DENSO

DENSO Robotics
THIRD PARTY PRODUCTS

PROVIDER MANUAL

Maker

OMRON

Products／Series

Vision Sensor

MODEL: FZ Series

Vision

Introduction

This document is a user's manual for the provider to use "OMRON Vision Sensor FZ Series" connected to the DENSO robot controller RC8 series. Note that some functions may be unavailable on the FZ series. For details and handling of the connected device, refer to the user's manual of "OMRON Vision Sensor FZ Series".

> Caution: (1) Note that the functions and performance cannot be guaranteed if this product is used without observing instructions in this manual.
> (2) All products and company names mentioned are trademarks or registered trademarks of their respective holders.

This manual covers the following product

OMRON   **FZ3, FZ4, and FZM1 Series**
              FZ5, FH Series
              FQ-M, FQ2 Series (Part of Commands)

Important

To ensure proper and safe operation, be sure to read "Safety Precautions Manual" before using the provider.

Notice to Customers

1. Risks associated with using this product

The user of this product shall be responsible for embedding and using the product (software) on a system and any result from using it.
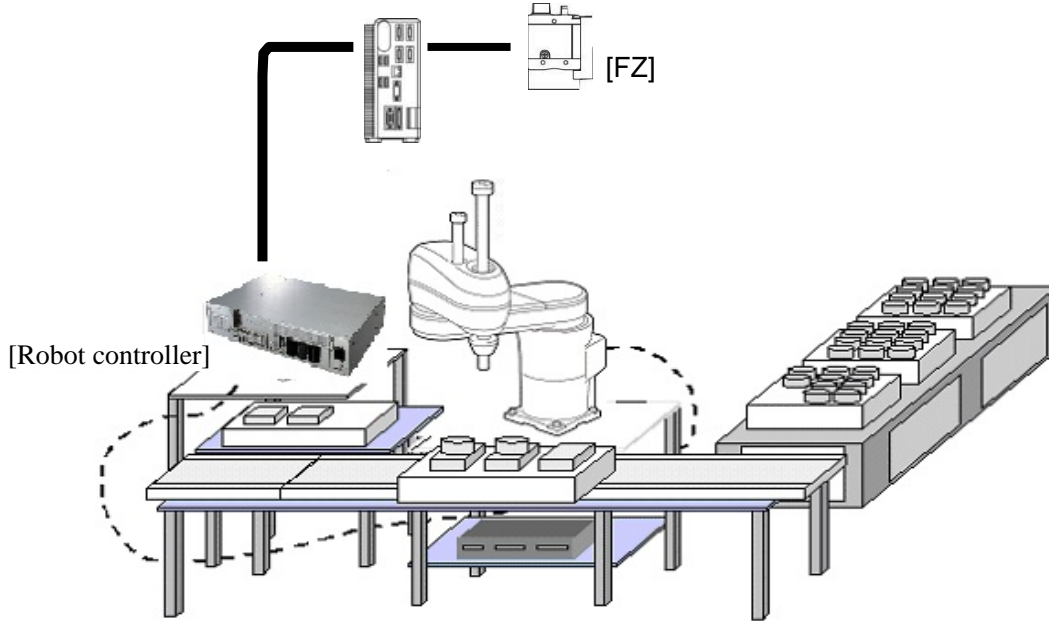
# Contents

1. Outline of This Product (Provider)

1.1 Target device of provider

This provider can be used only when a DENSO robot controller (RC8 series) is connected to the FZ series.


