DENSO

DENSO Robotics

THIRD PARTY PRODUCTS

PROVIDER MANUAL

Maker

KEYENCE

Products／Series

Machine Vision System

MODEL:CV-X Series

Vision

Introduction

This document is a user's manual for the provider to use "KEYENCE Machine Vision System CV-X Series" connected to the DENSO robot controller RC8 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 document targets the following models in CV-X series. (as of June, 2014)

KEYENCE CV-X100 Series

In this document, the above models are called CV-X series.

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

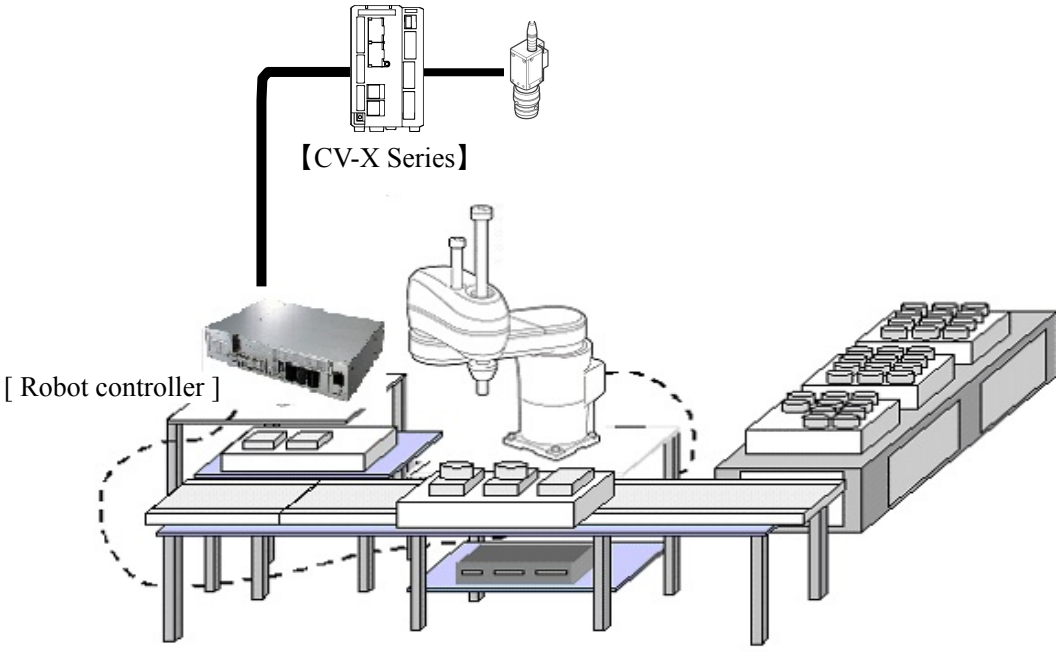
The user of this product shall be responsible for embedding and using the product (software) on a system and any result from using it.

