

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)
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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.

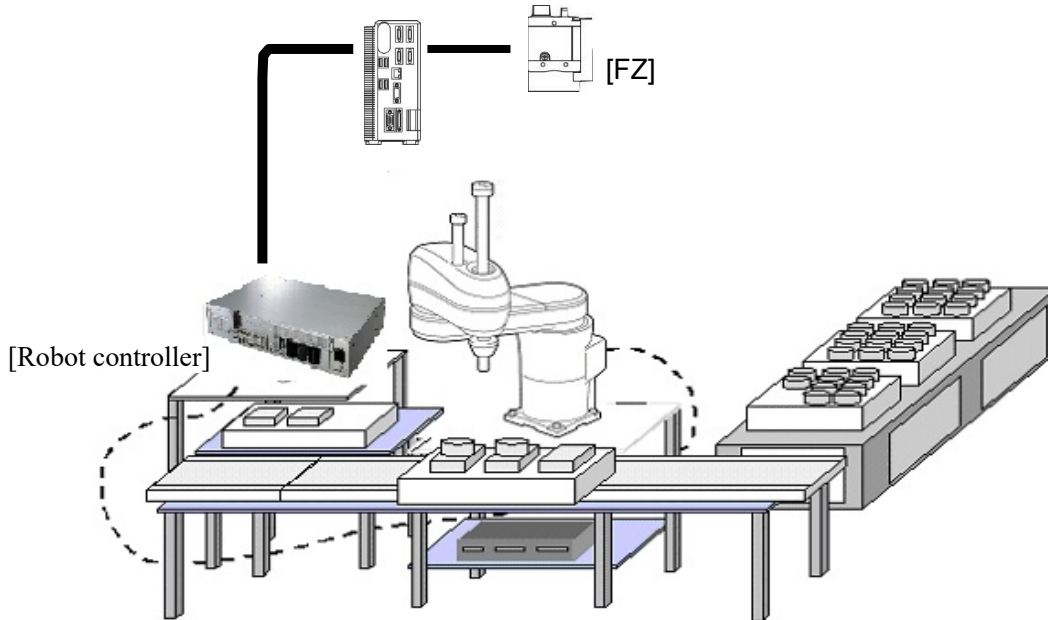
Contents

Introduction.....	2
Important.....	2
Notice to Customers.....	2
1. Outline of This Product (Provider)	4
2. How to Connect	6
3. Communication Settings for Robot Controller and Device Used	7
4. Provider Execution Procedure	10
5. Command Description	11
6. Error code of FZ provider	31
7. Operation Panel Screen.....	32
8. Sample Program.....	33
Revision History	34