1.2 Features of provider

This provider is provided to use the FZ native commands required to access FZ series in the robot program. Use of this provider allows customers to establish communication with a robot easily without creating a communication program for FZ series. The following shows a diagram of provider embedding.
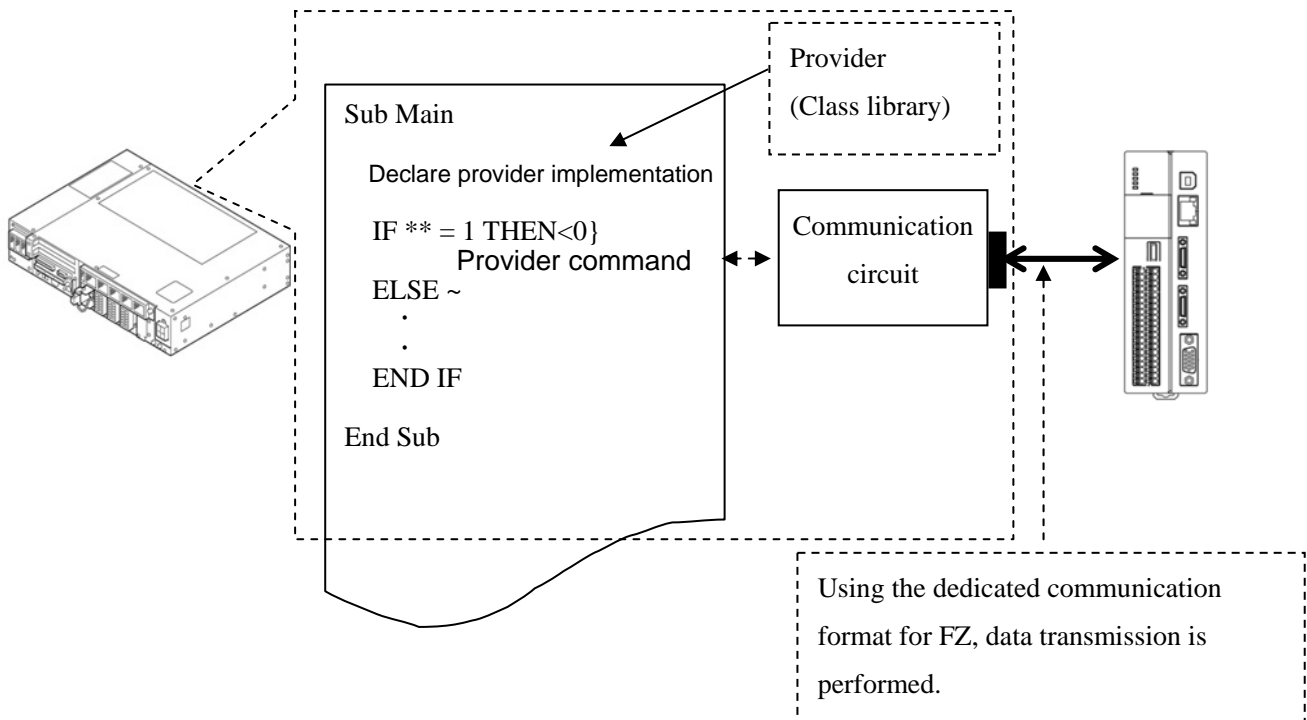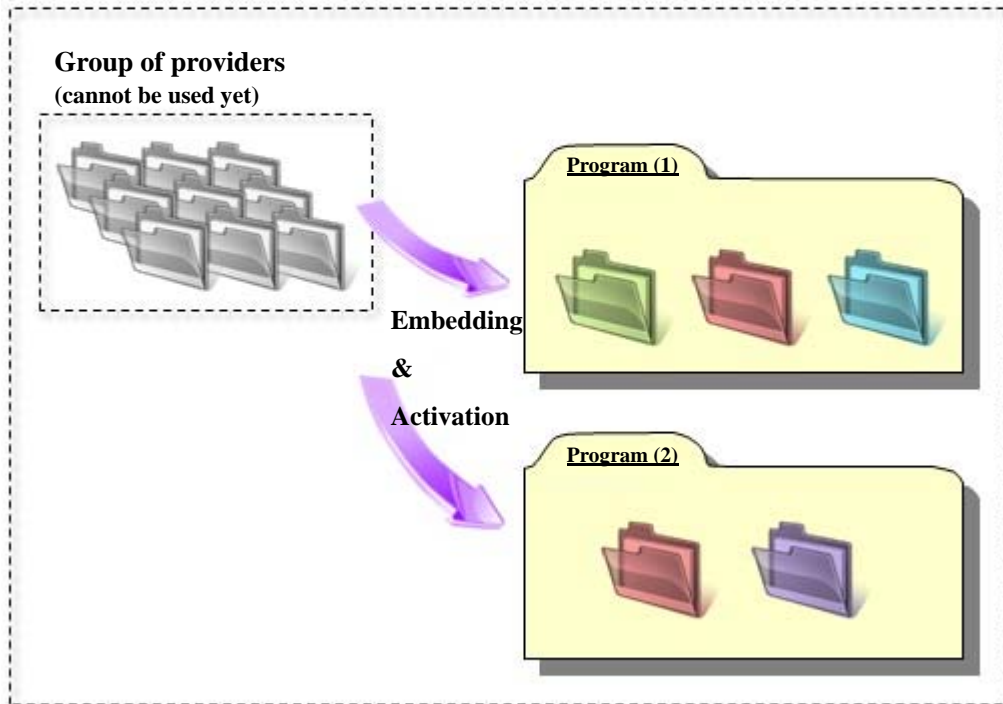
1.3 Mechanism of provider