Contents

1. Outline of This Product (Provider)

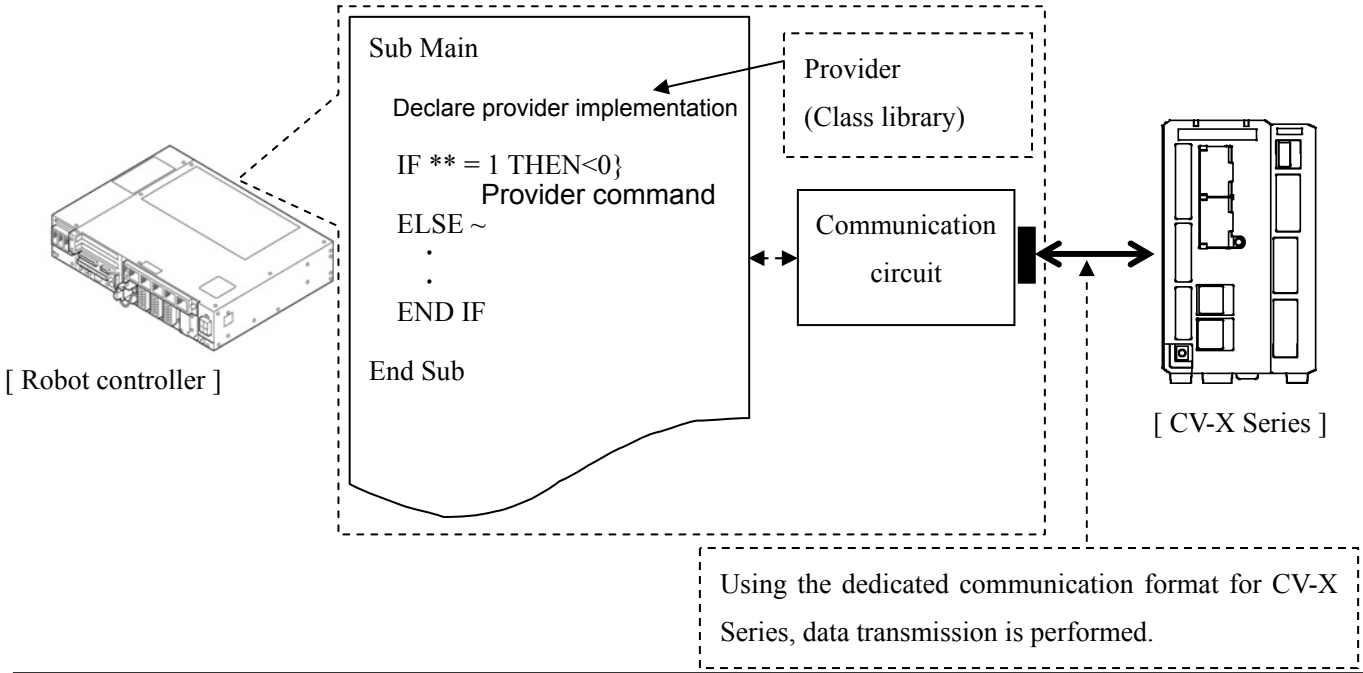
1.1. Target device of provider

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



1.2. Features of provider

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



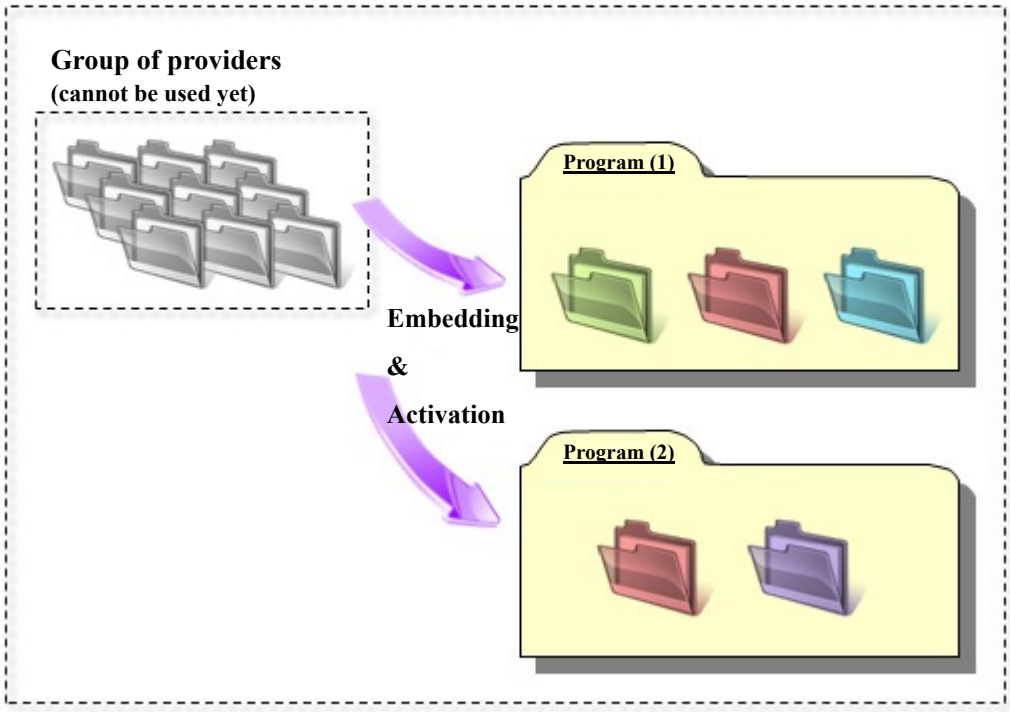
1.3. Mechanism of provider

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



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).

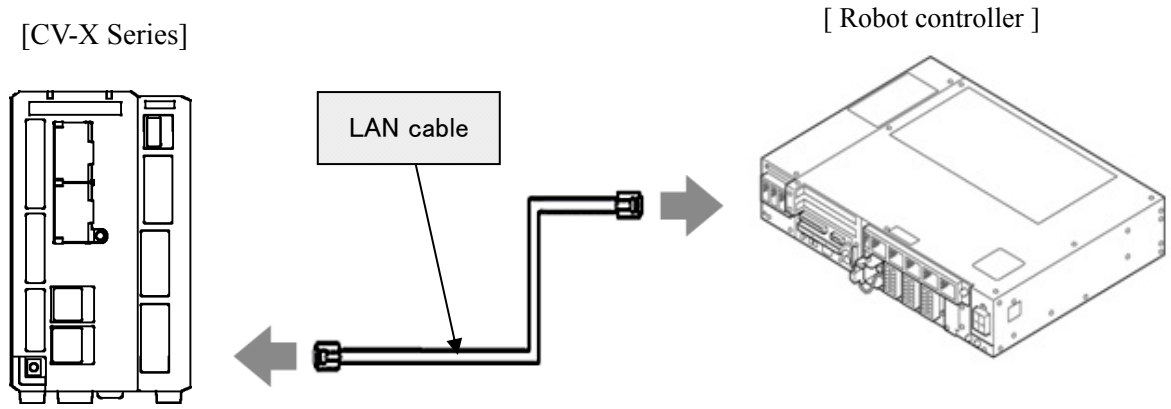
* The provider is provided as a dynamic link library (abbreviated as DLL) which can be used from PacScript.

2. How to Connect

You can use either Ethernet or RS232C for connection between a robot controller and CV-X series. When establishing a connection, use a cable compatible with the communication specification you use. For detailed information about each communication cable, refer to the CV-X Series User's Manual of KEYENCE.

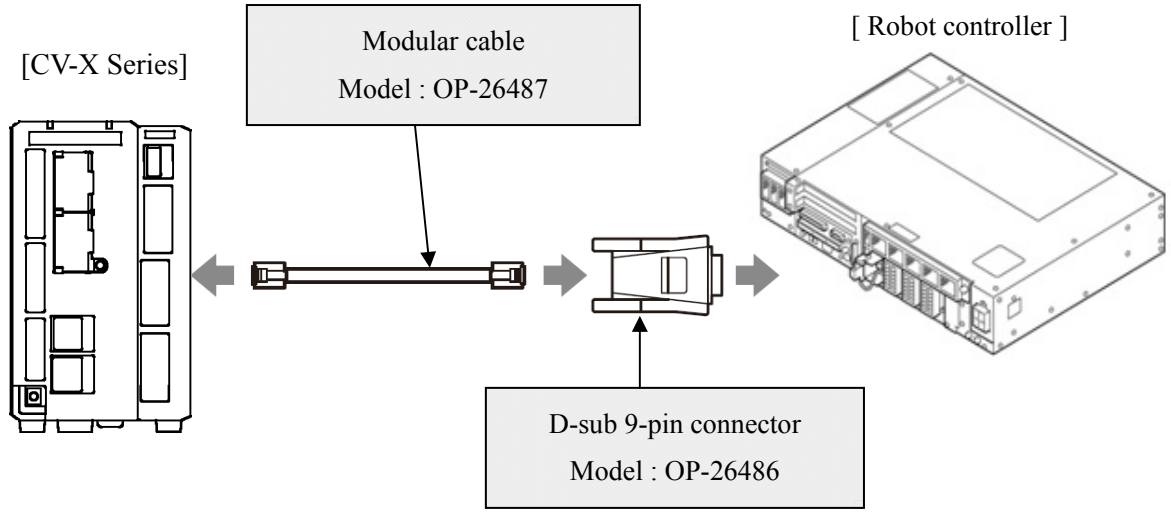
2.1. Ethernet Connection Example

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.



