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Chapter 1 Overview of CX-Simulator

Major Characteristics of CX-Simulator

Program execution, monitoring, debug without actual PLC

Monitoring of programs and IO memory present values is enabled. Moreover, normal debugs such as force on/off, differential monitoring, data trace and online edit are enabled from CX-Programmer. Also, any cyclic task can be started/stopped and interrupt tasks can be started in simulation.

Cycle time check without actual PLC

It is possible to check estimated cycle time (current, minimum, maximum, and mean values, servicing time *1) when the program is executed in an actual PLC in advance.

Program execution per step or scan, I/O brake condition settings

Debugs that cannot be realized in actual PLCs are provided.

- Step Run: Executes a program per instruction
- Scan Run: Executes a program per scan (cycle)
- I/O Break Condition Settings: Aborts execution when the conditions set in I/O memory are satisfied.
- Designation of the start and break points

Debugs in connection with display devices and serial communications devices *1

Regarding the serial communications port of a PC as the communications port of a PLC, it is possible to debug a program in combination with display devices or serial communications devices (barcode reader, ID sensor, etc.).

Display of the send messages of serial communications and network communications *1

It is possible to check the send messages issued by TXD instruction (communications port output), SEND instruction (network send), and CMND instruction (command send). It is useful for the debugs of serial communications and network communications.

*1: You need to start CX-Simulator from the Windows [Start] menu and set a virtual PLC. See Chapter 5 and the operation manual of CX-Simulator for the detailed operations.

Overview of CX-Simulator

CX-Simulator enables you to realize SYSMAC CS/CJ series CPU Units in your computer as a virtual PLC and operate (simulate) it equally as actual CPU Units. Combination use of CX-Simulator and CX-Programmer enables you to verify ladder program operation and cycle time in advance on a PC without an actual PLC. Moreover, various debug functions of CX-Simulator make it possible to debug ladders, which used to be impossible by using an actual PLC only.

Relationship between CX-Simulator and CX-Programmer

CX-Simulator creates a virtual PLC on a virtual network in your PC. If you use the "Work Online Simulator" function of CX-Programmer Ver.3.0 or greater versions, CX-Simulator automatically starts up a virtual PLC of the current project's device type to open connection between CX-Programmer and the virtual PLC.

Before Installation

There are two setup types in CX-Simulator V1.3, but choose "1. For online with CX-Programmer" if CX-Programmer has already been installed in your computer.

CX-Simulator is automatically installed in the directory where CX-Programmer is installed.



Choose "2. For online with FinsGateway Applications" if you want to use a virtual PLC for the debug of an application using the FinsGateway network.

Chapter 2 Creation of Sample Program

This chapter explains basic functions such as programming and comment entry of a simple ladder by using CX-Programmer.

Here, a sample program "a program of car entry control by opening/closing shutters" is created as an example. This program is used to explain how to use the debug functions of CX-Simulator, which are mentioned after Chapter 3.

Starting CX- Programmer	Opening a new projectCreating a sample programSaving a program
[Start]	<u>2-1 Starting CX-Programmer</u> Start up CX-Programmer from Windows.
[Programs]	Windows Update
[Omron]	Programs
[CX-Programmer]	Image: Favorites Image: Children Services Image: Children Service
[CX-Programmer]	Internet Explorer Image: Settings Image: Settings Image: Settings Image: Settings Image: Settings Image: Settings Image: Settings Image: Settings Image: Settings
double-click the	Eind Mindows Explorer
(-Programmer icon.	Bun
CX-Program	Log Off 088094022
and the second	Shut Down

The initial screen of CX-Programmer shows up.

0 C

🖀 CX-Programmer
Fie Yew FLC Look Help
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2-3 Creating Sample Program

The following is coding of a simple ladder program by using CX-Programmer.

This is a sample program of controlling car entry in a shed by opening/closing shutters. When a car approaches, the shutters automatically open; and in two seconds after the car passes the gate, the shutters close.



Operation Flow

- (1) When a car enters, the arrival detection sensor (000000) is turned on.
- (2) The normal rotation motor (000500) of the shutters is turned on.
- (3) The shutters reach the upper limit in three seconds, the upper limit SW (000001) is turned on, and the shutters open.
- (4) When the car passes the gate, the arrival detection sensor (000000) is turned off.
- (5) In two seconds, the reverse rotation motor (000501) is turned on.
- (6) In three seconds, the shutters reach the lower limit, the lower limit SW (000002) is turned on, and the shutters close.

