DENSO ROBOT

Communication Sample Program

KEYENCE

Vision Sensor

MODEL: CV-X100 Series

(CV-X100/150/170)

Sample Program User's manual



Introduction

This document is a user's manual for the sample program to use "KEYENCE Vision Sensor CV-X100 Series" connected to the DENSO robot controller.

For details and handling of the connected device, refer to the user's manual of "KEYENCE Vision Sensor CV-X100 Series".

Caution: (1) This library is designed exclusively for DENSO robot controller RC8 series and cannot be used for other devices. Note that the functions and performance cannot be guaranteed if this product is used without observing instructions in this manual or modified.

(2) All products and company names mentioned are trademarks or registered trademarks of their respective holders.

This manual covers the following product

KEYENCE CV-X100 Series

Important

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

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.

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1. Outline of This Sample

1.1 Target device of sample

This sample can be used only when a DENSO robot controller (RC8 series) is connected to the CV-X100 series.



1.2 Features of sample

This sample is provided to use the CV-X100/150/170 native commands required to access CV-X100/150/170 in the robot program. Inclusion of this sample allows customers to establish communication with a robot easily without creating a communication program for CV-X100/150/170. The following shows a position of the sample.



2. How to Import

2.1 What is "import"?

Retrieving of the files from this library into the project to use in WINCAPSIII is called "import". Importing files enables using the retrieved program.

2.2 How to import files to project

Select [Project] - [Add Existing File...] on WINCAPSIII to import the following files into the project.

- Main.pns
- KEYENCE_CVX.pcs
- KEYENCE_CVX_sample.pcs

Proj	ect	Connect	Debug	Arm	Tool	Window	He
`	Add	l Program	Ctrl+N				
	Add	Add Existing File				Ctrl+I	
	Ma	Make on boot setting of program files				;	۲
	Fol	Folder					۲

Program list after import

Proj	ect	window			E		
🕲 🐑 🕆 🖡 🎭							
	Pro	ject 'RC8_KEYENCE_CVX100' Source Files					
Pro	ojec	t window Model tree A	rm operation				
Prog	ran	n list			Ψ×		
No.		File name	Title	Make on boo	Priority		
1	Û	Main.pns			Normal		
2		KEYENCE_CVX.pcs	KEYENCE_CVX.pcs	OFF	Normal		
3		KEYENCE_CVX_sample.pcs	KEYENCE_CVX_sample	OFF	Normal		
Prog	Program list Output Search Result						

3. How to Connect

3.1 RS-232C connection example

A communication cable needs to be connected to establish communication between the CV-X100 series and a robot controller.

To connect to the robot controller via RS-232C, use the optional dedicated cable (KEYENCE PN: OP-26486, OP-26487).



3.2 Ethernet (TCP/IP) connection example

To connect to the robot controller via Ethernet, use the optional dedicated cable (KEYENCE PN: OP-66843) or a crossover LAN cable. Also, when a switching hub/router is used, use the cable suitable for the switching hub/router specifications.



4. Communication Settings for Robot Controller and Device Used

Use a teach pendant to adjust the communication settings for the device to be used.



4.1 Communication via RS-232C 4.1.1 RS-232 communication settings on robot controller

Press [F6 Setting] - [F5 Communication and Token] - [F3 Data Communication] to display the [Data Communication Settings] window.

Select the line No.1 for RS-232C and press [Edit] to change the setting value.

Make the following settings to use the default RS-232 communication settings for CV-X100.



4.1.2 RS-232C communication settings for CV-X100 series

Press [Global] - [Communications & I/O] - [RS-232C] to display the [RS-232C (Non-Procedural) Settings] window.

Select the desired setting item and change the value so that it agrees with the robot controller setting.

Changing the following settings is not required to use the default RS-232 communication settings for CV-X100.



4.1.3 Other settings for CV-X100 series

(1) Trigger Settings

Press [Set Camera] to display the [Camera Settings] window.

Press the [Trigger] tab and select [External].

Press [Trigger Settings] and check [RS-232C] check box for [Trigger Mode].