2.2. RS232C Connection Example

When you establish a connection with RS232C, use a Modular cable and D-sub 9-pin connector. Both of them are sold by KEYENCE as optional parts. There are two types of connectors though, use a D-sub 9-pin connector since the RS232C connector mounted in the robot controller is D-sub 9-pin.



3. Communication settings

3.1. Setup for Ethernet connection

3.1.1. Communication setting for CV-X series

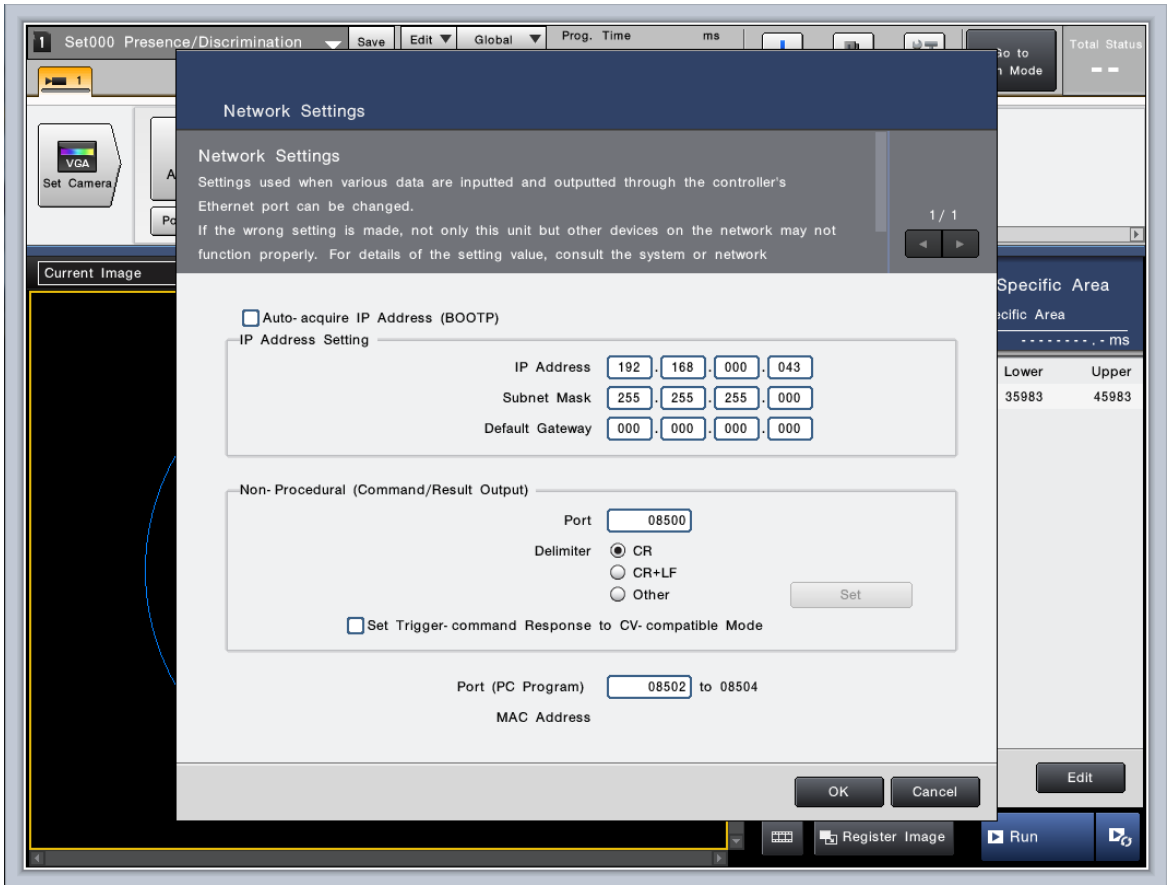
Communication settings for CV-X series is carried out by manipulating a setting window displayed in the monitor (sold separately) plugged in the CV-X series main unit by means of a mouse that comes with CV-X series. For details, refer to the CV-X series User's Manual of KEYENCE.
Note that the following items must be the same settings always.

Item	Setting
Auto-acquire IP address (BOOTP)	Unchecked
Delimiter	CR
Set Trigger-command Response to CV-compatible Mode	Unchecked

This setting example shows when CV-X100 series is used.

From the CV-X100 setting window, click [Global] - [Communications & I/O] - [Network] to display the Network Settings window as shown below.

- Uncheck the "Auto-acquire IP address (BOOTP)" checkbox.
- When you set "IP address" and "Subnet mask", make sure that these of the robot controller and CV-X series are in the same subnet mask. In this example, IP address and Subnet mask are 192.168.0.43 and 255.255.255.0., respectively.
- Set a "Default Gateway", if necessary. In this example, 0.0.0.0 is set.
- Set desired port number to "Port". The port number specified here will be the port number that is specified at the robot controller's Cao.AddController command execution as an option. In this example, the port number is set to 08500.
- "Delimiter" must be set to "CR" always.
- Uncheck the "Set Trigger-command Response to CV-compatible Mode" checkbox.
- "Port (PC Program)"has no relation to this provider