See CX-Programmer Introduction Guide or the operation manual of CX-Programmer for the detailed entry method of a ladder program.

Starting CX- Programmer	Opening new pr	g a rojec	t	Creating a sample pro	gram	Savin prog	g a ram		
			. .	_					
	Comple	eted	Sample	Program					
	The pro	ograr	n is moo	Jularized in t	wo sectio	ons "Shu	tter eleva	ating proce	essing" and "Er
	count p	roce	ssing" b	y the section	function	of CX-P	rogramm	er V2 or gr	rater versions.
ter elevating	Since	proce	essing i	s simplified	in the t	elow pr	rogram,	it's differe	nt from the a
essing	program	n	-	·			-		
	program								
Sample - CX-Programmer	r - [NewPLC1.New PLC Program Tor	Progra	1.Shutter_E	evating_Processing	[Diagram]]				
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		2 8	Car Entering F 5.00 Normal Rotati 0.00 U Car Arrival De	Upper Limit SW	•	•	•	SET W0.02	Set Timer Counting
		2 8	Lar Entering F 5.00 Normal Rotati 0.00 U Car Arrival De	Upper Limit S W	•	•	•	SET W0.02	Set Timer Counting Bit
		2 8 3 10	Lar Entering F 5.00 Normal Rotati 0.00 Lar Arrival De W0.02		•	•	•	SET W0.02	Set Timer Counting Bit
		2 8 3 10	Lar Entering F 5.00 Normal Rotati 0.00 UI Car Arrival De W0.02 Timer Counting	Upper 1.mm 5 W	•	•	•	SET W0.02 TIM 0000	Set Timer Counting Bit Timer
		2 8 3 10	Lar Entering F 5.00 Normal Rotati 0.00 1.1 Car Arrival De W0.02 Timer Counting	Upper Limit S W	•		· ·	SET W0.02 TIM 0000	Set Timer Counting Bit Timer Reverse Rotation Mor Timer number
		2 8 3 10	Lar Entering F 5.00 Normal Rotati 0.00 11 Car Arrival De W0.02 Timer Counting	Upper Limit S W	• • • •	- - - - - -	•	SET W0.02 TIM 0000 #20	Set Timer Counting Bit Timer Reverse Rotation Mo Timer number Set value
		2 8 3 10	Lar Entering F 5.00 Normal Rotati 0.00 UI Car Arrival De W0.02 Timer Counting T0000	0.02	•	- - - - - - -		SET W0.02 TIM 0000 #20 5.01	Set Timer Counting Bit Timer Reverse Rotation Mo Timer number Set value
		2 8 3 10 4 12	Lar Entering F 5.00 Normal Rotati 0.00 UI Car Arrival De W0.02 Timer Counting Tomoro Tomoro Reverse Rotati	0.02	•			SET W0.02 TIM 0000 #20 5.01	Set Timer Counting Bit Timer Reverse Rotation Mo Timer number Set value Reverse Rotation Mo
		2 8 3 10 4 12	Lar Entering F 5.00 Normal Rotati 0.00 11 Car Arrival De W0.02 Timer Counting Tomoro Tomoto Reverse Rotati 5.01	0.02 Lower Limit SW	· · · ·			SET W0.02 TIM 0000 #20 5.01	Set Timer Counting Bit Timer Reverse Rotation Mo Timer number Set value Reverse Rotation Mo

Entries count processing



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Starting CX- Opening a Creating a Saving a Programmer new project sample program program					
	Starting CX- Programmer	Opening a new project	Creating a sample program	Saving a program	

🚟 Sample - CX-Programmer - [NewPLC1.New	<pre>wProgram1.Entries_Count_Processing (Diagram)</pre>	
Eie Edt View Inset PLC Dogram Is	ols Window Malo	X
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🚾 🎮 🐺 🛱 🖆 🤞 🗒 🗒 🗖	16	
NewPoject	0 20 [Program Name : NewProgram I] [Section Name : Entries_Count_Processing]	*
Symbol Setingz WewProgram1 (00) Symbole	170.00 111 Car Entering F	1534 BCD Increment Completed Entries Mard (bod)
- The Shutter Elevating Processing	2 EN	DOUL F End
Project/		1
For Help, pease F1	NevPLC1[Net0]Ade0] - Offine // ung 2 (0, 0] - 100%	

2-4 Saving Program

Save the created program.