This provider offers various programs required to control the target device as a single provider. Just activate the license to use the provider. Once provider implementation is declared on a desired program file, the functions prepared by the provider can be used as commands in the user program. Since the provider is included in the controller, there is no need of installation. Also, it is possible to implement multiple providers of different type. Note that a program (procedure) cannot contain the providers of the same type.

If **provider** is compared to a folder,

the folder contains various **commands**.
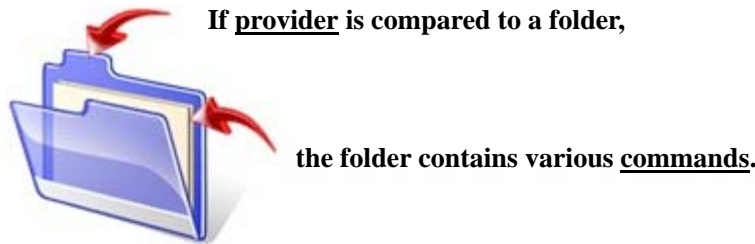
Controller internal image

Group of providers
(cannot be used yet)

Program (1)

Embedding

&

Activation

Program (2)

Provider prepared in the system. This cannot be used yet.

Provider after embedding. This can be used in a provider-embedded program. Different colors are used to indicate the provider type.

Note: When the same provider exists in different programs like ⬜ in the above figure, exclusion process is required between the programs (tasks).

* The provider is provided as a dynamic link library (abbreviated as DLL) which can be used from PacScript.

2. How to Connect

2.1 Ethernet (TCP/IP) connection example

To connect to the robot controller via Ethernet, use a crossover LAN cable. Also, when a switching hub/router is used, use the cable suitable for the switching hub/router specifications. (The provider for FZ does not support RS-232C.)

[FZ series]

[Robot controller]

LAN cable
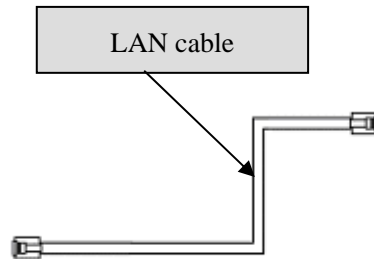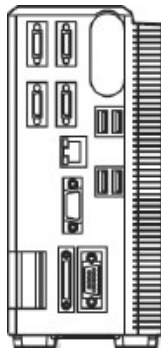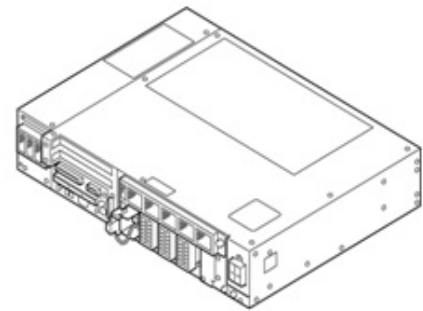
3. Communication Settings for Robot Controller and Device Used

Use a teach pendant to adjust the communication settings for the device to be used.
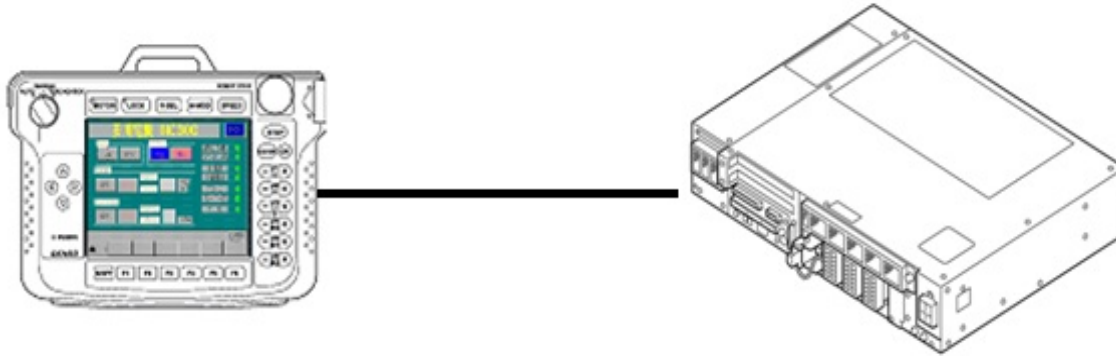
3.1 Communication via Ethernet (TCP/IP)

3.1.1 Ethernet (TCP/IP) communication settings on robot controller

Set the robot controller's IP address.