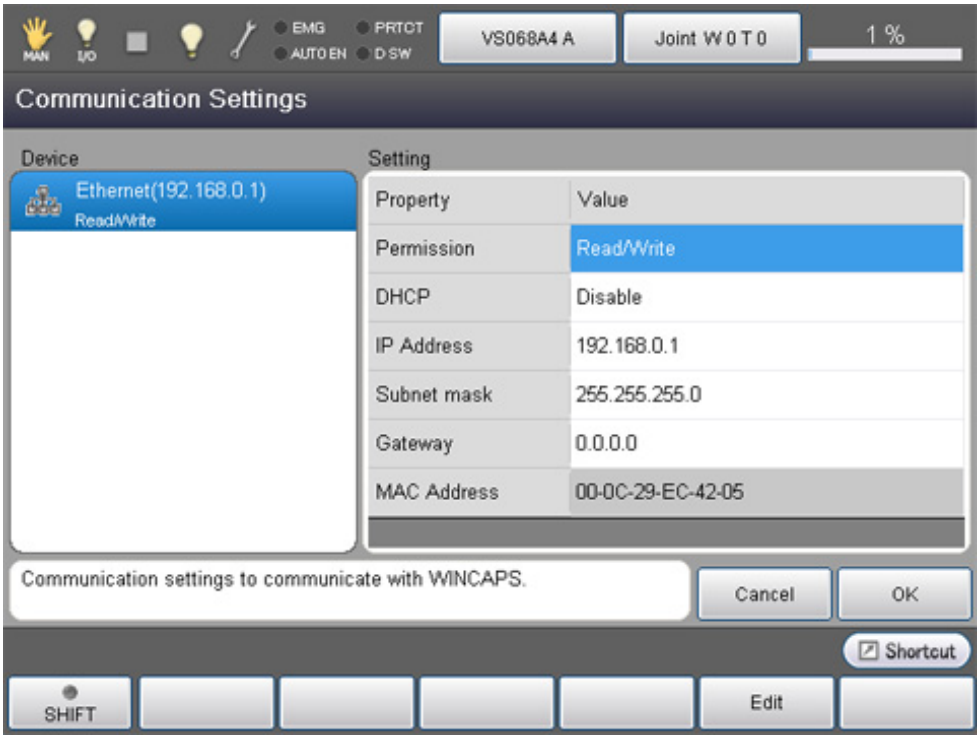
3.1.2. Communication setting for Robot controller

To set Ethernet communication setting for a robot controller, you can use a teach pendant or a mini-pendant. For detailed information about setting, refer to the followings on the DENSO ROBOT USER MANUALS.

Device	Referenced
Teach pendant	"Displaying and Changing Communication Settings Screen" of the TEACH PENDANT OPERATION GUIDE
Mini-pendant	"Setting DHCP" and "Setting IP Address" of the MINI PENDANT OPERATION GUIDE

This example shows the way of communication setting with a teach pendant.
From the top screen of a teach pendant, press [F6 Setting] - [F5 Communication and Token] - [F2 Network and Permission] to display the [Communication Settings] window.

- [Permission] has no relation to CV-X series communication.
- Once DHCP is enabled, IP address will automatically set. (Note that DHCP server may connect to the same network.) This example select "Disable".
- If you set DHCP to "Disable", make sure that IP addresses and subnet masks of the robot controller and CV-X series are the same. In this example, IP address and the subnet mask are 192.168.0.1 and 255.255.255.0, respectively.
- Set a gateway, if necessary. In this example, 0.0.0.0 is set.



3.2. Setup for RS232C connection

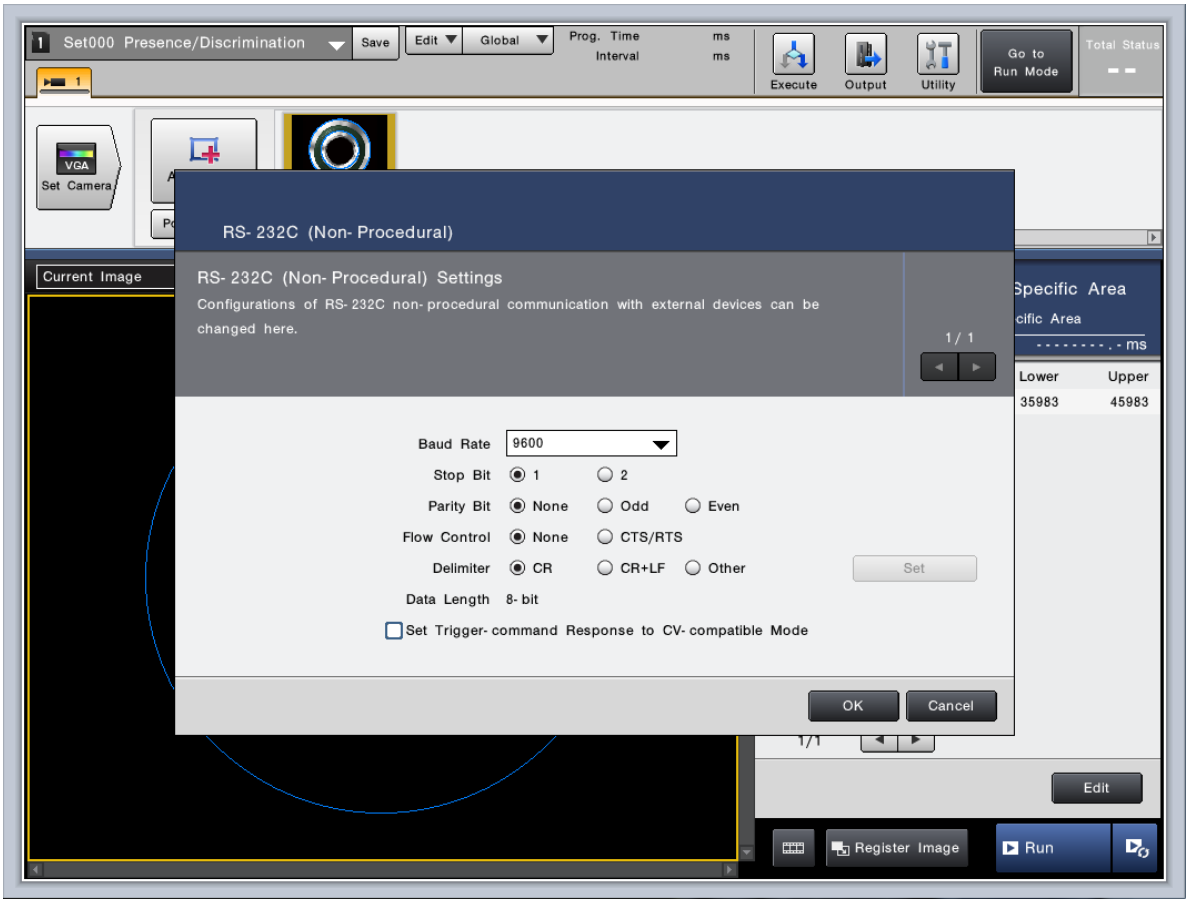
3.2.1. Communication setting for CV-X Series

RS232C communication setting for CV-X series is carried out by manipulating a setting window displayed in the monitor (sold separately) plugged in the CV-X series main unit by means of a mouse that comes with CV-X series. For details, refer to the CV-X series User's Manual of KEYENCE.
Note that the following items must be the same settings always.

