications for the robot controller.

1	Press [MENU] on the teaching pendant to display the right figure (HOME1 window). Select [Next>] - [Maint] - [Info] and then refer to the IP address for the robot controller on the SYSTEM INFORMATION window.	
2	Connect the PC and the robot controller with LAN cables.	
3	With right-click, select [Network and Sharing Center] - [Change adapter settings] from the control panel of the PC and open the property for a network adapter connecting the robot controller. The dialog shown on the right will be displayed, select [Internet protocol version 4 (TCP/IPv4)] and open the property.	 

	The dialog shown on the right will be displayed, set the IP address and the subnet mask for the PC so that the IP address and network part of the referred robot controller are the same, but the host part is different.	
4	Launch ACE.	
5	Enter the IP address of the robot controller and click [OK].	
6	Select “SmartController” in the Workspace Explorer and click [Configure]. The right dialog will be displayed, select “Configure Controller” and click [Finish].	 

	The right dialog will be displayed, select “SYSTEM SECTION” in the “Section” area and “ipaddress” in the “Statements” area and click [Edit].	
	The right dialog will be displayed, change the ipaddress and click [Accept]. Set the IP address not to overlap with other devices.	
7	Change the IP address of the PC again based on the changed one for the robot controller.	
8	Reconnect to the robot controller.	
9	Right-click “V+ User Module” in the Workspace Explorer and select “Load from V+ File”. Select OmronAdept_FHRobotLib, OmronAdept_FHRobotSample in the folder outputted by using the data set output tool for the robot vision.	

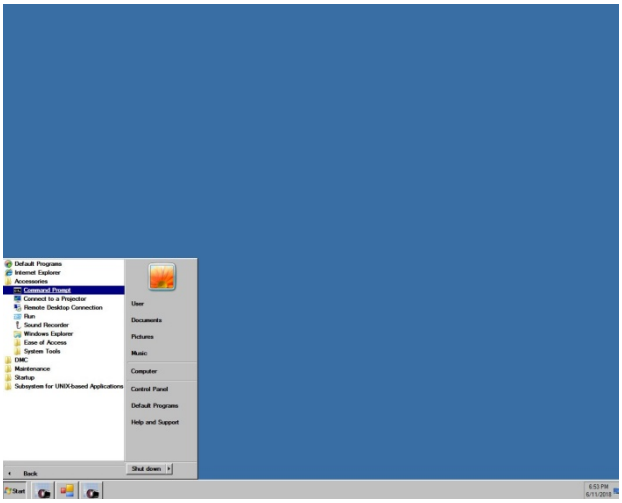
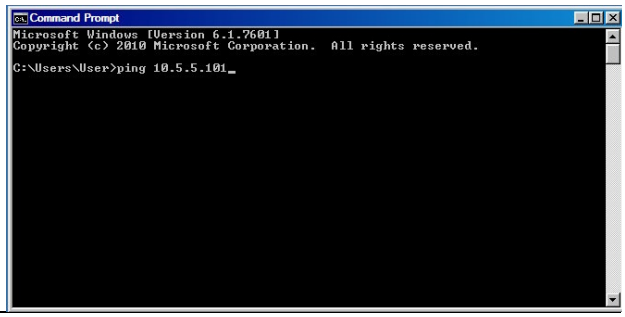
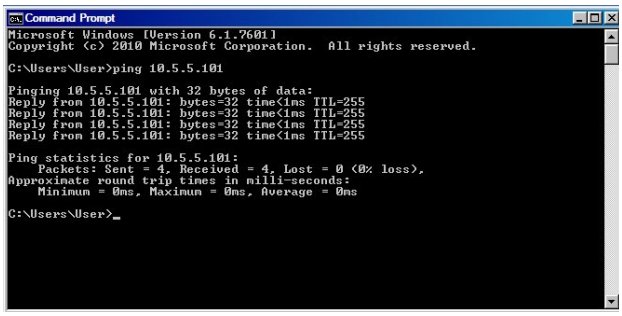
Additional Information

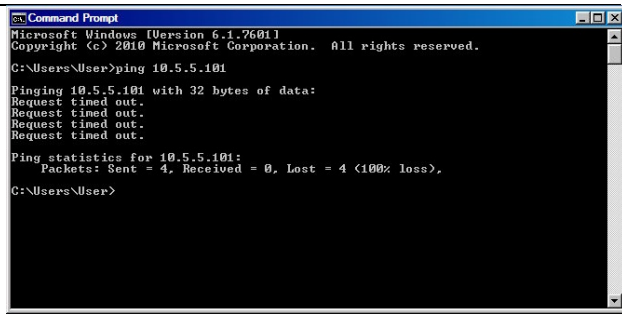
This manual does not provide operation, installation, and wiring methods for each device.
For details, refer to manuals noted in Related Manuals.

3.2. Connecting and Checking Vision Sensor and Robot Controller

Follow the procedures below to connect the Vision Sensor and the robot controller and to check the connection status.

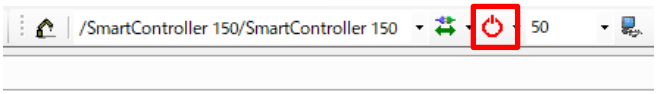
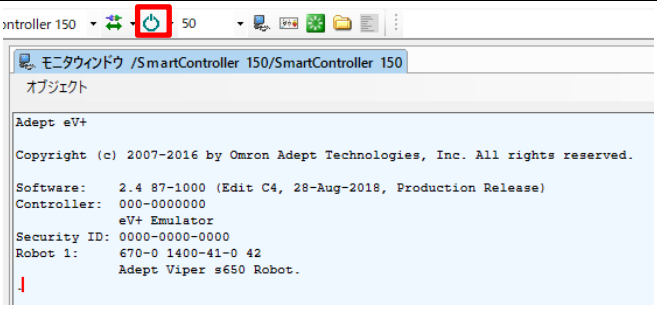
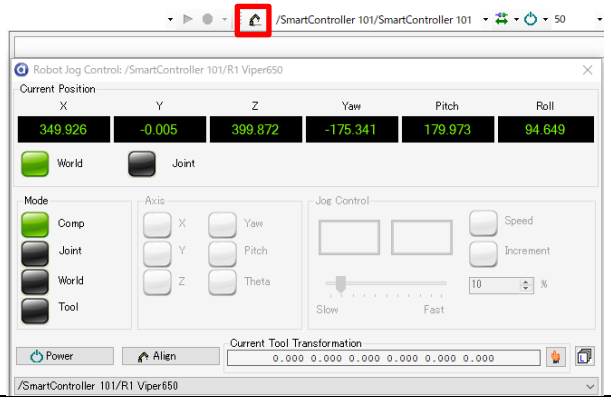
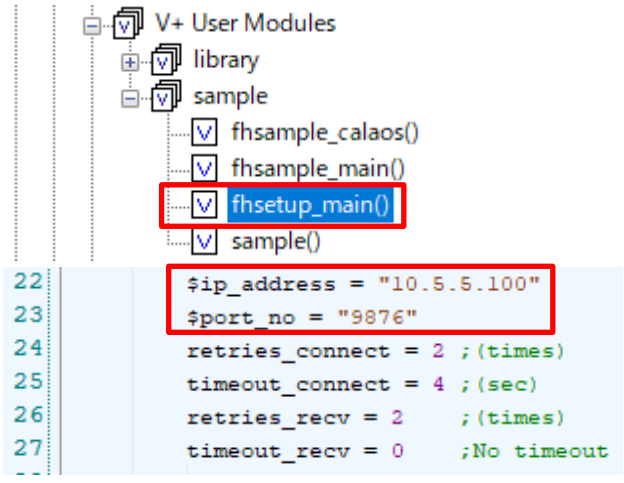
3.2.1. Verifying Ethernet Communication (FH Series Vision Sensor)