(1) Press [F6 Setting] - [F5 Communication and Token] - [F2 Network and Permission] to display the [Communication Settings] window. Set the IP address and subnet mask so that the robot controller and FZ series are within the same subnet mask.
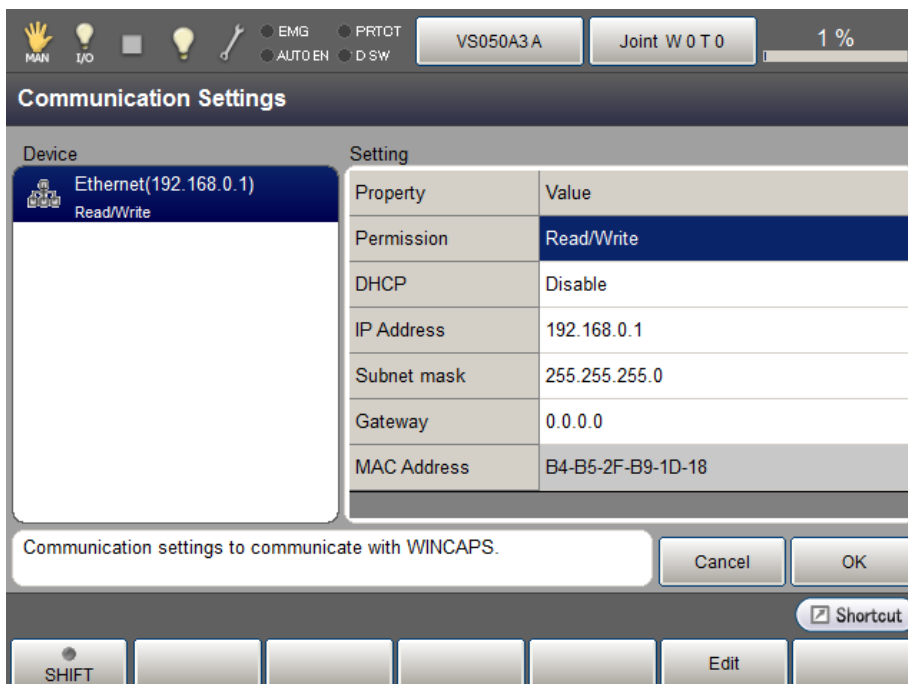
3.1.2 Ethernet (TCP/IP) communication settings for FZ

- Operation procedure

Select Mode - [System] - [Communication specifications] - [Serial] - [Ethernet] to open the setting window.

Set the IP address and subnet mask so that the robot controller and FZ are within the same subnet mask.

The port (transmission) number must be the same as that of the robot controller (Default: 9876).

[Status settings at startup]

- Operation procedure

Mode - [System] - [Controller] - [Startup setting] - [Communication]

Set "Normal (TCP)".

[Output settings]

[Flow edit] - [External output of results] - [Serial data output] - [Output format]

- ・ Communication method: Ethernet
- ・ Output form: ASCII
- ・ Minus: -
- ・ 0 suppress: Available
- ・ Field separator: Comma
- ・ Record separator: Delimiter

* For details, refer to the OMRON FZ user's manual.

4. Provider Execution Procedure

The basic process of the provider is implementation (declaration) -> execution. This provider takes a connection process at the time of implementation. The operation can be repeated as many times as needed. A program example is shown below.

```
Sub Main

On Error Goto ErrorProc      (1)                          'Declare error process routine
Dim caoCtrl as Object                (2)                            'Declare provider variable
Dim vntResult as Variant     (3)                          'Declare result acquisition variable

caoCtrl = cao.AddController("FZ", "caoProv.OMRON.FZ", "", "conn=eth:192.168.0.2") (4)

"State from trigger to data receiving process"      (5)


EndProc:
      'End process
      Exit Sub


ErrorProc:
      'Error process


End Sub
```

(1) Declare the provider error processing routine as needed. (Connection error detection at declaration)

(2) Declare the provider implementation variable as Object type. The variable name can be specified arbitrarily.