Items	Setting
Flow Control	None
Delimiter	CR
Set Trigger-command Response to CV-compatible Mode	Unchecked.

This setting example shows when CV-X100 series is used.

From the CV-X100 setting window, click [Global] - [Communications & I/O] - [RS-232C] to display the following window. You can set arbitrary values, except for items on the table above.



3.2.2. Communication setting for Robot controller

RS232C communication setting for the robot controller is carried out at the Cao.AddController command execution, by specifying an option parameter. Set an appropriate option according to the communication setting of RS232C on the CV-X series.
You can carry out the RS232C communication setup with a teach pendant or a mini-pendant; however, these are for Comm.Open command execution, so not applicable to this provider.

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("CVX", "CaoProv.KEYENCE.CVX", "",
                                "conn=eth:192.168.0.10")    (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.
Commands are classified the following three types.

- Connection commands
- CV-X series-supported command
- Proprietary extension commands

A CV-X series-supported command is the command that is paired with a CV-X series command. The correspondence between the CV-X series commands and the CV-X series-supported commands is shown in the command list on the next page.
For the detailed operation of CV-X Series commands, refer to the CV-X Series User's manual of KEYENCE.

Table 5-1 Command list

CV-X series provider command	CV-X series command	Usage	Page
Connection commands			
Cao.AddController	—	Implements the provider to a variable and makes a connection to CV-X series.	14
CV series-supported command			
Trigger	T1 、T2 、T3 、T4、TA	Input trigger.	16
ChangeMode	R0、S0	Changes the operation mode to run or stop modes.	17
Reset	RS	Reset an item.	17
Reboot	RB	Save the current program settings, and reboot the system.	18
StoreSetting	SS	Save currently selected program settings and global settings.	18
ClearError	CE	Clear the error status.	19
ChangeDisplayPattern	VW	Change the display to the specified operation screen.	19
ChangeInspectSetting	PW	Change the setting to the inspection setting number of the specified SD card.	20
ReadInspectSetting	PR	Obtain currently selected inspection setting number and its SD card number.	21
ChangeLightVolume	CLV	Set the intensity of the specified lighting.	22
ChangeExecuteCondition	EXW	Set a number of the execution condition currently enabled to the specified number.	23
ReadExecuteCondition	EXR	Obtain a number of the execute condition currently enabled.	23
WriteCharReg	CW	Set a registered string or reference pattern string for the specified tool number.	24
ReadCharReg	CR	Obtain a registered string or reference pattern string for the specified tool number.	25
ChangeToolParameter	DW	Set an upper limit or lower limit in the judgment conditions for the specified tool.	26
ReadToolParameter	DR	Obtain an upper limit or lower limit in the judgment conditions for the specified tool.	27
ChangeFlawLevel	SLW	Set the stain level for the specified stain tool.	28
ReadFlawLevel	SLR	Obtain a stain level for the specified stain tool.	28
EnableTrigger	TE	Enable or disable trigger input.	29
Proprietary extension commands			
ExecuteCommand	—	Execute a CV-X series command with a syntax of CV-X series command.	29
TriggerAndGetResult	—	Obtain a result after trigger execution.	30
RecievePacket	—	Obtain the result of trigger input.	31
ClearPacket	—	Delete result data stored in a robot controller.	32
SetTimeout	—	Set a time-out period.	32
GetTimeout	—	Obtain a currently assigned time-out period.	33

Cao.AddController

Usage Implements the provider to a variable and makes a connection to CV-X series.

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

Argument <Controller name>

Assign a name (The name is used for control) (character string).

<Provider name>

Specify "CaoProv.KEYENCE.CVX" with character string type data.

< Provider running machine name>

Specify "" with character string type data.

<Option>

Specify following items with character string type data.

Syntax "Conn=<Connection parameter>,Timeout=<Time>"

Argument <Connection parameter>

This differ from communication methods. Refer to "Description for parameters of each connection".

<Time>

Set an allowable waiting time given to the response from CV-X series at this provider's command execution by millisecond-unit. This is optional. This should be 500 milliseconds if it is omitted.

Description for parameters of each connection

For Ethernet

Syntax "eth:<IP address>:<Port number>"

Argument <IP address>

Specify IP address of CV-X series to connect.

<Port number>

Specify port number of CV-X series to connect. This is optional. This should be 8500 if it is omitted.

For RS232C

Syntax com:<COM Port>:<BaudRate>:<Parity>
:<DataBits>:<StopBits>:<Flow>

Argument <COM Port>

Specify a COM port number of a robot controller plugged in the CV-X series. Entered number will be the COM port number. For example, if you enter 1, it indicates COM1 is specified. If you use a serial communication connector on the front side of the controller while expansion RS232C communication module is not used, enter 2 in this parameter.

<BaudRate>

According to the communication speed of CV-X series to connect, select suitable baud rate from 4800, 9600, 19200, 38400, 57600, 115200 (bps).

This is optional. This should be "9600" if it is omitted.

<Parity>

According to the CV-X series to connect, select suitable parity from the followings.

N： None
E： Even parity
O： Odd parity

This is optional. This should be "N" if it is omitted.

<DataBits>

According to the data bit count of CV-X series to connect, select suitable number from the followings.

7 ： 7 bits
8 ： 8 bits

This is optional. This should be "8" if it is omitted.