	CAM 1 : Camera Settings	3	CAM 1 : > Trigger Se	ettings
2M	🖿 Camera 🛛 🗖 Trigger	ö Lighting	Trigger Mode	
Set Camera	Trigger Settings Trigger Mode	001) ms Trigger 1 V	 External External Terminal RS- 232C PLC- Link EtherNet/IP Trigger Settings 	 ✓ Internal ✓ Mouse ✓ Ethernet(TCP/IP) ✓ PC Program ✓ PROFINET
			Trigger Signal Trigger Delay (ms)	Trigger 1
			Live Image in Run I	(Global Settings) Mode

(2) Output Settings

Press [Output] to display the [Output Settings] window.

Select [RS-232C (Non-Procedural)] and press [Select Data] to display the [Output Item Settings] window.

	Output Settings			
	RS- 232C (Non- Procedural) (Specifies output details for perform	Output Settings ning the result output in the RS-232C n	on-procedural mode in this equipment.	1/1
	Judgment Settings			
	OR Terminal	Select Data		
Output	OUT Terminal	Quiput No. Output Data		Preview
Output	RS- 232C (Non- Procedural)	0 T101: ShapeTrax2	Number of Detected Patterns	0004
	Ethernet (Non- Procedural)	1 T101: ShapeTrax2	Pattern X Position Result[0]	+00497. 161
	SD Card 2		Pattern Y Position Result[0]	+00545.470
	PC Program		Pattern Angle Result[0]	+00000.692
	PLC- Link	2 T101: ShapeTrax2	. Pattern X Position Result[1]	+01182. 152
	EtherNet/IP		Pattern Y Position Result[1]	+00611.869
	PROFINET		Pattern Angle Result[1]	- 00164. 132
	FTP	3 T101: ShapeTrax2	Pattern X Position Result[2]	+00755.182
	Image Output	Select:		
	RS- 232C (Global Settings)	Result Output at Skipped Tool Data Delimiter	 Output "0" None Comma ▼ 	
				OK Cancel

Set items to output to the robot controller.

Output Item Settings		
Measured Value Judged Value Variables	Symbols String]
Select Candidate List		
T101: ShapeTrax2 ShapeTrax2 Pattern	Y Position Result XY Position Result Angle Result XY Position & Angle Result XY Position & Angle Result % Match Result Scale Result	[Judged Label] 2 [All] 1 [0] 1 [2] 3
No. Output Data	▼ Add	Setting Count 6/256
 0 T101: ShapeTrax2. Number of Detected Patterns Res 1 T101: ShapeTrax2. Pattern XY Position & Angle Res 2 T101: ShapeTrax2. Pattern XY Position & Angle Res 3 T101: ShapeTrax2. Pattern XY Position & Angle Res 4 T101: ShapeTrax2. Pattern XY Position & Angle Res 5 T101: ShapeTrax2. Pattern XY Position & Angle Res 	ult ult] ult] ult] ult] ult]]	
		OK Cancel

4.2 Communication via Ethernet (TCP/IP) 4.2.1 Ethernet (TCP/IP) communication settings on robot controller

(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 of the robot controller so that the robot controller and CV-X100 series are within the same subnet mask.

	PRTOT VS050A3	Joint	WOTO	1%
Communication Settings				
Device	Setting			
Ethernet(192.168.0.1) Read/Write	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	00-30-64-21-11	-72	
Communication settings to communica	ate with WINCAPS.		Cancel	ОК
				Shortcut
SHIFT			Edit	

(2) Make client communication settings with CV-100X series.

Press [F6 Setting] - [F5 Communication and Token] - [F3 Data Communication] to display the [Data Communication Settings] window.

Select the client line No. to use for the Ethernet line No.

W AN		D PRTOT	VS050A3	Joint W0T0	1 %
Data	a Communication Setting	S			
Devic	e	Setting			
	Serial #1 COM2, 9600bps	Server #4	TCP,49152,Te	xt,MultiByte	
	Serial #2 COM3, 38400bps	Server #5	TCP,49153,Te	xt,MultiByte	≡
	Serial #3 COM4, 19200bps	Server #6	TCP,49154,Te	xt,MultiByte	
686	Ethernet #4-7,8-15	Server #7	TCP,49155,Te	xt,MultiByte	
_	Serial #40 COM5, 19200bps	Client #8	TCP,192.168.0).10:8500,Text,MultiByte	
_	Serial #41 COM6, 19200bps	Client #9	TCP,192.168.0).1:49153,Text,MultiByte	
<u> </u>		λ			
				Cancel	ок
					Shortcut
SH	1IFT			Edit	

Press [Edit] to change the setting value.