1. Outline of This Product (Provider)

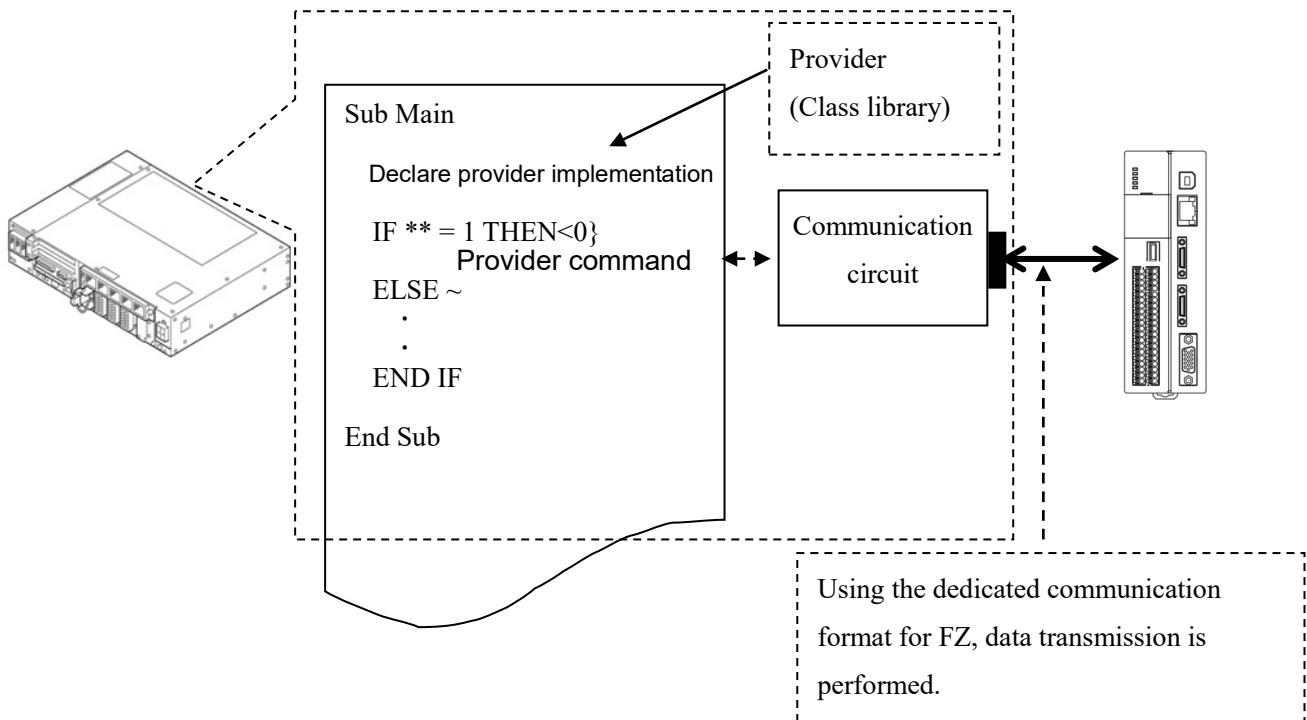
1.1 Target device of provider

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



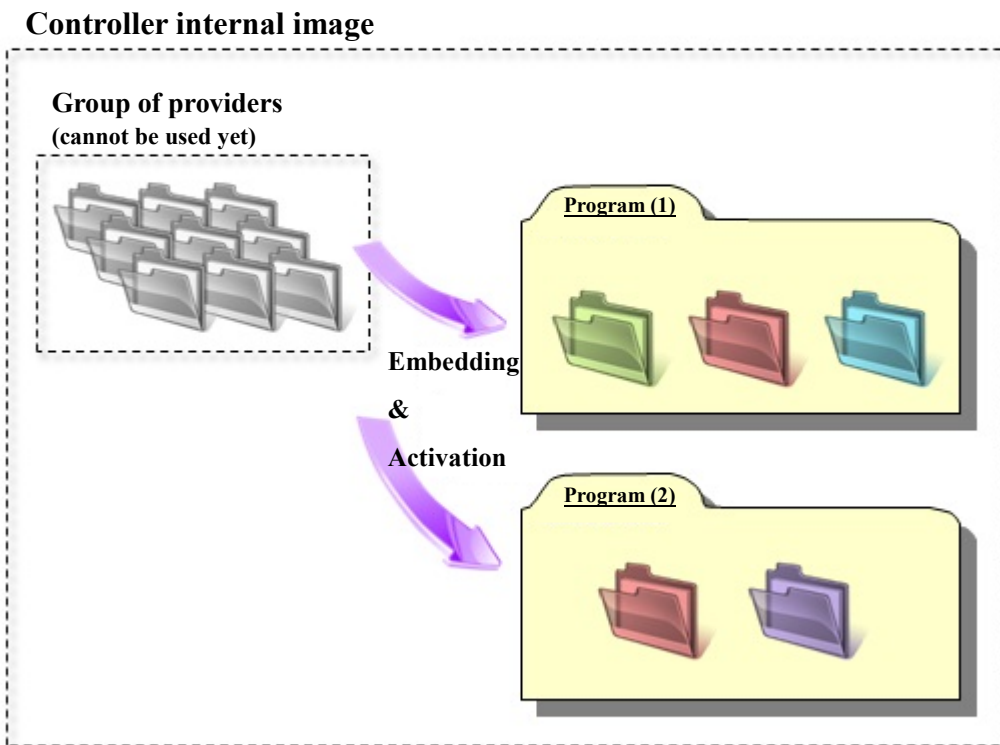
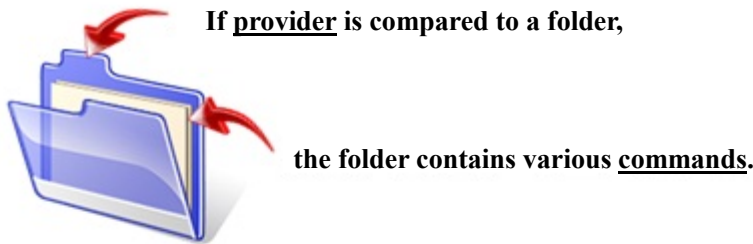
1.2 Features of provider