<StopBits>

According to the stop bit count of CV-X series to connect, select suitable number from the followings.

1 ： 1 bit
2 ： 2 bits

This is optional. This should be "1" if it is omitted.

<Flow>

The flow control selection is prepared as shown below. However, to communicate with CV-X series, set this parameter to "0: Without flow control".

0 ： Without flow control
1 ： Xon / Xoff
2 ： Hardware control

This is optional. This should be "0 " if it is omitted.

Return value Implemented objects are returned (Object).

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

'================  For Ethernet  ==================
'To specify a time-out period, but not specify COM port
caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX",
                                    "", "conn=eth:192.168.0.10, timeout=1000")

"To specify a time-out period and COM port
caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX",
                                    "", "conn=eth:192.168.0.10:8503")

'================  For RS232C  ==================
'To omit a baud rate and the following.
caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX",
                                    "", "conn= com:2")

'To specify a baud rate and the followings.
caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX",
                                    "", "conn= com:2:115200:E:8:1:0, timeout=1000")

'To specify a baud rate and the following.( Specify parity but omit others )
caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX",
                                    "", "conn= com:2::E:::")
```

<ImplVar>.Trigger

Usage Input trigger.

Syntax <ImplVar>.Trigger <Trigger No.>

Argument <Trigger No.>

Specify a trigger number (integer).

1 to 4	:	Trigger 1 to 4
-1	:	All triggers

Return value None

Description Input trigger. This command is exclusive to trigger input. To receive result data generated by trigger input, use RecievePacket command. To execute trigger input and result receiving at one processing, use TriggerAndGetResult command.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                    "", "conn=eth:192.168.0.10")

'Input a trigger in Trigger1.
caoCtrl.Trigger 1
```

<ImplVar>.ChangeMode

Usage Changes the operation mode to run or stop modes.

Syntax <ImplVar>.ChangeMode <Mode>

Argument <Mode>

Specify a desired mode (integer).

0 : Stop mode

1 : Run mode

Return value None

Description Changes the operation mode to run or stop modes.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Switch the mode to Run mode.
caoCtrl.ChangeMode 1
```

<ImplVar>.Reset

Usage Reset an item.

Syntax <ImplVar>.Reset

Argument None

Return value None

Description Reset an item.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Reset.
caoCtrl.Reset
```

<ImplVar>.Reboot

Usage Save the current program settings, and reboot the system.

Syntax <ImplVar>.Reboot

Argument None

Return value None

Description Save the current program settings, and reboot the system.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Save the current program settings, and reboot the system.
caoCtrl.Reboot
```

<ImplVar>.StoreSetting

Usage Save currently selected program settings and global settings.

Syntax <ImplVar>.StoreSetting

Argument None

Return value None

Description Save currently selected program settings and global settings.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Save currently selected program settings and global settings.
caoCtrl.StoreSetting
```

<ImplVar>.ClearError

Usage Clear the error status.

Syntax <ImplVar>.ClearError

Argument None

Return value None

Description Clear the error status. Even when an error status does not exist, the command execution finishes normally.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Clear the error status.
caoCtrl.ClearError
```

<ImplVar>.ChangeDisplayPattern

Usage Change the display to the specified operation screen.

Syntax <ImplVar>.ChangeDisplayPattern <Screen type>,<Screen number>

Argument <Screen type>

Specify a screen type with integer type data.

0 : Image display

1 : Operation screen

<Screen number>

Specify a screen number with integer type data.

0 to 4 : Camera number (1 to 4, 0 is All cameras)

0 to 9 : Operation screen number (S00 to S09)

Return value None

Description Change the display to the specified operation screen.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CV ", _
                                        "", "conn=eth:192.168.0.10")

'Change the image display to the camera number 1.
caoCtrl.ChangeDisplayPattern 0,1
```

<ImplVar>.ChangeInspectSetting

Usage Change the setting to the inspection setting number of the specified SD card.

Syntax <ImplVar>.ChangeInspectSetting <SD card number>,<Inspection setting number>

Argument <SD card number>

Specify an SD card number with integer type data .

1 : SD1

2 : SD2

<Inspection setting number>

Specify an inspection setting number with integer type data ranging from 0 to 999.

Return value None

Description Change the setting to the inspection setting number of the specified SD card.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Change the setting to the inspection setting number 1 of the SD1.
caoCtrl.ChangeInspectSetting 1,1
```

<ImplVar>.ReadInspectSetting

Usage Obtain currently selected inspection setting number and its SD card number.

Syntax <ImplVar>.ReadInspectSetting

Argument None

Return value The following two items are stored in an array of integer.

<SD card number>

Currently selected SD card number

1 : SD1

2 : SD2

<Inspection setting number>

Currently selected inspection setting number.

Description Obtain currently selected inspection setting number and its SD card number.

Example

```
Dim caoCtrl as Object
Dim iaryData(1) as Integer

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Obtain currently selected inspection setting number and its SD card number.
'iaryData(0) stores an SD card number.
'iaryData(1) stores an inspection setting number.
iaryData = caoCtrl.ReadInspectSetting
```

<ImplVar>.ChangeLightVolume

Usage Set the intensity of the specified lighting.

Syntax <ImplVar>.ChangeLightVolume <Lighting No>,<Lighting intensity value>,
<Capture count or capture point>,
<Lighting for multiple image capture>

Argument <Lighting number>

Specify a lighting number with integer type data ranging from 1 to 8.

<Lighting intensity value>

Specify a lighting intensity value with integer type data ranging from 0 to 255.

<Capture count or capture point>

Specify a capture count or capture point with integer type data ranging from 1 to 8. This is optional. The capture count and capture point will not be changed if it is omitted.

<Lighting for multiple image capture>

Specify a lighting for multiple image capture with integer type data ranging from 1 to 2. This is optional. The lighting for multiple image capture will not be changed if it is omitted.

Return value None

Description Set the intensity of the specified lighting.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                          "", "conn=eth:192.168.0.10")

'Set the lighting intensity value of lighting number 1 to 30.
caoCtrl.ChangeLightVolume 1,30
```

<ImplVar>.ChangeExecuteCondition

Usage Set a number of the execution condition currently enabled to the specified number.