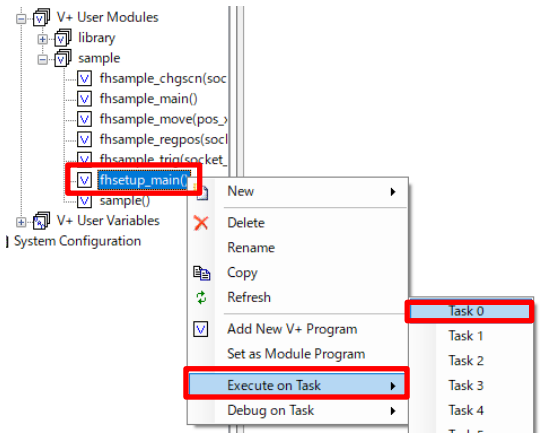
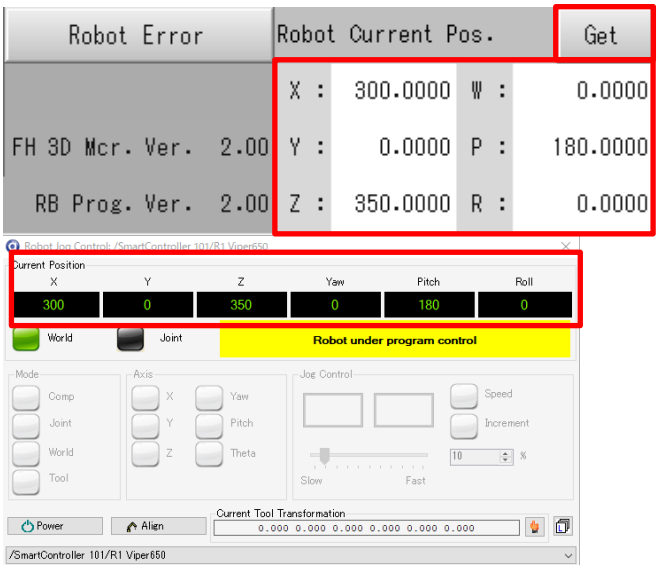
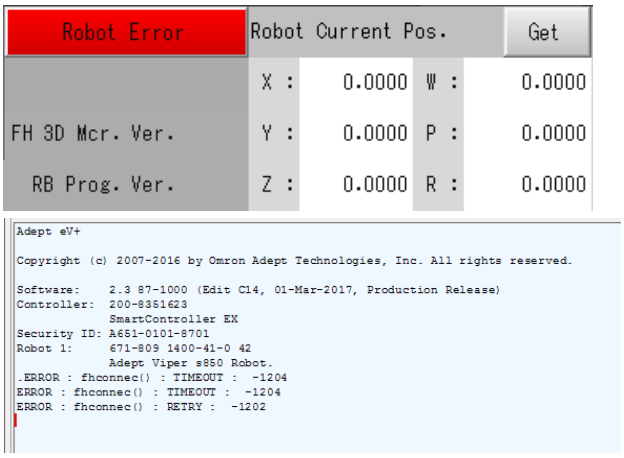
1	Connect the Vision Sensor and the robot controller with LAN cables.	
2	(Operation of the Vision Sensor) Move the mouse cursor to lower left of the window to display [Start]. Select [Start] - [All Programs] - [Accessories] - [Command Prompt] to launch [Command Prompt].	
3	(Operation of the Vision Sensor) Execute PING command to the IP address of the robot controller.	
4	(Operation of the Vision Sensor) When 32-byte data could be successfully sent/received four times as shown in the figure on the right, that means that the communications have been established and the wiring and settings of Ethernet is correctly done.	

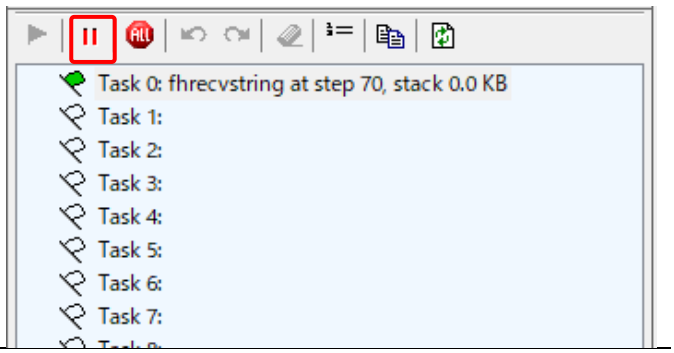
	When 32-byte data cannot be sent/received four times and PING command timed out, check whether or not the robot controller is turned on, the wiring was correctly done, or communication settings are correct.	

3.3. Verify Commands Sent/Received

Execute the setup program on the robot controller and follow the steps below to confirm that commands can be sent and received from the Vision Sensor.

1	(Operation of ACE) Click an icon enclosed in red square Make sure that the High Power button on the Front Panel is flashing, then press and release the button to enable High Power.	
2	(Operation of ACE) Click an icon enclosed in red square on the right figure to display the monitor window. Click an icon enclosed in red square on the right figure to display the robot jog operation dialog.	 
3	(Operation of ACE) Double-click [V+ User Module] – [sample] – [fhsetup_main()] from the Workspace Explorer to display the V+ Editor tool. Set the IP address and port number of the Vision Sensor.	