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.



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).

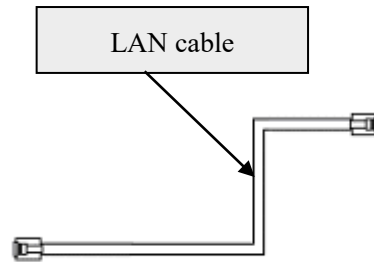
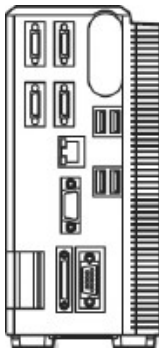
* The provider is provided as a dynamic link library (abbreviated as DLL) which can be used from PacScript.

2. How to Connect

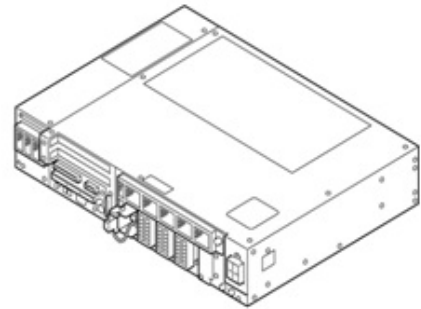
2.1 Ethernet (TCP/IP) connection example

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]

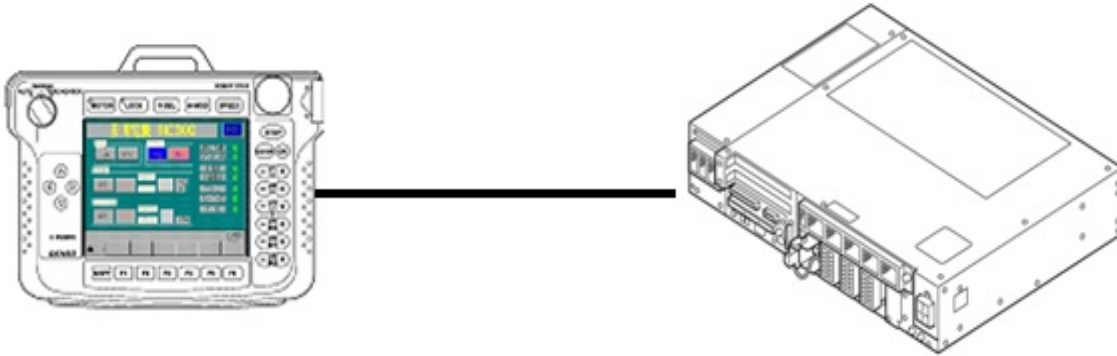


[Robot controller]



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.

 The screenshot shows the 'Communication Settings' window. At the top, there are status indicators for MAN, I/O, and a battery level of 1%. The window title is 'Communication Settings'. Below the title, there are two tabs: 'Device' and 'Setting'. The 'Device' tab is selected, showing 'Ethernet(192.168.0.1)' with 'Read/Write' permission. The 'Setting' tab is also visible, showing a table of properties and values.

Property	Value
Permission	Read/Write
DHCP	Disable
IP Address	192.168.0.1
Subnet mask	255.255.255.0
Gateway	0.0.0.0
MAC Address	B4-B5-2F-B9-1D-18

 At the bottom of the window, there is a text field containing 'Communication settings to communicate with WINCAPS.' and buttons for 'Cancel' and 'OK'. A 'Shortcut' button is also present. The bottom of the screen shows a row of function keys, including 'SHIFT' and 'Edit'.