Here, save the program as "sample".

Or select [File] [Save as] from the menu.	Save CX-Programmer File
	File name: Sample Save as type: CX-Programmer Project Files (*.cxp)
<u>S</u> ave	The program is saved.
	This sample program is used in the following operations to explain CX-Simulator. Keep CX-Programmer open.

Chapter 3 Executing Program by CX-Simulator

This chapter explains how to operate CX-Programmer functions such as program transfer, PLC mode change, cycle time check, and ladder program monitoring, when CX-Programmer is connected to a CX-Simulator virtual PLC.

In addition, you can use CX-Programmer when connecting to a virtual PLC by the exactly same operation as when connecting to an actual PLC. For detailed operations, see the operation manual of CX-Programmer.

Connecting	to
a virtual PLC	

Operation mode change of a virtual PLC Cycle time check in a virtual PLC

3-1 Connection of CX-Simulator Virtual PLC and CX-Programmer

Connect CX-Programmer with a CX-Simulator virtual PLC.

The sample program created in Chapter 2 is used for the explanation here.

Starting CX-Programmer

Click the [Open] button from the toolbar of CX-Programmer.







Cycle time check in a virtual PLC



3-3 Operating Mode Change of Virtual PLC

You can change the operating mode of a virtual PLC from the [CX-Simulator Debug Console] screen or CX-Programmer.

Operation from CX-Simulator Debug Console Tool

To start running a program (Monitor mode)



(Run: Monitor mode)



(Stop: Program mode)

Click the right mouse button on [NewPLC1] and select [Operating Mode].

Or Select [PLC] | [Operating Mode] from the menu.
 Image: Second second

To stop running a program (Program mode)

📲 CX-Simu	ator Del	oug Con	sole : 0	
	₽≯	$ \rangle$	📐 📌	C 🗟 🚯

The number shown in the title bar of Debug Console Tool indicates the count number of the present cycle in the virtual PLC.

Operation in CX-Programmer

Sample - CX Programmer - [NewPLC1	NewProgram1.Shutter_Elevation	N. Processing [Diagram]		- III -
C En Die New land MC Dollar	Two Alkan Ret			A ISLA
	- 4 - 9 18	A 2 1 1 1 1 1 1		1 1 1
KA 915 K	$\approx \approx \approx \approx (\approx) \approx (\ast) (\ast) \approx (\ast) () ($	8 D 2 0 1 2 2	22.4. BB	
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all'annini	2010) 191			
NewFLCL/NewFrogent	· Alow Docking			-
WVRINING: Duplicated output - RSET W0.	Elen			
NevPLCI - Denne, 2 manings.	Eloat in Main Window			
International Contraction Section (Contraction Section 1)	C ^R Rgetes	Thomas Minda	2010 incentili, 51 - 1000	

3-4 Cycle Time Check in Virtual PLC

Change the operating mode of a virtual PLC to the Monitor mode.

	👎 CX-Simulator Debug Console : 0 💦 🔲 🔀
	PLC Cycle Time - NewPLC1
	Cycle Time
Editj	Mean: 7.5 ma Beset
om the	Max 110.0 ms
	Mirc 0.0 me
ər.	Execution Time
	Start mark #: Messure
	Stop mark #: Abort
	Time:
	Close

Estimated Cycle Time and Simulated Cycle Time

Set Estimated Cycle Time when you want to simulate with accuracy, for instance, when you want to operate data traced per scan as input. At this point, the time of one scan is enlarged, so the present values of instructions such as TIM proceed depending on your PC performance.

On the other hand, set Simulated Cycle Time, the accuracy is inferior to Estimated Cycle Time though, when you want to check the exterior operation of instructions such as TIM.