(3) Declare the result acquisition variable. The data type depends on the command.

(4) Execute implementation with the provider declaration command cao.AddController. The parameters required for settings vary by provider. From this point the provider commands are available using the implementation variable caoCtrl.

(5) Now the program can be stated using the provider commands.

5. Command Description

This page contains a description of commands. The commands are classified into connection commands, FZ commands, and proprietary extension commands. For the detailed operation of FZ commands, refer to the reference manuals for the OMRON FZ and FQ2 series.

Table 5-1 List of commands

Command	FZ series command name	Usage	Refer to
Connection command			
cao.AddController	—	Implements the provider to a variable and makes a connection to FZ.	13
FZ commands			
SCENE	SCENE	Acquires the current scene number.	14
		Changes the scene number currently in use.	15
SCENEGROUP	SCENEGROUP	Acquires the scene group number currently in use.	16
		Changes the scene group number.	17
MEASURE	MEASURE	Executes measurement once and receives the result.	18
TRIGGER	—	Execute MEASURE command one time. The result of MEASURE command is not received.	19
GETRESULT	—	Get the result of the serial data output.	20
SCRSWITCH	SCRSWITCH	Switches between the adjustment screen and the operation screen.	21
LAYOUTNO	LAYOUTNO	Get current layout number.	22
		Switch currently used layout number.	23
UNITDATA	UNITDATA	Acquires the parameters and measurement values of a specified processing unit.	24
		Changes the parameters of a specified processing unit.	25
CLRMEAS	CLRMEAS	Clears all the measurement values in the current scene.	26
Proprietary extension commands			
RAW	—	Sends a specified command and receives a response.	27
CLEARPACKET	—	Clear the received packet.	28
SETTIMEOUT	—	Set the communication timeout value.	29
GETTIMEOUT	—	Get the timeout value.	30

Following abbreviated expressions are used for the command descriptions in this manual.

<Implementation variable>:<ImplVar>

<Property variable>:<PropVar>

Table 5-2 FZ provider supported commands

Non-procedure commands	Provider commands	FZ series		
		FZ3/4/FZM1	FZ5/FH	FQ-M/FQ2
SCENE	SCENE	A	A	A
SCNGROUP	SCNGROUP	A	A	NA
MEASURE	MEASURE	A	A	A
	TRIGGER	A	A	A
	GETRESULT	A	A	A
SCRSWITCH	SCRSWITCH	A	NA	NA
LAYOUTNO	LAYOUTNO	NA	A	NA
UNITDATA	UNITDATA	A	A	NA
CLRMEAS	CLRMEAS	A	A	A
─	RAW	A	A	A
─	CLEARPACKET	A	A	A
─	SETTIMEOUT	A	A	A
─	GETTIMEOUT	A	A	A

A: Available

NA: Not available

cao.AddController

Usage   Implements the provider to a variable and makes a connection to FZ.

Syntax   **cao.AddController** (<Controller name>,<Provider name>,
<Provider running machine name>,<Option>)

Argument:
<Controller name> Assign a name (The name is used for control).
<Provider name> "CaoProv.OMRON.FZ"
<Provider running machine name> Omit this parameter.
<Option> [Connection parameter], [Timeout period]

[Connection parameter] "conn=eth:<IP address>[:Port number]"
Default port number is 9876.
(The port number is optional.)
[Timeout period] Specify the timeout period (msec) for transmission.
"Timeout[=<Time>]" Default: 500
(The timeout period is optional.)

Description The provider becomes effective when implemented to a variable. From this point the implemented Object type variable is used to access the provider. (The implemented variable is called "Implementation Variable".)

Example
    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "","conn=eth:192.168.0.2")

* Specify a port number and timeout period as follows:
    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "","conn=eth:192.168.0.2:9876,
      Timeout = 500")

<ImplVar>.SCENE

Usage   Acquires the scene number currently in use.

Syntax   **<ImplVar>.SCENE**

Return value: The scene number currently in use (integer).

Description The scene number currently in use is acquired.