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]

The screenshot shows the 'Output Setting' dialog box with the following settings highlighted by red boxes:

- Communication method:** Ethernet (selected)
- Format setting:**
 - Output form: ASCII (selected)
 - Digits of integer: 6
 - Digits of decimal: 4
- Other settings:**
 - Minus: - (selected)
 - 0 suppress: Available (selected)
 - Field separator: Comma
 - Record separator: Delimiter

The red-bordered box on the right lists the following values:

- 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>. SCENE** <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>.LAYOUTNO

Usage Get the currently used layout number.

Syntax **<ImplVar>.LAYOUTNO (<ITargetNumber>)**

Argument: <ITargetNumber > 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** <ITargetNumber>, <ILayoutNo>

Argument: <ITargetNumber > Target Number (integer).

0 : Local

1 : Remote

<ILayoutNo> 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.LAYAOUTNO 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** <ITime>

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

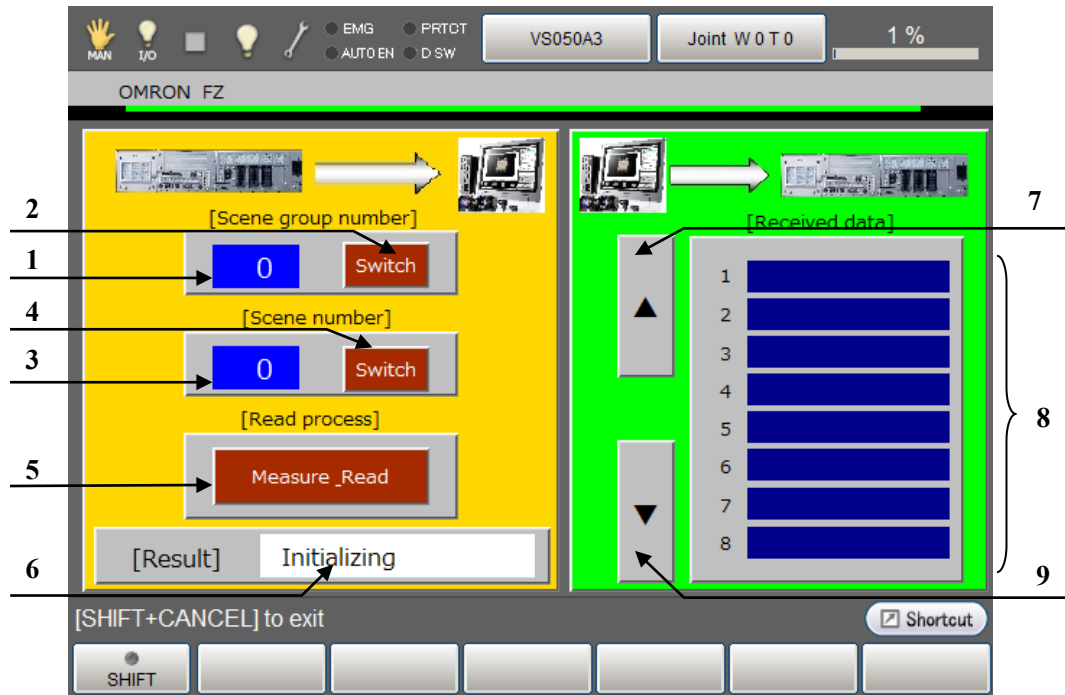
Refer to the FZ series user's manual of OMRON, for about error handling procedure.

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.
Ver.1.0.4	Same as above	Modified SCENE command.

DENSO WAVE INCORPORATED

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- The contents of this manual are subject to change without notice.
- Every effort has been made to ensure that the information in this manual is accurate. However, should any unclear point, error or omission be found, please contact us.
- Please note that we will not be responsible for any effects resulted from the use of this manual regardless of the above clauses.

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THIRD PARTY PRODUCTS

DENSO WAVE INCORPORATED