

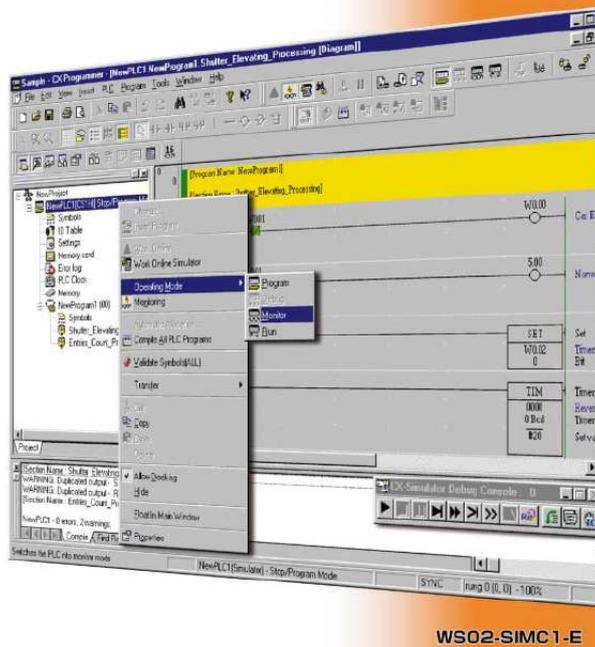


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You can read the recommendations in the user guide, the technical guide or the installation guide for OMRON CX-SIMULATOR. You'll find the answers to all your questions on the OMRON CX-SIMULATOR in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

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CX-Simulator *Introduction Guide*



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Manual abstract:

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. 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. @@@@ This program is used to explain how to use the debug functions of CX-Simulator, which are mentioned after Chapter 3. Starting CXProgrammer Opening a new project Creating a sample program Saving a program [Start] | [Programs] \ [Omron] \ [CX-Programmer] \ [CX-Programmer] Or double-click the CX-Programmer icon.

2-1 Starting CX-Programmer Start up CX-Programmer from Windows. The initial screen of CX-Programmer shows up. Starting CXProgrammer Opening a new project Creating a sample program Saving a program 2-2 New Project Opening and Device Type Settings Click the toolbar button [New] in CX-Programmer. Set the device type to "CS1H" and the CPU type to "CPU63" in this example. Click the left mouse button. Click the left mouse button. Click the left mouse button on the "Settings" button to show the [Device Type Settings] dialog. The PLC type is set. In this example, set "CS1H". The CPU type is set.

In this example, set "CPU63". Click the left mouse button on the spin control button and select a CPU type. Here is the end of the setting. Now CX-Programmer is ready for the connection with CX-Simulator. Click OK to decide the selected device type. Starting CXProgrammer Opening a new project Creating a sample program Saving a program 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. Upper limit SW (000001) Lower limit SW (000002) Normal rotation motor (000500) Reverse rotation motor (000501) Arrival detection sensor (000000) 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 CXProgrammer Opening a new project Creating a sample program Saving a program Completed Sample Program The program is modularized in two sections "Shutter elevating processing" and "Entries count processing" by the section function of CX-Programmer V2 or grater versions. Shutter elevating processing Since processing is simplified in the below program, it's different from the actual program. Entries count processing Starting CXProgrammer Opening a new project Creating a sample program Saving a program 2-4 Saving Program Save the created program. Here, save the program as "sample". Or select [File] \ [Save as] from the menu.

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 Program transfer to a virtual PLC Operation mode change of a virtual PLC Cycle time check in a virtual PLC

Ladder monitoring 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. Select the sample program created in Chapter 2.

Select "Sample". The sample program is loaded. Connecting to a virtual PLC Program transfer to a virtual PLC Operation mode change of a virtual PLC Cycle time check in a virtual PLC Ladder monitoring in a virtual PLC 3-2 Program Transfer to Virtual PLC Click the [Work Online Simulator] button. Or select [PLC] \ [Work Online Simulator] from the menu. The background color of Ladder Window changes to gray and online connection is established. Now a CX-Simulator virtual PLC and CX-Programmer have been connected. The Simulator Online function automatically shows the Transfer dialog after this and enables you to transfer the ladder program to the virtual PLC; however, you can change it to the setting of connection only in the option settings of CX-Programmer.