Syntax <ImplVar>.ChangeExecuteCondition <Execute condition number>

Argument <Execute condition number>

Specify an execute condition number with integer type data ranging from 0 to 99.

Return value None

Description Set a number of the execution condition currently enabled to the specified number.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set the execute condition number to 1.
caoCtrl.ChangeExecuteCondition 1
```

<ImplVar>.ReadExecuteCondition

Usage Obtain a number of the execute condition currently enabled.

Syntax <ImplVar>.ReadExecuteCondition

Argument None

Return value <Execute condition number>

Currently enabled execute condition number is returned with integer type data.

Description Obtain a number of the execute condition currently enabled.

Example

```
Dim caoCtrl as Object
Dim iParam as Integer

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Obtain a number of the execute condition currently enabled.
iParam = caoCtrl.ReadExecuteCondition
```

<ImplVar>.WriteCharReg

Usage Set a registered string or reference pattern string for the specified tool number.

Syntax <ImplVar>.WriteCharReg <Tool No.>,<Line No. / Reference condition No.>,
<Registered string / Reference pattern string>

Argument <Tool No.>

Specify a tool number with integer type data ranging from 100 to 499.

<Line No. / Reference condition No.>

Specify a line number or a reference condition number with integer type data. If a specified tool number is set to OCR tool, set 1. If specified tool number set to 1D code reader or 2D code reader, set 1 to 16.

<Registered string / Reference pattern string>

Specify a registered string or reference pattern string with character string type data.

Return value None

Description If a specified tool number set to OCR tool, a registered string is set. If a specified tool number set to 1D code reader or 2D code reader, a reference pattern string is set. When neither registered string nor reference pattern string is specified, the latest reading result is set.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set the No.101 OCR tool registered string to DEF.
caoCtrl.WriteCharReg 101,1,"DEF"
```

<ImplVar>.ReadCharReg

Usage Obtain a registered string or reference pattern string for the specified tool number.

Syntax <ImplVar>.ReadCharReg <Tool No.>,<Line No. / Reference condition No.>

Argument <Tool No.>

Specify a tool number with integer type data ranging from 100 to 499.

<Line No. / Reference condition No.>

Specify a line number or a reference condition number with integer type data. If specified tool number set to OCR tool, set 1. If specified tool number set to 1D code reader or 2D code reader, set 1 to 16.

Return value <Registered string / Reference pattern string>

Registered string or reference pattern string you have specified is returned with character string type data.

Description If a specified tool number set to OCR tool, a registered string is returned. If a specified tool number set to 1D code reader or 2D code reader, a reference pattern string is returned.

Example

```
Dim caoCtrl as Object
Dim bstrParam as String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Obtain the No.101 OCR tool registered string.
bstrParam = caoCtrl.WriteCharReg 101,1
```

<ImplVar>.ChangeToolParameter

Usage Set an upper limit or lower limit in the judgment conditions for the specified tool.

Syntax <ImplVar>.ChangeToolParameter <Tool No.>,
<Item ID for judgment condition type>,
<Upper limit / lower limit>,
<Judgment condition value>

Argument

<Tool No.>

Specify a tool number with integer type data .

<Item ID for judgment condition type>

Specify an item ID for judgment condition type with integer type data. For details, refer to the DW command of the KEYENCE CV-X Series User's Manual.

<Upper limit / lower limit>

Specify an upper limit or lower limit with integer type data .

0 : Upper limit

1 : Lower limit

<Judgment condition value>

Specify the Judgment condition value with character string type data .

Return value None

Description Set an upper limit or lower limit in the judgment conditions for the specified tool.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set the lower limit on the edge tool of the tool No.100 to 123.456.
caoCtrl.ChangeToolParameter 100,82,1,"123.456"
```

<ImplVar>.ReadToolParameter

Usage Obtain an upper limit or lower limit in the judgment conditions for the specified tool.

Syntax <ImplVar>.ReadToolParameter <Tool No.>,
<Item ID for judgment condition type>,
<Upper limit / Lower limit>

Argument <Tool No.>

Specify a tool number with integer type data.

<Item ID for judgment condition type>

Specify an item ID for judgment condition type with integer type data. For details, refer to the DR command of the KEYENCE CV-X Series User's Manual.

<Upper limit / Lower limit>

Specify an upper limit or lower limit with integer type data .

0 : Upper limit

1 : Lower limit

Return value <Judgment condition value>

Value of judgment condition is returned with character string type data.

Description Obtain an upper limit or lower limit in the judgment conditions for the specified tool.

Example

```
Dim caoCtrl as Object
Dim bstrParam String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Obtain the lower limit on the edge tool of the tool No.100.
bstrParam = caoCtrl.ReadToolParameter 100,82,1
```

<ImplVar>.ChangeFlawLevel

Usage Set the stain level for the specified stain tool.

Syntax <ImplVar>.ChangeFlawLevel <Tool No.>,<Stain level value>

Argument <Tool No.>

Specify a tool number with integer type data.

<Stain level value>

Specify a stain level value with integer type data.

Return value None

Description Set the stain level for the specified stain tool.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set the stain level value of the tool number 102 to 200.
caoCtrl.ChangeFlawLevel 102,200
```

<ImplVar>.ReadFlawLevel

Usage Obtain a stain level for the specified stain tool.

Syntax <ImplVar>. ReadFlawLevel <Tool No.>

Argument <Tool No.>

Specify a tool number with integer type data .

Return value <Stain level value>

Value of obtained stain level is returned with character string type data.

Description Obtain a stain level for the specified stain tool.

Example

```
Dim caoCtrl as Object
Dim bstrParam as String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Obtain the stain level value of the tool number 102.
bstrParam = ReadFlawLevel 102
```

<ImplVar>.EnableTrigger

Usage Enable or disable trigger input.

Syntax <ImplVar>.EnableTrigger <Enable / Disable>

Argument <Enable / Disable>

Set enable or disable trigger input with integer type data.