Make the following settings to use the default Ethernet communication settings for CV-X100.

💥 🐖 🔳 🌻 🖌	▶ ● EMG ● PRTCT ● AUTOEN ● D SW	VS050A3	Joint W 0 T 0	1 %
Data Communicatio	on Settings[Clie	nt #8]		
TCP/UDP	тср	UDP		
IPAddress	192.168.	0.10		
Port	8500			
Timeout	-1	msec -1 is to wait	forever.	
DataType	Text	Binary		
Delimiter	CR	CR+LF	LF	
Header	None	ENC		
			Cancel	ок
				Shortcut
SHIFT				

4.2.2 Ethernet (TCP/IP) communication settings for CV-X100 series

Press [Global] - [Communications & I/O] - [Network] to display the [Network Settings] window. Set the IP address and subnet mask so that the robot controller and CV-X100 series are within the same subnet mask.

Changing the following settings is not required to use the default Ethernet communication settings for CV-X100.

Global ▼ Prog. Time 85.7 ms	Network Settings
Camera Common System RS- 232C	Network Settings Using the Ethernet port on this unit enables the setting change for the input or output of
Startup Mode Setting FTP Set Account VNC	If the wrong setting is made, not only this unit but other devices on the network may not function properly. For details of the setting value, consult the system or network
Date & Time PLC- Link Language EtherNet/IP Reboot PROFINET	IP Address [BOOTP)
System Information	Subnet Mask 255 255 255 000 Default Gateway 000 000 000
	Port 08500 Delimiter @ CR CR+LF
	Set Trigger- command Response to CV- compatible Mode
	Port (PC Program) 08502 to 08504 MAC Address 00:01:FC:0E:83:85
	OK

4.2.3 Other settings for CV-X100 series

(1) Trigger Settings

Press [Set Camera] to display the [Camera Settings] window.

Press the [Trigger] tab and select [External].

Press [Trigger Settings] and check [Ethernet/IP] check box for [Trigger Mode].

	CAM 1 : Camera Settings	CAM 1 : > Trigger Settings
2м	Ne Camara	Trigger Mode
Set Camera	Camera R Trigger Clighting Trigger Settings → Trigger Mode e External o Internal 001 ms Trigger Signal Trigger 1 ▼	 External Iterminal Mouse External Terminal Mouse RS-232C Ethernet(TCP/IP) PLC-Link PC Program EtherNet/IP PROFINET Trigger Settings Trigger Signal Trigger 1 Trigger Delay (ms) 000 Run Screen Update Mode (Global Settings)
		Live Image in Run Mode

(2) Output Settings

Press [Output] to display the [Output Settings] window.

Select [Ethernet (Non-Procedural)] and press [Select Data] to display the [Output Item Settings] window.



Set items to output to the robot controller.

Output Item Settings				
Measured Value Judged Value Varia	bles Symbols String			
Select Candidate List				
T101: ShapeTrax2	Pattern Y Position Result Pattern XY Position Result	[Judged Labe [All]	1]	
	Pattern Angle Result	[0]		
	Pattern XY Position & Angle Result	▶ [1]		
	Pattern % Match Result Pattern Scale Result	[2]		
Select:T101: ShapeTrax2 Pattern XY Position & Ar	ngle Result [0]			
	T Add			
	▼Add		Setting Count 6/2	56
No. Output Data	▼Add		Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa	▼ Add		Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A	tterns Result Angle Result[0]		Setting Count 6/21	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A	▼Add tterns Result Angle Result[0] Angle Result[1]	THE REPORT OF TH	Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A 3 T101: ShapeTrax2. Pattern XY Position & A	▼Add tterns Result Angle Result[0] Angle Result[1] Angle Result[2]	<u></u><u></u>	Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A 3 T101: ShapeTrax2. Pattern XY Position & A 4 T101: ShapeTrax2. Pattern XY Position & A		İ	Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A 3 T101: ShapeTrax2. Pattern XY Position & A 4 T101: ShapeTrax2. Pattern XY Position & A 5 T101: ShapeTrax2. Pattern XY Position & A		<u></u>	Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pa 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A 3 T101: ShapeTrax2. Pattern XY Position & A 4 T101: ShapeTrax2. Pattern XY Position & A 5 T101: ShapeTrax2. Pattern XY Position & A		(m)()	Setting Count 6/2	56
No. Output Data 0 T101: ShapeTrax2. Number of Detected Pather 1 T101: ShapeTrax2. Pattern XY Position & A 2 T101: ShapeTrax2. Pattern XY Position & A 3 T101: ShapeTrax2. Pattern XY Position & A 4 T101: ShapeTrax2. Pattern XY Position & A 5 T101: ShapeTrax2. Pattern XY Position & A		(m)	Setting Count 6/2	56