Example
        Dim caoCtrl as Object
        Dim iResult as Integer

        caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
        iResult = caoCtrl.SCENE

<ImplVar>.SCENE

Usage   Changes the scene number to be used.

Syntax   **<ImplVar>.ChangeMode** <Scene number>

Argument: <Scene number> Scene number (integer).

Description The scene number to be used is changed.

Example
    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.SCENE 2   'To scene number 2

<ImplVar>.SCNGROUP

Usage   Acquires the scene group number currently in use.

Syntax   **<ImplVar>.SCNGROUP**

Return value: The scene group number currently in use (integer).

Description   The scene group number currently in use is acquired.

Example
        Dim caoCtrl as Object
        Dim iResult as Integer

        caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
        iResult = caoCtrl.SCNGROUP

<ImplVar>.SCNGROUP

Usage   Changes the scene group number to be used.

Syntax   **<ImplVar>.SCNGROUP** <Scene group number>

Argument: <Scene group number> Scene group number (integer).

Description The scene group number to be used is changed.

Example
    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.SCNGROUP 4   'To scene group number 4

<ImplVar>.MEASURE

Usage   Executes measurement once and receives the result.

Syntax   **<ImplVar>.MEASURE**

Return value: Measurement result (Variant type).

Description Measurement is executed once and the measurement result specified in the serial data output setting is received. If the serial data output is not set, the command waits until the timeout period passes. If multiple items of data are received, they are stored as an array.

Example
```
Dim caoCtrl as Object
Dim vntResult as Variant

caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
vntResult = caoCtrl.MEASURE
```

\<ImplVar\>.TRIGGER

Usage   Send MEASURE command.

Syntax   **\<ImplVar\>.TRIGGER**

         Return value: None

Description Send MEASURE command. To obtain the result of serial data output, use
         GETRESULT command. Use this command when serial data output is not set.

Example
      Dim caoCtrl as Object
      Dim vntResult as Variant

      caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
      caoCtrl.TRIGGER
      vntResult = caoCtrl.GETRESULT

<ImplVar>.GETRESULT

Usage   Get the result of the serial data output.

Syntax   **<ImplVar>.GETRESULT**

Return value: Measurement result (serial data output) (Variant type)

Description Get the result of the serial data output.

Example
        Dim caoCtrl as Object
        Dim vntResult as Variant

        caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
        caoCtrl.TRIGGER
        vntResult = caoCtrl.GETRESULT

<ImplVar>.SCRSWITCH

Usage Switches between the adjustment screen and the operation screen.

Syntax **<ImplVar>.SCRSWITCH**

Description The adjustment screen is switched to the operation screen and vice versa.

Example
    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.SCRSWITCH

<ImplVar>.LAYAOUTNO

Usage　　　Get the currently used layout number.

Syntax　　　**<ImplVar>.LAYAOUTNO (**⟨lTargetNumber⟩**)**

Argument: < lTargetNumber > Target Number (integer).
　　　　0 : Local
　　　　1 : Remote

Return value: Layout Number (integer).
　　　　FH : 0 – 7
　　　　FZ5 : 0 or 1

Description Get the currently used layout number.

Example
　　Dim caoCtrl as Object
　　Dim iResult as Integer

　　caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
　　iResult = caoCtrl.LAYOUTNO(0)

<ImplVar>.LAYAOUTNO

Usage   Switch the currently used layout number.

Syntax   **<ImplVar>.LAYAOUTNO** ⟨lTargetNumber⟩, ⟨lLayoutNo⟩

Argument: < lTargetNumber > Target Number (integer).
        0 : Local
        1 : Remote
      <lLayoutNo> Layout Number (integer).
        FH : 0 – 7
        FZ5 : 0 or 1

Return value: None

Description Switch the currently used layout number.

Example
    Dim caoCtrl as Object
    Dim iResult as Integer

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.LAYOUTNO 0,1

<ImplVar>.UNITDATA

Usage   Acquires the parameters and measurement values of a specified processing unit.

Syntax   **<ImplVar>.UNITDATA (**<Processing unit number>,

<External reference table>,**)**

Argument: <Processing unit number> Specify the processing unit number (integers 0 to 999).
<External reference table> Specify the external reference table (integer).

Return value: An acquired measurement value is stored (character string).

Description The parameters and measurement values of a processing unit specified in the scene currently in use are acquired.