0 : Disable trigger

1 : Enable trigger

Return value None

Description Enable or disable trigger input.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Disable the trigger input.
caoCtrl.EnableTrigger 0
```

<ImplVar>.ExecuteCommand

Usage Execute a CV-X series command with a syntax of CV-X series command.

Syntax <ImplVar>.ExecuteCommand <CV-X series command syntax>

Argument <CV-X series command syntax>

Specify CV-X series command syntax with character string type data.

Return value <Execution result data of CV-X series command>

The return value is the execution result data of CV-X series command. The data is returned with character string type data.

Description Execute a CV-X series command with a syntax of CV-X series command. For detailed operation of CV-X Series commands, refer to the CV-X Series User's manual of KEYENCE.

Example

```
Dim caoCtrl as Object
Dim strRet as String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set the lower limit on the edge tool of the tool No.100 to 123.456.
'If the command successfully finishes, strRet stores "DW".
'If the command fails, strRet stores "ER,DW,nn".
'( "nn" contains an error code. )
strRet = caoCtrl.ExecuteCommand "DW,100,82,1,123.456"
```

<ImplVar>.TriggerAndGetResult

Usage Obtain a result after trigger execution.

Syntax <ImplVar>.TriggerAndGetResult <Trigger No.>

Argument <Trigger No.>

Specify a trigger number with integer type data.

1 to 4 : Trigger 1 to 4

Return value <Result data>

Result of a trigger execution is returned with character string type data.

Description Obtain the result after trigger execution. If no result data returns from CV-X series, wait until time-out period passes. (To set time-out period, use Cao.AddController command option, or SetTimeout command). If still no result data returns, an error is issued.
If you want to execute other operations while waiting for the result, after inputting a trigger, do the following steps; 1) Input trigger with Trigger command. 2) Execute desired operations. 3) Obtain the result data with RecievePacket command.

Example

```
Dim caoCtrl as Object
Dim strRet as String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Input trigger in Trigger 1 and then obtain the result.
strRet = caoCtrl.TriggerAndGetResult 1
```

<ImplVar>.RecievePacket

Usage Obtain the result of trigger input.

Syntax <ImplVar>.RecievePacket

Argument None

Return value <Result data>

Result data generated by trigger input is received with character string type data.

Description Obtain result data generated by trigger input.
If the CV-X series is set so as to generate no result output against trigger input, no result data returns from CV-X series. As a result, an error is issued when a time-out period passes. (Time-out period is set by Cao.AddController command option, or SetTimeout command).
Also, after trigger input, if you input trigger one more time without executing ReceivePacket command, the result data for two of trigger inputs are stored in a robot controller. Under the condition if you execute the ReceivePacket command, the first trigger's result data will be returned.
Therefore, if the situation where the number of trigger input does not match with the number of ReceivePacket command execution occurs, delete the result data stored in the robot controller by executing ClearPacket command first. Then, input trigger again, and then execute ReceivePacket command to obtain result data.

Example

```
Dim caoCtrl as Object
Dim strRet as String

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Input trigger in Trigger 1.
caoCtrl.Trigger 1

'Obtain the result data.
strRet = caoCtrl.RecievePacket
```

<ImplVar>.ClearPacket

Usage Delete result data stored in a robot controller.

Syntax <ImplVar>.ClearPacket

Argument None

Return value None

Description Delete result data stored in a robot controller

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Delete result data
caoCtrl.ClearPacket
```

<ImplVar>.SetTimeout

Usage Set a time-out period.

Syntax <ImplVar>. SetTimeout <Time>

Argument <Time>

Set a time-out period with integer type data. Unit is millisecond.

Return value None

Description Basically, a time-out period is set at the Cao.AddController command execution. Use this command if you want to set a time-out period after Cao.AddController command execution.

Example

```
Dim caoCtrl as Object

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                        "", "conn=eth:192.168.0.10")

'Set a time-out period to 1000 milliseconds.
caoCtrl.SetTimeout 1000
```

<ImplVar>.GetTimeout

Usage Obtain a currently assigned time-out period.

Syntax <ImplVar>.GetTimeout

Argument None

Return value <Time>

Currently assigned time-out period is returned with integer type data. Unit is millisecond.

Description Obtain a currently assigned time-out period.

Example

```
Dim caoCtrl as Object
Dim iTimeout as Integer

caoCtrl=Cao.AddController("CVX"," CaoProv.KEYENCE.CVX ", _
                                                "", "conn=eth:192.168.0.10")

'Obtain a time-out period.
iTimeout = caoCtrl.GetTimeout
```

6. Error Code

As for how to check the provider errors, refer to Provider Errors in PROVIDER GUIDE on the DENSO ROBOT USER MANUALS.
In provider errors, an error issued by CV-X series will have original number ranging from 80108000 (hexadecimal) to 80108063 (hexadecimal), which lower two digits represents an error code sending from CV-X series. For example, when ChangeInspectSetting command execution, if you enter 5 in the SD card number, the original number of the robot controller's error will be 80108016 (hexadecimal). The lower two digits "16" (hexadecimal) is equal to "22" in decimal number. According to the explanation of UW command written in the CV-X Series User's Manual, the error code 22 stands for "The number or the range of the parameter is incorrect."

7. Sample Program

```
Sub Main
        Dim caoCtrl As Object
        Dim strRet As String

        'CV-X series provider implementation
        caoCtrl = Cao.AddController("CVX", "CaoProv.KEYENCE.CVX", "", _
                                                "conn=eth:192.168.0.3, timeout=1000")

        'Input trigger in Trigger 1 and then obtain the result data.
        strRet = caoCtrl.TriggerAndGetResult 1

        'Output the result data to the message output window on the teach pendant.
        PrintDbg strRet

        'Disconnect CV-X series provider and delete it.
        cao.Cotrollers.Remove caoCtrl.Index
        caoCtrl = Nothing
End Sub
```

Revision History

DENSO Robot
Provider
User's Manual
KEYENCE Machine Vision System CV-X Series

Version	Supported RC8	Content
Ver.1.0.0	Ver.1.8.6	First version

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