4	(Operation of ACE) Right-click [V+ User Module] – [sample] – [fhsetup_main()] from the Workspace Explorer and select [Execute on Task] – [Task 0].	
5	(Operation of the Vision Sensor and ACE) Like shown on the right figure, when [Get] is clicked on the Main Window of the Vision Sensor and the current robot position on ACE's monitor window is displayed at the same position on the Main Window of the Vision Sensor, sending/receiving commands between them have been succeeded. * Correspondence relation of notation **Vision Sensor** / **ACE** W / yaw P / pitch R / roll	
6	Like shown on the right figure, If the [Robot Error] button turns red, the connection has failed. Check the wiring and others. Errors in the robot program are displayed in the ACE monitor window.	

7	(Operation of ACE) After successfully sending and receiving commands from the image sensor and the robot controller, press the [Pause Task] button on ACE to stop the task.	

Additional Information

This manual does not provide operation, installation, and wiring methods for each device.
For details, refer to manuals noted in Related Manuals.

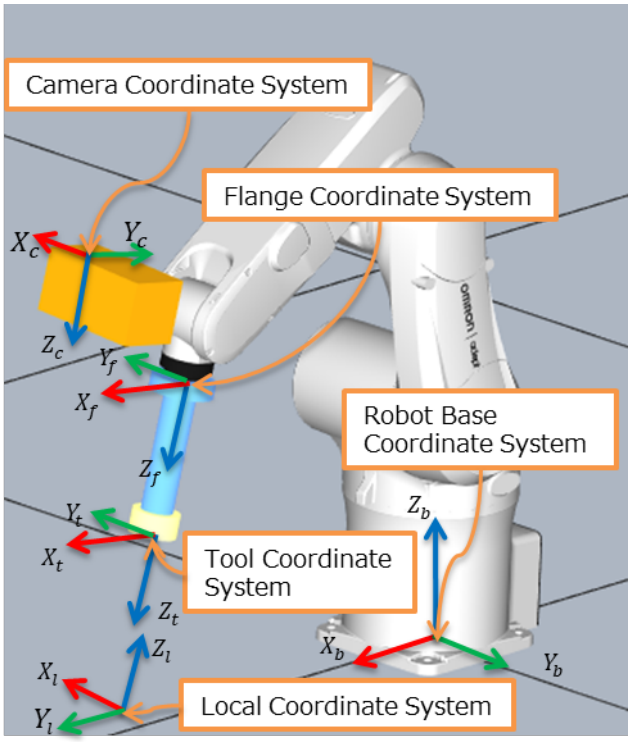
4. Coordinate System

This chapter describes the coordinate system handled by the robot vision application.

4.1. Name of Coordinate System

The robot coordinate system of the Vision Sensor uses the name shown in the table below.

Coordinate System	Meaning
Robot Base Coordinate System	Coordinate system with the robot base as the origin
Local Coordinate System	User-defined coordinate system
Flange Coordinate system	Coordinate system defined on the flange surface of the robot
Tool Coordinate System	The coordinate system is defined in the tool center point by offsetting the origin of the flange coordinates system.
Camera Coordinate System	With the optical center of the camera as the starting point, the X and Y axes are the horizontal and vertical directions of the image, and the Z axis is the optical axis of the camera.



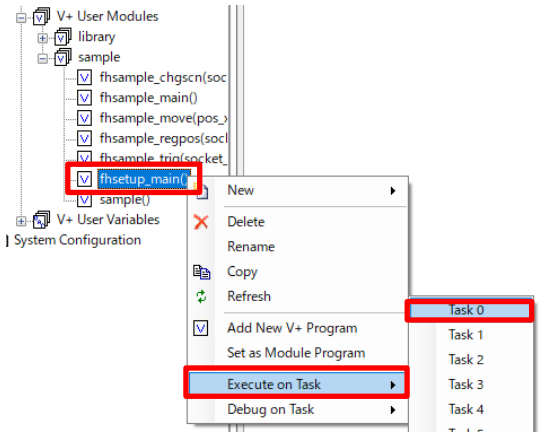
The orientation of the coordinate axes of each coordinate system depends on the robot. Please refer to the instruction manual for each robot.

There are the following differences between the names of the coordinate system in the Vision Sensor and the coordinate system in the OMRON Viper series.

Vision Sensor	OMRON Viper Series
Local Coordinate System	Local reference coordinate System
Tool Coordinate System	Tool Coordinate System

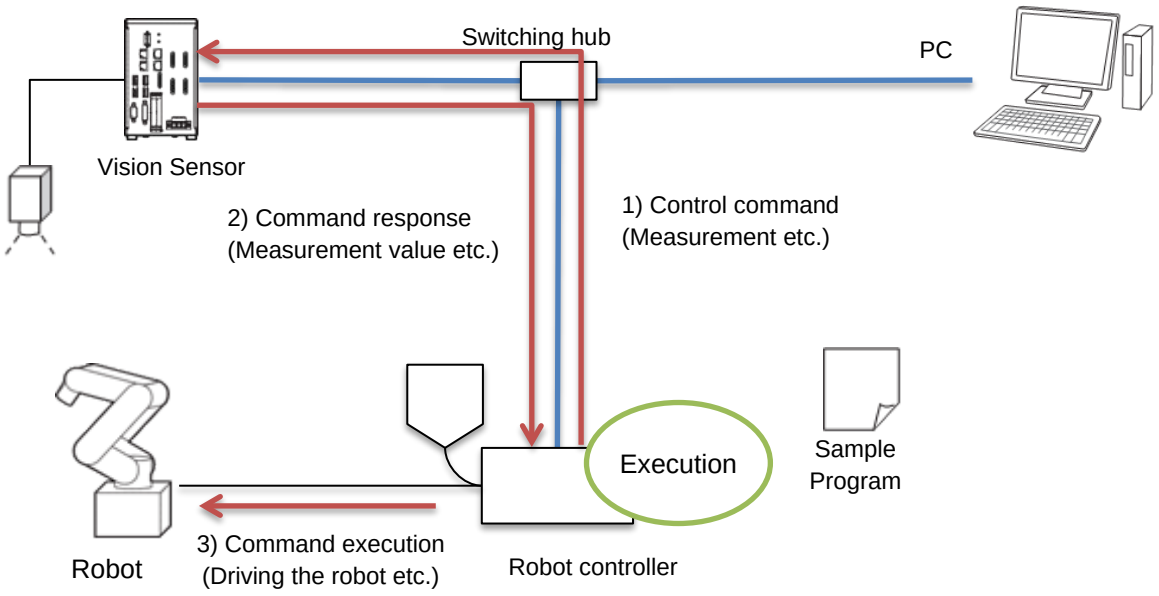
5. How to Start the Setup Program

This chapter describes how to start the setup program. To set the robot vision of the Vision Sensor, the setup program must be running on the robot side. Establish the connection between the Vision Sensor and the robot controller by [3. Connecting Vision Sensor to Robot Controller]

1	(Operation of ACE) Right-click [V+ User Module] – [sample] – [fhsetup_main()] from the Workspace Explorer and select [Execute on Task] – [Task 0].	