📆 CX-9	Simulator Debug Console	:0		PLC Clock Settings	×
	17 <u>0</u> Condition Operation Data <u>R</u> eplay			Cycle Time Mode Settings	
	<u>P</u> LC Clock Settings P <u>L</u> C Operation Settings		\sum	Scan interval(0.1s) 5 Max. CPU(3) 50	(1 to 1000) (10 to 100)
~	Always On Top Help •			OK. Cancel	

The default cycle time information in CX-Simulator is set to "Simulated Cycle Time" which is the time for running a program on an active PC. To check the estimated cycle time when running a program on an actual PLC, change "Cycle Time Mode Settings" from "Simulated Cycle Time" to "Estimated Cycle Time" in the PLC Clock Settings of CX-Simulator. Set "Cycle Time Mode Settings" to ""Simulated Cycle Time" previous to the following operations.

[Cycle Time] from the menu of CX-Programmer.

Select [PLC] |

3-5 Ladder Monitoring in Virtual PLC

Start monitoring of ladders in CX-Programmer.

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	****1-000 200 2	CL.76 %. 👪	
5 F F F F C 6 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	10 10 10 10 10 10 10 10 10 10 10 10 10 1		
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1940	11.		
Set at the Company of First Property Transf	e/		11
Hole press Ft	(NeviFLE1(Sexulator) - StapyProgram Mode	SVINC Surg 0.01.01 - 1004	

Besides ladder monitoring, debug operations such as force on/of, differential monitoring, data trace and online edit are enabled on CX-Programmer as is the case with connecting to an actual PLC.

Chapter 4 Program Debug by CX-Simulator

The debug operations of a ladder program by using the original functions of CX-Simulator, which are unavailable by actual PLCs, are explained in this chapter.

Other debug functions

4-1 Debug with Sample Program

CX-Simulator has various program-debug functions. Not only ladder program execution by a virtual PLC instead of an actual PLC, but also the ON operation of a limit switch after a work moves (I/O condition operation settings), the stop operation of program execution when a memory value becomes a designated value (I/O break condition settings), program execution of optional range (Start point/Break point settings), etc.

This section explains each function by using the sample program "Car entry control program by opening/closing a shutter" created in Chapter 2.

The below figure shows the image and operation flow of the sample program in Chapter 2:



Operation Flow

- (1) When a car enters, the arrival detection sensor (000000) is turned on.
- (2) The normal rotation motor (000500) of the shutter is turned on.
- (3) <u>The shutter reaches the upper limit in three seconds</u>, the upper limit SW (000001) is turned on, and the shutter opens.
- (4) When the car passes the gate, the arrival detection sensor (000000) is turned off.
- (5) In two seconds, the reverse rotation motor (000501) is turned on.
- (6) <u>In three seconds, the shutter reaches the lower limit</u>, the lower limit SW (000002) is turned on, and the shutter closes.

In the I/O condition operation settings, you can set the ON operations of the upper/lower limit switches by shutter elevating operations and the time until the limit switches are turned on, as virtual external input. In this example, the virtual external input that turns on the limit switches of the shutter in three seconds after the motors are turned on is designated.

4-2 Debug by Virtual External Input

CX-Simulator allows you to set external input; for example, the upper limit SW is turned on in three seconds after the shutter goes up (ON operation of the upper limit switch). How to set the I/O Condition tool of CX-Simulator is explained below.

4-2-1 Settings of Virtual External Input

In this example, the operations of two external input signals are set.

- (1) The upper limit SW (000001) is turned on in three seconds after the normal rotation motor (000500) is turned on. (At this point, the lower limit SW (000002) is off.)
- (2) The lower limit SW (000002) is turned on in three seconds after the reverse rotation motor (000501) is turned on. (At this point, the upper limit SW (000001) is actually off.)

No.	Run	Condition	Delay(ms)	Output
0	D	5.0=0N	3000	0.1=0N and 0.2=0FF
1	D	5.1=0N	3000	0.2=0N and 0.1=0FF
. ◀				•

Setting in I/O Condition Tool

The following section explains how to set virtual external input by using I/O Condition Tool:

4-2-2 Starting I/O Condition Tool

Select [I/O Condition] from the Debug Console screen.

📆 CX-Simulator Debug Cons	ole : 398 🔳 🔲 🖡
I/O Condition Operation	1 🕫 🚺 🖗 🕻
Data <u>R</u> eplay	
PLC Clock Settings	
	·
10 Compliant (Real	
Ele Help	
10 condition file	Browse .
Taget FINS Addess	
	P Synchronized
Network address	
Node address 10	
Unit address 0	
	200
	- Analy
	U cycles

Select [Replay] | [IO Condition] from the menu in the Debug Console screen.