Example

The following shows an example of acquiring the "detection result" (external reference table value "0") of [Search] specified for the sixth processing unit (with processing unit number "5").

Dim caoCtrl as Object
Dim bstrMeasure as String

caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
bstrMeasure = caoCtrl.UNITDATA(5,0)

<ImplVar>.UNITDATA

Usage   Changes the parameters of a specified processing unit.

Syntax   **<ImplVar>.UNITDATA (**<Processing unit number>,
<External reference table>,
<Setting data parameter>**)**

Argument: <Processing unit number> Specify the processing unit number (integers 0 to 999).
<External reference table> Specify the external reference table (integer).
<Setting data parameter> Specify the setting data (Variant type).

Return value: None

Description The parameters of a processing unit specified in the scene currently in use are changed.

Example

The following shows an example in which the "angle change step" (external reference table value "124") of [Search] specified for the sixth processing unit (with processing unit number "5") is changed to "10."

Dim caoCtrl as Object

caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
caoCtrl.UNITDATA 5, 124, 10

\<ImplVar\>.CLRMEAS

Usage   Clears all the measurement values in the current scene.

Syntax   **\<ImplVar\>.CLRMEAS**

Description All the measurement values in the current scene are cleared.

Example

    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.CLRMEAS

<ImplVar>.RAW

Usage   Sends a command and receives a response.

Syntax   **<ImplVar>.RAW (**<Command to send>, [<Reception count>]**)**

Argument: <Command to send> Specify a command with a character string
(character string).
[<Reception count>] Specify a reception count (integer).
Default: 1

Return value: A received response is stored (Variant type).

Description A specified command format is sent and a response is received.

Example
The following shows an example of receiving a scene number ("SCENE" command) (using scene 0).

```
Dim caoCtrl as Object
Dim vntResult as Variant

caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
vntResult = caoCtrl.RAW("SCENE", 2)
```

<ImplVar>.CLEARPACKET

Usage   Clear currently receiving all packets.

Syntax   **<ImplVar>.CLEARPACKET**

Argument: None

Return value: None.

Description Clear currently receiving all packets.

Example
        Dim caoCtrl as Object
        Dim vntResult as Variant

        caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
        vntResult = caoCtrl.CLEARPACKET

<ImplVar>.SETTIMEOUT

Usage   Set the communication timeout value.

Syntax   **<ImplVar>.SETTIMEOUT** <lTime>

Argument: Time-out time (msec) (integer)

Return value: None.

Description Set the communication timeout value.

Example

    Dim caoCtrl as Object

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    caoCtrl.SETTIMEOUT 1000

<ImplVar>.GETTIMEOUT

Usage   Get the communication timeout value.

Syntax   **<ImplVar>.GETTIMEOUT**

Argument: None

Return value: Time-out time (msec) (integer)

Description Get the communication timeout value.

Example

    Dim caoCtrl as Object
    Dim lTimeout as Long

    caoCtrl=cao.AddController("FZ","CaoProv.OMRON.FZ", "", "conn=eth:192.168.0.2")
    vntResult = caoCtrl.GETTIMEOUT
    lTimeout = caoCtrl.GETTIMEOUT

6. Error code of FZ provider

In the FZ provider, specific error codes shown below are designated.

| Error number	Explanation
0x80100010	FZ status code

Refer to the FZ series user's manual of OMRON, for about error handling procedure.
About the ORiN2 commonness error, please refer to the chapter of the error code of "ORiN2 Programming guide".

7. Operation Panel Screen

This provider provides the following operation panel screen. This operation panel uses the provider to check operations, etc. after connecting to the device. See the following as an application example of the operation panel. Displaying the operation panel establishes connection to FZ (implements the provider). The communication settings need to be configured beforehand. Closing the operation panel terminates the connection (releases the provider).