6. Description of the Sample Programs

This chapter describes design examples of robot programs to construct applications using a sample program (fhsample_main()).
You can understand how to implement a robot program to control the Vision Sensor as shown in the following figure.



The sample program is implemented with the following procedures. When building an actual application, design, implement and test the robot program, utilizing the functions described in Chapter 7.

6.1 Connecting the Vision Sensor to the Robot Controller

▼

6.2 Switching Scenes on the Vision Sensor

▼

6.3 Moving the Robot to the Image Position

▼

6.4 Register the Current Robot Position in the Vision Sensor

▼

6.5 Executing Measurements on the Vision Sensor

▼

6.6 Getting the Measurement Results

▼

6.7 Moving the Robot to the Robot Approach Position at Measurement

▼

6.8 Moving the Robot to the Robot Command Position at Measurement

▼

6.9 Disconnecting the Vision Sensor from the Robot Controller

Precautions for Correct Use

The implementation procedures for robot programs noted in this chapter are a reference. You should design, implement, and test actually operating robot programs based on your specific environment and applications.

In the Main Window or “Layout setup” of the Vision Sensor, check that the “Output” of the current layout is ON. If the setting were OFF, the Vision Sensor will not output measurement values.

6.1. Connecting Vision Sensor to Robot Controller

For connecting the Vision Sensor to the Robot Controller, follow the procedures below.

1 * Omitted (Refer to the source code)
Declare internal variables.

2 Execute the initialization function (fhdefglobal) for external variables.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (2)Initialaize global variables
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
CALL fhdefglobal()
socket_no = 0
err_no = success

cur_local_coord = 0
cur_tool_coord = 0

cmd_res = 0
TYPE "Initialization Done."
```

Initialization function for external variables

3 Set the IP address and the port number of the Vision Sensor to the variables. (When changing those from the default.)

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (1)Set the network configuration
;    You have to configure the following communication settings.
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
$ip_address = "10.5.5.100"
$port_no = "9876"
retries_connect = 2 ;times
timeout_connect = 4 ;sec
retries_connect = 2 ;times
timeout_connect = 4 ;sec
```

IP address

Port number

4 Set the variables as arguments for the connection function (fhconnect) to the Vision Sensor (FH server) and execute it.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (2)Connect to the FH server
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
WHILE bconnected == 0 DO
    CALL fhconnect($ip_address, $port_no, retries_connect, timeout_connect, socket_no,
err_no)
    ; Error check
    IF err_no <> success THEN
        TYPE "ERROR: fhsample_main(): Connection failed. Exit:", err_no
        GOTO 11
    END
END
TYPE "Connection Done."
```

Connection function with the Vision Sensor (FH server)

6.2. Switching Scenes on the Vision Sensor

For a processing to switch scenes on the Vision Sensor, follow the procedures below.

1 Set a scene number for the switching destination to a variable.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
        ; (1)Change the scene of the FH
        ;      You have to select a scene No. for your application.
        ;         0 : Workpiece picking scene
        ;         1 : Grasp adjustment scene
        ;         2 : Workpiece picking scene
        ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
        scene_no = 0
```

Scene number

2 Set the variables as arguments to the scene switching command execution sample function (fhsample_chgscn) to the Vision Sensor and execute it.

```
        CALL fhsample_chgscn(socket_no, retry_count, time_out, scene_no, err_no)
```

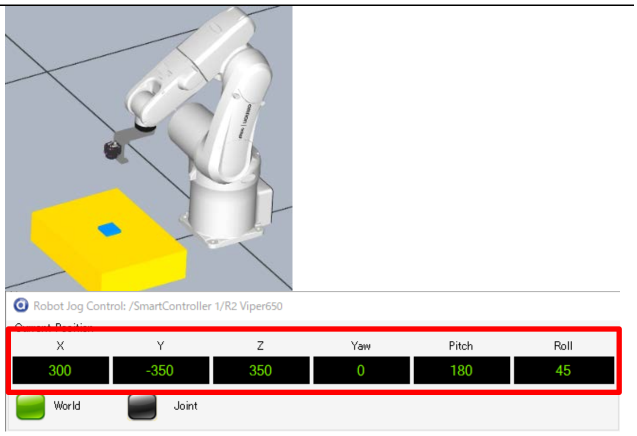
Scene switching command execution sample function

```
        ; Error check
        IF err_no <> success THEN
            TYPE "ERROR:   fhsample_main(): Connection failed. Exit:", err_no
            GOTO 10
        END
        TYPE "Change scene No. Done."
```

6.3. Moving Robot to Robot Image Position

For a processing to move the robot to the robot image position, follow the procedures below.

1 Move the robot to the imaging position.



Check the current robot position at the imaging position.

2	Set the referenced imaging position to the variables.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (2)Move the robot to the imaging position
;     You have to configure the following robot position for your application.
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
std_img_pos_x = 300
std_img_pos_y = -350
std_img_pos_y = 350
std_img_pos_y = 0
std_img_pos_y = 180
std_img_pos_y = 45
```

Set the robot imaging position to the variables.

3	Set the variables as arguments for the robot motion sample function (fhsample_move) and execute it.

```
;!!!!!!!!! CAUTION !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
; The following function drives a robot motion immediately.
; Confirm the settings before execution.
;!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
CALL fhsample_move(std_img_pos_x, std_img_pos_y, std_img_pos_z, std_img_pos_w,
std_img_pos_p, std_img_pos_r)

; Error check
IF err_no <> success THEN
    TYPE "ERROR: fhsample_main():The robot position is out of range :", err_no
    GOTO 10
END
TYPE "Move to the imaging position Done."
```

Robot motion sample function

⚠WARNING

- These operations drive the robot.
- Operate the robot in the state whereby pressing the [Emergency stop] button can stop its motion anytime.

6.4. Register the Current Robot Position in the Vision Sensor

To register the current robot position to the Vision Sensor, use "fhsample_regpos".

1	Before executing measurements, execute the current position registration c ommand execution function (fhsmaple_regpos) to the Vision Sensor.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (3)Register the current position of the robot to the FH before measurement
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
CALL fhsample_regpos(socket_no, retry_count, time_out, err_no)

; Error check
IF err_no <> success THEN
   GOTO 10
```

Current position registration command execution sample function

```
END
TYPE "Register the current robot position Done."
```

6.5. Executing Measurements on Vision Sensor

Send the measurement command to the Vision Sensor and receives a response to that command.