I/O Condition Tool

starts up.



4-2-3 Setting I/O Conditions

How to set I/O conditions is explained in the following example:

In three seconds after the normal rotation motor (000500) is turned on, the upper limit SW (000001) is turned on. (At this point, the lower limit SW (000002) is actually turned off at the same time.)

In this example, the following formulas are set:

- > Condition: The normal rotation motor (000500) is turned on.
- Delay time: 3 seconds (3000ms)
- Output: The lower limit SW (000002) is turned off. In three seconds, the upper limit SW (000001) is turned on.

Condition Settings

- (1) Click "Bit Condition" in the "Logical Expression" field.
- (2) Set "IO" to "Type".
- (3) Set "5.0" to "Address".
- (4) Set "=" to "Operator".
- (5) Set "ON" to "Value".
- (6) Click the register button

Bit Edit Help No. Run Condition (1) Click "Bit Condition". (2) Set "10". (3) Set "5.0". (4) Set "=". Secondary (4) Set "=". Instance (not) Delay time (not) Output (5) Set "ON". (6) Click the register button.	U Londiton - [Lonfiguration]	
No Fun Condition (1) Click "Bit Condition'. (2) Set "IO". (3) Set "5.0". Image: Set Condition (4) Set Condition Estimation Image: Set Condition (5) Image: Set Condition (5) Image: Set Condition (6) Condition (6) Click the register button. (6)	Ele Edit Help	
(1) Click "Bit Condition". (2) Set "IO". (3) Set "5.0". (4) Set "=". (5) Set "ON". (5) Set "ON".	No. Run Condition Delay(no) Output	
Implifie Condition Implifie Condition	(1) Click "Bit Condition" (2) Set "IO".	'.
Condition DEL and Type Address Operative Volue (5) Set "ON".	Register Condition	(4) Set "=".
Delay time (mol 0 Dulput DEL and condition (6) Click the register button.	Candidian DEL or and Type Address Operato Value	(5) Set "ON".
Chipmen DEL and (6) Click the register button.	Delay fine (inc)	
	Address Operative Value (6) Click the register button.	

Delay Time Setting

Enter 3000 (3 seconds) in the text box of "Delay time".

	 Registered Condition)	
	Condition DEL	or and	
	5.0=ON	<u> </u>	
		V	
	Delau time (ms)	2000	5
L	Delay time (ms)	3000	
	Output DEL	and	
		<u> </u>	
		~	

Enter 3000(ms) (=3 seconds) in the text box of "Delay time".



Select [Edit] | [Insert line] from the menu in "I/O Condition – [Configuration]". Add a new line to enter the second formula.

Debug by I/O

break settings

Debug by virtual

external input

Edit Help			
B Delete line Copy line Insett copigd lines	Delap(ms) 3000	0.1=0N and 0.2=0FF	

No.	Run	Condition	Delay(ms)	Output
Ö	D	5.0=0N	3000	0.1=0N and 0.2=0FF
1	Е			
•				

Other debug

functions

Like the registration operation of the first formula, set the followings.

The lower limit SW (000002) is turned on three seconds after the reverse rotation motor (000501) is turned on. (At this point, the upper limit SW (0000001) is actually turned off at the same time.)

In this example, the following formulas are set:

- Condition: The reverse rotation motor (000501) is turned on.
- Delay time: 3 seconds (3000ms)
- Output: The upper limit SW (000001) is turned off. In three seconds, the upper limit SW (000002) is turned on.

After the two formulas are registered, the set screen is displayed as follows:

No	Bun	Condition	Delau(ms)	Output
0	D	5.0=0N	3000	0.1=0N and 0.2=0FF
1	D	5.1=ON	3000	0.2=0N and 0.1=0FF
•				
				<u> </u>

You can enter the conditions and output formulas in each column directly from the keyboard.