5. Sample Program Execution Procedure

- (1) Include the function defined program (KEYENCE_CVX.pcs) into the program created by the user.
- (2) If the function is called, CV-100X receives and executes the command.
- (3) CV-X100 generates a response and sends it to RC8.
- (4) The data received by RC8 is stored to the static variable D_dnCvxData(0), sequentially from the received response.
- (5) The user program processes the next program based on the received data.

6. Function

6.1 Function

The functions with the function names shown in the following table are defined in the standard commands of CV-X100 series.

Function name	Process	Command
X_PW	Changes the program No.	PW
X_R0	Switches to the run mode.	R0
X_S0	X_S0 Switches to the setup mode.	
X_T Trigger input		T1 to T4, TA

Not all the commands of the device are supported.

NOTE: There is a limitation on executing each function, depending on conditions of CV-X100 series. For details, refer to the CV-X100 series user's manual.

For example, trigger input is accepted only when CV-X100 series is in the run mode.

7. Static Variable Used in Function

Static variables used in this program are as follows.

30 variables are declared as Double type.

(Change the number in the specification statement to change the size of received data.)

Variable declaration	Variable name	Description
static	D_dnCvxData (30)	Received data

static D_dnCvxData(30) as Double Received data (double)

NOTE: Static variables can be used in the controller of version 1.3.* or later.

8. Function Description

X_PW

Usage Changes the program No.

Syntax X_PW(<Line No.>,<SD No.>,<Program No.>) <Line No.> 1: Universal port, 2 to 3: Reserved 8 to 15: Ethernet client port <SD No.> 1 : SD1 ,2 : SD2 <Program No.> 0 to 999

Description The program No. of CV-X100 is changed.

Example

Include the function for communication.
'Connect as Line No. 8.
' Connection ON
'Switches to Program No.2 of SD1.
' Connection OFF

X_R0

Usage	Switches to the run mode.	
Syntax	X_R0(<line no.="">) <line no.=""> 1: Universal port, 2 to 3: Reserved 8 to 15: Ethernet client port</line></line>	

Description CV-X100 is switched to the run mode.

Example

#Include "KEYENCE_CVX.pcs"	'Include the function for communication.
Sub Main	
Dim lLineNo as Integer	
lLineNo = 8	'Connect as Line No. 8.
IF Not (ConnectCVX(lLineNo)) THEN PrintDbg "Connect NG" EXIT SUB	' Connection ON
End IF	
IF Not(X_R0(lLineNo)) Then PrintDBG "Switch NG" EXIT SUB	'Changes to the "run mode".
End If	
DisconnectCVX lLineNo	' Connection OFF

X_S0

Usage	Switches to the setup mode.	
Syntax	X_S0(<line no.="">) <line no.=""> 1: Universal port, 2 to 3: Reserved 8 to 15: Ethernet client port</line></line>	

Description CV-X100 is switched to the setup mode.