1 To send the measurement command to the Vision Sensor, set the command name to "MEASURE" and execute "fhrunsendcmd".

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (4)Execute measurement and get the measurement results of the FH
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;Send Measure Command
$cmd_name = "MEASURE"
$cmd_arg[0] = ""
$cmd_arg[1] = ""
$cmd_arg[2] = ""
$cmd_arg[3] = ""
$cmd_arg[4] = ""
cmd_arg_num = 0
CALL fhrunsendcmd(socket_no, cmd_arg_num, $cmd_name, $cmd_arg[], err_no)
```

nonprocedural command transmission function

```
;Error check
IF err_no <> success THEN
    GOTO 10
END
```

2 To receive the response to the measurement command from the Vision Sensor, execute "fhrunrecvres".

```
;Recv Command Response
CALL fhrunrecvres(retry_count, time_out, socket_no, cmd_res, err_no)
```

command response receiving function

```
;Error check
IF err_no <> success THEN
    GOTO 10
END

;Command Response Check
IF cmd_res <> 1 THEN
    GOTO 10
END
```

If the response is not OK, exit the program.

6.6. Getting the Measurement Results

The Vision Sensor measurements are received using "fhrunrecvval". In this sample program, it is assumed that the Vision Sensor measurements are sent in the order "TJG X Y Z W P R".

1 In order to receive the measurement results from the Vision Sensor, we execute "fhrunrecvval" and check the received overall judgment value.

```
;Get the Measurement Result
CALL fhrunrecvval(retry_count, time_out, socket_no, param[], err_no)
```

numerical sequence receiving function

```
;Error check
IF err_no <> success THEN
    GOTO 10
END

;Total Judge Check
IF param[0] <> 1 THEN
    GOTO 10
```

If the overall judgment is not OK, exit the program

2 Set the measurement results to the variables.

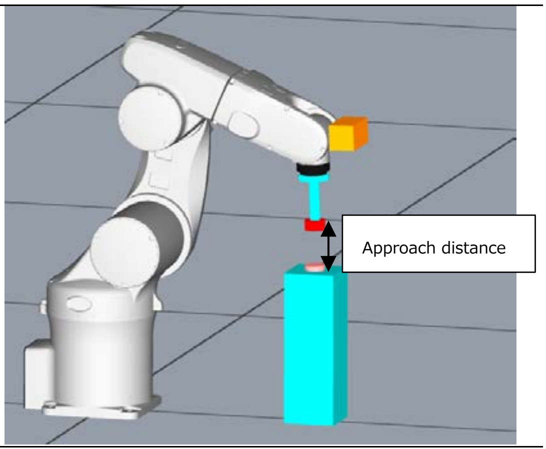
```
; Measurement results
res_cmd_pos_x = param [1]
res_cmd_pos_y = param [2]
res_cmd_pos_z = param [3]
res_cmd_pos_w = param [4]
res_cmd_pos_p= param [5]
res_cmd_pos_r = param [6]
TYPE "Measurement Done"
```

6.7. Moving Robot to Robot Approach Position at Measurement.

For a processing to move the robot to the robot approach position at measurement, follow the procedures below.

1 By the procedures at the step 2 in Chapter 6.6, check that the measurement results are stored in the variables

2 The depth of the container, the height of the workpiece position and the length of the hand are taken into account to determine the approach distance to the workpiece.



3 Set the referenced robot approach distance to the variable and add the robot approach distance to the measurement results acquired at step 2 in Chapter 6.6.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (5)Move the robot to the approach position
;       You have to configure the following robot approach distance for your application.
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
std_appro_dist = 30
```

Set the robot approach distance to the variable.

```
res_appro_pos_x = res_cmd_pos_x
res_appro_pos_x = res_cmd_pos_x
res_appro_pos_z = res_cmd_pos_z+std_appro_dist
res_appro_pos_x = res_cmd_pos_x
res_appro_pos_x = res_cmd_pos_x
res_appro_pos_x = res_cmd_pos_x
```

Add the robot approach distance to the measurement results.

4 Set the variable as arguments for the robot motion sample function (fhsample_move) and execute it.

```
;!!!!!!!!! CAUTION !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
; The following function drives a robot motion immediately.
; Confirm the settings before execution.
;!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
CALL fhsample_move(res_appro_pos_x, res_appro_pos_y, res_appro_pos_z,
res_appro_pos_w, res_appro_pos_p, res_appro_pos_r)
```

Robot motion sample function

```
; Error check
IF err_no <> success THEN
     TYPE "ERROR: fhsample_main():The approach position is out of range :", err_no
     GOTO 10
END
TYPE "Move to the approach position Done."
```

⚠WARNING

- These operations drive the robot.
- Operate the robot in the state whereby pressing the [Emergency stop] button can stop its motion anytime.

6.8. Moving Robot to Robot Command Position at Measurement

For a processing to move the robot to the robot command position at measurement, follow the procedures below.

1	By the procedures at step 2 in Chapter 6.6, check that the measurement results are stored in variables.
2	Set the variables as arguments for the robot motion sample function (fhsample_move) and execute it.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; (6)Move the robot to the measuring position.
;       You have to edit this section for your application.
;       e.g: Adding an end effector control, depart path motion, etc.
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

;!!!!!!!!! CAUTION !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
; The following function drives a robot motion immediately.
; Confirm the settings before execution.
;!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
        CALL fhsample_move(res_cmd_pos_x, res_cmd_pos_y, res_cmd_pos_z, res_cmd_pos_w,
res_cmd_pos_p, res_cmd_pos_r)

; Error check
IF err_no <> success THEN
    TYPE "ERROR: fhsample_main(): The measuring robot position is out of range :", err_no
    GOTO 10
END
TYPE "Move to the measuring position Done."
```

Robot motion sample function

⚠WARNING

- These operations drive the robot.
- Operate the robot in the state whereby pressing the [Emergency stop] button can stop its motion anytime.

6.9. Disconnecting Vision Sensor from Robot Controller

For a processing to disconnect the Vision Sensor from the Robot Controller, follow the procedures below.

1 Execute the disconnection function to the Vision Sensor.