Debug with a sample program	Debug by virtual external input Debug by I/O break settings Other debug functions
Prepare the external input debug by I/O Condition Configuration.	 4-2-5 Debug by Virtual External Input Execute the followings before starting debug: Load the sample program (Sample.cxp) created in Chapter 2 in CX-Programmer). Start the virtual PLC created in Chapter 3. Follow the procedure in Chapter 4 to connect CX-Programmer and the CX-Simulator virtual PLC. Start running the ladder of the virtual PLC.
L	Now you are ready to start debugging.
Select [File] [Open] from the menu in "I/O Configuration – [Run] " and select "Sample.csv".	Execution of I/O Condition Tool Load the file (Sample.csv) set in "I/O Condition [Configuration]".
	File name: Sample.csv Dpen Files of type: Comma Separated(*.csv)
Click the check box of "Synchronized" to deactivate it.	ID Condition - [flun] Fie Help ID condition file CMy Documents/Sample.cov Target FINS Address Image: Synchronized Node address Image: Topologic address Unit address Image: Staff Image: Condition file Image: Staff

Debug with a sample program	Debug by virtual external input Debug by I/O Other debug break settings functions
<u>S</u> tart	Click the [Start] button. I/O condition watching is started to check whether the set conditions are established.
	Target FINS Address Synchronized Network address 0 Node address 10 Unit address 0
	Executing ID Condition Watching

After I/O condition watching is started, the screen shows the message "Executing IO Condition Watching" and the number of cycles gradually increases.

If the ladder of a virtual PLC has not started running yet, the screen shows the message as follows. In this case, start running the ladder of the virtual PLC.

Standing by in Program mode. Start the continuous run. 0 cycles

By the above procedure, the following two formulas are established and the output operation after the establishment is started.

	No.	Run	Condition	Delay(ms)	Output	
	0	D	5.0=0N	3000	0.1=0N and 0.2=0FF	
U	1	D	5.1=ON	3000	0.2=0N and 0.1=0FF	
	•					\mathbf{F}



Configuration is monitored by the virtual PLC.

After this, pseudo input of car arrival and gate passing is executed and debug of a ladder program is executed.





Debug with a sample program

Debug by virtual external input

Debug by I/O break settings Other debug functions

Waiting for car arrival





After clicking the contact 0.00, click the right button of the mouse to select [Set] | [On].



Car arrival



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Setting on the arrival detection sensor (0.00) turns on the normal rotation motor (5.00).







Operation Check by Pseudo Input of Car Arrival

After this, program debug is proceeded according to the processing flow.

First, use the Set On function of CX-Programmer for simulating the waiting for car arrival status through the car arrival status.

Select [Set | On] on the arrival detection sensor (000000) to simulate car arrival.



After car arrival (Set on the arrival detection sensor), the normal rotation motor is turned on.

0	0	0.00 W0.01 Car Actival De Car Errity End	MEBO	Car Entering Rag
1	4	Cor Extensio F	5.00	Normel Botation Mot.r.
		Cor Extering F Upper Land 516 5.00 Nerval Extati		

If the motor isn't turned on, once switch the operation mode of the virtual PLC to Program Mode, and repeat the same operation.

In three seconds, the shutter turns on the upper limit SW and the normal rotation motor is turned off. <u>(Turn on the upper limit SW by the condition/output formulas set in</u> <u>I/O Condition Configuration)</u>

4 MBB0 BOIL Cor Extering 7 Upper Land SM 5.00 Normal Extering 7 Narmal Extering 7

Debug with a sample program

Debug by virtual external input

Debug by I/O break settings Other debug functions

Car passing



After click the bit 0.00, click the right-mouse button and select [Set] | [Off].



Timer starts calculating.

Operation Check by Pseudo Input of Car Arrival

Next, use the Set Off function of CX-Programmer for simulating the car passing status. Set off the arrival detection sensor (000000) to simulate the car passing status.



After car passing (Set off the arrival detection sensor), the Timer Calculating flag is turned on.

		MLOB	Car Extering Flag
Car Aintvial De., Car Birthy End.,			
W0.00 0.01		5.00	
Car Entering F Upper Limit SW 5.00			Bornal Kolatan Ma
0.00			
Car Annel De.	•	SET WIO2	Set Tener Counting Bit
	\bigvee		
W102			
Terver Counting		TIM 0000	Time: Reverse Rotation 2 fo
		10 Nod 1231	Setvaloe



completes two-second calculation, the reverse rotation motor (5.01) is turned on.



Shutter down



rotation motor is turned on.

58.074					
Timer Caranting				ΠМ	Timer
				0000	Reverse Rotation b o Timer number
				#20 #20	Setvalue
T0800	20.02			5.01	
Reverse Rotati. Lover	Livit SW			_ <u>_</u>	Beverse Botation Mo
501 Reverse Rotafi					
		N 1			

In three seconds, the shutter turns on the lower limit switch and the reverse rotation motor is turned off.