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Connecting to a virtual PLC Program transfer to a virtual PLC Operation mode change of a virtual PLC Cycle time check in a virtual PLC Ladder monitoring in a virtual PLC The Transfer dialog is automatically displayed. Connecting to a virtual PLC Program transfer to a virtual PLC Operation mode change of a virtual PLC Cycle time check in a virtual PLC Ladder monitoring 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) To stop running a program (Program mode) (Stop: Program mode) 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 Click the right mouse button on [NewPLC1] and select [Operating Mode]. Or Select [PLC] \ [Operating Mode] from the menu. Connecting to a virtual PLC Program transfer to a virtual PLC Operation mode change of a virtual PLC Cycle time check in a virtual PLC Ladder monitoring in a virtual PLC 3-4 Cycle Time Check in Virtual PLC Change the operating mode of a virtual PLC to the Monitor mode. Select [PLC] \ [Edit] \ [Cycle Time] from the menu of CX-Programmer. 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. 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 "Son Tool starts up. Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions Select [File] \ [Configuration] from the menu in the I/O Condition tool.

Select [File] \ [Configuration] in the I/O Condition tool. The [Configuration] screen of the I/O Condition tool is displayed. Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions 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. @@(2) Set "IO" to "Type". (3) Set "5.0" to "Address". (4) Set "=" to "Operator".

(5) Set "ON" to "Value". @@(2) Set "IO". (3) Set "5.0". (4) Set "=". @@@@ (4) Set "=" to "Operator". (5) Set "ON" to "Value". (6) Set the register button. (7) Click the button. @@(9) Set "IO" to "Type". (10) Set "0.2" to "Address". (11) Set "=" to "Operator". (12) Set "OFF" to "Value". @@(2)(9) Set "IO". (3) Set "0.1". (10) Set "0.2". (4)(11) Set "=".

(5) Set "ON". @@@@ Start the virtual PLC created in Chapter 3. @@@@ (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. Debug with a sample program Debug by virtual external input Debug by I/O break settings 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.

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 Debug by I/O break settings Other debug functions (1) Click "Register Word Condition". (2) Set "D" to "Type". (3) Set "0" to "Address". (4) Set "=" to "Operator". (5) Set "3" to "Value". (6) Press . (1) Click "Register Word" (2) Set "D" (3) Set "0" (4) Set "=" (5) Set "3" (6) Press OK Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions Check the formula registered in the list (Activate the formula). The setting is registered in a list (AND LIST). 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 Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions 4-3-3 Example of Program Debug Operation by Using IO Break Condition Double-click the sample program "Entries Count Process" and start monitoring in advance. To display Watch Window, press Alt 3 and together. Simulate car arrival and passing by using the Set On/Off functions of CX-Programmer.

Here, use Watch Window (IO Monitor function). Display Watch Window in advance. Run the virtual PLC in advance. Debug with a sample program Debug by virtual external input Debug by I/O break settings 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).



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00) in this sample program, enter these two addresses in Watch Window.

To register addresses, use Drag & Drop function from Ladder Window. Drag & Drop 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".) Click the icon in Debug Console. Debug with a sample program 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.) First, initialize the value of the number of completed entries (D0) (change the value to 0).

Enter "0" in "Value", and press the Return key. The value of D0 is changed to "0000 Hex". Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions Double-click W0.00 on Watch Window. Pause by IO Break (Pseudo Input of Car Arrival/Car Passing) Set W0.00 on for simulating the car arrival operation. Enter "1" (Set) in "Value" and press the Return key. The number of completed entries (D0) is incremented to "0001 Hex". Double-click W0.00 in Watch Window.

Set W0.00 off for simulating the car passing operation. Repeat until the value of D0 turns "0003". Enter "0" (Set Off) and press the Return key. When the number of completed entries (D0) turns "0003", the message shown bottom of the Step Rung view is changed to "Pause by IO break", and the program execution is aborted.

Debug with a sample program Debug by virtual external input Debug by I/O break settings Other debug functions 4-4 Other Debug Functions Scan run 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. Continuous scan run Show Step run Continuous step run Step run Pause Break point Fig 1. Debug example by step running 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. @@@@@this time. @@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. Starting CX-Simulator Creating a virtual PLC Saving/ending 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. .



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