```
10   ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
     ; 4. Example: Finalization sequence
     ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
     ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
     ; (1)Disconnect from the FH server
     ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
     WHILE bconnected == 1 THEN
        CALL fhclose(socket_no, err_no)
     END
     TYPE "Disconnection Done"
11
     TYPE "EXIT Program"
```

Disconnection function to the Vision Sensor (FH server)

7. Function Reference

This chapter describes the functions for building a robot vision application

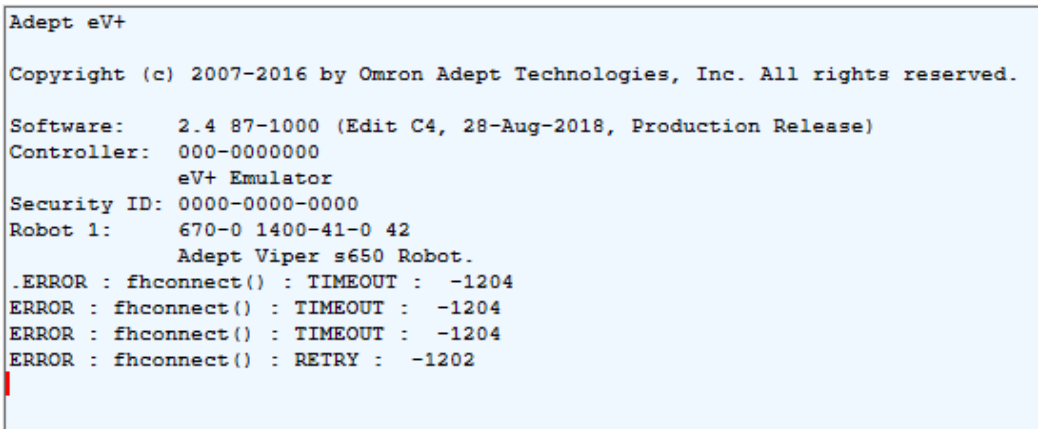
7.1. List of Functions

This is a list of functions that can be used by the actual driving robot program.

Function Name	Description	Reference
fhdefglobal	Initialize a global variable.	Chapter 7.3.1
fhconnect	Connect to the Vision Sensor	Chapter 7.3.2
fhclose	Disconnects from the Vision Sensor	Chapter 7.3.3
fhsample_chgscn	Switching the scene of the Vision Sensor	Chapter 7.3.4
fhsample_regpos	Register the current robot coordinates to the Vision Sensor	Chapter 7.3.5
fhsample_trig	Sends measurement commands to the Vision Sensor and receives the measurement results from the Vision Sensor	Chapter 7.3.6
fhsample_move	Move the robot	Chapter 7.3.7
fhrunsendcmd	Send a no-procedure command to the Vision Sensor	Chapter 7.3.8
fhrunrecvres	Receive a command response from the Vision Sensor	Chapter 7.3.9
fhrunrecvval	Receive numerical data from the Vision Sensor	Chapter 7.3.10

7.2. Error Message

The error message will be displayed in the ACE monitor window.



7.3. Function Details

7.3.1. fhdefglobal

■ Function

Initialize a global variable.

■ Syntax

fhdefglobal()

■ Parameters

None

■ Remarks

Define the global variables that are necessary to use the robot application.

■ Return Value

None

■ Precautions

Be sure to call this function before using any other function.

■ Example

The following example defines a global variable.

CALL fhdefglobal()

7.3.2. fhconnect

■ Function

Connect to the Vision Sensor

■ Syntax

fhconnect($ip_address, $port_no, retries_connect, timeout_connect, socket_no, err_no)

■ Parameters

Parameter Name	Input/Output	Data type	Description
$ip_address	Input	String	IP address of the Vision Sensor
$port_no	Input	String	Port number of the Vision Sensor
retries_connect	Input	Real	Number of connections retries (0 - 99)
timeout_connect	Input	Real	Connection Timeout Time (0 to 99sec)
socket_no	Output	Real	Number of sockets already connected to the Vision Sensor
err_no	Output	Real	Error number Store the result of the execution of this function.

■ Remarks

Connect to the Vision Sensor specified in the IP address and port number parameters.
Requests a connection every hour specified in the Connection Timeout Time parameter.
Request a connection as many times as specified in the connection retry count parameter.
Return an error if the connection fails.
Return an error if the parameter is out of the input range

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1200	ERROR:fhconnect():RETRY:-1200	Out of connection retry count input range
	ERROR:fhconnect():TIMEOUT:-1200	Connection Timeout Time Input Range
-1201	ERROR:fhconnect():ATTACH:-1201	attaching error * This error occurs when the network configuration for the device of the specified IP address fails.
-1202	ERROR:fhconnect():RETRY:-1202	Connection retry count over
-1204	ERROR:fhconnect():TIMEOUT:-1204	Connection timeout time is over.

■ Precautions

Only one Vision Sensor can be connected to the robot controller.

If you want to connect to another Vision Sensor, disconnect from the connected Vision Sensor.

■ Example

In the following example, we will connect to the Vision Sensor with IP address "10.5.5.100" and port number "9876".

```
$ip_address = "10.5.5.100"
$port_no = "9876"
retries_connect = 2
timeout_connect = 4
socket_no = 0
CALL fhconnect($ip_address, $port_no, retries_connect, timeout_connect, socket_no, err_no)
```

7.3.3. fhclose

■ function

Disconnects from the Vision Sensor

■ Syntax

fhclose(socket_no, err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
err_no	Output	Real	Error number Store the result of the execution of this function.

■ Remarks

Disconnects from the Vision Sensor

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1701	ERROR:fhclose():FCLOSE:-1701	disconnection failure
	ERROR:fhclose():DETCH:-1701	detachment failure * This error occurs when the specified socket is not released from the control of the application program.

■ Precautions

None

■ Example

The following example closes the connection to the Vision Sensor connected by fhconnect.

```
CALL fhclose(socket_no, err_no)
```

7.3.4. fhsample_chgscn

■ Function

Switching the scene of the Vision Sensor.

■ Syntax

fhsample_chgscn(socket_no, retry_count, time_out, scene_no, err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
retry_count	Input	Real	Number of receive retries (0 - 99)
time_out	Input	Real	Receive timeout time (0 to 99sec)
scene_no	Input	Real	Scene number to switch to (0 - 127)
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Sends a command to the Vision Sensor to switch to the scene number specified in the parameter.

It returns an error if this command is not connected to the Vision Sensor.

Return an error is returned if the scene number specified in the parameters is out of the input range.

Returns an error if a response is received from the Vision Sensor indicating that the scene change command failed.

■ Return value

Err. No.	Error Message	Description
0	-	normal termination
-1000	ERROR:fhsample_chgscn():Invalid Scene No.:-1000	Out of scene numbering range
-1300	ERROR:fhrecvstring():RETRY:-1300	Out of the range of receive retry count input
	ERROR:fhrecvstring():TIMEOUT:-1300	Out of the input range for the receive timeout count
-1301	ERROR:fhrecvstring():NO_CONNECTION:-1301	Calling in the unconnected state
-1303	ERROR:fhrecvstring():RETRY:-1303	Receive retry count overrun

-1304	ERROR:fhrecvstring():TIMEOUT:-1304	Receive timeout time is over.
-1601	ERROR:fhsample_chgscn():No Connection:-1601	Calling in the unconnected state
-1800	ERROR:fhsample_chgscn():Scene Change Failed:-1800	Response NG

■ Precautions

None

■ Example

In the following example, we will switch to scene 0.