[Main screen]
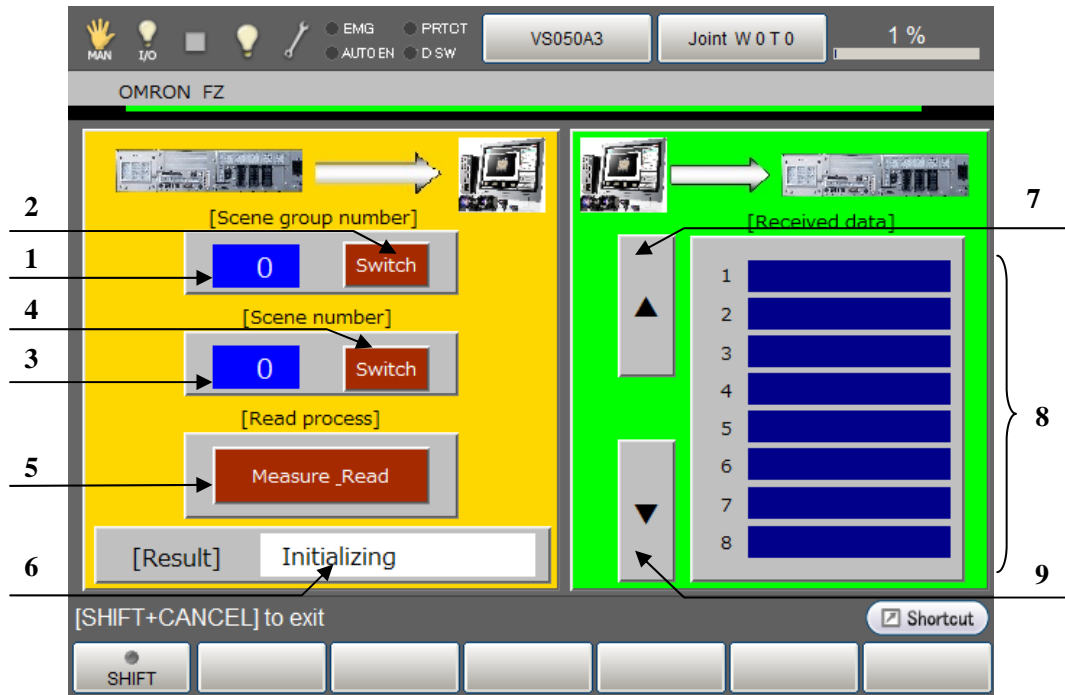
Description   Each button functions as follows.

1.   Sets a scene group number.

2.   Changes to the scene group number set in (1). (SCNGROUP)

3.   Sets a scene number.

4.   Changes to the scene number set in (3). (SCENE)

5.   Executes measurement and gets a reading. (Measure) Received data appears in the data display section (9).

6.   Displays the processing result.

7.   Moves up the page displayed for received data.

8.   Displays the received data.

9.   Moves down the page displayed for received data.

Note 1: When a provider implementation (initialization) is done properly, "Connected" is displayed in the field (6).

Note 2: Do not use the operation panel screen when the FZ provider is used by PacScript program.

8. Sample Program

Sub Main

    On Error Goto ErrProc   'Declare error process routine

    Dim caoFZ as Object   'Declare provider variable

    Dim vntResult as Variant   'Declare variable

    Dim pTargetPos as Position   'Declare P-type variable

    takearm keep = 0

    pTargetPos = P11

    caoFZ = cao.AddController("FZ", "CaoProv.OMRON.FZ" , "", "Conn=eth:192.168.0.2)

                             'Provider implementation

    caoFZ.SCENE 2   'Change to scene number 2

    vntResult = caoFZ.MEASURE   'Wait for measurement and reception

    letx pTargetPos = posx(P11) + vntResult(0)   'Expand X component of received data to

                             'position data

    lety pTargetPos = posy(P11) + vntResult(1)   'Expand Y component of received data to

                               'position data

    approach p, pTargetPos, @p 20, s = 100   'Go to position after correction

    move l, @e pTargetPos, s = 10

    call Hand.Close

    depart l, @p 50, s = 100

EndProc: 'Normal end routine

    "State necessary end process"

    exit sub

ErrProc: 'Abnormal end routine

    "State necessary error process"

End Sub

Revision History

DENSO Robot
Provider
User's Manual
OMRON　Vision Sensor FZ Series

Version	Supported RC8	Content
Ver.1.0.0	Ver.1.1.2	First version
Ver.1.0.1	Ver.1.2.2 and later	Change in the specification of the Measure command and addition to the setup
Ver.1.0.1	Ver.1.4.* and later	Addition of commands "UNITDATA" and "RAW"
Ver.1.0.3	Ver.1.7.* and later	Addition of commands " TRIGGER " and " GETRESULT ", "CLEARPACKET", "GETTIMEOUT", "SETTIMEOUT", "LAYOUTNO". FH, FZ5 is supported. Corrected misprints.

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