Example

#Include "KEYENCE_CVX.pcs"	'Include the function for communication.
Sub Main	
Dim lLineNo as Integer	
lLineNo = 8	'Connect as Line No. 8.
IF Not (ConnectCVX(lLineNo)) THEN PrintDbg "Connect NG" EXIT SUB	' Connection ON
End IF IF Not(X_S0(lLineNo)) Then PrintDBG "Switch NG" EXIT SUB	'Changes to the "setup mode".
End If	
DisconnectCVX lLineNo	' Connection OFF

X_T

Usage	Inputs a trigger.
Syntax	X_T(<line no.="">,<trigger no.="">,Result data) <line no.=""> 1: Universal port, 2 to 3: Reserved 8 to 15: Ethernet client port <trigger no.=""> 1 to 4: T1 to T4, -1: TA Result data: Returned as a character string.</trigger></line></trigger></line>
Descri	Dtion A trigger is inputted. The received data is sequentially stored from D_dnCvxData(0). The maximum number of received data items is 30. Data exceeding the maximum number is not stored.
Examp	le
	#Include "KEYENCE_CVX.pcs" Include the function for communication.
	Sub Main

10 1	, i cu i i i			
	Dim str	Results as string		
	Dim lLi	neNo as Integer		
	lLineNo	p = 8	'Con	nect as Line No. 8.
	IF Not	(ConnectCVX(lLineNo)) THEN	'	Connection ON
		PrintDbg "Connect NG"		
		EXIT SUB		
	End IF			
	IF Not(X_T(lLineNo, 1, strResults)) Then	'Exe	cute T1 trigger.
		PrintDBG "Trigger NG"		
		EXIT SUB		
	else			
		$P[0] = (D_dnCvData(0), D_dnCvI$	Data(1), D_dnCvData(2))
			'Rec	eived data to position data
	End If			
	Disconr	nectCVX lLineNo	'	Connection OFF

9. Sample Program

'Sample program of a communication command using KEYENCE CV-X series			
#Include "KEYENCE_CVX.pcs"	'Include the function for communication.		
Sub Main			
Dim strResults as string			
Dim iLineNo as Integer			
Dim iProgNo as Integer			
Dim iTriggerNo as Integer			
Dim iSDNo as Integer			
iLineNo = 8	'Connect as Line No. 8.		
iSDNo = 1	'SDNo. 1		
iProgNo = 0	'Program No.0		
iTriggerNo = 1	'Trigger No.1		
IF Not (ConnectCVX(iLineNo)) Then	' Connection ON		
PrintDbg "Connect NG"			
EXIT SUB			
End IF			
IF Not (X_PW(iLineNo, iSDNo, iProgNo)) Then	' Change the program No.		
PrintDbg "Change NG"			
EXIT SUB			
END IF			
IF Not(X_T(iLineNo, iTriggerNo, strResults)) Then	Execute the trigger.		
PrintDBG "Trigger NG"			
EXIT SUB			
else			
$P[0] = (D_dnCvxData(0), D_dnCvxData(1), D_dn$	lnCvxData(2))		
	'Received data to position data		
End If			
DisConnectCVX iLineNo	' Connection OFF		

10. Operation Panel Screen

This sample provides the following operation panel screen. This operation panel uses functions defined by the sample to check operations, etc. after connecting to the device. See the following as an application example of the operation panel.



Description Each button functions as follows.

- 1. Configures the Line No. to connect CV-X100 to. Range: 1 to 3, 8 to 15 (integer)
- 2. Switches CV-X100 to the run mode.
- 3. Switches CV-X100 to the setup mode.
- 4. Configures the SD No. to change the program No. Range: 1 to 2 (integer)
- 5. Configures the program No. Range: 0 to 999 (integer)
- 6. Sends the SD No. set in (4) and the program No. set in (5) to CV-X100 to change the program settings.
- 7. Configures the trigger No. Range: 0 to 4, -1 (integer)
- 8. Sends the trigger command (the trigger No. set in (7)) to CV-X100 and receives data.
- 9. Displays the communication result.
- 10. Displays up to 30 items of received data. Displayed data can be switched by using arrows.
- 11. Clears the received data.
- 12. Initializes the operation panel. Use this button if a system error is caused by using a line No. that does not exist.

NOTE: Changing and triggers can be executed only when CV-X100 series is in the run mode.

Revision History

DENSO Robot Communication Sample Program User's manual KEYENCE Vision Sensor CV-X100/150/170

Version	Date	Content
Ver1.0.0	2013/2/13	First edition

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