```
retry_count = 2
time_out = 4
scene_no = 0

CALL fhsample_chgscn(socket_no, retry_count, time_out, scene_no, err_no)
```

7.3.5. fhsample_regpos

■ Function

Register the current robot position to the Vision Sensor.

■ Syntax

fhsample_regpos(socket_no, retry_count, time_out, err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
retry_count	Input	Real	Number of receive retries (0 - 99)
time_out	Input	Real	Receive timeout time (0 to 99sec)
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Get the current robot position and register the current robot position to the Vision Sensor.
Return an error if this function is called while the Vision Sensor is not connected.
Returns an error if a response of current robot position registration failure is received from the Vision Sensor.

■ Return value

Err. No.	Error Message	Description
0	-	normal termination
-1300	ERROR:fhrecvstring():RETRY:-1300	Out of the range of receive retry count input
	ERROR:fhrecvstring():TIMEOUT:-1300	Out of the input range for the receive timeout count
-1303	ERROR:fhrecvstring():RETRY:-1303	Receive retry count overrun
-1304	ERROR:fhrecvstring():TIMEOUT:-1304	Receive timeout time is over.
-1601	ERROR:fhsample_regpos():No Connection:-1601	Calling in the unconnected state
-1800	ERROR:fhsample_regpos():ERROR_TRIG:-1800	Response NG

■ Precautions

None

■ Example

In the following example, the current robot position is registered to the Vision Sensor.

```
retry_count = 2
time_out = 4

CALL fhsample_regpos(socket_no, retry_count, time_out, err_no)
```

7.3.6. fhsample_trig

■ Function

Sends measurement commands to the Vision Sensor and receives the measurement results from the Vision Sensor

■ Syntax

fhsample_trig(socket_no, retry_count, time_out, param[], err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
retry_count	Input	Real	Number of receive retries (0 - 99)
time_out	Input	Real	Receive timeout time (0 to 99sec)
param[]	Output	Real	param[0]:Target X coordinate param[1]:Target Y coordinate param[2]:Target Z coordinate param[3]:Target W(yaw) coordinate param[4]:Target P(pitch) coordinate param[5]:Target R (roll) coordinates
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Sends measurement commands to the Vision Sensor.

Receives the measurement results from the Vision Sensor and get the robot position.

Returns an error if called while not connected to the Vision Sensor.

Returns an error if a measurement command failure response is received from the Vision Sensor.

Returns an error if the Vision Sensor's overall judgment is NG.

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1300	ERROR:fhrecvstring():RETRY:-1300	Out of the range of receive retry count input
	ERROR:fhrecvstring():TIMEOUT:-1300	Out of the input range for the receive timeout count
-1303	ERROR:fhrecvstring():RETRY:-1303	Receive retry count overrun
-1304	ERROR:fhrecvstring():TIMEOUT:-1304	Receive timeout time is over.
-1502	ERROR:fhmeasureresult():PARAM_NUM:-1502	Abnormal number of parameters
-1601	ERROR:fhsample_trig():No Connection:-1601	Calling in the unconnected state
-1800	ERROR:fhmeasureresult():TRIG_NG:-1800	Response NG
-1801	ERROR:fhmeasureresult():TJG_NG:-1801	Overall judgment NG

■ Precautions

The measurement result received from the Vision Sensor will be stored in the param[]. To get the measurement result with this function, Result Output (Message) must be placed in the flow, and the settings must be as follows

Result Output (Message) Processing Item		The destination of the received measurement results
Setting Target	Setting details	
Output device	IoModule2: Serial (Ethernet)	-
Termination string	\r (Carriage Return)	-
Delimiter string	\x20 (Space)	-
Output data 0	Overall judgment(*1)	(Do not store)
Output data 1	Robot command position X(*1)	param[0]
Output data 2	Robot command position Y(*1)	param[1]
Output data 3	Robot command position Z(*1)	param[2]
Output data4	Robot command position W(*1)	param[3]
Output data 5	Robot command position P(*1)	param[4]
Output data6	Robot command position R(*1)	param[5]

*1: The output data format should be set as follows

- Data type: Number
- Digits of integer: 6
- Digits of decimal: 4

■ Example

In the following example, a measurement command is sent to the Vision Sensor, and after receiving the measurement result from the image sensor, the robot moves to the position of the measurement result.

```
retry_count = 2
time_out = 4

CALL fhsample_trig(socket_no, retry_count, time_out, param[], err_no)

res_cmd_pos_x = param[0]
res_cmd_pos_y = param[1]
res_cmd_pos_z = param[2]
res_cmd_pos_w = param[3]
res_cmd_pos_p = param[4]
res_cmd_pos_r = param[5]

CALL fhsample_move(res_cmd_pos_x, res_cmd_pos_y, res_cmd_pos_z,
res_cmd_pos_w, res_cmd_pos_p, res_cmd_pos_r, err_no)
```

7.3.7. fhsample_move

■ Function

Move the robot

■ Syntax

fhsample_move(pos_x, pos_y, pos_z, pos_w, pos_p, pos_r, err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
pos_x	Input	Real	Moving target robot coordinates X
pos_y	Input	Real	Moving target robot coordinates Y
pos_z	Input	Real	Moving target robot coordinates Z
pos_w	Input	Real	Moving target robot coordinates W
pos_p	Input	Real	Moving target robot coordinates P
pos_r	Input	Real	Moving target robot coordinates R
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Moves the robot to the position specified by the parameter.

Returns an error if the target robot position is out of the movement range.

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1503	ERROR:fhsample_move():The Robot Position is Out of Range:-1503	out of range error

■ Precautions

None

■ Example

In the following example, Move the robot to the (X,Y,Z,W,P,R) = (300,0,200,0,180,0)