(The lower limit SW is turned on according to the condition/output formulas set in Set I/O Condition.)



The following operation makes it possible to debug a series of operation from car arrival to car passing.

The Set On/Off functions of CX-Programmer enable you to simulate the car arrival and passing statuses as explained above.

Moreover, setting I/O conditions enables you to automatically generate the shutter elevating operations.

Other debug functions

4-3 Debug by IO Break Condition Settings

CX-Simulator allows you to stop a program, for instance, when the number of entered cars reaches to a certain number. This is a function for break when I/O memory status is monitored and the set conditions are satisfied.

4-3-1 Setting Contents of IO Break Condition

Here, the way to stop the program by using IO Break Condition when the number of entered cars turns three is explained.

D0 (0 word of data memory) is set as the storing memory for the number of completed entries.

10 Break Condition Settings	×
Conditions	
(D0=#3)	<u> </u>
AND LIST	
□ D0=#3	
1	AND
Add Delete	Add Delete
Head Save	

Settings in IO Break Condition Settings

4-3-2 Setting IO Break Conditions

Start IO Break Condition Settings from Debug Console.





Debug with a sample program	Debug by virtual external input	by I/O Other ettings function	debug ons	
Check the formula registered in the list (Activate the formula).	The setting is registered in a lis	st (AND LIST).	AND LIST	
OK		\sum		
	Add Delete		Add Delete	

Now, the program is aborted when the number of completed entries (the value of D0) reaches to three (Hex: #0003).

Setting IO Break Condition makes it possible to abort the execution of a program when a certain address value becomes a specified value. It enables you to check the IO memory status when the conditions are satisfied. Using this function together with the Watch Window or PLC Memory function of CX-Programmer allows you to check all IO memory statuses with the program



Other debug functions

Register Addresses in Watch Window

Since the number of car entries is counted in the entry count (D0) by rise of the car entering flag (W0.00) in this sample program, enter these two addresses in Watch Window.

To register addresses, use Drag & Drop function from Ladder Window.



It is possible to register addresses to be monitored in Watch Window easily by Drag & Drop operation from Ladder Window. Not only the registration per rung but also per contact, coil, and advanced instruction is enabled by the same operation. Also, Set On/Off and Change Value operations are enabled to the registered addresses easily.

Display the view of Step Run in advance. (The status is currently displayed as "Running".) Elle Edit Debug Options Cyclic task 00(Statup) ۲ Add: Instruction OR W00000 Click the icon in AND N W00001 OUT W00000 -5 **Debug Console.** LD W00000 OR 000500 AND N 000001 0UT 000500 R %LD 000000 9 SET W00002 10 LD W00002 11 TIM 0000 #0020 12 13 LD T0000 OR 000501 14 AND N 000002 15 OUT 000501 GLD 000002 16 17 OUT W00001 RSET W00002 18 19 Section Marker 20 @LD W00000 21 **BI5941 D00000 22 END(001) 81 F Running.

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Debug w sample p	ith a rogram	Debug by virtual external input	Debug by I/O break settings	Other debug functions



Double-click D0 on Watch Window. (Or, select D0 and press the Return key.)



Enter "0" in "Value", and press the Return key.

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 \sim

The value of D0 is changed to "0000 Hex".

First, initialize the value of the number of	of completed entries	(D0) (change the v	alue to 0).
--	----------------------	--------------------	-------------

PLC Name	Name	Address	Data Type / Format	Value	Comment	
NewPLC1		W0.00	BOOL (On/Off,Contact)	1	Car Entering Flag	
NewPLC1		100	CHANNEL [Hex.Channel]	0005 Hex	Completed Entries	
						_
						_

Set New Valu	ie	×
Address:	DO	<u>S</u> et Value
Value:	&5	Close
New <u>V</u> alue:	0	Edit Address/Tupe
0 to 65535		
		<u>Binary</u> >>

PLC Name	Name	Address	Data Type / Format	Value	Comment	
NewPLC1		W0.00	800L (Dr./Off.Contect)	1	Car Entering Flag	
NewPLC1		100	CHANNEL [Hex.Cha.nel]	D000 Hex	Completed Entries	



DWHEL Hex.Chare

DI

til a a a seet (seet) start)

invPLC1

For Heigh, press FT

1 010

COUTH

18

+

Debug by I/O break settings Other debug functions

4-4 Other Debug Functions

Running Program in the Unit of Step and Scan, Break Point Setting

If "Step run" is used, for instance, it is possible to inspect a sequence calling subroutine processing or check the values in progress from FOR to NEXT (Fig 1).