```
pos_x = 300
pos_y = 0
pos_z = 200
pos_w = 0
pos_p = 180
pos_r = 0

CALL fhsample_move(pos_x, pos_y, pos_z, pos_w, pos_p, pos_r, err_no)
```

7.3.8. fhrunsendcmd

■ Function

Send a no-procedure command to the Vision Sensor

■ Syntax

fhrunsendcmd(socket_no, cmd_arg_num, $cmd_name, $cmd_arg[], err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
cmd_arg_num	Input	Real	Number of no-procedural command arguments to be sent to the Vision Sensor (0 to 5)
$cmd_name	Input	String	No-procedural commands to be sent to the Vision Sensor
$cmd_arg[]	Input	String	cmd_arg[0]: Argument 1 of the no-procedure command sent to the Vision Sensor(string). cmd_arg[1]: Argument 2 of the no-procedure command sent to the Vision Sensor(string). cmd_arg[2]: Argument 3 of the no-procedure command sent to the Vision Sensor(string). cmd_arg[3]: Argument 4 of the no-procedure command sent to the Vision Sensor(string). cmd_arg[4]: Argument 5 of the no-procedure command sent to the Vision Sensor(string).
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Sends a no-procedure command to the Vision Sensor, concatenating the parameters according to the following format.

If the number of no-protocol command arguments is out of the input range, an error is returned.

<Format>

No-protocol command	SP(*1)	Command argument 1	SP	Command argument 2	SP	…	Command argument n(*2)

*1: “SP” is space

*2: The command argument n depends on the number of non-procedural command arguments.

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1506	ERROR:fhrunsendcmd():Invalid Command Argument No.:-1506	The number of no-procedural command arguments is out of the input range.
-1601	ERROR:fhsendstring():NO_CONNECTION:-1601	Calling in the unconnected state
	ERROR:fhsendstring():NO_DATA:-1601	Send string length 0
	ERROR:fhsendstring():WRITE:-1601	Send failure
-1602	ERROR:fhsendstring():STRING_LEN:-1602	Send string length over

■ Precautions

The length of the string of the no-stepping command that can be sent is 127 bytes (not including the delimiter).

Set the parameters of $cmd_name and $cmd_arg[] so that the length of the string of the no-procedure command to be sent does not exceed 127 bytes.

■ Example

The following example shows how to send the measurement command "MEASURE" to the Vision Sensor

```
$cmd_name = "MEASURE"
$cmd_arg[0] = ""
$cmd_arg[1] = ""
$cmd_arg[2] = ""
$cmd_arg[3] = ""
$cmd_arg[4] = ""
cmd_arg_num = 0

CALL fhrunsendcmd(socket_no, cmd_arg_num, $cmd_name, $cmd_arg[], err_no)
```

7.3.9. fhrunrecvres

■ Function

fhrunrecvres

■ Syntax

fhrunrecvres(retries_recv, timeout_recv, socket_no, cmd_res, err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
retries_recv	Input	Real	Number of receive retries (0 - 99)
timeout_recv	Input	Real	Receive timeout time (0 to 99sec)
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
cmd_res	Output	Real	Command response results (1: Command response "OK" -1: Command response other than "OK")
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

Receive the response (command response) to the no-procedure command sent to the Vision Sensor.

If the command response is OK, assign 1 to the command response result cmd_res.

If the command response is not OK, assign "-1" to the command response result cmd_res.

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1300	ERROR:fhrecvstring():RETRY:-1300	Out of the range of receive retry count input
	ERROR:fhrecvstring():TIMEOUT:-1300	Out of the input range for the receive timeout count
-1301	ERROR:fhrecvstring():NO_CONNECTION:-1301	Calling in the unconnected state
-1303	ERROR:fhrecvstring():RETRY:-1303	Receive retry count overrun
-1304	ERROR:fhrecvstring():TIMEOUT:-1304	Receive timeout time is over.

■ Precautions

None

■ Example

In the following example, a command response is received from the Vision Sensor, and if the received command response is not OK (0), the program is terminated.

```
retry_count = 2
time_out = 4
CALL fhrunrecvres(retry_count, time_out, socket_no, cmd_res, err_no)

IF cmd_res <> 1 THEN
  GOTO 10
END
```

7.3.10. fhrunrecvval

■ Function

Receive numerical data from the Vision Sensor

■ Syntax

fhrunrecvval(retries_recv, timeout_recv, socket_no, param[], err_no)

■ Parameter

Parameter Name	Input/Output	Data type	Description
retries_recv	Input	Real	Number of receive retries (0 - 99)
timeout_recv	Input	Real	Receive timeout time (0 to 99sec)
socket_no	Input	Real	Number of sockets already connected to the Vision Sensor
param[]	Output	Real	Results of the analysis of the received numerical sequence (Element count: 10)
err_no	Output	Real	error number Store the result of the execution of this function.

■ Remarks

This function stores the numerical data sent from the Vision Sensor into the variable specified by the parameter.

This function outputs up to 10 values.

If there are more than 11 numbers, this function outputs only the first 10.

If the length of the segmented string is longer than 12 bytes, this function returns an error of abnormal parameter length.

Returns an error if the number of numeric data is zero.

The following is an example of the output when a string is included.

<Conversion example>

The string before conversion	The result of the analysis after conversion
abc	0
123abc	123
abc123	0
1.00E+03	1000

■ Return Value

Err. No.	Error Message	Description
0	-	normal termination
-1300	ERROR:fhrecvstring():RETRY:-1300	Out of the range of receive retry count input
	ERROR:fhrecvstring():TIMEOUT:-1300	Out of the input range for the receive timeout count
-1301	ERROR:fhrecvstring():NO_DATA:-1301	Receive data length 0
	ERROR:fhrecvstring():NO_CONNECTION:-1301	Calling in the unconnected state
-1302	ERROR:fhrecvstring():STRING_LEN:-1302	Receive data length over
-1303	ERROR:fhrecvstring():RETRY:-1303	Receive retry count overrun
-1304	ERROR:fhrecvstring():TIMEOUT:-1304	Receive timeout time is over.
-1502	ERROR:fhparseval():PARAM_TOO_LONG:-1502	Abnormal parameter length
-1502	ERROR:fhparseval():PARAM_NUM:-1502	Abnormal number of parameters
-1504	ERROR:fhparseval():NO_CMD:-1504	The length of the string to be divided is 0.

■ Precautions

The maximum length of the string to be received is 127 bytes (not including the delimiter). if more than 128 bytes are received, an error is returned.

The measurement result received from the Vision Sensor will be stored in the param[].

To get the measurement result with this function, Result Output (Message) must be placed in the flow, and the settings must be as follows

Result Output (Message) Processing Item		The destination of the received measurement results
Setting Target	Setting details	
Output device	IoModule2: Serial (Ethernet)	-
Termination string	\r (Carriage Return)	-
Delimiter string	\x20 (Space)	-
Output Data 0 - 9	numerical data(*1)	param[0] - param[9]

*1: The output data format should be set as follows

- Data type: Number
- Digits of integer: 6
- Digits of decimal: 4

■ Example

In the following example, the program receives a sequence of numbers sent by the Vision Sensor and exits the program if the first received data is not 1.

```
retry_count = 2
time_out = 4

CALL fhrunrecvval(retry_count, time_out, socket_no, param[], err_no)

IF param[0] <> 1 THEN
  GOTO 10
END
```

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