Also, when a break point is specified and "Scan run" is executed, it is possible to execute the program until the break point and then abort it. It enables you to restart the program execution from any line (Fig 2).

Step run: Executes a program per instruction.
Continuous step run: Executes instructions one by one automatically.
Pause: Aborts continuous step running temporarily.
Scan run: Executes one scan and then aborts.
Continuous scan run: Repeats the operation of one scan.

Step	Run		
<u>F</u> ile	<u>E</u> dit	<u>D</u> ebug <u>O</u> ptions	
Cyc	lic task	00(Startup)	
Π	Addr.	Instruction	
	0	LD 000000	
>	1	SBS(091) 0000	
	2	LD 000001	h
	3	OR 000002	
	4	OUT 000100 🔍	
	5	Section Marker	
	6	SBN(092) 0000	
	7	LD 000001	
	8	MOV(021) D00000 D0000	- Q
	9	RET(093)	μ
	10	END(001)	

Fig 1. Debug example by step running



Scan run



Fig 2. Debug example of break point

Chapter 5 Startup from CX-Simulator Menu

This chapter explains how to start and end CX-Simulator and how to set CX-Simulator for creating a virtual PLC in your PC.

Creating a virtual PLC from the CX-Simulator menu enables you to use the following functions. See the operation manual of CX-Simulator for the detailed operations.

- ·Serial communications for connecting with PT
- Network communications by network communications instructions
- ·Measurement of I/O refresh time with an I/O unit registered
- ·Display of message instructions or network communications instructions on your PC screen
- ·Record of the communications log of FINS Commands sent/received by a virtual PLC

[Start]

↓ [Programs] Saving/ending CX-Simulator

3-1 Starting CX-Simulator

Start up CX-Simulator from Windows.



The [Select PLC] and [CX-Simulator Debug Console] screens show up.



<u>File Beplay Help</u> ► ■ ■ ► ► > > ▲ 🕫 🗊 🚳	🖳 CX-Sim	iulator Debug Console	
	<u>File</u> <u>R</u> epla	ay <u>H</u> elp	
			c 🐵 😘

[Omron] ↓ [CX-Simulator] ↓ [CX-Simulator] Or double-click the CX-Simulator icon.



5-2 Creating Virtual PLC

Create a virtual PLC according to the contents of the [Select PLC] screen.











After checking that a virtual PLC is created, you can close the window.

It is the end of creating a virtual PLC.

Now the virtual PLC CS1H-CPU63 exists in your PC.

After a virtual PLC is created, [NETWORK] in [Status Settings] (above right) starts blinking.

The virtual PLC is created in your PC with the network address 1 and the node address 10. You can connect CX-Programmer and the virtual PLC by the exactly same procedure as the actual PLC.To connect to the virtual PLC from CX-Programmer, set the above addresses to the destination PLC.

CX-Simulator Console Display Settings

You can set display settings. Check [Always on Top] for your convenience.

	Console Display Settings
File Replay Help	Select Icon Size (valid from next boot)
Read all	Small icon (16*16)
<u>Save all</u>	C Large icon (32"32)
Work CX-Simulator	Event Action
Concelle Direllow Continent	Show a viewer automatically for Alarms
	Popup a window automatically for Messages
E <u>x</u> it system	
	Alarms Display
	Specify a program for Alarms (only Windows95/98)
	Browse
	└ Window Position
\langle	Always on To
	OK Cancel

Starting CX-Simulator	Creating a virtual PLC CX-Simulator
Select [File] [Work CX-Simulator] on the [Debug Console] screen.	5-3 Saving/Ending CX-Simulator Take the following procedure to save the data of a set virtual PLC and to end CX-Simulator.
Yes Yes Yes Yes	Standards Babagier Consecting to D Branders Latter Engres. Are yout takey post ware 1 to discovered #? Image: Degree ware 1 to discovered #? Image: Degree ware 1 to discovered #?